LIEBHERR

Crawler crane with lattice mast

LR 11000

LR 11000-001

Operating instructions

BAL No.: 23501-05-02

Serial No.	
Date	

ORIGINAL OPERATING INSTRUCTIONS

The operating instructions are part of the crane!

They must always be available within reach!

The regulations for crane operation must be observed!

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Preface

Manufacturer

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California Proposition 65

Proposition 65 of the US State of California warns against chemicals that are known to cause cancer, birth defects and other reproductive harm.

For additional information, see the website: **www.P65Warnings.ca.gov**.

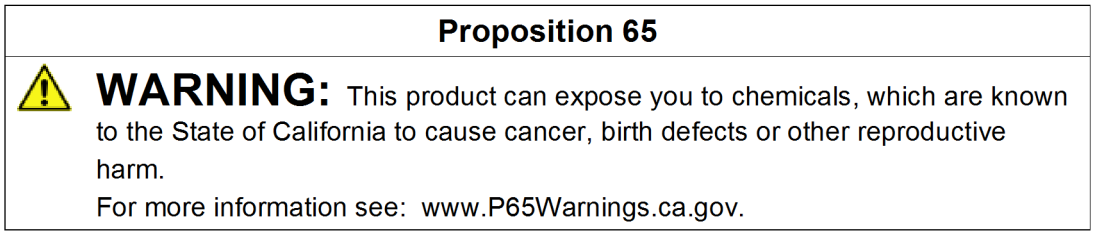

Fig.147844: Example of a Proposition 65 sign for USA: Chemicals

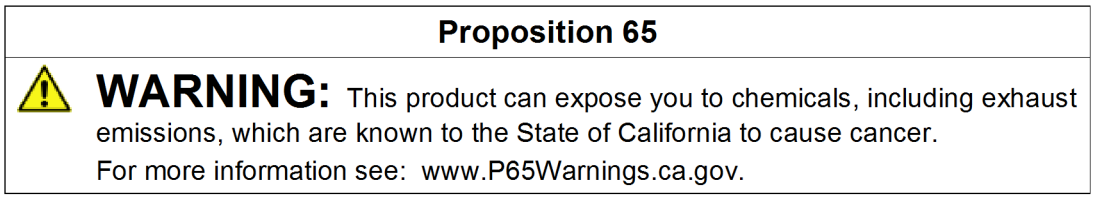

Fig.147842: Example of a Proposition 65 sign for USA: Exhaust emissions

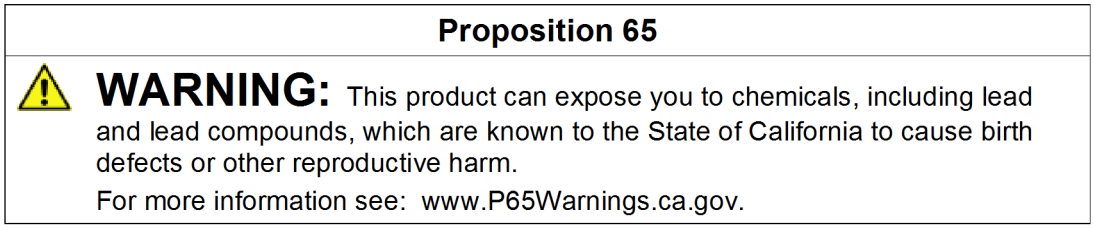

Fig.147843: Example of a Proposition 65 sign for USA: Lead and lead compounds

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General

This crane was built according to the state of technology and recognized safety technical regulations. Despite that, danger to body and life for the user and / or third persons or damage to the crane and / or other material assets is still possible.

This crane may only be used:
- when in a perfect technical condition.
- for destined use.
- by trained personnel, which acts in a safety and danger conscious way.
- when no safety relevant problems are present.
- when no modifications were made on the crane.

Any problems, which could affect safety must be fixed immediately.

Modifications on the crane may only be made with written approval by Liebherr-Werk Ehingen GmbH.

Data logger

This crane is equipped with a data recording device. Among others, the following data is recorded:
- Date and time of day
- Entered set up configuration of the crane
- Actual load
- Percentage of crane utilization
- Boom radius (working radius)
- Main boom angle, luffing jib angle
- Total telescopic boom length, length of each telescopic section
- Every actuation of bypass devices

The recorded data can be read with a respective software.

Safety and warning display

The safety and warning display is directed to all persons who work with the crane.

The terms **DANGER**, **WARNING**, **CAUTION** and **NOTICE** used in the crane documentation are intended to point out certain rules of conduct to all persons working with the crane.

Warning signs	Signal word	Explanation
	DANGER	Designates a dangerous situation which will lead to death or serious injury if it is not prevented. [1)]
	WARNING	Designates a dangerous situation, which can lead to death or serious injury if it is not prevented. [1)]
	CAUTION	Designates a dangerous situation, which can lead to slight or medium-grade injuries if it is not prevented. [1)]
	NOTICE	Designates a dangerous situation, which can lead to property damage if it is not prevented.

[1)] This could also result in property damage.

Additional notes

The term **Note** is used in the crane documentation to make all persons working with the crane aware of useful information and tips.

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Sign	Signal word	Explanation
	Note	Designates useful information and tips.

Crane documentation

The crane documentation is comprised of:
- all supplied documents on paper and in digital form.
- all supplied programs and applications.
- all subsequently supplied information, updates and addenda for the crane documentation.

The crane documentation:
- makes it possible for you to operate the crane safely.
- supports you in using the permissible application possibilities of the crane.
- provides you with information about the functionality of important components and systems.

Note
Terminology in the crane documentation.
Certain expressions are used in the crane documentation.
▶ In order to avoid misunderstandings, the same expressions should always be used.

Translations from the German version of the crane documentation: The crane documentation has been translated to be best of one's knowledge. Liebherr-Werk Ehingen GmbH assumes no liability for translation errors. The German version of the crane documentation is solely applicable for factual accuracy. If you find any errors or if any misunderstandings arise when reading the crane documentation, please contact Liebherr-Werk Ehingen GmbH immediately.

WARNING
Danger of accident due to incorrect operation of the crane!
Incorrect operation of the crane can lead to accidents.
Death, severe bodily injuries, property damage.
▶ Only authorized and trained expert personnel are permitted to work on the crane.
▶ The crane documentation is part of the crane and must be accessible on the crane.
▶ The crane documentation and on-site regulations and specifications (such as accident prevention regulations) must be observed.

Using the crane documentation:
- **makes it easier** to become familiar with the crane.
- **avoids** problems due to improper operation.

Observing the crane documentation:
- **increases** reliability in use.
- **extends** the service life of the crane.
- **minimizes** repair costs and downtime.

Place the crane documentation accessible in the driver's cab or in the crane cab.

WARNING
Outdated version of crane documentation!
If subsequently supplied information, updates and addenda to the crane documentation are not observed and added, there is a danger of accident.
Death, severe bodily injuries, property damage.
▶ Observe and add all subsequently supplied information, updates and addenda for the crane documentation.
▶ Make sure that all affected persons always know and understand the latest version of the crane documentation.

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WARNING
Crane documentation is not understood!
If parts of the crane documentation are not understood and the tasks are carried out on or with the crane, then there is a danger of accident.
Death, severe bodily injuries, property damage.
▶ Clear up open questions regarding the crane documentation with Liebherr Service before carrying out the respective task.

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All accident prevention guidelines, operating instructions, load charts etc. are based on the destined use of the crane.

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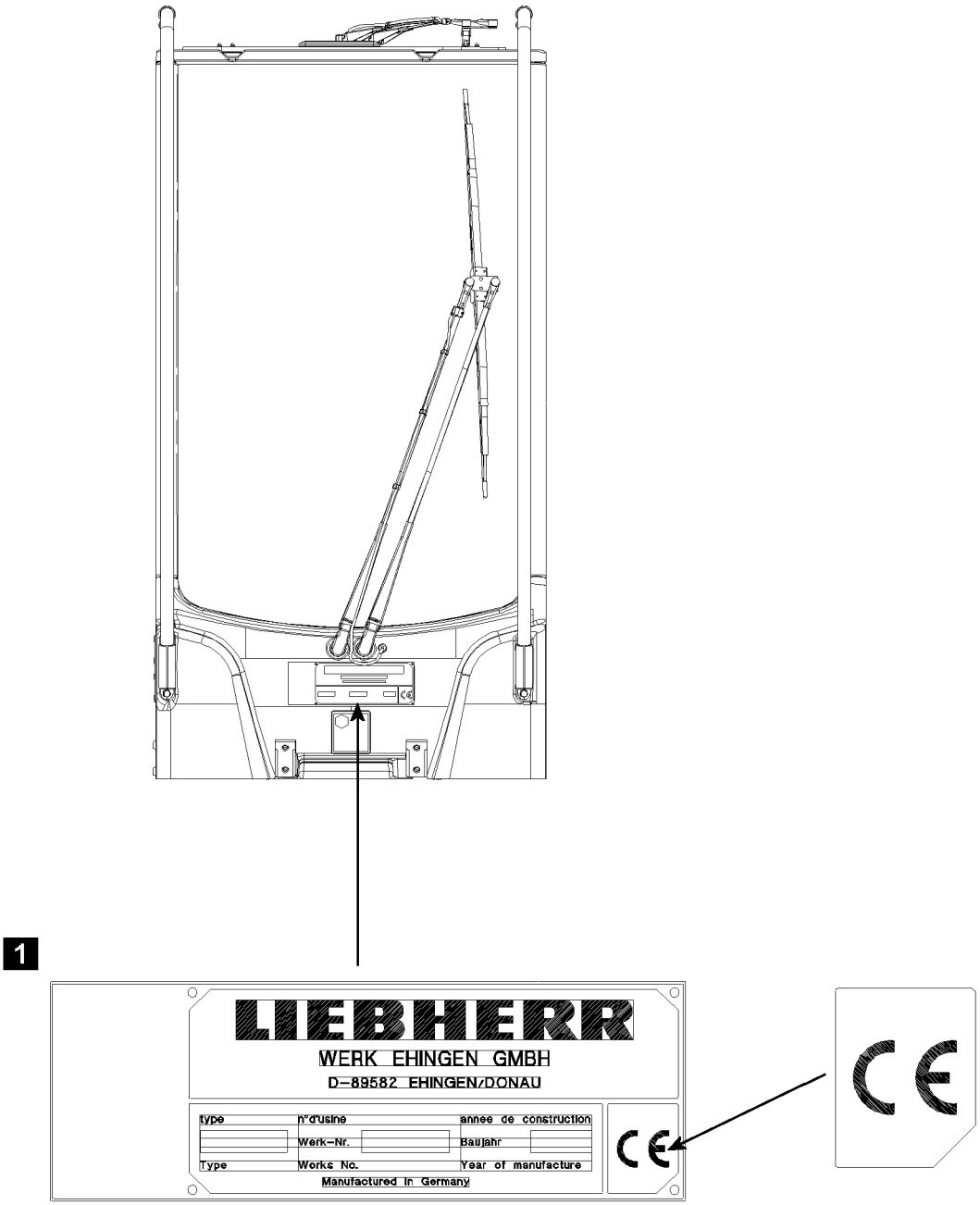

Fig.110001

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CE marking

The CE marking is a mark according to EU laws:
- Cranes with CE-marking are compliant with the European Directives applicable at the moment of placing the cranes on the market, and in particular European machinery directive 2006/42/EC and product standard EN 13000! Data tag Crane with CE-marking, see illustration **1**.
- Cranes that are operated outside the respective area of application of the European machinery directive do not require a CE marking. Data tag Crane without CE marking, see illustration **2**.
- It is prohibited to market and operate cranes without a CE marking, which do not meet the product-specific regulations valid in Europe, when a CE marking is specified for the country, especially in the single European market.
- It is prohibited to operate cranes with a tipping load utilization of 85 % or a bypass device that does not comply with EN 13000 within the European Union or in countries that only permit a lower tipping load utilization! The national regulations apply. These cranes may not have a CE marking.

EU Declaration of Conformity

Upon delivery of the equipment with a CE marking, the EU Declaration of Conformity according to Directive 2006/42/EC is provided directly after the cover sheet. The EU Declaration of Conformity is valid in the following form and language in all countries of the European Union, as well as in countries that recognise the Directives of the European Union. Keep the EU Declaration of Conformity in a safe place.

Note
- ▶ This declaration of conformity is only valid when this mobile crane meets the directives and standards stated in this EU Declaration of Conformity. This applies especially for the programming and function of the safety-relevant overload protection. The CE sign must be removed if changes were made on the crane, which do not conform to the stated directives and standards. These include in particular a tipping load utilization (85 % load charts) that are not permissible in Europe and a changed version of the bypass device for the overload protection.
- ▶ If this modified mobile crane is re-imported later into a country which is within the validity range of the EC machine directive, then the importer is responsible for the verification and the written confirmation, that the condition of the mobile crane at importation into the EC meets the directives and standards, which are stated in this declaration of conformity.
- ▶ The complete crane documentation must be complete and present in the official language of the community of the member state, in which the machine is placed into service and / or where it is operated.
- ▶ For the verification and confirmation we recommend that the importer contacts the crane manufacturer or a person authorized by him.
- ▶ After writing confirmation of the importer on the mobile crane manufacturer, the mobile crane may be labelled again with a CE label and the EU Declaration of Conformity become valid again. For this crane the directives and standard valid at initial delivery consequently continue to apply.

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EU Declaration of conformity

If changes are made to the equipment that were not approved in writing by Liebherr-Werk Ehingen GmbH, then this EU declaration of conformity becomes invalid.
Also observe the note regarding validity on the back of the page.

Type of machine:	**Mobile crane**
Type:	**XXX**
Serial No.:	**XXX**
Year of construction:	**XXX**
Power output of the diesel engine:	**XXX kW / XXX rpm**
L_{WA} measured[1)]:	**XXX dB**
L_{WA} guaranteed[1)]:	**XXX dB**

We herewith declare that the above declared machine in its delivery condition complies with all relevant provisions of the following EU Directives:

- **Directive 2006/42/EC of the European Parliament on machinery**
- **Directive 2005/88/EC of the European Parliament amending the Directive 2000/14/EC relating to noise emission[1)]**
- **Directive 2014/53/EU of the European Parliament relating to the making available on the market of radio equipment**

Applied harmonized standards:

EN 13000:2010 + A1:2014 Cranes – Mobile cranes

Applied evaluation procedure according to Annex VIII of Directive 2000/14/EC
Name of the notified body:

TÜV Rheinland LGA Products GmbH, D-90014 Nürnberg, Identification No.: 0197

Authorized agent for the compilation of the technical documentation:

Head of Design Department
Dr.-Hans-Liebherr-Straße 1
89584 Ehingen/Donau

[1)] during crane operation

Ehingen

_____
(Head of Design Department)

Liebherr-Werk Ehingen GmbH
Dr.-Hans-Liebherr-Straße 1
89584 Ehingen
Germany
04.07.2017_en

Fig.147811-en: Reprint of the crane's EU Declaration of Conformity

Intended use

The intended use of the crane consists solely in the vertical lifting and lowering of free and unfixed loads, whose weight and center of gravity are known.

To do so, a hook or hook block approved by Liebherr must be reeved on the hoist rope and it may only be operated within the permissible set up configurations.

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Driving with the crane, with or without an attached load is only permissible if a corresponding driving or load chart is available. The set up configurations intended for it and the safety conditions must be observed according to the corresponding crane documentation.

Any other use or any other exceeding utilization is **not** destined use.

Destined use also includes the adherence of the required safety guidelines, conditions, prerequisites, set up conditions and working steps in the crane documentation (for example: Operating instructions, load charts, erection and take down charts, job planner).

The manufacturer is **not** liable for damage caused by non-destined use or improper use of the crane. Any associated risk it is carried solely by the owner, the operator and the user of the crane.

Non-destined use

Non-destined use is:
- Working outside the permissible set up configurations according to the load chart.
- Working outside the permissible boom radii and slewing ranges according to the load chart.
- Selecting load charts, which do not correspond to the actual set up configuration.
- Selection of a set up configuration via code or via manual entry, which does not correspond to the actual set up configuration.
- Working with bypassed / deactivated safety equipment, for example bypassed load torque limiter or with bypassed hoist limit switch.
- Increasing the boom radius of the lifted load after a LMB shut-off, for example by diagonally pulling the load.
- Using the support pressure display as information in order to utilize the crane up to the tipping limit!
- Use of equipment parts which are not approved for the crane.
- Operation of the crane in an area exposed to explosion hazards.
- Using the crane at sports and recreational events, especially for "Bungee" jumps and / or "Dinner in the sky".
- On-road driving in an impermissible travel condition (axle load, dimension).
- Driving with the equipment in place in an impermissible travel condition.
- Pushing, pulling or lifting loads with the level control, the sliding beams or the support cylinders.
- Pushing, pulling or lifting loads by actuating the slewing gear, the luffing gear or the telescoping gear.
- Ripping stuck objects loose with the crane.
- Utilizing the crane for a longer period of time for material handling tasks.
- Releasing the crane suddenly (grapple or dumping operation).
- Utilizing the crane when the weight of the load is suspended on the crane is changed, for example by filling a container suspended on the load hook, except:
  - The load torque limiter was checked before for function with a known load.
  - The crane cab is occupied.
  - The crane is operational.
  - The container size is selected in such a way that an overload of the crane with full load is eliminated within the valid utilized load chart.

The crane may **not** be used for:
- Fastening a stuck load for which the weight and center of gravity are not known and which is released only by flame cutting, for example.
- Letting persons drive along outside the driver’s cab.
- Letting persons drive along outside the crane cab.
- Transporting personnel in the crane cab while driving.
- Transporting personnel with the load handling equipment and on the load.
- Transporting of persons with work baskets (cherry pickers), if the national regulations of the responsible work safety organization are not observed.
- Transporting loads and objects on the crane chassis.
- Transporting loads and objects on the crane superstructure.
- Transporting loads and objects on the ballast trailer.
- Transporting loads and objects on the suspended ballast.
- Transporting loads and objects on the boom lattice sections and / or the crane boom.
- Two hook operation without auxiliary equipment.

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- Extended material handling operation.
- Crane operation on a floating device if the conditions in chapter „Crane on a floating device“ are not fulfilled and the written release by **Liebherr Werk Ehingen GmbH** is not present.

The crane documentation must be read and used by all persons who are involved in use, operation, assembly and maintenance of the crane.

Ambient temperature

The crane is designed for an ambient temperature of -20 °C to +50 °C.

If the ambient temperature is lower than -20 °C the crane must be modified with „auxiliary equipment for working at low temperatures“.

WARNING
Working at low temperatures without the corresponding auxiliary equipment!
The crane components can be damaged and fail. The load can rip off.
Death, severe bodily injuries, property damage.

If the crane is operated at an ambient temperature lower than -20 °C:
▶ Make sure that the crane is equipped with the corresponding „auxiliary equipment for working at low temperatures“. Observe and comply with chapter 2.08.
▶ Use the operating fluids for the corresponding ambient temperature in time. Observe and comply with chapter 7.07.

Safety equipment

Special attention must be paid to the safety equipment built into the crane. The safety equipment must constantly be checked for functionality. The crane may not be operated if the safety equipment are not working or not working correctly.

Note
Your motto must always be:
▶ **Safety first!**

The crane has been built in accordance with the applicable regulations for crane operation and travel operation and has been approved by the relevant authorities.

Equipment and spare parts

WARNING
Danger of fatal injury if original equipment parts are **not** used!
If the crane is operated with **not** original equipment parts, the crane can fail.
Death, severe bodily injuries, property damage.
▶ Operate the crane only with original equipment parts!
▶ Crane operation with equipment parts, which do **not** belong to the crane is prohibited!
▶ If there is any doubt about the origin of equipment parts, contact Liebherr Service!

WARNING
The crane permit and the manufacturer’s warranty will become void!
If any original installed parts are modified, manipulated or replaced (e.g. removal of parts, installation of non-original Liebherr parts), both the crane permit and the manufacturer’s warranty will become void.
▶ Leave installed original parts unchanged.
▶ Do not remove installed original parts.
▶ Use only Original Liebherr spare parts.
▶ If there is any doubt about the origin of spare parts, contact Liebherr Service.

For ordering equipment and spare parts, always keep the crane number handy and provide it.

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Definition of directional data for mobile cranes

Driving forward: Driving with the driver's cab on the front.

Driving in reverse: Driving with the taillights of the crane chassis on the front.

Front, **rear**, **right**, **left** in the **driver's cab** refer to the crane chassis. The driver's cab is always in the front.

Front, **rear**, **right**, **left** in the **crane cab** refer to the crane superstructure. Front is always in direction of the placed down boom.

0° crane superstructure slewing angle: The boom points in the longitudinal direction to the rear past the rear of the vehicle.

180° crane superstructure slewing angle: The boom points in the longitudinal direction to the front past the driver's cab.

Definition of directional data for crawler cranes

Driving forward driving forward from the view of the crane operator seated in the crane cab. Turntable in 0° or 180° position.

Driving reverse driving backward from the view of the crane operator seated in the crane cab. Turntable in 0° or 180° position.

Front, **rear**, **right**, **left** always orient themselves on the **crawler travel gear** from the position of the chain tension devices. The chain tension devices on the crawler travel gear are always on the front.

Front, **rear**, **right**, **left** refer to the direction of view of the crane operator seated in the **crane cab**. Front is always in direction of the placed down boom.

Optional equipment and functions

The equipment marked with ***** and the functions are optionally available and are **not** part of the standard crane (optional equipment).

Conversion chart

	Initial unit	Multiplication factor	Target unit
Length	mm	0.03937	in
	in	25.4000	mm
	mm	0.00328	ft
	ft	304.8	mm
	cm	0.39370	in
	in	2.5400	cm
	cm	0.0328	ft
	ft	30.48	cm
	m	39.37	in
	in	0.0254	m
	m	**3.281**	**ft**
	ft	**0.3048**	**m**
	km	0.62137	mile
	mile	1.6093	km

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	Initial unit	Multiplication factor	Target unit
Area	cm^2	0.155	in^2
	in^2	6.4516	cm^2
	m^2	**10.764**	**ft^2**
	ft^2	**0.0929**	**m^2**
Volume	cm^3	0.06102	in^3
	in^3	16.387	cm^3
	m^3	35.3147	ft^3
	ft^3	0.0283	m^3
	l	0.001	m^3
	m^3	1000	l
	l	61.024	in^3
	in^3	0.016387	l
	l	0.0353	ft^3
	ft^3	28.32	l
	l	0.264178	US. liq. gal
	US. liq. gal	3.7853265	l
Mass (weight)	kg	2.20462	lb
	lb	0.45359	kg
	t	**2204.62**	**lb**
	lb	**0.0004536**	**t**
	t	1.1023	short ton US (tn. sh.)
	short ton US (tn. sh.)	0.90718	t
	t	**0.45359**	**kip**
	kip	**2.20462**	**t**
Mass / length	kg/m	0.055998	lb/in
	lb/in	17.857781	kg/m
	kg/m	0.67197	lb/ft
	lb/ft	1.48816	kg/m
Force	N	0.2248	lbf
	lbf	4.4483986	N
	kN	**224.809**	**lbf**
	lbf	**0.0044483986**	**kN**
Turning moment	Nm	8.85075	lbf·in
	lbf·in	0.112984	Nm
	Nm	0.73756	lbf·ft
	lbf·ft	1.3559	Nm
Performance	HP (DIN HP)	0.7355	kW
	kW	1.3596	HP (DIN HP)

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	Initial unit	Multiplication factor	Target unit
Speed	m/s	39.37	in/s
	in/s	0.0254	m/s
	m/s	**3.28084**	**ft/s**
	ft/s	**0.3048**	**m/s**
	km/h	0.62137	mph (mi/h)
	mph (mi/h)	1.60935	km/h
	m/s	2.2369	mph (mi/h)
	mph (mi/h)	0.44704	m/s
Pressure	kPa (kN/m²)	0.01	bar
	bar	100	kPa (kN/m²)
	bar	14.5038	psi
	psi	0.06895	bar
	kPa (kN/m²)	**0.145038**	**psi**
	psi	**6.894759**	**kPa (kN/m²)**
	N/cm²	1.450377	psi
	psi	0.6894759	N/cm²
	N/m²	0.000145038	psi
	psi	6894.759	N/m²
	t/m²	204.81	lbs/ft²
	lbs/ft²	0.0048828	t/m²
Load-related area	m²/t	0.004882	ft²/lbs
	ft²/lb	204.81	m²/t
Temperature	**°C**	**([°C] · 1.8) + 32**	**°F**
	°F	**([°F] - 32) / 1.8**	**°C**

Conversion chart

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2 Safety

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1 Description of crane

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1.01 Terminology

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1 Component overview crawler travel gear

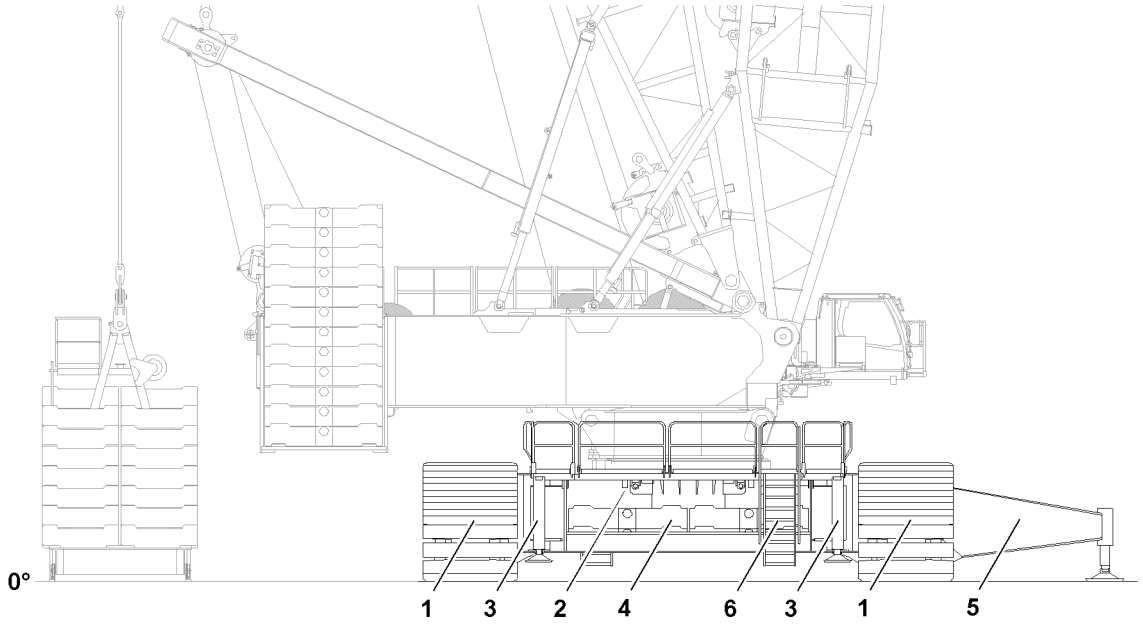

Fig.146670: Component overview crawler travel gear

1 Crawler carrier
2 Crawler center section
3 Hydraulic assembly support
4 Central ballast
5 Mechanical auxiliary support
6 Access / railing / catwalk

2 Turntable component overview

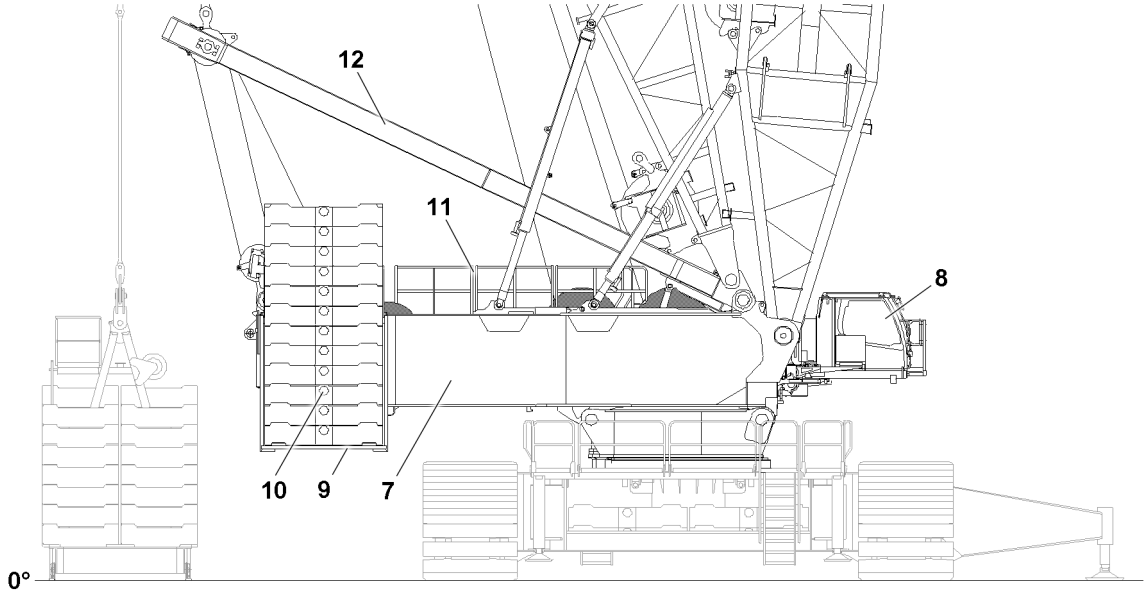

Fig.146671: Turntable component overview

7 Turntable
8 Crane cab
9 Counterweight bracket
10 Counterweight
11 Turntable railing
12 SA-frame

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3 Component overview of turntable with turntable extension

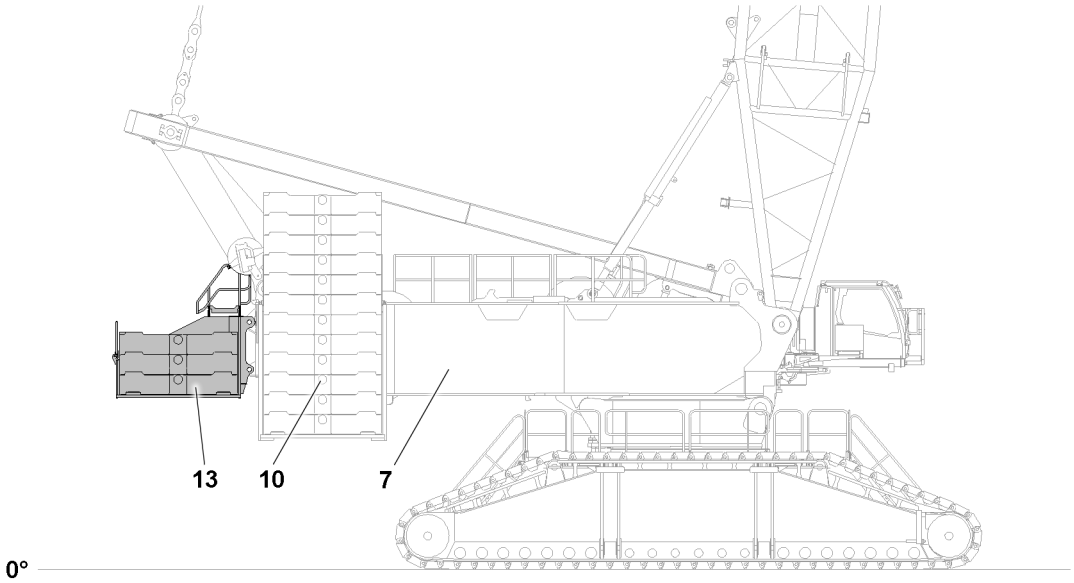

Fig.154210: Component overview of turntable with turntable extension

7 Turntable
10 Counterweight
13 Turntable extension with counterweight

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4 Winch component overview

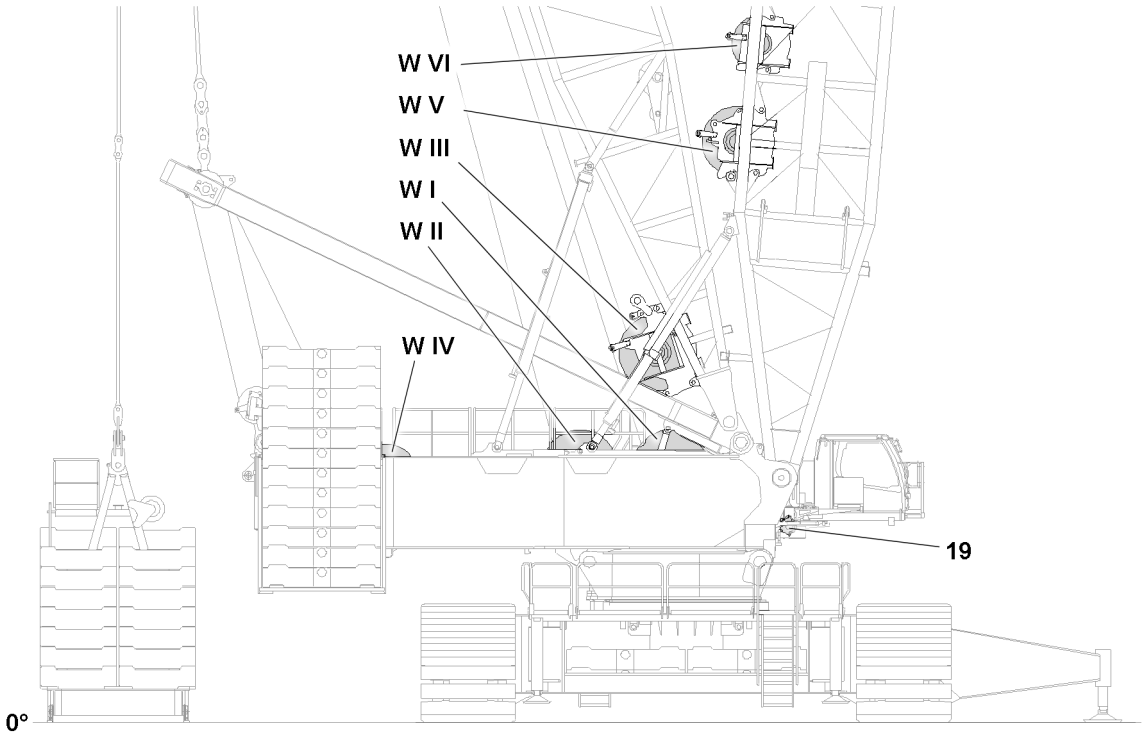

Fig.146736: Winch component overview

W I Winch 1
W II Winch 2
W III Winch 3
W IV Winch 4
W V Winch 5
W VI Winch 6
19 Assembly winch

5 Derrick ballast component overview

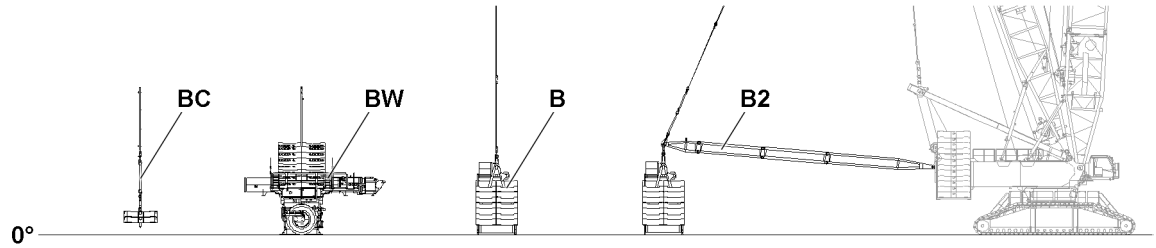

Fig.146737: Derrick ballast component overview

BC Derrick ballast - suspended ballast - special design Ballast Constant (BC)
BW Derrick ballast - ballast trailer
B Derrick ballast - suspended ballast
B2 Derrick ballast - suspended ballast with guide

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6 Ground connection

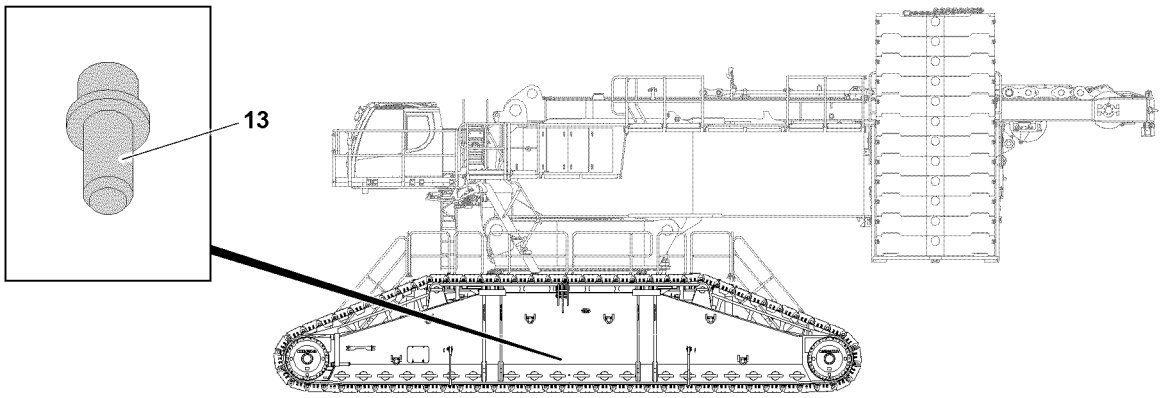

Fig.147682: Ground connection

13 Ground connection

Note

Ground the crane:

▶ Observe and adhere to the instructions in chapter 2.04.

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7 S2 // SL // SLF // SL3F-boom

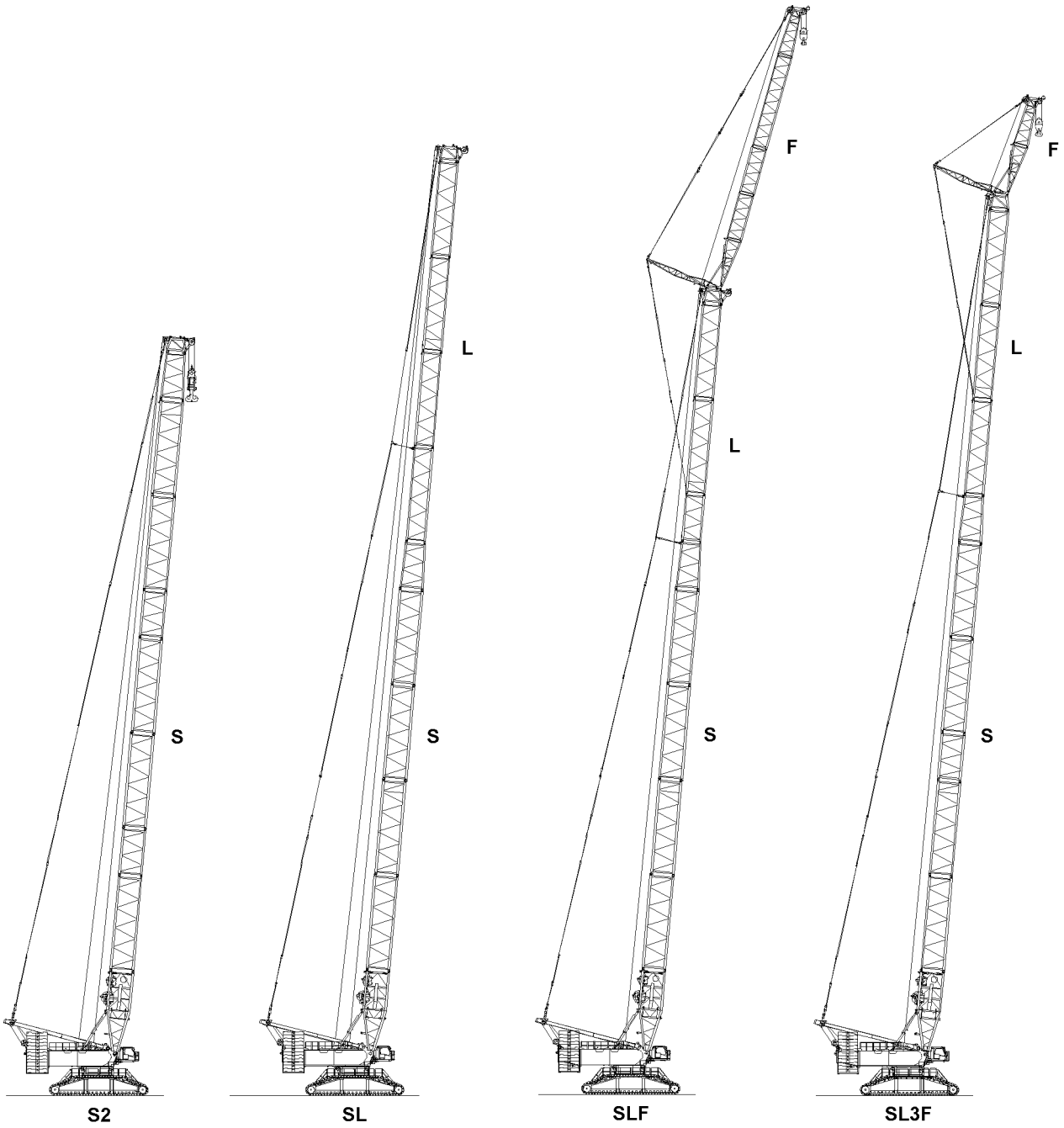

Fig.120894: S2 // SL // SLF / SL3F

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WARNING
The crane can topple over!
- ▶ Make sure that all boom systems are installed only according to the respective assembly chapter and the associated rod plans.
- ▶ Make sure that danger notes for assembly and for crane operation are observed and adhered to.
- ▶ Do not use the following boom illustrations for assembly purposes.

7.1 S2 boom combination

S2 Main boom
- Heavy version, supplemented on the bottom with reinforced lattice sections
- Variation **S2**

7.2 SL boom combination

SL Main boom
- Heavy-duty version, supplemented on top with light lattice sections **L**
- With roller set / roller sets on L-end section

7.3 SLF-boom combination

SL Main boom
- Heavy-duty version, supplemented on top with light lattice sections **L**
- With roller set / roller sets on L-end section

F Auxiliary boom
- With F-lattice sections and FA-frame

7.4 SL3F - boom combination

SL3 Main boom
- Heavy-duty version, supplemented on top with light lattice sections **L**
- With F-connector head
- Variation **SL3**

F Auxiliary boom
- With F-lattice sections and FA-frame

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8 SL8F2 // SL9-boom combination

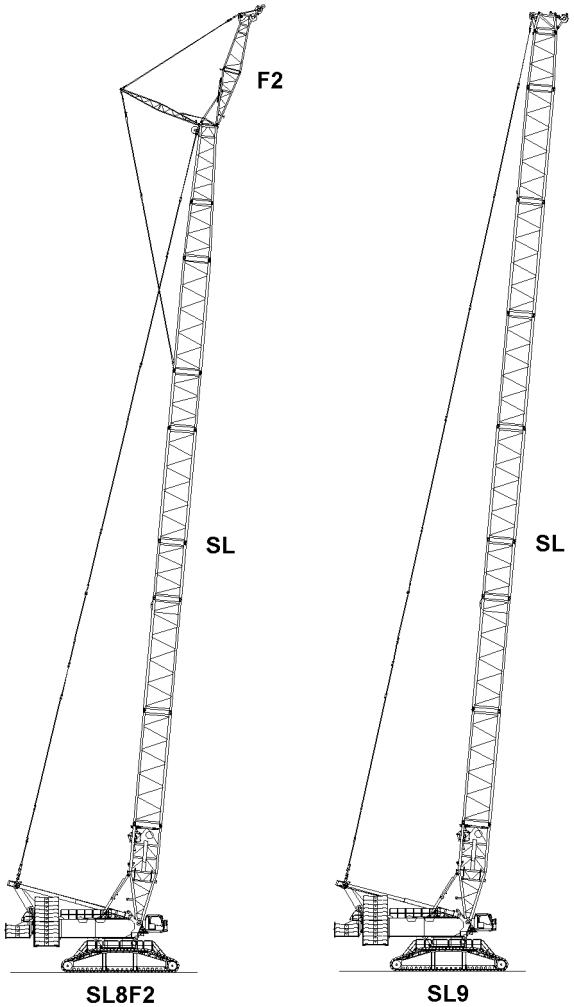

Fig.154206: SL8F2

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- ▶ Make sure that danger notes for assembly and for crane operation are observed and adhered to.
- ▶ Do not use the following boom illustrations for assembly purposes.

8.1 SL8F2-boom combination

Turntable
- With turntable extension

SL8 Main boom
- Heavy-duty version, supplemented on top with SL-reducer and F-connector head
- With F-connector head / F2-system
- Variation **SL8**

F2 Auxiliary boom
- With F-assembly unit / F2-system
- With F-frame / F2-system
- With F-pivot section / F2-system
- With F-intermediate section(s) / F2-system
- With F-end section / F2-system with integrated boom nose
- With F-guying / F2-system

8.2 SL9-boom combination

Turntable
- With turntable extension

SL9 Main boom
- Heavy-duty version, supplemented on top with L-end section
- Variation **SL9**

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9 SW1 - boom combination

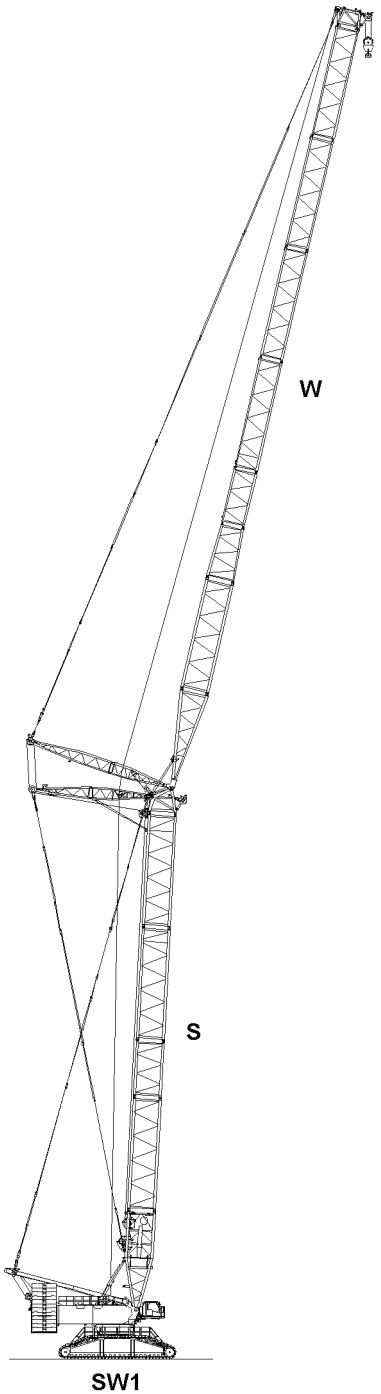

Fig.119469: SW1

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- ▶ Make sure that all boom systems are installed only according to the respective assembly chapter and the associated rod plans.
- ▶ Make sure that danger notes for assembly and for crane operation are observed and adhered to.
- ▶ Do not use the following boom illustrations for assembly purposes.

9.1 SW1 - boom combination

S Main boom
- Heavy-duty version

W1 Luffing lattice jib
- Heavy lattice section **S**, supplemented on top with light **L** lattice sections
- Short WA-frames
- Variation **W1**

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10 SDB/B2/BW // S2DB/B2/BW // SL2DB/B2/BW boom combination

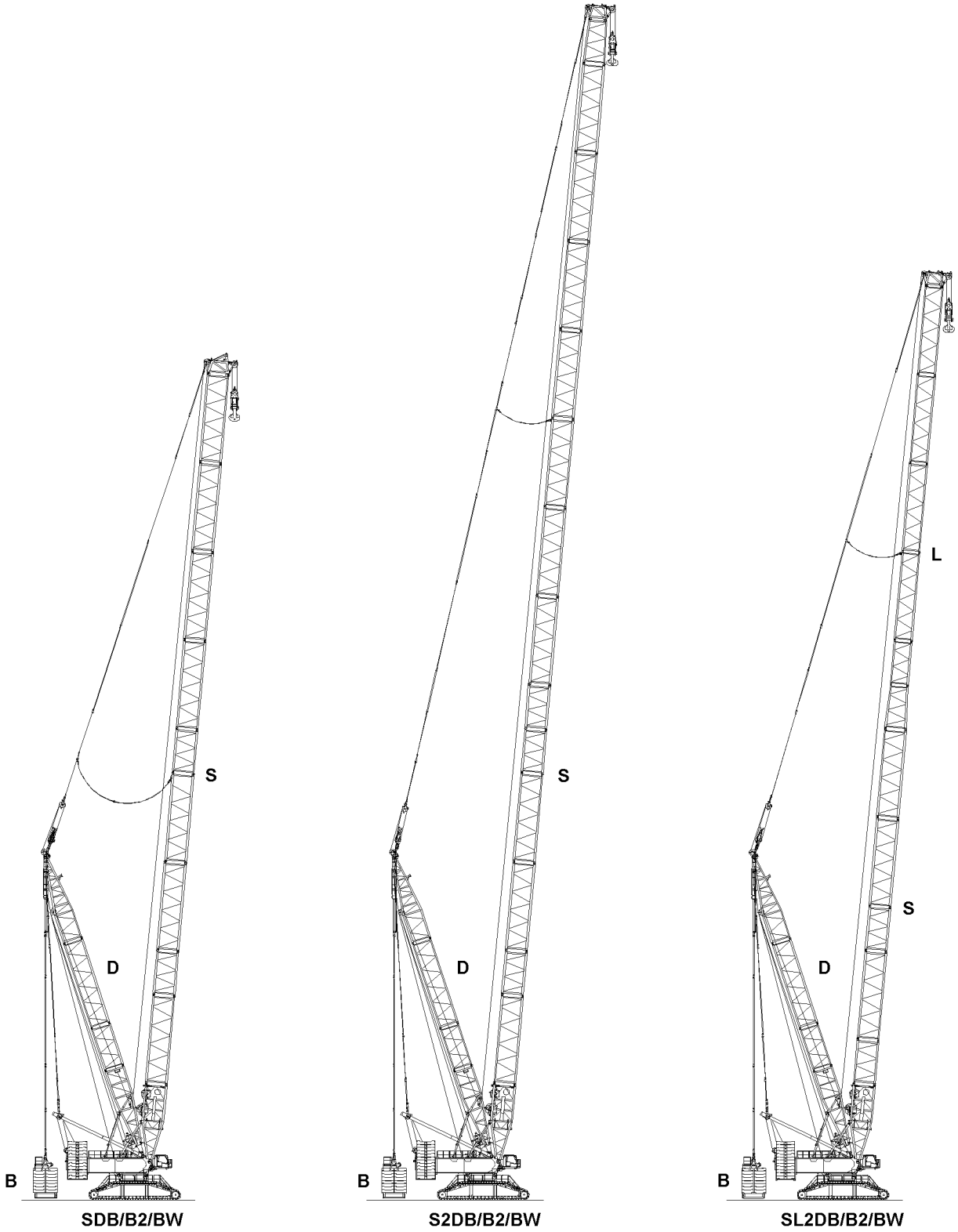

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Fig.120895: SDB/B2/BW // S2DB/B2/BW // SL2DB/B2/BW

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- ▶ Make sure that all boom systems are installed only according to the respective assembly chapter and the associated rod plans.
- ▶ Make sure that danger notes for assembly and for crane operation are observed and adhered to.
- ▶ Do not use the following boom illustrations for assembly purposes.

10.1 SDB/B2/BW-boom combination

S Main boom
- Heavy-duty version

D Derrick boom
- Alone as an assembly device or in connection with SD or SL2D

B Derrick ballast
- Suspended ballast

B2 Derrick ballast
- Suspended ballast with guide

BW Derrick ballast
- Ballast trailer

10.2 S2DB/B2/BW boom combination

S2 Main boom
- Heavy version, supplemented on the bottom with reinforced lattice sections
- Variation **S2**

D Derrick boom
- Alone as an assembly device or in connection with SD or SL2D

B Derrick ballast
- Suspended ballast

B2 Derrick ballast
- Suspended ballast with guide

BW Derrick ballast
- Ballast trailer

10.3 SL2DB/B2/BW boom combination

SL2 Main boom
- Heavy-duty version, supplemented on top with light lattice sections **L**
- With roller set / roller sets on L-end section
- Variation **SL2**

D Derrick boom
- Alone as an assembly device or in connection with SD or SL2D

B Derrick ballast
- Suspended ballast

B2 Derrick ballast
- Suspended ballast with guide

BW Derrick ballast
- Ballast trailer

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11 SL2DFB/BC/B2/BW // SL4DFB/BC/B2 boom combination

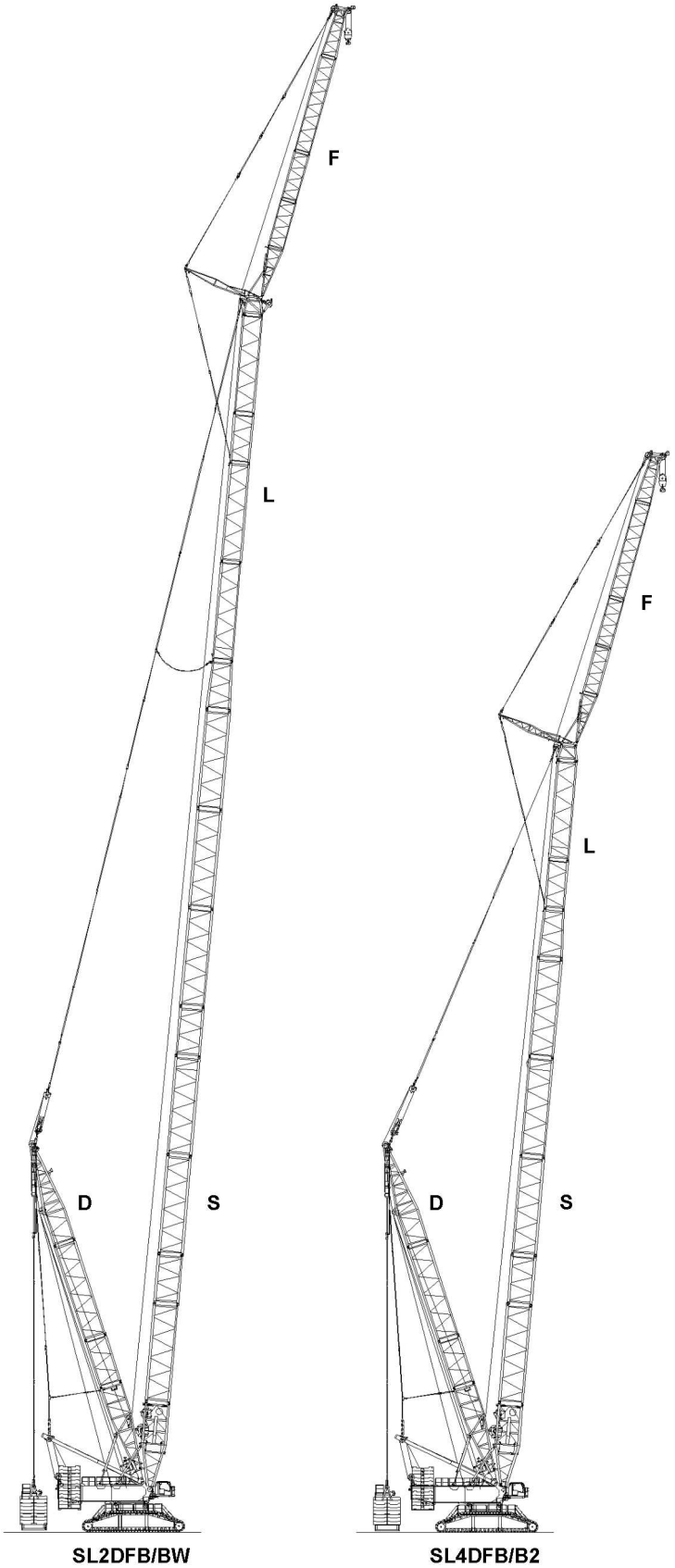

Fig.120896: SL2DFB/BC/B2/BW // SL4DFB/BC/B2

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- ▶ Make sure that all boom systems are installed only according to the respective assembly chapter and the associated rod plans.
- ▶ Make sure that danger notes for assembly and for crane operation are observed and adhered to.
- ▶ Do not use the following boom illustrations for assembly purposes.

11.1 SL2DFB/BC/B2/BW boom combination

SL2 Main boom
- Heavy-duty version, supplemented on top with light lattice sections **L**
- With roller set / roller sets on L-end section
- Variation **SL2**

D Derrick boom
- Alone as an assembly device or in connection with SD or SLD

F Auxiliary boom
- With F-lattice sections and FA-frame

B Derrick ballast
- Suspended ballast

BC Derrick ballast
- Suspended ballast - special design Ballast Constant
- Derrick ballast plates without suspended ballast pallet
- With or without cross beam

B2 Derrick ballast
- Suspended ballast with guide

BW Derrick ballast
- Ballast trailer

11.2 SL4DFB/BC/B2 boom combination

SL4 Main boom
- Heavy-duty version, supplemented on top with light lattice sections **L**
- With F-connector head
- Variation **SL4**

D Derrick boom
- Alone as an assembly device or in connection with SD or SLD

F Auxiliary boom
- With F-lattice sections and FA-frame

B Derrick ballast
- Suspended ballast

BC Derrick ballast
- Suspended ballast - special design Ballast Constant
- Derrick ballast plates without suspended ballast pallet
- With or without cross beam

B2 Derrick ballast
- Suspended ballast with guide

12 SL2RDB // SL4RDB-reconverted boom combination

Note
- ▶ Reconverted boom combination for crane driving.

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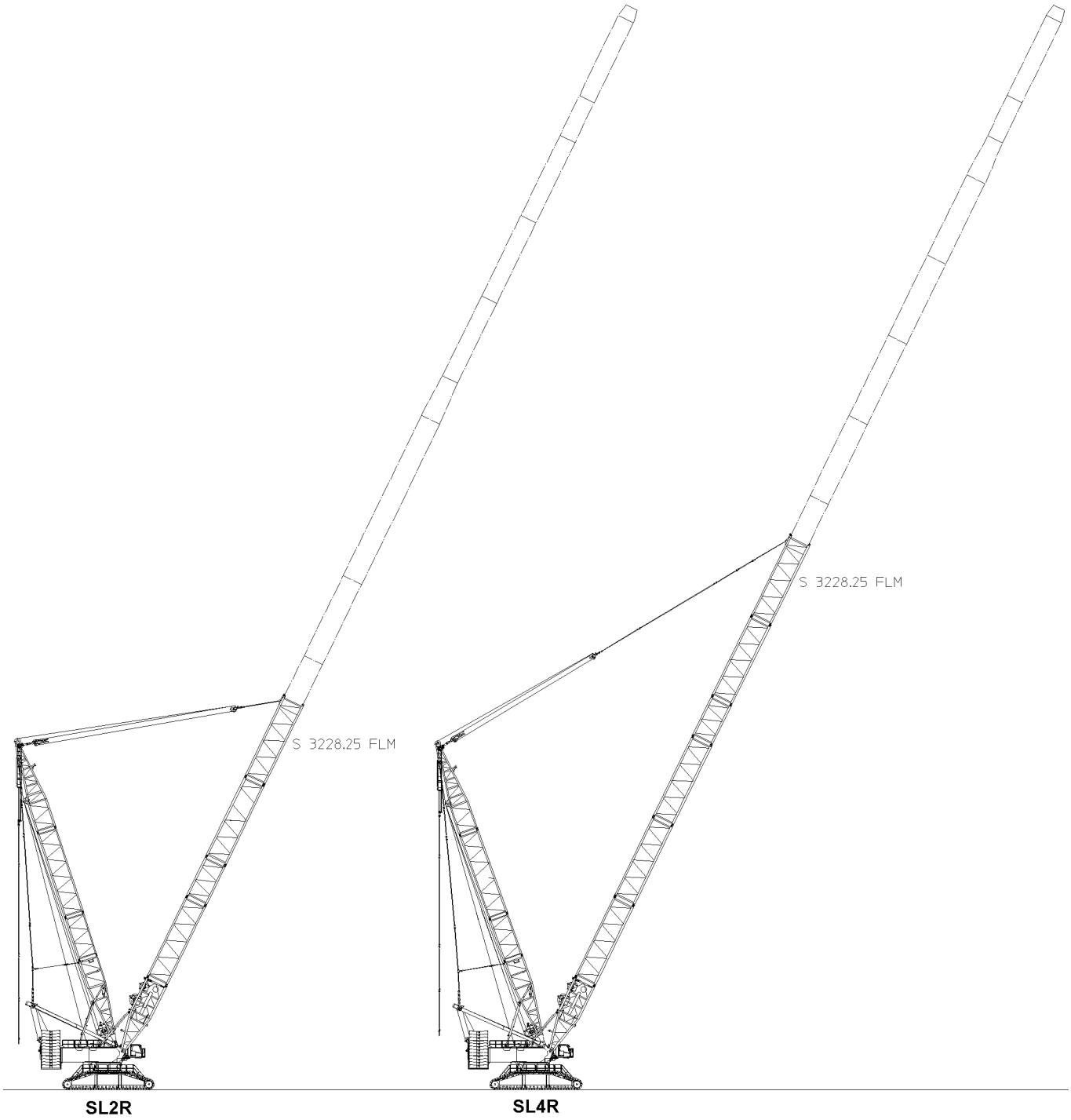

Fig.154216: SL2RDB // SL4RDB

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WARNING
The crane can topple over!
- ▶ Make sure that all boom systems are installed only according to the respective assembly chapter and the associated rod plans.
- ▶ Make sure that the danger notes regarding assembly are observed and complied with, see chapter 5.01.
- ▶ Make sure that the danger notes regarding driving the crane are observed and complied with, technical notes for crane operation with ballast trailer are observed and adhered to, see Crane operating instructions, chapter 4.10.
- ▶ Make sure that the boom system is reconverted depending on the initial boom length up to the flying assembly intermediate section, observe the rod plan.
- ▶ Make sure that the derrick ballast is disassembled.
- ▶ Observe the erection and take-down charts.
- ▶ Observe the load charts.
- ▶ Do not use the following boom illustrations for assembly purposes.

12.1 SL2RDB-reconverted boom combination

SL2R Main boom
- Heavy-duty version reconverted to S 3228.25 FLM
- Variation **SL2R**

D Derrick boom
- Alone as an assembly device or in connection with SL2RD
- With pull cylinders
- With guy rods
- **Without** derrick ballast

12.2 SL4RDB-reconverted boom combination

SL4R Main boom
- Heavy-duty version reconverted to S 3228.25 FLM
- Variation **SL4R**

D Derrick boom
- Alone as an assembly device or in connection with SL4RD
- With pull cylinders
- With guy rods
- **Without** derrick ballast

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13 SL6DFB/B2-boom combination

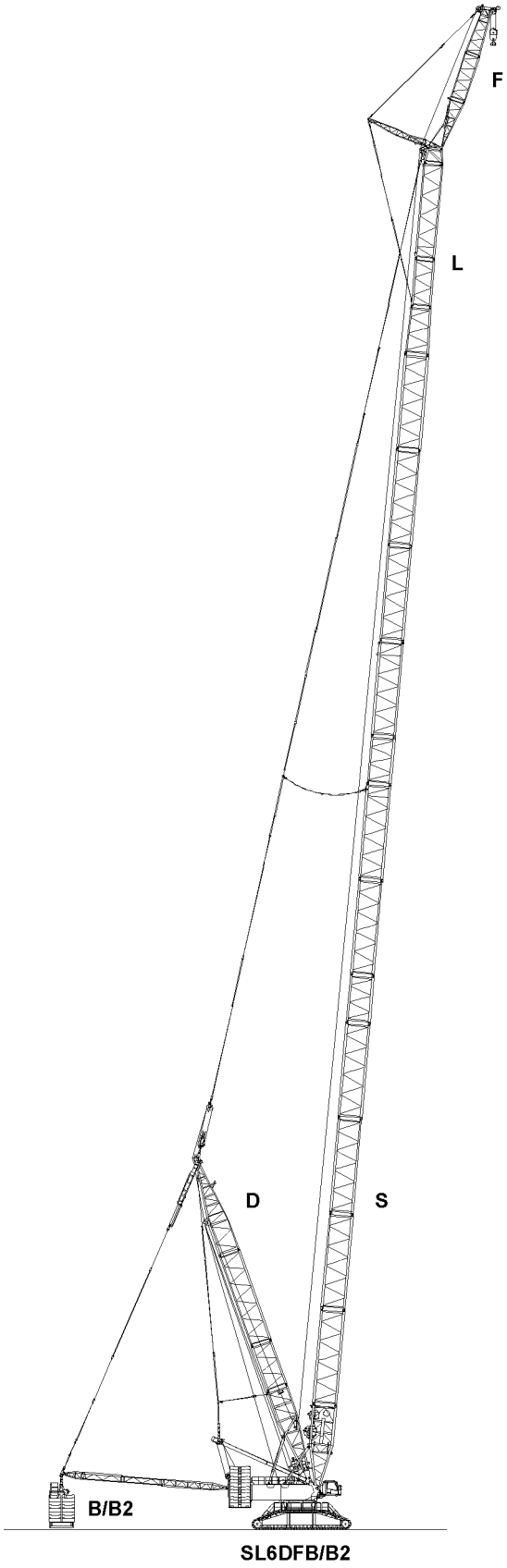

Fig.149990: SL6DFB/B2

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- ▶ Make sure that all boom systems are installed only according to the respective assembly chapter and the associated rod plans.
- ▶ Make sure that danger notes for assembly and for crane operation are observed and adhered to.
- ▶ Do not use the following boom illustrations for assembly purposes.

13.1 SL6DFB/B2-boom combination

SL6 Main boom
- Heavy-duty version, supplemented on top with light lattice sections **L**
- With F-connector head
- Variation **SL6**

D Derrick boom
- Alone as an assembly device or in connection with SD or SLD

F Auxiliary boom
- With F-lattice sections and FA-frame

B Derrick ballast
- Suspended ballast

B2 Derrick ballast
- Suspended ballast with guide

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14 SL5DB/B2 // SL7DB/B2-boom combination

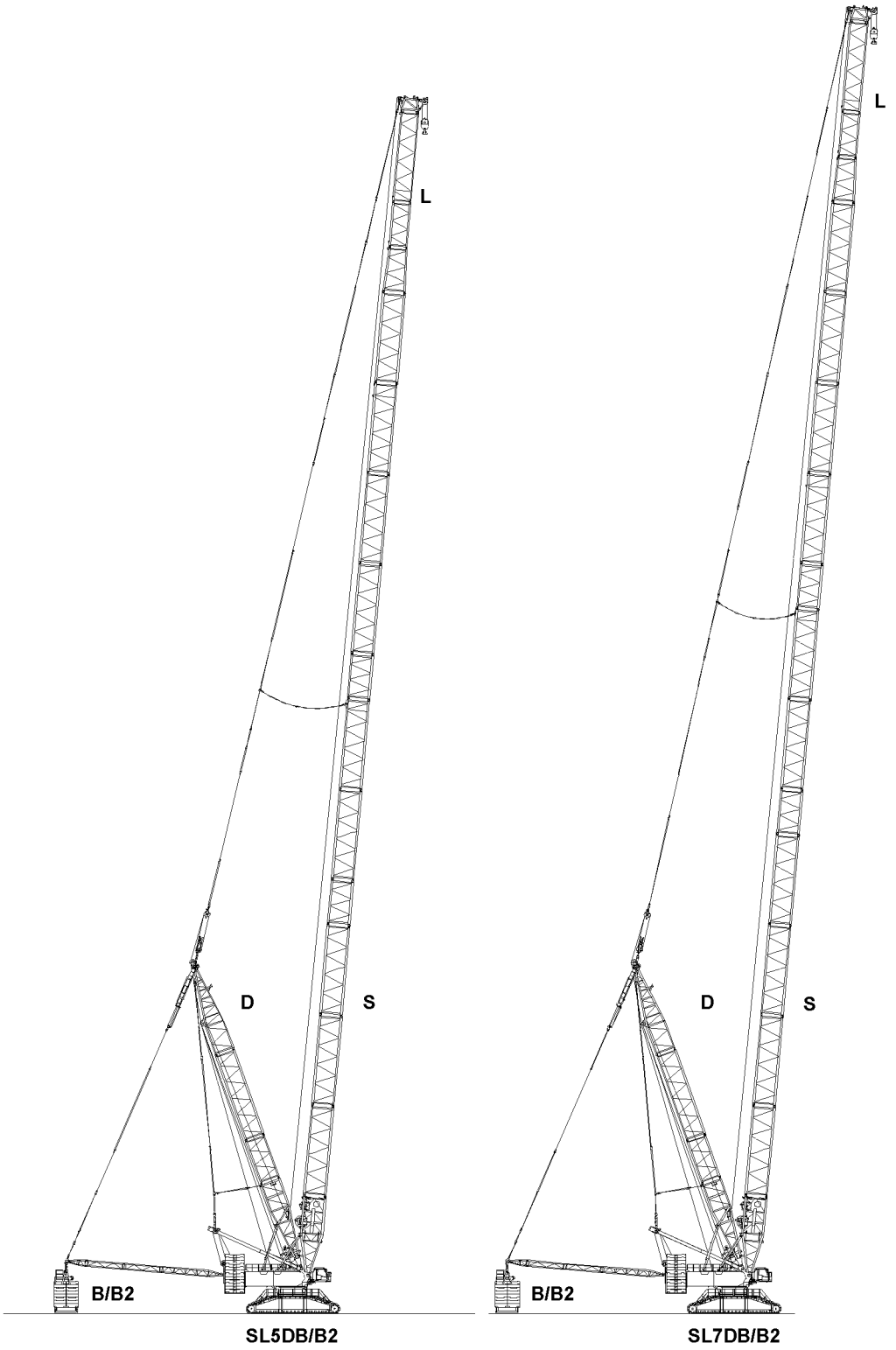

Fig.149991: SL5DB/B2 // SL7DB/B2

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- ▶ Make sure that all boom systems are installed only according to the respective assembly chapter and the associated rod plans.
- ▶ Make sure that danger notes for assembly and for crane operation are observed and adhered to.
- ▶ Do not use the following boom illustrations for assembly purposes.

14.1 SL5DB/B2-boom combination

SL5 Main boom
- Heavy-duty version, supplemented on top with light lattice sections **L**
- With L-end section 650 t
- Variation **SL5**

D Derrick boom
- Alone as an assembly device or in connection with SD or SLD

B Derrick ballast
- Suspended ballast

B2 Derrick ballast
- Suspended ballast with guide

14.2 SL7DB/B2-boom combination

SL7 Main boom
- Heavy-duty version, supplemented on top with light lattice sections **L**
- With L-end section 650 t
- Variation **SL7**

D Derrick boom
- Alone as an assembly device or in connection with SD or SLD

B Derrick ballast
- Suspended ballast

B2 Derrick ballast
- Suspended ballast with guide

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15 SDWB/B2/BW boom combination

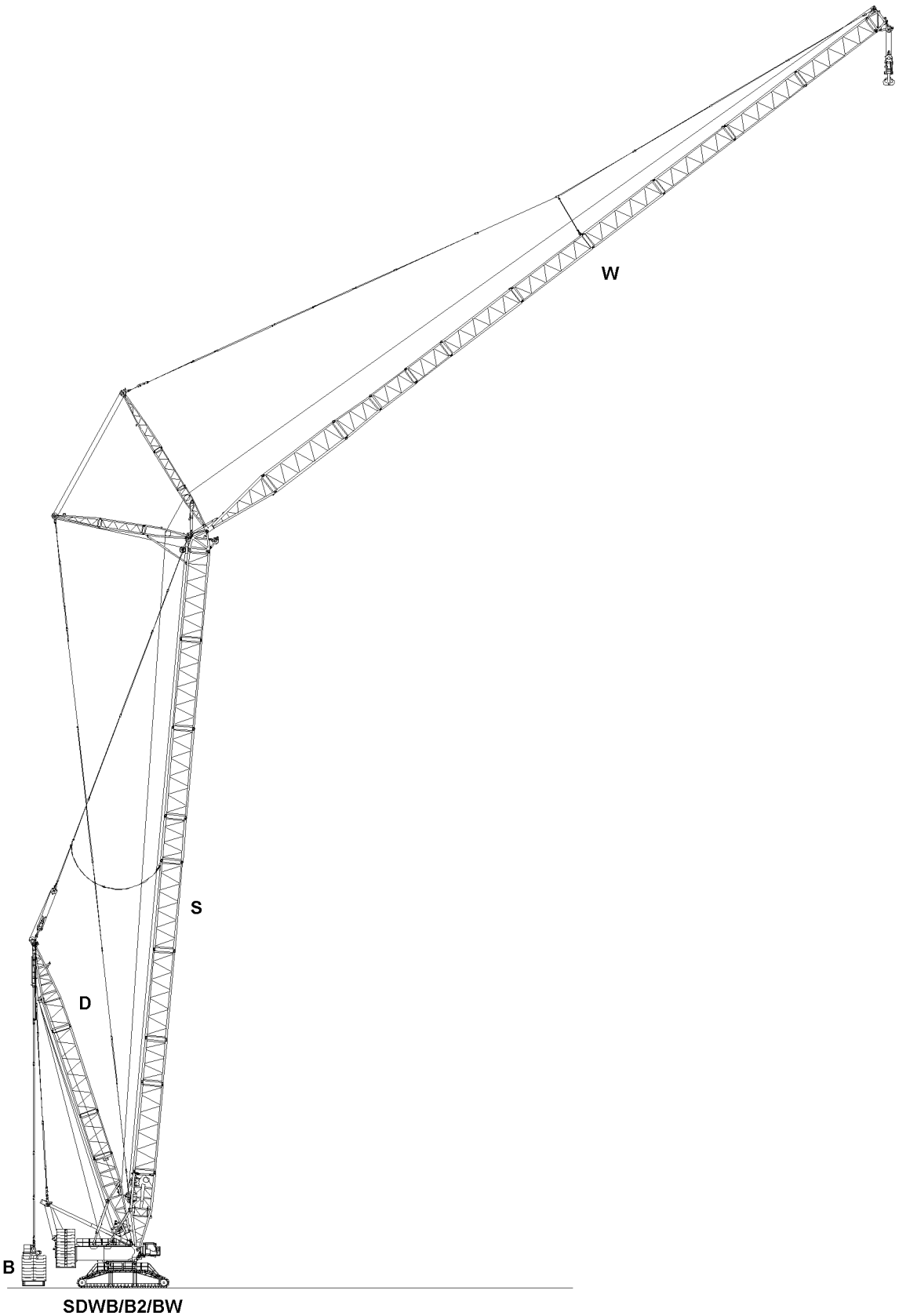

Fig.120941: SDWB/B2/BW

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The crane can topple over!
- ▶ Make sure that all boom systems are installed only according to the respective assembly chapter and the associated rod plans.
- ▶ Make sure that danger notes for assembly and for crane operation are observed and adhered to.
- ▶ Do not use the following boom illustrations for assembly purposes.

15.1 SDWB/B2/BW boom combination

S Main boom
- Heavy-duty version

D Derrick boom
- Alone as an assembly device or in connection with SD or SLD

W Luffing lattice jib
- Heavy lattice section **S**, supplemented on top with light **L** lattice sections
- Long WA-frames

B Derrick ballast
- Suspended ballast

B2 Derrick ballast
- Suspended ballast with guide

BW Derrick ballast
- Ballast trailer

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16 PDB/B2/BW boom combination

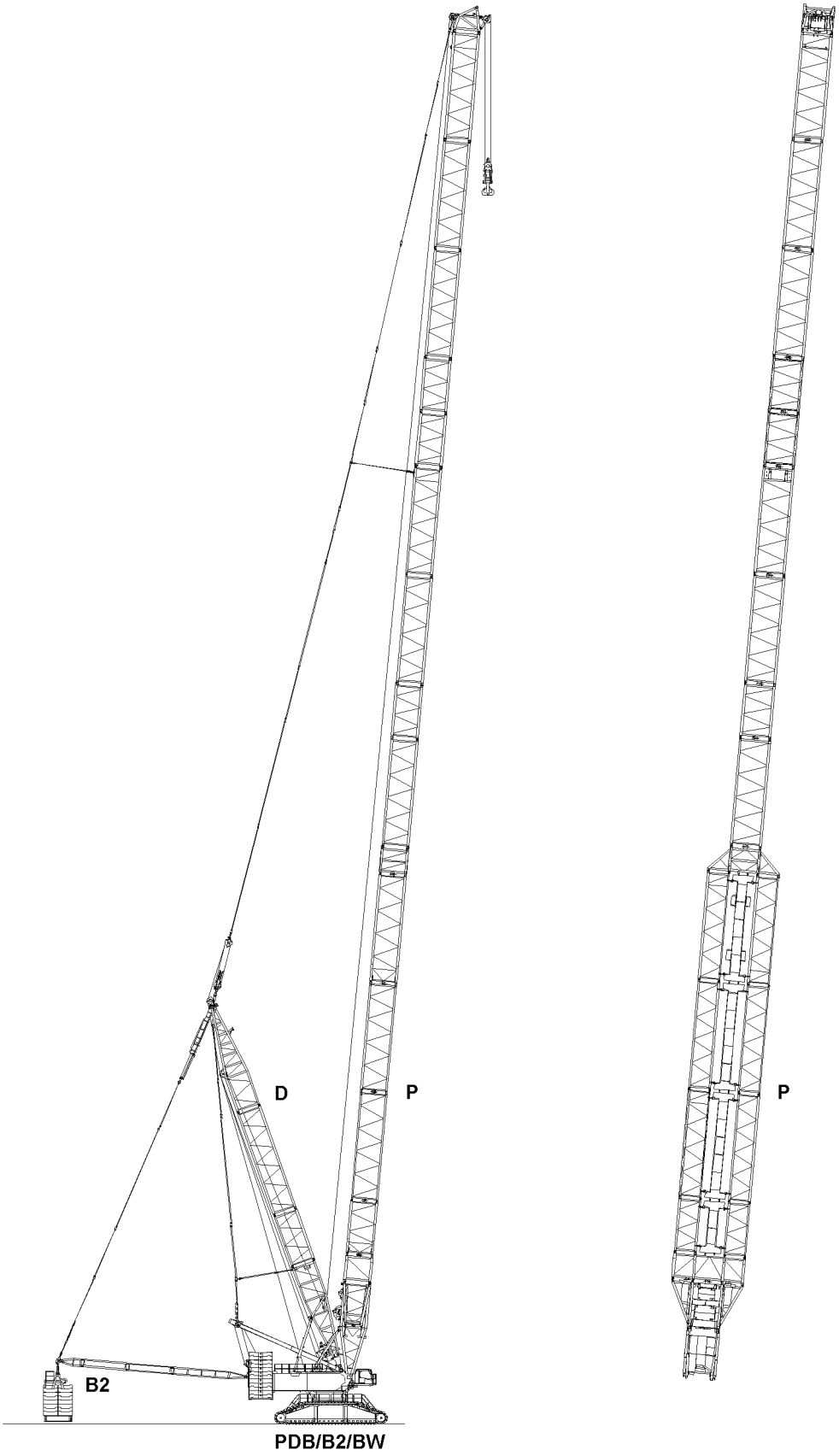

Fig.120897: PDB/B2/BW

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WARNING
The crane can topple over!
- ▶ Make sure that all boom systems are installed only according to the respective assembly chapter and the associated rod plans.
- ▶ Make sure that danger notes for assembly and for crane operation are observed and adhered to.
- ▶ Do not use the following boom illustrations for assembly purposes.

16.1 PDB/B2/BW boom combination

P Main boom
- PowerBoom

D Derrick boom
- Alone as an assembly device or in connection with PD or PDW

B Derrick ballast
- Suspended ballast

B2 Derrick ballast
- Suspended ballast with guide

BW Derrick ballast
- Ballast trailer

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17 PDW3B/B2/BW boom combination

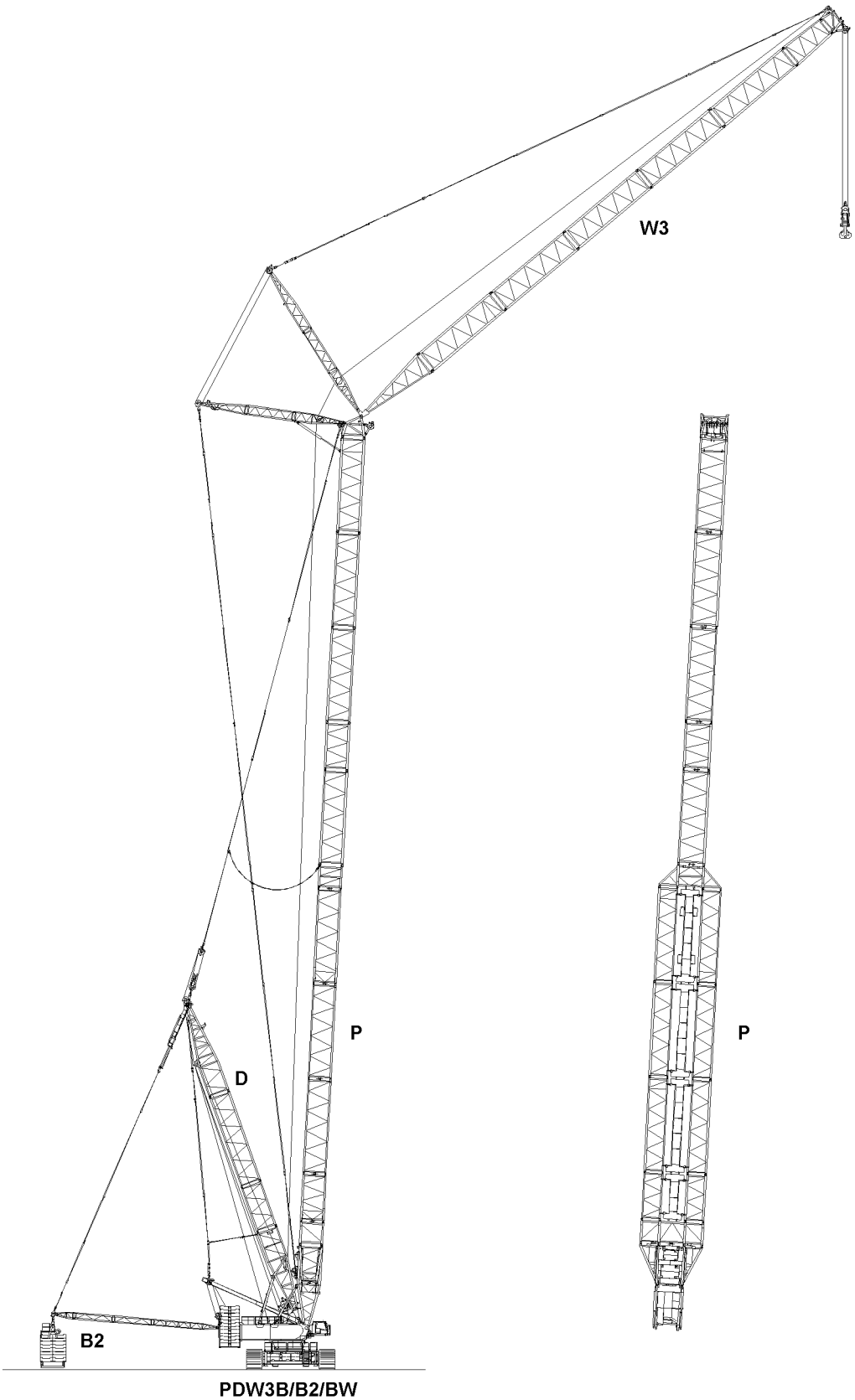

Fig.120898: PDW3B/B2/BW

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- ▶ Make sure that all boom systems are installed only according to the respective assembly chapter and the associated rod plans.
- ▶ Make sure that danger notes for assembly and for crane operation are observed and adhered to.
- ▶ Do not use the following boom illustrations for assembly purposes.

17.1 PDW3B/B2/BW boom combination

P Main boom
- PowerBoom

D Derrick boom
- Alone as an assembly device or in connection with PD or PDW

W3 Luffing lattice jib
- Heavy lattice sections **S**
- Long WA-frames

B Derrick ballast
- Suspended ballast

B2 Derrick ballast
- Suspended ballast with guide

BW Derrick ballast
- Ballast trailer

18 W - boom combination

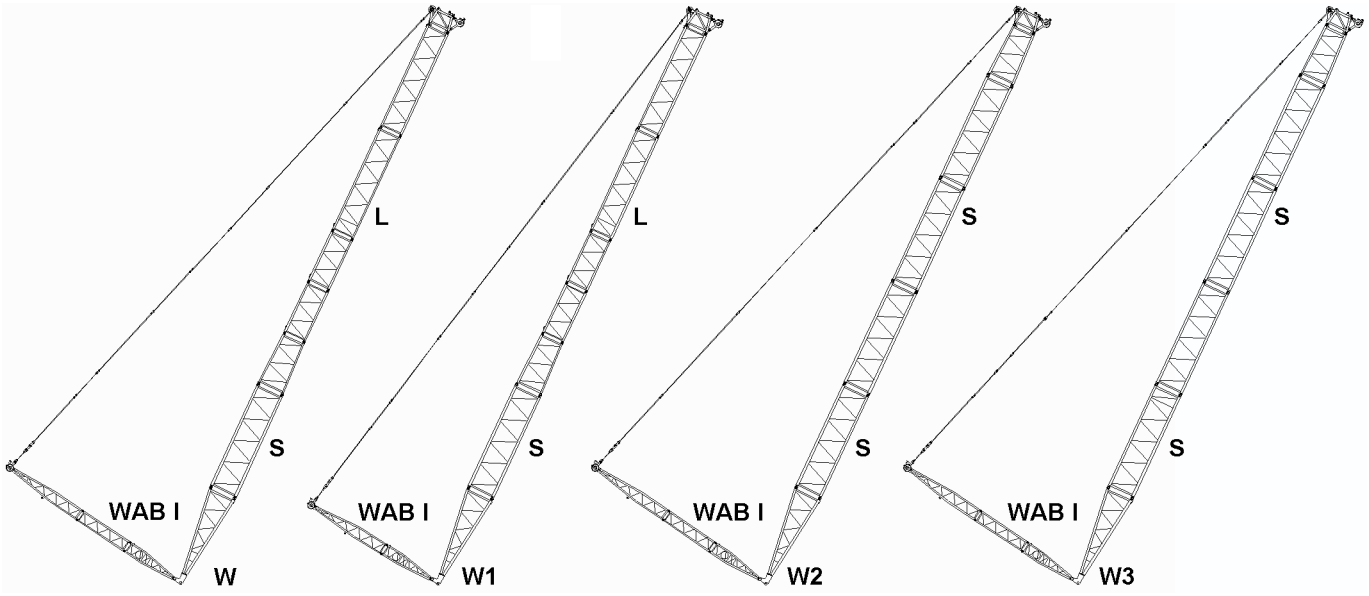

Fig.154207: W-, W1-, W2-, W3-boom combinations

Note
- ▶ The W-boom combination is available in different variations, lengths and configurations.

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WARNING
The crane can topple over!
- ▶ Make sure that all boom systems are installed only according to the respective assembly chapter and the associated rod plans.
- ▶ Make sure that danger notes for assembly and for crane operation are observed and adhered to.
- ▶ Do not use the following boom illustrations for assembly purposes.

18.1 W - boom combination

W Luffing lattice jib
- Heavy lattice sections **S** at the bottom
- Light lattice sections **L** on the top
- Long WA-frames

18.2 W1 - boom combination

W1 Luffing lattice jib
- Heavy lattice sections **S** at the bottom
- Light lattice sections **L** on the top
- Short WA-frames

18.3 W2 - boom combination

W2 Luffing lattice jib
- Heavy lattice sections **S** at the bottom
- Heavy lattice sections **S** on the top
- Long WA-frames

18.4 W3 - boom combination

W3 Luffing lattice jib
- Heavy **S**-flying assembly lattice section **FLM** at the bottom
- Heavy lattice sections **S** on the top
- Long WA-frames

19 F-boom combination

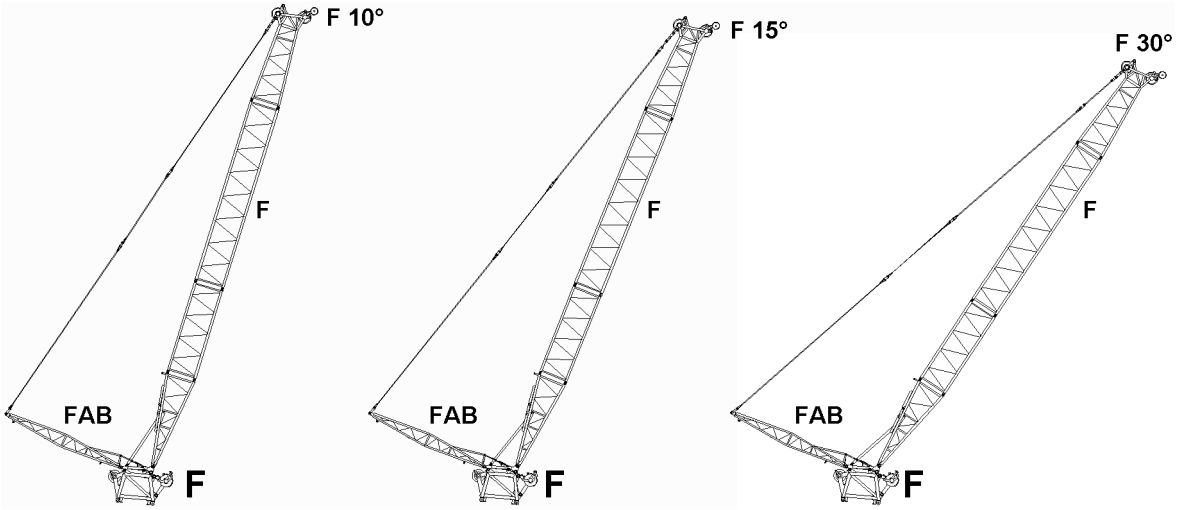

Fig.154208: F-boom combinations

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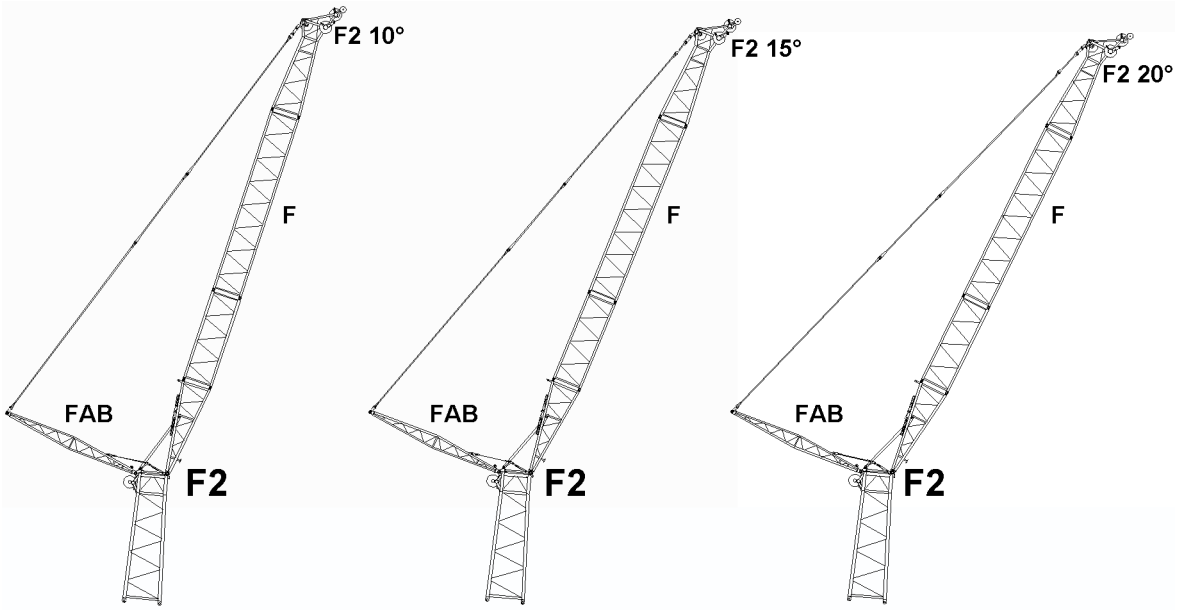

Fig.154209: F2 - boom combinations

Note

▶ The F-boom combination is available in different variations, lengths and guying angles.

WARNING

The crane can topple over!

▶ Make sure that all boom systems are installed only according to the respective assembly chapter and the associated rod plans.

▶ Make sure that danger notes for assembly and for crane operation are observed and adhered to.

▶ Do not use the following boom illustrations for assembly purposes.

19.1 F-boom combination

F F-lattice jib
- Permissible guying angle: 10°, 15°, 30°
- F-end section
- FA-frame

19.2 F2 - boom combination

F2 F2-lattice jib
- Permissible guying angle: 10°, 15°, 20°
- F-end section with integrated boom nose
- FA-frame

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1.02 Product description

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4	Auxiliary equipment	5

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1 Crawler travel gear

1.1 Frame

- In-house manufactured, distortion-resistant welded structure made from high-strength, close-grained structural steel
- The crawler carriers can be removed and can be installed / removed by the crane itself

1.2 Crawler travel gear

- Dirt protected crawler track with flat bottom pads
- Pad width: 2.0 m / 2.4 m *****
- Track width: 9.2 m

1.3 Drive

- Hydraulic travel drives with planetary gears
- The crawler chains can be controlled independently and in the opposite direction

1.4 Travel power

- Travel direction *forwards*: Stepless speed from 0 km/h to 1.36 km/h
- Travel direction *reverse*: Stepless speed from 0 km/h to 0.9 km/h
- **Note**: The *forward* driving direction refers to the crawler travel gear, independently of the position of the crane superstructure. The chain tension devices are always located on the front of the crawler travel gear.

1.5 Central ballast

- 2 platforms each 5.0 t
- 8 central ballast plates each 10.0 t
- Total central ballast 90.0 t
- Expansion: 4 central ballast plates each 10.0 t
- Total central ballast^{expanded} 130,0 t

2 Crane superstructure

2.1 Turntable frame

- In-house manufactured, distortion-resistant welded structure made from high-strength, close-grained structural steel
- Connection to the crawler travel gear via the slewing ring connection
- Turntable frame swingable by 360°

2.2 Diesel engine

- Number of cylinders: 8
- Make: LIEBHERR
- Water cooled

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Note
▶ Engine type, see also separate operating instructions for the diesel engine.

2.2.1 Engine type D 9508 A7-04 with exhaust aftertreatment system SCR

- Performance: 500 KW at 1600 rpm
- Maximum torque: 3165 Nm at 1500 rpm

2.2.2 Engine type D 9508 A7-03 without exhaust aftertreatment system

- Performance: 500 KW at 1600 rpm
- Maximum torque: 3165 Nm at 1500 rpm

2.3 Crane cab

- Air conditioned crane cab can be tilted backwards
- Wrap-around heat-insulating safety glass
- Roof window with composite-safety glass
- Standardized control units ergonomically located
- Thermostatically regulated warm water auxiliary heater

2.4 Crane control

- All crane movements are controlled by three 4-way master switches as well as two 2-way hand / foot levers
- All working movements can be actuated independently from each other

2.5 Winch 1

- Standard hoist winch, hydraulically driven via axial piston displacement pumps and integrated planetary gear
- Disk brakes spring loaded and hydraulically vented

2.6 Winch 4

- Intake gear
  - For adjusting the main boom in operating modes without a derrick boom
  - For adjusting the derrick boom in operating modes with a derrick boom

2.7 Assembly winch

- To reeve the ropes in

2.8 Slewing gear

- Slewing gear hydraulic driven via axial piston displacement pumps and integrated planetary gear
- Disk brakes spring loaded and hydraulically vented
- Slewing speed steplessly regulated from 0 rpm to 0.95 rpm

2.9 Counterweight

- 2 platforms with each 5.0 t
- 24 counterweight plates* each 10,0 t

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– Total counterweight 250.0 t

2.10 Safety equipment

– Hoist limit switch for hoist limitation
– Rope drum limit switch with 3 safety coils
– Safety valves against hose and pipe bursts
– Wind warning system
– Electronic incline display
– Airplane warning light

2.11 Electrical system

– Modern data bus technology
– 24 Volt Direct current
– 2x 3 12V batteries, each with 70 Ah

3 Boom systems / boom combinations

3.1 Boom systems

Note
▶ See the Crane operating instructions, chapter 1.01.

3.2 Optionalwinches*

– Winch 2* as the second hoist winch
– Winch 3* for adjusting the main boom in operating modes with derrick boom
– Winch 5* for adjusting the luffing lattice jib
– Winch 6* as an auxiliary hoist gear

4 Auxiliary equipment

4.1 Mechanical auxiliary support

– To erect long boom combinations without derrick ballast

4.2 Hydraulic assembly support

– Lifting of basic machine for assembly / removal
– Consisting of 4 support cylinders, including support plates, installed on center section

4.3 Hydraulic assembly cylinder

– For self-assembly / disassembly of crawler travel gear

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4.4 Pin pulling device

- Including mobile hydraulic aggregate
- For assembly / disassembly of pins on crawler travel gear and center section as well as boom intermediate sections

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Fig.195219

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1 Dimensions and weights of the crane components

Note

- The following listed weights are reference values and may not match your crane exactly.
- The illustrations of crane components / crane parts are examples and may not apply exactly to your crane.

WARNING

Danger of accidents when handling crane components / crane parts!

- Make sure that the actual weight is known before fastening crane components / crane parts.
- Check the weight label on the crane components / crane parts.
- Fasten crane components / crane parts solely with approved and sufficiently load bearing fastening equipment.
- Make sure that crane components / crane parts are fastened only on the intended fastening points.

2 Dimensions of the crane basic unit

All dimension data in meters (m)

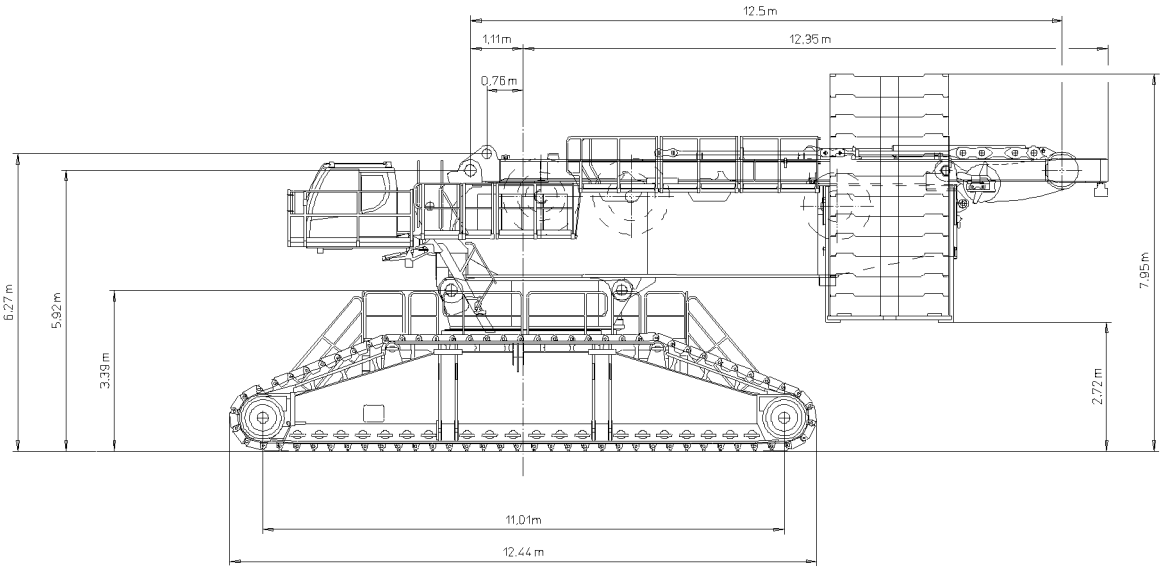

Fig.145943: Side view

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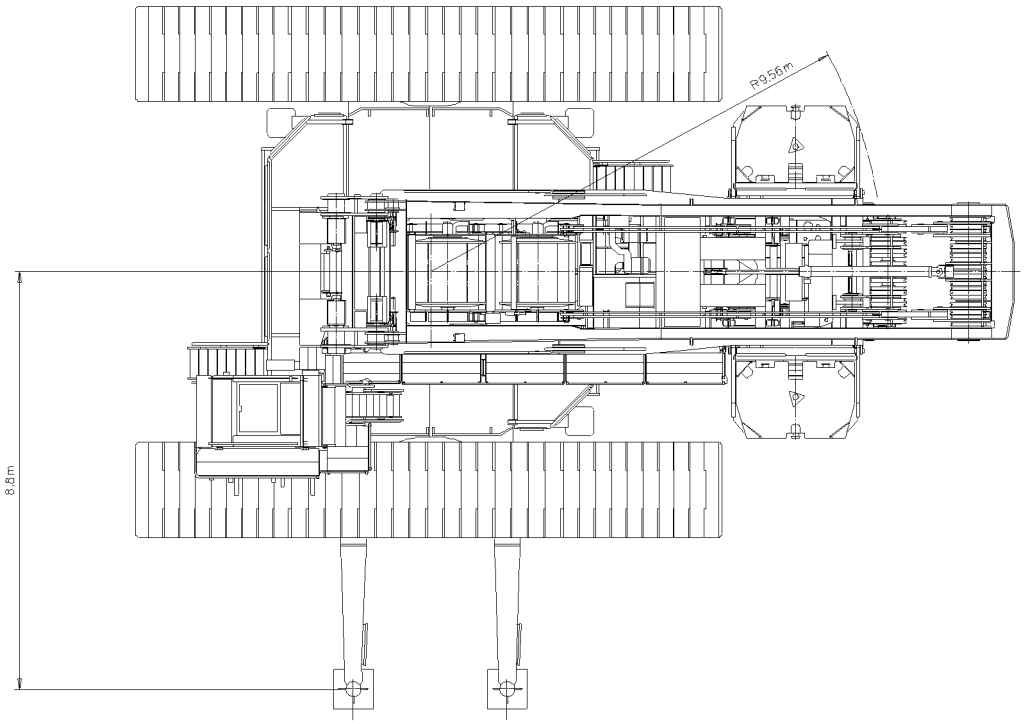

Fig.145944: Overhead view

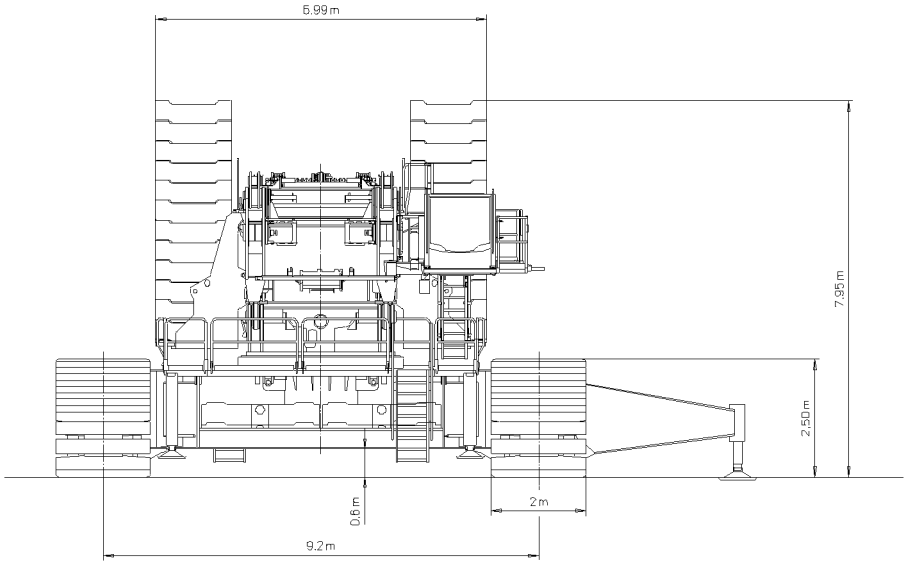

Fig.145945: Front view

3 Noise emission

Control platform Crane cab	
Sound pressure level [L_{pA}], according to EN13000	70 db(A)

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4 Vibrations

Vibrations transferred to the operator	Value
Total vibration value to which the upper body limbs are exposed	Not more than 2.5 m/s^2
Effective value of weighted acceleration to which the entire body is exposed	Not more than 0.5 m/s^2

5 Crane speeds

Note

▶ The crane speeds refer to a nominal engine rpm of 1600 rpm !

Drives	Speed
Winch 1	0 m/min to 120 m/min for single strand
Winch 2	0 m/min to 120 m/min for single strand
Winch 3	0 m/min to 115 m/min for single strand
Winch 5	0 m/min to 105 m/min for single strand
Winch 6	0 m/min to 118 m/min for single strand
Winch 4	0 m/min to 60 m/min for single strand

Drives	RPM
Slewing gear	0 rpm to 0.89 rpm

Drives	Rapid gear travel speed (normal gear)
2 drives per crawler carrier	Forward: 0 km/h to 1.41 km/h (0.29 km/h)
	Reverse: 0 km/h to 1.17 km/h (0.24 km/h)

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6 Crane surface pressure

Note

▶ Determining the surface pressure in relation to the various set up configurations and load cases, see the LICCON job planner.

	Track pad width 2.0 m
Maximum surface pressure of the crane at nominal load	1900 kN/m²

7 Load handling equipment

Note

▶ For load handling equipment, see load chart manual.

8 Hoist ropes

	Rope diameter	Rope category number RCN
Winch 1	32 mm	See Rope certificate
Winch 2	32 mm	See Rope certificate
Winch 6	28 mm	See Rope certificate

9 Control ropes

	Rope diameter	Rope category number RCN
Winch 3	32 mm	See Rope certificate
Winch 4	32 mm	See Rope certificate
Winch 5	32 mm	See Rope certificate

10 Guy rope

	Rope diameter	Rope category number RCN
Auxiliary guying	40 mm	See Rope certificate

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11 Assembly rope

	Rope diameter	Rope category number RCN
Assembly winch	8 mm	See Rope certificate

12 Crawler center section with turntable frame lower section

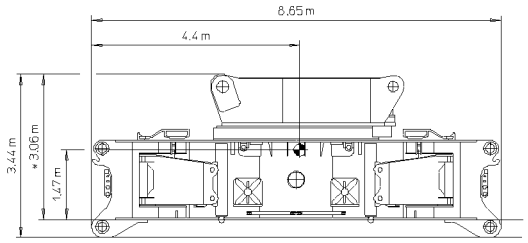

Fig.117655: Crawler center section with turntable frame lower section

Component	Weight	Width
Crawler center section with turntable frame lower section	60.0 t	3.5 m

13 Turntable with crawler center section with SA-frame

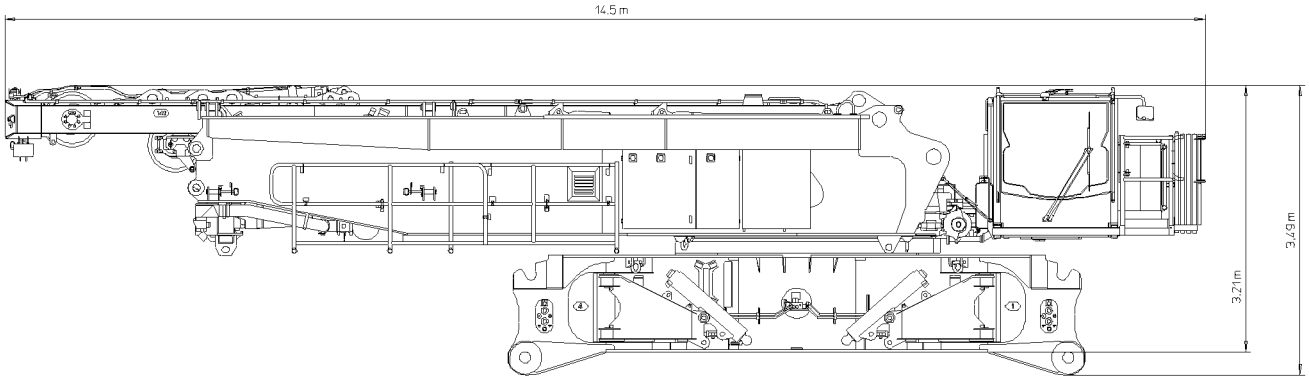

Fig.145523: Turntable with SA-frame

Component	Weight
Turntable / crawler center section with SA-frame	59.0 t

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14 Crawler center section with Quick-Connection (QC)

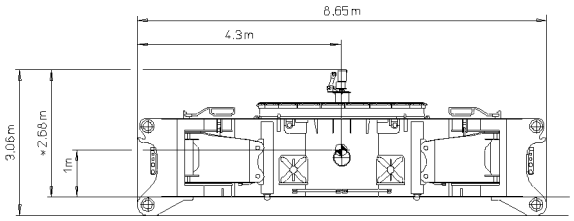

Fig.126151: Crawler center section with Quick-Connection (QC)

Component	Weight	Width
Crawler center section with turntable frame lower section	40.0 t	3.5 m

15 Crawler carrier complete

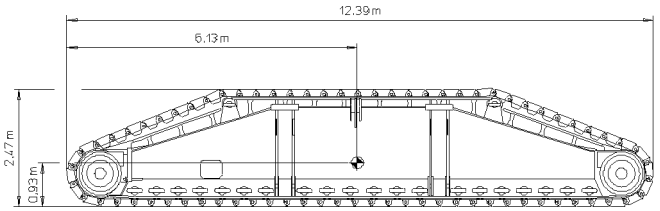

Fig.149501: Crawler carrier complete

Component	Weight	Width [1]
Crawler carrier complete	30.0 t	2.0 m
Crawler carrier complete	40.0 t	2.4 m

1) Corresponds to the track pad width

16 Turntable frame lower section with Quick-Connection (QC)

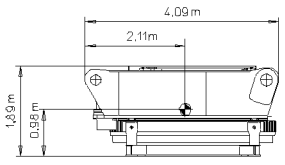

Fig.126152: Turntable frame lower section with Quick-Connection (QC)

Component	Weight	Width
Crawler center section with turntable frame lower section	27.1 t	3.5 m

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17 Central ballast platform

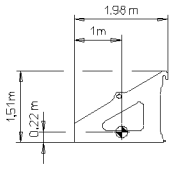

Fig.117656: Central ballast platform

Component	Weight	Width
Central ballast platform	5.0 t	5.3 m

18 Catwalk crawler

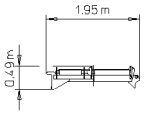

Fig.117657: Catwalk crawler

Component	Weight	Width
Catwalk crawler	1.0 t	6.7 m

19 Mechanical auxiliary support

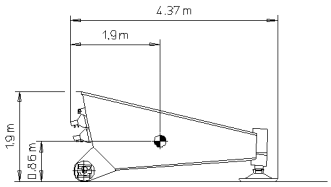

Fig.117658: Mechanical auxiliary support

Component	Weight	Width
Mechanical auxiliary support	3.1 t	0.8 m

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20 Turntable without SA-frame

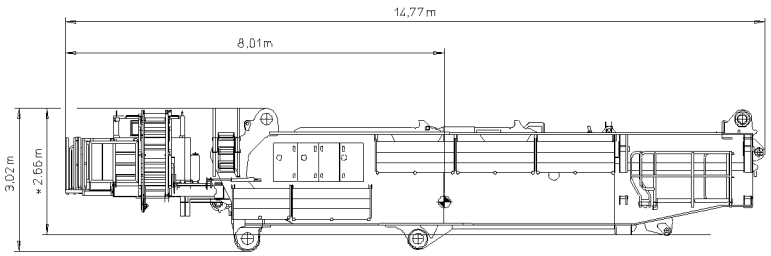

Fig.117659: Turntable without SA-frame

Component	Weight	Width
Turntable without SA-frame	45.0 t	3.5 m

21 SA-frame with winch 4

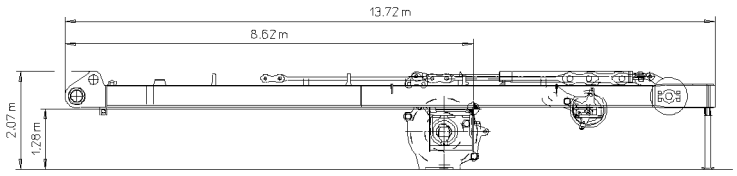

Fig.117660: SA-frame with winch 4

Component	Weight	Width
SA-frame with winch 4	34.0 t	3.1 m

22 Turntable with SA-frame

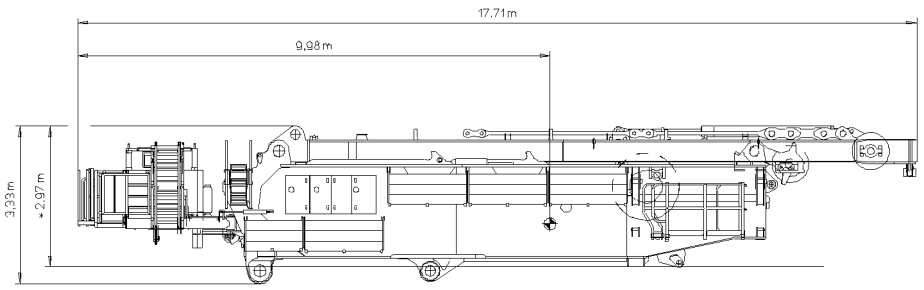

Fig.117661: Turntable with SA-frame

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Component	Weight	Width
Turntable with SA-frame	77.0 t	3.5 m

23 Winch 1

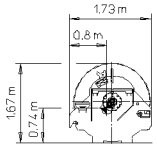

Fig.117662: Winch 1

Component	Weight	Width
Winch 1	14.0 t	2.1 m

24 Winch 2

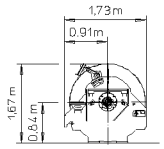

Fig.117663: Winch 2

Component	Weight	Width
Winch 2	14.0 t	2.2 m

25 Winch 5

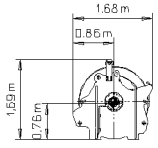

Fig.126153: Winch 5

Component	Weight	Width
Winch 5	11.0 t	2.2 m

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26 Winch 6

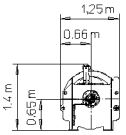

Fig.126154: Winch 6

Component	Weight	Width
Winch 6	5.2 t	1.9 m

27 Counterweight platform

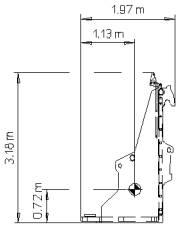

Fig.117664: Counterweight platform

Component	Weight	Width
Counterweight platform	6.0 t	2.8 m

28 Ballast plate for central ballast / counterweight / derrick ballast

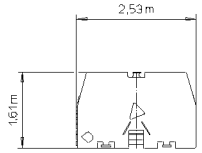

Fig.117665: Ballast plate for central ballast / counterweight / derrick ballast

Component	Weight	Width
Ballast plate	10.0 t	0.5 m
Ballast plate	5.0 t	0.3 m

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29 S-pivot section

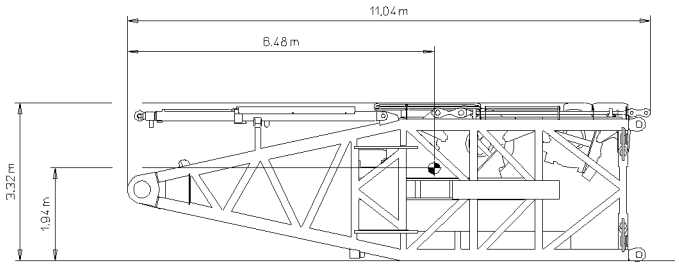

Fig.117666: S-pivot section

Component	Weight	Width
S-pivot section without winch 5 without winch 6	26.8 t	3.7 m
S-pivot section with winch 5 without winch 6	37.8 t	
S-pivot section without winch 5 with winch 6	32.0 t	
S-pivot section with winch 5 and winch 6	43.1 t	

30 S-intermediate section 6 m

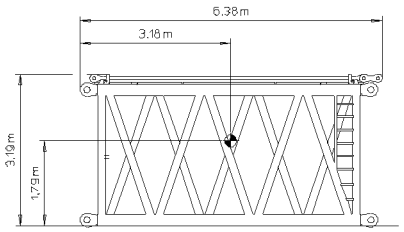

Fig.117667: S-intermediate section 6 m

Component	Weight	Width
S-intermediate section 6 m **3228.25**	8.0 t	3.5 m
S-intermediate section 6 m **3228.20**	7.5 t	

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31 S-intermediate section 12 m

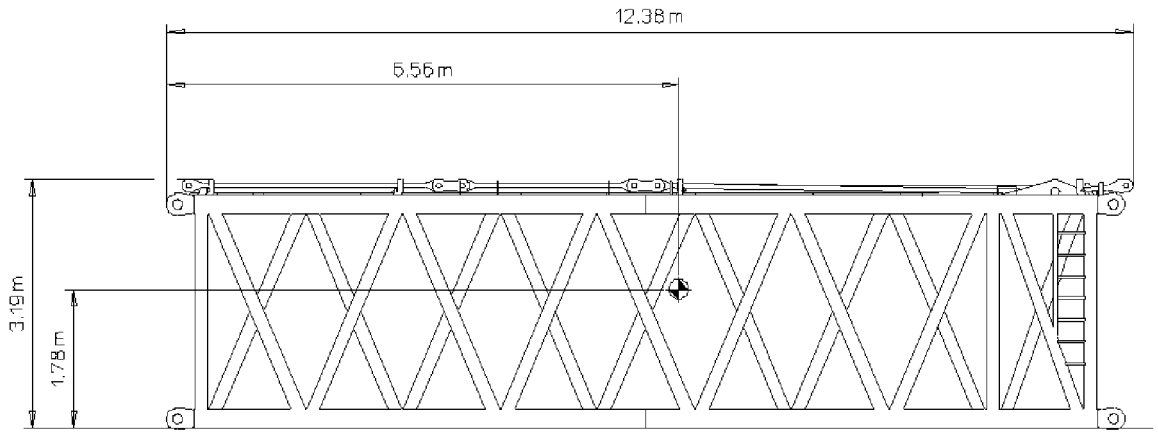

Fig.117671: S-intermediate section 12 m

Component	Weight	Width
S-intermediate section 12 m **3228.40**	17.0 t	3.5 m
S-intermediate section 12 m **3228.25**	13.8 t	
S-intermediate section 12 m **3228.25 FLM**	15.6 t	
S-intermediate section 12 m **3228.20**	12.7 t	
S-intermediate section 12 m **3228.16**	10.6 t	

32 S-adapter

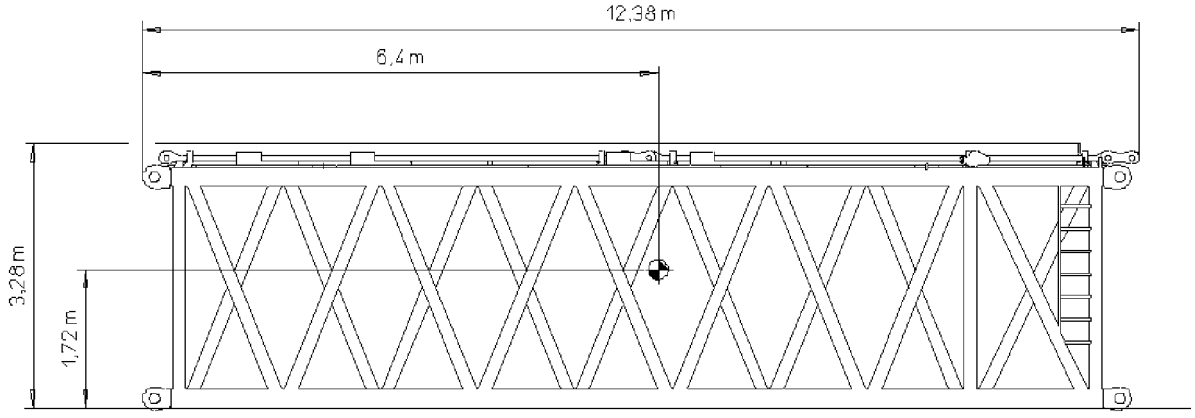

Fig.117674: S-adapter

Component	Weight	Width
S-adapter 12 m **3228.25/20A**	13.6 t	3.5 m

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33 S-end section

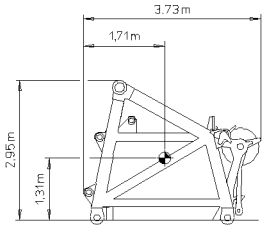

Fig.117682: S-end section

Component	Weight	Width
S-end section	9.8 t	3.5 m

34 SL-reducer

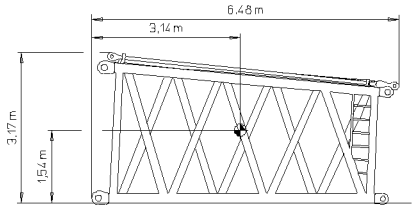

Fig.117675: SL-reducer

Component	Weight	Width
SL-reducer	5.7 t	3.5 m

35 P-adapter bottom left / P-adapter bottom right

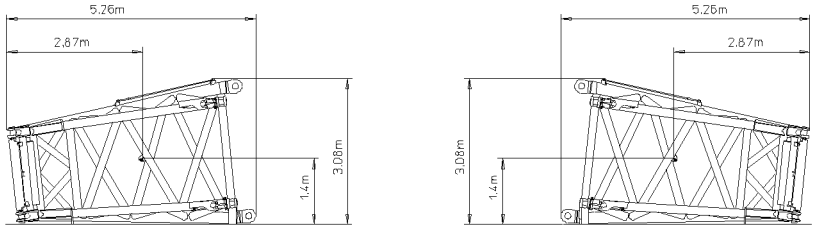

Fig.119454: P-adapter bottom left / P-adapter bottom right

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Component	Weight	Width
P-adapter	4.3 t	2.5 m

36 Cross carrier 3 m , P-adapter bottom

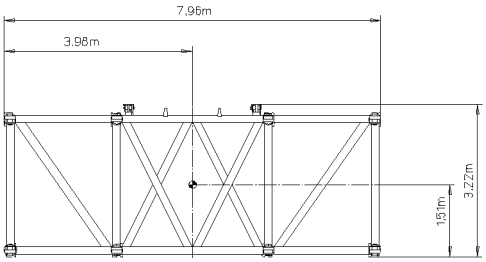

Fig.119455: Cross carrier 3 m , P-adapter bottom

Component	Weight	Width
Cross carrier 3 m , P-adapter bottom	9.0 t	3.4 m

37 P-adapter top, 3 m

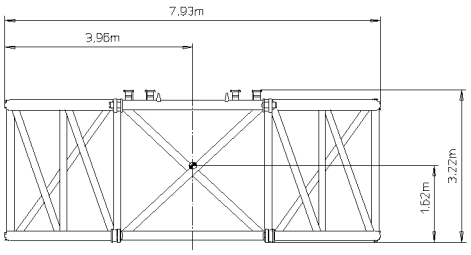

Fig.119456: P-adapter top 3 m

Component	Weight	Width
P-adapter top 3 m	9.8 t	3.3 m

38 Bridges

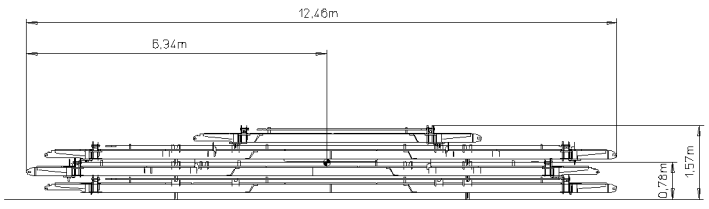

Fig.119457: Bridges

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Component	Weight	Width
Bridges	5.0 t	2.4 m

39 L-intermediate section 6 m

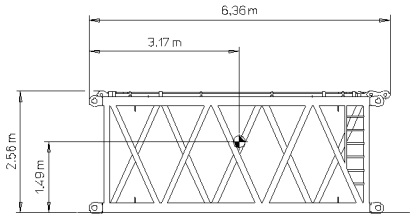

Fig.117681: L-intermediate section 6 m

Component	Weight	Width
L-intermediate section 6 m **2722.20**	4.6 t	3.0 m
L-intermediate section 6 m **2722.20 F**	4.7 t	

40 L-intermediate section 12 m

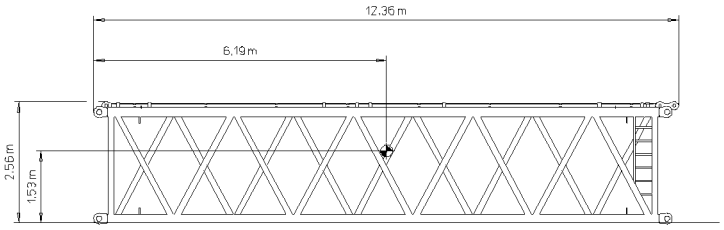

Fig.117678: L-intermediate section 12 m

Component	Weight	Width
L-intermediate section 12 m **2722.20**	8.1 t	3.0 m
L-intermediate section 12 m **2722.20 F**	8.4 t	
L-intermediate section 12 m **2722.16**	7.3 t	
L-intermediate section 12 m **2722.16 F**	7.7 t	

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41 L-end section

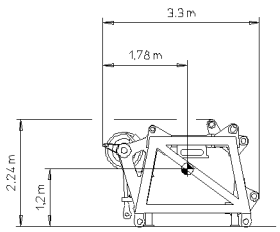

Fig.117683: L-end section

Component	Weight	Width
L-end section	7.6 t	3.0 m

42 F-connector head

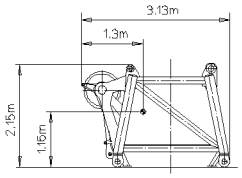

Fig.126155: F-connector head

Component	Weight	Width
F-connector head	3.4 t	3.0 m

43 Roller set

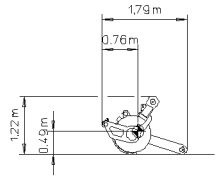

Fig.117684: Roller set

Component	Weight	Width
Roller set 1 (400 t)	2.5 t	1.5 m
Roller set 2 (350 t)	2.2 t	1.1 m

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44 W- and WA-frame 1 - pivot section

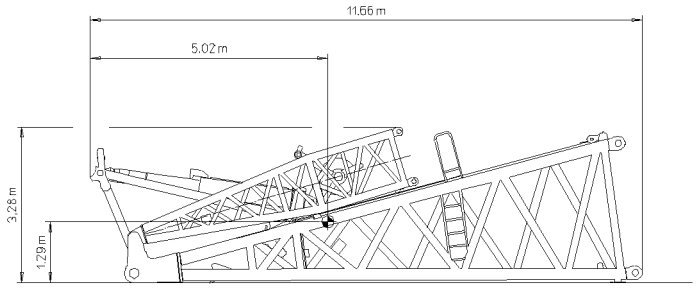

Fig.117686: W- and WA-frame 1 - pivot section

Component	Weight	Width
W- and WA-frame 1 - pivot section	18.5 t	3.7 m

45 WA-frame 2 - pivot section

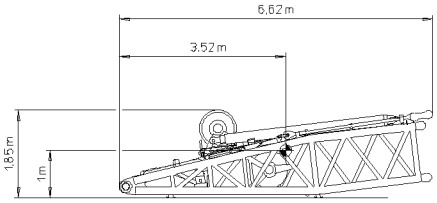

Fig.117687: WA-frame 2 - pivot section

Component	Weight	Width
WA-frame 2 - pivot section	5.8 t	3.0 m

46 WA-frame - intermediate section 1 and 2

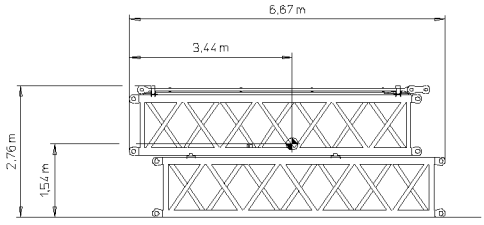

Fig.117688: WA-frame - intermediate section 1 and 2

Component	Weight	Width
WA-frame - intermediate section 1 and 2	4.7 t	2.9 m

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47 WA-frame - end section 1 and 2

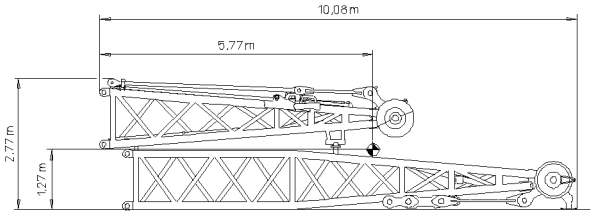

Fig.117689: WA-frame - end section 1 and 2

Component	Weight	Width
WA-frame - end section 1 and 2	11.6 t	2.9 m

48 D-pivot section with winch 3

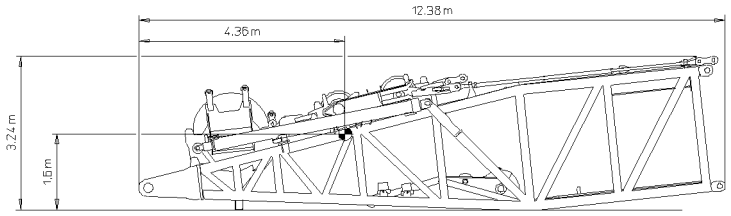

Fig.117690: D-pivot section with winch 3

Component	Weight	Width
D-pivot section with winch 3	37.6 t [1)]	3.5 m

1) Also taken into account in the weight: 2x D-relapse support and luffing pulley block

49 D-intermediate section 12 m

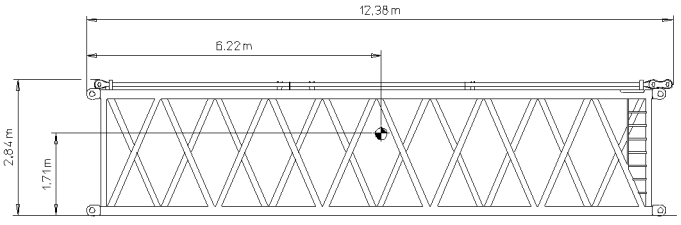

Fig.117691: D-intermediate section 12 m

Component	Weight	Width
D-intermediate section 12 m	10.1 t	3.1 m

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50 D-intermediate section 6 m

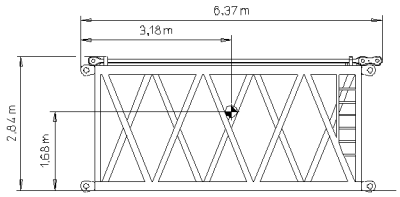

Fig.117692: D-intermediate section 6 m

Component	Weight	Width
D-intermediate section 6 m	6.0 t	3.1 m

51 D-end section

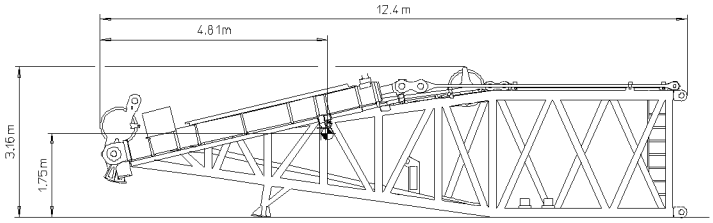

Fig.117693: D-end section

Component	Weight	Width
D-end section	22.5 t	3.1 m

52 F-assembly unit with F-end section

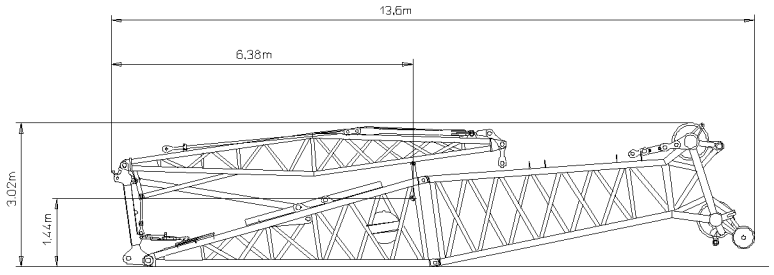

Fig.119458: F-assembly unit with F-end section

Component	Weight	Width
F-assembly unit with F-end section	7.8 t	3.0 m

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53 F-assembly unit

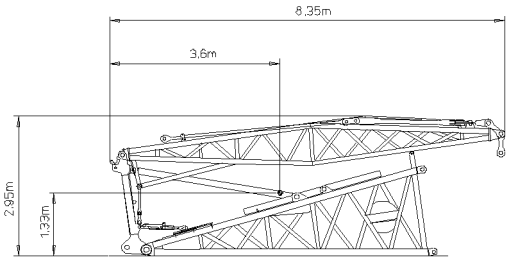

Fig.119459: F-assembly unit

Component	Weight	Width
F-assembly unit	5.0 t	3.0 m

54 F-intermediate section 6 m

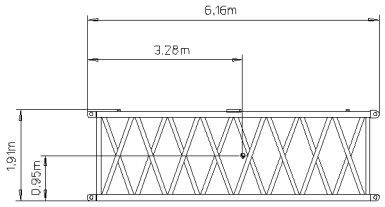

Fig.119460: F-intermediate section 6 m

Component	Weight	Width
F-intermediate section 6 m	1.7 t	2.5 m

55 F-intermediate section 12 m

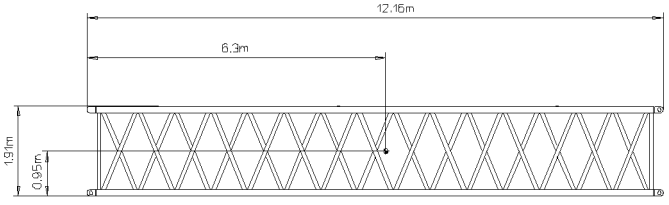

Fig.119461: F-intermediate section 12 m

Component	Weight	Width
F-intermediate section 12 m	3.0 t	2.5 m

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56 F-end section

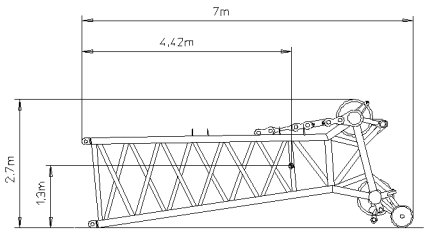

Fig.119462: F-end section

Component	Weight	Width
F-end section	2.8 t	2.5 m

57 Suspended ballast guide B2

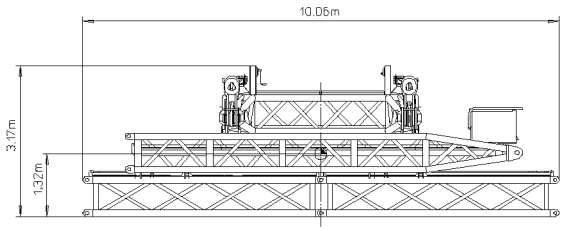

Fig.119463: Suspended ballast guide B2

Component	Weight	Width
Suspended ballast guide B2	9.2 t	3.0 m

58 Ballast pallet

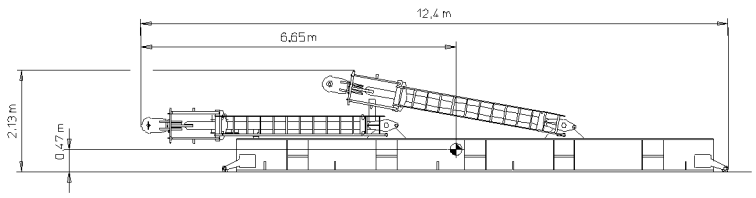

Fig.117694: Ballast pallet

Component	Weight	Width
Ballast pallet	15.1 t	3.0 m

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59 Ballast pallet special design (LTR as ballast)

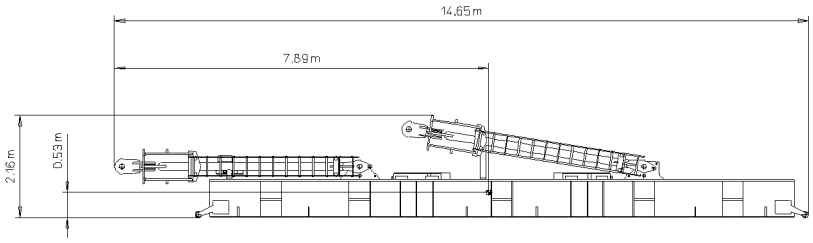

Fig.145938: Ballast pallet special design

Component	Weight	Width
Ballast pallet special design	20.3 t	3.0 m

60 Ramp

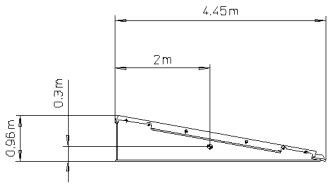

Fig.145940: Ramp for ballast pallet special design

Component	Weight	Width
Ramp for ballast pallet special design	3.3 t	1.1 m

61 Cross beam

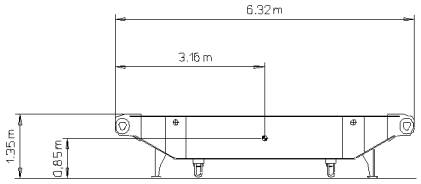

Fig.145939: Cross beam

Component	Weight	Width
Cross beam	2.0 t	1.08 m

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62 Ballast trailer

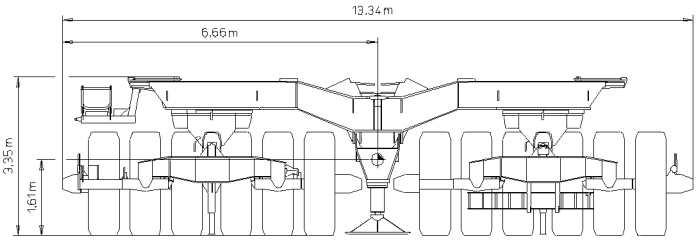

Fig.126156: Ballast trailer

Component	Weight	Width
Ballast trailer	76.0 t	3.0 m

63 Ballast trailer guide with adapter for ballast trailer

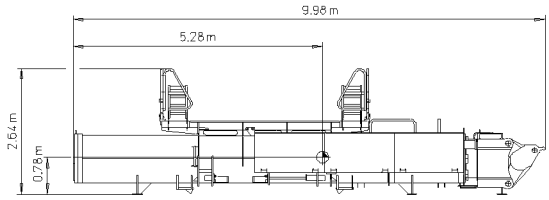

Fig.126157: Ballast trailer guide with adapter for ballast trailer

Component	Weight	Width
Ballast trailer guide with adapter for ballast trailer	25.3 t	3.0 m
Ballast trailer guide **without** adapter for ballast trailer	24.0 t	3.0 m

64 Ballast trailer guide extension

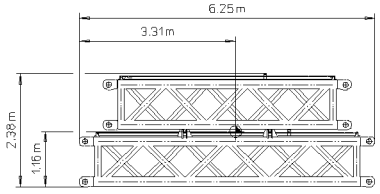

Fig.126158: Ballast trailer guide extension

Component	Weight	Width
Ballast trailer guide extension	7.2 t	3.0 m

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65 Boom nose 32 t

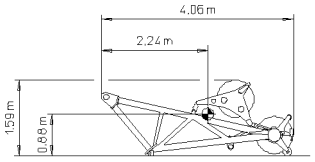

Fig.117695: Boom nose 32 t

Component	Weight	Width
Boom nose 32 t	0.8 t	0.9 m

66 Roller cart

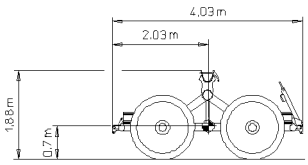

Fig.117696: Roller cart

Component	Weight	Width
Roller cart	7.0 t	2.5 m

67 Overview rods

Note
▶ Use of rods, see Rod plan!

Article	Designation	Nominal length	Width	Height	Weight
967746908	Rod complete	6184 mm	223 mm	164 mm	0.4 t
967743808	Rod complete	12184 mm	223 mm	164 mm	0.6 t
967913408	Rod complete	1615 mm	160 mm	300 mm	0.2 t
967846208	Pull rod complete	3620 mm	263 mm	263 mm	0.4 t
967846608	Pull bracket	755 mm	40 mm	260 mm	0.1 t
967845508	Pull bracket complete	1352 mm	60 mm	400 mm	0.1 t
967897608	Pull rod complete	3684 mm	223 mm	164 mm	0.3 t
967898308	Pull rod complete	8706 mm	223 mm	164 mm	0.5 t
968026108	Pull rod preassembled	6250 mm	150 mm	250 mm	0.4 t

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Article	Designation	Nominal length	Width	Height	Weight
968026208	Pull rod complete	4120 mm	200 mm	190 mm	0.3 t
967704008	Rod complete	12220 mm	223 mm	190 mm	0.7 t
967733608	Rod complete	6220 mm	223 mm	190 mm	0.4 t
968026008	Pull rod complete	6160 mm	263 mm	260 mm	0.5 t
968242208	Pull rod complete	6317 mm	320 mm	164 mm	0.5 t
968190208	Pull rod complete	6211 mm	226 mm	270 mm	0.4 t
968246608	Pull rod complete	1680 mm	102 mm	202 mm	0.1 t

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2 Safety

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2.03 Job planning

1 Planning Crane operation 3

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Fig.195219

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1 Planning Crane operation

In addition to a perfectly working crane and a well-trained crew, the **planning for crane operation** is an important principle for safe crane operation.

WARNING
Missing information!
Death, severe bodily injuries, property damage.
▶ Obtain the required information and adhere to it.

Obtain the following information before crane operation and adhere to it:
- Type of crane operation
- National laws and regulations
- Height and width clearance measurements
- When mobile crane: Job site, distance and travel route
- Space prerequisites at the job site
- Electrical transmission lines with voltage data
- Movement restrictions caused by buildings
- Weight and dimensions of the load(s) to be lifted
- Geometric form and air resistance coefficient of the load(s) to be lifted
- Required lifting height and boom projection
- Ground bearing capacity at the job site
- Required space for the assembly and disassembly of the crane
- Weather data and weather forecasts

Assemble the equipment for crane operation:
- Hook block / load hook
- Auxiliary boom
- Fastening equipment
- Counterweight
- Base materials for support plates

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2.04 Technical safety instructions

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Fig.195219

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Note

▶ The illustrations in this chapter are only examples. The illustrations may differ depending on the crane model.

1 Dangers on the crane

1.1 California Proposition 65

Proposition 65 of the US State of California warns against chemicals that are known to cause cancer, birth defects and other reproductive harm.

For additional information, see the website: **www.P65Warnings.ca.gov**.

Proposition 65
WARNING: This product can expose you to chemicals, which are known to the State of California to cause cancer, birth defects or other reproductive harm. For more information see: www.P65Warnings.ca.gov.

Fig.147844: Example of a Proposition 65 sign for USA: Chemicals

Proposition 65 WARNING: This product can release chemicals that have been classified by the state of California to cause cancer, birth defects and other reproductive harm.

1.2 Exhaust emissions

Proposition 65 of the US State of California warns against chemicals that are known to cause cancer, birth defects and other reproductive harm.

Proposition 65
WARNING: This product can expose you to chemicals, including exhaust emissions, which are known to the State of California to cause cancer. For more information see: www.P65Warnings.ca.gov.

Fig.147842: Example of a Proposition 65 sign for USA: Exhaust emissions

WARNING

Exhaust emissions!

Damage to health such as cancer.

▶ Avoid exposure to exhaust emissions.
▶ Avoid breathing in exhaust emissions.
▶ **Always** work in properly ventilated spaces.
▶ Use personal protective equipment, such as dust masks with micro-particle filters.

1.3 Lead and lead compounds

Proposition 65 of the US State of California warns against chemicals that are known to cause cancer, birth defects and other reproductive harm.

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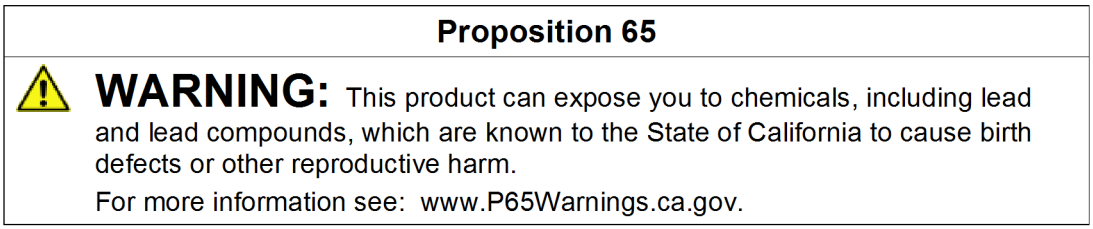

Fig.147843: Example of a Proposition 65 sign for USA: Lead and lead compounds

WARNING
Batteries, battery poles, battery terminals and other battery components contain lead and lead compounds!
Damage to health such as birth defects and other reproductive harm.
- ▶ Avoid direct contact with batteries and their components.
- ▶ Do not touch them with bare hands.
- ▶ Use personal protective equipment: **Always** wear protective gloves.
- ▶ After handling: Wash hands thoroughly.
- ▶ Dispose of disused batteries in an environmentally acceptable manner according to local regulations.

1.4 Hydraulic oil, diesel fuel, operating fluids

WARNING
Due to technical defects or open tank covers, hydraulic oil, diesel fuel or service fluids spill out!
Dirt from the road and ground.
Traffic endangerment: Danger of skidding, death, severe bodily injuries.
Environmental pollution: Death, severe damage to health.
- ▶ Remedy the technical defect immediately.
- ▶ Securely close the tank cover after refuelling.
- ▶ Immediately and thoroughly remove traces of hydraulic oil, diesel fuel, operating fluids.
- ▶ Avoid skin contact with hydraulic oil, diesel fuel and operating fluids.
- ▶ Use personal protective equipment, such as protective gloves.

1.5 Heated crane components

WARNING
Heated crane components! Hot surfaces!
Severe burns.
This applies in particular to exhaust systems, engines and transmissions.
- ▶ Let the components cool down before touching them.
- ▶ Proceed with special caution near heated crane components.
- ▶ Avoid skin contact with hot surfaces.
- ▶ Use personal protective equipment, such as protective gloves.

2 Danger zone of crane

2.1 Crane in operation

The danger zone of the crane is made up of the areas which are accessed during crane operation by the load or by movements of the crane or the crane components.

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WARNING
Do not stay in danger zone!
Personnel within the danger zone can be hit by falling loads or components.
Personnel in the danger zone can be caught by moving crane components or loads.
Fatal or severe injuries can be the result.
- ▶ Warn any personnel within the danger zone with the warning device of the crane.
- ▶ After the warning is issued, wait and ensure that no personnel remains within the danger zone.
- ▶ If required, block off the danger zone at a safety distance.

2.2 Crane out of service

Take the crane out of service, failure to comply with the regulations represents considerable danger for the entire area around the crane.

WARNING
Actual wind speed higher than the wind speed permitted for the crane set up configuration!
Personnel within the danger zone can be hit by a toppling crane or crane components.
- ▶ Make sure that the condition of the crane complies with the regulations and the wind speed charts.
- ▶ If required, block off the danger zone at a safety distance.

WARNING
Icing on the boom!
Personnel within the danger zone can be hit by a falling ice.
- ▶ Make sure that there is no personnel in the danger zone.
- ▶ If required, block off the danger zone at a safety distance.

3 Traffic endangerment and environmental damage

WARNING
Danger of slipping and skidding!
If the road becomes contaminated due to technical defects, open tank covers or leaking hydraulic oil, then this would pose a severe traffic endangerment.
Fatal accidents can result.
- ▶ Remove oil immediately and thoroughly.

4 Endangering air traffic

When working with crane, heights are reached which could endanger air traffic. This applies especially to areas near airports.

WARNING
Endangering air traffic!
If no protective measures are taken, this can result in endangerment to air traffic.
- ▶ Get the approval from agency responsible for air traffic.
- ▶ Install the airplane warning light on the boom head and turn it on.
- ▶ If the airplane warning lights is operated for a longer period of time, with the engine turned off, then the battery can be discharged and as the result the airplane warning light turns off. To prevent the battery from discharging, an external electrical power supply must be established.

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5 Movement on the crane

WARNING
Danger of slipping and falling!
The traction of steps, walkways and hand rails changes due to effects of the weather, such as wetness, ice, snow, frost and dirt.
Personnel can be severely injured or killed.
The crane can be damaged.

- ▶ Step on the walkways and steps only by taking the present conditions into account, such as icing in winter or dirt.
- ▶ Step or place a load only on the approved walkways and steps.
- ▶ Observe the signage.
- ▶ Replace damaged safety signs (warning signs) immediately.

6 Emergency exit

6.1 Emergency exit - driver's cab

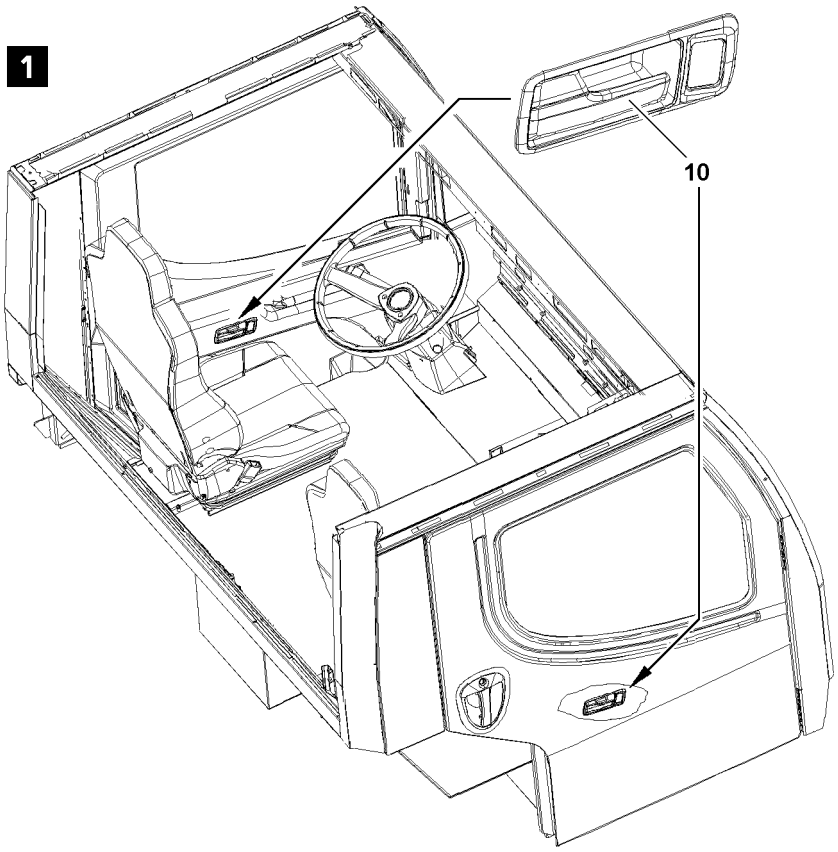

Fig.120932: Example of emergency exit - driver's cab

The driver's cab can be exited through the „left driver's door" or the „right passenger door", see illustration **1**.

Note

- ▶ Exit the driver's cab through the „left driver's door" or the „right passenger door", see illustration **1**: Pull and open the door handle **10** on the „left driver's door" or the „right passenger door".

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6.2 Emergency crane cab exit

WARNING
Danger of falling!
If the crane driver cannot leave the crane cab through the door or if the crane cab is tilted, then there is a danger of falling during the emergency exit.
Death or severe injuries.
▶ Exit carefully in an emergency.

During the emergency exit there is an increase danger of accidents:
▶ Accept help from others.

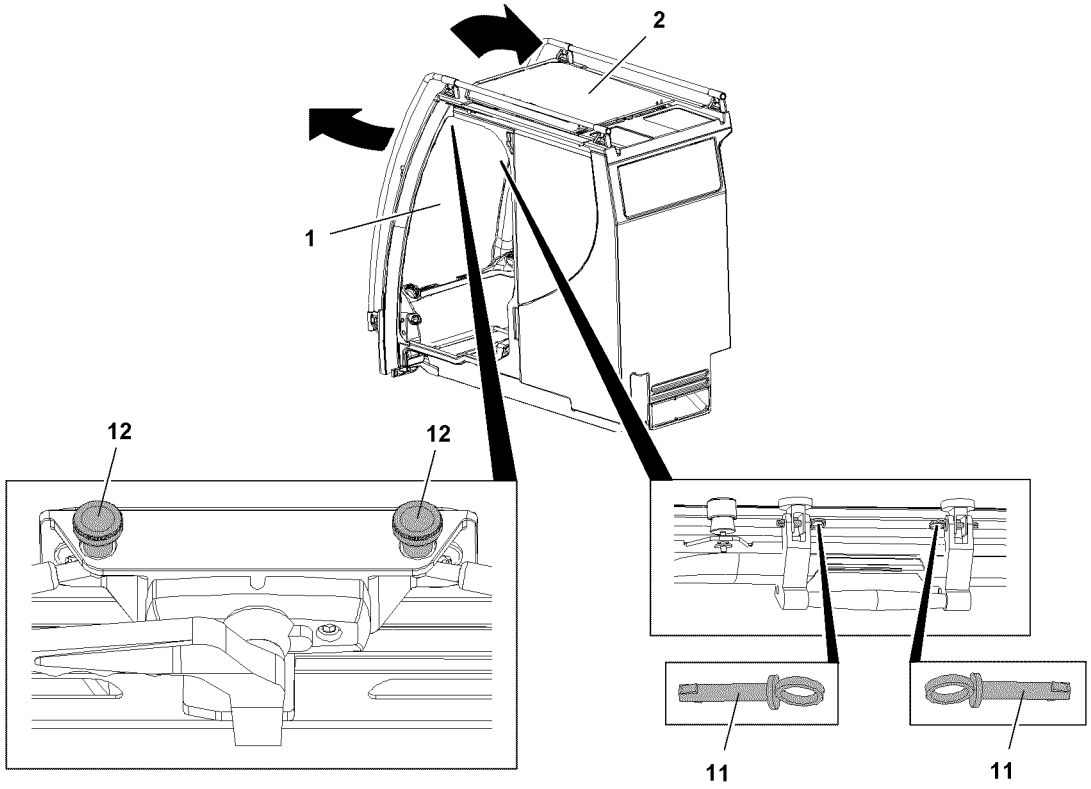

Fig.121111: Examples of emergency exit from the crane cab

If the emergency exit through the door is not possible, then the crane cab can be exited through additional openings.

The following openings are possible:
– **1** Front window
– **2** Roof window

6.2.1 Emergency exit through front window

– Unlock all turn handles.
– Open the front window **1**.
– Leave the crane cab through the front window **1**.

6.2.2 Emergency exit through the roof window

There are two ways to unlock the roof window **2** for the emergency exit:
– Unpin both pins **11**.
– Release both thumbscrews **12**.

– Unlock all turn handles.

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– Unlock the roof window **2** for the emergency exit.
– Open the roof window **2**.
– Leave the crane cab through the roof window **2**.

6.2.3 Emergency exit with EMERGENCY hammer*

Certain crane types carry an EMERGENCY hammer* in the crane cab.

– Knock the front window out with the EMERGENCY hammer* or a suitable object.
– Leave the crane cab.

7 Personal protective equipment

When working on the crane, the required personal protective equipment according to national regulations and accident prevention regulations must be provided and used.

Personal protective equipment includes the following:
– Supplied fall arrest system (safety harness and height safety equipment)
– Supplied height rescue system
– Head protection with chin strap
– Safety shoes
– Protective gloves
– Safety goggles
– Warning apparel
– Hearing protection
– Respiratory protection

WARNING
Personal protective equipment when working on the crane not used!
Death, severe bodily injuries.

The crane operator must ensure the following:
▶ The personal protective equipment is made available.
▶ The provided personal protective equipment is taken along and used.
▶ The operating instructions and maintenance instructions of the manufacturer for the personal protective equipment are observed and complied with.
▶ The product identifications are regularly checked for damage.
▶ Personal protective equipment with damaged product identification is replaced immediately.
▶ Damaged fall arrest systems with height rescue systems will be replaced immediately and handed over to an authorized inspector.
▶ Personal protective equipment is checked for damage and completeness before use.
▶ Defective or damaged personal protective equipment is replaced immediately with functioning protective equipment.

7.1 Supplied fall arrest system

When no other safety measures are possible for working in the presence of a fall hazard, the supplied fall arrest system must be used.

A fall with a fall arrest system cannot exclude an injury. The fall arrest system reduces however the severity of the injuries.

WARNING
Persons not secured!
Personnel can fall down. Death, severe bodily injuries.
▶ Use the supplied fall arrest system.

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WARNING
Fall arrest system damaged!
Personnel can fall down. Death, severe bodily injuries.
▶ Do **not** use a damaged fall arrest system.
▶ Replace a damaged fall arrest system immediately with a new fall arrest system.
▶ Do **not** use the fall arrest system as fastening equipment for loads.
▶ Protect the fall arrest system from external influences.

The fall arrest system must be protected against the following external influences:
– Extreme temperatures
– Guiding the connecting devices over or around sharp edges
– Chemical influences
– Electrical influences
– Cuts, wear
– Climatic effects

Note
If the fall arrest system (safety harness and height safety equipment) is not available or is damaged:
▶ Order is from Liebherr-Werk Ehingen GmbH.

Identification and operating instructions
– The supplied fall arrest system must be clearly and permanently identified.
– If the identification is no longer legible, then the supplied fall arrest system must be immediately replaced and handed over to an authorized inspector.
– The operating instructions must be available in the language of the user country.
– If the crane and the relative personal protective equipment is sold to another country, then the purchaser must make sure that the complete documentation, such as the operating instructions, the manufacturer's operating instructions, inspection log and maintenance documents, are available in the language of the user country.

7.1.1 Safety harness with height safety equipment

The fall arrest system consists of the following components:
– Safety harness **1** approved according to **EN 361**
– Single strand height safety equipment **2** approved according to **EN 360** (for horizontal use and sharp edges)
– or two strand height safety equipment **3** approved according to **EN 360** (for horizontal use and sharp edges)

Fall arrest systems that are not obtained from Liebherr-Werk Ehingen GmbH are **not** designed for the crane structure.

WARNING
Impermissible fall arrest system!
Personnel can fall down. Death, severe bodily injuries.
▶ Utilize exclusively a fall arrest system from Liebherr-Werk Ehingen GmbH.

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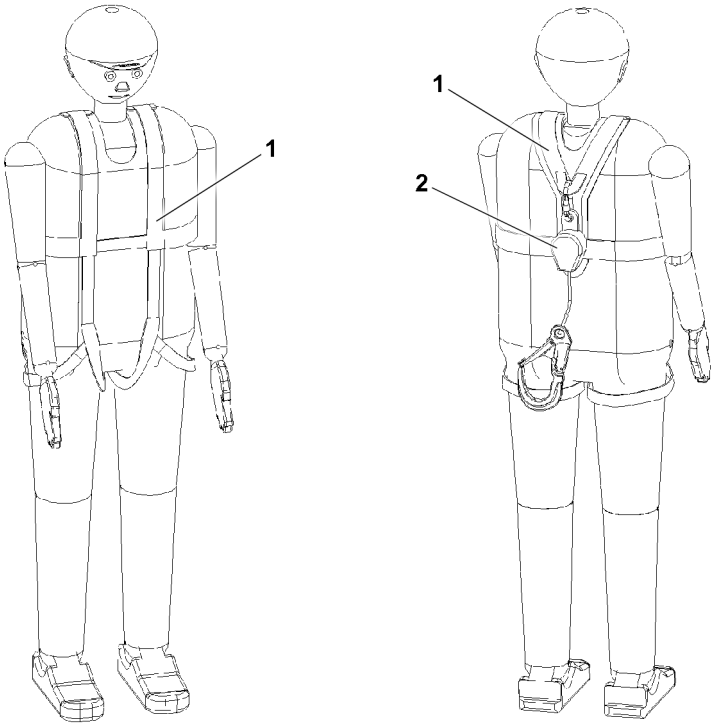

*Fig.146453: Example of a safety harness **1** with a single strand height safety equipment **2***

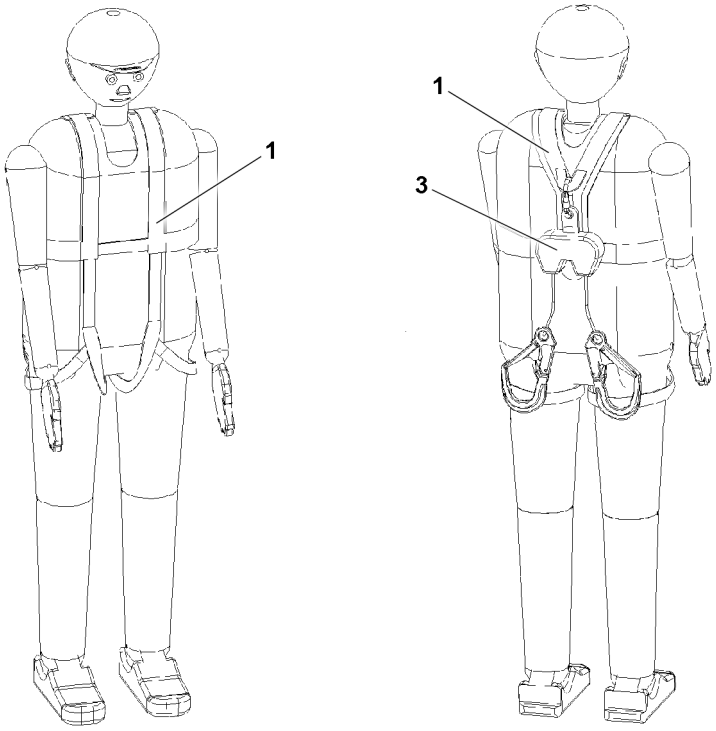

*Fig.146454: Example of a safety harness **1** with a two strand height safety equipment **3***

Prior to crane operation:
- Make sure that the fall arrest system is completely available and functional.
- Check the fall arrest system before use for visible defects. In the case of visible defects: Replace the fall arrest system immediately.

Handling the supplied fall arrest system:
- Observe and comply with the operating instructions of the fall arrest system.
- Check the fall arrest system before use for visible defects.

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- The fall arrest system must be work where no other fall protection equipment, such as railings, can be installed for technical reasons.
- The fall arrest system is effective from a height of 2.5 m. The fall space must be free of obstacles.
- Do **not** change the configuration of the fall arrest system.
- Do **not** lengthen or shorten the fall arrest rope.
- A fall absorber is integrated in the height safety equipment. Do **not** use an additional fall absorber.
- Fasten the fall arrest system only to the hook points, safety ropes and fastening points designed for this purpose. See chapter 2.06.

Behavior in the case of a fall, damage or impairment of the functionality:
- In the case of damage or impairment of the functionality: Replace the fall arrest systems immediately and hand then over to an authorized inspector.
- After every fall: Take down the fall arrest system immediately and hand it over to an authorized inspector. The results must be documented in the fall arrest system inspection log book.
- Only after a written approval may the fall arrest system be reused. The approval must be provided in writing and documented.
- Fall arrest systems that are no longer approved must **not** be used. Unapproved fall arrest systems must be disposed of and replaced with new fall arrest systems.

Storage of the fall arrest system:
- Store the fall arrest system dry and without the effect of UV radiation in the corresponding transport bag.

The operator must ensure the following:
- Personnel must be instructed at least once a year on how to use the supplied fall arrest system (safety harness and height safety equipment) with practical exercises. Performance of the instruction and exercises must be documented.
- The safety harness and height safety equipment must be checked at least once a year by an authorized inspector. The results must be documented in the fall arrest system inspection log book.

Single strand height safety equipment

The single strand height safety equipment is equipped with a belt strap. Single strand height safety equipment is provided for all cranes that do not have walking surfaces with safety ropes.

Use the supplied height safety equipment with extendable belt strap and snap hook with swivel according to **EN 362 Class A**.

Two strand height safety equipment

The two strand height safety equipment is equipped with two belt straps. Height safety equipment with two belt straps are provided for cranes with walking surfaces and two ropes as fastening device on the left and right hand side of the walking surface, for example lattice sections, lattice booms, possibly telescopic booms or assembly units.

Use the supplied height safety equipment with two extendable belt straps and snap hooks with swivel according to **EN 362 Class A**.

WARNING
Height safety equipment incorrectly used!
Personnel can fall down. Death, severe bodily injuries.

When two safety ropes are present on the booms, lattice sections or other components:
- ▶ Only use the height safety equipment with two belt straps.
- ▶ Hook one belt strap with snap hook for the fall arrest system per safety rope.
- ▶ When transferring to new safety equipment, a snap hook for the fall arrest system must **always** be hooked.

7.2 Height rescue system

The height rescue system is only supplied on certain crane types.

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The height rescue system is an evacuation and rescue device. It is used to lift the fallen person to be able to unhook him from the height safety equipment and to lower him by rope.

The height rescue system consists of the following components:
- Rappelling rescue device
- Telescopic rod for hooking the snap hook on the safety harness

WARNING
Height rescue system not present!
Fallen person cannot be saved. Suspension trauma, death, severe bodily injuries.
▶ Always have the height rescue system ready.

WARNING
Height rescue system damaged!
Personnel cannot be saved.
▶ Do **not** use a damaged height rescue system.
▶ Replace a damaged height rescue system immediately with a new height rescue system.
▶ Protect the height rescue system from external influences.

The height rescue system must be protected against the following external influences:
- Extreme temperatures
- Chemical influences
- Electrical influences
- Cuts, wear
- Climatic effects

Prior to crane operation:
- Make sure that the height rescue system is completely available and functional.
- Check the height rescue system before use for visible defects. In the case of visible defects: Replace the height rescue system immediately.

Handling the height rescue system:
- Observe and comply with the operating instructions of the height rescue system.
- Do **not** change the configuration of the height rescue system.

Behavior in the case of a fall, damage or impairment of the functionality:
- In the case of damage or impairment of the functionality: Replace the height rescue system immediately and hand it over to an authorized inspector.
- After every use: Hand the height rescue system over to authorized inspector. The results must be documented in the height rescue system inspection log book.
- Only after a written approval may the height rescue system be reused. The approval must be provided in writing and documented.
- Height rescue systems that are no longer approved must **not** be used. Unapproved height rescue systems must be disposed of and replaced with new height rescue systems.

Storage of the height rescue system:
- Store the height rescue system dry and without the effect of UV radiation in the corresponding transport bag.

The operator must ensure the following:
- Personnel must be instructed at least once a year on how to use the height rescue system with practical exercises. Performance of the instruction and exercises must be documented.
- The height rescue system must be checked at least once a year by an authorized inspector. The results must be documented in the height rescue system inspection log book.

7.3 Hard hat

Wear a hard hat with a chin strap, if head injuries are possible. For example, due to:
- Striking
- Falling, tipping or flying objects
- Oscillating objects

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Replace the hard hat immediately, if:
- If is struck with force
- It has visible defects
- The maximum service life specified by the manufacture has been reached

An industrial hard hat can protect against striking fixed objects and falling or oscillating objects, but **not** against falling loads.

WARNING
Suspended and falling loads!
Death, severe bodily injuries.
▶ Do **not** remain under suspended loads.

7.4 Protective gloves

Wear protective gloves, if hand injuries are possible. For example, due to:
- Pointy or sharp objects
- Hot surfaces

When working with ropes: Protective gloves must be puncture proof.

7.5 Safety shoes

Wear safety shoes, if foot injuries are possible. For example, due to:
- Oscillating or falling parts
- Pointy or sharp objects
- Impact or trapping
- Slipping on slippery ground or surfaces

7.6 Warning apparel

Avoid accidents: Wear reflecting, signal color warning clothing, when personnel must be visible and recognizable.

The „warning clothing“ category includes, for example:
- Safety vest
- Safety jacket
- Safety pants

7.7 Safety goggles

Wear safety goggles when eye injuries are possible. For example, due to:
- Corrosive fluids
- Pressurized fluids
- Flying parts

7.8 Hearing protection

Wear hearing protection when there is danger of hearing damage due to noise.

7.9 Respiratory protection

Wear respiratory protection when there is danger of damage due to polluted air.

7.10 Aids for work at a height

All work at a height, when there is a danger of falling, must be carried out with suitable aids.

Part of the category „Aids for working at a height“ are, for example:
- Work platforms

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- Scaffolding
- Assembly platform
- Catwalks
- Ladders

When working at a height, working on a work platform, scaffolding, assembly platform, catwalk or similar is preferential to working on a ladder.

WARNING
Persons not secured when working at a height!
Personnel can fall down. Death, severe bodily injuries.

When work platforms, scaffolding, catwalks or similar are not available and the work cannot be carried out from the ground:
▶ Secure personnel with the supplied fall arrest system to prevent falling.

When fall protection equipment such as hook points, safety ropes and fastening points are available on the crane:
▶ Secure personnel with the fall arrest system to the fall protection equipment. See chapter 2.06.

When stepping on a ladder:
▶ Do not hold any objects in your hands.
▶ Adhere to the 3-point support. See chapter 2.04.10.

Rules when using the aids:
- Step on the ladder only with clean shoes.
- Keep it free from heavy dirt deposits.
- Keep it free of snow and ice.

8 Supplied fire extinguisher

Storage of the fire extinguisher:
- To protect against damage, store the fire extinguisher in its designated location.

Before crane operation and travel operation:
- Make sure that the fire extinguisher is always freely accessible and functional.

After use:
- Have the fire extinguisher refilled immediately or replaced.

Replace the fire extinguisher immediately, if:
- It has visible defects.
- The fire extinguisher does not function.
- The inspection term specified by the manufacturer has been exceeded.
- The maximum service life specified by the manufacture has been reached.

The operator must ensure the following:
- Personnel must be instructed at least once a year on how to use the fire extinguisher with practical exercises. Performance of the instruction and exercises must be documented.
- The fire extinguisher must be checked by an authorized inspector according to the manufacturer's specifications and national regulations. The results must be documented.
- Non-functional and used fire extinguishers must be immediately repaired or replaced.

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9 Securing persons to prevent them from falling

WARNING
Danger of falling!
- ▶ Wear the supplied fall arrest systems (safety harnesses and height safety equipment) correctly.
- ▶ When accessing a ladder, do not hold any objects in your hands.
- ▶ When accessing a ladder, adhere to the 3-point support. See the Crane operating instructions, chapter 2.04.10.

9.1 Working on the telescopic boom head and / or auxiliary boom

When performing assembly or disassembly work on a ladder, people can fall down:
- A second person must be present to hand the necessary items to the person on the ladder.

Reeve the hoist rope in or out on the pulley head:
- For ladder work, use the supplied ladder: For fastening and hook points, see the Crane operating instructions, chapter 2.06.
- For cranes that carry a ladder along **with** a hook device:
  Use the hook device to secure the ladder.
- For cranes, which carry a ladder along **without** hook device:
  Use the rigging belt to secure the ladder.
- When ascending, the assembly personnel must ensure a 3-point support.
- If there is a danger of falling, the assembly personnel must hook themselves with the snap hooks of the fall arrest system on the fastening points and secure themselves against falling.

9.2 Walking on the telescopic boom

WARNING
Danger of falling!
The assembly personnel can fall down by slipping on the telescopic boom and be killed or severely injured!
- ▶ The telescopic boom may only be accessed if assembly personnel is protected with suitable safety measures to prevent them from falling.
- ▶ If safety ropes are present on the telescopic boom, then the assembly personnel must hook themselves with the supplied fall arrest system on the safety ropes of the telescopic boom on the left and right with both snap hooks and secure themselves against falling.
- ▶ Without safety measures, it is **strictly** prohibited to step on the telescopic boom.

Assembly of the hoist rope or the TY-guying:
- During assembly, the assembly personnel must hook themselves on the fastening devices on the left and right with both snap hooks of the fall arrest system and secure themselves against falling.

9.3 Accessing the lattice sections or booms

Climbing the ladder:
- When ascending, the assembly personnel must ensure a 3-point support.

Changing from ladder to catwalk **without** transition aid:
- From a transition height above 1.8 m: **Before** transitioning, assembly personnel must hook at least one snap hook of the fall arrest system to a safety rope and secure themselves against falling.

Changing from ladder to catwalk **with** transition aid:
- **After** transitioning, the assembly personnel must hook at least one snap hook of the fall arrest system on a safety rope and secure themselves against falling.

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9.4 Walking on lattice sections or booms

Walking on catwalks:
- When walking on catwalks, the assembly personnel must hook themselves on the safety ropes on the left and right with both snap hooks of the fall arrest system and secure themselves against falling.
- When changing the fall arrest system over to a new lattice section, the assembly personnel must be hooked with at least one snap hook of the fall arrest system to one item of safety equipment.

9.5 Working on lattice sections or booms

Pinning, unpinning the lattice sections of pull rods:
- During pinning, unpinning of lattice sections or pull rods, the assembly personnel must hook themselves on the safety ropes on the left and right with both snap hooks of the fall arrest system and secure themselves against falling.

Fastening the lattice sections:
- When fastening the lattice sections, the assembly personnel must hook themselves on the safety ropes on the left and right with both snap hooks of the fall arrest system and secure themselves against falling.

9.6 Descending from lattice sections or booms

Accessing the ladder **without** transition aid:
- From a transition height above 1.8 m: **Before** stepping on the ladder, assembly personnel must hook at least one snap hook of the fall arrest system to a safety rope and secure themselves against falling.
- When stepping on the ladder, the assembly personnel must ensure a 3-point support.
- The snap hook of the fall arrest system may only be unhooked after standing safely on the ladder (3-point support).

Accessing the ladder **with** transition aid:
- When stepping on the ladder, the assembly personnel must ensure a 3-point support.

Climbing down the ladder:
- When descending, the assembly personnel must ensure a 3-point support.

10 Rescuing the assembly personnel

The height rescue system is only supplied on certain crane types.

The height rescue system, consisting of the rappelling rescue device, is an evacuation and rescue device. It is used to lift the fallen person to be able to unhook him from the height safety equipment and to lower him by rope.

WARNING
Danger of falling!
- ▶ The assembly personnel must be instructed and trained properly in the correct handling of the height rescue system. Annual practice instructions and drills must be carried out.
- ▶ The supplied height rescue system must be kept available.
- ▶ The operating instructions of the manufacturer for the height rescue system must be observed and adhered to.
- ▶ The height rescue system must be checked annually by authorized and trained expert personnel and documented in the inspection log book.

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10.1 First aid measures after rescue

WARNING
Danger of fatal injury!
- ▶ After the rescue, the patient must be positioned with the upper body raised (in seated or squatting position).
- ▶ Immediate flat position or even shock position can be fatal.

11 Crane cab

11.1 Extendible step* for cranes on tires

An extendible step allows comfortable entry into the crane cab as well as safe exit from the crane cab to the crane chassis and safe access to the turntable.

The description for an „extendible step for cranes on tires“ only applies for cranes that drive on tyres.

Ascending and descending takes place via the ladder on the crane chassis. See chapter 2.07 „Accesses to the crane“.

WARNING
Extendible step in the incorrect position!
Personnel can fall down. Death, severe bodily injuries.
- ▶ Make sure that the extendible step is in the correct position.

When directly accessing the crane cab via the ladder from the ground or when directly descending from the crane cab via the ladder to the ground:
- – The extendible step must be **retracted**.

When accessing the crane cab via the crane chassis or the crane superstructure:
- – The extendible step must be **extended**.

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11.1.1 Accessing the crane cab via the ladder on the crane chassis

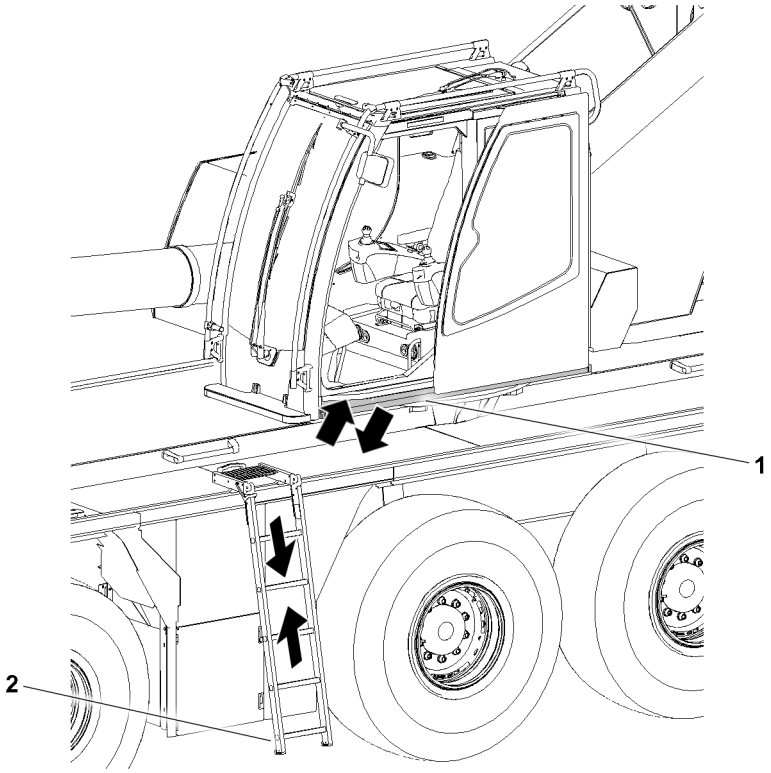

*Fig.152871: Crane superstructure in the 0° position or 180° position: Step **retracted***

Prior to ascending to the crane cab via the ladder from the ground or before descending from the crane cab via the ladder **2** to the ground, the following prerequisites must be met:
- The crane superstructure is in the 0° position or 180° position.
- In the case of a crane cab with incline adjustment: The crane cab is in the horizontal position.
- The step **1** under the crane cab is **retracted**.
- The folding ladders are in the ascent and descent position.

WARNING
Extendible step in the incorrect position!
Personnel can fall down. Death, severe bodily injuries.
▶ Make sure that the extendible step is fully retracted.

WARNING
The step **1 cannot** be retracted!
People can fall during ascent and descent via the ladder **2**. Death, severe bodily injuries.
▶ Guarantee safe ascent / descent: Set up suitable climbing aids, such as a platform or ladder.

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11.1.2 Crane cab access on the crane chassis

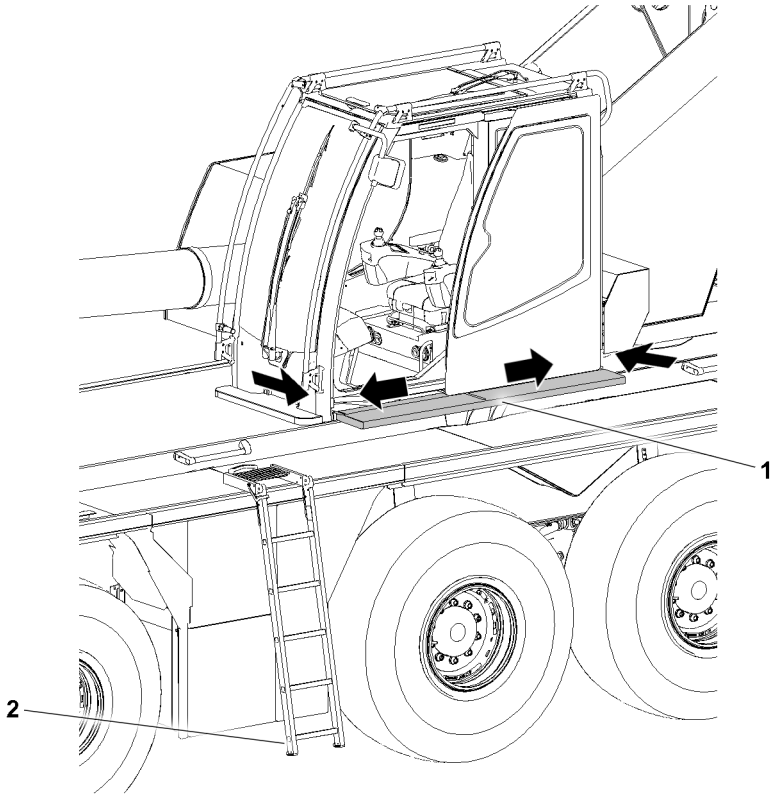

*Fig.152870: Crane superstructure in the 0° position or 180° position: Step **extended***

When accessing the crane cab via the crane chassis or the crane superstructure the following prerequisites must be met:
- The extendible step **must** be extended.
- In the case of a crane cab with incline adjustment: The crane cab is in the horizontal position.

WARNING
Extendible step in the incorrect position!
Personnel can fall down. Death, severe bodily injuries.
▶ Make sure that the extendible step is fully extended.

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11.1.3 Crane cab access with a turned crane superstructure

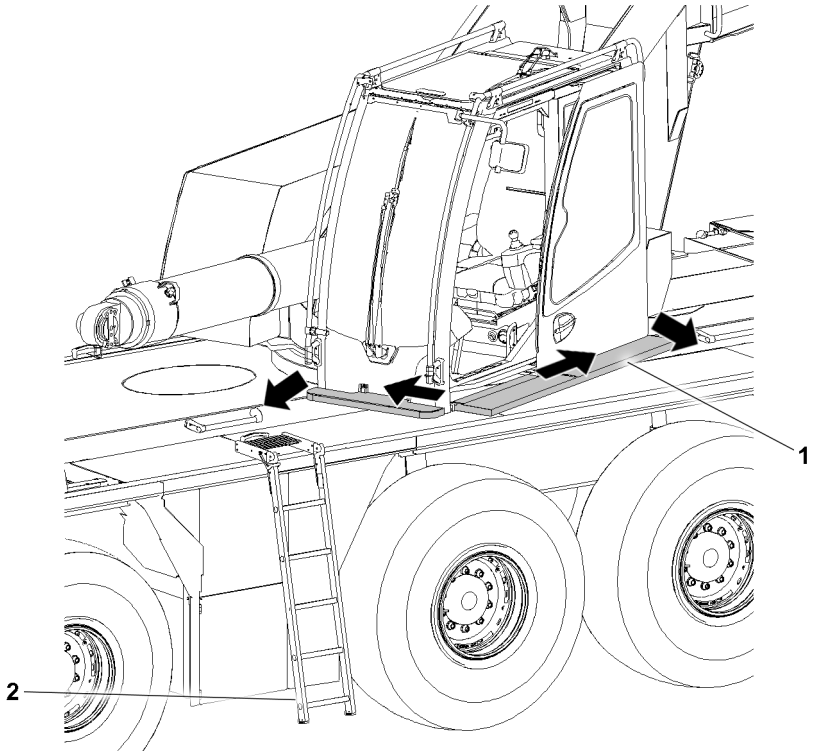

*Fig.152872: Crane superstructure turned: Step **extended***

When accessing the crane cab with a turned crane superstructure, the following prerequisites must be met:

- The crane superstructure is swung to the point where a safe access to walkable surfaces of the crane chassis is ensured.
- The extendible step **must** be extended.
- In the case of a crane cab with incline adjustment: The crane cab is in the horizontal position.
- The folding ladders are in the ascent and descent position.

WARNING
Extendible step in the incorrect position!
Personnel can fall down. Death, severe bodily injuries.
▶ Make sure that the extendible step is fully extended.

11.2 Extendible step* for LTR cranes

An extendible step allows comfortable entry into the crane cab as well as safe exit from the crane cab to the crane chassis and safe access to the turntable.

The description for an „extendible step for LTR cranes“ only applies for LTR cranes.

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11.2.1 Extendible step for LTR 1060 and LTR 1100

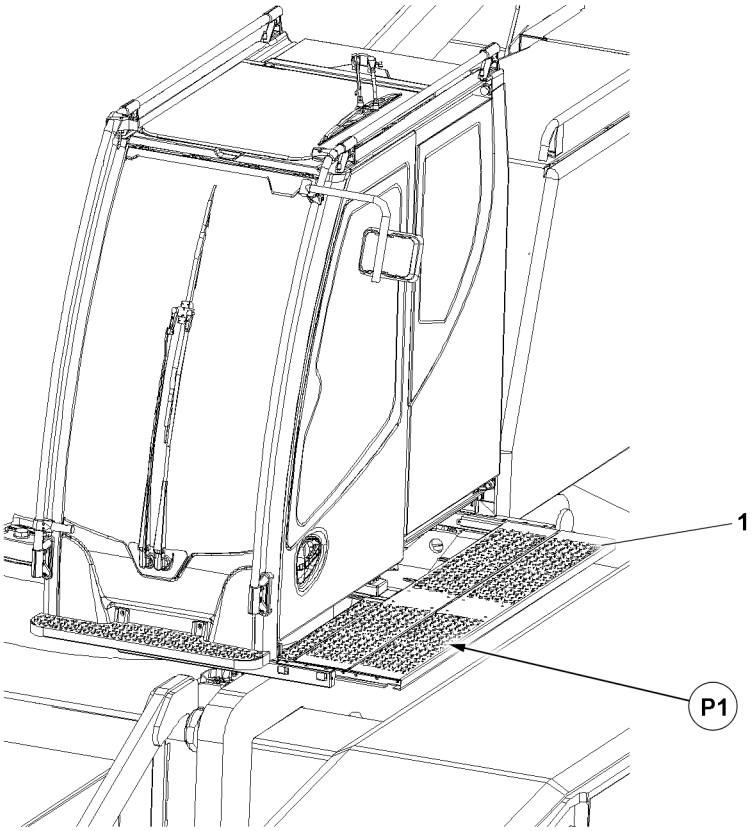

Fig.149549: Extendible step for LTR 1060 and LTR 1100

Ascending and descending takes place on the walking surfaces of the crawler chain. See chapter 2.07 „Accesses to the crane“.

Before entering or exiting the crane cab, the following prerequisites must be met:
- The crane superstructure is in the 0° position or 180° position.
- In the case of a crane cab with incline adjustment: The crane cab is in the horizontal position.
- The step **1** under the crane cab is extended in position **P1**.

WARNING
The crane superstructure is in 0°-position or in 180° position and the step **1** is **not** extended!
Personnel can fall down. Death, severe bodily injuries.
▶ Before entering or exiting: Extend the step **1** completely.

If the step **1 cannot** be extended:
▶ Guarantee safe entry and exit: Set up suitable climbing aids, such as a platform or ladder.

WARNING
The crane **cannot** be brought into the safe 0° position or 180° position for ascent or descent via the walking surfaces of the crawler chain!
The distance between the step and the walking surfaces of the crawler chain is more than 300 mm.
Personnel can fall down. Death, severe bodily injuries.
▶ Guarantee safe ascent and descent: Set up suitable climbing aids, such as a platform or ladder.

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11.2.2 Extendible step for LTR 1220

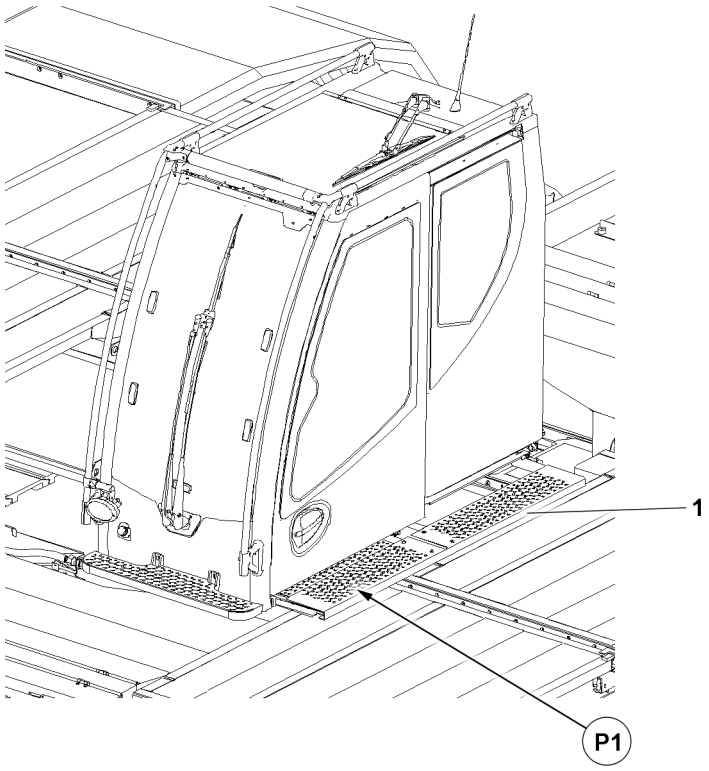

Fig.149550: Extendible step for LTR 1220

Ascending and descending takes place on the walking surfaces of the crawler chain. See chapter 2.07 „Accesses to the crane“.

Before entering or exiting the crane cab, the following prerequisites must be met:
- The crane superstructure is turned to the point where a safe access to walkable surfaces of the crane chassis is ensured.
- In the case of a crane cab with incline adjustment: The crane cab is in the horizontal position.
- The step **1** under the crane cab is extended in position **P1**.

WARNING
The crane **cannot** be brought into the safe 0° position or 180° position for ascent or descent via the walking surfaces of the crawler chain!
The distance between the step and the walking surfaces of the crawler chain is more than 300 mm.
Personnel can fall, death, severe bodily injuries.
▶ Guarantee safe ascent and descent: Set up suitable climbing aids, such as a platform or ladder.

11.3 Crane cab with incline adjustment

WARNING
Danger of falling!
If the crane cab cannot be swung from an inclined position (for example 20° position) to the horizontal position, for example due to a problem, then utmost caution must be used when entering and exiting.
Personnel can fall, death, severe bodily injuries.
▶ For safety reasons, we recommend making use of outside help.
▶ If necessary, have platforms or other suitable entry aids set up to ensure safe exit from the crane cab.

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WARNING
Danger of accident!
If the door of the crane cab is opened in inclined position, then the door can move back suddenly. Hands can be crushed or injured.
▶ When the crane cab is in inclined position, open the door carefully.

11.4 Securing bracket

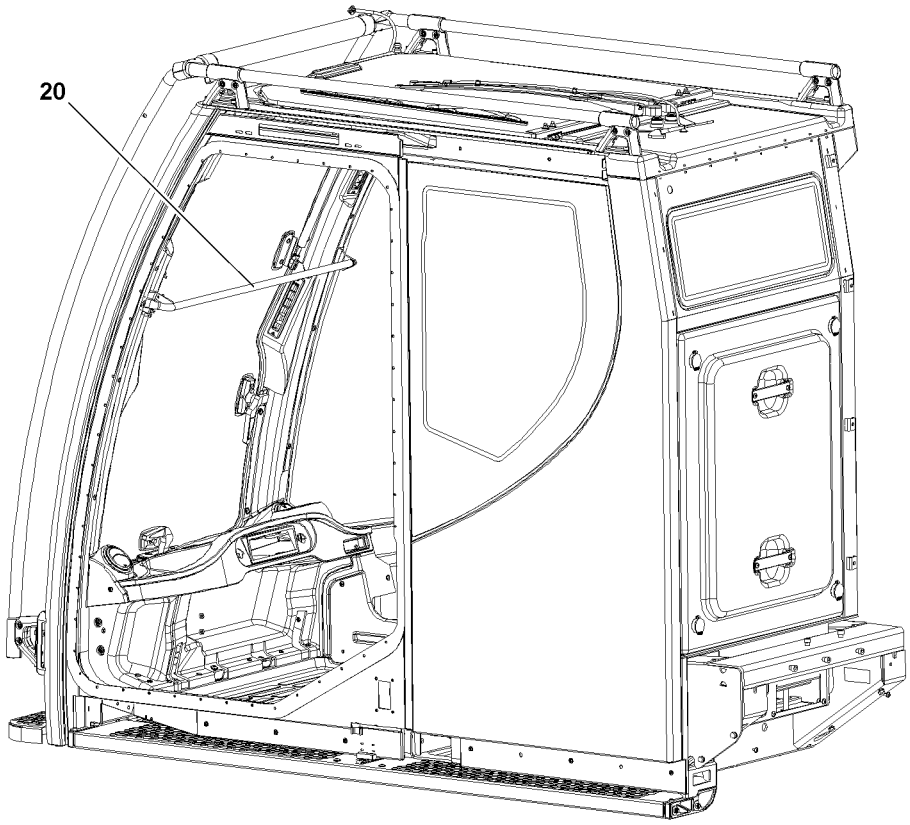

Fig.121158: Example of crane cab with securing bracket

Note
▶ The securing bracket **20** is installed to protect the crane operator from a danger of falling when the front window is open.
▶ Do not use the securing bracket **20** as a handle.

11.5 Closing the side window pane

WARNING
Danger of crushing!
Never close the side window pane carelessly or uncontrolled. Significant crushing injuries can occur.
▶ During closing, watch the side window pane as it moves up.
▶ Make sure that no personnel or objects are crushed.

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12 Transport

WARNING
Error during transport!
Death, severe bodily injuries, property damage.
- ▶ To avoid accidents, observe and follow the notes provided in the following sections.
- ▶ Observe the legal as well as country-specific regulations for load securing.

WARNING
Falling of crane components!
If rigging devices are released and removed from crane components after transport, the crane components can slip or fall over.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the crane components are fastened to the auxiliary crane after releasing the rigging devices.
- ▶ Make sure that the fastening equipment is tensioned before releasing the rigging devices on the crane components.

12.1 Crane and crane components

Follow the notes provided below to safely transport the crane and crane components:
- Close the crane cab and all cover doors.
- Use suitable transport vehicles.
- Use rigging devices with sufficient load capacity.
- Regularly check the rigging points and fastening points. See chapter 8.01.
- Properly support and secure the components on the transport vehicle.
- Use special transport devices. See chapter 3.80.
- Transporting a complete luffing lattice jib is prohibited.

12.2 Lattice sections

Follow the notes provided below to safely transport the telescoped lattice sections:
- Securely rig the lattice sections on the transport vehicle and secure them together in at least two independent points.
- When there are rigging points on the lattice sections: Secure each lattice section individually to the provided rigging points using suitable rigging elements and clamping elements on the transport vehicle.
- If there are no rigging points on the lattice sections: Secure each lattice section individually with suitable rigging devices and clamping elements to the transport vehicle.

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12.3 Fiber guy ropes

WARNING
Damage to the fiber guy ropes during storage and transport!
If the following prerequisites for storage and transport are not observed, then the load bearing capacity can be significantly reduced and the fiber guy ropes can rip off.
Death, severe bodily injuries, property damage.

- ▶ Make sure that minimum bending diameter during storage and transport of **20** x rope diameter on the fiber guy ropes is **never** fallen below.
- ▶ Make sure that the fiber guy ropes are **not** kicked or knotted during storage and transport.
- ▶ Make sure that the fiber guy ropes are **not** twisted during storage and transport. Pay attention to the twist display - marker line along the longitudinal axis of the rope braid.
- ▶ Make sure that the fiber guy ropes do **not** lie over sharp edges during storage and transport and are pulled over them.
- ▶ Make sure that the fiber guy ropes are not thrown onto the ground or components.
- ▶ Make sure that the fiber guy ropes are **not** in contact with chemicals or acids during storage and transport.
- ▶ Make sure that the fiber guy ropes are **not** stored or transported together with other components.
- ▶ Store and transport the fiber guy ropes in the provided transport box.
- ▶ Inspect the fiber guy ropes regularly, see chapter 8.16.

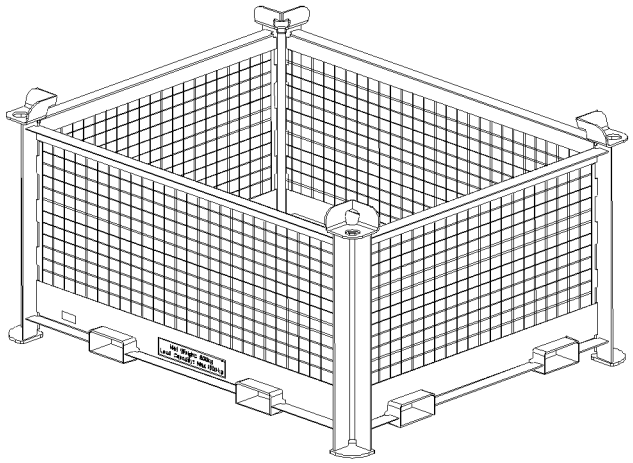

Fig.149503: Transport box for fiber guy ropes

12.4 Mobile cranes

Follow the notes provided below for the safe transport of mobile cranes:

- To ensure the largest possible frictional coefficient to the transport surface, clean the wheels before transport.
- When driving on the transport vehicle, check the easy movement of the vehicle with the aid of a guide to avoid hitting too hard.
- Apply the parking brake. See the Crane operating instructions, chapter 3.04.
- Lower the crane with the level control to obtain a center of gravity as low as possible. Level control, see Crane operating instructions, chapter 3.03
- Stopping the mobile crane: Place wedges under the wheels. See the Crane operating instructions, chapter 2.04.
- Close the driver's cab.

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12.5 Accelerating, changing the load

NOTICE
Permissible acceleration exceeded!
Damage to the crane.
- ▶ Observe the maximum permissible longitudinal acceleration of 1.0 g.
- ▶ Observe the maximum permissible lateral acceleration of 0.8 g.
- ▶ Offloading and running is prohibited during rail transport.

If higher accelerations are expected (sea transport, rail transport, maneuvering operation):
- ▶ Carry out the special measures to secure the crane and crane components.

NOTICE
Frequent dynamic load change!
Premature fatigue of load bearing crane components.
- ▶ Demount and properly secure components with large masses.
- ▶ Prior to transport: Have the rigging points and crane structures checked for damage by an authorized inspector. See chapter 8.01.

13 Fastening

WARNING
Defective fastening equipment or fastening points!
The load can fall down.
- ▶ Make sure that the fastening points and fastening equipment are in a perfect condition.
- ▶ Regularly check the rigging points and fastening points. See the Crane operating instructions, chapter 8.01.
- ▶ Check the fastening equipment regularly. See the Crane operating instructions, chapter 8.01.

WARNING
Load bearing capacity of the fastening equipment is **not** sufficient!
The load can fall down.
- ▶ Determine the weight of the crane component to be fastened.
- ▶ Fasten the components solely with approved and sufficiently load bearing fastening equipment.

WARNING
Component incorrectly fastened!
The load can fall down.
- ▶ Attach the components only on the intended fastening points.

14 Heated crane components

WARNING
Danger of burns!
You can get severely burnt on the surfaces of hot components.
This applies especially to exhaust systems, the engines and the respective gears in the crane chassis and in the crane superstructure.
- ▶ Let the components cool down before touching them.
- ▶ Proceed with special caution near heated crane components.

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15 Crane operator responsibilities

15.1 General

The crane operator's primary responsibility is to use and operate the crane in a manner that is safe for both himself and others.

The following important safety instructions will help you achieve this.

Many crane accidents are caused by crane control errors.

WARNING
Danger due to operating error!
▶ In your interest and in the interest of others, make sure that you know your crane. Also learn to recognize all dangers connected with the work to be carried out.

Operating errors, which are made again and again during travel operation or crane operation are especially careless while working, in particular:
- Swinging too quickly
- Stopping the load too quickly
- Pulling the load at an angle
- Allowing slack rope formation
- Overloading the crane
- Driving too fast with a load and / or equipment on an uneven road
- Error when fastening the load
- Unsuitable operation; especially angular pulling, breaking away stuck loads
- Wind action on suspended loads
- Errors during on-road driving, for example:
  - Overspeeding the engine when driving downhill
  - Driving with turned on differential lock
- Crashing into bridges, roofs or high voltage wires due to insufficient overhead clearance
- Inadequate support; support base, substructure under the support plates
- Errors during assembly or removal of booms
- Incorrect positioning of the crane when it is taken out of service
- Exceeding the permissible wind speeds in operation and when out of service

In many cases, crane damage is caused by improper maintenance:
- Insufficient oil, grease or antifreeze
- Contamination
- Broken cable wires, defective tires, worn components
- Emergency limit switch or load torque limiter (LMB) not operating properly
- Brake and clutch failure
- Hydraulic defects; for example cracked hoses
- Loose bolts

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15.2 Working on the crane superstructure or boom

WARNING
Danger of falling!
When working on the crane superstructure or boom, personnel must be secured with appropriate safety measures to prevent them from falling. If this is not observed, working personnel can fall and be killed or severely injured.

- ▶ For all work on the crane where there is a danger of falling, suitable safety measures must be taken.
- ▶ The crane superstructure or the boom may not be accessed without suitable aids.
- ▶ Suitable aids are, for example: Lifting platforms, scaffoldings, ladders, assembly platforms, auxiliary crane.
- ▶ If railing are present on the crane superstructure, then they must be swung into operating position and secured for all work, see Crane operating instructions, chapter 2.06.
- ▶ Step on aids and stepping surfaces on the crane only with clean shoes.
- ▶ Keep aids and stepping surfaces on the crane clean and free from snow and ice.
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with supplied fall arrest systems to avoid falling, see section „Personal protective equipment“.
- ▶ It is prohibited to step on the driver’s cab or crane cab roof and specially marked surfaces, see Crane operating instructions, chapter 2.05.

15.3 Obligations of the crane operator

1. Before starting to work, the crane operator must check the brake function and the emergency shut off devices. He must monitor the condition of the crane for obvious defects. On wireless controlled cranes, he must check the assignment of control unit and crane.
2. The crane operator must cease crane operation in case of problems endangering the safety.
3. The crane operator must report all defects on the crane to the appropriate supervisor, also to his replacement in case of crane change.
4. The crane operator must make sure that:
   - All control systems are set to neutral or idle position before release of the energy supply to the drive components.
   - The control systems are set to neutral or idle position and the energy supply is shut off before leaving the control platform.
   - When taking down the control unit for wireless control, the control unit is secured to prevent unauthorized persons from turning it on.
5. The crane operator must ensure that cranes subjected to wind are not operated past the limits which were set by the crane manufacturer, and that the boom is taken down at least when the critical wind speeds for the crane are reached and at the end of the work.
6. The crane operator must monitor the load for all crane movements or the load lifting devices when moving the crane without a load, if they could cause a dangerous situation. If observation is not possible, then the crane operator may move the crane only with the aid of a guide.
7. The crane operator must give warning signs when necessary.
8. The crane operator may not move loads over personnel.
9. Any loads attached by hand may only be moved by the crane operator after he received a clear sign from the person who attached the load, the guide or any other responsible party which was assigned to that task by the contractor. If signals must be used to communicate with the crane operator, then these signals must be agreed upon before use between the responsible party and the crane operator. If the crane operator determines that the loads are not properly attached, then he may not move these loads.
10. As long as a load is suspended on the crane, the crane operator must keep the control systems within reach. This does not apply for the towing of vehicles with towing cranes.
11. The crane operator may not run up operationally to end positions that are only limited by the emergency limit switches.
12. After a load torque limiter was triggered, the crane operator may not pick up an overload by pulling in / raising the boom.

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13. The crane operator may **not** bypass the overload protection to increase the hoisting power of the crane.

16 Selecting the location

In the following illustrations 1 to 3 the possible situations are shown as an example.

It is very important to choose an appropriate placement location in order to minimize safety risks.

It must always be possible to take down the crane in order to take down the crane in a timely manner in the case of unexpected weather conditions.

It must always be possible to position the crane in a safe out of service position.

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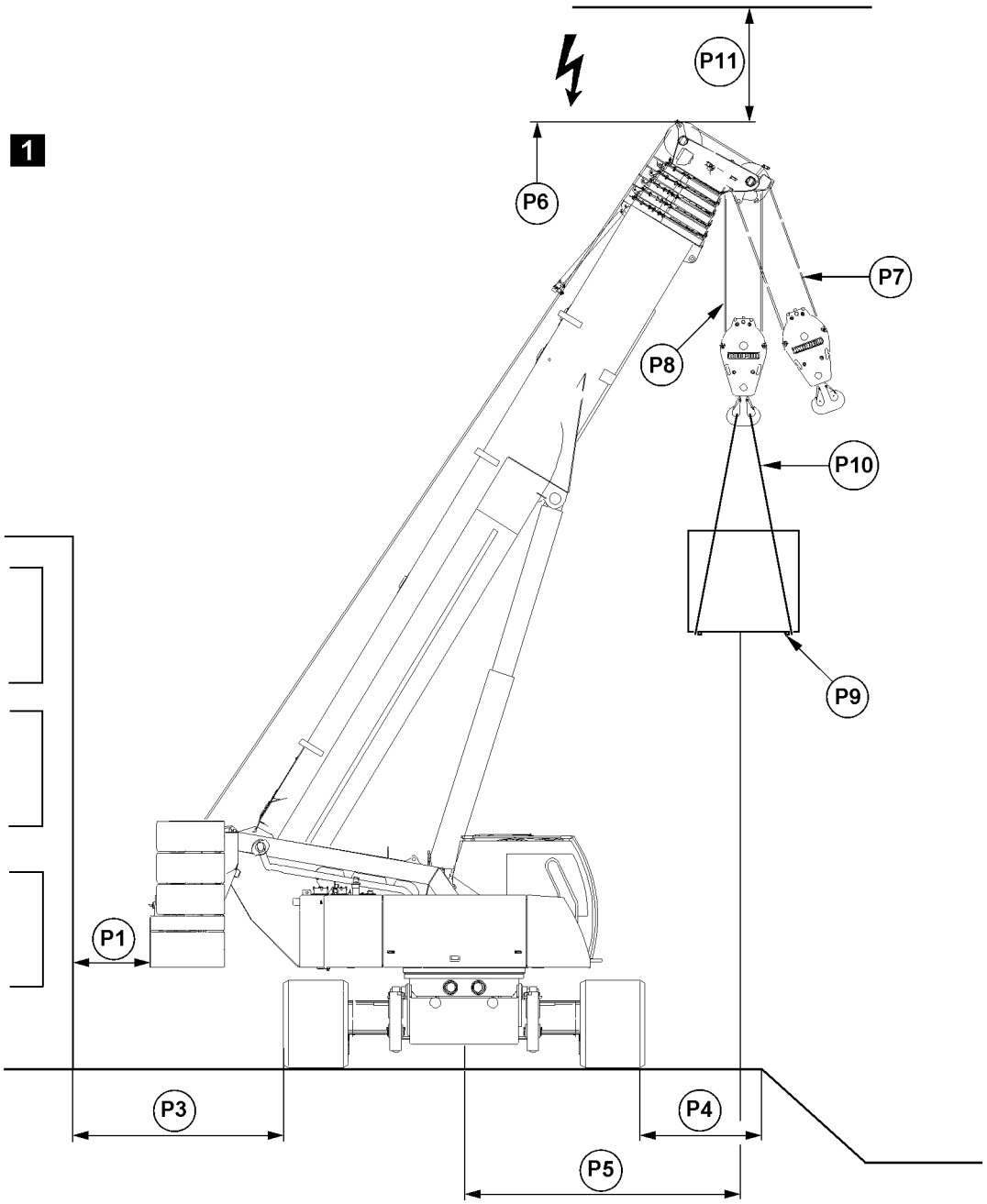

Fig.121166: Example of crawler crane with telescopic boom

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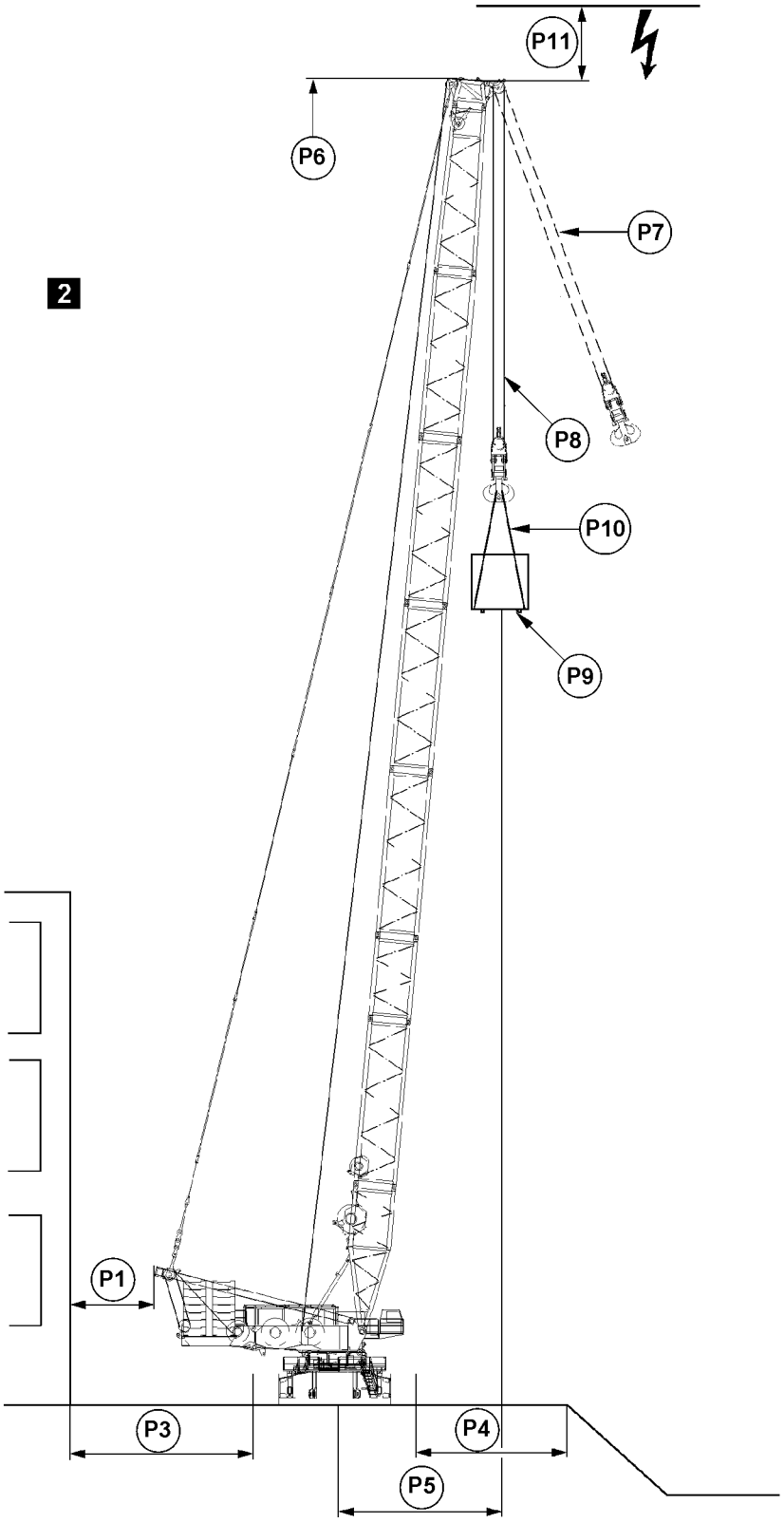

Fig.121167: Example of crawler crane with lattice mast boom

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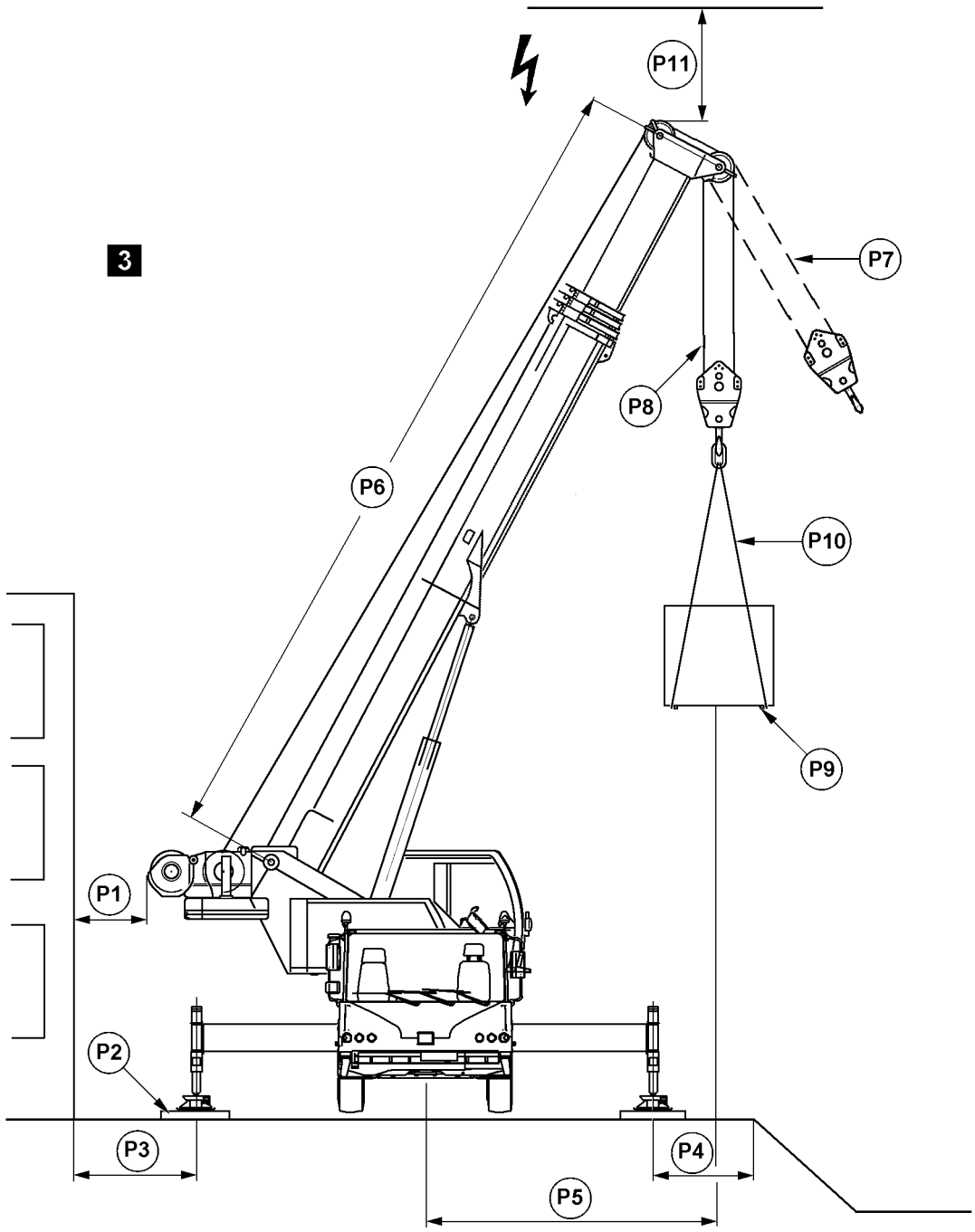

Fig.121168: Example of mobile cranes

DANGER
Danger of accidents due to ground with **insufficient** load bearing capacity!
If the crane is supported or driven on ground with **insufficient** load bearing capacity, then the crane can topple over and kill personnel.
- ▶ Only support or drive the crane on ground with sufficient load bearing capacity.
- ▶ Act responsibly when planning and selecting the crane location and route.
- ▶ Observe the following points.

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Sign	When selecting the placement location for the crane, observe and adhere to the following:
P1	Select the placement location in such a way that crane movements can be carried out without collision and that the supports can be extended to the support base specified in the load charts Make sure that no personnel is injured or killed Always keep a safety distance of 0.5 m. If this is not possible, block the danger zone off
P2	When crane support is required: Support the crane correctly and support the support plates large enough according to the load bearing capacity of the ground and the placement location
P3	Maintain a safe distance from basements or similar
P4	Maintain a safe distance from slopes or similar
P5	Select a boom radius as low as possible
P6	Select the correct boom length for the load case
P7	Angular pull is prohibited
P8	Select the correct reeving of the hoist rope for the load case
P9	Keep in mind the weight and the wind exposure surface of the load
P10	Select fastening equipment according to the weight of the load, the type of attachment and the incline angle
P11	Maintain a sufficient distance from overhead electrical wiring

17 Slopes and excavations

In the following illustrations 4 and 5 the possible situations are shown as an example.

The crane may not be set up too close to slopes or excavations. Maintain adequate safety distance **A** and safety distance **B** in accordance with the type of soil.

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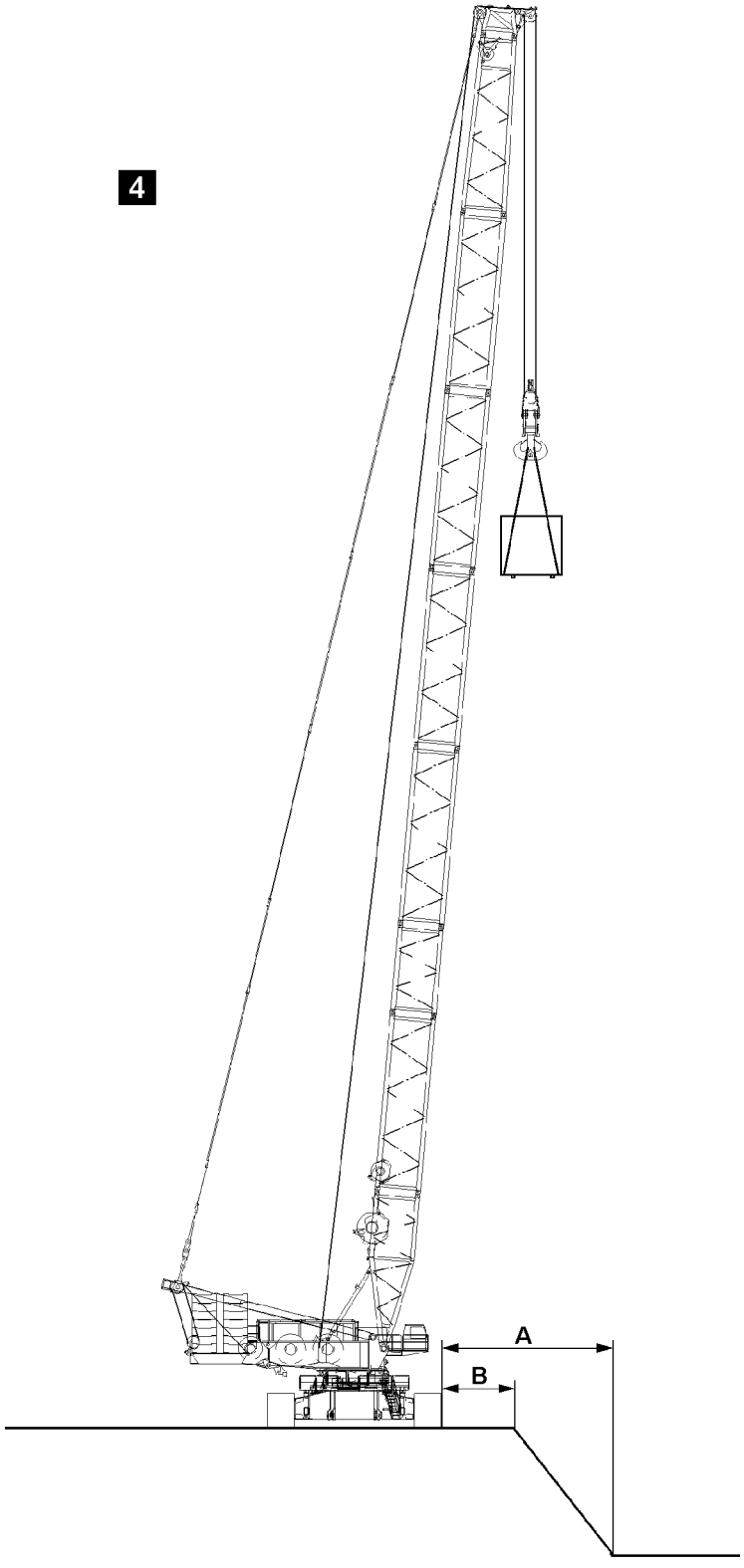

Fig.121162: Example of crawler cranes

A Distance from the bottom of excavation

B Distance from the excavation

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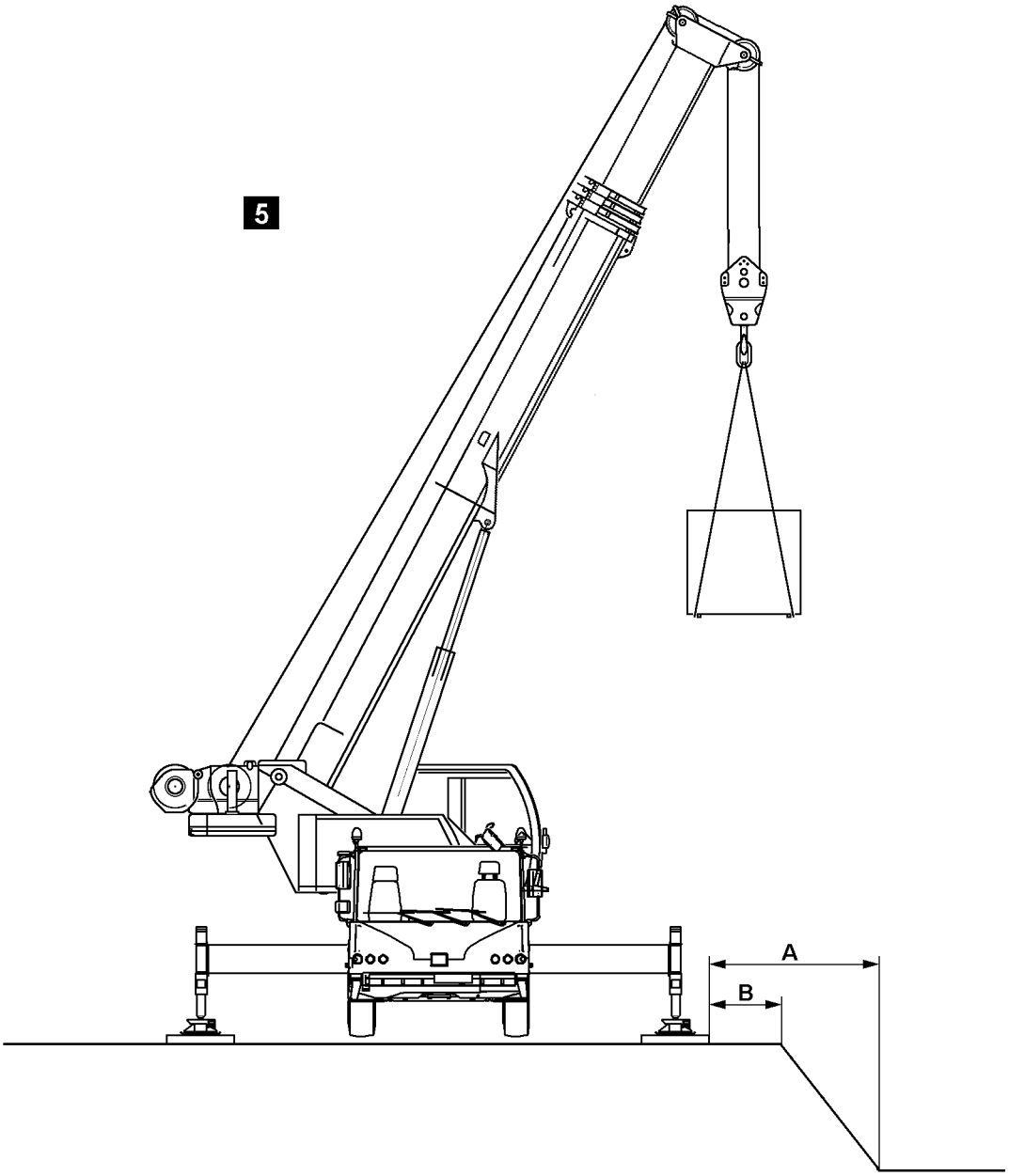

Fig.121163: Example of mobile cranes

A Distance from the bottom of excavation

B Distance from the excavation

WARNING
Safety distance **A** or safety distance **B** are too small!
The edge or the slope or the edge of the excavation can cave in.
The crane can topple over. Death, severe bodily injuries, property damage.
▶ Maintain the safety distance **A** and safety distance **B**.

Have the safety distance **A** and safety distance **B** calculated by a soil expert or geologist.

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18 Loads on the ground due to crane operation

Note

▶ Take into account that on a crane with high counterweight the crawler pressures or support forces at low load can be higher than at high load.

18.1 Load burdens on the ground on cranes on crawlers

For cranes on crawlers significant forces are transferred via the track pads of the crawlers into the ground (crawler pressures).

- The ground must be able to safely withstand the resulting pressure.
- If the area of the track pads is inadequate, then the crawlers must be supported from below according to the load bearing capacity of the ground.
- The required substructure can be calculated from the load bearing capacity of the ground and the crawler pressures of the crane.

WARNING

Load bearing capacity of the ground insufficient!
The ground can give, the crane can topple over.
Death or severe bodily injuries.

▶ Support large enough, according to the load bearing capacity of the ground with suitable materials, such as wooden beams or steel plates.

To obtain an even pressure distribution over the substructure surface:

▶ Set the crawlers centered on the substructure.

Note

▶ The respective ideal crawler pressure can be determined with the job planner program.

18.2 Load burdens on the ground on cranes on supports

When the crane is supported, significant forces (support forces) are transferred by the support cylinders via the support plates to the ground.

The ground must be able to safely withstand the resulting pressure.

If the support plate surface area is inadequate, then the support plates must be supported from below according to the load bearing capacity of the ground.

The required support surface areas can be calculated from the load bearing capacity of the ground and the support forces of the crane.

WARNING

Load bearing capacity of the ground insufficient!
The ground can give, the crane can topple over.
Death or severe bodily injuries.

▶ Support large enough, according to the load bearing capacity of the ground with suitable materials, such as wooden beams or steel plates.

To obtain an even pressure distribution over the substructure surface:

▶ Set the support plates centered on the substructure.

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18.3 Examples of the load bearing capacity of the ground

	Soil type	Permissible ground pressure [kN/m²]
1.	Organic ground:	
	Peat, sludge, muck	0
2.	Uncompacted fill:	
	Construction debris	0 to 100
3.	Non-cohesive ground:	
	Sand, gravel, rocks and mix	200
4.	Cohesive soil:	
	a) Clayed silt, mixed with topsoil	120
	b) Silt, consisting of poor clay and coarse clay	130
	c) Plastic clay, consisting of potter's clay and fill	
	Stiff	90
	Semi-solid	140
	Solid	200
	d) Mixed granular ground, clay to sand, gravel and rocky areas	
	Stiff	150
	Semi-solid	220
	Solid	330
5.	Rock in evenly solid condition:	
	a) Brittle, with traces of decomposition	1500
	b) Not brittle	4000

Examples: Permissible ground pressure of the ground

If there is any doubt about the load bearing capacity of the ground at the placement location, soil tests must be carried out by an authorized inspector, for example with a ram penetrometer.

18.4 Calculation examples

The following are general calculation examples. The values are used only to explain the calculation steps. The crane specific values are in chapter 1.03 of the crane operating instructions.

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Example: Calculation of ground pressure of support plates for cranes on supports		□
Support force according to Crane operating instructions, chapter 1.03 for example: 720 kN	720 kN	
Surface of square support plate with 550 mm side length according to the crane operating instructions, chapter 1.03, for example: 0.55 m x 0.55 m = 0.3 m^2	0.3 m^2	
80 % as carrying surface of support plate: 0.3 m^2 x 0.8 = 0.24 m^2	0.24 m^2	
Ground pressure = Support force / load bearing surface support plate	720 kN / 0.24 m^2 = 3000 kN/m^2	
Ground pressure per support:	**3000 kN/m^2**	

Example: Calculation of ground pressure

- The value of the ground pressure is far higher than the permissible ground pressure for all types of granular soil.
- If this crane is utilized on bedrock, gravel type of ground, permissible ground pressure 200 kN/m^2 , then the support surface must be increased.

Example: Calculation of required support surface for cranes on supports		□
Support force according to Crane operating instructions, chapter 1.03 for example: 720 kN	720 kN	
Ground pressure from chart *Permissible ground pressures* for example: 200 kN/m^2	200 kN/m^2	
Required support surface = Support force / permissible ground pressure	720 kN / 200 kN/m^2 = 3.6 m^2	
Required support surface per support:	**3.6 m^2**	

Example: Calculation of support surface

- The surface of the substructure for each support plate must be at least **3.6 m^2**.
- The height of the substructure must be selected depending on the load distribution angle.

Note

▶ The corresponding ideal support forces can be determined with the Job planner.

18.5 LICCON job planner

The calculation of support forces and crawler pressures with the LICCON job planner are based on idealized assumptions: level and homogenous ground, rigid crane structure, no consideration in regard to wind.

Side deformations of the boom system due to wind, incline position and elastic compliance of the steel structure can lead to increase of support forces or to increase of crawler pressures.

The determination of the values, taking wind load on the crane and the load into account, as well as the elastic deformation of the crane can only be carried out by the crane manufacturer or a qualified authorized inspector.

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18.5.1 Example of crane on crawler with derrick boom, suspended ballast and short (main) boom system

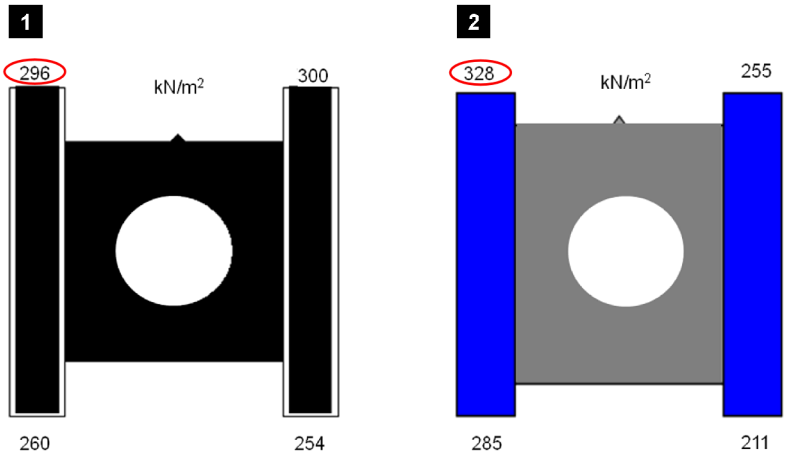

Fig.125052: Example of crane on crawler with derrick boom, suspended ballast and short (main) boom system

Illustration 1: Idealized crawler pressures from Job planner calculated with the aid of a rigid body system and no consideration regarding wind

Illustration 2: Idealized crawler pressures with consideration of elastic deformation and wind on crane and load

18.5.2 Example of crane on crawler with derrick boom, suspended ballast and long (main) boom system

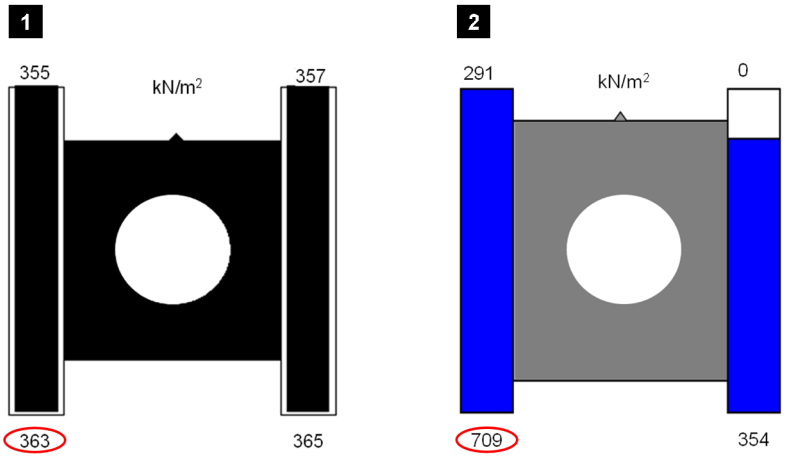

Fig.125053: Example of crane on crawler with derrick boom, suspended ballast and long (main) boom system

Illustration 1: Idealized crawler pressures from Job planner calculated with the aid of a rigid body system and no consideration regarding wind

Illustration 2: Idealized crawler pressures with consideration of elastic deformation and wind on crane and load

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18.5.3 Example of crane on supports

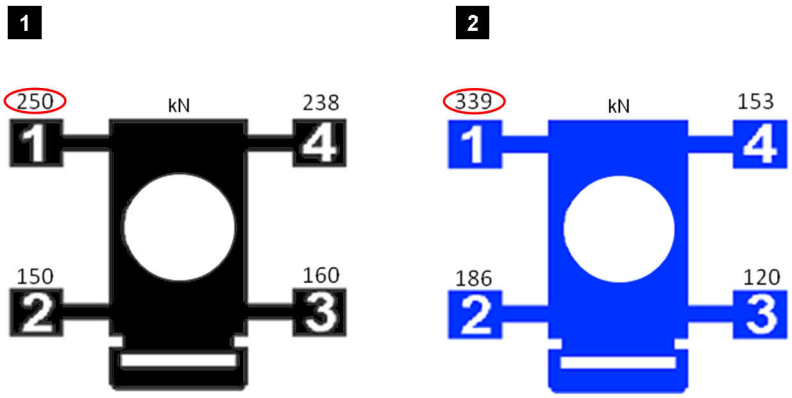

Fig.125054: Example of crane on supports

Illustration 1: Support forces from Job planner calculated with the aid of a rigid body system and no consideration regarding wind

Illustration 2: Support forces with consideration of elastic deformation and wind on crane and load

19 Support

19.1 Support plates

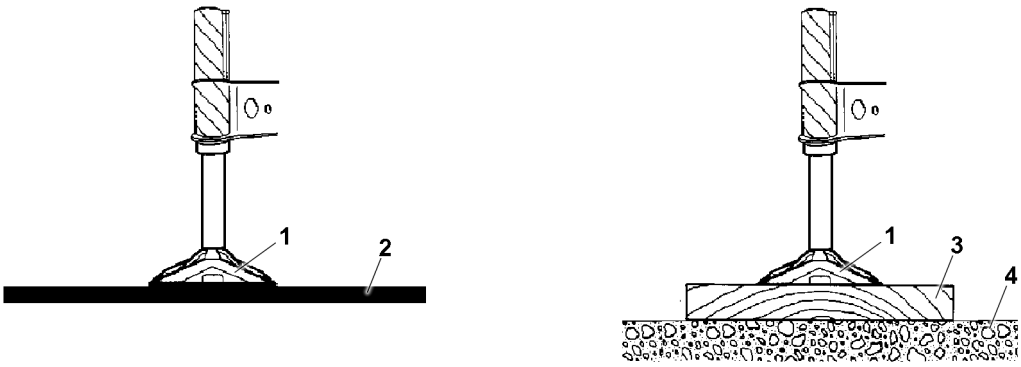

Fig.144244: Support plates

1 Support plate
2 Ground (**no** substructure necessary)
3 Substructure
4 Ground (substructure necessary)

When supporting the crane, the support plates must lay horizontally on the ground or on the substructure.

WARNING
The support plate are **not** laying horizontally!
The crane can topple over, death, property damage.
▶ Before supporting the crane, align the support plates horizontally.

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19.2 Supporting the crane

WARNING
The crane is **not** horizontally aligned!
The crane can topple over, death, property damage.
▶ Align the crane horizontally to 0.0° during the support procedure.

DANGER
The crane can topple over!
When actuating the supports with attached load and / or at loaded derrick ballast guying, the incline and the force conditions of the entire boom system change.
There is **no** shut-off by the LICCON overload protection.
The crane can topple over.
Personnel can be severely injured or killed.
▶ When a load is suspended it is prohibited to actuate the support.
▶ When the derrick ballast guying is loaded it is prohibited to actuate the support.

It is absolutely essential that the crane be supported with the support base exactly in accordance with the load chart to ensure safe crane operation.

The correspondence of the sliding beams placement surfaces must be observed to ensure proper force transfer between the sliding beams.

The crane may only be supported in these extension conditions.

WARNING
The crane can topple over!
If only the sliding beams on the load side are extended, then the crane can topple over and kill personnel.
▶ Push all four sliding beams and support cylinders out according to the data in the load chart and pin.
▶ Do **not** support in intermediate positions between the support bases.
▶ Pin the sliding beams to support base according to the load chart.
▶ Fully insert and secure the pins.

WARNING
Risk of toppling the crane due to incorrect extension of the sliding beams!
The load suspended on the hook causes tension and deformation of the hoist rope and telescopic boom. The same applies for operation with lattice jib and guy ropes. If the load falls from the fastening ropes or if the fastening or hoist rope breaks in this situation, a sudden relief occurs. The boom snaps back quickly. This can cause the crane to topple over.
Despite previous assumption, it might become necessary to swing the load to the opposite side. This can cause the crane to topple over.
The boom and / or counterweight momentum may cause the crane to topple when turning from the longitudinal vehicle direction.
▶ Extend all four sliding beams and support cylinders according to the data in the load chart.

19.3 Supporting the crane with a *variable support*

When supporting the crane with a *variable support* special measures are required. These measures are described in detail in the Crane operating instructions, chapter 6.26.

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20 Aligning the crane

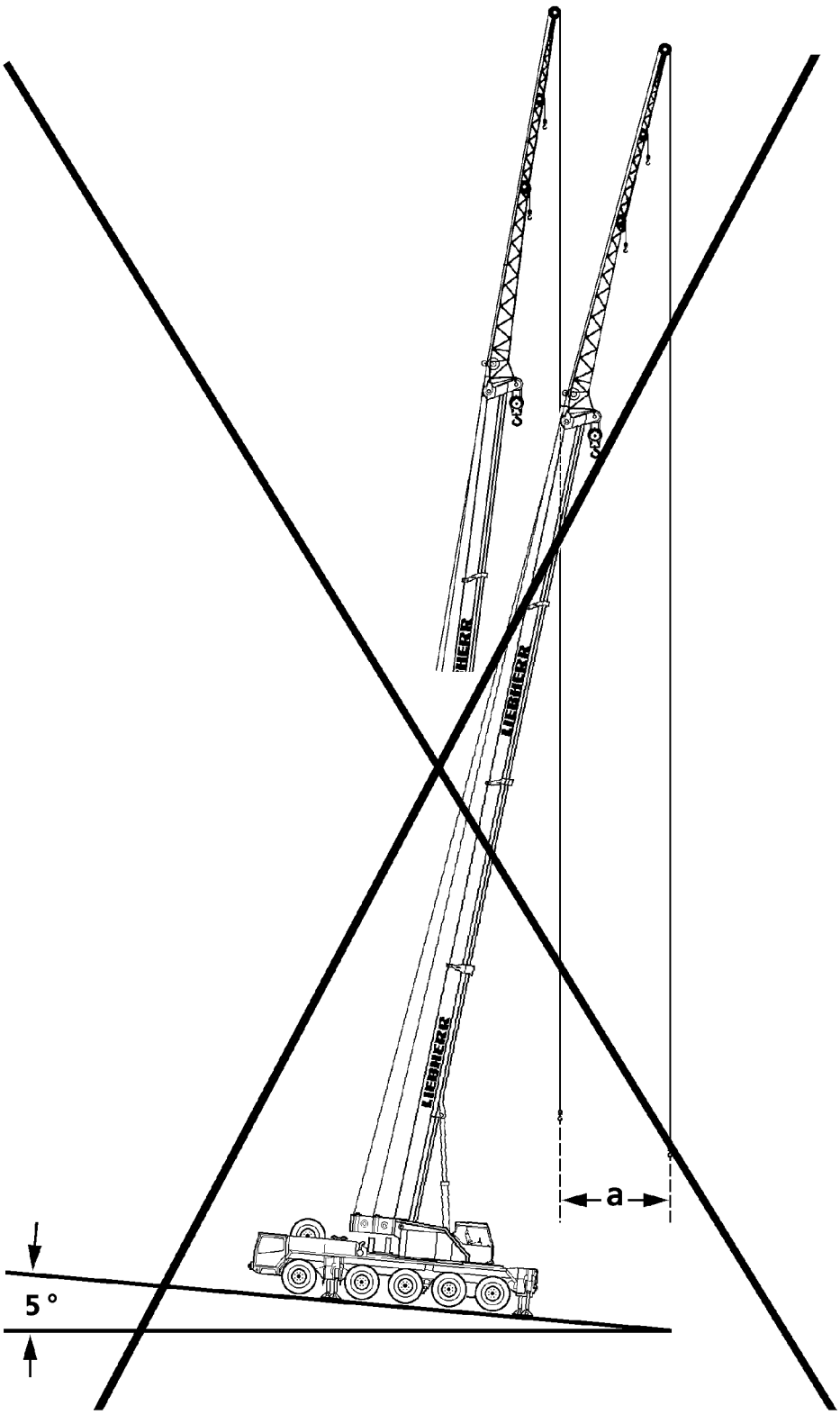

*Fig.121164: Example of **non-permissible** incline position*

In addition to the proper substructure for the supports, the horizontal alignment of the crane is of utmost importance for safe crane operation.

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DANGER
The crane can topple over due to the incline position!
If the crane is positioned at an incline, and if the boom is turned towards the slope, then the boom radius is increased as a result.
It is possible that the slewing gear can no longer hold the crane superstructure and, in extreme cases, the crane can topple over.
Personnel can be severely injured or killed.
▶ Align the crane horizontally before starting crane operation.

If the horizontal alignment of the crane has to be readjusted:
▶ Set the load down on the ground before readjusting the crane.

For cranes on crawlers, readjustment is **not** possible:
▶ If possible, use load charts for limited terrain incline.

Example: At a boom length of 50 m , an incline position of the crane by only 5° at a boom radius of 10 m causes an increase of the radius of a = 4 m.

21 Checking the safety measures

- The placement location has been selected so that all planned lifts included in the load chart for the erected set up configuration can be lifted.
- The load bearing capacity of the ground is adequate.
- There is safe clearance to excavations and slopes.
- There are no live transmission wires within the working range of the crane.
- There are no obstacles that will hinder required crane movements.
- The crane is horizontally aligned.
- When crane support is required:
  - All four sliding beams and support cylinders have been extended according to the support base given in the load chart.
  - The sliding beams have been secured with pins to prevent them from moving.
  - The support plates are pinned and secured in the operating position.
- On mobile cranes:
  - The axle suspension is blocked.
  - The axles are relieved, which means the tires do not touch the ground.

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22 Safety instructions in case of an external power supply

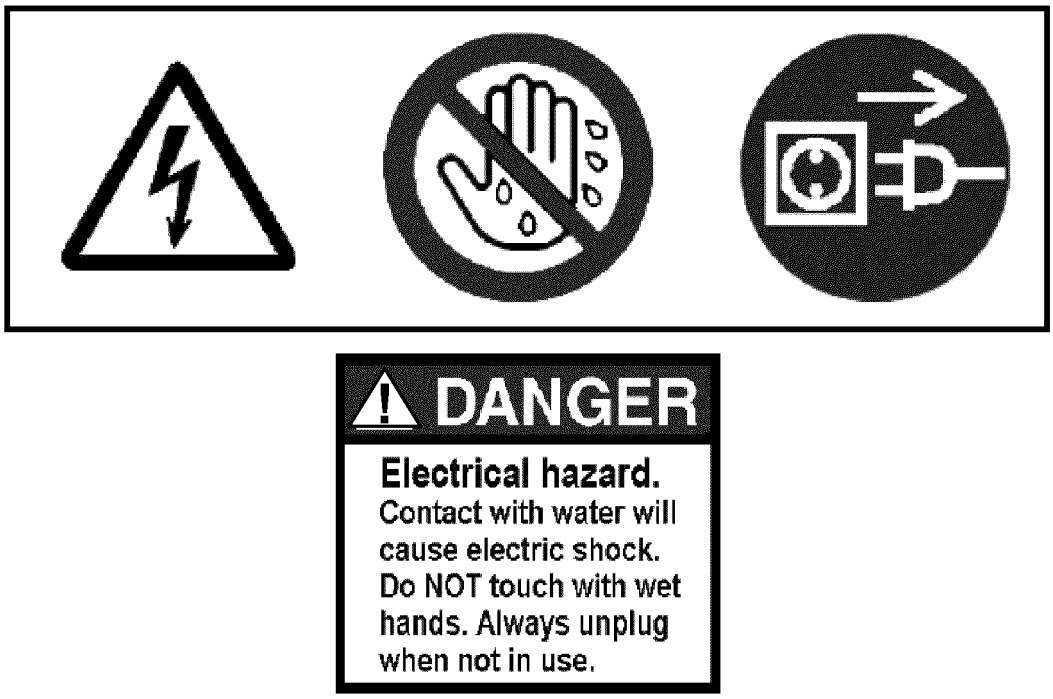

Fig.197720

A potential danger exists when supplying a crane with an external power supply from a low voltage distribution system (100 V AC to 400 V AC).

A special electrical hazard is present when a protective conductor is interrupted (caused by the mechanical stress on flexible supply lines or the service connection), loose terminal connections, high wire or contact resistance, mixed up conductors, defective or missing protective equipment (FI / fault interrupters) in combination with a body contact on the crane.

WARNING
Danger of fatal injury if the body conducts current!
Water and / or defective devices can cause hazardous stray voltages when touched. The person touching the crane is subject to lethal currents.
▶ The external supply cable must be in good working order.

Make sure that the external flexible supply cable is in good working order.

Where applicable, we recommend the use of a power isolating transformer.

23 Grounding

23.1 Grounding the crane

For the location of the ground connection, see chapter 1.01 or chapter 3.01.

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WARNING
Danger of fatal injury due to electric shock!
There is a danger of electrical shock, if the crane is not properly grounded.
▶ Properly ground the crane.
▶ Make sure that there is a potential equalization between the crane and the ground.

The crane must be grounded before start up:
– Near transmitters (radio and TV transmitters, radio stations, etc.)
– Near high frequency switching stations
– In case of severe possibility of thunderstorms or potential thunderstorms

The crane can become electrostatically charged, especially if the crane is equipped with synthetic support mats or if the support mats are placed on insulating materials (such as wooden planks).

23.2 Grounding the load

WARNING
Danger of fatal injury due to electric shock!
There is a danger of electrical shock, if the load is not properly grounded.
▶ Properly ground the load.
▶ Make sure that there is a potential equalization between the load and the ground.

The load must be grounded before start up:
– Near transmitters (radio and TV transmitters, radio stations, etc.)
– Near high frequency switching stations
– In case of severe possibility of thunderstorms or potential thunderstorms

The load can become electrostatically charged, even if the crane is grounded. This applies in particular if a hook block with pulleys made of synthetic material and non-conductive fastening equipment (for example plastic or manila ropes) are used.

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24 Working in the vicinity of transmitters

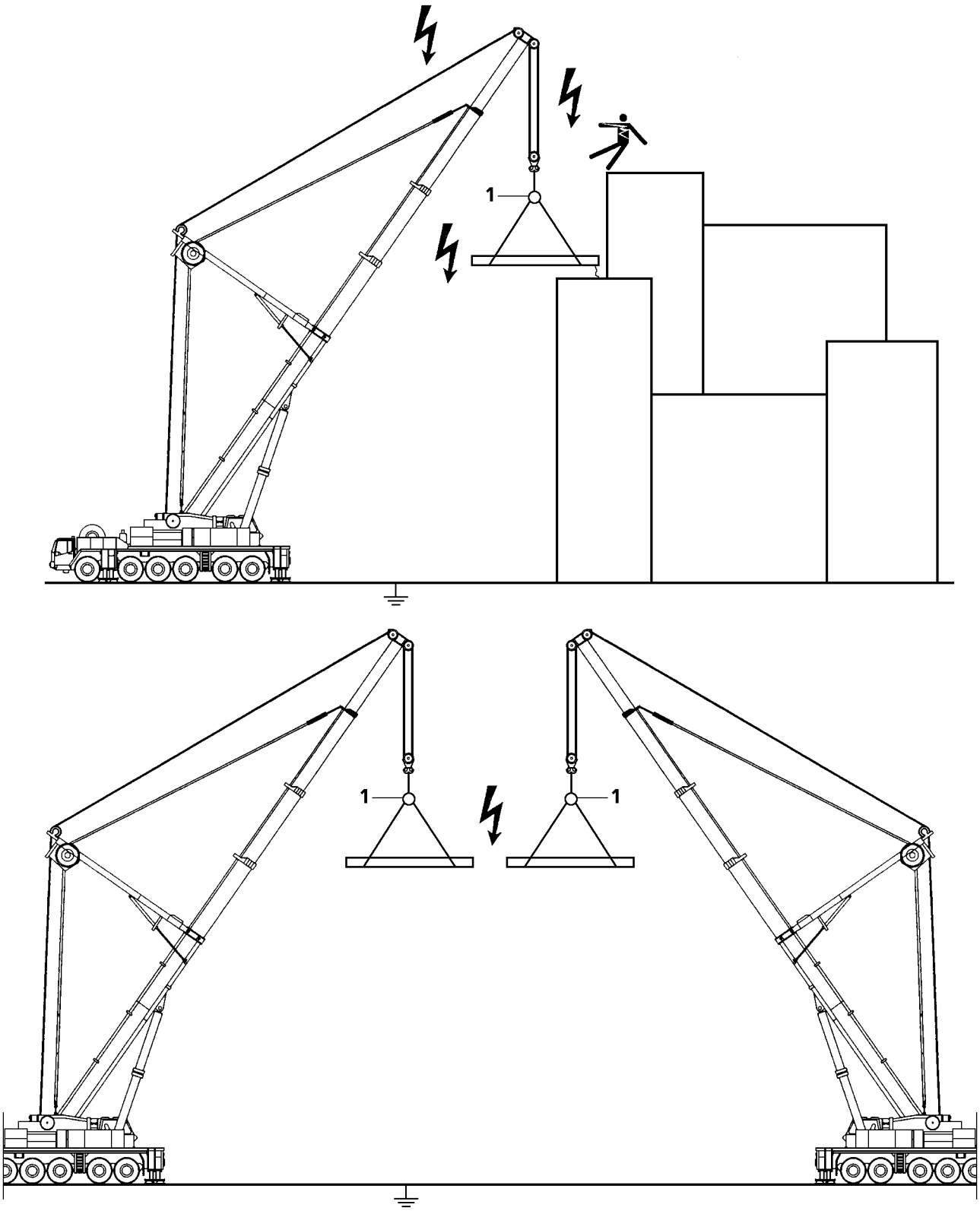

Fig.121165: Example of electrostatic charge

Strong electromagnetic fields are likely to be present if the construction site is close to a transmitter.

These electromagnetic fields can pose direct or indirect danger to persons or objects, for example:
- Effect on human organs due to temperature increase

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- Danger of burns or inflammation due to temperature increase
- Spark or electric arc formation

DANGER
Danger due to electromagnetic fields!
▶ Before operating a crane in the vicinity of transmitters, be sure to consult with Liebherr-Werk Ehingen GmbH.
▶ Also consult a high frequency specialist.

High frequency (HF) radiation from a transmitter requires supplementary work safety protection and special environmental specifications for crane operators and slingers:

1. Each crane must be „fully“ grounded. Check visually or with a simple continuity tester to ensure that ladder, crane cab and rope pulleys are grounded.
2. All personnel working on the crane or with large metal objects must protect themselves from burns by wearing non-conductive synthetic gloves and suitable clothing while working.
3. There is no need to panic if you feel your hand warm up. Always work under the assumption that the respective workpiece, structural steel member or support is „hot“.
4. The temperature of objects affected by high frequency radiation depends on their „size“. Cranes, carriers and coverings, for example, are „hotter“.
5. Contact with other crane loads is not permitted when operating the crane (arcing). Since defects caused by burns considerably reduce rope’s load bearing capacity, any such occurrences must be reported immediately to the customer service of Liebherr-Werk Ehingen GmbH so that the ropes can be inspected.
6. An insulator **1** is required at all times between the crane load hook and fastening equipment. It is strictly prohibited to remove this insulator **1**.
7. Do not touch the ropes above the insulator **1**.
8. Loads that are attached to the crane may not be touched by any unprotected parts of the body after the load has been lifted or set down.
9. Do not work with a bare upper torso or in short pants, this is prohibited.
10. To minimize absorption of high-frequency radiation, larger loads should be transported horizontally if possible.
11. Loads must be grounded, or additional insulation used (rubber material between the object and gloves) when manual work is required.
12. Use a suitable measuring instrument to check the „temperature“ of the workpiece.
    For example, if 500 V can be measured on a workpiece at a distance of 1 cm to 2 cm , then the workpiece may not be touched with bare hands.
    The greater the distance, the higher the voltage is on the object:
    At 10 cm distance, approx. 600 V are present, at 30 cm distance approx. 2000 V are present.
13. When refueling the crane, it must be ensured that no sparks are created within a radius of 6 m , neither by handling larger metallic parts nor by other work.
14. To avoid secondary accidents, use personal protective equipment when working on components that are high off the ground.
15. Any accidents and unexpected events must immediately be reported to the local construction supervisor and the safety engineer.

25 Crane operation in case of thunderstorms

In weather conditions, which can include lightning:
- Stop work on the crane.
- If possible, take the load down.
- If possible, telescope the boom in and / or take it down in the boom receptacle and bring it into a safe condition.

If this is not possible, the crane cab must remain occupied by the crane operator to keep the crane and the load always under control.

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WARNING
Danger of accidents due to lightning strikes!
▶ Make sure that there are no persons in the immediate area of the crane.

26 Wind influences

Note
▶ The wind speeds are valid for a 360° wind direction for a 3-second wind gust at the highest point of the crane.

WARNING
Disregard of permissible wind speeds!
If the permissible wind speeds are disregarded, the crane can topple over. Personnel can be severely injured or killed.
▶ It is prohibited to erect the crane to measure the wind speed.
▶ Observe the permissible wind speeds depending on the assembly / crane conditions and act accordingly, see following chart.

Assembly / crane conditions	Reference for permissible wind speed
Erection and take-down of various boom configurations	Wind speed charts and / or erection and take-down charts
Crane operation	Load chart manual
When the permissible wind speed according to the load charts is exceeded in crane operation, then **crane operation is prohibited**	Wind speed charts
Interruption of crane operation when crane remains equipped	Wind speed charts
Crane out of operation, when crane remains equipped	Wind speed charts

Note
No wind speed charts available!

For a set up configuration for which no wind speed charts are available:
▶ Observe and adhere the maximum wind speeds of the load charts.

The wind load on the crane boom has **not** been taken into account for the planning of crane operation with the LICCON job planner.
– As a result, the actual values of the support force and / or the crawler pressure can be significantly higher than the values determined with the LICCON Job planner.
– The wind affecting the crane and the load, the elastic distortion of the crane structure, incline position as well as wind exposure surface (A_W) per ton of hoist load larger than 1.2 m^2/t can significantly increase the support force and / or the crawler pressure.

WARNING
Increase of support force and / or the crawler pressure!
The resulting pressure on the ground becomes larger.
The permissible ground pressure can be exceeded.
▶ Do not exceed the permissible ground pressure.

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Note
- ▶ The determining factor for all crane work in the actual wind speed at the job site of the crane.
- ▶ The current wind speed can be checked at the nearest weather bureau.
- ▶ Be aware that the wind speed on the boom jib is higher than near the ground.
- ▶ Always observe the national valid regulations.

26.1 Wind speed charts for a *variable support*

For *variable support*: Observe and adhere to the wind speed charts according to the support base for the smallest extension length of the sliding beams.

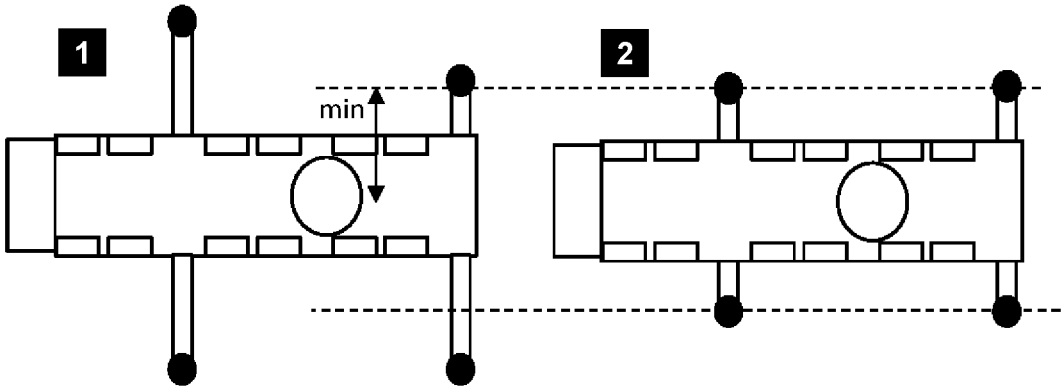

Fig.121577: Example of the selection of wind speed charts for a variable support

Example of the selection of wind speed charts for a *variable support*:
- The crane is supported with *variable support* according to illustration **1**.
- Select wind speed charts according to the support base in illustration **2**.

Note
No wind speed charts available!

If the smallest extension length of a sliding beam is less than those of the wind speed charts on hand:
- ▶ Observe and adhere the maximum wind speeds of the load charts.

26.2 Wind speed, wind gust speed and wind direction

The depiction of the wind is made by statement of wind speed (wind force), wind gust speed and wind direction.

High above the ground, the wind is less influenced by the surface condition of the ground. In the lower layers of the atmosphere, the wind speed is reduced by the ground friction. One differentiates between roughness of terrain, influence of obstacles and influence of terrain contours. Vegetation, buildings etc have great influence on the wind speed, wind gust speed and wind direction.

The site selection is thus especially important for wind measurement.

The wind speed, wind gust speed and wind direction are subject to significant time and local fluctuations. For that reason it is important to have reliable information regarding the expected wind speed, wind gust speed and wind direction during a load lift and to carry out exact wind measurements.

For mobile cranes, always assume a wind load of 360°. The determining factor is the „3 second gust speed“ on the highest point of the boom.

26.3 Measurement of wind speed

The anemometer installed on the crane boom measures the wind speed on the boom jib and shows the current wind speed in the crane cab.

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The function of the anemometer must be checked every time before erection of the boom by manually actuating the shell start for easy movement and proper function.

Before lifting a load, especially with large wind exposure surface, the wind speed and the wind direction expected during the lift must be known. Information can be obtained for example at the local weather bureau. The determining factor is the „3 second gust speed“ on the highest point of the boom.

WARNING
Overload of crane!
The acoustic wind warning is only issued if the standard wind exposure surface in the load chart is exceeded (wind surface per ton load: 1 m^2 , drag coefficient: 1.2) given wind speed.
If the permissible wind speed must be reduced for loads due to large wind exposure surfaces, no acoustic wind warning is issued.
There is no shut-off of crane movement.

- ▶ The wind exposure surface and the wind resistance coefficient for the load to be lifted must be known.
- ▶ The maximum permissible wind speed specified in the load chart must be reduced for large wind exposure surfaces as described in the load chart manual chapter "Wind influences during crane operation".

For safe determination of wind speed, the crane must be turned before application by 360°. The highest measured value while doing so must be compared with the „maximum permissible wind speed“ for the load according to the load chart. Thus the possibility that the result of the measurement is distorted due to nearby buildings, cranes or components is eliminated.

In gusty wind conditions, the probability of sudden high wind speed increases. In gusty wind conditions no large surface loads may be lifted.

Note

- ▶ If in doubt and in case of questions for further information and / or training in the area of „Wind influences in crane operation“ contact the Customer Service at Liebherr-Werk Ehingen GmbH.

26.4 Conversion chart for wind force

Note

- ▶ The influence of the wind on the surrounding is described clearly in the Beaufort scale to provide an orientation for the crane driver.
- ▶ The wind force of the Beaufort scale refers to the wind speed determined over 10 minutes at a height of 10 m.

Wind force		Wind speed		Effect of the wind
Beaufort number	Designation	[m/s]	[km/h]	Inland
0	Calm	0 to 0.2	1	Calm, smoke rises vertically
1	Slight air movement (draft)	0.3 to 1.5	1 to 5	Wind direction is shown only by observing the trail of smoke, not by the wind sock
2	Light breeze	1.6 to 3.3	6 to 11	Wind can be felt on the face, the leaves rustle, wind sock moves slightly
3	Gentle breeze	3.4 to 5.4	12 to 19	Leaves and small twigs in constant motion Wind extends a flag
4	Moderate breeze	5.5 to 7.9	20 to 28	Swirls up dust and loose paper, moves twigs and thin branches

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Wind force		Wind speed		Effect of the wind
Beaufort number	Designation	[m/s]	[km/h]	Inland
5	Fresh breeze	8.0 to 10.7	29 to 38	Small deciduous trees begin to sway, whitecaps form at sea
6	Strong breeze	10.8 to 13.8	39 to 49	Thicker branches move; telephone lines begin to whistle, umbrellas are difficult to use
7	Near gale	13.9 to 17.1	50 to 61	Entire trees swaying; difficult to walk into wind
8	Gale force wind	17.2 to 20.7	62 to 74	Breaks branches off trees, impedes walking in open areas considerably
9	Gale	20.8 to 24.4	75 to 88	Minor damage to property (chimney caps and roofing tile are blown off)
10	Severe storm	24.5 to 28.4	89 to 102	Trees are uprooted, significant damage to property
11	Violent storm	28.5 to 32.6	103 to 117	Extensive, widespread storm damage
12	Hurricane	32.7 and more	118 and more	Major destruction

Beaufort scale

26.5 Height dependant wind speed

Note

- The maximum permissible wind speed (v_{max}) and the maximum permissible wind speed according to the load chart (v_{max_TAB}) always refer to the 3 second wind gust speed, which is present at the maximum height of the crane.
- Instead of the 3 second wind gust speed, weather information services often report a wind speed (v_m), which is averaged within a time period of 10 minutes (so-called 10 minute average). It refers to the wind force on the Beaufort scale, normally to the medium value of the wind speed, which is determined within a time from of 10 minutes at a height of 10 m above ground or above sea level.
- The determining factor for the calculation of the 3 second wind gust speed in maximum height of the crane is significantly higher than the average value of the wind speed, which is determined over a time of 10 minutes at a height of 10 m above ground.

Note

- The following chart shows the 3-second wind gust speed depending on the height and the Beaufort number and / or the wind speed determined over a period of 10 minutes at a height of 10 m.
- With the aid of this chart the 3-second wind gust speed for a certain height can be determined.

Beaufort number	3	4	5[a]	5	6	7[a]	7	8	9	10
v_m [m/s[b]]	5.4	7.9	**10.1**	10.7	13.8	**14.3**	17.1	20.7	24.4	28.4
z [m]	v(z) [m/s]									
10	7.6	11.1	**14.1**	15.0	19.3	**20.0**	23.9	29.0	34.2	39.8
20	8.1	11.9	**15.2**	16.1	20.7	**21.5**	25.7	31.1	36.6	42.7
30	8.5	12.4	**15.8**	16.8	21.6	**22.4**	26.8	32.4	38.2	44.5
40	8.7	12.8	**16.3**	17.3	22.3	**23.1**	27.6	33.4	39.4	45.8
50	8.9	13.1	**16.7**	17.7	22.8	**23.6**	28.3	34.2	40.3	46.9

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Beaufort number	3	4	5[a]	5	6	7[a]	7	8	9	10
60	9.1	13.3	**17.0**	18.0	23.3	**24.1**	28.8	34.9	41.1	47.9
70	9.3	13.5	**17.3**	18.3	23.6	**24.5**	29.3	35.5	41.8	48.7
80	9.4	13.7	**17.6**	18.6	24.0	**24.8**	29.7	36.0	42.4	49.4
90	9.5	13.9	**17.8**	18.8	24.3	**25.1**	30.1	36.4	42.9	50.0
100	9.6	14.1	**18.0**	19.1	24.6	**25.4**	30.4	36.9	43.4	50.6
110	9.7	14.2	**18.2**	19.2	24.8	**25.7**	30.8	37.2	43.9	51.1
120	9.8	14.3	**18.3**	19.4	25.1	**25.9**	31.1	37.6	44.3	51.6
130	9.9	14.5	**18.5**	19.6	25.3	**26.2**	31.3	37.9	44.7	52.0
140	10.0	14.6	**18.7**	19.8	25.5	**26.4**	31.6	38.2	45.1	52.5
150	10.0	14.7	**18.8**	19.9	25.7	**26.6**	31.8	38.5	45.4	52.9
160	10.1	14.8	**18.9**	20.1	25.9	**26.8**	32.1	38.8	45.7	53.2
170	10.2	14.9	**19.1**	20.2	26.0	**27.0**	32.3	39.1	46.0	53.6
180	10.3	15.0	**19.2**	20.3	26.2	**27.1**	32.5	39.3	46.3	53.9
190	10.3	15.1	**19.3**	20.4	26.4	**27.3**	32.7	39.5	46.6	54.2
200	10.4	15.2	**19.4**	20.6	26.5	**27.4**	32.8	39.8	46.9	54.6

[a] Wind stages for the crane in operation:

1 light	v_m = 10.1 m/s	at z = 10 m	v(z) = 14.1 m/s	q(z) = 125 N/m²
2 normal	v_m = 14.3 m/s	at z = 10 m	v(z) = 20.0 m/s	q(z) = 250 N/m²

[b] Upper limit of Beaufort scale

3-second wind gust speed depending on the height and the Beaufort number and / or the wind speed determined over a time of 10 minutes at a height of 10 m

Sign	Unit	Definition
v_m	[m/s]	Wind speed determined over a time of 10 minutes at a height of 10 m
z	[m]	Height above level ground
v(z)	[m/s]	Speed effective at height z, decisive for the calculation of a 3 second gust
q(z)	[N/m²]	At a height z effective quasi-static dynamic pressure, determined from v(z)

Symbol

26.6 Wind influences during erection and take-down

WARNING
The crane can topple over!
If a boom or a boom system is erected or taken down and the expected wind speeds are larger than the maximum permissible wind speeds according to the wind speed chart, then the crane can topple over and fatally injure personnel.

- ▶ If wind speeds are expected which are larger than the maximum permissible wind speeds for erection, then erection of the boom or erection of the boom system is prohibited.
- ▶ If wind speeds are expected, which are larger than the maximum permissible wind speeds for take-down, then the boom or the boom system must be taken down immediately.

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WARNING
Wind speed higher than permissible!
When the permissible wind speed for „Crane out of operation“ is higher than the permissible wind speed for take-down: Take-down of the boom is not permissible in case of unexpected increase of wind speed.
The crane can topple over. Death, severe injury, property damage.
- ▶ If wind speeds are expected that are higher than the maximum permissible wind speeds for "Crane out of operation", then take the equipment and the boom down.
- ▶ Always take the boom down for safety reasons if weather conditions are unclear, see the Erection and take-down charts.
- ▶ Observe the permissible wind speeds for take-down.

26.7 Wind influences during crane operation

WARNING
The crane can topple over!
Unforeseeable factors, such as sudden wind gusts on the crane and the load cannot be exactly predicted in advance.
- ▶ The size and shape of the load has a significant influence on the permissible wind speed during crane operation.
- ▶ Carry out a professional job planning with authorized and trained expert personnel. All environmental conditions, such as weather forecast and wind speeds must be taken into account.
- ▶ The authorized and trained expert personnel must have sufficient knowledge in the area of „Wind influences in crane operation“.

Note
- ▶ Calculation examples are included in the load charts. If you need further information, contact Liebherr-Werk Ehingen GmbH.

Depending on crane application, for example:
1. Lifting of large surfaced loads.
2. Working with long boom combinations.
3. Erection and take-down of boom combinations.

The crane operator must check with appropriate information sources about the expected wind speeds, at:
1. The start of crane operation.
2. Interruption of crane operation.
3. Resumption of crane operation.

WARNING
The crane can topple over!
If the crane is operated at wind speeds which are larger than the maximum permissible wind speeds according to the load chart, then the crane can topple over and kill personnel.
- ▶ If wind speeds are expected that are larger than the maximum permissible wind speeds for the equipped crane, then the equipment and the boom must be taken down.
- ▶ If wind speeds are expected that are larger than the maximum permissible winds speeds for crane operation, then it is prohibited to lift a load.

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26.8 Wind influences for „Crane out of operation“

WARNING
The crane can topple over. Death, severe injury, property damage!
If the crane is taken out of operation in set up condition and the expected wind speeds are higher than the maximum permissible wind speeds according to the wind chart, then the crane can topple over and fatally injure personnel.

- ▶ If wind speeds are expected that are higher than the maximum permissible wind speeds for „Crane out of operation“, then take the equipment and the boom down.
- ▶ Always take the boom down for safety reasons if weather conditions are unclear, see the Erection and take-down charts.
- ▶ Observe the permissible wind speeds for take-down.

27 Lifting a load with two cranes

Before lifting a load with two cranes, the crane operator or a representative of the operator must determine the work sequence and assign a responsible supervisory person for the operation. The responsible supervisor must monitor the operation and remain in constant contact with the crane operators.

WARNING
Overload and toppling of the cranes!
If the load is not lifted or lowered exactly evenly by both cranes, then the center of gravity changes.
The cranes can be overloaded and topple over.
Personnel can be killed or seriously injured.

- ▶ Make sure that the cranes are horizontally aligned.
- ▶ Observe the national valid standards, regulations and accident prevention regulations.
- ▶ Determine the utilization degree of the cranes in operation, depending on the complexity of the load lift.
- ▶ Plan for sufficient safety reserves.
- ▶ Avoid side load on the boom.
- ▶ Carry out crane movements synchronously and slowly.

Note

- ▶ The total weight and the center of gravity of the load must be known exactly.
- ▶ Carry out the job planning in detail and with care.
- ▶ Avoid fastening points below the center of gravity of the load.

When the operational conditions or the work to be carried out require:

- ▶ Set up an assembly plan and operating instructions for the operation.

In the drawing is shown how the center of gravity for the load changes if the load is lifted or lowered unevenly. Already a slight incline of the load can cause the crane to be overloaded.

If the load on crane 2 **(F_2)** is lowered, the load on crane 1 **(F_1)** increases. Crane 1 can thereby be overloaded.

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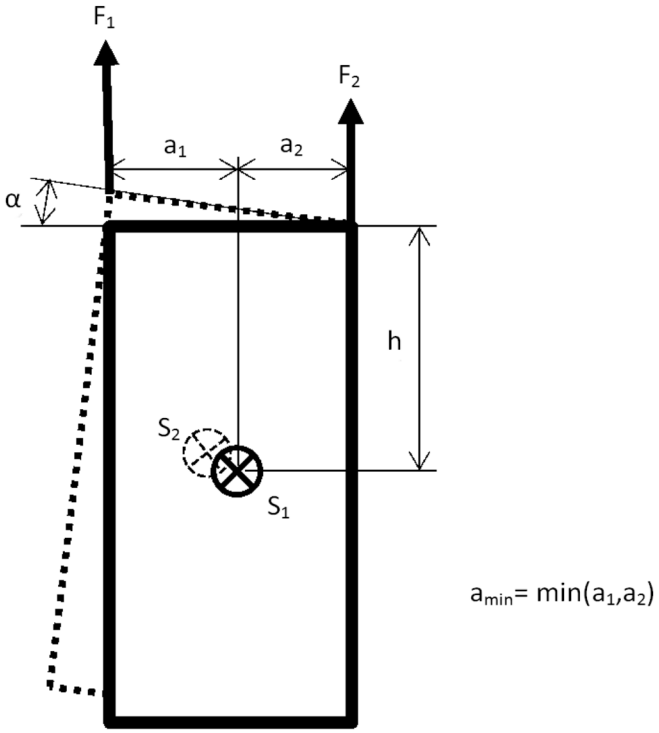

Fig.124126: Geometric conditions

F_1	Load on crane 1	**F_2**	Load on crane 2
S_1	Center of gravity of load	**S_2**	Center of gravity of load at incline position
h	Vertical distance between center of gravity of load and fastening points	**α**	Angle of load at incline position
a_1	Horizontal distance between center of gravity of load and fastening point crane 1	**a_2**	Horizontal distance between center of gravity of load and fastening point crane 2
a_{min}	Smallest horizontal distance between center of gravity of load and fastening point (minimum from a_1 and a_2)		

The following diagram shows the dependence of the ratio of h/a_{min} at a maximum permissible incline position of the load of 3° in reference to the permissible load utilization of cranes in percentages.

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Fig.124127: Maximum permissible load utilization

x Ratio of h to a_{min}

y Maximum permissible load utilization in percentages, if α is smaller or equal to 3°

Example: A ratio h to a_{min} of 6, when retaining the incline position of the load of maximum 3° results in a maximum permissible load utilization of both cranes of approx. 76 % each.

28 Overlapping of working ranges of several cranes

WARNING
Danger of collision!
If the working ranges of several cranes overlap, there is a danger of collision.
Personnel can be injured or killed.
Significant property damage can result.
- ▶ The contractor or his representative must determine the work sequence in detail in advance.
- ▶ The contractor or his representative must ensure flawless communication between crane operators.
- ▶ The crane operators must ensure through calm operating mode, that no collisions occur due to uncontrolled movements. The crane operators must have been trained and instructed accordingly.

If the communication between the crane operators is not ensured by sound or visual connection, then suitable measures must be taken, such as using radio communication, guides or similar. When using derrick booms or TY-guying, it is necessary to proceed with extreme caution as these components protrude far past the rear turning radius of the turntable.

Note
- ▶ If guides are used, then the signals must be agreed upon between them and the crane operators, see section „Hand signals for guidance“.

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29 Hand signals for guidance

For all crane movements, the crane operator must always keep the load as well as the crane hook or load handling equipment when the crane is not loaded, in his field of vision.

WARNING
Danger of accident if standing under suspended loads!
- ▶ Always keep loads in sight.
- ▶ Standing under suspended loads is prohibited.

If this is not possible, the crane operator may only operate the crane if he is signed by an assigned guide.

The operator may be guided by hand signals or a two-way radio. It must be ensured that there are no misunderstandings.

WARNING
Danger of accident caused by misunderstood hand signals!
- ▶ Hand signals must be mutually agreed upon and clearly executed.
- ▶ In any case, the **national regulations** must be observed.

29.1 Hand signals

29.1.1 Starting operation, follow my instructions

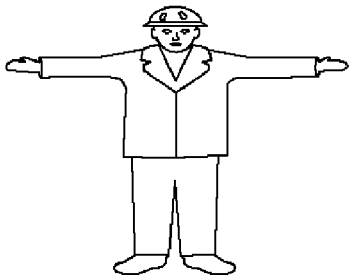

Fig.111700: Starting operation, follow my instructions

Both arms stretched out horizontally with hands open and palms directed to the front.

29.1.2 Stop (normal stop)

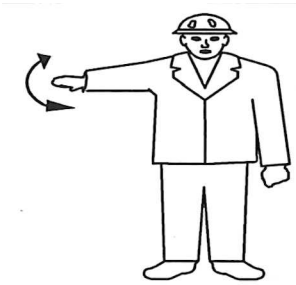

Fig.144245: Stop (normal stop)

Arm stretched out, palm of hand facing down, move the arm horizontally backward and forward.

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29.1.3 Emergency stop (quick stop)

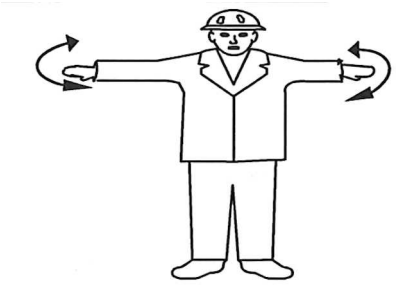

Fig.144246: Emergency stop (quick stop)

Both arms stretched out, both hand palms facing down, move arms horizontally backward and forward.

29.1.4 Ending operation, no longer follow my instructions

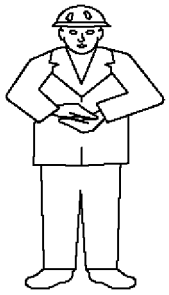

Fig.111703: Ending operation, no longer follow my instructions

Fold hands together at chest height in front of body.

29.1.5 Creeper gear or very slow movement

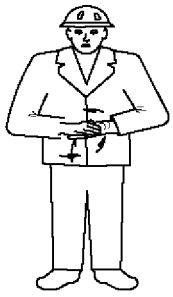

Fig.111704: Creeper gear or very slow movement

Rub palms together in circular motion. After this sign, all other applicable hand signals apply.

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29.2 Vertical movements

29.2.1 Showing the vertical distance

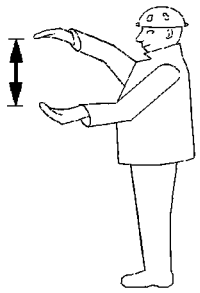

Fig.121364: Showing the vertical distance

Both arms stretched out in front of the body one on top of the other, with opposing palms.

29.2.2 Lifting / lowering a load with even speed

Fig.111706: Lifting / lowering a load with even speed

Lift one arm overhead with closed hand and index finger pointing upward, with small horizontal circular movements with forearm.

29.2.3 Lifting slowly

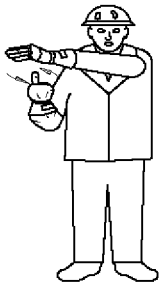

Fig.121365: Lifting slowly

Give lift signal with one hand, the other palm is not moving and positioned over the hand, which gives the signal.

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29.2.4 Lowering the load while stationary

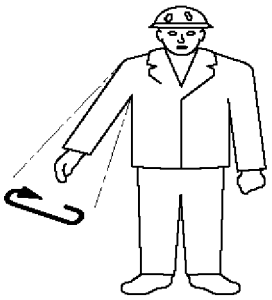

Fig.111708: Lowering the load while stationary

Point one arm away from the body, downward, with hand closed and index finger pointing down. Make small circular movements with forearm.

29.2.5 Lowering slowly

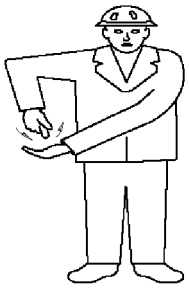

Fig.121366: Lowering slowly

Give lowering signal with one hand, do not move the other palm and hold it under the hand, pointing to the hand which gives the signal.

29.3 Horizontal movements

29.3.1 Driving / swinging in the specified direction

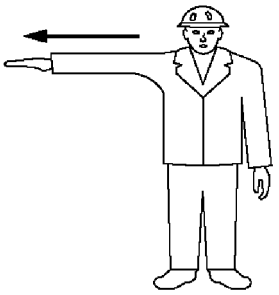

Fig.111710: Driving / swinging in the specified direction

Hold stretched out arm horizontally into the desired direction, with the hand open and the palm pointing down.

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29.3.2 Moving away from me

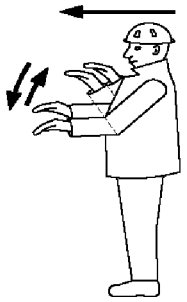

Fig.111711: Moving away from me

Stretch out both arms simultaneously with forearms in front, with both hands open and the palms pointing down. Move the forearms repeatedly between the horizontal and vertical position up and down.

29.3.3 Moving toward me

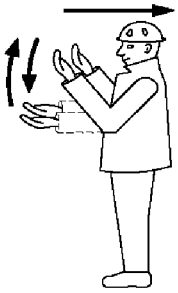

Fig.111712: Moving toward me

Stretch out both arms simultaneously with forearms vertically, with both hands open and the palms pointing to the rear. Move the forearms repeatedly up and down.

29.3.4 Moving both track chains

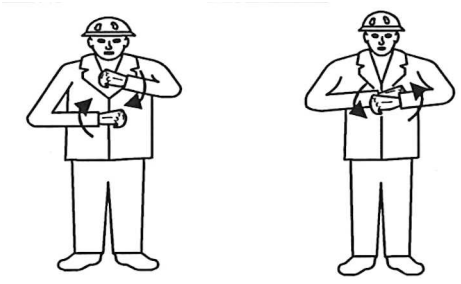

Fig.144247: Moving both track chains

Turn both fists around each other in front of the body in direction of the movement (forward or reverse).

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29.3.5 Moving one crawler chain

Fig.144248: Moving one crawler chain

Lift one fist to show blockage of chain on one side. Turn the other fist vertically in front of the body to signal movement of the opposite chain.

29.3.6 Showing the horizontal distance

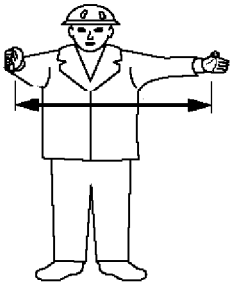

Fig.121380: Showing the horizontal distance

Keep both arms stretched out horizontally in front of the body with the palms opposite each other.

29.3.7 Transfer (between two cranes or two hooks)

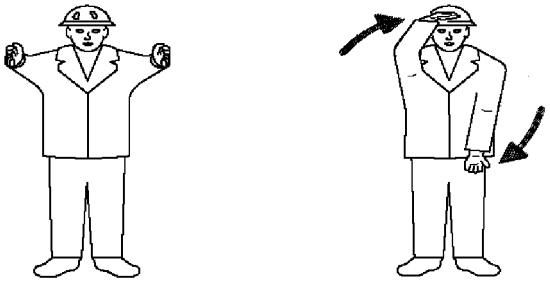

Fig.121368: Transfer (between two cranes or two hooks)

Hold both arms stretched out to the front, parallel and horizontally and turn by 90° in direction of the transfer.

WARNING
Load bearing capacity is **not** sufficient!
The crane can topple over, death, property damage.
▶ Make sure that the load bearing capacity of the individual crane and hook is sufficient even if the transfer of the load is suddenly asymmetric.

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29.4 Machine related movements

29.4.1 Lifting with main winch

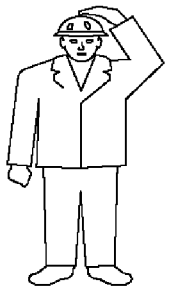

Fig.111719: Lifting with main winch

Place on hand on your head and hold the other arm on the side of the body.

After this signal all other hand signals apply only for the main winch.

Note

▶ If two or more main winches are present, then the signaller can show the number of the crane by pointing to it or signal with one finger.

29.4.2 Lifting with auxiliary winch

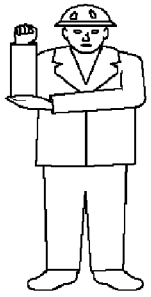

Fig.111720: Lifting with auxiliary winch

Hold one forearm vertically with closed hand and touch the elbow of this arm with the other hand.

After this signal all other hand signals apply only for the auxiliary winch.

29.4.3 Lifting the boom

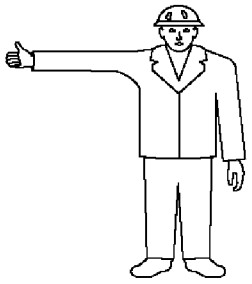

Fig.111721: Lifting the boom

Hold one arm horizontally with thumb directed upward.

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29.4.4 Lowering the boom

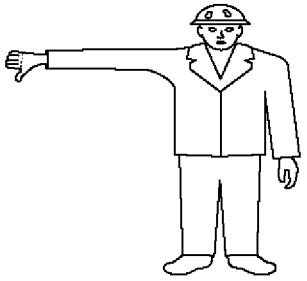

Fig.111722: Lowering the boom

Hold one arm horizontally with thumb directed downward.

29.4.5 Extending the boom

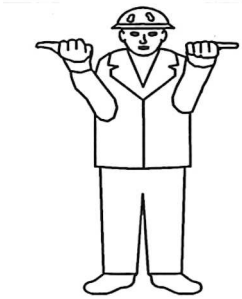

Fig.144249: Extending the boom

Hold both hands (with closed fists) stretched out to the front, with both thumbs directed away from each other.

29.4.6 Retracting the boom

Fig.144250: Retracting the boom

Hold both hands (with closed fists) stretched out to the front, with both thumbs directed toward each other.

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29.4.7 Lifting the boom and lower the load at the same time

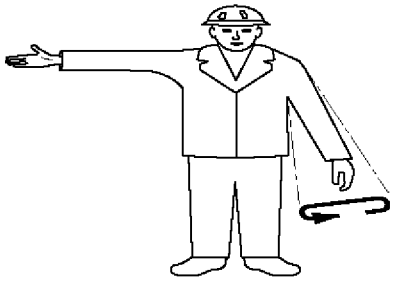

Fig.111725: Lifting the boom and lower the load at the same time

Hold one arm stretched out horizontally with thumb directed upward and stretch the other arm downward and away from the body, make small flat circles with the forearm.

29.4.8 Lowering the boom and lift the load at the same time

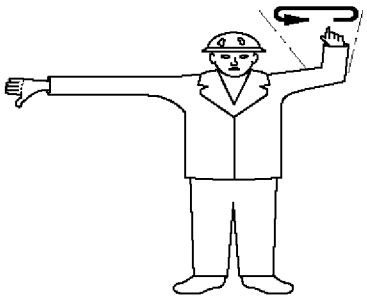

Fig.111726: Lowering the boom and lift the load at the same time

Hold one arm stretched out with thumb pointing down, stretch the other forearm upward and make small flat circles.

30 Travel operation

30.1 Starting to drive

Before starting to drive the crane
- Close all doors.
- Keep the doors closed during the travel operation.

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30.2 Turning / driving in reverse

WARNING
Danger of accidents when turning or driving in reverse!
When turning or driving in reverse, personnel can be overlooked and killed.
Objects can be severely damaged.
- ▶ When turning or driving in reverse, the driver must act in such a way that he does not endanger other traffic participants.
- ▶ The driver may only drive in reverse or reset when persons or devices are **not** endangered. If this can **not** be ensured, then he must use a guide.
- ▶ An acoustical back up warning device will never replace the guide.
- ▶ Make sure that there are no persons or objects behind the vehicle when driving in reverse.
- ▶ Make sure that no personnel is injured or even killed.
- ▶ Make sure that no objects are damaged.
- ▶ Driving in reverse is only permissible at slow driving speed (maneuvering speed).
- ▶ Adhere to the national regulations.

30.3 Driving with a trailer

Driving with a trailer depends on the weight of the mobile crane. The minimum weight of the mobile crane in trailer mode is 70 percent of the permissible total weight.

Number of axles	Permissible total weight of the mobile crane	Minimum weight of the mobile crane in trailer mode
4	48000 kg	Approx. 33000 kg
5	60000 kg	Approx. 42000 kg
6	72000 kg	Approx. 50000 kg

30.3.1 Driving with a reduced load

The load of the vehicle crane has been reduced to a range between the permissible total weight and the minimum weight for trailer mode. The load of the vehicle crane can be reduced by disassembling equipment.

The vehicle crane has a different, strong braking behavior. The vehicle crane can reeve out.

30.3.2 Driving with an extremely reduced load

The load of the vehicle crane has been reduced to the minimum weight for trailer mode or less. The load of the vehicle crane can be reduced extremely for example by disassembling the telescopic boom and by disassembling other equipment.

WARNING
Driving with a trailer with an extremely reduced load!
The mobile crane has a different, strong braking behavior. The mobile crane can reeve out.
Danger of accident, death, property damage.
- ▶ In the case of an extremely reduced load, do **not** drive the crane vehicle with a trailer.

30.4 Stopping the mobile crane

Make sure that the following prerequisites are met:
- – The mobile crane is standing on load bearing, level and tractive ground.
- – The parking brake is applied.

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WARNING
Parking brake is **not** applied!
The mobile crane can roll off, death, property damage.
▶ Park the mobile crane exclusively with applied parking brake.

– Turn off the ignition and pull out the ignition key.

When a battery master switch is present:
– Turn off the battery master switch and remove the switch cams.

WARNING
Downhill or uphill slope is too large!
The mobile crane can roll off, death, property damage.
▶ Park the mobile crane at an downhill or uphill slope of no more than maximum 18 %.

Under the following conditions the mobile crane must be additionally secured with wheel chocks to prevent it from rolling off:
– The mobile crane is parked on a slope or an incline.
– The mobile crane is defective, particularly when the brake system is defective.

WARNING
Wedges incorrectly placed!
The mobile crane can roll off, death, property damage.
▶ So that the wedges have an immediate braking action and hold the mobile crane in park position: Place all wedges tightly directly under the wheel.
▶ Place all specified wedges.
▶ All wedges must counteract the downhill slope force.

If necessary:
– Place the wedges.

31 Crane operation

31.1 Before starting to work

Before starting to work with the crane:
– Make sure that the cylinders are free of ice.
– Close all doors.
– Keep the doors closed during crane operation.

31.2 While working with the crane

WARNING
Defective crane!
Death, severe bodily injuries, property damage.

If an erroneous function of a crane movement is recognized during crane operation:
▶ Telescope the boom in all the way and take it down, find the source of the problem and remedy it.

WARNING
Relapse cylinder pressure loss!
The luffing lattice jib can luff uncontrollably.

If the luffing lattice jib is assembled
▶ Make sure that no persons or obstacles are in the luffing range or are located below the lattice jib.

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WARNING
Relapse cylinder pressure loss!
The luffing lattice jib can luff uncontrollably due to slack rope on the luffing pulley block.

If an actuated luff down movement does not take place as expected:
▶ Immediately stop the luff down movement.
▶ Make sure that no slack rope has formed.

If slack rope has formed:
▶ Remedy the slack rope.

NOTICE
Freezing rain!
Property damage to the cylinder seals.

If freezing rain starts when working with the crane:
▶ Working with the crane is prohibited.
▶ Make sure that all cylinders are free of ice.

31.3 Crane operation with a load

WARNING
The crane can topple over!
If the crane is in condition which is **not** operationally safe, the crane can topple over or crane components can fall down.
Personnel can be severely injured or killed.
▶ Before starting to work, the crane operator must ensure that the crane is in operationally safe condition.
▶ If safe crane operation cannot be ensured by the crane operator, then crane operation is prohibited until an operationally safe condition for the crane is established.
▶ Safety equipment, for example: Load torque limiter, hoist limit switch, brakes must be fully functioning, otherwise crane operation is prohibited.

Make sure that the following prerequisites are met:
– The load torque limiter must be adjusted according to the current set up configuration of the crane.
– The loads given in the load chart may not be exceeded.
– The crane may never be subjected to a load that exceeds what is specified in the load charts.
– The weight, center of gravity and dimensions of the load to be lifted must be known.
– Load carriers, load handling and fastening equipment must be in accordance with specified requirements.

Note
▶ Make sure that the weight of the hook block and the weight of the fastening equipment is subtracted from the load given in the load chart, see the following chart.

Example:		
Maximum permissible load according to chart		30.000 t
Weight of the hook block	350 kg	- 0.350 t
Weight of the fastening rope	50 kg	- 0.050 t
Actual load capacity of the crane		**= 29.600 t**

The weight of the load to be lifted, in this example, may not exceed **29.6 t**.

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DANGER
There is a high danger of accidents should the following points not be observed!
▶ Observe the following points.

There is a great danger of accident if:
- The load torque limiter is not set in accordance with the current crane set up configuration and is therefore not able to provide proper protection.
- The load torque limiter is defective or taken out of operation.
- The hoist limit switches are defective or not functioning.
- For crawler cranes and mobile cranes with luffing lattice jib:
  The angle sensor and the force test brackets are not functioning.
- For mobile cranes and crawler cranes with support:
  The sliding beams of the hydraulic support are not extended to the dimensions specified in the load chart.
- On crawler cranes:
  The crawlers are not supported with stable base material sufficiently large for the ground conditions.
- For mobile cranes and crawler cranes with support:
  The support plates are not supported with stable materials large enough for the ground conditions.
- Angular pulling is performed.
  Angular pulling to the side is particularly dangerous, because the boom has only minimal lateral resistance momentum.
  Angular pull is prohibited.
- Load attached during disassembly is too heavy and is freely suspended on the crane after release.
- The load hook is used to break away stuck loads.
  Even if the weight of a stuck load does not exceed the permissible load capacity, the crane can topple over backwards if the load is suddenly released due to the tension of the boom, which can cause it to tip backwards.
- Working when the wind is excessively strong.
  Comply with the load chart specifications.
- The crane is not levelled and the load is slewed in the direction of the slope.
- If improper control of crane movements cause the suspended load to swing like a pendulum.
- The loads and boom radii specified in the load charts are exceeded.
- When working in the vicinity of electricity transmission lines:
  - The electricity transmission lines were not turned off by expert electricians.
  - The danger zone was not covered or blocked off.

WARNING
Danger of current transfer!
If electricity transmission lines are not shut off nor covered nor blocked off, then there is an increased danger of accident due to current transfer.
▶ Adhere to the safety distance according to the following chart.

If the crane becomes electrified despite having taken all necessary precautions, proceed as follows:
▶ Remain calm.
▶ Do not leave the crane cab.
▶ Warn people outside: Stay in place and do not touch the crane.
▶ Move the crane away from the danger zone.

Nominal voltage	Safety clearance	
Up to 50 kV	4 m	10 ft
More than 50 kV to 200 kV	5 m	15 ft
More than 200 kV to 350 kV	7 m	20 ft
More than 350 kV to 500 kV	8 m	25 ft

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Nominal voltage	Safety clearance	
More than 500 kV to 750 kV	11 m	35 ft
More than 750 kV to 1000 kV	14 m	45 ft
More than 1000 kV	Determination by power supplier or authorized electrician	Determination by power supplier or authorized electrician

Safety distance to electrical power lines depending on the nominal voltage

31.3.1 Counterweight and / or ballast

The type of counterweight and / or ballast required depends on the weight of the load to be lifted and the boom radius required for crane operation. The deciding factor for the selection of the counterweight and / or ballast is the data in the corresponding load chart.

WARNING
The crane can topple over!
If the counterweight and / or ballast is not installed according to the load chart, then the crane can topple over and fatally injure personnel.
▶ Install the counterweight and / or ballast according to the load chart.

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31.3.2 Derrick ballast - suspended ballast

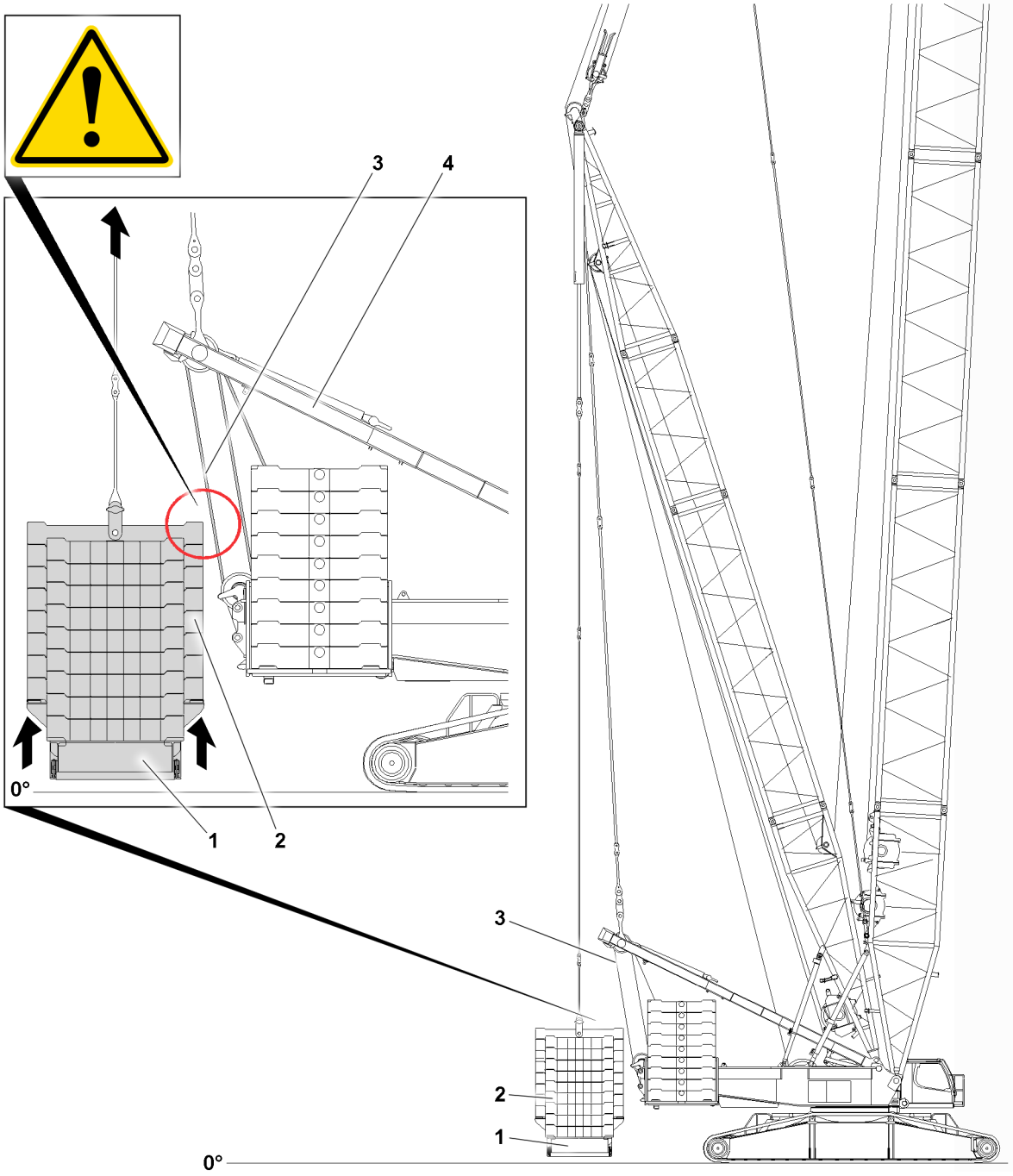

Fig.154801: Danger of collision when lifting the derrick ballast with small derrick ballast radii

1 Suspended ballast pallet

2 Derrick ballast plate

3 Winch 4 control rope

4 SA-frame

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WARNING
Danger of collision!
With small derrick ballast radii, the derrick ballast plates **2** can collide with the winch 4 control rope **3** when lifting the derrick ballast up off the ground.
Death, severe bodily injuries, property damage.
▶ Make sure that a guide monitors the lifting of the derrick ballast up off the ground.
▶ Adapt the lifting height of the derrick ballast.

31.3.3 Hoist gear, hoist rope

The lifting capability of the crane depends on the pull force of the hoist gear and the number of possible hoist rope reevings. When using a single strand, the crane can only lift a load that is pulled by the hoist gear.

If the load to be lifted is heavier than the pull force if the hoist gear, then the hoist rope must be reeved as needed according to the principle of a pulley between the pulley head on the boom and the hook block.

When reeving, carefully observe the load chart specifications and the operating instructions.

WARNING
Hoist rope failure!
If the maximum pull force of the hoist gear is exceeded, the hoist rope can break or the hoist gear can be damaged.
The load can fall and kill personnel.
▶ Observe the maximum pull force of the hoist gear.

31.3.4 Hydraulically adjustable auxiliary boom

WARNING
Impermissible luffing of the auxiliary boom!
Damage to the auxiliary boom due to collision with the ground or other objects. Component failure.
Death, severe bodily injuries, property damage.
▶ Do **not** luff the auxiliary boom down onto the ground or other objects by means of hydraulic adjustment.
▶ Do **not** luff the auxiliary boom down onto the ground or other objects by means of luffing down the main boom.

31.4 Interrupting crane operation

WARNING
Impermissible weather conditions!
If the crane is exposed to impermissible weather conditions during interruption of crane operation, situations can occur which could bring the crane into an unsafe condition.
Toppling crane, death, severe bodily injuries, property damage.
▶ Get the weather forecast for the entire period during which the crane is set up.

If the predicted wind speeds are above the permissible values according to the load chart and / or the wind speed chart:
▶ Take the boom and equipment down in time before impermissible wind speeds occur. See Crane operating instructions, wind speed charts and Erection and take down charts.

When wind conditions are present, which are above the permissible values of the wind speed chart and the boom can no longer be taken down:
▶ Make sure that there is no danger for persons, crane and surrounding area. Secure the crane and surrounding area of the crane far enough against access. Warn persons in the surrounding area and bring them in safety.

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A weather forecast includes information about:
- Changing weather conditions
- Wind
- Ice
- Precipitation
- Flooding
- Lightning

WARNING
Defective crane!
Death, severe bodily injuries, property damage.

If a crane movement occurs during the interruption of crane operation:
▶ Make sure, when an unintentional crane movement occurs, for example as a result of leak, no danger for persons, crane and surrounding is created.

Leaks can occur all on pressurized hydraulic cylinders, for example on the following cylinders:
- Support cylinder
- Luffing cylinder
- Telescoping cylinder
- Control cylinder
- Relapse cylinders

Note
▶ Movements can occur on hydraulic cylinders also as a result of changing oil temperature.

WARNING
Set up crane is not supervised!
Situations during interruption of crane operation may occur which could cause the crane to become unsafe if left unsupervised.
Toppling crane, death, severe bodily injuries, property damage.
▶ Always watch the crane and keep it under control.

If the crane is in set up condition:
▶ Do **not** leave the crane.

If the crane can **not** be constantly kept under control:
▶ Take the equipment down and telescope the boom in and place it down.
▶ The boom on the crane may only be placed down if the predicted wind speeds according to the wind speed charts are less than the maximum permissible wind speeds during assembly and disassembly.
▶ Before the crane is unsupervised: Establish an emergency plan.
▶ Carry out the measures listed below.

Note
▶ An emergency plan includes information how the crane is brought into a safe condition if an unforeseen event occurs.

If possible:
- Take down and secure the equipment, see the erection and take-down charts.
- Telescope the boom in and secure it. The crane boom may only be telescoped when the prevalent wind speed is lower than the wind speed indicated in the load chart for the boom.
- Take the boom down and secure it. The crane boom may only be placed down if the wind speeds are lower than the maximum permitted wind speeds according to the wind speed charts or does not exceed them according to the assembly / disassembly instructions.

On mobile cranes:
- Lift the axles to the maximum position and block the hydraulic suspension.

On lattice mast cranes:
- Set the Derrick ballast, if present, down on the ground.

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- Place the load completely on the ground and unhook it from the crane hook.
- Remove the fastening ropes from the hook.

- Place the load completely on the ground and unhook it from the crane hook.
- Remove the fastening ropes from the hook.

When the hook block remains installed:
- Lift the hook block into the highest position.
- Make sure that the hook block does not touch other crane parts or obstacles.

- Make sure that all measures were taken to keep the crane in a safe condition if something happens.
- If possible, turn the engines off.
- Set all control levers into neutral position or into a locked position.
- Turn all secondary systems off, except systems that are required for restart.
- Establish the energy supply and functionality of safety equipment.
- Close off all control devices, which are not in use.
- Disconnect all control devices, which are connected with cables, if possible, and secure them to prevent unauthorized use.
- Secure control devices without cables to prevent unauthorized use.
- Make sure that the batteries in control devices without cables are charged.
- Make sure that access to the crane and operation for unauthorized personnel is excluded: Lock the driver's cab and the crane cab.
- Secure all keys to prevent unauthorized access.

If the construction site has limited space:
- The decision not to take the boom down while the crane is unsupervised can only be made by an authorized and qualified crane operator, who is familiar with the construction site.
- Make sure that no danger can occur for persons, crane and its surroundings should something unforeseen happen.
- Make sure for the duration of the interruption of crane operation, that the predicted wind speeds do not exceed the permissible values for the respective set up configuration, see wind speed chart.
- If the wind speed charts do not provide values for the set up condition, the permissible wind speed in the load chart shall be observed.

If crane operation with a set up crane is interrupted:
- Make sure measures are initiated in time by trained, qualified personnel to bring the crane into a safe condition if anything happens.
- Make sure that no danger can occur for persons, crane and its surroundings should something unforeseen happen.

If the predicted wind speeds are above the permissible values:
- Bring the boom and equipment in time into a permissible condition before impermissible wind speeds occur, depending on the predicted wind speed, or take it down completely on the ground. See Crane operating instructions, wind speed charts and Erection and take down charts.
- Telescope the telescopic boom in and luff down to 0°. Position the boom and auxiliary boom, see the Crane operating instructions, wind speed charts and erection and take-down charts.

Situations are for example:
- Vandalism
- The ground giving way due to severe rain
- Melting ice under the supports
- Storm and thunderstorm
- Storm and wind
- Lightning
- Flooding
- Earthquakes
- Landslides
- Washouts
- For mobile cranes and crawler cranes with support:
  Yielding of support cylinders (leak, temperature changes)
- For cranes with a telescopic boom:
  Yielding of luffing cylinders (leak, temperature changes)

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– Yielding of luffing lattice jib relapse cylinders (leak, temperature changes)

31.5 Resuming crane operation

Before resuming crane operation, the crane operator is obligated, among others, but not exclusively, to check the crane condition, the safety equipment, as well as the environmental conditions.

WARNING
Danger of accident!

When the crane operator leaves the crane cab:
▶ Before resuming work, check the operating mode setting and reset, if necessary.

31.6 Ending crane operation

Before the crane operator may leave the crane, the following prerequisites must be met:
– Place the load fully on the ground and unhook from the crane hook.
– On crane with telescopic boom: Telescope the telescopic boom in all the way and take the boom down in the boom receptacle.
– For a crane with a lattice mast boom: Take the lattice mast boom down and disassemble if necessary.
– Bring the control lever (master switch) to the 0-position.
– Apply the parking brake on the crane chassis.
– Turn the engine off and pull out the ignition key.
– When a battery master switch is present: Wait ten minutes after removing the ignition key. After these ten minutes have passed, turn off the battery master switch and pull off the switch cam.
– Lock the crane cab.
– Secure the crane to prevent unauthorized use.
– For mobile crane: Make sure that the driver's cab is **not** occupied. Lock the driver's cab. Secure the crane to prevent it from rolling off unintentionally, see section „Parking the vehicle".
– Make sure that no danger can occur for persons, crane and its surroundings should something unforeseen happen.

32 Lifting of personnel

32.1 Intended use

– The destined use of the crane is **lifting of loads**.
– **Lifting of personnel** is **not** considered to be destined use of the crane.

Note
▶ These instructions do **not** apply for work platforms, which are attached on the crane boom and are used to lift personnel. This subject is governed by international standards for mobile aerial work platforms.

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WARNING
Non-designated use of the crane!
Personnel can be severely injured or killed.
- ▶ The crane is **not** intended to lift personnel.
- ▶ Lifting persons on the variable support is prohibited.
- ▶ The crane may **not** be used for recreational purposes and exhibitions, such as lifting personnel for shows, bungee jumping or Dinner in the sky.
- ▶ The crane may **not** be used for lifting of devices with personnel on them or under the device, such as lifting of tents.
- ▶ Exception: If lifting of personnel for special work situations is the least dangerous possibility to carry out the work, then personnel may be lifted or brought into a suspended position when using lifting cages (cherry pickers).

32.2 Prerequisites for lifting of personnel

Make sure that the following prerequisites are met:
- Lifting personnel with cranes is permissible by national and local laws in the country where this crane application is carried out.

DANGER
Lifting of personnel!
Accidents which occur when lifting personnel often result in severe injuries or even death.
- ▶ This exceptional application is within the scope of responsibility of the user and is only permitted if the requirements and instructions in the next sections are observed and adhered to.
- ▶ The company, the supervisor, the crane operator and auxiliary personnel must proceed especially carefully and safety conscious.
- ▶ Before the lifting procedure, a meeting must be held with all associated personnel.
- ▶ The following warning notes and safety regulations must be strictly observed.

32.2.1 Legal prerequisites

Make sure that the following prerequisites are met:
- Special arrangements were made for the use of the lifting cage (cherry picker) according to the requirements of national laws.
- If required by national laws: The use of the crane to lift personnel is reported to the state agency for occupational health and safety. The lifting procedure may possibly require a special permit.
- Before the implementation of the lifting procedure with the aid of a work-specific risk analysis for the possibility of rescuing personnel in emergencies was defined.
- To rescue personnel in emergencies, precautionary measures must be present on the crane, if they are required by national laws.
- The measures for safe operation near power lines, depending on the conditions on the job site and the national laws / national regulations were observed and adhered to.

32.2.2 Prerequisites for crane equipment and accessories

Make sure that the following prerequisites are met:
- The hoist gear to lift personnel must also be able to be moved in emergency operation.
- Before lifting personnel, the crane was inspected. No damage was found.
- The lifting cage (cherry picker) is utilized according to national laws and / or standards and according to intended purpose.
- Before lifting personnel, the lifting cage (cherry picker) was carefully inspected. No damage was found.
- Every emergency rescue device was inspected and its operational readiness was determined, if required by national laws.
- Any hooks in use must be equipped with a latch, which prevents the hook mouth to open. According to national laws, the latch must be manually closable or lockable or must automatically close via a spring.

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32.2.3 Inspecting before start up

Make sure that the following inspections are made before starting up the lifting cage (cherry picker):
- On every new construction site and after every modification or repair: To ensure the operating safety of the lifting cage (cherry picker) and the lifting equipment, a test with 125 % of the nominal load carrying capacity of the lifting cage (cherry picker) without personnel must be carried out. During the test, the lifting cage (cherry picker) may only be lifted just above the ground.
- A test lift with loaded lifting cage (cherry picker) without personnel must be carried out. The weight in the lifting cage (cherry picker) for the test lift must be at least as large as the weight of the personnel and the weight with the work equipment carried along. For this test lift, the course of all planned movements of the lifting procedure must be simulated.
- This test lift must be carried out for every location on a construction site, where personnel must be carried.

32.2.4 Prerequisites for operation with lifting cage (cherry picker)

Make sure that the following prerequisites are met for operation with lifting cage (cherry picker):
- The personnel and technical prerequisites for safe use and operation of the emergency control of the crane are present.
- The emergency control for emergency rescue of the person in the lifting cage is functioning.
- The rope pull is limited to 50 % of the maximum rope pull.
- The crane is utilized only to 50 % of its maximum load bearing capacity of the valid load chart.
- Only the hoist gear lifting / lowering, turning and luffing crane movements may be performed.

WARNING
Superimposed crane movements with hydraulic auxiliary users!
Superimposed crane movements by actuating hydraulic auxiliary users can lead to the unwanted acceleration or deceleration of the safety cage movement.
▶ It is prohibited to superimpose crane movements with hydraulic auxiliary users to tilt the cab, for example.

33 Securing personnel on shut off crane

33.1 Terms and abbreviations

- PSAgA: Personal protective equipment to prevent falling
- HSG: Height safety device

33.2 Intended use

Cranes are **not** designed to protect personnel against falling.

When the following prerequisites are met, the personnel protection may be permissible:
- A justified individual case is present.
- A project-specific written risk assessment and work procedure for the precise case by the employer is on hand.
- The specific safety measures are strictly adhered to.

Limitations for movement and operation:
- Moving the secured person on the crane **from** job site and **to** job site is impermissible.
- Moving the secured person on the crane **from** job site and **to** job site is permissible only in case of a rescue operation.
- Operation of the crane by the secured person is impermissible.
- The crane is stopped off and secured against any movement.

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33.3 Prerequisites

WARNING
Prerequisites for personnel protection are **not** met!
Danger of accident. Death, severe bodily injuries.
▶ Carry out the personnel protection on the shut off crane only when **all** prerequisites in this section have been met.

Make sure that the following prerequisites are met:
– The country-specific, legal regulations are being observed.
– The written risk assessment shows:
  • Technical protective measures with at least the same protective effect are **not** available.
  • The normal fastening devices can **not** be used.
  • Personnel protection on the shut off crane is the safest and most useful method to carry out this work.
– Last transport and personnel protection occur independent of each other:
  • Do **not** carry out personnel protection at the same time as load transport. Simultaneous personnel movement is impermissible.
  • Riding along on the load is impermissible.
– Determination of fastening points and rescue plan for the precise case is on hand from the employer.

33.3.1 Personnel and qualification

Make sure that the following prerequisites for personnel and qualification are met:
– The crane operator is suited and competent to operate the crane.
– Person, which is secured, must be trained in handling the PSAgA.
– The following persons are present on the job site and separately instructed:
  • A supervisor
  • The crane operator
  • The required number of rescue staff according to the rescue plan
– Access protection, fall protection on the shut off crane is made in accordance with the project-specific risk assessment on hand and the measures to be taken.
– The supervisor monitors the safe execution of work. He may **not** take part in the work.
– An effective communication must be ensured between crane operator and the secured person.

33.3.2 PSAgA, rescue equipment and tools

Make sure that the following prerequisites and measures are met:
– Use only HSG (height safety device) according to EN 360 in connection with a safety harness according to EN 361 to secure the person.
– Connecting device is suited for the occurring stress on the edges, see Manufacturer's documentation or device identification.
– Recurring inspections have been made. There are **no** visible defects present.
– At least 1 m connecting device of the maximum possible extension length of the HSG (height safety device) must remain in the housing.
– Fasten the HSG (height safety device) with two separate connecting devices (for example Securing on crane hook and on crane pulley block).
– Position the crane in such a way that the HSG (height safety device) is at least 5 m and plumb **over** the person, which is being secured.
– Do **not** exceed the maximum permissible deflection of the HSG (height safety device)
– Keep the required space **underneath** the person, which is being secured.
– All required objects (tools, building material) for the work are secured to prevent them from falling.

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33.3.3 Crane

Make sure that the following prerequisites are met:
- The maintenance intervals and periodic crane inspections have been adhered to. There are **no** visible defects present.
- The load on the crane hook in any possible position is at least 600 kg , see Load chart (take the crane pulley block into account).
- Ensure sufficient load bearing capacity: For the load cases catching, pendular fall and possible angular pull adhere to the manufacturer's instructions.
- The crane is secured against movements and inadvertent movement (remote control is deactivated, crane control is activated).
- The overload protection is active.

33.4 Fastening device

Make sure that the following prerequisites are met:
- The crane hook is equipped with the hook safety.
- On the carrying device two connecting devices separated from each other can be fastened.
- HSG (height safety device) is redundantly fastened.
- Suitable fastening devices according to EN 795 Type B are on hand:
  - Round sling or fastening rope with steel core
  - Belt loop
- Textile components must be protected against greases, oils and other aggressive substances.
- Use only steel carabiners according to EN 362 with Tri-Lock function.

33.5 Rescue

A person in an accident must be lifted or lowered with the aid of the crane.

Carry out the following measures to ensure a safe rescue operation:
- Determine the rescue plan and rescue chain at the preparation of the mission.
- Ensure the rescue of a person involved in an accident immediately with locally available means and trained personnel.
- Have the rescue mission coordinated by another person, with visual and voice contact to the crane operator, ground personnel as well as to the person, which is rescued.

33.6 Additional risks

Make sure that the following risks are taken into account:
- Wind effect and environmental influences.
- Crushing and shearing points.
- Endangerment by additional cranes, for example material transport.

34 Welding work on the load

Note
▶ The load must also be grounded.

In case of welding work on the load, the screw clamp of the welding unit must be attached on the work piece to avoid current flow via hoist rope, crane superstructure or crane chassis.

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2.04.10 Ladders

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2	Safety instructions	2
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4	Ladder inspection	12
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1 Intended use

Ladders are mobile work equipment that can be used in different locations. Ladders can be used to perform minor work at heights in cases where the use of other equipment would not be appropriate.

Ladders are designated for the ascent and descent of personnel.

Ladders may only be used as described. Any other use is considered unintended use and is therefore forbidden.

The manufacturer is **not** liable for damage caused by unintended use or improper usage.

2 Safety instructions

The ladders are built according to the present level of technology and recognized safety technical regulations. Despite that, during their use dangers to life and physical condition of the user and / or third parties can occur.

Ladders may exclusively be used in a flawless technical condition and according to their missions as well as with constant awareness of safety and dangers.

Changes to the structure may exclusively be made with written approval of the manufacturer.

The ladders that are illustrated are an example. Ladders with the same functional principle may appear differently.

WARNING
Safety instructions not observed!
Personnel can fall, death, severe bodily injuries.
- ▶ Observe and adhere to the assembly and safety instructions for ladders.
- ▶ Observe and adhere to the safety signs on the ladders.
- ▶ Install and secure the ladders properly.
- ▶ Use ladders exclusively if you are healthy enough to do this.
- ▶ Climb up / down the ladder with the 3-point support.
- ▶ Use the rungs as handles.
- ▶ Step into the rungs deep enough.
- ▶ Never bring the ladder to a new position during use.
- ▶ Do not use damaged ladders and replace them immediately.
- ▶ Repair the ladder exclusively through authorized service facilities.

2.1 Ladder categories

Ladders are divided into two categories according to the most up-to-date specifications:
- Ladders for industrial use
- Ladders for private use

Ladders for industrial use are tested according to the strictest criteria. Only use ladders for industrial use.

Ladders are marked according to their category allocation by a corresponding pictogram. See section „Safety signs“.

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2.2 Stationary stability

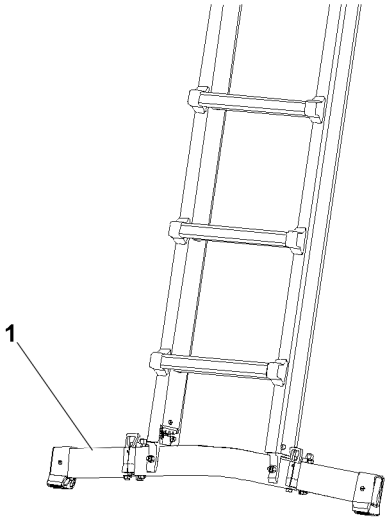

Fig.149993: Ladder with cross beam

According to the most up-to-date regulations, ladders with a length of more than 3 m must have a larger standing width. These ladders are equipped with a cross beam **1**.

2.3 Retrofitting old ladders

It is not mandatory to retrofit old ladders. It is the responsibility of the industrial user to ensure, in accordance with the operational safety regulation by means of a risk assessment, that the safety of the work equipment is ensured for all work tasks.

Older ladders that no longer corresponds with the state of technology according to current regulations, can continue to be used, **if** their safety has been checked **and** guaranteed.

3 Safety signs

Note

- ▶ The safety signs and instructions on the ladders must be complete and always legible.
- ▶ Observe and adhere to the manufacturer's operating instructions.

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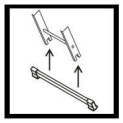
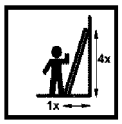
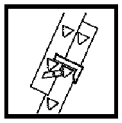
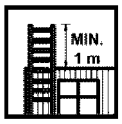
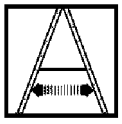
3.1 Symbols until the end of 2017

Sign	Explanation
	Read the operating instructions
	Maximum number of users on one ladder
	Maximum load
	In the case of ladders that have a cross beam, the cross beam must be assembled before the first use
	Correct set up angle 65° to 75°
	Before use: Engage the lift out safety
	Ladder overhang above the exit level
	Secure the upper / lower end of the ladder
	Before use: Tension the safety struts on stepladders

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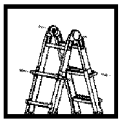
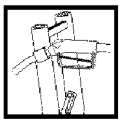
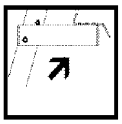
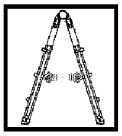
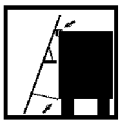
Sign	Explanation
	Before use: Engage the locking pin joints and pull pin locks
	To open / close the tank cover and to ascent / descent: Insert the fuel nozzle into the retainer
	Before setting up the ladder Fold out the platform
	Before use: Check the ladder for damage
	Check the legs of the ladder
	Do not use the three uppermost rungs of an extension ladders as rungs to stand on
	Do not use the four uppermost rungs / steps of a stepladder without a platform to stand on
	Do not use the two uppermost rungs of a stepladder with integrated extension ladder as rungs to stand on
	If hinged ladders are used as stepladders: Spread the ladder legs to the stop
	Place the upper placement angle flat. Hold the belt on tension

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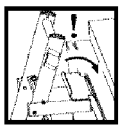
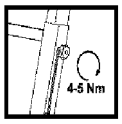
Sign	Explanation
	Hook the hook on the platform of the refueling ladder on the vehicle
	Tighten the star knob on the beam extension tightly
	Do **not** use a damaged ladder
	Preclude any contaminants on the ground
	Make sure the upper end of the ladder is placed correctly. Place the ladder only on safe surfaces
	Only one person may climb up / down on any accessible leg of the ladder
	Avoid leaning out to the side. Keep the body's center of gravity between the ladder beams
	Face the ladder when climbing up / down the ladder
	Use the ladder only with suitable shoes
	Do not use a stepladder as a leaning ladder

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Sign	Explanation
	Do **not** use the inner section of multi-part hinged ladders without outer sections as a stepladder
	Crushing danger
	Set the ladder up on horizontal and solid ground
	Set the ladder up on solid ground
	Use the ladder in the correct set up direction
	Do not carry along bulky objects or objects over 10 kg on the ladder
	It is not permitted to step off the ladder to the side
	During transport, pay attention to danger due to power lines
	Do not use the ladder as a walkway
	Do not transport snow and ice shovels over the ladder. Use hooks!

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Sign	Explanation
	Danger due to shearing point
	Do not use the ladder with the cross beam folded in
	Do not use a ladder under the influence of drugs or alcohol
	Do not use a ladder to climb up to another lever
	Make sure that both ladder sections are opened completely and secured. Avoid an incorrect ladder position
	Only use the platform ladder with a locked spreader lock
	Only permissible ladder rungs / platforms may be used as standing and stepping surfaces. Other surfaces such as placement surfaces for cable clips or attachment hooks may **not** be used as standing and stepping surfaces
	If a crossbars is part of the scope of delivery of the mobile platform ladder: Only use a mobile platform ladder with the crossbar assembled
	If auxiliary weights are part of the scope of delivery of the mobile platform ladder: Only use the platform ladder with the auxiliary weights assembled

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Sign	Explanation
	If a foot brake is installed on the mobile platform ladder: Use the foot brake
	Make sure that the joint is locked
	In unfavorable weather conditions, do **not** use the ladder in the open

3.2 Symbols from 2018

Sign	Explanation
	Danger of falling!
	Read the operating instructions
	Maximum load
	Ladder for professional use
	Ladder for private use
	Maximum number of users on one ladder

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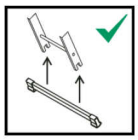
Sign	Explanation
	In the case of ladders that have a cross beam, the cross beam must be assembled before the first use
	Correct set up angle 65° to 75°
	Always keep a firm grip: When ascending and descending and when working on the ladder
	Ladder overhang above the exit level
	Before use: Engage the lift guards
	Do **not** use a damaged ladder
	Only use the ladder with the cross beam folded out
	Prior to use: The hinges and locks must be engaged
	Use the ladder in the correct set up direction
	Only use the ladder with appropriate footwear

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Sign	Explanation
	Do **not** use the ladder if physically impaired or under the influence of drugs or alcohol
	Do **not** use the ladder on uneven or unsteady surface
	Do **not** use the ladder on a slippery or contaminated surface
	Do **not** place the ladder on unsuitable surfaces
	Do **not** carry along bulky objects or objects over 10 kg on the ladder
	Do **not** use the top three rungs as rungs to stand on
	Avoid leaning out to the side. Keep the body's center of gravity between the ladder beams
	Avoid working with a side load
	Climb up and down the ladder while facing it
	Do **not** use a stepladder as a leaning ladder

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Sign	Explanation
	Prior to use: Tension the safety struts on stepladders
	For stepladders without a platform: Do **not** use the top two rungs as rungs to stand on
	It is not permitted to step off to the side from the ladder
	When transporting or using the ladder, be aware of any danger due to overhead wires
	Do **not** use the ladder as a walkway

4 Ladder inspection

Make sure that the following conditions are met:
- All ladders are inspected at lease every 12 months. See chapter 8.17.
- The inspection may be made exclusively by authorized and trained expert personnel.
- The results of the inspection are documented.

5 User guidelines

Make sure that the following prerequisites are met before using the ladder:
- A risk evaluation had been made.
  The national legal regulations have been taken into account.
- People are physically able to use a ladder.
- The ladder is suited for the respective application.
- The ladder is complete and not damaged (visual inspection).
- The ladder is free of contaminants, such as:
  - Ice
  - Snow
  - Frost
  - Wet paint
  - Lubricants
- The legs of the ladders are not worn.
- Screws and connections have been checked for tight seating.
- The base is:

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- Level
- Horizontal
- Slip-resistant
- Unmoveable

When climbing up the ladder:
- Set the ladder up in the correct set up angle.
- Secure the locking devices of the ladder.
- Tension the spreaders of the stepladder.
- Do **not** set up the ladder from above.
- Do **not** set the ladder on braces or steps.
- Avoid the risk of a collision with pedestrians, vehicles or doors.
- Place the leaning ladder only suitably stable contact surfaces with both rails.

When using the ladder:
- Make sure that no children are playing on the ladders.
- Subject the ladder to no more than maximum 150 kg.
- Use the ladder exclusively as described in section „Ladder access“.
- Do **not** use the ladder outside in strong wind.
- Do **not** subject the ladder horizontally to excessive loads in side assembly work.
- Face the ladder when climbing up or down the ladder.
- Step on the ladder with suitable shoes.
- Do not use the ladder as a walkway.
- Secure the ladder to prevent it from being knocked over inadvertently.
- For leaning ladders, do not step on the uppermost three steps / rungs, in reference to the ladder placement point.
- For stepladders, do not step on the uppermost two steps / rungs.
- Do not work too long on the ladder without pauses. Tiredness is a safety risk.
- When working on a ladder, hold on tightly with one hand.
  If this is not possible: Take additional safety measures, such as: Use the WORK POSITIONING SYSTEM (WPS).

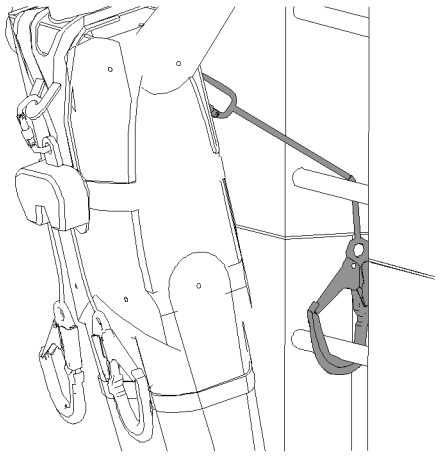

Fig.126746: Example of how to use the WPS

For repair, maintenance and storage of a ladder:
- Have repairs and maintenance made by expert personnel according to the manufacturer’s instructions.
- Store the ladders according to the manufacturer’s instructions.

Before transporting the ladders:
- Lock and secure the ladders in their provided transport retainers.

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6 Assembling the ladder

6.1 Supplied cross beam

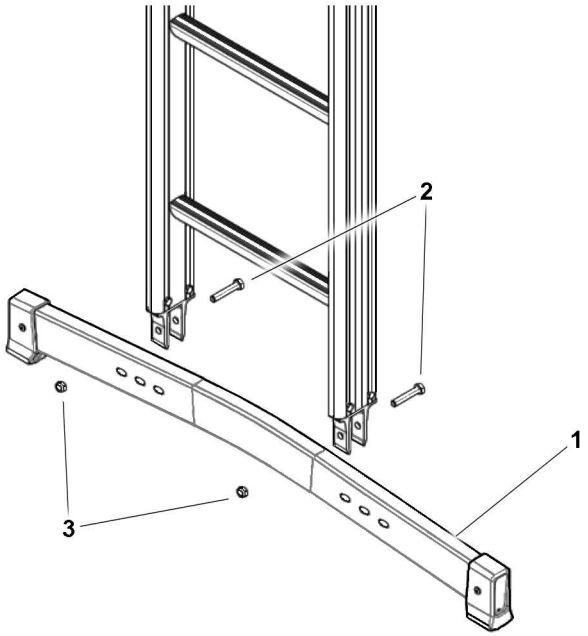

Fig.149565: Assembling the cross beam

Depending on the type of ladder and the delivery condition, the cross beam must be assembled prior to use.

Required tools:
- 2 x 13 mm wrenches
- The screws and nuts are included in the delivery scope.

Tightening torque:
- Approx. 8 Nm

▶ Position the cross beam **1** centrally between the cross beam fasteners.
▶ Secure the cross beam **1** with screws **2** and nuts **3**.
▶ Before using the ladder: Make sure that the screws **2** and nuts **3** are tightened correctly.

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6.2 Folding cross beam

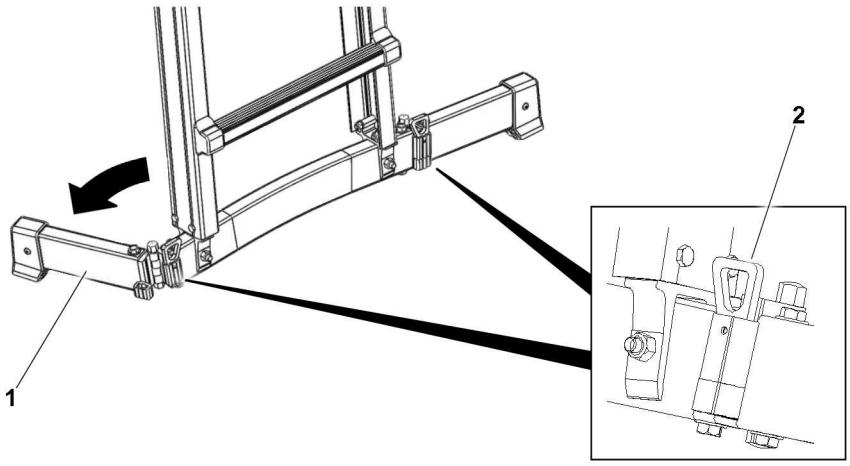

Fig.149566: Using the folding cross beam

Depending on the type of Ladder, the folding cross beam must be brought into the operating position prior to use and brought to the transport position after use.

6.2.1 Bringing the cross beam into the operating position

- ▶ Swing the folding cross beam **1** on both sides into the operating position.
- ▶ Make sure that the retaining element **2** is engaged.
- ▶ Before using the ladder: Make sure that both retaining elements **2** have engaged.

6.2.2 Bringing the cross beam into the transport position

- ▶ Unlock the retaining element **2**.
- ▶ Swing the folding cross beam **1** on both sides into the transport position.
- ▶ Before storing the ladder: Make sure that both retaining elements **2** have engaged.

6.3 Cross beams for platform ladder

For platform ladders, the supplied cross beams must be assembled prior to use.

Required tools:
- 2 x 13 mm wrenches
- The screws and nuts are included in the delivery scope.

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6.3.1 Assembling the cross beam without wheels

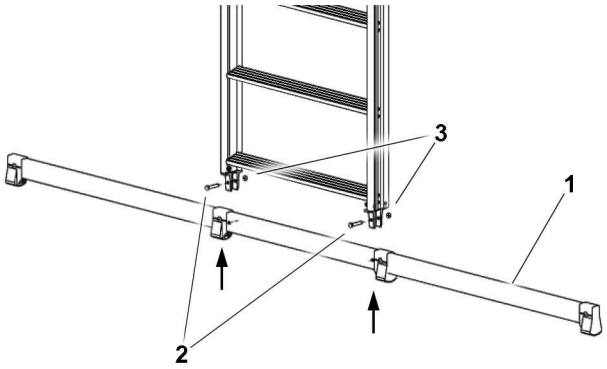

Fig.149595: Assembling the cross beam

- ▶ Position the cross beam **1** centrally between the cross beam fasteners.
- ▶ Secure the cross beam **1** with two screws **2** and two nuts **3**.
- ▶ Tighten the screws **2** by hand.

6.3.2 Assembling the cross beam with wheels

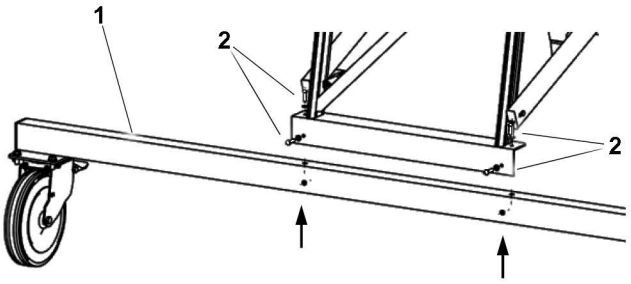

Fig.149596: Assembling the cross beam

- ▶ Position the cross beam **1** centrally between the cross beam fasteners.
- ▶ Secure the cross beam **1** with four screws **2** and four nuts.
- ▶ Tighten the screws **2** by hand.
- ▶ Before using the ladder: Make sure that all screws and nuts are correctly tightened.

6.4 Platform ladder

At least two people are required for ladder assembly and removal.

6.4.1 Assembling the platform ladder

WARNING
Platform ladder not correctly assembled!
Personnel can fall down. Death, severe bodily injuries.
- ▶ Before the platform ladder is correctly assembled: Do **not** step on or load the platform ladder.

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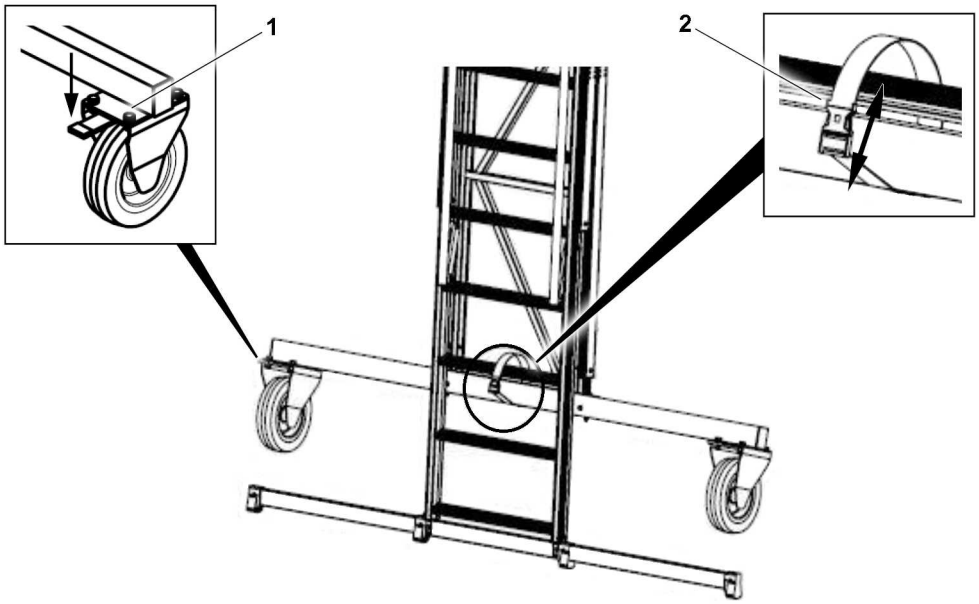

Fig.149597: Preparing the ladder

- ▶ Secure both pulleys **1**.
- ▶ Erect the ladder with two people.
- ▶ Release the rigging belt **2**.

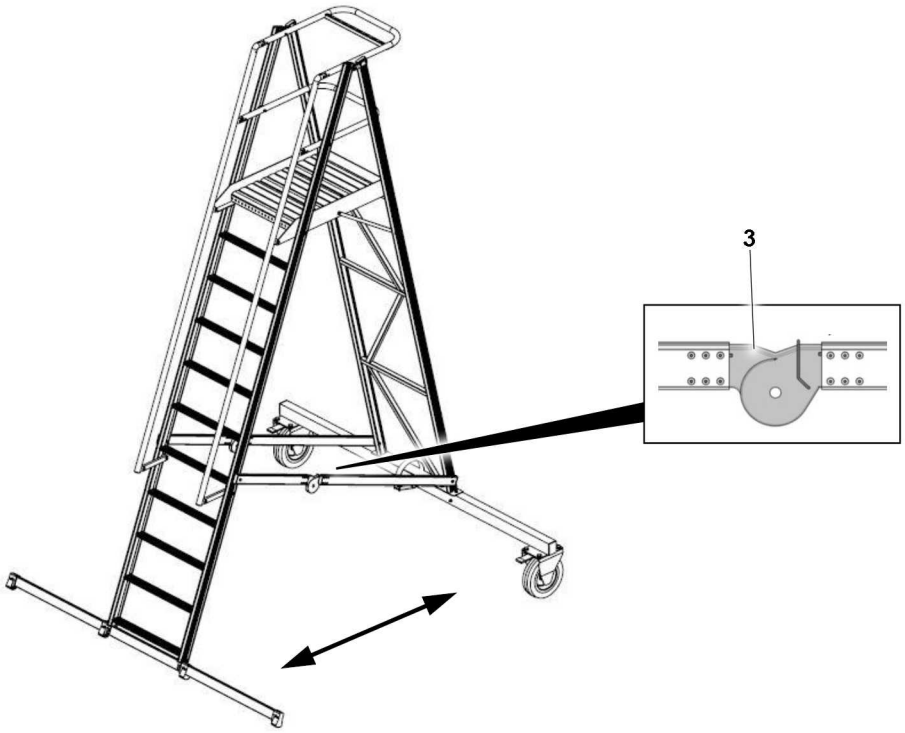

Fig.149598: Setting up the ladder

- ▶ Each half of the ladder is held by a person.
- ▶ Until both hinges **3** engage audibly: Carefully guide the ladder halves away from each other. When doing so, the platform surface will fold out automatically.

Result:

– The ladder is now assembled.

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6.4.2 Dismantling the platform ladder

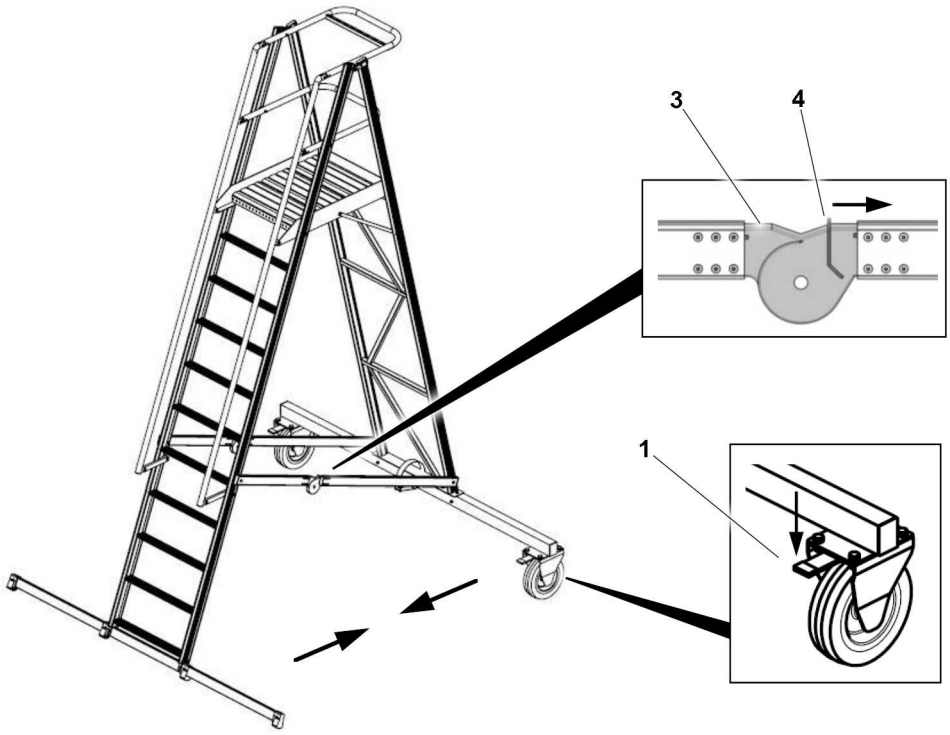

Fig.149599: Releasing the hinges

- ▶ Secure both pulleys **1**.
- ▶ Unlock the locking bracket **4** in the hinge **3** on both sides.
- ▶ Each half of the ladder is held by a person.
- ▶ Carefully guide the ladder halves toward each other. When doing so, the platform surface will fold together automatically.

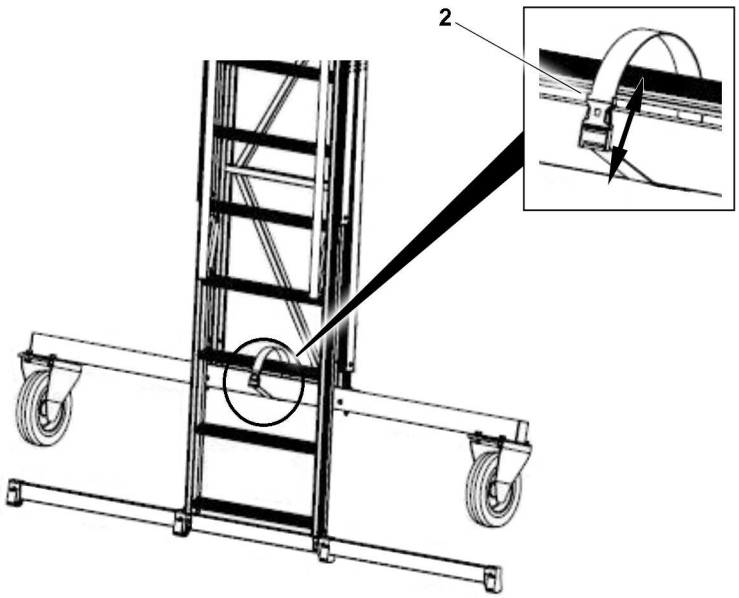

Fig.149600: Securing the ladder in the transport position

- ▶ Secure the rigging belt **2** on the cross beam and rung.
- ▶ Make sure that the clasp on the rigging belt **2** is closed.

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Result:
– The ladder is dismantled and secured in the transport position.

6.5 Hinged ladders

The hinged ladder can be used as a leaning ladder or stepladder.

To adjust a part of the ladder, both hinges on opposite sides must be actuated.

6.5.1 Using a hinged ladder as a leaning ladder

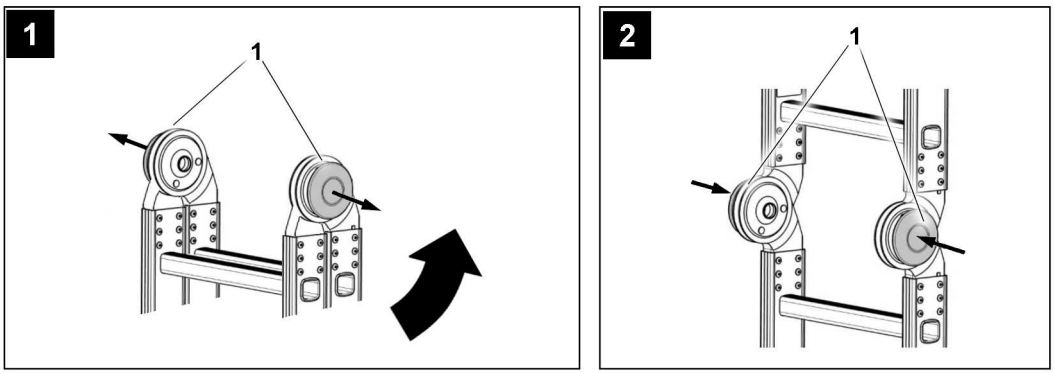

Fig.149567: Using a hinged ladder as a leaning ladder

▶ Release the hinges **1**.
▶ Until the hinges **1** engage again: Spread out the legs to the stop.
▶ Before using the hinged ladder as a leaning ladder: Make sure that the hinges **1** have engaged.

6.5.2 Bringing the leaning ladder into the transport position

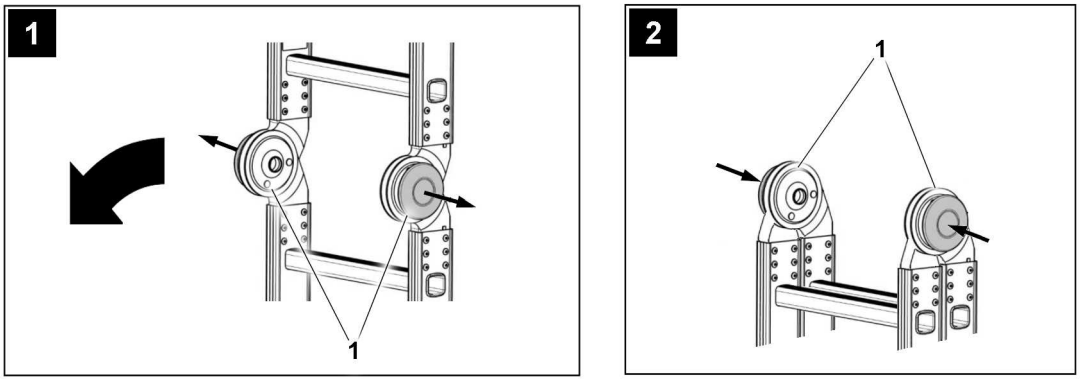

Fig.151625: Bringing the leaning ladder into the transport position

▶ Release the hinges **1**.
▶ Until the legs lie together and the hinges **1** engage: Fold the legs together.

Result:
– The hinged ladder is now in the transport position. The hinged ladder can now be stored.

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6.5.3 Using a hinged ladder as a stepladder

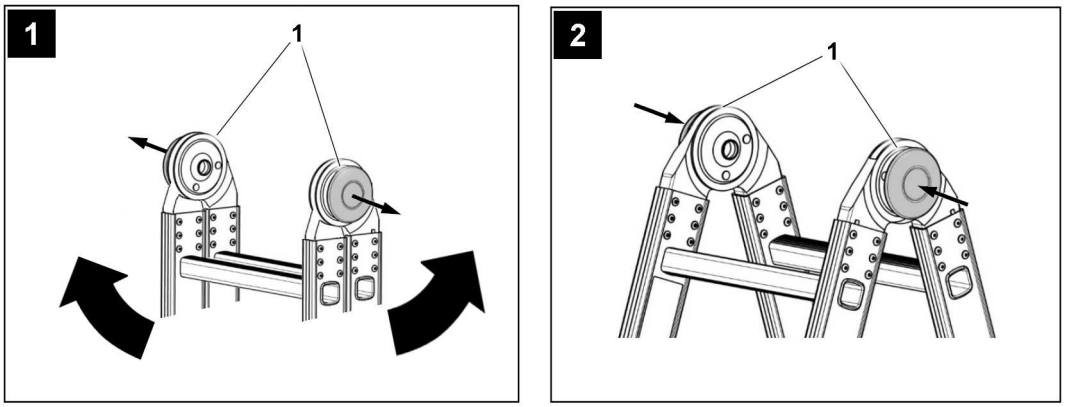

Fig.149568: Using a hinged ladder as a stepladder

- ▶ Release the hinges **1**.
- ▶ Until the hinges **1** engage again: Spread out the legs.
- ▶ Before using the hinged ladder as a stepladder: Make sure that the hinges **1** have engaged.

6.5.4 Bringing the stepladder into the transport position

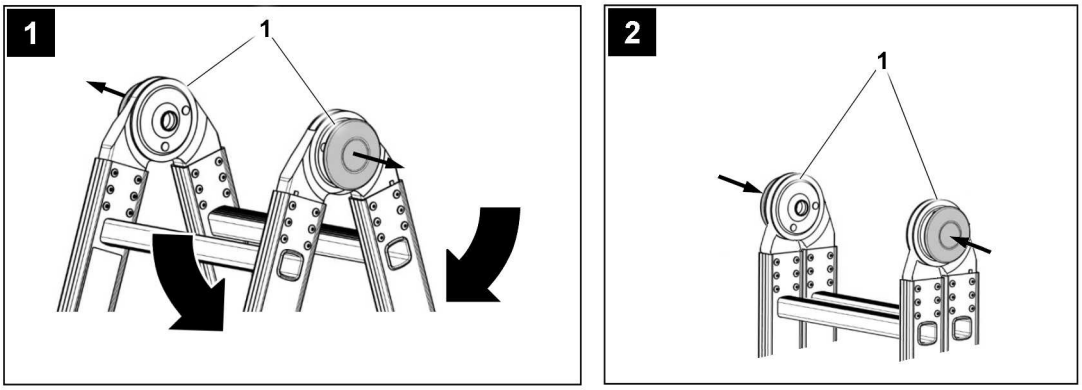

Fig.151607: Bringing the stepladder into the transport position

- ▶ Release the hinges **1**.
- ▶ Until the legs lie together and the hinges **1** engage: Fold the legs together.

Result:

– The ladder is now in the transport position. The ladder can be stored.

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6.6 Multi-purpose ladder with height adjustment

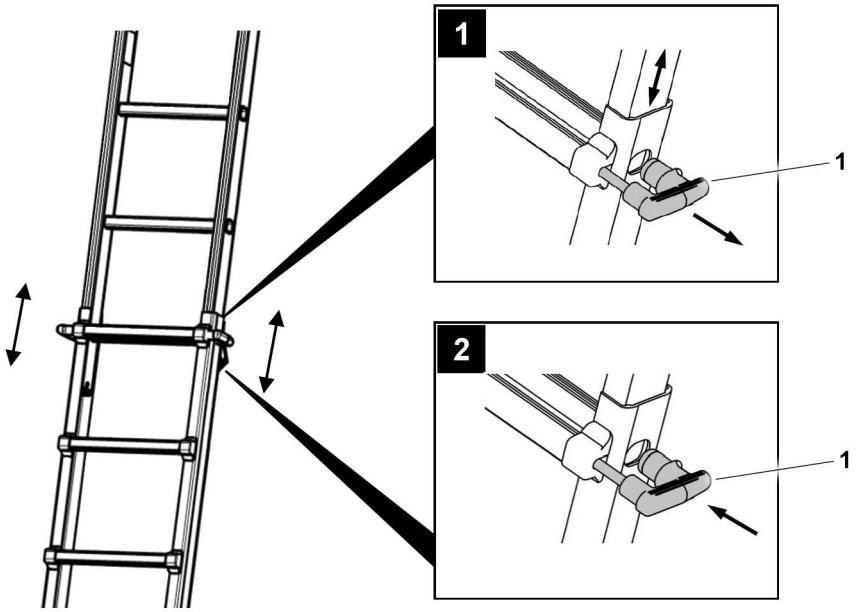

Fig.149570: Ladder with height adjustment

Multi-purpose ladders have a height adjustment device.

- ▶ Release the handle **1** on both sides.
- ▶ Pull out or push in the ladder to the desired length.
- ▶ Lock the ladder with the handle **1** on both sides.
- ▶ Before using the ladder: Make sure that both handles **1** have engaged.

6.7 Three-part multi-purpose ladder

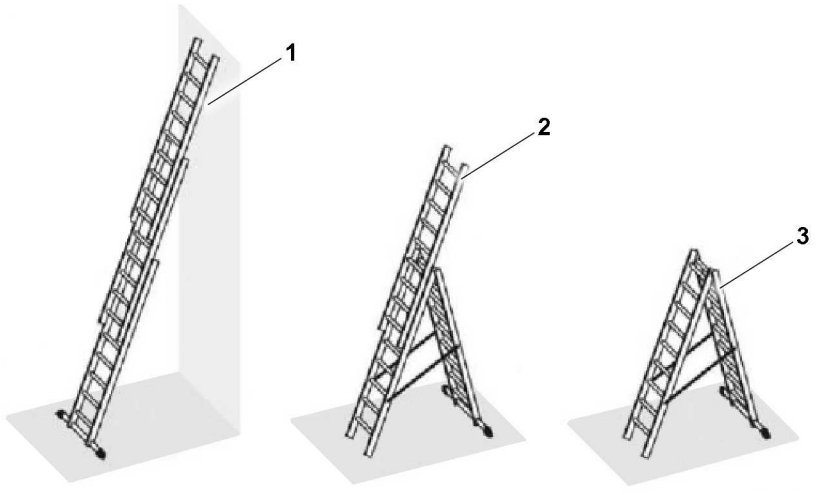

Fig.152833: Three-part multi-purpose ladder

The three-part multi-purpose ladder can be used as a leaning ladder **1**, stepladder with integrated extension ladder **2** or as a stepladder **3**.

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6.7.1 Using the three-part multi-purpose ladder as a leaning ladder

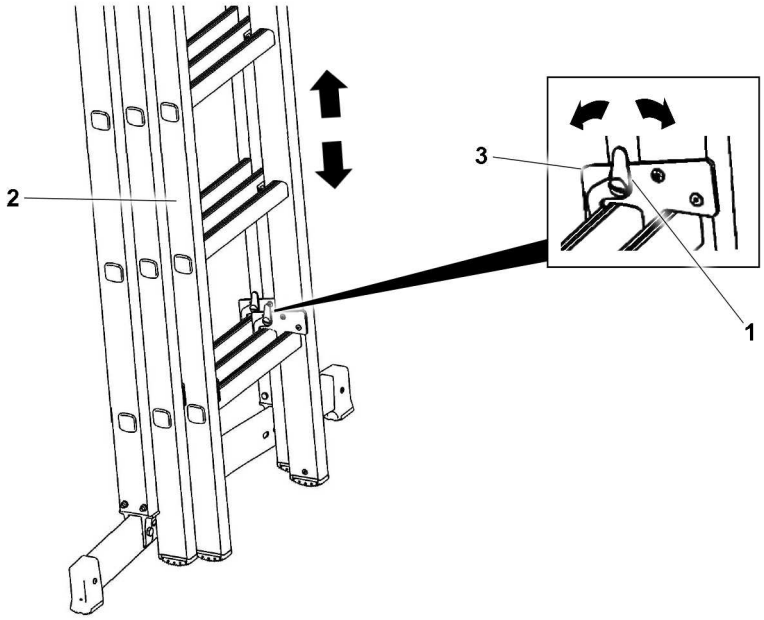

Fig.152834: Pushing out the ladder

Push out the upper ladder section **2**:

- ▶ Release the lock **1**. Slightly lift up the upper ladder section **2** at the same time.
- ▶ Swing out the upper ladder section **2** and push it out to the desired length.
- ▶ Refit the securing hooks **3**.
- ▶ Make sure that the lock **1** engages.

Push out the middle ladder section:

- ▶ Pull out and lock the middle ladder section in the same manner.
- ▶ Make sure that the lock **1** engages.

Result:
– The ladder can now be used.

Push the ladder together:

- ▶ Push together and lock the middle ladder section.
- ▶ Subsequently push together and lock the upper ladder section.
- ▶ Make sure that the lock **1** engages.

Result:
– The ladder is now in the transport position. The ladder can be stored.

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6.7.2 Using the three-part multi-purpose ladder as a stepladder

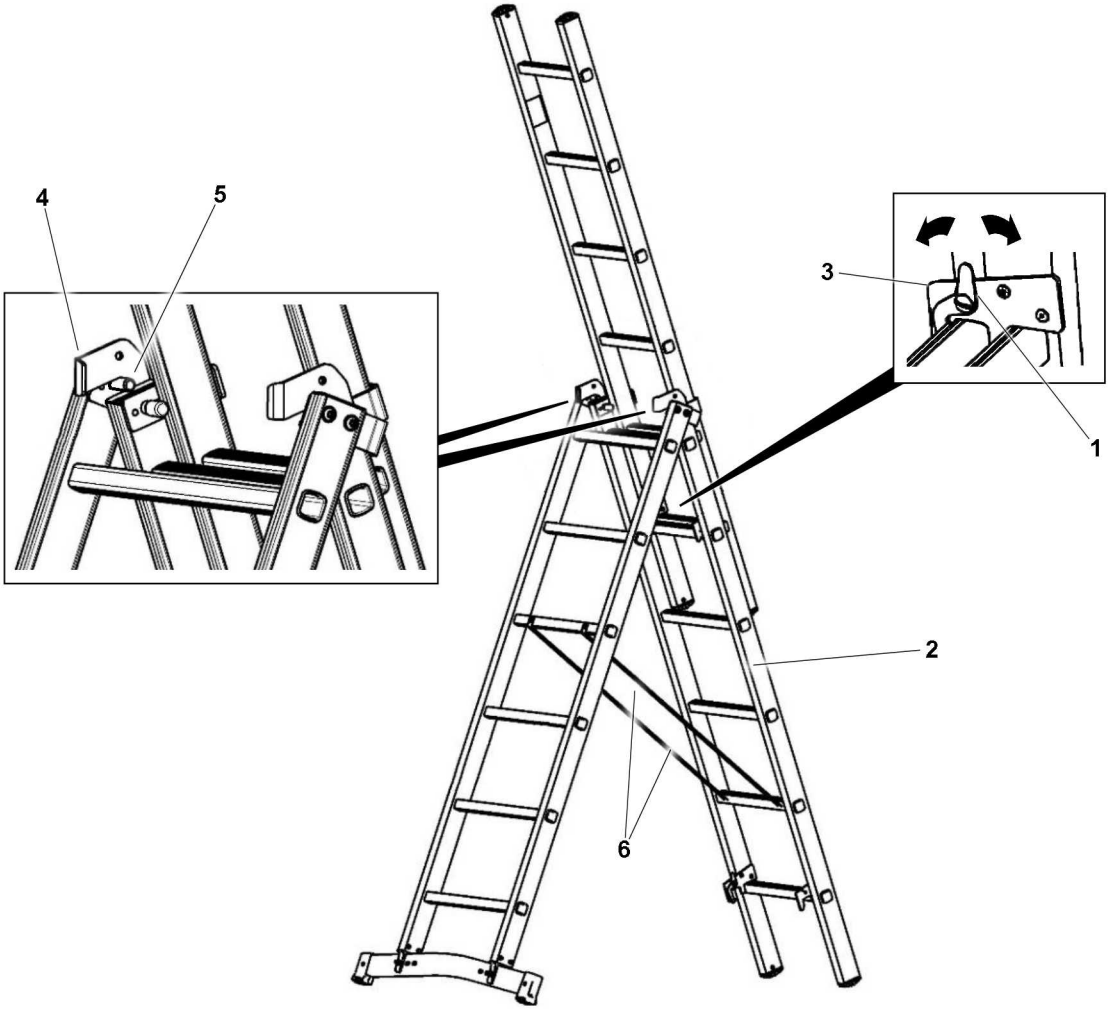

Fig.152835: Setting up the ladder

Push out the upper ladder section:

▶ Push out the upper ladder section to the desired length. See section „Using the three-part multi-purpose ladder as a leaning ladder“.

Swing out the middle ladder section **2**:

▶ Release the lock **1**. Slightly lift up the middle ladder section **2** at the same time.
▶ Until the contact point **5** of the bottom ladder section slides along the guide fitting **4** on both sides into the storage position: Spread out the legs.
▶ Make sure that the belt straps of the ladder locks **6** are tensioned.

Result:
– The ladder can now be used.

Bring the ladder into the transport position:

▶ Fold the middle and bottom ladder sections together.
▶ Push the upper ladder section together again.

Result:
– The ladder is now in the transport position. The ladder can be stored.

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6.8 Extension ladder

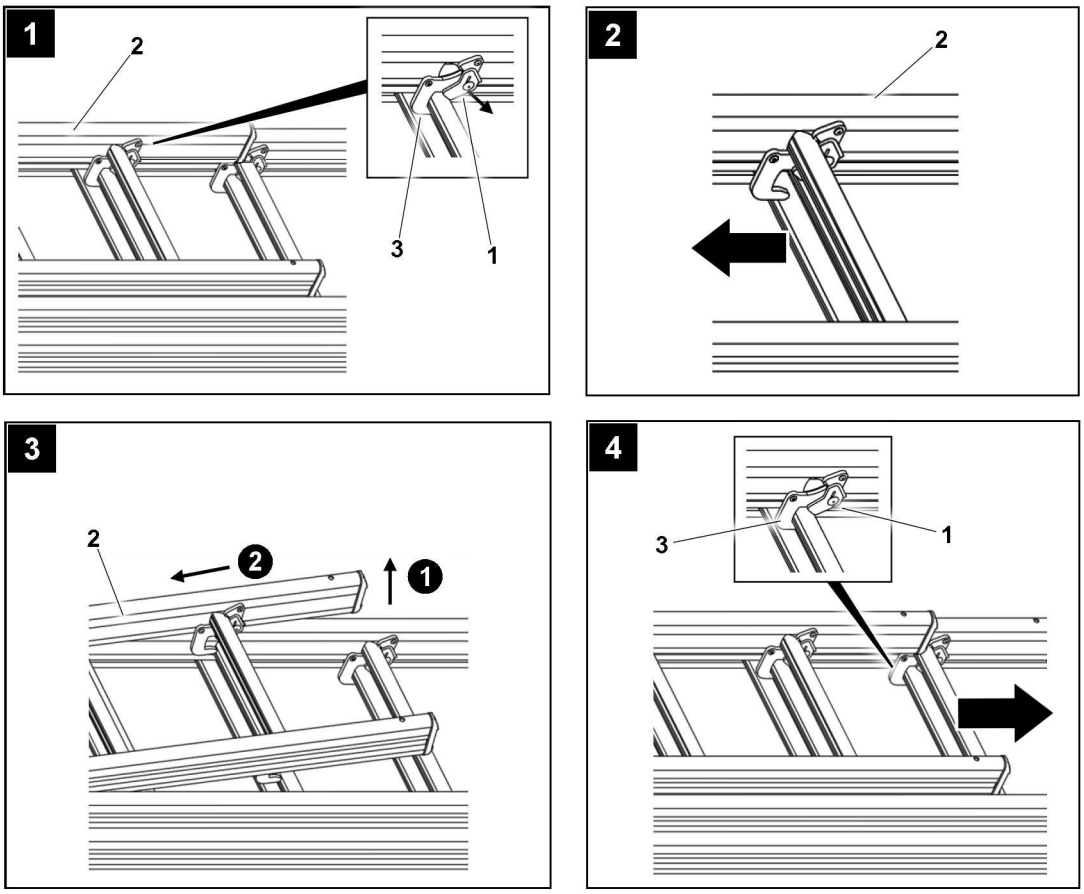

Fig.149569: Pushing out the ladder

Only pull out or push in the ladder when it is laid down.

Push out the upper ladder section:

- ▶ Release the lock **1** on the securing hook **3** on the upper ladder section **2**.
- ▶ Move the upper ladder section **2** slightly at the same time.
- ▶ Now swing the ladder section **2** outward and push it out to the desired length.
- ▶ Refit the securing hooks **3**.
- ▶ Make sure that the lock **1** re-engages.

Push out the middle ladder section:

- ▶ Pull out and lock the middle ladder section in the same manner.
- ▶ Make sure that the lock **1** engages.

Result:
– The ladder can now be used.

Push the extension ladder together:

- ▶ Push together and lock the middle ladder section.
- ▶ Subsequently push together and lock the upper ladder section.
- ▶ Make sure that the lock **1** engages.

Result:
– The ladder is now in the transport position. The ladder can be stored.

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7 Ladder access

Wearing the personal protection equipment to prevent falling and the ladder safeguard depend on the type of work, among others.

7.1 Ladder safeguards

The ladder can be secured to prevent it from sliding away to the side by:
- Restraint device, for example: Tether or side stops on component
- Friction lock, for example: Rubber caps or plastic caps on the end of the ladder beam at direct placement on a surface

The ladder can be secured to prevent it from tipping to the rear by:
- The correct placement angle

7.2 3-point support

A 3-point support is ensured when:
- Two hands have a safe hold and one leg is standing safely.
- Two legs are standing safely and one hand has a safe hold.
- Two legs are standing safely in straddle position on a stepladder which can be accessed from both sides, on the third respective rungs / steps from the top. The user locks the ladder with the knees.
- Two legs are standing safely and at the same time, the body is leaned on higher rungs / steps of the leaning (extension) ladder. The center of gravity of the body must always be between the two ladder beams.
- A WORK POSITIONING SYSTEM (WPS) is used.

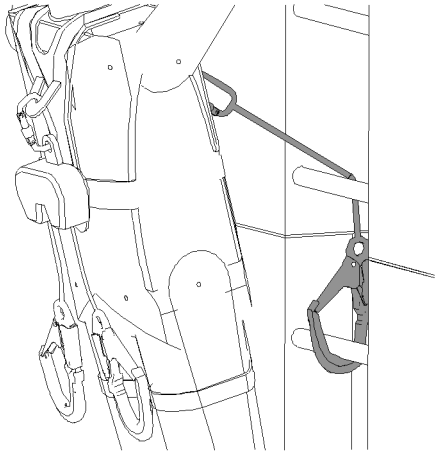

Fig.126746: Example of how to use the WPS

7.3 Light and / or heavy work

The following lists various light and heavy work

Examples for light work:
- Installing / removing retaining pins or spring retainers
- Fastening components, disengaging fastening equipment
- Pushing the transition aid out / in
- Establishing / disconnecting electrical or hydraulic connection between components
- Actuating the hand pump for the folding jib
- Reeving the auxiliary winch in / out
- Setting up / taking down foldable railings
- Carrying out maintenance and inspection work
- Refueling the crane chassis and / or crane superstructure

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Examples for heavy work:
- Knocking the connector pins in / out
- Installing / removing the wind warning
- Reeving the hoist rope in / out
- Installing / removing the connector pin with assembly aid (hydraulic cylinder or mechanical assembly tool)
- Installing / removing the rope lock

7.4 Removing the end section on the conical leaning ladder

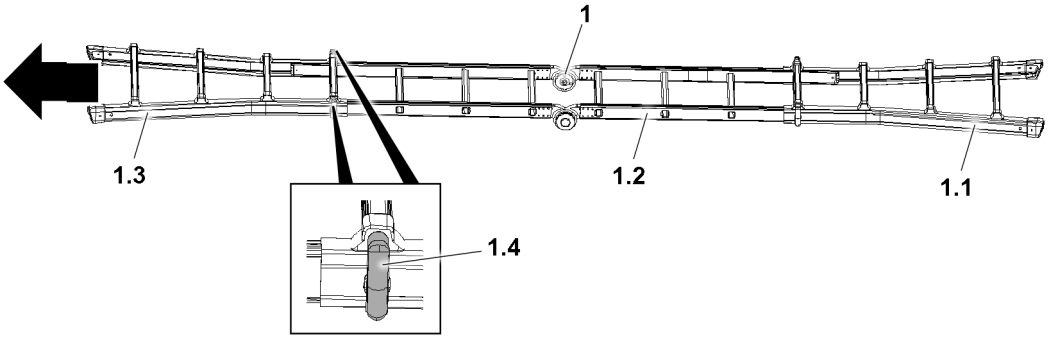

*Fig.126873: Leaning ladder **1***

The leaning ladder **1** consists of the following components:
- **1.1** Base
- **1.2** Center section
- **1.3** End section
- **1.4** Locks

When the end section **1.3** is wider than the leaning tube on the telescopic boom or the intended placement surface, the leaning ladder **1** cannot be placed fully expanded. In order to position the leaning ladder **1** fully expanded, the end section **1.3** must be disassembled and removed.

CAUTION
Fingers in the spring range of the lock **1.4**!
Finger crushing when locking and unlocking.
▶ Grip the lock **1.4** outside of the spring range.

▶ Release the locks **1.4** on the left and right.
▶ Slide the end section **1.3** out of the center section **1.2** and remove it.

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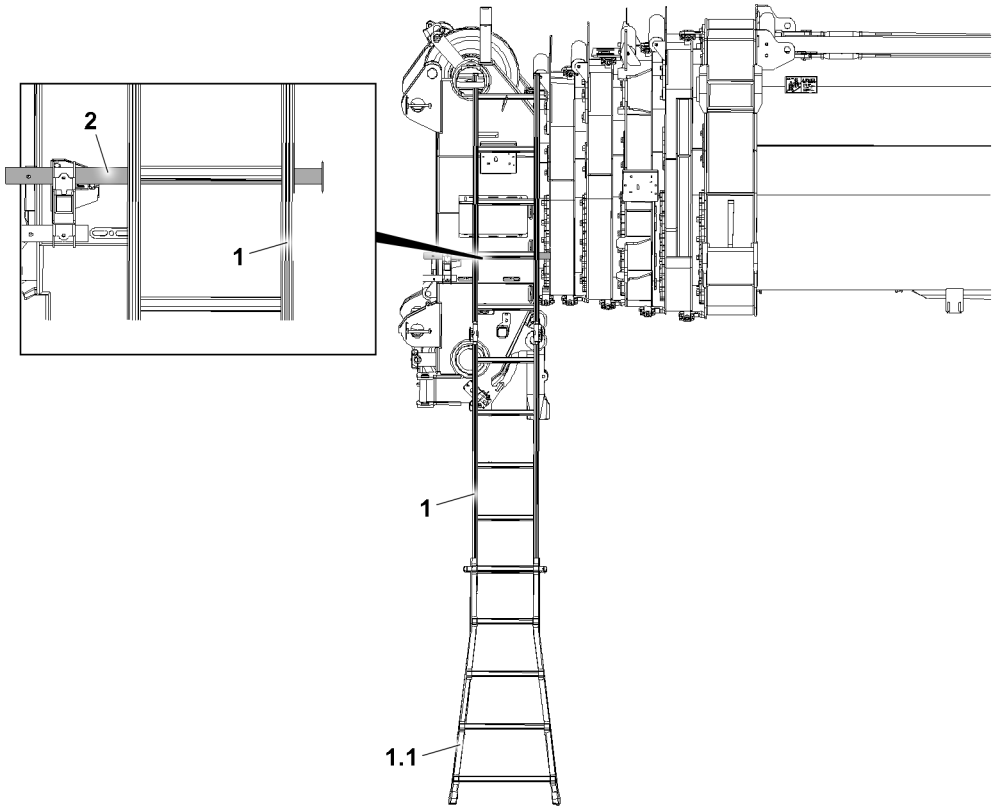

*Fig.126874: Leaning ladder **1** placed on the leaning tube **2***

When placing the leaning ladder **1**, the base **1.1** must be placed on the ground.

▶ Place the leaning ladder **1** on the leaning tube **2** or the intended placement surface.

WARNING
The leaning ladder **1** is wider than the leaning tube **2** or the intended placement surface!
Assembly personnel can fall when stepping on the leaning ladder **1** and be severely injured.
▶ When stepping on the leaning ladder **1** make sure that the leaning ladder **1 is not** wider than the leaning tube **2** or the intended placement surface.

▶ Climb on the leaning ladder **1**. Carry out the assembly work.

Before leaving the jobsite, the end section **1.3** must be reinstalled.

▶ Before leaving the jobsite: Install the end section **1.3**.
▶ Secure the leaning ladder **1** in transport position.

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7.5 Types of ladders

7.5.1 Stepladder

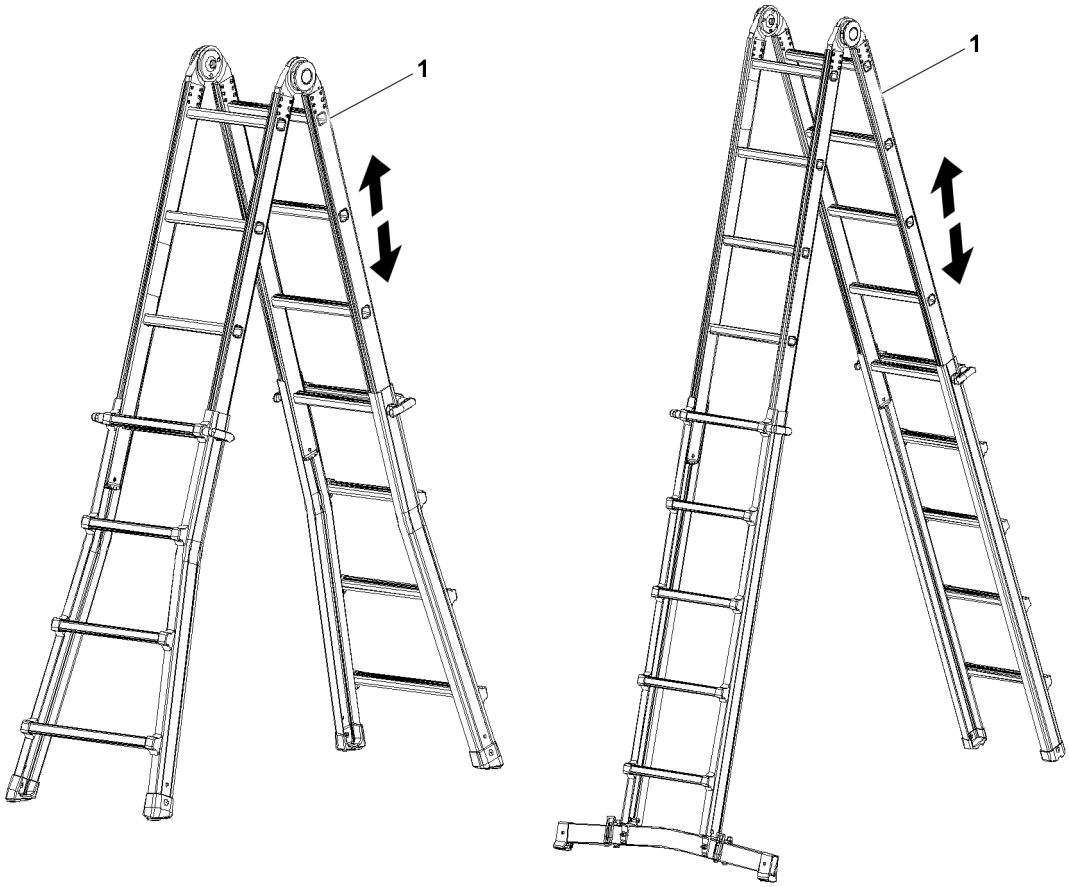

Fig.149996: Example of stepladders

WARNING
Transitioning from a stepladder **1** to other components!
Personnel can fall, death, severe bodily injuries.
▶ Do **not** transition from a stepladder **1** to other components.

WARNING
3-point support not adhered to!
Personnel can fall, death, severe bodily injuries.
▶ When using stepladders **1**, adhere to the 3-point support.
▶ Adhere to the prerequisites and conditions for the use of stepladders **1**.

Prerequisites for the use of stepladders **1**:
– Make sure that the weight of the tool carried along does not weigh more than 10 kg.

Access	Work
Maximum rise to the third rung / step from the top	Maximum rise to the third rung / step from the top
3-point support required	3-point support required
	Rise to 1 m: Personal protective equipment to prevent falling not required

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Access	Work
	Rise above 1 m to 7 m **Light work**: Personal protective equipment to prevent falling not required
	Rise above 1 m to 7 m **Heavy work**: Personal protective equipment to prevent falling required

*Conditions for access and work on stepladders **1***

7.5.2 Leaning ladder

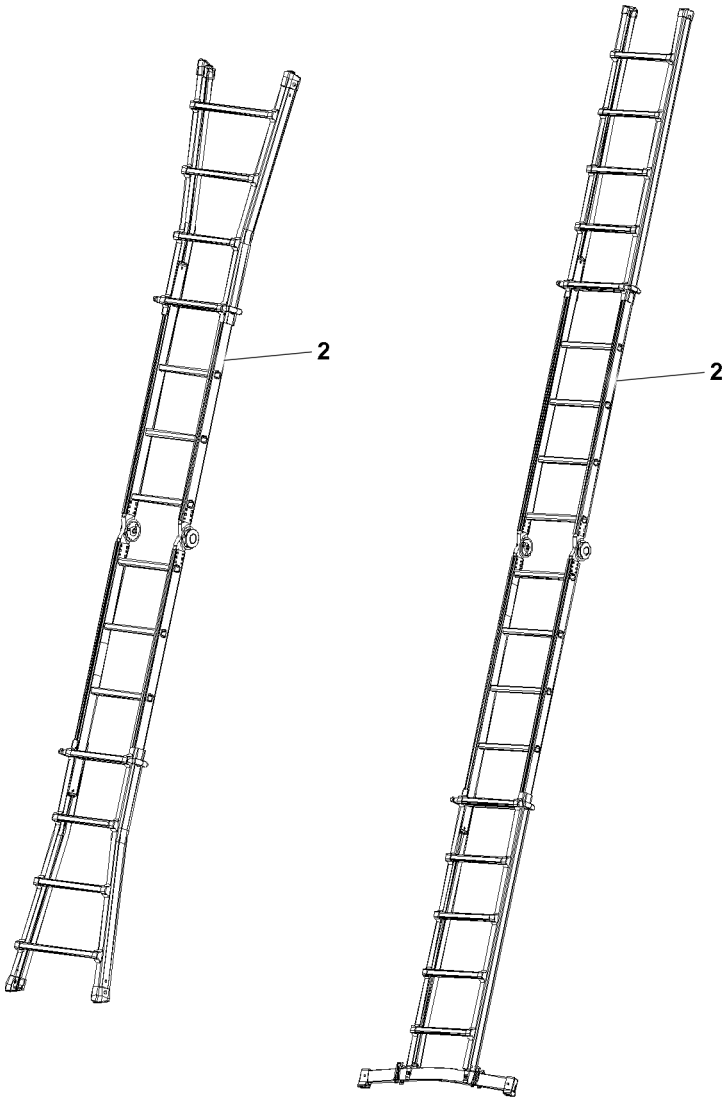

Fig.149997: Example of leaning ladders

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WARNING
3-point support not adhered to!
Personnel can fall, death, severe bodily injuries.
▶ When using leaning ladders **2**, adhere to the 3-point support.
▶ Adhere to the prerequisites and conditions for the use of leaning (extension) ladders **2**.

Prerequisites for the use of leaning (extension) ladders **2**:
– Make sure that the leaning ladder **2** is positioned onto a level placement surface.
– Make sure that the leaning ladder **2** is placed in an incline angle of 65° to 75° (approx. 1:4) to the horizontal.
– Make sure that the ladder overhang when leaning it on components is selected in such a way that the leaning ladder **2** is safely placed when subjected to a load / flex due to ascending persons.
– Make sure that the weight of the tool carried along does not weigh more than 10 kg.

Access	Work
Maximum rise to the fourth rung / step from the top, in reference to the placement point	Maximum rise to the fourth rung / step from the top, in reference to the placement point
3-point support required	3-point support required
	Rise to 1 m: Ladder safeguard not required Personal protective equipment to prevent falling not required
	Rise above 1 m to 7 m **Light work**: Ladder safeguard required Personal protective equipment to prevent falling not required
	Rise above 1 m to 7 m **Heavy work**: Ladder safeguard and protection to prevent it from tipping to the rear required Personal protective equipment to prevent falling required

*Conditions for access and work on leaning (extension) ladders **2***

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7.5.3 Leaning ladder with transition

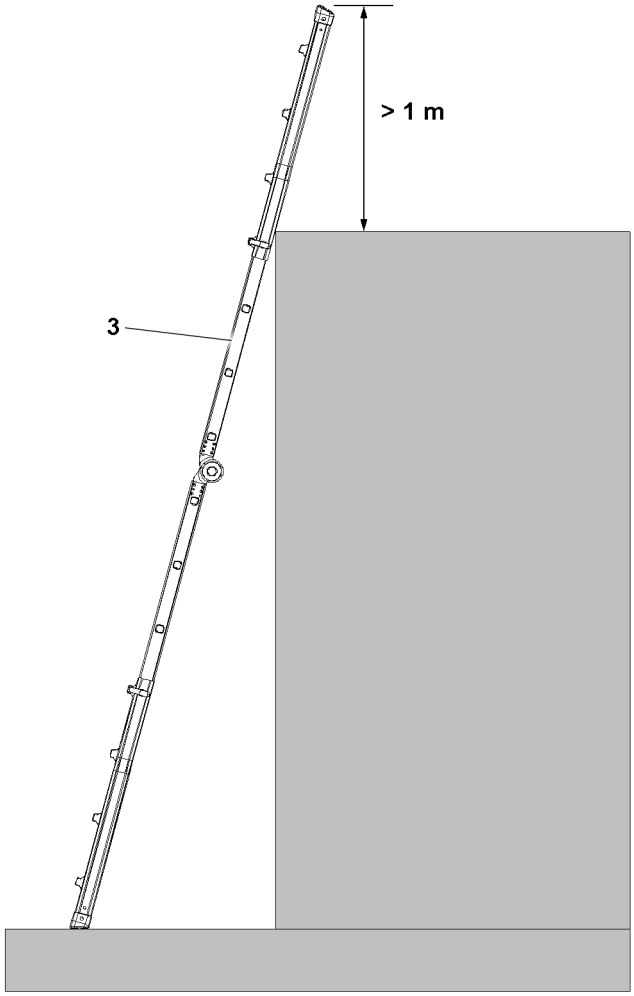

Fig.151626: Examples for leaning ladders with ladder overhang above the exit level

The leaning ladder can be used for transitioning.

WARNING
3-point support not adhered to!
Personnel can fall, death, severe bodily injuries.
▶ When transitioning, adhere to the 3-point support.
▶ Adhere to the prerequisites and conditions for the use of leaning ladders as a transition **3**.

Prerequisites for the use of leaning ladders as a transition **3**:
– Make sure that the leaning ladder **3** is positioned onto a level placement surface.
– Make sure that the leaning ladder **3** is placed in an incline angle of 65° to 75° (approx. 1:4) to the horizontal.
– Make sure, for transitioning to higher work locations, when no other safehold possibilities are available, that the ladders beams of the leaning ladder go past the placement location by at least 1 m.
– Make sure that the transition area is slip-resistant.
– Make sure that the ladder position can be recognized from above.
– Make sure that the contact point of the ladder on the component is selected such that it will not be deformed or swing away due to the load of the person climbing up the ladder.
– Make sure that the weight of the tool carried along does not weigh more than 10 kg.

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Access	Transition
Maximum rise to a rung / step below the placement edge	Maximum rise to a rung / step below the placement edge
3-point support required	3-point support required
Personal protective equipment to prevent falling not required	Personal protective equipment to prevent falling not required
	Rise to 1 m: Ladder safeguard not required
	Rise above 1 m to 7 m: Ladder safeguard required

*Conditions for access and transition to leaning (extension) ladders with transition **3***

7.5.4 Vertical ladder with transition aid

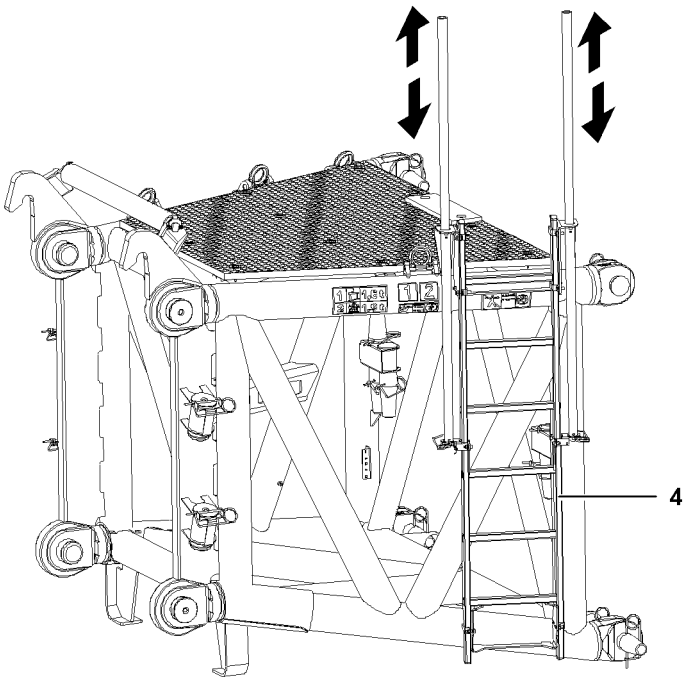

Fig.121178: Example for vertical ladder with transition aid

WARNING
Persons not secured!
Personnel can fall, death, severe injuries.

When using vertical ladders with transition aid **4**:
▶ Adhere to the 3-point support.

Before transitioning:
▶ Hook the personal protective equipment to prevent falling on a suitable location (for example: uppermost rung, safety rope or separate hook point).
▶ Adhere to the prerequisites and conditions for the use of vertical ladders with transition aid **4**.

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Prerequisites for the use of vertical ladders with transition aid **4**:
- Make sure, a centered grip reachable from the transition edge and a possibility to support oneself with the second hand is present for transitioning.
- Make sure that the transition area is slip-resistant.
- Make sure that the ladder position can be recognized from above.
- Make sure that the weight of the tool carried along does not weigh more than 10 kg.

Access	Work
3-point support required	3-point support required
If necessary: Use a WORK POSITIONING SYSTEM (WPS) at a suitable hook point	If necessary: Use a WORK POSITIONING SYSTEM (WPS) at a suitable hook point

*Conditions for access and work on vertical ladders with transition aid **4***

Ascent	Transition
3-point support required	3-point support required
Rise to 5 m: Personal protective equipment to prevent falling not required	Rise to 1.8 m: Without transition aid: Personal protective equipment to prevent falling not required
Rise above 5 m: Fall arrest system with moving along fall arrest device or back protection required	Rise above 1.8 m: Without transition aid: Personal protective equipment to prevent falling required

*Conditions for ascent and transition to vertical ladders with / without transition aid **4***

7.5.5 Platform ladder

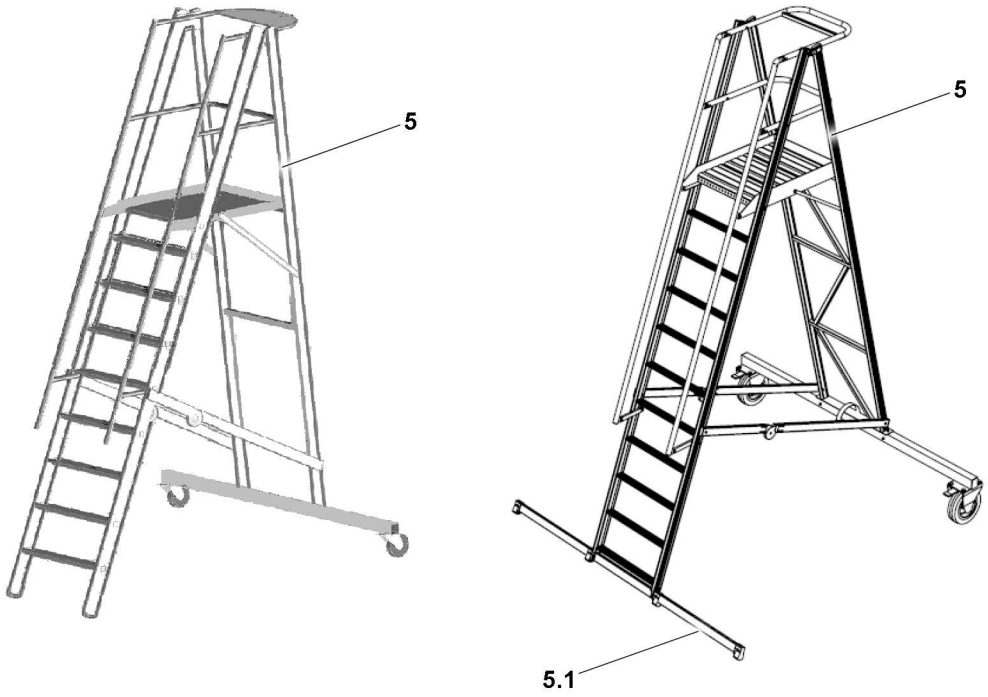

Fig.149995: Example of platform ladders

A platform ladder **5** with a cross beam **5.1** offers more stability. It is recommended to use a platform ladder with a cross beam.

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WARNING
Transitioning from a platform ladder **5** to other components!
Personnel can fall, death, severe bodily injuries.
▶ Do **not** transition from a platform ladder **5** to other components.

WARNING
3-point support not adhered to!
Personnel can fall, death, severe bodily injuries.

When using platform ladders **5**:
▶ Adhere to the 3-point support.
▶ Adhere to the prerequisite and conditions for the use of platform ladders **5**.

Prerequisite for the use of platform ladders **5**:
– Make sure that the weight of the tool carried along does not weigh more than 10 kg.

Access	Working on the ladder	Working on the platform
Maximum rise to platform height	Maximum rise to platform height	Maximum height: Platform height
3-point support required	3-point support required	
	Rise to 1 m: Personal protective equipment to prevent falling not required	
	Rise above 1 m to 7 m **Light work**: Personal protective equipment to prevent falling not required	Platform height **Light work**: Personal protective equipment to prevent falling not required
	Rise above 1 m to 7 m **Heavy work**: Personal protective equipment to prevent falling required	Platform height **Heavy work**: Personal protective equipment to prevent falling required

*Conditions for access and work on platform ladders **5***

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2.05 Signs on the crane

1 Signs 2

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1 Signs

1.1 7725039 – Warning of high voltage

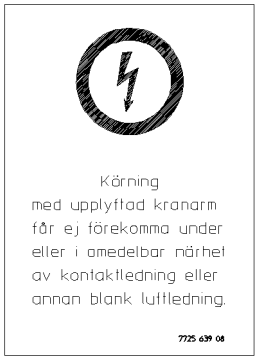

Fig.116269: Warning of high voltage

Note
▶ Only for certain countries.

1.2 772564008 – Slewing range

Fig.116270: Slewing range

Note
▶ Only for certain countries.

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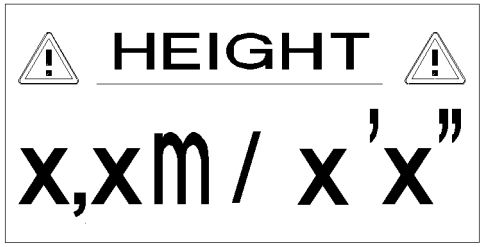
1.3 772580408 – Limitation of maximum travel speed

Fig.106035: Limitation of maximum travel speed

1.4 Vehicle height

	Vehicle height
970610408	
970629508	
970596108	
970608708	
979459108	

Vehicle height

Note
▶ Vehicle height x.x m (x.x ft)

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1.5 Note for assembly aid

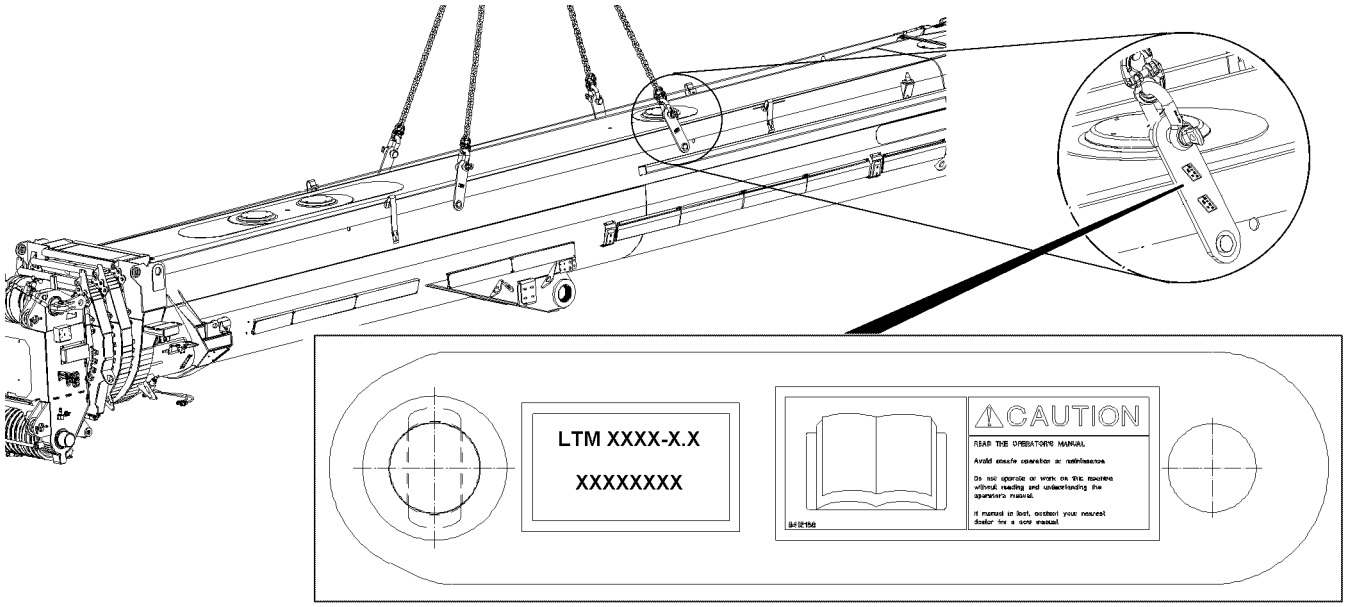

Fig.122741

Id. No.	Mobile crane
966713608	LTM 1750–9.1 LTM 1450-8.1
968483508	LTM 1500-8.1
962961708	LTM 11200-9.1, LTM 1400-7.1, LTM 1350-6.1, LTM 1300-6.2,
	LTM 1250-6.1, LTM 1250-5.1, LTM 1220-5.2, LTM 1200-5.1,
	LTM 1160-5.2, LTM 1160-5.1, LTM 1130-5.1, LTM 1100-4.2,
	LTM 1095-5.1, LTM 1090-4.1,
	LTR 11200, LTR 1220, LTR 1100

Note for assembly aid

WARNING
Incorrect assembly aids!
Falling telescopic boom, death, property damage.

To assemble and disassemble the telescopic boom:
▶ Use solely the assembly aids that belong to the crane.

1.6 9412158 – Reading the operating instructions

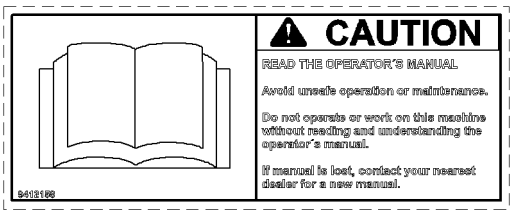

Fig.106048: Reading the operating instructions

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WARNING
Danger of accident due to non-observance of operating instructions!
If the operating instructions are not read or understood, then this can lead to unsafe operation and improper maintenance.
Accidents with bodily injuries and property damage can result.
- ▶ The crane may only be operated if the contents of the operating instructions have been read and understood.
- ▶ Replace lost or incomplete operating instructions immediately.

1.7 97004046 – Safety harness, maximum two persons

Fig.115119: Safety harness, maximum two persons

DANGER
Danger of accidents due to overloaded safety ropes!
If safety ropes are used by more than two persons, then the safety ropes can be overloaded and fail in case of an accident.
Personnel can be severely injured or killed.
- ▶ Safety ropes are designed to secure a maximum of two persons against falling, one on the right and one on the left.

1.8 97017585 – Falling telescopic boom during disassembly / assembly

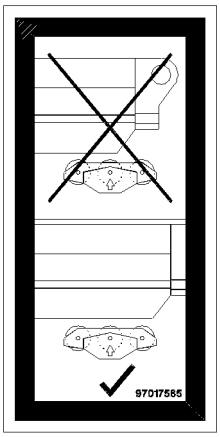

Fig.118467: Falling telescopic boom during disassembly / assembly

WARNING
Fatal accidents due to falling telescopic boom!
- ▶ Make sure that all pulleys are touching and carrying during the assembly and disassembly of the telescopic boom.

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1.9 97018351 – Falling telescopic boom during transport!

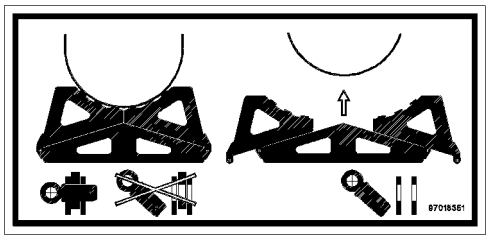

Fig.118466: Falling telescopic boom during transport

WARNING
Fatal accidents due to falling telescopic boom during transport!
▶ Pin and secure the transport bracket on the left and right.

1.10 97018564 – Falling telescopic boom during transport!

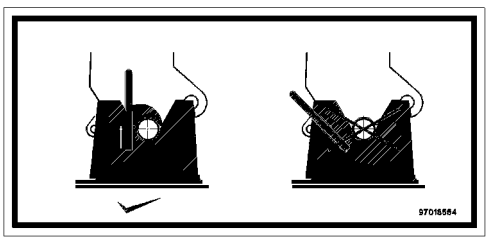

Fig.118533: Falling telescopic boom during transport

WARNING
Fatal accidents due to falling telescopic boom during transport!
▶ Lock the telescopic boom in the head receptacle.

1.11 97027147 – Overloading of the combi box is prohibited

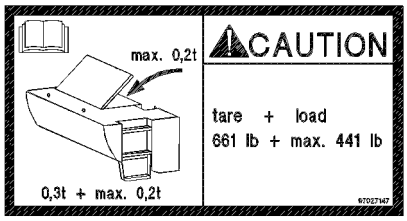

Fig.113829: Overloading of the combi box is prohibited

WARNING
Danger of overload!
If the combi box is subjected to a load of more than 0.2 t , the combi box can be damaged!
▶ The own weight of the combi box is 0.3 t and may be loaded with a maximum payload of 0.2 t.
▶ Do not subject the combi box to a weight of more than 0.2 t.

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1.12 97036733 – Fastening point

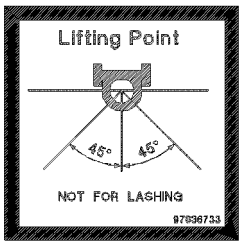
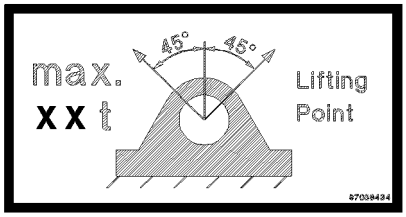


Fig.121184: Fastening point

WARNING
Damage to the fastening points!
- ▶ Use the fastening point solely to lift the load.
- ▶ Observe the maximum permissible fastening angle.

Note
- ▶ Fastening points and fastening angle.

1.13 Suspended load fastening point

	Suspended load fastening point
97038434	 *Fastening point*
97037482	
97039068	

WARNING
Mortal danger if the load falls down!
If the maximum suspended load or the maximum fastening angle is exceeded, the load can fall down and kill personnel.
- ▶ Observe the maximum permissible suspended load and fastening angle.

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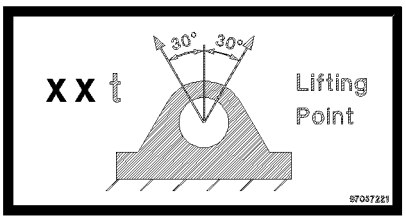
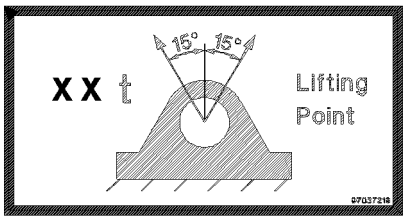
1.14 Suspended load fastening point

	Suspended load fastening point
97037221	 *Fastening point*
97037223	

WARNING
Mortal danger if the load falls down!
If the maximum suspended load or the maximum fastening angle is exceeded, the load can fall down and kill personnel.
▶ Observe the maximum permissible suspended load and fastening angle.

1.15 Suspended load fastening point

	Suspended load fastening point
97037219	 *Fastening point*

WARNING
Mortal danger if the load falls down!
If the maximum suspended load or the maximum fastening angle is exceeded, the load can fall down and kill personnel.
▶ Observe the maximum permissible suspended load and fastening angle.

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1.16 97037625 – Suspended load Fastening points / rigging points

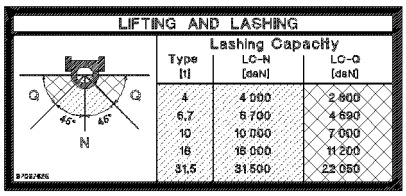

Fig.119988: Fastening points / rigging points

Note
▶ Fastening points and rigging points.

1.17 9402377 – Fastening point / lifting point

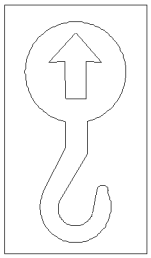

Fig.127586: Fastening point / lifting point

Note
▶ Fastening point / lifting point.

1.18 97106824 – Installing the N-assembly unit

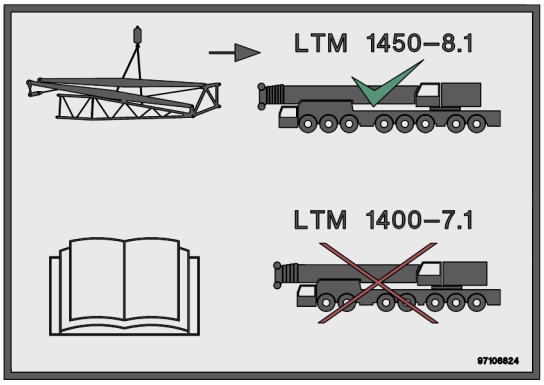

Fig.147594: Installing the N-assembly unit

WARNING
N-assembly unit installed on an impermissible crane type!
Death, severe bodily injuries, property damage.
▶ Use N-assembly units marked with this sign only for crane type LTM 1450-8.1.
▶ Observe and adhere to the operating instructions.

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1.19 97096132 – Fastening points for N-assembly unit

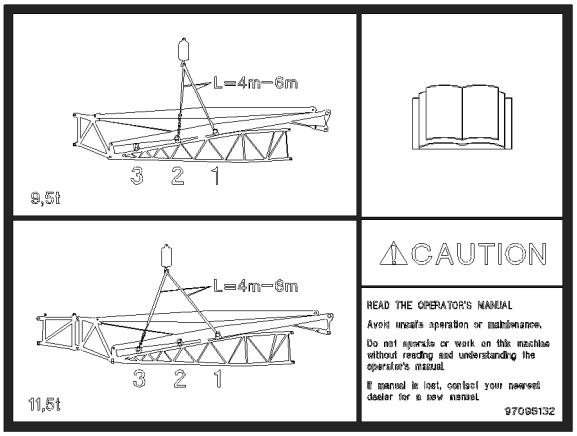

Fig.144774: Fastening points for N-assembly unit

WARNING
Incorrectly selected fastening points!
The N-assembly unit can tip over and kill personnel.
- ▶ Fasten the N-assembly unit only on the intended fastening points.
- ▶ Use fastening equipment with the correct strand length.
- ▶ Observe and adhere to the operating instructions.
- ▶ Replace lost or incomplete operating instructions immediately.

1.20 97036735 – Fastening point for lattice section

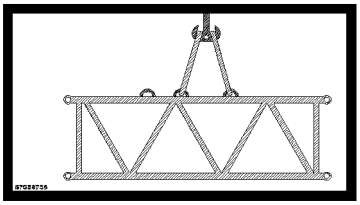

Fig.116266: Fastening point for lattice section

Note
- ▶ Fastening points for lattice section.

1.21 97036736 – Fastening point for lattice sections

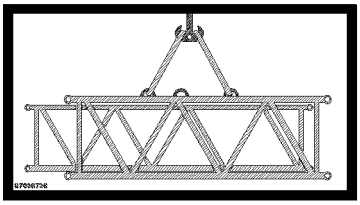

Fig.116267: Fastening point for lattice sections

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Note
▶ Fastening points for lattice sections.

1.22 97038442 – Fastening point for lattice section

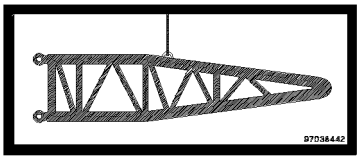

Fig.116288: Fastening point for lattice sections

Note
▶ Fastening point for lattice section.

1.23 97038452 – Fastening point for lattice sections

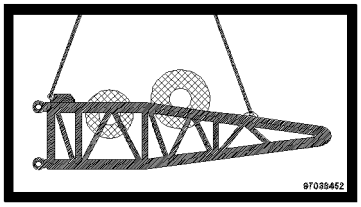

Fig.116289: Fastening point for lattice sections

Note
▶ Fastening points for lattice sections.

1.24 97038454 – Fastening point for lattice sections

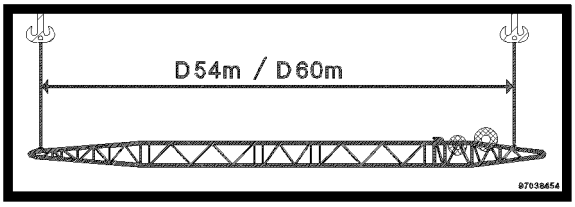

Fig.116290: Fastening point for lattice sections

Note
▶ Fastening points for lattice sections.

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1.25 97037871 – Fastening points for lattice sections

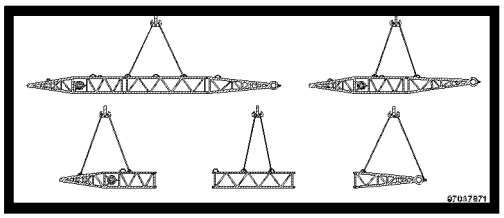

Fig.116292: Fastening points for lattice sections

Note
▶ Fastening points for lattice sections.

1.26 97057767 – Fastening points for lattice sections

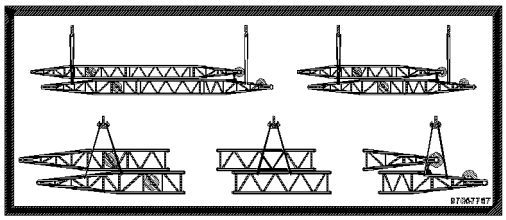

Fig.121181: Fastening points for lattice sections

Note
▶ Fastening points for lattice sections.

1.27 97057524 – Fastening point for assembly of lattice sections

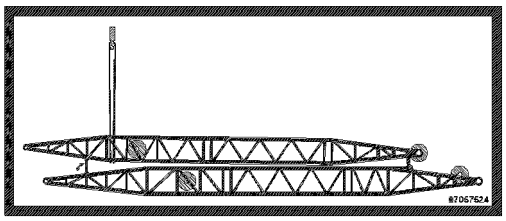

Fig.121182: Fastening point for assembly of lattice sections

Note
▶ Fastening point for assembly of lattice sections.

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1.28 97057097 – Fastening point to turn the component

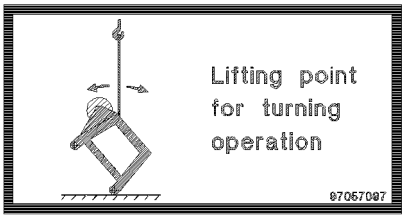

Fig.119987: Fastening point to turn the component

Note
▶ Fastening point to turn the component.

1.29 97039035 – Suspended load Assembly unit

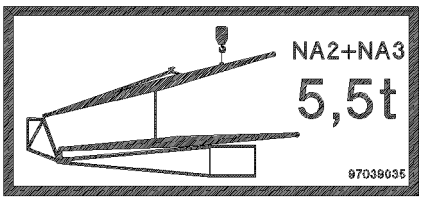

Fig.117348: Suspended load Assembly unit

Note
▶ Notice the suspended load.

1.30 97059339 – Suspended load Derrick pivot section

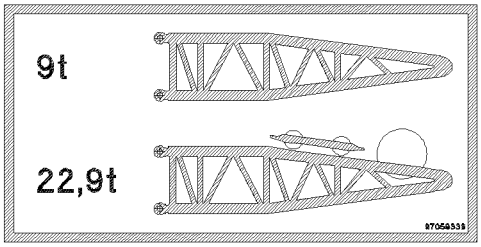

Fig.127469: Suspended load Derrick pivot section

Note
▶ Suspended load Derrick pivot section.
▶ Suspended load Derrick pivot section with rope winch and luffing pulley block.

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1.31 Fastening point for end section

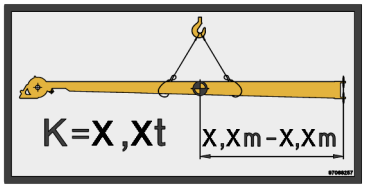

Fig.147595: Fastening point for end section

K = Weight in tons (t)

X.X to X.X = Distance of center of gravity in meters (m)

WARNING
End section improperly fastened!
The end section can tip over and fall down.
Death, severe bodily injuries, property damage.
- ▶ Fasten the end section only with two hooks.
- ▶ Select the fastening point such that the center of gravity is located within the fastening points.

1.32 97095312 – Suspended load and fastening points for counterweight frame

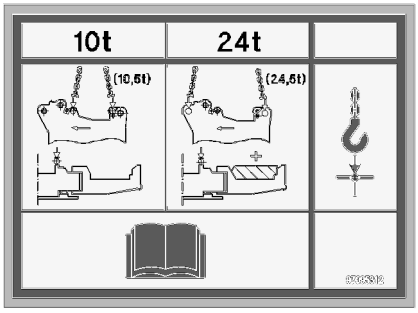

Fig.148126: Suspended load and fastening points for counterweight frame

Note
- ▶ Observe the suspended load and fastening points for counterweight frame.
- ▶ Observe and adhere to the operating instructions.

1.33 97003109 – Accessing the step ladder

Fig.109032: Accessing the step ladder

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WARNING
Danger of falling!
If the step ladder is accessed before it is completely folded out, the assembly personnel can fall and be fatally injured.
▶ Before accessing the step ladder, fold the lowest step out.

1.34 97003110 – Folding the step ladder in and out

Fig.109033: Folding the step ladder in and out

WARNING
Danger of falling!
When folding the step ladder in or out or when driving the crane, no persons may remain on the step ladder or within the entire danger zone! Persons can fall from the step ladder or be killed as the step ladder folds in or out.
▶ Fold the step ladder in and out only if there are no persons within the danger zone.

1.35 97006167 – Identifying the support base

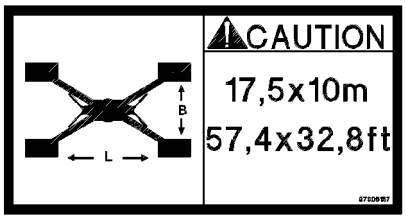

Fig.116285: Identifying the support base

Note
▶ The support beams are swung out / extended to a support base of 17.50 m x 10.0 m ; (57.4 ft x 32.8 ft).

1.36 97006167 – Identifying the support base

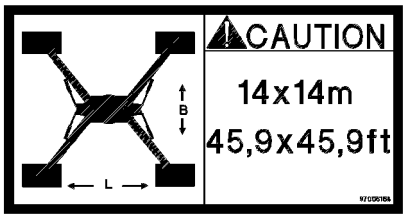

Fig.116286: Identifying the support base

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Note
▶ The support beams are swung out / extended to a support base of 14.0 m x 14.0 m ; (45.9 ft x 45.9 ft).

1.37 97008514 – Warning of head injuries

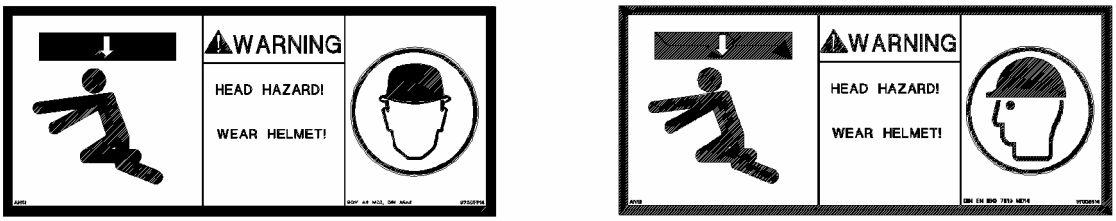

Fig.110550: Warning of head injuries

WARNING
Head injuries!
Due to falling parts, personnel can be killed or severely injured.
Hitting the head can cause injuries.
▶ Protect your head with a hard hat.
▶ Proceed in an aware and safe manner.

1.38 97009799 – Data logger

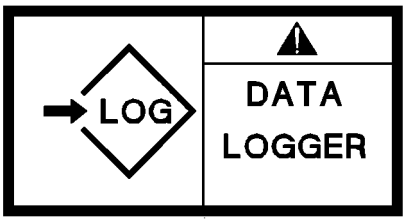

Fig.116261: Data logger

Note
▶ Data logger.

1.39 97012949 – Maximum load

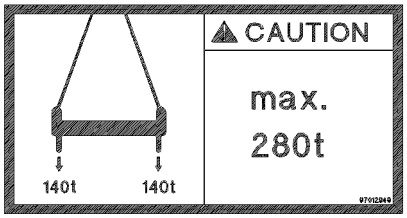

Fig.116263: Maximum load

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CAUTION
Property damage due to overload!
If the cross beam is subjected to a higher load than permissible, damage can occur.
▶ Do not overload the cross beam.

1.40 97012095 – Maximum load

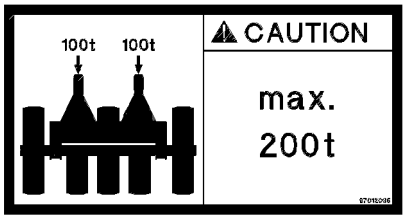

Fig.116265: Maximum load

CAUTION
Property damage due to overload!
If the roller cart is subjected to a higher load than permissible, damage can occur.
▶ Do not overload the roller cart.

1.41 97069053 – Storage boxes open

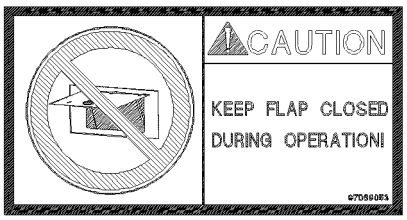

Fig.144736: Storage boxes open

NOTICE
Storage boxes open!
Damage of storage boxes.
▶ Before crane operation and before driving the crane, close the storage boxes.

1.42 97068370 – Closing the cab door

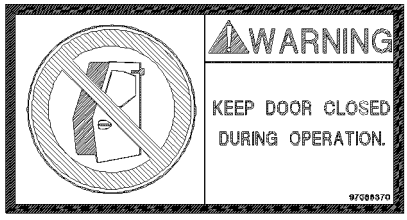

Fig.144737: Closing the cab door

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WARNING
Cab door during crane operation **not** closed!
The crane operator can fall down.
Death, severe bodily injuries.
▶ Close the cab door during crane operation.

1.43 97053409 – Entanglement hazard during winch operation

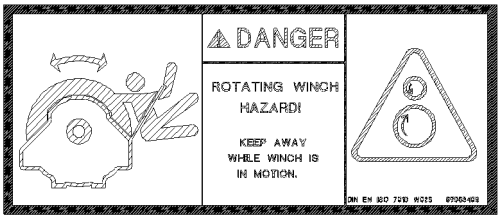

Fig.144738: Entanglement hazard during winch operation

DANGER
Entanglement hazard during winch operation!
Body parts can be caught and entangled.
Death, severe bodily injuries, property damage.
▶ Do **not** stand in the hazard area of the winch.

1.44 97011689 – Danger of crushing

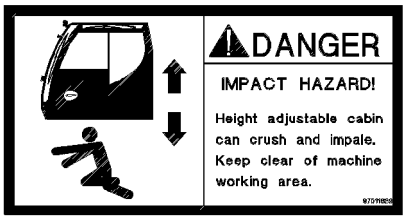

Fig.111047: Danger of crushing

DANGER
Danger of fatal injury!
▶ It is prohibited to remain within the danger zone of the cab.
▶ Stay away from the movement range of the cab.

1.45 97011690 – Overload of cab is prohibited

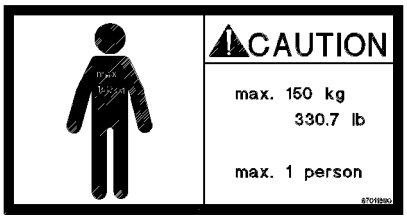

Fig.111048: Overload of cab is prohibited

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WARNING
Danger of overload!
If the cab is subjected to a load of more than 150 kg then the cab or the telescoping arm can be damaged!
- ▶ Only one person at a time may remain in the cab!
- ▶ Do not subject the cab to a weight of more than 150 kg.

1.46 97016304 – Refueling

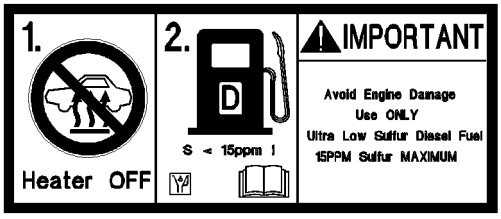

Fig.113766: Refueling

WARNING
Danger of fire and explosion!
- ▶ Turn the auxiliary heater* off approx. 3 min before refueling the fuel tank.
- ▶ Before refueling the fuel tank, turn the engine off.

NOTICE
Property damage to the engine!
If incorrect fuel is added, the engine can be severely damaged.
- ▶ Refuel with fuel according to the Engine manufacturer's operating instructions.

1.47 97046488 – Corrosion inhibitor - antifreeze fluids

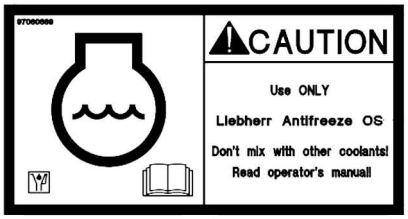

Fig.127585: Corrosion inhibitor - antifreeze fluids

NOTICE
Mixing of different corrosion inhibitor-antifreeze agents!
Damage to the cooling system!
- ▶ Fill the cooling system with corrosion inhibitor-antifreeze, see Service fill list.

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1.48 97016392 – Crushing danger for feet

Fig.112474: Crushing danger for feet

WARNING
Crushing danger for feet!
Feet can be trapped or crushed.
▶ Keep feet away from the crushing area.

1.49 97012737 – Danger of accident

Fig.111748: Danger of accident

WARNING
Danger of accident!
▶ Close the windshield when driving.

1.50 97023034 – Disassembling

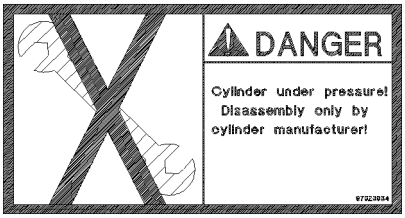

Fig.116264: Disassembling

DANGER
Danger of fatal injury due to repair!
Cylinder is pressurized.
Disassembly of the cylinder can result in death or serious injuries.
▶ The cylinder may only be removed by the manufacturer.

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1.51 97036732 – Access via 3-point support

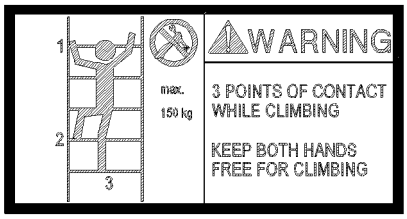


Fig.115172: Access via 3-point support

DANGER
Access via 3-point support!
While climbing up and down via a ladder, assembly personnel can fall down and be injured severely.
- ▶ When climbing up and down, a 3-point support must be ensured.
- ▶ Use ladders only up to a weight of 150 kg.
- ▶ When climbing up and down, hands must be free.

A 3-point support is ensured when:
- – two legs are standing safely and one hand has a safe hold.
- – two hands have a safe hold and one leg is standing safely.

1.52 97003112 – Maximum suspended load

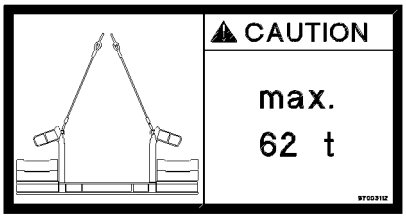
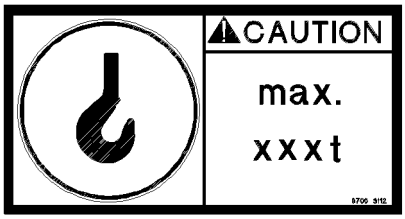


Fig.116282: Maximum suspended load

WARNING
Maximum suspended load!
If the maximum suspended load of 62 t is exceeded, the load can fall down and kill personnel.
- ▶ Observe the maximum permissible suspended load.

1.53 97036917 – Maximum suspended load

	Suspended load fastening point
97047630	
97036917	
97047630	

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WARNING
Mortal danger if the load falls down!
If the maximum suspended load is exceeded, the load can fall down and kill personnel.
▶ Observe the maximum permissible suspended load.

1.54 97037383 – Urea

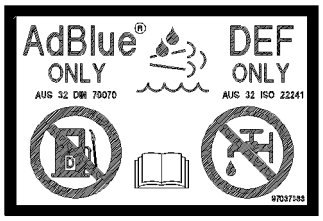

Fig.115173: Urea

CAUTION
Property damage due to incorrect operating fluids!
When refilling urea and the urea which is specified by the engine manufacturer is not used, then damage can occur.
▶ Refill **exclusively** urea.
▶ See engine manufacturer's operating instructions.

1.55 97037952 – Warning of fatal electric shock

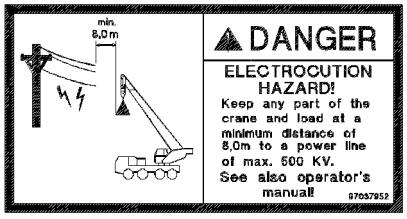

Fig.116280: Warning of fatal electric shock

DANGER
Danger of fatal injury due to electric shock!
If the boom or the hoist rope is under electric voltage, then death or severe injuries can occur if anyone touches the crane, the vehicle or the load.
▶ Keep a minimum distance of 8.0 m from current carrying parts.

1.56 97042730 – Falling luffing cylinder

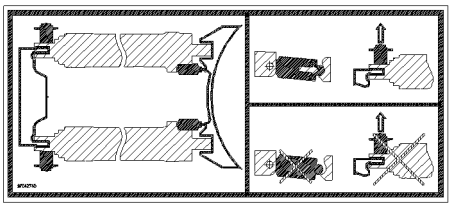

Fig.118465: Falling luffing cylinder

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WARNING
Mortal danger if the luffing cylinders fall down!
▶ Make sure, before unpinning the luffing cylinder, that the erection cylinders are place don both luffing cylinders.

1.57 97047810 – Pinning brackets

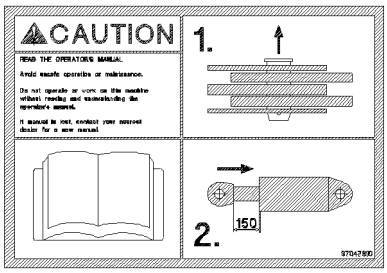

Fig.121709: Pinning brackets

NOTICE
Damage of brackets due to collision!
▶ Make sure, before pinning and unpinning, that the hydraulic cylinder is set to a distance of 150 mm.

1.58 97042797 – Overload of components

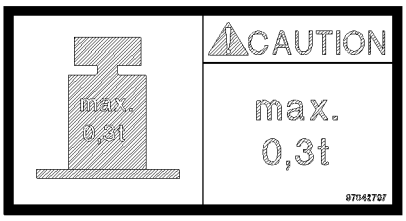

Fig.117347: Overload of components

DANGER
Danger of falling due to overload!
If a component, such as a sliding beam platform, is subjected to a weight of more than 0.3 t , then the sliding beam platform can break.
Personnel can fall down and be severely injured or killed.
▶ Subject the component (sliding beam platform) to no more than maximum 0.3 t.

1.59 97041305 – Overload of components

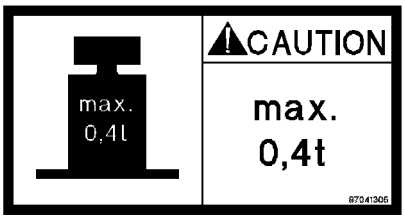

Fig.116792: Warning of overload of components

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DANGER
Danger of falling due to overload!
If a component, such as a sliding beam platform, is subjected to a weight of more than 0.4 t , then the sliding beam platform can break.
Personnel can fall down and be severely injured or killed.
▶ Subject the component (sliding beam platform) to no more than maximum 0.4 t.

1.60 97070905 – Removing the auxiliary jib (boom nose)

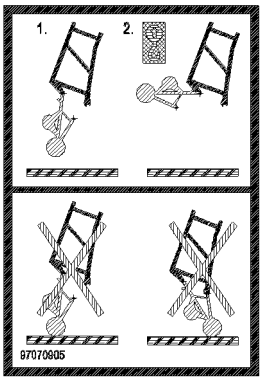

Fig.122645: Removing the auxiliary jib (boom nose)

NOTICE
Property damage

Before taking the N-head down:
▶ Remove the auxiliary jib (boom nose).

1.61 97033982 – Assembling / disassembling the Derrick pivot section

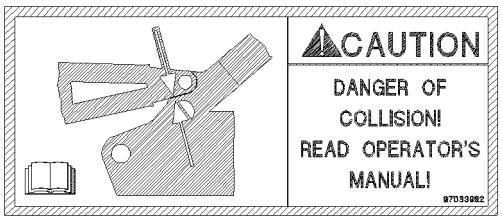

Fig.127470: Assembling / disassembling the Derrick pivot section

NOTICE
Derrick pivot section assembly procedure carried out incorrectly!

Damage to the Derrick pivot section receptacle.
▶ Perform the assembly procedure according to the operating instructions.

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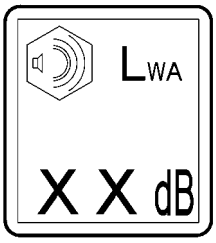
1.62 Maximum sound power level

	Maximum sound power level
975809508	 *Maximum sound power level*
971693308	
971693408	
971693508	
971693608	

Note

▶ The maximum sound power level can be read on the outside of the crane operator's cab or in the CE declaration of conformity.

1.63 97097951 – Counterweight

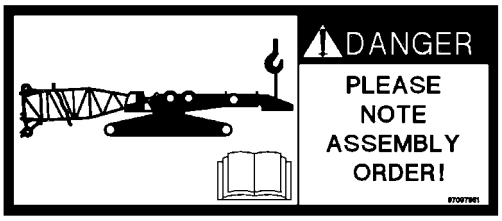


Fig.146805: Counterweight

DANGER

Counterweight not secured!

Falling counterweight death, property damage.

▶ Observe and adhere to the operating instructions.

▶ Do not remove the auxiliary crane until the counterweight is pinned and secured on both sides with the turntable.

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1.64 97107101 – Unlocking the telescopic boom locking pin

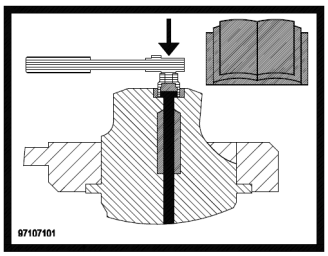

Fig.148421: Unlocking the telescopic boom locking pin

Note
- ▶ The locking pin may be unlocked according to the operating instructions.
- ▶ Observe and adhere to the operating instructions.

1.65 97107199 – Do not unlock the telescopic boom locking pin

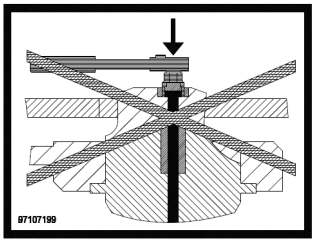

Fig.148422: Do not unlock the telescopic boom locking pin

WARNING
Impermissible telescopic boom locking pin unlocked!
The telescopic boom can retract in an uncontrolled manner.
Death, severe bodily injuries, property damage.

If a locking pin is marked with this sign:
- ▶ **Never** unlock the locking pin.

1.66 977055908 – Fastening point for swingable sliding beam

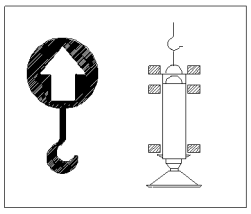

Fig.106894: Fastening point for swingable sliding beam

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1.67 971494208 – Limitation of maximum travel speed

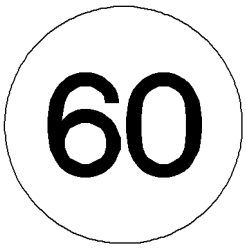

Fig.106034: Limitation of maximum travel speed

1.68 971539808 – Warning notice for unpinning the auxiliary boom on the pulley head

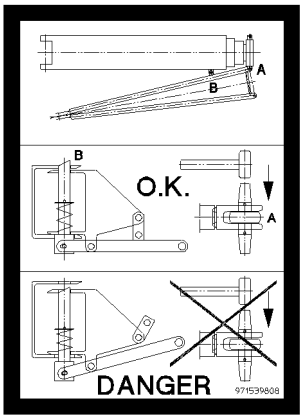

Fig.106040: Warning notice for unpinning the auxiliary boom on the pulley head

DANGER
Danger of fatal injury!
If the auxiliary boom is not locked correctly to the pivot section, it can fall down.
Personnel can be severely injured or killed.
▶ Unpinning the auxiliary boom on the pulley head is prohibited.

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1.69 971539908 – Warning notice for unlocking the auxiliary boom

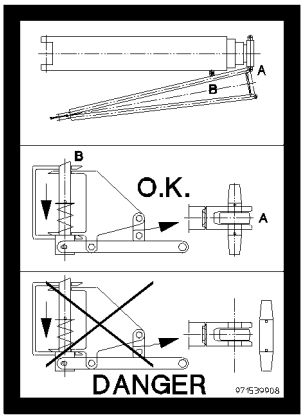

Fig.106041: Warning notice for unlocking the auxiliary boom

DANGER
Danger of fatal injury!
If the auxiliary boom is not locked correctly to the pulley head, it can fall down.
Personnel can be severely injured or killed.
▶ Unpinning the auxiliary boom on the pivot section is prohibited.

1.70 978673908 – Warning of suspended load

Fig.106026: Warning of suspended load

DANGER
Danger of fatal injury under suspended load!
▶ Standing under a suspended load is prohibited.
▶ Stay away from the working range of the machine.

1.71 978674008 – Access for unauthorized personnel prohibited

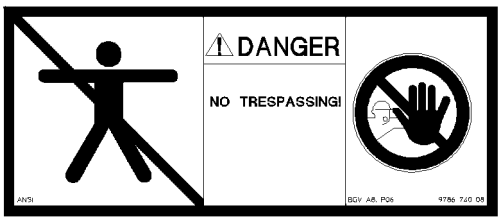

Fig.106037: Access for unauthorized personnel prohibited

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DANGER
Danger of fatal injury!
If the crane or the working area is accessed by unauthorized personnel, life threatening injuries can occur as a result.
▶ It is prohibited for unauthorized personnel to enter the crane or the working area.

1.72 97039753 – Danger of stumbling

Fig.117346: Danger of stumbling

WARNING
Danger of stumbling!
▶ Move with caution.

1.73 978674108 – Warning of crushing danger

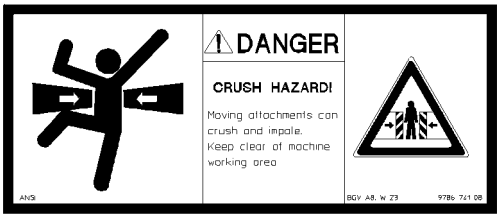

Fig.106027: Danger of crushing

DANGER
Danger of fatal injury when remaining in areas with crushing danger!
▶ It is prohibited for anyone to remain in areas where there is a crushing danger.
▶ Stay away from the working range of the machine.

1.74 97016911 – Danger of collision

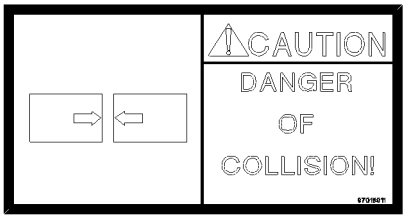

Fig.117344: Danger of collision

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NOTICE
Danger of collision!
▶ Avoid a collision.

1.75 978674308 – Radio remote control

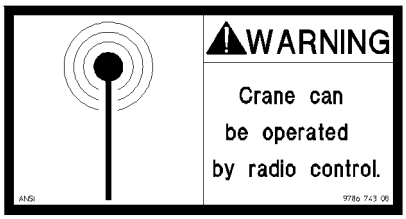

Fig.106047: Radio remote control

WARNING
Danger of injury due to crane operation with radio remote control!
▶ The crane can be operated with radio remote control!
▶ During crane operation, it is prohibited for anyone to remain in the danger zone!

1.76 978674408 – Danger of burns to hands

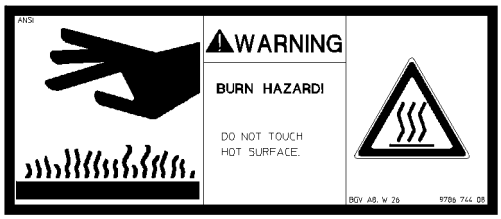

Fig.106028: Danger of burns to hands

WARNING
Danger of burns when touching hot surfaces!
▶ Do not touch hot surfaces.

1.77 978674508 – Warning of rotating parts

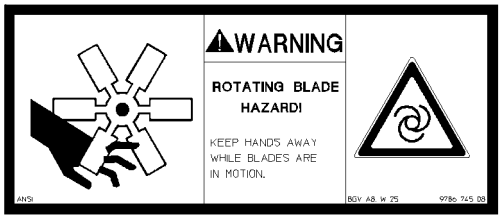

Fig.106029: Warning of rotating parts

WARNING
Rotating parts!
The rotating fan blade can cause finger and hand injuries.
▶ Keep your hands away from the rotating fan blade.

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1.78 978674608 - Crushing danger for hands

Fig.106030: Crushing danger for hands

WARNING
Danger of injuries for hands!
Hands can be caught, trapped or crushed within the danger zone.
▶ Keep hands away from the danger zone!

1.79 978674808 – Personal protective equipment

Fig.123900: Personal protective equipment

DANGER
Danger of falling!
▶ Use personal protective equipment.

1.80 978674908 – Accessing the area is prohibited

Fig.106038: Accessing the area is prohibited

WARNING
Danger of accident!
If the prohibited area is accessed, accidents can occur.
Personnel can be severely injured or killed.
▶ Do not access the prohibited area.

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1.81 978675008 – Access prohibited

Fig.106039: Access prohibited

WARNING
Danger of falling!
If the crane is accessed by unauthorized personnel, life threatening injuries can occur.
▶ Do not get on the crane.

1.82 978687408 – Rigging point

Fig.112475: Rigging point

WARNING
Rigging point!
▶ Use the rigging point **solely** for rigging.
▶ Lifting on the rigging point is prohibited.

1.83 97036734 – Rigging point

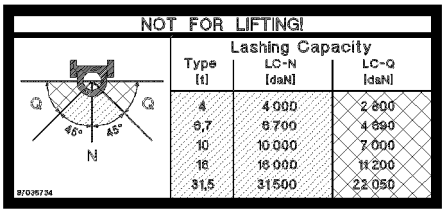

Fig.116287: Rigging point

WARNING
Rigging point!
▶ Use the rigging point **solely** for rigging.
▶ Lifting on the rigging point is **prohibited**.

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1.84 978867108 – Warning of fatal electric shock

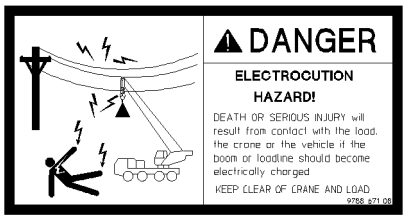

Fig.106814: Warning of fatal electric shock

DANGER
Danger of fatal injury due to electric shock!
If the boom or the hoist rope is under electric voltage, then death or severe injuries can occur if anyone touches the crane, the vehicle or the load.
▶ Stay away from the crane and load.

1.85 97094940 – Spark catcher

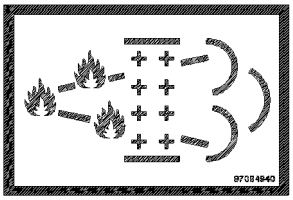

Fig.144735: Spark catcher

Note
▶ The exhaust system is equipped with an integrated spark catcher.

1.86 979383308 – Oil change

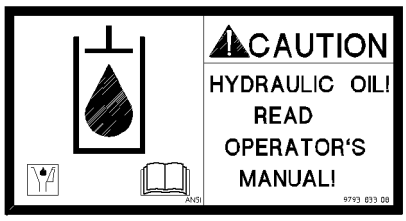

Fig.113827: Oil change

CAUTION
Property damage due to oil change!
If the oil specified in the operating instructions is not used during the oil change, it can lead to damage.
▶ See the Crane operating instructions, chapter 7.07.

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1.87 979561108 – Counterweight

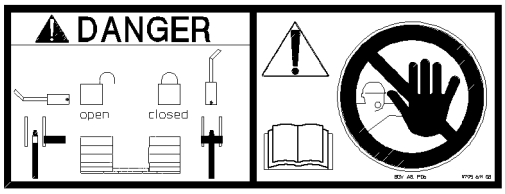

Fig.109026: Counterweight

WARNING
The counterweight can fall down!
If the auxiliary crane is removed on the counterweight before the counterweight is locked on both sides with the turntable, then the counterweight will fall down and can fatally injure assembly personnel.
▶ Do not remove the auxiliary crane until the counterweight is locked and secured on both sides with the turntable. See the Crane operating instructions, chapter 4.07.

1.88 97001802 – Falling platform

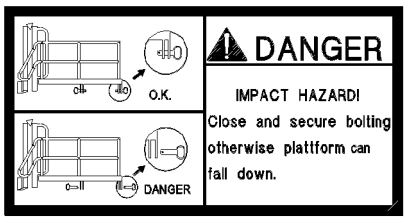

Fig.117345: Falling platform

WARNING
Falling platform!
▶ Pin and secure the platform in assembly / disassembly position.

1.89 973974408 - Transport weights of the components

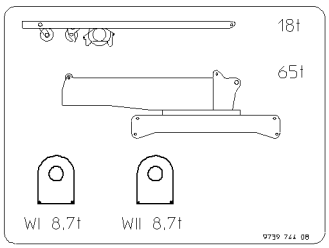

Fig.112440: Transport weights of the components

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1.90 973974608 - Transport weights of the components

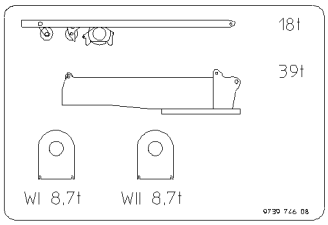

Fig.112441: Transport weights of the components

1.91 97011336 - Transport weights of the components

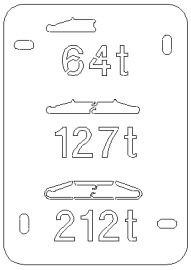

Fig.116271: Transport weights of the components

1.92 97068839 - Transport weights of the components / fastening length of the fastening equipment

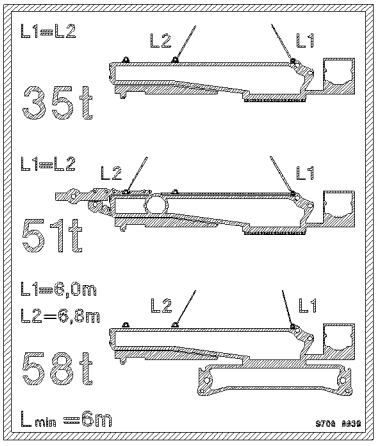

Fig.127587: Transport weights of the components / fastening length of the fastening equipment

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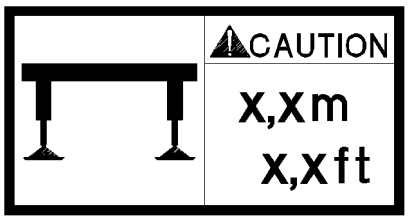
1.93 Identification of sliding beam

	Identification of sliding beam
978675108	 *Identification of sliding beam*
978675208	
978772808	
978772908	
978809308	
978809408	
978809508	
978818408	
978818508	
978875908	
978902608	
978903108	
97029203	
978903208	
979126008	
979126108	
979210508	
979210608	
979210608	
979210708	
979309108	
979309208	
97019140	
97003224	
979410808	

Identification of sliding beam

Note

▶ Extend the sliding beams to a support width of X.X m (X.X ft).

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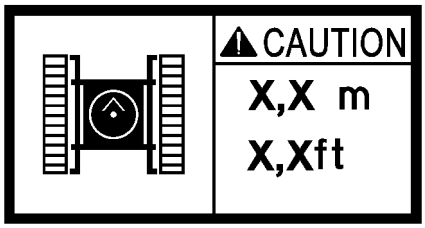
1.94 Identification Track width retracted

	Identification Track width retracted
97009840	 *Identification of track width*
97009841	
97017044	
97017045	
97017046	

Identification of track width

Note
▶ Track width retracted to x.xx m (x.x ft)

1.95 976624808 – Fastening the load

Fig.116283: Fastening the load

WARNING
Fastening the load is prohibited!
If the load is lifted on this point, the load can fall down and kill personnel.
▶ Lifting the load on unmarked locations is prohibited.

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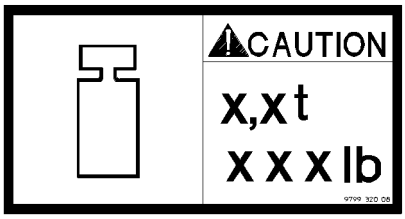
1.96 Note Weight sliding beams

	Weight of sliding beams
979932008	 *Weight of sliding beams*
979932108	
979932708	
979932808	

Note

▶ Pay attention to the weight of the sliding beams.

1.97 Center of gravity of the counterweight

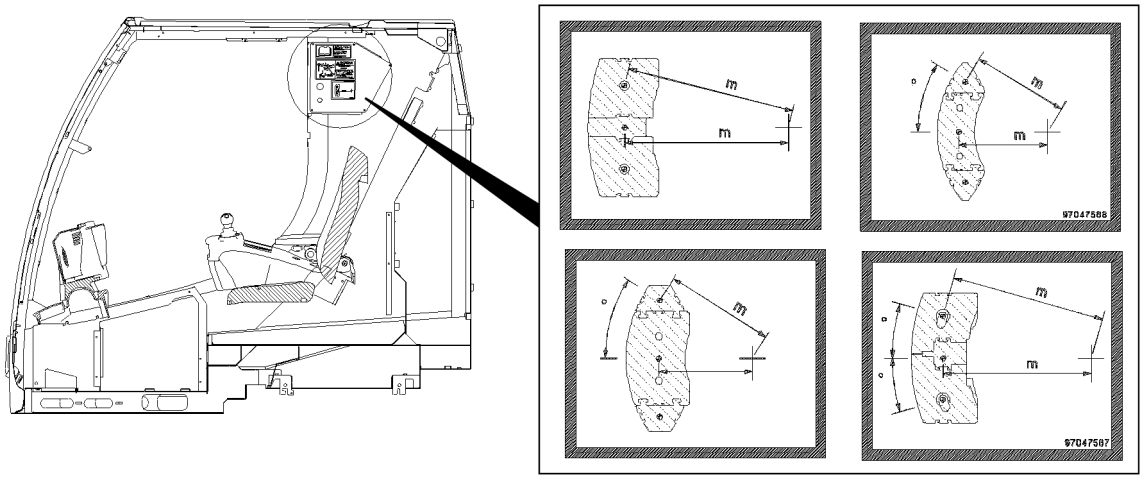


Fig.154058: Notice sign: Distance between center of gravity of counterweight and center of rotation

The depicted notice sign are only examples and can differ depending on the crane type.

The notice signs are displayed in the crane operator's cab.

Note

▶ This notice sign indicates the distance between the center of rotation and the center of gravity of the counterweight.

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Notice sign: Distance between center of gravity of counterweight and center of rotation			
Crane type	ID number notice sign	Crane type	ID number notice sign
LTM 1030-2.1	97096584	LTM 1230-5.1	97103719
LTM 1040-2.1	97095218		97103720
LTM 1050-3.1	97094881	LTM 1250-5.1	97070214
LTM 1055-3.1	97047566		97070215
LTM 1060-3.1	97051053	LTM 1300-6.2	97064080
LTM 1070-4.1	97095971	LTM 1350-6.1	97128099
LTM 1090-4.1	97092106	LTM 1450-8.1	97093816
	97092109		
LTM 1095-5.1	97047565	LTC 1050-3.1	97095960
LTM 1100-4.2	97094364	LTF 1045-4.1	97095046
LTM 1100-5.2	97095763	LTF 1060-4.1	97096030
LTM 1130-5.1	97055765	LTR 1060	97128100
LTM 1160-5.2	97081129		

1.98 Minimum rope reeving / minimum hook block weight

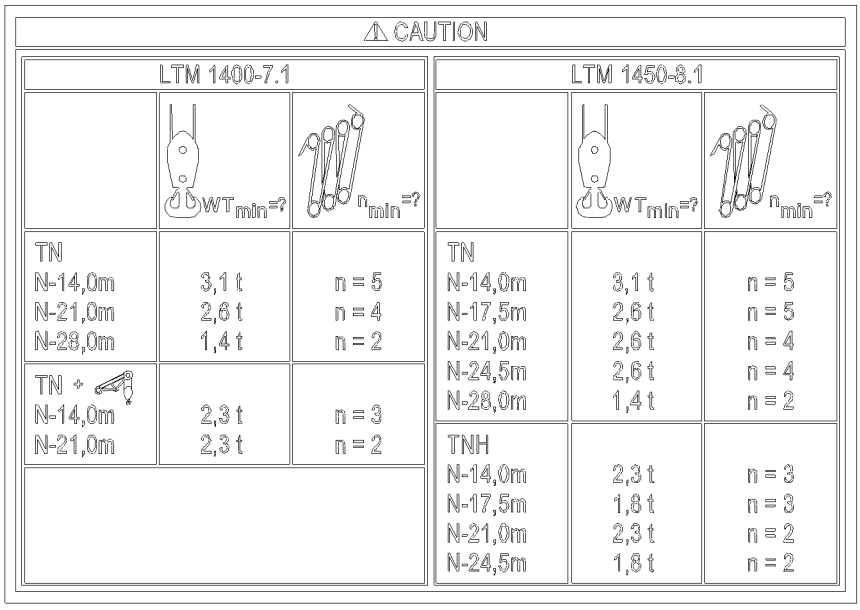

Fig.127972: Minimum rope reeving / minimum hook block weight with luffing lattice jib / boom nose

WARNING
Minimum rope reeving / minimum hook block weight not adhered to!
Too low hook block weight leads to the formation of slack rope.
Rope reeving too low, hoist rope is overloaded.
▶ Adhere to the hook block weight and hoist rope reeving.

Example: LTM 1400-7.1

With a luffing lattice jib -TN **N-21 m** a hook block with a weight of **2.6 t must** be installed and minimum rope reeving of **4** must be used.

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With a luffing lattice jib **N-21 m** and boom nose a hook block with a weight of **2.3 t must** be installed and minimum rope reeving of **2** must be used.

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2.05.10 Labeling of the load carriers

1	Identifications on the hook block or load hook	3
2	Identifications on single hook or double hook	4
3	Identifications on auxiliary weights	5

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Fig.195219

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1 Identifications on the hook block or load hook

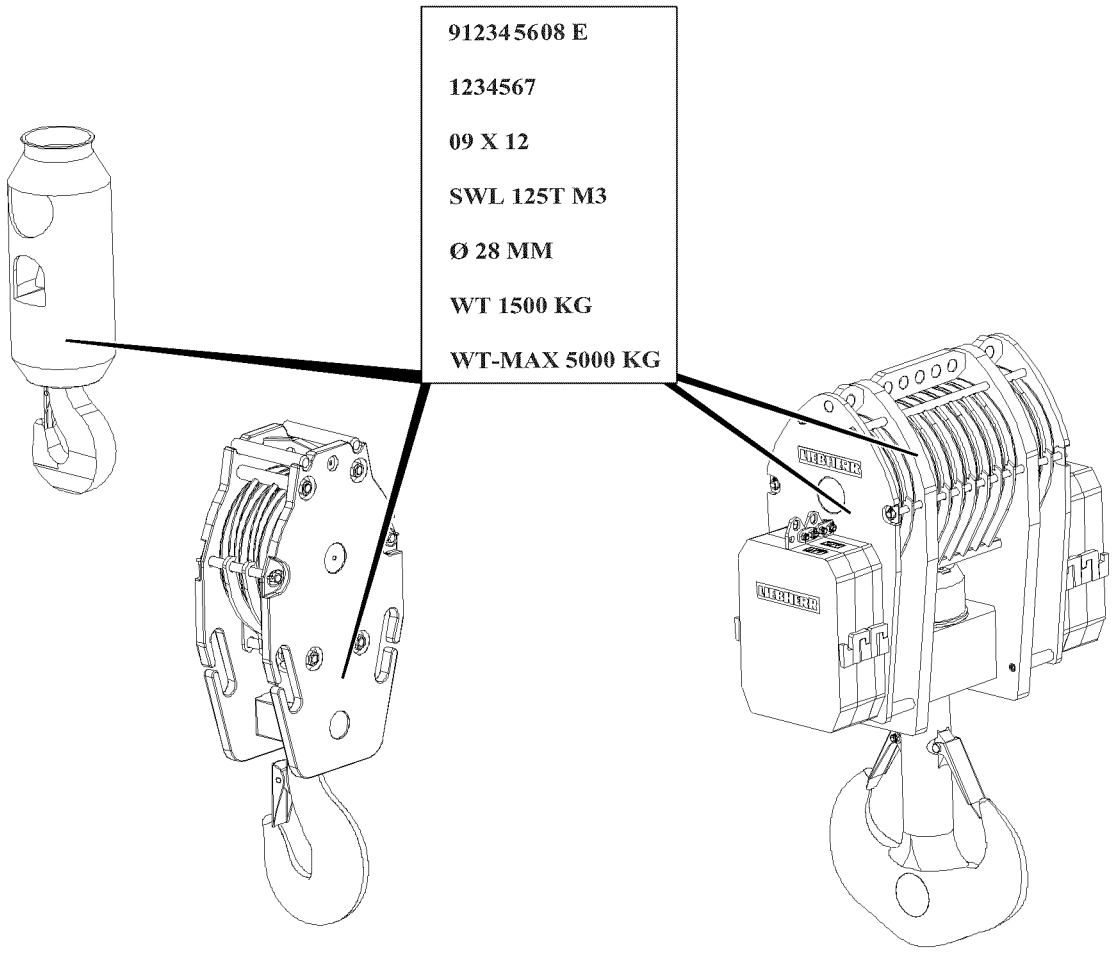

Fig.118509: Identifications on the hook block or load hook

Note

- ▶ The load hooks and hook blocks approved for this crane type can be found in the load chart.
- ▶ The hook blocks shown are examples only and can deviate from the existing hook block.

Punch mark area	Explanation
912345608 E	Liebherr ID no., „E = entschärft (deburred)“
123456	Series or factory test number
09 X 12	Month of construction / supplier marks / year of construction
SWL 125T M3	SWL (Safe Working Load) = Load carrying capacity for power train group M3
Ø 28 mm	Hoist rope diameter
WT 1500 Kg	WT (Weight Tare) = Own weight (without auxiliary weights)

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Punch mark area	Explanation
WT-MAX 5000 Kg	WT-Max = Maximum permissible own weight of lower pulley block and total number of progressively installed auxiliary weights
	Limits the number of installed auxiliary weights
	Determination via addition of assembled own weights (number of auxiliary weights + hook block)

Identifications on the hook block or load hook

2 Identifications on single hook or double hook

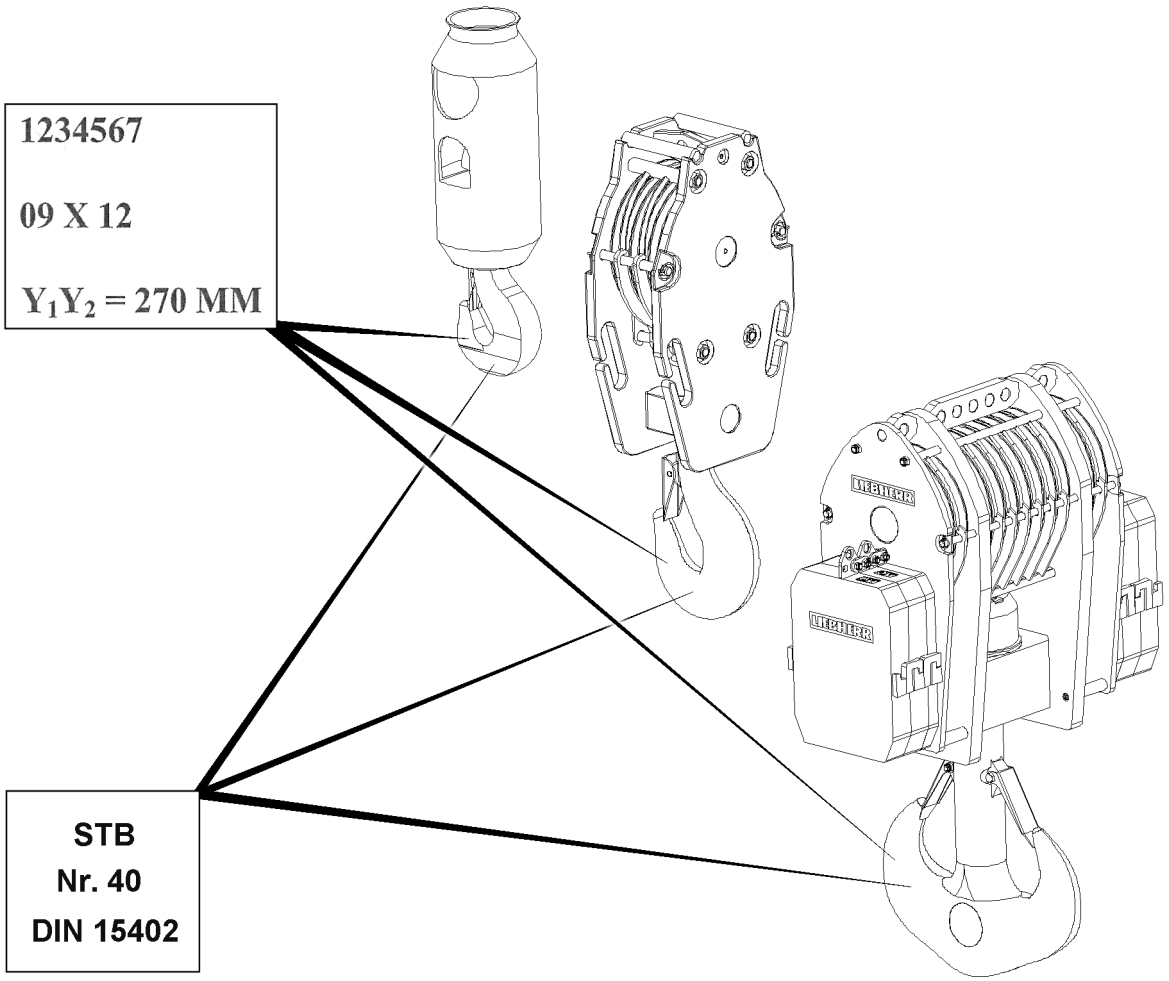

Fig.149061: Identifications on single hook or double hook

Punch mark area	Explanation
STB	Hook manufacturer
40-T	Hook number + strength class according to DIN 15 400
DIN	Hook shape according to DIN 15 401 /DIN 15 402
123456	Series or factory test number

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Punch mark area	Explanation
09 X 12	Month of construction / supplier marks / year of construction
Y1Y2 = 270 mm	Dimension Y or dimension Y1 and dimension Y2 according to DIN (= Test dimensions for recurrent tests)

Identifications on single hook or double hook

3 Identifications on auxiliary weights

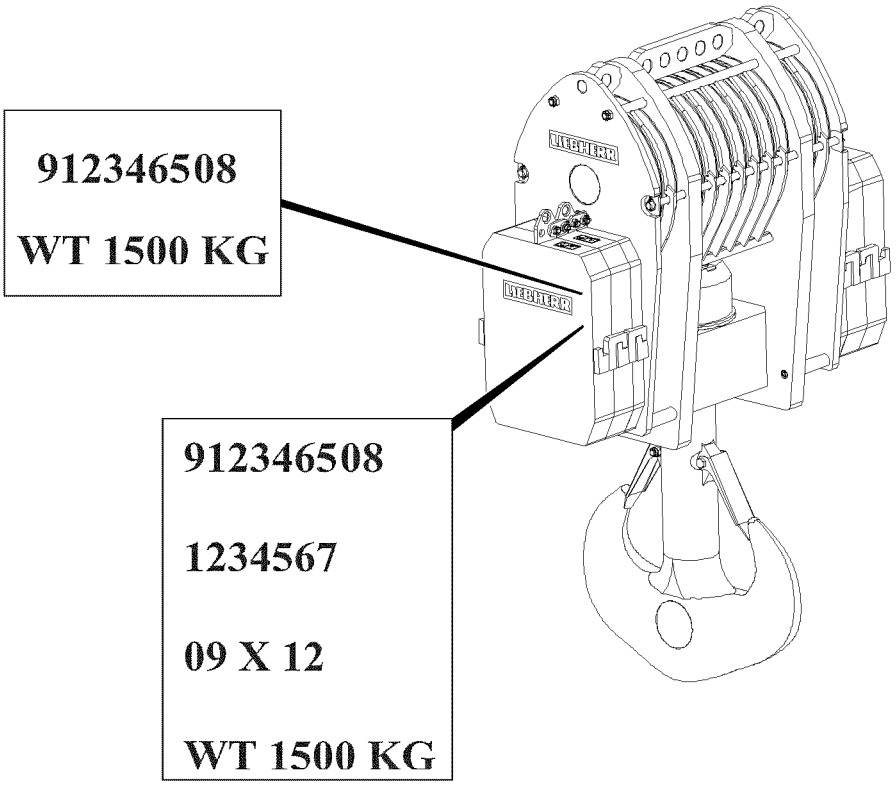

Fig.118511: Identifications on auxiliary weights

Note

▶ The own weight of the individual auxiliary weight is noted on the side on the respective auxiliary weight.

3.1 Identifications on auxiliary weights at delivery

Punch mark area	Explanation
912346508	Liebherr ID no.
WT 1500 Kg	WT (Weight Tare) = Own weight of individual auxiliary weight

Identifications of auxiliary weights at delivery

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3.2 Identifications on auxiliary weights for reorder

Punch mark area	Explanation
912346508	Liebherr ID no.
123456	Series or factory test number
09 X 12	Month of construction / supplier marks / year of construction
WT 1500 Kg	WT (Weight Tare) = Own weight of individual auxiliary weight

Identifications of auxiliary weights at reorder

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2.06 Fall protection equipment on the crane

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Fig.195219

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1 Personal protective equipment

Fig.123919

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe injury, property damage.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ It is prohibited to lean the ladder against the component being disassembled.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of accident due to fall arrest system exposed to a fall!
If a fall arrest system is not replaced after a fall, then the fall arrest system can fail in case of a new fall.
Death, severe injury, property damage.
- ▶ After every fall, the fall arrest system must be removed and inspected by authorized and trained experts.
- ▶ The results must be documented in the inspection log book.
- ▶ Only after written release by expert personnel may be fall arrest system be reused.

Note
- ▶ The sign **3** marks the fastening points, where assembly personnel must hook in with a fall arrest system to secure themselves against falling.

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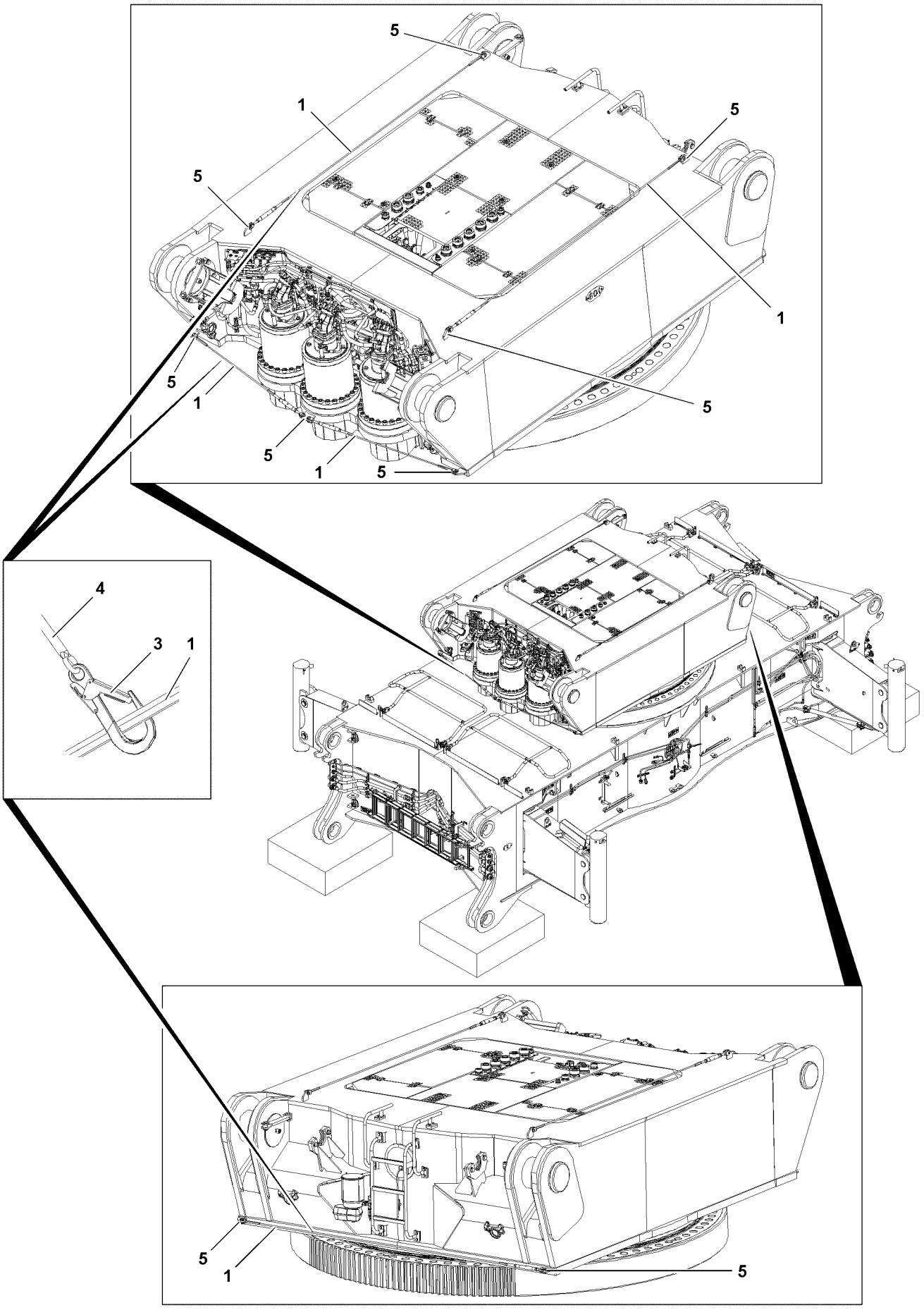

Fig.117738

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2 Safety ropes as fall protection equipment

WARNING
Danger of falling!
During assembly and disassembly, assembly personnel must be secured with appropriate aids to prevent them from falling.
Death, severe injury, property damage.

- ▶ Any work, where there is a danger of falling, must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane).
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved fall arrest systems **4** to avoid falling, see Crane operating instructions, chapter 2.04.
- ▶ The assembly personnel must hook themselves for all assembly / disassembly work, maintenance work and inspections with an approved fall arrest system **4** on the safety ropes **1** with both snap hooks **3** and secure themselves to prevent them from falling.
- ▶ Fall absorbers may not be used, because they stretch too much in case of a fall.
- ▶ On the safety ropes **1** on the left and right no more than maximum two persons may hook themselves with snap hooks **3** and to prevent them from falling.
- ▶ Transferring the snap hooks **3** is only permissible on the connection points.
- ▶ When transferring the snap hooks **3**, one snap hook **3** must always remain hooked on one safety rope **1**.
- ▶ Never release both snap hooks **3** simultaneously from the safety rope **1**.
- ▶ Before any assembly / disassembly work, maintenance and inspection work it must be ensured that all obstacles below the work place have been removed and that there is sufficient clearance in case of a fall.
- ▶ During all assembly / disassembly work, maintenance work and inspections, travel or crane operation is prohibited.

2.1 Safety ropes turntable frame lower section

NOTICE
Danger of damage!

- ▶ Never hang loads or objects on the safety ropes **1**.

2.2 Safety ropes on lattice sections

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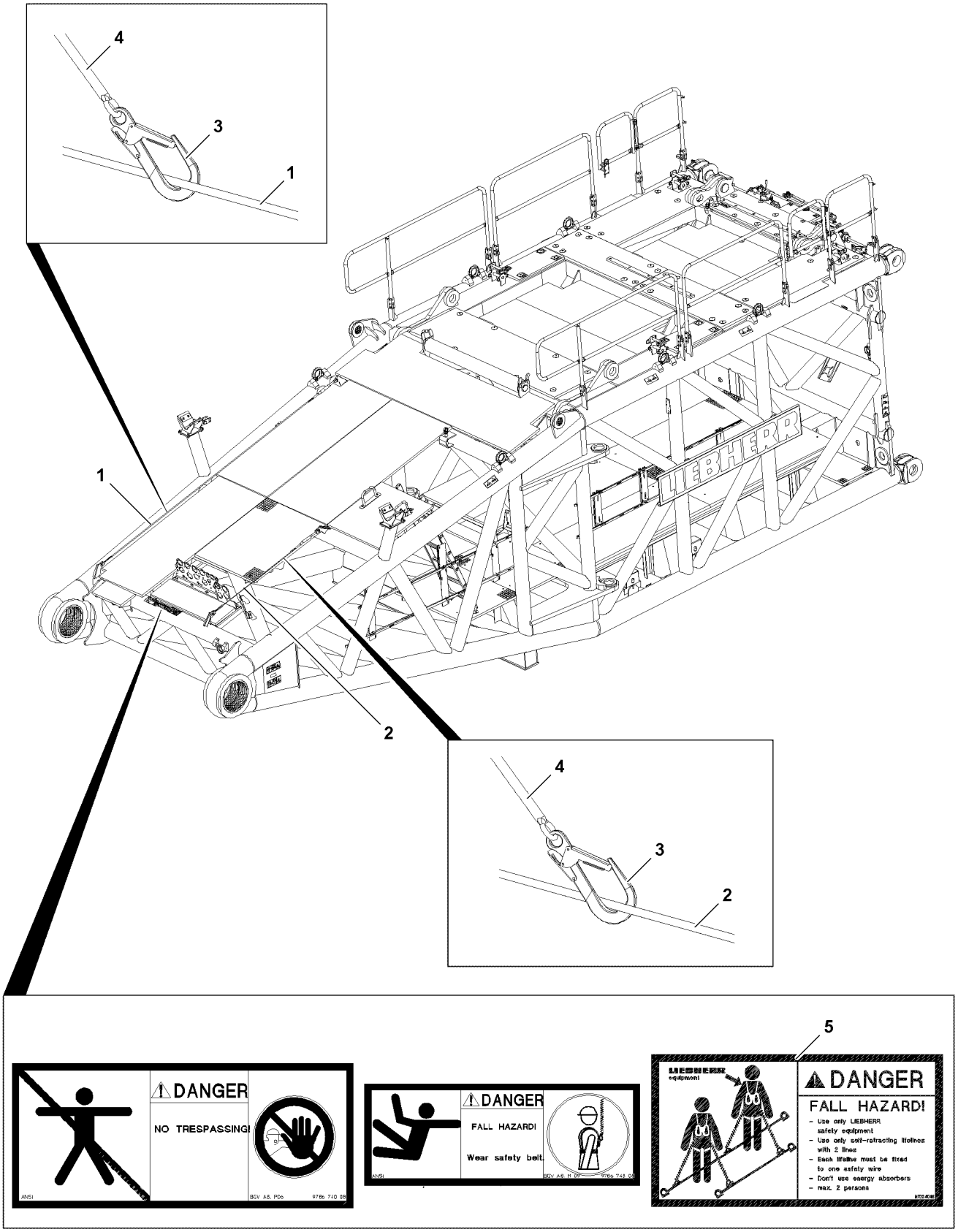

Fig.117740: S-pivot section

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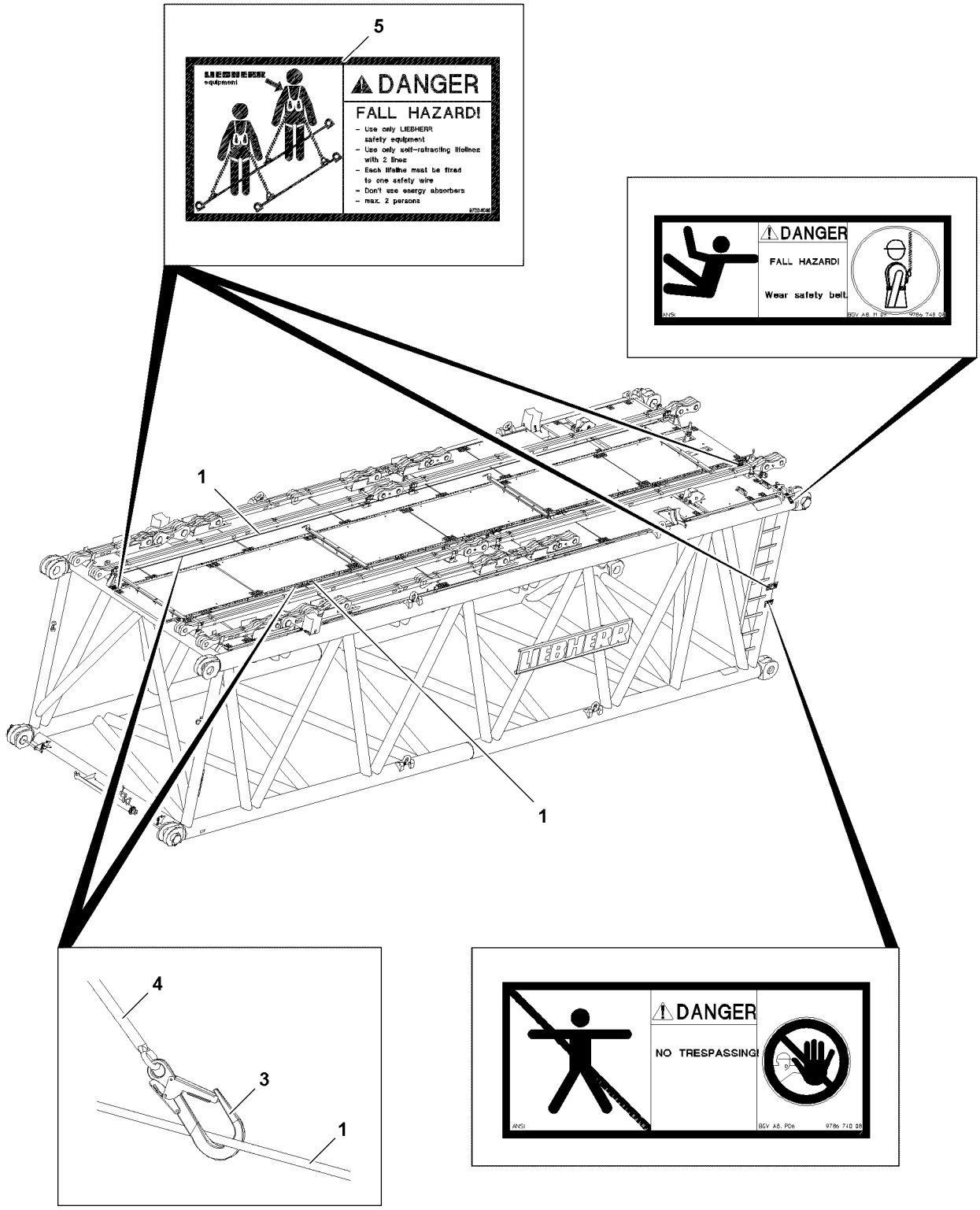

Fig.117741: S-intermediate section (6.0 m and 12.0 m) // S-adapter

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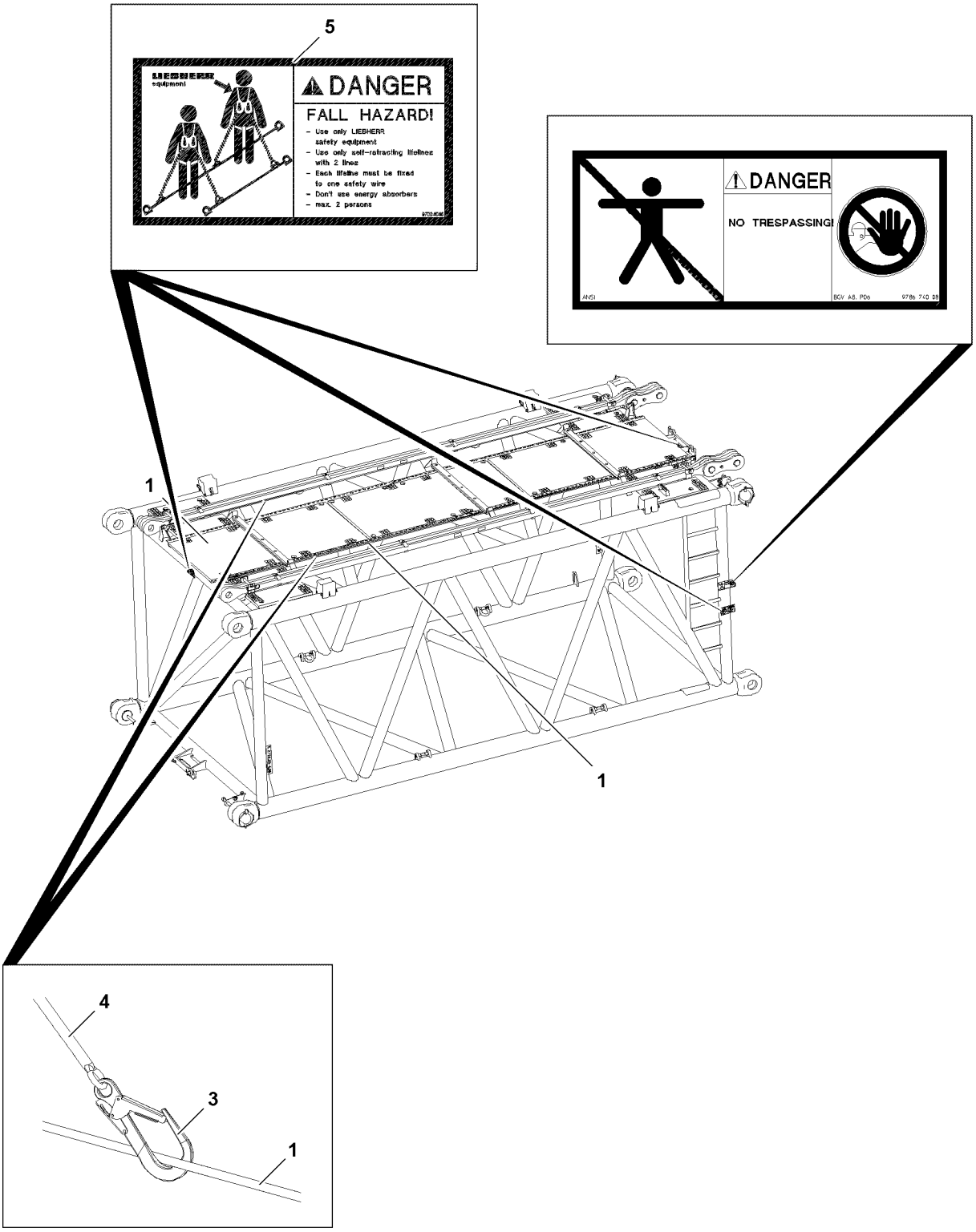

Fig.117742: L-intermediate section (6.0 m and 12.0 m) // SL-reducer section

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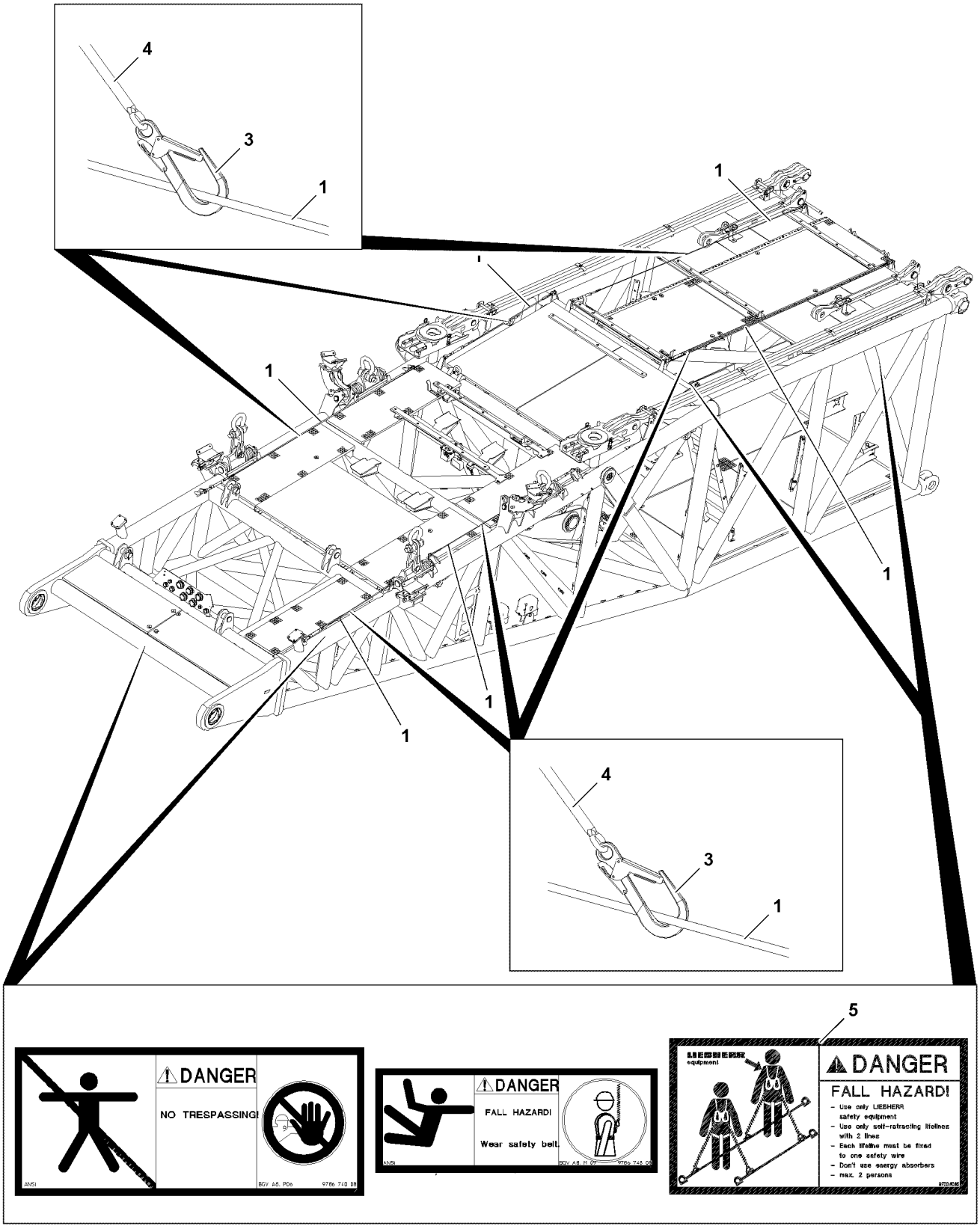

Fig.117743: D-pivot section

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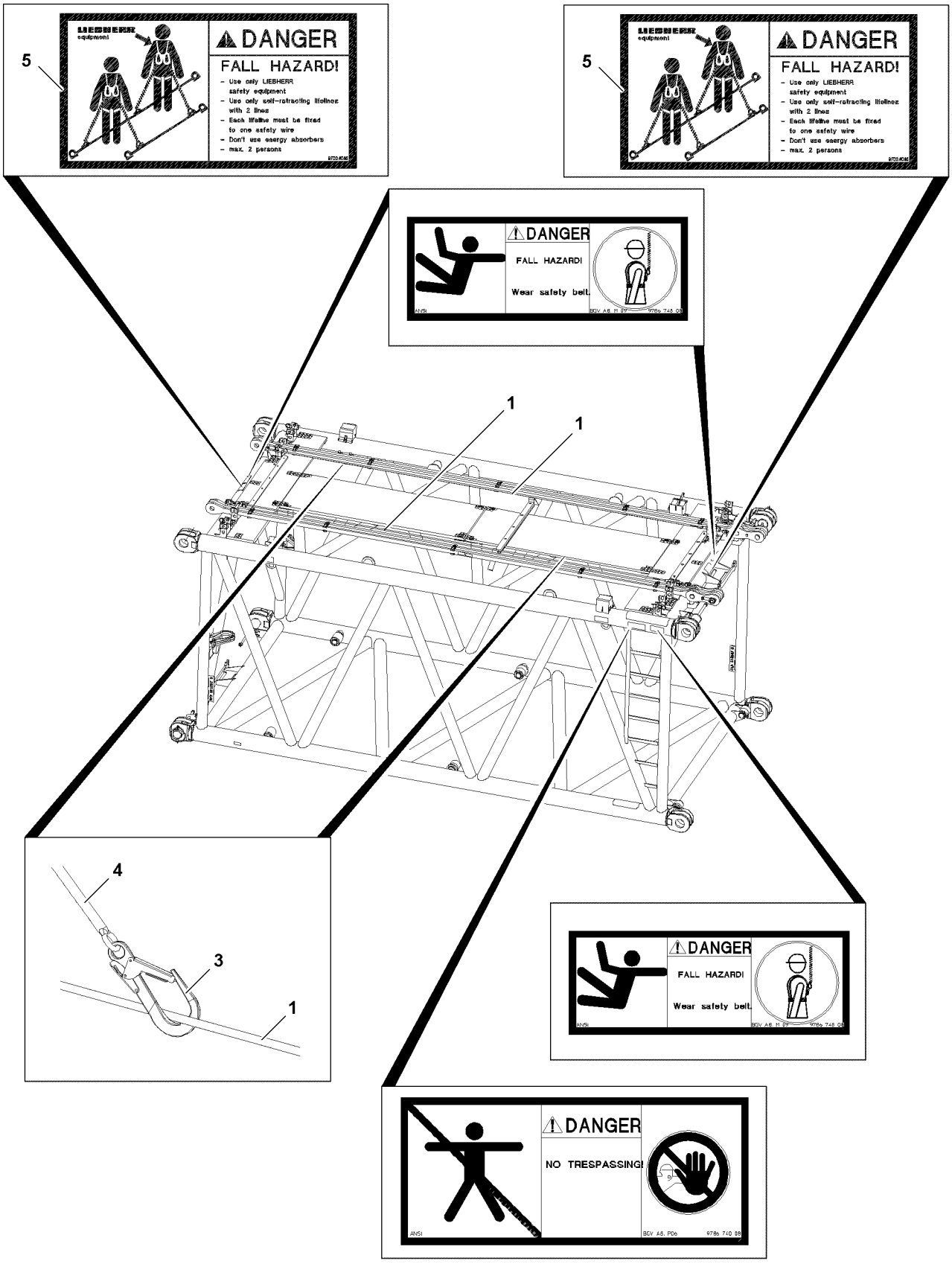

Fig.117746: D-intermediate section (6.0 m and 12.0 m)

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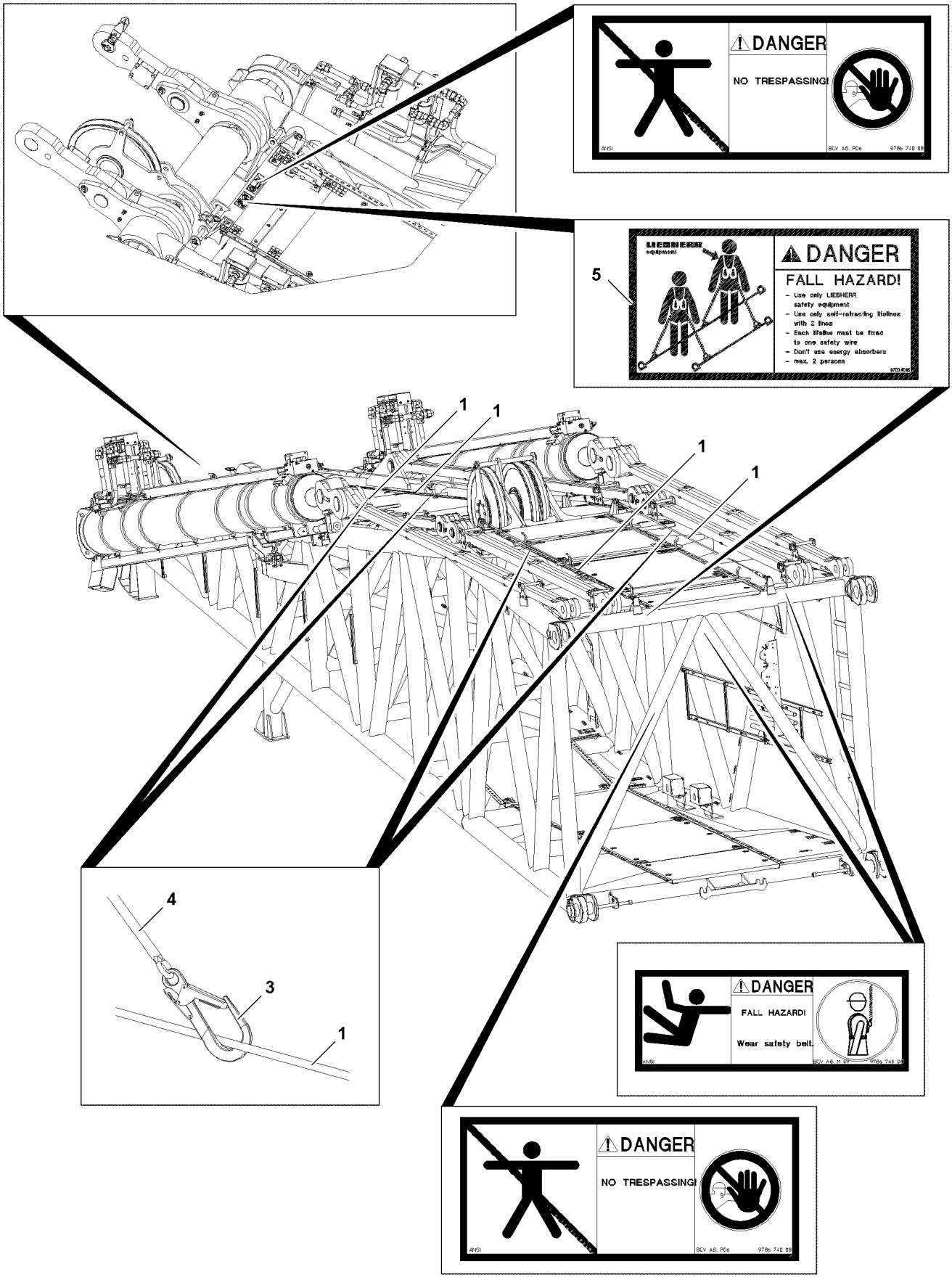

Fig.117744: D-end section

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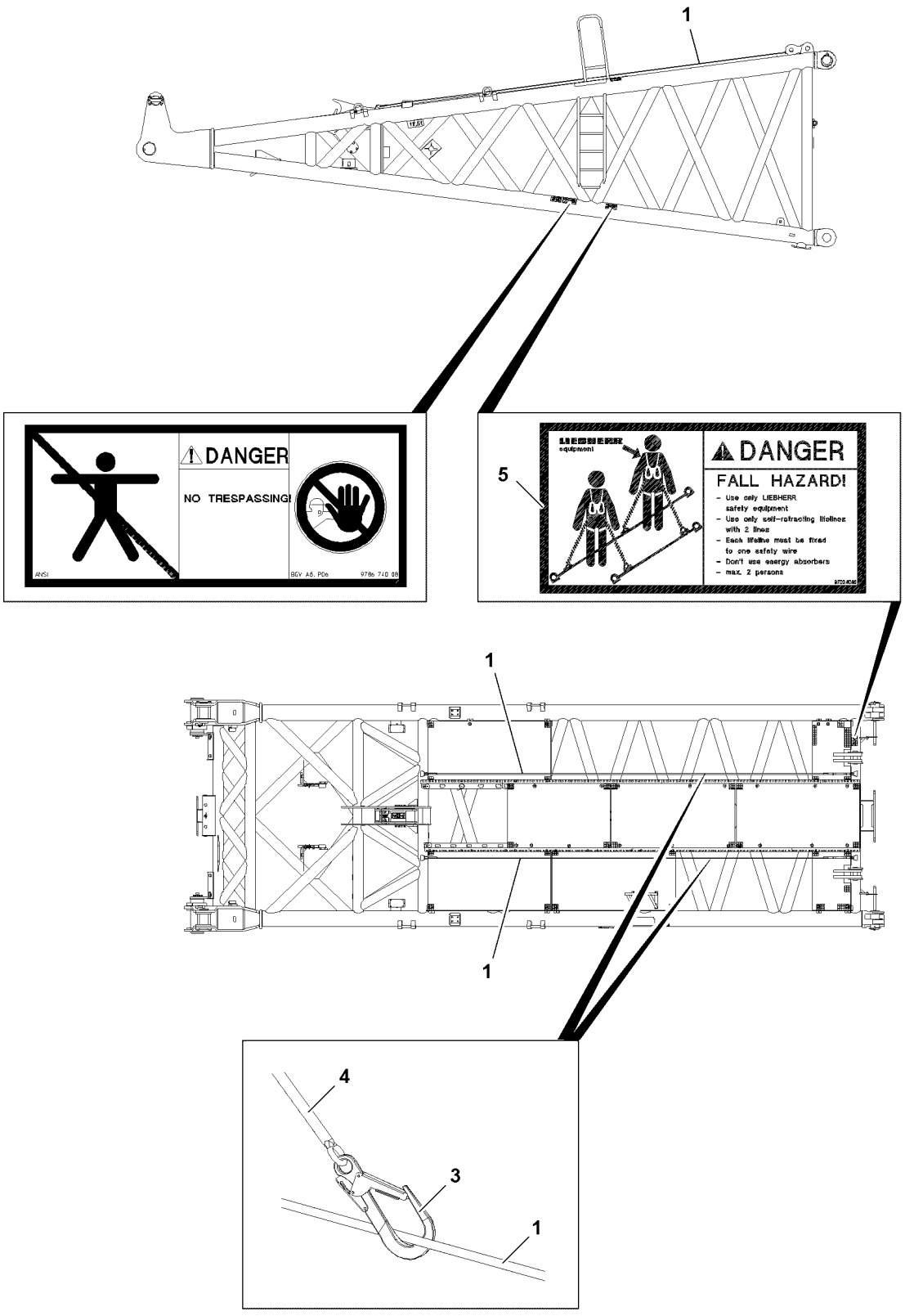

Fig.117745: W-pivot section

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2.3 Replacing safety ropes subjected to a fall

WARNING
Danger of accident due to fall subjected safety ropes!
If safety ropes **1** that have been subjected to a fall are not replaced after a fall, then the safety ropes can fail in case of another fall.
Death, severe injury, property damage.

- ▶ **Expert personnel** must immediately replace any safety ropes **1** which were subjected in a fall and inspect the respective anchor points **3** for damage.
- ▶ If the anchor points **3** are damaged, then they must be replaced immediately by **expert personnel**.
- ▶ Only after a written release by **expert personnel** may the safety ropes **1** and the respective anchor points **3** be put into operation.

2.4 Checking the safety ropes and anchor points

For detailed description of „Inspection of safety ropes and anchor points“ refer to the Crane operating instructions, chapter 8.01.

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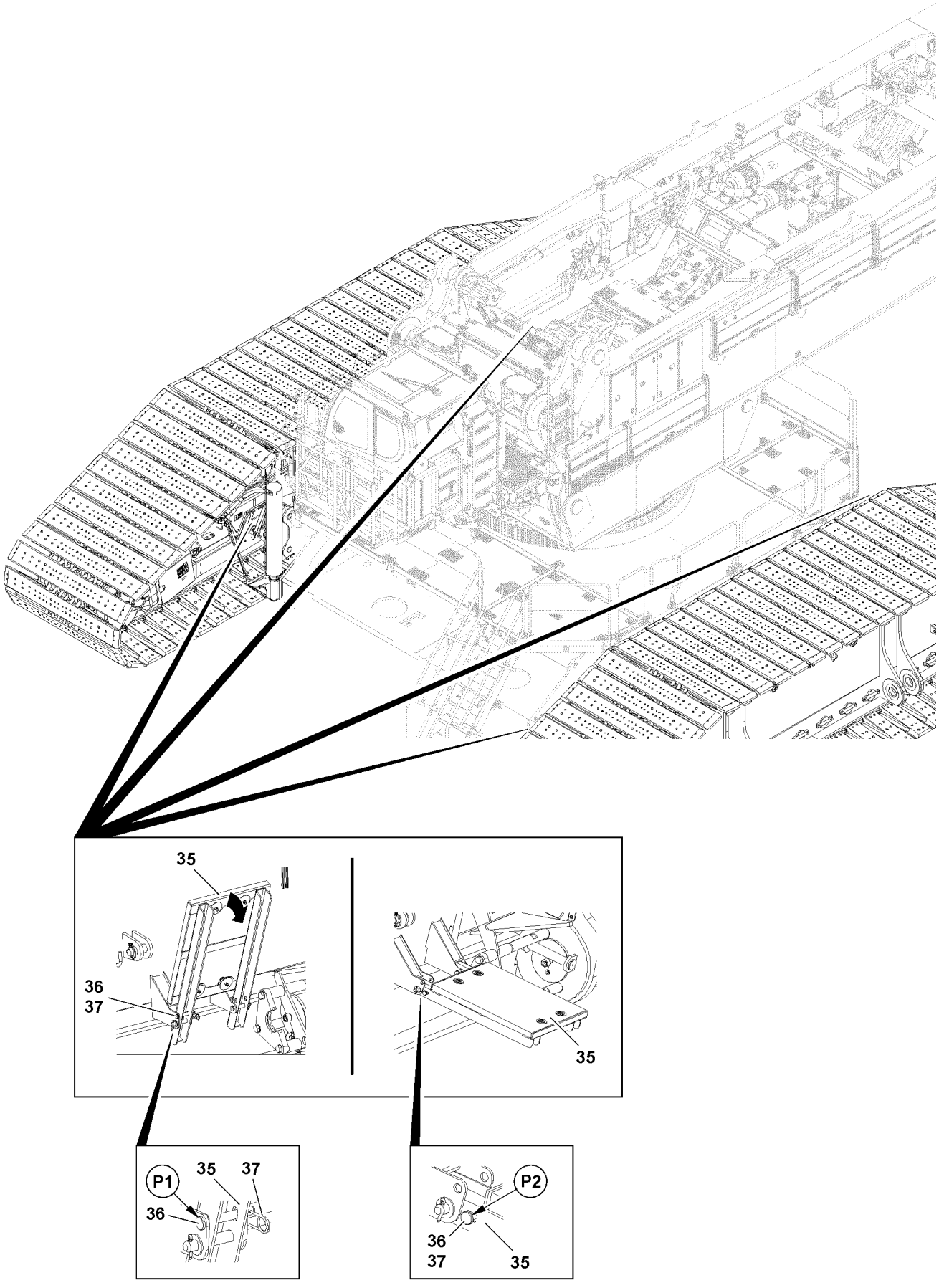

Fig.118183

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3 Platforms on the crawler carriers

Note

- ▶ The platforms **35** on the crawler carriers are used for better accessibility of the upper pin points at assembly of the crawler carriers on the crawler center section.
- ▶ Two platforms each are on each crawler carrier.

NOTICE

Damage of platforms!

If the platforms **35** are in operating position during crane operation, then the platforms **35** can be damaged.

- ▶ Make sure that the platforms **35** are in transport position during crane operation.

WARNING

Danger of crushing!

When folding down the platforms **35**, fingers or limbs can be crushed and personnel can be severely damaged.

- ▶ Do not reach into the danger zone.
- ▶ Hold the platform **35** before unpinning of pin **36**.

3.1 Folding the platform down from transport position into operating position

- ▶ Hold the platform **35** in transport position.
- ▶ Remove the spring retainer **37** and unpin the pin **36** at point **P1**.
- ▶ Fold the platform down into operating position.

When the platform is in operating position:

- ▶ Insert the pin **36** on point **P2** and secure with spring retainer **37**.

Result:

– The platform is in operating position.

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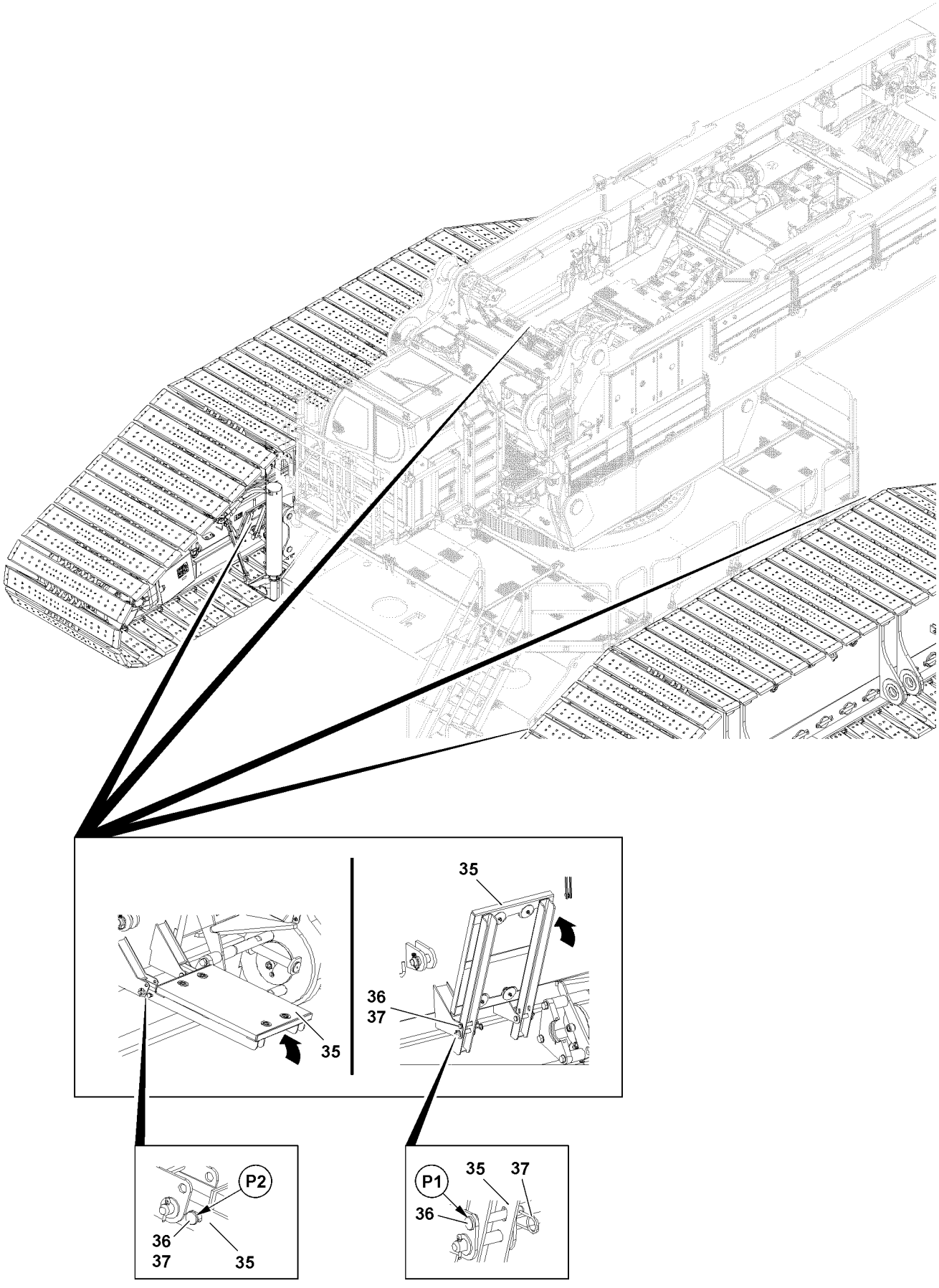

Fig.118185

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3.2 Folding the platform from operating position into transport position

▶ Remove the spring retainer **37** and unpin the pin **36** at point **P2**.
▶ Fold the platform **35** up into transport position.

When the platform is in transport position:
▶ Insert the pin **36** on point **P1** and secure with spring retainer **37**.

Result:

– The platform is in transport position.

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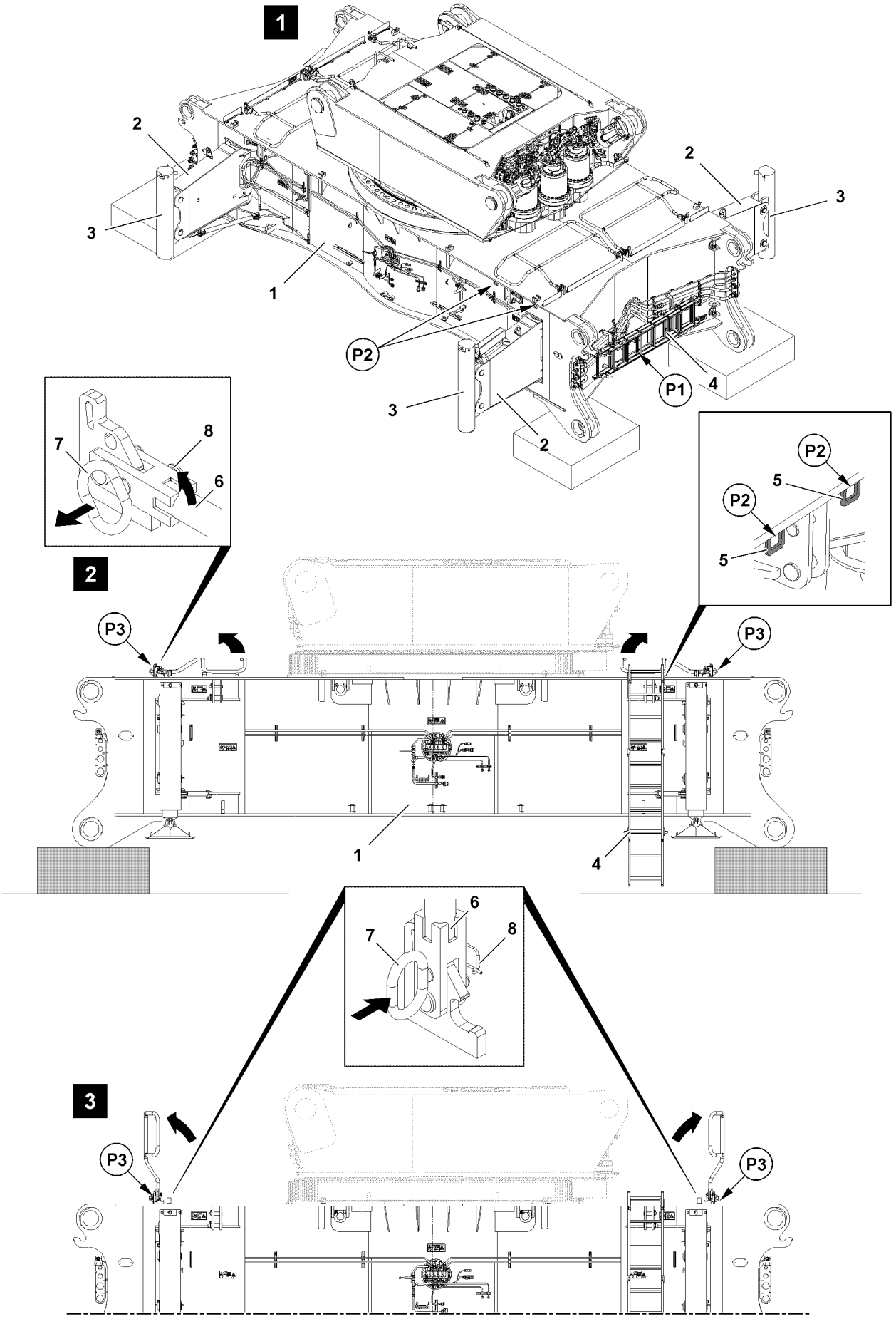

Fig.119726

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4 Assembling the railing on crawler center section

WARNING
Danger of falling!
During assembly and disassembly of the railing, personnel must be secured with appropriate aids to prevent them from falling.
Even during the assembly of protective devices there is a danger of falling.
Death, severe injury, property damage.
- ▶ Hang the personal protective equipment on the provided safety ropes.
- ▶ Keep a safety distance to edges.

4.1 Bringing the extension ladder into operating position

Make sure that the following prerequisites are met:
- The crawler center section **1** is laying properly on the substructure.
- The hydraulic assembly supports **2** are swung out and properly pinned.
- The crawler center section **1** is horizontally aligned.

- ▶ Remove the extension ladder **4** from the transport position at point **P1**.
- ▶ Extend the extension ladder **4** to the maximum length and lock.
- ▶ Hang the extension ladder **4** with hooks **4.1** on the bars **5** (points **P2**).

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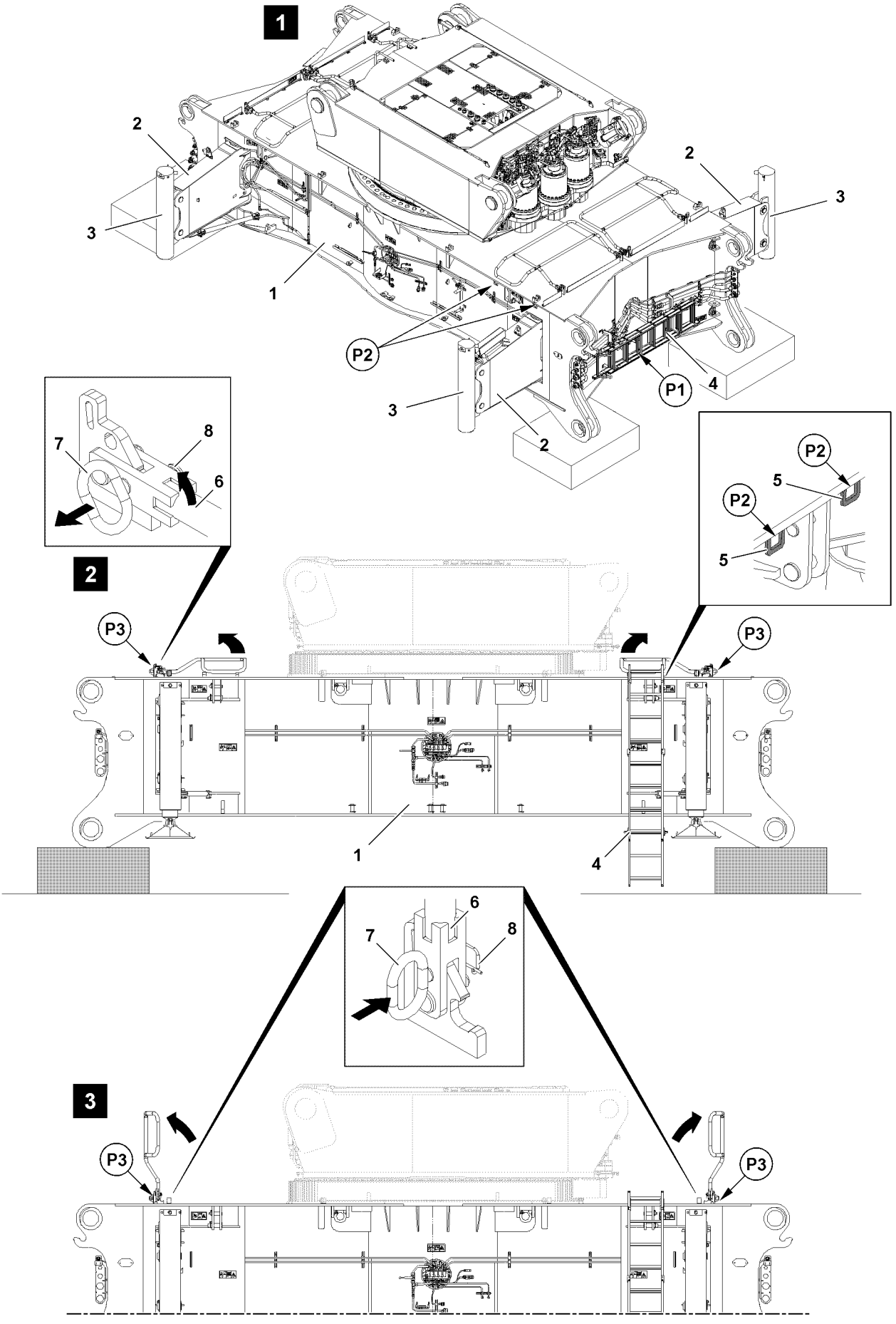

Fig.119726

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4.2 Swinging the railing on the crawler center section into operating position

Make sure that the following prerequisites are met:
– Both extension ladders **4** are properly installed on the crawler center section **1**.

WARNING
Danger of falling!
During assembly and disassembly of the railing, personnel must be secured with appropriate aids to prevent them from falling.
Even during the assembly of protective devices there is a danger of falling.
Death, severe injury, property damage.
▶ Hang the personal protective equipment on the provided safety ropes.
▶ Keep a safety distance to edges.

▶ Release the railing **6** from the transport position: Remove the spring retainer **8** and unpin the pin **7**, see illustration **2**.

WARNING
Danger of crushing!
When swinging the railings **6**, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

When the railings **6** are released:
▶ Swing the railing **6** into the operating position.
▶ Secure the railing **6** in the operating position: Insert the pin **7** and secure with the spring retainer **8**, see illustration **3**.

Note
▶ The procedure to install the railing on the opposite side is identical with the above procedure.

▶ Bring the railing **6** on the opposite side in operating position.

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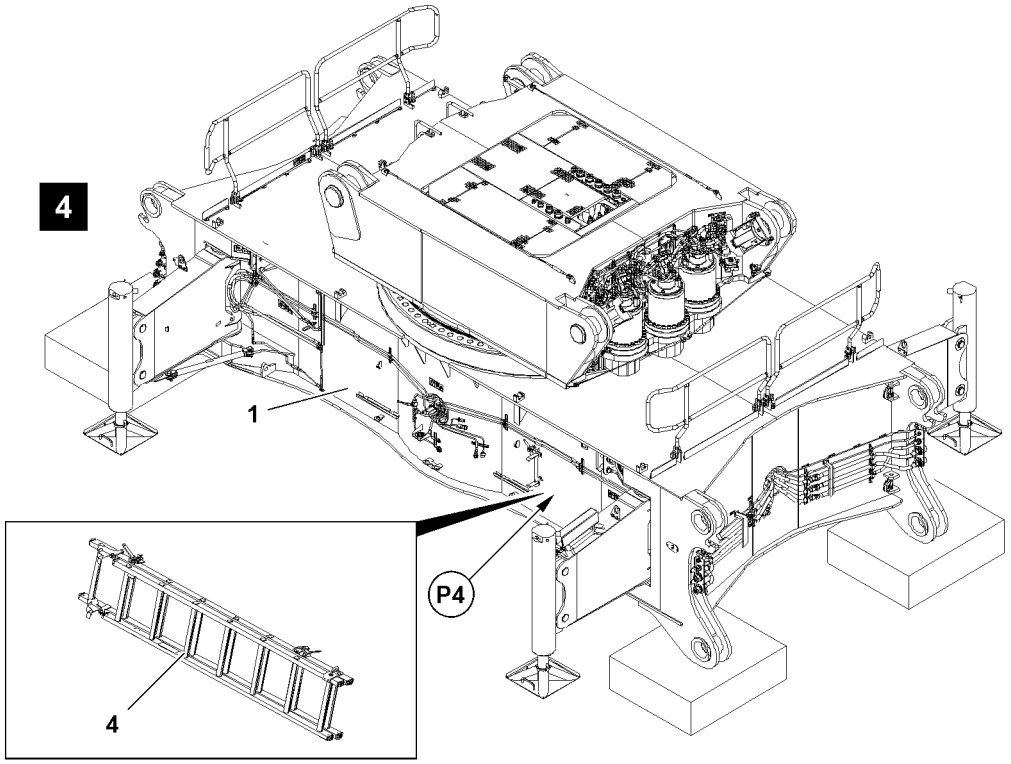

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Fig.119727

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4.3 Taking the extension ladder down in park position for assembly

Note

- ▶ Remove the extension ladder from the operating position and place it in park position before installation of the central ballast.
- ▶ Take the extension ladder down alternatively outside the crane operating range.
- ▶ If the extension ladder is in park position when the central ballast is installed, then the extension ladder is no longer accessible.

Make sure that the following prerequisites are met:

- The turntable frame main section is properly assembled and secured on the crawler center section.
- The SA-frame is properly assembled and secured on the turntable frame main section.
- The crawler carriers are properly assembled and secured on the crawler center section.

- ▶ Unhook the extension ladder **4** from operating position.
- ▶ Slide the extension ladder **4** together to short length and lock.
- ▶ Hang the extension ladder **4** in park position on the side on the crawler center section, point **P4**.
- ▶ Secure the extension ladder **4** properly in park position.

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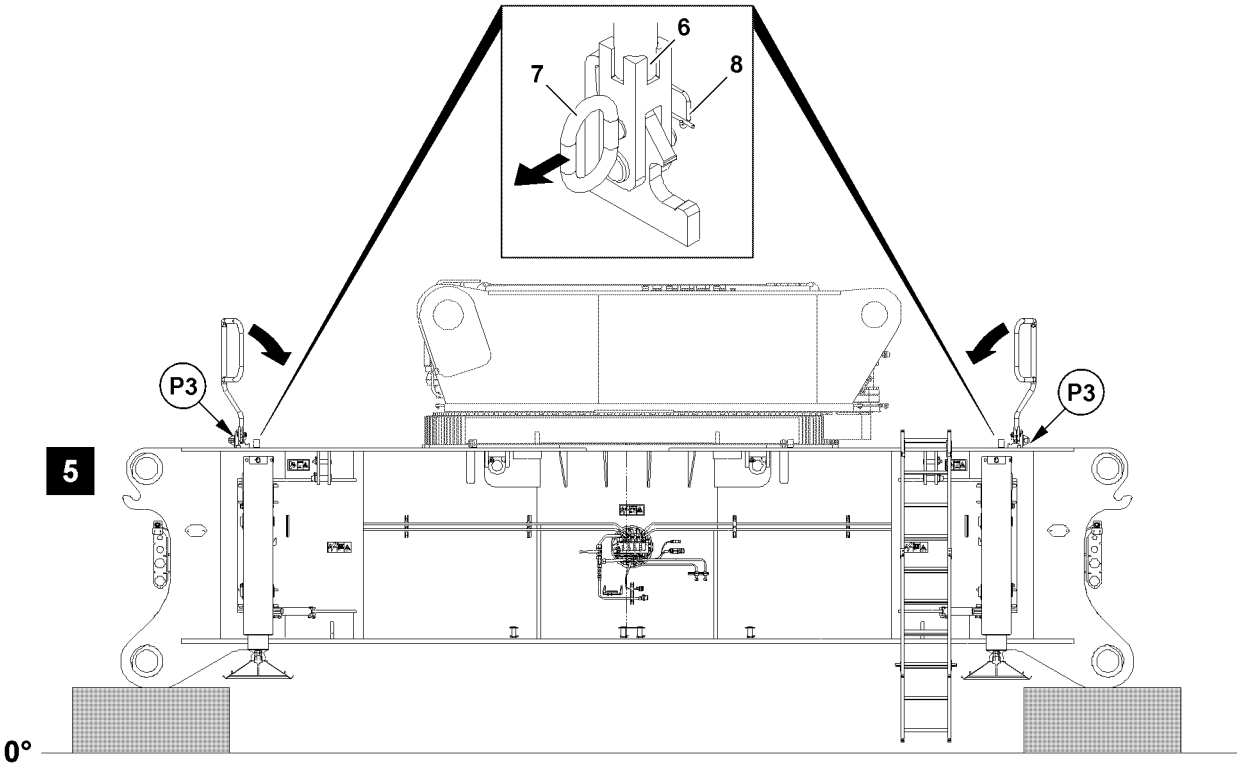

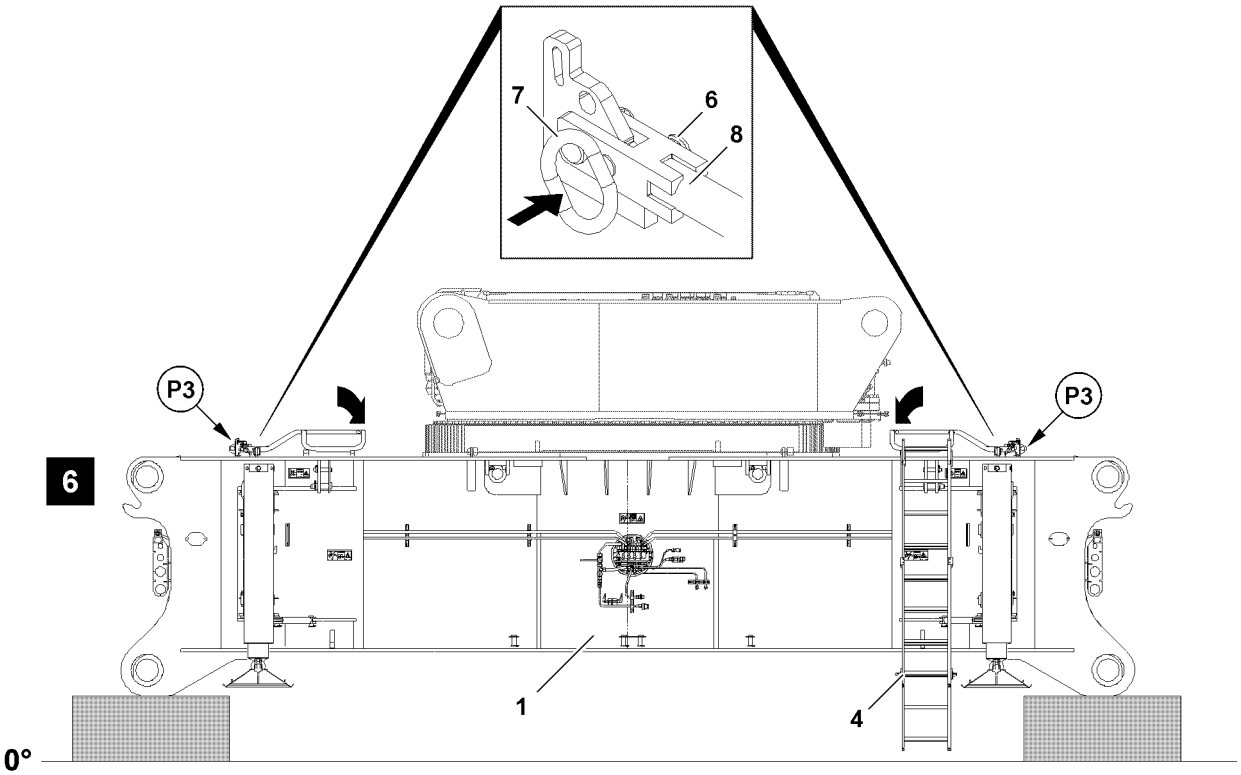

Fig.119728

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4.4 Swinging the railing on the crawler center section into transport position

Make sure that the following prerequisites are met:
– Both extension ladders **4** are properly installed on the crawler center section **1**.

WARNING
Danger of falling!
During assembly and disassembly of the railing, personnel must be secured with appropriate aids to prevent them from falling.
Even for assembly and disassembly of protective devices there is a danger of falling.
Death, severe injury, property damage.
▶ Hang the personal protective equipment on the provided safety ropes, see section „Safety ropes as fall protection“.
▶ Keep a safety distance to edges.

▶ Release the railing **6** in operating position: Remove the spring retainer **8** and unpin the connector **7**.

WARNING
Danger of crushing!
When swinging the railings **6**, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

When the railings **6** are released:
▶ Swing the railing **6** into the transport position.
▶ Secure the railings **6** in transport position: Insert the connector **7** and secure with spring retainer **8**, see illustration **2**.

Note
▶ The procedure to remove the railing on the opposite side is identical with the above procedure.

▶ Bring the railing **6** on the opposite side on the crawler center section **1** into transport position as described above.

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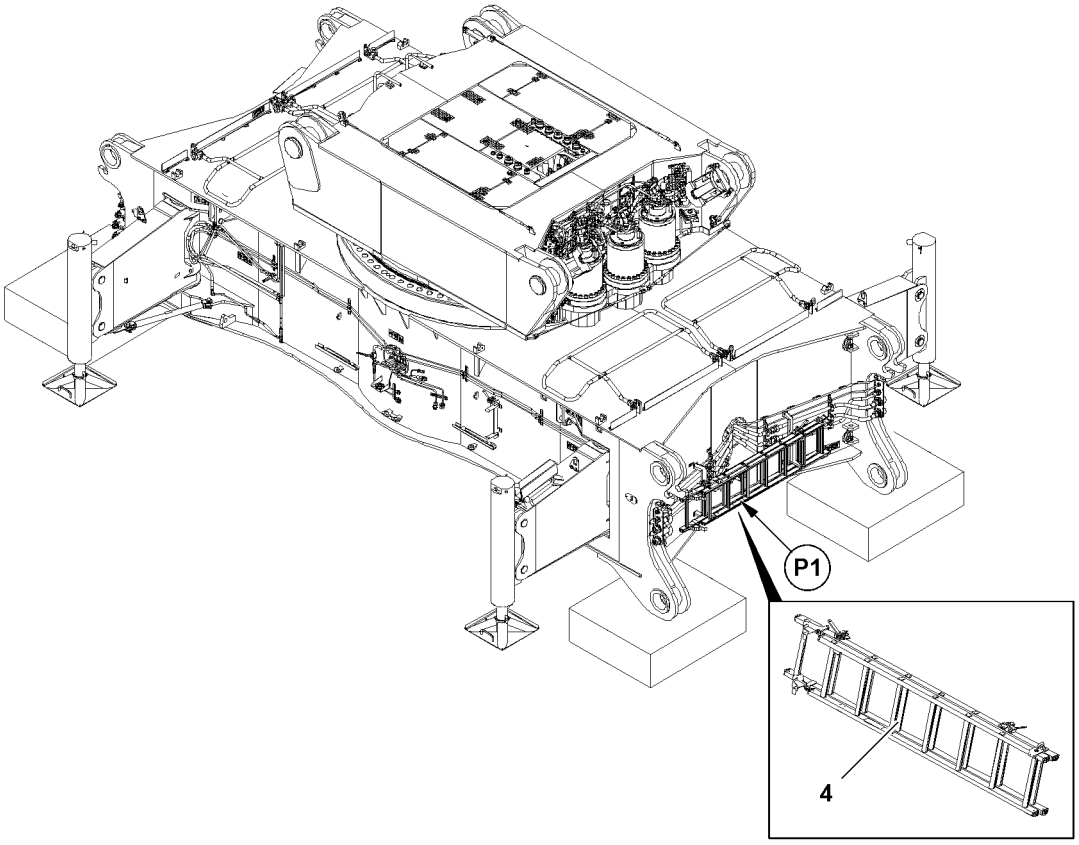

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Fig.119729

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4.5 Bringing the extension ladder into transport position

Make sure that the following prerequisites are met:
- The central ballast is removed.
- The crawler carriers are removed.
- The crawler center section **1** is laying properly on the substructure.
- The hydraulic assembly supports **2** are swung out and properly pinned.
- The crawler center section **1** is horizontally aligned.

▶ Unhook the extension ladder **4** from operating position.
▶ Slide the extension ladder **4** together to short length and lock.
▶ Hang the extension ladder **4** in transport position on the crawler center section, point **P1**.
▶ Secure the extension ladder **4** properly in transport position.

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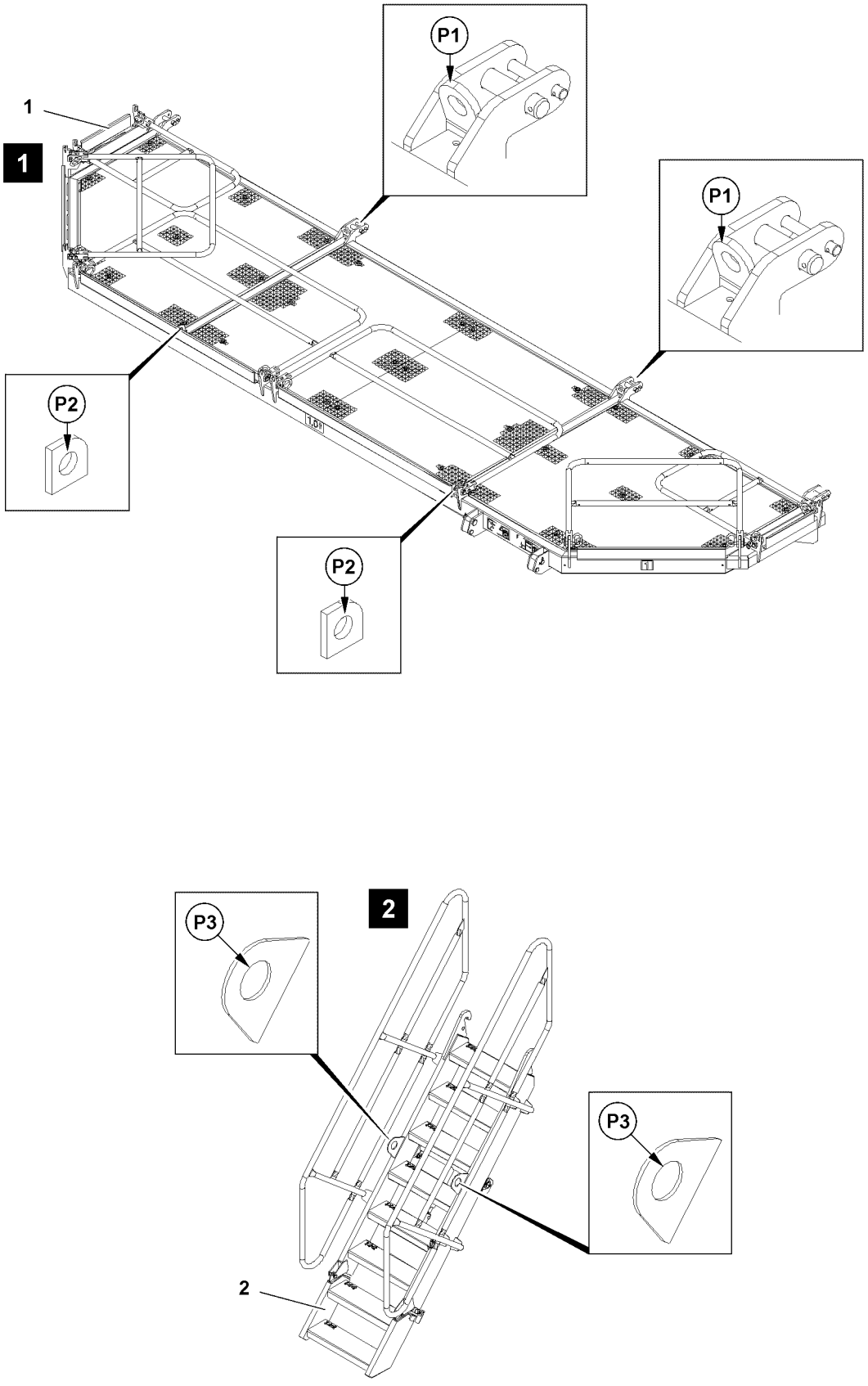

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Fig.117739

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5 Catwalk / stairs crawler travel gear

5.1 Catwalk / stairs fastening points

Fastening points	
P1 + P2	Catwalk **1** with railing

Fastening points	
P3	Stairs **2** with railing

WARNING
Component incorrectly fastened!
Life-threatening situations can arise if components are incorrectly or improperly fastened.
Components can fall down.
Death, severe injury, property damage.
- ▶ Attach the components only on the intended fastening points.
- ▶ Make sure that there is no personnel in the danger zone.
- ▶ Make sure that there are no obstacles within the assembly area.

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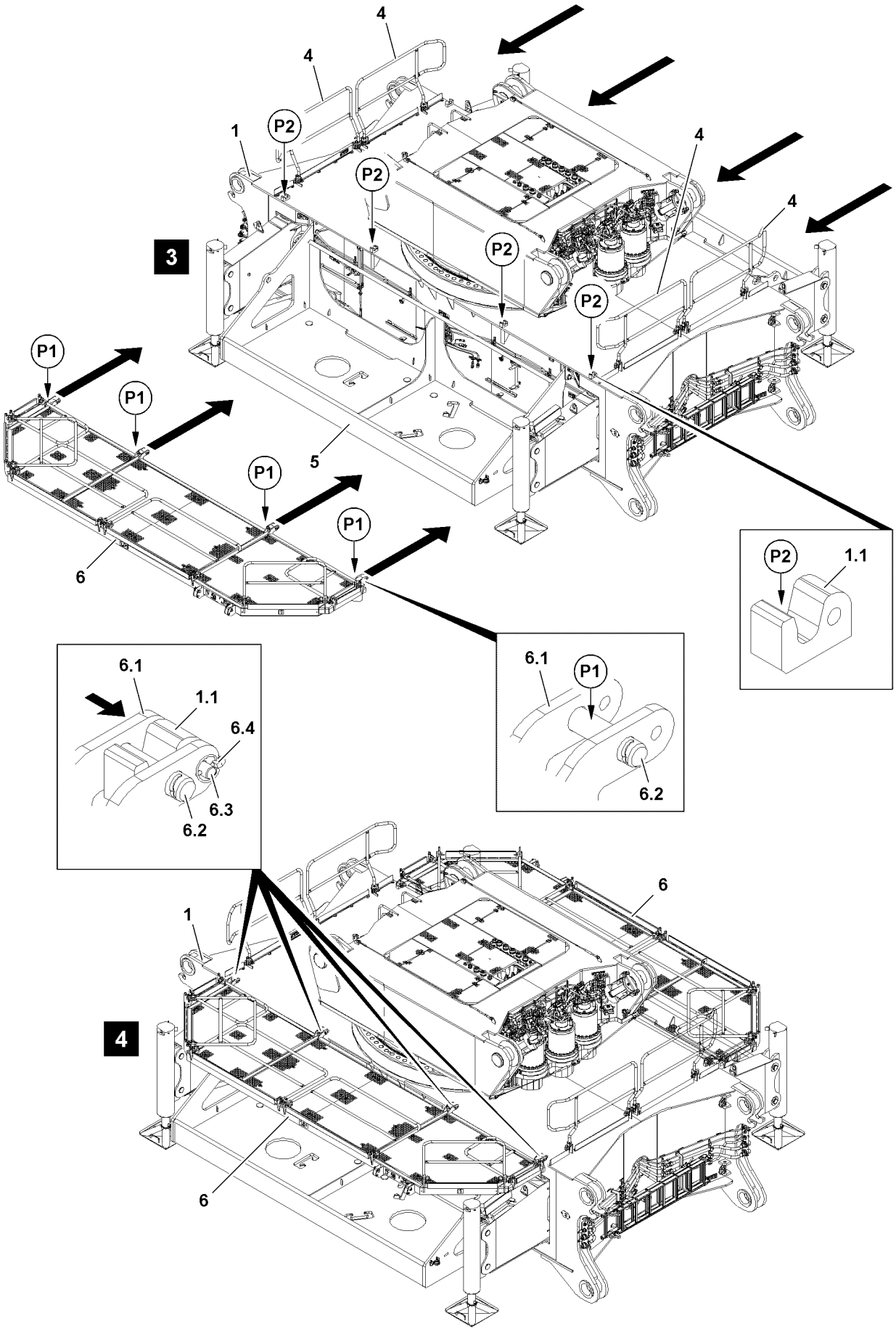

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5.2 Assembling catwalks on crawler center section

WARNING
Danger of falling!
During assembly and disassembly of the catwalks, assembly personnel must be secured with appropriate aids to prevent them from falling.
Even during the assembly of protective devices there is a danger of falling.
Death, severe injury, property damage.
▶ Hang the personal protective equipment on the provided safety ropes.
▶ Keep a safety distance to edges.

WARNING
Danger of crushing!
Death, severe injury, property damage.
▶ Make sure that there are no persons or obstacles within the danger zone when swinging the catwalks **6** in.

5.2.1 Assembling the first catwalk

Note
▶ For simpler illustration, the crane is shown in the following illustrations without turntable and crawler travel gear.

Make sure that the following prerequisites are met:
– The turntable frame main section is properly installed on the crawler center section.
– The SA-frame is properly installed on the turntable frame main section.
– Winches (winch 1, winch 2, winch 4) are properly installed on the turntable frame main section.
– The crawler carriers are properly assembled on the crawler center section.
– The crawler travel gear is completely lowered to the ground.
– The central ballast brackets are properly assembled on the crawler center section.
– The central ballast is placed according to the erection and take down chart.
– The catwalk is properly fastened on the auxiliary crane, see section „Fastening points catwalk / stairs“.

▶ Lift the catwalk **6** with the auxiliary crane.
▶ Swing the catwalk **6** in with the auxiliary crane to the crawler center section **1**.
▶ Hang the catwalk **6** with the hook pins **6.2** (point **P1**) on the hooks **1.1** (point **P2**), see illustration **3**.

When the catwalk **6** is properly hooked with the hook pins **6.2** on the hooks **1.1**:
▶ Insert the retaining pins **6.3** on all pin points and secure with locking pin **6.4**, see illustration **4**.

Result:

– The catwalk **6** is properly assembled and secured.

▶ Remove the fastening equipment on the first catwalk **6**.

5.2.2 Assembling the second catwalk

Note
▶ The assembly of the second catwalk is identical with the assembly procedure of the first catwalk.

▶ Assemble the second catwalk according to the description of the first catwalk.

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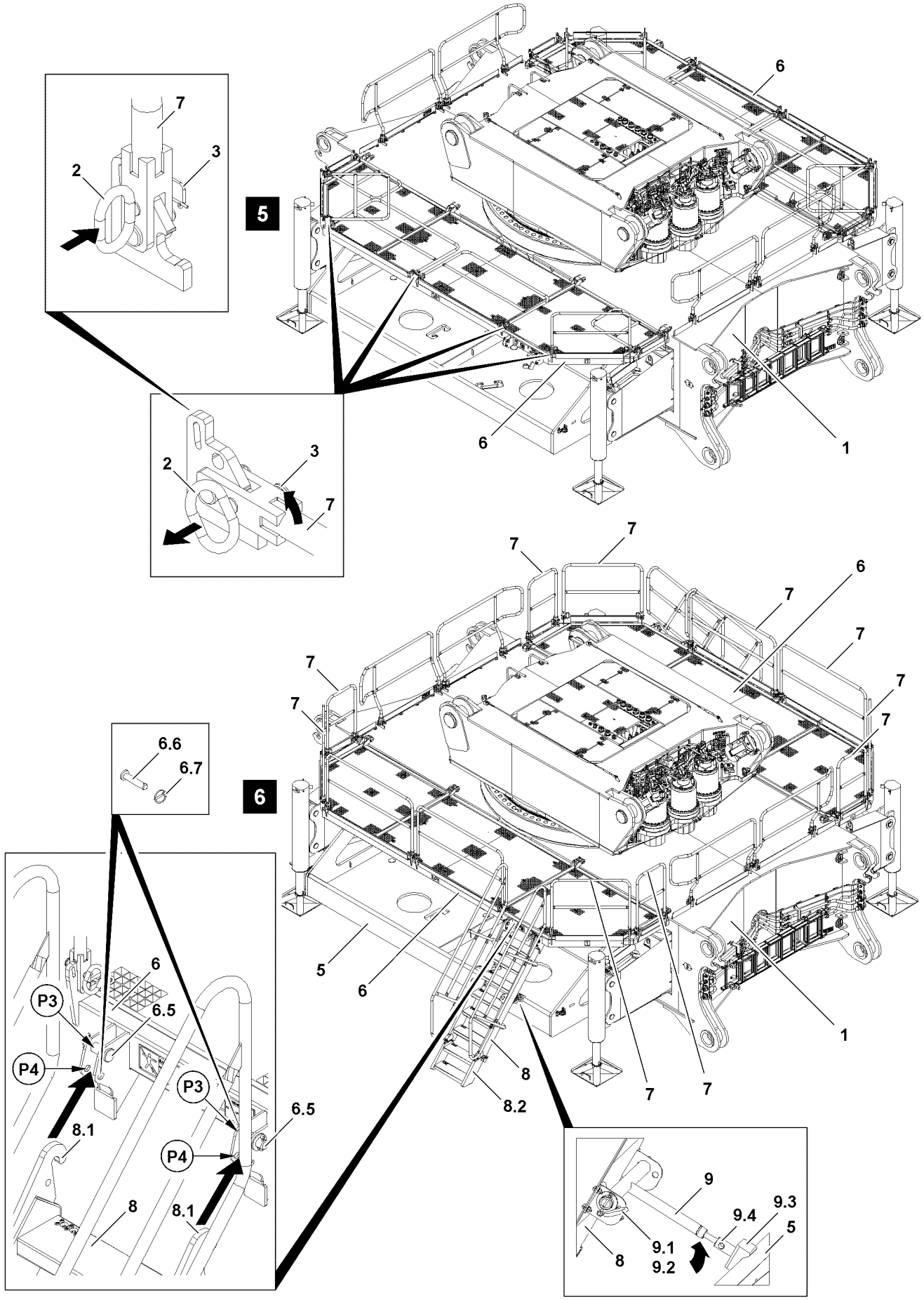

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5.3 Swinging the railing on the catwalk into operating position

WARNING
Danger of crushed limbs!
When swinging the railings, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Release the railing **7** from the transport position: Remove the spring retainer **3** and unpin the connector **2**, see illustration **5**.

When the railings **7** are released:
▶ Swing the railing **7** into the operating position.
▶ Secure the railing **7** in the operating position: Insert the connector **2** and secure with spring retainer **3**.

Note
▶ The assembly procedure of the railing on the second catwalk is identical with the procedure on the first catwalk.

▶ Swing and secure railing **7** on the second catwalk into operating position.

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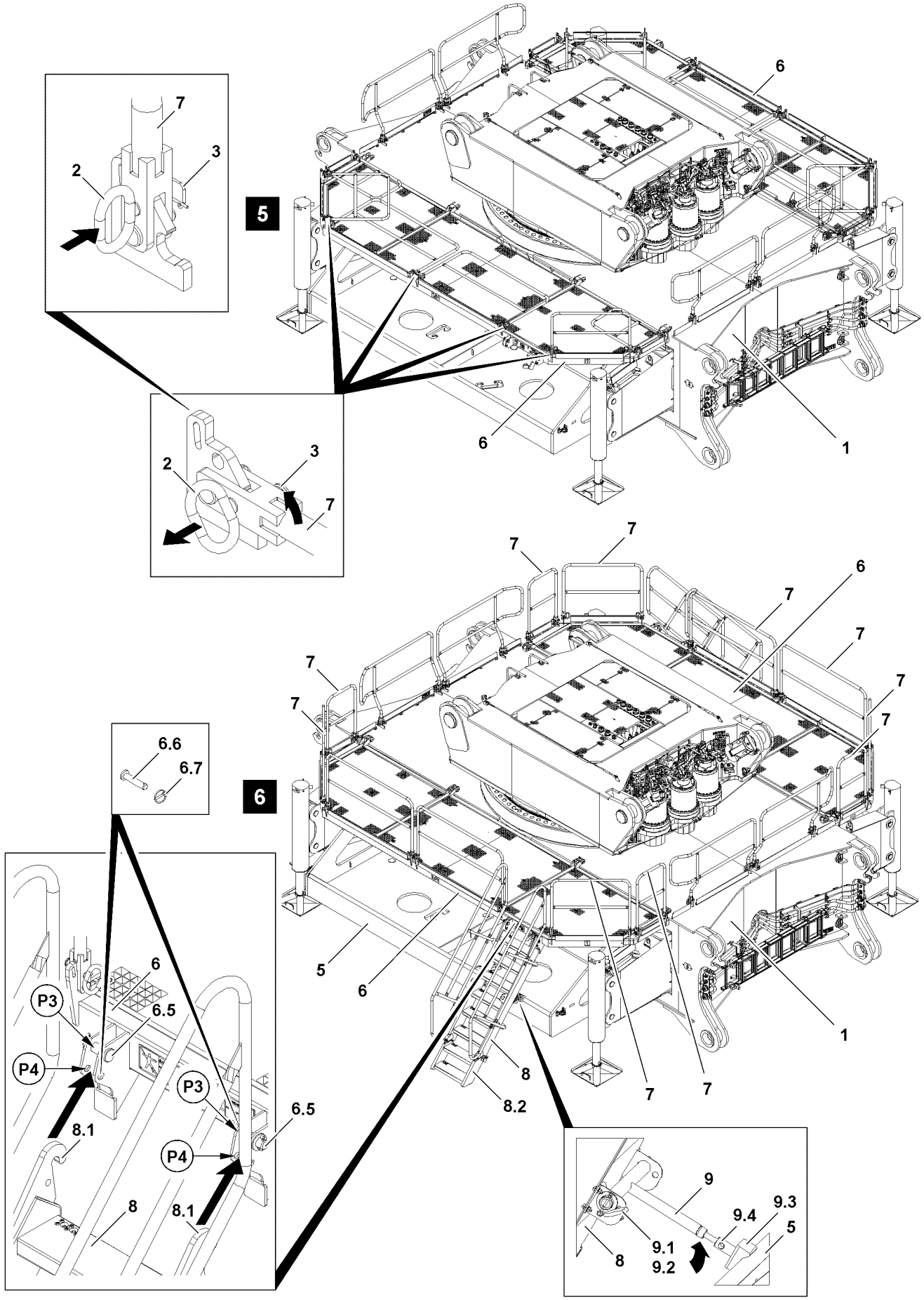

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5.4 Assembling the stairs on the catwalk

WARNING
Danger of crushing!
Death, severe injury, property damage.
▶ Make sure that there are no persons or obstacles within the danger zone when swinging the stairs **8** in to the catwalk **6**.

5.4.1 Assembling the stairs

NOTICE
Property damage of stairs!
If the support **9** is not installed or improperly installed, then the stairs **8** can be damaged.
▶ Make sure that the support **9** is properly installed before the stairs **8** are accessed.

Make sure that the following prerequisites are met:
– The catwalks **6** are assembled on both sides on the crawler center section.
– The railings **7** are in operating position.

▶ Fasten the stairs **8** on the auxiliary crane, see section „Fastening points catwalk / stairs“.
▶ Lift the stairs **8** with the auxiliary crane.
▶ Swing the stairs **8** in with the auxiliary crane to the installation position on the catwalk **6**.
▶ Hang the stairs **8** with the hook **8.1** at point **P3** on the catwalk **6**.

When the stairs **8** are properly hooked on the catwalk **6**:
▶ Secure the stairs **8** at point **P4** with pin **6.6** and locking pin **6.7**.

Note
▶ The assembly procedure of the stairs on the second catwalk is identical with the procedure on the first catwalk.

5.4.2 Assembling the support

Make sure that the following prerequisite is met:
– The stairs **8** are properly assembled and secured on the catwalk **6**.

▶ Release the support **9** in transport position: Release and unpin the pin **9.1**.
▶ Swing the support **9** upward into operating position.
▶ Pin the support **9** in operating position with pin **9.1** and secure with spring retainer **9.2**, see illustration **6**.
▶ Support the stairs **8**: **9.3**Support the pressure section **9.3** by turning the pressure rod **9.4**.

Result:

– The stairs **8** are supported against the central ballast bracket **5**, see illustration **6**.

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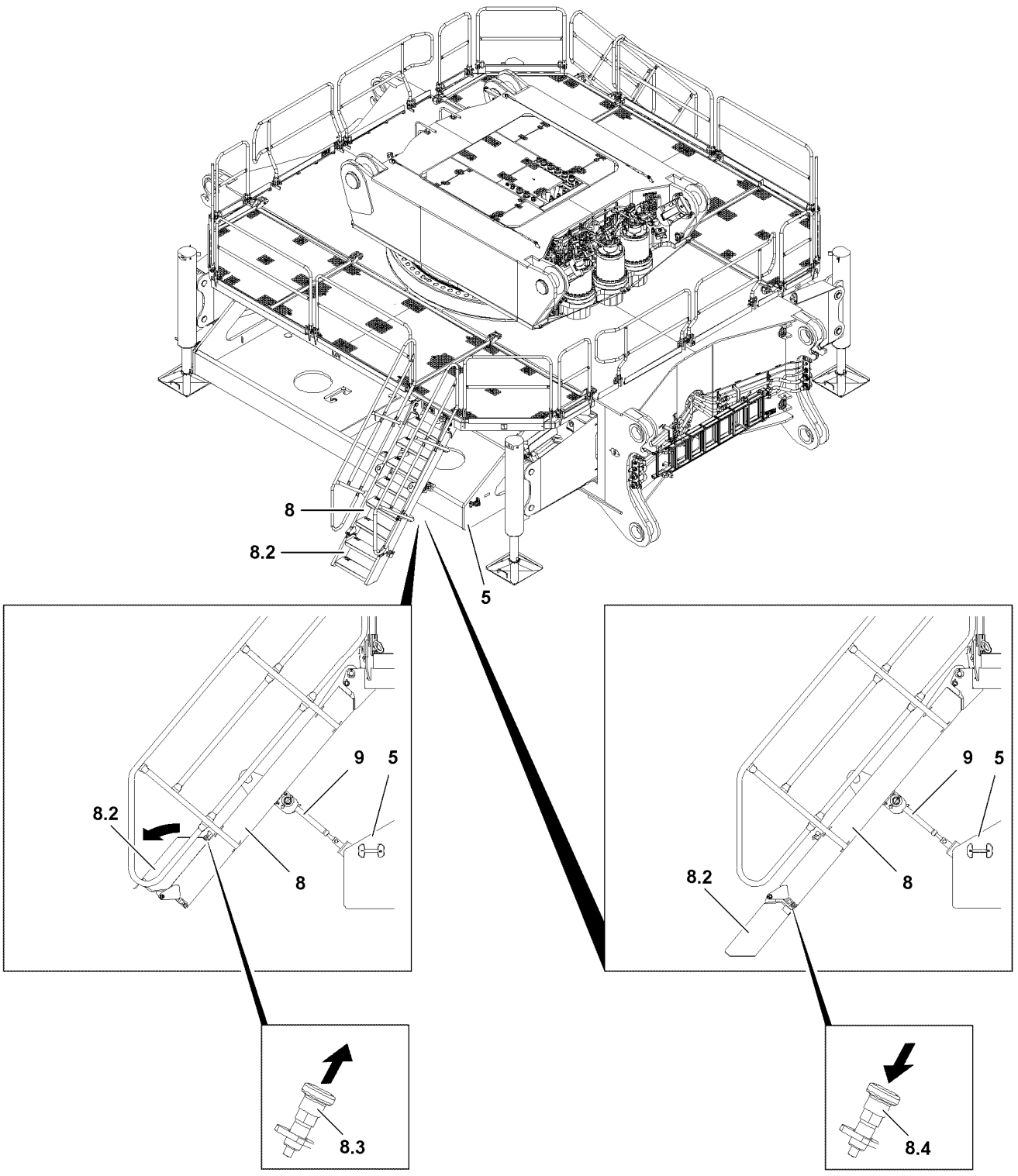

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Fig.117736

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5.4.3 Swinging the stair folding section into operating position

Make sure that the following prerequisites are met:
- The stairs **8** are properly assembled and secured.
- The support **9** is properly installed and secured.
- The stairs **8** are properly supported by the support **9** on the central ballast bracket **5**.

WARNING
Danger of crushed limbs!
When swinging the stair folding section **8.2**, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Pull the detent pin **8.3** up and hold.

Result:

– The stair folding section **8.2** is released.

▶ Fold the stair folding section **8.2** completely down until the detent pin **8.4** engages.

Result:

– The stair folding section **8.2** is in the operating position.

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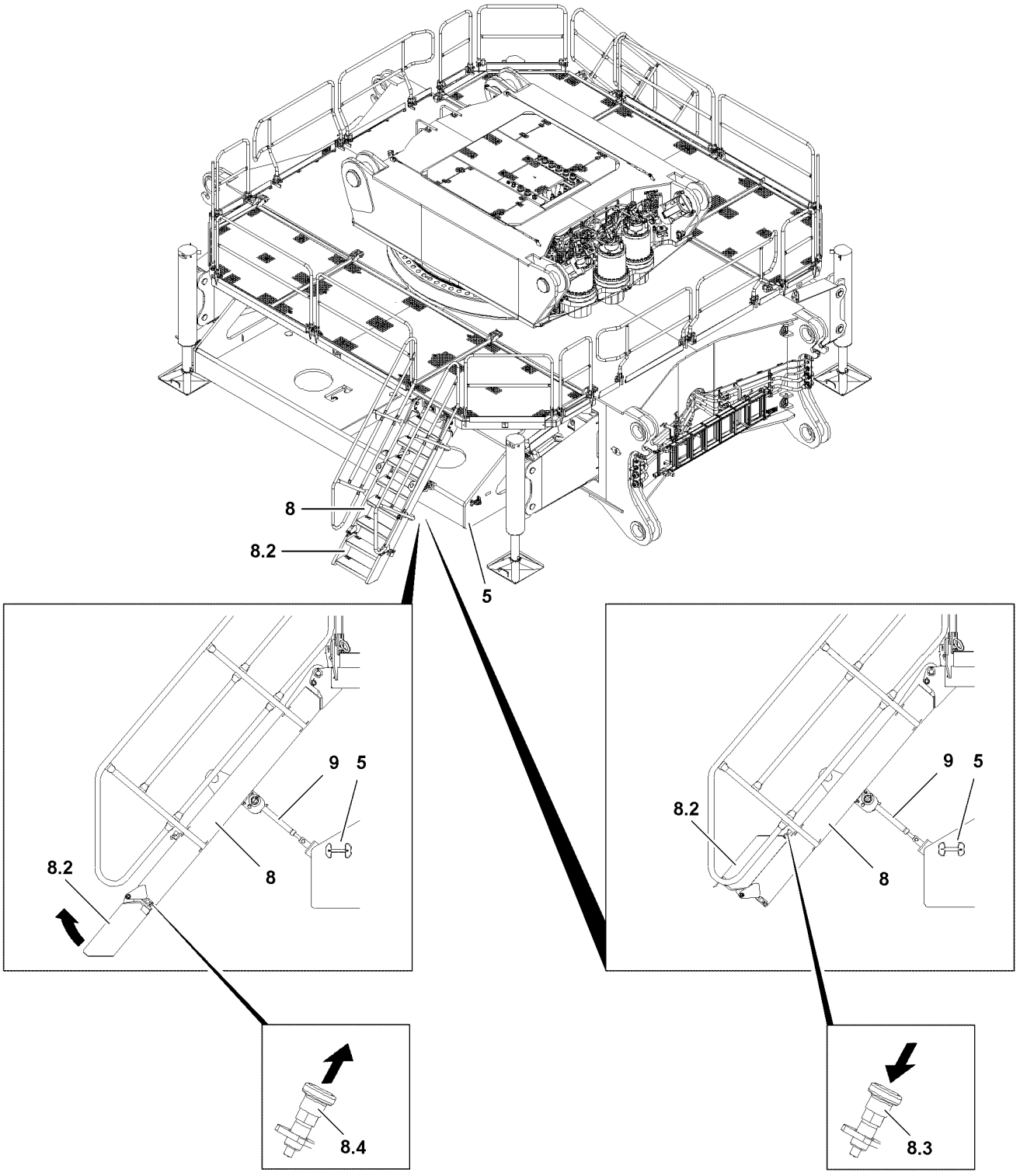

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Fig.117748

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6 Disassembling the crawler travel gear catwalk / stairs

6.1 Disassembling the stairs on the catwalk

WARNING
Danger of crushing!
Death, severe injury, property damage.
▶ Make sure that there are no persons or obstacles within the danger zone when removing the stairs **8**.

6.1.1 Swinging the stair folding section into transport position

WARNING
Danger of crushed limbs!
When swinging the stair folding section **8.2**, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Pull the detent pin **8.4** up and hold.

Result:

– The stair folding section **8.2** is released.

▶ Fold the stair folding section **8.2** completely up until the detent pin **8.3** engages.

Result:

– The stair folding section **8.2** is in transport position.

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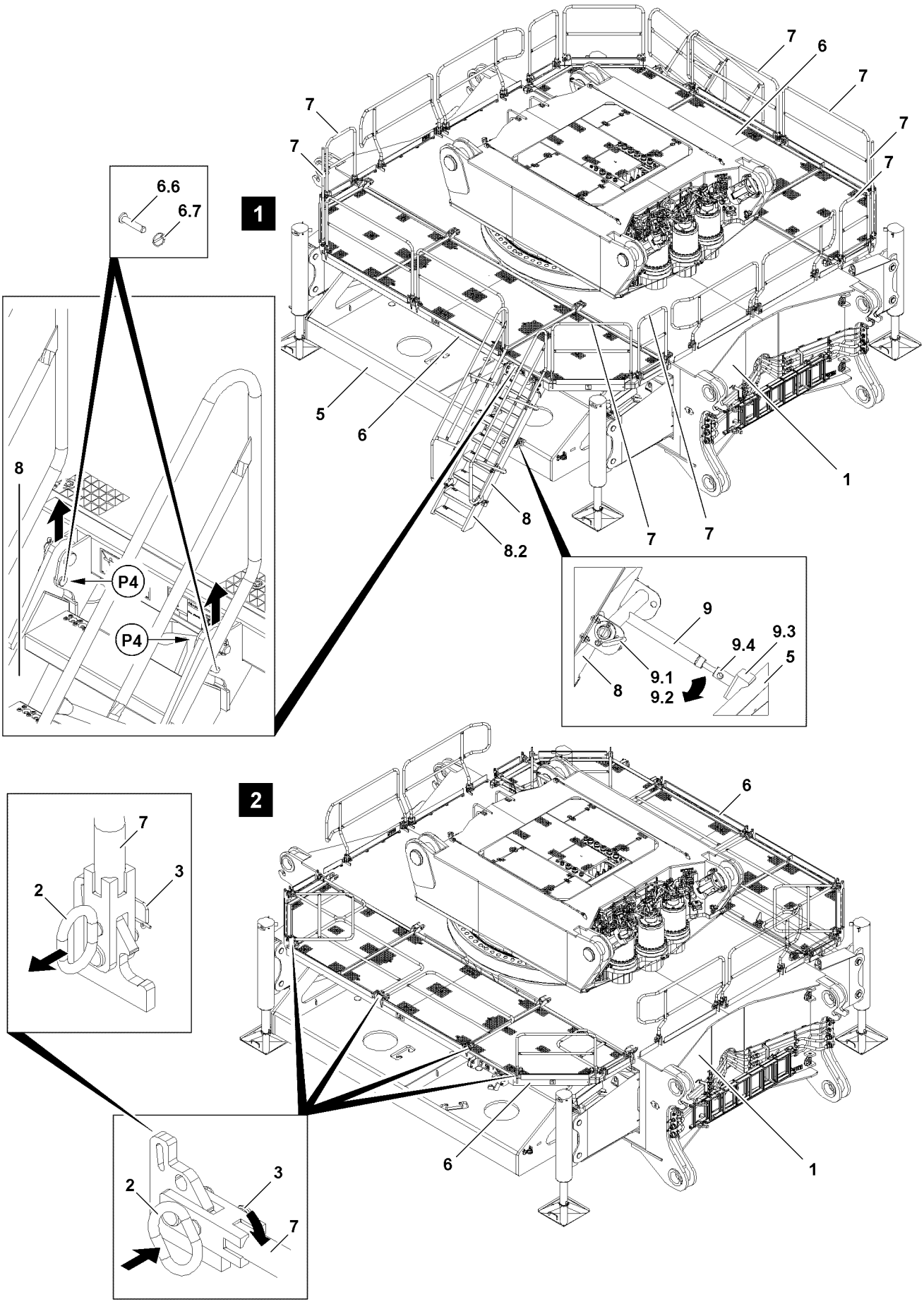

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6.1.2 Removing the support

Make sure that the following prerequisite is met:
- The stair folding section **8.2** is properly folded in transport position and secured.

▶ Relieve the pressure section **9.3** by turning the pressure rod **9.4**.

Result:

- The pressure section **9.3** is „cleared“.
- The stairs **8** are **no longer** supported.

▶ Release the support **9** in operating position: Release and unpin the pin **9.1**.
▶ Swing the support **9** downward into transport position.
▶ Pin the support **9** in transport position with pin **9.1** and secure with spring retainer **9.2**.

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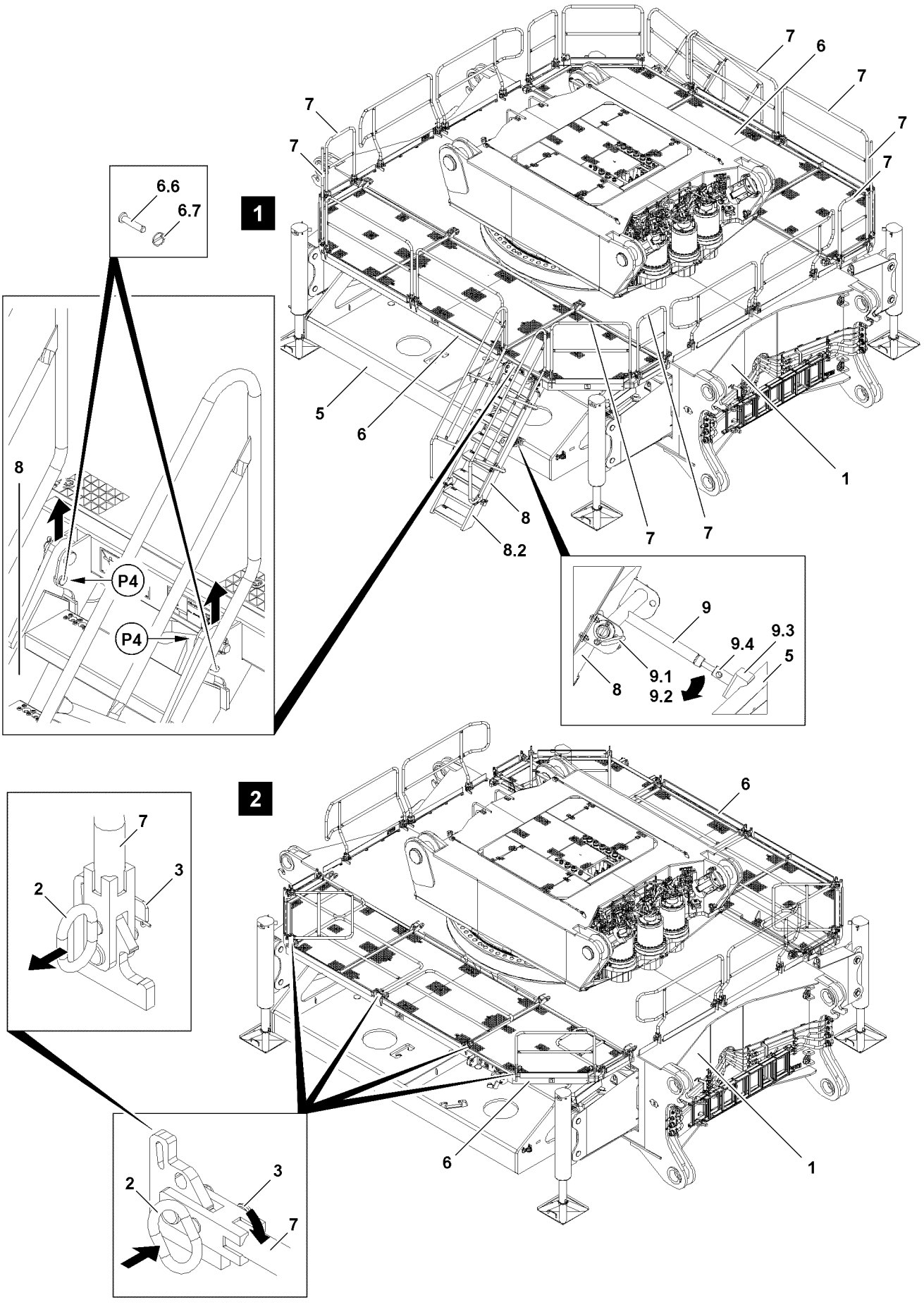

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6.1.3 Disassembling the stairs

WARNING
Oscillating stairs!
When disassembling the stairs, they can start to swing back and forth.
Death, severe injury, property damage.
- ▶ Make sure that there are no obstacles or persons within the danger zone.
- ▶ Secure the stairs **8** with an auxiliary rope to prevent them from swinging back and forth.

Make sure that the following prerequisites are met:
- The stair folding section **8.2** is in transport position.
- The retaining pin **6.6** is released and unpinned on both sides at point **P4**.

- ▶ Fasten the stairs **8** on the auxiliary crane, see section „Fastening points catwalk / stairs“.
- ▶ Lift the stairs **8** with the auxiliary crane.

When the stairs **8** are lifted out on the catwalk **6**:
- ▶ Swing the stairs **8** out with auxiliary crane.
- ▶ Take the stairs **8** down with the auxiliary crane on a proper support.

Note
- ▶ The disassembly procedure of the stairs on the second catwalk is identical with the procedure on the first catwalk.

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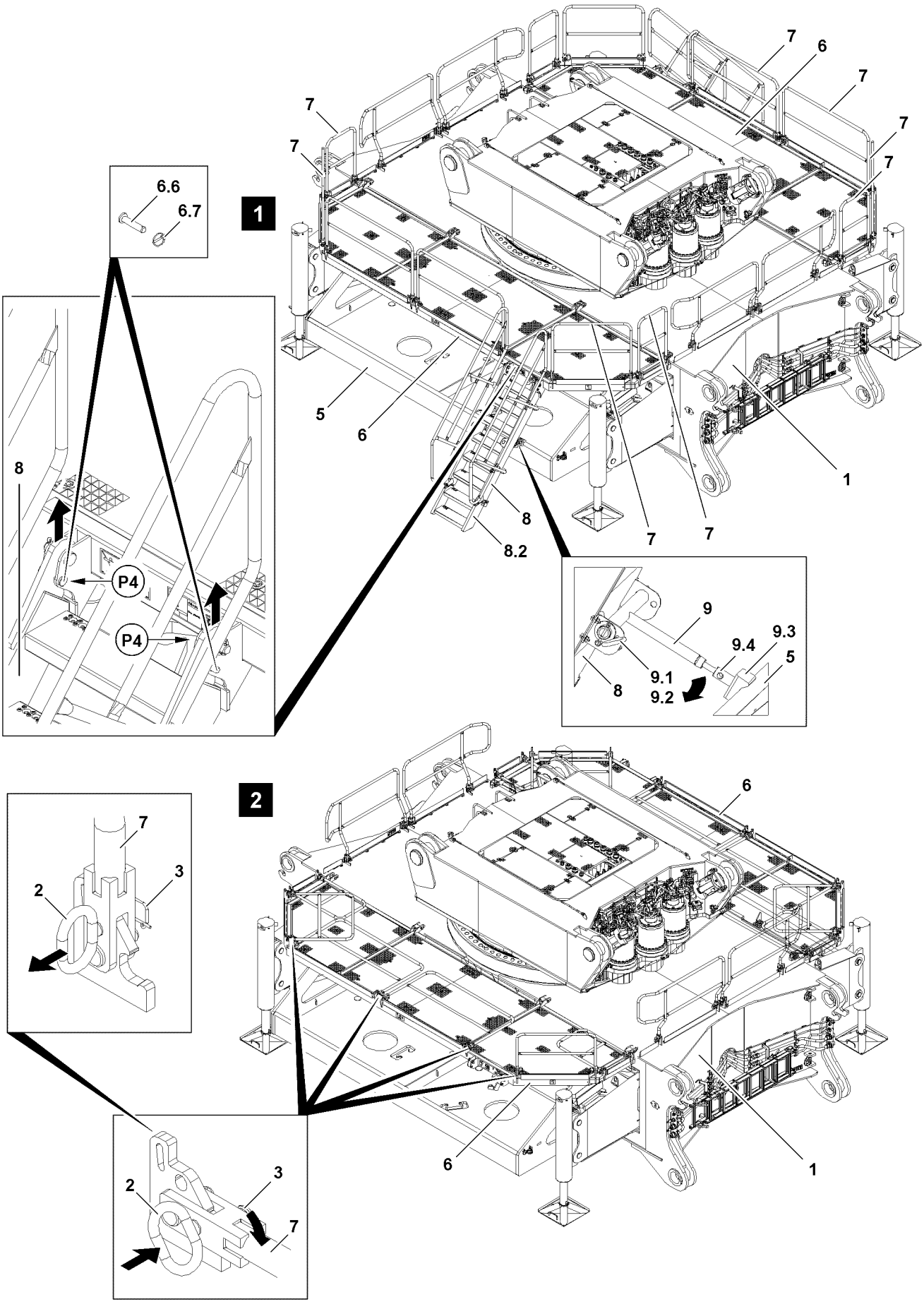

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6.2 Swinging the railing on the catwalk into transport position

WARNING
Danger of crushed limbs!
When swinging the railings, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Release the railing **7** in operating position: Remove the spring retainer **3** and unpin the connector **2**, see illustration **2**.

When the railings **7** are released:
▶ Swing the railing **7** into the transport position.
▶ Secure the railings **7** in transport position: Insert the connector **2** and secure with spring retainer **3**.

Note
▶ The disassembly procedure of the railings on the second catwalk is identical with the procedure on the first catwalk.

▶ Swing and secure railing **7** on the second catwalk into transport position.

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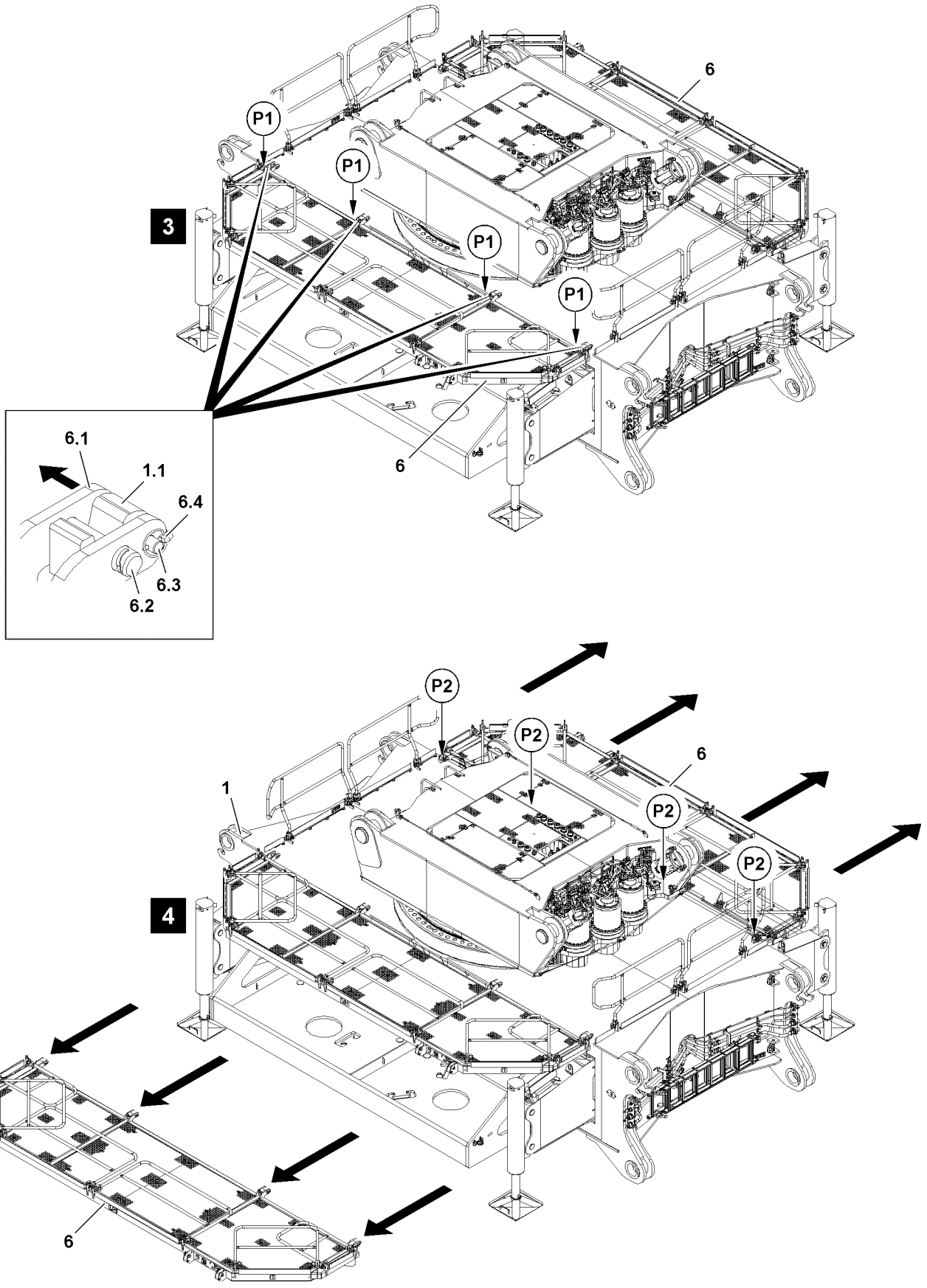

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6.3 Disassembling catwalks on crawler center section

Make sure that the following prerequisites are met:
- The stairs are disassembled on the catwalks.
- All railings on the catwalks are in transport position.

WARNING
Danger of falling!
During assembly and disassembly of the catwalks, assembly personnel must be secured with appropriate aids to prevent them from falling.
Even during the assembly of protective devices there is a danger of falling.
Death, severe injury, property damage.
- ▶ Hang the personal protective equipment on the provided safety ropes.
- ▶ Keep a safety distance to edges.

WARNING
Danger of crushing!
Death, severe injury, property damage.
- ▶ Make sure that there are no persons or obstacles within the danger zone when removing the catwalks **6** on the crawler center section.

6.3.1 Disassembling the first catwalk

Make sure that the following prerequisite is met:
- The catwalk is properly fastened on the auxiliary crane, see section „Fastening points catwalk / stairs“.

When the catwalk **6** is properly fastened on the auxiliary crane:
- ▶ Bring the fastening equipment carefully to tension with the auxiliary crane.

When the fastening equipment is tensioned:
- ▶ Release and unpin the retaining pins **6.3** on all pin points.
- ▶ Lift the catwalk **6** with the auxiliary crane and swing out.
- ▶ Take the catwalk **6** down on the load bearing support.
- ▶ Remove the fastening equipment on the first catwalk **6**.

6.3.2 Disassembling the second catwalk

Note
- ▶ The disassembly of the second catwalk is identical with the disassembly procedure of the first catwalk.

- ▶ Disassemble the second catwalk according to the description of the first catwalk.

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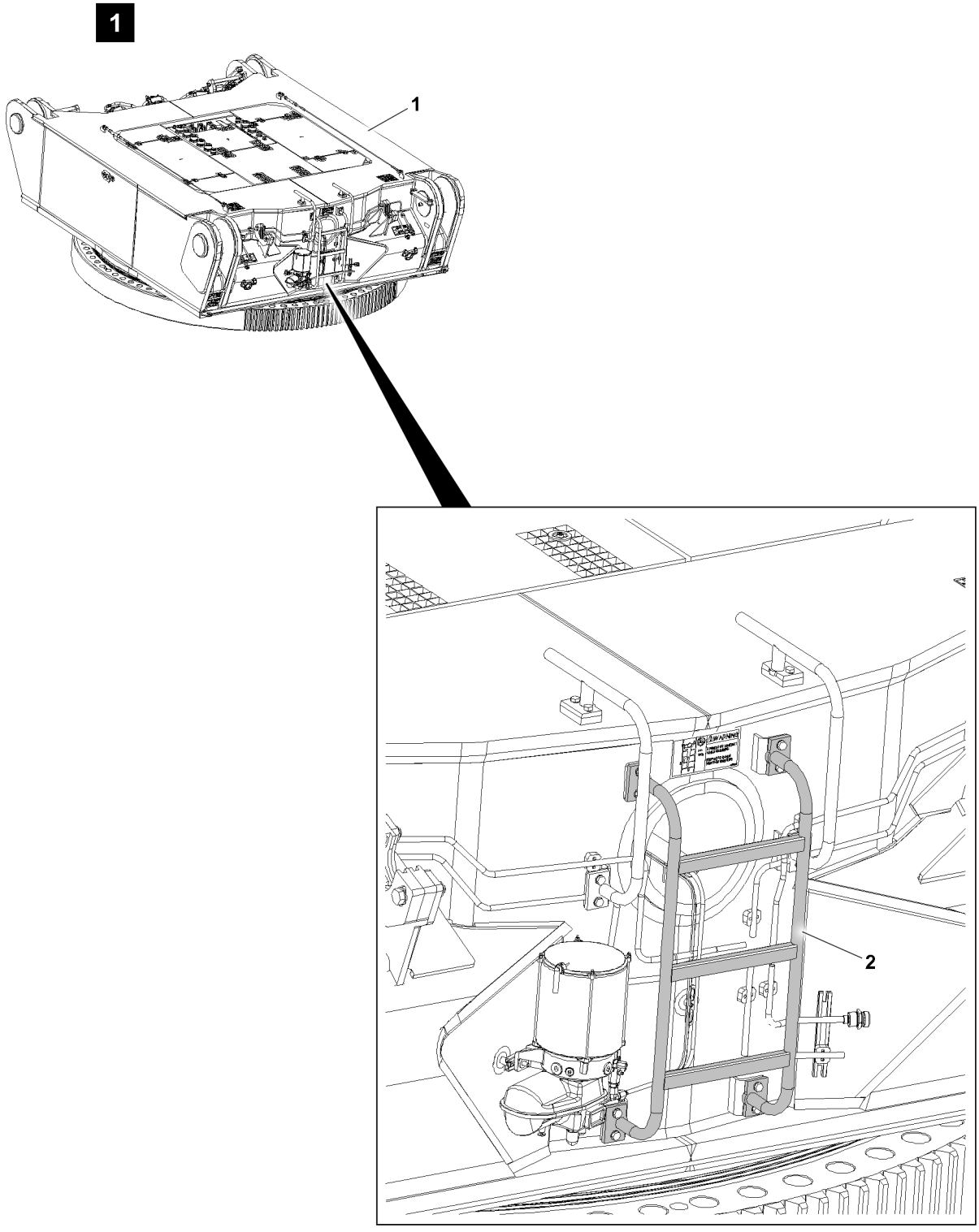

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Fig.126312

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7 Ladder Turntable frame lower section

Depending on the crane type, there are three different versions of ladders turntable frame lower section available:

- Fixed ladder
- Removable ladder
- Removable ladder QC[1)]

1) QC: Quick-Connection

WARNING
Danger of falling!
During assembly and disassembly of the ladder, assembly personnel must be secured with appropriate aids to prevent them from falling.
Even during the assembly of protective devices there is a danger of falling.
Death, severe injury, property damage.
▶ Hang the personal protective equipment on the provided safety ropes.
▶ Keep a safety distance to edges.

WARNING
Danger of falling!
Death, severe injury, property damage.
▶ When ascending and descending, the assembly personnel must ensure a 3-point support.
▶ When ascending and descending, use rungs and ladder beams as handles.
▶ The assembly personnel must step into the rungs deep enough.

7.1 Fixed ladder

Note
▶ Fixed ladder **2**, see illustration **1**.

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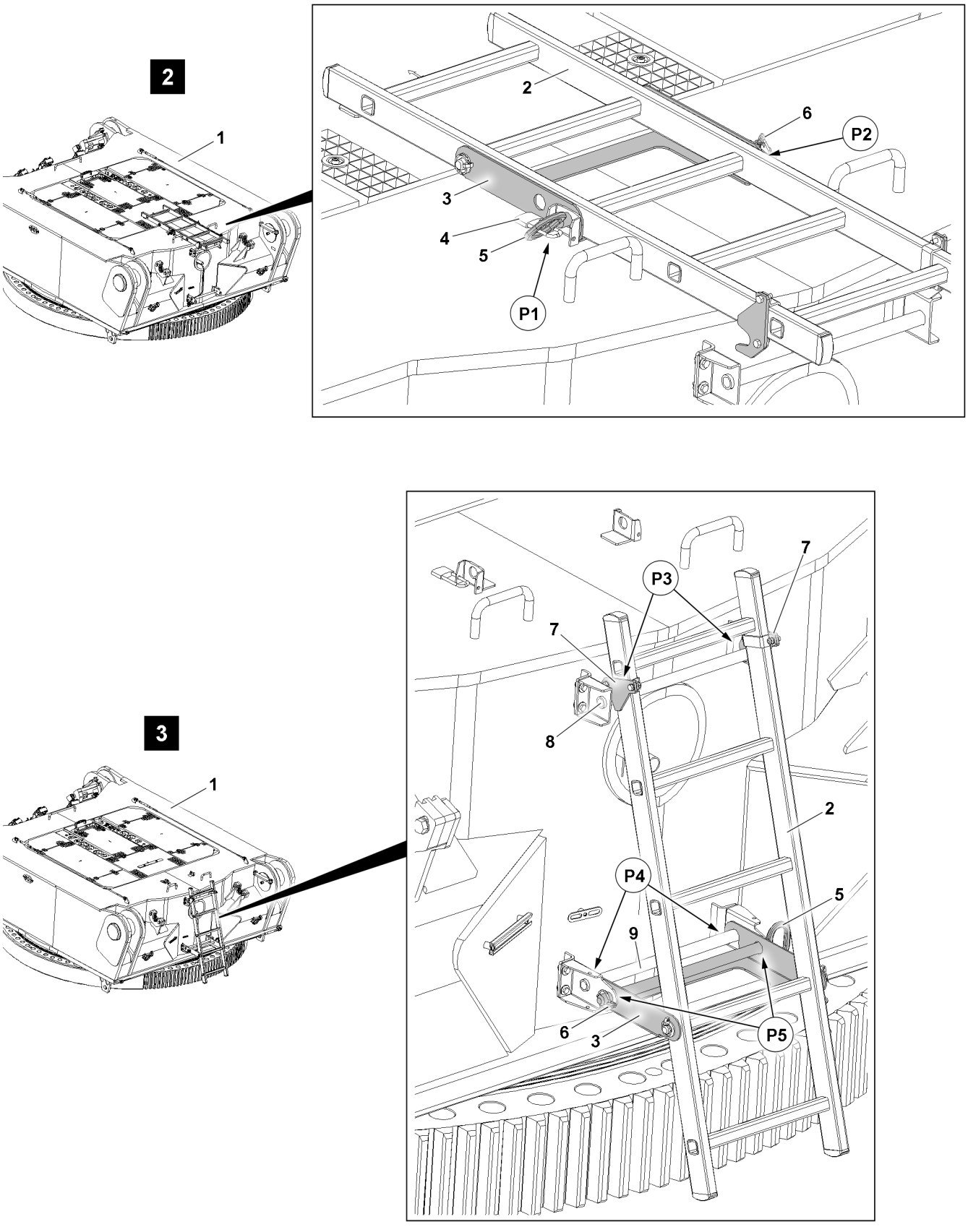

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Fig.126311

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7.2 Removable ladder

7.2.1 Bringing the removable ladder into assembly position

- ▶ Open and remove the lock **4** at point **P1**, see illustration **2**.
- ▶ Remove the safety locking pin **6** at point **P2**.
- ▶ Unpin the grip pin **5**.

WARNING
Danger of crushed limbs!
When removing the ladder **2** the folding mechanism **3** can swing downward uncontrolled!
Fingers and hands can be crushed.
- ▶ When removing the ladder, hold the folding mechanism.

- ▶ Take the removable ladder **2** from park position.
- ▶ Hang the removable ladder with the hook **7** on points **P3** on rod **8**, see illustration **3**.
- ▶ Hang the removable ladder **2** with the folding mechanism **3** on points **P4** on rod **9**.
- ▶ Insert the grip pin **5** at points **P5** and secure with safety locking pin **6**.

Result:

– Removable ladder **2** secured in assembly position.

7.2.2 Bringing the removable ladder into park position

- ▶ Remove the safety locking pin **6** at point **P5** and unpin the grip pin **5**, see illustration **3**.

WARNING
Danger of crushed limbs!
When removing the ladder **2** the folding mechanism **3** can swing downward uncontrolled!
Fingers and hands can be crushed.
- ▶ When removing the ladder, hold the folding mechanism.

- ▶ Take the removable ladder **2** from assembly position.
- ▶ Fold the folding mechanism **3** in.
- ▶ Take the removable ladder **2** down in park position, see illustration **2**.
- ▶ Insert the grip pin **5** at point **P1** through the retainer on the turntable and through the rungs of the removable ladder **2**.
- ▶ Secure the grip pin **5** at point **2** with safety locking pin **6**.
- ▶ Attach the lock **4** at point **P1**.

Result:

– Removable ladder **2** secured in park position.

7.3 Removable ladder QC

Note
- ▶ Removable ladder QC differs from the removable ladder only by the number of rungs.
- ▶ Assembly and disassembly of the removable ladder QC are identical with the assembly and disassembly of the removable ladder.

Ladder	Removable ladder	Removable ladder QC[1)]
Number of rungs	5	6

1) QC: Quick-Connection

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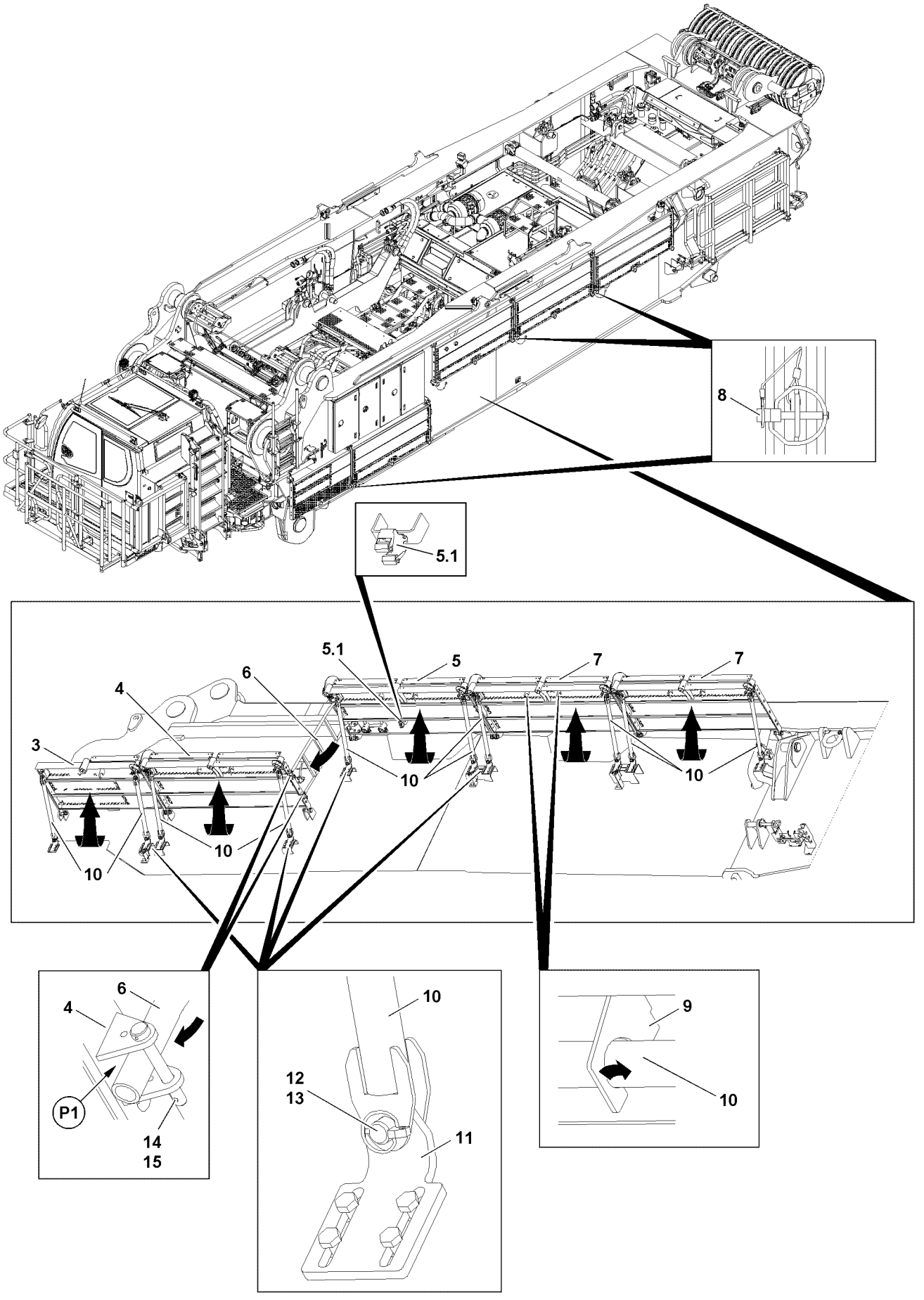

Fig.118173

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8 Catwalks and railing on the turntable frame main section

WARNING
Danger of falling!
During assembly and disassembly of the protective equipment and / or the fall protection equipment, there is also a danger of falling for the assembly personnel.
Death, severe injury, property damage.
- ▶ Use suitable and approved aids, such as working platforms.
- ▶ The assembly personnel must secure themselves during assembly and disassembly work with suitable aids to prevent them from falling.
- ▶ Use personal protective equipment.

8.1 Assembling the catwalks on the left turntable frame main section in operating position

WARNING
Danger of accident due to catwalks!
Due to improper assembly of the catwalks, the catwalks can suddenly fold down.
Death, severe injury, property damage.
- ▶ Make sure that the catwalks are pinned and secured properly in operating position.

Note
- ▶ Carry out the assembly of the catwalks starting with catwalk **3** from the „front“ to the „rear“.

Make sure that the following prerequisites are met:
- The turntable frame main section is on the flatbed trailer.
- Appropriate aids, such as a scaffolding or working platform are available.

8.1.1 Assembling catwalk 3 in operating position

- ▶ Release the transport retainers for all catwalks: Remove locking pins **8** on the catwalks.
- ▶ Swing the catwalks **3** upward into operating position.
- ▶ Take the supports **10** from the transport retainers **9** on the underside of the catwalk **3**.
- ▶ Pin the supports **10** on both sides on the retaining plates **11** with pins **12** and secure with locking pins **13**.

Result:

- The catwalk **3** is in operating position.

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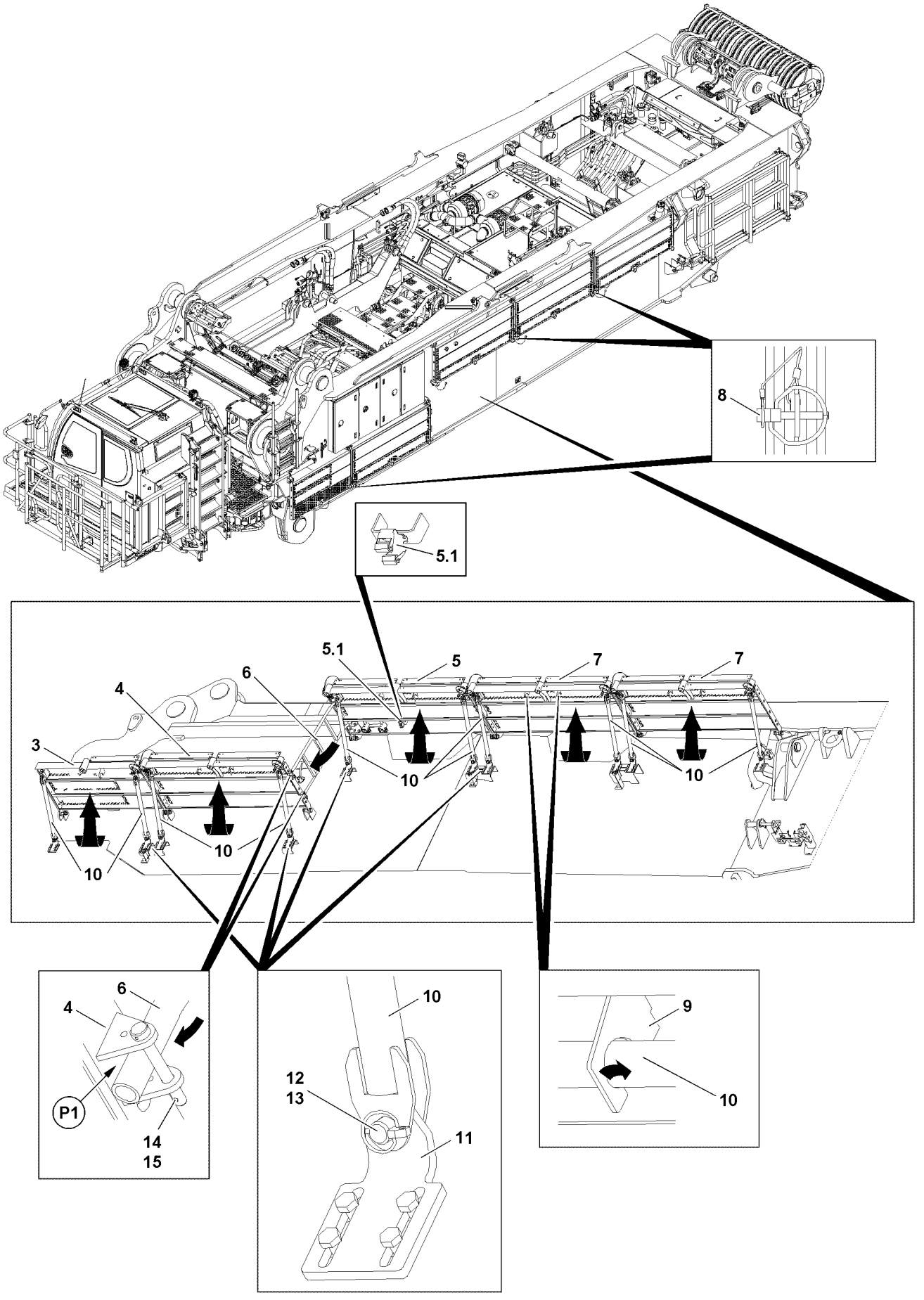

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8.1.2 Assembling catwalk 4 in operating position

Note

▶ The assembly of the catwalk **4** is identical to the installation of the catwalk **3**.

▶ Assemble the catwalk **4** properly, pin and secure.

Result:

– The catwalk **4** is in operating position.

8.1.3 Assembling catwalk 5 in operating position

Make sure that the following prerequisites are met:
– The catwalk **3** is properly assembled and secured.
– The catwalk **4** is properly assembled and secured.

▶ Swing the catwalks **5** upward into operating position.

WARNING
Swinging ladder!
If the ladder **6** is released from the clamp **5.1** then the ladder **6** can swing down by itself.
Death, severe injury, property damage.
▶ Make sure that the ladder **6** is held safely in position when releasing it from the clamp **5.1**.
▶ After releasing it, move the ladder **6** downward vertically.

▶ Pull the ladder **6** from the clamp **5.1** on the catwalk **5** and guide it carefully downward.
▶ Let the ladder **6** hang first in this position.
▶ Take the supports **10** from the transport retainers **9** on the underside of the catwalk **5**.
▶ Pin the supports **10** on both sides on the retaining plates **11** with pins **12** and secure with locking pins **13**.

Result:

– The catwalk **5** is in operating position.

▶ Fasten the ladder **6** on the catwalk **4** at point **P1**: Insert the pin **14** on both sides and secure with the spring retainer **15**.

Result:

– The ladder **6** is in operating position.

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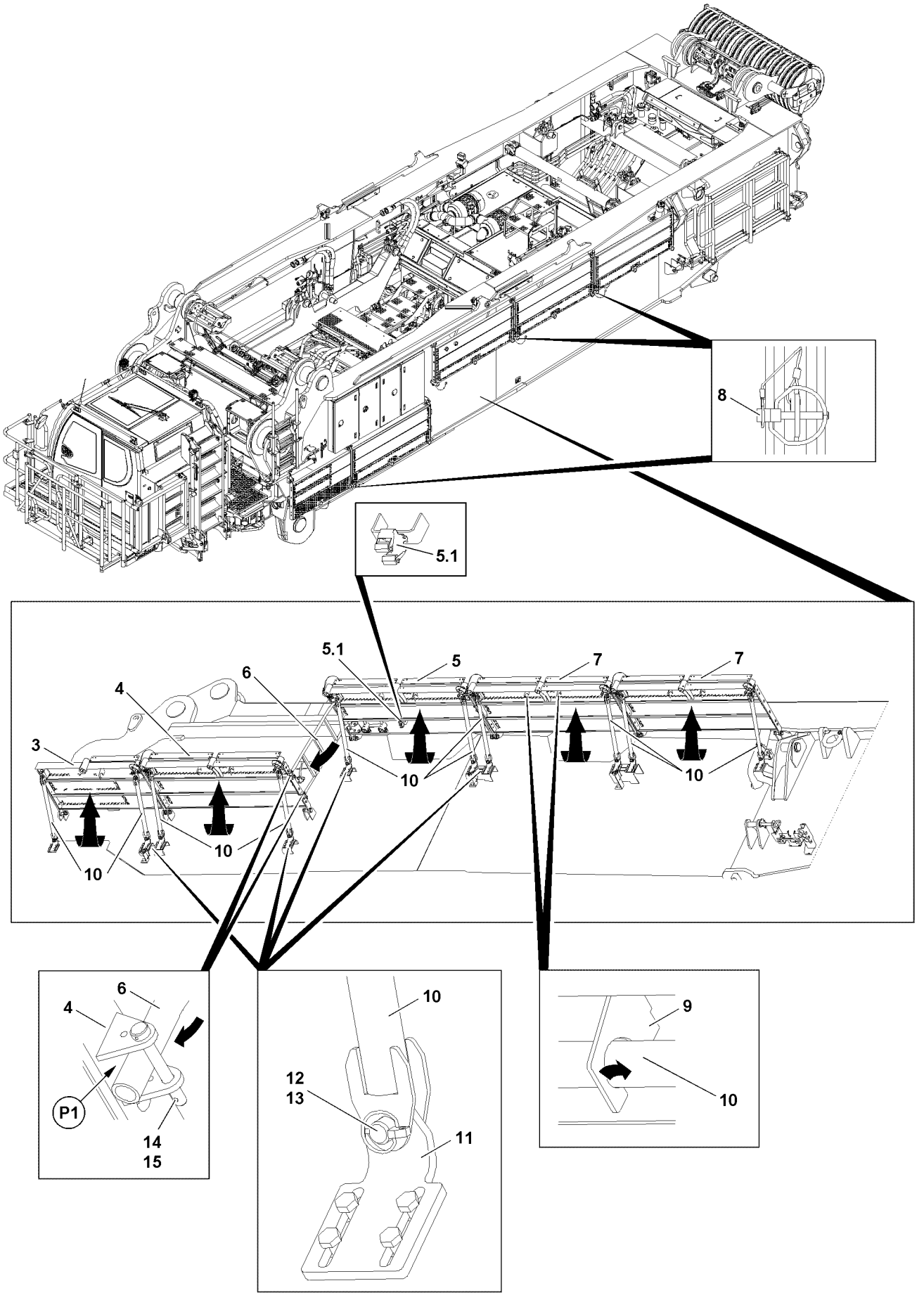

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8.1.4 Assembling catwalk 7 in operating position

Make sure that the following prerequisites are met:
- The catwalk **5** is properly assembled and secured.
- The ladder **6** is properly installed and secured.
- The catwalks **7** are released in transport position.

▶ Swing the catwalks **7** upward into operating position.
▶ Take the supports **10** from the transport retainers **9** on the underside of the catwalk **7**.
▶ Pin the supports **10** on both sides on the retaining plates **11** with pins **12** and secure with locking pins **13**.

Result:

– The catwalk **7** is in operating position.

Note
▶ The assembly of the second catwalk **7** is identical with the assembly of the first catwalk **7**.

▶ Assemble the second catwalk **7** properly, pin and secure.

Result:

– All catwalks on the outside of the turntable frame main section are in operating position.

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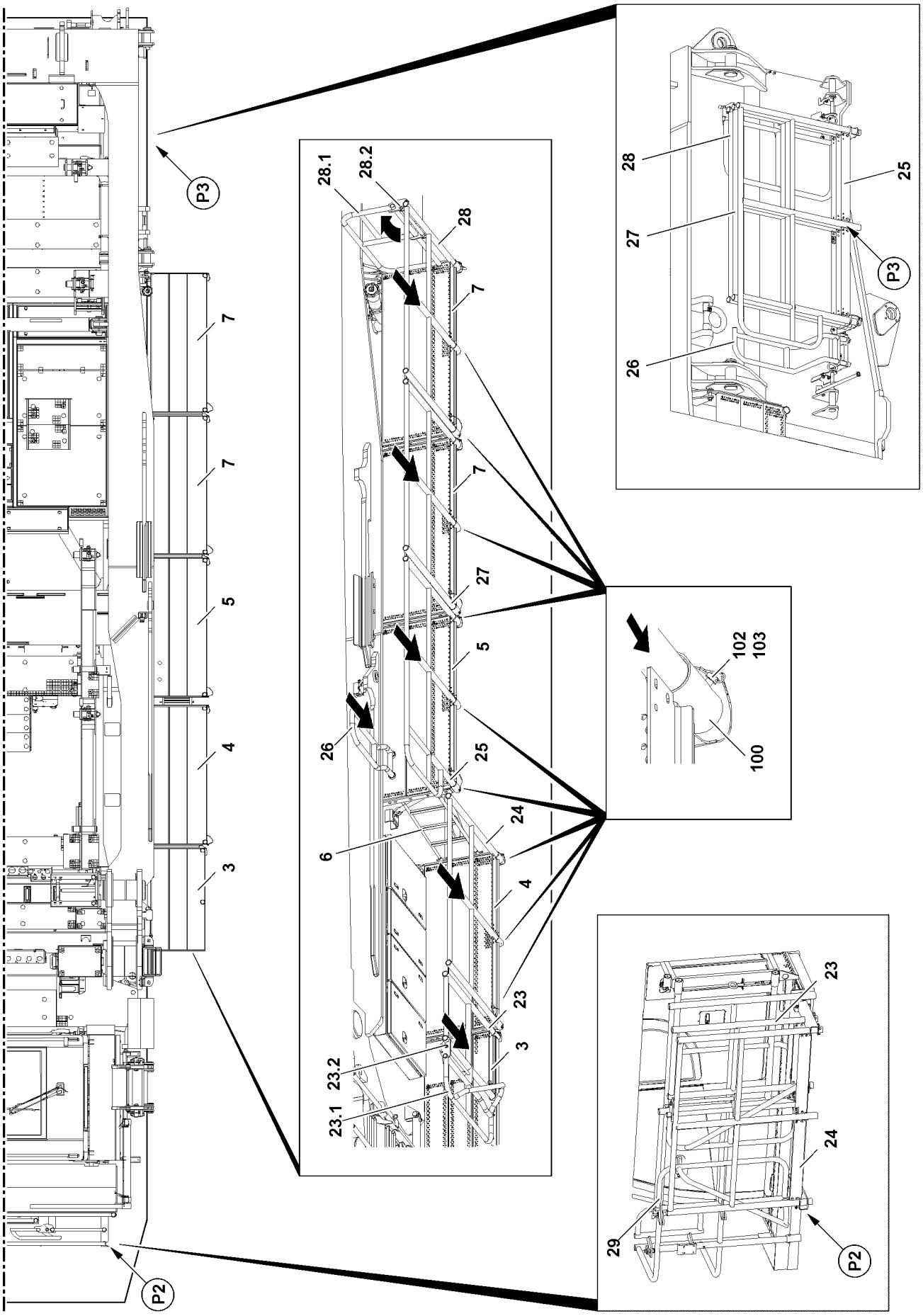

Fig.118174

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8.2 Assembling the railings on the left turntable frame main section in operating position

Make sure that the following prerequisites are met:
- The crane operator's cab is in transport position.
- The catwalks on the turntable frame main section are assembled in operating position and secured.
- The ladder **6** is installed and secured in operating position.
- The railings are released in the transport retainers at point **P2** and point **P3**.

8.2.1 Assembling railing 24 on catwalk 4

▶ Remove the railing **24** from the transport retainer at point **P2**.
▶ Insert the railing **24** in the receptacle sleeves **100** on catwalk **4**.

When the railing **24** is properly inserted in the receptacle sleeves **100** on catwalk **4**:
▶ Pin the railing **24** in the receptacle sleeves **100** with pin **102** and secure with spring retainer **103**.

8.2.2 Assembling railing 23 on catwalk 3

▶ Remove the railing **23** from the transport retainer at point **P2**.
▶ Insert the railing **23** in the receptacle sleeves **100** on catwalk **3**.

When the railing **23** is properly inserted in the receptacle sleeves **100** on catwalk **3**:
▶ Pin the railing **23** in the receptacle sleeves **100** with pin **102** and secure with spring retainer **103**.
▶ Lock the swing bar **23.1** in operating position in stretched direction to railing **23**.

8.2.3 Assembling railing 25 and railing 26 on catwalk 5

▶ Remove the railing **25** from the transport retainer at point **P3**.
▶ Insert the railing **25** in the receptacle sleeves **100** on catwalk **5**.

When the railing **25** is properly inserted in the receptacle sleeves **100** on catwalk **5**:
▶ Pin the railing **25** in the receptacle sleeves **100** with pin **102** and secure with spring retainer **103**.

When the railing **25** is properly installed and secured:
▶ Remove the railing **26** from the transport retainer at point **P3**.
▶ Insert the railing **26** in the receptacle sleeves **100** on catwalk **5**.

When the railing **26** is properly inserted in the receptacle sleeves **100** on catwalk **5**:
▶ Pin the railing **26** in the receptacle sleeves **100** with pin **102** and secure with spring retainer **103**.

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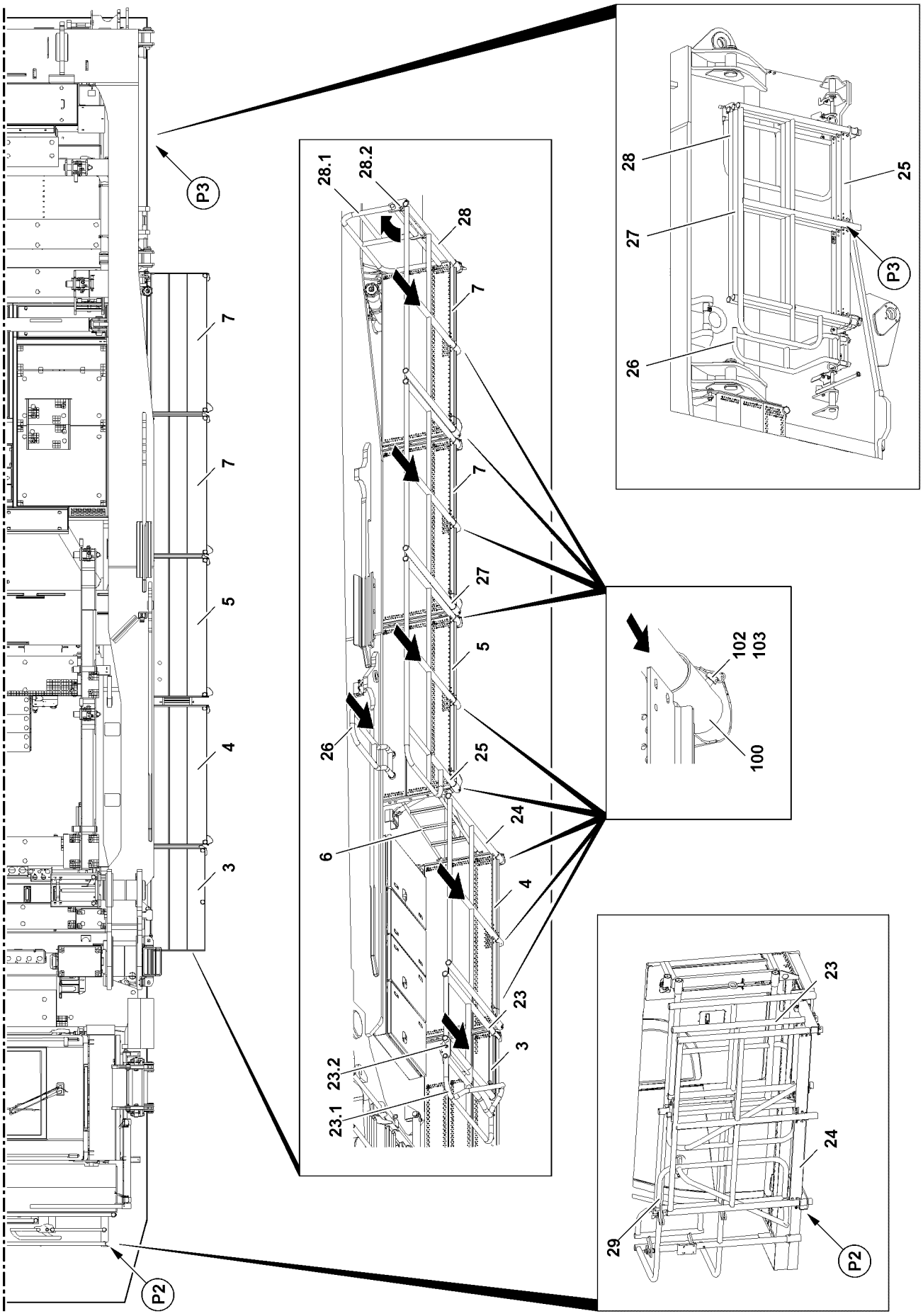

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8.2.4 Assembling railing 27 on catwalk 7

▶ Remove the railing **27** from the transport retainer at point **P3**.
▶ Insert the railing **27** in the receptacle sleeves **100** on catwalk **7**.

When the railing **27** is properly inserted in the receptacle sleeves **100** on catwalk **7**:
▶ Pin the railing **27** in the receptacle sleeves **100** with pin **102** and secure with spring retainer **103**.

8.2.5 Assembling railing 28 on catwalk 7

▶ Remove the railing **28** from the transport retainer at point **P3**.
▶ Insert the railing **28** in the receptacle sleeves **100** on catwalk **7**.

When the railing **28** is properly inserted in the receptacle sleeves **100** on catwalk **7**:
▶ Pin the railing **28** in the receptacle sleeves **100** with pin **102** and secure with spring retainer **103**.
▶ Bring the swing bar **28.1** from railing **28** in operating position: Pull the detent pin **28.2** up and swing the swing bar **28.1** outward into operating position.

Result:

– The swing bar **28.1** is locked at a 90° angle to railing **28** (operating position).

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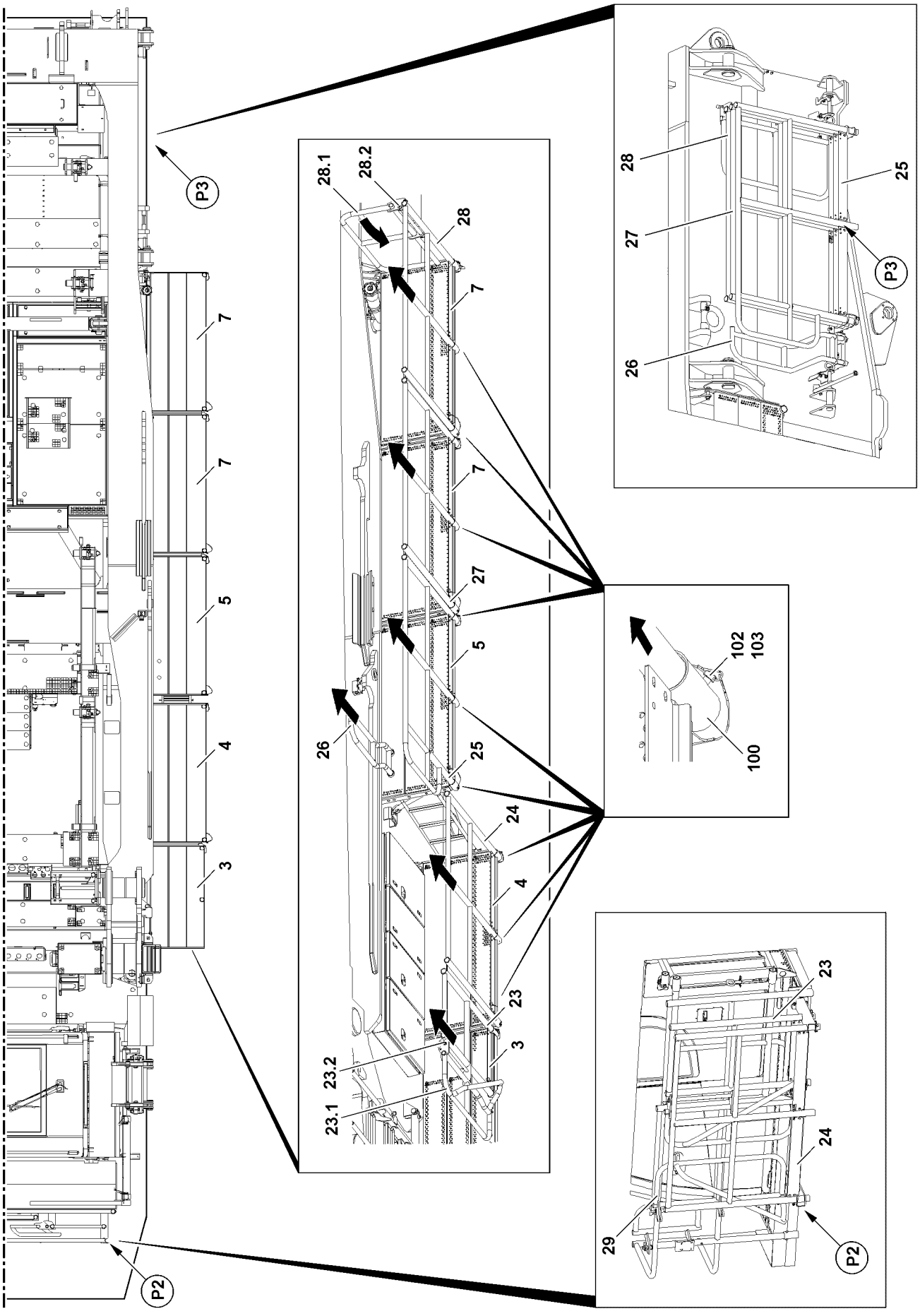

Fig.118177

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8.3 Assembling the railings on the left turntable frame main section in transport position

Make sure that the following prerequisites are met:
- The turntable frame main section is on the flatbed trailer.
- The crane operator's cab is in transport position.

8.3.1 Disassembling railing 28 on catwalk 7

- ▶ Bring the swing bar **28.1** from railing **28** in transport position: Pull the detent pin **28.2** up and swing the swing bar **28.1** inward into transport position.
- ▶ Lock the swing bar **28.1** in transport position.
- ▶ Release the railing **28** in the receptacle sleeves **100** on catwalk **7**.
- ▶ Lift the railing **28** from the receptacle sleeves **100** on catwalk **7**.
- ▶ Insert the railing **28** in the transport retainer on the turntable frame main section at point **P3**, insert pins and secure with spring retainers.

8.3.2 Disassembling railing 27 on catwalk 7

- ▶ Release the railing **27** in the receptacle sleeves **100** on catwalk **7**.
- ▶ Lift the railing **27** from the receptacle sleeves **100** on catwalk **7**.
- ▶ Insert the railing **27** in the transport retainer on the turntable frame main section at point **P3**, insert pins and secure with spring retainers.

8.3.3 Disassembling railing 25 and railing 26 on catwalk 5

- ▶ Release the railing **25** in the receptacle sleeves **100** on catwalk **5**.
- ▶ Lift the railing **25** from the receptacle sleeves **100** on catwalk **5**.
- ▶ Insert the railing **25** in the transport retainer on the turntable frame main section at point **P3**, insert pins and secure with spring retainers.
- ▶ Release the railing **26** in the receptacle sleeves **100** on catwalk **5**.
- ▶ Lift the railing **26** from the receptacle sleeves **100** on catwalk **5**.
- ▶ Insert the railing **26** in the transport retainer on the turntable frame main section at point **P3**, insert pins and secure with spring retainers.

8.3.4 Disassembling railing 23 on catwalk 3

- ▶ Release the railing **23** in the receptacle sleeves **100** on catwalk **3**.
- ▶ Lift the railing **23** from the receptacle sleeves **100** on catwalk **3**.
- ▶ Insert the railing **23** in the transport retainer on the crane operator's cab at point **P2**, insert pin and secure with spring retainer.

8.3.5 Disassembling railing 24 on catwalk 4

- ▶ Release the railing **24** in the receptacle sleeves **100** on catwalk **4**.
- ▶ Lift the railing **24** from the receptacle sleeves **100** on catwalk **4**.
- ▶ Insert the railing **24** in the transport retainer on the crane operator's cab at point **P2**, insert pin and secure with spring retainer.

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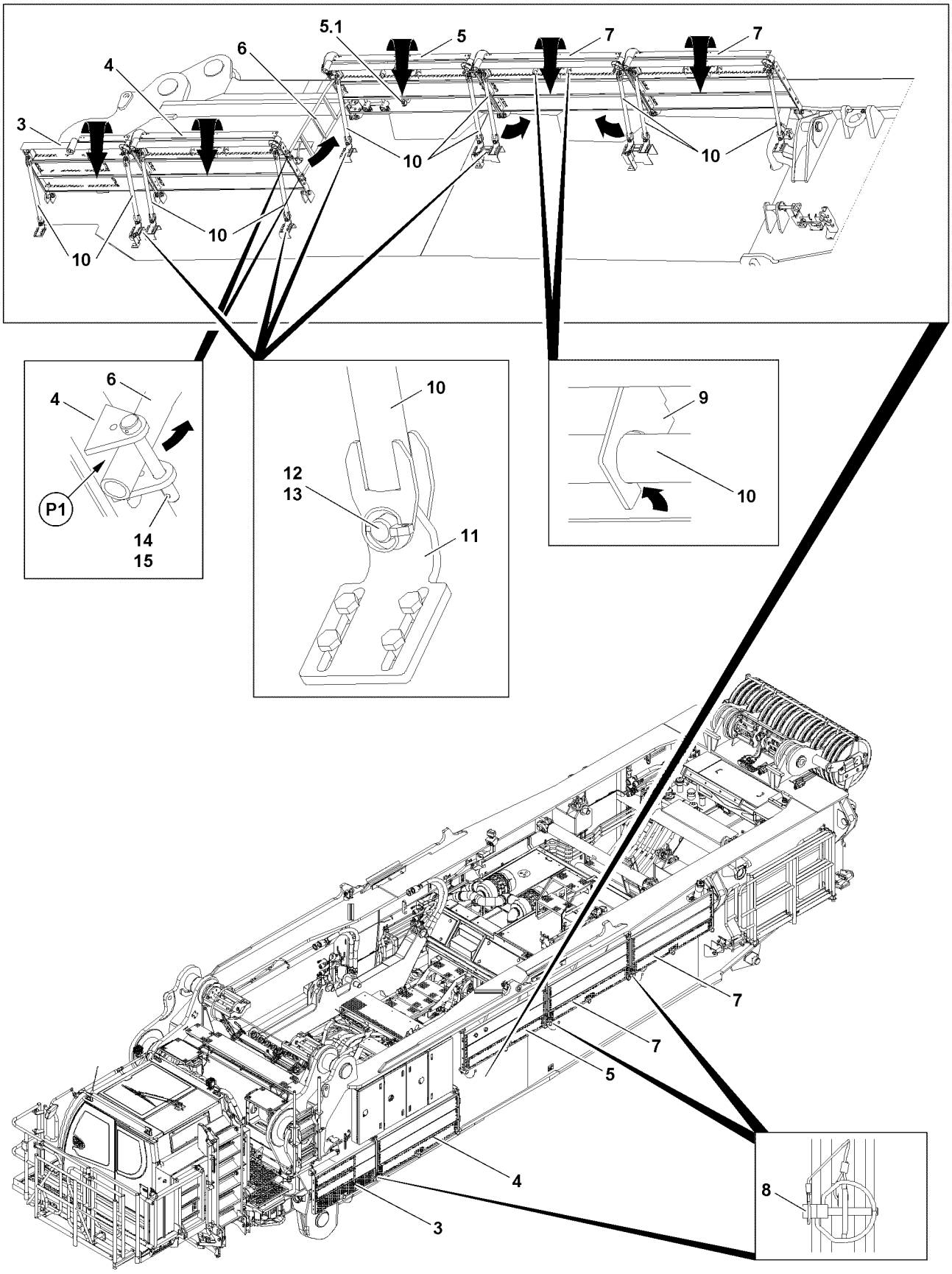

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Fig.118178

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8.4 Bringing the catwalks on the left turntable frame main section in transport position

WARNING
Danger of accident due to catwalks!
Catwalks can fold down suddenly during disassembly.
Death, severe injury, property damage.
- ▶ Make sure that the catwalks are held safely in position by a second person during unpinning.
- ▶ Lower the catwalks slowly and controlled into the transport position after unpinning.

Note
- ▶ Carry out the disassembly of the catwalks starting with catwalk **7** from the „rear“ to the „front“.

Make sure that the following prerequisites are met:
- All railings on the catwalks are disassembled.

8.4.1 Bringing catwalks 7 into transport position

- ▶ Release the supports **10** on both sides on retaining plates **11** and unpin.
- ▶ Place the supports **10** in the transport retainers **9** on the underside of the catwalk **7**.
- ▶ Swing the catwalk **7** downward into transport position.
- ▶ Let the catwalk **7** hang first in this position.

Note
- ▶ The disassembly of the second catwalk **7** is identical with the disassembly of the first catwalk **7**.

- ▶ Disassemble the second catwalk **7** properly.

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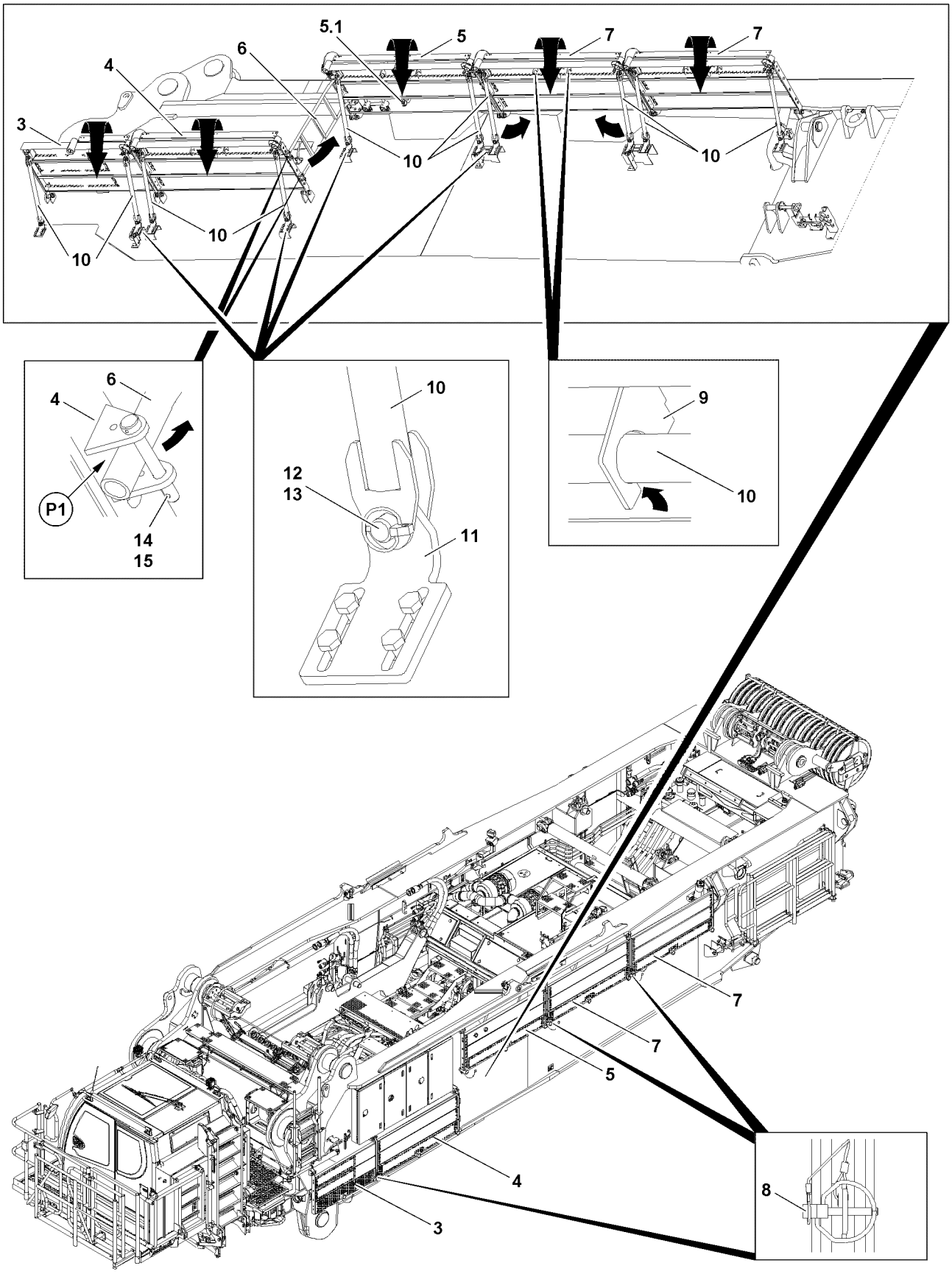

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8.4.2 Bringing catwalk 5 into transport position

- ▶ Release the ladder **6** on catwalk **4** at point **P1** and unpin.
- ▶ Let the ladder **6** hang first in this position.
- ▶ Release the supports **10** on both sides on retaining plates **11** and unpin.
- ▶ Place the supports **10** in the transport retainers **9** on the underside of the catwalk **5**.
- ▶ Swing the ladder **6** up and lock on clamp **5.1**.
- ▶ Swing the catwalk **5** downward into transport position.

When the catwalk **5** is in transport position:

- ▶ Let the catwalk **5** hang first in this position.

8.4.3 Securing catwalks 7 and catwalks 5 in transport position

In transport position, retaining brackets are between the catwalks, on which the catwalks are secured for transport.

- ▶ Secure the catwalks in transport position: Insert the locking pins **8** in the retaining brackets between the catwalks.

Result:

– The catwalks are secured.

8.4.4 Bringing catwalk 4 into transport position

- ▶ Release the supports **10** on both sides on retaining plates **11** and unpin.
- ▶ Place the supports **10** in the transport retainers **9** on the underside of the catwalk **4**.
- ▶ Swing the catwalk **4** downward into transport position.

When the catwalk **4** is in transport position:

- ▶ Let the catwalk **4** hang first in this position.

8.4.5 Bringing catwalk 3 into transport position

- ▶ Release the supports **10** on both sides on retaining plates **11** and unpin.
- ▶ Place the supports **10** in the transport retainers **9** on the underside of the catwalk **3**.
- ▶ Swing the catwalk **3** downward into transport position.

When the catwalk **3** is in transport position:

- ▶ Let the catwalk **3** hang first in this position.

8.4.6 Securing catwalk 3 and catwalk 4 in transport position

In transport position, retaining brackets are between the catwalks, on which the catwalks are secured for transport.

- ▶ Secure the catwalks in transport position: Insert the locking pins **8** in the retaining brackets between the catwalks.

Result:

– The catwalks are secured.

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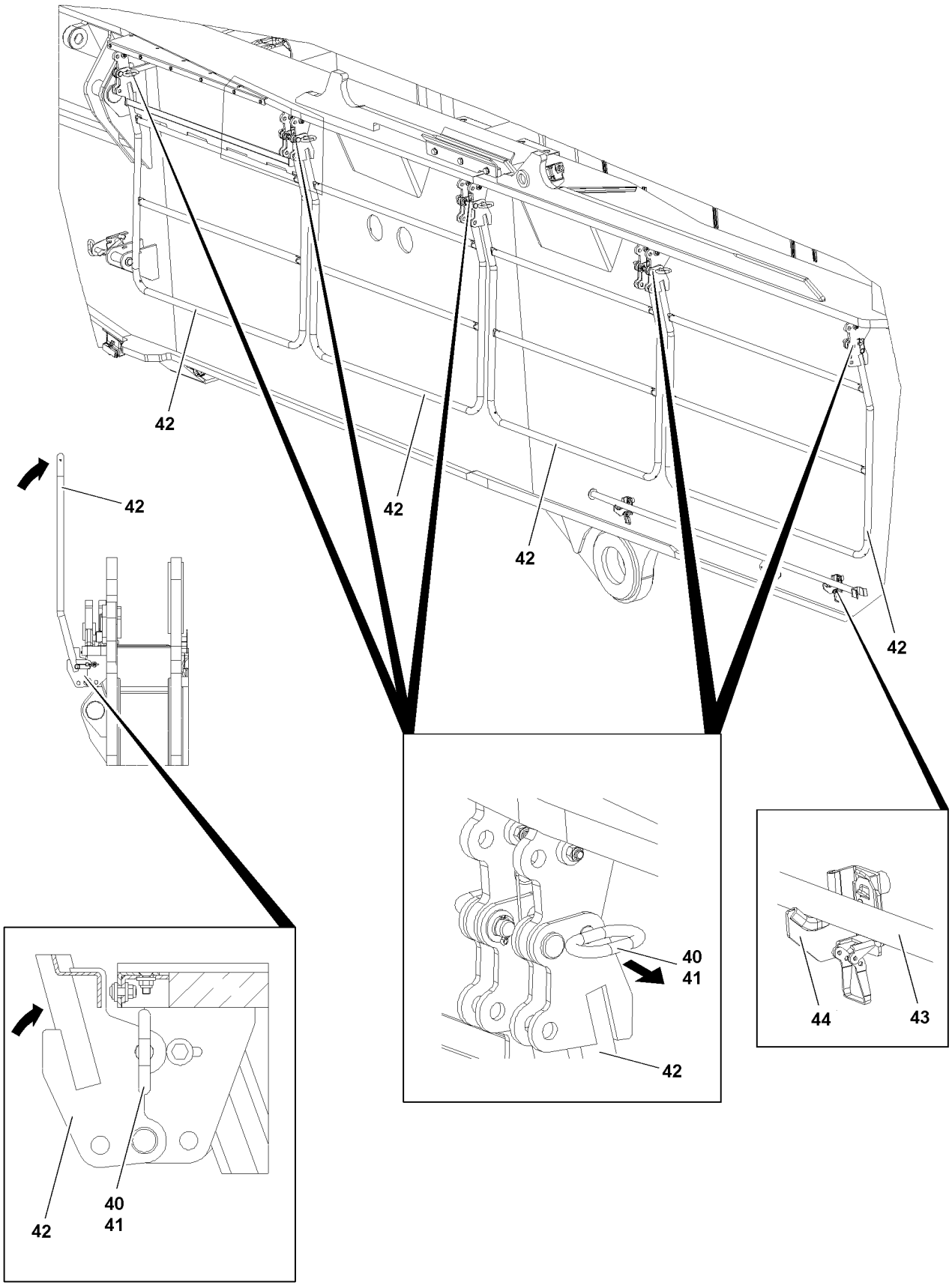

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Fig.119732

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8.5 Assembling the railings on the right turntable frame main section in operating position

WARNING
Danger of accident due to railing **42**!
Due to improper assembly of the railings **42**, the railings can suddenly fold down.
Death, severe injury, property damage.
▶ Make sure that the railings **42** are pinned and secured properly in operating position.

Make sure that the following prerequisites are met:
– The turntable frame main section is on the flatbed trailer.
– The railings on the left turntable frame main section are in operating position.
– Appropriate aids, such as a scaffolding or working platform are available.

▶ Release the railings **42** in transport position: Remove the spring retainer **41** and unpin the pin **40**.

WARNING
Danger of crushing!
In the swing range of the railings **42** hands can be crushed.
▶ Do not reach into the swing range of the railings.

▶ Swing the railings **42** upward into the operating position: Use assembly rod **43**.
▶ Pin and secure railings **42** in operating position: Insert the pin **40** and secure with the spring retainer **41**.

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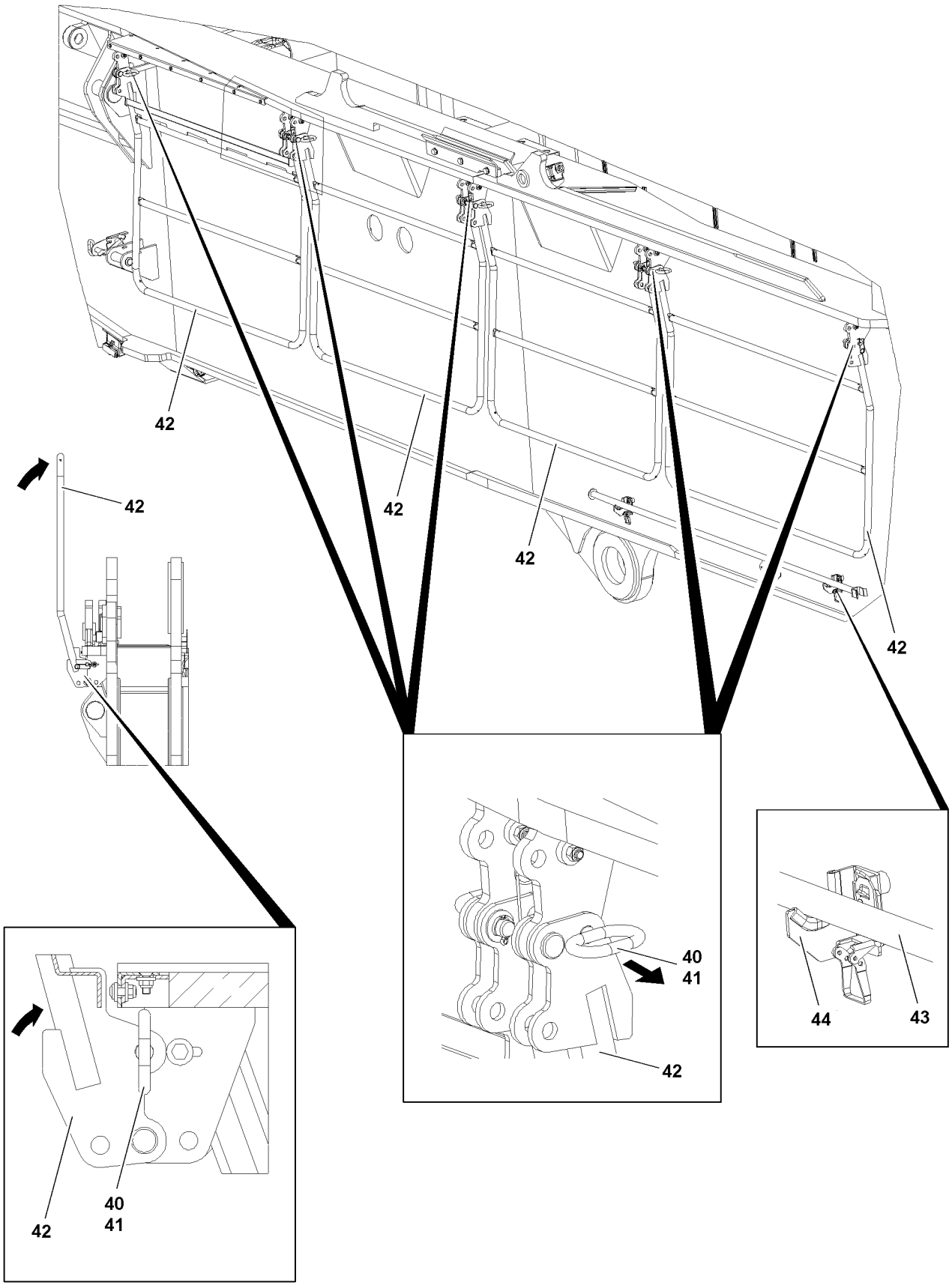

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8.6 Bringing the railings on the right turntable frame main section in transport position

WARNING
Danger of accident due to railing **42**!
Due to improper assembly of the railings **42**, the railings can suddenly fold down.
Death, severe injury, property damage.
▶ Make sure that the railings **42** are pinned and secured properly in operating position.

Make sure that the following prerequisites are met:
– The turntable frame main section is on the flatbed trailer.
– The railings on the left turntable frame main section are in operating position.
– Appropriate aids, such as a scaffolding or working platform are available.

WARNING
Danger of accidents due to railings **42** swinging downward!
▶ Make sure that the railings are held by a person or are secured in operating position before unpinning.

▶ Release the railing **42** in operating position: Remove the spring retainer **41** and unpin the pin **40**.

WARNING
Danger of crushing!
In the swing range of the railings **42** hands can be crushed.
▶ Do not reach into the swing range of the railings **42**.

▶ Swing the railings **42** downward into the transport position: Use assembly rod **43**.
▶ Pin and secure railings **42** in transport position: Insert the pin **40** and secure with the spring retainer **41**.
▶ Insert the assembly rod **43** in the transport retainer **44** and secure.

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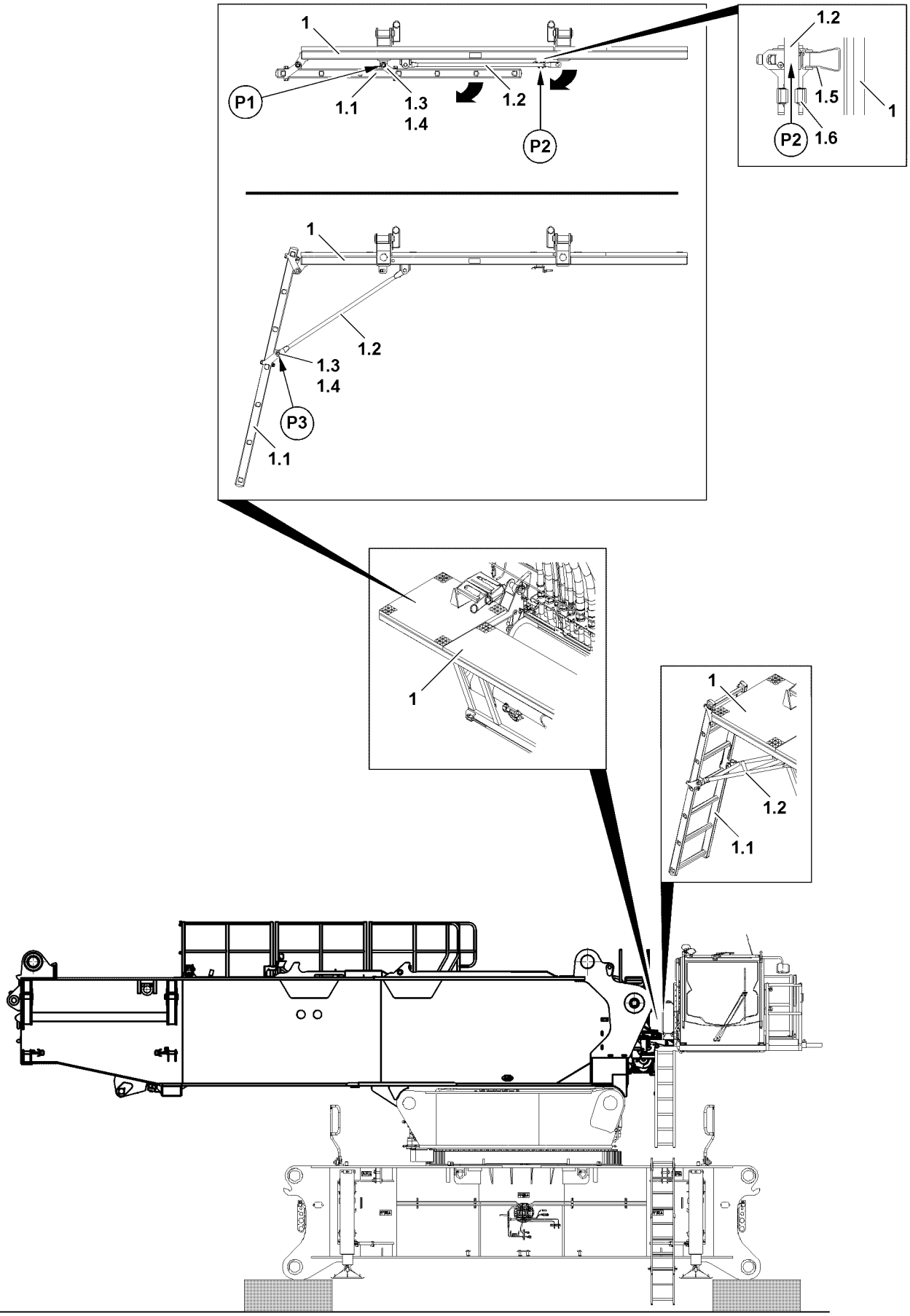

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Fig.119730

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9 Main boom assembly pedestal on the turntable

9.1 Bringing the ladder on the main boom assembly pedestal into the operating position

Access to the crane operator's cab **3** is provided via the ladder **1.1** on the main boom assembly pedestal **1** at assembly of the turntable frame main section **3** on the turntable frame lower section **2**.

Note

▶ The ladder **1.1** on the main boom assembly pedestal **1** remains during crane operation in operating position.

Make sure that the following prerequisites are met:
- The catwalks on the crawler travel gear are in operating position.
- The railings on the crawler travel gear are in operating position.
- The turntable frame main section **3** is properly pinned and secured on the turntable frame lower section **2**.

WARNING
Swinging ladder!
If the transport retainer on the ladder **1.1** is released, then the ladder **1.1** can swing down by itself.
Death, severe injury, property damage.
▶ Make sure that the ladder **1.1** is held safely in position when releasing the transport retainer.
▶ After releasing it, move the ladder **1.1** controlled downward into operating position.

▶ Release the transport retainer for the ladder at point **P1**: Remove the locking pin **1.4** and unpin the pin **1.3**.

When the transport retainer is released:
▶ Lower the ladder **1.1** slowly.

WARNING
Swinging strut!
If the transport retainer on the strut **1.2** is released, then the strut **1.2** can swing down by itself.
Death, severe injury, property damage.
▶ Make sure that the strut **1.2** is held safely in position when releasing the transport retainer.
▶ After releasing it, move the strut **1.2** downward vertically.

▶ Release the transport retainer for the strut at point **P2**: Open the securing bracket **1.5**.
▶ Pull the strut **1.2** from the clamp **1.6** and guide downward.
▶ Pin the ladder **1.1** in operating position: Insert the pin **1.3** in point **P3** and secure with the locking pin **1.4**.

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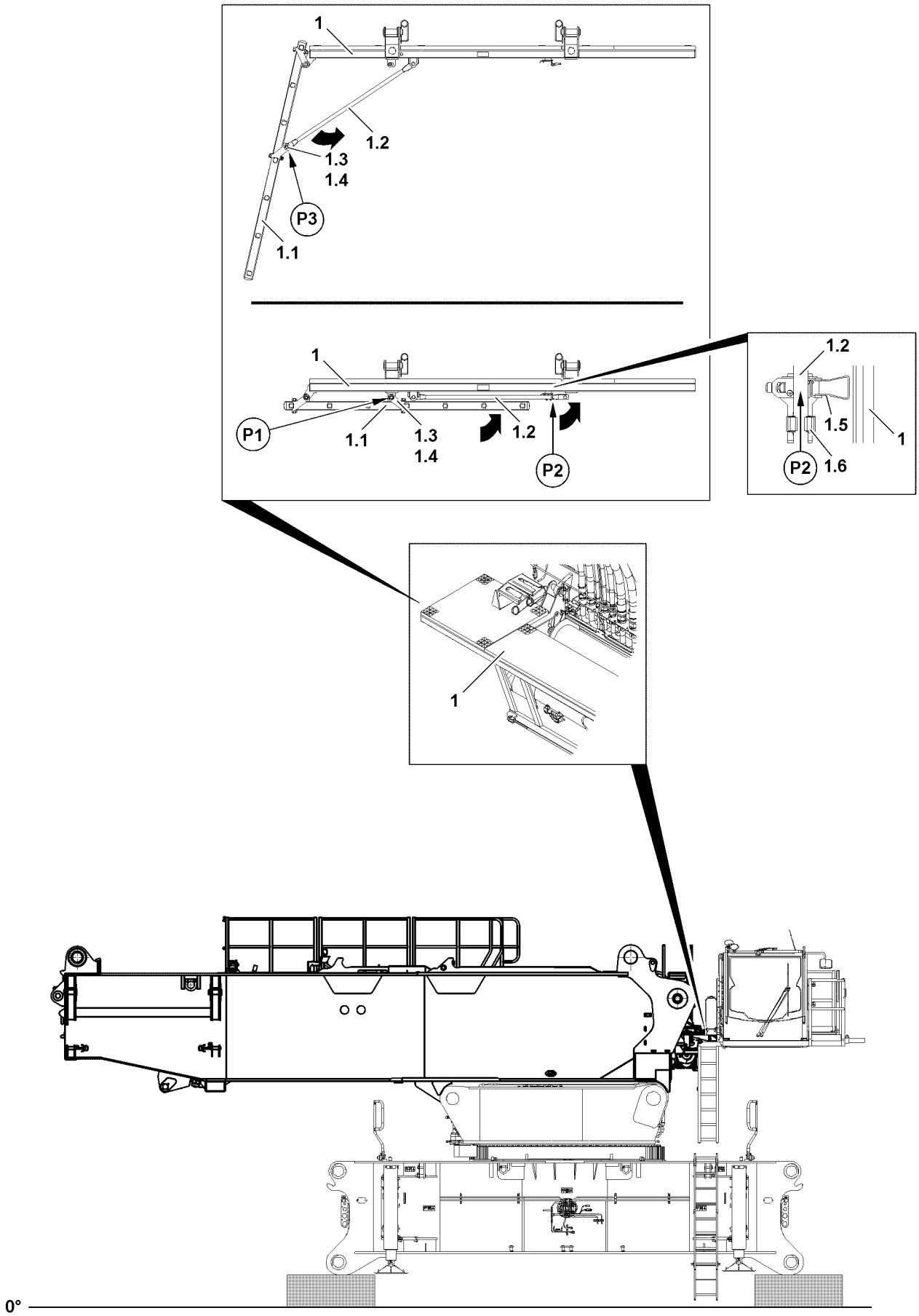

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Fig.119731

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9.2 Bringing the ladder on the main boom assembly pedestal into the transport position

▶ Unpin the support **1.2** at point **P3**: Remove the locking pin **1.4** and unpin the pin **1.3**.

When the support **1.2** is unpinned on ladder **1.1**:
▶ Guide the support **1.2** upward and engage it at point **P2** in clamp **1.6**.
▶ Close the securing bracket **1.5** at point **P2**.

Result:

– The support **1.2** is properly secured in transport position.

▶ Swing the ladder **1.1** up into the transport position. Insert the pin **1.3** at point **P1** and secure with locking pin **1.4**.
▶ Pin the ladder **1.1** with the pin **1.3** at point **P1** and secure with locking pin **1.4**.

Result:

– The ladder **1.1** is pinned and secured in transport position.

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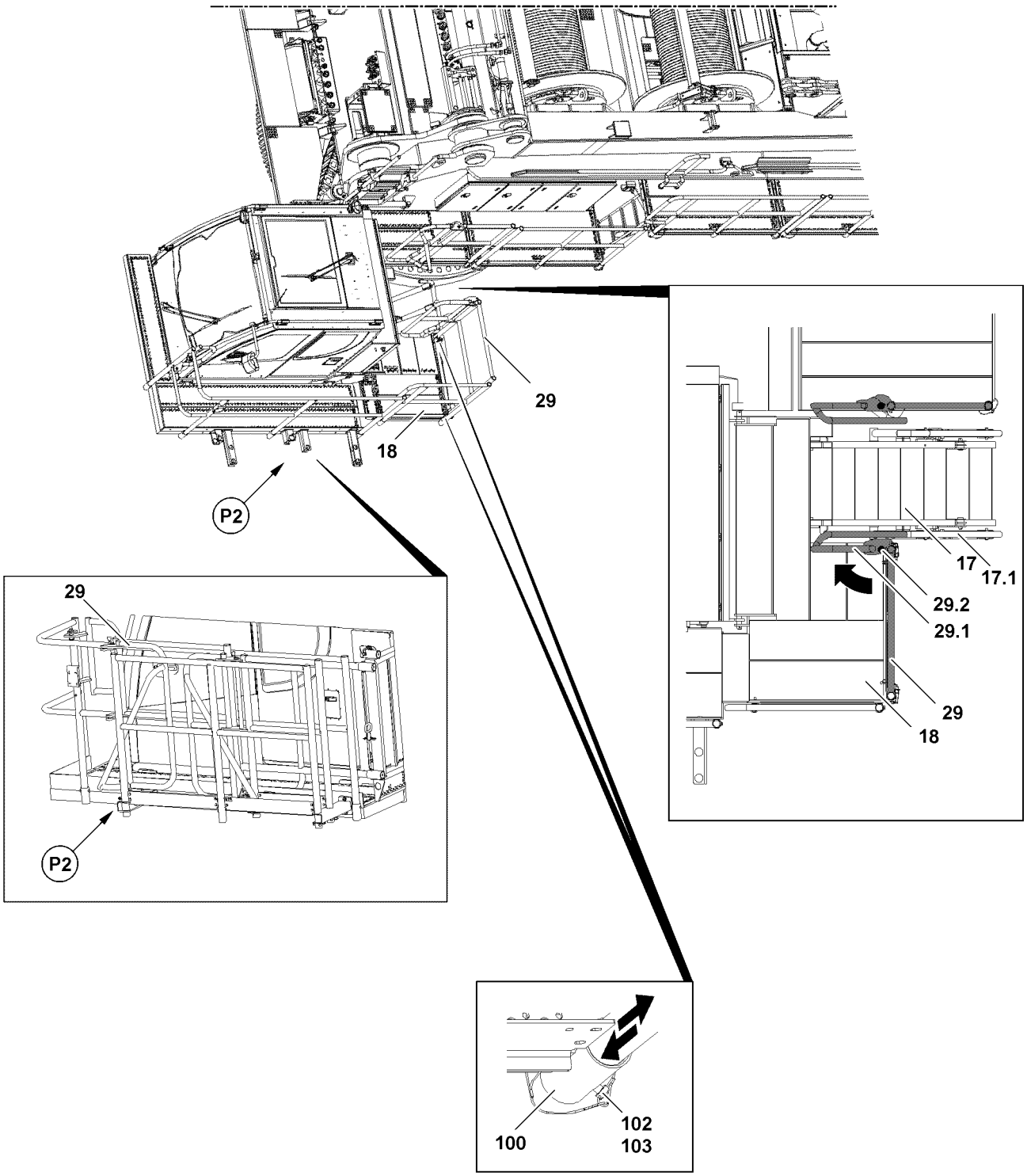

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Fig.118191

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10 Cab platform rear

WARNING
Danger of falling!
If the crawler carriers and the catwalks are not correctly assembled on the crawler center section, then the operating or assembly personnel can fall off from the crane operator's cab.
Death, severe injury, property damage.
- ▶ Swing the access stairs only into operating position when the crawler carriers and the catwalks are properly assembled on the crawler travel gear, see Crane Operating instructions, chapter 3.01.
- ▶ Make sure that the crawler carriers and the catwalks on the crawler center section are properly assembled.

WARNING
Danger of accident!
Death, severe injury, property damage.
- ▶ Make sure that no personnel is within the danger zone when lowering the access stairs **17**.
- ▶ Lowering the access stairs **17**, see Crane operating instructions, chapter 4.03.

NOTICE
Damage to the crane operator's cab!
If the access stairs **17** are swung into transport position - with assembled railing **29** on the cab platform **18**, then property damage can occur.
- ▶ Make sure that the access stairs **17** remain in operating position during crane operation.

10.1 Bringing the railing on the cab platform into the operating position

Make sure that the following prerequisites are met:
- – The crawler carriers are properly assembled on the crawler center section.
- – The catwalks and stairs on the crawler travel gear are properly assembled.
- – The crane operator's cab is in operating position.
- – The access stairs **17** are in operating position.
- – The cab platform **18** are in operating position.

- ▶ Remove the railing **29** from the transport retainer at point **P2**.
- ▶ Insert the railing **29** in the receptacle sleeves **100** on cab platform **18**.

When the railing **29** is properly inserted in the receptacle sleeves **100** on cab platform **18**:
- ▶ Pin the railing **29** in the receptacle sleeves **100** with pin **102** and secure with spring retainer **103**.
- ▶ Bring the swing bar **29.1** from railing **29** in operating position: Pull the detent pin **29.2** up and swing the swing bar **29.1** outward into operating position.

Result:

- – The swing bar **29.1** is locked at a 90° angle to railing **29** (operating position).

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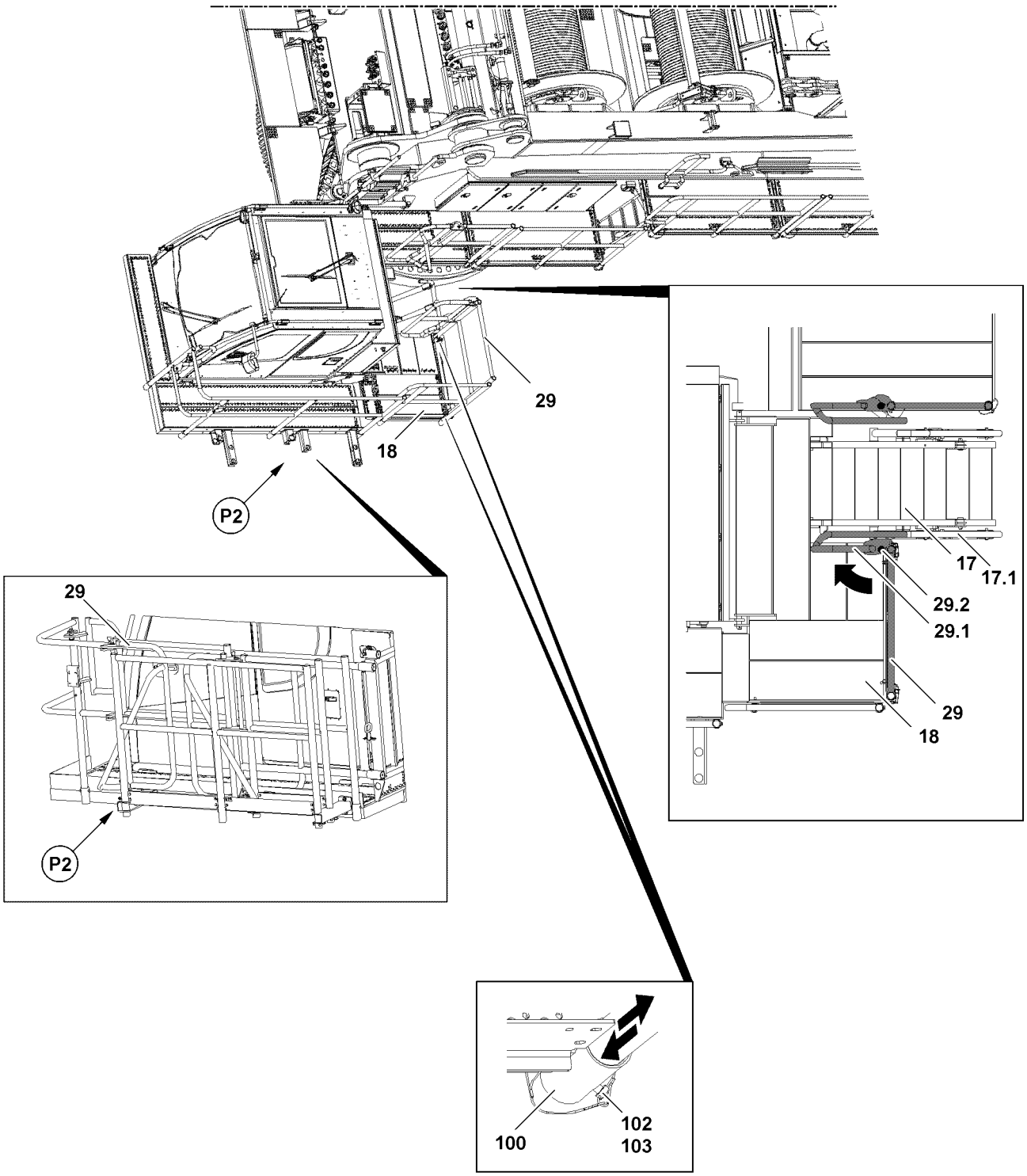

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Fig.118191

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10.2 Bringing the railing on the cab platform into the transport position

- ▶ Bring the swing bar **29.1** from railing **29** in transport position: Pull the detent pin **29.2** up and swing the swing bar **29.1** inward into transport position.
- ▶ Lock the swing bar **29.1** in transport position.
- ▶ Release the railing **29** in the receptacle sleeves **100** on cab platform **18**.
- ▶ Lift the railing **29** from the receptacle sleeves **100** on cab platform **18**.
- ▶ Insert the railing **29** in the transport retainer on the crane operator's cab at point **P2**, insert pins and secure with spring retainers.

Note

- ▶ Swing the access stairs **17** into transport position, see Crane operating instructions, chapter 4.03.

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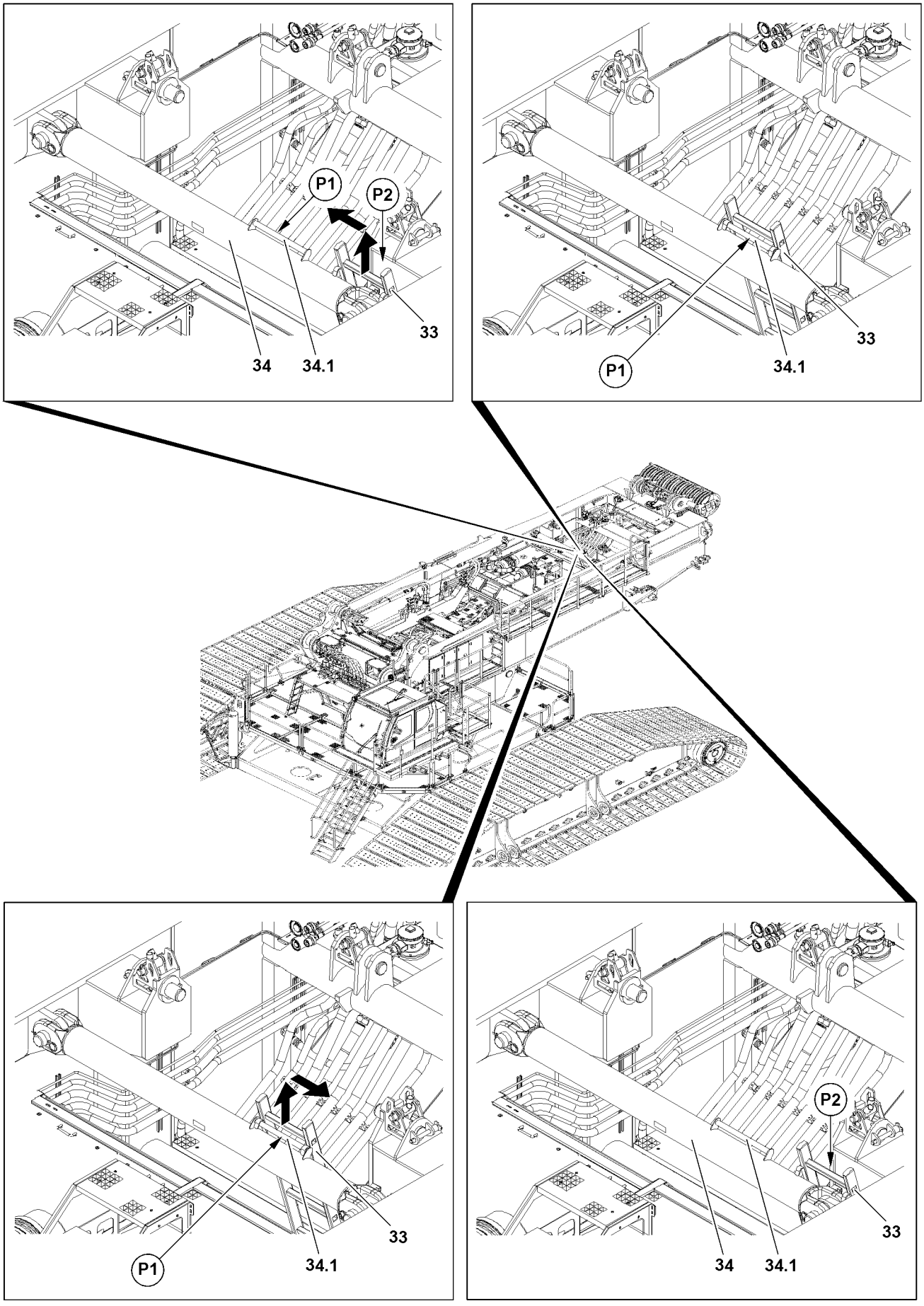

Fig.118180

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11 Ladder turntable frame main section

Note

▶ Ladder **33** is used for assembly personnel to get down to the pin devices of winch 4 or the installation position of winch 4.

NOTICE

Damage of ladder!

If the ladder **33** is in assembly position before installation of winch 4, then the ladder **33** can be damaged.

▶ Make sure that the ladder **33** is in park position at assembly of winch 4.

WARNING

Danger of falling!

Death, severe injury, property damage.

▶ When ascending and descending, the assembly personnel must ensure a 3-point support.
▶ When ascending and descending, use rungs and ladder beams as handles.
▶ The assembly personnel must step into the rungs deep enough.

11.1 Bringing the ladder into assembly position

▶ Release the ladder **33** in park position at point **P2**.
▶ Remove the ladder **33** from park position at point **P2**.
▶ Hang the ladder **33** on point **P1** on rod **34.1** of strut **34**.

11.2 Bringing the ladder into park position

▶ Remove the ladder **33** from assembly position at point **P1**.
▶ Bring the ladder **33** on point **P2** into park position.
▶ Secure the ladder **33** in park position at point **P2**.

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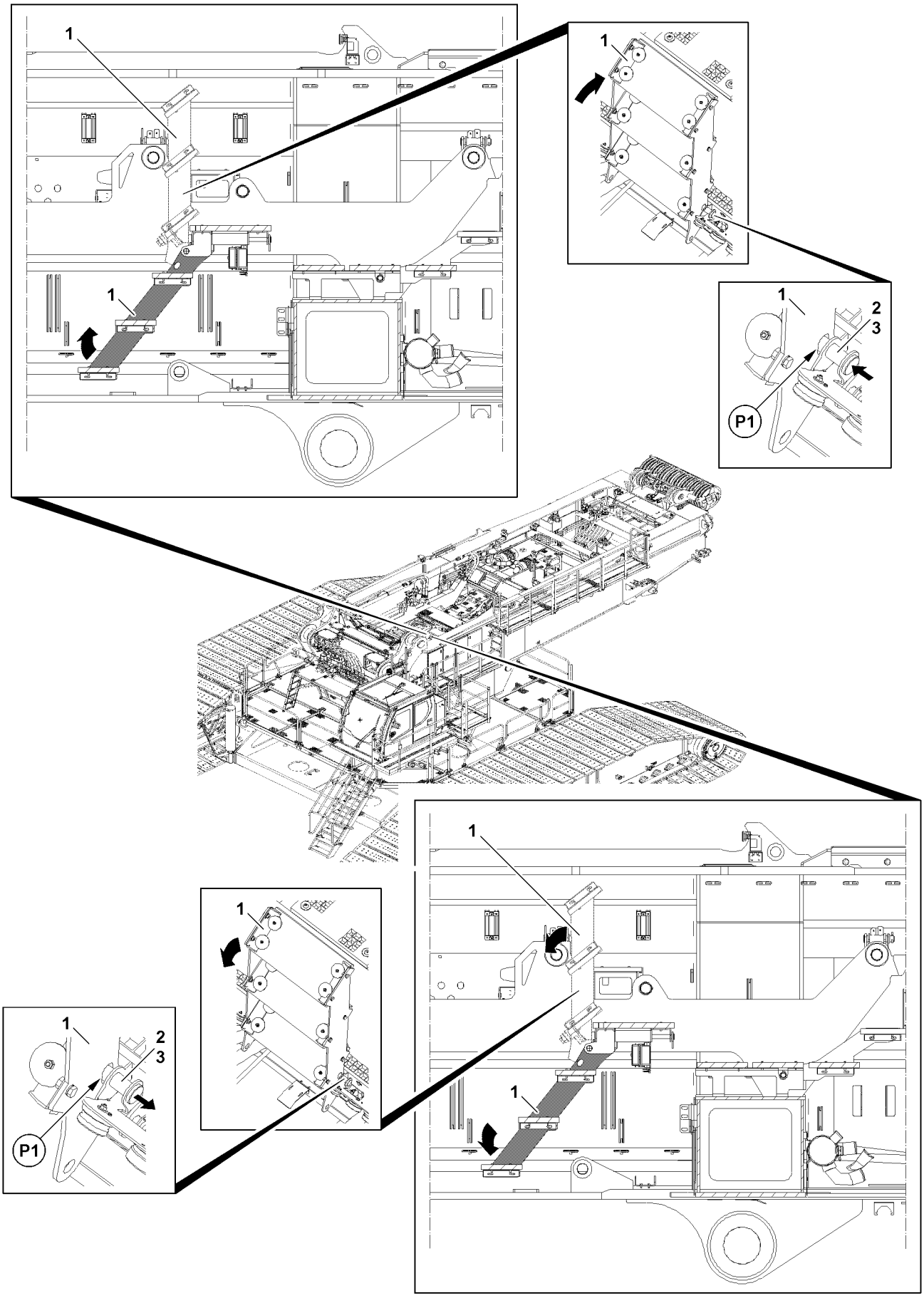

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Fig.118202

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12 Stairs turntable frame main section

Note

- The stairs **1** are used in operating position for assembly personnel to get down to the rotary connection or the turntable frame lower section.
- To improve accessibility during assembly work in the area of the hydraulic and electrical connections on the rotary connection, fold the stairs up in assembly position and secure.

12.1 Bringing the stairs into assembly position

WARNING
Danger of accident due to stairs!
The stairs can fold down by themselves from the assembly position.
Death, severe injury, property damage.
- Make sure that the stairs are pinned and secured properly in assembly position.

- Release the stairs **1** in operating position.
- Fold the stairs **1** up in assembly position.
- Pin the stairs **1** at point **P1** in assembly position with pin **2** and secure with retaining element **3**.

12.2 Bringing the stairs into operating position

WARNING
Danger of accident due to stairs!
The stairs can fold down by themselves from the assembly position.
Death, severe injury, property damage.
- Make sure that the stairs are held in position before unpinning.
- After releasing them, fold the stairs down into operating position.

- Hold the stairs **1** in assembly position.
- Release the stairs **1** at point **P1**: Remove the retaining element **3** and unpin the pin **2**.
- Swing the stairs **1** downward into operating position.

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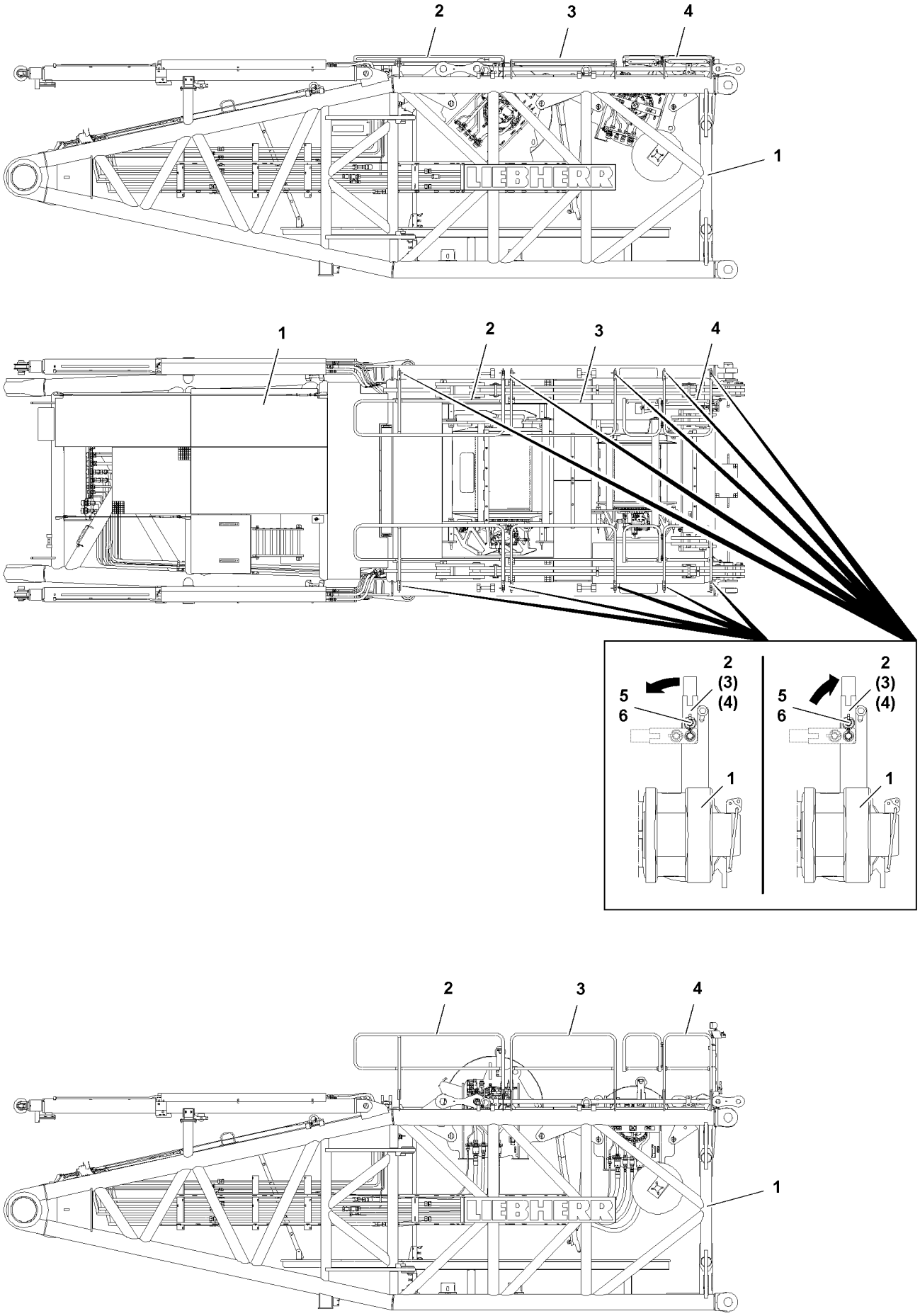

Fig.118192

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13 Railings on the S-pivot section

WARNING
Danger of crushing!
When swinging the railings, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

13.1 Positioning the railings into operating position

▶ Unpin railing (railing **2**, railing **3**, railing **4**) in transport position: Remove the locking pin **5** and unpin the grip pin **5**.
▶ Swing the railings individually into operation position up and hold.
▶ Secure the railing in the operating position: Insert the grip pin **5** and secure with locking pin **5**.
▶ Bring the railing on the opposite side properly into operating position.

13.2 Bringing the railings into the transport position

▶ Unpin the railings individually in operating position: Remove the locking pin **5** and unpin the grip pin **5**.
▶ Swing the railings downward into the transport position.
▶ Secure the railings in transport position: Insert the grip pin **5** and secure with locking pin **5**.
▶ Bring the railing on the opposite side properly into transport position.

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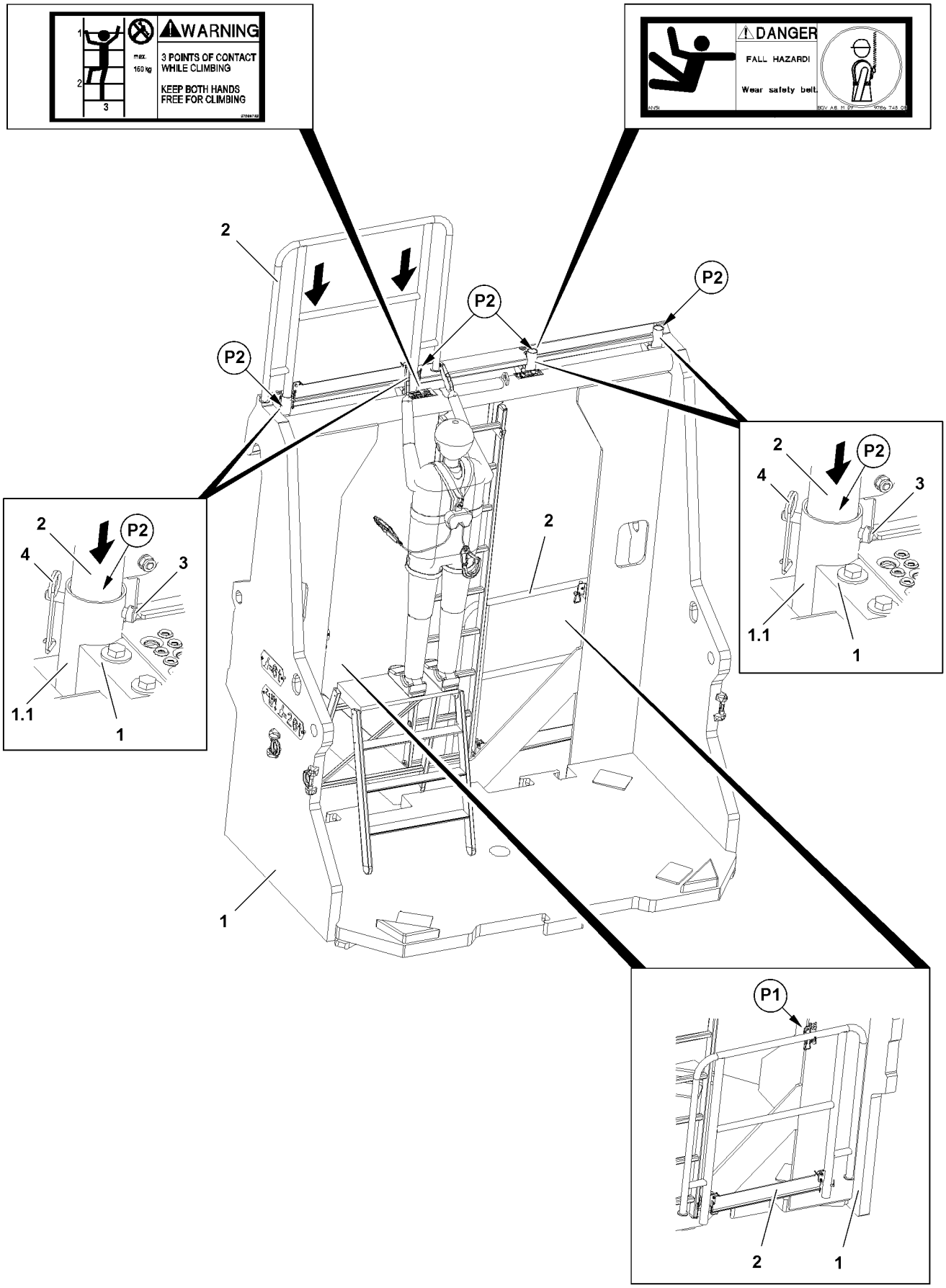

Fig.118184

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14 Fall protection equipment on the counterweight bracket

Note

▶ **Liebherr-Werk Ehingen GmbH** recommends for the safe assembly / disassembly of the railings **2** to use an assembly pedestal or a stepladder with sufficiently sized placement surface.

WARNING

Falling assembly personnel!
During the assembly / disassembly of the railings **2** the assembly personnel can fall down.
Death, severe injury, property damage.

▶ Carry out the assembly of the railings with utmost caution.

14.1 Bringing the railings on the counterweight bracket into operating position

Make sure that the following prerequisites are met:

– The counterweight bracket **1** is on the flatbed trailer or on the ground.
– An assembly pedestal or a stepladder is available.

▶ Release the railing **2** in transport position at point **P1**.
▶ Remove the railing **2** from the transport receptacle.
▶ Set the railing **2** on points **P2** in the sleeve **1.1**.
▶ Secure the railing **2** with pin: Insert the pin **3** on sleeve **1.1** and secure with spring retainer **4**.

Result:

– The railing **2** is properly pinned and secured in operating position.

Note

▶ The assembly of the second railing is identical with the assembly of the first railing.

▶ Assemble the second railing according to the description above in operating position.

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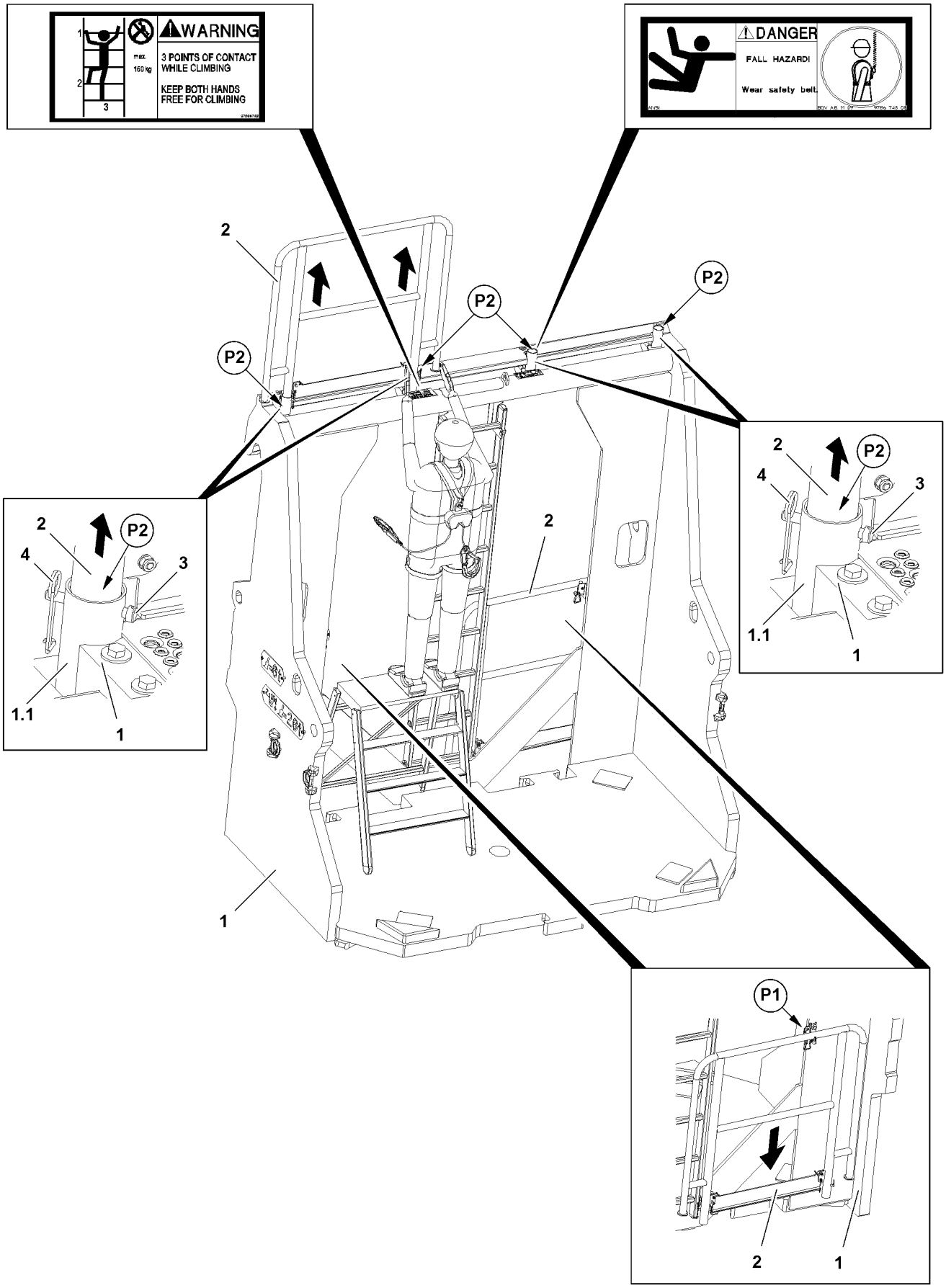

Fig.118186

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14.2 Bringing the railings on the counterweight bracket into transport position

Make sure that the following prerequisites are met:
- The counterweight bracket **1** is on the flatbed trailer or on the ground.
- An assembly pedestal is on hand.

▶ Release the railing **2** in operating position: Remove the spring retainer **4** and unpin the pin **3** on the sleeve **1.1**.
▶ Lift the railing **2** from the sleeves **1.1**.
▶ Set the railing **2** on point **P1** in transport position.

Note
▶ The disassembly of the second railing is identical with the disassembly of the first railing.

▶ Bring the second railing in transport position and secure.

15 Fall protection equipment on the turntable extension

WARNING
When working at a height, there is a danger of falling!
If fall protection equipment (railing) is intended for winches, for example, or assembly units, then it must be properly assembled and secured.
▶ Properly assemble and secure all fall protection equipment, such as catwalks, platforms, ladders and railings on the crane superstructure.

15.1 Bringing the railing on the turntable extension into the operating position

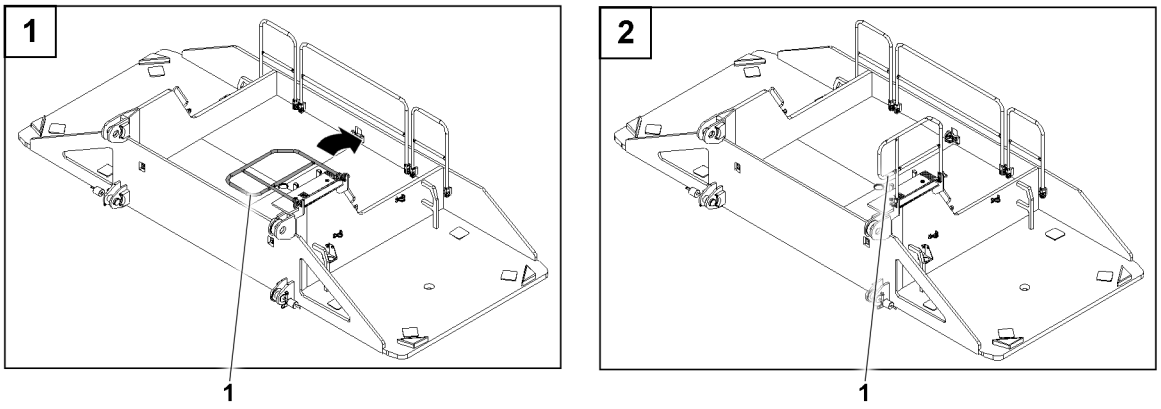

Fig.153153: Bringing the railing on the turntable extension into the operating position

Make sure that the following prerequisite is met:
- The turntable extension is located on the ground or on a substructure with load bearing capacity.
- There are no counterweight plates on the turntable extension.

WARNING
Railing swinging down!
Death, severe bodily injuries, property damage.
▶ Make sure that the railings are safely held and brought to the operating position in a controlled manner.

▶ Swing the railing **1** „upward“ into the operating position.

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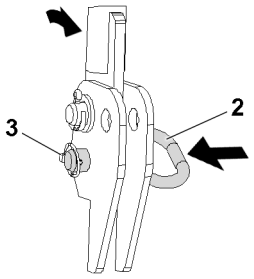

Fig.153154: Pin location

When the railing **1** is in the operating position:

▶ Pin the railing in operating position: Insert the pin **2** and secure it with the retaining element **3**.

15.2 Bringing the railing on the turntable extension into the transport position

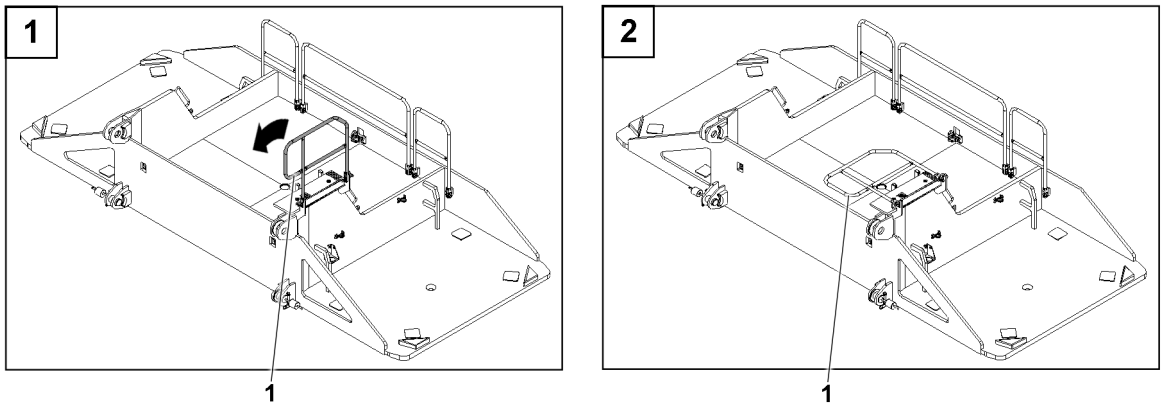

Fig.153155: Bringing the railing on the turntable extension into the transport position

Make sure that the following prerequisites are met:

– The turntable extension is located on the ground or on a substructure with load bearing capacity.
– There are no counterweight plates on the turntable extension.

WARNING
Railing swinging down!
Death, severe bodily injuries, property damage.

▶ Make sure that the railings are safely held and lowered to the transport position in a controlled manner.

▶ Swing the railings **1** „downward“ into the transport position.

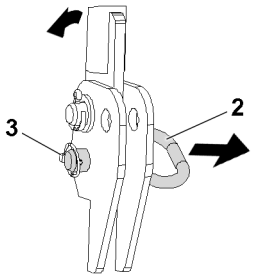

Fig.153156: Pin location

When the railing **1** is in the transport position:

▶ Pin the railings in transport position: Insert the pin **2** and secure it with the retaining element **3**.

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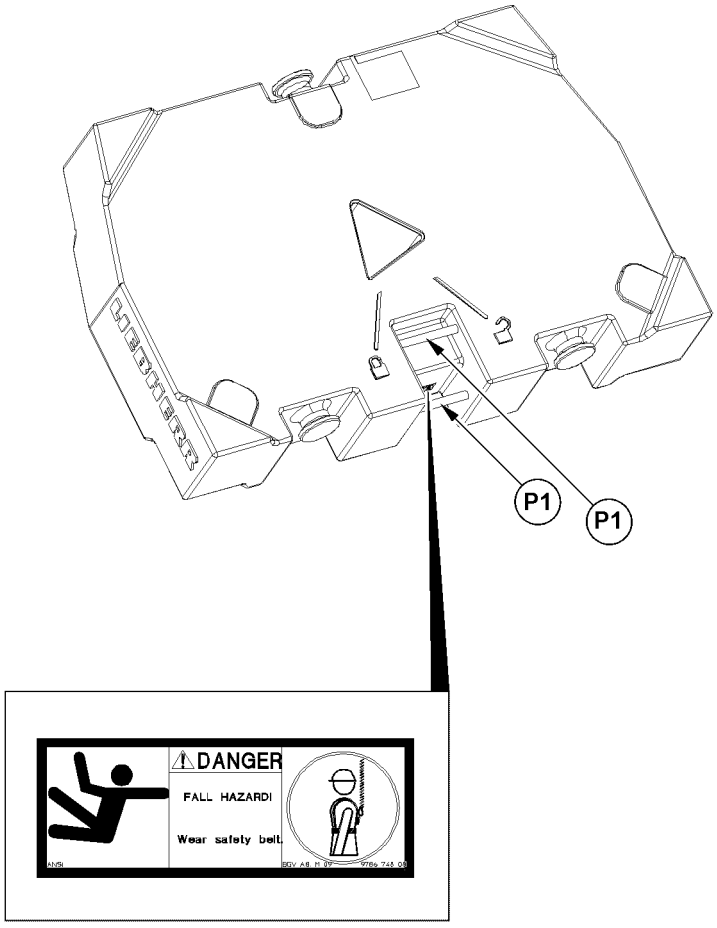

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Fig.118182

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16 Fall protection equipment on the counterweights

16.1 Fastening and hook points on the counterweights

The hook points **P1** are integrated in the counterweights.

WARNING
When working at a height, there is a danger of falling!
Death, severe injury, property damage.
- ▶ Assembly personnel must wear an approved fall arrest system and protective equipment before performing any assembly / disassembly, inspection and maintenance work on the counterweights.
- ▶ The assembly personnel must hook themselves on the hook points **P1** with an approved fall arrest system to prevent them from falling.

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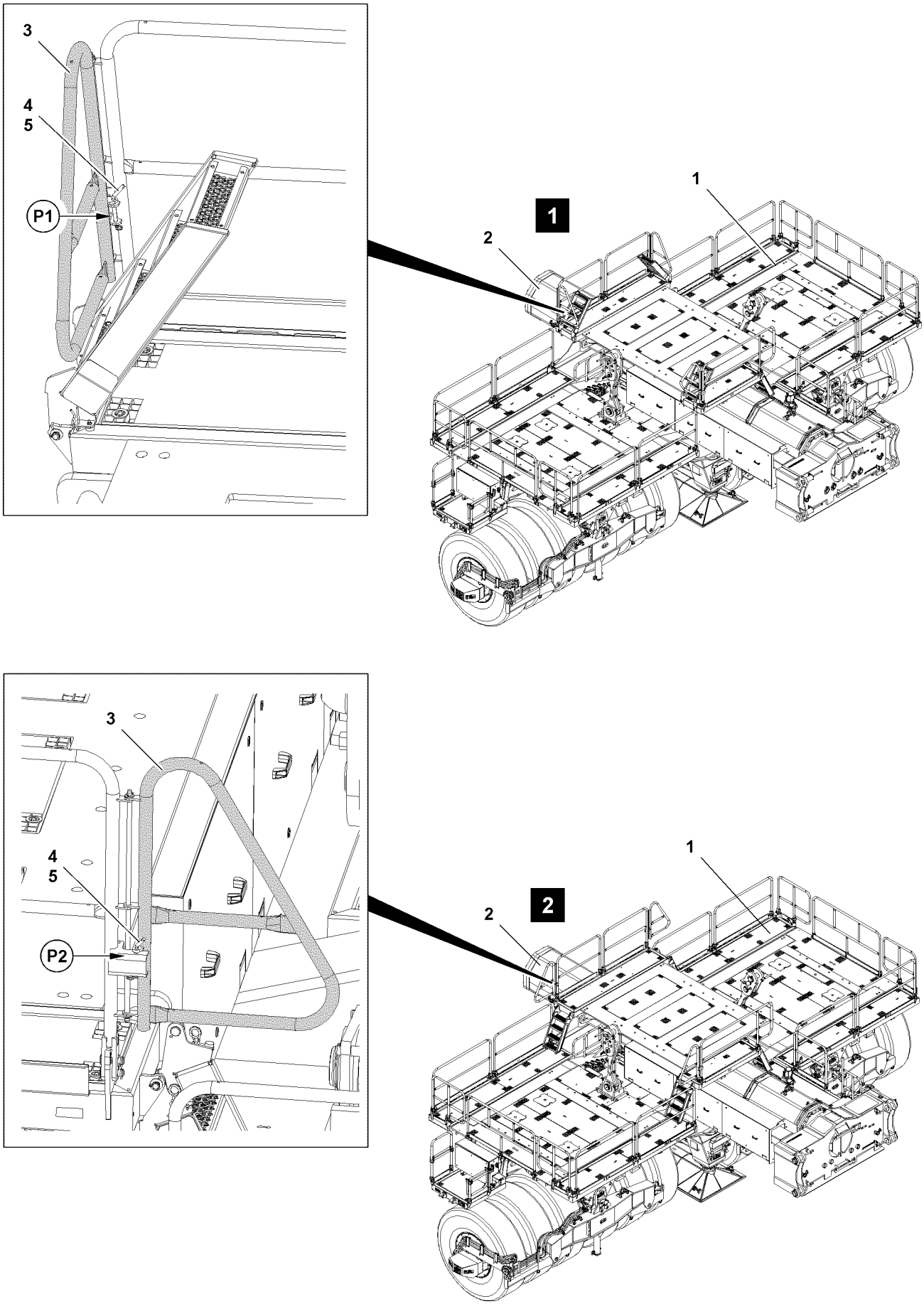

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Fig.121032

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17 Railing on ballast trailer guide

Note

▶ The assembly and disassembly of the railings is identical and is described on the example for one railing.

WARNING

Danger of falling!

During assembly and disassembly of the railing, personnel must be secured with appropriate aids to prevent them from falling.

Even during the assembly of protective devices there is a danger of falling.

Death, severe injury, property damage.

▶ Use personal protective equipment.

17.1 Swinging the railing into operating position

The ballast trailer guide **2** is equipped with three foldable railings **3**, see illustration **1**.

▶ Release the railing **3** from the transport position: Remove the cotter pin **5** at point **P1** and unpin the connector **4**, see illustration **1**.

WARNING

Danger of crushed limbs!

When swinging the railing, fingers and hands can be crushed.

▶ Do not reach with your hands into the danger zone.

▶ Swing the railing **3** into the operating position.

▶ Secure the railing **3** in the operating position: Insert the connector **4** at point **P2** and secure with cotter pin **5**, see illustration **2**.

17.2 Swinging the railings into the transport position

▶ Release the railing **3** from the operating position: Remove the cotter pin **5** at point **P2** and unpin the connector **4**, see illustration **2**.

WARNING

Danger of crushed limbs!

When swinging the railing, fingers and hands can be crushed.

▶ Do not reach with your hands into the danger zone.

▶ Swing the railing **3** into the transport position.

▶ Secure the railings **3** in transport position: Insert the connector **4** at point **P1** and secure with cotter pin **5**, see illustration **1**.

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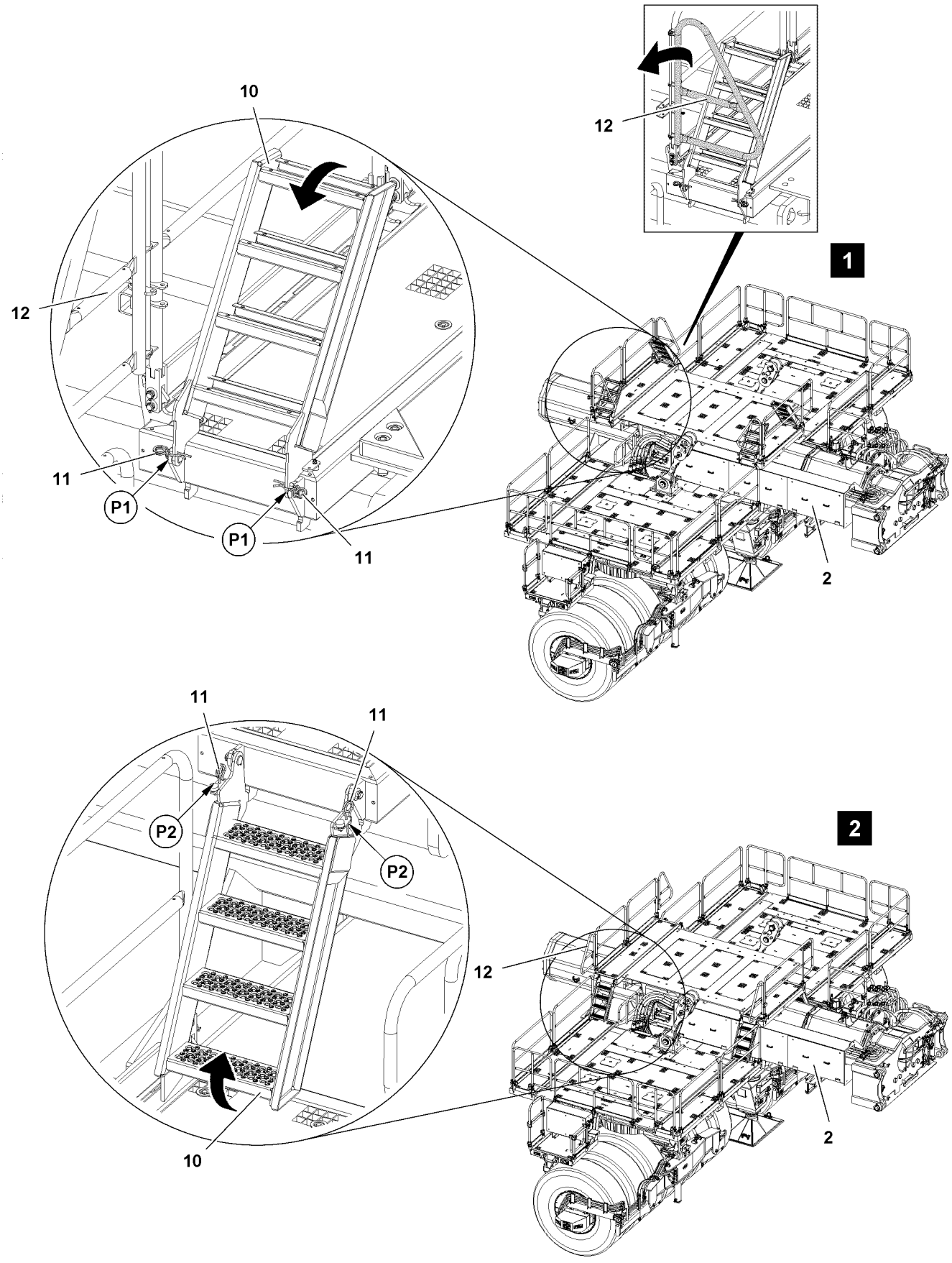

Fig.121024

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18 Ladders on ballast trailer guide

The ballast trailer guide **2** is equipped with four ladders **10**.

The ladders **10** are used for assembly personnel to ascent and descent on the guide.

The assembly and disassembly of the ladders **10** is described on the example of one ladder.

NOTICE
Damage of ladder!
If the ladders **10** are in operating position before installation of the ballast trailer guide **2**, ladders **10** can be damaged.
▶ Make sure that ladders **10** are in transport position at installation of the ballast trailer guide **2**.

18.1 Swinging the ladder into operating position

Make sure that the following prerequisites are met:
– The ballast trailer guide **2** is installed.
– The railing **12** is open, see illustration **1**.

▶ Release the ladder **10** from transport position: Remove the safety spring **11** at point **P1**, see illustration **1**.

WARNING
Danger of crushing!
When swinging the ladder, it can fall down by itself due to its own weight.
Crushing injuries of limbs can occur.
▶ Hold the ladder **10** and swing it slowly into operating position.

▶ Swing the ladder **10** from transport position into operating position to the stop, see illustration **2**.
▶ Fasten the safety spring **11** at point **P2** in park position, see illustration **2**.

18.2 Swinging the ladder into transport position

Make sure that the following prerequisite is met:
– The railing **12** is open, see illustration **2**.

▶ Remove the safety spring **11** at point **P2** from park position, see illustration **2**.

WARNING
Danger of crushing!
When swinging the ladder, it can fall down by itself due to its own weight.
Crushing injuries of limbs can occur.
▶ Hold the ladder **10** and swing it slowly into transport position.

▶ Swing the ladder **10** from operating position into transport position, see illustration **1**.
▶ Secure the ladder **10** in transport position with safety spring **11** at point **P1**, see illustration **1**.

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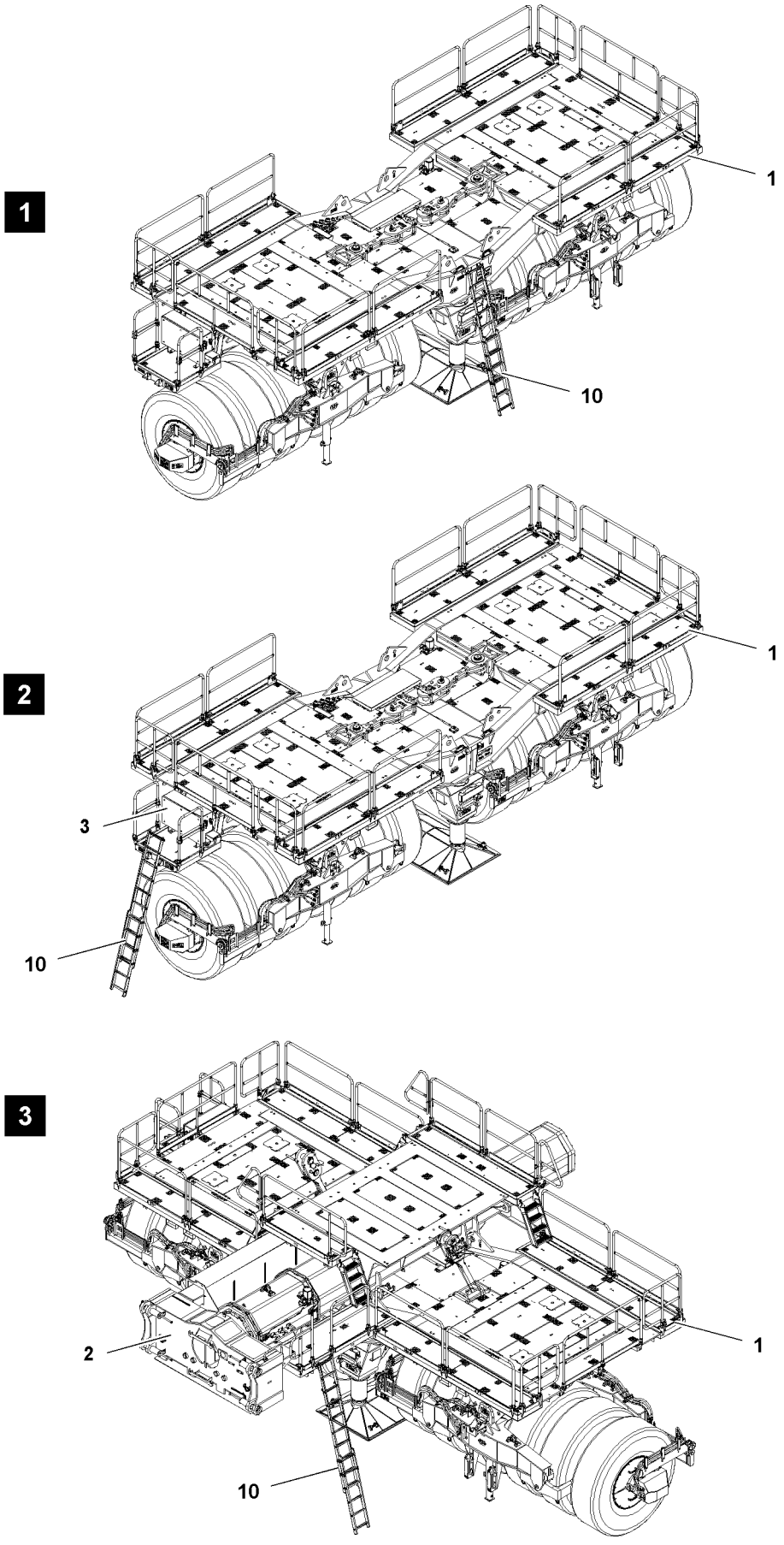

Fig.121025

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19 Extension ladder on ballast trailer

The extension ladder **10** is used for assembly personnel to ascent and descent on the ballast trailer.

Area of operation of the extension ladder:
- Extension ladder on ballast trailer **1**, see illustration **1**
- Extension ladder on control cabinet **3**, see illustration **2**
- Extension ladder on ballast trailer guide **2**, see illustration **3**

Note
▶ The weight of the extension ladder is 12.5 kg.

WARNING
Danger of falling!
Death, severe injury, property damage.
▶ When ascending and descending, the assembly personnel must ensure a 3-point support.
▶ When ascending and descending, use rungs and ladder beams as handles.
▶ The assembly personnel must step into the rungs deep enough.

NOTICE
Danger of crushing!
During assembly and disassembly of the extension ladder fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.
▶ Install the ladder solely from the ground.
▶ Step on the extension ladder only when the extension ladder is secured in ascent and descent position.
▶ Observe the national regulations and standards regarding the use of rung ladders.

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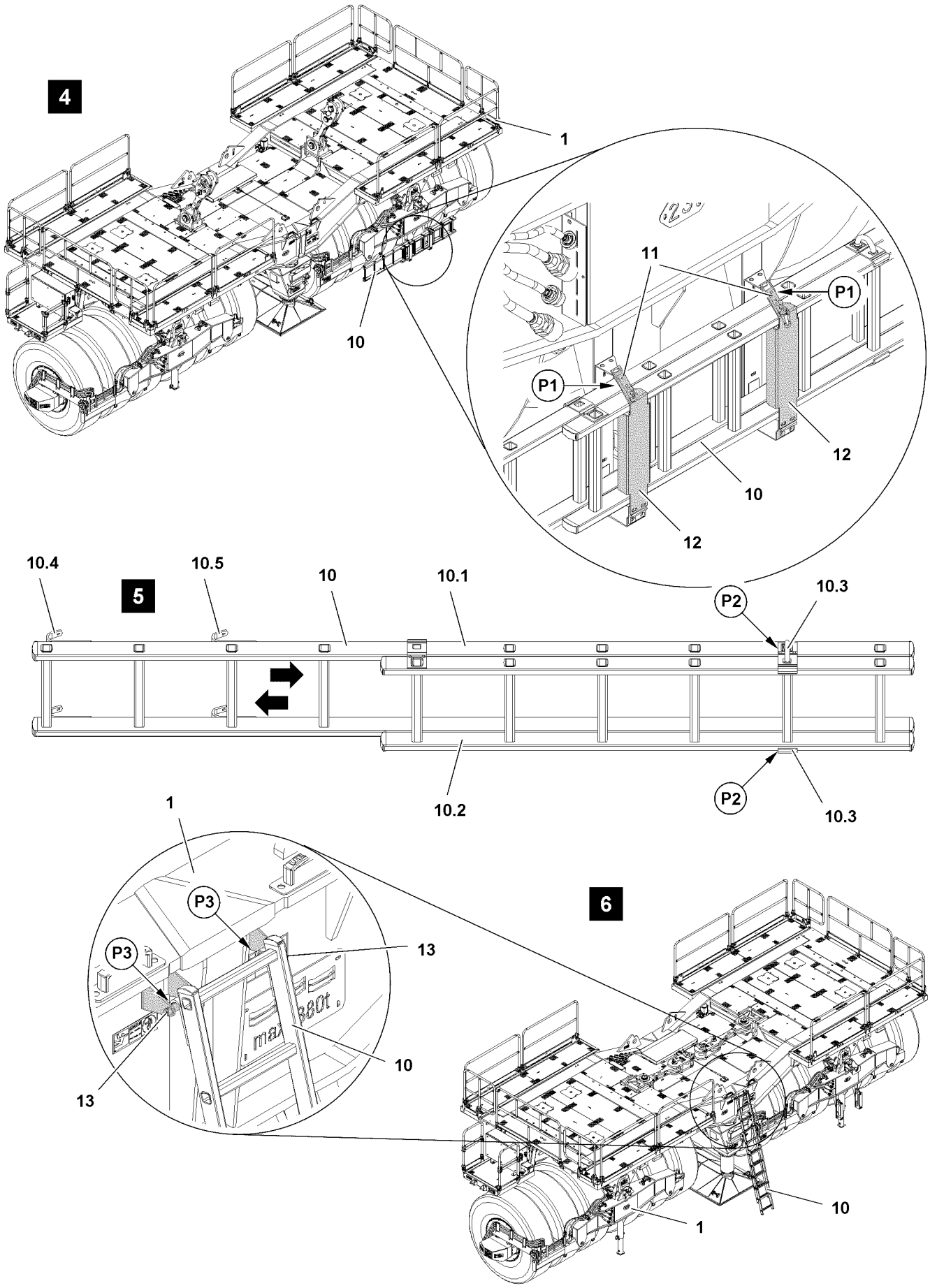

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Fig.121026

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19.1 Extension ladder on ballast trailer

Make sure that the following prerequisite is met:
– The ballast trailer **1** is supported.

19.1.1 Hanging the extension ladder in operating position

▶ Release the extension ladder **10** from the transport position: Open both turnbuckles **11** at points **P1**, swing the retainer **12** and remove the extension ladder **10**, see illustration **4**.

NOTICE
Danger of crushed limbs!
When sliding the upper extension ladder section **10.1**, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Pull the extension ladder **10** out: Pull the two sided lock **10.3** out on points **P2** and turn to the side, see illustration **5**.
▶ Move the upper extension ladder section **10.1** by **one** rung.
▶ Turn and engage the two sided lock **10.3** again on points **P2**.
▶ Hang the extension ladder **10** with the hooks **10.4** at points **P3** on the receptacles **13** on the ballast trailer **1**, see illustration **6**.

19.1.2 Setting the extension ladder in transport position

▶ Disengage the extension ladder **10** with the hooks **10.4**, see illustration **6**.
▶ Pull the extension ladder **10** in: Pull the two sided lock **10.3** out on points **P2** and turn to the side, see illustration **5**.

NOTICE
Danger of crushed limbs!
When sliding the upper extension ladder section **10.1**, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Move the upper extension ladder section **10.1** until it is flush with the lower extension ladder section **10.2**.
▶ Turn and engage the two sided lock **10.3** again on points **P2**, see illustration **5**.
▶ Fasten the extension ladder **10** in transport position on the ballast trailer **1**: Open both turnbuckles **11**, swing the retainer **12** and set the extension ladder **10** in, see illustration **6**.
▶ Close both turnbuckles **11** again.

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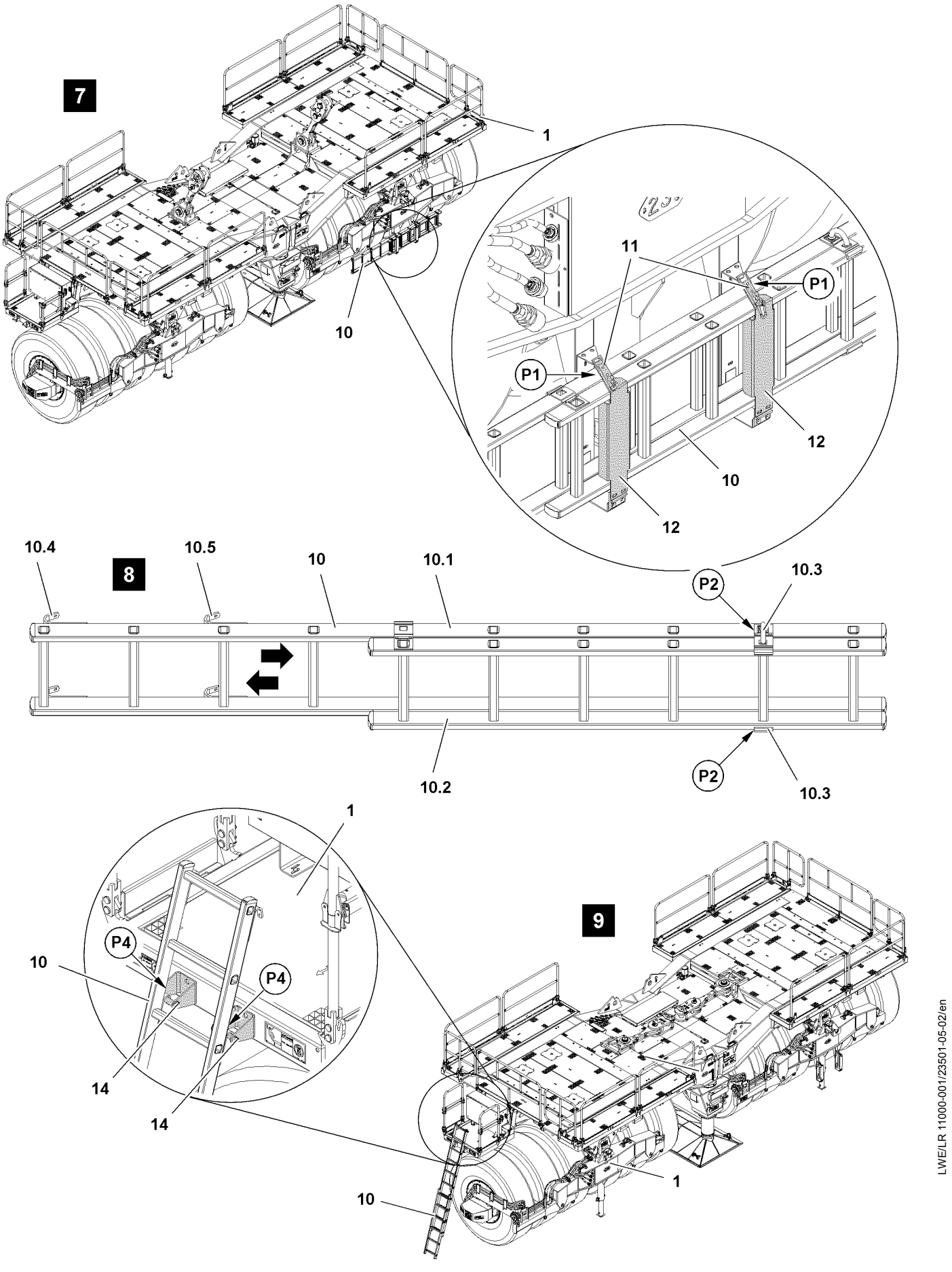

Fig.121027

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19.2 Extension ladder on control cabinet pedestal

Make sure that the following prerequisite is met:
– The ballast trailer **1** is supported.

19.2.1 Hanging the extension ladder in operating position

▶ Release the extension ladder **10** from the transport position: Open both turnbuckles **11** at points **P1**, swing the retainer **12** and remove the extension ladder **10**, see illustration **7**.

NOTICE
Danger of crushed limbs!
When sliding the upper extension ladder section **10.1**, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Pull the extension ladder **10** out: Pull the two sided lock **10.3** out on points **P2** and turn to the side, see illustration **8**.
▶ Move the upper extension ladder section **10.1** by **two** rungs.
▶ Turn and engage the two sided lock **10.3** again on points **P2**.
▶ Hang the extension ladder **10** with the hooks **10.5** at points **P4** on the receptacles **14** on the control cabinet platform **3**, see illustration **9**.

19.2.2 Setting the extension ladder in transport position

▶ Disengage the extension ladder **10** with the hooks **10.5**, see illustration **9**.

Note
▶ Pull the extension ladder **10** in and fasten in transport position, see section „Extension ladder on ballast trailer“ - „Set the extension ladder in transport position.“

▶ Set the extension ladder in transport position.

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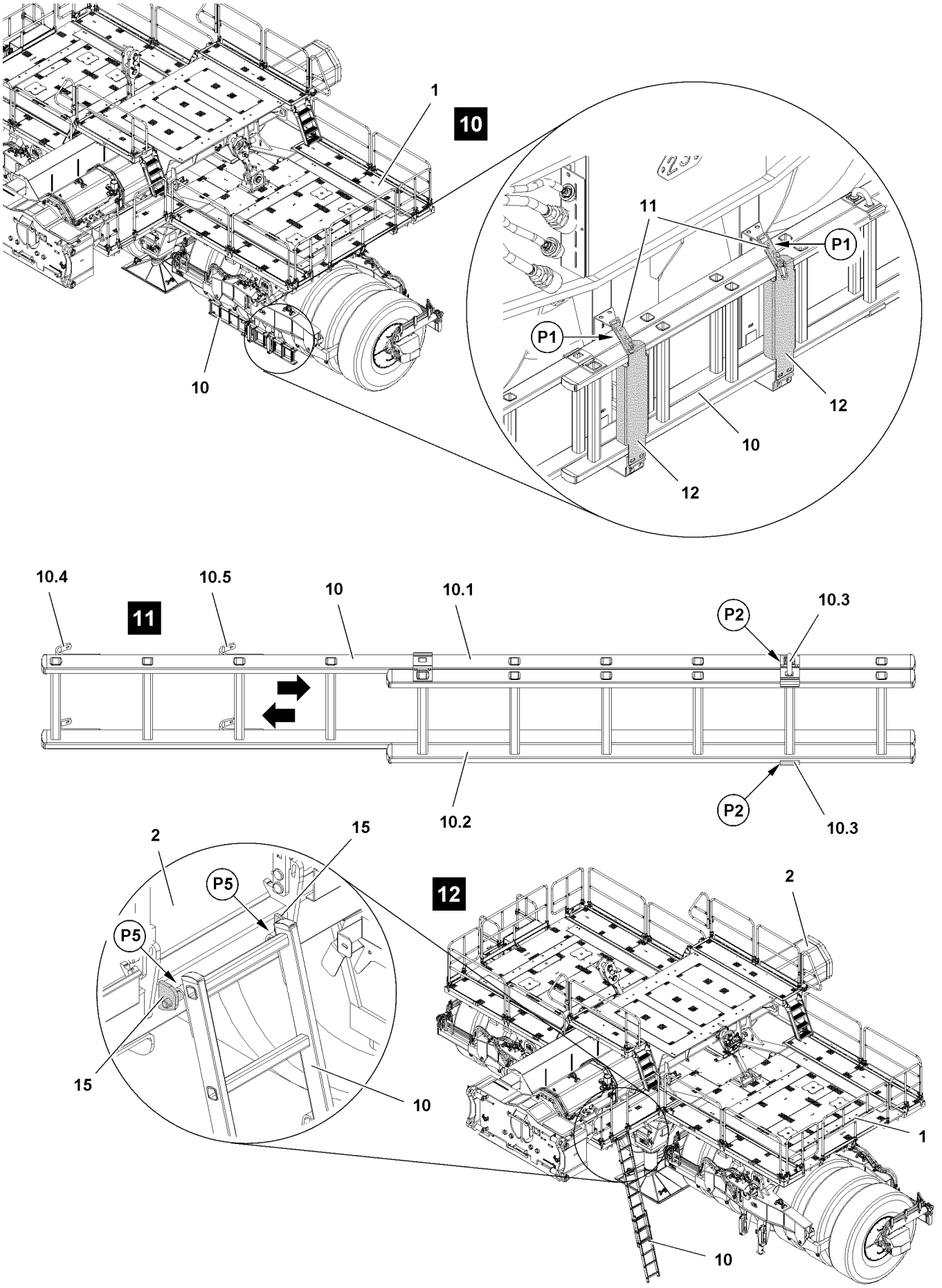

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Fig.121028

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19.3 Extension ladder on ballast trailer guide

Make sure that the following prerequisite is met:
– The ballast trailer guide **2** is installed.

19.3.1 Hanging the extension ladder in operating position

▶ Release the extension ladder **10** from the transport position: Open both turnbuckles **11** at points **P1**, swing the retainer **12** and remove the extension ladder **10**, see illustration **10**.

NOTICE
Danger of crushed limbs!
When sliding the upper extension ladder section **10.1**, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Pull the extension ladder **10** out: Pull the two sided lock **10.3** out on points **P2** and turn to the side, see illustration **11**.
▶ Move the upper extension ladder section **10.1** by **three** rungs.
▶ Turn and engage the two sided lock **10.3** again on points **P2**, see illustration **11**.
▶ Hang the extension ladder **10** with the hooks **10.4** at points **P5** on the receptacles **15** on the ballast trailer guide **2**, see illustration **12**.

19.3.2 Setting the extension ladder in transport position

▶ Disengage the extension ladder **10** with the hooks **10.4**, see illustration **12**.

Note
▶ Pull the extension ladder **10** in and fasten in transport position, see section „Extension ladder on ballast trailer“ - „Set the extension ladder in transport position.“

▶ Set the extension ladder in transport position.

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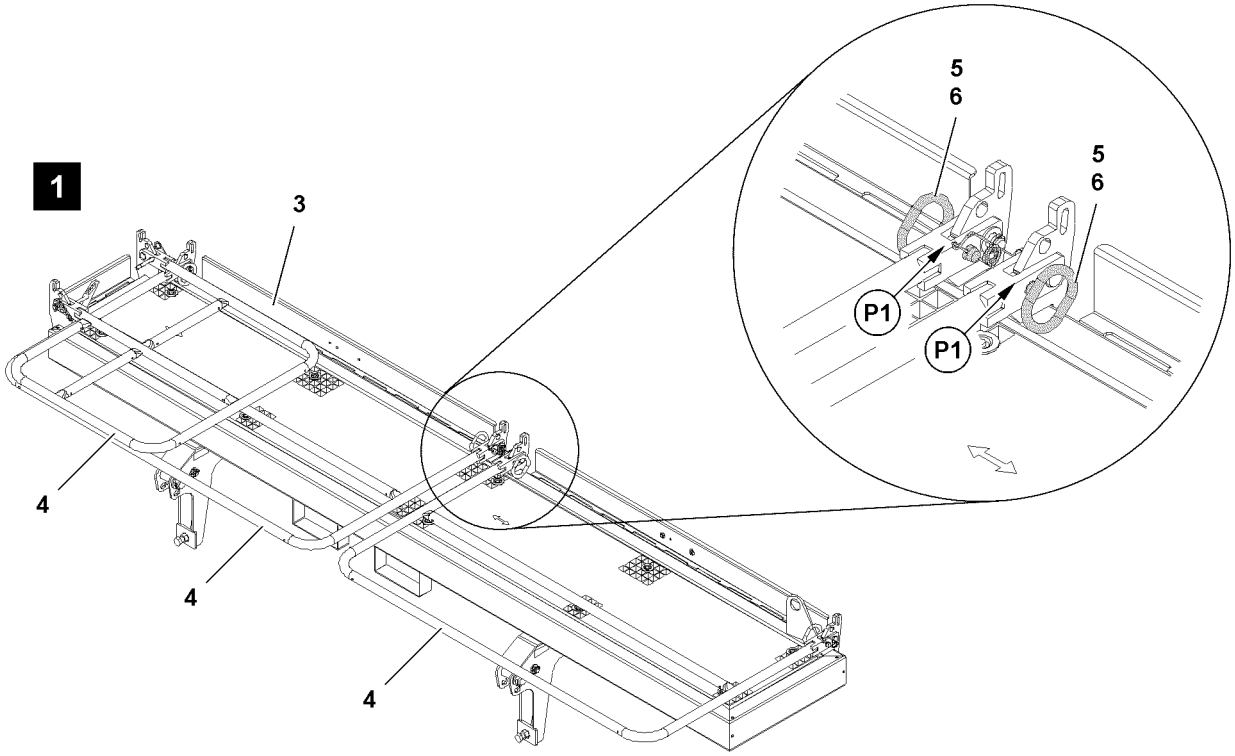

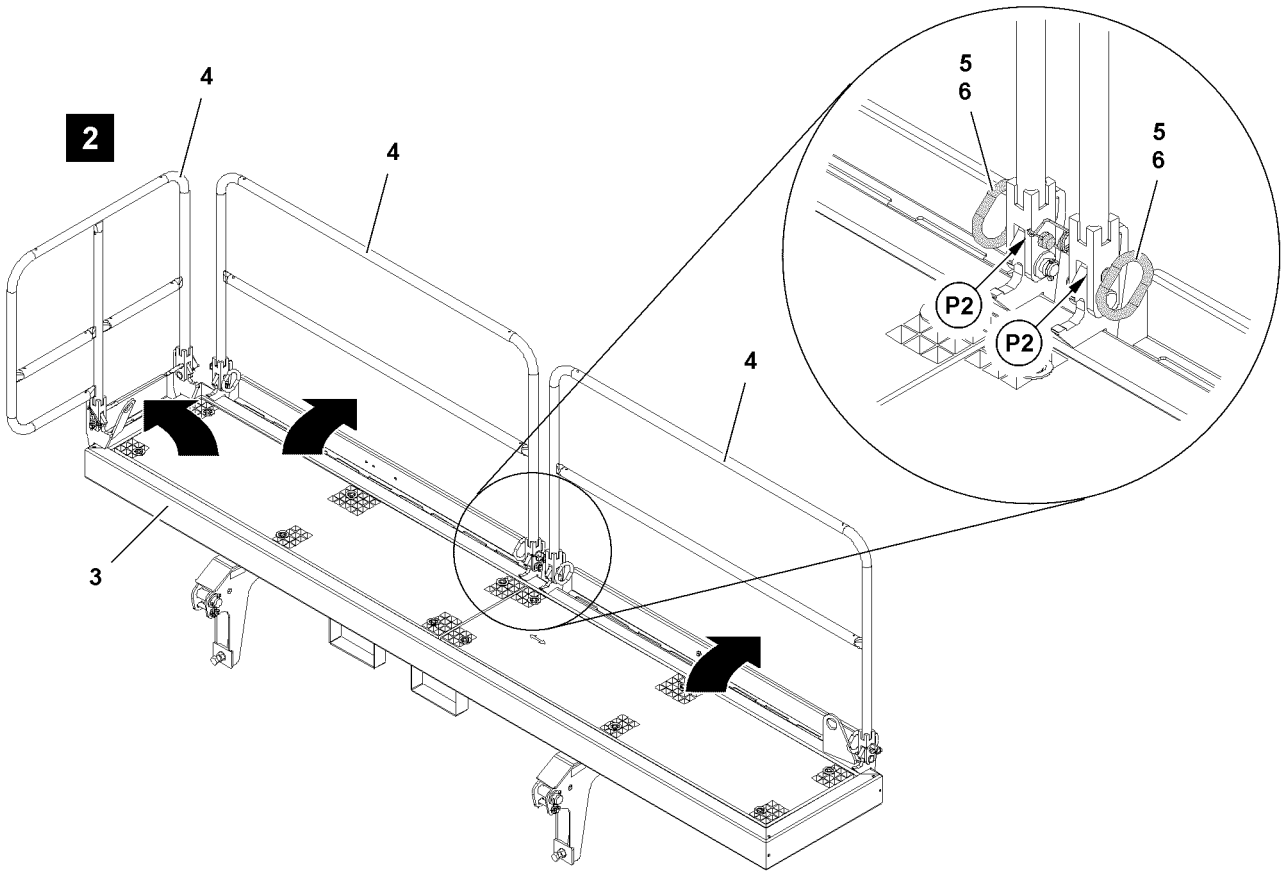

Fig.121029

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20 Railing on ballast trailer

Note

▶ The assembly and disassembly of the railings is identical and is described on the example for one railing, see illustration.

WARNING
Danger of falling!
During assembly and disassembly of the railing, personnel must be secured with appropriate aids to prevent them from falling.
Even during the assembly of protective devices there is a danger of falling.
Death, severe injury, property damage.

▶ Use personal protective equipment.

WARNING
Danger of crushed limbs!
When swinging the railings, fingers and hands can be crushed.

▶ Do not reach with your hands into the danger zone.

20.1 Railing on platforms

The platform **3** is equipped with three railings **4**, see illustration **1**.

20.1.1 Swinging the railings on the platforms in operating position

▶ Release the railing **4** from the transport position: Remove the spring retainer **6** at point **P1** and unpin the connector **5**, see illustration **1**.
▶ Swing the railing **4** into the operating position.
▶ Secure the railing **4** in the operating position: Insert the connector **5** at point **P2** and secure with spring retainer **6**, see illustration **2**.

20.1.2 Swinging the railings on the platforms in transport position

WARNING
Danger of crushed limbs!
The railing **4** can swing down by itself due to its own weight when it is unpinned.
Fingers and hands can be crushed.

▶ Before unpinning, hold the railing and swing it down slowly.

▶ Release the railing **4** from the operating position: Remove the spring retainer **6** at point **P2** and unpin the connector **5**, see illustration **2**.
▶ Swing the railing **4** into the transport position.
▶ Secure the railings **4** in transport position: Insert the connector **5** at point **P1** and secure with spring retainer **6**, see illustration **1**.

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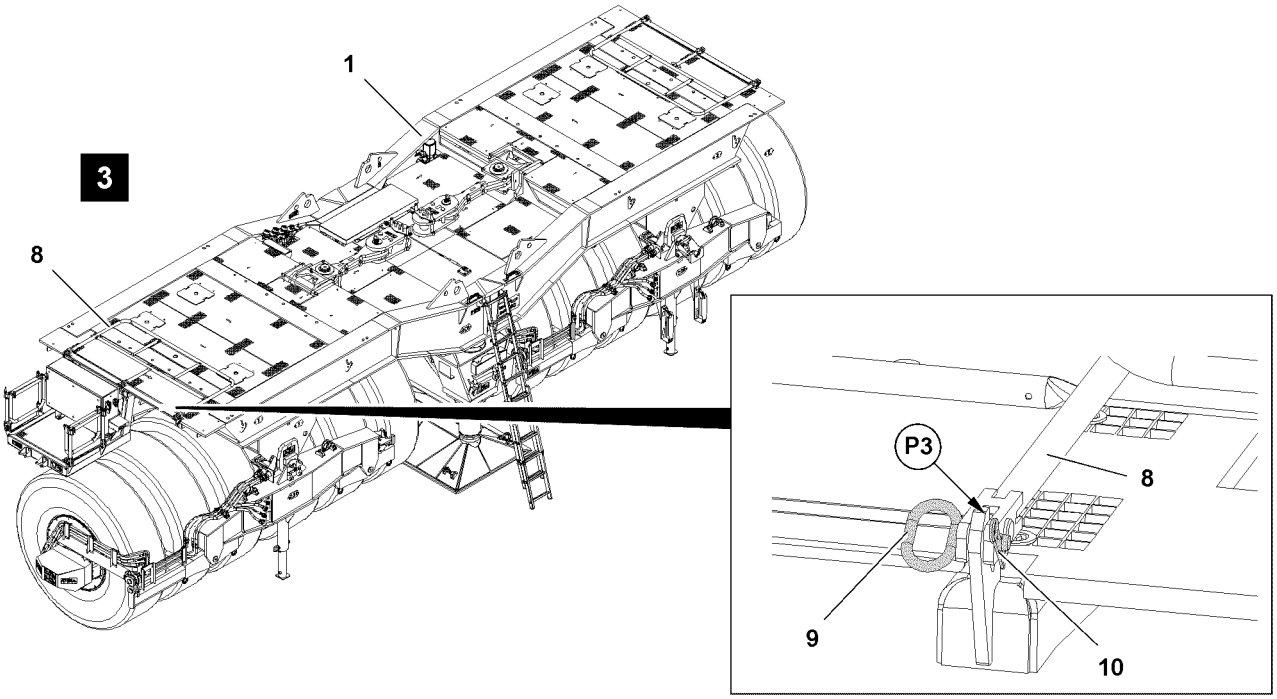

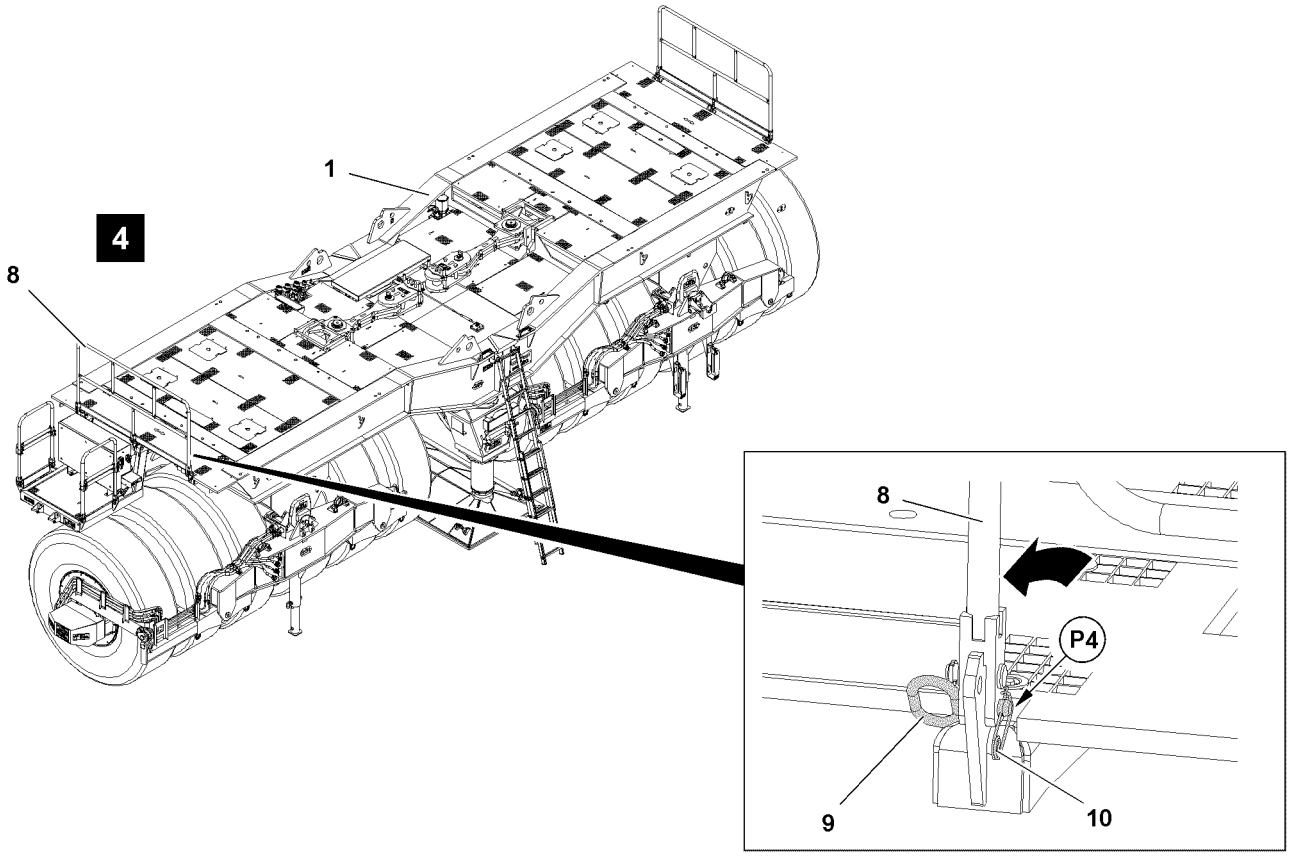

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Fig.121030

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20.2 Railing on ballast trailer

20.2.1 Swinging the railing on the ballast trailer into operating position

The ballast trailer **1** is equipped with two railings **8**, see illustration **3**.

- ▶ Release the railing **8** from the transport position: Remove the spring retainer **10** at point **P3** and unpin the connector **9**, see illustration **3**.
- ▶ Swing the railing **8** into the operating position.
- ▶ Secure the railing **8** in the operating position: Insert the connector **9** at point **P4** and secure with spring retainer **10**, see illustration **4**.

20.2.2 Swinging the railing on the ballast trailer into transport position

WARNING
Danger of crushed limbs!
The railing **8** can swing down by itself due to its own weight when it is unpinned.
Fingers and hands can be crushed.
- ▶ Before unpinning, hold the railing and swing it down slowly.

- ▶ Release the railing **8** from the operating position: Remove the spring retainer **10** at point **P4** and unpin the connector **9**, see illustration **4**.
- ▶ Swing the railing **8** into the transport position.
- ▶ Secure the railings **8** in transport position: Insert the connector **9** at point **P3** and secure with spring retainer **10**, see illustration **3**.

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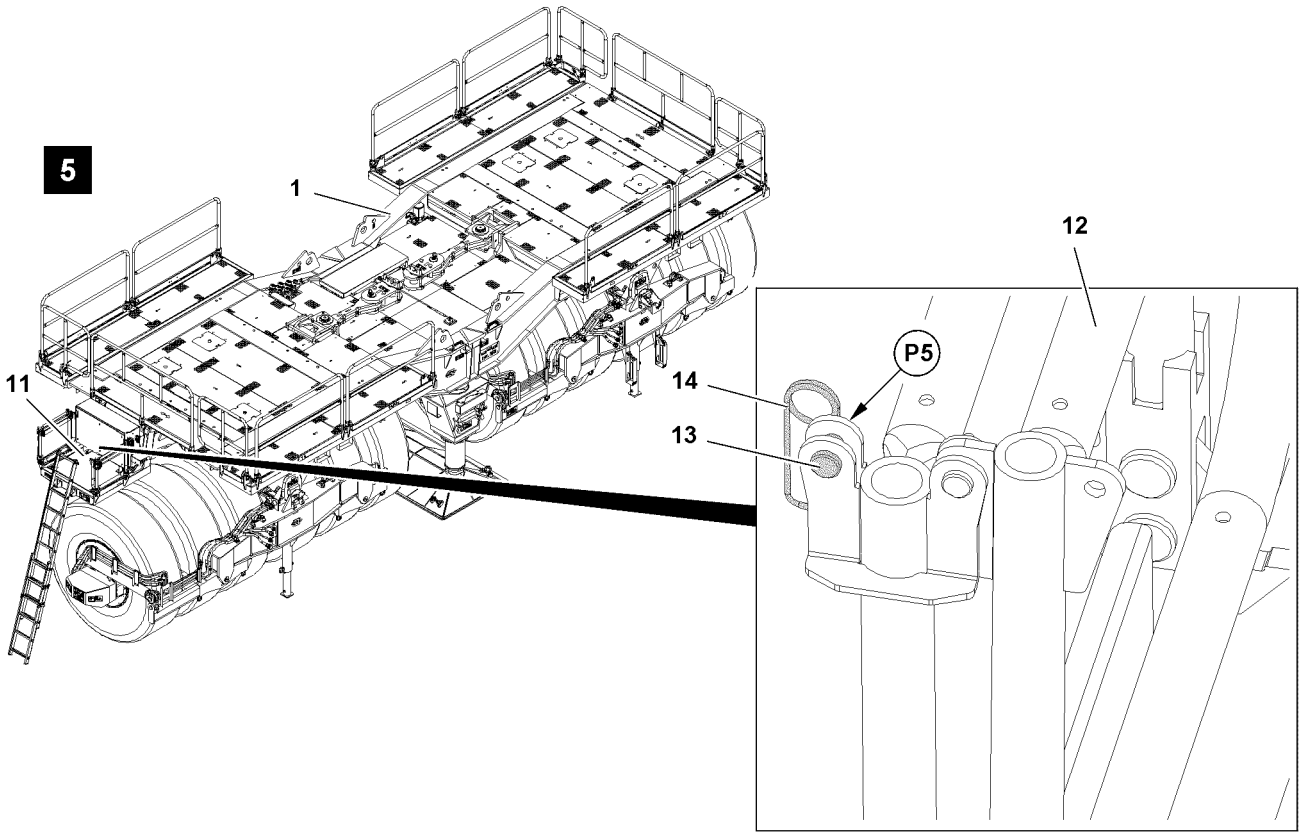

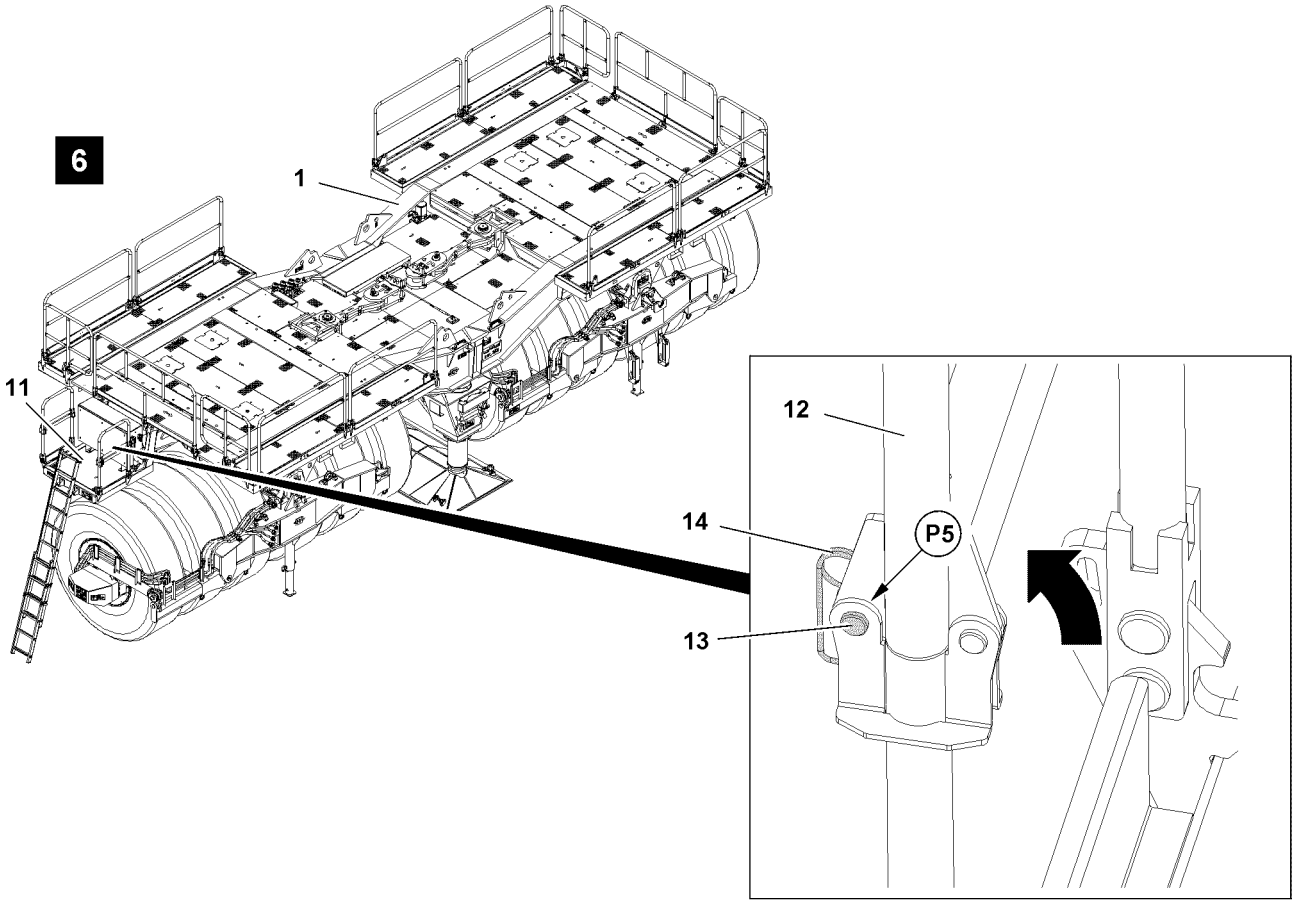

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Fig.121031

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20.3 Railing on the control cabinet platform

20.3.1 Swinging the railing on the control cabinet platform into operating position

The control cabinet platform **11** is equipped with two railings **12**, see illustration **5**.

- ▶ Remove the spring retainer **14** at point **P5** and unpin the pin **13**, see illustration **5**.
- ▶ Swing the railing **12** into the operating position.
- ▶ Secure the railing **12** in the operating position: Insert the pin **13** at point **P5** and secure with spring retainer **14**, see illustration **6**.

20.3.2 Swinging the railing on the control cabinet platform into transport position

WARNING
Danger of crushed limbs!
The railing **12** can swing down by itself due to its own weight when it is unpinned.
Fingers and hands can be crushed.
- ▶ Before unpinning, hold the railing and swing it down slowly.

- ▶ Release the railing **12** from the operating position: Remove the spring retainer **14** at point **P5** and unpin the pin **13**, see illustration **6**.
- ▶ Swing the railing **12** into the transport position.
- ▶ Secure the railings **12** in transport position: Insert the pin **13** at point **P5** and secure with spring retainer **14**, see illustration **5**.

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2.08 Working in low temperatures

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4	Maintenance	7

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1 Auxiliary equipment

At ambient temperatures between -20 °C and +50 °C the crane „can be operated and stored without auxiliary equipment for working in low temperatures“.

At ambient temperatures below -20 °C , the crane must be modified and equipped with „auxiliary equipment for working at low temperatures“.

WARNING
Working at low temperatures without the corresponding auxiliary equipment!
The crane components can be damaged and fail. The load can rip off.
Death, severe bodily injuries, property damage.

If the crane is operated at an ambient temperature lower than -20 °C:
- ▶ Make sure that the crane is equipped with the corresponding „auxiliary equipment for working at low temperatures“.
- ▶ Match the operating fluids in time to the ambient temperature.

2 Safety

Note
- ▶ Temperature changes cause technological changes to material properties in the case of steel / cast steel and many other materials.
- ▶ Crane components made of steel / cast steel are very sensitive to sudden movements, impacts and shocks at decreasing negative temperatures.
- ▶ This effect increases if the crane compacts are impacted with a load and / or large weights.

DANGER
The crane can topple over!
Due to decreasing negative temperatures, crane components reach their technological load limits much earlier.
Crane components can break.
The crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ For safe crane operation, the **temperature of the crane components is the deciding factor** and not the ambient temperature.
- ▶ For safe crane operation with component temperatures **down to -40 °C** , the crane must be equipped with „auxiliary equipment for working at low temperatures“.
- ▶ With component temperatures **below -40 °C** , do not operate the crane. In the case of doubt, contact Customer Service at LIEBHERR-Werk Ehingen GmbH.

Pay attention to the danger note.

3 Environmental / component temperature below -20 °C

3.1 Winter operation

Low temperatures, as well as snow, frost and ice can impair crane operation and cause problems on the crane.

Freezing takes place often at low temperatures.

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WARNING
Snow, frost and ice on the accesses!
Personnel can fall from the accesses.
Death, severe bodily injuries, property damage.
▶ Remove the snow, frost and ice from all accesses, steps and catwalks.
▶ Remove the snow, frost and ice from the crane.

NOTICE
Snow, frost and ice on the crane components!
The crane components can be damaged and fail.
Cylinder seals can be destroyed by frozen piston rods.
▶ Remove the snow, frost and ice from the piston rods.
▶ Remove the snow, frost and ice from all rope pulleys and winches.
▶ Remove the snow, frost and ice from the hose drums and limit switches.

WARNING
Snow, frost and ice below the support plates or the crawler carriers!
The crane can slide.
Death, severe bodily injuries, property damage.
▶ Remove the snow, frost and ice on top and below the support plates.
▶ Remove the snow, frost and ice on top and below the crawler carrier.
▶ Remove the snow, frost and ice from the roadway.

Prerequisites for crane start up with component temperatures below -20 °C
– The hose drums and cables are easy to move.
– All rope pulleys are easily movable.
– The view from the crane cab is free.
– The mirrors are free of snow, frost and ice.
– Fastening equipment is approved for the ambient temperatures present.
– The load fastening points are approved for the ambient temperatures present.

3.2 Preheating time

WARNING
Limited crane control during radio operation!
In the case of falling minus temperatures, the LCD displays react increasingly slowly to changes made to images and icons on the displays.
In the case of minus temperatures below -25 °C , changes made to images and icons could be displayed with a considerable delay or not at all.
This can lead to dangerous situations if warnings are displayed with a delay.
Death, severe bodily injuries, property damage.
▶ If the component temperature of the radio remote control is below -25 °C: Preheat the radio remote control prior to start up.
▶ In the case of increasing sluggishness of the LCD displays during radio operation with temperatures below -25 °C: Warm up or preheat the radio remote control occasionally.

Crane components	Preheating time
Engine preheating up to start at -40 °C component temperature	45 minutes
Preheat the hydraulic system in the crane superstructure and the crane chassis	30 minutes
Preheat the crane cab / driver's cab for start up at the same time up to 5 °C	10 minutes
Total preheating time	**75 minutes**

▶ To ensure safe crane operation: Adhere to the preheating times.

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3.3 Engine preheating

If the components temperature is lower than -20 °C the chassis engine and / or superstructure engine must be preheated before starting.

Depending on the crane type, a chassis engine and / or a superstructure engine is installed.

Pre-warming the chassis engine is described in chapter 6.01.

Pre-warming the superstructure engine is described in chapter 6.02.

▶ Preheat the chassis engine and / or the superstructure engine.
▶ Start the chassis engine and / or the superstructure engine.

When the chassis engine and / or the superstructure engine has reached its operating temperature:
▶ Turn off engine preheating.

3.4 Preheating the hydraulic oil

If the ambient temperature is lower than -20 °C the hydraulic oil must be preheated prior to crane operation.

NOTICE
Hydraulic oil **not** preheated!
The hydraulic system can be damaged during crane operation.
▶ Before starting crane operation, preheat the hydraulic oil to at least 20 °C.
▶ Retract and extend all the hydraulic cylinders in an unloaded state over the entire stroke multiple times.

WARNING
Persons in the area of the hoist movement!
Death, severe bodily injuries, property damage.
▶ Observe the area of the hoist movement.
▶ Make sure that there are **no** persons in the area of the hoist movement.

3.4.1 Turning the hydraulic oil preheating on

Make sure that the following prerequisites are met:
– The engine is running.
– Hydraulic oil preheating is available.

Hydraulic oil preheating is described in chapter 4.03.

▶ Turn the hydraulic oil preheating on.

When the hydraulic oil is preheated:
▶ Turn the hydraulic oil preheating off.

3.4.2 Supporting the crane

Supporting the crane vehicle is described in chapter 3.05.

All support plates must be supported with suitable and stable materials.

If moveable support plates are not available, the support plates must be supported **on one side of the crane** with greased polyamide plates.

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WARNING
No movable support plates or crane **not** supported with greased polyamide plates!
The sliding beams can bend. The support plates can suddenly move to the side.
The load can oscillate.
Death, severe bodily injuries, property damage.
▶ Use moveable support plates.

If there are no movable support plates available:
▶ Support the support plates **on one side of the crane** with greased polyamide plates.

When supporting the crane, extend the support cylinder a maximum of 50 %.

The wheels must not come in to contact with the ground after the crane is supported.

▶ Support the support plates when necessary.
▶ Support the crane.

3.4.3 Cranes with lattice mast boom

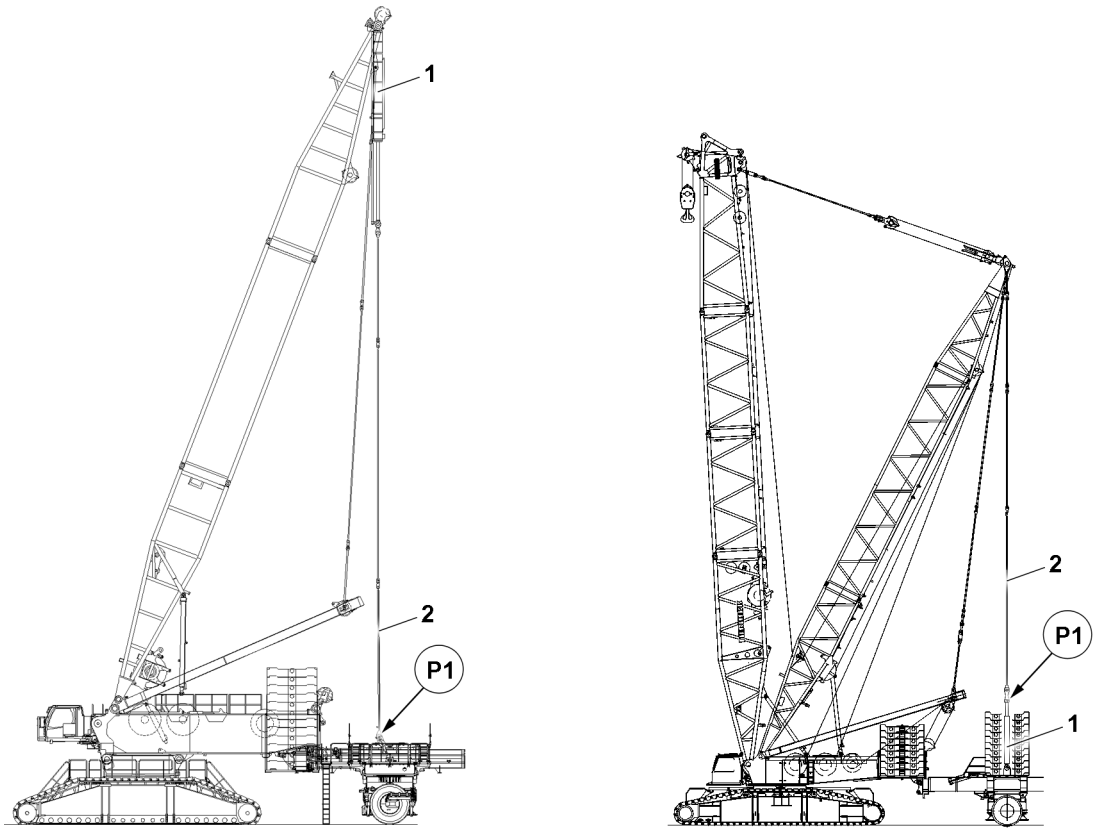

Fig.126875: Removing the guy rods on the derrick ballast

With component temperatures of less than -20 °C , the pull cylinders must be preheated by means of retraction and extension. Before the pull cylinders can be preheated, the guy rods **2** must be removed in position **P1** on the derrick ballast.

Disassembly and assembly of the guy rods **2** on the derrick ballast is described in the Crane operating instructions, chapter 5.35 and chapter 5.36.

▶ Remove the guy rods **2** at position **P1** on the derrick ballast.

NOTICE
Danger of collision!
Damage of the guy rods, derrick ballast or other components.
▶ When retracting and extending the guy rods, avoid contact with other components.

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▶ Retract and extend the pull cylinders **1** in an unloaded state over the entire stroke multiple times.

When additional hydraulic cylinders are installed on the crane with lattice mast:

▶ Retract and extend the hydraulic cylinders in an unloaded state over the entire stroke multiple times.

3.4.4 Cranes with telescopic boom

Make sure that the following prerequisites are met:

– The crane is supported and horizontally aligned.
– There is no load on the hook.

▶ Retract and extend the luffing cylinder in an unloaded state over the entire stroke multiple times.
▶ Retract and extend the telescoping cylinder in an unloaded state over the entire stroke multiple times.

3.5 Assembling / disassembling the crane component

If the component temperature is lower than -20 °C , there is an increased danger that in the case of impact and / or strong component contact that the crane components will be damaged as a result of their changed technological material properties. In particular counterweights and crane components made of cast steel are subject to a greater risk of damage due to impact at component temperatures below -20 °C .

NOTICE
Striking of the crane component during assembly or disassembly!
Crane components can be damaged.
▶ Do **not** strike the crane component during assembly and disassembly.
▶ Carry out all work slowly and with utmost caution.

3.6 Reducing rope pull

When working with rope / component temperature below -20 °C Liebherr-Werk Ehingen GmbH recommends reducing the rope pull.

The rope pull on the hoist rope can be reduced by increasing the rope reeving.

Note
Increase of rope reeving!
Due to the increased rope reeving, the hoist rope length may not be sufficient for lowering the hook block to the ground.
▶ Pay attention to rope length.

NOTICE
Rope reeving higher than specified in the load chart!
Danger of slack rope formation due to a too low hook block weight. Damage of hoist rope.
▶ Increase the hook block weight accordingly.

▶ Increase the rope reeving specified in the load chart.
▶ If necessary: Increase the hook block weight.

3.7 Increasing the hook block weight

The calculation of the minimum required hook block weight is described in the load chart.

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Rope / component temperature	Increasing the hook block weight
-21 °C to -30 °C	Increase the minimum required hook block weight by 10 %
-31 °C to -40 °C	Increase the minimum required hook block weight by 15 %

▶ Increase the required hook block weight depending on the rope or component temperature.
▶ Observe and adhere to the „hook block weight“ charts.

Note
▶ Observe and comply with the permissible hook block weights for erection and take-down of the boom systems in the erection and take down charts.

3.8 Crane operation

In case of an ambient / component temperature below -20 °C , crane operation requires an anticipatory working procedure adapted to the weather conditions.

WARNING
Sudden acceleration and deceleration of crane movements!
Crane components can break.
Death, severe bodily injuries, property damage.
▶ Accelerate and decelerate crane movements sensitively and with utmost caution.

3.8.1 Decreasing crane utilization

Cranes with lattice mast boom

In the case of cranes with pull cylinders in the derrick ballast guying, if the component temperature is between -30 °C and -40 °C the maximum derrick ballast must be reduced. The maximum load is also reduced due to the reduction of the maximum derrick ballast.

Note
▶ Take load reduction into account during job planning.

▶ Reduce the maximum derrick ballast by 15 % in case of component temperatures between -30 °C and -40 °C.

Cranes with telescopic boom

In the case of cranes with a telescopic boom, if the component temperature is between -30 °C and -40 °C crane utilization must be reduced.

▶ Reduce crane utilization by 15 % in the case of component temperatures between -30 °C and -40 °C.

4 Maintenance

4.1 Load bearing crane structures

Checking the load bearing crane structure is described in Chapter 8.01.

▶ The load bearing crane structure must be visually inspected more often at low temperatures.

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4.2 Rope pulleys and hydraulic cylinders

Checking the rope pulleys and hydraulic cylinders is described in Chapter 8.01.

▶ Rope pulleys and hydraulic cylinders must be visually inspected more often at low temperatures.

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2.15 General technical safety instructions for operation with a ballast trailer

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2	Inspecting tires and disk wheels	4

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1 Safety guidelines

WARNING
Danger of falling!
- ▶ During assembly or disassembly work on the ballast trailer, assembly personnel must be secured with appropriate aids! If this is not observed, assembly personnel can fall and suffer life-threatening or fatal injuries!

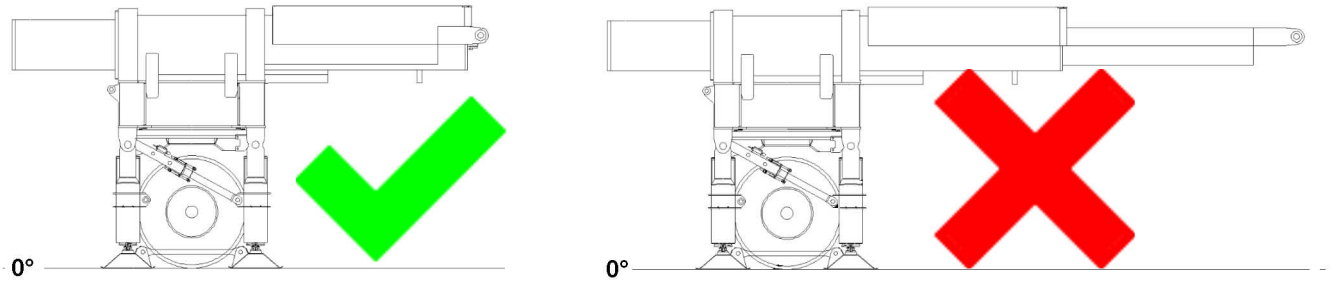

Fig.144267: Ballast trailer correctly parked // ballast trailer incorrectly parked

WARNING
Ballast trailer tipping danger!
If the following notes are not observed, the freestanding ballast trailer or the ballast trailer which needs to be disassembled can tip over.
Death, severe bodily injuries, property damage.
- ▶ The ballast trailer may only be parked on level ground with a sufficient load bearing capacity.
- ▶ The ballast trailer may only be unpinned from the crane and parked if the ballast trailer guide is fully retracted.
- ▶ The ballast trailer may only be unpinned from the crane and parked if there is sufficient ballast on the ballast trailer to ensure the stability of the ballast trailer.
- ▶ To unpin and disassemble the ballast trailer from the crane, it may be necessary for the ballast trailer guides to not be fully retracted. This is only permissible when in chapter 5.35 the procedure for this is fully described and specifically permitted. The specifications and prerequisites in chapter 5.35 must be observed and adhered to.
- ▶ The ballast trailer may only be unpinned from the crane and parked if the support cylinders are extended and the tires are relieved.
- ▶ The ballast trailer may only be unpinned from the crane and parked if the brace on the support cylinders is pinned and secured.

WARNING
Danger of fatal injury if the permissible travel speed is exceeded!
If the permissible travel speed is exceeded, the tires can be damaged.
Death, severe bodily injuries, property damage.
As a result, significant property damage can occur on the crane and on the ballast trailer.
- ▶ The travel speed of the ballast trailer when turning or driving with maximum ballast on the tires may be not more than maximum 1 km/h (0.28 m/s).

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WARNING
The crane can topple over if the level of the road differs!
Due to impermissible level differences between the ballast trailer roadway and the crane placement level, the entire crane system can be pulled back suddenly.
The relapse cylinders can run out to the block position. The relapse cylinders and the boom system can be damaged.
Depending on the distortion of the turntable and the load of the tires on the ballast trailer, a shut-off of crane movements may be activated with a retracted ballast trailer guide due to an excessive inclination of the ballast trailer (depending on the crane type and time of crane delivery), see chapter 4.02.
Death, severe bodily injuries, property damage.
- ▶ Do not exceed or fall below the permissible level difference between the ballast trailer road and the crane placement level.
- ▶ The travel path of the crane or the circular path of the ballast trailer must be level and of sufficient load bearing capacity.
- ▶ The permissible level difference of the ballast trailer travel path and crane travel path for „towing“ and „parallel driving“, may be maximum 250 mm when the ballast trailer guide is extended.
- ▶ The permissible level difference of the ballast trailer path and the crane travel path in relation to the crane travel path for circular driving may be no more than maximum 250 mm with the ballast trailer guide extended - based on a constant uphill incline or constant downhill incline on a 90° turning range.

WARNING
The crane can topple over!
If the following notes are not observed, the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ When lifting or lowering the ballast trailer, pay attention to the horizontal alignment of the ballast trailer.
- ▶ The assembly or disassembly work must be carried out according to chapter 5.35 **or** chapter 5.35.10 **or** chapter 5.35.20.

NOTICE
Damage to the ballast trailer, ballast trailer guide and / or the turntable!
If the ballast trailer inclination is too large or the level difference of the standing levels between the crane and ballast trailer are too large, this can cause damage to the ballast trailer, the ballast trailer guide and / or the turntable.
- ▶ Keep the ballast trailer inclination as small as possible.
- ▶ Do not exceed the maximum permissible level difference of the standing levels of 250 kg between the crane and the ballast trailer.

NOTICE
Danger of damage to the crane and the ballast trailer!
Due to steering movements on the crawler tracks while driving parallel, the crane and the ballast trailer can be significantly damaged.
- ▶ During parallel travel, steering the crawler travel gear is prohibited.
- ▶ For parallel travel, the side tire distortion on the wheel sets must be observed by an instructed person over the entire travel route of the crane. If the tires distort by more than 100 mm , then the position of the wheel sets must be corrected.

Note
General technical safety instructions!
- ▶ The ballast trailer guy rods must be assembled and secured according to the rod plan. The numbering on the rod plan must be identical to the numbering on the guy rods.

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2 Inspecting tires and disk wheels

Note
▶ See chapter 8.01.

WARNING
Danger of fatal injury when using non-approved tires!
Due to the use of tires that are not explicitly approved by **LIEBHERR-Werk Ehingen GmbH**, uncontrollable operation conditions on the ballast trailer can occur due to the heavy load.
The tires can be destroyed and the ballast trailer as well as the crane can be significantly damaged.
Death, severe bodily injuries, property damage.
▶ Use only spare tires that have been approved in writing by **LIEBHERR-Werk Ehingen GmbH**.
▶ Using spare tires that have been not explicitly approved in writing by **LIEBHERR-Werk Ehingen GmbH** is prohibited.

NOTICE
Damage to tires!
Due to external environmental influences (for example: rain, wind, snow, rime, frost, sun exposure) and the great weight load on the tires by the ballast trailer, the tires can become porous and the body can loose its original strength.
▶ The tires must be replaced according to the data of the tire manufacturer at least after 5 years, or if an expert representative of the tire manufacturer states in writing, after extensive inspection of the tires, that the tires can be utilized for an additional operation period stated by the expert representative.

Note
Tightening torque of ballast trailer tires!
▶ The tightening torque for the wheel lugs is 600 Nm.
▶ Check the wheel lugs according to the specified maintenance intervals for tight seating, see chapter 7.02.

2.1 Tires with air inflation

It is imperative to comply with the following instructions:
– After extended downtime, the inflation pressure must be checked before using the ballast trailer.
– The tires must be protected against UV rays during extended downtimes with tarps or wooden boards.

Note
Inflation pressure of ballast trailer tires!
▶ The inflation pressure in all tires inflated with air that were approved in writing by **LIEBHERR-Werk Ehingen GmbH** is **10 bar**.
▶ Check the inflation pressure according to the specified maintenance intervals for tight seating, see chapter 7.02.

WARNING
Danger of accident due to damaged ballast trailer tires!
Due to extended downtime of the crane, when the ballast trailer tires are not relieved with supports, the tires can become irregular.
As a result, the tires can be destroyed and the ballast trailer as well as the crane can be significantly damaged.
Death, severe bodily injuries, property damage.
▶ During extended downtimes, the ballast trailer tires must always be relieved by the supports.

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WARNING
Danger of accident due to damaged ballast trailer tires!
When driving the crane on insufficiently prepared ground, the tires can become damaged or punctured by large rocks or other foreign matter.
As a result, the ballast trailer as well as the crane can be significantly damaged.
Death, severe bodily injuries, property damage.

- ▶ The travel route of the crane or the ballast trailer must be level, of sufficient load bearing capacity and free of rocks or other foreign matter.
- ▶ The travel route of the crane must be walked off personally in advance by the crane operator.
- ▶ Rocks and other foreign matter on the travel route must be removed before starting to travel.
- ▶ If the crane operator cannot ensure that the ballast trailer tires may not be damaged when driving the crane, then the ballast trailer tires must be foamed with a special foam approved by **LIEBHERR-Werk Ehingen GmbH**. Contact **LIEBHERR-Werk Ehingen GmbH** in this regard.
- ▶ If you decide to foam the ballast trailer tires, then ballast trailer operation is only permissible if all tires of the ballast trailer have been foamed according to the specifications of **LIEBHERR-Werk Ehingen GmbH**.

2.2 Tires foamed with special foam

The tires of the ballast trailer are foamed with a special, high quality foam.

Due to extended downtime of the crane, when the ballast trailer tires are not relieved with supports, the tires can become irregular.

It is imperative to comply with the following instructions:

- Relieve the tires on the ballast trailer if it is at a standstill for more than 2 h via the support cylinders.
- The tires must be protected against UV rays during extended downtimes with tarps or wooden boards.

WARNING
Danger of fatal injury when using non-approved tire foams!
Due to the use of tire foams that are not explicitly approved by **LIEBHERR-Werk Ehingen GmbH**, uncontrollable operation conditions on the ballast trailer can occur due to the heavy load.
The tires can be destroyed and the ballast trailer as well as the crane can be significantly damaged.
Death, severe bodily injuries, property damage.

- ▶ Use of spare tires filled with water, air or special foam of lower quality is prohibited.
- ▶ Using spare tires that have been not explicitly approved in writing by **LIEBHERR-Werk Ehingen GmbH** is prohibited.

WARNING
Danger of accident due to retreaded tires!
If tires foamed with the special foam are retreaded, the usage properties can be significantly changed in a negative manner.
The tires can be destroyed and the ballast trailer as well as the crane can be significantly damaged.
Death, severe bodily injuries, property damage.

- ▶ Tires which are filled with special foam may not be retreaded, except if a written approval has been issued by the tire manufacturer.

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2.25 Crane on floating body

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Fig.195219

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1 Non-destined use

WARNING
Non-destined use!
The boom can break off. The crane can topple over.
Death, severe injuries, property damage.
▶ Only use the crane as intended.
▶ Comply with the operating conditions and notes provided in this chapter.

Liebherr mobile cranes and crawler cranes are **not** designed for special requirements according to „EN 13852-2, Cranes - Offshore cranes“ or other offshore specifications and regulations.

For a precise definition of **non**-destined use, see the preface to the crane operating instructions.

2 Destined use

Liebherr mobile cranes and crawler cranes are only designed for assembly work and erection work and can only withstand a limited number of load cycles.

Liebherr mobile cranes and crawler cranes are designed for special properties and movements: evenly distributed drive forces, only occasional operation and load conditions according to „EN 13000, Cranes - Mobile cranes“ and comparable international standards.

For a precise definition of destined use, see the preface to the crane operating instructions.

3 Floating device

The term floating device includes all floating devices such as barges and ships.

The floating device must fulfil the prerequisites for crane operation.

4 Operating conditions

Observe the areas of responsibility:
– The crane contractor and crane operator are responsible for ensuring that the conditions for crane operation at the job site are fulfilled. It is strongly recommended to consult a naval engineer.
– The correct functional, technical and static interaction between the crane and the floating device is the sole responsibility of the crane contractor and the crane operator. This must be clarified and checked before operating the crane on a floating device.

Observe the following to ensure the safe operation of the crane on floating devices:
– Comply with all country-specific, legal specifications and conditions.
– Perform a risk assessment according to the Occupational Safety and Health Act to ensure safe working conditions.
– Outrigger forces or crawler pressures generated by crane operation must be safely supported by the steel construction of the floating device.
– Assemble and operate the crane according to manufacturer specifications.
– Comply with the maximum permissible lateral deflection angle between the hoist rope and the rope pulley. The deflection angle consists of the lateral elastic deformation of the boom system, the inclination of the crane supporting surface and a possible diagonal pull on the hoist rope.

  Maximum permissible deflection angle:
  • 2.5° with a hoist rope diameter of less than 23 mm
  • 5° with a hoist rope diameter of 23 mm or more
– The conditions when working on a floating device must correspond with the conditions on land.

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– Lifting and lowering loads in very calm waters and on very calmly moving floating devices correspond to the lifting and lowering a load on land.

4.1 Floating device, supported

Observe the following to ensure the safe operation of the crane on supported floating devices:
– For crawler cranes, observe the maximum permissible ground inclination of the crane of ±0.3°, see the load charts.
– Supported cranes must be horizontally aligned (0°).

4.2 Floating device, not supported

Observe the following to ensure the safe operation of the crane on **non** supported floating devices:
– Crane operation on a floating device is only permissible in very calm waters.
– Crane operation is only permissible on a floating device with a main boom (no derrick operation, no operation with luffing jib permitted).
– The inclination of the floating device may **not** exceed the maximum permissible ground inclination of the crane according to the load chart.
– Before the crane is operated on the floating device: The inclination of the floating device in the lateral and longitudinal direction must be calculated in advance. This incline results from the interaction of the crane with the floating device.
– Comply with the maximum permissible ground inclination according to the load charts:
  • ±0.3° for cranes operating on a crawler travel gear.
  • 0° for cranes operating on outriggers.
– The load values must be reduced when the above indicated include values are exceeded.
– Load charts for higher permissible ground inclinations (for example 1°, 2°) can be provided upon request of LWE customers only for operation with a „main boom“ and with a „main boom + jib boom“.
– LTR 1060, LTR 1100 and LTR 1220 are programmed with load charts that permit operation up to a maximum ground inclination of 4°. The crane's respective maximum permissible ground inclination depends on the crane's operating mode.

5 Crane transport on floating devices

Observe the areas of responsibility:
– The crane contractor is solely responsible for transporting the crane on a floating device.
– The crane contractor and crane operator are responsible for the assembly and disassembly of the crane on the floating device.

Observe the following to ensure the safe transport of the crane on floating devices:
– Secure the crane during „transport on a floating device“ so that the following is prevented:
  • Damage and releasing of components on the crane
  • Slipping of the crane
  • Inadvertent turning of the superstructure
  • Capsizing of the floating device
– Transport at sea can have a negative impact on the structural strength / stability and the fatigue limit of the crane.

  Make sure that the following measures are carried out prior to „transport on a floating device“:
  • Take the boom down and support it using adequate means.
  • With telescope cranes: Disassemble the counterweight plates and secure on the floating device.
  • On crawler cranes: Support the turntable and counterweight using adequate means and secure against slipping.
  • Observe and adhere to the specifications for transporting the crane and the crane components, see Crane operating instructions, chapter 3.80.

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6 Increased corrosion

Extremely salty air near the sea can cause severe corrosion on the crane.

Increased corrosion can cause premature damage to the components (for example, the hydraulic cylinder, wire ropes, electrical and electronic components, driver's cab).

Submerging the hook block in water causes damage to the hook block and the rope.

The crane contractor and the crane operator are solely responsible for preventing severe corrosion.

Measures for preventing corrosion:
- Avoid direct contact between the crane and its components with salt water.
- Do **not** submerge the hook block in water.

Measures for detecting premature damage:
- Have the crane checked regularly and extensively by a qualified person.

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3 Crane assembly

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3.01 Crawler carrier assembly

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1 Component overview

Note
▶ Dimensions and weights, see chapter 1.03.

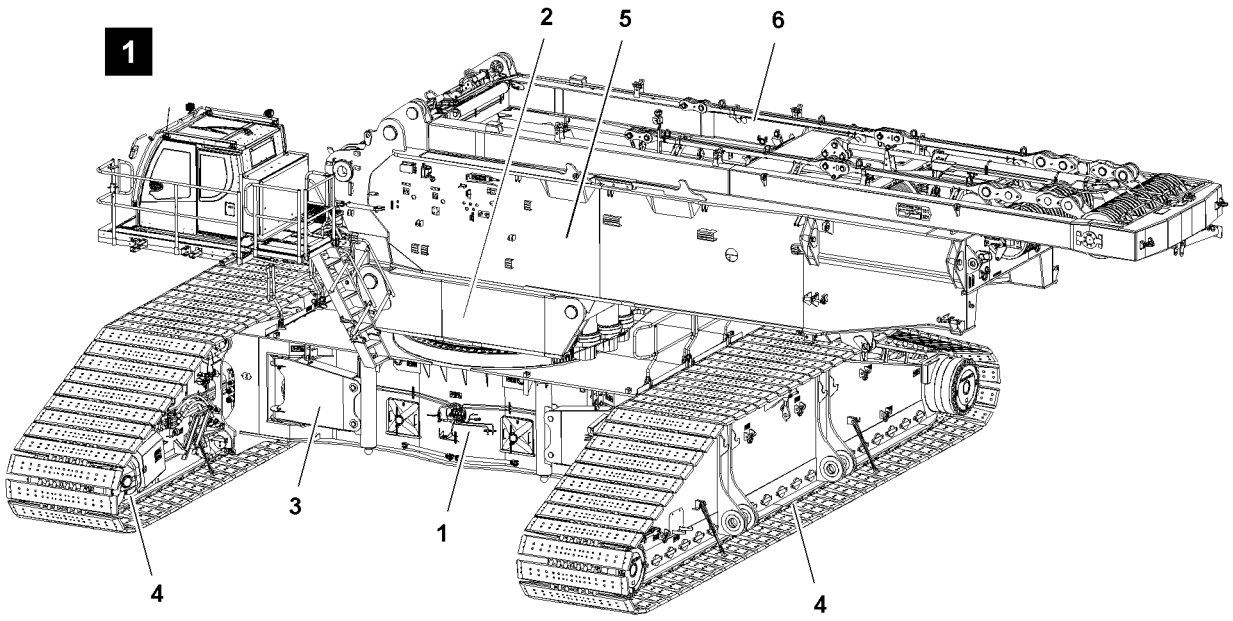

Fig.123920: Component overview

Position	Component
1	Crawler center section
2	Turntable frame-lower section
3	Support
4	Crawler carrier
5	Turntable frame-main section
6	SA-frame

2 Fastening points

WARNING
Components incorrectly fastened!
Death, severe bodily injuries, property damage.
▶ Fasten the components only on the intended fastening points on both sides.

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2.1 Crawler center section fastening points (turntable frame lower section firmly assembled)

WARNING
Danger of accident due to grating covers!
Death, severe bodily injuries, property damage.
▶ Make sure that the grating covers in point **P1** are closed off properly immediately after removing the fastening equipment.

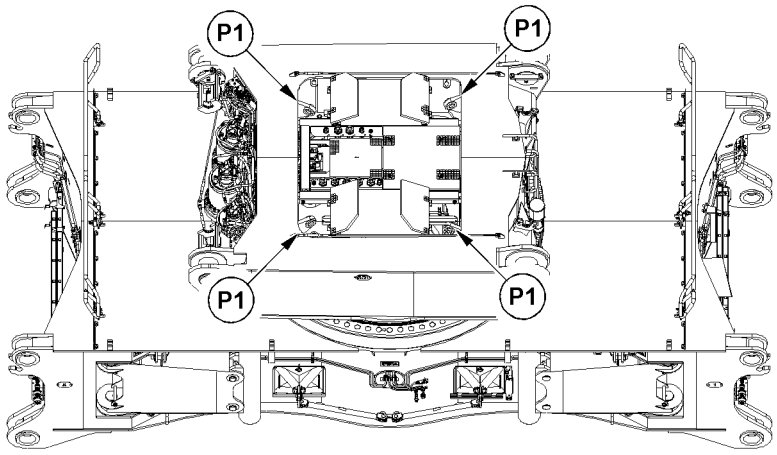

Fig.126163: Fastening points on the crawler center section

Fastening points	Component
P1	Crawler center section

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2.2 Fastening points on the crawler center section with QC (turntable frame lower section not assembled)

2.2.1 Fastening points on the crawler center section with QC

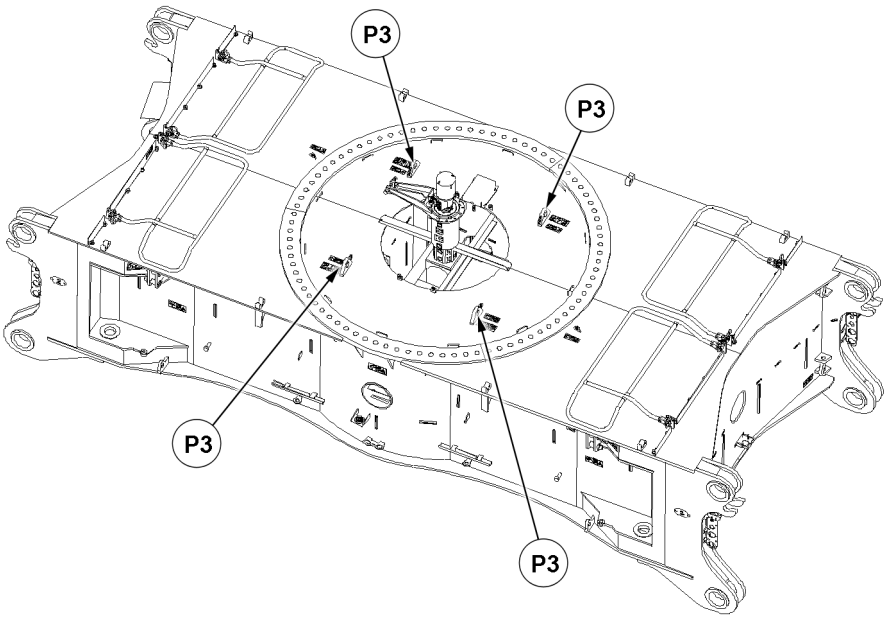

Fig.126161: Fastening points on the crawler center section with Quick Connection (QC)

Fastening points	Component
P3	Fastening points on the crawler center section with Quick Connection (QC)

2.2.2 Fastening points on the turntable frame lower section with QC

WARNING
Danger of accident due to grating covers!
Death, severe bodily injuries, property damage.
▶ Make sure that the grating covers in point **P1** are closed off properly immediately after removing the fastening equipment.

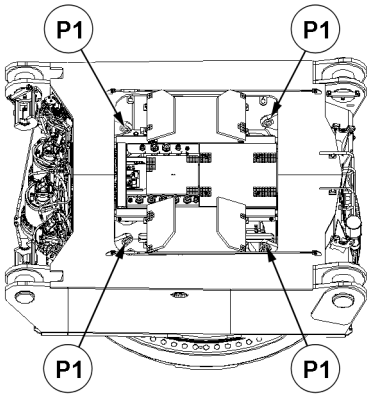

Fig.126160: Fastening points on the turntable frame lower section with QC

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Fastening points	Component
P1	Turntable frame lower section with QC

2.3 Fastening points on the crawler carrier

NOTICE
Danger of property damage!
If the lashing lugs at point **P2** are not folded down into transport position after assembly with the auxiliary crane, then the crawler carrier and the hook points can be damaged later when driving the crane.
▶ Make sure that the lashing lugs at point **P2** are folded in transport position after completion of the crawler carrier assembly.

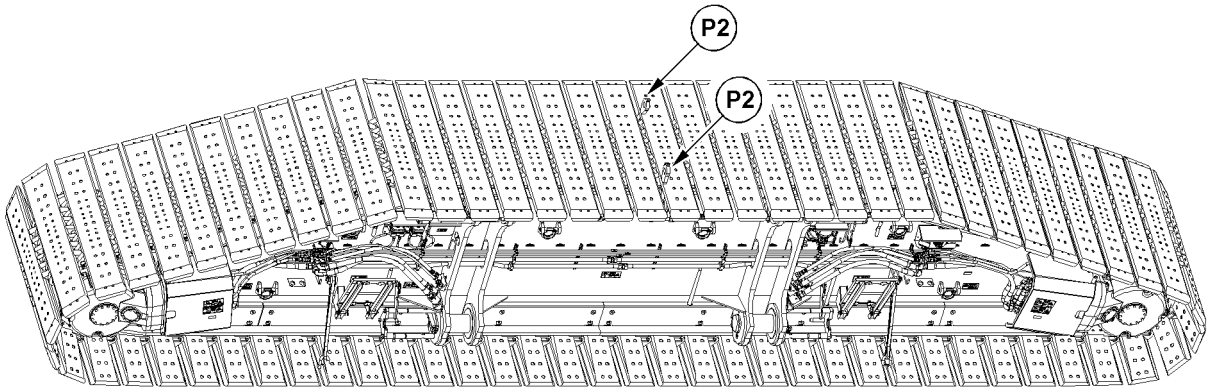

Fig.126162: Fastening points on the crawler carrier

Fastening points	Component
P2	Crawler carrier

3 Safety

Before starting with crawler crane assembly, observe the safety instructions.

- General safety information: See chapter 2.04.
- Information regarding personal protective equipment: See chapter 2.04.
- Information regarding the use of ladders: See chapter 2.04.10.
- Information regarding available hook points: See chapter 2.06.
- Information for assembly and disassembly: See chapter 5.01.

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WARNING
Slippery surfaces, lack of stability!
Death, severe bodily injuries, property damage.
- ▶ Keep ladders, walking surfaces, stairs and stepping surfaces free of objects and obstacles.
- ▶ Only step on ladders, stairs, walking surfaces and stepping surfaces with sufficiently clear height.
- ▶ Only step on ladders, stairs, walking surfaces and stepping surfaces with clean shoes.
- ▶ Keep ladders, stairs, walking surfaces and stepping surfaces free of heavy dirt, snow and ice.
- ▶ Stepping on ladders, stairs, walking surfaces and stepping surfaces by persons, including tools and equipment, weighing more than 150 kg is prohibited.
- ▶ Do **not** step on damaged ladders, stairs, walking surfaces and stepping surfaces and replace them immediately.
- ▶ Do **not** trip over attachment parts.
- ▶ Personnel must wear an approved fall arrest system and protective equipment before performing any work on the crane superstructure.

When fall protection equipment is **not** in the assembly / disassembly position or personnel is on **non**-walking surfaces and stepping surfaces:
- ▶ Personnel must hook themselves to the hook points and safety ropes with an approved fall arrest system to prevent falling.

4 Assembling the turntable frame lower section with Quick Connection (QC) on the crawler center section with QC

Note
- ▶ The Quick Connection (QC) is a quick assembly device for the assembly of the turntable frame lower section on the crawler center section. The Quick Connection (QC) is indicated further in the assembly description as QC.

WARNING
The crawler center section can topple over!
If the turntable frame lower section is not assembled on the crawler center section during the assembly of the first crawler carrier, then the crawler center section can tilt and topple over.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the assembly area of the crawler center section is level and load bearing to take on the weight of the crawler center section with the turntable frame lower section.
- ▶ The crawler center section is properly supported.

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Make sure that the following prerequisites are met:
- An auxiliary crane with a suitable load-bearing capacity is available.
- The crawler center section is properly supported and horizontally aligned, see section „Supporting the crawler center section without the turntable frame lower section“.
- The extension ladder is in the operating position, see chapter 2.06.
- The railings on the crawler center section are in the operating position, see chapter 2.06.

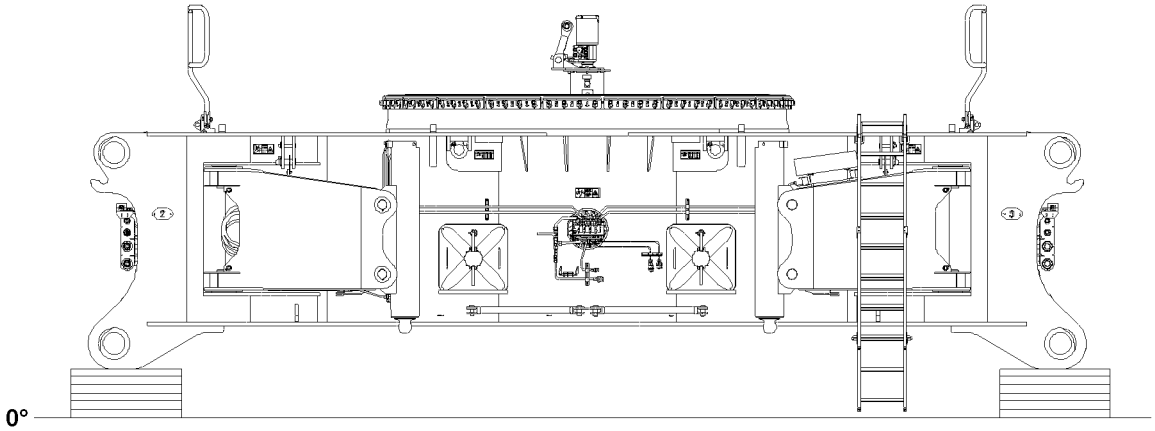

Fig.126164: Crawler center section with QC on the substructure

4.1 Placing the turntable frame lower section on the crawler center section

Make sure that the following prerequisites are met:
- The centering pins **8** are properly assembled and secured to the lower section of the QC **1.1**.
- The centering pins **8** are greased with water repellent grease.

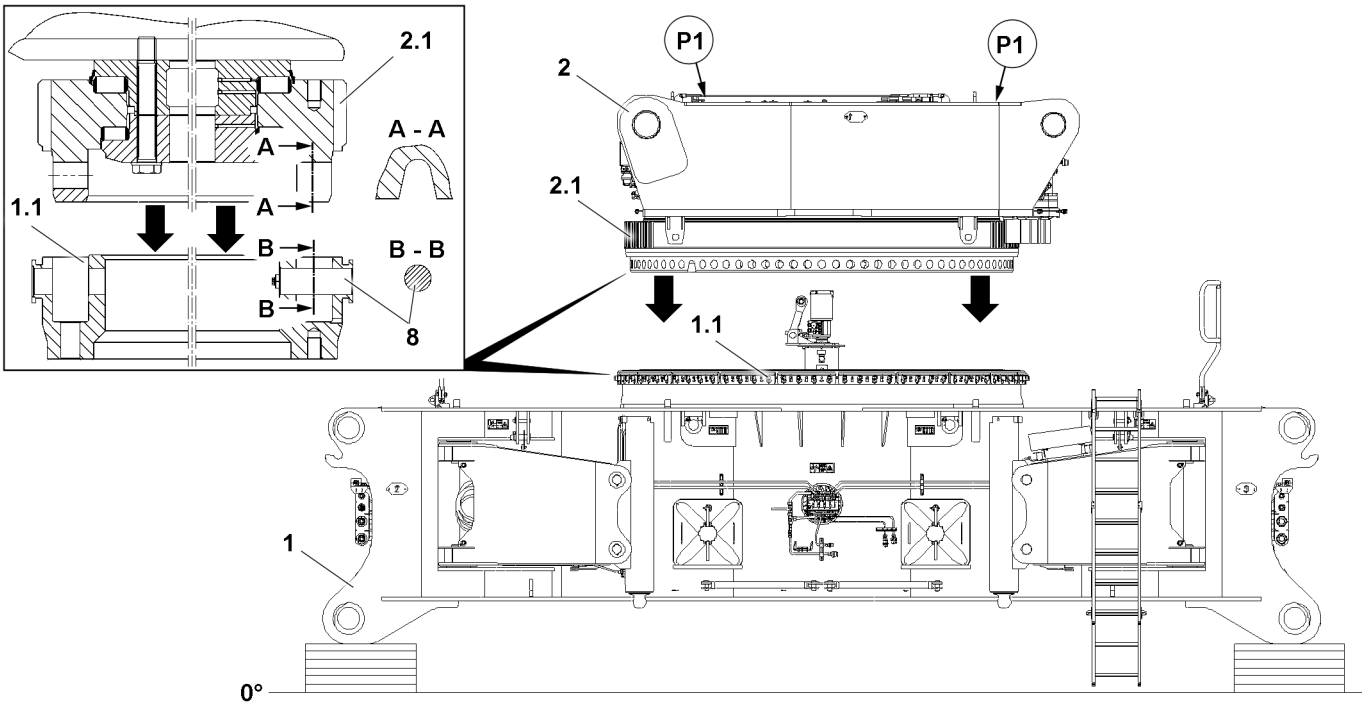

Fig.126165: Placing the turntable frame lower section on the crawler center section

▶ Properly fasten the turntable frame lower section **2** to the fastening points **P1** on the auxiliary crane, see also section „Fastening points“.

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DANGER
Danger of accident!
It is prohibited for anyone to remain within the slewing range of the auxiliary crane and under the turntable frame lower section **2** when swinging in the turntable frame lower section **2** and lowering it.
▶ Swing the turntable frame lower section **2** with the auxiliary crane slowly over the aligned crawler center section.

Note
▶ Pay attention to the exact alignment of the turntable frame lower section **2** or the pocket receptacles **A-A** with the centering pins **8**.
▶ Before lowering the turntable frame lower section **2**, bring it into position in such a way that the pocket receptacles **A-A** are positioned over the centering pins **8** on the crawler center section **1**.
▶ Carefully and slowly lower the turntable frame lower section **2**.

WARNING
Sheering off of limbs!
During the assembly of the QC on the roller ring connection, fingers and hands can be crushed or limbs can be severed.
Death, severe bodily injuries, property damage.
▶ Do not reach with your hands into the danger zone.

WARNING
Tipping turntable frame lower section!
If the turntable frame lower section **2** is set on the crawler center section, then it can tip over and fall down when removing the fastening equipment.
Death, severe bodily injuries, property damage.
▶ Make sure that the fastening equipment remains „tensioned“ between the turntable frame lower section **2** and the auxiliary crane until the pins of the QC are properly inserted and secured.

▶ Set the turntable frame lower section **2** carefully on the crawler center section **1**.

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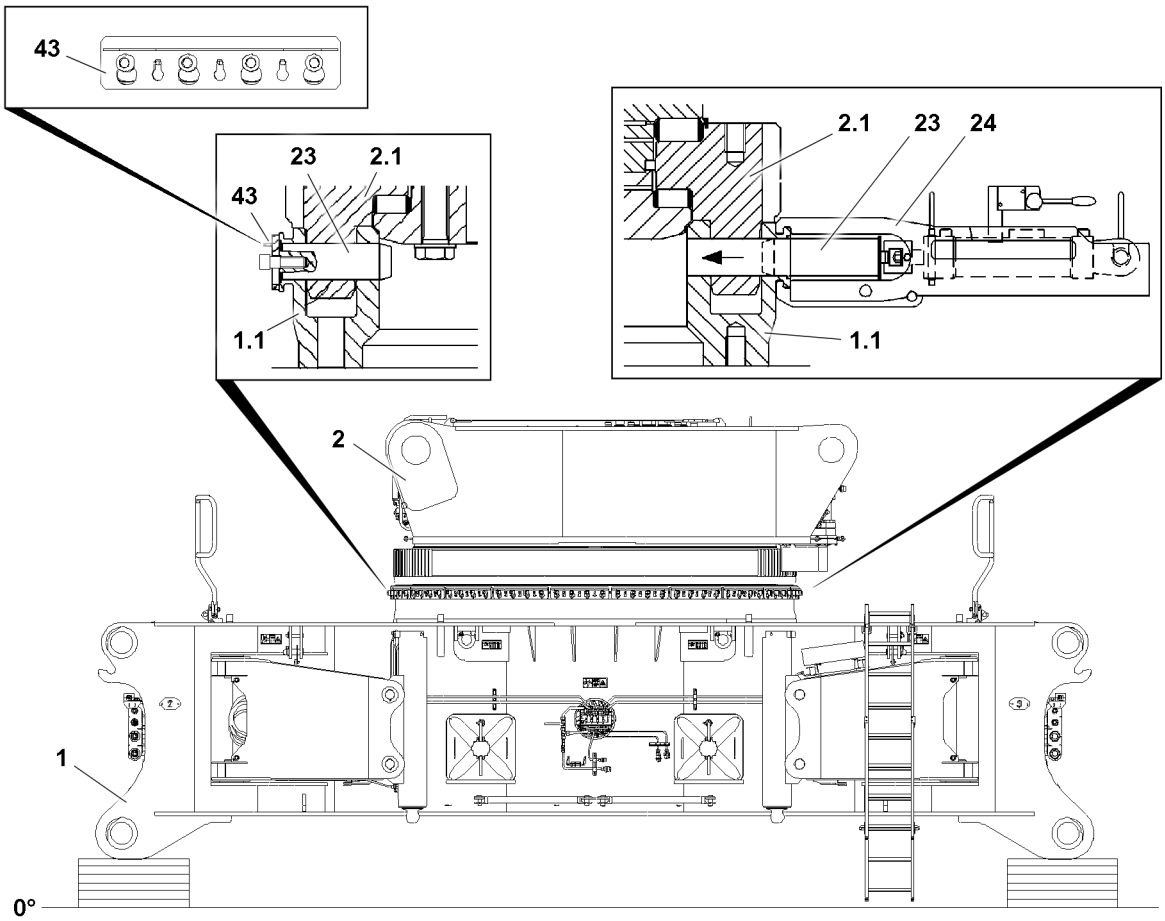

Fig.126166: Pinning and securing the QC

When the turntable frame lower section **2** is properly set on the crawler center section **1**:
▶ Pin the QC properly, see section „Pinning the Quick Connection“.

4.2 Pinning the Quick Connection

Make sure that the following prerequisites are met:
– The turntable frame lower section **2** is properly set on the crawler center section **1**.
– The pin bores are free around the circumference of the QC.
– The fastening equipment on the turntable frame lower section **2** is tensioned.
– The connector pins **23** are greased with water repellent grease.

4.2.1 Pinning

Note
▶ Align the pin bores by lifting or lowering the turntable frame lower section **2**.

WARNING
Danger of accident if the connector pins loosen up by themselves!
Death, severe bodily injuries, property damage.
▶ After pinning, secure the connector pins **23** immediately with the retaining bars **43**.
▶ Secure the connector pins **23** with retaining brackets **43**.

▶ Insert all connector pins **23** around the circumference of the QC by hand.

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Problem remedy

The connector pins cannot be pinned or only with difficulty?

- ▶ Make sure that the pin bores align around the entire circumference of the QC.
- ▶ Make sure that all pin bores are greased.
- ▶ If it is still difficult, use the hydraulic pin pulling device.

When all retaining pins are properly pinned:

- ▶ Attach the securing bracket **43** and secure all connector pins **23** around the circumference of the QC.

When all connector pins **23** are properly secured:

- ▶ Carefully relieve the fastening equipment on the turntable frame lower section **2**.
- ▶ Remove the fastening equipment.

Result:

– The turntable frame lower section **2** is properly assembled.

4.3 Assembling the drawbars on the rotary connection on the turntable frame lower section

Make sure that the following prerequisites are met:

- All connector pins **23** of the QC are properly inserted.
- All connector pins **23** are properly secured with the securing brackets **43**.
- The fastening equipment on the turntable frame lower section **2** is removed.

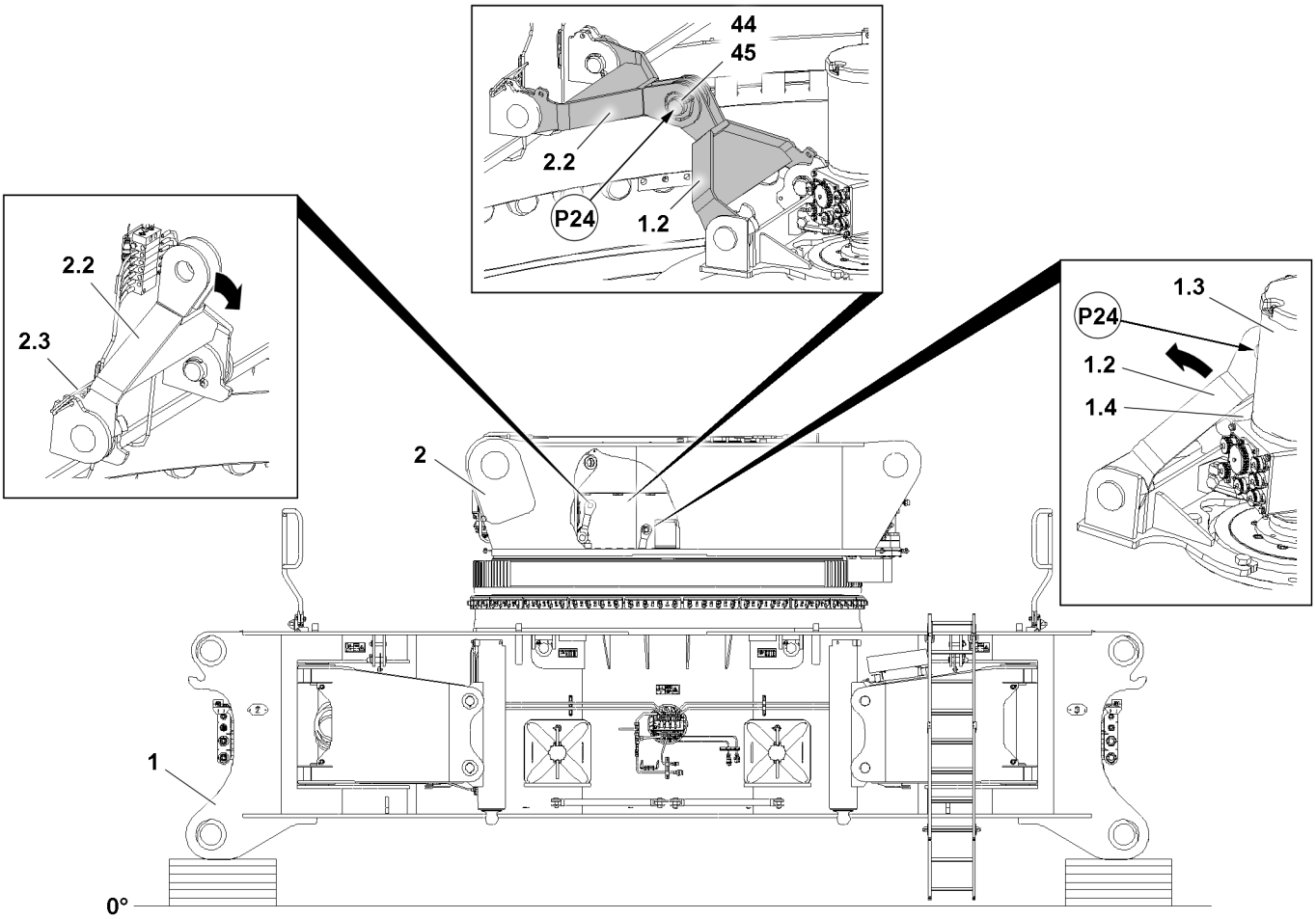

Fig.126167: Assembling the drawbars on the rotary connection on the turntable frame lower section

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WARNING
The drawbar can fold down!
When unpinning the drawbars from the transport positions, they can fold down by themselves.
Death, severe bodily injuries, property damage.
▶ Make sure that the drawbars are safely held in position before unpinning.

- ▶ Unpin the drawbar **2.2** on the turntable frame lower section **2** from transport position: Remove the spring retainer **2.3**.
- ▶ Fold the drawbar **2.2** down slowly.
- ▶ Unpin the drawbar **1.2** on the rotary connection **1.3** from transport position: Remove the spring retainer **1.4**.
- ▶ Fold the drawbar **1.2** forward slowly.
- ▶ Pin the drawbar **1.2** of the rotary connection **1.3** with the drawbar **2.2** on the turntable frame lower section **2**.
- ▶ Insert the pin **44** in point **P24** and secure properly with the locking pin **45**.

Note
Assemble the assembly supports!
▶ Continue the assembly of the crawler carriers with section „Assembling the assembly supports“.

5 Assembling the crawler center section

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ It is prohibited to lean the ladder against the component being disassembled.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

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WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

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5.1 Supporting the crawler center section

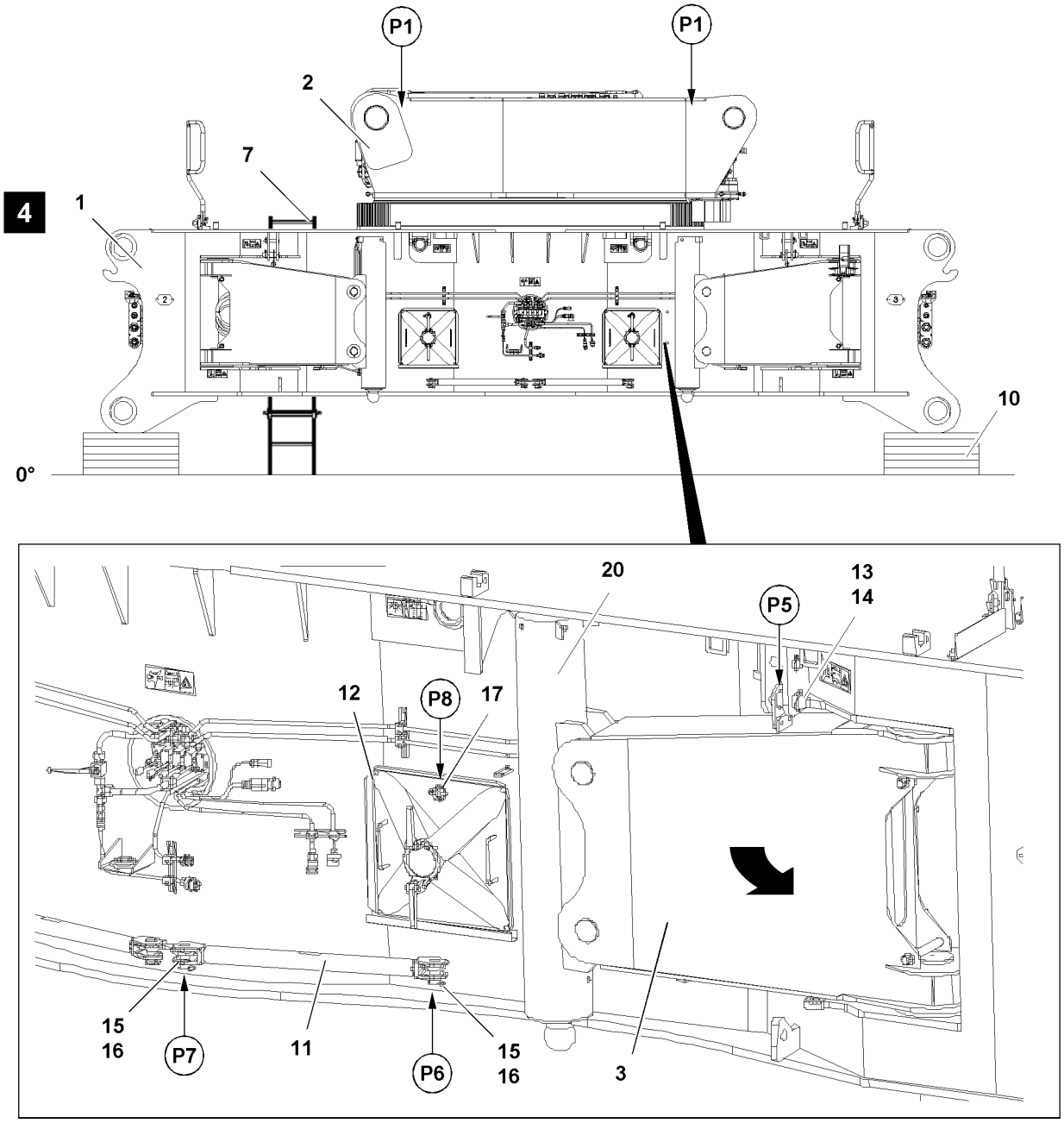

Fig.126241

5.1.1 Supporting the crawler center section with the turntable frame lower section

Make sure that the following prerequisites are met:
- An auxiliary crane with a suitable load-bearing capacity is available.
- The installation / assembly location must be level and have adequate load-bearing capacity.

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WARNING
Danger of accident due to improper substructure!
If the crawler center section is not properly supported, then it can sink into the ground.
Death, severe bodily injuries, property damage.
- ▶ The substructure must safely absorb the weight of the crawler center section.
- ▶ The substructure must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see chapter 2.04.

Make sure that the following prerequisite is met:
- – Suitable and load bearing material must be available for the substructure of the crawler center section.

▶ Support the crawler center section **1** with hardwood timbers or other suitable materials.

WARNING
Danger of falling!
During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ Use personal protective equipment.

- ▶ Fold the grating covers open on the turntable frame lower section **2** in points **P1**.
- ▶ Attach the fastening equipment to the four fastening brackets in points **P1**, see section „Fastening points“.
- ▶ Lift the crawler center section **1** with the auxiliary crane and set it on the supporting base **10**, illustration **4**.
- ▶ Set up the extension ladder **7**, see chapter 2.06.
- ▶ Remove the fastening equipment.

5.1.2 Supporting the crawler center section without the turntable frame lower section

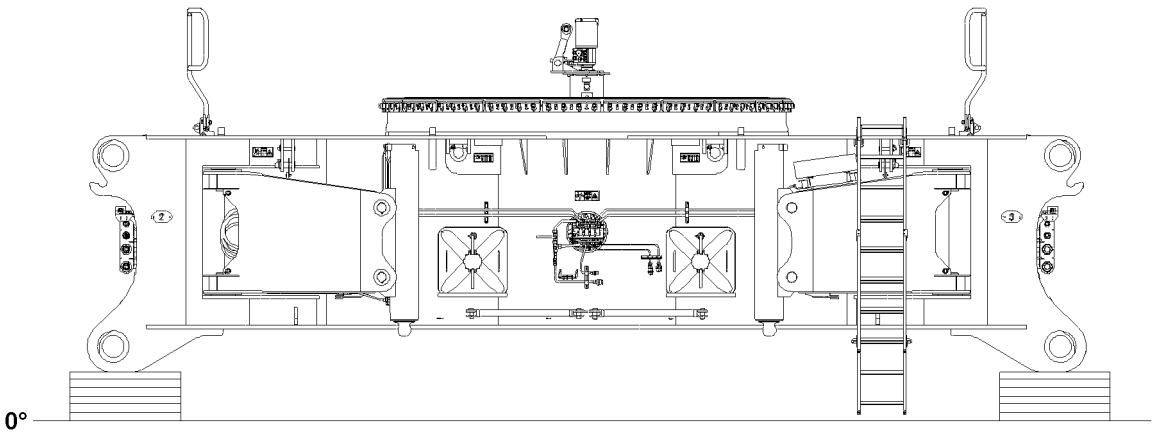

Fig.126164: Supporting the crawler center section without the turntable frame lower section

Make sure that the following prerequisites are met:
- – An auxiliary crane with a suitable load-bearing capacity is available.
- – The installation / assembly location must be level and have adequate load-bearing capacity.

WARNING
Danger of accident due to improper substructure!
If the crawler center section is not properly supported, then it can sink into the ground.
Death, severe bodily injuries, property damage.
- ▶ The substructure must safely absorb the weight of the crawler center section.
- ▶ The substructure must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see chapter 2.04.

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Make sure that the following prerequisite is met:
– Suitable material must be available for the substructure of the crawler center section.

▶ Support the crawler center section with hardwood timbers or other suitable materials.

WARNING
Danger of falling!
During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
▶ Use personal protective equipment.

▶ Attach the fastening equipment to the four fastening brackets in points **P3**, see section „Fastening points“.
▶ Lift the crawler center section with the auxiliary crane and set it on the substructure **10**.
▶ Remove the fastening equipment.

5.2 Assembling the assembly supports

Note
▶ The swinging out and locking procedure of the support is the same for all four assembly supports and is therefore described only once.

6

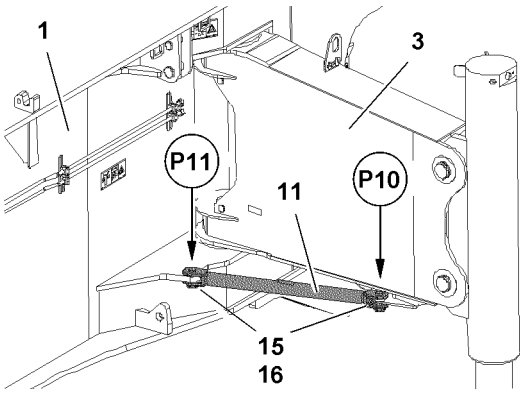

Fig.116937: Assembling the assembly supports

▶ Release the support **3** from the transport position: Remove the safety locking pin **14** in point **P5** and unpin the pin **13**, illustration **4**.
▶ Swing the support **3** out so that it can be pinned in point **P10** and in point **P11**, illustration **6**.

WARNING
Falling bar!
The bar **11** can fall down due to its own weight when unpinning it.
Death, severe bodily injuries, property damage.
▶ For safety reasons, **two** persons must always be used to unpin the bar.
▶ Make sure that there are no persons within the danger zone during the entire unpinning procedure.

Note
▶ The weight of the bar is 10 kg.

▶ Release the rod **11** in the transport receptacle: Remove the safety locking pin **16** in point **P6** and in point **P7** and unpin the pin **15**, illustration **4**.

When the rod **11** is unpinned in the transport receptacle:
▶ Place the rod **11** in the operating position, illustration **6**.

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WARNING
Rod not secured!
If the rod **11** is not properly secured in the operating position, then it can loosen up by itself during crane operation.
This can cause the crane to topple over.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the rod **11** is properly secured with the pin **15** and safety locking pin **16**.
- ▶ Make sure that all four assembly supports are properly secured.

- ▶ Secure the support **3** in the operating position: Pin the rod **11** with pin **15** in point **P10** and in point **P11** and secure with the safety locking pin **16**, illustration **6**.

5

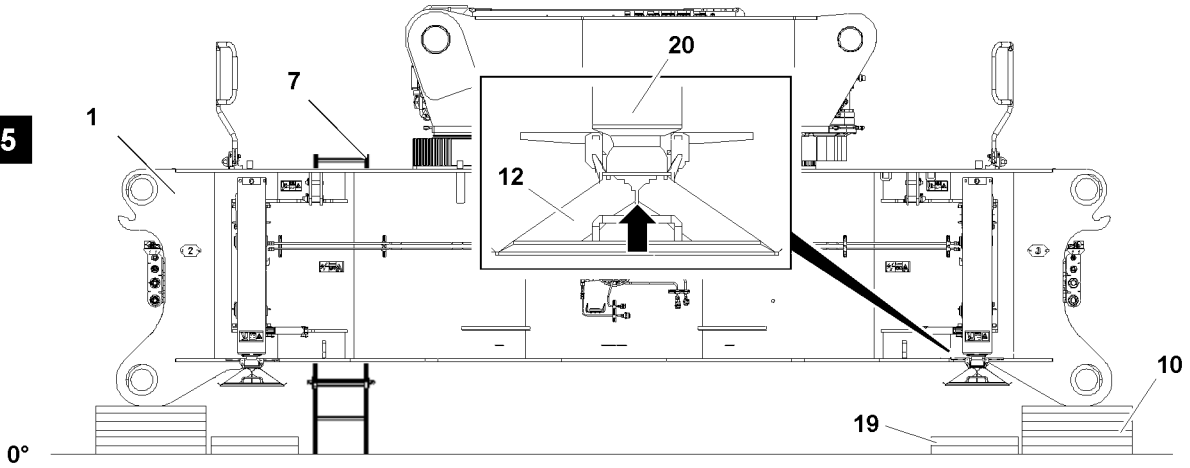

Fig.126242

WARNING
Falling support plate!
The support plate **12** can fall down due to its own weight when releasing it.
Death, severe bodily injuries, property damage.
- ▶ For safety reasons, assemble the support plate always with **two** persons.
- ▶ Make sure that there are no persons within the danger zone during the entire unpinning procedure.

Note
- ▶ The weight of the support plate is 33 kg.

- ▶ Release the support plate **12** from the transport position: Remove the safety locking pin **17** in point **P8**, illustration **4**.
- ▶ Take the support plates **12** from the transport retainer and assemble on the ball head of the support cylinder **20**, illustration **5**.

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5.3 Connecting the hydraulic aggregate

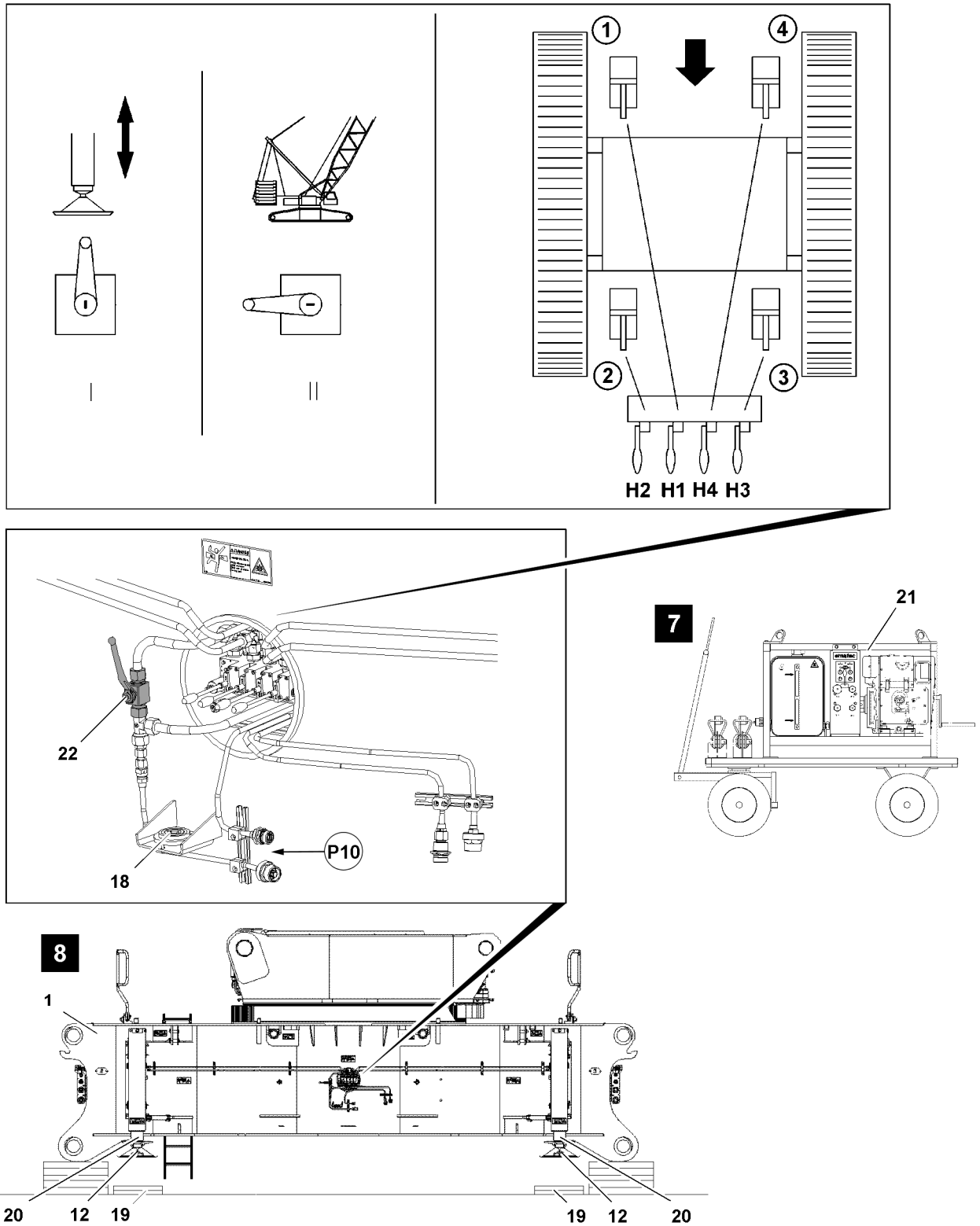

Fig.122406

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Make sure that the following prerequisites are met:
- The assembly supports are locked with the rods.
- The support plates are properly locked with the support cylinders.

Note
▶ The support cylinders are marked with numbers.

Note
▶ Observe the information in the Operating and Maintenance manual of the hydraulic aggregate.
▶ Hydraulic connections from the hydraulic aggregate **21** to the crawler center section **1**, see the Hydraulic diagram.

WARNING
Pressure in the hydraulic lines!
If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.
Death, severe bodily injuries, property damage.
▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

▶ Connect the coupling components (sleeve and connector) and screw together with the knurled nut.
▶ Tighten the hydraulic coupling by hand. Turn the knurled nut until it reaches a tangible, fixed stop position.
▶ Establish the hydraulic connections from the hydraulic aggregate **21** to the crawler center section **1** in point **P10**, illustration **8**.

5.4 Lifting the crawler center section over the assembly support

WARNING
The crawler center section can topple over!
Depending on the assembly condition of the crawler center section and the extension condition of the support cylinders, the support forces on the support cylinders can occur up to **114 t**.
Death, severe bodily injuries, property damage.
▶ Make sure that the ground under the support cylinders is able to safely take on the occurring support forces.
▶ Make sure that the support cylinders are supported from below over a large surface with load bearing materials.
▶ Make sure that the support cylinders are moved in and / or out evenly.
▶ When supporting or lowering the crawler center section pay attention to the horizontal alignment.

Make sure that the following prerequisites are met:
- The substructure **19** is properly established.
- The hydraulic connections from the hydraulic aggregate **21** to the crawler center section **1** are properly established.
- The support cylinders **20** of the assembly support are properly supported.
- The ball valve **22** is in position I „assembly support“.

WARNING
Danger of accident due to improper substructure!
If the support plates **12** are not properly supported, then they can sink into the ground.
Death, severe bodily injuries, property damage.
▶ The substructure must be able to safely absorb the weight of the crawler center section, the turntable frame lower section and the crawler carrier.
▶ The substructure must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see chapter 2.04.

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5.4.1 Lifting the crawler center section with the hydraulic hand levers

Make sure that the following prerequisite is met:
– The hydraulic aggregate **21** is turned on.

Note
▶ The support cylinders are marked with numbers.
▶ Pay attention to the identification on the hand lever and on the support cylinder, illustration **8**.

Ball valve positions	
Position **I**	Assembly support
Position **II**	Crane operation / crawler carrier installation with SA-frame

Function assignment of hand levers for the support cylinders	
H1	Hand lever for the support cylinder **1**, right rear
H2	Hand lever for support cylinder **2**, right front
H3	Hand lever for support cylinder **3**, left front
H4	Hand lever for support cylinder **4**, left rear

▶ Move the ball valve **22** in the „assembly support“ position **I**, illustration **8**.

WARNING
Tipping of the crawler center section!
If the support cylinders **20** are retracted / extended unevenly, the crawler center section can tip over.
Death, severe bodily injuries, property damage.
▶ When extending / retracting the support cylinders **20**, pay attention to the horizontal alignment of the crawler center section.
▶ Check the horizontal alignment of the spirit level on the crawler center section.

▶ Extend the support cylinders **20** completely: Actuate the hand lever **H1**, hand lever **H2**, hand lever **H3** and hand lever **H4**.

Result:

– The support cylinders **20** extend.

5.4.2 Lifting the crawler center section with the control panel

Note
▶ Alternatively to the operation of the assembly support with the hand levers, the assembly support can also be operated with the control panel **200**, see Electrical wiring diagram.

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Make sure that the following prerequisites are met:
- The electric external feed (maximum 24 V) to the crawler center section is properly established, see the Electrical wiring diagram.
- The dummy plug on the socket in point **P25 or** on the socket in point **P26** on the crawler center section has been removed.
- The control panel **200** is connected on the socket in point **P25 or** on the socket in point **P26** on the crawler center section, see the Electrical wiring diagram.
- The hydraulic aggregate **21** is turned on.

WARNING
Tipping of the crawler center section!
If the support cylinders **20** are retracted / extended unevenly, the crawler center section can tip over.
Death, severe bodily injuries, property damage.
▶ When extending / retracting the support cylinders **20**, pay attention to the horizontal alignment of the crawler center section.
▶ Check the horizontal alignment of the spirit level on the crawler center section.

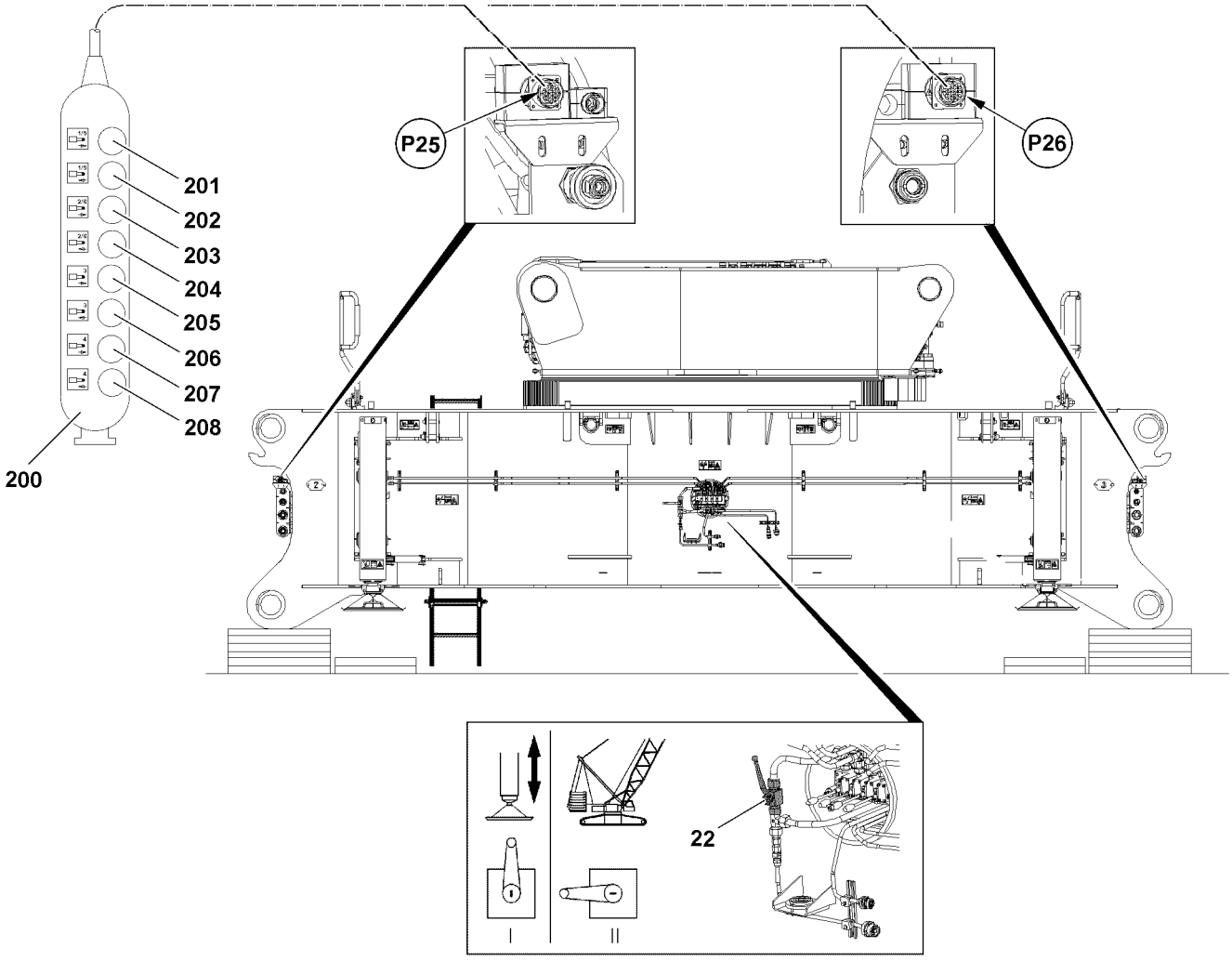

*Fig.122403: Lifting the crawler center section with the control panel **200***

Right rear support

▶ Press the button **201**.

Result:

– The right rear support cylinder extends.

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▶ Press the button **202**.

Result:

– The right rear support cylinder retracts.

Right front support

▶ Press the button **203**.

Result:

– Support cylinder moves out on the right front.

▶ Press the button **204**.

Result:

– Support cylinder moves in on the right front.

Left front support

▶ Press the button **205**.

Result:

– The left front support cylinder extends.

▶ Press the button **206**.

Result:

– The left front support cylinder retracts.

Left rear support

▶ Press the button **207**.

Result:

– The left rear support cylinder extends.

▶ Press the button **208**.

Result:

– The left rear support cylinder retracts.

5.5 Aligning the crawler center section horizontally

Note

▶ The horizontal alignment of the crawler center section is checked and aligned with the aid of the sight gauge **18**.

▶ The center of the sight gauge **18** shows the precise incline value.

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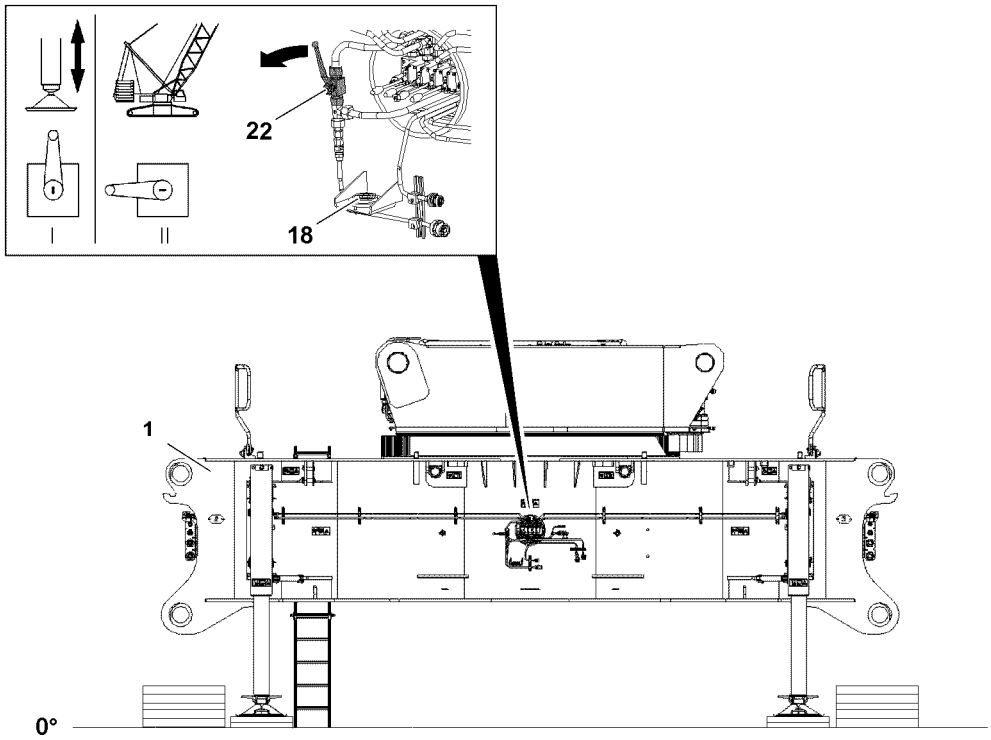

Fig.122404: Aligning the crawler center section horizontally

▶ Align the crawler center section horizontally with the aid of the sight gauge **18**.

When the crawler center section is properly supported and horizontally aligned:
▶ Actuate the ball valve **22** in the „crane operation / crawler carrier installation“ position **II**.
▶ Turn the hydraulic aggregate **21** off.

When supported with the control panel:
▶ Store the control panel **200** safely.
▶ Remove the substructure **10**.
▶ Align the extension ladder **7** again, see chapter 2.06.

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6 Assembling the crawler carrier with the auxiliary crane

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ It is prohibited to lean the ladder against the component being disassembled.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

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6.1 Preparing the crawler carrier for assembly

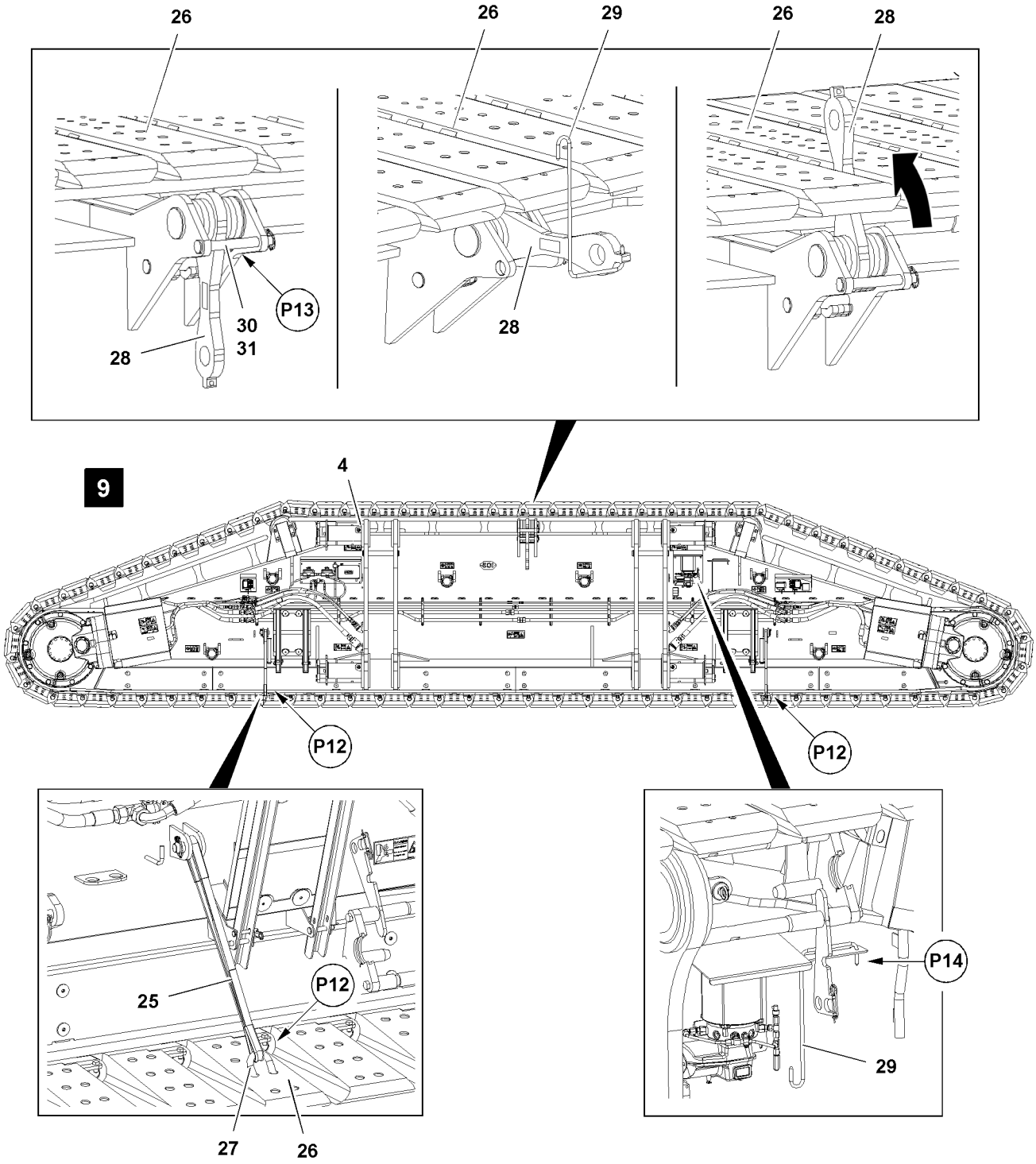

Fig.126240

Make sure that the following prerequisites are met:
- An auxiliary crane with a suitable load-bearing capacity is available.
- The turntable frame lower section is properly assembled on the crawler center section (only for cranes with QC).
- The assembly supports are in the operating position.
- The crawler center section is supported: The support cylinders are completely extended.
- The crawler center section is horizontally aligned.

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WARNING
Danger of falling!
During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
▶ Use personal protective equipment.

Note
▶ Hang in two belts **25** per crawler carrier side.

The track pads **26** must be secured before assembly of the crawler carriers with the belts **25** to prevent sag.

▶ Attach the belts **25** with the bars **27** in points **P12** to the track pads, illustration **9**.

Note
▶ The brackets **28** must be swung into the operating position between the track pads **26**, „upward“.

▶ Remove the safety locking pin **31** in point **P13** and unpin the pin **30**, illustration **9**.

Note
▶ The handle **29** is fastened in the transport position in point **P14**.

▶ Swing the brackets **28** with the handle **29** up, illustration **9**.
▶ Fasten the fastening equipment to the brackets **28** of the crawler carrier.

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6.2 Assembling the first crawler carrier with the auxiliary crane

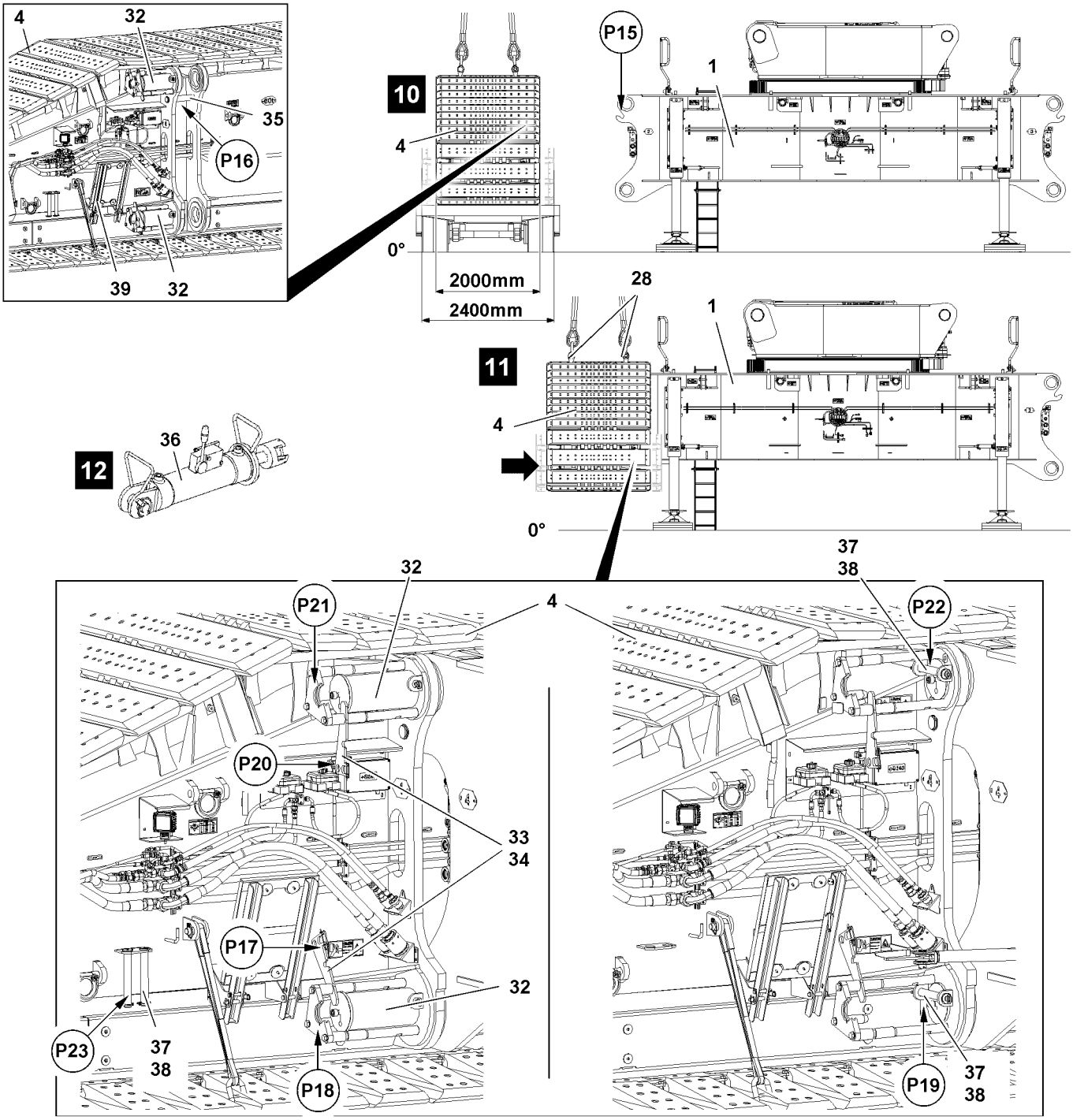

Fig.149361: Assembling the first crawler carrier with the auxiliary crane

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WARNING
The crawler center section can topple over!
Depending on the assembly condition of the crawler center section and the extension condition of the support cylinders, the support forces on the support cylinders can occur up to **114 t**.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the ground under the support cylinders is able to safely take on the occurring support forces.
- ▶ Make sure that the support cylinders are supported from below over a large surface with load bearing materials.
- ▶ Make sure that the support cylinders are moved in and / or out evenly.
- ▶ When supporting or lowering the crawler center section pay attention to the horizontal alignment.

Note
- ▶ Note the identification on the crawler carrier and the crawler center section.
- ▶ The crawler carrier and the crawler center section are marked with numbers.

Note
- ▶ For assembly of the crawler carriers on the crawler center section, the assembly procedure and the process are identical for both crawler carrier sides.
- ▶ For that reason, the assembly of the crawler carrier is only described for one side as an example.

WARNING
Danger of falling!
During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ Use personal protective equipment.

Make sure that the following prerequisites are met:
- – The turntable frame lower section is properly assembled on the crawler center section (only for QC).
- – The track pads are secured to prevent them from sagging.
- – The pins **32** are secured in the transport position, illustration **10**.

- ▶ Carefully swing the crawler carrier **4** with the auxiliary crane up to the pin points on the crawler center section **1**.
- ▶ Attach the crawler carrier **4** with centering pins **35** in points **P16** to the centerings in points **P15** on the crawler center section **1**, illustration **10** and illustration **11**.
- ▶ Release the pin **32** from transport position: Remove the spring retainer **34** in point **P17** and swing the securing bracket **33** upward, illustration **11**.
- ▶ Attach the spring retainer **34** again in point **P17**.
- ▶ Connect the pin pulling cylinder **36** to the hydraulic supply line or the hydraulic aggregate, illustration **12**.
- ▶ Set the pin pulling cylinder **36** in the pin pulling device in point **P18**, illustration **11**.
- ▶ Insert the pin **32** with the pin pulling cylinder **36** to the stop.
- ▶ Remove the pin pulling cylinder **36**, illustration **12**.

Note
- ▶ The retaining pins **37** are located in point **P23** in the park position, illustration **11**.

- ▶ Remove the safety locking pin **38** and unpin the retaining pin **37** from the park position in point **P23**.

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WARNING
The pin is not secured!
If the retaining pins **37** are not secured, the retaining pins can loosen up by themselves during crane operation.
This can cause the crane to topple over.
Death, severe bodily injuries, property damage.
▶ Make sure that the retaining pins **37** are secured with safety locking pins **38**.

▶ Secure the pin **32**: Insert the retaining pin **37** in point **P19** and secure with the safety locking pin **38**.
▶ Fold the assembly platform **39** down, see the Crane operating instructions, chapter 2.06.
▶ Release the pin **32** from transport position: Remove the spring retainer **34** in point **P20** and swing the securing bracket **33** downward, illustration **11**.
▶ Attach the spring retainer **33** again in point **P20**, illustration **11**.
▶ Set the pin pulling cylinder **36** in the pin pulling device in point **P21**.
▶ Insert the pin **32** with the pin pulling cylinder **36** to the stop.
▶ Remove the pin pulling cylinder **36**, illustration **12**.

Note
▶ The retaining pins are located in point **P23** in the park position, illustration **11**.

▶ Remove the safety locking pin **38** and unpin the retaining pin **37** from the park position in point **P23**.

WARNING
The pin is not secured!
If the retaining pins **37** are not secured, the retaining pins can loosen up by themselves during crane operation.
This can cause the crane to topple over.
Death, severe bodily injuries, property damage.
▶ Make sure that the retaining pins **37** are secured with safety locking pins **38**.

▶ Secure the pin **32**: Insert the retaining pin **37** in point **P22** and secure with the safety locking pin **38**.
▶ Pin the crawler carrier **4** on the other crawler carrier side with the crawler center section.
▶ Remove the fastening equipment.

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6.3 Assembling the second crawler carrier with the auxiliary crane

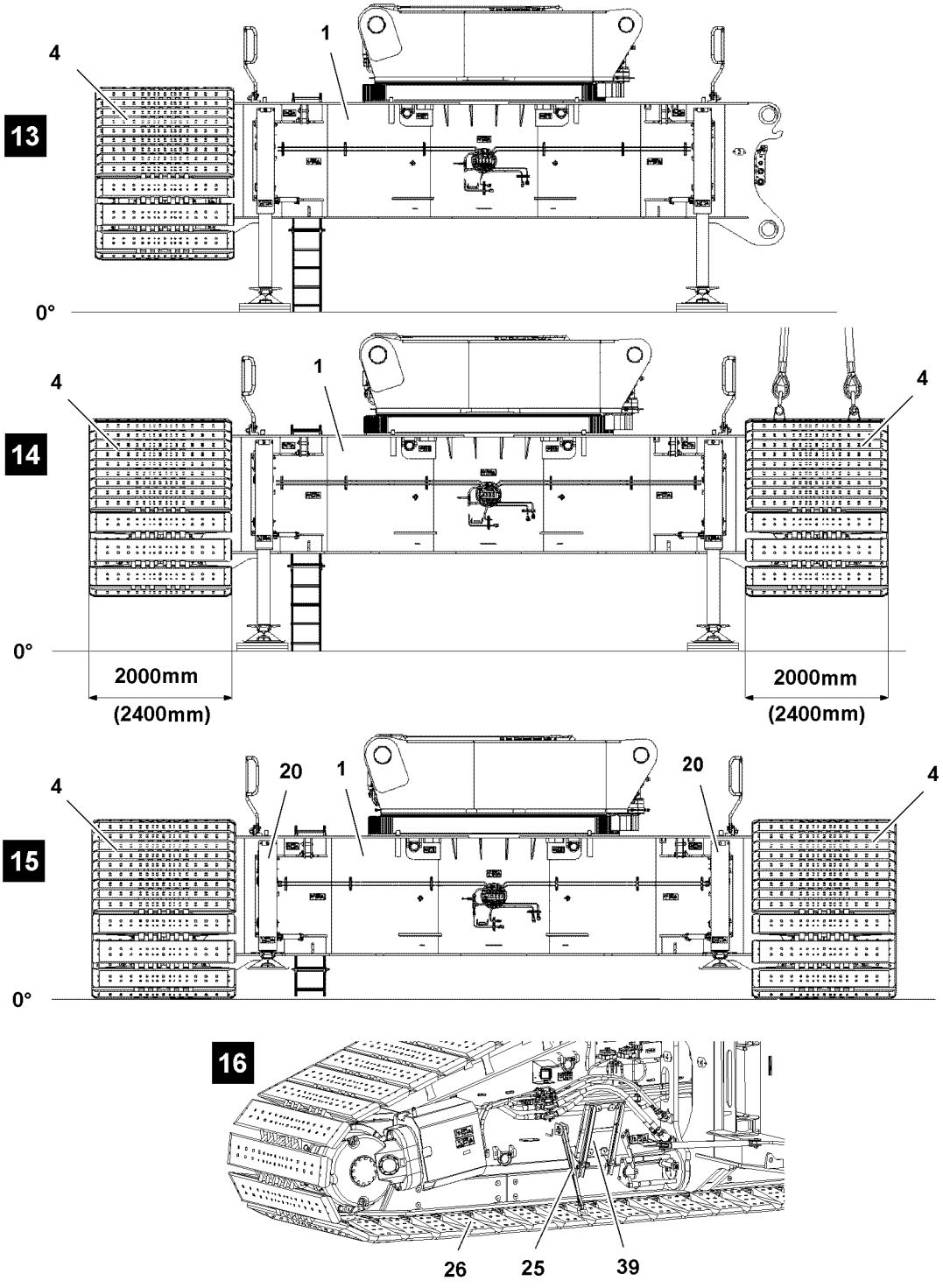

Fig.149362

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WARNING
Toppling crawler travel gear!
Depending on the assembly condition of the crawler travel gear and the extension condition of the support cylinders, the support forces on the support cylinders can occur up to **114 t**.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the ground under the support cylinders is able to safely take on the occurring support forces.
- ▶ Make sure that the support cylinders are supported over a large surface with load bearing materials.
- ▶ Make sure that the support cylinders are moved in and / or out evenly.
- ▶ When supporting or lowering the crawler center section pay attention to the horizontal alignment.

Make sure that the following prerequisite is met:
- The first crawler carrier **4** is pinned and secured on the crawler center section **1**.

Note
- ▶ For assembly of the crawler carriers on the crawler center section, the assembly procedure and the process are identical for both crawler carriers.
- ▶ For that reason, the assembly of the crawler carrier is only described for crawler carrier as an example.

- ▶ Assemble the second crawler carrier, see section „Assembling the first crawler carrier with the auxiliary crane“.

6.4 Lowering the crawler travel gear

WARNING
Danger of accident due to improper substructure!
Death, severe bodily injuries, property damage.
- ▶ The support must be able to safely absorb the weight of the crawler travel gear, the turntable frame lower section and the crawler center section.
- ▶ The substructure must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see chapter 2.04.

NOTICE
Environmental pollution due to hydraulic oil!
When retracting the assembly support, if a hydraulic aggregate with full hydraulic oil tank is used, then the hydraulic oil tank on the hydraulic aggregate can be flooded when retracting the assembly support. Hydraulic oil can escape causing severe environmental pollution.
- ▶ Make sure that the hydraulic oil tank on the hydraulic aggregate has sufficient capacity to be able to safely take on the hydraulic oil of the assembly support.
- ▶ Make sure that the extension and retraction of the assembly support is carried out solely with the same hydraulic aggregate.
- ▶ Make sure that suitable measures are made to prevent an oil spill in the environment.

Make sure that the following prerequisites are met:
- The second crawler carrier **4** is properly pinned and secured on the crawler center section **1**.
- The hydraulic aggregate is turned on.
- The ball valve **22** is in position I.

- ▶ Retract the support cylinders **20** completely.

Result:

- Both crawler carriers **4** are on the ground.

- ▶ Remove the fastening equipment.

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NOTICE
Damage to the brackets!
▶ After removing the fastening equipment, the brackets **28** must be swung down.

▶ Swing the brackets **28** down, see section „Preparing the crawler carrier for assembly“.
▶ Disengage the belts **25** on the track pads **26**, illustration **16**.
▶ Fold the assembly platforms **39** up again into the transport position, see chapter 2.06 and illustration **16**.

6.5 Establishing the connections to the crawler carriers

Make sure that the following prerequisite is met:
– Both crawler carriers are properly assembled, pinned and secured.

6.5.1 Establishing the hydraulic connections

The hydraulic connections are made with quick couplings.

When connecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

WARNING
Pressure in the hydraulic lines!
If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.
Death, severe bodily injuries, property damage.
▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

WARNING
Loss of pressure or leakage!
Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.
▶ Check that the quick couplings have been properly connected before using the crane.

▶ Connect the coupling components (sleeve and connector) and screw together with the knurled nut.
▶ Tighten the hydraulic coupling by hand. Turn the knurled nut until it reaches a tangible, fixed stop position.
▶ Establish the hydraulic connections, see the Hydraulic diagram.

6.5.2 Establishing the electrical connections

▶ Establish the electrical connections, see the Electric wiring diagram.

6.5.3 Establishing the connections to the central lubrication system

▶ Establish the connections to the central lubrication system.

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7 Disassembly of the crawler carrier with the auxiliary crane

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ It is prohibited to lean the ladder against the component being disassembled.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

7.1 Disconnecting the connections from the crawler carriers

Make sure that the following prerequisites are met:
- – The turntable is disassembled.
- – The central ballast is disassembled.
- – An auxiliary crane is available.
- – The disassembly location must be level and have adequate load bearing capacity.
- – Suitable material must be available for the substructure of the assembly supports.
- – The support plates are installed.

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7.1.1 Disconnecting the hydraulic connections

The hydraulic connections are made with quick couplings.

When disconnecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

WARNING
Pressure in the hydraulic lines!
If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.
Death, severe bodily injuries, property damage.
- ▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

- ▶ Release the hydraulic coupling by hand.
- ▶ Disconnect the hydraulic connections, see the Hydraulic diagram.
- ▶ Protect the hydraulic connections from contamination with caps.

7.1.2 Disconnecting the electrical connections

- ▶ Disconnect the electrical connections to the crawler carrier, see Electrical wiring diagram.

7.1.3 Disconnecting the connection to the central lubrication system

- ▶ Disconnect the connection to the central lubrication system.
- ▶ Protect the connections of the central lubrication system with caps from contamination.

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7.2 Preparing the crawler carrier for disassembly

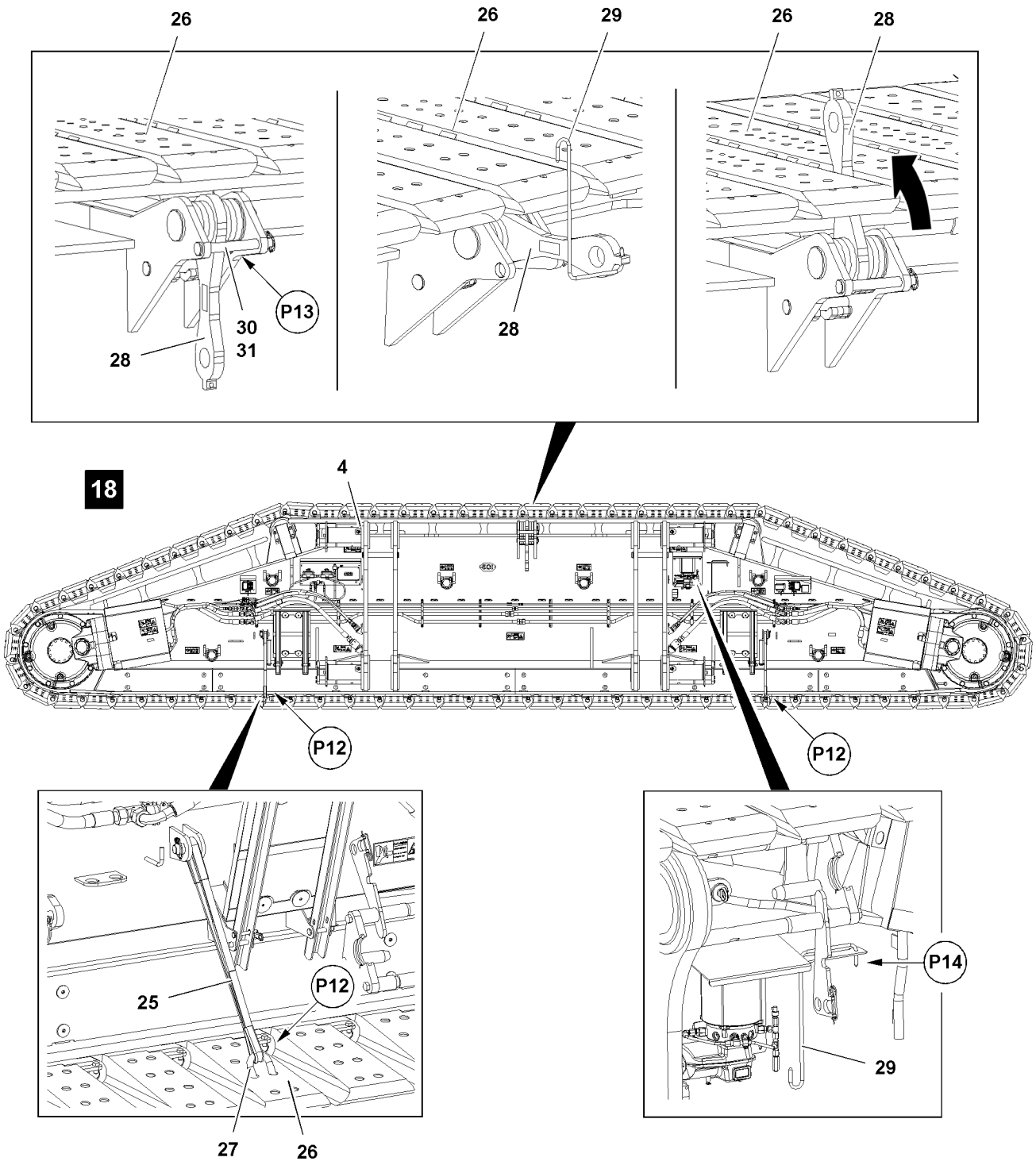

Fig.126239

WARNING
Danger of falling!
During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
▶ Use personal protective equipment.

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Note
▶ Hang in two belts **25** per crawler carrier side.

The track pads **26** must be secured before disassembly of the crawler carriers with the belts **25** to prevent them from sagging.

▶ Attach the belts **25** with the bars **27** in points **P12** to the track pads, illustration **18**.

Note
▶ The brackets **28** must be swung into the operating position between the track pads **26**, „upward“.

▶ Remove the safety locking pin **31** in point **P13** and unpin the pin **30**, illustration **18**.

Note
▶ The handle **29** is fastened in the transport position in point **P14**.

▶ Swing the brackets **28** with the handle **29** up, illustration **18**.
▶ Fasten the fastening equipment to the brackets **28** of the crawler carrier.

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7.3 Connecting the hydraulic aggregate

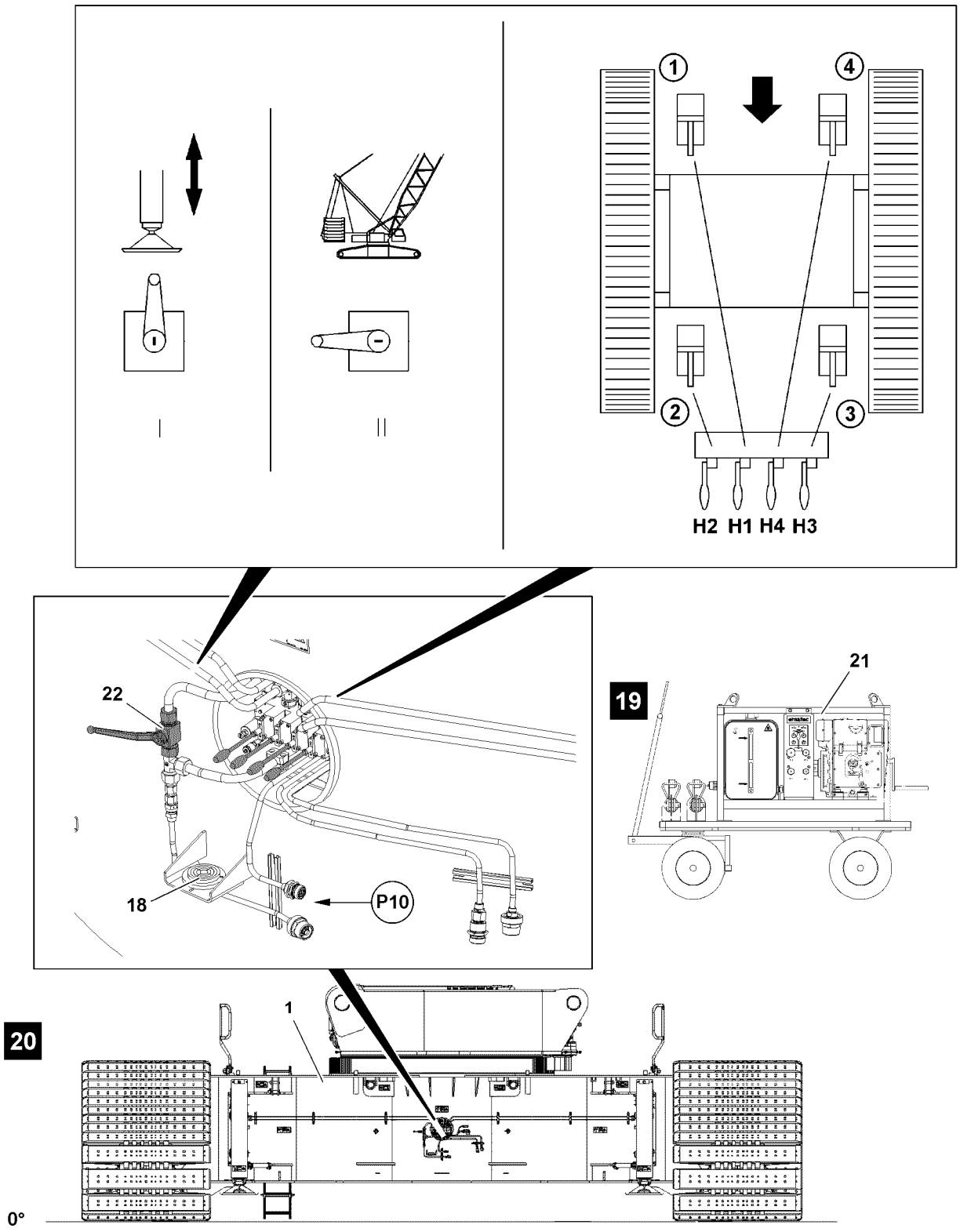

Fig.122264

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Make sure that the following prerequisites are met:
- The assembly supports are locked in the operating position.
- The support plates are properly locked with the support cylinders.
- The central ballast is disassembled.

Note
- ▶ The support cylinders are marked with numbers.
- ▶ Pay attention to the identification on the hand lever and on the support cylinder, illustration **20**.

Ball valve positions	
Position **I**	Assembly support
Position **II**	Crane operation / crawler carrier installation with SA-frame

Function assignment of hand levers for the support cylinders	
H1	Hand lever for the support cylinder **1**, right rear
H2	Hand lever for support cylinder **2**, right front
H3	Hand lever for support cylinder **3**, left front
H4	Hand lever for support cylinder **4**, left rear

Note
- ▶ Observe the information in the Operating and Maintenance manual of the hydraulic aggregate.
- ▶ Hydraulic connections from the hydraulic aggregate **21** to the crawler center section **1**, see the Hydraulic diagram.

▶ Establish the hydraulic connections from the hydraulic aggregate **21** to the crawler center section **1** in point **P10**, illustration **20**.

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7.4 Lifting the crawler center section with the crawler carriers

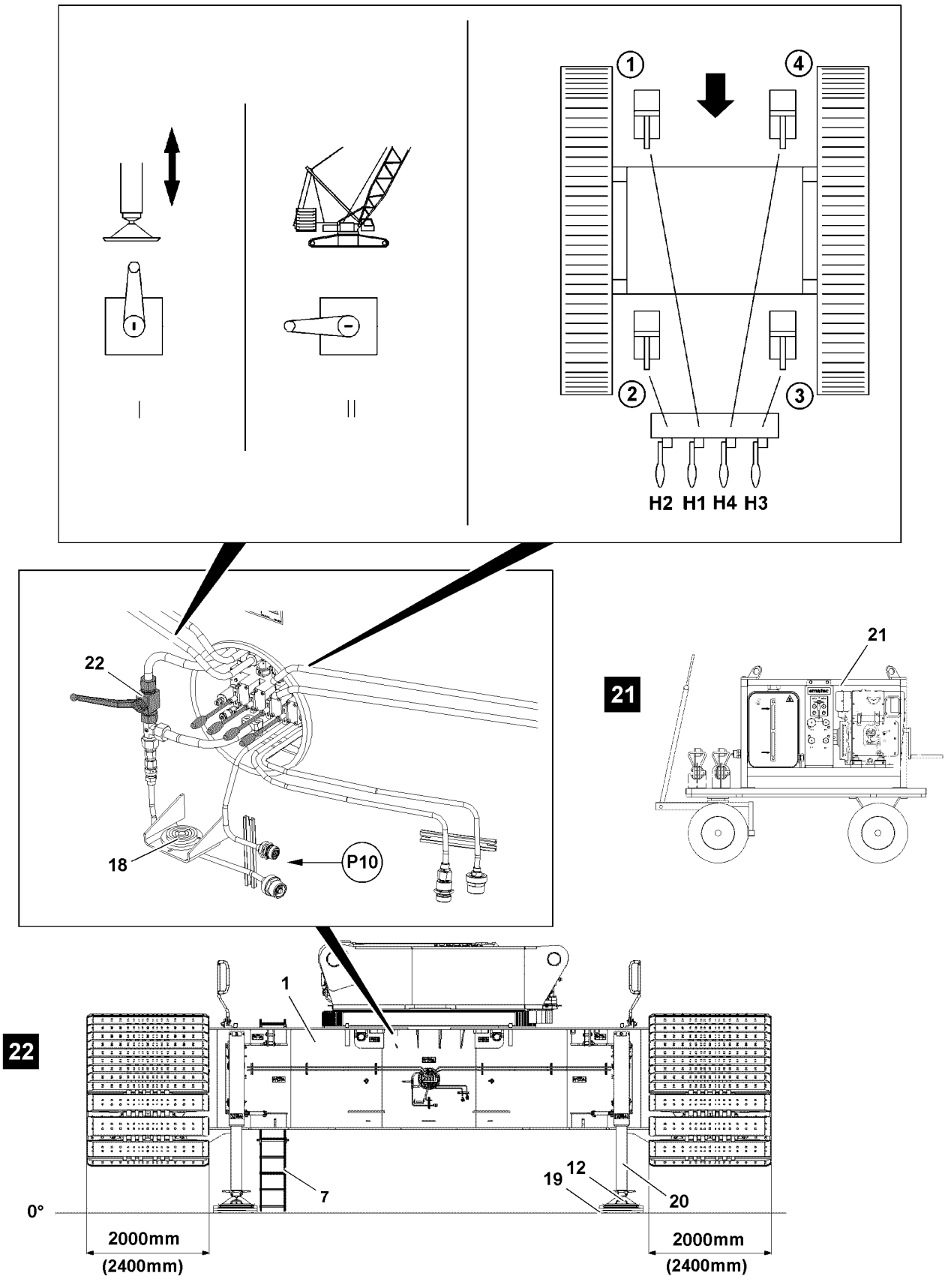

Fig.149363

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WARNING
The crawler center section can topple over!
Depending on the assembly condition of the crawler center section and the extension condition of the support cylinders, the support forces on the support cylinders can occur up to **114 t**.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the ground under the support cylinders is able to safely take on the occurring support forces.
- ▶ Make sure that the support cylinders are supported from below over a large surface with load bearing materials.
- ▶ Make sure that the support cylinders are moved in and / or out evenly.
- ▶ When supporting or lowering the crawler center section pay attention to the horizontal alignment.

- ▶ Turn the hydraulic aggregate **21** on, illustration **21**.
- ▶ Move the ball valve **22** in the „assembly support“ position **I**, illustration **22**.

WARNING
Danger of accident due to improper substructure!
If the support plates **12** are not properly supported, then they can sink into the ground.
Death, severe bodily injuries, property damage.
- ▶ The supporting base must be able to safely absorb the weight of the crawler center section, the turntable frame lower section and the crawler carrier.
- ▶ The substructure must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see chapter 2.04.

- ▶ Assemble the substructure **19**, see illustration **22**.
- ▶ Extend the support cylinders completely: Actuate the hand lever **H1**, hand lever **H2**, hand lever **H3** and hand lever **H4**.

Result:

– The support cylinders **20** extend.

WARNING
Tipping of the crawler center section!
If the support cylinders **20** are retracted / extended unevenly, the crawler center section can tip over.
Death, severe bodily injuries, property damage.
- ▶ When extending / retracting the support cylinders **20**, pay attention to the horizontal alignment of the crawler center section.
- ▶ Check the horizontal alignment of the spirit level on the crawler center section.

Note
- ▶ The horizontal alignment of the crawler center section is checked and aligned with the aid of the sight gauge **18**, illustration **22**.
- ▶ The center of the sight gauge **18** shows the precise incline value.

- ▶ Align the crawler center section horizontally with the aid of the sight gauge **18**, illustration **22**.
- ▶ Align the extension ladder **7** again, see chapter 2.06.

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7.5 Disassembling the first crawler carrier with the auxiliary crane

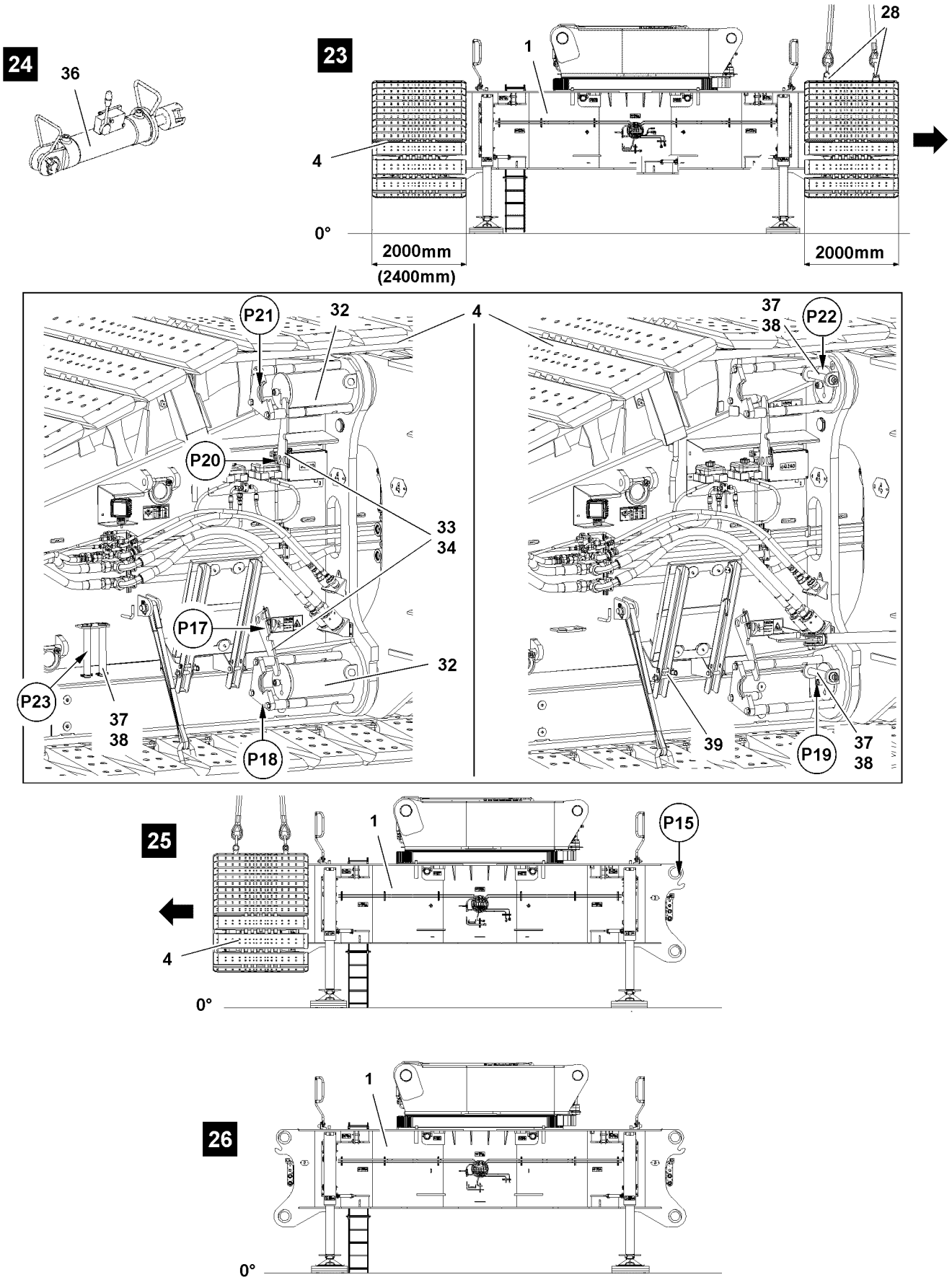

Fig.149364

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Note

- ▶ For disassembly of the crawler carriers on the crawler center section, the disassembly procedure and the process are identical for both crawler carrier sides.
- ▶ For that reason, the disassembly of the crawler carriers is only described for one side as an example.

WARNING

Danger of falling!

During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.

Death, severe bodily injuries, property damage.

- ▶ Use personal protective equipment.

WARNING

Toppling crawler center section!

If the turntable frame lower section is disassembled before disassembly of the crawler carriers on the crawler center section, then the crawler center section can topple over.

Death, severe bodily injuries, property damage.

- ▶ Make sure that the assembly area of the crawler center section is level and of sufficient load bearing capacity.
- ▶ Make sure that the turntable frame lower section remains properly assembled on the crawler center section until both crawler carriers are properly disassembled.

Make sure that the following prerequisites are met:

- The turntable frame lower section is assembled on the crawler center section.
- An auxiliary crane with a suitable load-bearing capacity is available.
- The track pads are secured to prevent them from sagging.

- ▶ Fasten the fastening equipment to the brackets **28** of the crawler carrier.
- ▶ Tension the fastening equipment, illustration **23**.
- ▶ Fold the assembly platform **39** down, see the Crane operating instructions, chapter 2.06.
- ▶ Release the pin **32**: Remove the safety locking pin **38** and unpin the retaining pin **37** at point **P22**.

Note

- ▶ The retaining pins **37** are located in point **P23** in the park position, illustration **23**.

- ▶ Insert the retaining pin **37** in park position in point **P23** and secure with the safety locking pin **38**.
- ▶ Set the pin pulling cylinder **36**, illustration **24**, in the pin pulling device in point **P21**.
- ▶ Unpin the pin **32** with the pin pulling cylinder **36** to the stop.
- ▶ Remove the pin pulling cylinder **36**, illustration **23**.
- ▶ Secure the pin **32** in the transport position: Remove the spring retainer **34** in point **P20** and swing the securing bracket **33** upward, illustration **23**.
- ▶ Secure the securing bracket **33** again in point **P20** with the spring retainer **34**, illustration **23**.

Result:

- The pin **32** is secure in transport position.

- ▶ Fold the assembly platform **39** up, see the Crane operating instructions, chapter 2.06.
- ▶ Release the pin **32**: Remove the safety locking pin **38** and unpin the retaining pin **37** at point **P19**.
- ▶ Insert the retaining pin **37** in park position in point **P23** and secure with the safety locking pin **38**.
- ▶ Set the pin pulling cylinder **36** in the pin pulling device in point **P18**.
- ▶ Unpin the pin **32** with the pin pulling cylinder **36** to the stop.
- ▶ Remove the pin pulling cylinder **36**, illustration **23**.
- ▶ Secure the pin **32** in the transport position: Remove the spring retainer **34** in point **P17** and swing the securing bracket **33** downward, illustration **23**.
- ▶ Secure the securing bracket **33** again in point **P17** with the spring retainer **34**, illustration **23**.

Result:

- The pin **32** is secure in transport position.

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- ▶ Unpin the crawler carrier **4** on the other crawler carrier side.
- ▶ Lift the crawler carrier **4** with the auxiliary crane.

When the crawler carrier is raised above the hook points in point **P15**:

- ▶ Swing the crawler carrier **4** out.
- ▶ Set the crawler carrier **4** down.
- ▶ Remove the fastening equipment.
- ▶ Swing the brackets **28** down, see section „Preparing the crawler carrier for assembly“.

7.6 Removing the second crawler carrier with the auxiliary crane

Note

- ▶ For disassembly of the crawler carriers on the crawler center section, the disassembly procedure and the process are identical for both crawler carriers.
- ▶ For that reason, the disassembly of the crawler carrier is only described for crawler carrier as an example.

WARNING

Danger of falling!

During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.

Death, severe bodily injuries, property damage.

- ▶ Use personal protective equipment.

Make sure that the following prerequisite is met:

– The first crawler carrier has been disassembled.

- ▶ Remove the second crawler carrier, see section „Removing the first crawler carrier with the auxiliary crane“.

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7.7 Supporting the crawler center section

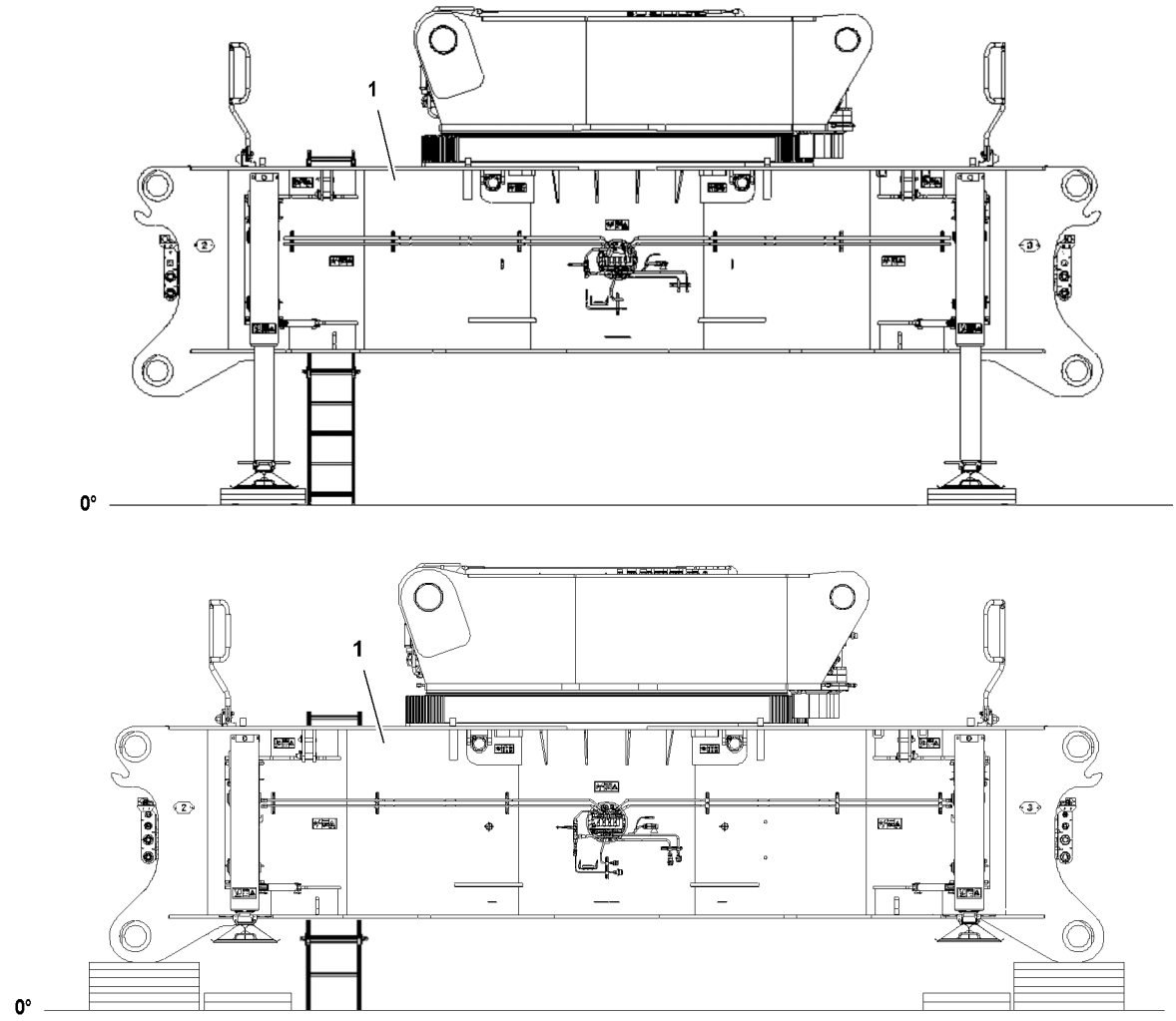

Fig.126238

Make sure that the following prerequisites are met:
- The crawler carriers are completely disassembled.
- The disassembly location is level and sufficiently load bearing.

▶ Support the crawler center section, see section „Disassembling the crawler center section“.

7.8 Lowering the crawler center section onto the substructure

WARNING
Danger of accident due to improper substructure!
If the crawler center section is not properly supported, then it can sink into the ground.
Death, severe bodily injuries, property damage.
▶ The substructure must safely absorb the weight of the crawler center section.
▶ The substructure must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see chapter 2.04.

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WARNING
Tipping of the crawler center section!
If the support cylinders are retracted / extended unevenly, the crawler center section can tip over.
Death, severe bodily injuries, property damage.
- ▶ When extending / retracting the support cylinders **20**, pay attention to the horizontal alignment of the crawler center section.
- ▶ Check the horizontal alignment of the spirit level on the crawler center section.

Make sure that the following prerequisite is met:
- The crawler center section **1** is supported.

▶ Lower the crawler center section on the substructure base, see section „Disassembling the crawler center section“.

7.9 Disassembling the turntable frame lower section with the QC on the crawler center section with QC

Make sure that the following prerequisites are met:
- The crawler carriers are properly disassembled on the crawler center section.
- The crawler center section is properly supported.
- The support cylinders are fully retracted.

7.9.1 Disassembling the drawbars of the rotary connection on the turntable frame lower section

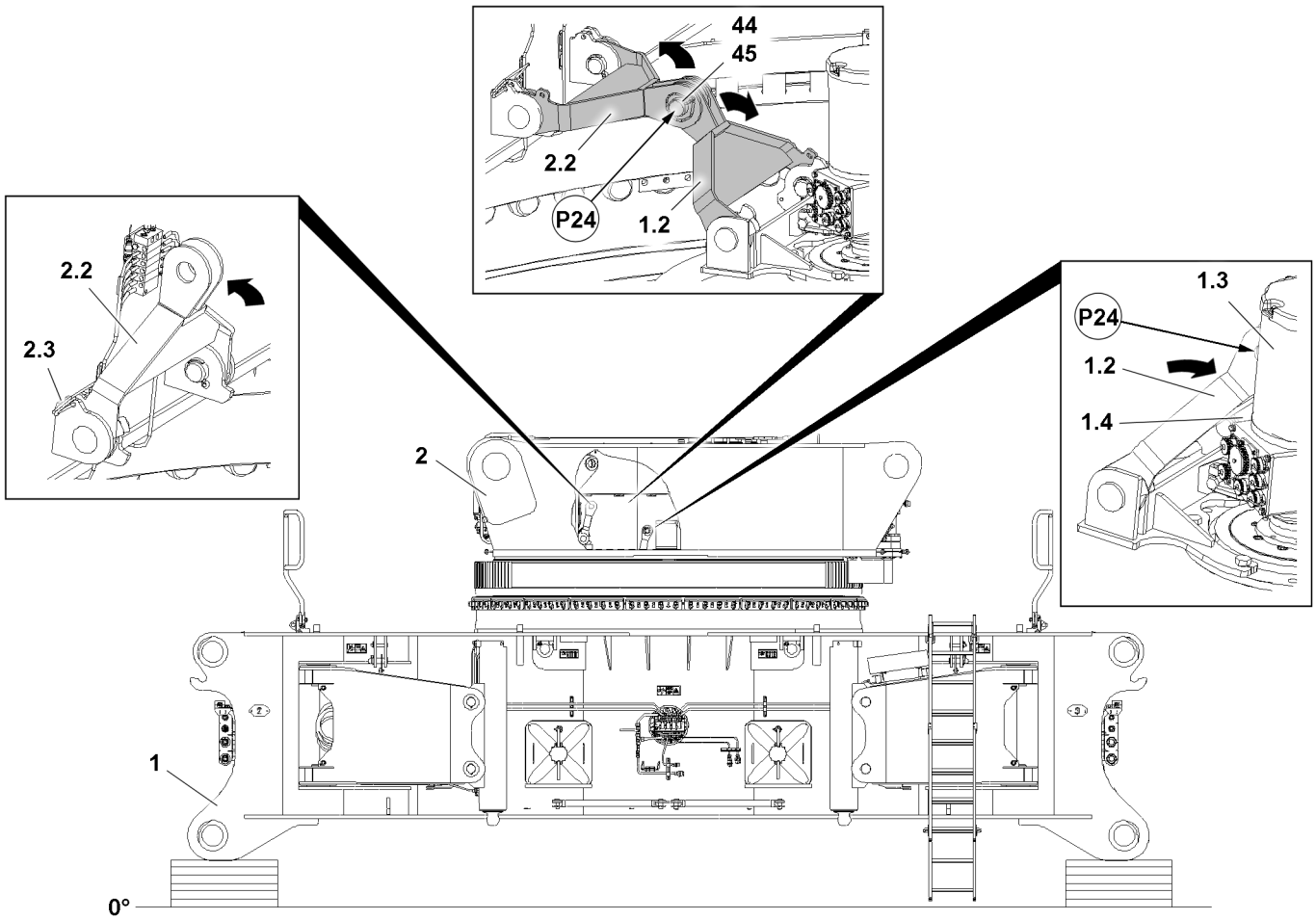

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Fig.126168: Disassembling the drawbars of the rotary connection on the turntable frame lower section

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WARNING
Danger of crushing!
When unpinning the drawbars, they can fold down and crush fingers and hands.
▶ Make sure that the drawbars are safely held in position before unpinning.

▶ Unpin the drawbars: Remove the locking pin **45** at point **P24** and unpin the pin **44**.

When the drawbars are unpinned.
▶ Fold the drawbar **1.2** up in transport position (see arrow).
▶ Secure the drawbar **1.2** in the transport position with the spring retainer **1.4**.

When the drawbars are unpinned.
▶ Fold the drawbar **2.2** up in transport position (see arrow).
▶ Secure the drawbar **2.2** in the transport position with the spring retainer **2.3**.
▶ Insert the pins **44** in the drawbar at point **P24** and secure with locking pin **45**.

Result:

– The drawbars between the turntable frame lower section **2** and rotary connection **1.3** are in the transport position.

7.9.2 Unpinning the Quick Connection

Make sure that the following prerequisite is met:
– The drawbars between the turntable frame lower section **2** and rotary connection **1.3** are in the transport position.

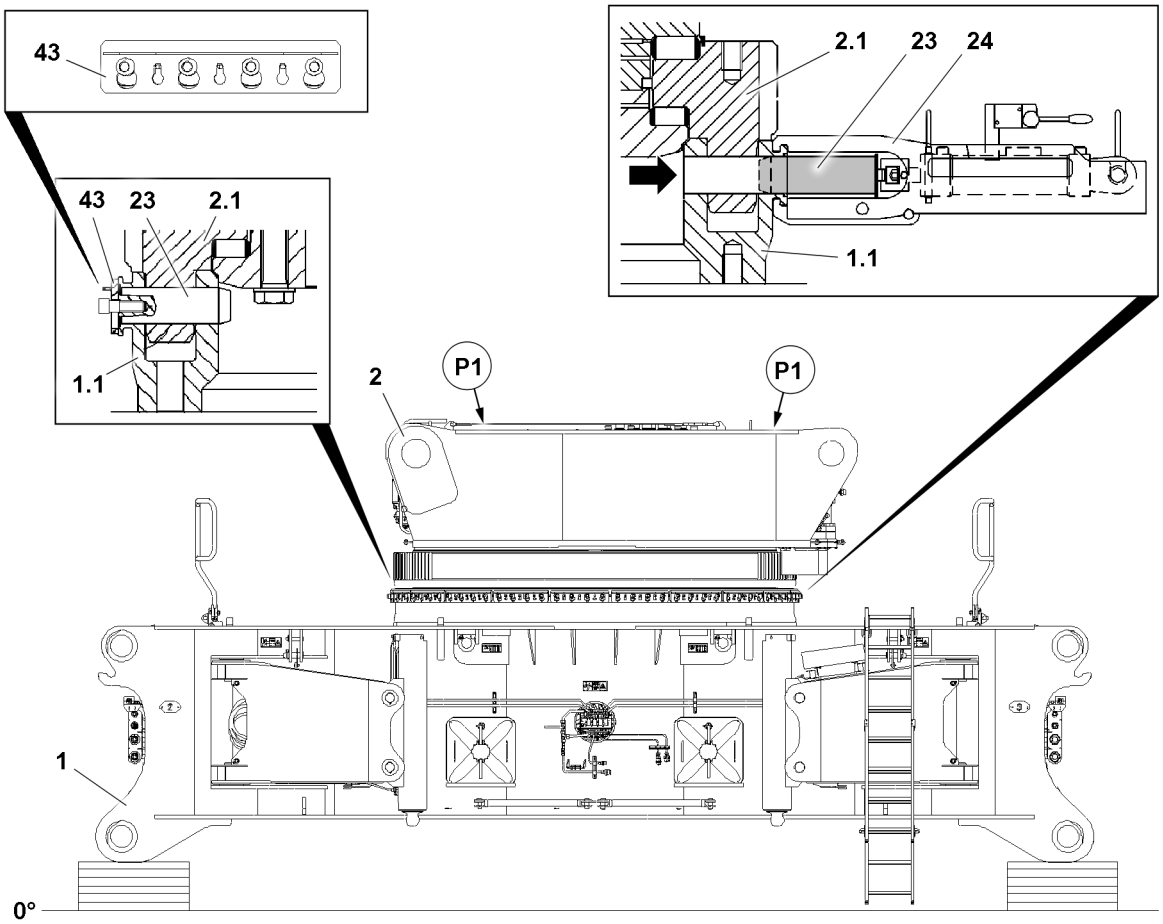

Fig.126169: Unpinning the Quick Connection

▶ Properly fasten the turntable frame lower section **2** to the fastening points **P1** on the auxiliary crane, see also section „Fastening points“.

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WARNING
Tipping turntable frame lower section!
During the disassembly of the turntable frame lower section **2** the turntable frame lower section **2** can tip over and fall down.
Death, severe bodily injuries, property damage.
▶ Make sure that the fastening equipment between the turntable frame lower section **2** and auxiliary crane is tensioned before the pins of the QC are unpinned.

DANGER
Danger of accident!
Death, severe bodily injuries, property damage.
▶ It is prohibited for anyone to remain within the danger range of the auxiliary crane and under the turntable frame lower section **2** when lifting and swinging out the turntable frame lower section **2**.
▶ Swing the turntable frame lower section **2** out slowly with the auxiliary crane after unpinning the QC.

When the turntable frame lower section **2** is properly fastened on the auxiliary crane:
▶ Carefully bring the fastening equipment to „tension“.

When the fastening equipment is tensioned:
▶ Remove the securing bracket **43** around the circumference of the QC.
▶ Unpin the pin **23** of the QC with the pin pulling device **24**.

When all pins **23** of the QC are properly unpinned:
▶ Lift the turntable frame lower section **2** with the auxiliary crane from the crawler center section.
▶ Swing the turntable frame lower section **2** out with the auxiliary crane and set it properly on a load bearing substructure or on a flatbed trailer.
▶ Remove the auxiliary crane.

7.10 Removing the hydraulic aggregate

Make sure that the following prerequisite is met:
– The crawler center section **1** is set down on the substructure.

▶ Remove the hydraulic aggregate, see section „Disassembling the crawler center section“.

7.11 Disassembling the assembly support

▶ Disassemble the assembly support, see section „Disassembling the crawler center section“.

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8 Assembling the crawler carriers with SA-frame

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ It is prohibited to lean the ladder against the component being disassembled.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

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8.1 Assembling the crawler carriers with SA-frame

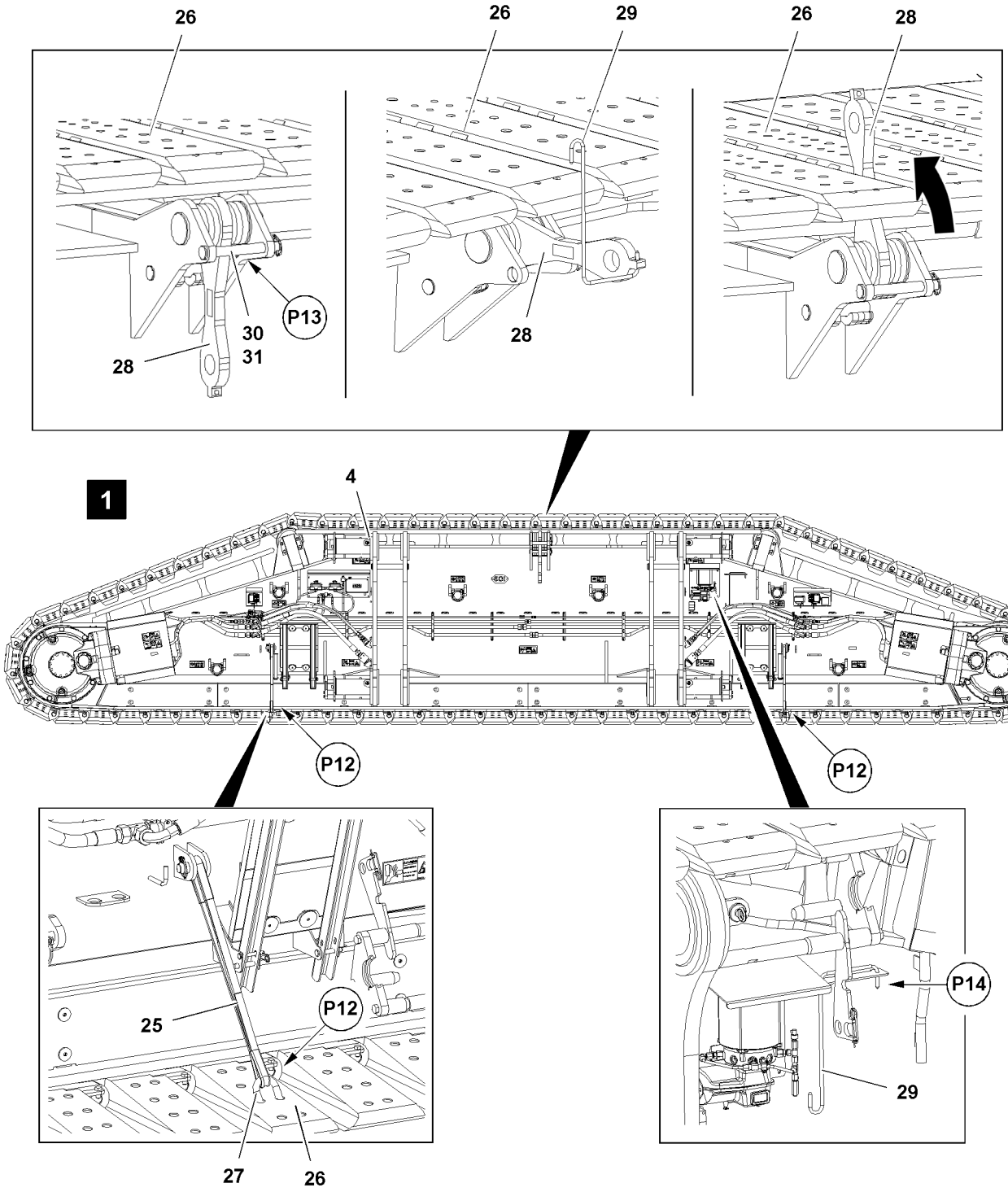

Fig.126237

8.1.1 Preparing the crawler carrier for assembly

Make sure that the following prerequisites are met:

- The installation / assembly location for the crane must be level and of adequate load bearing capacity.
- There is no counterweight on the turntable.
- The crawler center section is lying completely on the substructure.

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WARNING
Danger of accident due to improper substructure!
If the crane is not properly supported, then it can sink into the ground.
Death, severe bodily injuries, property damage.
- ▶ The supporting base must be able to safely absorb the weight of the crawler carrier, the turntable and the crawler center section.
- ▶ The substructure must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see chapter 2.04.

WARNING
Danger of falling!
During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ Use personal protective equipment.

Note
- ▶ Hang in two belts **25** per crawler carrier side.

The track pads **26** must be secured before assembly of the crawler carriers with the belts **25** to prevent sag.

- ▶ Attach the belts **25** with the bars **27** in points **P12** to the track pads, illustration **1**.

Note
- ▶ The brackets **28** must be swung into the operating position between the track pads **26**, „upward“.

- ▶ Remove the safety locking pin **31** in point **P13** and unpin the pin **30**, illustration **1**.

Note
- ▶ The handle **29** is fastened in the transport position in point **P14**.

- ▶ Swing the brackets **28** with the handle **29** up, illustration **1**.

8.1.2 Assembling the first crawler carrier with SA-frame

WARNING
The crane can topple over!
Depending on the assembly condition of the crane and the extension condition of the support cylinders, the support forces on the support cylinders can occur up to **114 t**.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the ground under the support cylinders is able to safely take on the occurring support forces.
- ▶ Make sure that the support cylinders are supported from below over a large surface with load bearing materials.
- ▶ Make sure that the support cylinders are moved in and / or out evenly.
- ▶ When supporting or lowering the crawler center section pay attention to the horizontal alignment.

Note
- ▶ Note the identification on the crawler carrier and the crawler center section.
- ▶ The crawler carrier and the crawler center section are marked with numbers.

Note
- ▶ For assembly of the crawler carriers on the crawler center section, the assembly procedure and the process are identical for both crawler carrier sides.
- ▶ For that reason, the assembly of the crawler carrier is only described for one side as an example.

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WARNING
Danger of falling!
During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
▶ Use personal protective equipment (PPE).

NOTICE
Damage to the crane!
If the following instructions are not observed, the crane can topple over or be severely damaged when unloading the crawler carrier.
▶ Comply with the specifications in the SA operation load chart.

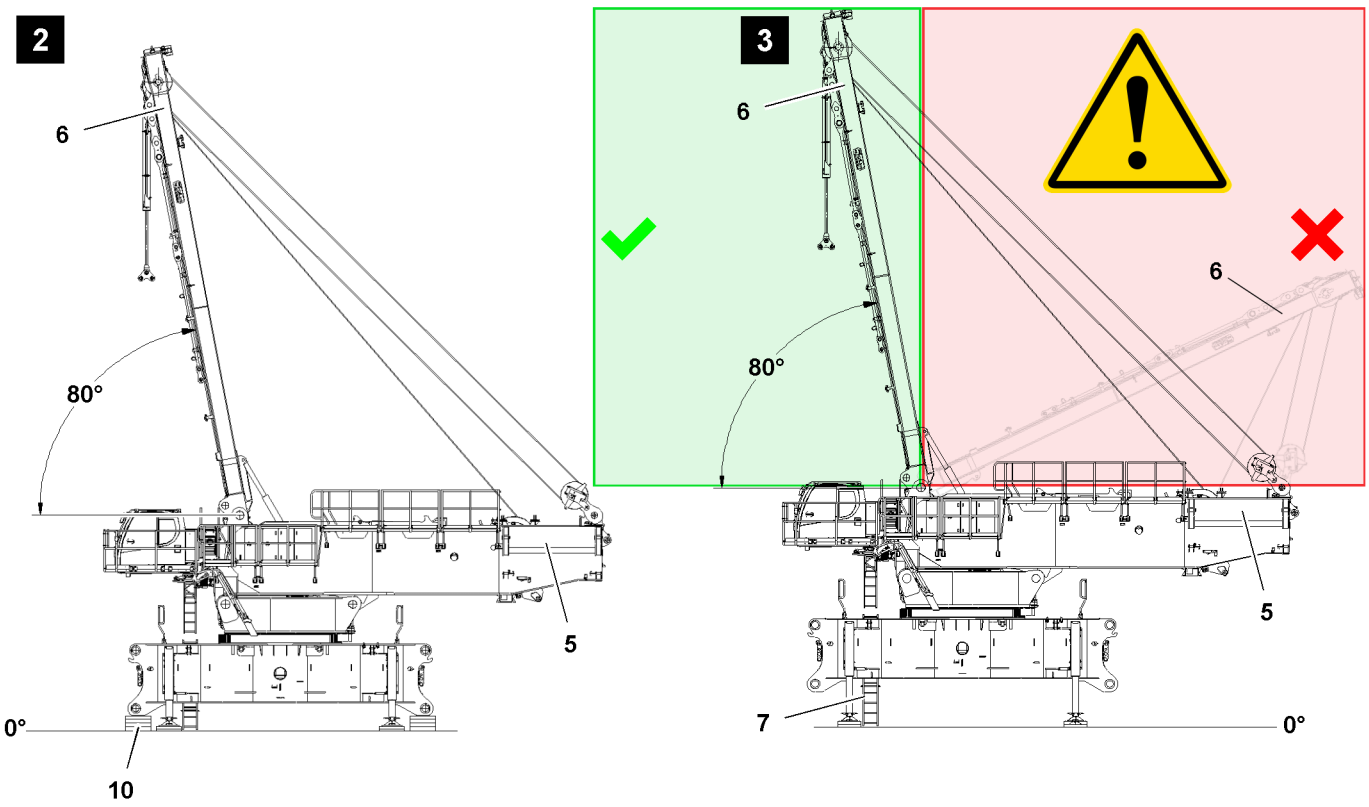

Fig.154250: Erected SA-frame // Supported and horizontally aligned crane

WARNING
The crane can topple over!
When the SA-frame is taken down onto the turntable or is at an angle between 90° and 180° (red range), the turntable may **not** be turned. The crane will topple over.
Death, severe bodily injuries, property damage.
▶ Make sure that the crane is supported and horizontally aligned.
▶ Make sure that the SA-frame **6** is at an angle between 0° and 90° (green range) before turning the turntable.
▶ If the crane is supported and horizontally aligned and the SA-frame is at an angle between 90° and 180° (red range), then it is **prohibited** to turn the turntable.

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Make sure that the following prerequisites are met:
- The track pads of the crawler carrier are secured to prevent them from sagging.
- The turntable is properly assembled and secured on the crawler center section, see chapter 3.02.
- The maximum height of the transport vehicle of the crawler carriers may not exceed 1000 mm.
- The „SA-frame“ operating mode has been set and confirmed on the LICCON computer system.
- The SA-frame is erected to approx. 80°, see chapter 5.02.
- Observe the SA-frame angle display on the LICCON monitor, see chapter 4.02.

Note

▶ External hydraulic aggregate: Function assignment for the hand lever on the crawler center section for extending / retracting the support cylinders, see section „Lifting the crawler center section“.

WARNING

The crane can tip over!
If the support cylinders are retracted / extended unevenly, the crane can tip over.
Death, severe bodily injuries, property damage.

▶ When extending / retracting the support cylinders, pay attention to the horizontal alignment of the crane.
▶ Check the horizontal alignment of the spirit level on the crawler center section or on the LICCON monitor.

▶ Support the crane and lift it off the substructure **10**.
▶ Align the crane horizontally.

When the crane is supported and horizontally aligned:

▶ Remove the substructure **10**, illustration **3**.
▶ Realign the extension ladder **7**, illustration **3**. See also chapter 2.06.

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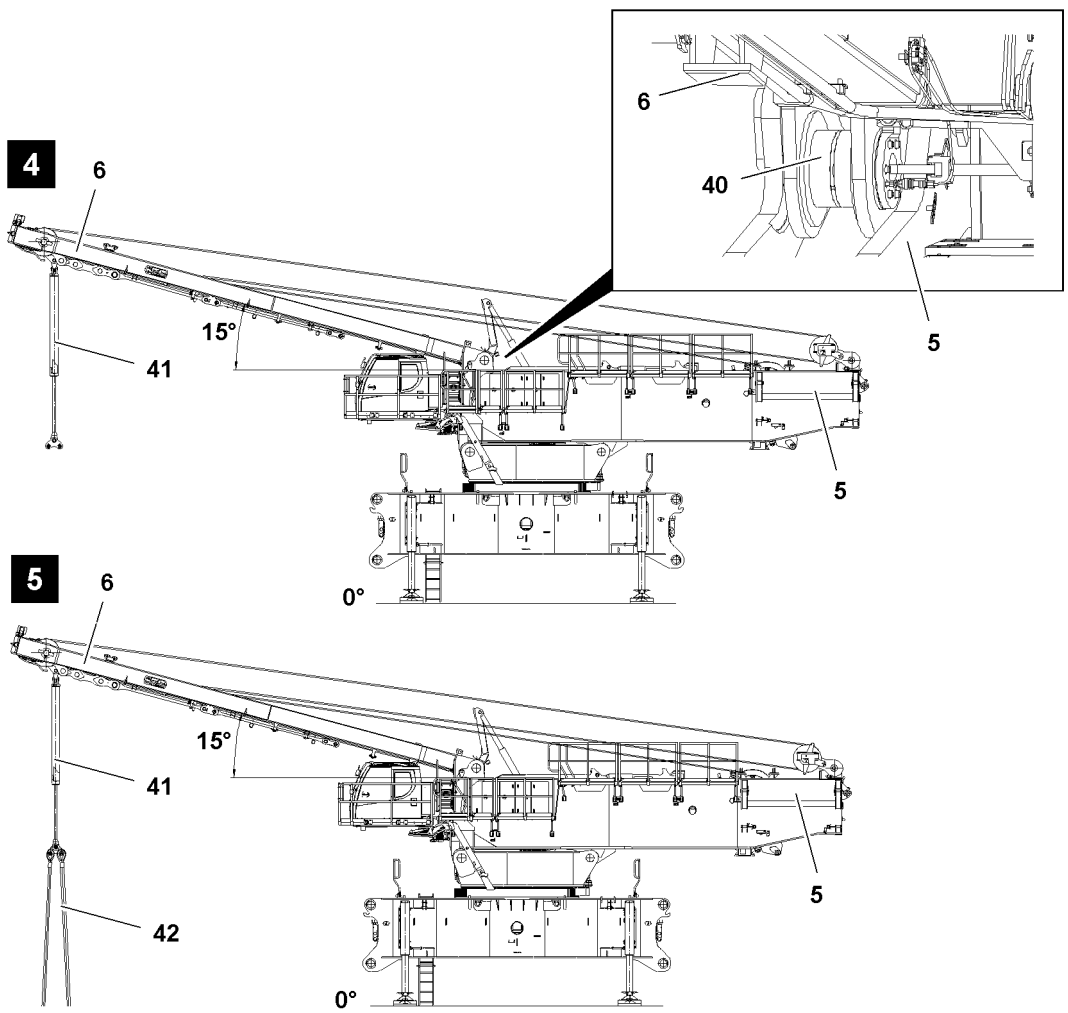

Fig.154251: Assembling the first crawler carrier with SA-frame

NOTICE
Damage to the crane!
When luffing the SA-frame **6** down to 15°, there is the danger that the connector pins **40** of the derrick boom will collide with the turntable frame main section **5**.
The SA-frame **6** can be damaged by a collision resulting in high repair costs.
▶ Make sure, when luffing the SA-frame down to 15°, that the connector pins **40** of the derrick boom are inserted.

When the connector pins **40** are inserted:
▶ Luff the SA-frame **6** down to the front to 15°, illustration **4**.

Note
▶ The pull cylinder **41** may not be moved out all the way.
▶ If the pull cylinder **41** is completely extended and the limit switch position is reached, an error display occurs on the LICCON monitor and the LMB stop.

▶ Extend the pull cylinder **41**.
▶ Pin and secure the fastening equipment **42** on the pull cylinder **41**, illustration **5**.

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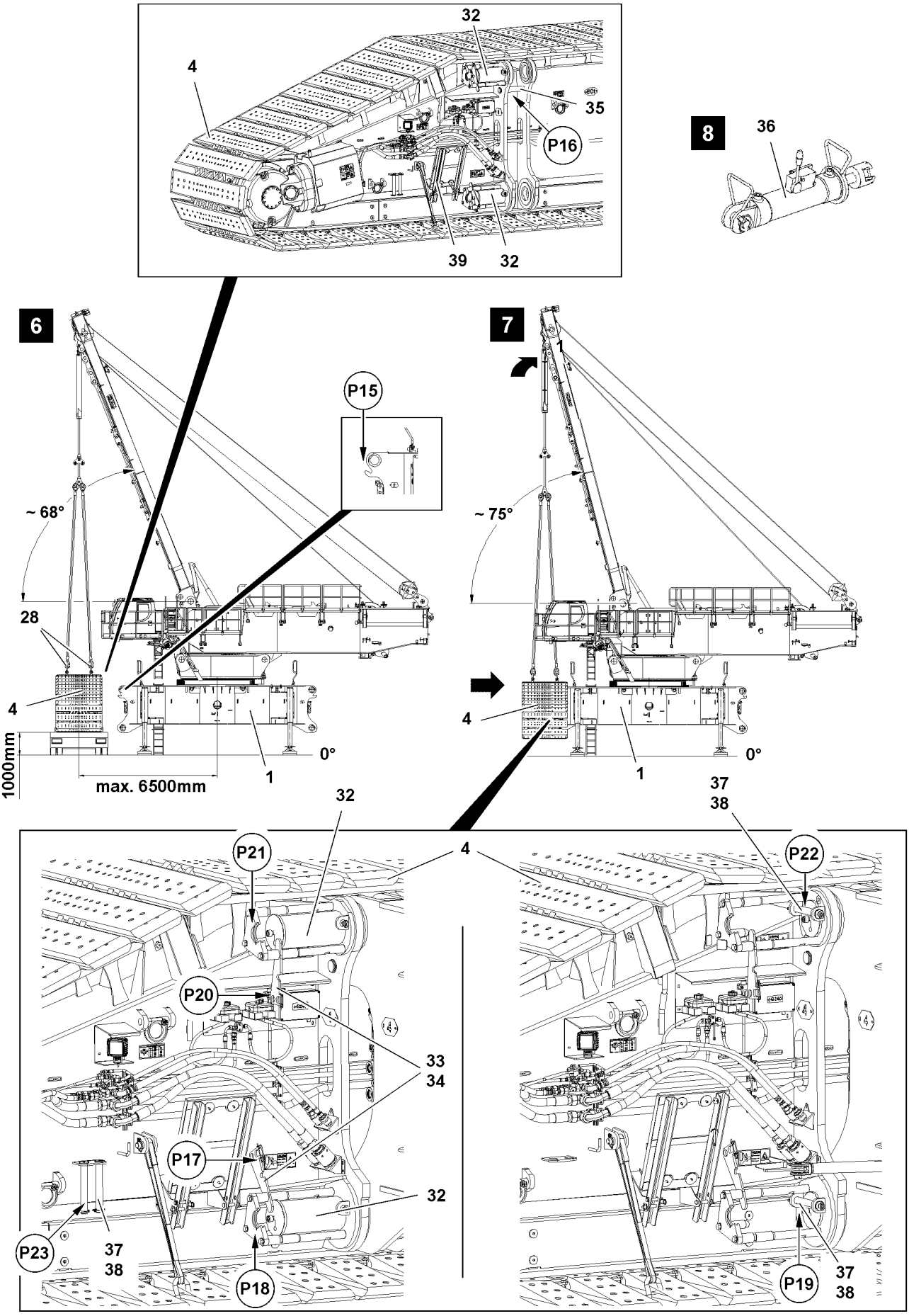

Fig.126222

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WARNING
Danger of tipping!
If the following instructions are not observed, the crane can tip over at assembly.
Death, severe bodily injuries, property damage.
▶ The maximum permissible distance of 6500 mm between the crawler carrier and the center of the turntable may not be exceeded.

▶ Fasten the fastening equipment to the brackets **28** of the crawler carrier, illustration **6**.
▶ Carefully swing the crawler carrier **4** with the auxiliary crane up to the pin points on the crawler center section **1**.
▶ Attach the crawler carrier **4** with centering pins **35** in points **P16** to the centerings in points **P15** on the crawler center section **1**, illustration **6** and illustration **7**.
▶ Release the pin **32** from transport position: Remove the spring retainer **34** in point **P17** and swing the securing bracket **33** upward, illustration **7**.
▶ Attach the spring retainer **34** again in point **P17**.
▶ Connect the pin pulling cylinder **36** to the hydraulic supply line or the hydraulic aggregate, illustration **8**.
▶ Set the pin pulling cylinder **36** in the pin pulling device in point **P18**.
▶ Insert the pin **32** with the pin pulling cylinder **36** to the stop.
▶ Remove the pin pulling cylinder **36**, illustration **7**.

Note
▶ The retaining pins **37** are located in point **P23** in the park position, illustration **7**.

▶ Remove the safety locking pin **38** and unpin the retaining pin **37** from the park position in point **P23**.

WARNING
The pin is not secured!
If the retaining pins **37** are not secured, the retaining pins can loosen up by themselves during crane operation.
This can cause the crane to topple over.
Death, severe bodily injuries, property damage.
▶ Make sure that the retaining pins **37** are secured with the safety locking pin **38**.

▶ Secure the pin **32**: Insert the retaining pin **37** in point **P19** and secure with the safety locking pin **38**.
▶ Fold the assembly platform **39** down, see the Crane operating instructions, chapter 2.06.
▶ Release the pin **32** from transport position: Remove the spring retainer **34** in point **P20** and swing the securing bracket **33** downward, illustration **7**.
▶ Attach the spring retainer **33** again in point **P20**, illustration **7**.
▶ Set the pin pulling cylinder **36** in the pin pulling device in point **P21**.
▶ Insert the pin **32** with the pin pulling cylinder **36** to the stop.
▶ Remove the pin pulling cylinder **36**, illustration **7**.

Note
▶ The retaining pins are located in point **P23** in the park position, illustration **7**.

▶ Remove the safety locking pin **38** and unpin the retaining pin **37** from the park position in point **P23**.

WARNING
The pin is not secured!
If the retaining pins **37** are not secured, the retaining pins can loosen up by themselves during crane operation.
This can cause the crane to topple over.
Death, severe bodily injuries, property damage.
▶ Make sure that the retaining pins **37** are secured with the safety locking pin **38**.

▶ Secure the pin **32**: Insert the retaining pin **37** in point **P22** and secure with the safety locking pin **38**, illustration **7**.
▶ Pin the crawler carrier **4** on the other crawler carrier side with the crawler center section.

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▶ Remove the fastening equipment.

NOTICE
Damage to the brackets!
▶ After removing the fastening equipment, the brackets **28** must be swung down.

▶ Swing the brackets **28** down, see section „Preparing the crawler carrier for assembly“.

8.1.3 Assembling the second crawler carrier with SA-frame

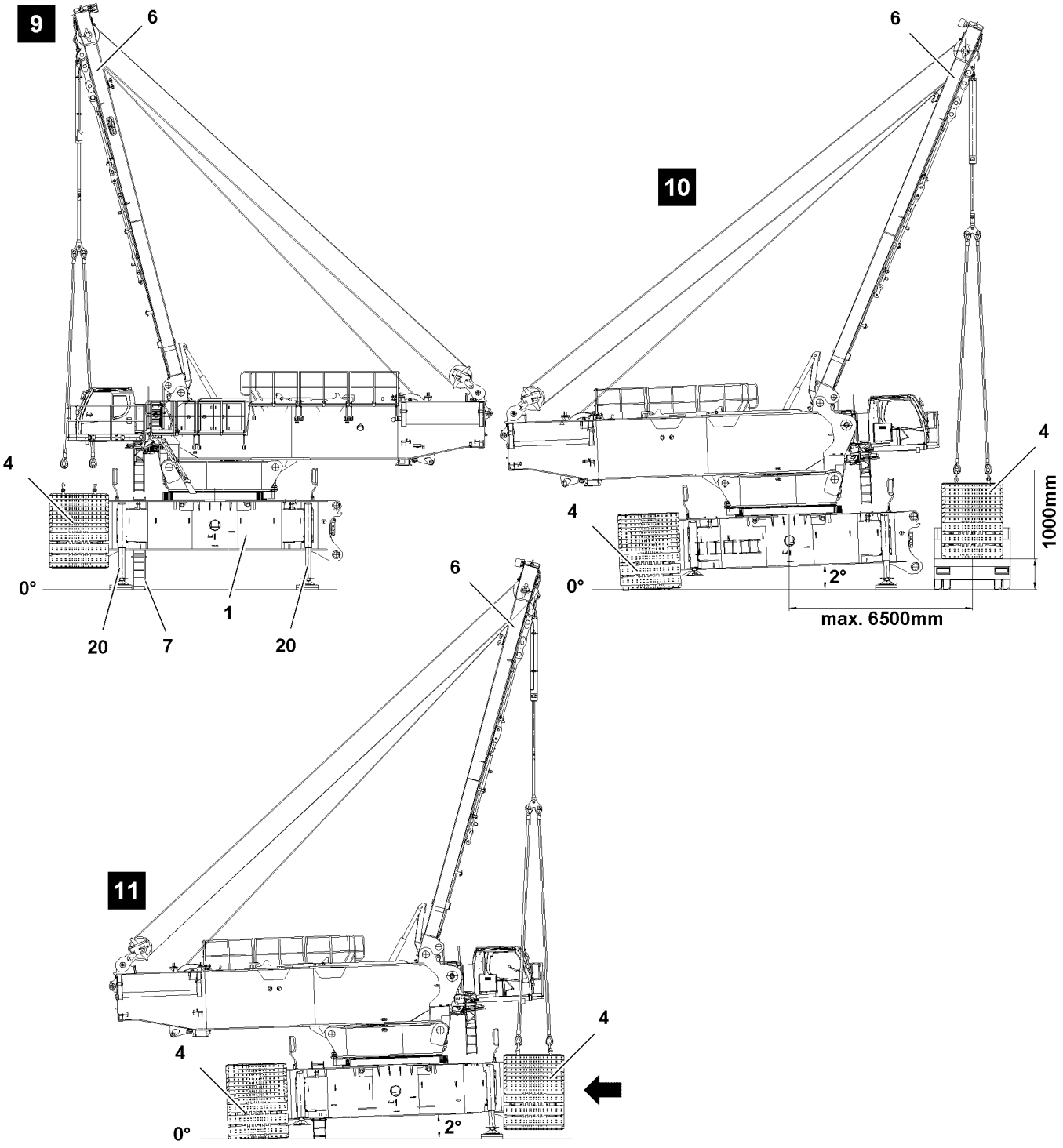

Fig.126223: Assembling the second crawler carrier with SA-frame

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WARNING
The crane can topple over!
Depending on the assembly condition of the crane and the extension condition of the support cylinders, the support forces on the support cylinders can occur up to **114 t**.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the ground under the support cylinders is able to safely take on the occurring support forces.
- ▶ Make sure that the support cylinders are supported from below over a large surface with load bearing materials.
- ▶ Make sure that the support cylinders are moved in and / or out evenly.
- ▶ When supporting or lowering the crawler center section pay attention to the horizontal alignment.

Make sure that the following prerequisite is met:
- – The first crawler carrier **4** is pinned and secured on the crawler center section **1**, illustration **9**.

Note
- ▶ For assembly of the crawler carriers on the crawler center section, the assembly procedure and the process are identical for both crawler carriers.
- ▶ For that reason, the assembly of the crawler carrier is only described for crawler carrier as an example.

WARNING
The crane can tip over!
If the support cylinders are retracted / extended unevenly, the crane can tip over.
Death, severe bodily injuries, property damage.
- ▶ When extending / retracting the support cylinders **20**, pay attention to the horizontal alignment of the crane.
- ▶ Check the horizontal alignment of the spirit level on the crawler center section or on the LICCON monitor.

- ▶ Retract the support cylinders **20** evenly until the first crawler carrier is positioned on the ground.

When the first crawler carrier is standing on the ground:
- ▶ Fully retract the support cylinder **20** on the side of the already assembled crawler carrier.
- ▶ Extend the opposite support cylinders again until the angle between the ground and the crawler center section is approx. 2°.

WARNING
Danger of tipping!
Before turning the turntable, if the first assembled crawler carrier is not positioned on the ground, there is a danger of tipping over.
Death, severe bodily injuries, property damage.
- ▶ The support cylinders on the side of the already installed crawler carrier have to be moved in all the way.

- ▶ Turn the turntable 180°, illustration **10**.
- ▶ Align the extension ladder **7** again, see chapter 2.06.

WARNING
Danger of tipping!
If the following instructions are not observed, the crane can tip over at assembly.
Death, severe bodily injuries, property damage.
- ▶ The maximum permissible distance of 6500 mm between the crawler carrier and the center of the turntable may not be exceeded.

- ▶ Assemble the second crawler carrier, illustration **10** and illustration **11**, see section „Assembling the first crawler carrier with SA-frame“.

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8.1.4 Lowering the crane

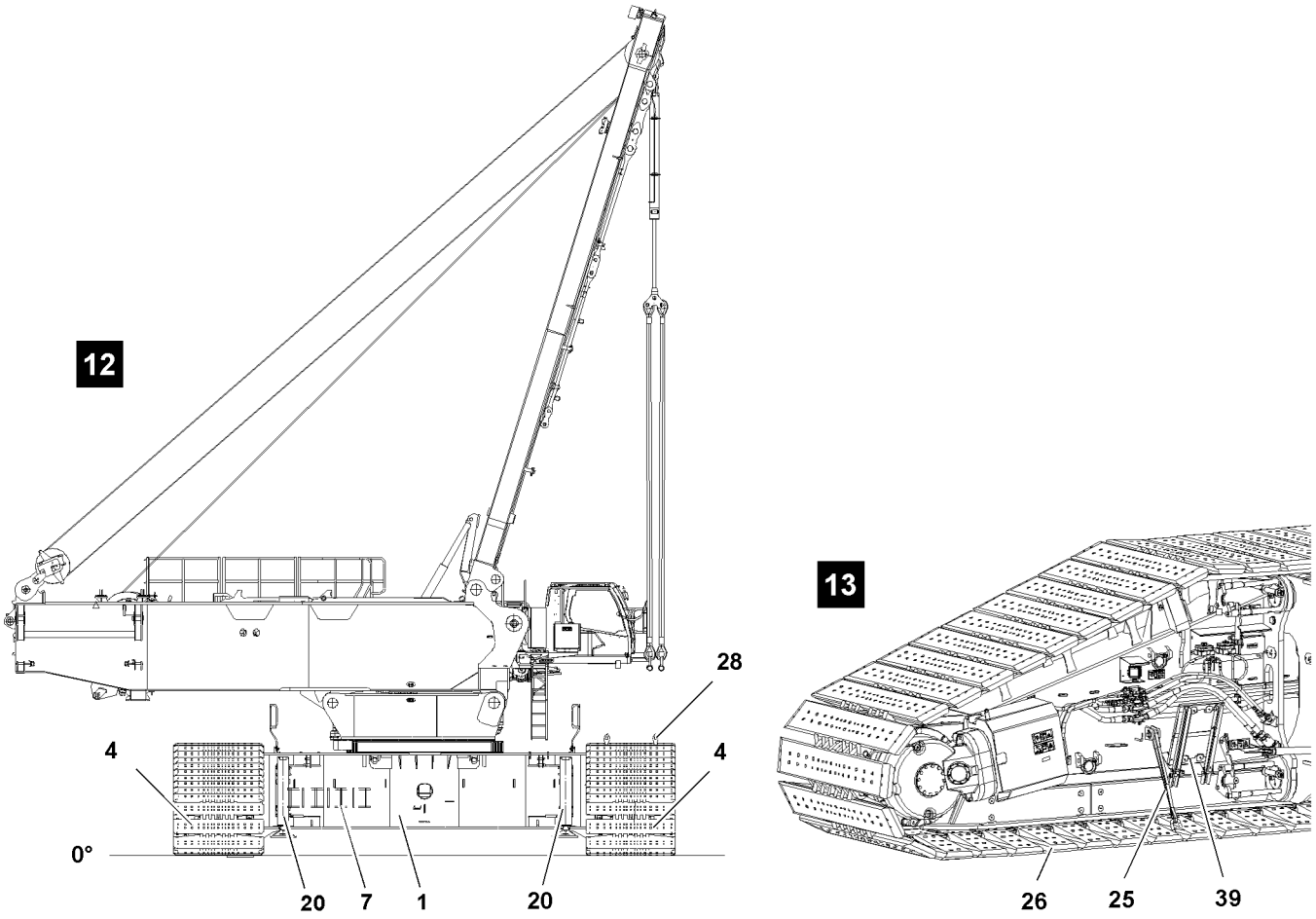

Fig.126224

WARNING
Danger of accident due to improper substructure!
Death, severe bodily injuries, property damage.
- ▶ The supporting base must absorb the weight of the crane safely.
- ▶ The substructure must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see chapter 2.04.

Note
- ▶ External hydraulic aggregate: Function assignment for the hand lever on the crawler center section for extending / retracting the support cylinders, see section „Lifting the crawler center section“.

NOTICE
Environmental pollution due to hydraulic oil!
When retracting the assembly support, if a hydraulic aggregate with full hydraulic oil tank is used, then the hydraulic oil tank on the hydraulic aggregate can be flooded when retracting the assembly support. Hydraulic oil can escape causing severe environmental pollution.
- ▶ Make sure that the hydraulic oil tank on the hydraulic aggregate has sufficient capacity to be able to safely take on the hydraulic oil of the assembly support.
- ▶ Make sure that the extension and retraction of the assembly support is carried out solely with the same hydraulic aggregate.
- ▶ Make sure that suitable measures are made to prevent an oil spill in the environment.

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Make sure that the following prerequisite is met:
– The second crawler carrier **4** is pinned and secured on the crawler center section **1**.

▶ Retract the support cylinders **20** completely.

Result:

– Both crawler carriers **4** are on the ground, illustration **12**.

▶ Remove the fastening equipment.

NOTICE
Damage to the brackets!
▶ After removing the fastening equipment, the brackets **28** must be swung down.

▶ Swing the brackets **28** down, see section „Preparing the crawler carrier for assembly“.
▶ Fasten the extension ladder **7** in the park position, illustration **12**, see chapter 2.06.
▶ Disengage the belts **25** on the track pads **26**, illustration **13**.
▶ Fold the assembly platforms **39** up again into the transport position, see chapter 2.06 and illustration **13**.

8.1.5 Establishing the connections to the crawler carriers

Make sure that the following prerequisite is met:
– Both crawler carriers are properly assembled, pinned and secured.

Establishing the hydraulic connections

The hydraulic connections are made with quick couplings.

When connecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

WARNING
Pressure in the hydraulic lines!
If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.
Death, severe bodily injuries, property damage.
▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

WARNING
Loss of pressure or leakage!
Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.
▶ Check that the quick couplings have been properly connected before using the crane.

▶ Connect the coupling components (sleeve and connector) and screw together with the knurled nut.
▶ Tighten the hydraulic coupling by hand. Turn the knurled nut until it reaches a tangible, fixed stop position.
▶ Establish the hydraulic connections, see the Hydraulic diagram.

Establishing the electrical connections

▶ Establish the electrical connections, see the Electric wiring diagram.

Establishing the connections to the central lubrication system

▶ Establish the connections to the central lubrication system.

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9 Disassembling the crawler carrier with SA-frame

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ It is prohibited to lean the ladder against the component being disassembled.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

9.1 Disconnecting the connections from the crawler carriers

9.1.1 Disconnecting the hydraulic connections

The hydraulic connections are made with quick couplings.

When disconnecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

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WARNING
Pressure in the hydraulic lines!
If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.
Death, severe bodily injuries, property damage.
▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

▶ Release the hydraulic coupling by hand.
▶ Disconnect the hydraulic connections, see the Hydraulic diagram.
▶ Protect the hydraulic connections from contamination with caps.

9.1.2 Disconnecting the electrical connections

▶ Disconnect the electrical connections to the crawler carrier, see Electrical wiring diagram.

9.1.3 Disconnecting the connection to the central lubrication system

▶ Disconnect the connection to the central lubrication system.
▶ Protect the connections of the central lubrication system with caps from contamination.

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9.2 Preparing the crawler carrier for disassembly

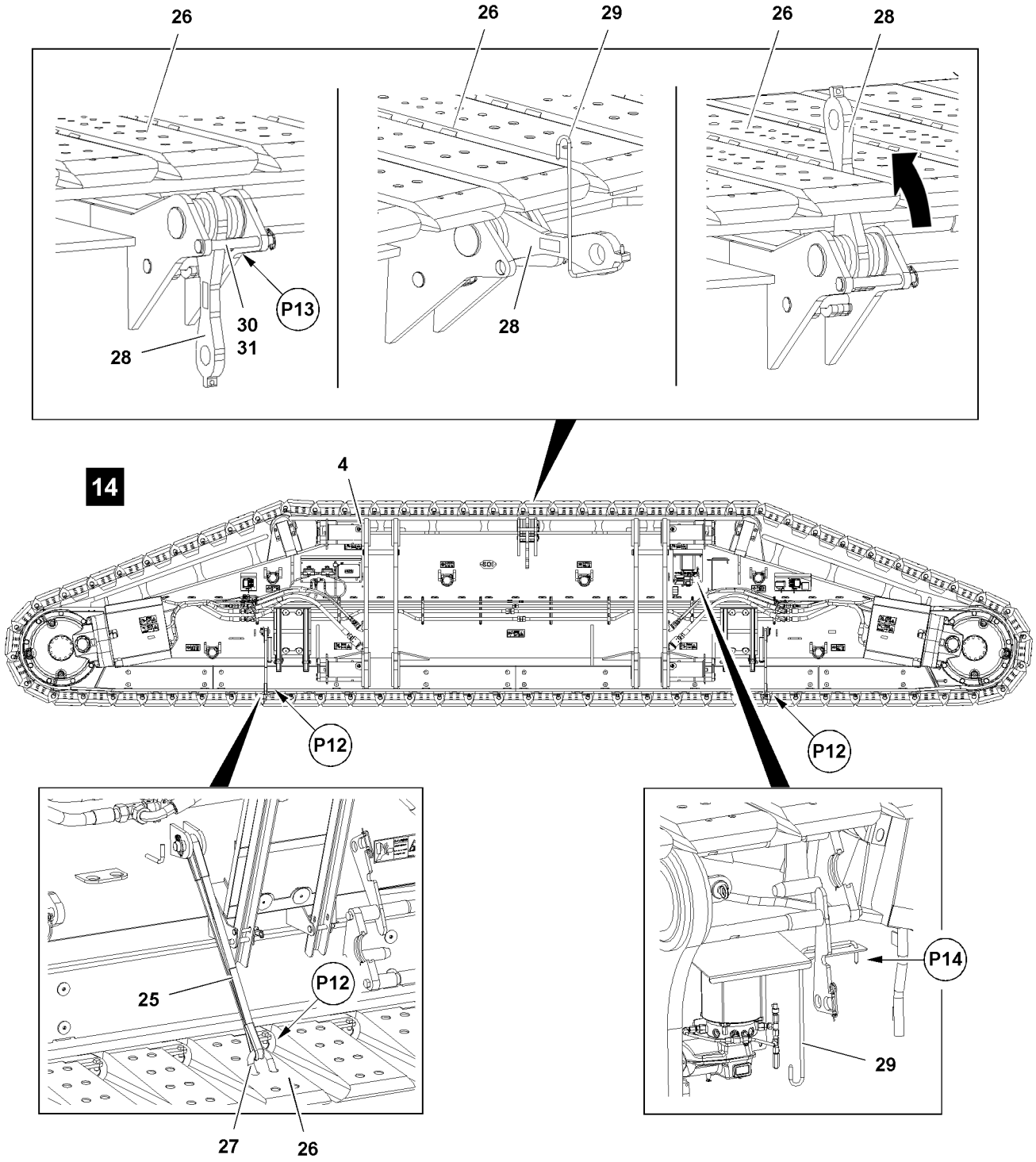

Fig.126225: Preparing the crawler carrier for disassembly

WARNING
Danger of falling!
During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
▶ Use personal protective equipment.

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Note
▶ Hang in two belts **25** per crawler carrier side.

The track pads **26** must be secured before disassembly of the crawler carriers with the belts **25** to prevent them from sagging.

▶ Attach the belts **25** with the bars **27** in points **P12** to the track pads, illustration **14**.

Note
▶ The brackets **28** must be swung into the operating position between the track pads **26**, „upward“.

▶ Remove the safety locking pin **31** in point **P13** and unpin the pin **30**, illustration **14**.

Note
▶ The handle **29** is fastened in the transport position in point **P14**.

▶ Swing the brackets **28** with the handle **29** up, illustration **14**.

9.3 Supporting the support plates

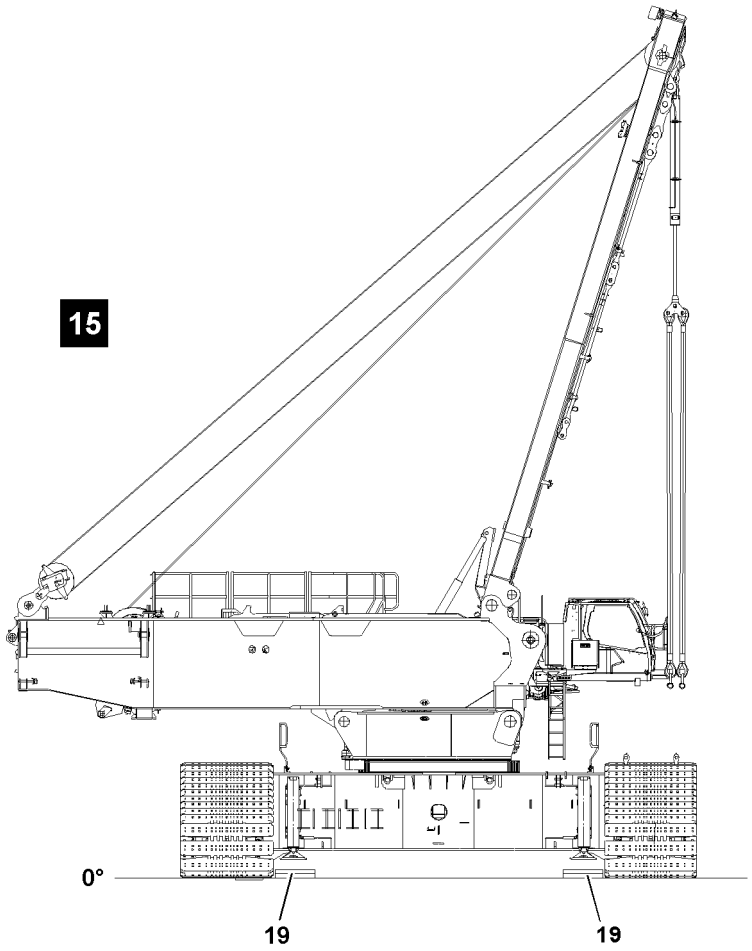

Fig.126226: Supporting the support plates

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WARNING
The crane can topple over!
Depending on the assembly condition of the crane and the extension condition of the support cylinders, the support forces on the support cylinders can occur up to **114 t**.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the ground under the support cylinders is able to safely take on the occurring support forces.
- ▶ Make sure that the support cylinders are supported from below over a large surface with load bearing materials.
- ▶ Make sure that the support cylinders are moved in and / or out evenly.
- ▶ When supporting or lowering the crawler center section pay attention to the horizontal alignment.

WARNING
Danger of falling!
During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ Use personal protective equipment.

WARNING
Danger of accident due to improper substructure!
If the support plates are not properly supported, then they can sink into the ground.
Death, severe bodily injuries, property damage.
- ▶ The supporting base must be able to safely absorb the weight of the crawler center section, the turntable frame lower section and the crawler carrier.
- ▶ The substructure must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see chapter 2.04.

Make sure that the following prerequisites are met:
- The central ballast is disassembled.
- The disassembly location must be level and have adequate load bearing capacity.
- Suitable material must be available for the substructure **19** of the assembly supports.
- The assembly supports are locked in the operating position.
- The support plates are properly locked with the support cylinders.
- The track pads are secured to prevent them from sagging.

- ▶ Support the crane with hardwood timbers or other suitable materials, illustration **15**.

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9.4 Disassembling the first crawler carrier with SA-frame

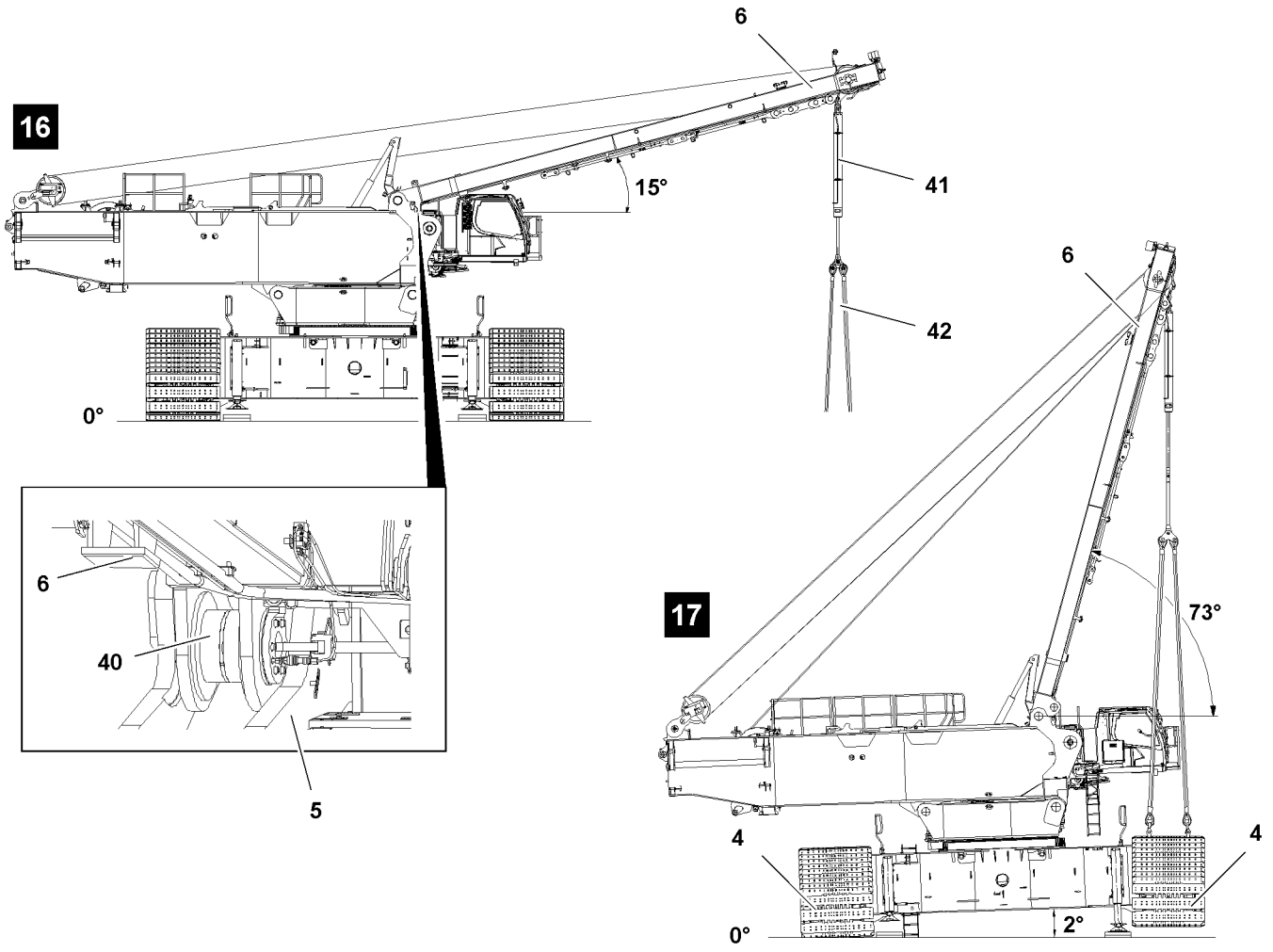

Fig.126227: Disassembling the first crawler carrier with SA-frame

Note

- ▶ For disassembly of the crawler carriers on the crawler center section, the disassembly procedure and the process are identical for both crawler carrier sides.
- ▶ For that reason, the disassembly of the crawler carriers is only described for one side as an example.

Note

- ▶ External hydraulic aggregate: Function assignment for the hand lever on the crawler center section for extending / retracting the support cylinders, see section „Lifting the crawler center section“.

WARNING

Danger of falling!

During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.

Death, severe bodily injuries, property damage.

- ▶ Use personal protective equipment.

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NOTICE
Damage to the crane!
When luffing the SA-frame **6** down to 15°, there is the danger that the connector pins **40** of the derrick boom will collide with the turntable frame main section **5**.
The SA-frame **6** can be damaged by a collision resulting in high repair costs.
▶ Make sure, when luffing the SA-frame down to 15°, that the connector pins **40** of the derrick boom are inserted.

When the connector pins **40** are inserted:
▶ Luff the SA-frame **6** down to the front to 15°, illustration **16**.

Note
▶ The pull cylinder **41** may not be moved out all the way.
▶ If the pull cylinder **41** is completely extended and the limit switch position is reached, an error display occurs on the LICCON monitor and the LMB stop.

▶ Extend the pull cylinder **41**.
▶ Pin and secure the fastening equipment **42** on the pull cylinder **41**, illustration **16**.

WARNING
The crane can tip over!
If the support cylinders are retracted / extended unevenly, the crane can tip over.
Death, severe bodily injuries, property damage.
▶ When extending / retracting the support cylinders **20**, pay attention to the horizontal alignment of the crane.
▶ Check the horizontal alignment of the spirit level on the crawler center section or on the LICCON monitor.

▶ Lift the first crawler carrier: The support cylinder on the side of the crawler carrier which is being disassembled is extended until the angle between the ground and the crawler center section is approximately 2°, illustration **17**.

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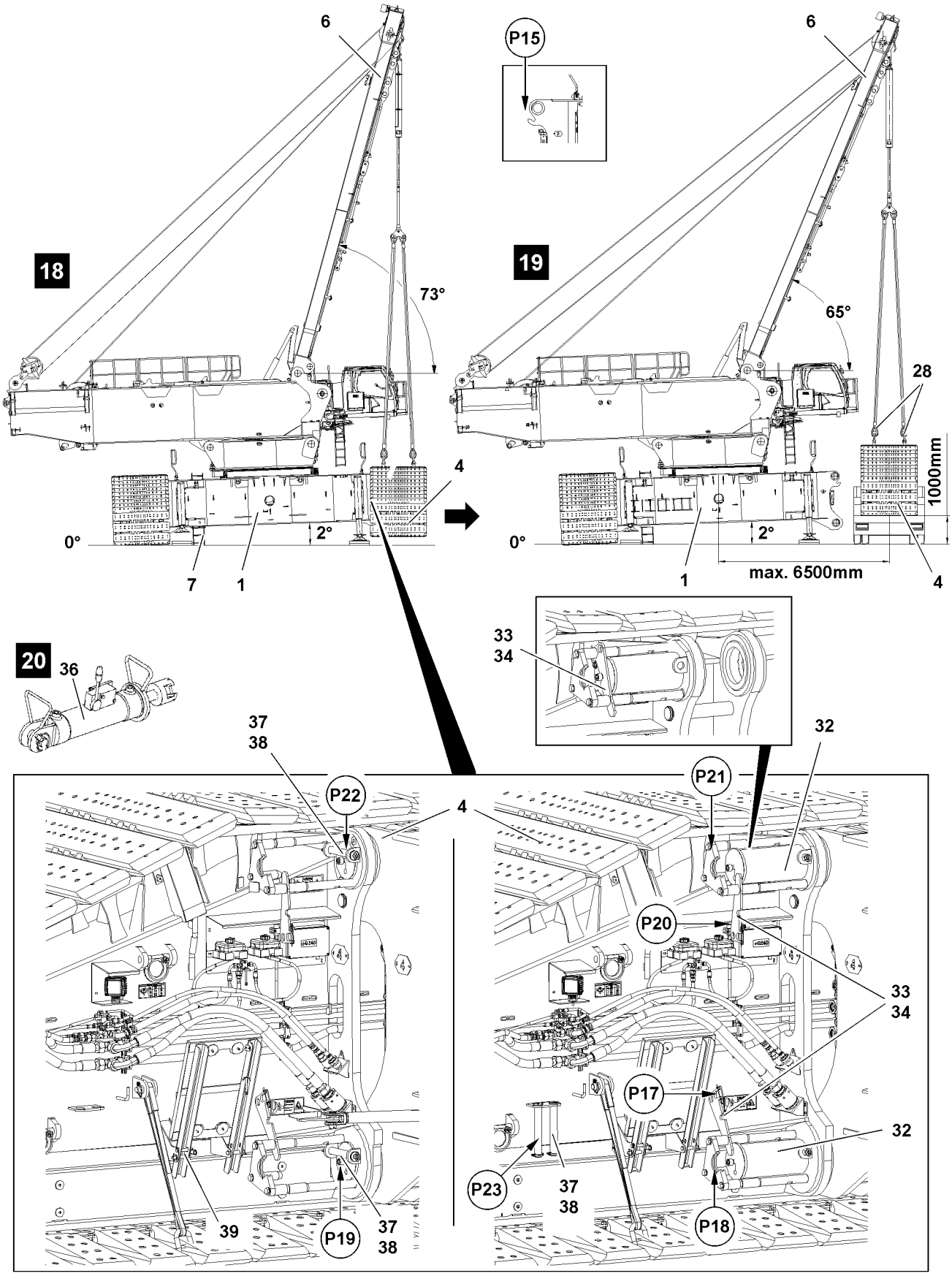

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Fig.126228: Lifting the crawler carrier out on the crawler center section and swinging it out

- ▶ Set up the extension ladder **7**, see chapter 2.06.
- ▶ Tension the fastening equipment.

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- ▶ Fold the assembly platform **39** down, see the Crane operating instructions, chapter 2.06.
- ▶ Release the pin **32**: Remove the safety locking pin **38** and unpin the retaining pin **37** in point **P22**, illustration **18**.

Note

- ▶ The retaining pins **37** are located in point **P23** in the park position, illustration **18**.

- ▶ Insert the retaining pin **37** in park position in point **P23** and secure with the safety locking pin **38**.
- ▶ Set the pin pulling cylinder **36**, illustration **20**, in the pin pulling device in point **P21**.
- ▶ Unpin the pin **32** with the pin pulling cylinder **36** to the stop.
- ▶ Remove the pin pulling cylinder **36**, illustration **18**.
- ▶ Secure the pin **32** in the transport position: Remove the spring retainer **34** in point **P20** and swing the securing bracket **33** upward, illustration **18**.
- ▶ Secure the securing bracket **33** again in point **P20** with the spring retainer **34**, illustration **18**.

Result:

– The pin **32** is secure in transport position.

- ▶ Fold the assembly platform **39** up, see the Crane operating instructions, chapter 2.06.
- ▶ Release the pin **32**: Remove the safety locking pin **38** at point **P19** and unpin the retaining pin **37**.
- ▶ Insert the retaining pin **37** in park position in point **P23** and secure with the safety locking pin **38**.
- ▶ Set the pin pulling cylinder **36** in the pin pulling device in point **P18**.
- ▶ Unpin the pin **32** with the pin pulling cylinder **36** to the stop.
- ▶ Remove the pin pulling cylinder **36**, illustration **18**.
- ▶ Secure the pin **32** in the transport position: Remove the spring retainer **34** in point **P17** and swing the securing bracket **33** downward, illustration **18**.
- ▶ Secure the securing bracket **33** again in point **P17** with the spring retainer **34**.

Result:

– The pin **32** is secure in transport position.

- ▶ Unpin the crawler carrier **4** on the other crawler carrier side.
- ▶ Lift the crawler carrier **4** with the auxiliary crane.

When the crawler carrier is raised above the hook points in point **P15**:

- ▶ Swing the crawler carrier **4** out, illustration **18**.

WARNING

Danger of tipping!
If the following instructions are not observed, the crane can tip over at disassembly.
Death, severe bodily injuries, property damage.

- ▶ The maximum permissible distance of 6500 mm between the crawler carrier and the center of the turntable may not be exceeded.

- ▶ Set the crawler carrier **4** on the transport vehicle, illustration **19**.
- ▶ Remove the fastening equipment.
- ▶ Swing the brackets **28** down, see section „Preparing the crawler carrier for assembly“.

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9.5 Disassembling the second crawler carrier with SA-frame

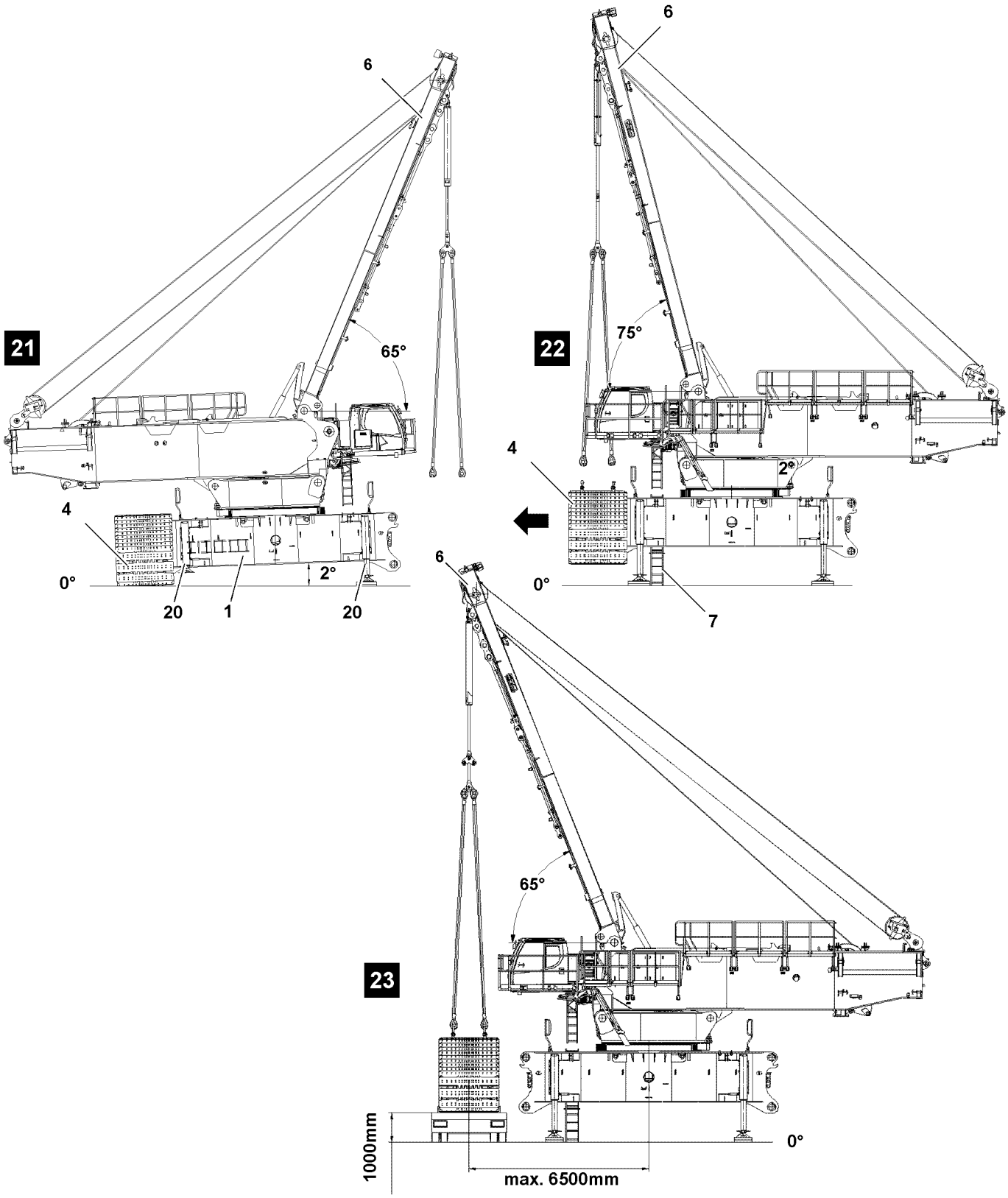

Fig.126229

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Note

- ▶ For disassembly of the crawler carriers on the crawler center section, the disassembly procedure and the process are identical for both crawler carriers.
- ▶ For that reason, the disassembly of the crawler carrier is only described for crawler carrier as an example.

WARNING

Danger of falling!

During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.

Death, severe bodily injuries, property damage.

- ▶ Use personal protective equipment.

Make sure that the following prerequisite is met:

– The first crawler carrier has been disassembled.

WARNING

Danger of tipping!

Before turning the turntable, if the second crawler carrier is not positioned on the ground, there is a danger of tipping over.

Death, severe bodily injuries, property damage.

- ▶ The support cylinders **20** on the side of the crawler carrier, which still must be disassembled, must be fully retracted, illustration **21**.
- ▶ Make sure that the crawler carrier is positioned on the ground.

- ▶ Turn the turntable 180°.
- ▶ Extend the opposite support cylinders until the crane is in horizontal position.

When the crane is aligned in horizontal direction:

- ▶ Extend all support cylinders completely, illustration **22**.
- ▶ Align the crane horizontally.
- ▶ Align the extension ladder **7** again, see chapter 2.06.

WARNING

Danger of tipping!

If the following instructions are not observed, the crane can tip over at disassembly.

Death, severe bodily injuries, property damage.

- ▶ The maximum permissible distance of 6500 mm between the crawler carrier and the center of the turntable may not be exceeded.

- ▶ Disassemble the second crawler carrier, see section „Disassembling the first crawler carrier with SA-frame“, illustration **23**.

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9.6 Removing the fastening equipment

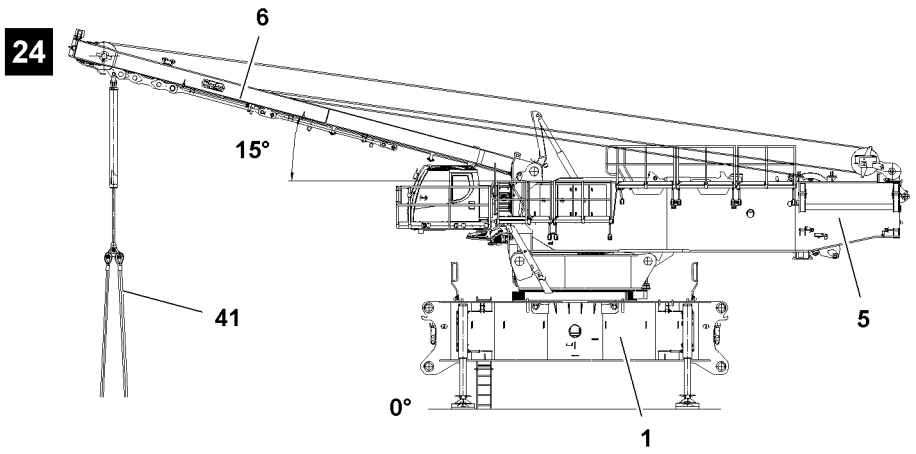

Fig.126233

- ▶ Luff the SA-frame down to the front to 15°.
- ▶ Remove the fastening equipment **41**, illustration **24**.

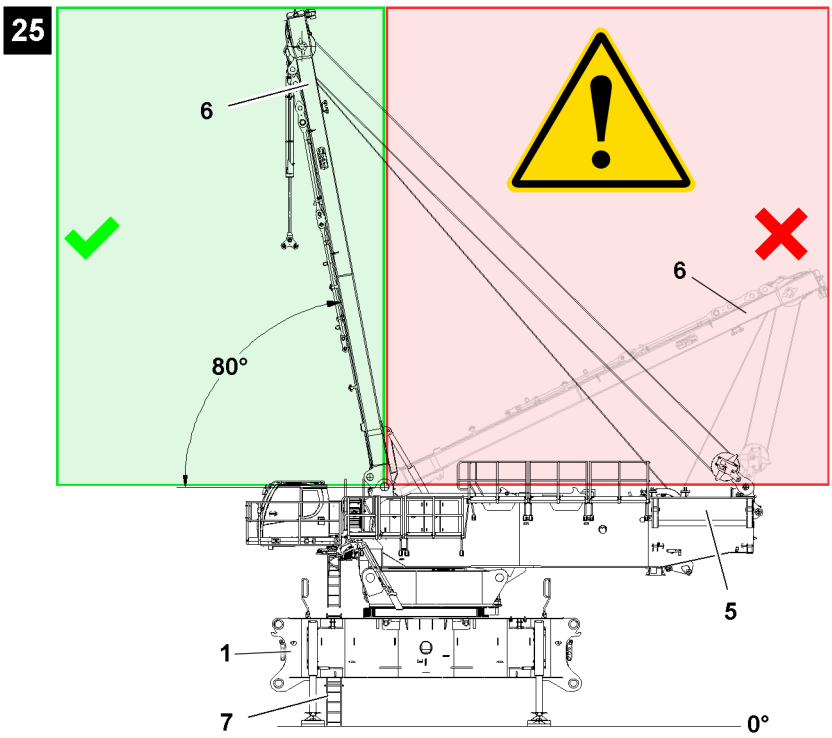

Fig.154252

WARNING
The crane can topple over!
When the SA-frame is taken down onto the turntable or is at an angle between 90° and 180° (red range), then the turntable may **not** be turned. The crane will topple over.
Death, severe bodily injuries, property damage.

- ▶ Make sure that the crane is supported and horizontally aligned.
- ▶ Make sure that the SA-frame **6** is at an angle between 0° and 90° (green range) before turning the turntable.
- ▶ If the crane is supported and horizontally aligned and the SA-frame is at an angle between 90° and 180° (red range), then it is **prohibited** to turn the turntable.

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▶ Luff the SA-frame up again to approximately 80°, illustration **25**.

9.7 Supporting the crawler center section

Make sure that the following prerequisites are met:
- The crawler carriers are completely disassembled.
- The disassembly location is level and sufficiently load bearing.
- The SA-frame is erected to at least 80°.

▶ Support the crawler center section, see section „Disassembling the crawler center section“.

9.8 Lowering the crane on the substructure

Make sure that the following prerequisites are met:
- The crane is supported.
- The „SA-frame“ operating mode has been set and confirmed on the LICCON computer system.
- The SA-frame is erected to at least 80°, see chapter 5.02.

Note

▶ External hydraulic aggregate: Function assignment for the hand lever on the crawler center section for extending / retracting the support cylinders, see section „Lifting the crawler center section“.

WARNING

The crane can tip over!
If the support cylinders are retracted / extended unevenly, the crane can tip over.
Death, severe bodily injuries, property damage.

▶ When extending / retracting the support cylinders, pay attention to the horizontal alignment of the crane.

▶ Check the horizontal alignment of the spirit level on the crawler center section or on the LICCON monitor.

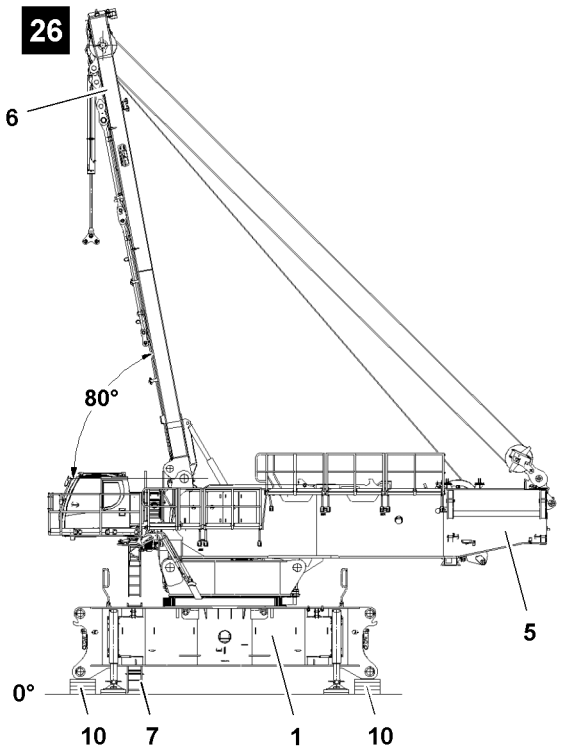

Fig.126235: Lowering the crawler center section onto the substructure

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▶ Lower the crane onto the substructure, see section „Disassembling the crawler center section“, illustration **26**.

9.9 Taking the SA-frame down

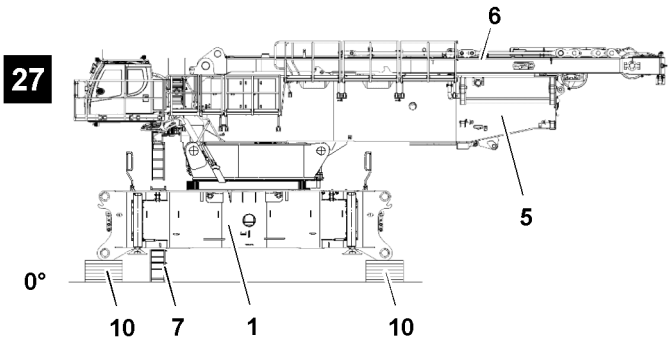

Fig.126230: Taking the SA-frame down onto the turntable

When the crane is laying on the substructure:

▶ Take the SA-frame down, see chapter 5.02, illustration **27**.

9.10 Removing the hydraulic aggregate

Make sure that the following prerequisite is met:

– The crawler center section **1** is set down on the substructure.

▶ Remove the hydraulic aggregate, see section „Disassembling the crawler center section“.

9.11 Disassembling the assembly support

▶ Disassemble the assembly support, see section „Disassembling the crawler center section“.

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10 Disassembling the crawler center section

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ It is prohibited to lean the ladder against the component being disassembled.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

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10.1 Supporting the crawler center section

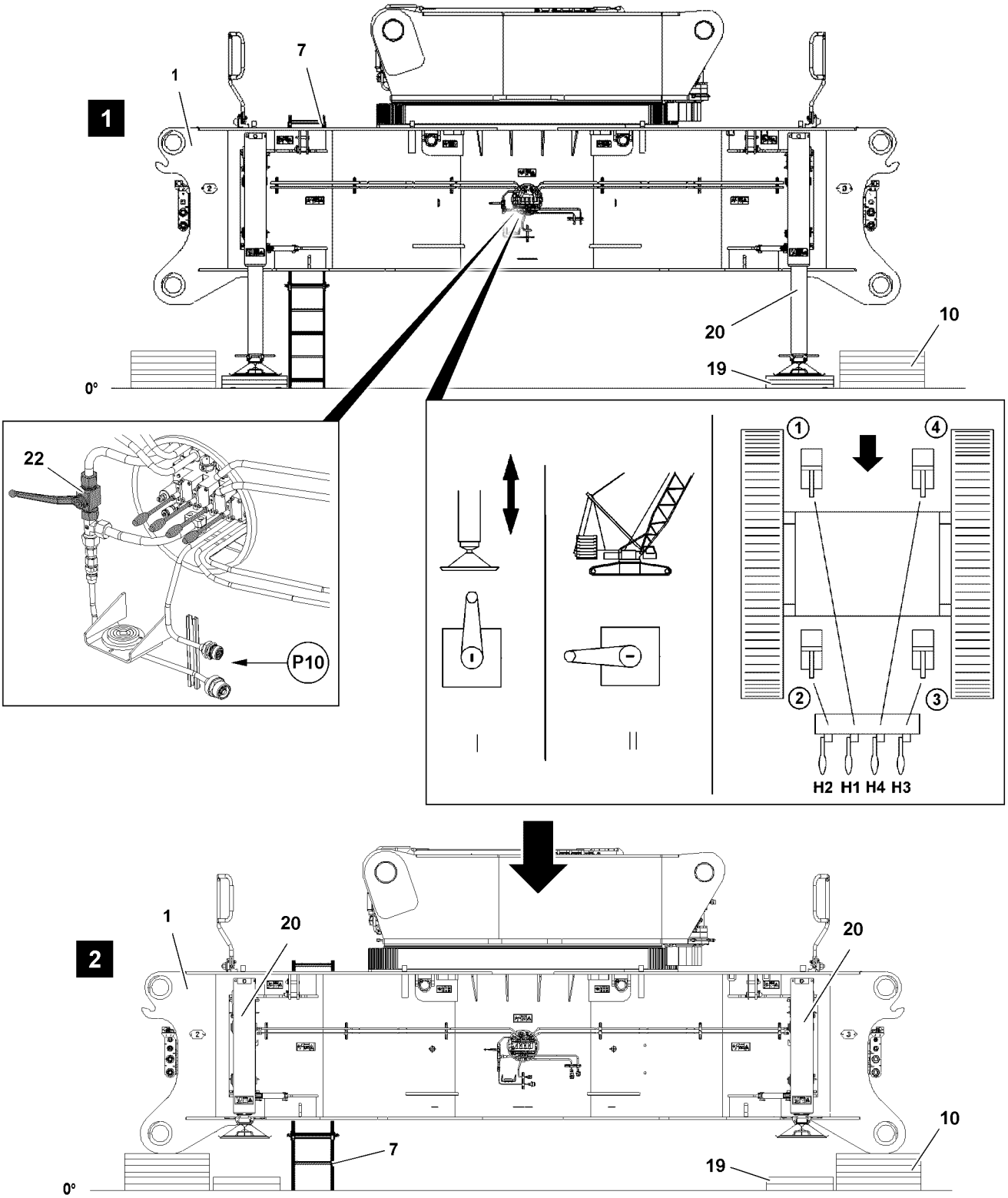

Fig.126231: Supporting the crawler center section / setting the crawler center section on the substructure

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WARNING
Danger of falling!
During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
▶ Use personal protective equipment.

Make sure that the following prerequisites are met:
– The crawler carriers are completely disassembled.
– The disassembly location is level and sufficiently load bearing.

Note
▶ The substructure **10** must be high enough so that the support cylinders **20** can be retracted completely and folded down into the transport position.
▶ The substructure **10** must safely absorb the weight of the crawler center section **1**.

▶ Support the crawler center section **1** with hardwood timbers or other suitable materials, illustration **1**.

10.2 Lowering the crawler center section onto the substructure

Make sure that the following prerequisites are met:
– The crawler center section is supported properly with materials of sufficient load-bearing capacity.
– The hydraulic connections from the hydraulic aggregate to the crawler center section **1** are properly established.

WARNING
Danger of accident due to improper substructure!
If the crawler center section **1** is not properly supported, then it can sink into the ground.
Death, severe bodily injuries, property damage.
▶ The substructure must safely absorb the weight of the crawler center section **1** and the turntable frame lower section.
▶ The substructure must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see chapter 2.04.

10.2.1 Lowering the crawler center section with the hydraulic hand levers

WARNING
Tipping of the crawler center section!
If the support cylinders are retracted / extended unevenly, the crawler center section can tip over.
Death, severe bodily injuries, property damage.
▶ When extending / retracting the support cylinders **20**, pay attention to the horizontal alignment of the crawler center section.
▶ Check the horizontal alignment of the spirit level on the crawler center section.

Note
▶ The support cylinders are marked with numbers.
▶ Pay attention to the identification on the hand lever and on the support cylinder, illustration **1**.

Ball valve positions	
Position **I**	Assembly support
Position **II**	Crane operation / crawler carrier installation with SA-frame

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Function assignment of hand levers for the support cylinders	
H1	Hand lever for the support cylinder **1**, right rear
H2	Hand lever for support cylinder **2**, right front
H3	Hand lever for support cylinder **3**, left front
H4	Hand lever for support cylinder **4**, left rear

▶ Actuate the hand lever **H1**, hand lever **H2**, hand lever **H3** and hand lever **H4**.

Result:

– The support cylinders **20** retract.

▶ Retract the support cylinders **20** and set the crawler center section **1** on the substructure **10**, illustration **2**.
▶ Realign the extension ladder **7**, see chapter 2.06, illustration **2**.
▶ Remove the substructure **19**.

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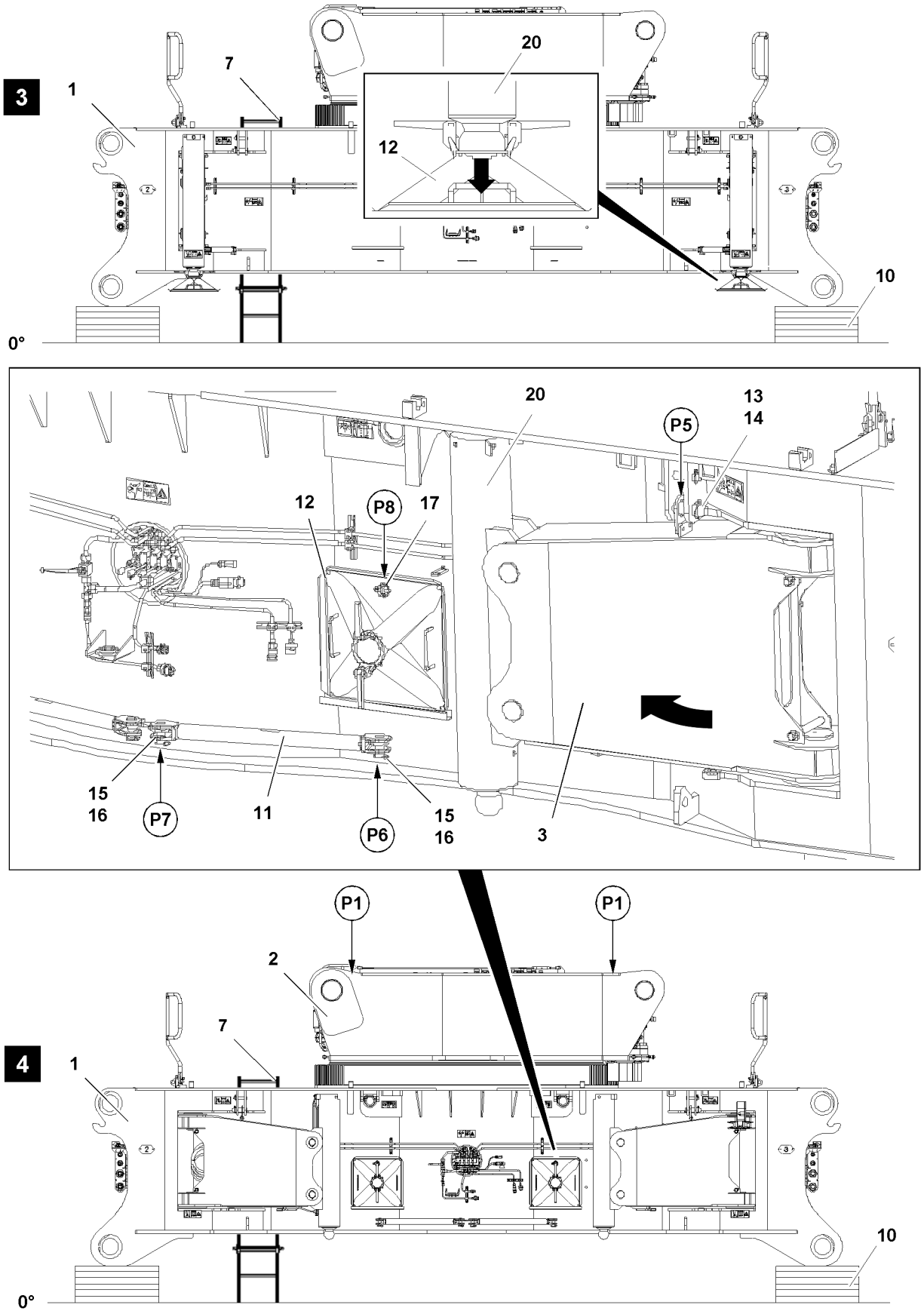

Fig.126232

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WARNING
Falling support plate!
The support plate **12** can fall down due to its own weight when releasing it.
Death, severe bodily injuries, property damage.
- ▶ For safety reasons, assemble the support plate always with **two** persons.
- ▶ Make sure that there are no persons within the danger zone during the entire disassembly procedure.

Note
- ▶ The weight of the support plate is 33 kg.

- ▶ Release the support plates **12** on the ball head of the support cylinder **20**, illustration **3**.

WARNING
Support plates not secured!
If the support plates **12** are not properly secured in the transport position, then the support plates can loosen up by themselves during transport.
This can cause accidents.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the support plates **12** are in the transport position and secured with safety locking pins **17**.

- ▶ Position and secure the support plates **12** in the transport position: Attach the safety locking pin **17** in point **P8**, illustration **4**.
- ▶ Disassemble all support plates.

10.2.2 Lowering the crawler center section with the control panel

Note
- ▶ Alternatively to the operation of the assembly support with the hand levers, the assembly support can also be operated with the control panel **200**, see Electrical wiring diagram.

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Make sure that the following prerequisites are met:
- The electric external feed (maximum 24 V) to the crawler center section is properly established, see the Electrical wiring diagram.
- The control panel **200** is connected on the socket in point **P25 or** on the socket in point **P26** on the crawler center section, see the Electrical wiring diagram.
- The hydraulic aggregate **21** is turned on.

WARNING
Tipping of the crawler center section!
If the support cylinders **20** are retracted / extended unevenly, the crawler center section can tip over.
Death, severe bodily injuries, property damage.
▶ When extending / retracting the support cylinders **20**, pay attention to the horizontal alignment of the crawler center section.
▶ Check the horizontal alignment of the spirit level on the crawler center section.

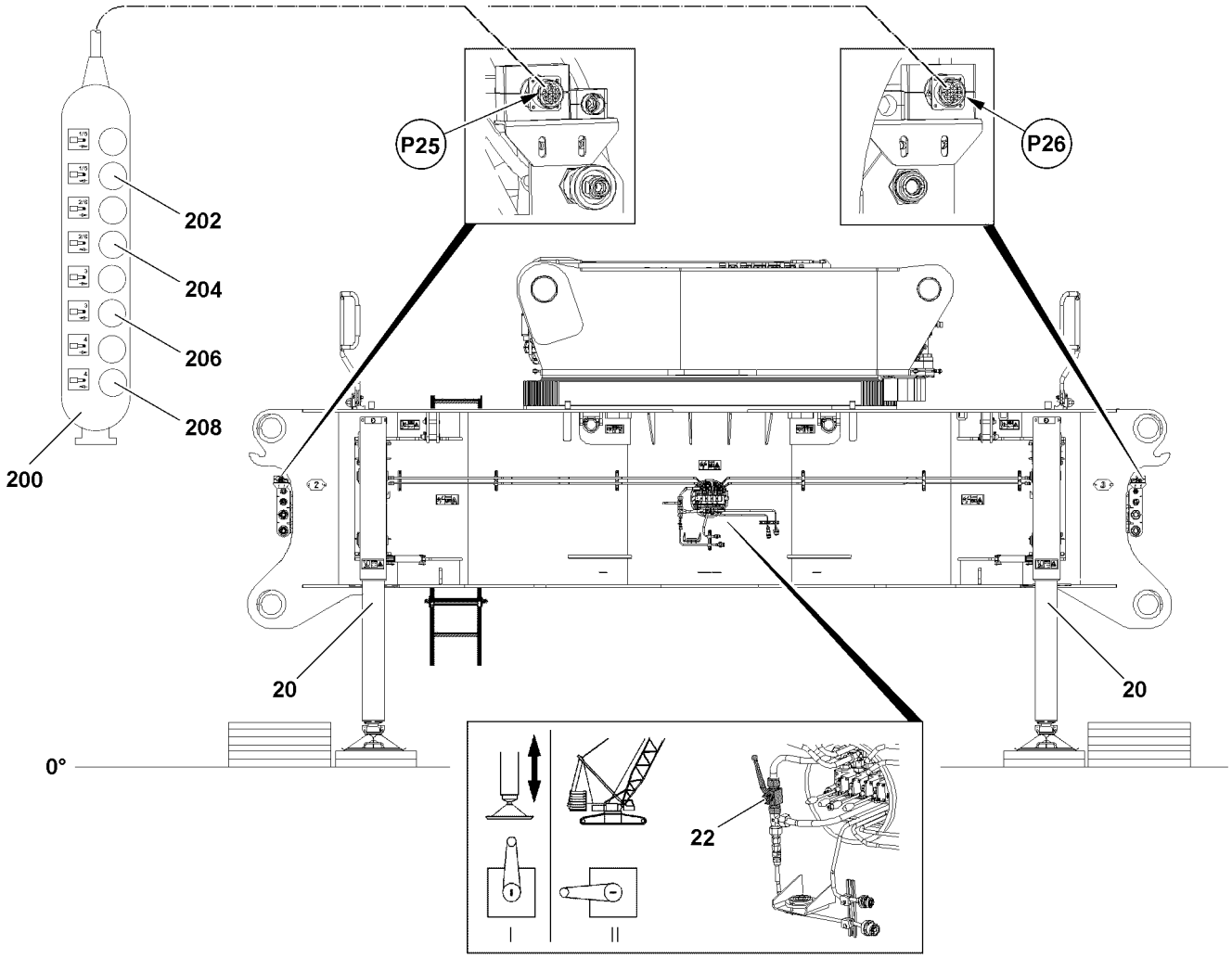

*Fig.122407: Lowering the crawler center section with the control panel **200***

Right rear support

▶ Press the button **202**.

Result:

– The right rear support cylinder retracts.

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Right front support

▶ Press the button **204**.

Result:

– Support cylinder moves in on the right front.

Left front support

▶ Press the button **206**.

Result:

– The left front support cylinder retracts.

Left rear support

▶ Press the button **208**.

Result:

– The left rear support cylinder retracts.

▶ Lower the crawler center section completely until the crawler center section is lying on the sub-structure.
▶ Remove the control panel **200** and store it properly.
▶ Close the socket on the crawler center section - after removing the control panel- with a dummy plug.

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10.3 Disconnecting the hydraulic aggregate

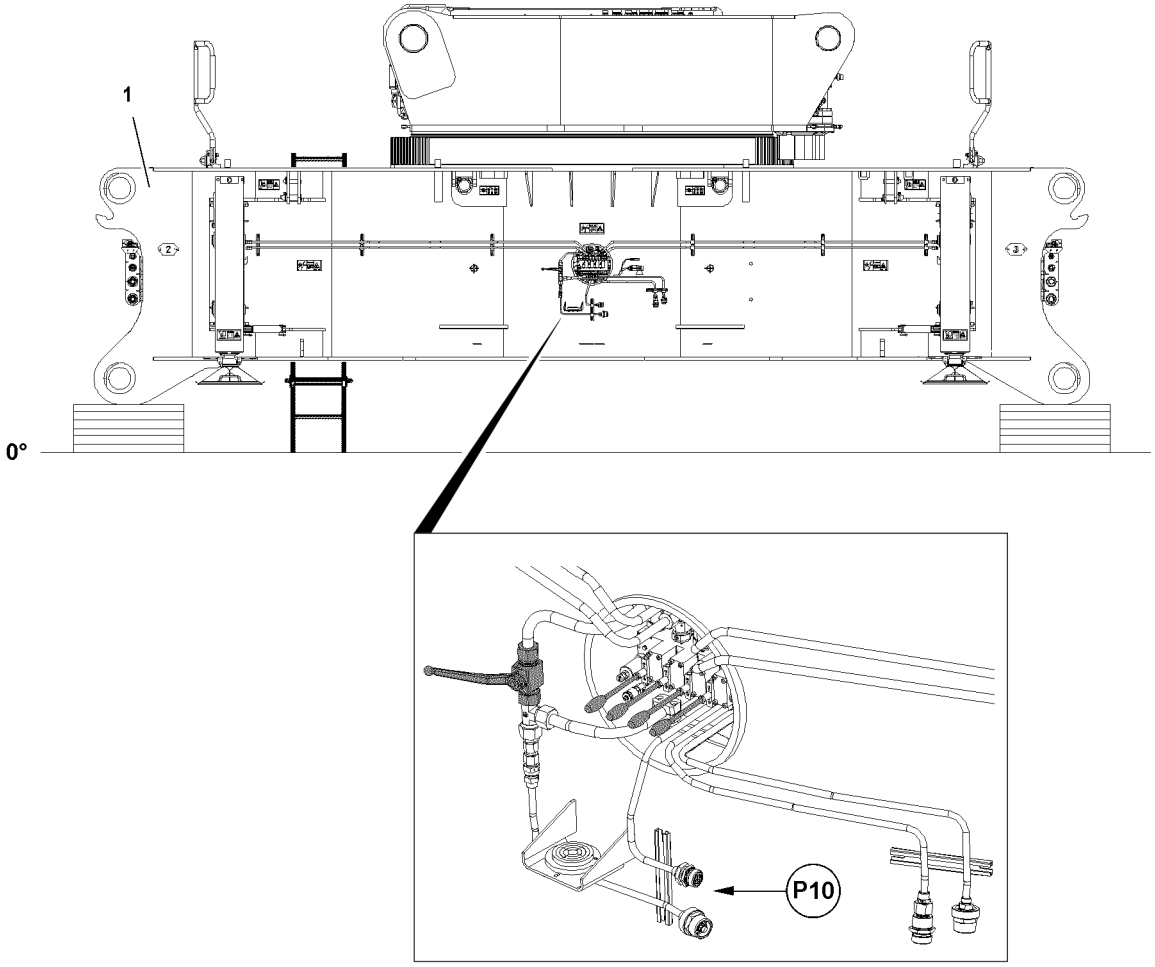

Fig.126236: Disconnecting the hydraulic aggregate

Make sure that the following prerequisites are met:
- The support cylinders are fully retracted.
- The crawler center section is lying completely on the substructure.

When disconnecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

WARNING
Pressure in the hydraulic lines!
If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.
Death, severe bodily injuries, property damage.
▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

▶ Release the hydraulic coupling by hand.

Note
▶ Observe the information in the Operating and Maintenance manual of the hydraulic aggregate.
▶ Disconnect the hydraulic connections from the hydraulic aggregate to the crawler center section **1**, see the hydraulic diagram.

▶ Disconnect the hydraulic connections from the hydraulic aggregate to the crawler center section **1** in point **P10**, illustration **1**.

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▶ Protect the hydraulic connections from contamination with caps.

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10.4 Disassembling the assembly supports

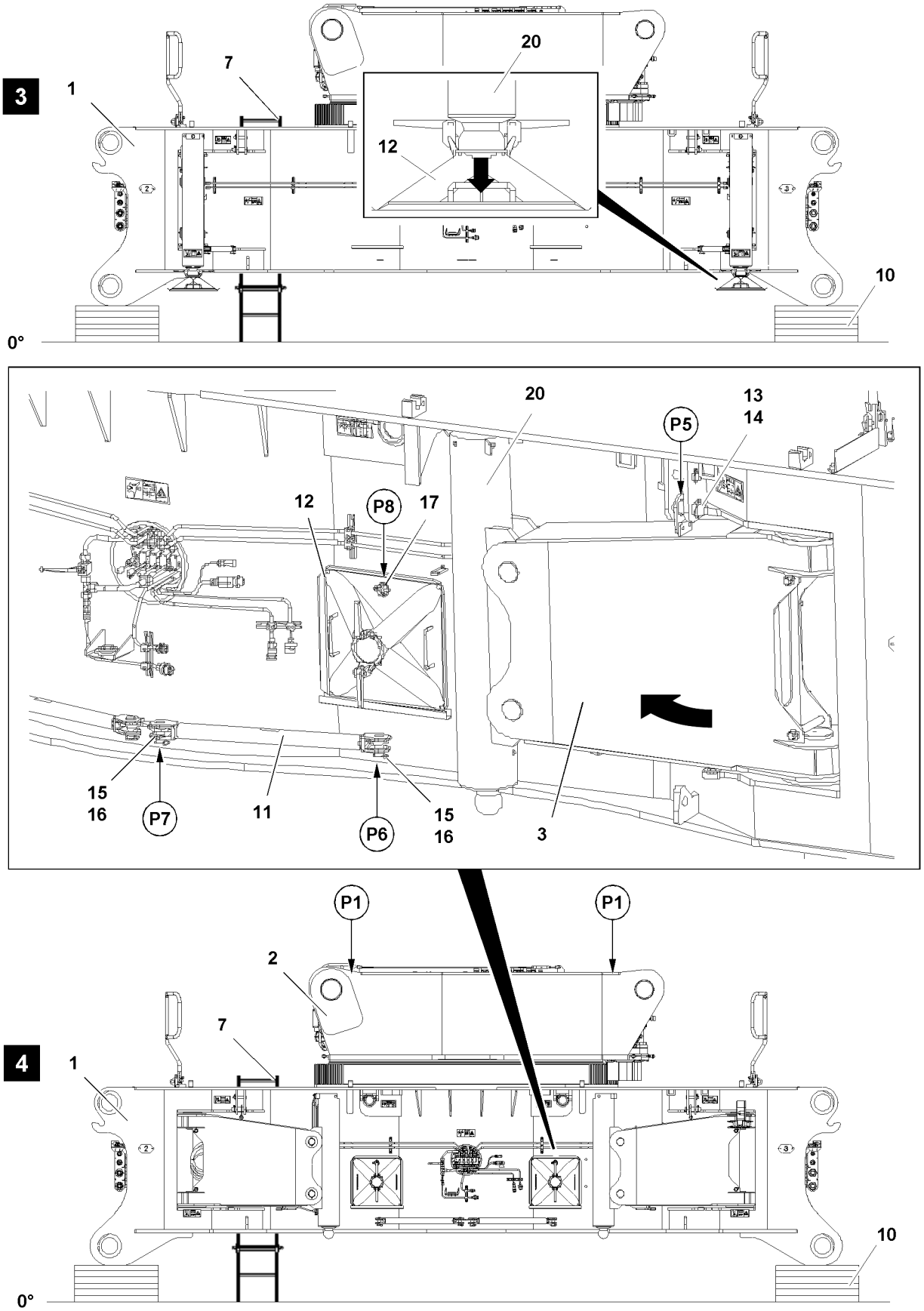

Fig.126232

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Note

▶ The swinging in and locking procedure of the support is the same for all four assembly supports and is therefore described only once.

WARNING

Falling bar!

The bar **11** can fall down due to its own weight when unpinning it.

Death, severe bodily injuries, property damage.

▶ For safety reasons, **two** persons must always be used to unpin the bar.

▶ Make sure that there are no persons within the danger zone during the entire unpinning procedure.

Note

▶ The weight of the bar is 10 kg.

5

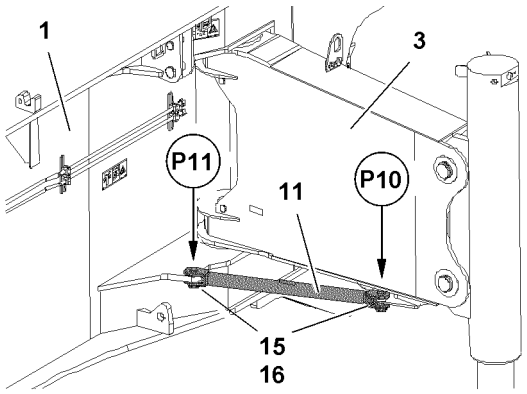

Fig.116956: Disassembling the assembly supports

▶ Release the bar **11** from the operating position: Remove the safety locking pin **16** in point **P10** and in point **P11** and unpin the pin **15**, illustration **5**.

▶ Remove the bar **11** and position it in the transport position, illustration **4**.

WARNING

The pin is not secured!

If the pins **16** are not secured, the connector pins can loosen up by themselves during transport operation.

This can cause accidents.

Death, severe bodily injuries, property damage.

▶ Make sure that the pins **15** are secured with the safety locking pin **16**.

▶ Secure the bar **11** in the transport position: Insert the pin **15** in point **P6** and in point **P7** and secure with the safety locking pin **16**, illustration **4**.

▶ Remove the safety locking pin **14** in point **P5** and unpin the pin **13**, illustration **4**.

Result:

– The support **3** can be swung into the transport position.

▶ Swing the support **3** in so that it can be pinned in point **P5**, illustration **4**.

WARNING

The pin is not secured!

If the pins **13** are not secured, the connector pins can loosen up by themselves during transport operation.

This can cause accidents.

Death, severe bodily injuries, property damage.

▶ Make sure that the pins **13** are secured with the safety locking pin **14**.

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- ▶ Secure the support **3** in the transport position: Insert the pin **13** in point **P5** and secure with the safety locking pin **14**, illustration **4**.
- ▶ Fold the grating covers open on the turntable frame lower section **2** in points **P1**.
- ▶ Attach the fastening equipment to the four fastening brackets in points **P1**, see section „Fastening points“.
- ▶ Lift the crawler center section **1** with the auxiliary crane and take it down on the transport vehicle.
- ▶ Remove the substructure **10**.

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3.02 Turntable assembly

1	Component overview	3
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3	Turntable assembly	9
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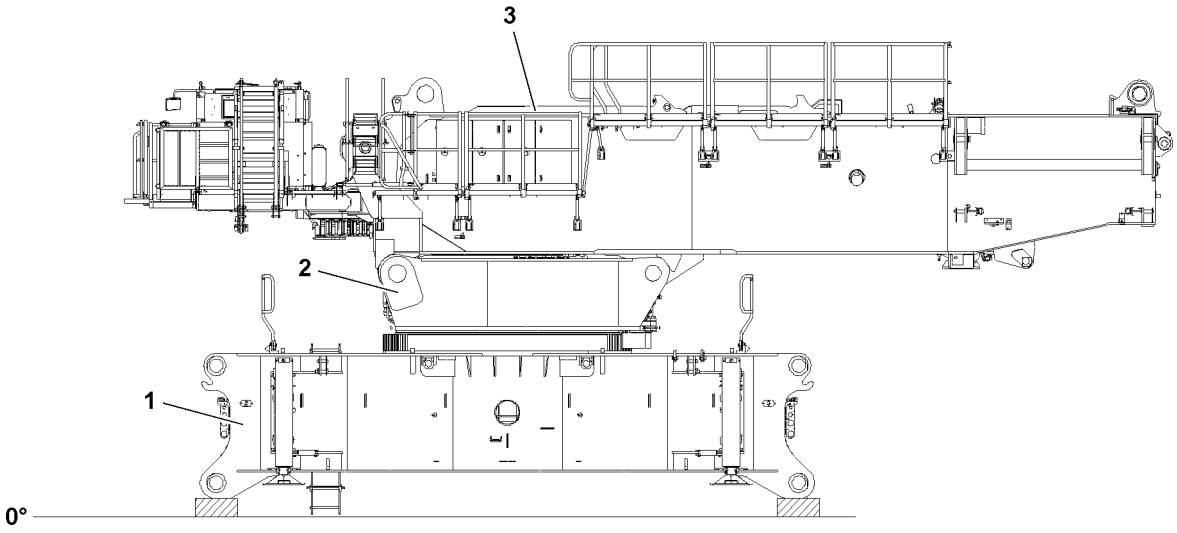

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Fig.118557

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1 Component overview

Position	Component description
1	Crawler center section [1)]
2	Turntable frame lower section [1)]
3	Turntable frame main section

1) Crawler center section and turntable frame lower section are preassembled at the factory as an assembly unit.

2 Fastening points

Note

▶ Pay attention to the labels of the fastening points on the components.

2.1 Fastening points Crawler center section with turntable frame lower section

WARNING

Fastening equipment can be ripped off!

- ▶ Make sure to use fastening equipment on the fastening points **P1** always only in connection with shackles.
- ▶ Make sure that the fastening equipment has a sufficient load carrying capacity.
- ▶ Make sure that the auxiliary crane / the auxiliary cranes have a sufficient load carrying capacity to be able to safely take on the crawler center section in connection with the turntable frame lower section.
- ▶ For dimensions and weights of the crawler center section with turntable lower section, see Crane operating instructions, chapter 1.03.
- ▶ Make sure that there are no persons within the danger zone of the crawler center section.

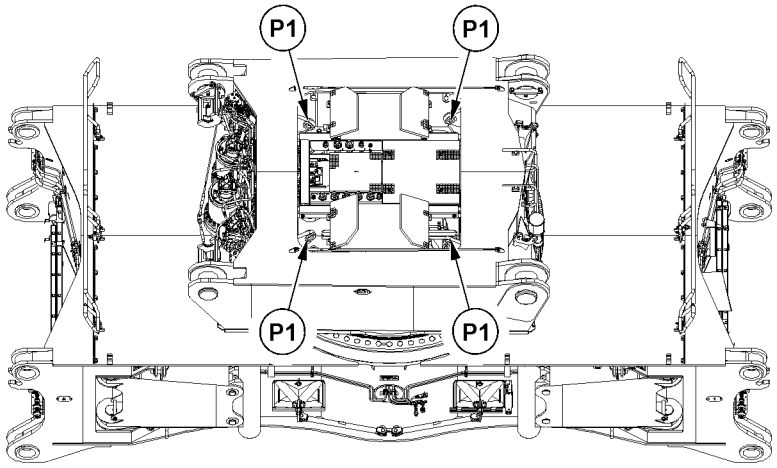

Fig.118554: Fastening points Crawler center section with turntable frame lower section

Fastening points	
P1	Crawler center section with turntable frame lower section

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2.2 Fastening points on turntable frame main section

WARNING
Fastening equipment can be ripped off!
- ▶ Make sure to use fastening equipment on the fastening points always only in connection with shackles.
- ▶ Make sure that the fastening equipment has a sufficient load carrying capacity and the required minimum length.
- ▶ Make sure that the auxiliary crane / the auxiliary cranes have a sufficient load carrying capacity to be able to safely take on the turntable frame main section.
- ▶ For dimensions and weights of turntable frame main section, see Crane operating instructions, chapter 1.03.
- ▶ Make sure that there are no persons within the danger zone of the turntable frame main section.

Note
- ▶ The turntable frame main section can be fastened and installed either with one or with two auxiliary cranes, depending on the transport condition.
- ▶ For dimension **Y** as well as other dimensions for the turntable, refer to the Crane operating instructions, chapter 1.03.

2.2.1 Fastening the transport unit „Turntable“ with an auxiliary crane

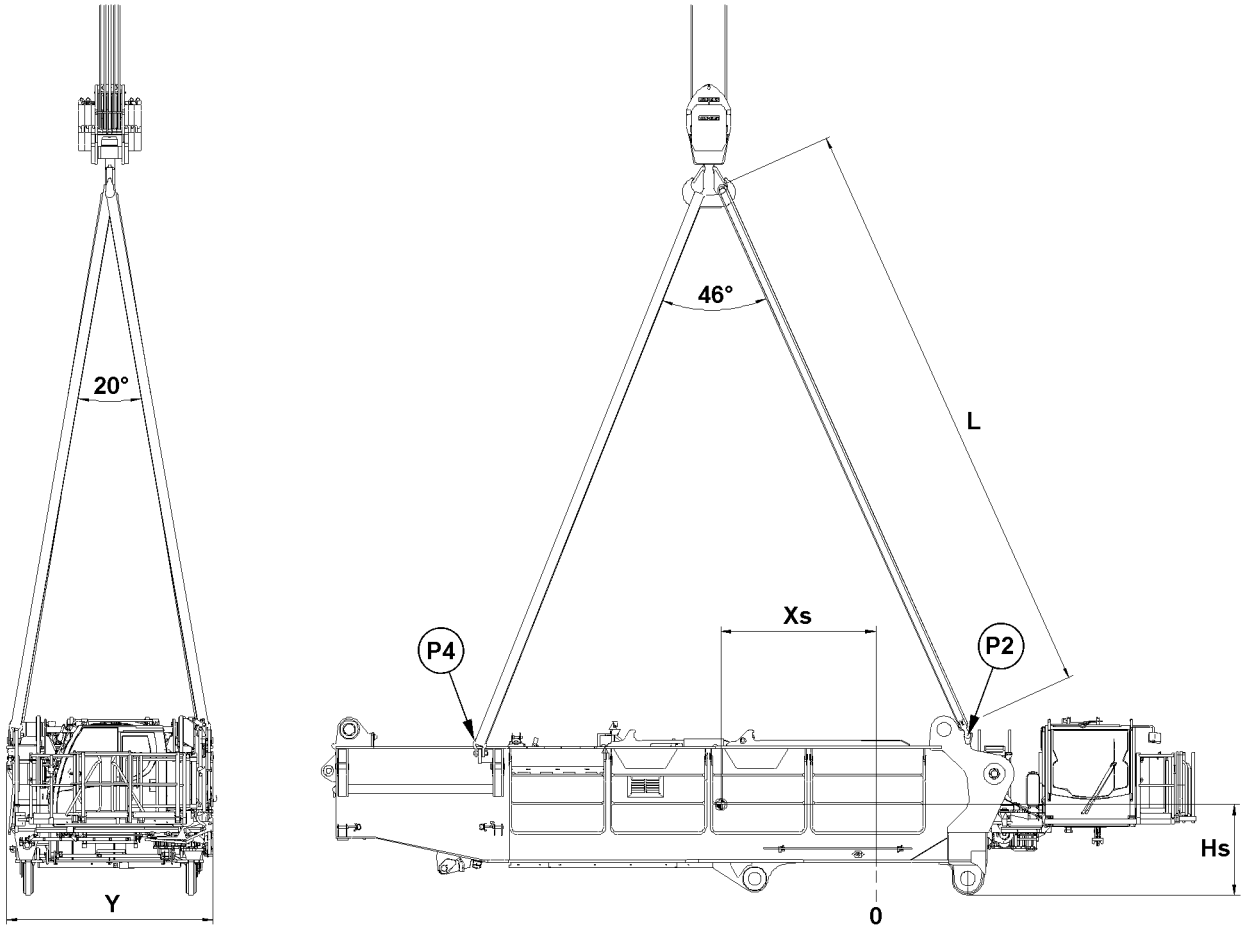

Fig.119451: Take on the load of the turntable frame main section with one auxiliary crane

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	Weight	Suspended load at		Center of gravity		Length[3]
		P4	P2	Xs[2]	Hs	L
Transport unit Turntable[1]	45.0 t	22.8 t	22.3 t	2.62 m	1.56 m	10.00 m

[1] Without winches and without SA-frame
[2] Starting from the center point 0 (rotation point) of the roller ring connection
[3] Minimum length of fastening equipment

2.2.2 Fastening the transport unit „Turntable with winches“ with two auxiliary cranes

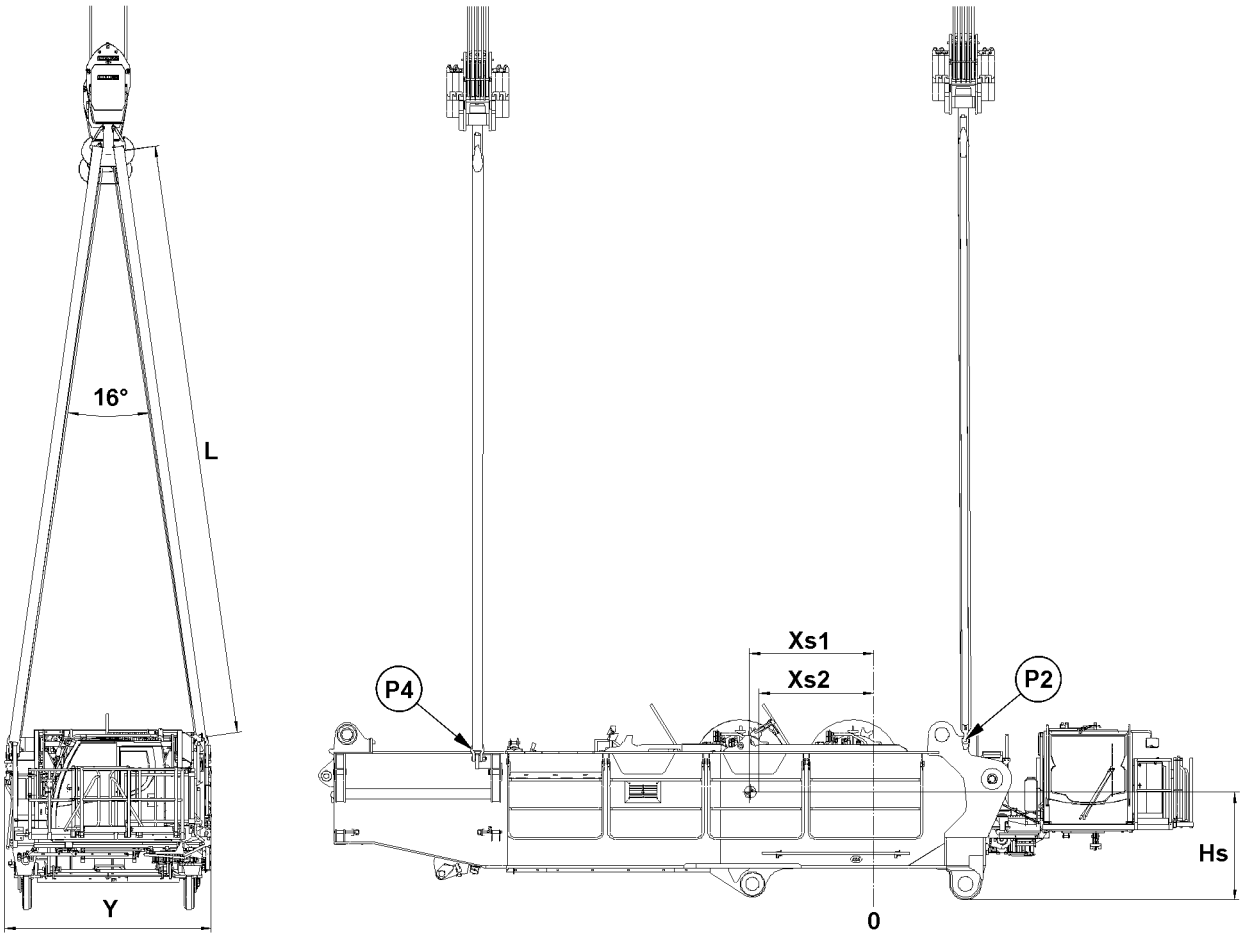

Fig.119452: Take on the load of the turntable frame main section with two auxiliary cranes

	Weight	Suspended load at		Center of gravity			Length[4]
		P4	P2	Xs1[3]	Xs2[3]	Hs	L
Transport unit Turntable[1]	72.1 t	32.2 t	40.0 t	2.12 m		1.81 m	10.00 m
Transport unit Turntable[2]	58.5 t	32.7 t	25.9 t		2.09 m	1.81 m	10.00 m

[1] With winch 1 and winch 2
[2] With winch 1 without winch 2
[3] Starting from the center point 0 (rotation point) of the roller ring connection
[4] Minimum length of fastening equipment

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2.2.3 Fastening the transport unit „Turntable with SA-frame and winch 4“ with two auxiliary cranes

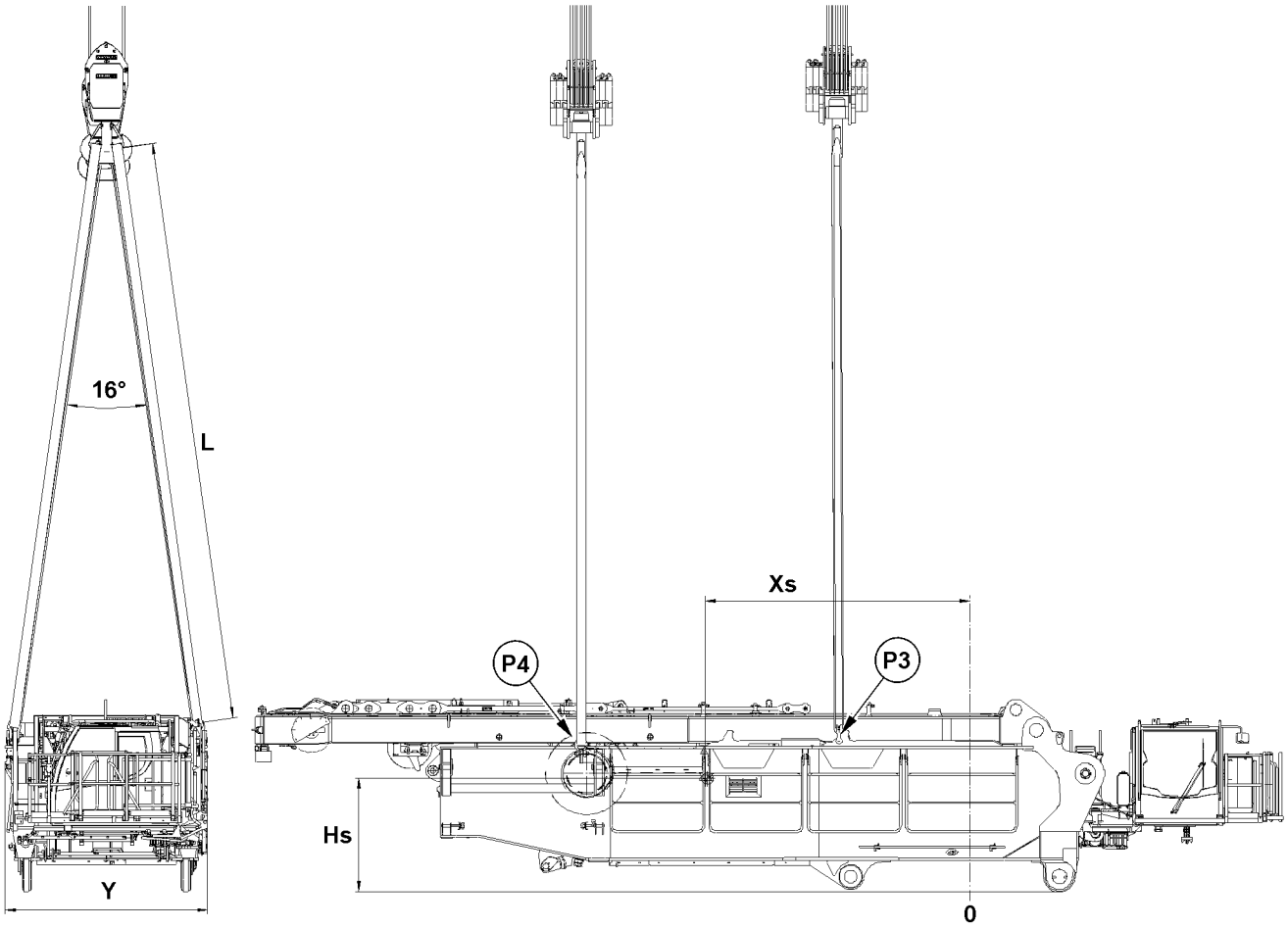

Fig.119453: Take on the load of the turntable frame main section with two auxiliary cranes

	Weight	Suspended load at		Center of gravity		Length[3]
		P4	P3	Xs[2]	Hs	L
Transport unit Turntable[1]	76.8 t	39.8 t	37.1 t	4.55 m	1.96 m	10.00 m

[1] With SA-frame, roller frame and winch 4
[2] Starting from the center point 0 (rotation point) of the roller ring connection
[3] Minimum length of fastening equipment

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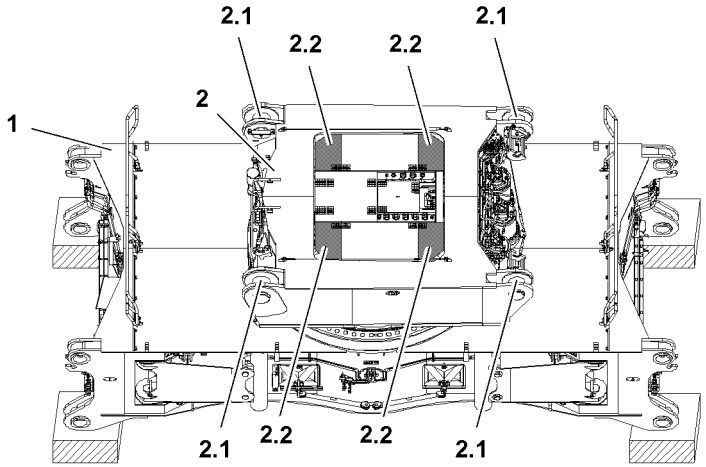

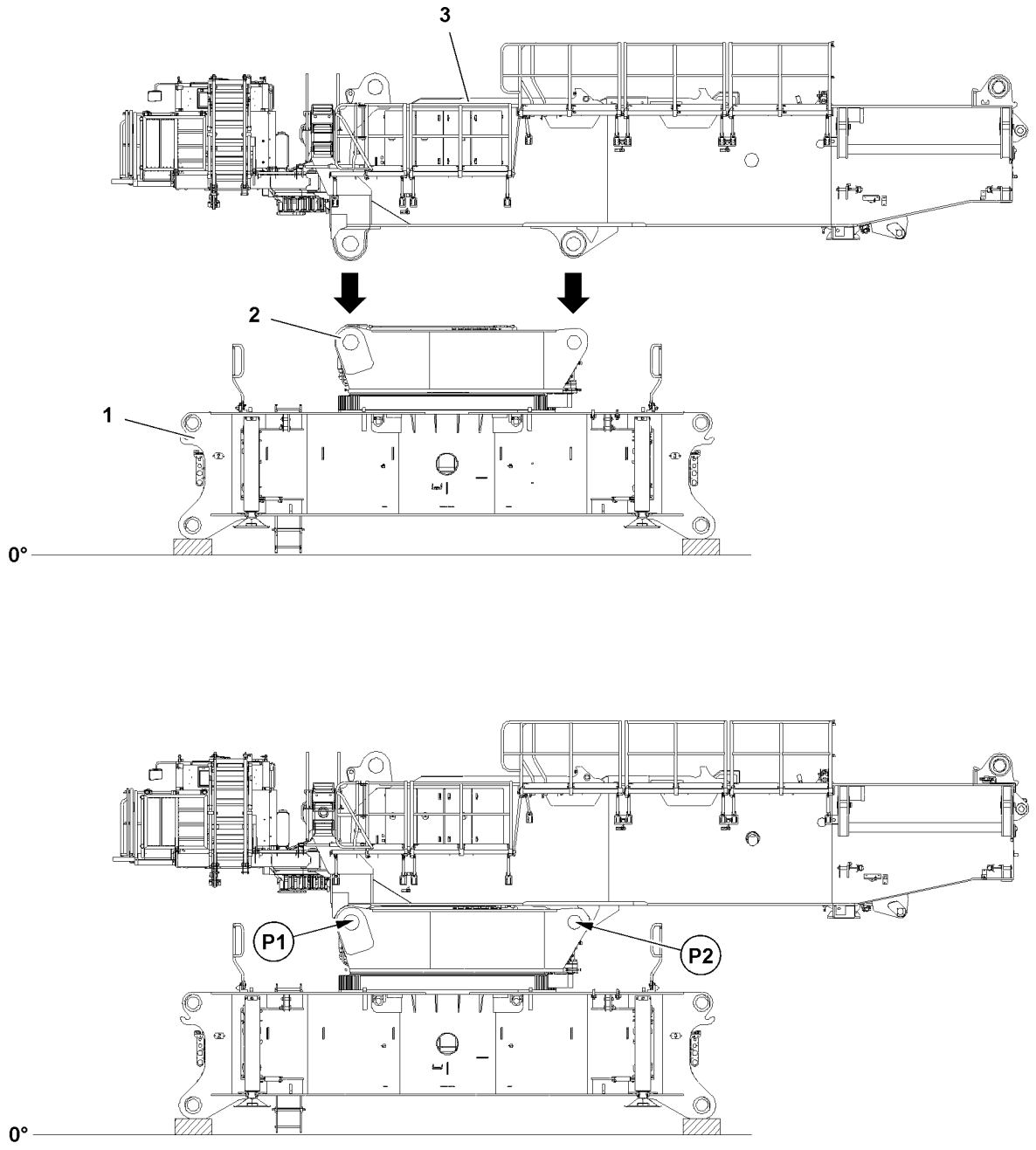

Fig.118552

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3 Turntable assembly

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.
If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries.

- ▶ The assembly personnel must always move carefully and anticipatory on the crane, the crane components or lattice sections.
- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
- ▶ If fall protection equipment is available, then it must be used.
- ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the approved fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
- ▶ The fall arrest system must be attached on the fastening and hook points as well as on the safety ropes.
- ▶ Always secure ladders on structural parts and / or components to prevent them from falling over.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.

Note

- ▶ For the assembly of the turntable frame main section **3** on the turntable frame lower section **2** use a pin pulling device, see Crane operating instructions, chapter 5.30.

Make sure that the following prerequisites are met:

- – The ground is level and of sufficient load bearing capacity.
- – The crawler center section **1** is laying on the support.
- – The crawler center section is horizontally aligned.
- – The pins **2.1** on the turntable frame lower section **2** are completely unpinned.
- – The fastening equipment on the turntable frame lower section **2** has been removed.
- – The grating flaps **2.2** on the turntable frame lower section **2** are closed.
- – At least one auxiliary crane is available.

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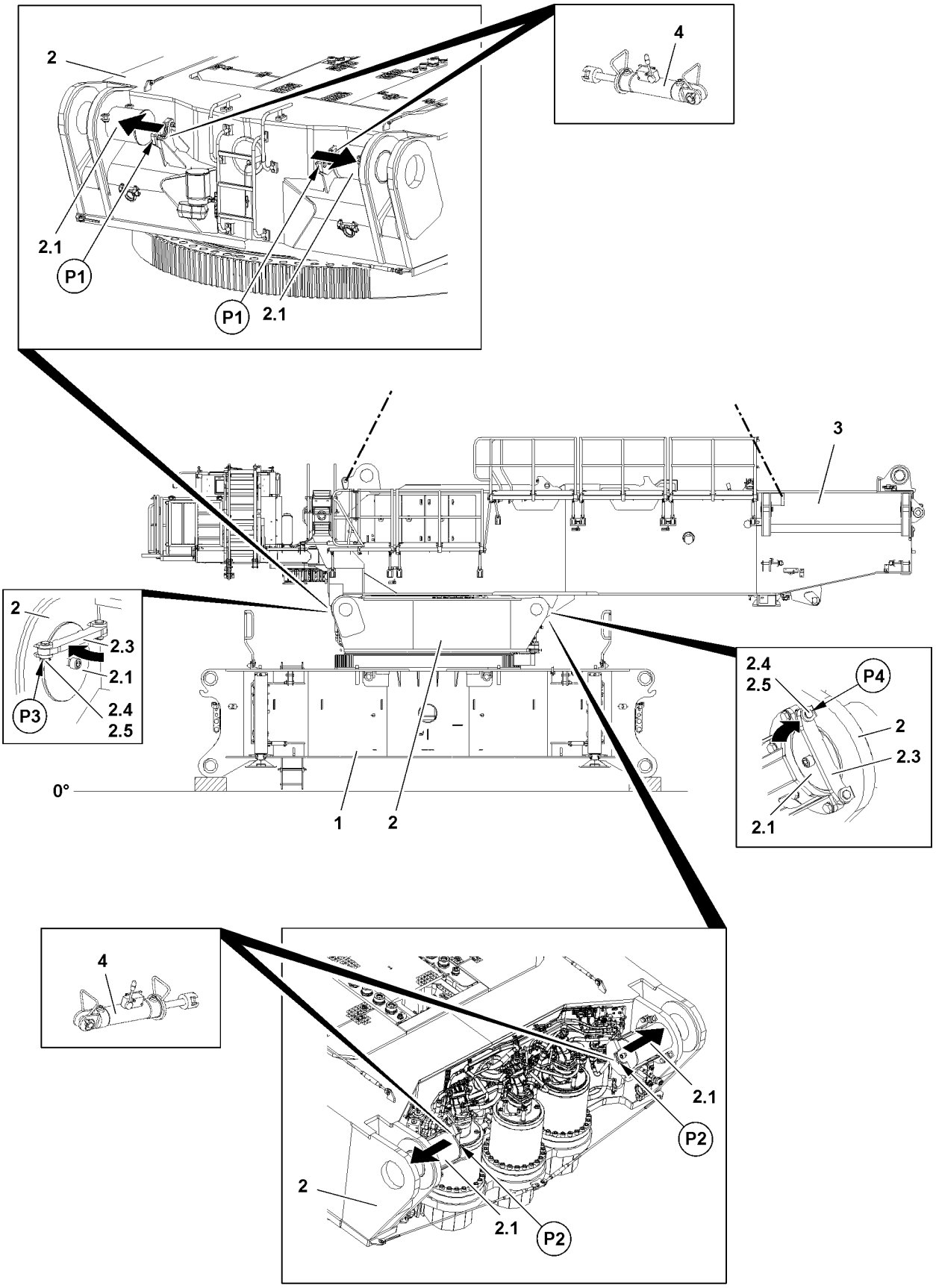

Fig.118555

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3.1 Assembly Turntable frame main section

Make sure that the following prerequisites are met:
- The crane operator's cab is in transport position.
- The railings and fall protection equipment on the left of the turntable frame main section **3** is in operating position.
- The SA-frame is not installed.

3.1.1 Pinning the turntable frame main section on the front

▶ Attach the turntable frame main section **3** properly on the auxiliary crane / auxiliary cranes, see section „Fastening points".

When the turntable frame main section **3** is properly fastened on the auxiliary crane / auxiliary cranes:
▶ Lift the turntable frame main section **3** with the auxiliary crane.
▶ Swing the turntable frame main section **3** in to the crawler center section **1**.
▶ Position the turntable frame main section **3** over the pin points on the turntable frame lower section **2**.
▶ Set the turntable frame main section **3** on the turntable frame lower section **2**.

When the turntable frame main section **3** is properly set on the turntable frame lower section:
▶ Place the pin pulling cylinder **4** properly in the front pin pulling devices at point **P1**.
▶ Insert the pins **2.1** with the pin pulling cylinder **4** completely on both sides, see Crane operating instructions, chapter 5.30.

Result:

– The turntable frame main section **3** is pinned in the front area with the turntable frame lower section **2**.

▶ Secure the pins **2.1** with retaining bars **2.3**: Close the retaining bars **2.3** on both sides and secure with pin **2.4** and locking pin **2.5** at point **P3**.

Result:

– The pins **2.1** are secured on both sides in the front turntable area.

3.1.2 Pinning the turntable frame main section on the rear

▶ Remove the pin pulling cylinder **4** from the front pin pulling devices at point **P1**.
▶ Place the pin pulling cylinder **4** properly in the rear pin pulling devices at point **P2**.
▶ Insert the pins **2.1** with the pin pulling cylinder **4** completely on both sides, see Crane operating instructions, chapter 5.30.

Result:

– The turntable frame main section **3** is pinned in the rear area with the turntable frame lower section **2**.

▶ Secure the pins **2.1** with retaining bars **2.3**: Close the retaining bars **2.3** on both sides and secure with pin **2.4** and locking pin **2.5** at point **P4**.

Result:

– The pins **2.1** are secured on both sides in the rear turntable area.
– The turntable frame main section **3** is properly pinned and secured with the turntable frame lower section **2**.

When the turntable frame main section **3** is properly pinned and secured:
▶ Remove the fastening equipment on the turntable frame main section **3** and swing the auxiliary crane out.

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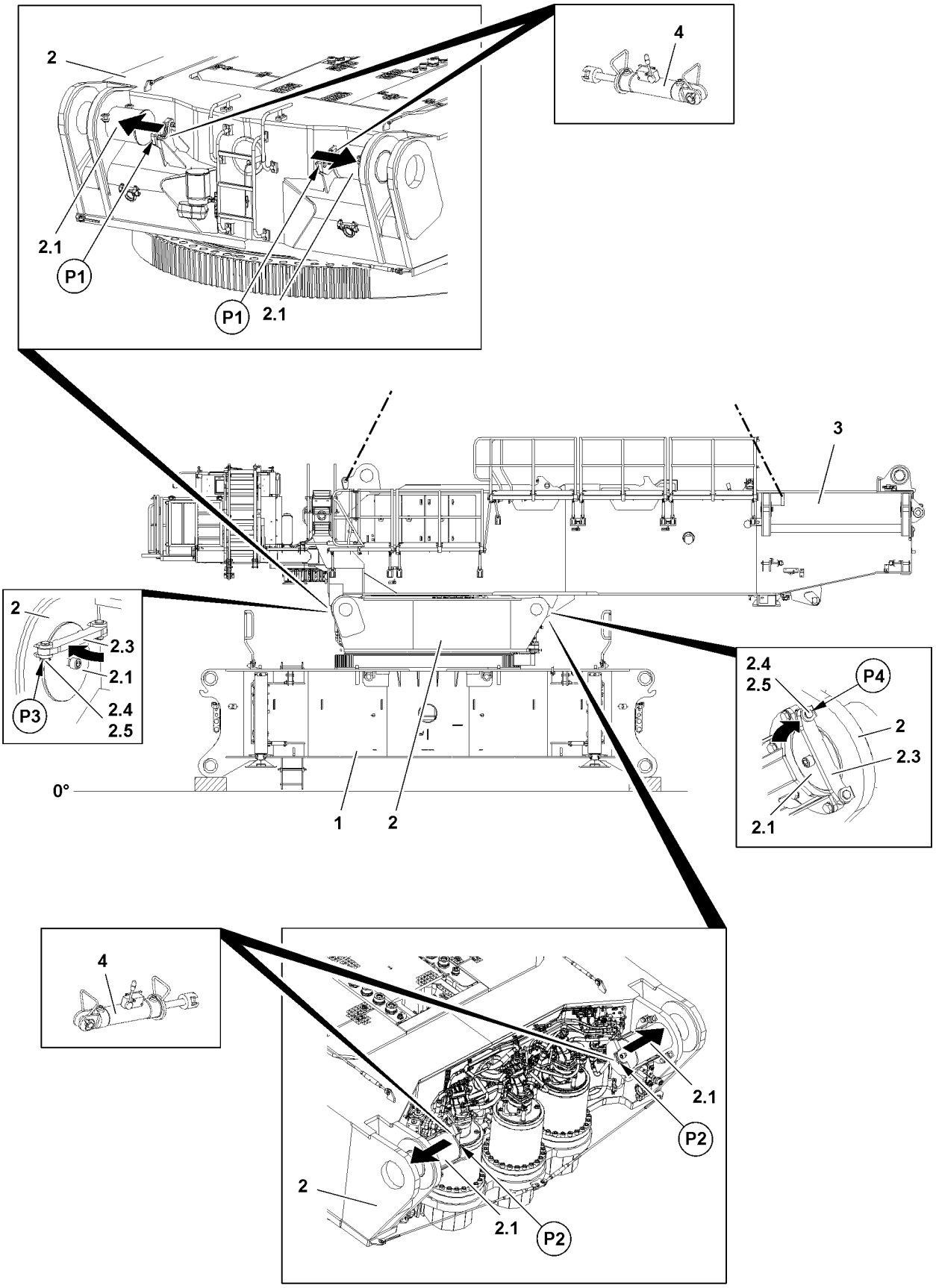

Fig.118555

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3.2 Establishing the electrical connections

Note

▶ To establish the electrical connections between the turntable frame main section and the turntable frame lower section use the Electric wiring diagram.

Make sure that the following prerequisite is met:

– The turntable frame main section is completely and properly installed on the turntable frame lower section.

▶ Establish the electrical connections.

▶ Make sure that all electrical connections are established.

3.3 Establishing the hydraulic connections

When connecting and releasing hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

DANGER

Danger of accident due to loss of pressure or leakage!

Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.

▶ Check that the quick couplings have been properly connected before using the crane.

Note

▶ To connect or release the hydraulic lines with quick couplings, see Crane operating instructions, chapter 5.01.

▶ Release the pressure in the hydraulic system before connecting and disconnecting: Turn the engine off and wait for short time.

▶ Assembling coupling components (sleeve and connector) by using hand-tightened nut.

▶ Connect coupling components.

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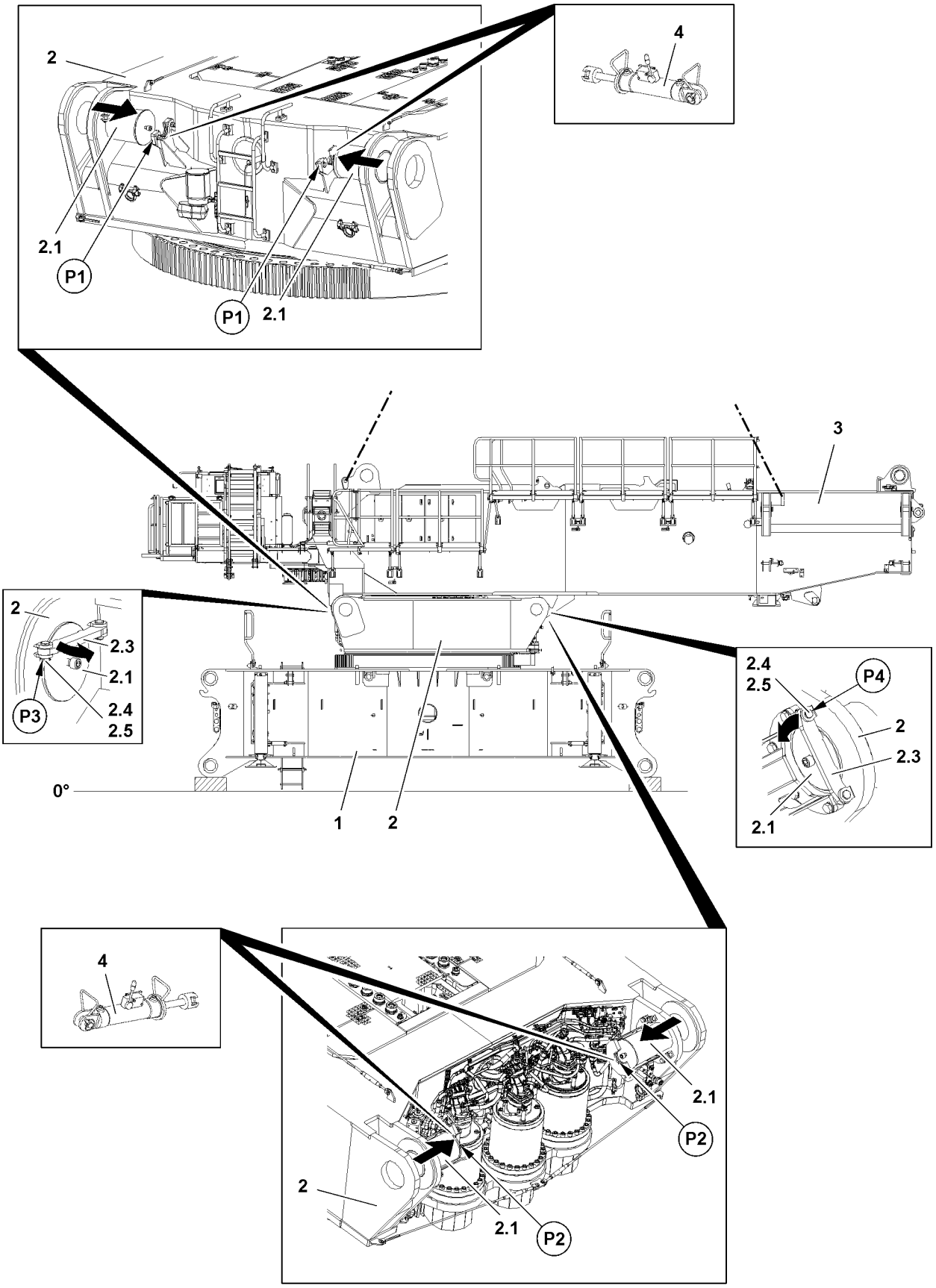

Fig.118556

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4 Disassembly of turntable

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.
If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries.

- ▶ The assembly personnel must always move carefully and anticipatory on the crane, the crane components or lattice sections.
- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
- ▶ If fall protection equipment is available, then it must be used.
- ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the approved fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
- ▶ The fall arrest system must be attached on the fastening and hook points as well as on the safety ropes.
- ▶ Always secure ladders on structural parts and / or components to prevent them from falling over.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.

Note

- ▶ For the disassembly of the turntable frame main section **3** on the turntable frame lower section **2** use a pin pulling device, see Crane operating instructions, chapter 5.30.

Make sure that the following prerequisites are met:

- – At least one auxiliary crane is available.
- – The derrick ballast has been removed.
- – The main boom has been removed.
- – The derrick boom has been removed.
- – The counterweight has been removed.
- – The SA-frame has been removed.
- – Winch 1 and winch 2 have been removed on the turntable frame main section.

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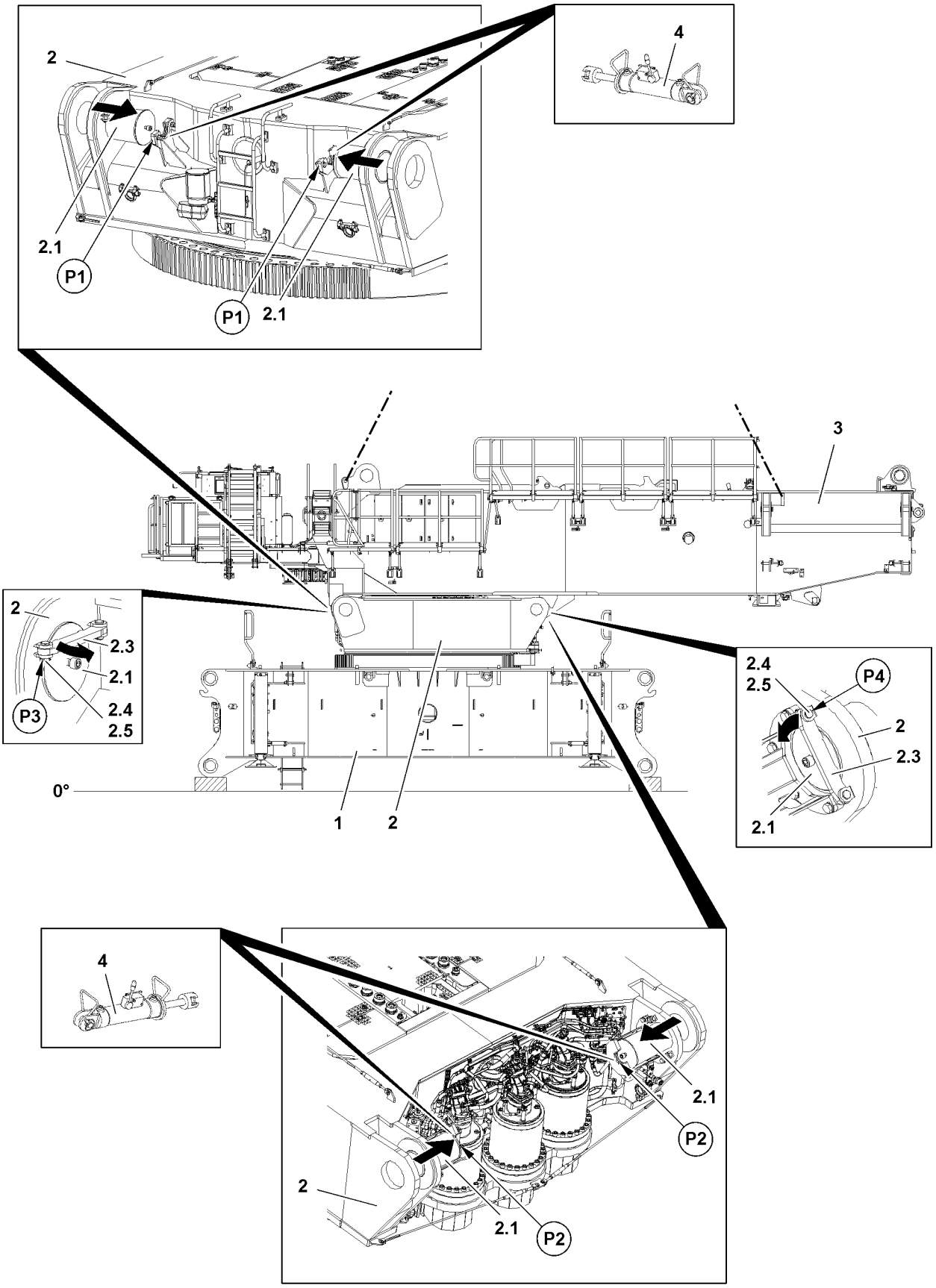

Fig.118556

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4.1 Disconnecting the electrical connections

NOTICE
Damage to cables!
If the cables are not properly stored after unplugging, then the cables can be significantly damaged.
▶ Store the cables properly after unplugging.

▶ Disconnect the electrical connections and store the plugs and cables properly.

4.2 Disconnecting the hydraulic connections

When connecting and releasing hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

DANGER
Danger of accident due to loss of pressure or leakage!
Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.
▶ Check that the quick couplings have been properly connected before using the crane.

Note
▶ To connect or release the hydraulic lines with quick couplings, see Crane operating instructions, chapter 5.01.

▶ Release the pressure in the hydraulic system before connecting and disconnecting: Turn the engine off and wait for short time.
▶ Assembling coupling components (sleeve and connector) by using hand-tightened nut.
▶ Connect coupling components.

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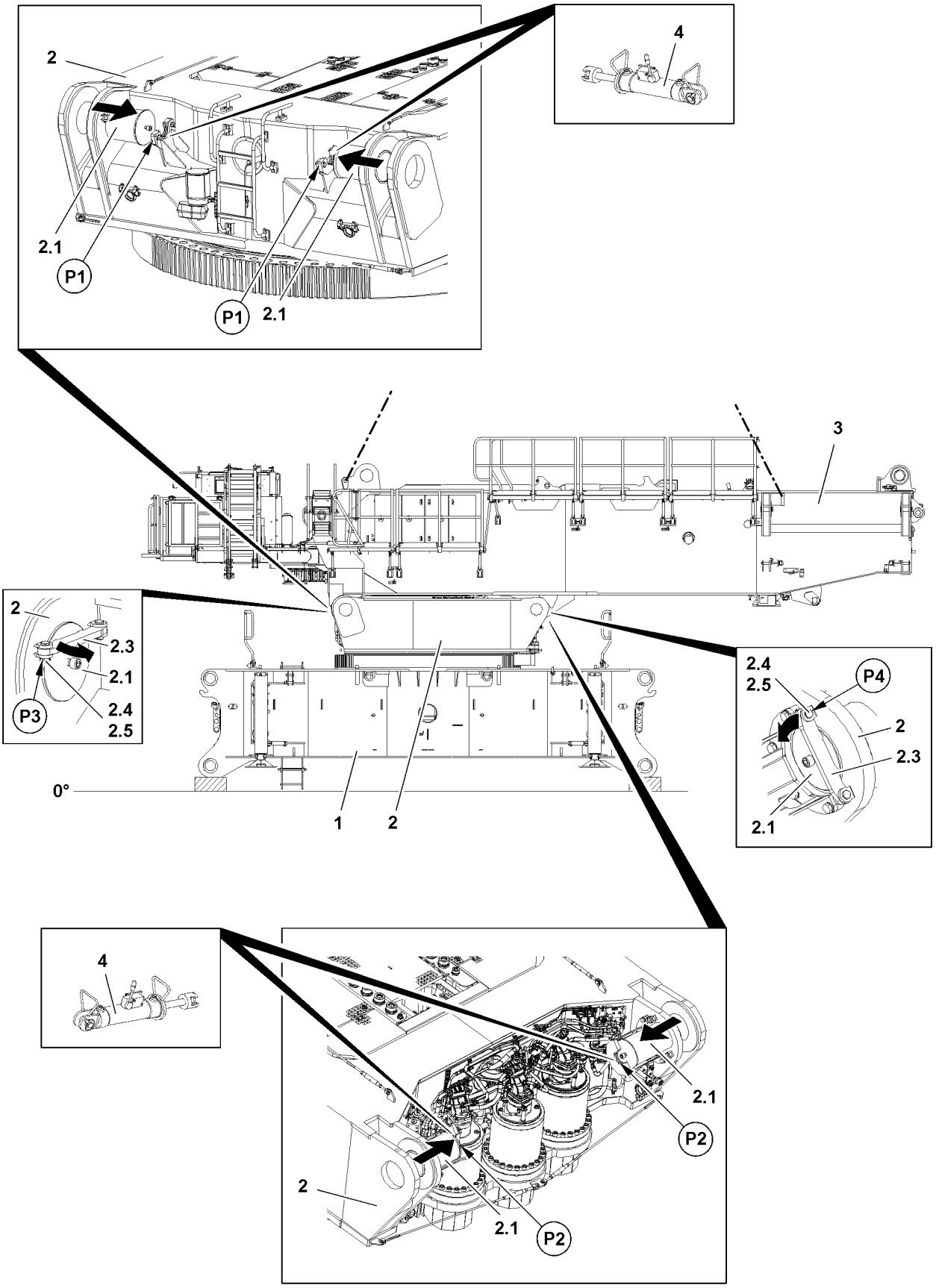

Fig.118556

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4.3 Disassembly Turntable frame main section

Make sure that the following prerequisites are met:
- The ground is level and of sufficient load bearing capacity.
- The crawler center section **1** is laying on the support.
- The crawler center section is horizontally aligned.
- The crane operator's cab is in transport position.
- The fastening equipment has been properly pinned and secured on the fastening points of the turntable frame main section **3**, see section „Fastening points".
- The electrical connections between the turntable frame main section **3** and the turntable frame lower section **2** are disconnected.
- The hydraulic connections between the turntable frame main section **3** and the turntable frame lower section **2** are disconnected.

4.3.1 Unpinning the turntable frame main section on the rear

▶ Bring the fastening equipment between the turntable frame main section **3** and the auxiliary crane carefully to „tension".

When the turntable frame main section **3** is properly secured by the auxiliary crane:
▶ Release pins **2.1** on both sides: Remove the locking pin **2.5** and pin **2.4** on both sides at point **P4**.

Result:

– The retaining bar **2.3** is released.

▶ Swing the retaining bar **2.3** out on both sides.

Result:

– The pins **2.1** are released.

When the pins **2.1** are released on both sides:
▶ Place the pin pulling cylinder **4** on the rear area of the turntable frame main section **3** on both sides in the pin pulling device at point **P2**.
▶ Unpin the pins **2.1** with the pin pulling cylinder **4** completely on both sides, see Crane operating instructions, chapter 5.30.

Result:

– The turntable frame main section **3** is unpinned in the rear area on the turntable frame lower section **2** .

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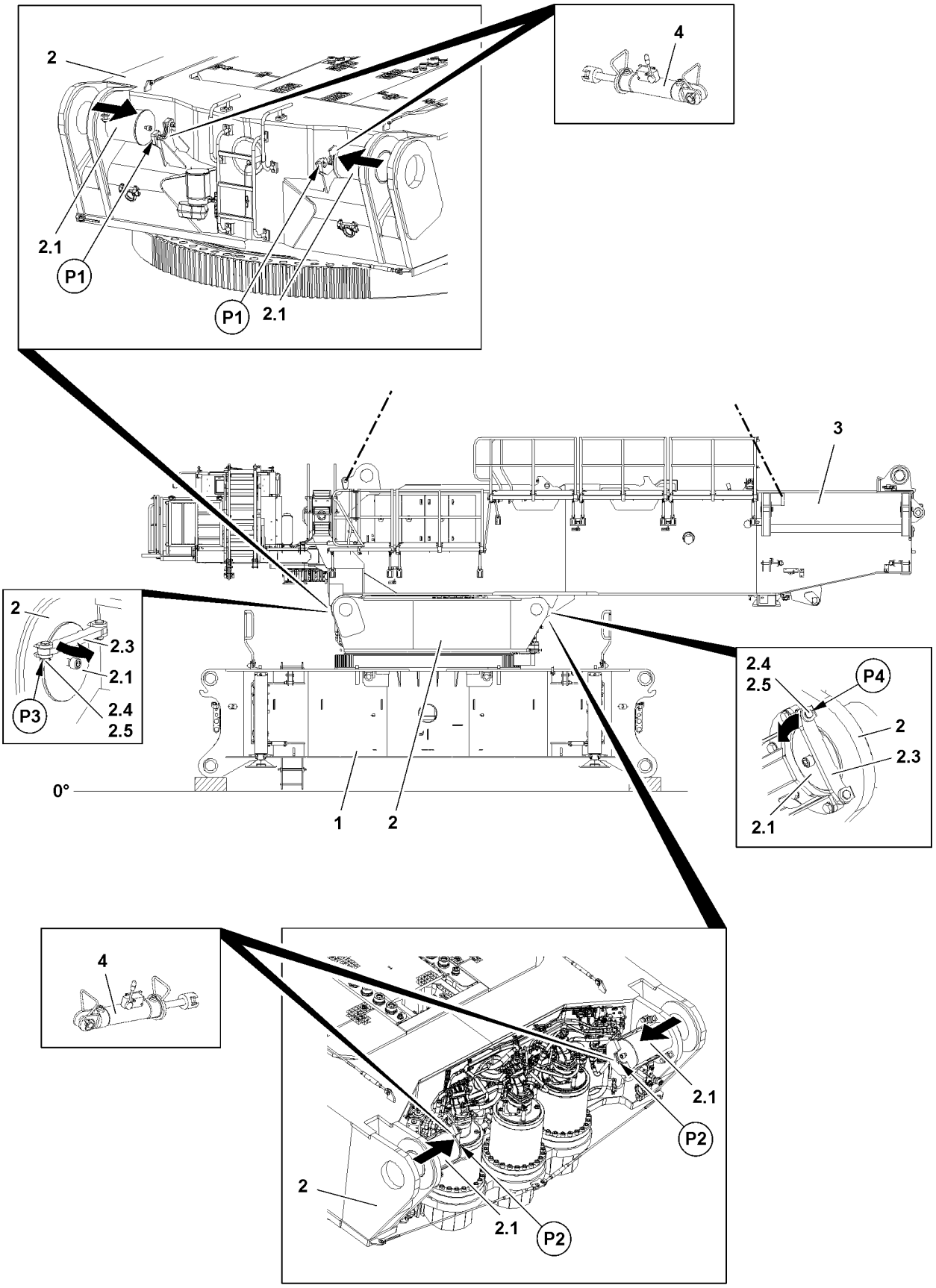

Fig.118556

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4.3.2 Unpinning the turntable frame main section on the front

▶ Release pins **2.1** on both sides: Remove the locking pin **2.5** and pin **2.4** on both sides at point **P3**.

Result:

– The retaining bar **2.3** is released.

▶ Swing the retaining bar **2.3** out on both sides.

Result:

– The pins **2.1** are released.

When the pins **2.1** are released on both sides:
▶ Place the pin pulling cylinder **4** on the front area of the turntable frame main section **3** on both sides in the pin pulling device at point **P1**.
▶ Unpin the pins **2.1** with the pin pulling cylinder **4** completely on both sides, see Crane operating instructions, chapter 5.30.

Result:

– The turntable frame main section **3** is completely unpinned.

NOTICE
Damage to crane!
▶ Make sure that all pins **2.1** are completely unpinned before lifting the turntable frame main section **3** off.

When all four pins **2.1** between the turntable frame main section **3** and the turntable frame lower section **2** are unpinned:
▶ Lift the turntable frame main section **3** with the auxiliary crane from the turntable frame lower section **2**.
▶ Swing the turntable frame main section **3** out with the auxiliary crane.
▶ Set the turntable frame main section **3** on a load bearing support or on a flatbed trailer.

When the turntable frame main section **3** is properly set on the support or on the flatbed trailer:
▶ Remove the fastening equipment and the auxiliary crane.

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3.03 Central ballast

1	Components	3
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Fig.195219

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1 Components

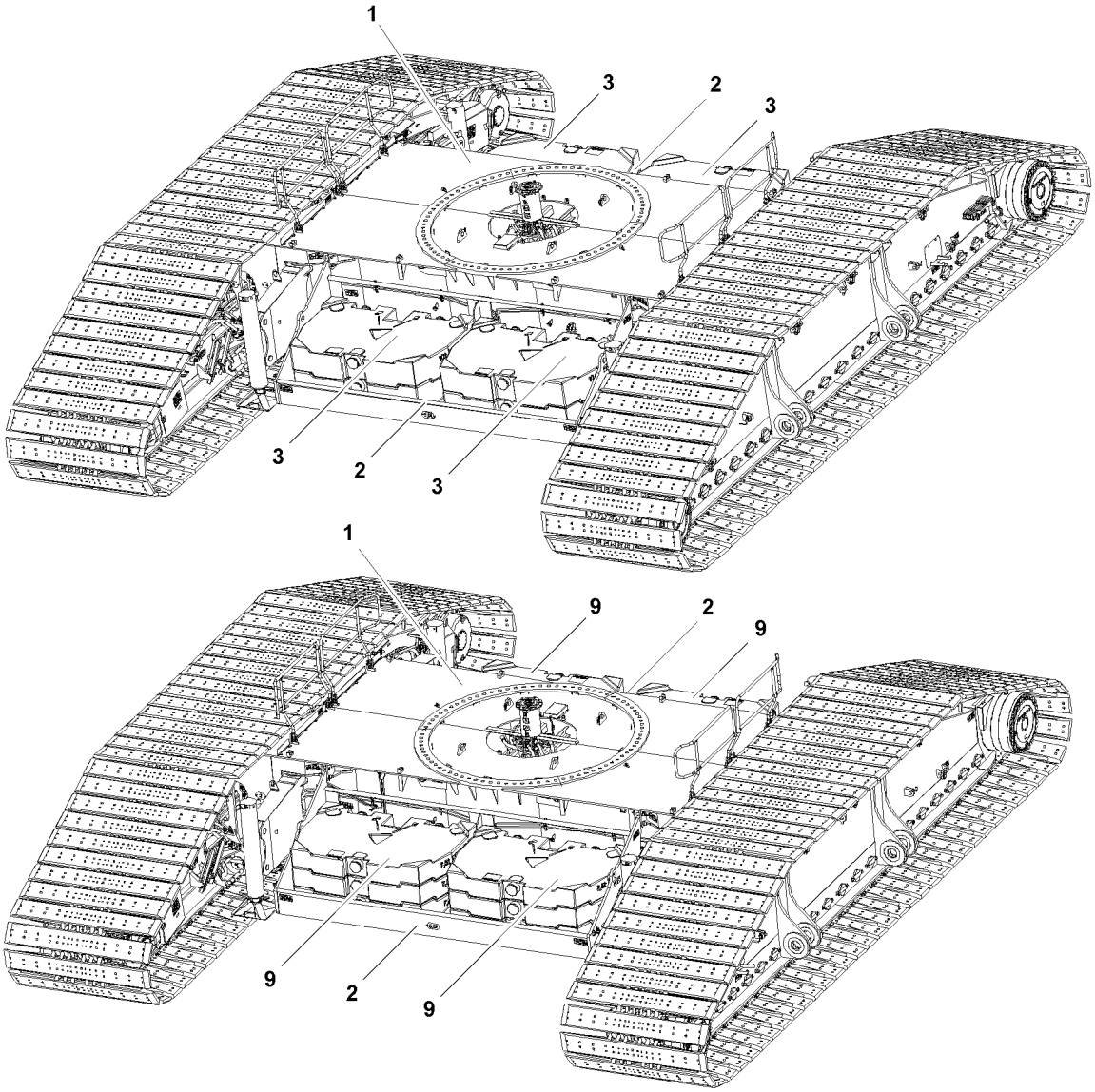

Fig.126080

1 Crawler center section
2 Central ballast brackets
3 Ballast plate 10.0 t
9 Alternative to 10 t ballast plates: Ballast plate 7.5 t

2 Fastening points and weights

Note

▶ The ballast plates **3**, the ballast plates **9** and the central ballast consoles **2** are marked with their own weight.

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2.1 Fastening points central ballast bracket

WARNING
Falling central ballast bracket!
- ▶ Fasten the central ballast bracket properly on the fastening points **P1**.
- ▶ Make sure that the central ballast bracket **2** is always fastened horizontally on the auxiliary crane.

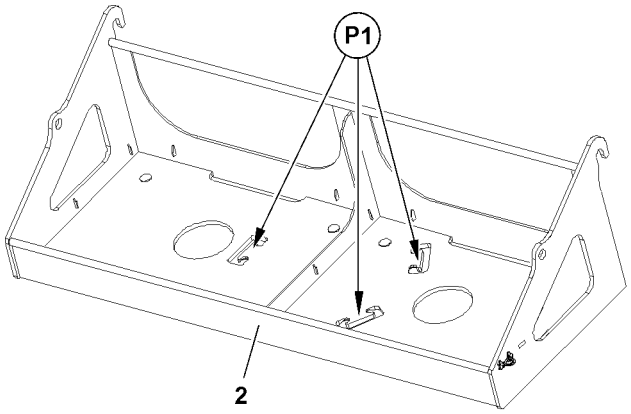

Fig.118217: Central ballast bracket

Fastening points	
P1	Central ballast bracket

2.2 Fastening points central ballast bracket with ballast plates

WARNING
Tipping central ballast bracket!
If the central ballast bracket **2** is fastened on the auxiliary crane with more than the maximum permissible two ballast plates (ballast plates **3** or ballast plates **9**), then the central ballast bracket can tip over.
The ballast plates can fall down.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the assembly of the central ballast bracket is carried out with maximum two inside ballast plates.
- ▶ Make sure that the central ballast bracket **2** is always fastened horizontally on the auxiliary crane.

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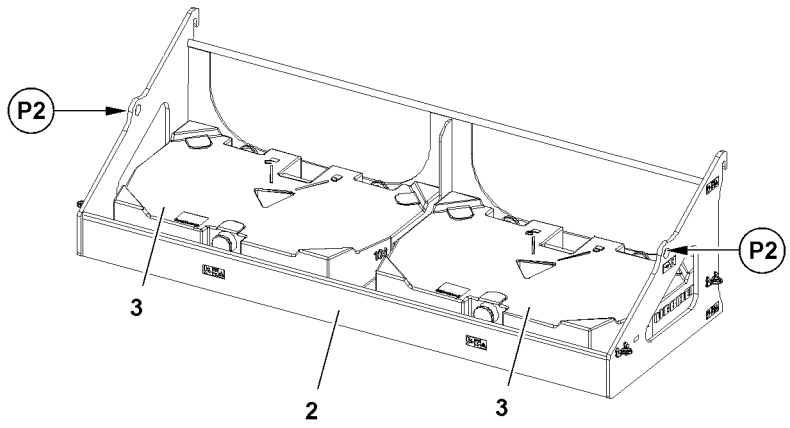

*Fig.118225: Central ballast bracket **with** ballast plates*

WARNING
Falling central ballast bracket!
If no shackles are used when fastening the central ballast bracket **2**, in connection with the inside ballast plates, then the fastening ropes can be damaged and rip off.
Death, severe bodily injuries, property damage.
- ▶ Make sure that per fastening point fastening equipment with a minimum 5.0 m length is used.
- ▶ Fasten the central ballast bracket **2** only on the fastening points **P2** in connection with shackles.

Fastening points	
P2	Central ballast bracket **with** ballast plates[1)]

1) Maximum permissible: 2 x 10.0 t **or** 2 x 7.5 t „inside positioned“

2.3 Weight central ballast bracket

Weight	Component
5.0 t	Central ballast bracket **2**

2.4 Weight ballast plate

Individual weight	Component
10.0 t	Ballast plate **3**
7.5 t	Ballast plate **9**

2.5 Weight central ballast bracket with ballast plates

WARNING
Falling central ballast bracket!
- ▶ Make sure that the central ballast bracket, including the inside positioned ballast plates, do not exceed the maximum permissible total weight of 25.0 t at assembly.

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Weight	Component
25.0 t	Central ballast bracket with 2 x 10.0 t ballast plate[1)]
20.0 t	Central ballast bracket with 2 x 7.5 t ballast plate

1) Maximum permissible: 2 x 10.0 t „inside“

3 Central ballast combinations

Various central ballast combinations can be placed in the central ballast stacks.

WARNING
The crane can topple over!
- ▶ Make sure that the ballast plates are always placed symmetrically on the central ballast brackets.
- ▶ Make sure that both central ballast brackets always have the identical number of the same ballast plates and an identical weight.

For erection / take down of boom systems the following applies:
- ▶ Always place the central ballast according to the Erection / take down chart.

For crane operation the following applies:
- ▶ Always place the central ballast according to the load chart.

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4 Permissible counterweight assemblies

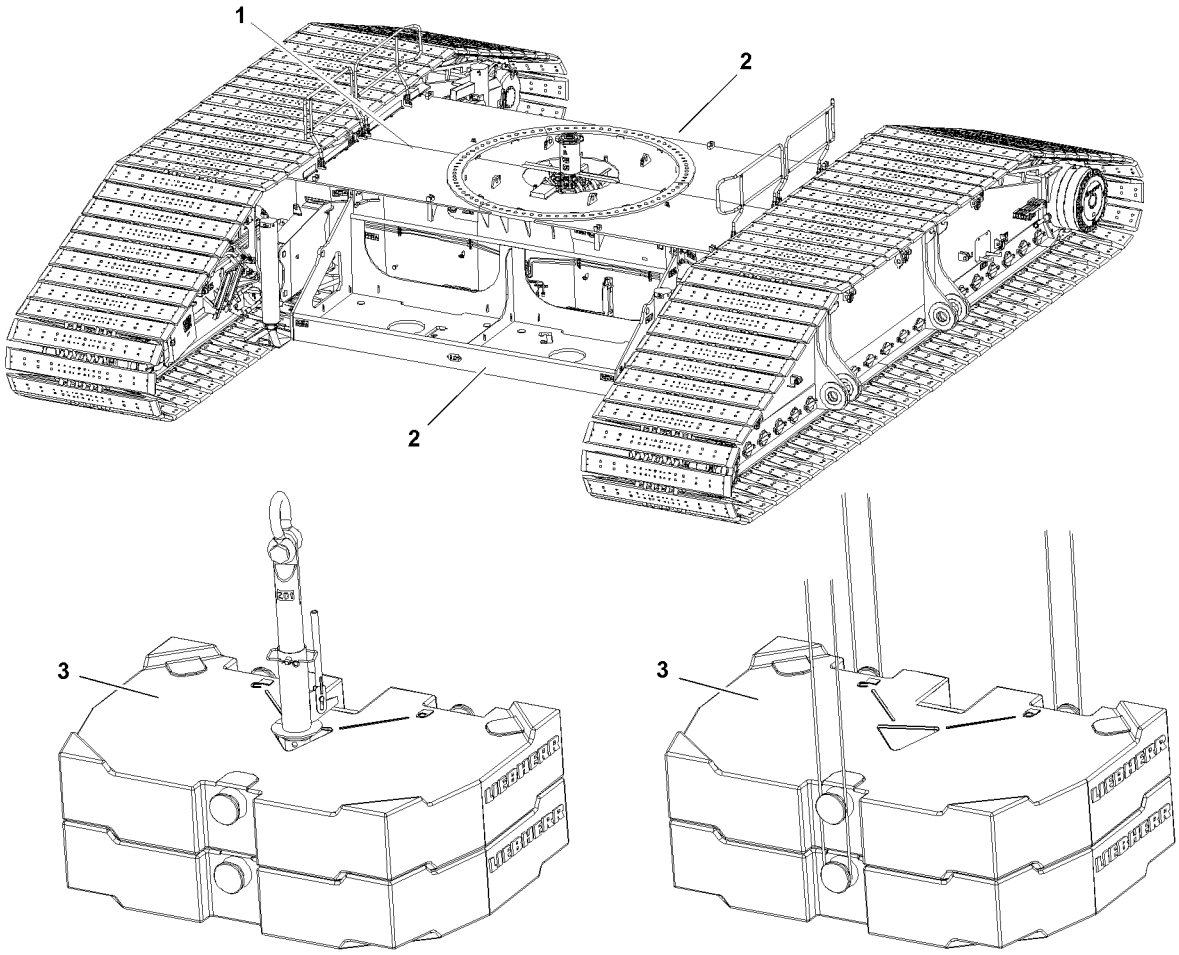

Fig.122412: Permissible counterweight assemblies

WARNING
Overload fastening points counterweight assemblies!
If more than the permissible number of counterweights are lifted together, then the fastening points can be overloaded.
The counterweights and components can fall down.
Death, severe bodily injuries, property damage.
▶ Attach only the maximum permissible number of counterweights per lift.

Individual weight	Maximum number of same counterweight plates per lift over	
Counterweight plate	Twistlock	Bitt
10.0 t	2	2
7.5 t	2	2

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5 Installing the central ballast

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ It is prohibited to lean the auxiliary ladder against the component being disassembled.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

WARNING
Danger of impact / crushing!
If anyone remains within the assembly / disassembly area of the ballast, they would be exposed to a danger of impact / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that there are no persons between the components which are to be assembled / disassembled and the crawler travel gear.

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Make sure that the following prerequisites are met:
- The installation of the crawler carriers is completed.
- Both crawler carriers are standing on the ground.
- The assembly supports are in operating position.
- The support cylinders on the assembly supports are moved in.
- The crane is horizontally aligned.
- The railings on the crawler center section are in operating position, see Crane operating instructions, chapter 2.06.
- The extension ladder on the crawler center section is removed on both sides.
- There are no persons or objects in the assembly area of the central ballast brackets.

5.1 Assembling the central ballast brackets

Make sure that the following prerequisites are met:
- The assembly supports are pinned in operating position and secured.
- The retaining pins **6** are unpinned on both sides at point **P3**.
- The fastening equipment for the assembly of the central ballast brackets must have a minimum length of 5000 mm.

Note
- ▶ It is permissible to install the central ballast bracket **2** under certain prerequisites with placed ballast plates.
- ▶ Observe section „Installing the central ballast brackets with placed ballast plates“ in this chapter.

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5.1.1 Assembling the first central ballast bracket (turntable is assembled on the crawler center section)

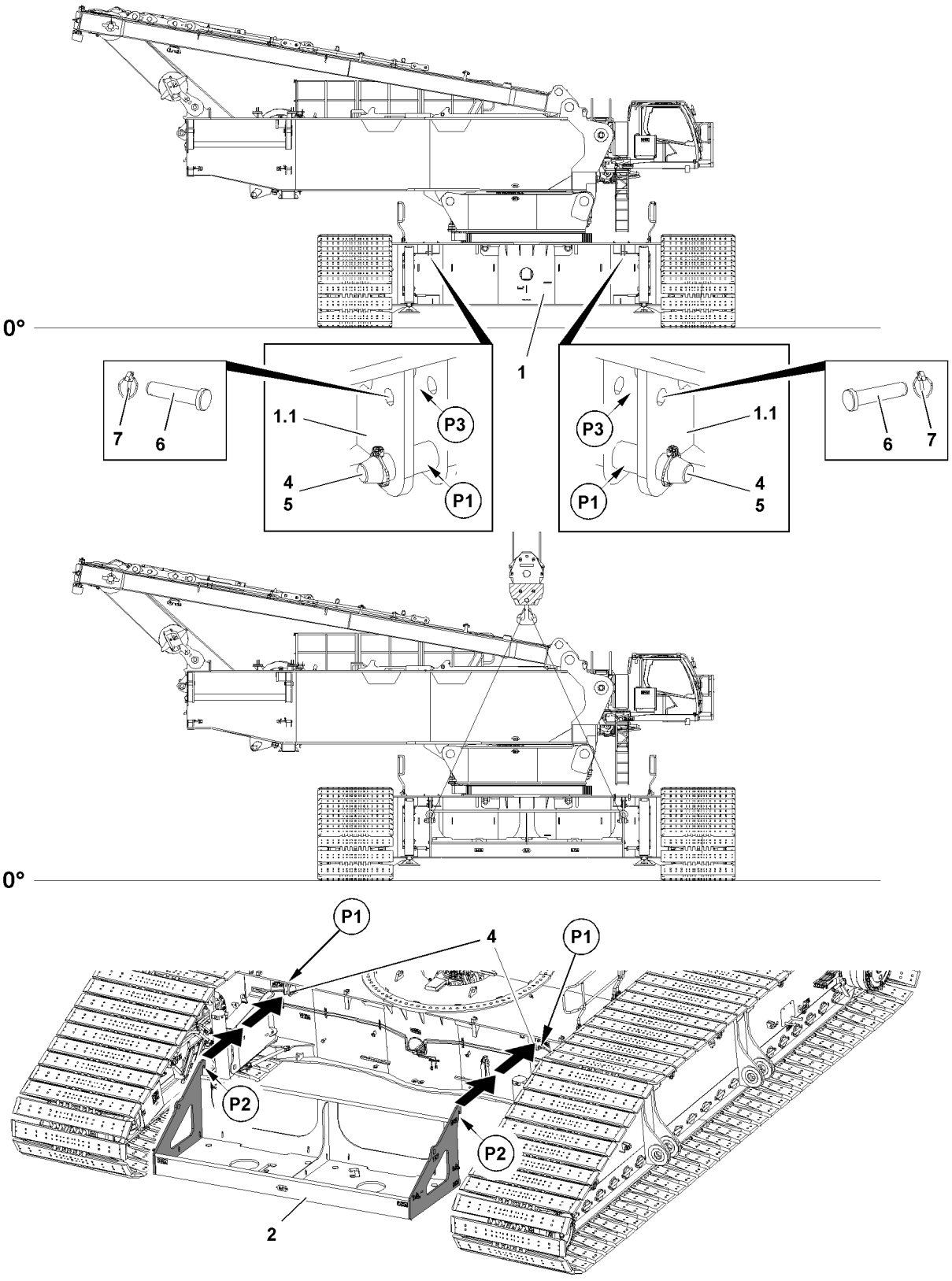

Fig.122413: Assemble the central ballast bracket on the crawler center section

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Note

- ▶ Due to better accessibility for assembly / disassembly of the central ballast brackets **2** we recommend to carry out the assembly / disassembly of the central ballast brackets **2** on the side facing away from the crane operator's cab.
- ▶ After assembly of the first central ballast bracket **2** and the respective ballast plates, turn the turntable by 180°.

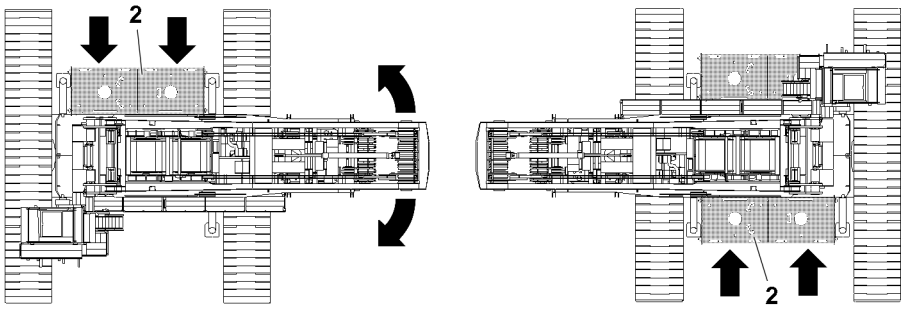

Fig.126087: Turn the turntable for assembly of the central ballast by 180°

Make sure that the following prerequisite is met:

– The turntable is in 90° position to the crawler travel gear.

▶ Fasten the central ballast bracket **2** onto the auxiliary crane.

WARNING

Danger of crushing!

Death, severe bodily injuries, property damage.

▶ Make sure, when swinging the central ballast brackets in to the hook points **P1** on the crawler center section **1**, that there are no persons or objects within the danger zone.

▶ Swing the central ballast bracket **2** in with the auxiliary crane to the hook points **P1**.

▶ Hang the central ballast bracket **2** on the hook pins **4** on both sides.

When the central ballast bracket is properly hooked on the hook pins **4**:

▶ Insert the retaining pins **6** on both sides at point **P3** and secure with locking pin **7**.

When the first central ballast bracket is properly assembled and secured:

▶ Place the ballast plates properly on the central ballast bracket, see section „Placing the ballast plates“.

When the ballasting of the first central ballast bracket is completed:

▶ Assemble the catwalk / staircase on the crawler carrier, see Crane operating instructions, chapter 2.06.

When the catwalk is properly assembled and secured:

▶ Assemble the staircase, see Crane operating instructions, chapter 2.06.

WARNING

Danger of accidents when turning the turntable!

Death, severe bodily injuries, property damage.

▶ Make sure that no persons or objects are within the danger zone when turning the turntable.

When the staircase is properly assembled and secured:

▶ Turn the turntable by 180°.

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5.1.2 Assembling the second central ballast bracket (turntable is assembled on the crawler center section)

Note

▶ The procedure for assembly of the second central ballast bracket is identical with the assembly of the first central ballast bracket.

Make sure that the following prerequisites are met:
- The first central ballast bracket is properly assembled and secured.
- The first catwalk is properly assembled and secured.
- The staircase is properly assembled and secured on the catwalk.
- The turntable is turned by 180°.

▶ Assemble the second central ballast bracket, see section „Assembling the first central ballast bracket“ (turntable is assembled on the crawler center section).
▶ Assemble the second catwalk, see Crane operating instructions, chapter 2.06.
▶ Assemble the second staircase, see Crane operating instructions, chapter 2.06.

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5.1.3 Assembling the first central ballast bracket (turntable is not assembled on the crawler center section)

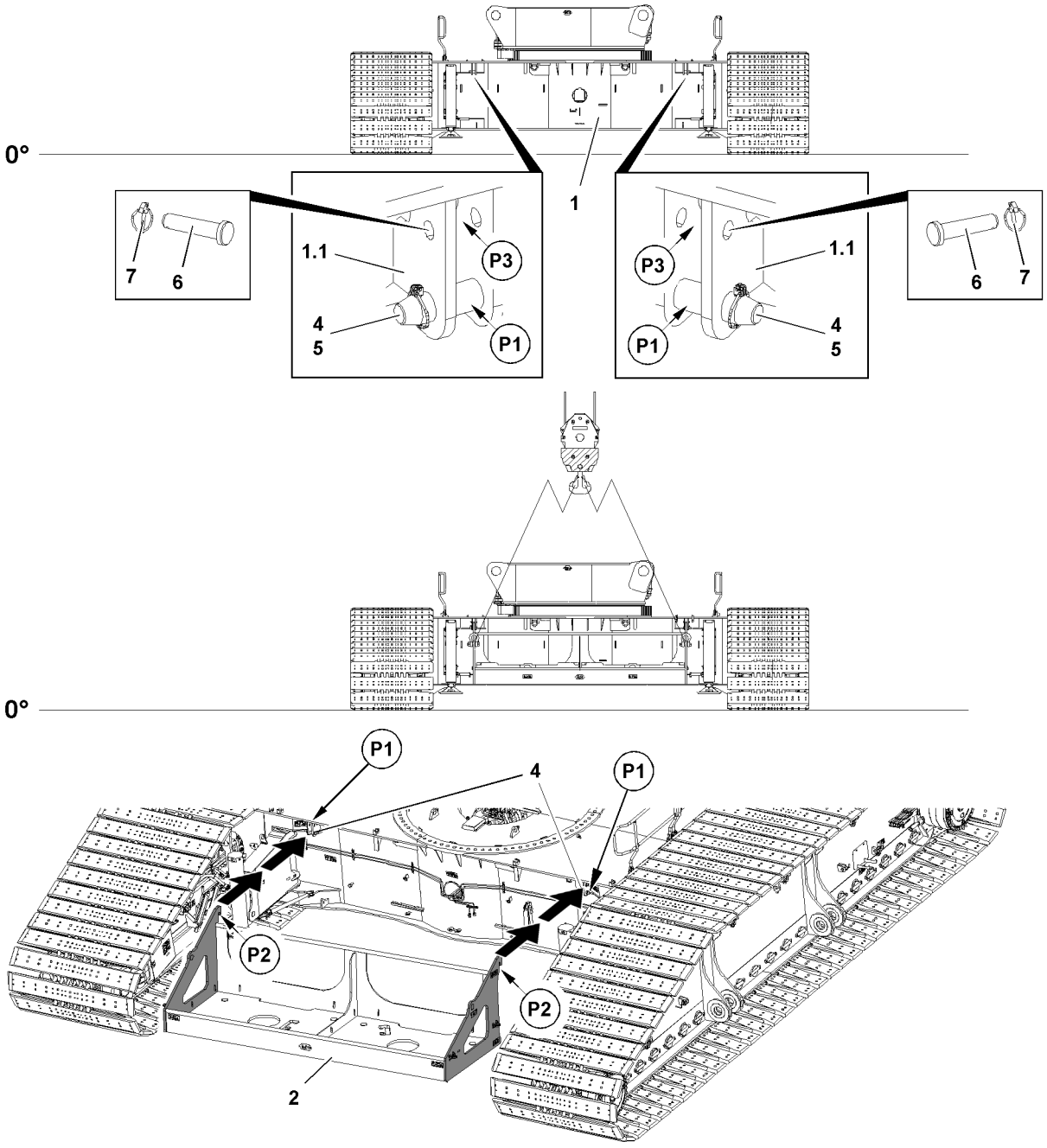

Fig.126081: Assemble the central ballast bracket on the crawler center section

▶ Fasten the central ballast bracket **2** onto the auxiliary crane.

WARNING
Danger of crushing!
Death, severe bodily injuries, property damage.
▶ Make sure, when swinging the central ballast brackets in to the hook points **P1** on the crawler center section **1**, that there are no persons or objects within the danger zone.

▶ Swing the central ballast bracket **2** in with the auxiliary crane to the hook points **P1**.
▶ Hang the central ballast bracket **2** on the hook pins **4** on both sides.

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When the central ballast bracket is properly hooked on the hook pins **4**:
▶ Insert the retaining pins **6** on both sides at point **P3** and secure with locking pin **7**.

When the first central ballast bracket is properly assembled and secured:
▶ Place the ballast plates properly on the central ballast bracket, see section „Placing the ballast plates“.

When the ballasting of the first central ballast bracket is completed:
▶ Assemble the catwalk / staircase on the crawler carrier, see Crane operating instructions, chapter 2.06.

When the catwalk is properly assembled and secured:
▶ Assemble the staircase, see Crane operating instructions, chapter 2.06.

5.1.4 Assembling the second central ballast bracket (turntable is not assembled on the crawler center section)

Note
▶ The procedure for assembly of the second central ballast bracket is identical with the assembly of the first central ballast bracket.

Make sure that the following prerequisites are met:
– The first central ballast bracket is properly assembled and secured.
– The first catwalk is properly assembled and secured.
– The staircase is properly assembled and secured on the catwalk.

▶ Assemble the second central ballast bracket, see section „Assembling the first central ballast bracket“ (turntable is not assembled on the crawler center section).
▶ Assemble the second catwalk, see Crane operating instructions, chapter 2.06.
▶ Assemble the second staircase, see Crane operating instructions, chapter 2.06.

5.2 Installing the central ballast brackets with placed ballast plates

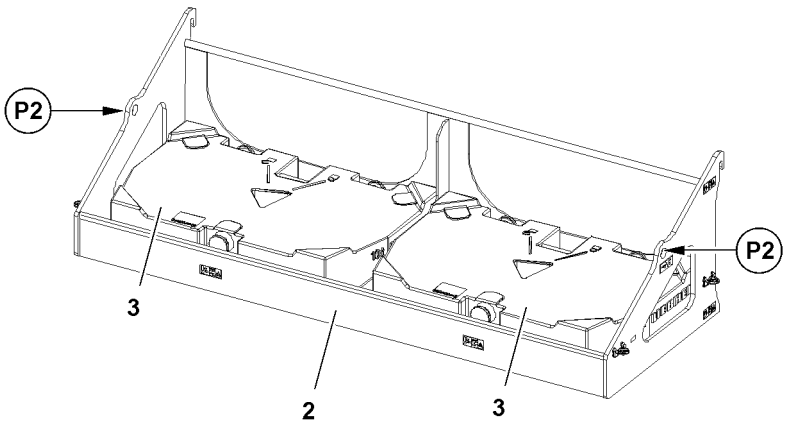

Fig.118225: Central ballast bracket with two inside ballast plates

WARNING
Overload of fastening points bracket!
If the central ballast bracket **2** is lifted with more than two ballast plates, then the fastening points will be overloaded.
The central ballast bracket **2** and the ballast plates can fall down.
Death, severe bodily injuries, property damage.
▶ Make sure that maximum two ballast plates are placed on the central ballast bracket **2** to be lifted.

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Note

▶ When placing the ballast plates on the central ballast bracket **2** observe Section „Placing the ballast plates“ in this chapter.

Make sure that the following prerequisites are met:
- The assembly supports are pinned in operating position and secured.
- The retaining pins **6** are unpinned on both sides at point **P3**.
- The fastening equipment for the assembly of the central ballast brackets must have a minimum length of 5000 mm.

5.2.1 Assembling the central ballast brackets with placed ballast plates (turntable is assembled on the crawler center section)

Note

▶ The procedure for the assembly of the central ballast brackets with placed ballast plates is identical with the assembly of the central ballast brackets without ballast plates, see section „Assembling the central ballast brackets“.

Make sure that the following prerequisite is met:
- The turntable is in 90° position to the crawler travel gear.

5.2.2 Assembling the central ballast brackets with placed ballast plates (turntable is not assembled on the crawler center section)

Note

▶ The procedure for the assembly of the central ballast brackets with placed ballast plates is identical with the assembly of the central ballast brackets without ballast plates, see section „Assembling the central ballast brackets“.

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5.3 Place the ballast plates

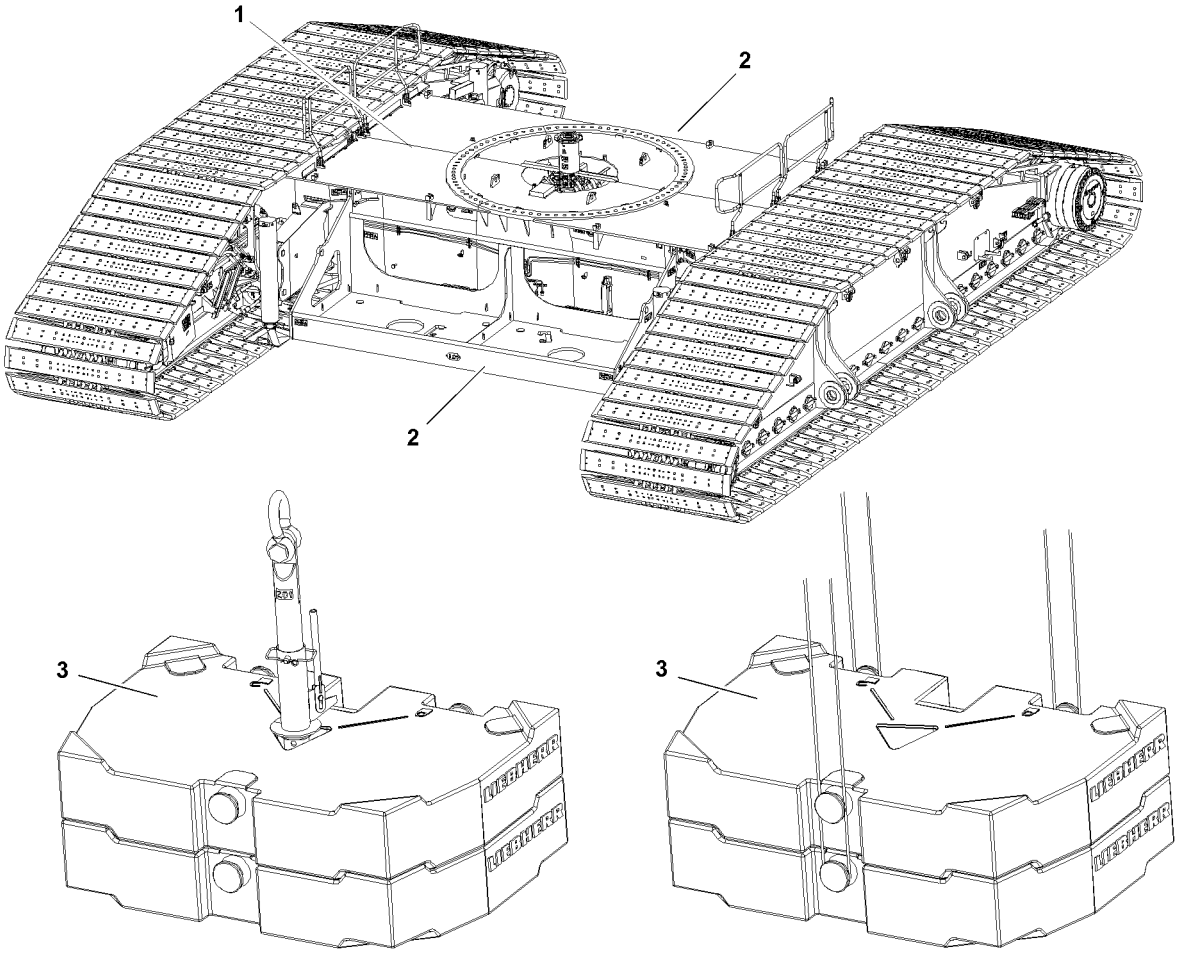

Fig.122412: Place the ballast plates

WARNING
Central ballast too low / too high!
If the placed central ballast deviates from the specified data in the load charts or the assembly conditions, then the crane can be damaged or topple over.
Death, severe bodily injuries, property damage.
▶ Make sure that the central ballast is placed according to the load chart.

WARNING
Damaged ballast plates!
Damage on the ballast plates **3** can cause the fastening equipment to release.
The ballast plates **3** and components can fall down.
Death, severe bodily injuries, property damage.
▶ Do not use damaged ballast plates **3** and replace them immediately.

WARNING
Asymmetric central ballast distribution!
If the central ballast is not distributed evenly on both central ballast brackets **2**, then this can lead to overloads on the crane.
The crane can be damaged and components can fall down.
Death, severe bodily injuries, property damage.
▶ Make sure that the central ballast is distributed evenly on the central ballast brackets **2**.

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WARNING
Toppling central ballast stack!
Lopsided stacked ballast plates **3** create instability in the central ballast stack **4**.
The ballast plates **3** can tip from the central ballast brackets **2** and cause the crane to topple over.
Death, severe bodily injuries, property damage.
▶ Make sure that the ballast plates **3** are placed correctly in the centerings.

Make sure that the following prerequisite is met:
– The central ballast brackets **2** are properly installed and secured on the crawler center section **1**.

5.3.1 Placing the ballast plates, fastening system: „Twistlock“

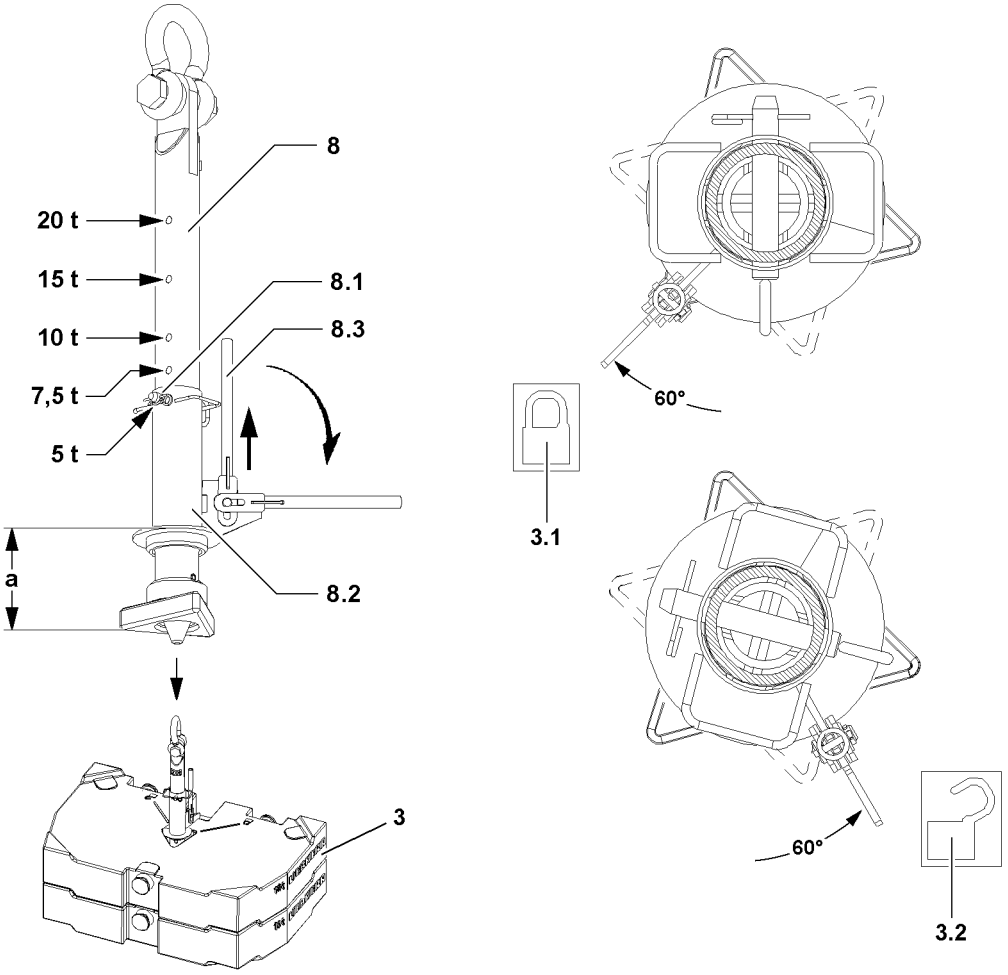

Fig.126084: Fastening system „Twistlock“:

WARNING
Overload of receptacle stud and ballast plates!
If more than the permissible number of ballast plates **3** are lifted with the receptacle stud **8**, the receptacle stud **8** and the ballast plates **3** can be overloaded and damaged.
The ballast plates **3** can fall down.
Death, severe bodily injuries, property damage.
▶ Observe the chart „Permissible central ballast assemblies“ in this chapter.

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WARNING
Damage of receptacle stud and ballast plates!
If two ballast plates **3** are lifted which do not lay correctly in their centerings, the receptacle stud **8** and the ballast plates **3** can be damaged.
Damage can cause the ballast plates **3** to fall down.
Death, severe bodily injuries, property damage.
▶ Make sure that the ballast plates **3** to be lifted are placed correctly in the centerings.

WARNING
The Twistlock system opens by itself!
If the receptacle stud **8** is not correctly locked, the Twistlock system can open by itself.
The ballast plates **3** can fall down.
Death, severe bodily injuries, property damage.
▶ Make sure, when initiating a lift, that the lever **8.3** points directly on the „Locked“ icon **3.1** of the ballast plates **3**.

Note
▶ During a lift, the locked Twistlock system cannot release by itself due to its gravitational retention.
▶ During a lift, the locked Twistlock system cannot be released by hand due to its gravitational retention.

Before the receptacle stud **8** is guided in the ballast plates **3**, make sure that the insertion length **a** of the receptacle stud **8** is set correctly.

The insertion length **a** of the receptacle stud **8** for the ballast plates **3** can be adjusted by hand.

If the insertion length **a** of the receptacle stud **8** is to be adjusted:
▶ Release and unpin the pin **8.1**.
▶ Adjust the insertion length **a** by moving the guide sleeve **8.2** to the desired value, observe the stages.
▶ Insert and secure pin **8.1**.

Result:

– The receptacle stud **8** is adjusted.

Note
▶ The receptacle stud **8** in the illustration is set to 5 t.

▶ Fasten the receptacle stud **8** on the auxiliary crane and guide it into the ballast plate(s) **3**.
▶ Pull the lever **8.3** up and fold it down.
▶ Turn the receptacle stud **8** with the lever **8.3** by 60° until it points to the „Locked“ icon **3.1** of the ballast plate **3**.

Note
▶ The receptacle stud **8** is locked by lifting the ballast plate(s) **3**.

▶ Lift the ballast plate(s) **3** or the central ballast assembly with the receptacle stud **8** and place it carefully on the centerings on the central ballast bracket **2** or on another ballast plate **3**.

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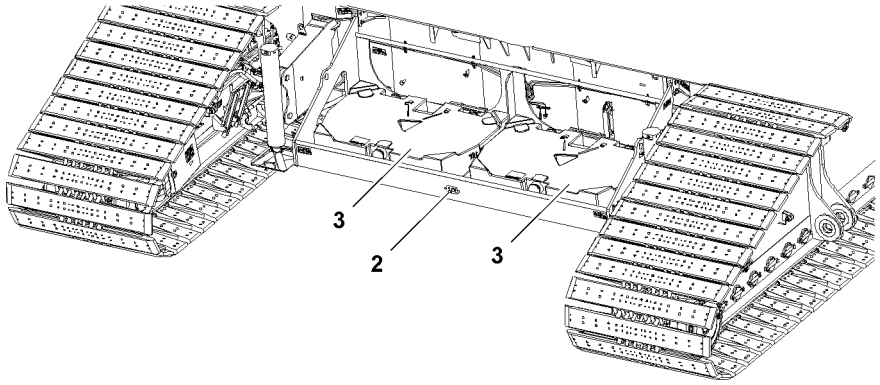

Fig.126086: Ballast plates placed in the central ballast bracket

When the ballast plates **3** are placed down:

▶ Turn the receptacle stud **8** with the lever **8.3** by 60° to the stop in direction of the „Unlocked“ icon **3.2** of the ballast plate **3**.

Result:

– The receptacle stud **8** is unlocked.

▶ Carefully pull out the receptacle stud **8**.
▶ Place the ballast plates **3** according to the load chart.

When the ballast plates are properly placed on the first central ballast bracket:

▶ Turn the turntable by 180°.

When the turntable is turned by 180°:

▶ Carry out the assembly of the second central ballast bracket and the ballast plates according to the assembly of the first central ballast bracket.

5.3.2 Placing the ballast plates, fastening points: Bitt

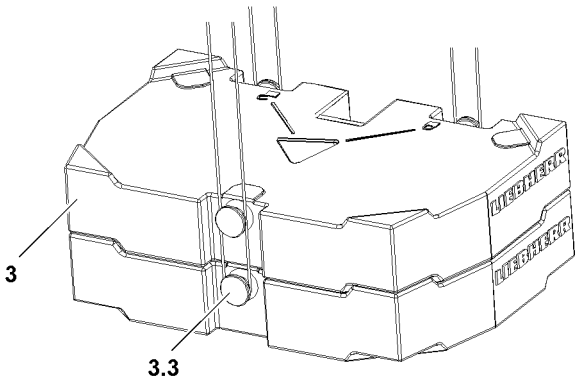

Fig.126085: Fastening points „Bitt“

WARNING
Overloaded ballast plates!
If more than the permissible loads are lifted, the bitts **3.3** are overloaded.
The ballast plates **3** can be damaged and fall down.
Death, severe bodily injuries, property damage.

▶ Observe the chart „Permissible central ballast assemblies“ in this chapter.

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WARNING
Incorrect handling of the fastening equipment!
If the fastening equipment is not attached correctly and / or if it is not secured sufficiently to prevent it from loosening up, the ballast plates **3** can fall down.
Death, severe bodily injuries, property damage.
▶ Make sure that the fastening equipment is correctly attached on the bitts **3.3** and that it is secured sufficiently to prevent it from loosening up.

▶ Fasten the ballast plates **3** or central ballast assembly on the auxiliary crane.

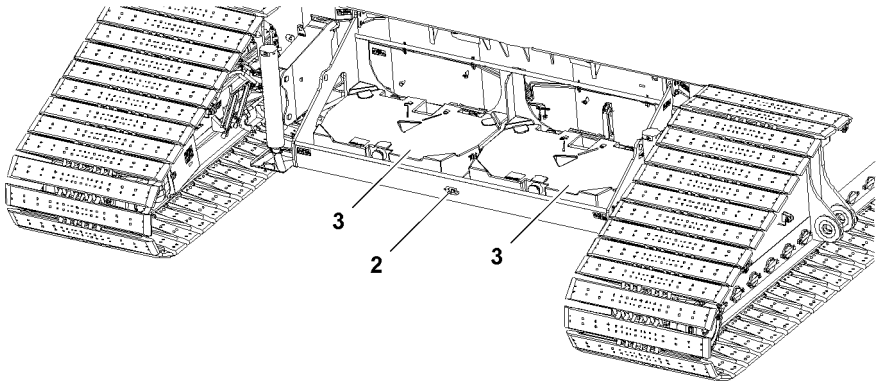

Fig.126086

▶ Place the ballast plates **3** or the central ballast assembly on the centerings of the central ballast bracket **2** or on another ballast plate **3**.

When the ballast plates are properly placed on the first central ballast bracket:
▶ Turn the turntable by 180°.

When the turntable is turned by 180°:
▶ Carry out the assembly of the second central ballast bracket and the ballast plates according to the assembly of the first central ballast bracket.

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6 Disassembling the central ballast

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ It is prohibited to lean the auxiliary ladder against the component being disassembled.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

WARNING
Danger of impact / crushing!
If anyone remains within the assembly / disassembly area of the ballast, they would be exposed to a danger of impact / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that there are no persons between the components which are to be assembled / disassembled and the crawler travel gear.

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Make sure that the following prerequisites are met:
- Both crawler carriers are standing on the ground.
- The crane is aligned in horizontal direction.
- The turntable is in 90° position to the crawler travel gear

or:
- The turntable is disassembled on the crawler travel gear.
- The staircases to the catwalks are disassembled, see Crane operating instructions, chapter 2.06.
- The catwalks are disassembled, see Crane operating instructions, chapter 2.06.
- There are no persons or objects in the assembly area of the central ballast brackets.

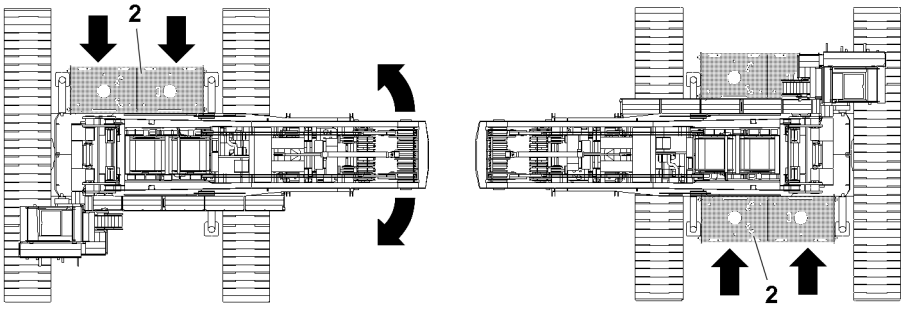

Fig.126087: Turn the turntable for assembly of the central ballast by 180°

Note
- ▶ Due to better accessibility for assembly / disassembly of the central ballast brackets we recommend to carry out the assembly / disassembly of the central ballast brackets on the side facing away from the crane operator's cab.
- ▶ After lifting the ballast plates off and after disassembly of the first central ballast bracket, turn the turntable by 180°.

6.1 Removing the ballast plates

Note
- ▶ It is permissible to remove the central ballast bracket **2** under certain prerequisites with placed ballast plates **3**.
- ▶ Observe section „Removing the central ballast brackets with placed ballast plates“ in this chapter.

WARNING
Damaged ballast plates!
Damage on the ballast plates **3** can cause the fastening equipment to release.
The ballast plates **3** and components can fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not use damaged ballast plates **3** and replace them immediately.

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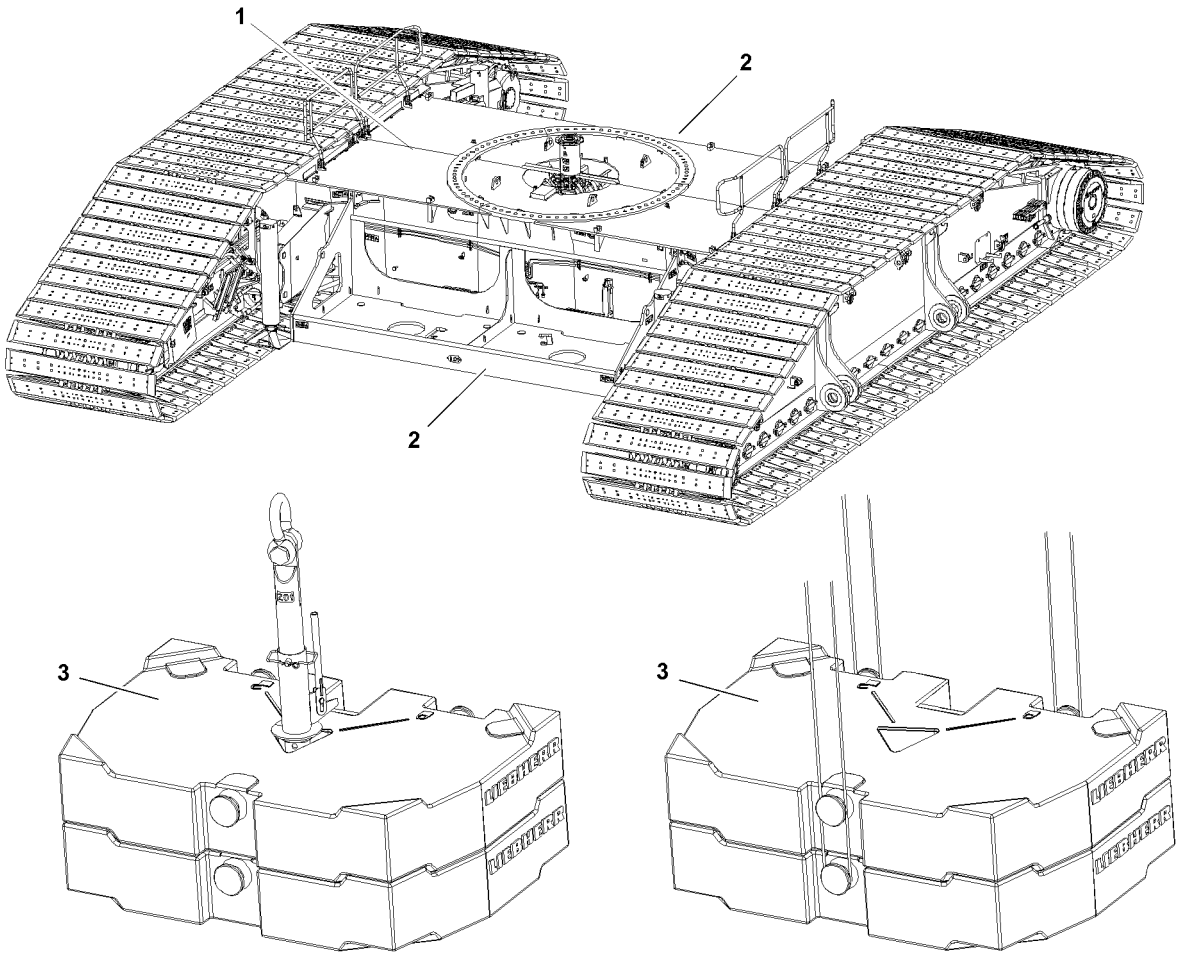

Fig.122412

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6.1.1 Removing the ballast plates, fastening system: „Twistlock“

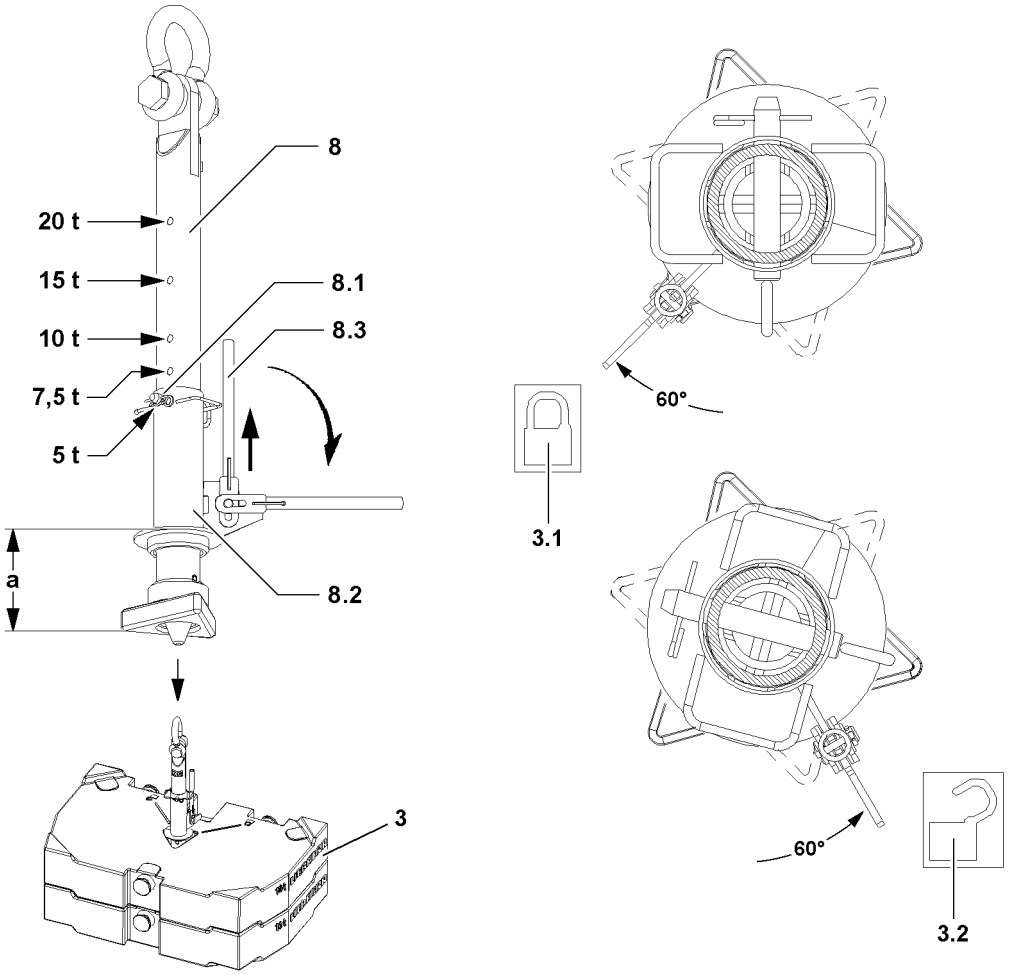

Fig.126084: Fastening points „Twistlock“:

WARNING
Overload of receptacle stud and central ballast plates!
If more than the permissible number of ballast plates **3** are lifted with the receptacle stud **8**, the receptacle stud **8** and the ballast plates **3** can be overloaded and damaged.
The ballast plates **3** can fall down.
Death, severe bodily injuries, property damage.
▶ Observe the chart „Permissible central ballast assemblies“ in this chapter.

WARNING
Damage of receptacle stud and central ballast plates!
If two ballast plates **3** are lifted which do not lay correctly in their centerings, the receptacle stud **8** and the ballast plates **3** can be damaged.
Damage can cause the ballast plates **3** to fall down.
Death, severe bodily injuries, property damage.
▶ Make sure that the ballast plates **3** to be lifted are placed correctly in the centerings.

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WARNING
The Twistlock system opens by itself!
If the receptacle stud **8** is not correctly locked, the Twistlock system can open by itself.
The ballast plates **3** can fall down.
Death, severe bodily injuries, property damage.
▶ Make sure, when initiating a lift, that the lever **8.3** points directly on the „Locked“ icon **3.1** of the ballast plates **3**.

Note
▶ During a lift, the locked Twistlock system cannot release by itself due to its gravitational retention.
▶ During a lift, the locked Twistlock system cannot be released by hand due to its gravitational retention.

Before the receptacle stud **8** is guided in the ballast plates **3**, make sure that the insertion length **a** of the receptacle stud **8** is set correctly.

The insertion length **a** of the receptacle stud **8** for the ballast plates **3** can be adjusted by hand.

If the insertion length **a** of the receptacle stud **8** is to be adjusted:
▶ Release and unpin the pin **8.1**.
▶ Adjust the insertion length **a** by moving the guide sleeve **8.2** to the desired value, observe the stages.
▶ Insert and secure pin **8.1**.

Result:

– The receptacle stud **8** is adjusted.

Note
▶ The receptacle stud **8** in the illustration is set to 5 t.

▶ Fasten the receptacle stud **8** on the auxiliary crane and guide it into the ballast plate(s) **3**.
▶ Pull the lever **8.3** up and fold it down.
▶ Turn the receptacle stud **8** with the lever **8.3** by 60° until it points to the „Locked“ icon **3.1** of the ballast plate **3**.

Note
▶ The receptacle stud **8** is locked by lifting the ballast plate(s) **3**.

▶ Lift the ballast plate(s) **3** or the central ballast assembly with the receptacle stud **8** and place them carefully on a suitable storage location.

When the ballast plates **3** are placed down:
▶ Turn the receptacle stud **8** with the lever **8.3** by 60° to the stop in direction of the „Unlocked“ icon **3.2** of the ballast plate **3**.

Result:

– The receptacle stud **8** is unlocked.

▶ Carefully pull out the receptacle stud **8**.

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6.1.2 Removing the ballast plates, fastening points: Bitt

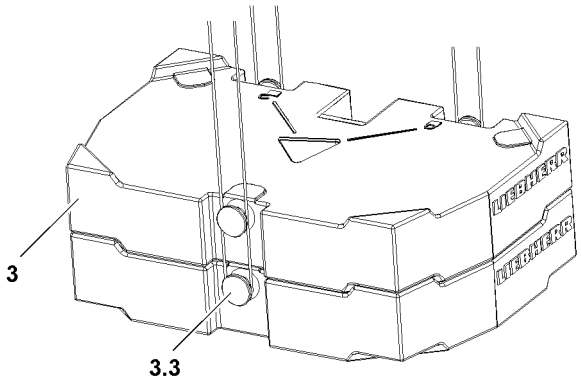

Fig.126085: Fastening points „Bitt“

WARNING
Overloaded ballast plates!
If more than the permissible loads are lifted, the bitts **3.3** are overloaded.
The ballast plates **3** can be damaged and fall down.
Death, severe bodily injuries, property damage.
▶ Observe the chart „Permissible central ballast assemblies“ in this chapter.

WARNING
Incorrect handling of the fastening equipment!
If the fastening equipment is not attached correctly and / or if it is not secured sufficiently to prevent it from loosening up, the ballast plates **3** can fall down.
Death, severe bodily injuries, property damage.
▶ Make sure that the fastening equipment is correctly attached on the bitts **3.3** and that it is secured sufficiently to prevent it from loosening up.

▶ Fasten the ballast plates **3** or central ballast assembly on the auxiliary crane.
▶ Remove the ballast plates **3** or the central ballast assembly from the central ballast bracket **3** and place it on a suitable storage location.

6.2 Removing the central ballast brackets

Make sure that the following prerequisites are met:
– The retaining pins **6** are unpinned on both sides at point **3**.
– The fastening equipment for the assembly of the central ballast brackets must have a minimum length of 5000 mm.

Note
▶ It is permissible to install the central ballast bracket **2** under certain prerequisites with placed ballast plates.
▶ Observe section „Removing the central ballast brackets with placed ballast plates“ in this chapter.

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6.2.1 Disassembling the first central ballast bracket (turntable is assembled on the crawler center section)

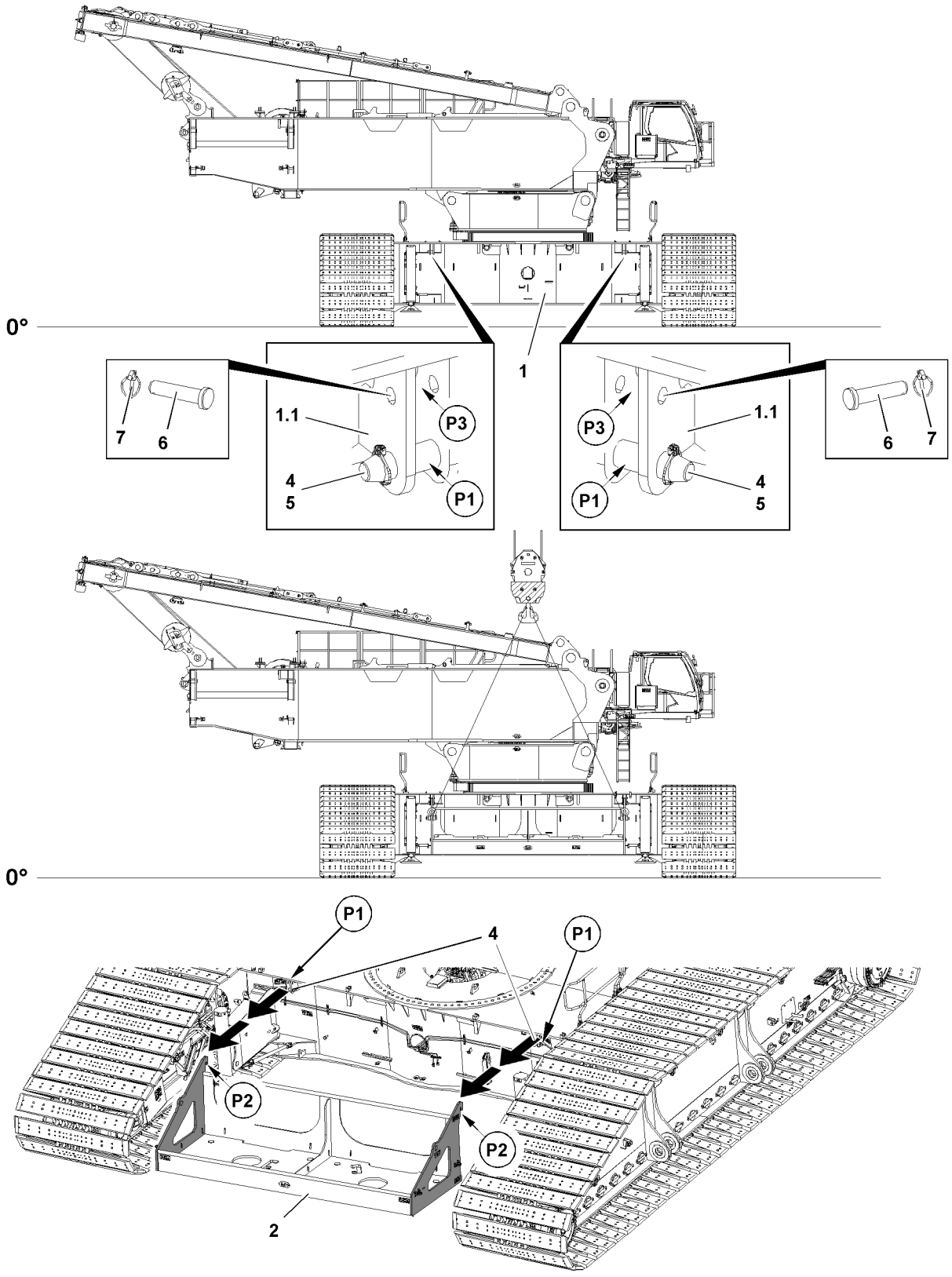

Fig.126088: Disassemble the central ballast bracket on the crawler center section

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Note

- ▶ Due to better accessibility for assembly / disassembly of the central ballast brackets **2** we recommend to carry out the assembly / disassembly of the central ballast brackets **2** on the side facing away from the crane operator's cab.
- ▶ After assembly of the first central ballast bracket **2** and the respective ballast plates, turn the turntable by 180°.

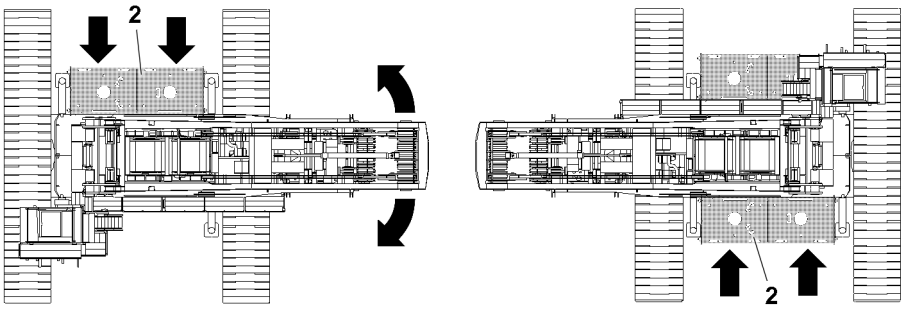

Fig.126087

Make sure that the following prerequisite is met:

– The turntable is in 90° position to the crawler travel gear.

- ▶ Remove the retaining pin **6** at point **P3** and unpin.
- ▶ Position the fastening equipment with the auxiliary crane in the center above fastening points.
- ▶ Fasten the central ballast bracket **2** onto the auxiliary crane.
- ▶ Tighten the fastening equipment with the auxiliary crane.
- ▶ Lift the central ballast bracket **2** with the auxiliary crane and swing out.

When the first central ballast bracket is properly removed:

- ▶ Turn the turntable by 180°.

When the turntable is turned by 180°:

- ▶ Carry out the disassembly of the second central ballast bracket according to the disassembly of the first central ballast bracket.

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6.3 Disassembling the central ballast brackets with placed ballast plates (turntable is not assembled on the crawler center section)

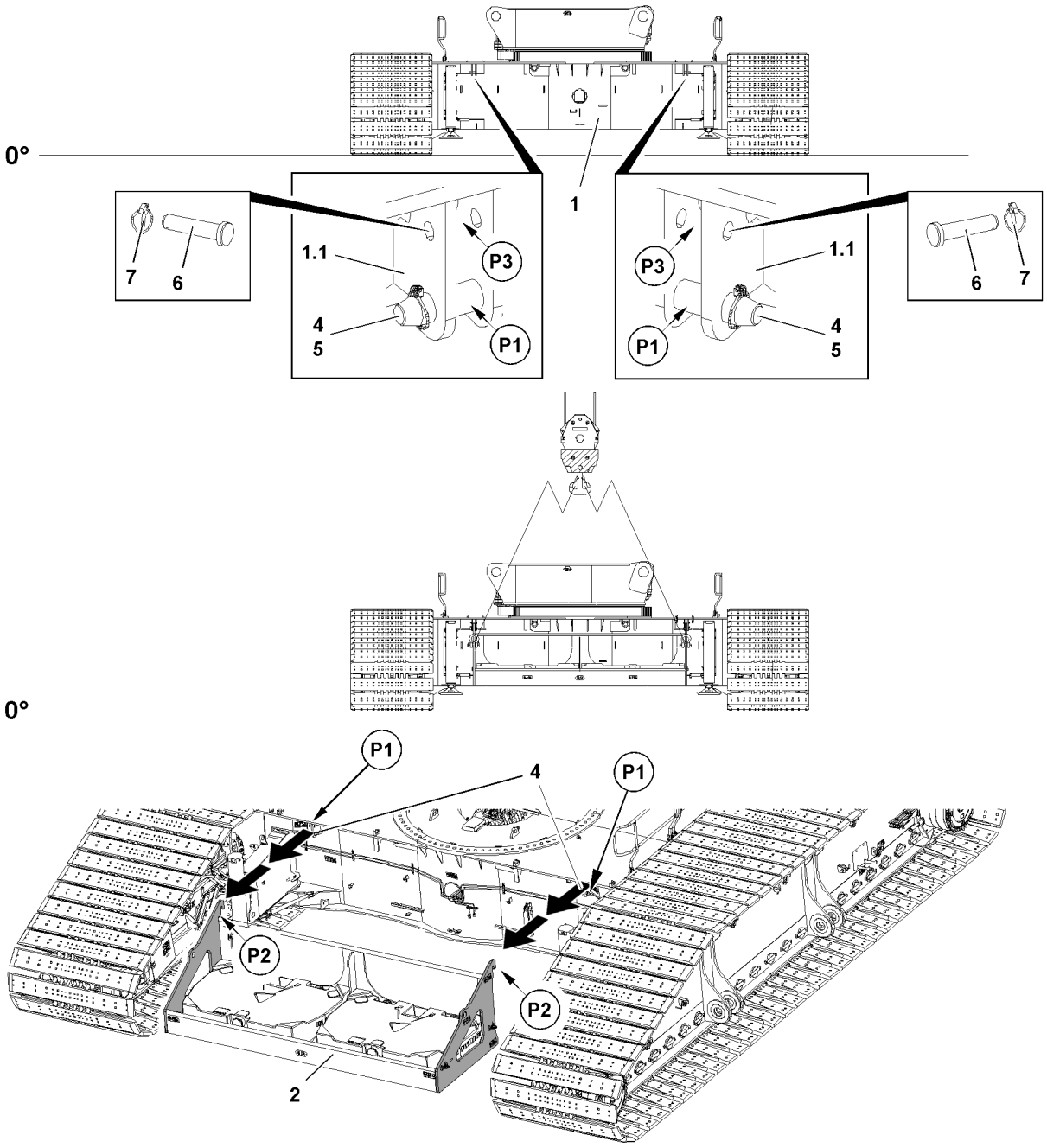

Fig.126091: Removing the central ballast brackets with placed ballast plates

WARNING
Danger of accidents due to angular pull!
If pulled angularly, a suspended central ballast bracket **2** can start to swing back and forth after releasing it from the crawler center section **1**.
Death, severe bodily injuries, property damage.
- ▶ Always position the fastening equipment in the center above the fastening points.
- ▶ Take special caution when unhooking the central ballast bracket **2**.

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WARNING
Overload of fastening points central ballast bracket!
If the central ballast bracket **2** is lifted with more than two placed ballast plates **3**, then the fastening points will be overloaded.
The central ballast bracket **2** and the ballast plates **3** can fall down.
Death, severe bodily injuries, property damage.
▶ Make sure that maximum two ballast plates **3** are placed on the central ballast bracket **2** to be lifted.

Note
▶ When removing the ballast plates **3** from the central ballast bracket **2** observe section „Removing the ballast plates“ in this chapter.

▶ Remove the retaining pin **6** at point **P3** and unpin.
▶ Position the fastening equipment with the auxiliary crane in the center above central ballast bracket **2**.
▶ Fasten the central ballast bracket **2** onto the auxiliary crane.
▶ Tighten the fastening equipment with the auxiliary crane.
▶ Lift the central ballast bracket **2** with the auxiliary crane and swing out.

When the first central ballast bracket is properly removed:
▶ Carry out the disassembly of the second central ballast bracket according to the disassembly of the first central ballast bracket.

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3.04 Mechanical auxiliary support

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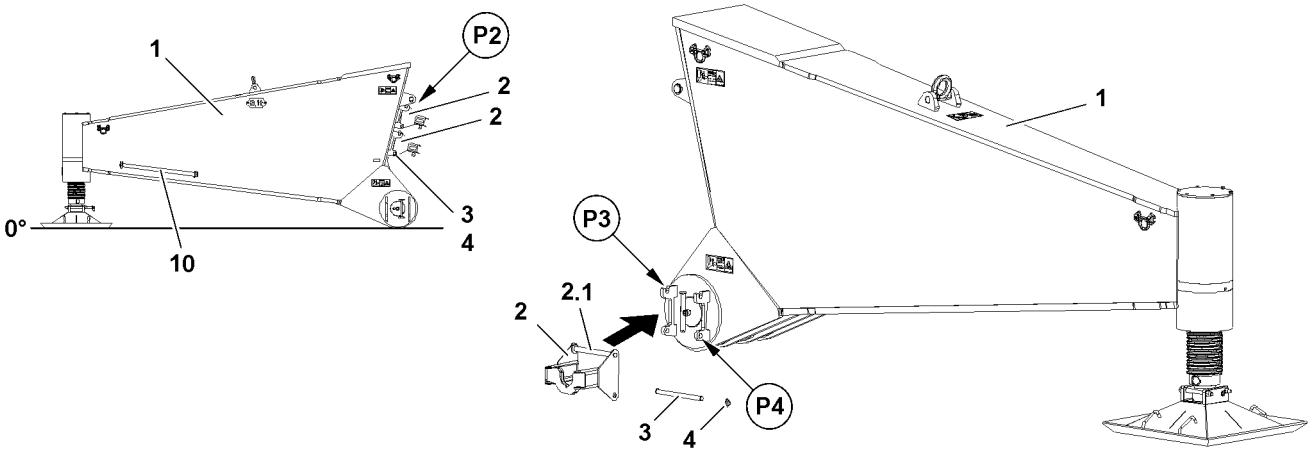

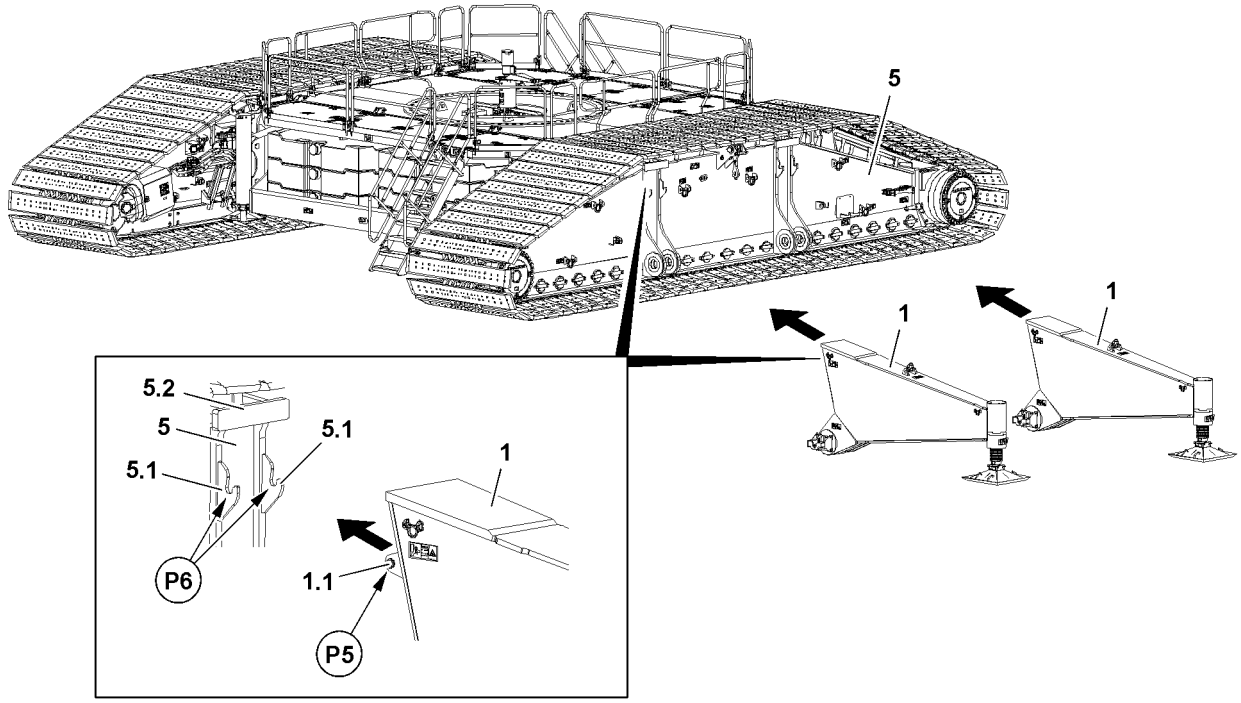

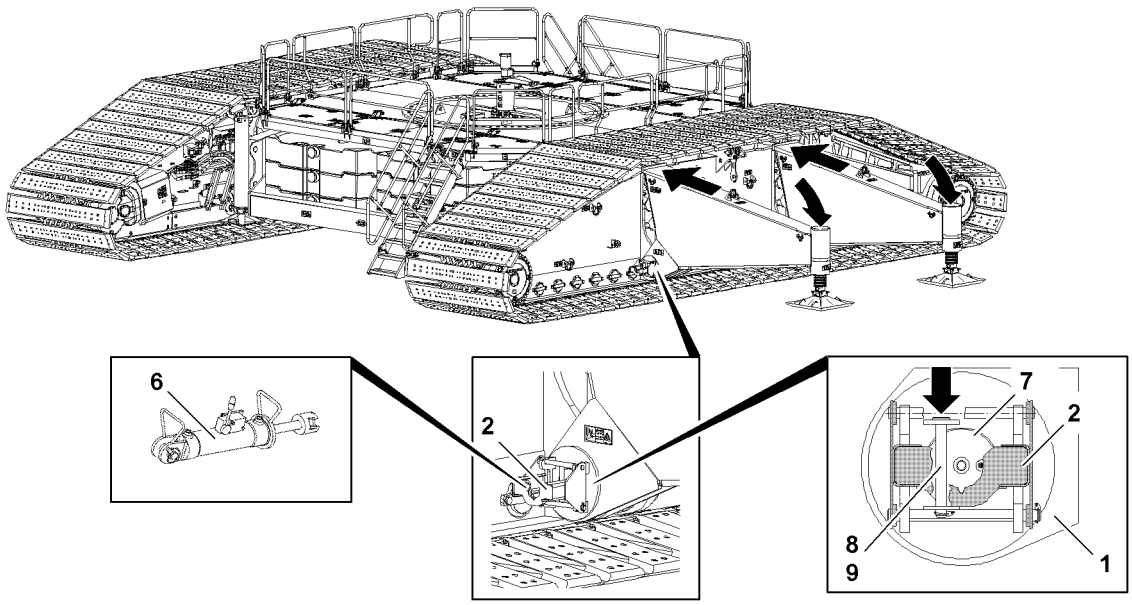

Fig.118230

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1 Fastening points

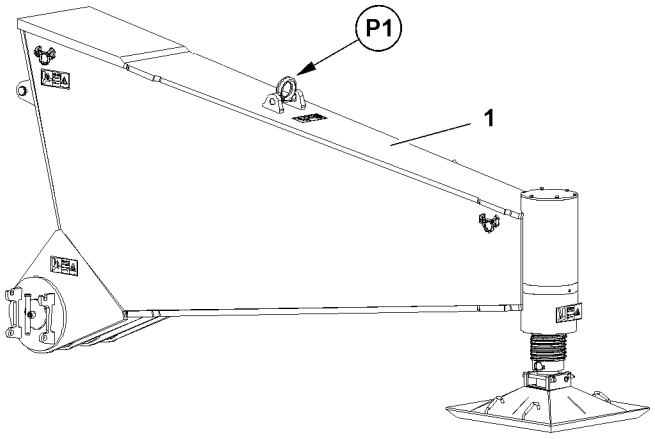

Fig.118550: Mechanical auxiliary support

Fastening point for mechanical auxiliary support	
P1	For Assembly / disassembly

2 Assembling the mechanical auxiliary support

Make sure that the following prerequisites are met:
- The crawler carriers are properly assembled on the crane.
- The crane is horizontally aligned.
- The ground has sufficient load bearing capacity in the area of the support plates.
- An auxiliary crane is available.

Note
- ▶ The mechanical auxiliary support is required to erect and / or take down long boom combinations.
- ▶ The mechanical auxiliary support can be installed on the left crawler carrier or on the right crawler carrier.
- ▶ Install the mechanical auxiliary support always on the crawler carrier side, which is used to place or take down the boom system.

WARNING
The crane can topple over!
If long boom combinations are erected or taken down without mechanical auxiliary support **1**, then the crane can topple over.
Personnel can be severely injured or killed.
- ▶ Observe and adhere to the data in the erection and take-down charts.
- ▶ Install the mechanical auxiliary support only in pairs on the crawler carrier.
- ▶ Erection and / or take-down of long boom systems with only one installed support beam is prohibited.

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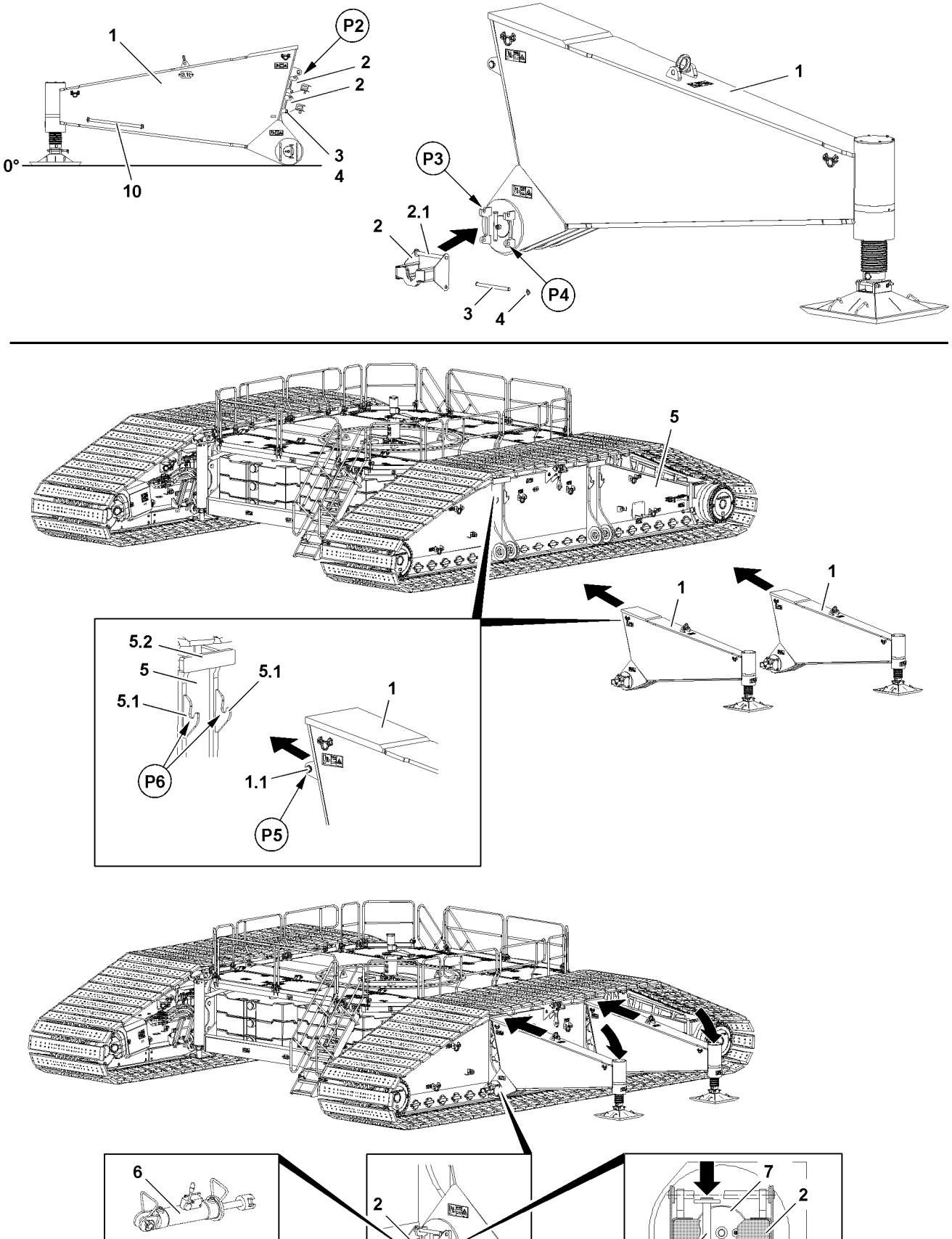

Fig.118230

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2.1 Installing the pin pulling device on the support beam

NOTICE
Damage to pin pulling device!
If the pin pulling devices **2** are not taken from the park position before installation of the mechanical auxiliary support **1** on the crawler carrier **5**, then they can be damaged.
▶ Take the pin pulling devices **2** from the park position before installation of the mechanical auxiliary support **1**.

Note
▶ The installation of the pin pulling device **2** is identical for both sides of the support beam.

▶ Release the first pin pulling device **2** in park position: Release the pin **3** in point **P2** and unpin.
▶ Take the pin pulling device **2** from the park position.
▶ Hang the pin pulling device **2** on the support beam **1** at point **P3** in operating position.

When the pin pulling device **2** are properly hooked on point **P3** in operating position:
▶ Secure the pin pulling device **2** in operating position: Insert the pin **3** in point **P4** and secure with the locking pin **4**.

2.2 Installing the mechanical auxiliary support on the crawler travel gear

Note
▶ The installation of the mechanical auxiliary support **1** is the same for both support beams on the left and right hand side!

Make sure that the following prerequisites are met:
– The pin pulling devices **2** are installed on both sides on the respective support beam **1**.
– There are no objects or obstacles within the assembly area of the mechanical auxiliary support **1**.

▶ Fasten the mechanical auxiliary support **1** on point **P1** on the auxiliary crane.
▶ Swing the mechanical auxiliary support **1** in with the auxiliary crane to the hook points **5.1** (points **P6**) on the crawler carrier **5**.
▶ Hang the mechanical auxiliary support **1** with the hook pins **1.1** (point **P5**) in the hook points (point **P6**) on the crawler carrier **5**.

When the mechanical auxiliary support is properly hooked on the crawler carrier **5**:
▶ Lower the mechanical auxiliary support **1** with the auxiliary crane into the operating position.
▶ Place the pin pulling cylinder **6** in the pin pulling device **2**.
▶ Insert the connector pins **7** with the pin pulling cylinder **6** in on both sides, see Crane operating instructions, chapter 5.30.

When the connector pins **7** are pinned on both sides on the support beam **1**:
▶ Secure the connector pins **7** with retaining pin **8** and locking pin **9**.

Result:

– The first support beam is pinned and secured on the crawler carrier.

▶ Release the fastening equipment from the first support beam **1**.
▶ Remove the auxiliary crane.
▶ Install the second support beam properly on the crawler carrier.

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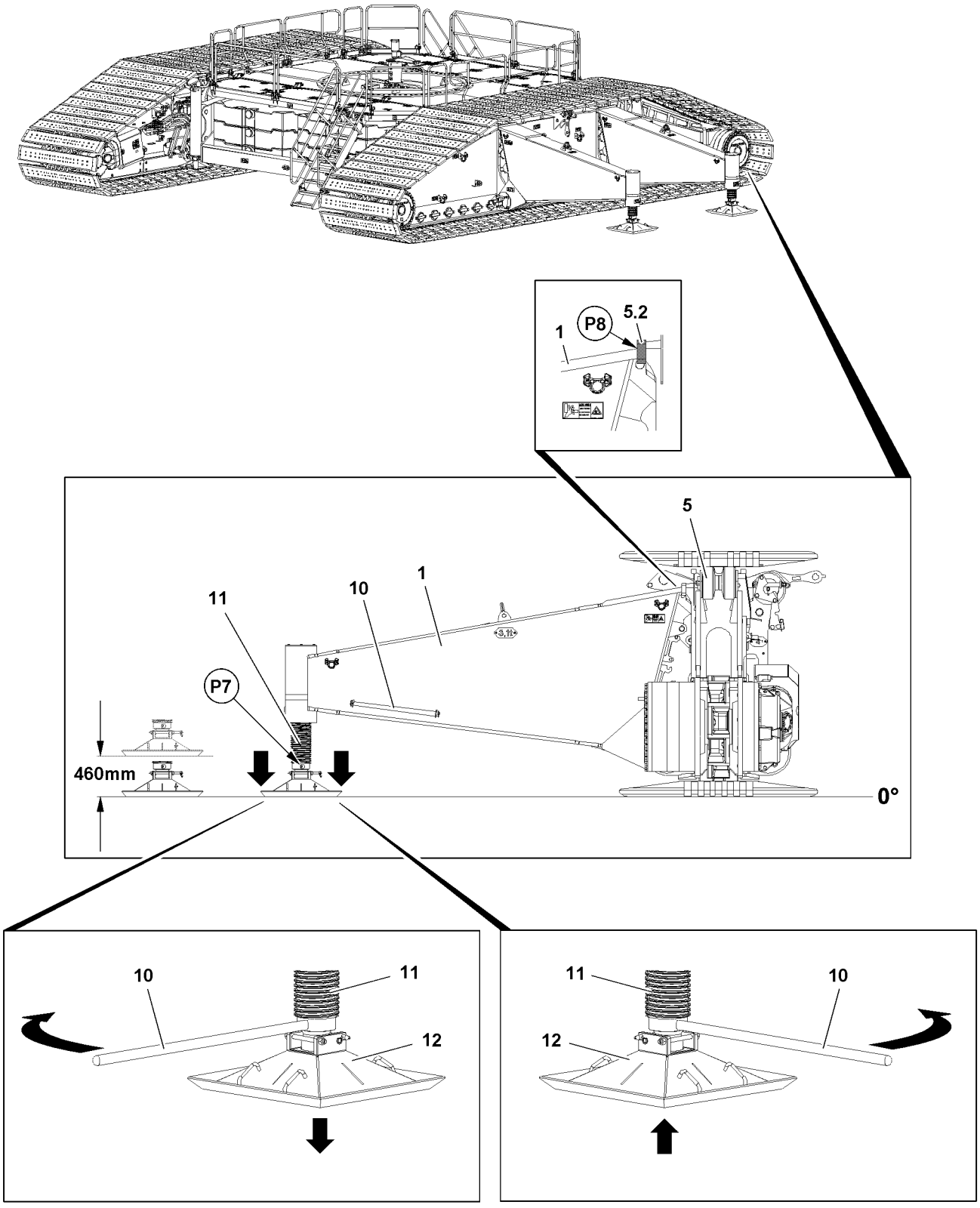

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Fig.118551

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2.3 Adjusting the mechanical auxiliary support

Note
- ▶ The mechanical auxiliary support **1** is only an erection and take down device.
- ▶ Due to the mechanical auxiliary support **1**, the stability momentum of the crane increases toward the side, on which the auxiliary support is installed.

DANGER
The crane can topple over!
If the load momentum is increased in crane operation due to the use of the mechanical auxiliary support **1**, the crane will tip over.
Personnel can be severely injured or killed.
- ▶ The increase of stability momentum through the mechanical auxiliary support **1** may not be used to increase the load momentum.
- ▶ The use of the mechanical auxiliary support **1** in crane operation is prohibited.
- ▶ Make sure that the mechanical auxiliary support **1** is only used for erection and take-down of long boom systems.
- ▶ Support the support plates large enough for the ground conditions with solid materials, such as wood, steel or concrete slabs, see Crane operating instructions, chapter 2.04.

WARNING
Jerky movements during erection / take-down of the boom system!
If the mechanical auxiliary support **1** is not placed on the pressure plate **5.2** on the crawler carrier **5** (point **P8**, then the boom system can move jerkily during erection and / or take down.
Personnel can be severely injured or killed.
The crane can be damaged.
- ▶ Turn the support plates **12** with the spindle **11** until the mechanical auxiliary support **1** touches on the pressure plates at point **P8**.

Note
- ▶ Adjustment range of support plate **12** via the spindle: 460 mm.

- ▶ Remove the pipe **10** from the transport retainer on the mechanical auxiliary support **1**.
- ▶ Insert the pipe **10** at point **P7** into the bore on the spindle **11**.
- ▶ Support the support plates **12** on both sides properly with load bearing materials.
- ▶ Turn the spindle **11** downward until the support plate **12** makes surface contact with the substructure.

When the support plate **12** is laying on the substructure:
- ▶ Continue to turn the spindle **11** until the mechanical auxiliary support **1** is touching on the pressure plate **5.2**.

When the mechanical auxiliary support **1** is touching on the pressure plate **5.2**:
- ▶ Remove the pipe **10** on the spindle **11** and install it properly in park position on the support beam **12**.

Note
- ▶ The adjustment of the second support plate **12** is identical with the adjustment of the first support plate **12**.

- ▶ Adjust the second support plate.

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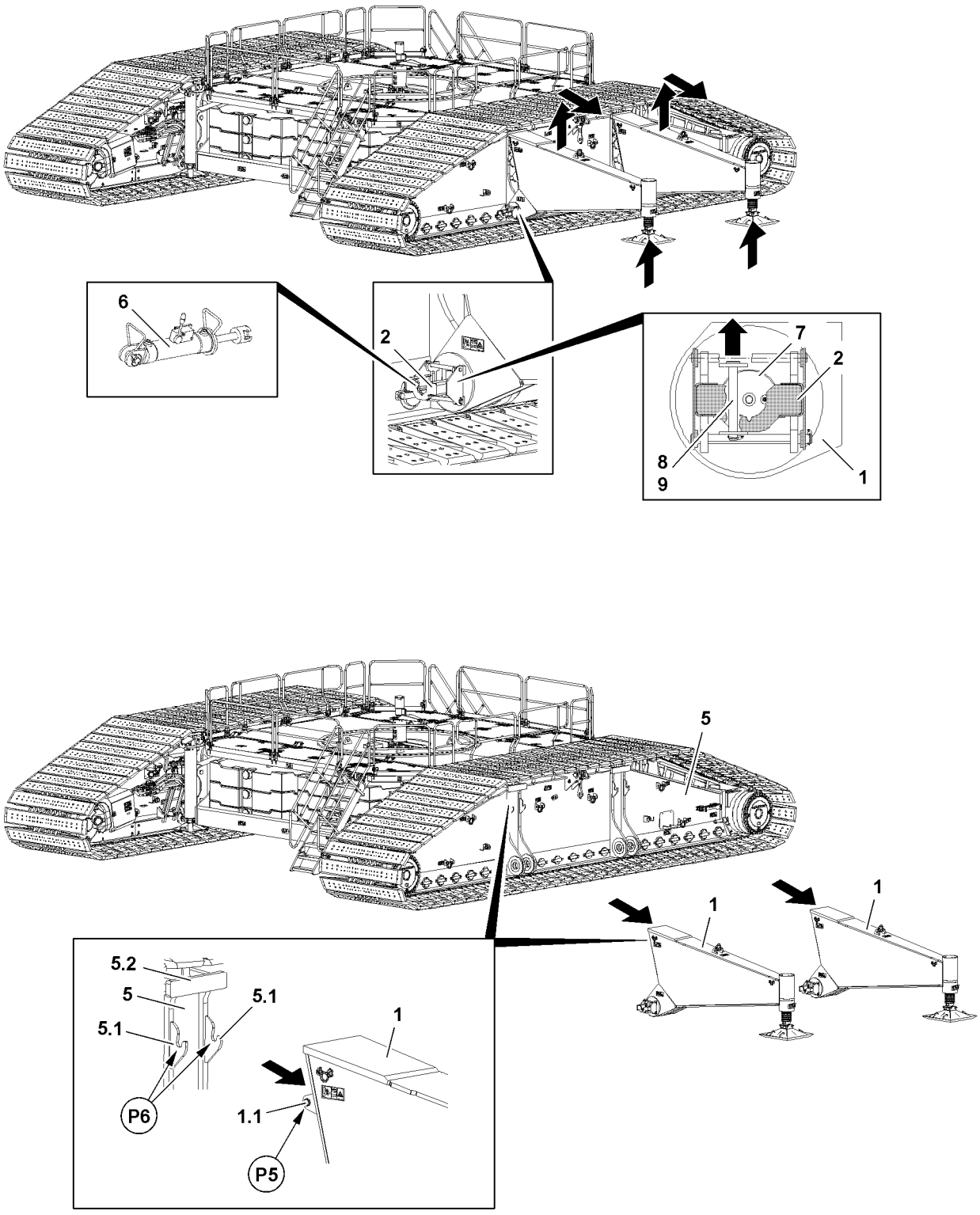

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Fig.118558

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3 Disassembling the mechanical auxiliary support

Make sure that the following prerequisites are met:
- The main boom has been removed on the crane.
- The crane is horizontally aligned.
- The support plates are not in contact with the ground.
- The pin pulling device is installed.
- An auxiliary crane is available.

3.1 Removing the mechanical auxiliary support on the crawler travel gear

Note

▶ The disassembly of the mechanical auxiliary support **1** is the same for both support beams on the left and right hand side!

Make sure that the following prerequisites are met:
- The pin pulling devices **2** are installed on both sides on the respective support beam **1**.
- There are no objects or obstacles within the assembly area of the mechanical auxiliary support **1**.

▶ Fasten the mechanical auxiliary support **1** on point **P1** on the auxiliary crane, see section „Fastening points“.
▶ Carefully bring fastening equipment on the support beam **1** to tension.

When the fastening equipment is tensioned:
▶ Release and remove the retaining pin **8**.

Result:

– The connector pin **7** is released.

▶ Place the pin pulling cylinder **6** in the pin pulling device **2**.
▶ Unpin the connector pins **7** with the pin pulling cylinder **6** completely on both sides, see Crane operating instructions, chapter 5.30.

When the connector pins **7** are unpinned on both sides on the support beam **1**:
▶ Carefully lift the support beam **1** with the auxiliary crane and swing out.

WARNING
Toppling support beam!
The support beams can fall over after disassembly.
Personnel can be severely injured or killed.
▶ Secure the support beam **1** immediately after setting it on the substructure or the flatbed trailer to prevent it from falling over.

▶ Place the support beam **1** on the load bearing substructure.
or
Set the support beam **1** on the flatbed trailer.
▶ Secure the support beam **1** immediately after setting it down to prevent it from falling over.

When the support beam **1** is properly secured to prevent it from falling over:
▶ Remove the auxiliary crane.
▶ Remove the pin pulling devices **2** on the support beam **1** and install in park position on the support beam.
▶ Secure the pin pulling devices **2** properly in parking position.
▶ Remove the second support beam **1** properly on the crawler carrier and secure.

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3.05 SA-frame assembly

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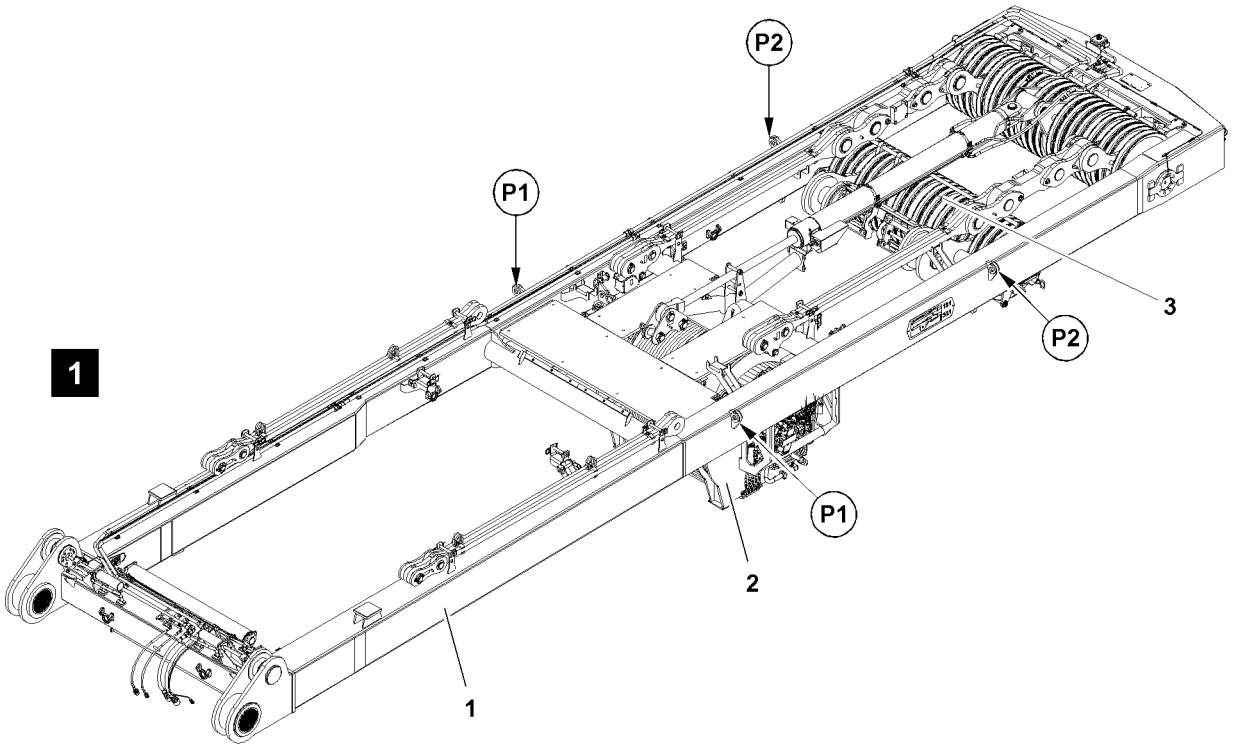

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Fig.116915

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1 Component overview

Note
▶ Dimensions and weights, see Crane operating instructions, chapter 1.03.

Position	Component
1	SA-frame
2	Winch 4
3	Pulley support

2 Attachment points SA-frame

WARNING
Component incorrectly fastened!
Life-threatening situations can arise due to improper or incorrect attachment of the corresponding components.
Death, severe injury, property damage.
▶ Fasten the components only on the intended fastening points on both sides.

Fastening points	
P1 and P2	SA-frame with winch 4

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Fig.195219

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3 Assembling SA-frame

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe injury, property damage.
- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe injury, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.
Death, severe injury, property damage.
- ▶ Do not disengage the auxiliary crane until the corresponding component is pinned and secured.

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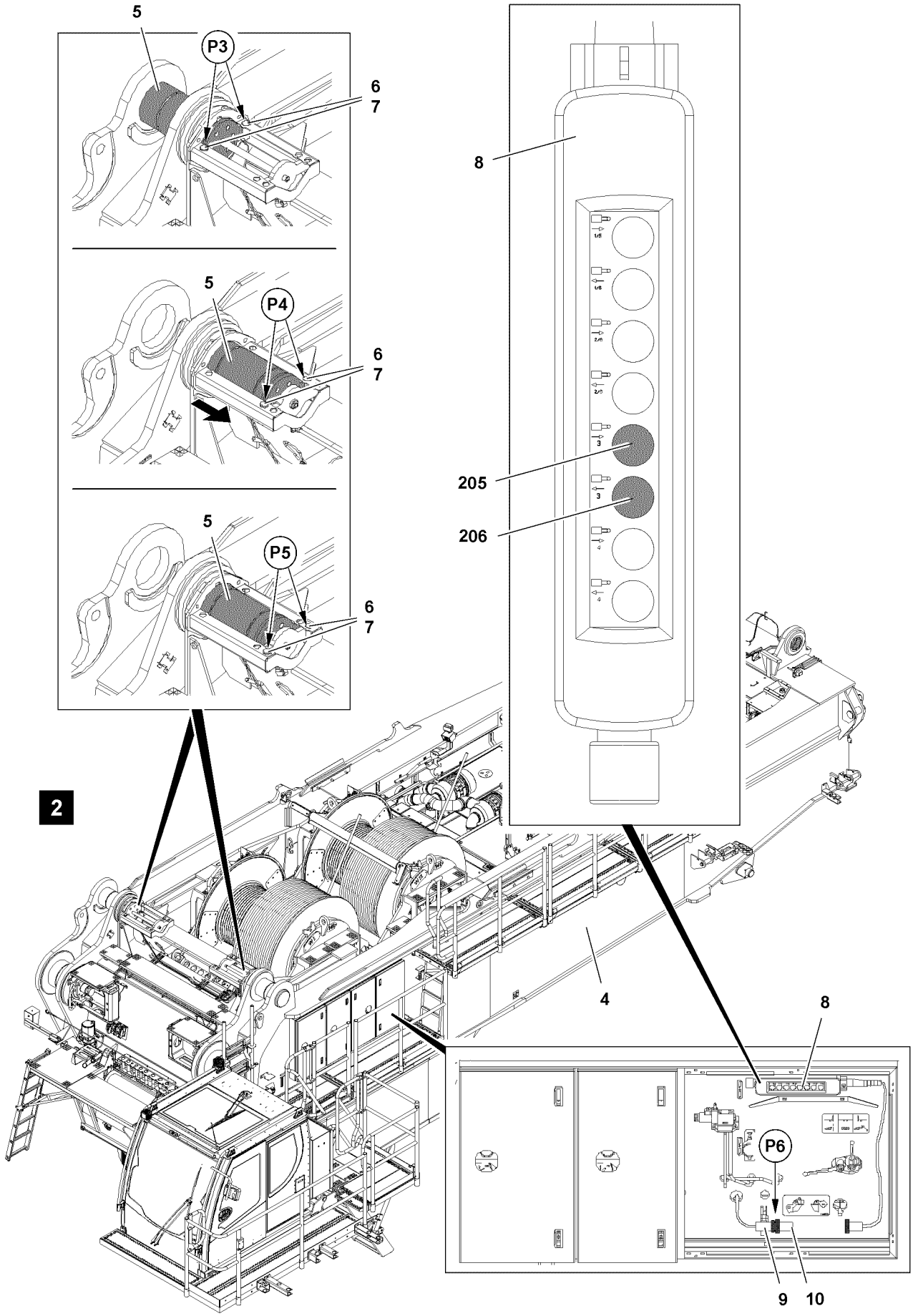

Fig.116916

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3.1 Preparing the pin locations on the turntable

Make sure that the following prerequisites are met:
- The installation of the turntable **4** on the crawler center section is completed.
- The crawler center section is laying on the supporting bases or is standing in tracks.
- The crane is aligned in horizontal direction.
- The crane engine is running.

WARNING
Danger of falling!
During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe injury, property damage.
▶ Use personal protective equipment.

▶ Release the pin **5**: Remove the safety locking pin **7** on both sides at points **P3** and unpin the retaining pin **6**, see illustration **2**.
▶ Insert the retaining pin **6** at points **P4** on both sides and secure with safety locking pin **7**, see illustration **2**.
▶ Open the control cabinet on the turntable **4**, see illustration **2**.
▶ Remove the dummy plug **10** on the connection **9** at point **P6**, see illustration **2**.

Note
▶ Electrical connections, see Electric wiring diagram.

▶ Connect the control panel **8** on the connection **9** at point **P6**, see illustration **2**.
▶ Unpin the pin **5**: Press button **205** on the control panel **8**, see illustration **2**.

When the pins **5** are unpinned:
▶ Remove the safety locking pin **7** on both sides at points **P4** and unpin the retaining pin **6**, see illustration **2**.
▶ Insert the retaining pin **6** at points **P5** on both sides and secure with safety locking pin **7**, see illustration **2**.

Result:

– The pin is prepared for unpinning.

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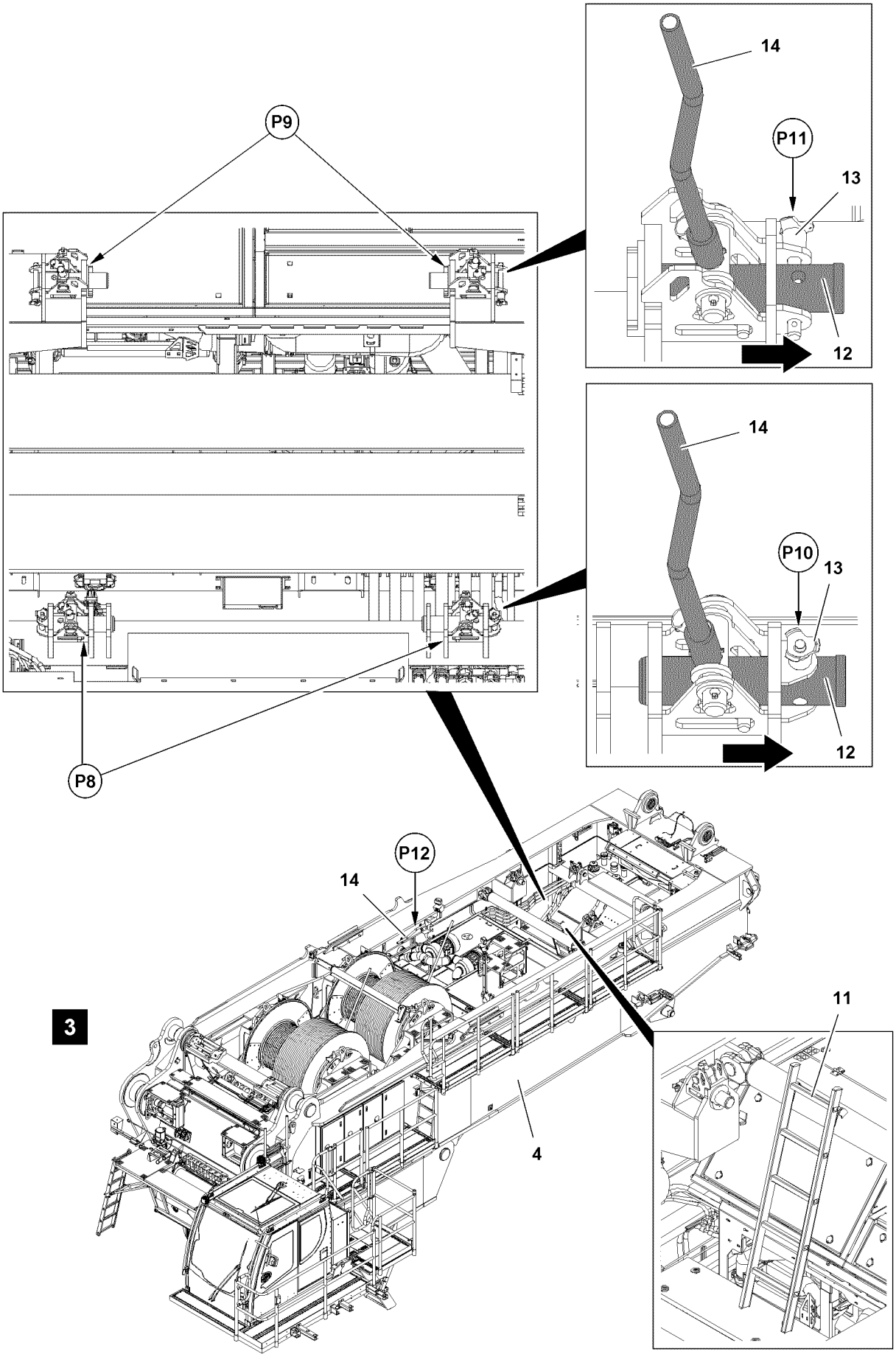

Fig.116917

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WARNING
Danger of falling!
During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe injury, property damage.
▶ Use personal protective equipment.

Note
▶ Bring the ladder **11** into assembly / park position, see Crane operating instructions, chapter 2.06.

▶ Bring the ladder **11** in assembly position, see illustration **3**.
▶ Release the pins **12** at points **P8** and on points **P9**: Unpin the ball locking pins **13** at points **P10** and points **P11**, see illustration **3**.

Note
▶ The lever **14** is positioned at point **P12** in the transport position, see illustration **3**.

▶ Unpin pins **12** at points **P8** and points **P9** with the lever **14**, see illustration **3**.
▶ Secure the pins **12** at points **P8** and points **P9**: Insert the ball locking pins **13** at points **P10** and points **P11**, see illustration **3**.

NOTICE
Danger of property damage!
If the ladder **11** is not in park position at installation of the SA-frame in the turntable, then a collision will occur at installation of the SA-frame between winch 4 and the ladder **11**.
This could result in high property damage.
▶ Make sure that the ladder **11** is in park position at installation of the SA-frame in the turntable.

When all pins **12** are unpinned and secured at points **P8** and points **P9**:
▶ Bring the ladder **11** in park position.

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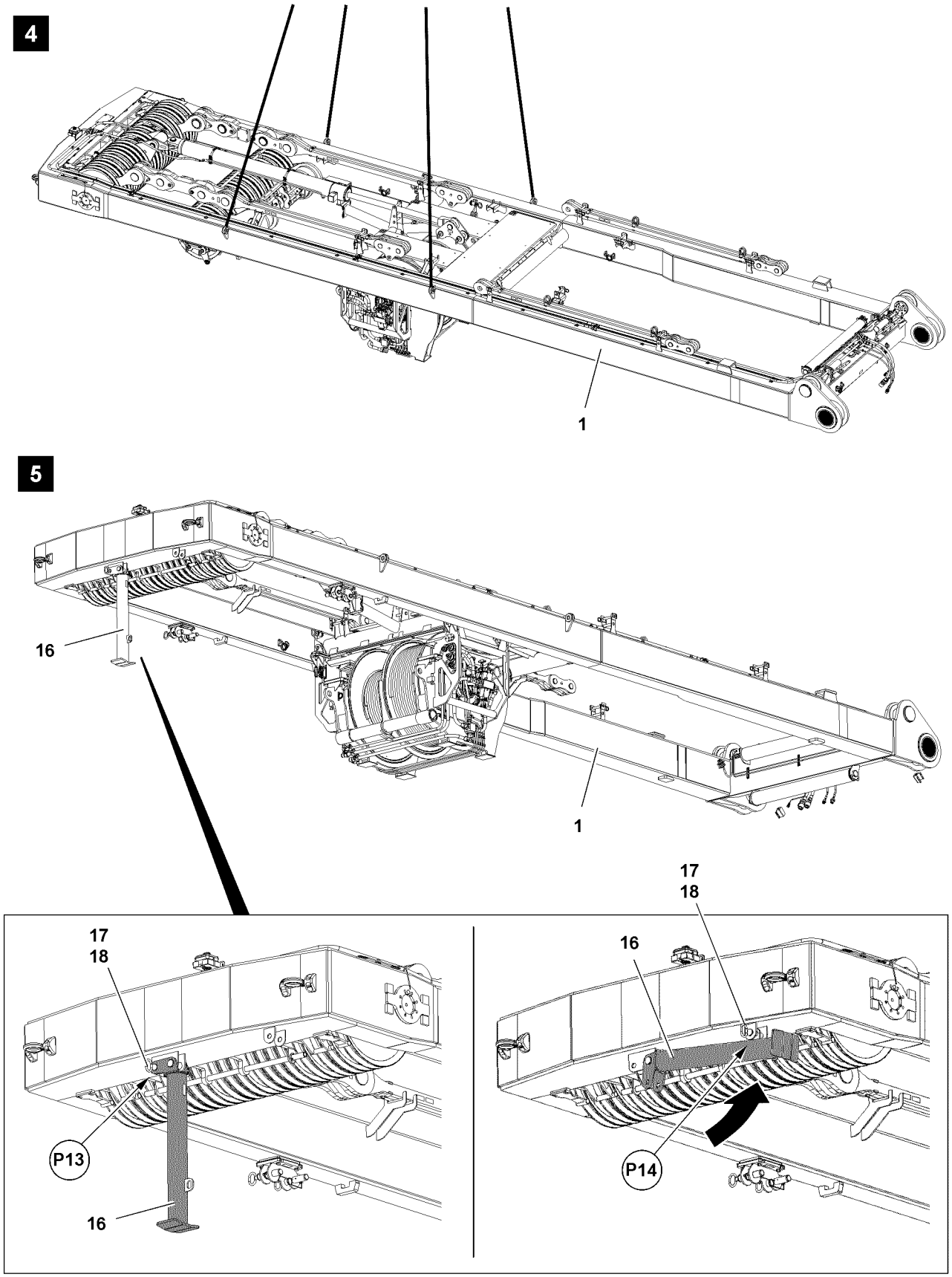

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Fig.116918

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3.2 Pinning the SA-frame on the turntable

3.2.1 Fastening the SA-frame on the auxiliary crane

Make sure that the following prerequisites are met:
- The ladder **11** is in park position.
- An auxiliary crane with an adequate load-bearing capacity is available.

WARNING
Danger of falling!
During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe injury, property damage.
▶ Use personal protective equipment.

▶ Attach the fastening equipment on the SA-frame **1**, see section „Fastening points SA-frame“.
▶ Tension the fastening equipment.

When the fastening equipment is tensioned:
▶ Release the rigging between the SA-frame **1** and the transport vehicle.
▶ Lift the SA-frame **1** with the auxiliary crane, see illustration **4**.

3.2.2 Swinging the support into operating position

▶ Release the support **16** at point **P13** from the transport position: Remove the safety locking pin **18** and unpin the pin **17**, see illustration **5**.

WARNING
Support swinging down!
The support **16** can swing down during pinning.
Death, severe injury, property damage.
▶ For safety reasons, carry out the pinning of the support always with **two** persons.
▶ Make sure that there are no persons within the danger zone during the entire pin procedure.

Note
▶ The weight of the support is 35 kg.

▶ Swing the support **16** into operating position, see illustration **5**.
▶ Secure the support **16** at point **P14** in operating position: Insert the pin **17** and secure with safety locking pin **18**, see illustration **5**.

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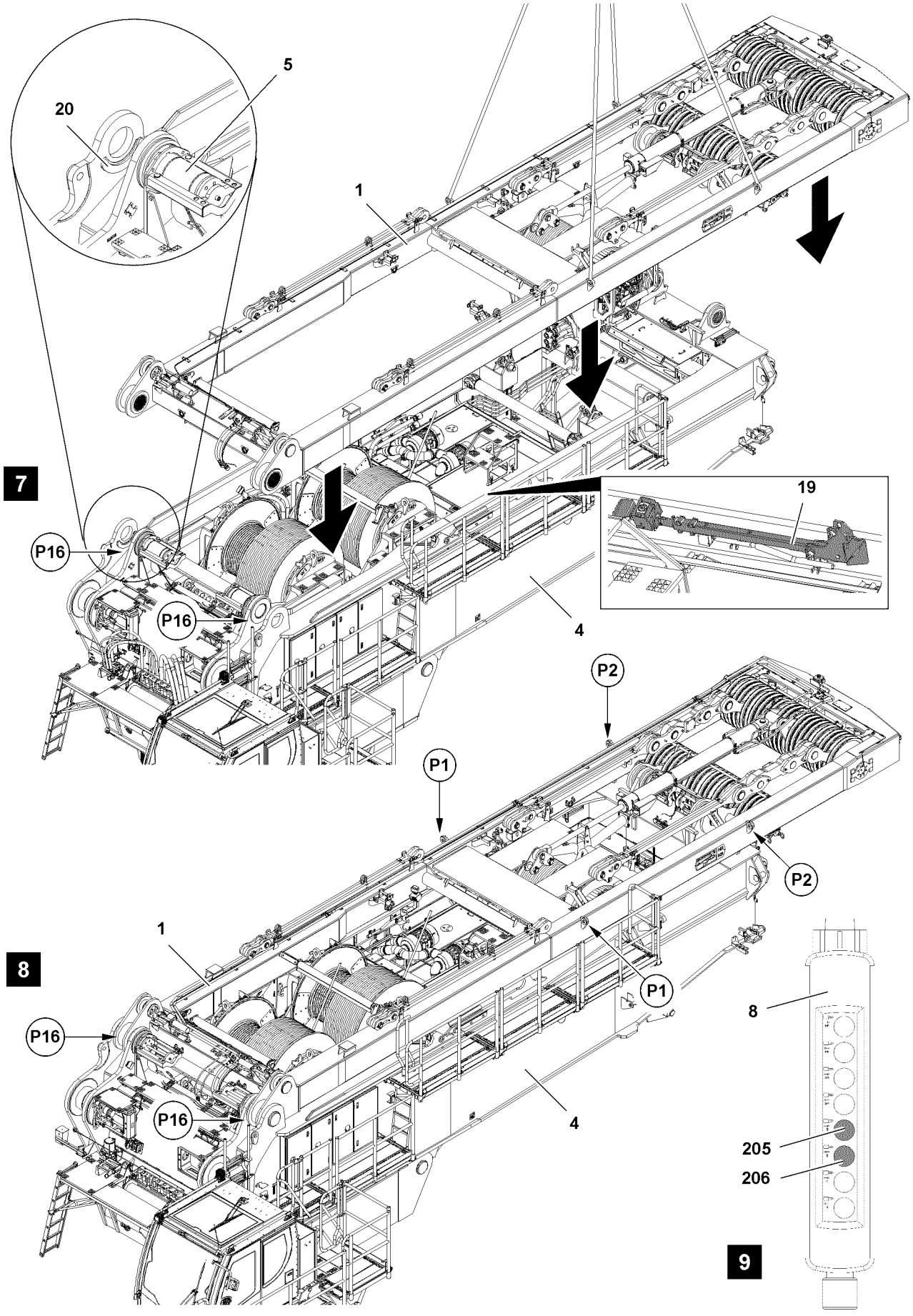

Fig.116919

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3.2.3 Pinning the SA-frame

Make sure that the following prerequisites are met:
- The pins on the turntable for the installation of the SA-frame are unpinned.
- The pins on the turntable for the installation of winch 4 are unpinned.
- The pins on the pulley support for the installation on the turntable are unpinned.
- The camera for winch 1 has been placed down.
- The crane engine is running.

WARNING
Danger of falling!
During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe injury, property damage.
▶ Use personal protective equipment.

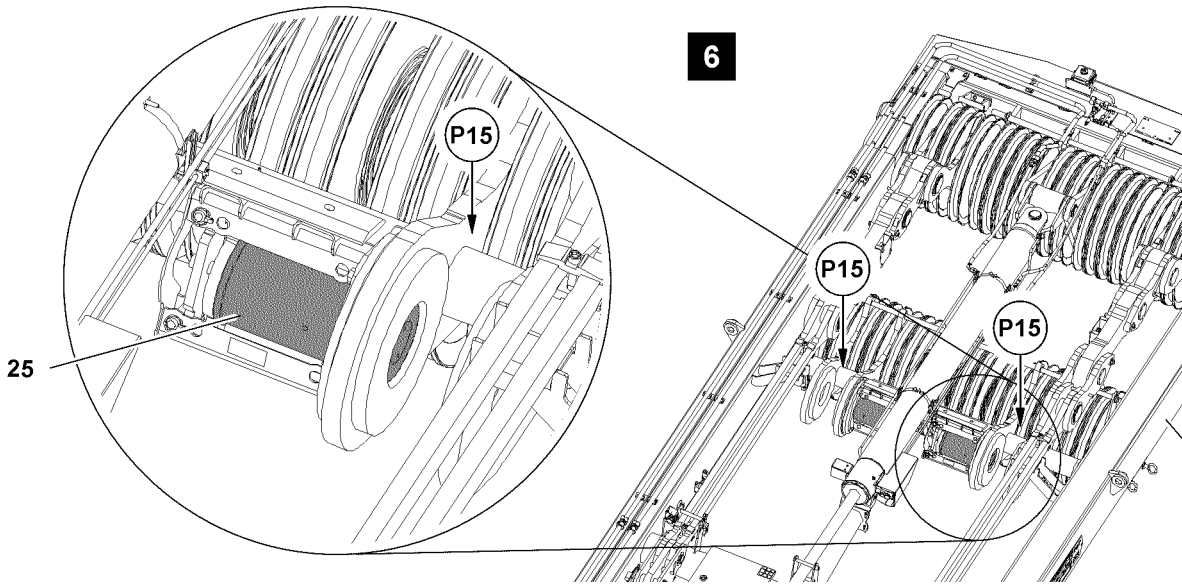

*Fig.116923: The pins **25** are unpinned.*

NOTICE
Danger of property damage!
If the pins **25** at points **P15** are in **pinned** position when moving the SA-frame in the turntable, components can be severely damaged.
▶ Make sure that the pins **25** of the SA-frame at points **P15** are in **unpinned** position when moving in, see illustration **6**.

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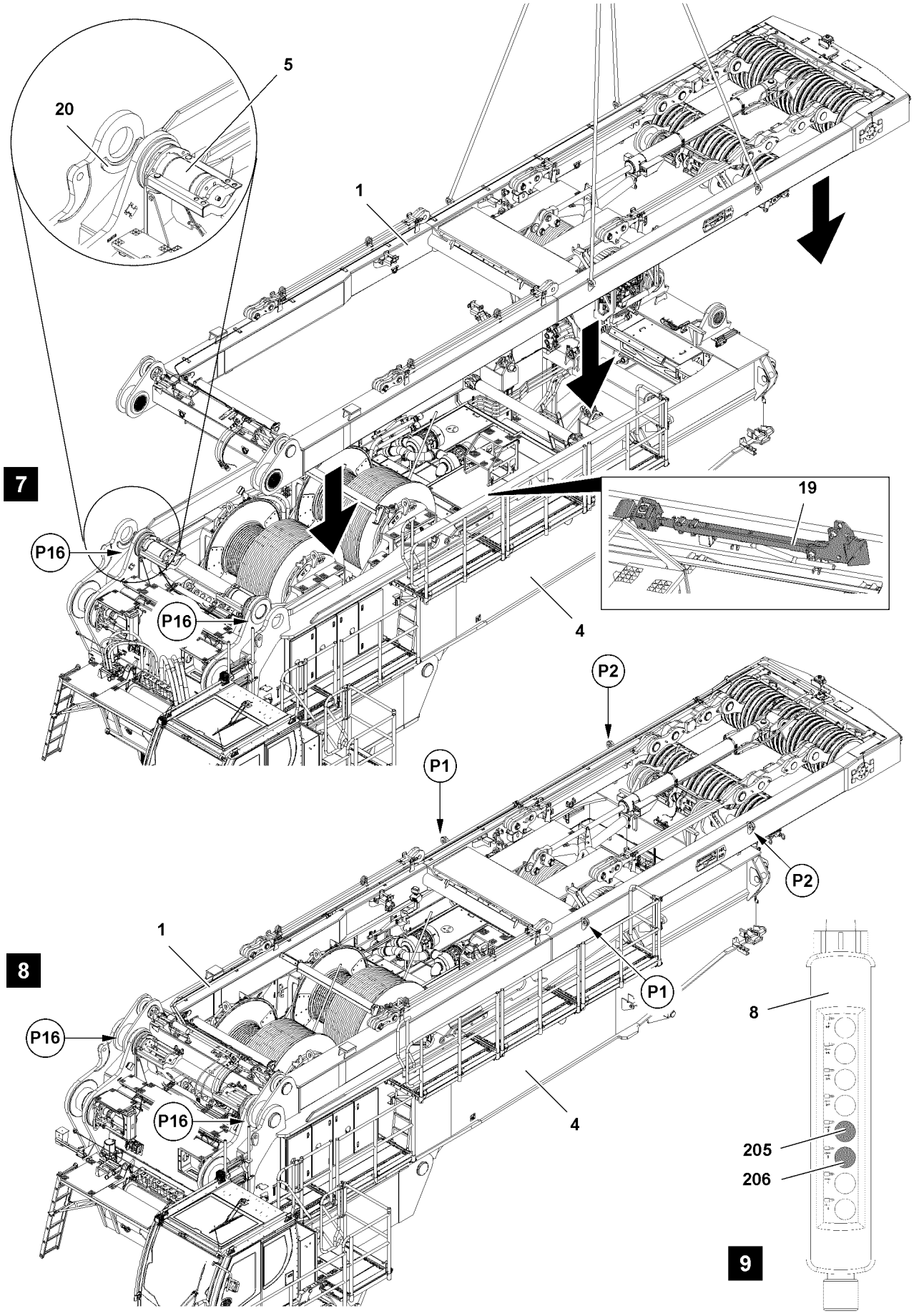

Fig.116919

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NOTICE
Danger of property damage!
If the pins **5** at points **P16** are in **pinned** position when moving the SA-frame in the turntable, components can be severely damaged.
▶ Make sure that the pins **5** are in **unpinned** position when moving the SA-frame into the turntable, see points **P16** / in illustration **7**.

NOTICE
Danger of property damage!
If the camera for winch 1 **19** is in operating position - when swinging the SA-frame to the turntable - it will be damaged when moving the SA-frame in.
▶ Make sure that the camera for winch 1 **19** is in transport position when moving the SA-frame in, see illustration **7**.

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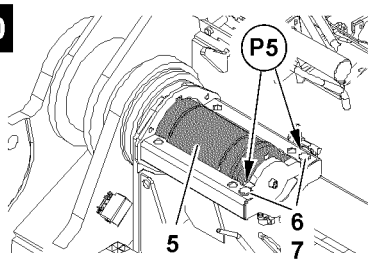

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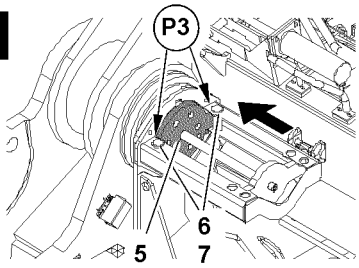

*Fig.116920: Insert the pin **5**.*

▶ Lift the SA-frame **1** with the auxiliary crane and position it on the turntable **4**.
▶ Place the SA-frame **1** in the centerings **20** at point **P16** on the turntable **4**, see illustration **7**.

Result:

– Align the pin bores.

▶ Insert the pin **5**: Press button **206** on the control panel **8**, see illustration **9** and illustration **10**.

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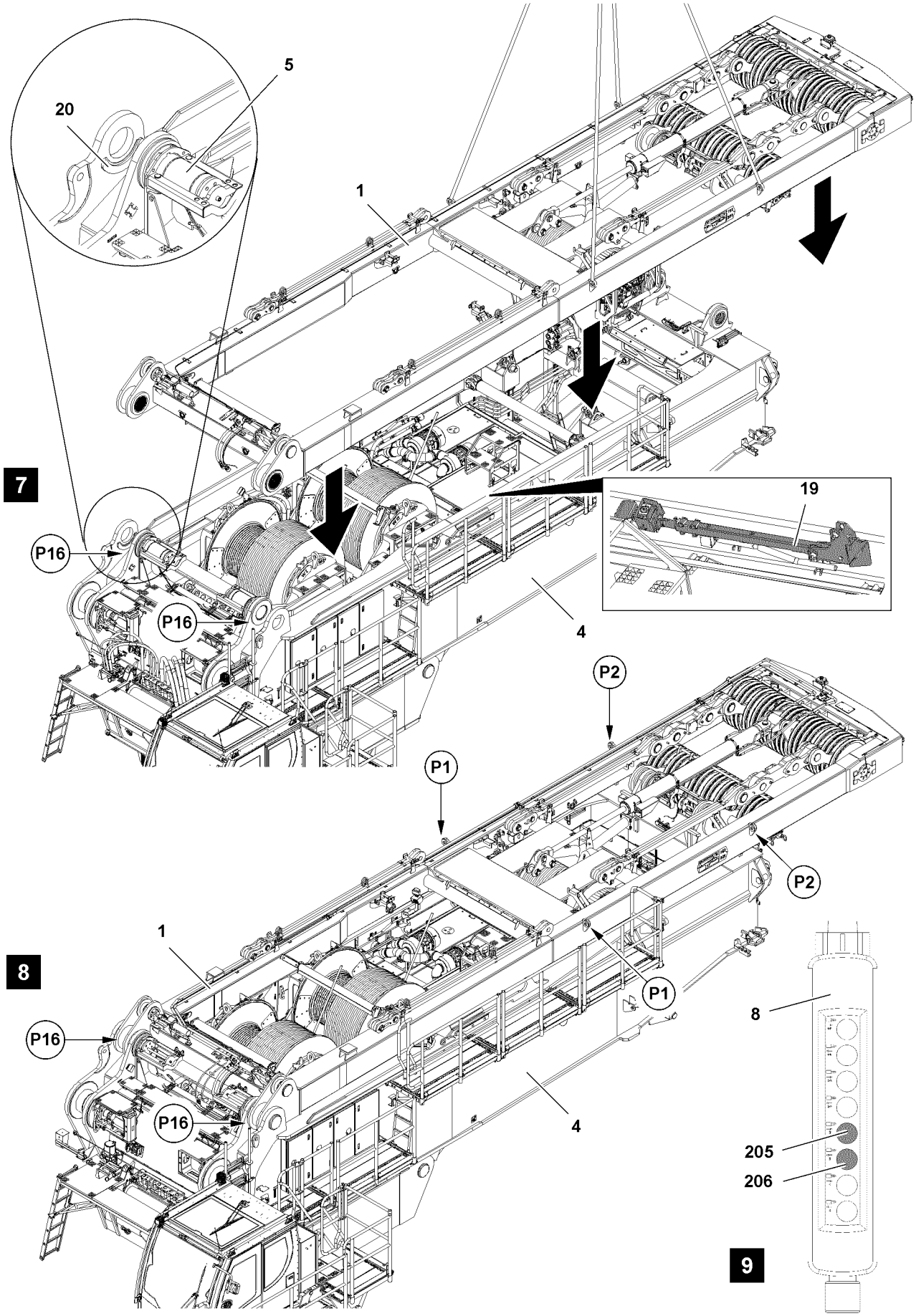

Fig.116919

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WARNING
The pin is not secured!
If the pins **5** are not secured, the pins can loosen up by themselves during crane operation.
This can cause the crane to topple over.
Death, severe injury, property damage.
▶ Make sure that the pins **5** with pins **6** are secured.

*Fig.116920: Insert the pin **5**.*

When the pins **5** are pinned:
▶ Remove the safety locking pin **7** on both sides at points **P5** and unpin the retaining pin **6**, see illustration **10**.
▶ Insert the retaining pin **6** at points **P3** on both sides and secure with safety locking pin **7**, see illustration **11**.

When the SA-frame is pinned:
▶ Remove the fastening equipment on points **P1**, see illustration **8**.

WARNING
Danger of falling!
Death, severe injury, property damage.
▶ The fastening equipment may only be removed on points **P2** with the aid of a work platform.

▶ Remove the fastening equipment on points **P2**, see illustration **8**.

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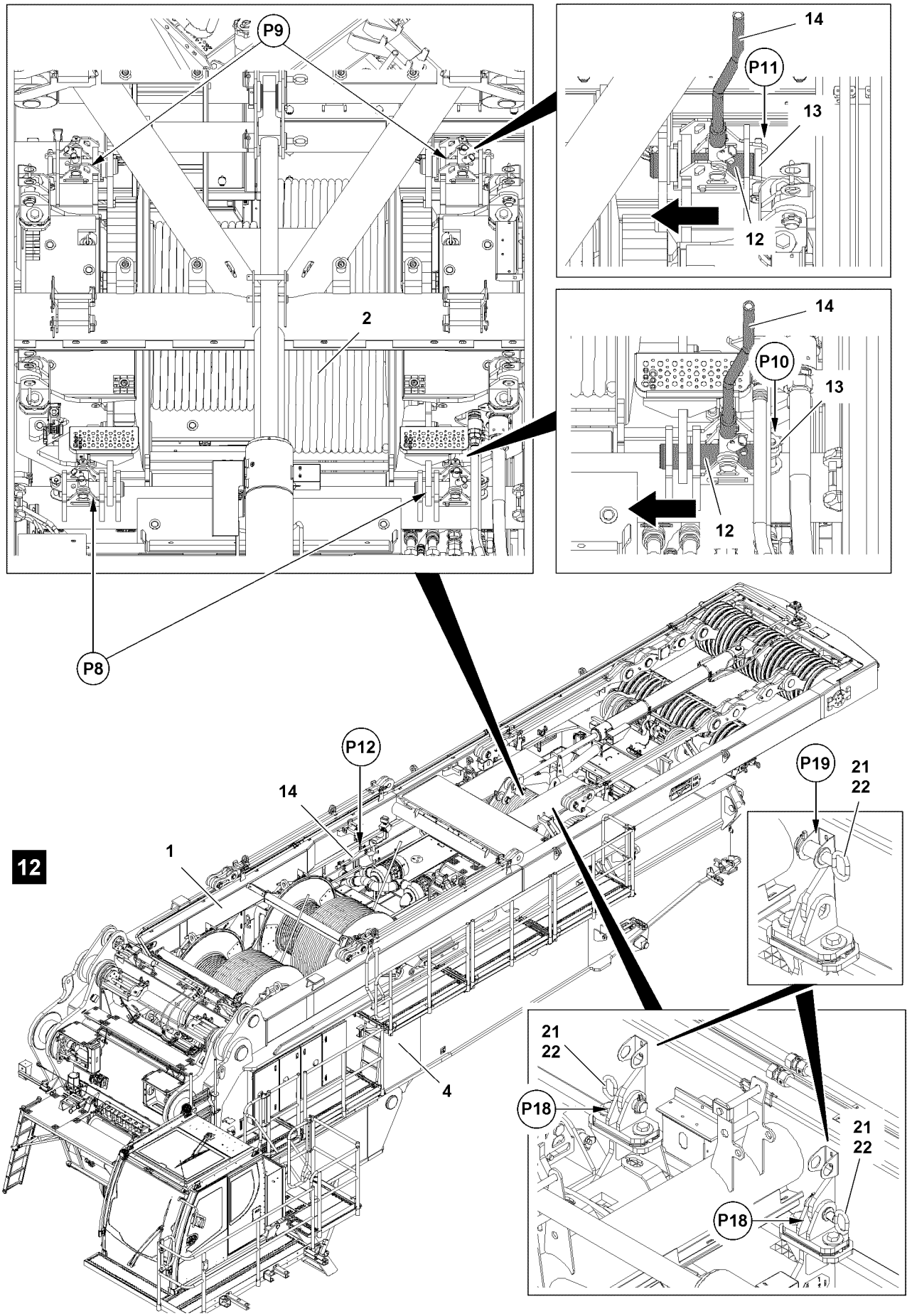

Fig.116921

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3.3 Pinning winch 4 on the turntable

Make sure that the following prerequisites are met:
- The SA-frame is pinned on the turntable.
- The fastening equipment has been removed.

WARNING
Danger of falling!
During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe injury, property damage.
▶ Use personal protective equipment.

▶ Release the pins **12** at points **P8** and on points **P9**: Unpin the ball locking pins **13** at points **P10** and points **P11**, see illustration **12**.

Note
▶ The lever **14** is positioned at point **P12** in the transport position, see illustration **12**.

▶ Insert pins **12** at points **P8** and points **P9** on both sides with the lever **14**, see illustration **12**.

WARNING
The pin is not secured!
If the pins **12** are not secured, the pins can loosen up by themselves during crane operation.
This can cause the crane to topple over.
Death, severe injury, property damage.
▶ Make sure that the pins **12** are secured with ball locking pins **13**.

▶ Secure the pins **12** at points **P8** and points **P9**: Insert the ball locking pins **13** at points **P10** and points **P11**, see illustration **12**.

When winch 4 is pinned on the turntable and secured:
▶ Remove the safety locking pins **22** at points **P18** and unpin the connector pins **21**, see illustration **12**.

Result:

– Winch 4 is released from the SA-frame.

▶ Insert the connector pins **21** at points **P19** in park position and secure with safety locking pin **22**.

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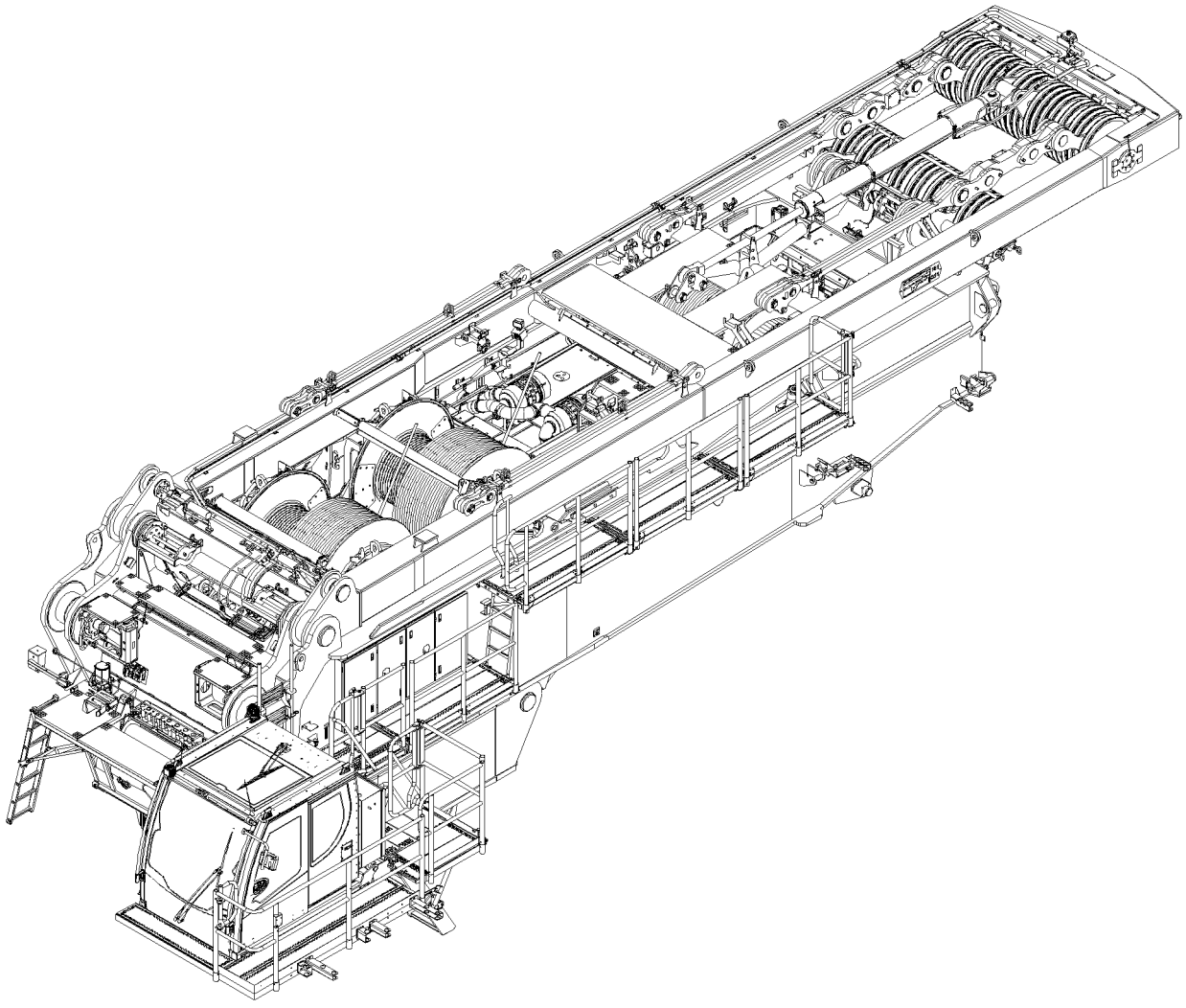

Fig.116922

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3.4 Establishing the connections to the SA-frame

Make sure that the following prerequisites are met:
- The SA-frame is installed, pinned and secured.
- The winch 4 is installed, pinned and secured.

3.4.1 Establishing the hydraulic connections

The hydraulic connections are made with quick couplings.

When connecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

WARNING
Pressure in the hydraulic lines!
If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.
Death, severe injury, property damage.
▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

WARNING
Loss of pressure or leakage!
Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.
Death, severe injury, property damage.
▶ Check that the quick couplings have been properly connected before using the crane.

▶ Connect the coupling components (sleeve and connector) and screw together with the hand-tightened nut.
▶ Tighten the hydraulic coupling by hand. Rotate the hand-tightened nut until it reaches a tangible, fixed stop position.
▶ Establish the hydraulic connections, see Hydraulic diagram.

3.4.2 Establishing the electrical connections

▶ Establish the electrical connections, see Electric wiring diagram.

3.4.3 Establishing the connections to the central lubrication system

▶ Establish the connections to the central lubrication system.

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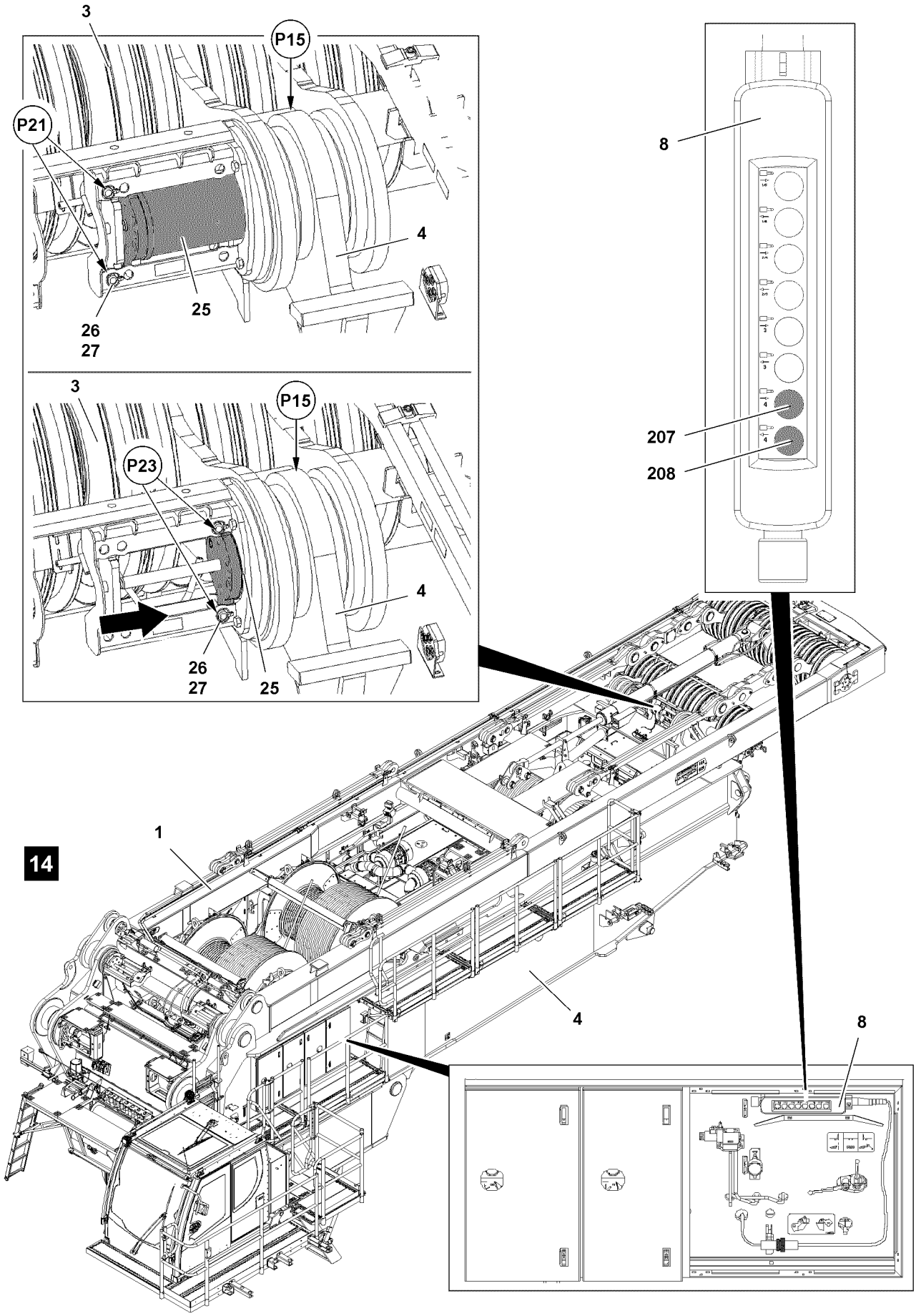

Fig.116924

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3.5 Pinning the pulley support with the turntable

Make sure that the following prerequisites are met:
- All hydraulic connections have been made.
- All electrical connections have been made.
- The connections of the central lubrication system are established.
- The pins **26** are on points **P21**.
- The crane engine is running.

WARNING
Danger of falling!
During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe injury, property damage.
▶ Use personal protective equipment.

▶ Pin the pulley support **3** with the turntable **4** at points **P15** on both sides: Press button **208** on the control panel **8**, see illustration **14**.

Result:

– The pins **25** extend.

When the pins **25** are pinned:
▶ Remove the safety locking pin **27** on both sides at points **P21** and unpin the retaining pin **26**, see illustration **14**.

WARNING
The pin is not secured!
If the pins **25** are not secured, the pins can loosen up by themselves during crane operation.
This can cause the crane to topple over.
Death, severe injury, property damage.
▶ Make sure that the pins **25** with pins **26** are secured.

▶ Insert the retaining pin **26** at points **P23** on both sides and secure with safety locking pin **27**, see illustration **14**.

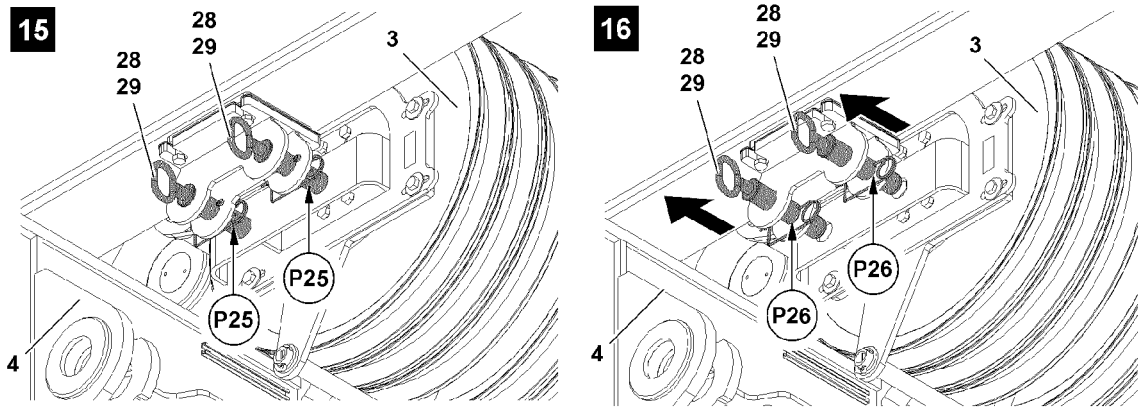

Fig.116925: Release the pulley support from the SA-frame

When pulley support **3** is pinned and secured on the turntable **4**:
▶ Release the pulley support **3** from the SA-frame: Remove the spring retainer **29** on points **P25** on both sides and unpin the grip pin **28** to the stop, see illustration **15**.
▶ Secure the grip pin **28** in park position with spring retainer **29** at points **P26**, see illustration **16**.

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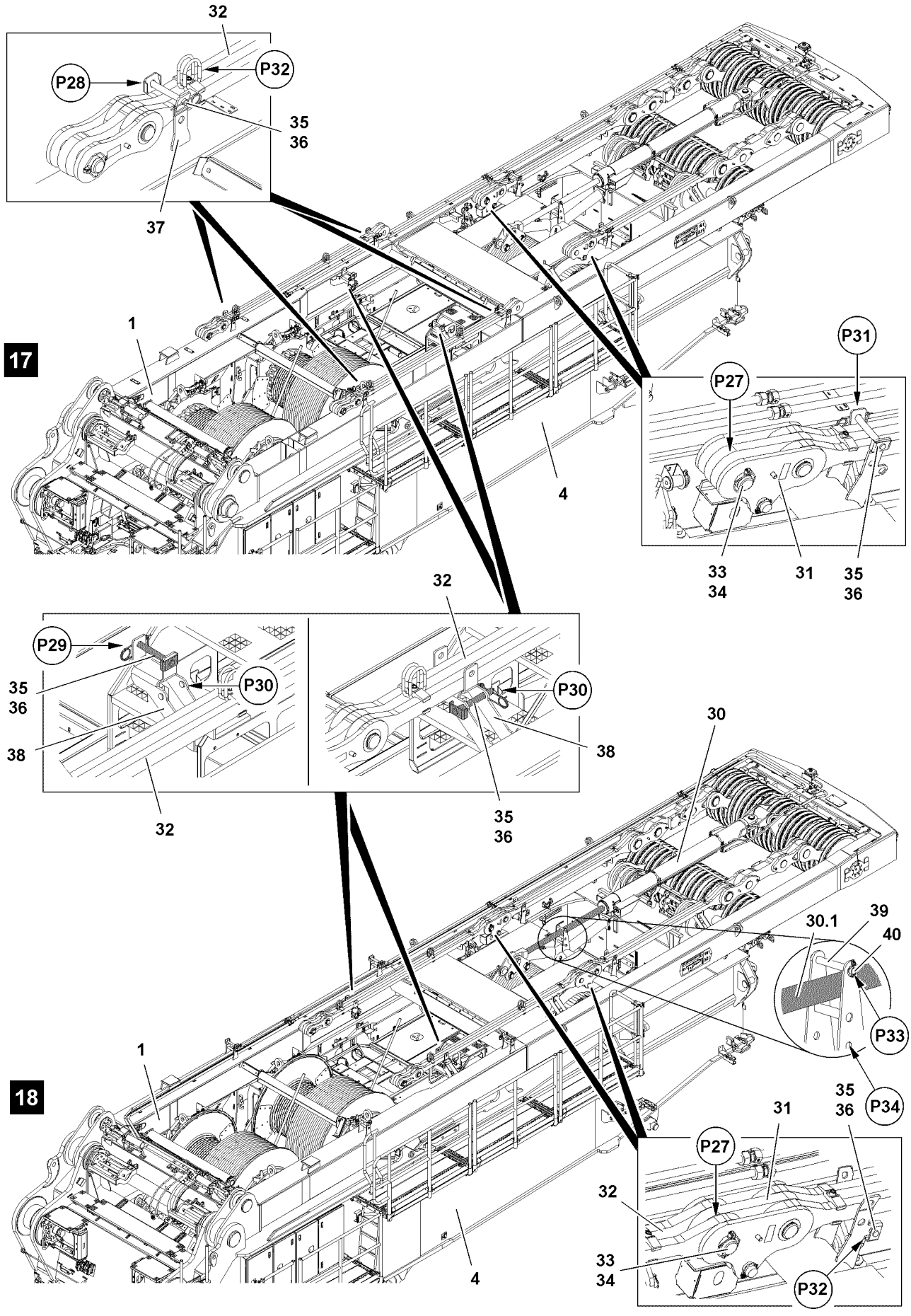

Fig.122241

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3.6 Pinning the pull rods

Make sure that the following prerequisites are met:
- The winch 4 is installed, pinned and secured.
- The pulley support is pinned and secured on the turntable.

WARNING
The crane can topple over!
Death, severe injury, property damage.
▶ The guying must be installed according to the rod plans, see Rod plan.

▶ Prepare the connection point on the pull rods **31**: Remove the safety locking pin **34** at points **P27** and unpin the connector pin **33**.
▶ Remove the spring retainer **36** at points **P28** on the retainers **37** and unpin pin **35**.

Result:

– The pull rods **32** are released and can be removed from the retainers **37**.

▶ Prepare the placement location for the pull rods **32**: Remove the spring retainer **36** at points **P29** and unpin pin **35** on the retainers **38**.
▶ Insert pin **35** on points **P30** in park position and secure with spring retainer **36**.
▶ Attach the pull rods **32** on the points **P32** on the auxiliary crane.
▶ Lift the pull rods **32** and swing to the connection point on the pull rods **31**.
▶ Insert the pin **35** again at points **P28** and secure with spring retainer **36**.
▶ Place the pull rods **32** in operating position on retainers **38** so that the bores align at the connection point.

WARNING
The pin is not secured!
If the connector pins are not secured, the connector pins can loosen up by themselves during crane operation.
This can cause the crane to topple over.
Death, severe injury, property damage.
▶ Make sure that the connector pins **33** are secured with safety locking pins **34**.

▶ Insert the connector pins **33** at points **P27** and secure with safety locking pin **34**.

Result:

– The pull rods **31** are pinned and secured with pull rods **32** for crane operation.

▶ Release the pull rods **31**: Remove the spring retainer **36** at points **P31** and unpin pin **35**.
▶ Insert pin **35** on points **P32** in park position and secure with spring retainer **36**.

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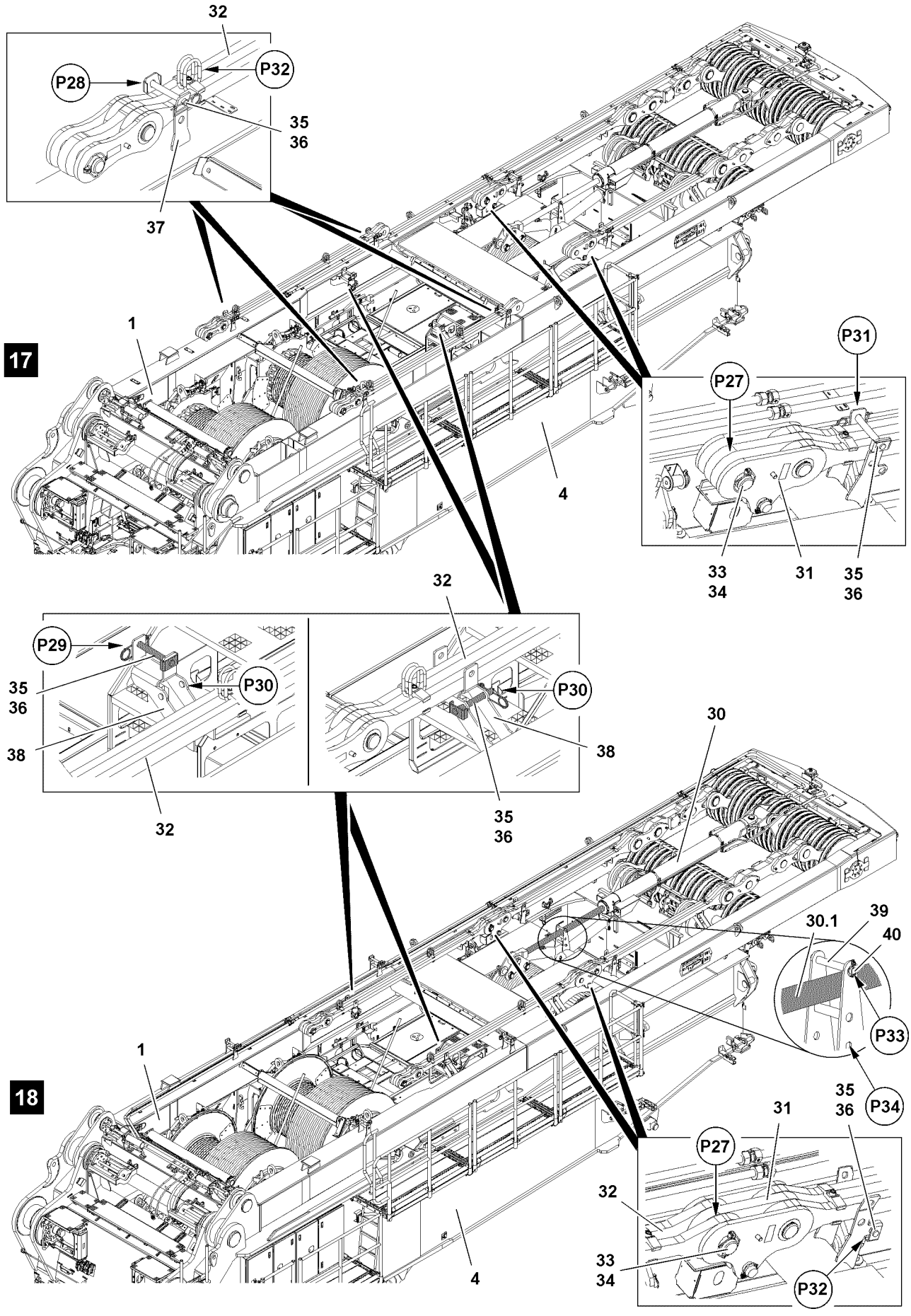

Fig.122241

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WARNING
Danger due to oscillating guying!
During assembly work with the SA-frame, the pull rods can start to move back and forth.
Death, severe injury, property damage.
▶ During assembly work with the SA-frame make sure that the pull rods are secured in their retainers.

When additional assembly work must be carried out with the SA-frame:
▶ Pin and secure the pull rods **31** and pull rods **32** on the retainers.

3.7 Removing the transport retainer on the assembly cylinder

If the assembly cylinder **30** on the SA-frame is required for crawler assembly, then the transport retainer of the assembly cylinder must be removed.

Note
▶ Before erecting the SA-frame in operation position, remove the transport retainer of the assembly cylinder.

WARNING
Danger of accident due to assembly cylinder!
If the SA-frame is erected to more then 90° after removing the transport retainer, then the assembly cylinder **30** swings forward by itself.
Death, severe injury, property damage.
▶ Make sure that no personnel is within the danger zone when erecting the SA-frame.
▶ Make sure that no objects or obstacles are within the danger zone.

▶ Release retaining pin **39** on point **P33** and unpin.

When the retaining pin **39** is unpinned at point **P33**:
▶ Insert the retaining pin **39** at point **P34** in transport position and secure with spring retainer **40**.

Result:

– The assembly cylinder is prepared for crawler carrier assembly.

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Fig.195219

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4 Disassembling the SA-frame

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe injury, property damage.
- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe injury, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.
Death, severe injury, property damage.
- ▶ Do not disengage the auxiliary crane until the corresponding component is pinned and secured.

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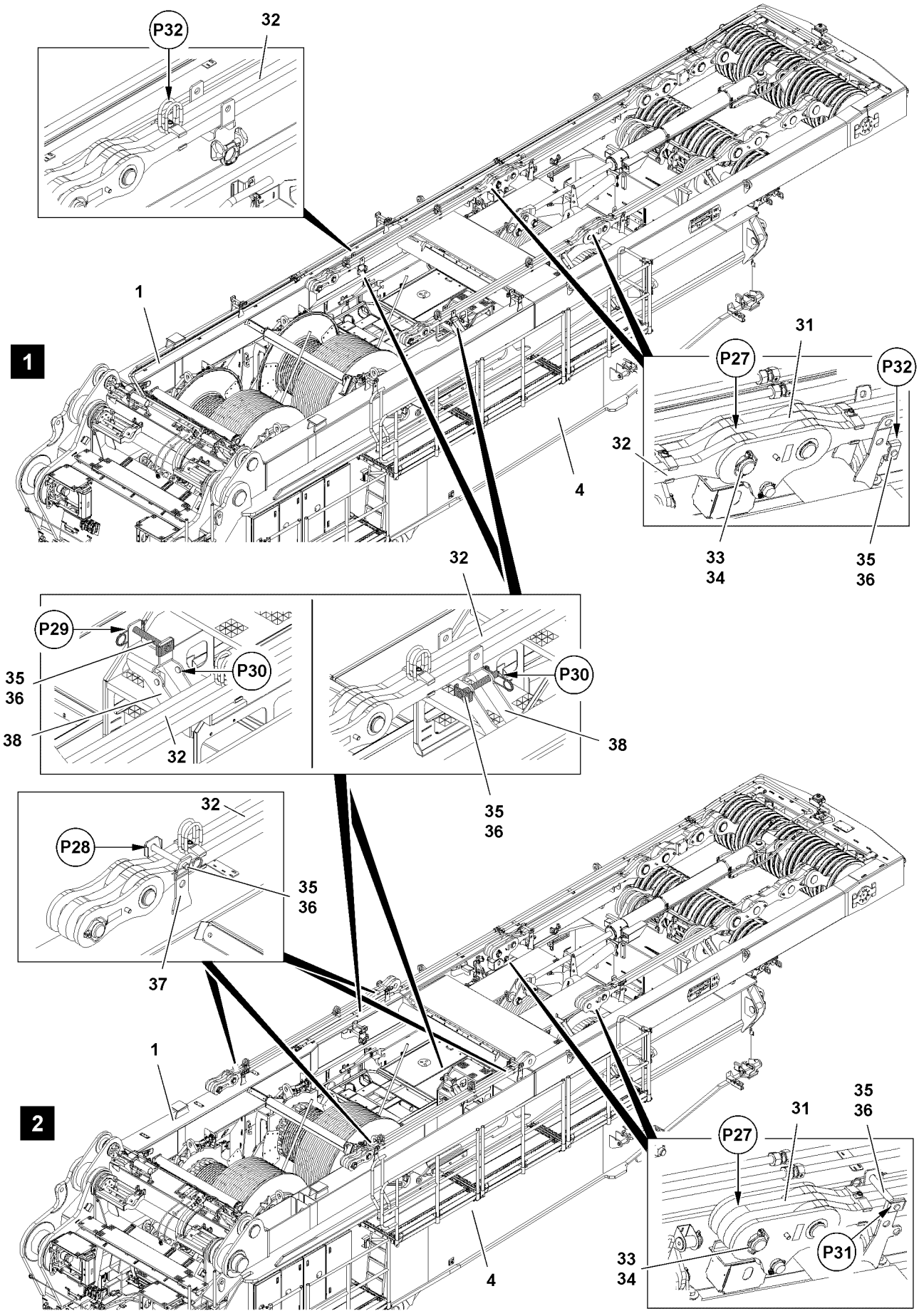

Fig.116927

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4.1 Unpinning the pull rods

Make sure that the following prerequisite is met:
– The SA-frame is laying all the way on the turntable.

▶ Remove the spring retainer **36** at points **P32** from the park position and unpin the pin **35**, see illustration **11**.

WARNING
The pin is not secured!
If the pins **35** are not secured, the connector pins can loosen up by themselves during transport operation.
Death, severe injury, property damage.
▶ Make sure that the pins **35** are secured with spring retainers **36**.

▶ Secure the pull rods **31**: Insert the pin **35** at points **P31** and secure with spring retainer **36**, see illustration **2**.
▶ Remove the safety locking pins **34** at points **P27** and unpin the connector pins **33**, see illustration **1**.

Result:

– The pull rods **31** are separated from pull rods **32**.

▶ Remove the spring retainers **36** at points **P28** on the retainers **37** and unpin the pin **35**, see illustration **1**.

Result:

– The pull rods **32** can be placed in the retainers **37**.

▶ Fasten the pull rods **32** at points **P32** on the auxiliary crane, see illustration **1**.
▶ Lift the pull rods **32** and swing to park position on the SA-frame **1**.
▶ Place the pull rods **32** in park position on the retainers **37**, see illustration **2**.

WARNING
The pin is not secured!
If the pins **35** are not secured, the connector pins can loosen up by themselves during transport operation.
Death, severe injury, property damage.
▶ Make sure that the pins **35** are secured with spring retainers **36**.

▶ Insert the pins **35** at points **P28** again and secure with spring retainer **36**, see illustration **2**.

Result:

– The pull rods **31** are pinned and secured for transport.

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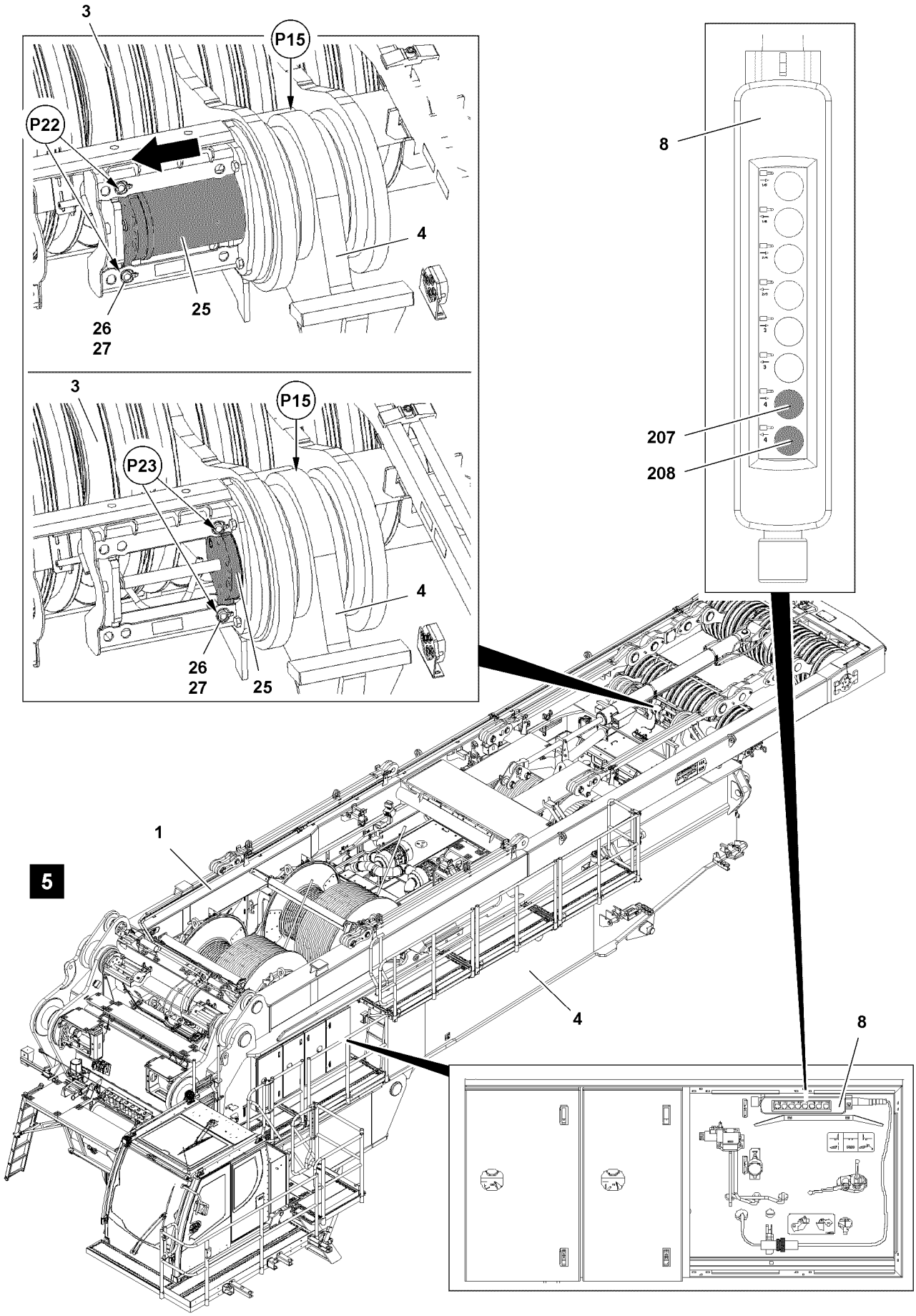

Fig.116929

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4.2 Unpinning the pulley support on the turntable

Make sure that the following prerequisite is met:
- All hydraulic connections have been made.
- The crane engine is running.

WARNING
Danger of falling!
During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe injury, property damage.
▶ Use personal protective equipment.

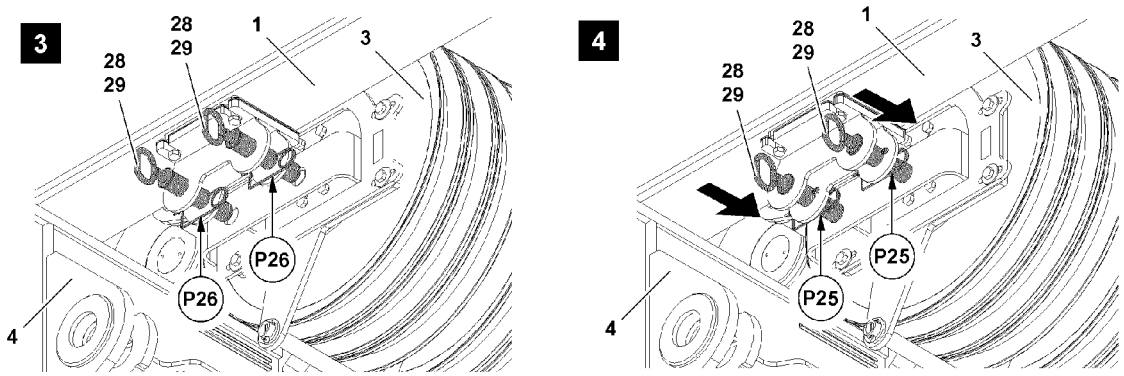

Fig.116928: Connect the pulley support with the SA-frame

▶ Connect the pulley support **3** with the SA-frame **1**: Remove the spring retainer **29** at points **P26** on both sides and insert the grip pin **28** to the stop, see illustration **3**.

WARNING
The pin is not secured!
If the grip pins **28** are not secured, the pins can loosen up by themselves during transport operation.
Death, severe injury, property damage.
▶ Make sure that the pins **28** are secured with spring retainers **29**.

▶ Secure the grip pin **28** with spring retainer **29** at points **P25**, see illustration **4**.

Result:

– The pulley support **3** is pinned and secured on the SA-frame **1** for transport.

▶ Remove the safety locking pin **27** on both sides at points **P23** and unpin the retaining pin **26**, see illustration **5**.
▶ Insert the retaining pin **26** at points **P22** on both sides and secure with safety locking pin **27**, see illustration **5**.

When the pulley support **3** is connected with the SA-frame **1**:
▶ Unpin the pulley support **3** on the turntable **4** at points **P15** on both sides: Press button **207** on the control panel **8**, see illustration **5**.

Result:

– The pins **25** move in.

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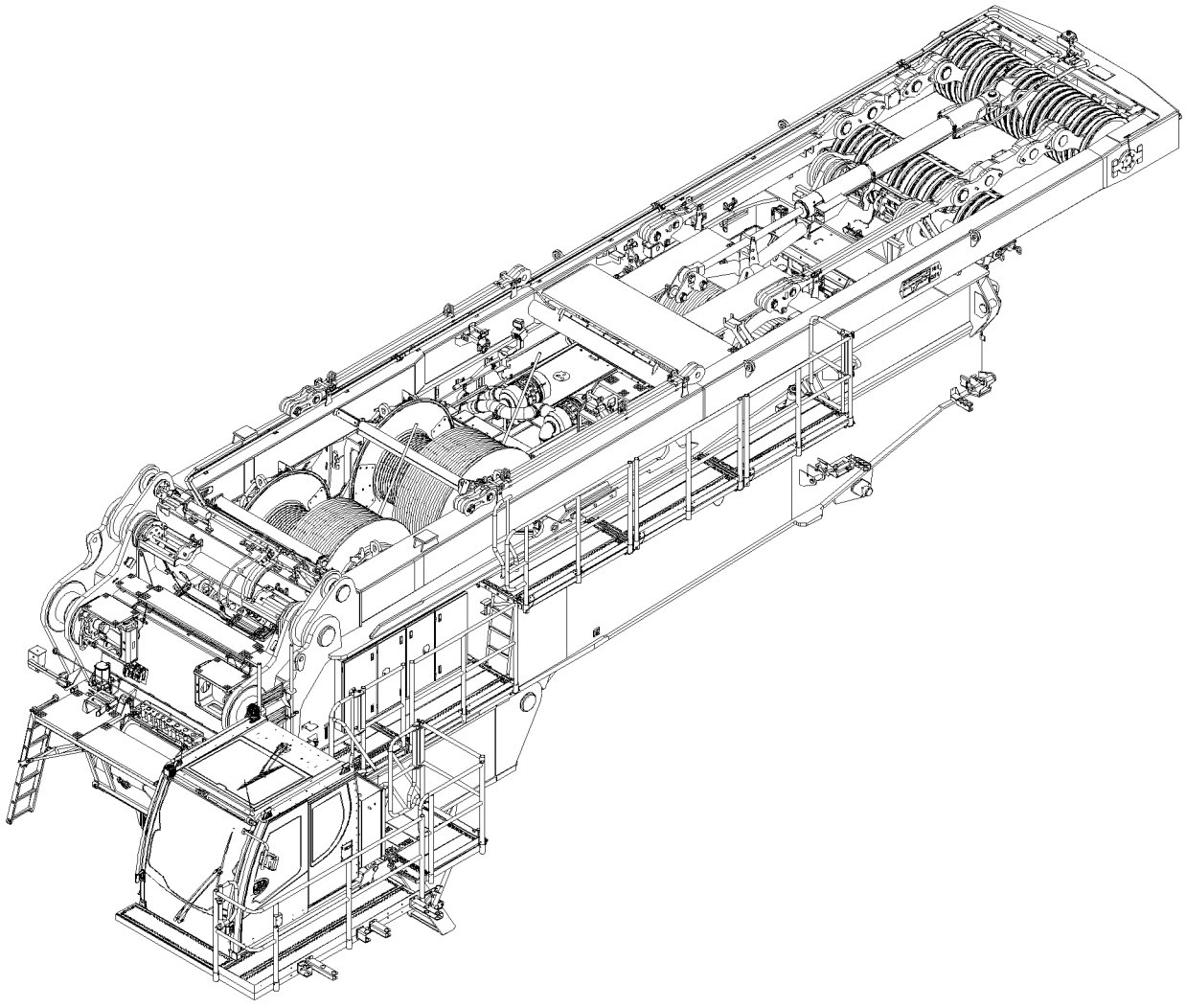

Fig.116922

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4.3 Disconnecting the connections to the SA-frame

4.3.1 Disconnecting the hydraulic connections

The hydraulic connections are made with quick couplings.

When disconnecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

WARNING
Pressure in the hydraulic lines!
If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.
Death, severe injury, property damage.
- ▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

- ▶ Release the hydraulic coupling by hand.
- ▶ Disconnect the hydraulic connections, see Hydraulic diagram.
- ▶ Protect the hydraulic connections from contamination with caps.

4.3.2 Disconnecting the electrical connections

- ▶ Disconnect the electrical connections, see Electric wiring diagram.

4.3.3 Disconnecting the connection to the central lubrication system

- ▶ Disconnect the connection to the central lubrication system.
- ▶ Protect the connections of the central lubrication system with caps from contamination.

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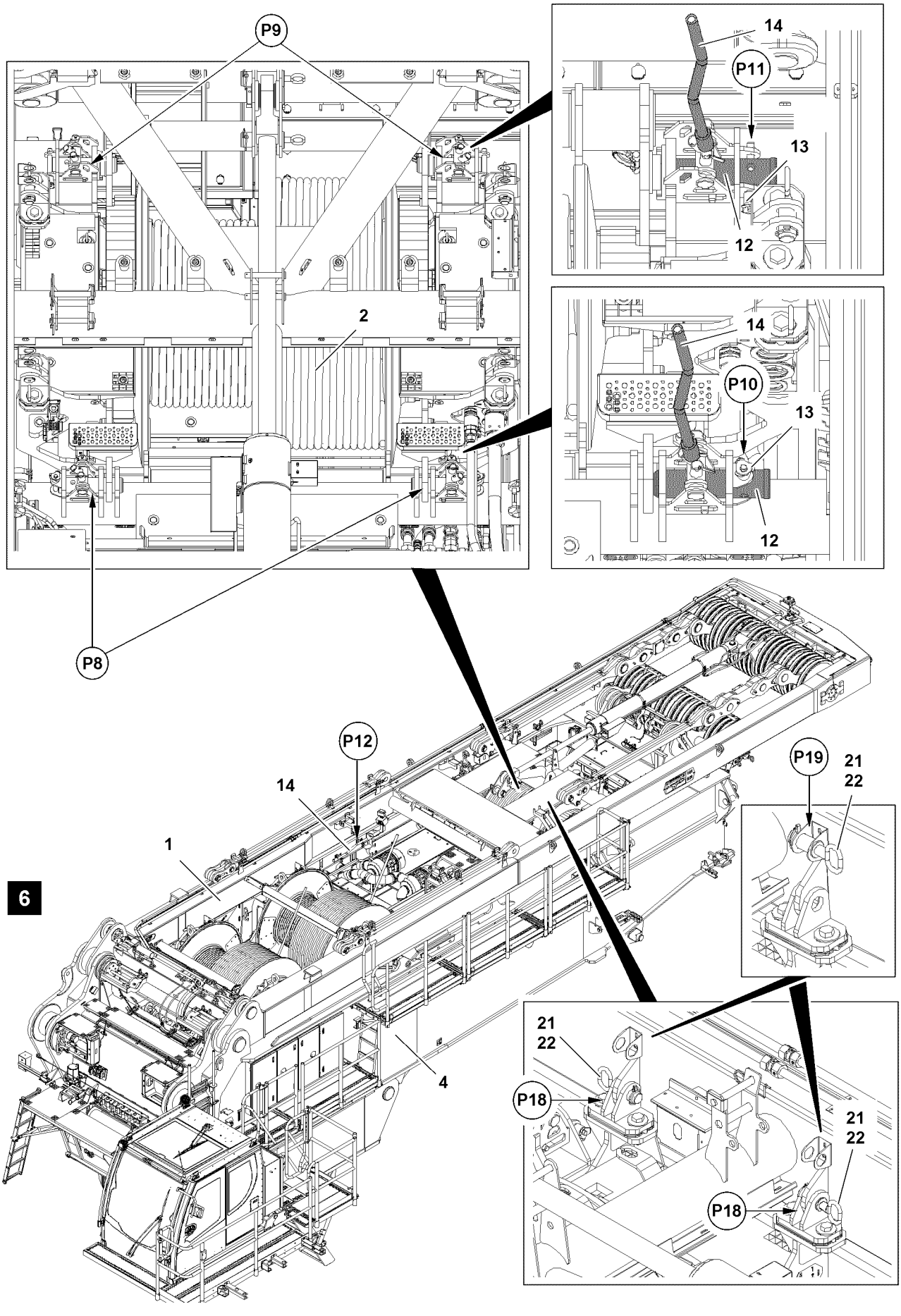

Fig.116930

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4.4 Unpinning winch 4 on the turntable

Make sure that the following prerequisite is met:
– The pull rods are placed down in transport position and are secured.

WARNING
Danger of falling!
During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe injury, property damage.
▶ Use personal protective equipment.

▶ Remove the safety locking pin **22** at points **P19** and unpin the connector pin **21** from park position.

WARNING
The pin is not secured!
If the connector pins **21** are not secured, the pins can loosen up by themselves during transport.
Death, severe injury, property damage.
▶ Make sure that the connector pins **21** are secured with safety locking pins **22**.

▶ Connect winch 4 with SA-frame: Insert the connector pins **21** at points **P18** and secure with safety locking pin **22**.
▶ Release the pins **12** at points **P8** and on points **P9**: Unpin the ball locking pins **13** at points **P10** and points **P11**, see illustration **6**.

Note
▶ The lever **14** is positioned at point **P12** in the transport position, see illustration **6**.

When winch 4 is pinned and secured with the SA-frame:
▶ Unpin pins **12** at points **P8** and points **P9** on both sides with the lever **14**, see illustration **6**.

Result:

– Winch 4 is separated from the turntable.

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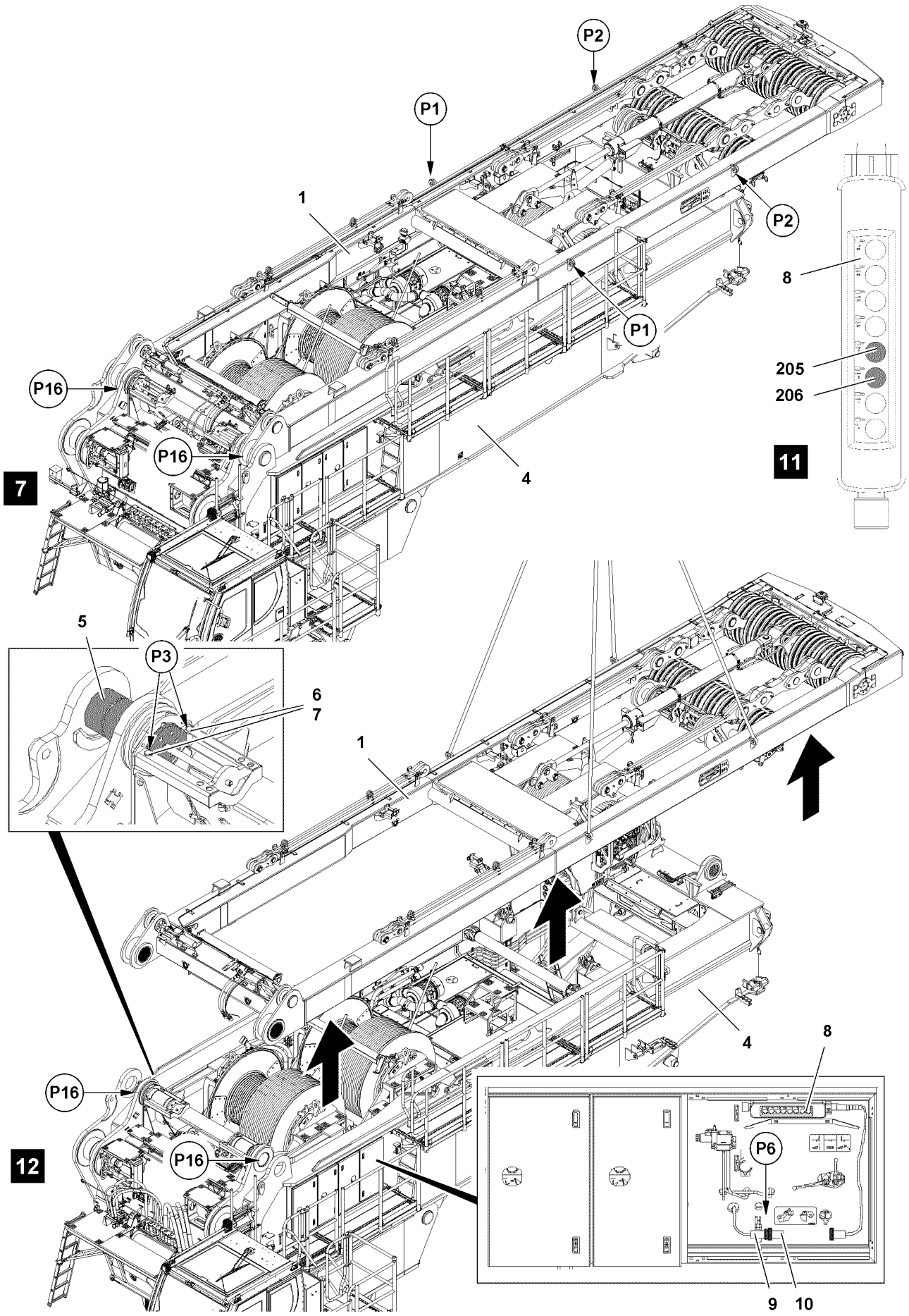

Fig.116931

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4.5 Unpinning the SA-frame on the turntable

WARNING
Danger of falling!
During assembly and disassembly of crane components, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe injury, property damage.
▶ Use personal protective equipment.

4.5.1 Fastening the SA-frame on the auxiliary crane

Make sure that the following prerequisite is met:
– An auxiliary crane with an adequate load-bearing capacity is available.

▶ Attach the fastening equipment at points **P1** on the SA-frame **1**, see illustration **7**.

WARNING
Danger of falling!
Death, severe injury, property damage.
▶ The fastening equipment may only be attached on points **P2** with the aid of a work platform.

▶ Attach the fastening equipment at points **P2** on the SA-frame **1**, see illustration **7**.
▶ Tension the fastening equipment.

4.5.2 Unpinning the SA-frame

Make sure that the following prerequisites are met:
– The pull rods are placed down in transport position and are secured.
– The hydraulic connections are disconnected.
– The electrical connections are disconnected.
– The connections of the central lubrication system are disconnected.
– The assembly cylinder is properly secured in transport position.
– The winch 4 is pinned and secured with the SA-frame.
– The pulley support is pinned and secured with the SA-frame.
– The fastening equipment is tensioned.
– The crane engine is running.

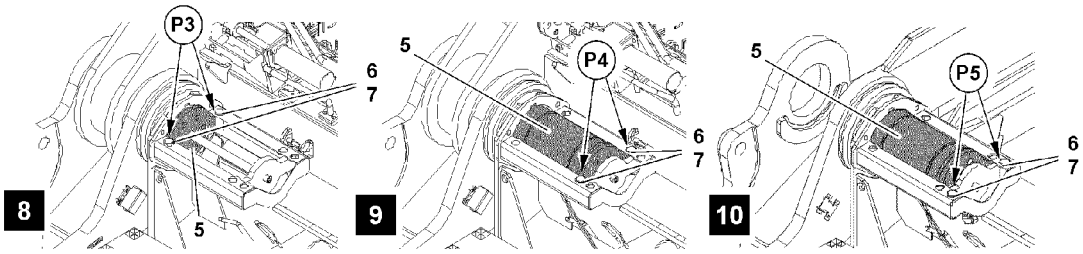

*Fig.116932: Unpin the pins **5**.*

▶ Release the pin **5**: Remove the safety locking pin **7** on both sides at points **P3** and unpin the retaining pin **6**, see illustration **8**.
▶ Insert the retaining pin **6** at points **P4** on both sides and secure with safety locking pin **7**, see illustration **9**.

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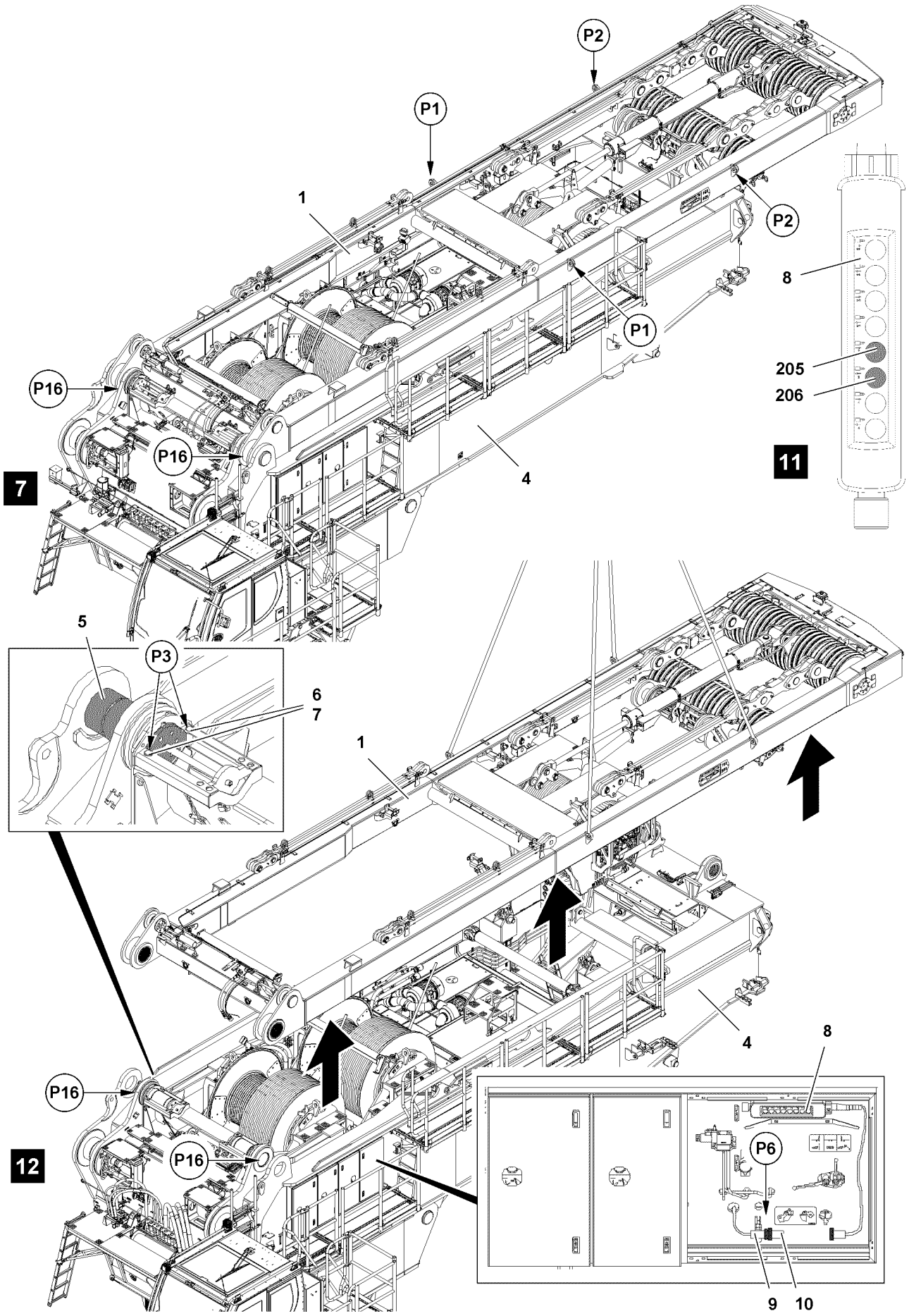

Fig.116931

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▶ Open the control cabinet on the turntable **4** and remove the control panel, see illustration **12**.
▶ Unpin the pin **5**: Press button **205** on the control panel **8**, see illustration **11**.

When the pins **5** are unpinned:
▶ Remove the safety locking pin **7** on both sides at points **P4** and unpin the retaining pin **6**, see illustration **9**.

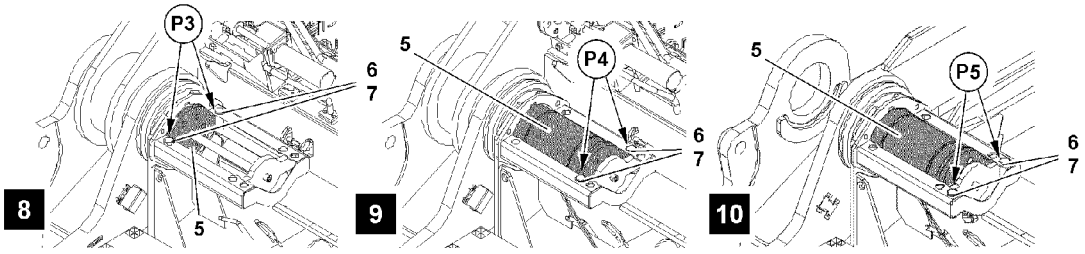

*Fig.116932: Unpin the pins **5**.*

▶ Insert the retaining pin **6** at points **P5** on both sides and secure with safety locking pin **7**, see illustration **10**.

Result:

– The SA-frame **1** can be removed.

▶ Lift the SA-frame **1** with the auxiliary crane, swing it and lower it until the support can be brought into transport position.
▶ Insert the pins **5** again: Press button **206** on the control panel **8**, see illustration **11**.

When the pins **5** are pinned:
▶ Remove the safety locking pin **7** on both sides at points **P5** and unpin the retaining pin **6**, see illustration **10**.
▶ Insert the retaining pin **6** at points **P3** on both sides and secure with safety locking pin **7**, see illustration **12**.
▶ Disconnect the control panel **8** on connection **9** at point **P6**.
▶ Connect the dummy plug **10** on connection **9**, see illustration **12**.
▶ Close the control cabinet.

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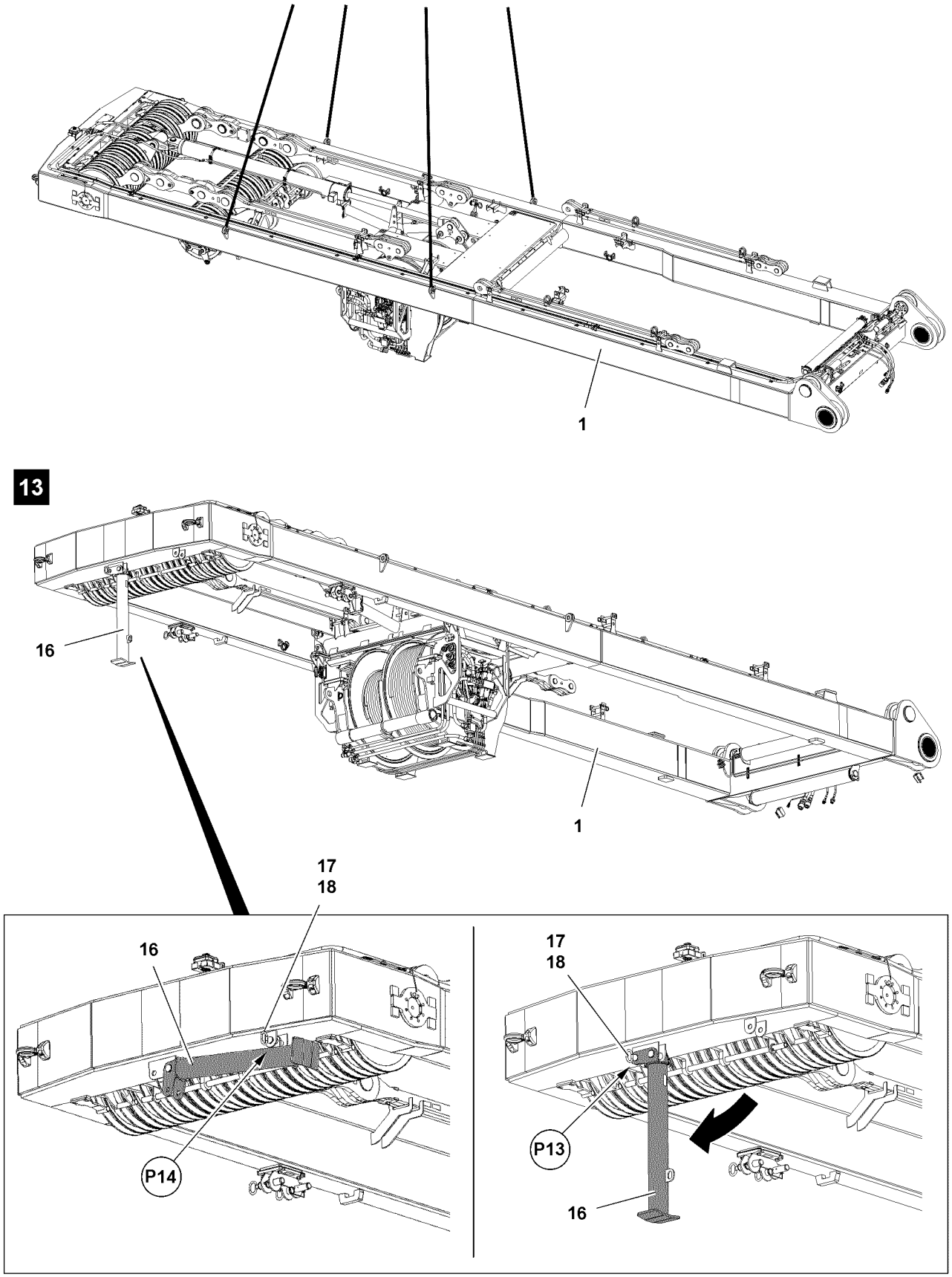

Fig.116933

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4.5.3 Swinging the support into the transport position

Note

▶ The weight of the support is 35 kg.

WARNING

Support swinging down!

The support **16** can swing downward due to its own weight when unpinning it.

Death, severe injury, property damage.

▶ For safety reasons, **two** persons must always be used to unpin the support.

▶ Make sure that there are no persons within the danger zone during the entire unpinning procedure.

▶ Release the support **16** at point **P14** from the transport position: Remove the safety locking pin **18** and unpin the pin **17**, see illustration **13**.

▶ Swing support **16** into transport position, see illustration **13**.

WARNING

The pin is not secured!

If the pin **17** is not secured, the pin can loosen up by itself during transport.

Death, severe injury, property damage.

▶ Make sure that the pin **17** is secured with safety locking pin **18**.

▶ Secure the support **16** at point **P13** in transport position: Insert the pin **17** and secure with safety locking pin **18**, see illustration **13**.

When the support **16** is swung into the transport position:

▶ Place the SA-frame **1** on the ground or on the transport vehicle.

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3.06 Assembly conditions

1 Assembly conditions for operation on crawlers 2

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1 Assembly conditions for operation on crawlers

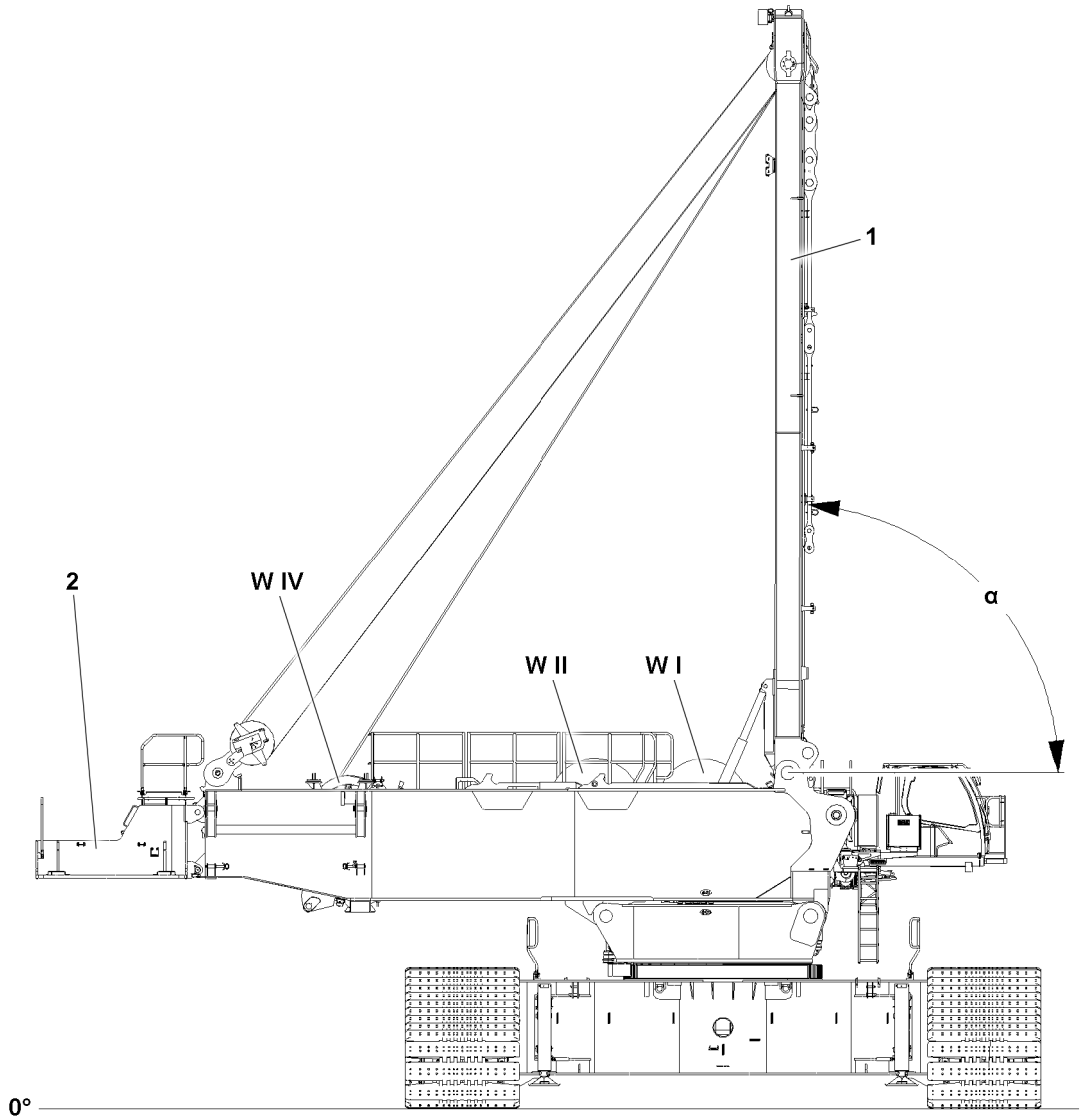

Fig.153943: Crane illustration

1	SA-frame	**W I**	Winch 1
2	Turntable extension	**W II**	Winch 2
α	SA-frame angle	**W IV**	Winch 4

WARNING
The crane can topple over!
During operation on a crawler and with an installed turntable extension, the crane is particularly susceptible to falling backward.
Death, severe bodily injuries, property damage.
- ▶ Only assemble the turntable extension according to the operating instructions, see chapter 4.07.10.
- ▶ Observe and apply the charts in this chapter only in combination.

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1.1 Definition of assembly conditions

Assembly condition	SA-frame, angle α	Winch I	Winch II	Winch IV	S/D-pivot section
1	Placed down	–	–	With rope	–
2	90°	–	–	With rope	–
3	Placed down	With rope	–	With rope	–
4	90°	With rope	–	With rope	–
5	Placed down	With rope	With rope	With rope	–
6	90°	With rope	With rope	With rope	–
7	90°	–	–	With rope	Installed (laying on the ground)

Definition of assembly conditions

1.2 Permissible counterweight / permissible ballast combinations

Note
▶ Definition of assembly conditions, see section „Definition of assembly conditions“.

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
▶ Observe the maximum permissible counterweight / permissible ballast combinations.

Assembly condition		360° on crawlers 9.6 m x 9.2 m Central ballast				
		130 t	90 t	50 t	10 t	0 t
1	1)	230 t	190 t	150 t	110 t	90 t
2		250 t	230 t	190 t	150 t	130 t
3		250 t	210 t	170 t	130 t	110 t
4		250 t	230 t	190 t	150 t	150 t
5		250 t	210 t	170 t	130 t	130 t
6		250 t	250 t	210 t	170 t	150 t
7		250 t	230 t	190 t	150 t	150 t

Maximum permissible counterweight for assembly conditions on crawlers

1) Maximum permissible counterweight in [t]

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3.07.10 Winch 1 assembly

1	Component overview	3
2	Fastening points winch 1	3
3	Assembly winch 1	5
4	Disassembly winch 1	15

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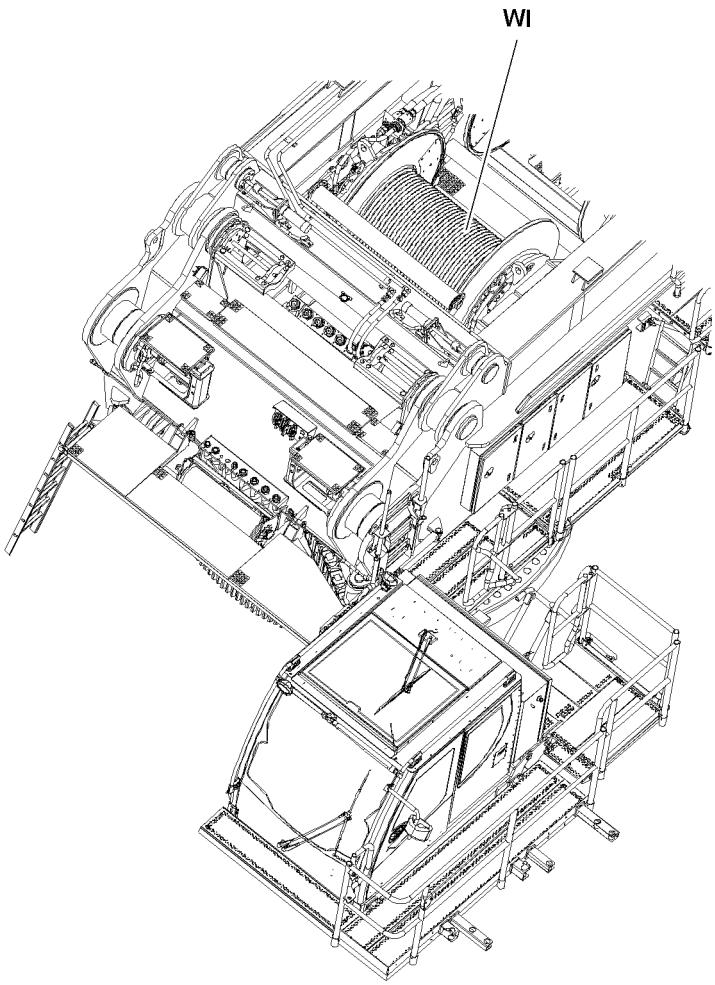

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Fig.118559

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1 Component overview

Note
▶ Dimensions and weights of winch 1, see Crane operating instructions, chapter 1.03.

Note
▶ The winch 1 is marked with its own weight.

2 Fastening points winch 1

WARNING
Winch incorrectly fastened!
Life-threatening situations can arise if the winch is incorrectly or improperly attached.
Death, severe bodily injuries, property damage.
▶ Attach the winch only on the intended fastening points.
▶ Attach the fastening equipment on winch solely in connection with shackles.
▶ Make sure that the shackels and fastening equipment have sufficient load capacity.
▶ Observe the technical safety instructions during assembly and disassembly, see Crane operating instructions, chapter 5.01.

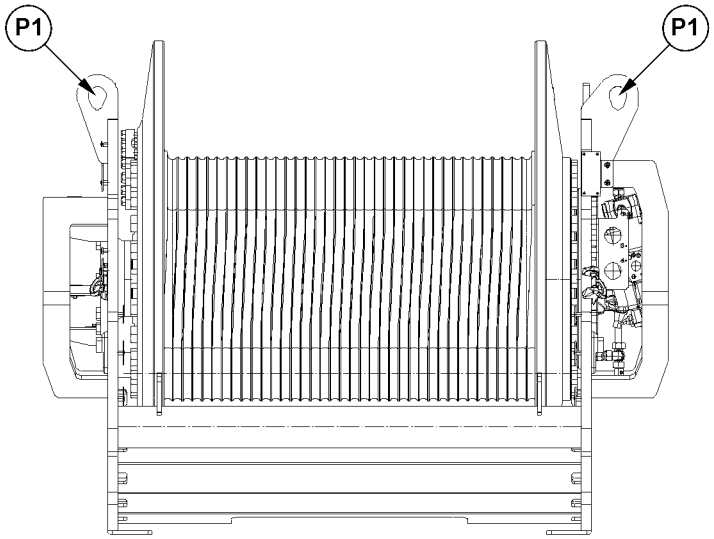

Fig.118560: Fastening points winch 1

Fastening points	
P1	Winch 1

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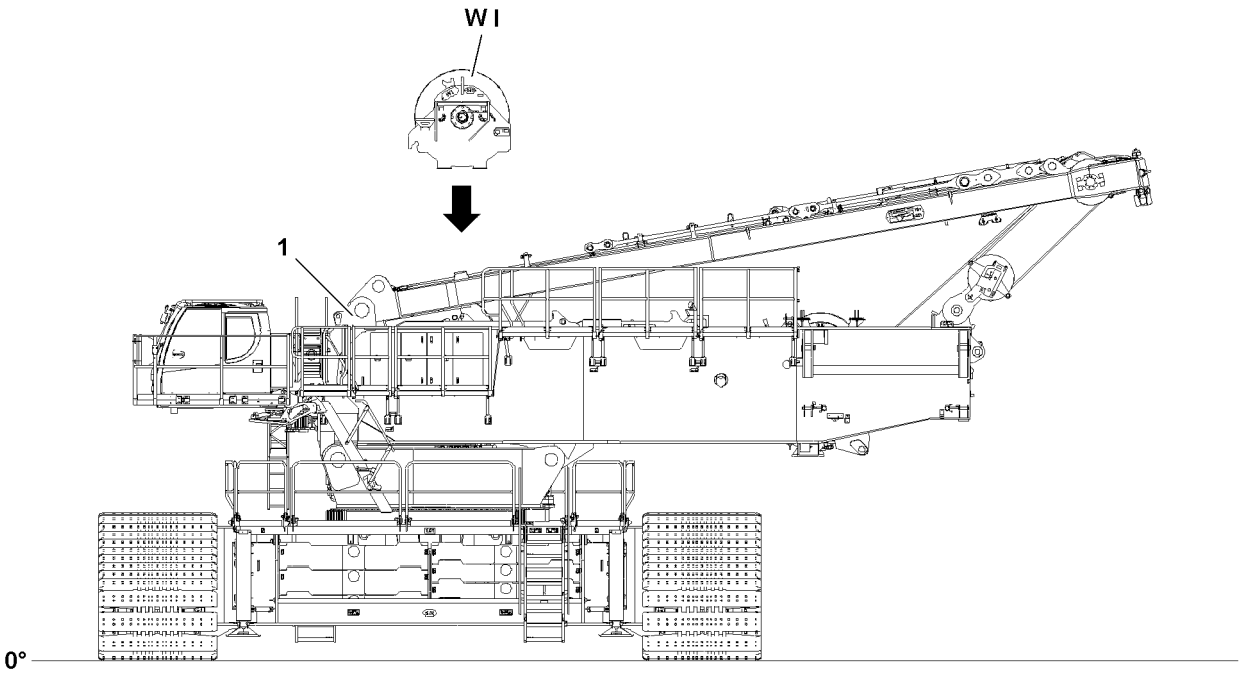

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Fig.118563

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3 Assembly winch 1

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.
If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries.
- ▶ The assembly personnel must always move carefully and anticipatory on the crane, the crane components or lattice sections.
- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
- ▶ If fall protection equipment is available, then it must be used.
- ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the approved fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
- ▶ The fall arrest system must be attached on the fastening and hook points as well as on the safety ropes.
- ▶ Always secure ladders on structural parts and / or components to prevent them from falling over.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.

WARNING
Components not pinned and secured!
If a component is released from the auxiliary crane before having been pinned and secured, the component can slip and fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not disengage the auxiliary crane until the corresponding component is pinned and secured.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

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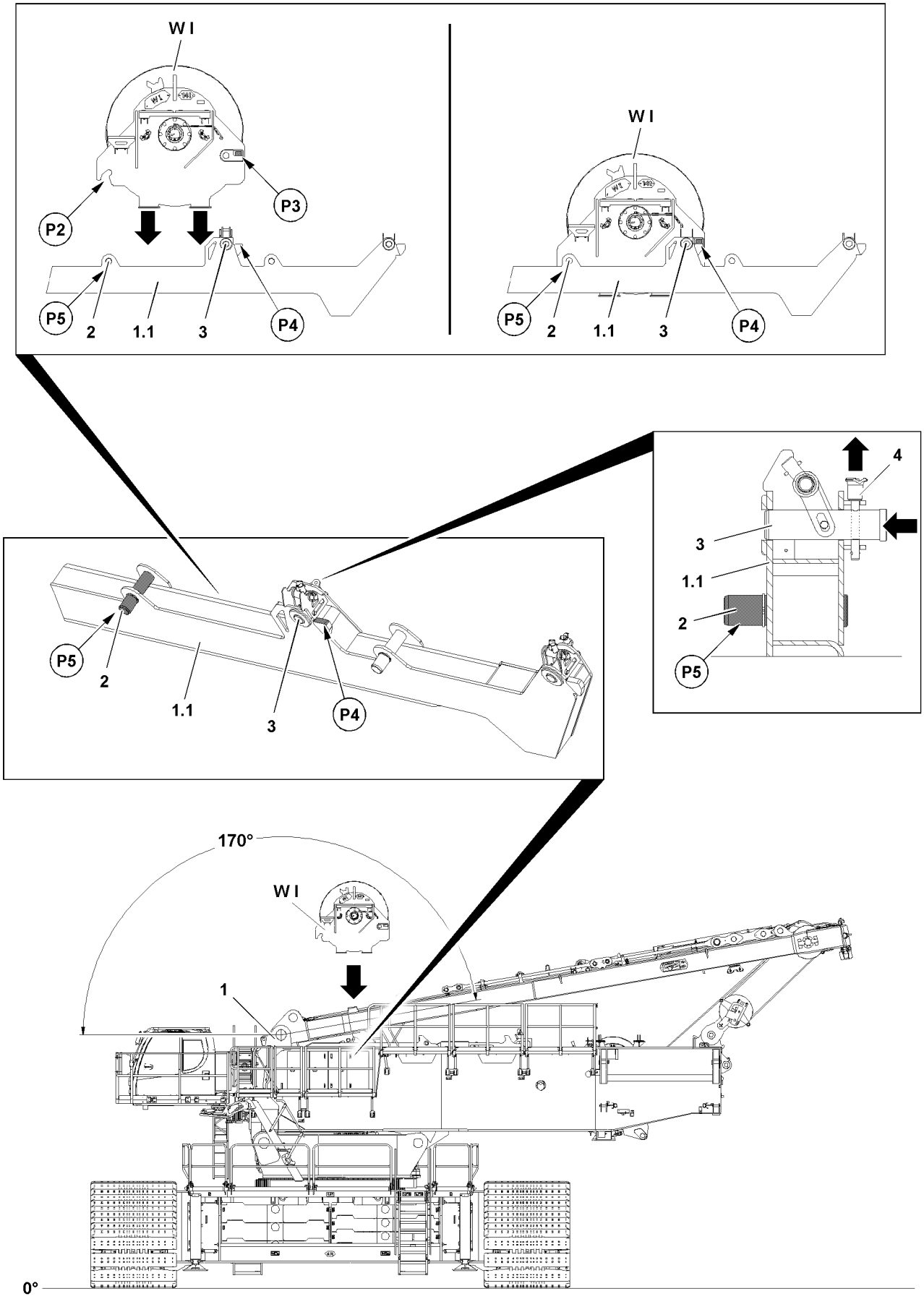

Fig.126245

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3.1 Installing winch 1

WARNING
Danger of accident during installation of winch 1!
Death, severe bodily injuries, property damage.
▶ Make sure that the following prerequisites are met for the installation of winch 1.

Make sure that the following prerequisites are met:
- The turntable **1** is properly installed.
- SA-frame and winch 4 are properly installed.
- The SA-frame is at approx. 170°; pay attention to SA-frame angle display on the LICCON monitor, see Crane operating instructions, chapter 4.02
- The crawler carriers are properly installed.
- The central ballast is properly installed.
- Gratings, catwalks and fall protection equipment are properly installed.
- Access stairs to the catwalks are properly installed.
- The access stairs to the cab platform are in operating position.
- An auxiliary crane with sufficient load carrying capacity is available.

3.1.1 Lifting winch 1 from the flatbed trailer

WARNING
Danger of accident due to incorrect attachment!
Life-threatening situations can arise if the winch 1 is incorrectly or improperly attached.
Death, severe bodily injuries, property damage.
▶ Fasten winch 1 only on the fastening points (points **P1**).
▶ Make sure that the fastening equipment is correctly attached on the fastening points (points **P1**) and that it is secured sufficiently to prevent it from loosening up.

▶ Attach the fastening equipment (points **P1**) on the fastening points, see section „Fastening points Winch 1“.
▶ Bring the fastening equipment to „tension“ with the auxiliary crane.
▶ Release and remove the transport retainers on the flatbed trailer.

WARNING
Falling components!
When lifting winch 1 from the flatbed trailer, components or winch 1 can fall down.
Death, severe bodily injuries, property damage.
▶ Make sure that there are no persons within the danger zone.

▶ Lift winch 1 with the auxiliary crane from the flatbed trailer.

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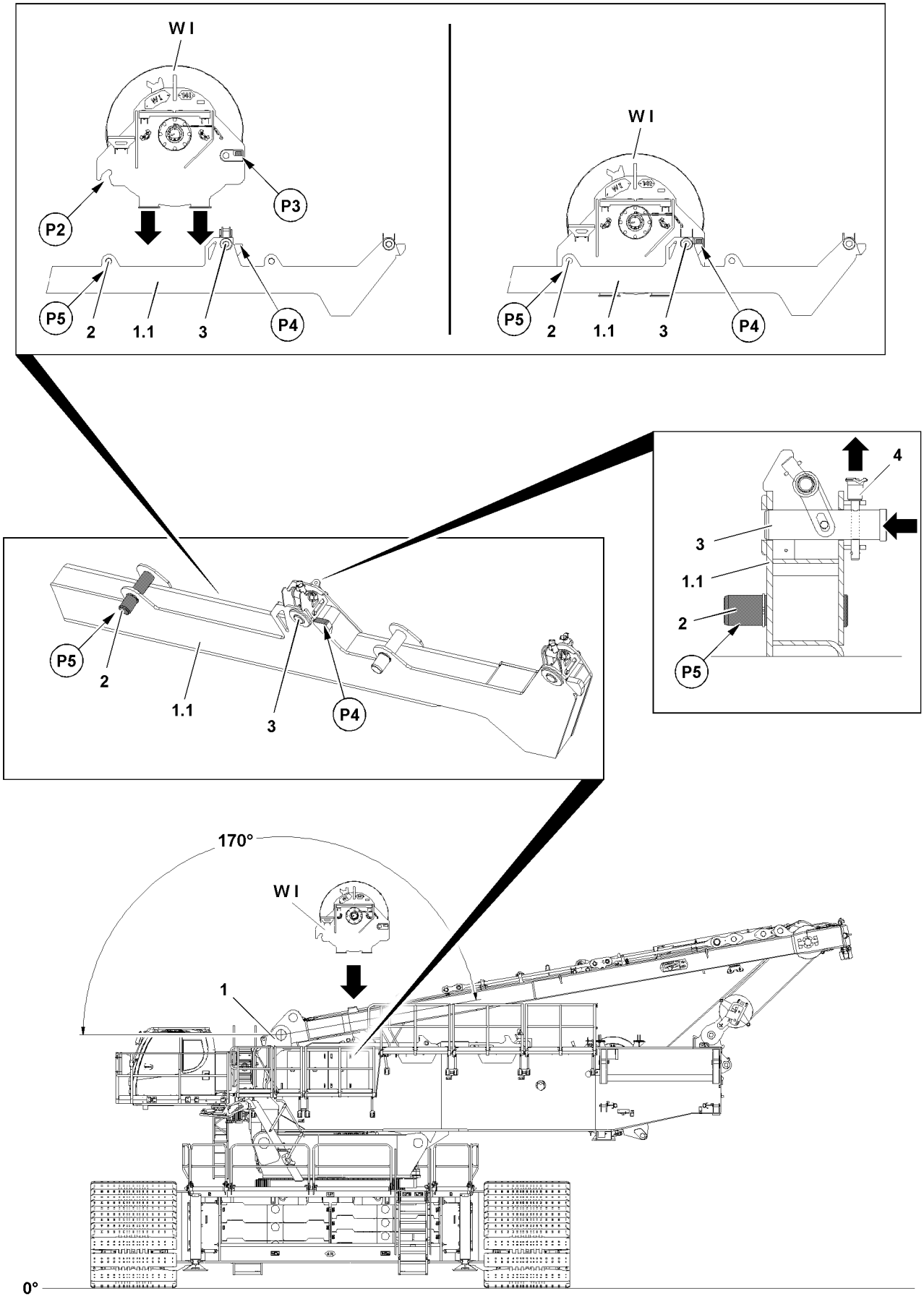

Fig.126245

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3.1.2 Positioning winch 1

Make sure that the following prerequisites are met:
- The pins **3** are unpinned completely on both sides.
- The pins **3** are secured in the „unpinned“ position with ball locking pins **4**.

WARNING
Danger of accident when swinging in and lowering winch 1!
When swinging in and lowering winch 1 on the turntable **1**, limbs can be crushed or even severed.
Death, severe bodily injuries, property damage.
▶ Make sure that there are no persons within the danger zone.
▶ Do not reach with your hands into the danger zone.

NOTICE
Property damage!
If the following notes are not observed, damage can result to the crane or winch 1.
▶ When retracting winch 1, it must be ensured that winch 1 does not hit against the turntable **1**!

Note
▶ The guide must be in constant visual and acoustic contact with the crane operator.

Note
▶ Pay attention to exact alignment of winch 1 to the installation position or the pocket receptacles, point **P2**, to the centering pins **2**.
▶ Before lowering, bring winch 1 into position that the pocket receptacles, point **P2** are above the centering pins **2** at point **P5** on the turntable **1**!

▶ Carefully swing winch 1 in with the auxiliary crane to the turntable **1**.
▶ Position and align winch 1.

When winch 1 is aligned:
▶ Set winch 1 on both sides at point **P5** on the centering pins **2** and at point **P4** on the receptacle plates on the turntable **1**.

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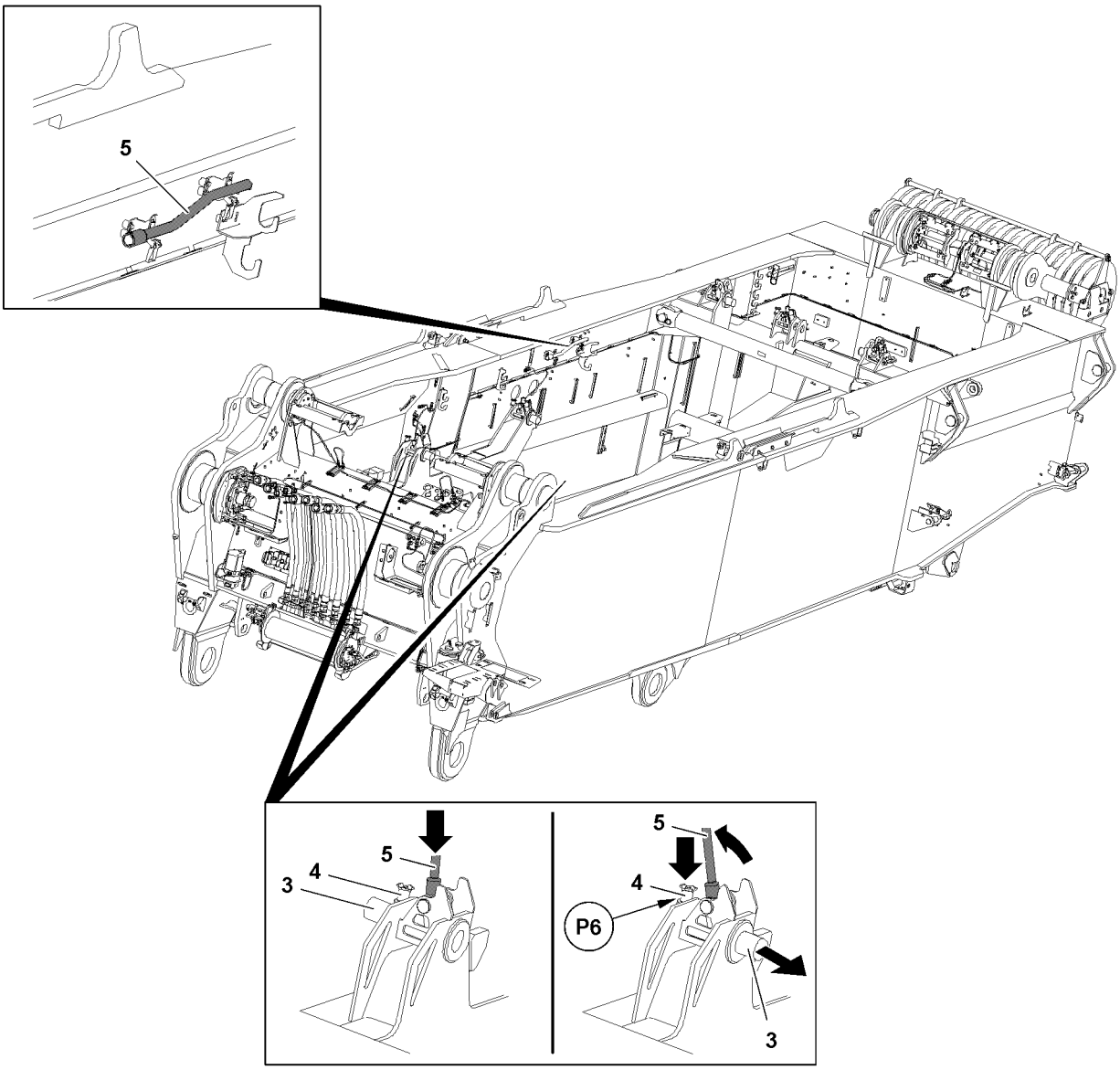

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Fig.118561

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3.1.3 Pinning winch 1

Make sure that the following prerequisites are met:
- Winch 1 is laying on both sides on the centering pins **2**, point **P5**.
- Winch 1 is laying on both sides on the receptacle plates, point **P4**.

▶ Release the pins **3**: Remove the ball locking pins **4**.
▶ Release the control lever **5** in park position.
▶ Remove the control lever **5** from the park position and set it on the stud of the pin pulling device.
▶ Insert pins **3** on both sides with the control lever **5** on winch 1.

WARNING
The pins can loosen up by themselves!
▶ Secure pins **3** immediately after pinning with ball locking pins **4**!

When the pins **3** on winch 1 are completely pinned on both sides:
▶ Secure the pins **3** in „Pinned“ position: Pin the ball locking pin **4** again at point **P6**.
▶ Release the fastening equipment on winch 1.
▶ Remove the auxiliary crane.
▶ Place the control lever **5** in park position and secure it properly.

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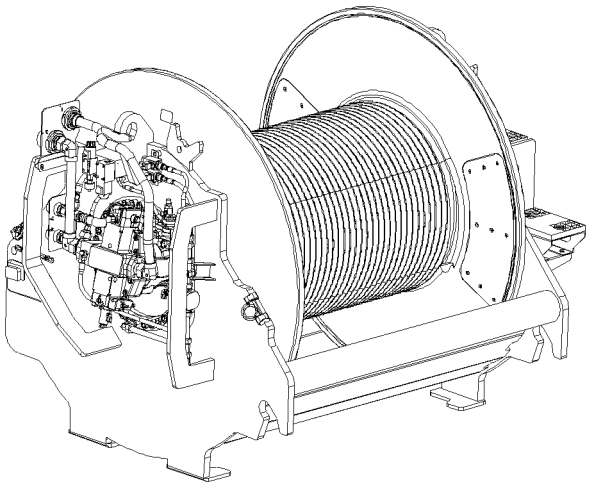

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Fig.118567

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3.2 Establishing the hydraulic connections to winch 1

Note

▶ Establish the connections to winch 1 only when winch 1 is properly installed and secured on the turntable.

Make sure that the following prerequisites are met:

– The winch 1 is properly installed, pinned and secured.

3.2.1 Establishing the hydraulic connections to the winch

Note

▶ After the hydraulic connections to the winch are established, the expansion tank must be checked and emptied.

The hydraulic connections for the winch are made with quick couplings.

When connecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

WARNING

Pressure in the hydraulic lines!

If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.

Death, severe bodily injuries, property damage.

▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

WARNING

Loss of pressure or leakage!

Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.

▶ Check that the quick couplings have been properly connected before using the crane.

▶ Connect the coupling components (sleeve and connector) and screw together with the hand-tightened nut.

▶ Tighten the hydraulic coupling by hand. Rotate the hand-tightened nut until it reaches a tangible, fixed stop position.

▶ Establish the hydraulic connections to the winch.

3.2.2 Establishing the electrical connections to the winch

▶ Establish the electrical connections to the winch, see Electric wiring diagram.

3.2.3 Establishing the connections of the central lubrication system to the winch

▶ Establishing the connections of the central lubrication system to the winch.

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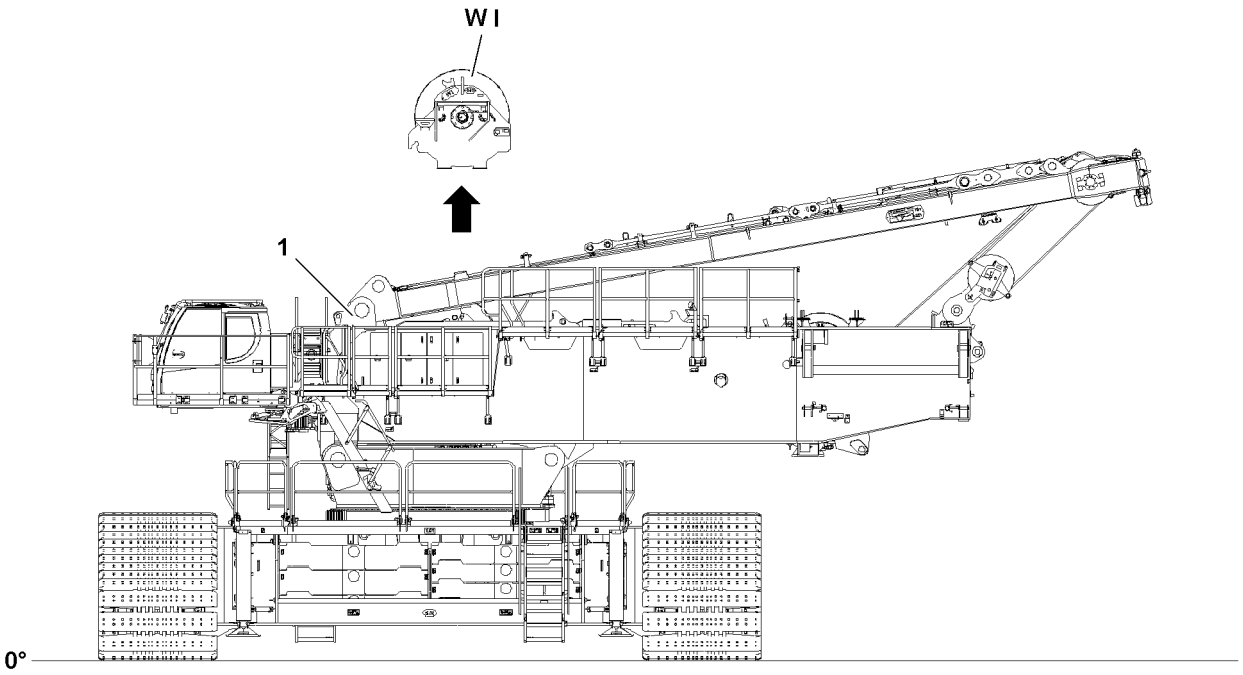

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Fig.118564

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4 Disassembly winch 1

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.
If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries.
- ▶ The assembly personnel must always move carefully and anticipatory on the crane, the crane components or lattice sections.
- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
- ▶ If fall protection equipment is available, then it must be used.
- ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the approved fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
- ▶ The fall arrest system must be attached on the fastening and hook points as well as on the safety ropes.
- ▶ Always secure ladders on structural parts and / or components to prevent them from falling over.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.

WARNING
Components not pinned and secured!
If a component is released from the auxiliary crane before having been pinned and secured, the component can fall down.
Death, severe bodily injuries, property damage.
- ▶ Remove the auxiliary crane only after the respective component has been properly pinned and secured.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

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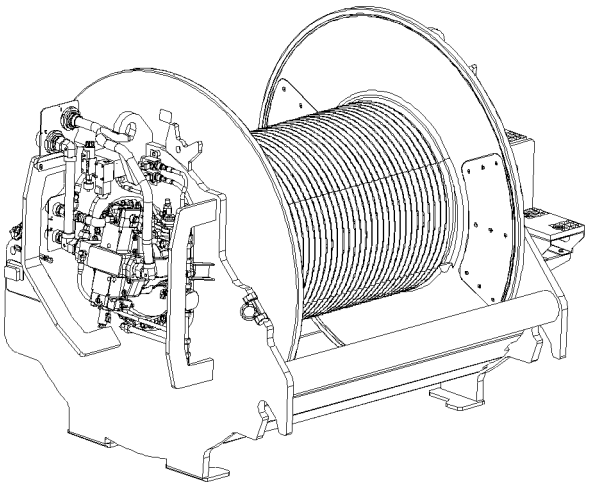

Fig.118567

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4.1 Disconnecting the connections to winch 1

Make sure that the following prerequisites are met:
- The hoist rope is completely spooled up to the winch.
- The hoist rope is secured on the winch to prevent it from spooling out by itself.

4.1.1 Disconnecting the hydraulic connections to the winch

When releasing hydraulic lines with quick couplings, make sure that the uncoupling procedure is carried out correctly.

WARNING
Pressure in the hydraulic lines!
If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.
Death, severe bodily injuries, property damage.
▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

▶ Release the hydraulic coupling by hand.
▶ Disconnect the hydraulic connections to the winch.
▶ Close the hydraulic hoses and hydraulic lines off properly with the intended caps.
▶ Bring the hydraulic hoses in park position for transport and secure them properly.

4.1.2 Disconnecting the electrical connections to the winch

▶ Disconnect the electrical connections to the winch.
▶ Close the electrical connections properly off with the intended caps.

4.1.3 Disconnecting the connections of the central lubrication system to the winch

▶ Disconnect the connections to the winch.
▶ Close the lube line connections properly off with the intended caps.

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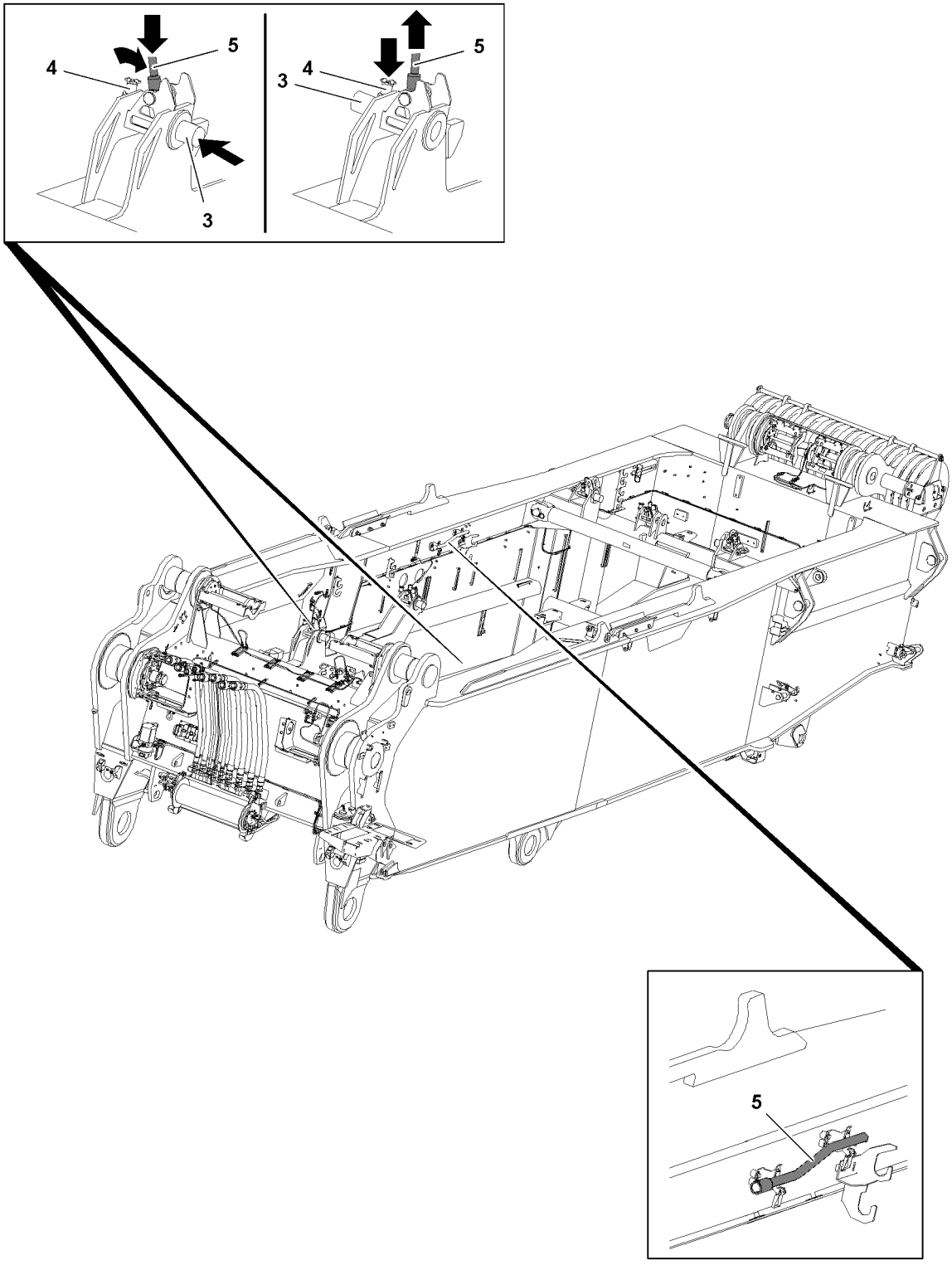

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Fig.118566

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4.2 Removing winch 1

4.2.1 Unpinning winch 1

Make sure that the following prerequisites are met:
- The hydraulic connections are properly disconnected and closed off.
- The electrical connections are properly disconnected and closed off.
- The connections of the central lubrication system are properly disconnected and closed off.
- An auxiliary crane with sufficient load carrying capacity is available.

WARNING
Danger of accident due to incorrect attachment!
Life-threatening situations can arise if the winch 1 is incorrectly or improperly attached.
Death, severe bodily injuries, property damage.
- ▶ The fastening equipment may be attached on the winch 1 only on the intended fastening points.
- ▶ Make sure that the fastening equipment is properly attached on winch 1 and that it is secured sufficiently to prevent it from loosening up.

▶ Attach the fastening equipment on both sides on winch 1, see section „Fastening points Winch 1“.

When the fastening equipment is properly fastened on winch 1:
▶ Bring the fastening equipment with the auxiliary crane carefully to „tension“.

When the fastening equipment is tensioned:
▶ Release pins **3** on both sides: Remove the ball locking pins **4**.
▶ Unpin the pins **3** with the control lever on both sides completely.
▶ Secure the pins **3** in the „unpinned“ position with ball locking pins **4**.
▶ Place the control lever **5** in park position and secure it properly.

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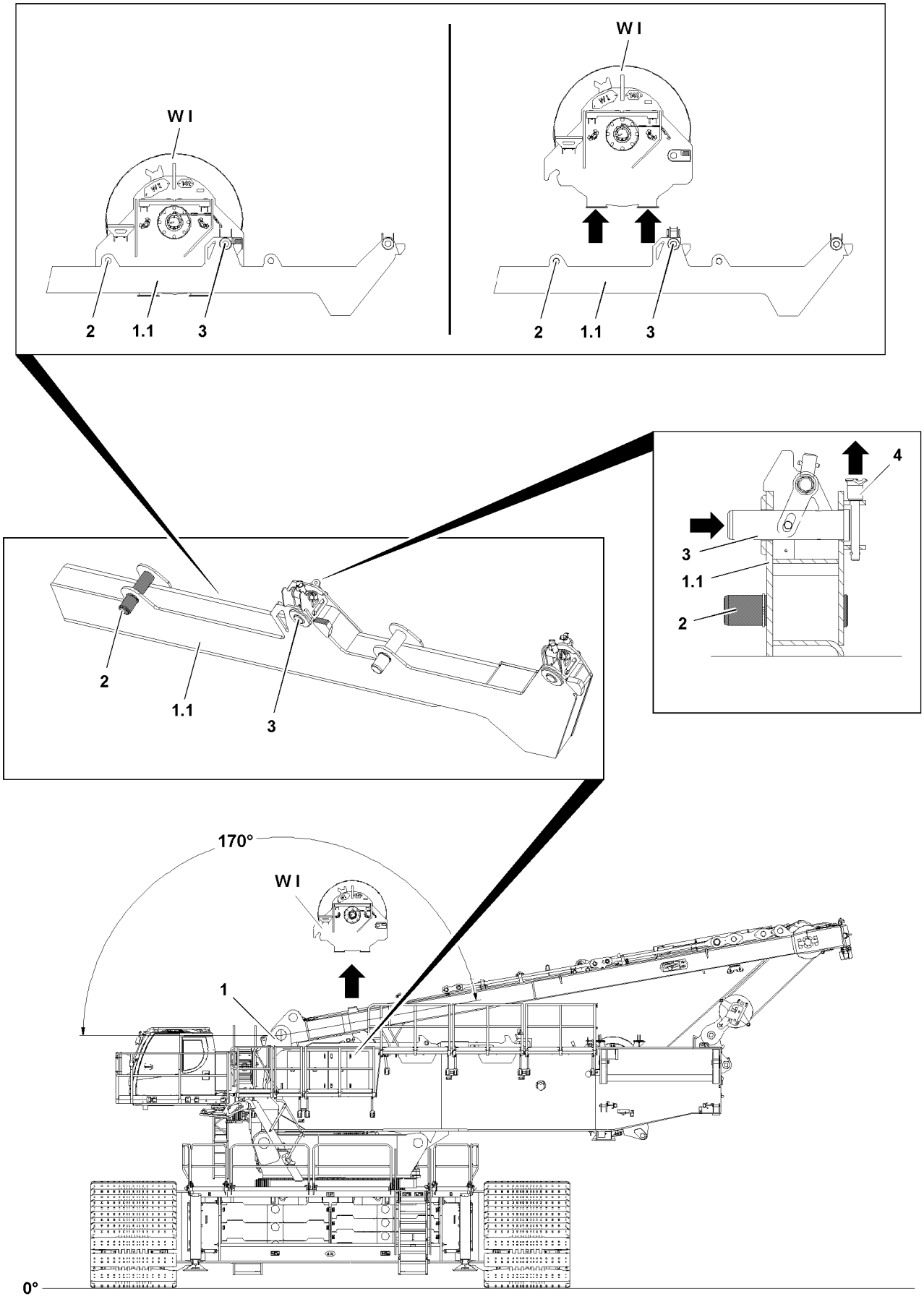

Fig.126246

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4.2.2 Lifting winch 1 from the turntable

Make sure that the following prerequisites are met:
- Winch 1 is properly unpinned on the turntable **1**.
- The SA-frame is at approx. 170°; pay attention to SA-frame angle display on the LICCON monitor, see Crane operating instructions, chapter 4.02

WARNING
Falling components!
When lifting the winch 1 on the turntable **1**, components or winch 1 can fall down.
Personnel can be severely injured or killed.
▶ Make sure that there are no persons within the danger zone.

▶ Carefully lift winch 1 with the auxiliary crane from the turntable **1**.

WARNING
Toppling winch!
When setting winch 1 on the ground, the winch can sink into the ground and fall over.
Death, severe bodily injuries, property damage.
▶ Make sure that the ground has sufficient load bearing capacity to safely take on the weight of the winch.

▶ Swing winch 1 out with the auxiliary crane and set it on the ground on a suitable support.
or
Swing winch 1 out with the auxiliary crane and set it on the flatbed trailer.

When winch 1 has been set down properly:
▶ Remove the auxiliary crane.

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3.07.20 Winch 2 assembly

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3	Assembly winch 2	5
4	Disassembly winch 2	15

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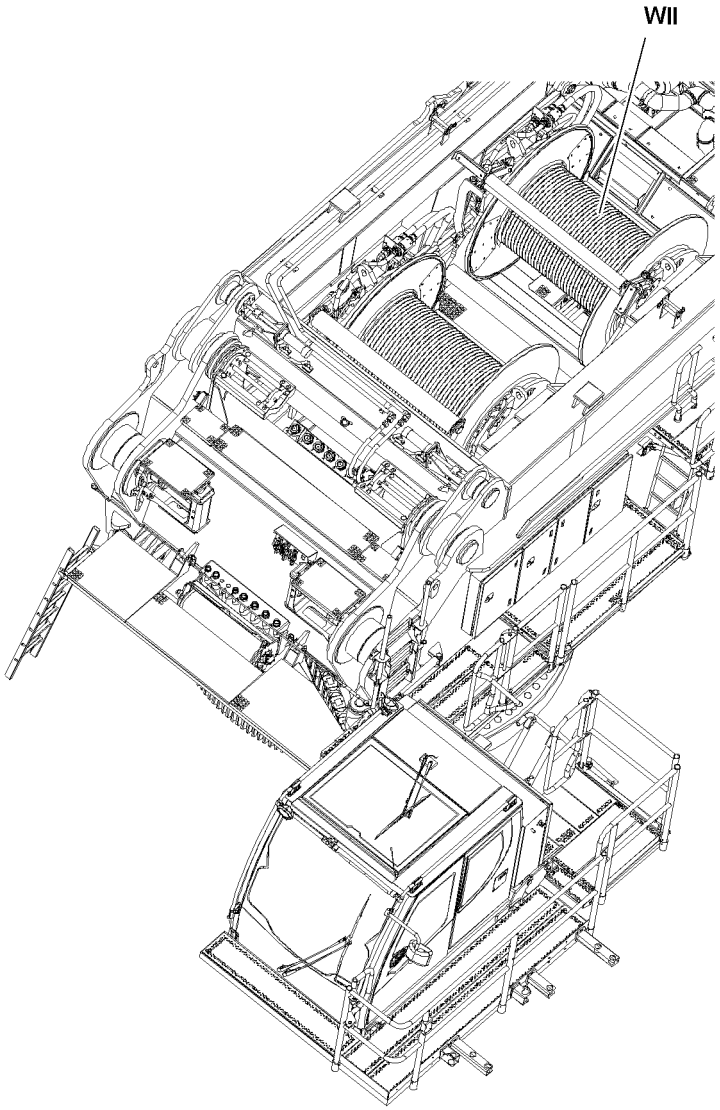

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Fig.118568

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1 Component overview

Note
▶ Dimensions and weights of winch 2, see Crane operating instructions, chapter 1.03.

Note
▶ The winch 2 is marked with its own weight.

2 Fastening points winch 2

WARNING
Winch incorrectly fastened!
Life-threatening situations can arise if the winch is incorrectly or improperly attached.
Death, severe bodily injuries, property damage.
▶ Attach the winch only on the intended fastening points.
▶ Attach the fastening equipment on winch 2 solely in connection with shackles.
▶ Make sure that the shackels and fastening equipment have sufficient load bearing capacity.
▶ Observe the technical safety instructions during assembly and disassembly, see Crane operating instructions, chapter 5.01.

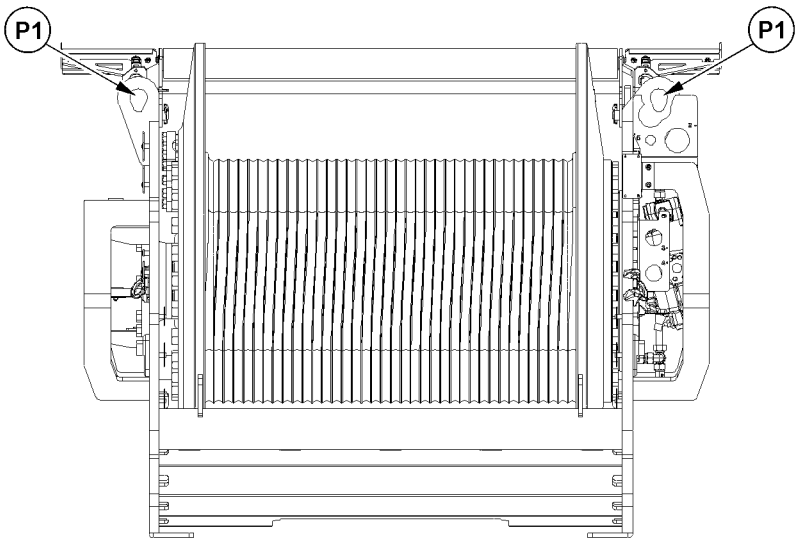

Fig.118587: Fastening points winch 2

Fastening points	
P1	Winch 2

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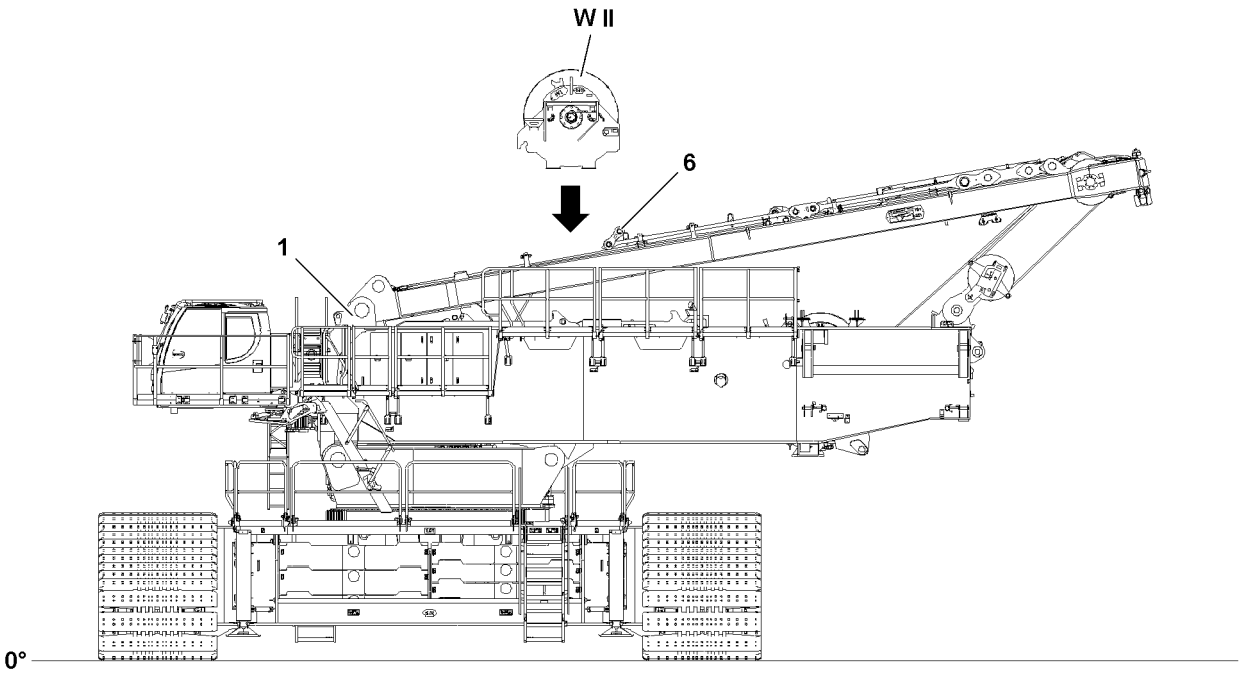

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Fig.118569

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3 Assembly winch 2

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.
If this is not observed, assembly personnel could fall and be killed or seriously injured!
- ▶ The assembly personnel must always move carefully and anticipatory on the crane, the crane components or lattice sections.
- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
- ▶ If fall protection equipment is available, then it must be used.
- ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the approved fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
- ▶ The fall arrest system must be attached on the fastening and hook points as well as on the safety ropes.
- ▶ Always secure ladders on structural parts and / or components to prevent them from falling over.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.

WARNING
Components not pinned and secured!
If a component is released from the auxiliary crane before having been pinned and secured, the component can slip and fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

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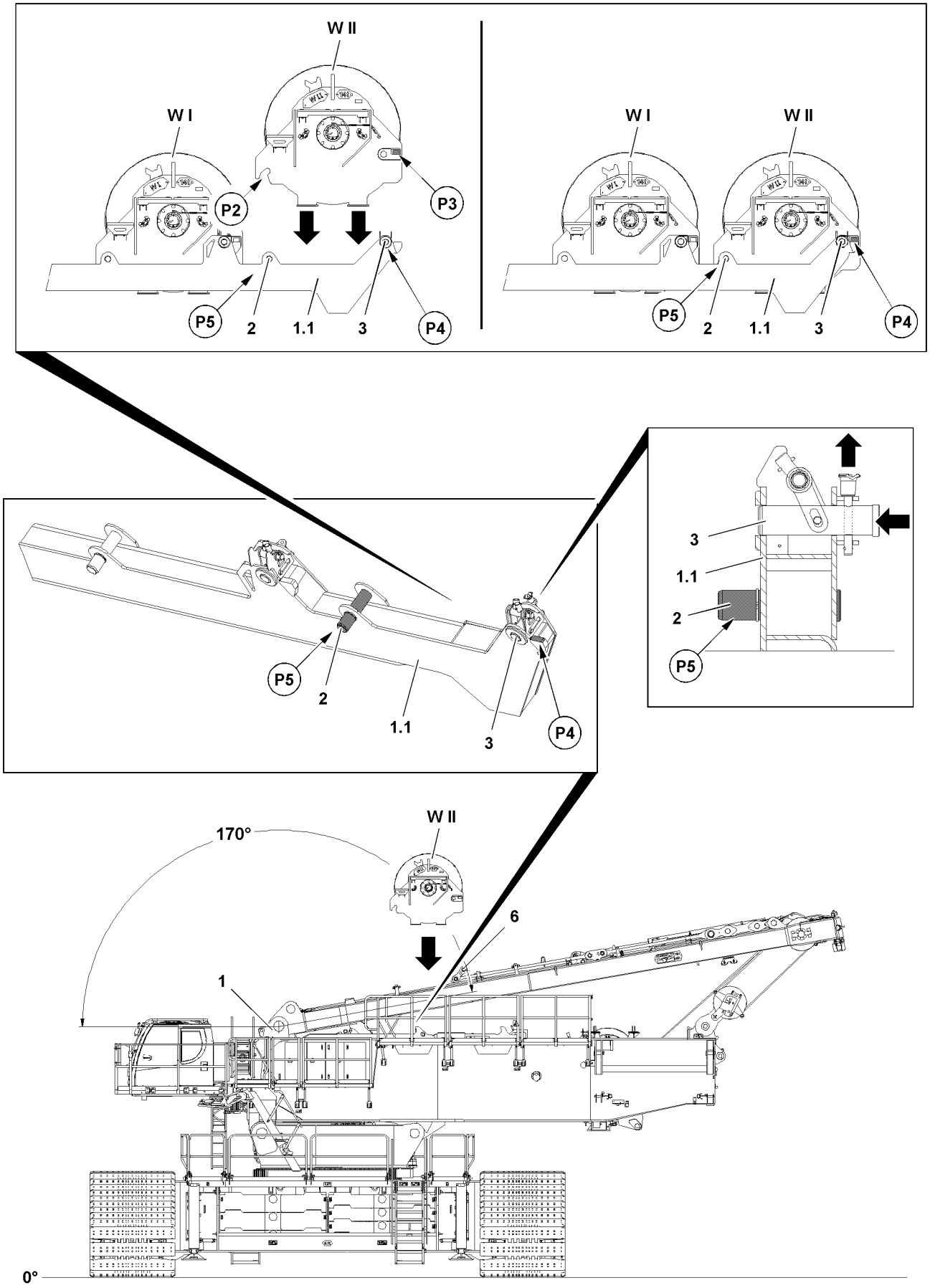

Fig.126247

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3.1 Installing winch 2

WARNING
Danger of accident during installation of winch 2!
Death, severe bodily injuries, property damage.
▶ Make sure that the following prerequisites are met for the installation of winch 2.

Make sure that the following prerequisites are met:
- The turntable **1** is properly installed.
- SA-frame and winch 4 are properly installed.
- The SA-frame is at approx. 170°; pay attention to SA-frame angle display on the LICCON monitor, see Crane operating instructions, chapter 4.02.
- The brackets **6** on the SA-frame have been changed over to the rear.
- The crawler carriers are properly installed.
- The central ballast is properly installed.
- Gratings, catwalks and fall protection equipment are properly installed.
- Access stairs to the catwalks are properly installed.
- The access stairs to the cab platform are in operating position.
- An auxiliary crane with appropriate load carrying capacity is available.

3.1.1 Lifting winch 2 from the flatbed trailer

WARNING
Danger of accident due to incorrect attachment!
Life-threatening situations can arise if the winch 2 is incorrectly or improperly attached.
Death, severe bodily injuries, property damage.
▶ Fasten winch 2 only on the fastening points (points **P1**).
▶ Make sure that the fastening equipment is correctly attached on the fastening points (points **P1**) and that it is secured sufficiently to prevent it from loosening up.

▶ Attach the fastening equipment (points **P1**) on the fastening points, see section „Fastening points Winch 2“.
▶ Bring the fastening equipment to „tension“ with the auxiliary crane.
▶ Release and remove the transport retainers on the flatbed trailer.

WARNING
Falling components!
When lifting winch 2 from the flatbed trailer, components or winch 2 can fall down.
Death, severe bodily injuries, property damage.
▶ Make sure that there are no persons within the danger zone.

▶ Lift winch 2 with the auxiliary crane from the flatbed trailer.

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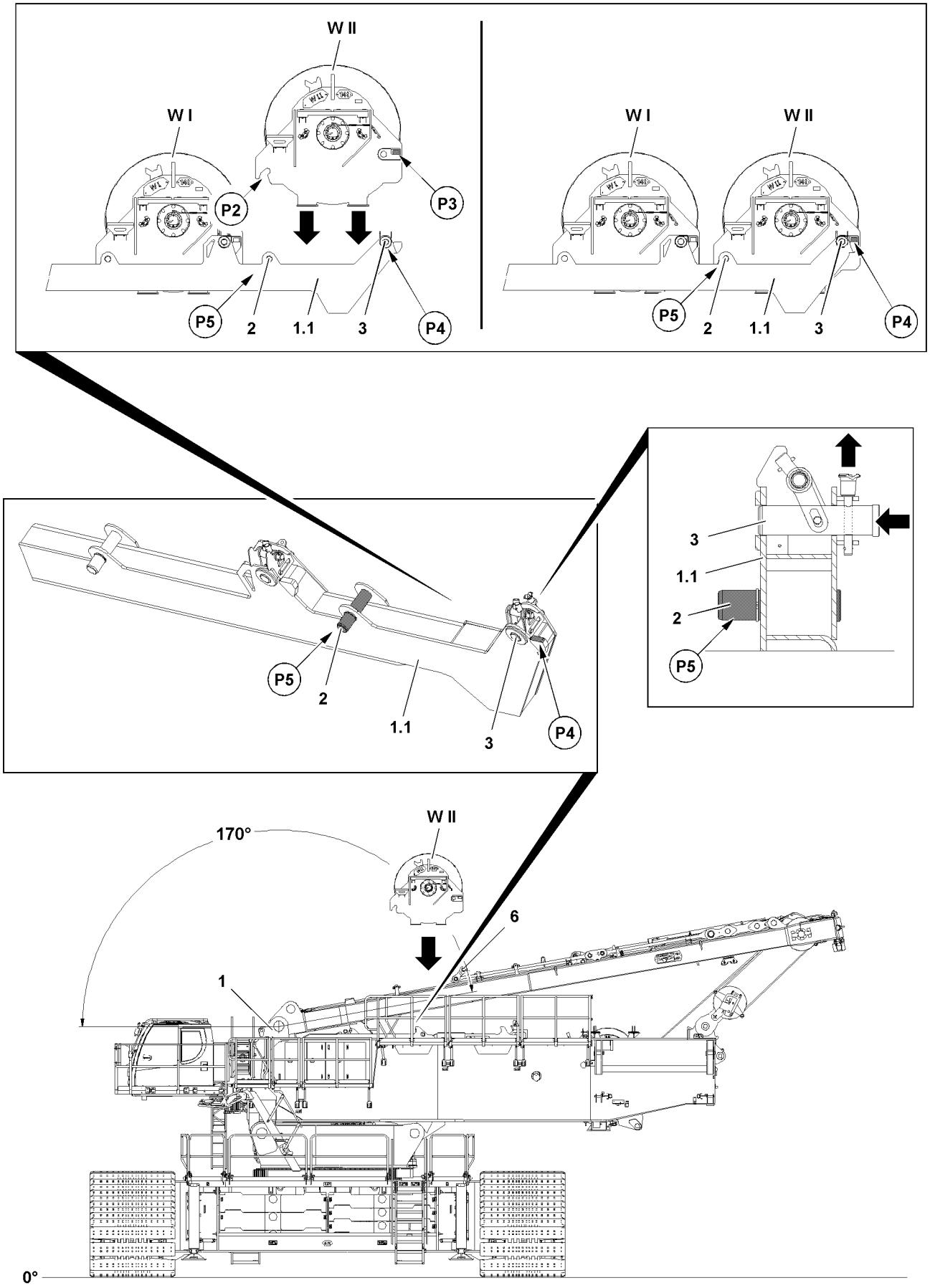

Fig.126247

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3.1.2 Positioning winch 2

Make sure that the following prerequisites are met:
- The pins **3** are unpinned completely on both sides.
- The pins **3** are secured in the „unpinned“ position with ball locking pins **4**.

WARNING
Danger of accident when swinging in and lowering winch 2!
When swinging in and lowering winch 2 on the turntable **1** limbs can be crushed or even severed.
Death, severe bodily injuries, property damage.
- ▶ Make sure that there are no persons within the danger zone.
- ▶ Do not reach with your hands into the danger zone.

NOTICE
Property damage!
If the following notes are not observed, damage can result to the crane or winch 2.
- ▶ When retracting winch 2, it must be ensured that winch 2 does not hit against the turntable **1**!

Note
- ▶ The guide must be in constant visual and acoustic contact with the crane operator.

Note
- ▶ Pay attention to exact alignment of winch 2 to the installation position or the pocket receptacles, point **P2**, to the centering pins **2**.
- ▶ Before lowering, bring winch 2 into position that the pocket receptacles, point **P2** are above the centering pins **2** at point **P5** on the turntable **1**!

- ▶ Carefully swing winch 2 in with the auxiliary crane to the turntable **1**.
- ▶ Position and align winch 2.

When winch 2 is aligned:
- ▶ Set winch 2 on both sides at point **P5** on the centering pins **2** and at point **P4** on the receptacle plates on the turntable **1**.

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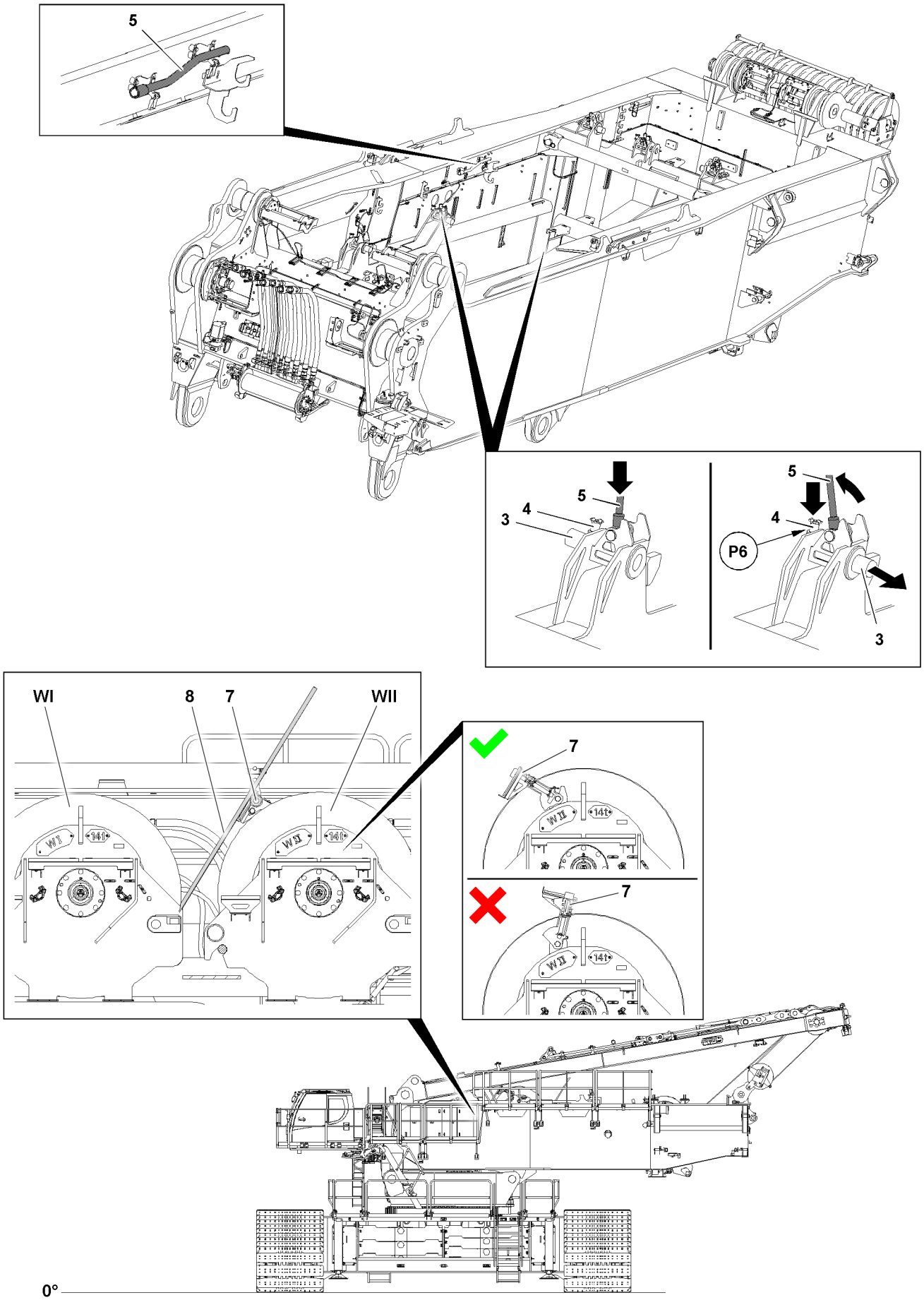

Fig.128219

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3.1.3 Pinning winch 2

Make sure that the following prerequisites are met:
- Winch 2 is positioned on both sides on the centering pins **2**, point **P5**.
- Winch 2 is positioned on both sides on the mounting plates, point **P4**.

▶ Release the pin **3**: Remove the ball locking pins **4**.
▶ Release the control lever **5** in park position.
▶ Remove the control lever **5** from the park position and set it on the stud of the pin pulling device.
▶ Insert pins **3** on both sides with the control lever **5** on winch 2.

WARNING
The pins can loosen up by themselves!
▶ Secure pins **3** immediately after pinning with ball locking pins **4**!

When the pins **3** on winch 2 are completely pinned on both sides:
▶ Secure the pins **3** in the „pinned“ position: **4**Pin the ball locking pin **4** again at point **P6**.
▶ Release the fastening equipment on winch 2.
▶ Remove the auxiliary crane.
▶ Place the control lever **5** in park position and secure it properly.

3.1.4 Protective roller on winch 2

The purpose of the protective roller **7** of winch 2 **WII** is to deflect the hoist rope **8** of winch 1 **WI** during derrick operation if necessary to prevent hoist rope contact with winch 2 **WII** and the resulting property damage.

Note
▶ The hoist rope **8** of winch 1 **WI** is represented in the indicated installation situation for clarification purposes only.

WARNING
Load can be ripped off!
If during crane operation the hoist rope **8** comes into contact with winch 2 **WII**, the hoist rope **8** can be significantly damaged and rip off. Crane components can be damaged significantly.
The load can rip off.
Death, severe bodily injuries, property damage.
▶ Make sure that the protective roller **7** is in the position shown before starting to work with the crane.
▶ Make sure that the hoist rope **8** of winch 1 **WI** never comes into contact with winch 2 **WII**.

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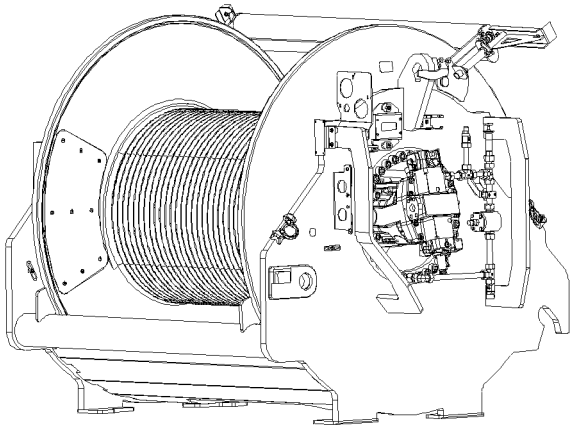

Fig.118588

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3.2 Establishing the hydraulic connections to winch 2

Note

▶ Establish the connections to winch 2 only when winch 2 is properly installed and secured on the turntable.

Make sure that the following prerequisites are met:

– The winch 2 is properly installed, pinned and secured.

3.2.1 Establishing the hydraulic connections to the winch

Note

▶ After the hydraulic connections to the winch are established, the expansion tank must be checked and emptied.

The hydraulic connections for the winch are made with quick couplings.

When connecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

WARNING

Pressure in the hydraulic lines!

If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.

Death, severe bodily injuries, property damage.

▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

WARNING

Loss of pressure or leakage!

Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.

▶ Check that the quick couplings have been properly connected before using the crane.

▶ Connect the coupling components (sleeve and connector) and screw together with the knurled nut.

▶ Tighten the hydraulic coupling by hand. Rotate the knurled nut until it reaches a tangible, fixed stop position.

▶ Establish the hydraulic connections to the winch.

3.2.2 Establishing the electrical connections to the winch

▶ Establish the electrical connections to the winch, see Electric wiring diagram.

3.2.3 Establishing the connections of the central lubrication system to the winch

▶ Establishing the connections of the central lubrication system to the winch.

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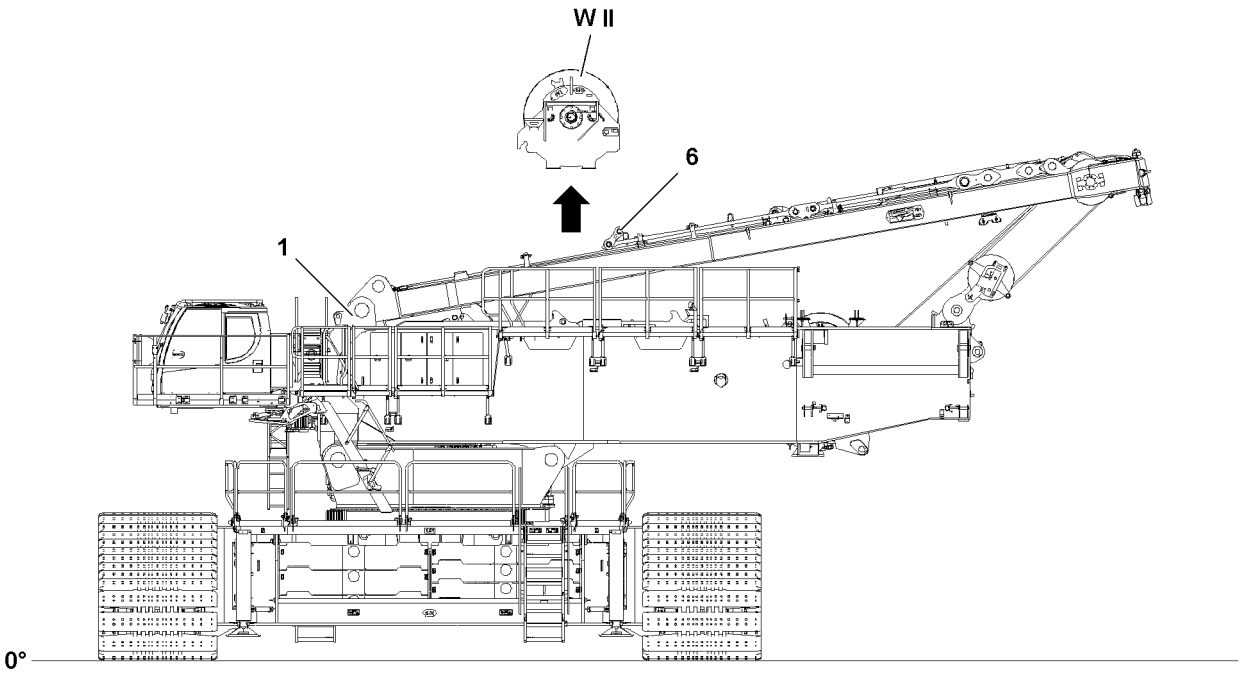

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Fig.118572

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4 Disassembly winch 2

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.
If this is not observed, assembly personnel could fall and be killed or seriously injured!
- ▶ The assembly personnel must always move carefully and anticipatory on the crane, the crane components or lattice sections.
- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
- ▶ If fall protection equipment is available, then it must be used.
- ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the approved fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
- ▶ The fall arrest system must be attached on the fastening and hook points as well as on the safety ropes.
- ▶ Always secure ladders on structural parts and / or components to prevent them from falling over.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.

WARNING
Components not pinned and secured!
If a component is released from the auxiliary crane before having been pinned and secured, the component can fall down.
Death, severe bodily injuries, property damage.
- ▶ Remove the auxiliary crane only after the respective component has been properly pinned and secured.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

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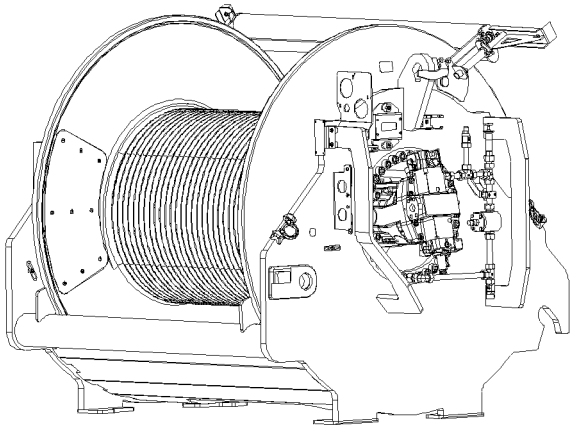

Fig.118588

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4.1 Disconnecting the connections to winch 2

Make sure that the following prerequisites are met:
- The hoist rope is completely spooled up to the winch.
- The hoist rope is secured on the winch to prevent it from spooling out by itself.

4.1.1 Disconnecting the hydraulic connections to the winch

When releasing hydraulic lines with quick couplings, make sure that the uncoupling procedure is carried out correctly.

WARNING
Pressure in the hydraulic lines!
If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.
Death, severe bodily injuries, property damage.
▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

▶ Release the hydraulic coupling by hand.
▶ Disconnect the hydraulic connections to the winch.
▶ Close the hydraulic hoses and hydraulic lines off properly with the intended caps.
▶ Bring the hydraulic hoses in park position for transport and secure them properly.

4.1.2 Disconnecting the electrical connections to the winch

▶ Disconnect the electrical connections to the winch.
▶ Close the electrical connections properly off with the intended caps.

4.1.3 Disconnecting the connections of the central lubrication system to the winch

▶ Disconnect the connections to the winch.
▶ Close the lube line connections properly off with the intended caps.

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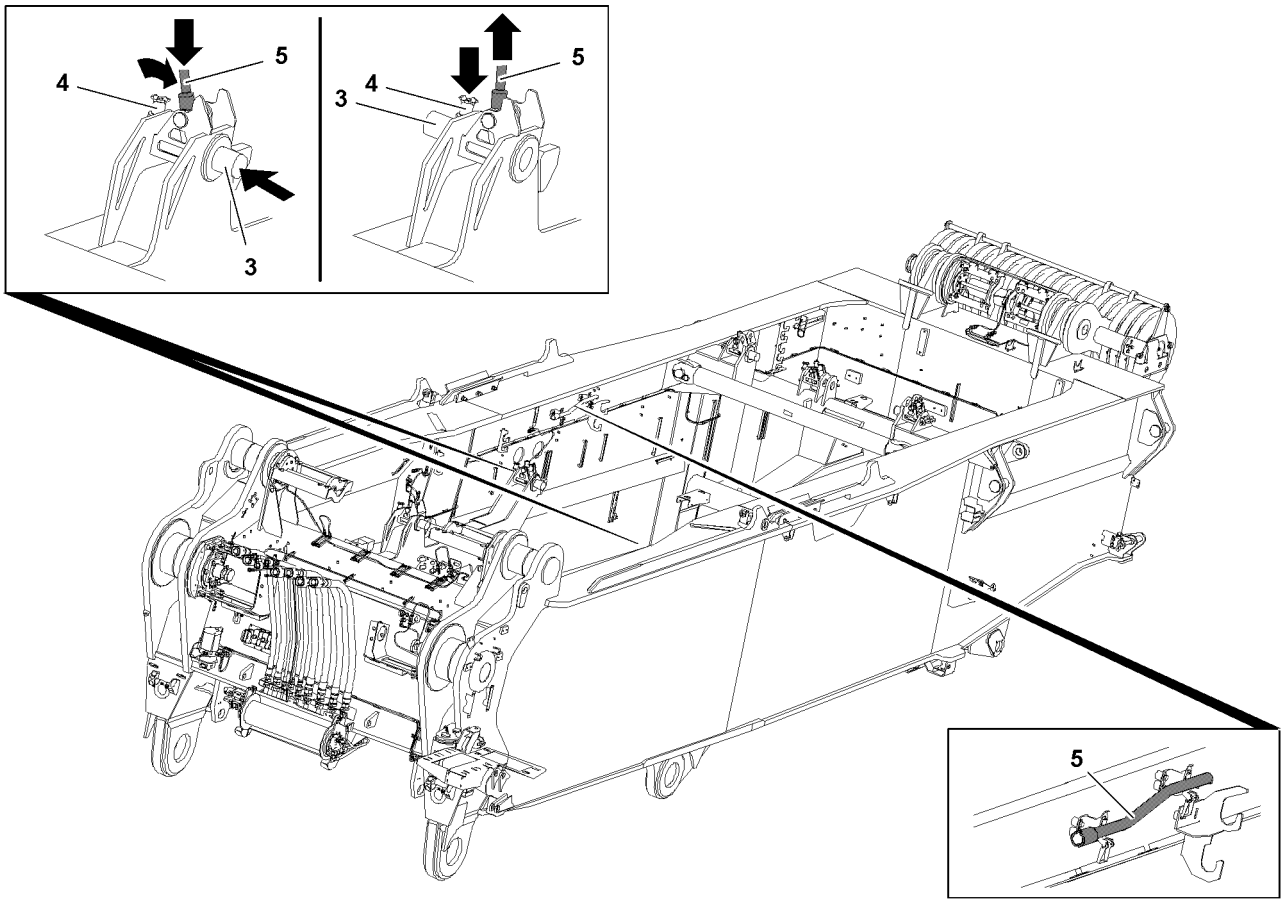

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Fig.118573

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4.2 Removing winch 2

4.2.1 Unpinning winch 2

Make sure that the following prerequisites are met:
- The hydraulic connections are properly disconnected and closed off.
- The electrical connections are properly disconnected and closed off.
- The connections of the central lubrication system are properly disconnected and closed off.
- An auxiliary crane with appropriate load carrying capacity is available.

WARNING
Danger of accident due to incorrect attachment!
Life-threatening situations can arise if the winch 2 is incorrectly or improperly attached.
Death, severe bodily injuries, property damage.
- ▶ The fastening equipment may be attached on the winch only on the intended fastening points.
- ▶ Make sure that the fastening equipment is properly attached on winch 2 and that it is secured sufficiently to prevent it from loosening up.

▶ Attach the fastening equipment on both sides on winch 2, see section „Fastening points Winch 2“.

When the fastening equipment is properly fastened on winch 2:
▶ Bring the fastening equipment with the auxiliary crane carefully to „tension“.

When the fastening equipment is tensioned:
▶ Release pins **3** on both sides: Remove the ball locking pins **4**.
▶ Unpin the pins **3** with the control lever on both sides completely.
▶ Secure the pins **3** in the „unpinned“ position with ball locking pins **4**.
▶ Place the control lever **5** in park position and secure it properly.

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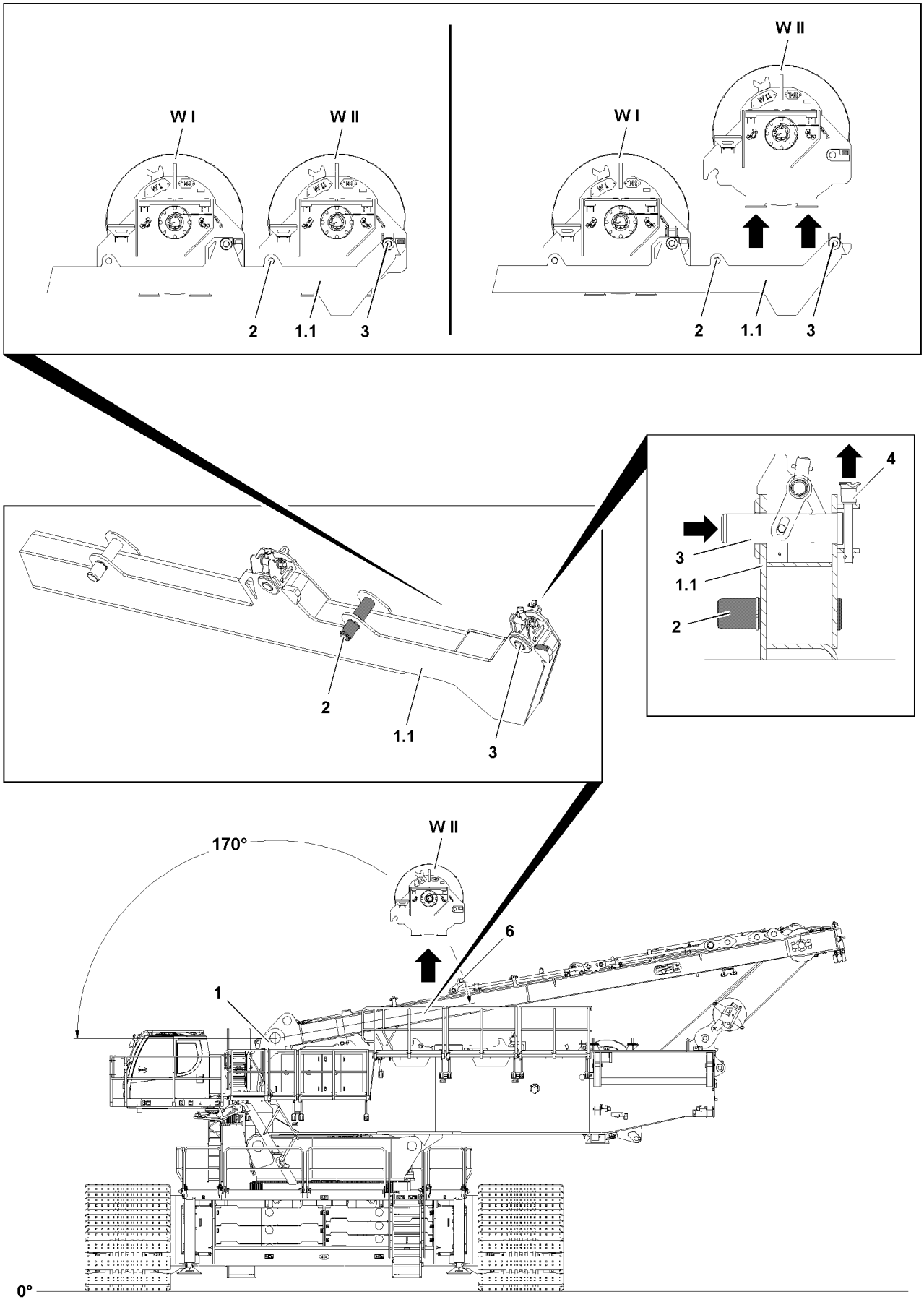

Fig.126248

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4.2.2 Lifting winch 2 from the turntable

Make sure that the following prerequisites are met:
- Winch 2 is properly unpinned on the turntable **1**.
- The SA-frame is at approx. 170°; pay attention to SA-frame angle display on the LICCON monitor, see Crane operating instructions, chapter 4.02
- The brackets **6** on the SA-frame have been changed over to the rear.

WARNING
Falling components!
When lifting the winch 2 on the turntable **1**, components or winch 2 can fall down.
Death, severe bodily injuries, property damage.
▶ Make sure that there are no persons within the danger zone.

▶ Carefully lift winch 2 with the auxiliary crane from the turntable **1**.

WARNING
Toppling winch!
When setting the winch on the ground, the winch can sink into the ground and fall over.
Death, severe bodily injuries, property damage.
▶ Make sure that the ground has sufficient load bearing capacity to safely take on the weight of the winch.

▶ Swing winch 2 out with the auxiliary crane and set it on the ground on a suitable substructure.
or
Swing winch 2 out with the auxiliary crane and set it on the flatbed trailer.

When winch 2 has been set down properly:
▶ Remove the auxiliary crane.

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3.07.30 Winch 3 assembly

1 Component overview 3

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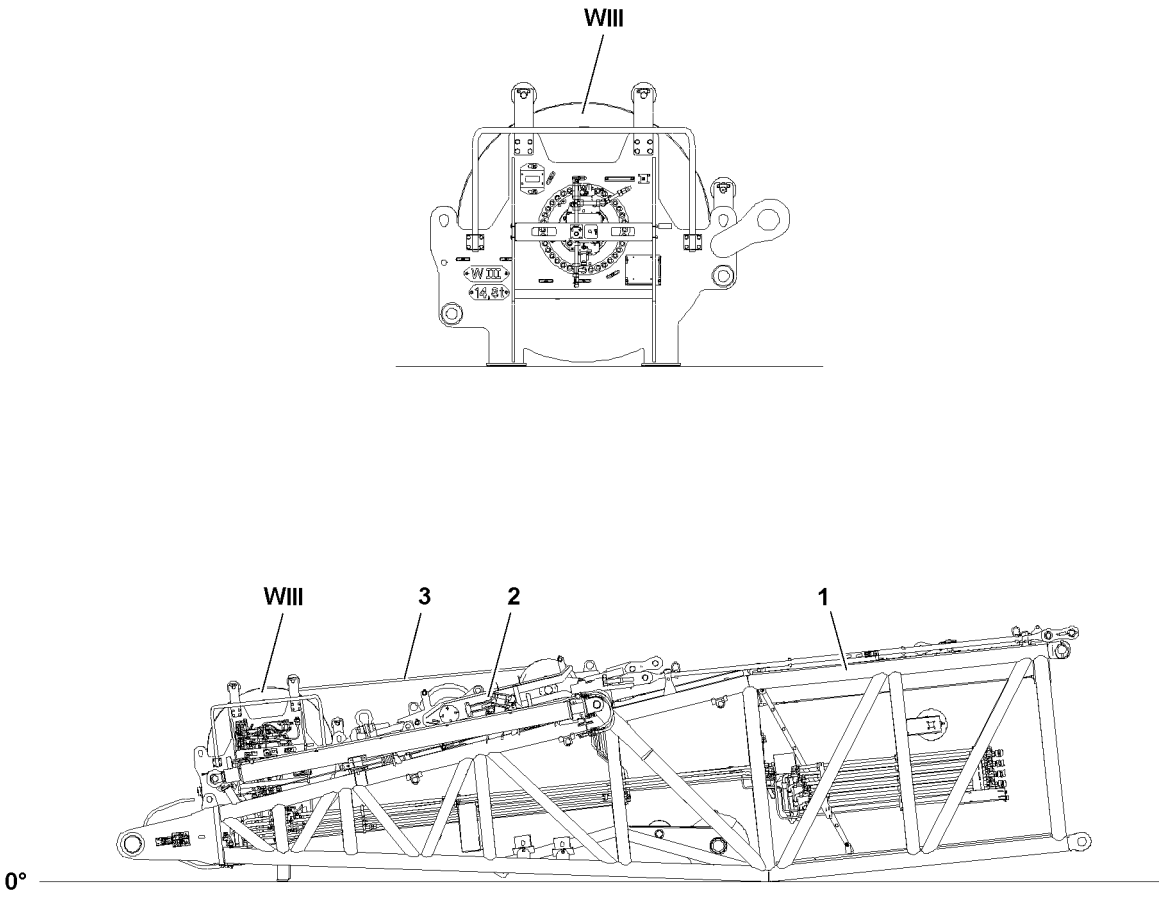

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Fig.118575

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1 Component overview

Note

▶ Winch 3 is installed at the factory on the derrick pivot section **1** (D-pivot section).

Note

▶ In the transport unit „D-pivot section with winch 3“ the pulley block **2** in transport position is also taken into account. In this case the hoist rope **3** of winch 3 has already been reeved at the factory on pulley block **2**.

▶ For dimensions and weights of the transport unit „D-pivot section with winch 3“, see Crane operating instructions, chapter 1.03.

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3.07.50 Winch 5 assembly

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2	Fastening points winch 5	3
3	Installation winch 5 from transport into operating position	5
4	Assembly winch 5	11
5	Disassembly winch 5	21

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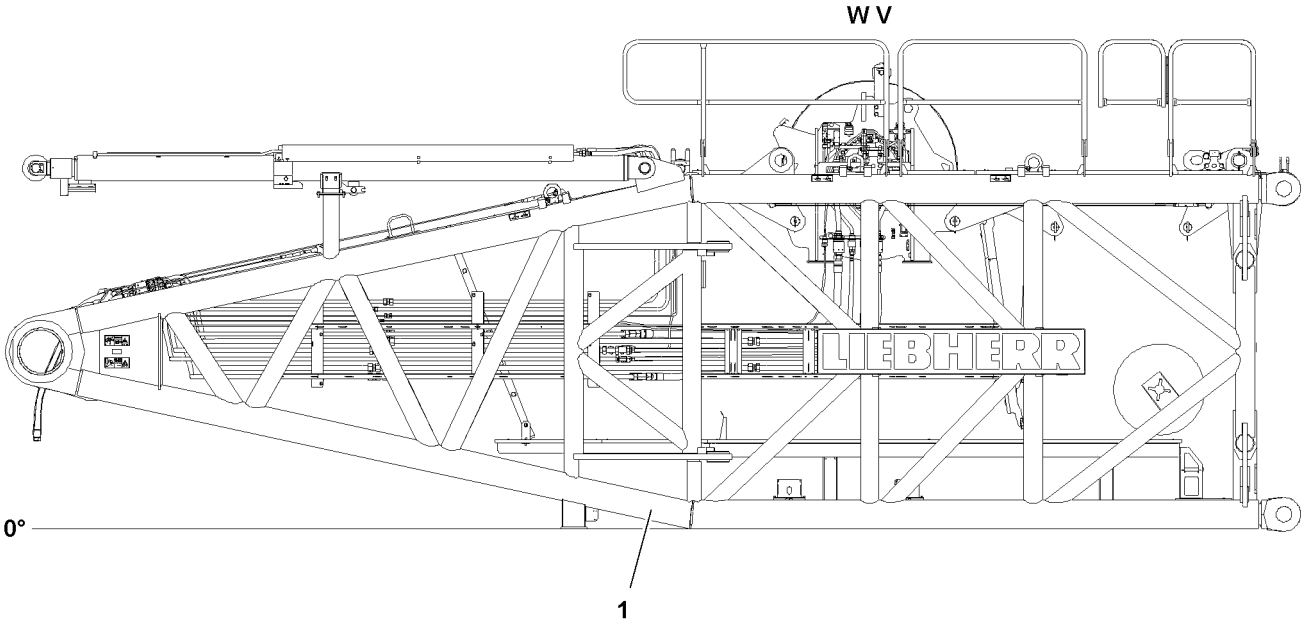

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Fig.118582

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1 Component overview

Note

▶ The weight of winch 5 together with the S-pivot section **1**, see Crane operating instructions, chapter 1.03.

Note

▶ The winch 5 is marked with its own weight.

2 Fastening points winch 5

WARNING

Winch incorrectly fastened!

Life-threatening situations can arise if the winch is incorrectly or improperly attached.

Death, severe bodily injuries, property damage.

▶ Attach the winch only on the intended fastening points.

▶ Attach the fastening equipment on winch solely in connection with shackles.

▶ Make sure that the shackels and fastening equipment have sufficient load capacity.

▶ Observe the technical safety instructions during assembly and disassembly, see Crane operating instructions, chapter 5.01.

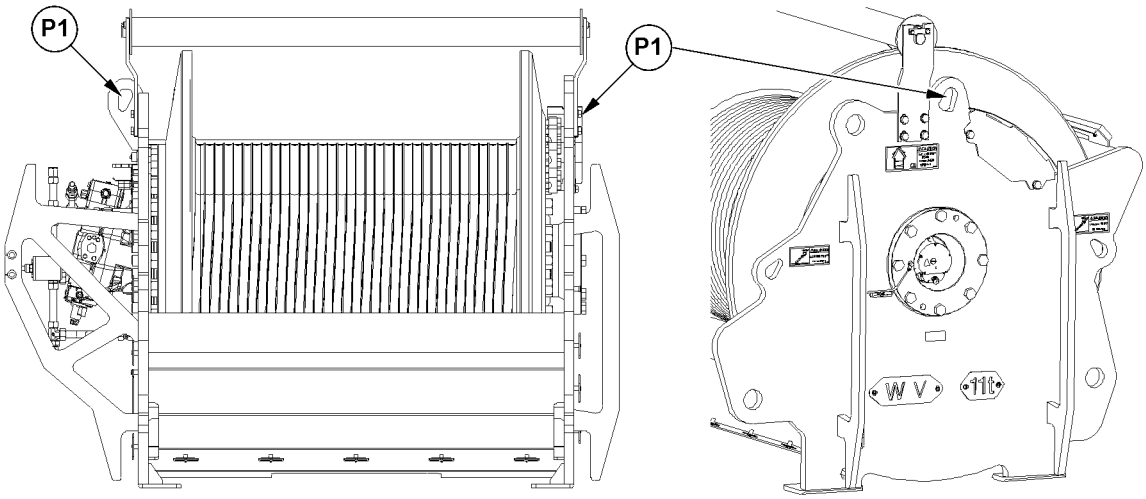

Fig.118583: Fastening points winch 5

Fastening points	
P1	Winch 5

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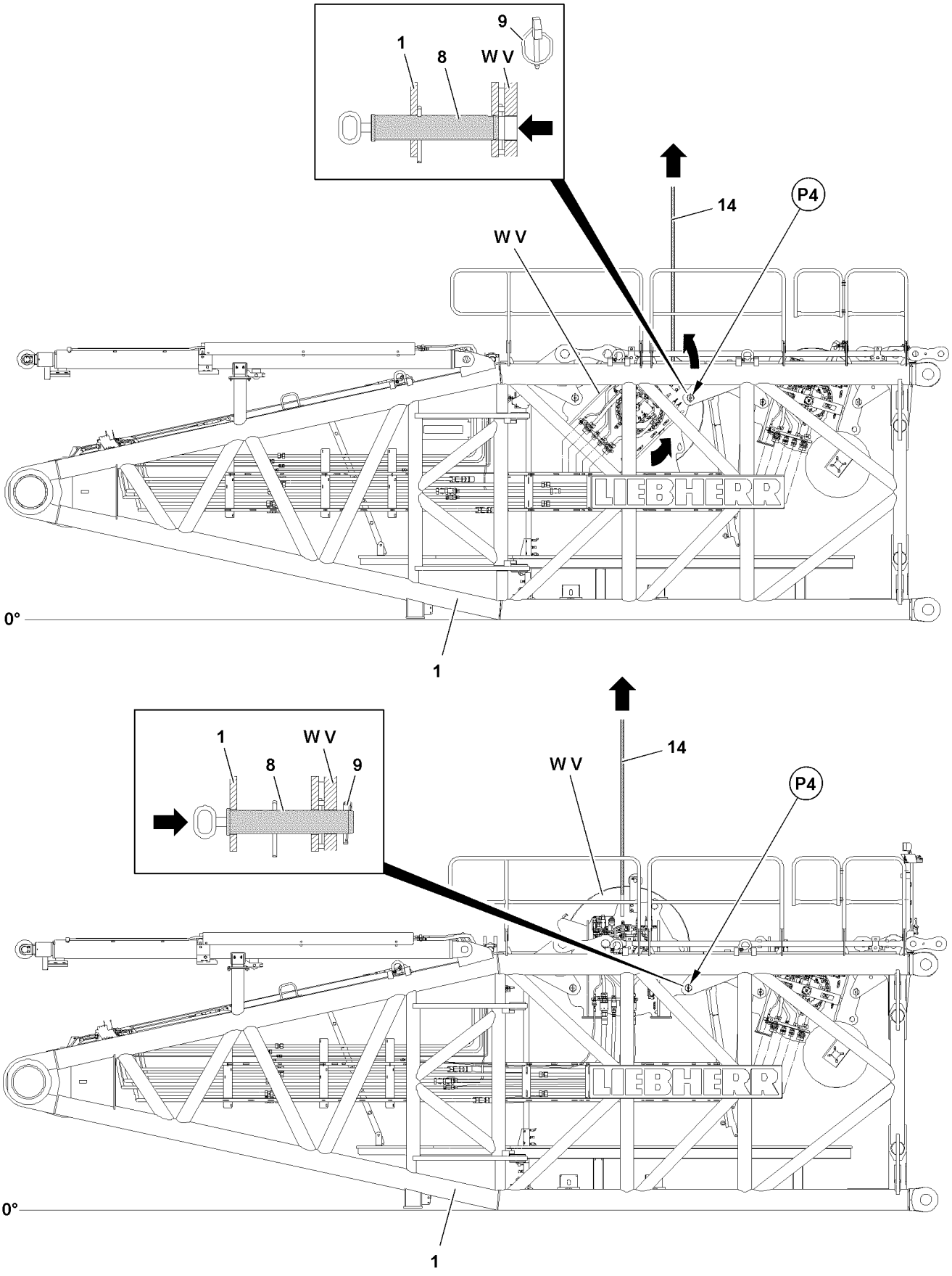

Fig.118585

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3 Installation winch 5 from transport into operating position

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.
If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries.
- ▶ The assembly personnel must always move carefully and anticipatory on the crane, the crane components or lattice sections.
- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
- ▶ If fall protection equipment is available, then it must be used.
- ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the approved fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
- ▶ The fall arrest system must be attached on the fastening and hook points as well as on the safety ropes.
- ▶ Always secure ladders on structural parts and / or components to prevent them from falling over.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.

WARNING
Components not pinned and secured!
If a component is released from the auxiliary crane before having been pinned and secured, the component can slip and fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not disengage the auxiliary crane until the corresponding component is pinned and secured.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

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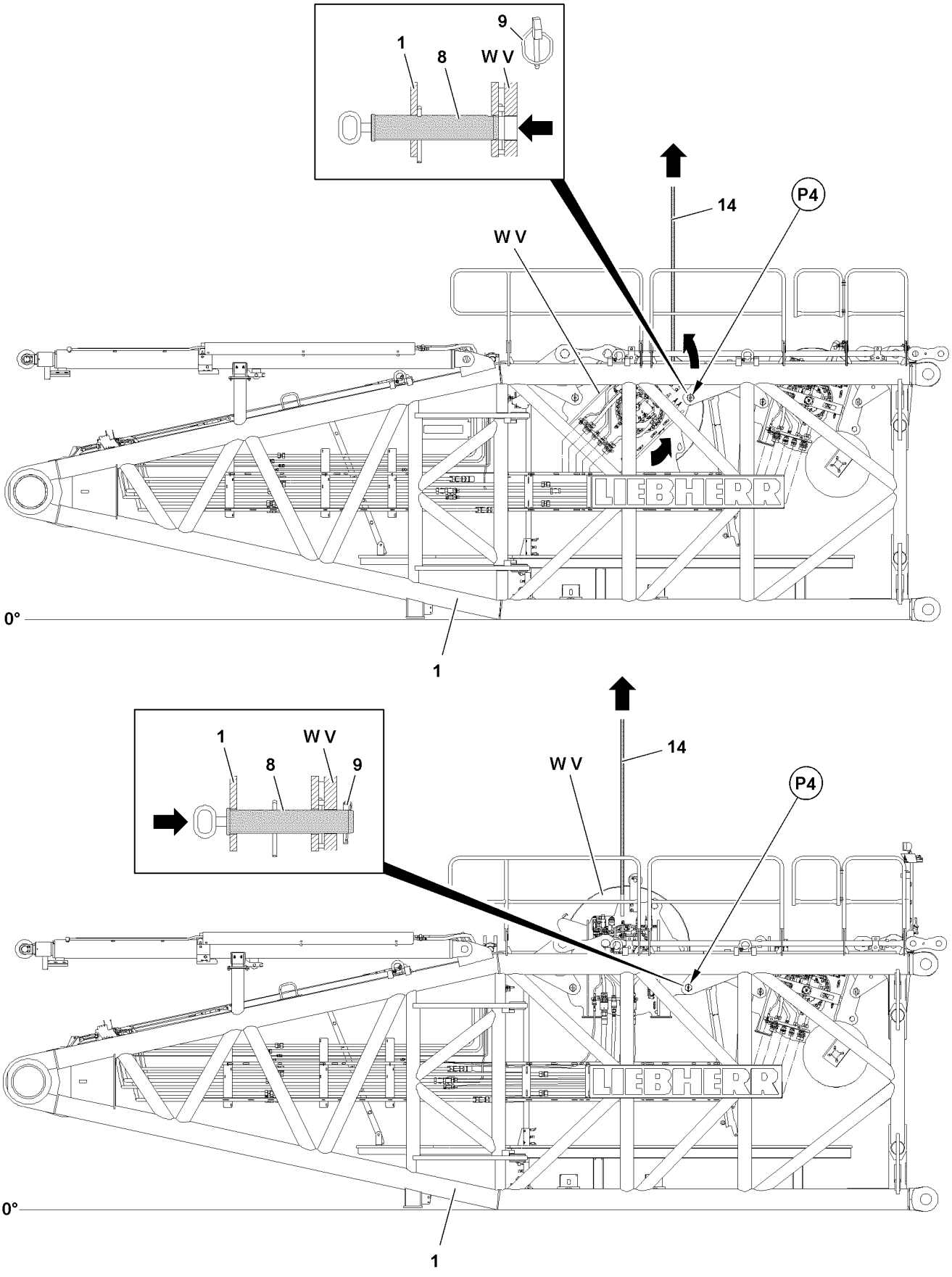

Fig.118585

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3.1 Bringing winch 5 from transport position into operating position

Make sure that the following prerequisites are met:
- The fall protection equipment is in operating position.
- An auxiliary crane with sufficient load carrying capacity is available.

Note

▶ During the installation procedure of winch 5 from transport into operating position, all hydraulic and electrical connections as well as the central lubrication connection remain connected with winch 5.

▶ Attach winch 5 with fastening equipment **14** on the auxiliary crane.

WARNING

Danger of accident due to winch 5!
If the pins **8** at point **P4** are unpinned on both sides and the fastening equipment **14** is not tensioned, then winch 5 can suddenly swing downward.
Death, severe bodily injuries, property damage.

▶ Make sure that the fastening equipment **14** is tensioned before the pins **8** are unpinned on both sides on point **P4**.
▶ Make sure that no personnel is within the danger zone when unpinning winch 5.

When winch 5 is properly fastened on the auxiliary crane:
▶ Carefully bring the fastening equipment **14** to tension.

When the fastening equipment is tensioned:
▶ Release pins **8** on both sides at point **P4** and unpin.
▶ Lift winch 5 with the auxiliary crane into operating position upward until the pin bores align at point **P4**.

When the pin bores align at point **P4**:
▶ Insert the pins **8** completely on both sides.
▶ Secure the pins **8** on both sides with locking pins **9**.

When winch 5 is properly pinned and secured in operating position:
▶ Remove the auxiliary crane and the fastening equipment **14** on winch 5.

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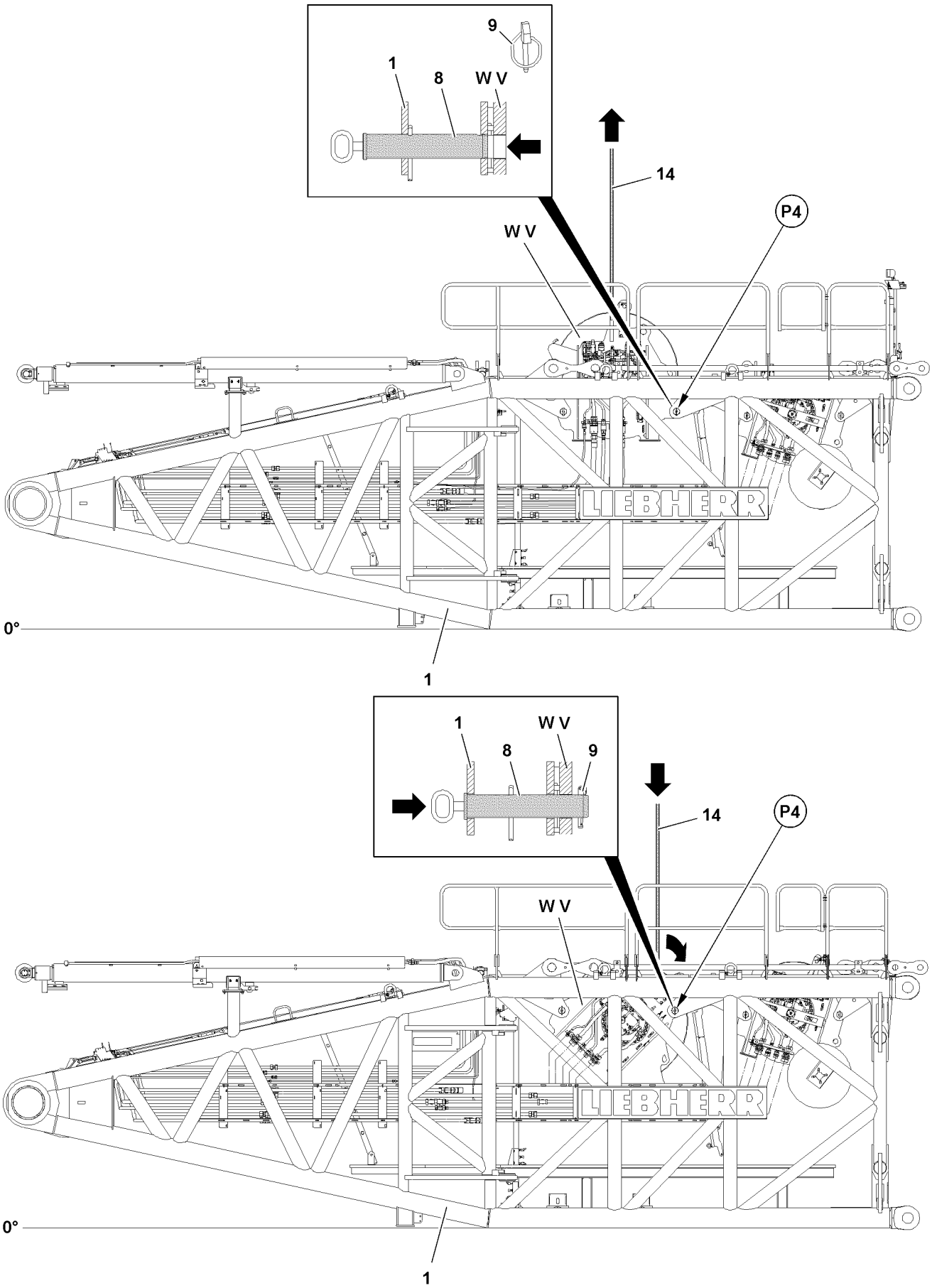

Fig.118586

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3.2 Bringing winch 5 from operating position into transport position

Make sure that the following prerequisites are met:
- The fall protection equipment is in operating position.
- An auxiliary crane with sufficient load carrying capacity is available.

Note

▶ During the removal procedure of winch 5 from operating to transport position, all hydraulic and electrical connections as well as the central lubrication connection remain connected with winch 5.

▶ Attach winch 5 with fastening equipment **14** on the auxiliary crane.

WARNING

Danger of accident due to winch 5!
If the pins **8** at point **P4** are unpinned on both sides and the fastening equipment **14** is not tensioned, then winch 5 can suddenly swing downward.
Death, severe bodily injuries, property damage.

▶ Make sure that the fastening equipment **14** is tensioned before the pins **8** are unpinned on both sides on point **P4**.
▶ Make sure that no personnel is within the danger zone when unpinning winch 5.

When winch 5 is properly fastened on the auxiliary crane:
▶ Carefully bring the fastening equipment **14** to tension.

When the fastening equipment is tensioned:
▶ Release pins **8** on both sides at point **P4** and unpin.
▶ Lower winch 5 into transport position until the upper pin bores of winch 5 align with the pin bores at point **P4**.

When the pin bores align at point **P4**:
▶ Insert the pins **8** completely on both sides.
▶ Secure the pins **8** on both sides with locking pins **9**.

When winch 5 is properly pinned and secured in transport position:
▶ Remove the auxiliary crane and the fastening equipment **14** on winch 5.

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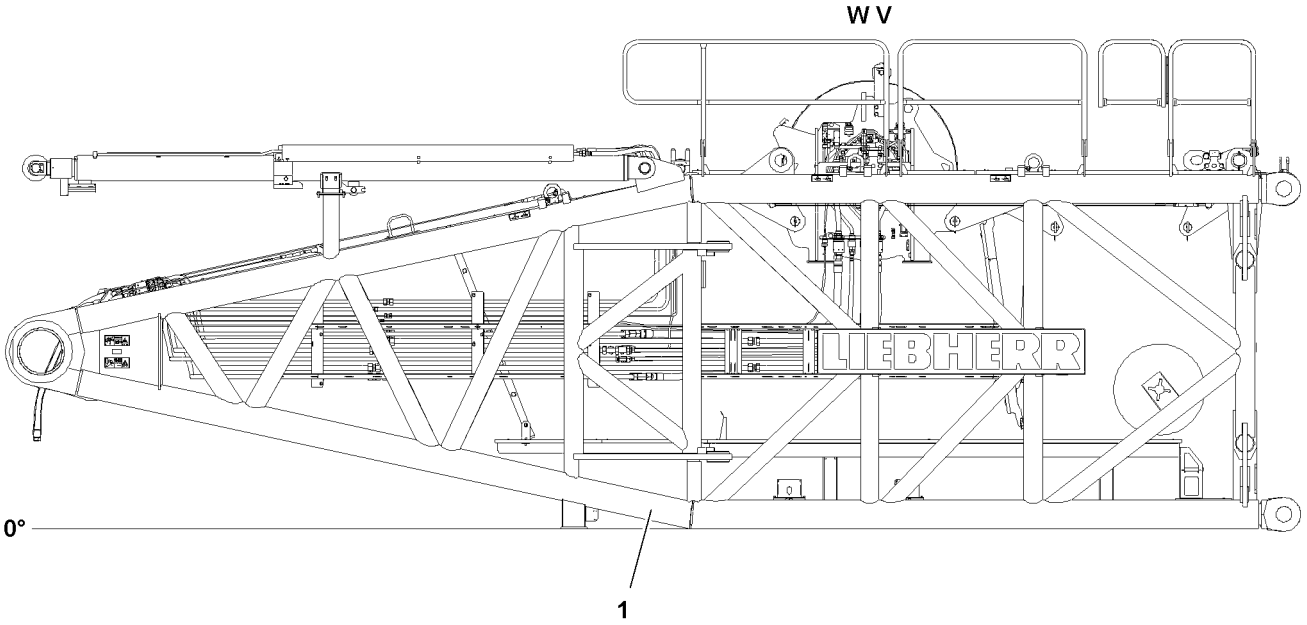

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Fig.118582

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4 Assembly winch 5

Note

▶ The description in this section may only be used when winch 5 is delivered separately from the S-pivot section **1** to the installation and / or job location of the crane.

WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.

If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries.

▶ The assembly personnel must always move carefully and anticipatory on the crane, the crane components or lattice sections.
▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
▶ If fall protection equipment is available, then it must be used.
▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the approved fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
▶ The fall arrest system must be attached on the fastening and hook points as well as on the safety ropes.
▶ Always secure ladders on structural parts and / or components to prevent them from falling over.
▶ Only step on the aids, ladders and catwalks with clean shoes.
▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.

WARNING

Components not pinned and secured!

If a component is released from the auxiliary crane before having been pinned and secured, the component can slip and fall down.

Death, severe bodily injuries, property damage.

▶ Do not disengage the auxiliary crane until the corresponding component is pinned and secured.

WARNING

Danger of impact / crushing!

When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.

When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.

Death, severe bodily injuries.

▶ Make sure that personnel cannot be caught by components.
▶ When working in danger zones: Use aids to protect limbs.
▶ Guide components with suitable aids to minimize oscillation.

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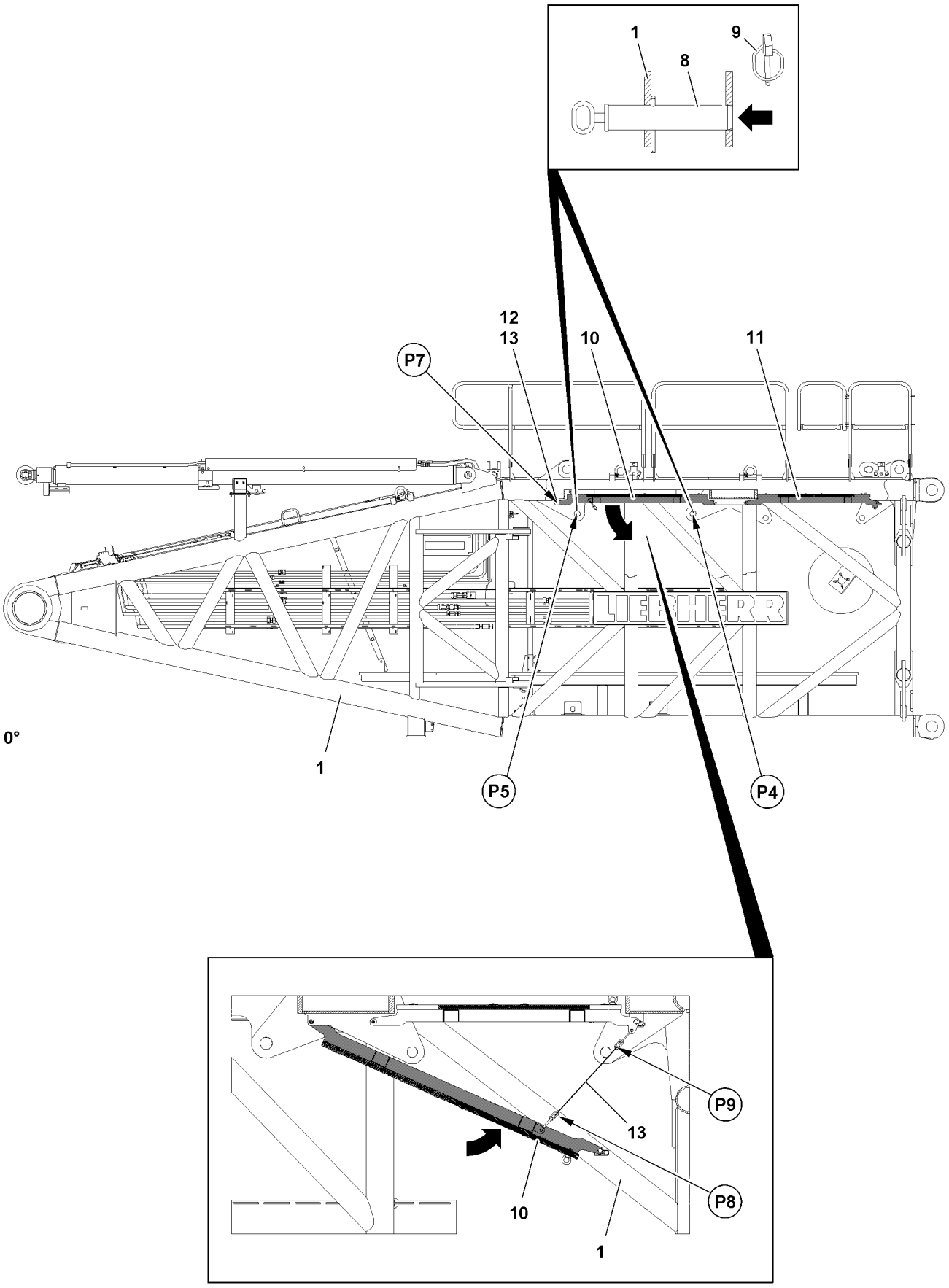

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Fig.118584

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4.1 Preparing installation of winch 5

Note

- ▶ If winch 5 is not installed in transport condition of the S-pivot section **1**, then the installation / assembly opening of winch 5 on the S-pivot section is closed off with a catwalk **10**.
- ▶ The catwalk **10** must be unpinned for the installation of winch 5 on the S-pivot section **1** on one side, swung down and secured in this position.

Make sure that the following prerequisites are met:
- The fall protection equipment is properly installed.
- The railings are in operating position.
- The assembly openings of winch 5 and winch 6 are closed off by the catwalks **10** and catwalks **11**.
- An auxiliary crane with sufficient load carrying capacity is available.

▶ Fasten the catwalk **10** on the auxiliary crane.

When the catwalk **10** is properly fastened on the auxiliary crane:
- ▶ Carefully bring the fastening equipment to tension.
- ▶ Unpin the pin **12**: Remove the spring retainer **13** at point **P7** on both sides and unpin the pin **12** on both sides.

WARNING

Danger of accident due to catwalk!
If there is any personnel within the swing range when lowering the catwalk **10**, then personnel can be severely injured or killed.
- ▶ Make sure that there are no persons within the swing range of the catwalk **10**.

When the pins **12** are unpinned on both sides:
- ▶ Lower the catwalk **10** slowly downward with the auxiliary crane.

When the catwalk **10** is lowered down completely:
- ▶ Pin and secure the catwalk **10** in assembly position between point **P8** and point **P9** on both sides and secure.

When the catwalk **10** is properly secured in assembly position:
- ▶ Remove the auxiliary crane.
- ▶ Release the connector pin **8** for winch 5 at point **P4** and point **P5** on both sides: Remove the locking pin **9**.
- ▶ Unpin the connector pin **8** at point **P4** and point **P5** on both sides to the stop.

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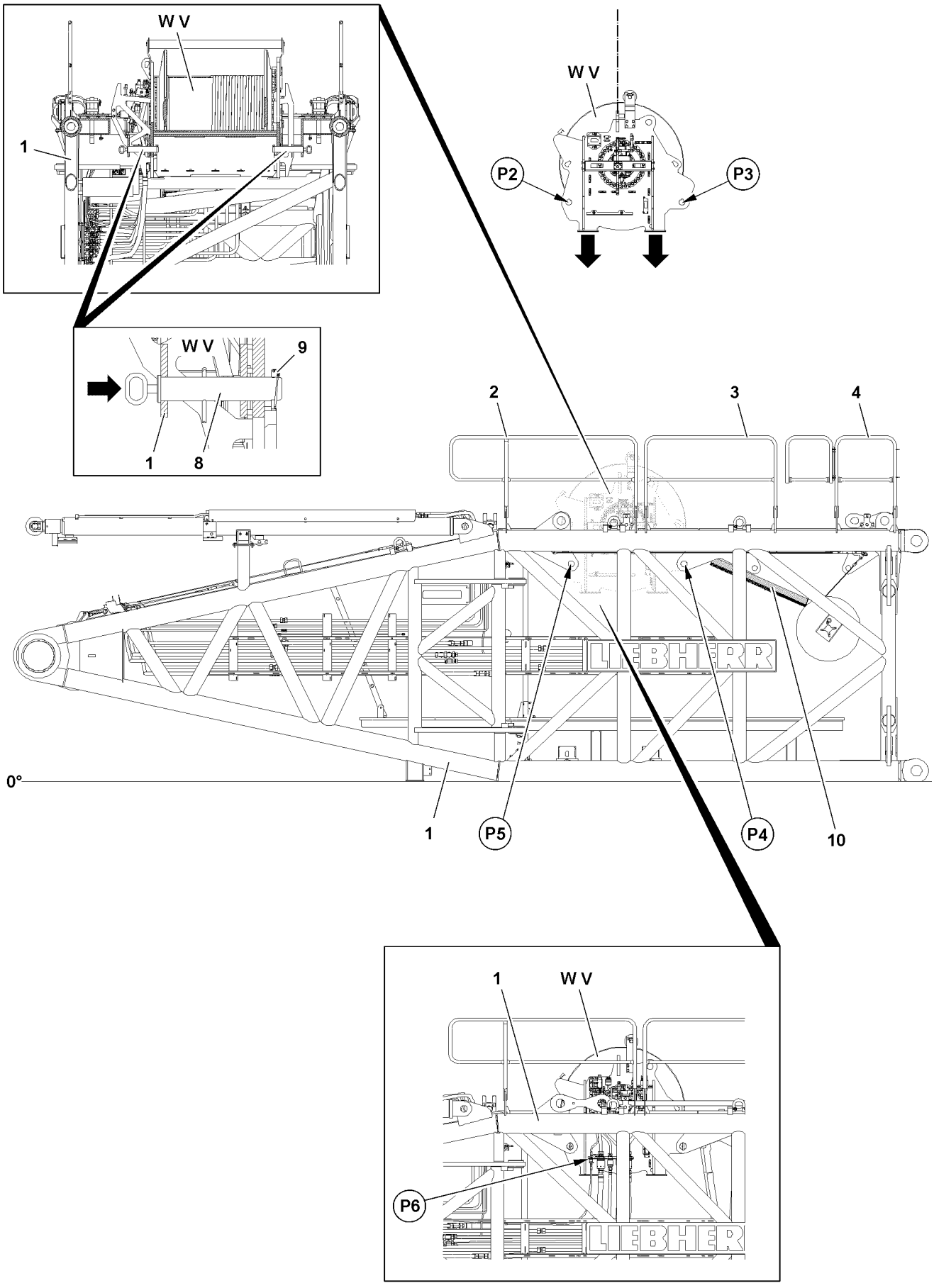

Fig.118578

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4.2 Installing winch 5

WARNING
Danger of accident during installation of winch 5!
Death, severe bodily injuries, property damage.
▶ Make sure that the following prerequisites are met for the installation of winch 5.

Make sure that the following prerequisites are met:
– The assembly opening winch 6 is properly closed and secured with the catwalk **11**.
– The catwalks **10** are in assembly position.
– An auxiliary crane with sufficient load carrying capacity is available.

4.2.1 Lifting winch 5 from the flatbed trailer

WARNING
Danger of accident due to incorrect attachment!
Life-threatening situations can arise if the winch 5 is incorrectly or improperly attached.
Death, severe bodily injuries, property damage.
▶ Fasten winch 5 only on the fastening points (points **P1**).
▶ Make sure that the fastening equipment is correctly attached on the fastening points (points **P1**) and that it is secured sufficiently to prevent it from loosening up.

▶ Attach the fastening equipment (points **P1**) on the fastening points, see section „Fastening points Winch 5“.
▶ Bring the fastening equipment to „tension“ with the auxiliary crane.
▶ Release and remove the transport retainers on the flatbed trailer.

WARNING
Falling components!
When lifting winch 5 from the flatbed trailer, components or winch 5 can fall down.
Death, severe bodily injuries, property damage.
▶ Make sure that there are no persons within the danger zone.

▶ Lift winch 5 with the auxiliary crane from the flatbed trailer.

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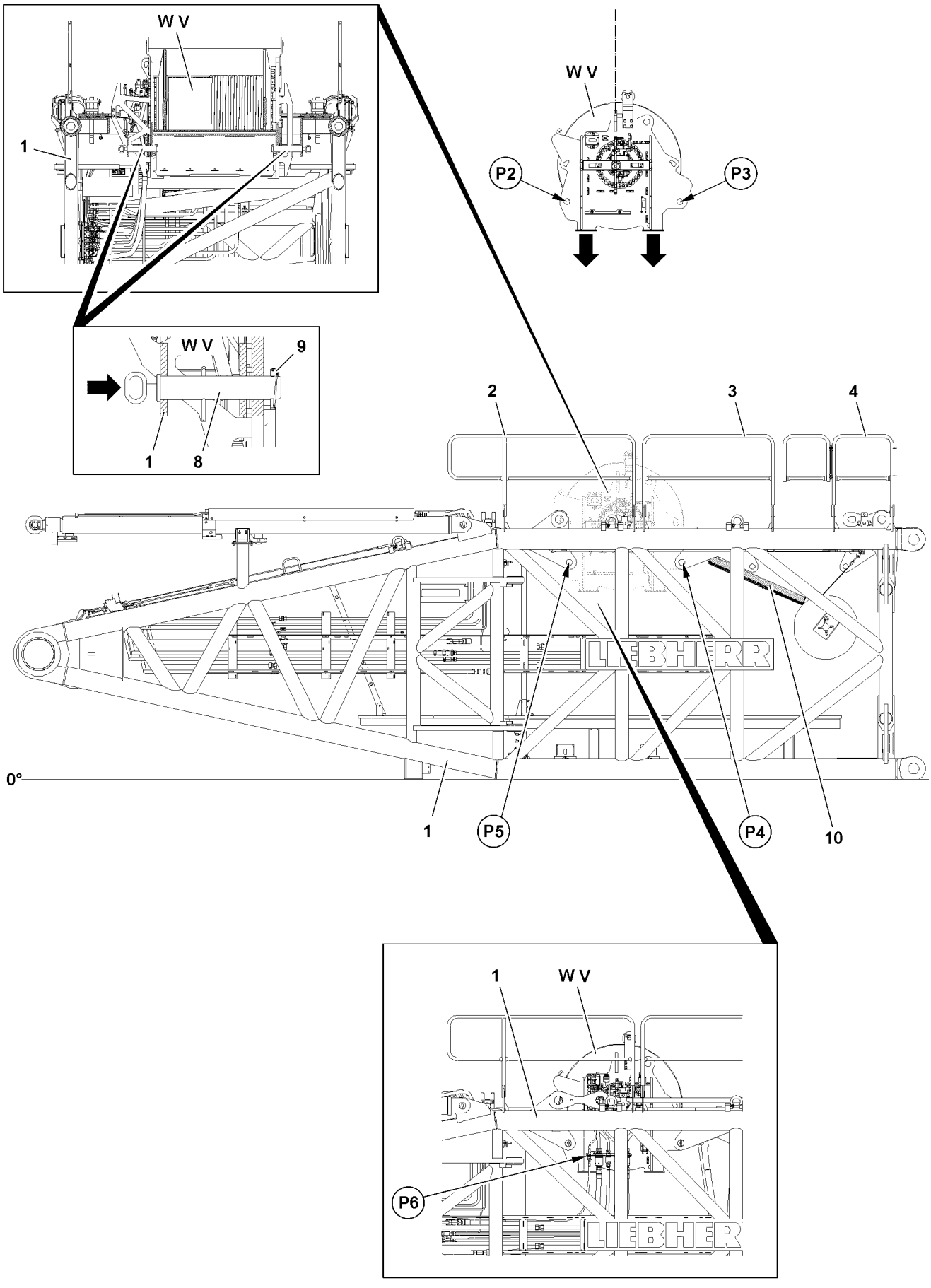

Fig.118578

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4.2.2 Positioning winch 5

Make sure that the following prerequisites are met:
– Pins **8** are completely unpinned on both sides at point **P4** and point **P5**.

WARNING
Danger of accident when swinging in and lowering winch 5!
When swinging in and lowering winch 5 in the assembly opening of the S-pivot section **1**, limbs can be crushed or even severed.
Death, severe bodily injuries, property damage.
▶ Make sure that there are no persons within the danger zone.
▶ Do not reach with your hands into the danger zone.

NOTICE
Property damage!
If the following notes are not observed, damage can result to the crane or winch 5.
▶ When retracting winch 5, it must be ensured that winch 5 does not hit against the S-pivot section **1**.

Note
▶ The guide must be in constant visual and acoustic contact with the crane operator.

Note
▶ Pay attention to the exact alignment of winch 5 to the installation position.

▶ Swing winch 5 in with the auxiliary crane to the S-pivot section **1**.
▶ Position and align winch 5.

When winch 5 is aligned:
▶ Lower winch 5 with the auxiliary crane in the assembly opening until the pin bores of winch 5 (point **P2** and point **P3**) align with the pin bores on the S-pivot section (point **P4** and point **P5**) on both sides.

4.2.3 Pinning winch 5

Make sure that the following prerequisites are met:
– The pin bores between winch 5 and the S-pivot section **1** align.

WARNING
The connector pins can loosen up!
▶ Make sure that the pins **8** are immediately secured with the locking pin **9** after pinning winch 5 in the S-pivot section **1**.

▶ Insert the pins **8** at point **P4** and point **P5** on both sides and secure with locking pin **9**.

When winch 5 is properly pinned and secured on all four pin points:
▶ Remove the auxiliary crane.

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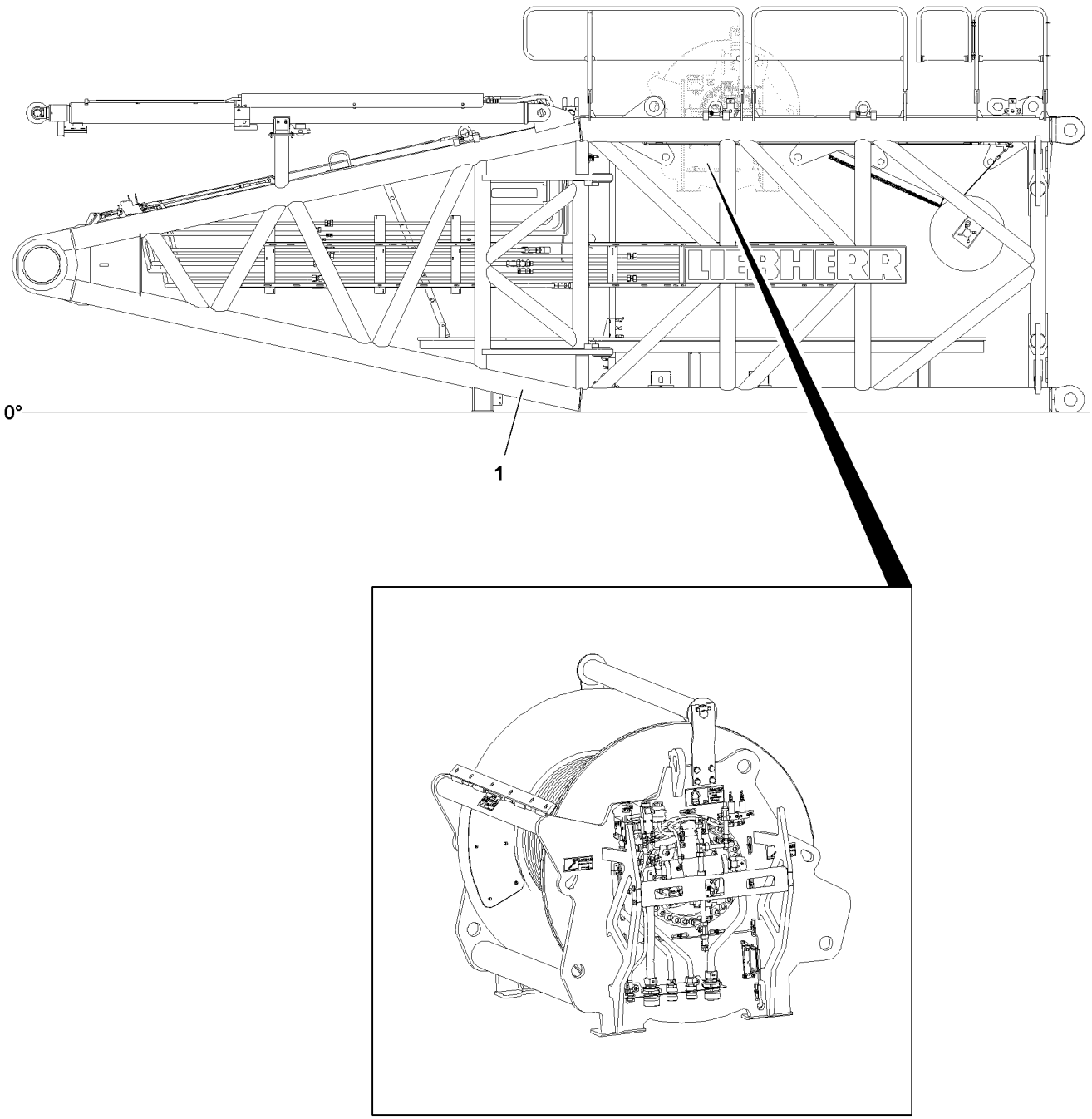

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Fig.118579

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4.3 Establishing the hydraulic connections to winch 5

Note

▶ Establish the connections to winch 5 only when winch 5 is properly installed and secured on the S-pivot section.

Make sure that the following prerequisites are met:

– The winch 5 is properly installed, pinned and secured.

4.3.1 Establishing the hydraulic connections to the winch

Note

▶ After the hydraulic connections to the winch are established, the expansion tank must be checked and emptied.

The hydraulic connections for the winch are made with quick couplings.

When connecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

WARNING

Pressure in the hydraulic lines!

If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.

Death, severe bodily injuries, property damage.

▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

WARNING

Loss of pressure or leakage!

Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.

▶ Check that the quick couplings have been properly connected before using the crane.

▶ Connect the coupling components (sleeve and connector) and screw together with the hand-tightened nut.

▶ Tighten the hydraulic coupling by hand. Rotate the hand-tightened nut until it reaches a tangible, fixed stop position.

▶ Establish the hydraulic connections to the winch.

4.3.2 Establishing the electrical connections to the winch

▶ Establish the electrical connections to the winch, see Electric wiring diagram.

4.3.3 Establishing the connections of the central lubrication system to the winch

▶ Establishing the connections of the central lubrication system to the winch.

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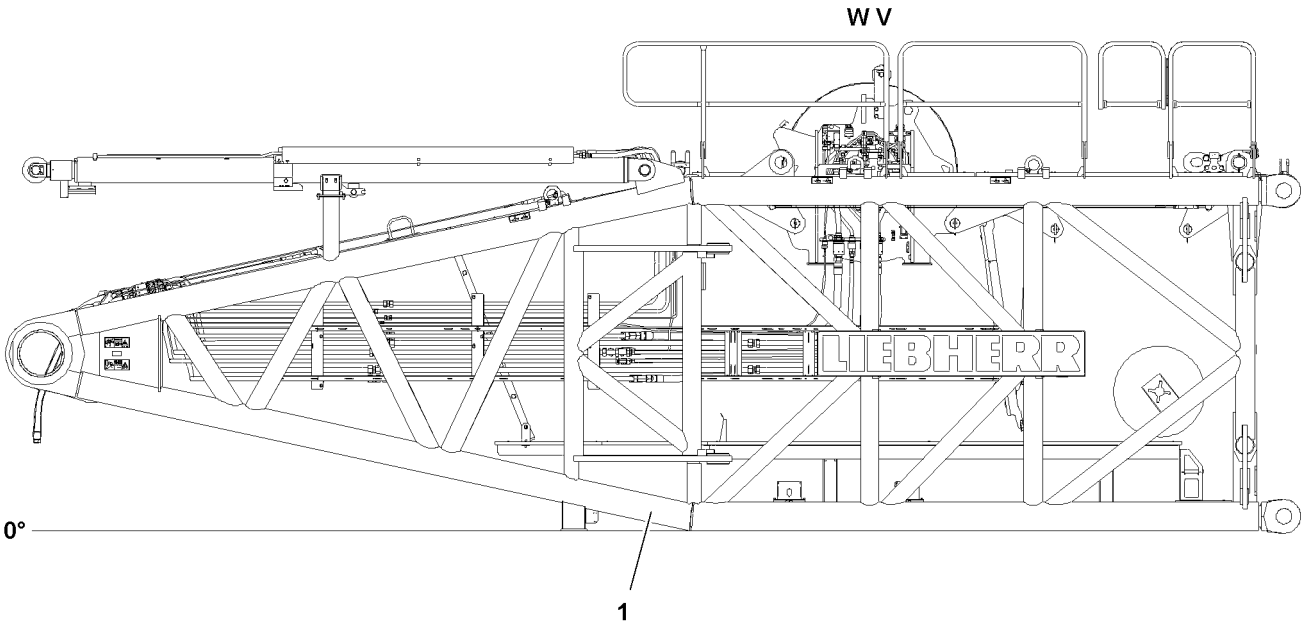

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Fig.118582

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5 Disassembly winch 5

Note

▶ The description in this section only has to be used when winch 5 is to be transported separately from the S-pivot section **1**.

WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.

If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries.

▶ The assembly personnel must always move carefully and anticipatory on the crane, the crane components or lattice sections.
▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
▶ If fall protection equipment is available, then it must be used.
▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the approved fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
▶ The fall arrest system must be attached on the fastening and hook points as well as on the safety ropes.
▶ Always secure ladders on structural parts and / or components to prevent them from falling over.
▶ Only step on the aids, ladders and catwalks with clean shoes.
▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.

WARNING

Components not pinned and secured!

If a component is released from the auxiliary crane before having been pinned and secured, the component can slip and fall down.

Death, severe bodily injuries, property damage.

▶ Do not disengage the auxiliary crane until the corresponding component is pinned and secured.

WARNING

Danger of impact / crushing!

When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.

When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.

Death, severe bodily injuries.

▶ Make sure that personnel cannot be caught by components.
▶ When working in danger zones: Use aids to protect limbs.
▶ Guide components with suitable aids to minimize oscillation.

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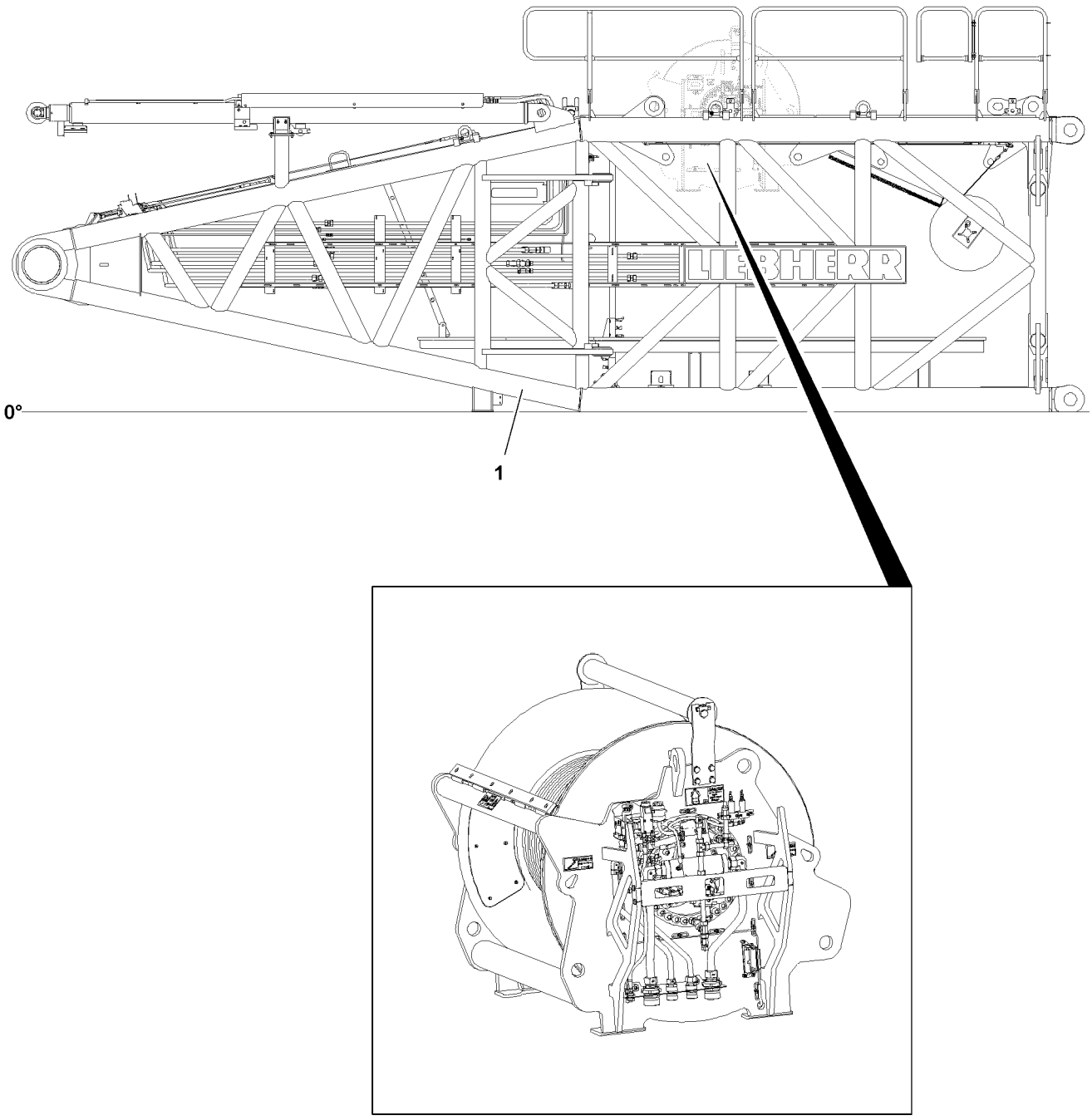

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Fig.118579

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5.1 Disconnecting the connections to winch 5

Make sure that the following prerequisites are met:
- The hoist rope is completely spooled up to the winch.
- The hoist rope is secured on the winch to prevent it from spooling out by itself.

5.1.1 Disconnecting the hydraulic connections to the winch

When releasing hydraulic lines with quick couplings, make sure that the uncoupling procedure is carried out correctly.

WARNING
Pressure in the hydraulic lines!
If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.
Death, severe bodily injuries, property damage.
▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

▶ Release the hydraulic coupling by hand.
▶ Disconnect the hydraulic connections to the winch.
▶ Close the hydraulic hoses and hydraulic lines off properly with the intended caps.
▶ Bring the hydraulic hoses in park position for transport and secure them properly.

5.1.2 Disconnecting the electrical connections to the winch

▶ Disconnect the electrical connections to the winch.
▶ Close the electrical connections properly off with the intended caps.

5.1.3 Disconnecting the connections of the central lubrication system to the winch

▶ Disconnect the connections to the winch.
▶ Close the lube line connections properly off with the intended caps.

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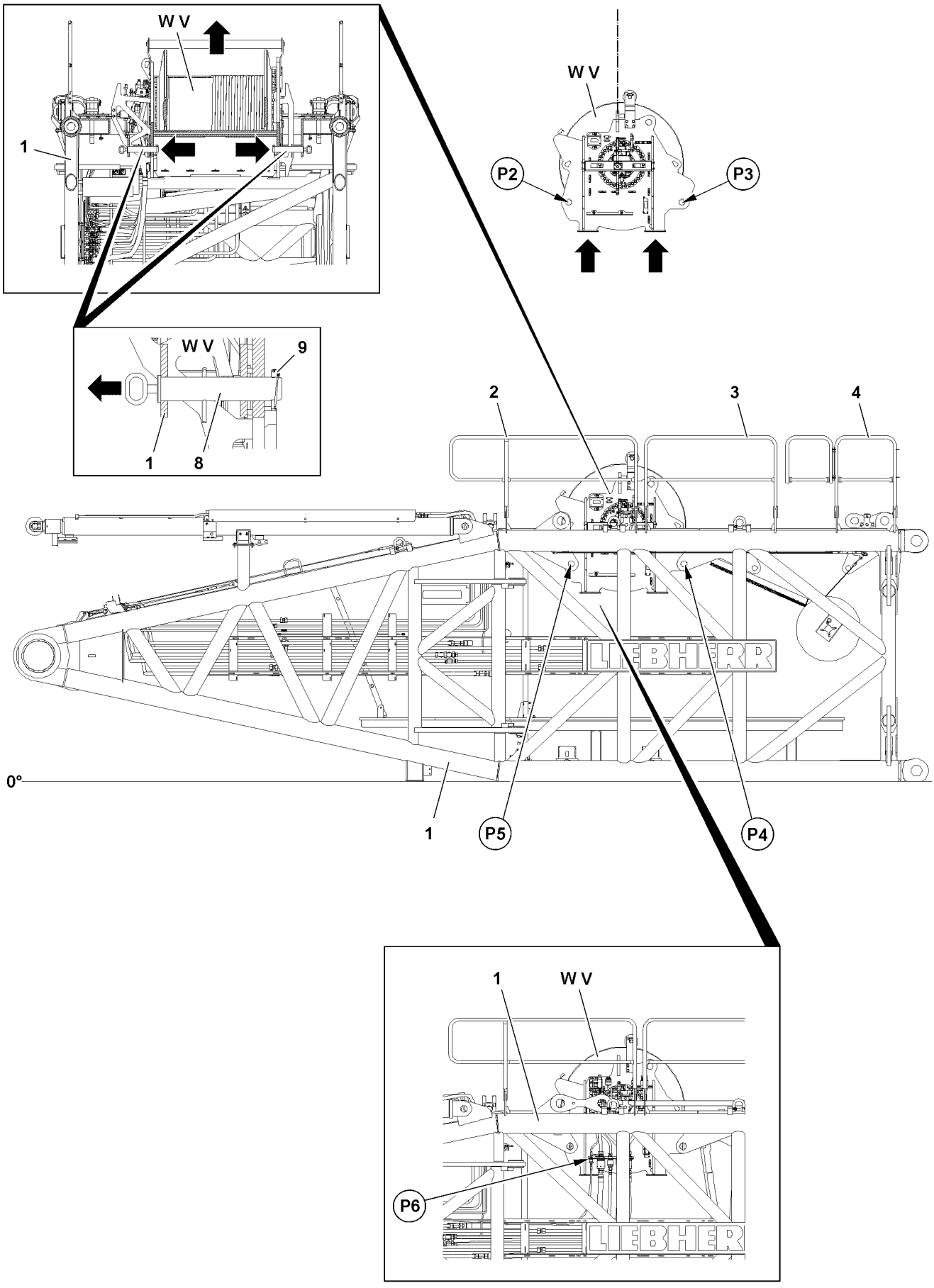

Fig.118580

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5.2 Removing winch 5

5.2.1 Unpinning winch 5

Make sure that the following prerequisites are met:
- The hydraulic connections are properly disconnected and closed off.
- The electrical connections are properly disconnected and closed off.
- The connections of the central lubrication system are properly disconnected and closed off.
- An auxiliary crane with sufficient load carrying capacity is available.

WARNING
Danger of accident due to incorrect attachment!
Life-threatening situations can arise if the winch 5 is incorrectly or improperly attached.
Death, severe bodily injuries, property damage.
- ▶ The fastening equipment may be attached on the winch only on the intended fastening points.
- ▶ Make sure that the fastening equipment is properly attached on winch 5 and that it is secured sufficiently to prevent it from loosening up.

▶ Attach the fastening equipment on both sides on winch 5, see section „Fastening points Winch 5“.

When the fastening equipment is properly fastened on winch 5:
▶ Bring the fastening equipment with the auxiliary crane carefully to „tension“.

When the fastening equipment is tensioned:
▶ Release pins **8** on both sides: Remove the locking pin **9** at point **P4** and point **P5**.
▶ Unpin pins **8** completely on both sides at point **P4** and point **P5**.

5.2.2 Lifting winch 5 from the S-pivot section

Make sure that the following prerequisites are met:
- Winch 5 is properly unpinned on the S-pivot section **1**.
- All connections to winch 5 are disconnected.

WARNING
Falling components!
When lifting the winch 5 on the S-pivot section **1**, components or winch 5 can fall down.
Death, severe bodily injuries, property damage.
- ▶ Make sure that there are no persons within the danger zone.

▶ Lift winch 5 carefully out with the auxiliary crane on the S-pivot section **1**.

WARNING
Toppling winch!
When setting winch 5 on the ground, the winch can sink into the ground and fall over.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the ground has sufficient load bearing capacity to safely take on the weight of winch 5.

▶ Swing winch 5 out with the auxiliary crane and set it on the ground on a suitable support.
or
Swing winch 5 out with the auxiliary crane and set it on the flatbed trailer.

When winch 5 has been set down properly:
▶ Remove the auxiliary crane.

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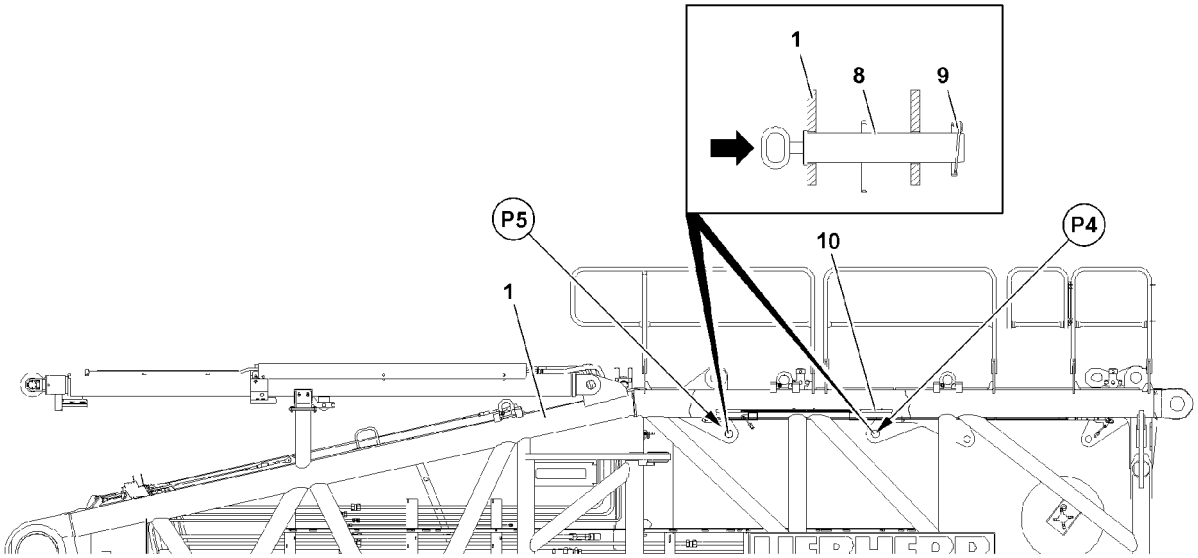

Fig.118581

5.2.3 Inserting the pins for transport

- ▶ Insert the pins **8** at point **P4** and point **P5** completely on both sides.
- ▶ Secure the pins **8** at point **P4** and point **P5** on both sides with locking pins **9**.

5.2.4 Closing the assembly opening winch 5

WARNING
Falling assembly personnel!
If the assembly opening of winch 5 is not properly closed off and secured after disassembly of the winch, then assembly personnel can fall down.
Death, severe bodily injuries, property damage.

- ▶ Make sure, after disassembly of winch 5, that the assembly opening is properly closed off and secured with the catwalk **10**.

- ▶ Release the catwalk **10** in transport position and swing it upward.
- ▶ Close the assembly opening winch 5: Properly pin and secure the catwalk **10** in up position.

Result:

– The assembly opening of winch 5 is closed off by the catwalk **10**.

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3.07.60 Winch 6 assembly

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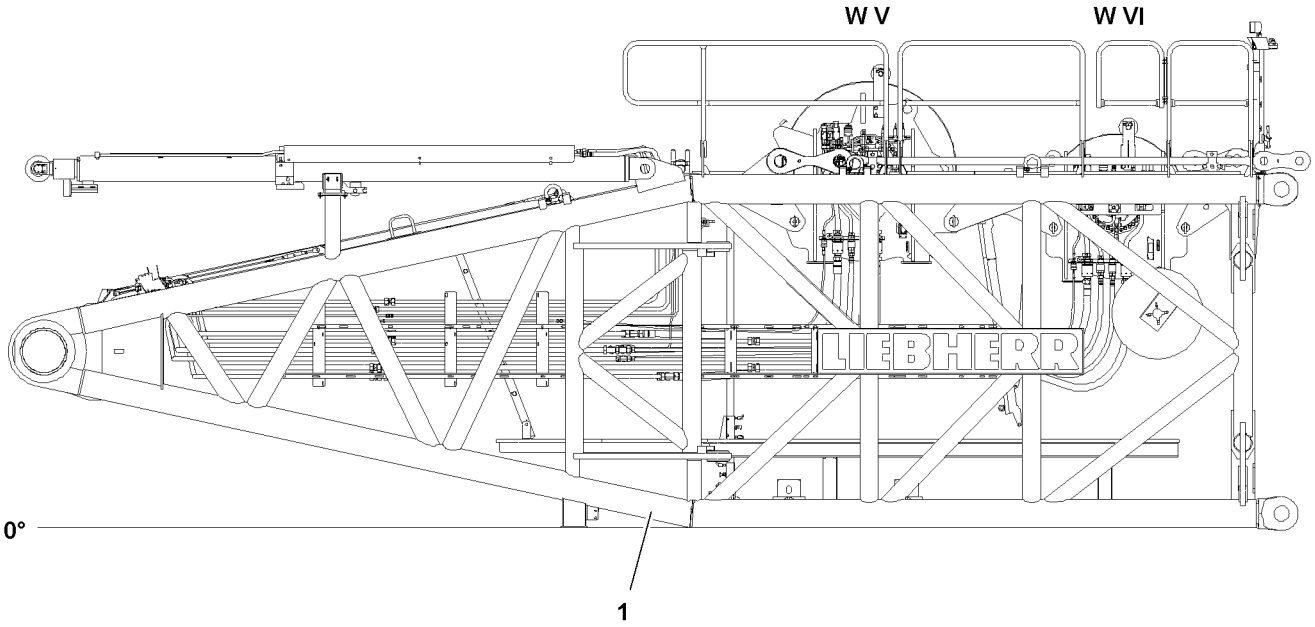

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Fig.118591

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1 Component overview

Note

▶ The weight of winch 6 together with the S-pivot section **1**, see Crane operating instructions, chapter 1.03.

Note

▶ The winch 6 is marked with its own weight.

2 Fastening points winch 6

WARNING

Winch incorrectly fastened!

Life-threatening situations can arise if the winch is incorrectly or improperly attached.

Death, severe bodily injuries, property damage.

▶ Attach the winch only on the intended fastening points.

▶ Attach the fastening equipment on winch solely in connection with shackles.

▶ Make sure that the shackels and fastening equipment have sufficient load capacity.

▶ Observe the technical safety instructions during assembly and disassembly, see Crane operating instructions, chapter 5.01.

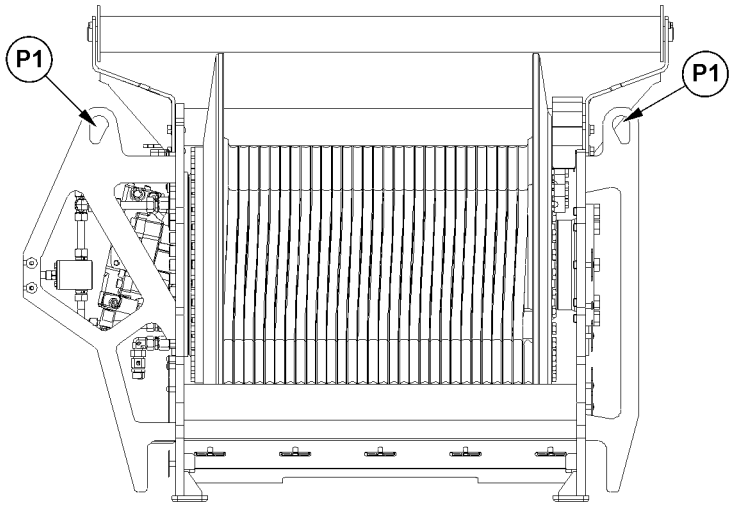

Fig.118592: Fastening points winch 6

Fastening points	
P1	Winch 6

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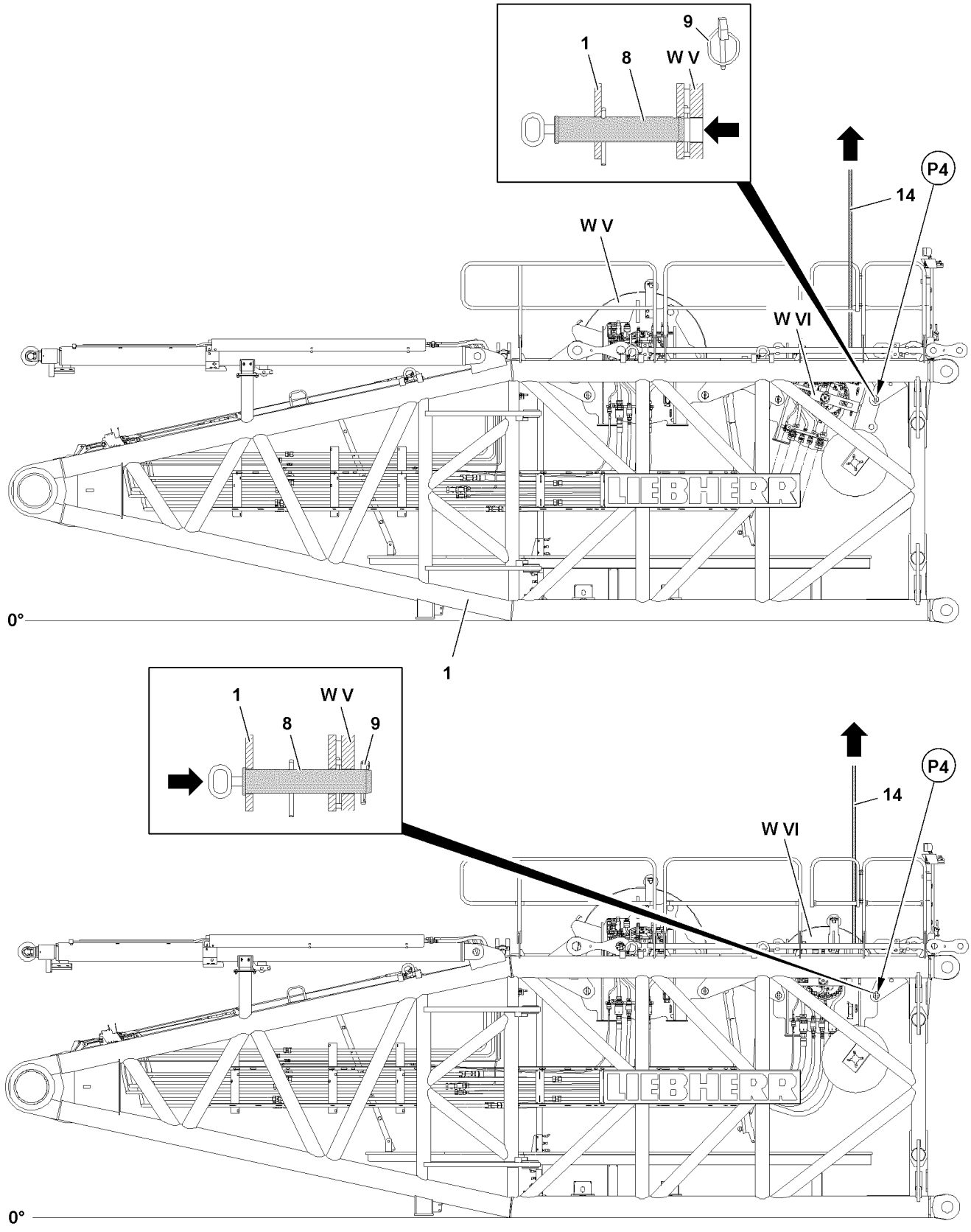

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Fig.118593

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3 Installation winch 6 from transport into operating position

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.
If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries.
- ▶ The assembly personnel must always move carefully and anticipatory on the crane, the crane components or lattice sections.
- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
- ▶ If fall protection equipment is available, then it must be used.
- ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the approved fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
- ▶ The fall arrest system must be attached on the fastening and hook points as well as on the safety ropes.
- ▶ Always secure ladders on structural parts and / or components to prevent them from falling over.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.

WARNING
Components not pinned and secured!
If a component is released from the auxiliary crane before having been pinned and secured, the component can slip and fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not disengage the auxiliary crane until the corresponding component is pinned and secured.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

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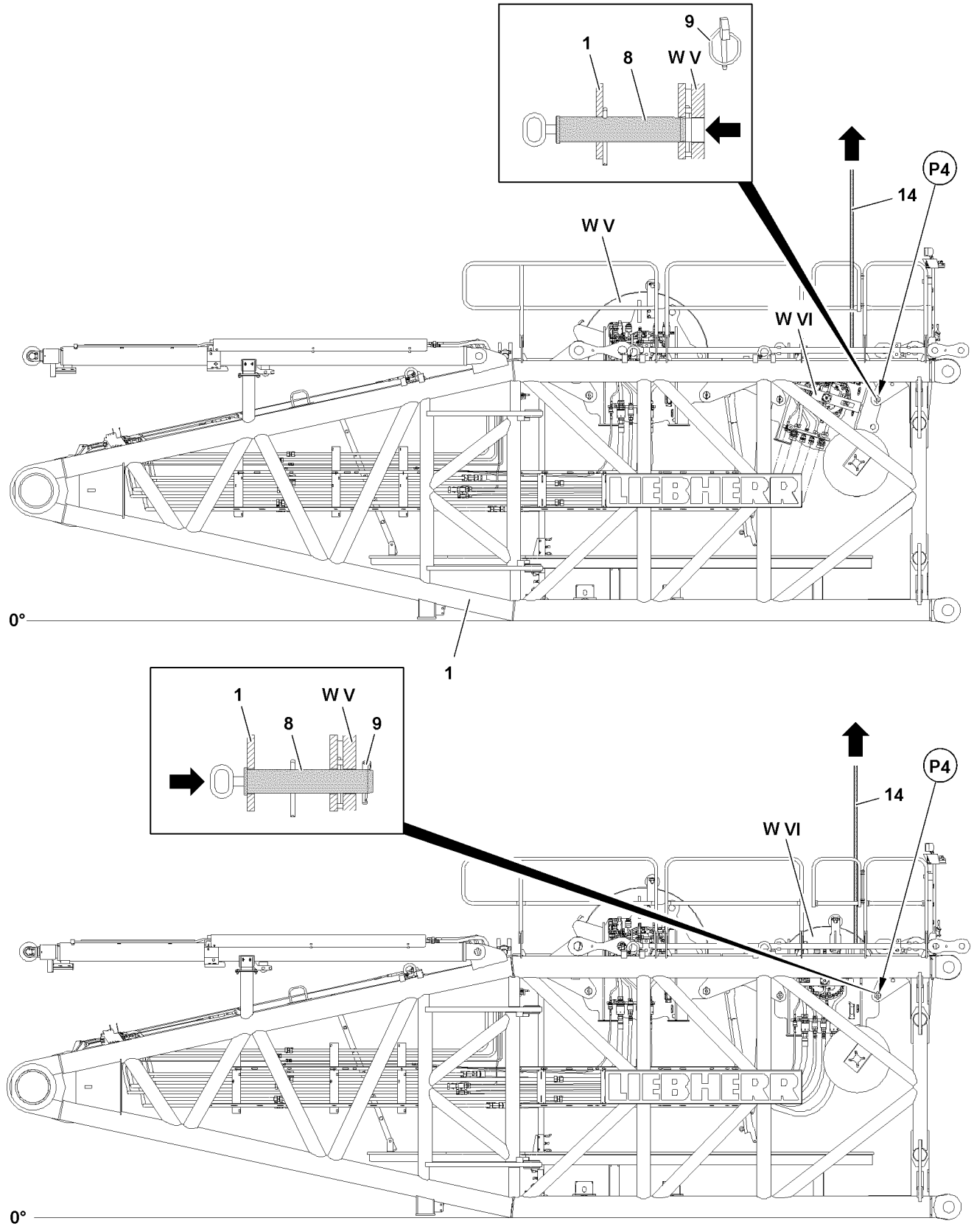

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Fig.118593

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3.1 Bringing winch 6 from transport position into operating position.

Make sure that the following prerequisites are met:
- The fall protection equipment is in operating position.
- An auxiliary crane with sufficient load carrying capacity is available.

Note

▶ During the installation procedure of winch 6 from transport into operating position, all hydraulic and electrical connections as well as the central lubrication connection remain connected with winch 6.

▶ Attach winch 6 with fastening equipment **14** on the auxiliary crane.

WARNING

Danger of accident due to winch 6!
If the pins **8** at point **P4** are unpinned on both sides and the fastening equipment **14** is not tensioned, then winch 6 can suddenly swing downward.
Death, severe bodily injuries, property damage.

▶ Make sure that the fastening equipment **14** is tensioned before the pins **8** are unpinned on both sides on point **P4**.
▶ Make sure that no personnel is within the danger zone when unpinning winch 6.

When winch 6 is properly fastened on the auxiliary crane:
▶ Carefully bring the fastening equipment **14** to tension.

When the fastening equipment is tensioned:
▶ Release pins **8** on both sides at point **P4** and unpin.
▶ Lift winch 6 with the auxiliary crane into operating position upward until the pin bores align at point **P4**.

When the pin bores align at point **P4**:
▶ Insert the pins **8** completely on both sides.
▶ Secure the pins **8** on both sides with locking pins **9**.

When winch 6 **W VI** is properly pinned and secured in operating position:
▶ Remove the auxiliary crane and the fastening equipment **14** on winch 6.

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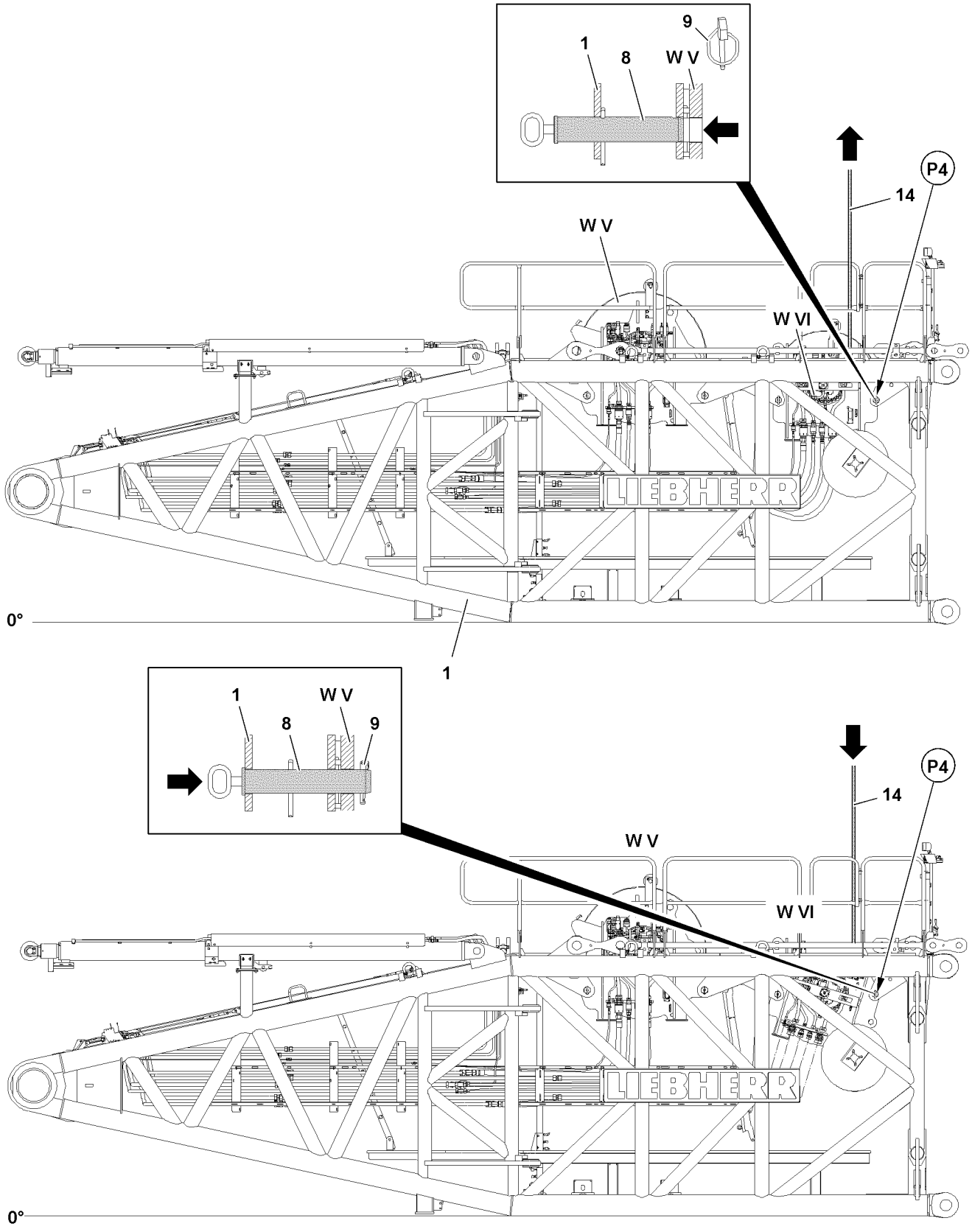

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Fig.118594

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3.2 Bringing winch 6 from operating position into transport position

Make sure that the following prerequisites are met:
- The fall protection equipment is in operating position.
- An auxiliary crane with sufficient load carrying capacity is available.

Note

▶ During the removal procedure of winch 6 from operating to transport position, all hydraulic and electrical connections as well as the central lubrication connection remain connected with winch 6.

▶ Attach winch 6 with fastening equipment **14** on the auxiliary crane.

WARNING

Danger of accident due to winch 6!
If the pins **8** at point **P4** are unpinned on both sides and the fastening equipment **14** is not tensioned, then winch 6 can suddenly swing downward.
Death, severe bodily injuries, property damage.

▶ Make sure that the fastening equipment **14** is tensioned before the pins **8** are unpinned on both sides on point **P4**.
▶ Make sure that no personnel is within the danger zone when unpinning winch 6.

When winch 6 is properly fastened on the auxiliary crane:
▶ Carefully bring the fastening equipment **14** to tension.

When the fastening equipment is tensioned:
▶ Release pins **8** on both sides at point **P4** and unpin.
▶ Lower winch 6 into transport position until the upper pin bores of winch 6 align with the pin bores at point **P4**.

When the pin bores align at point **P4**:
▶ Insert the pins **8** completely on both sides.
▶ Secure the pins **8** on both sides with locking pins **9**.

When winch 6 is properly pinned and secured in transport position:
▶ Remove the auxiliary crane and the fastening equipment **14** on winch 6.

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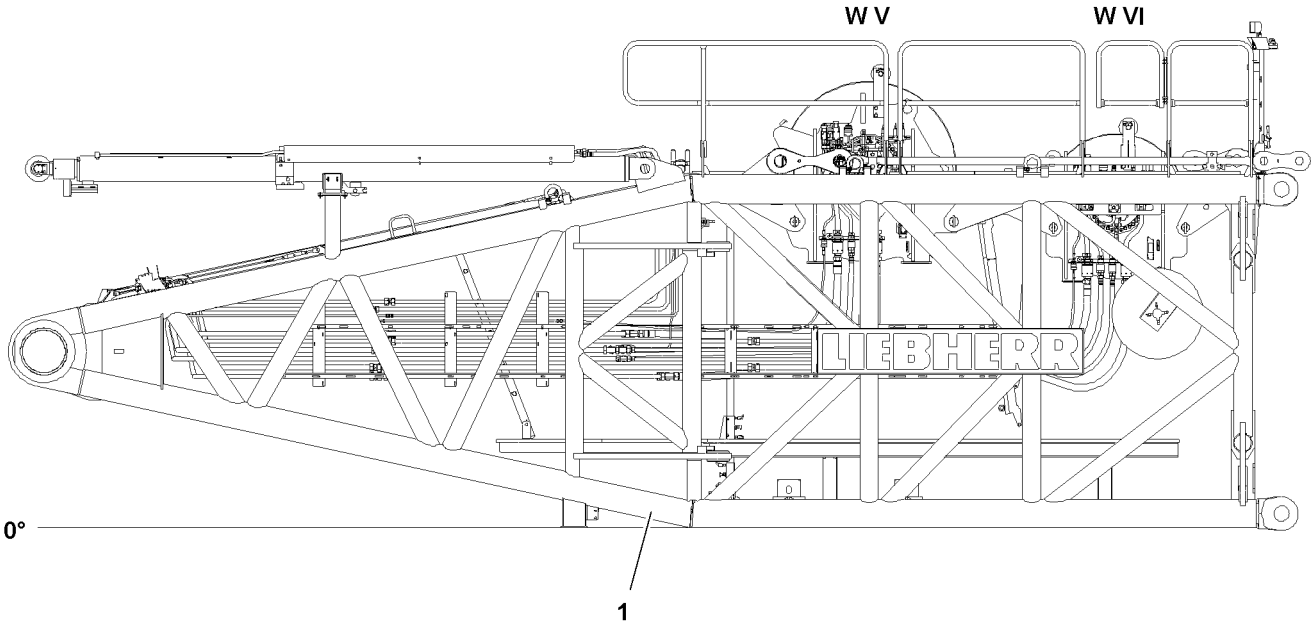

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Fig.118591

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4 Assembly winch 6

Note

▶ The description in this section may only be used when winch 6 is delivered separately from the S-pivot section **1** to the installation and / or job location of the crane.

WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.

If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries.

▶ The assembly personnel must always move carefully and anticipatory on the crane, the crane components or lattice sections.
▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
▶ If fall protection equipment is available, then it must be used.
▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the approved fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
▶ The fall arrest system must be attached on the fastening and hook points as well as on the safety ropes.
▶ Always secure ladders on structural parts and / or components to prevent them from falling over.
▶ Only step on the aids, ladders and catwalks with clean shoes.
▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.

WARNING

Components not pinned and secured!

If a component is released from the auxiliary crane before having been pinned and secured, the component can slip and fall down.

Death, severe bodily injuries, property damage.

▶ Do not disengage the auxiliary crane until the corresponding component is pinned and secured.

WARNING

Danger of impact / crushing!

When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.

When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.

Death, severe bodily injuries.

▶ Make sure that personnel cannot be caught by components.
▶ When working in danger zones: Use aids to protect limbs.
▶ Guide components with suitable aids to minimize oscillation.

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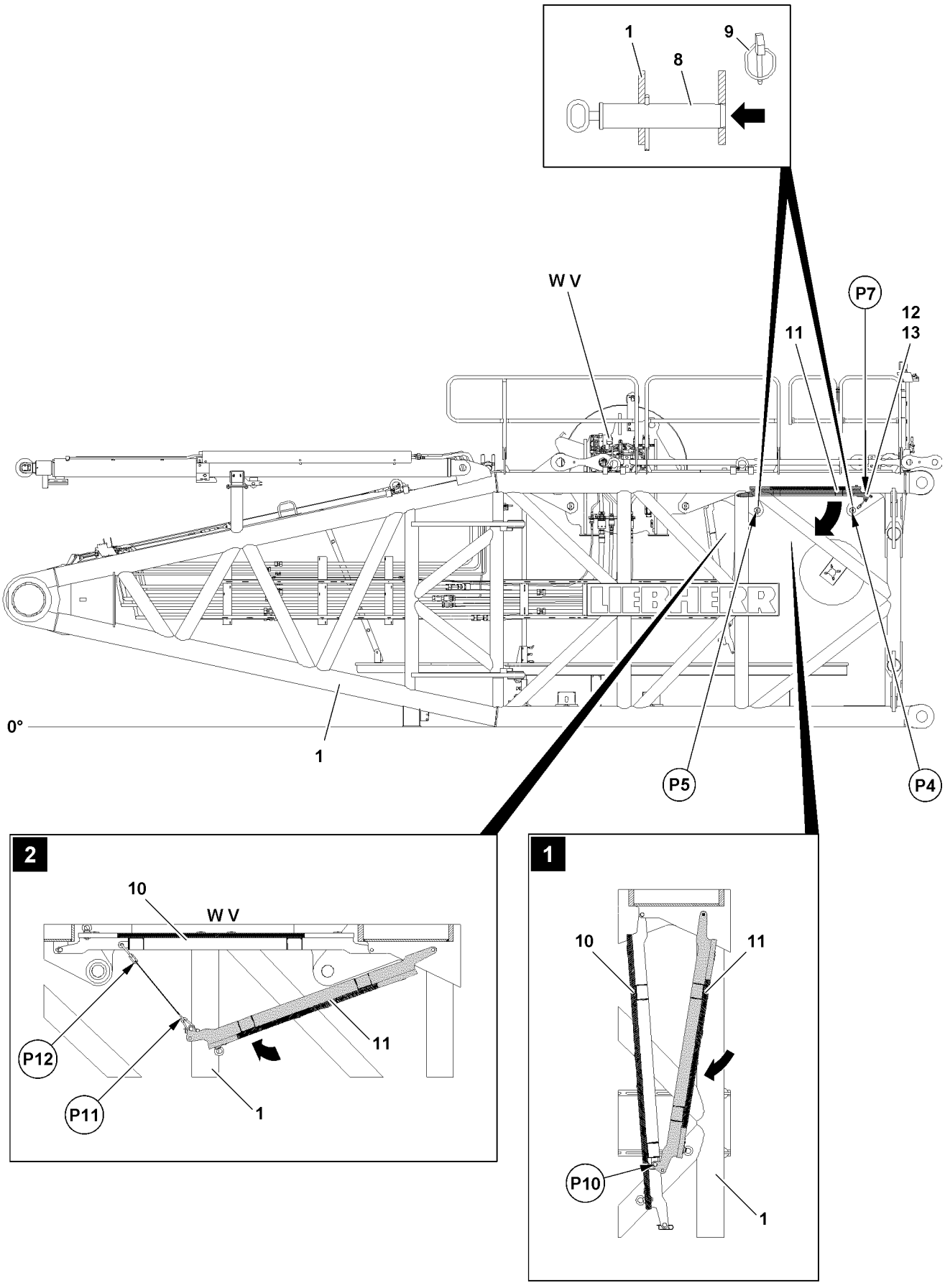

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Fig.118596

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4.1 Preparing installation of winch 6

Note

- ▶ If winch 6 is not installed in transport condition of the S-pivot section **1**, then the installation / assembly opening of winch 6 on the S-pivot section is closed off with a catwalk **11**.
- ▶ The catwalk **11** must be unpinned for the installation of winch 6 on the S-pivot section **1** on one side, swung down and secured in this position.

Make sure that the following prerequisites are met:
- The fall protection equipment is properly installed.
- The railings are in operating position.
- The assembly opening of winch 6 is closed off by the catwalk **11**.
- An auxiliary crane with sufficient load carrying capacity is available.

WARNING
Danger of accident due to catwalk!
If there is any personnel within the swing range when lowering the catwalk **11**, then personnel can be severely injured or killed.
- ▶ Make sure that there are no persons within the swing range of the catwalk **11**.

4.1.1 If winch 5 is installed

- ▶ Fasten the catwalk **11** on the auxiliary crane.

When the catwalk **11** is properly fastened on the auxiliary crane:
- ▶ Carefully bring the fastening equipment to tension.
- ▶ Unpin the pin **12**: Remove the spring retainer **13** at point **P7** on both sides and unpin the pin **12** on both sides.

When the pins **12** are unpinned on both sides:
- ▶ Lower the catwalk **11** slowly downward with the auxiliary crane.

When the catwalk **11** is lowered down completely:
- ▶ Pin and secure the catwalk **11** in assembly position at point **P10** with catwalk **10** on both sides, illustration **1**.

When the catwalk **10** is properly secured in assembly position:
- ▶ Remove the auxiliary crane.
- ▶ Release the connector pin **8** for winch 6 at point **P4** and point **P5** on both sides: Remove the locking pin **9**.
- ▶ Unpin the connector pin **8** at point **P4** and point **P5** on both sides to the stop.

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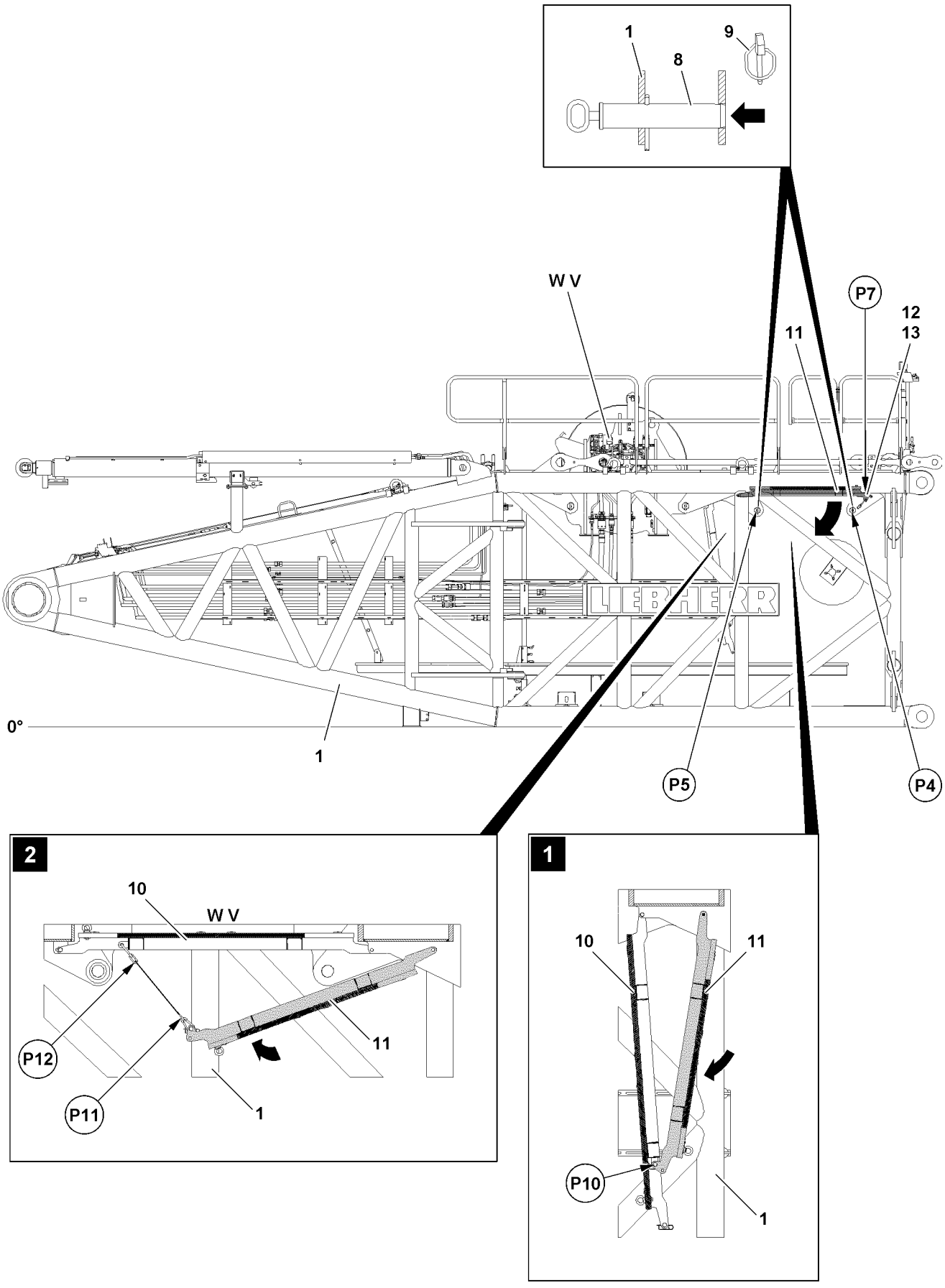

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4.1.2 If winch 5 is not installed

▶ Fasten the catwalk **11** on the auxiliary crane.

When the catwalk **11** is properly fastened on the auxiliary crane:
▶ Carefully bring the fastening equipment to tension.
▶ Unpin the pin **12**: Remove the spring retainer **13** at point **P7** on both sides and unpin the pin **12** on both sides.

When the pins **12** are unpinned on both sides:
▶ Lower the catwalk **11** slowly downward with the auxiliary crane.

When the catwalk **11** is lowered down completely:
▶ Pin and secure the catwalk **11** in assembly position between point **P11** and point **P12** on both sides and secure, illustration **2**.

When the catwalk **11** is properly secured in assembly position:
▶ Remove the auxiliary crane.
▶ Release the connector pin **8** for winch 6 at point **P4** and point **P5** on both sides: Remove the locking pin **9**.
▶ Unpin the connector pin **8** at point **P4** and point **P5** on both sides to the stop.

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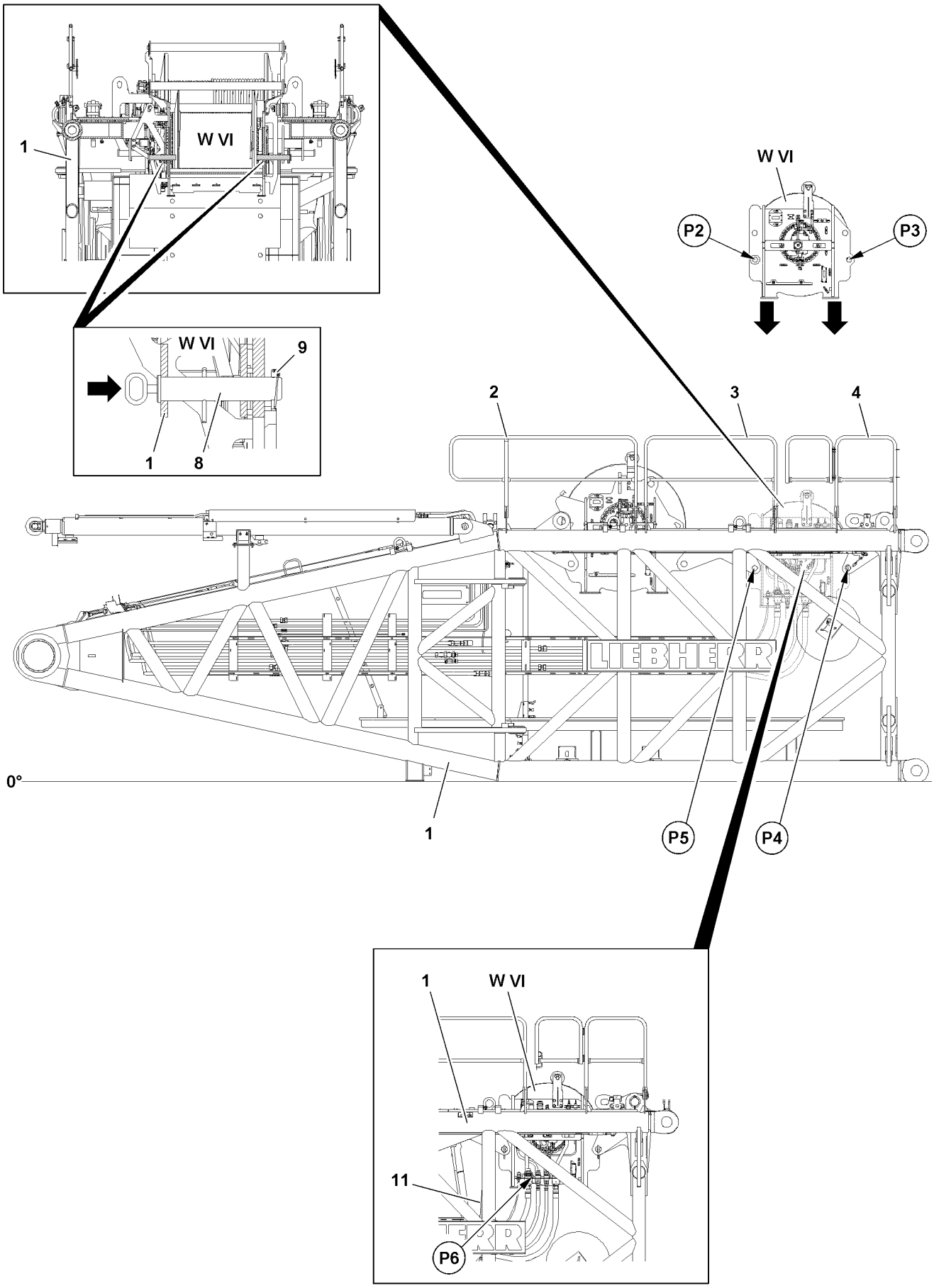

Fig.118597

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4.2 Installing winch 6

WARNING
Danger of accident during installation of winch 6!
Death, severe bodily injuries, property damage.
▶ Make sure that the following prerequisites are met for the installation of winch 6.

Make sure that the following prerequisites are met:
– Winch 5 is properly installed.
– The catwalk **11** is in assembly position.
– An auxiliary crane with sufficient load carrying capacity is available.

4.2.1 Lifting winch 6 from the flatbed trailer

WARNING
Danger of accident due to incorrect attachment!
Life-threatening situations can arise if the winch 6 is incorrectly or improperly attached.
Death, severe bodily injuries, property damage.
▶ Fasten winch 6 only on the fastening points (points **P1**).
▶ Make sure that the fastening equipment is correctly attached on the fastening points (points **P1**) and that it is secured sufficiently to prevent it from loosening up.

▶ Attach the fastening equipment (points **P1**) on the fastening points, see section „Fastening points Winch 6“.
▶ Bring the fastening equipment to „tension“ with the auxiliary crane.
▶ Release and remove the transport retainers on the flatbed trailer.

WARNING
Falling components!
When lifting winch 6 from the flatbed trailer, components or winch 6 can fall down.
Death, severe bodily injuries, property damage.
▶ Make sure that there are no persons within the danger zone.

▶ Lift winch 6 with the auxiliary crane from the flatbed trailer.

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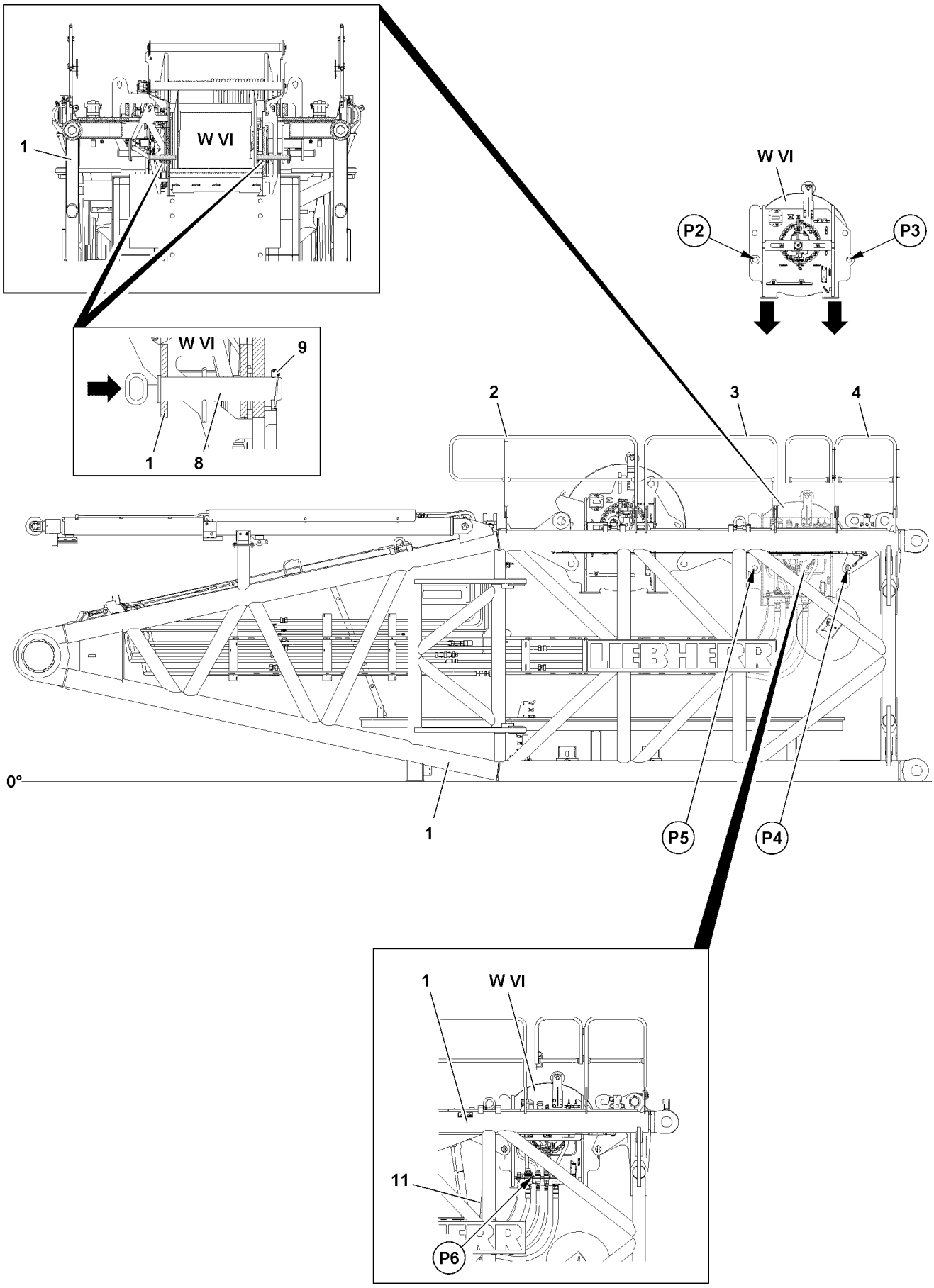

Fig.118597

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4.2.2 Positioning winch 6

Make sure that the following prerequisites are met:
– Pins **8** are completely unpinned on both sides at point **P4** and point **P5**.

WARNING
Danger of accident when swinging in and lowering winch 6!
When swinging in and lowering winch 6 in the assembly opening of the S-pivot section **1**, limbs can be crushed or even severed.
Death, severe bodily injuries, property damage.
▶ Make sure that there are no persons within the danger zone.
▶ Do not reach with your hands into the danger zone.

NOTICE
Property damage!
If the following notes are not observed, damage can result to the crane or winch 6.
▶ When retracting winch 6, it must be ensured that winch 6 does not hit against the S-pivot section **1**.

Note
▶ The guide must be in constant visual and acoustic contact with the crane operator.

Note
▶ Pay attention to the exact alignment of winch 6 to the installation position.

▶ Swing winch 6 in with the auxiliary crane to the S-pivot section **1**.
▶ Position and align winch 6.

When winch 6 is aligned:
▶ Lower winch 6 with the auxiliary crane in the assembly opening until the pin bores of winch 6 (point **P2** and point **P3**) align with the pin bores on the S-pivot section (point **P4** and point **P5**) on both sides.

4.2.3 Pinning winch 6

Make sure that the following prerequisites are met:
– The pin bores between winch 6 and the S-pivot section **1** align.

WARNING
The connector pins can loosen up!
▶ Make sure that the pins **8** are immediately secured with the locking pin **9** after pinning winch 6 in the S-pivot section **1**.

▶ Insert the pins **8** at point **P4** and point **P5** on both sides and secure with locking pin **9**.

When winch 6 is properly pinned and secured on all four pin points:
▶ Remove the auxiliary crane.

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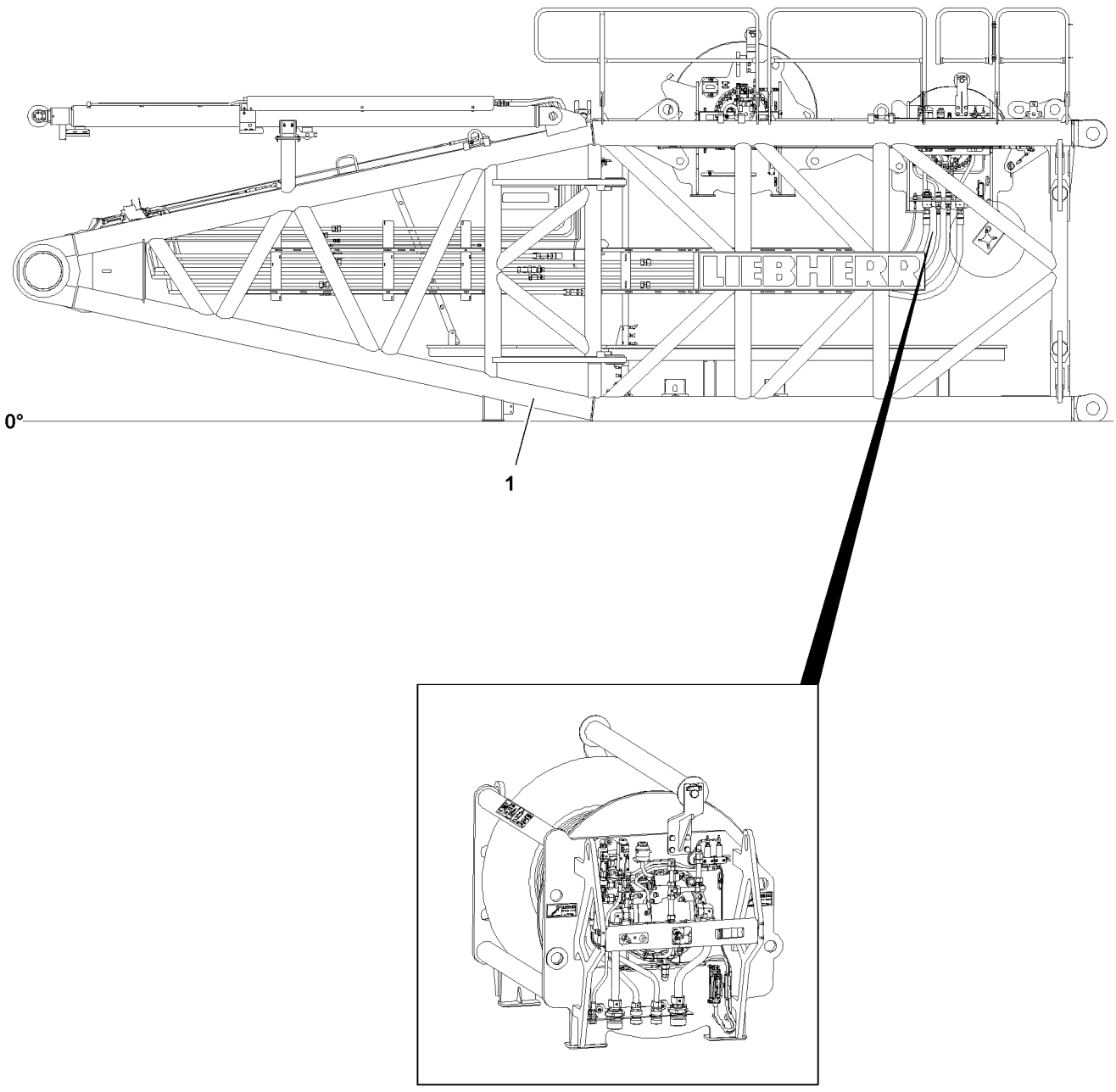

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Fig.118598

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4.3 Establishing the hydraulic connections to winch 6

Note

▶ Establish the connections to winch 6 only when winch 6 is properly installed and secured on the S-pivot section.

Make sure that the following prerequisites are met:

– The winch 6 is properly installed, pinned and secured.

4.3.1 Establishing the hydraulic connections to the winch

Note

▶ After the hydraulic connections to the winch are established, the expansion tank must be checked and emptied.

The hydraulic connections for the winch are made with quick couplings.

When connecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

WARNING

Pressure in the hydraulic lines!

If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.

Death, severe bodily injuries, property damage.

▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

WARNING

Loss of pressure or leakage!

Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.

▶ Check that the quick couplings have been properly connected before using the crane.

▶ Connect the coupling components (sleeve and connector) and screw together with the hand-tightened nut.

▶ Tighten the hydraulic coupling by hand. Rotate the hand-tightened nut until it reaches a tangible, fixed stop position.

▶ Establish the hydraulic connections to the winch.

4.3.2 Establishing the electrical connections to the winch

▶ Establish the electrical connections to the winch, see Electric wiring diagram.

4.3.3 Establishing the connections of the central lubrication system to the winch

▶ Establishing the connections of the central lubrication system to the winch.

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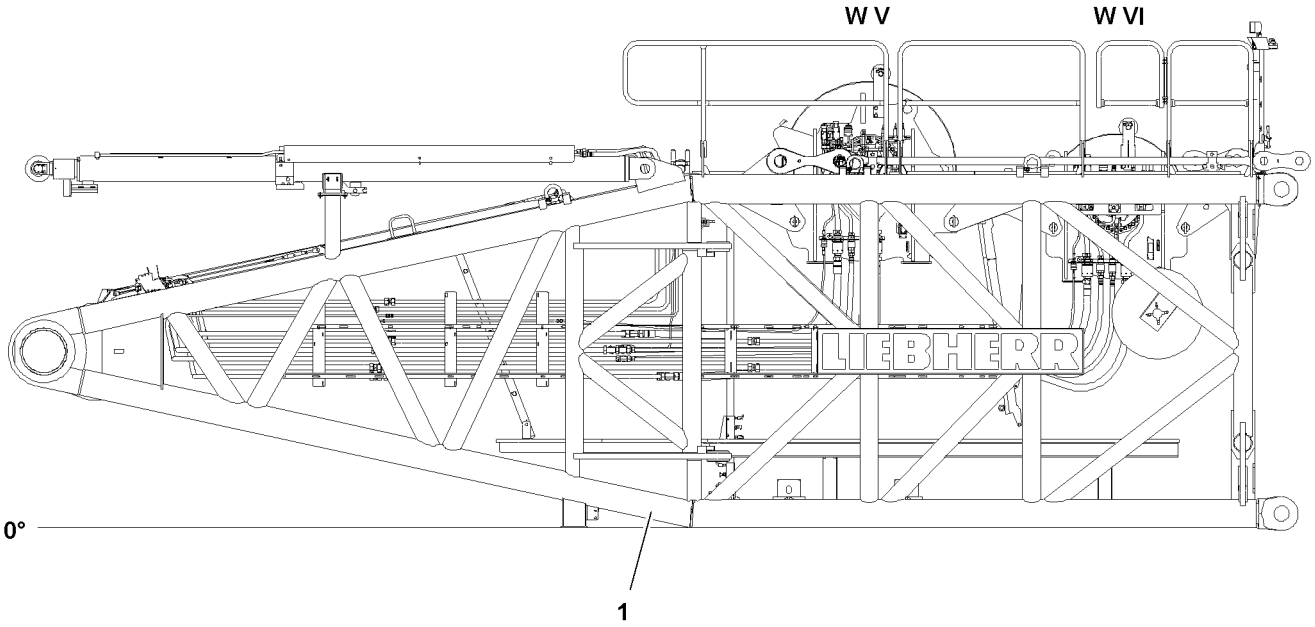

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Fig.118591

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5 Disassembly winch 6

Note

▶ The description in this section only has to be used when winch 6 is to be transported separately from the S-pivot section **1**.

WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.

If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries.

▶ The assembly personnel must always move carefully and anticipatory on the crane, the crane components or lattice sections.
▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
▶ If fall protection equipment is available, then it must be used.
▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the approved fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
▶ The fall arrest system must be attached on the fastening and hook points as well as on the safety ropes.
▶ Always secure ladders on structural parts and / or components to prevent them from falling over.
▶ Only step on the aids, ladders and catwalks with clean shoes.
▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.

WARNING

Components not pinned and secured!

If a component is released from the auxiliary crane before having been pinned and secured, the component can slip and fall down.

Death, severe bodily injuries, property damage.

▶ Do not disengage the auxiliary crane until the corresponding component is pinned and secured.

WARNING

Danger of impact / crushing!

When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.

When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.

Death, severe bodily injuries.

▶ Make sure that personnel cannot be caught by components.
▶ When working in danger zones: Use aids to protect limbs.
▶ Guide components with suitable aids to minimize oscillation.

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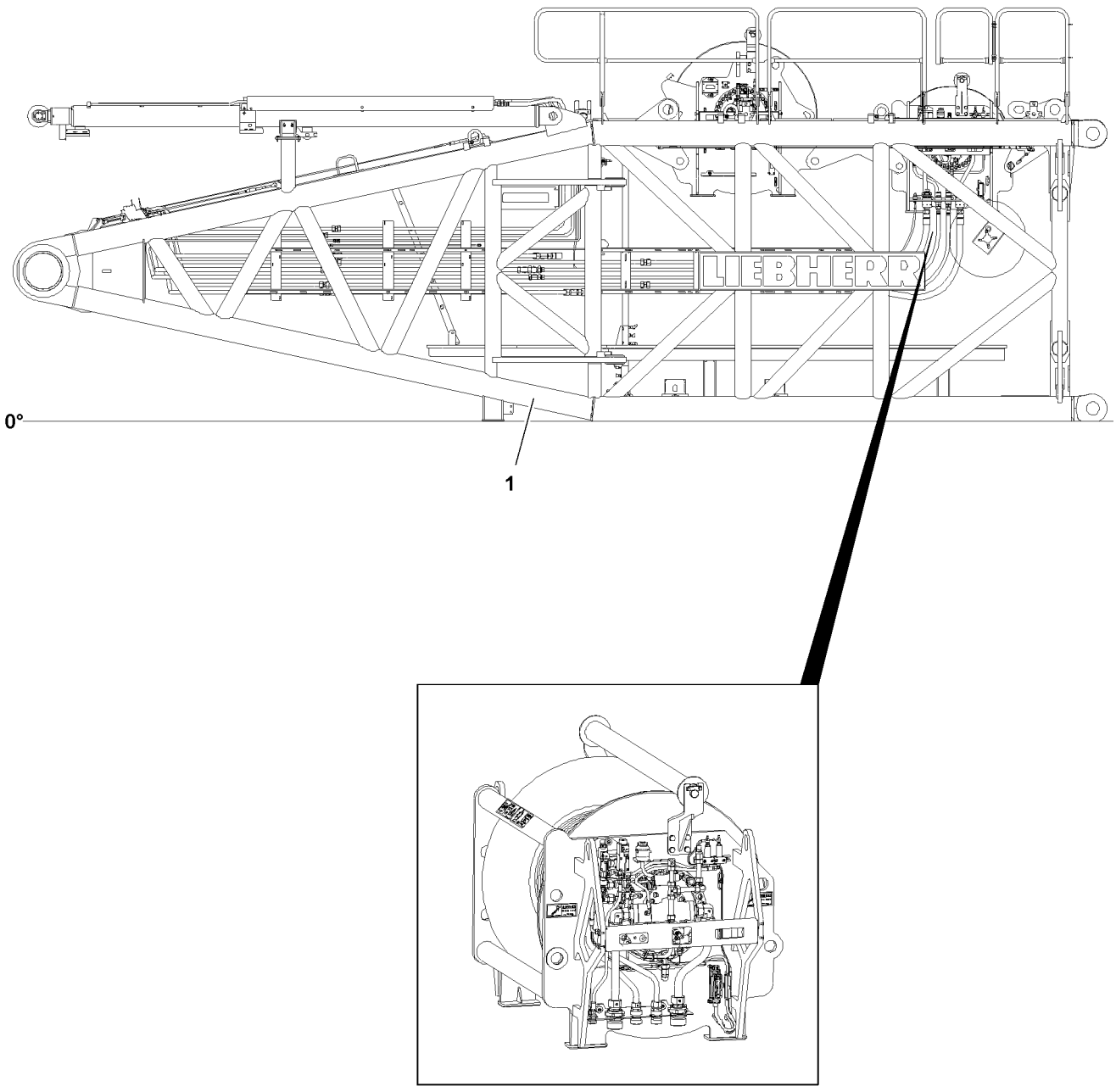

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Fig.118598

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5.1 Disconnecting the connections to winch 6

Make sure that the following prerequisites are met:
- The hoist rope is completely spooled up to the winch.
- The hoist rope is secured on the winch to prevent it from spooling out by itself.

5.1.1 Disconnecting the hydraulic connections to the winch

When releasing hydraulic lines with quick couplings, make sure that the uncoupling procedure is carried out correctly.

WARNING
Pressure in the hydraulic lines!
If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.
Death, severe bodily injuries, property damage.
▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

▶ Release the hydraulic coupling by hand.
▶ Disconnect the hydraulic connections to the winch.
▶ Close the hydraulic hoses and hydraulic lines off properly with the intended caps.
▶ Bring the hydraulic hoses in park position for transport and secure them properly.

5.1.2 Disconnecting the electrical connections to the winch

▶ Disconnect the electrical connections to the winch.
▶ Close the electrical connections properly off with the intended caps.

5.1.3 Disconnecting the connections of the central lubrication system to the winch

▶ Disconnect the connections to the winch.
▶ Close the lube line connections properly off with the intended caps.

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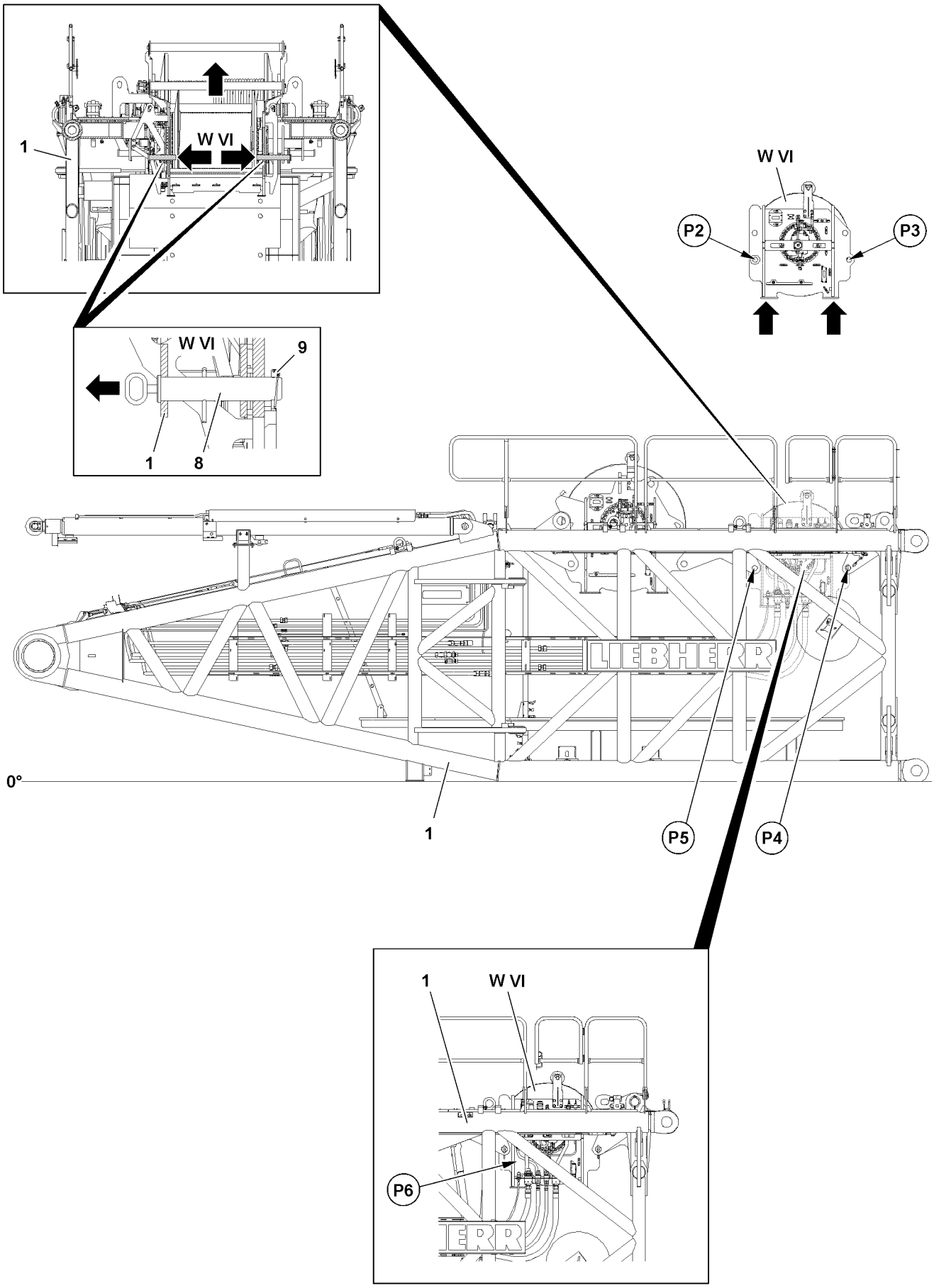

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Fig.118599

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5.2 Removing winch 6

5.2.1 Unpinning winch 6

Make sure that the following prerequisites are met:
- The hydraulic connections are properly disconnected and closed off.
- The electrical connections are properly disconnected and closed off.
- The connections of the central lubrication system are properly disconnected and closed off.
- An auxiliary crane with sufficient load carrying capacity is available.

WARNING
Danger of accident due to incorrect attachment!
Life-threatening situations can arise if the winch 6 is incorrectly or improperly attached.
Death, severe bodily injuries, property damage.
- ▶ The fastening equipment may be attached on the winch only on the intended fastening points.
- ▶ Make sure that the fastening equipment is properly attached on winch 6 and that it is secured sufficiently to prevent it from loosening up.

▶ Attach the fastening equipment on both sides on winch 6, see section „Fastening points Winch 6“.

When the fastening equipment is properly fastened on winch 6:
▶ Bring the fastening equipment with the auxiliary crane carefully to „tension“.

When the fastening equipment is tensioned:
▶ Release pins **8** on both sides: Remove the locking pin **9** at point **P4** and point **P5**.
▶ Unpin pins **8** completely on both sides at point **P4** and point **P5**.

5.2.2 Lifting winch 6 from the S-pivot section

Make sure that the following prerequisites are met:
- Winch 6 is properly unpinned on the S-pivot section **1**.
- All connections to winch 6 are disconnected.

WARNING
Falling components!
When lifting the winch 6 on the S-pivot section **1**, components or winch 6 can fall down.
Death, severe bodily injuries, property damage.
- ▶ Make sure that there are no persons within the danger zone.

▶ Lift winch 6 carefully out with the auxiliary crane on the S-pivot section **1**.

WARNING
Toppling winch!
When setting winch 6 on the ground, the winch can sink into the ground and fall over.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the ground has sufficient load bearing capacity to safely take on the weight of winch 6.

▶ Swing winch 6 out with the auxiliary crane and set it on the ground on a suitable support.
or
Swing winch 6 out with the auxiliary crane and set it on the flatbed trailer.

When winch 6 has been set down properly:
▶ Remove the auxiliary crane.

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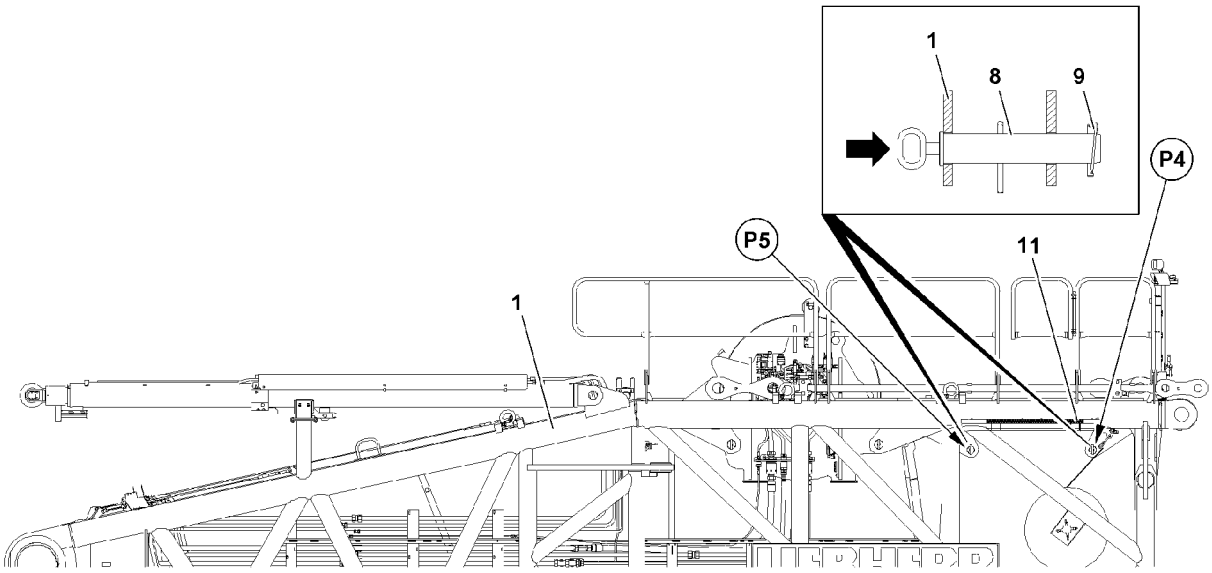

Fig.118600

5.2.3 Inserting the pins for transport

- ▶ Insert the pins **8** at point **P4** and point **P5** completely on both sides.
- ▶ Secure the pins **8** at point **P4** and point **P5** on both sides with locking pins **9**.

5.2.4 Closing the assembly opening winch 6

WARNING
Falling assembly personnel!
If the assembly opening of winch 6 is not properly closed off and secured after disassembly of the winch, then assembly personnel can fall down.
Death, severe bodily injuries, property damage.

- ▶ Make sure, after disassembly of winch 6, that the assembly opening is properly closed off and secured with the catwalk **11**.

- ▶ Release the catwalk **11** in transport position and swing it upward.
- ▶ Close the assembly opening winch 6: Properly pin and secure the catwalk **11** in up position.

Result:

– The assembly opening of winch 6 is closed off by the catwalk **11**.

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3.80 Crane and crane component transport

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Fig.195219

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1 Safety

Observe and adhere to the transport safety instructions. See Crane operating instructions, chapter 2.04.

2 Rigging plans

Observe and adhere to the rigging plans, see the separate rigging plans.

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4 Operation of crane superstructure

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4.01 Operating and monitoring instruments on the crane superstructure

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Fig.195219

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1 Operating and monitoring instruments

1.1 Crane cab outside and turntable

This section describes the elements on the outside of the crane cab and on the turntable:
- Installation parts Crane cab / control cabinet outside
- Emergency equipment Crane cab outside
- Installation parts Crane cab bottom
- Installation parts rear of turntable

1.1.1 Installation parts Crane cab / control cabinet outside

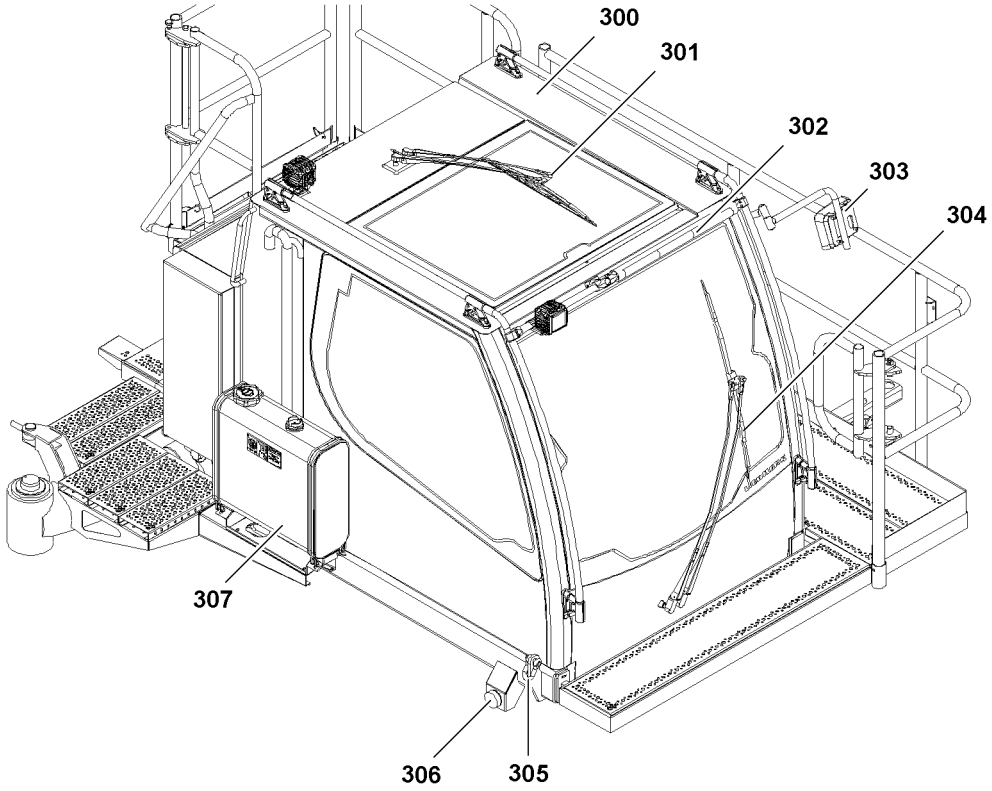

Fig.125405: Crane cab from the front

300 Crane cab

301 Windshield wiper roof window
- With adjustable wipe speeds

302 LMB three color light
- Shows the current crane utilization or the operating condition via light signals
- Description of light signals and operating conditions, see Crane operating instructions, chapter 4.20

303 Rear view mirror
- Wide angle mirror to increase the field of visibility of the crane operator

304 Windshield wiper front window
- With adjustable wipe speeds

305 Rigging eye / shackle
- To secure the crane cab in transport position

306 Bumper stop
- As stop for the crane cab in transport position

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307 Fuel container
- To supply the engine independent heater for the crane cab and / or engine preheating*

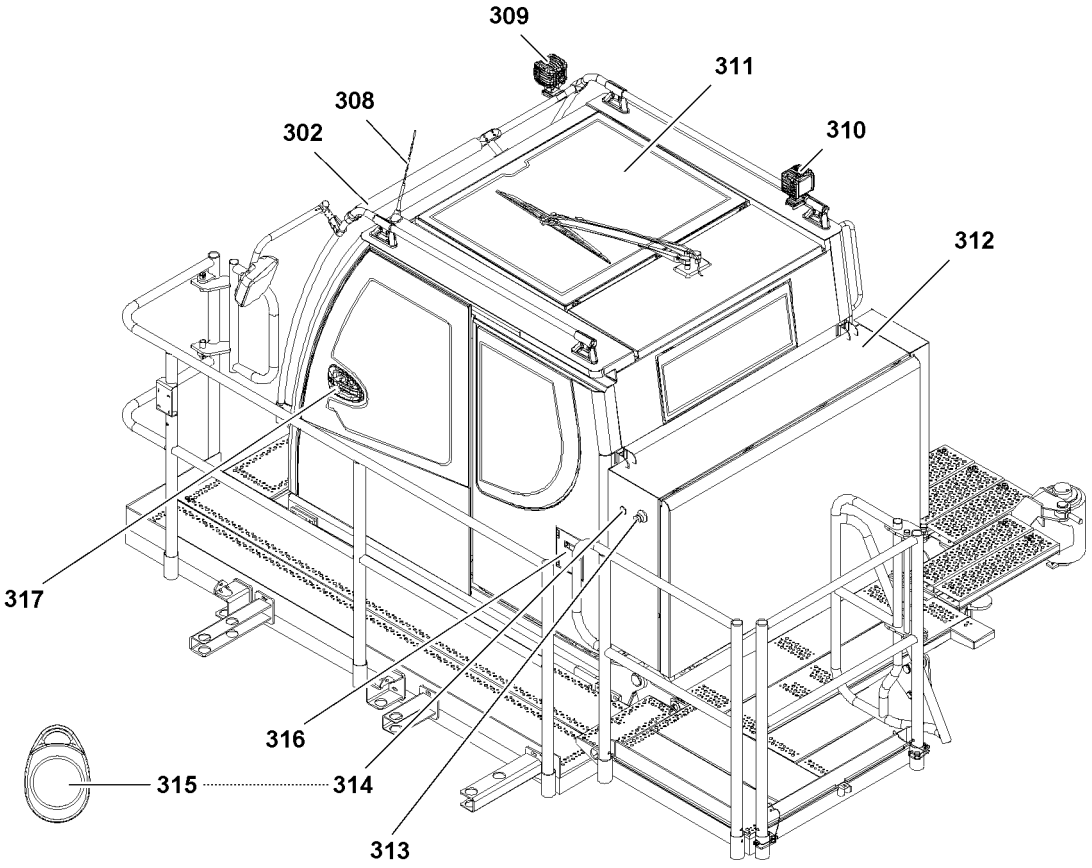

Fig.125393: Crane cab from rear

308 Antenna
- Combined roof antenna for radio and GSM module

309 Floodlight
- Outside area crane cab front

310 Floodlight
- Outside area crane cab rear

311 Roof window
- Can be moved out
- **Note:** Also provides possibility for emergency exit.

312 Control cabinet crane cab

313 EMERGENCY STOP switch

314 Sensor
- Operating element for LMB emergency operation
- Description LMB emergency operation, see Crane operating instructions, chapter 4.02 and 4.20.

315 Transponder
- For LMB emergency operation
- Control element for sensor **314**
- Description LMB emergency operation, see Crane operating instructions, chapter 4.02 and 4.20.

316 Filler port window cleaning fluid
- Filler port for container in inside of crane cab

317 Sliding door Crane cab

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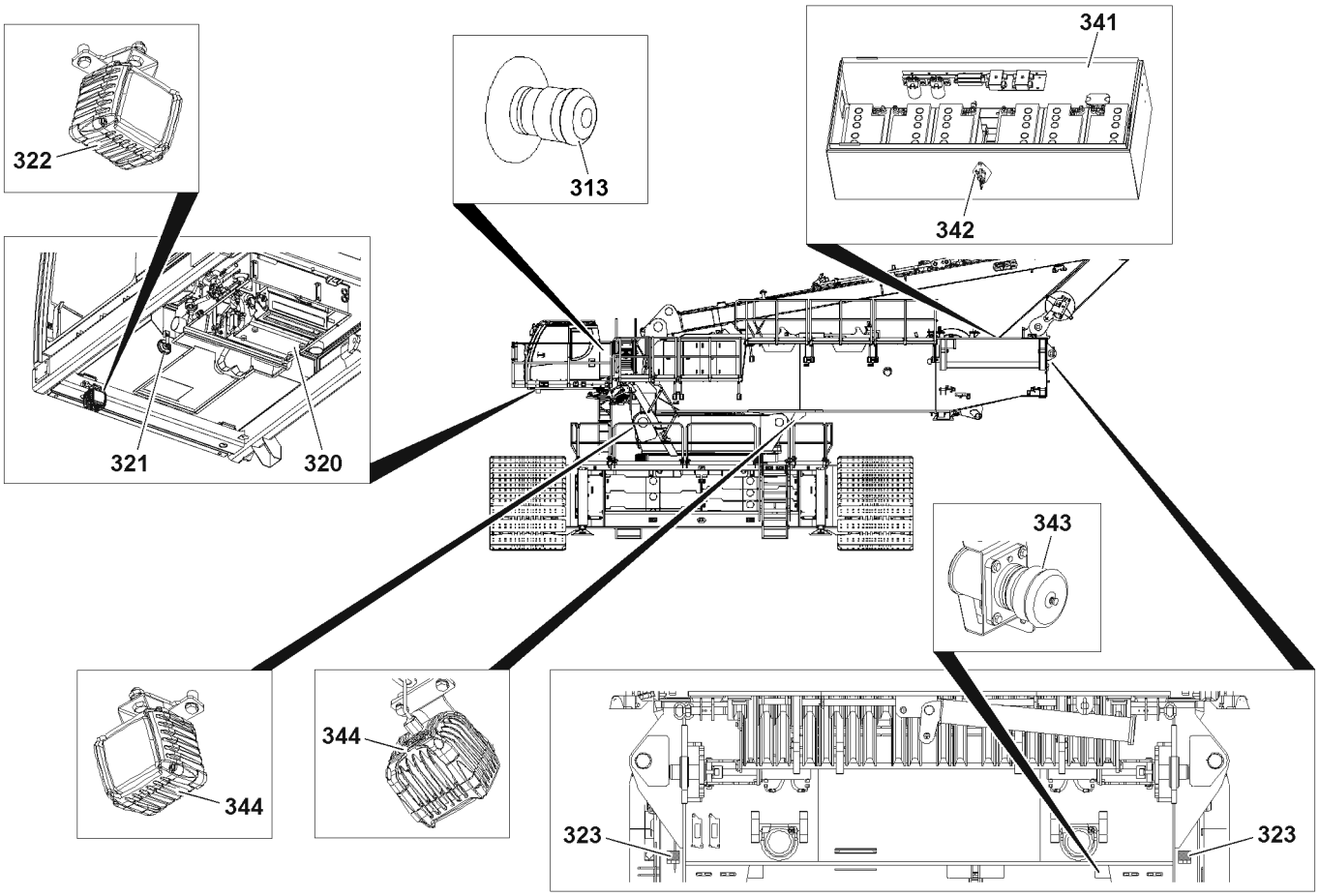

Fig.125404: Crane cab outside and turntable

1.1.2 Emergency equipment Crane cab outside

313 EMERGENCY STOP switch

1.1.3 Installation parts Crane cab bottom

320 Heater unit
- Engine independent heater for crane cab and / or engine preheating*****

321 Horn turntable
- For acoustic warnings by crane driver or crane control

322 Floodlight
- Lighting – turntable

1.1.4 Installation parts turntable

323 LMB warning lights
- Active together with LMB three color light on crane cab
  Right and left each one LMB warning light

341 Battery box starter batteries

342 Disconnect switch*****
- To interrupt line from plus terminal of starter batteries
  Note: Thus the starter batteries no longer need to be disconnected by hand to avoid discharge during longer transport times.

343 Socket external power supply*****
- For example for external start of diesel engine via the starter batteries

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344 Floodlight
- Two working floodlights for illumination of turntable

WARNING
Disabled electrical functions!
An interruption of the line from the plus terminal by the disconnect switch* **342** is solely intended for transport of disassembled crane.
- ▶ After turning the switch, the line from the plug terminal of the starter batteries is interrupted. All electrical functions as disabled. For example, the airplane warning light is not functioning.
- ▶ The disconnect switch* **342** may solely be turned when no electrical functions are required.
- ▶ The disconnect switch* **342** may solely be turned when the LICCON computer system is shut down and the auxiliary heater has turned off.

1.2 Crane cab inside and control cabinet

This section describes the elements on the inside of the crane cab and on the control cabinet:
- Interior equipment crane cab
- Emergency equipment Crane cab inside
- Interfaces crane cab
- Control cabinet

1.2.1 Interior equipment crane cab

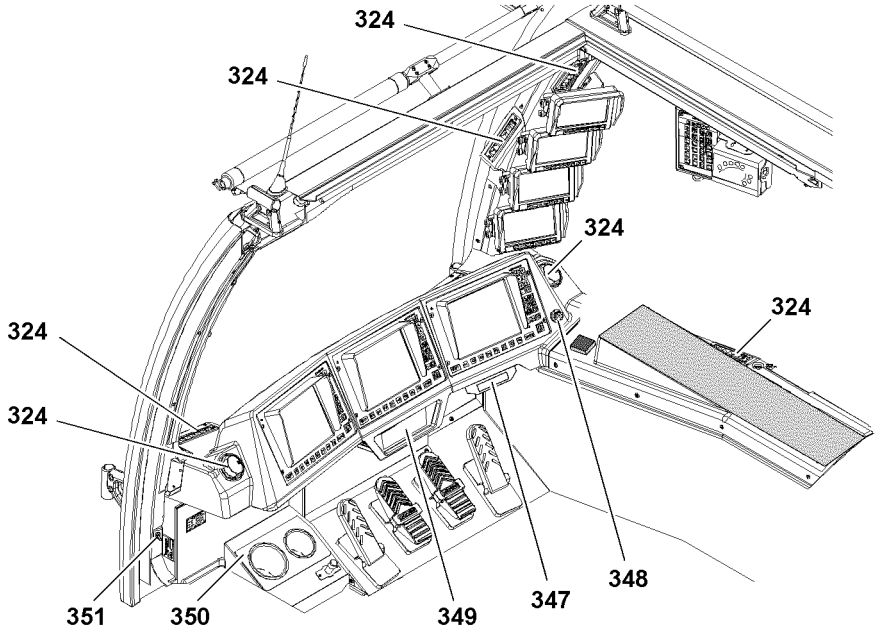

Fig.125406: Interior equipment crane cab, front section

324 Outlet nozzles
- For individual control of air flow of heater / ventilation / climate control*

347 Ashtray

348 Cigarette lighter

349 Radio*

350 Drink holder

351 Door contact button

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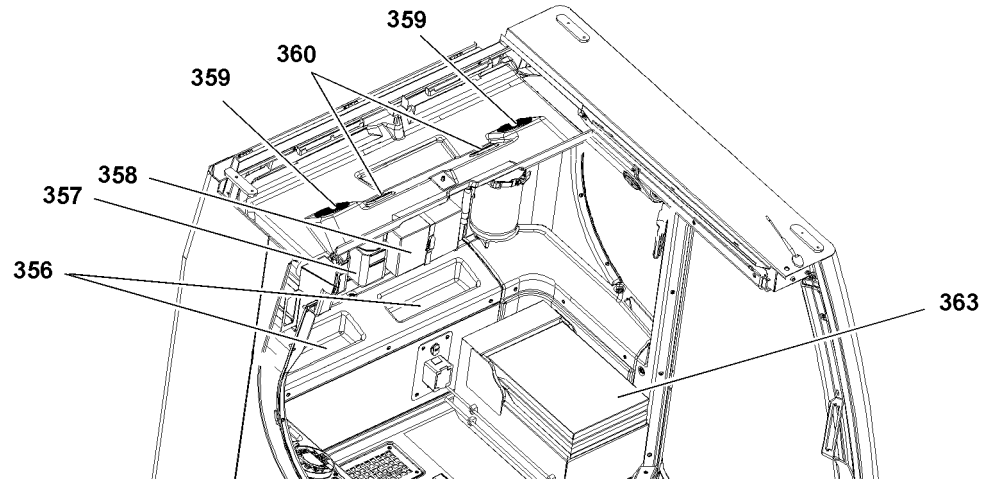

Fig.125407: Interior equipment crane cab, rear section

356 Compartment

357 Drink holder

359 Speaker
- For radio*

360 Interior lights

363 Emergency seat
- With storage compartment

1.2.2 Emergency equipment Crane cab inside

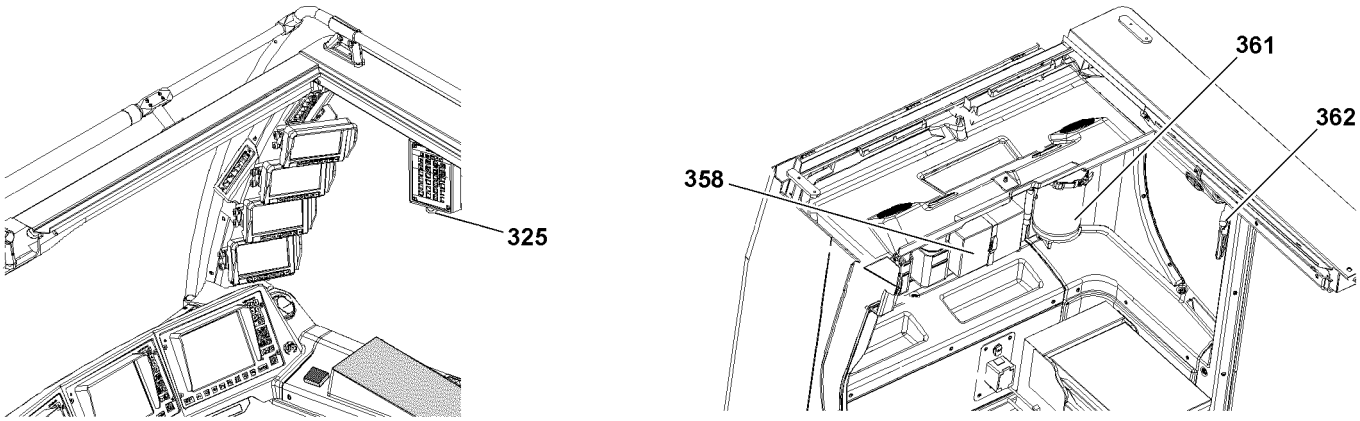

Fig.125410: Emergency equipment Crane cab inside

325 EMERGENCY STOP switch

358 First aid kit

361 Fire extinguisher

362 Emergency hammer
- To break glass panes - for self-rescue or salvage of persons

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1.2.3 Interfaces crane cab

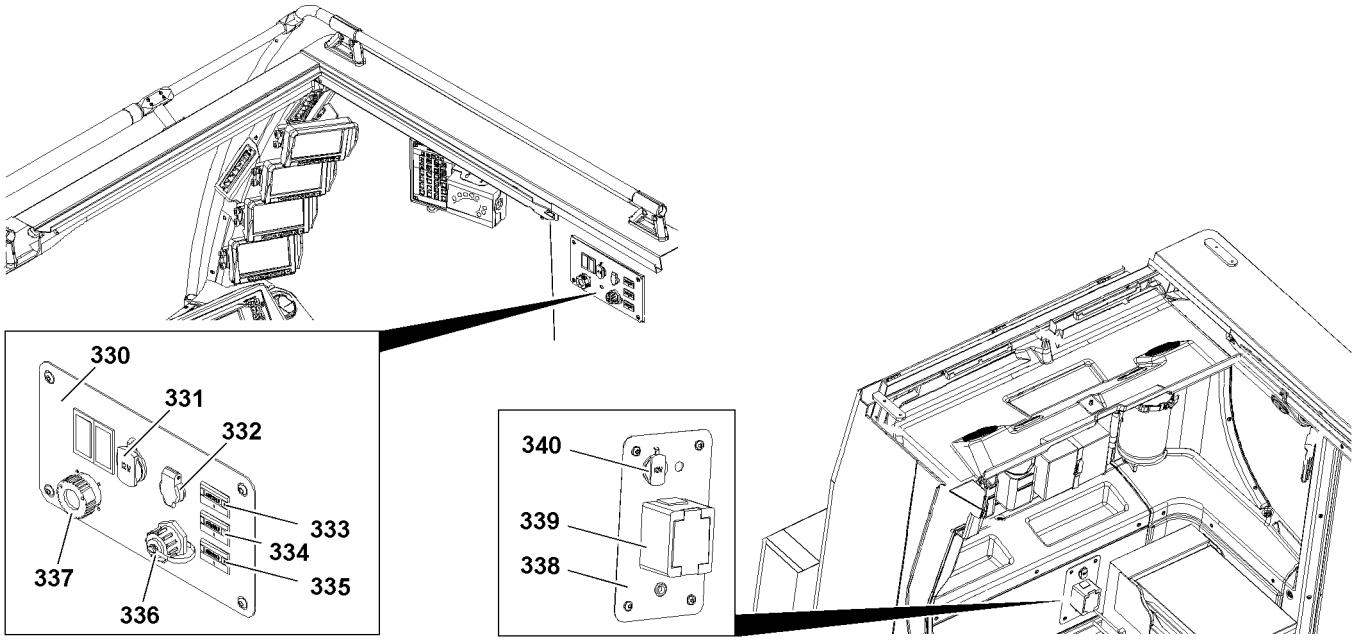

Fig.125411: Interfaces crane cab

330 Interface unit

331 Electrical socket 12 V

332 Electrical socket 24 V

333 Operating hour meter
- Display operating hours crane / diesel engine

334 Operating hour meter*****
- Display operating hours winch 1

335 Operating hour meter*****
- Display operating hours winch 2

336 Ethernet interface
- For crane control (BSE)

337 Diagnostic plug
- For diagnostics diesel engine and SCR

338 Electrical socket unit

339 Electrical socket 230 V*****

340 Electrical socket 12 V

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1.2.4 Control cabinet

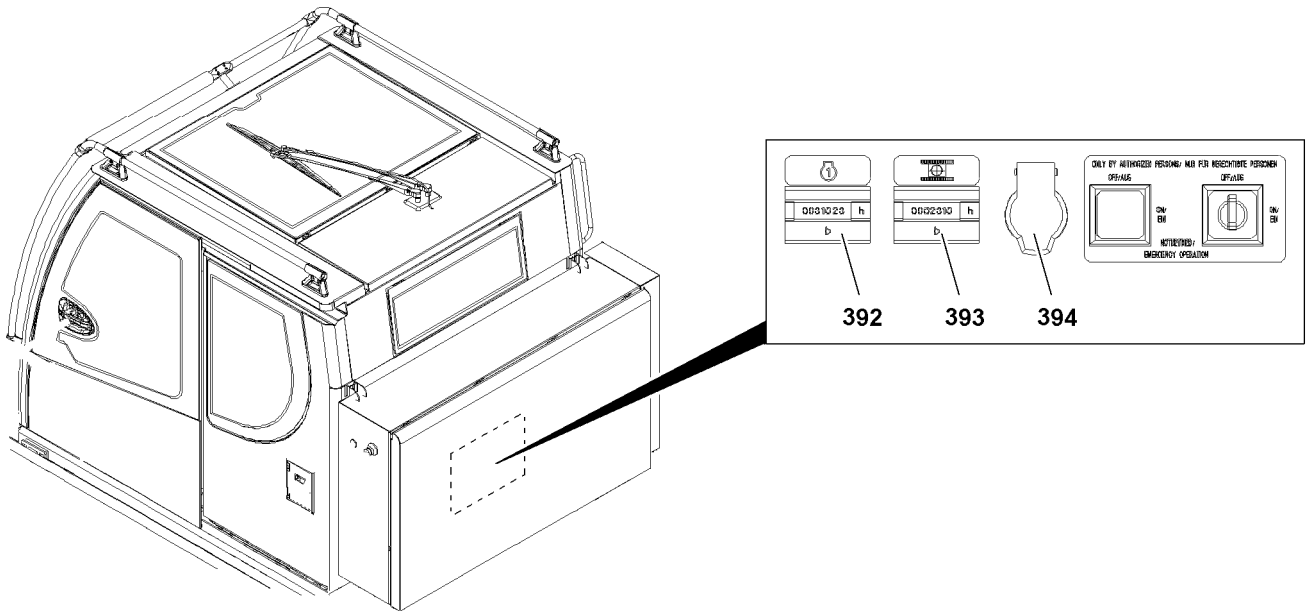

Fig.125412: Elements in control cabinet

392 Operating hour meter*****
- **Note**: Assignment according to signs, for example additional display of diesel engine operating hours

393 Operating hour meter
- Display operating hours crawler

394 Electrical socket 24 V

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2 Overview Control units crane cab

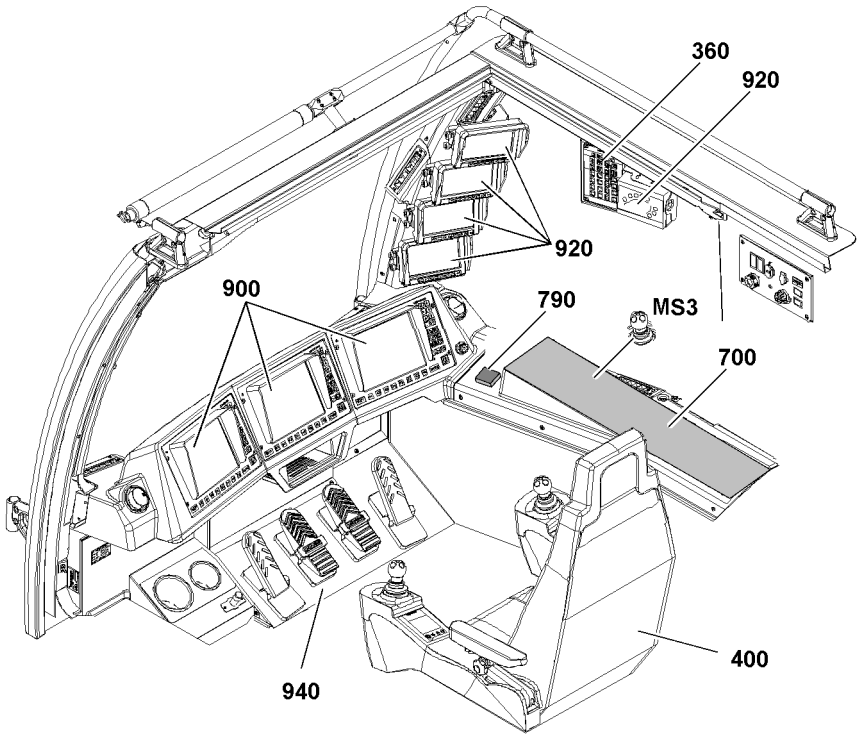

Fig.125413: Control units crane cab

The following control units are in the crane cab:

400 Control platform

700 Instrument panel

790 Operating unit HATZ Diesel*****
- Displayed installation location is exemplified

360 Operating and control unit (BKE)

900 LICCON monitors
- See section „LICCON computer system monitor“

920 Camera monitoring
- Monitor and operating unit, see section „camera monitoring“

940 Pedal carrier

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3 Control platform

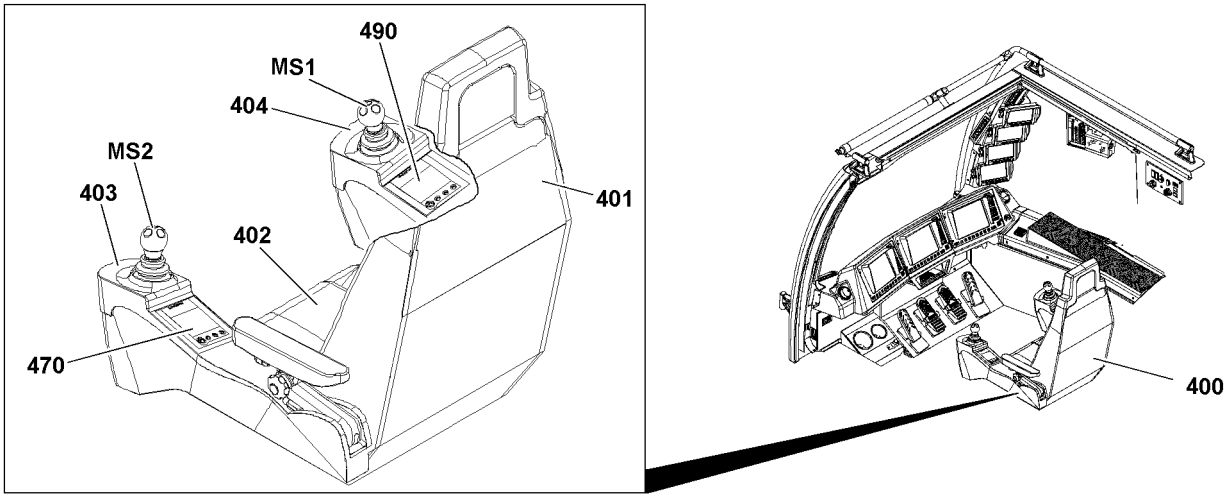

Fig.125414: Elements in control platform

Note

▶ For detailed description of operating elements to adjust the crane operator's seat, see Crane operating instructions, chapter 4.03!

The control platform **400** consists of the following elements:

401 Crane operator's seat
- With seat contact button **402** in seat surface

403 Control panel, left
- **MS2** Master switch
- **470** Touch display (TE2)

404 Control panel, right
- **MS1** Master switch
- **490** Touch display (TE1)

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4 Instrument panel

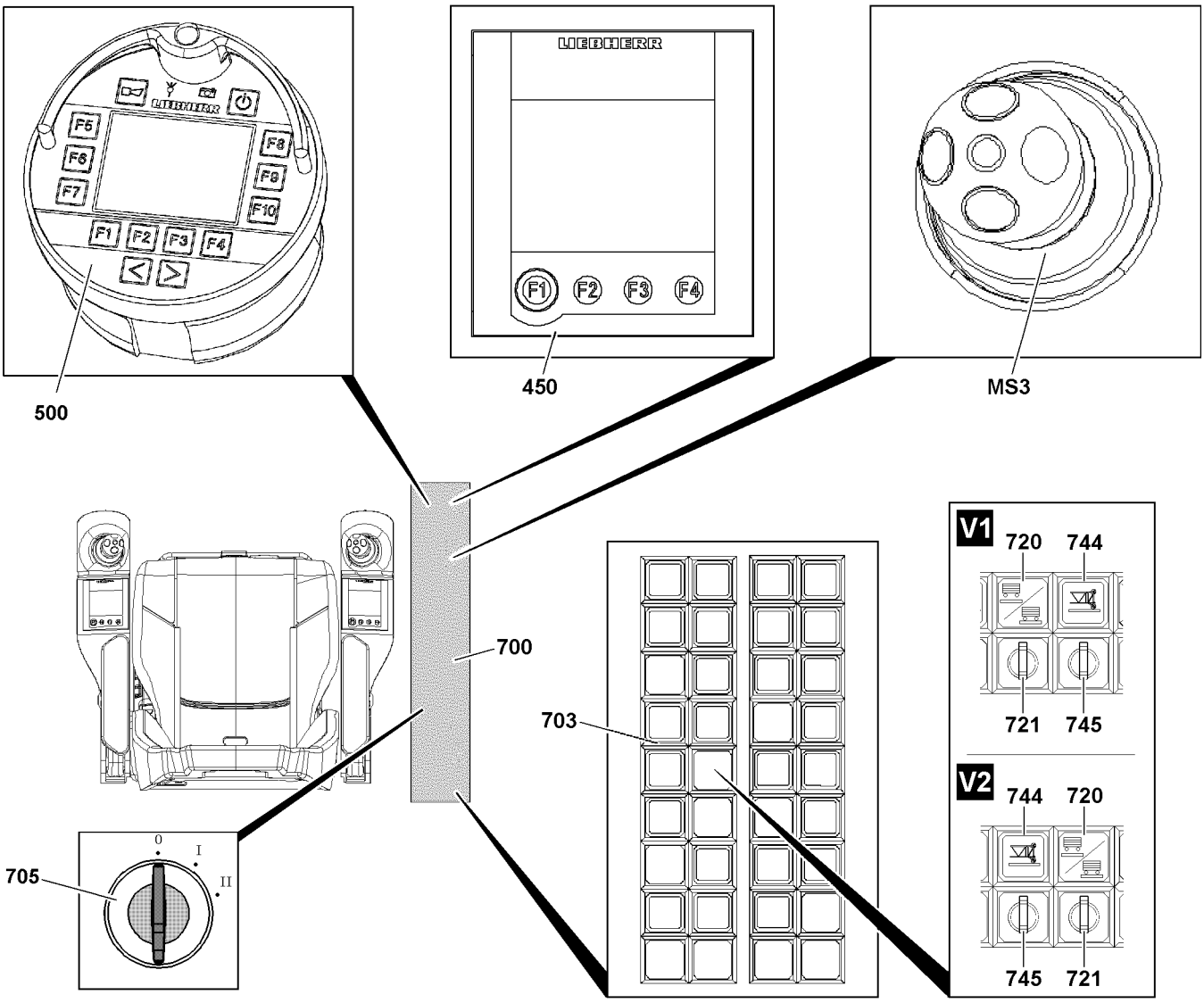

Fig.125395: Elements instrument panel

The instrument panel **700** consists of the following elements:

- **500** Bluetooth Terminal (BTT)
- **450** Touch display (TE3)
- **MS3** Master switch
- **703** Keypad
  - Key button
  - Indicator lights
  - Operating button
  - Operating button with indicator lights
  - Operating switch
  - Operating switch with indicator lights
- **705** Ignition starter switch

4.1 Key button with associated indicator lights / operating buttons / signs

Depending on the crane version, two different arrangements of key buttons with associated indicator lights / operating buttons in instrument panel are available:

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V1 Arrangement variation
V2 Arrangement variation

Position	Operating element	Function	Beacon	Description
720	*Derrick ballast lifted off* sign	–	–	To identify the *Derrick ballast lifted* key button **Note**: Function only for derrick ballast versions without ground contact monitoring
721		On[2)]	–	Turn on by pressing the key button
	Derrick ballast lifted key button[1)]	Off	–	Turn off by pressing the key button

1) For a detailed description see Crane operating instructions, chapter 5.35.
2) If the *Derrick ballast lifted* key button is pressed, the derrick ballast is shown lifted in the LICCON monitor, see Crane operating instructions, chapter 4.02.

Position	Operating element	Function	Beacon	Description
744		–	Lights up	*Boom on ground* function is active
	Boom on ground indicator light	–	Off	*Boom on ground* function is inactive
745		On	–	Turn on by pressing the on key button - *boom on ground* function is active, *boom on ground* indicator light lights up
	Boom on ground key button[4)]	Off	–	Turn off by pressing the off key button - *boom on ground* function is inactive, *boom on ground* indicator light turns off

4) For a detailed description, see the Crane operating instructions, chapter 4.20.

4.2 Operating switch / operating button / indicator lights

Position	Operating element	Function	Beacon	Description
722		Off	–	Turn off by pressing the operating switch
	Operating switch *Lighting instrument panel*	On	–	Turn on by pressing the operating switch
723		Off	–	Turn off by pressing the operating switch
	Operating switch Lighting access ladder	On	–	Turn on by pressing the operating switch

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Position	Operating element	Function	Beacon	Description
724	Operating button Ladder crane cab up	Up	–	By pressing the operating button **Note**: As long as the operating button is pressed, the ladder moves up until the upper end position of the ladder is reached.
725	Operating button Ladder crane cab down	Down	–	By pressing the operating button **Note**: As long as the button is pressed, the ladder moves down until the lower end position of the ladder is reached.
726	Operating button Derrick ballast down	Off	–	Releasing the operating button interrupts the movement.
		On	–	Pressing and holding the operating button lowers the derrick ballast.
727	Operating button Derrick ballast up	Off	–	Releasing the operating button interrupts the movement.
		On	–	Pressing and holding the operating button lifts the derrick ballast.
728	Operating button Telescope derrick ballast in	Off	–	Releasing the operating button interrupts the movement.
		On	–	Pressing and holding the operating button telescopes the derrick ballast in.
729	Operating button Telescope the derrick ballast out	Off	–	Releasing the operating button interrupts the movement.
		On	–	Pressing and holding the operating button telescopes the derrick ballast out.
730	Operating button block derrick ballast compensation cylinder **A**	Off	–	Releasing the operating button releases the compensation cylinder **A** on the derrick ballast.
		On	–	Pressing and holding the operating button blocks the compensation cylinder **A** on the derrick ballast.
731	Operating button Block derrick ballast compensation cylinder **B**	Off	–	Releasing the operating button releases the compensation cylinder **B** on the derrick ballast.
		On	–	Pressing and holding the operating button blocks the compensation cylinder **B** on the derrick ballast.
732	Operating button Move ballast trailer support cylinder in on the front	Off	–	Releasing the operating button interrupts the movement.
		On	–	Press and hold the operating button: Support cylinder moves in on the front

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Position	Operating element	Function	Beacon	Description
733		Off	–	Releasing the operating button interrupts the movement.
	Operating button Move ballast trailer support cylinder out on the front	On	–	Press and hold the operating button: Support cylinder moves out on the front
734		Off	–	Releasing the operating button interrupts the movement.
	Operating button Move ballast trailer support cylinder in on the rear	On	–	Press and hold the operating button: Support cylinder moves in on the rear
735		Off	–	Releasing the operating button interrupts the movement.
	Operating button Move ballast trailer support cylinder out on the rear	On	–	Press and hold the operating button: Support cylinder moves out on the rear
736		On	–	Oil levels of all installed winches are checked. If the oil fill level is too low on one winch, then this is shown in the respective winch icon. The display remains active until the oil level sensor reports a correct fill level.
	Operating button *Oil level measurement winch gear*			**NOTICE!**: Property damage! If a winch is actuated when the „oil fill level is too low“ then there is **no** shut off of the winch movement. An operating error message appears.
737		On	On	By actuating the switch: Drive for ballast trailer is added See the Crane operating instructions, chapter 5.35.
	Switch Drive Ballast trailer	Off	Off	By actuating the switch: Drive for ballast trailer is turned off
738		On	Blinks	Press and hold the operating button: Sets the wheel sets into Towing position
	Operating button towing ballast trailer		Lights up	The wheel sets are in Towing position
739		On	Blinks	Press and hold the operating button: Turn the wheels sets into Parallel driving position
	Operating button parallel travel ballast trailer		Lights up	The wheel sets are in Parallel driving position
740		On	Lights up	Operating mode Manual steering correction: Pressing and holding the operating button sets the wheel sets for left curves. The turntable turns when driving to the left, in reference to the crawler travel gear Function for driving in tight left curves, in tight spaces.
	Operating button Manual steering correction, left curve			

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Position	Operating element	Function	Beacon	Description
741	Operating button Manual steering correction, right curve	On	Lights up	Operating mode Manual steering correction: Pressing and holding the operating button sets the wheel sets for right curves. The turntable turns when driving to the right, in reference to the crawler travel gear Function for driving in tight right curves, in tight spaces.
742	Operating button ballast trailer circular travel (cornering)	On	Blinks	Press and hold the operating button: Turn the wheels sets into Circular driving position
			Lights up	The wheel sets are in Circular driving position
411	Indicator light Request engine stop		Lights up or blinks	In case of a warning occurrence
				Note: Pay attention to system error, remedy the cause of the error immediately, turn the engine off if necessary.

5 Operating unit HATZ Diesel aggregate*

The HATZ Diesel aggregate* supplies the power for auxiliary equipment* if needed.

Description of operating unit HATZ Diesel aggregate*, see Documentation of manufacturer.

6 Operating and control unit (BKE)

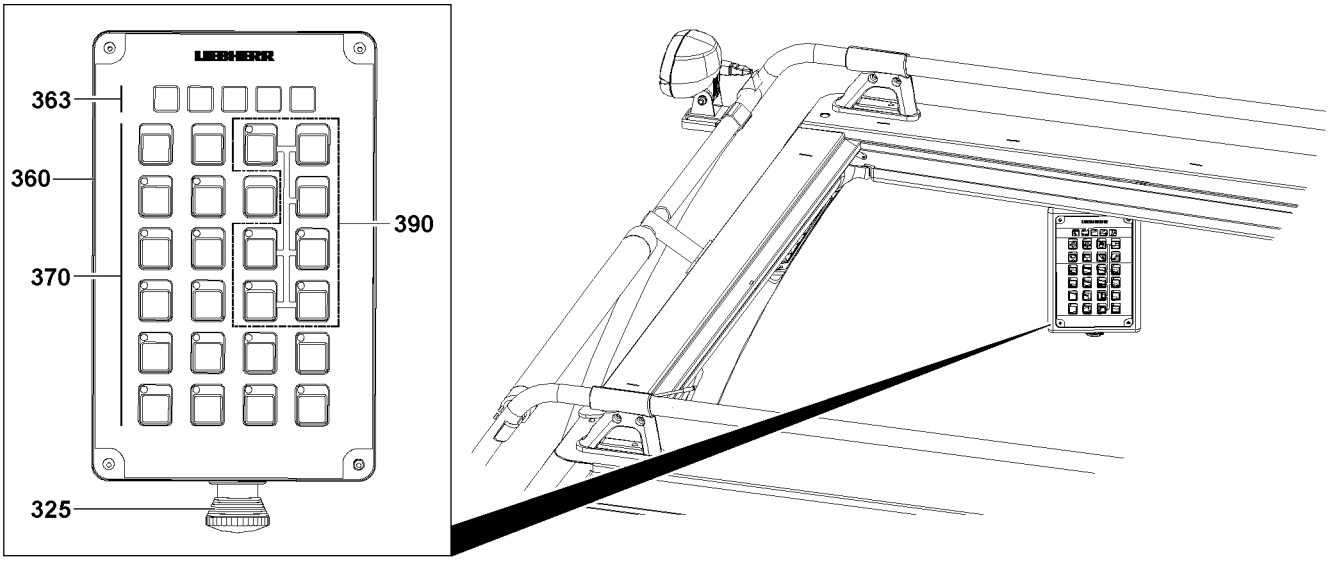

Fig.125415: Operating and control unit (BKE)

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6.1 Overview Operating console

Note
▶ The indicator lights as well as the operating keys are described in detail in the following sections!

360 Operating console
- Housing with indicator lights and buttons

325 EMERGENCY STOP switch

363 Indicator lights BKE

370 Operating buttons BKE
- Standard assignment

390 Operating buttons on the BKE
- Standard assignment for release controls

6.2 Indicator lights on the BKE

Here you find the description of the indicator lights **363**.

Position	Indicator light	LED	Description
364	Engine monitoring	Orange	Engine not ready to start, engine preheating active
		Orange blinking	Engine ready to start
		Off	Engine is running (after engine has been started)
		Red	The engine is running, the alternator does not charge
		Red blinking	Engine is running in emergency operation
365	Central lubrication 1 for: Winch 1, winch 2, winch 3, winch 5/6, Winch 4, SA-frame, pin S/D	Green + red	Functional readiness (is shown after engine start for 1.5 seconds)
		Green	Lubrication active
		Red / red blinking	Error / problem
		Off	Central lubrication not active
366	Central lubrication 2 for: Slewing ring	Green + red	Functional readiness (is shown after engine start for 1.5 seconds)
		Green	Lubrication active
		Red / red blinking	Error / problem
		Off	
367	Central lubrication 3 for: Ballast trailer Crawler travel gear	Green + red	Functional readiness (is shown after engine start for 1.5 seconds)
		Green	Lubrication active
		Red / red blinking	Error / problem
		Off	Central lubrication not active

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6.3 Operating keys on the BKE, Standard assignment

Here you find the description of the Operating keys, standard assignment **370**.

Note

▶ With the LEDs in the operating buttons, the operating conditions and problems can be recognized quickly and reliably by the crane driver!

Position	Operating button	Function	LED	Description
371	*Washer pump front window*	On	–	Clean the front window: By pressing and holding the operating button
		Off	–	By releasing the operating button **Note:** After releasing the operating button, three additional wipe movements are carried out before the wiper blades return to their original position.
372	*Washer pump Roof window*	On	–	Clean the roof window: By pressing and holding the operating button
		Off	–	By releasing the operating button **Note:** After releasing the operating button, three additional wipe movements are carried out before the wiper blades return to their original position.
373	Windshield wiper front window	On	Lights up	By momentarily pressing the operating button (less than one second). By momentarily pressing it further, the interval stage changes incrementally.
		Intermittent	Lights up	There are different interval stages: 1. Interval stage: Wipe with long pauses 2. Interval stage: Wipe with short pauses 3. Wipe continuously off
		Off	Off	By pressing the operating button longer (more than one second until a beep sounds) **or** By pressing the operating button momentarily (several times, less than one second) until the LED turns off[1)]

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Position	Operating button	Function	LED	Description
374	Windshield wiper roof window	On	Lights up	By momentarily pressing the operating button (less than one second). By momentarily pressing it further, the interval stage changes incrementally.
		Intermittent	Lights up	There are different interval stages: 1. Interval stage: Wipe with long pauses 2. Interval stage: Wipe with short pauses 3. Wipe continuously off
		Off	Off	By pressing the operating button longer (more than one second until a beep sounds) **or** By pressing the operating button momentarily (several times, less than one second) until the LED turns off[1)]
375	Interior lighting crane cab	On	–	By opening the door **or** By momentarily pressing the operating button (less than one second). By momentarily pressing it further, the dimmer stage changes incrementally.
		Dim	–	There are different dimmer stages: 1. Dimmer stage 75 % 2. Dimmer stage 50 % 3. Dimmer stage 25 % 4. Interior lighting continuously off
		Off	–	By pressing the operating button longer (more than one second) **or** By pressing the operating button momentarily (several times, less than one second) until the interior lighting turns off **or** If the following conditions are present simultaneously for longer than 30 seconds: – crane operator's seat not occupied – cab door closed – crane engine off
376	Camera lighting	On	Lights up	By pressing the operating button
		Off	Off	By pressing the operating button
		Error	Blinks	Error / problem

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Position	Operating button	Function	LED	Description
377	Lighting Crawler travel gear	On	Lights up	By pressing the operating button
		Off	Off	By pressing the operating button
		Error	Blinks	Error / problem
378	Airplane warning light	On	Lights up	By pressing the button **Note**: To identify aviation obstructions The airplane warning light can also be actuated when the ignition „Off“, by pressing the button longer than one second. Pressing it again switches the next shift stage. **Note**: The light signal illuminates or blinks depending on the airplane warning light version.
		On	Blinks (1 Hz)	By pressing the button **Note**: Only on crane types with switchable airplane warning light*: If the LED blinks continuously once per second, the airplane warning light is in blinking mode
		Off	Off	By pressing the button
		Error	Blinks (2 Hz)	**Note**: Only on crane types with airplane warning light monitoring: Error / problem: If the LED blinks continuously twice per second, there is a detected airplane warning error.
379	Illumination outside area crane cab front / rear	On	Lights up	By pressing the operating button
		Off	Off	By pressing the operating button
		Error	Blinks	Error / problem
380	Pressure supply auxiliary users	On	Lights up	By pressing the operating button
		Off	Off	By pressing the operating button
		Error	Blinks	Error / problem
				Note: For all functions, which are actuated with the hydraulic manual control levers, the pressure supply for the auxiliary users must be turned on.
381	Intermediate lubrication central lubrication system	On	Lights up	By pressing the operating button, an intermediate lubrication is carried out, then the function turns off.
		Off	Off	Automatically after completion of intermediate lubrication
		Error	Blinks	Error / problem

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Position	Operating button	Function	LED	Description
382		On	Lights up	By pressing the operating button
		Off	Off	By pressing the operating button
	Lighting – turntable	Error	Blinks	Error / problem
383		Increase	Lights up	By pressing and holding the operating button or By momentarily pressing (less than one second) the rpm changes incrementally by 50 rpm
		Lock	Off	By releasing the operating button
	Increase the engine rpm	Error	Blinks	Error / problem
384		lower	Lights up	By pressing and holding the operating button or By momentarily pressing (less than one second) the rpm is lowered incrementally by 50 rpm
		Lock	Off	By releasing the operating button
	Lower engine rpm	Error	Blinks	Error / problem
385		Start	Lights up	Start turned off crane engine: By pressing and holding the button until the engine is running
		Turn off	Off	Turn the started crane engine off: By pressing the operating button
	Engine START / STOP	Error	Blinks	Crane engine Nominal rpm not reached
				Note: If the crane engine is turned off via this operating button when the ignition is turned on, then the stand-by mode is started in the LICCON computer system.

6.4 Operating buttons BKE for release operations

Here you find the description of the Operating keys for release actuations **390**.

Note

- ▶ The following functions require the activation of the release button.
- ▶ The release button is active for 30 seconds. If the operating key is pressed during this time, the release time is reset to 30 seconds. The release stops after 30 seconds.
- ▶ A function is triggered by activation of the release button and then pressing the corresponding operating button.
- ▶ For the listed key combinations, hold the corresponding operating button until the desired end position is reached.

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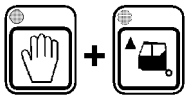
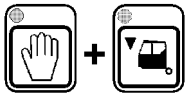
Position	Key combination	Function	LED	Description
390	Release button	On	Lights up	Press the release button, within 30 seconds the functions which require a release must now be activated.
		Off	Off	By pressing the button **or** Automatically after 30 seconds when no release button is pressed, a release is required.
390+391	 Lift the crane cab	On	Lights up	By pressing and holding the operating button lift the crane cab on the front to the desired position
		Lock	Off	By releasing the operating button
		Error	Blinks	Error / problem
390+392	 Lower the crane cab	On	Lights up	By pressing and holding the operating button lower the crane cab on the front to the desired position
		Lock	Off	By releasing the operating button
		Error	Blinks	Error / problem
390+393	Swing the crane cab in	On	Lights up	Function inactive
		Off	Off	Error / problem
		Error	Blinks	The crane cab is swung in
390+394	Swing the crane cab out	On	Lights up	Function inactive
		Off	Off	Error / problem
		Error	Blinks	The crane cab is swung out

7 LICCON computer system monitors

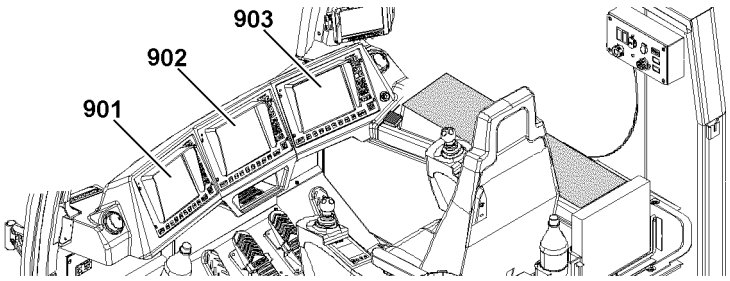


Fig.144103: LICCON computer system monitors

Note

▶ For detailed descriptions of the operating element and functions on the LICCON monitors, see Crane operating instructions, chapter 4.02!

901 LICCON monitor 2
- Also described as BSE 3

902 LICCON monitor 1
- Also described as BSE 2

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903 LICCON monitor 0
- Also described as BSE 1

8 Camera monitoring

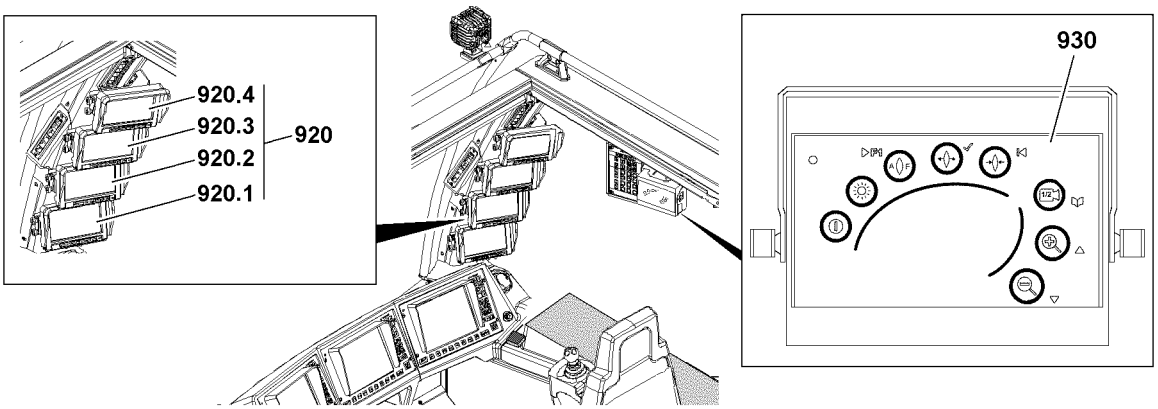

Fig.144104: Camera monitoring

WARNING
Non-available camera view!
The individual camera views in the monitors can be changed over or masked.
The camera objective can become dirty, fogged up or otherwise impaired in the sight window.
Incorrectly set or dirty floodlights can impair the camera monitoring.
▶ Always allow to show required camera views.
▶ Remedy any impairments of picture quality of camera views immediately.

Location of monitors **920** in the crane cab:

920.1 Monitor 1
920.2 Monitor 2
920.3 Monitor 3
920.4 Monitor 4

Assignment of cameras to monitors, see Electrical wiring diagram.

For a description of the monitor **920** operating buttons, see documentation from the manufacturer.

For description of the camera control unit **930**, see the documentation from the manufacturer.

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9 Pedal carrier

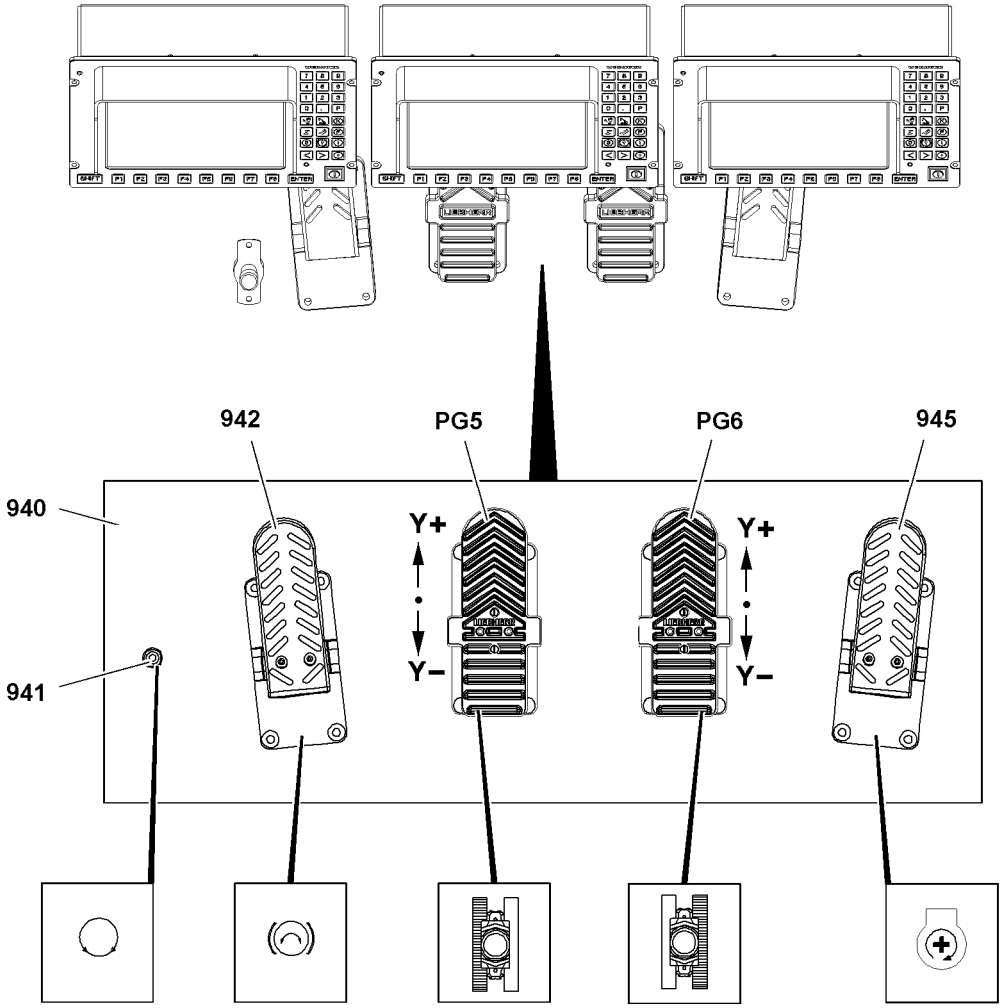

Fig.125416: Pedal carrier

940 Pedal carrier

941 Foot button
- Freewheeling slewing gear

942 Pedal
- Slewing gear brake

PG5 Pedal sensor 5

Drive the left crawler:
Actuate the foot rocker **PG5** in direction Y+ (forward): The left crawler drives forward.
Actuate the foot rocker **PG5** in direction Y- (backward): The left crawler drives backward.

PG6 Pedal sensor

Drive the right crawler:
Actuate the foot rocker **PG6** in direction Y+ (forward): The right crawler drives forward.
Actuate the foot rocker **PG6** in direction Y- (backward): The right crawler drives backward.

945 Pedal
- Engine regulation

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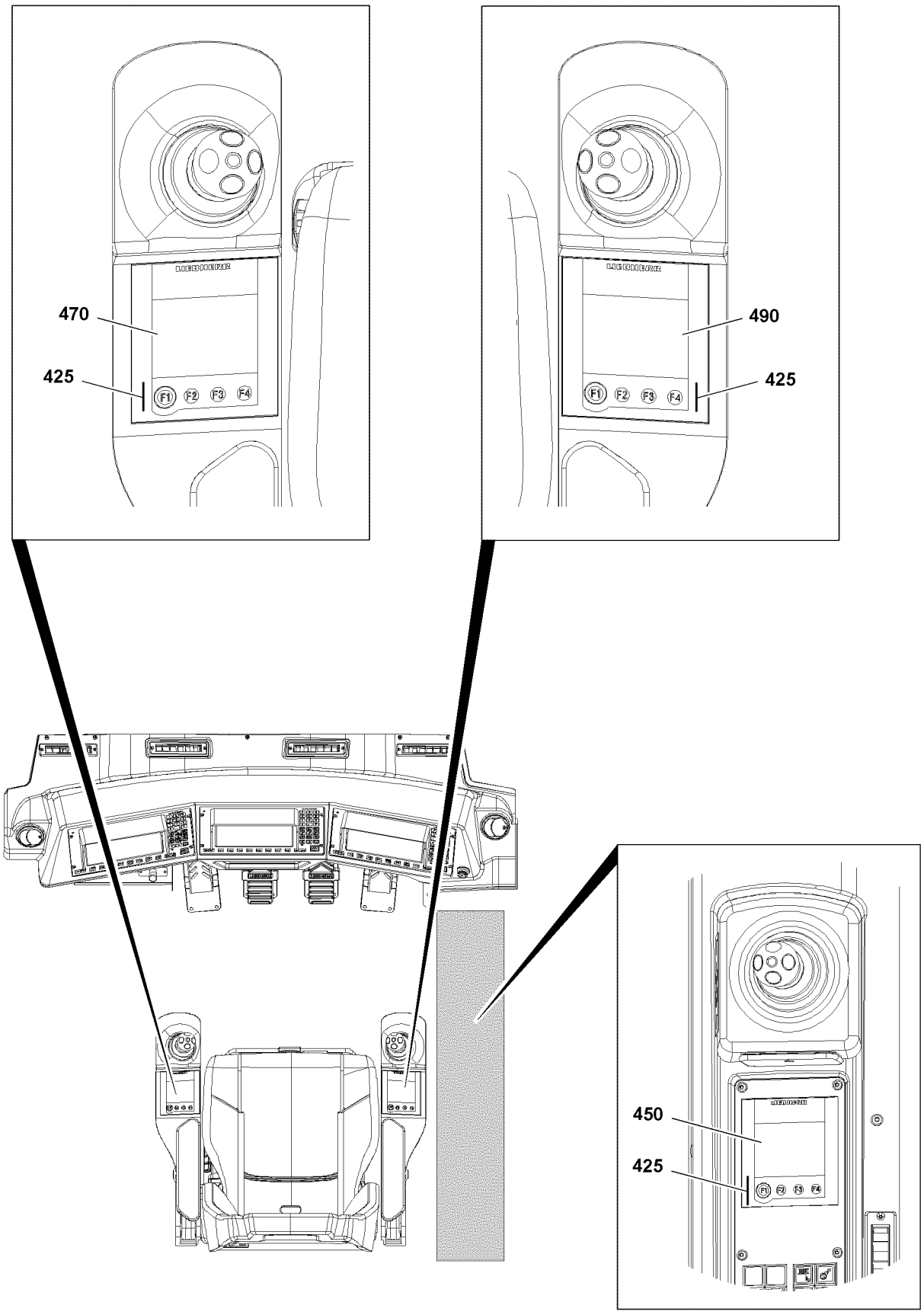

Fig.122048

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10 Touch displays

The touch displays are combined display and operating elements. The touch displays are operated using the row of function keys „F1“ to „F4“ and by direct „touch“ (fingertip) on the corresponding display icons.

Note
- ▶ The illustrations or icons in the touch displays are only examples.
- ▶ The illustrations may differ depending on the crane!
- ▶ If the F1-function key is continuously pressed, the system shifts continuously between the existing menu points.

Via the left touch display **470** and the right touch display **490**, you can call up various menus. In these menus you can select or preselect different crane functions, turn them on and off or control them directly.

Note
- ▶ In low temperatures it is possible that the touch displays initially change to the menu items delayed and that the touch functions remain deactivated for that time.
- ▶ Wait a few minutes after ignition „ON“ until the menu items are shown on the touch display.

425 Function keys
- The assignment of the function keys depends on the icons or the functions, which are visible on the individual touch displays.
- On touch display TE1 and on touch display TE2, additional functions can be called up via the menus.
- The functions are described in this chapter together with the menus.

490 Right touch display TE1
- Main menu: Master switch assignment MS1, select master switch assignment, spool assembly winch, parallel operation: Adjusting the winches
- Menu „Block winches“

470 Left touch display TE2
- Main menu: Master switch assignment MS2, slewing gear brake
- „Floodlight“ menu
- Menu „Climate control settings“
- Menu „Hydraulic oil preheating“

450 Touch display TE3, instrument panel
- Main menu: Master switch assignment MS3, drive crawler

10.1 Touch functions

10.1.1 Selecting and deselecting touch functions

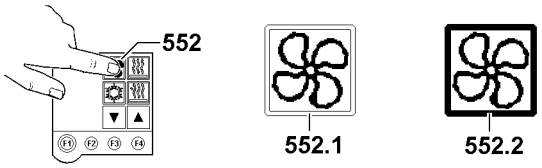

Fig.114231: Selecting and deselecting touch functions

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Note

- ▶ Touch functions are identified by the double border (empty frame) of the touch display icons. The function in the icon is selected / deselected with the press of a finger („touch“) on the icon. Example on „Fan / blower“ icon **552**:
- ▶ „Fan / blower“ icon **552.1**: Fan / blower deselected (not active), double border (empty frame) is visible.
- ▶ „Fan / blower“ icon **552.2**: Fan / blower selected (active), double border is filled (frame filled).

10.1.2 Operating touch functions

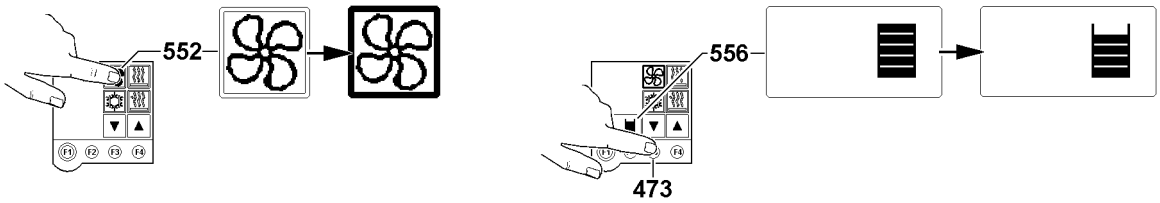

Fig.115020: Operating touch functions

Note

As an example, the blower stage of the heater is reduced:

- ▶ The „Fan / blower“ icon **552** is selected in the touch display by „touching“.

When the function is selected:

- ▶ The double frame area is filled out, the function „Fan / blower“ is now active.
- ▶ When the F3 key **473** is actuated, the blower stage is reduced. The status display **556** is updated.

10.2 Starting up the LICCON Computer system and the touch displays

After turning on and correct boot up of the LICCON computer system, a static crane picture appears momentarily on the touch display. From here the system automatically switches to the master switch assignment for the relevant master switch, MS1 (right), MS2 (left) and MS3 (instrument panel).

The touch display always displays the master switch assignment on the touch displays that was set or „active“ before the LICCON computer system was turned off.

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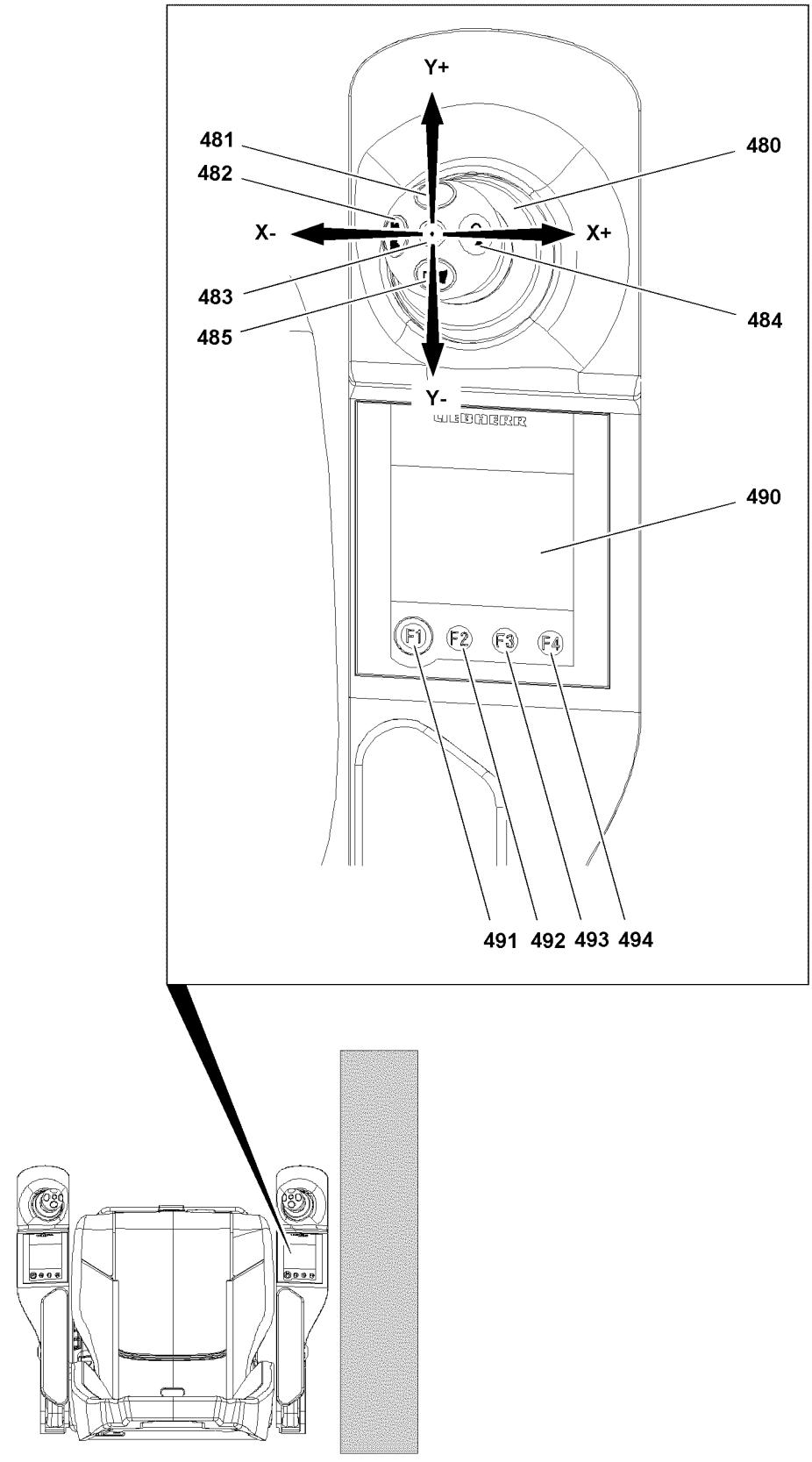

Fig.122217

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11 Master switch assignment MS1

WARNING
Change of master switch assignment!
The assignment of the master switches to the respective units on the crane can change, depending on the set up configuration and winch application.
▶ Select the correct master switch assignment.
▶ Check the assignment before actuating the master switch on the TE.

Note
▶ For description of function of the master switches, see Crane operating instructions, chapter 4.05.

480 Master switch right (MS1)
- The functions for the master switch MS1 depend on the set up configuration and the selected master switch assignment on TE1.

481 Button
- Bypass of the seat contact button
- **Or:** When the seat contact button is actuated: Activation of the vibration sensor **483**

482 Button
- „Power Plus“ addition, crane operation

483 Vibration sensor
- Turn sensor and winches

Note
▶ Pressing the button **484** will lock the engine regulation in the current position.

484 Button
- Lock the engine regulation of superstructure engine.
  The idling speed can be increased up to the maximum rpm.
  - Can be „overridden“ by the engine regulation (gas pedal).
  - At continued actuation of the engine regulation (gas pedal), the current rpm is taken over.
  - By pressing the button **484** with the engine regulation (gas pedal) **NOT actuated**, the manual throttle is cancelled.
  - If the engine rpm is locked, a **„+“** appears on the LICCON monitor in the „dynamic engine rpm display“ (driving mode) and the „dynamic load utilization bar display“ (crane operation).
  - Delete the lock by touching the gas pedal momentarily.

485 Button
- Horn

11.1 TE1 Function key assignment

491 F1 key
- No function on TE1

492 F2 key
- Change to the menu „Lock winch“

Note
▶ The winch status (winch activated / blocked) can be seen on the touch display. Blocked winches are recognizable on the icon.

493 F3 key
- Change master switch assignment; identification via letter in icon.
  The number of possible master switch assignments depends on the set up configuration, which was configured in the LICCON computer system.

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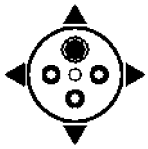
Conditions: Master switch 1 **480** (MS1), master switch 2 (MS2) and master switch 3 (MS3) are not actuated.

494 F4 key

- If a touch function of assembly winch is activated on the touch display: Spool assembly winch out, spool up or constantly spool up.
  When parallel operation winch 1 || winch 2 is activated: „Adjusting the winches“

11.2 TE1 main menu: Functions and assignment

Position	Icon	Assignment TE1
1.01		Display of master switch with deflection directions: Icon visible in main menu on every touch display
1.02		Identification of master switch assignment in center of icon, for example „D“

11.2.1 TE1 Touch functions

Position	Icon	Assignment TE1 Main menu: Touch functions
1.10		Adjusting winch 1 and winch 2
1.11		Winch 1 and winch 2 are adjusted.

11.2.2 TE1 Assignment winches

Position	Icon	Assignment TE1 Main menu: Winches
1.20		Spool up winch 1
1.21		Spool winch 1 out, display of maximum winch speed in percentages
1.22		Spool up winch 1 and winch 2 in parallel operation
1.23		Spool out winch 1 and winch 2 in parallel operation, display of maximum winch speed in percentages

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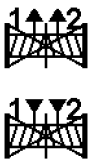
Position	Icon	Assignment TE1 Main menu: Winches
1.24		Winch 1 is blocked
		Note: If a winch is blocked, the functions „spool winch up“ and „spool winch out“ can **NOT** be carried out!
1.25		Parallel operation winch 1 and winch 2 is blocked
		Note: If the parallel operation is blocked, the functions „spool winch up“ and „spool winch out“ can **NOT** be carried out!
1.26		Spool up winch 4
1.27		Spool winch 4 out, display of maximum winch speed in percentages

11.2.3 TE1 Assignment boom and equipment

Position	Icon	Assignment TE1 Main menu: Boom and equipment
1.30		Luffing the main boom up
1.31		Luff main boom down; display of maximum winch speed in percentages
1.32		Luffing the luffing jib up
1.33		Luff luffing jib down; display of maximum winch speed in percentages
1.34		Luffing the main boom up
1.35		Luff main boom down; display of maximum winch speed in percentages
1.36		Luffing the main boom up
1.37		Luff main boom down; display of maximum winch speed in percentages

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Position	Icon	Assignment TE1 Main menu: Boom and equipment
1.38		Luffing the luffing jib up
1.39		Luff luffing jib down; display of maximum winch speed in percentages
1.40		Luffing the main boom up
1.41		Luff main boom down; display of maximum winch speed in percentages
1.42	 	If a crane movement is blocked, the functions „luffing up“ and „luffing down“ can **NOT** be carried out! **Note:** Boom and equipment: Crane movement is blocked, example SW, „luff luffing jib up“ and „luff luffing jib down“ can **NOT** be carried out.
1.43		Lower derrick ballast: Extend pull cylinder A and pull cylinder B
1.44		Lift derrick ballast: Retract pull cylinder A and pull cylinder B
1.43		Lifting / lowering the derrick ballast: Lock pull cylinder A
1.44		Lifting / lowering the derrick ballast: Lock pull cylinder B
1.45		Ballast automatic* - Lower derrick ballast: Extend pull cylinder A and pull cylinder B
1.46		Ballast automatic* - Lift derrick ballast: Retract pull cylinder A and pull cylinder B

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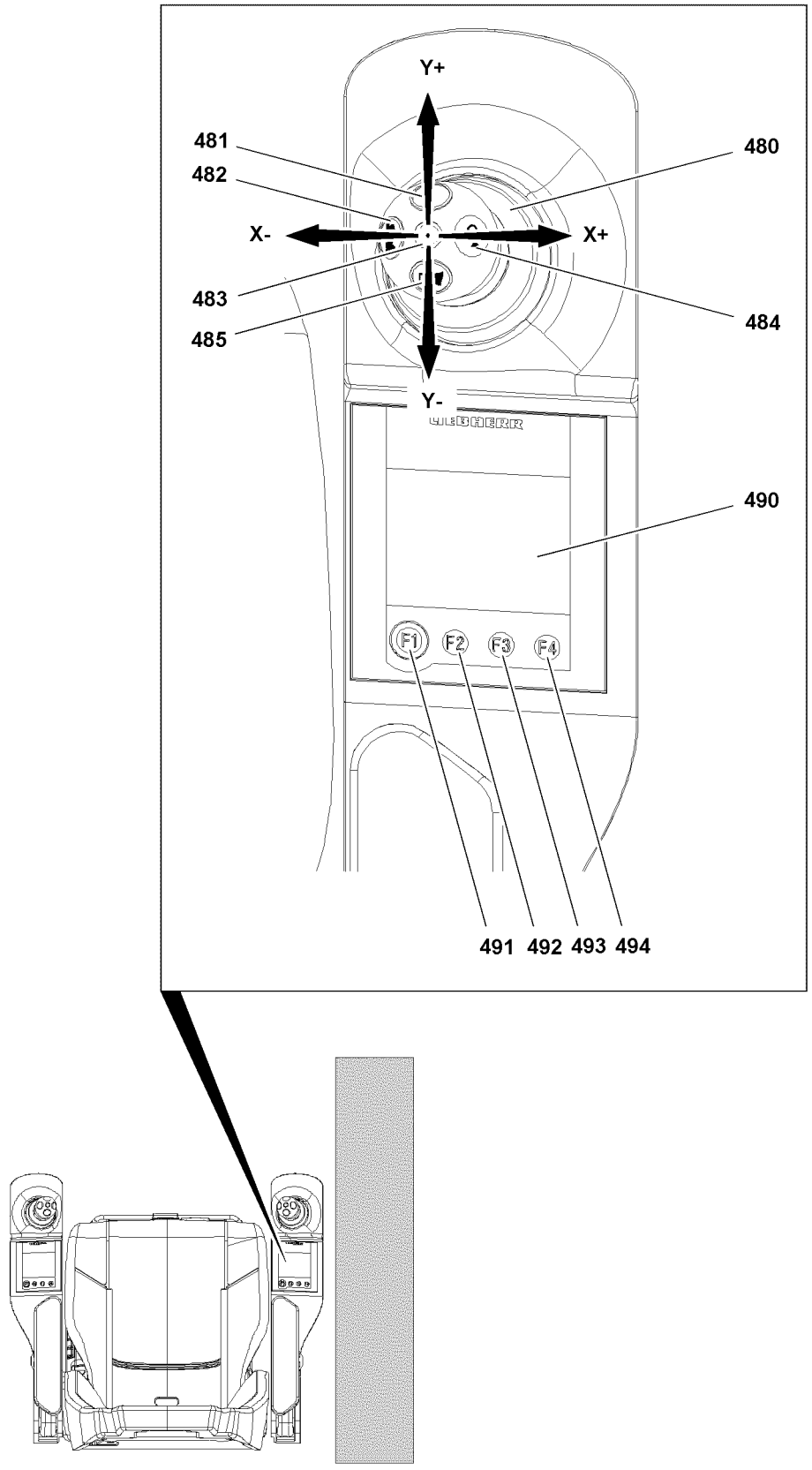

Fig.122217

11.3 TE Menu „Block winch“ (right touch display)

The crane operator has the possibility to block a winch which is not needed in the „Block winch“ menu.

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Note
- ▶ „Touch“ on a touch function to activate the function.
- ▶ Only an activated winch can be blocked or released with the F4 function key **494**.
- ▶ The touch display changes 20 seconds after the last button actuation to the main menu.

11.3.1 TE Menu „Block winch“ function key assignment

You can reach the „block winch“ menu via the TE1 **490**.

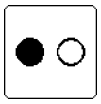
491 F1 key
- Change to the main menu

492 F2 key
- No function in this menu

493 F3 key
- No function in this menu

494 F4 key
- Block / release the winch: When the winch is blocked, the winch is shown as in icon **541**.

11.3.2 TE Menu „Block winch“ assignment

Position	Icon	TE Menu „Block winch“ assignment
530		Block winches which are selected

11.3.3 TE Menu „Block winch“ touch functions

Position	Icon	TE Menu „Block winch“ touch functions
535		Winch 1
536		Winch 2
537		Winch 3
538		Winch 4
539		Winch 5
540		Winch 6
541		Winch 3 is blocked

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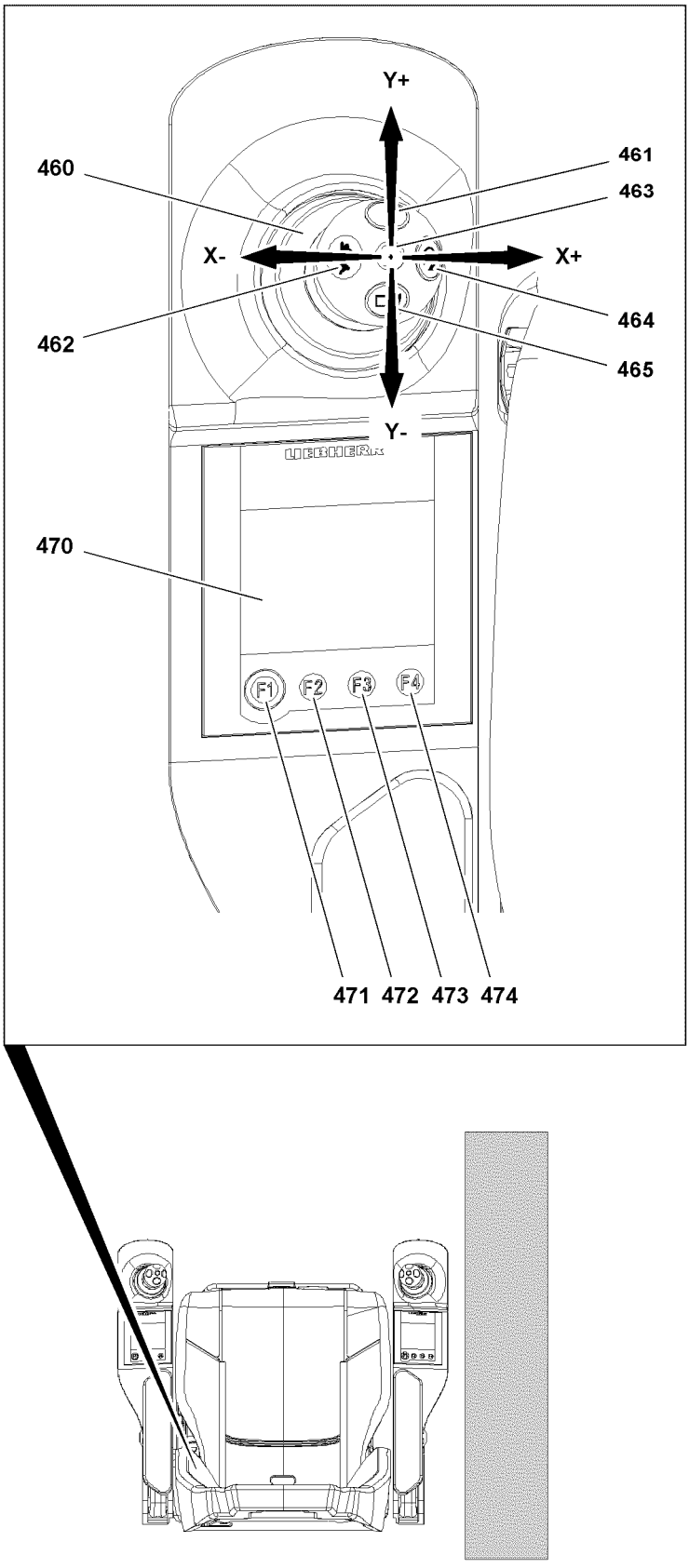

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Fig.122218

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12 Master switch assignment MS2

Note
Change of master switch assignment!
The assignment of the master switches to the respective units on the crane can change, depending on the set up configuration and winch application!
▶ **Check the assignment before actuating the master switch on the TE!**

12.1 Functions master switch MS2

Note
▶ For description of function of the master switches, see Crane operating instructions, chapter 4.05.

460 Master switch left (MS1)
- The functions for the master switch MS1 depend on the set up configuration and the selected master switch assignment on TE2.

461 Button
- Bypass of the seat contact button
- **Or:** When the seat contact button is actuated: Activation of the vibration sensor **463**

462 Button
- „Power Plus“ addition, crane operation

463 Vibration sensor
- Turn sensor and winches

Note
▶ Pressing the button **464** will lock the engine regulation in the current position.

464 Button
- Lock the engine regulation of superstructure engine.
  The idling speed can be increased up to the maximum rpm.
  - Can be „overridden“ by the engine regulation (gas pedal).
  - At continued actuation of the engine regulation (gas pedal), the current rpm is taken over.
  - By pressing the button **464** with the engine regulation (gas pedal) **NOT actuated**, the manual throttle is cancelled.
  - If the engine rpm is locked, a **„+“** appears on the LICCON monitor in the „dynamic engine rpm display“ (driving mode) and the „dynamic load utilization bar display“ (crane operation).
  - Delete the lock by touching the gas pedal momentarily.

465 Button
- Horn

12.2 TE2 Function key assignment

471 F1 key
- You can change to the next menu in this sequence:
  - Menu „Climate control settings“
  - „Floodlight“ menu
  - Menu „Hydraulic oil preheating“

472 F2 key
- No function in the main menu TE2

473 F3 key
- Open / close slewing gear brake
  or
- Ballast automatic out / in

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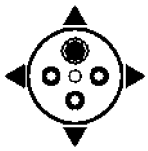
474 F4 key
- Spool the assembly winch out / up
- Luff in with suspended load (icon **2.14**), see Crane operating instructions, chapter 4.20

12.3 TE2 main menu: Functions and assignment

Position	Icon	Assignment TE2
2.01		Display of master switch with deflection directions: Icon visible in main menu on every touch display

12.3.1 TE2 Touch functions

Position	Icon	Assignment TE2 Main menu: Touch functions
2.14		Luff in with suspended load
2.10		Spool the assembly winch up
2.11		Spool the assembly winch out
2.12		Spooling the assembly winch up constantly

12.3.2 TE2 Assignment winches

Position	Icon	Assignment TE2 Main menu: Winches
2.20		Spool up winch 2
2.21		Spool winch 2 out; display of maximum winch speed in percentages
2.22		Spool up winch 6

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Position	Icon	Assignment TE2 Main menu: Winches
2.23		Spool winch 6 out; display of maximum winch speed in percentages
2.24		**Note:** If a winch is blocked, the functions „spool winch up“ and „spool winch out“ can **NOT** be carried out!
		Winch 2 is blocked

12.3.3 TE2 Assignment slewing gear and equipment

Position	Icon	Assignment TE2 Main menu: Slewing gear
2.30		Turn slewing gear to the left
2.31		Turn slewing gear to the right, display of maximum slewing gear speed in percentages
2.32		Slewing gear brake is released
2.33		Slewing gear brake is applied
2.34		Ballast automatic can be turned on
2.35		Ballast automatic can be turned off
2.36		Extend the assembly cylinder
2.37		Retract the assembly cylinder
2.38		Increase radius derrick ballast
2.38		Decrease radius derrick ballast

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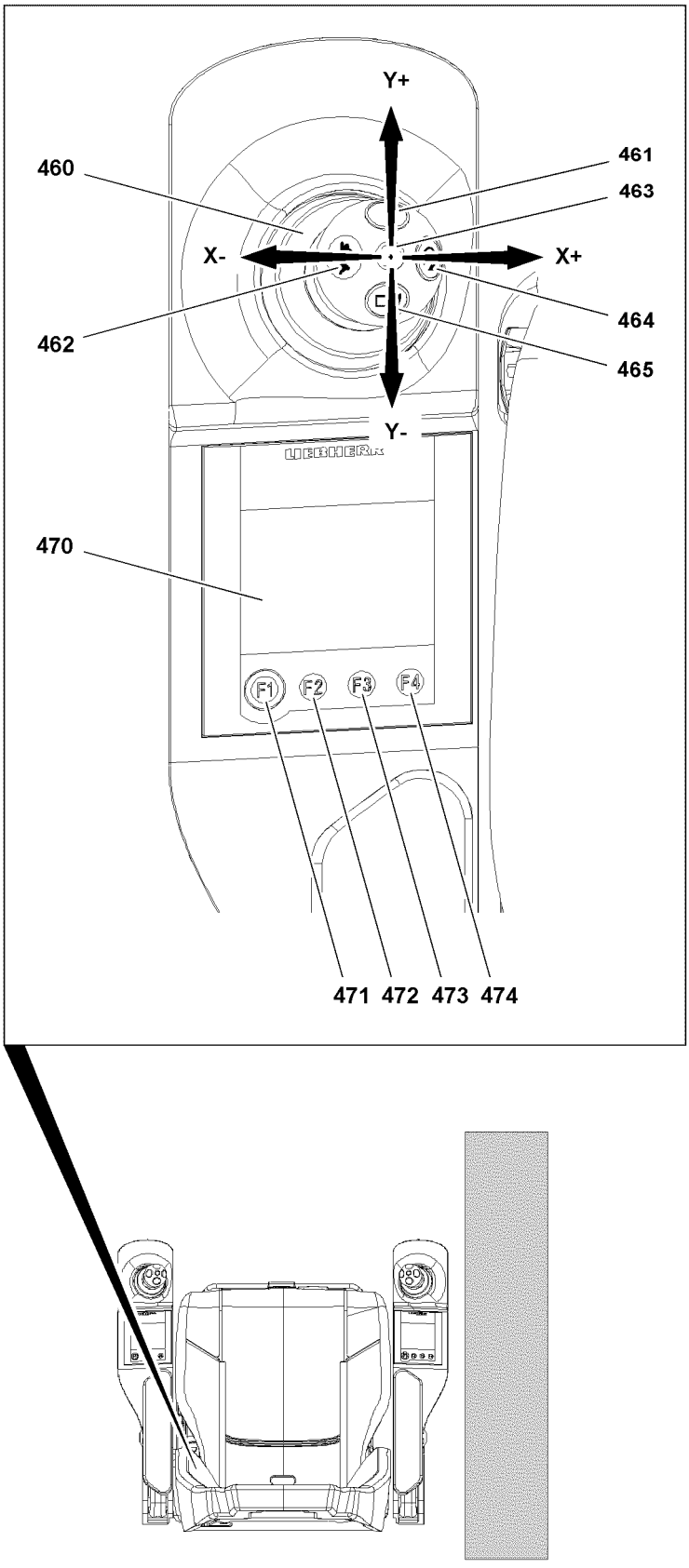

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12.4 TE2 Menu: „Climate control settings“ (Left touch display)

In the „Climate control settings“ menu the crane driver has the opportunity to make any heater, air conditioning and ventilation settings.

Note

- ▶ Refer to the Crane operating instructions, chapter 6.02 for a detailed description of the heater / air conditioning and ventilation settings.
- ▶ The Floodlight menu is solely available if the floodlight is installed and connected.
- ▶ „Touch“ on a touch function to activate the function.
- ▶ Only an activated function can be turned off or reduced in value with the F3 key **473**.
- ▶ Only an activated function can be turned on or increased in value with the F4 key **474**.
- ▶ The touch display changes 30 seconds after the last button actuation to the main menu.

12.4.1 TE Menu „Climate control settings“ function key assignment

471 F1 key
- Change to the next menu

472 F2 key
- „Minus“ - reduce stage / temperature or turn „OFF“

Note

- ▶ The **automatic climate control** can only be turned on if the climate control system **551** has been selected.

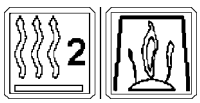
473 F3 key
- „Plus“ - increase stage / temperature or turn „ON“

474 F4 key
- Automatic climate control „ON“ / „OFF“

12.4.2 TE Menu „Climate control settings“ touch functions

Note

- ▶ „Touching“ a function in the „Climate control settings“ menu causes a black border to appear around the relevant icon (function selection) and at the same time the current setting, the selected stage or the on / off status („ON“ / „OFF“) for a function is displayed in the Status display **555**.
- ▶ Solely one function can be selected and edited in the „climate control settings“ menu.

Position	Icon	TE Menu „Climate control settings“ touch functions
551		Climate control system
552		Fan / blower
554		Auxiliary heater

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Position	Icon	TE Menu „Climate control settings“ touch functions
556		Air distribution
557		Recirculating air
560		Defroster

12.4.3 TE Menu „Climate control settings“ assignment

Position	Icon	TE Menu „Climate control settings“ assignment
555		Status display: The status display shows the different icons, depending on the selected function.
		Status display in this example: Automatic operation, temperature set to 15 °C.
558		Reduce temperature. After selecting a touch function: Decrease current size or conditions of a function, change current status of a function.
559		Increase temperature. After selecting a touch function: Increase current size or conditions of a function, change current status of a function.
561		Icon turned off in manual operation: Turn manual operation on.
562		Icon turned on in automatic operation: Turn automatic operation off.

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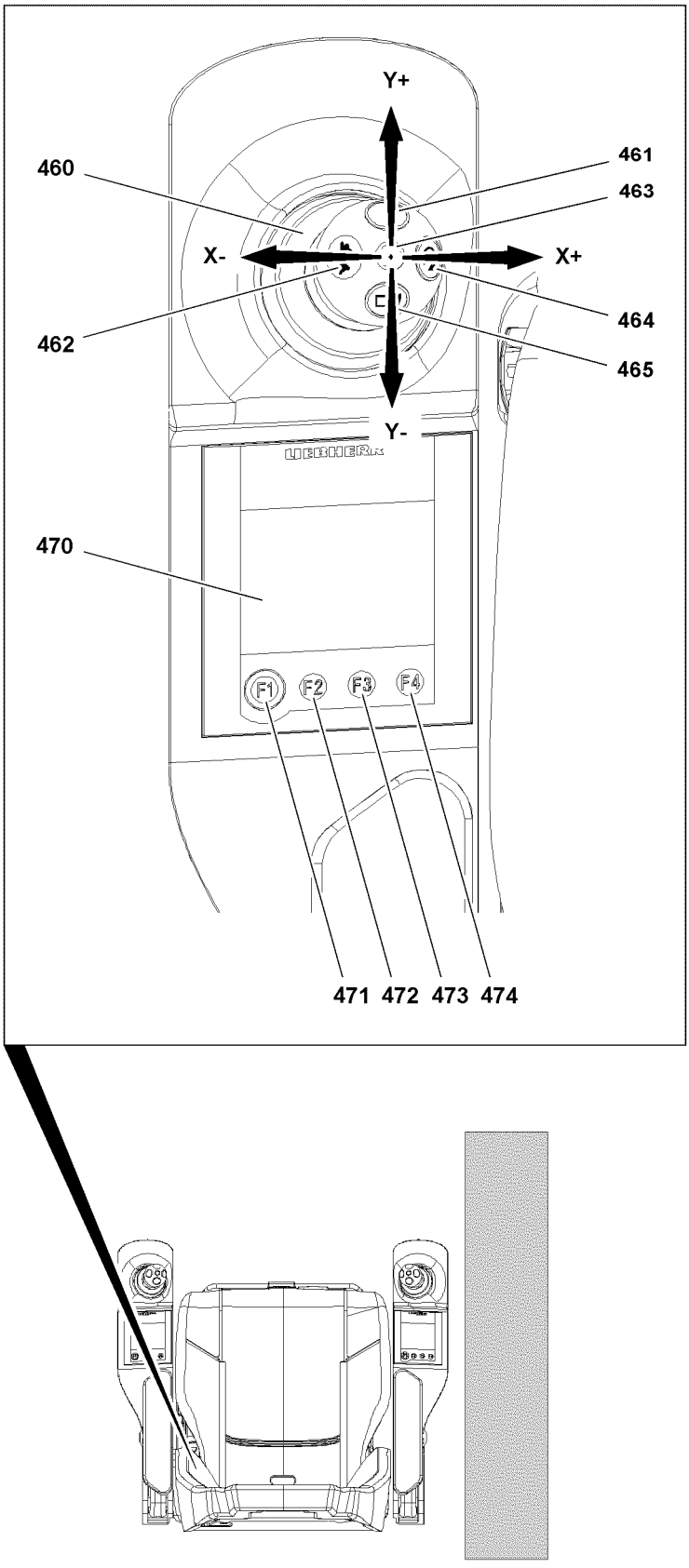

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12.5 TE2 Menu „Working floodlight“ (left touch display)

Note

- ▶ The floodlight on the S-pivot section is installed together with the zoom camera on one control drive.
- ▶ The alignment and the adjustment of the working floodlight transfers automatically to the zoom camera.
- ▶ Functions of zoom camera, see section „Control unit camera monitoring“

In the floodlight menu the crane driver has the opportunity to manually align the working floodlight to suit the current load or the planned working range. In crane operation, the previously aligned floodlight changes its position according to the movement direction of the load (load-following) or the working range (fixed to working range).

Note

- ▶ The Floodlight menu is solely available if the floodlight is installed and connected.
- ▶ „Touch“ on a touch function to activate the function.
- ▶ Solely an activated function can be turned on or off with the F4 key **474**.
- ▶ The touch display changes 20 seconds after the last button actuation to the main menu.

12.5.1 TE Menu „Working floodlight“ function key assignment

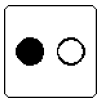
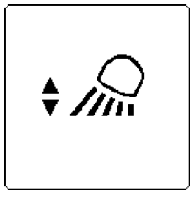
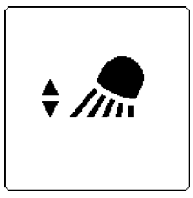
471 F1 key
- Change to the next menu

472 F2 key
- **No** function

473 F3 key
- One hook position: **No** function
- From two hook positions: Select hook position

474 F4 key
- Turning the floodlight on / off

12.5.2 „Floodlight“ TE menu assignment

Position	Icon	„Floodlight“ TE menu assignment
510		Turn the floodlight on / off.
511		From two hook positions: Select hook position.
512		Status display: The status display shows the different icons, depending on the selected function. This example shows the working floodlights turned off.
513		Status display: The status display shows the different icons, depending on the selected function. This example shows the working floodlights turned on.

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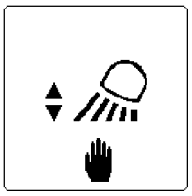
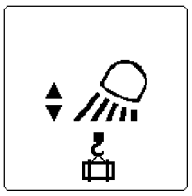
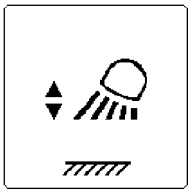
12.5.3 TE Menu „Working floodlight“ touch functions

Note

- ▶ Before the desired operating mode of the working floodlights is selected, set the initial position of the working floodlights manually.
- ▶ Set the initial position: In the operating mode „Working floodlight manual“ deflect the master switch 2 **460** (MS2) left in direction Y+ or Y-.

Position	Icon	TE Menu „Working floodlight“ touch functions	Status display
515		Align the working floodlight „manually“.	
516		Set the working floodlight „following the load“ (icon shows sample setting for load position 5).	
517		Set working floodlight „fixed to working range“.	

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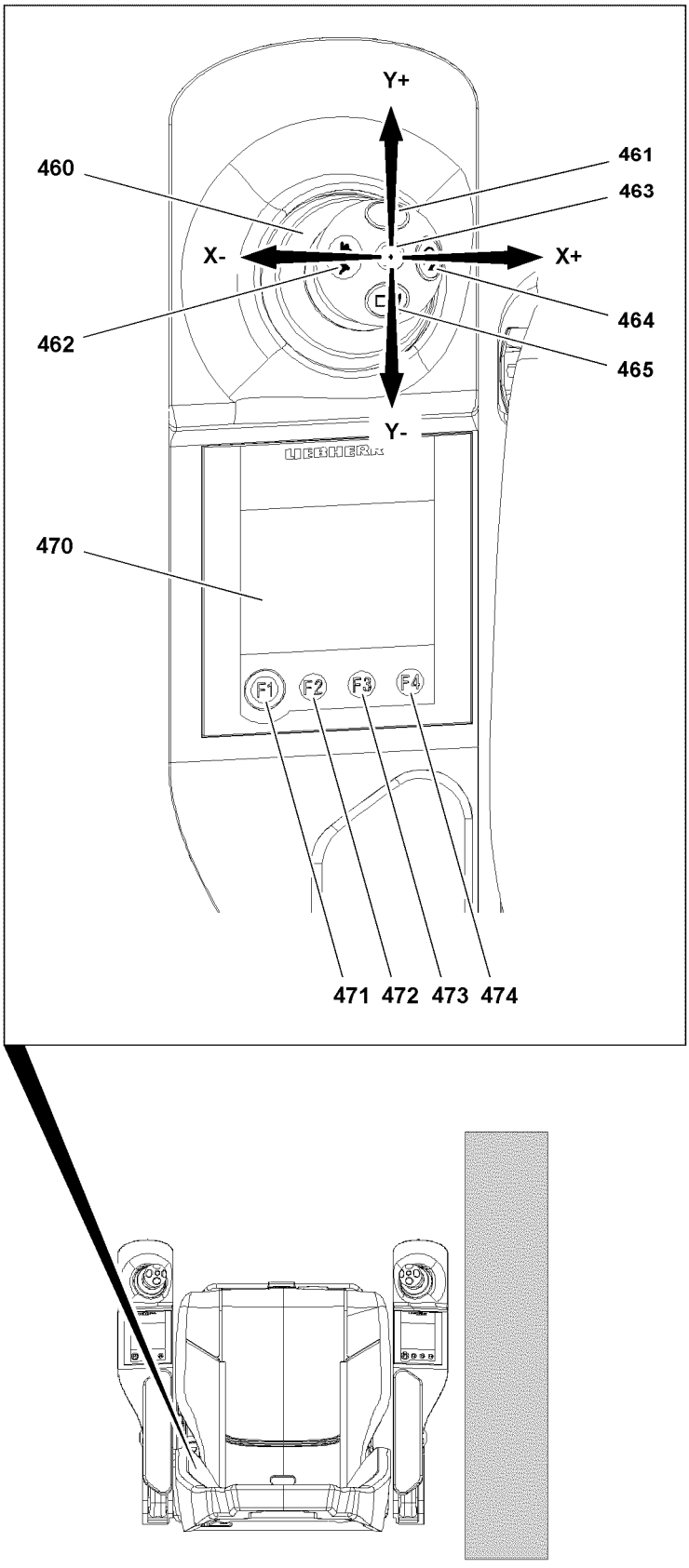

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12.6 TE2 Menu: „Hydraulic oil preheating“ (Left touch display)

Note

- ▶ „Touch“ on a touch function to activate the function.
- ▶ Solely an activated function can be turned on or off with the F4 key **474**.
- ▶ The touch display changes 20 seconds after the last button actuation to the main menu.

12.6.1 „Hydraulic oil preheating“ TE menu function key assignment

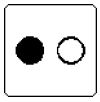
471 F1 key
- Change to the next menu

472 F2 key
- **No** function

473 F3 key
- **No** function

474 F4 key
- Turn the hydraulic oil preheating on / off

12.6.2 TE Menu „Hydraulic oil preheating“ assignment

Position	Icon	TE Menu „Hydraulic oil preheating“ assignment
570		Turn the hydraulic oil preheating on / off

12.6.3 TE Menu „Hydraulic oil preheating“ touch functions

Position	Icon	TE Menu „Hydraulic oil preheating“ touch functions
575		Select / deselect hydraulic oil preheating

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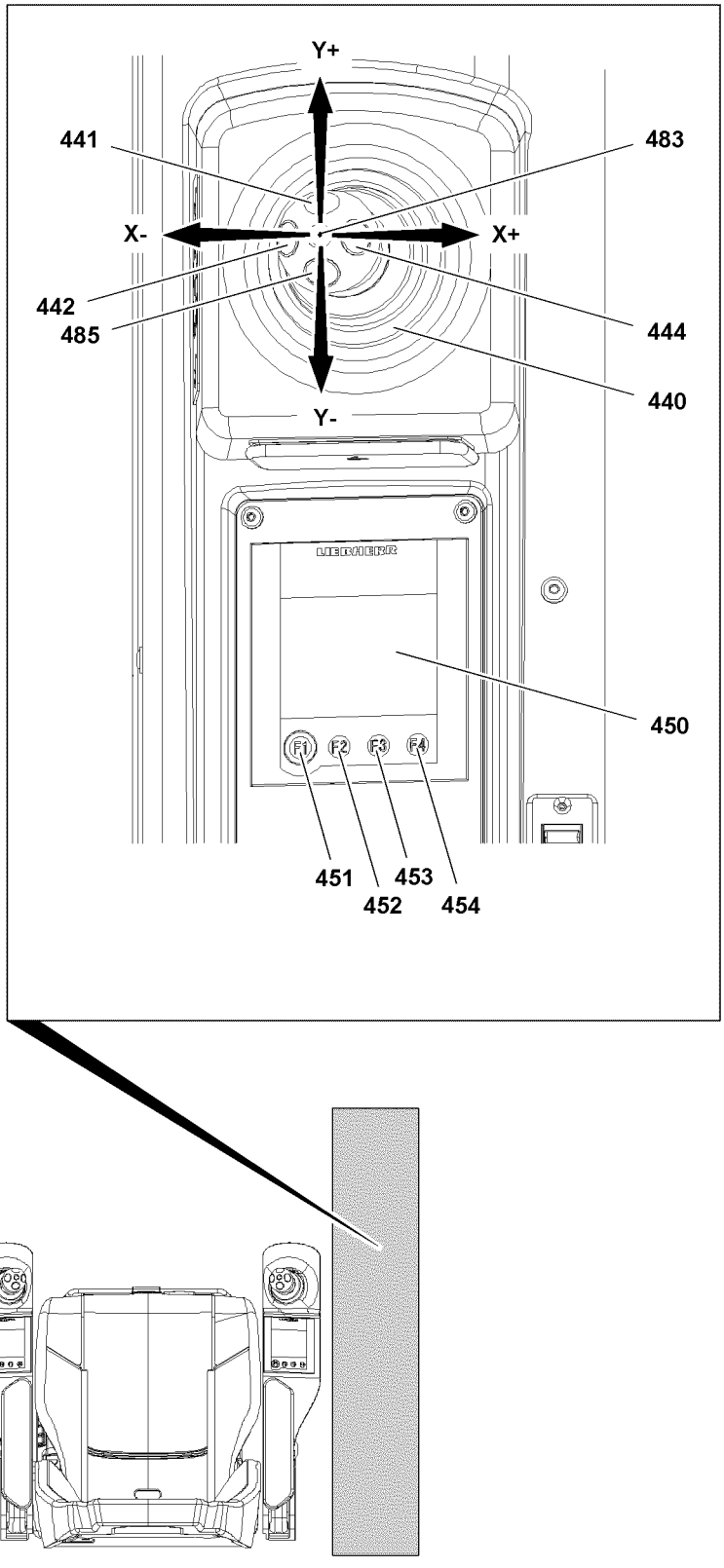

Fig.122219

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13 Master switch assignment MS3

Note
Change of master switch assignment!
The assignment of the master switches on the control platform to the respective units on the crane can change, depending on the set up configuration and winch application!
▶ **Check the assignment before actuating the master switch on the TE!**

Note
▶ For description of function of the master switches, see Crane operating instructions, chapter 4.05.

440 Master switch instrument panel (MS3)
- The functions for the master switch MS3 depend on the set up configuration and the selected master switch assignment on TE3.

441 Button
- Bypass of the seat contact button. **Or** if the seat contact button is actuated: Activation of the vibration sensor **443**

442 Button
- Addition „Power Plus“ for winch(es) and luffing up.

443 Vibration sensor
- Winch turn sensor, (vibrator) winch **or** turn sensor

Note
▶ Pressing the button **444** will lock the engine regulation in the current position.

444 Button
- Lock the engine regulation of superstructure engine.
  The idling speed can be increased up to the maximum rpm.
  - Can be „overridden“ by the engine regulation (gas pedal).
  - At continued actuation of the engine regulation (gas pedal), the current rpm is taken over.
  - By pressing the button **444** with the engine regulation (gas pedal) **NOT actuated**, the manual throttle is cancelled.
  - If the engine rpm is locked, a **„+“** appears on the LICCON monitor in the „dynamic engine rpm display“ (driving mode) and the „dynamic load utilization bar display“ (crane operation).
  - Delete the lock by touching the gas pedal momentarily.

445 Button
- Horn

13.1 Function key assignment TE3

451 F1 key
- No function on TE3

452 F2 key
- No function on TE3

453 F3 key
- No function on TE3

WARNING
Incorrect travel direction!
When the travel direction is incorrectly interpreted, the crane moves in the opposite direction.
Persons and objects can be rolled over.
▶ Before starting to drive, make sure that the correct travel direction is actuated.
▶ In the case of uncertainty, monitor the travel route in both directions.
▶ Initiate travel movement very slowly and check the travel of direction driving as slow as possible.

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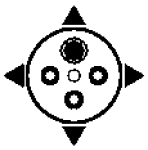
454 F4 key
- Driving the crawler

13.2 TE3 main menu: Functions and assignment

Position	Icon	Assignment TE3
3.01		Display of master switch with deflection directions: Continuously visible icon on every touch display

13.2.1 TE3 Touch functions

Position	Icon	TE3 main menu: Touch functions
3.10		Driving the crawler, normal travel crawler operation deactivated
		Driving the crawler, normal travel crawler operation activated, icon blinks
3.11		Driving the crawler, rapid gear crawler operation deactivated
		Driving the crawler, rapid gear crawler operation activated, icon blinks
3.12		Driving the crawler, parallel travel crawler operation deactivated
		Driving the crawler, parallel travel crawler operation activated, icon blinks

13.2.2 TE3 Assignment winches

Position	Icon	TE3 main menu: Assignment winches
3.20		Not present on all crane types. Spool winch 5 out; display of maximum winch speed in percentages
3.21		Not present on all crane types. Spool up winch 5
3.20		Spool winch 6 out; display of maximum winch speed in percentages

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Position	Icon	TE3 main menu: Assignment winches
3.21		Spool up winch 6
3.22	**Note:**	If a winch is blocked, the functions „spool winch up“ and „spool winch out“ can **NOT** be carried out!
		Winch 6 blocked

13.2.3 TE3 Assignment boom and equipment

Position	Icon	TE3 main menu: Assignment Boom and equipment
3.30		Luff SW – luffing jib up
3.31		Luff SW – luffing jib down; display of maximum winch speed in percentages
3.32		Luff SW – main boom up
3.33		Luff SW – main boom down; display of maximum winch speed in percentages
3.34		Luff SD – derrick boom up
3.35		Luff SD – derrick boom down; display of maximum winch speed in percentages
3.36		Luff SDW – luffing jib up
3.37		Luff SDW – luffing jib down; display of maximum winch speed in percentages
3.38		Luff SDW – derrick boom up

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Position	Icon	TE3 main menu: Assignment Boom and equipment
3.39		Luff SDW – derrick boom down; display of maximum winch speed in percentages
3.40	**Note:**	If a crane movement is blocked, the functions „luffing up“ and „luffing down“ can **NOT** be carried out!
		Boom and equipment: Crane movement is blocked, example SW, „luff luffing jib up“ and „luff luffing jib down“ can **NOT** be carried out.

13.2.4 TE3 Assignment support ballast trailer

Position	Icon	TE3 main menu: Assignment support ballast trailer
3.50		Extend the support ballast trailer at the front and at the rear. Support the ballast trailer.
3.51		Retract the support ballast trailer at the front and at the rear. Lower the ballast trailer on the wheels.
3.52		Support cylinder blocked at the front.
3.53		Support cylinder blocked at the rear.

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4.02 LICCON computer system

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Fig.195219

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1 General

Note
- ▶ The illustrations, icons and monitor illustrations in this chapter are only examples.
- ▶ The numerical values in the individual icons and charts do not have to necessarily match the crane exactly.
- ▶ Numbers and letters can be replaced by place holders.
- ▶ The display and assignment of the icons can deviate, depending on the set up configuration, operating status and configuration of the crane.
- ▶ In addition, many of the illustrations show the maximum configuration of the LICCON monitor with icons.
- ▶ In crane operation, an identical display will **not** appear on the LICCON monitor.

The LICCON computer system is a computer system for controlling and monitoring mobile and crawler cranes. In addition to the use of overload protection and load capacity display there are a number of application programs that can be used for controlling and monitoring the crane movements.

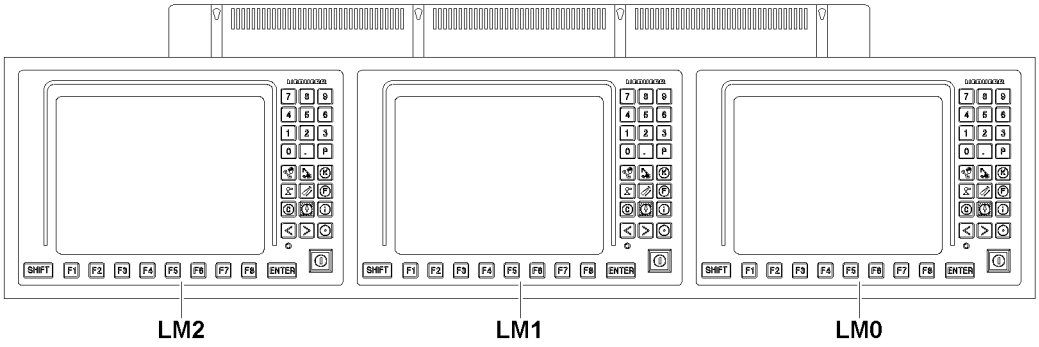

Fig.119921

The LICCON computer system is visualized among other possibilities via three LICCON monitors:
- **LM0** LICCON monitor 0
  - Placed on the right in the monitor arrangement
- **LM1** LICCON monitor 1
  - Placed in the center in the monitor arrangement
- **LM2** LICCON monitor 2
  - Placed to the left in the monitor arrangement

Note
- ▶ The electrical and electronic components are linked via data bus transmission technology (Liebherr System-Bus = LSB).

1.1 Overload protection

The overload protection includes limiters and displays (for example load capacity displays), which also alert to danger conditions via acoustical and optical warning signals.

The computer controlled part of the overload protection is called the LICCON overload protection. The LICCON overload protection is set by entering the set up configuration in the LICCON computer system.

The LICCON overload protection works, among other possibilities, according to the principle of comparing the current and actual load with the maximum load (also *Maximum load according to the load chart and reeving)* of the crane.

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1.1.1 Acoustic and optical warning signals

The crane is equipped with acoustical and optical warning device to warn crane operator, auxiliary personnel and any person nearby.

Overview of acoustic / optical warnings, see Crane operating instructions, chapter 4.20.

1.1.2 Actual load

The actual load is determined by recording changing dimensions, the set up configuration and situational influences.

The **load on the crane** results from the load momentum, boom momentum as well as environmental and mechanical influences. The occurring moments and forces are measured and processed by the LICCON computer system.

The **load momentum** results from load and boom radius. The load includes load, fastening equipment and hook block / load hook. The boom radius is calculated with aid of the angle sensor information (boom angle) and the length of the boom system. This also takes into account the boom flexation due to its own weight and the weight of the load.

The **boom momentum** is calculated from the length of the boom system, the crane data (boom weights) and angle sensor information (boom angle).

Environmental and mechanical influences are recorded, determined and taken into account individually.

1.1.3 Maximum load according to load chart and reeving

Note

▶ The *Maximum load according to load chart and reeving* is also called *Maximum load* in the description.

The crane data such as load charts (also called load capacity charts), boom weights and geometry data are stored in the central data memory of the LICCON computer system.

The *maximum load according to load chart and reeving* value (maximum load) is constantly determined, based on the load charts, for the set up configuration, the set reeving, the calculated boom radius and additional influences.

1.1.4 Comparison

The *actual load* value and *maximum load* value are compared. When they approach the specified limit, an advance warning is issued by the overload protection. If this limit is exceeded, the overload protection turns the load moment increasing crane movements off.

1.2 Error messages

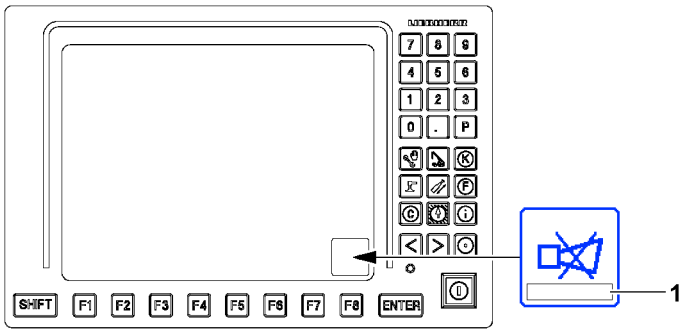

Fig.119922

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The LICCON computer system monitors the crane permanently for operating and system errors.

If operating and / or system errors occur, error messages **1** are issued. Error messages appear in the *Horn* icon of the LICCON monitor.

Note

- ▶ Always pay attention to error messages **1**.
- ▶ For procedure in case of error messages, see Diagnostics manual and the respective chapter in the Crane operating instructions.

2 System start of the LICCON computer system

There are two operating modes for the LICCON computer system:

- LICCON computer system in normal mode (crane engine turned on).
- LICCON computer system in stand-by mode (crane engine turned off).

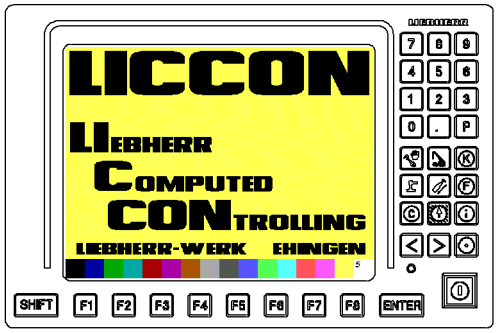
Starting in normal mode:

- System start of LICCON computer system in connection with a started crane engine.

Starting in stand-by mode:

- See Section „LICCON computer system in stand-by mode“.

1



2

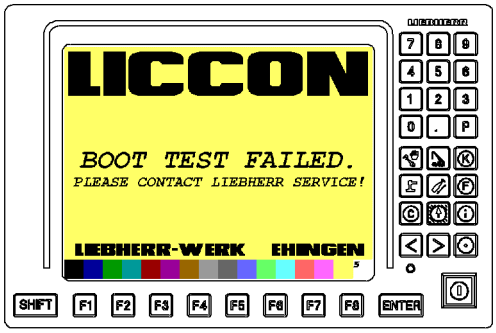


Fig.119923

All the components of the LICCON computer system run through a self-test after turning the computer on.

During the self test, the start screen of the LICCON computer system appears on all LICCON monitors, see illustration **1**.

Note

Error during the system start of the LICCON computer system.
If an error is found during the system start of the LICCON computer system, then the system start procedure is interrupted, see illustration **2**.

- ▶ Consult Liebherr Service if an error occurs during system start.

2.1 The LICCON monitors at system start

After successful self test and system start, every LICCON monitor changes into a separate view.

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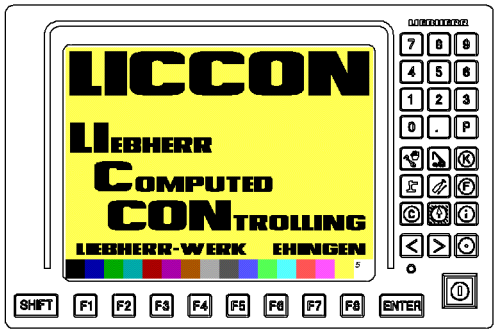
2.1.1 LICCON monitor 0

1.1



1.2

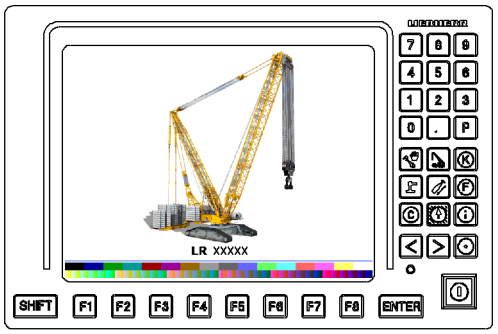
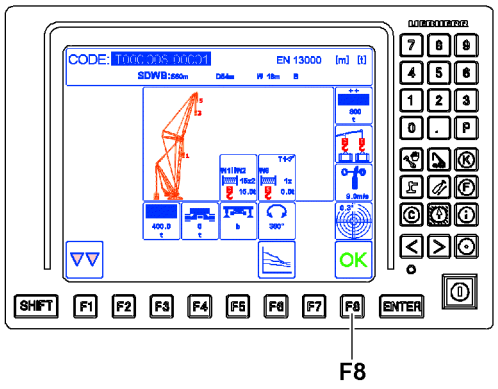


Fig.119916

During the self test, the start screen appears, illustration **1.1**.

After successful starting procedure, a wall paper of the crane appears on the **LICCON monitor 0** for a few seconds, see illustration **1.2**.

1.3



1.4

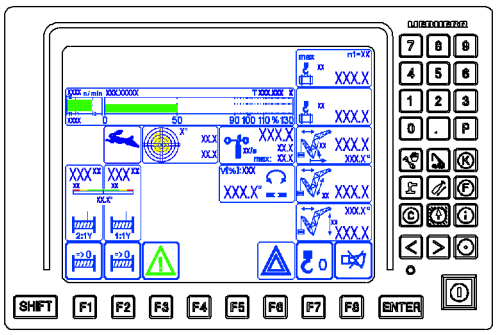


Fig.119936

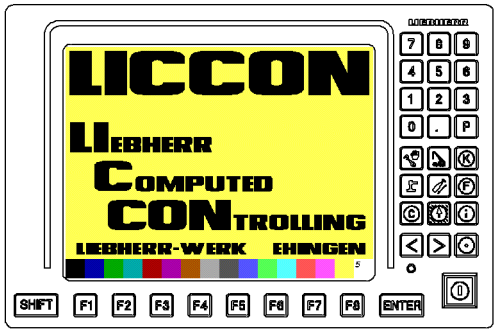
When the last set up configuration appears (see example illustration **1.3**), then system start on **LICCON monitor 0** is completed.

The existing set up configuration or a newly entered set up configuration must be confirmed with the function key **F8**.

Then the crane operating screen appears for **LICCON monitor 0**, see illustration **1.4**.

2.1.2 LICCON monitor 1

2.1



2.2

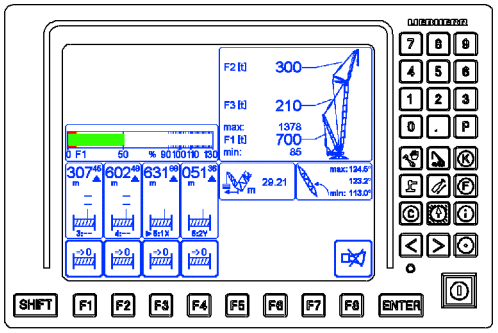


Fig.119924

During the self test, the start screen appears, illustration **2.1**.

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After successful starting procedure, a respective operating screen appears on **LICCON monitor 1**, see example illustration **2.2**.

2.1.3 LICCON monitor 2

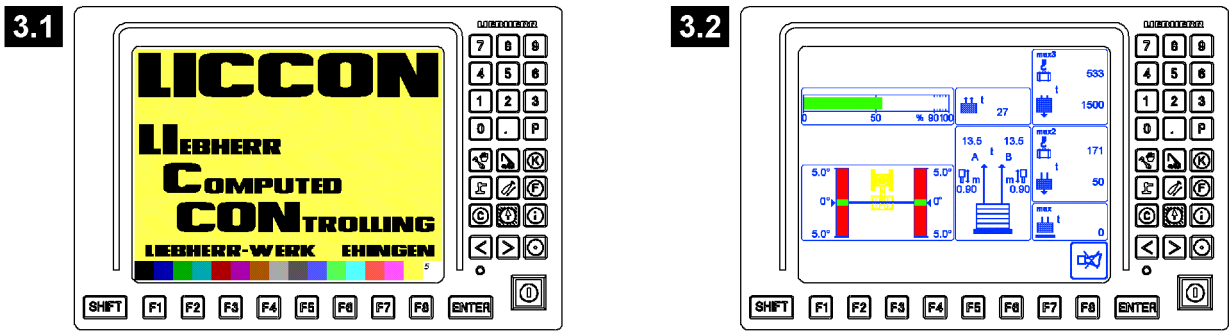

Fig.146955

During the self test, the start screen appears, illustration **3.1**.

After successful starting procedure, a respective operating screen appears on **LICCON monitor 2**, see example illustration **3.2**.

3 Overview of general operating elements on the LICCON monitors

All LICCON monitors are optically the same, the installation location is the deciding factor for the function of the operating elements.

In addition, the functions of the individual monitor operating elements are program-dependent and can differ, depending on the currently running LICCON program. This will be described in more detail in the description of the individual LICCON programs.

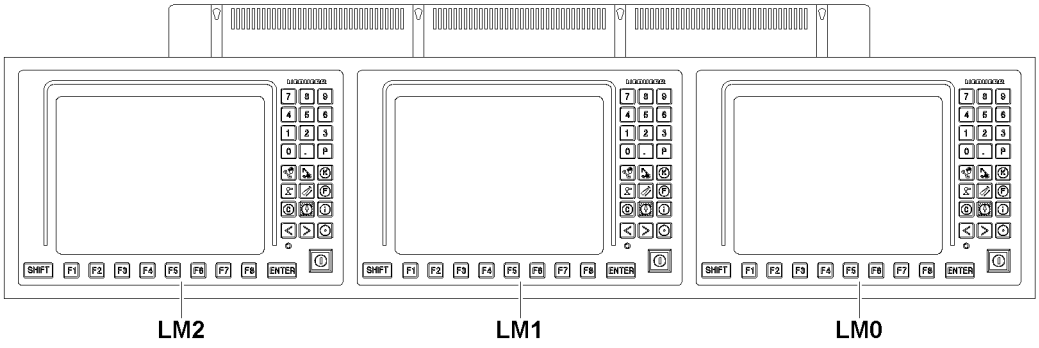

Fig.119921

LM0 LICCON monitor 0
- Placed on the right in the monitor arrangement

LM1 LICCON monitor 1
- Placed in the center in the monitor arrangement

LM2 LICCON monitor 2
- Placed to the left in the monitor arrangement

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3.1 General operating elements on LICCON Monitor 0

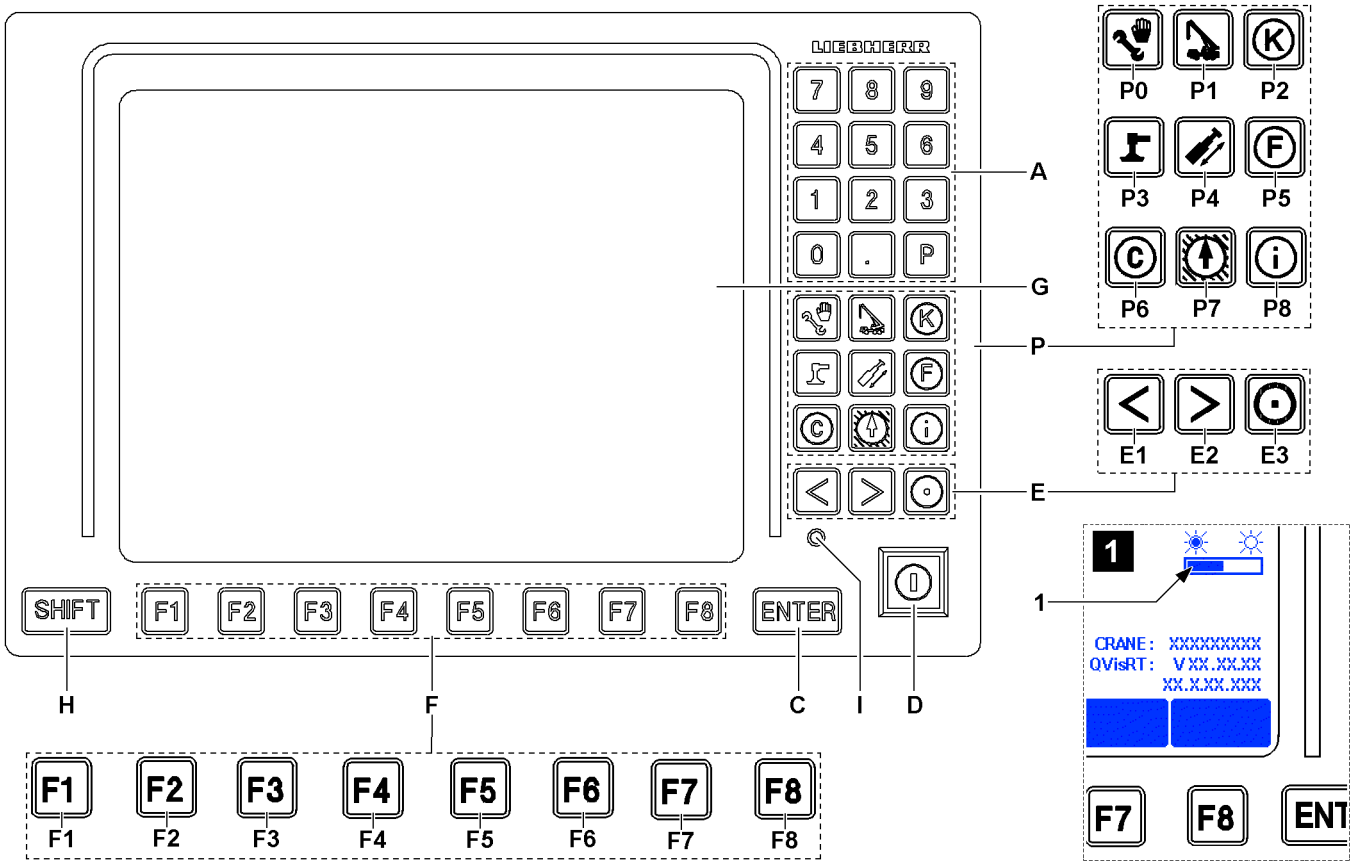

Fig.120677

A Keypad
- Function is program dependent

P Program keys
- Selection of the individual LICCON programs

P0 Set up
- Call up the *Set up* program

P1 Crane operation
- Call up the *Crane operation* program

P2 Chart view
- Call up the *Chart view* program

P3 —
- Program key not assigned.

P4 —
- Program key not assigned.

P5 —
- Program key not assigned.

P6 —
- Program key not assigned.

P7 Working range limitation*
- Call up the *Working range limitation* program

P8 Test system
- Call up the *Test system* program
- **Note:** Test system description, see the Diagnostics manual.

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C ENTER key
- Confirmation of changes in running program

D Set up key
- Zero position (not actuated):
  Normal operation.
- Touching:
  Function *Exceedance of shut off limits of LICCON overload protection* is released and / or the hoist limit switch is bypassed

Note

▶ By actuating the set up key **D**, all erection / take down procedures can be carried out within the erection / take down charts, for which no load charts are available.

E Special function keys
- Functions of the special function keys are program-dependent and are further explained in the description of the individual LICCON programs.
- **Monitor brightness adjustment:**
  - Press **E3** (hold down) and **E1**: 6-stage night design.
  - Press **E3** (hold down) and **E2**: Brightness setting in 7 stages.
    The brightness adjustment can be made from all available programs (for example: Set up, Crane operation).

Note

Automatic brightness adjustment of the LICCON monitor
The brightness of the LICCON monitor can be matched to the existing light conditions automatically or manually.
The current brightness setting of the LICCON monitor can be seen via the bar display in the starting screen of the test system program (illustration **1**).

▶ In brightness setting *medium brightness* the automatic brightness adjustment is **activated.**
▶ In brightness setting *lowest brightness* the automatic brightness adjustment is **inactive.**
▶ In brightness setting *highest brightness* the automatic brightness adjustment is **inactive.**

F Function keys
- The function keys should always be viewed in conjunction with the function key icon line displayed on the display **G**.

G Display
- In the display appears a program-dependent operating screen

H SHIFT key
- Second-level key assignments, for example Supervisory function

I Indicator light
- Indicator light for the supply voltage of the monitor

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3.2 General operating elements on LICCON Monitor 1

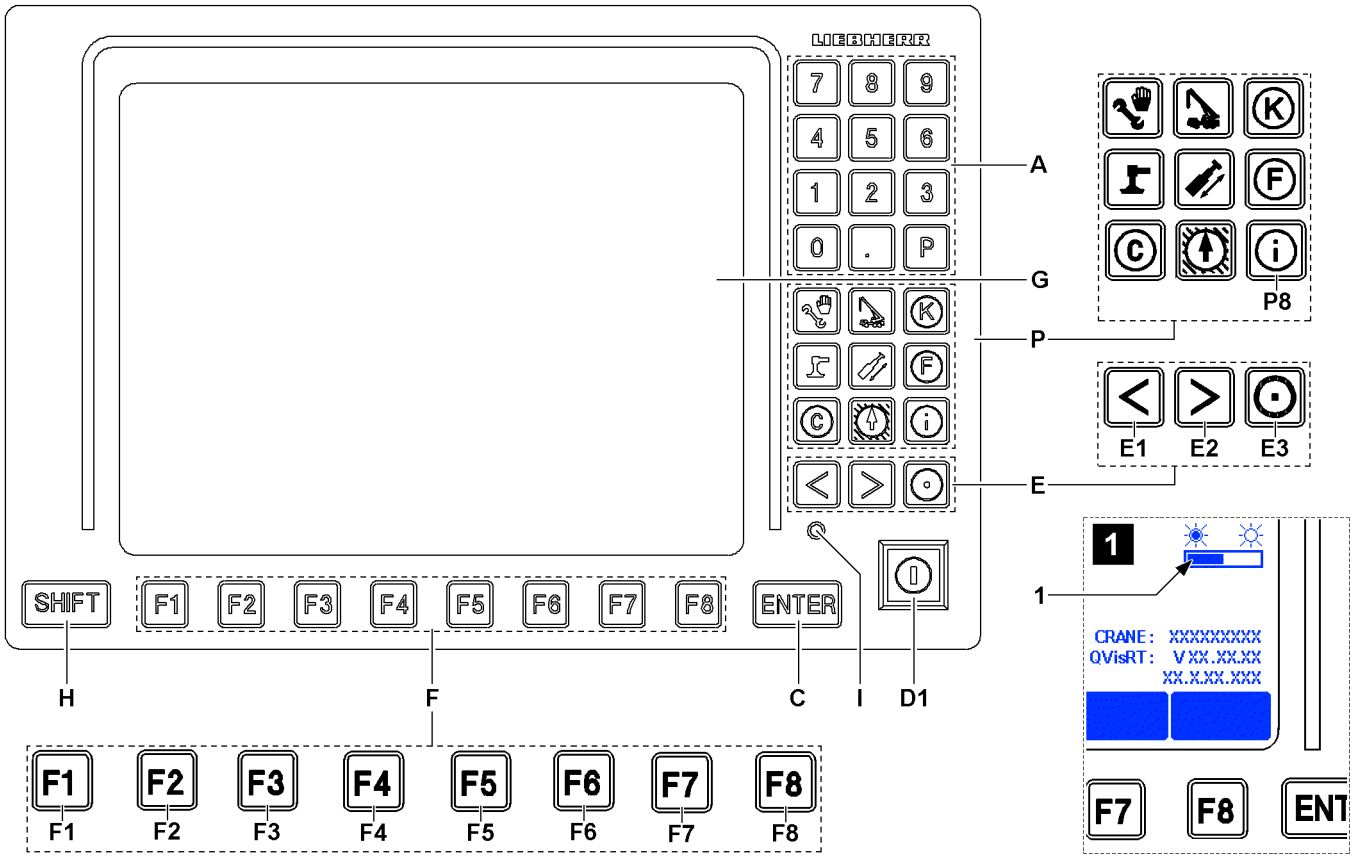

Fig.125385

A Keypad
- Function is program dependent

P Program keys
- Only program key Test system **P8** with function

P8 Test system
- Call up the *Test system* program
- **Note:** Test system description, see the Diagnostics manual.

C ENTER key
- Confirmation of changes in running program

D1 Key button
- No function

E Special function keys
- Functions of the special function keys are program-dependent and are further explained in the description of the individual LICCON programs.
- **Monitor brightness adjustment:**
- Press **E3** (hold down) and **E1**: 6-stage night design.
- Press **E3** (hold down) and **E2**: Brightness setting in 7 stages.
- **Note:** See also section „Operating elements LICCON monitor 0“

F Function keys
- The function keys should always be viewed in conjunction with the function key icon line displayed on the display **G**.

G Display
- In the display appears a program-dependent operating screen

H SHIFT key
- Second-level key assignments, for example Supervisory function

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I Indicator light
- Indicator light for the supply voltage of the monitor

3.3 General operating elements on LICCON Monitor 2

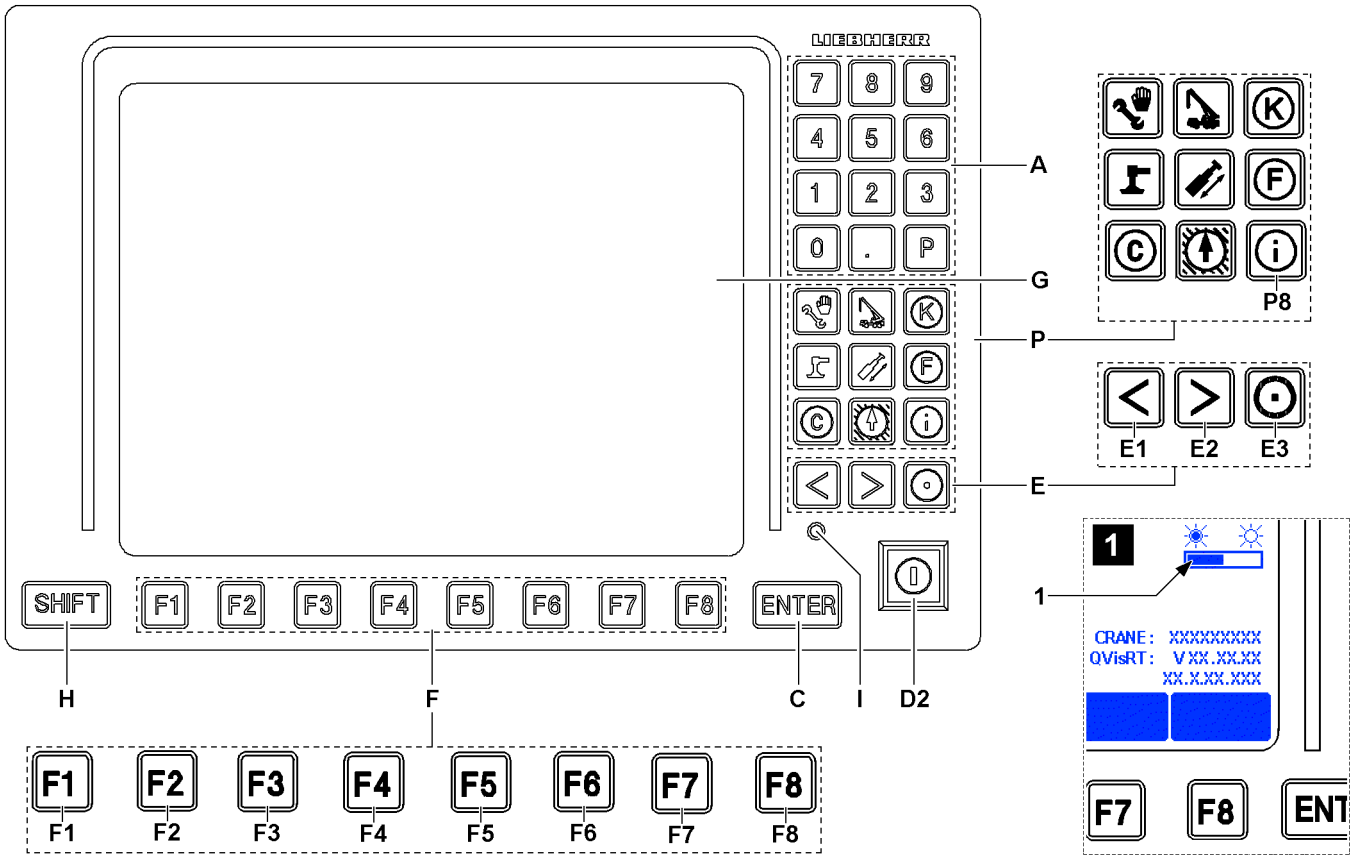

Fig.125386

A Keypad
- Function is program dependent

P Program keys
- Only program key *Test system* **P8** with function

P8 Test system
- Call up the *Test system* program
- **Note:** Test system description, see the Diagnostics manual.

C ENTER key
- Confirmation of changes in running program

D2 Key button
- Change over regulation Parallel operation winch 1 and winch 2.
- **Note:** Only active for parallel operation of winch 1 and winch 2.

E Special function keys
- Functions of the special function keys are program-dependent and are further explained in the description of the individual LICCON programs.
- **Monitor brightness adjustment:**
  - Press **E3** (hold down) and **E1**: 6-stage night design.
  - Press **E3** (hold down) and **E2**: Brightness setting in 7 stages.
  - **Note:** See also section „Operating elements LICCON monitor 0“

F Function keys
- The function keys should always be viewed in conjunction with the function key icon line displayed on the display **G**.

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G Display
- In the display appears a program-dependent operating screen

H SHIFT key
- Second-level key assignments, for example Supervisory function

I Indicator light
- Indicator light for the supply voltage of the monitor

4 *Set up* program

Note
- ▶ The monitor illustrations in this chapter are only examples.
- ▶ The numerical values in the individual icons and charts do not have to necessarily match the crane exactly.
- ▶ Numbers and letters can be replaced by place holders.
- ▶ The programmed load charts for the crane are binding.

WARNING
Danger of accident due to deviating set up configuration!
If the actual set up configuration of the crane deviates from the entries and settings in the *Set up* program, then the overload protection is not correctly set.
An incorrectly set overload protection calculates the actual load incorrectly and transmits faulty display values.
The crane can be overloaded unnoticed and topple over. Personnel can be severely injured or killed.
- ▶ The entries and settings in the *set up* program must match the actual set up configuration of the crane.

After correct system start of the LICCON computer system, it changes automatically into the *Set up* program. The set up screen is shown in the *Set up* program.

The program can also be called up via the program key, see section „Operating elements LICCON Monitor 0“.

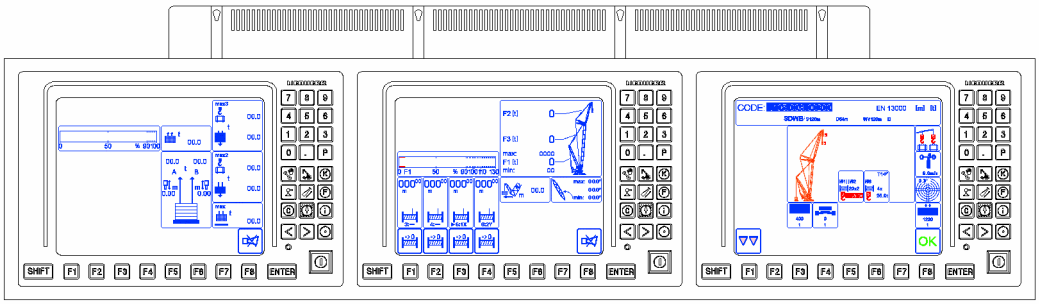

Fig.146956

Note
- ▶ All entries and settings, which are to be made by the crane operator in the *Set up* program can only be carried out on **LICCON monitor 0**.
- ▶ The LICCON monitor 0 is located on the right in the monitor arrangement.

Note
Adjustment and display of set up configuration and reeving.
- ▶ Normally, after booting up the LICCON computer system, the most recently used set up configuration and the reeving used at that time will be automatically set and displayed.

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The crane operator must enter and set the actual set up configuration of the crane in the *Set up* program. The LICCON computer system will then set the overload protection accordingly with these entries and settings.

4.1 Screen display in the *Set up* program

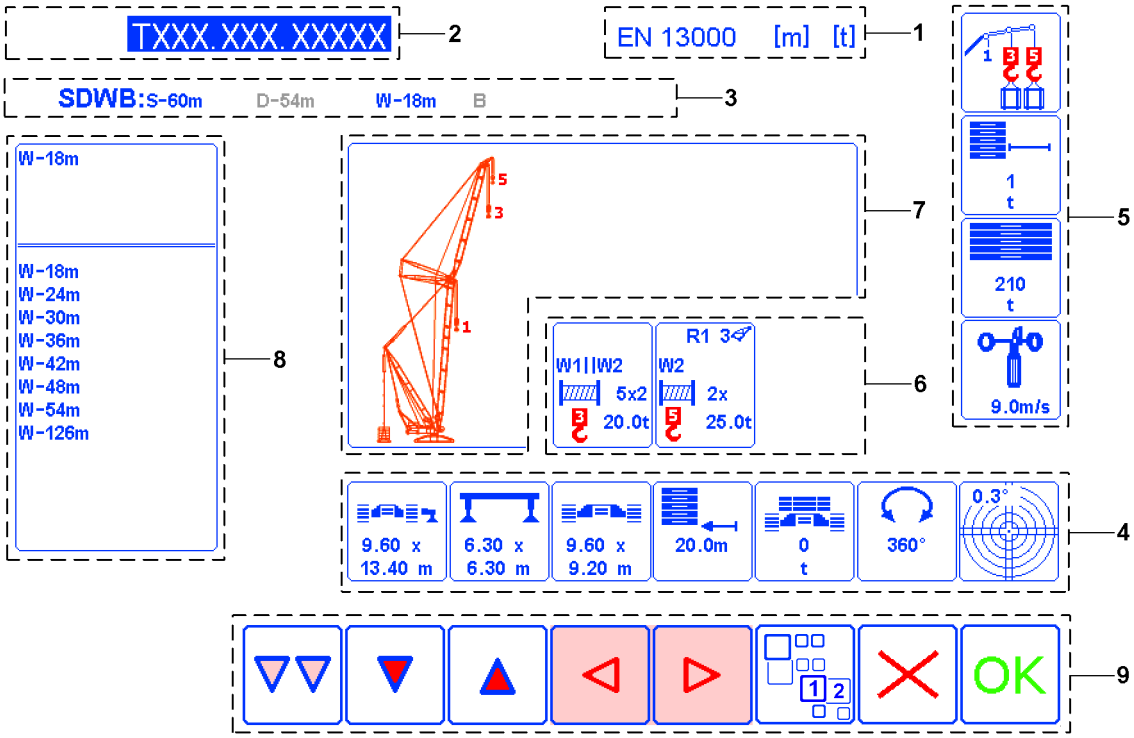

Fig.120678: Example of Screen display in the Set up program

The screen display in the *Set up* program consists of the following program categories:

1 Unit category
- Measuring units with which the crane control works are displayed.

2 Chart name category
- The set chart name (chart number) is displayed.

3 Operating mode category
- The set operating mode is displayed.

4/5 Set up functions
- **4** Set up completion category
  - The set values for the set up completion are displayed.
- **5** Environmental / mechanical influence category
  - The set values for environmental / mechanical influence are displayed.

6 Lifting category
- The set hoist winch operation is displayed.
- The set hoist winch assignment is displayed.
- The set reeving is displayed.
- The set hook weight is displayed.

As well as program comprehensive:

7 Display window
- The set operating mode is symbolized.
- The possible hook positions are displayed.

8 Editing / selection window
- Possible settings and values for editing or selecting are displayed.

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9 *Function key* icons
- Functions assigned to the function keys are displayed as icons.

4.2 Control elements in the *set up* program

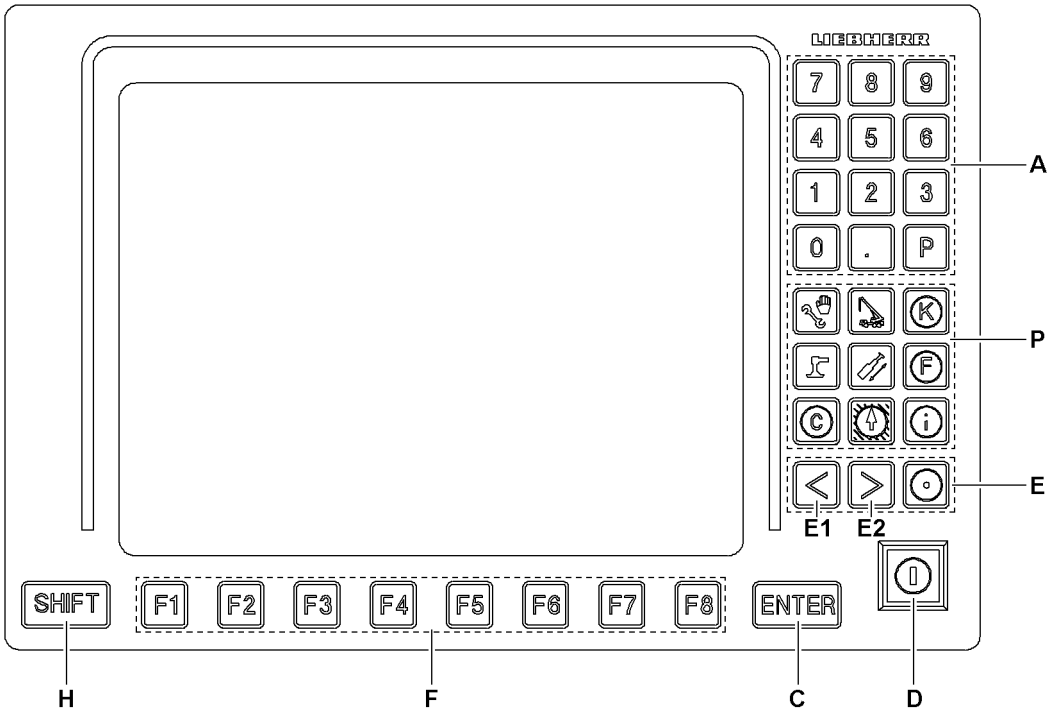

Fig.119927

A Keypad
- The keys **0** to **9** on the keypad can be used to enter the respective number directly.
- Decimal digits can be created with the key „**.**“
- The „P“ button has no function in the *Set up* program.

P Program keys
- Selection of individual programs. The settings in the set up program are discarded and the set up configuration, which was last confirmed with the function key **F8** (OK) is used.
  A program that is currently running **cannot** be called up again using its program key.

C ENTER key
- Entry confirmation for selections made or for edited values.
- ENTER key **C** after entering the chart name (chart number) searches the corresponding operating mode. If an error is present, a short beep sounds.
- ENTER key **C** after changing / editing within a category sets the new value

D Set up key
- Has no function in the *Set up* program

E Special function keys
- **Note:** The key **E1** in the *Set up* program has the same function as function key F4. The key **E2** in the *Set up* program has the same function as function key F5.

F Function keys
- The function key line consists of function keys **F1** to **F8** and the function key icon bar above it.
  The function keys correspond to the various function key icons above them.

H SHIFT key
- No function

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4.3 The function key line in the *set up* program

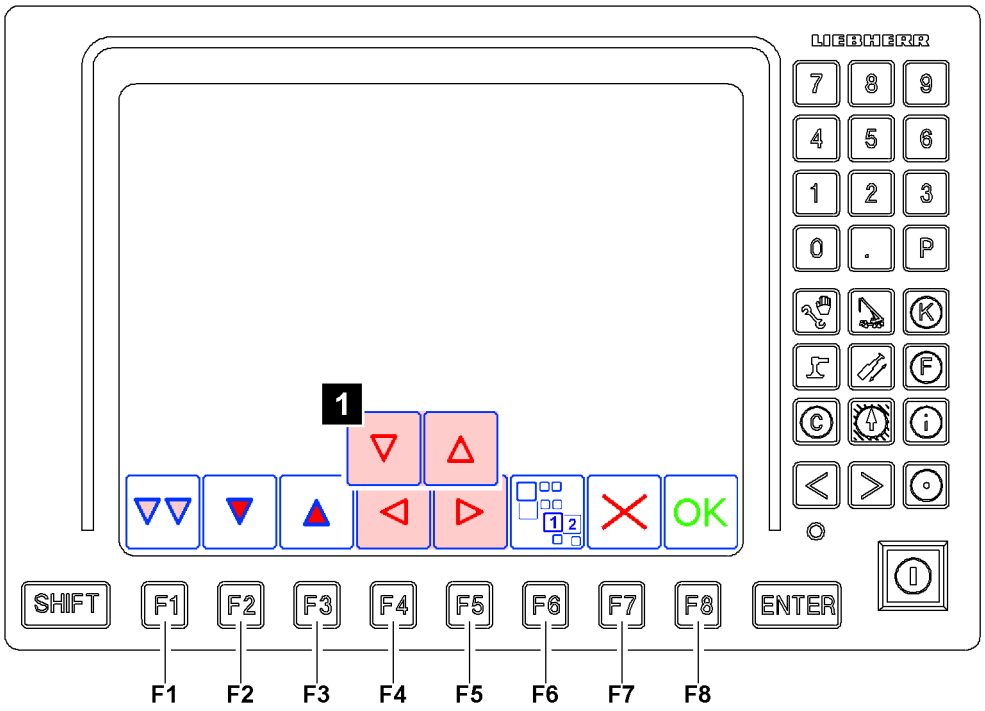

Fig.119928

The function key line consists of function keys **F1** to **F8** and the function key icon bar above it. The function keys correspond to the various function key icons above them.

Note

▶ Not all function keys on the LICCON monitor are always active and assigned with icons. Only when a function key is presently available is the corresponding icon shown.

F1 Function key
- Change to the next category by pressing the function key **F1**.
- **Note:** The active category is highlighted in pink.

F2 Function key
- Navigation in Editing / selection window: change downward
- **Note:** If it is not possible to change further downward, a short beep sounds.

F3 Function key
- Navigation in Editing / selection window: change upward
- **Note:** If it is not possible to change further upward, a short beep sounds.

F4 Function key
- Navigation in the pink highlighted (active) program category
- Left arrow: change within the selection to the left
- Down arrow, Illustration **1**: change within the selection downward
- **Note:** If it is not possible to change further in the direction a short beep sounds.

F5 Function key
- Navigation in the pink highlighted (active) program category
- Right arrow: change within the selection to the left
- Up arrow, Illustration **1**: change within the selection downward
- **Note:** If it is not possible to change further in the direction a short beep sounds.

F6 Function key
- If additional levels are present, then they can be selected by pressing the function key **F6**.

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F7 Function key
- Reset the *Set up* program to the last valid set up configuration

F8 Function key
- Take over the current settings as the new set up configuration.
- **Note:** By pressing the function key **F8**, the *Set up* program is completed and the *Crane operation* program is called up.

4.4 Setting the set up configuration in general

Make sure that the following prerequisite is met:
– There is no load on the hook.

The set up configuration is set in the following program categories:
– Operating mode category
– Set up completion category
– Environmental / mechanical influence category
– Lifting category

WARNING
Incorrect operation in *Set up* program!
The *Set up* program is only correctly carried out when **all** program categories are set and the actual configurations for crane and environment are depicted.
Incorrect operation in the *Set up* program leads to an incorrectly set overload protection.
An incorrectly set overload protection calculates the actual load incorrectly and transmits faulty display values.
The crane can be overloaded unnoticed and topple over. Personnel can be severely injured or killed.
▶ In the *Set up* program, always set **all** program categories according to the actual configurations of crane and environment.
▶ Before taken over the settings in the *Set up* program, check all program categories.

Note
In the following sections it is described by example how it is changed from the basic setting of the crane into a more extensive operating mode.
All entries and settings can therefore be explained by example.
▶ If the required operating mode deviates, make your own entries and settings and do not skip required steps.

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4.5 Structure of the operating mode category

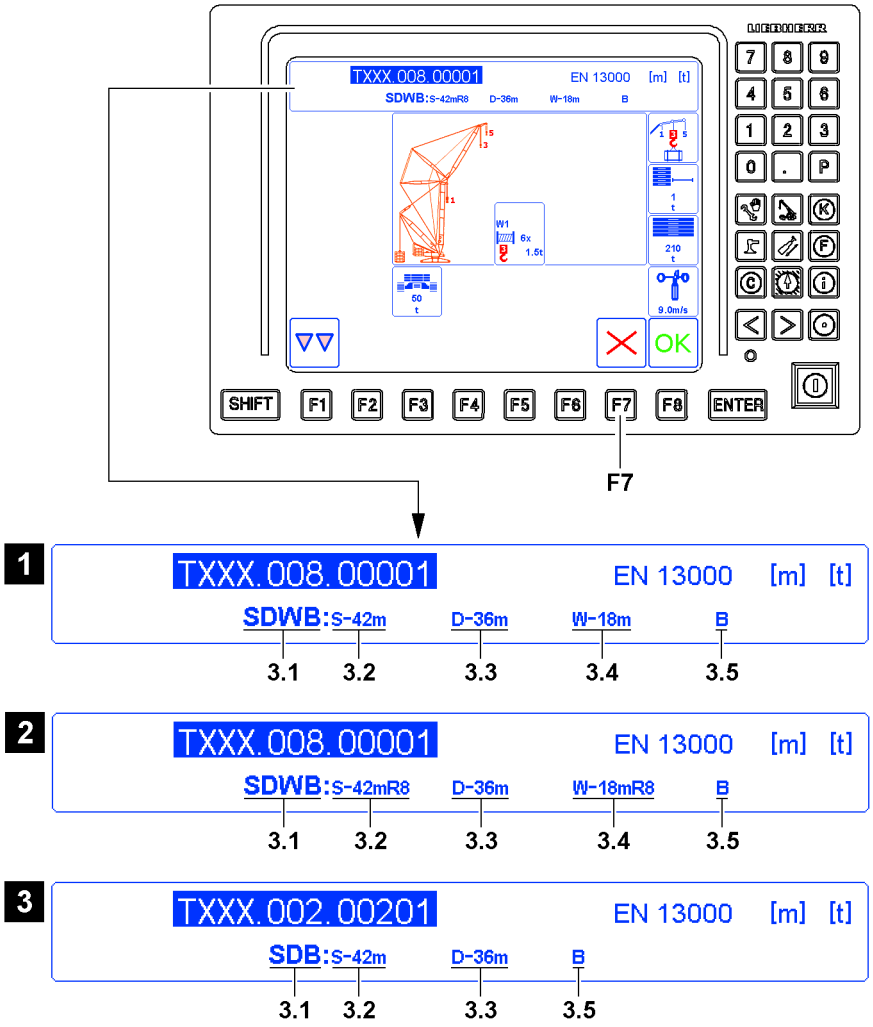

Fig.119915

The components of the boom system can be combined with each other to operating modes according to certain rules.

The individual components are coded via markers.

The operating mode consists of up to five markers, see illustration **1**.

The operating mode is set in the operating mode category.

Markers for operating mode in the *Set up* program:

3.1 Abbreviation
- Abbreviation of operating mode

3.2 Main boom
- Type and length of main boom
- **Note**: On some main booms various roller sets can be additionally set up, see illustration **2**

3.3 Derrick boom
- Length of derrick boom
- **Note**: Appears only in corresponding operating mode.

3.4 Auxiliary boom / accessory
- Type and length of auxiliary boom / accessory
- **Note**: On some auxiliary booms various roller sets can be additionally set up, see illustration **2**.

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- **Note**: Appears only in corresponding operating mode.

3.5 Derrick ballast
- Version of derrick ballast
- **Note**: Appears only in corresponding operating mode.

Note
- ▶ If a marker for an operating mode does not appear, then the following markers move up, see example illustration **3**.
- ▶ If the *Abort* icon appears above a function key **F7**, then the procedure can be aborted at any time. All entries and settings made up to that point are discarded.

The operating mode can be set two ways:
- – Setting the operating mode via chart names (chart number)
- – Setting the operating mode via the function keys

4.6 Setting the operating mode via chart name (chart number)

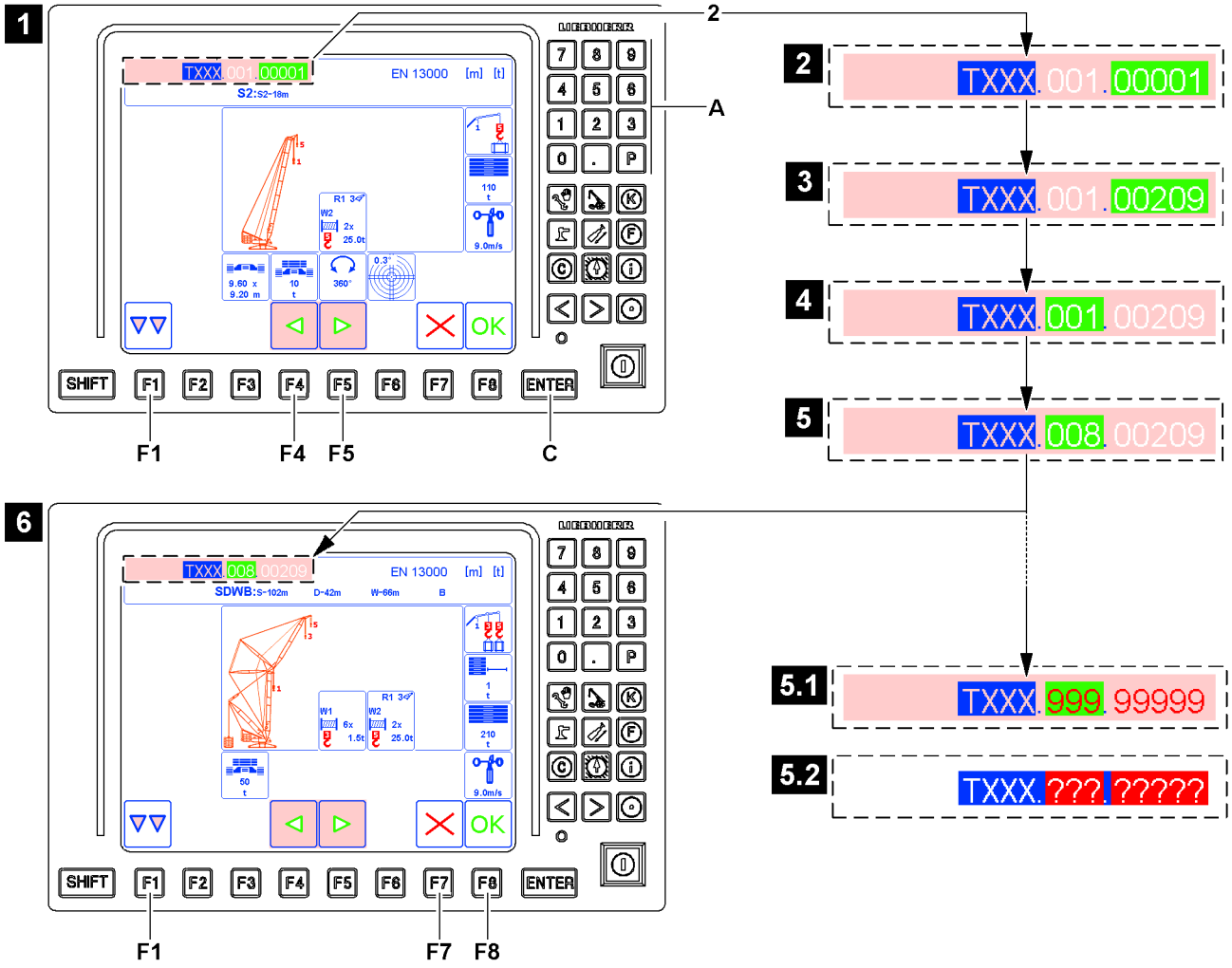

Fig.120679

Note
The following section describes by example how a certain chart name (chart number) is entered.
- ▶ Always enter the required chart name (chart number).
- ▶ If the *Abort* icon appears above a function key **F7**, then the procedure can be aborted at any time. All entries and settings made up to that point are discarded.

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Make sure that the following prerequisites are met:
- The *Set up* program is called up.
- The required chart name (chart number) is known.

▶ Press the function key **F1** until the chart name category **2** is highlighted in pink, see illustration **1**.

Result:

– The chart name category **2** is active. The editable area of the chart name (chart number) is additionally highlighted in green.

Note
Navigation in the chart name category **2**
▶ Press the function key **F4**: The editable area changes to the left.
▶ Press the function key **F5**: The editable area changes to the right.

When the rear five digits of the chart name (chart number) are highlighted in green (illustration **2**):
▶ Enter the number sequence via the keypad **A**, in example „00209“.

Result:

– In the editable area of the chart name (chart number), the entered number sequence is shown, see illustration **3**.

▶ Press the function key **F4**.

Result:

– The editable area of the chart name (chart number) changes, see illustration **4**.

When the center three digits of the chart name (chart number) are highlighted in green (illustration **4**):
▶ Enter the number sequence via the keypad **A**, in example „008“.

Result:

– In the editable area of the chart name (chart number), the entered number sequence is shown, see illustration **5**.

▶ Accept the chart name (chart number) with the ENTER key **C**.

Result:

– The chart names (chart number) are accepted.
– The screen display is matched, see illustration **6**.

Problem remedy
Invalid chart name (chart number)
When trying to accept an invalid number sequence, the numbers are displayed in red (illustration **5.1**) or replaced by red question marks („?“) (illustration **5.2**).
▶ Enter and accept only valid chart names (chart number).

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4.7 Setting the operating mode via the function keys

Note
The following section describes by example how a certain operating mode is entered.
▶ Always enter the required operating mode.

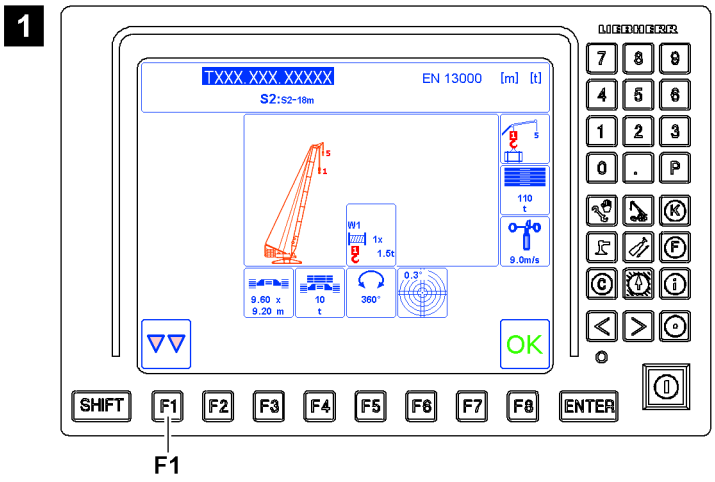

Fig.119929

Make sure that the following prerequisite is met:
– The *Set up* program is called up, see illustration **1**.

4.7.1 Selecting the operating mode category

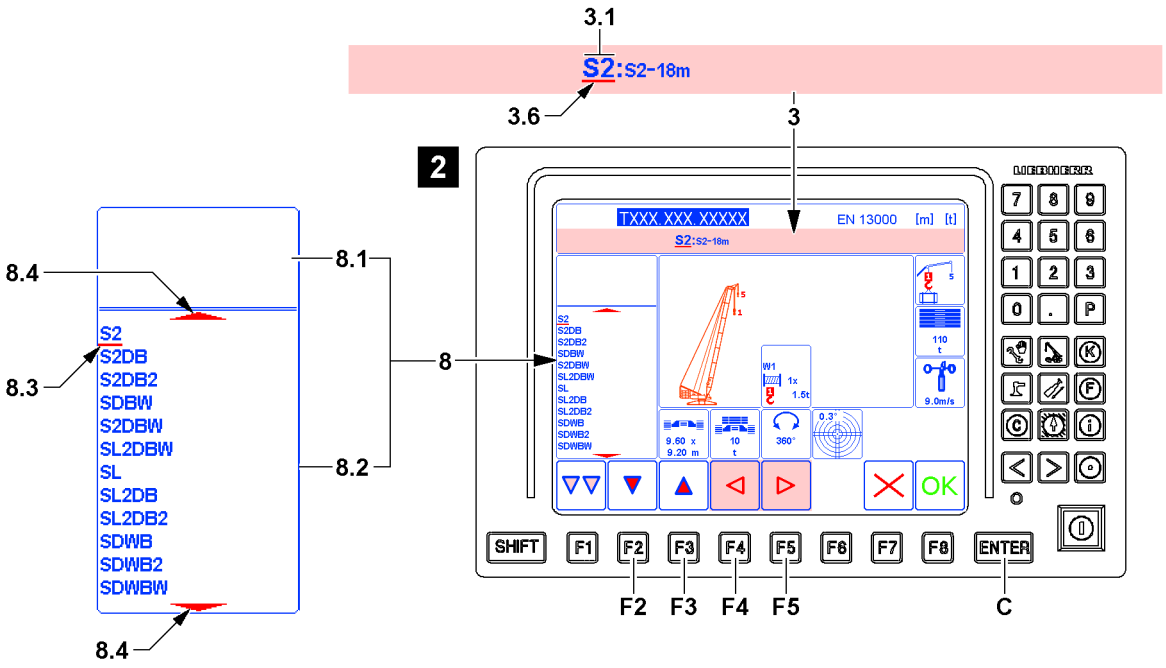

Fig.119919

▶ Press the function key **F1** until the operating mode category **3** is highlighted in pink, see illustration **2**.

Result:

– The operating mode category **3** is selected.
The selection bar **3.6** automatically underlines the first marker: Abbreviation **3.1**

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– The Editing / selection window **8** appears.
– In the lower area **8.2** of the Editing / selection window **8** the abbreviations available for selection are displayed.
– Above function key **F2**, function key **F3**, function key **F4** and function key **F5** appear the icons for navigation in the individual program categories.

Note
Navigation in the operating mode category **3**
▶ Press the function key **F4**: The selection bar **3.6** moves to the left.
▶ Press the function key **F5**: The selection bar **3.6** moves to the right.

Note
Navigation in Editing / selection window **8**
▶ Press the function key **F2**: The selection bar **8.3** changes downward by one line.
▶ Press the function key **F3**: The selection bar **8.3** changes upward by one line.
▶ If a directional triangle **8.4** appears on the upper and lower end of a window, additional selection possibilities are present in this direction.
▶ When the upper area **8.1** and the lower area **8.2** are assigned: Press the ENTER **C** key and change between the upper area **8.1** and the lower area **8.2**.

4.7.2 Selecting the abbreviation for the boom system

Make sure that the following prerequisite is met:
– The operating mode category **3** is selected.

▶ Press the function key **F5** or function key **F4** until the abbreviation **3.1** is underlined with the selection bar **3.6** (in the example „S2“), see illustration **2**.

Result:

– In the lower area **8.2** of the Editing / selection window **8** the abbreviations available for selection are displayed.

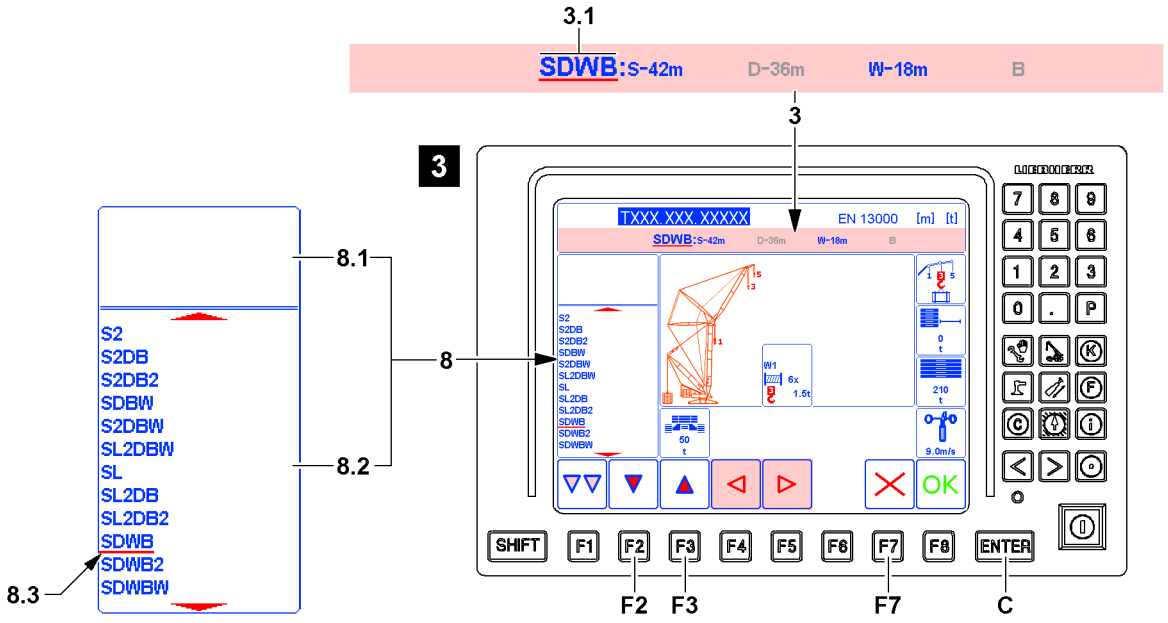

Fig.119930

▶ Press the function key **F2** or function key **F3** until the required abbreviation is underlined with the selection bar **8.3**. In example „SDWB“, see illustration **3**.

When the required abbreviation is underlined with the selection bar **8.3**:
▶ Press the ENTER key **C**.

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Result:

– The abbreviation is selected (example „SDWB“).
– In the operating mode category **3** appears the newly selected abbreviation **3.1**.
– The graphic display of the crane in the display window changes accordingly.

4.7.3 Determining main boom variation

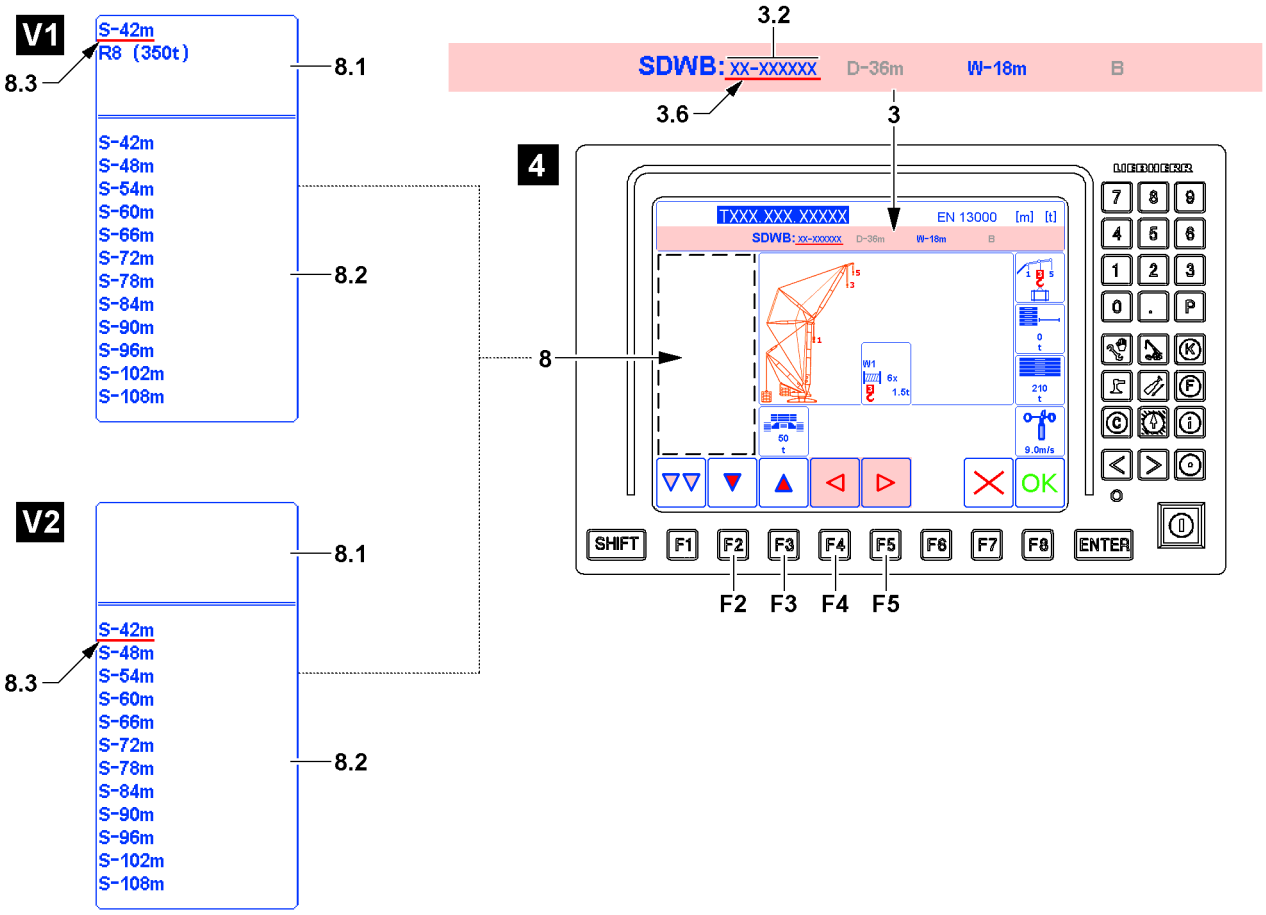

Fig.119935

At first, the main boom **3.2** must be selected in the operating mode category **3**.

▶ Press the function key **F5** or function key **F4** until the main boom **3.2** is underlined with the selection bar **3.6**, see illustration **4**.

Result:

– First variation, illustration **V1**
Note: The first variation appears solely when various roller sets can be assigned to the main boom in the *Set up* program.

  • The preselection possibilities are displayed in the upper area **8.1** of the Editing / selection window **8**. The first preselection possibility is automatically underlines and activated with the selection bar **8.3**.
  • In the lower area **8.2** of the Editing / selection window **8** the main booms available for section are displayed.

– Second variation, illustration **V2**
Note: The second variation appears solely when no various roller sets can be assigned to the main boom in the *Set up* program.

  • In the upper area **8.1** of the Editing / selection window **8** appears no selection possibility.
  • In the lower area **8.2** of the Editing / selection window **8** the main booms available for section are displayed.

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Depending on the view of the Editing / selection window **8** you must proceed differently:

- ▶ If the first variation is shown (illustration **V1**), proceed with section „Selecting main boom for the first variation (V1)“.
- ▶ If the second variation is shown (illustration **V2**), proceed with section „Selecting main boom for the second variation (V2)“.

4.7.4 Selecting main boom for the first variation (V1)

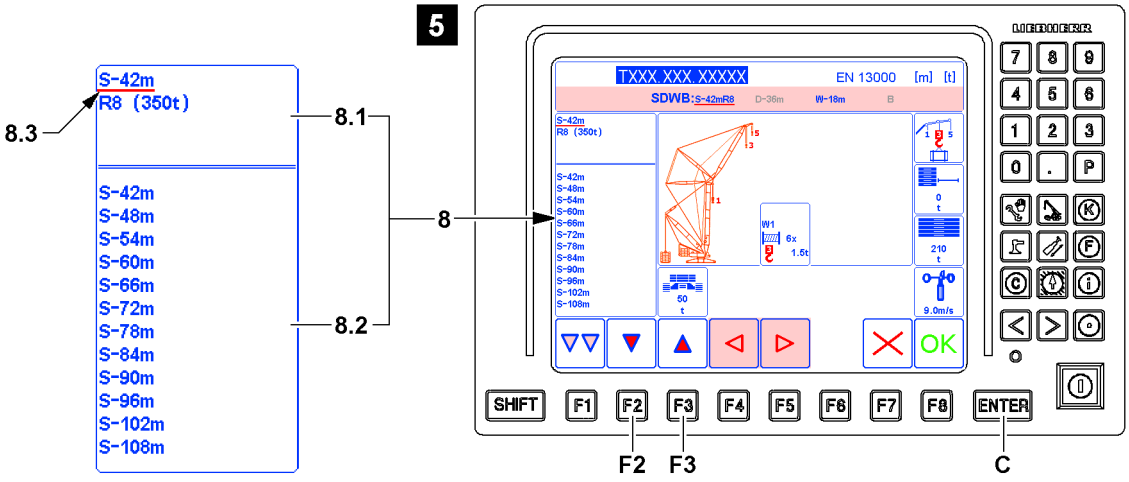

Fig.119920

- ▶ Press the function key **F2** or function key **F3** until the required preselection possibility in the upper area **8.1** is underlined with the selection bar **8.3** (in the example „S-42m“), see illustration **5**.

When the required preselection possibility is underlined with the selection bar **8.3**:

- ▶ Press the ENTER key **C**.

Result:

– The selection bar **8.3** changes in the lower area **8.2** of the Editing / selection window **8**.

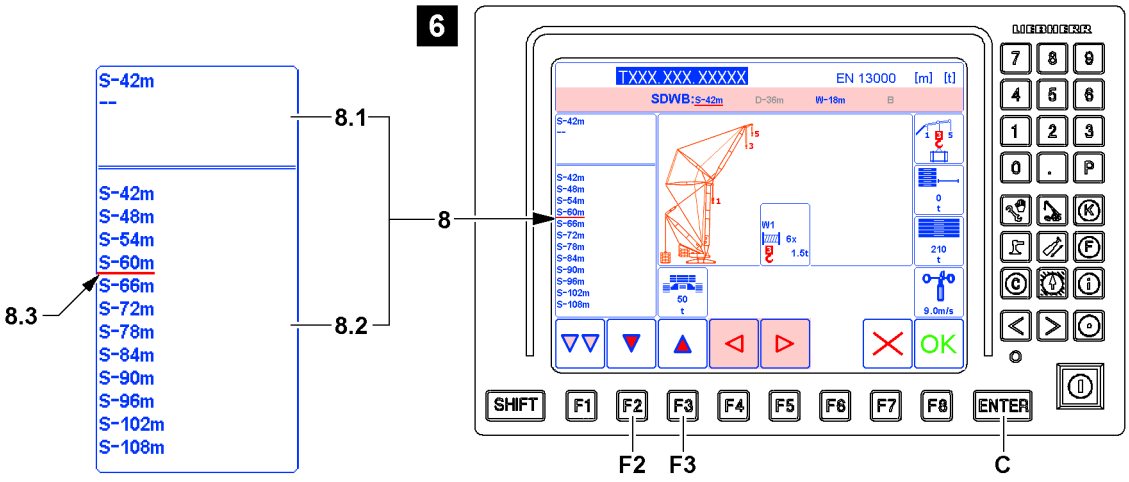

Fig.119937

- ▶ Press the function key **F2** or function key **F3** until the required main boom is underlined with the selection bar **8.3** (in the example „S60m“), see illustration **6**.

When the required main boom is underlined with the selection bar **8.3**:

- ▶ Press the ENTER key **C**.

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Result:

– The main boom is selected (in example „S60m“).
– The selection bar **8.3** changes in the upper area **8.1** of the Editing / selection window **8**.

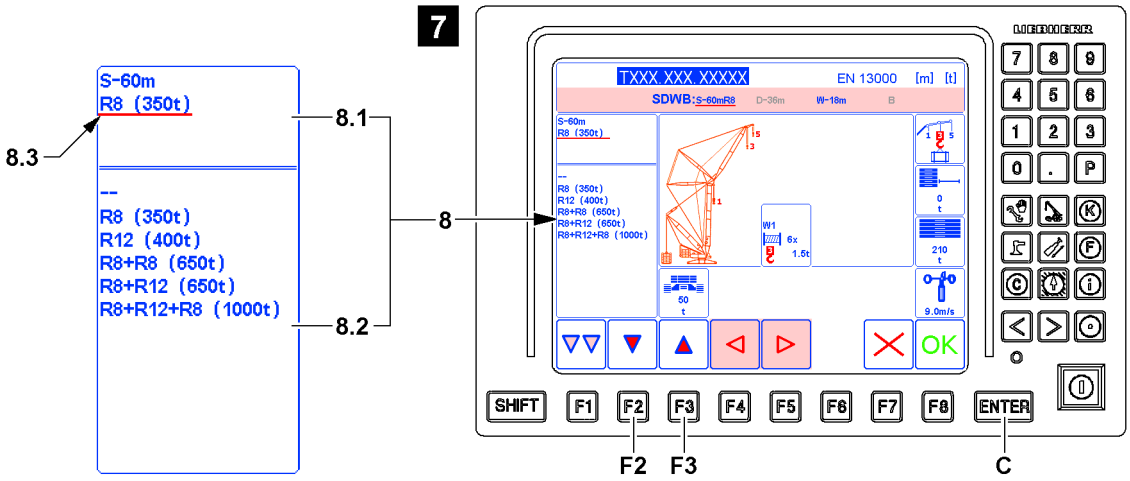

Fig.119938

▶ Press the function key **F2** or function key **F3** until the required preselection possibility in the upper area **8.1** is underlined with the selection bar **8.3** (in the example „R8 (350t)“), see illustration **7**.

When the required preselection possibility is underlined with the selection bar **8.3**:
▶ Press the ENTER key **C**.

Result:

– The selection bar **8.3** changes in the lower area **8.2** of the Editing / selection window **8**.

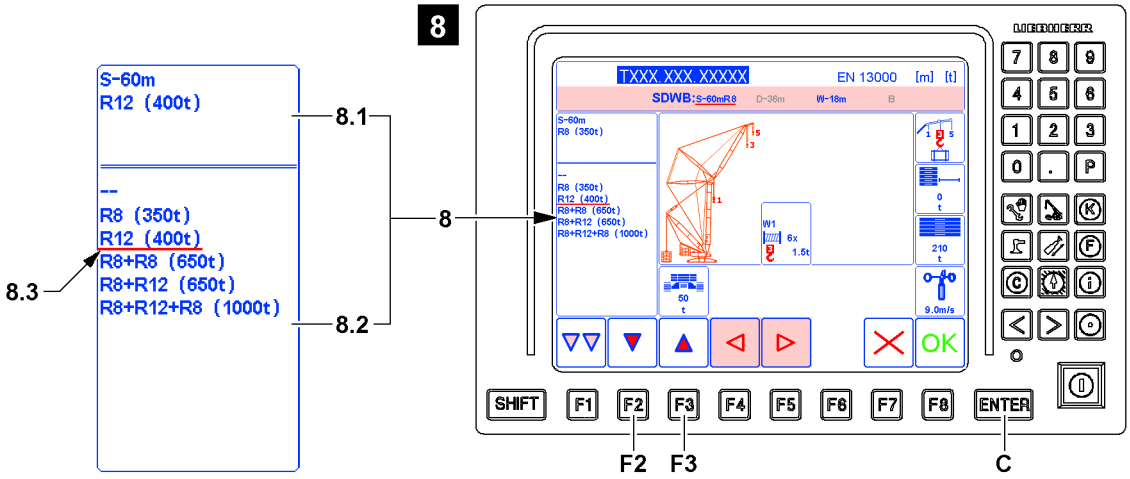

Fig.119939

▶ Press the function key **F2** or function key **F3** until the required roller set is underlined with the selection bar **8.3** (in the example „R12 (400t)“), see illustration **8**.

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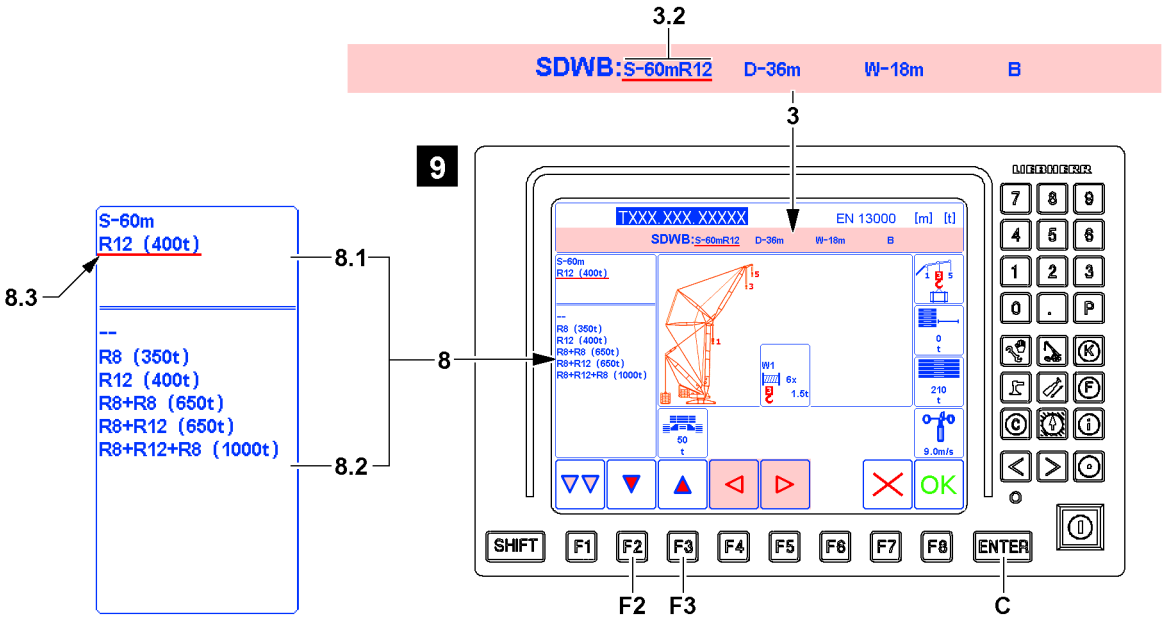

Fig.119940

When the required roller set is underlined with the selection bar **8.3**:

▶ Press the ENTER key **C**.

Result:

– The roller set is selected (in example „R12 (400t)“).
– The selection bar **8.3** changes in the upper area **8.1** of the Editing / selection window **8**.
– In the operating mode category **3** appears the newly selected main boom with roller set **3.2**, see illustration **9**.

4.7.5 Selecting the main boom for the second variation (V2)

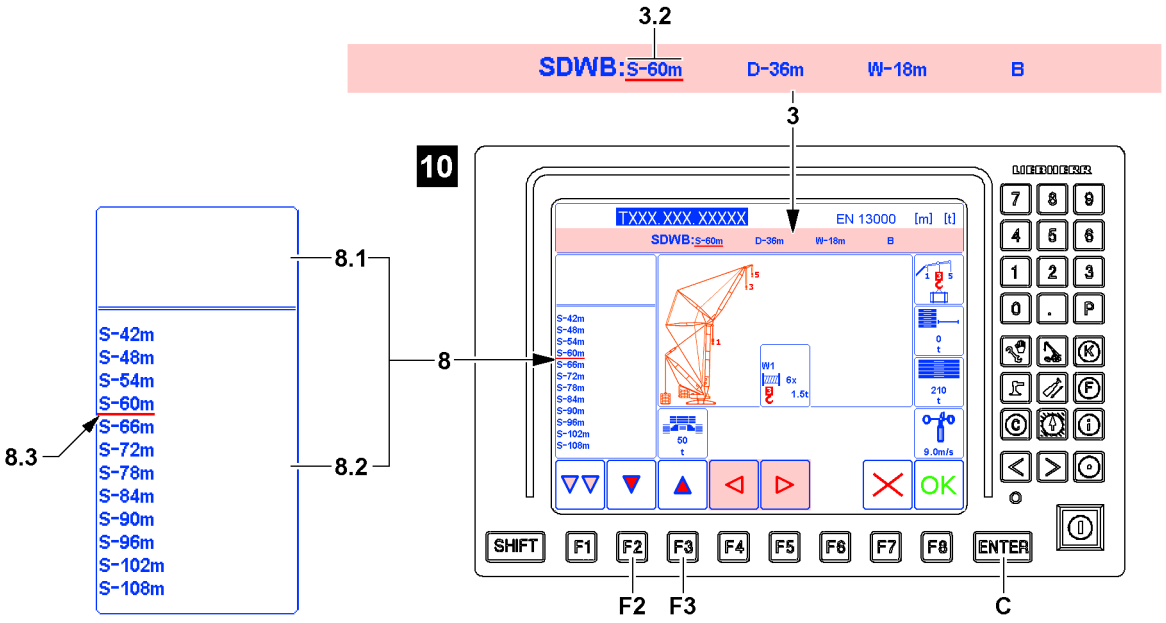

Fig.119931

▶ Press the function key **F2** or function key **F3** until the required main boom is underlined with the selection bar **8.3** (in the example „S60m“), see illustration **10**.

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When the required main boom is underlined with the selection bar **8.3**:
▶ Press the ENTER key **C**.

Result:

– The main boom is selected (in example „S60m“).
– In the operating mode category **3** appears the newly selected main boom **3.2**.

4.7.6 Invalid chart name

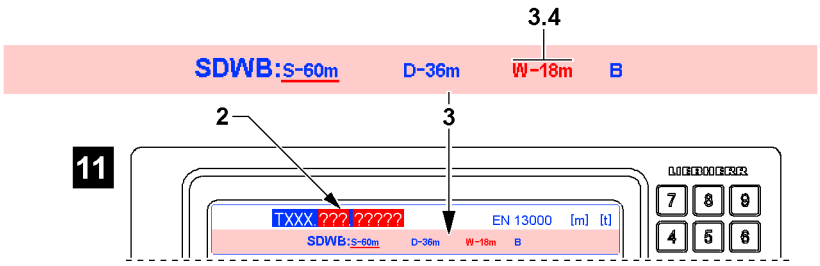

Fig.119932

▶ Check if the chart name **2** is displayed in blue lettering.

Problem remedy
After pressing the ENTER key **C**, the chart name **2** is replaced by the red highlighted question mark („?“- see illustration **11**)?
Additional entries and settings must be made to obtain a valid set up configuration. If a valid set up configuration is prevented by a certain marker, then this marker is highlighted in red. In the example, the marker for auxiliary boom / accessory **3.4** must still be processed.
▶ Continue entries and settings normally until it is the turn for the red highlighted marker.

4.7.7 Selecting the derrick boom

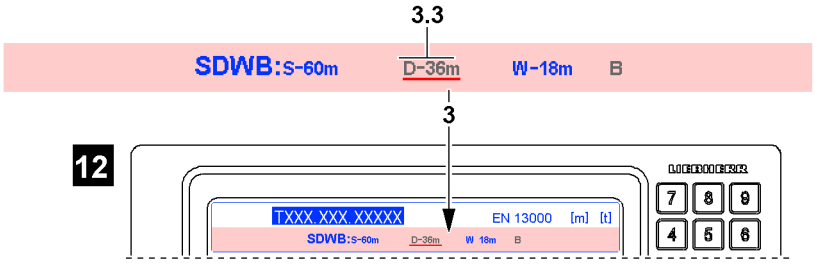

Fig.119933

Note
Illustration **12**: If the text for the derrick boom **3.3** appears in gray, then no additional entries and settings for this marker are possible.
▶ Correctly selected markers with gray lettering can be skipped.

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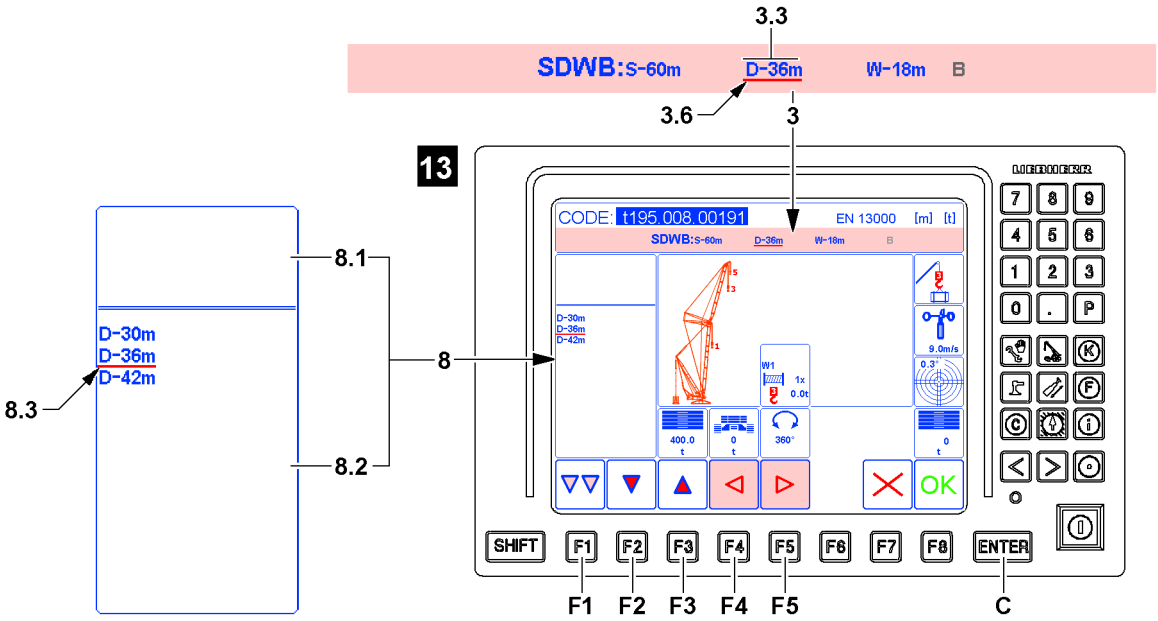

Fig.119934

Note

If the correct derrick boom **3.3** already appears, then the entries and settings for this marker can be skipped.

- ▶ Press the function key **F5** or function key **F4** until the next marker to be changed is underlined with the selection bar **3.6**.
- ▶ If all entries and settings in the operating mode category **3** are correct, press function key **F1** and change into the next category.

At first, the operating mode category **3** for the derrick boom **3.3** must be selected.

- ▶ Press the function key **F5** or function key **F4** until the derrick boom **3.3** is underlined with the selection bar **3.6** (in the example „D36m“), see illustration **13**.

Result:

– In the lower area **8.2** of the Editing / selection window **8** the abbreviations for derrick booms available for selection are displayed.

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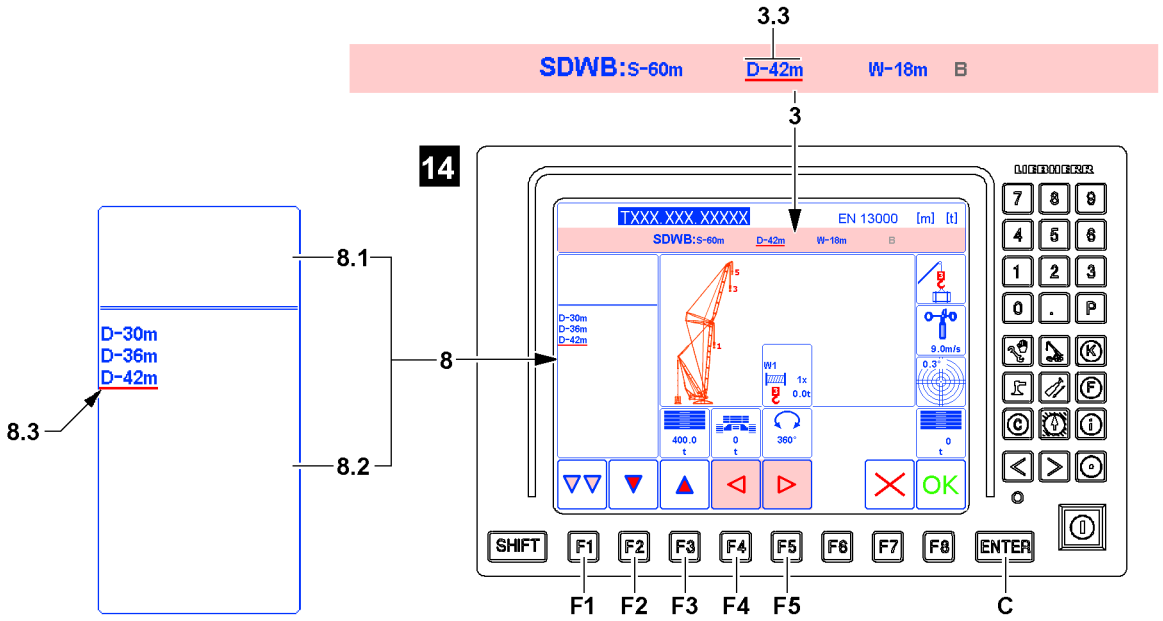

Fig.119941

▶ Press the function key **F2** or function key **F3** until the required derrick boom is underlined with the selection bar **8.3**. (For example „D42m“), see illustration **14**.

When the required derrick boom is underlined with the selection bar **8.3**:
▶ Press the ENTER key **C**.

Result:

– The derrick boom is selected (example „D42m“).
– In the operating mode category **3** appears the newly selected derrick boom **3.3**.

Problem remedy
The required selection for a marker is not available in the operating mode category **3**?
The previously made entries and settings were not made correctly.
In the *Set up* program only entries and settings can be made for which load charts are available.
▶ Correct previously made entries and settings.

4.7.8 Selecting auxiliary boom / accessory

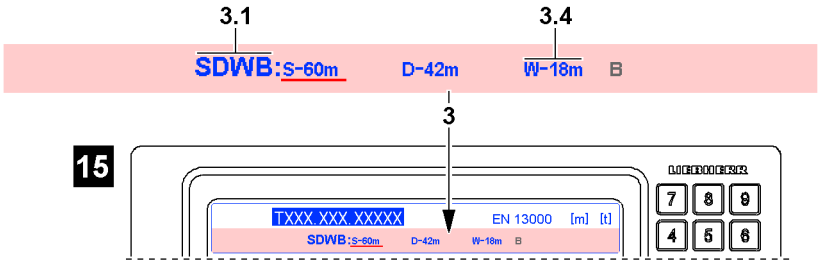

Fig.119942

The marker auxiliary boom / accessory **3.4** only appears when a corresponding abbreviation **3.1** is selected, see illustration **15**.

Note
If the text for the auxiliary boom / accessory **3.4** appears in gray, then no additional entries and settings for this marker are possible.
▶ Correctly selected markers with gray lettering can be skipped.

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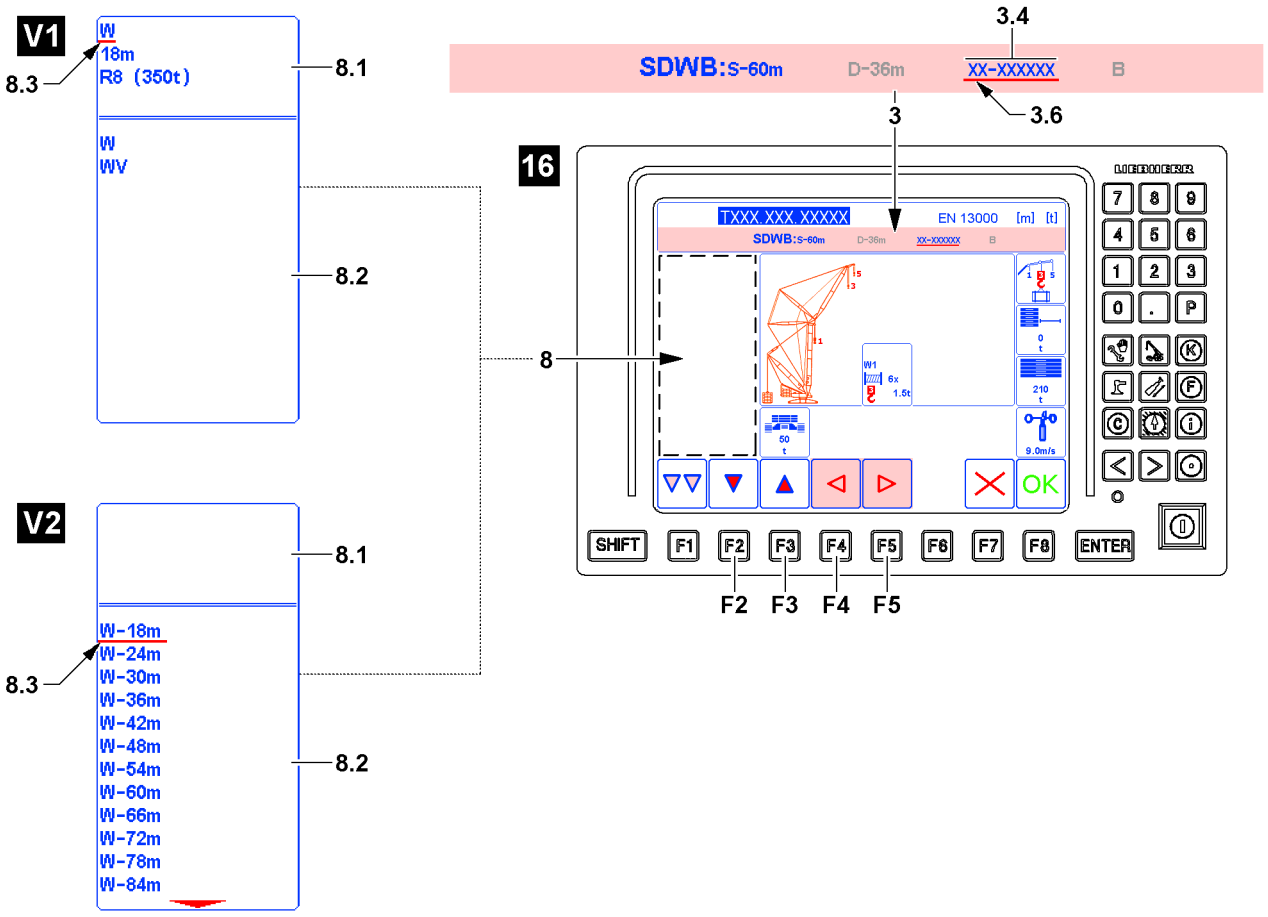

Fig.119943

Note
If the correct auxiliary boom / accessory **3.4** already appears, then the entries and settings for this marker can be skipped.

- ▶ Press the function key **F5** or function key **F4** until the next marker to be changed is underlined with the selection bar **3.6**.
- ▶ If all entries and settings in the operating mode category **3** are correct, press function key **F1** and change into the next category.

4.7.9 Determining variation auxiliary boom / accessory

At first, the operating mode category **3** for the auxiliary boom / accessory **3.4** must be selected.

- ▶ Press the function key **F5** or function key **F4** until the marker auxiliary boom / accessory **3.4** is underlined with the selection bar **3.6**, see illustration **16**.

Result:

– First variation, illustration **V1**
Note: The first variation appears solely when various operating modes and / or roller sets can be assigned to the auxiliary boom / accessory in the *Set up* program.

- The preselection possibilities are displayed in the upper area **8.1** of the Editing / selection window. **8** The first preselection possibility is automatically underlines and activated with the selection bar **8.3**.
- In the lower area **8.2** of the Editing / selection window **8** the settings available for selection are displayed.

– Second variation, illustration **V2**
Note: The second variation appears solely when no various operating modes and roller sets can be assigned to the auxiliary boom / accessory in the *Set up* program.

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- In the upper area **8.1** of the Editing / selection window **8** appears no selection possibility.
- In the lower area **8.2** of the Editing / selection window **8** the settings available for selection are displayed.

Depending on the view of the Editing / selection window **8** you must proceed differently:

▶ If the first variation is shown (illustration **V1**), proceed with section „Selecting auxiliary boom / accessory for the first variation (V1)“.
▶ If the second variation is shown (illustration **V2**), proceed with section „Selecting auxiliary boom / accessory for the second variation (V2)“.

4.7.10 Selecting auxiliary boom / accessory for the first variation (V1)

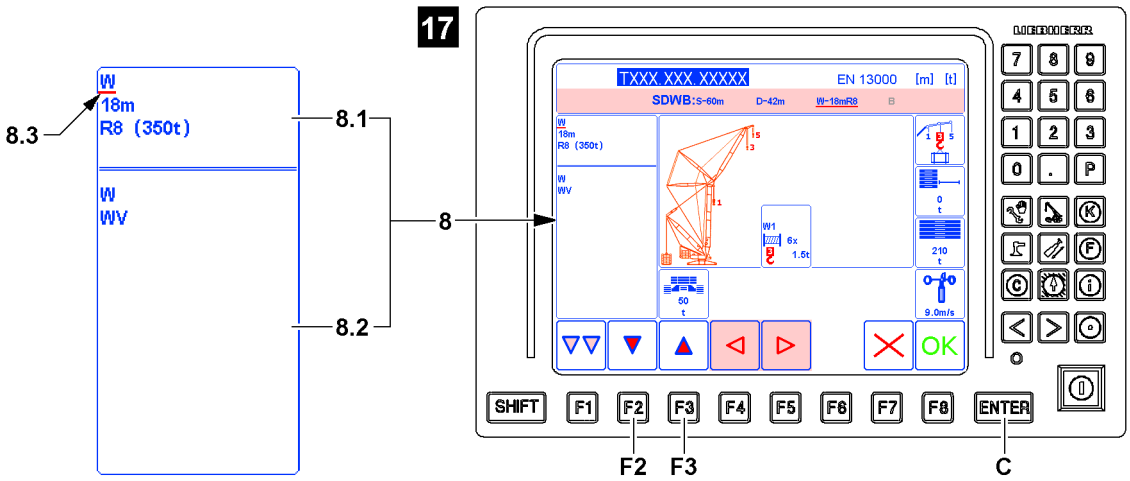

Fig.119944

▶ Press the function key **F2** or function key **F3** until the required preselection possibility in the upper area **8.1** is underlined with the selection bar **8.3** (in the example „W“), see illustration **17**.

When the required preselection possibility is underlined with the selection bar **8.3**:
▶ Press the ENTER key **C**.

Result:

– The selection bar **8.3** changes in the lower area **8.2** of the Editing / selection window **8**.

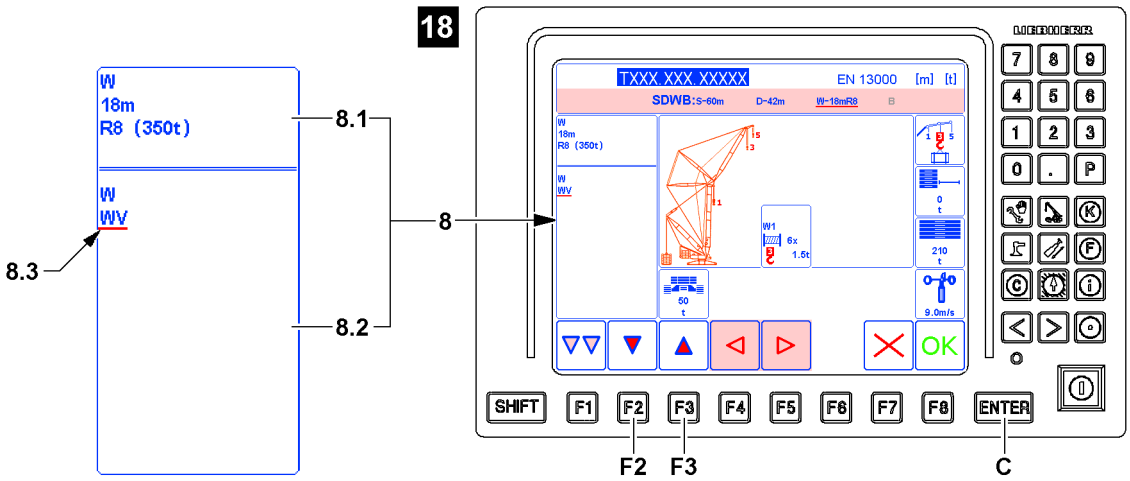

Fig.119945

▶ Press the function key **F2** or function key **F3** until the required setting is underlined with the selection bar **8.3** (in the example „WV“), see illustration **18**.

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When the required setting is underlined with the selection bar **8.3**:
▶ Press the ENTER key **C**.

Result:

– The setting is selected.
– The selection bar **8.3** changes in the upper area **8.1** of the Editing / selection window **8**.

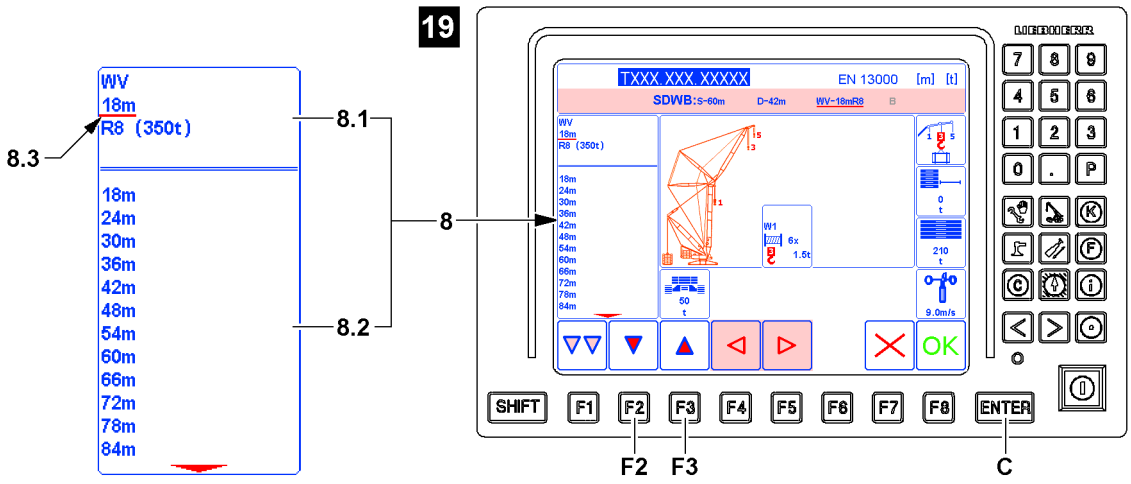

Fig.119946

▶ Press the function key **F2** or function key **F3** until the required preselection possibility in the upper area **8.1** is underlined with the selection bar **8.3** (in the example „18m“), see illustration **19**.

When the required preselection possibility is underlined with the selection bar **8.3**:
▶ Press the ENTER key **C**.

Result:

– The selection bar **8.3** changes in the lower area **8.2** of the Editing / selection window **8**.

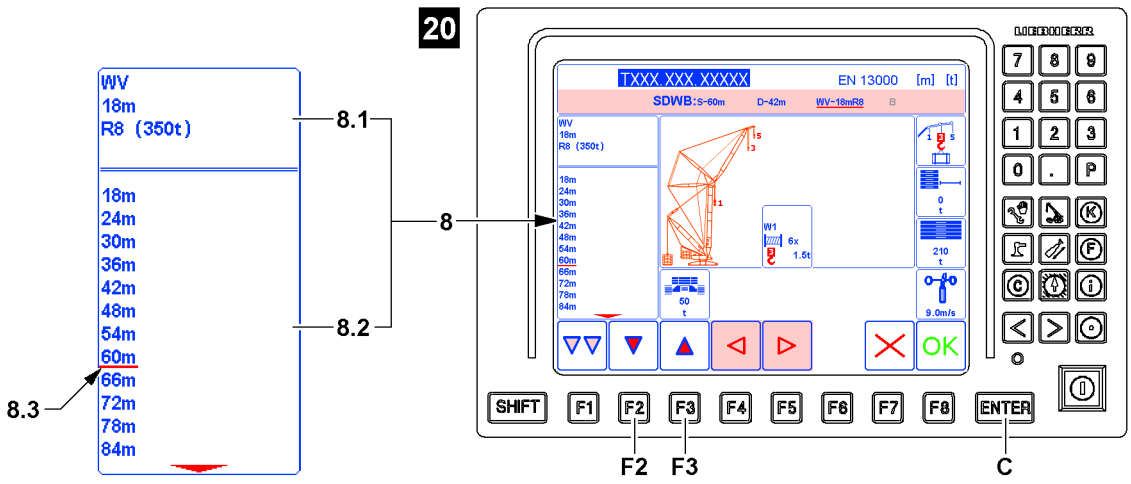

Fig.120576

▶ Press the function key **F2** or function key **F3** until the required setting is underlined with the selection bar **8.3** (in the example „60m“), see illustration **20**.

When the required roller set is underlined with the selection bar **8.3**:
▶ Press the ENTER key **C**.

Result:

– The setting is selected.

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– The selection bar **8.3** changes in the upper area **8.1** of the Editing / selection window **8**.

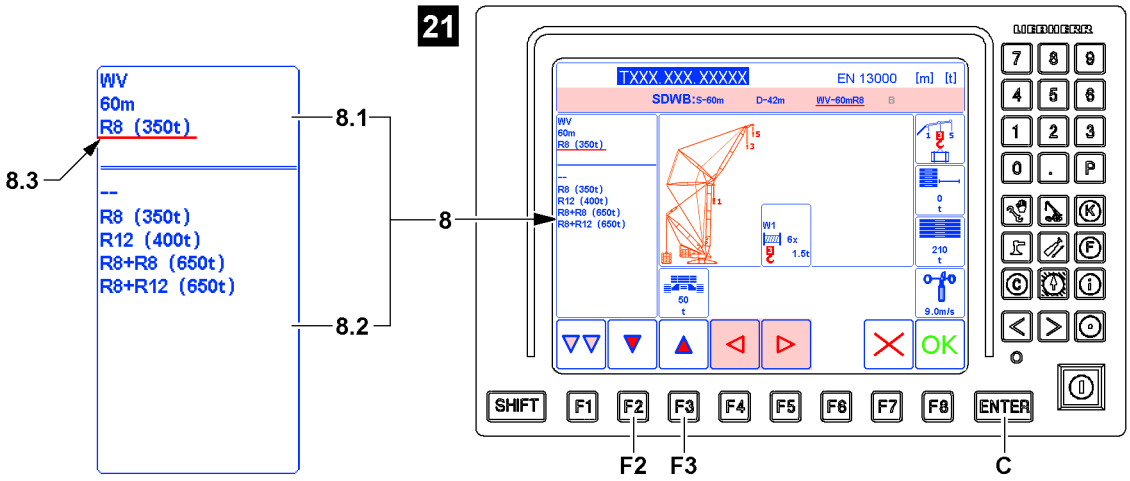

Fig.120577

▶ Press the function key **F2** or function key **F3** until the required preselection possibility in the upper area **8.1** is underlined with the selection bar **8.3** (in the example „R8 (350t)“), see illustration **21**.

When the required preselection possibility is underlined with the selection bar **8.3**:

▶ Press the ENTER key **C**.

Result:

– The selection bar **8.3** changes in the lower area **8.2** of the Editing / selection window **8**.

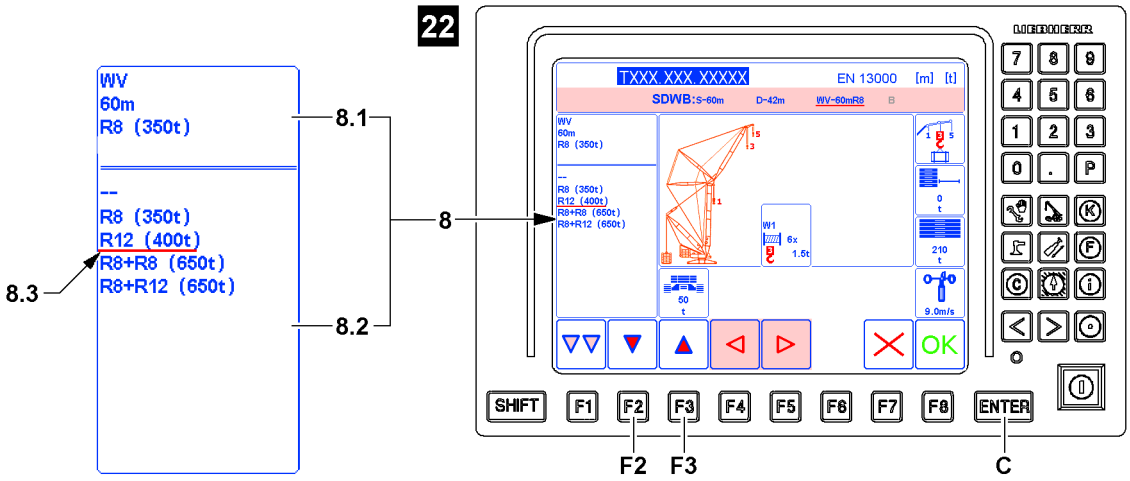

Fig.120578

▶ Press the function key **F2** or function key **F3** until the required setting is underlined with the selection bar **8.3** (in the example „R12 (400t)“), see illustration **22**.

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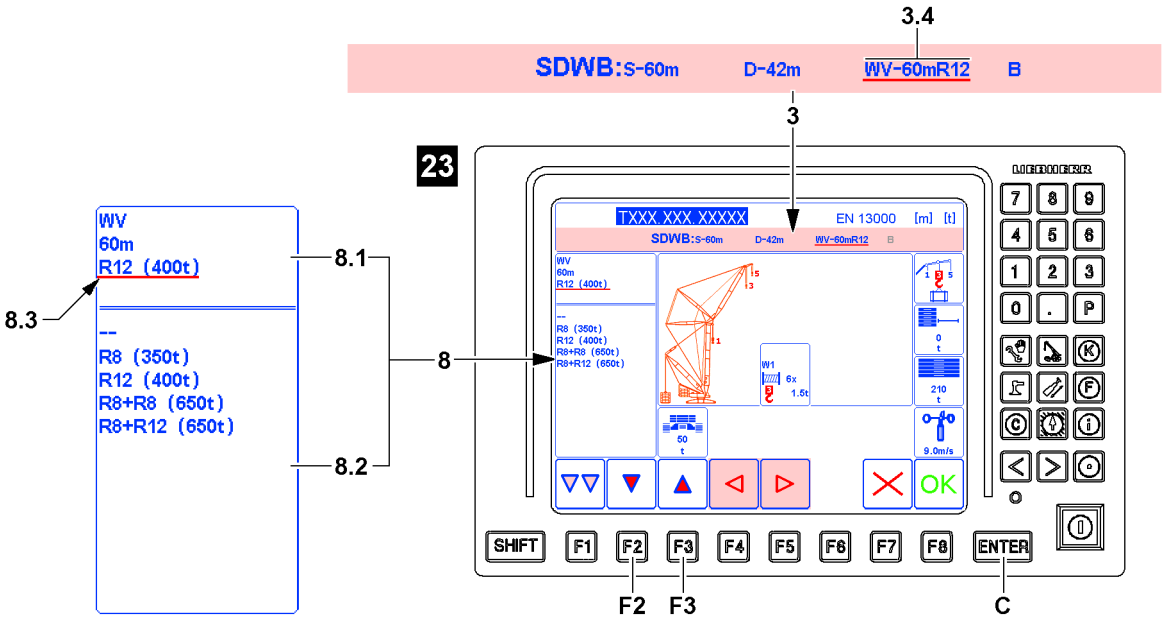

Fig.120579

When the required setting is underlined with the selection bar **8.3**:

▶ Press the ENTER key **C**.

Result:

– The setting is selected.
– The selection bar **8.3** changes in the upper area **8.1** of the Editing / selection window **8**.
– In the operating mode category **3** appear the selected settings for auxiliary boom / accessory **3.4**, see illustration **23**.

4.7.11 Selecting auxiliary boom / accessory for the second variation (V2)

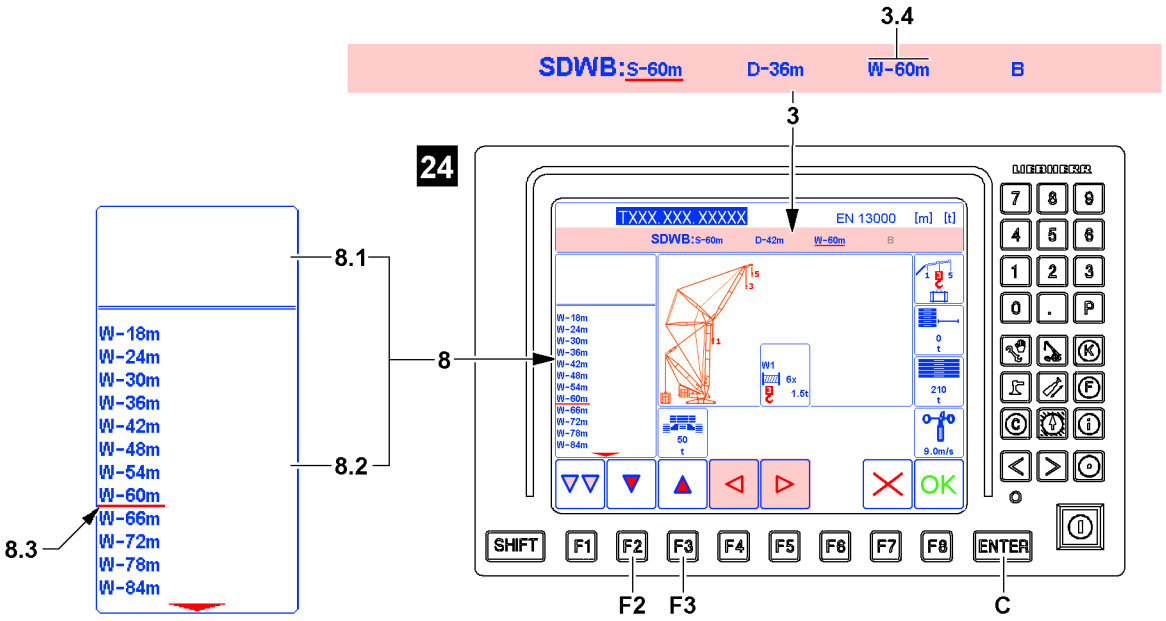

Fig.120580

▶ Press the function key **F2** or function key **F3** until the required main boom is underlined with the selection bar **8.3** (in the example „W-60m“), see illustration **24**.

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When the required main boom is underlined with the selection bar **8.3**:

▶ Press the ENTER key **C**.

Result:

– The auxiliary boom / accessory is selected (in example „W-60m“).
– In the operating mode category **3** appear the selected settings for auxiliary boom / accessory **3.4**.

4.7.12 Selecting derrick ballast settings

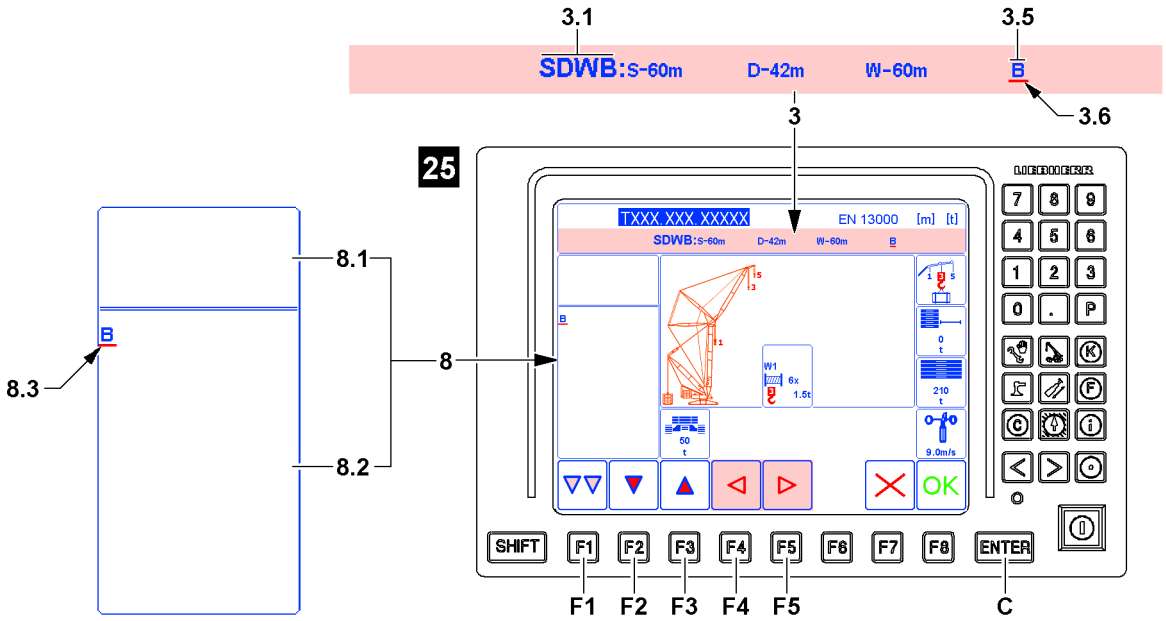

Fig.120581

The marker derrick ballast **3.5** only appears when a corresponding abbreviation **3.1** is selected.

Note
If the text for the derrick ballast **3.5** appears in gray, then no additional entries and settings for this marker are possible.

▶ Correctly selected markers with gray lettering can be skipped.

Note
If the correct derrick ballast **3.5** already appears, then the entries and settings for this marker can be skipped.

▶ Press the function key **F5** or function key **F4** until the next marker to be changed is underlined with the selection bar **3.6**.
▶ If all entries and settings in the operating mode category **3** are correct, press function key **F1** and change into the next category.

Note
If a suspended ballast or a ballast trailer or the operating mode with removed ballast pallet is used as a derrick ballast **3.5** depends on the selected abbreviation **3.1**.

▶ To change between suspended ballast, ballast trailer or the operating mode with removed ballast pallet, see section: „Selecting the abbreviation for the boom system“.
▶ Settings regarding the derrick ballast weight are made via the set up functions, see section „Setting the set up functions“.

At first, the operating mode category **3** for the derrick ballast **3.5** must be selected.

▶ Press the function key **F5** or function key **F4** until the derrick ballast **3.5** is underlined with the selection bar **3.6** (in the example „B“), see illustration **25**.

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Result:

– In the lower area **8.2** of the Editing / selection window **8** the abbreviations for derrick ballast settings available for selection are displayed.

When another derrick ballast setting is available for selection:

▶ Press the function key **F2** or function key **F3** until the required derrick ballast setting is underlined with the selection bar **8.3**.

When the required derrick ballast setting is underlined with the selection bar **8.3**:

▶ Press the ENTER key **C**.

Result:

– The derrick ballast setting is selected.
– In the operating mode category **3** appears the newly selected derrick ballast **3.5**.

Problem remedy

The required selection for a entries and settings of a marker is not available in the operating mode category **3**?

The previously made entries and settings were not made correctly.

In the *Set up* program only entries and settings can be made for which load charts are available.

▶ Correct previously made entries and settings.

4.7.13 Accepting the entries and settings of the operating mode category

Make sure that the following prerequisites are met:

– All selected entries and settings in the operating mode category **3** are correct and complete.

▶ Press the function key **F1**.

Result:

– The entries and settings of the operating mode category are completed.
– The set up completion category is automatically called up.

Problem remedy

After pressing the function key **F1** is was determined that one or several markers are not correct?

By pressing the function key **F1**, the individual program categories can be switched through one after the other. After the last program category, the first is called up again.

▶ Press the function key **F1** until the operating mode category **3** is called up again. Then all entries and settings can be changed.

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4.8 Setting the set up functions

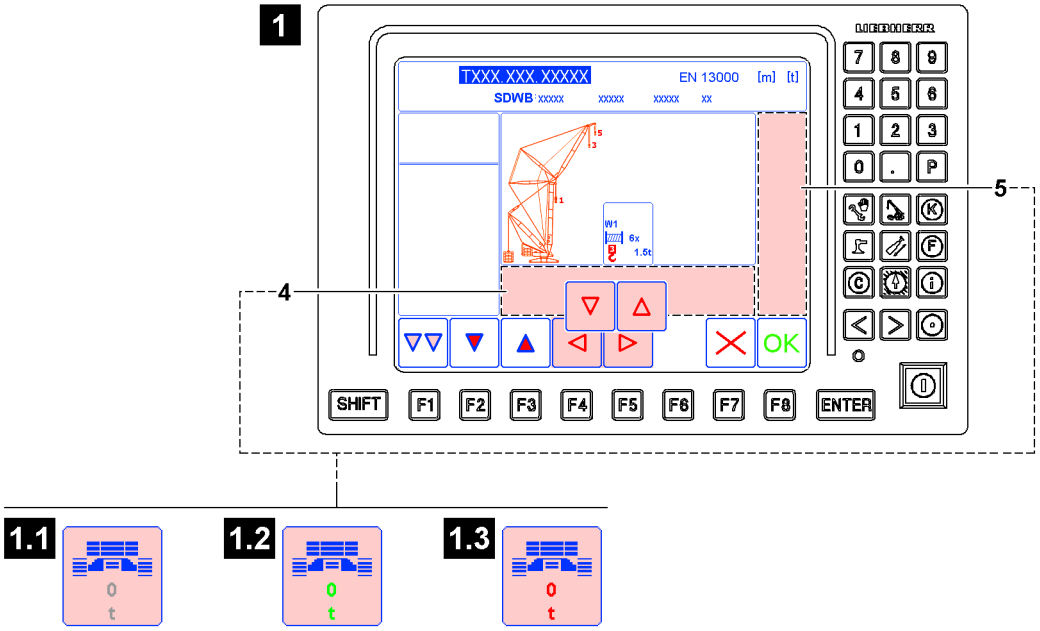

Fig.121745

The set up functions include the set up supplement category and the environmental influence / mechanical influence category.

The individual set up functions are described as markers.

- The set up supplement category **4** includes the lower area of the screen display.
- The environmental / mechanical influence category **5** includes the right area of the screen display.

Depending on the respective load chart, the individual set up functions are assigned to the respective program category.

Note
Values in gray letters
Example Illustration **1.1**: If in one or several of the icons the text of the value for the entries and settings appears in gray, then no additional entries and settings for this marker are presently possible. All entries and settings are specified by the operating mode category.
▶ Correctly selected markers with gray lettering can be skipped.

Note
Values in green letters
Example Illustration **1.2**: If in one or several of the icons the text of the value for the entries and settings appears in green, then additional entries and settings for this marker are possible.
▶ Correctly selected markers with green lettering can be skipped.

Note
Values in red letters
Example Illustration **1.3**: If in one or several of the icons the text of the value for the entries and settings appears in red, then additional entries and settings for this marker within the chart filter are required.
▶ A release for the set up configuration only occurs when no values for the entries and settings appear in red.

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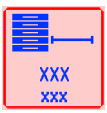
Overview Markers of set up supplement category and the environmental / mechanical influence category	
	Set up function *Crane chassis* Adjustment option for the crane chassis (on crawler travel gear, auxiliary support or assembly support) **Note:** Adjustment option does not appear for all operating modes.
	Set up function *Derrick ballast radius* Adjustment option for derrick ballast radius **Note:** Adjustment option does not appear for all operating modes.
	Set up function *Central ballast* Adjustment option for central ballast **Note:** Adjustment option does not appear for all operating modes.
	Set up function *Slewing range* Adjustment option for slewing range of crane superstructure **Note:** Adjustment option does not appear for all operating modes.
	Set up function *Incline range* Adjustment option of incline range of load chart **Note:** Adjustment option does not appear for all operating modes.
	Set up function *Load position* Adjustment option for the position of the load on the boom system **Note:** Adjustment option does not appear for all operating modes.
	Set up function *Weight derrick ballast* Adjustment option for the weight of the derrick ballast on the derrick boom **Note:** Adjustment option does not appear for all operating modes.
	Set up function *Counterweight* Adjustment option for the weight of the counterweight on the crane superstructure **Note:** Adjustment option does not appear for all operating modes.
	Set up function *Wind speed* Adjustment option for the maximum permissible wind speed of the load chart **Note:** Adjustment option does not appear for all operating modes.

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4.8.1 Selecting the program category

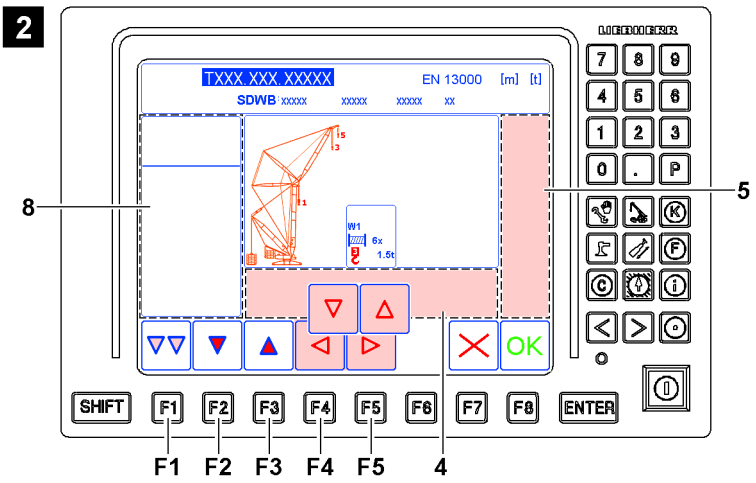

Fig.121746

Selecting the set up completion category

▶ Press the function key **F1** until the set up completion category **4** is highlighted in pink.

Result:

– The set up completion category **4** is selected.
  A red selection frame surrounds the first marker.
– The Editing / selection window **8** appears.
– Above function key **F2**, function key **F3**, function key **F4** and function key **F5** appear the icons for navigation in the individual program categories.

Note
Navigation in the set up completion category **4**
▶ Press the function key **F4**: The red selection frame moves by one icon to the left.
▶ Press the function key **F5**: The red selection frame moves by one icon to the right.
▶ If the red selection frame is moved in one direction past the edge of the set up supplement category **4** then it enters again from the other direction.

Note
Navigation in Editing / selection window **8**
▶ Press the function key **F2**: The selection bar changes downward by one line.
▶ Press the function key **F3**: The selection bar changes upward by one line.

Selecting the environmental / mechanical influence category

▶ Press the function key **F1** until the environmental / mechanical influence category **5** is highlighted in pink.

Result:

– The environmental / mechanical influence category **5** is selected.
  The red selection frame surrounds the first marker.
– The Editing / selection window **8** appears.
– Above function key **F2**, function key **F3**, function key **F4** and function key **F5** appear the icons for navigation in the individual program categories.

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Note
Navigation in the environmental / mechanical influence category **5**
- ▶ Press the function key **F4**: The red selection frame moves down by one icon.
- ▶ Press the function key **F5**: The red selection frame moves up by one icon.
- ▶ If the red selection frame is moved in one direction past the edge of the environmental / mechanical influence category **5** then it enters again from the other direction.

Note
Navigation in Editing / selection window **8**
- ▶ Press the function key **F2**: The selection bar changes downward by one line.
- ▶ Press the function key **F3**: The selection bar changes upward by one line.

4.8.2 Setting the crane chassis

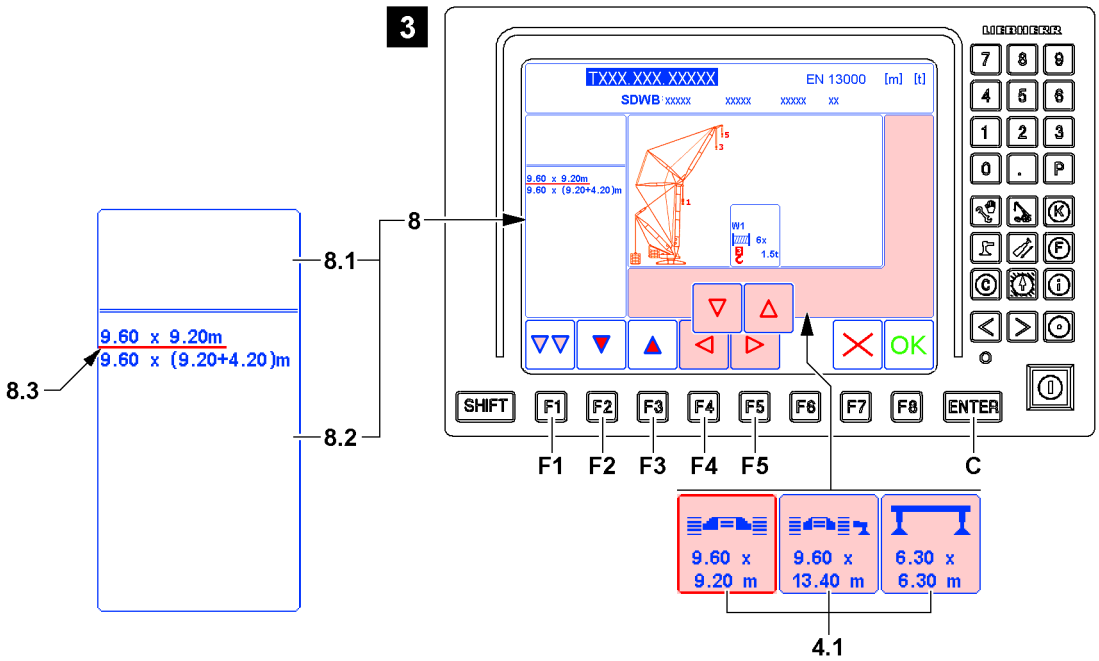

Fig.121747

Note
If the correct set up configuration crane chassis **4.1** already appears, then the entries and settings for this marker can be skipped.
- ▶ Press the function key **F5** or the function key **F4** and select the next marker to be changed.

Note
The following section describes by example how a certain set up configuration for the crane chassis is set.
- ▶ Always set the required set up configuration for the crane chassis.

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Icons *Set up configuration crane chassis*	
	Crane on crawler travel gear[1)]
	Crane on crawler travel gear with auxiliary support installed on one side[1)]
	Crane on assembly support[1)]

1) Only for certain crane types and / or operating modes

When the respective program category is not yet highlighted in pink:

▶ Press the function key **F1** until the respective program category is highlighted in pink.

When icon *Set up configuration crane chassis* **4.1** is not yet bordered in red:

▶ Press the function key **F5** or the function key **F4** until the icon *Set up configuration crane chassis* **4.1** is bordered in red.

Result:

– In the lower area **8.2** of the Editing / selection window **8** the settings available for selection are displayed, see example illustration **3**.

▶ Press the function key **F2** or function key **F3** until the required setting is underlined with the selection bar **8.3** (in the example „9.60m x 9.20m“).

When the required main boom is underlined with the selection bar **8.3**:

▶ Press the ENTER key **C**.

Result:

– The set up configuration for the crane chassis is selected, the respective icon for the set up configuration crane chassis **4.1** (in the example Crane on crawler track „9.60 x 9.20m“) appears.

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4.8.3 Setting the derrick ballast radius

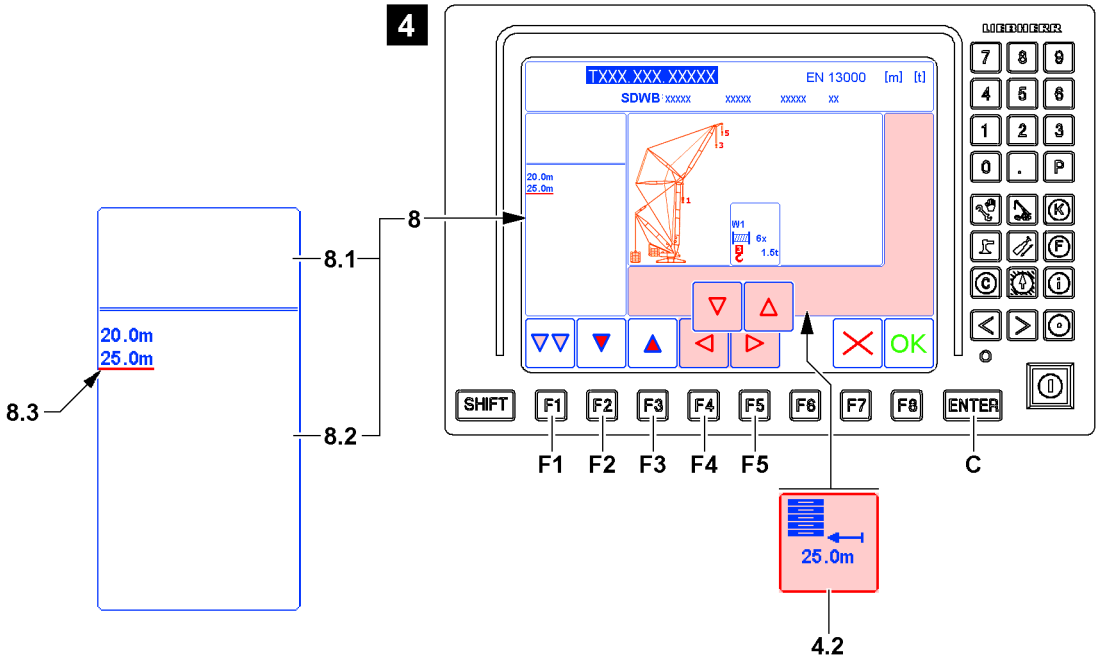

Fig.121756

Note
If the correct derrick ballast radius **4.2** already appears, then the entries and settings for this marker can be skipped.
▶ Press the function key **F5** or the function key **F4** and select the next marker to be changed.

Note
The following section describes by example how a certain derrick ballast radius is set.
▶ Always set the required derrick ballast radius.

When the respective program category is not yet highlighted in pink:
▶ Press the function key **F1** until the respective program category is highlighted in pink.

When icon *Derrick ballast radius* **4.2** is not yet bordered in red:
▶ Press the function key **F5** or the function key **F4** until the icon *Derrick ballast radius* **4.2** is bordered in red.

Result:

– In the lower area **8.2** of the Editing / selection window **8** the settings available for selection are displayed, see example illustration **4**.

▶ Press the function key **F2** or function key **F3** until the required setting is underlined with the selection bar **8.3** (in the example „25.0m“).

When the required derrick ballast radius is underlined with the selection bar **8.3**:
▶ Press the ENTER key **C**.

Result:

– The derrick ballast radius is selected, the respective icon *Derrick ballast radius* **4.2** (in the example „25.0m“) appears.

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4.8.4 Setting the central ballast

Depending on the crane type and load chart there are two possibilities to set the central ballast:
- Specified settings distances: The central ballast must be selected from a list, see section „Setting the central ballast: Specified settings distances“.
- Stepless settings distances: The central ballast must be entered within a specified range, see section „Setting the central ballast: Stepless settings distances“.

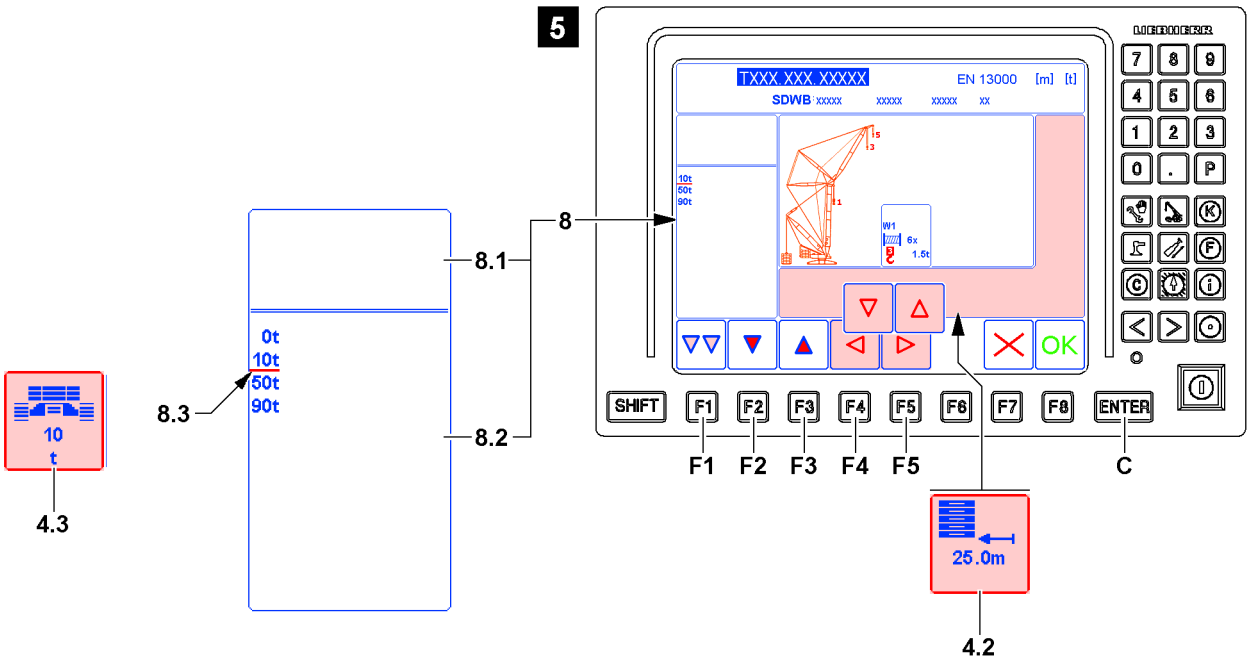

Fig.121757

Note
If the correct central ballast **4.3** already appears, then the entries and settings for this marker can be skipped.
▶ Press the function key **F5** or the function key **F4** and select the next marker to be changed.

Note
The following section describes by example how a certain central ballast is set.
▶ Always set the required central ballast.

Setting the central ballast: Specified settings distances

When the respective program category is not yet highlighted in pink:
▶ Press the function key **F1** until the respective program category is highlighted in pink.

When icon *Central ballast* **4.3** is not yet bordered in red:
▶ Press the function key **F5** or the function key **F4** until the icon *Central ballast* **4.3** is bordered in red.

Result:

– In the lower area **8.2** of the Editing / selection window **8** the settings available for selection are displayed, see example illustration **5**.

▶ Press the function key **F2** or function key **F3** until the required setting is underlined with the selection bar **8.3** (in the example „10t“).

When the required central ballast is underlined with the selection bar **8.3**:
▶ Press the ENTER key **C**.

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Result:

– The central ballast is selected, the respective icon *Central ballast* **4.3** (in the example „10t“) appears.

Setting the central ballast: Stepless settings distances

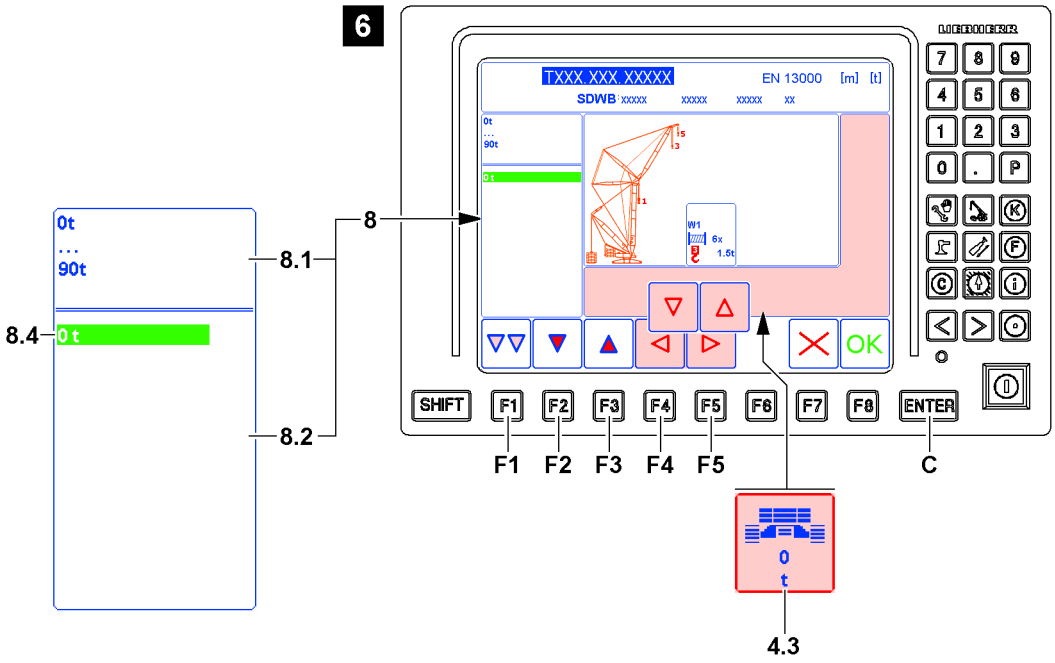

Fig.121758

When the respective program category is not yet highlighted in pink:
▶ Press the function key **F1** until the respective program category is highlighted in pink.

When icon *Central ballast* **4.3** is not yet bordered in red:
▶ Press the function key **F5** or the function key **F4** until the icon *Central ballast* **4.3** is bordered in red.

Result:

– Illustration **6**:

- In the upper area **8.1** of the Editing / selection window **8** the permissible range of the central ballast is displayed.
- In the lower area **8.2** of the Editing / selection window **8** appears a green field **8.4** with the currently selected central ballast.

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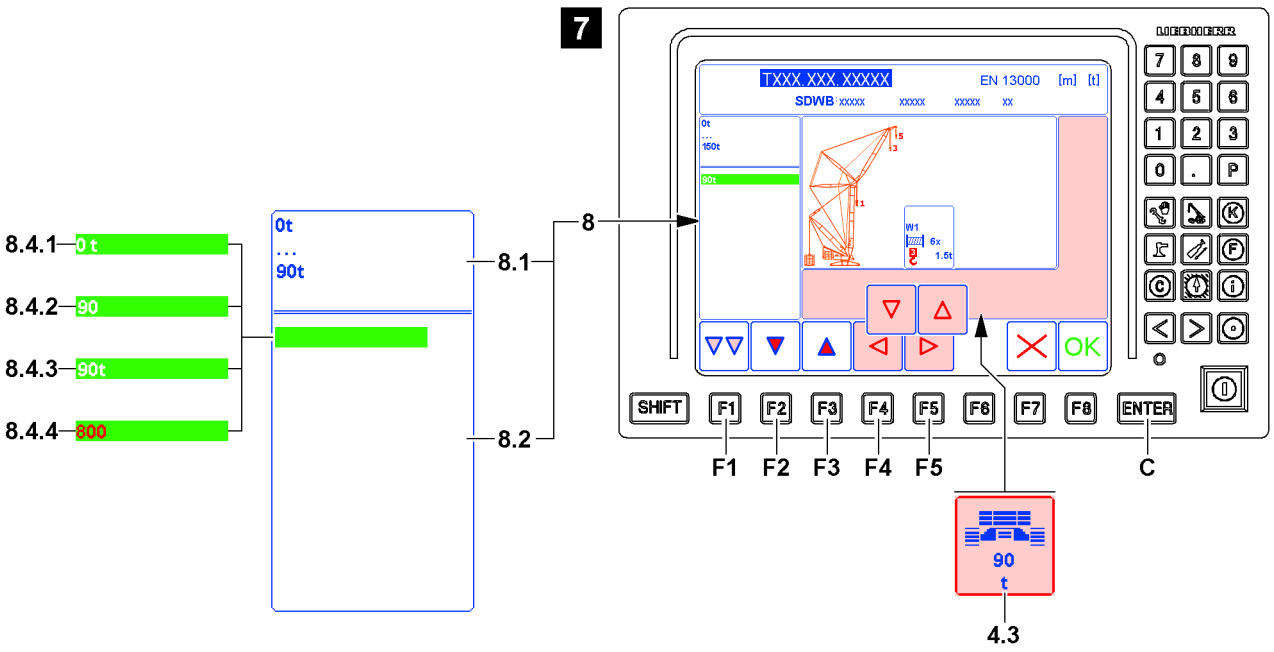

Fig.121744

Illustration **7**: The entry is made without the weight unit.

▶ Enter the required number sequence via the keypad **A**, in example „90“.

Result:

– The original value **8.4.1** (in example „0t“) turns off.
– The entered value **8.4.2** (in example „90“) appears.

▶ Press the ENTER key **C**.

Result:

– The new value **8.4.3** is taken over and displayed in the icon *Central ballast* **4.3**.

Problem remedy

Invalid input value

When trying to accept an invalid input value **8.4.4** then the numbers are shown in red.

Enter only permissible values according to the specifications from the upper area **8.1** of the Editing / selection window **8**.

▶ Enter the permissible value via the keypad **A**.

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4.8.5 Setting the slewing range

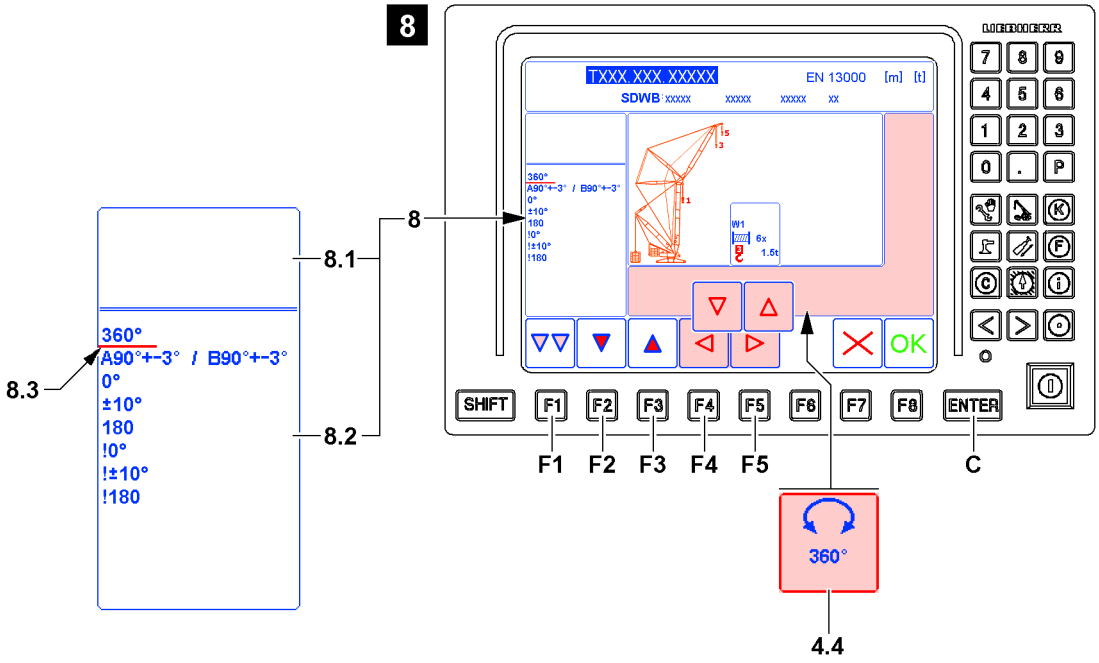

Fig.121759

The marker turning range **4.4** only appears when an alternative setting is possible.

Note
If the correct turning range **4.4** already appears, then the entries and settings for this marker can be skipped.
▶ Press the function key **F5** or the function key **F4** and select the next marker to be changed.

Note
The following section describes by example how a certain turning range is selected.
▶ Always select the required turning range.

When the respective program category is not yet highlighted in pink:
▶ Press the function key **F1** until the respective program category is highlighted in pink.

When icon *Slewing range* **4.4** is not yet bordered in red:
▶ Press the function key **F5** or the function key **F4** until the icon *Slewing range* **4.4** is bordered in red.

Result:

– In the lower area **8.2** of the Editing / selection window **8** the settings available for selection are displayed, see sample listing illustration **8**.

When another setting for the slewing range is to be set:
▶ Press the function key **F2** or function key **F3** until the required setting is underlined with the selection bar **8.3**, in the example „360°“.

When the required turning range setting is underlined with the selection bar **8.3**:
▶ Press the ENTER key **C**.

Result:

– The new value is taken over and displayed in the *Turning range* icon **4.4**.

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4.8.6 Setting the incline range

WARNING
Impermissible incline exceeded!
When no incline range is shown, then ±0.3° applies as the largest permissible incline.
▶ Never exceed the permissible incline.

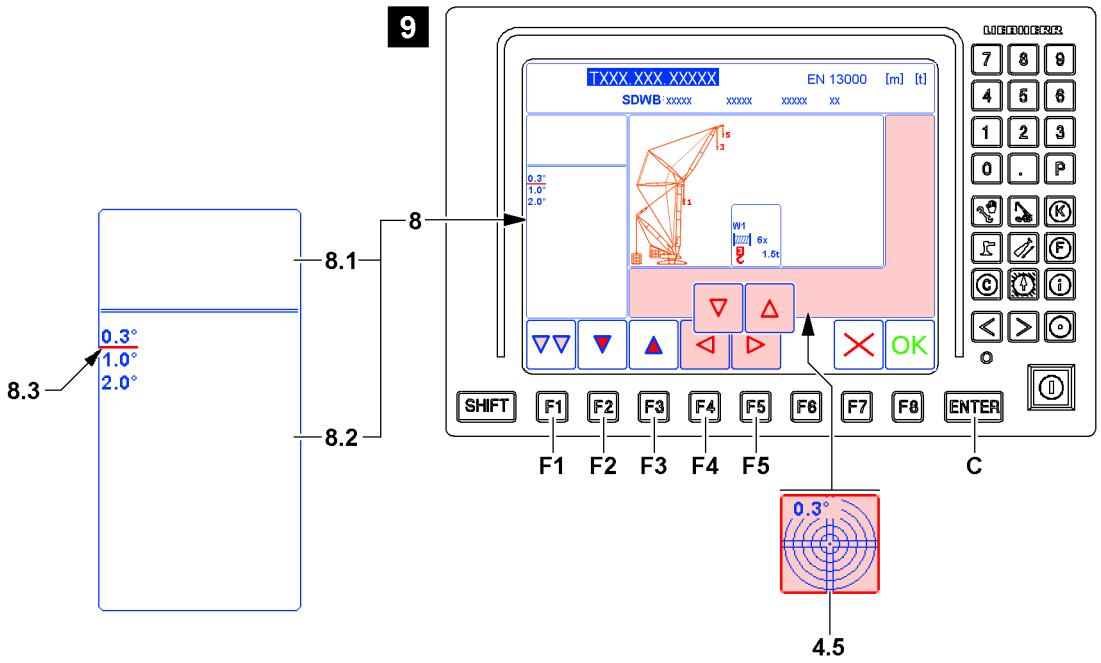

Fig.121760

The incline range cannot be set in all operating modes. If the incline range is not adjustable, then the icon *Incline range* **4.5** is not shown in some operating modes.

Depending on the crane type and load chart there are two possibilities to set the incline range:
– Specified settings distances: The incline range must be selected from a list, see section „Setting the incline range: Specified settings distances“.
– Stepless settings distances: The incline range must be entered within a specified range, see section „Setting the incline range: Stepless settings distances“.

Note
If the correct incline range **4.5** already appears, then the entries and settings for this marker can be skipped.
▶ Press the function key **F5** or the function key **F4** and select the next marker to be changed.

Note
The following section describes by example how a certain incline range is set.
▶ Always set the required incline range.

Setting the incline range: Specified settings distances

When the respective program category is not yet highlighted in pink:
▶ Press the function key **F1** until the respective program category is highlighted in pink.

When icon *Incline range* **4.5** is not yet bordered in red:
▶ Press the function key **F5** or the function key **F4** until the icon *Incline range* **4.5** is bordered in red.

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Result:

– In the lower area **8.2** of the Editing / selection window **8** the settings available for selection are displayed, see example illustration **9**.

▶ Press the function key **F2** or function key **F3** until the required setting is underlined with the selection bar **8.3**, (in the example „0.3°“).

When the required incline range is underlined with the selection bar **8.3**:
▶ Press the ENTER key **C**.

Result:

– The incline range is selected, the respective icon *Incline range* **4.5** (in the example „0.3°“) appears.

Setting the incline range: Stepless settings distances

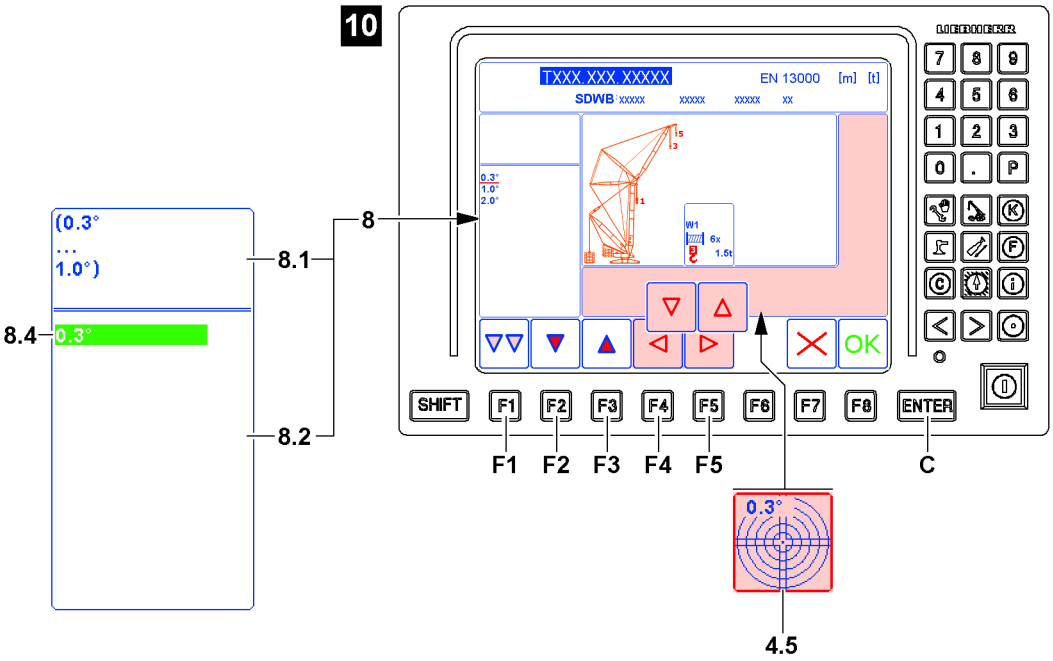

Fig.121761

When the respective program category is not yet highlighted in pink:
▶ Press the function key **F1** until the respective program category is highlighted in pink.

When icon *Incline range* **4.5** is not yet bordered in red:
▶ Press the function key **F4** or the function key **F5** until the icon *Incline range* **4.5** is bordered in red.

Result:

Illustration **10**:
– In the upper area **8.1** of the Editing / selection window **8** the permissible incline range is displayed.
– In the lower area **8.2** of the Editing / selection window **8** appears a green field **8.4** with the currently selected incline range.

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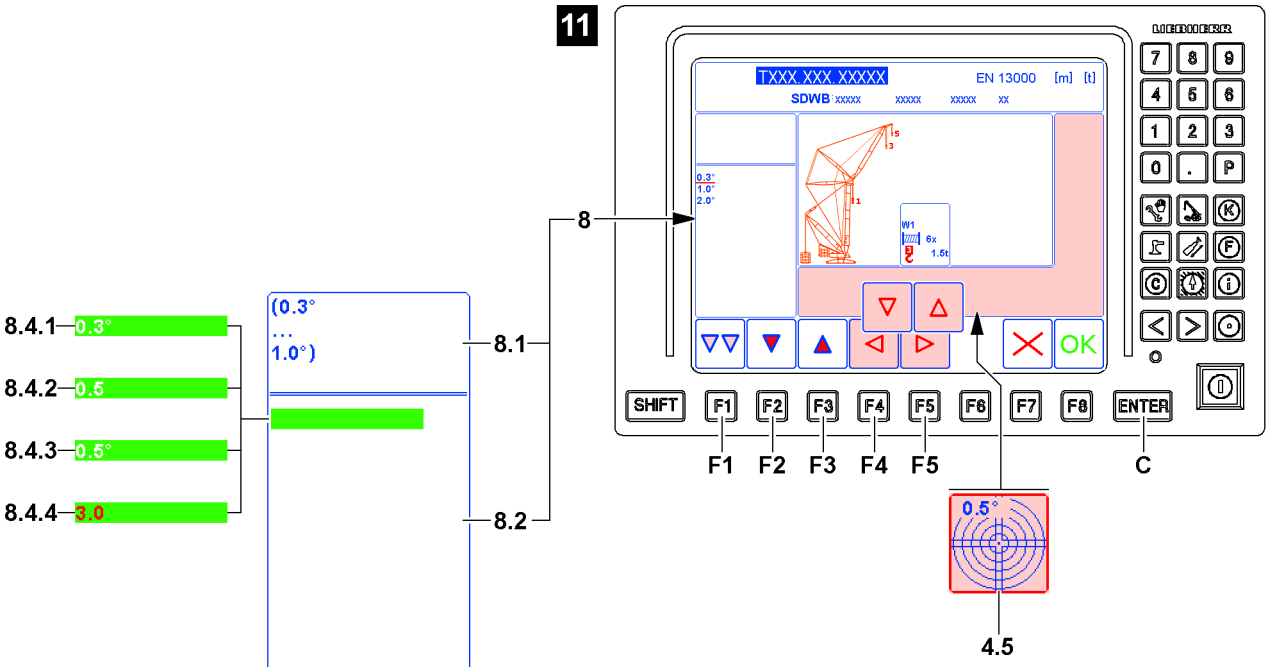

Fig.121762

Illustration **11**: The entry is made without the measuring unit.

▶ Enter the required number sequence via the keypad **A**, in example „0.5“.

Result:

– The original value **8.4.1** (in example „0.3°“) turns off.
– The entered value **8.4.2** (in example „0.5“) appears.

▶ Press the ENTER key **C**.

Result:

– The new value **8.4.3** (in example „0.5°“) is taken over and shown in the icon *Incline range* **4.5**.

Problem remedy

Invalid input value

When trying to accept an invalid input value **8.4.4** then the numbers are shown in red.

Enter only values according to the specifications from the upper area **8.1** of the Editing / selection window **8**.

▶ Enter the permissible value via the keypad **A**.

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4.8.7 Setting the load position

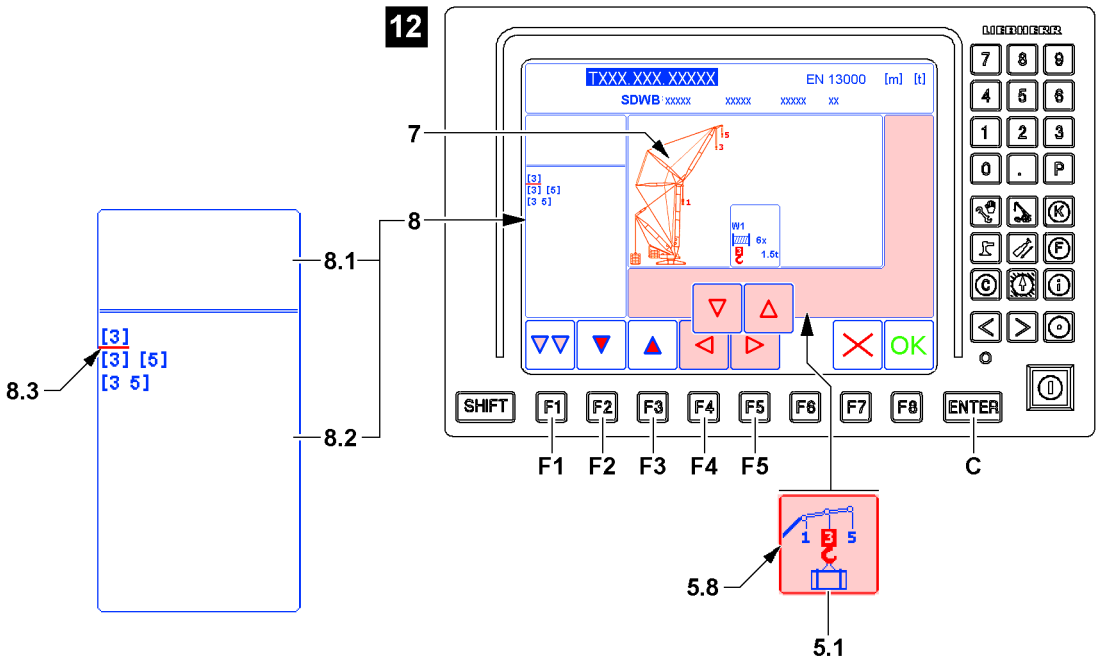

Fig.121763

Note
If the correct load position **5.1** already appears, then the settings for this marker can be skipped.
▶ Press the function key **F5** or the function key **F4** and select the next marker to be changed.

Note
The following section describes by example how a certain load position is selected.
▶ Always select the required load position.

When the respective program category is not yet highlighted in pink:
▶ Press the function key **F1** until the respective program category is highlighted in pink.

When icon *Load position* **5.1** is not yet bordered in red:
▶ Press the function key **F4** or the function key **F5** until the icon *Load position* **5.1** is bordered in red.

Result:

Illustration **12**:
– The *Load position* icon **5.1** is bordered in red and activated.
– In the lower area **8.2** of the Editing / selection window **8** the possible load positions are displayed.

Note
Possible load positions
▶ The possible load positions are visualized in the display window **7**.
▶ The possible load positions depend on the selected operating mode.

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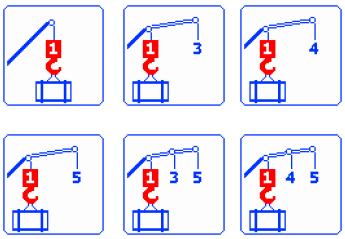
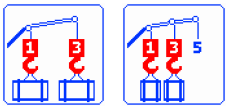
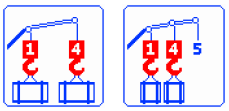
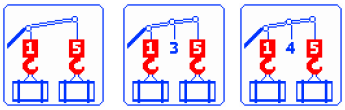
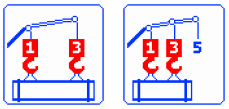
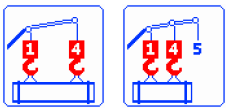
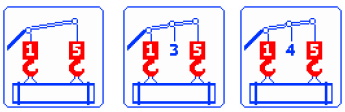
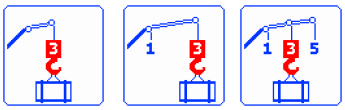
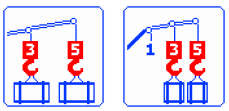
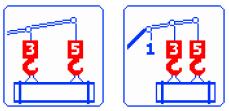
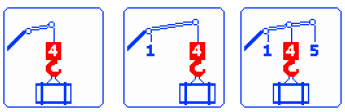
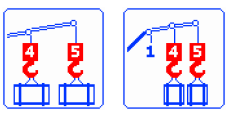
Possible load positions		
	Possible icons	**Description**
[1]		One hook operation: Hook 1 is reeved on load position 1. A load is fastened on hook 1.
[1] [3]		Two hook operation: Hook 1 is reeved on load position 1. Hook 3 is reeved on load position 3. First load is fastened on hook 1. Second load is fastened on hook 3.
[1] [4]		Two hook operation: Hook 1 is reeved on load position 1. Hook 4 is reeved on load position 4. First load is fastened on hook 1. Second load is fastened on hook 4.
[1] [5]		Two hook operation: Hook 1 is reeved on load position 1. Hook 5 is reeved on load position 5. First load is fastened on hook 1. Second load is fastened on hook 5.
[1 3]		Two hook operation: Hook 1 is reeved on load position 1. Hook 3 is reeved on load position 3. A combined load is fastened on hook 1 and hook 3.
[1 4]		Two hook operation: Hook 1 is reeved on load position 1. Hook 4 is reeved on load position 4. A combined load is fastened on hook 1 and hook 4.
[1 5]		Two hook operation: Hook 1 is reeved on load position 1. Hook 5 is reeved on load position 5. A combined load is fastened on hook 1 and hook 5.
[3]		One hook operation: Hook 3 is reeved on load position 3. A load is fastened on hook 3.
[3] [5]		Two hook operation: Hook 3 is reeved on load position 3. Hook 5 is reeved on load position 5. First load is fastened on hook 3. Second load is fastened on hook 5.
[3 5]		Two hook operation: Hook 3 is reeved on load position 3. Hook 5 is reeved on load position 5. A combined load is fastened on hook 3 and hook 5.
[4]		One hook operation: Hook 4 is reeved on load position 4. A load is fastened on hook 4.
[4] [5]		Two hook operation: Hook 4 is reeved on load position 4. Hook 5 is reeved on load position 5. First load is fastened on hook 4. Second load is fastened on hook 5.

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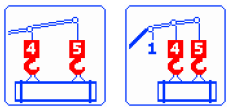
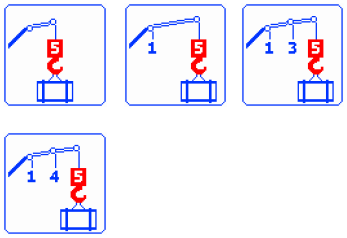
Possible load positions		
	Possible icons	**Description**
[4 5]		Two hook operation: Hook 4 is reeved on load position 4. Hook 5 is reeved on load position 5. A combined load is fastened on hook 4 and hook 5.
[5]		One hook operation: Hook 5 is reeved on load position 5. A load is fastened on hook 5.

▶ Press the function key **F2** or function key **F3** until the required load position is underlined with the selection bar **8.3**. As example „[3]“.

When the required load position is underlined with the selection bar **8.3**:

▶ Press the ENTER key **C**.

Result:

– The load position is selected (example „[3]“).
– The load position is accepted and shown in the icon *Load position* **5.1**.

4.8.8 Setting the derrick ballast weight

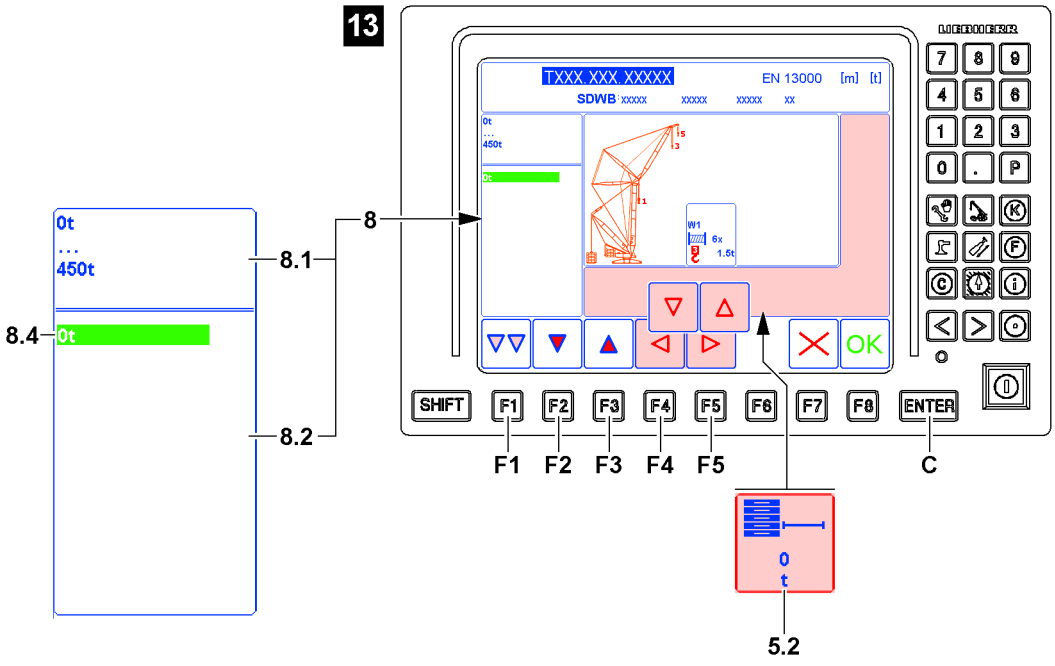


Fig.121764

The marker derrick ballast weight **5.2** only appears when a an operating mode with derrick ballast is selected.

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Note
If the correct derrick ballast weight **5.2** already appears, then the entries and settings for this marker can be skipped.
▶ Press the function key **F5** or the function key **F4** and select the next marker to be changed.

Note
The following section describes by example how a certain derrick ballast weight is entered.
▶ Always enter the required derrick ballast weight.

When the respective program category is not yet highlighted in pink:
▶ Press the function key **F1** until the respective program category is highlighted in pink.

When icon *Derrick ballast weight* **5.2** is not yet bordered in red:
▶ Press the function key **F5** or the function key **F4** until the icon *Derrick ballast weight* **5.2** is bordered in red, see illustration **13**.

Result:

– In the upper area **8.1** of the Editing / selection window **8** the possible range of the derrick ballast weight is displayed.
– In the lower area **8.2** of the Editing / selection window **8** appears a green field **8.4** with the currently selected derrick ballast weight.

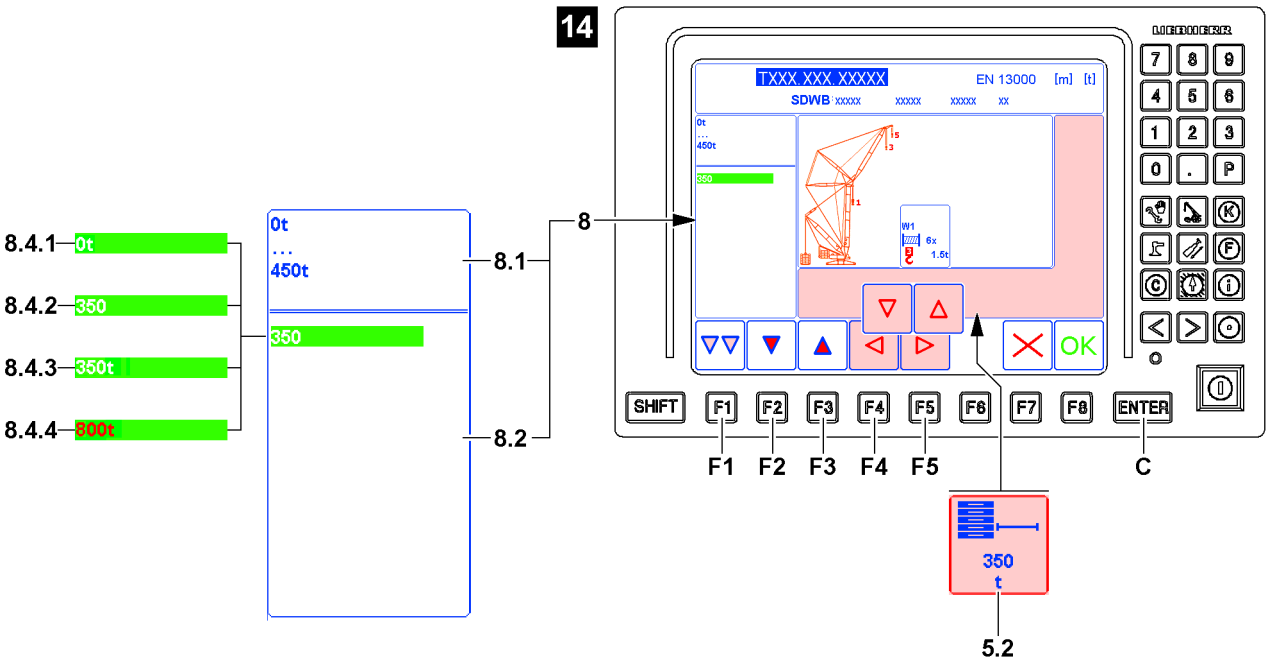

Fig.121765

Illustration **14**, the entry is made without the measuring unit:
▶ Enter the required number sequence via the keypad **A**, in example „350“.

Result:

– The original value **8.4.1** (in example „0“) turns off.
– The entered value **8.4.2** (in example „350“) appears.

▶ Press the ENTER key **C**.

Result:

– The new value **8.4.3** (in example „350t“) is taken over and shown in the icon *Derrick ballast weight* **5.2**.

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Problem remedy
Invalid input value
When trying to accept an invalid input value **8.4.4** then the numbers are shown in red.
Enter only values according to the specifications from the upper area **8.1** of the Editing / selection window **8**.
▶ Enter the permissible value via the keypad **A**.

4.8.9 Setting the counterweight

Depending on the crane type and load chart there are two possibilities to set the counterweight:
– Specified settings distances: The counterweight must be selected from a list, see section „Setting the counterweight: Specified settings distances“.
– Stepless settings distances: The counterweight must be entered within a specified range, see section „Setting the counterweight: Stepless settings distances“.

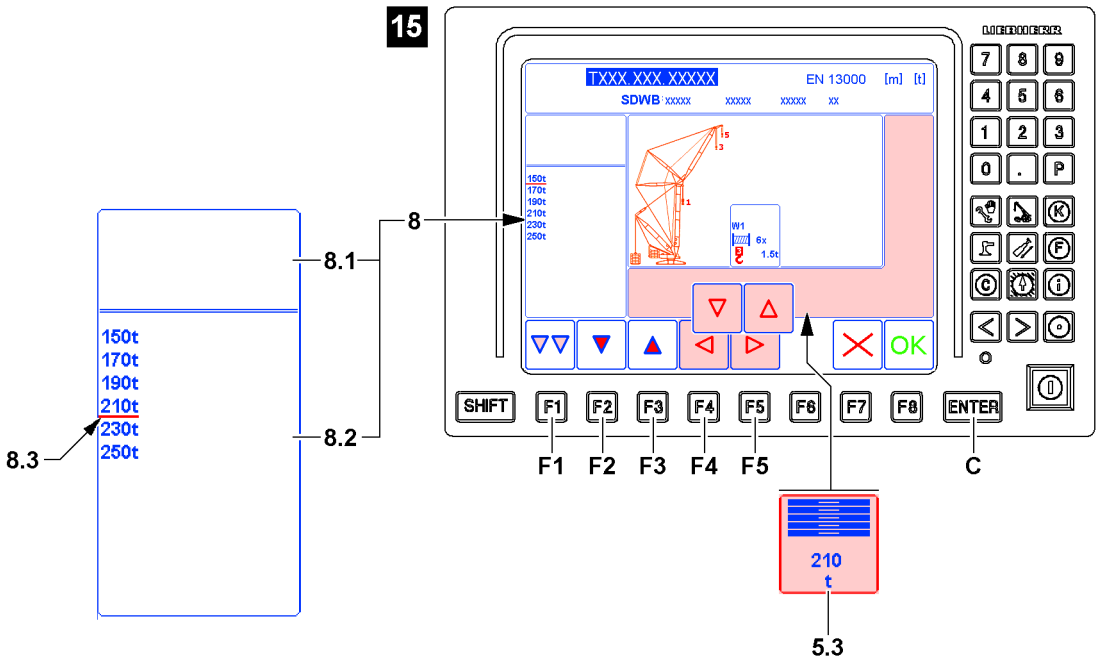

Fig.121766

Note
If the correct counterweight **5.3** already appears, then the entries and settings for this marker can be skipped.
▶ Press the function key **F5** or the function key **F4** and select the next marker to be changed.

Note
The following section describes by example how a certain counterweight is set.
▶ Always set the required counterweight.

Setting the counterweight: Specified settings distances

When the respective program category is not yet highlighted in pink:
▶ Press the function key **F1** until the respective program category is highlighted in pink.

When icon *Counterweight* **5.3** is not yet bordered in red:
▶ Press the function key **F5** or the function key **F4** until the icon *Counterweight* **5.3** is bordered in red.

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Result:

– In the lower area **8.2** of the Editing / selection window **8** the settings available for selection are displayed, see example illustration **15**.

▶ Press the function key **F2** or function key **F3** until the required setting is underlined with the selection bar **8.3** (in the example „210t“).

When the required counterweight is underlined with the selection bar **8.3**:
▶ Press the ENTER key **C**.

Result:

– The counterweight is selected, the respective icon *Counterweight* **5.3** (in the example „210t“) appears.

Setting the counterweight: Stepless settings distances

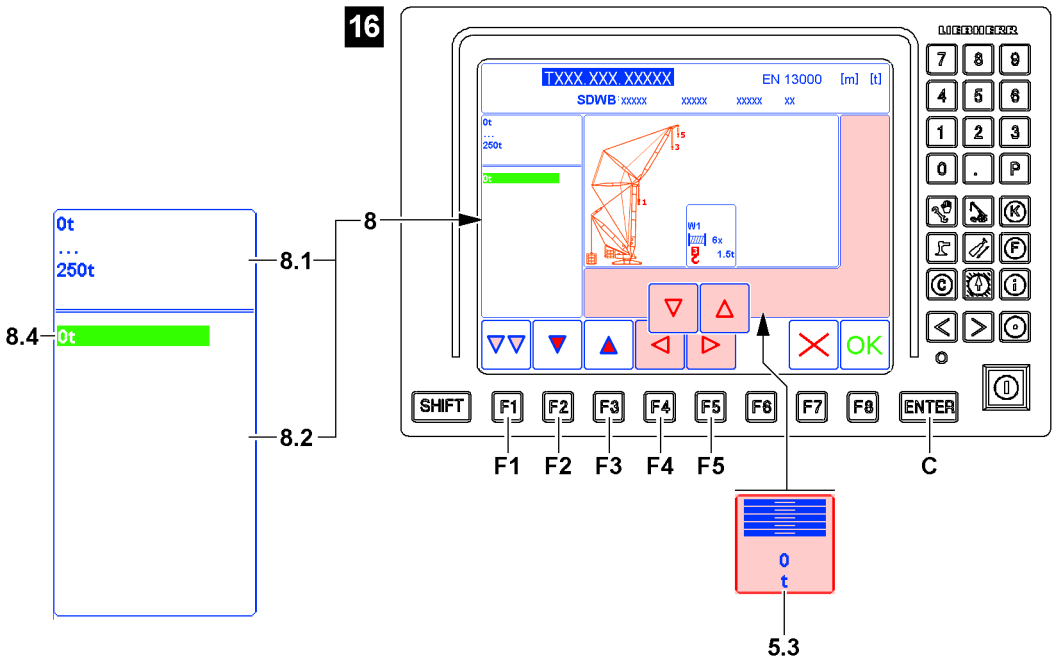

Fig.121767

When the respective program category is not yet highlighted in pink:
▶ Press the function key **F1** until the respective program category is highlighted in pink.

When icon *Counterweight* **5.3** is not yet bordered in red:
▶ Press the function key **F5** or the function key **F4** until the icon *Counterweight* **5.3** is bordered in red.

Result:

– Illustration **16**:

- In the upper area **8.1** of the Editing / selection window **8** the permissible range of the counterweight is displayed.
- In the lower area **8.2** of the Editing / selection window **8** appears a green field **8.4** with the currently selected counterweight.

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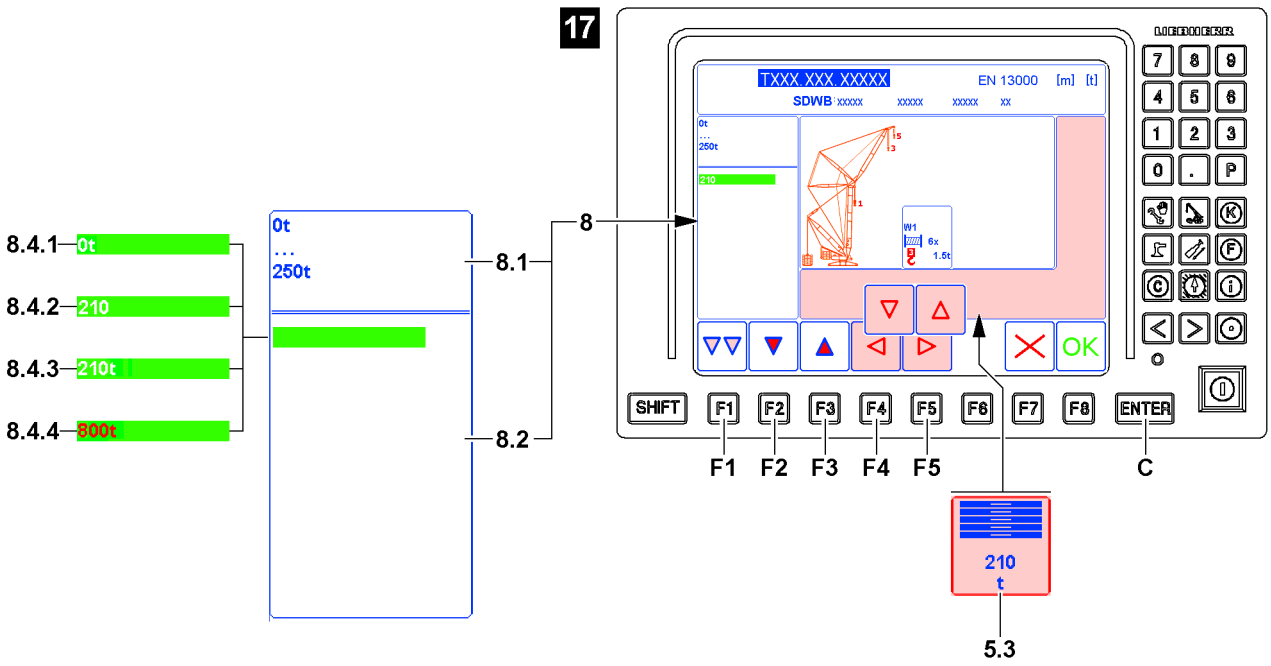

Fig.121768

Illustration **17**: The entry is made without the weight unit.

▶ Enter the required number sequence via the keypad **A**, in example „210“.

Result:

– The original value **8.4.1** (in example „0t“) turns off.
– The entered value **8.4.2** (in example „210“) appears.

▶ Press the ENTER key **C**.

Result:

– The new value **8.4.3** is taken over and displayed in the icon *Counterweight* **5.3**.

Problem remedy

Invalid input value

When trying to accept an invalid input value **8.4.4** then the numbers are shown in red.

Enter only permissible values according to the specifications from the upper area **8.1** of the Editing / selection window **8**.

▶ Enter the permissible value via the keypad **A**.

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4.8.10 Setting the wind speed

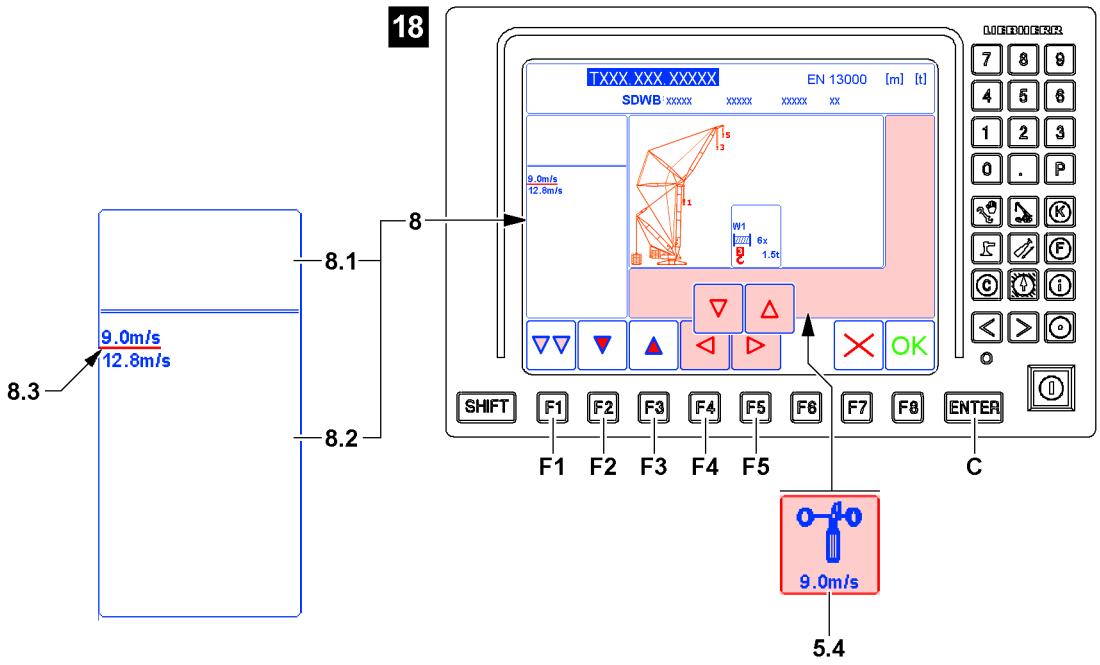

Fig.121769

Note
If the correct maximum wind speed **5.4** already appears, then the settings for this marker can be skipped.
▶ Press the function key **F5** or the function key **F4** and select the next marker to be changed.

Note
The following section describes by example how a certain wind speed is set.
▶ Always set the required wind speed.

When the respective program category is not yet highlighted in pink:
▶ Press the function key **F1** until the respective program category is highlighted in pink.

When icon *Wind speed* **5.4** is not yet bordered in red:
▶ Press the function key **F4** or the function key **F5** until the *Wind speed* icon **5.4** is bordered in red, see illustration **18**.

Result:

– In the lower area **8.2** of the Editing / selection window **8** the possible maximum wind speeds are displayed.

▶ Press the function key **F2** or function key **F3** until the required wind speed is underlined with the selection bar **8.3**. In example „9.0m/s“.

When the required wind speed is underlined with the selection bar **8.3**:
▶ Press the ENTER key **C**.

Result:

– The maximum wind speed is selected (example „9.0m/s“).
– The maximum wind speed is accepted and shown in the *Wind speed* icon **5.4**.

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4.8.11 Accepting the entries and settings

Make sure that the following prerequisites are met:
– All entries and settings in the currently called up program category are correct and complete.

▶ Press the function key **F1**.

Result:

– Entries and settings are completed.
– The next category is automatically called up.

Problem remedy
After pressing the function key **F1** is was determined that one or several markers are not correct? By pressing the function key **F1**, the individual program categories can be switched through one after the other. After the last program category, the first is called up again.

▶ Press the function key **F1** until the respective program category is called up again. Then all entries and settings can be changed.

4.9 Lifting category

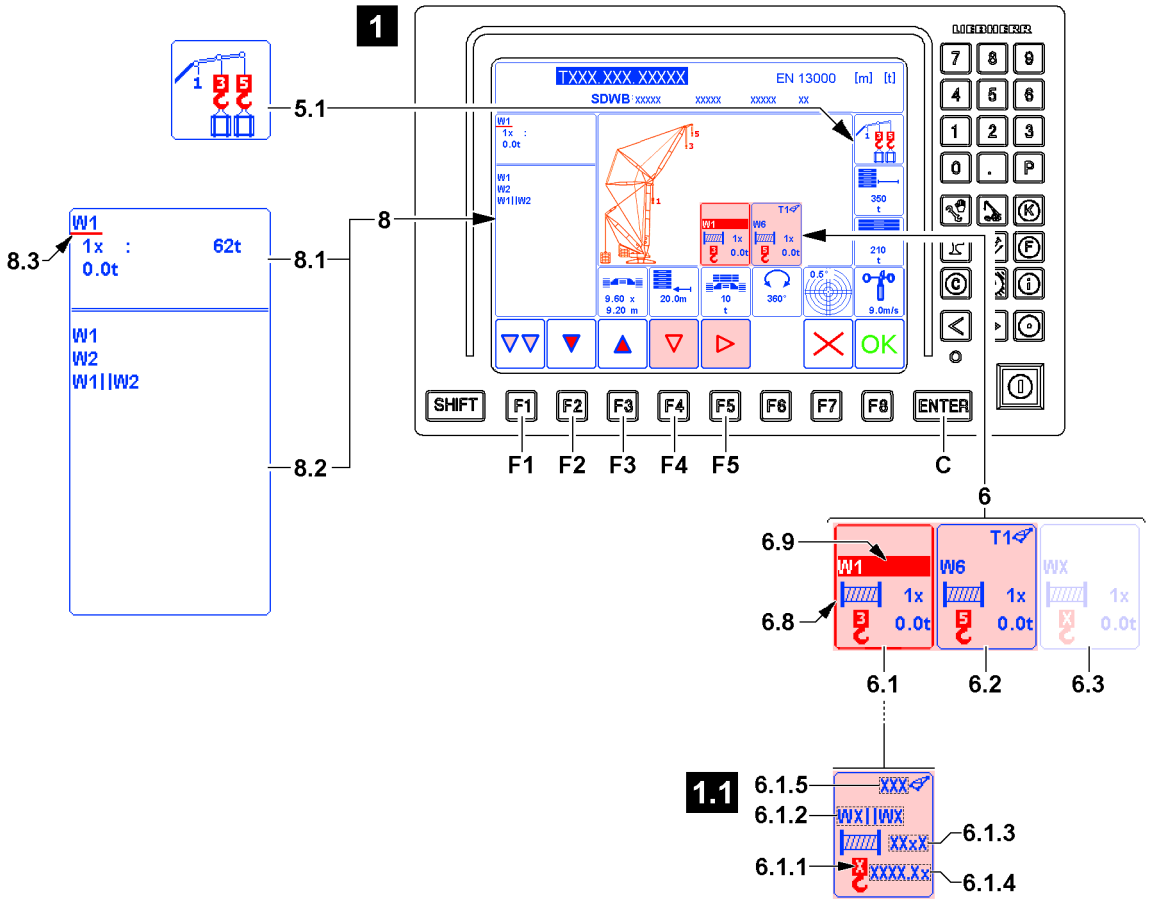

Fig.120603

The lifting category **6** includes, depending on the number of selected load positions, one to three display windows, see illustration **1**.

The display windows are always dependent on the settings for the icon *Load position* **5.1**.

6.1 Display window
- Display window for the first load position

6.2 Display window
- Display window for the second load position

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- **Note**: Appears only when a second load position was selected.

6.3 Display window
- Display window for the third load position
- **Note**: Appears only when a third load position was selected.

Markers in the display window of the respective load position, see illustration **1.1**:

6.1.1 Load position
- Selected load position

6.1.2 Hoist winch
- Assigned hoist winch, at parallel operation both assigned hoist winches are shown.

6.1.3 Reeving
- Reeving of assigned hoist winch

6.1.4 Hook block weight
- Weight of reeved hook block

6.1.5 Fixed accessory
- Type / kind of fixed accessory
- **Note**: Appears only when fixed accessory (load position 5) was selected.

4.9.1 Selecting the lifting category

Note
If the correct hoist winch, reeving and accessory, if applicable, is already assigned to a load position, then the settings for this marker can be skipped.

▶ Press function key **F2** or function key **F3** until the display window for the next load position is activated.

▶ If no other settings are required: Change to the following section „Taking over the entries and settings from the lift category“.

▶ Press the function key **F1** until the lifting category **6** is highlighted in pink, see illustration **1**.

Result:

– The lifting category **6** is selected.
The red selection frame **6.8** surrounds the first display window **6.1**.
The first marker in the first display window **6.1** is set to active.
The active marker is always highlighted with a red surface **6.9**.
– The Editing / selection window **8** appears.
– The preselection possibilities are displayed in the upper area **8.1** of the Editing / selection window **8**. The first preselection possibility is automatically underlines and activated with the selection bar **8.3**.
– In the lower area **8.2** of the Editing / selection window **8** the respective selection possibilities are displayed.
– Above function key **F2**, function key **F3**, function key **F4** and function key **F5** appear the icons for navigation in the individual program categories.

Note
Navigation in the lifting category **6**
Applies only when several display windows are shown.

▶ Press the function key **F4**: The red selection frame **6.8** moves by one icon to the left.

▶ Press the function key **F5**: The red selection frame **6.8** moves by one icon to the right.

▶ If the red selection frame **6.8** is moved in one direction past the edge of the lifting category **6** then it enters again from the other direction.

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Note
Navigation in Editing / selection window **8**
- ▶ Press the function key **F2**: The selection bar **8.3** changes downward by one line.
- ▶ Press the function key **F3**: The selection bar **8.3** changes upward by one line.
- ▶ When the upper area **8.1** and the lower area **8.2** are assigned: Press the ENTER **C** key and change between the upper area **8.1** and the lower area **8.2**.

4.9.2 Assigning the hoist winch

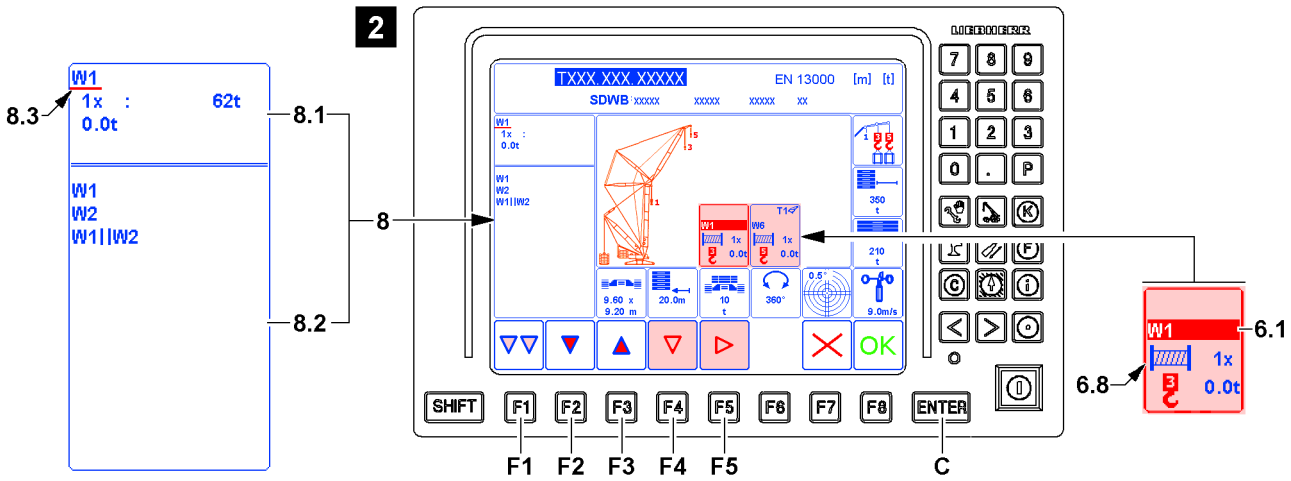

Fig.120604

Note
Assigning abbreviations for the hoist winches
- ▶ W1: Abbreviation for winch 1.
- ▶ W2: Abbreviation for winch 2.
- ▶ W6: Abbreviation for winch 6.

Note
The following section describes by means of an example how a certain hoist winch is assigned.
- ▶ Always assign the required hoist winch.

Make sure that the following prerequisite is met:
- – All entries and settings in the previous program category are correct and complete.

When the desired display window is not marked with the red selection frame **6.8**:
- ▶ Press the function key **F5** or function key **F4** until the red selection frame **6.8** marks the desired display window (in example „load position 3“), see illustration **2**.

Result:

- – The preselection possibilities are displayed in the upper area **8.1** of the Editing / selection window. **8** The first preselection possibility is automatically underlines and activated with the selection bar **8.3**.
- – In the lower area **8.2** of the Editing / selection window **8** the respective selection possibilities are displayed.

- ▶ Press the function key **F2** or function key **F3** until the hoist winch selection in the upper area **8.1** is underlined with the selection bar **8.3**. (In example „W1“).

Result:

- – In the active display window, the display for the assigned hoist winch **6.1.2** is highlighted in red.

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When the hoist winch selection is underlined with the selection bar **8.3**:

▶ Press the ENTER key **C**.

Result:

– The selection bar **8.3** changes in the lower area **8.2** of the Editing / selection window **8**.

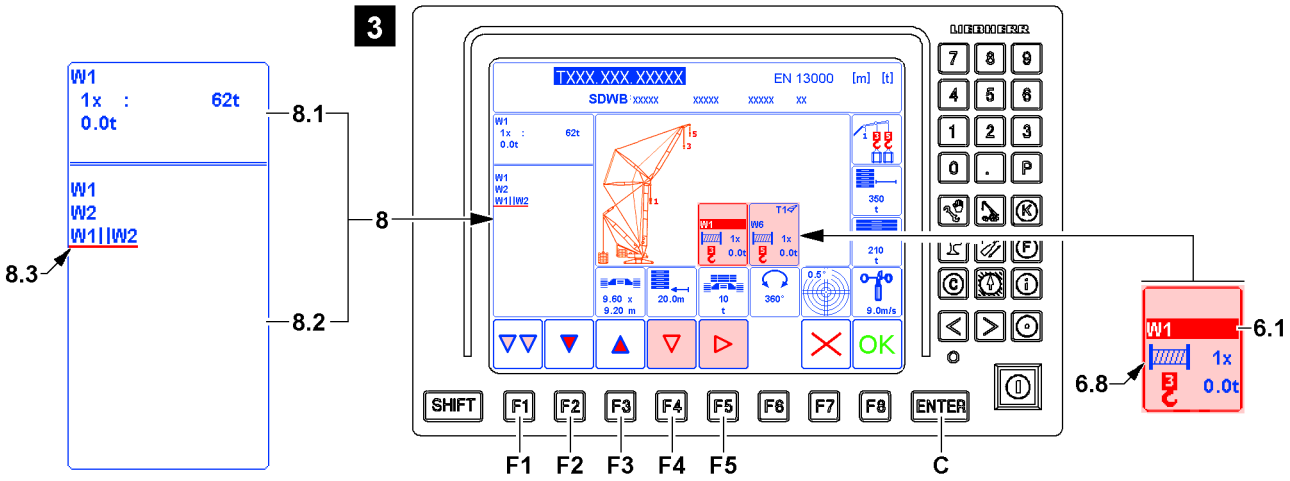

Fig.120605

▶ Press the function key **F2** or function key **F3** until the required selection in the upper area **8.2** is underlined with the selection bar **8.3**. (As example „Parallel operation WI and WII“), see illustration **3**.

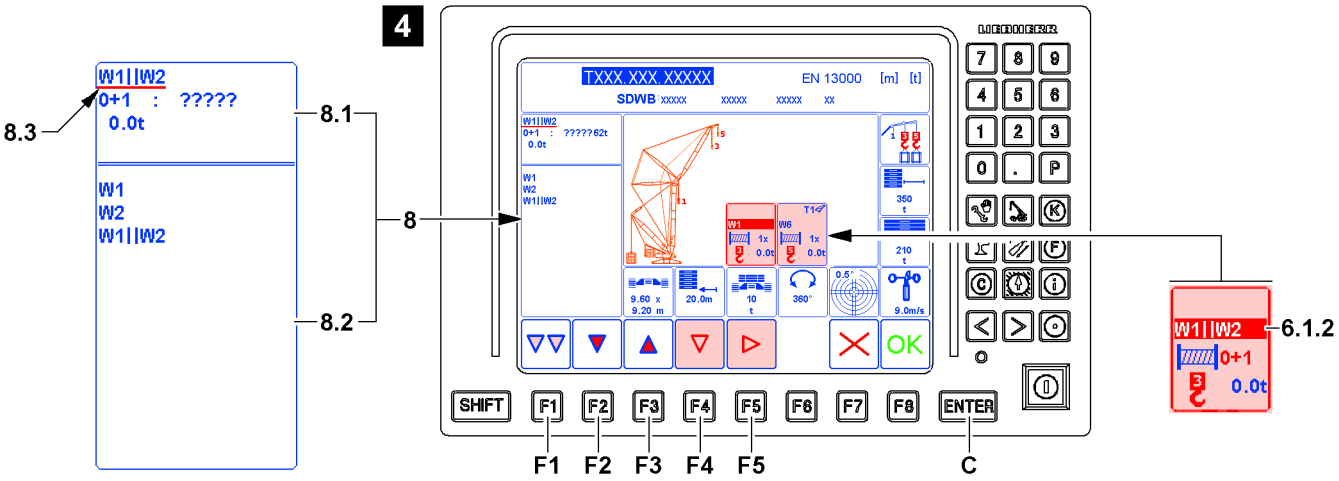

Fig.120606

When the required preselection possibility is underlined with the selection bar **8.3**:

▶ Press the ENTER key **C**.

Result:

– The preselection possibility is defined (In example „Parallel operation WI and WII“).
– In the icon for load position 3 appears as the new setting as assigned hoist winch **6.1.2**, see illustration **4**.
– The selection bar **8.3** changes again in the upper area **8.1** of the Editing / selection window **8**.

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Note
Effect of single / parallel operation of hoist winches for the reeving line
Changes for values for the reeving **8.1.1** and the maximum load **8.1.2**:
When changing from parallel operation of hoist winches to single operation of one hoist winch, the current reevings are added up.
When changing from single operation of one hoist winch to parallel operation of two hoist winches, the current reeving **8.1.1** is divided.
If it is not a number which can be divided, then question marks („?“) or the value „0.0“ appear instead of a maximum load **8.1.2**, see illustration **4**.
▶ A valid reeving must be entered.
▶ For subsequent procedure, see the following section „Assigning reeving“.

4.9.3 Assigning reeving

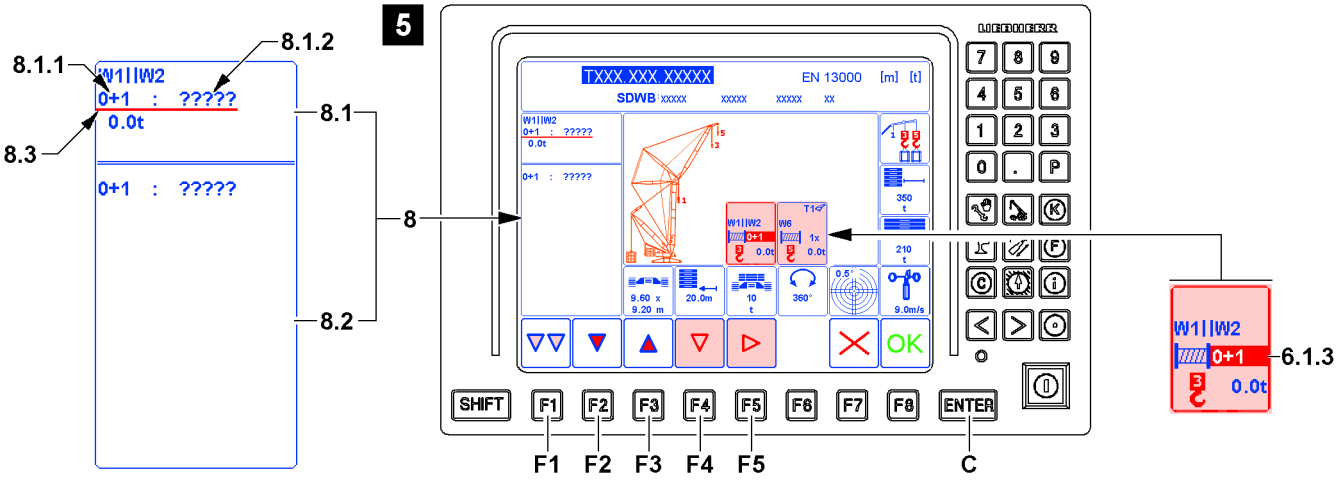

Fig.120607

Note
The following section describes by means of an example how a certain reeving is assigned.
▶ Always assign the required reeving.

Note
Illustration **5**: If question marks („?“) appear behind the reeving number **8.1.1**, then no valid reeving has been entered.
If the icon *OK* turns off above the function key **F8**, then an invalid selection is active.
▶ A valid reeving must now be entered.

– The preselection possibilities are displayed in the upper area **8.1** of the Editing / selection window **8**. The first preselection possibility is automatically underlines and activated with the selection bar **8.3**.
– In the lower area **8.2** of the Editing / selection window **8** the respective selection possibilities are displayed.

Note
The following section describes by means of an example how a certain reeving is entered.
▶ Always enter the required reeving.

▶ Press the function key **F2** or function key **F3** until the reeving in the upper area **8.1** is underlined with the selection bar **8.3**. (As example „0+1 : ?????“).

Result:

– In the active display window, the display for the reeving **6.1.3** is highlighted in red.

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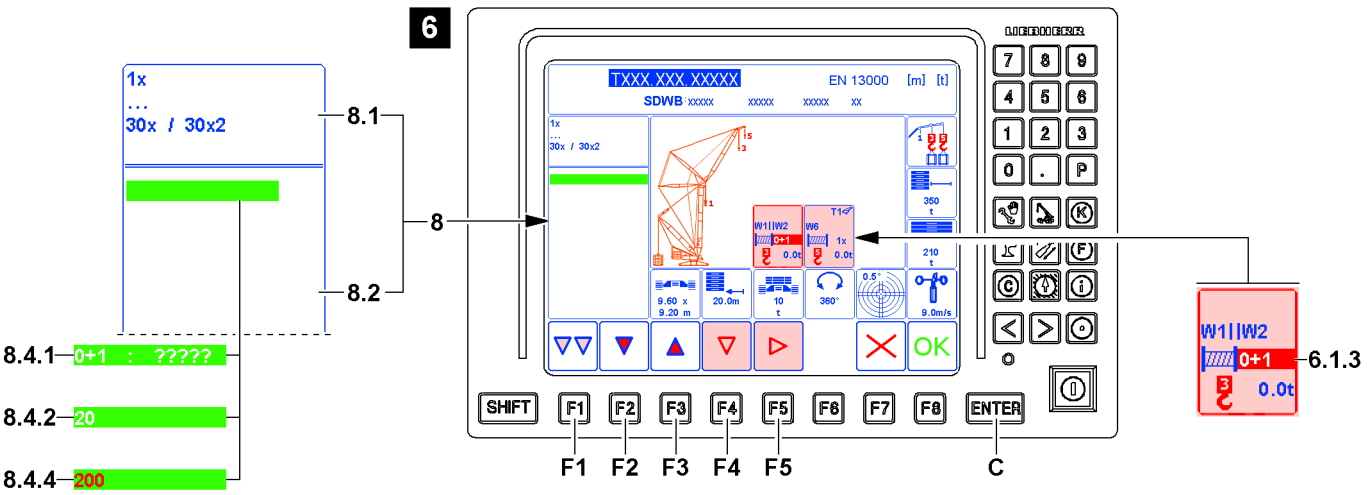

Fig.120608

When the reeving is underlined with the selection bar **8.3**:

▶ Press the ENTER key **C**.

Result:

– In the upper area **8.1** of the Editing / selection window **8** the permissible reevings are displayed, see illustration **6**.
– In the lower area **8.2** of the Editing / selection window **8** appears a green input field with the reeving value from the upper area **8.1**.

Note

▶ Always only one value must be entered for the reeving. In parallel operation, the code „x2“ is automatically added to the value and the value is assigned to both hoist winches.

▶ Enter the required number sequence via the keypad **A**, in example „20“.

Result:

– The original value **8.4.1** (in example „0+1 : ?????“) turns off.
– The new value **8.4.2** (in example „20“) appears.

Problem remedy

Invalid input value

When trying to accept an invalid input value **8.4.4** then the numbers are shown in red.

Enter only values according to the specifications from the upper area **8.1** of the Editing / selection window **8**.

▶ Enter the permissible value via the keypad **A**.

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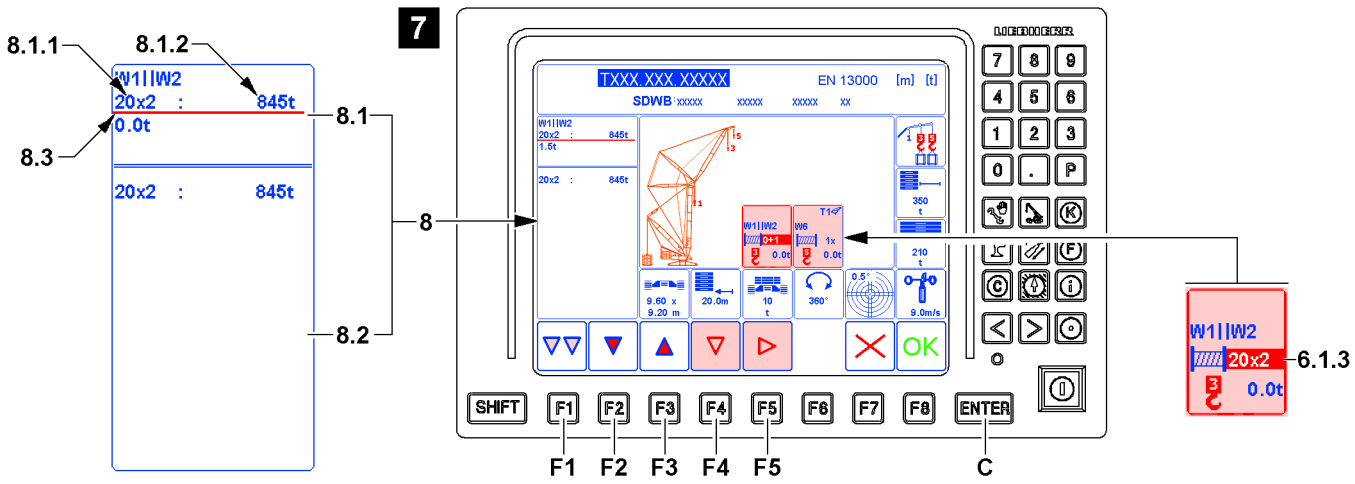

Fig.120609

▶ Press the ENTER key **C**.

Result:

– The new value is accepted and changed for parallel operation if necessary, see illustration **7**.
– In the display window appears the new value for the reeving **6.1.3**.
– In the upper area **8.1** appears the entered reeving **8.1.1**. In addition, the maximum load **8.1.2** appears, which could be lifted with this reeving under ideal conditions.

4.9.4 Entering the hook block weight

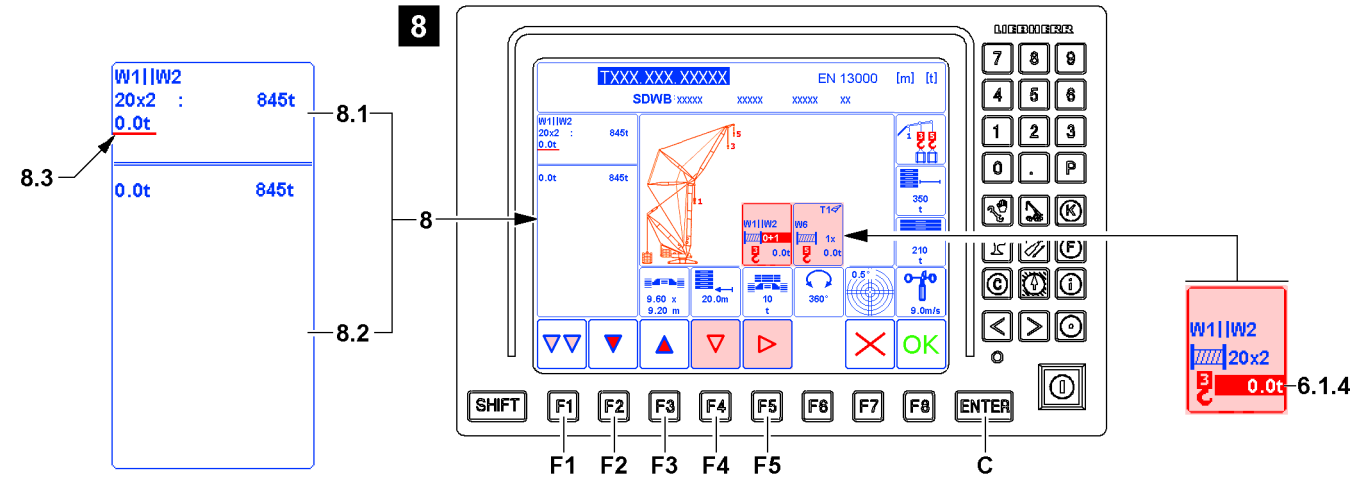

Fig.120610

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Note
If the correct hook block weight **6.1.4** already appears, then the settings for this marker can be skipped.

Change to the next marker (if present):
▶ Press the function key **F2** or function key **F3** until the next marker to be changed is underlined with the selection bar **8.3**.

Change into the next display window (if present):
▶ Press the function key **F5** or the function key **F4** and select the next display window.

Ending the *Set up* program (when all entries and settings are made):
▶ When all entries and settings in the lifting category **6** are correct, see section „Taking over entries and settings from the set up program“.

– The preselection possibilities are displayed in the upper area **8.1** of the Editing / selection window. **8** The first preselection possibility is automatically underlines and activated with the selection bar **8.3**.
– In the lower area **8.2** of the Editing / selection window **8** the respective selection possibilities are displayed.

Note
The following section describes by example how a certain hook block weight is entered.
▶ Always enter the required hook block weight.

▶ Press the function key **F2** or function key **F3** until the hook block weight in the upper area **8.1** is underlined with the selection bar **8.3**. (In example „0.0t“).

Result:

– In the active display window, the display for the hook block weight **6.1.4** is highlighted in red.

When the hook block weight is underlined with the selection bar **8.3**, see illustration **8**:
▶ Press the ENTER key **C**.

Result:

– In the upper area **8.1** of the Editing / selection window **8** the permissible hook block weight is displayed.
– In the lower area **8.2** of the Editing / selection window **8** appears a green input field with the hook block weight from the upper area **8.1**.

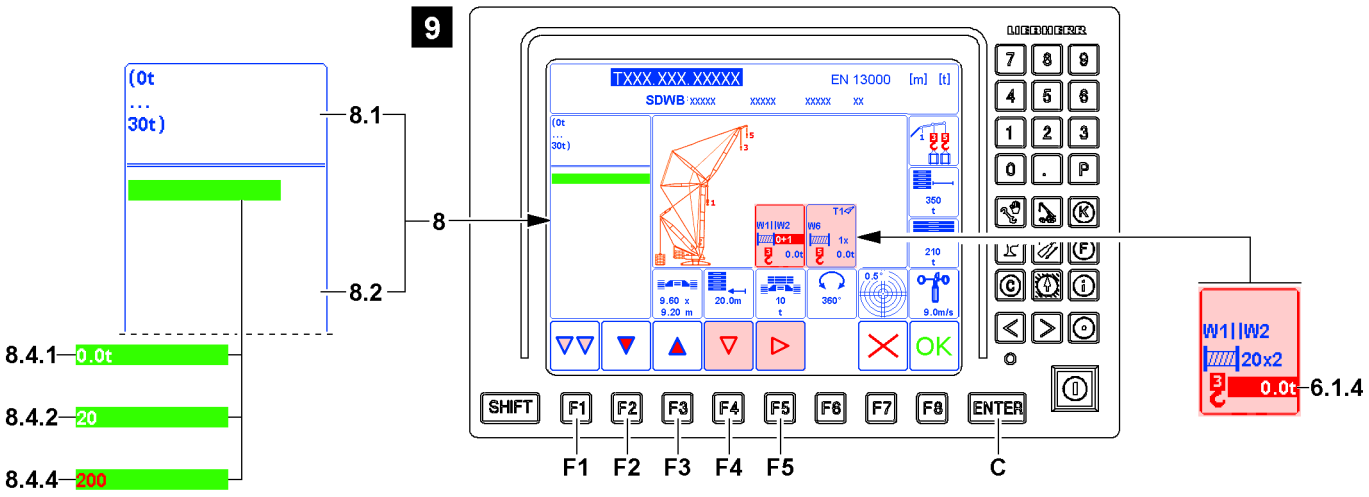

Fig.120611

The entry is made without the measuring unit:
▶ Enter the required number sequence via the keypad **A**, in example „20“.

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Result:

Illustration **9**:
– The original value **8.4.1** (in example „0t“) turns off.
– The new value **8.4.2** (in example „20“) appears.

Problem remedy
Invalid input value
When trying to accept an invalid input value **8.4.4** then the numbers are shown in red.
Enter only values according to the specifications from the upper area **8.1** of the Editing / selection window **8**.
▶ Enter the permissible value via the keypad **A**.

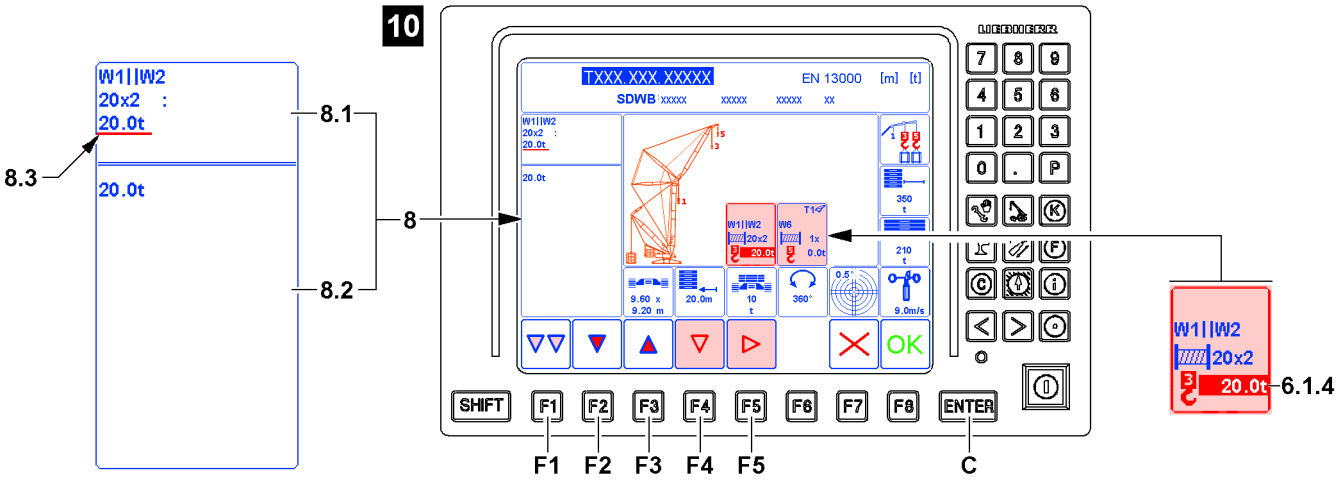

Fig.120612

▶ Press the ENTER key **C**.

Result:

– The new value is taken over, see illustration **10**.
– In the display window appears the new value for the hook block weight **6.1.4**.
– In the upper area **8.1** appears the new value for the hook block weight.

4.9.5 Assigning fixed accessory

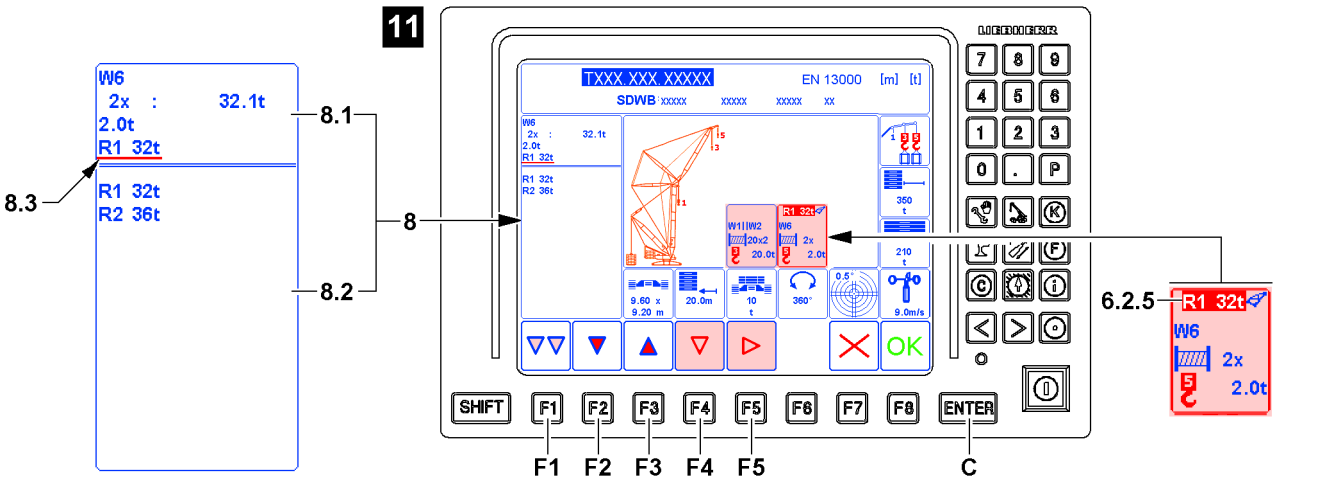

Fig.120613

The marker for the fixed accessory **6.2.5** only appears when a corresponding load position is selected.

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Note
If the correct maximum fixed accessory **6.2.5** already appears, then the settings for this marker can be skipped.

Change to another marker (if necessary):
▶ Press the function key **F2** or function key **F3** until the next marker to be changed is underlined with the selection bar **8.3**.

Change into the next display window (if present):
▶ Press the function key **F5** or the function key **F4** and select the next display window.

Ending the *Set up* program (when all entries and settings are made):
▶ When all entries and settings in the lifting category **6** are correct, see section „Taking over entries and settings from the set up program“.

– The preselection possibilities are displayed in the upper area **8.1** of the Editing / selection window. **8** The first preselection possibility is automatically underlines and activated with the selection bar **8.3**.
– In the lower area **8.2** of the Editing / selection window **8** the respective selection possibilities are displayed.

Note
Abbreviations for fixed accessory
Only the fixed accessory is listed for which a load chart is available.
For example, the following can appear corresponding to the load chart name (chart number):
▶ R1: Abbreviation for boom nose 1. (Appears only when a valid load chart for boom nose 1 is available)
▶ R2: Abbreviation for boom nose 2. (Appears only when a valid load chart for boom nose 2 is available).

Make sure that the following prerequisite is met:
– The desired display window is marked with the red selection frame **6.8**.

When the desired display window is not marked with the red selection frame **6.8**:
▶ Press the function key **F5** or function key **F4** until the red selection frame **6.8** marks the desired display window (in example „load position 5“), see illustration **11**.
▶ Press the function key **F2** or function key **F3** until the fixed accessory in the upper area **8.1** is underlined with the selection bar **8.3**. (In example „R1 32t“).

Result:

– In the active display window, the display for the fixed accessory **6.2.5** is highlighted in red.

When the fixed accessory is underlined with the selection bar **8.3**:
▶ Press the ENTER key **C**.

Result:

– The selection bar **8.3** changes in the lower area **8.2** of the Editing / selection window **8**.

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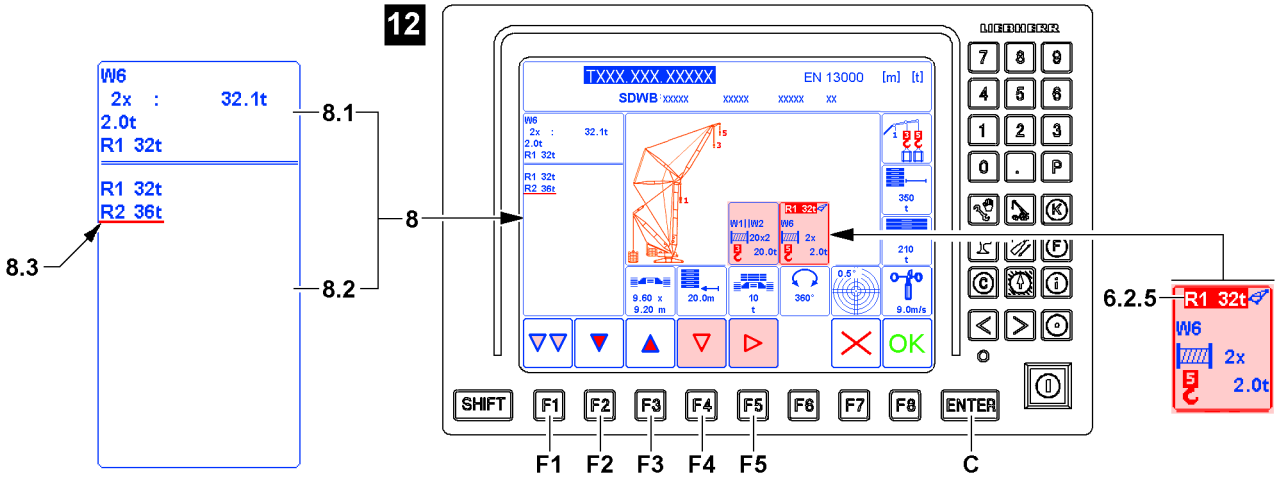

Fig.120614

▶ Press the function key **F2** or function key **F3** until the required selection in the upper area **8.2** is underlined with the selection bar **8.3**. (In example „R2 36t“), see illustration **12**.

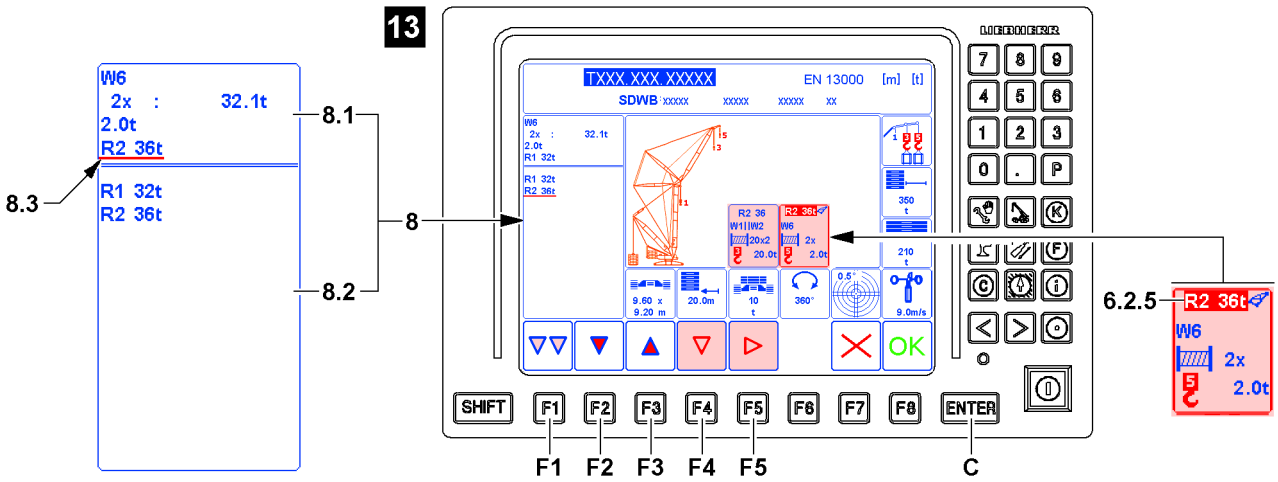

Fig.120615

▶ Press the ENTER key **C**.

Result:

– The selection is defined (example „R2 36t“).
– In the icon for load position 5 appears as the selected setting as fixed accessory **6.2.5**, see illustration **13**.
– The selection bar **8.3** changes again in the upper area **8.1** of the Editing / selection window **8**.

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4.9.6 Accepting the entries and settings of the lifting category

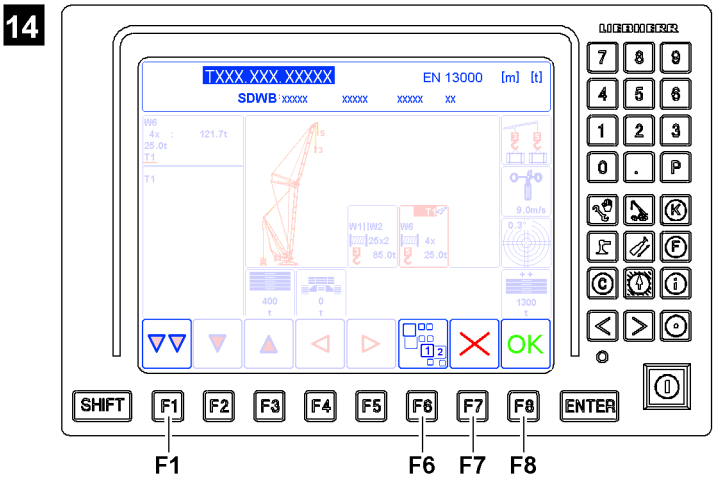

Fig.120616

Make sure that the following prerequisites are met:
– All selected entries and settings in the lifting category are correct and complete.

▶ Change to the following section „Taking over the entries and settings from the set up program“.

Problem remedy
It was determined that one or several markers are not correct?
By pressing the function key **F1**, the individual program categories can be switched through one after the other. After the last program category, the first is called up again.
▶ Press the function key **F1** until the lifting category is called up again. Then all entries and settings can be changed.

4.10 Taking over the entries and settings from the *Set up* program

WARNING
Danger of accident due to deviating set up configuration!
If the actual set up configuration of the crane deviates from the entries and settings in the *Set up* program, then the overload protection is not correctly set.
An incorrectly set overload protection calculates the actual load incorrectly and transmits faulty display values.
The crane can be overloaded unnoticed and topple over. Personnel can be severely injured or killed.
▶ The entries and settings in the *set up* program must match the actual set up configuration of the crane.

Make sure that the following prerequisite is met:
– There is no load on the hook.

▶ Check all entries and settings on the screen to ensure they are correct.

If the icon for additional levels appears above the function key **F6** (see illustration **14**), then they must be checked also.

When the icon for additional levels appears:
▶ Press the function key **F6** and check all entries and settings on the screen to ensure they are correct.

When all entries and settings have been checked to ensure that they are correct:
▶ Press the function key **F8** (below the *OK* icon) and take over the entries and settings from the *Set up* program.

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Result:

– The *Set up* program is ended.
– Entries and settings from the *Set up* program have been taken over into the crane operating screen.
– The crane operating screen is called up.

Problem remedy

It was determined that one or several markers are not correct?
By pressing the function key **F1**, the individual program categories can be switched through one after the other. After the last program category, the first is called up again.

▶ Press the function key **F1** until the category to be changed is called up. Then all entries and settings can be changed.

Note

Caution Program abort.

▶ By pressing the function key **F7**, the process is aborted and the last valid entries and settings from the *Set up* program are called up.

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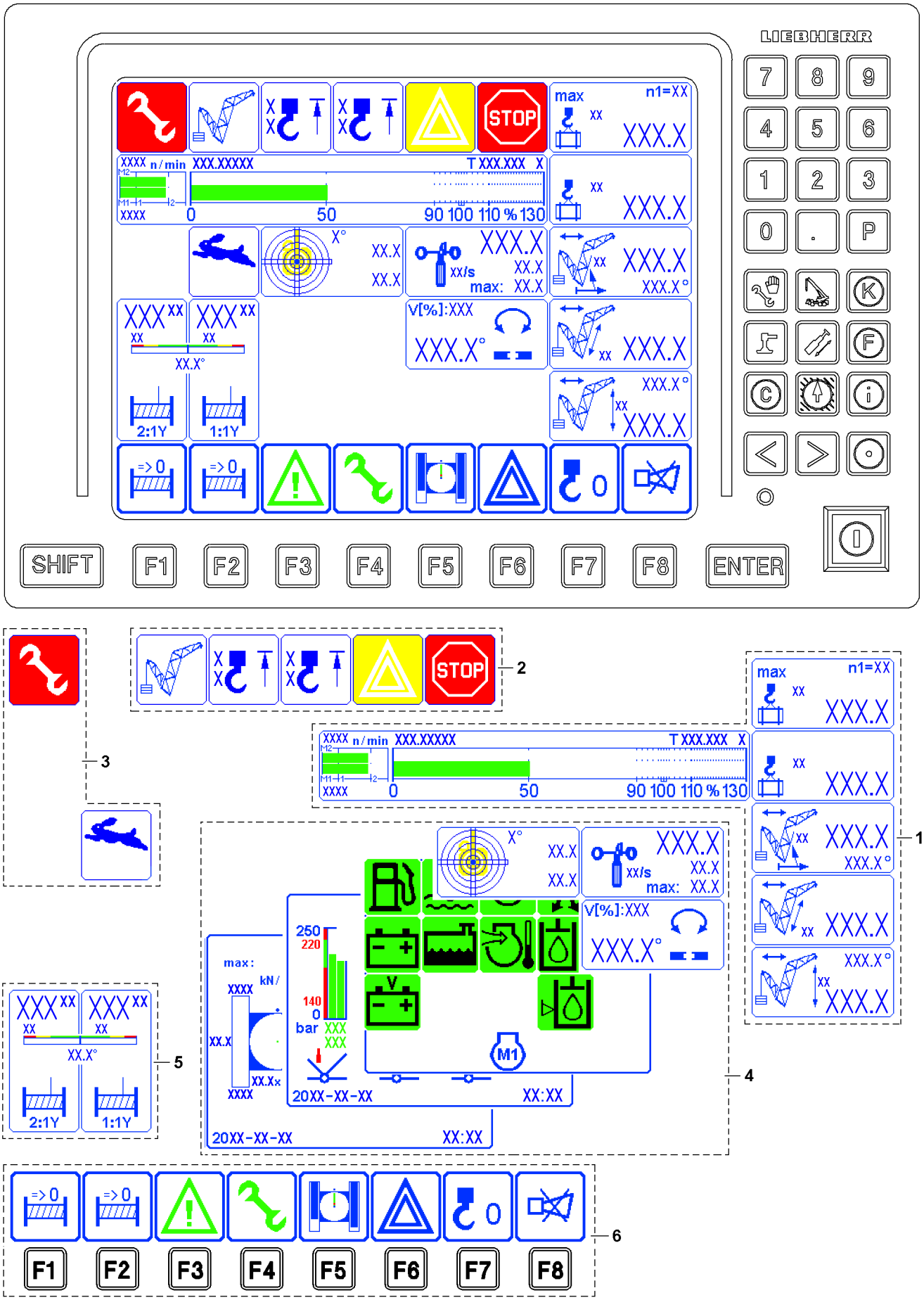

Fig.113426

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5 The *Crane operation* program on LICCON monitor 0

The *Crane operation* LICCON program assists the crane operator by displaying the data relevant for crane operation clearly on three LICCON monitors. An acoustic signal accompanies all critical displays. Depending on the equipment, a range of other icons may also be turned on as additional displays, either as required by the crane operator, or automatically in the event of a problem.

It also alerts the crane operator to imminent overload conditions. In the event of overload and many error conditions, which could be hazardous during crane operation, the system shuts off.

The LICCON monitor 0 is divided into six areas in the *Crane operation* program:

1 Crane geometry and load information

2 Alarm functions

3 LICCON Monitor 0 special functions

4 Monitoring field
- Monitoring functions during crane operation
- Monitoring of relapse cylinders
- Monitoring of surface pressure and center of gravity
- Monitored auxiliary functions

5 Winch display
- Winch 1 and winch 2

6 Function key line
- Function keys always refer to the icons shown directly above
- **Note:** If no icon is shown in the line directly above the function key, then no function is assigned in the program to the function key.

Note

▶ The monitor illustrations in this chapter are only examples.

▶ The numerical values in the individual icons and charts do not have to necessarily match the crane exactly.

▶ The configuration of the LICCON monitor with icons is only descriptive.

▶ An identical icon display will **not** appear during crane operation.

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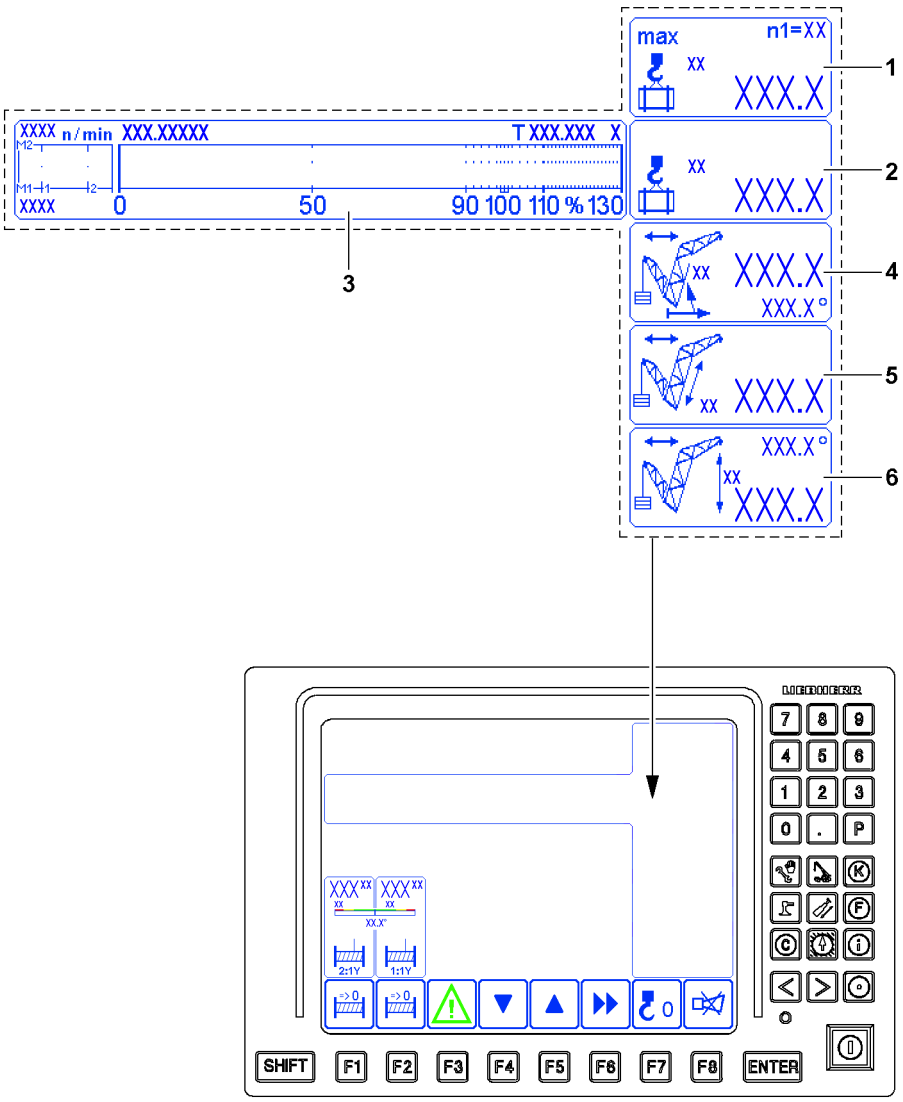

Fig.114296

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5.1 Crane geometry and load information

Display on LICCON monitor 0

Note

- The crane illustrations in this section are only examples and are generalized.
- They may differ from the crane type and equipment.

The information regarding crane geometry and load involves six icons:

1 Maximum load

2 Actual load

3 Bar diagram Utilization

4 Boom radius

5 Boom length

6 Pulley head height

Note

- A question mark (?) is shown instead of values when no load chart value can be accessed. Example: The crane is not in the range of the load chart.
- A question mark (?) is shown instead of values if the value cannot be calculated / determined. Example: A sensor error can be present - pay attention to error messages.

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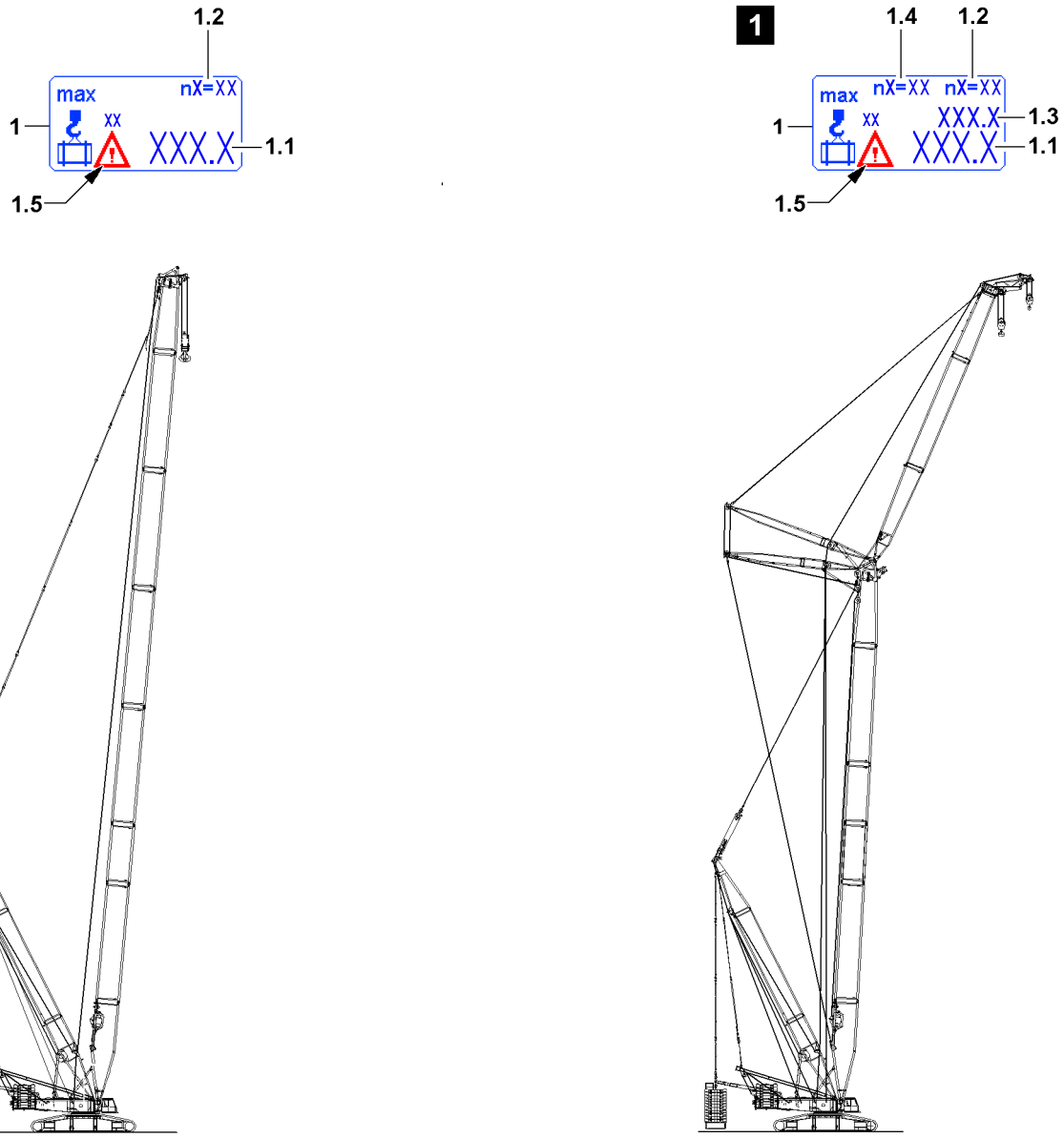

Fig.121770

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5.1.1 Maximum load

According to the set up configuration, the following changes:
- The illustration of the icon.
- The position of values in the icon, see sample illustration **1**.

1 *Maximum load* icon
- In [t] or [lbs]

1.1 Maximum load
- Maximum load on the **first** load position
- In [t] or [lbs]

1.2 Reeving
- Reeving on the **first** load position
- Load position (n1 to n5) and assigned reeving number (settings from the *Set up* program)
  n1= Load position 1
  n2= Load position 2
  n3= Load position 3
  n4= Load position 4
  n5= Load position 5

1.3 Maximum load
- **Note**: Appears only when a second load position is selected (settings from the *Set up* program).
- Maximum load on the **second** load position
- In [t] or [lbs]

1.4 Reeving
- Reeving on the **second** load position
- Load position (n1 to n5) and assigned reeving number (settings from the *Set up* program)
  n1= Load position 1
  n2= Load position 2
  n3= Load position 3
  n4= Load position 4
  n5= Load position 5

1.5 Warning icon*
- **Note**: Appears solely for certain crane types.
- Appears possibly when:
  - The permissible wind speed is exceeded.
  - The permissible crane incline is exceeded.

Note

▶ The *Maximum load* (also *Maximum load according to the load chart and the reeving*) is the load, which the crane can lift in its current operating condition with the maximum utilized ballast / counterweight.

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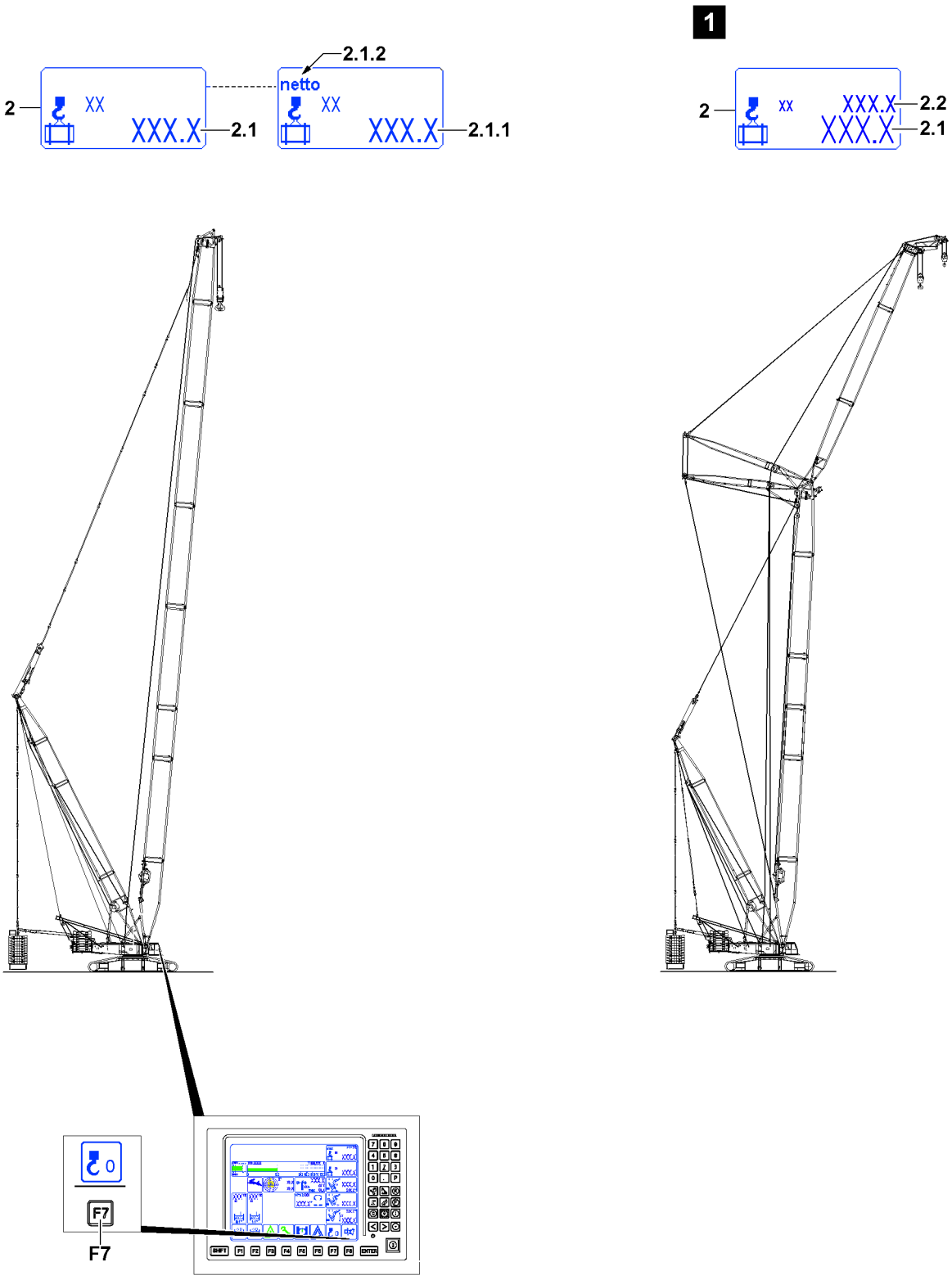

Fig.123759

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5.1.2 Actual load (current load) / net load

According to the set up configuration, the following changes:
- The illustration of the icon
- The position and number of values in the icon, see sample illustration **1**.

2 *Actual load / net load* icon
- With text for MU [t] or [lbs]

2.1 *Actual load* display
- *Actual load* display = load in [t] or [lbs] that is currently suspended on the **first** load position.
- Display of the calculated total load including the weights for the load carrying, load taking on and / or fastening equipment.

2.1.1 *Net load* display
- *Net load* display = the *Actual load* display **2.1** can be changed at any time to *Net load* display **2.1.1** (tared) by pressing the function key **F7**.
- After pressing the function key **F7** the display value is set to zero and the word *net* **2.1.2** is shown.
- As long as net load is set, the icon above the function key **F7** is shown in red.
- If the taring is cancelled, the word *net* **2.1.2** disappears from the icon and the gross load value is displayed.

  The change to net load is cancelled by the following actions:
  - By pressing the function key **F7** again.
  - By telescoping the boom by more than three LE (LE= 1 decimeter or 1/10 ft).
  - By luffing by more than ±4°.
- **Note**: This makes it possible to eliminate the weights of the load handling, load taking on and / or fastening equipment in the display value. The maximum load is not increased / adjusted.

WARNING
Incorrectly determined weight of the load!
Due to operating errors or tolerances, deviations can occur for the displayed values in the *Actual load / net load* icon **2**.
- ▶ The *Actual load* / *Net load* display is no calibrated weighing device.
- ▶ Always observe the actual weight of the load in connection with the load charts and the set up configuration of the crane.

Note
- ▶ The *Actual load* display **2.2** for the **second** load position appears only for certain crane types with special load charts for two load positions.

2.2 *Actual load* display
- **Note:** Appears only when a second load position is selected (settings from the *Set up* program).
- *Actual load* display = load (in [t] or [lbs]) that is currently suspended on the **second** load position.
- Display of the calculated total load including the weights for the load carrying, load taking on and / or fastening equipment.

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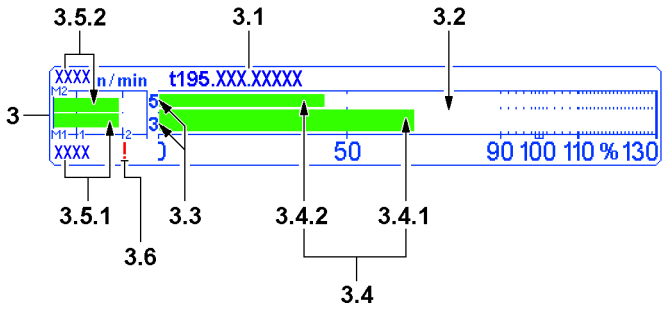

Fig.121771

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5.1.3 Bar diagram Utilization

3 *Bar diagram Utilization* icon
- In percent [%]

3.1 Chart names
- Note to the set chart name (chart number) with associated operating mode

3.2 Utilization scale
- Marking from a utilization of 90 %: LMB advance warning
- Marking at a utilization of 100 %: LMB STOP shut off

3.3 Load position
- The load position assigned to the respective utilization bar

3.4 Utilization bar
- Current utilization of the crane
- Appears in blue, green, yellow and red, depending on the situation
- Utilization bar **3.4** blue / green: Utilization in permissible range
- Utilization bar **3.4** yellow: Advance warning! Utilization just before impermissible range
- Utilization bar **3.4** red: Warning! Utilization in impermissible range
- For two load positions:
  3.4.1 Utilization bar for the **first** load position
  3.4.2 Utilization bar for the **second** load position

Note
▶ The set up configuration of the crane can only be changed when the utilization bar **3.4** is blue.

Utilization of the crane		
Current utilization of the crane	=	$\frac{\text{Actual load}}{\text{Maximum load}}$

3.5 Engine rpm
- In revolutions per minute
- The engine rpm is always shown numerically and graphically
- When the rpm is locked, a „+“ is shown behind the rpm value.
- **NOTICE!** If the display is in red, an error is present.
- **Note:** Question marks (?) appear if there is an error in the rpm recording. Then the nominal rpm for the diesel engine is set for the output regulation of the drives. The set nominal rpm is shown blinking. An error message is issued.
- Only for crane types with two engines:
  3.5.1 First engine (Engine 1)
  3.5.2 Second engine (Engine 2)

3.6 Limitation of engine rpm*****
- **Note**: Only for certain crane types with ECO-Mode*****.
- If the engine rpm is limited by the ECO mode, then a „!“ is displayed behind the value for the engine rpm.

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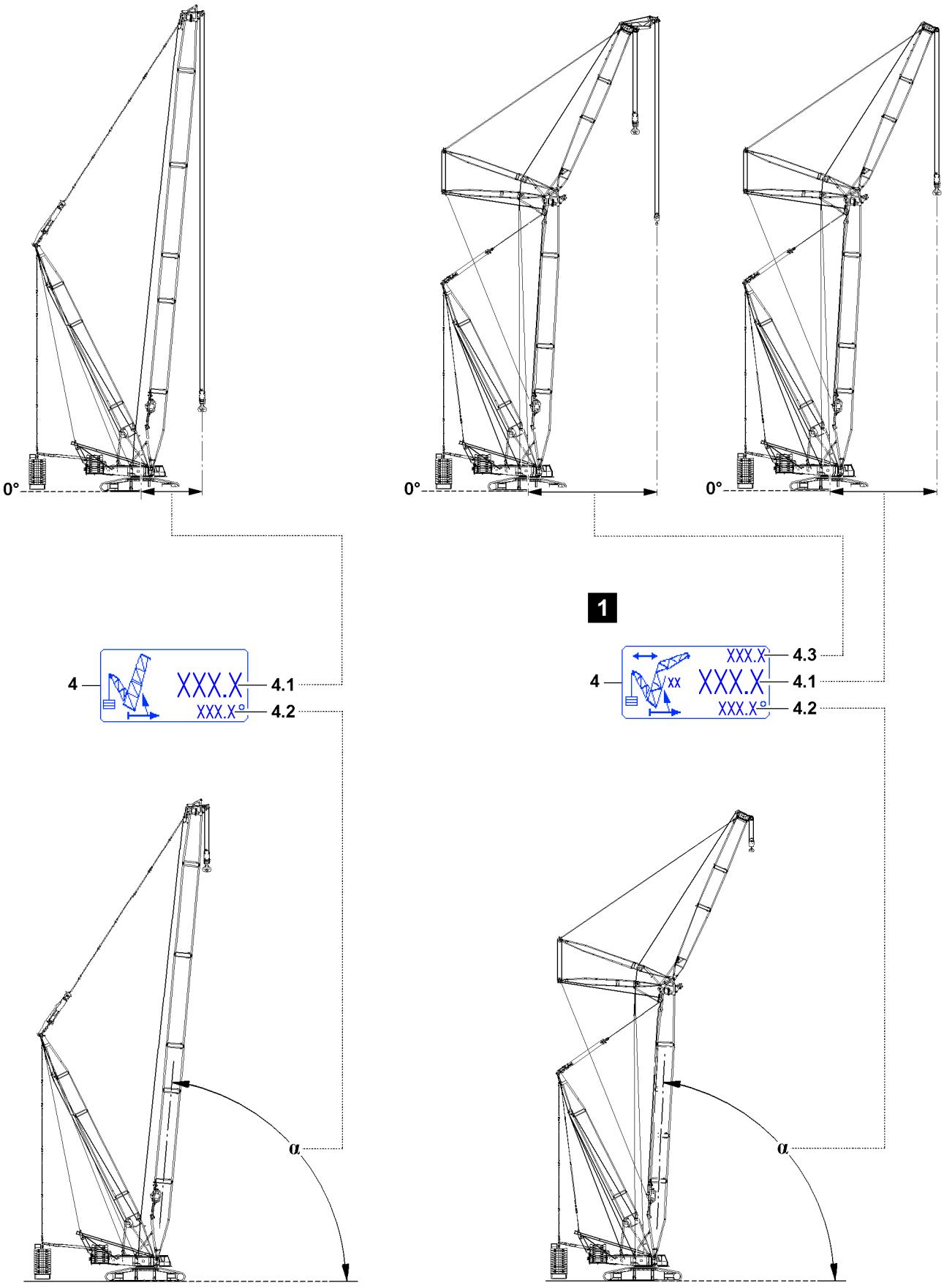

Fig.114264

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5.1.4 Boom radius

According to the set up configuration, the following changes:
- The illustration of the icon
- The position and number of values in the icon, see sample illustration **1**.

4 *Boom radius* icon

4.1 Boom radius
- Boom radius **first** load position
- In [m] or [ft]
  Denotes the horizontal distance of the load hook from the center of rotation of the crane superstructure. This also takes into account the boom flexation due to its own weight and the suspended weight of the load.

4.2 Main boom angle
- In [°]
- Displayed is the angle of the main boom (angle α) to the horizontal

4.3 Boom radius
- **Note**: Appears only when a **second** load position is selected (settings from the *Set up* program).
- Boom radius **second** load position
- In [m] or [ft]
  Denotes the horizontal distance of the load hook from the center of rotation of the crane superstructure. This also takes into account the boom flexation due to its own weight and the suspended weight of the load.

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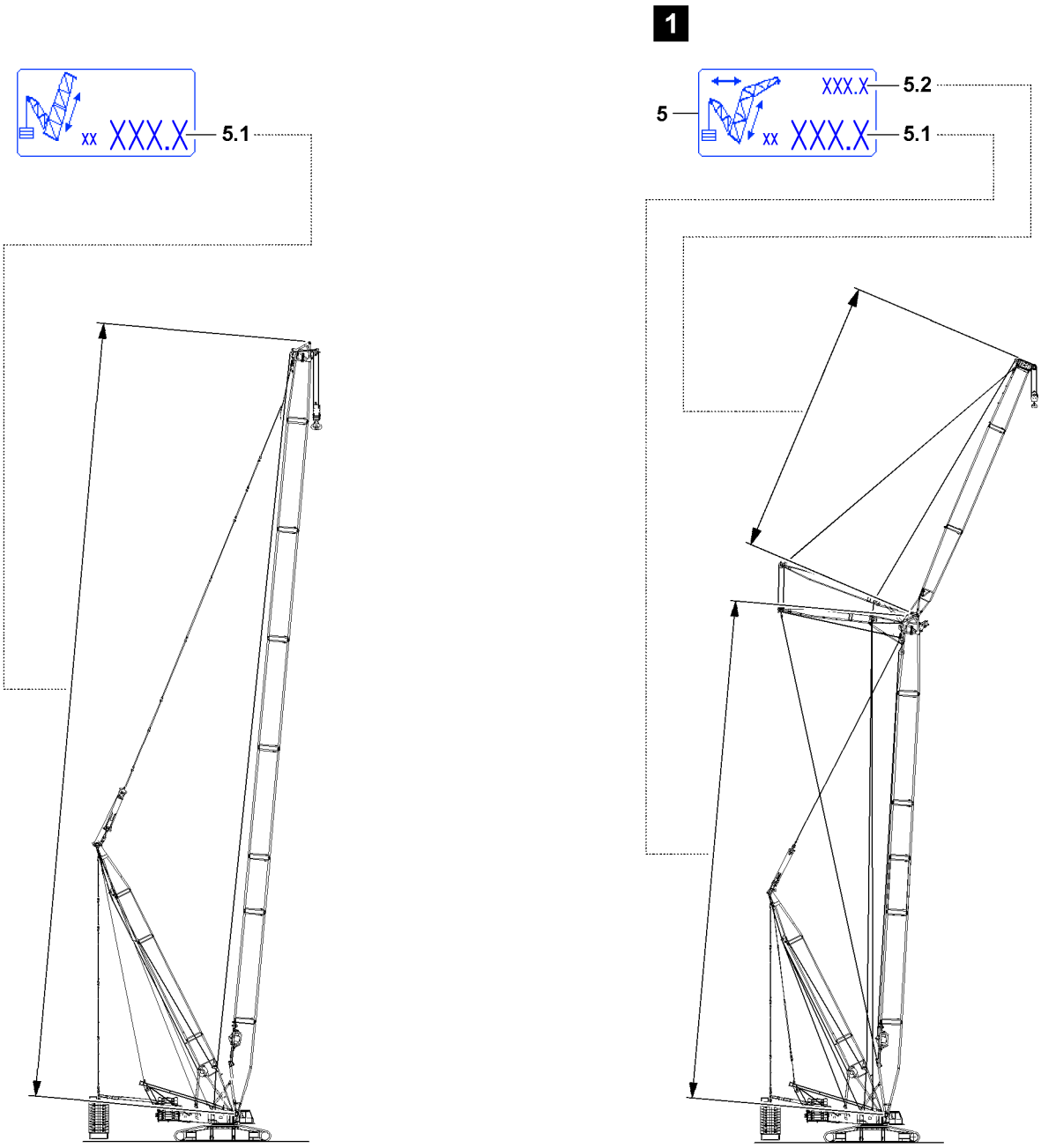

Fig.114265

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5.1.5 Boom length

According to the set up configuration, the following changes:
- The illustration of the icon
- The position of values in the icon, see sample illustration **1**.

5 *Boom length* icon

5.1 Length of main boom
- In [m] or [ft]

5.2 Length of auxiliary boom / accessory
- In [m] or [ft]

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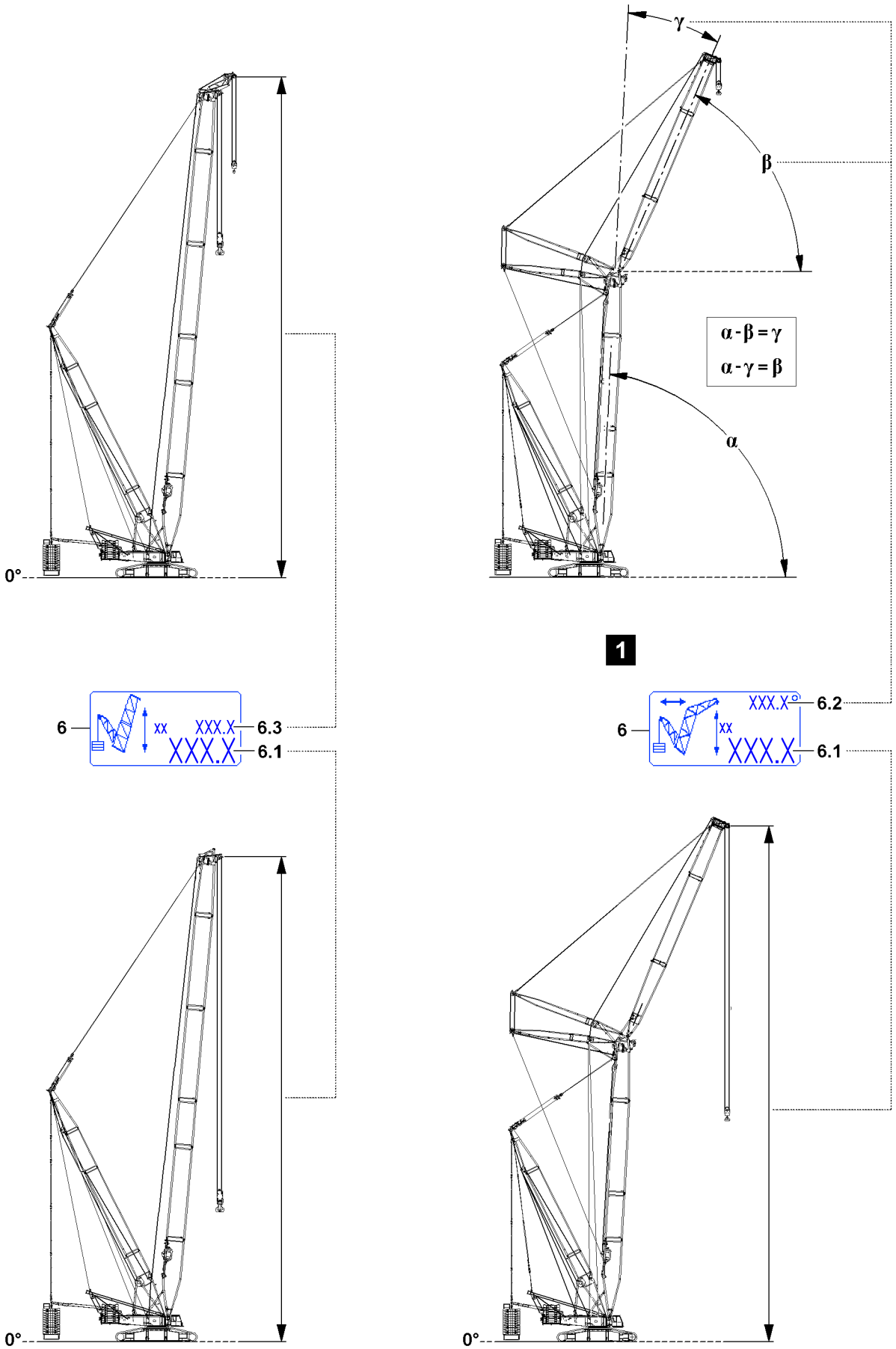

Fig.114266

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5.1.6 Pulley head height

Note
- ▶ Main boom angle **α**: The angle of the main boom to the horizontal.
- ▶ Angle auxiliary boom / accessory **β**: The angle of the auxiliary boom / accessory to the horizontal.
- ▶ Relative angle auxiliary boom / accessory **γ**: The angle of the auxiliary boom / accessory is determined relative to the main boom.

According to the set up configuration, the following changes:
- The illustration of the icon
- The position of values in the icon, see sample illustration **1**.

6 *Pulley head height* icon

6.1 Pulley head height
- Pulley head height **first** load position
- In [m] or [ft]
- Marks the vertical distance from the placement surface of the crane to the selected pulley head axle.

6.2 Angle auxiliary boom / accessory
- In [°]

Note
- ▶ Depending on the set up configuration and the load chart, a differentiation is made between an absolute angle display or a relative angle display.

β Absolute angle auxiliary boom / accessory
- The angle of the auxiliary boom / accessory to the horizontal in [°]
- Display absolute angle: For operating modes with load chart for a fixed defined main boom angle.

or

γ Relative angle auxiliary boom / accessory
- Angle between the main boom and the auxiliary boom / accessory in [°]
- Display relative angle: For operating modes with load chart for a fixed defined angle auxiliary boom / accessory.

6.3 Pulley head height
- **Note**: Appears only when a second load position is selected (settings from the *Set up* program).
- Pulley head height **second** load position
- In [m] or [ft]
- Marks the vertical distance from the placement surface of the crane to the selected pulley head axle.

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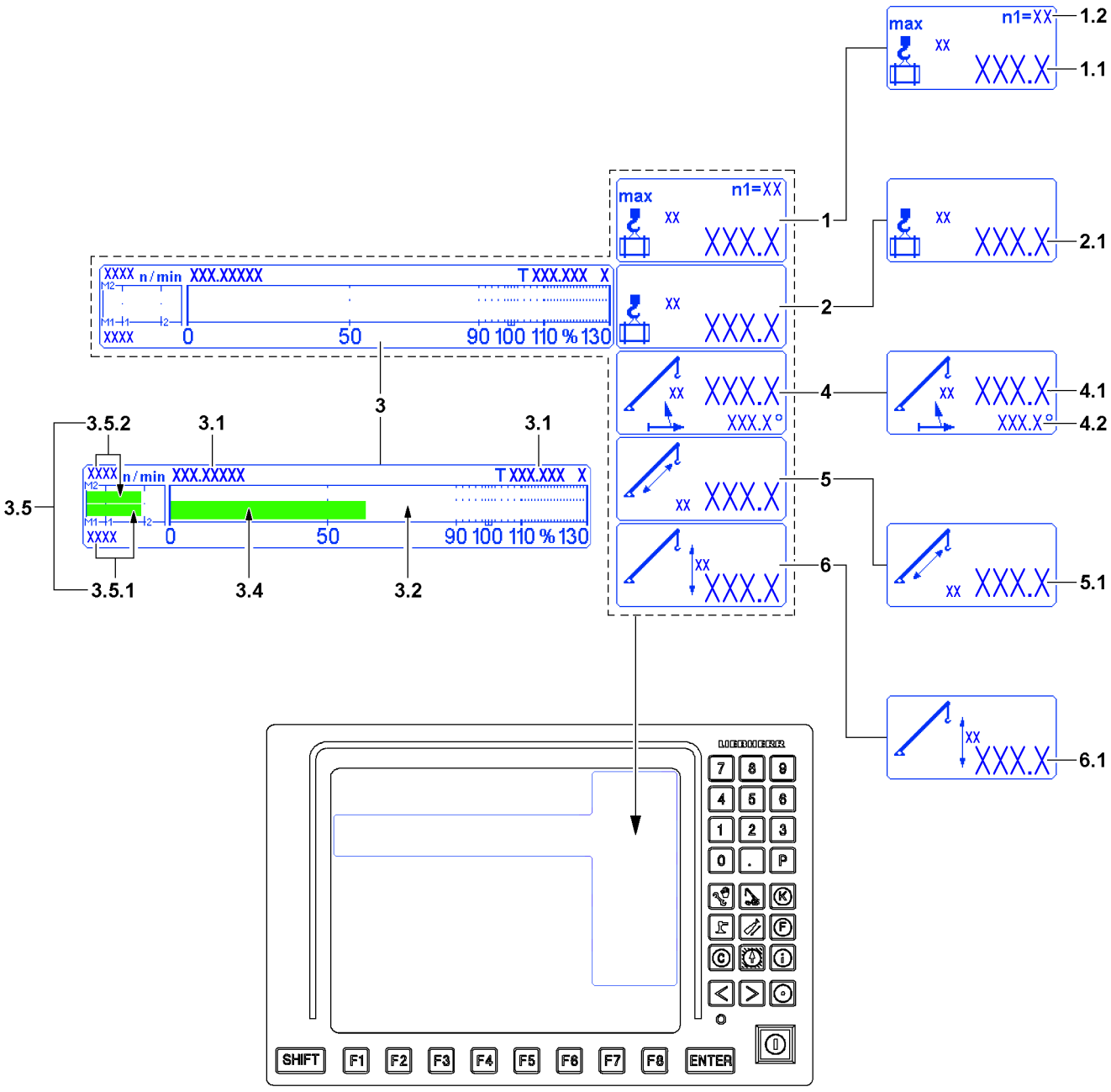

Fig.120624

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5.2 Information about crane geometry and load in the SA-operating mode

Display on LICCON monitor 0

Note
▶ Only for crane types with SA-operating mode.

The information about crane geometry and load in the SA-operating mode is comprised of six icons:

1 Maximum load
- Maximum load **1.1** in the SA-operating mode
  In [t] or [lbs]
- **1.2** Place holder Reeving

2 Actual load
- *Actual load* display **2.1** in the SA-operating mode
  In [t] or [lbs]

3 Bar diagram Utilization
- **3.1** Chart names
  - Note to the set chart name (chart number) with associated operating mode
  - **Note**: Depending on the crane type either in the left or right upper area of the Bar diagram Utilization **3**.
- **3.2** Utilization scale
  - Marking from a utilization of 90 %: Advance warning
  - Marking at a utilization of 100 %: STOP shut-off
- **3.4** Utilization bar
  - Current utilization of the crane in the SA-operating mode
  - Appears in blue, green, yellow and red, depending on the situation
  - Utilization bar **3.4** blue / green: Utilization in permissible range
  - Utilization bar **3.4** yellow: **Advance warning!** Utilization just before impermissible range
  - Utilization bar **3.4** red: **Warning!** Utilization in impermissible range
- **3.5** Engine rpm
  - In revolutions per minute
  - The engine rpm is always shown numerically and graphically
  - When the rpm is locked, a „+“ is shown behind the rpm value.
  - **NOTICE!** If the display is in red, an error is present.
  - **Note:** Question marks (?) appear if there is an error in the rpm recording. Then the nominal rpm for the diesel engine is set for the output regulation of the drives. The set nominal rpm is shown blinking. An error message is issued.
  - Only for crane types with two engines:
    3.5.1 First engine (Engine 1)
    3.5.2 Second engine (Engine 2)

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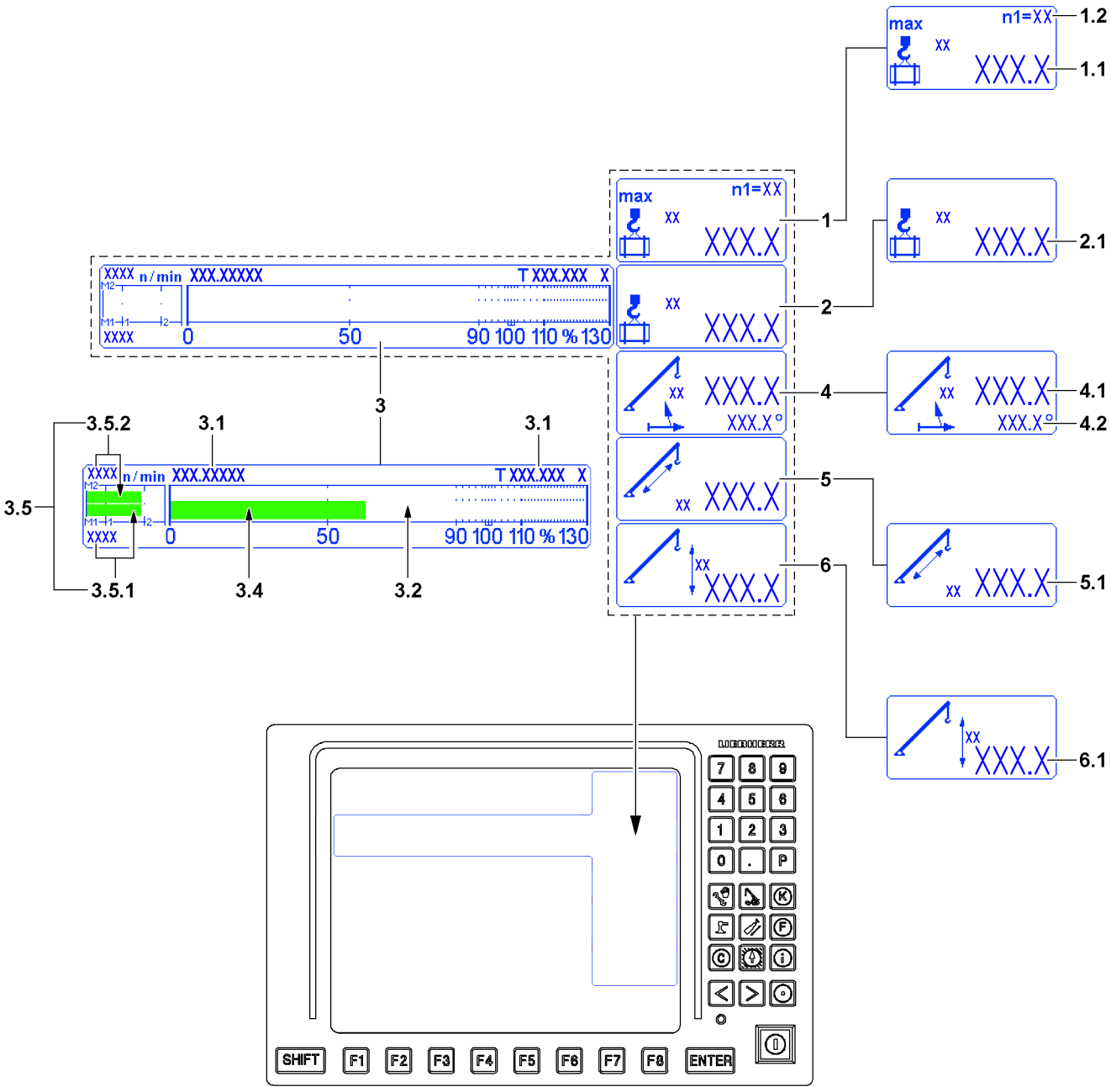

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Fig.120624

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4 Boom radius
- Boom radius **4.1** of SA-frame in reference to the slewing ring center
  In [m] or [ft]
- Angle **4.2** of the SA-frame

5 Length
- Length **5.1** of the SA-frame between the pin point on the turntable and the pin point of the SA-assembly cylinder
  In [m] or [ft]

6 Height
- Height **6.1** of the center of the pin point of the SA-assembly cylinder above the placement location of the crane
  In [m] or [ft]

WARNING
Tolerances at *Actual load* display!
Due to tolerances, deviations can occur for the displayed values in the *Actual load* icon **2**!
The *Actual load* display is not a calibrated weighing device.
▶ Always observe the actual weight of the load in connection with the load charts and the set up configuration of the crane.

Note
▶ A question mark (?) is shown instead of values when no load chart value can be accessed. Example: The crane is not in the range of the load chart.
▶ A question mark (?) is shown instead of values if the value cannot be calculated / determined. Example: A sensor error can be present - pay attention to error messages.

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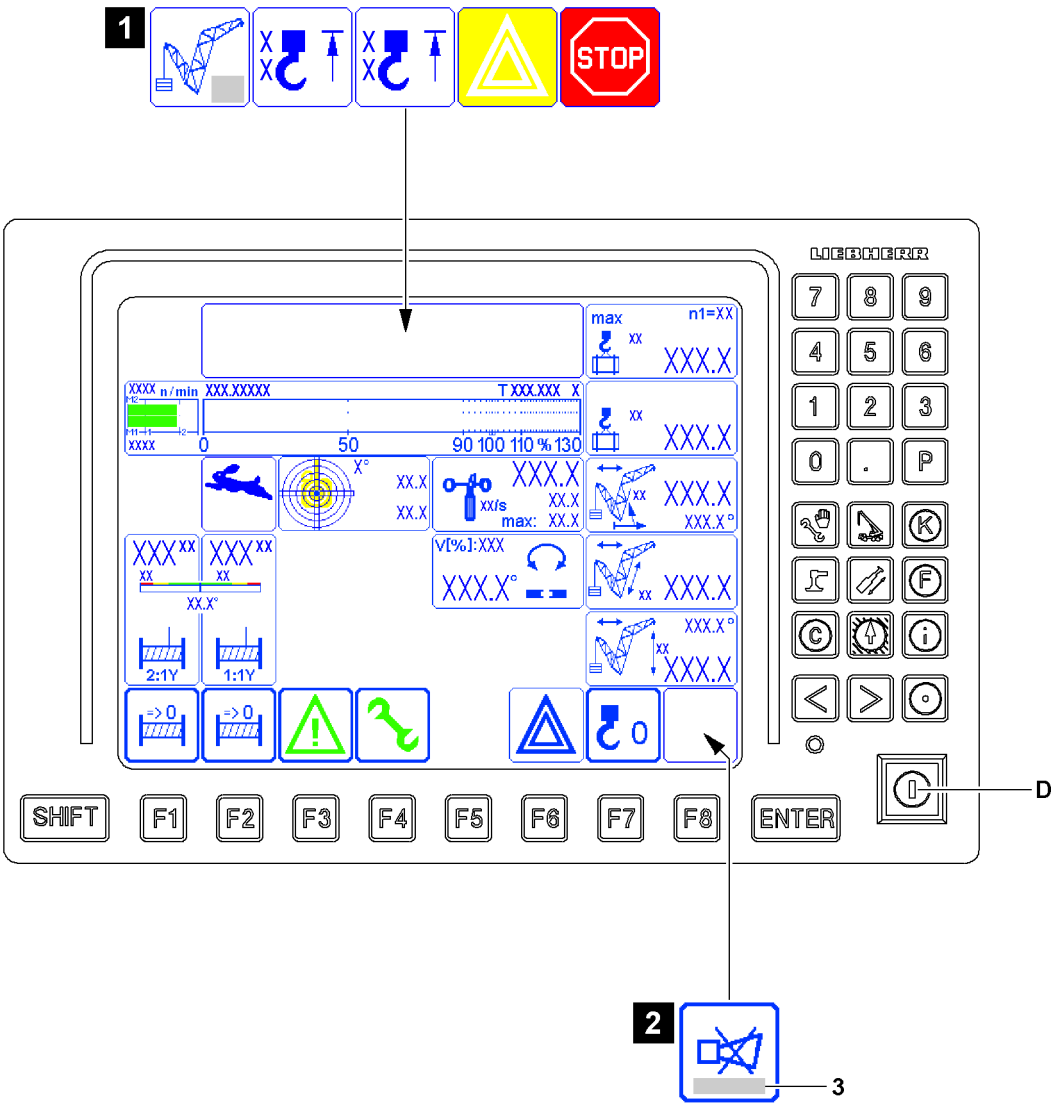

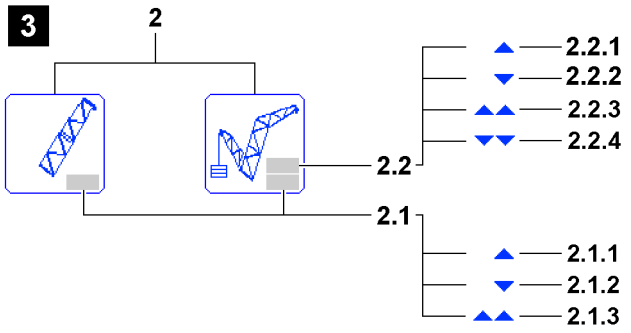

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Fig.114267

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5.3 Alarm functions

NOTICE
Triggered alarm function!
If an alarm function is triggered (for example an advance warning occurrence or shut off of crane movement), the cause must be determined.
▶ Always pay attention to triggered alarm functions.
▶ Alarm function can flash over the monitor.

The limit ranges of the crane movements are monitored. When the limit ranges are reached, the crane operator is warned by the alarm functions.

The alarm functions are shown by the LICCON monitor:

– Optically with icons, see illustration **1**.
– Acoustically by a warning sound *Horn*, see illustration **2**.

In case of a failure of the relevant sensors / limit switches, special error messages **3** are added.

5.3.1 Boom limitation

See illustration **3**

Limit signs main boom

Note
▶ The *Boom limitation* icon **2** can change in different operating modes, but it is shown always at the same position in the LICCON monitor.
▶ The field *on the bottom* **2.1** refers to the main boom.
▶ The field *on the top* **2.2** refers to the auxiliary boom / accessory.

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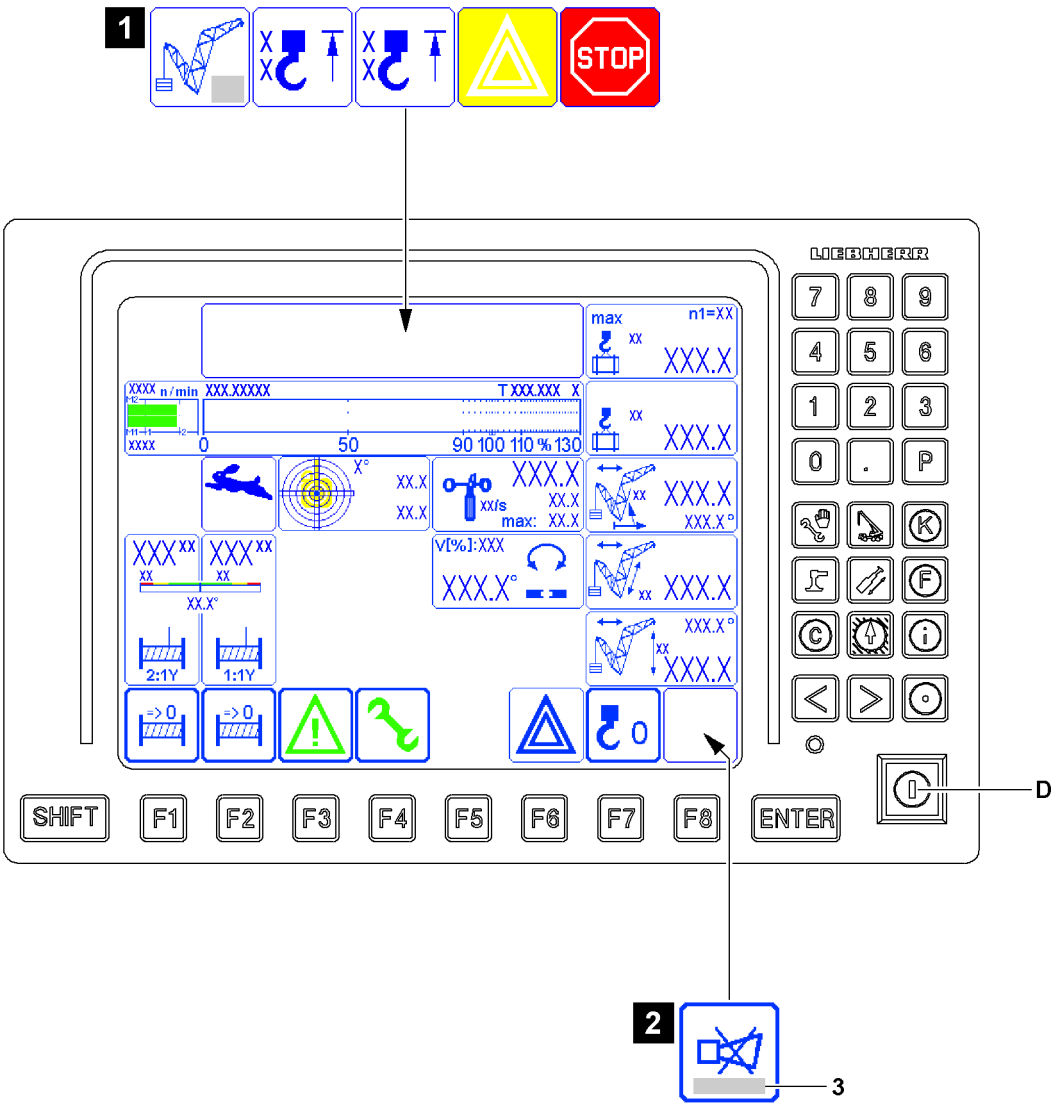

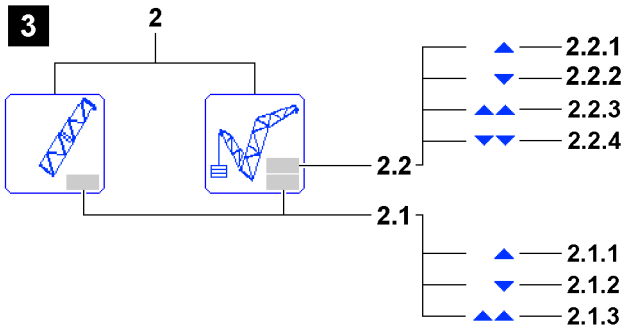

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Fig.114267

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2.1 *Boom limitation main boom* icon
- The luffing range of the main boom is limited both upward and downward.
- This icon appears if an end position determined by the load chart is reached when luffing the boom or when luffing the boom is disabled by a proximity switch.

Position	Icon	Description
2.1.1		The shut-off *Luffing up the main boom* is made by running against the upper load chart limit. **or** The shut off *Luff main boom up*, due to utilization, is larger than **95 %** and falling load capacity when luffing main boom up occurs[1)]. **Note:** Luffing down the main boom is still possible.
2.1.2		The shut-off *Luffing down the main boom* is made by running against the lower load chart limit. **Note:** Luffing up the main boom is still possible.

1) Only for certain crane types and boom systems.

WARNING
Alarm function deactivated!
When the set up key **D** is actuated, there is no shut-off of crane movement via position **2.1.1** and position **2.1.2**.
▶ Observe the Crane operating instructions, chapter 4.20.

Position	Icon	Description
2.1.3		The shut-off *Luffing up the main boom* is triggered by running against the block limit switch of the main boom relapse cylinders on the left / right (boom steep) **or** due to an error in one block limit switch of the main boom relapse cylinders. **Note:** Luffing down the main boom is still possible.

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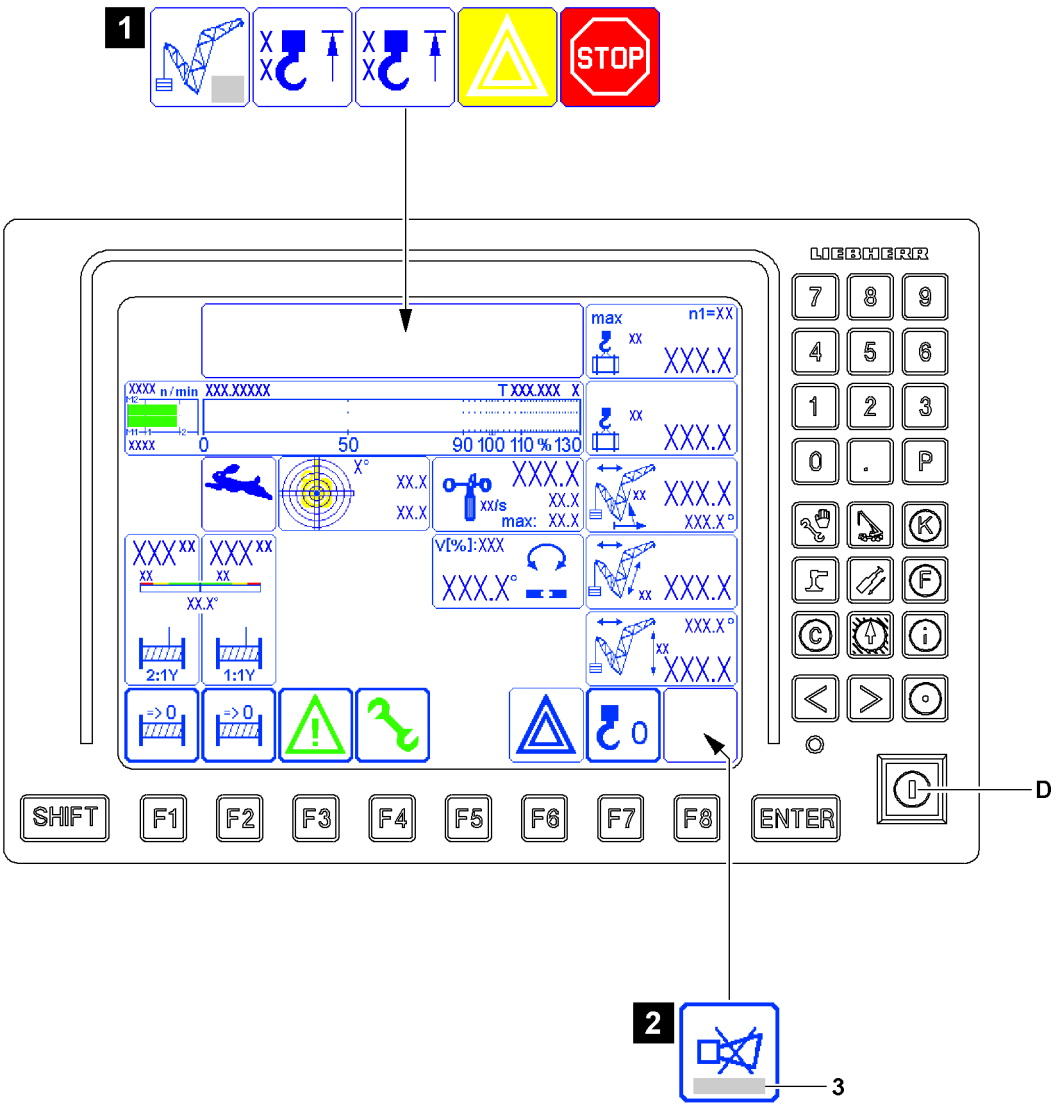

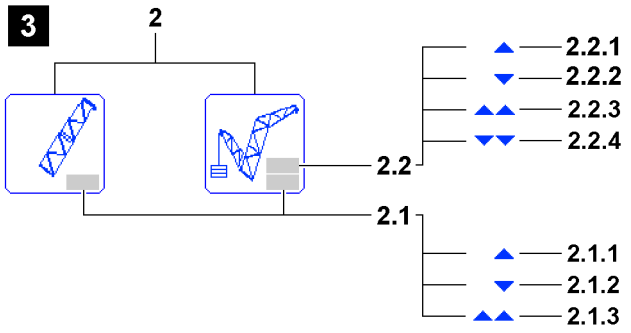

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Fig.114267

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Limit sign auxiliary boom / accessory

Note

- ▶ The *Boom limitation* icon **2** can change in different operating modes, but it is shown always at the same position in the LICCON monitor.
- ▶ The field *on the bottom* **2.1** refers to the limit sign main boom.
- ▶ The field *on top* **2.2** refers to the limit sign auxiliary boom / accessory.

2.2 *Boom limitation Auxiliary boom / accessory* icon

- The luffing range of the auxiliary boom / accessory is limited both upward and downward.
- This icon appears if an end position determined by the load chart is reached when luffing the auxiliary boom / accessory or when luffing is disabled by a limit switch.

Position	Icon	Description
2.2.1	▲	The shut-off *Luffing up the auxiliary boom / accessory* is triggered by running against the upper load chart limit. **Note:** Luffing the auxiliary boom / accessory down remains possible.
2.2.2	▼	The shut-off *Luffing down the auxiliary boom / accessory* is triggered by running against the lower load chart limit. **Note:** Luffing the auxiliary boom / accessory up remains possible.

WARNING

Alarm function deactivated!

When the set up key **D** is actuated, there is no shut-off of crane movement via position **2.2.1** and position **2.2.2**.

- ▶ Observe the Crane operating instructions, chapter 4.20.

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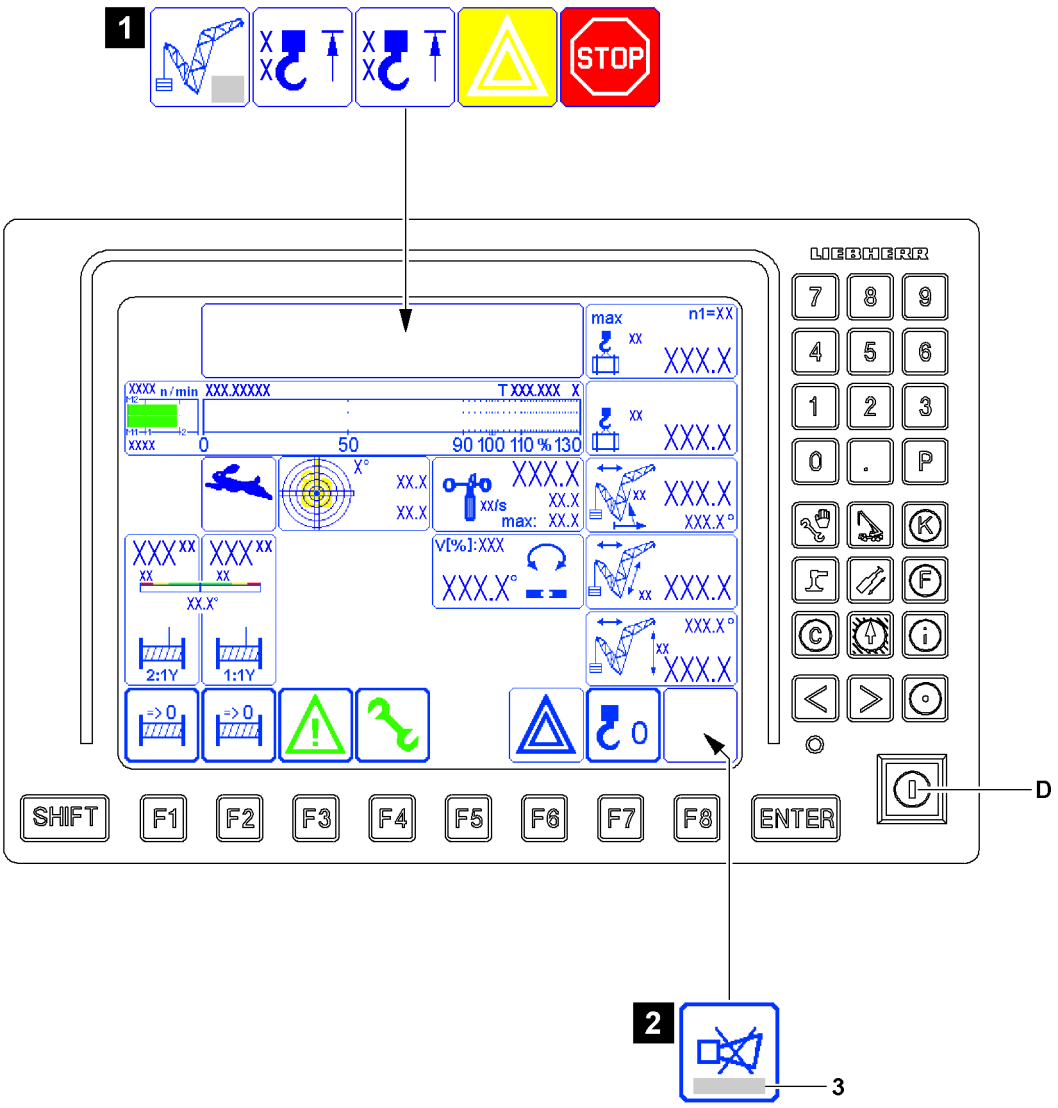

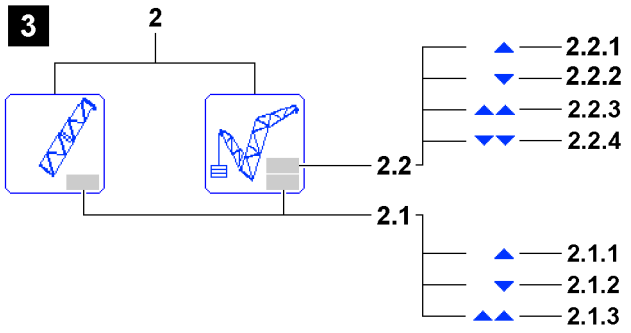

Fig.114267

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Position	Icon	Description
2.2.3		The shut-off *Luffing up the auxiliary boom / accessory* is triggered by running against a block limit switch of the relapse cylinders auxiliary boom / accessory **or** the relapse flap **or** an error on one limit switch occurs. **Note:** Luffing the auxiliary boom / accessory down remains possible.
2.2.4		The shut-off *Luffing down the auxiliary boom / accessory* is triggered by running against a block limit switch (on auxiliary boom / accessory lower left / right) **or** an error on one of these limit switches occurs. **Note:** Luffing the auxiliary boom / accessory up remains possible.

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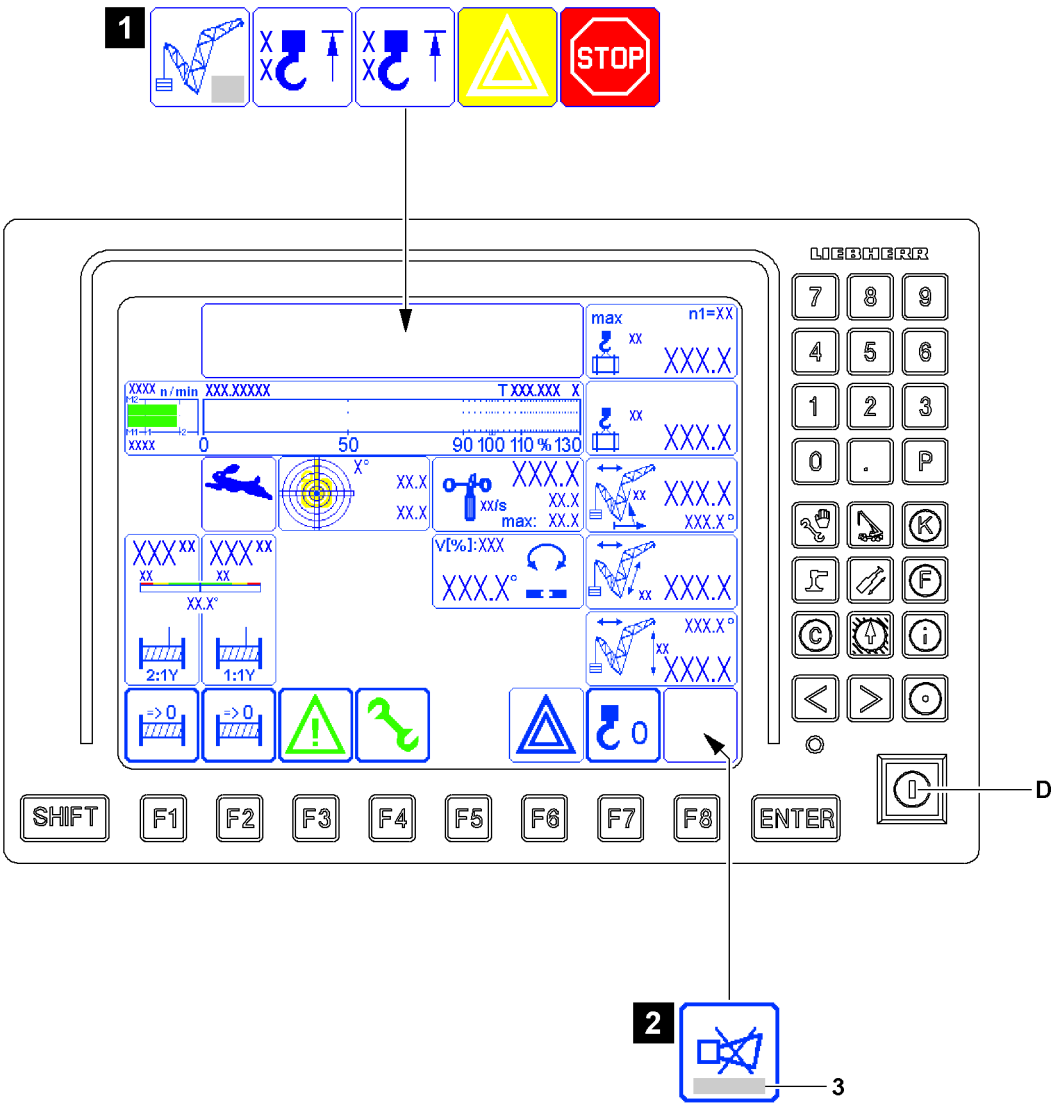

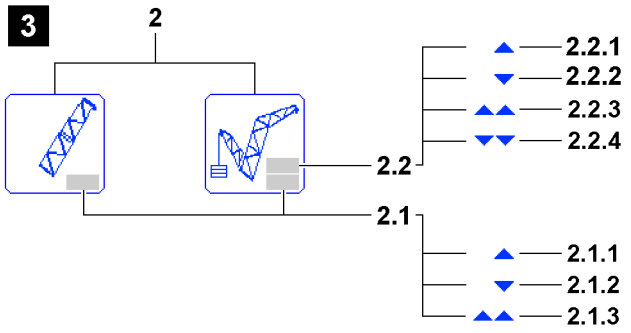

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Fig.114267

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5.3.2 Failure of sensor / limit switch!

NOTICE
Failure of sensor / limit switch!
Depending on the classification of the sensor / limit switch, the crane can continue to be operated with limitation or is shut off by the control.
An error message is issued in the *Horn* icon **3**, see illustration **2**.
The error message shows defective sensors / limit switches, see Diagnostics manual.
- ▶ The error must be remedied immediately.
- ▶ Crane movements after a failure of a sensor / limit switch must be carried out anticipatorily and with extreme caution.

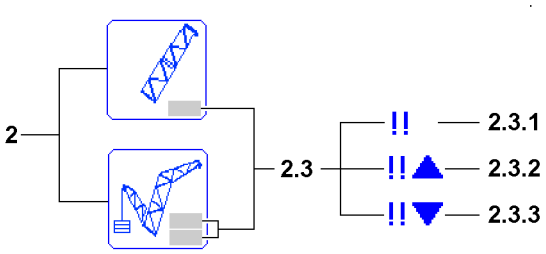

Fig.114275

Position	Icon	Description
2.3.1	!!	On the auxiliary boom / accessory, at least one associated sensor / limit switch is defective / missing. If an alarm function occurs at the same time, then the icon can be shown differently, see position **2.3.1**, position **2.3.2** or position **2.3.3**.
2.3.2	!! ▲	
2.3.3	!! ▼	

Note
- ▶ Not every failure of a sensor / limit switch on the boom is shown in the *Boom limitation* icon **2**. Observe the error message in the *Horn* icon **3**.
- ▶ Depending on the classification of the sensor / limit switch, the respective crane movement is shut off in case of a failure and **cannot be bypassed**.
- ▶ When deflecting the master switch, an operating error message is issued in the *Horn* icon **3**. The operating error message shows defective sensors / limit switches.
- ▶ If the error cannot be remedied by yourself, contact Liebherr Service.

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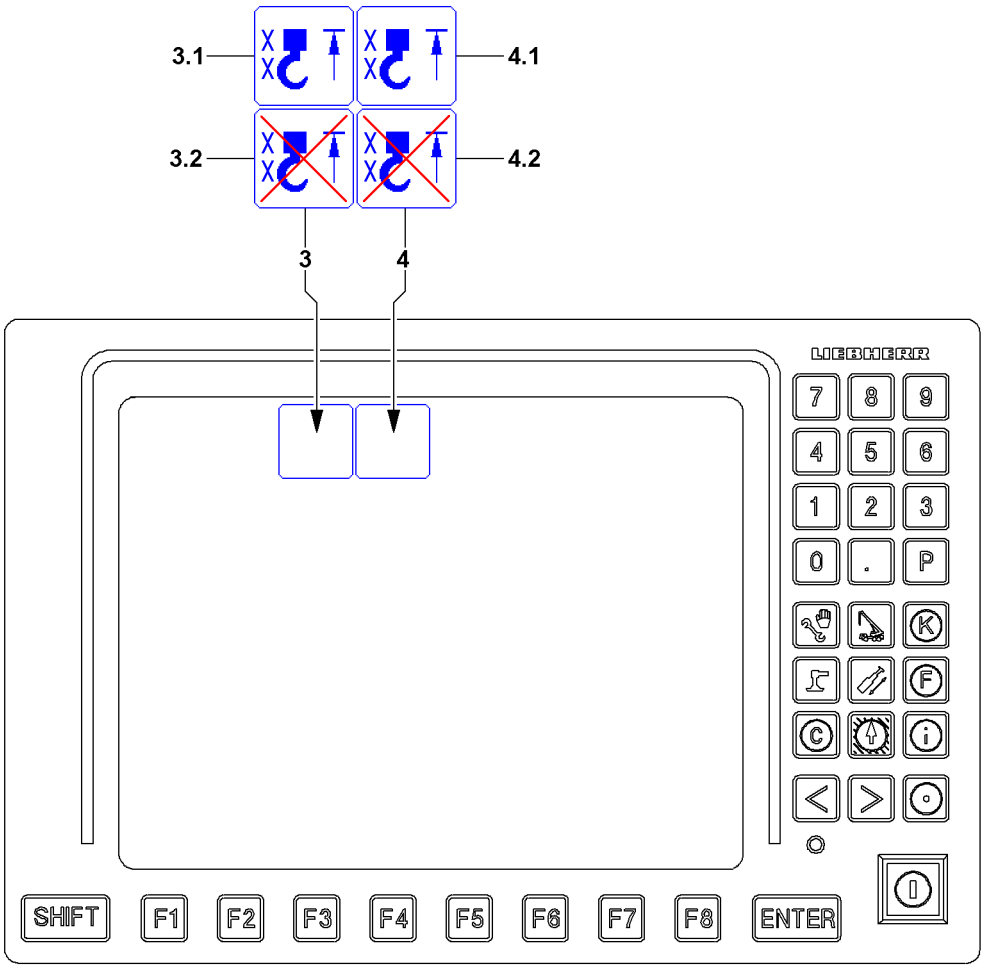

Fig.114276

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5.3.3 Hoist limit switch

In order to prevent the crane from being operated without hoist limit switch (HES), the presence of the hoist limit switch is continuously monitored by the crane control. If a hoist limit switch required for a particular operating mode is not plugged in, therefore not active on the LSB bus system, the corresponding crane movements are stopped and an operating error message is also issued.

The identification of the triggered hoist limit switch (for example HES1 for hoist limit switch 1) appears in the respective icon.

WARNING
Hoist limit switch not functioning!
▶ Before crane operation, check the hoist limit switches for function and correct assembly.

3 *Hoist top* icon
Hoist limit switch for the first load position

3.1 *Hoist top triggered* icon
- The *Hoist top triggered* icon appears when:
  - The hook block is pulled against the hoist limit switch weight.
  - The hoist limit switch weight is not attached freely (for example on placed down boom).
  - The hoist limit switch is not recognized by the crane control, even though it is required for the operating mode.
  - The hoist limit switch has an internal error.
- **Note:** Spool up hoist winches is turned off. Additional crane movements can be turned off.

3.2 *Hoist top bypassed* icon
- The *hoist top bypassed* icon appears if the hoist limit switch is bypassed, see section „Special functions LICCON monitor 0“.

4 *Hoist top* icon
Hoist limit switch for the second load position

4.1 *Hoist top triggered* icon
- The *Hoist top triggered* icon appears when:
  - The hook block is pulled against the hoist limit switch weight.
  - The hoist limit switch weight is not attached freely (for example on placed down boom).
  - The hoist limit switch is not recognized by the crane control, even though it is required for the operating mode.
  - The hoist limit switch has an internal error.
- **Note:** Spool up hoist winches is turned off. Additional crane movements can be turned off.

4.2 *Hoist top bypassed* icon
- The *hoist top bypassed* icon appears if the hoist limit switch is bypassed, see section „Special functions LICCON monitor 0“.

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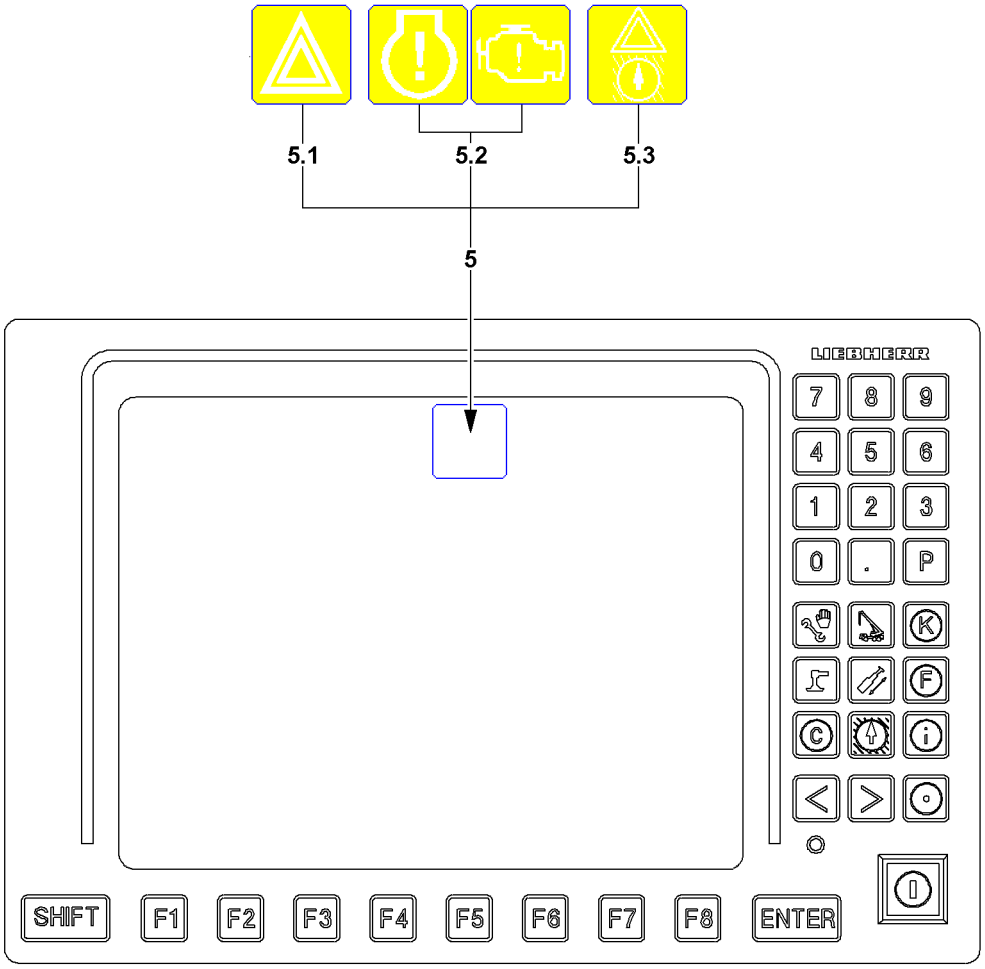

Fig.121772

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5.3.4 Occurrence of an advance warning

5 *Advance warning* icons

5.1 *Advance warning Utilization* icon
- The current utilization of the crane results from the *actual load* value and the *maximum load* value.
- The *Advance warning utilization* icon appears if:
  - The current utilization of the crane exceeds the programmed limit (standard value **90 percent**) for the advance warning.

5.2 *Advance warning Engine monitoring* icon
- Appears if an advance warning for one or more monitoring functions in the engine monitoring occurs.
- **NOTICE!**: If the Advance warning engine monitoring **5.2** appears, the monitoring functions must be checked.
- **Note**: Depending on the respective crane, either the right or the left *Advance warning engine monitoring* icon **5.2** appears.

5.3 Advance warning Working range limitation*****
- Appears if an advance warning in the *Working range limitation* program occurs.
- **NOTICE!**: Pay attention to the set working range.
- **Note**: Appears only on crane types with Working range limitation*****.

WARNING
Non-observance of advance warnings!
If advance warnings are not observed, then it can result in a sudden shut off of the crane movement.
A sudden shut off of the crane movement can result in high stress and strain for crane and load.
High stress and strain for crane and load can cause accidents.
- ▶ Operate the crane in such a way that there is no shut off of crane movements by the crane control.
- ▶ Pay attention to advance warnings and approach a possible shut off of crane movements extremely cautiously.

NOTICE
Shut off engine monitoring!
Outside of the *crane operation* program, the engine monitoring is turned off.
When the engine monitoring is turned off, problems and warning occurrences are not recognized.
This could result in crane failure.
- ▶ If work is not carried out in the *Crane operation* program, then turn the crane engine off and operate the LICCON computer system in stand-by mode, see section „LICCON computer system in stand-by mode“.
- ▶ If work has to be carried out for a longer period outside of the *Crane operation* program, with the crane engine running, then switch regularly into the engine monitoring screen.

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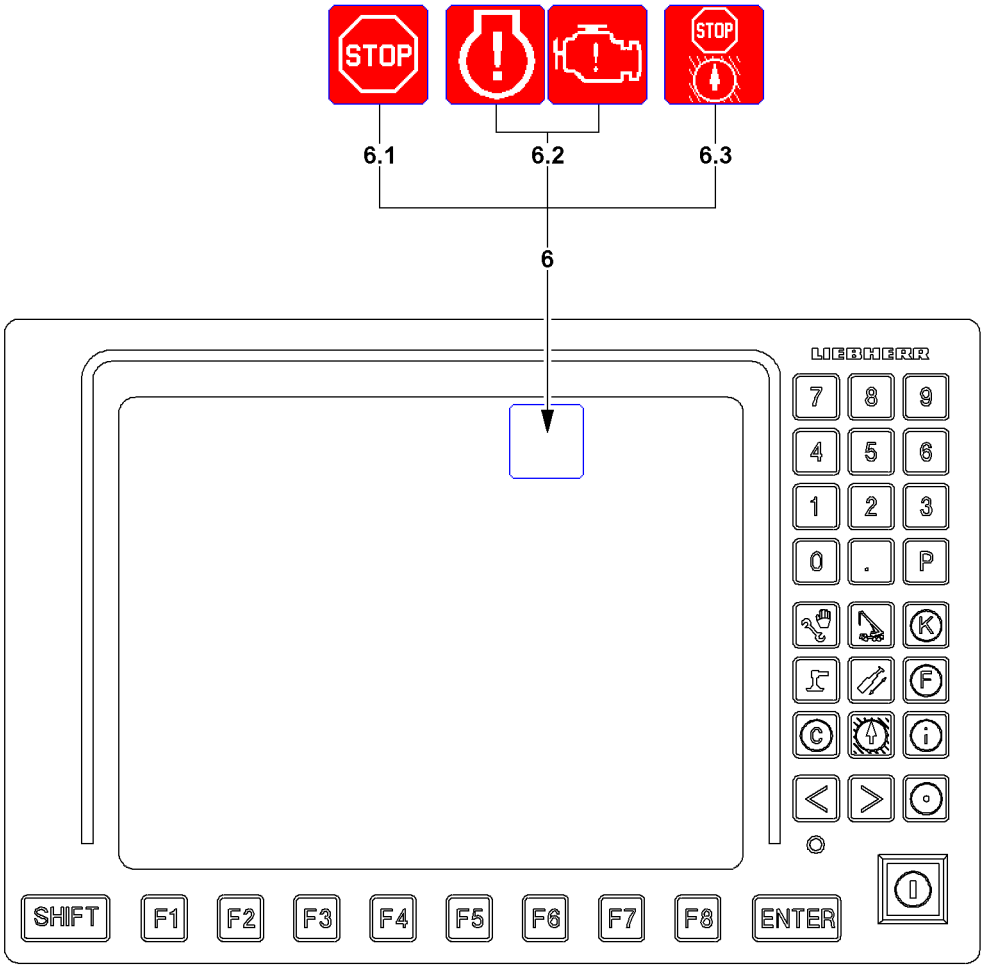

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Fig.121773

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5.3.5 Shut off of crane movement

6 *STOP* icons

6.1 *LMB-STOP* icon

- The *LMB-STOP* icon appears when the crane movement is turned off.

Possible causes:

1. **Utilization of the crane**: The *LMB-STOP* icon appears when the current utilization of the crane exceeds the programmed limit for the LMB-STOP (Standard **100 %**).
2. **Sensor error**: The *LMB-STOP* icon appears when a sensor which is required to monitor the load chart has an error (LMB-STOP is actuated).
3. **No load chart**: The *LMB-STOP* icon appears if no load chart is available (LMB-STOP is triggered).

WARNING
Crane movements at active LMB-STOP!
At active LMB-STOP **6.1**, not all crane movements are necessarily turned off. In certain circumstances, load moment decreasing crane movements are possible.

▶ Always remedy the cause for the LMB-STOP **6.1** first.
▶ Carry out any crane movements which are still possible with extreme caution.

6.2 *Engine STOP* icon

- Appears if a STOP event takes place in engine monitoring.
  Note: Depending on the respective crane, either the right or the left *Engine STOP* icon **6.2** appears.

6.3 *Working range limitation STOP* icon

- Appears when the *Working range limitation program* turns the crane movement off.

WARNING
Shut off of crane movement!
A sudden shut off of the crane movement can result in high stress and strain for crane and load.
High stress and strain for crane and load can cause accidents.

▶ Operate the crane in such a way if possible that there is no shut off of crane movements by the crane control.
▶ Monitor the display instruments constantly.
▶ If not otherwise possible, approach a possible shut off of crane movements with extreme caution.

NOTICE
Shut off engine monitoring!
Outside of the *crane operation* program, the engine monitoring is turned off.
When the engine monitoring is turned off, problems and warning occurrences are not recognized.
This could result in crane failure.

▶ If work is not carried out in the *Crane operation* program, then turn the crane engine off and operate the LICCON computer system in stand-by mode, see section „LICCON computer system in stand-by mode“.
▶ If work has to be carried out for a longer period outside of the *Crane operation* program, with the crane engine running, then switch regularly into the engine monitoring screen.

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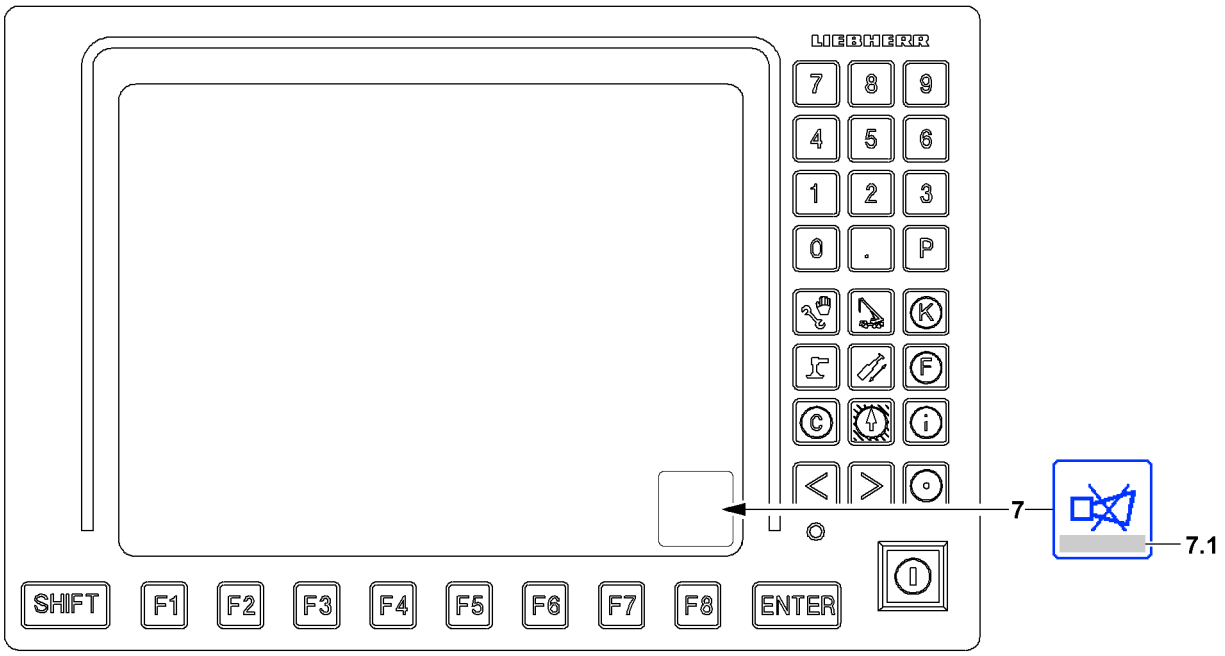

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Fig.114279

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5.3.6 Acoustic warning on LICCON monitor 0

Acoustic warnings on LICCON monitor 0 are indicated by the warning sound *Horn*.

The warning sound *Horn* is divided into two categories:
- *Horn* is a beeping sound of a duration of approximately 0.5 seconds, which is repeated in a second cycle.
- *Short horn* is a beeping sound of a duration of approximately 0.1 seconds, which is repeated in a second cycle.

7 *Horn* icon
- When the *Horn* icon **7** is shown in the LICCON monitor, any acoustic signals which will occur can be shut off by the LICCON monitor 0 by pressing the function key **F8**.
- If an error message is shown in the *Horn* icon **7** in field **7.1**, then the present error can be determined through it. Pressing the function key **F8** twice, automatically changes to the error determination screen of the test system. The error is displayed there in documentary form.

Warning sound *Horn*

- Sounds in addition to the visual display of an error message in field **7.1** in case of operational errors are found, which lead to a shut off of a crane movement.
  Operational errors are, for example:
  - Overload
  - Boom outside of the angle / boom radius range of the load chart
- In case of application errors with error number (LICCON Error Code LEC). For example sensor errors, which occur due to insufficient sensor signals or a defective sensor.
  Monitored sensors are, for example:
  - Length sensors
  - Angle sensors
  - Pressure sensors
  - Pull test brackets (force test boxes)
  - Inductive sensors
  - Hoist limit switch
  - Wind sensor
  - Battery voltage

Warning sound *Short horn*

Sounds in addition to the visual display of error messages without an error number and which do not lead directly to crane movement shut off by the LICCON overload protection.
Monitored error messages are, for example:
- Maximum permissible wind speed exceeded (only with an activated wind sensor*****)
- Crane utilization value for advance warning (90 %) has been reached

Priority acoustic warning

- The *Horn* warning around has higher priority than the *Short horn* warning sound, i.e. *Horn* takes preference over *Short horn*.
- The *Horn* warning sound as well as the *Short horn* warning sound become active again after shut down if a new error occurs.

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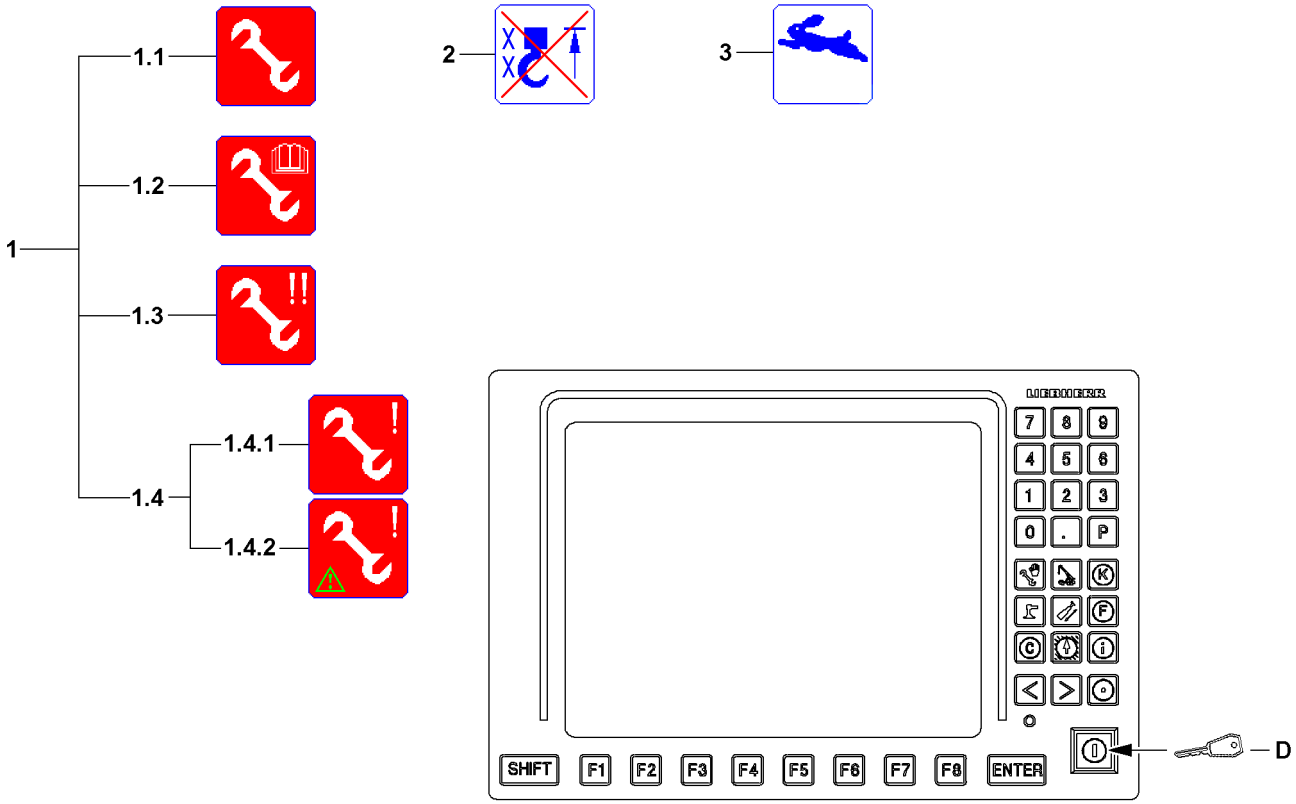

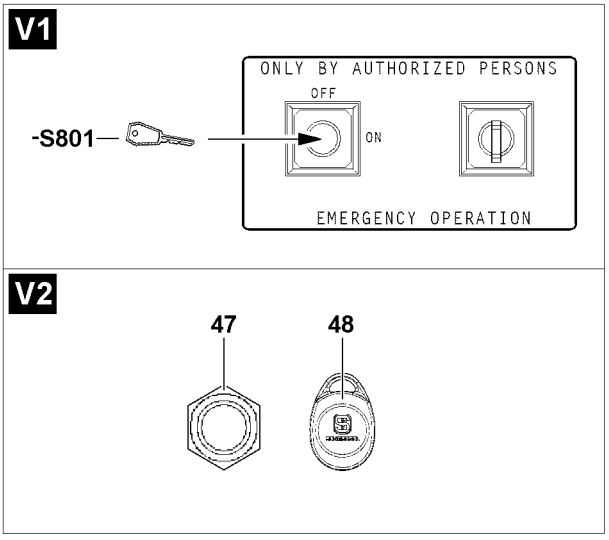

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Fig.120622

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5.4 LICCON Monitor 0 special functions

Note
Additional special functions
▶ Observe section „Special function LICCON monitor 2“.

WARNING
Danger of accident due to the *Exceedance of shut-off limits of the LICCON overload protection* function!
If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload.
Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.
Personnel can be severely injured or killed.
▶ The function *Exceedance of shut off limits of the LICCON overload protection* is only permissible in emergencies and for assembly purposes.
▶ The set up key **D** may only be actuated by persons who are aware of the effects of their acts regarding the function *Exceeding the shut off limits of the LICCON overload protection*.
▶ The *Exceedance of shut off limits of the LICCON overload protection* function requires the presence of an authorized person and must be performed with utmost caution.
▶ Crane operation with activated function *Exceedance of shut off limits of the LICCON overload protection* is prohibited.

Before pressing the set up key **D** make sure that:
– Operation and specifications to use the set up key **D** from the Crane operating instructions, chapter 4.20 and 7.15 are known to the crane operator and have been understood.

Note
▶ The various *Assembly operation* icons **1** are shown on the same position in the LICCON monitor, depending on the operating mode, illustration **2**.

5.4.1 Exceeding the shut off limits of the LICCON overload protection

1.1 *Assembly* icon
- The *Assembly* icon **1.1** appears when a special case for operation of the LICCON overload protection was activated, for example the shut off limits of the LICCON overload protection were bypassed by the set up key **D**.

Note
▶ The *Assembly* icon **1.1** appears in the LICCON monitor 2, when the difference monitoring of the derrick ballast guying is bypassed, see Crane operating instructions, chapter 5.35 / 5.36.

5.4.2 No load chart is available

1.2 *Assembly - no load chart* icon
- The *Assembly - no load chart* icon **1.2** appears when the shut off limits of the LICCON overload protection are bypassed via the set up key **D and** no load chart is available.
- The crane may only be operated according to the specifications of the respective chapter in the Crane operating instructions and / or the erection / take down charts.
- **Note:** By actuating the set up key **D**, all erection / take down procedures can be carried out within the erection / take down charts, for which no load charts are available.

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5.4.3 Emergency operation LICCON overload protection (according to EN 13000:2010)

WARNING
Increased danger of accident during emergency operation of the LICCON overload protection!
In emergency operation, the crane movements are no longer monitored by the LICCON overload protection.
- ▶ The emergency operation may only be activated by persons who are aware of the consequences of their actions.
- ▶ A shut off by the LICCON overload protection may not be circumvented by the emergency operation.
- ▶ If normal crane operation is possible, then the emergency operation may not be activated.
- ▶ All crane movements must be carried out with extreme caution and anticipatorily.

1.3 *Emergency operation activated* icon
- The *Emergency operation activated* icon **1.3** appears:
  - when the emergency operation of the LICCON overload protection is activated via the key button **S801** or by actuation of the transponder **48** on the sensor **47**.

Note
Activating emergency operation
- ▶ If emergency operation of the LICCON overload protection is activated via the key button **S801** or by actuation of the transponder **48** on a sensor **47** depends on the crane type. For location, see Crane operating instructions, chapter 4.01.

5.4.4 Additional emergency operating modes

WARNING
Erroneous operation of the crane!
If one of the *additional emergency operating modes* icon **1.4** appears, then there is a high danger of accidents due to erroneous operation of the crane.
Safety equipment could be deactivated.
Personnel can be killed or injured.
This could result in property damage.
- ▶ Deactivate *additional operating modes* **1.4** icon again or contact Liebherr Service and coordinate further procedure.

1.4 *Additional emergency operating modes* icon
- *Additional emergency operating modes* icon **1.4** appears if additional emergency operating modes were activated.

5.4.5 Bypassing the difference force monitoring for derrick ballast guying

WARNING
Overload of crane!
Erroneous operation when bypassing the difference force monitoring for the derrick ballast guying.
- ▶ Observe the Crane operating instructions, chapter 5.35 / 5.36.

D The shut off *Difference force monitoring derrick ballast guying* is bypassed by the set up key **D**. Observe the Crane operating instructions, chapter 5.35 / 5.36.

5.4.6 Bypass of hoist limit switch

2 *Hoist top bypassed* icon
- The *Hoist top bypassed* icon **2** appears when the shut off *Hoist top* is bypassed by the set up key **D**.
  Note: The *Crane operation* program is locked, meaning, no other program can be turned on via the program keys.

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5.4.7 Rapid gear

Note

- ▶ **Crane operation without rapid gear**: The speeds of the individual crane movements are independent of each other. There is no interference of the movement speeds.
- ▶ **Crane operation with rapid gear**: If the rapid gear is added, the individual crane movements can reach the largest possible movement speed. As a result, it can happen that during several simultaneous crane movements individual crane movements are slowed down.

Add the rapid gear only when:

- If the highest possible movement speed is to be made possible for individual crane movements **and**
- An interference amongst the movement speeds creates no problem.

3 *Rapid gear* icon

- The *Rapid gear* icon **3** appears if the rapid gear is enabled for one or several crane movements.

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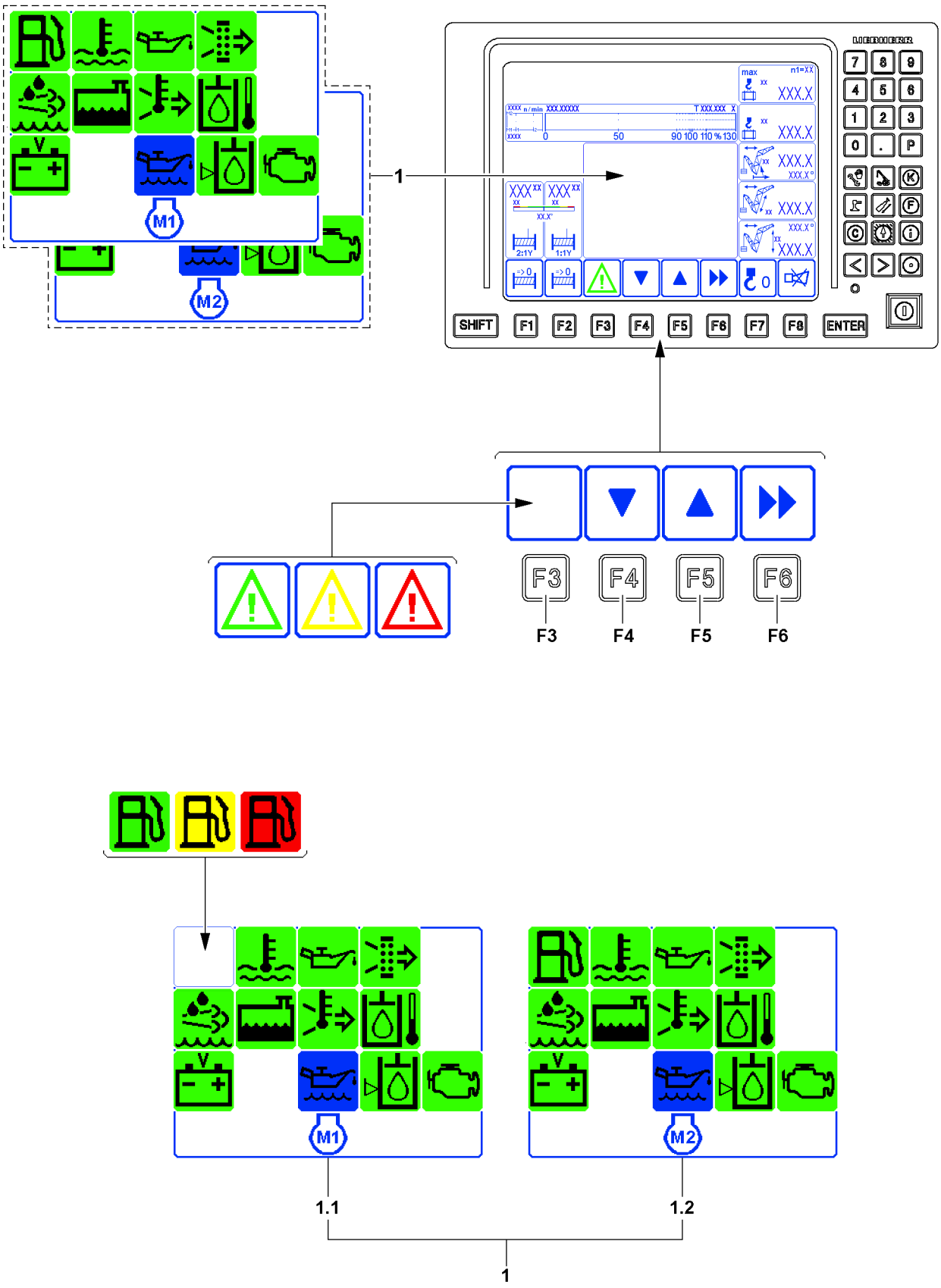

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Fig.121774

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5.5 Monitoring functions during crane operation

The monitoring functions **1** are always active and can be displayed in the monitoring field, if necessary. Due to the color of the icon over the function key **F3** the crane operator is automatically alerted in case of a warning occurrence.

The monitoring field has its fixed place on the LICCON monitor and can be hidden or assigned with other functions.

By pressing the function key **F3**, the monitoring functions **1** are displayed in the monitoring field.

NOTICE
There is a danger of severe damage to the engine if warnings are ignored!
If other programs are used for extended periods of time, for example the *Set up* program or *Test system* program, it is essential to switch to the crane operation screen in order to ensure that no events have occurred, which could lead to damage or destruction of the engine.
▶ Switch continuously into the crane operation screen and check the displays.

NOTICE
Danger of severe engine damage!
If the engine monitoring reports a problem and / or warning occurrence, then you must react immediately and remedy the problem.
▶ React to problems and / or warning occurrences immediately and remedy the problem.
▶ If necessary, stop crane operation and turn the engine off.

NOTICE
Shut off engine monitoring!
Outside of the *crane operation* program, the monitoring functions are turned off.
When the engine monitoring is turned off, problems and warning occurrences are not recognized.
This could result in crane failure.
▶ If work is not carried out in the *Crane operation* program, then turn the crane engine off and operate the LICCON computer system in stand-by mode, see section „LICCON computer system in stand-by mode“.
▶ If work has to be carried out for a longer period outside of the *crane operation* program, with the crane engine running, then switch continuously into the engine monitoring screen and check the display values.
▶ Register changes in the display values mindfully and proceed anticipatorily, for example, refuel in time.

Color key Warning icon above function key **F3**.
– Warning icon green: All monitoring functions are ok.
– Warning icon yellow: Advance warning for one or several monitoring functions.
– Warning icon red: Warning for one or several monitoring functions.

Monitoring functions **1**:
– Monitoring functions **1.1** Engine M1
– Monitoring functions **1.2** Engine M2
Note: Appears exclusively for crane types with two crane engines.

5.5.1 Calling up the monitoring functions

If a warning event occurs in one or more monitoring functions in the monitoring field, this is indicated by the color change of the warning icon over the function key **F3**. The warning icon is displayed statically and in the color of the monitoring function that triggered the warning event.

▶ Press the function key **F3** until the desired page of the monitoring functions **1** is called up.

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Result:

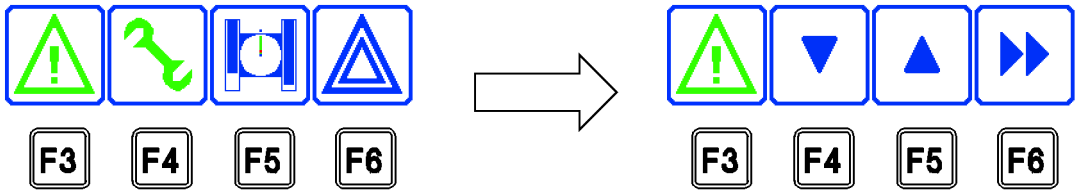

Fig.114282

– The assignment of the function key **F4**, function key **F5** and function key **F6** changes.
– The monitoring functions **1** are displayed in the monitoring field on the LICCON monitor.

For the colors for the icons of the monitoring function **1**, see the following section „Overview of icons for monitoring functions“:
– Green: Monitored function ok
– Yellow: Advance warning for the monitored function
– Red: : Warning for the monitored function

Call up the individual control displays one after the other:

▶ Press function key **F4** or function key **F5**.

Result:

– The individual control displays appear, see the following section „Overview of individual control displays“

Mask the monitoring functions **1**:

▶ Press the function key **F6**.

5.5.2 Overview of icons for monitoring functions

In the monitoring field **1** appear the following monitoring functions:

	Fuel reserve
Green:	Fuel reserve **more** or equal to 5 %
Yellow:	Fuel reserve approx. 3 % - 4 %
Red:	Fuel reserve **less than** 3% **NOTICE!** Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Pay attention to error message.

	Coolant temperature
Green:	Coolant temperature OK
Red:	Coolant temperature **too high** **NOTICE!** Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Pay attention to error message.

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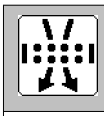
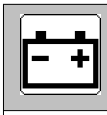
/	**Engine oil pressure**
Green:	Engine oil pressure OK (engine on)
Red:	Engine oil pressure too low (engine on) **NOTICE!** Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Pay attention to error message.

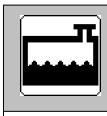
 /	**Air filter Engine**
Green:	Air filter OK (engine on)
Yellow	Air filter dirty (engine on) **NOTICE!** Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Pay attention to error message.

	**Charge control display[1)]**
Green:	Alternator OK (engine on)
Red:	Alternator does not charge (engine on) **NOTICE!**: Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Pay attention to error message.

1) Only for certain crane types

	Urea tank / exhaust aftertreatment[1)]
Green:	Urea available
Yellow / red:	Urea level too low or erroneous function of exhaust aftertreatment system **NOTICE!** Add urea or remedy the erroneous function of the exhaust aftertreatment. Under some circumstances a power reduction or start block of the engine [1] is triggered, pay attention to the error message.

1) Only for certain crane types

	**Coolant level**
Green:	Coolant level OK
Red:	Insufficient coolant **NOTICE!**: Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Pay attention to error message.

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/	**Charge air temperature**
Green:	Charge air temperature OK
Red:	Charge air temperature too high **NOTICE!**: Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Pay attention to error message.

	Hydraulic oil temperature[1)]
Green:	Hydraulic oil temperature OK
Red:	Hydraulic oil temperature too high **NOTICE!**: Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Pay attention to error message.

1) Only for certain crane types

	Battery voltage
Green:	Battery voltage OK
Red:	On-board power supply over / undervoltage **NOTICE!**: Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Pay attention to error message.

/	**Engine oil level**[1)]
Green:	Engine oil level OK
Blue	The engine oil level can not be checked here on the display, call up the individual indicator light
Red:	Engine oil level not OK **NOTICE!**: Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Call up individual indicator lights and adjust the engine oil according to the display - pay attention to error message.

1) Only for certain crane types

	Hydraulic oil level[1)]
Green:	Hydraulic oil level OK
Yellow / red:	Hydraulic oil level too low **NOTICE!**: Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Pay attention to error message.

1) Only for certain crane types

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	Exhaust aftertreatment[1)]
Green:	Exhaust aftertreatment OK
Yellow / red:	Erroneous function Exhaust aftertreatment or Urea level too low **NOTICE!** Add urea or remedy the erroneous function of the exhaust aftertreatment. Under some circumstances a power reduction or start block of the engine [1] is triggered, pay attention to the error message.

1) Only for certain crane types

5.5.3 Overview of individual control displays

Note

▶ For some monitoring functions in the monitoring field the display values can be shown by switching through with function key **F4** or function key **F5**. The illustrated individual control displays are only examples.

Individual control display *Fuel reserve*

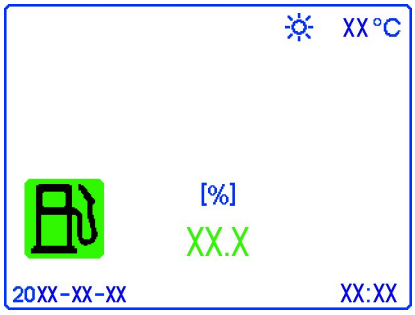

Fig.114283: Fuel reserve

Individual control display *Coolant temperature Single motor / Double motor*

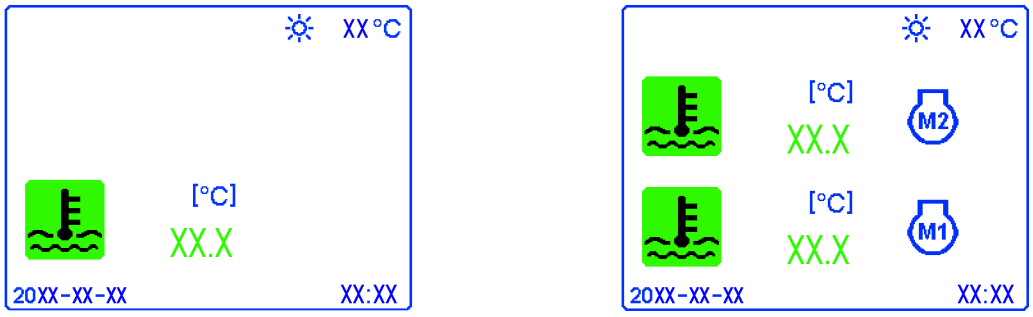

Fig.121781: Coolant temperature Single motor / Double motor

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Individual control display *Engine oil pressure*

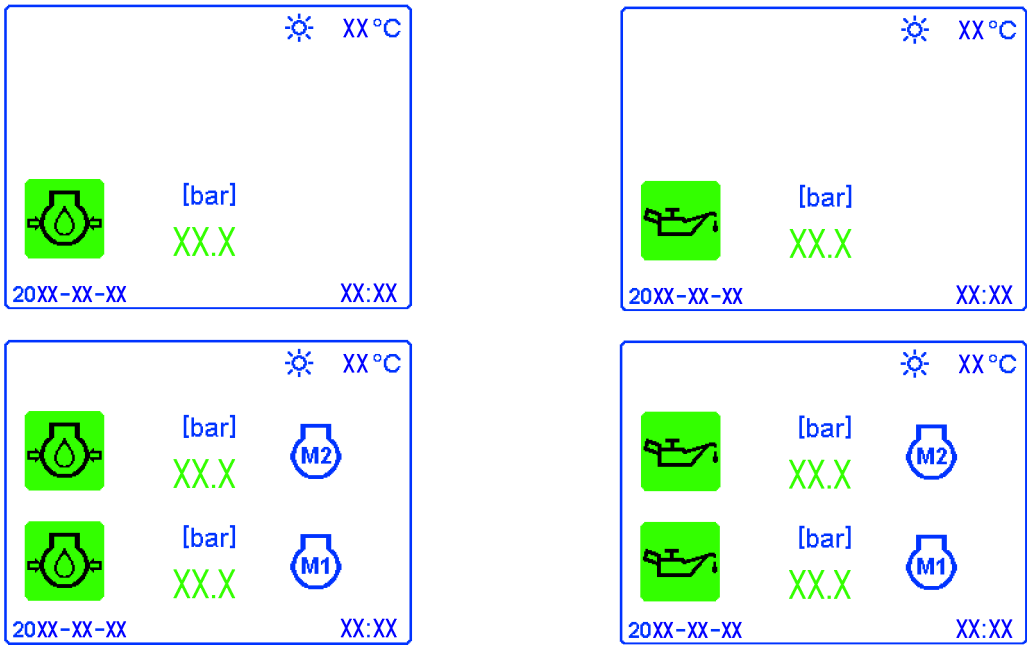

Fig.121782: Engine oil pressure Single motor / double motor (both variations of icons)

Individual control display *Urea reserve*

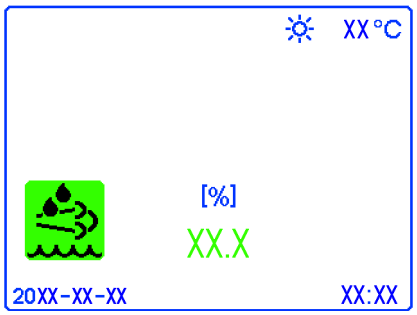

Fig.121788: Urea reserve (only for certain crane types)

Individual control display *Charge air temperature*

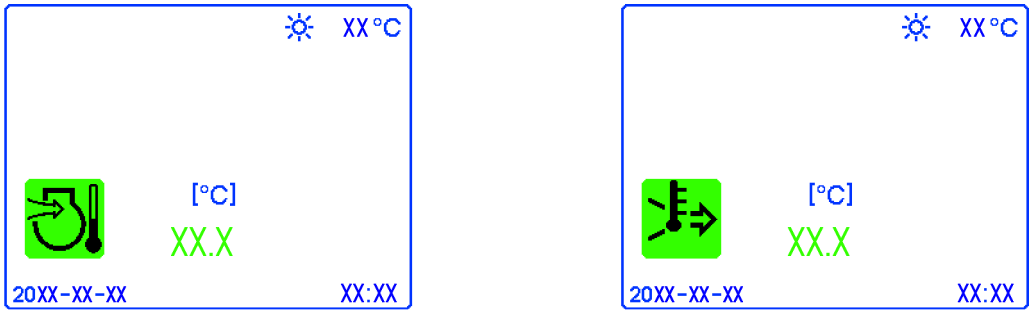

Fig.121784: Charge air temperature (both variation of icons)

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Individual control display *Hydraulic oil temperature*

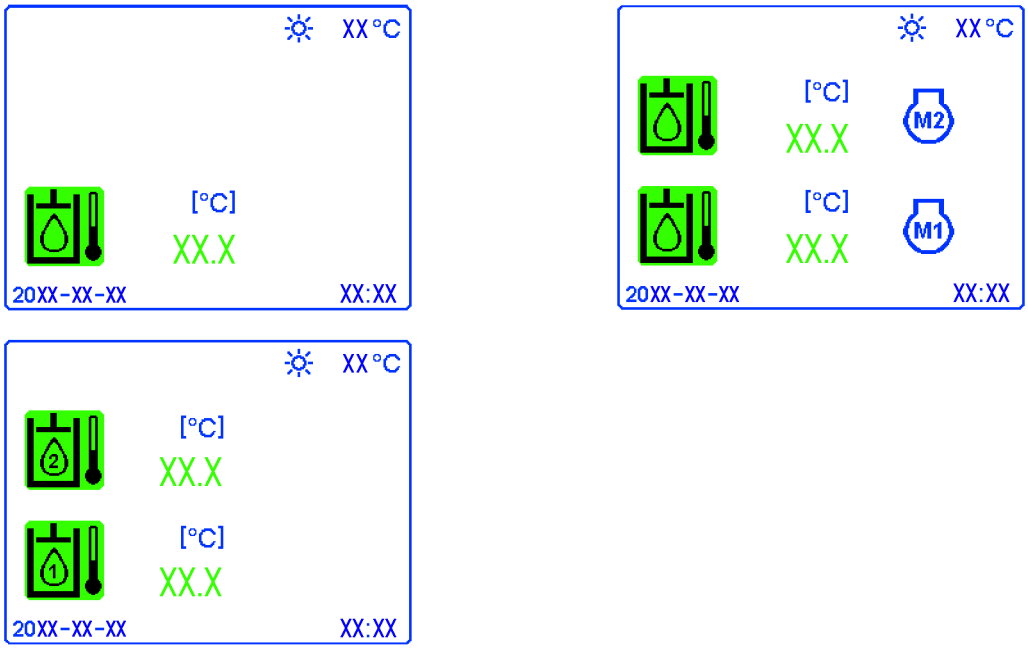

Fig.121787: Hydraulic oil temperature Single motor / double motor / two circuit (only for certain crane types)

Individual control display *Battery voltage*

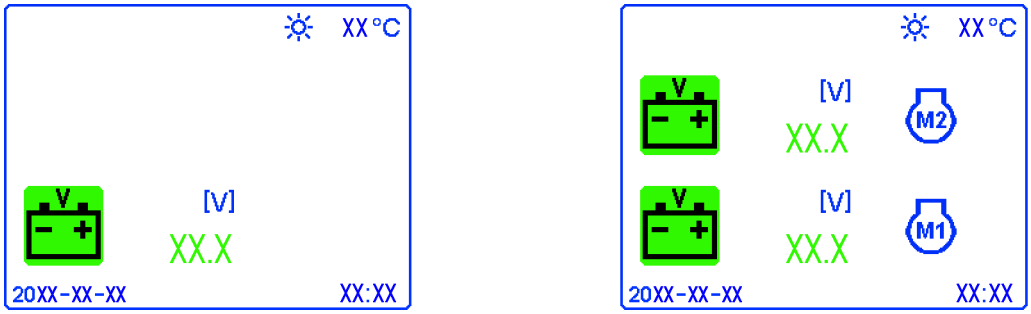

Fig.121785: Battery voltage Single motor / Double motor

Individual control display *Engine oil level*

Note

▶ When the engine is running an erroneous test value appears, to check the engine oil level align the crane horizontally and turn the engine off.

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Engine oil level Number value

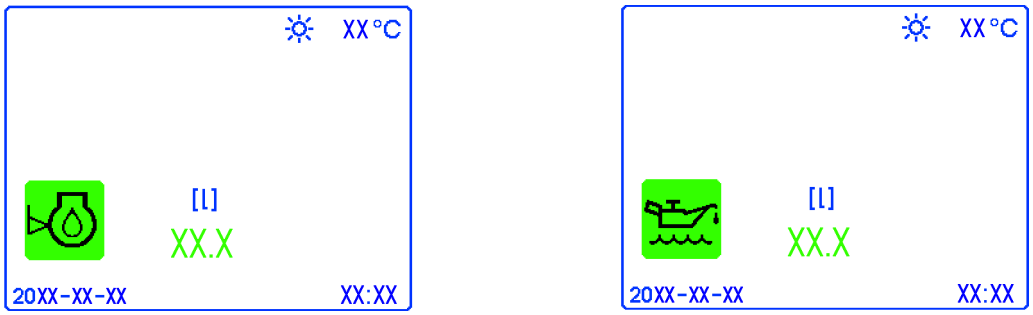

Fig.121786: Engine oil level number value over / under fill (both variations of the icons, only for certain crane types)

Engine oil level Bar diagram

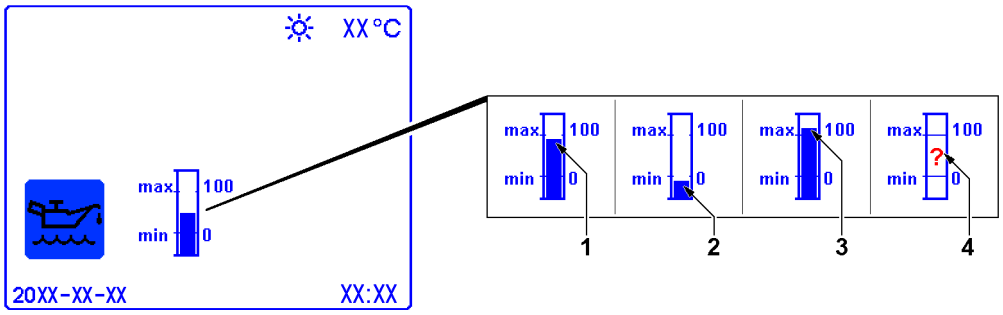

Fig.123757: Engine oil level Bar diagram fill level (only for certain crane types)

- At normal level, the bar **1** reaches a display between 0 and 100
- If underfilled, the bar **2** reaches a display under 0
- If overfilled, the bar **3** reaches a display above 100
- In case of an incorrect test value, the question mark (?) **4** appears

Individual control display *Hydraulic oil level*

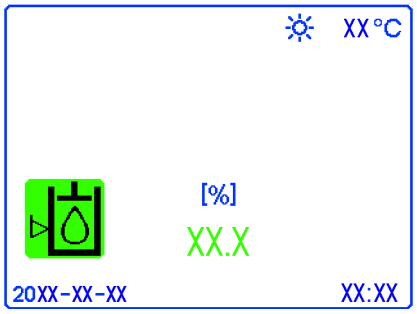

Fig.121790: Hydraulic oil level (only for certain crane types)

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5.5.4 Overview of function key assignment

Function key	Function / description
F3	By pressing the function key **F3** once, the monitoring functions of engine M1 are displayed. By pressing the function key **F3** twice, the monitoring functions of engine M2 are displayed. Icon green: All monitoring functions are ok. Icon yellow: Advance warning for one or several monitoring functions. Icon red: Warning for one or several monitoring functions. **NOTICE!**: Always pay attention to advance warnings and act accordingly.

Function key	Function / description
F4	By pressing the function key **F4**, the individual control displays are called up one after the other in sequence from the beginning.

Function key	Function / description
F5	By pressing the function key **F5**, the individual control displays are called up one after the other in sequence from behind.

Function key	Function / description
F6	Change back by one selection level by pressing the function key **F6**.

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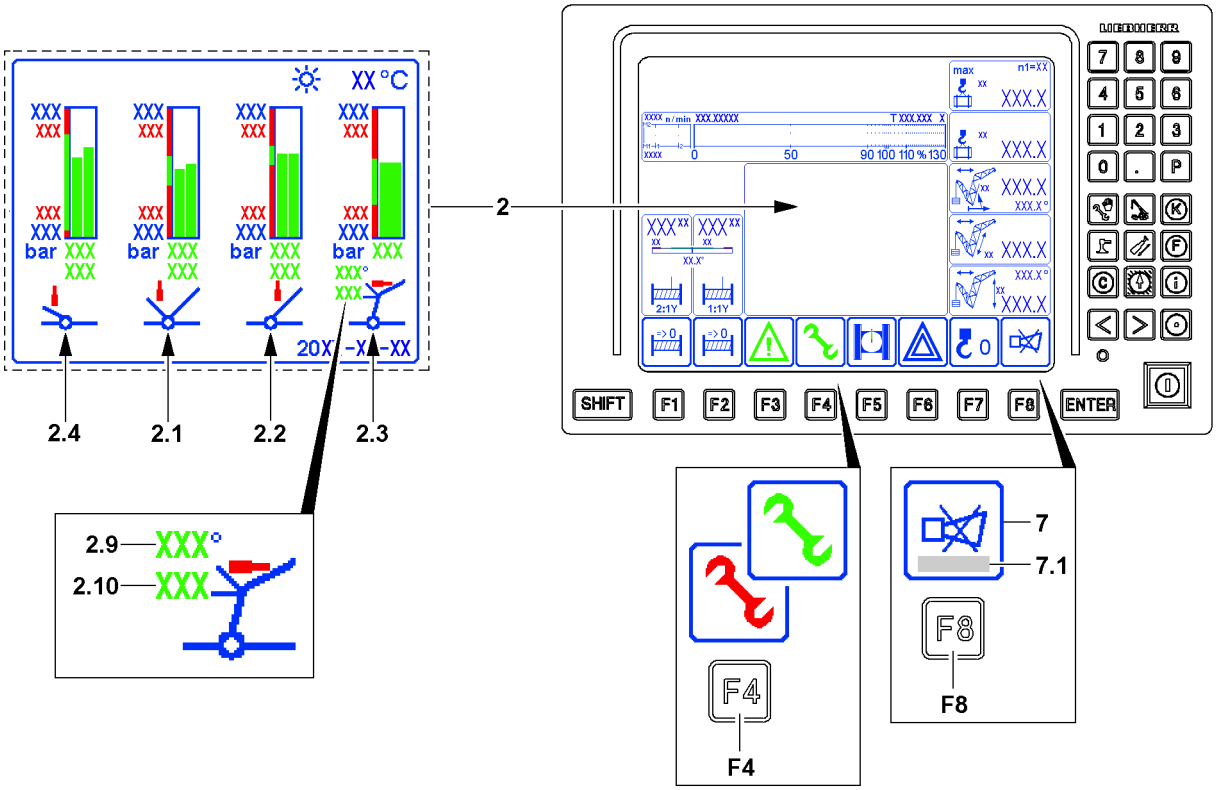

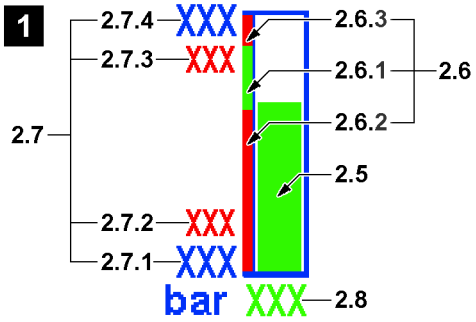

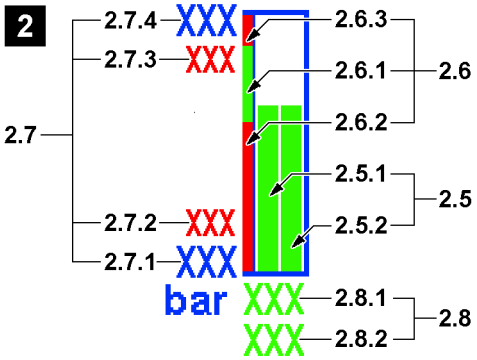

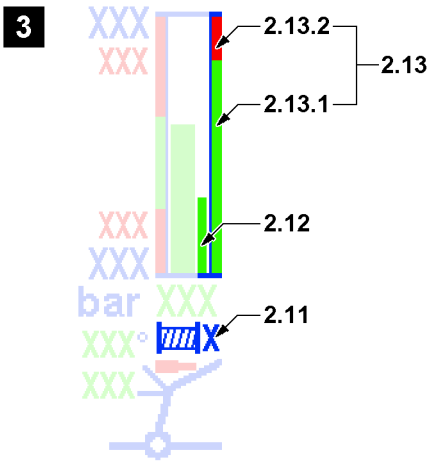

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Fig.125388

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5.6 Monitoring Relapse cylinder / erection cylinder

The monitoring of the relapse cylinders **2** are always active and can be displayed in the monitoring field, if necessary. Due to the color of the icon over the function key **F4** the crane operator is automatically alerted in case of a warning occurrence.

The monitoring field has its fixed place on the LICCON monitor and can be hidden or assigned with other functions.

By pressing the function key **F4**, the monitoring of the relapse cylinders **2** is displayed in the monitoring field.

WARNING
Pressure in impermissible range!
▶ Make sure that the pressure displays are always in the permissible range.
▶ Counteract an impermissible pressure immediately.

WARNING
Shut off monitoring of relapse cylinders!
▶ Outside of the *Crane operation* program, the monitoring of the relapse cylinders is turned off!
▶ When the monitoring of the relapse cylinders is turned off, warning events are not recognized!

Color key of warning icon above function key **F4**
– Warning icon green: Monitoring of relapse cylinders is ok.
– Warning icon red: Warning for one or several relapse cylinders.

- If a warning occurs, an error message **7.1** is issued in the *Horn* icon **7** for some errors. The error message **7.1** includes an acoustic signal through the LICCON monitor and an error description.
- Press the function key **F8** once: The acoustic signal is turned off.
  Press the function key **F8** twice: The error description for the error message **7.1** which occurred last is called up.

2 Display field
- Depending on the set up configuration and crane type, up to four pressure displays appear.
- The individual pressure displays always refer to the relapse cylinder / erection cylinder, which are highlighted in the icon directly underneath.

2.1 Derrick relapse cylinder

2.2 Main boom relapse cylinder

2.3 Auxiliary boom / accessory relapse cylinder

2.4 SA-frame Erection cylinder
- **Note**: Only present for certain crane types

Note
▶ **Illustration 1**: Example of display of individual relapse cylinders
▶ **Illustration 2**: Example of display of double relapse cylinders
▶ **Illustration 3**: Example supplementary Winch pressure display* during erection procedures (only for certain crane types)

2.5 Bargraph Actual pressure
- Bar display of actual pressure on relapse cylinder
- For double relapse cylinders:
  2.5.1 Bargraph of first relapse cylinder
  2.5.2 Bargraph of second relapse cylinder
- **Note:** When the actual pressure is in the permissible range, the actual pressure bargraph **2.5** is shown in green.
  Warning!: When the actual pressure is in the impermissible range, the actual pressure bargraph **2.5** is shown in red. Counteract immediately to the high pressure.

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2.6 Scale pressure display
- **2.6.1** Ideal pressure range
- **2.6.2** Minimum pressure range fallen below
  Note: Appears only if a minimum pressure is monitored.
- **2.6.3** Highest pressure range exceeded

2.7 Values pressure display
- **2.7.1** Lowest display value
- **2.7.2** Minimum pressure value
  Note: Appears only if a minimum pressure is monitored.
- **2.7.3** Highest pressure value
- **2.7.4** Highest display value

2.8 Pressure relapse cylinder
- Actual value relapse cylinder
- For double relapse cylinders:
  2.8.1 Pressure of the first relapse cylinders
  2.8.2 Pressure of the second relapse cylinders

2.9 Angle WA-frame 1

2.10 Angle WA-frame 2

Winch pressure display* during erection procedures (only for certain crane types)

See illustration **3**

Note
- ▶ The winch pressure is shown when the main boom is luffed under 10 degrees, the luffing jib was set up and no parallel operation was preselected.
- ▶ The winch moved last is always shown (winch 1 or winch 2).

2.11 Displayed winch
- Shows for which winch the winch pressure is shown

2.12 Bargraph Winch pressure
- Bargraph for winch pressure of respectively shown winch **2.11**
- **Note:** When the actual pressure is in the permissible range, the winch pressure bargraph **2.12** is shown in green.
  Warning! When the actual pressure is in the impermissible range, the winch pressure bargraph **2.12** is shown in red. Counteract immediately to the high pressure.

2.13 Scale pressure display
- **2.13.1** Ideal pressure range
- **2.13.2** Highest pressure range exceeded

Note
Additional display values in the display *Monitoring of relapse cylinders* **2**
- ▶ Date and ambient temperature are also displayed.

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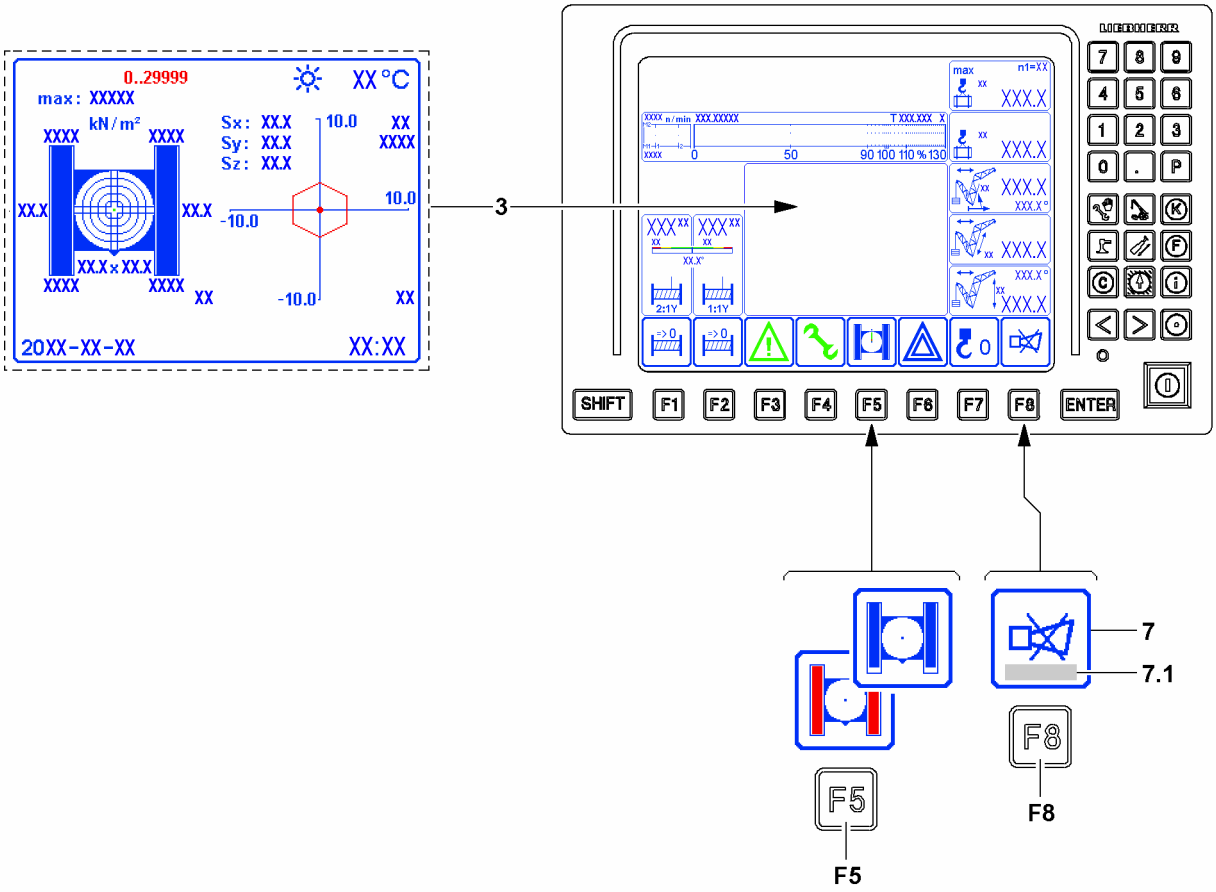

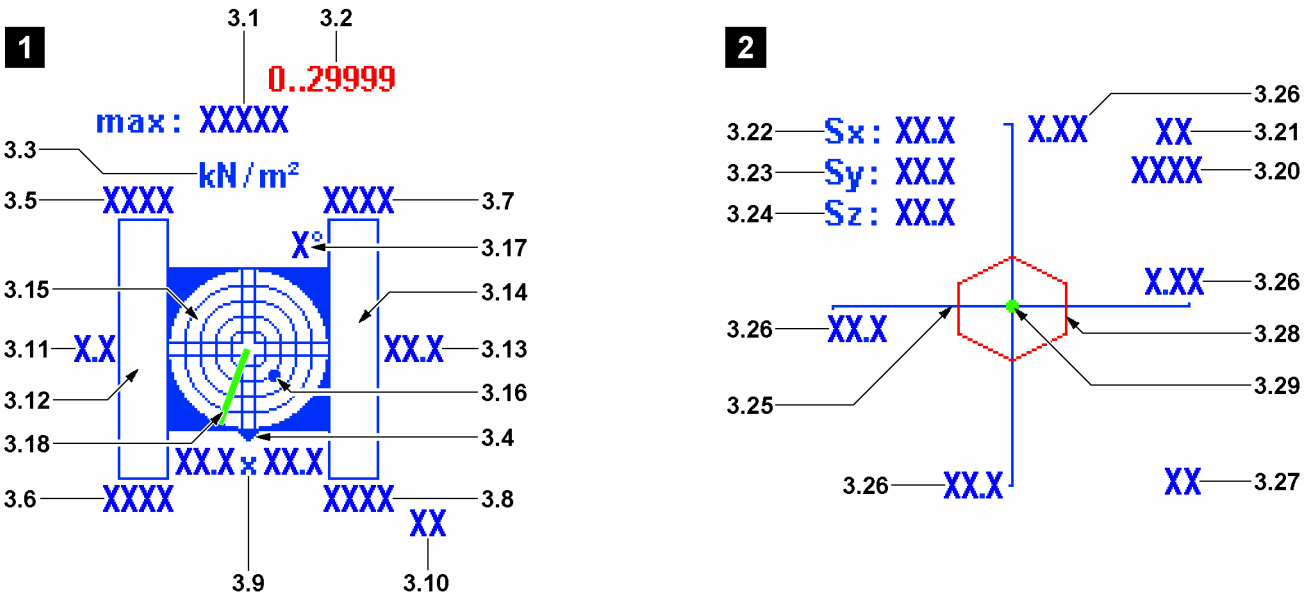

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Fig.144107

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5.7 Monitoring of surface pressure and center of gravity

WARNING
The crane can topple over!
When the programmed limit values are reached in the monitoring of surface pressure and center of gravity, there is no automatic shut off of crane movements.
The displayed values are calculated and are informative. Calculated values are below the tolerances and unpredictable influences, for example crane control, surrounding and environmental influences.
Due to the resulting tolerance field of the values, the monitoring of surface pressure and center of gravity may not be used to determine the limit values of the crane.
If this is disregarded, then the crane can topple over.
Personnel can be severely injured or killed.
- ▶ Do not use the displayed values to determine the limit values of the crane and to utilize the crane to its tipping limit or until it sinks in.
- ▶ Make sure that all values are within the programmed limit values.

WARNING
Increased surface pressure!
The calculation of the values for the display of the surface pressure in the LICCON monitor are based on ideal assumptions.
- ▶ Side deformations of the boom system due to wind, inclined position and elastic resilience of the steel structure are not taken into account but they can lead to an increase of the surface pressure.

WARNING
Shifting of center of gravity!
The calculation of the values for the display of the center of gravity in the LICCON monitor are based on ideal assumptions.
- ▶ Side deformations of the boom system due to wind, inclined position and elastic resilience of the steel structure are not taken into account but they can lead to a shifting of the center of gravity.

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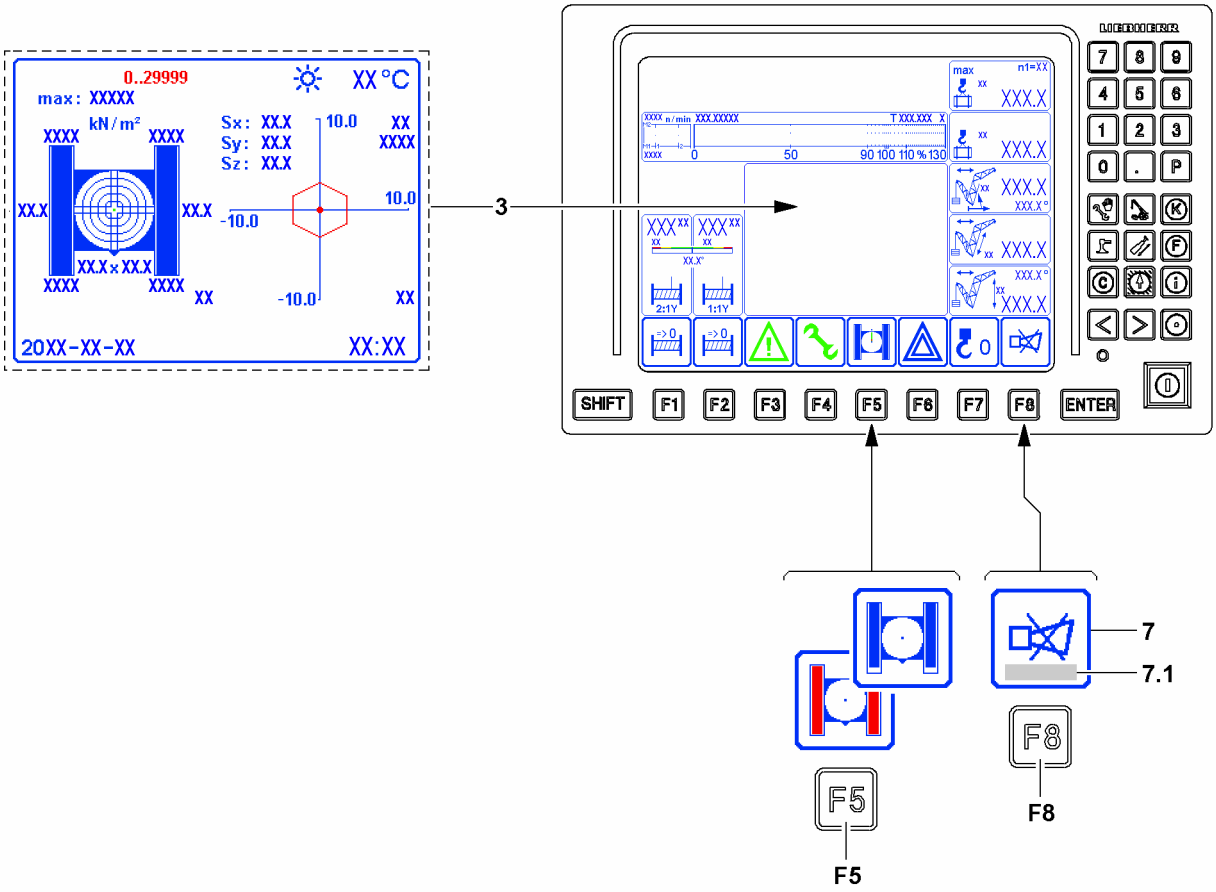

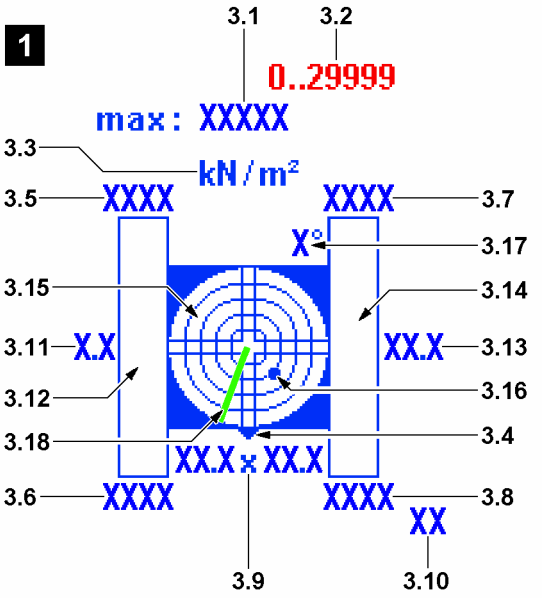

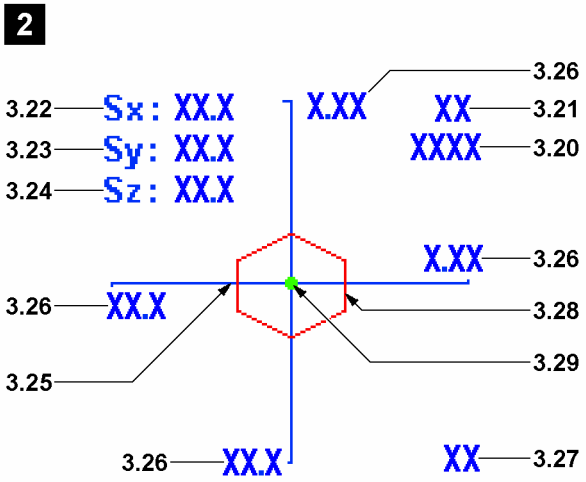

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Fig.144107

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The monitoring of surface pressure and center of gravity **3** is always active and can be displayed in the monitoring field, if necessary. Due to the color of the icon over the function key **F5** the crane operator is automatically alerted in case of a warning occurrence.

The monitoring field has its fixed place on the LICCON monitor and can be hidden or assigned with other functions.

By pressing the function key **F5**, the monitoring of surface pressure and center of gravity **3** is displayed in the monitoring field.

Note
Turned off monitoring of surface pressure and center of gravity.
- ▶ Outside of the *Crane operation* program, the monitoring of surface pressure and center of gravity is turned off.
- ▶ When the monitoring of surface pressure and center of gravity is turned off, warning events are not recognized.

Color key of warning icon above function key **F5**:
- – Warning icon blue: Monitoring of surface pressure and center of gravity is ok.
- – Crawler carrier in warning icon red: Warning for monitoring of surface pressure and center of gravity.

Error messages:
- – If a warning occurs, an error message **7.1** is issued in the *Horn* icon **7** for some errors. The error message **7.1** includes an acoustic signal through the LICCON monitor and an error description.
- – Press the function key **F8** once: The acoustic signal is turned off.
- – Press the function key **F8** twice: The error description for the error message **7.1** which occurred last is called up.

Note
- ▶ **Illustration 1**: Display Surface pressure
- ▶ **Illustration 2**: Display *Center of gravity*

3 Display *Monitoring of surface pressure and center of gravity*
- The values are calculated depending on the set up configuration of the crane and the load.

Display Surface pressure, illustration **1:**

3.1 Permissible surface pressure
- The value is entered by the crane operator via the keypad.

3.2 Input area
- Input area for the permissible surface pressure **3.1**.

3.3 Measuring unit for surface pressure
- Measuring unit for the pressure data in the display surface pressure (illustration **1**).

3.4 Direction specification
- The triangle symbolizes where the front of the crawler travel gear is in the illustration.
- **Note:** The front on the crawler travel gear is always on the side where the chain tension devices for the crawler carriers are located. The position of the turntable has no influence on this. The position of the turntable can be derived from the boom direction **3.18**.

3.5 Surface pressure
- Calculated actual value of surface pressure on the crawler travel gear, left rear.

3.6 Surface pressure
- Calculated actual value of surface pressure on the crawler travel gear, left front.

3.7 Surface pressure
- Calculated actual value of surface pressure on the crawler travel gear, right rear.

3.8 Surface pressure
- Calculated actual value of surface pressure on the crawler travel gear, right front.

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3.9 Travel gear base
- Base dimensions of the crawler travel gear.

3.10 Measuring unit Length data
- Measuring unit for the measuring data in the display surface pressure (illustration **1**).

3.11 Placement surface
- Calculated placement surface of crawler carrier right as value.

3.12 Placement surface
- Calculated placement surface of crawler carrier right as graphic.

3.13 Placement surface
- Calculated placement surface of crawler carrier left as value.

3.14 Placement surface
- Calculated placement surface of crawler carrier left as graphic.

3.15 Incline display
- The graphic display is in the form of a spirit level, with a moving dot **3.16** representing the air bubble.
- **Note**: Incline display with number values, see section „Monitored auxiliary functions“.

3.16 Point
- The center of the dot **3.16** shows the incline.

3.17 Resolution of view
- This value describes the resolution of the graphic view of the incline indicator. This displayed value corresponds with the outermost ring of the spirit level. The resolution is matched automatically to the incline.

3.18 Boom direction
- Current boom direction in reference to the displayed icon.
- The boom direction corresponds to the viewing direction *to the front* from the crane cab.

Note
Example for the incline indicator **3.15**:
▶ **Example**: The point **3.16** lies on the second ring from the inside in the lower right quadrant. The display resolution **3.17** is 1°. Therefore an inclination of 0.4° is displayed. The highest point on the placement surface of the crawler travel gear is on the front left side. Therefore, the crane is inclined back to the right 0.4° from the point of view of the crawler travel gear.

WARNING
The crane can topple over!
If the permissible incline of the crane is exceeded, the crane can topple over.
▶ Do not exceed the permissible incline from the load chart.
▶ Do not exceed the permissible incline for driving the crane, see Crane operating instructions, chapter 4.10.

Display Center of gravity, illustration **2:**

3.20 Weight data
- Calculated total weight of the crane including load.

3.21 Weight unit
- Weight unit for the weight data **3.20** in the display center of gravity (illustration **2**).

3.22 Center of gravity position
- Calculated center of gravity position in direction *Sx*

3.23 Center of gravity position
- Calculated center of gravity position in direction *Sy*

3.24 Center of gravity position
- Calculated center of gravity position in direction *Sz*

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3.25 Axis of coordinates
- The axis of coordinates **3.25** is aligned according to the direction of the display surface pressure (illustration **1**) centered to the slewing ring on the placement surface of the crane.

3.26 Scale value
- Scale value on the axis of coordinates **3.25**

3.27 Measuring unit
- Measuring unit in the display center of gravity (illustration **2**)

3.28 Core surface
- Calculated core surface of the crane according to the set up configuration, load and ground conditions.
- **Note:** The core surface is an important reference point for the center of gravity of the crane.

3.29 Center of gravity Sx/Sy
- Calculated center of gravity displayed graphically in direction Sx/Sy
- **Note:** The actual position is in direct relation to the values center of gravity position **3.22** and center of gravity position **3.23**

Note
Additional display values in the Display *Monitoring of surface pressure and center of gravity* **3**
▶ Date, time of day and ambient temperature are also displayed.

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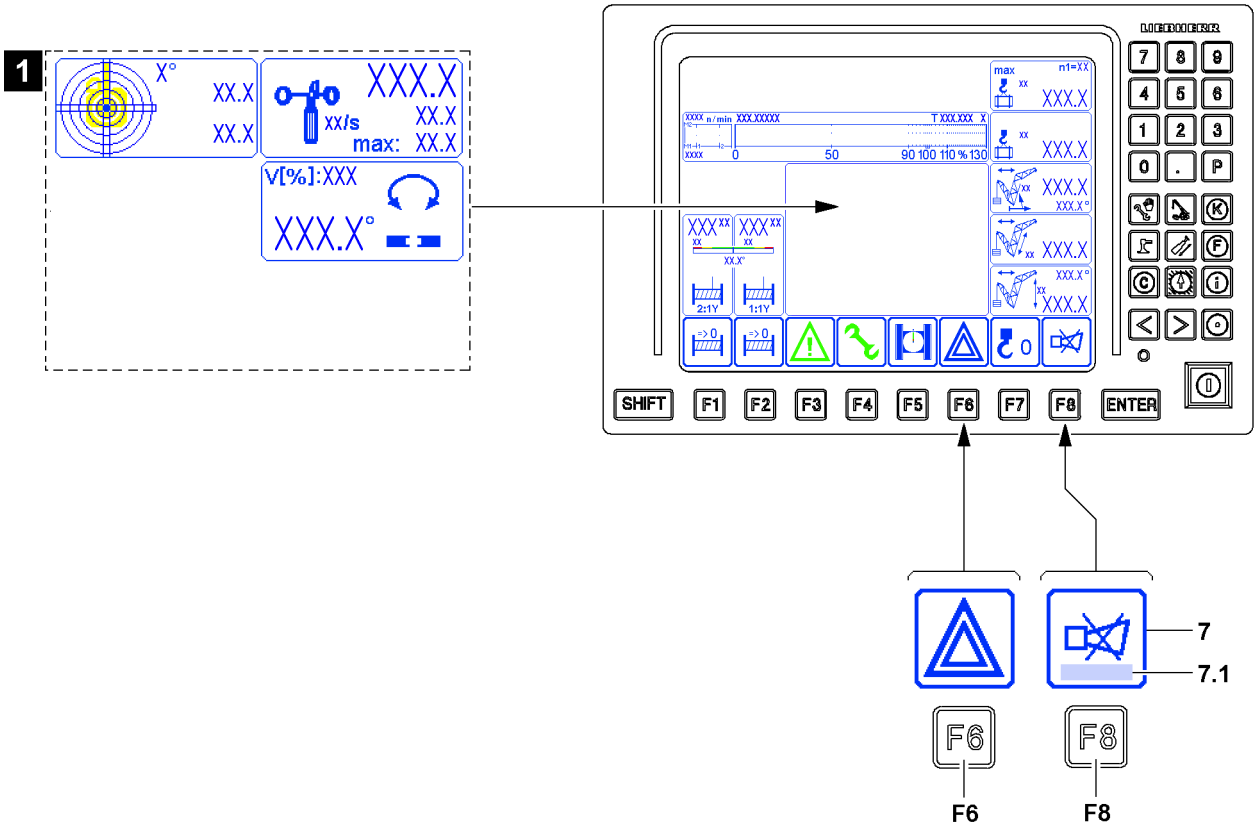

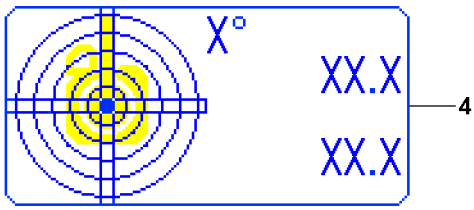

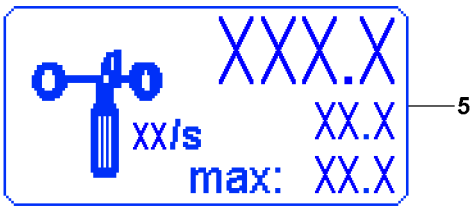

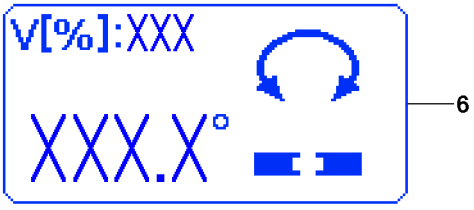

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Fig.116013

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5.8 Monitored auxiliary functions

The monitored auxiliary functions (illustration **1**) are always active and can be displayed in the monitoring field, if necessary.

The monitoring field has its fixed place on the LICCON monitor and can be hidden or assigned with other functions.

By pressing the function key **F6**, the monitored auxiliary functions are displayed / masked in the monitoring field.

Note
Shut off *Monitored auxiliary functions*
- ▶ Outside of the *Crane operation* program, the monitored auxiliary functions are turned off.
- ▶ When the monitored auxiliary functions are turned off, warning events are not recognized.

The appearance of the icon over function key **F6** changes according to the condition:
Icon with filled out frame = auxiliary functions icons turned off
Icon with frame not filled out = auxiliary functions icons turned on
Note: If a monitored limit has been exceeded, a warning is issued the corresponding icon is displayed, even if the monitoring icons have been hidden.

Error messages:
- – If a warning occurs, an error message **7.1** is issued in the *Horn* icon **7** for some errors. The error message **7.1** includes an acoustic signal through the LICCON monitor and an error description.
- – Press the function key **F8** once: The acoustic signal is turned off.
- – Press the function key **F8** twice: The error description for the error message **7.1** which occurred last is called up.

Auxiliary functions:

4 Crane incline
5 Wind speed
6 Slewing range

5.8.1 Display of auxiliary functions

The display changes depending if the monitored auxiliary functions are turned on or off via the function key **F6**.

Monitored auxiliary functions turned off:
- – No error:
  Icons are not shown.
- – Error in one function:
  Icon with error message is shown.

Monitored auxiliary functions turned on:
- – Icons are displayed permanently

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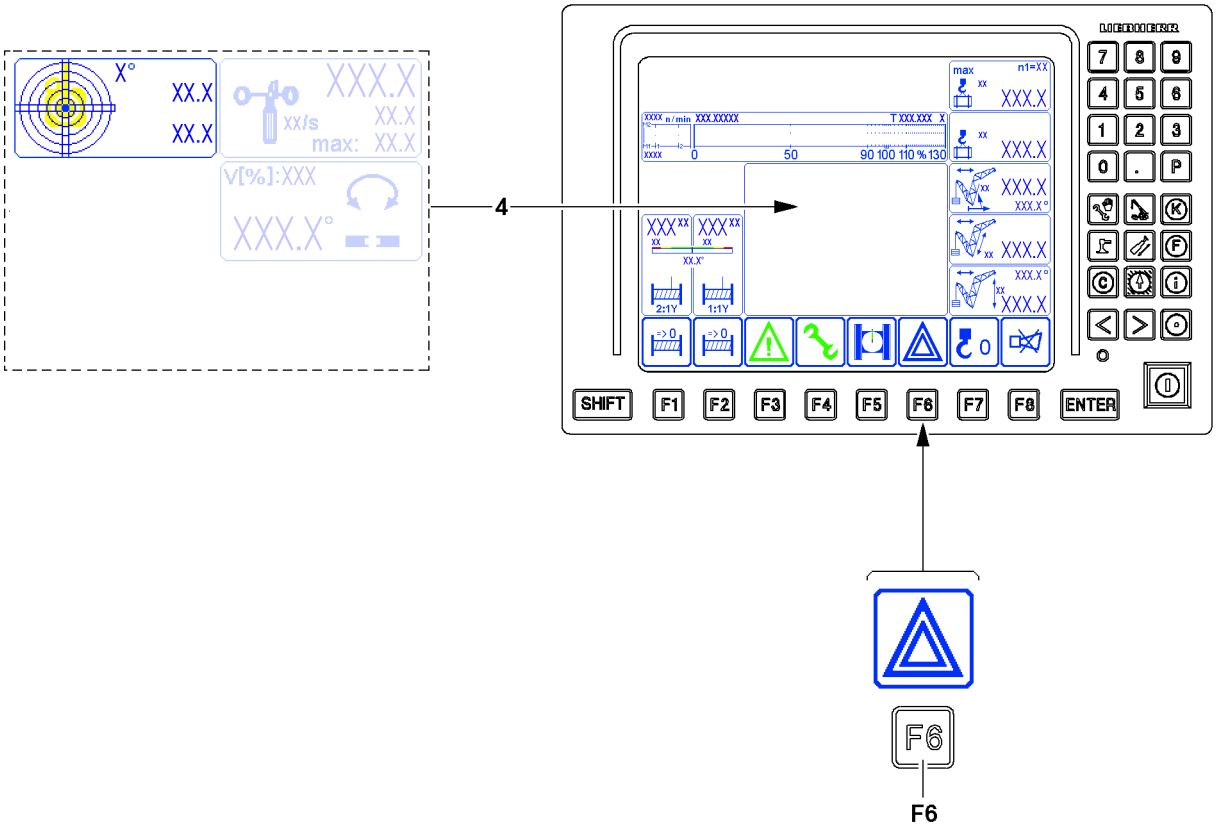

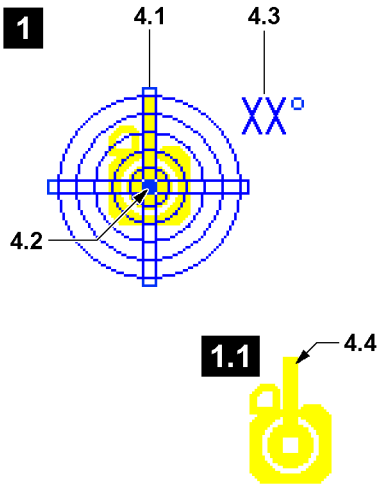

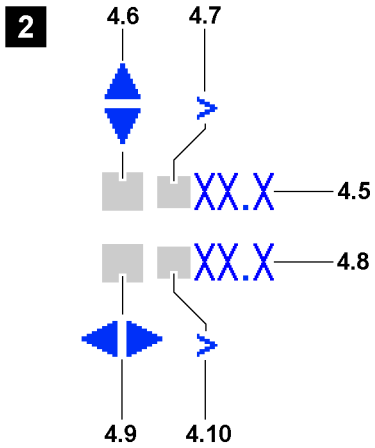

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Fig.114292

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5.8.2 Crane incline

WARNING
The crane can topple over!
If the permissible incline of the crane is exceeded, the crane can topple over.
The *larger than* icon shows that the crane is inclined further than can be shown.
The exact incline can then not be read.
▶ Do not exceed the permissible incline from the load chart.
▶ Do not exceed the permissible incline for driving the crane, see Crane operating instructions, chapter 4.10.

4 *Inclination* icon
- Display of the incline of the crane to the horizontal in longitudinal and lateral direction. The display is graphic as well as numeric.
- The display is divided in a graphic section (illustration **1**) and a numeric section (illustration **2**).
- The directional data refers to the direction of the crane superstructure (view from the cab).

Graphical section (illustration **1):**

4.1 Graphic display
- The graphic display is in the form of a spirit level, with a moving dot **4.2** representing the air bubble.

4.2 Point
- The center of the dot **4.2** shows the incline value.

4.3 Resolution of view
- This value describes the resolution of the graphic view. The resolution is matched automatically to the incline.

4.4 Boom direction
- To the graphic view **4.1**, the overhead view of the imitated crane superstructure is provided, see illustration **1.1**. The main boom direction **4.4** is symbolized by a wide yellow line and is provided for orientation in the display.

Numeric section (illustration **2):**

4.5 Longitudinal direction
- Incline of crane in longitudinal direction in [°].

4.6 Direction arrow
- The direction arrow shows the direction of the incline.

4.7 Display range exceeded
- If the *larger than* icon appears, then the display range is exceeded.
- **Note:** The crane is inclined further than can be shown.

4.8 Lateral direction
- Incline of crane in lateral direction in [°].

4.9 Direction arrow
- The direction arrow shows the direction of the incline.

4.10 Display range exceeded
- If the *larger than* icon appears, then the display range is exceeded.
- **Note:** The crane is inclined further than can be shown.

Note
Orientation of the crane in *Incline* icon **4**.
▶ Observe the main boom direction **4.4**.

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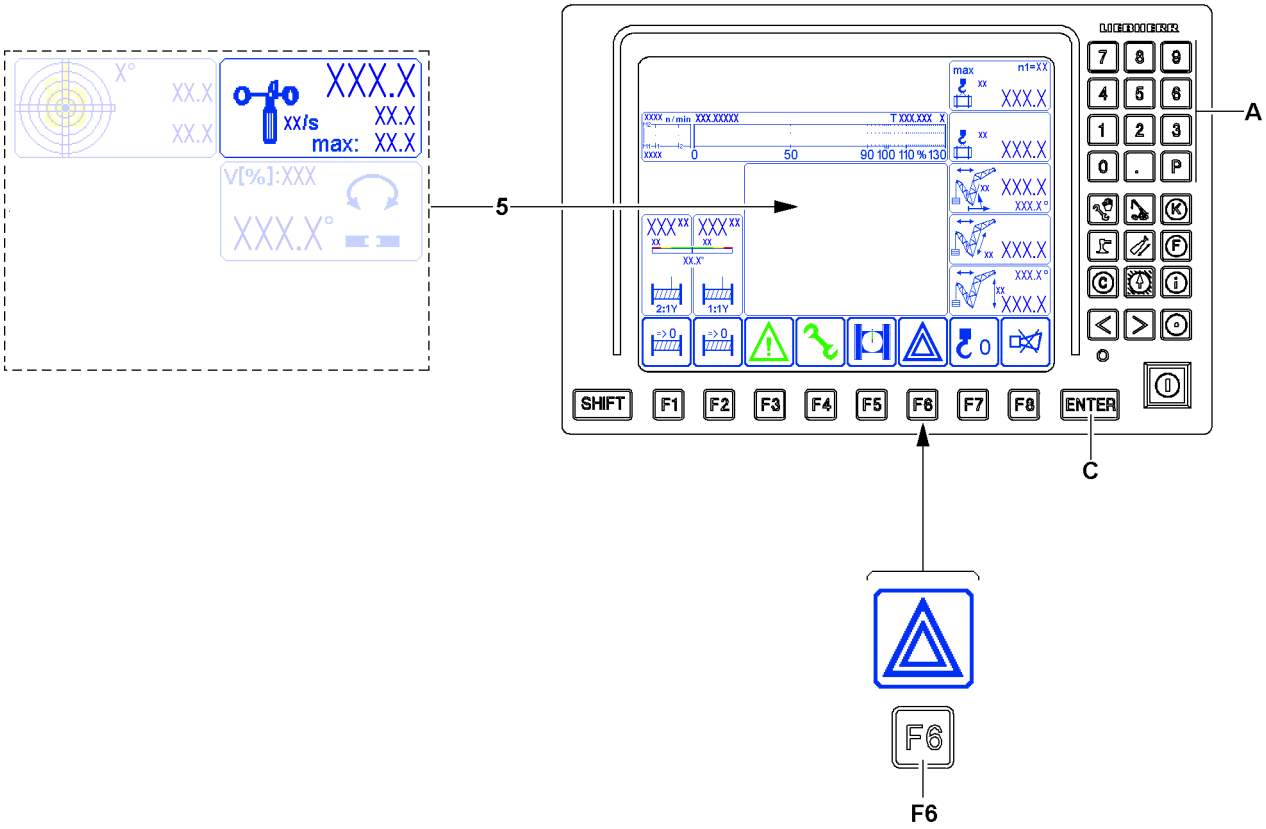

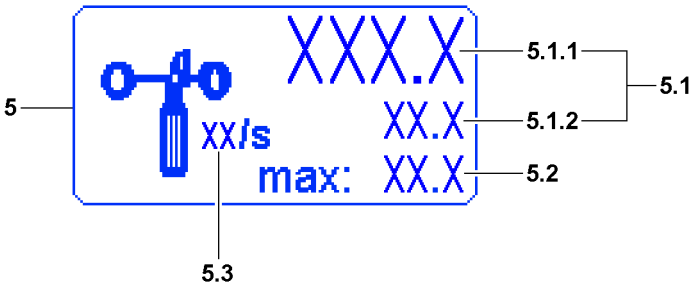

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Fig.121798

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5.8.3 Wind speed

WARNING
Wind speed too high!
If the maximum permissible wind speed is exceeded with an erected boom system, there is a danger of accident.
Dangerous situations can arise, such as oscillating load or shaking crane.
The crane can topple over, personnel can be severely injured or killed.

- ▶ **The crane movements will not be shut off.**
- ▶ The boom system must be taken down in time before exceeding the maximum permissible wind speed of the crane.
- ▶ The danger notes, see Crane operating instructions, chapter 2.04 must be strictly observed and adhered to.

5 *Wind speed* icon

5.1 Current wind speed

- **Note:** If a wind sensor is connected, then the wind speed appears at **5.1.1**. If two wind sensors are connected (Example: Crane operation with auxiliary boom / accessory), a second wind speed appears additionally at **5.1.2**
- **5.1.1** current wind speed WG1
- **5.1.2** current wind speed WG2

WARNING
Crane operation without display value of wind speed!
If a question mark (?) appears in the display of the current wind speed **5.1** instead of number values, then a wind sensor which must be present is missing or there is an error in the wind sensor.

- ▶ Before starting to work with the crane, make sure that all wind sensors which must be present are present and functioning.
- ▶ Remedy the error immediately.
- ▶ If an error cannot be remedied, then it must be ensured that the wind speed is monitored otherwise.

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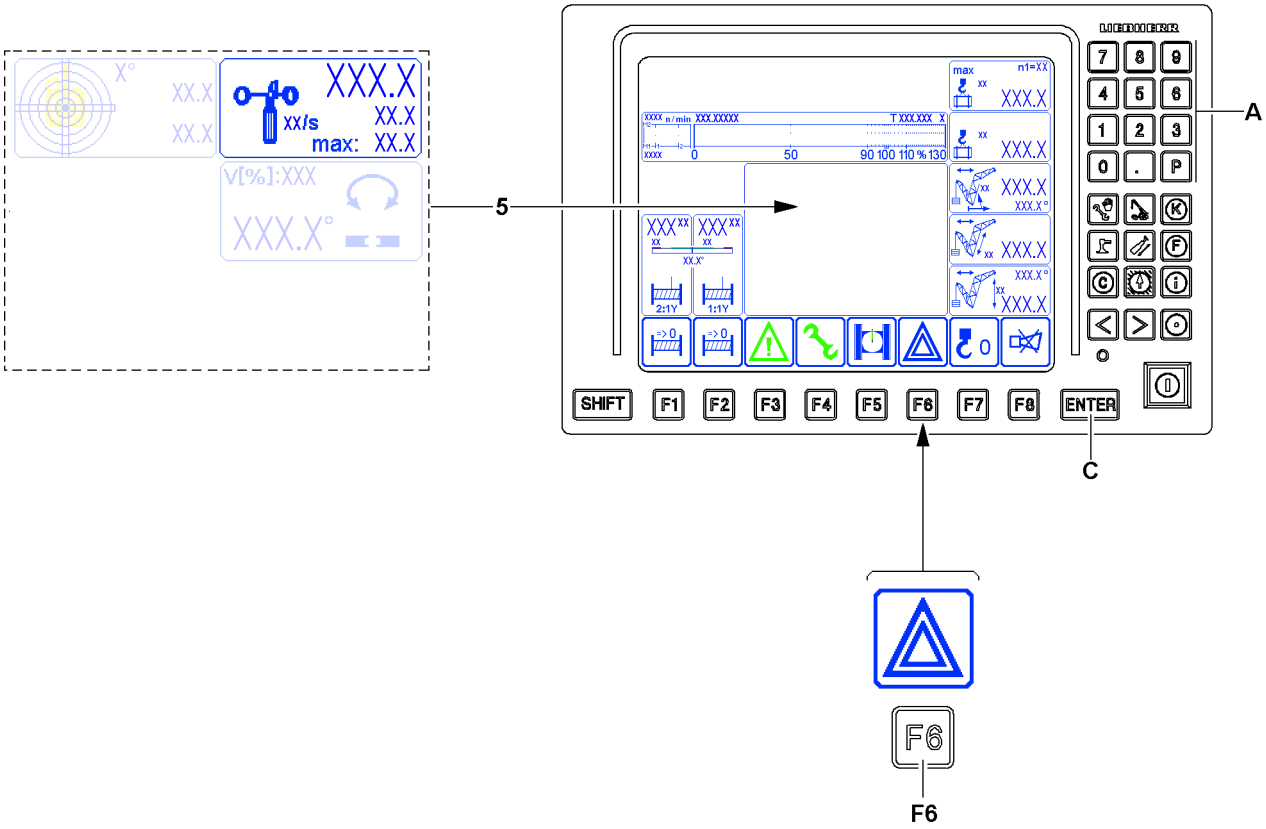

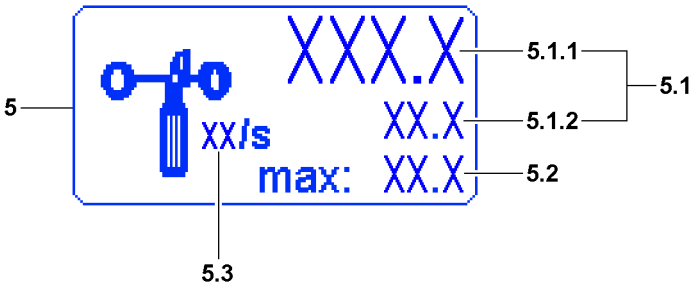

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Fig.121798

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Note
- ▶ If several wind sensors are connected, the installation location of the wind sensor determines the corresponding display in the *Wind speed* icon **5**.
- ▶ The priority depends on the installation location of the wind sensor, from outside (auxiliary boom / accessory) to inside (main boom). The wind speed for the outside wind sensor is shown independent from the inside wind sensor.

5.2 Maximum permissible wind speed
- The value depends on the operating mode and the set up configuration.
- If the current wind speed value exceeds the displayed maximum value, the maximum value starts to blink and the warning sound *Short horn* sounds.

Note
- ▶ If access to a load chart is not possible, then the maximum value starts to blink and the warning sound *Short horn* sounds.

5.3 Measuring unit
- [m/s] or [ft/s]

Reducing the maximum permissible wind speed*

Note
- ▶ This function is not available for all crane types.

The value for the maximum permissible wind speed **5.2** can possibly be reduced.

Ensure that the following prerequisite is met:
– The *Wind speed* icon **5** is shown.

Reduce the wind speed:
1. Press the ENTER key **C**.
2. As soon as the value for the maximum permissible wind speed **5.2** is highlighted in blue, enter the new value via the keypad **A**.
3. Press the ENTER **C** key again. The changed value for the maximum permissible wind speed **5.2** is shown in red.

Cancel reduce the wind speed:
1. Press the ENTER key **C**.
2. As soon as the value for the maximum permissible wind speed **5.2** is highlighted in blue, enter 0 (zero) as the new value via the keypad **A**.
3. Press the ENTER **C** key again. The original value from the load chart is taken over again.

Note
- ▶ If you try to enter a value for the maximum permissible wind speed **5.2** which is too high, then the highest possible value is taken over.

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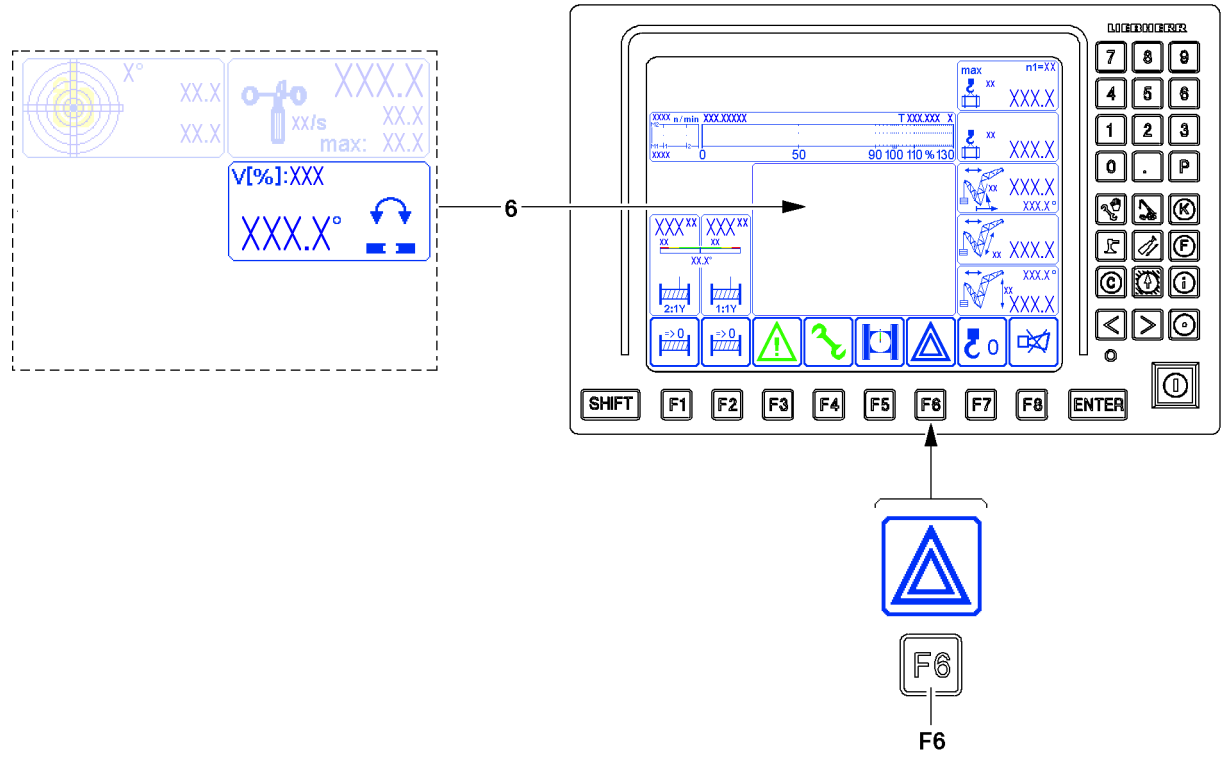

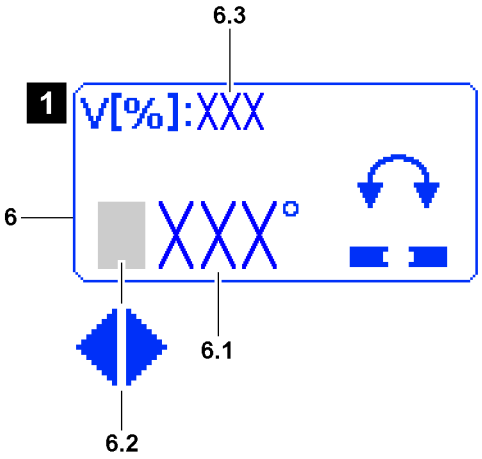

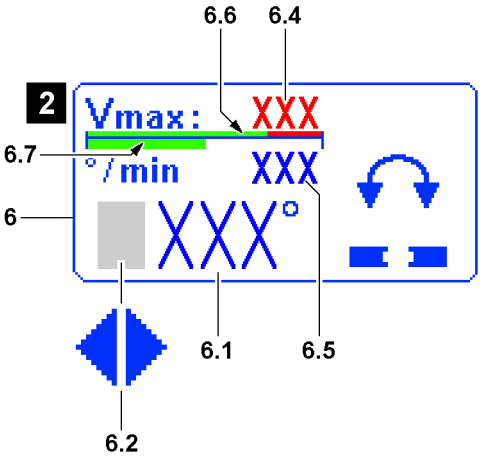

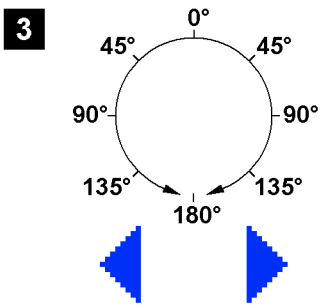

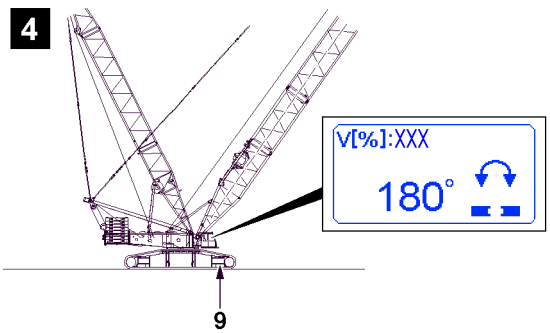

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Fig.144105

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5.8.4 Slewing range

6 *Slewing range* icon
- depending on the crane type, either the icon illustration **1** or illustration **2** appears

WARNING
Danger of accidents in case of excessive slewing speed!
Danger of toppling or collapsing crane.
Death, severe bodily injuries, property damage.
▶ Observe the slewing speed according to the specifications in the load chart manual.

6.1 Slewing angle
- Slewing angle of the crane superstructure in relation to the working direction *to the rear* (0°)
- The number value can increase on both sides to the maximum value of 180°, see illustration **3**
- **Note**: At display value 180°, the crane superstructure is exactly in the forward position, see illustration **4**. The front of the crawler travel gear is where the chain tension devices **9** are located.

6.2 Direction of rotation
- The direction arrow in front of the value indicates the direction of rotation of the crane superstructure.
- The direction arrow is in relation to the working direction *to the rear* (0°), see illustration **3**
- Arrow to the left: The crane superstructure is turned to the left.
- Arrow to the right: The crane superstructure is turned to the right.
- **Note**: If the crane superstructure is positioned exactly to the front (display value 180°) or to the rear (display value 0°) there is no direction arrow.

6.3 Slewing speed
- Only for crane types with the icon illustration **1**
- Maximum slewing speed in [%]
- Identifies the set maximum slewing speed of the slewing gear with a fully deflected master switch, relating to the maximum attainable slewing speed of the slewing gear at a preselected speed of 100 %.
  This value can be infinitely preselected, see section „Settings window Speed reduction master switch“.

6.4 Permissible slewing speed
- Only for crane types with the icon illustration **2**
- Number value for the permissible slewing speed in degrees per minute [°/min]. The permissible slewing speed is calculated depending on the current crane utilization and displayed.
- **Note**:
  The permissible slewing speed is reduced depending on the load down until the permissible value indicated in the load chart manual is reached. The crane driver is responsible for making sure this value is never exceeded. The slewing speed is not reduced automatically with the help of the crane control.

6.5 Current slewing speed
- Only for crane types with the icon illustration **2**
- Number value for the actual slewing speed in degrees per minute [°/min]
- Blue number value: Slewing speed in the permissible range
- Red number value (blinking): Slewing speed above the permissible range

6.6 Slewing speed scale
- Only for crane types with the icon illustration **2**
- Green range: Slewing speed in the permissible range
- Red range: Slewing speed above the permissible range

6.7 Slewing speed bar diagram
- Only for crane types with the icon illustration **2**
- Green bar: Slewing speed in the permissible range

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- Red bar: Slewing speed above the permissible range

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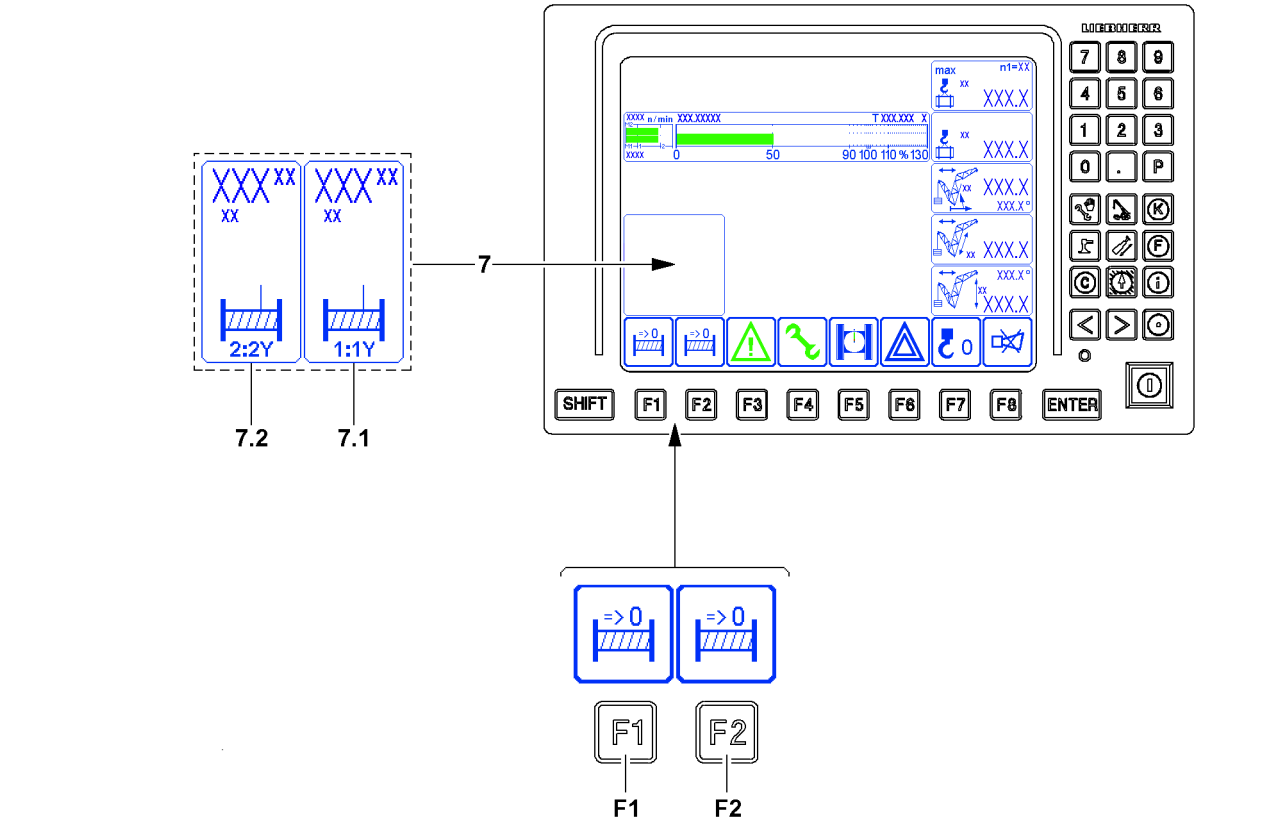

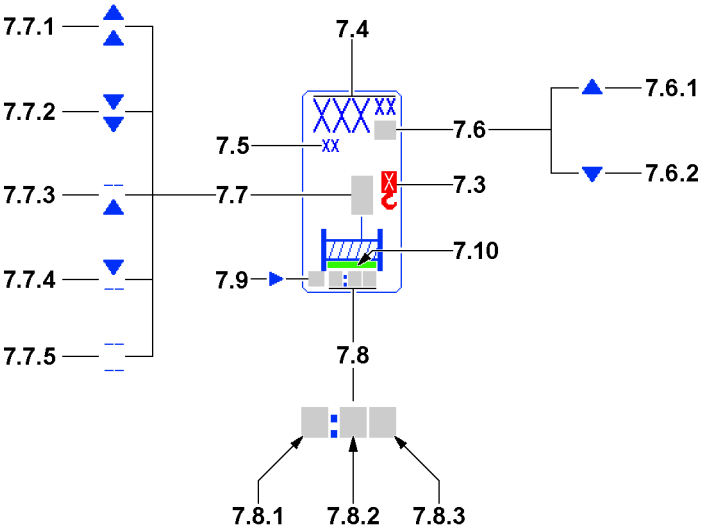

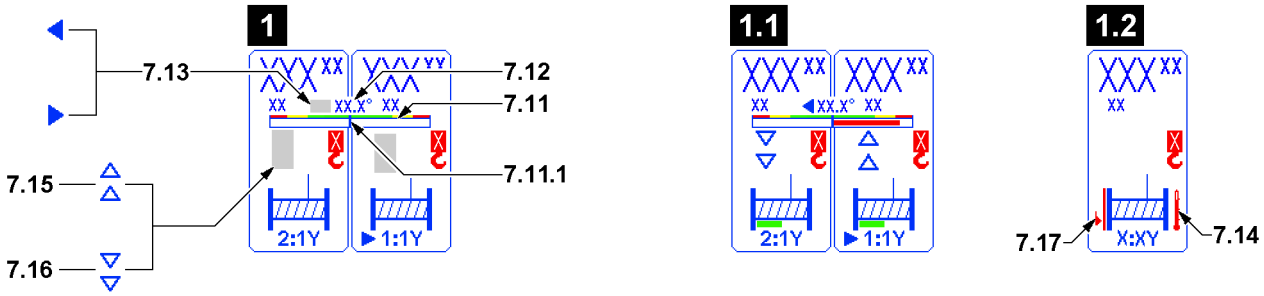

Fig.120621

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5.9 Winch display

The winch displays **7** have their fixed place on the LICCON monitor.

The current position of each winch can be set as zero point:
- Hoist winch: The completed hook path is calculated with the reeving set in the *Set up* program. A prerequisite for a correct display is that the value entered matches the entered reeving and the actual number of rope strands between the boom head and the hook block.
- Control winch: Rope length of winch spooled out / up

F1 Function key
- Above the function key **F1** appears the icon *Reset winch display*. Pressing on the button sets the display of the rope measurement to zero. The path measurement begins here.

F2 Function key
- Above the function key **F2** appears the icon *Reset winch display*. Pressing on the button sets the display of the rope measurement to zero. The path measurement begins here.

7 Winch display

7.1 *Winch 1* icon
- Icon for winch 1 (WI)

7.2 *Winch 2* icon
- Icon for winch 2 (WII)

Note

▶ The displays for winch 1 and winch 2 are identical and are explained on one icon element.

7.3 Load position
- Load position to which the winch is assigned.

7.4 Travelled distance
- In [m] or [ft], see Measuring unit **7.5**
  From a zero point to be determined
- The positions before the decimal point are displayed with a maximum of three large digits. The digits after the decimal point are displayed with small digits. Setting to zero point, see also section „The function key line of LICCON monitor 0“).
- As hoist winch the following applies:
  - For single operation with the reeving set in the *set up* program: completed hook path.
  - For parallel operation with the set total reeving made in the *set up* program: distance completed by the hook block.
  - A prerequisite for a correct display is that the reeving value entered equals the actual number of rope strands between the boom head and the hook block.

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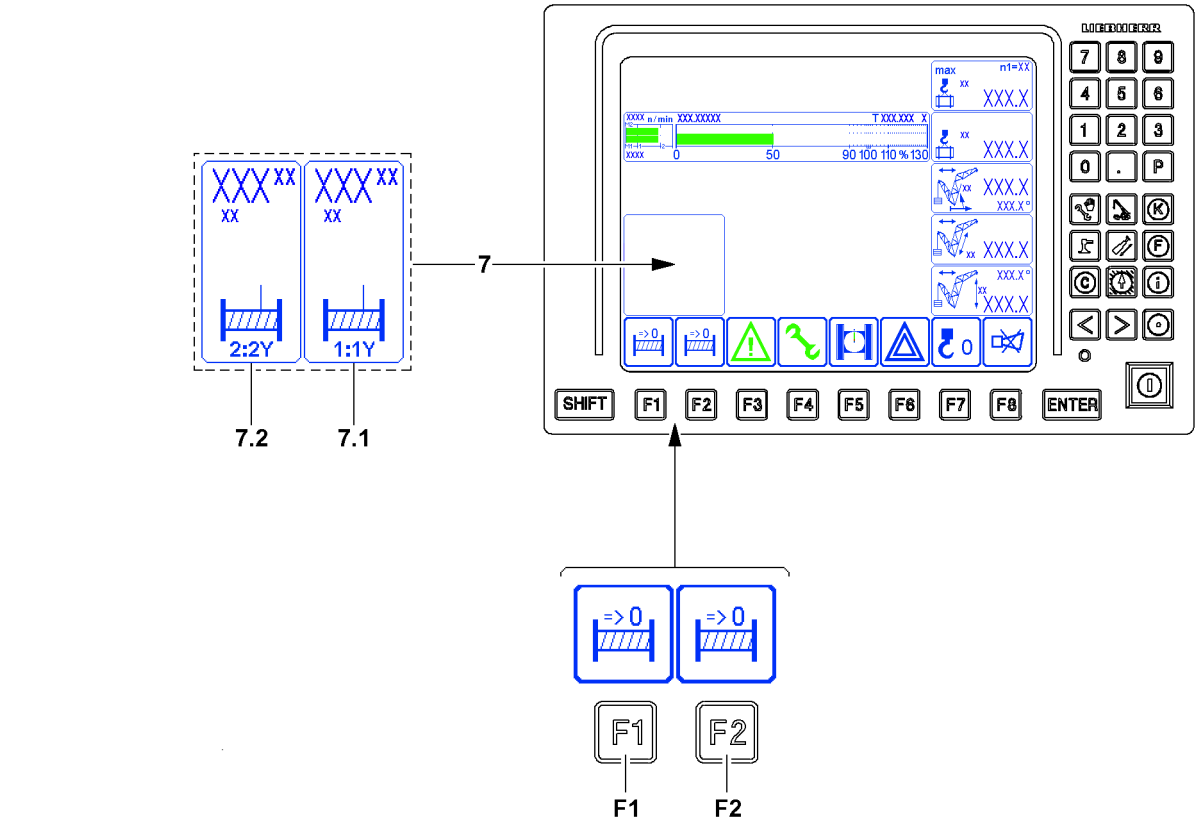

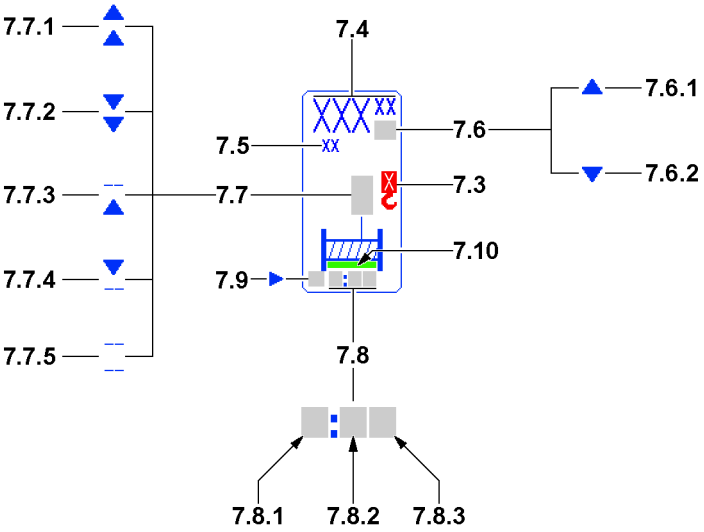

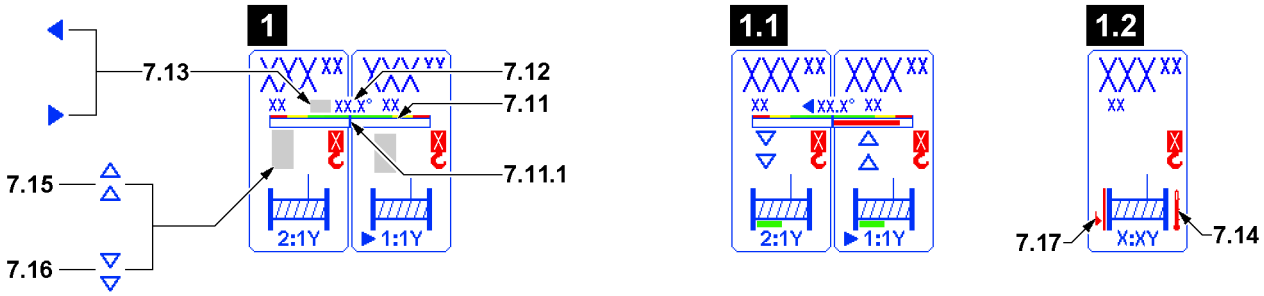

Fig.120621

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Note
Display area winch displays.

▶ The completed path **7.4** display has only three positions before the comma, any positions before that are cut off. The crane operator must evaluate for himself if, for example 200 m rope are spooled up on a winch or 1200 m. **The display in both cases would be identical with 200 m.**

For use as hoist winch:

▶ The hook path calculation only works accurately if the load is suspended freely and is not luffed during the lifting procedure. Not taken into account are flexation and rope expansion.

▶ The length display (hook path display) is only correct when the winch is calibrated.

7.5 Measuring unit
- Measuring unit of hook path display: [m] or [ft]

7.6 Direction of hook movement
- The arrows on the length value show the direction of the hook movement in relation to the zero point
- Arrow *up* **7.6.1**: Hook moves upward from the zero point
- Arrow down **7.6.2**: Hook moves downward from the zero point

7.7 Winch status display
- There are five winch condition icons, all blinking
- **Note:** If no winch status icon appears, the activated winch is inactive and is neither spooled up nor spooled out.

7.7.1 Spool out
- Winch is spooled out

7.7.2 Spool up
- Winch is spooled up

7.7.3 Spooled out
- Additional spooling out of the winch is blocked

7.7.4 Spooled up
- Additional spooling up of the winch is blocked

7.7.5 Winch deactivated
- Winch is deactivated or unplugged
- **Note:** Winch cannot be controlled.

7.8 Assignment of master switch
- **7.8.1** First digit
  - First digit: Winch number, every winch icon is permanently assigned to a winch
- **7.8.2** Second digit
  - Master switch number, according to the assigned master switch
  - ? : No master switch assigned
- **7.8.3** Letter
  - Actuation direction of the master switch, see illustration
  - ? : No actuation direction assigned

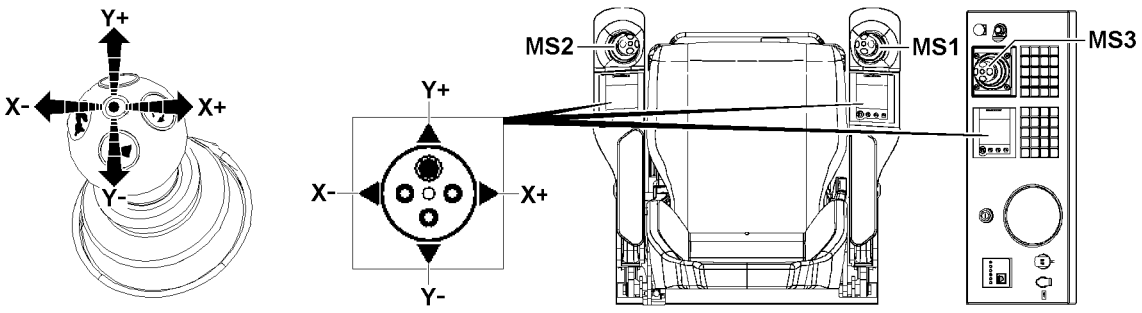

Fig.123758: Actuation directions Master switch

MS1 Master switch 1
MS2 Master switch 2
X- To the left
Y+ To the front

For continuation of legend for illustrations, see next page

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MS3 Master switch 3
X+ To the right
Y- To the rear

7.9 Vibration sensor
- If the vibration sensor for a winch is added on the master switch, then an arrow appears in this winch icon for the added vibration sensor.
- **Note:** The vibration sensor is added at the first actuated crane function.

7.10 Winch speed
- **Note:** Only for certain crane types.
- If the maximum winch speed is reduced, a bar in the respective length appears on the bottom in the winch icon. Example: Half the length corresponds to a reduction of the maximum winch speed of 50 %, see example in illustration **1.1**.

Note

▶ For detailed description of parallel operation of winch 1 and winch 2, see Crane operating instructions, chapter 4.05.

Parallel operation of Winch 1 and winch 2, illustration **1:**

7.11 Incline display
- Graphic display of incline of hook block during parallel operation with winch 1 and winch 2

7.11.1 Display bar
- Appears as soon as the hook block is inclined
- The display bar **7.11.1** appears in green, yellow and red, depending on the situation
- Display bar **7.11.1** green: Incline in permissible range
- Display bar **7.11.1** yellow: **Advance warning!** Incline just before impermissible range
- Display bar **7.11.1** red: **Warning!** Incline in impermissible range

7.12 Incline value
- Incline value of hook block in parallel operation with winch 1 and winch 2.
- The incline value appears in degrees [°].

7.13 Incline direction
- Incline direction of hook block in parallel operation with winch 1 and winch 2.

7.15 Spool the winch out
- If the *Spool winch out* icon **7.15** appears in the winch display: Spool the winch out to align the hook block

7.16 Spool the winch up
- If the *Spool winch up* icon **7.16** appears in the winch display: Spool the winch up to align the hook block

WARNING

Hook block in sloped position!
If the hook block gets so far into a sloped position that the red range (example illustration **1.1**) is reached in the incline display, then there is a danger of accident.

▶ Always correct the position of the hook block in time.
▶ Keep the incline of the hook block always within the green range.

Maintenance displays, illustration **1.2:**

7.14 *Winch overheated* icon
- If the *Winch overheated* icon **7.14** appears, the temperature in the respective winch is too high.
  Note: Only for certain crane types with temperature sensors in the winches.

7.17 *Insufficient oil* icon
- If the *Insufficient oil* icon **7.17** appears after correct completion of oil level measurement *Winch gear* permanently, the oil level in the respective winch is too low.
  Note: Only for certain crane types.

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WARNING
Overheated winch!
If a winch is operated further, even though the *Winch overheated* icon **7.14** appears, the winch can be severely damaged.
The winch can fail and accidents can result.
▶ Let the overheated winch cool off.

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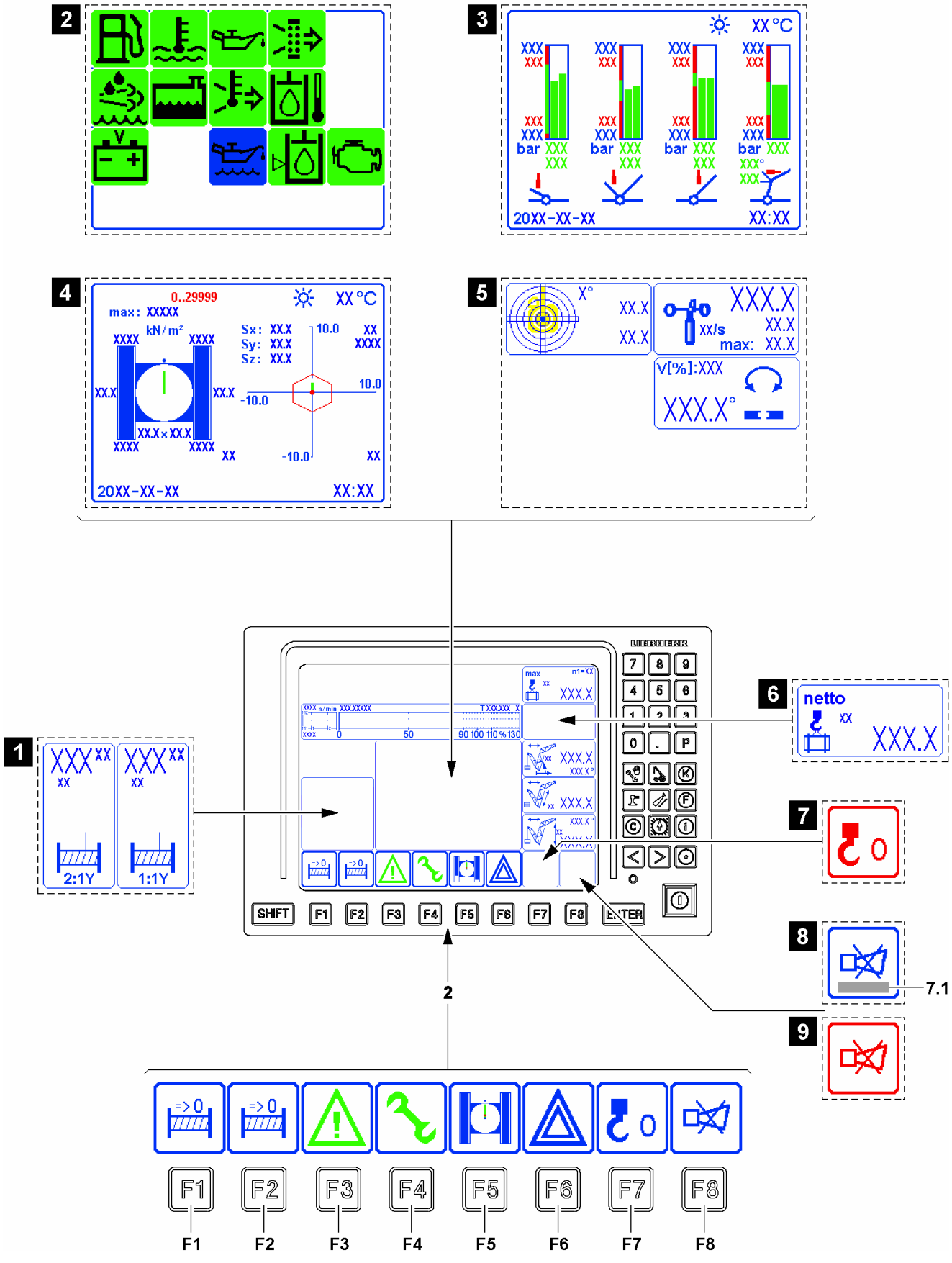

Fig.144106

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5.10 The function key line of LICCON monitor 0

The function key line consists of function keys **F1** to **F8** and the function key icon bar above it. The function keys correspond to the various function key icons above them.

The function key icons always show the functions which are activated by pressing the button.

The function is called up after pressing a button. In addition, the icon above it can change its display, its meaning or its text.

Not all function keys must have assigned icons. This depends on the respective program selection.

F1 Function key
- Determine the zero point for the path display Winch 2*****, see illustration **1**
- Above the function key **F1** appears the icon *Reset winch display*. Pressing on the button sets the display *Completed path* to zero. The path measurement begins here.

F2 Function key
- Determine the zero point for hook path display winch 1, see illustration **1**
- Above the function key **F2** appears the icon *Reset winch display*. Pressing on the button sets the display *Completed path* to zero. The path measurement begins here.
- **Note:** When winch 1 and winch 2 work in parallel operation, then the displays *completed path* of winch 1 and winch 2 can only be set together to zero with the function key **F1**.
  Then the function key **F2** has no function.

F3 Function key
- Show or not show monitoring functions (illustration **2**)
  See also section „Monitoring functions“.

F4 Function key
- Show or not show monitoring of relapse cylinders (illustration **3**)
  See also section „Monitoring of relapse cylinders“

F5 Function key
- Show or not show monitoring of surface pressure and center of gravity (illustration **4**)
  See also section „Monitoring of surface pressure and center of gravity“

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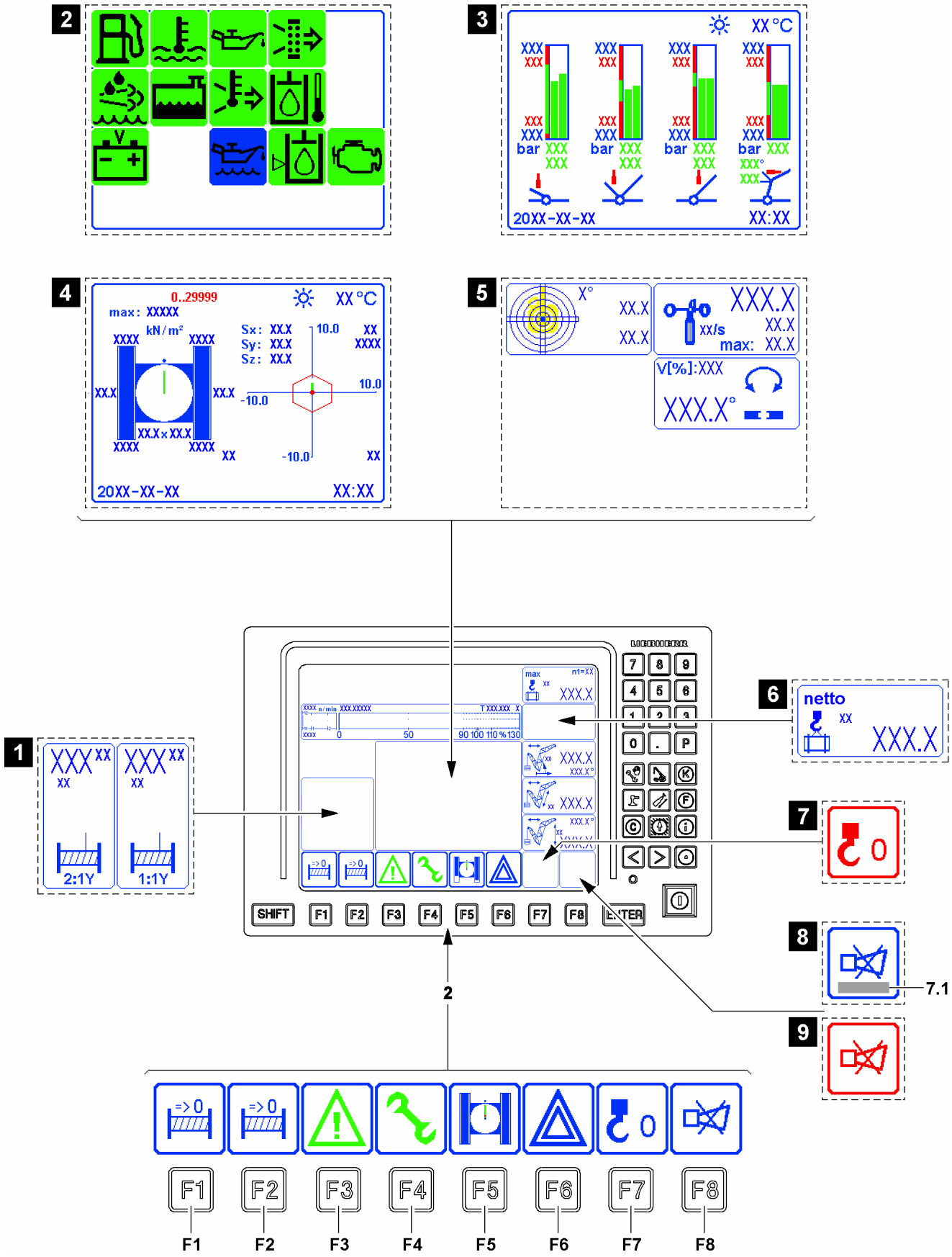

Fig.144106

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F6 Function key
- Show or not show monitored auxiliary functions (illustration **6**)
- The appearance of the icon changes according to the status:
  thick border = auxiliary functions icons not shown
  thin border = auxiliary functions icons shown

Note
▶ The monitoring of all auxiliary functions is always active, even if the monitoring icons are hidden.
▶ When a monitored limit is exceeded, then an acoustic warning is issued by the LICCON monitor and the respective icon is shown permanently.

F7 Function key
- Taring: When the function key **F7** is pressed, the *Actual load* display is set to zero. At the same time, the word *net* appears in the display, see illustration **6**.
  If the taring is cancelled again, then the word *net* disappears from the display and the gross load value is displayed.
- Taring is cancelled by one of the following two actions:
  1.By pressing the function key **F7** again.
  2.By luffing by more than ±4°.

Note
By taring it is possible, for example, to eliminate weights of carrying equipment, load handling equipment or fastening equipment.
▶ Therefore the calculated weight of the load to be lifted (net load) can be displayed.
▶ As long as taring is active, the function key icon is shown in red, see illustration **7**.

F8 Function key
- Shut off of acoustic warning and possibly calling up of error message **7.1** (illustration **8**).
  Press the function key **F8** once: The acoustic signal is turned off.
  Press the function key **F8** twice: The error description for the error message **7.1** which occurred last is called up.
- **Note:** A new error turns the acoustic warning on again.

WARNING
Malfunctions in the crane control!
A special program is available for LIEBHERR crane acceptance in the LICCON computer system.
This program is blocked after completion of crane acceptance.
If the function key icon displays red permanently and without a visible reason (illustration **9**), then the special program is activated.
▶ Contact Liebherr Service immediately.
▶ In order to prevent error functions, access to the special program is only permitted for trained Liebherr personnel.

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5.11 Other operating elements

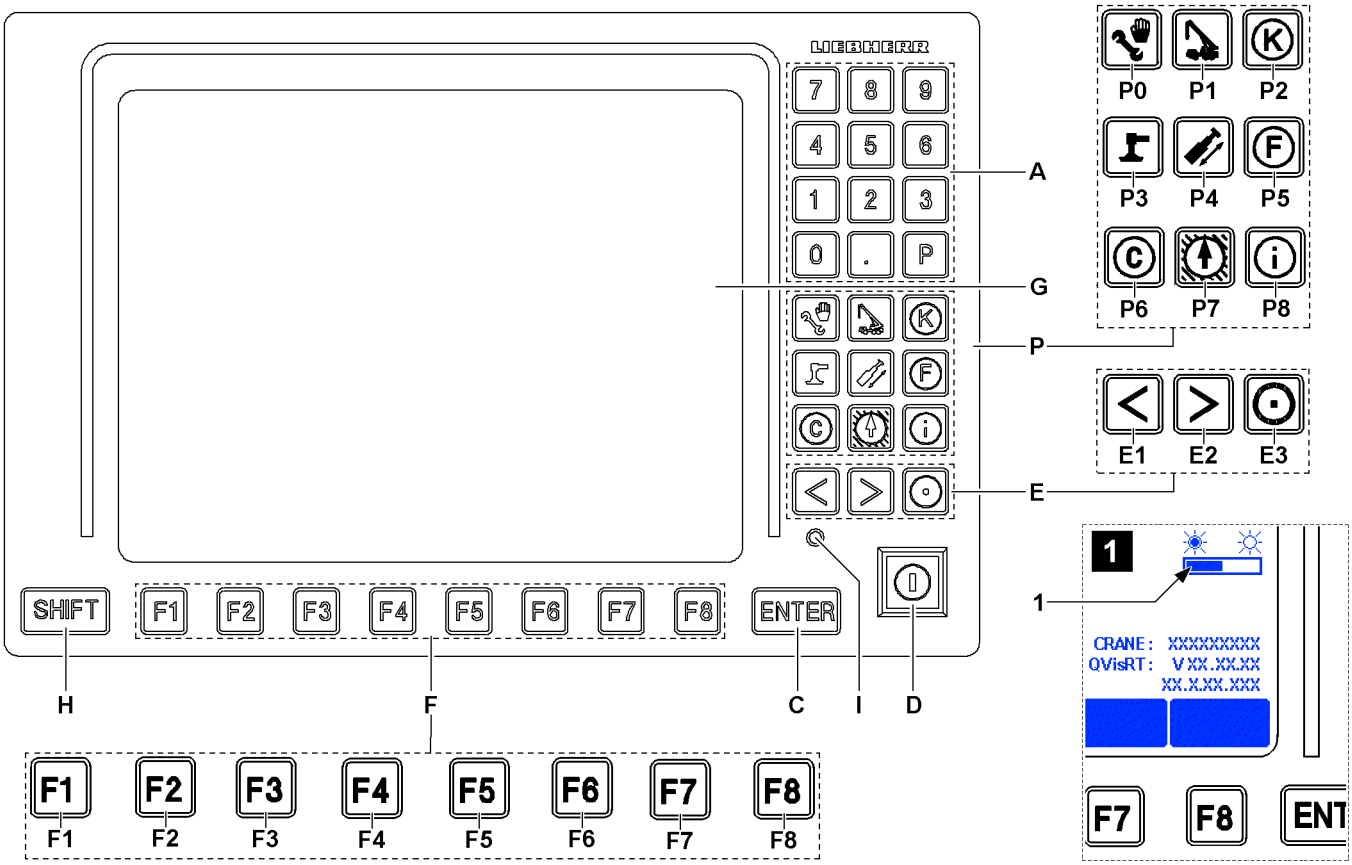

Fig.120677

The following functions are assigned to the other operating elements of the display and operating unit of the LICCON computer system in program *Crane operation*.

A Keypad
- Keys „0“ to „9“, „P“ and „.“(illustration **1**) have no function in the *Crane operation* program.

P Program keys
- The program keys are used to select individual programs. The program specific peculiarities must be observed, see respective sections of programs in this chapter.
- **Note:** The program currently running **cannot** be called up again using its program key. The programs can only be called up with the program key when no functions are activated via the set up key **D** at the same time.

C ENTER key
- No function in *crane operation* program

D Set up key
- Zero position (not actuated):
  Normal operation.
- Touching:
  Function *Exceedance of shut off limits of the LICCON overload protection* released.
- **Exceeding the shut off limits of the LICCON overload protection**
  If the shut off limits of the LICCON overload protection are exceeded, the LICCON overload protection shuts the crane movements off.
  These shut offs can be exceeded by the set up key **D** in the *right touching* position. To do so, chapter 4.20 in the Crane operating instructions must be observed.

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Note
Carry out the erection / take down procedures.
▶ By actuating the set up key **D**, all erection / take down procedures can be carried out within the erection / take down charts, for which no load charts are available.

- **Bypass of hoist limit switch**

  The hoist limit switch turns the crane movement off when:
  - The hook block is pulled against the hoist limit switch weight.
  - The hoist limit switch weight is not attached freely (for example on placed down boom).
  - The hoist limit switch has an internal error.

  This shut off can be bypassed by the set up key **D** in the *right touching* position. To do so, chapter 4.20 in the Crane operating instructions must be observed.

E Special function keys
- Monitor brightness adjustment
  - Key combination **E3** and **E1**: Turn background illumination on / off
  - Key combination **E3** and **E2**: Brightness adjustment in three stages

Note
▶ Additional functions of the special function keys **E** are program-dependent and are further explained in the description of the individual LICCON programs.

F Function keys
- The function key line consists of function keys **F1** to **F8** and the function key icon bar above it.
  The function keys correspond to the various function key icons above them.

H SHIFT key
- Second level key assignments

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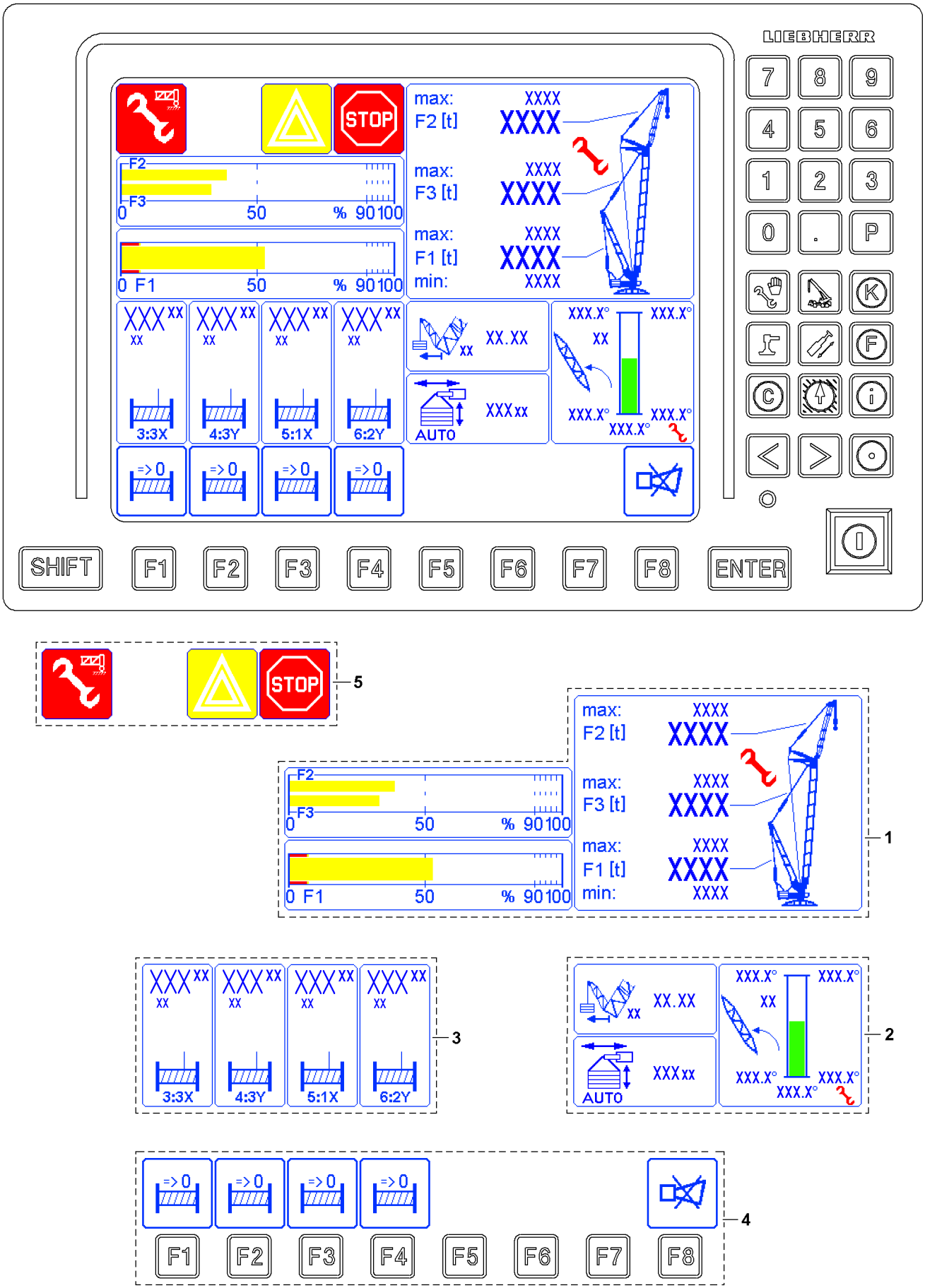

Fig.125381

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6 The *Crane operation* program on LICCON monitor 1

The *Crane operation* LICCON program assists the crane operator by displaying the data relevant for crane operation clearly on three LICCON monitors. An acoustic signal accompanies all critical displays.

The LICCON monitor 1 is divided into four areas in the *Crane operation* program:

1 F-load display
- F1-load display
- F2-load display
  Note: Appears only for corresponding boom system
- F3-load display
  Note: Appears only for corresponding boom system

2 Geometry Derrick boom
- Boom radius and angle of the derrick boom
  Note: Appears only for corresponding boom system

3 Winch display
- Winch 3 to winch 6

4 Function key line
- Function keys always refer to the icons shown directly above
- **Note:** If no icon is shown in the line directly above the function key, then no function is assigned in the program to the function key. See for example function key F5 to function key F7.

5 Alarm functions
- Alarm functions of LICCON monitor 1

Note

▶ The monitor illustrations in this chapter are only examples.
▶ The numerical values in the individual icons and charts do not have to necessarily match the crane exactly.
▶ The configuration of the LICCON monitor with icons is only descriptive.
▶ An identical icon display will **not** appear during crane operation.

Note

▶ The suspended ballast and the ballast trailer***** are generally referred to as the **derrick ballast**.

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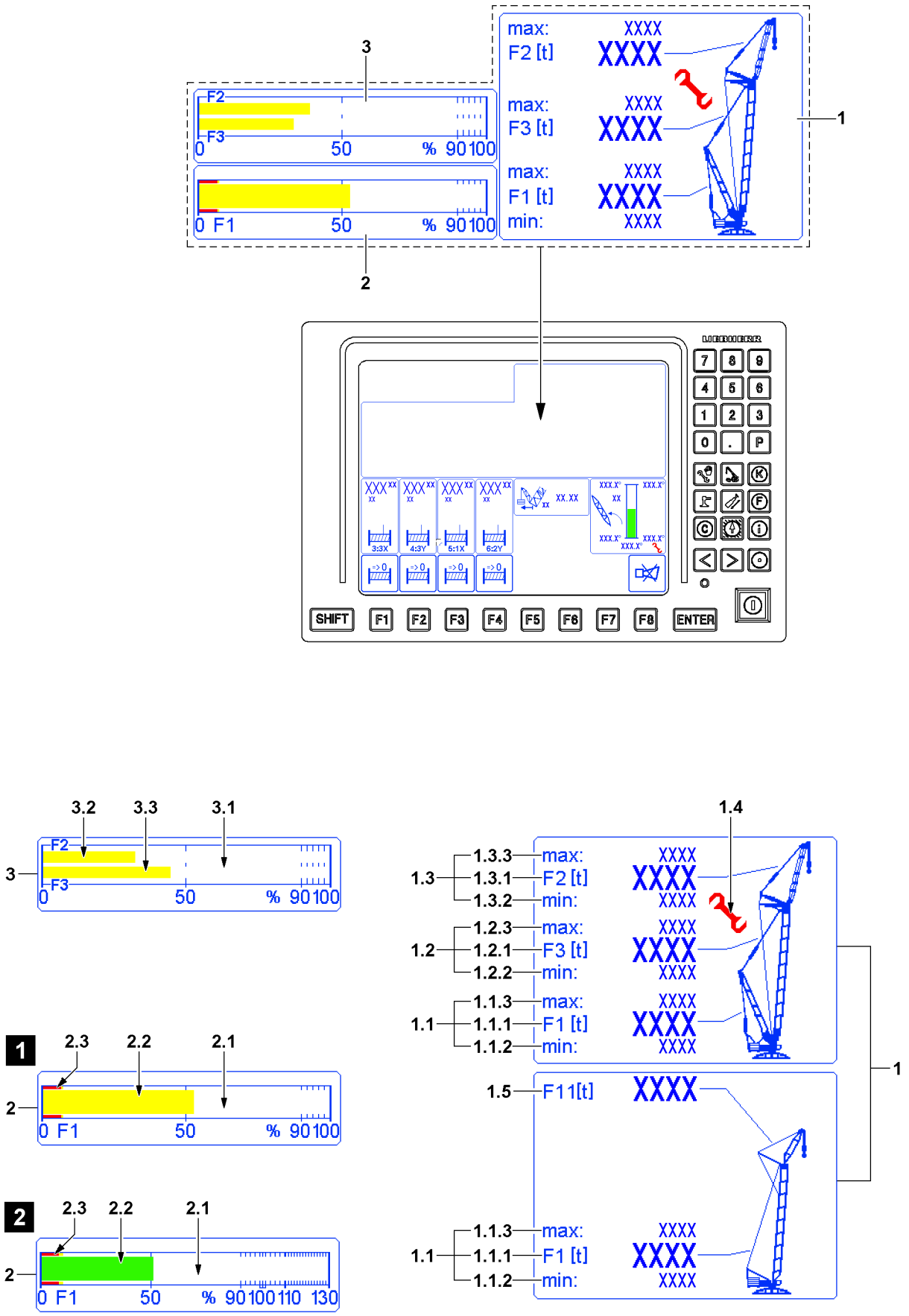

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Fig.122454

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6.1 F-load display

From the ratio of the operating force F_{actual} to the permissible maximum force F_{max} results the respective F-utilization.

The F-load display includes various display modes:
- Numeric displays
- Bar diagrams, when a ratio of operating force F_{actual} to the permissible maximum force F_{max} is shown.

WARNING
Damage, overload and toppling of the crane!
If the permissible values of the F-load display are exceeded / fallen below, then the crane can be damaged or overloaded and topple over.
As long as the set up boom system is not completely assembled and not all sensors, which are required for this operating mode are electrically connected, no maximum forces and minimum forces are displayed in the F-load display.
In these cases it must be determined with the assembly drawing which maximum forces are permissible in the F-load display.
These maximum forces must be monitored by the crane operator and may not be exceeded during set up / removal of the crane.
▶ The crane operator must ensure that the permissible values of the F-load display are not exceeded / fallen below.
▶ Observe and adhere to the maximum forces for the F-load display from the assembly drawings.

Note
The values of the F-load display depend on the set up configuration of the crane and the crane geometry.
The values of the F-load display change continuously when the crane is moved.
▶ Monitor the F-load display continuously.

6.1.1 Numeric F-load display

1 Numeric displays
- Type and scope of numeric displays depends on the set up configuration and the operating situation.

1.1 F1-display

1.1.1 F1-actual value ($F1_{actual}$)
- Actual value F1-force

1.1.2 F1-minimum ($F1_{min}$)
- Minimum value F1-force
  Note: Appears only outside a load chart, at activated assembly operation or in special situations.

1.1.3 F1-maximum ($F1_{max}$)
- Maximum value F1-force
  Note: Appears only outside a load chart, at activated assembly operation or in special situations.

1.2 F3-display
- **Note**: Appears only for corresponding boom system

1.2.1 F3-actual value ($F3_{actual}$)
- Actual value F3-force

1.2.2 F3-minimum ($F3_{min}$)
- Minimum value F3-force
  Note: Appears only outside a load chart, at activated assembly operation or in special situations.

1.2.3 F3-maximum ($F3_{max}$)
- Maximum value F3-force

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Note: Appears only outside a load chart, at activated assembly operation or in special situations.

1.3 F2-display
- **Note**: Appears only for corresponding boom system

1.3.1 F2-actual value ($F2_{actual}$)
- Actual value F2-force

1.3.2 F2-minimum ($F2_{min}$)
- Minimum value F2-force
  Note: Appears only outside a load chart, at activated assembly operation or in special situations.

1.3.3 F2-maximum ($F2_{max}$)
- Maximum value F2-force
  Note: Appears only outside a load chart at activated assembly operation

1.4 *Assembly* icon
- Appears when assembly operation is activated

1.5 F11-display
- Actual value F11-force
- **Note**: Appears only for corresponding boom system

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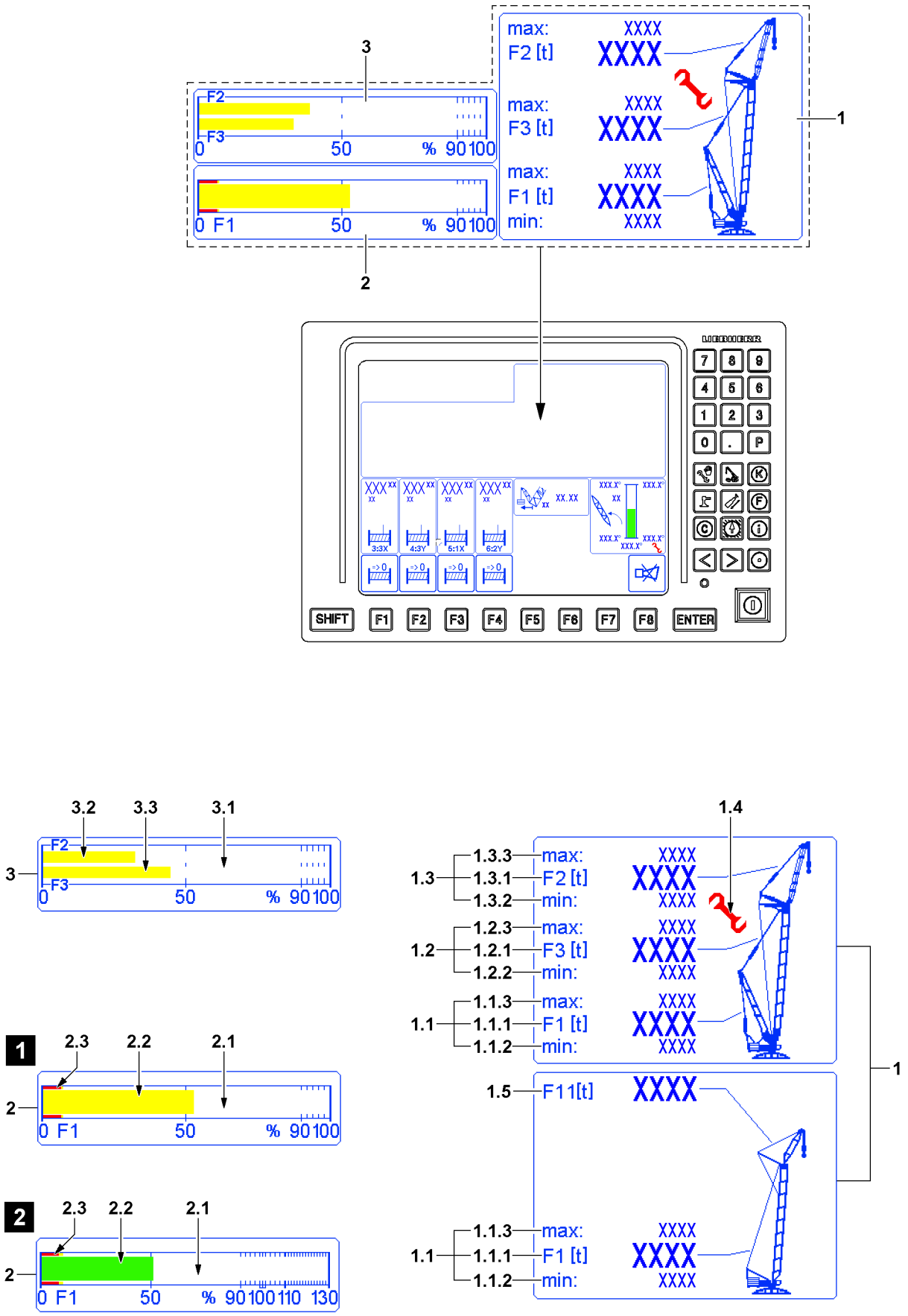

Fig.122454

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6.1.2 F1-display bar

Pull test brackets Test point 1A and 1B (F1 force) are in the A-frame guying

- F1-display bar in assembly operation: Scale from 0 % to 100 % (outside a load chart), see illustration **1**
- F1-display bar in cane operation: Scale from 0 % to 130 % (within a load chart), see illustration **2**

2 Display bar
- Display bar for graphic illustration of F1-force

2.1 Display scale
- Crane operation: Scale from 0 % to 130 % (within a load chart)
- Assembly operation: Scale from 0 % to 100 % (outside a load chart)

2.2 F1-bar
- Graphic illustration of the F1-actual value ($F1_{actual}$)
- Appears in green, yellow and red, depending on the situation
- F1-bar **2.2** green: $F1_{is}$ present in the permissible range and load chart
- F1-bar **2.2** yellow: **Advance warning!** $F1_{is}$ shortly before impermissible range
- **Note:** In assembly operation, the F1-bar **2.2** is also shown in yellow within the permissible range.
- F1-bar **2.2** red: **Warning!** $F1_{actual}$ in impermissible range

2.3 F1-minimum
- Graphic illustration of range $F1_{min}$
  Yellow range: $F1_{min\text{-}advance\ warning}$ - advance warning for F1-minimum
  Red range: $F1_{min\text{-}Stop}$ - Warning / stop for F1-minimum

6.1.3 F2/F3-display bar

Pull test brackets test point 2A and 2B (F2 force) are in the N/W-guying

Pull test brackets test point 3A and 3B (F3 force) are in the guying derrick boom / main boom on the main boom head

Note

▶ The F2/F3-display bar appears only in certain situations, for example at activated assembly operation and corresponding boom system.

3 Display bar
- Display bar for graphic illustration of F2/F3-force

3.1 Display scale
- Scale from 0 % to 100 %

3.2 F2-bar
- Graphic illustration of the F2-actual value ($F2_{actual}$)
- Appears in yellow and red, depending on the situation
- F2-bar **3.2** yellow: Assembly operation - $F2_{actual}$ in permissible range
- F2-bar **3.2** red: **Warning!** $F2_{actual}$ in impermissible range

3.3 F3-bar
- Graphic illustration of F3-actual value
- Appears in yellow and red, depending on the situation
- F3-bar **3.3** yellow: Assembly operation - $F3_{actual}$ in permissible range
- F3-bar **3.3** red: **Warning!** $F3_{actual}$ in impermissible range

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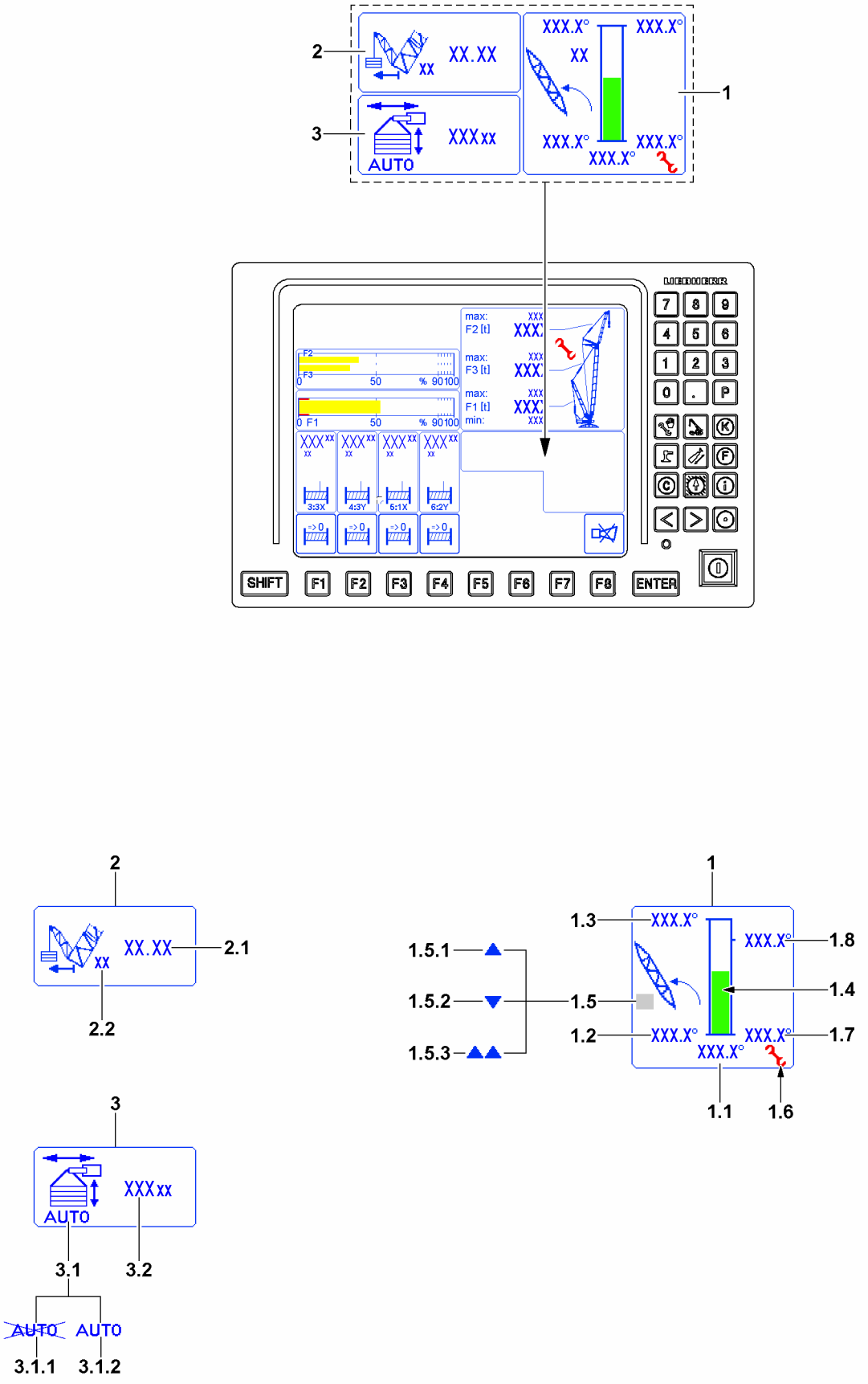

Fig.144127

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6.2 Angle display Derrick boom

1 Derrick angle

1.1 Actual angle
- Current actual angle of derrick boom
- Actual angle **1.1** red: **Warning!** Angle derrick boom in impermissible range

1.2 Minimum angle
- Minimum angle Derrick boom to the front (to the horizontal)

1.3 Maximum angle
- Maximum angle Derrick boom to the front (to the horizontal)

1.4 Bargraph
- Graphic illustration of derrick angle as bargraph in relation to the minimum / maximum value.
- Appears in green and red, depending on the situation
- Column **1.4** green: Angle Derrick boom in permissible range
- Column **1.4** red: **Warning!** Angle derrick boom in impermissible range

1.5 Alarm function Derrick
- **1.5.1** Arrow up: Maximum angle derrick boom exceeded
- **1.5.2** Arrow down: Minimum derrick angle fallen below
- **1.5.3** Double up arrow: Derrick boom relapse cylinder on block position

1.6 *Assembly* icon
- *Assembly* icon **1.6** appears when a defined angle range for the derrick boom for erection and take down of the boom system is specified.

1.7 Minimum angle Assembly
- Assembly: Minimum angle Derrick boom to the front (to the horizontal)

1.8 Maximum angle Assembly
- Assembly: Maximum angle Derrick boom to the front (to the horizontal)

6.3 Radius display Derrick ballast

2 Boom radius *derrick ballast*

2.1 Radius value
- Current radius value of derrick ballast
- Measured from the center of the slewing ring to the center of the derrick ballast

2.2 Measuring unit
- Measuring unit of radius value

6.4 Ballast automatic*

After selecting the ballast automatic (F3-key on Touch-Display *TE2*, see the Crane operating instructions, chapter 4.01) the system saves the current F1-force and the ballast trailer incline.

If the ballast trailer is moved out or in, the ballast automatic automatically regulates the ballast cylinders to keep the saved value (depending on the situation F1-force or ballast trailer incline).

3 Ballast automatic icon

3.1 Status Ballast automatic
- **3.1.1** Ballast automatic turned off
- **3.1.2** Ballast automatic turned on

3.2 Saved value
- Depending on the situation:
  - Saved F1-force
    or
  - Ballast trailer incline

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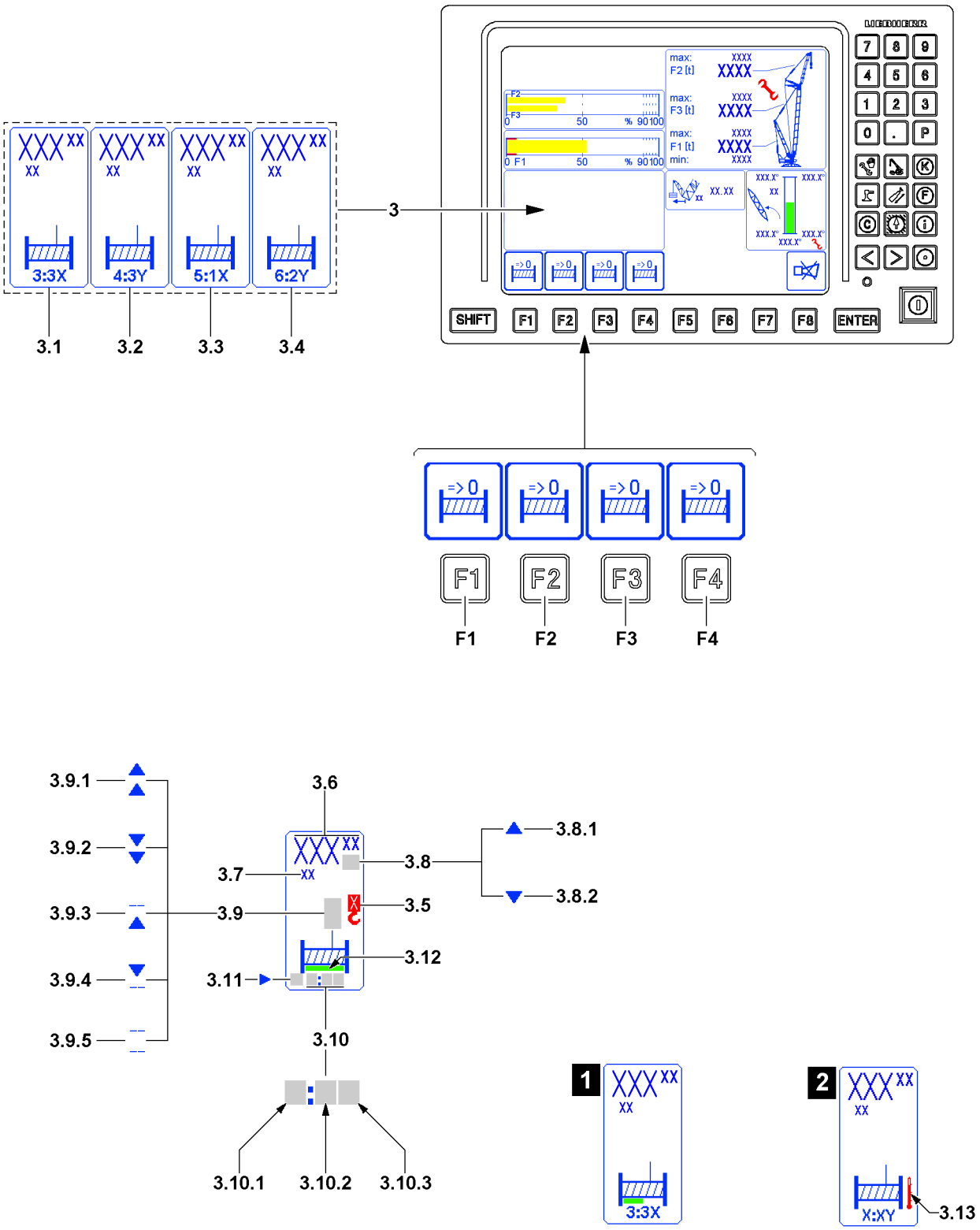

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Fig.115251

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6.5 Winch display

The winch displays **3** have their fixed place on the LICCON monitor.

The current position of each winch can be set as zero point:
- Hoist winch: The completed hook path is calculated with the reeving set in the *Set up* program. A prerequisite for a correct display is that the value entered matches the entered reeving and the actual number of rope strands between the boom head and the hook block.
- Control winch: Rope length of winch spooled out / up

F1 Function key
- Above the function key **F1** appears the icon *Reset winch display*. Pressing on the button sets the display of the rope measurement to zero. The path measurement begins here.

F2 Function key
- Above the function key **F2** appears the icon *Reset winch display*. Pressing on the button sets the display of the rope measurement to zero. The path measurement begins here.

F3 Function key
- Above the function key **F3** appears the icon *Reset winch display*. Pressing on the button sets the display of the rope measurement to zero. The path measurement begins here.

F4 Function key
- Above the function key **F4** appears the icon *Reset winch display*. Pressing on the button sets the display of the rope measurement to zero. The path measurement begins here.

3 Winch display

3.1 *Winch 3* icon
- Icon for winch 3 (WIII)

3.2 *Winch 4* icon
- Icon for winch 4 (WIV)

3.3 *Winch 5* icon
- Icon for winch 5 (WV)

3.4 *Winch 6* icon
- Icon for winch 6 (WVI)

Note

▶ The displays for winch 3 to winch 6 are identical and are explained on one icon element.

3.5 Load position
- Load position to which the winch is assigned.
- **Note:** Appears only when using it as hoist winch.

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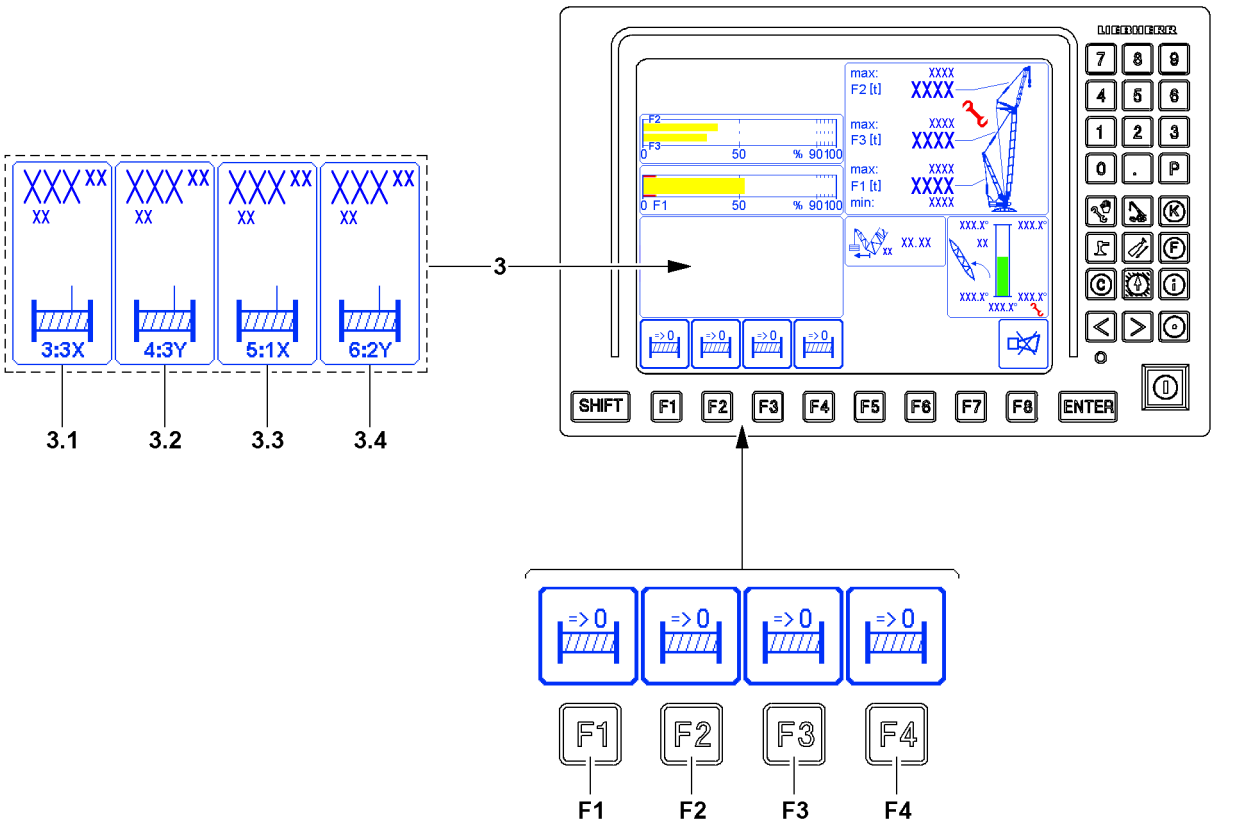

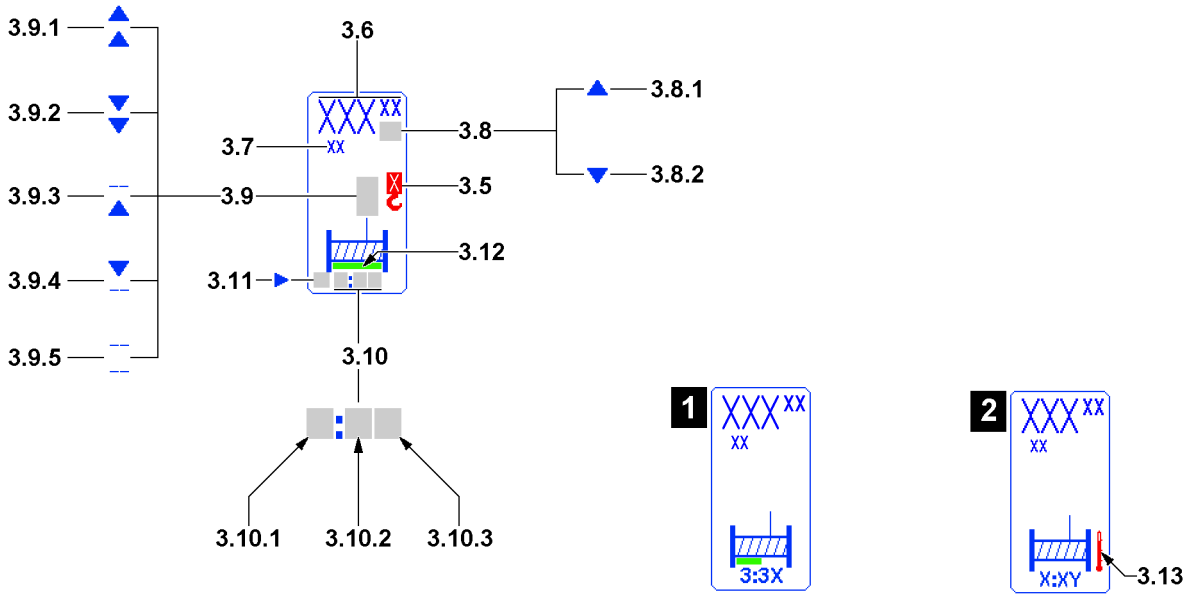

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Fig.115251

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3.6 Travelled distance
- In [m] or [ft], see Measuring unit **3.7**
  From a zero point to be determined
- The positions before the decimal point are displayed with a maximum of three large digits. The digits after the decimal point are displayed with small digits. Setting to zero point, see also section „The function key line of LICCON monitor 0“).
- As hoist winch the following applies:
  - For single operation with the reeving set in the *set up* program: completed hook path.
  - For parallel operation with the set total reeving made in the *set up* program: distance completed by the hook block.
  - A prerequisite for a correct display is that the reeving value entered equals the actual number of rope strands between the boom head and the hook block.

Note

Display area winch displays.

▶ The completed path **3.6** display has only three positions before the comma, any positions before that are cut off. The crane operator must evaluate for himself if, for example 200 m rope are spooled up on a winch or 1200 m. **The display in both cases would be identical with 200 m.**

For use as hoist winch:

▶ The hook path calculation only works accurately if the load is suspended freely and is not luffed during the lifting procedure. Not taken into account are flexation and rope expansion.

▶ The length display (hook path display) is only correct when the winch is calibrated.

3.7 Measuring unit
- Measuring unit of hook path display: [m] or [ft]

3.8 Direction of hook movement

The arrows on the length value show the direction of the hook movement in relation to the zero point:
- Arrow up **3.8.1**: Hook moves upward from the zero point
- Arrow down **3.8.2**: Hook moves downward from the zero point

3.9 Winch status display
- There are five winch status icons (all blinking):

3.9.1 Spool out
- Winch is spooled out

3.9.2 Spool up
- Winch is spooled up

3.9.3 Spooled out
- Additional spooling out of the winch is blocked

3.9.4 Spooled up
- Additional spooling up of the winch is blocked

3.9.5 Winch deactivated
- Winch is deactivated or unplugged
- **Note:** Winch cannot be controlled.

3.10 Assignment of master switch
- **3.10.1** First digit
  - First digit: Winch number, every winch icon is permanently assigned to a winch
- **3.10.2** Second digit
  - Master switch number, according to the assigned master switch
  - ? : No master switch assigned
- **3.10.3** Letter
  - Actuation direction of the master switch, see illustration
  - ? : No actuation direction assigned

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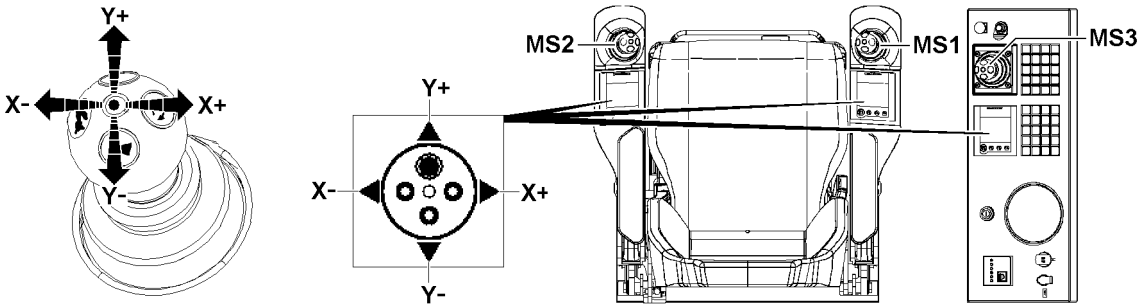

Fig.123758: Actuation directions Master switch

MS1 Master switch 1
MS2 Master switch 2
MS3 Master switch 3
X+ To the right
X- To the left
Y+ To the front
Y- To the rear

3.11 Vibration sensor
- If the vibration sensor for a winch is added on the master switch, then an arrow appears in this winch icon for the added vibration sensor.
- **Note:** The vibration sensor is added at the first actuated crane function.

3.12 Winch speed
- If the maximum winch speed is reduced, a bar in the respective length appears on the bottom in the winch icon. Example: Half the length corresponds to a reduction of the maximum winch speed of 50 %, see example in illustration **1**.

Winch overheated, illustration **2:**

3.13 *Overheated* icon
- If the *Overheated* icon **3.13** appears, the temperature in the winch is too high.
  Note: Only for certain crane types with temperature sensors in the winches.

WARNING
Overheated winch!
If a winch is operated further, even though the *Overheated* icon **3.13** appears, the winch can be severely damaged.
The winch can fail and accidents can result.
▶ Let the overheated winch cool off.

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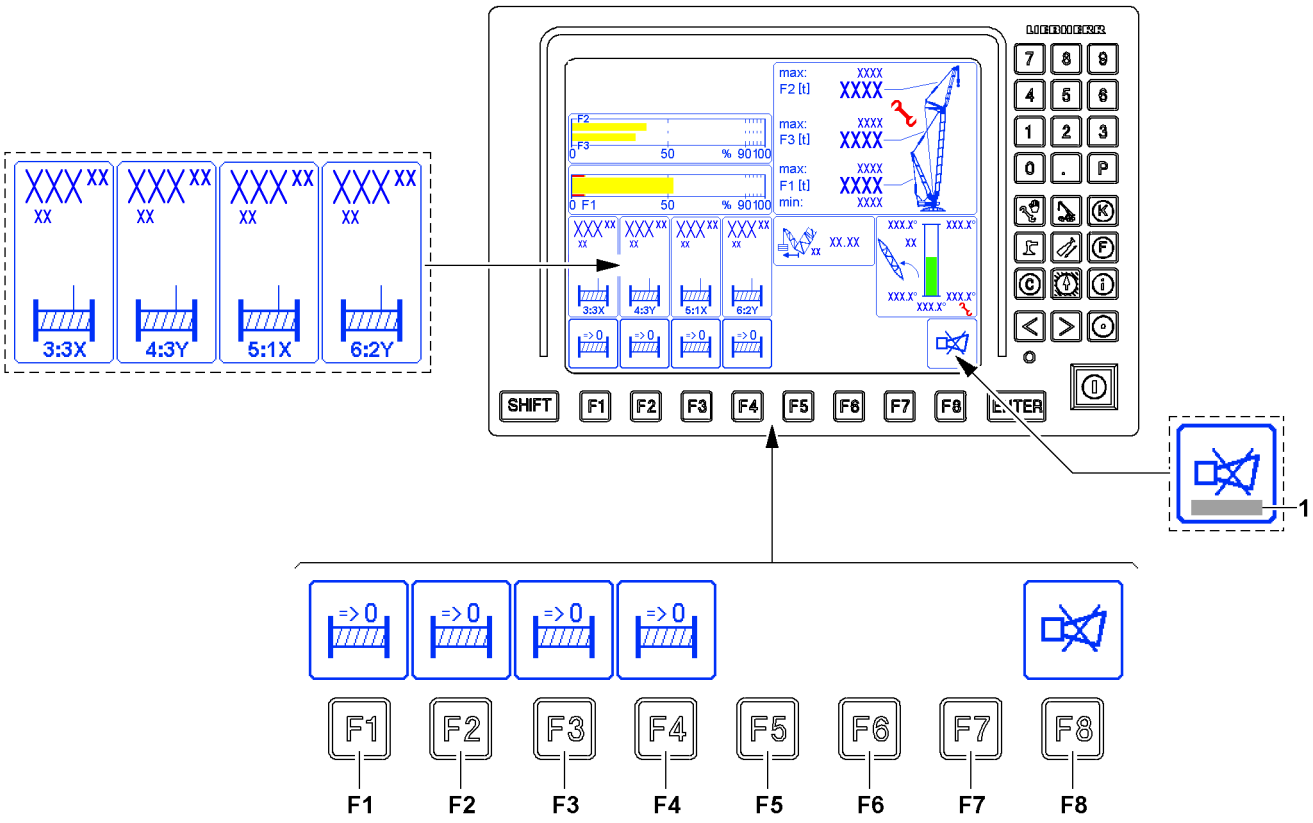

Fig.115252

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6.6 The function key line of LICCON monitor 1

The function key line consists of function keys **F1** to **F8** and the function key icon bar above it. The function keys correspond to the various function key icons above them.

The function key icons always show the functions which are activated by pressing the button.

The function is called up after pressing a button. In addition, the icon above it can change its display, its meaning or its text.

Not all function keys must have assigned icons. This depends on the respective program selection.

F1 Function key
- Determine the zero point for path display winch 3*****
- Above the function key **F1** appears the icon *Reset winch display*. Pressing on the button sets the display *Completed path* to zero. The path measurement begins here.

F2 Function key
- Determine the zero point for path display winch 4
- Above the function key **F2** appears the icon *Reset winch display*. Pressing on the button sets the display *Completed path* to zero. The path measurement begins here.

F3 Function key
- Determine the zero point for path display winch 5*****
- Above the function key **F3** appears the icon *Reset winch display*. Pressing on the button sets the display *Completed path* to zero. The path measurement begins here.

F4 Function key
- Determine the zero point for path display winch 6*****
- Above the function key **F4** appears the icon *Reset winch display*. Pressing on the button sets the display *Completed path* to zero. The path measurement begins here.

F5 Function key
- No function

F6 Function key
- No function

F7 Function key
- No function

F8 Function key
- Shut off of acoustic warning and possibly calling up of error messages **1**.
  Press the function key **F8** once: The acoustic signal is turned off.
  Press the function key **F8** twice: The error description for the error message **1** which occurred last is called up.
- **Note:** A new error turns the acoustic warning on again.

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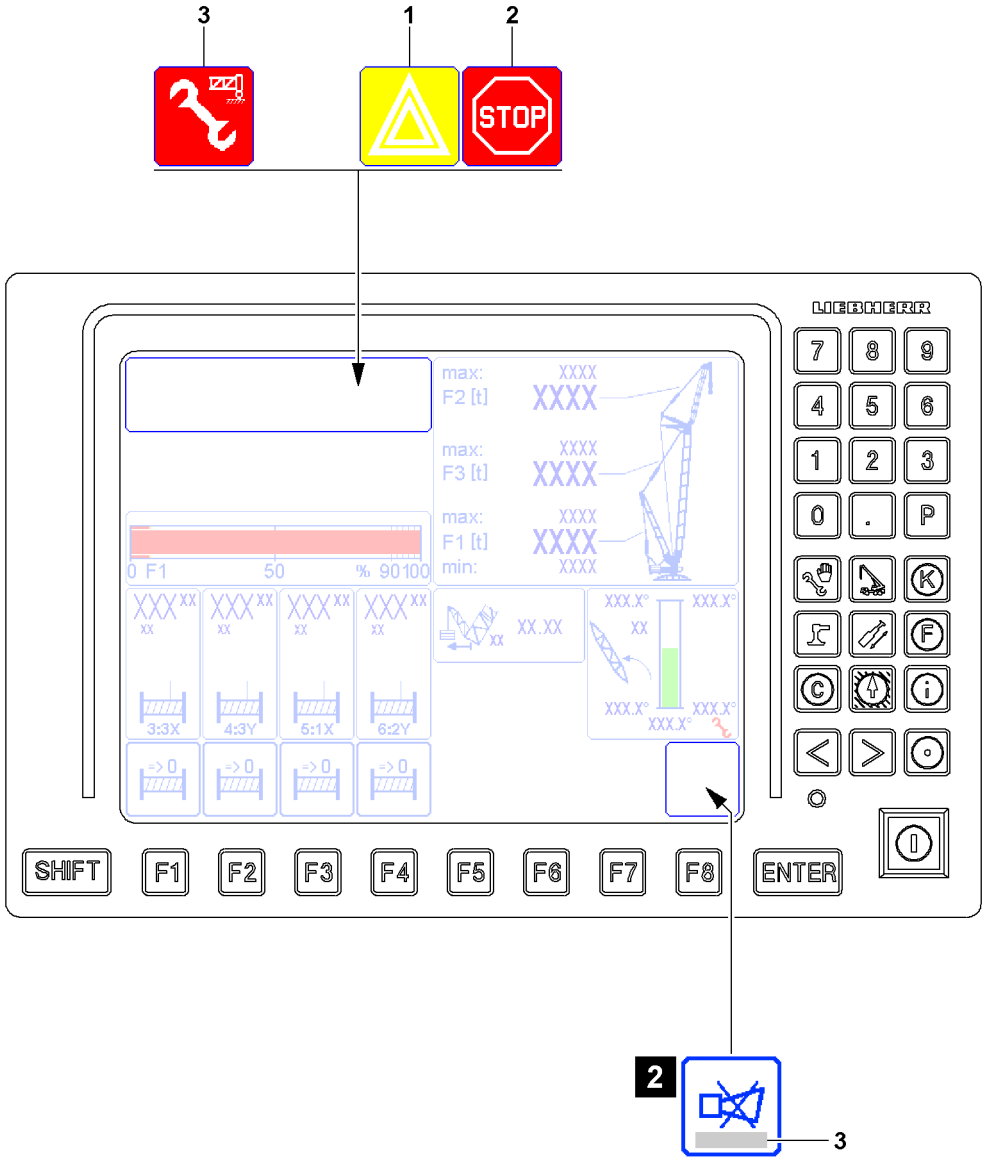

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Fig.125389

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6.7 Alarm functions of LICCON monitor 1

WARNING
Shut off of crane movement!
If advance warnings are not observed, then it can result in a sudden shut off of the crane movement.
A sudden shut off of the crane movement can result in high stress and strain for crane and load.
High stress and strain for crane and load can cause accidents.
- ▶ Operate the crane in such a way if possible that there is no shut off of crane movements by the crane control.
- ▶ Monitor the display instruments constantly.
- ▶ If not otherwise possible, approach a possible shut off of crane movements with extreme caution.

Note
Shut off delay LMB-STOP
- ▶ A LMB-STOP with shut off delay remains for a certain period of time. Possible fluctuating movements of the crane can be thereby minimized.

6.7.1 Occurrence of an advance warning

1 *Advance warning* icon
- If an advance warning occurs, for example: $F1_{actual}$ smaller than $F1_{min\text{-}warning\ value}$
- $F1_{min\text{-}warning\ value}$ is prioritized to $F1_{min}$ as advance warning value.
- **Example:** $F1_{min}$ plus advance warning extra (approx. 15 t) results in $F1_{min\text{-}warning\ value}$.

6.7.2 Shut off of crane movement

2 *LMB-STOP* icon
- The *LMB-STOP* icon **2** appears if a shut off limit is exceeded.
  Example: $F1_{actual}$ smaller than $F1_{min}$
- **Note:** Individual crane movements are shut off. **3**Pay attention to error messages **3** and display values.

6.7.3 *Boom on the ground* function

3 *Boom on ground* icon
- The *Boom on ground* icon **3** appears when the *Boom on ground function is activated.*
- **Note:** Operating elements *Boom on ground* function, see the Crane operating instructions, chapter 4.01

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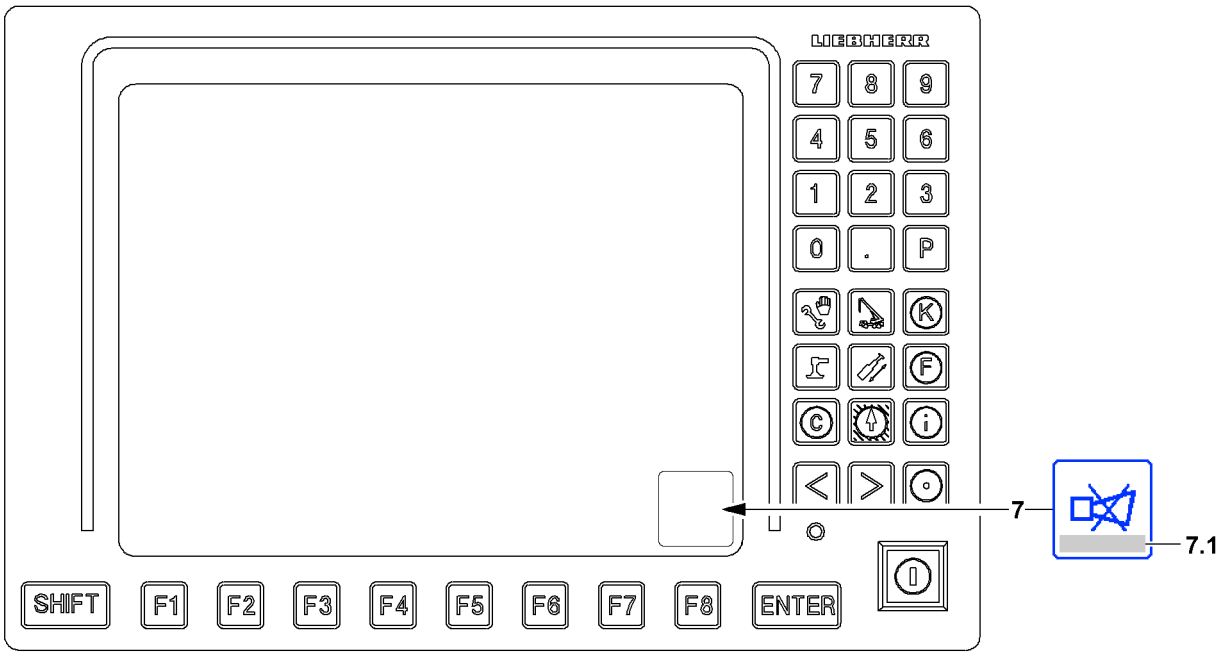

Fig.114279

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6.8 Acoustic warning on LICCON monitor 1

Acoustic warnings on LICCON monitor 1 are indicated by the warning sound *Horn*.

The warning sound *Horn* is divided into two categories:
- *Horn* is a beeping sound of a duration of approximately 0.5 seconds, which is repeated in a second cycle.
- *Short horn* is a beeping sound of a duration of approximately 0.1 seconds, which is repeated in a second cycle.

7 *Horn* icon
- When the *Horn* icon **7** is shown in the LICCON monitor, any acoustic signals which will occur can be shut off by the LICCON monitor 1 by pressing the function key **F8**.
- If an error message is shown in the *Horn* icon **7** in field **7.1**, then the present error can be determined through it. Pressing the function key **F8** twice, automatically changes to the error determination screen of the test system. The error is displayed there in documentary form.

6.8.1 Warning sound *Horn*

- Sounds in addition to the visual display of an error message in field **7.1** in case of operational errors are found, which lead to a shut off of a crane movement.
  Operational errors are, for example:
  - Exceeding of limit values in the F-load display
  - Exceeding of limit values in the geometry Derrick boom
- In case of application errors with error number (LICCON Error Code LEC)

6.8.2 Warning sound *Short horn*

Sounds in addition to the visual display of error messages without an error number and which do not lead directly to crane movement shut off by the LICCON overload protection.
Monitored error messages are, for example:
- Advance warning by approaching the limit values in the F-load display

6.8.3 Priority acoustic warning

- The *Horn* warning around has higher priority than the *Short horn* warning sound, i.e. *Horn* takes preference over *Short horn*.
- The *Horn* warning sound as well as the *Short horn* warning sound become active again after shut down if a new error occurs.

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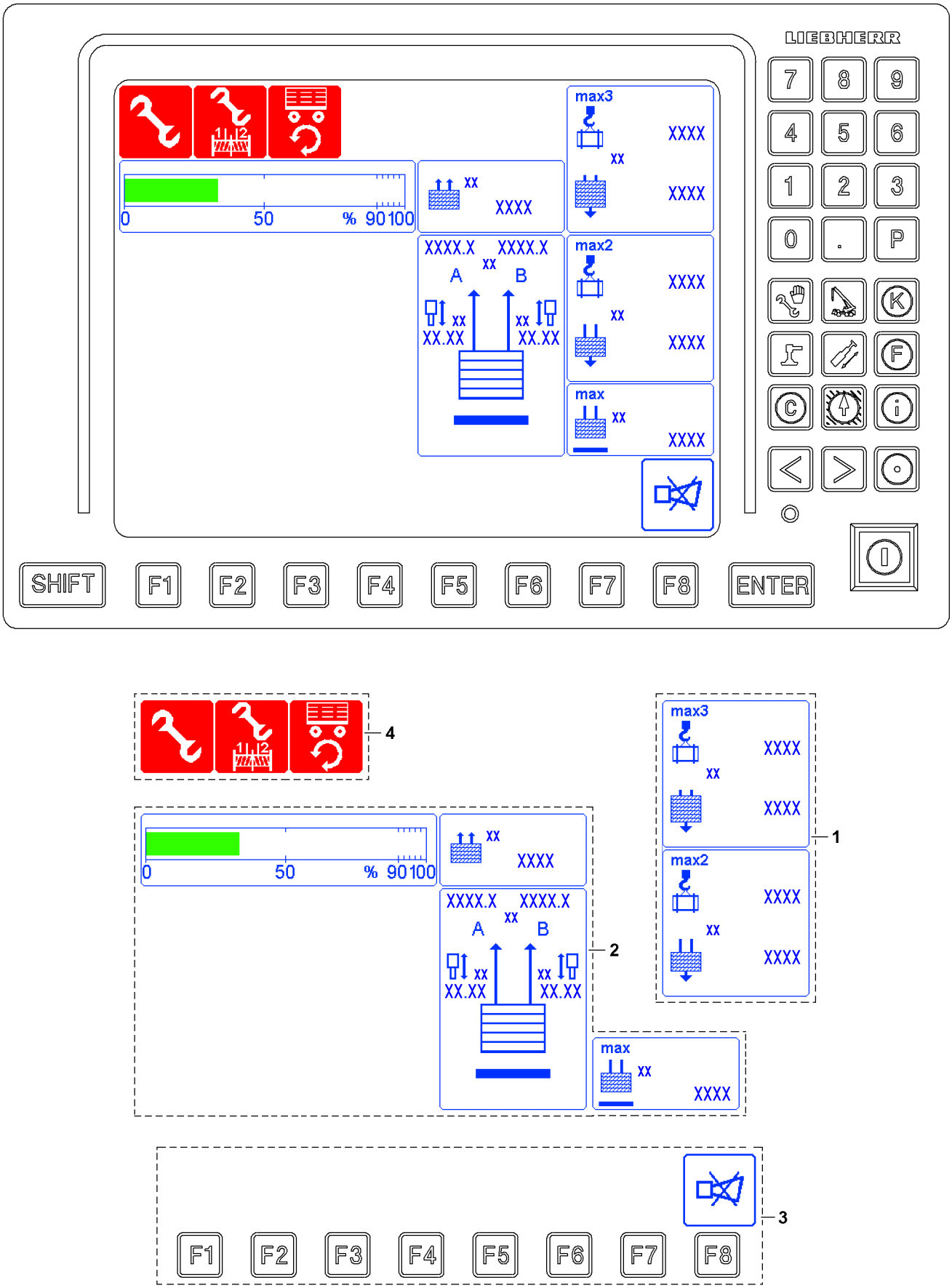

Fig.146957

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7 The *Crane operation* program on LICCON monitor 2

The *Crane operation* LICCON program assists the crane operator by displaying the data relevant for crane operation clearly on three LICCON monitors. An acoustic signal accompanies all critical displays. Depending on the equipment, a range of other icons may also be turned on as additional displays, either as required by the crane operator, or automatically in the event of a problem.

It also alerts the crane operator to imminent overload conditions. In the event of overload and many error conditions, which could be hazardous during crane operation, the system shuts off.

Note

- ▶ The suspended ballast and the ballast trailer* are generally referred to as the **derrick ballast**.
- ▶ The fixed compensation weight that is installed on the turntable is generally referred to as the **counterweight**.

The LICCON monitor 2 is divided into three areas in the *Crane operation* program:

1 Load max
- Maximum load depending on the derrick ballast

2 Derrick ballast
- Derrick ballast weight
- Derrick guying forces
- Utilization of the derrick ballast
- Maximum liftable derrick ballast for the current crane condition, without falling below $F1_{min}$ when lifting

3 Function key line
- Function keys always refer to the icons shown directly above
- **Note:** If no icon is shown in the line directly above the function key, then no function is assigned in the program to the function key.

4 LICCON Monitor 2 special functions

Note

- ▶ The monitor illustrations in this chapter are only examples.
- ▶ The numerical values in the individual icons and charts do not have to necessarily match the crane exactly.
- ▶ The configuration of the LICCON monitor with icons is only descriptive.
- ▶ An identical icon display will **not** appear during crane operation.

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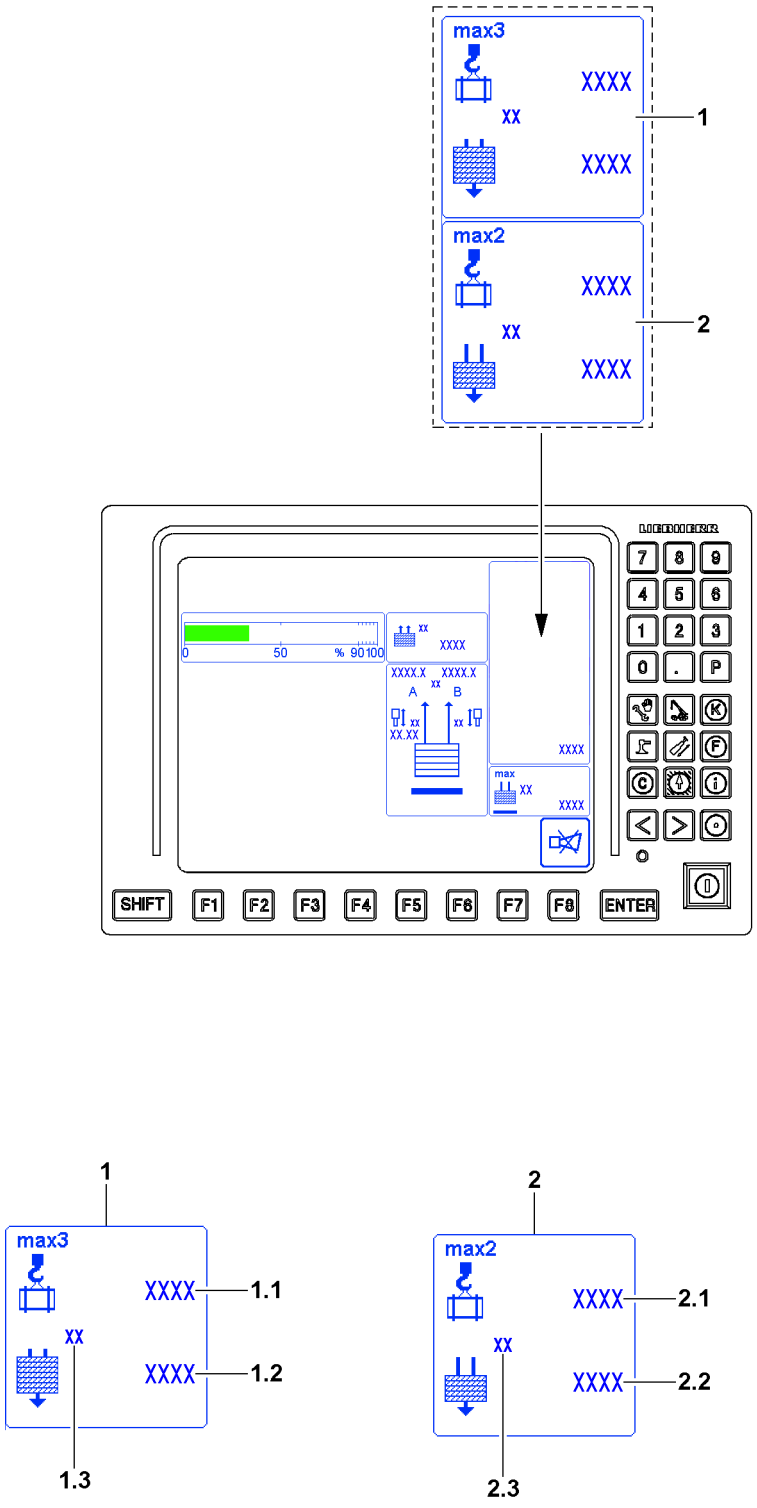

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Fig.146958

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7.1 Load max

The information regarding crane geometry and load involves two icons:

1 Load max3
Note: This is hidden as soon as two hook operation is set in the *set up* program.

2 Load max2
Note: This is hidden as soon as two hook operation is set in the *set up* program.

Note

▶ Question marks (?) are shown instead of values if the value cannot be calculated / determined. Example: A sensor error can be present - pay attention to error messages.

7.1.1 Load max3

The *load max3* icon **1** shows the maximum load at the maximum derrick ballast within the framework of the load chart.

The *load max3* icon **1** is hidden as soon as two hook operation is set in the *set up* program.

1 *Load max3* icon

1.1 Possible $load_{max3}$
- Is the load which the crane could currently lift when the maximum derrick ballast according to the load chart would have been placed
- In [t] or [lbs]

1.2 Maximum derrick ballast
- Maximum derrick ballast according to load chart

1.3 Measuring unit
- Measuring unit for display values in icon *Load max3* **1**: [t] or [lbs]

7.1.2 Load max2

In the icon *load max2* **2** the highest possible load in the current operating status is shown **(current derrick ballast** fully utilized).

The *load max2* icon **2** is hidden as soon as two hook operation is set in the *set up* program.

2 *Load max2* icon

2.1 Possible $load_{max2}$
- Is the maximum load, which the crane can lift in the current operating status. For that, the placed derrick ballast must be fully utilized (Derrick ballast lifted off the ground).
- In [t] or [lbs]

2.2 Placed derrick ballast
- Currently placed derrick ballast

2.3 Measuring unit
- Measuring unit for display values in icon *Load max2* **2**: [t] or [lbs]

7.2 Derrick ballast

Note

▶ A question mark (?) is shown instead of values if the value cannot be calculated / determined. Example: A sensor error can be present - pay attention to error messages.

The force components / load of the guying derrick ballast is recorded on guying A and guying B of the derrick ballast.

Test points guying A are:
- Test point 4A = pressure sensor ring surface left F4A
- Test point 5A = pressure sensor piston surface left F5A

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Test points guying B are:
- Test point 4B = pressure sensor ring surface right F4B
- Test point 5B = pressure sensor piston surface right F5B

7.2.1 Utilization display Derrick ballast

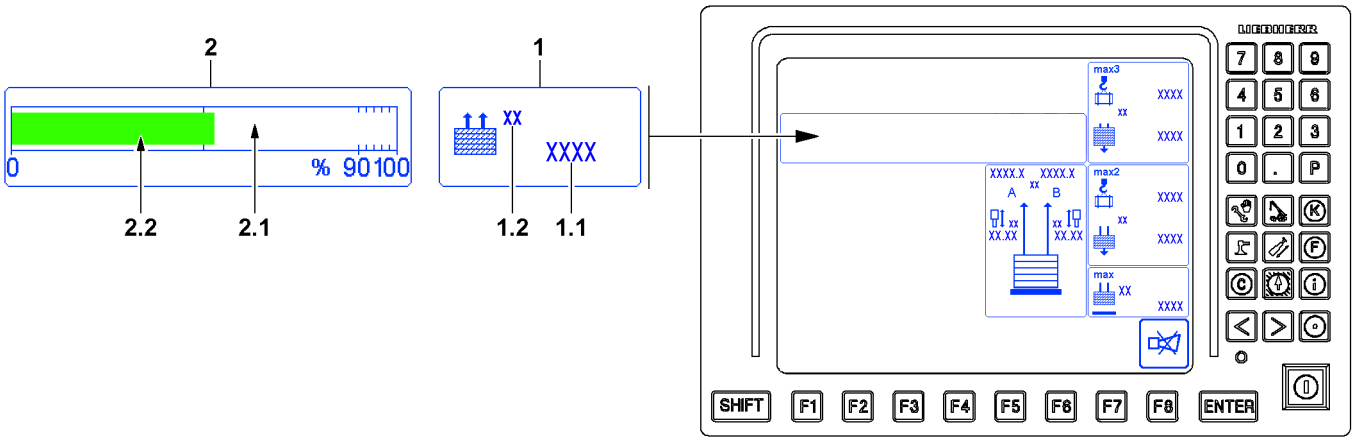

Fig.146959

In the icon *Pulled derrick ballast* **1** the currently pulled derrick ballast is shown. The value results from the vertical force components / load on guying A and guying B of the derrick ballast.

1 *Pulled derrick ballast* icon

1.1 Pulled derrick ballast
- Currently pulled derrick ballast
- Sum of forces / load from guying A and guying B

1.2 Measuring unit
- Measuring unit for display values in icon *Pulled derrick ballast* **1**: [t] or [lbs]

The *Utilization bar Derrick ballast* icon **2** depicts the ratio of the pulled derrick ballast (BA_{pulled}) to the placed derrick ballast (BA_{placed}) in percentages.

2 *Utilization bar Derrick ballast* icon
- Display bar for graphic display of utilization of derrick ballast

2.1 Display scale
- Scale from 0 % to 100 %

2.2 Pulled derrick ballast
- Graphic illustration of pulled derrick ballast
- If the derrick ballast is completely pulled, the derrick ballast lifts off the ground

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7.2.2 Suspended ballast*

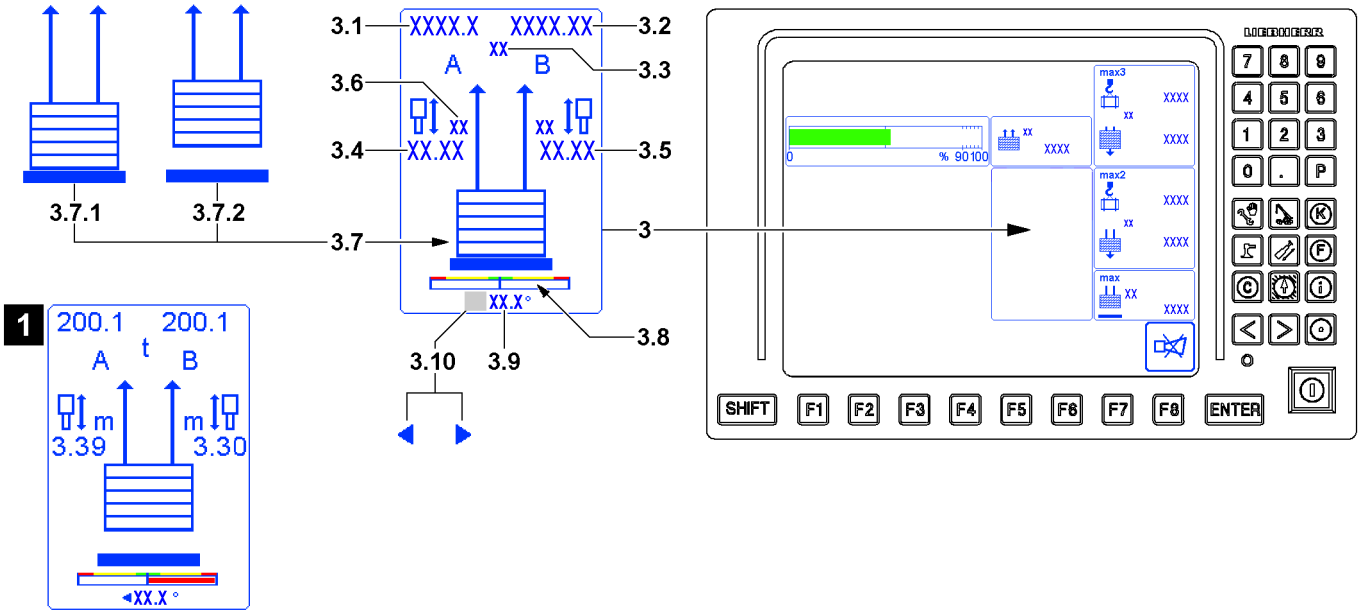

Fig.146960

If the crane is set up with suspended ballast*, then the displays in the *Guying derrick ballast* icon **3** are automatically adapted by the LICCON computer system.

WARNING
Derrick ballast on unsuitable ground!
If the derrick ballast gets so far into a sloped position in lateral direction that the red range (example illustration **1**) is reached in the incline display, then there is a danger of accident.
If the derrick ballast sinks too far into the ground, then there is a danger of accident.

- ▶ Always correct the position of the derrick ballast in time. Hold the extension length A and extension length B even.
- ▶ The derrick ballast may only be set down if the ground is sufficiently load bearing and even.

3 *Guying Derrick ballast* icon

3.1 Guying A
- Current force / load on guying A

3.2 Guying B
- Current force / load on guying B

3.3 Measuring unit
- Measuring unit for display values guying A and guying B: [t] or [lbs]

3.4 Extension length A
- Current extension length of pull cylinder of guying A

3.5 Extension length B
- Current extension length of pull cylinder of guying B

3.6 Measuring unit
- Measuring unit for extension length of pull cylinders of guying A and guying B: [m] or [ft]

3.7 Ground contact
- Display for ground contact of derrick ballast
- **3.7.1** Derrick ballast has ground contact
- **3.7.2** Derrick ballast lifted off

3.8 Incline display
- Graphic display of incline of derrick ballast in lateral direction
- **Note**: Not for the suspended ballast for the *Ballast Constant* version

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3.9 Incline value
- Incline value of derrick ballast in lateral direction
  The incline value appears in degrees [°].

Note
▶ The incline direction **3.10** appears only when the derrick ballast is inclined in the lateral direction.

3.10 Incline direction
- Incline direction of derrick ballast in lateral direction
- Appears only when the derrick ballast is inclined in lateral direction

7.2.3 Ballast trailer*

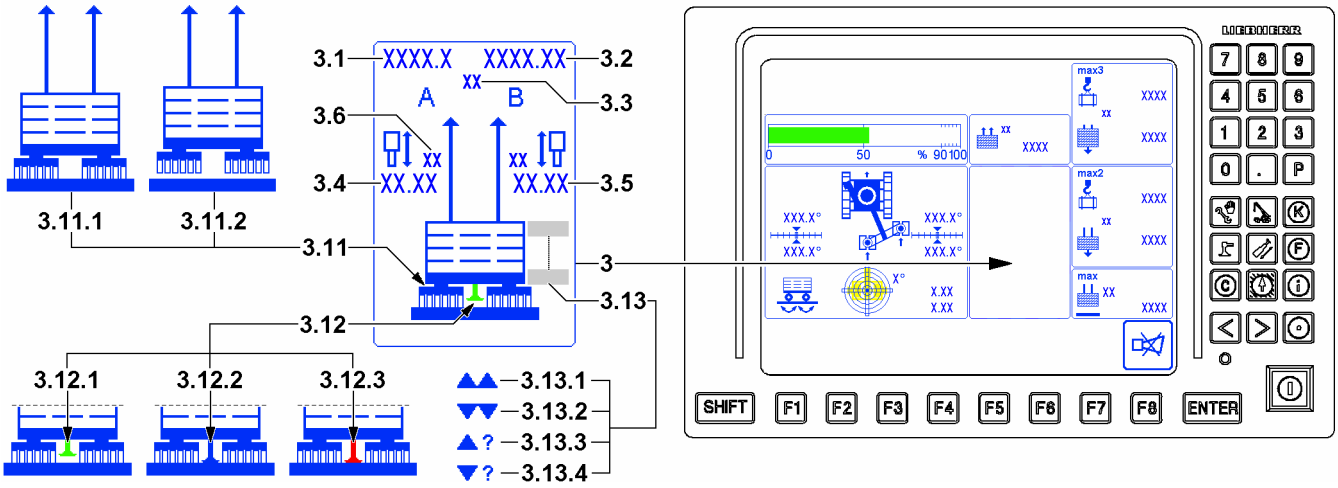

Fig.146961

If the crane is set up with a ballast trailer*, then the displays in the *Guying derrick ballast* icon **3** are automatically adapted by the LICCON computer system.

WARNING
Ballast trailer on unsuitable ground!
If the ballast trailer gets too far into an incline position, then there is a danger of accident.
If the ballast trailer sinks too far into the ground, then there is a danger of accident.
▶ Always correct the position of the ballast trailer in time. Hold the extension length A and extension length B even.
▶ The ballast trailer may only be set down if the ground is sufficiently load bearing and even.

3 *Guying Derrick ballast* icon

3.1 Guying A
- Current force / load on guying A

3.2 Guying B
- Current force / load on guying B

3.3 Measuring unit
- Measuring unit for display values guying A and guying B: [t] or [lbs]

3.4 Extension length A
- Current extension length of pull cylinder of guying A

3.5 Extension length B
- Current extension length of pull cylinder of guying B

3.6 Measuring unit
- Measuring unit for extension length of pull cylinders of guying A and guying B: [m] or [ft]

3.11 Ground contact
- Display for ground contact of ballast trailer

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- **3.11.1** Ballast trailer has contact with the ground
- **3.11.2** Ballast trailer lifted off

3.12 Support Ballast trailer
- Display for the status of the support ballast trailer
- **3.12.1** Support retracted, ballast trailer not supported
- **3.12.2** Support extended, ballast trailer is supported
- **3.12.3** Support not in nominal position
  Notice! Support not completely retracted and selection travel gear, slewing gear or sliding cylinder selected

Note
Ballast trailer limit signs **3.13**

▶ The level difference between the placement surface of the crane and the ballast trailer is limited both upward and downward. In order to avoid damaging the crane or the ballast trailer, the upper and lower stop positions are monitored by limit switches. If one of the end positions, the corresponding limit sign appears. The movements on the crane, or on the ballast trailer, are turned off.

3.13 Ballast trailer limit signs
- **3.13.1** *upper end position* limit switch triggered (ballast trailer too far above the crane placement surface)
- **3.13.2** *lower end position* limit switch triggered (ballast trailer too far below the crane placement surface)
- **3.13.3** *upper end position* limit switch defective
  Notice! There is no shut-off when reaching the upper end position. Remedy the error immediately.
- **3.13.4** *lower end position* limit switch defective
  Notice! There is no shut-off when reaching the lower end position. Remedy the error immediately.

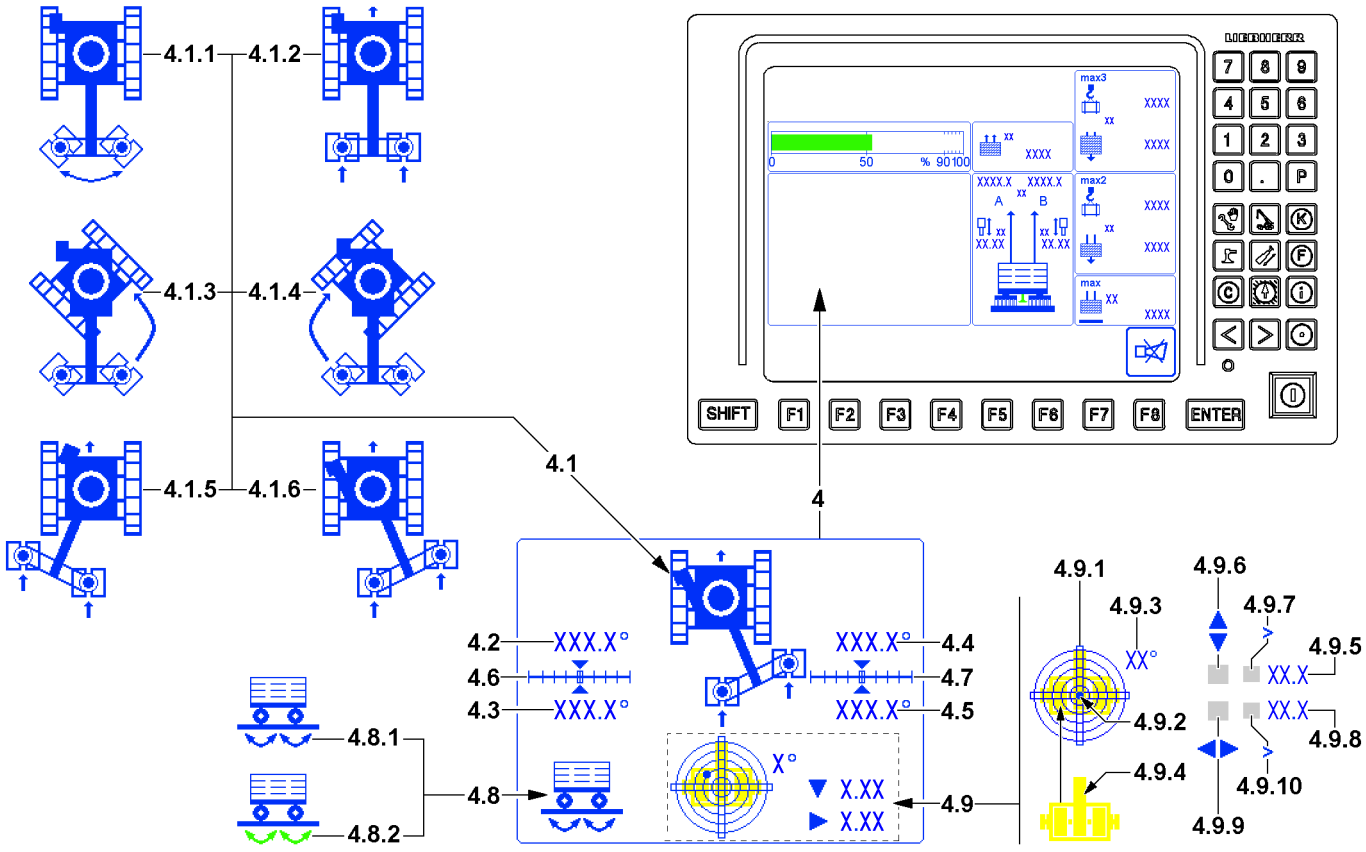

Fig.146962

4 *Ballast trailer* icon

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4.1 Steering operating modes
- Display for a set steering operating mode
- **4.1.1** Circular travel Ballast trailer
- **4.1.2** Towing Ballast trailer
- **4.1.3** Corrective steering Ballast trailer (crane drives left)
- **4.1.4** Corrective steering Ballast trailer (crane drives right)
- **4.1.5** Parallel travel Ballast trailer (ballast trailer offset left)
- **4.1.6** Parallel travel Ballast trailer (ballast trailer offset right)

4.2 Nominal angle left
- Nominal angle for the left wheel set

4.3 Actual angle left
- Actual angle for the left wheel set
- If the nominal angle left **4.2** is not reached:
  - The actual angle left **4.3** is shown in red
  - In the graphic display left **4.6** the position arrow *actual value* is not the same as arrow *nominal value*

4.4 Nominal angle right
- Nominal angle for the right wheel set

4.5 Actual angle right
- Actual angle for the right wheel set
- If the nominal angle right **4.2** is not reached:
  - The actual angle right **4.5** is shown in red
  - In the graphic display right **4.7** the position arrow *actual value* is not the same as arrow *nominal value*

4.6 Graphic display left
- Graphic display Actual angle and nominal angle for the left wheel set

4.7 Graphic display right
- Graphic display Actual angle and nominal angle for the right wheel set

4.7 Status Drive
- Status display for the ballast trailer drive
- **4.8.1** Drive turned on (not active)
- **4.8.2** Drive turned on and active

4.9 Display *Incline Ballast trailer*
- Display of the incline of the ballast trailer to the horizontal in longitudinal and lateral direction.
- The display is divided in a graphic section and a numeric section.
- The direction data refers to the overhead view of the ballast trailer in the graphic display.

Graphic part:

4.9.1 Graphic display
- The graphic display is in the form of a spirit level, with a moving dot **4.2** representing the air bubble.

4.9.2 Point
- The center of the dot **4.9.2** shows the incline value.

4.9.3 Resolution of view
- This value describes the resolution of the graphic view. The resolution is matched automatically to the incline.

4.9.4 Position Ballast trailer guide
- An overhead view of the ballast trailer is highlighted in the graphic illustration **4.9.1**. The displayed position of the ballast trailer guide **4.9.4** is serves as orientation in the display.

Numeric part:

4.9.5 Longitudinal direction
- Incline of crane in longitudinal direction in [°].

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4.9.6 Direction arrow
- The direction arrow shows the direction of the incline.

4.9.7 Display range exceeded
- If the *larger than* icon appears, then the display range is exceeded.
- **Note:** The crane is inclined further than can be shown.

4.9.8 Lateral direction
- Incline of crane in lateral direction in [°].

4.9.9 Direction arrow
- The direction arrow shows the direction of the incline.

4.9.10 Display range exceeded
- If the *larger than* icon appears, then the display range is exceeded.
- **Note:** The crane is inclined further than can be shown.

Note
Orientation of the crane in the display *Incline Ballast trailer* **4.9**.
▶ Pay attention to the position of the ballast trailer guide **4.9.4**.

7.3 Maximum liftable derrick ballast

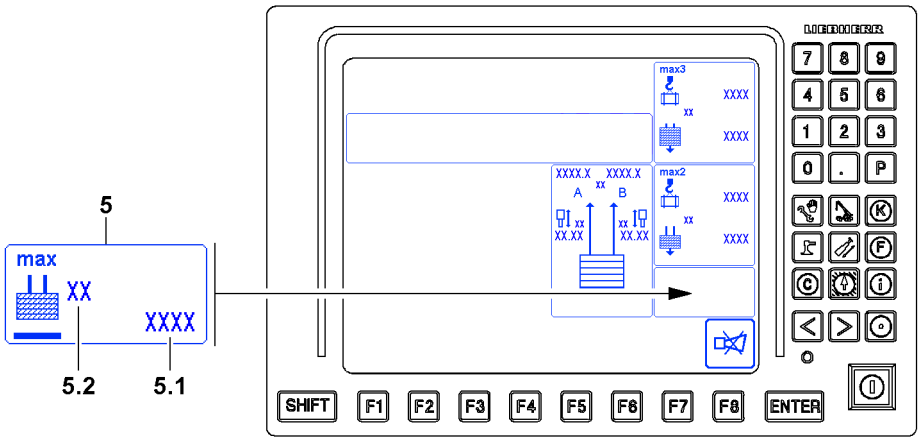

Fig.146950

The *maximum liftable derrick ballast* icon **5** displays the derrick ballast that, with reference to the current crane condition, can be lifted off the ground with the pull cylinder or off the suspended ballast palette in case of the VarioTray without falling below the $F1_{min}$ force.

5 *Maximum liftable derrick ballast* icon

5.1 Maximum liftable derrick ballast
- Maximum derrick ballast

5.2 Measuring unit
- Measuring unit for display values in the *Pulled derrick ballast* icon **5**: [t] or [lb]

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7.4 LICCON Monitor 2 special functions

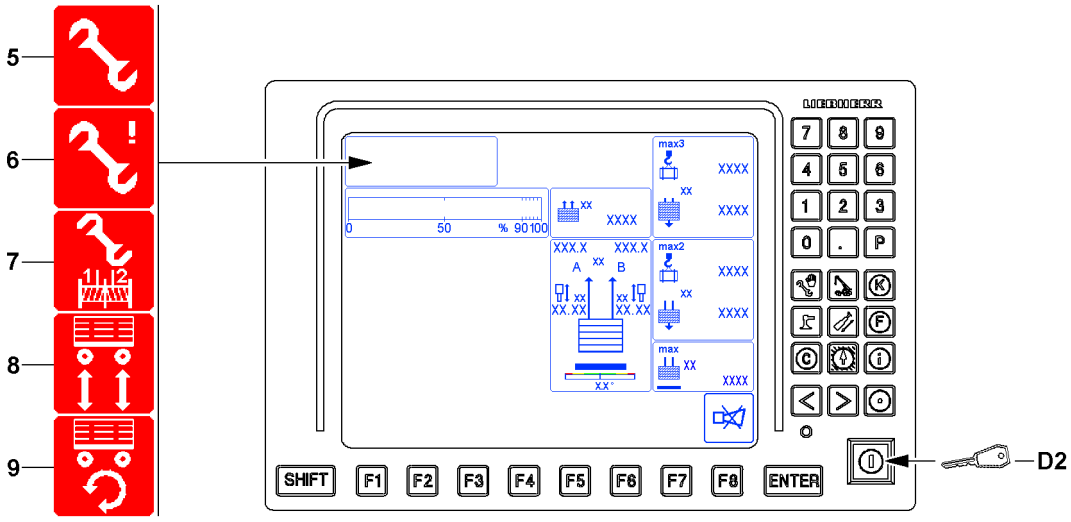

Fig.146963

7.4.1 Shut off *difference force monitoring derrick ballast guying*

5 *Assembly* icon
- The *Assembly* icon **5** appears when the shut off *difference force monitoring derrick ballast guying* is bypassed. The bypass of the shut off is made via the key button (set up key) of LICCON monitor 0 (right monitor), see section „Special functions LICCON monitor 0“.

Note
Shut off *difference force monitoring derrick ballast guying*
▶ Observe the Crane operating instructions, chapter 5.35 / 5.36.

7.4.2 Changing over regulation Parallel operation winch 1 and winch 2

The parallel operation of winch 1 and winch 2 is regulated from a pulley head height of more than 20 m via the change over pulleys. If a problem occurs, then switch over to a regulation via the winch speed sensors.

WARNING
Impermissible change over of regulation *parallel operation winch 1 and winch 2*!
▶ Changing the regulation *parallel operation winch 1 and winch 2* is only permissible if - due to contamination, icing or failure of the path measurement system of the test pulleys - a correct path measurement of the hoist ropes of winch 1 and winch 2 is not possible.
▶ Changing the regulation *parallel operation winch 1 and winch 2* is only permissible if it is not possible to immediately clean or de-ice the test pulleys or repair the path measurement system.
▶ As long as the regulation *parallel operation winch 1 and winch 2* is changed over, the crane driver must align the position of the hook block generally manually.

D2 Key button
- Change over regulation Parallel operation winch 1 and winch 2.
- **Note:** At a pulley head height below 20 m the function is deactivated, since the system is already regulated via the winch speed sensors.
  By pressing the key button **D2** again, the function is turned off.
  The function is also turned off if the engine of the ignition is turned off.

7 *Regulation parallel operation switched over* icon
- The *Regulation parallel operation switched over* icon **7** appears when the regulation parallel operation winch 1 and winch 2 is switched over.

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- **Note:** After turning the function off, the icon turns off.

7.4.3 Emergency operation ballast trailer

6 *Assembly* icon
- The *Assembly* icon **6** appears when the emergency operation ballast trailer is engaged, see Crane operating instructions, chapter 5.35.

8 *Emergency operation travel clear* icon
- The *Emergency operation travel clear* icon **8** appears when:
  - The emergency operation ballast trailer is engaged
  - *Emergency operation travel clear* is engaged

9 *Emergency operation turn clear* icon
- The *Emergency operation turn clear* icon **9** appears when:
  - The emergency operation ballast trailer is engaged
  - *Emergency operation turn clear* is engaged

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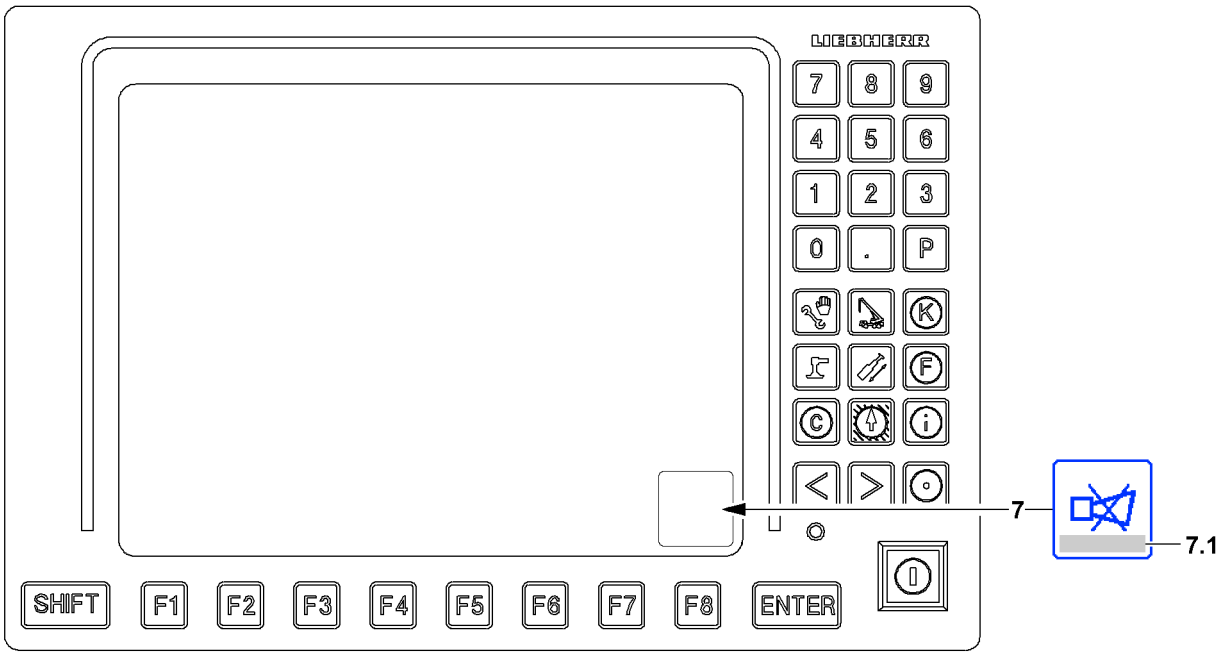

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Fig.114279

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7.5 Acoustic warning on LICCON monitor 2

Acoustic warnings on LICCON monitor 2 are indicated by the warning sound *Horn*.

The warning sound *Horn* is divided into two categories:
- *Horn* is a beeping sound of a duration of approximately 0.5 seconds, which is repeated in a second cycle.
- *Short horn* is a beeping sound of a duration of approximately 0.1 seconds, which is repeated in a second cycle.

7 *Horn* icon
- When the *Horn* icon **7** is shown in the LICCON monitor, any acoustic signals which will occur can be shut off by the LICCON monitor 2 by pressing the function key **F8**.
- If an error message is shown in the *Horn* icon **7** in field **7.1**, then the present error can be determined through it. Pressing the function key **F8** twice, automatically changes to the error determination screen of the test system. The error is displayed there in documentary form.

7.5.1 Warning sound *Horn*

1. Sounds in addition to the visual display of an error message in field **7.1** in case of operational errors are found, which lead to a shut off of a crane movement.
   Operational errors are, for example:
   - Difference between *Force / load on guying A* and *Force / load on guying B* is too large
2. In case of application errors with error number (LICCON Error Code LEC)

7.5.2 Warning sound *Short horn*

Sounds in addition to the visual display of error messages without an error number and which do not lead directly to crane movement shut off by the LICCON overload protection.
Monitored error messages are, for example:
- Advance warning by approaching the limit values in the F-load display

7.5.3 Priority acoustic warning

- The *Horn* warning around has higher priority than the *Short horn* warning sound, i.e. *Horn* takes preference over *Short horn*.
- The *Horn* warning sound as well as the *Short horn* warning sound become active again after shut down if a new error occurs.

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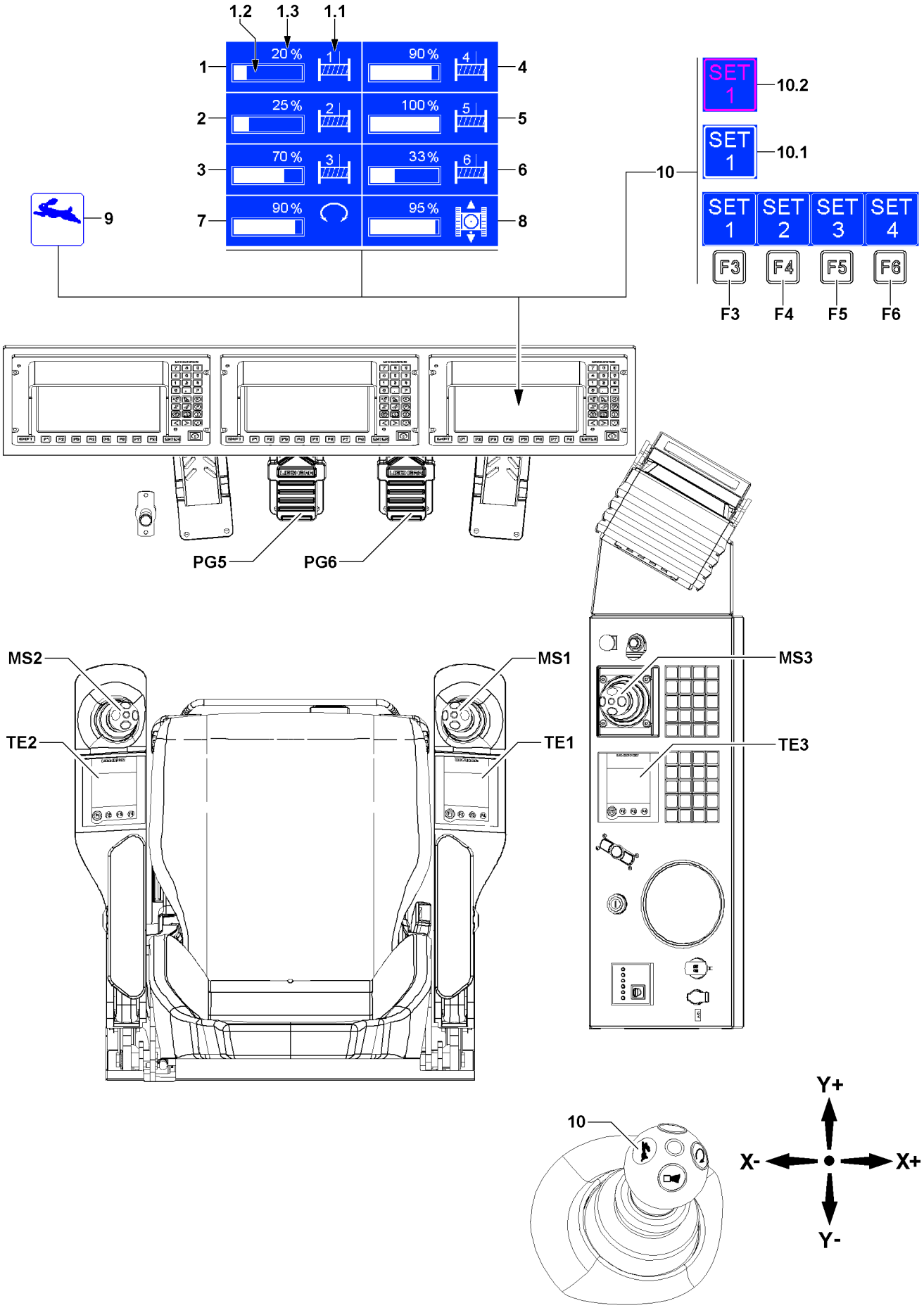

Fig.120651

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8 Speed reduction master switch / pedal sensor

The speed reduction of master switches is made in the settings window. The speeds of the displayed crane movements / crane functions can be limited steplessly to the desired value.

Speed reduction of master switches is the speed of the crane function reduced to the speed set in the settings window.

WARNING
Deactivated speed reduction of master switches!
When the rapid gear **9** is engaged, the speed reductions of the master switches can be ineffective.
Too high a crane speed can cause accidents.
▶ Turn the rapid gear **9** off when a speed reduction of the master switches is necessary.

WARNING
Danger of accident!
▶ Make the preselection of the slewing speed according to the specifications in the load chart manual.
▶ The following applies: The longer the boom and / or the greater the load, the lower the set maximum slewing speed must be.
▶ **Never** deflect the master switch for the slewing gear to the stop with a long boom and / or great load.

8.1 Operating elements at speed reduction of master switch / pedal sensor

MS1 Master switch 1
TE1 Touch display 1
MS2 Master switch 2
TE2 Touch display 2
MS3 Master switch 3
TE3 Touch display 3
PG5 Pedal sensor 5
PG6 Pedal sensor 6

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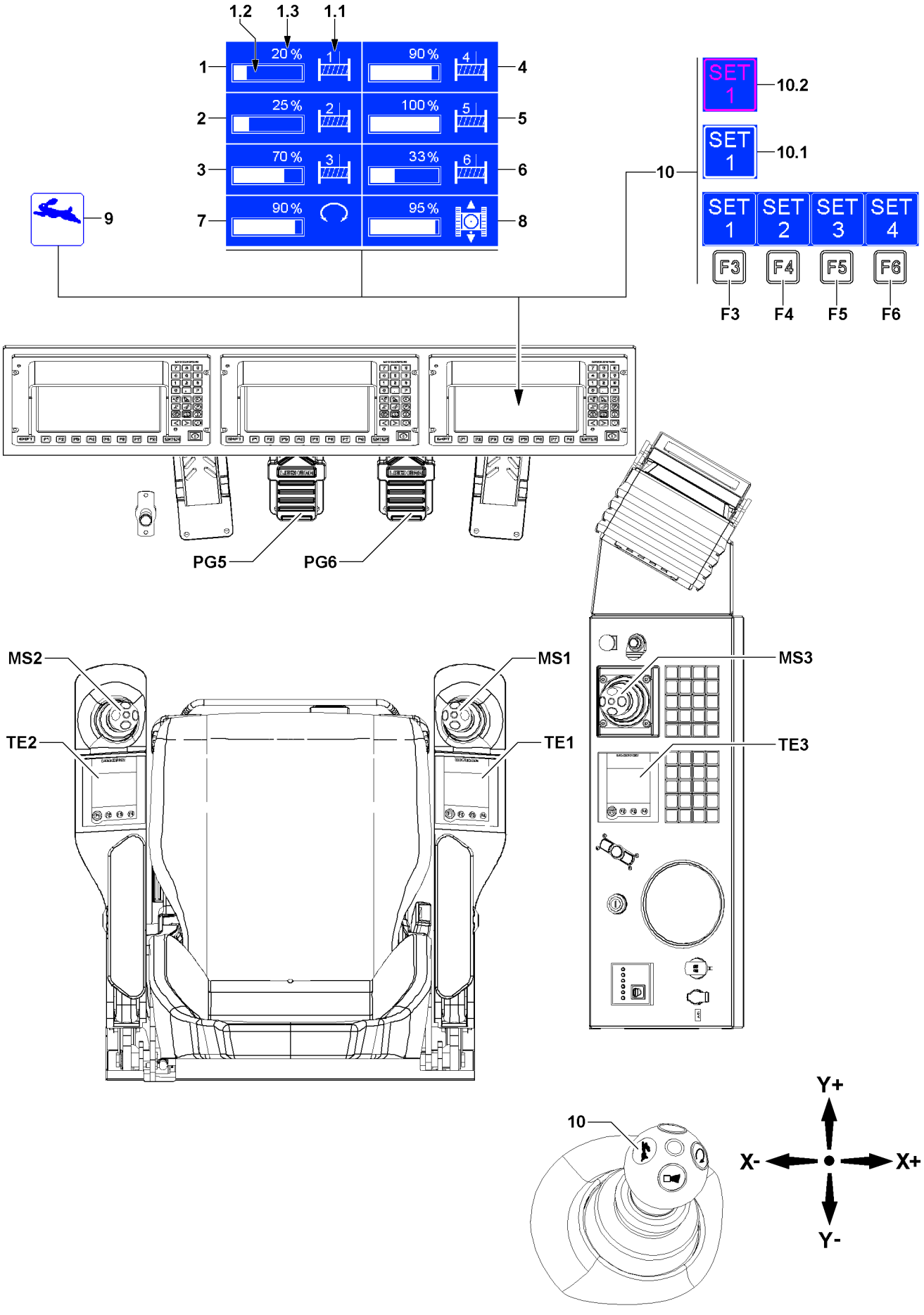

Fig.120651

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8.2 User platform in settings window for speed reduction of master switch / pedal sensor

Note

▶ The structure of the individual settings windows is always the same. The structure is explained based on the first settings window (setting window for winch 1).

1 Settings window Winch 1
- **Note:** Appears only when the winch is active.

1.1 *Assignment* icon
- Icon of assigned crane movement / crane function
- The icon corresponds to the illustration in the respective TE- display

1.2 Bar display
- Graphic illustration of current speed reduction

1.3 Display value
- Numeric display of current speed reduction in [%]

2 Settings window Winch 2
- **Note:** Appears only when the winch is active.

3 Settings window Winch 3
- **Note:** Appears only when the winch is active.

4 Settings window Winch 4
- **Note:** Appears only when the winch is active.

5 Settings window Winch 5
- **Note:** Appears only when the winch is active.

6 Settings window Winch 6
- **Note:** Appears only when the winch is active.

7 Settings window Slewing gear

8 Settings window for crawler

8 Fast setting
- Four freely programmable fast settings are possible.

8.3 Processing the speed reduction

The procedure in the settings window *Speed reduction master switch / pedal sensor* is identical for all crane functions.

Using the example Speed reduction for winch 1, the individual steps are explained.

Note

Only the settings for the displayed crane movements / crane functions can be carried out.

▶ If necessary, activate required crane movements / crane functions before calling up the settings windows.

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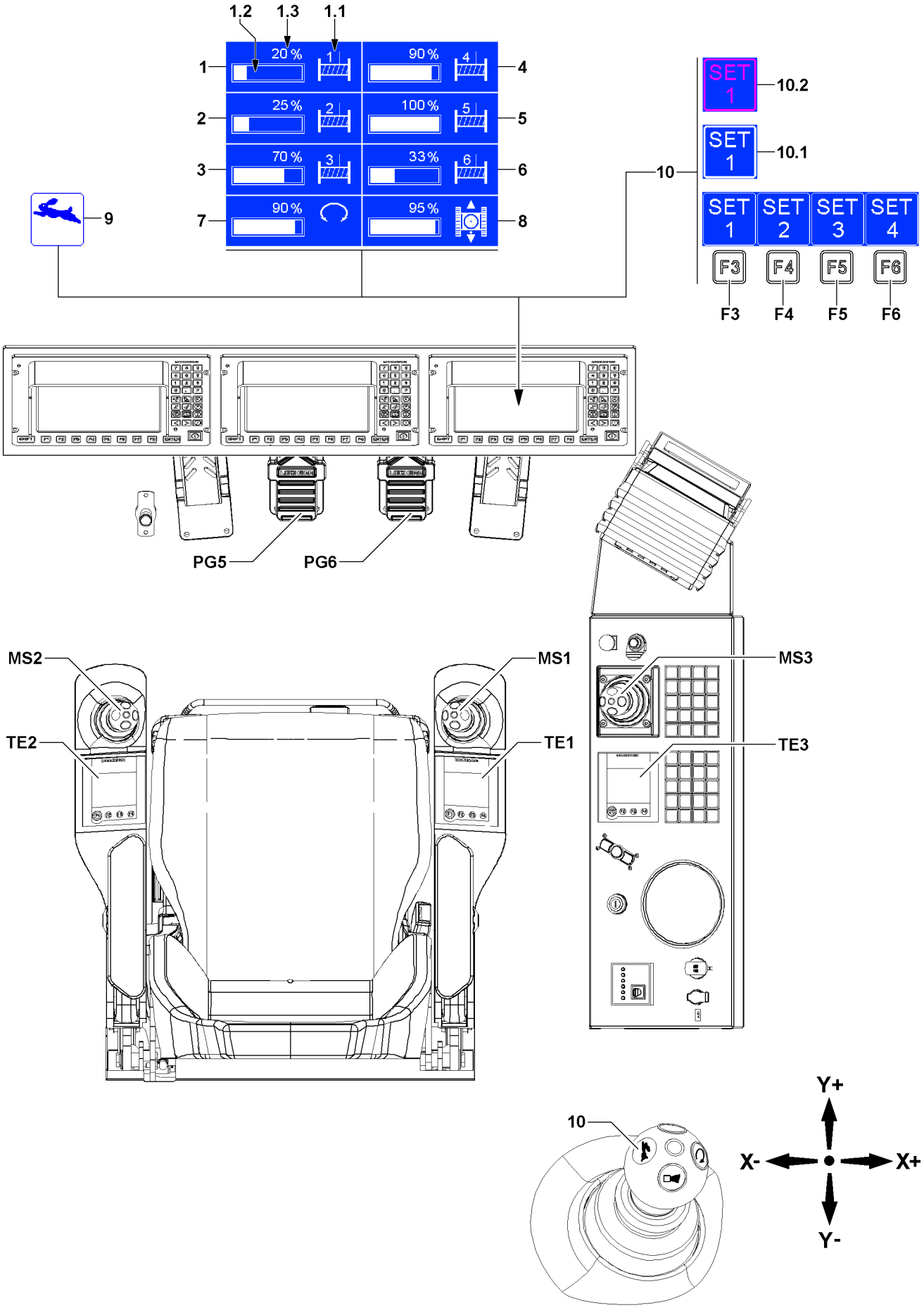

Fig.120651

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8.3.1 Displaying the settings windows

▶ Press the rapid gear **10** button on a master switch at least two seconds.

Result:

– The settings window for the speed reduction of the master switch / pedal sensor is shown for ten seconds.

Note
The settings window is automatically hidden after ten seconds if during that time there is no access to the speed reduction of a crane function.
▶ Continue in time with the next steps.

8.3.2 Procedure

The speed reduction is always set via the master switch / pedal sensor which controls the crane movement.

Note
▶ If the master switch / pedal sensor is deflected lightly, the value is slowly increased / reduced.
▶ If the master switch / pedal sensor is deflected strongly, the value is quickly increased / reduced.

Example: Set crane movement *spool winch 1*. The crane movement is carried out via the master switch **MS1**.

Reducing the value of the speed reduction:
▶ Move the master switch **MS1** in direction Y- (to the rear).

Result:

– The bar in the bar display **1.2** gets shorter.
– The display value **1.3** is reduced.
– The speed for crane movement *spool winch 1* is set to the new display value **1.3**.

Increasing the value of the speed reduction:
▶ Move master switch **MS1** in direction Y+ (forward).

Result:

– The bar in the bar display **1.2** gets longer.
– The display value **1.3** is increased.
– The speed for crane movement *spool winch 1* is set to the new display value **1.3**.

8.4 Fast settings* Speed reduction master switch / pedal sensor

Four different fast settings for the speed reduction master switch / pedal sensor can be saved and called up by pressing a button.

Make sure that the following prerequisite is met:
– The settings window is shown.

8.4.1 Programming fast settings

Operating elements:
– **F3** Function key
  • Operate fast setting 1 (SET1)
– **F4** Function key
  • Operate fast setting 2 (SET2)
– **F5** Function key
  • Operate fast setting 3 (SET3)
– **F6** Function key

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- Operate fast setting 6 (SET4)

As an example in fast setting 1 (SET1) a new setting for crane movement *spool winch 1* is programmed:

▶ Press the function key **F3**.

Result:

– The frame around the *SET1* icon is shown in bold.

Reducing the value of the speed reduction:
▶ Move the master switch **MS1** in direction Y- (to the rear).

Result:

– The frame and lettering in the *SET1* icon are shown in red.
– The bar in the bar display **1.2** gets shorter.
– The display value **1.3** is reduced.
– The speed for crane movement *spool winch 1* is set to the new display value **1.3**.

Increasing the value of the speed reduction:
▶ Move master switch **MS1** in direction Y+ (forward).

Result:

– The frame and lettering in the *SET1* icon are shown in red.
– The bar in the bar display **1.2** gets longer.
– The display value **1.3** is increased.
– The speed for crane movement *spool winch 1* is set to the new display value **1.3**.

Note
▶ All settings can be changed one after the other as desired.

When the desired setting is reached:
▶ Press the function key **F3**.

Result:

– The frame and lettering in the *SET1* icon are shown in white.
– All current settings are saved as fast setting 1 (SET1).

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Empty page!

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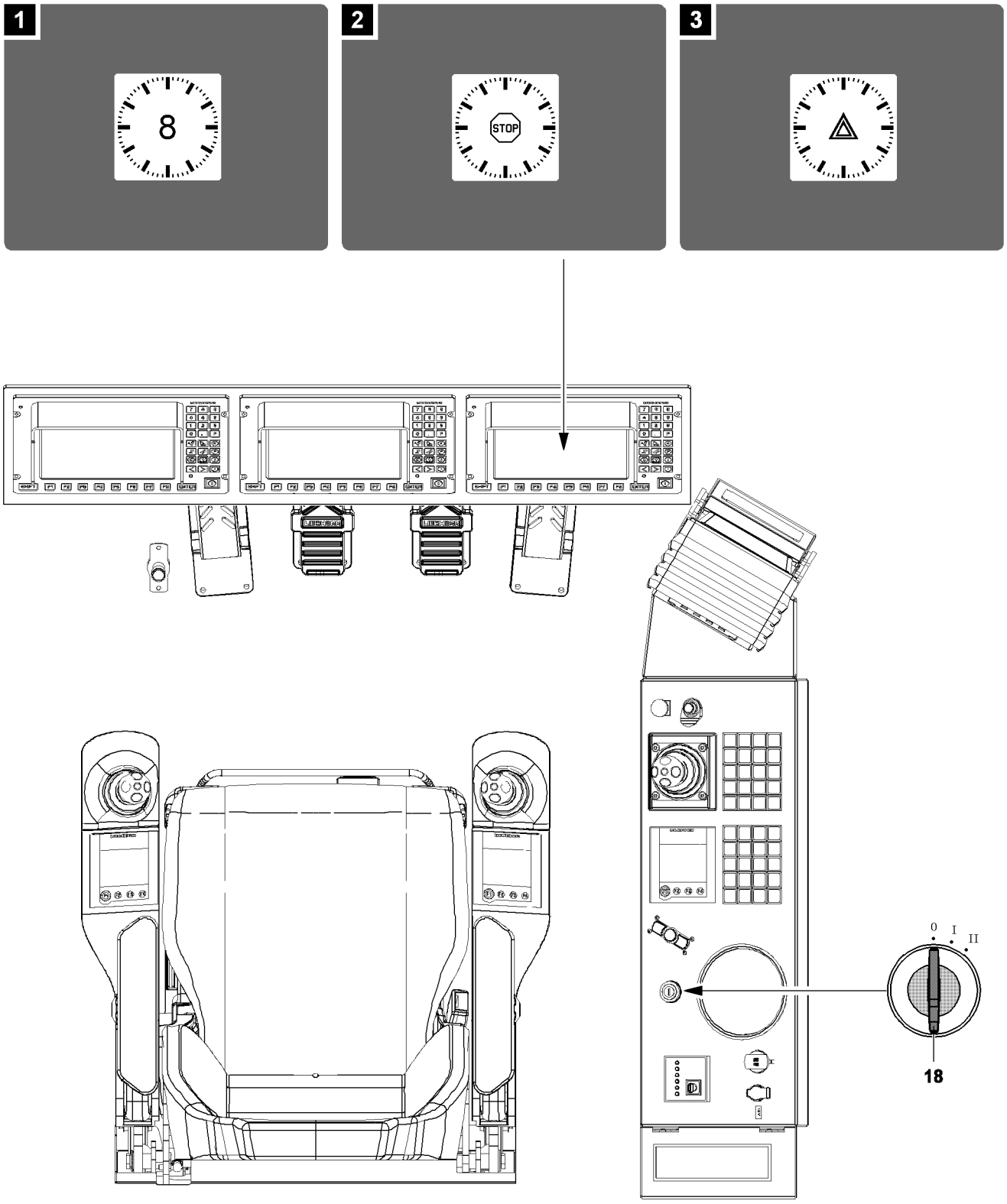

Fig.115263

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9 Power-Save mode and Stand-by mode in the LICCON computer system

9.1 The Power-Save mode

If the crane engine - by turning the ignition switch **18** - is turned off to position 0 (ignition **OFF**), the LICCON computer system changes to the Power-Save mode.

The Power-Save mode enables the crane operator - within approx. eight seconds after turning the ignition off - either to change to Stand-by mode or to start the crane engine again without having to start the LICCON computer system again.

If no program key is actuated within eight seconds, then the LICCON computer system turns off completely.

Note

▶ In the Power-Save mode, no crane movements are possible.

Turning the crane engine off

▶ Turn the ignition switch **18** to position 0 (ignition **OFF**).

Result:

– The crane engine is turned off.
– The **Power-Save mode** is active.
– The clock with a Power-Save run time (approx. eight seconds) appears, illustration **1**.

Note

▶ After eight seconds have expired, a clock appears briefly with an integrated STOP icon, which displays the complete turning off of the LICCON computer system.

– The clock with integrated STOP icon appears for a few seconds, illustration **2**.
– All processes on the LICCON computer system are stopped.
– The LICCON computer system turns off completely.

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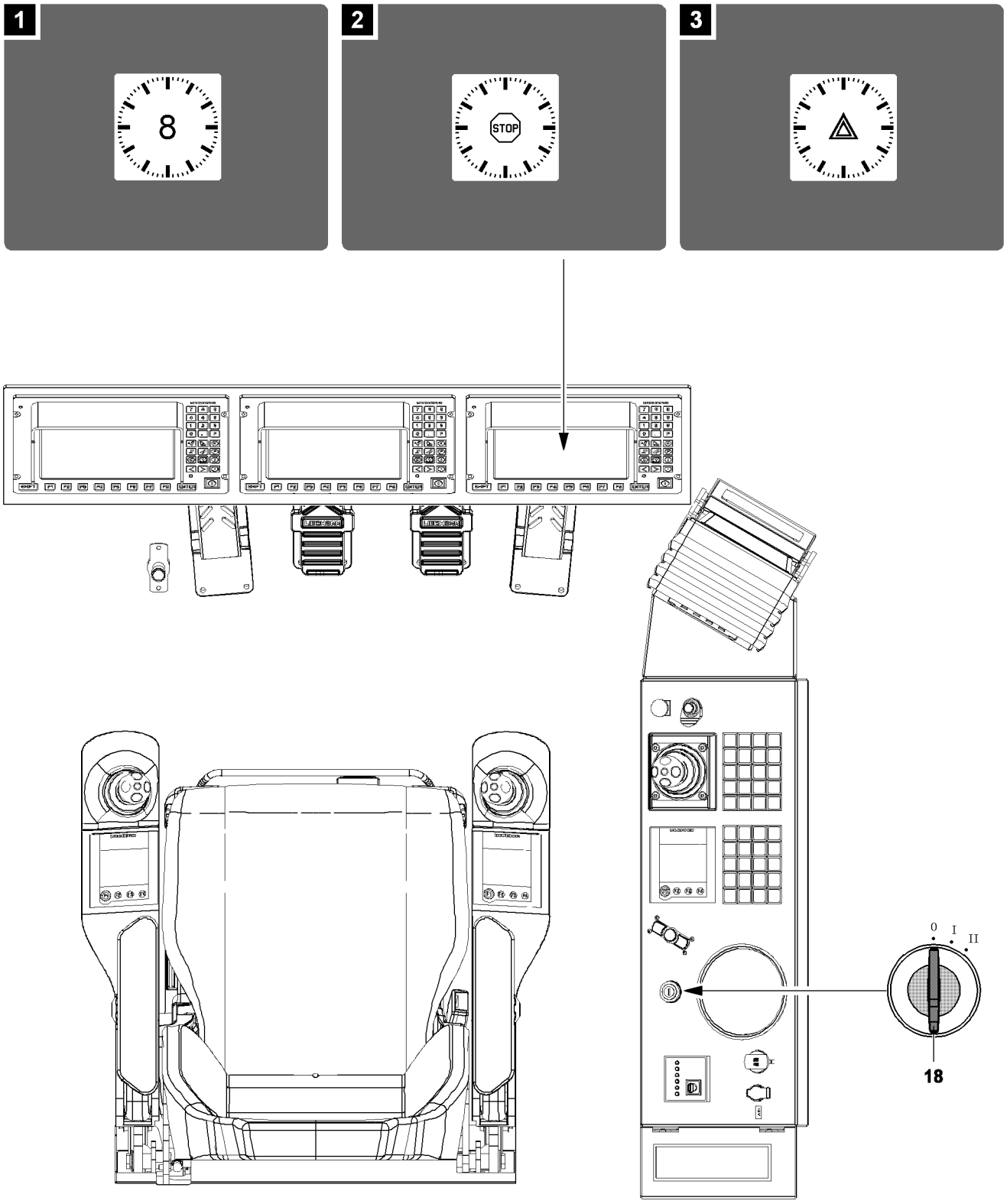

Fig.115263

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Press any key in Power-Save mode once

Note

▶ Pressing a key in Power-Save mode once shortens the Power-Save alarm time to five seconds.

▶ Press any key.

Result:

– The Power-Save alarm time is shortened to five seconds.

Press any key in Power-Save mode twice

▶ Press any key twice in succession.

Result:

– The Power-Save alarm time is set to zero.
– The clock with integrated STOP icon appears for a few seconds, illustration **2**.
– All processes on the LICCON computer system are stopped.
– The LICCON computer system turns off completely.

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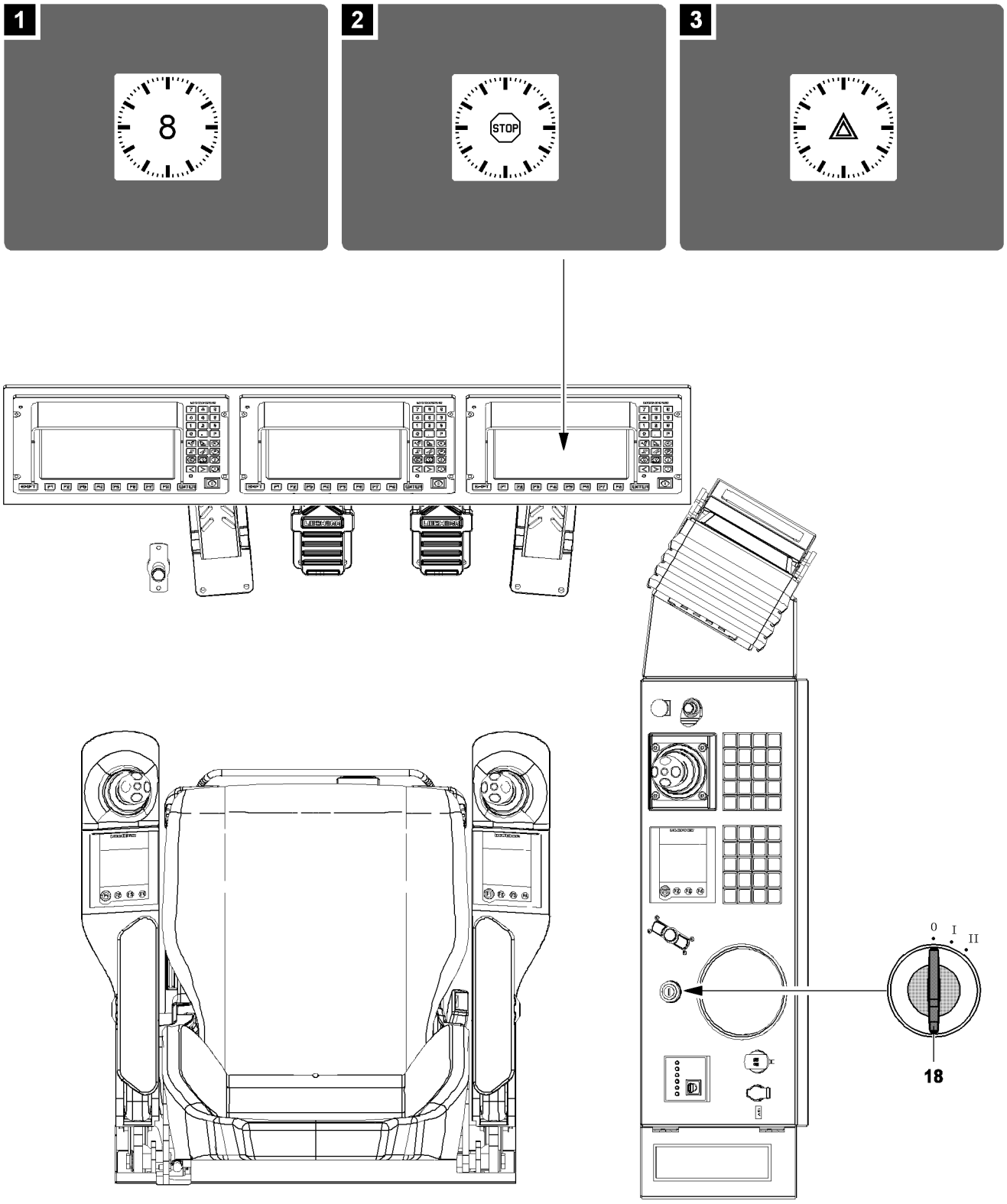

Fig.115263

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9.2 Stand-by mode

After pressing the Engine STOP key - the crane engine is turned off - on the LICCON monitor, the operating interface of the most recently active application program continues to be displayed for an additional 10 minutes, illustration **3**.

After 10 minutes are over, the Stand-by mode is reached. The Stand-by mode is displayed by the Stand-by clock + warning icon on the LICCON monitor and by a repeated short acoustic signal (*short horn*) with longer intervals.

Note
▶ In the Stand-by mode, no crane movements are possible.

There are two ways of achieving Stand-by mode with the LICCON computer system.

Turning the crane engine off

Turning the engine off with the engine STOP key:

▶ Press the engine STOP key.
▶ Leave the ignition key **18** in position „I“.

Result:

– The crane engine is turned off.
– The ten minute time frame is over.

▶ Within the ten minute time frame, press **any key**.

Result:

– The ten minute time frame is reset and starts again.

▶ Within the ten minute time frame, press **no key**.

Result:

– After the time is over, the **Stand-by mode** is reached.
– The display area on the LICCON monitor turns black.
– The stand-by clock with a warning icon is shown, illustration **3**.
– Every half a minute a repeating acoustic signal from the LICCON monitor sounds.

Note
▶ The Stand-by mode does not lead to any automatic shut off of the LICCON computer system.

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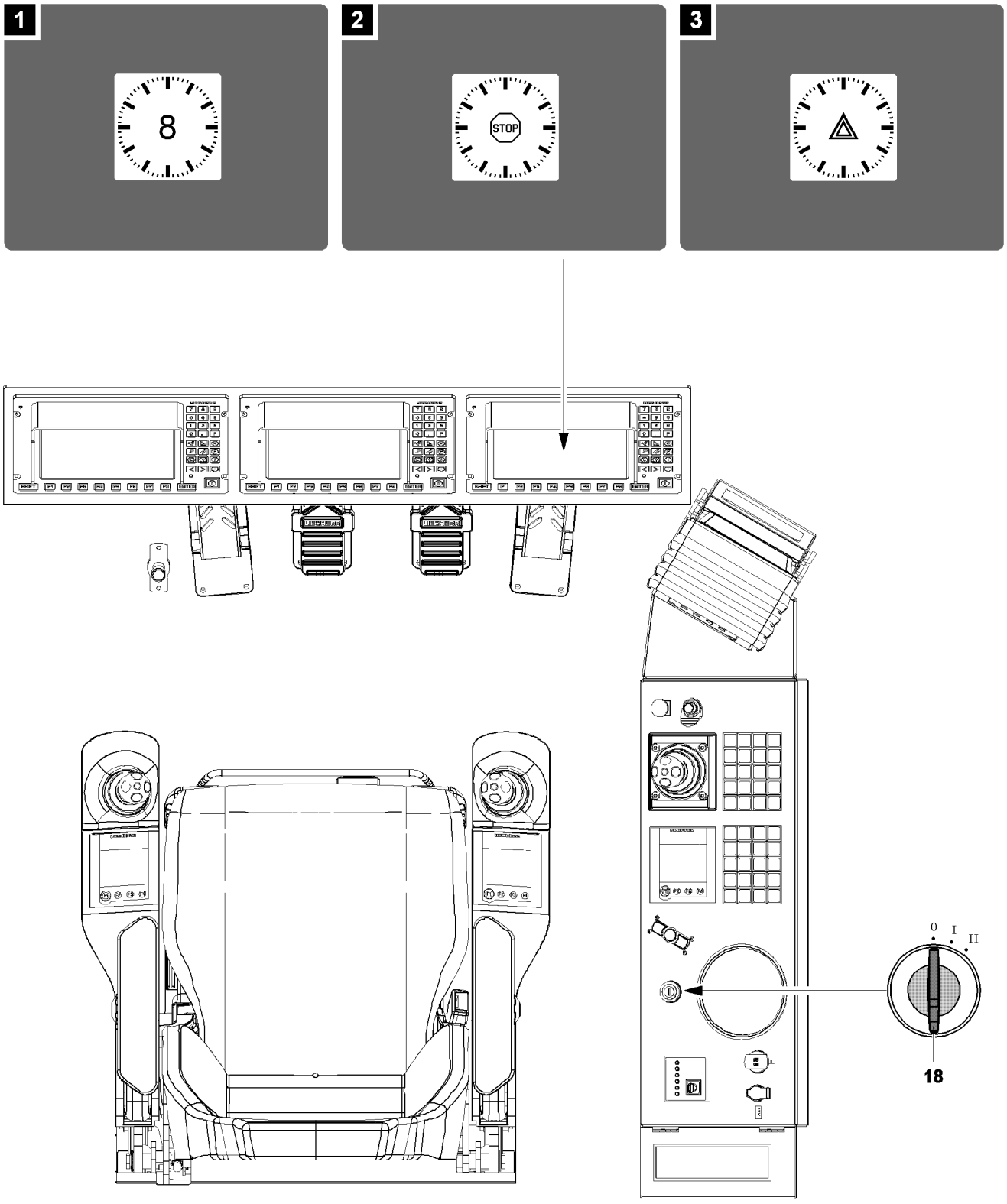

Fig.115263

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Turn the LICCON computer system off from the Stand-by mode

▶ Turn the ignition switch to position 0.

Result:

– The Power-Save mode is active.

Note

▶ See section „Power-Save mode“.

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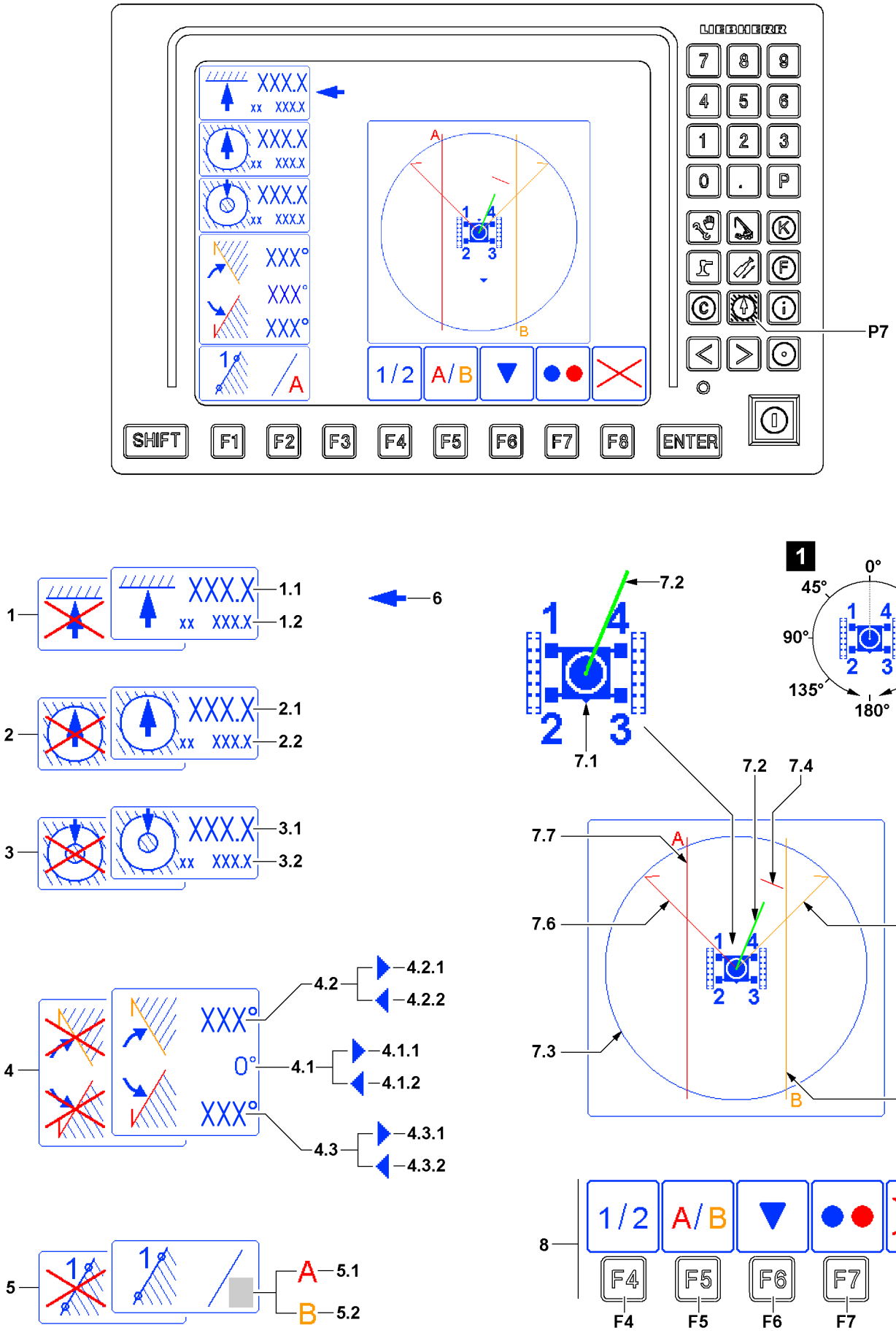

Fig.116057

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10 The *Working range limitation* program

For a detailed description of *Working range limitation* program, see separate Operating instructions for Working range limitation.

10.1 Starting the program

▶ Press the program key **P7**.

10.2 Operating interface

Note

▶ The limit function icons are shown crossed out if they are inactive

1 Pulley head height
- Limitation of pulley head height
- Limits the height of the load pulley to a predetermined dimension

1.1 Limit value
- The limitation is made by reaching the limit value of the pulley head height

1.2 Actual value
- Current pulley head height

2 Working radius$_{max}$
- Limitation of maximum working radius (maximum boom radius)
- Limits the working radius of the load hook to a predetermined upper limit

2.1 Limit value
- The limitation is made by reaching the limit value for the maximum working radius

2.2 Actual value
- Current working radius

3 Working radius$_{min}$
- Limitation of minimum working radius (minimum boom radius)
- Limits the working radius of the load hook to a predetermined lower limit

3.1 Limit value
- The limitation is made by reaching the limit value for the minimum working radius

3.2 Actual value
- Current working radius

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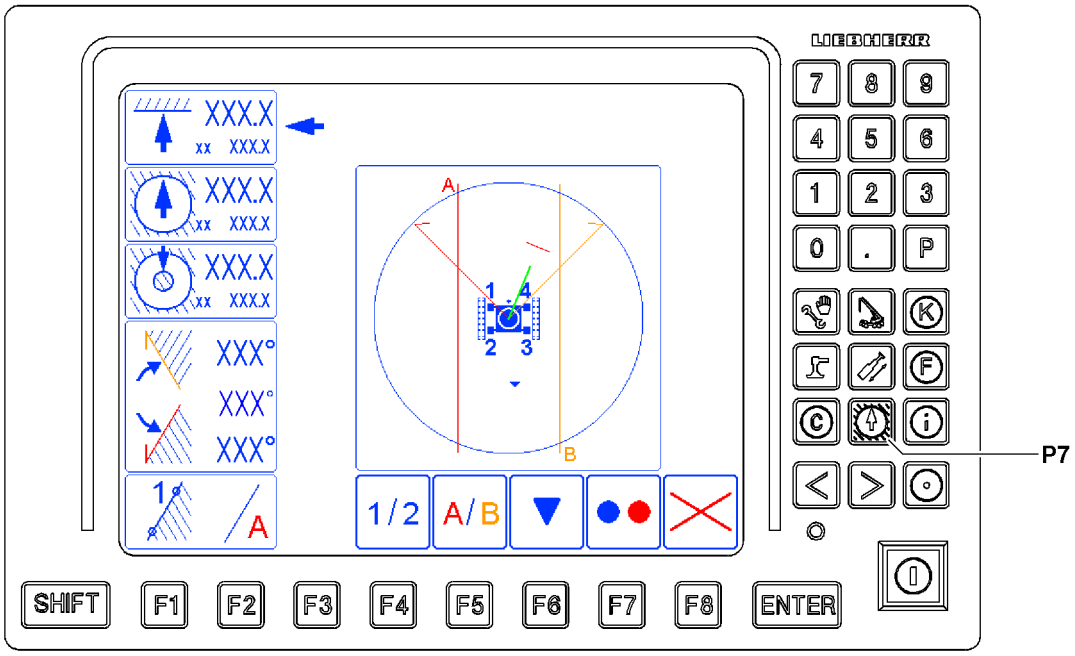

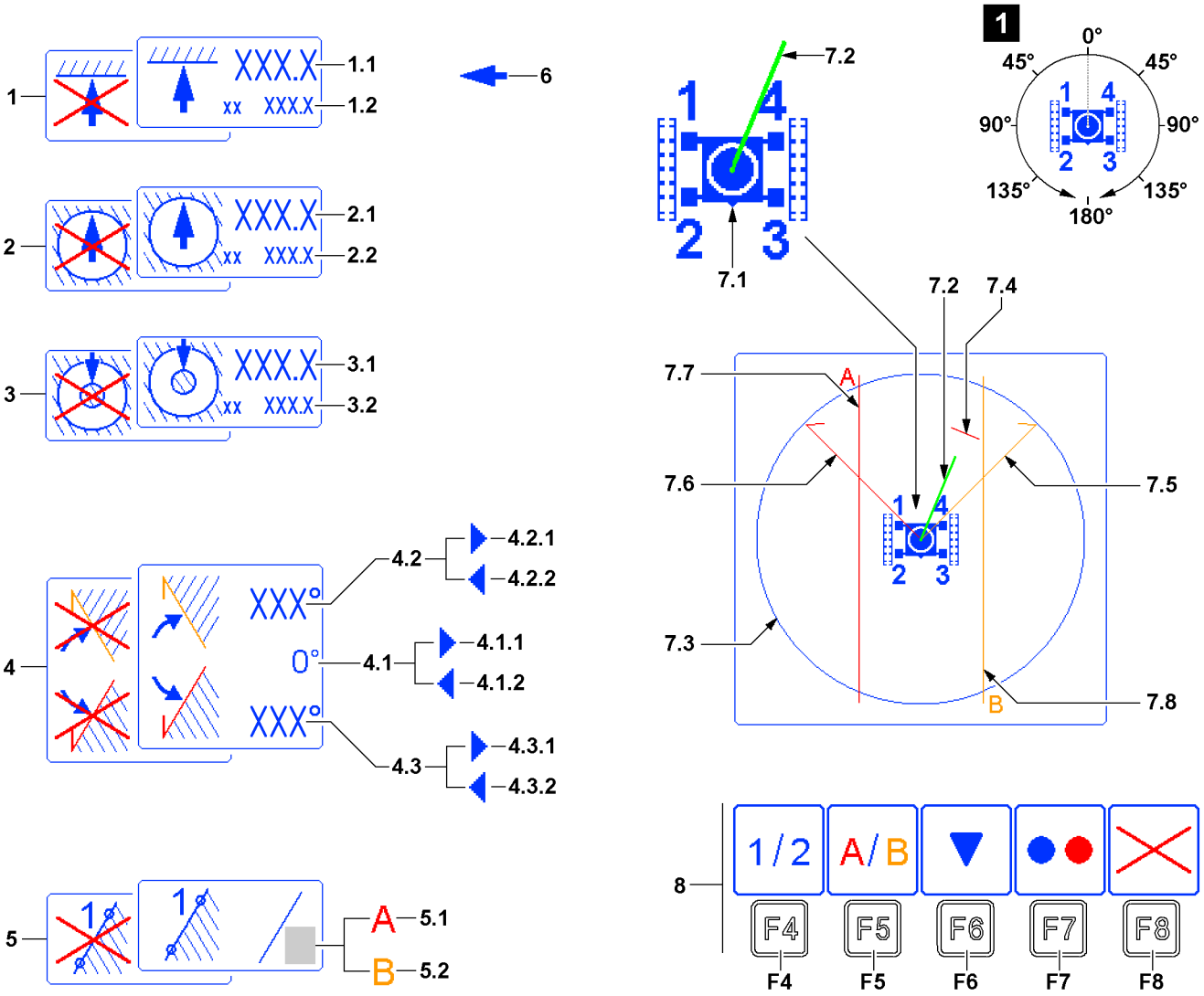

Fig.116057

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4 Turning limitation
- Limitation of turning range
- Limits the turning range of the crane superstructure to a predetermined angle range.
- Each consists of one right limit angle **4.2** and one left limit angle **4.3**.

4.1 Slewing angle
- Current slewing angle of the crane superstructure
- Main working direction of the crane = slewing angle 0°
  Slewing angle 0° is displayed when the crane superstructure is oriented exactly to the rear.
- The slewing angle increases on both sides up to 180° when the crane superstructure is turned. When turning past 180°, the side is changed on the Scaling display, see illustration **1**.
- Arrow to the right **4.1.1**: Range *Crane superstructure turned to the right*
- Arrow to the left **4.1.2**: Range *Crane superstructure turned to the left*

4.2 Limit angle right
- The limitation is made by reaching this right limit angle
- Arrow to the right **4.2.1**: Limit angle is in range *Crane superstructure turned to the right*
- Arrow to the left **4.2.2** Limit angle is in range *Crane superstructure turned to the left*

4.3 Limit angle left
- The limitation is made by reaching this left limit angle
- Arrow to the right **4.3.1**: Limit angle is in range *Crane superstructure turned to the right*
- Arrow to the left **4.3.2** Limit angle is in range *Crane superstructure turned to the left*

5 Edge limitation
- Limitation of freely selectable edges (limitations)
- Consists of up to two edges („edge A **5.1**“ and „edge B **5.2**“), which do not have to run through the center of the slewing ring.

Note

▶ Due to the edge limitation it is possible to determine the working range limits, which allow a rotation of 360° compared to the slewing angle limitation. If necessary, the boom radius must be shorted for turning.

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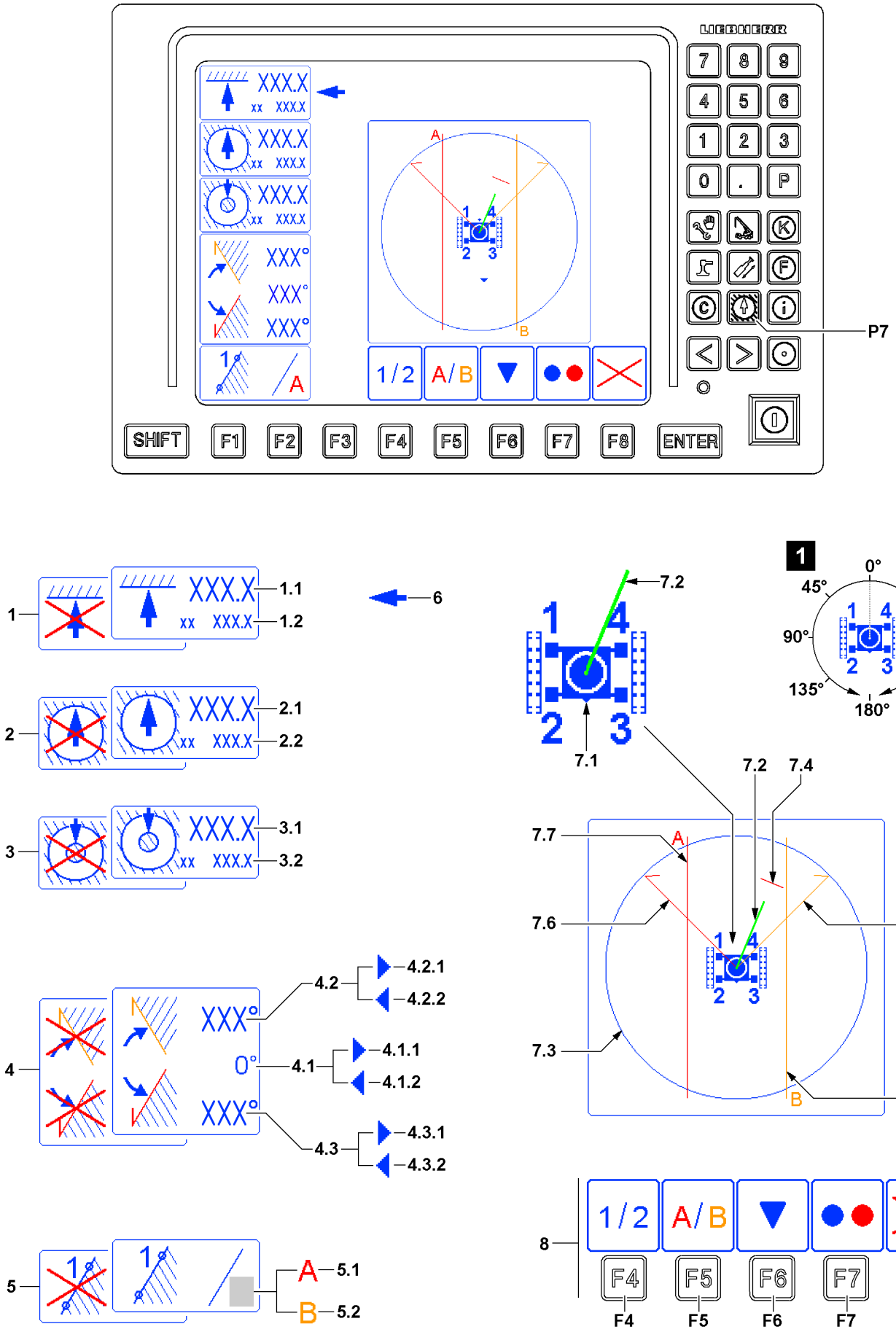

Fig.116057

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6 Function selector
- To select the limitation functions (Position **1** to **5**)

7 Graphic display
- Graphic display of programmed working range limits viewed from above. The crawler travel gear is shown in the center.
- The triangle **7.1** shows where the front is on the crawler travel gear.
- The green bar **7.2** shows the current direction and boom radius of the main boom. The longer the green bar, the larger the boom radius of the crane.

7.3 Crane working radius
- Graphic illustration of the maximum working radius (maximum boom radius) of the crane under ideal conditions.
- **Note:** Setting cannot be changed in the program.

7.4 Working radius$_{max}$
- Graphic illustration of the maximum working radius (maximum boom radius).
- Based on the limit value **2.1** from *Working radius$_{max}$* icon **2**
- **Note:** If the green bar **7.2** crosses the red line of the working radius$_{max}$ **7.4**, a shut off occurs.

7.5 Limit angle right
- Graphic illustration of the right limit angle.
- Based on the limit angle right **4.2** from *Turning limit* icon **4**
- **Note:** If the green bar **7.2** and the orange line of the limit angle right **7.5** are superimposed, a shut off occurs.

7.6 Limit angle left
- Graphic illustration of the left limit angle.
- Based on the limit angle left **4.3** from *Turning limit* icon **4**
- **Note:** If the green bar **7.2** and the red line of the limit angle left **7.6** are superimposed, a shut off occurs.

7.7 Edge A
- Graphic illustration of edge A
- Based on the edge A **5.1** from *Edge limitation* icon **5**
- **Note:** If the green bar **7.2** crosses the red line of the edge A **7.7**, a shut-off occurs.

7.8 Edge B
- Graphic illustration of edge B
- Based on the edge B **5.2** from *Edge limitation* icon **5**
- **Note:** If the green bar **7.2** crosses the orange line of the edge B **7.8**, a shut-off occurs.

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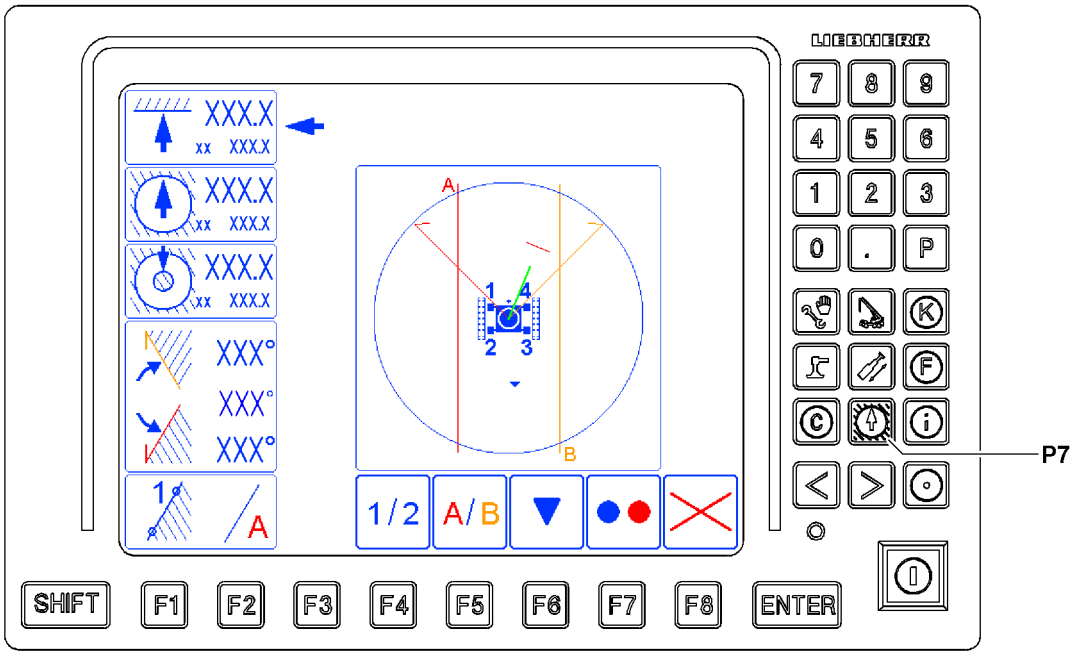

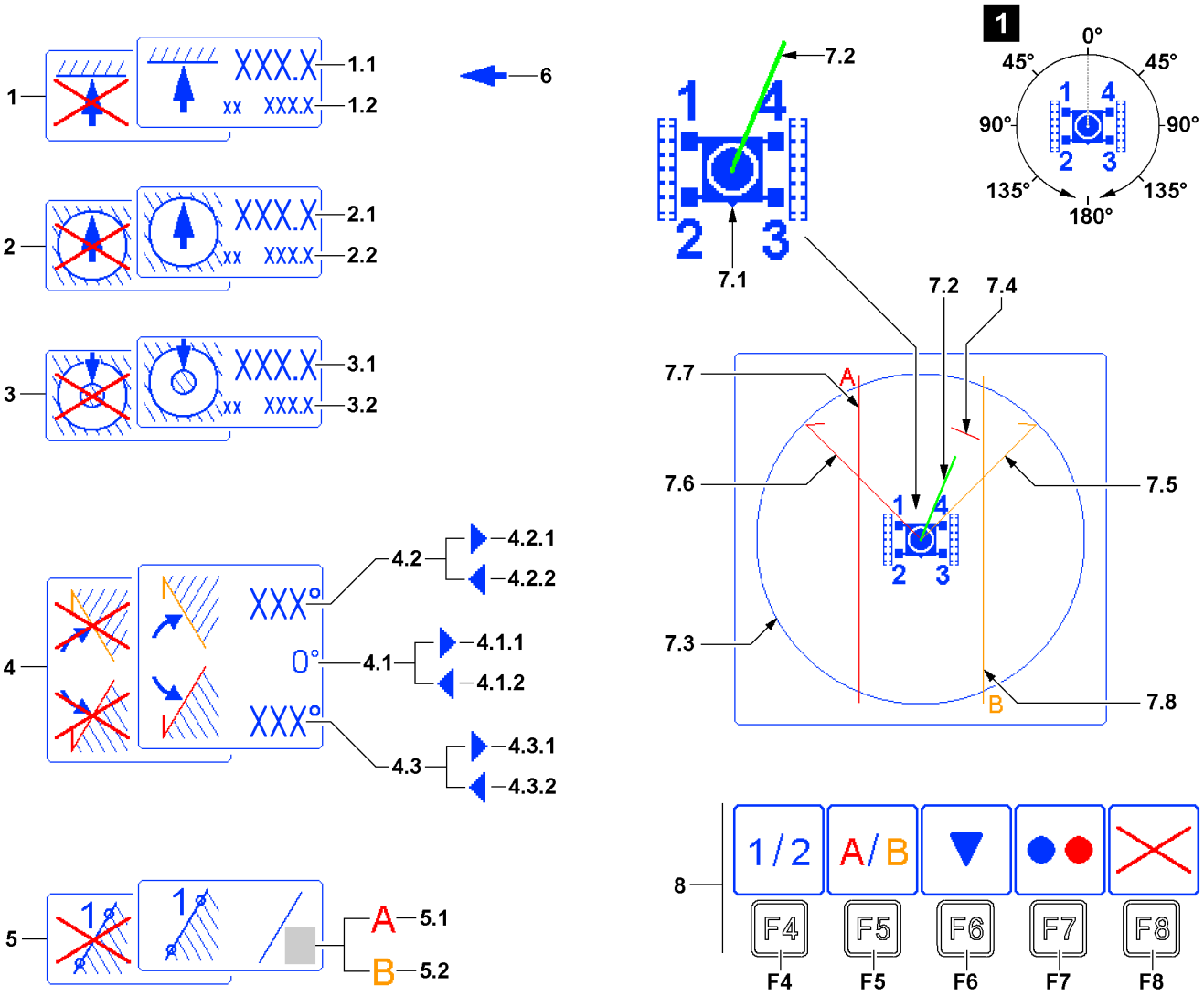

Fig.116057

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10.2.1 Function key line in the *Working range limitation* program

F4 Function key
- Select point 1 or 2 of selected edge A (red) or B (black)

F5 Function key
- Selected edge A (red) or B (black) that is being programmed

F6 Function key
- The function selector is moved down by one limit function

F7 Function key
- ON / OFF
  The limitation function selected with the function selector **6** changes its status. If previously active, it will now be inactive when the function key **F7** is pressed, and vice versa. An inactive limit function is identified by a crossed out icon. If the function selector **6** shows a turning limit to the left or the right, then both limits will always be switched.
  Note: For the edge limitation **5**, only the preselected edge will be switched. The edge that is not displayed can be active or inactive at the same time.

Note

▶ Limit functions can only be added via the function key **F7** when the boom is in the respective permissible range.

F8 Function key
- All limit functions become inactive

10.3 Occurrence of a shut off in the working range limitation

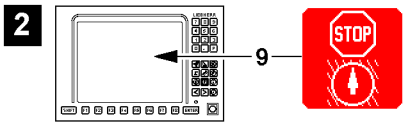

Fig.115262

If the programmed working range limitation is actuated, then this status is shown in the crane operating screen by a STOP icon **9**, see illustration **2**.

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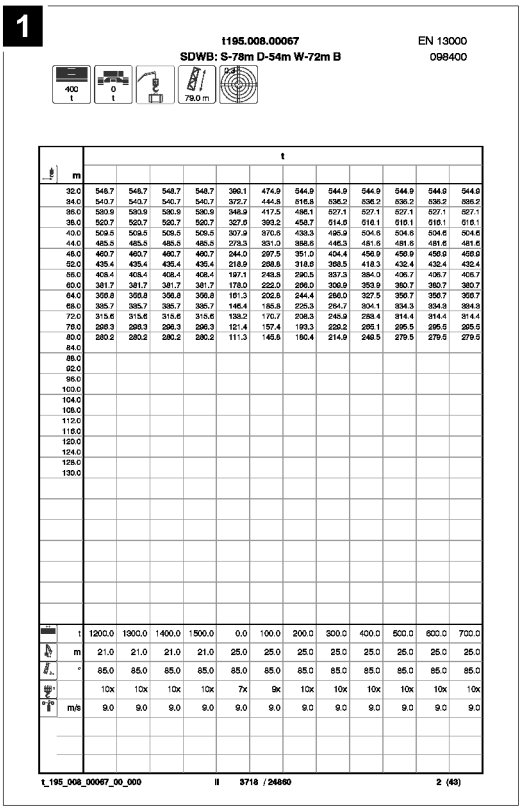
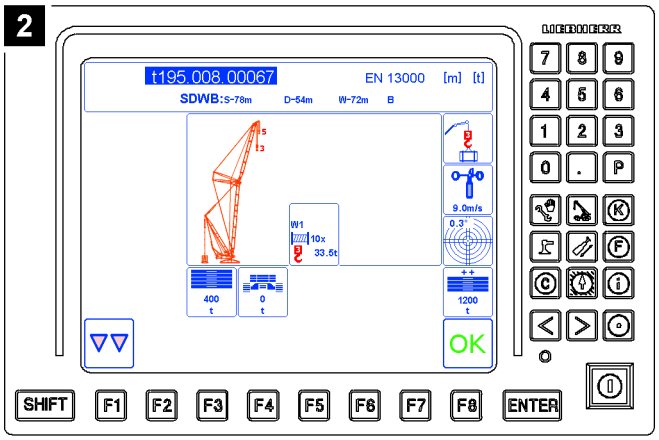
11 *Chart view* program: Curve illustration of load charts





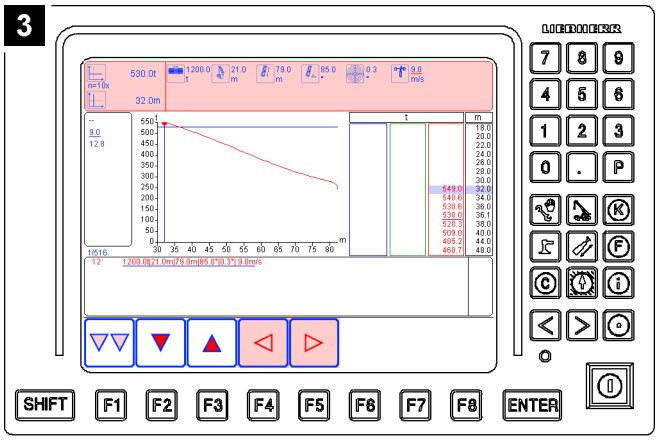


Fig.120685

Note

- ▶ The monitor illustrations in this section are only examples!
- ▶ The numerical values in the individual icons and charts do not have to necessarily match the crane exactly!
- ▶ Numbers and letters can be replaced by place holders!
- ▶ The programmed load charts for the crane are binding!

The curve illustration of the load charts is based on:

– the load charts, illustration **1**
– the entries and settings in the *Set up* program, illustration **2**
– the entries and settings in the *Chart view* program, illustration **3**

In the *Chart view* program, the following can be carried out:

– Display of load charts as curves and as numeric values
– Filtration of load columns according to certain column criteria
– Comparison of up to three curves

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11.1 Ranges of curve display of load charts

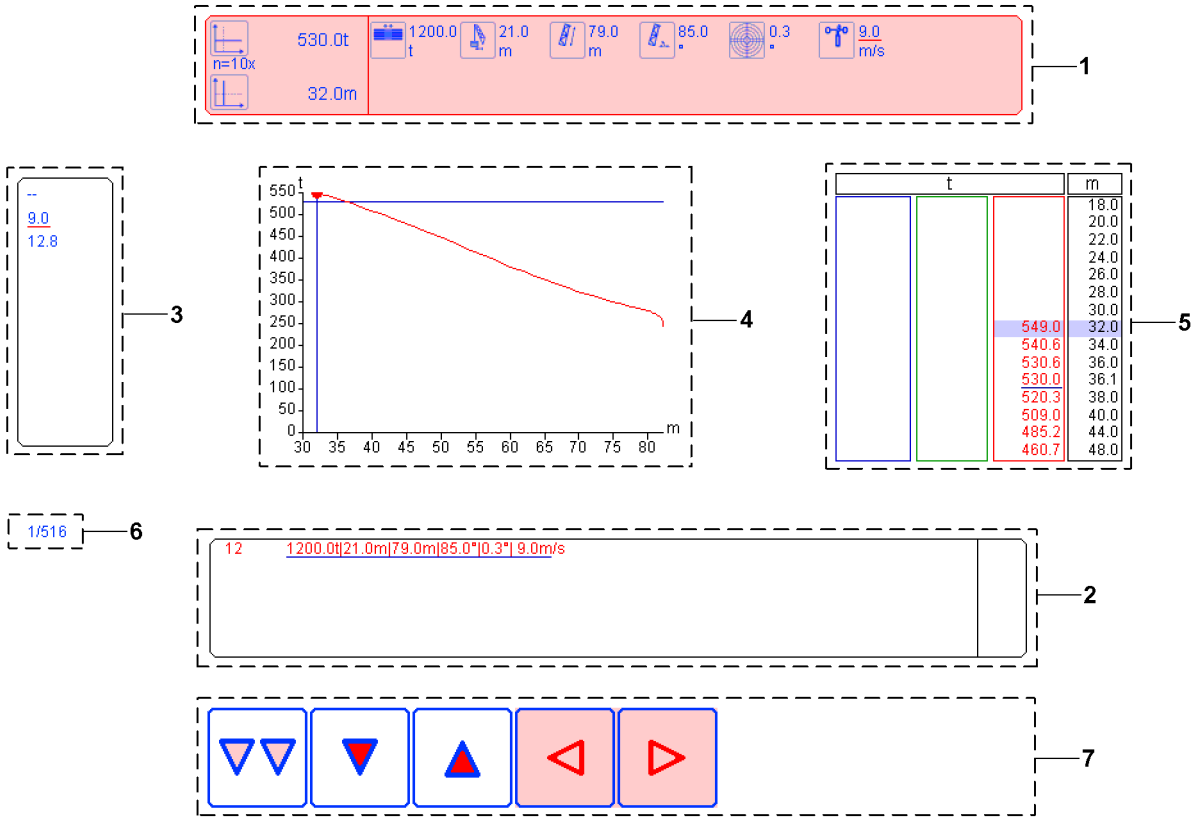

Fig.120686

The curve display window consists of the following program categories and areas:

1 Filter category
- Depending on the settings in the *Set up* program, different parameters are shown

2 Column category
- Depending on the parameters of the Filter category **1** load columns are shown.

3 Editing and selection area
- To edit or select values

4 Curve display
- Curve display of load columns from the column category **2**

5 Numeric display
- Number display of load columns from the column category **2**

6 Page counter
- Number of filtered / all columns

7 Function keys
- For navigation within the screen display
- The icons correspond to the various function keys below them

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11.2 Filter category

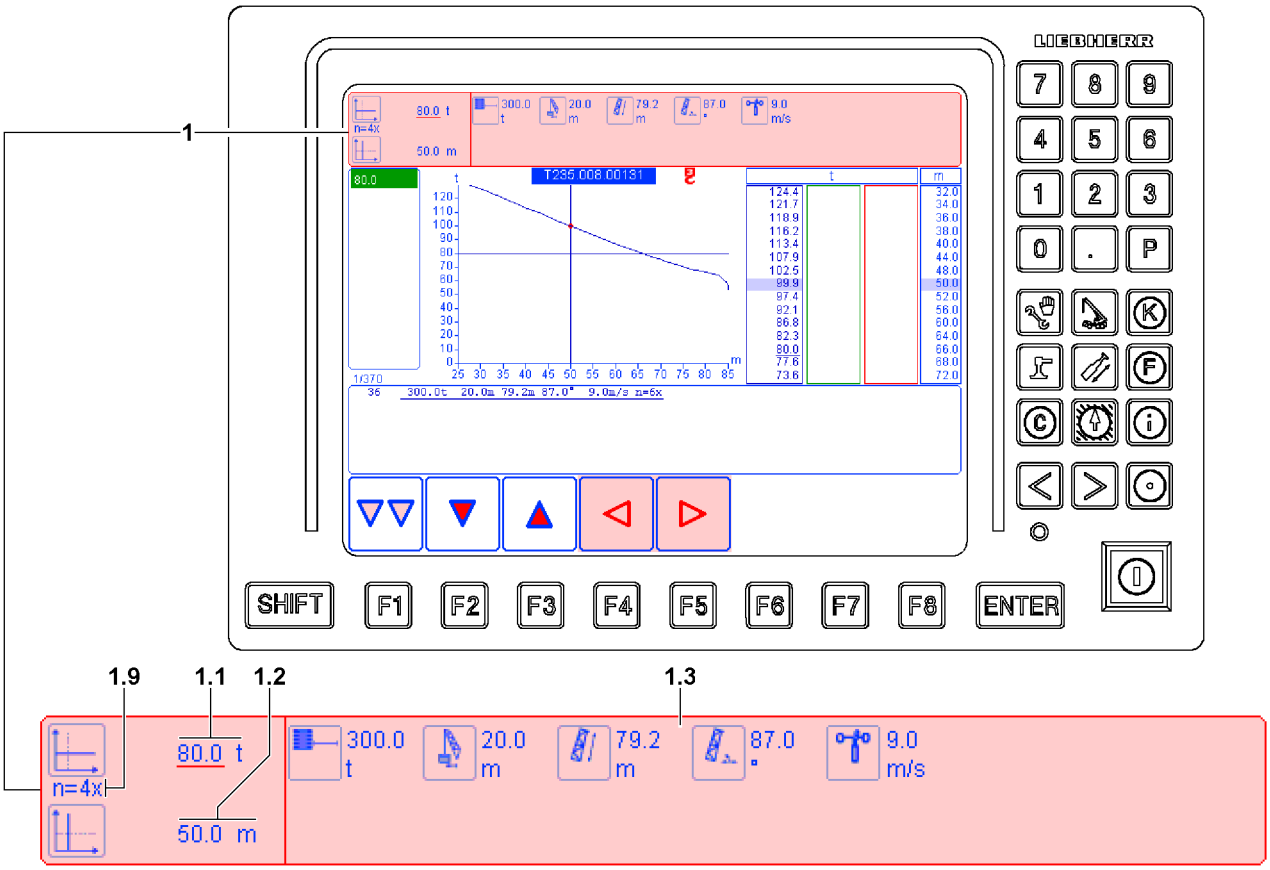

Fig.120663

The filter category **1** is divided into two areas.

- In the left area, the parameter boom radius and load can be set to analyze the displayed load curves in the numeric curve display area.
- In the right area, a filter can be set which can be used to limit the number of relevant load columns.

Depending on the settings in the *Set up* program, different parameters are shown. It is only possible to change parameters within the load chart, whose chart name is set in the *Set up* program.

It is not possible to change the parameters within the filter category in such a way that another chart name and therefore another load chart is called up.

Parameters in the left area:

1.1 Load
- Desired load on the hook
- **Note:** In addition to load **1.1** the required reeving **1.9** is shown.

1.2 Boom radius
- Desired boom radius of the crane

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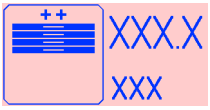
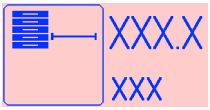
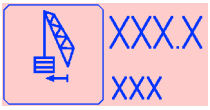
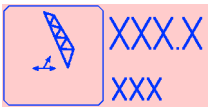
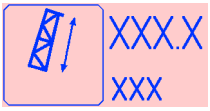
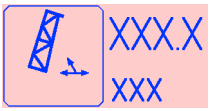
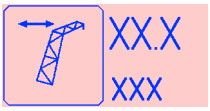
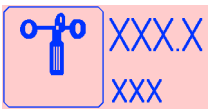
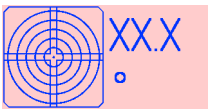
Parameters in the right area **1.3**	
	Counterweight: Weight of counterweight
	Central ballast[1]: Weight of central ballast
 	Derrick ballast[1]: Weight of derrick ballast **Note**: Depending on the crane type, one of the icons is shown.
	Derrick radius[1]: Boom radius of the derrick boom
	Derrick angle[1]: Angle of derrick boom to the horizontal
	Calculation value main boom: The length display refers to a static calculation value for the main boom. The static calculation value can deviate slightly from the set up main boom length.
	Angle main boom[2]: Angle of main boom to the horizontal
	Angle accessory / auxiliary boom[2]: The angle of the accessory / auxiliary boom to the horizontal
	Wind speed[3]: Maximum permissible wind speed
	Incline range[3]: Permissible maximum incline of crane to the horizontal

1) Appears solely at respective operating mode
2) Appears solely in operating modes with luffing accessory / auxiliary boom
2) Appears solely in operating modes with selection possibility for this parameter

Note

- ▶ Set the parameter, see section „Carry out parameter settings“.
- ▶ If a parameter for an operating mode does not appear, then the following parameters move up.

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11.3 Column category

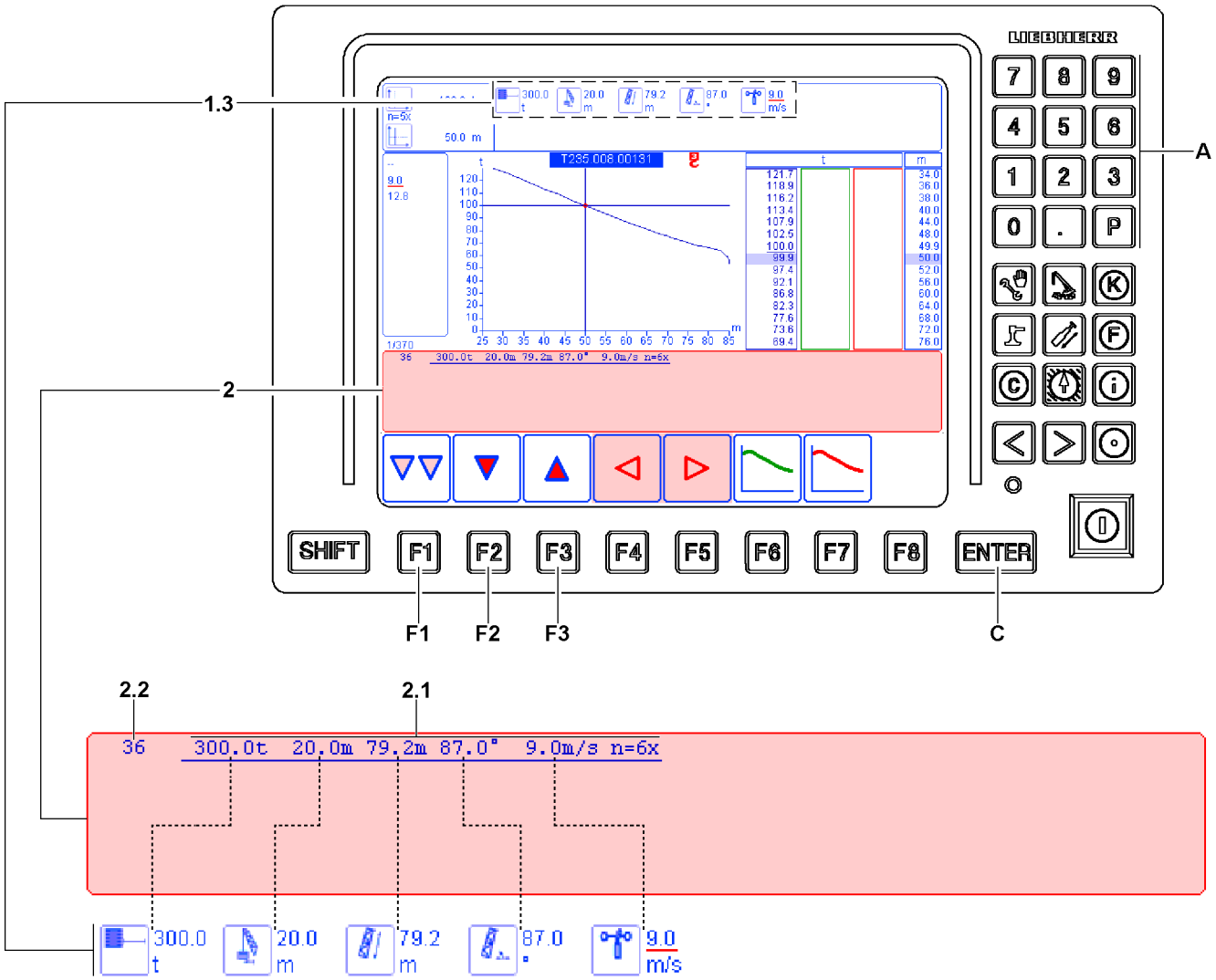

Fig.120664

For all display load columns **2.1** the values of the column parameters are combined to a text line. This happens in the same sequence as the parameters in the right area **1.3** are located in the filter category.

Every load column **2.1** is numbered and has a column number **2.2** for identification. In the column category **2** the relevant load columns **2.1** for the set operating mode are listed.

The number of load columns **2.1** can be reduced or expanded by setting the parameters in the filter category, see section „Carrying out parameter settings“.

If more than seven load columns exists in the column category **2**, then you have to page to view. To page, the column category **2** must be active.

– Set the column category to active: Press the function key **F1** until the column category **2** is highlighted in pink.
– Page in the column category: Press function key **F2** or function key **F3**.

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11.4 Editing and selection area

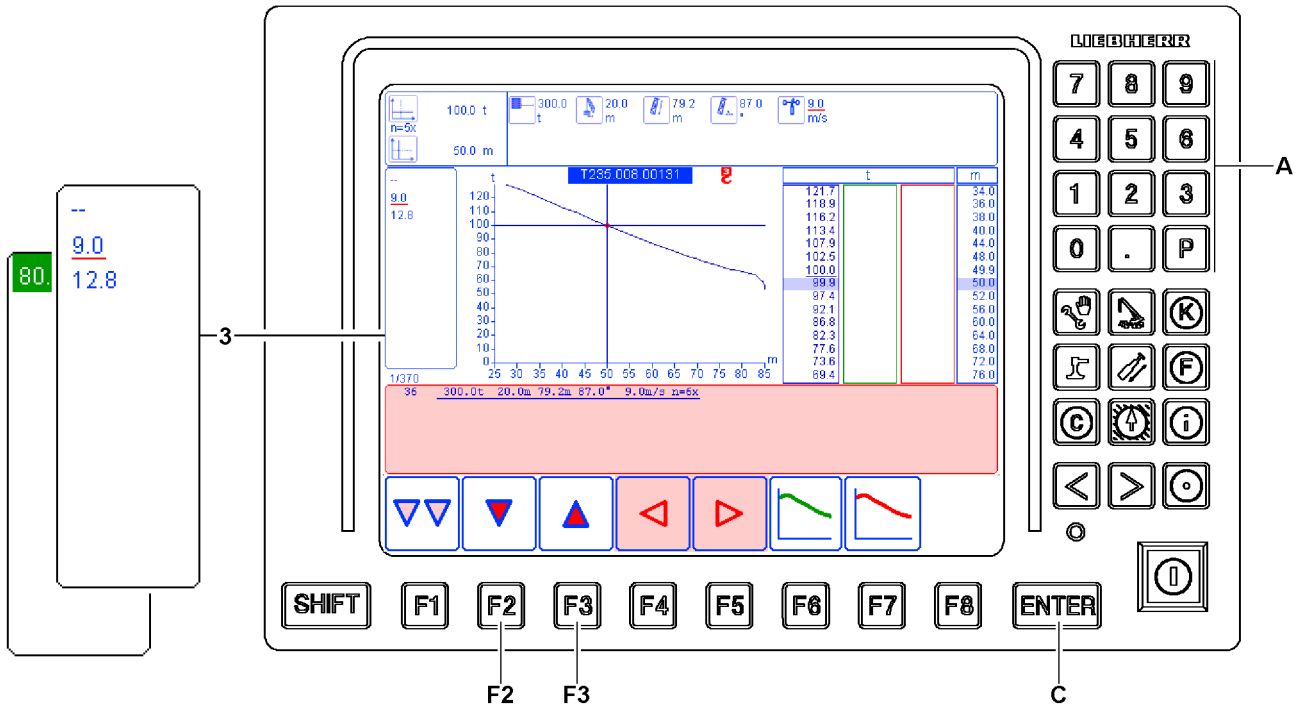

Fig.120680

If an element is selected in the filter category there are two possibilities to select the values:

- The value for this element is entered via the keypad **A**.
- The values to be selected are shown directly in the Editing and selection area **3**. The selection is made by positioning a selection bar. The positioning is made via the function key **F2** and die function key **F3**.

The respective selection possibility is specified by the program.

If the value is confirmed by pressing the ENTER key **C**, then it is accepted into the filter category.

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11.5 Curve display

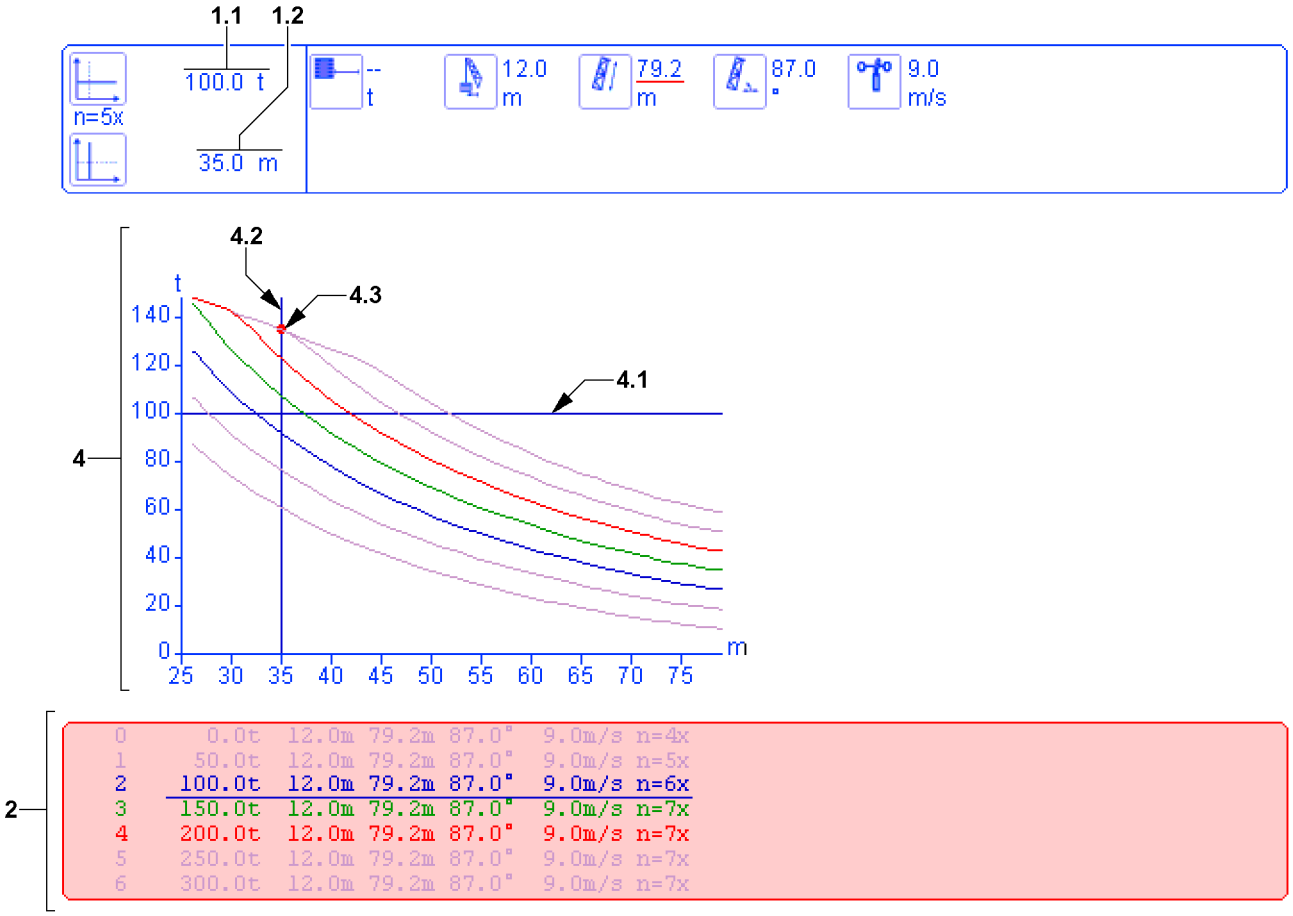

Fig.120665

Only the load columns are shown in the curve display **4**, which are also shown in the column category **2**.

- Up to three curves of marked load columns are displayed in red, green or blue.
- The curves of the unmarked load columns are displayed in gray.
- If a value of more than 0 is entered for the parameter load **1.1**, then a horizontal line **4.1** appears.
- If a value of more than 0 is entered for the parameter boom radius **1.2**, then a vertical line **4.2** appears.
- A red dot **4.3** shows the maximum load of the current load columns.

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11.6 Numeric display

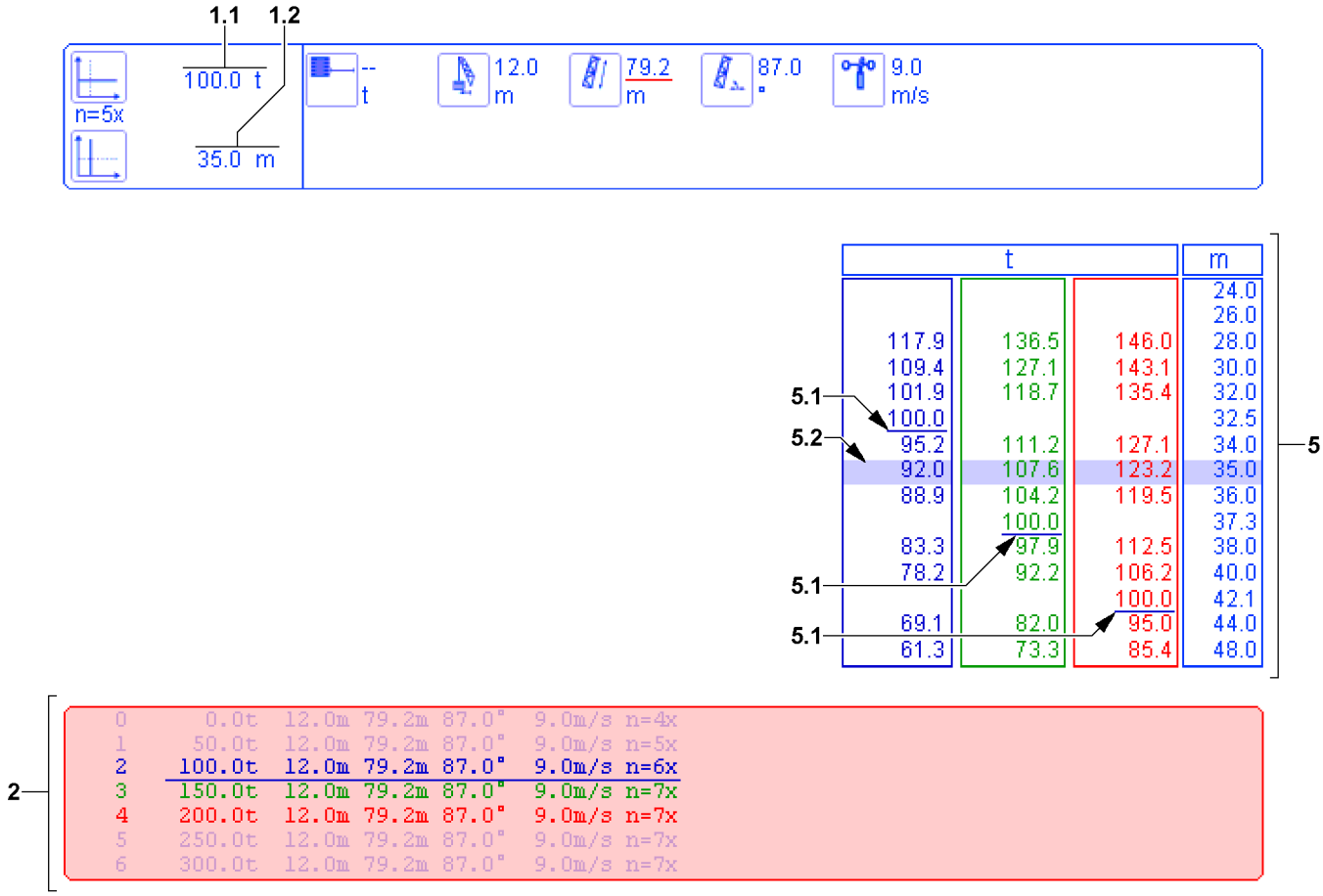

Fig.120683

For the numeric display **5** up to three load columns can be shown and compared with each other.

Only the load columns are shown in the numeric display **5**, which are also shown in the column category **2**.

To do so:
- The load columns are highlighted in color in the column category, see section „Highlighting load column in color“
- Enter values for the parameter load **1.1** and boom radius **1.2**, see section „Carrying out the parameter settings“.

The areas of the load column correspond in color to the assigned curve display and the load column.

The parameters for Load **1.1** and Boom radius **1.2** are highlighted.
- The nominal value for the Load **1.1** is underlined in the listing with a line **5.1**.
- The nominal value for the boom radius **1.2** is highlighted with a blue bar **5.2** in the listing.

11.7 Page counter

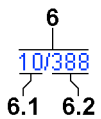

Fig.120684

The page counter **6** shows the number of the filtered columns and the total number of all columns.

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A slash separates the left numbers from the right numbers.

Layout of page counter:
– The left numbers **6.1** show the number of filtered displayable columns in the column category.
– The right numbers **6.2** show the number of all load columns relevant for this operating mode.

11.8 Function keys

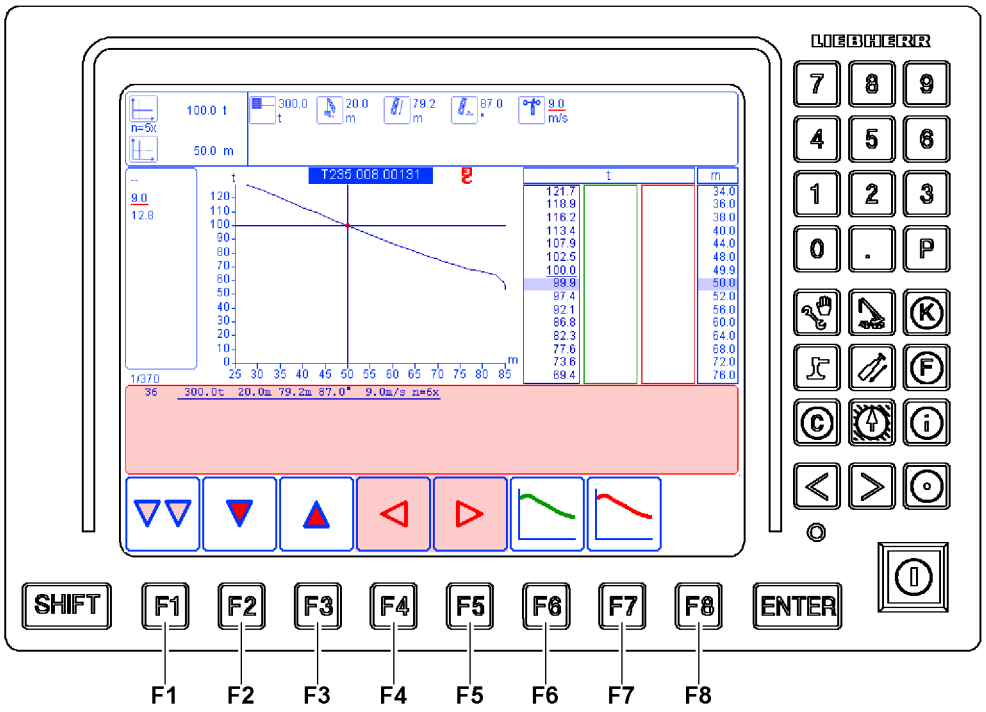

Fig.120666

The function key line consists of function keys **F1** to **F8** and the function key icon bar above it. The function keys correspond to the various function key icons above them.

Note
▶ Not all function keys on the LICCON monitor are always active and assigned with icons. Only when a function key is presently available is the corresponding icon shown.

F1 Function key
- Change to the next category by pressing the function key **F1**.
- **Note:** The active category is highlighted in pink.

F2 Function key
- Navigation: change downward
- **Note:** If it is not possible to change further downward, a short beep sounds.

F3 Function key
- Navigation: change upward
- **Note:** If it is not possible to change further upward, a short beep sounds.

F4 Function key
- Navigation: change to the left
- **Note:** At active column category reduce the value for the nominal boom radius.
- **Note:** If it is not possible to change further to the left, a short beep sounds.

F5 Function key
- Navigation: change to the right
- **Note:** At active column category increase the value for the nominal boom radius.
- **Note:** If it is not possible to change further to the right, a short beep sounds.

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F6 Function key
- For active column category active curve assign the color green

F7 Function key
- For active column category active curve assign the color red

F8 Function key
- Not assigned

11.9 Operating elements for curve display of load charts

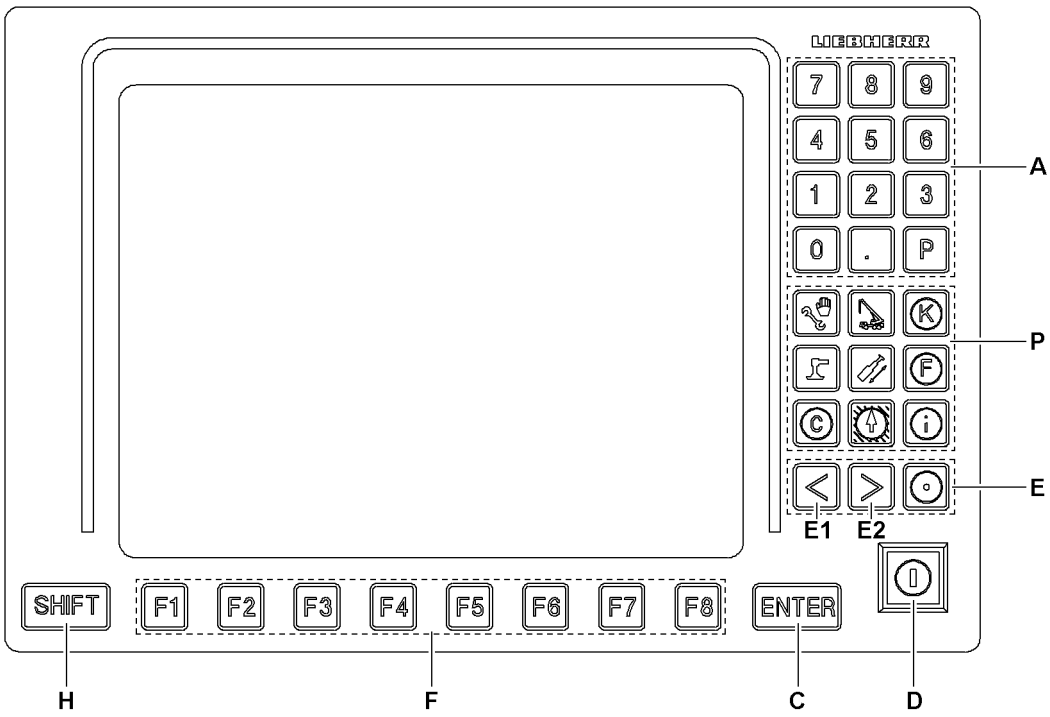

Fig.119927

A Keypad
- The keys **0** to **9** on the keypad can be used to enter the respective number directly.
- Decimal digits can be created with the key „**.**“
- The key „P“ has no function in the curve display of the load charts

P Program keys
- Selection of individual programs.
  A program that is currently running **cannot** be called up again using its program key.

C ENTER key
- Entry confirmation for selections made or for edited values.
- ENTER key **C** after changing / editing within a category sets the new value

D Set up key
- Has not function in the curve display of load charts

E Special function keys
- **Note:** The key **E1** has the same function as function key F4 in the curve display. The key **E2** has the same function as function key F5 in the curve display.

F Function keys
- The function key line consists of function keys **F1** to **F8** and the function key icon bar above it.
  The function keys correspond to the various function key icons above them.

H SHIFT key
- No function

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11.10 Advance settings for curve display of load charts

The curve display of load charts always refers to the currently called up chart name in the *Set up* program. The currently called up chart name does not have been taken over as set up configuration in the crane operating screen. It is therefore possible to display all programmed load charts quickly in the *Chart view* program.

Possible is:
- Advance settings for curve display of the current set up configuration
- Advance settings for curve display of any desired set up configuration

11.10.1 Advance settings for curve display of the current set up configuration

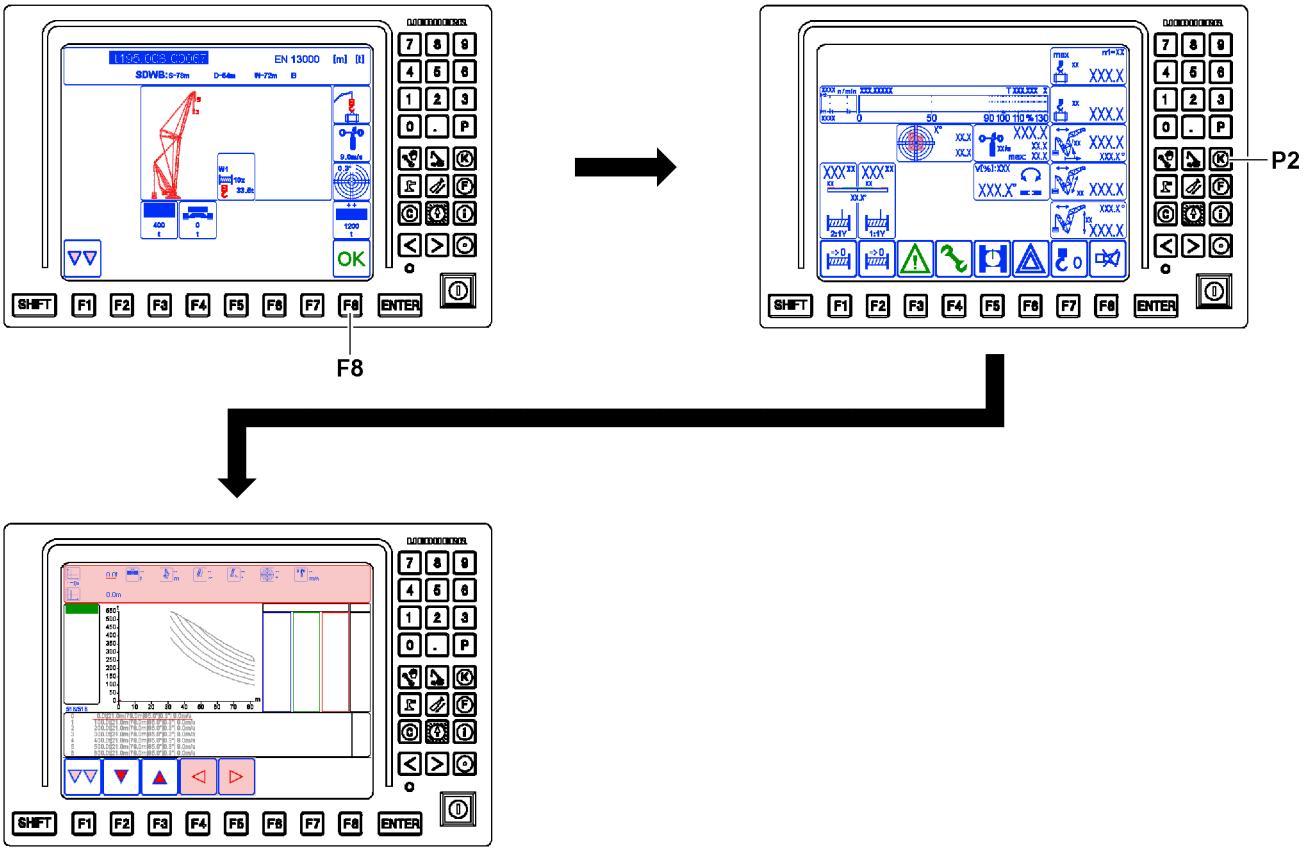

Fig.120681

Make sure that the following prerequisites are met:
- The entries and settings of the current set up configuration were entered correctly in the *Set up* program.
- The entries and settings in the *Set up* program were taken over by pressing the function key **F8** (below *OK* icon).
- The displays in the *Crane operation* program corresponds to the current set up configuration of the crane.

With the *Crane operation* program running:

▶ Press the program key **P2**.

Result:

- The *Chart view* program is called up with the advance settings of the current set up configuration.

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11.10.2 Advance settings for curve display of any desired set up configuration

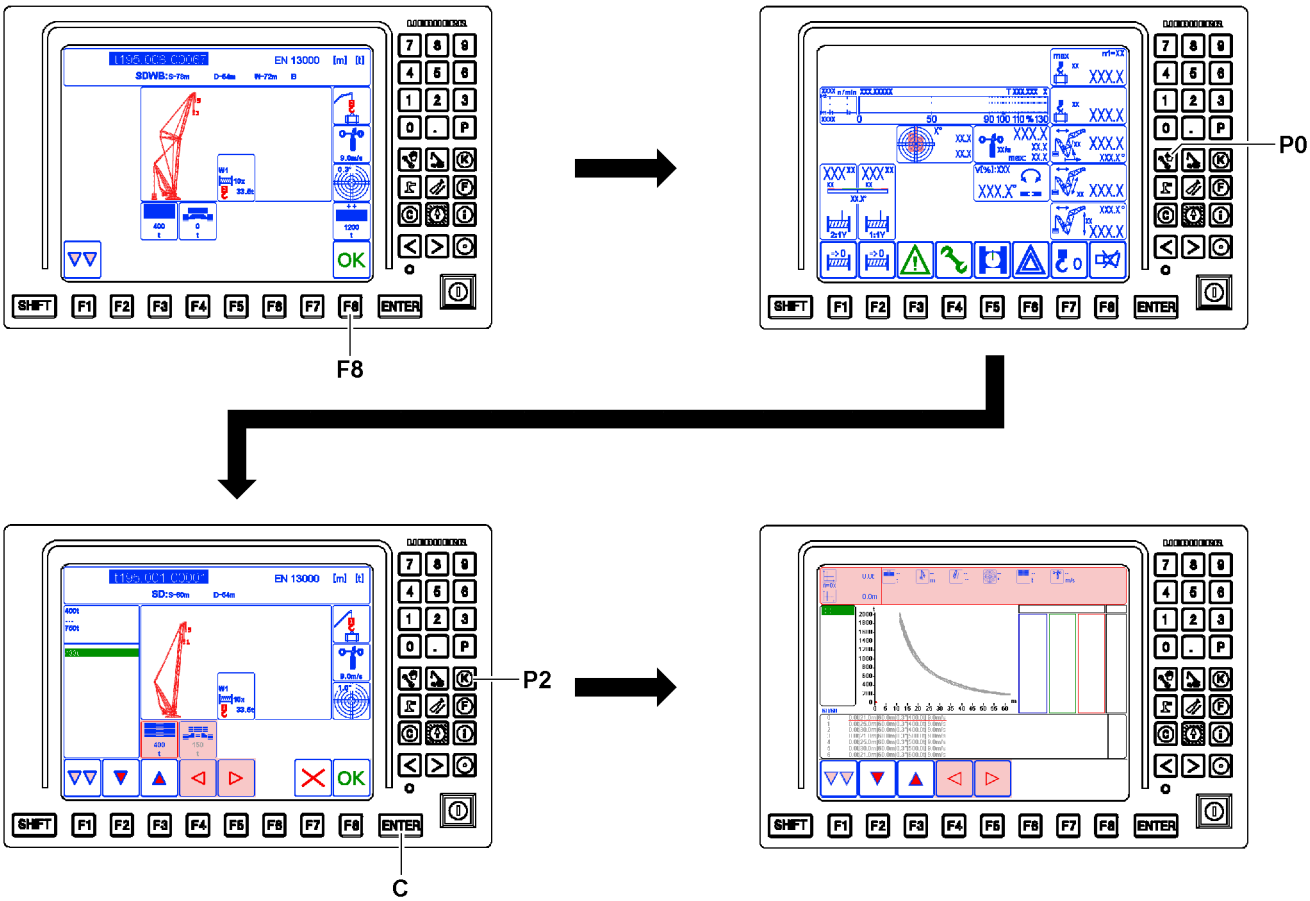

Fig.120682

Make sure that the following prerequisites are met:
- The entries and settings of the actual set up configuration are entered correctly in the *Set up* program.
- The entries and settings in the *Set up* program were taken over by pressing the function key **F8** (below *OK* icon).
- The displays in the *Crane operation* program correspond to the current set up configuration.

With the *Crane operation* program running:
▶ Press the program key **P0**.

Result:

- The *Set up* program is called up.

WARNING
Take over of a deviating set up configuration!
If a deviating set up configuration is taken over by pressing the function key **F8** (below *OK* icon), then the overload protection is incorrectly set.
An incorrectly set overload protection calculates the actual load incorrectly and transmits faulty display values.
The crane can be overloaded unnoticed and topple over. Personnel can be severely injured or killed.
▶ If any desired set up configuration is to be called up in the *Chart view* program, then it **may not** be taken over by pressing the function key **F8** (below *OK* icon).

▶ Set the desired set up configuration and confirm with the ENTER key **C**.
▶ **Do not** press the function key **F8** in the *Set up* program.
▶ Press the program key **P2**.

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Result:

– The *Chart view* program is called up with the advance settings of the currently set up configuration.

11.11 Carrying out the parameter settings

Note
The following section describes by example how the parameter setting for selected parameters is made.
▶ Always carry out all required parameter settings.

The parameter settings are either carried out by entering numbers or by selection:
– Example for the number entry of a parameter setting, see section „Setting parameters via number entry“
– Example for the selection of a parameter setting, see section „Selecting parameter setting from a list“

Make sure that the following prerequisites are met:
– The advance setting for curve display of load charts was made.
– The *Chart view* program is called up.

11.11.1 Calling up the filter category

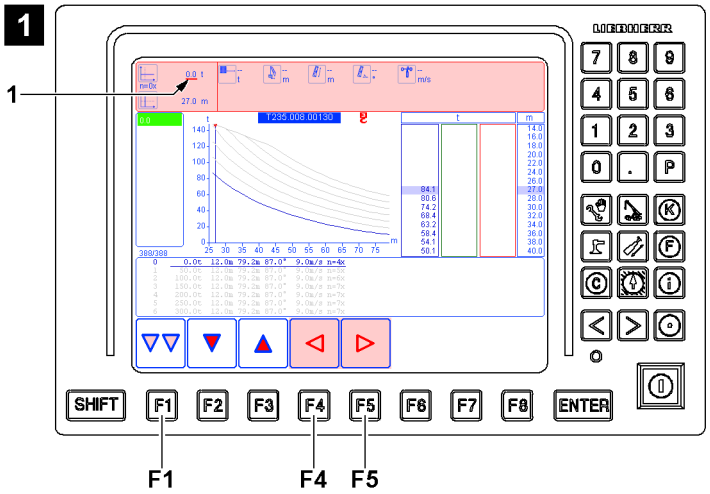

Fig.120668

▶ Press the function key **F1** until the filter category is highlighted in pink, see illustration **1**.

Result:

– The filter category is selected.
– The selection bar **1** underlines the first parameter.

Note
Navigation in the filter category
▶ Press the function key **F4**: The next parameter is underlined by the selection bar **1**.
▶ Press the function key **F5**: The previous parameter is underlined by the selection bar **1**.

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11.11.2 Setting parameters via number entry

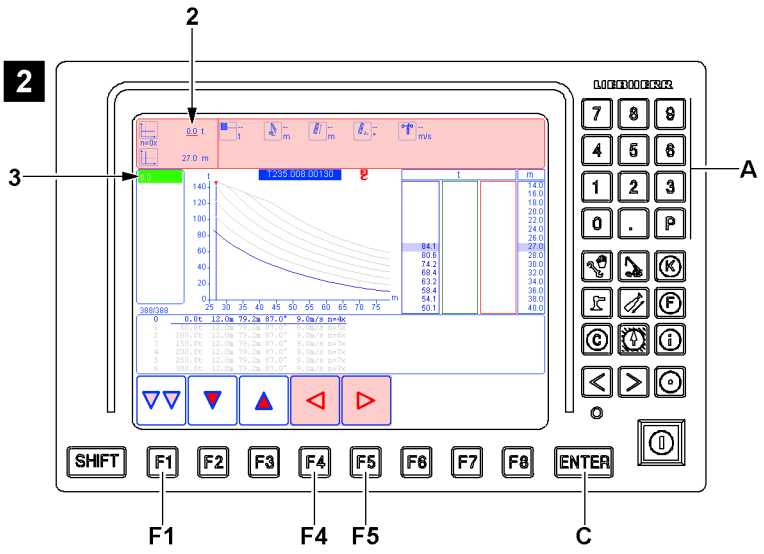

Fig.120667

Note
The following section describes by example how the parameter load is set via number entry.
▶ The procedure for all parameters, which are set via number entry is accordingly.

▶ Press function key **F4** or function key **F5** until the Parameter load **2** is underlined in red, see illustration **2**.

Result:

– The Parameter load **2** is selected.
– In the Editing / selection window **3** appears a green input field.

The entry of the value is made without the weight unit.
▶ Enter the required number sequence via the keypad **A**, in example „120“.
▶ Press the ENTER key **C**.

Result:

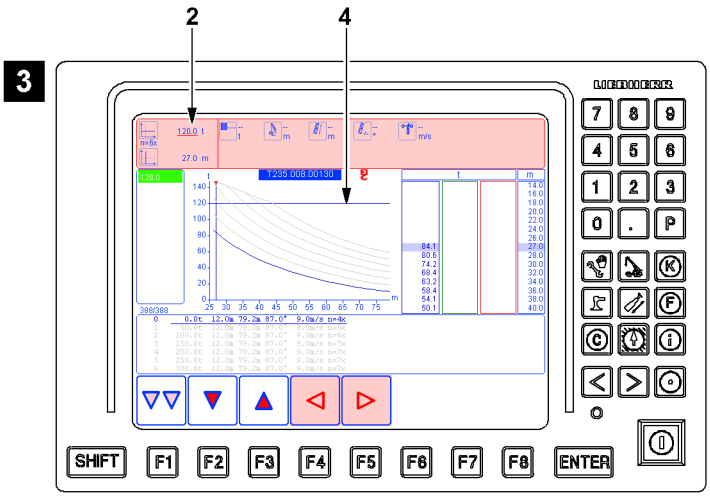

Fig.120669

– The entered value for the parameter load **2** (in example „120.0t“) appears, see illustration **3**.
– The entered value is shown as a line **4** at „120.0t“ in the curve display.

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11.11.3 Selecting the parameter setting from a list

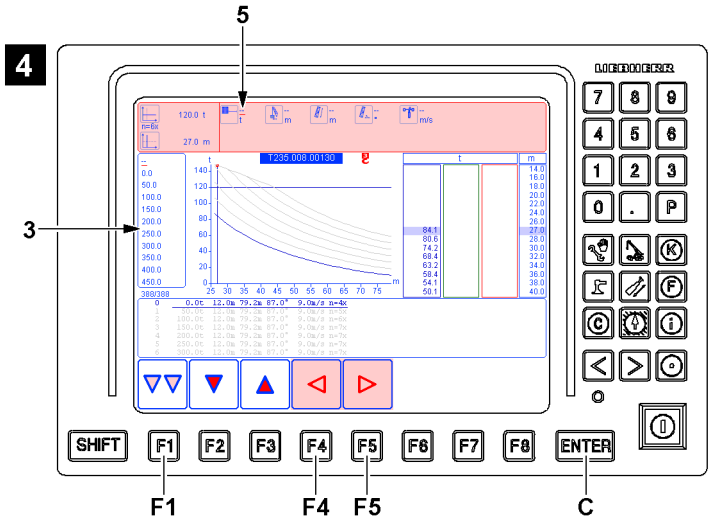

Fig.120670

Note
The following section describes by means of an example how the Derrick ballast parameter is selected from the list in the Editing / selection window **3**.

▶ The procedure is accordingly for all parameters, which are selected from the list in the Editing / selection window **3**.

▶ Press function key **F4** or function key **F5** until the parameter Derrick ballast **5** is underlined in red, see illustration **4**.

Result:

– The parameter Derrick ballast **5** is selected.
– Shown in the Editing / selection window **3** is the derrick ballast which is available for selection.

▶ Press the function key **F2** or function key **F3** until the desired derrick ballast is underlined with the red line **6**, as example „300.0“.
▶ Press the ENTER key **C**.

Result:

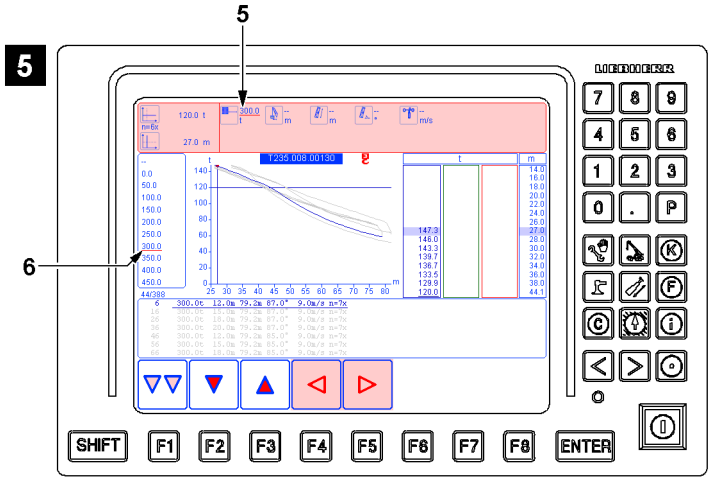

Fig.120671

– The entered value for the Derrick ballast **5** (in example „300.0t“) appears, see illustration **5**.

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11.12 Highlighting the load column in color

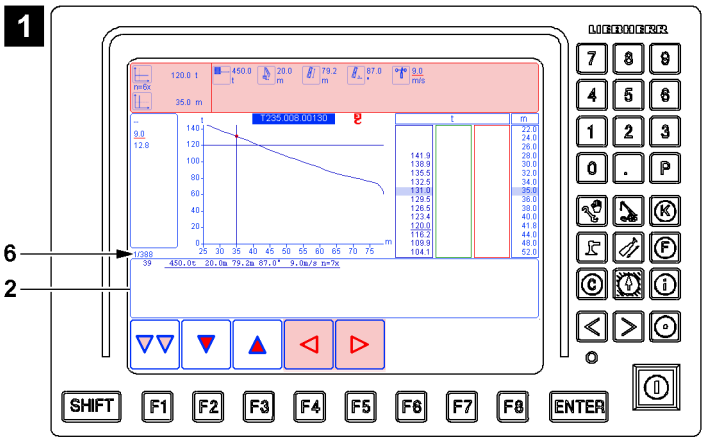

Fig.120672

– When all parameters in the filter category **1** have a value, only the current load columns in the column category **2** are listed, see example in illustration **1**.
In the page counter **6** it is noted that only one load column is still valid (example 1/388 = one of three hundred eighty eight load columns).

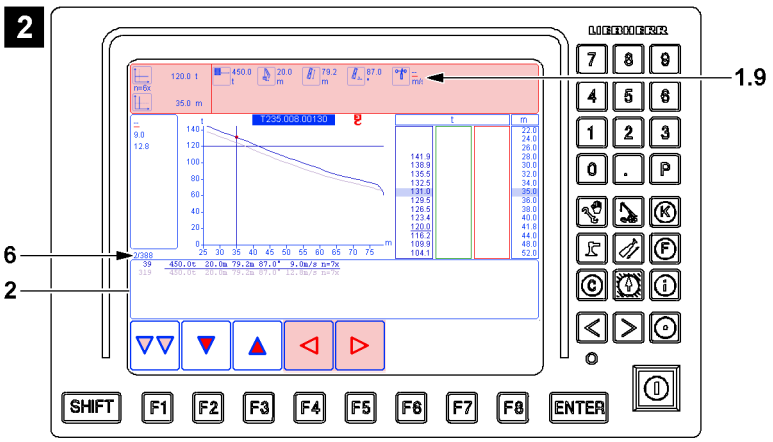

Fig.120673

– If „- -“ is selected as a value on one individual parameter for the filter category, then all load columns are listed in the column category **2**, which have an arbitrary value at this parameter and contain the remaining parameters, see example in illustration **2**.
In the page counter **6** is it noted that only certain load columns are still valid (example 2/388 = two of three hundred and eighty eight load columns).
In the example (illustration **2**) the parameter for the permissible wind speed is set to „- -“. All respective load charts with all permissible wind speeds available for selection are listed.
Then no load column is filtered out due to the permissible wind speed.

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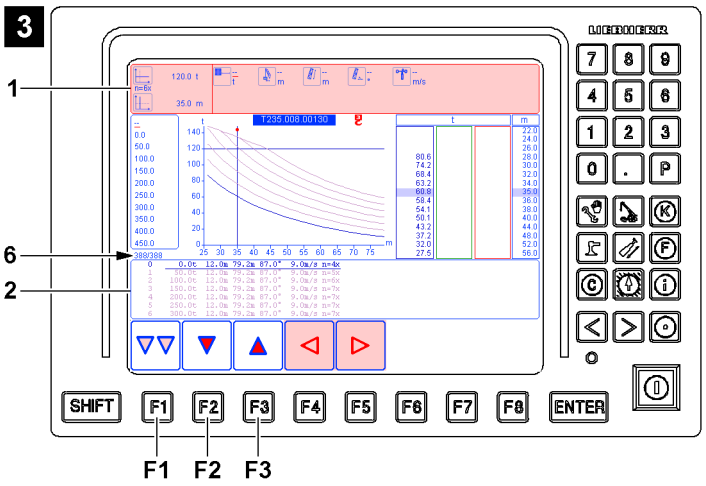

Fig.120674

– When all filter elements have a value „- -“, then all load columns are listed in the column category **2**, see example in illustration **3**.
In the page counter **6** is it noted that all load columns are valid (example 388/388 = three hundred and eighty eight of three hundred and eighty eight load columns).
If more than seven load columns are valid, then you have to page in the column category **2** to view.
To page, the column category must be active, see section „Column category“.

Note
Change between filter category **1** and column category **2**.
▶ Press the function key **F1**.
▶ The respectively active category is highlighted in pink.

Note
Navigation in the Column category **2**:
▶ Press the function key **F2**: One load column down.
▶ Press the function key **F3**: One load column up.

11.12.1 Assigning a color

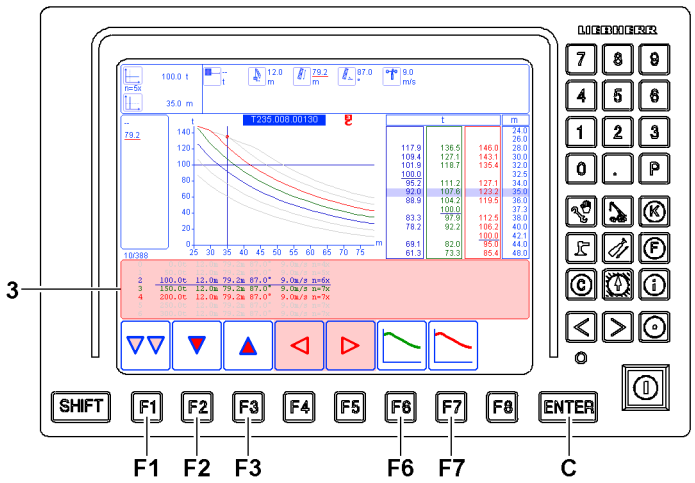

Fig.120675

Three different colors can be assigned.

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▶ Press the function key **F1** until the column category is highlighted in pink.
▶ Press function key **F2** or function key **F3** until the desired load column is underlined.
▶ Highlight the load column in green: Press the function key **F6**.

Result:

– The load column is highlighted in green.
– The curve display of the load column is shown in green.
– The numeric display of the load column is shown in green.
– The next load column can be selected by pressing the function key **F2** or function key **F3**.

▶ Highlight the load column in red: Press the function key **F7**.

Result:

– The load column is highlighted in red.
– The curve display of the load column is shown in red.
– The numeric display of the load column is shown in red.
– The next load column can be selected by pressing the function key **F2** or function key **F3**.

Note
▶ If the same color is reissued, then the older selection is eliminated.
▶ The blue color can always be used for the currently selected load column and cannot be assigned permanently.

▶ Assign the green and red color to the first two columns.
▶ Highlight the third column only via the function key **F2** or function key **F3**.

11.13 Comparing the load columns

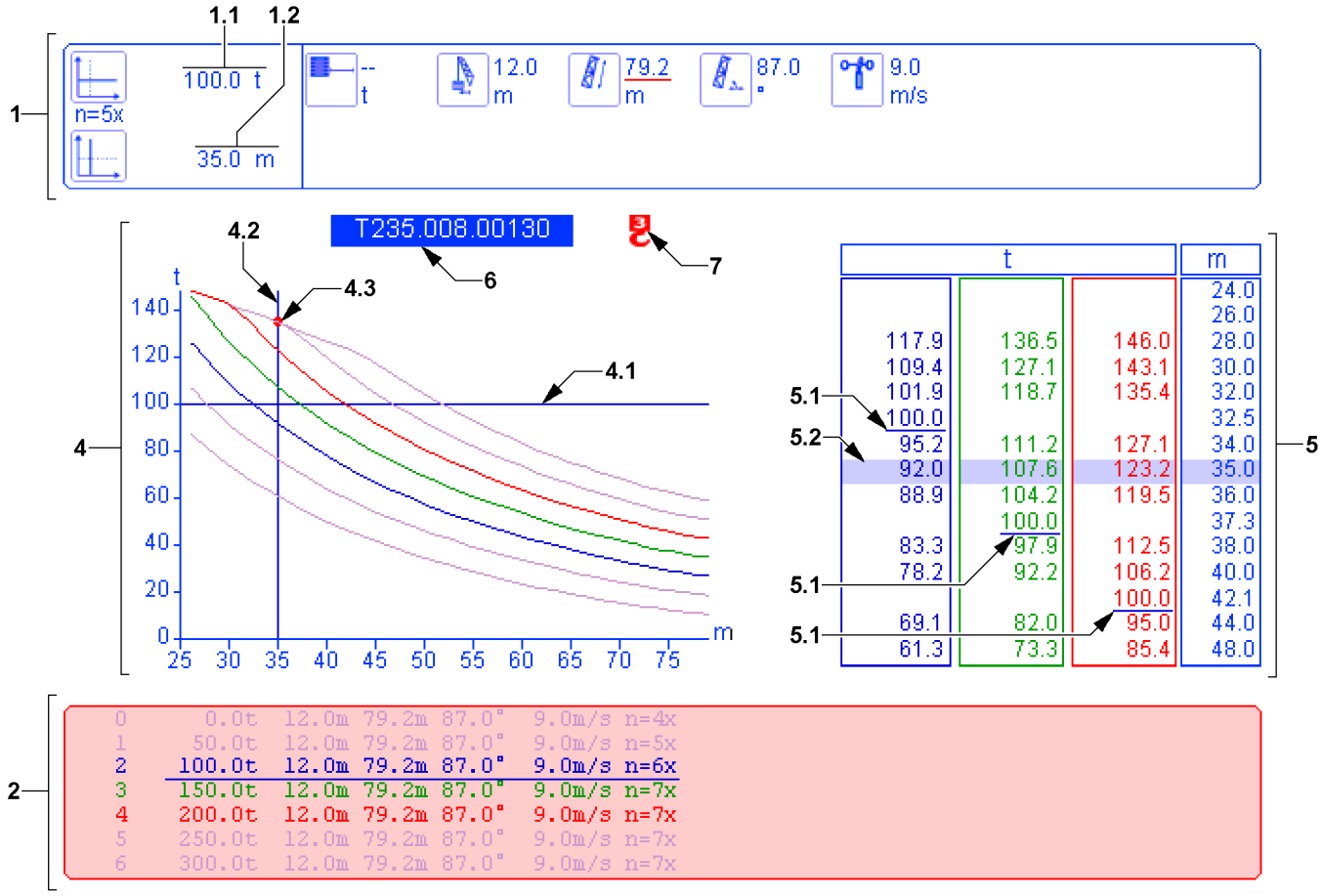

Fig.120676

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If several load columns are highlighted in a color, then they can be easily compared in the curve display and the numeric display.

Note

▶ If the parameter in the filter category **1** are changed, then the load columns must be highlighted again.

Make sure that the following prerequisites are met:
- The load columns are highlighted in color, see section „Highlighting a load column“
- The correct chart number **6** and load position **7** are shown.
- The nominal values for the parameter load **1.1** and boom radius **1.2** have been entered, see section „Carrying out the parameter settings“.

The parameters for load **1.1** and Boom radius **1.2** are highlighted for comparison:
- The nominal value for the load **1.1** is:
  - displayed in the curve display **4** with a horizontal line **4.1** through the respective scale value.
  - underlined in the numeric display **5** with a line **5.1**.
- The nominal value for the boom radius **1.2** is:
  - displayed in the curve display **4** with a vertical line **4.2** through the respective scale value.
  - Highlighted in the numeric display **5** with a blue bar **5.2**.

▶ Load columns can be compared visually and numerically.

When the parameter boom radius **1.2** is to be changed for comparison:

▶ Press the function key **F1** until the column category **2** is highlighted in pink.
▶ Reduce the parameter for boom radius **1.2**: Press the function key **F4**.
▶ Increase the parameter for boom radius **1.2**: Press the function key **F5**.

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4.03 Start up and shut down of crane

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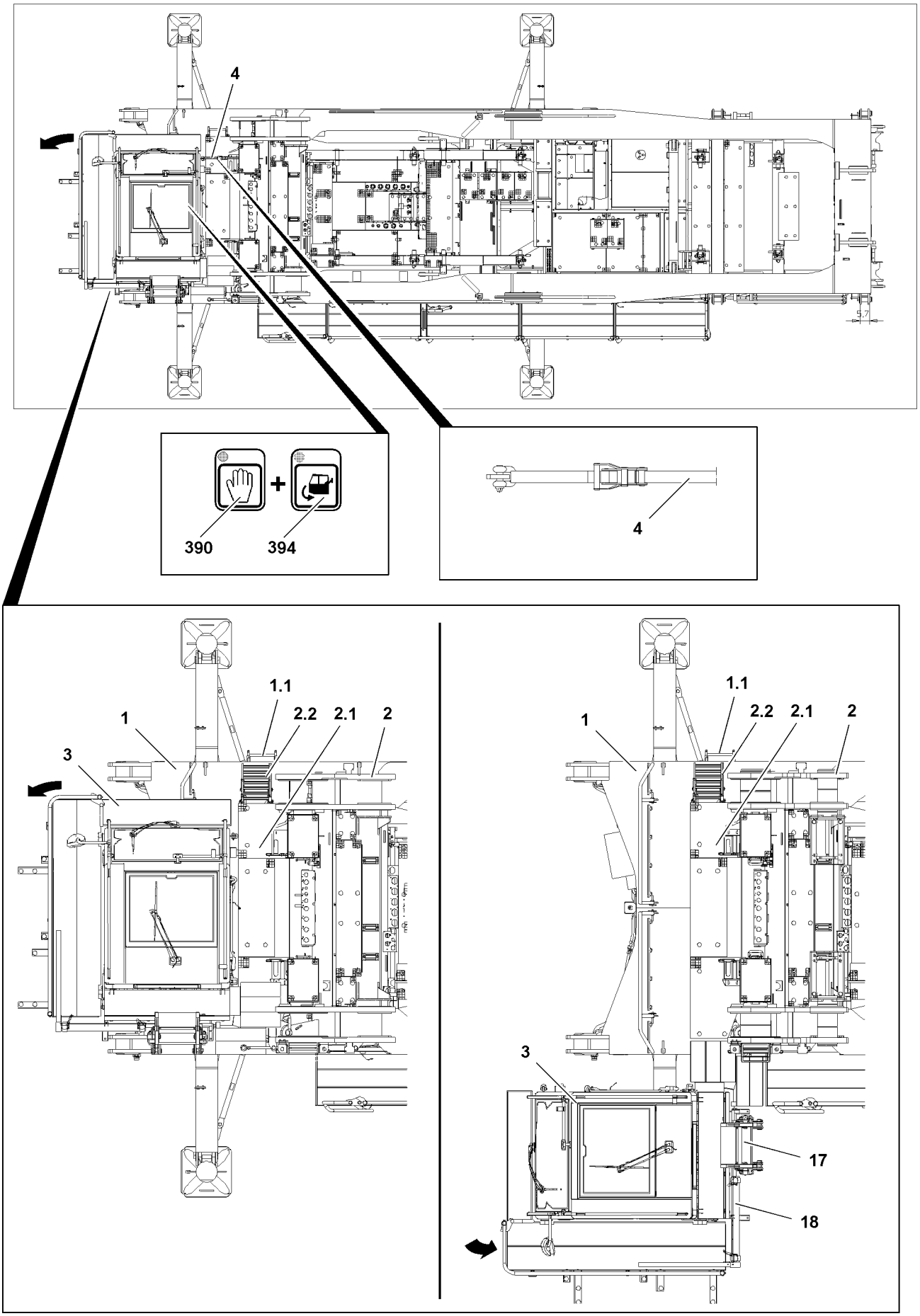

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Fig.118194

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1 Crane start-up

Note

▶ Before crane start-up, especially in low temperatures, pay attention and adhere to chapter 2.08.

2 Bringing the crane operator's cab into the operating position

WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.

If this is not observed, assembly personnel could fall and be killed or seriously injured.

- ▶ The assembly personnel must always move carefully and anticipatory on the crane, the crane components or lattice sections.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If fall protection equipment is available, then it must be used.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the approved fall arrest system to prevent falling, see chapter 2.04.
- ▶ The fall arrest system must be attached to the fastening and hook points as well as the safety ropes.
- ▶ Always secure ladders to structural parts and / or components to prevent them from falling over.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.

– The crawler center section **1** is laying properly on the substructure.
– The extension ladders **1.1** are properly attached to the crawler center section **1**.
– The railings on the crawler center section **1** are in the operating position.
– The catwalks and railings on the turntable frame main section **2** are in the operating position.
– The turntable frame main section **2** is properly installed and secured on the turntable frame lower section.
– The ladder **2.2** on the main boom assembly platform **2.1** is in the operating position.

2.1 Releasing the tension belt from the crane operator's cab

- ▶ Climb on the crawler center section **1** via the extension ladder **1.1**.
- ▶ Use the fall arrest system to secure to the retaining ropes on the turntable frame lower section to prevent falling, see chapter 2.06.
- ▶ Bring the ladder **2.2** on the main boom assembly platform **2.1** into the operating position, see chapter 2.06.
- ▶ Release and remove the tension belt **4** between the crane operator's cab **3** and the turntable frame main section **2**.

Result:

– The crane operator's cab **3** is released.

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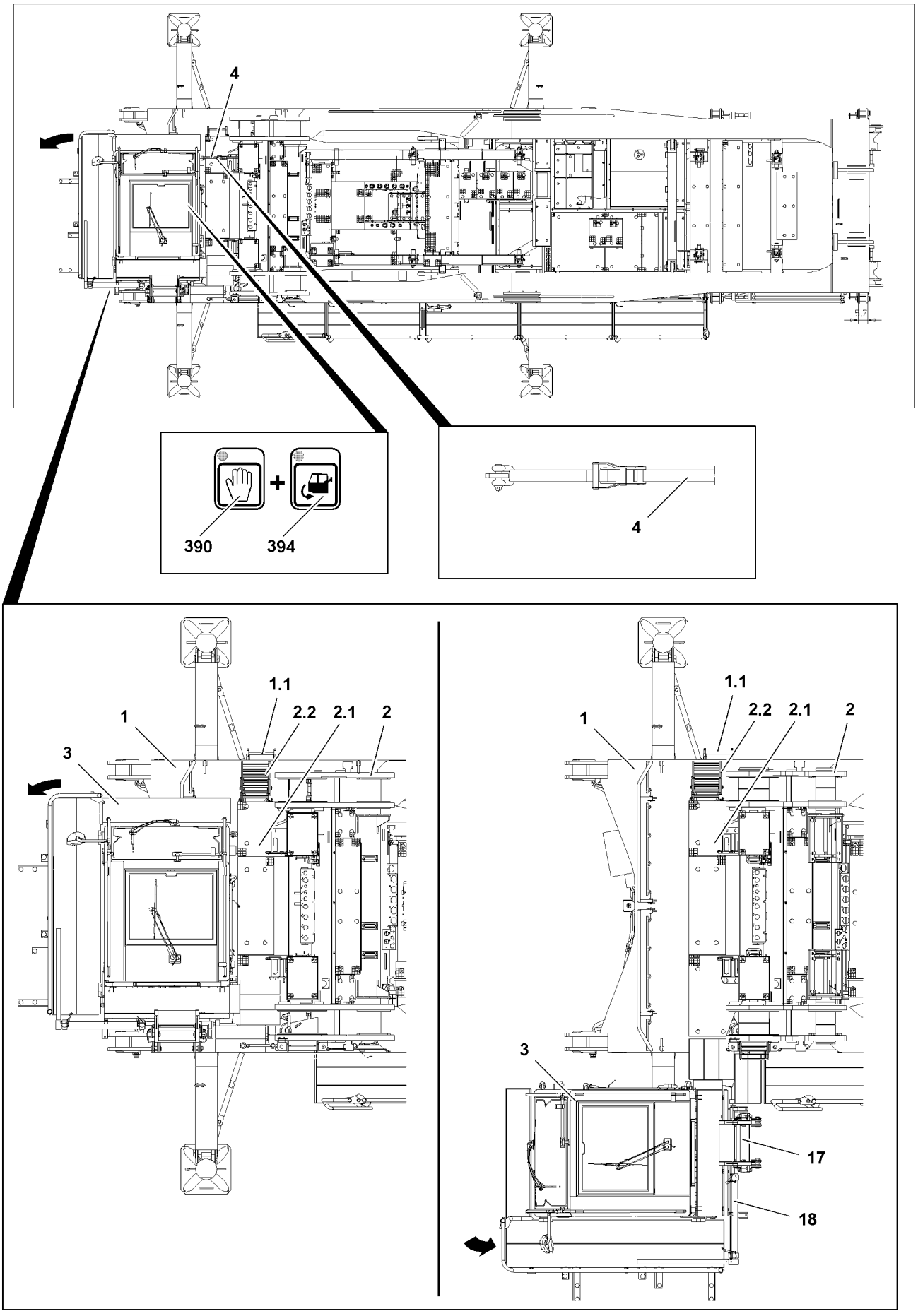

Fig.118194

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2.2 Swinging the crane operator’s cab into the operating position

Make sure that the following prerequisites are met:
- The tension belt **4** is removed.
- The access stairs **17** are in the transport position.

WARNING
Fatal injury when swinging out the crane operator’s cab!
▶ Make sure that there are no persons within the danger zone during the swinging out procedure of the crane operator’s cab **3**.

▶ Start the engine, see section „Starting the engine“.

When the engine is running:
▶ Swing the crane operator’s cab **3** out: Press the button **390** and button **394**.

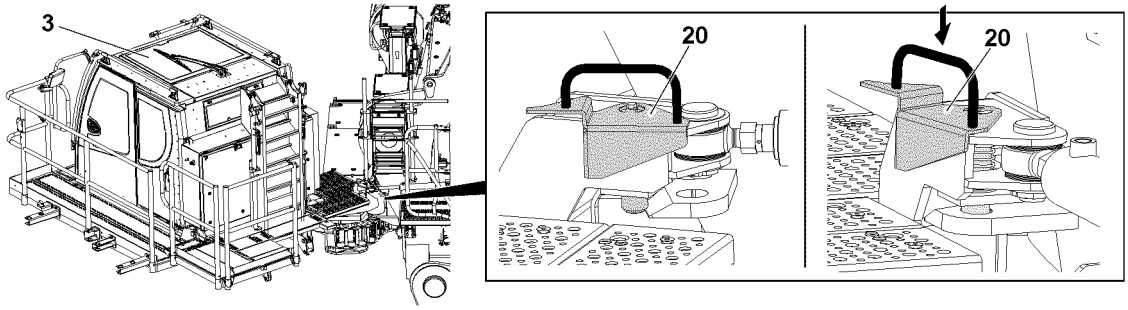

Fig.124499

Note
▶ The lock **20** is spring-loaded.
▶ When the crane operator’s cab **3** reaches the operating position, it is automatically held in position by the lock **20**.

▶ Swing the crane operator’s cab **3** out further until the lock **20** engages.

When the crane operator’s cab **3** is held in place in operating position:
▶ Release the button **390** and button **394**.

Note
▶ The crane operator’s cab **3** can be swung out by the BTT, see chapter 5.31.

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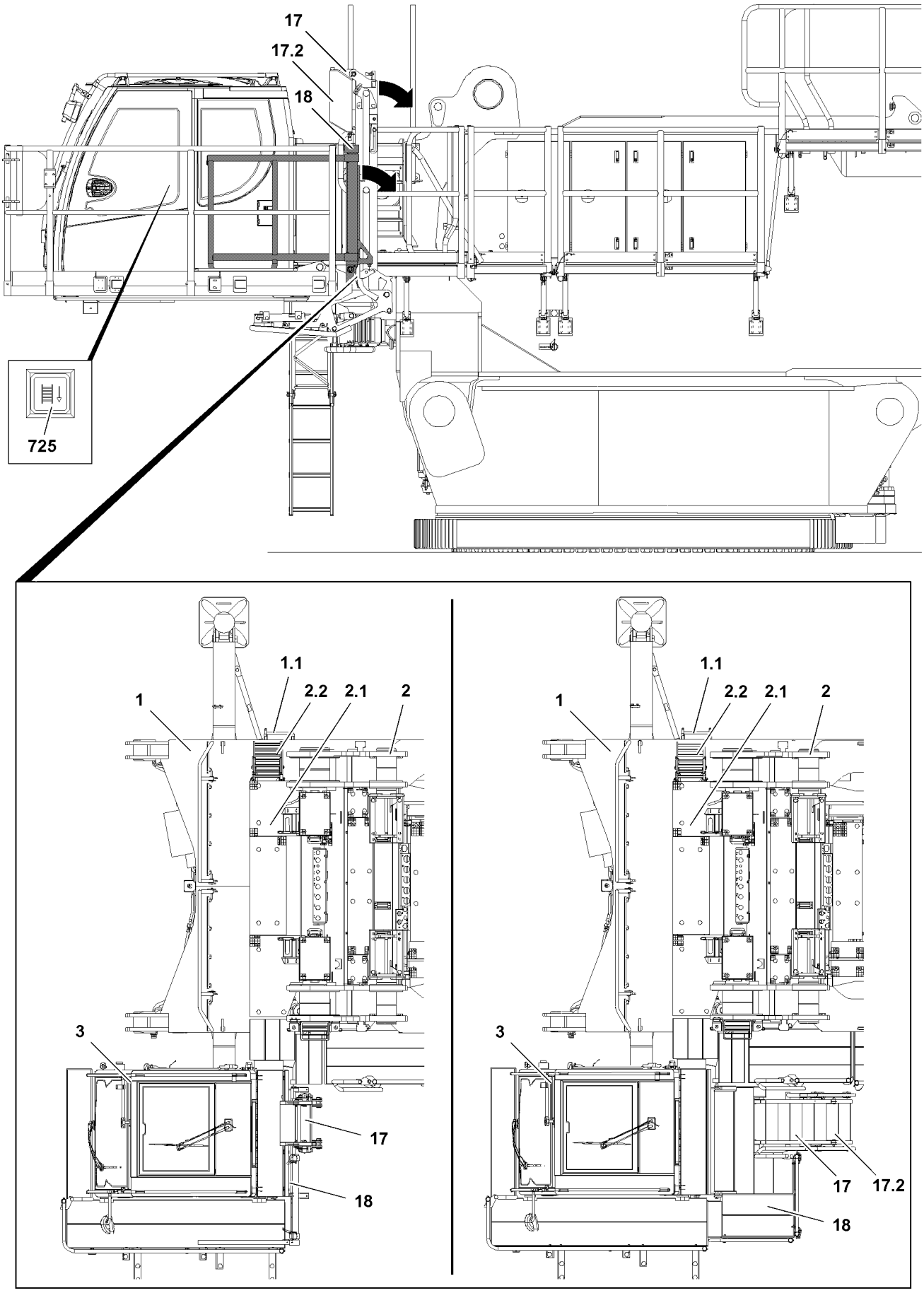

Fig.118195

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2.3 Bringing the access stairs / cab platform into the operating position

Make sure that the following prerequisites are met:
- The crane cab **3** is in the operating position.
- The engine is running.

2.3.1 Swinging the access stairs into operating position

WARNING
Danger of accident due to the access stairs!
Death, severe bodily injuries, property damage.
▶ Make sure that no persons are within the swinging range of the access stairs **17**.
▶ Step on the cab platform **18** and access stairs **17** only when they are in operating position.

▶ Press and hold the button **725** on the instrument panel.

Result:

- The access stairs **17** and cab platform **18** lower into operating position.

WARNING
Danger of falling!
When the access stairs **17** and cab platform **18** are in the operating position, operating or assembly personnel can fall from the cab platform.
Death, severe bodily injuries, property damage.
▶ The operating and / or assembly personnel must secure themselves with an approved fall arrest system when stepping on the cab platform.
▶ Immediately assemble the railing on the cab platform, see chapter 2.06.

When the access stairs **17** and cab platform **18** are in operating position:
▶ Release the button **725**.

Note
▶ The access stairs can be operated from the BTT, see chapter 5.31.

2.3.2 Assembling the railings on the cab platform

Make sure that the following prerequisite is met:
- The access stairs **17** and cab platform **18** are in the operating position.

Note
▶ Assemble the railings on the cab platform, see chapter 2.06.

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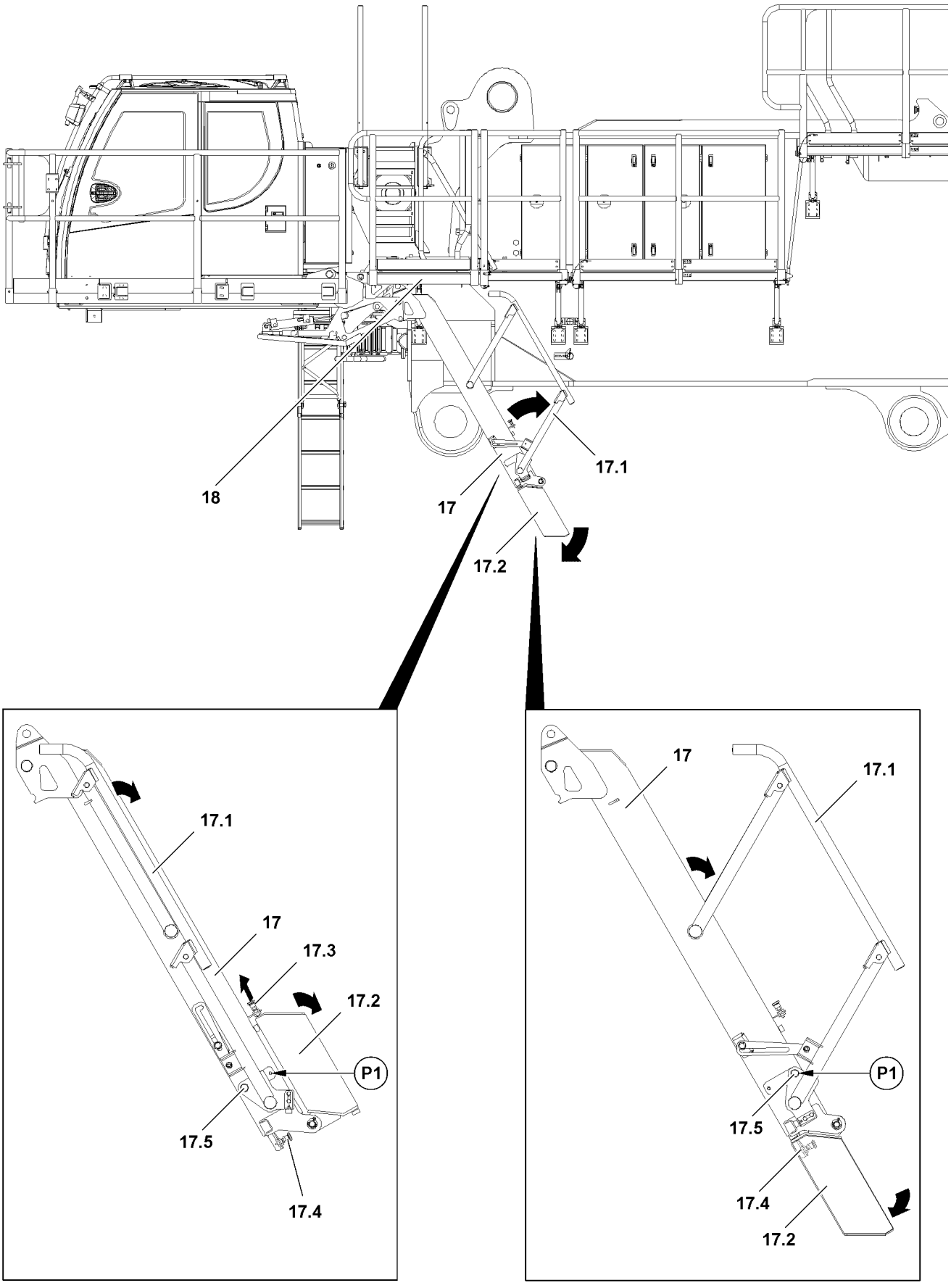

Fig.118196

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2.3.3 Swinging the stair folding section into operating position

Make sure that the following prerequisites are met:
- The access stairs **17** and cab platform **18** are in the operating position.
- The railing on the cab platform is in the operating position, see chapter 2.06.
- The crawler carriers are properly assembled and secured on the crawler center section, see chapter 3.01.
- The catwalks and stairs on the crawler travel gear are properly assembled and secured, see chapter 2.06.

WARNING
Danger of crushed limbs!
When swinging the stair folding section **17.2**, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Pull the detent pin **17.3** up and hold.

Result:

– The stair folding section **17.2** is released.

▶ Fold the stair folding section **17.2** completely down until the detent pin **17.4** engages.

Result:

– The stair folding section **17.2** is in the operating position.

2.3.4 Bringing the handrails into operating position

Make sure that the following prerequisite is met:
- The stair folding section **17.2** is in the operating position.

WARNING
Danger of crushed limbs!
When swinging the handrails **17.1**, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Pull and hold the detent pin **17.5**.
▶ Move the first handrail **17.2** into operating position until the detent pin **17.5** engages at point **P1**.

Result:

– The first handrail **17.2** is in the operating position.

▶ Bring the second handrail **17.2** into the operating position.

3 Checking before start up

Various checks must be performed every time before crane start up.

If an item is found to be low during an inspection, it must be refilled or brought to normal status before crane start-up.

If the inspection shows a very dirty filter, then it must be replaced before crane start-up.

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WARNING
Operating safety of the crane!
Defects in components, low levels or dirty filters affect the operating safety of the crane.
- ▶ If a defect on a component is found during an inspection, the defect must be remedied before crane start-up.
- ▶ If an item is found to be low during an inspection, it must be refilled or brought to normal status before crane start-up.
- ▶ If the inspection shows a very dirty filter, then it must be replaced before crane start-up.

WARNING
Heated crane components!
When the engine is running, crane components can heat up significantly. This applies especially to exhaust system, the engine, the coolant circuit and the respective gears in the crane chassis and in the crane superstructure.
Touching heated crane components can cause severe injuries.
- ▶ Carry out the checks before starting the crane, when the crane components are cold.
- ▶ Let already heated components cool off before checking.
- ▶ Proceed with special caution near heated crane components.

WARNING
Emergency devices not operational!
If emergency devices, such as the EMERGENCY STOP switch, ladders etc. are not accessible or operational, then they cannot be used in case of an emergency.
Death, severe bodily injuries, property damage.
- ▶ Check emergency devices before start up for accessibility or operational readiness.
- ▶ Open or remove anti-theft devices, such as locks on the emergency devices.

Note
- ▶ The illustrations, icons and monitor illustrations in this chapter are only examples.
- ▶ The numerical values in the individual icons and charts do not have to necessarily match the crane exactly.
- ▶ Numbers and letters can be replaced by place holders.
- ▶ The display and assignment of the icons can deviate, depending on the set up configuration, operating condition and configuration of the crane.
- ▶ In addition, many of the illustrations show the maximum configuration of the LICCON monitor with icons.
- ▶ In crane operation, an identical display will **not** appear on the LICCON monitor.

Note
- ▶ For fill quantities, service items and lubricants, see Service fill and chapter 7.06 and chapter 7.07.

Make sure that the following prerequisites are met:
- – The ignition switches are in position „I“.
- – The engine is off.
- – The engine is at ambient temperature.
- – The LICCON computer system is in stand-by mode.

3.1 Checking the general condition of the crane

WARNING
Danger of accident due to falling parts!
Loose parts, such as pins, spring retainers or ice, which are on the boom or crane superstructure can fall down during crane operation and hit personnel.
Death, severe bodily injuries, property damage.
- ▶ Before starting crane operation, make sure that there are no loose parts on the boom and crane superstructure.

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- ▶ Check the crane for visible damage before starting crane operation.
- ▶ Carry out a function test of available safety equipment.
- ▶ Make sure that the crane is standing on level, load bearing ground.
- ▶ Make sure that the crane is properly supported and horizontally aligned.
- ▶ Make sure that the gear ring of the slewing ring connection is clean and greased.
- ▶ Make sure that the air supply to the oil and water cooler is clear.
- ▶ Make sure that side covers are closed and locked.
- ▶ Make sure that no persons or objects are within the danger zone of the crane.
- ▶ Make sure that the cable, hose and rope drum as well as the limit switches are free of snow, frost and ice.
- ▶ Make sure that there are no loose parts on the boom and the crane superstructure.

3.2 Performing a visual inspection

WARNING
Avoidable low quantities / problems can cause critical situations unnecessarily.
▶ Carry out visual inspections thoroughly, conscientiously and completely.

Make sure that the following prerequisites are met:
– The engine is off.
– The engine is at ambient temperature.

3.2.1 Checking the engine oil level

For a detailed description of checking the oil level, see chapter 7.05.

For detailed description of the crane engine, see the Operating instructions of the engine manufacturer.

▶ Check the engine oil level.

3.2.2 Checking the winch oil level

By pressing the button **736** in the instrument panel, all oil level sensors for the winches installed on the crane are checked. If all oil levels of the winches are in the permissible range, then the oil level displays **7.17** on all winch icons turn off after releasing the button **736** again. If the oil level of one or several winches is below the permissible range, then the oil level display **7.17** in the winch icons of the affected winches remains on until the oil level has been brought to the required level.

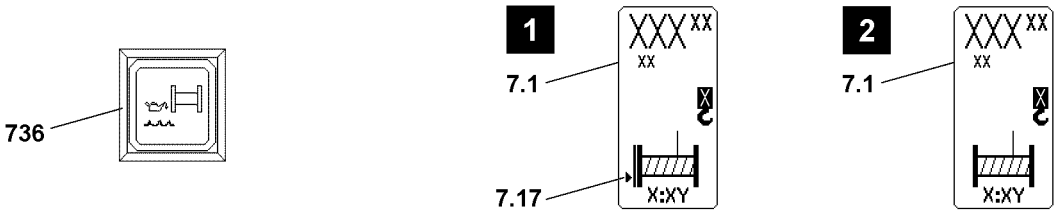

*Fig.119737: Button Oil level monitoring **736** and Winch icon **7.1** with and without oil level display **7.17***

Note
▶ The winch icon **7.1** is an example and takes the place for all winches installed on the crane.
▶ The oil level icon **7.17** is identical on all winch icons **7.1**.
▶ When checking the oil level, pay attention to the installation position of the winches.

▶ Press the button **736** on the instrument panel.

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Result:

When the oil levels of the winches are in the permissible range:
– The oil level icon **7.17** is masked on the winch icons after releasing the button **736** again.

When the oil level of one or several installed winches is **not** in the permissible range:
– The oil level icon **7.17** remains shown on the respective winch icon **7.1** until the oil level sensor of the respective winch reports the correct fill level.

NOTICE
Damage to winch(es)!
If missing oil on the winches is not replenished, the winches can be severely damaged.
Longer downtimes of the crane and associated costs can be the result.
▶ Make sure that the winches are only operated when they show a correct oil level.
▶ Make sure that the oil level icons **7.17** turn off after the oil level check in the respective winch icon **7.1**.

When the oil level icon **7.17** on a winch is shown:
▶ Add the oil to the respective winch, see chapter 7.05, until the oil level icon **7.17** turns off.

3.2.3 Checking the hydraulic tank

For detailed description of checking the filters on the hydraulic tank, see chapter 7.05.

Checking the oil level in the hydraulic tank

▶ Check the oil level in the hydraulic tank on the sight gauge.

Checking the filter for the hydraulic tank

▶ Check the hydraulic tank filter.

3.2.4 Checking the coolant level

WARNING
Danger of injury due to scalding of the skin!
▶ Check the coolant level only when the engine is cold.
▶ Never open the cap on the coolant reservoir as long as the engine is warm. The cooling system is under pressure.
▶ To protect face, hands and arms from hot steam of hot coolant, cover the cap with a large rag when opening.

The coolant expansion tanks must be filled up to the overflow on the filler neck.
▶ Check the coolant level on the engine.

If the coolant level is too low:

▶ Add coolant, see chapter 7.05.

3.2.5 Checking the central lubrication systems

NOTICE
Damage of crane components!
Missing or insufficient lubrication can cause damage on the crane components.
Expensive and extensive repairs can result.
▶ Make sure that the grease containers for the central lubrication system always show a sufficient fill level.
▶ Replace missing lubricant.

The grease container must be filled at all times with sufficient lubricant.

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▶ Check the grease container.

If the fill level on the grease container is too low:

▶ Add lubricant, see chapter 7.04 and chapter 7.05.

3.2.6 Checking the window cleaning fluid

NOTICE
Frozen window cleaning fluid!
If the window cleaning fluid is not frost resistant, then the windshield washer system can freeze during the cold time of the year.
Failure of the windshield washer system is the result.
The windshield washer system can be damaged.
▶ Change the window cleaning fluid in time to a frost resistant type.

Before the start of the cold season:
▶ Empty the container for the window cleaning fluid and refill it with a commercially available, frost resistant window cleaning fluid.

3.3 Calling up and checking the monitoring functions of the LICCON computer system

If a control value has reached a limit value, then the monitoring functions are automatically called up in the Crane operation program and the error or problem are pointed out.

The monitoring functions do not replace the visual inspections:
– Levels close to being too low can be recognized during visual inspections.
– Imminent problems can be recognized better through visual inspections.

The monitoring functions react in general only when a low amount / problem is present. Avoidable missing amounts / problems impede crane operation and cause unnecessary delays and / or downtime.

Make sure that the following prerequisites are met:
– The ignition switch in the crane operator's cab is in position „I".
– The engine is off.
– The engine is at ambient temperature.
– The LICCON computer system is in stand-by mode.
– The LICCON computer system is in the „Crane operation" program.

Note
▶ For a detailed description of the displays on the LICCON monitor, see chapter 4.02.
▶ For a detailed description of the safety equipment, see chapter 4.04.

3.3.1 Checking the fuel level

WARNING
Danger of fire and explosion!
▶ Turn the engine independent heater* off approx. 3 minutes before refueling the fuel tank.
▶ Before refueling the fuel tank, turn the engine off.

Note
Fuel tank empty!
If the fuel tank has run dry, then the fuel system must be bled.
▶ Refuel in time.

Make sure that the following prerequisite is met:
– The LICCON computer system is booted up and in the „Crane operation" program.

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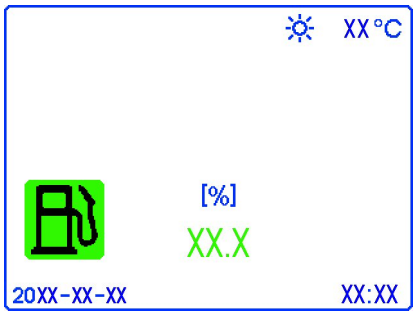

Fig.114283: Fuel level in percentages

On the LICCON monitor, the amount in the tank is given in the form of a numerical display in percent [%].

For a detailed description see chapter 4.02.

▶ Call up the screen display monitoring functions in the LICCON computer system and check the fuel level.

3.3.2 Checking the urea reserve

WARNING
Power reduction or starting block of the engine!
Insufficient urea reserve can trigger a power reduction or starting block of the engine.
Crane and / or travel operation can be limited.
▶ Add Urea in time.

Make sure that the following prerequisite is met:
– The LICCON computer system is booted up and in the „Crane operation“ program.

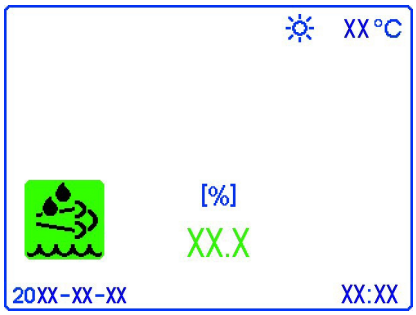

Fig.118203: Urea reserve in percentages

On the LICCON monitor, the Urea reserve is given in the form of a numerical display in percent [%].

For a detailed description see chapter 4.02.

▶ Call up the screen display monitoring functions in the LICCON computer system and check the Urea level.

3.3.3 Checking the engine oil level

Make sure that the following prerequisite is met:
– The LICCON computer system is booted up and in the „Crane operation“ program.

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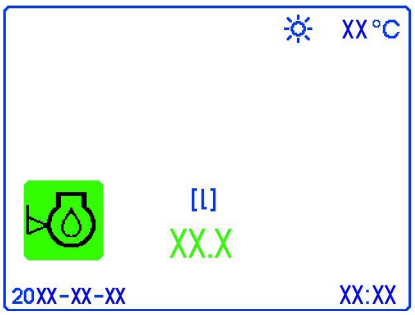

Fig.118206: Engine oil level in liters

On the LICCON monitor, the engine oil level is indicated in liters.

▶ Call up the screen display monitoring functions in the LICCON computer system and check the engine oil level.

The engine oil level can be read on the analog display:
– If „0.0“ is shown on the analog display, then the engine oil level is ok.
– If „-1.0“ is shown on the analog display, then 1 liter of engine oil must be drained.
– If „+1.5“ is shown on the analog display, then 1.5 liter of engine oil must be added.

▶ Adjust the engine oil, if necessary.

3.3.4 Checking the hydraulic oil level

Make sure that the following prerequisite is met:
– The LICCON computer system is booted up and in the „Crane operation“ program.

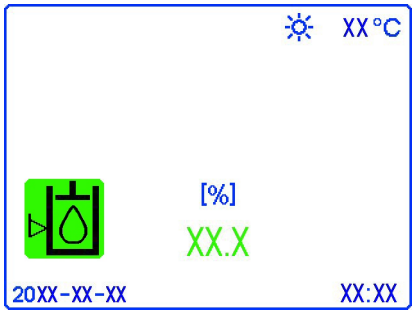

Fig.118207: Hydraulic oil level as a percentage

On the LICCON monitor, the fill level of the hydraulic oil tank is given in the form of a numerical display in percent [%].

For a detailed description see chapter 4.02.

▶ Call up the screen display monitoring functions in the LICCON computer system and check the hydraulic oil level.

3.3.5 Checking the battery voltage

When the crane has been „out of operation“ for a longer period of time and users, such as the airplane warning light are turned on, the batteries can discharge significantly.

At low ambient temperatures, there is a greater power requirement as well as reduced battery power.

– The battery voltage must be checked at regular intervals and the batteries must be recharged, if necessary.
– At low ambient temperatures, pay attention that the batteries are well charged.

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Checking the battery voltage on LICCON monitor

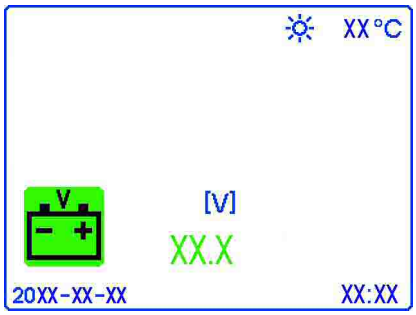

Fig.118204: Battery voltage

The battery voltage is shown in Volt on the LICCON monitor.

For a detailed description see chapter 4.02.

▶ Call up the screen display monitoring functions in the LICCON computer system and check the battery voltage.
or

Check the battery voltage on the batteries:
See chapter 7.05.

Checking the battery voltage on the batteries

Note
▶ See chapter 7.05

3.3.6 Checking the display for the center of gravity on the LICCON monitor

WARNING
Shifting of the center of gravity!
The calculation of the values for the display of the center of gravity in the LICCON monitor are based on ideal assumptions.
▶ Side deformations of the boom system due to wind, inclined position and elastic resilience of the steel structure are not taken into account but they can lead to a shifting of the center of gravity.

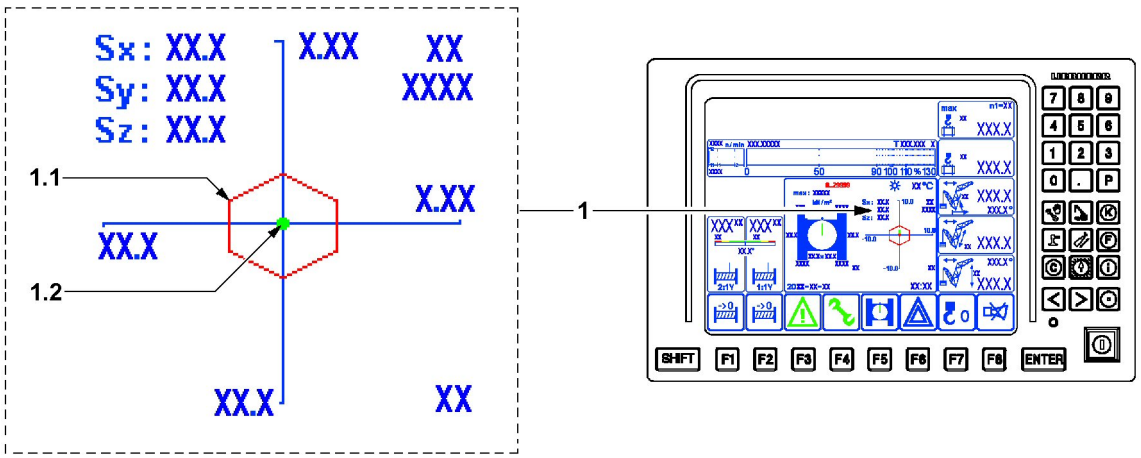

Fig.115325

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Center of gravity display	
Position	**Name**
1.1	Core area
1.2	Center of gravity

WARNING
The center of gravity of the crane is outside the core area!
If the center of gravity **1.2** of the crane is outside the core area **1.1**, then the crane can topple over.
Death, severe bodily injuries, property damage.
▶ The center of gravity **1.2** must always be within the core area **1.1**.

Note
▶ If the center of gravity **1.2** of the crane is within the core area **1.1**, then the center of gravity **1.2** is shown in green.
▶ If the center of gravity **1.2** of the crane is outside the core area **1.1**, then the center of gravity **1.2** is shown in red.

3.3.7 Checking the display for the surface pressure in the LICCON monitor

WARNING
Increased surface pressure!
The calculation of the values for the display of the surface pressure in the LICCON monitor are based on ideal assumptions.
▶ Side deformations of the boom system due to wind, inclined position and elastic resilience of the steel structure are not taken into account but they can lead to an increase of the surface pressure.

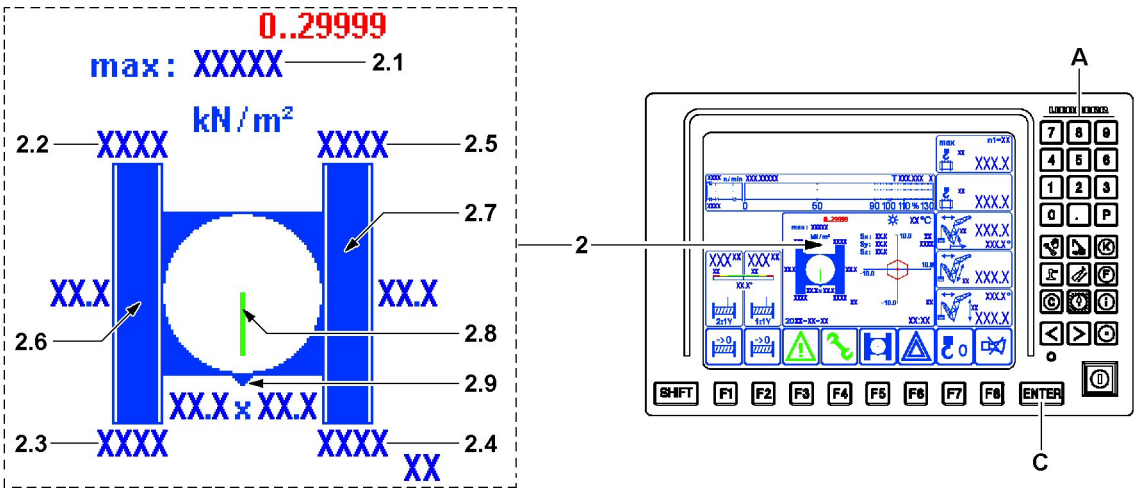

Fig.115326

Surface pressure display	
Position	**Name**
2.1	Maximum surface pressure
2.2	Surface pressure right rear
2.3	Surface pressure right front
2.4	Surface pressure left front
2.5	Surface pressure left rear

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Surface pressure display	
Position	**Name**
2.6	Right crawler carrier support
2.7	Left crawler carrier support
2.8	Boom position[1)]
2.9	Marker „Front side of crawler carrier“[2)]

1) The boom position corresponds to the „viewing direction to the front“ from the crane cab.
2) The front on the crawler travel gear is always on the side where the chain tension device for the crawler carriers is located.

WARNING
Surface pressure too high!
If the maximum surface pressure **2.1** is exceeded, the crane can topple over.
Death, severe bodily injuries, property damage.
▶ Do not exceed the maximum value for the surface pressure.

Note
▶ The support of the crawler carriers is shown graphically.
▶ If the resulting surface pressure can be distributed so that the maximum surface pressure is not exceeded **and** the resulting forces can be transferred safely into the ground, then the stability of the crane is ensured.

The following specifications and instructions must be observed:
– The highest possible surface pressure, which may be obtained on the travel route must be entered as the maximum surface pressure **2.1**.

Entering / changing the maximum permissible surface pressure

Make sure that the following prerequisite is met:
– The Crane operation program is called up.
– The maximum permissible surface pressure of the ground is known.

▶ Press the enter key **C**.

Result:

– The value for the maximum surface pressure **2.1** can be changed.

▶ Enter the value for the maximum permissible surface pressure via the keypad **A**.
▶ Press the enter key **C**.

Result:

– The new value for the maximum surface pressure **2.1** appears.

▶ Check the value for the maximum permissible surface pressure.

3.3.8 Checking the display for the incline in the LICCON monitor

Display of the inclination of the crane to the horizontal in the longitudinal and lateral direction. The display is graphic as well as numeric.

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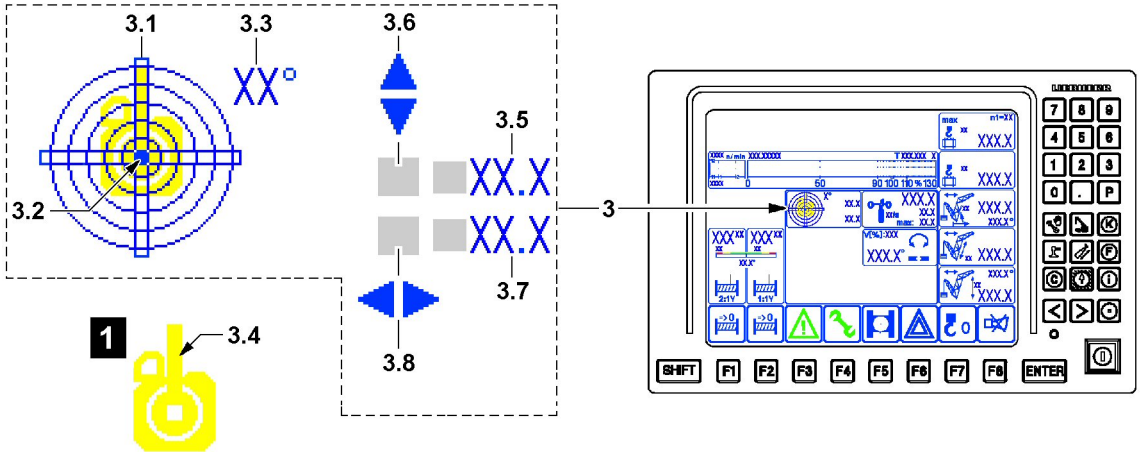

Fig.115327

Surface pressure display	
Position	**Name**
3.1	Sight gauge
3.2	Bubble
3.3	Display resolution
3.4	Boom position[3)]
3.5	Incline in longitudinal direction
3.6	Incline direction
3.7	Incline in lateral direction
3.8	Incline direction

3) The boom position in the sight gauge **3.1** is highlighted as orientation aid, see detail **1**. The boom position corresponds to the „viewing direction to the front“ from the crane cab in relation to the spirit level **3.1**.

WARNING
The crane can topple over!
If the permissible inclines are exceeded, the crane can topple over.
Death, severe bodily injuries, property damage.
▶ Make sure that the permissible inclines are never exceeded.

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4 Crane driver’s seat Version 1

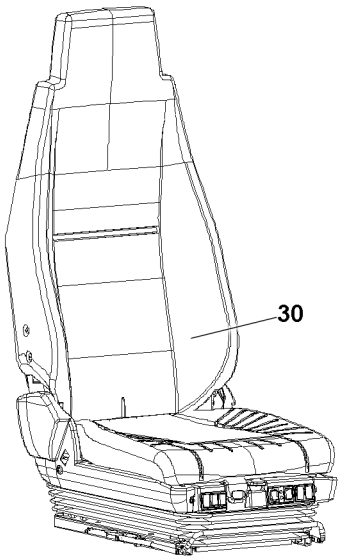

Fig.147578: Adjusting the crane driver’s seat

The crane driver’s seat **30** can be adjusted to suit any body size.

WARNING
Sudden backward movement of the crane driver’s seat when the crane cab is tilted!
Danger of crushing.
▶ Adjust the seat position only when the crane cab is in the horizontal position.

4.1 Horizontal adjustment

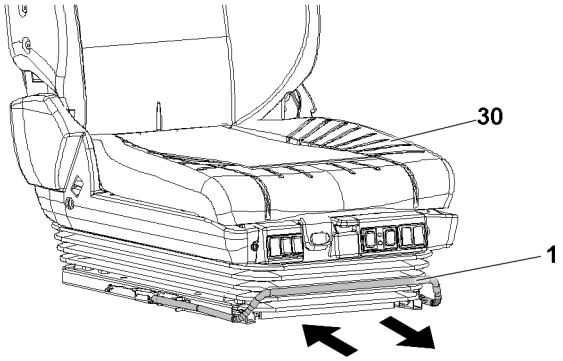

Fig.147579: Adjusting the crane driver’s seat horizontally

▶ Pull the lever **1** up.
▶ Push the crane driver’s seat **30** forward / backward.
▶ Engage the lever **1**.

Result:
– The crane driver’s seat **30** is horizontally adjusted.

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4.2 Backrest adjustment

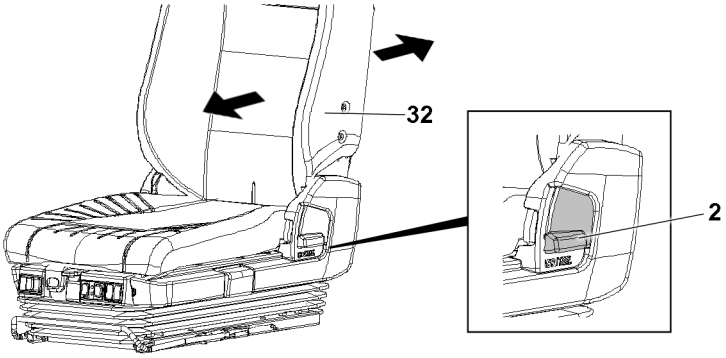

Fig.147580: Adjusting the backrest

- ▶ Pull the lever **2** up completely.
- ▶ Bring the backrest **32** into the desired position using body weight.
- ▶ Engage the lever **2**.

Result:
– The desired backrest position is adjusted.

4.3 Integrated pneumatic system (IPS)

The „Integrated pneumatic system“ (IPS) makes it possible to optimally adapt the backrest contour to the body.

4.3.1 „Lower“ lumbar area support

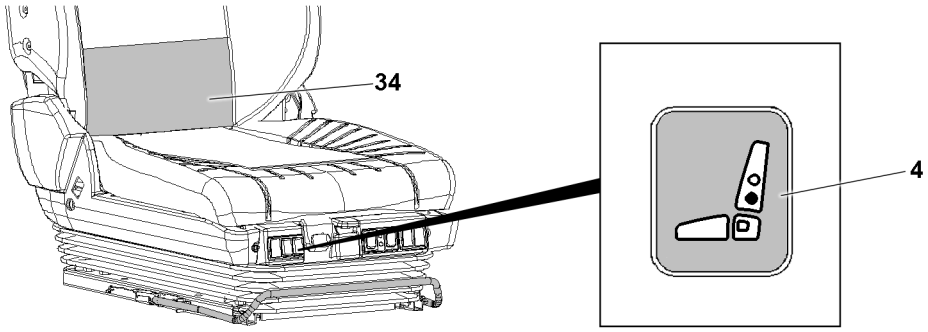

Fig.147581: Lower lumbar area support

- ▶ Press the button **4**.

Result:
– The air chamber **34** for the „lower lumbar area support“ is inflated.

- ▶ Press the button **4**.

Result:
– The air chamber **34** for the „lower lumbar area support“ is deflated.

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4.3.2 „Upper“ lumbar area support

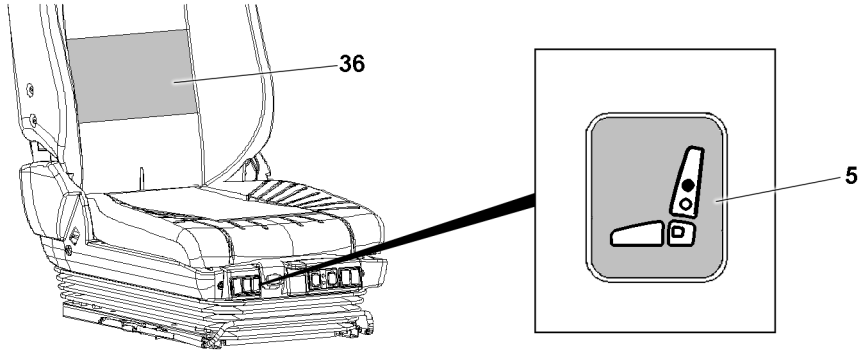

Fig.147582: Upper lumbar area support

▶ Press the button **5** forward.

Result:
– The air chamber **36** for the „upper lumbar area support“ is inflated.

▶ Press the button **5** backward.

Result:
– The air chamber **36** for the „upper lumbar area support“ is deflated.

4.4 Incline adjustment

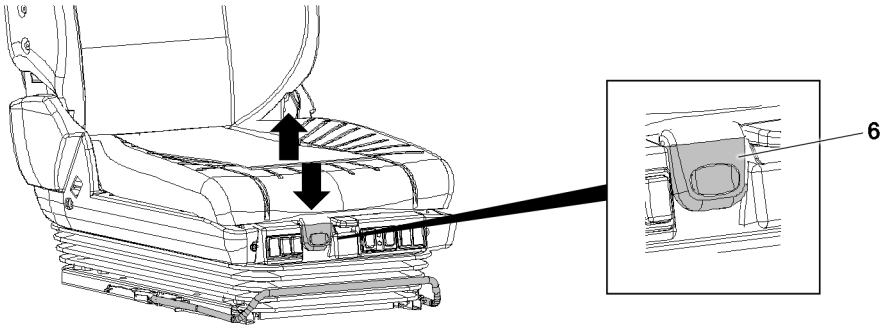

Fig.147583: Incline adjustment

▶ Pull the lever **6** up.
▶ Adjust the seat incline by inflating or releasing the front of the seat cushion.
▶ Engage the lever **6**.

Result:
– The incline adjustment has been set.

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4.5 Seat cushion adjustment

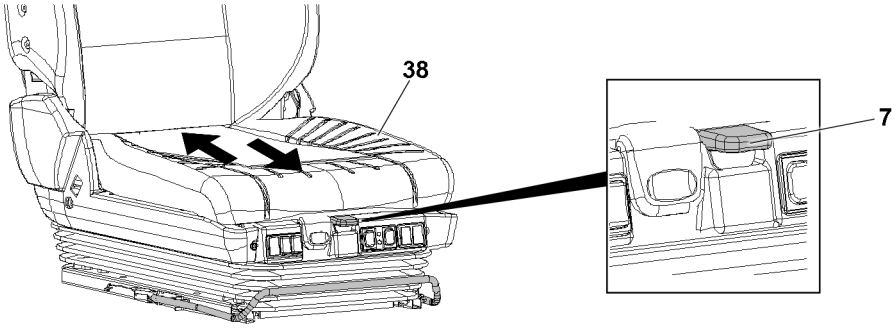

Fig.147584: Adjusting the seat cushion

- ▶ Pull the lever **7** up.
- ▶ Push the seat cushion **38** forward / backward.
- ▶ Engage the lever **7**.

Result:
– The seat cushion **38** is adjusted.

4.6 Height adjustment

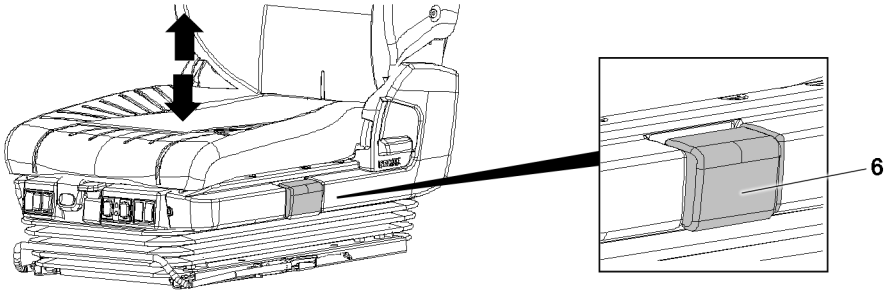

Fig.147585: Adjusting the seat height

NOTICE
Crane driver's seat adjusted too low!
No seat suspension is available.
- ▶ Before starting to work: Adjust the crane driver's seat so that there is headroom and the pedals can be pressed down fully.

- ▶ Adjust the seat height: Pull or press the handle **6**.
- ▶ Release the handle **6**.

Result:
– The desired seat height is adjusted.

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4.7 Heater / climate control

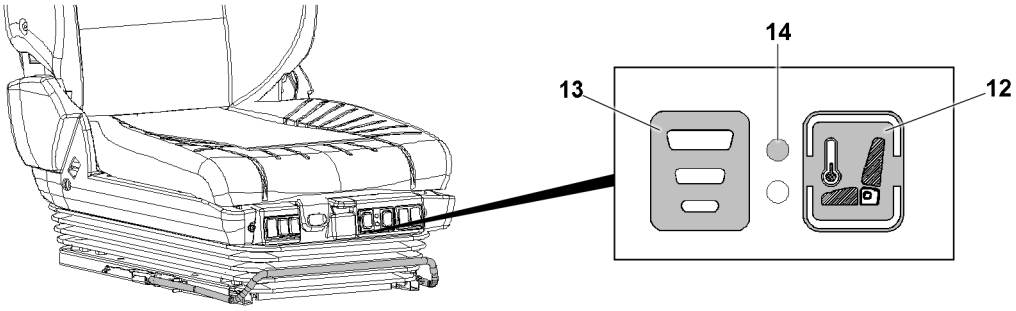

Fig.147586: Heater / climate control

NOTICE
Anomalous use of the heater / climate control!
Overheating, damage to the seat.
- ▶ Do **not** dry wet clothing.
- ▶ Do **not** place objects such as clothing, cushions, bags on the seat.
- ▶ Do **not** use seat covers on the seat.
- ▶ If the seat is not occupied, use of the heater / climate control is prohibited.

WARNING
Continuous operation of the climate control!
Undercooling.
- ▶ Avoid the continuous operation of the climate control.

4.7.1 Heater / climate control

The button **12** has three switch positions.

Switch position neutral (center position): No function, switch position „OFF“.
Switch position up: Heater turned on.
Switch position down: Fan on.

▶ Button **12** in the „OFF“ switch position.

Result:
– The heater / climate control is turned off.

▶ Push the button **12** upward.

Result:
– Heater turned on.

▶ Press the button **12** downward.

Result:
– Fan on.

4.7.2 Heater / fan stages

The button **13** has three switch stages. The switch levels can be selected from low to high.

▶ Select the switch level: Press the button **13**.

Result:
– The heater / fan stage is set.

4.7.3 Heater / climate control indicator light

If the red indicator light **14** blinks, a problem is displayed.

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▶ The red indicator light **14** blinks: Switch the button **12** to the neutral switch position (center position).

Result:
– The heater / climate control is turned off.

▶ Remedy the problem.

5 Crane driver's seat Version 2

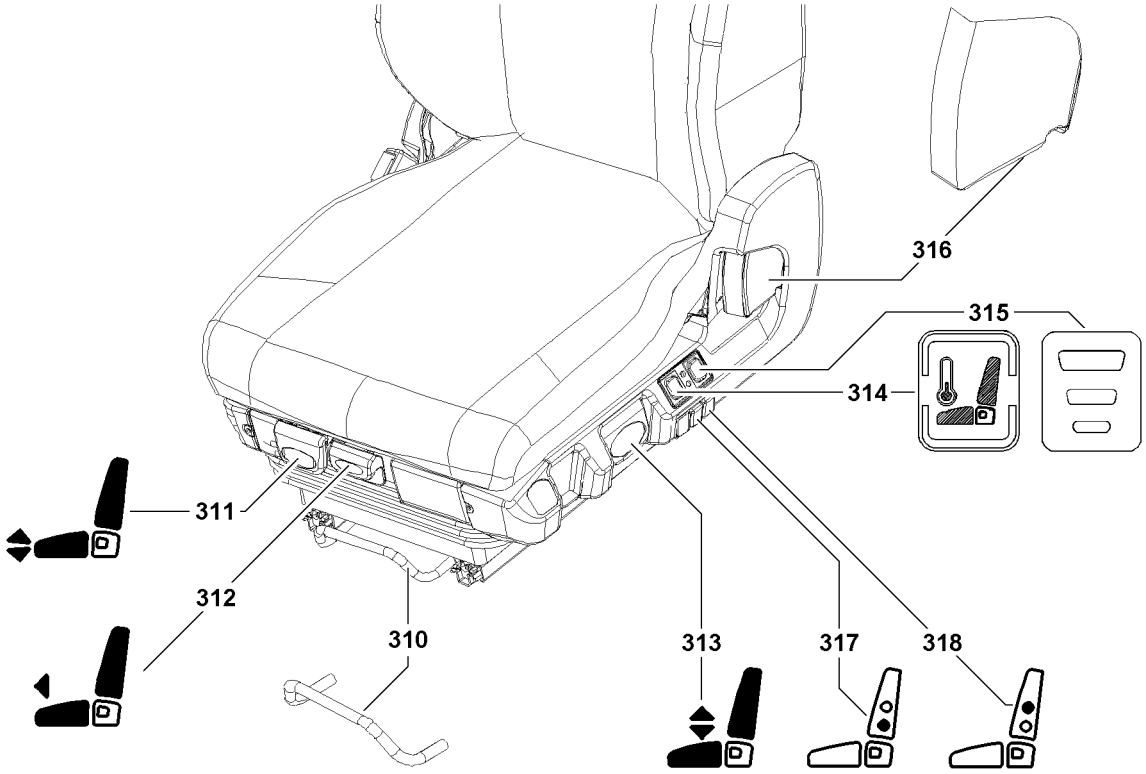

Fig.122070: Crane driver's seat

5.1 Horizontal adjustment

WARNING
Sudden backward movement of the crane driver's seat when the crane cab is tilted!
Danger of crushing.
▶ Adjust the seat position only when the crane cab is in the horizontal position.

▶ Pull the lever **310** up.
▶ Position the seat.
▶ Engage the lever **310**.

Result:
– The horizontal adjustment is adjusted.

5.2 Incline adjustment

▶ Pull the lever **311** up.
▶ Adjust the seat incline by inflating or releasing the front of the seat cushion.
▶ Engage the lever **311**.

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Result:
– The incline adjustment is adjusted.

5.3 Seat cushion adjustment

▶ Pull the lever **312** up.
▶ Push the seat cushion forward / backward.
▶ Engage the lever **312**.

Result:
– The seat cushion is adjusted.

5.4 Height adjustment

▶ Pull or press the lever **313**.
▶ Adjust the desired seat height.
▶ Engage the lever **313**.

Result:
– The seat height is adjusted.

5.5 Seat heater / seat climate control*

▶ Set the switch **314** upward.

Result:
– Seat cushion and backrest heater turned on. The seat cushion and backrest heater are thermostatically controlled.

▶ Set the switch **314** to neutral (middle position).

Result:
– Seat heater / seat climate control turned off.

▶ Set the switch **314** downward.

Result:
– Seat cushion and backrest climate control turned on.

5.6 Fan*

Note: The fan is only available in conjunction with the seat heater / climate control*****.

▶ Operate the lever **315**.
▶ Adjust the fan stage.

Result:
– The fan stage is adjusted.

5.7 Backrest adjustment

▶ Pull the lever **316** up.
▶ Bring the backrest into the desired position using body weight.
▶ Engage the lever **316**.

Result:
– Backrest adjustment set.

5.8 Upper lumbar area support*

▶ Operate the lever **317**.
▶ Until the desired support is adjusted: Inflate or vent the air chamber in the „upper lumbar area support“.

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Result:
– Upper lumbar area support adjusted.

5.9 Side support*

▶ Operate the lever **318**.
▶ Until the desired support is adjusted: Inflate or vent the air chamber in the „side support“.

Result:
– The side support is adjusted.

6 Control platform

6.1 Folding the console

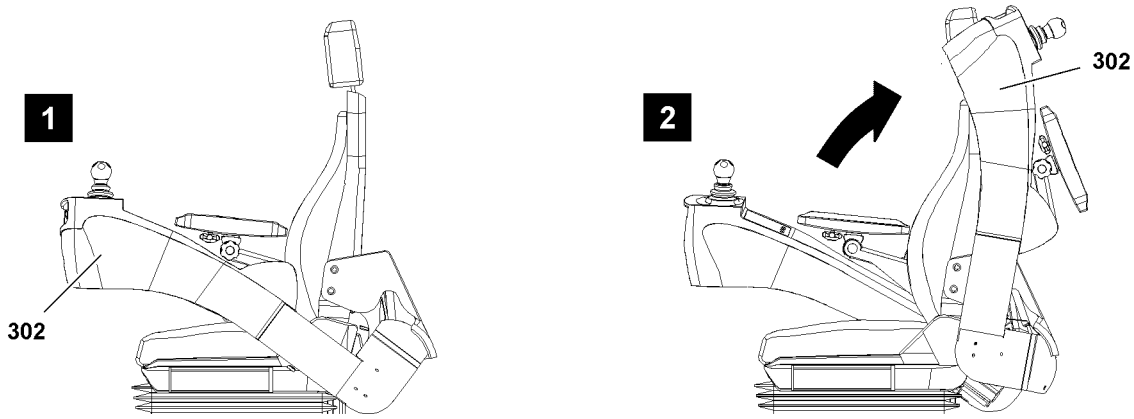

Fig.122071: Folding the console

The console **302** can be folded up or down.

– Operating position: The console **302** is folded down, illustration **1**.
– Entry / exit position: The console **302** is folded up, illustration **2**.

WARNING
Sudden folding down of the console!
Danger of crushing, property damage.

After entering and exiting:
▶ Fold down the console **302** each time after entering and exiting.
▶ Do not allow the console **302** to fall down.

Before entering and exiting:
▶ Fold the console **302** up.

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6.2 Adjusting the consoles

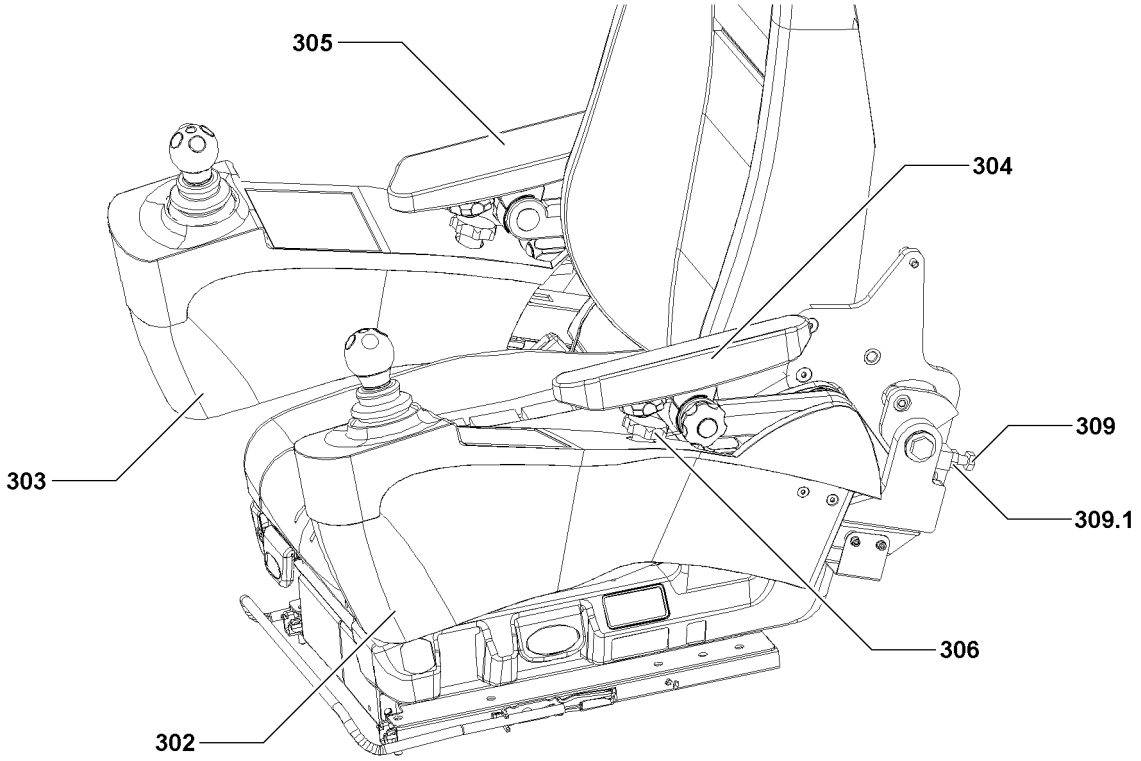

Fig.122072: Adjusting the consoles

The consoles can be adjusted individually to the respective body size of the crane driver.

The consoles can be adjusted to suit the crane driver as described for the left console **302**. The adjustment of the right console **303** functions the same way.

6.2.1 Adjusting the incline

- ▶ Bring the console **302** to the operating position.
- ▶ Release the nut **309.1**.
- ▶ Turn the stop screw **309** until the console **302** is set to the desired inclination.
- ▶ Secure the stop screw **309** with the nut **309.1**.

Result:

– The console inclination is adjusted.

6.2.2 Adjusting the console horizontally

Note

- ▶ The star handle screw **306** functionally a combination of a clamping screw and a detent pin.

- ▶ Fold the armrest **304** up.
- ▶ Turn the star handle screw **306** and unclamp the console **302**.
- ▶ Tighten the star handle screw **306**.

Result:

– The console **302** is unlocked.

- ▶ Adjust the console **302** by moving it horizontally.

When the console **302** is in the desired position:

- ▶ Release and engage the star handle screw **306**.

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▶ Turn the star handle screw **306** and clamp the console.

Result:

– The console **302** is horizontally adjusted.

▶ Fold the armrest **304** down.

6.3 Armrests

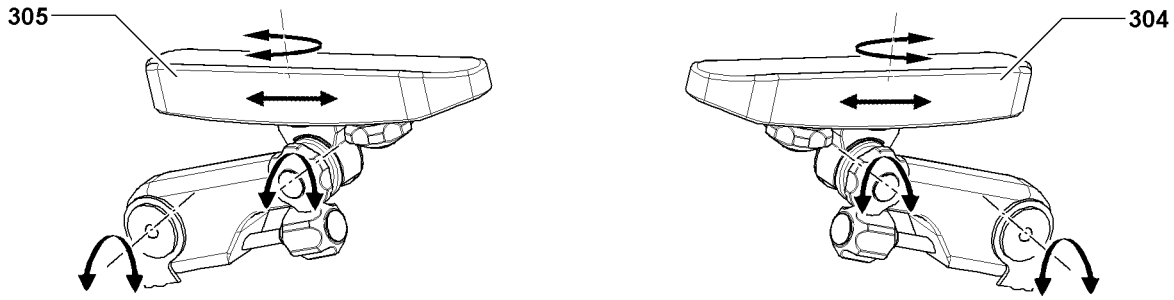

Fig.122073: Armrests

By releasing the adjustment screws, the armrests can be adjusted individually. To operate the master switches comfortably, set the armrests to the size of the crane driver.

▶ Release the adjustment screws.
▶ Adjust the left armrest **304** and right armrest **305**.
▶ Close the adjustment screws.

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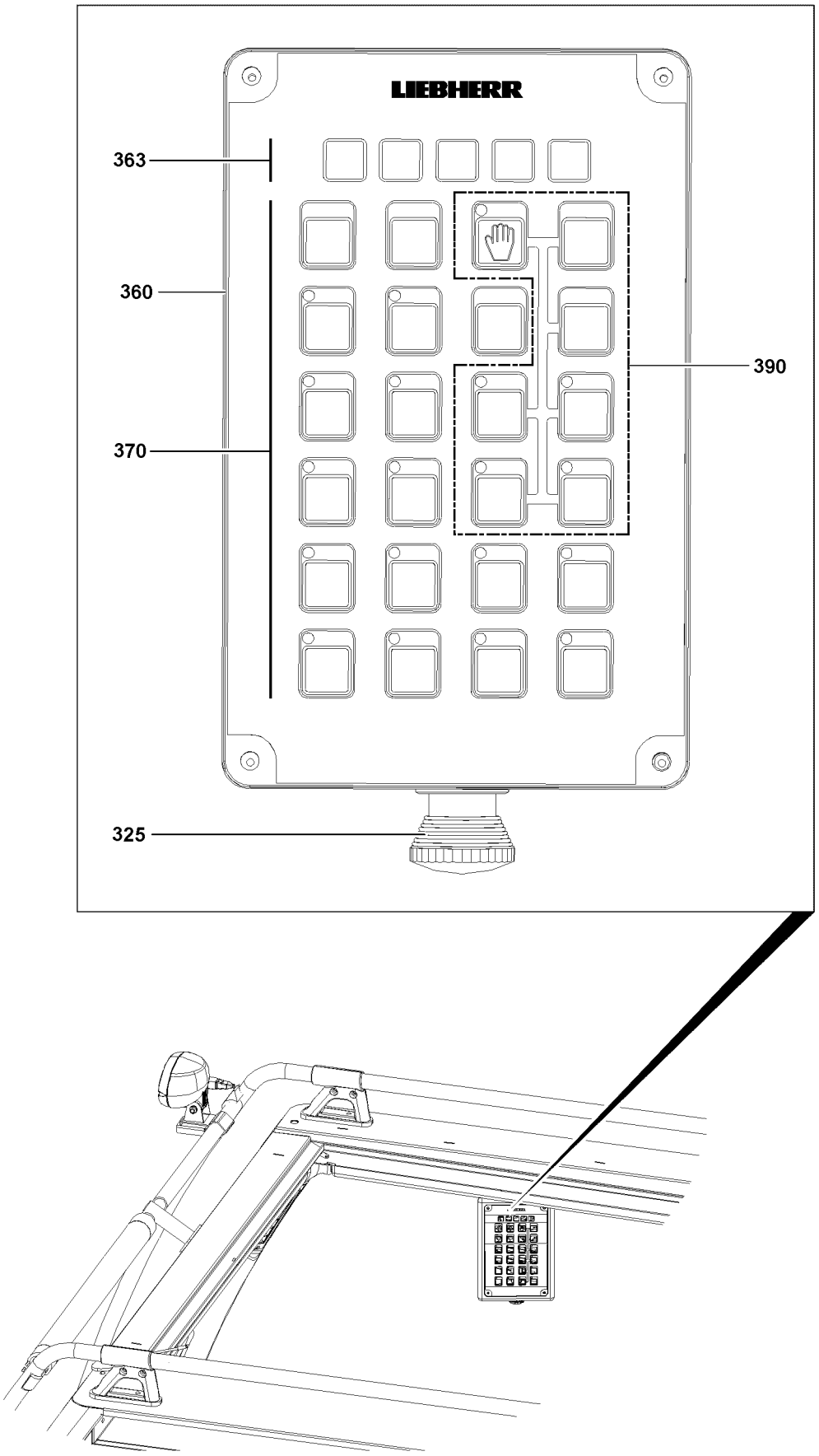

Fig.117705

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7 Crane cab work station

7.1 Tilting the crane operator’s cab*

To give the crane driver a better field of view, the crane operator’s cab can be tilted up.

When the crane operator’s cab is tilted up, the catwalk around the cab is also inclined.

The incline of the crane operator’s cab can be adjusted via the function keys on the operating and control unit (BKE).

WARNING
Danger of accident!
When the crane operator’s cab is tilted or tilting, personnel moving freely in the cab can fall.
When the crane operator’s cab is tilted or tilting, the cab door can start to move suddenly when opening it.
Death, severe bodily injuries, property damage.
- ▶ Tilt the crane operator’s cab only when properly seated in the crane operator’s seat.
- ▶ Before getting up from the crane operator’s seat, return the crane operator’s cab to the horizontal position.
- ▶ After completing work with the crane, return the crane operator’s cab to the horizontal position.

When the cab door must be opened with tilted crane operator’s cab:
- ▶ Grasp the cab door handle safely and carefully open the cab door.

WARNING
Inclined catwalk!
If persons are on a tilted or tilting catwalk, they can fall.
Death, severe bodily injuries, property damage.
- ▶ It is prohibited for anyone to remain under the catwalk when tilting the crane cab.
- ▶ It is prohibited for anyone to remain on a tilted catwalk.
- ▶ Before stepping on the catwalk, set it to horizontal position.

After completing work with the crane, return the crane operator’s cab to the horizontal position.

Make sure that the following prerequisite is met:
- – There are no persons in the incline range of the crane operator’s cab and the catwalk.

7.1.1 Tilting the cab upward

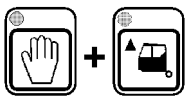

Fig.117719

- ▶ Activate the release button **390** and then press the control button **391**.

Result:

- – The cab swings upward.

7.1.2 Moving the cab to the horizontal position

Fig.117720

- ▶ Activate the release button **390** and then press the control button **392**.

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Result:

– The cab swings downward.

7.2 Window wiper / window washer system

7.2.1 Operating the window wipers

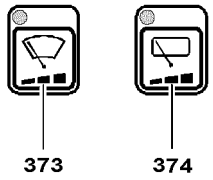

Fig.118205

The windshield wipers on the front and roof window can be operated via the function buttons on the operating and control unit (BKE), see illustration. Each window has a button assigned to it.

Turn the window wiper on

There are four different wipe stages.

Pressing the button **373** or the button **374** (less than 0.5 seconds) reduces the wiper speed incrementally:
1. Continuous operation
2. Short interval
3. Long interval
4. Wiper off

   • When the wipe stage „Wiper off“ is reached, an acoustical signal sounds on the BKE.

To activate the window wiper on the front window:
▶ Press the button **373** until the desired wipe stage is reached.
or

To activate the window wiper on the roof window:
Press the button **374** until the desired wipe stage is reached.

Turning the window wiper off

▶ Press the button **373** or the button **374** for at least one second.
or
Press the button **373** or button **374** until an acoustical signal sounds on the BKE (0.5 seconds).

7.2.2 Operating the window washer system

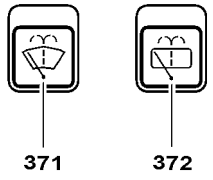

Fig.118214

The window washer system on the front and roof window can be operated using the function buttons on the operating and control unit. Each window has a button assigned to it.

The wiper motor and the water pump run as long as the button **371** or button **372** is pressed down.

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After pressing the button **371** or the button **372**, three additional wipe movements are carried out before the wiper arms return to their original position.

To activate the window washer system for the front window:
▶ Press the button **371**.
or

To activate the window washer system for the roof window:
Press the button **372**.

7.2.3 Filling the window washer system

For the location of the reservoir for the window washer fluid, see chapter 4.01.

NOTICE
Frozen window cleaning fluid!
If the window cleaning fluid is not frost resistant, then the windshield washer system can freeze during the cold time of the year.
Failure of the windshield washer system is the result.
The windshield washer system can be damaged.
▶ Change the window cleaning fluid in time to a frost resistant type.

Before the start of the cold season:
▶ Fill the reservoir with a frost resistant window cleaning fluid.

7.3 Checking the horn

WARNING
Improper use of horn!
If the horn is used outside of danger situations, then it can lose its warning effect.
If the horn loses its warning effect, then severe injuries can occur as a result.
Death, severe bodily injuries, property damage.

If the horn is to be checked:
▶ Notify all personnel in the vicinity that the horn is being checked for function.

When the horn test is completed:
▶ Notify all personnel in the vicinity that the testing of the horn has been completed.
▶ Do not use the horn unnecessarily.

Make sure that the following prerequisite is met:
– Any personnel in the vicinity has been notified that the horn is being checked for function.

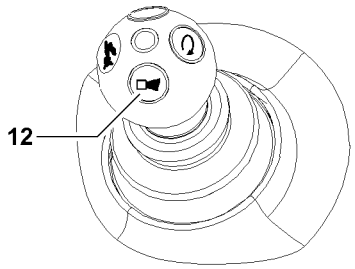

Fig.115322: Horn button

Before starting to work, check that the horn is functioning:
▶ Press the button **12** on any desired master switch.

Result:

– The horn sounds.

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Problem remedy
The horn does not sound?
The horn is defective or is malfunctioning.
▶ Repair the horn before starting crane operation.

After successful testing of the horn:

▶ Notify any personnel in the vicinity that the testing of the horn has been completed.

7.4 Opening / closing cab doors and cab windows

Unsecured or unlocked cab doors or cab windows can move suddenly if, for example:
– The crane is driven / braked.
– The cab or the entire crane is inclined.

WARNING
Danger of accident!
Unsecured or unlocked cab doors or cab windows that move suddenly can catch personnel and cause accidents.
If the crane is driven with an open window or open crane door, the crane cab can be damaged.
▶ Secure or lock cab doors or cab windows to prevent them from moving suddenly.

WARNING
Danger of crushing!
When closing the cab door and cab windows, hands and / or other limbs can be crushed.
▶ When closing the cab door and cab windows, make sure that no limbs are injured.

Open the cab door:
▶ Unlock and open the cab door.

Close the cab door:
▶ Pull the cab door closed and lock.

Open the cab window:
▶ Unlock and open the cab window.

Close the cab window:
▶ Pull the cab window closed and lock.

7.5 Opening / closing the roof window

7.5.1 Opening the roof window

WARNING
Hands can get trapped!
▶ Watch your hands when closing the roof window.

A pair of nitrogen gas cylinders support the lifting movement of the roof window.

▶ Open the window lock.
▶ To open from inside, press on the roof window.
or

If you only want to partly open the roof window:
Adjust the window in the desired position with the provided perforated belt.

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7.5.2 Closing the roof window

WARNING
Hands can get trapped!
▶ Watch your hands when closing the roof window.

▶ To close the roof window, pull the window down on the locking handle.

When the roof window is closed:
▶ Close the window lock.

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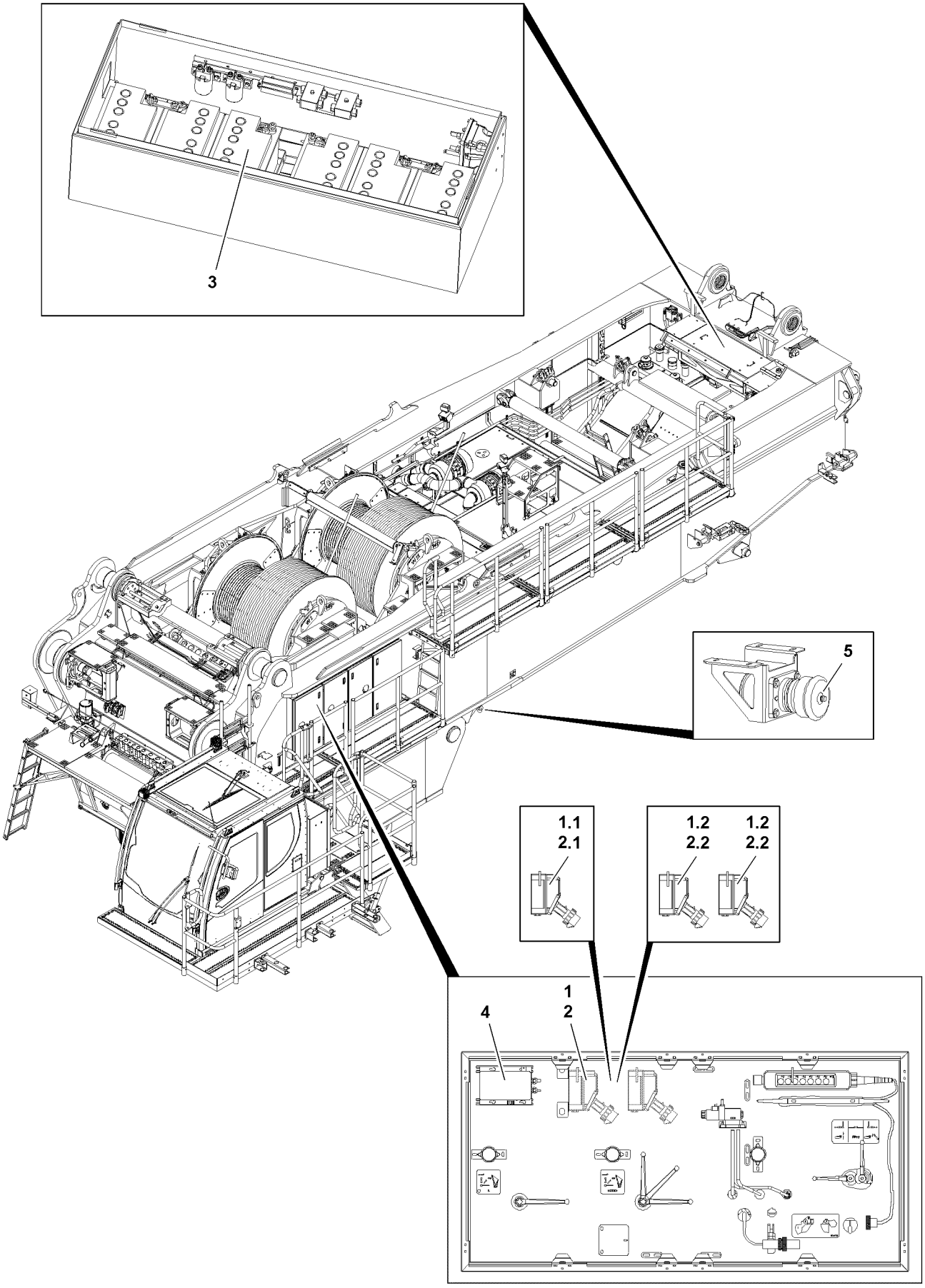

Fig.118208

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8 Supply via external feed / power aggregate

The following types of supply are available:
- Supply via plug connection for external feed from power supply system

Position	Description
1	Plug connection(s) External feed
1.1	Plug connection for external feed (230 V)
1.2*	Plug connections for external feed (2 x 110 V)
2	Circuit breaker
2.1	Circuit breaker for external feed (230 V)
2.2*	Circuit breaker for external feed (2 x 110 V)
3	Battery system
4	Battery charger
5	Feed for external start

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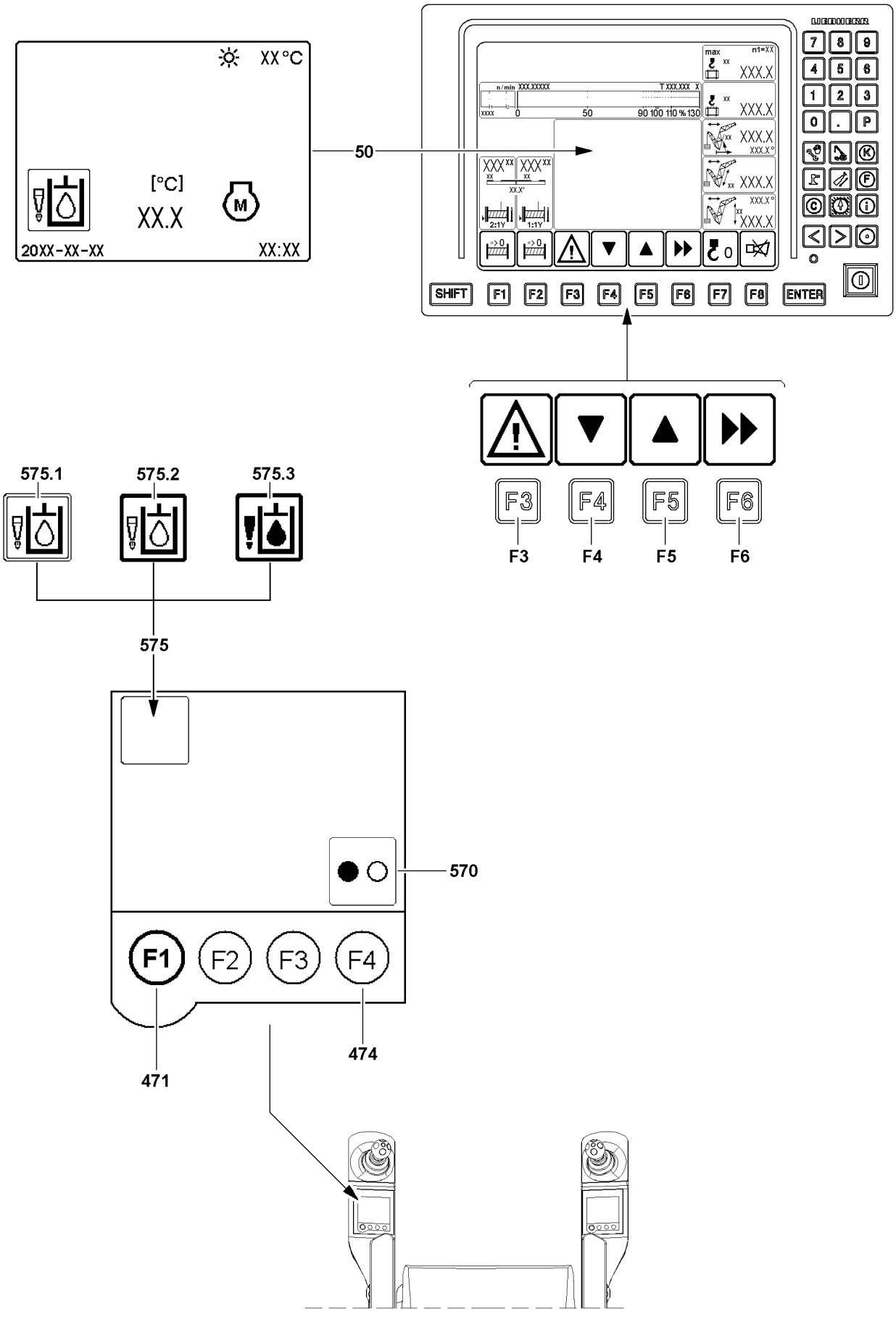

Fig.118213

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9 Preheating the hydraulic oil with Hydraulic oil preheating*

The hydraulic oil can be preheated with the Hydraulic oil preheating*.

NOTICE
Damage of hydraulic crane components!
If the required measures are not carried out for use of the crane at low temperatures, then the crane or crane components can be damaged.
Extensive repairs and / or downtime can result.
- ▶ Engage the Hydraulic oil preheating*.
- ▶ Warm up the crane components according to chapter 2.08.

Note
- ▶ Always preheat the hydraulic oil at low ambient temperatures.
- ▶ From a hydraulic oil temperature above 25 °C , do not turn the Hydraulic oil preheating* on.
- ▶ The current hydraulic oil temperature can be called up via the individual control display on the LICCON monitor.

9.1 Turning the Hydraulic oil preheating* on

Make sure that the following prerequisite is met:
– The engine is running.

Note
When the Hydraulic oil preheating* is turned on, various crane movements are turned off.
- ▶ If necessary, turn the Hydraulic oil preheating* off.

▶ In the „Crane operation“ program, press the function key **F3**.

Result:

– The monitoring area with its monitoring functions is displayed on the LICCON monitor.

▶ Press the function key **F4** until the individual control display for the hydraulic oil temperature is shown on the LICCON monitor.

Result:

– The current hydraulic oil temperature can be read.

▶ Press the F1 function key **471** on the left touch display until the „Hydraulic oil preheating“ menu appears.

Fig.115320

▶ Select the „Hydraulic oil preheating“ **575** function by touching the icon **575.1** on the display.

Result:

– The icon **575.1** changes to icon **575.2** (icon bordered in black)

▶ Press the F4 key **474**.

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Result:

– The icon **575.2** changes to icon **575.3** (icon filled out).
– The hydraulic oil preheating is turned on.

When the hydraulic oil temperature on the individual control display **50** has reached the operating temperature:
▶ Press the F4 key **474**.

Result:

– Hydraulic oil preheating is turned off.
– The icon **575.2** appears (icon not filled out).

▶ Press the function key **F3**.
or
Press the function key **F6** twice.

Result:

– The monitoring field with monitoring functions is hidden.

10 Starting the LICCON computer system (before engine start)

There are two operating modes for the LICCON computer system:
– LICCON computer system in stand-by mode (crane engine turned off).
– LICCON computer system in normal mode (crane engine turned on).

10.1 System start of the LICCON computer system

After the ignition is turned on, the LICCON computer system boots up and carries out a self-test, see chapter 4.02.

Make sure that the following prerequisite is met:
– Do not operate any operating elements during the system start of the LICCON computer system.

Note
During the boot up phase, if an operating element is actuated (for example the master switch is moved from the zero position), the system start may be aborted as a result.
▶ After an abort at system start: Turn the engine and ignition off and then start again.

▶ Wait for the boot up phase.

Result:

– The set up screen appears on the LICCON monitor.

– Normally the previously selected set up configuration is displayed.

▶ Check the set up configuration.

Problem remedy
The LICCON monitor does not show the required set up configuration?
▶ Set the required set up configuration, see section „Changing the set up configuration“.

Problem remedy
Does an error message appear on the LICCON monitor?
▶ Turn the engine and ignition off and then start again.

When an error message appears again:
▶ Contact Liebherr Service.

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10.2 Taking over the set up configuration that was previously set

Make sure that the following prerequisite is met:
- The entries and settings in the Set up program match the actual set up configuration of the crane.

When the entries and settings in the set up program are correct:
▶ Press the **F8** function key.

Result:

– The entries and settings are taken over and the „Set up“ program is ended. The crane operation program is called up and the crane operating screen is shown.

10.3 Changing the set up configuration

The entries and settings for the set up configuration can be changed in the Set up program.

▶ Call up the set up program and make the entries and settings for the set up configuration.

Note
▶ For detailed description of the entries and settings in the Set up program, see chapter 4.02.

When the entries and settings in the set up program are correct:
▶ Press the **F8** function key.

Result:

– The entries and settings are taken over and the „Set up“ program is ended. The crane operation program is called up and the crane operating screen is shown.

10.4 Setting the speed reduction master switch

Note
▶ For a detailed description for setting the speed reduction master switch, see chapter 4.02.

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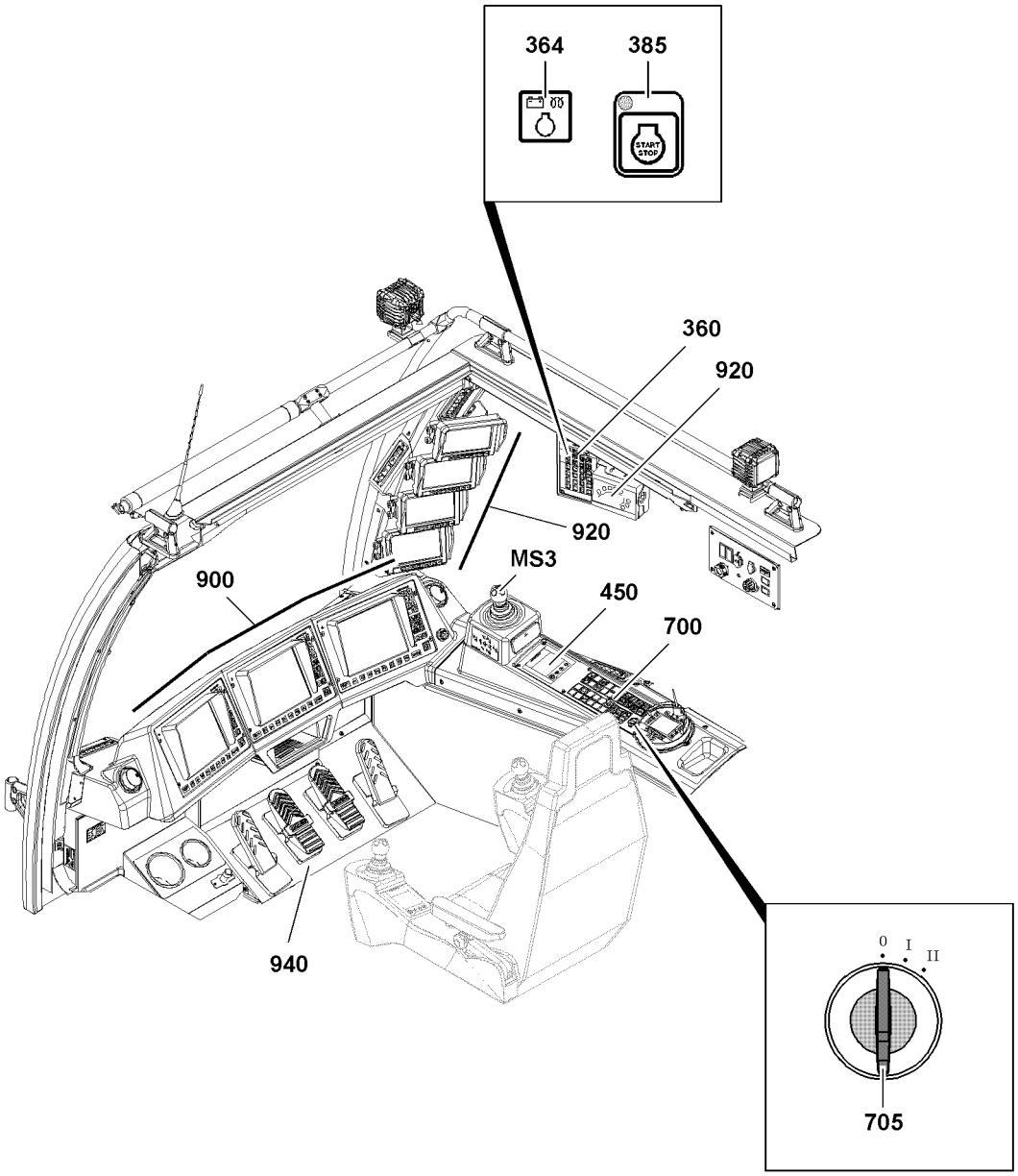

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Fig.118209

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11 Starting and turning off the engine

Operate the engine according to the manufacturer's specifications, see the separate operating instructions of the engine manufacturer.

Note

▶ As long as the indicator light **364** lights up yellow, engine preheating is active.

Make sure that the following prerequisites are met:

– The ignition switch **705** is in position „I".
– In the LICCON computer system, the Crane operation program is called up and the crane operation screen is shown.
– The Indicator light **364** blinks yellow (1 Hz).

NOTICE

Danger of property damage!

▶ Start the engine only when the indicator light **364** blinks yellow.
▶ Do not press down on the gas pedal during starting.
▶ Do not actuate the starter too long and pause between starting attempts, see the operating instructions from the engine manufacturer.
▶ Let the engine warm up before subjecting the engine to a full load, see Operating instructions from the engine manufacturer.

11.1 Starting the engine

When the indicator light **364** blinks yellow (1 Hz), the engine is ready to start.

▶ Press the „Engine START / STOP" control button **385**.

Result:

– The engine starts.

▶ Check the instruments after starting the engine.

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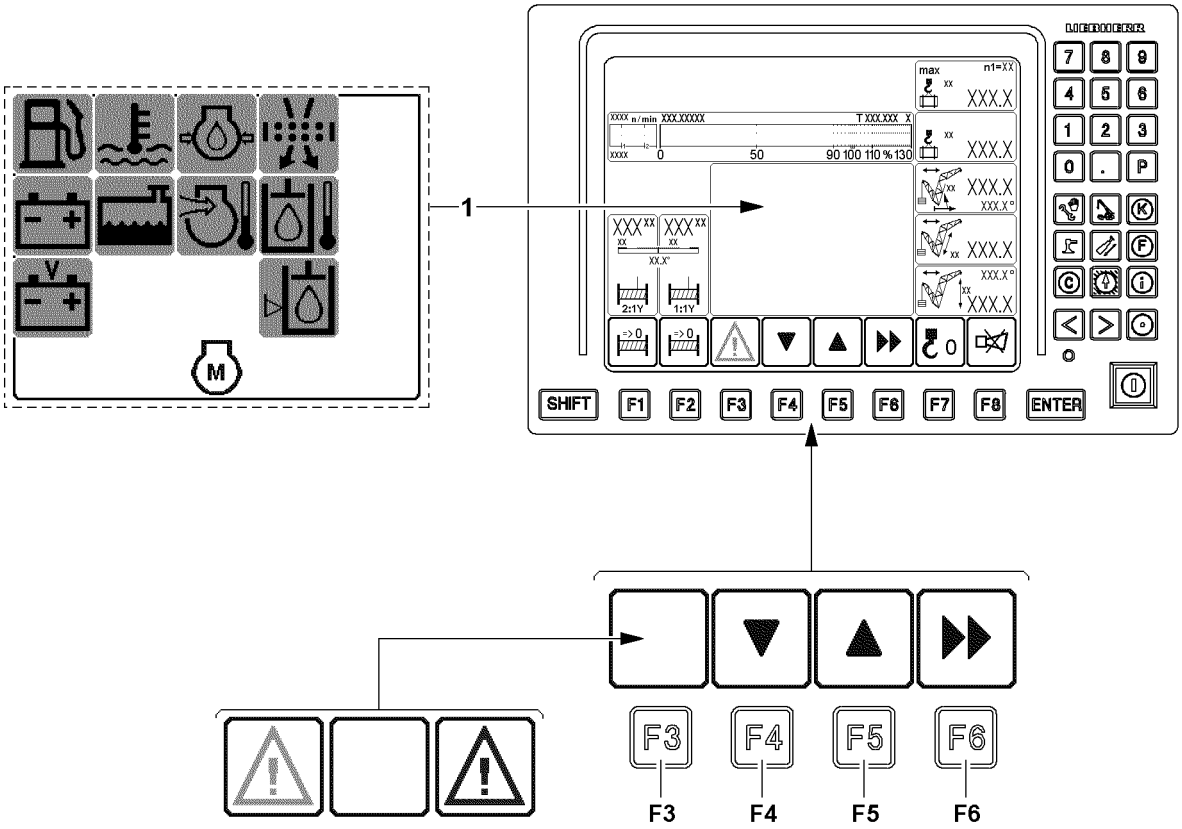

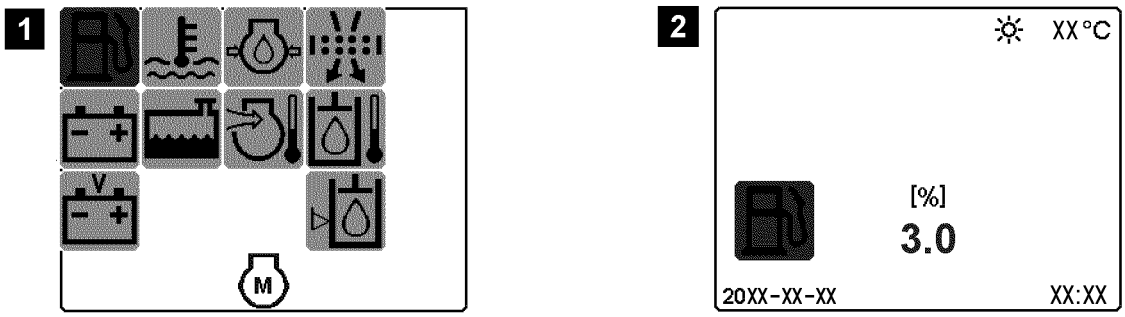

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Fig.118212

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11.2 Checking the operating and control instruments after start

- LICCON monitor: If a control value has reached a limit value, then the monitoring functions are automatically called up in the Crane operation program and the error or problem are pointed out.
- Operating and control unit (BKE): If an error or a problem occurs, then the error or the problem are pointed out.

Note
▶ For a detailed description of the operating and control instruments, see chapter 4.01.

11.2.1 Checking the monitoring functions on the LICCON monitor

If a control value has reached a limit value, then the monitoring functions are automatically called up in the Crane operation program and the error or problem are pointed out.

- The monitoring functions react in general only when an error or problem is present. Avoidable missing amounts / problems impede crane operation and cause unnecessary delays and / or downtime.
- If the warning icon of the function key **F3** is „yellow“ or „red“, then there is an error or a problem on the crane.

▶ Check the warning icon of the function key **F3**.

When the warning icon for the function key **F3** is shown in „yellow“ or „red“ and the monitoring functions **1** are not automatically shown:
▶ Press the function key **F3**.

Result:

– The monitoring functions **1** on LICCON monitor are called up.
– The erroneous function is displayed in the monitoring field in „yellow“ or „red“ (see example illustration **1**).

When the warning icon of the function key **F3** is shown in „red“:
▶ Turn the engine off immediately and remedy the error or the problem.

Note
▶ For a detailed description of monitoring functions, see chapter 4.02.

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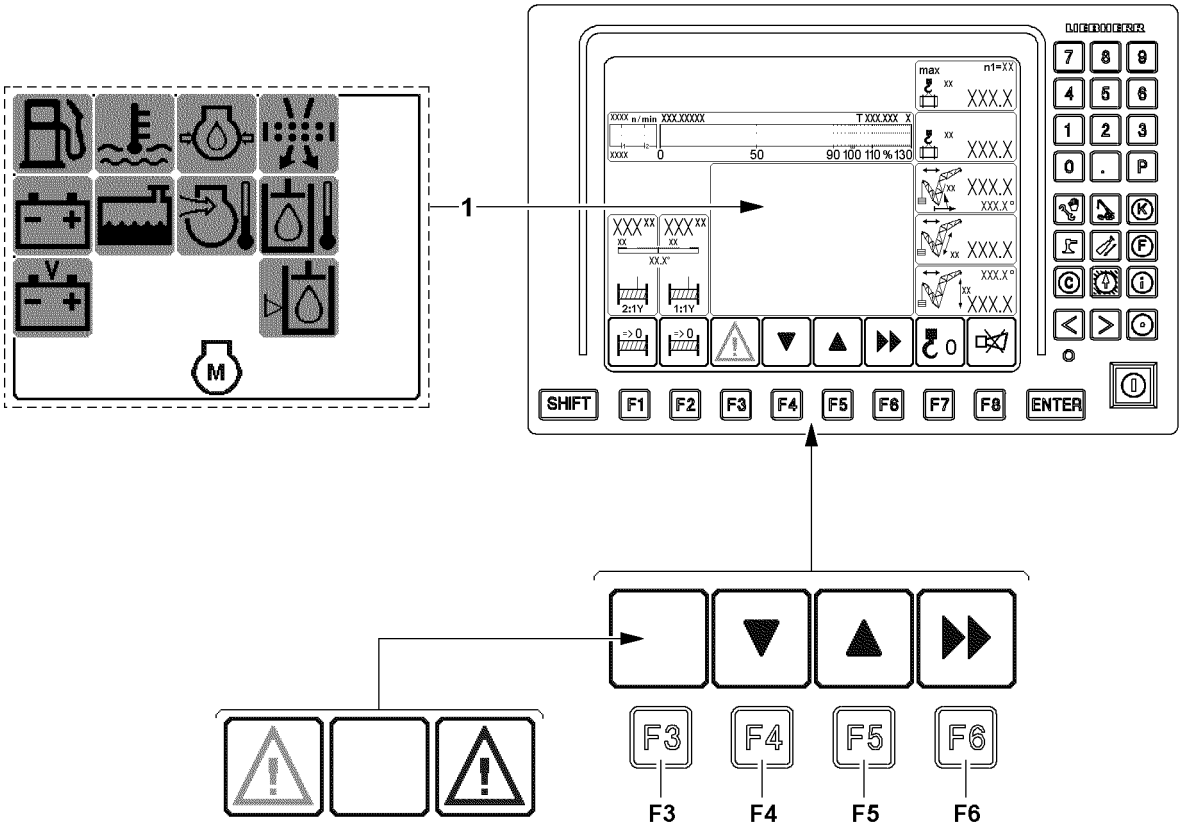

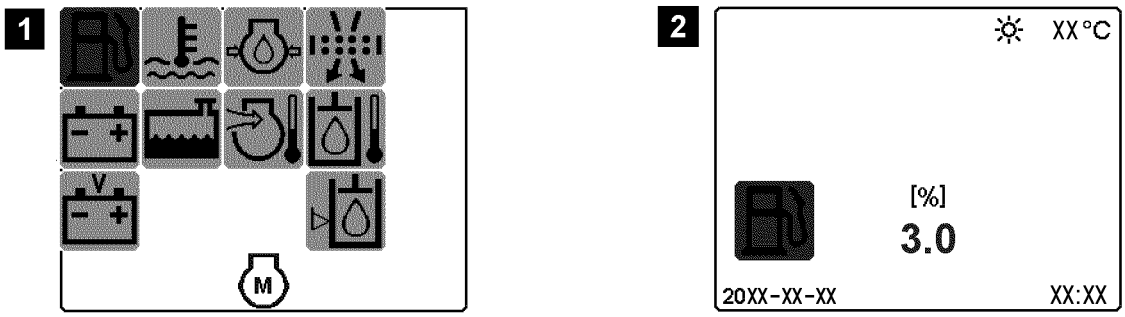

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Fig.118212

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11.2.2 Calling up and checking the individual control displays

The relevant values for some monitoring functions in the monitoring field can be displayed.

In the example, the fuel reserve is low and:

– The monitoring functions report an error or a problem.
– The fuel reserve icon is shown in the monitoring field in „red“, see example illustration **1**.

▶ Press the function key **F4** or function key **F5** and call up the individual control display for the fuel reserve.

Result:

– The individual control display with the current fuel reserve is displayed, see example illustration **2**.
– The fuel reserve is 3 % and would have to be replenished immediately.

By continuing to press the function key **F4** or function key **F5**, all additional individual control displays can be switched through one after the other.

Change back to the monitoring field using the function key **F6**.

▶ Press the function key **F6**.

Result:

– The monitoring field is shown again.

The monitoring field can be exited using the function key **F3**.

▶ Press the function key **F3**.

Result:

– The monitoring field is faded out.

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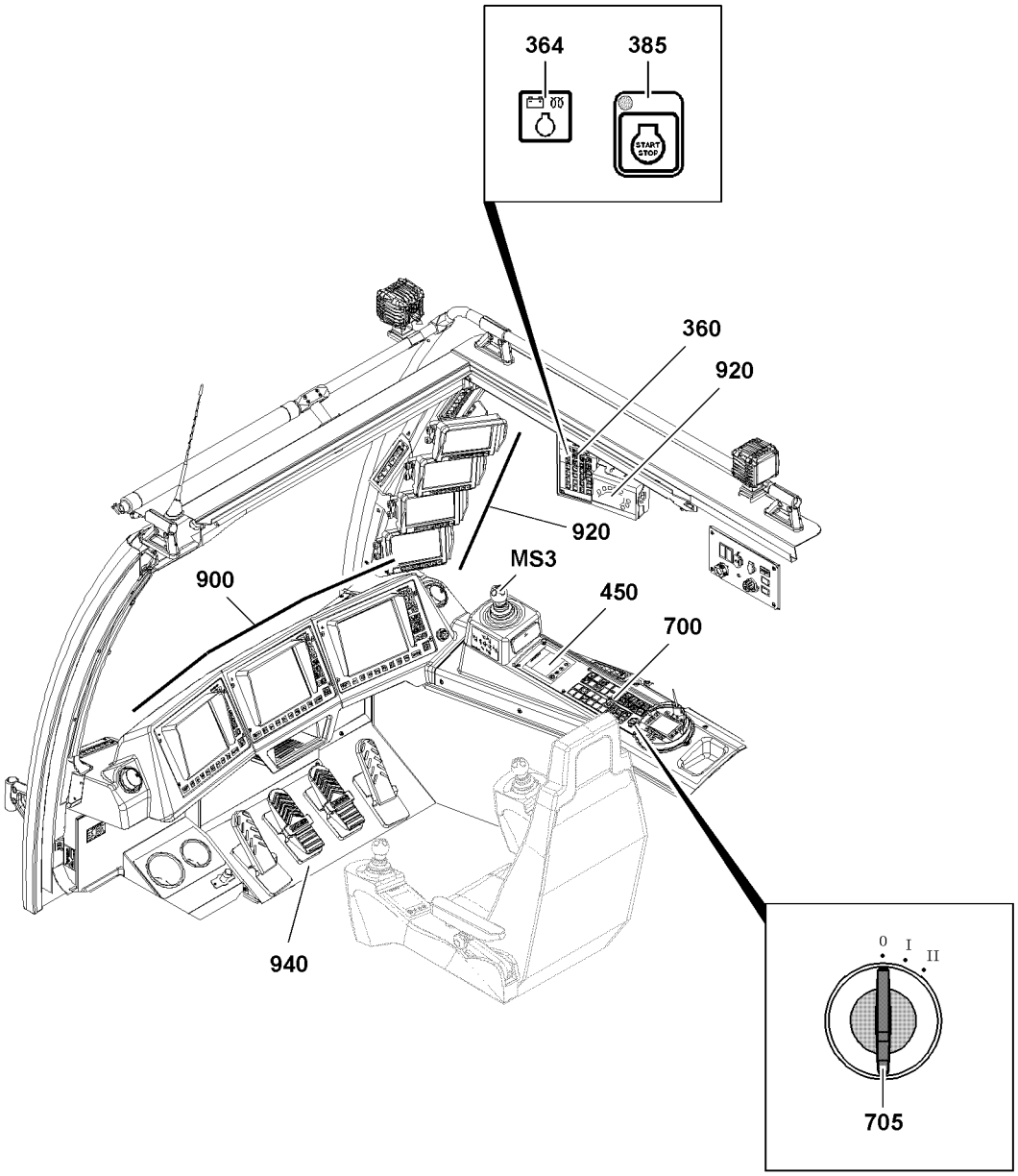

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Fig.118209

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11.3 Turning the engine off

NOTICE
Increased engine wear!
If the engine is suddenly turned off after operation with full engine load or in case of increased coolant temperature (above 95 °C), then this can lead to increased wear over time.
▶ Before turning the engine off, let the engine run for approximately three to five minutes at idling speed without a load.

Note
LICCON computer system in stand-by mode
▶ If the engine is turned off, the LICCON computer system can continue to be operated in Stand-by mode, see chapter 4.02.

11.3.1 Turning the engine off

To turn the engine off use the operating and control unit (BKE).

When the engine is running:
▶ Press the „Engine START / STOP“ control button **385**.

Result:

– The engine turns off.

▶ Release the control button **385**.

11.3.2 Turning the engine off in the event of danger

NOTICE
Improper use of the EMERGENCY STOP switch!
Repeated improper use of the EMERGENCY STOP switch can cause increased wear on the crane.
▶ Use of the EMERGENCY STOP switch for normal operation is not permitted.
▶ Use the EMERGENCY STOP switch only in emergency situations.

If an emergency situation occurs:
▶ Actuate the EMERGENCY STOP switch.

Result:

– The crane is turned off.

After pressing an EMERGENCY STOP switch it is possible that the LICCON computer system must be reset.

Reset the LICCON computer system after an EMERGENCY STOP:
▶ Release the actuated EMERGENCY STOP switch.
▶ Turn the ignition switch **705** momentarily to position „0“ and then again to position „I“.

12 Starting the LICCON computer system parallel to the engine

Note
If the engine was started with the ignition switch **705** without having started the LICCON computer system first, then the LICCON computer system starts parallel to the engine start.
▶ Start the LICCON computer system first, see section „Starting the LICCON computer system (before engine start)“

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13 Load weighing and load display

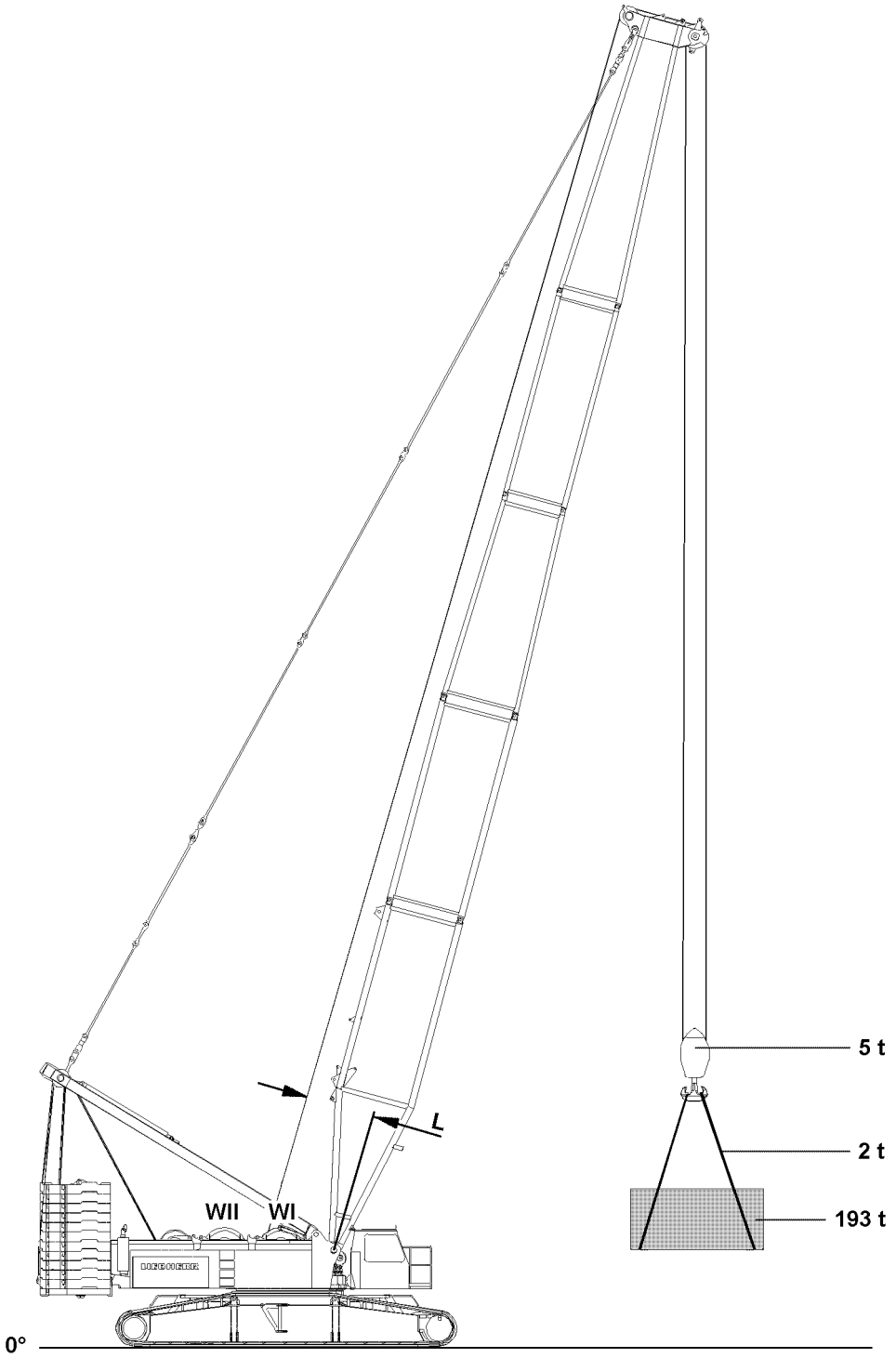

Fig.127379: Load weighing and load display

In the loads stated in the load chart, the weight of the lifting equipment (hoist rope at nominal reeving) has been taken into account.

Note

▶ The weight of the hook block and the weights of the fastening equipment must be subtracted from the load given in the load chart.

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Example:		
Maximum permissible load according to chart		200 t
Weight of the hook block	5t	- 5 t
Weight of the fastening rope	2t	- 2 t
Actual load capacity of the crane		= 193 t

In this case, the load to be lifted may not exceed **193 t**.

Note

- ▶ In the LMB calculation, the lever arm to winch **2** is not used, but the lever arm **L** to winch **1** is always used.
- ▶ For that reason, to ensure an exact load weighing to lift the load on the main boom and on the fixed accessories (for example the „fixed jib“), winch 1 must be used.

DANGER

Danger of accident due to overload!
In case of inaccurate load weighing or load display, a danger exists due to an unrecognized overload of the crane.

- ▶ The crane driver must know the weight, center of gravity and dimensions of the load to be lifted before operating the crane.
- ▶ The crane driver must check, before lifting the load, if he may even lift the load according to the data in the load chart.

13.1 Load weighing

Make sure that the following prerequisites are met:

- The angle sensors are functioning.
- The incline sensors are functioning.
- The turn sensor in the turntable is functioning.
- The pressure sensors are functioning.
- The pull sensors are functioning.

The boom position where the relapse cylinders are actuated must be recognized by the LICCON exactly via the sensors, because otherwise the relapse cylinders have a strong effect on the load - weighing error.

Note

- ▶ If only one of these sensors is not functioning, a LEC error display is issued, then the load display and the load weighing are not exact.
- ▶ The calculation is made anyway, but the result is not exact.

13.1.1 Possible weighing errors

For an exact load weighing, exact signals of the pull test bracket, angle sensor, incline sensors and pressure sensors are required.

Since all sensor values are always within a certain tolerance, a weighing error can occur.

The weighing error is increasingly larger if:

- The hoist winch is on the turntable instead of the main boom.
- The reeving is small.
- The hoist winch is positioned far to the rear in the turntable.
- Several hoist winches are used (parallel operation).
- The boom, on which the load is suspended, is short.
- The boom, on which the load is suspended, is steep.

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DANGER
Danger of accident due to overload!
Overload due to weighing error.
▶ When the prerequisites for small weighing errors not given, special caution must be exercised.

13.1.2 Adjustment of reeving

The number of reevings must be correctly set on the LICCON computer system. The reeving should not be higher than the nominal reeving, otherwise the hoist ropes reeved above the nominal reeving count as part of the load.

Note
▶ The nominal reeving determines for which reeving the load chart values of a load chart are valid.
▶ If the crane is in a position outside of the load chart, the hoist rope is added to the load, because no nominal reeving is recognized outside the load chart.

13.2 Load display

13.2.1 Lifting, illustration 1

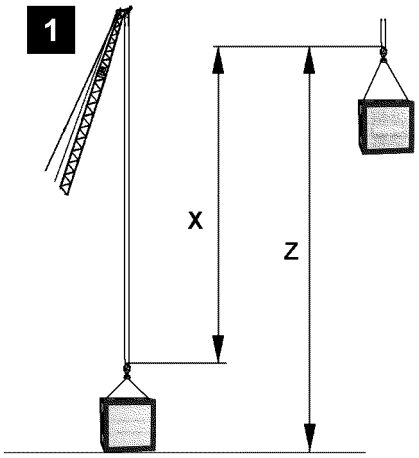

Fig.127400

For the calculation of the displayed actual load, total load **Z**, that hangs on the pulley head **X**, the weight of the hoist rope to the ground, see illustration.

In that case, the number of the reevings set on the LICCON are taken into account, but no more than the nominal reeving.

Note
▶ If the load is raised far above the ground, see illustration **1**, then the load display is too small by the weight of the hoist rope from the load to the ground.

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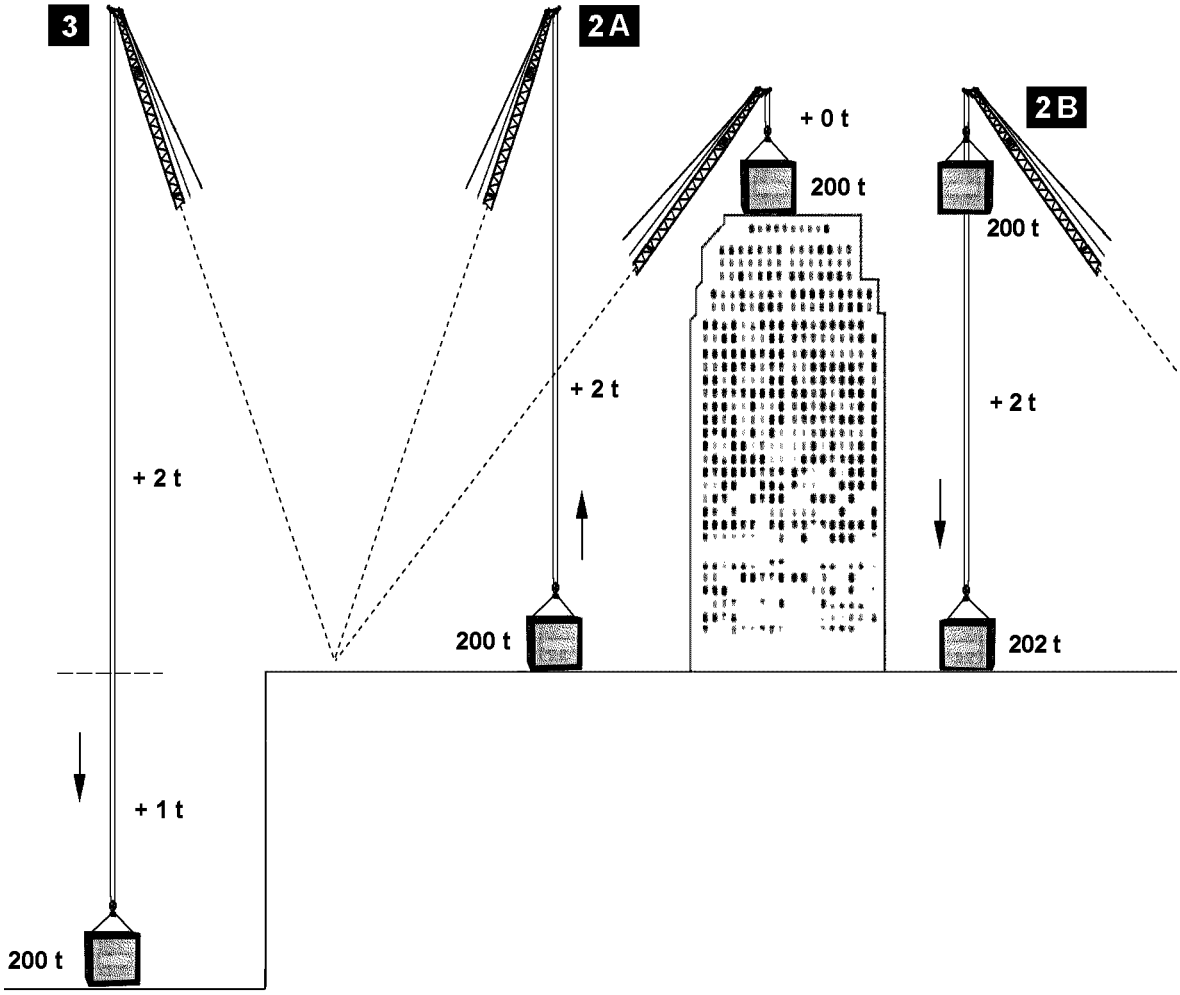

Fig.127380

13.2.2 Lifting above ground level, illustration 2A

When the load is lifted above the crane level (high rise), then the hoist rope to the ground is always deducted anyway for the display, therefore the load seems increasing lighter when lifting than it did on the ground.

Therefore a somewhat larger load can be lifted in large heights than on the ground, without triggering the LMB overload shut off at 100 %.

This poses no danger because the load stress for the crane is the same if, for example 200 t if load on the bottom and 2 t rope or 202 t load on top and 0 t rope hang on the pulley head.

13.2.3 Taking on a load on a high rise, illustration 2B

When a load is picked up on the high rise on top (=100 %), for example 200 t , and then lowered to the ground, the weight of the hoist rope below the high rise level is calculated as load and displayed.

13.2.4 Lifting below ground, illustration 3

When a load is lowered below the crane level (excavation), then the hoist rope below the crane level is calculated as load and displayed.

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DANGER

Danger of accident due to overload!

It must be noted that even though the load display in illustration **2B** and illustration **3** is correct, the overload of the crane is also shown in the utilization bar, but the lowering movement is not shut off.

- In the case of an LMB overload, all crane movements are shut off, which would increase the danger of overload, however load lowering at 100 % LMB shut off remains possible as it is normally assumed that overload takes place due to load lifting.
- However, the crane can also be overloaded by lowering the load, especially in case of high reevings with a large hoist rope weight on the pulley head. The crane driver must know this, so that he can relieve the crane by careful lifting again in this special case, even though the lifting and not the lowering of the load is automatically shut off.

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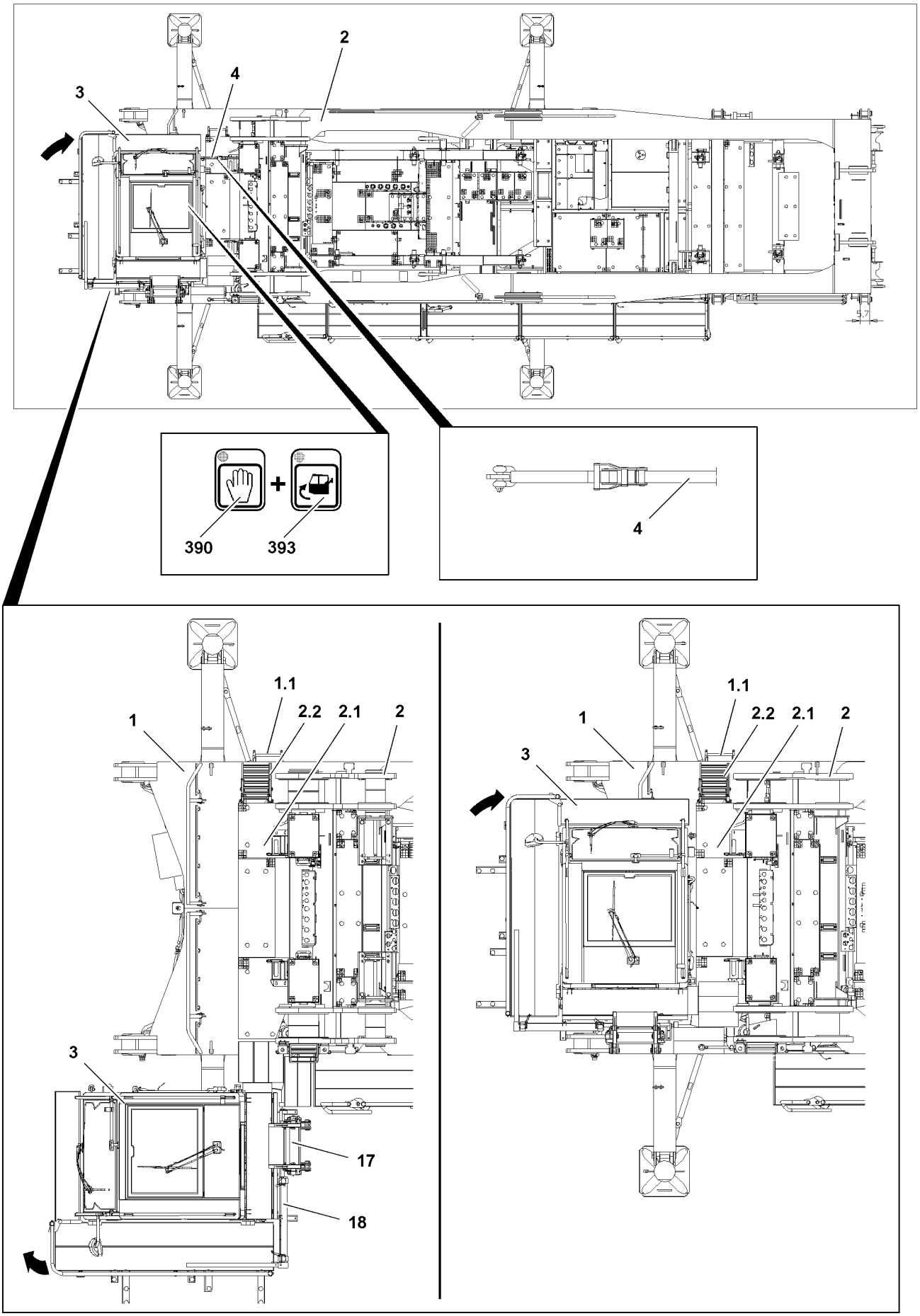

Fig.118199

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14 Bringing the crane operator’s cab into the transport position

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.
If this is not observed, assembly personnel could fall and be killed or seriously injured.

- ▶ The assembly personnel must always move carefully and anticipatory on the crane, the crane components or lattice sections.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If fall protection equipment is available, then it must be used.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the approved fall arrest system to prevent falling, see chapter 2.04.
- ▶ The fall arrest system must be attached to the fastening and hook points as well as the safety ropes.
- ▶ Always secure ladders to structural parts and / or components to prevent them from falling over.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.

- The crawler carriers are removed on the crawler travel gear.
- The crawler center section **1** is laying properly on the substructure.
- The extension ladders **1.1** are properly attached to the crawler center section **1**.
- The catwalks and railings on the turntable frame main section **2** are in the operating position.
- The turntable frame main section **2** is properly installed and secured on the turntable frame lower section.
- The ladder **2.2** on the main boom assembly platform **2.1** is in the operating position.

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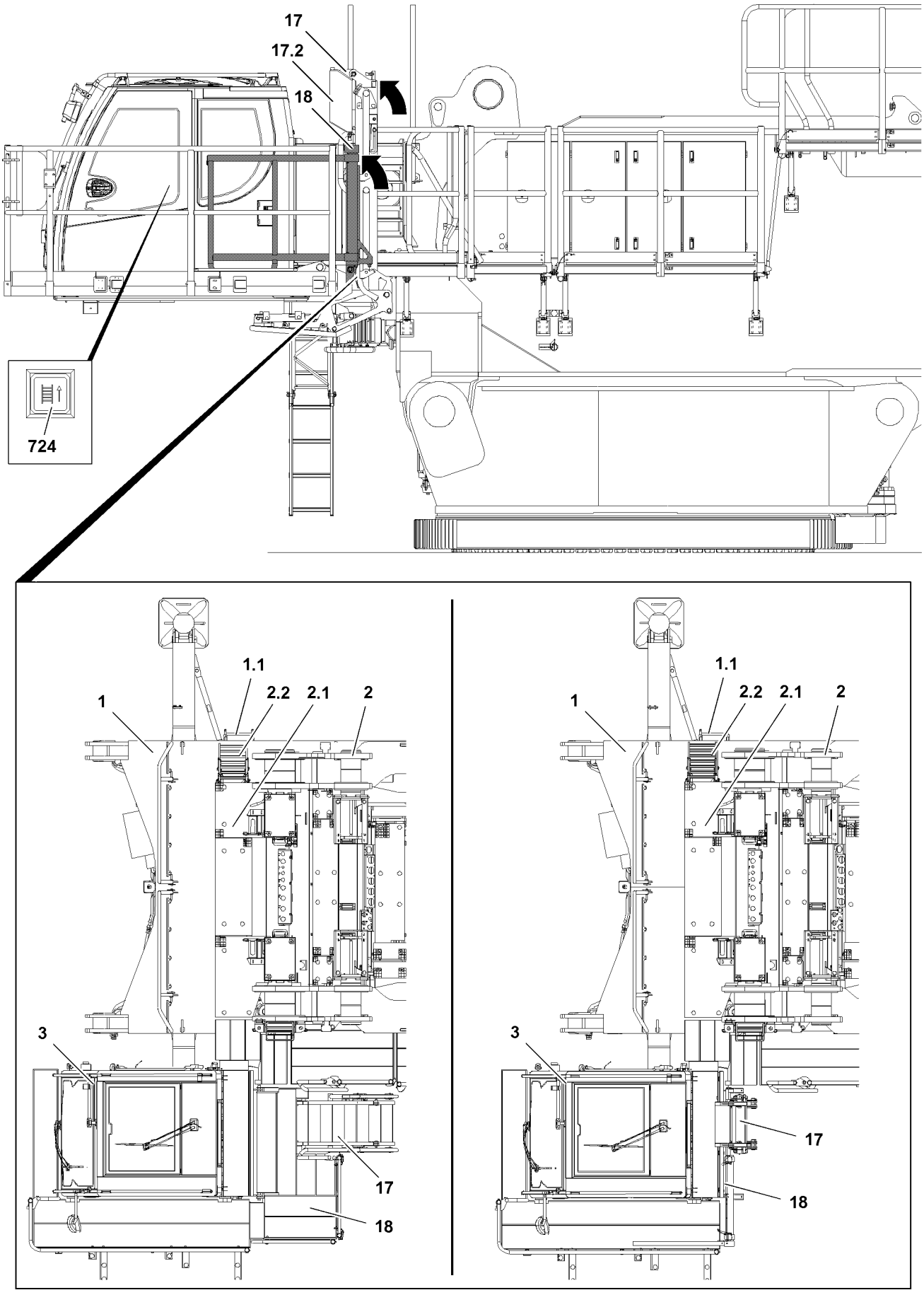

Fig.118198

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14.1 Bringing the access stairs into transport position

Make sure that the following prerequisites are met:
- The crane cab **3** is in the operating position.
- The engine is running.

14.1.1 Bringing the hand rails into transport position

Make sure that the following prerequisite is met:
- The stair folding section **17.2** is in the operating position.

WARNING
Danger of crushed limbs!
When swinging the handrails **17.1**, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Pull and hold the detent pin **17.5**.
▶ Move the first handrail **17.2** into transport position until the detent pin **17.5** engages at point **P2**.

Result:

– The first handrail **17.2** is in the transport position.

▶ Bring the second handrail **17.2** into the transport position.

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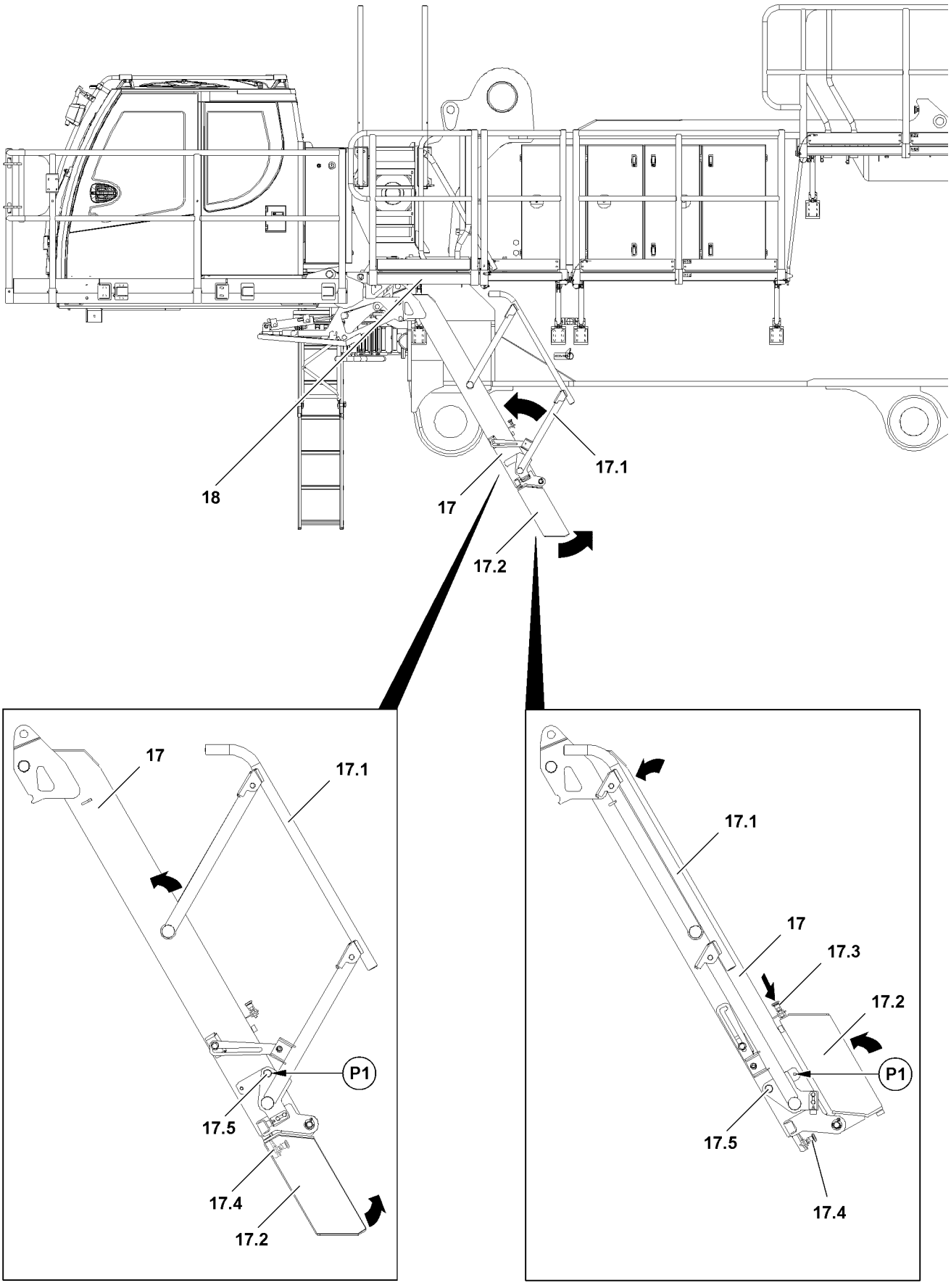

Fig.118197

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14.1.2 Swinging the stair folding section into transport position

Make sure that the following prerequisite is met:
– The hand rails **17.2** are in the transport position.

WARNING
Danger of crushed limbs!
When swinging the stair folding section **17.2**, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Pull the detent pin **17.4** up and hold.

Result:

– The stair folding section **17.2** is released.

▶ Fold the stair folding section **17.2** completely up until the detent pin **17.3** engages completely.

Result:

– The stair folding section **17.2** is in transport position.

14.1.3 Removing the railings on the cab platform

Make sure that the following prerequisites are met:
– The access stairs **17** and cab platform **18** are in the operating position.

Note
▶ Disassemble the railings on the cab platform, see chapter 2.06.

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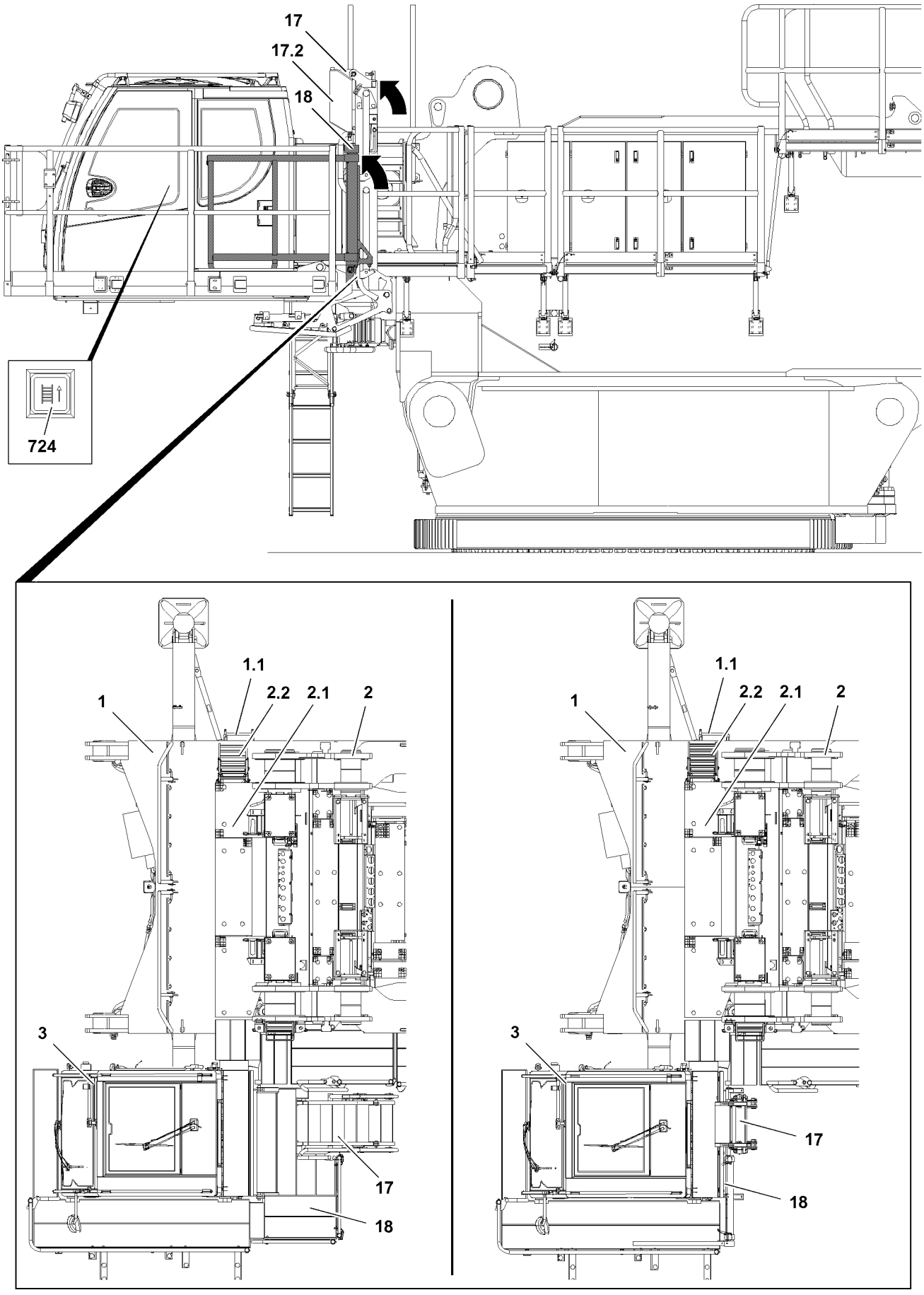

Fig.118198

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14.1.4 Swinging the access stairs into transport position

WARNING
Danger of accident due to the access stairs!
Due to the folding mechanism of the access stairs, personnel can be trapped between the control cabinet and the cab platform and be killed.
Death, severe bodily injuries, property damage.
▶ Make sure that no persons are within the swinging range of the access stairs **17** and the cab platform **18**.

▶ Press and hold the button **724** on the instrument panel.

Result:

– The access stairs **17** are raised.

When the access stairs **17** and cab platform **18** are in operating position:
▶ Release the button **724**.

Note
▶ The access stairs can be operated from the BTT, see chapter 5.31.

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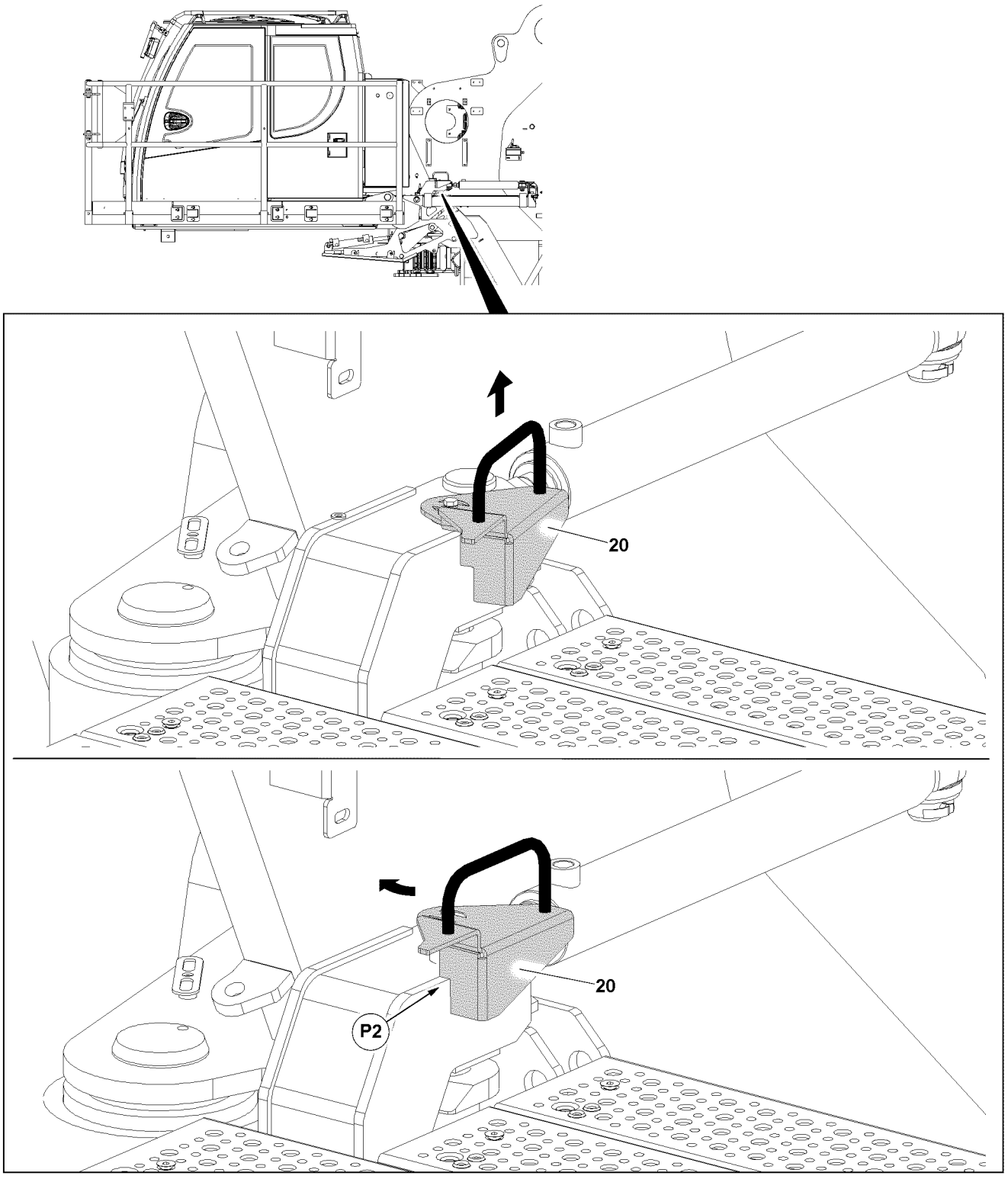

Fig.124497

14.2 Bringing the crane operator’s cab into the transport position

Make sure that the following prerequisite is met:
– The access stairs **17** are in the transport position.

▶ Unlock the crane operator’s cab: Pull the lock **20** up.
▶ Swing the lock **20** to the turntable.

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▶ Set the lock **20** with the recess in point **P2** on the steel structure of the turntable.

Result:

– The lock **20** is held in place in the top position.
– The crane operator's cab can be swung.

Note
▶ The lock **20** is spring-loaded.
▶ The lock **20** is automatically reset by the reset mechanism when the crane operator's cab is swung.

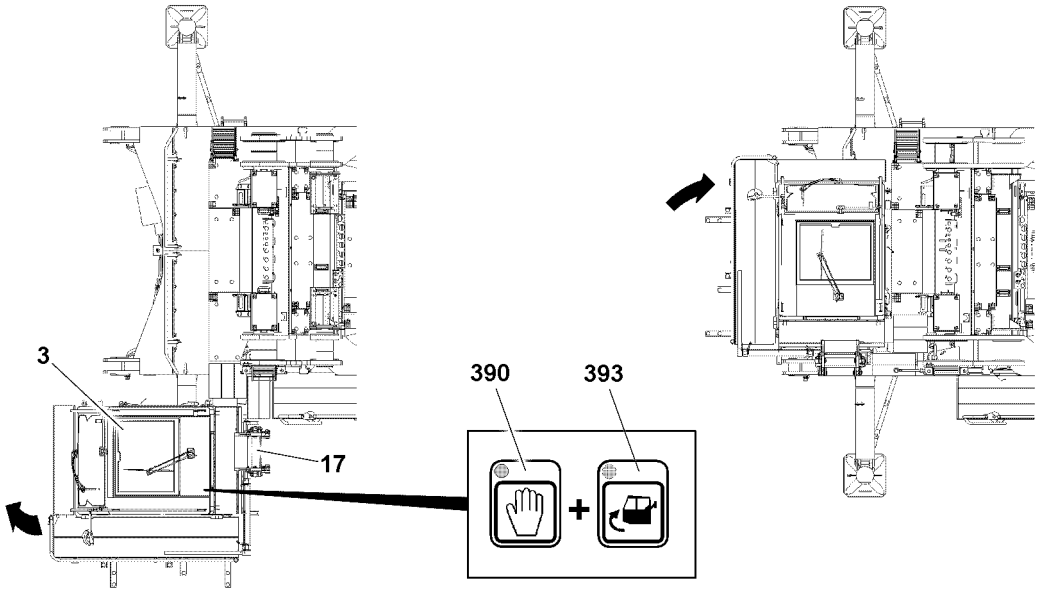

Fig.124498

▶ Start the engine, see section „Starting the engine".

When the motor is running:
▶ Swing the crane operator's cab in: Press the button **390** and button **393**.

When the crane operator's has reached the transport position:
▶ Release the button **390** and button **393**.

Note
▶ The crane operator's cab can be swung out by the BTT, see chapter 5.31.

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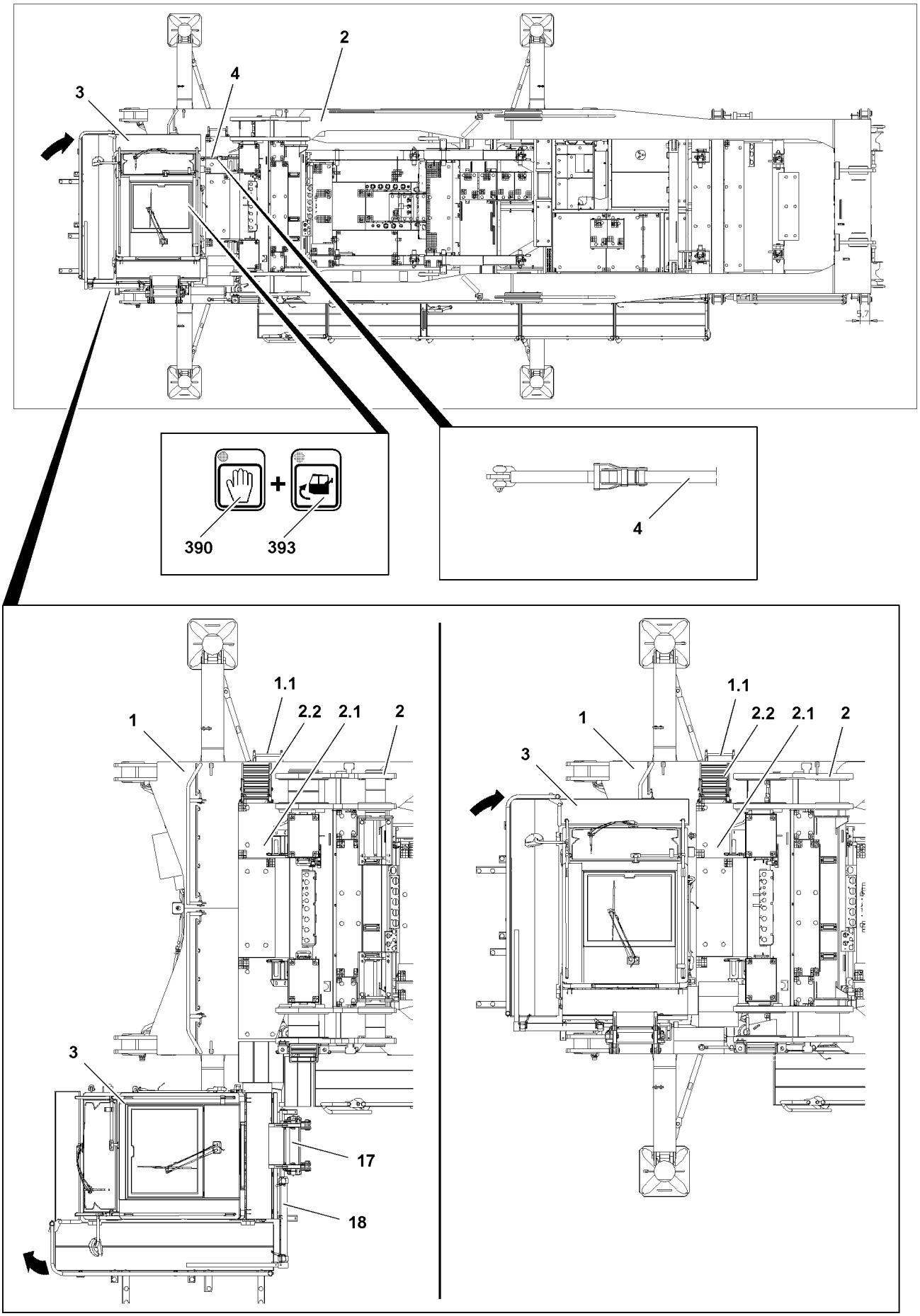

Fig.118199

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14.3 Securing the crane operator’s cab with the tension belt in transport position

▶ Guide the tension belt **4** through the shackle on the crane operator’s cab **3** and on the turntable frame main section **2**.

▶ Rig the crane operator’s cab **3** on the turntable frame main section **2** with the tension belt **4**.

Result:

– The crane operator’s cab **3** is secured in transport position.

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4.04 Safety equipment

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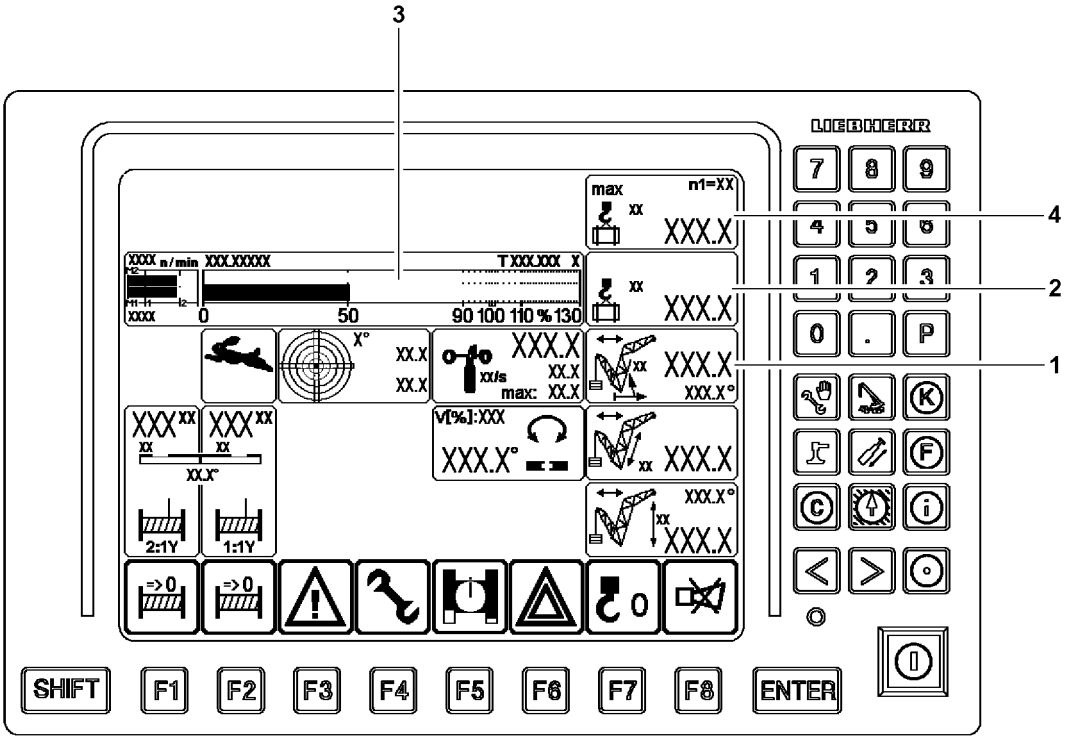

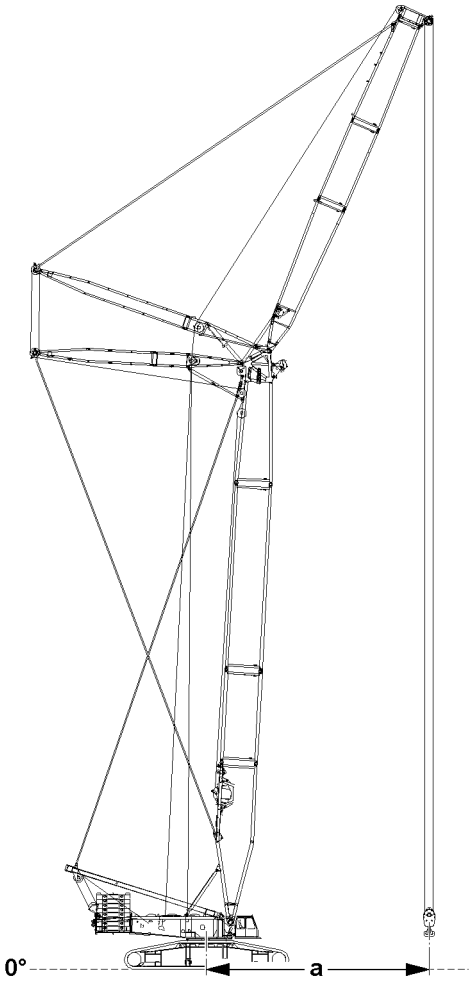

Fig.115293

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1 General

The crane operator is obligated before every crane operation to ensure that the warning and safety equipment are functioning.

WARNING
Danger of accident due to defective warning and safety systems!
If the crane is operated with defective warning and safety equipment, then there is a danger of accidents!
Personnel can be killed or seriously injured!
This could result in property damage!
▶ Make sure that all warning and safety equipment are functioning.
▶ Make sure that the overload protection is functioning.

2 Quick test Crane geometry

Make sure that the following prerequisites are met:
– The crane is aligned in horizontal direction.
– The set up configuration has been entered correctly into the LICCON computer system.
– There is no load on the hook.

Measure the horizontal distance of the load hook from the center of rotation of the crane superstructure on the ground:
– The value display radius **1** must match the measured value **a**.

3 Quick test Overload protection

Fasten a known weight, for example a counterweight plate. Then lift the counterweight plate completely and then set it down.

Make sure that the following prerequisite is met:
– The crane is aligned in horizontal direction.

The respective displayed values must be plausible:
– **2** Actual load display
– Utilization bar **3**: Ratio of value of Actual load display **2** to maximum load value **4**
– Example:
  Value Actual load display **2** is 100 t.
  Maximum load value **4** is 200 t.
  Utilization bar **3** shows 50 %.

4 LICCON computer system

The LICCON computer system is a system for controlling and monitoring mobile cranes. In addition to the LICCON overload safety device (Load torque limiter = LMB), there are a number of application programs that can be used for controlling and monitoring the crane movements. For a detailed description see Crane operating instructions, chapter 4.02 and chapter 4.20.

4.1 LICCON overload safety device

The LICCON overload safety device is programmed to **shut off** the crane movements if the permissible load moment is exceeded (LMB-STOP).

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The LICCON overload safety device may not be used as an operational shut off device for crane movements of any kind.

An overload protection cannot detect all occurring conditions by itself. Careful and diligent crane operation by the crane operator is important.

The basis for the calculation of the utilization of the crane are:
- The currently data and values recorded by the crane control.
- The set up configuration entered by the crane operator.

Direct influence is taken, among others:
- Failure of a test device (for example: Pull test brackets, angle sensor, pressure sensor).
- A set up configuration incorrectly or deviating entered by the crane operator.
- Environmental influences not considered (such as wind influence, ground with insufficient load bearing capability).
- Assembly and operating errors.

WARNING
Danger of accident due to assembly and operating errors!
Due to assembly and operating errors it is possible that the overload protection is not effective or shut off is delayed!
A set up configuration which deviates from the load chart cannot be detected by the overload protection!
Environmental influences which are not considered cannot be detected by the overload protection!
Dangerous situations and accidents can result!
Personnel can be killed or seriously injured!
This could result in property damage!
▶ Always assemble and operate the crane carefully!

WARNING
Operational utilization of the overload protection!
If the LICCON overload safety device is utilized as an operational shut off device for crane movements, then there is a danger of accidents!
For example, crane movements can be shut off abruptly or uncontrolled!
The behavior of load and crane cannot be foreseen in such a case!
Personnel can be killed or seriously injured!
This could result in property damage!
▶ Do not use the LICCON overload safety device as an operational shut off device for crane movements!

WARNING
Lifting of unknown loads!
The presence of the overload protection does not relieve the crane operator of his obligation for care and attention!
The crane may not only be operated according to the displays of the LICCON overload safety device!
Lifting of loads with unknown weight and unknown properties can lead to accidents!
Personnel can be killed or seriously injured!
This could result in property damage!
▶ Before lifting a load, its weight and properties must be known to the crane operator!
▶ The crane operator must check with the load chart if the crane is able to carry out the work safely!

The LICCON computer system detects various values, which result in optical and acoustical warnings if exceeded:

Within the crane operator's cab:
- Acoustic warning „Horn / short horn“ on the LICCON monitor
- Optical warning „blinking value / display“ on the LICCON monitor

Outside the crane operator's cab:
- Acoustic warning via the horn on the turntable
- Optical warning via the warning light on the turntable

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All warnings, even those which do not lead to an immediate shut off must be noted by the crane operator and personnel within the danger zone.

The overload protection can **not** detect (examples of cases):
- The hooking of the load or the load handling equipment
- Excessive retarding forces
- Loads falling onto the rope
- Angular pulling
- Driving the crane on ground with large slope
- Collapsing ground

4.1.1 Failure of the overload protection

WARNING
Crane operation without overload protection!
If the LICCON overload safety device is no longer functioning properly because of one or more errors, then there is a danger of accidents if crane operation is continued!
Due to operation of the crane with failed LICCON overload safety device, the crane can be overloaded and collapse!
Personnel can be killed or seriously injured!
This could result in property damage!
- ▶ Crane operation without overload protection is prohibited!
- ▶ Place the boom system down if necessary according to the specification in the crane documentation!
- ▶ Do not take up crane operation again until the overload protection is functioning again!

A failed overload protection:
- Must be repaired before the crane can be operated again.
- May only be bypasses in emergency cases or emergency situations.

4.2 Bypass of overload protection

The overload protection can be bypassed in case of:
- Failure of the overload protection
- In an emergency situation (according to EN 13000:2010)

4.2.1 Bypass of overload protection: Failure of the overload protection

Note
- ▶ Applies **not** for cranes with configuration according to EN 13000:2010!

To bring the crane into safe condition after failure of a component required for the overload protection, it can be necessary that the overload protection has to be bypassed.

WARNING
Bypassed overload protection!
If the overload protection is bypassed, crane movements are no longer monitored!
The crane can be overloaded and collapse!
Personnel can be killed or seriously injured!
This could result in property damage!
- ▶ Then carry out only crane movements in the range of a valid load chart!
- ▶ Place the boom system down if necessary according to the specification in the crane documentation!

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4.2.2 Bypass of overload protection: Failure of overload protection (according to EN 13000:2010)

Note
▶ Applies **only** for cranes with configuration according to EN 13000:2010!

To bring the crane into safe condition after failure of a component required for the overload protection, it can be necessary that the overload protection has to be bypassed.

With the specification that:
– The bypass is automatically reset at engine stop.
– The bypass is automatically reset after no later than 30 minutes.
– The bypass of the overload protection limits the working speed to no more than maximum 15 %.

WARNING
Bypassed overload protection!
If the overload protection is bypassed, crane movements are no longer monitored!
The crane can be overloaded and collapse!
Personnel can be killed or seriously injured!
This could result in property damage!
▶ Then carry out only crane movements in the range of a valid load chart!
▶ Place the boom system down if necessary according to the specification in the crane documentation!

4.2.3 Bypass of overload protection: Emergency situation (according to EN 13000:2010)

In an emergency situation, a bypass of the overload protection may become necessary.

With the specification that:
– The bypass is automatically reset at engine stop.
– The bypass is automatically reset after no later than 30 minutes.
– The bypass of the overload protection limits the working speed to no more than maximum 15 %.

DANGER
Overload of crane!
After a bypass of the overload protection, the crane movements are no longer shut off in case of a danger of overload of the crane!
An overload of the crane can result in severe damage or collapse!
Personnel can be killed or seriously injured!
This could result in property damage!
▶ Do not subject the crane to such a load that it collapses!
▶ Clear and secure the danger zone of the crane!

Note
▶ Location of bypass device, see Crane operating instructions, chapter 4.01 and chapter 4.02.

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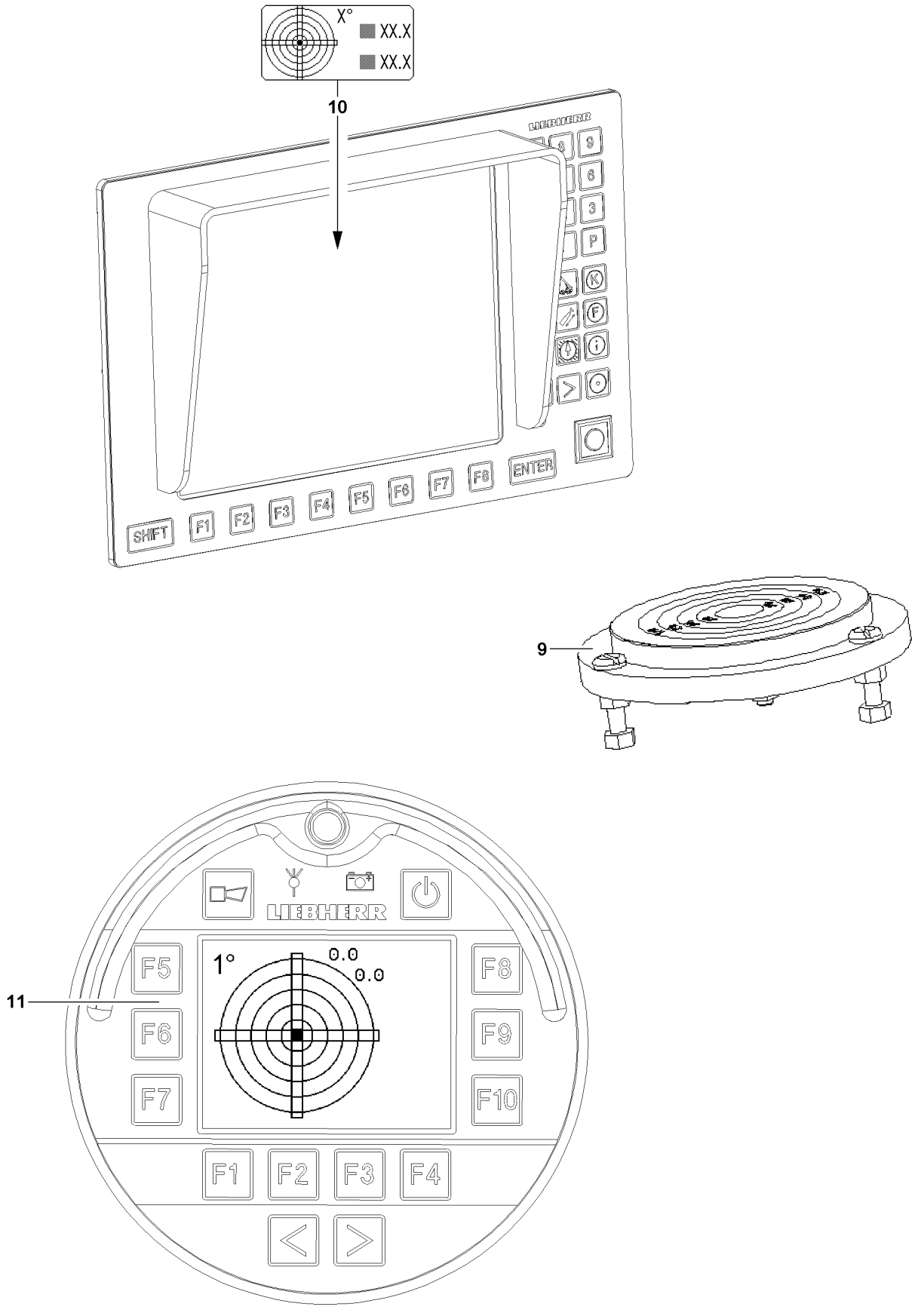

Fig.115294

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5 Safety systems on the crane

5.1 Leveling instruments

To ensure the working safety of the crane, the crane must be aligned on level ground with sufficient load bearing capacity according to the load chart.

The current values are continuously shown in the Incline icon **10**, see Crane operating instructions, chapter 4.02.

The incline is shown manually in the sight gauge **9** on the crawler travel gear.

WARNING
The crane can topple over!
If the leveling instruments are defective or incorrectly adjusted, there is a danger that the crane is not aligned according to the load chart!
A crane which is not aligned according to the load chart can topple over!
Personnel can be killed or seriously injured!
This could result in property damage!
▶ Make sure to align the crane according to the load chart!

5.1.1 Leveling instruments in the LICCON monitor

The incline of the crane is shown in the Incline icon **10** graphically as well as numerically, see Crane operating instructions, chapter 4.02.

5.1.2 Leveling instrument in the Bluetooth™ Terminal (BTT)

Note
▶ Applies only for cranes with Bluetooth™ Terminal (BTT).

The incline of the crane is shown in the Incline display menu **11** graphically as well as numerically, see Crane operating instructions, chapter 3.05 and 5.31.

5.1.3 Quick test Leveling instrument

Note
The horizontal alignment of the crane can be checked with a spirit level on the top of the slewing ring, for example.
▶ The alignment of the top of the slewing ring is the determining factor for the incline display.

Make sure that the following prerequisites are met:
– The crane is aligned in horizontal direction.
– There is no load on the hook.

For horizontally aligned crane:
– The sight gauge **9** on the crawler travel gear must show 0°.
– In the incline icon **10** 0° must always be shown.

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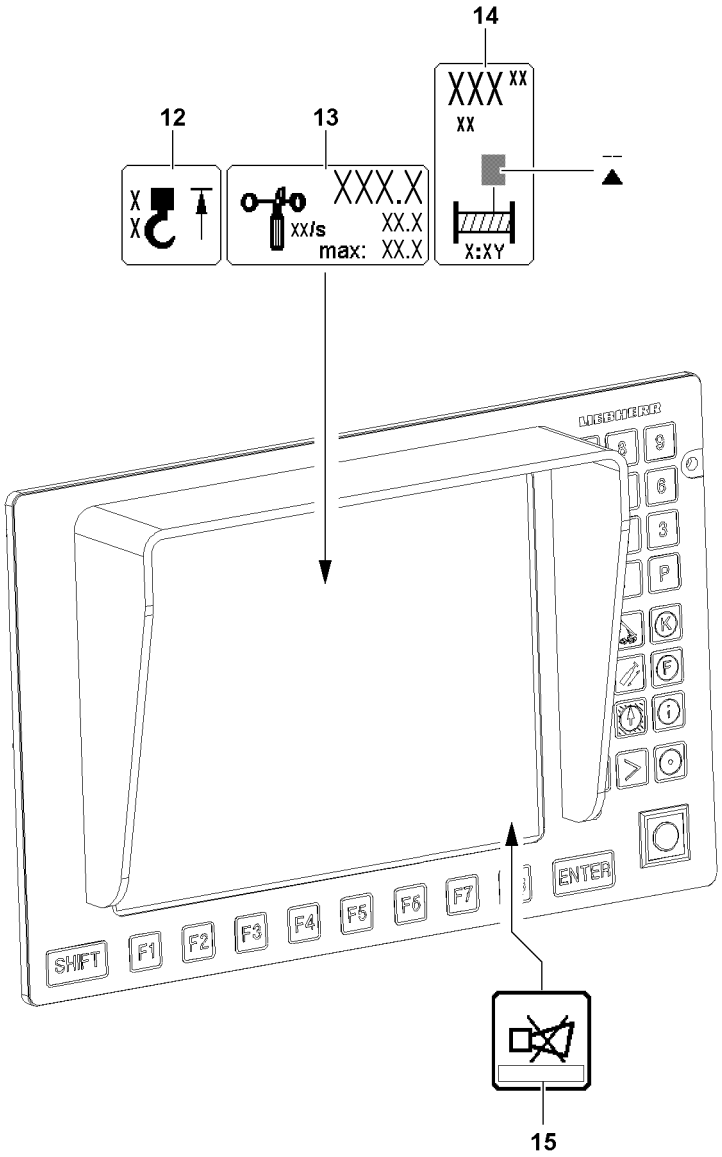

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Fig.115295

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5.2 Acoustic and optical warning devices

Note

▶ Overview of acoustic and optical warnings, see Crane operating instructions, chapter 4.20.

– The acoustic and optical warning devices must be functioning and operational.
– Take care of any possible detriments in function, such as snow on the warning lights.

5.3 Hoist limit switch „Hoist top“

The hoist limit switch is intended to prevent the hook block from running against the boom head.

Before every crane application, the function of the hoist limit switch must be checked by running against the switch weight with the hook block.

For installation purposes and in emergency cases, the hoist limit switch can be bypassed, see Crane operating instructions, chapter 4.20.

WARNING
Falling load and property damage!
If the hoist limit switch is defective, there is the danger that the hook block or the load hook is pulled against the pulley head!
Falling load and property damage can result!
Personnel can be severely injured or killed!
▶ Crane operation without or with defective hoist limit switch is prohibited!
▶ Repair or replace a defective hoist limit switch!

The hoist limit switch must actuate when the hoist limit switch weight is lifted by the load hook / hook block:
– When the hoist limit switch is actuated, the icon **12** „Hoist top“ appears in the operating screen. The crane movement „Spool winch up“ as well as other crane movements which have an influence on the hoist rope are shut off.

5.3.1 Quick test Hoist limit switch

When the hoist limit switch weight is lifted:
– The icon **12** „Hoist top“ must appear in the operating screen.
– The actuated crane movement must be shut off.

5.4 Error messages by the LICCON computer system

Two types are differentiated (all crane types except LR1400/2):
– Operating errors
  • Displayed in field **15** by error number / LEC: B.....
– System errors in LICCON computer system
  • Displayed in field **15** by error number / LEC: E.....

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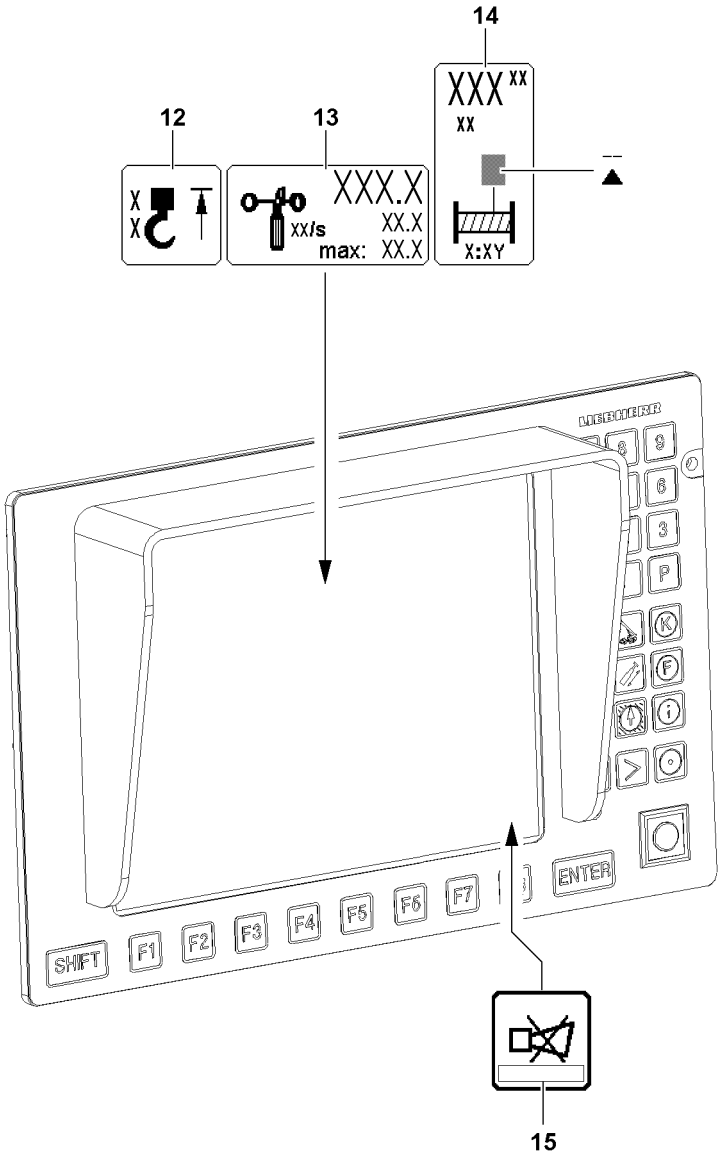

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5.5 Wind speed sensor

The wind warning by the wind speed sensor appears in the operating screen of the LICCON computer system.

WARNING
The crane can topple over!
If the crane is operated with a defective wind speed sensor, then there is the danger that excessively high wind speeds are not recognized!
The crane can topple over!
Personnel can be killed or seriously injured!
This could result in property damage!
▶ Crane operation with a defective wind speed sensor is prohibited!
▶ Repair / replace a defective wind speed sensor!

If wind occurs, then the wind speed sensor must report it speed:
– If the actual wind speed value exceeds the displayed maximum value, the value in the icon **13** „Wind speed“ starts to blink and the acoustic alarm „Short horn“ sounds on the LICCON monitor. But there is **no shut off** of crane movements.

Note
▶ To set the wind speed, see Crane operating instructions, chapter 4.02.

5.5.1 Quick test Wind speed sensor

When blowing in the cups:
– The wind speed sensor must start to move.
– An actual value must be shown in the icon **13** „Wind speed“.

5.6 Limit switch winch spooled out

The limit switches for the winches are adjusted at the factory. If used properly, the winches will not need readjustment.

Note
Minimum rope coils on the shut off point!
For the winches, a minimum of three rope coils are set for each drum.
▶ The shut off must occur **before** reaching the third minimum rope coil.

WARNING
The load can fall off!
If the limit switch „Winch spooled out“ does not turn off **before** three minimum rope coils are reached, then there is the danger, when it is further spooled out, that the rope mounting locks are ripped out and the load falls down!
Falling load can cause the crane to sway and / or topple over!
Personnel can be severely injured or killed!
This could result in property damage!
▶ Crane operation with an incorrectly or non-adjusted winch is strictly prohibited!
▶ If the winch falls below the three minimum rope coils per winch, have it readjusted by **Liebherr Service**!

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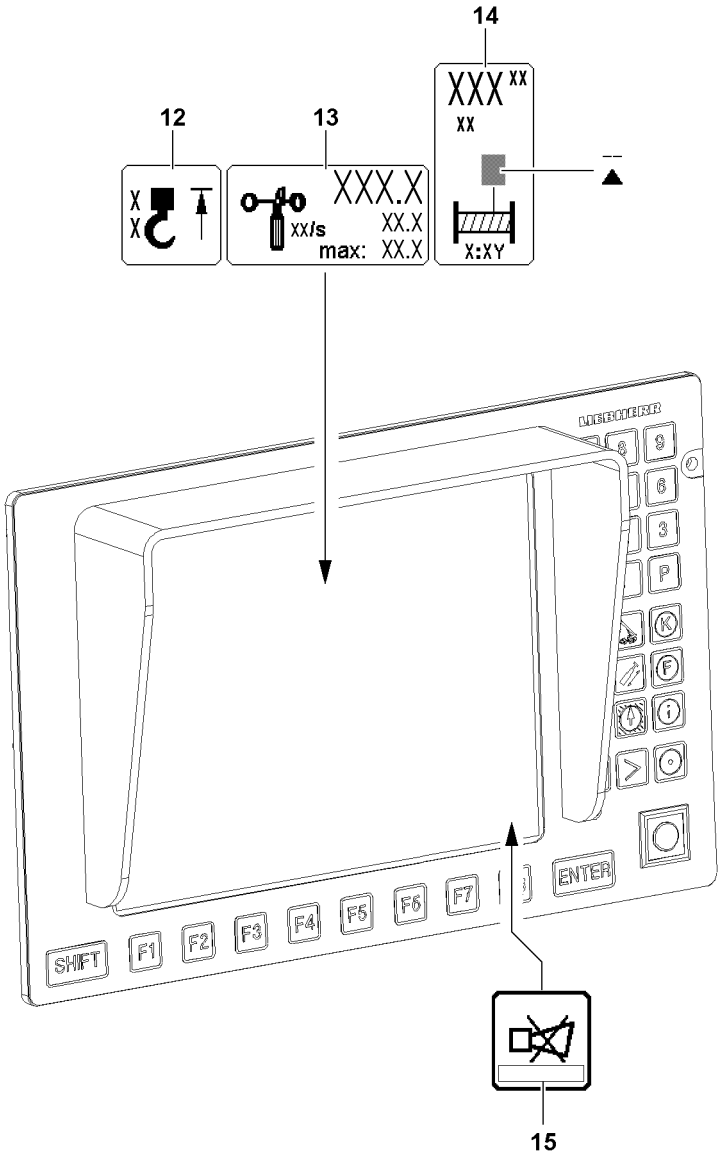

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WARNING
The load can fall off!
If the rope is not spooled up or out properly, then the adjustment of the limit switch „Winch spooled out“ is changed!
If the adjustment of the limit switch „Winch spooled out“ has changed, then the minimum rope coils are fallen below!
The load call fall down!
Falling load can cause the crane to sway and / or topple over!
Personnel can be severely injured or killed!
This could result in property damage!
▶ **Never** pull the end of rope underneath the winch by spooling up the rope winch!
▶ **Never** pull the rope from the „stationary“ winch!
▶ If you suspect that the limit switch „Winch spooled out“ is not adjusted correctly: Check the shut off without a load on the hook!

The limit switch „Winch spooled out“ must shut off when the minimum rope coils for the winch are reached:
– When the minimum rope coil for the winch is reached, then the display „Winch spooled out“ appears in the Winch icon **14**, see illustration. The crane movement „Spool winch out“ is shut off.

5.6.1 Quick test Limit switch winch

When the minimum rope coil is reached:
– The display „Winch spooled out“ must appear in the Winch icon **14**.
– The crane movement „Spool winch out“ must be shut off.

5.7 Servo oil pressure monitoring in the winches

– If no servo oil pressure is present when the master switch is actuated, a corresponding error message appears in field **15**.

5.8 Pressure monitoring in the relapse cylinders

Pressure sensors are installed in the hydraulic cylinders. The pressure measured with the pressure sensor is shown on the LICCON monitor, see Crane operating instructions, chapter 4.02.

WARNING
Danger of accident due to crane toppling over or destruction of the crane!
If the pressure drops, the relapse cylinder can no longer stabilize the boom!
The crane can topple over or be destroyed!
Personnel can be severely injured or killed!
▶ During crane operation: Constantly monitor the pressure in the relapse cylinders!

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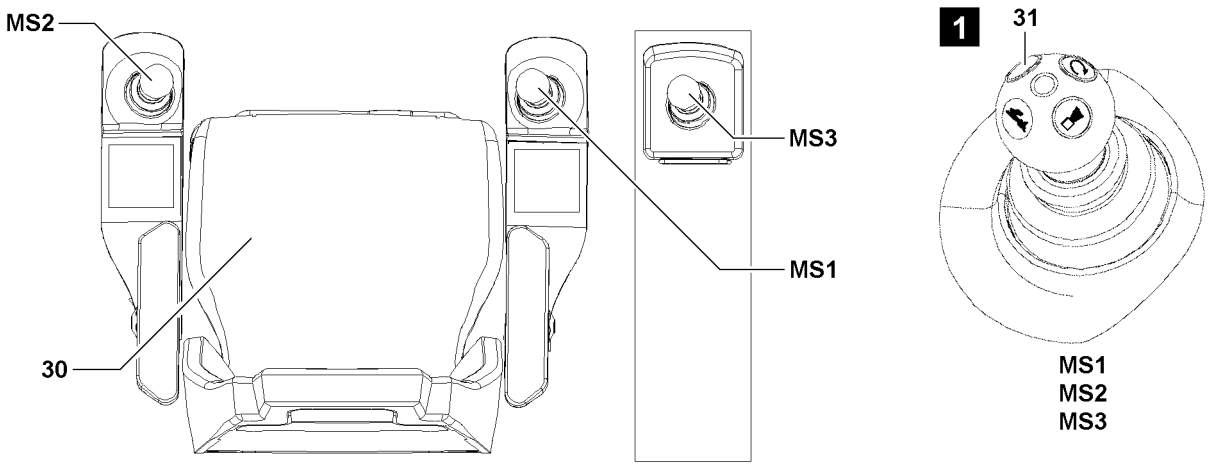

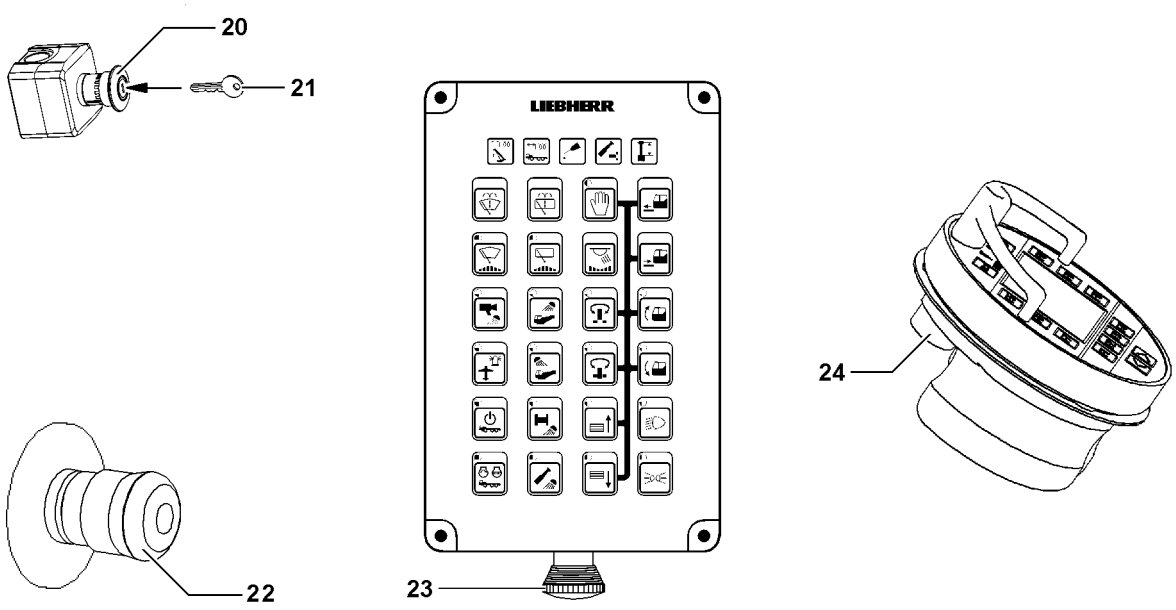

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5.9 EMERGENCY STOP switch / EMERGENCY OFF switch

If an EMERGENCY STOP switch / EMERGENCY OFF switch is actuated, then the crane movement can be stopped with it.

WARNING
Defective EMERGENCY STOP switch / EMERGENCY OFF switch!
If the crane is operated with a defective EMERGENCY STOP switch / EMERGENCY OFF switch, then the crane movement cannot be stopped by actuating the EMERGENCY STOP switch!
This could result in accidents!
Personnel can be killed or seriously injured!
This could result in property damage!
- ▶ Crane operation with a defective EMERGENCY STOP switch / EMERGENCY OFF switch is prohibited!
- ▶ Repair or replace a defective EMERGENCY STOP switch / EMERGENCY OFF switch!

NOTICE
Operational actuation of the EMERGENCY STOP switch / EMERGENCY OFF switch
Actuation of the EMERGENCY STOP switch / EMERGENCY OFF switch causes the crane movement to stop abruptly!
Abruptly stopping the crane movement can cause the load to swing!
Swinging loads can cause accidents!
- ▶ Do not use the EMERGENCY STOP switch / EMERGENCY OFF switch operationally!
- ▶ Use the EMERGENCY STOP switch / EMERGENCY OFF switch only in emergency situations!

The EMERGENCY STOP switch / EMERGENCY OFF switch is available in various versions, depending on the crane type:
- After actuation of a switch of version*** 20**, the release is only obtained by an authorized person with key **21** and by subsequently turning the ignition „Off - On“ momentarily.
- After actuation of the switch of version*** 22**, the release is obtained by turning and unlocking the knob and subsequently turning the ignition „Off - On“ momentarily.
- After actuation of the switch of version*** 23**, the release is obtained by turning and unlocking the knob and subsequently turning the ignition „Off - On“ momentarily.
- After actuation of the switch of version*** 24**, the release is obtained by turning and unlocking the knob and subsequently turning the ignition „Off - On“ momentarily.

Note
- ▶ Which EMERGENCY STOP switch / EMERGENCY OFF switch is on the crane depends on the crane type.
- ▶ The switch **24** on the BTT is only activated when working with the BTT.

5.9.1 Quick test EMERGENCY STOP switch / EMERGENCY OFF switch

After actuation of the EMERGENCY STOP switch / EMERGENCY OFF switch:
- The crane movements must be stopped.
- No crane movements must be possible until the release was issued by turning and unlocking the knob and then turning the ignition „Off - On“ momentarily.

5.10 Control release

The control release can be made via the following switches:
- **30** Seat contact button
- Button **31** on master switch **MS1** and **MS2** and **MS3**.

The seat contact button **30** shuts down the crane control as soon as the crane operator gets up from the seat.

This prevents unintended crane movements by accidentally touching the master switch, for example when getting in or out of the cab.

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Each one of the buttons **31** on master switch **MS1**, **MS2** and **MS3** bypasses the seat contact button **30** if needed, for example when it is necessary to work while standing up.

5.11 Hydraulic safety valves

A differentiation is made between three types:

- Pressure limiting valves
  - Prevent pipe and hose bursts due to excessive pressure.
- Shut off valves
  - Control and secure the working cylinders.
- Check valves
  - Control and secure the flow direction.

Note

▶ See separate Hydraulic schematic.

5.12 Gravity actuated relapse retainer

Note

▶ Only for cranes with luffing accessories.

The gravity actuated relapse retainer (oscillation guard / flap / relapse support) prevent luffing accessory from tipping to the rear in „steepest position“.

WARNING

The crane can topple over!
If the gravity actuated relapse retainer (oscillation guard / flap / relapse support) is hard to move, then it will no longer function!
Shut off and limit functions can be set out of service!
The crane can be overloaded and topple over!
Personnel can be killed or seriously injured!
This could result in property damage!

▶ Before erecting the crane, check the relapse retainer for easy movement!
▶ Crane operation with hard to move relapse retainer is prohibited!

5.13 Angle sensors

Note

▶ See separate Electrical diagram.

5.14 Test brackets (force test boxes)

Note

▶ See separate Electrical diagram.

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5.15 Limit switch Boom system

WARNING
Danger of toppling or destroying the crane!
If the crane movement is stopped by the block limit switches, then the load forces cannot be absorbed and calculated by the control!
The crane can be overloaded and topple over!
Personnel can be hit and killed or seriously injured!
This could result in property damage!

- ▶ Do **not** use the hoist limit switch as an operational shut off device!
- ▶ Do not actuate the block limit switches!

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4.05 Crane operation

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Fig.195219

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1 LICCON computer system

WARNING
Danger of accidents due to overload!
Death, severe bodily injuries, property damage.
▶ Constantly monitor the displays on the LICCON monitor.
▶ Observe changing utilization conditions and forces.

WARNING
Danger of accident!
Death, severe bodily injuries, property damage.
▶ The crane driver must evaluate constantly if the data shown on the operating screen can even be correct. He may not rely blindly on the LICCON system but must think for himself and must recognize a possible error or overload conditions.

For detailed description of the operation of the LICCON computer system, refer to Crane operating instructions, chapter 4.02.

Make sure that the following prerequisites are met:
– The crane is horizontally aligned.
– The ground is able to carry the weight of the crane, the load and the load handling equipment.
– The counterweight is attached and secured according to the data in the load chart.
– The Diesel engine is running.
– The crawler operation is turned off.
– The hook block is correctly reeved in according to the reeving plan.
– All safety equipment has been adjusted according to the data in the load chart.
– The winches are correctly assigned to the respective load positions, see Crane operating instructions, chapter 4.02.
– The crane is properly put into operation, see Crane operating instructions, chapter 4.03.
– The set up configuration has been entered in the LICCON computer system and all displays are within the permissible range, see the Crane operating instructions, chapter 4.02.
– There are no persons or objects in the danger zone.

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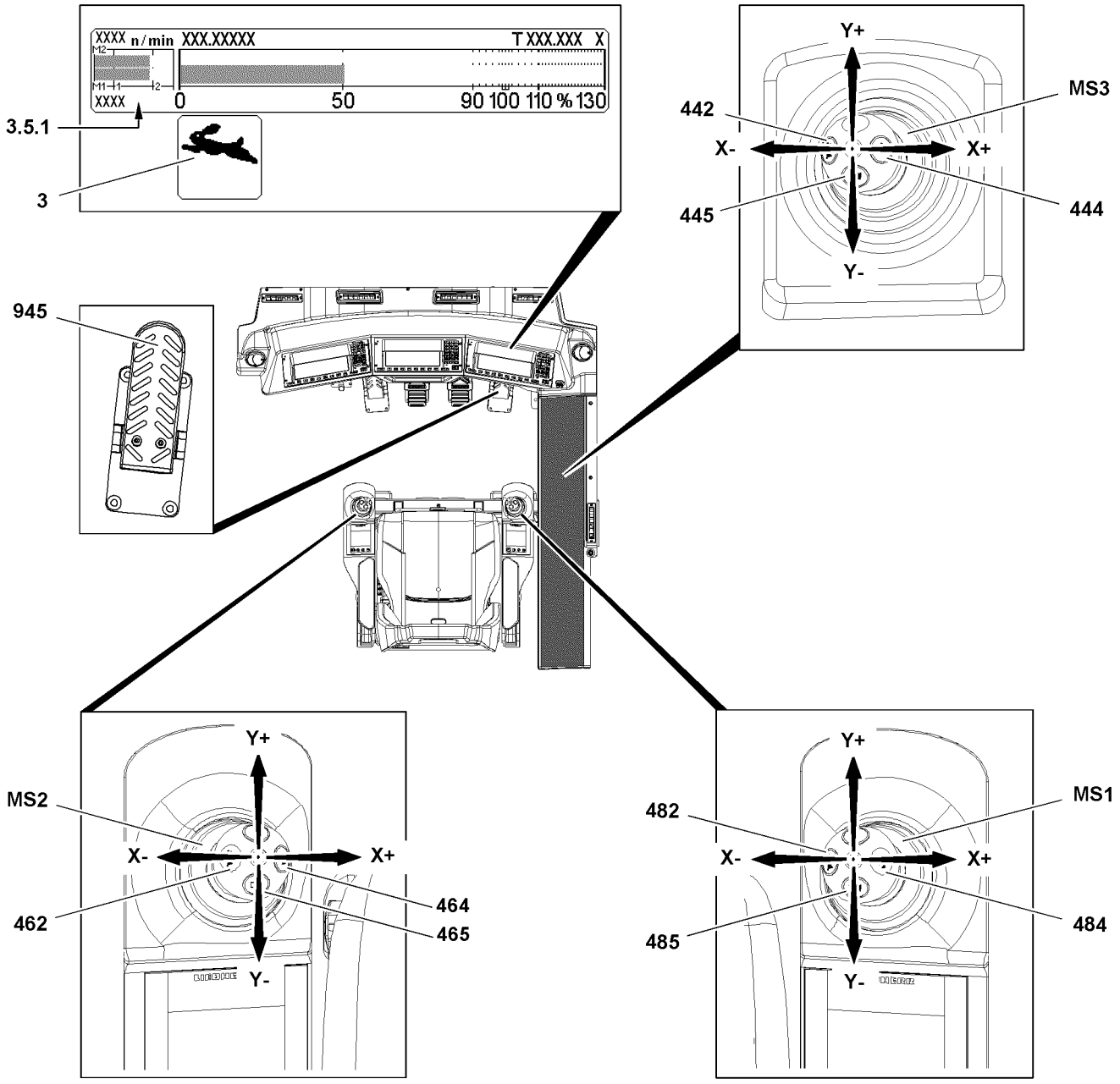

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Fig.122227

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2 Master switch functions

WARNING
Danger of fatal injury!
Death, severe bodily injuries, property damage.
- ▶ It is prohibited for personnel to remain in the danger zone.
- ▶ Make sure that there are no obstacles within the working area of the crane.
- ▶ Give a short warning signal (horn) before starting a crane movement.
- ▶ Observe the danger notes for crane operation, see Crane operating instructions, chapter 5.01.

Note
Change of master switch assignment!
The assignment of the master switches to the respective units on the crane can change, depending on the set up configuration and winch application.
- ▶ **Check the assignment before actuating the master switch on the TE.**

Note
- ▶ In order to protect the crane and reduce the danger of accidents always use the master switch slowly and sensitively.

2.1 Giving a warning signal

WARNING
Crane movement without warning signal!
Without warning signals, personnel within the danger zone of the crane can be surprised by a crane movement.
Death, severe bodily injuries, property damage.
- ▶ Before initiating a crane movement, give a warning signal (horn).

- ▶ Press the button **485** on the master switch **MS1**.
  or
  Press the button **465** on the master switch **MS2**.
  or
  Press the button **445** on the master switch **MS3**.

Result:

– Warning signal sounds.

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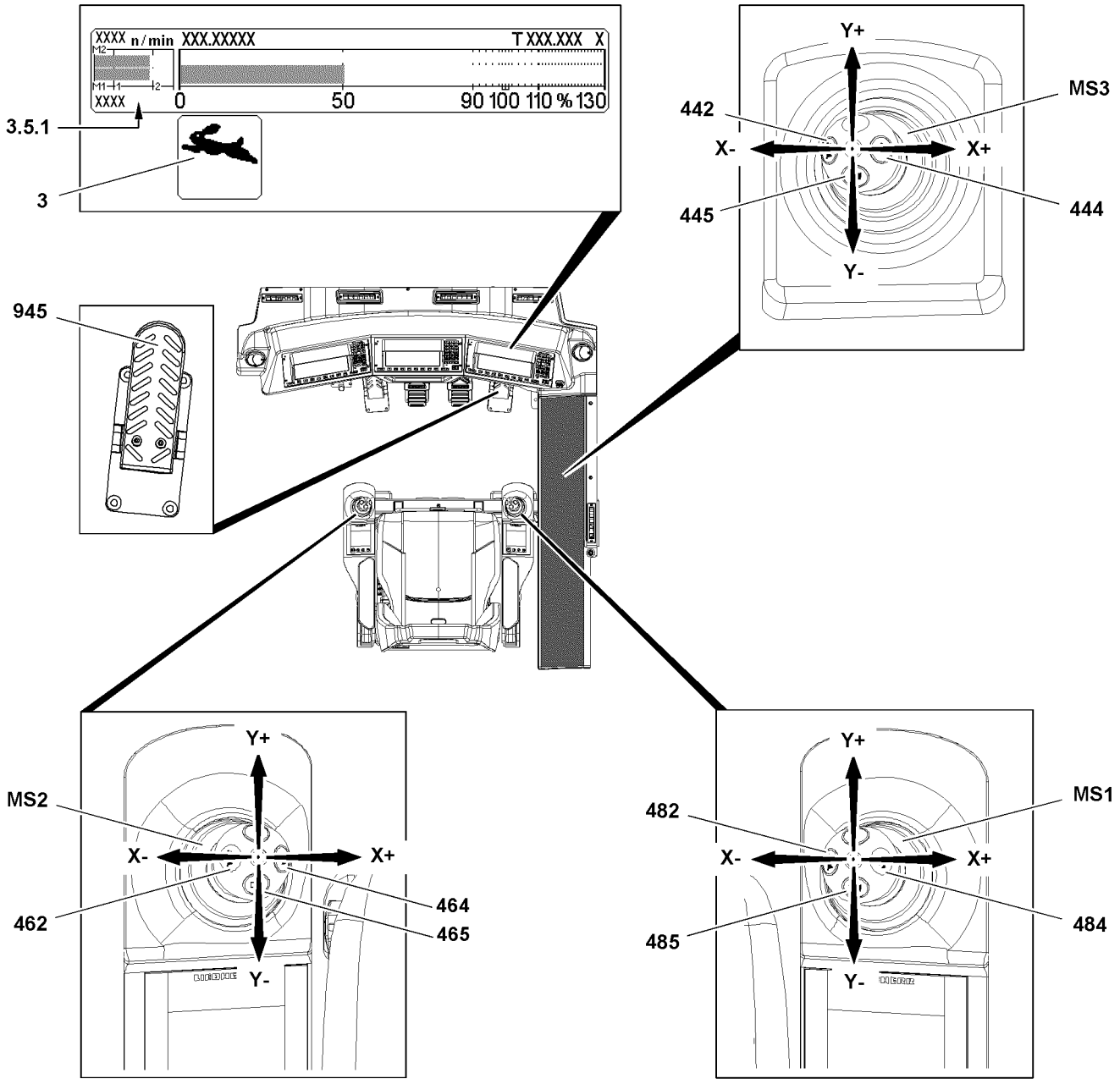

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Fig.122227

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2.2 Engine rpm

2.2.1 Locking the engine rpm

Locking the engine rpm relieves the crane operator if he needs to work for an extended period with constant rpm. The engine regulation can be locked in any position.

▶ Press the pedal **945** for the engine regulation down until the desired rpm is reached.
▶ Press the button **484**.
or
Press the button **464**.
or
Press the button **444**.

Result:

– The pedal **945** is locked and the engine rpm is saved.
– The icon „+“ appears behind the rpm display **3.5.1** on the LICCON monitor.

Note
▶ The locked engine rpm can be overridden by pressing the pedal **945**. If the button **484**, the button **464** or the button **444** is pressed during the override, the current rpm will be used.

2.2.2 Releasing the engine rpm lock

Make sure that the following prerequisite is met:
– The pedal **945** is not actuated.

When the engine rpm is locked:
▶ Press the button **484**.
or
Press the button **464**.
or
Press the button **444**.
or
Tap the pedal **945** momentarily.

Result:

– The engine rpm lock is revoked.
– The icon „+“ turns off behind the rpm display **3.5.1** on the LICCON monitor.

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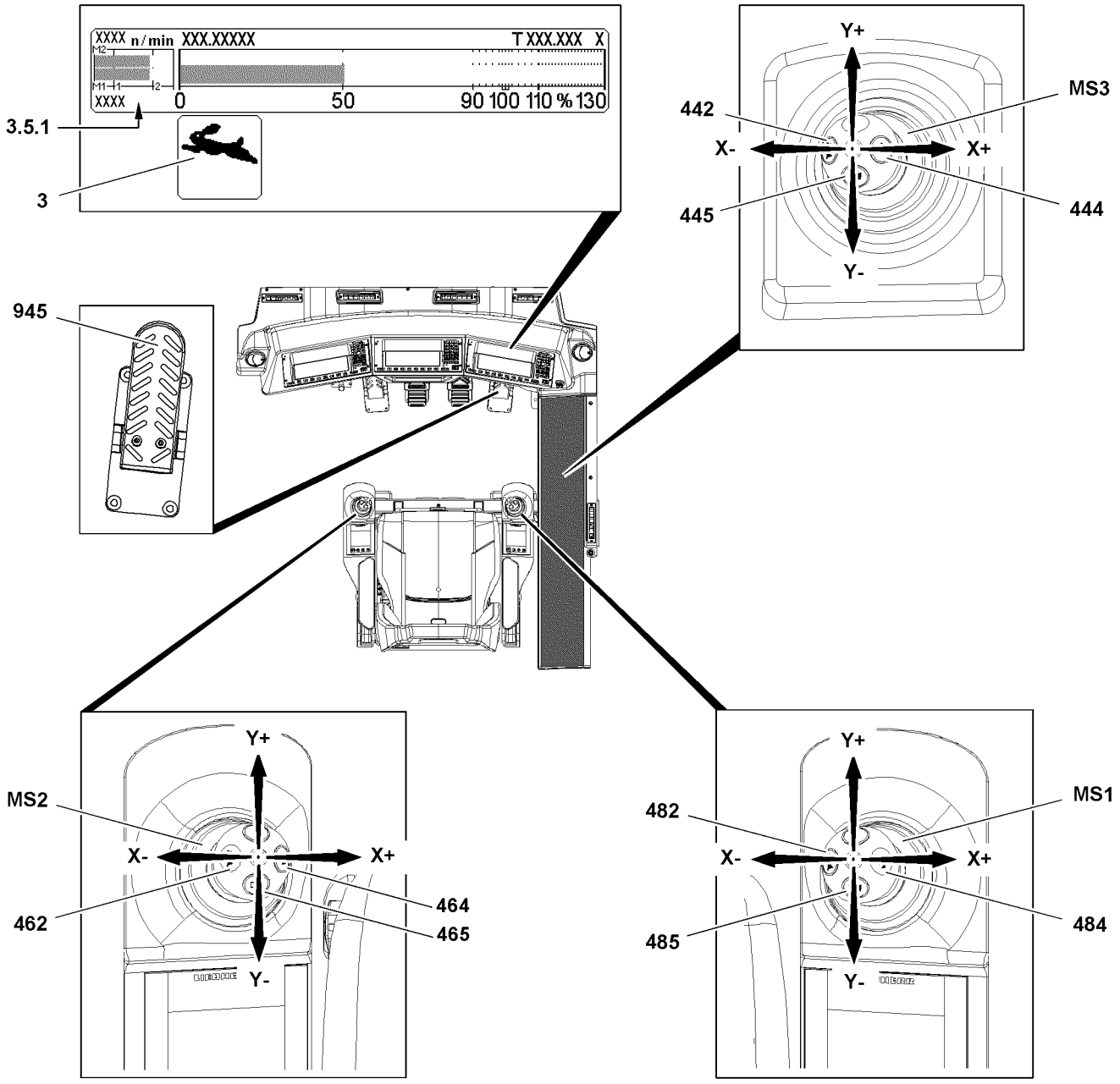

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2.3 „Power Plus“ rapid gear

Using the button **482**, the button **462** or the button **442** will increase the speed of the crane movement for „luffing up“, „luffing down“ and „lifting / lowering“.

WARNING
Danger of accident in the event of one to three strand reeving!
Death, severe bodily injuries, property damage.
- ▶ Do **NOT** turn the rapid gear on if the crane is loaded to more than 50 % of its maximum permitted load bearing capacity for the respective boom radius.

Note
When „Power Plus“ is turned on, observe the following:
- ▶ If the total power requirement of all actuated crane movements is larger than the available power, then the crane movements that require the most power are reduced.
- ▶ If another crane movement is added or taken back to one or more actuated crane movements then this has an influence on the other movements. For that reason we recommend in situations in which an interference of the individual crane movements is troublesome, not to add the „Power Plus“ or to turn the „Power Plus“ off.

Note
- ▶ The effectiveness of the rapid gear function „Power Plus“ depends on the size of the „speed reduction master switch“. If a small value is set for the speed reduction, then the rapid gear function „Power Plus“ is accordingly low.
- ▶ When the „Power Plus“ rapid gear is active and various crane movements are actuated at the same time, then speed reductions can occur.

2.3.1 Turning on „Power Plus“ rapid gear

- ▶ Press the button **482**.
  or
  Press the button **462**.
  or
  Press the button **442**.

Result:

– The rapid gear is switched on.
– The icon **3** appears on the LICCON monitor.

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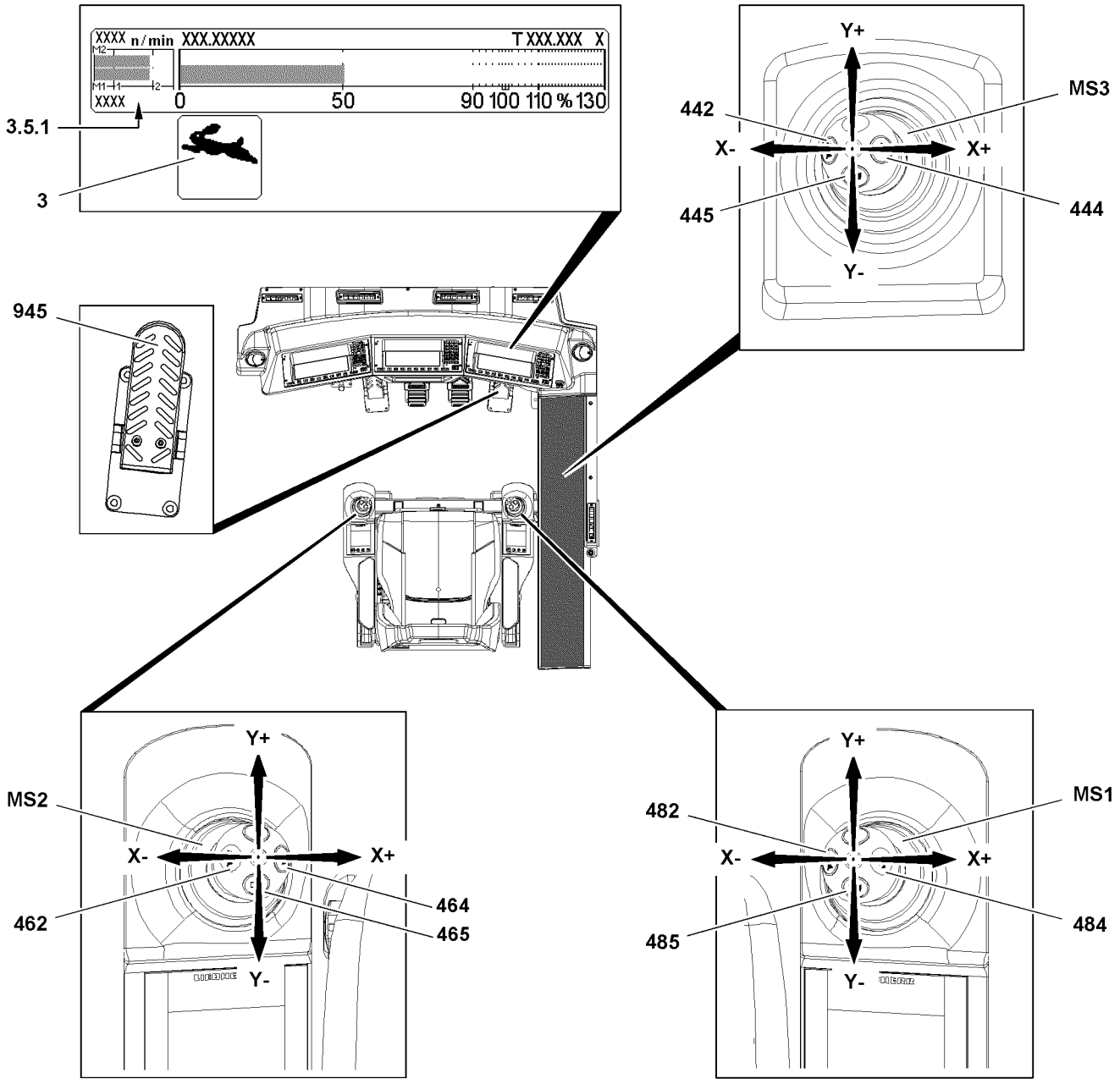

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2.3.2 Turning off „Power Plus“ rapid gear

When the rapid gear is turned on:

▶ Press the button **482**.
or
Press the button **462**.
or
Press the button **442**.

Result:

– The rapid gear is turned off.
– The icon **3** turns off on the LICCON monitor.

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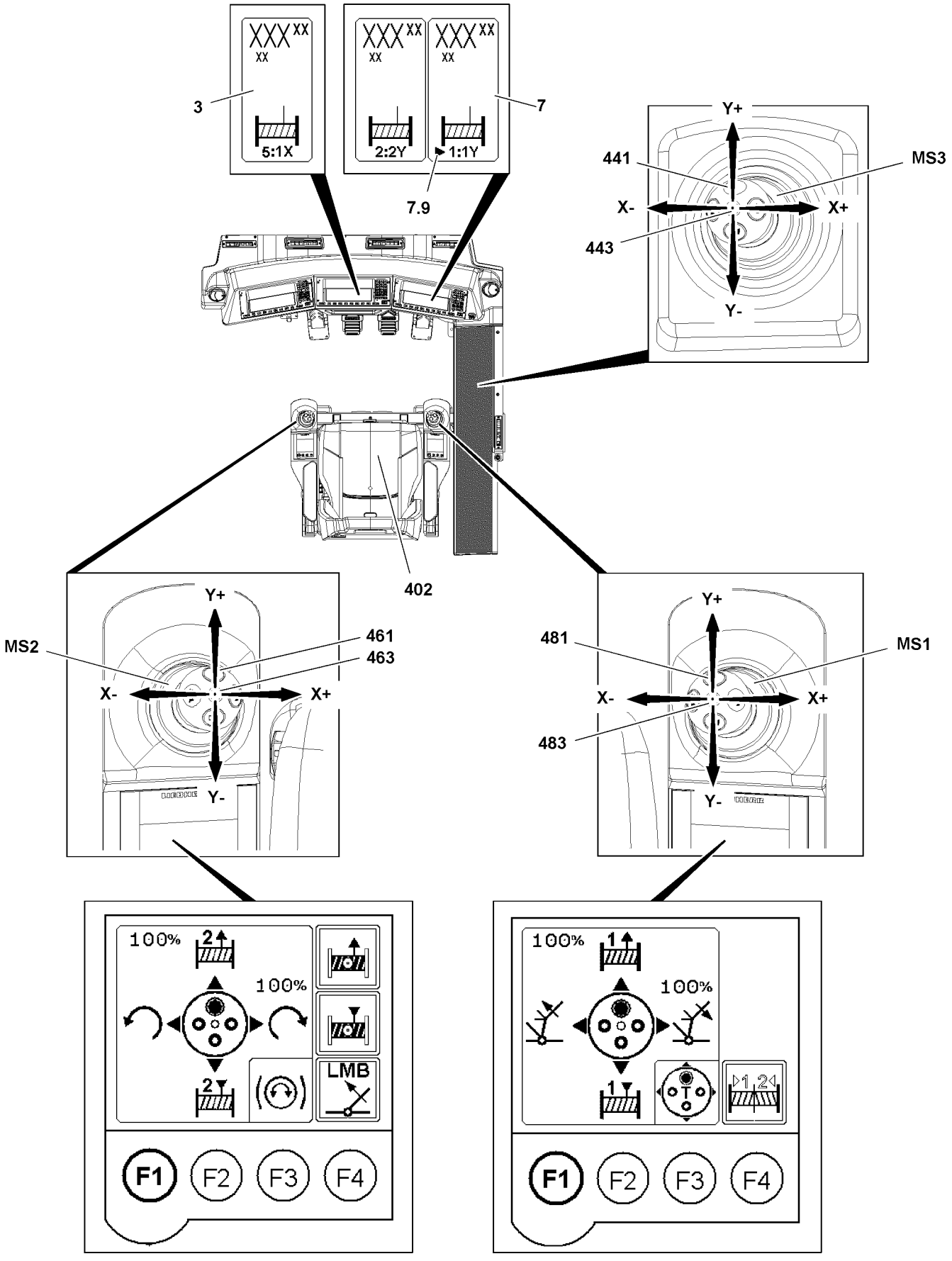

Fig.122228

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2.4 Vibration sensor

By adding on the vibration sensor, crane movements also can be detected via master switch vibration.

Note

▶ After the vibration sensor on the master switch is activated, the vibration sensor can be assigned to a deflection axle. To assign the vibration sensor to another deflection axle, the master switch must first be brought back into zero position. Then the master switch must be deflected in the other deflection axle.

Make sure that the following prerequisite is met:
– The seat contact button **402** is actuated.

2.4.1 Vibration sensor winches

This section applies for the deflection axles for hoist winches and for the control winches on the master switches:
– **MS1** Master switch
– **MS2** Master switch
– **MS3** Master switch

Note

When the vibration sensor is activated on one master switch:
▶ For very winch, which is assigned to the master switch, the icon **7.9** before every winch display appears on the LICCON monitors, see example for winch 1 in the illustration.
▶ The vibration sensor is activated on one master switch exclusively for the movement axle that was deflected first.
▶ When a movement axle is deflected and a winch is actuated, the icon **7.9** for the other winches turns off on the winch displays.
▶ For description of winch displays on the LICCON monitors, see sections „Winch display“, Crane operating instructions, chapter 4.02.

Adding the vibration sensor winch 1

This example shows how the vibration sensor for winch 1 is added, master switch **MS1** at master switch assignment „T“.

▶ Press the button **481**.

Result:

– The vibration sensor **483** on the master switch **MS1** is turned on.
– In the winch display **7** for winch 1 and in the winch display **3** for winch 5, luffing jib, appears the icon **7.9**, see illustration.

▶ Deflect the master switch **MS1** in Y-direction.

Result:

– In the winch display **7** for winch 1, the icon **7.9** remains visible, the other icons turn off.
– The vibration sensor for winch 1 is activated.

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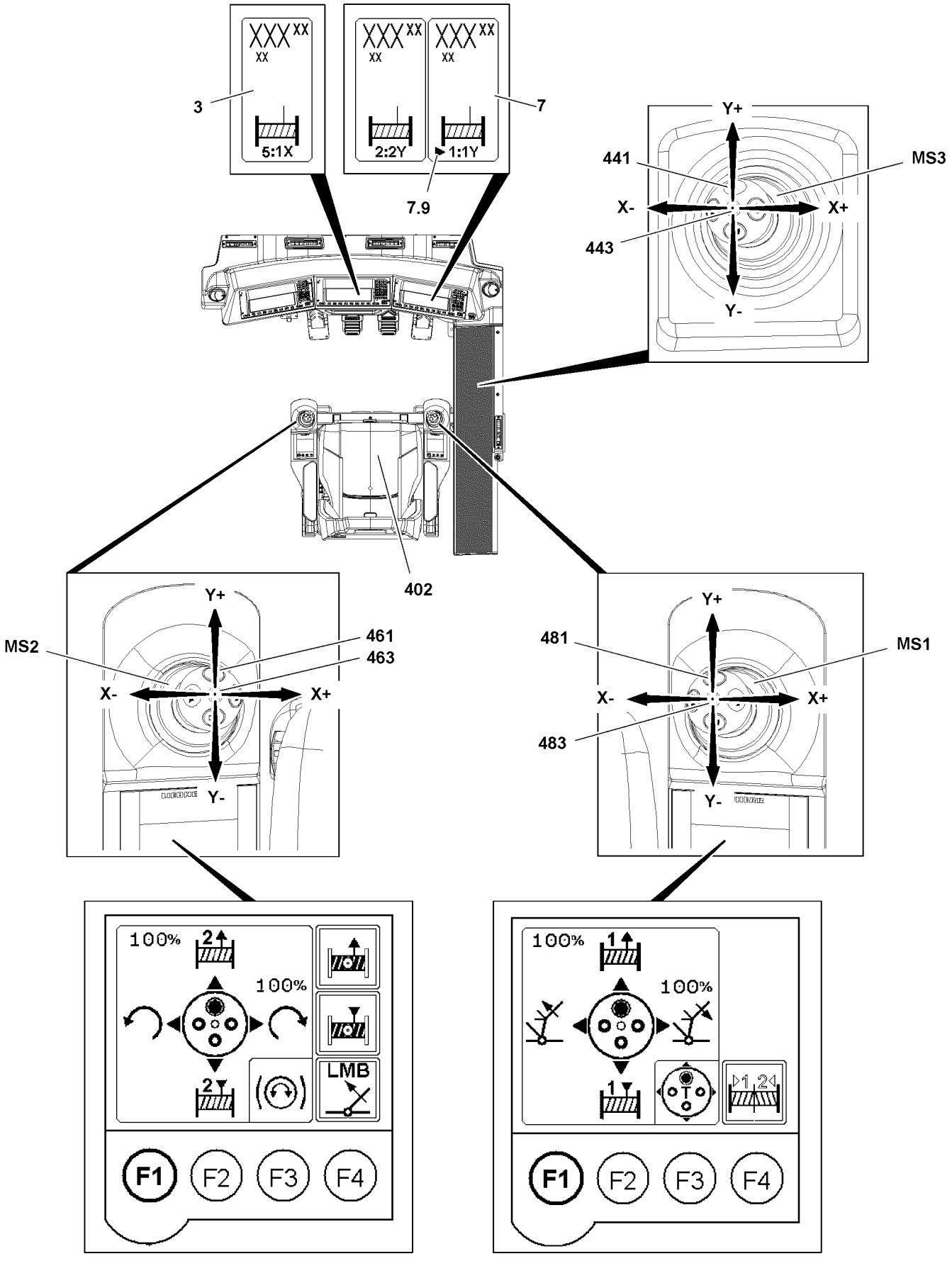

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Turning the vibration sensor winch 1 off

When the vibration sensor **483** for winch 1 is turned on:
▶ Press the button **481**.

Result:

– The vibration sensor **483** on the master switch **MS1** is deactivated and turned off.
– The icon **7.9** turns off in the winch display **7** for winch 1.

2.4.2 Vibration sensor slewing gear

This section applies for the deflection axle for the slewing gear on master switch **MS2**.

Note
▶ The vibration sensor for the slewing gear is **NOT** displayed by an icon on the LICCON monitor.
▶ The vibration sensor is activated on one master switch exclusively for the movement axle that was deflected first.
▶ If a movement for the slewing gear is deflected, then the icons **7.9** for the winches on the winch displays turn off.

Adding the vibration sensor for the slewing gear

This example shows how the vibration sensor for the slewing gear is added, master switch **MS2** at master switch assignment „T“.

▶ Press the button **461**.

Result:

– The vibration sensor **463** on the master switch **MS2** is turned on.

▶ Deflect the master switch **MS2** in X-direction.

Result:

– The vibration sensor for the slewing gear is activated.

Turning the vibration sensor for the slewing gear off

When the vibration sensor **463** for the slewing gear is turned on:
▶ Press the button **461**.

Result:

– The vibration sensor **463** on the master switch **MS2** is deactivated and turned off.

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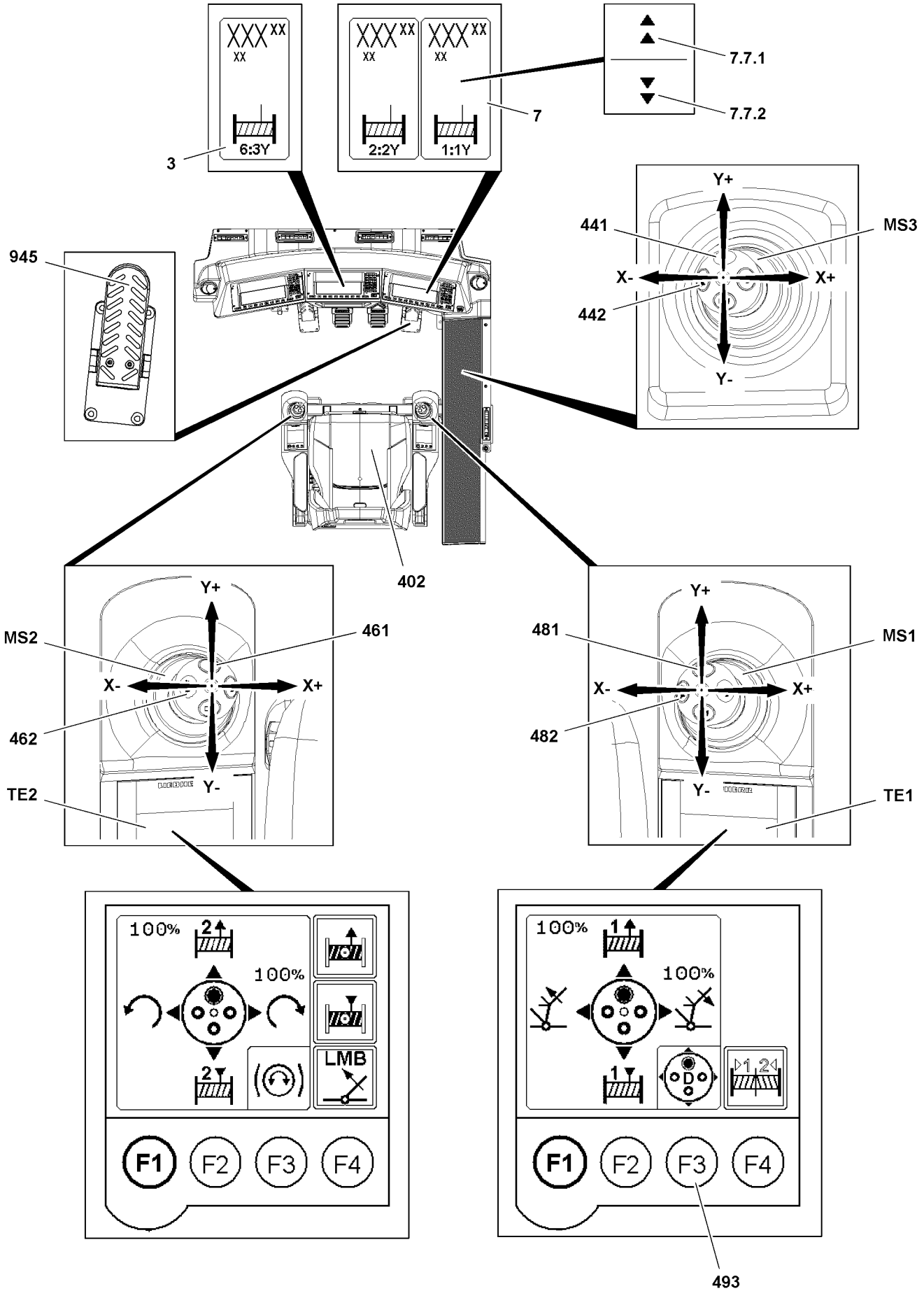

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3 Lifting and lowering

The speed of crane movement „lifting and lowering“ is controlled via the deflection of the corresponding master switch and via the pedal **945** of the engine regulation.

The maximum winch speed can be reduced or increased in the „Speed reduction master switch“ menu, see Crane operating instructions, chapter 4.02.

Every winch can be blocked or released, see section „TE1 Menu block winch“, Crane operating instructions, chapter 4.01.

Note

- The seat contact button **402** in the crane operator's seat can be bypassed by the button **481** on the master switch **MS1** or the button **461** on the master switch **MS2** or the button **441** on the master switch **MS3**.
- For description of winch displays on the LICCON monitors, see Crane operating instructions, chapter 4.02.
- For description of the touch functions and the icons on the individual touch displays, see Crane operating instructions, chapter 4.01.

Note

- With the button **482**, the button **462** or the button **442** the speed of the crane movement „lift / lower“ is increased, see section „Rapid gear Power Plus“.

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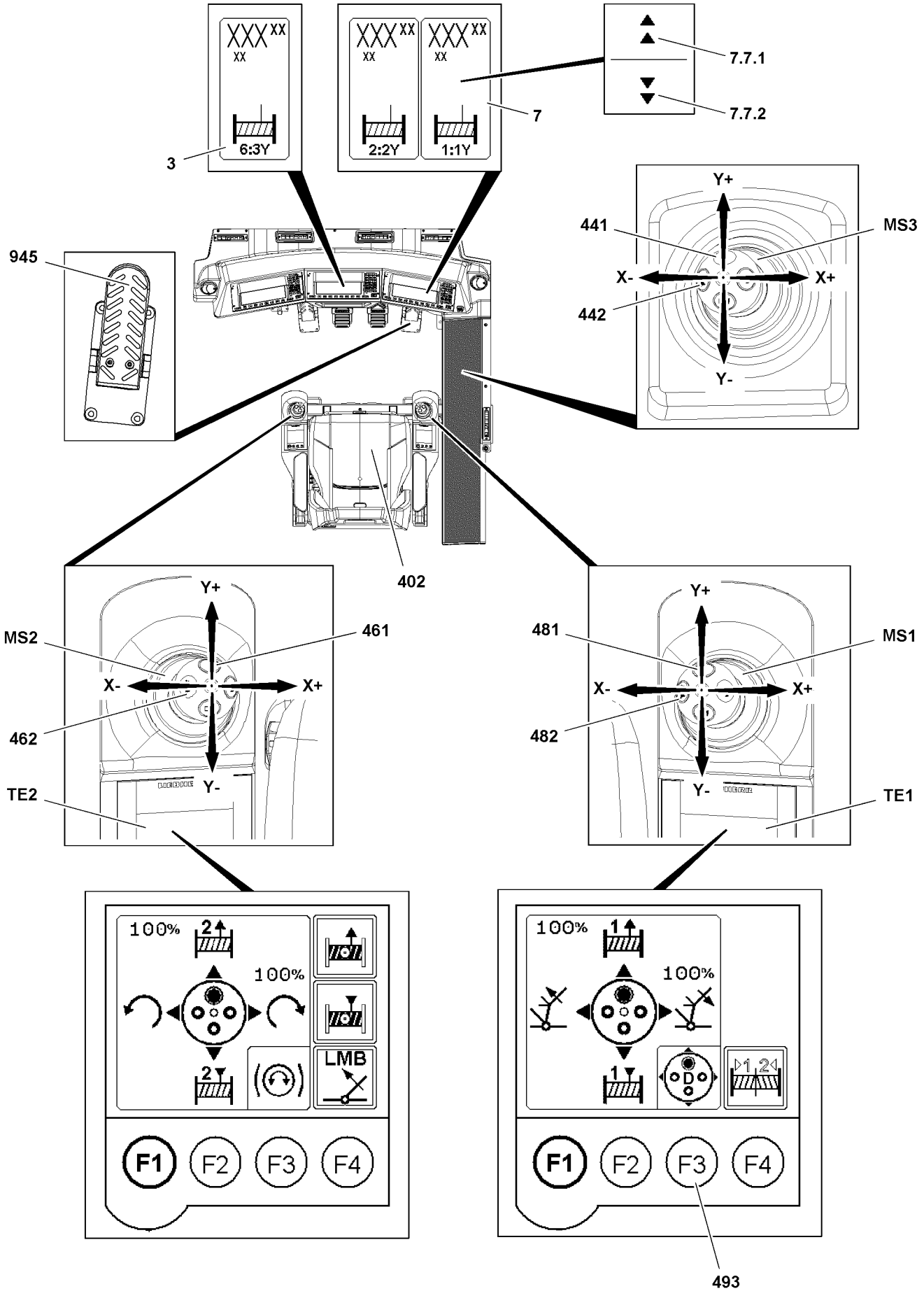

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3.1 Spooling the hoist winches up and out

Note
Change of master switch assignment!
The assignment of the master switches to the respective units on the crane can change, depending on the set up configuration and winch application.
▶ **Check the assignment before actuating the master switch on the TE.**

This section is valid for the following winches:
- Winch 1 and winch 2
- Winch 6 as hoist winch

In the winch display **7** and in the winch display **3** on the LICCON monitors is shown that the winch is turning, even if no hook movement is visible due to multiple reeving and low speed:
- Winch display **7** for winch 1 and winch 2
- Winch display **3** for winch 6 and the control winches

Make sure that the following prerequisites are met:
- The master switches are in the neutral position.
- The crane is at a standstill.
- On the touch displays, the assignment of the main menu is visible.
- The seat contact button **402** is activated or the button **481**, button **461** or button **441** is pressed.

3.1.1 Spooling the hoist winch out

This example shows how the winch 1 is spooled out, master switch **MS1** at master switch assignment „D“.

In this assignment, winch 2 on master switch **MS2** and winch 6 on master switch **MS3** are spooled out the same way.

▶ Select the master switch assignment: Press the F3-key **493** on the touch display **TE1** until the master switch assignment „D“ appears.
▶ Deflect the master switch **MS1** in direction Y+.

Result:

– The icon **7.7.1** appears in the winch display and blinks.
– The winch spools out, the load is lowered.

Problem remedy
Winch blocked?
When a winch is blocked, then the crane movement is also blocked.
▶ Release the winch, see section „Blocking the winch (touch display right)“, Crane operating instructions, chapter 4.01.

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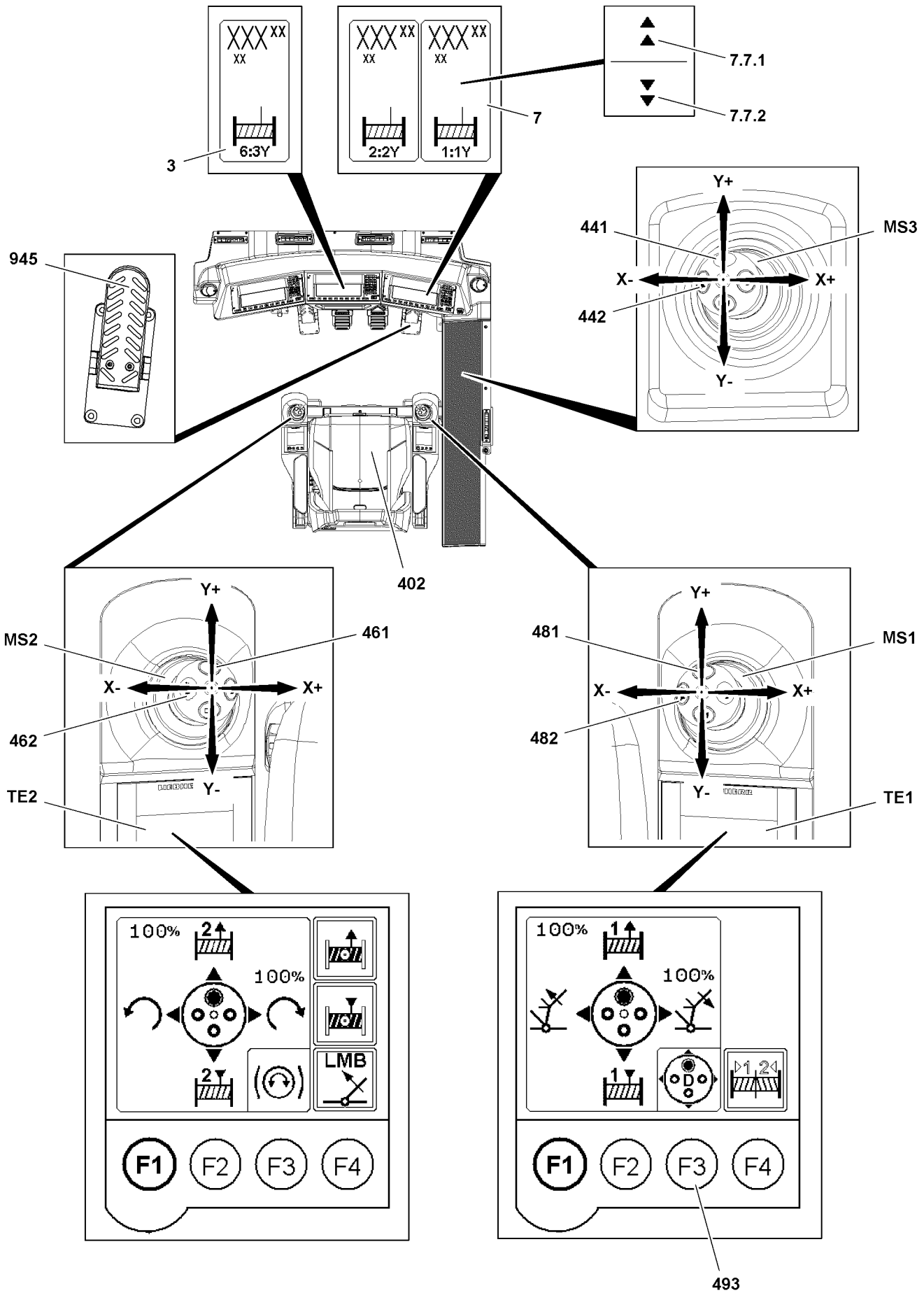

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3.1.2 Spooling the hoist winch up

This example shows how the winch 1 is spooled out, master switch **MS1** at master switch assignment „D“.

In this assignment, winch 2 on master switch **MS2** and winch 6 on master switch **MS3** are spooled out the same way.

▶ Deflect the master switch **MS1** in direction Y-.

Result:

– The icon **7.7.2** appears in the winch display and blinks.
– Winch spools up and the load is lifted.

3.2 Setting up parallel operation

For parallel operation, winch 1 and winch 2 are used.

In parallel operation, winch 1 and winch 2 are actuated simultaneously with the master switch **MS1**.

Make sure that the following prerequisites are met:
– All rope pulleys, change over pulleys and test pulleys on the boom system are free of contamination, snow, frost and ice.
– The pulley blocks of the hook block are installed together, see Crane operating instructions, chapter 5.19 or separate operating instructions.
– The pulley blocks of the hook block are reeved according to the load charts.
– The pulley blocks of the hook block are properly reeved according to the reeving plan, see separate reeving plan.
– The minimum reeving according tot he reeving plan may not be fallen below.
– The total reeving has been entered on the LICCON monitor.
– The number of the reeving of the hoist ropes for every winch must be identical and even.

WARNING
Danger of accident!
Death, severe bodily injuries, property damage.
▶ The number of the reeving of the hoist ropes for every winch in parallel operation must be identical and even.
▶ Make sure to unpin the transport pins on the roller blocks before the horizontal alignment and before crane operation.
▶ Make sure that the danger zone of the hook blocks is free of any personnel.

3.2.1 Adapting to the wind speed

In the case or rope reevings> 2 x 20-way, the wind speed must be reduced to 70 %.

▶ Call up the setting window Speed reduction Master switch / pedal sensor, see Crane operating instructions, chapter 4.02
▶ Reduce the master switch for crane movement *Spooling winch 1II2 up / out* to 70 %.

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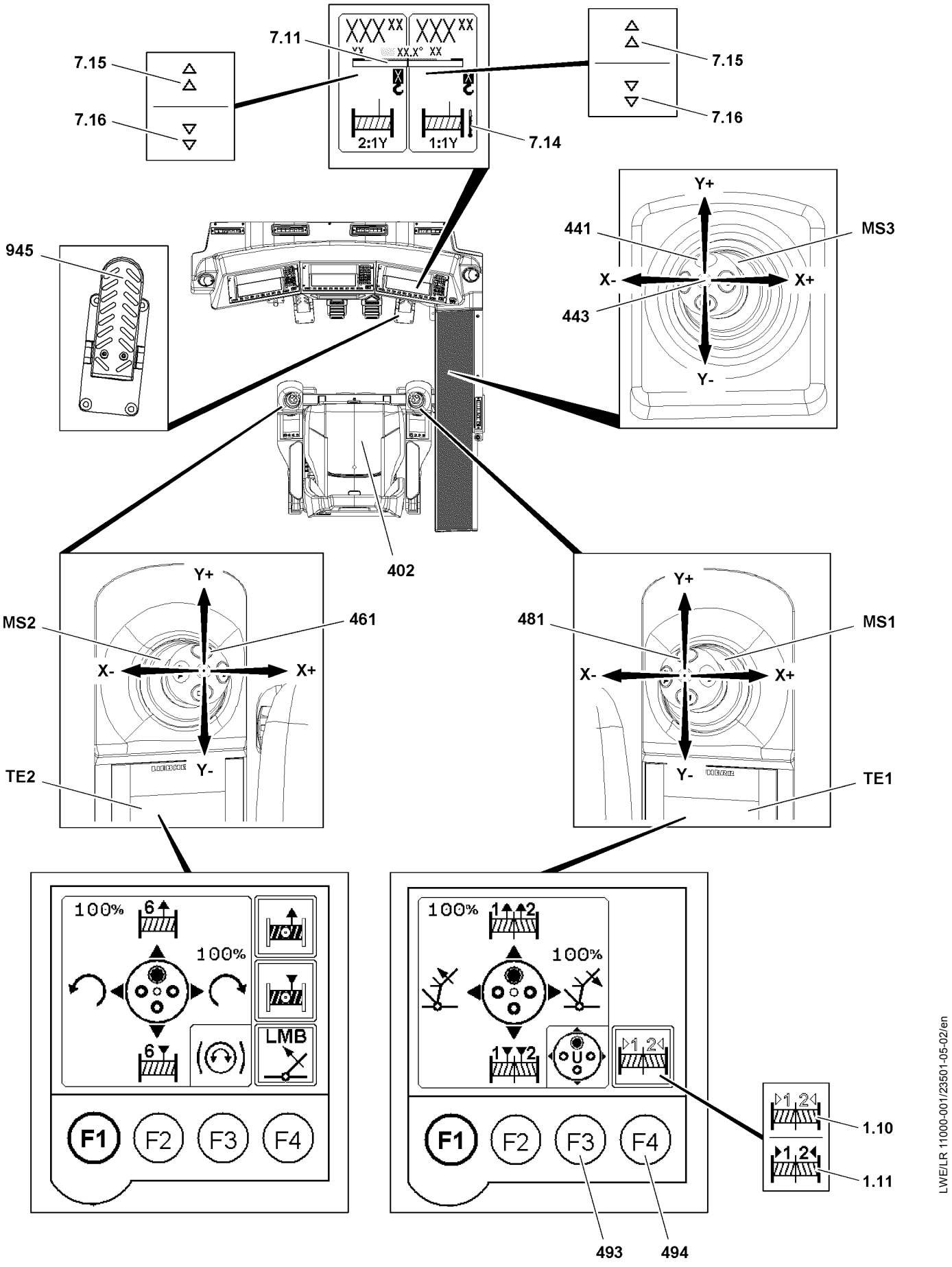

Fig.145930

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3.2.2 Horizontally aligning the hook block

Make sure that the following prerequisite is met:
– Winch 1 and winch 2 are **NOT** adjusted.

The hook blocks align horizontally through visual check and the icons on the winch display.

To align the hook blocks horizontally, proceed depending on the icons in the winch display **7**:
– If the icon **7.15** appears in the winch display, you have to spool the corresponding winch out.
– If the icon **7.16** appears in the winch display, you have to spool the corresponding winch up.

Set individual operation for winch 1 and winch 2:

▶ Press the F3 key **493** until the master switch assignment for individual operation of winch 1 and winch 2 is displayed.

Winch 1 can only be controlled if the seat contact switch **402 and** the button **481** are actuated at the same time:
▶ Spool winch 1 out or up until the hook block is aligned horizontally.
or

Winch 2 can only be controlled if the seat contact switch **402 and** the button **461** are actuated at the same time:
Spool winch 2 out or up until the hook block is aligned horizontally.

Note
▶ In order to horizontally align winch 1 or winch 2 for the alignment of the hook block, the seat contact switch **402 and** the button **481** must be actuated at the same time.

▶ Press the F3 key **493** until the master switch assignment for the parallel operation of winch 1 and winch 2 is displayed.

Result:

– Winch 1 and winch 2 can be adjusted.

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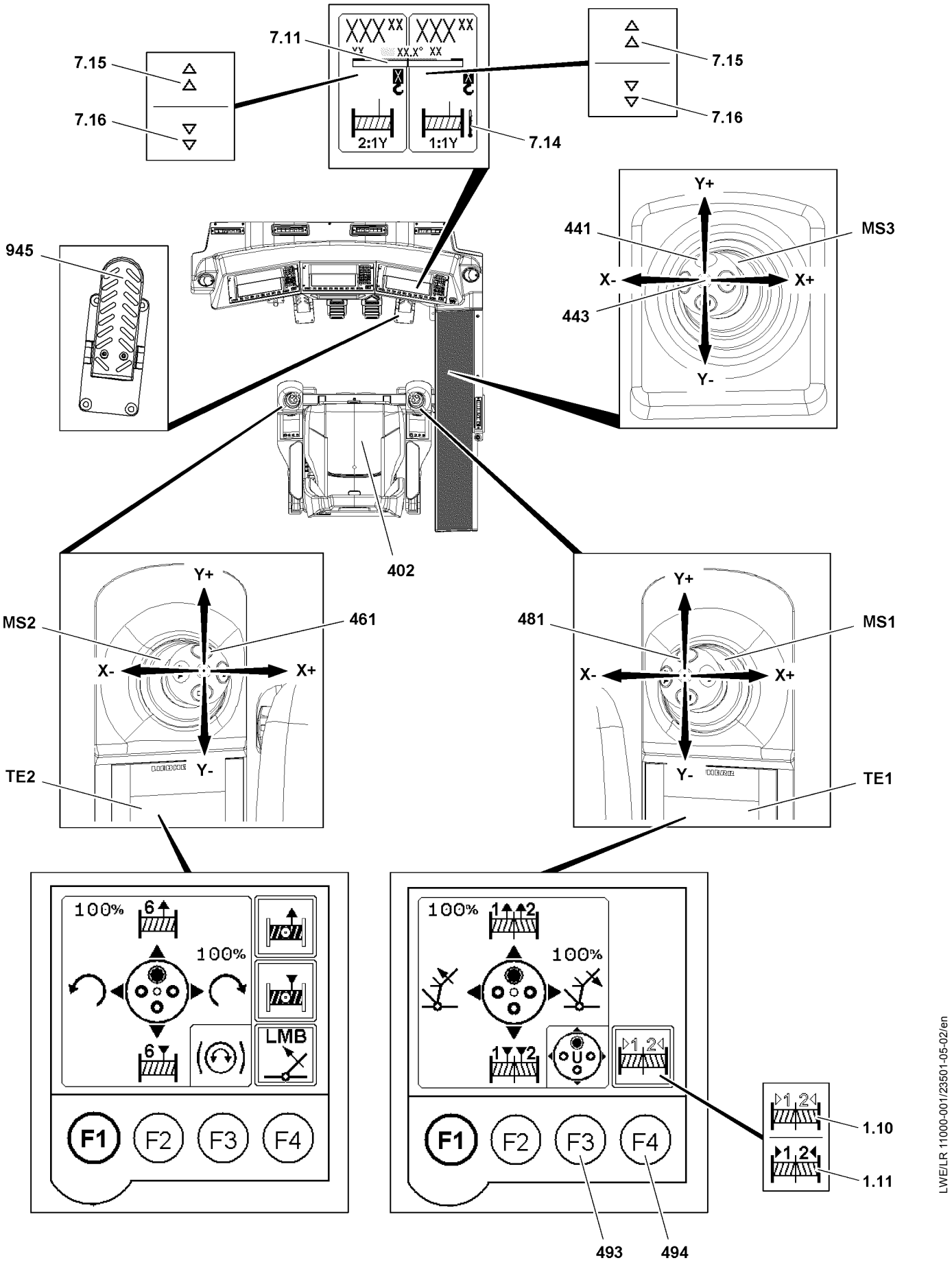

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3.2.3 Adjusting winch 1 and winch 2

Note

- ▶ At master switch assignment with parallel operation of winch 1 and winch 2 both winches can **NOT** be spooled up or out individually.
- ▶ In parallel operation, the winch display **7** changes. For description of winch displays on the LIC-CON monitors, see Crane operating instructions, chapter 4.02.

Make sure that the following prerequisites are met:

- The hook blocks are horizontally aligned, check visually.
- A master switch assignment with parallel operation winch 1 and winch 2 is set on the touch display **TE1**.

The icon **1.10** is located on the touch display **TE1**.

▶ Preselect the touch function „Adjust winch 1 and winch 2“ by „touching“ the icon **1.10**.

Result:

– The icon **1.10** is bordered in black.

▶ Activate the touch function „Adjust winch 1 and winch 2“: Press the F4 key **494** on the touch display **TE1**.

Result:

– Instead of the icon **1.10**, the icon **1.11** is shown.
– Winch 1 and winch 2 are adjusted.

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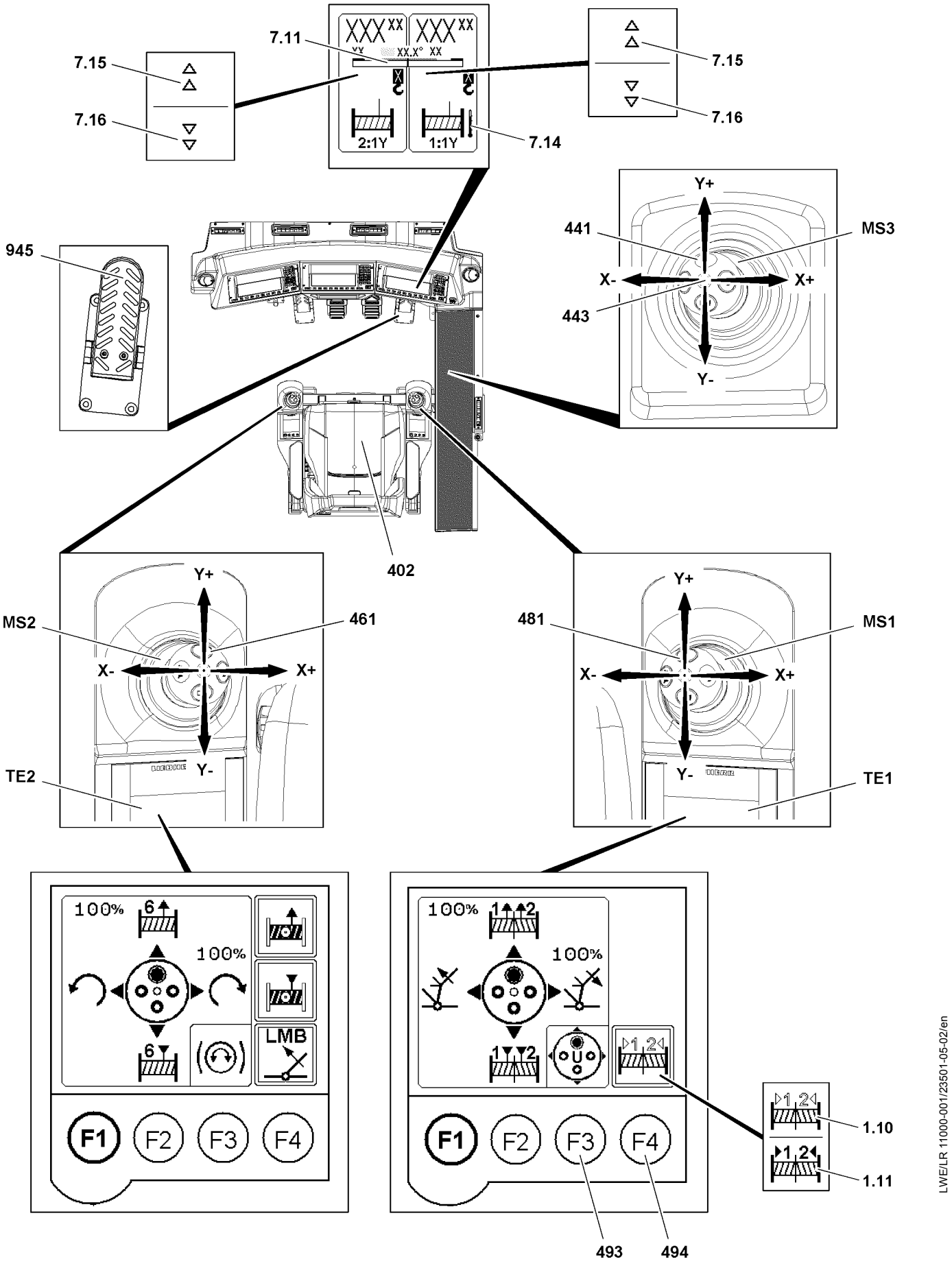

Fig.145930

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3.3 Parallel operation: Spooling the hoist winches up and out

WARNING
Incline position of the hook block!
If the balance bar on the roller blocks is inclined, then the load on the individual roller blocks is significantly increased. The boom, hook block or ropes can be overloaded.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the number of reevings on winch 1 and winch 2 is identical and even.
- ▶ Unpin the transport pin on the roller blocks before crane operation.
- ▶ Make sure that the balance bar is always aligned horizontally on the roller blocks. Visual inspection hook block.
- ▶ Always correct the position of the hook block in time.

WARNING
Hook block in sloped position!
If the hook block gets so far into a sloped position that the red range is reached in the incline display, then there is a danger of accident.
Death, severe bodily injuries, property damage.
- ▶ The incline of the hook block is displayed in the winch display **7** on the LICCON monitor.
- ▶ When the incline display **7.11** of the hook block is in the red range, then there is a danger of accidents.
- ▶ Make sure that the incline display **7.11** of the hook block is always in the green range.

Note
- ▶ The LICCON computer system monitors in parallel operation the rope length of winch 1 and winch 2 with the aid of test pulleys.

WARNING
Hook block in sloped position!
Due to dirty or iced-up test pulleys it is possible that the rope length of winch 1 and winch 2 is incorrectly measured.
This incorrect measurement causes the hook block to move into an impermissible incline position and the winches are not automatically stopped.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the test pulleys on the boom end section are free of dirt, snow, frost and ice.

The crane operator must ensure that the hook block is always aligned in parallel operation:
- ▶ Monitor the incline display of the hook block on the LICCON computer system.
- ▶ Monitor the hook block.

If incline position is present:
- ▶ Stop the winch movement and align the hook block.

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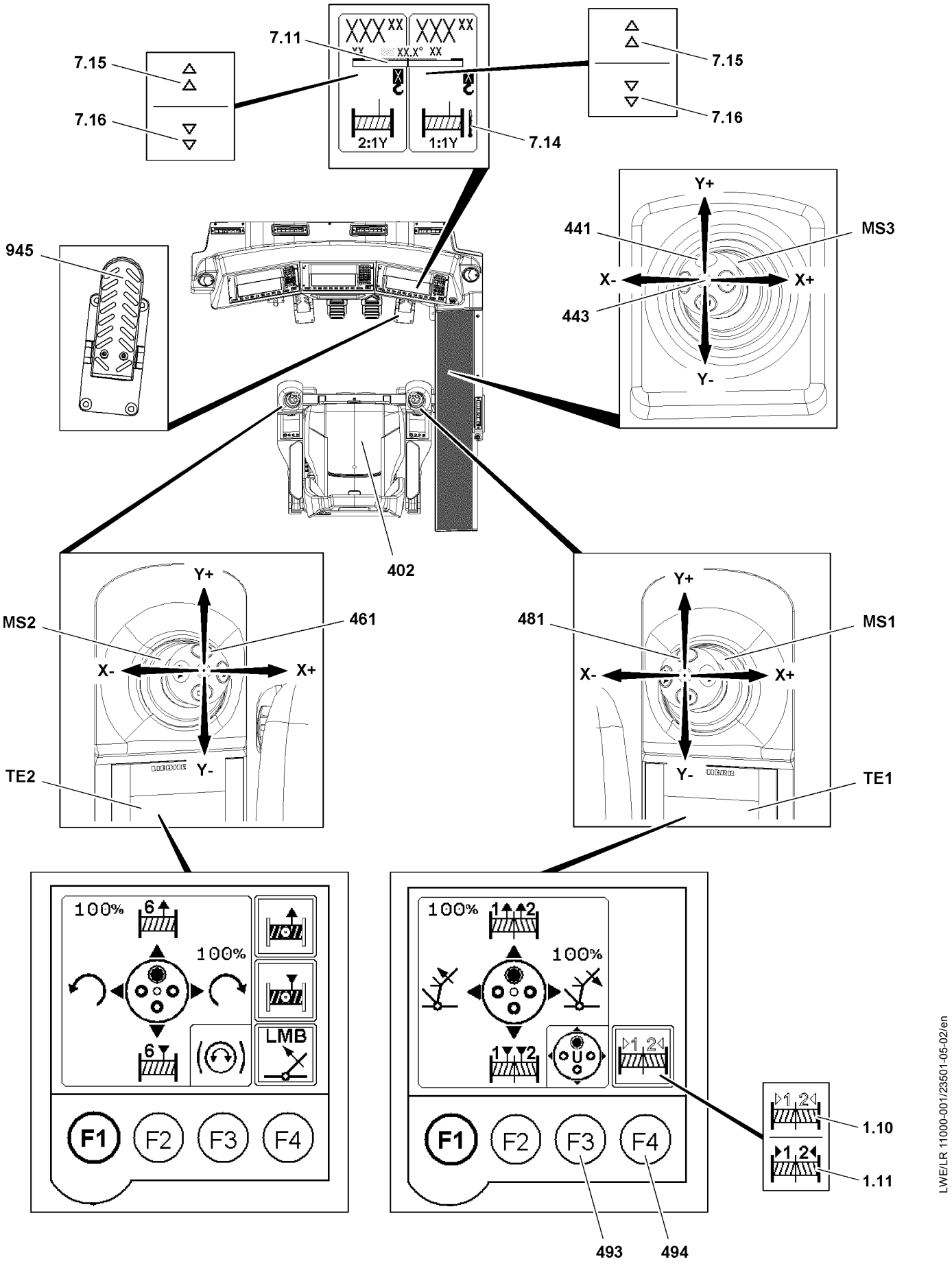

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Note

- ▶ In parallel operation, the winch display changes. For description of winch displays on the LICCON monitors, see Crane operating instructions, chapter 4.02.
- ▶ There are several master switch assignments, in which parallel operation is possible.
- ▶ In the master switch assignment „U“, you can actuate winch 1 and winch 2 simultaneously (parallel), winch 6 can be actuated with the master switch **MS2** independent of master switch **MS1**.

Make sure that the following prerequisites are met:

- The parallel operation is set, see section „Setting up parallel operation“
- The total reeving has been entered on the LICCON monitor.
- Winch 1 and winch 2 are adjusted.
- The seat contact button **402** is activated or the button **481**, button **461** or button **441** is pressed.

3.3.1 Parallel operation: Spooling the hoist winches up

This example shows how the hoist winches are spooled up parallel, master switch **MS1** at master switch assignment „U“.

▶ Deflect the master switch **MS1** in direction Y-.

Result:

– Winch 1 and winch 2 spool up simultaneously: The load is lifted.

Problem remedy

Parallel operation is blocked?
Winch 1 and / or winch 2 is blocked.

▶ Release the winches, see section „Blocking the TE1 winches“, Crane operating instructions, chapter 4.01.

Problem remedy

Incline of hook block in red range of winch display?
When the incline value of the hook block is in the red range, there is an increased danger of damage to persons and properly.

▶ Stop parallel operation.
▶ Align the hook block horizontally.
▶ Adjust winch 1 and winch 2.

Problem remedy

Path measurement in parallel operation is faulty?

▶ Switch the regulation for the path measurement over, see Crane operating instructions, chapter 4.02.

Problem remedy

The icon **7.14** „Winch overheated“ appears in the winch display?
The Winch is overheated.

▶ Let the winch cool off.

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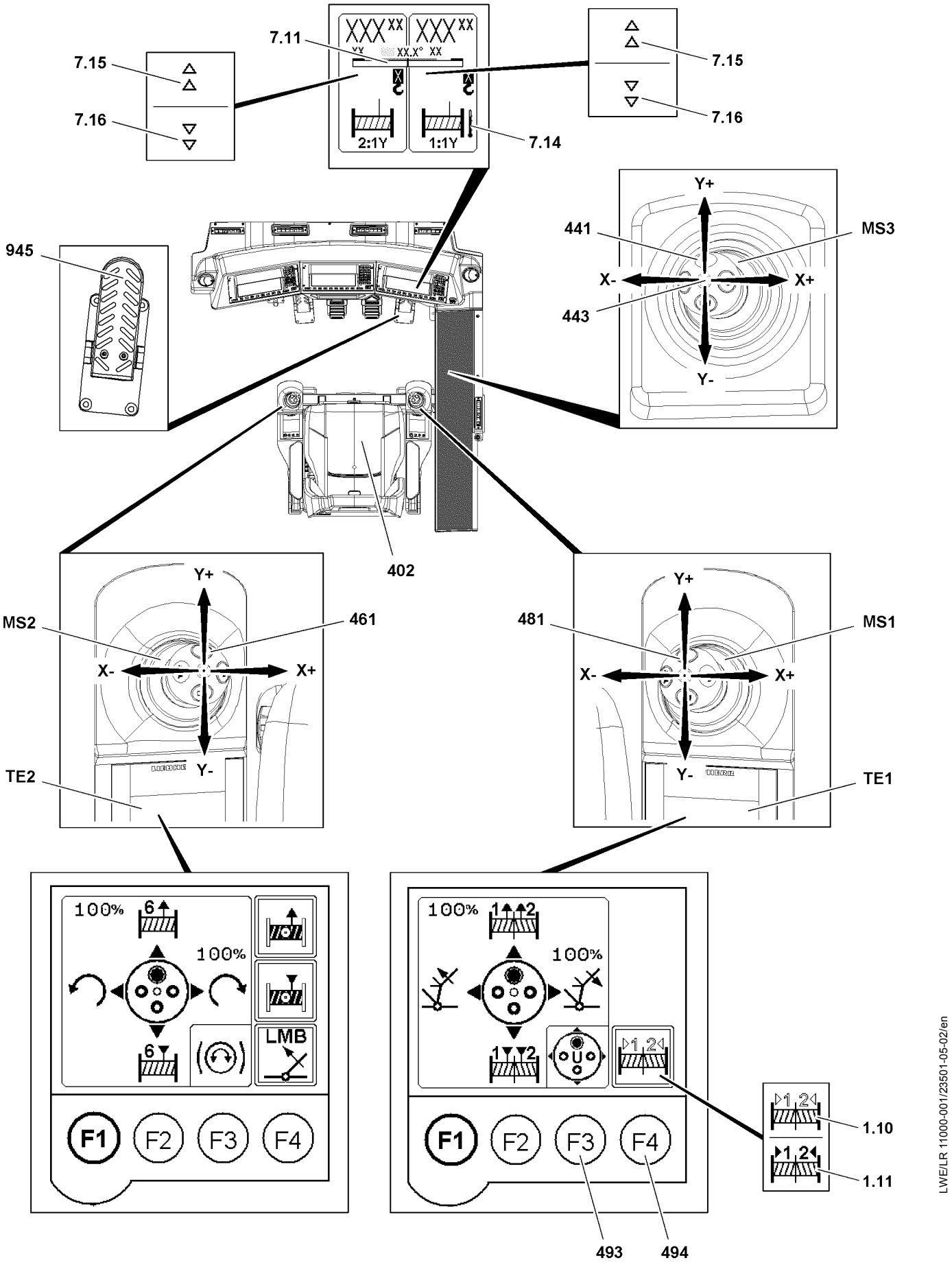

Fig.145930

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3.3.2 Parallel operation: Spool the hoist winches out.

Notes for problem remedy are in section „Parallel operation: Spooling the hoist winches up“.

This example shows how the hoist winches are spooled out parallel, master switch **MS1** at master switch assignment „U“.

▶ Deflect the master switch **MS1** in direction Y+.

Result:

– Winch 1 and winch 2 spool out simultaneously: The load is lowered.

3.3.3 Changing over regulation Parallel operation winch 1 and winch 2

The parallel operation of winch 1 and winch 2 is regulated from a pulley head height of more than 20 m via the change over pulleys. If there is a problem, the regulation can be switched over by the winch speed sensors, see Crane operating instructions, chapter 4.02.

WARNING
Impermissible change over of regulation *parallel operation winch 1 and winch 2*!

▶ Changing the regulation *parallel operation winch 1 and winch 2* is only permissible if - due to contamination, icing or failure of the path measurement system of the test pulleys - a correct path measurement of the hoist ropes of winch 1 and winch 2 is not possible.
▶ Changing the regulation *parallel operation winch 1 and winch 2* is only permissible if it is not possible to immediately clean or de-ice the test pulleys or repair the path measurement system.
▶ As long as the regulation *parallel operation winch 1 and winch 2* is changed over, the crane driver must align the position of the hook block generally manually.

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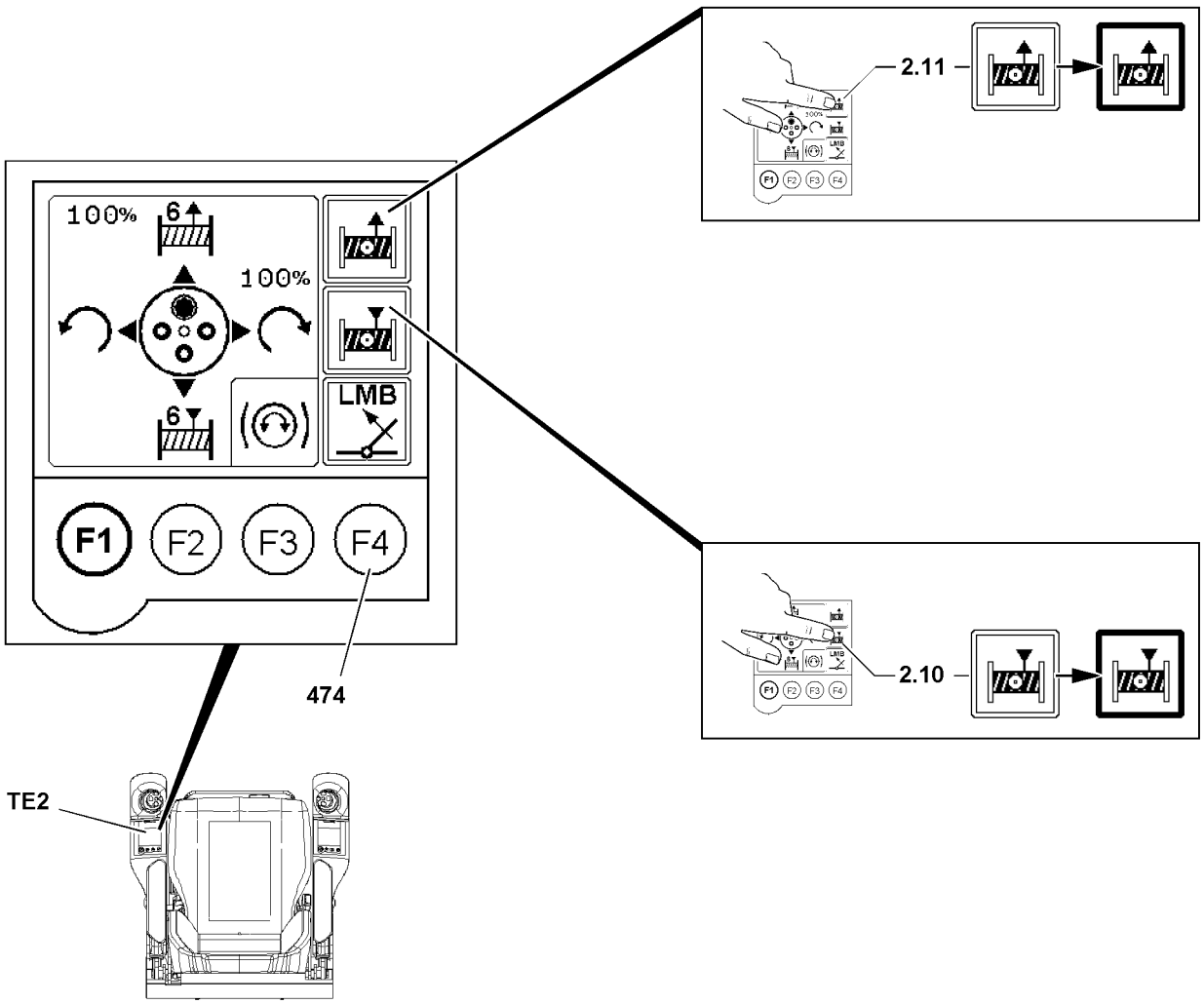

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Fig.123993

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3.4 Spooling the assembly winch up and out

WARNING
Overload of assembly winch!
When the assembly winch is used for hoisting work, then the assembly winch can be overloaded.
Death, severe bodily injuries, property damage.
▶ Use the assembly winch only for reeving work.

The assembly winch is installed on the turntable front side.

The assembly winch is actuated from the crane operator's cab.

Note
▶ The assembly winch is operated with the touch display **TE2**.

Make sure that the following prerequisite is met:
– The touch functions for the assembly winch are visible on the touch display **TE2**, see illustration.

3.4.1 Spool the assembly winch out

▶ Select the touch function „Spooling the assembly winch out“ by „touching“ the icon **2.11**.

Result:

– The icon **2.11** is bordered in black.

The assembly winch is spooled out as long as the F4 key **474** is actuated.

▶ Press the F4 key **474**.

Result:

– The winch in the icon **2.11** blinks as long as the F4-key **474** is actuated.

Deselect the touch function „Spooling the assembly winch out“

▶ Deselect the touch function „Spooling the assembly winch out“ by „touching“ the icon **2.11**.
or
Select other touch functions on the touch display **TE2**.

Result:

– The icon **2.11** is no longer bordered in black.

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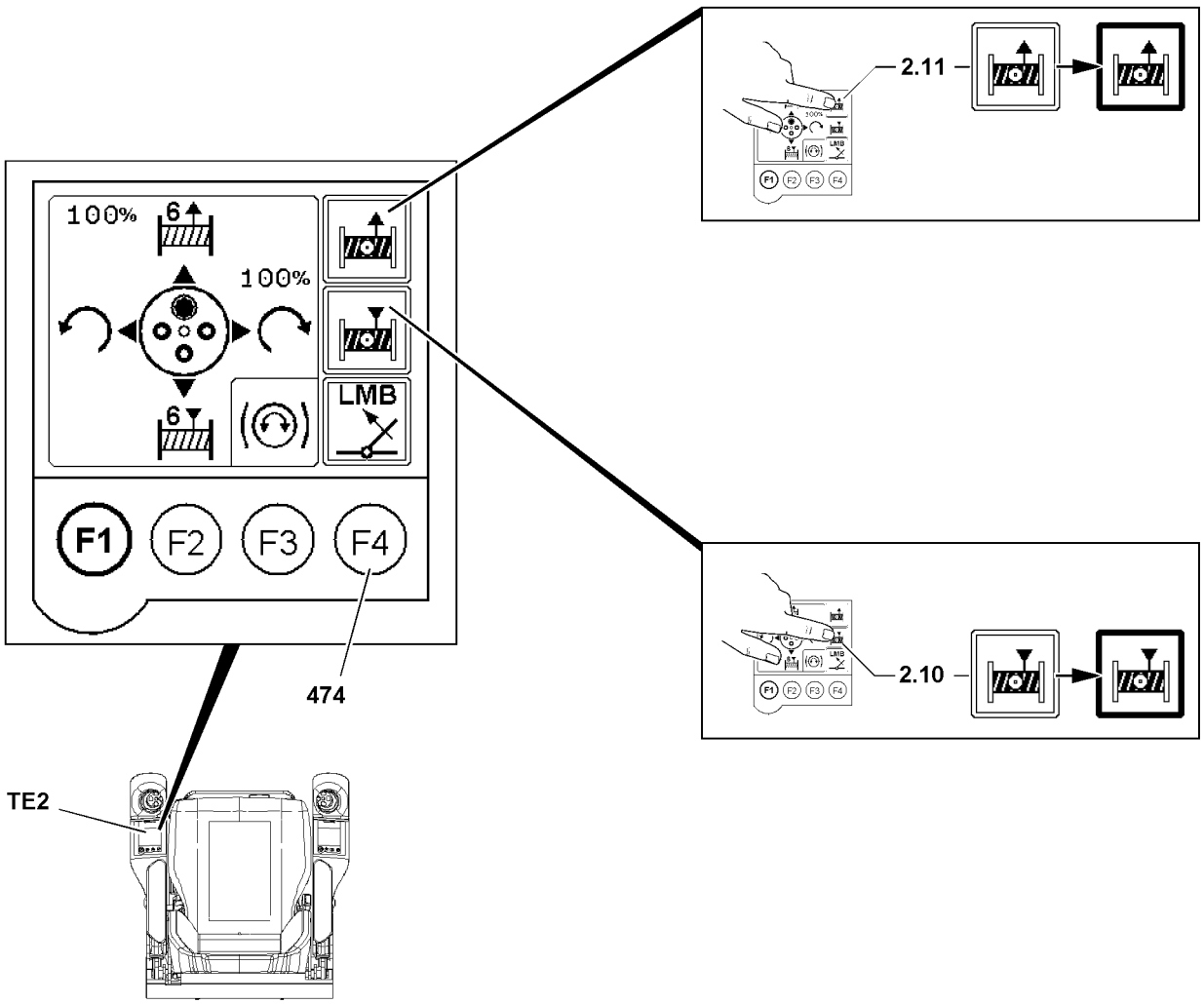

Fig.123993

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3.4.2 Spool the assembly winch up

▶ Select the touch function „Spooling the assembly winch up“ by „touching“ the icon **2.10**.

Result:

– The icon **2.10** is bordered in black.

The assembly winch is spooled up as long as the function key **474** is actuated.

▶ Press the function key **474**.

Result:

– The winch in the icon **2.10** blinks as long as the function key **474** is actuated.

Deselect the touch function „Spooling the assembly winch up“

▶ Deselect the touch function „Spooling the assembly winch up“ by „touching“ the icon **2.10**.
or
Select other touch functions on the touch display **TE2**.

Result:

– The icon **2.10** is no longer bordered in black.

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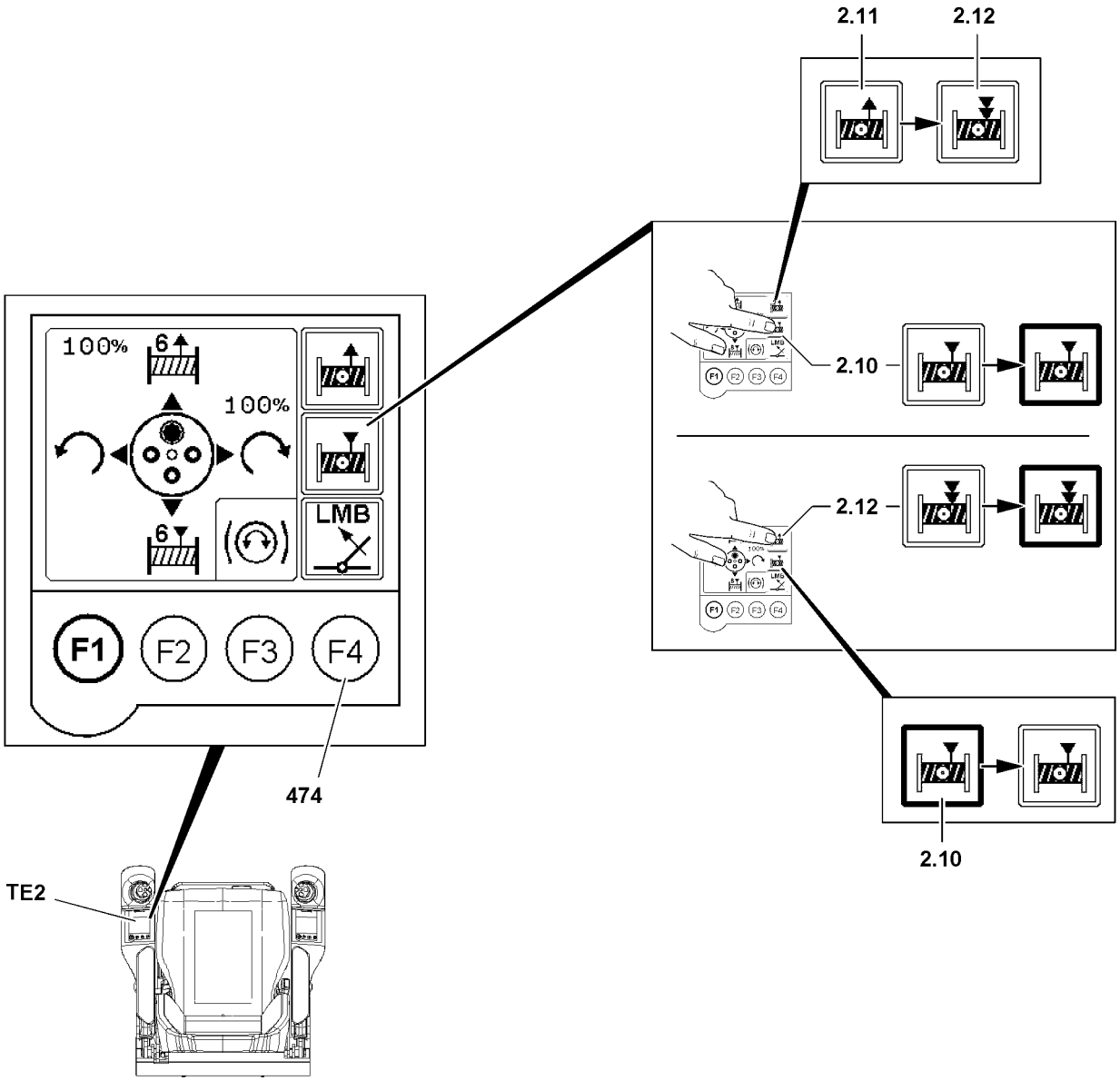

Fig.119696

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3.4.3 Spooling the assembly winch up constantly

▶ Call up touch function „Spool the assembly winch up constantly“: Press the icon **2.10** for at least 1.5 s.

Result:

– The icon **2.10** is bordered in black.
– Instead of the icon **2.11**, the icon **2.12** is shown.

▶ Select the touch function „Spooling the assembly winch up constantly“ by „touching“ the icon **2.12**.

Result:

– The icon **2.12** is bordered in black.
– The icon **2.10** is no longer bordered in black.

▶ Press the function key **474** for at least 1 s.

Result:

– The assembly winch is spooled up constantly.
– The winch in the icon **2.12** blinks.

Stop the constant spooling up of the assembly winch

▶ Deselect the touch function „Spooling the assembly winch up constantly“ by „touching“ the icon **2.12**.

Result:

– The assembly winch is no longer spooled up.
– The icon **2.12** is no longer bordered in black.

or

▶ Press the function key **474**.

Result:

– The assembly winch is no longer spooled up.
– The icon **2.12** remains bordered in black.

or

▶ Select other touch functions on the touch display **TE2**.

Result:

– The assembly winch is no longer spooled up.
– The icon **2.12** is no longer bordered in black.

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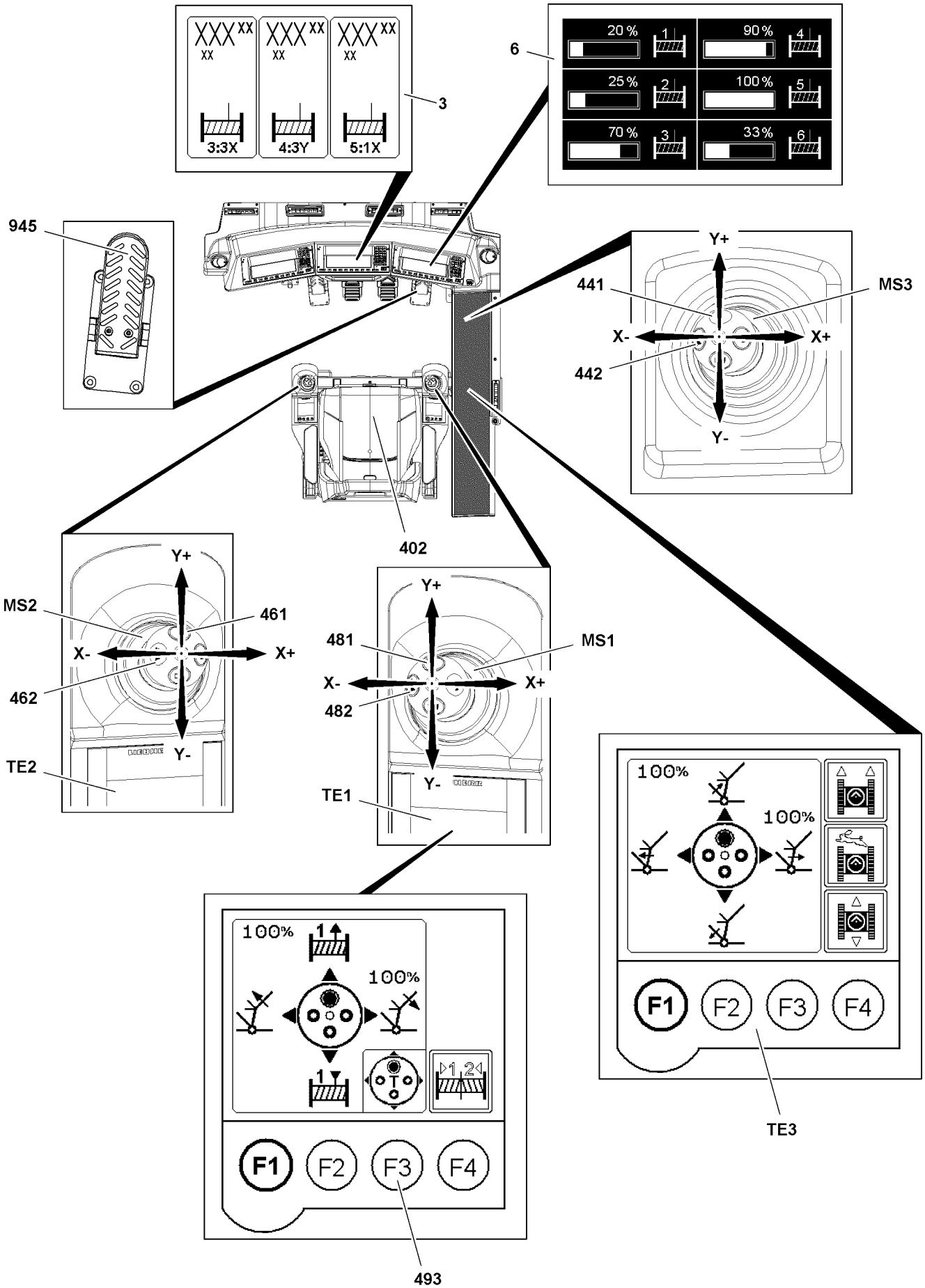

Fig.122231

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4 Luffing

WARNING
Luffing the boom up!
If the LICCON overload protection turns off while trying to lift the load with the winch, then a subsequent luffing movement can cause the crane to topple over or damage it.
Death, severe bodily injuries, property damage.
▶ Do **NOT** luff up the boom to lift a load off the ground.

The speed of crane movement „luffing“ is controlled by the deflection of the corresponding master switch and via the pedal **945** of the engine regulation.

The maximum winch speed can be reduced or increased in the „Speed reduction master switch“ menu, see Crane operating instructions, chapter 4.02.

Every winch can be blocked or released, see section „TE1 Menu block winch“, Crane operating instructions, chapter 4.01.

Note
▶ The seat contact button **402** in the crane operator's seat can be bypassed by the button **481** on the master switch **MS1** or the button **461** on the master switch **MS2** or the button **441** on the master switch **MS3**.
▶ For description of winch displays on the LICCON monitors, see Crane operating instructions, chapter 4.02.
▶ For description of the touch functions and the icons on the individual touch displays, see Crane operating instructions, chapter 4.01.

Note
▶ With the button **482**, the button **462** or the button **442** the speed of the crane movement „luffing up“ and „luffing down“ is increased, see section „Rapid gear Power Plus“.

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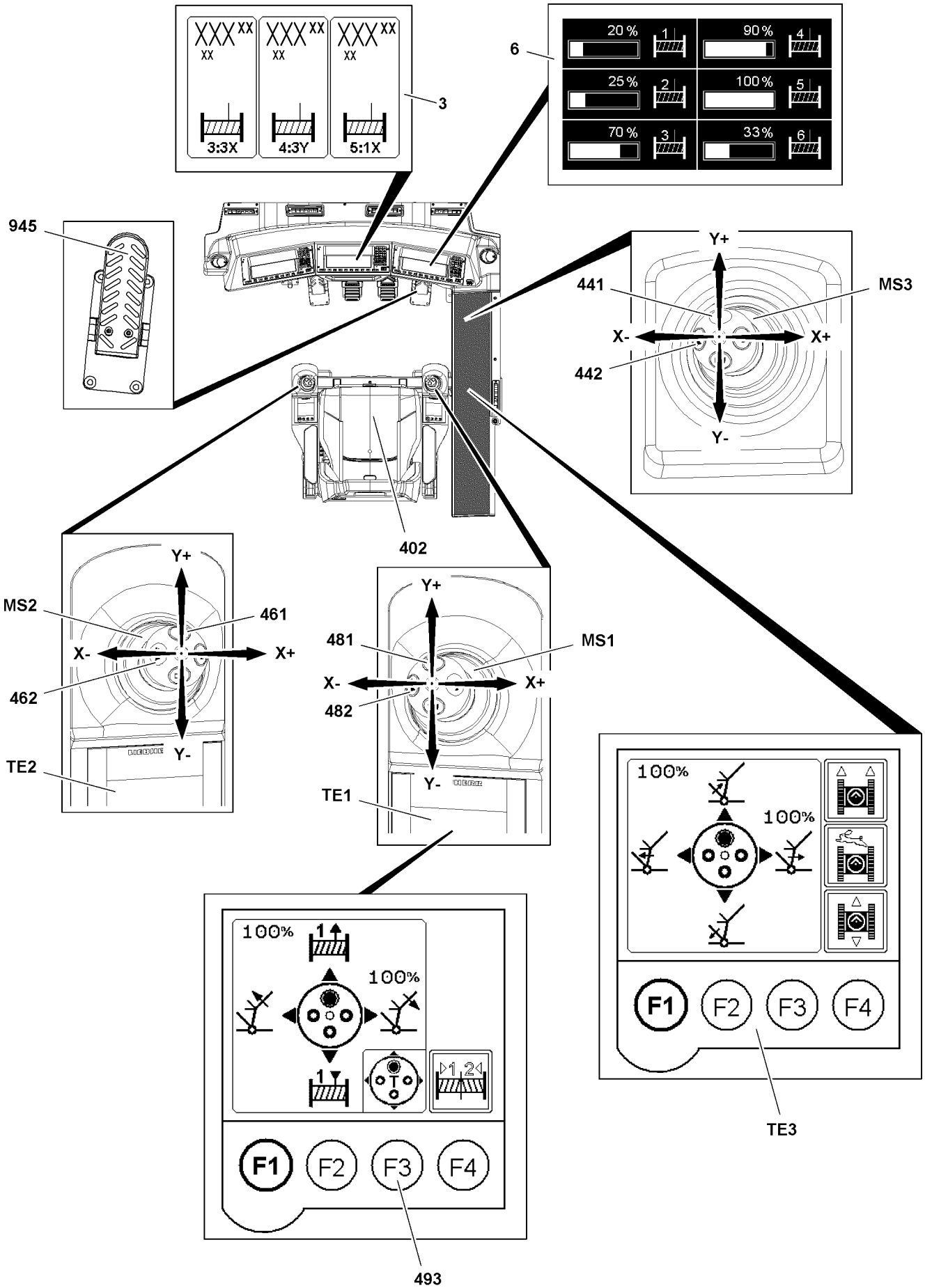

Fig.122231

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4.1 Luffing the main boom

Note
Change of master switch assignment!
The assignment of the master switches to the respective units on the crane can change, depending on the set up configuration and winch application.
▶ **Check the assignment before actuating the master switch on the TE.**
▶ The following sections describe the luffing movement in the master switch assignment „T“.

The maximum luffing speed of the main boom can be preselected in the setting window „Speed reduction master switch“ **6**, see Crane operating instructions, chapter 4.02.

Make sure that the following prerequisites are met:
– The master switch is in the zero position.
– The seat contact button **402** is activated or the button **481**, button **461** or button **441** is pressed.

4.1.1 Luffing the main boom up

This example shows how the main boom is luffed up, master switch **MS3** at master switch assignment „T“.

▶ Press the F3-key on the touch display **TE1** until the master switch assignment „T“ appears.
▶ Deflect the master switch **MS3** in direction X-.

Result:

– The main boom is luffed up.

4.1.2 Luffing the main boom down

This example shows how the main boom is luffed down, master switch **MS3** at master switch assignment „T“.

▶ Deflect the master switch **MS3** in direction X+.

Result:

– The main boom is luffed down.

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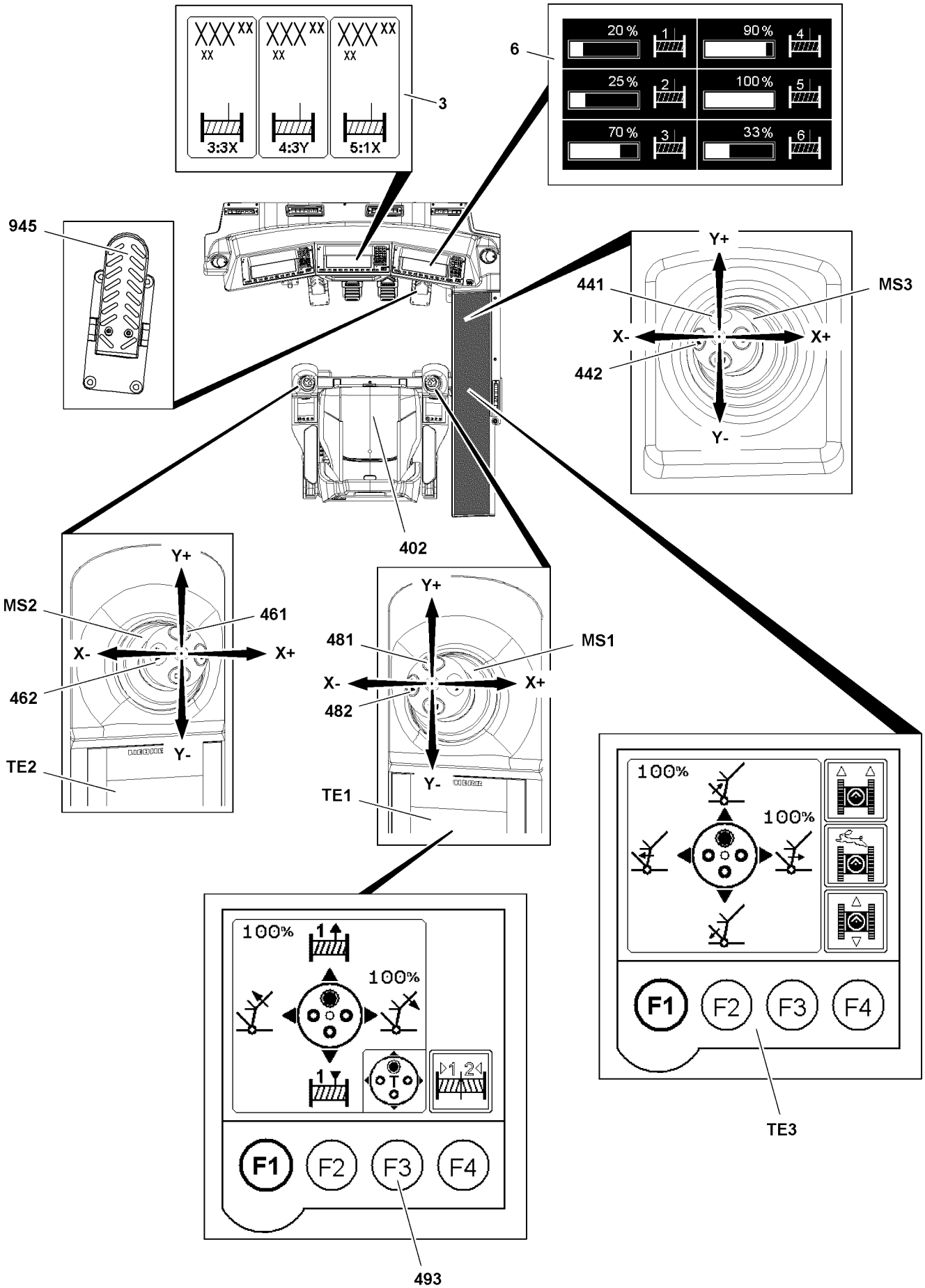

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4.2 Luffing the derrick boom

Note
Change of master switch assignment!
The assignment of the master switches to the respective units on the crane can change, depending on the set up configuration and winch application.
▶ **Check the assignment before actuating the master switch on the TE.**
▶ The following sections describe the luffing movement in the master switch assignment „T“.

The maximum luffing speed of the derrick boom can be preselected in the setting window „Speed reduction master switch“ **6**, see Crane operating instructions, chapter 4.02.

Make sure that the following prerequisites are met:
– The master switch is in the zero position.
– The seat contact button **402** is activated or the button **481**, button **461** or button **441** is pressed.

4.2.1 Luffing the derrick boom up

This example shows how the derrick boom is luffed up, master switch **MS3** at master switch assignment „T“.

▶ Press the F3-key on the touch display **TE1** until the master switch assignment „T“ appears.
▶ Deflect the master switch **MS3** in direction Y+.

Result:

– The derrick boom is luffed up.

4.2.2 Luffing the derrick boom down

This example shows how the derrick boom is luffed down, master switch **MS3** at master switch assignment „T“.

▶ Deflect the master switch **MS3** in direction Y-.

Result:

– The derrick boom is luffed down.

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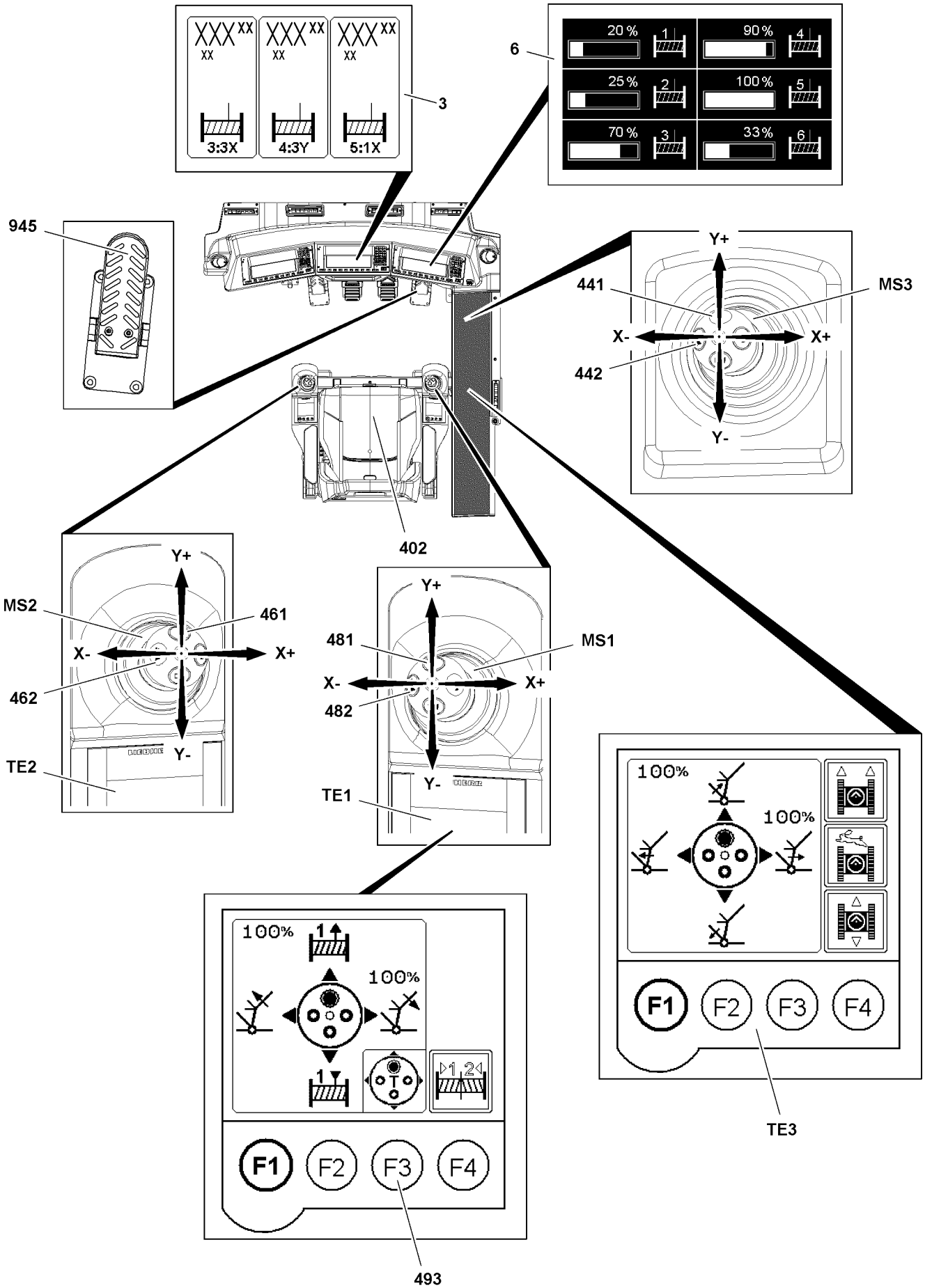

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4.3 Luffing the luffing jib

Note
Change of master switch assignment!
The assignment of the master switches to the respective units on the crane can change, depending on the set up configuration and winch application.
▶ **Check the assignment before actuating the master switch on the TE.**
▶ The following sections describe the luffing movement in the master switch assignment „T“.

The maximum luffing speed of the luffing jib can be preselected in the setting window „Speed reduction master switch“ **6**, see Crane operating instructions, chapter 4.02.

Make sure that the following prerequisites are met:
– The master switch is in the zero position.
– The seat contact button **402** is activated or the button **481**, button **461** or button **441** is pressed.

4.3.1 Luffing the luffing jib up

This example shows how the luffing jib is luffed up, master switch **MS1** at master switch assignment „T“.

▶ Press the F3-key on the touch display **TE1** until the master switch assignment „T“ appears.
▶ Deflect the master switch **MS1** in direction X-.

Result:

– The luffing jib is luffed up.

4.3.2 Luffing the luffing jib down

This example shows how the luffing jib is luffed down, master switch **MS1** at master switch assignment „T“.

▶ Deflect the master switch **MS1** in direction X+.

Result:

– The luffing jib is luffed down.

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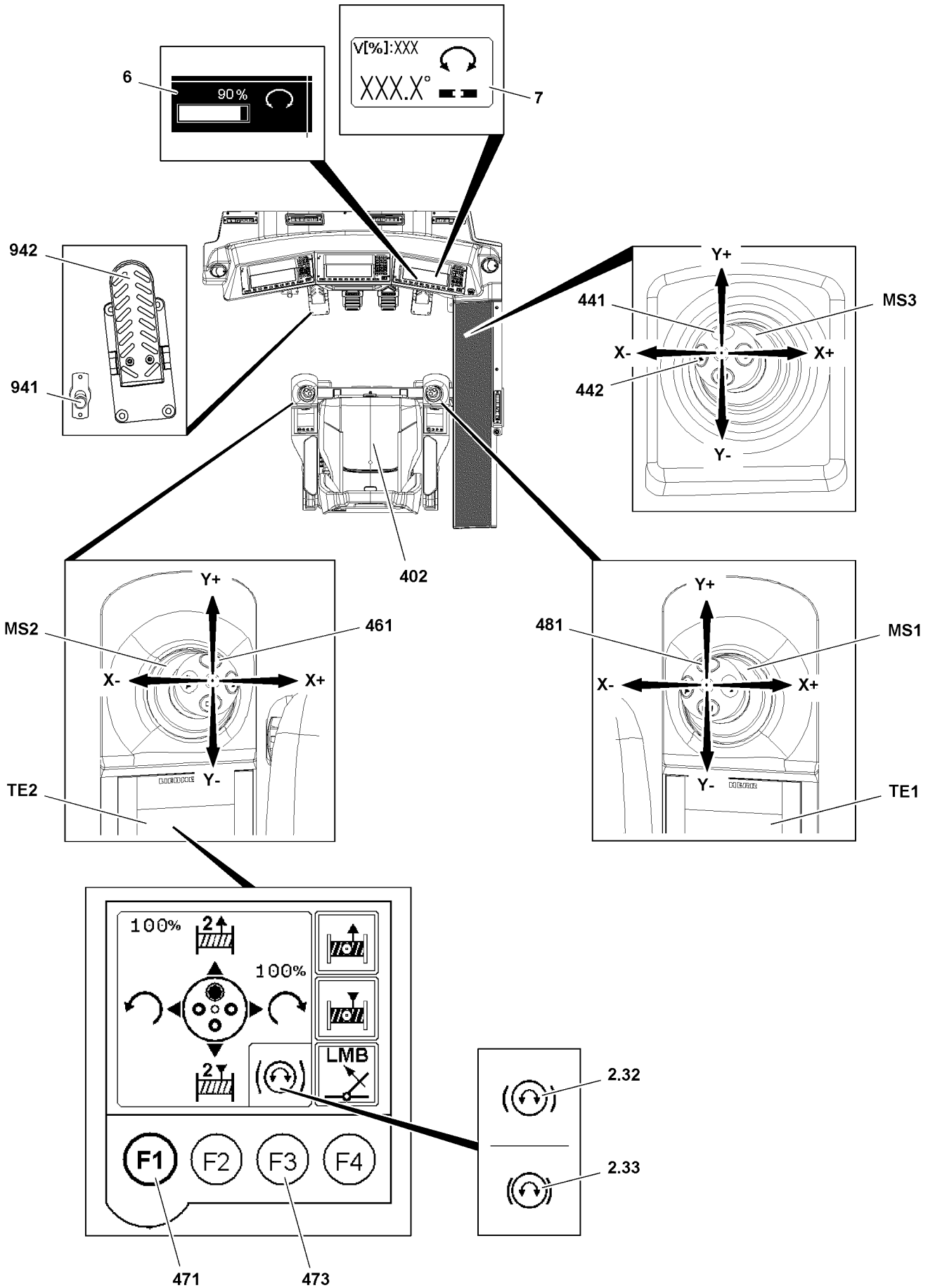

Fig.122232

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5 Turning

The slewing gear can be operated with the parking brake **released** or **applied**, see section „Parking brake slewing gear“.

WARNING
Uncontrolled turning of the crane superstructure!
As long as the „parking brake of the slewing gear“ is released, the slewing gear can turn in an uncontrolled manner due to wind, incline position or angular pull.
Death, severe bodily injuries, property damage.
▶ Close the „parking brake slewing gear“ by pressing the F3-key **473** on the touch display **TE2**.

Note
▶ Once the parking brake is released, it remains released, regardless of whether the slewing gear is actuated with the master switch **MS2** or if it is not actuated. This is to prevent a sudden stop.
▶ If the parking brake is applied, it is released as soon as the master switch **MS2** is deflected. The parking brake engages again as soon as the master switch **MS2** is moved to the zero position and the slewing gear is **NO** longer actuated.

Note
▶ The seat contact button **402** in the crane operator's seat can be bypassed by the button **481** on the master switch **MS1** or the button **461** on the master switch **MS2** or the button **441** on the master switch **MS3**.
▶ For description of winch displays on the LICCON monitors, see Crane operating instructions, chapter 4.02.
▶ For description of the touch functions and the icons on the individual touch displays, see Crane operating instructions, chapter 4.01.

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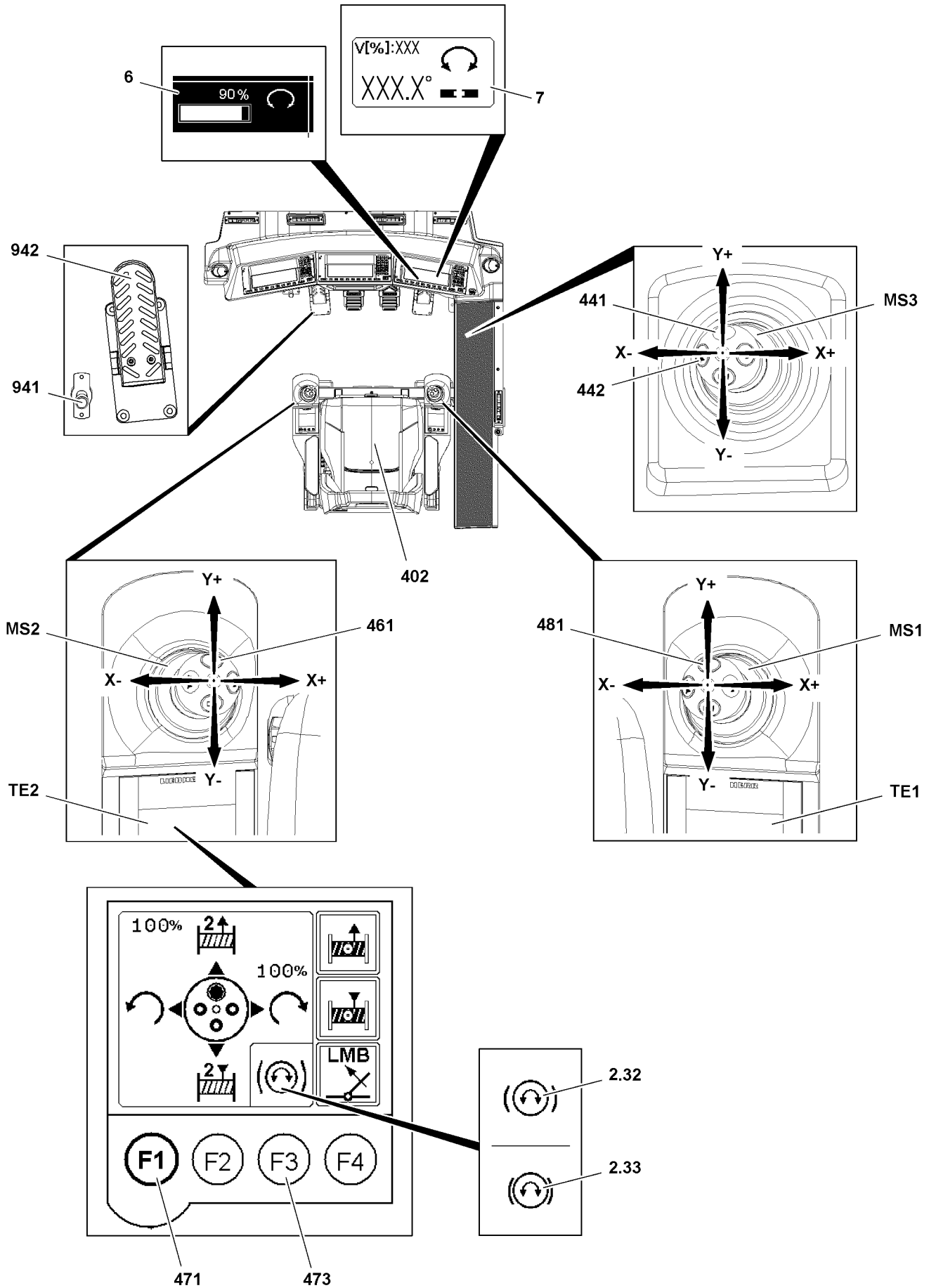

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5.1 Opening and closing the parking brake slewing gear

The parking brake of the slewing gear can be „applied“ or „released“ with the F3-key **473** on the touch display **TE2**.

The status of the parking brake can be seen on the icon on the touch display **TE2**:
- Icon **2.32** shows that the parking brake is released.
- Icon **2.33** shows that the parking brake is applied.

The parking brake closes automatically if:
- The crane operator gets up from the crane operator's seat (seat contact button **402** no longer actuated).
- The Diesel engine is turned off.

The parking brake can **NOT** be released if:
- The working range limitation is active.
- A load chart with limited slewing range is selected.

5.1.1 Releasing the parking brake

Make sure that the following prerequisites are met:
- The parking brake is applied.
- The icon **2.33** appears on the touch display **TE2**.
- The seat contact button **402** or button **441** or button **461** or button **481** is actuated.
- The Diesel engine is running

▶ Press the F3 key **473**.

Result:

– The parking brake is released.
– Icon **2.32** appears on the touch display **TE2**.

5.1.2 Applying the parking brake

Make sure that the following prerequisites are met:
- The parking brake is released.
- The icon **2.32** appears on the touch display **TE2**.

▶ Press the F3 key **473**.
or
Turn the Diesel engine off.
or
Do not actuate the seat contact button **402** or button **441** or button **461** or button **481** any longer.

Result:

– The parking brake is applied.
– Icon **2.33** appears on the touch display **TE2**.

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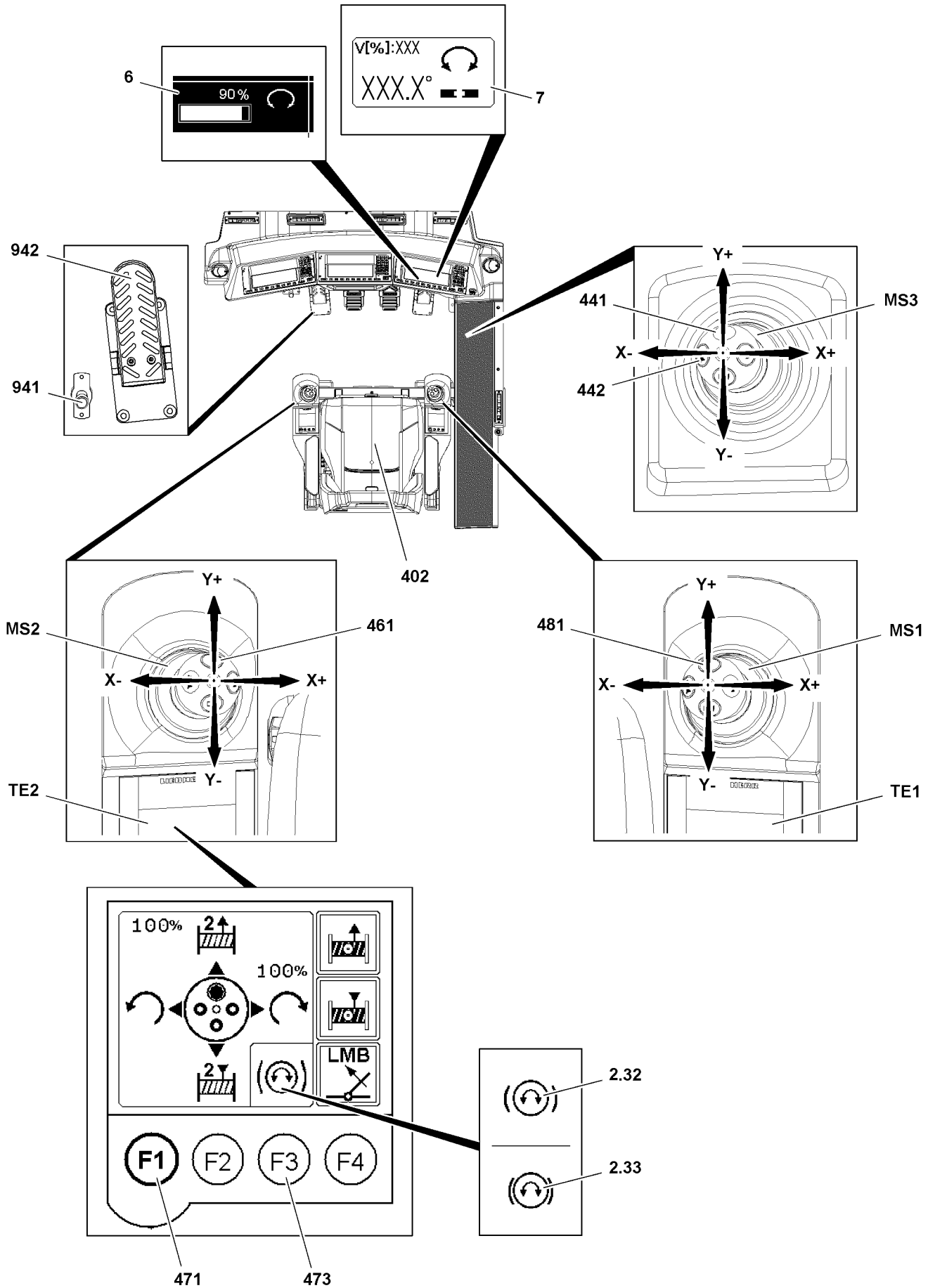

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5.2 Actuating the slewing gear brake with the pedal

CAUTION
Risk of damaging the slewing gear or the roller ring connection!
The slewing gear brake cannot brake the full turning momentum. Failure to comply with the following instructions could damage the slewing gear or roller ring connection.

- ▶ Use the pedal **942** only at minimum rotation speeds, in other words with master switch **MS2** almost at the zero position.
- ▶ Do **NOT** abruptly brake the turning movement of the crane by moving the master switch **MS2** back to the zero position and by simultaneously applying the pedal **942**.

Use the pedal **942** to actuate the slewing gear brake only in the following cases:

- Starting out with a strong side wind
- Stopping the slewing movement with a strong side wind

5.2.1 Starting out with a strong side wind

When turning against the wind with a strong side wind and with a long boom system, the superstructure will turn to the opposite direction due to leaks in the hydraulic motor.

This can be avoided as follows:

- ▶ Actuate the pedal **942** and deflect the master switch **MS2** into the desired turning direction.
- ▶ Slowly release the pedal **942** until the superstructure turns in the desired turning direction.

5.2.2 Stopping the slewing movement with a strong side wind

- ▶ Slow down the crane with master switch **MS2** to minimum slewing speed.
- ▶ Apply the pedal **942** carefully, until the crane has come to a standstill at the desired position.

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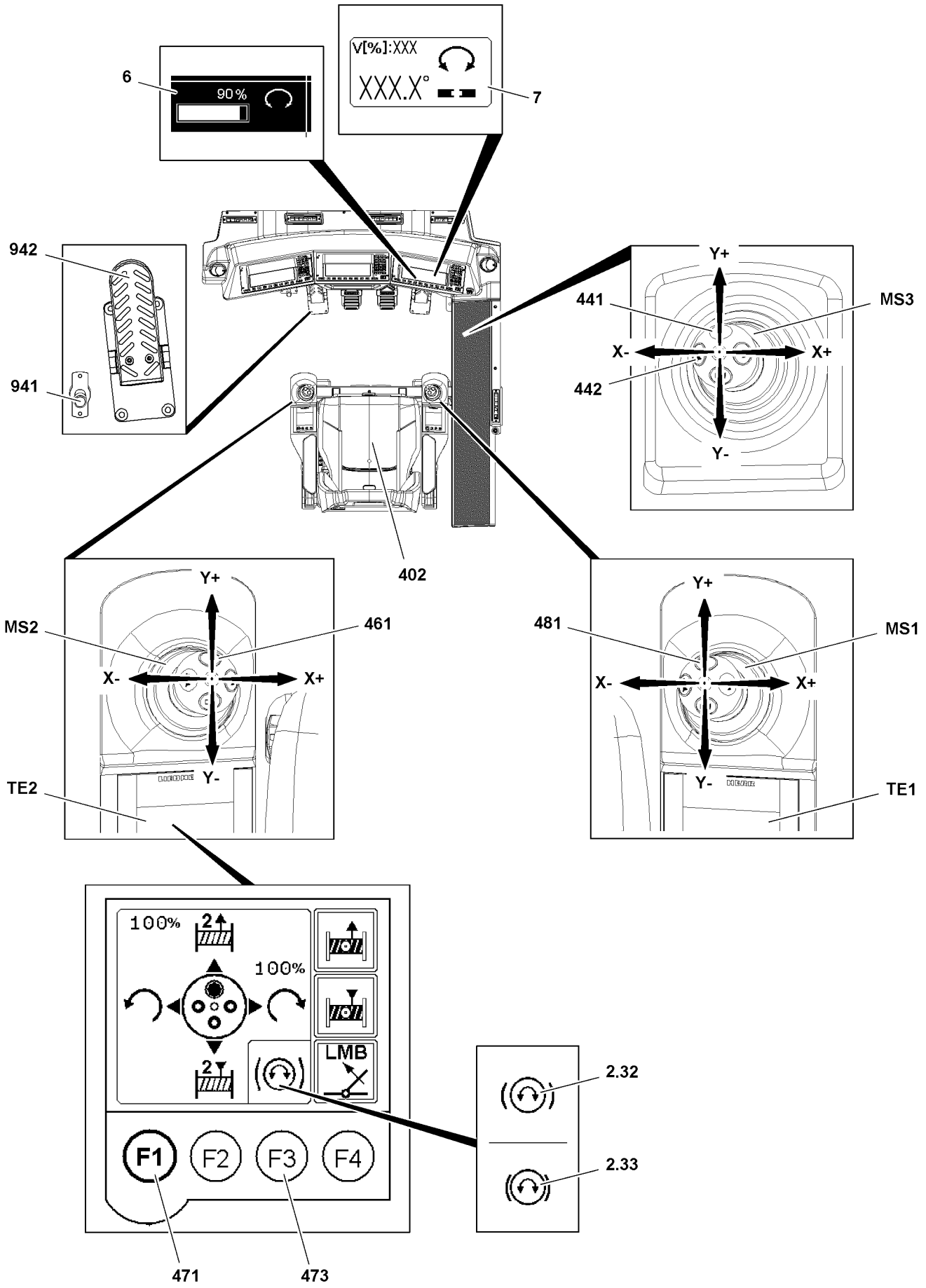

Fig.122232

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5.3 Switching the slewing gear to freewheeling

In order to position the boom over the load more easily, the slewing gear can be switched to freewheeling.

Make sure that the following prerequisites are met:
- The seat contact button **402** or button **441** or button **461** or button **481** is actuated.
- The Diesel engine is running
- The master switch **MS2** is **NOT** deflected.

Note
The activation of the freewheel and actuation of the slewing movement via the master switch **MS2** are mutually exclusive.
- ▶ When the master switch **MS2** is deflected, the slewing gear cannot be switched to freewheeling via the foot button **941**.
- ▶ When pressing the foot button **941**, the slewing movement can **NOT** be carried out by deflecting the master switch **MS2**.

The slewing gear can **NOT** be switched to freewheel / coasting if:
- A load chart with limited slewing range is selected.
- The working range limitation is active.

▶ Press the foot button **941**.

Result:

– The slewing gear is switched to freewheeling.

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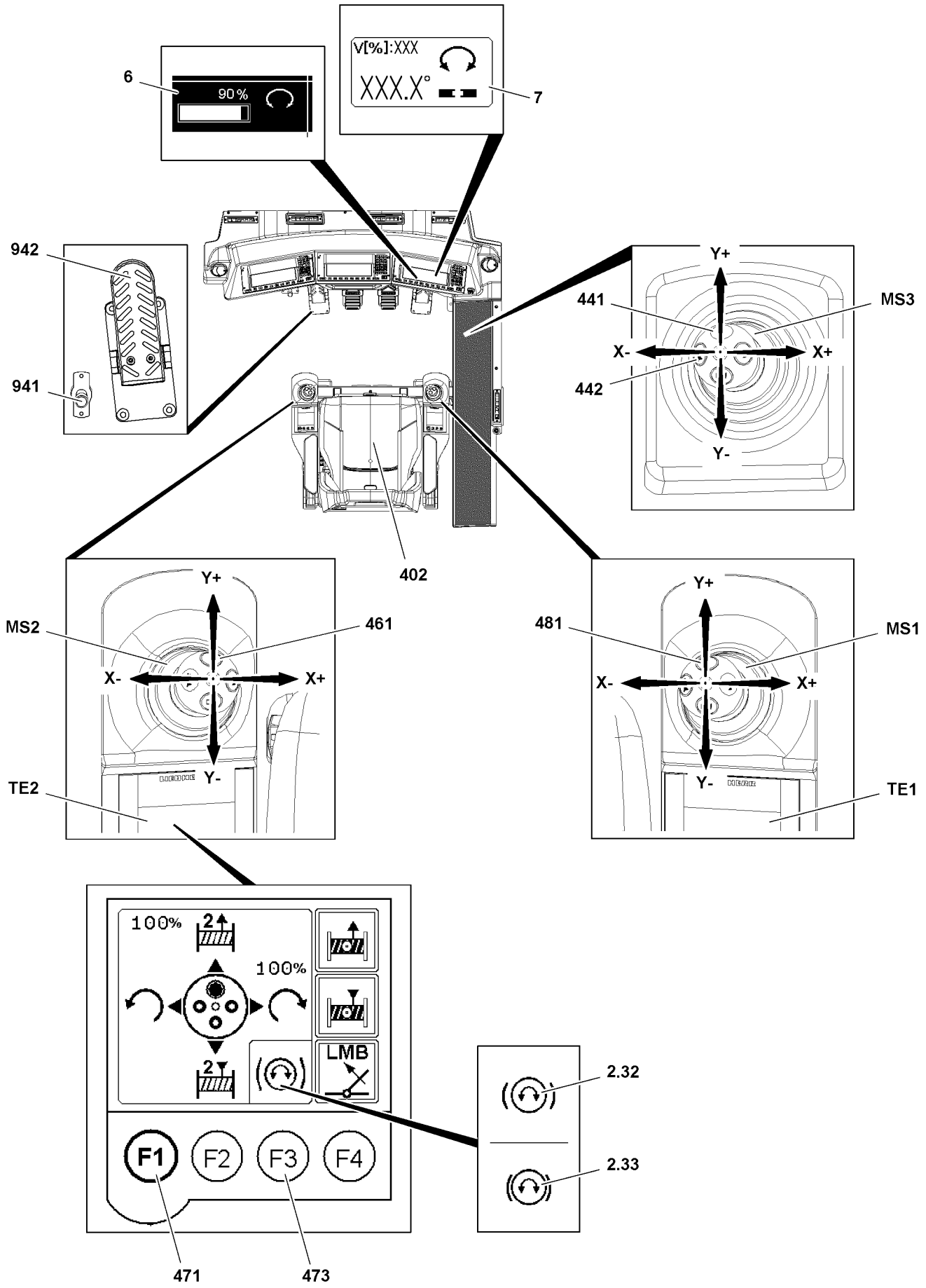

Fig.122232

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5.4 Turning the crane superstructure

5.4.1 Preselection of slewing speed

WARNING
Slewing speed too high for actual operating conditions!
Toppling crane, failure of crane structure.
Death, severe bodily injuries, property damage.
- ▶ Adhere to the permissible slewing speed in the load charts.
- ▶ When selecting the slewing speed, take the actual operating conditions also into account.
- ▶ Select the slewing speed depending on the actual operating conditions.

The load chart manual lists the maximum slewing speeds in percentages for **ideal conditions**.

The maximum permissible slewing speeds can be set on the LICCON computer system in the „Speed reduction master switch“ setting window **6**, see the Crane operating instructions, chapter 4.02.

Basic rule: With a longer boom and a larger load, you have to turn with a slower speed.

5.4.2 Turning the crane superstructure

WARNING
Persons or obstacles within the danger zone!
Death, severe bodily injuries, property damage.
- ▶ It is prohibited for personnel to remain in the danger zone.
- ▶ Make sure that there are no obstacles within the working area of the crane.
- ▶ Give a short warning signal (horn) before starting a crane movement.
- ▶ When turning with a load: Initiate and slow down a turning movement extremely sensitively.

WARNING
Oscillating loads!
If the slewing speed is exceeded, there is the danger that the loads start to swing. The crane can be damaged or topple over.
Death, severe bodily injuries, property damage.
- ▶ Turning with a load: Initiate and slow down a turning movement extremely sensitively.
- ▶ Longer boom and larger load: Operate the crane with lower slewing speed.
- ▶ Observe and adhere to the values in the load chart manual.

The maximum rotational speed is shown in the slewing range **7** on the LICCON monitor, see Crane operating instructions, chapter 4.02.

Make sure that the following prerequisite is met:
- The maximum permissible slewing speed is set on the LICCON computer system in the „Speed reduction master switch“ setting window **6**, see the Crane operating instructions, chapter 4.02.
- The seat contact button **402** is activated or the button **481**, button **461** or button **441** is pressed.

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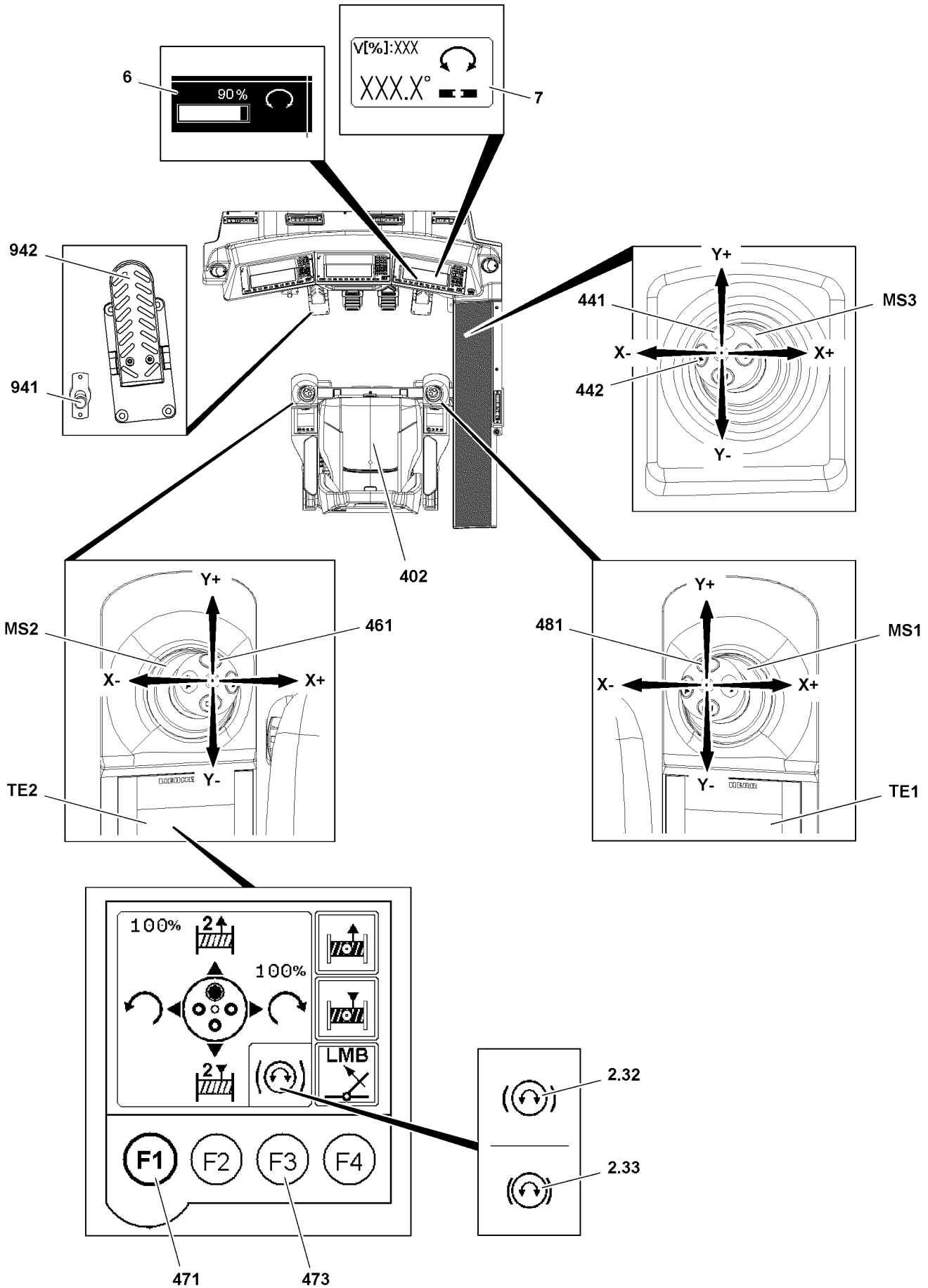

Fig.122232

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Turning crane superstructure to the right

▶ Press the F1-key **471** on the touch display **TE2** until the TE2 menu the „master switch assignment“ appears.
▶ Deflect the master switch **MS2** in direction X+.

Result:

– The crane superstructure turns to the right.

Turning the crane superstructure to the left

▶ Press the F1-key **471** on the touch display **TE2** until the TE1 menu the „master switch assignment“ appears.
▶ Deflect the master switch **MS2** in direction X-.

Result:

– The crane superstructure turns to the left.

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4.06 Rope reeving

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Fig.195219

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1 Wire ropes and rope end connections

1.1 Wire ropes

Check if a **rotating resistant** or a **non-rotating** rope is required for the application. The selected type of rope then requires the corresponding rope end connections, see Crane operating instructions, chapter 8.04.

Note

▶ Correct choice and use of the wire rope and the rope end connections are a decisive precondition for proper and accident-free crane operation.

DANGER

Incorrect rope type!

Danger of severe injuries to personnel and property damage.

▶ **Never** use rotation-resistant ropes with a rotating rope end connection.

▶ **Never** install a twist compensator / swivel.

1.2 Rope end connections

Rope end connections are grouped into:

– Rope end connections with locking clamp or locking cast sleeve
– The L-shaped rope end connection with locking clamp or locking cast sleeve (LR 11000 only)
– Rope end connection **without** locking clamp or locking cast sleeve

Note

▶ The locking clamp **8** is pressed on the rope.

▶ The locking cast sleeve **8** is cast with the rope.

1.2.1 Rope end connections with locking clamp or locking cast sleeve

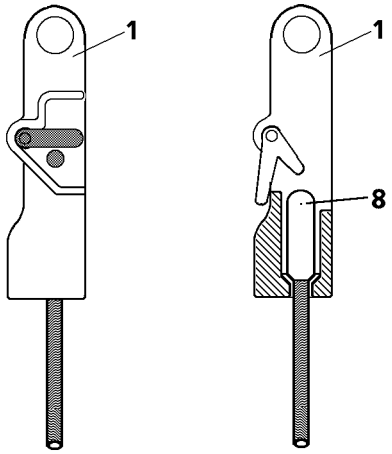

*Fig.144019: Rope end connections with locking clamp **8** or locking cast sleeve **8***

– Rope end connections **with** locking clamp **8** or locking cast sleeve **8**.
A rope end connection **1** or an L-shaped rope end connection **24** should be used for this.

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1.2.2 The L-shaped rope end connection with locking clamp or locking cast sleeve (LR 11000 only)

WARNING
Load can be ripped off!
Death, severe bodily injuries, property damage.
- ▶ The L-shaped rope end connection **24** is only permitted for use on LR 11000.
- ▶ It is prohibited to use the L-shaped rope end connection **24** on other crane types.
- ▶ Make sure that the L-shaped rope end connection is only used for **reeving with a even number of strands**.

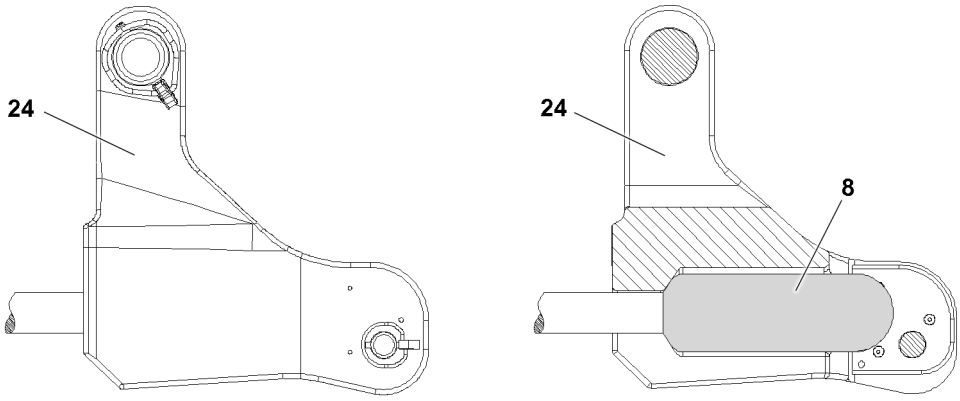

*Fig.144020: L-shaped rope end connection **24** with locking clamp **8** or locking cast sleeve **8***

– Rope end connections **with** locking clamp **8** or locking cast sleeve **8**.
An L-shaped rope end connection **24** or a rope end connection **1** should be used for this.

1.2.3 Rope end connection without locking clamp or locking cast sleeve

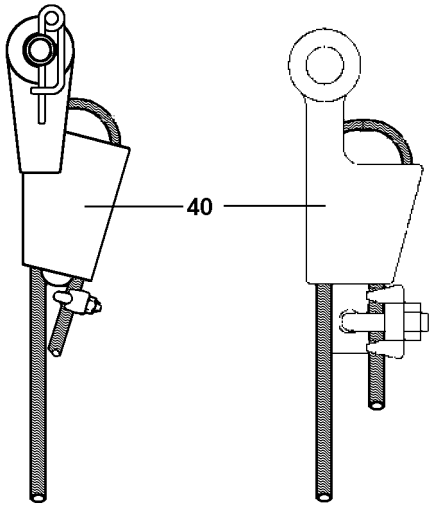

Fig.144021: Rope end connection without locking clamp or locking cast sleeve

– Rope end connections **without** locking clamp **8** or locking cast sleeve **8**.
For that, use a wedge lock **40**.

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2 Reeving in the hoist rope

WARNING
Slipping at assembly work!
Danger of falling.
Death, severe injury, property damage.
- ▶ The boom system may only be accessed if the assembly personnel is protected with suitable safety measures to prevent them from falling.
- ▶ If retaining ropes are present on the boom system, then the assembly personnel must hang an approved fall arrest system to the retaining ropes of the boom system on the left and right with both snap hooks and secure themselves to prevent them from falling.
- ▶ Without appropriate safety measures it is **strictly** prohibited to step on the boom system.
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly.
- ▶ Carry out all assembly work from a safe location.
- ▶ Observe the assembly guidelines in the Crane operating instructions, chapter 5.01.

Make sure that the following prerequisites are met:
- The ground is level and of sufficient load carrying capacity.
- **Only for cranes with crane support:** The crane is properly supported.
- The crane is horizontally aligned.
- The crane is ballasted according to the load chart.
- The LICCON overload protection has been set according to the load chart.
- The slewing gear brake is applied.
- The boom end section is just above the ground.

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2.1 Reeving in the hoist rope with the assembly winch

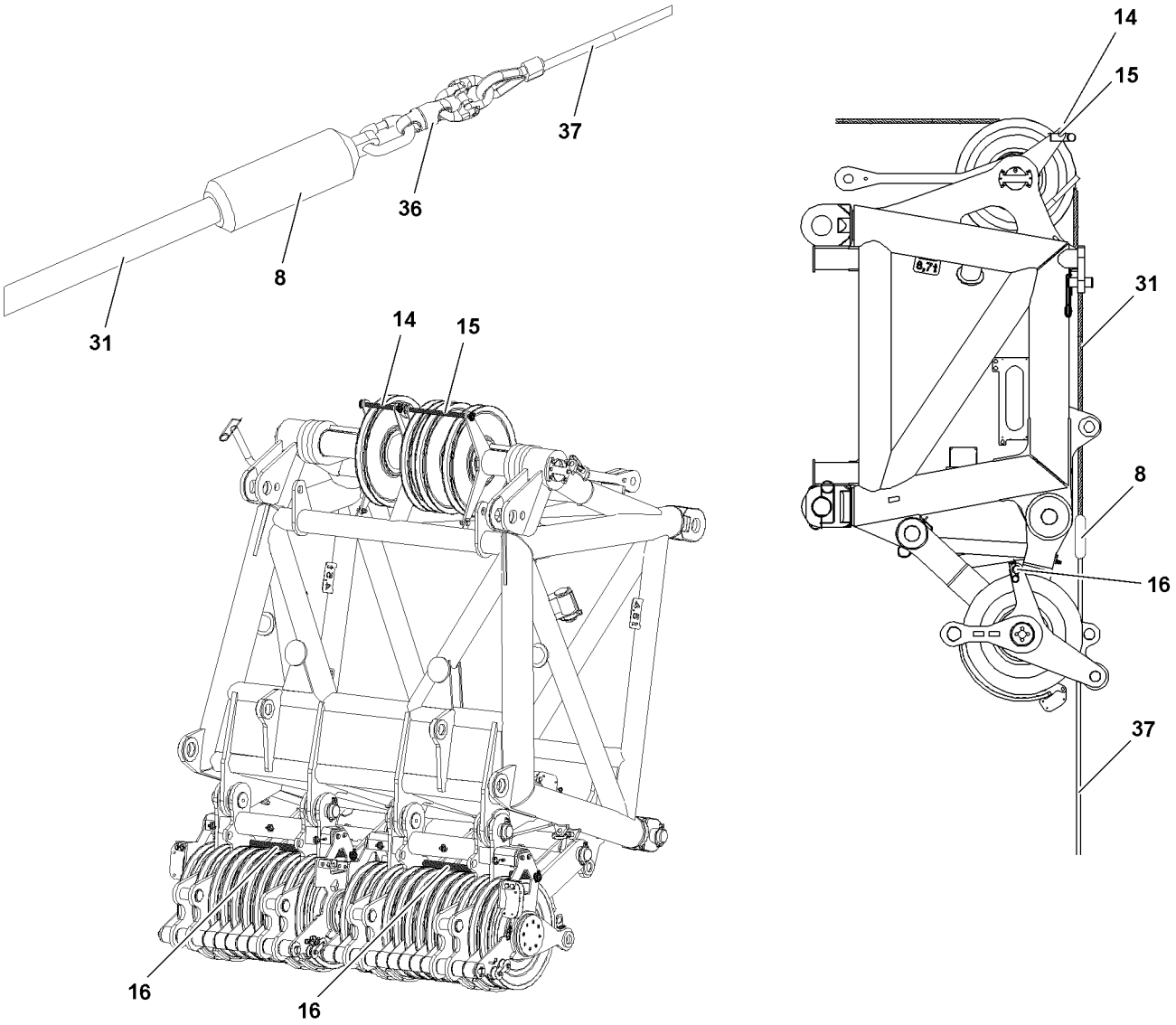

Fig.121853: Reeving in with assembly winch

- ▶ Wear approved fall arrest system and protective equipment, see Crane operating instructions, chapter 2.04.
- ▶ Bring the fall protection equipment on the crane superstructure and on the lattice boom in operating position and secure, see Crane operating instructions, chapter 2.06.
- ▶ Properly hang the fall arrest system on the intended safety ropes and / or fastening points.
- ▶ Switch the assembly winch to freewheeling.
- ▶ Remove the rope retaining pin **14**, rope retaining pin **15** and rope retaining pin **16**.
- ▶ Connect the auxiliary rope **37** with the auxiliary reeving rope (hemp rope).
- ▶ Reeve in the auxiliary rope **37** in the reverse direction between the hook block and the pulley head.
- ▶ Bring the auxiliary rope **37** with the auxiliary reeving rope (hemp rope) upward over the back pulley, which is to be reeved according to the reeving plan.
- ▶ Pull the auxiliary rope **37** to the rear to the hoist winch.
- ▶ Release the auxiliary reeving rope (hemp rope) from the auxiliary rope **37**.

When the auxiliary rope is on the hoist winch:

- ▶ Connect the auxiliary rope **37** with the hoist rope **31**: Open the connecting link **36**, connect it with the eyehook of the lock clamp **8** and close the connecting link **36**.
- ▶ Turn the freewheeling off on the assembly winch.

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NOTICE
Hoist rope tension too low!
Slack rope formation.
▶ Permit no slack rope on the hoist winch and the assembly winch.

▶ Reeve in the hoist rope **31**: Spool the hoist rope **31** from the hoist winch and simultaneously spool up the auxiliary rope **37** on the assembly winch.

When the hoist rope **31** is reeved:
▶ Release the auxiliary rope **37** from the hoist rope **31**.
▶ Spool the auxiliary rope on the assembly winch.
▶ Pin and secure the rope retaining pin **14**, rope retaining pin **15** and rope retaining pin **16**.
▶ Hang the hoist rope properly in on the rope lock, see section „Hanging the hoist rope in on the rope lock“.

When the hoist rope is properly hung in on the rope lock:
▶ Attach the hoist limit switch weight, see section „Attaching the hoist limit switch weight“.

Note
Parallel operation of winch 1 and winch 2!
▶ Repeat the above described reeving procedure with the second hoist rope.
▶ Observe the reeving plan.

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3 Reeving the hook block in and out

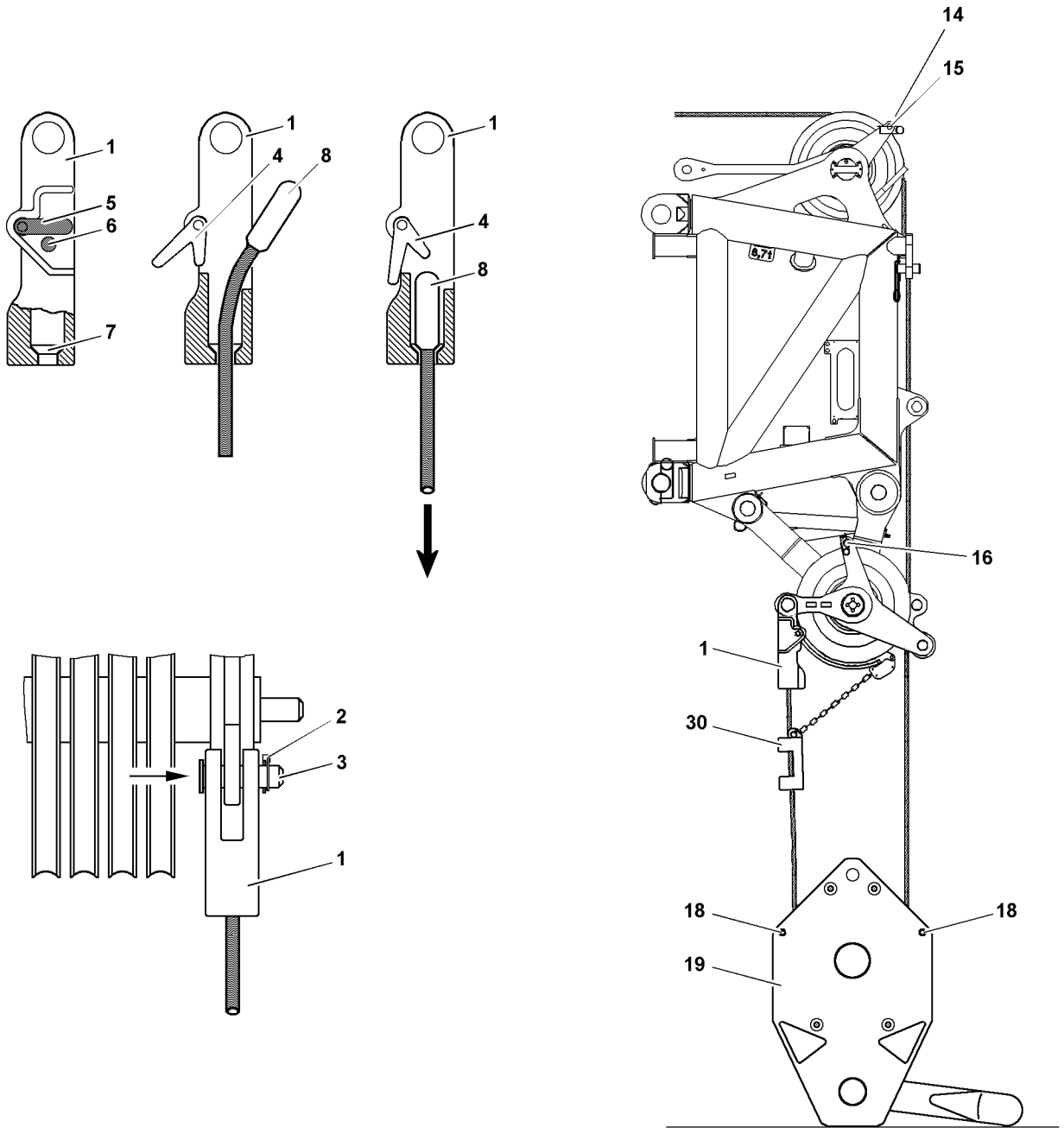

Fig.144024: Details Reeving Hook block

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3.1 Reeving in the hook block

WARNING
Toppling of hook block!
If the retaining pins are **not** pinned in the roller block / the pulley blocks of the hook block before placing the hook block down, then the pulley blocks / the hook block can topple over when unreeving the hoist rope.
Death, severe injury, property damage.
▶ Pin the retaining pins, see Crane operating instructions, chapter 5.19 or separate operating instructions.

3.1.1 Preparing the hook block

Make sure that the following prerequisites are met:
– The crane is horizontally aligned.
– The slewing gear brake is applied.
– The hook block is set down on the ground properly.
– The boom is luffed down to the point where the pulley head is above the hook block.
– An assistant is present to guide the hoist rope.

WARNING
Danger of accident due to side wind!
If the slewing gear brake is released after reeving in / reeving out the hook block / the load hook, then the crane can turn uncontrolled in strong side wind.
Death, severe injury, property damage.
The crane can collide with close-by structures or objects.
▶ Make sure that the current wind speed does not exceed the values from the wind speed chart when releasing the slewing gear brake.

NOTICE
Hook block incorrectly reeved!
Damage to the hoist rope.
▶ Carry out the reeving of the hoist rope according to the reeving plan.
▶ Select the rope fixed point on the hook block is in such a way that the last strand runs parallel to the remaining rope strands, as much as possible.

▶ Set the required hook block under the boom head.
▶ At the hook block **19**, remove the spring retainers **18** for both rope retaining pins and pull them both out.

WARNING
Slipping at assembly work!
Danger of falling.
Death, severe injury, property damage.
▶ The boom system may only be accessed if the assembly personnel is protected with suitable safety measures to prevent them from falling.
▶ If retaining ropes are present on the boom system, then the assembly personnel must hang an approved fall arrest system to the retaining ropes of the boom system on the left and right with both snap hooks and secure themselves to prevent them from falling.
▶ Without appropriate safety measures it is **strictly** prohibited to step on the boom system.
▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly.
▶ Carry out all assembly work from a safe location.
▶ Observe the assembly guidelines in the Crane operating instructions, chapter 5.01.

▶ Reeve the hook block.
▶ Insert the rope retaining pins again and secure with spring retainers.

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3.1.2 Hooking the hoist rope on the rope lock

NOTICE
Hoist rope is incorrectly installed!
Damage to the hoist rope.
▶ Always insert the pins **3** from „inside to outside“ and secure from the outside.

▶ The rope lock **1** must be pinned in either at the pulley head or on the hook block and secured with locking pins **2**, depending on reeving.
▶ On the rope lock **1**, push the safety pin **6** in.
▶ Swing the lever **5** „down“ and hold it in this position.

Result:

– The latch **4** is swung „downward“.

▶ Attach the rope end with the locking clamp **8** in the rope lock **1** and pull „down“ firmly (in direction of arrow), until the locking clamp **8** is touching in the cone **7**.

WARNING
Locking clamp is incorrectly installed!
Danger of accident.
Death, severe injuries, property damage.
▶ The locking clamp **8** must touch on the cone **7** after hanging it into the rope lock **1** and must be secured by the latch **4**.

▶ Release the lever **5**.

Result:

– The lever **5** returns to the initial position and is locked by the safety pin **6**.

▶ Check the rope retainer. Visual check.

3.2 Unreeving the hook block

WARNING
Toppling of hook block!
If the retaining pins are **not** pinned in the roller block / the pulley blocks of the hook block before placing the hook block down, then the pulley blocks / the hook block can topple over when unreeving the hoist rope.
Death, severe injury, property damage.
▶ Pin the retaining pins, see Crane operating instructions, chapter 5.19 or separate operating instructions.

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Make sure that the following prerequisites are met:
- The ground is level and of sufficient load carrying capacity.
- **Only for cranes with crane support:** The crane is properly supported.
- The crane is horizontally aligned.
- The crane is ballasted according to the load chart.
- The LICCON overload protection has been set according to the load chart.
- The slewing gear brake is applied.
- The boom end section is just above the ground.

WARNING
Danger of accident due to side wind!
If the slewing gear brake is released after reeving in / reeving out the hook block / the load hook, then the crane can turn uncontrolled in strong side wind.
Personnel can be severely injured or killed.
The crane can collide with close-by structures or objects.
▶ Make sure that the current wind speed does not exceed the values from the wind speed chart when releasing the slewing gear brake.

3.2.1 Lowering the hook block

WARNING
Crushing of hands!
When unreeving the hook block, it can topple over.
Death, severe injury, property damage.
▶ Use the handles in the safe area of the hook block.
▶ Make sure the hook block is safely positioned.

▶ Lower the hook block and set it on the ground.
▶ Remove the hoist limit switch weight.

3.2.2 Detaching the hoist rope

▶ On the rope lock **1**, push the safety pin **6** in.
▶ Swing the lever **5** „down“ and hold it in this position.

Result:

- The latch **4** is swung downward.
- The locking clamp **8** is released.

▶ Push the hoist rope up and detach the locking clamp **8**.
▶ Release and unpin the rope retaining pin on the hook block.
▶ Unreeve the hoist rope from the hook block and the pulley head.
▶ Insert the rope retaining pins again and secure with spring retainers.

4 Reeving in / reeving out the hook block, L-shaped rope end connection (LR 11000 only)

WARNING
Load can be ripped off!
Death, severe bodily injuries, property damage.
▶ The L-shaped rope end connection **24** is only permitted for use on LR 11000.
▶ It is prohibited to use the L-shaped rope end connection **24** on other crane types.
▶ Make sure that the L-shaped rope end connection is only used for **reeving with a even number of strands**.

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Depending on the number of rope strands, with the even reeving of the hook block, the L-shaped rope end connection must be installed on one of the pin points (pin point **P1** to pin point **P4**) on the roller set / roller sets.

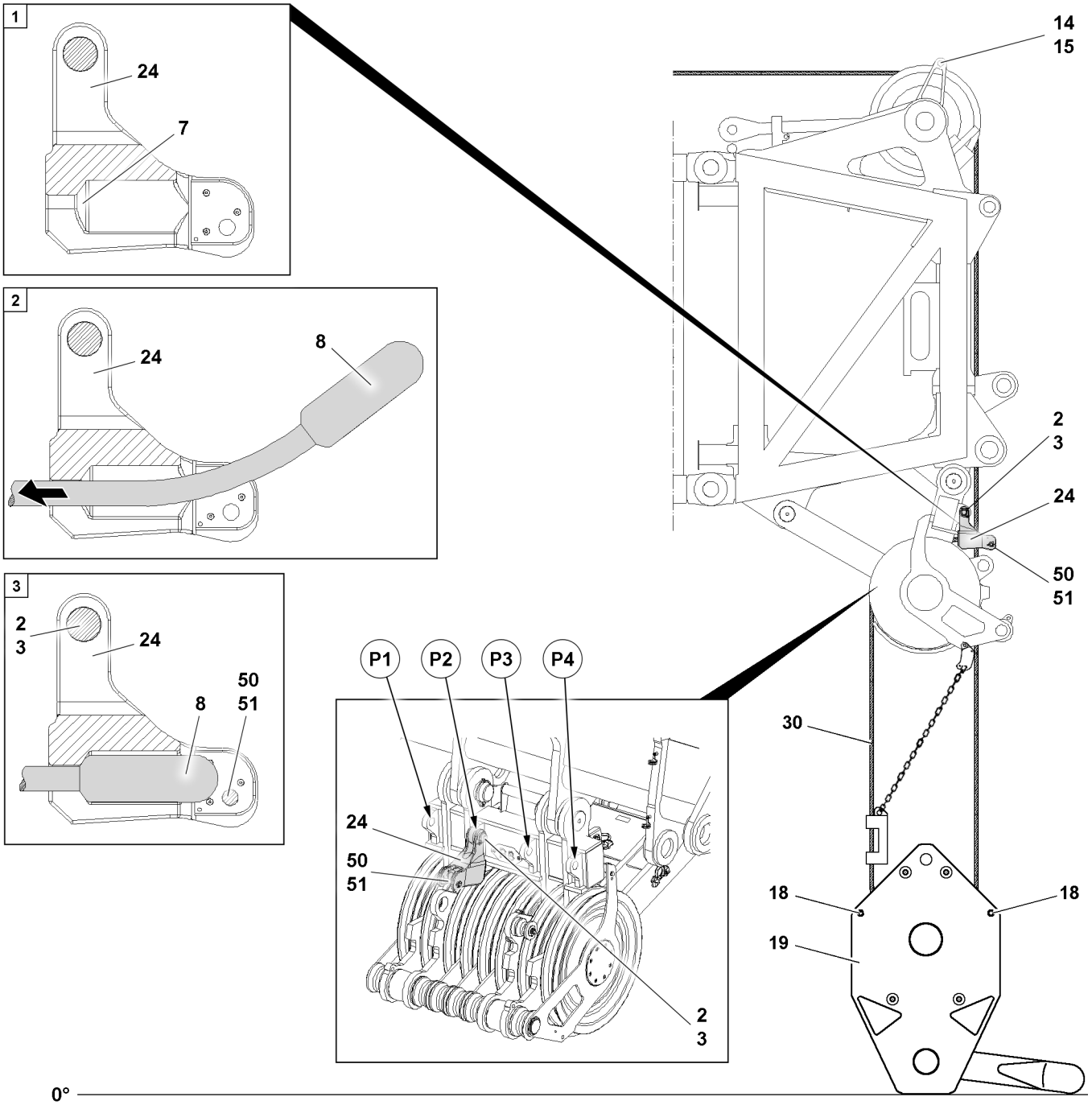

*Fig.144022: Details reeving hook block, L-shaped rope end connection **24***

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4.1 Reeving in the hook block

WARNING
Toppling of hook block!
If the retaining pins are **not** pinned in the roller block / the pulley blocks of the hook block before placing the hook block down, then the pulley blocks / the hook block can topple over when unreeving the hoist rope.
Death, severe injury, property damage.
▶ Pin the retaining pins, see Crane operating instructions, chapter 5.19 or separate operating instructions.

4.1.1 Preparing the hook block

Make sure that the following prerequisites are met:
– The crane is horizontally aligned.
– The slewing gear brake is applied.
– The hook block is set down on the ground properly.
– The boom is luffed down to the point where the pulley head is above the hook block.
– An assistant is present to guide the hoist rope.

WARNING
Danger of accident due to side wind!
If the slewing gear brake is released after reeving in / reeving out the hook block / the load hook, then the crane can turn uncontrolled in strong side wind.
Death, severe injury, property damage.
The crane can collide with close-by structures or objects.
▶ Make sure that the current wind speed does not exceed the values from the wind speed chart when releasing the slewing gear brake.

NOTICE
Hook block incorrectly reeved!
Damage to the hoist rope.
▶ Carry out the reeving of the hoist rope according to the reeving plan.
▶ Select the rope fixed point on the hook block is in such a way that the last strand runs parallel to the remaining rope strands, as much as possible.

▶ Set the required hook block under the boom head.
▶ At the hook block **19**, remove the spring retainers **18** for both rope retaining pins and pull them both out.

WARNING
Slipping at assembly work!
Danger of falling.
Death, severe injury, property damage.
▶ The boom system may only be accessed if the assembly personnel is protected with suitable safety measures to prevent them from falling.
▶ If retaining ropes are present on the boom system, then the assembly personnel must hang an approved fall arrest system to the retaining ropes of the boom system on the left and right with both snap hooks and secure themselves to prevent them from falling.
▶ Without appropriate safety measures it is **strictly** prohibited to step on the boom system.
▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly.
▶ Carry out all assembly work from a safe location.
▶ Observe the assembly guidelines in the Crane operating instructions, chapter 5.01.

▶ Reeve the hook block.
▶ Insert the rope retaining pins again and secure with spring retainers.

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4.1.2 Fitting the hoist rope on the rope lock, L-shaped rope end connection

NOTICE
Hoist rope is incorrectly installed!
Damage to the hoist rope.
▶ Always insert the pins **50** from „inside to outside“ and secure from the outside.

▶ Only pin the rope lock **24** on the roller set / roller sets and secure with a locking pin **2**.
▶ On the rope lock **24**, release and unpin the retaining pin **50**.
▶ Fit the rope end with the locking clamp **8** in the rope lock **24** and pull the rope firmly in the direction of the arrow, until the locking clamp **8** contacts the cone **7**.

WARNING
Locking clamp is incorrectly installed!
Danger of accident.
Death, severe injuries, property damage.
▶ The locking clamp **8** must touch on the cone **7** after fitting it into the rope lock **24** and must be secured by the retaining pin **50**.

▶ Insert the retaining pin **50** and secure properly with the retaining element **51**.
▶ Check the rope retainer. Visual check.

4.2 Unreeving the hook block

WARNING
Toppling of hook block!
If the retaining pins are **not** pinned in the roller block / the pulley blocks of the hook block before placing the hook block down, then the pulley blocks / the hook block can topple over when unreeving the hoist rope.
Death, severe injury, property damage.
▶ Pin the retaining pins, see Crane operating instructions, chapter 5.19 or separate operating instructions.

Make sure that the following prerequisites are met:
– The ground is level and of sufficient load bearing capacity.
– **Only for cranes with crane support:** The crane is properly supported.
– The crane is horizontally aligned.
– The crane is ballasted according to the load chart.
– The LICCON overload protection has been set according to the load chart.
– The slewing gear brake is applied.
– The boom end section is just above the ground.

WARNING
Danger of accident due to side wind!
If the slewing gear brake is released after reeving in / reeving out the hook block / the load hook, then the crane can turn uncontrolled in strong side wind.
Personnel can be severely injured or killed.
The crane can collide with close-by structures or objects.
▶ Make sure that the current wind speed does not exceed the values from the wind speed chart when releasing the slewing gear brake.

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4.2.1 Lowering the hook block

WARNING
Crushing of hands!
When unreeving the hook block, it can topple over.
Death, severe injury, property damage.
- ▶ Use the handles in the safe area of the hook block.
- ▶ Make sure the hook block is safely positioned.

- ▶ Lower the hook block and set it on the ground.
- ▶ Remove the hoist limit switch weight.

4.2.2 Detaching the hoist rope

- ▶ On the rope lock **24**, release and unpin the retaining pin **50**.

Result:

– The locking clamp **8** is released.

- ▶ Push the hoist rope forward and detach the locking clamp **8**.
- ▶ Release and unpin the rope retaining pin on the hook block.
- ▶ Unreeve the hoist rope from the hook block and the pulley head.
- ▶ Insert the rope retaining pins again and secure with spring retainers.

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5 Attaching and removing the load hook*

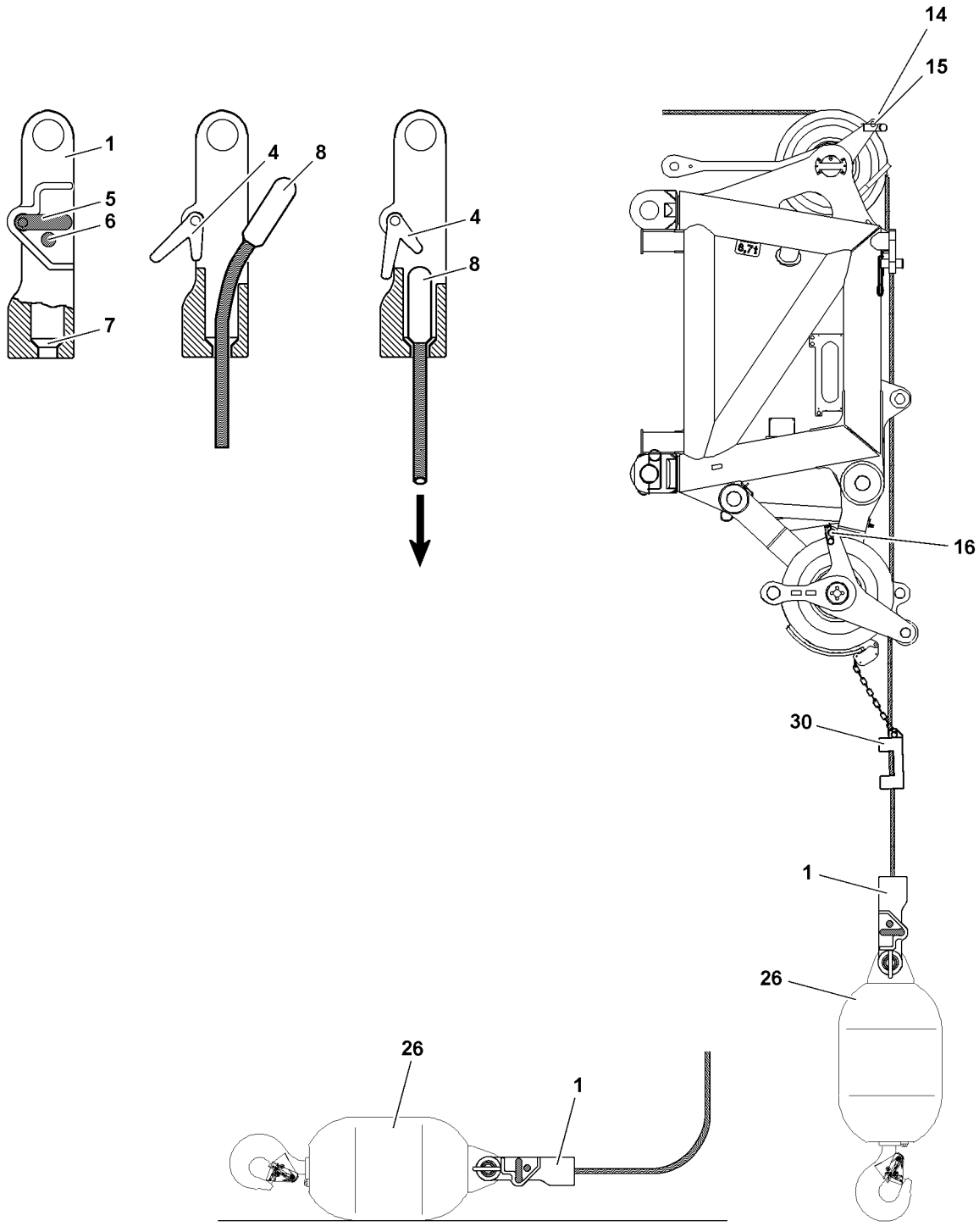

Fig.121854: Fastening load hook

5.1 Fastening the load hook*

5.1.1 Assembling the load hook*

- ▶ Place the load hook under the pulley head of the boom.
- ▶ Release and unpin the rope retaining pins on the back pulley and on the pulley head.

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WARNING
Slipping at assembly work!
Danger of falling.
Death, severe injury, property damage.
- ▶ The boom system may only be accessed if the assembly personnel is protected with suitable safety measures to prevent them from falling.
- ▶ If retaining ropes are present on the boom system, then the assembly personnel must hang an approved fall arrest system to the retaining ropes of the boom system on the left and right with both snap hooks and secure themselves to prevent them from falling.
- ▶ Without appropriate safety measures it is **strictly** prohibited to step on the boom system.
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly.
- ▶ Carry out all assembly work from a safe location.
- ▶ Observe the assembly guidelines in the Crane operating instructions, chapter 5.01.

- ▶ Place the hoist rope over the back pulley on the boom head.
- ▶ Insert the rope retaining pins again and secure with spring retainers.
- ▶ Pin the rope lock **1** in the load hook **26** and secure with spring retainers.

5.1.2 Fastening the hoist rope

Make sure that the following prerequisites are met:
- The crane is horizontally aligned.
- The slewing gear brake is applied.
- The hook block is set down on the ground properly.
- The boom is luffed down to the point where the pulley head is above the hook block.
- An assistant is present to guide the hoist rope.

WARNING
Danger of accident due to side wind!
If the slewing gear brake is released after reeving in / reeving out the hook block / the load hook, then the crane can turn uncontrolled in strong side wind.
Personnel can be severely injured or killed.
The crane can collide with close-by structures or objects.
- ▶ Make sure that the current wind speed does not exceed the values from the wind speed chart when releasing the slewing gear brake.

- ▶ On the rope lock **1**, push the safety pin **6** in.
- ▶ Swing the lever **5** „down“ and hold it in this position.

Result:

- The latch **4** is swung „downward“.

- ▶ Attach the rope end with the locking clamp **8** in the rope lock and pull „down“ firmly (in direction of arrow), until the locking clamp **8** is touching in the cone **7**.

WARNING
Locking clamp is incorrectly fastened!
Damage to locking clamp.
Death, severe injuries, property damage
- ▶ The locking clamp **8** must touch on the cone **7** after hanging it into the rope lock **1** and must be secured by the latch **4**.

- ▶ Release the lever **5**.

Result:

- The lever **5** returns to the initial position and is locked by the safety pin **6**.

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5.2 Removing the load hook*

Make sure that the following prerequisites are met:
- The ground is level and of sufficient load carrying capacity.
- **Only for cranes with crane support:** The crane is properly supported.
- The crane is horizontally aligned.
- The slewing gear brake is applied.
- The load hook is prepared for assembly.
- An assistant is present to guide the hoist rope.

5.2.1 Lowering the load hook

WARNING
Crushing of hands!
When unreeving the hook block, it can topple over.
Death, severe injury, property damage.
▶ Use the handles in the safe area of the hook block.
▶ Make sure the hook block is safely positioned.

▶ Place the load hook **26** on the ground.
▶ Remove the hoist limit switch weight.

5.2.2 Detaching the hoist rope

WARNING
Danger of accident due to side wind!
If the slewing gear brake is released after reeving in / reeving out the hook block / the load hook, then the crane can turn uncontrolled in strong side wind.
Death, severe injury, property damage.
The crane can collide with close-by structures or objects.
▶ Make sure that the current wind speed does not exceed the values from the wind speed chart when releasing the slewing gear brake.

▶ On the rope lock **1**, push the safety pin **6** in.
▶ Swing the lever **5** „down“ and hold it in this position.

Result:

- The latch **4** is swung „downward“.
- The locking clamp **8** is released.

▶ Push the hoist rope in the direction of the load hook and detach the locking clamp **8**.
▶ Remove the rope retaining pins on the pulley head and on the back pulley.
▶ Lift the hoist rope from the rope pulleys.
▶ Insert the rope retaining pins again and secure with spring retainers.

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6 Attaching / removing the hoist limit switch weight

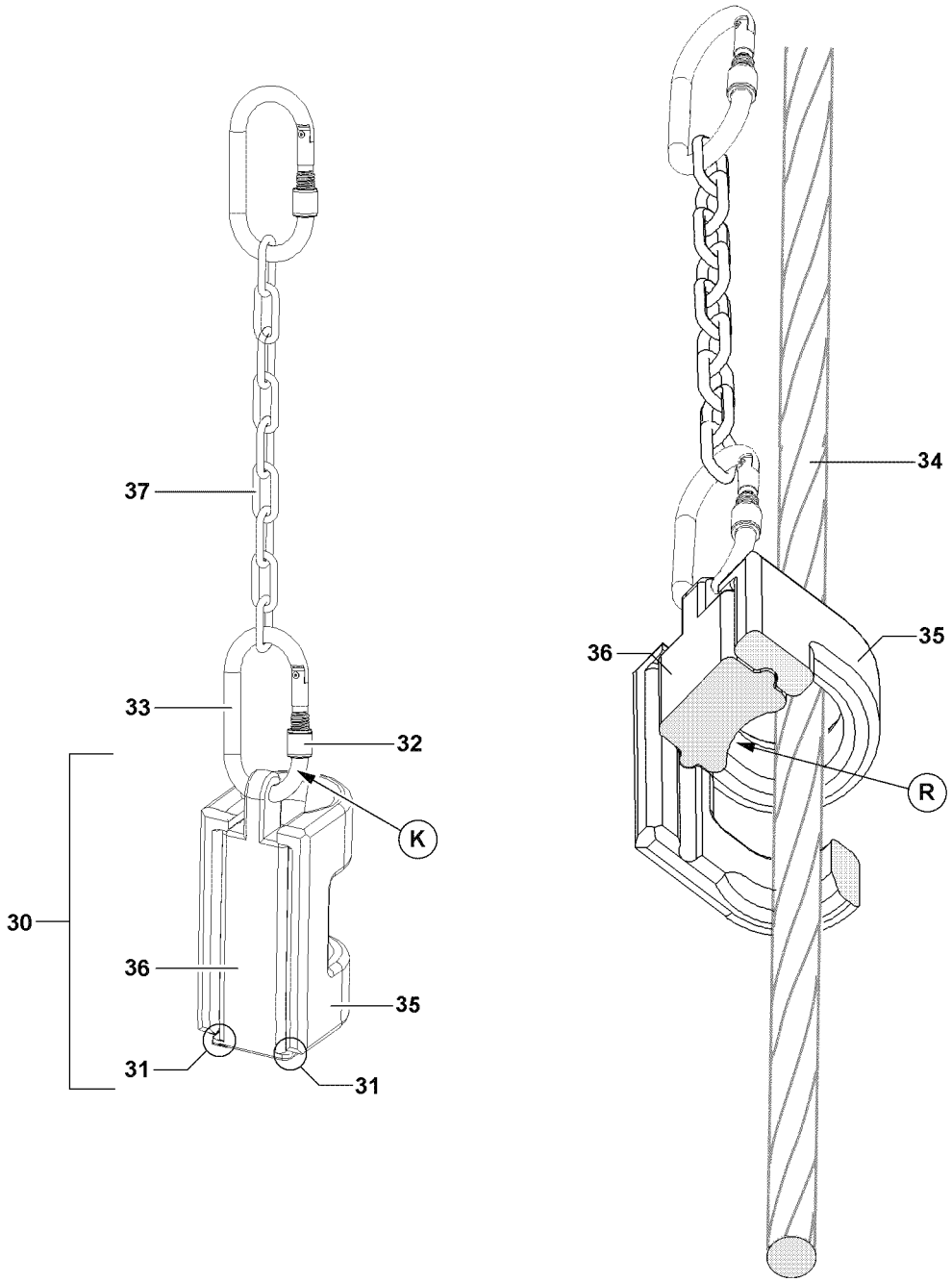

Fig.122728: Details Hoist limit switch weight

6.1 Attaching the hoist limit switch weight

The hoist limit switch weight **30** consists of two parts, which are pushed into each other:
- The weight **35**
- The carrier section **36**

▶ Loosen and open the screw retainer **32**.

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WARNING
Hoist limit switch weight is incorrectly installed!
Hoist limit switch weight can fall down. Death, severe injuries.
- ▶ Do not replace the snap hook **33** with other parts, such as a shackle or similar.
- ▶ When detaching or attaching the hoist limit switch weight **30** make sure that the weight **35** and the carrier section **36** do not fall down.
- ▶ Make sure that the curvature **R** of the carrier section **36** points to the hoist rope **34**.
- ▶ Make sure that the noses **31** of the carrier section **36** is placed on the weight **35**.
- ▶ Make sure that the screw retainer **32** can be turned to be closed from top to bottom, point **K**.

The attachment of the hoist limit switch weight **30** depends on the position of the rope fixed point.

Rope fixed point on the pulley head:
– In the event of multiple hoist rope reeving, the hoist limit switch weight **30** must always be laid around the „stationary rope strand“, in other words around the rope strand that leads directly to the cable lock.

Rope fixed point on hook block:
– The hoist limit switch weight **30** is laid around the outer strand which shows the least angular pull, i.e. the one with the smallest angle between the hanging hoist limit switch weight and the hoist rope.

Note
- ▶ The chain **37** must be attached in full length during crane operation and may not be shortened.

- ▶ Push the weight **35** with one hand on the hoist rope **34** and hold.
- ▶ With the other hand, guide the carrier section **36** behind the hoist rope **34** and under the weight **35**. The curvature **R** of the carrier section **36** must point to the hoist rope **34**.
- ▶ Push the weight **35** on the carrier section **36**.
- ▶ Hang in the hoist limit switch weight **30** with the carrier section **36** in the snap hook **33**.

The snap hook **33** must be secured with the screw retainer **32**.

- ▶ Screw the screw retainer **32** closed on the snap hook **33**.

6.2 Removing the hoist limit switch weight

WARNING
Hoist limit switch weight is incorrectly installed!
Hoist limit switch weight can fall down. Death, severe injuries.
- ▶ When detaching or attaching the hoist limit switch weight **30** make sure that the weight **35** and the carrier section **36** do not fall down.
- ▶ It is prohibited to remain within the danger zone.

- ▶ Release and open the screw retainer **32** on the snap hook **33**.
- ▶ Detach the hoist limit switch weight **30** from the snap hook **33**.
- ▶ Hold the weight **35** with one hand and with the other hand, push the carrier section **36** from the weight **35**.
- ▶ Store the weight **35** and carrier section **36** safely.

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7 Assembling / disassembling the wedge lock

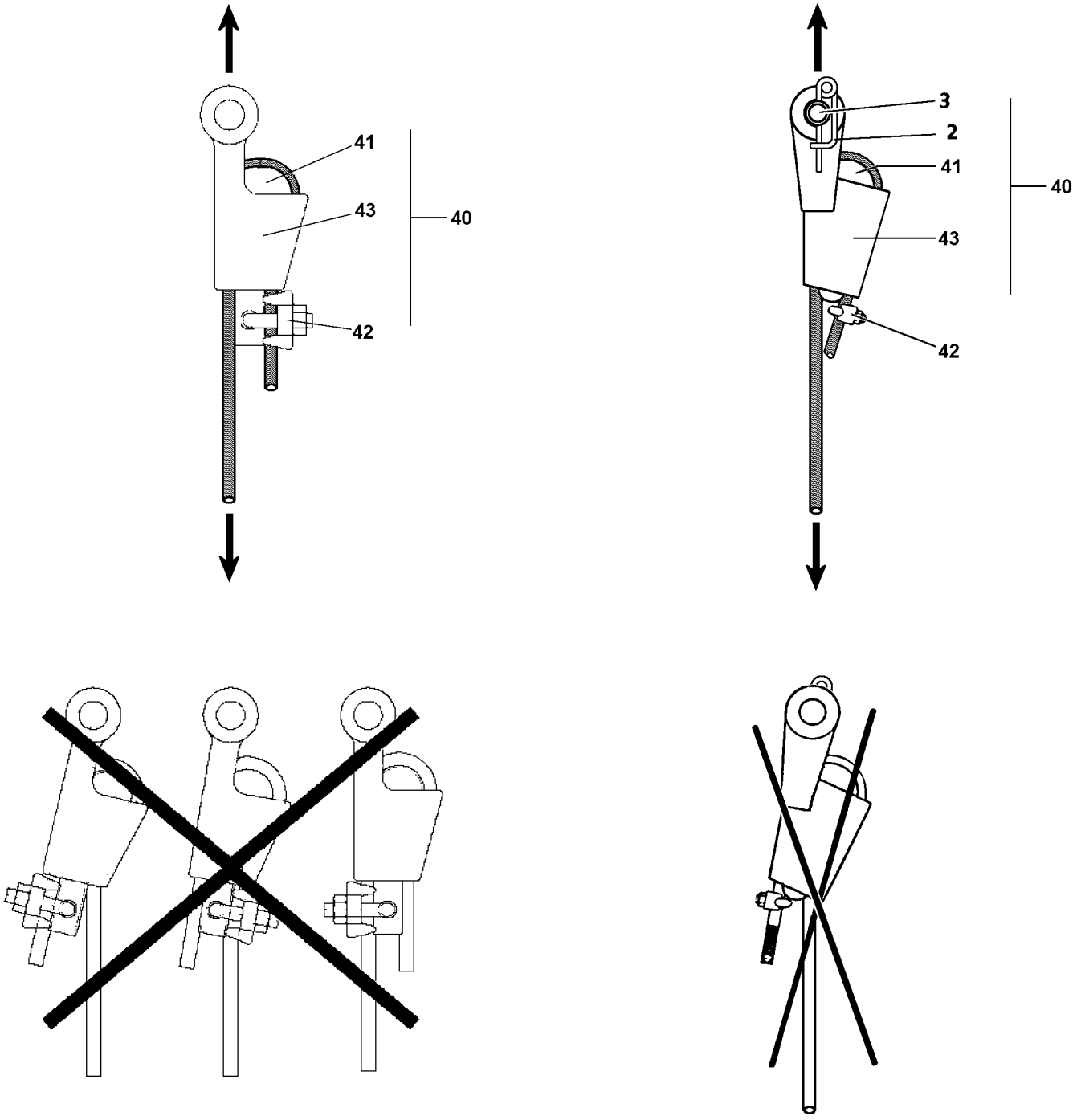

Fig.122729: Wedge lock

Make sure that the following prerequisites are met:
- The rope clamp is cut off on the hoist rope.
- The hook block or the load hook is ready for assembly.

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7.1 Installing the wedge lock

WARNING
Wedge lock is incorrectly installed!
Hook block or load can fall down. Death, severe injuries, property damage.
- ▶ Use only a wedge lock **40** approved by Liebherr-Werk Ehingen.
- ▶ Install the wedge lock **40** correctly.
- ▶ Place the hoist rope with the wedge **41** into the housing **43** in such a way that the rope strand runs in the pull axle of the wedge lock **40**.
- ▶ The dead end of the rope must be secured by the clamp **42** to prevent it from being pulled through.
- ▶ It is prohibited for personnel to remain in the danger zone.

- ▶ Take a matching wedge lock **40** from the tool box.
- ▶ Place the hoist rope with the wedge **41** into the housing **43**.
- ▶ If possible, assemble the clamp **42** through the wedge **41** on the dead end of the rope.

NOTICE
Damage to the hoist rope!
If the pin **3** has been assembled incorrectly, the hoist rope may rub against the pin **3** or on the linch pin **2**.
- ▶ Always insert the pins **3** from „inside to outside“ and secure from the outside.

- ▶ Pin and secure the wedge lock **40** on the fixed point of the pulley head or on the fixed point of the hook block or on the load hook, depending on the reeving plan.

7.2 Removing the wedge lock

- ▶ Unpin the wedge lock **40** on the fixed point.
- ▶ Remove the clamp **42** and pull the hoist rope with the wedge from the housing.
- ▶ Store the wedge lock **40**.

8 Rope reeving

Note
- ▶ See separate reeving plans.

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4.07 Counterweight

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Fig.195219

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1 Component overview

Note
- ▶ Dimensions and weights, see Crane operating instructions, chapter 1.03.
- ▶ The components are marked with their own weight.

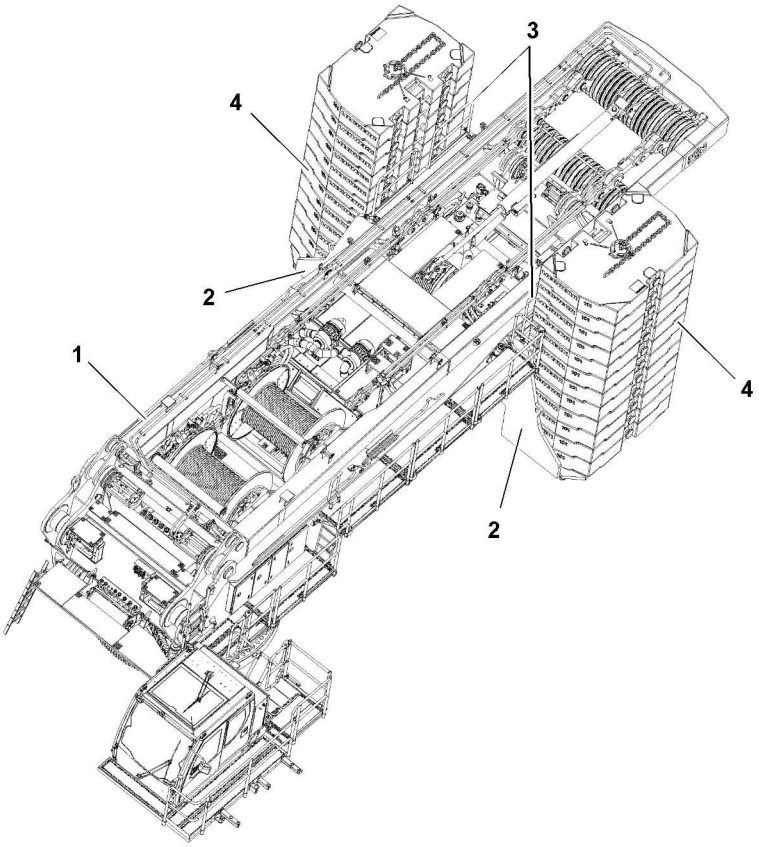

Fig.144010

Position	Component description
1	Turntable
2	Counterweight bracket
3	Railings
4	Counterweight plate

2 Fastening points

Note
- ▶ Pay attention to the labels of the fastening points on the counterweight brackets **2**.

WARNING
Falling counterweight bracket!
Death, severe bodily injuries, property damage.
- ▶ Fasten the counterweight bracket **2** on the fastening points (fastening points **P1** and fastening points **P2**) only in connection with shackles with sufficient load carrying capacity **5**.

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2.1 Fastening points Counterweight bracket

WARNING
Tipping of counterweight bracket!
Death, severe bodily injuries, property damage.
- ▶ Make sure that the fastening equipment is fastened on the correct fastening points, pay attention to the labels.
- ▶ Make sure that the fastening ropes **6** have a length of at least 4 m.
- ▶ Make sure that there are no persons or obstacles within the danger zone.

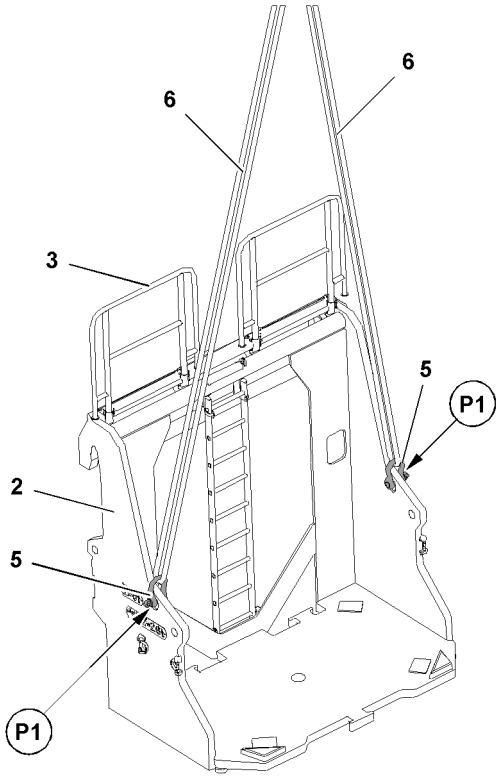

Fig.144009: Fastening points Counterweight bracket

Fastening points	
P1	Counterweight bracket

2.2 Fastening points counterweight bracket with counterweight plates

WARNING
Tipping of counterweight bracket!
If the counterweight bracket **2** is fastened on the auxiliary crane with more than the maximum permissible two counterweight plates **4**, then the counterweight bracket **2** can tip over.
The counterweight plates **4** can fall down.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the assembly of the counterweight bracket **2** is carried out with maximum two inside counterweight plates **4**.
- ▶ Make sure that the fastening equipment is fastened on the correct fastening points, pay attention to the labels.
- ▶ Make sure that the fastening ropes **6** have a length of at least 4 m.
- ▶ Make sure that there are no persons or obstacles within the danger zone.

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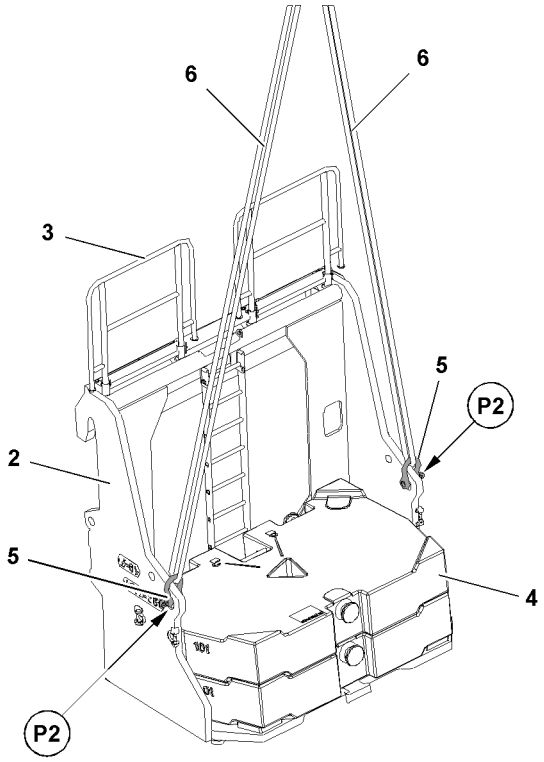

Fig.144013: Fastening points counterweight bracket with counterweight plates

Fastening points	
P2	Counterweight bracket **with** counterweight plates[1)]

1) Maximum permissible: 2 x 10.0 t

3 Permissible counterweight assemblies

WARNING
Overload fastening points counterweight assemblies!
If more than the permissible number of counterweights are lifted together, then the fastening points can be overloaded.
The counterweights **4** and components can fall down.
Death, severe bodily injuries, property damage.
▶ Attach only the maximum permissible number of counterweights **4** per lift.

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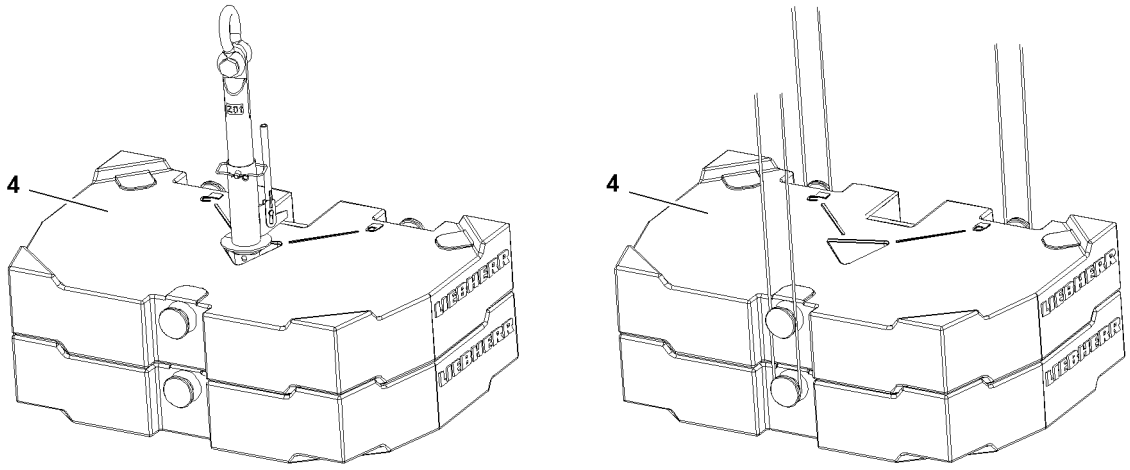

Fig.118980

Individual weight	Maximum number of same counterweight plates per lift over	
Counterweight plate	Twistlock	Bitt
5.0 t	2	1
7.5 t	2	2
10.0 t	2	2

4 Installing the counterweight

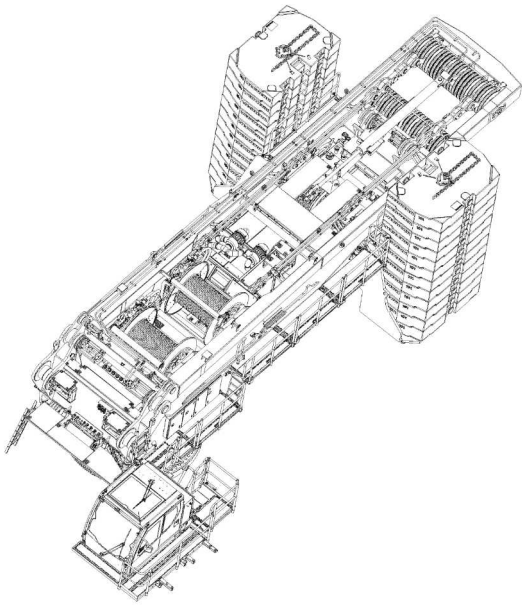

Fig.144011: Installing the counterweight

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Make sure that the following prerequisite is met:
– The crane is horizontally aligned.

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Components not pinned and secured!
If a component is released from the auxiliary crane before having been pinned and secured, the component can slip and fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not disengage the auxiliary crane until the corresponding component is pinned and secured.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

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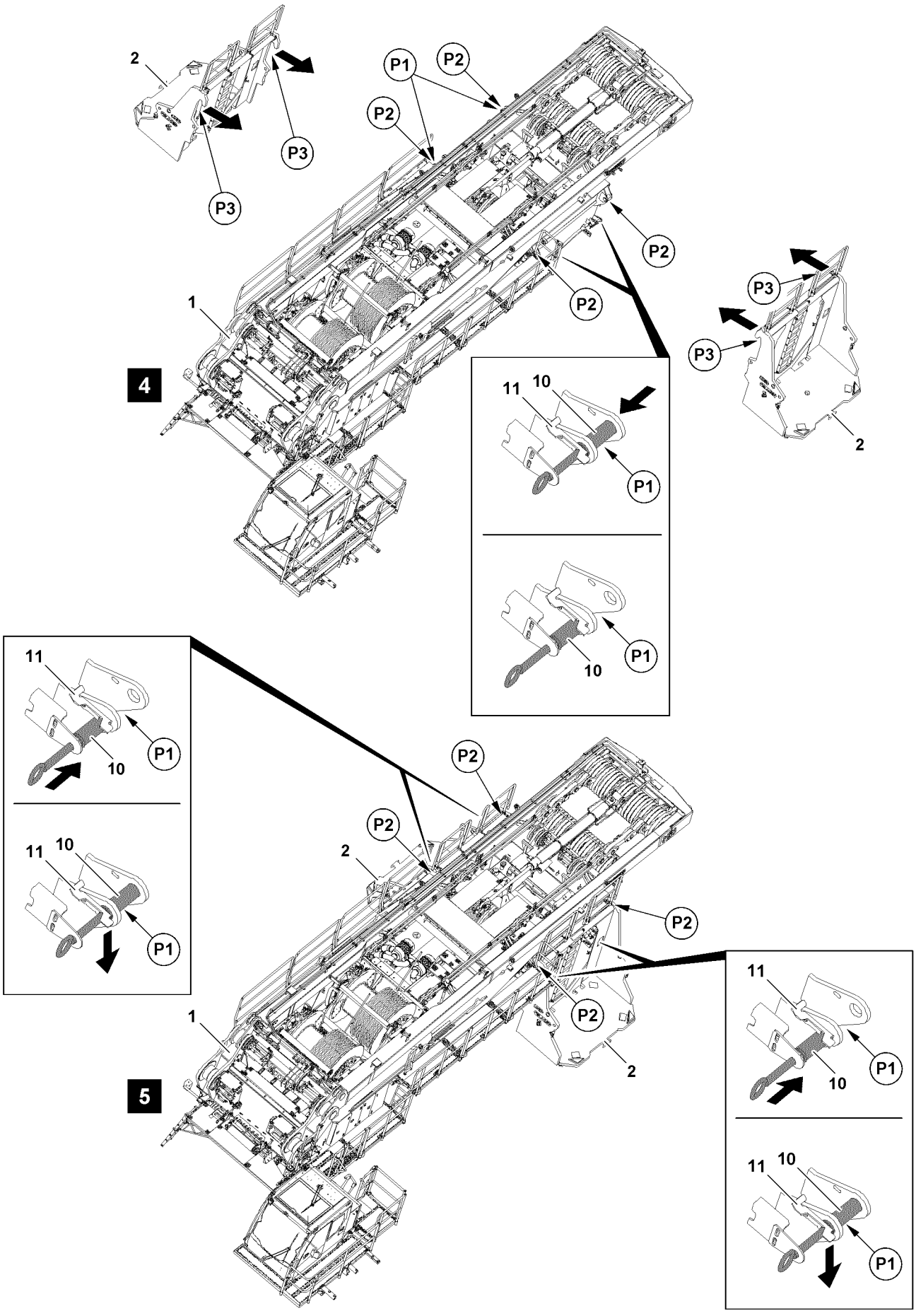

Fig.118982

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4.1 Bringing the railings on the counterweight brackets into operating position

Note

▶ The assembly / disassembly of the railings is described in the Crane operating instructions, chapter 2.06.

WARNING

Danger of falling for assembly personnel!

▶ Assemble / disassemble the railings only according to the description in the Crane operating instructions, chapter 2.06.

4.2 Assembling the counterweight brackets on the turntable

Make sure that the following prerequisites are met:

– The retaining pins **10** are completely unpinned on both sides on the turntable **1**.
– The railings **3** are properly installed and secured on the counterweight brackets **2**.

4.2.1 Installing the counterweight brackets

Note

▶ The assembly / disassembly of the counterweight brackets **2** is explained on an example without inside counterweight plates.

▶ Fasten the counterweight bracket **2** on the auxiliary crane, see section „Fastening points“.

WARNING

Tipping of counterweight bracket!

When lifting the counterweight bracket **2** with maximum two inside counterweight plates **4**, then the counterweight bracket **2** tips to the rear by approx. 5° to 8° - due to the position of the center of gravity.

▶ Make sure that the assembly of the counterweight bracket **2** is carried out with maximum two inside counterweight plates **4**.
▶ Make sure that the fastening ropes have a length of at least 4 m.
▶ Make sure that there are no persons within the danger zone when lifting the counterweight bracket **2**.

▶ Swing the counterweight bracket **2** in with the auxiliary crane to the hook pins (points **P2**), on the turntable.
▶ Hang the counterweight bracket **2** with the hangers (point **P3**) on the hook pins (points **P2**) on the side on the turntable **1**.
▶ Lower the counterweight bracket **2** completely on the hook pins (points **P2**).

When the counterweight bracket **2** is properly hooked on the hook pins:

▶ Insert the retaining pin **10** on both sides at point **P1** and secure.

Result:

– The counterweight bracket **2** is pinned with the turntable **1**.

▶ Make sure that retaining pins **10** are secured with retaining clamps **11**.
▶ Release the fastening equipment **6** on the counterweight bracket **2** and remove the auxiliary crane.

Note

▶ The procedure to install the second counterweight bracket **2** is identical with the above procedure.

▶ Install the second counterweight bracket **2**.

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4.3 Placing the counterweight plates

WARNING
The crane can topple over!
If the placed counterweight deviates from the specified data in the erection / take down charts, the load charts or the assembly conditions, then the crane can be damaged or topple over.
Death, severe bodily injuries, property damage.
- ▶ Always place the counterweight plates symmetrically on the counterweight brackets **2**.
- ▶ Place the counterweight according to the data in the erection / take down charts as well as the load chart.
- ▶ Before placing the counterweight plates check the maximum permissible counterweight depending on the assembly conditions, see Crane operating instructions, chapter 3.06.

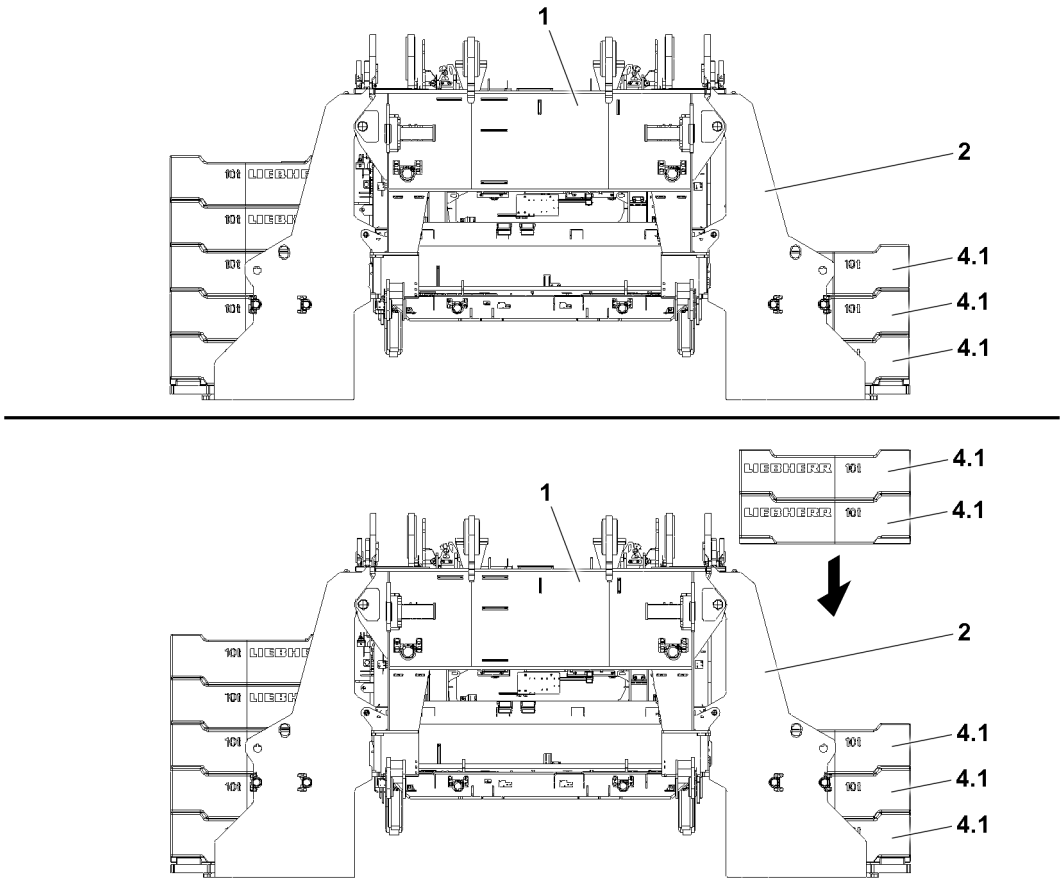

Fig.144008: Placing the counterweight plates

WARNING
The crane can topple over!
When ballasting the crane up / down, a weight difference of more than 20 t between the left and right turntable side can cause the crane to topple over.
Death, severe bodily injuries, property damage.
- ▶ A weight difference between the left and right turntable side of more than 20 t is prohibited.
- ▶ Alternately place no more than maximum 20 t counterweight assemblies on the counterweight stacks, alternately symmetrically on the left and right.

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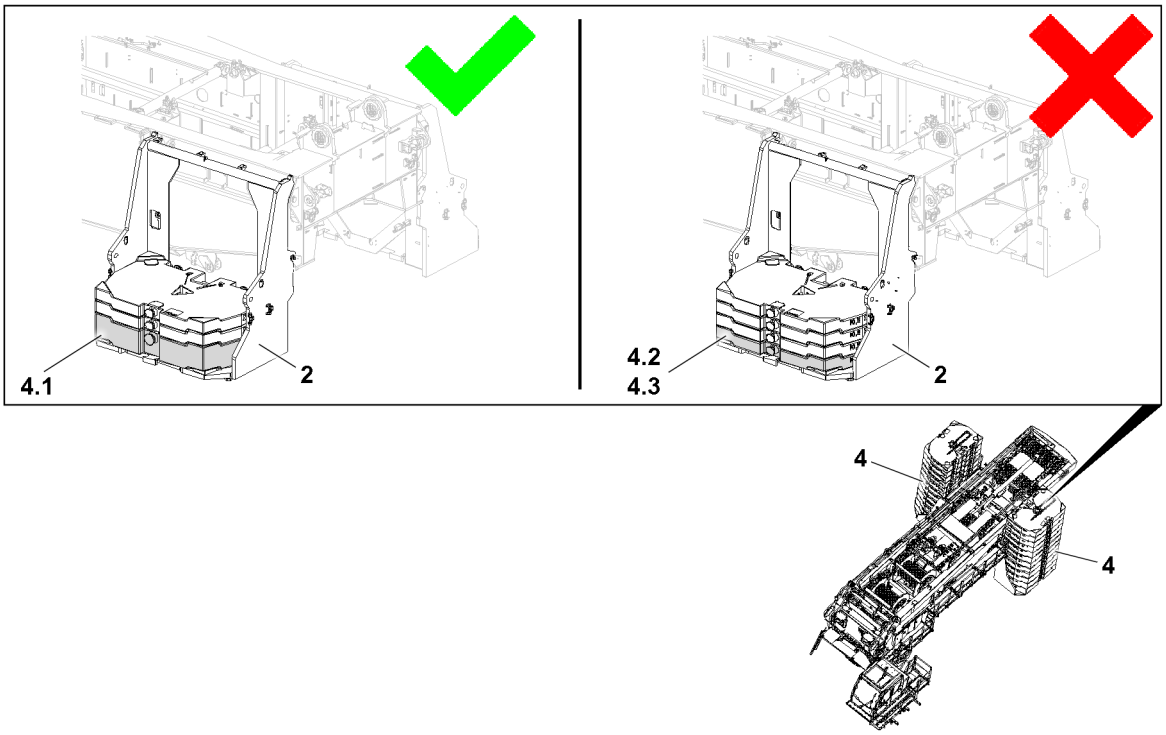

Fig.144007: Ballasting the counterweight stack

WARNING
Falling counterweight plates!
If the ballasting sequence is not adhered to when placing the counterweights on the counterweight brackets **2**, the counterweight plates located at the bottom of the counterweight stack may be damaged.
The counterweight plates can fall down from the counterweight stack.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the counterweight stack is only started with 10 t counterweight plates **4.1**.
- ▶ Make sure that the counterweight stack is never started with 5.0 t counterweight plates **4.3** or 7.5 t counterweight plates **4.2**.
- ▶ Further ballasting from the first 10 t counterweight plates **4.1** in the counterweight stack can be continued with 5.0 t or 7.5 t counterweight plates.

Make sure that the following prerequisites are met:
- The counterweight brackets **2** are properly pinned and secured on the turntable.
- There are no obstacles, objects or personnel in the danger zone.

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4.3.1 Placing the counterweight plates, fastening system: „Twistlock“

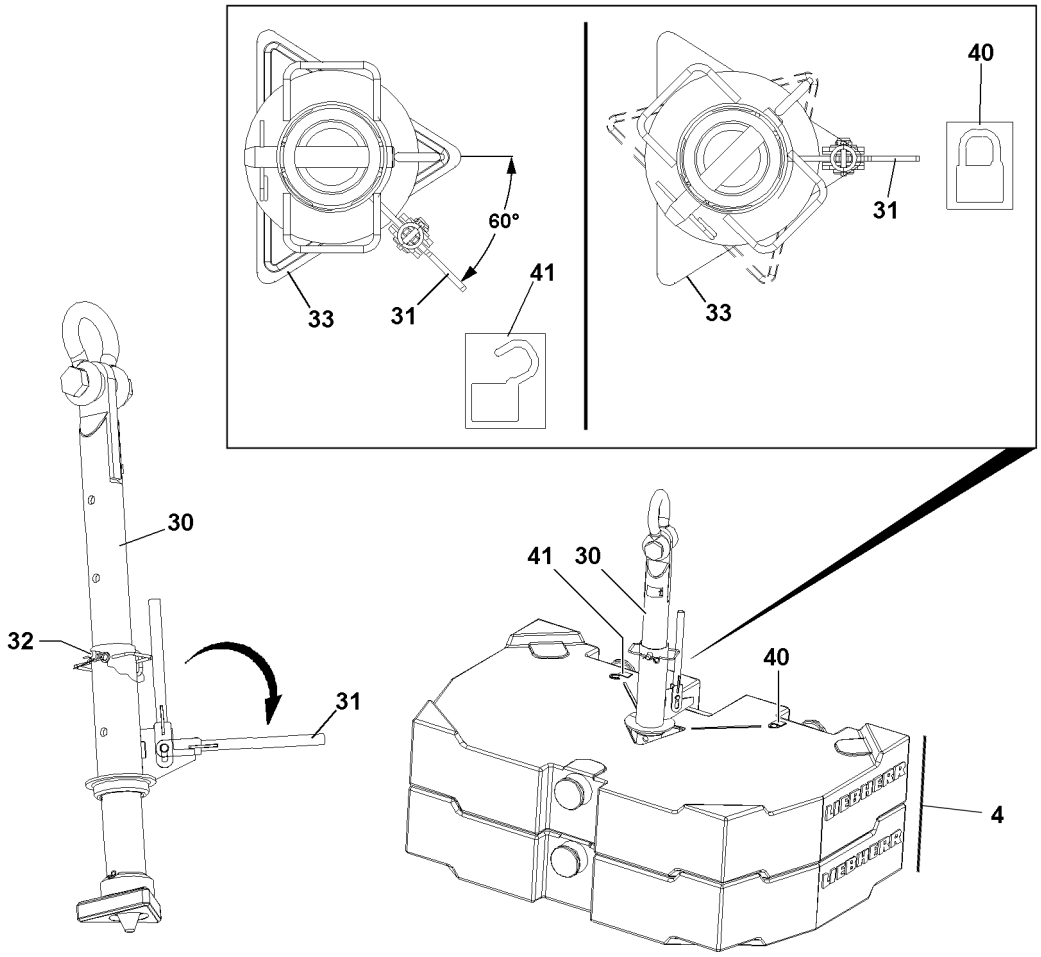

*Fig.128757: Placing the counterweight plates **4**, fastening system: „Twistlock“*

WARNING
Danger of accident!
If more than the permissible two counterweight plates **4** are lifted with the receptacle stud, the receptacle stud will be overloaded and can be damaged.
Death, severe bodily injuries, property damage.
▶ Make sure that the counterweight plates **4** are placed correctly in the centerings.
▶ Replace damaged counterweight plates **4**.

To stack the counterweight plate(s) **2**, use the receptacle stud **30**.

Before the receptacle stud **30** is guided into the counterweight plates **4**, it must be ensured that the length of the receptacle stud **30** is set correctly. The length of the receptacle stud **30** can be adjusted with the pin **32**.

If the length of the receptacle stud **30** is to be adjusted:
▶ Release and unpin the pin **32**.
▶ Adjust the length of the receptacle stud by moving the receptacle stud **30**.
▶ Insert the pin **32** and secure with the spring retainer.
▶ Attach the receptacle stud **30** on the auxiliary crane and guide it into the counterweight plate(s).
▶ Pull the lever **31** up and fold it down.
▶ Turn the lever **31** by 60° until the lever **31** points to the icon **40**.

Result:

– The receptacle stud **30** is locked with the counterweight plate.

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▶ Lift the counterweight plate(s) with the receptacle stud **30** and place carefully onto the centerings on the counterweight bracket **2** or on another counterweight plate.

When the counterweight plate(s) are placed on the counterweight bracket **2** or on another counterweight plate:

▶ Turn the lever **31** by 60° until the lever **31** points to the icon **41**.

Result:

– The receptacle stud **30** is unlocked.

▶ Carefully pull the receptacle stud **30** from the counterweight plate / the counterweight plates.
▶ Stack the counterweight plates **4** according to the erection / take down charts or the load charts.

4.3.2 Placing the counterweight plates, fastening points: Bitt

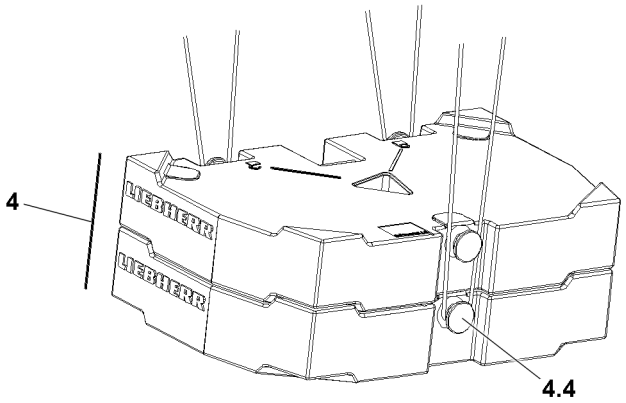

Fig.128758: Placing the counterweight plates, fastening points: Bitt

WARNING
Falling counterweight plates!
If more than the permissible loads are lifted, then the bitts **4.4** are overloaded and the counterweight plates **4** can fall down.
Death, severe bodily injuries, property damage.
▶ Lift no more than maximum 20 t with the ropes, 3 fastening points.
▶ Replace damaged counterweight plates **4** immediately.

WARNING
Incorrect handling of the fastening equipment!
If fastening equipment cannot be attached correctly and if it is not secured sufficiently to prevent it from loosening up, loads can fall down.
Death, severe bodily injuries, property damage.
▶ Make sure that the fastening equipment is correctly attached on the bitts **4.4** and that it is secured sufficiently to prevent it from loosening up.

Note
▶ Place the counterweight plates **4** individually or as a counterweight assembly, maximum 20 t.
▶ Weight difference between the counterweight stacks, no more than maximum 20 t.
▶ 20 t counterweight assembly.

▶ Attach the counterweight plate **4** or counterweight assembly on the auxiliary crane and place it on both sides on the counterweight brackets **2** or on the already placed counterweight plates **4**.

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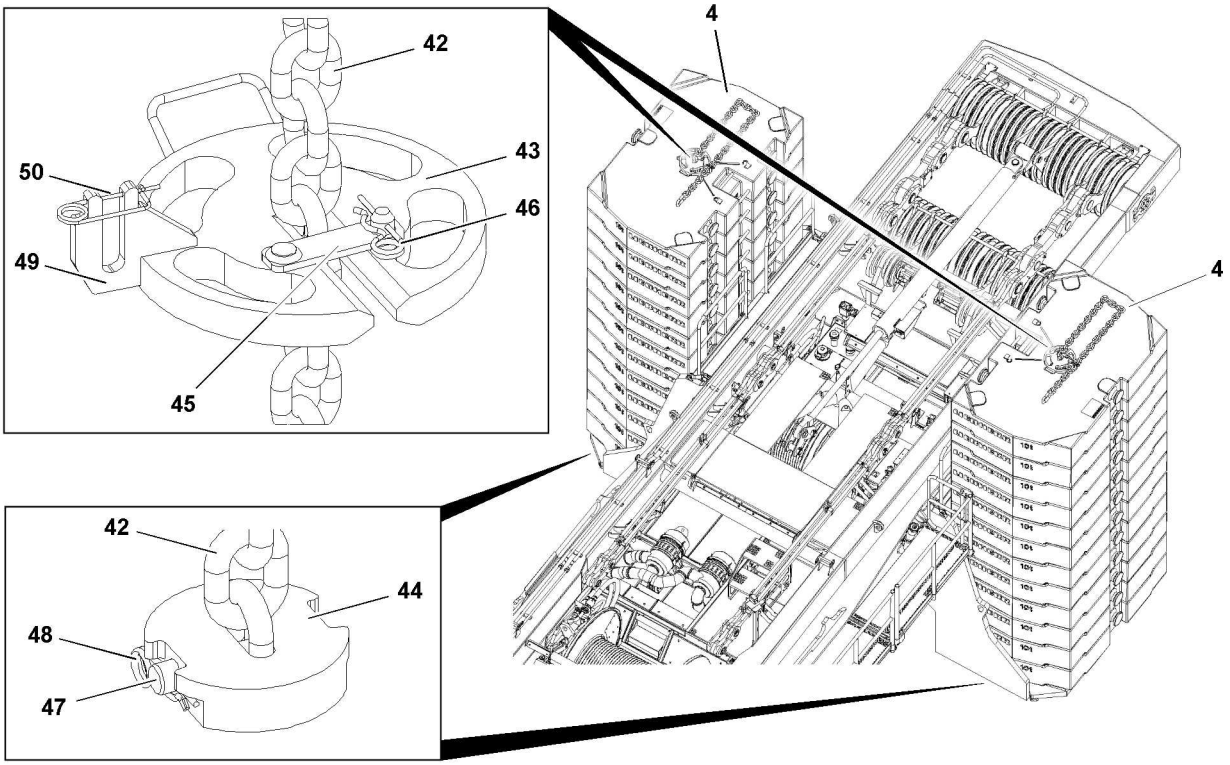

Fig.144014

4.4 Securing the counterweight

Make sure that the following prerequisite is met:
– The counterweight has been stacked according to the load chart and the operating instructions.

WARNING
Danger of accident when securing the counterweight plates **4**!
If the counterweight is not properly secured, then it can fall down from the counterweight brackets.
Death, severe bodily injuries, property damage.
▶ Before starting crane operation, the complete counterweight must be secured.

▶ Guide the retaining chain **42** with the auxiliary crane from the top through the counterweight assembly.
▶ Pin the retaining chain **42** on the bottom with the retaining plate **44**: Insert the pin **47** and secure with the spring retainer **48**.
▶ Carefully tighten the retaining chain **42** with the auxiliary crane.
▶ Secure the retaining chain **42** on top with the retaining plate **43**.
▶ Secure the retaining plate **43** with the retaining plate **45**.
▶ Secure the retaining plate **45** with spring retainer **46**.

WARNING
Danger of accidents due to chain overhang!
On a partial ballast, the chain overhang can fall down on the side of the counterweight stack!
Death, severe bodily injuries, property damage.
▶ In case of a chain overhang, hang in the retaining chain **42** into the fork **49** and secure with spring retainer **50** to prevent it from falling down.

▶ Secure the retaining chain to prevent it from falling down.

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5 Removing the counterweight

Make sure that the following prerequisite is met:
– The crane is horizontally aligned.

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Components not pinned and secured!
If a component is released from the auxiliary crane before having been pinned and secured, the component can slip and fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not disengage the auxiliary crane until the corresponding component is pinned and secured.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

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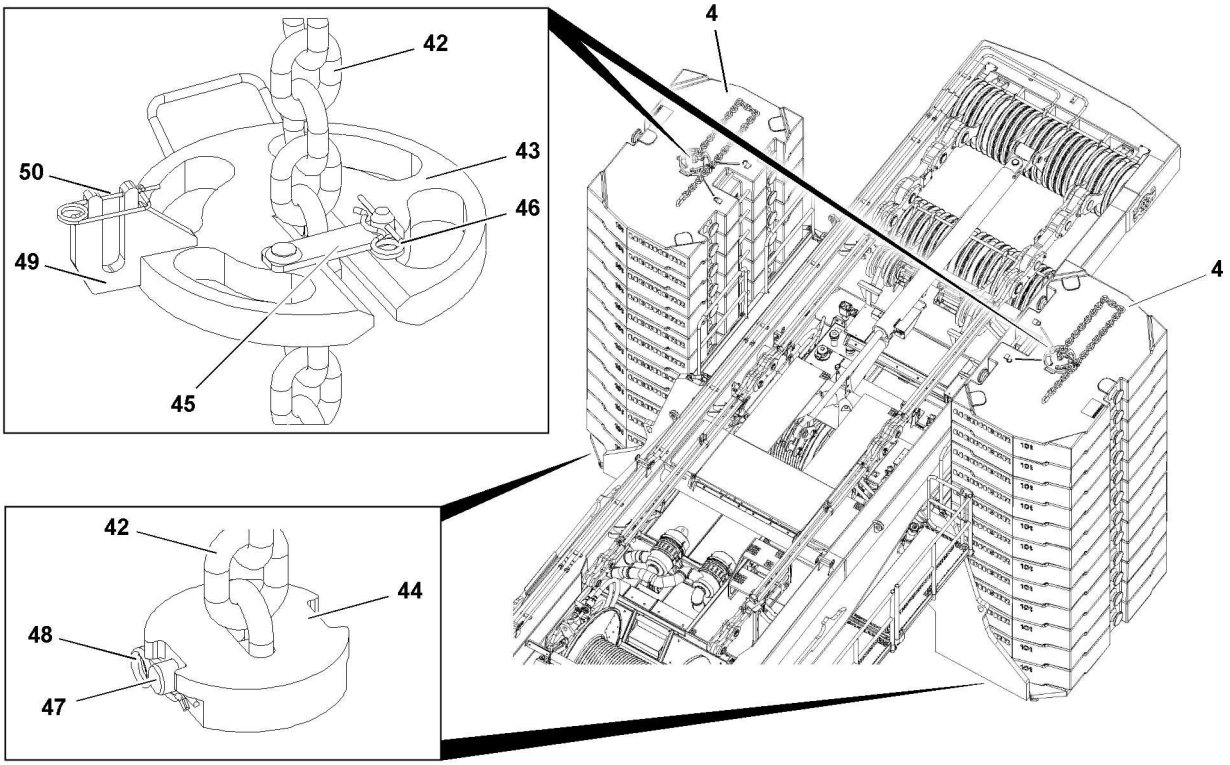

Fig.144014

5.1 Releasing the counterweight

If necessary:

- ▶ Remove the spring retainer **50**.
- ▶ Attach the retaining chain **42** on the auxiliary crane and secure it to prevent it from falling.
- ▶ Remove the retaining plate **44**: Release and unpin the pin **47**.
- ▶ Pull the retaining chain **42** with the auxiliary crane from the counterweight assembly and place it on a suitable base or on the ground.
- ▶ Release the retaining plate **45** and remove the retaining plate **43**.
- ▶ Remove the counterweight plates **4**.

5.2 Removing the counterweight plates

Make sure that the following prerequisite is met:

– The retaining chains are removed.

Note

- ▶ The counterweight plates **4** are marked with their own weights.

WARNING

The crane can topple over!

When ballasting the crane up / down, a weight difference of more than 26 t between the left and right turntable side can cause the crane to topple over.

Death, severe bodily injuries, property damage.

- ▶ A weight difference between the left and right turntable side of more than 26 t * is prohibited.
- ▶ Alternately remove no more than maximum 20 t counterweight assemblies from the counterweight stacks, alternately symmetrically on the left and right.

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5.2.1 Removing the counterweight plates, fastening system: „Twistlock“

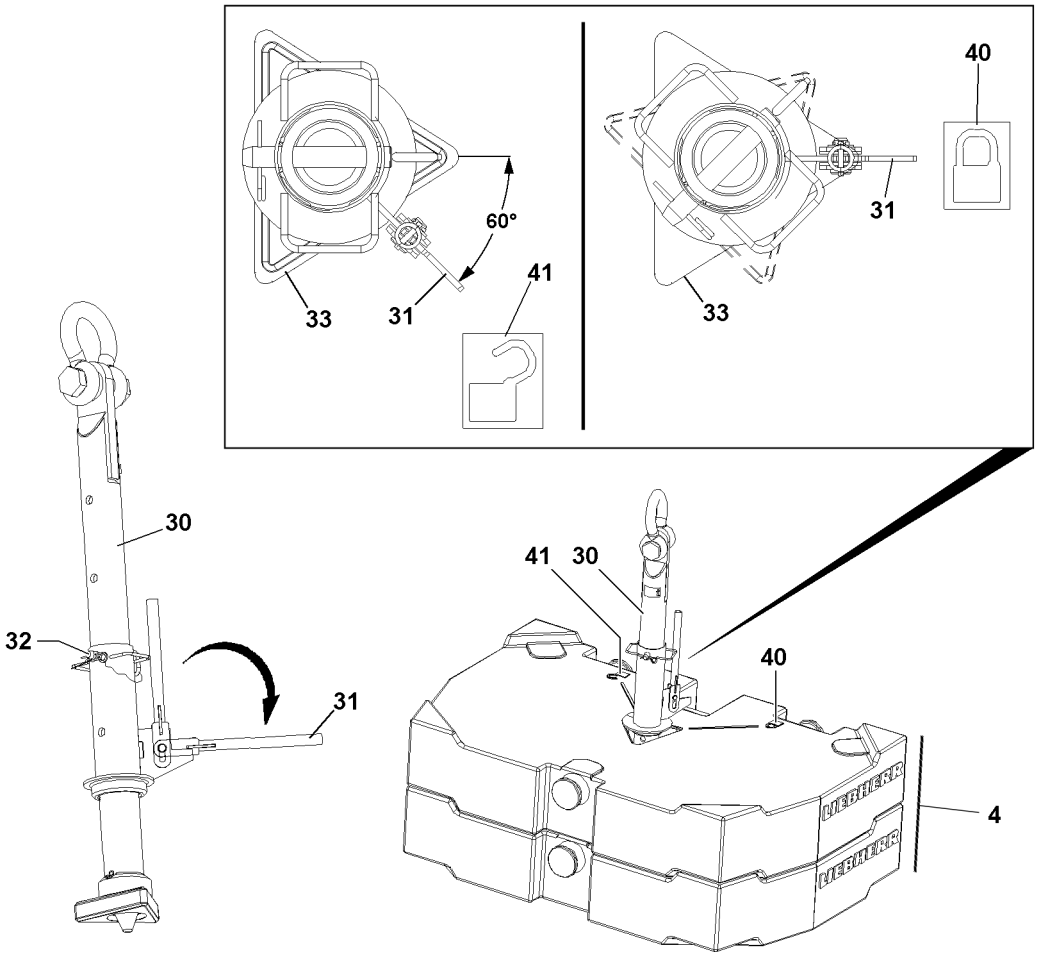

Fig.128757: Removing the counterweight plates, fastening system: „Twistlock“

DANGER
Danger of accident!
If more than the permissible two counterweight plates **4** are lifted with the receptacle stud, the receptacle stud will be overloaded and can be damaged.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the counterweight plates **4** are placed correctly in the centerings.
- ▶ Replace damaged counterweight plates **4**.

To remove the counterweight plate(s) **2**, use the receptacle stud **30**.

Before the receptacle stud **30** is guided into the counterweight plates **4**, it must be ensured that the length of the receptacle stud **30** is set correctly. The length of the receptacle stud **30** can be adjusted with the pin **32**.

If the length of the receptacle stud **30** is to be adjusted:
- ▶ Release and unpin the pin **32**.
- ▶ Adjust the length of the receptacle stud by moving the receptacle stud **30**.
- ▶ Insert the pin **32** and secure with the spring retainer.
- ▶ Attach the receptacle stud **30** on the auxiliary crane and guide it into the counterweight plate(s).
- ▶ Pull the lever **31** up and fold it down.
- ▶ Turn the lever **31** by 60° until the lever **31** points to the icon **40**.

Result:

– The receptacle stud **30** is locked with the counterweight plate.

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▶ Lift the counterweight plate with the receptacle stud **30** and remove it from the counterweight stack or the counterweight brackets **2**.
▶ Turn the lever **31** by 60° until the lever **31** points to the icon **41**.

Result:

– The receptacle stud **30** is unlocked from the counterweight plate.

▶ Carefully pull the receptacle stud **30** from the counterweight plate.
▶ Alternately remove the counterweight plates **4** from both sides.

5.2.2 Removing the counterweight plates, fastening points: Bitt

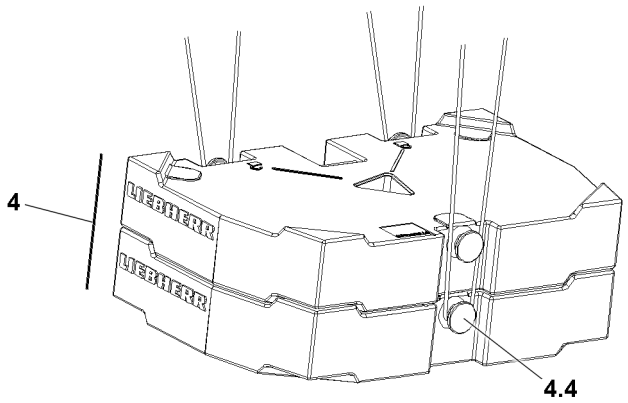

Fig.128758: Removing the counterweight plates, fastening points: Bitt

WARNING
Falling counterweight plates **4**!
If more than the permissible loads are lifted, then the bitts **4.4** are overloaded and the counterweight plates **4** can fall down.
Death, severe bodily injuries, property damage.
▶ Lift no more than maximum 20 t with the ropes, 3 fastening points.
▶ Replace damaged counterweight plates **4** immediately.

WARNING
Incorrect handling of the fastening equipment!
If fastening equipment cannot be attached correctly and if it is not secured sufficiently to prevent it from loosening up, loads can fall down.
Death, severe bodily injuries, property damage.
▶ Make sure that the fastening equipment is correctly attached on the bitts **4.4** and that it is secured sufficiently to prevent it from loosening up.

Note
▶ Remove the counterweight plates **4** individually or as a counterweight assembly, maximum 20 t.
▶ Weight difference between the counterweight stacks, maximum 20 t.

▶ Lift the counterweight plate **4** or the counterweight assembly and remove it from the counterweight stack or the counterweight brackets **2**.

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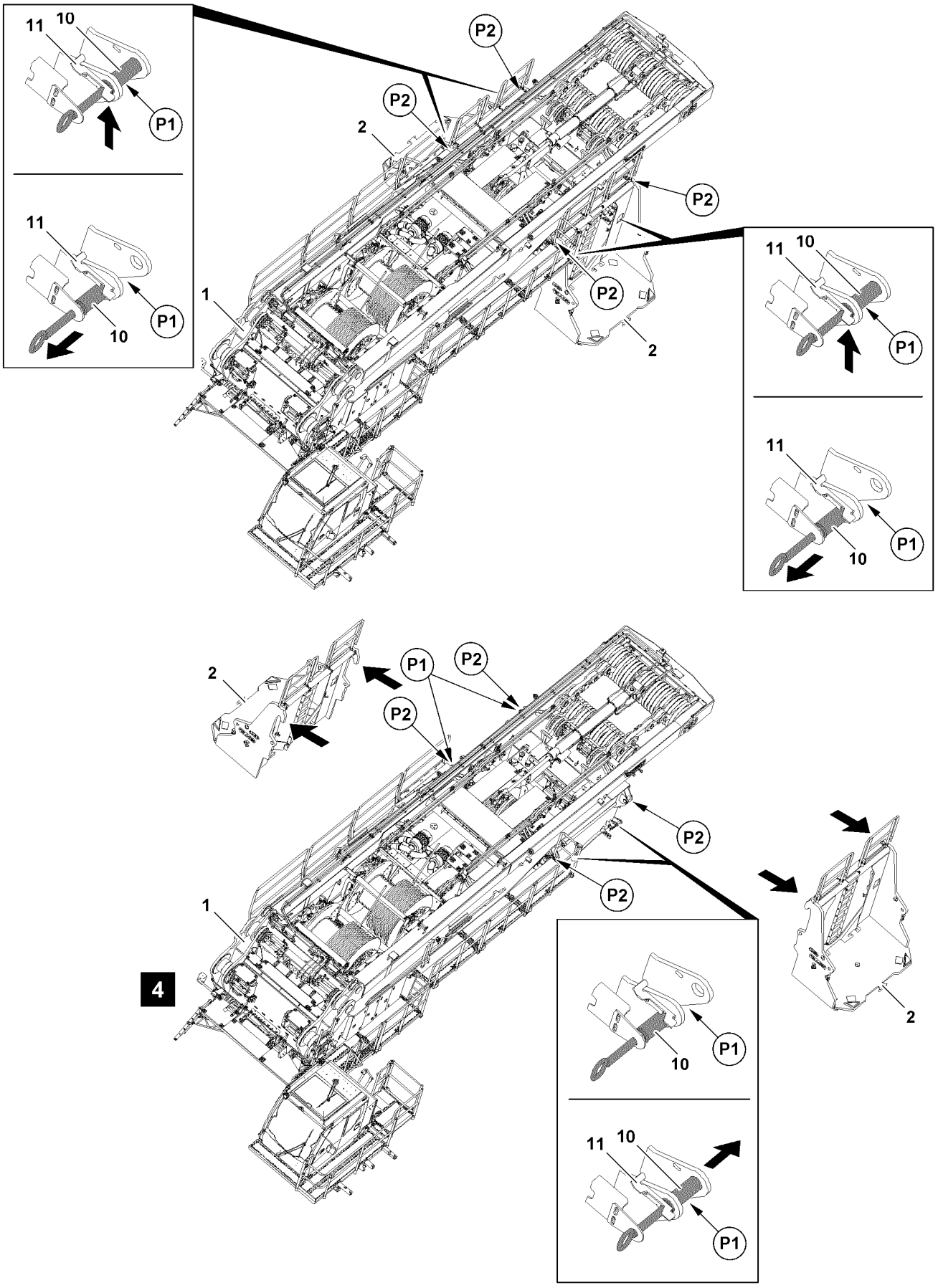

Fig.118985

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5.3 Removing the counterweight brackets on the turntable

Note

▶ The assembly / disassembly of the counterweight brackets **2** is explained on an example without inside counterweight plates.

Make sure that the following prerequisites are met:
- The railings **3** are in the operating position.
- The retaining pins **10** are unpinned completely on both sides.
- Maximum two 10 t counterweight plates **4** are on one counterweight bracket **2**.

▶ Fasten the counterweight bracket **2** on the auxiliary crane, see section „Fastening points“.

WARNING

Tipping of counterweight bracket!

When lifting the counterweight bracket **2** with maximum two inside counterweight plates **4**, the counterweight bracket **2** tips to the rear by approx. 5° to 8° due to the position of the center of gravity.

▶ Make sure that the disassembly of the counterweight bracket **2** is carried out with maximum two inside counterweight plates **4**.

▶ Make sure that the fastening ropes have a length of at least 4 m.

▶ Make sure that there are no persons within the danger zone when lifting the counterweight bracket **2**.

▶ Release the retaining pin **10**: Fold the retaining bar **11** up and hold.

▶ Unpin the retaining pins **10** on both sides.

When the retaining pins **10** are completely unpinned on both sides:

▶ Lift the counterweight bracket **2** with the auxiliary crane and swing out.

▶ Set the counterweight bracket **2** on a load bearing support or on a flatbed trailer.

▶ Depending on the disassembly status of the counterweight bracket **2**: Remove the remaining counterweight plates **4**.

When the counterweight bracket **2** is properly set on the support or on the flatbed trailer:

▶ Remove the fastening equipment and the auxiliary crane.

5.4 Bringing the railings on the counterweight brackets into transport position

Note

▶ The assembly / disassembly of the railings is described in the Crane operating instructions, chapter 2.06.

WARNING

Danger of falling for assembly personnel!

▶ Assemble / disassemble the railings only according to the description in the Crane operating instructions, chapter 2.06.

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4.07.10 Turntable extension

1	Component overview	2
2	Fastening points	3
3	Permissible counterweight assemblies	4
4	Assembling the turntable extension	5
5	Disassembling the turntable extension	17

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1 Component overview

The ballast installed on the turntable is generally referred to as the counterweight.

The components are marked with their own weight.

Description of the **counterweight**, see chapter 4.07.

Dimensions and weights, see chapter 1.03.

1.1 Counterweight

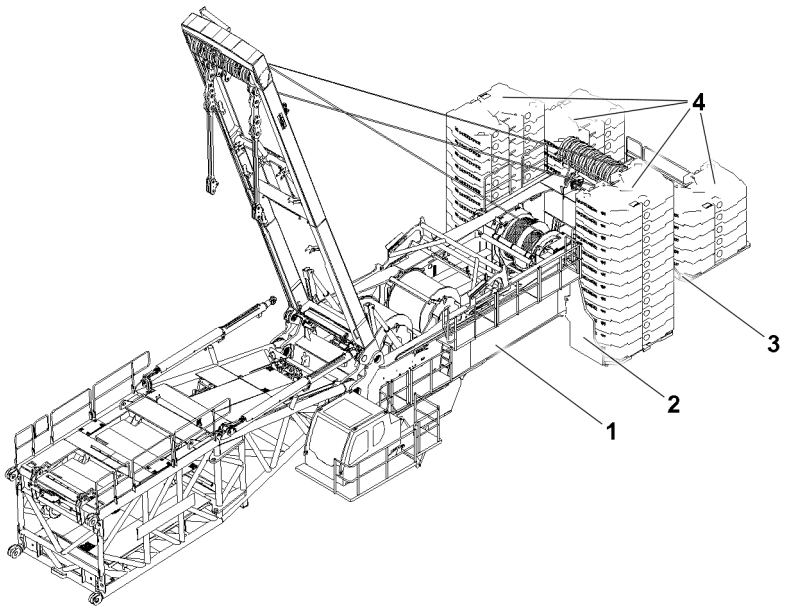

Fig.153149: Component overview counterweight

1 Turntable
2 Counterweight bracket
3 Turntable extension
4 Counterweight plate

1.2 Counterweight plate

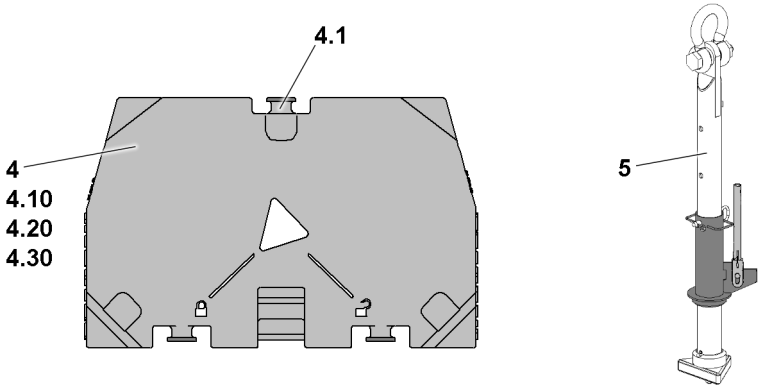

Fig.153150: Counterweight plate

4 Counterweight plate
4.1 Bitt
4.10 10.0 t counterweight plate
4.20 7.5 t counterweight plate
4.30 5.0 t counterweight plate
5 Receptacle stud

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2 Fastening points

WARNING
Fastening equipment on the fastening points incorrectly fastened!
Death, severe bodily injuries, property damage.
▶ Make sure that the fastening equipment is properly fastened to the fastening points.

WARNING
Use of incorrect fastening equipment!
Death, severe bodily injuries, property damage.
▶ Make sure that the fastening equipment has a sufficient length.

WARNING
Non-observance of the fastening point labels!
Death, severe bodily injuries, property damage.
▶ Pay attention to the labels of the fastening points.

WARNING
Persons and obstacles within the danger zone!
Death, severe bodily injuries, property damage.
▶ Make sure that there are no persons or obstacles within the danger zone.

2.1 Turntable extension

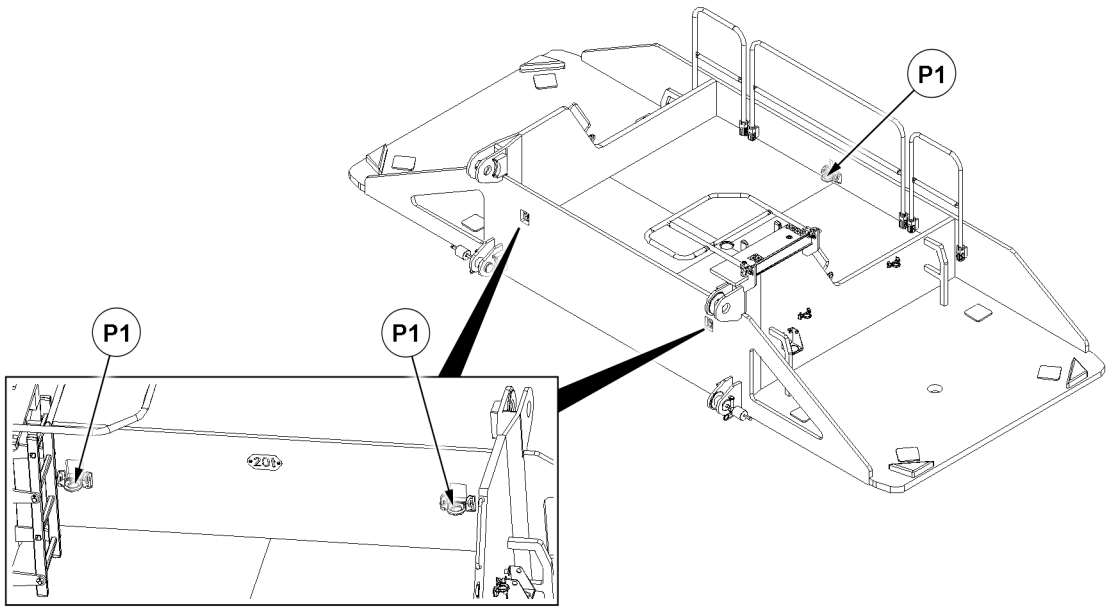

Fig.153151: Turntable extension fastening points

Fastening points	
P1	Turntable extension

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2.2 Counterweight plate

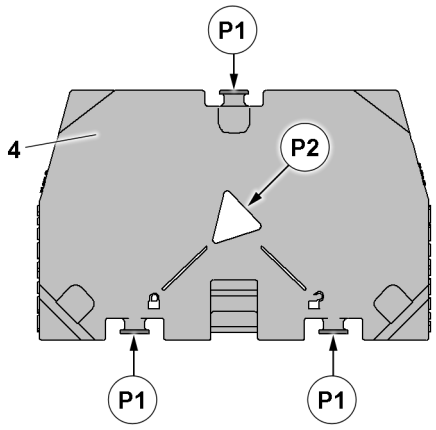

Fig.153152: Fastening points Counterweight plate

4 Counterweight plate

„Bitt“ fastening system	
P1	Counterweight plate

„Twistlock“ fastening system (with help of the receptacle stud)	
P2	Counterweight plate

3 Permissible counterweight assemblies

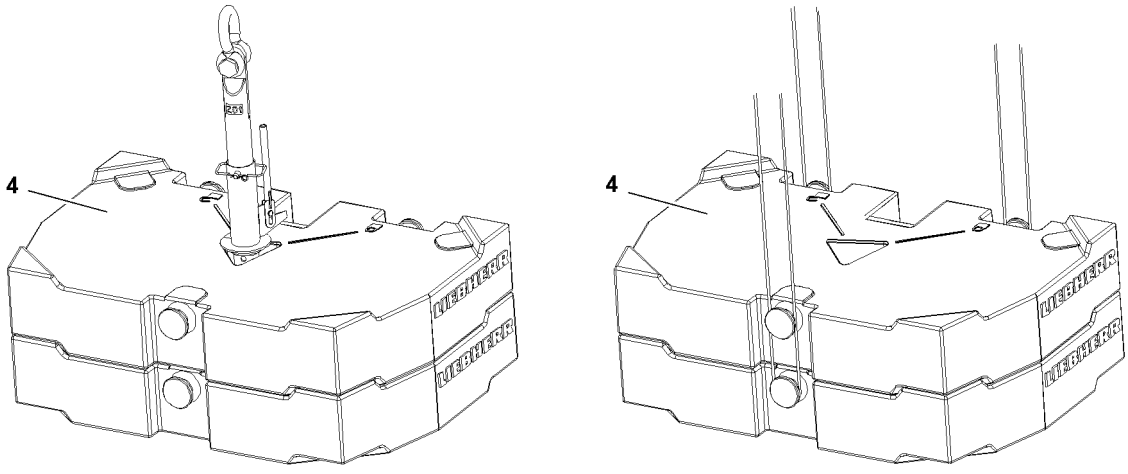

Fig.153160: Counterweight plates: fastened with Twistlock // fastened with bitts

4 Counterweight plate

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WARNING
Exceedance of the maximum permissible number of counterweight plates **4** per lift!
Death, severe bodily injuries, property damage.
If more than the permissible number of counterweight plates **4** are lifted together, then the bitts or the receptacle stud can be overloaded.
The counterweight plates **4** and components can fall down.
▶ Do not exceed the maximum permissible number of counterweight plates **4** per lift.

WARNING
Lighter counterweight plate **4** of a counterweight assembly positioned at the bottom!
When lifting a counterweight assembly with counterweight plates **4** of different weights, if the heaviest plates are not placed at the bottom, the fastening points can be overloaded.
The counterweight plates **4** and components can fall down.
Death, severe bodily injuries, property damage.
▶ Always stack the heavier counterweight plate **4** at the bottom in the counterweight assembly.

Individual weight Counterweight plate	Maximum number of same counterweight plates per lift over	
	„Twistlock“	„Bitt“
5.0 t	2	1
7.5 t	2	2
10.0 t	2	2

4 Assembling the turntable extension

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see chapter 2.04.
▶ If fall protection equipment is available, then it must be used, see chapter 2.06.
▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
▶ When closing or opening boom systems during boom assembly or boom disassembly, no persons may remain on the boom system or in the danger zone.
▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
▶ Only step on the aids, ladders and catwalks with clean shoes.
▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
▶ Remaining on a suspended load is prohibited.
▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
▶ For all assembly work, the crane driver of the main crane must be in voice contact with the crane driver / crane drivers of the auxiliary crane / auxiliary cranes.
▶ For assembly / disassembly tasks, the crane driver may only initiate crane movements when the responsible guide has explicitly released the movement.

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WARNING
Working without aids!
Death, severe bodily injuries, property damage.
When assembling and disassembling crane components with the auxiliary crane, they can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
Do not disengage the auxiliary crane until the component is completely pinned and secured!
Death, severe bodily injuries, property damage.
If a component is disengaged from the auxiliary crane before it is pinned, then it can fall.
- ▶ Do not disengage the auxiliary crane until the component is pinned and secured.

WARNING
Turning of the turntable with the counterweight assembled!
Death, severe bodily injuries, property damage.
If the turntable with assembled counterweight is turned when the boom is not assembled, then the crane can topple over.
- ▶ Always leave the turntable with an assembled counterweight and without a boom in the travel position.

DANGER
Danger of accidents due to ground with insufficient load bearing capacity!
Death, severe bodily injuries, property damage.
If the crane is supported or driven on ground with insufficient load bearing capacity, then the crane can fall over.
- ▶ Only support or drive the crane on ground with sufficient load bearing capacity.
- ▶ Act responsibly when planning and selecting the crane location and route.

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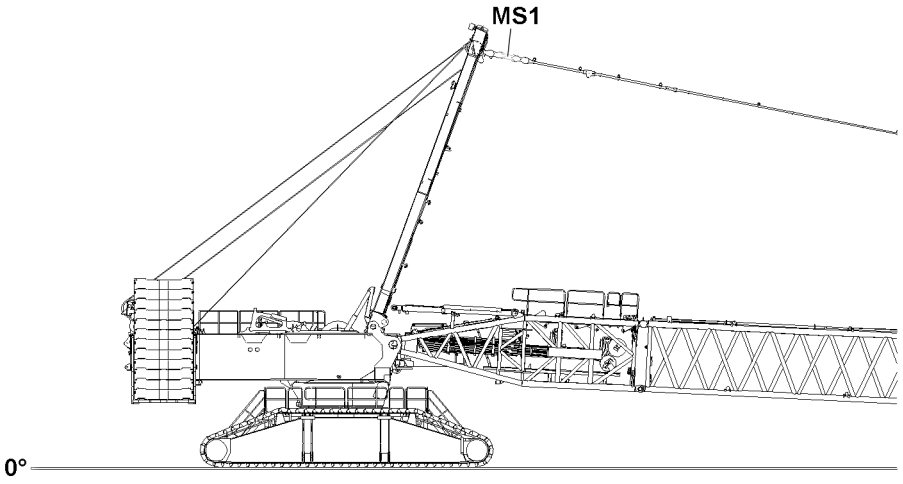

Fig.153161: Test point 1 position

MS1 Test point 1

WARNING
$F1_{actual}$ force does not lie between 50 t and 90 t !
Death, severe bodily injuries, property damage.
▶ If the following prerequisites are not observed, the crane can topple over.
▶ Make sure that the $F1_{actual}$ force (test point 1 **MS1**) is between 50 t and 90 t.

Make sure that the following prerequisites are met:
– The crane is positioned on load-bearing, level ground.
– The crane is horizontally aligned.
– The turntable is positioned in the „travel direction“ (parallel to the crawler travel gear).
– An auxiliary crane is available.
– The 130 t central ballast is properly assembled, see chapter 3.03.
– The 250 t counterweight is properly assembled, see chapter 4.07.
– The boom combination SL8 is assembled completely with a minimum length of 84 m on the turntable, Assembling the S/SL boom, see chapter 5.38.
Or:
– The boom combination SL9 is assembled completely with a minimum length of 78 m on the turntable, Assembling the S/SL boom, see chapter 5.38.
– The boom guying is pretensioned and the $F1_{actual}$ force on test point 1 **MS1** is between 50 t and 90 t.

4.1 Bringing the railing on the turntable extension into the operating position

Note
▶ The assembly / disassembly of the railings is described in chapter 2.06.

WARNING
Railings not assembled / disassembled according to the description in chapter 2.06!
Death, severe bodily injuries, property damage.
▶ Assemble / disassemble the railings only according to the description in chapter 2.06.

The turntable extension is on the ground or on a substructure with load bearing capacity:
▶ Assemble the railing in the operating position.

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4.2 Assembling the turntable extension on the turntable

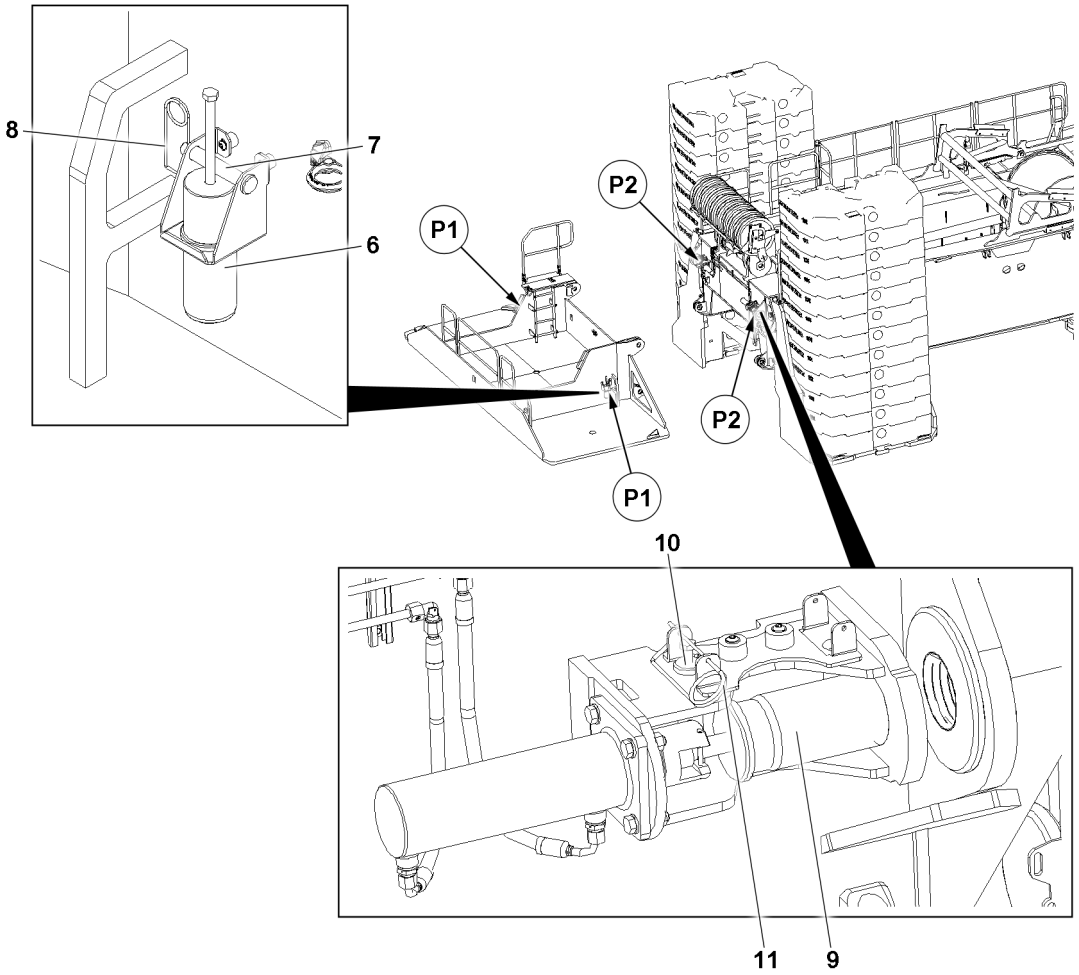

Fig.153157: Assembling the turntable extension on the turntable — prerequisites

6 Pin
7 Retaining pin
8 Retaining element
9 Pin
10 Retaining pin
11 Retaining element

Make sure that the following prerequisites are met:
- The pins **6** are secured in the transport position **P1** with the retaining pin **7** and retaining element **8**.
- The pins **9** are secured in the transport position **P2** with the retaining pin **10** and retaining element **11**.

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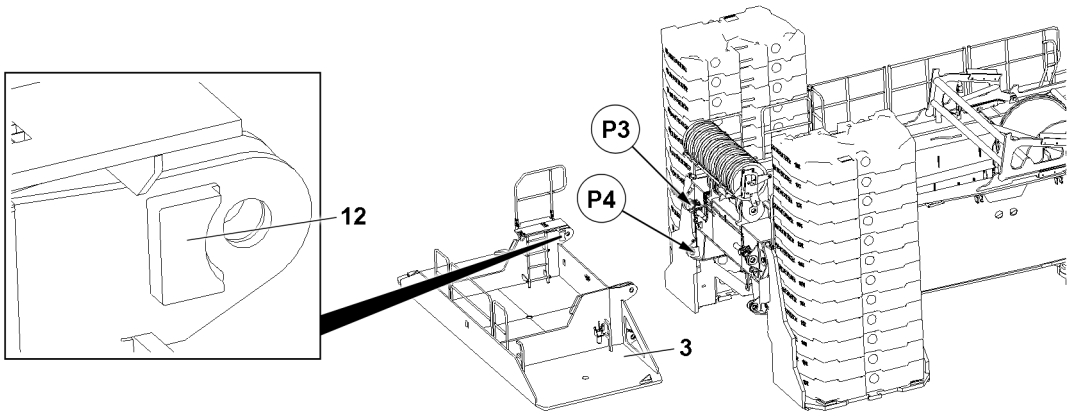

Fig.153158: Assembling the turntable extension on the turntable — positioning the turntable extension

3 Turntable extension **12** Centering aid

▶ Fasten the turntable extension **3** to the auxiliary crane.
▶ Lift the turntable extension **3** with the auxiliary crane and position it with the centering aid **12** in such a way that it can be pinned on both sides in points **P3**.

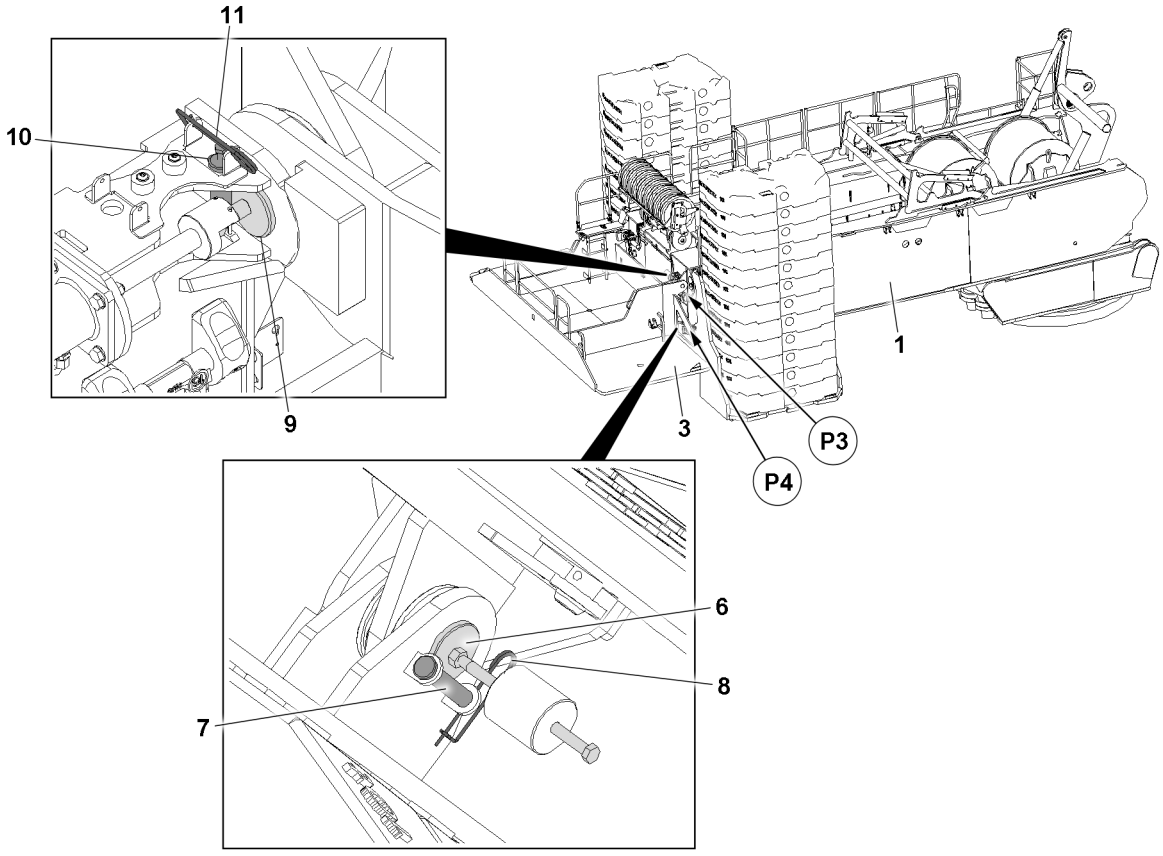

Fig.153159: Assembling the turntable extension on the turntable — Pinning procedure

1 Turntable
3 Turntable extension
6 Pin
7 Retaining pin
8 Retaining element
9 Pin
10 Retaining pin
11 Retaining element

▶ Pin the turntable extension **3** with the turntable **1**: Insert the pins **9** on both sides in points **P3**.
▶ Secure both pins **9** with retaining pins **10** and retaining elements **11**.
▶ Lower the turntable extension **3** with the auxiliary crane so that it can be pinned in points **P4**.
▶ Pin the turntable extension **3** with the turntable **1**: Insert the pins **6** on both sides in points **P4**.

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▶ Secure both pins **6** with retaining pins **7** and retaining elements **8**.

Result:

– The turntable extension **3** is pinned with the turntable **1**.

▶ Release and remove the fastening equipment.

4.3 Placing the ballast on the turntable extension

WARNING
Use of damaged counterweight plates!
Death, severe bodily injuries, property damage.
Damage on the counterweight plates can cause the fastening equipment to release.
The counterweight plates and components can fall down.
▶ Do not use damaged counterweight plates and replace them immediately.

WARNING
Counterweight too low / too high!
Death, severe bodily injuries, property damage.
If the placed counterweight deviates from the specifications in the load charts or the assembly condition, then the crane can be damaged or topple over.
▶ Place the counterweight according to the specifications in the load chart.
▶ Before placing the counterweight plates, observe the maximum permissible counterweight depending on the assembly conditions, see chapter 3.06.
▶ The maximum permissible counterweight is 60 t.

WARNING
Asymmetrical counterweight distribution!
Death, severe bodily injuries, property damage.
If more than 20 t are asymmetrically placed on / removed from the counterweight stacks, the crane can topple over.
▶ A weight difference between the right and left counterweight stack of more than 20 t is prohibited.
▶ Place / remove the counterweight assemblies alternately symmetrically on the left and right on the counterweight stack.

WARNING
The counterweight plates are not positioned correctly on the centerings!
Death, severe bodily injuries, property damage.
Lopsided stacked counterweight plates create instability in the counterweight stack.
The counterweight plates can tip from the counterweight brackets and cause the crane to topple over.
▶ Make sure that the counterweight plates are placed correctly in the centerings.

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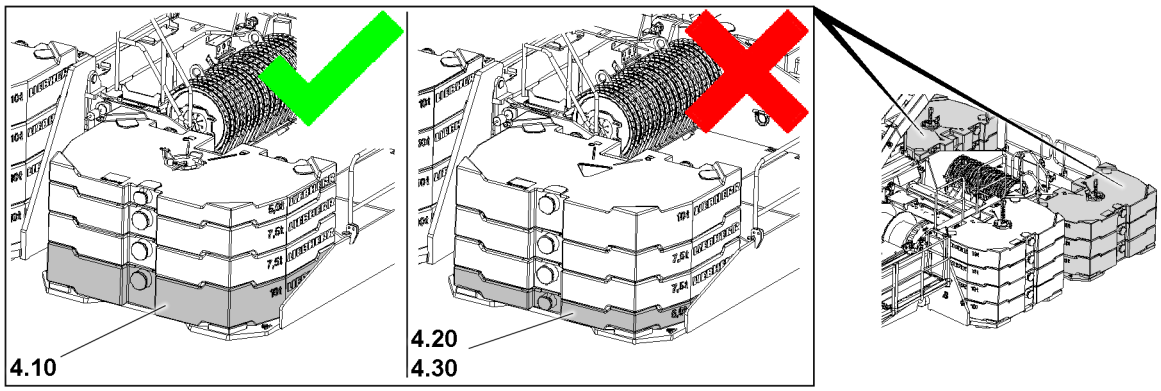

Fig.153162: Placing the ballast on the turntable extension — ballasting of the counterweight stack

4.10 10 t counterweight plate
4.20 7.5 t counterweight plate
4.30 5.0 t counterweight plate

WARNING
Incorrect sequence of the counterweight plates **4**!
Death, severe bodily injuries, property damage.
If the ballasting sequence is not adhered to when placing the counterweight plates **4** on the turntable extension, the counterweight plate **4** located at the bottom of the counterweight stack may be damaged.
The counterweight plates **4** can fall down from the counterweight stack.

- ▶ Make sure that the counterweight stack is only started with 10 t counterweight plates **4.10**.
- ▶ Make sure that the counterweight stack is never started with 5.0 t counterweight plates **4.30** or 7.5 t counterweight plates **4.20**.
- ▶ Further ballasting from the first 10 t counterweight plates **4.10** in the counterweight stack can be continued with 5.0 t or 7.5 t counterweight plates.

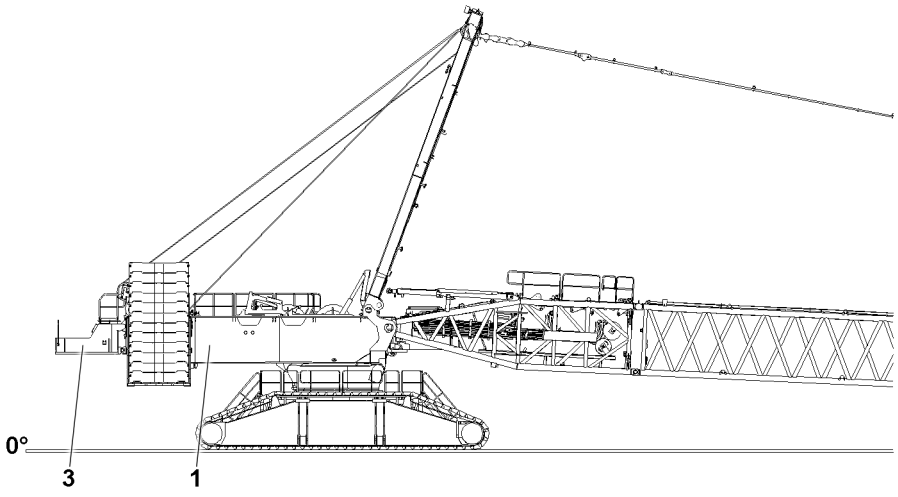

Fig.153163: Placing the ballast on the turntable extension — Prerequisites

1 Turntable
3 Turntable extension

Make sure that the following prerequisites are met:
– The turntable extension **3** is properly pinned and secured on the turntable **1**.
– There are no obstacles, objects or personnel in the danger zone.

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4.3.1 Placing the counterweight plates, fastening system: „Twistlock“

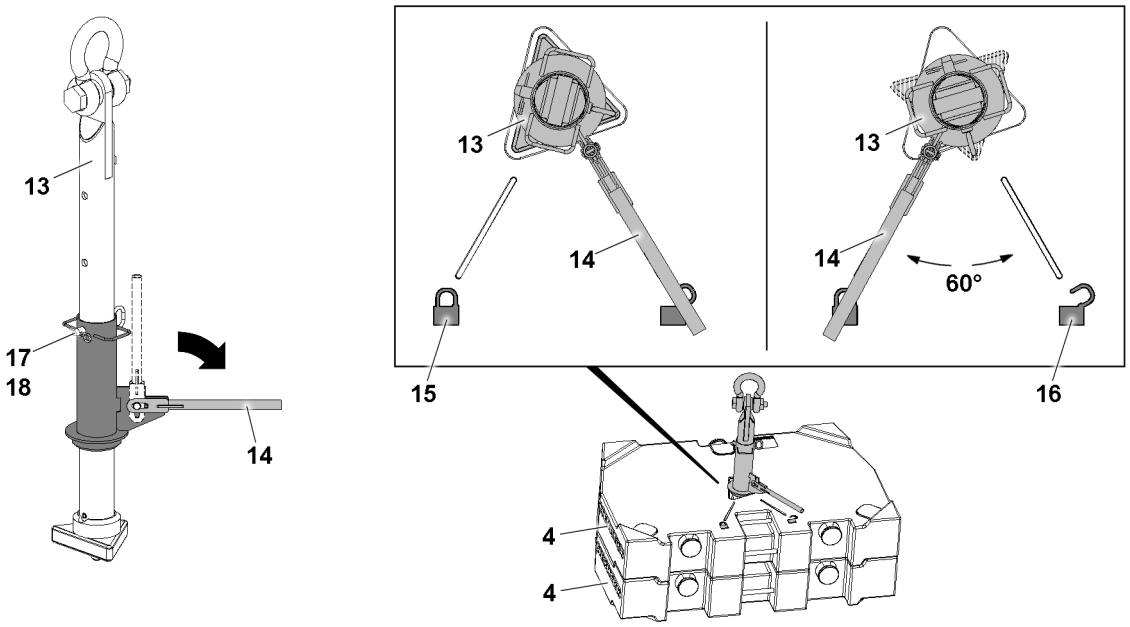

Fig.153164: Placing the counterweight plates, fastening system: „Twistlock“

4 Counterweight plate
13 Receptacle stud
14 Lever
15 Icon
16 Icon
17 Pin
18 Retaining element

WARNING
Lifting of more than two counterweight plates **4**!
Death, severe bodily injuries, property damage.
If more than the permissible two counterweight plates **4** are lifted with the receptacle stud, the receptacle stud will be overloaded and can be damaged.
▶ Lift a maximum of two counterweight plates **4** at the same time.
▶ Make sure that the counterweight plates **4** are placed correctly in the centerings.
▶ Replace damaged counterweight plates **4**.

WARNING
Twistlock-System not correctly locked!
Death, severe bodily injuries, property damage.
If the receptacle stud is not correctly locked, the Twistlock system can open by itself.
Counterweight plates **4** can fall down.
▶ Make sure, when initiating a lift, that the lever points directly to the „Locked“ icon.

WARNING
The counterweight plates **4** are not positioned in the centerings!
Death, severe bodily injuries, property damage.
If two counterweight plates **4** are lifted that are not positioned correctly in their centerings, the receptacle stud and the counterweight plates **4** can be damaged.
Damage can cause the counterweight plates **4** to fall down.
▶ Make sure that the counterweight plates **4** to be lifted are placed correctly in the centerings.

Note
▶ During a lift, the locked Twistlock system cannot release by itself due to its gravitational retention.
▶ During a lift, the locked Twistlock system cannot be released by hand due to its gravitational retention.

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To stack the counterweight plate(s) **4**, use the receptacle stud **13**.

Before the receptacle stud **13** is guided into the counterweight plates **4**, it must be ensured that the length of the receptacle stud is set correctly. The length of the receptacle stud **13** can be adjusted with the pin **17**.

If the length of the receptacle stud **13** is to be adjusted:
- ▶ Release and unpin the pin **17**.
- ▶ Adjust the length of the receptacle stud by moving the receptacle stud **13**.
- ▶ Insert the pin **17** and secure it with the retaining element **18**.
- ▶ Fasten the receptacle stud **13** to the auxiliary crane and guide it into the counterweight plate(s) **4**.
- ▶ Pull the lever **14** up and fold it down.
- ▶ Turn the lever **14** 60° until the lever **14** points to the icon **15**.

Result:

– The receptacle stud **13** is locked with the counterweight plate(s) **4**.

▶ Lift the counterweight plate(s) **4** with the receptacle stud **13** and take down carefully onto the centerings on the counterweight bracket.

When the counterweight plate(s) **4** are taken down:
- ▶ Turn the lever **14** 60° until the lever **14** points to the icon **16**.

Result:

– The receptacle stud **13** is unlocked.

- ▶ Carefully pull the receptacle stud **13** out from the counterweight plate(s) **4**.
- ▶ Stack the counterweight plate(s) **4** alternately on both sides according to the load chart, observe the danger notes.

4.3.2 Placing the counterweight plates, fastening points: Bitt

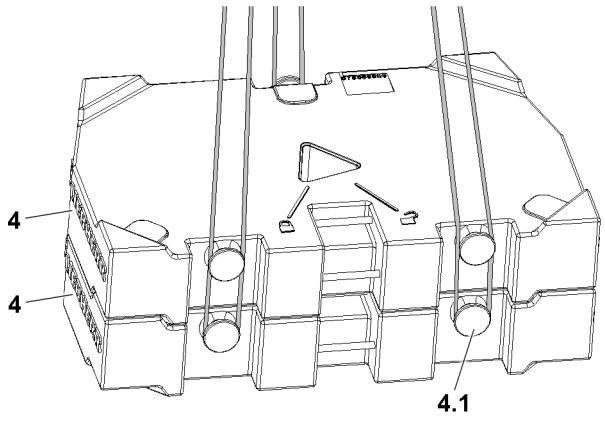

Fig.153165: Placing the counterweight plates, fastening system: „Bitt“

4 Counterweight plate **4.1** Bitt

WARNING
Lifting counterweight assemblies that weigh more than 20 t !
Death, severe bodily injuries, property damage.
If more than the permissible loads are lifted, then the bitts **4.1** are overloaded and the counterweight plates **4** can fall down.
- ▶ Place the counterweight plates **4** individually or as a package, maximum 20 t , 3 fastening points.
- ▶ Replace damaged counterweight plates **4** immediately.

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WARNING
Fastening equipment incorrectly fastened or insufficiently secured!
Death, severe bodily injuries, property damage.
If fastening equipment cannot be fastened correctly and if it is not secured sufficiently to prevent it from loosening up, loads can fall down.
▶ Make sure that the fastening equipment is correctly attached on the bitts **4.1** and that it is secured to prevent it from loosening up.

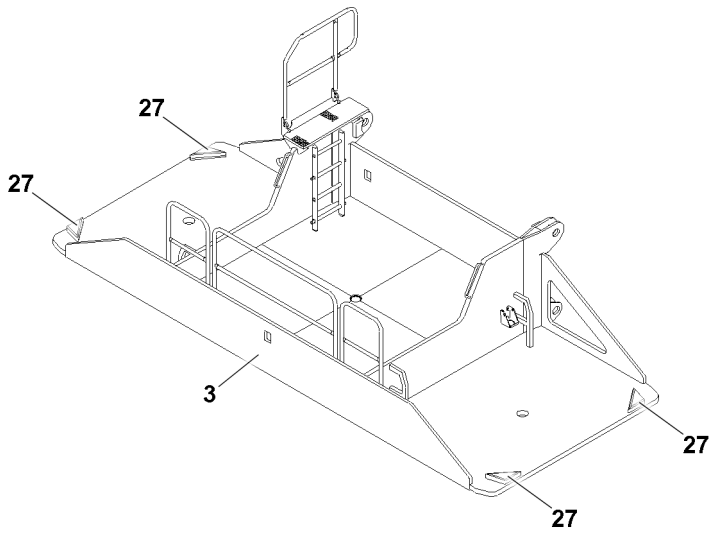

Fig.153169: Placing the counterweight plates, fastening points: Bitt — Positions of the centerings

3 Turntable extension **27** Centering

▶ Fasten the counterweight plate(s) **4** to the auxiliary crane.
▶ Place the counterweight plate **4** individually or in an assembly of maximum two plates with the auxiliary crane onto the centerings **27** on the turntable extension **3**.
▶ Stack the counterweight plate(s) **4** alternately on both sides according to the load chart, observe the danger notes.

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4.4 Securing the counterweight

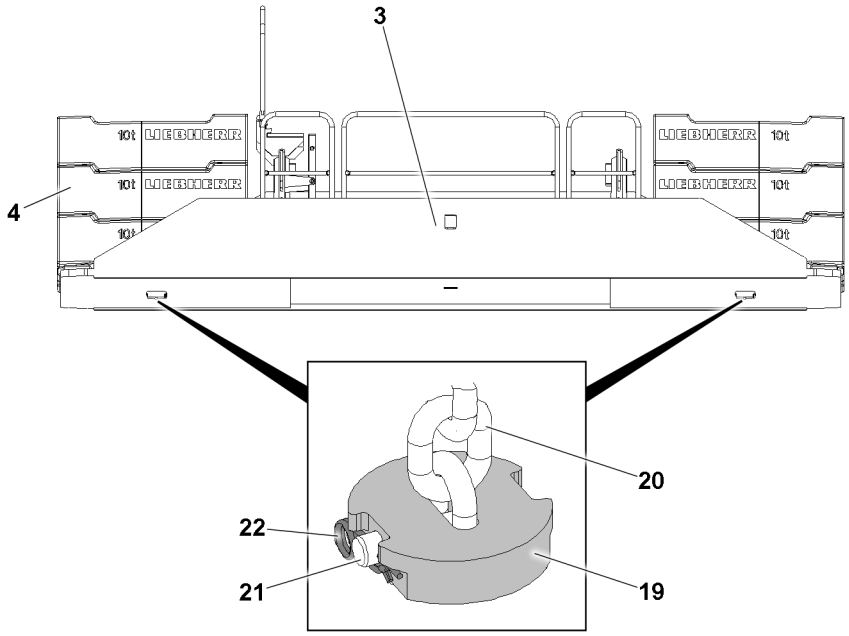

Fig.153166: Securing the counterweight on the bottom

3 Turntable extension
4 Counterweight plate
19 Retaining plate
20 Retaining chain
21 Pin
22 Retaining element

WARNING
Unsecured counterweight plates **4**!
Death, severe bodily injuries, property damage.
If the counterweight is not or not correctly secured, then it can fall down.
▶ Before starting crane operation, the complete counterweight must be secured.

Make sure that the following prerequisite is met:
– The counterweight has been stacked according to the load chart and the operating instructions.

▶ Guide the retaining chain **20** carefully on the auxiliary crane from top through the counterweight stack.
▶ Pin the retaining chain **20** on the bottom with the retaining plate **19**: Insert the pin **21** in the lowest chain link and secure with the retaining element **22**.
▶ Carefully tighten the retaining chain **20** with the auxiliary crane vertically.

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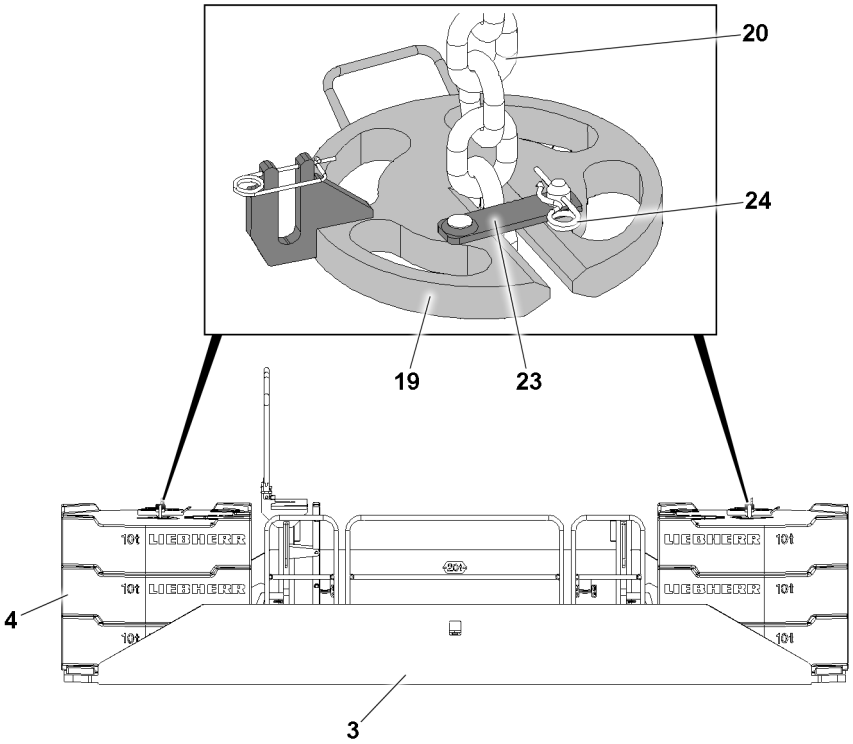

Fig.153167: Securing the counterweight on the top

3 Turntable extension
4 Counterweight plate
19 Retaining plate
20 Retaining chain
23 Retaining plate
24 Retaining element

Note

▶ To optimally secure the counterweight stack, keep the retaining chain between the retaining plates as short as possible.

▶ Push the retaining plate **19** on top on the side over the retaining chain **20**.
▶ Turn the retaining plate **23** in the retaining position.
▶ Secure the retaining plate **23** with the retaining element **24**.

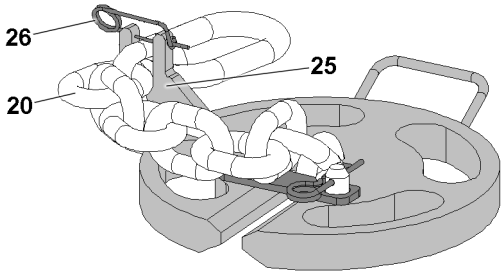

Fig.153168: Securing the chain overhang

20 Retaining chain
25 Fork
26 Retaining element

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WARNING
The chain overhang is not secured against falling down!
Death, severe bodily injuries, property damage.
If the stack height of the counterweight plates is not high enough, the chain overhang of the retaining chain **20** on the side on the counterweight stack can fall down.
▶ Secure the chain overhang from falling down.

▶ Hang the chain overhang of the retaining chain **20** into the fork **25** and secure with retaining element **26** to prevent it from falling down.

5 Disassembling the turntable extension

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see chapter 2.04.
▶ If fall protection equipment is available, then it must be used, see chapter 2.06.
▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
▶ When closing or opening boom systems during boom assembly or boom disassembly, no persons may remain on the boom system or in the danger zone.
▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
▶ Only step on the aids, ladders and catwalks with clean shoes.
▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
▶ Remaining on a suspended load is prohibited.
▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
▶ For all assembly work, the crane driver of the main crane must be in voice contact with the crane driver / crane drivers of the auxiliary crane / auxiliary cranes.
▶ For assembly / disassembly tasks, the crane driver may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Working without aids!
Death, severe bodily injuries, property damage.
When assembling and disassembling crane components with the auxiliary crane, they can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
▶ Make sure that personnel cannot be caught by components.
▶ When working in danger zones: Use aids to protect limbs.
▶ Guide components with suitable aids to minimize oscillation.

DANGER
Do not disengage the auxiliary crane until the component is completely pinned and secured!
Death, severe bodily injuries, property damage.
If a component is disengaged from the auxiliary crane before it is pinned, then it can fall.
▶ Do not disengage the auxiliary crane until the component is pinned and secured.

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WARNING
Turning of the turntable with the counterweight assembled!
Death, severe bodily injuries, property damage.
If the turntable with assembled counterweight is turned when the boom is not assembled, then the crane can topple over.
▶ Always leave the turntable with an assembled counterweight and without a boom in the travel position.

WARNING
Use of impermissible fastening equipment!
Death, severe bodily injuries, property damage.
▶ Use only inspected fastening equipment.
▶ Use only load bearing and approved substructures.

WARNING
Working without personal protective equipment!
During assembly and disassembly of the crane components, assembly personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
▶ Use personal protective equipment.

DANGER
Danger of accidents due to ground with insufficient load bearing capacity!
Death, severe bodily injuries, property damage.
If the crane is supported or driven on ground with insufficient load bearing capacity, then the crane can fall over.
▶ Only support or drive the crane on ground with sufficient load bearing capacity.
▶ Act responsibly when planning and selecting the crane location and route.

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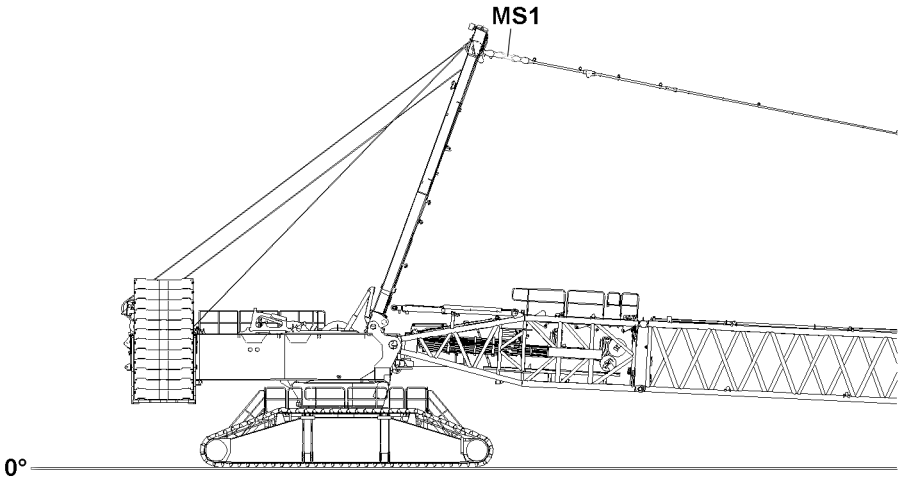

Fig.153161: Disassembling the turntable extension — Test point 1 position

MS1 Test point 1

WARNING
$F1_{actual}$ force does not lie between 50 t and 90 t !
Death, severe bodily injuries, property damage.
▶ If the following prerequisites are not observed, the crane can topple over.
▶ Make sure that the $F1_{actual}$ force (test point 1 **MS1**) is between 50 t and 90 t.

Make sure that the following prerequisites are met:
– An auxiliary crane is available.
– The crane is positioned on load-bearing, level ground.
– The crane is horizontally aligned.
– The turntable is positioned in the „travel direction“ (parallel to the crawler travel gear).
– The boom combination SL8 is assembled completely with a minimum length of 84 m on the turntable, Assembling the S/SL boom, see chapter 5.38.
Or:
– The boom combination SL9 is assembled completely with a minimum length of 78 m on the turntable, Assembling the S/SL boom, see chapter 5.38.
– The boom has been taken down.
– The 130 t central ballast is assembled, see chapter 3.03.
– The 250 t counterweight is assembled, see chapter 4.07.
– The boom guying is pretensioned and the $F1_{actual}$ force on test point 1 **MS1** is between 50 t and 90 t.

5.1 Releasing the counterweight

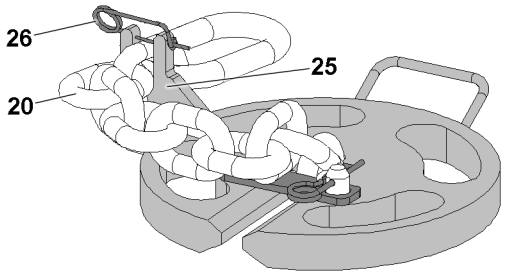

Fig.153168: Releasing the counterweight — Securing the chain overhang

20 Retaining chain
25 Fork
26 Retaining element

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With a secured chain overhang:

- ▶ Remove the retaining element **26**.
- ▶ Disengage the retaining chain **20** from the fork **25**.

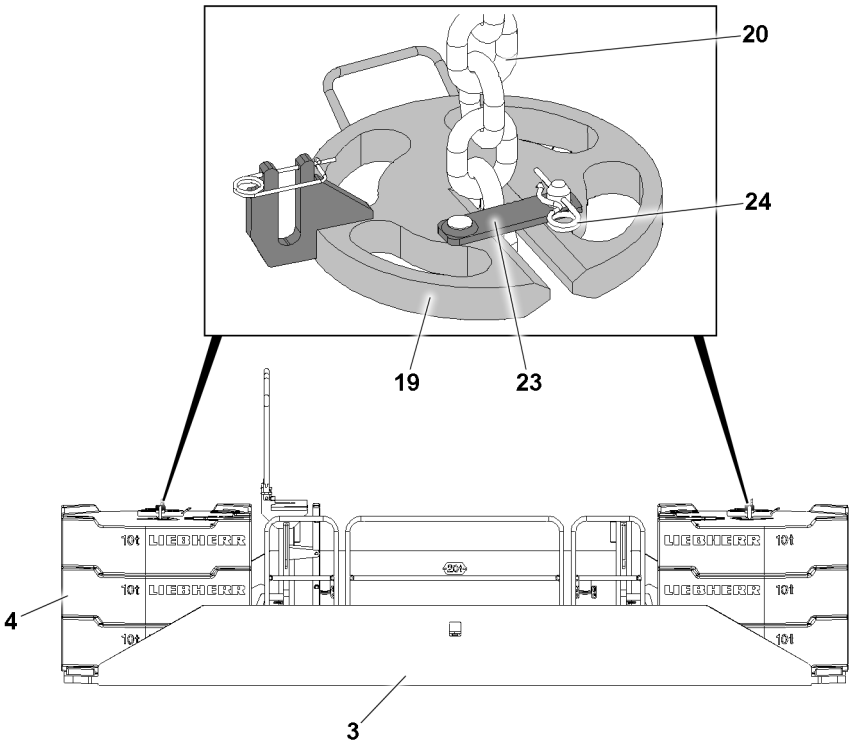

Fig.153167: Releasing the counterweight —Releasing the counterweight on the top

3	Turntable extension	**20**	Retaining chain
4	Counterweight plate	**23**	Retaining plate
19	Retaining plate	**24**	Retaining element

- ▶ Fasten the retaining chain **20** to the auxiliary crane and tension it slightly.
- ▶ Release the retaining plate **23**: Remove the retaining element **24**.
- ▶ Turn the retaining plate **23** to the side.
- ▶ Remove the retaining plate **19** on the side.

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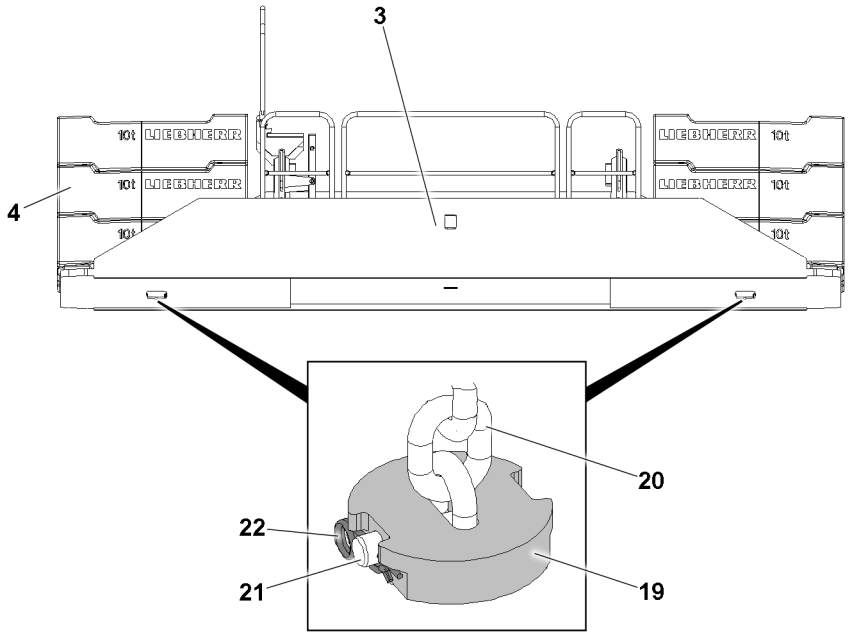

Fig.153166: Releasing the counterweight —Releasing the counterweight on the bottom

3	Turntable extension	**20**	Retaining chain
4	Counterweight plate	**21**	Pin
19	Retaining plate	**22**	Retaining element

- ▶ Lower the retaining chain **20** until the lower retaining plate **19** is freely accessible.
- ▶ Remove the retaining element **22** and unpin the pin **21**.
- ▶ Remove the retaining plate **19**.
- ▶ Carefully pull the retaining chain **20** through upward and remove it.

5.2 Removing the counterweight plates

WARNING
Use of damaged counterweight plates!
Death, severe bodily injuries, property damage.
Damage on the counterweight plates can cause the fastening equipment to release.
The counterweight plates and components can fall down.
- ▶ Do not use damaged counterweight plates and replace them immediately.

WARNING
Asymmetrical counterweight distribution!
Death, severe bodily injuries, property damage.
If more than 20 t are asymmetrically placed on / removed from the counterweight stacks, the crane can topple over.
- ▶ A weight difference between the right and left counterweight stack of more than 20 t is prohibited.
- ▶ Place / remove the counterweight assemblies alternately symmetrically on the left and right on the counterweight stack.

Note
- ▶ The counterweight plates are marked with their own weights.

Make sure that the following prerequisite is met:
- – The retaining chains are disassembled.

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5.2.1 Removing the counterweight plates, fastening system: „Twistlock“

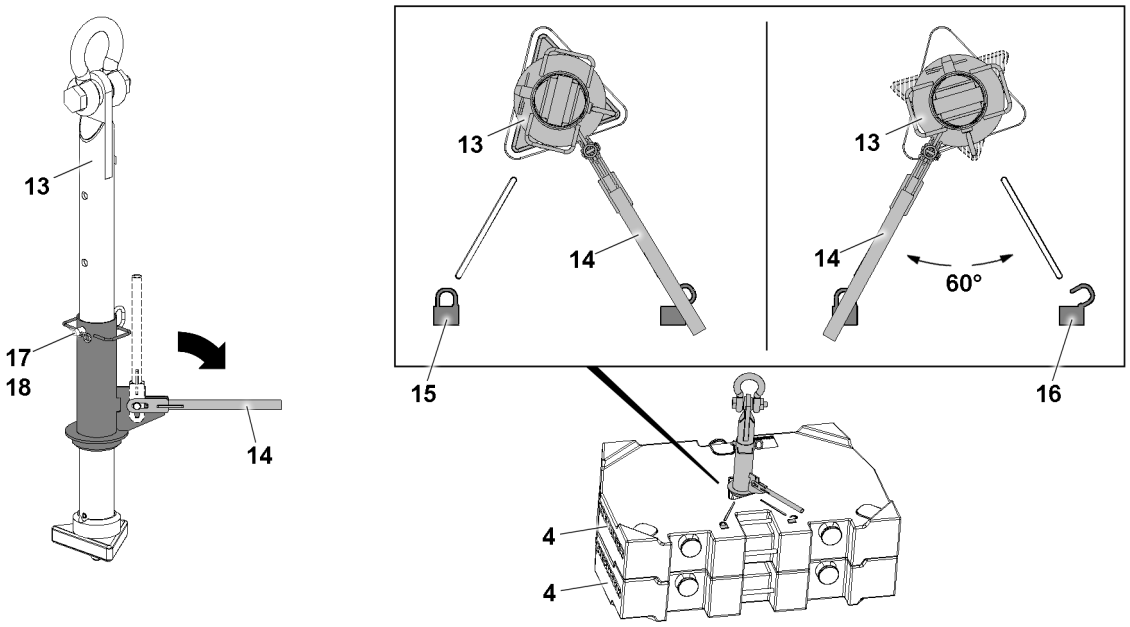

Fig.153164: Removing the counterweight plates — Counterweight plates, fastening system: „Twistlock“

4 Counterweight plate
13 Receptacle stud
14 Lever
15 Icon
16 Icon
17 Pin
18 Retaining element

WARNING
Lifting of more than two counterweight plates **4**!
Death, severe bodily injuries, property damage.
If more than the permissible two counterweight plates **4** are lifted with the receptacle stud, the receptacle stud will be overloaded and can be damaged.
▶ Lift a maximum of two counterweight plates **4** at the same time.
▶ Make sure that the counterweight plates **4** are placed correctly in the centerings.
▶ Replace damaged counterweight plates **4**.

WARNING
Twistlock-System not correctly locked!
Death, severe bodily injuries, property damage.
If the receptacle stud is not correctly locked, the Twistlock system can open by itself.
Counterweight plates can fall down.
▶ Make sure, when initiating a lift, that the lever points directly to the „Locked“ icon.

WARNING
The counterweight plates **4** are not positioned in the centerings!
Death, severe bodily injuries, property damage.
If two counterweight plates **4** are lifted that are not positioned correctly in their centerings, the receptacle stud **13** and the counterweight plates **4** can be damaged.
Damage can cause the counterweight plates **4** to fall down.
▶ Make sure that the counterweight plates **4** to be lifted are placed correctly in the centerings.

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Note

- ▶ During a lift, the locked Twistlock system cannot release by itself due to its gravitational retention.
- ▶ During a lift, the locked Twistlock system cannot be released by hand due to its gravitational retention.

To remove the counterweight plate(s) **4**, use the receptacle stud **13**.

Before the receptacle stud **13** is guided into the counterweight plate(s) **4**, it must be ensured that the length of the receptacle stud **13** is set correctly. The length of the receptacle stud **13** can be adjusted with the pin **17**.

If the length of the receptacle stud **13** is to be adjusted:

- ▶ Release and unpin the pin **17**.
- ▶ Adjust the length of the receptacle stud by moving the receptacle stud **13**.
- ▶ Insert the pin **17** and secure it with the retaining element **18**.
- ▶ Fasten the receptacle stud **13** to the auxiliary crane and guide it into the counterweight plate(s) **4**.
- ▶ Pull the lever **14** up and fold it down.
- ▶ Turn the lever **14** 60° until the lever **14** points to the icon **15**.

Result:

– The receptacle stud **13** is locked with the counterweight plate(s) **4**.

- ▶ Lift the counterweight plate(s) **4** with the receptacle stud **13** and remove it from the counterweight stack.

When the counterweight plate(s) **4** are taken down:

- ▶ Turn the lever **14** 60° until the lever **14** points to the icon **16**.

Result:

– The receptacle stud **13** is unlocked from the counterweight plate(s) **4**.

- ▶ Carefully pull the receptacle stud **13** out from the counterweight plate(s) **4**.
- ▶ Alternately remove the counterweight plate(s) **4** from both sides.

5.2.2 Removing the counterweight plates, fastening points: Bitt

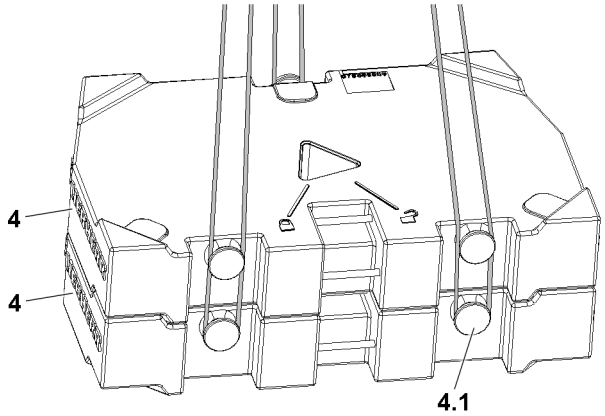

Fig.153165: Removing the counterweight plates — Counterweight plates, fastening points: Bitt

4 Counterweight plate **4.1** Bitt

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WARNING
Lifting counterweight assemblies that weigh more than 20 t !
Death, severe bodily injuries, property damage.
If more than the permissible loads are lifted, then the bitts **4.1** are overloaded and the counterweight plates **4** can fall down.
- ▶ Place the counterweight plates **4** individually or as a package, maximum 20 t , 3 fastening points.
- ▶ Replace damaged counterweight plates **4** immediately.

WARNING
Fastening equipment incorrectly fastened or insufficiently secured!
Death, severe bodily injuries, property damage.
If fastening equipment cannot be fastened correctly and if it is not secured to prevent it from loosening up, loads can fall down.
- ▶ Make sure that the fastening equipment is correctly attached on the bitts **4.1** and that it is secured to prevent it from loosening up.

- ▶ Lift the counterweight plate **4** or assembly of maximum two plates and remove from the counterweight stack.
- ▶ Alternately remove the counterweight plate(s) **4** from both sides.

5.3 Disassembling the turntable extension on the turntable

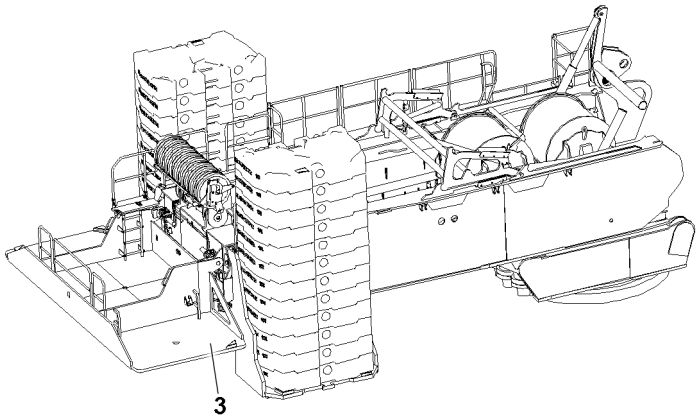

Fig.153170: Disassembling the turntable extension on the turntable — Turntable extension without counterweight plates

3 Turntable extension

Make sure that the following prerequisite is met:
- There are no counterweight plates placed on the turntable extension **3**.

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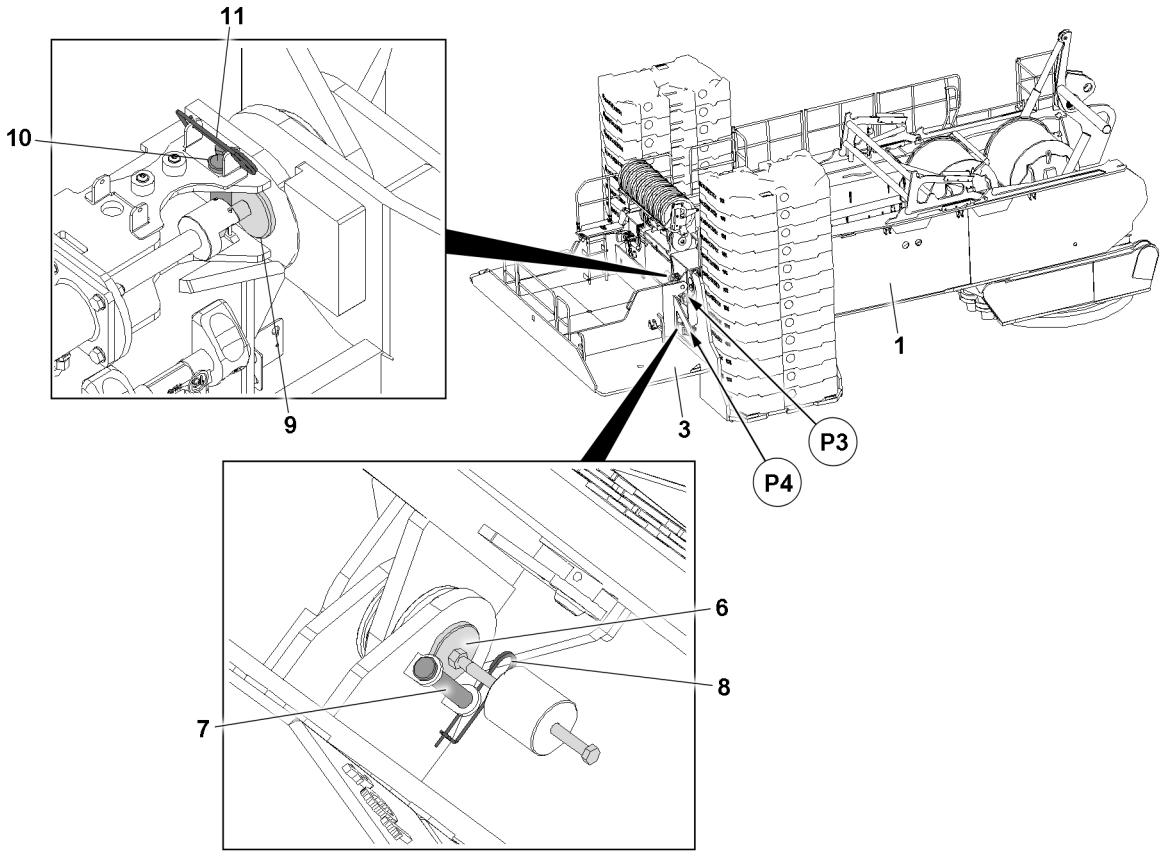

Fig.153159: Disassembling the turntable extension on the turntable — Unpinning procedure

1	Turntable	**8**	Retaining element
3	Turntable extension	**9**	Pin
6	Pin	**10**	Retaining pin
7	Retaining pin	**11**	Retaining element

▶ Fasten the turntable extension **3** to the auxiliary crane, see section „Fastening points“.

WARNING
Fastening equipment not tensioned!
Death, severe bodily injuries, property damage.
▶ Make sure that the fastening equipment has a sufficient length.
▶ Make sure that there are no persons are in the danger zone when lifting the turntable extension **3**.
▶ Make sure that the fastening equipment between the turntable extension **3** and the auxiliary crane is tensioned before the turntable extension **3** is unpinned on the turntable **1**.

When the fastening equipment is tensioned slightly on the turntable extension **3**:
▶ Remove the retaining elements **8** on both sides in points **P4**.
▶ Unpin the retaining pin **7**.
▶ Unpin the turntable extension **3** on the turntable **1**: Unpin the pins **6** on both sides in points **P4**.
▶ Remove the retaining elements **11** on both sides in points **P3**.
▶ Unpin the retaining pin **10**.
▶ Unpin the turntable extension **3** on the turntable **1**: Unpin the pins **9** on both sides in points **P4**.

When the pins **9** are fully unpinned on both sides:
▶ Lift the turntable extension **3** with the auxiliary crane and swing out.
▶ Set the turntable extension **3** on a load bearing substructure or on a flatbed trailer.

When the turntable extension **3** is properly set on the substructure or on the flatbed trailer:
▶ Remove the fastening equipment and the auxiliary crane.

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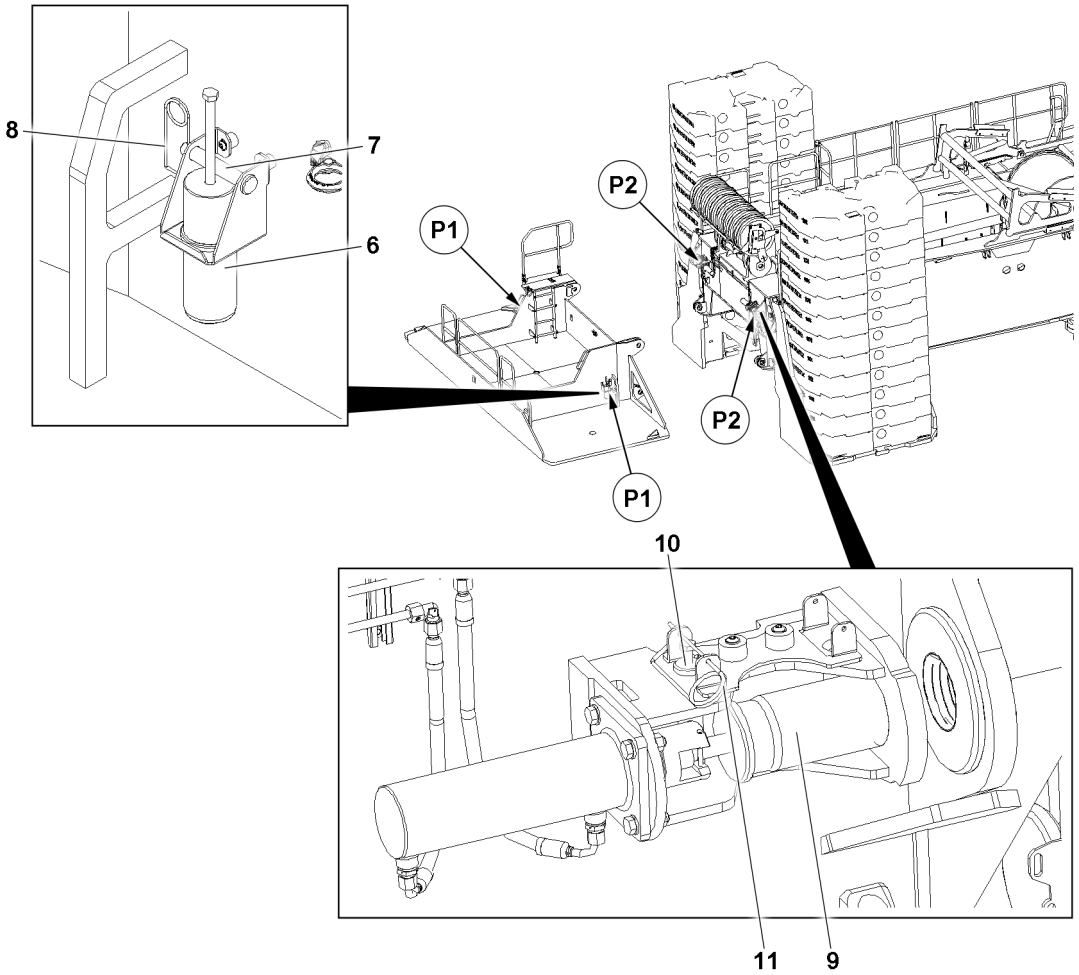

Fig.153157: Disassembling the turntable extension on the turntable — Assembling pins in the transport position

6 Pin
7 Retaining pin
8 Retaining element
9 Pin
10 Retaining pin
11 Retaining element

- ▶ Assemble both pins **6** in points **P1** in the transport position.
- ▶ Secure both pins with retaining pins **7** and retaining elements **8**.
- ▶ Assemble both pins **9** in points **P2** in the transport position.
- ▶ Secure both pins **9** with retaining pins **10** and retaining elements **11**.

5.4 Bringing the railing on the turntable extension into the transport position

Note

When the turntable extension is on the ground or taken down on a substructure with load bearing capacity:

- ▶ Bring the railing into the transport position, see chapter 2.06.

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4.08 Working with a load

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2	Checks before starting to work with the crane	4
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4	Taking on a load	7
5	Crane operation	13
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7	Crane rope pretension	15

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Fig.195219

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1 Safety instructions

In addition, observe the general technical safety instructions in chapter 2.04.

In steep boom positions for which no loads are specified in the load charts, there is a danger of tipping to the rear to the counterweight side.

The danger of tipping to the rear exists especially in case of:
- Crane operation on tires
- Supported, with retracted sliding beams
- Reduced support base

WARNING
Crane operation in steep boom positions for which no loads are specified in the load charts!
The crane can tip to the rear and fatally injure personnel.
- ▶ Comply with the boom radius specified in the load chart.
- ▶ Crane operation outside the permissible set up configurations, boom radii and slewing ranges according to the load chart is prohibited.

WARNING
Incorrect reeving number set up!
If the reeving number on the pulley head is less than the reeving number set on the LICCON computer system, it can result in an overload of the hoist rope.
The hoist rope can rip. The load can fall down and fatally injure personnel.
- ▶ Comply with the reeving numbers specified in the load chart for maximum loads.
- ▶ Make sure that the reeving on the pulley head and the reeving set on the LICCON computer system match.

The minimum rope coils must remain on the rope winches. The number of minimum rope coils depends on if the rope winch is equipped with a cam limit switch or a winch speed sensor.

WARNING
Minimum rope coils fallen below!
The rope will be ripped out. The load falls down.
Personnel can be killed.
- ▶ Make sure that the minimum rope coils remain on the rope winch.
- ▶ Observe and comply with the number of the minimum rope coils in chapter 5.01.

WARNING
Lift the load by luffing up!
The crane can topple over and fatally injure personnel.
- ▶ Lift the load with the hoist gear.

Always comply with the maximum loads specified in the load chart.

The weight of the hook block according the load chart must be taken into account. Subtract the weight of the hook block from the load chart value. The minimum hook block weight must be determined according to the reeving number and the data in the load charts.

For the lift, use the hook block which is suited best for the existing set up configuration in connection with the load chart.

Initiate all crane movements carefully. Also brake the crane movements carefully. That way you can avoid a swinging or pendulum motion in the suspended load.

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2 Checks before starting to work with the crane

Before starting work with the crane, the crane operator must carry out a further inspection to satisfy himself about the crane's operational safety:
- Check that the crane is properly supported and level.
- Check that the set up configuration set in the control matches the actual set up configuration.
- Check that all values in the load chart that apply to the current equipment configuration have been entered and met.
- Ensure that there are no people or objects within the danger zone of the crane.

WARNING
Persons in the slewing range!
Crushing danger, death, severe bodily injuries.
▶ Monitor the slewing range.
▶ Make sure that there are **no** persons within the slewing range.
▶ Block off the slewing range if necessary.

WARNING
Obstacle in the slewing range!
Property damage on crane and on obstacle.
▶ Make sure that there are **no** obstacles within the turning range of the crane and the crane components.

2.1 Visual check for damage

WARNING
Danger of accident!
If the crane is operated despite existing defects, personnel can be severely injured or killed.
▶ In the event of deficiencies which threaten operational safety, stop crane operation immediately.

The following deficiencies threaten the crane's operational safety:
- Damage to load-bearing parts of the crane design, such as booms, supports etc.
- Failure of the hoist gear brake and consequent slipping of the load
- Functional failures in the crane control system
- Functional defects in the indicator and warning lights
- Damage to the hoist ropes
- Safety defects in the safety equipment
- Leaks on safety relevant components of the crane hydraulic

Inform the appropriate supervisor about the deficiencies on the crane and also inform your relief when crane operators are changed.

2.2 Operating with telescopic boom and auxiliary boom

When operating with a telescopic boom and auxiliary boom in the 0° position and with a steep luffed up telescopic boom, the hook blocks can collide with the telescopic boom or the auxiliary boom.

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NOTICE
Operation with the telescopic boom and auxiliary boom in the 0° position and steep luffed up telescopic boom!
The hook block can collide with the telescopic boom or auxiliary boom.
▶ Make sure that the hook block is always at a sufficient distance from the crane structure.

Before collision of the hook block with the telescopic boom or the auxiliary boom:
▶ Stop spooling up the winch or end luffing up the boom.

With a hydraulic auxiliary boom:
▶ Increase the freedom of movement of the hook block with respect to the auxiliary boom by luffing down the auxiliary boom.

2.3 Telescopic boom distortion because of sunshine on one side

A temperature difference occurs between the side facing the sun and the side facing away from the sun for cranes with telescopic booms. This causes telescopic boom side distortion, which can reduce the load bearing capacity of the telescopic boom.

For example, a temperature difference between the two boom sides of 30 °C and a boom length of 60 m results in a length difference caused by the temperature difference between the two sides of the telescopic boom of approximately 22 mm. With narrow boom parts, this causes the profiles to bend sideways.

If the maximum load is being utilized during operation with a telescopic boom extension such as a fixed lattice jib, luffing lattice jib or folding jib, then it must be ensured through a visual inspection before picking up the load that the boom is not showing signs of side deformation due to one-sided sun exposure.

WARNING
Danger of accident due to component overload!
If the telescopic boom has become distorted because of one-sided sunlight, this can cause component overload and therefore accidents.
▶ Turn the crane so that both sides of the boom are heated up equally, eliminating side deformation due to temperature difference.

3 Crane movement - Telescoping

If the telescopic boom is telescoped with the jib boom or telescopic boom extension, before the telescoping procedure, ensure that:
– The crane is properly supported and horizontally aligned.
– The telescopic boom is evenly warmed up by solar radiation.
– There is no strong side wind.

WARNING
Damage to the telescopic boom or the hoist rope!
If these 3 factors are not adhered to, damage of the telescopic boom or the hoist rope can occur and lead to accidents.
▶ Support the crane properly and align it horizontally.
▶ Keep both sides of the boom at about the same temperature.
▶ Telescope only to the permissible wind speed according to the load chart.
▶ If the actual wind speed is higher than the permissible wind speed noted on the load chart, telescoping is prohibited.

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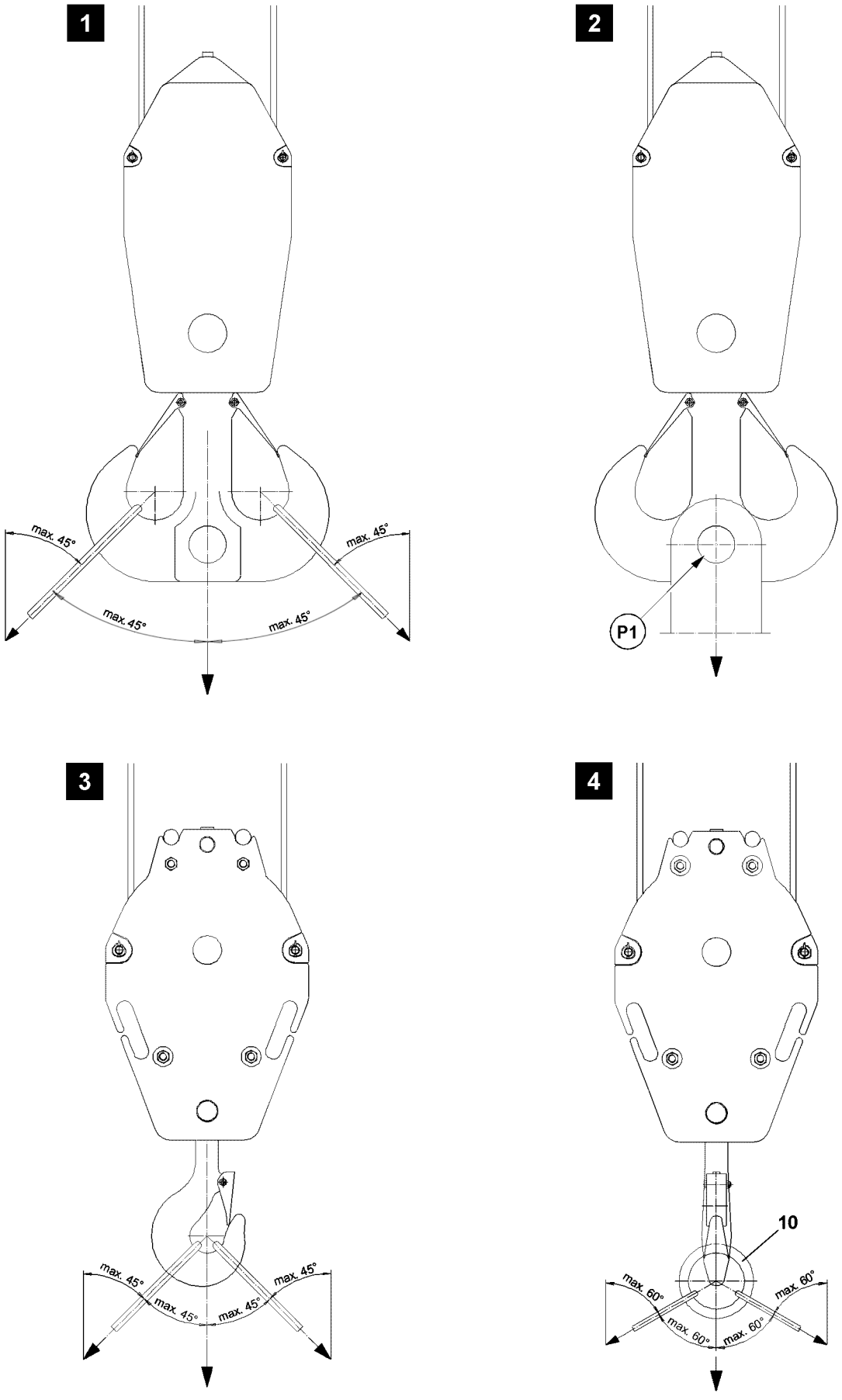

Fig.145147

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4 Taking on a load

The crane must always be operated in such a way that its load-bearing parts are not destroyed or damaged and its stability is ensured.

Make sure that the following prerequisites are met:
- The crane is supported and horizontally aligned.
- The LICCON overload protection has been set according to the load chart and the set up configuration.
- The LICCON overload protection is active.
- In the case of cranes with central ballast: The central ballast is installed according to the load chart.
- The counterweight is installed according to the load chart.
- In the case of cranes with derrick ballast: The derrick ballast is installed according to the load chart.
- The hook block or the load hook is correctly reeved.

4.1 Fastening the load

WARNING
Load can be ripped off!
If impermissible fastening and / or load handling equipment is used when taking on a load on the centric bore on the double hook at point **P1** (illustration **2**), then the double hook as well as the hook block can be damaged.
The load can rip off and fall down.
Personnel can be severely injured or killed.
▶ Lift the load via the centric bore on the double hook (point **P1**): For the technical requirements and the technical design of the fastening and / or load handling equipment contact the hook block manufacturer.

WARNING
The crane can topple over!
If the following conditions are not met, the crane can topple over.
Personnel can be severely injured or killed.
This could result in significant property damage.
▶ Pay attention to the own weight of the load handling equipment.
▶ Pay attention to the load bearing capacity of the load handling equipment!
▶ The maximum permissible incline of the strands fastened on the single or double hook in the hook jaws is 45°. See illustration **1** and illustration **3**.

If necessary for the single hook:
▶ Use fastening equipment with a suspension link **10**. The maximum permissible incline in this case is 60°. See illustration **4**.
▶ Load a single and double hook symmetrically. A maximum deviation of ±3° from the direction of the center of gravity is permissible.

If necessary:
▶ Use cross beam or two cranes for taking on the load.

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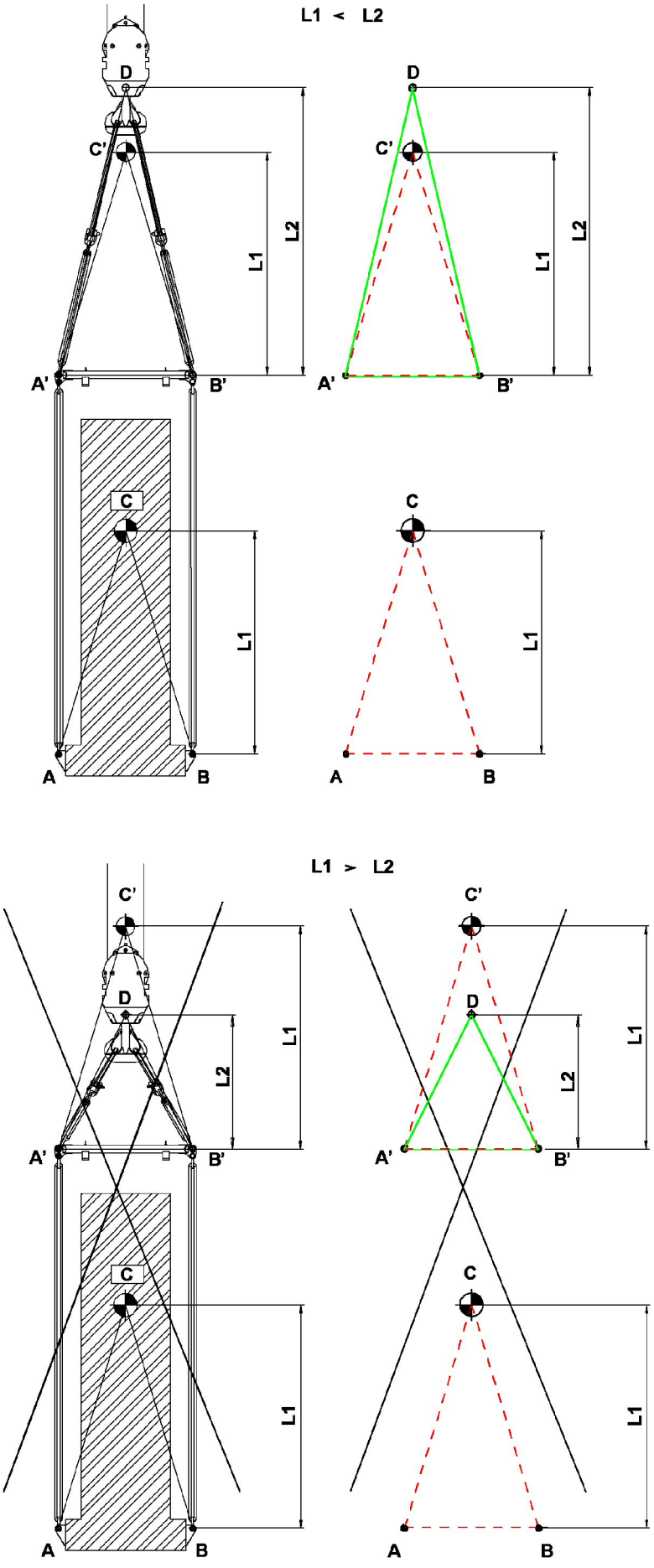

Fig.116274

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4.2 Taking on a load with cross beam

Cross beam are load handling equipment between crane hook and load.

The distance of the center of gravity **L1** is the vertical dimension from the fastening point of the load to the center of gravity of the load.

The cross beam height **L2** is the vertical dimension from the point of rotation of the crane hook to the next lower linkage point of the cross bar.

WARNING
Tipping of load to the side!
If fastening ropes are used which are too short, so that the load center of gravity is above the fastening point, then there is a danger of the load tipping to the side.
Personnel can be severely injured or killed.
- ▶ The load center of gravity must be below the crane hook.
- ▶ The distance of the center of gravity **L1** must be smaller than the cross beam height **L2** (L1 < L2).
- ▶ The triangle **A'B'C'** must be within the triangle **A'B'D**.

4.3 Transporting the hook block

WARNING
Danger of accident!
If a hook block is fastened incorrectly for transport, personnel can be injured.
- ▶ Fasten the hook block for transport on the fixed point in the center.
- ▶ Fastening the complete hook block on the auxiliary weights is prohibited.
- ▶ When setting down, secure the hook block against falling over.
- ▶ Prevent the load hook from rolling away.

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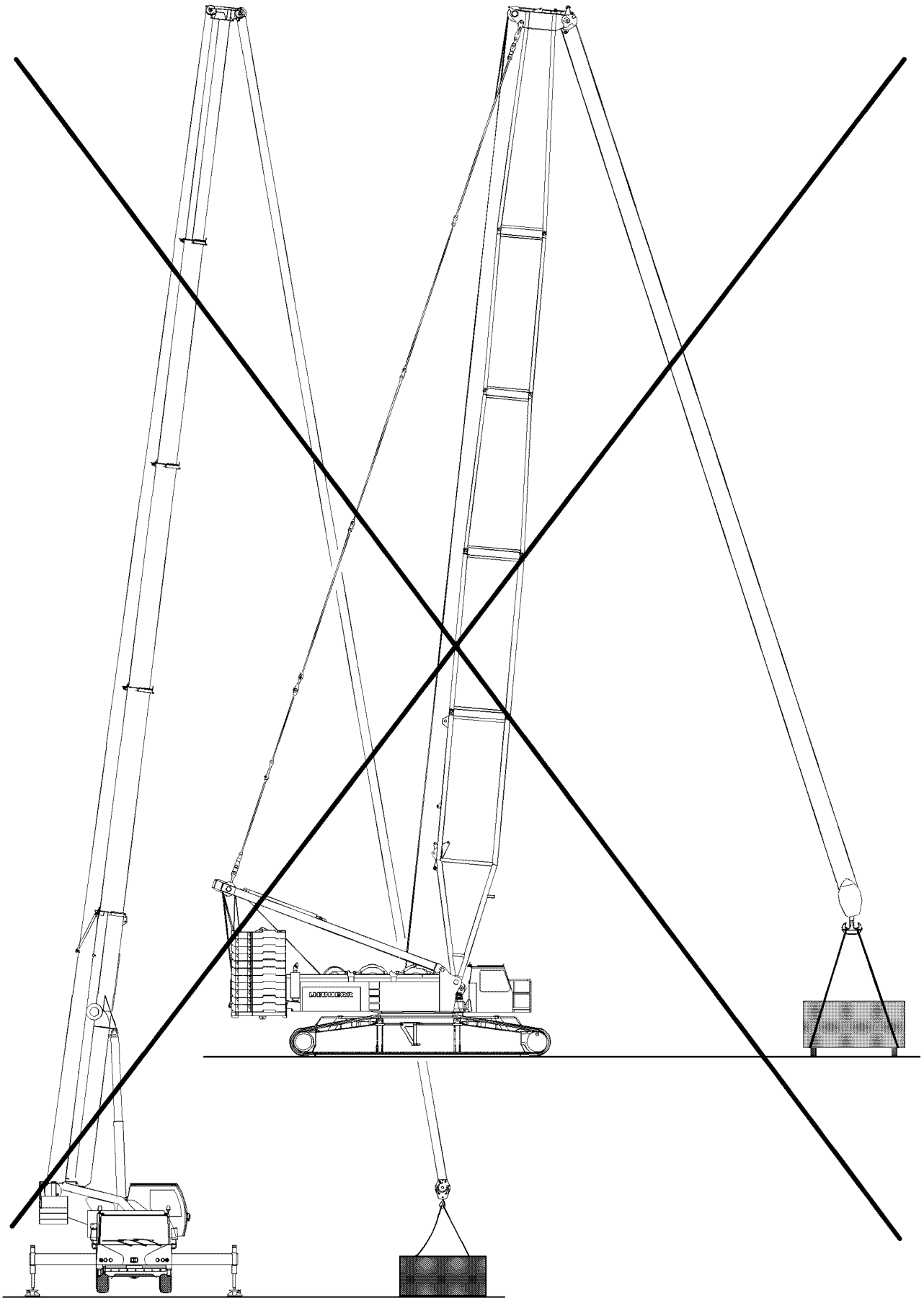

Fig.102716

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4.4 Lifting the load

WARNING
Danger of crushing for people in the load zone!
If personnel is located between the load to be lifted and a possible interfering edge (such as a wall of a building or similar) when the load is lifted, personnel can be severely injured or killed.
- ▶ Before lifting the load it must be ensured that there are no persons within the danger zone.
- ▶ It is prohibited to remain in the danger zone.
- ▶ It is prohibited for anyone to be under the load. Maintain a safe distance.
- ▶ Swinging the load is prohibited.
- ▶ Exercise extreme caution when lifting a load.

WARNING
The crane can topple over!
If an attempt to lift a load over the hoist gear causes the LICCON overload protection to turn off, then the load may not be lifted by luffing up the boom. This causes overload or toppling the crane.
Personnel can be severely injured or killed.
- ▶ Do not lift the load by luffing up the boom off the ground.

Note
When using the assembly winch* observe the following:
- ▶ Use the assembly winch* only for assembly and not for lifting loads.
- ▶ Lifting of loads with the auxiliary winch is prohibited.

If the fastening rope is manually attached by an assistant to the load to be lifted:
- – Make sure that the assistant's hands are not crushed by the tightened ropes between the load and the fastening rope.
- – Make sure that the assistant's body parts (hands, legs etc.) are not crushed by a swaying movement of the load during lifting.

4.5 Angular pull

WARNING
The crane can topple over!
Angular pulling can destroy the crane or cause it to topple over.
Personnel can be severely injured or killed.
- ▶ Fasten (hang) the hook block always vertically over the center of gravity of the load to be lifted.
- ▶ Do not use the slewing gear to pull and set up loads.
- ▶ When lifting, compensate for boom deflection.
- ▶ Angular pull is prohibited.

The crane is designed only to lift loads vertically. During angular pulling, regardless of whether this is done in the same direction as the boom or laterally, horizontal forces are generated from the load in addition to the vertical forces, for which the boom is not designed.

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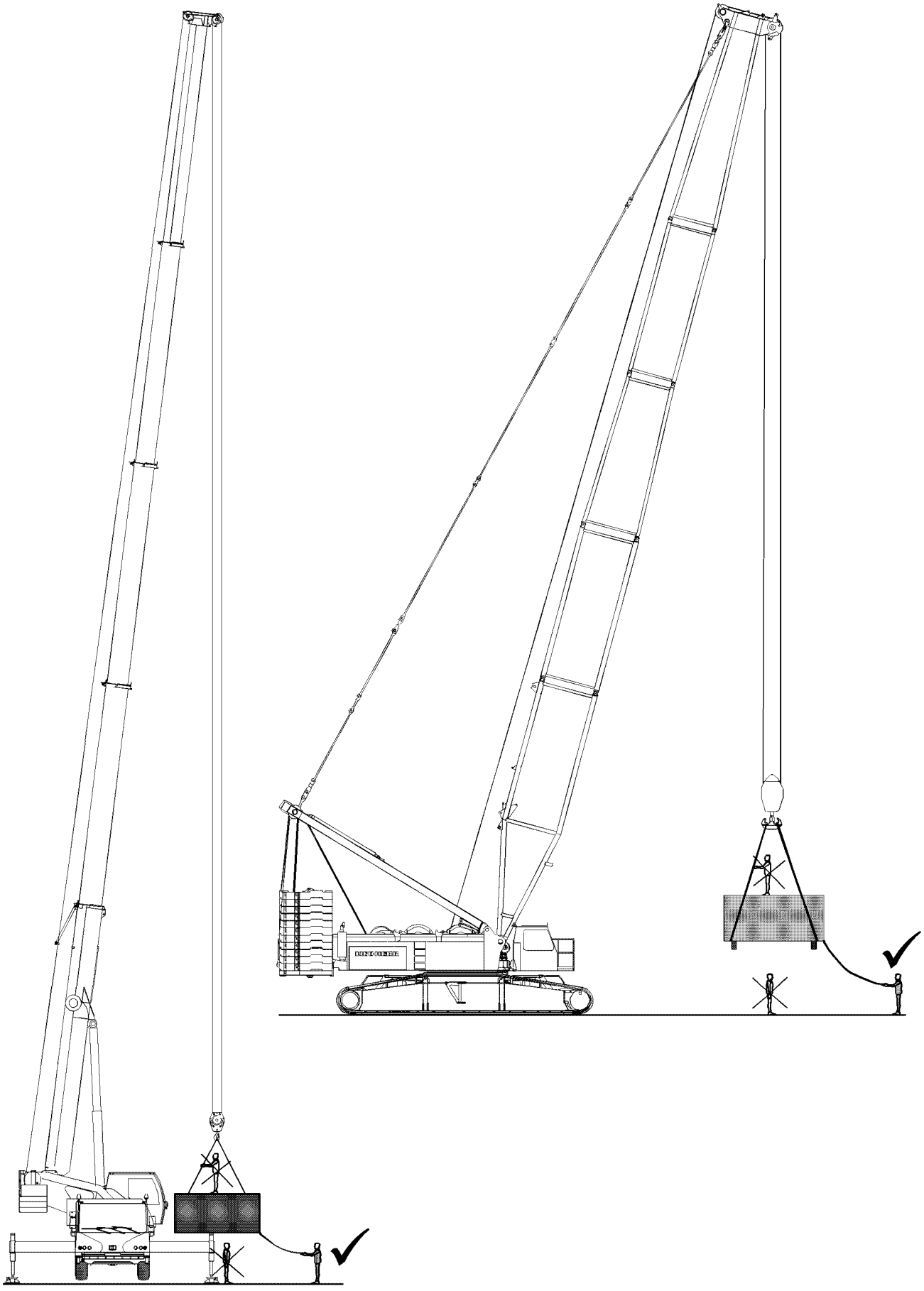

Fig.102717

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4.6 Breaking away fixed loads

WARNING
The crane can topple over!
Ripping stuck loads free can destroy the crane or cause it to topple over.
Personnel can be severely injured or killed.
▶ Ripping stuck loads free is prohibited.

5 Crane operation

The maximum load capacity of the crane is not just limited by the stability, but in many cases a load-bearing component breaks when the crane is overloaded **before** the crane topples over. Components that are susceptible to buckling such as the telescopic boom may fail suddenly **without showing signs of distortion beforehand** if the crane is overloaded.

WARNING
Danger of accidents for cranes with luffing cylinders!
When the luffing cylinder is on block position, the overload protection is not functioning.
▶ Crane operation at block position of luffing cylinders is prohibited.

5.1 General

A suspended load must always be kept under control. A fundamental requirement for this is the safe and delicate control of the crane's functions.

WARNING
Danger of accident due to swaying loads!
A swaying load can damage the crane and cause it to topple.
▶ All crane movements must be executed slowly and delicately.
▶ Initiate all crane movements slowly.
▶ Apply the brakes slowly in all crane movements.
▶ Crane operation with swaying load is prohibited.

NOTICE
Damage of rope pulleys!
▶ Place down hook blocks, booms, folding jibs, jib booms and boom noses in such a way that the rope pulleys do not lie on the ground and are damaged.

5.2 Guiding the load

The use of guide ropes is recommended to help the crane operator manage the load more precisely and to prevent the load from swaying. This will prevent undesirable movements of the load and consequent damage.

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5.3 Danger of crushing

WARNING
Danger of fatal injury!
Extreme care is needed when lowering a load. Danger of fatal injury exists for personnel in the immediate area of the load being lowered.
Personnel can be severely injured or killed.
- ▶ Standing under a suspended loads is strictly prohibited.
- ▶ Observe the danger of tipping when setting down the load. For example, small support surfaces or unsuitable ground.

5.4 Danger of falling

WARNING
Danger of fatal injury!
If persons are on the suspended load, then they can fall down and be severely injured or killed.
- ▶ Remaining on a suspended load is strictly prohibited.
- ▶ Remaining on or within crane components (for example: At assembly of boom sections, lattice sections) which are moved during lifting, lowering, turning or closing procedures is strictly prohibited.

5.5 Working in the vicinity of electricity transmission lines

If there are electricity transmission lines in the immediate vicinity of the building site, then the electrical transmission lines must be turned off by qualified electricians. If this is not possible, the danger area must be covered over or cordoned off.

WARNING
Danger of current transfer!
If electricity transmission lines are not shut off nor covered nor blocked off, then there is an increased danger of accident due to current transfer.
- ▶ For rated voltages up to 500 kV AC: Adhere to a safety distance of 8 m.

If the crane becomes electrified despite having taken all necessary precautions, proceed as follows:
- ▶ Remain calm!
- ▶ Do not leave the crane cab.
- ▶ Warn people outside: Stay in place and do not touch the crane.
- ▶ Move the crane away from the danger zone.

6 Ram work or pulling sheet piles

Vibration can be transmitted to the supporting steel structure of the crane during ram work or when pulling sheet piles with the crane. This vibration can cause premature fatigue of the material and therefore cracks in the supporting steel structure.

Following higher loads on the crane, shorter inspection intervals must be defined by an authorized inspector.

Ramming equipment and pulling equipment must be equipped with vibration dampers.

The following vibration dampers are permissible:
- – Ramming equipment and pulling equipment with integrated vibration dampers
- – Combination of ramming equipment and pulling equipment with vibration dampers designed for this equipment

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NOTICE
No vibration dampers used!
The boom or the crane can be damaged.
▶ Use ramming equipment and pulling equipment with vibration dampers.
▶ The ramming equipment and pulling equipment may **not** pass on vibrations to the boom.

When pulling sheet piles, the maximum permissible pull force must be limited to 50% of the load chart value for the corresponding crane boom radius. The utilization of the hook block load may not exceed 50%.

Note
▶ When pulling sheet piles, **only** work in main boom operation or telescopic boom operation.
▶ Do **not** use operating modes with a Derrick, auxiliary boom or boom extensions.

NOTICE
Maximum permissible tractive power exceeded when pulling sheet piles!
The boom or the crane can be damaged.
▶ Limit the maximum permissible pull force to 50% of the load chart value for the corresponding crane boom radius.
▶ Additionally check the pull force by measuring it.
▶ Do not limit the maximum pull force of the crane **exclusively** by means of the overload protection.

NOTICE
Hook block load utilization exceeded when pulling sheet piles!
The hook blocks or the crane can be damaged.
▶ Limit the utilization of the hook block load to maximum 50%.

7 Crane rope pretension

Damage that can occur with multi layer spooling:
– Abrasion
– Broken wires and loop formation
– Flattenings, deformations

NOTICE
Crane rope pretension too low!
Loosely coiled rope layers.
Rope damage. Reduced service life of the crane rope.
Cutting of the crane rope into the lower rope layers. The load can not be lowered any further.
▶ To maximize the service life of the crane rope, carry out the measures in the following sections.

Note
▶ Liebherr recommends to shorten crane ropes with damage in the cross over area of the coils, in order to lengthen the service life. Shortening the crane rope, see Crane operating instructions, chapter 7.05.50.

7.1 Working with a high rope pull

If multiple lifts are performed with a high rope pull, loosen the lower rope layers that are rarely or never spooled out.

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NOTICE
Loosely spooled out rope layers!
Rope damage.
Upper rope layers with a high rope pull deform the lower rope layers in the cross over area of the crane rope.
Spooling deformed rope sections over rope pulleys reduces the service life of the crane rope.
▶ Place a shorter crane rope.

When the lower rope layers are **not** used during repeat work:
▶ Increase the pretension of the lower rope layers: Spool out the entire rope length and then spool back up with the highest rope pull possible. See section „Increasing the hoist rope pretension“.

7.1.1 Placing a shorter crane rope

Note
▶ Liebherr recommends using the entire rope length.

Unused rope sections cause the loosening of the lower rope layers.

When only a part of the crane rope length is used for a longer period of time:
▶ Place a shorter crane rope.

7.1.2 Reducing rope unwinding

Telescopic boom

When telescoping out less, then the smallest amount of fixed coiled up crane rope is spooled out.

▶ Telescope out as little as possible.

Picking up the fastening equipment

If the fastening equipment with a flat boom system must be picked up, then the smallest possible amount of crane rope is spooled up loose.

▶ Establish a flat boom system: Telescope out or luff up the boom.
▶ Pick up the fastening equipment.

7.1.3 Restoring hoist rope pretension

Brief description

If a multi-pulley hook block is reeved, then the entire hoist rope length can be spooled out from the rope drum.

▶ Spool the hoist rope out until three safety coils.
▶ Create 10 % maximum strand pull: Attach the load.

While the hoist rope is spooled up:
– Hold the load just off the ground.
– In the permissible range of the load chart of the relevant set up configuration: Increase the load radius by luffing down.

▶ Spool the hoist rope up.

Description using the example LR 1600-2, SL3F

This section explains the procedure with the help of the set up configuration for LR 1600-2 with boom system SL3F.

The crane-specific parameters ensure that rope is spooled out until four rope coils and as many rope coils with pretension as possible can be spooled up.

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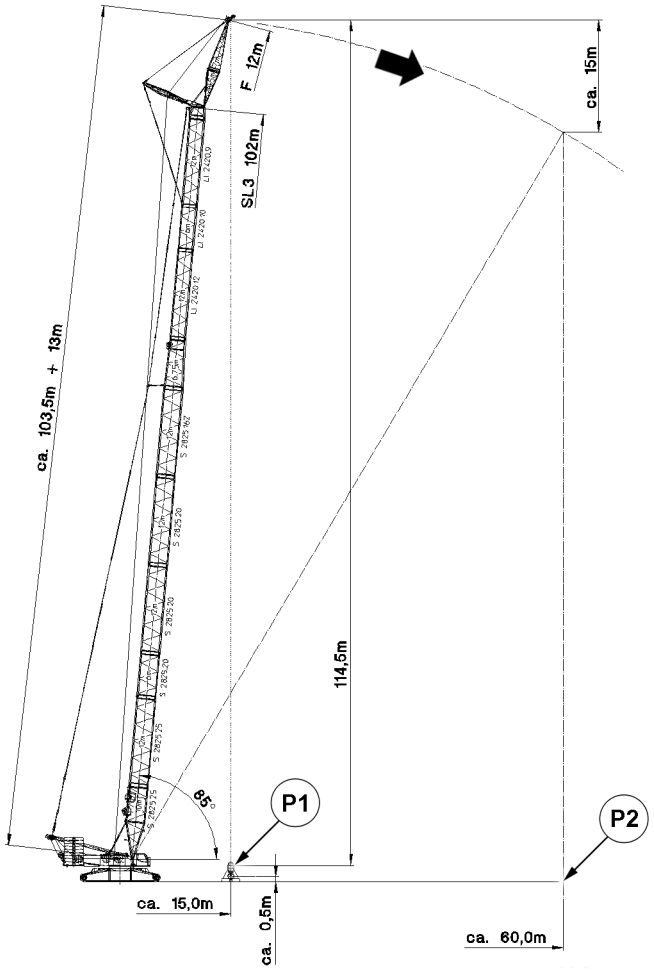

Fig.127131: LR 1600-2, SL3F: Spooling up hoist rope with pretension

Boom radius	Load	10 % of maximum strand pull
60 m	14.4 t	1.8 t

Load example: LR 1600-2, SL3 102, F12, according to the load chart

Hoist rope for this example:
– Hoist rope with a length of 1050 m

Hook block for this example:
– Hook block 200 DM, 5-pulley, reeved 8 times
– The weight of the hook block with ten auxiliary weights is 7.0 t

To reach sufficient rope pull, another load must be hung in addition to the hook block.

Make sure that the following prerequisites are met when hanging the load:
– Load is hung as short as possible.
– For a boom radius of 15.0 m , the hoist rope can be spooled out on the winch until four coils.
– The load is suspended over the ground.

▶ Pick up the load with 7.4 t.
▶ Set the boom system to boom radius 15.0 m.
▶ Spool the hoist rope out.

Result:
– In position **P1** there are 9 m of hoist rope (four coils) on the hoist winch:

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Spooled out rope section	Length
8-way reeving, distance of ground to the F-jib with boom radius 15 m	8 x 114,5 m = 916,0 m
Winch to FA-frame	103.5 m
F-head	13.0 m
Rope pulleys	7.5 m
Total of spooled out hoist rope	1040.0 m

*Rope lengths in position **P1***

While the hoist rope is spooled up:
– Hold the load just off the ground.
– In the permissible range of the load chart of the relevant set up configuration: Increase the load radius by luffing down.

▶ Spool up the hoist rope and luff down the boom at the same time until boom radius 60.0 m is reached.
▶ Set down the load.

Result:

– The pretension of the first and second position of the rope coils is restored.
– In position **P2** there are 130 m of hoist rope (23 coils) on the hoist winch:

Spooled up rope section	Length
Four coils initial situation	9 m
8-way reeving, F-jib height difference with boom radius 60 m	8 x 15 m = 120 m
Total of spooled up hoist rope	130 m

*Rope lengths in position **P2***

▶ Make sure that the hoist rope on the winch remains pretensioned: Reeve out the hook block and reeve in with slower reeving. See Reeving plan.

7.2 Picking up and lowering overhead loads

The load is picked up overhead in the following application examples:
– Repowering wind power plants
– Disassembly of slewing tower cranes

NOTICE
Load picked up overhead with loosely coiled rope layers!
The rope pull increases when the load is picked up. The rope coils in the lower rope layers move laterally and are compressed. The hoist rope can cut into the lower rope layers.
▶ Spool up the hoist rope without a load only with rope pretension.

NOTICE
Load lowered with cut in rope layers!
The hoist rope is pulled jerkily from the lower rope layers. Vibrations are introduced into the crane system.
Cut in hoist rope clamped between the lower rope layers. The load can **not** be lowered any further.
▶ To prevent the cutting in of the hoist rope, carry out the measures in the following sections.

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7.2.1 Increasing the reeving number

NOTICE
Higher reeving number than indicated on the load chart!
Slack rope formation.
The crane load drops due to additional weight from the rope strands and hook block.
If a higher reeving number is not considered in the set up configuration, the load display on the LIC-CON monitor no longer corresponds.
▶ Redetermine the hook block weight according to the load chart manual and adjust if necessary.
▶ Check if the crane load is sufficient for higher reeving.
▶ After telescoping out, check if the hook block can still reach the desired position for putting down the load.

A higher reeving number reduces the rope pull. A lower rope pull prevents the cutting in of the hoist rope in the lower rope layers.

▶ Select the highest reeving number possible for the hoist rope.

7.2.2 Increasing the hook block weight

NOTICE
Lift the hook block without a load!
The hoist rope is spooled up with a low rope pull. The rope layers are spooled up loose on the rope pulley.
▶ Increase the rope pull: Increase the hook block weight.

A higher hook block weight increases the rope pull.

▶ Increase the hook block weight.

If the crane load is sufficient:
▶ Attach an auxiliary weight between the load and hook block.

7.2.3 Pretensioning the hoist rope with pretensioning ballast with two hook operation

The pretensioning ballast is **not** included in the Liebherr scope of delivery.

NOTICE
Lift the hook block without a load!
The hoist rope is spooled up with a low rope pull. The rope layers are spooled up loose on the rope drum.
▶ Pretension the hoist rope with pretensioning ballast with two hook operation.

Make sure that the following prerequisites are met:
– The crane is equipped for two hook operation.
– The pretensioning ballast is present.

Properties of the pretensioning ballast:
– Developed by Liebherr.
– The weight is 4 t.
– Special tow coupling

▶ Fasten the pretensioning ballast on the main hook and on the auxiliary hook.

The pretensioning ballast is lifted with the main hook, the auxiliary hook is carried along without a load.

▶ Lift the pretensioning ballast.

When the main hook has reached the required height:
▶ Stop the main hook.

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After the load is completely transferred to the auxiliary hook, the main hook fastening ropes release automatically.

▶ Lift the auxiliary hook until the pretensioning ballast hangs completely on the auxiliary hook.

When the main hook fastening ropes have released:
▶ Lower the pretensioning ballast with the auxiliary hook and place it on the ground.

Result:

– The full load is present on the main hook.

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4.10 Driving from the crane cab

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1 Prerequisites for driving the crane (crawler operation)

For driving the crane (crawler operation) the conditions of the travel route are the deciding factor.
- For **ground inclinations within the area of a valid load chart Driving with load** is possible at a slow speed. The ground must be sufficiently level and capable of supporting the load. The supplements to the load charts for driving the crane must be observed.
- For **ground inclinations outside the area of a valid load chart Driving without load** is possible at a slow speed up to certain inclination ranges. The ground must be sufficiently level and capable of supporting the load.

Driving the crane: Load chart available
- Valid and regular load chart available
- With load on the hook
- Without load on the hook

Driving the crane: No load chart is available
- Only without load on the hook
- Only without derrick ballast
- With specifications and limitations for the set up configuration of the crane

WARNING
The crane can topple over!
If the permissible inclinations of the crane are exceeded, the crane can topple over.
Death, severe bodily injuries, property damage.
▶ Do not exceed the permissible inclinations of the crane.
▶ Do not exceed the permissible surface pressures for the travel route.

WARNING
The crane can topple over!
If the following specifications, instructions and prerequisites are not observed, then the crane can topple over or be overloaded.
Death, severe bodily injuries, property damage.
▶ The crane operator is responsible for adhering to all specifications, instructions and prerequisites in the crane documentation.
▶ The crane operator may not drive the crane if not all specifications, instructions and prerequisites in the crane documentation can be adhered to.
▶ The crane operator is responsible for the correct and complete data entry into the LICCON computer system and into the LICCON job planner, if applicable.
▶ All acceleration and delay maneuvers must be initiated with extreme caution and at the lowest possible speed.
▶ Depending on the situation, additional observers, who are acoustically or visually in contact with the crane operator (for example by radio or sight), may have to support the crane operator with shared responsibility.

WARNING
Combined crane movements at crawler operation!
▶ In crawler operation, do not carry out any additional crane movements.
▶ Carry out additional crane movements when the crane is at a standstill, if possible.

Make sure that the following prerequisites are met:
- No personnel or objects are within the danger zone.
- The crane is in an operational condition.
- The crane is in a set up configuration permitted for travel operation.
- The installed ballast (central ballast, counterweight and derrick ballast) is locked and secured.
- There are no loose objects on the crane.
- The assembly brackets of the crawler carrier are folded down.

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1.1 Travel route

WARNING
The crane can topple over!
If the following specifications, instructions and prerequisites are not observed, then the crane can topple over or be overloaded.
Death, severe bodily injuries, property damage.
- ▶ The transfer from the horizontal to an uphill slope and from an uphill slope to the horizontal must be made evenly, i.e.: There may be no edges that can cause the crane to topple over. Any inclination changes must be made continuously.
- ▶ If the travel route cannot safely absorb the surface pressure, then measures must be taken to be able to safely transfer the forces to the ground.
- ▶ If measures were taken to transfer the forces to the ground, then they must be checked by an expert before starting to drive for proper execution and sufficient supportability.
- ▶ An insufficient ground condition can cause accidents, for example the crane can slide away to the side and as a result get into an impermissible incline position.

Make sure that the following prerequisites are met:
- Before starting to drive, the travel route was determined.
- Before starting to drive, the condition of the ground has been checked.
- The entire travel route can safely absorb the surface pressure.
- All inclinations occurring on the travel route can be driven safely by the crane.
- The entire travel route is free of obstacles.
- The friction coefficient between crawler travel gear and ground is sufficiently large to absorb the occurring drive forces or to exclude that the crane slips away in an incline position.
- Possible environmental influences for driving the crane (among others precipitation and wind) were taken into account for the travel route.
- The travel route was selected and prepared in such a way that the boom system can be taken down at any time.
- Select the travel route in such a way that no steering movements are required, if possible.
- With a load on the hook: Setting down the load is possible at any time.
- The entire travel route is secured as a danger zone.
- The travel route has been selected in such a way that it is possible to maintain a sufficient distance from local facilities (power lines, etc.).

For ground outside the range of a valid load chart, the following applies additionally:
- Before starting to drive, the travel route was checked in connection with the actual set up configuration of the crane on the LICCON job planner.
- Before starting to drive, the optimum positions for the boom system were determined to obtain as even a surface pressure as possible - the LICCON job planner can be used for this purpose.

Note
- ▶ For a detailed description of the LICCON job planner on the crane, see the operating instructions LICCON job planner.
- ▶ For a detailed description of the LICCON job planner computer program, see the separate description.

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1.1.1 Optimizing measures for the travel route

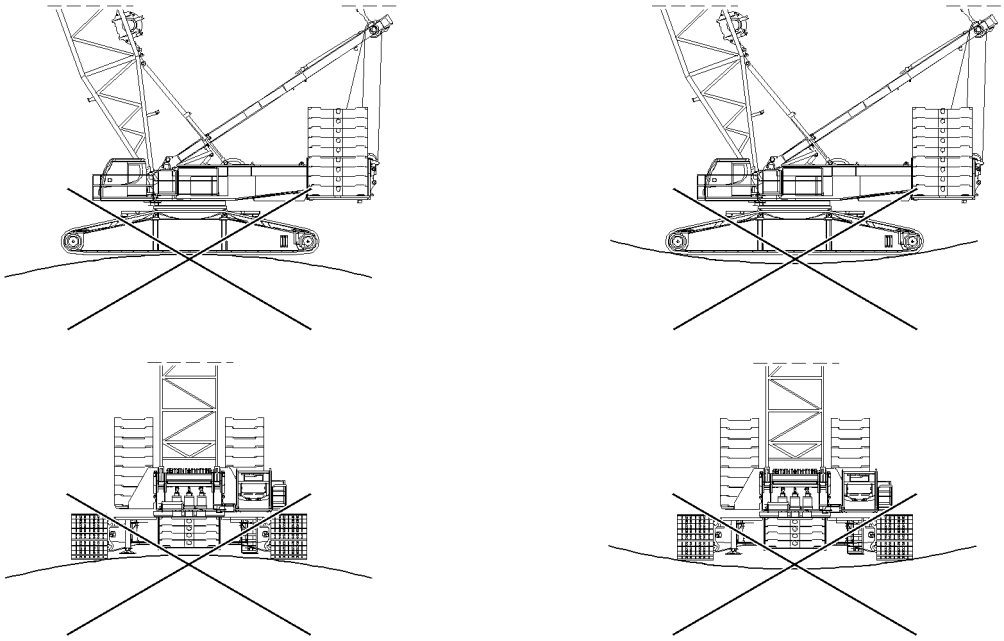

Fig.119598: Depressions, crests, track grooves and other uneven areas of the travel route cause localized pressure on the crawler travel gear

NOTICE
Damage to the crawler travel gear!
Continuous localized pressure on the crawler travel gear causes increased wear. Continuous increased wear can cause damage to the crawler travel gear.
- ▶ Set up the travel routes in such a way that the crawler travel gear is not subjected to continuous localized pressure.
- ▶ For extended travel operation shorten the maintenance intervals.

Through the following configuration features of the travel route, wear on the crawler travel gear can be minimized:
- – Shapings of the travel route (such as depressions, crests, track grooves) have been eliminated via suitable measures.
- – Lay out the travel route in such a way that no steering movements are required, if possible.

1.2 Calculation of required length of transfers on uphill / downhill slopes

The required length **L** for transfers results from the existing uphill angle **α** and the length of the crawlers **LC**.

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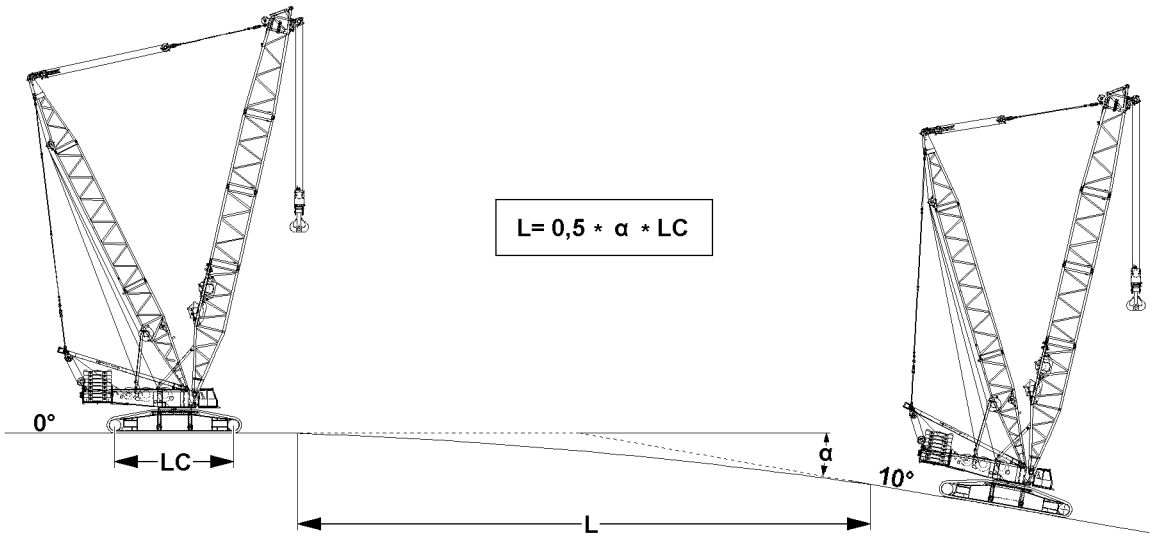

Fig.119612: Visualization: Length of transfers on uphill / downhill slopes

Abbreviation	Description
L	Required length of transfers
α	Angle rising / falling inclines in degrees
LC	Length of crawlers between drive wheels / steering wheels

1.2.1 Calculation example

Given:

α = 10°

LC = 17.3 m (only use the actual crane value!)

Wanted:

L = ?

Calculation formula						
L	=	0.5	*	**α**	*	**LC**
L	=	0.5	*	10	*	17.3 m
L	=	86.5 m				

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1.3 Travel gear / hydraulic motors / track rollers

NOTICE
Damage to the travel gear, hydraulic motors and track rollers!
On longer travel routes and / or when driving uphill / downhill, the travel gears, hydraulic motors and / or track rollers can be overheated and damaged.
- ▶ Make sure that the travel gears - before driving the crane - have the maximum fill level.
- ▶ With suitable measuring devices make sure that the maximum permissible temperature of the travel gears, hydraulic motors and / or track rollers in travel operation over longer distances is below 90 °C. For a short time (**maximum** 10 minutes), the temperature may increase to a value between 90 °C and 100 °C.
- ▶ As soon as the maximum permissible temperature in one position is exceeded, take a break from driving for cooling down.
- ▶ The crane operator is responsible for any damage to travel gears, hydraulic motors and / or track rollers.

When the maximum permissible temperature range on a travel gear and / or hydraulic motor is reached:
- ▶ Take a break until the temperature on travel gear(s), hydraulic motor(s) and / or track rollers had dropped considerably.

Maximum permissible temperature range on travel gear(s) / hydraulic motor(s)		
	to 90 °C	**between 90 °C and 100 °C**
Duration of exposure	continuous	not longer than 10 minutes

When the temperature of all travel gears / hydraulic motors has dropped below 90 °C:
- ▶ Travel operation is permissible again.

2 Displays on the LICCON monitor

WARNING
Danger of accident due to deviating set up configuration!
If the actual set up configuration of the crane deviates from the entries and settings in the Set up program, then the overload protection is not correctly set.
An incorrectly set overload protection calculates the actual load incorrectly and transmits faulty display values.
The crane can be overloaded without noticing it and topple over or collapse as a result.
Death, severe bodily injuries, property damage.
- ▶ The entries and settings in the set up program must match the actual set up configuration of the crane.

WARNING
Incorrect display values!
If the display values do not increase correspondingly when lifting known weights, an erroneous display value may be present.
If the crane is operated with erroneous display values, then the crane can be overloaded.
This could result in serious accidents.
- ▶ When lifting the hook block off the ground check if the display value for the actual load increases correspondingly.
- ▶ When lifting the derrick ballast off the ground check if the display value for the pulled derrick ballast BA_{pulled} increases correspondingly.
- ▶ When lifting the load off the ground check if the display value for the actual load increases correspondingly.

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Make sure that the following prerequisites are met:
- The actual set up configuration of the crane matches the entries and settings in the set up configuration.
- The assignment of the crane to the displays on the LICCON monitor is clear.
- All displays function perfectly.

Note
- ▶ For a detailed description of the displays on the LICCON monitor, see chapter 4.02.
- ▶ For a detailed description of the safety equipment, see chapter 4.04.

2.1 Center of gravity display on the LICCON monitor

WARNING
Shifting of the center of gravity!
The calculation of the values for the display of the center of gravity in the LICCON monitor are based on ideal assumptions.
- ▶ Side deformations of the boom system due to wind, inclined position and elastic resilience of the steel structure are not taken into account but they can lead to a shifting of the center of gravity.

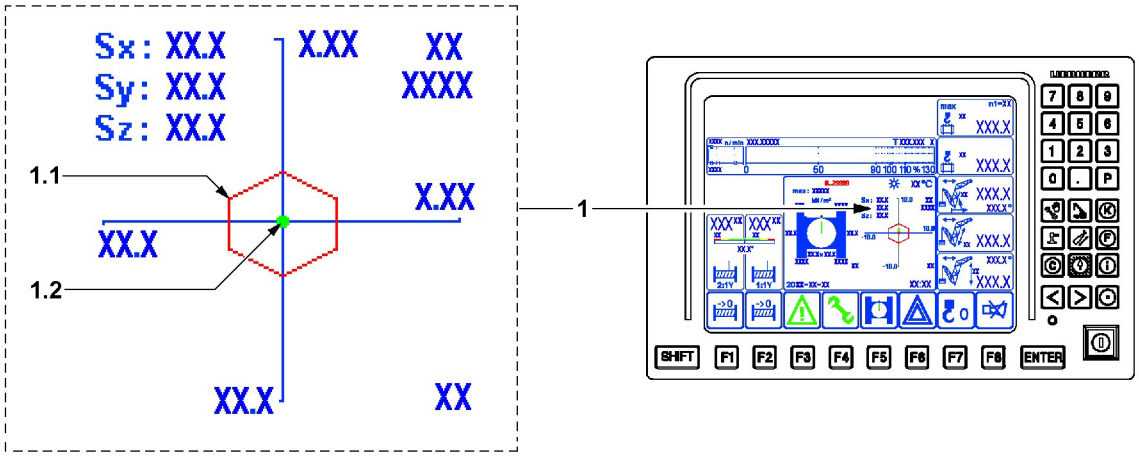

Fig.115325: Center of gravity display

Center of gravity **1 display**	
Position	**Name**
1.1	Core area
1.2	Center of gravity

WARNING
Center of gravity of the crane is outside the core area!
If the center of gravity **1.2** of the crane is outside the core area **1.1**, then the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ To drive the crane, the center of gravity **1.2** must always be within the core area **1.1**.
- ▶ If the center of gravity **1.2** is outside of the core area **1.1**, then it is prohibited to drive the crane.

The following specifications and instructions must be observed:
- By luffing the boom system up and down, the position of the center of gravity **1.2** must be corrected in such a way that the overall center of gravity remains within the core area **1.1**.

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2.2 Surface pressure display on the LICCON monitor

WARNING
Increased surface pressure!
The calculation of the values for the display of the surface pressure in the LICCON monitor are based on ideal assumptions.
▶ Side deformations of the boom system due to wind, inclined position and elastic resilience of the steel structure are not taken into account but they can lead to an increase of the surface pressure.

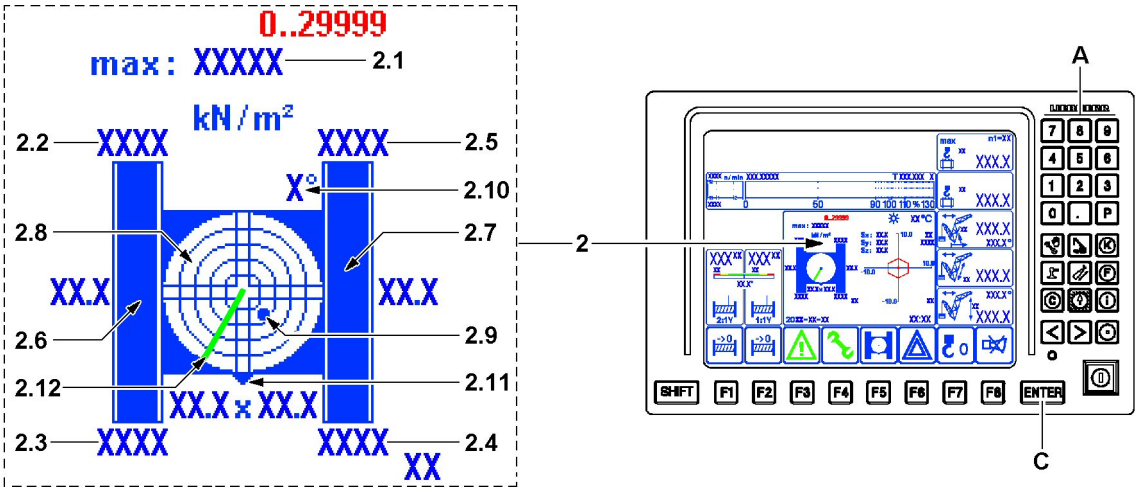

Fig.119613: Surface pressure display

Surface pressure **2 display**	
Position	**Name**
2.1	Maximum surface pressure
2.2	Surface pressure right rear
2.3	Surface pressure right front
2.4	Surface pressure left front
2.5	Surface pressure left rear
2.6	Right crawler placement surface
2.7	Left crawler placement surface
2.8	Incline indicator[1)]
2.9	Point[1)]
2.10	Display resolution[2)]
2.11	Marker „Front side of crawler carrier“[3)]
2.12	Boom direction[4)]

1) The graphic display is in the form of a spirit level with a moving dot **2.9** representing the air bubble.
2) This value describes the resolution of the graphic view. The resolution is matched automatically to the inclination.
3) The front on the crawler travel gear is always on the side where the chain tension devices for the crawler carriers are located.
4) Current boom direction in reference to the displayed icon.

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WARNING
Surface pressure too high!
If the maximum surface pressure is exceeded, the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ Do not exceed the maximum surface pressure.
- ▶ The value entered in the LICCON computer system for the maximum surface pressure **2.1** must match the actual conditions of the travel route.

WARNING
The crane can topple over!
If the permissible incline of the crane is exceeded, the crane can topple over.
- ▶ Do not exceed the permissible incline from the load chart.
- ▶ Do not exceed the permissible inclination for driving the crane, see the following sections.

Note
- ▶ The placement surface of the crawler carriers is graphically shown on the surface pressure display.
- ▶ If the resulting surface pressure can be distributed so that the maximum surface pressure of the travel route is not exceeded **and** the resulting forces can be transferred safely into the ground, then the stability of the crane is ensured.
- ▶ Incline indicator **2.8** with number values, see section „Display of incline in LICCON monitor“.

The following specifications and instructions must be observed:
- The maximum surface pressure that may be reached must be entered as the maximum surface pressure **2.1**.
- By luffing the boom system up and down, the resulting surface pressure must be distributed in such a way that the maximum surface pressure of the travel route is not exceeded.
- The inclinations that are reached on the travel route are known and are taken into account.
- As soon as the crane shows the tendency that the permissible inclination could be exceeded, the load must be set down. If necessary, driving the crane must be interrupted.

2.2.1 Entering the maximum permissible surface pressure

Make sure that the following prerequisites are met:
- The Crane operation program is called up.
- The maximum permissible surface pressure of the travel route is known.

▶ Press the enter key **C**.

Result:

– The value for the maximum surface pressure **2.1** can be changed.

▶ Enter the value for the maximum permissible surface pressure via the keypad **A**.
▶ Press the enter key **C**.

Result:

– The new value for the maximum surface pressure **2.1** appears.

▶ Check the value for the maximum permissible surface pressure.

2.3 Display for the inclination on the LICCON monitor

The display of the inclination is additionally shown for the monitored auxiliary functions.

Display of the inclination of the crane to the horizontal in the longitudinal and lateral direction. The display is graphic as well as numeric.

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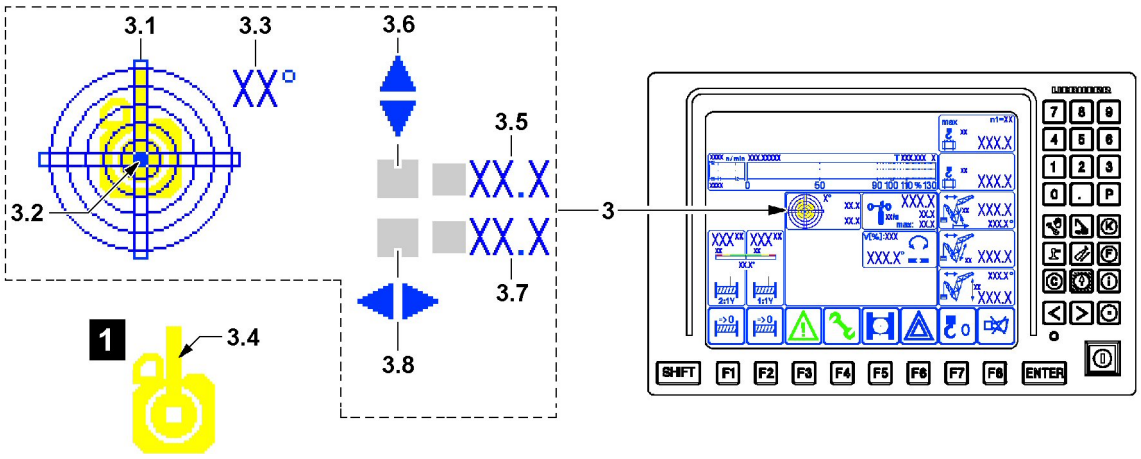

Fig.115327: Incline display

Incline **3 display**	
Position	**Name**
3.1	Sight gauge
3.2	Bubble
3.3	Display resolution
3.4	Boom position[3)]
3.5	Incline in longitudinal direction
3.6	Incline direction
3.7	Incline in lateral direction
3.8	Incline direction

3) The boom position in the spirit level **3.1** is highlighted as orientation aid, see detail **1**. The boom position corresponds to the „viewing direction to the front“ from the crane cab in relation to the spirit level **3.1**.

WARNING
The crane can topple over!
If the permissible incline of the crane is exceeded, the crane can topple over.
▶ Do not exceed the permissible incline from the load chart.
▶ Do not exceed the permissible inclination for driving the crane, see the following sections.

The following specifications and instructions must be observed:
– The inclinations that are reached on the travel route are known and are taken into account.
– As soon as the crane shows the tendency that the permissible inclination could be exceeded, the load on the hook and / or the suspended ballast must be set down.

3 Preparing for driving the crane

3.1 Distribution of the surface pressure

While driving, pay attention in all driving conditions to the ratio of the surface pressure between the front and the rear sides of both crawlers.

In the following examples it is assumed that the crawler travel gear and the turntable are oriented to the front.

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Distribution of the surface pressure	
Position	**Name**
1	Center of gravity
2	Surface pressure on the front
3	Surface pressure on the rear
4	Boom position[1)]
5	Marker „Front side of crawler carrier“[2)]
6	Crawler carrier chain tension device
7	Main boom angle display
8	Core area
α	Main boom angle

1) The boom position corresponds to the „viewing direction to the front“ from the crane cab.
2) The front on the crawler travel gear is always on the side where the chain tension device for the crawler carriers is located.

Before driving the crane is it required to position the boom in such a way that a suitable distribution of surface pressure for driving is obtained.

3.1.1 Examples for the distribution of surface pressure

Surface pressure: Center of gravity in the middle

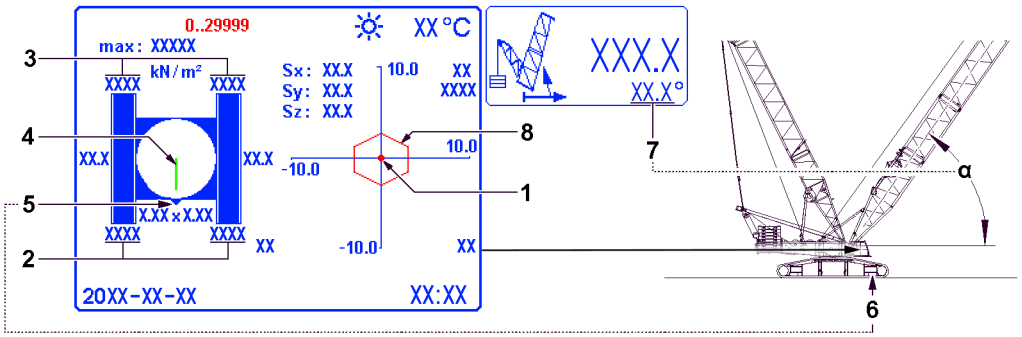

*Fig.153785: Center of gravity **1** in the middle*

– The surface pressure in the front **2** is the same as the surface pressure in the rear **3**.

Surface pressure: Center of gravity in the rear

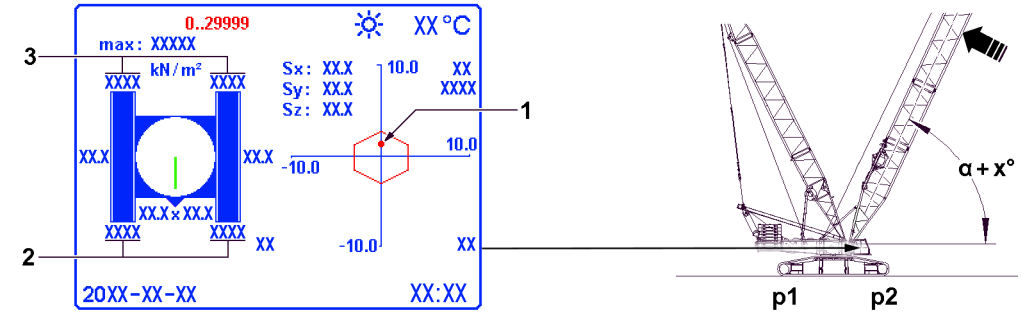

*Fig.153786: Center of gravity **1** in the rear*

– The main boom was luffed up.
– The surface pressure on the rear **3** is higher.

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Surface pressure: Center of gravity in the front

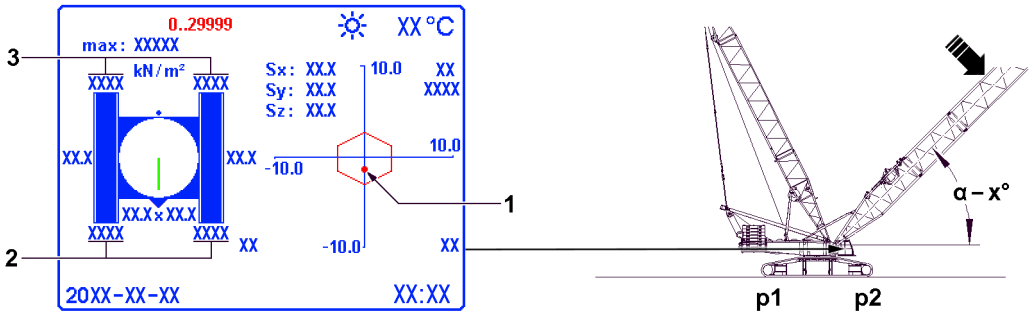

*Fig.153787: Center of gravity **1** in the front*

- The main boom was luffed down.
- The surface pressure on the front **2** is higher.

3.2 Suitable distribution of the surface pressure

If the distribution of the surface pressure is even (surface pressure on the front **2** and surface pressure on the rear **3** have approx. the same value), then steering is difficult or not possible at all.

For the suitable distribution of the surface pressure, the following applies:
- p1 = Surface pressure on the side of both crawlers with less load.
- p2 = Surface pressure on the side of both crawlers with more load.
- The center of gravity **1** must always be within the core area **8**.

Distribution of surface pressure p1 to p2				
p1	/	**p2**	=	should be greater than 0.3

In case of unfavorable distribution of surface pressure it is required to position the boom system in such a way that a suitable distribution of the surface pressure is reached for driving.

- ▶ The turntable should be turned while at a standstill: The boom system should be luffed in such a way that the crawlers are subjected to a load as evenly as possible.
- ▶ Driving uphill: The boom system should be luffed in such a way that the side of the two crawlers that has less load is in the rear.
- ▶ Driving downhill: The boom system should be luffed in such a way that the side of the two crawlers that has less load is in the front.

Note
- ▶ The side with the higher surface pressure should be within the field of vision of the crane operator or the auxiliary personnel. This will ensure that it will recognized early on that the crawler carriers sink in and respective countermeasures can be initiated.

3.3 Steering ability

Note
High load on the crane!
When driving the crane, steering movements cause a high load on the crane travel gear.
- ▶ If possible, forego steering movements with a load on the hook and / or derrick ballast.
- ▶ Select the travel route in such a way that no steering movements are required, if possible.
- ▶ If not otherwise possible, before initiating a steering movement, set down the load and / or derrick ballast.

The steering ability depends on the following factors:
- Friction conditions under the chains.

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– Evenness of the ground:
  • Steering is not possible if the crawler travel gear is only making contact with the ground in the front and rear.
– Load bearing capacity of the ground:
  • If the crawler travel gear sinks into the ground, then the steering ability is significantly restricted.
– Position of the total center of gravity:
  • If the total center of gravity - taking the suspended load into account - is in the center of the crane, then steering is hard or not possible at all.

Steering ability can be improved by:
– Placing metal sheeting, sand, gravel, water underneath.
– Taking the load bearing capacity of the ground and the position of the center of gravity into account: Changing the center of gravity.

4 Driving the crane: Load chart available

WARNING
The crane can topple over!
If the following conditions are not observed, the crane can topple over.
Death, severe bodily injuries, property damage.
▶ The ground must be sufficiently level and within the range of the permissible inclination.
▶ The ground must be able to safely absorb the maximum occurring surface pressures.

WARNING
The crane can topple over!
If the permissible inclinations of the load charts are exceeded when driving the crane, then the crane can topple over or be overloaded.
If the permissible wind speeds of the load charts are exceeded when driving, then the crane can topple over or be overloaded.
Death, severe bodily injuries, property damage.
▶ If the inclinations are too large then driving the crane is prohibited.
▶ If the wind speeds are too high then driving the crane is prohibited.

Make sure that the following prerequisites are met:
– The permissible inclinations from the load charts are adhered to.
– The maximum permissible wind speeds from the load charts are adhered to.
– The maximum permissible travel speed is adhered to.
– Driving in curves: slewing gear freewheeling is actuated.

Permissible inclinations	
Overall inclination	Load charts for inclination± 0.3°
Overall inclination[1)]	Load charts for inclination± 1.0°

1) Only certain boom systems

Permissible wind speeds	
Wind speeds	See load charts

Driving with a load is possible under the conditions of the regular load chart:
– The permissible inclinations from the load charts apply for driving.
– Take the maximum permissible wind speeds from the load charts.
– Take the maximum permissible driving speed from the following sections.

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4.1 Driving with a load on the hook and / or derrick ballast

WARNING
The crane can topple over!
If the load on the hook or the suspended ballast collides with the crane, the ground or obstacles when driving, then the crane can be damaged and topple over.
Death, severe bodily injuries, property damage.
▶ Make sure that the load on the hook or the suspended ballast does not collide with anything when driving.

WARNING
Danger of accident!
If the suspended load or the suspended derrick ballast starts to swing, then the crane operator can lose control over the crane.
If the following prerequisites are not observed, the crane can topple over.
This could result in serious accidents.
▶ Do not exceed the maximum permissible driving speed.
▶ Avoid jerky driving movements.
▶ The attached load and suspended derrick ballast must be secured to prevent it from swinging. If oscillating movements should occur, set the load / derrick ballast as fast as possible down on the ground. Hereby pay attention to the limit values of the load moment display and the F-load display.
▶ Driving and steering the crawler at the same time with a suspended load and / or installed derrick ballast is prohibited.

Make sure that the following prerequisites are met:
– The permissible inclinations from the load charts are adhered to.
– Without derrick ballast: the travel speed may **not** exceed 0.1 m/s **or** 6 m/min **or** 0.36 km/h.
– With derrick ballast: the travel speed may **not** exceed 0.05 m/s **or** 3 m/min **or** 0.18 km/h.
– Crawler operation rapid gear may not be engaged.
– The attached load hangs freely.
– The attached load must be secured to prevent it from swinging back and forth, if necessary.
– Hold the attached load as close to the ground as possible.
– Hold the attached load with the smallest boom radius as possible.
– Derrick ballast: the suspended ballast hangs freely.
– Derrick ballast: the suspended ballast is lifted off the ground maximum 250 mm.
– Derrick ballast: the derrick ballast must also be secured to prevent it from swinging back and forth.

4.2 Driving without a load on the hook and without derrick ballast

Make sure that the following prerequisites are met:
– Driving the crane takes place according to the inclinations from the load charts.
– Take the maximum permissible wind speeds from the load charts.
– The travel speed may not exceed 0.4 m/s **or** 24 m/min **or** 1.44 km/h.
– The hook block is secured to prevent it from swinging back and forth.

5 Driving the crane: No load chart is available

WARNING
The crane can topple over!
If the following note is not observed, the crane can topple over.
Death, severe bodily injuries, property damage.
▶ Driving uphill must always be anticipatory, with utmost caution and at the slowest speed.
▶ Drive on the start of uphill and downhill slopes (for example ramps) at a right angle.
▶ It is prohibited to let the crane tip over an edge.

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WARNING
The crane can topple over!
If the crane is driven outside the load chart with a load or with the derrick ballast, accidents can occur.
The crane can topple over or be overloaded.
Death, severe bodily injuries, property damage.
▶ Driving the crane with a load outside the load chart is prohibited.
▶ Driving the crane with derrick ballast outside the load chart is prohibited.

Make sure that the following prerequisites are met:
– There is no load on the hook.
– No derrick ballast is installed.
– The crane engine oil level is at the maximum fill level.
– The oil level in the hydraulic oil tank must be lowered by extending the cylinders so that overflow is not possible.
– The contents of the fuel tank must be reduced so that overflow is not possible, even with the largest crane inclination.
– The travel speed may **not** exceed 0.1 m/s **or** 6 m/min **or** 0.36 km/h.
– Driving in curves: slewing gear freewheeling is actuated.
– The maximum permissible wind speed of 9 m/s is adhered to.
– The permissible lateral incline when driving without a load is adhered to.
– The permissible longitudinal inclination when driving without a load is adhered to.

Permissible lateral inclination when driving without a load and without derrick ballast		
Overall length of the main boom	**Maximum permissible lateral inclination**	**For longitudinal inclination**
Shorter than / equal to 96 m	± 3°	± 0.3°
97 m to 150 m	± 2°	± 0.3°

Permissible longitudinal inclination when driving without a load and without derrick ballast		
Overall length of the main boom	**Maximum permissible longitudinal inclination**	**For lateral inclination**
To 150 m	± 10°	± 0.3°

5.1 Driving uphill / downhill

WARNING
The crane can topple over!
If the following notes are not observed, the crane can topple over.
Death, severe bodily injuries, property damage.
▶ The deciding factor for driving on inclines is the exact knowledge of the operational conditions at the job site.
▶ Specifications, instructions and prerequisites in this chapter must be adhered to.
▶ Driving uphill / downhill must always be anticipatory, with utmost caution and at the slowest speed.

WARNING
The crane can topple over!
If the crane is driven uphill / downhill with a load or derrick ballast, the crane can topple over.
If the angle of the boom system is not matched to the incline when driving the crane on inclines, then the crane can topple over.
Death, severe bodily injuries, property damage.
▶ Match the angle of the boom system to the incline.
▶ Driving uphill with a load and / or derrick ballast is prohibited.

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WARNING
The crane can topple over!
If the turntable is not parallel to the crawler travel gear when driving the crane on uphill or downhill inclines, then the crawler crane can topple over or be overloaded.
▶ For ground inclinations of more than 0.3°, make sure that the turntable is aligned parallel to the crawler travel gear in the 0° or 180° position before driving the crawler crane!

WARNING
The crane can topple over!
On ground inclinations of more than ±0.3° the travel direction may not be changed.
▶ On ground inclinations of more than ±0.3° plan the travel route in such a way that a travel direction change is not necessary.

WARNING
The crane can topple over!
A longitudinal inclination of more than ±0.3° and a lateral inclination of more than ±0.3° may not be combined.
▶ For a longitudinal inclination of more than ±0.3° a maximum lateral inclination of ±0.3° always applies. For a lateral inclination of more than ±0.3° a maximum longitudinal inclination of ±0.3° always applies.

Make sure that the following prerequisites are met:
– The turntable is aligned parallel to the crawler travel gear, 0° or 180° position.
– Uphill / downhill slopes with more than ±0.3° can be driven without travel direction change.
– The maximum side inclination of ±0.3° is adhered to.

There are two different possibilities for driving crawler cranes on uphill / downhill slopes:
– By adjusting the angle of the boom system.
– Without adjusting the angle of the boom system.

5.1.1 Maximum climbing ability

The maximum climbing ability of the crawler crane is limited by the following criteria:
– The location of the center of gravity for the complete crawler crane.
– The friction coefficient between the road and track pads.
– The transition between the horizontal and the uphill incline.
– The maximum permissible uphill incline of 10° up to a boom length of 150 m.

5.1.2 Driving uphill / downhill by changing the angle of the boom system

The following specifications and instructions must be observed:
– On level ground, set the optimum angle of the boom system regarding the center of gravity and the surface pressure.
– Uphill / downhill slopes: As soon as the value of the displays for the center of gravity and the surface pressure become more unfavorable, match the boom angle in the permissible range.

WARNING
The crane can topple over!
If the limit values for the center of gravity and the surface pressure are exceeded, then the crane can topple over or be overloaded.
▶ Driving without display values for the center of gravity and the surface pressure is only permissible when the center of gravity and the surface pressure are otherwise monitored and ensured.

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Note
Driving without display values for center of gravity and surface pressure!
- ▶ On level ground, set the optimum angle of the boom system regarding the center of gravity and the surface pressure.
- ▶ When driving into an uphill incline, during the transition between the horizontal into the incline, the original angle of the boom system must be changed continuously in such a way that the same angle ratio always remains between the boom system and the horizontal. This angle must be retained in the uphill incline.
- ▶ When driving out from an uphill incline, at the transition from incline to the horizontal, change the angle of the boom system continuously so that the same angle ratio is always retained.
- ▶ As a rule, the center of gravity and the surface pressure of the crane must be taken into account.

Positive longitudinal inclination

Note
- ▶ When driving on positive longitudinal inclinations (uphill), the main boom must usually be luffed down.

Status	Transition	Boom angle
Driving horizontally	after uphill incline	match
Driving on the uphill incline		
Driving on the uphill incline	after horizontal	match
Driving horizontally		

Negative longitudinal inclination

Note
- ▶ When driving on negative longitudinal inclinations (downhill), the main boom must usually be luffed up.

Status	Transition	Boom angle
Driving horizontally	after downhill slope	match
Driving downhill		
Driving downhill	after horizontal	match
Driving horizontally		

5.1.3 Prerequisites for driving uphill / downhill without changing the angle of the boom system

The following specifications and instructions must be observed:
- Make sure that with the selected position of the boom system, the center of gravity and the surface pressure are within the permissible range.

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WARNING
The crane can topple over!
If the limit values for the center of gravity and the surface pressure are exceeded, then the crane can topple over or be overloaded.
Death, severe bodily injuries, property damage.
- ▶ Before driving onto uphill and downhill slopes, check the change of the center of gravity and the surface pressure and ensure that it is permissible.
- ▶ Before driving the crane, determine if the crane may drive on the intended route without changing the boom system.
- ▶ If the intended uphill / downhill slope cannot be driven without changing the angle of the boom system, then the boom angle must be changed to be able to drive on the uphill / downhill slope.

5.2 Driving on side inclinations

WARNING
The crane can topple over!
With inclinations of more than ±0.3° the travel direction may not be changed.
- ▶ With inclinations of more than ±0.3° plan the travel route in such a way that a travel direction change is not necessary.

WARNING
The crane can topple over!
A longitudinal inclination of more than ±0.3° and a lateral inclination of more than ±0.3° may not be combined.
- ▶ For a longitudinal inclination of more than ±0.3° a maximum lateral inclination of ±0.3° always applies. For a lateral inclination of more than ±0.3° a maximum longitudinal inclination of ±0.3° always applies.

Make sure that the following prerequisites are met:
- The turntable is aligned parallel to the crawler travel gear (0° or 180° position).
- Side inclinations with more than ±0.3° can be driven without travel direction change.
- The maximum longitudinal inclination of ±0.3° is adhered to.

6 Driving the crane: Ballast trailer installed

WARNING
The crane can topple over if the level of the road differs!
Due to impermissible level differences between the ballast trailer roadway and the crane placement level, the entire crane system can be pulled back suddenly.
The relapse cylinders can run out to the block position. The relapse cylinders and the boom system can be damaged.
Depending on the distortion of the turntable and the load of the tires on the ballast trailer, a shut-off of crane movements may be activated with a retracted ballast trailer guide due to an excessive inclination of the ballast trailer (depending on the crane type and time of crane delivery), see chapter 4.02.
Death, severe bodily injuries, property damage.
- ▶ Do not exceed or fall below the permissible level difference between the ballast trailer road and the crane placement level.
- ▶ The travel path of the crane or the circular path of the ballast trailer must be level and of sufficient load bearing capacity.
- ▶ The permissible level difference of the ballast trailer travel path and crane travel path for „towing“ and „parallel driving“, may be maximum 250 mm when the ballast trailer guide is extended.
- ▶ The permissible level difference of the ballast trailer path and the crane travel path in relation to the crane travel path for circular driving may be no more than maximum 250 mm with the ballast trailer guide extended - based on a constant uphill incline or constant downhill incline on a 90° turning range.

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WARNING
Danger of fatal injury if the permissible travel speed is exceeded!
If the permissible travel speed is exceeded, the tires can be damaged.
Death, severe bodily injuries, property damage.
As a result, significant property damage can occur on the crane and on the ballast trailer.
▶ The travel speed of the ballast trailer for turning and driving with more than 80 % of the maximum ballast may be no more than 0.05 m/s or 0.18 km/h.

NOTICE
Damage to the ballast trailer, ballast trailer guide and / or the turntable!
If the ballast trailer inclination is too large or the level difference of the standing levels between the crane and ballast trailer are too large, this can cause damage to the ballast trailer, the ballast trailer guide and / or the turntable.
▶ Keep the ballast trailer inclination as small as possible.
▶ Do not exceed the maximum permissible level difference of the standing levels of 250 kg between the crane and the ballast trailer.

NOTICE
Danger of damage to the crane and the ballast trailer!
Due to steering movements on the crawler track during parallel travel, the crane and the ballast trailer can be significantly damaged.
▶ During parallel travel, steering the crawler travel gear is prohibited.
▶ For parallel travel, the side tire distortion on the wheel sets must be observed by an instructed person over the entire travel route of the crane. If the tires distort by more than 100 mm , then the position of the wheel sets must be corrected.

WARNING
Danger of accident when driving the crane with ballast trailer!
When driving the crane - this also applies for „circular travel“ - and the ballast trailer is raised due to ground unevenness, the force on test point 1 (F1-load display) increases immediately and the crane will be overloaded.
If the ballast trailer sinks while driving due to ground unevenness, the force on test point 1 (F1-load display) drops and the ballast trailer lifts off the ground, or the entire boom system is pulled backward. The crane can topple over.
Death, severe bodily injuries, property damage.
▶ The crane operator must constantly observe the displays on the LICCON monitor while driving the crawler crane.
▶ The crane operator must act anticipatorily. Already when an advance warning on test point 1 (F1-load display) occurs, the crane operator must act accordingly: By actuating the pull cylinders of the derrick ballast, correct the load / force on test point 1 (F1-load display) until it is in a permissible operating range. The permissible extension lengths of the pull cylinders must be observed.

Make sure that the following prerequisite is met:
– All specifications and notes in chapters 2.15 and 5.35 are observed and adhered to.

In principle the following must be observed:
– If the derrick ballast is raised due to external influences, then this leads to a relief of the guying between the derrick head and the derrick ballast (force on test point 4/5 drops). This leads to an increased load on the guying between the derrick head and the A-frame (force on test point 1 increases).
– If the derrick ballast loses contact with the ground due to external influences, then this leads to a higher load of the guying between the derrick head and the derrick ballast (force on test point 4/5 increases). This leads to a relief of the guying between the derrick head and the A-frame (force on test point 1 drops).

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7 Driving the crawler crane

WARNING
Danger of accident in inclined position!
When the slewing gear brake is released, the crane superstructure can turn uncontrolled to the side.
As a result the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ In an inclined position, crane operation or crawler operation with opened slewing gear is prohibited.
- ▶ In an inclined position, the slewing gear brake must be applied.

WARNING
The crane can topple over!
If the permissible incline of the crane is exceeded, the crane can topple over.
In impermissible inclines, the LICCON computer system does **not** turn the travel operation off.
The crane driver carries the sole responsibility for possible risks or dangers when working with impermissible inclines.
- ▶ Do not exceed the permissible incline from the load chart.
- ▶ Do not exceed the permissible incline for driving the crane.
- ▶ While driving the crane, monitor the displays for center of gravity, surface pressure and inclination on the LICCON monitor constantly.

WARNING
The crane can topple over!
If the crane is driving too fast, then the crane can topple over.
This applies especially if the crane is driven too fast with a load and / or derrick ballast.
Death, severe bodily injuries, property damage.
- ▶ Observe the permissible highest speeds for driving the crawler crane.
- ▶ For the travel speed, take the actual operating conditions also into account.
- ▶ The data for permissible highest speeds for driving the crawler crane is based on ideal conditions. When the conditions are not ideal, then the travel speed of the crane must be reduced accordingly.
- ▶ Driving with a load and / or derrick ballast in rapid gear is prohibited.
- ▶ Driving and steering the crawler at the same time with suspended load and / or installed derrick ballast is prohibited.

WARNING
Personnel in the danger zone!
People who remain in the danger zone are exposed to considerable danger.
Death, severe bodily injuries, property damage.
- ▶ An additional observer in radio contact with the crane operator must ensure that there are no persons or objects within the danger zone of the crane.
- ▶ The observer may not remain in the danger zone of the crane.

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7.1 Surface pressures and force distribution when driving the crane

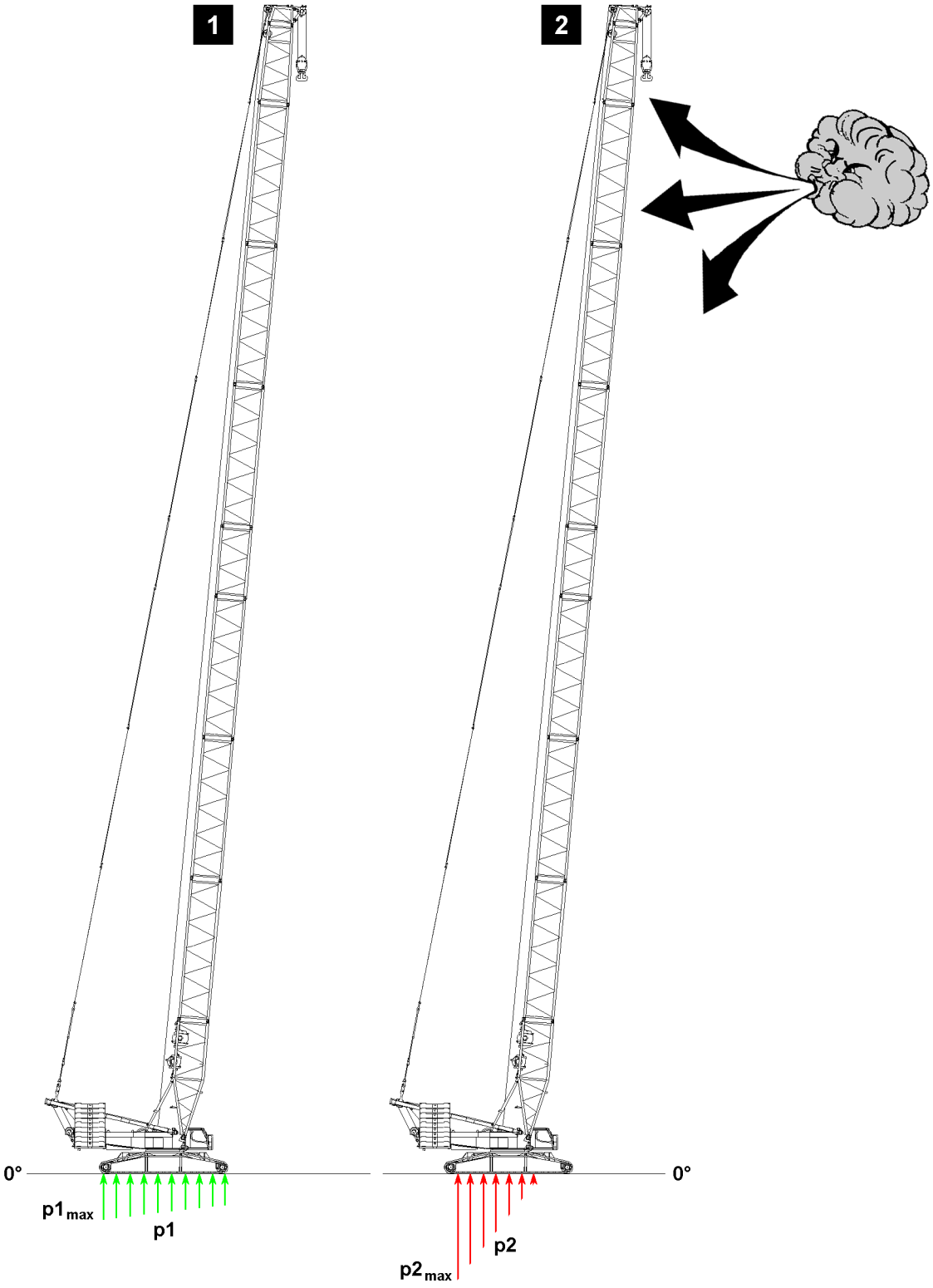

Fig.153644: $p2_{max}$ greater than $p1_{max}$

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WARNING
The crane can topple over!
When driving crawler cranes, surface pressures can significantly increase or change due to different factors.
This can cause the crane to topple over.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the ground has a sufficient load bearing capacity in the entire working range and / or over the entire travel route, to be able to safely absorb even increased surfaces pressures of the crane.
- ▶ Make sure that the center of gravity is always within the core area, see section „Prerequisites for crawler operation“ and LICCON job planner.

7.1.1 Surface pressures in case of wind load on the boom

WARNING
The crane can topple over!
When driving the crane with long boom lengths and / or when driving with large sized loads and / or at high wind speeds, the surface pressures can increase significantly.
This can cause the crane to topple over.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the entire travel route of the crane is sufficiently load bearing to be able to absorb even increase surface pressures - for example if „wind is coming front the front on the boom“.
- ▶ Change of surface pressures on the crawler travel gear under wind load, see the adjacent graphic.

Illustration 1:
- Surface pressures **p1** on the crawler travel gear without wind load.

Illustration 2:
- Surface pressures **p2** on the crawler travel gear in case of wind load from the front.

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7.1.2 Force distribution when driving on pressure distributor plates

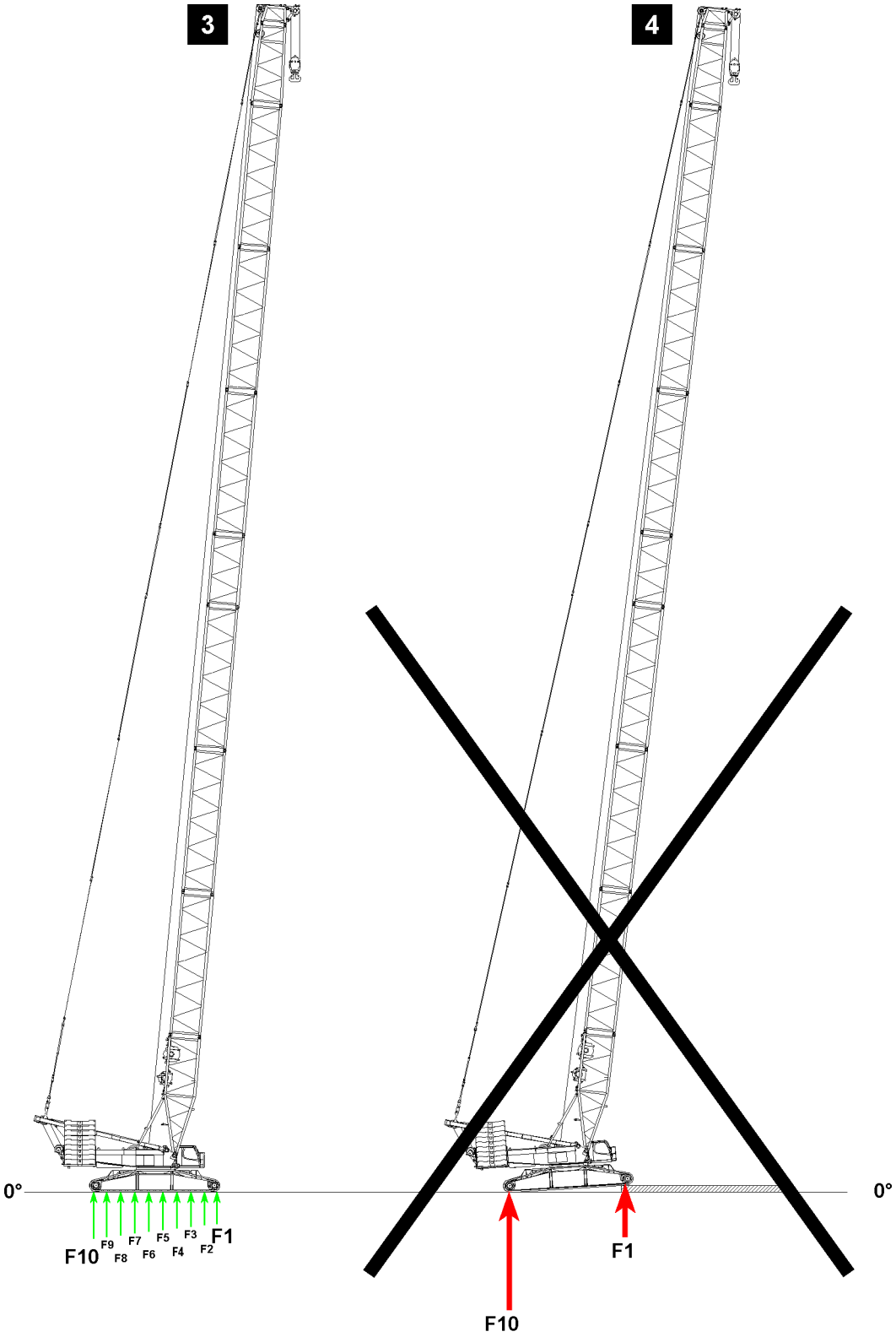

Fig.153645: Force distribution during normal operation // driving on pressure distributor plates

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WARNING
The crane can topple over!
When driving the crane on pressure distributor plates, a movement of forces occurs due to the reduction of the ground contact surfaces on the crawler travel gear. The forces concentrate at force **F1** and force **F10**, see illustration **4**.
This can cause the crane to topple over.
Death, severe bodily injuries, property damage.
▶ Make sure, before driving the crane on pressure distributor plates, that a load bearing transfer (height equalization) was established, see section „Calculation of required length of transfers“.
▶ Driving the crane on pressure distributor plates without transfer (height equalization) is prohibited.

Illustration 3:
– Force distribution on crawler travel gear of the crane (normal operation)
  • Without wind influence

Illustration 4:
– Not permissible

Make sure that the following prerequisites are met:
– The crane is ready to drive.
– The crane engine is running.
– The set up configuration of the crane has been entered correctly in the LICCON computer system.
– The displays for inclination, surface pressure and center of gravity are shown.
– There are no persons or objects in the danger zone.

7.2 Operating elements for the crawler operation

7.2.1 Pedal carrier

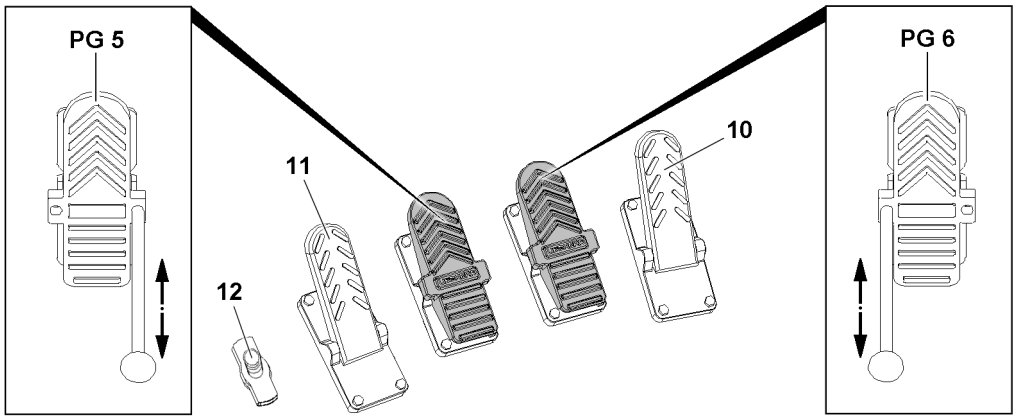

Fig.153791: Pedal carrier

– **10** Pedal for engine regulation
– **11** Slewing gear brake pedal
– **12** Foot button for freewheeling slewing gear
  • **Note**: The foot button for freewheeling slewing gear **12** is only available on certain crane types.
– **PG5** Foot rocker (pedal sensor 5)
– **PG6** Foot rocker (pedal sensor 6)

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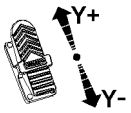
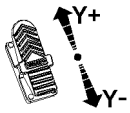
Crawler operating mode	Pedal carrier	
	 *Foot rocker **PG5***	 *Foot rocker **PG6***
Normal travel	Left crawler forward / backward: **PG5** direction **Y+ / Y-**	Right crawler forward / backward: **PG6** direction **Y+ / Y-**
Parallel travel	Steer both crawlers[1]: **PG5** direction **Y+ / Y-**	Forward / backward both crawlers: **PG6** direction **Y+ / Y-**

1) Only for crane types with steering function with parallel travel engaged.

Engine regulation

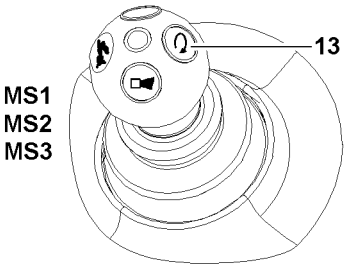


Fig.153792: Master switch (MS1, MS2, MS3)

The rpm of the crane engine is controlled with the engine regulation pedal **10**. For crawler operation, a certain rpm can be locked in, see chapter 4.05.

▶ Lock the current rpm of the crane engine: Press the button **13** on master switch **MS1** or master switch **MS2**.

Result:

– A „+“ appears on the LICCON monitor behind the rpm display.
– The current rpm of the crane engine is locked.
– The rpm can be increased further via the engine regulation pedal **10**.

▶ Release the rpm lock: Press the button **13** on master switch **MS1** or master switch **MS2** again.

Result:

– The „+“ behind the rpm display turns off.

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7.2.2 Slewing gear brake on touch display 2 (TE2)

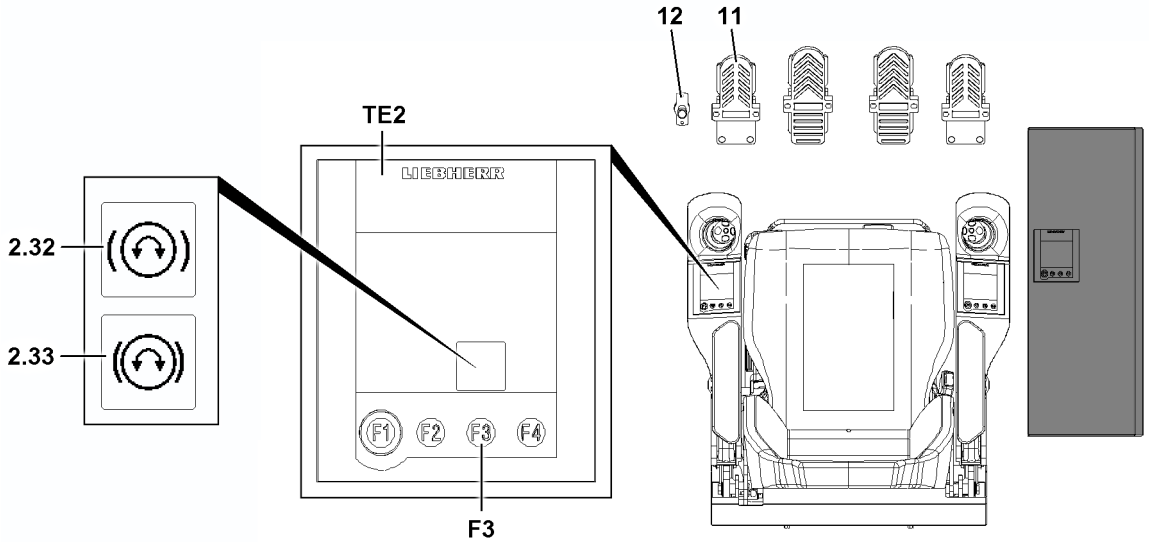

Fig.153793: Slewing gear brake in TE2

Slewing gear brake operating elements:
- **11** Slewing gear brake pedal
- **12** Foot button for freewheeling slewing gear
- Key **F3**: Slewing gear brake in TE2 (parking brake)

▶ Regulate the slewing gear brake steplessly: Press down the slewing gear brake pedal **11**.

Result:

– The slewing gear brake is regulated according to the pedal position: The further the pedal is pressed down, the stronger the slewing gear brake brakes.

▶ Switch on slewing gear freewheeling: Actuate the foot button for freewheeling the slewing gear **12**.

Result:

– Freewheeling the slewing gear is engaged as long as the foot button for freewheeling the slewing gear **12** is pressed down.

Touch display 2 **TE2**		
Position	**Icon**	**Description of the function**
2.32		Nominal status slewing gear brake released, icon remains even when the slewing gear brake is applied with the slewing gear brake pedal **11**.
2.33		Nominal status slewing gear applied, icon remains even when the slewing gear brake is automatically released by the control.

▶ Apply the slewing gear brake (parking brake): Press the button **F3** on touch display 2 **TE2**.

Result:

– The „Slewing gear brake applied“ icon appears.

▶ Release the slewing gear brake (parking brake): Press the button **F3** on touch display 2 **TE2** again.

Result:

– The „slewing gear brake released“ icon appears.

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7.2.3 Crawler operating mode icons on touch display 3 (TE3)

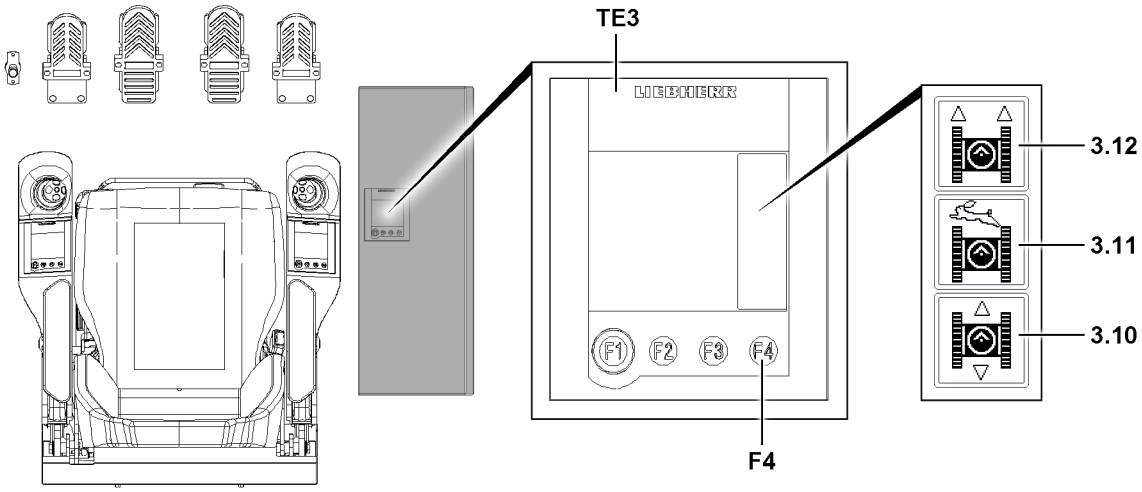

Fig.153794: Crawler operation modes in TE3

Touch display 3 **TE3**		
Position	**Icon**	**Description of the function**
3.10		Normal travel crawler operation turned off
		Normal travel crawler operation preselected
		Normal travel crawler operation engaged, icon blinks
3.11		Rapid gear crawler operation turned off
		Rapid gear crawler operation preselected
		Rapid gear crawler operation engaged, icon blinks

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Touch display 3 **TE3**		
Position	**Icon**	**Description of the function**
3.12		Parallel travel crawler operation turned off
		Parallel travel crawler operation preselected
		Parallel travel crawler operation engaged, icon blinks

7.3 Assignment of the crane superstructure to the travel direction

The travel direction of the crane is continuously assigned to the position of the crane superstructure.

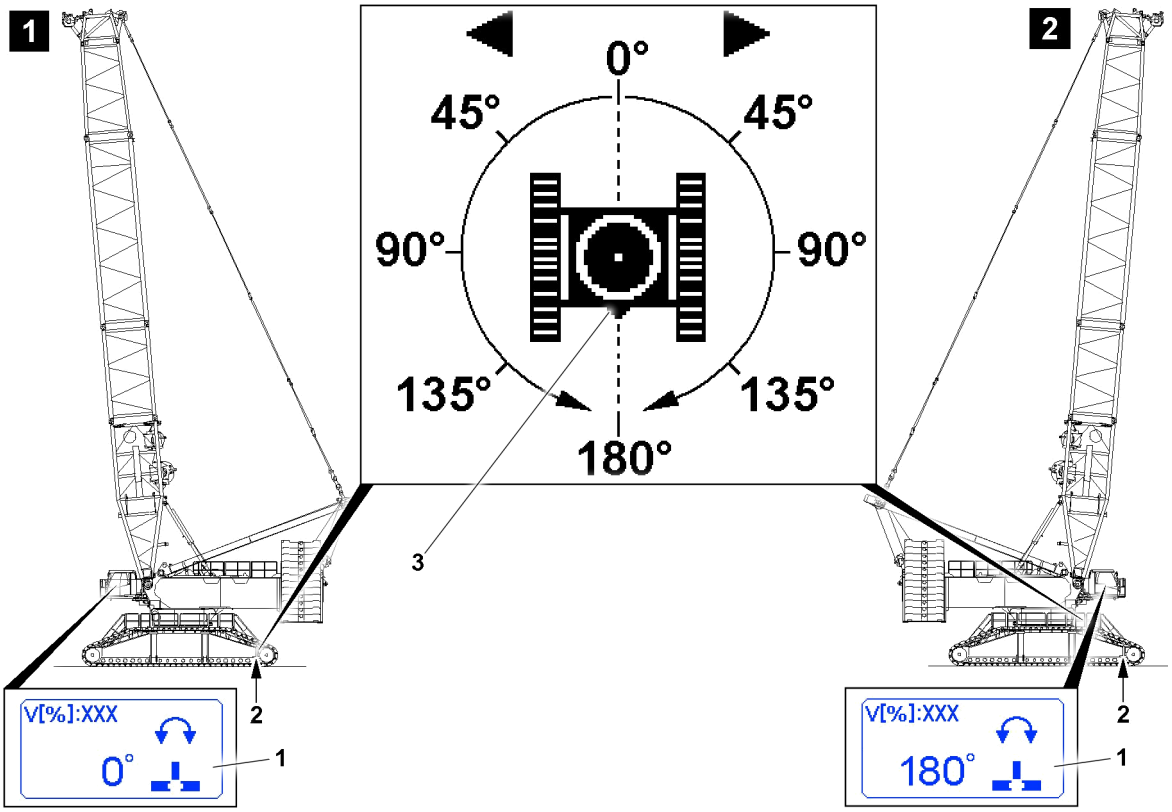

Fig.153795: Assignment of the crane superstructure to the travel direction

The position of the crane superstructure with respect to the crawler travel gear can be read with one glance on the slewing range icon **1**:

- With display value 0° in the slewing range icon **1** the crane superstructure is exactly in position „to the rear“, see illustration **1**.
- With display value 180° in the slewing range icon **1** the crane superstructure is exactly in position „to the front“, see illustration **2**.
  Note: The front on the crawler travel gear is always on the side where the chain tension device **2** for the crawler carriers is located. In the LICCON view of the crawler travel gear, the front side is marked by a directional triangle **3**.

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– With display value 0° in the slewing range icon **1** the crane superstructure is exactly in position „to the rear“.
– The apex for the assignment of the crane superstructure is at display value 90° in the slewing range icon **1**. At display values from 0° to 90° the crane superstructure is positioned „to the rear“. At display values from 90° to 180° the crane superstructure is positioned „to the front“.
– If the crane superstructure is swung over / under the display value 90° in the slewing range icon **1**, then the running direction of the crawler carriers changes to actuation direction of the foot rockers. The change happens only when the foot rockers are in position 0 (not actuated).
– If the crane superstructure is swung while driving over / under the display value 90° in the slewing range icon **1**, then the running direction of the crawler carriers and therefore the travel direction remains until the respective foot rocker is „returned“ to the zero position.
The new assignment of the travel direction becomes only active after the foot rockers are next time in position 0 (not actuated).

WARNING
Change of travel direction after turning the crane superstructure!
If the crane superstructure is swung while driving over / under the display value 90° in the slewing range icon **1**, then the running direction of the crawler carriers only remains until the respective foot rocker is „returned“ to the zero position. If the foot rocker is actuated again in the same direction, the crane is driven in the opposite direction.
▶ When performing turning movements of the crane superstructure in connection with driving the crane, pay attention to the assignment of the crane superstructure to the travel direction.
▶ After turning the crane superstructure, check the travel route in both directions for persons and obstacles. Initiate travel movements with utmost caution.

7.4 Turning crawler operating modes on / off

The crawler crane can be driven with various crawler operating modes:
– Normal crawler operation:
  • Classic crawler operation, each crawler is controlled via a separate foot pedal.
– Parallel travel crawler operation:
  • The steering movement is controlled by a separate foot pedal.
  • The travel direction is controlled by a separate foot pedal.

To obtain a higher travel speed, the rapid gear can be activated.

7.4.1 Selecting the function on the touch display TE3

Select a function on the touch display **TE3**, in the example „Crawler parallel operation“.

Fig.119615: Selecting the function on the touch display TE3

▶ „Parallel travel crawler operation“ example: Select parallel travel crawler operation by touching the icon **3.12** on the touch display 3 **TE3**, see illustration **1**.

Result:

– The „parallel travel crawler operation“ icon is bordered all over.
– Parallel travel crawler operation is preselected.

▶ Press the button **F4** on touch display 3 **TE3**, see illustration **2**.

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Result:

– The „Crawler parallel operation“ icon blinks.
– Parallel operation is activated.

7.4.2 Turn normal travel crawler operation on / off

Normal travel crawler operation is the prerequisite to drive the crane and must generally be activated.

Turn normal travel crawler operation on:

▶ Select normal travel crawler operation by touching the icon **3.10** on the touch display 3 **TE3**.

Result:

– The icon **3.10** is bordered all over.
– Normal travel crawler operation is preselected.

▶ Press the button **F4** on touch display 3 **TE3**.

Result:

– The icon **3.10** blinks.
– Normal travel crawler operation is activated.

Turn normal travel crawler operation off:

▶ Press the button **F4** on touch display 3 **TE3**.

Result:

– The icon **3.10** no longer blinks.
– Normal travel crawler operation is turned off.

▶ Deselect normal travel crawler operation by touching the icon **3.10** on the touch display 3 **TE3**.

Result:

– The border around the icon **3.10** disappears.
– Preselection of normal travel crawler operation is cancelled.

7.4.3 Turning parallel travel crawler operation on / off

Make sure that the following prerequisites are met:
– Normal travel crawler operation is activated.
– The crawlers are at a standstill.

Turn parallel travel crawler operation on:

▶ Select parallel travel crawler operation by touching the icon **3.12** on the touch display 3 **TE3**.

Result:

– The icon **3.12** is bordered all over.
– Parallel travel crawler operation is preselected.

▶ Press the button **F4** on touch display 3 **TE3**.

Result:

– The icon **3.12** blinks.
– Parallel travel crawler operation is activated.

Turn parallel travel crawler operation off:

▶ Press the button **F4** on touch display 3 **TE3**.

Result:

– The icon **3.12** no longer blinks.
– Parallel travel crawler operation is turned off.

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▶ Deselect parallel travel crawler operation by touching the icon **3.12** on the touch display 3 **TE3**.

Result:

– The border around the icon **3.12** disappears.
– Preselection of parallel travel crawler operation is cancelled.

7.4.4 Turning rapid gear crawler operation on / off

WARNING
Travel speed too high!
If the travel speed is too high, the crane can topple over.
Death, severe bodily injuries, property damage.
▶ Driving with a load or derrick ballast in rapid gear crawler operation is prohibited.
▶ Observe the permissible highest speeds for driving the crawler crane.

Make sure that the following prerequisite is met:
– Normal travel crawler operation is activated.
or
– Parallel travel crawler operation is activated.

Turn rapid gear crawler operation on:

▶ Select rapid gear crawler operation by touching the icon **3.11** on the touch display 3 **TE3**.

Result:

– The icon **3.12** is bordered all over.
– Rapid gear crawler operation is preselected.

▶ Press the button **F4** on touch display 3 **TE3**.

Result:

– The icon **3.11** blinks.
– Rapid gear crawler operation is activated.

Turn rapid gear crawler operation off:

▶ Press the button **F4** on touch display 3 **TE3**.

Result:

– The icon **3.11** no longer blinks.
– Rapid gear crawler operation is turned off.

▶ Deselect rapid gear crawler operation by touching the icon **3.12** on the touch display 3 **TE3**.

Result:

– The border around the icon **3.11** disappears.
– Preselection of rapid gear crawler operation is cancelled.

7.5 Driving the crawler crane in normal travel

NOTICE
Increased wear on the crawler travel gear!
When steering in small radii, high friction forces are created that lead to increased wear.
▶ If possible, always drive in curves with large radii.
▶ Avoid turning over a stationary track, if possible.
▶ Avoid turning on the spot, if possible.

Make sure that the following prerequisites are met:
– A travel direction change may only be done when at a standstill.
– The desired rpm of the crane engine is set.
– Normal travel crawler operation is selected, the icon **310** blinks.

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Note
Special hand levers can be attached on the foot rockers. The hand levers are used for delicate driving maneuvers.
The hand levers are stored in a transport retainer in the crane cab.
The technical design of the hand lever **1-A** and the hand lever **1-B** is completely identical. The differentiation of the two hand levers refers only in their assignment to the corresponding foot rockers in the assembled (connected) condition.
▶ Use the hand levers to control the crane especially sensitively.

7.5.1 Driving forward

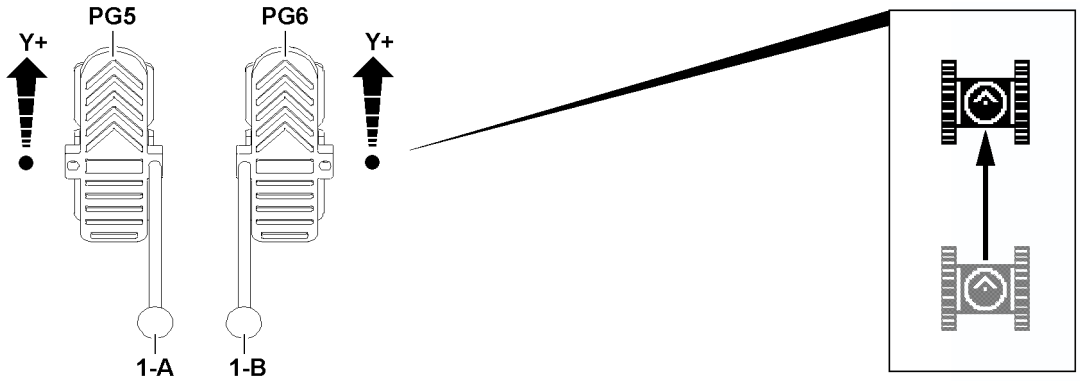

Fig.153796: Driving forward

▶ Deflect the left foot rocker **PG5** and the right foot rocker **PG6** synchronously to the front (direction **Y+**).

Result:

– The crane drives forward.

7.5.2 Driving in reverse

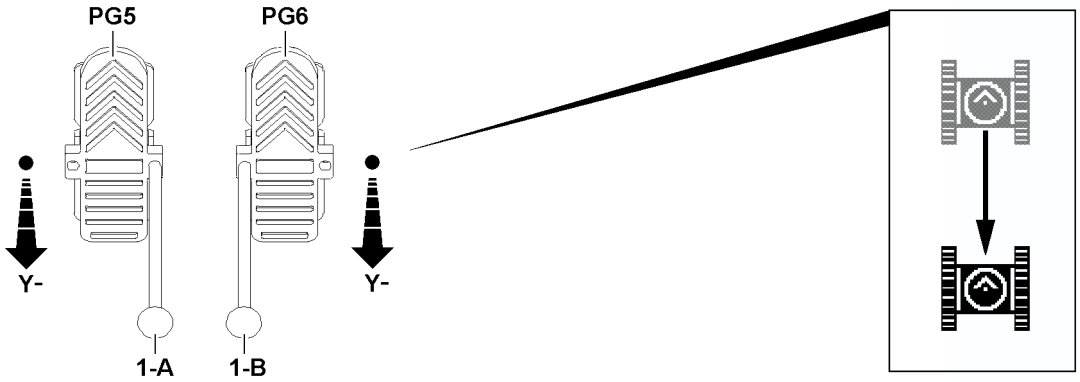

Fig.153797: Driving in reverse

▶ Deflect the left foot rocker **PG5** and the right foot rocker **PG6** synchronously to the rear (direction **Y-**).

Result:

– The crane drives backward.

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7.5.3 Driving in curves forward to the left

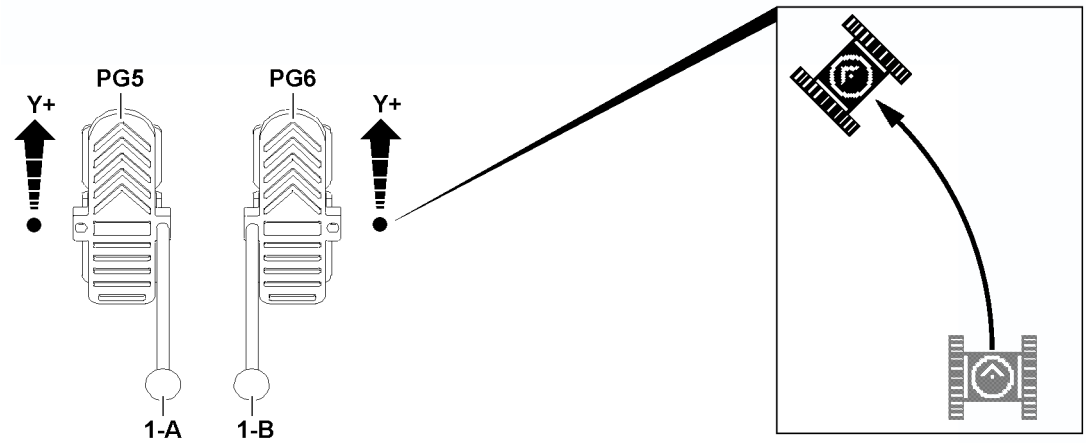

Fig.153798: Driving in curves forward to the left

▶ Actuate the left foot rocker **PG5** reduced to the front (direction **Y+**) and the right foot rocker **PG6** stronger to the front (direction **Y+**).

Result:

– The crane drives a forward curve to the left.

7.5.4 Driving in curves forward to the right

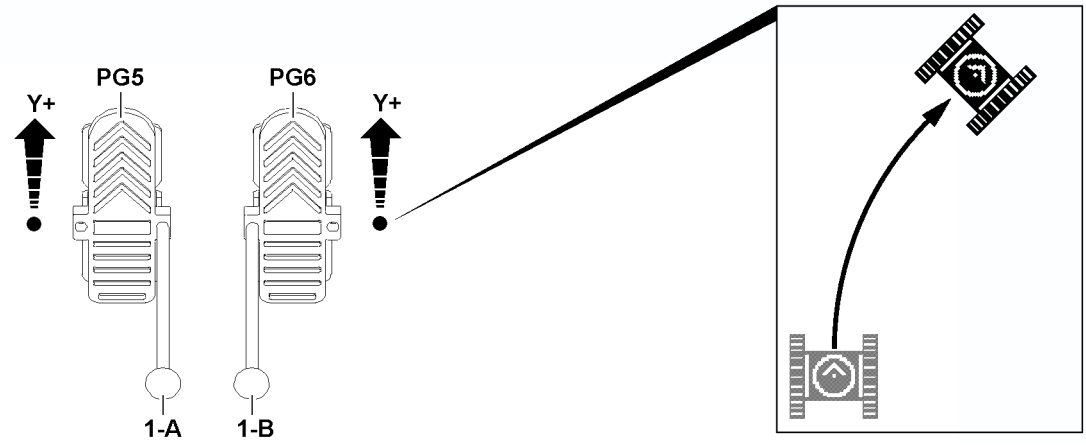

Fig.153799: Driving in curves forward to the right

▶ Actuate the left foot rocker **PG5** stronger to the front (direction **Y+**) and the right foot rocker **PG6** reduced to the front (direction **Y+**).

Result:

– The crane drives a forward curve to the right.

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7.5.5 Driving in curves in reverse to the left

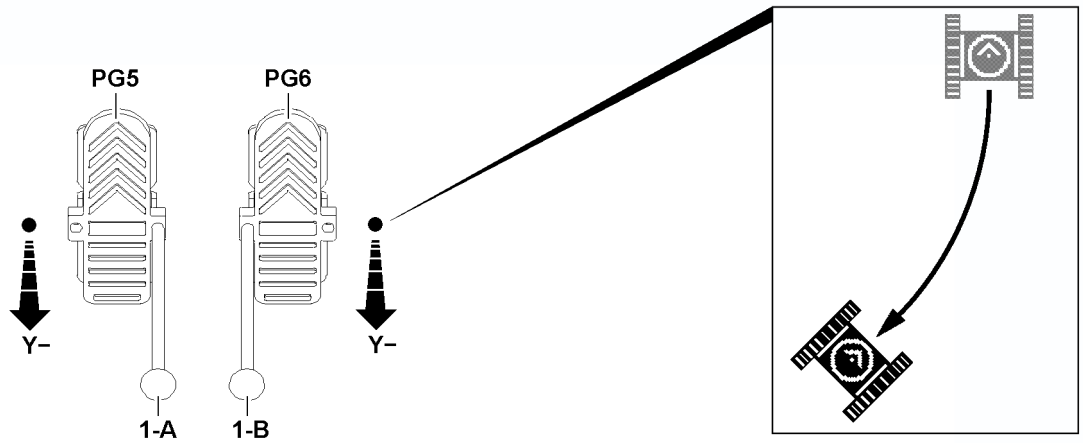

Fig.153800: Driving in curves in reverse to the left

▶ Actuate the left foot rocker **PG5** reduced to the rear (direction **Y-**) and the right foot rocker **PG6** stronger to the rear (direction **Y-**).

Result:

– The crane drives a reverse curve to the left.

7.5.6 Driving in curves in reverse to the right

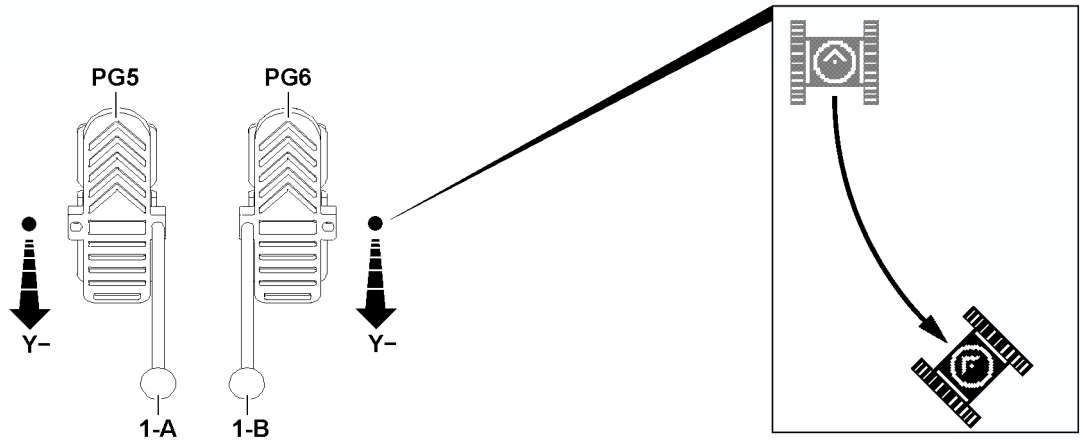

Fig.153801: Driving in curves in reverse to the right

▶ Actuate the left foot rocker **PG5** stronger to the rear (direction **Y-**) and the right foot rocker **PG6** reduced to the rear (direction **Y-**).

Result:

– The crane drives a reverse curve to the right.

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7.5.7 Turning forward to the left

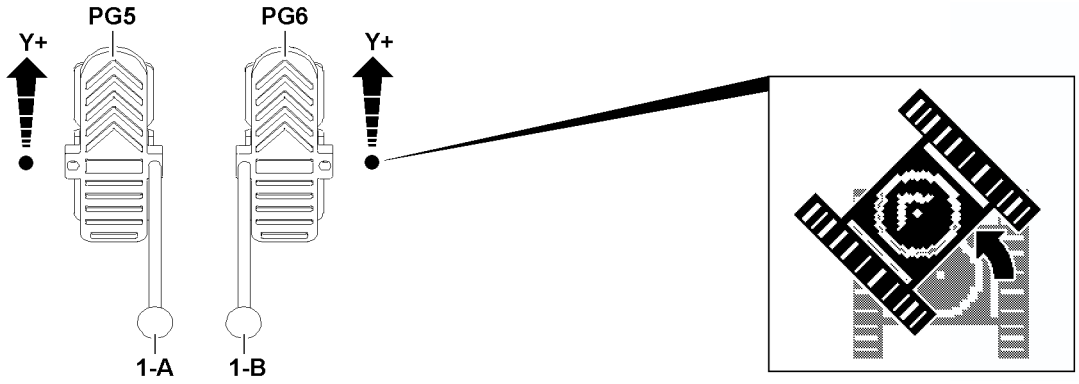

Fig.153802: Turning forward to the left

▶ Actuate the right foot rocker **PG6** forward (direction **Y+**).

Result:

– The crane is turned forward to the left.

7.5.8 Turning forward to the right

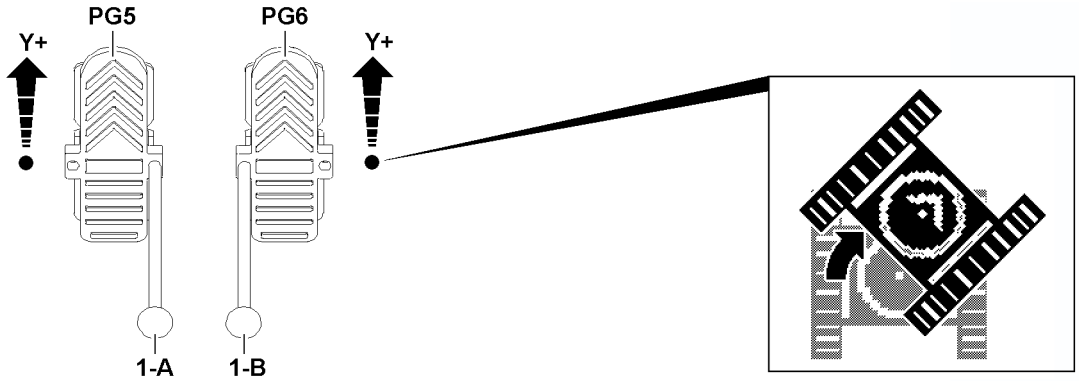

Fig.153803: Turning forward to the right

▶ Actuate the left foot rocker **PG5** forward (direction **Y+**).

Result:

– The crane is turned forward to the right.

7.5.9 Turning backward to the left

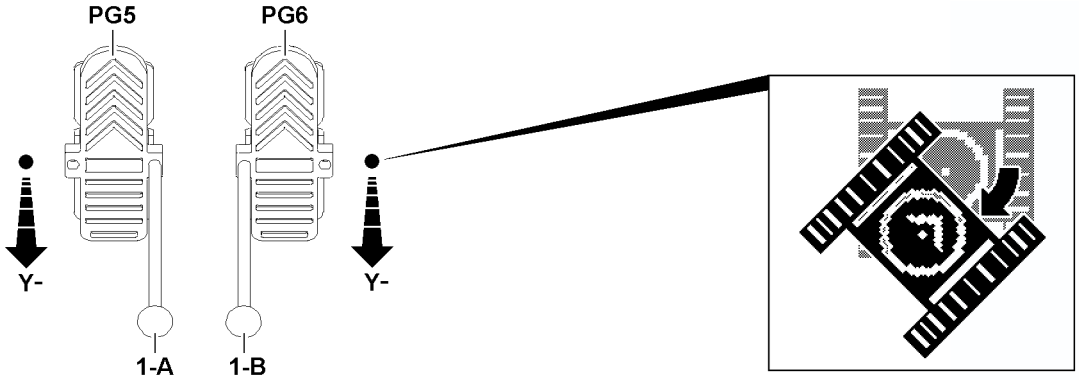

Fig.153804: Turning backward to the left

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▶ Actuate the right foot rocker **PG6** backward (direction **Y-**).

Result:

– The crane is turned backward to the left.

7.5.10 Turning backward to the right

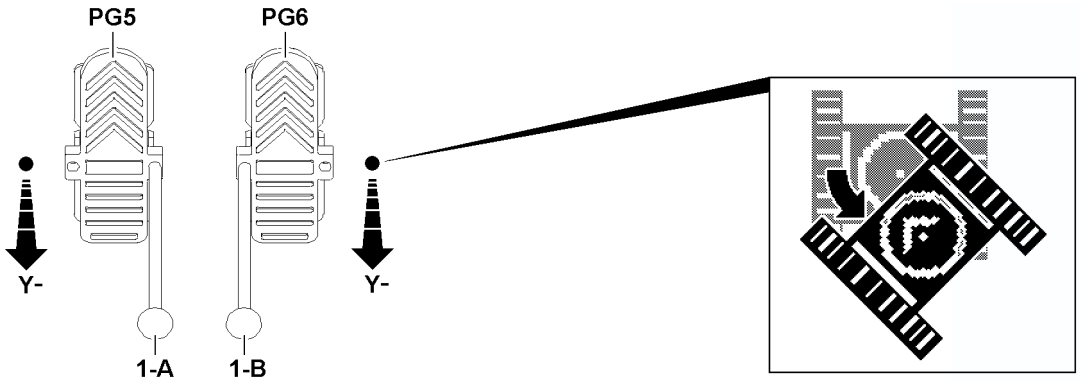

Fig.153805: Turning backward to the right

▶ Actuate the left foot rocker **PG5** backward (direction **Y-**).

Result:

– The crane is turned backward to the right.

7.5.11 Turning on the spot to the left (counterclockwise direction)

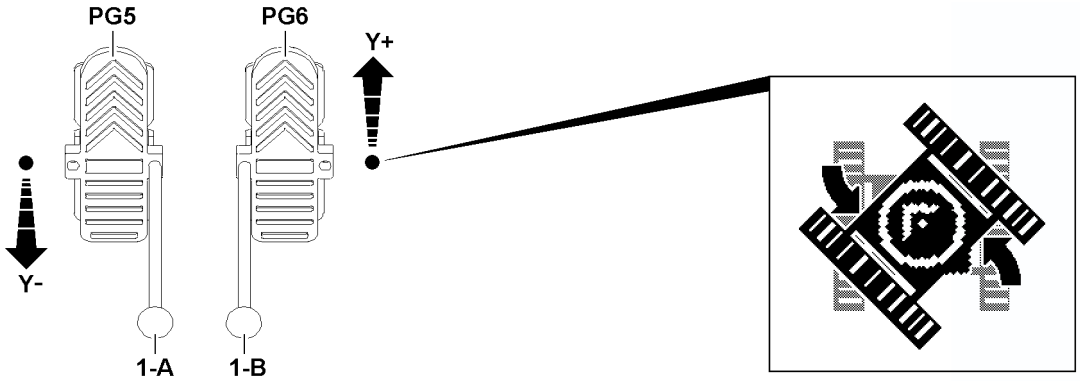

Fig.153806: Turning on the spot to the left (counterclockwise direction)

▶ Actuate the left foot rocker **PG5** to the rear (direction **Y-**) and the right foot rocker **PG6** to the front (direction **Y+**).

Result:

– The crane is turned to the left.

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7.5.12 Turning on the spot to the right (clockwise)

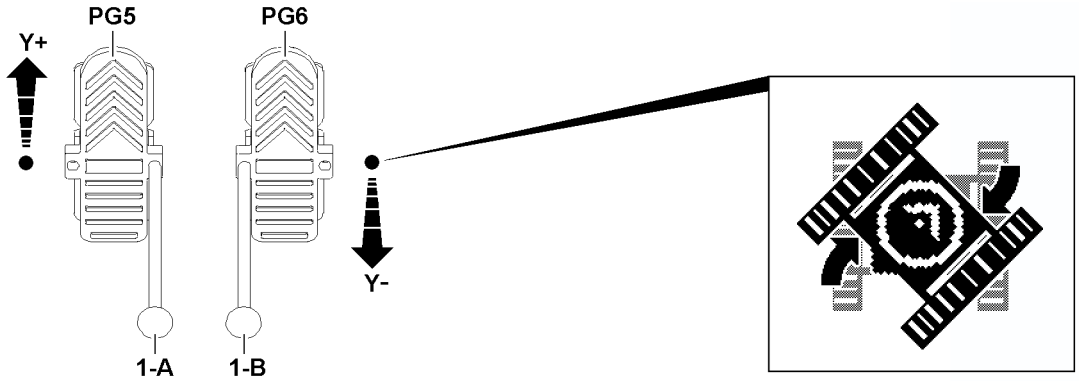

Fig.153807: Turning on the spot to the right (clockwise)

▶ Actuate the left foot rocker **PG5** to the front (direction **Y+**) and the right foot rocker **PG6** to the rear (direction **Y-**).

Result:

– The crane is turned to the right.

7.6 Driving the crawler crane in parallel travel

NOTICE
Increased wear on the crawler travel gear!
When steering in small radii, high friction forces are created that lead to increased wear.
▶ If possible, always drive in curves with large radii.
▶ Avoid turning over a stationary track, if possible.

Make sure that the following prerequisites are met:
– The desired rpm of the crane engine is set.
– Parallel travel crawler operation is selected, icon **310** and icon **312** blink.

Note
▶ Special hand levers **1-A** and hand levers **1-B** can be inserted into the foot rockers. These hand levers **1-A** and hand levers **1-B** are used for delicate driving maneuvers. The operation is identical to that for the foot rockers.
▶ Hand lever **1-A** and hand lever **1-B** are placed in the transport retainer on the left of the crane operator's seat.
▶ The technical design of the hand lever **1-A** and the hand lever **1-B** is completely identical. The differentiation of the two hand levers refers only in their assignment to the corresponding foot rockers in the assembled (connected) condition.

Turning the crawler travel gear on the spot is not possible in parallel travel.

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7.6.1 Driving forward

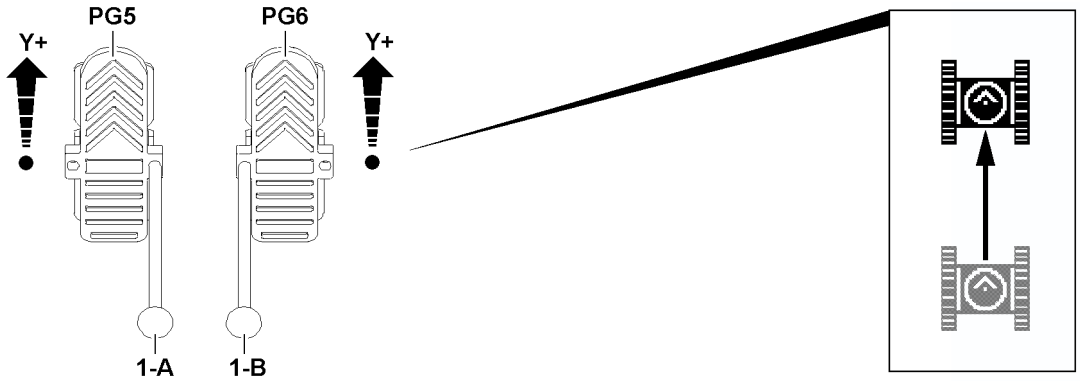

Fig.153796

▶ Deflect the right foot rocker **PG6** forward (direction **Y+**).

Result:

– The crane drives forward.

Note
▶ The further the foot rockers are actuated forward (direction **Y+**) the higher the speed.

7.6.2 Driving in reverse

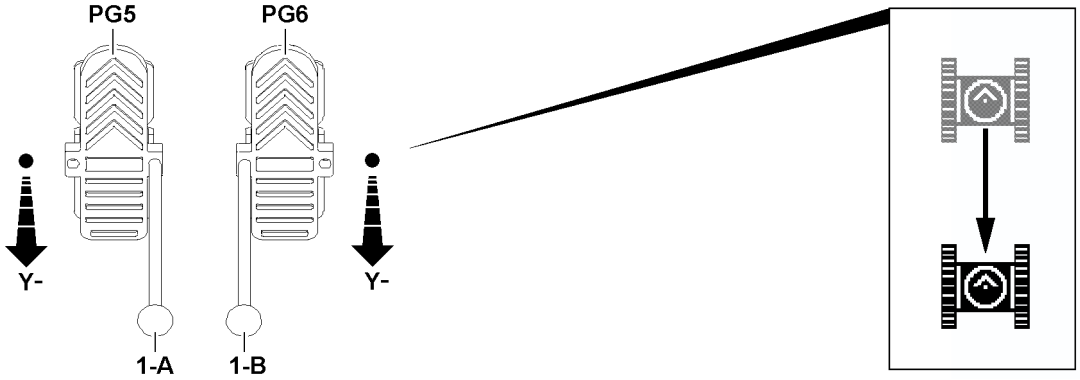

Fig.153797

▶ Deflect the right foot rocker **PG6** backward (direction **Y-**).

Result:

– The crane drives backward.

Note
▶ The further the foot rockers are actuated forward (direction **Y+**) the higher the speed.

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7.6.3 Driving in curves forward to the left

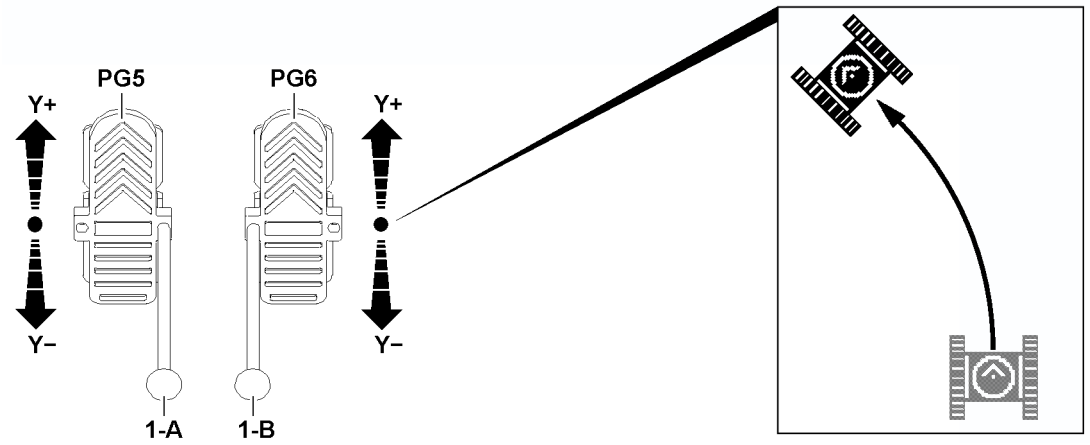

Fig.153810: Driving in curves forward to the left

▶ Actuate the left foot rocker **PG5** reduced to the rear (direction **Y-**) and the right foot rocker **PG6** to the front (direction **Y+**).

Result:

– The crane drives a forward curve to the left.

Note

▶ The further the right foot rocker **PG6** is actuated forward (direction **Y+**) the higher the speed of driving a curve.

▶ If the left foot rocker **PG5** is pushed fully to the rear (direction **Y-**), the left crawler stops.

7.6.4 Driving in curves forward to the right

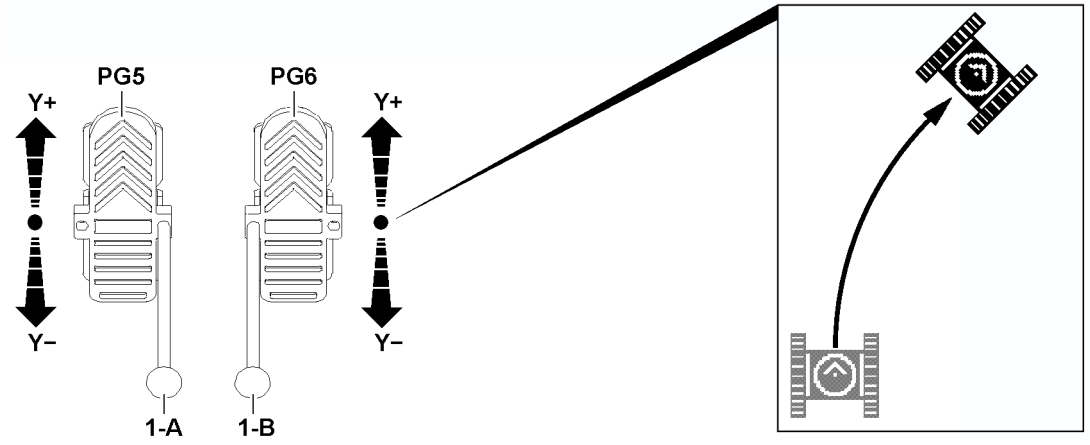

Fig.153811: Driving in curves forward to the right

▶ Actuate the left foot rocker **PG5** reduced to the front (direction **Y+**) and the right foot rocker **PG6** to the front (direction **Y+**).

Result:

– The crane drives a forward curve to the right.

Note

▶ The further the right foot rocker **PG6** is actuated forward (direction **Y+**) the higher the speed of driving a curve.

▶ If the left foot rocker **PG5** is pushed fully to the front (direction **Y+**), the right crawler stops.

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7.6.5 Driving in curves in reverse to the left

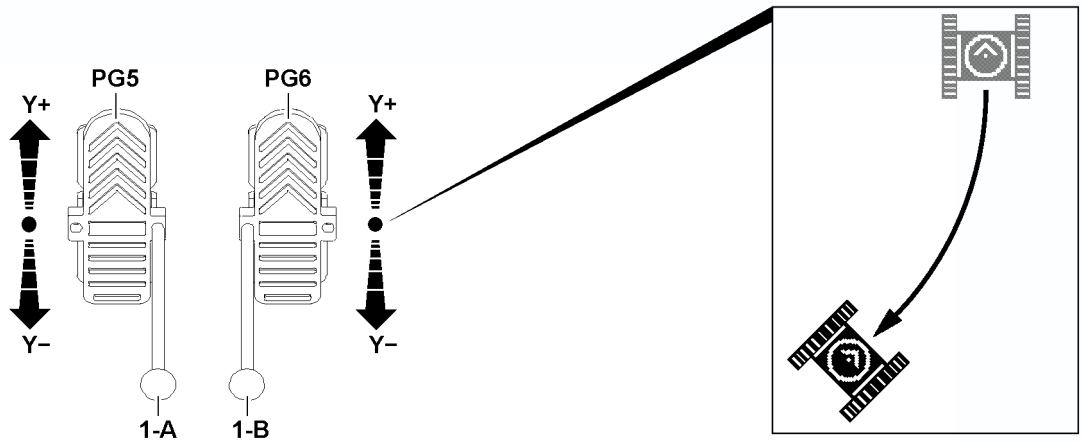

Fig.153812: Driving in curves in reverse to the left

▶ Actuate the left foot rocker **PG5** reduced to the rear (direction **Y-**) and the right foot rocker **PG6** to the rear (direction **Y-**).

Result:

– The crane drives a reverse curve to the left.

Note

▶ The further the right foot rocker **PG6** is actuated backward (direction **Y-**) the higher the speed of driving a curve.

▶ If the left foot rocker **PG5** is pushed fully to the rear (direction **Y-**), the left crawler stops.

7.6.6 Driving in curves in reverse to the right

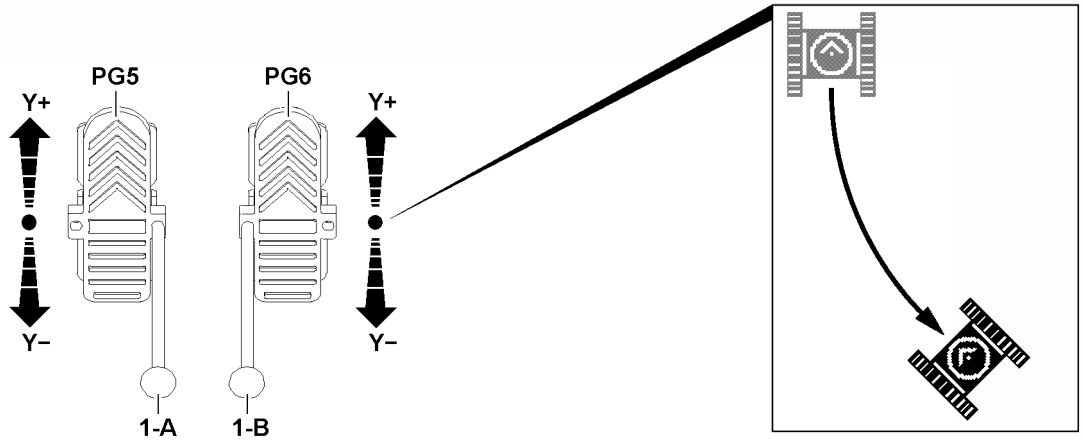

Fig.153813: Driving in curves in reverse to the right

▶ Actuate the left foot rocker **PG5** reduced to the front (direction **Y+**) and the right foot rocker **PG6** to the rear (direction **Y-**).

Result:

– The crane drives a reverse curve to the right.

Note

▶ The further the right foot rocker **PG6** is actuated backward (direction **Y-**) the higher the speed of driving a curve.

▶ If the left foot rocker **PG5** is pushed fully to the front (direction **Y+**), the right crawler stops.

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7.6.7 Turning forward to the left

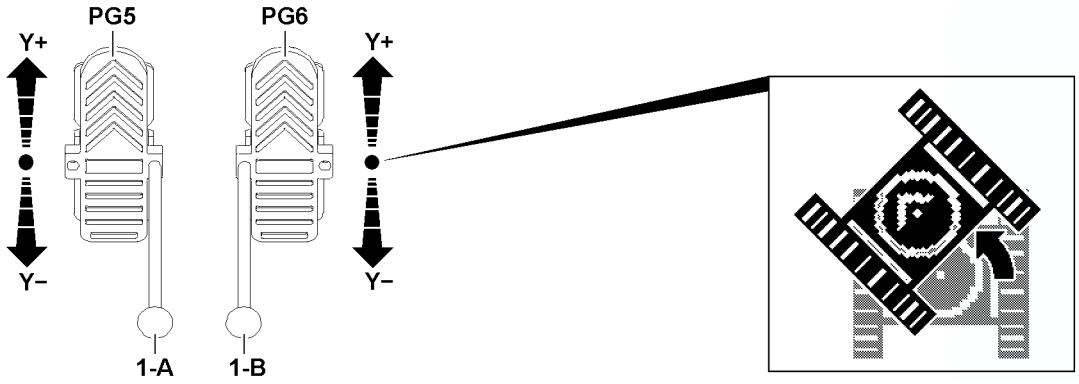

Fig.153814: Turning forward to the left

- ▶ Push through and hold the left foot rocker **PG5** fully to the rear (direction **Y-**).
- ▶ Actuate the right foot rocker **PG6** forward (direction **Y+**).

Result:

– The crane is turned forward to the left.

Note

- ▶ The further the right foot rocker **PG6** is actuated forward (direction **Y+**) the higher the speed of the turning movement.

7.6.8 Turning forward to the right

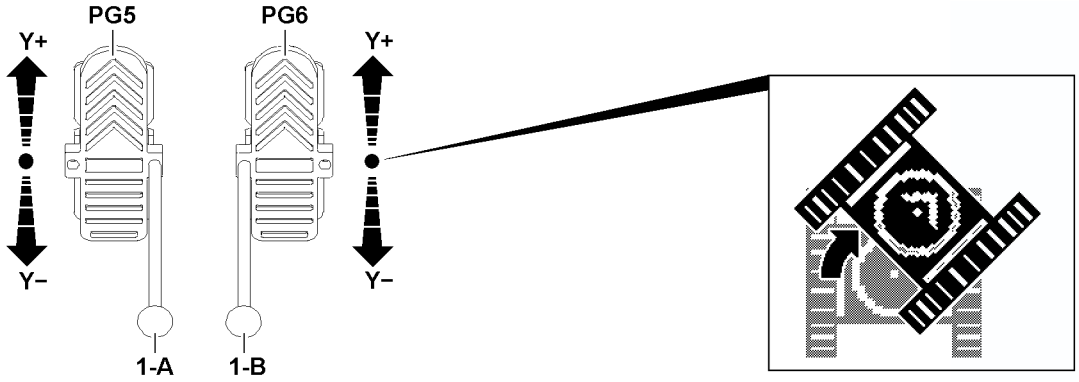

Fig.153815: Turning forward to the right

- ▶ Push through and hold the left foot rocker **PG5** fully to the front (direction **Y+**).
- ▶ Actuate the right foot rocker **PG6** forward (direction **Y+**).

Result:

– The crane is turned forward to the right.

Note

- ▶ The further the right foot rocker **PG6** is actuated forward (direction **Y+**) the higher the speed of the turning movement.

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7.6.9 Turning backward to the left

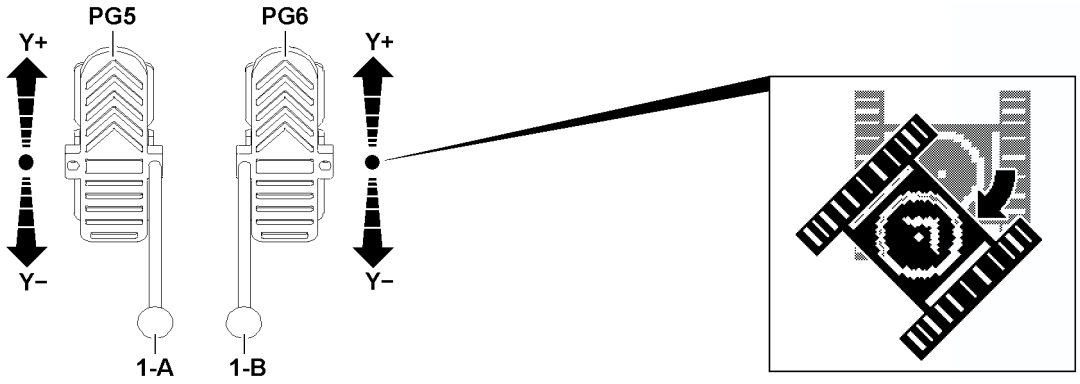

Fig.153816: Turning backward to the left

- ▶ Push through and hold the left foot rocker **PG5** fully to the rear (direction **Y-**).
- ▶ Actuate the right foot rocker **PG6** backward (direction **Y-**).

Result:

– The crane is turned backward to the left.

Note

- ▶ The further the right foot rocker **PG6** is actuated backward (direction **Y-**) the higher the speed of the turning movement.

7.6.10 Turning backward to the right

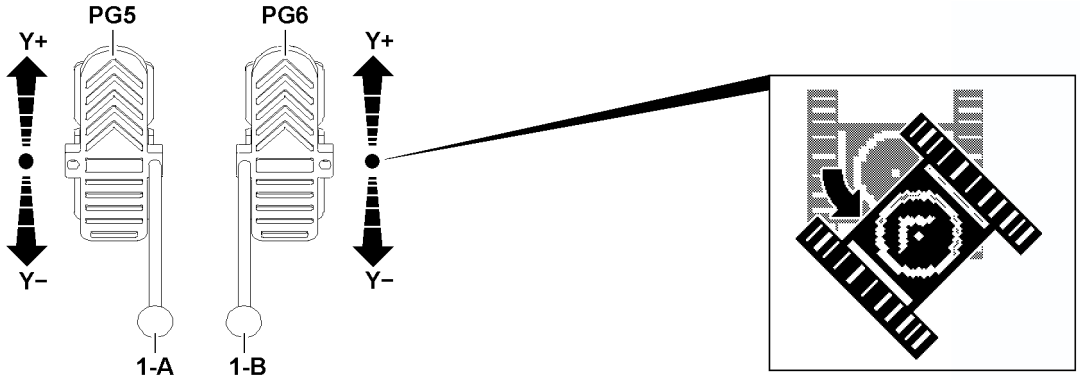

Fig.153817: Turning backward to the right

- ▶ Push through and hold the left foot rocker **PG5** fully to the front (direction **Y+**).
- ▶ Actuate the right foot rocker **PG6** backward (direction **Y-**).

Result:

– The crane is turned backward to the right.

Note

- ▶ The further the right foot rocker **PG6** is actuated backward (direction **Y-**) the higher the speed of the turning movement.

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4.20 Procedure for shut-off of crane movement

1	General	3
2	Instructions for resuming crane movement	17

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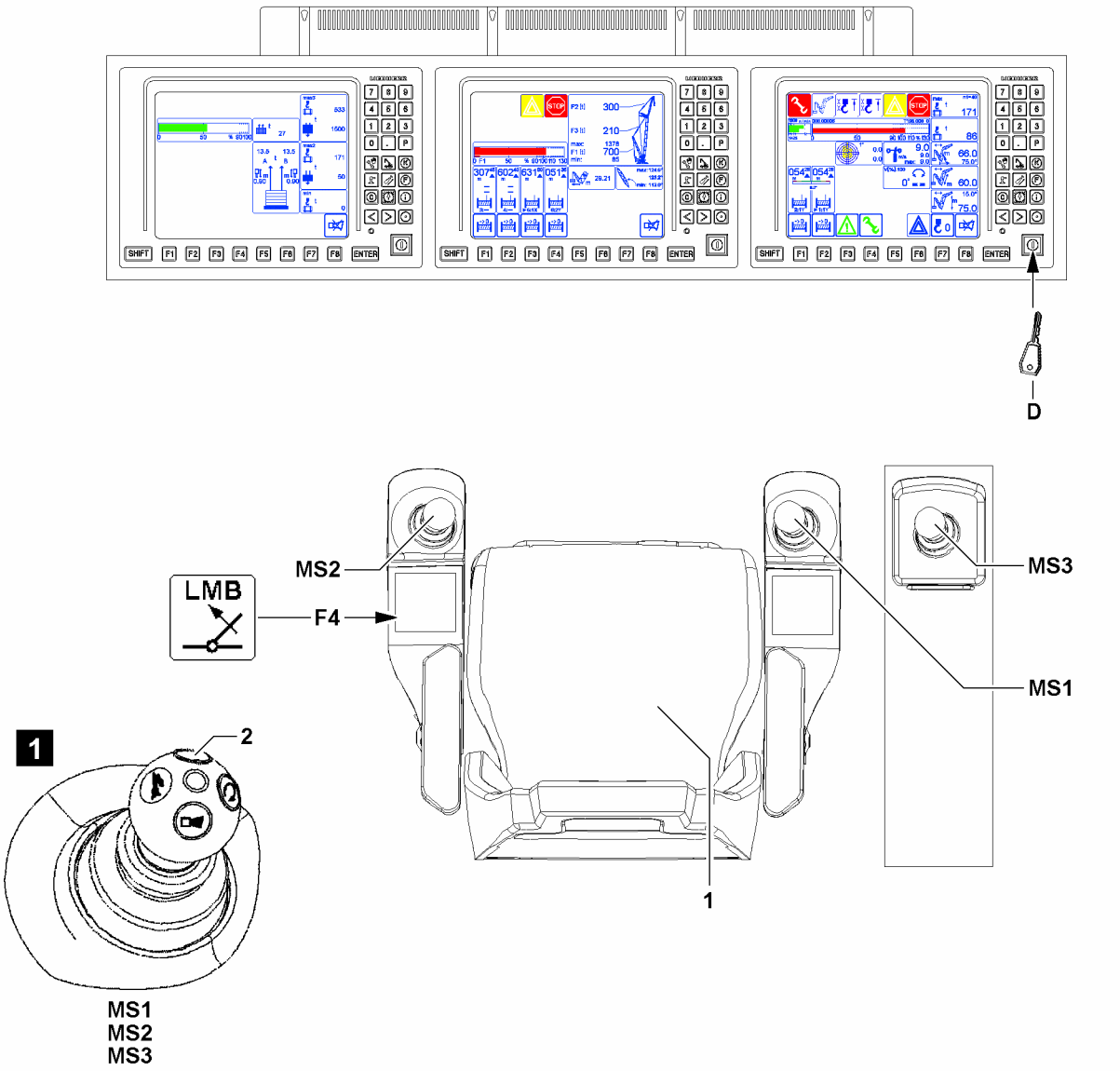

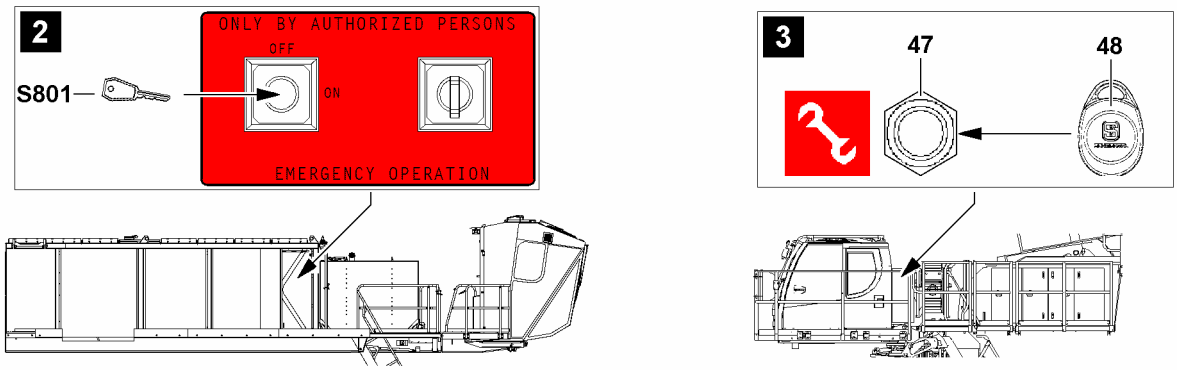

Fig.144109

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1 General

Note
- ▶ The monitor illustrations in this chapter are only examples.
- ▶ The numerical values in the individual icons and charts do not have to necessarily match the crane exactly.
- ▶ Numbers and letters can be replaced by place holders.
- ▶ The display and assignment of the icons can deviate, depending on the set up configuration, operating status and configuration of the crane.
- ▶ In addition, many of the illustrations show the maximum configuration of the LICCON monitor with icons.
- ▶ In crane operation, an identical display will **not** appear on the LICCON monitor.

For monitoring the crane, three LICCON monitors are available in the instrument panel.

LICCON monitor 0
- Placed on the right in the monitor arrangement

LICCON monitor 1
- Placed in the center in the monitor arrangement

LICCON monitor 2
- Placed to the left in the monitor arrangement

If a crane movement is to be carrier out with a master switch (MS1, MS2 or MS3), then at least one of the following buttons must be pressed:
- **1** Seat contact button
  - Is actuated by sitting properly on the seat.
- **2** Button
  - To bypass the seat contact button **1**, to be able to work while standing up, if necessary.
  - Each master switch (MS1, MS2 or MS3) has a button **2**, see illustration **1**

Note
- ▶ Load hook and hook block are also generally described as hooks.

1.1 Operating elements for special cases at operation of the LICCON overload protection

Within the crane operator's cab, two buttons are installed as operating elements for „Special cases at operation of the LICCON overload protection“:
- Button **F4** on the left control panel
- Set up key **D** on LICCON monitor 0

Depending on the crane configuration, an additional operating element can be installed outside the crane operator's cab for „Special cases at operation of the LICCON overload protection“.

Depending on the crane type, either:
- Key button **S801** in the control cabinet, see illustration **2**

or
- Sensor **47** and transponder **48** on the outside of the control cabinet, see illustration **3**

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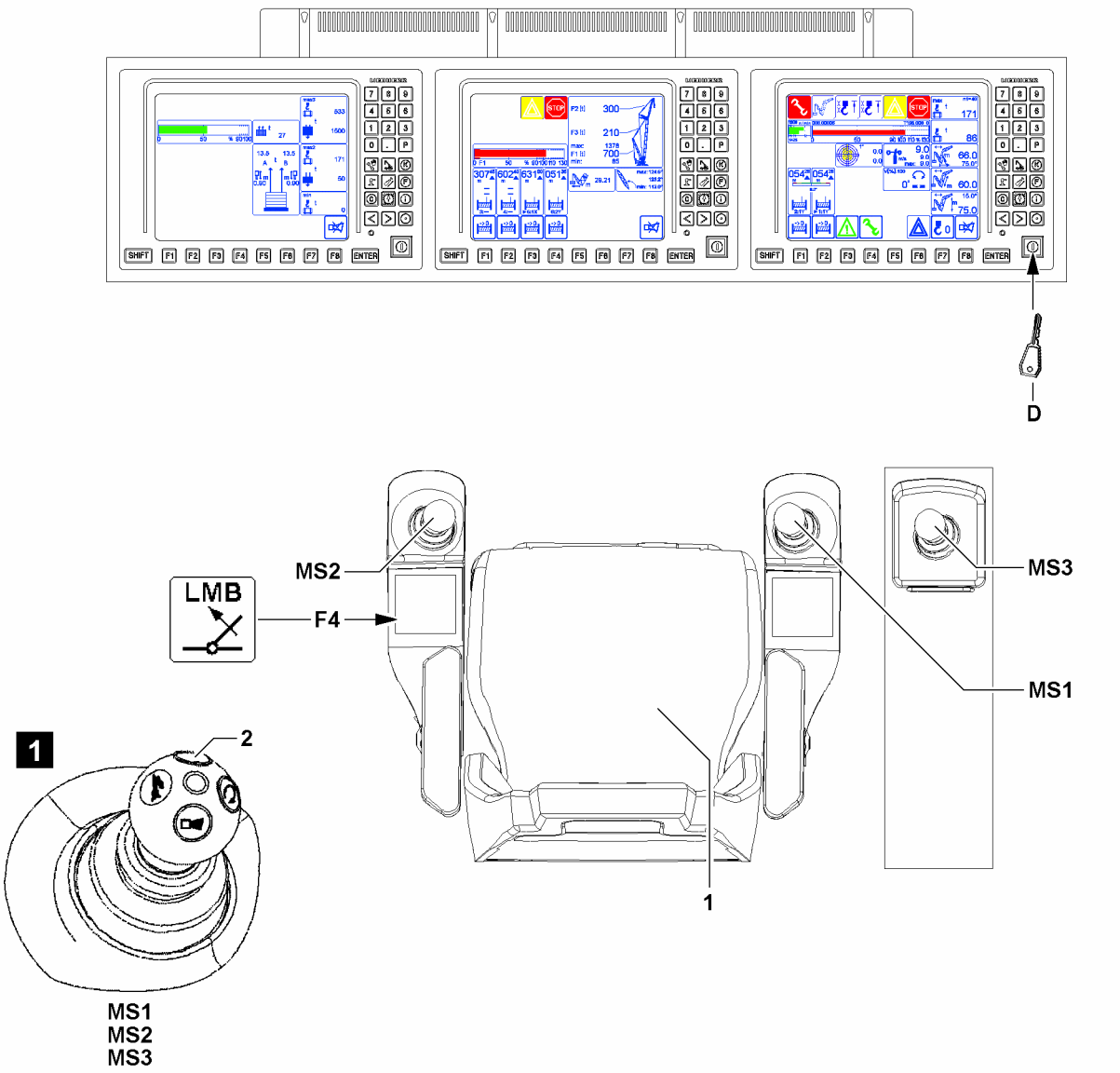

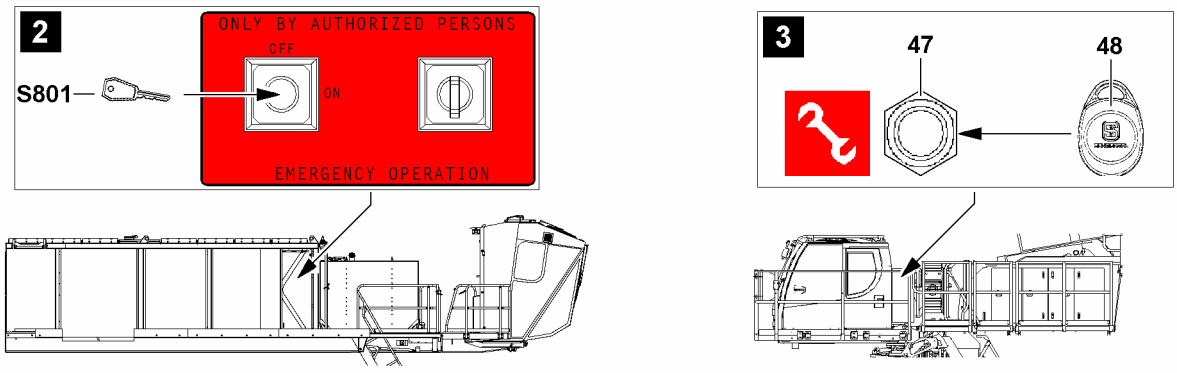

Fig.144109

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1.2 Special cases at operation of the LICCON overload protection

When special cases at operation of the LICCON overload protection occur, then the functionality of the LICCON overload protection is accessed.

WARNING
Access the functionality of the LICCON overload protection!
If the functionality of the LICCON overload protection is accessed by pressing the key **F4**, set up key **D**, the key switch **S801** or sensor **47** via transponder **48**, then the LICCON overload protection is entirely deactivated, bypassed or limited.
It is possible to exceed several shut-off limits of the LICCON overload protection simultaneously or one after the other.
It is possible to carry out crane movements that are not monitored by the LICCON overload protection.
Without the LICCON overload protection, no additional protection against overload of the crane via the crane control is present.

- ▶ When accessing the functionality of the LICCON overload protection, take into account that the LICCON overload protection is deactivated totally or limited.
- ▶ Access the functionality of the LICCON overload protection exclusively according to the specifications in the crane documentation.

Possible limitation in the crane control:

- During certain „Special cases at operation of the LICCON overload protection“, the working speed of the crane is significantly reduced.
- During certain „Special cases at operation of the LICCON overload protection“, the possibility to control the crane is limited in time.
- During certain „Special cases at operation of the LICCON overload protection“, the individual display instruments show no values.

1.2.1 Special operating conditions

If a special operating condition occurs, such as self-blocking of overload protection („Deadlock“), pressing key **F4** or set up key **D** can provide a remedy.

By pressing the key **F4** you can:

- Luff in with suspended load

By pressing the set up key **D**, the function „Exceeding the shut-off limits of the LICCON overload protection“ is activated. This makes it possible:

- To exceed the maximum permissible load moment.
- To exceed the maximum value of the F-load display in crane operation.
- To make it possible to carry out some limited crane movements after shut-off *LMB-STOP* due to sensor errors, if the erroneous sensor is not required for monitoring by the LICCON overload protection.

Note

- ▶ If there is no sensor defect and a load chart is available, then the display values remain for the crane utilization (load capacity display).
- ▶ Depending on the crane configuration, exceeding the maximum permissible load moment is limited to 110 %.

1.2.2 Assembly / disassembly procedures

By pressing the set up key **D** you can:

- Bypass the LICCON overload protection to carry out erection / take down procedures and assembly procedures.
- Bypass *hoist top* shut-off (erection / take down procedures and assembly procedures)

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Note

- ▶ For assembly / disassembly procedures, depending on the circumstances there may not be any display values or they may be significantly reduced.
- ▶ The display of the required display values or determination of required values is ensured when proceeding correctly.

1.2.3 Failure of components

WARNING

Erroneous operation of the crane!

If the LICCON overload protection turns the crane movement off due to failure of components, then the exact cause for the shut-off must be determined.

After a failure of components, no normal operating condition can be reached. No normal crane operation is possible.

- ▶ For the procedure, see Crane operating instructions, chapter 4.04.
- ▶ Assume normal crane operation only when the cause for the shut-off has been remedied and the crane control is fully functioning.

Depending on the crane configuration, a shut-off due to a failure of components can be bypassed by:

- Press the set up button **D**.
  or
- Actuate the key switch **S801**.
  or
- Actuate the sensor **47** through the transponder **48**.

The activated function includes the following:

- Allows crane movements in case of failure of components, for example sensors which are required for monitoring by the LICCON overload protection.

1.2.4 Emergency situations

WARNING

Overload of crane!

If the LICCON overload protection is bypassed, then the LICCON overload protection is entirely deactivated.

If the LICCON overload protection is bypassed, there is no further protection against crane overload.

There is no longer a load torque limiter.

If the LICCON overload protection is bypassed, the crane can be overloaded readily.

Overloading the crane can lead to accidents.

During accidents, personnel could be killed or seriously injured.

- ▶ If the LICCON overload protection is bypassed, take into account that the LICCON overload protection is entirely deactivated.
- ▶ If the LICCON overload protection is bypassed, the crane operator assumes the full responsibility for his actions.

Depending on the crane configuration, the LICCON overload protection can be bypassed as follows:

- Press the set up button **D**.
  or
- Actuate the key switch **S801**.
  or
- Actuate the sensor **47** through the transponder **48**.

The activated function includes the following:

- Allowing crane movements in emergency situations without monitoring by the LICCON overload protection

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Note

- ▶ Installation location of key switch **S801** or sensor **47**, see illustration. The transponder **48** (when sensor **47** is installed) is supplied at crane delivery and must be accessible to the respective personnel (for example the crane operator).
- ▶ For the procedure, see Crane operating instructions, chapter 4.04.

1.3 Operating condition of crane

A **„normal operating condition“** can only be reached if all of the following statements apply:

- The crane is in a proper condition.
- The crane is set up according to the specifications in the crane documentation.
- The set up configuration of the crane has been entered correctly into the LICCON computer system.
- The crane is in the range of a valid load chart.
- The crane utilization is in the range of 0 % to 100 %.
- The F-load display is in the permissible range.
- All required displays in the LICCON monitors provide the correct display values.
- All required display instruments are functioning.
- The local conditions meet the specifications for crane application.

„**The operating condition is not normal**“, among others, if one or more of the following statements apply:

- The crane has defects that compromise operational safety.
- The crane is not set up according to the specifications in the crane documentation.
- The set up configuration of the crane deviates from the entries in the LICCON computer system.
- The limit values from the load charts are exceeded.
- The maximum permissible load moment is exceeded.
- The *hoist top* shut-off is bypassed.
- The limit values from the F-load display are exceeded.
- Required displays in the LICCON monitors provide no correct display values.
- Required display instruments are not functioning.
- The functionality of the LICCON overload protection has been accessed by pressing the key **F4**, set up key **D** or key switch **S801** or sensor **47** via transponder **48**.
- Crane movements are carried out without functioning overload protection.
- Crane movements are carried out outside of the load charts.
- A special case at operation of the LICCON overload protection has occurred.

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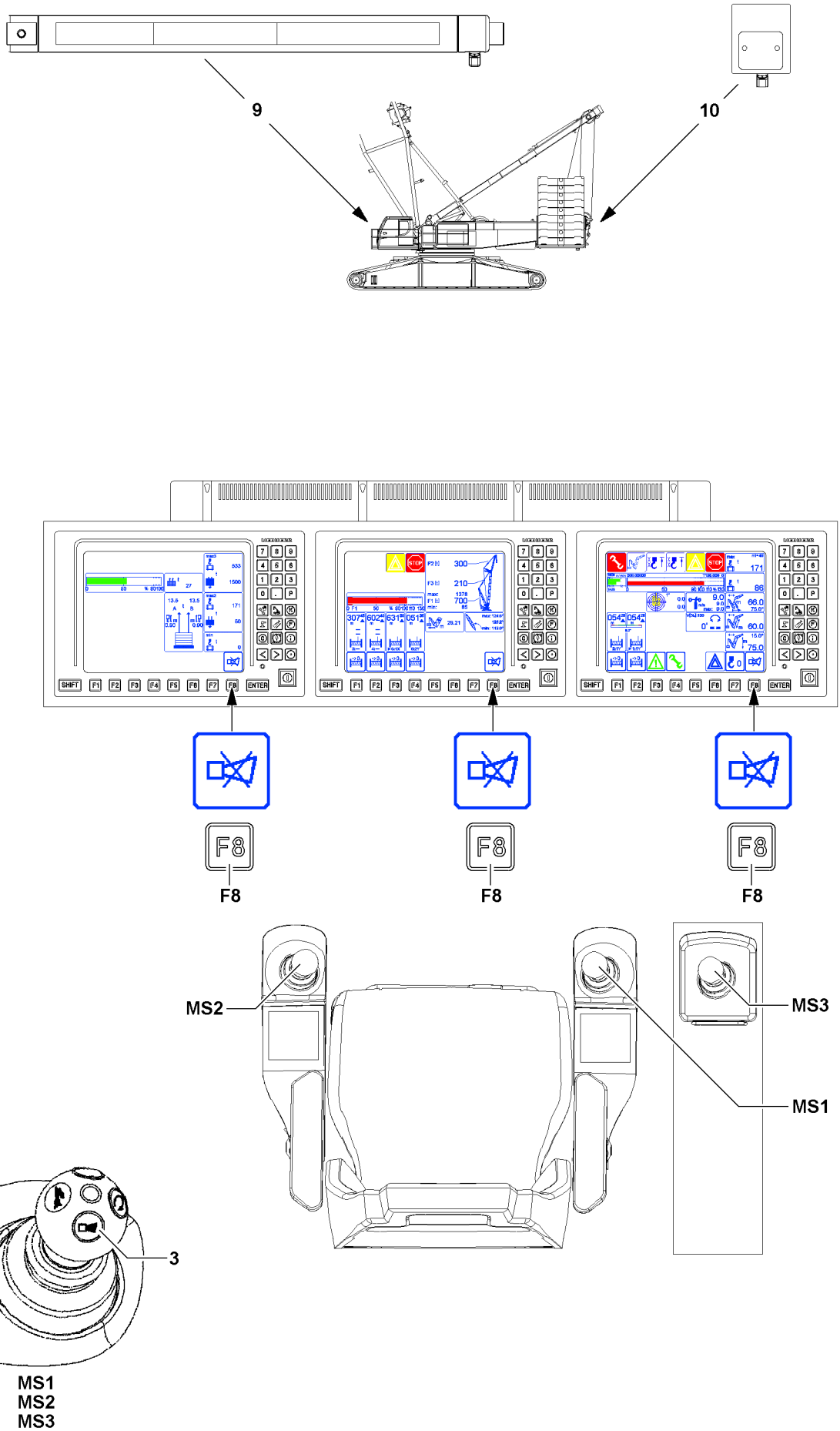

Fig.144108

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1.4 Overview of acoustic / optical warnings

- The acoustic warnings are issued to the crane operator via the signal sounds of the LICCON monitors.
- The acoustic warnings are issued to the crane surrounding area via a horn on the turntable.
- The optical warnings are issued to the crane operator via warning icons in the LICCON monitors.
- The LMB warning lights (three color light **9** on the crane cab and warning light **10** on the rear of the turntable) are used to issue optical warnings to the crane surrounding area.
- The acoustic warnings within the crane operator's cab are turned off by pressing the button **F8** on the corresponding LICCON monitor.
- The acoustic warnings outside the crane operator's cab are turned off by pressing the button **3**. Each master switch (MS1, MS2 or MS3) has a button **3**, see illustration **1**

1.4.1 General notes regarding the acoustic / optical warnings to the crane surrounding area

WARNING
Disregard of acoustic or optical warnings!
If persons in the crane surrounding area are not informed about the meaning of acoustic / optical warnings of the crane, then there is a danger of accidents.
▶ Only persons who have been informed about how to proceed correctly according to the acoustic / optical warnings may be in the crane surrounding area.

In reference to the horn on the turntable, the following applies:
- An intermittent sound is heard: A special case in the operation of the LICCON overload protection has occurred or the overload protection has turned the crane movement off.

In reference to the three color light **9**, the following applies:
- The three color light **9** lights up green: The crane is in normal operating condition.
- The three color light **9** lights up yellow: The crane is still in normal operating condition, an advance warning for upcoming shut-off exists.
- The three color light **9** lights up red: The crane movement was turned off by the overload protection.
- The three color light **9** blinks yellow: A special case at operation of the LICCON overload protection has occurred.
- The three color light **9** blinks red: A special case at operation of the LICCON overload protection has occurred.

In reference to the warning light **10** on the rear of the turntable, the following applies:
- The warning light **10** lights up red: The crane movement was shut off.
- The warning light **10** blinks red: A special case at operation of the LICCON overload protection has occurred.

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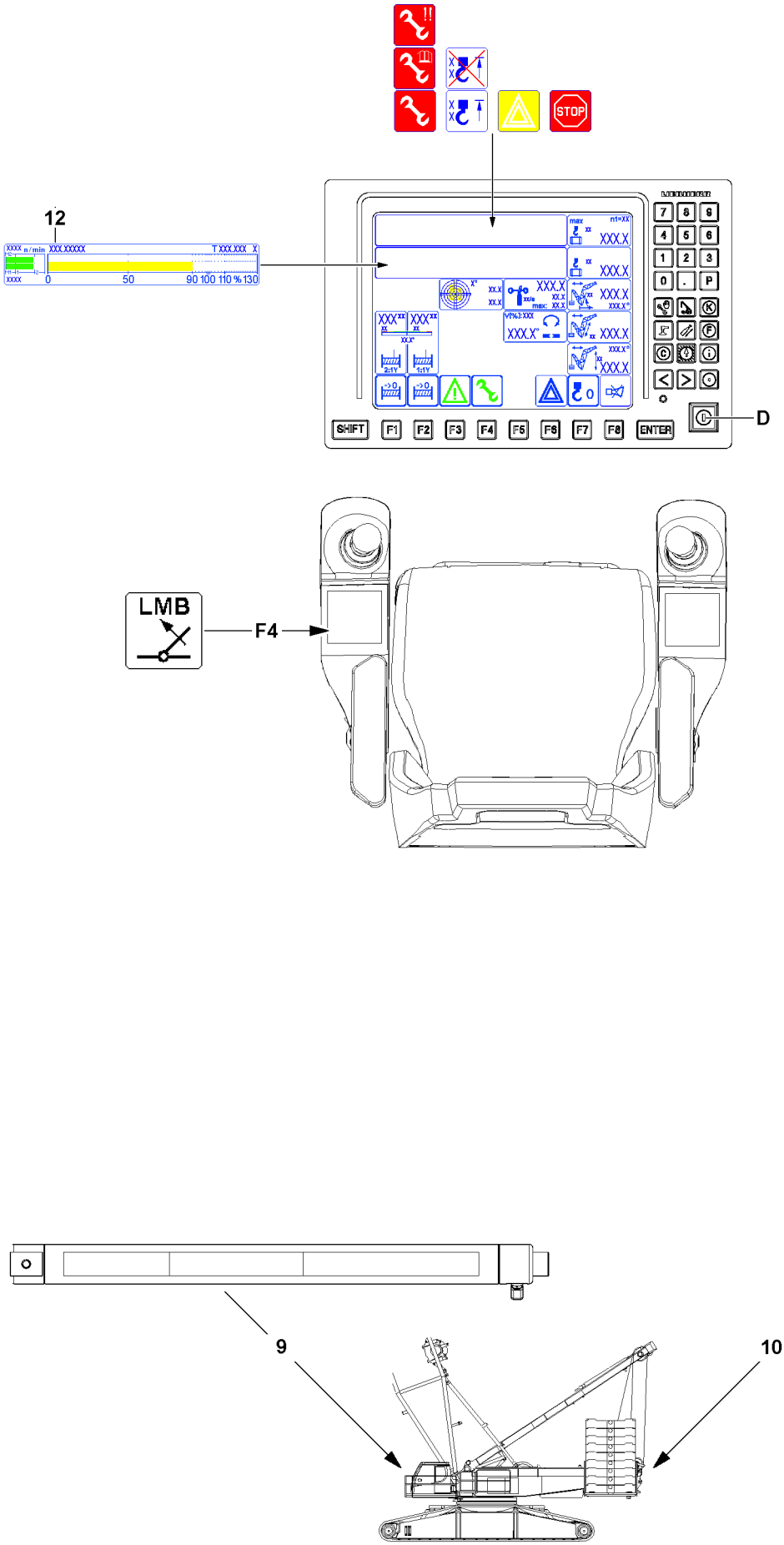

Fig.115284

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1.4.2 Description of acoustic / visual warnings

The occurrence of acoustic / optical warnings in crane operation is explained via sample situations. The situation numbers from the chart „Overview of possible situations“ is valid for the following charts in this chapter:

- Acoustic / visual warnings on the LICCON monitor
- LMB warning lights
- Horn on the turntable

Note

▶ The percentage values in the chart „Overview of possible situations“ refers to the crane utilization according to the display in the bar diagram for utilization **12**.

Overview of possible situations	
Situation number	**Sample description of the situation**
Situation 001	Normal operating condition with crane utilization of 0 % to 100 %.
Situation 003	The crane movement was turned off due to a crane utilization above 100 % - shut-off *LMB-STOP* was triggered.
Situation 004	The crane movement was turned off even though the crane utilization is below 100 % - shut-off *LMB-STOP* was triggered.
Situation 005	The crane movement „luffing in with suspended load“ is carried out at a crane utilization above 100 % via the **F4** key.
Situation 006	Failure of components
Situation 010	The shut-off limits of the LICCON overload protection are deactivated / exceeded with the set up key **D**.
Situation 011	An actuated hoist limit switch (*hoist top* shut-off) is bypassed via the set up key **D**.
Situation 020	The assembly operation was activated via the set up key **D** to erect / take down the boom. No load chart is available.

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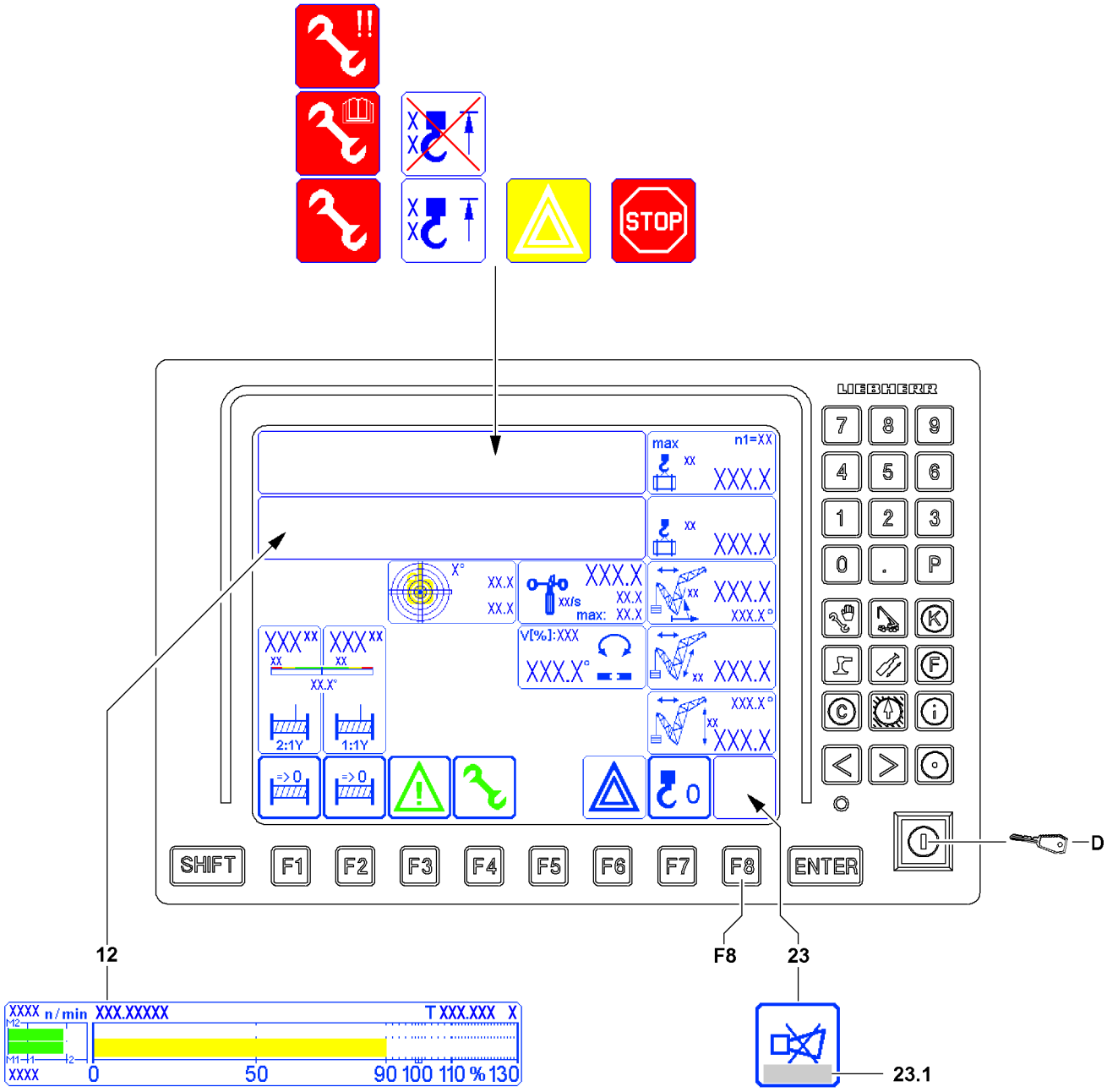

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Fig.115267

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1.4.3 Acoustic / visual warnings within the crane operator's cab

Note

- For description of the situations assigned to the situation numbers, see chart „Overview of possible situations“
- The percentage values refer to the crane utilization according to the display in the bar diagram for utilization **12**.

WARNING

Erroneous operation of the crane!

- In relation with acoustic / optical warnings in the *Horn* icon **23**, observe the notes regarding error messages **23.1**.

Acoustic / visual warnings on the LICCON monitor							
Situation number	**Acoustic warning**		**Visual warning LICCON monitor**				
	Horn short[2]	**Horn long**[2]	**Warning signs**		**Special signs**		
Situation 001	From 90 %	-	From 90 %	-	-	-	-
Situation 003	From 90 %	From 101 %	From 90 %	From 101 %	-	-	-
Situation 004	-	Always	-	Always	-	-	-
Situation 005	-	From 101 %	From 101 %	From 101 %			
Situation 006				Always		Always[3]	
Situation 010	From 90 %	From 101 %	From 90 %	From 101 %	Always	-	-
Situation 011[1]	-	Always	-	-	-	-	Always
Situation 020	-	Always	-	-	-	Always	-

1) Is in part superseded by other warnings

2) Can be turned off immediately on the LICCON monitor key **F8**

3) Depending on the crane configuration, a similar icon appears, in which two exclamation marks (upper right) appear, see also Crane operating instructions, chapter 4.02

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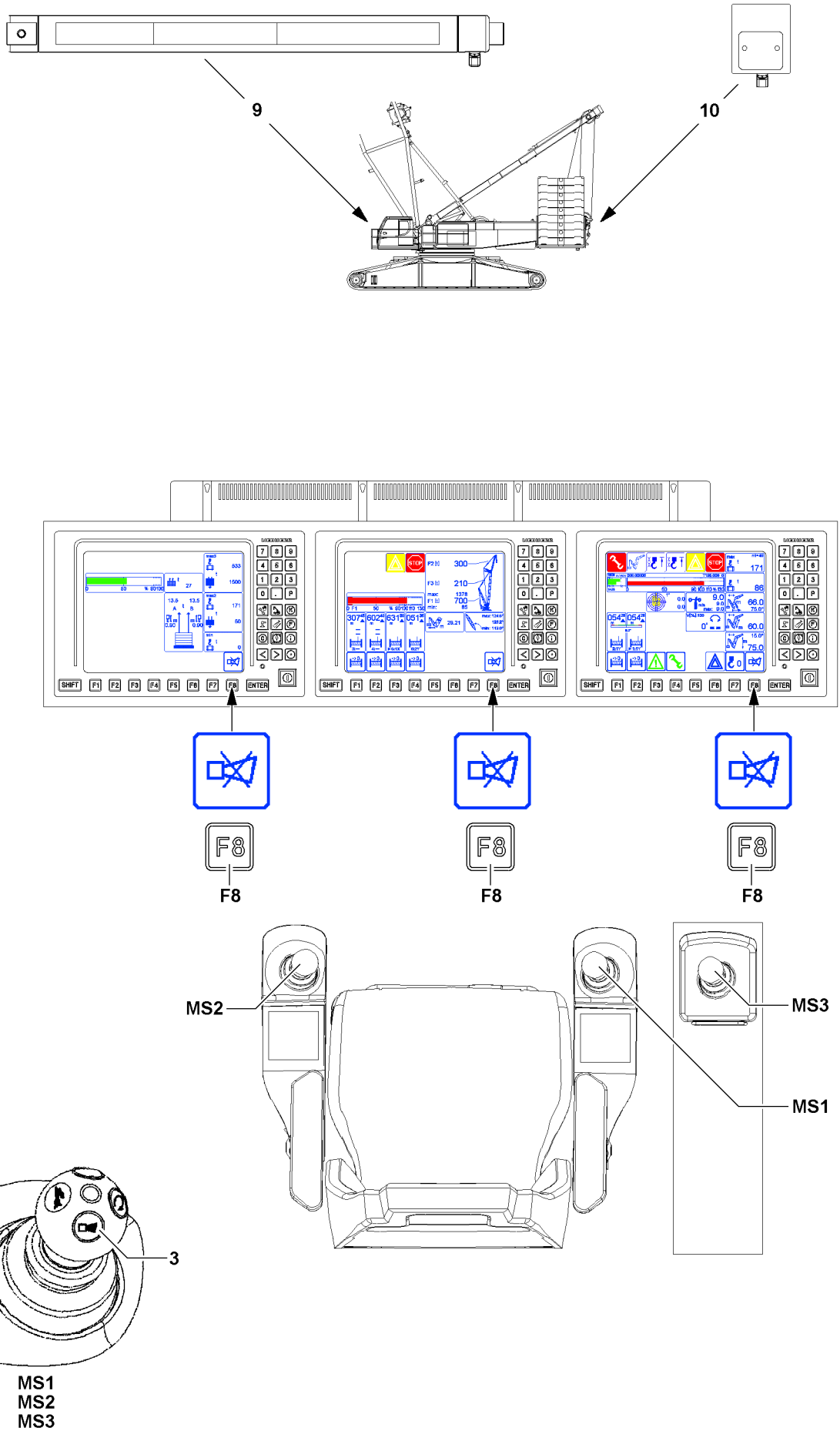

Fig.144108

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1.4.4 Acoustic / visual warnings outside the crane operator's cab

Note

- For description of the situations assigned to the situation numbers, see chart „Overview of possible situations“
- The percentage values refer to the crane utilization according to the display in the crane operating screen.

LMB warning lights					
Situation number	**At utilization of crane**	Three color light **9**			Warning light **10**
		Green	**Yellow**	**Red**	**Red**
Situation 001	0 % to 89 %	Lights up			
	90 % to 100 %		Lights up		
Situation 003	From 101 %			Lights up	Lights up
Situation 004	Always			Lights up	Lights up
Situation 005	From 101 %			Blinks	Blinks
Situation 006	Always			Blinks	Blinks
Situation 010[4)]	0 % to 89 %	Lights up			
	90 % to 100 %		Lights up		
	101 % to 110 %		Blinks		
	From 111 %			Lights up	Lights up
Situation 010	0 % to 89 %	Lights up			
	90 % to 100 %		Lights up		
	From 101 %			Blinks	Blinks
Situation 011[1)]	Always		Blinks		
Situation 020	No display value		Blinks		

1) Is in part superseded by other warnings

4) Cranes according to EN13000:2010

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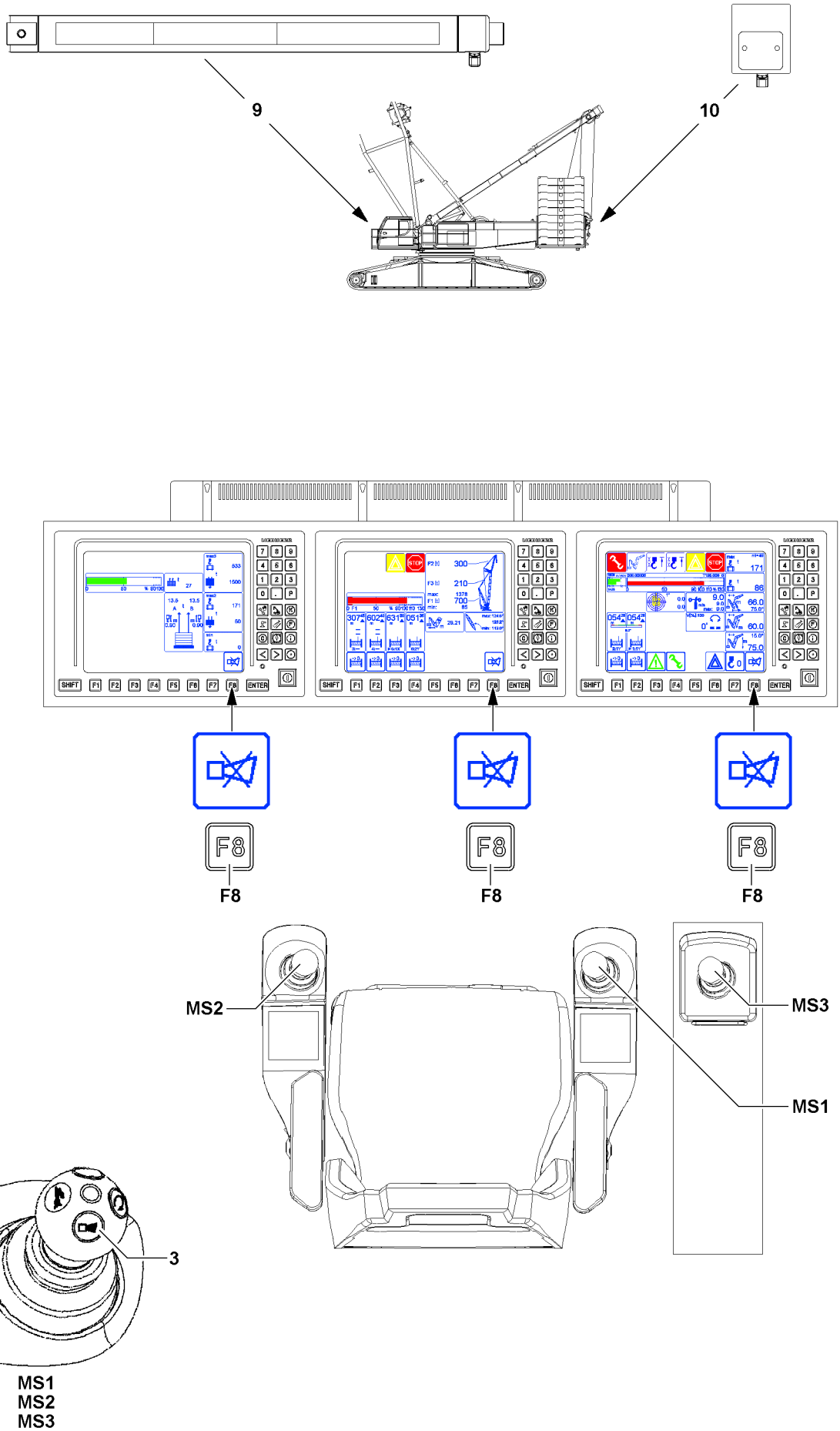

Fig.144108

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Note

- ▶ For description of the situations assigned to the situation numbers, see chart „Overview of possible situations“
- ▶ The percentage values refer to the crane utilization according to the display in the crane operating screen.

Acoustical signals on the turntable that can be shut off by actuating a button **3** (illustration **1**). The signal shut-off is effective no earlier than after five seconds.

Signal turntable		
Situation number	**At utilization of crane**	**Signal type**
Situation 001	0 % to 89 %	-
Situation 002	90 % to 100 %	-
Situation 003	From 101 %	Intermittent sound, can be shut off after five seconds
Situation 004	Always	-
Situation 005	From 101 %	Intermittent sound, can be shut off after five seconds
Situation 006	Always	Intermittent sound
Situation 010	From 111 %	Intermittent sound, can be shut off after five seconds
Situation 011[1)]	Always	Intermittent sound, can be shut off after five seconds
Situation 020	No display value	-

1) Is in part superseded by other warnings

2 Instructions for resuming crane movement

WARNING
Danger of accident!
If the following points are not observed, personnel can be severely injured or killed.

- ▶ The crane operator bears the sole and full responsibility for the adherence to measures to be taken in case of shut-off of crane movement.

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2.1 Overview Load chart

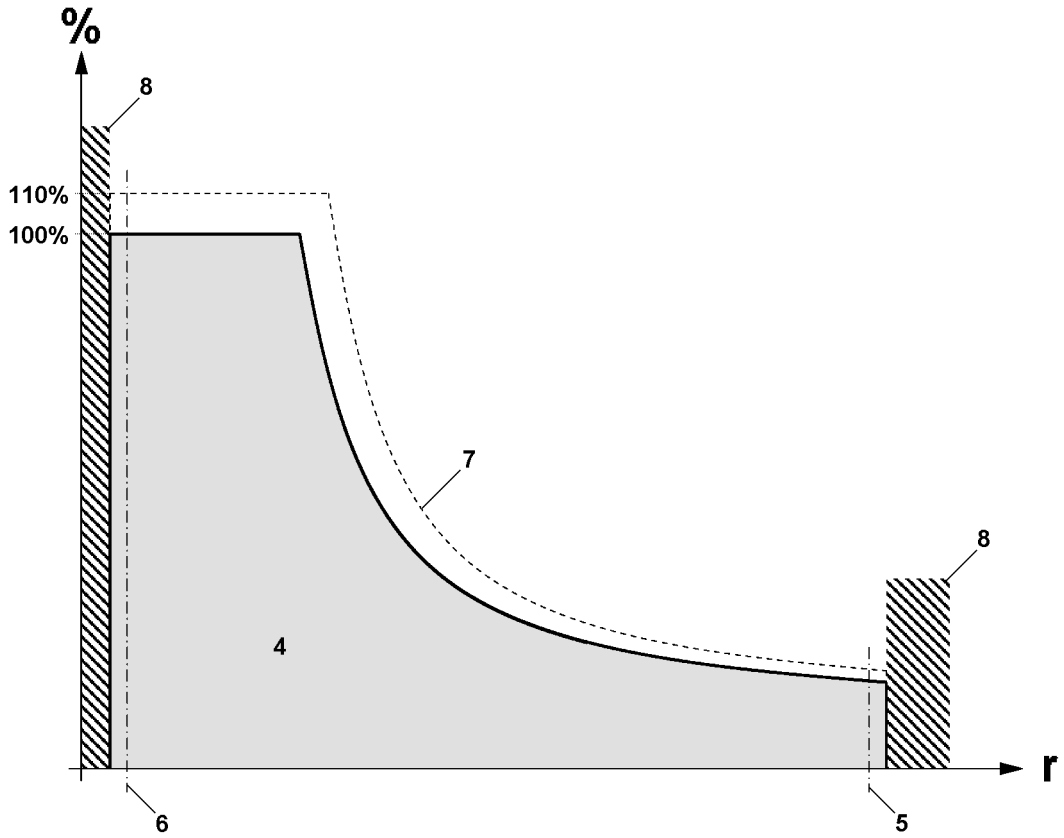

Fig.125392: Sample overview of a load chart

Axle	Description
r	Boom radius (working radius)
%	Utilization of the crane in percentages

Position	Description
4	Range „Load chart available“
5	Lower limit angle load chart
6	Upper limit angle load chart
7	Curve utilization 110 %
8	Range „No load chart available“

2.2 Shut-off of crane movement

The LICCON computer system carries out the following shut-offs if a limit value is exceeded in crane operation:

- Shut-off *overload*
- Shut-off *luffing the main boom up / down*
- Shut-off *luffing the auxiliary boom / accessory up / down*
- Shut off *maximum / minimum value F-load display*
- Shut-off *spooling the winch up / out*
- Shut-off hoist top

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- Shut-off *luffing the derrick boom up / down*
- Shut-off *parallel operation winch 1 and winch 2*
- Shut-off *difference force monitoring of derrick ballast guying*
- Shut-off due to error message

Note

▶ For detailed description of the individually listed icons, see Crane operating instructions, chapter 4.02.

WARNING

Erroneous operation of the crane!

If the LICCON overload protection turns the crane movement off, then the exact cause for the shut-off must be determined first.

▶ Determine the cause for the shut-off and remedy it if possible without pressing the key **F4** „Luffing in with suspended load“ or the set up key **D**.

▶ If it is not possible to reset the crane movement causing the shut-off, see section „Procedure for special cases at operation of the LICCON overload protection“.

2.2.1 Shut-off *overload*

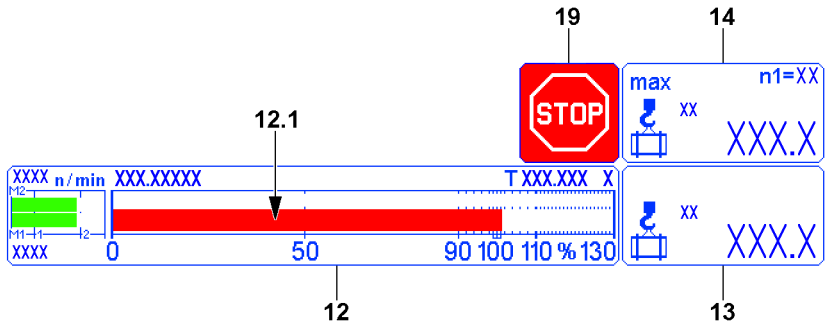

Fig.115274

In the bar diagram utilization **12** the utilization bar **12.1** exceeds the 100 % mark. The LICCON overload protection has turned off the crane movement, *LMB-STOP* icon **19** appears. The actual load **13** has exceeded the maximum load **14**.

▶ Wait for a short time until the crane movement has come to a complete standstill.

When the bar diagram utilization **12** shows less or equal 100 %:

▶ Carry out crane movements in such a way that no repeated shut-off by the LICCON overload protection occurs.

When the bar diagram utilization **12** shows more than 100 %:

▶ Check if there are permissible tasks, which positively influence the utilization of the crane.

When necessary and possible:

▶ Set down the load.

Note

It is possible that the following tasks can positively influence the utilization of the crane:

▶ Set down the load and reduce the boom radius by driving the crane.

▶ Set down the load and reduce.

▶ Set down the load and reconfigure the crane to obtain higher load chart values.

▶ Carry out permissible tasks that positively influence the utilization of the crane.

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Problem remedy

The crane operation is limited because the maximum load **14** is seemingly too low or reached too soon?

- ▶ Make sure that the load bearing capacity of the crane is sufficient for the upcoming crane application.
- ▶ Make sure that a valid set up configuration has been entered on the LICCON computer system.
- ▶ Make sure that the crane is assembled according to the specifications in the crane documentation.
- ▶ Make sure that the actual set up configuration and the entered set up status of the crane match.
- ▶ Make sure that all attachment parts and guy rods on the boom system, which are not needed, have been removed (weight).
- ▶ Make sure that the boom system is free of snow and ice (weight).
- ▶ Make sure that the environmental influences (for example wind influence) onto the crane are not too great.
- ▶ Contact Liebherr Service.

When the shut-off cannot be remedied despite the observance of all points listed here:

- ▶ Change to section „Procedure for special cases at operation of the LICCON overload protection“.

2.2.2 Shut-off *luffing the main boom up / down*

Note

- ▶ The illustration of icon **15** depends on the set up configuration of the crane.

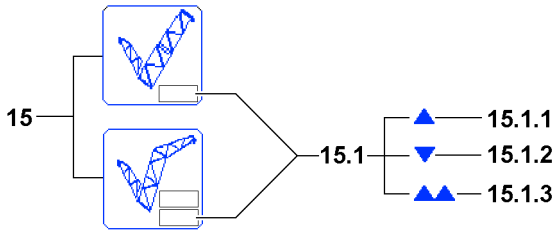

Fig.115275

In the icon **15** the arrow **15.1.1** or arrow **15.1.2** blinks and the LICCON overload protection has shut off the crane movement.

„Luffing the main boom up“ (arrow **15.1.1**) or „Luffing the main boom down“ (arrow **15.1.2**) was shut off because the upper / lower limit angle of the selected load chart was exceeded / fallen below.

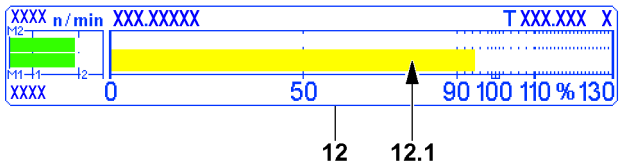

Fig.115276

Note

- ▶ If the utilization of the crane is more than 95 % (in bar diagram utilization **12** the utilization bar **12.1** exceeds 95 %) and the maximum load according to the load chart (falling load capacity) drops by continuing to luff up the boom, then the arrow **15.1.1** also appears and the crane movement „Luffing the main boom up“ is turned off.

If the double arrow **15.1.3** appears, then:

- – **either** it was luffed up to a limit switch or the limit switch has turned off the crane movement „Luffing the main boom up“
- – **or** there is an error on one of the limit switches „Main boom top“

The arrow **15.1.1** appears and the crane movement „Luffing the main boom up“ was turned off:

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▶ Luff the main boom down.

Result:

– Crane operation is possible again.

The arrow **15.1.2** appears and the crane movement „Luffing the main boom down“ was turned off:

▶ Luff the main boom up.

Result:

– Crane operation is possible again.

The double arrow **15.1.3** appears and the crane movement „Luffing the main boom up“ was turned off:

▶ Luff the main boom down.

Result:

– Crane operation is possible again.

Problem remedy
The double arrow **15.1.3** appears continuously?
If a double arrow **15.1.3** appears without having luffed the main boom up to a limit switch, then there may be an error in the limit switches / sensors.
▶ Check if there is an error message from the LICCON computer system, see the Diagnostics manual.
▶ If yes: Remedy the error immediately.

WARNING
Limited warning functions!
If one of the double version limit switches / sensors is not OK and the crane is continued to be operated, then the warning functions of the LICCON overload protection are limited.
▶ The crane can only be operated in an emergency after failure of a double version limit switch.

▶ Carry out crane movements in such a way that no repeated shut-off by the LICCON overload protection occurs.

2.2.3 Shut-off *luffing the auxiliary boom / accessory up / down*

Note
▶ Only in operating modes with auxiliary boom / accessory
▶ The illustration of icon **15** depends on the set up configuration of the crane.
▶ The description „auxiliary boom / accessory“ comprises all boom types which can be luffed and are installed on the main boom.

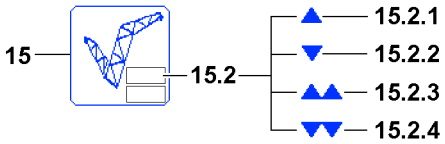

Fig.115277

In the icon **15** (upper field) the arrow **15.2.1** or arrow **15.2.2** blinks and the LICCON overload protection has shut off the crane movement.

„Luffing the equipment up“ (arrow **15.2.1**) or „Luffing the equipment down“ (arrow **15.2.2**) was shut off because the upper / lower limit angle of the selected load chart was exceeded or fallen below.

If the double arrow **15.2.3** appears, then:
– **either** it was luffed up to a limit switch or the limit switch has turned off the crane movement „Luffing the auxiliary boom / accessory up“

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- **or** the mechanical relapse support has turned off the crane movement „Luffing the auxiliary boom / accessory up“
- **or** there is an error on one of the limit switches „Auxiliary boom / accessory top“.

If the double arrow **15.2.4** appears, then:
- **either** it was luffed down to a limit switch „Auxiliary boom / accessory bottom“ and the limit switch has turned off the crane movement „Luffing the auxiliary boom / accessory up“
- **or** there is an error on one of the limit switches „Auxiliary boom / accessory bottom“

The arrow **15.2.1** appears and the crane movement „Luffing the auxiliary boom / accessory up“ was turned off:

▶ Luff the auxiliary boom / accessory down.

Result:

– Crane operation is possible again.

The arrow **15.2.2** appears and the crane movement „Luffing the auxiliary boom / accessory down“ was turned off:

▶ Luff the auxiliary boom / accessory up.

Result:

– Crane operation is possible again.

The double arrow **15.2.3** appears and the crane movement „Luffing the auxiliary boom / accessory up“ was turned off:

▶ Luff the auxiliary boom / accessory down.

Result:

– Crane operation is possible again.

Problem remedy
The double arrow **15.2.3** appears continuously?
If a double arrow **15.2.3** appears without having luffed up to a limit switch, then there may be an error in the limit switches „Auxiliary boom / accessory top“.
▶ Check if there is an error message from the LICCON computer system, see the Diagnostics manual.
▶ If yes: Remedy the error immediately.

The double arrow **15.2.4** appears and the crane movement „Luffing the auxiliary boom / accessory down“ was turned off:

▶ Luff the auxiliary boom / accessory up.

Result:

– Crane operation is possible again.

Problem remedy
The double arrow **15.2.4** appears continuously?
If a double arrow **15.2.4** appears without having luffed down to a limit switch, then there may be an error in the limit switches / sensors.
▶ Check if there is an error message from the LICCON computer system, see the Diagnostics manual.
▶ If yes: Remedy the error immediately.

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WARNING
Limited warning functions!
If one of the double version limit switches / sensors is not OK and the crane is continued to be operated, then the warning functions of the LICCON overload protection are limited.
▶ The crane can only be operated in an emergency after failure of a double version limit switch / sensor.

▶ Carry out crane movements in such a way that no repeated shut-off by the LICCON overload protection occurs.

2.2.4 Shut off *maximum / minimum value F-load display*

The illustration of the F-load display **17** depends on the set up configuration of the crane and can vary. The values for test point 2 (force F2) and test point 3 (force F3) are possibly shown.

Note
▶ The force determined on test point 1 is generally described as $F1_{actual}$ (actual value F1).
▶ In the icon **17** (F-load display), the force ratio is shown in number values as well as a bar display (called F-bar display).
▶ The value $F1_{max}$ **17.3** corresponds to 100 % in the F1-bar display.
▶ The F1-utilization bar **17.1** shows the relationship $F1_{actual}$ **17.2** to $F1_{max}$ **17.3**.
▶ The illustration of the F-load display **17** depends on the set up configuration of the crane and can vary.

Shut off *maximum value F1 in crane operation*

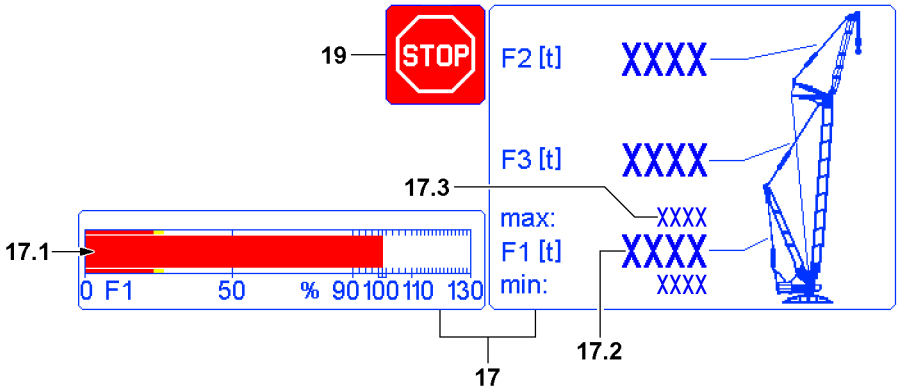

Fig.115278

In the F-load display **17** the F1-utilization bar **17.1** exceeds the 100 % mark and the LICCON overload protection has shut off the crane movement. The value $F1_{actual}$ **17.2** has exceeded the value $F1_{max}$ **17.3**.

All other movements, which lead to a decline of the force ratio in the F-load display **17** are turned off.

▶ Reverse any crane movement that has caused the shut-off.
or
Alternatively initiate a crane movement that improves the force ratio in the F-load display **17**.

Result:

– Crane operation is possible again.

▶ Carry out crane movements in such a way that no repeated shut-off by the LICCON overload protection occurs.

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Problem remedy

The crane operation is limited because the value $F1_{max}$ **17.3** apparently is being reached too early?

- ▶ Make sure that a valid set up configuration has been entered on the LICCON computer system.
- ▶ Make sure that the crane is assembled according to the specifications in the crane documentation.
- ▶ Make sure that the actual set up configuration and the entered set up status of the crane match.
- ▶ Make sure that all attachment parts and guy rods on the boom system, which are not needed, have been removed (weight).
- ▶ Make sure that the boom system is free of snow and ice (weight).
- ▶ Make sure that the wind influence on the crane is not too great.

If no irregularities can be found:

- ▶ Contact Liebherr Service.

When the shut-off cannot be remedied despite the observance of all points listed here:

- ▶ Change to section „Procedure for special cases at operation of the LICCON overload protection“.

Shut off *minimum value F1 in crane operation*

Note

- ▶ A shut-off *minimum value F1 ($F1_{min}$)* only occurs in operating modes with derrick ballast. The status $F1_{actual}$ = $F1_{min}$ cannot be reached in all other operating modes.

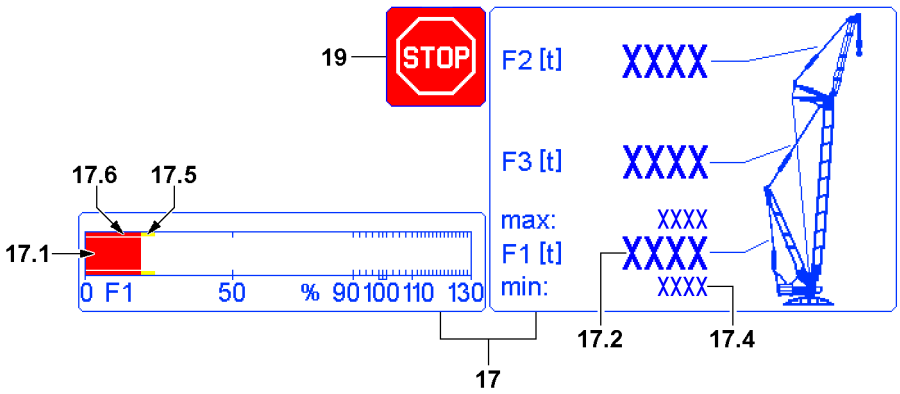

Fig.115279

In the F-load display **17**, when falling below the $F1_{min}$ advance warning bar **17.5**, a warning of the upcoming shut-off is issued by the F1-utilization bar **17.1**.

If the F1-utilization bar **17.1** falls below the $F1_{min}$-STOP bar **17.6**, then the LICCON overload protection shuts off the crane movement. The value $F1_{actual}$ **17.2** has fallen below the value $F1_{min}$ **17.4**.

All other movements, which lead to a decline of the force ratio in the F-load display **17** are turned off.

- ▶ Reverse any crane movement that has caused the shut-off.
  or
  Initiate an alternative crane movement that increases the force F1 (value $F1_{actual}$ **17.2**).

Result:

– Crane operation is possible again.

- ▶ Carry out crane movements in such a way that no repeated shut-off by the LICCON overload protection occurs.

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Problem remedy

The crane operation is limited because the value $F1_{min}$ **17.4** apparently is being reached too early?

- ▶ Make sure that a valid set up configuration has been entered on the LICCON computer system.
- ▶ Make sure that the crane is assembled according to the assembly drawings.
- ▶ Make sure that the actual set up configuration and the entered set up status of the crane match.
- ▶ Make sure that all attachment parts and guy rods on the boom system, which are not needed, have been removed (weight).
- ▶ Make sure that the boom system is free of snow and ice (weight).
- ▶ Make sure that the wind influence on the crane is not too great.

If no irregularities can be found:

- ▶ Contact Liebherr Service.

When the shut-off cannot be remedied despite the observance of all points listed here:

- ▶ Change to section „Procedure for special cases at operation of the LICCON overload protection“.

2.2.5 Shut-off *spooling the winch up / out*

Note

- ▶ Applies independently for winch 1 to winch 6.
- ▶ For detailed description of winch 1 to winch 6, see Crane operating instructions, chapter 4.02.

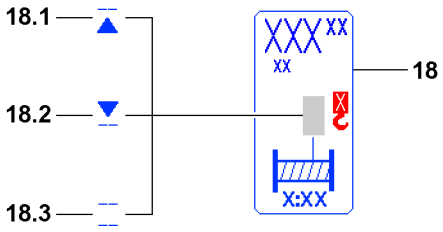

Fig.115280

In the icon **18**, the line / arrow **18.1**, arrow / line **18.2** or line / line **18.3** appears and the LICCON overload protection has shut off the crane movement.

„Spooling the winch out“ (line / arrow **18.1**) or „Spooling the winch up“ (arrow / line **18.2**) was shut off because the upper / lower limit value of the rope for the selected winch was exceeded or fallen below.

If line / line **18.3** appears blinking in the icon **18**, then the affected winch is deactivated.

The line / arrow **18.1** appears and the crane movement „Spooling the winch out“ was turned off:

- ▶ Spool the winch up.

Result:

– Crane operation is possible again.

The arrow / line **18.2** appears and the crane movement „Spooling the winch up“ was turned off:

- ▶ Spool the winch out.

Result:

– Crane operation is possible again.

The line / line **18.3** appears and the winch is deactivated:

- ▶ Activate the winch, see Crane operating instructions, chapter 4.02.

Result:

– Crane operation is possible again.

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2.2.6 Shut off *hoist top*

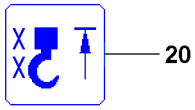

Fig.115281

The *hoist top* icon **20** appears in the LICCON monitor and the LICCON overload protection has turned off crane movement.

Spooling the hoist winch up was turned off because the hook (hook block / load hook) has touched a hoist limit switch weight during the upward movement and the affected hoist limit switch was triggered.

WARNING
Property damage / falling load!
▶ After shut-off *spool hoist winch up (hoist top)*, for every further crane movement, the distance between the hook (hook block / load hook) and the boom head must be checked.

Note
▶ After a *hoist top* shut-off occurred, further crane movements that affect the length of the hoist rope are also shut off.

▶ Spool the hoist winch out.

Result:

– Crane operation is possible again.

2.2.7 Shut-off *luffing the derrick boom up / down*

Note
▶ Only in operating modes with derrick boom.

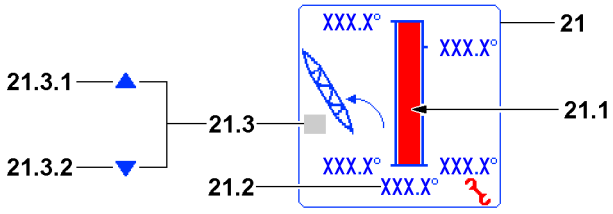

Fig.115282

In icon **21**, the column diagram **21.1** of the derrick angle has reached the minimum / maximum value. The actual angle **21.2** has left the permissible angle range.

Arrow **21.1** or arrow **21.2** appears and the movement of the derrick boom is turned off.

„Luffing the derrick boom up“ (arrow **21.1**) or „Luffing the derrick boom down“ (arrow **21.2**) was shut off because the upper / lower limit angle was reached.

The arrow **21.1** appears and „Luffing the derrick boom up“ was turned off:

▶ Luffing the derrick boom down.

Result:

– The shut off is nullified.

The arrow **21.2** appears and the crane movement „Luffing the derrick boom down“ was turned off:

▶ Luff the derrick boom up.

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Result:

– The shut off is nullified.

Problem remedy
The derrick boom is to be placed down?
▶ See Crane operating instructions, chapter 5.05.

2.2.8 Shut-off *parallel operation winch 1 and winch 2*

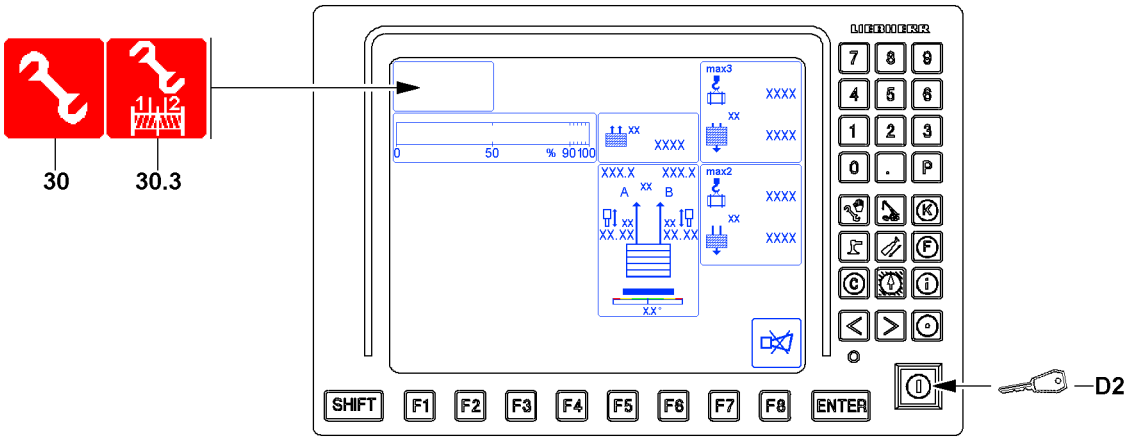

Fig.122459

WARNING
Impermissible change over of regulation *parallel operation winch 1 and winch 2*!
▶ Changing the regulation *parallel operation winch 1 and winch 2* is only permissible if - due to contamination, icing or failure of the path measurement system of the test pulleys - a correct path measurement of the hoist ropes of winch 1 and winch 2 is not possible.
▶ Changing the regulation *parallel operation winch 1 and winch 2* is only permissible if it is not possible to immediately clean or de-ice the test pulleys or repair the path measurement system.
▶ As long as the regulation *parallel operation winch 1 and winch 2* is changed over, the crane driver must align the position of the hook block generally manually.

If a correct path measurement of the hoist ropes of winch 1 and winch 2 is not possible via the LICCON computer system, then spooling the winches is shut off and an error message is issued.

If an immediate cleaning or de-icing of the test pulleys or repair of the path measurement system is not possible:
▶ Reestablish parallel operation of winches, see Crane operating instructions, chapter 4.05.

Change over the regulation Parallel operation winch 1 and winch 2:
▶ Actuate the key button **D2**.

Result:

– The regulation of the parallel operation winch 1 and winch 2 is switched over by the change over pulleys to the winch speed sensors.
– Assembly icon **30.3** and possibly assembly icon **30** appear.

▶ Remedy the problem as quickly as possible.
▶ Turn the regulation off again via the winch speed sensors: Actuate the key button **D2** again.

Result:

– Assembly icon **30.3** and possibly assembly icon **30** turn off.

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Note

▶ If the engine or the ignition is turned off, the regulation is also turned off via the winch speed sensors.

2.2.9 Shut-off *difference force monitoring of derrick ballast guying*

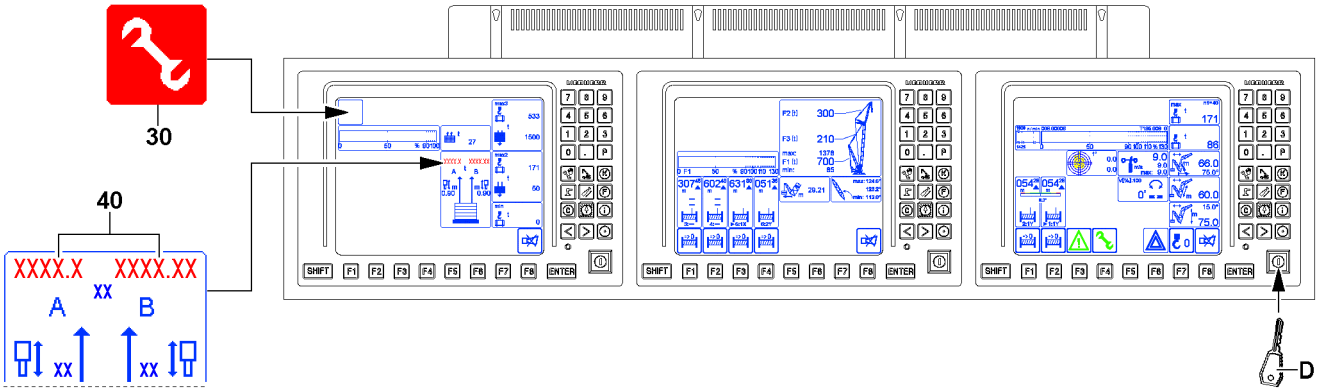

Fig.125390

WARNING

Danger of accident!

If the forces in the derrick ballast guyings A and B are too high, then this can lead to an overload of the crane. Components can fail and severe accidents can be the result.

▶ Load the derrick ballast guyings A and B evenly.

After reaching the specified limit value of the difference force threshold, the displays *guying A/B* **40** blink and turn red, the function *ballast up / down* is stopped. The difference force must be lowered again.

The assembly icon **30** appears when the shut-off *difference force monitoring - derrick ballast guying* is bypassed. The shut-off is bypassed via the set up key **D** (right monitor).

Shut-off *difference force monitoring derrick ballast guying:*

▶ Observe the Crane operating instructions, chapter 5.35 / 5.36.

2.2.10 Shut-off due to error message

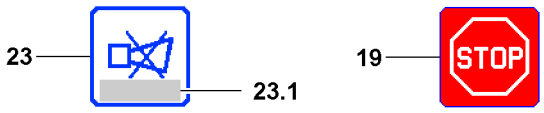

Fig.115283

In the icon **23** appears an error message, the icon **19** appears in the LICCON monitor and the LICCON overload protection has turned off crane movement.

▶ Determine the existing error with the help of the error message from the error field **23.1** in icon **23**, see Diagnostics manual.

▶ Rectify the error.

If the error cannot be remedied:

▶ Contact Liebherr Service.

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Problem remedy

The erection of the crane, for example after assembly on a new job site or with another set up configuration, is not possible due to an error message?

- ▶ Evaluate the error message.
- ▶ Make sure that all electrical connections are established correctly.
- ▶ Check if all sensors or dummy plugs with integrated electric have been connected properly.

Note

If there is a defect on an involved sensor of the load torque limiter (LMB), then the crane can no longer be operated in normal operating condition.

- ▶ Fix / replace the sensor, contact Liebherr Service if necessary.

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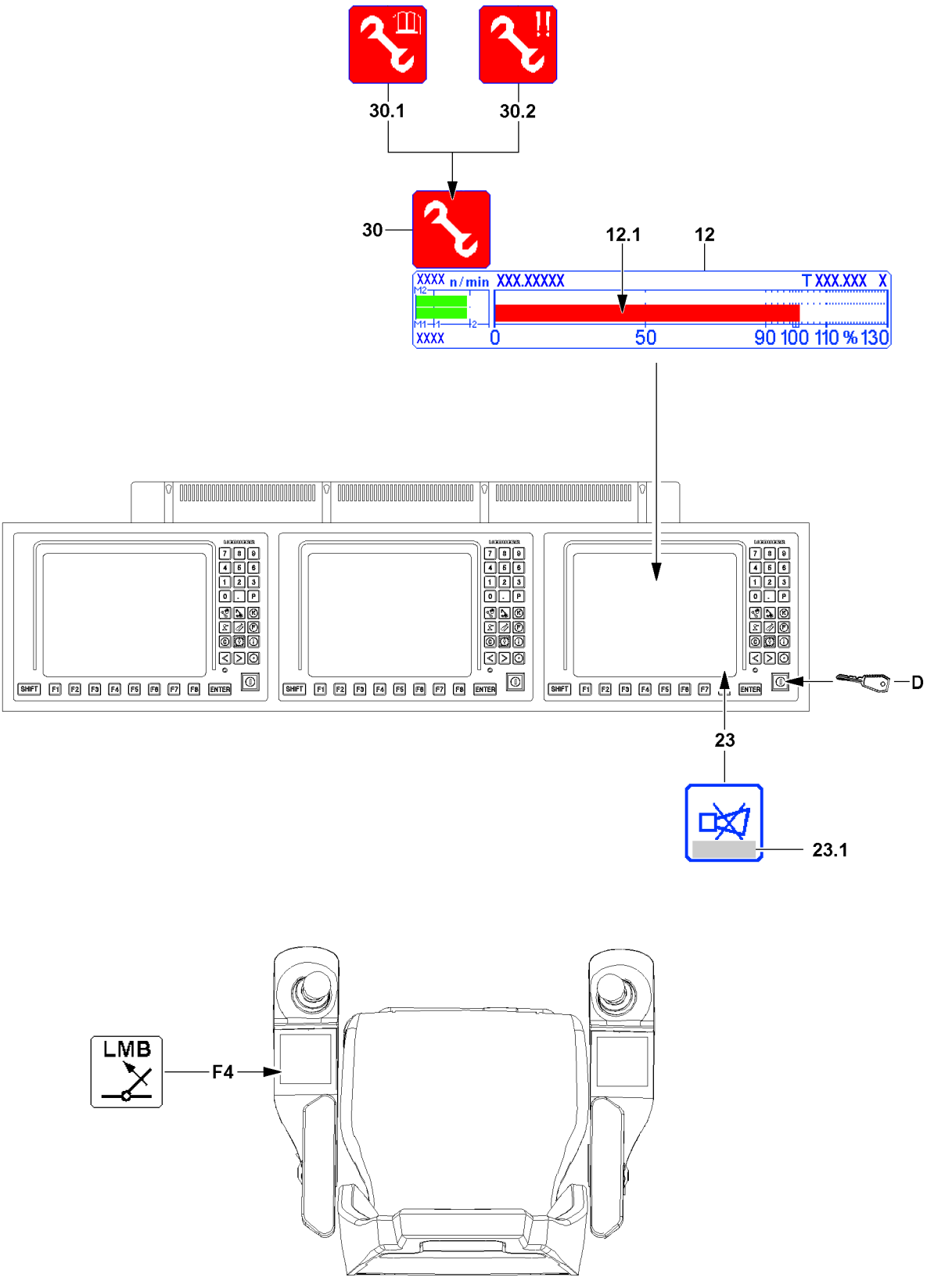

Fig.115285

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2.3 Procedure for special cases at operation of the LICCON overload protection

Within the crane operator's cab, the following operating elements available for Special cases at operation of the LICCON overload protection:
- Button **F4** on the left control panel
- Set up key **D** on the right LICCON monitor

By pressing key **F4** and set up key **D** the functionality of the LICCON overload protection is accessed.
If the set up key **D** is actuated, the assembly icon **30** appears in the LICCON monitor 0.

The assembly icon **30** appears, depending on the situation, also as:
- Assembly icon **30.1** - no load chart / assembly condition / sensor defect
- Assembly icon **30.2** - emergency operation (also with only one exclamation mark)

The *horn* icon **23** possibly displays error messages **23.1**:
- Observe and evaluate the error messages **23.1**, see also Diagnostics manual.

WARNING
Risk of overloading and toppling of the crane!
If the functionality of the LICCON overload protection is accessed without knowing the exact cause for the shut-off, then the crane can be overloaded and topple over.
Personnel can be severely injured or killed.
- ▶ Before accessing the functionality of the LICCON overload protection, determine the exact cause for the shut-off.
- ▶ Observe and evaluate the error messages **23.1**.

WARNING
Access the functionality of the LICCON overload protection!
When accessing the functionality of the LICCON overload protection, the LICCON overload protection is deactivated totally or limited.
It is possible to exceed several shut-off limits of the LICCON overload protection simultaneously or one after the other.
It is possible to carry out crane movements that are not monitored by the LICCON overload protection.
Without the LICCON overload protection, no additional protection against overload of the crane via the crane control is present.
- ▶ When accessing the functionality of the LICCON overload protection, take into account that the LICCON overload protection is deactivated totally or limited.
- ▶ Access the functionality of the LICCON overload protection exclusively according to the specifications in the crane documentation.
- ▶ Outside of the load charts, the data in the erection / take-down charts is binding.

WARNING
Leaving the load chart!
If the set up key **D** is actuated, it is possible that the crane leaves the range of the load charts.
Without a load chart, various display values are no longer displayed on the crane operating screen.
A load on the hook can no longer be monitored by the LICCON overload protection.
Severe accidents due to crane overload can result.
Personnel can be severely injured or killed.
- ▶ Do not leave the range of the load charts.

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WARNING
Danger of accident due to incorrect procedure!
Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.
Key **F4** „Luffing in at suspended load“ and set up key **D** may only be actuated when it is ensured that without their actuation no normal operating status (see section „operating status of the crane“) can be reached.

- ▶ Actuate the set up key **D** only when no normal operating status can be reached with the key **F4** „Luffing in with suspended load“.
- ▶ The set up key **D** may only be actuated by persons who are aware of the effects of their acts regarding the access into the functionality of the LICCON overload protection.
- ▶ Accessing the functionality of the LICCON overload protection requires the presence of an authorized person and must be performed with utmost caution.
- ▶ Accessing the functionality of the LICCON overload protection is prohibited in normal crane operation.

WARNING
Expanded working / danger zone of the crane!
Due to an access the functionality of the LICCON overload protection it is possible that the working / danger zone of the crane is significantly expanded.
If these circumstances are not observed, collisions and accidents can occur.
Personnel can be severely injured or killed.

- ▶ During a special case at operation of the LICCON overload protection take an expanded working / danger zone of the crane into account and monitor it.

WARNING
Overload of crane!
Luffing in / pulling in of a load standing on the ground is not permissible.
When taking on a load by luffing the boom up, the crane can be overloaded.
This could result in serious accidents.

- ▶ Taking on load by luffing up the boom is prohibited.
- ▶ Take on a load solely via the hoist gear.

WARNING
Self-blockade of overload protection (Deadlock)!
After activation of the function „exceeding the shut-off limits of the LICCON overload protection“, if no crane movements that lead immediately to a normal operating status (see section „operating status of the crane“) are initiated, then the overload protection can be self-blocked (Deadlock).
At a self-blocked overload protection it is no longer possible to control the crane.

- ▶ After activation of the function „exceeding the shut-off limits of the LICCON overload protection“ initiate crane movements that lead immediately to a normal operating condition (see section „operating condition of the crane“).

NOTICE
Danger of mix up!
The individual functions of the set up key **D** can only be activated with this key button.
The key buttons on the other LICCON monitors are not assigned with this function.

- ▶ Do not mix up the set up key **D** with the other key buttons.
- ▶ In case of mix up: Deactivate the activated function immediately.

Possible limitation in the crane control during certain „Special cases at operation of the LICCON overload protection“:

- – During certain „Special cases at operation of the LICCON overload protection“ the shut-off limits of the overload protection can be exceeded by pressing the set up key **D** maximum to 110 %.
- – During certain „Special cases at operation of the LICCON overload protection“, the working speed of the crane is significantly reduced.

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- During certain „Special cases at operation of the LICCON overload protection“, the possibility to control the crane is limited in time.
- During certain „Special cases at operation of the LICCON overload protection“, the individual display instruments show no values.

Note

Depending on the number of load positions, the display in the bar diagram utilization **12** changes.

- ▶ If an additional utilization bar appears next to the utilization bar **12.1**, then the description applies accordingly.
- ▶ For a detailed description of the Bar diagram utilization **12**, see Crane operating instructions, chapter 4.02.

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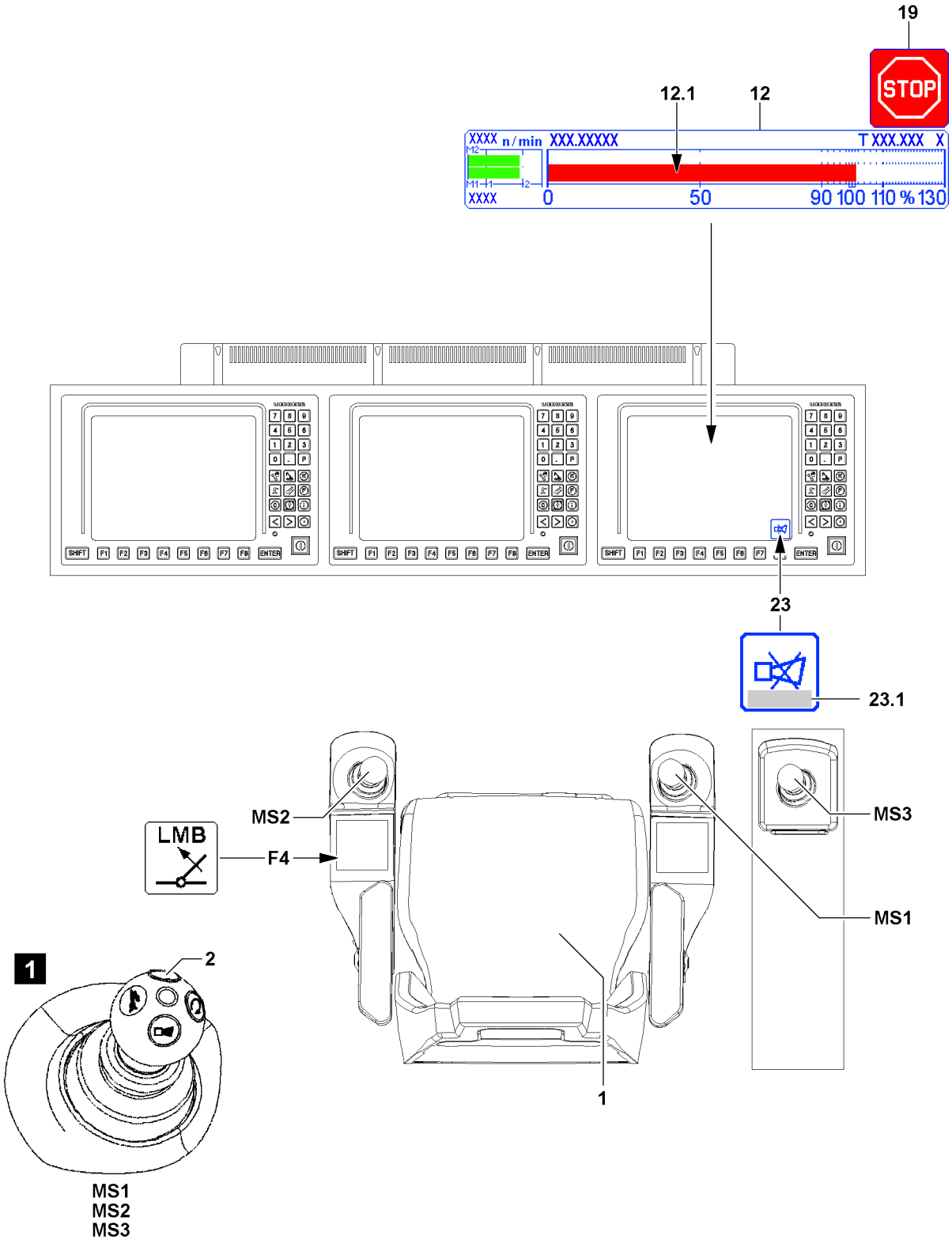

Fig.115286

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2.3.1 Luff in with suspended load

If the maximum permissible load torque is exceeded, the LICCON overload protection turns off all crane movements that increase the load torque.

In the bar diagram utilization **12** (load moment display) the utilization bar **12.1** has exceeded the 100 % mark and in the LICCON monitor appears the icon **19**

This shut-off limit can be exceeded by actuating the button **F4** „Luffing in with suspended load“.

Make sure that the following prerequisites are met:
- The load hangs freely.
- The load hook / hook block and boom system have no ground contact.
- Either the seat contact button **1** or one of the buttons **2** (illustration **1**) of the master switches (MS1, MS2, MS3) is actuated.

Note
If the load is reduced by luffing up or the values in the bar diagram utilization **12** are exceeded too far, then the key **F4** „Luffing in with suspended load“ is possibly not functioning.
- ▶ Pay attention to notes regarding error messages **23.1** occurring in the *horn* icon **23**.
- ▶ For the procedure when the key **F4** „Luffing in with suspended load“ is not functioning, see section „Exceedance of maximum permissible load moment“.

▶ Press the key **F4** „Luffing in with suspended load“ and hold it.

Result:

– The LICCON overload protection is inactive.

▶ Luff the load in.

Result:

– If the crane reaches a normal operation condition, then the icon **19** turns off, normal crane operation is possible again.

The function „Luffing in with suspended load“ is deactivated:
– When the key **F4** „Luffing in with suspended load“ is not longer actuated.
– When neither the seat contact button **1** nor one of the buttons **2** of the master switches (MS1, MS2, MS3) is actuated.

The function „Luffing in with suspended load“ is deactivated:
– The LICCON overload protection is active.

▶ Carry out crane movements in such a way that no repeated shut-off by the LICCON overload protection occurs.

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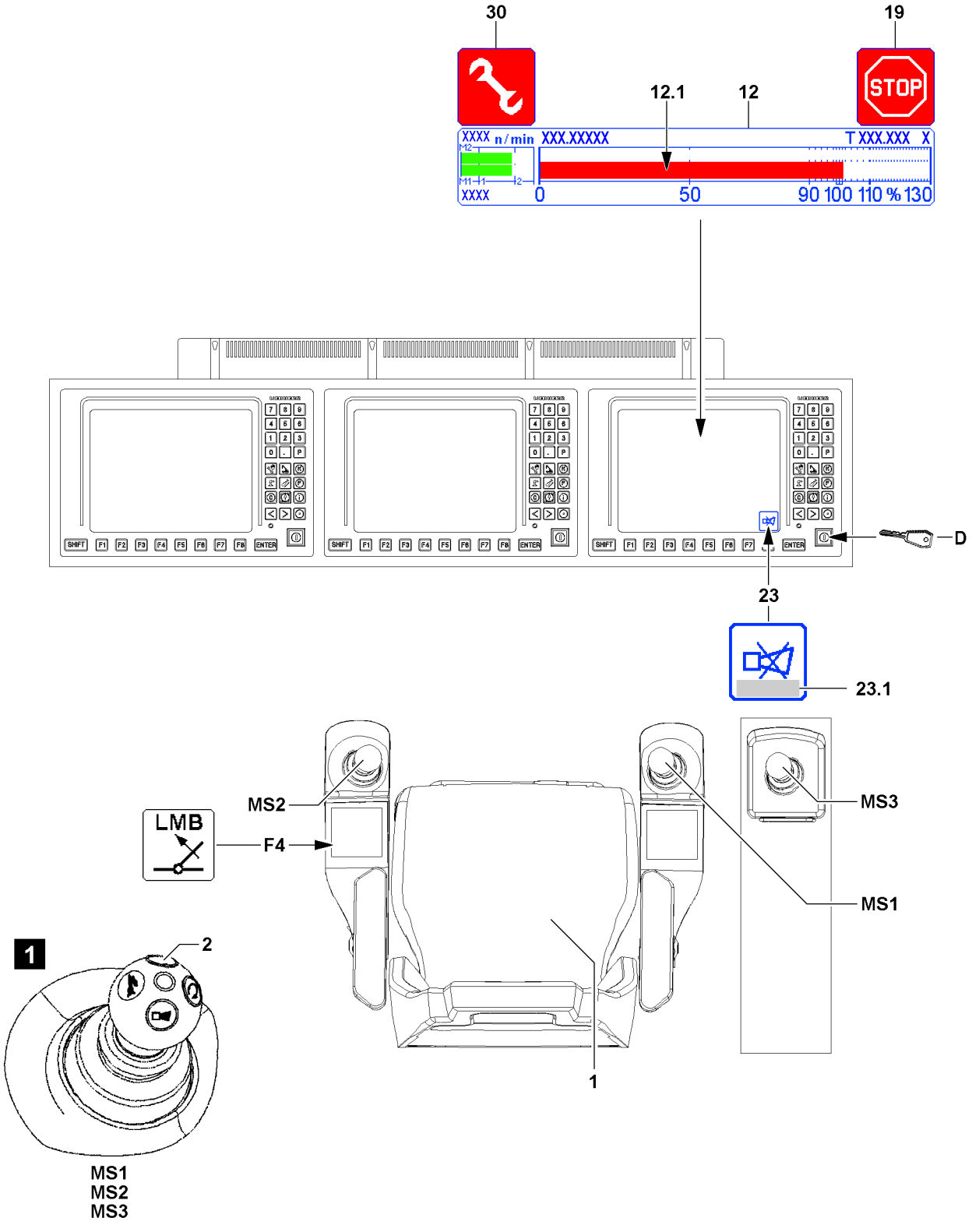

Fig.115287

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2.3.2 To exceed the maximum permissible load moment.

If the maximum permissible load torque is exceeded, the LICCON overload protection turns off all crane movements that increase the load torque.

In the bar diagram utilization **12** (load moment display) the utilization bar **12.1** has exceeded the 100 % mark and in the LICCON monitor appears the icon **19**

This limit value can be exceeded by the set up key **D** in the „right touching“ position.

WARNING
Shut off safety device!
If the function „Exceedance of shut-off limits of LICCON overload protection“ is activated by actuating the set up key **D** then it is possible to exceed the maximum permissible load torque.
▶ All notes regarding the „Special cases at operation of LICCON overload protection“ must be observed.

The set up key **D** on the LICCON monitor has two positions:
– Operating position (not actuated): Crane is in normal operation.
– Position to right (touching): The function „Exceedance of shut-off limits of the LICCON overload protection“ is activated, the assembly icon **30** appears in the LICCON monitor.

Make sure that the following prerequisites are met:
– With the button **F4** „Luffing in with suspended load“ no normal operating condition (utilization below 100 % and no active shut-off) can be reached.
– All master switches (MS1, MS2, MS3) are in the zero position (not deflected).
– Either the seat contact button **1** or one of the buttons **2** (illustration **1**) of the master switches (MS1, MS2, MS3) is actuated.
– The crane is in the range of a load chart.

Note
If the values in the bar diagram utilization **12** are exceeded too far, then the functionality of the set up key **D** may be disabled.
▶ Pay attention to notes regarding error messages **23.1** occurring in the *horn* icon **23**.

▶ Turn the set up key **D** to the right (touching).

Result:

– The LICCON overload protection is inactive.
– The assembly icon **30** appears in the LICCON monitor.

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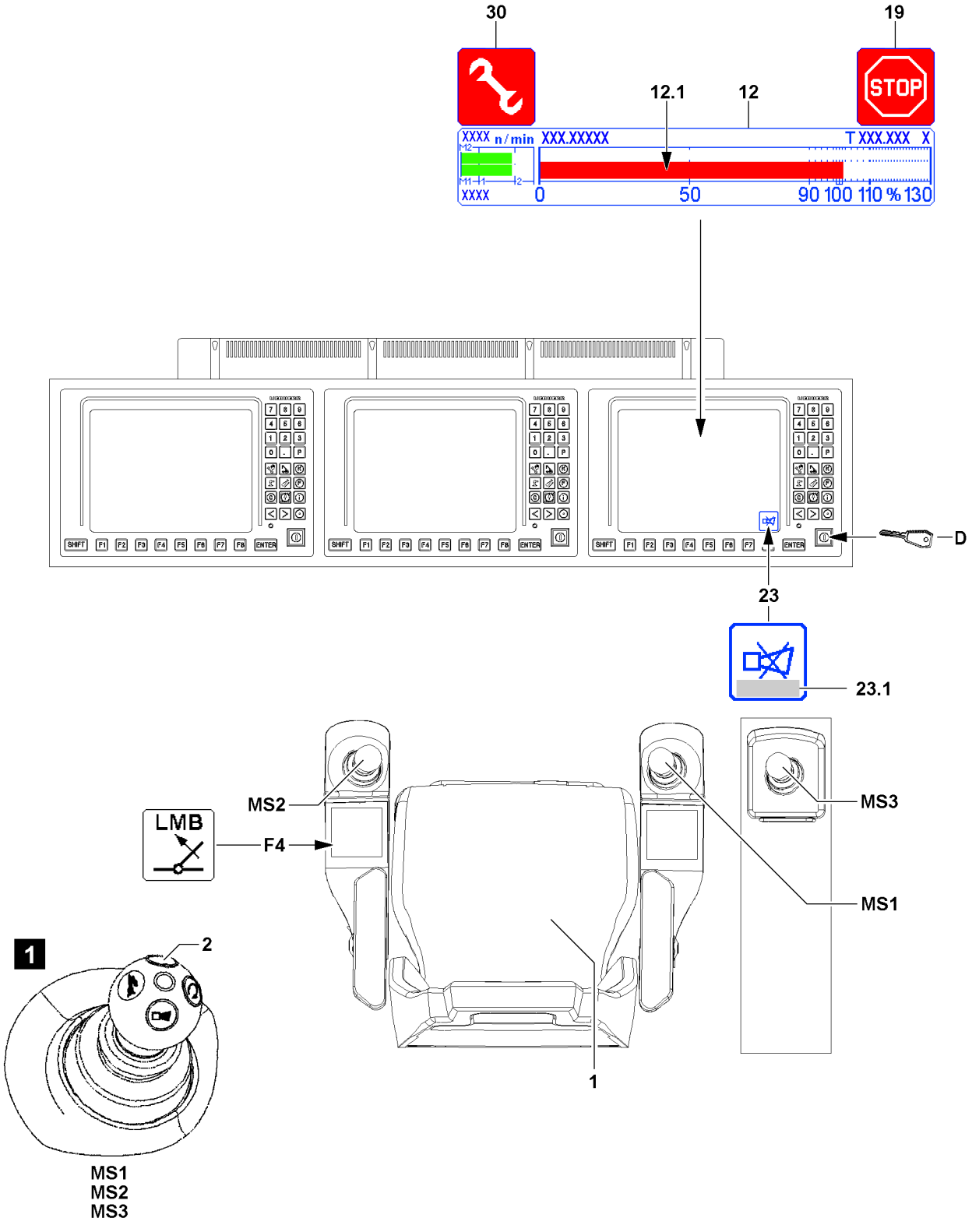

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▶ Initiate crane movements which lead immediately to a normal operating condition (see section „operating condition of the crane“).

Result:

– If the crane reaches a normal operating condition, the function „Exceeding the shut-off limits of the LICCON overload protection“ turns off - the assembly icon **30** turns off.

The function „Exceedance of shut-off limits of LICCON overload protection“ turns off immediately also:
– If the set up key **D** is actuated again.
– If all master switches (MS1, MS2, MS3) are in zero position for 10 seconds.
– When neither the seat contact button **1** nor one of the buttons **2** of the master switches (MS1, MS2, MS3) is actuated.
– When a *hoist top* shut-off occurs.

Note
▶ The function „Exceedance of shut-off limits of the LICCON overload protection“ is only turned off when the assembly icon **30** in the LICCON monitor turns off.
▶ If the function „Exceedance of shut-off limits of the LICCON overload protection“ does not turn off after pressing the set up key **D** once, then press the set up key **D** again until the assembly icon **30** in the LICCON monitor turns off.

The function „Exceedance of shut-off limits of the LICCON overload protection“ has / was shut off:
– The assembly icon **30** in the LICCON monitor turns off.
– The working speed is possibly reduced until all master switches (MS1, MS2, MS3) are in the zero position at the same time.

▶ Make sure that the assembly icon **30** no longer appears in the LICCON monitor.
▶ Carry out crane movements in such a way that no repeated shut-off by the LICCON overload protection occurs.

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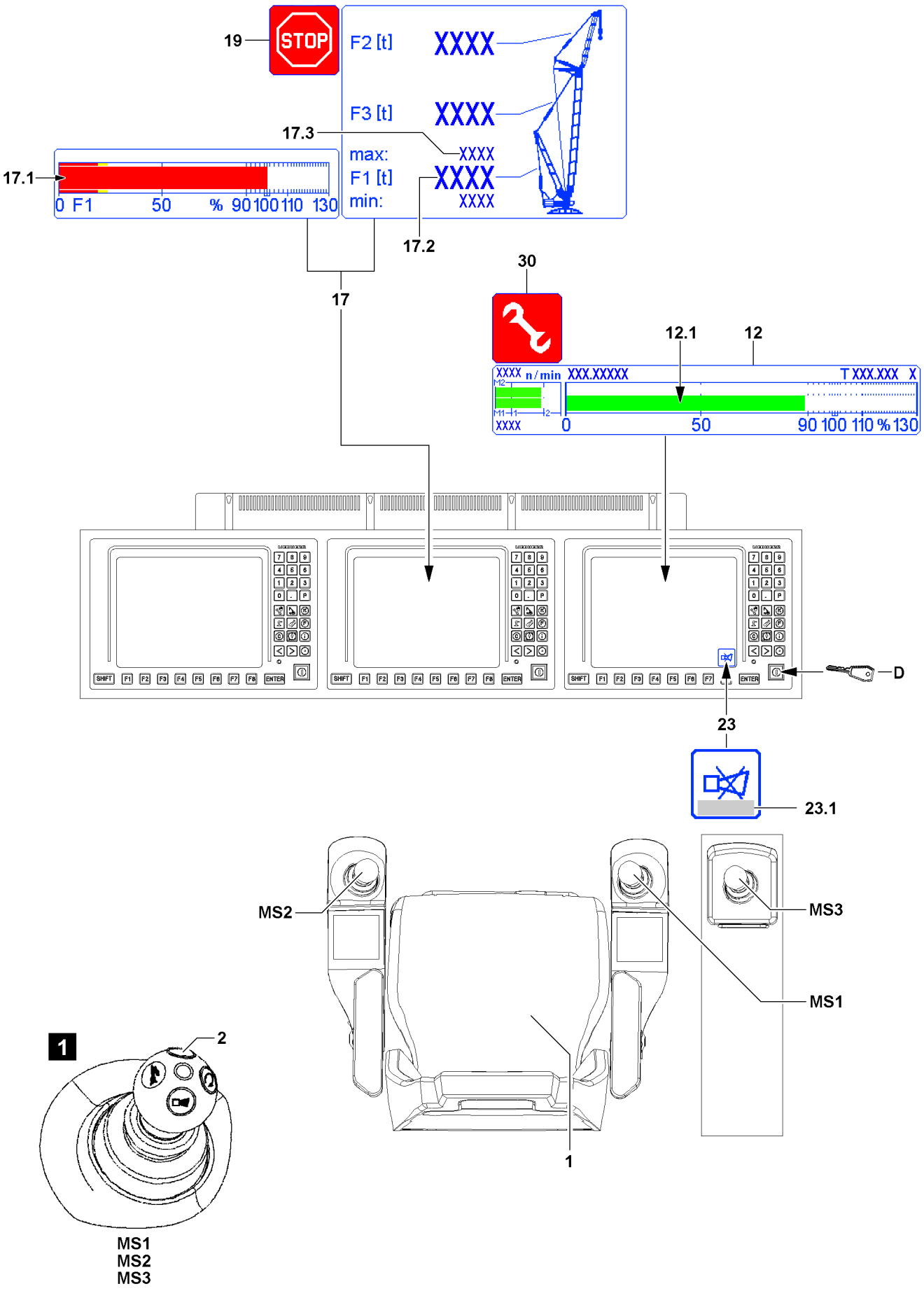

Fig.115288

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2.3.3 To exceed the maximum value of the F-load display in crane operation.

The illustration of the F-load display **17** depends on the set up configuration of the crane and can vary. The values for test point 2 (force F2) and test point 3 (force F3) are possibly shown.

WARNING
Shut off safety device!
By pressing the set up key **D** if the maximum value of the F-load display is exceeded, then the function „Exceedance of shut-off limits of the LICCON overload protection“ is automatically activated Thus there is no shut-off if the maximum permissible load moment is exceeded.

- ▶ All notes regarding the „Special cases at operation of LICCON overload protection“ must be observed.
- ▶ The utilization bar **12.1** of the bar diagram utilization **12** must be observed.
- ▶ The F1-utilization bar **17.1** of the F-load display **17** must be observed.

Note

- ▶ The force determined on test point 1 is generally described as $F1_{actual}$ (actual value F1).
- ▶ In the F1-load display **17**, the force ratio is shown as number values as well as a bar display (called F1-bar display).
- ▶ The value $F1_{max}$ **17.3** corresponds to 100 % in the F1-bar display.
- ▶ The F1-utilization bar **17.1** shows the relationship $F1_{actual}$ **17.2** to $F1_{max}$ **17.3**.

Note

- ▶ See also section „Minimum values or maximum values of F-load display reached“.

In the F1-load display **17** the utilization bar_{actual} **17.1** exceeds the 100 % mark and the LICCON overload protection has shut off the crane movement. The value $F1_{actual}$ **17.2** has exceeded the value $F1_{max}$ **17.3**.

All other movements, which lead to a decline of the force ratio in the F-load display **17** are turned off.

The LICCON monitor with the derrick operating screen displays the icon **19**.

Note
If the values in the F-load display **17** or in the bar diagram utilization **12** are outside the permissible range, then the functionality of the set up key **D** may be disabled.

- ▶ Pay attention to notes regarding error messages **23.1** occurring in the *horn* icon **23**.

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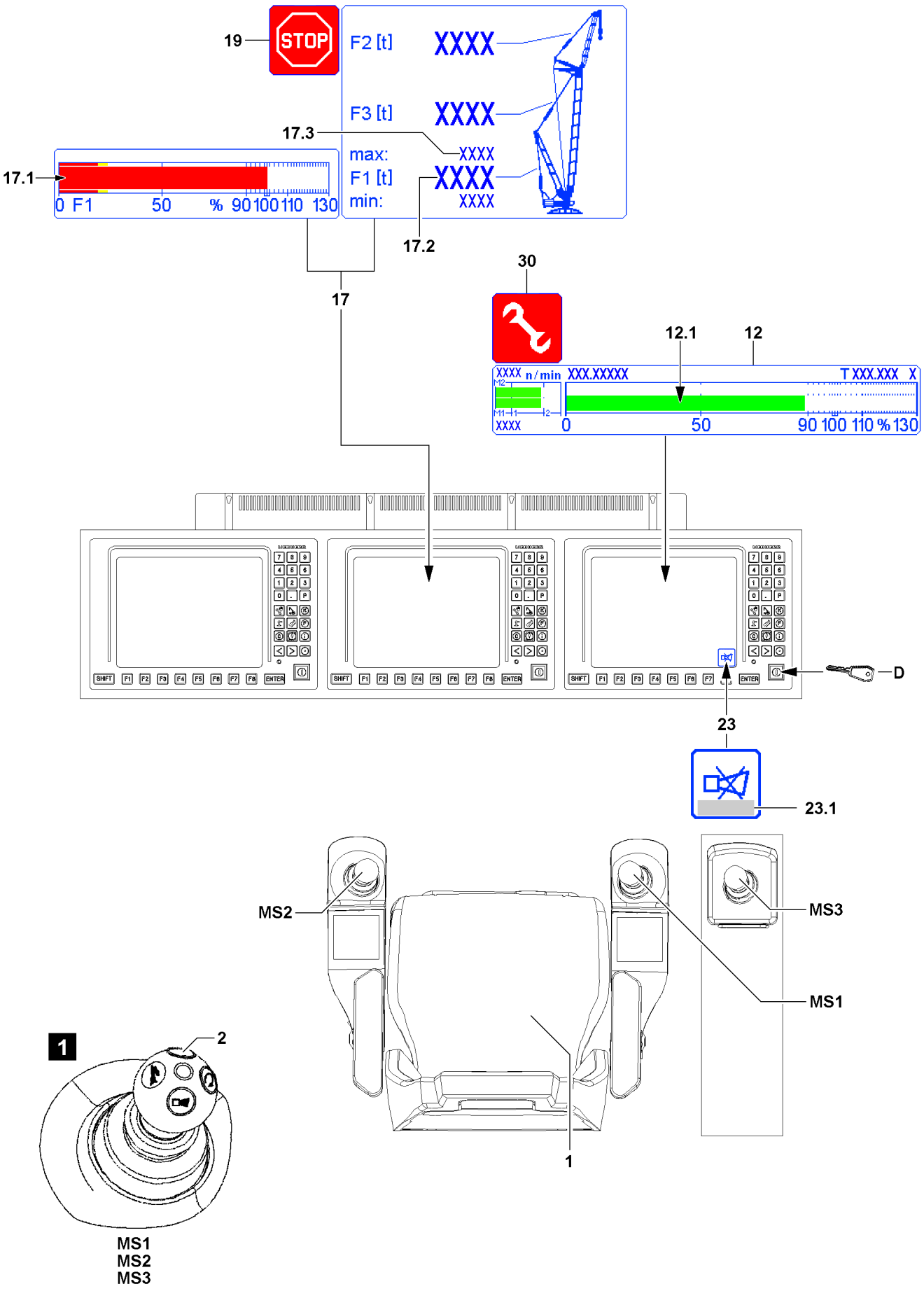

Fig.115288

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Make sure that the following prerequisites are met:
- All master switches (MS1, MS2, MS3) are in the zero position (not deflected).
- Either the seat contact button **1** or one of the buttons **2** (illustration **1**) of the master switches (MS1, MS2, MS3) is actuated.
- The crane is in the range of a load chart.

▶ Turn the set up key **D** to the right (touching).

Result:

– The function „Exceedance of shut-off limits of the LICCON overload protection“ is activated. As a result the maximum value of the F-load display can be exceeded.
– The assembly icon **30** appears.
– $F1_{max}$ **17.3** can be exceeded.

▶ Initiate crane movements which lead immediately to a normal operating condition (see section „operating condition of the crane“).

Result:

– If the crane reaches a normal operating condition, the function „Exceeding the shut-off limits of the LICCON overload protection“ turns off - the assembly icon **30** turns off.

The function „Exceedance of shut-off limits of LICCON overload protection“ turns off immediately also:
– If the set up key **D** is actuated again.
– If all master switches (MS1, MS2, MS3) are in the zero position for 10 seconds (with load chart available).
– When neither the seat contact button **1** nor one of the buttons **2** of the master switches (MS1, MS2, MS3) is actuated.
– When a *hoist top* shut-off occurs.

Note
▶ The function „Exceedance of shut-off limits of the LICCON overload protection“ is only turned off when the assembly icon **30** in the LICCON monitor turns off.
▶ If the function „Exceedance of shut-off limits of the LICCON overload protection“ does not turn off after pressing the set up key **D** once, then press the set up key **D** again until the assembly icon **30** in the LICCON monitor turns off.

The function „Exceedance of shut-off limits of the LICCON overload protection“ has / was shut off:
– The assembly icon **30** in the LICCON monitor turns off.
– The working speed is possibly reduced until all master switches (MS1, MS2, MS3) are in the zero position at the same time.

▶ Make sure that the assembly icon **30** no longer appears in the LICCON monitor.
▶ Carry out crane movements in such a way that no repeated shut-off by the LICCON overload protection occurs.

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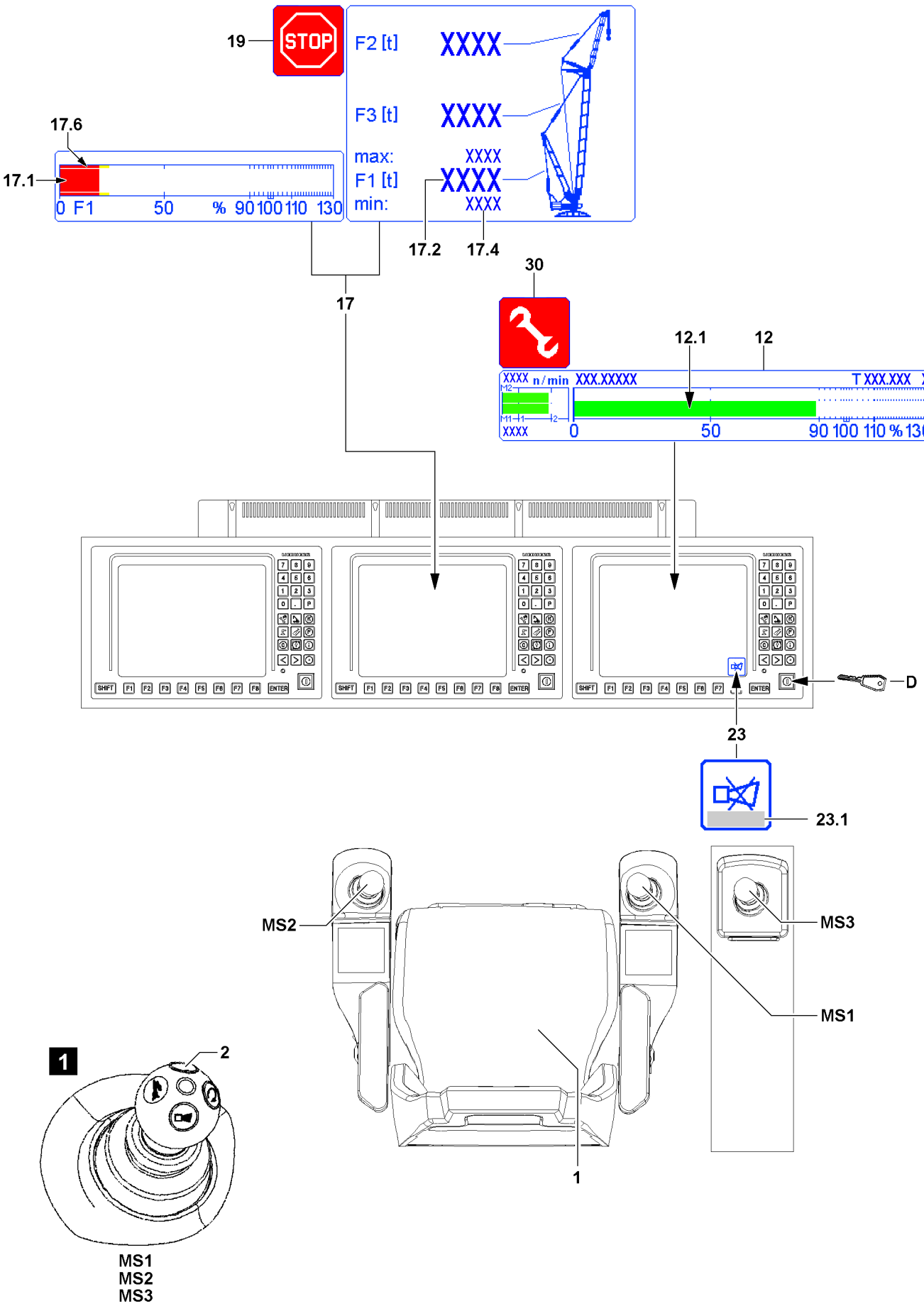

Fig.115307

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2.3.4 Falling below the minimum value of the F-load display in crane operation

The illustration of the F-load display **17** depends on the set up configuration of the crane and can vary. The values for test point 2 (force F2) and test point 3 (force F3) are possibly shown.

WARNING
Shut off safety device!
By pressing the set up key **D** if the minimum value of the F-load display is fallen below, then the function „Exceedance of shut-off limits of the LICCON overload protection“ is automatically activated Thus there is no shut-off if the maximum permissible load moment is exceeded.

- ▶ All notes regarding the „Special cases at operation of LICCON overload protection“ must be observed.
- ▶ The utilization bar **12.1** of the bar diagram utilization **12** must be observed.
- ▶ The F1-utilization bar **17.1** of the F-load display **17** must be observed.

Note

- ▶ The force determined on test point 1 is generally described as $F1_{actual}$ (actual value F1).
- ▶ In the F1-load display **17**, the force ratio is shown as number values as well as a bar display (called F1-bar display).
- ▶ The value $F1_{max}$ **17.3** corresponds to 100 % in the F1-bar display.
- ▶ The F1-utilization bar **17.1** shows the relationship $F1_{actual}$ **17.2** to $F1_{max}$ **17.3**.

Note

- ▶ See also section „Minimum values or maximum values of F-load display reached“.

In the F1-load display **17** the utilization bar_{actual} **17.1** falls below the $F1_{min}$-STOP-Bar **17.6** and the LICCON overload protection has shut off the crane movement. The value $F1_{actual}$ **17.2** has fallen below the value $F1_{min}$ **17.4**.

All other movements, which lead to a decline of the force ratio in the F-load display **17** are turned off.

The LICCON monitor with the derrick operating screen displays the icon **19**.

Note
If the values in the F-load display **17** or in the bar diagram utilization **12** are outside the permissible range, then the functionality of the set up key **D** may be disabled.

- ▶ Pay attention to notes regarding error messages **23.1** occurring in the *horn* icon **23**.

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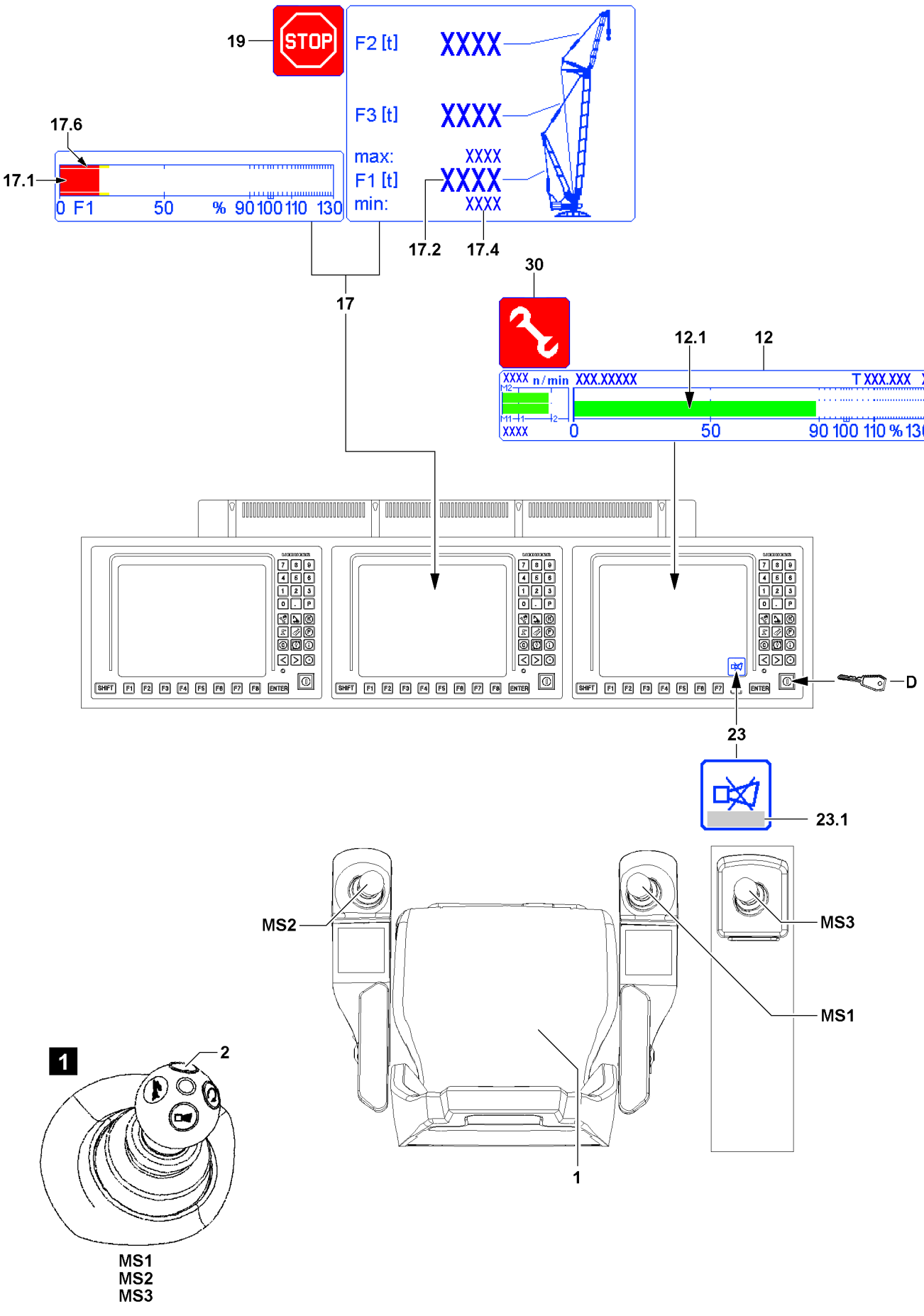

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Make sure that the following prerequisites are met:
- All master switches (MS1, MS2, MS3) are in the zero position (not deflected).
- Either the seat contact button **1** or one of the buttons **2** (illustration **1**) of the master switches (MS1, MS2, MS3) is actuated.
- The crane is in the range of a load chart.

▶ Turn the set up key **D** to the right (touching).

Result:

– The function „Exceedance of shut-off limits of the LICCON overload protection“ is activated. As a result the minimum value of the F-load display can be fallen below.
– The assembly icon **30** appears.
– $F1_{min}$ **17.4** can be fallen below.

▶ Initiate crane movements which lead immediately to a normal operating condition (see section „operating condition of the crane“).

Result:

– If the crane reaches a normal operating condition, the function „Exceeding the shut-off limits of the LICCON overload protection“ turns off - the assembly icon **30** turns off.

The function „Exceedance of shut-off limits of LICCON overload protection“ turns off immediately also:
– If the set up key **D** is actuated again.
– If all master switches (MS1, MS2, MS3) are in the zero position for 10 seconds (with load chart available).
– When neither the seat contact button **1** nor one of the buttons **2** of the master switches (MS1, MS2, MS3) is actuated.
– When a *hoist top* shut-off occurs.

Note
▶ The function „Exceedance of shut-off limits of the LICCON overload protection“ is only turned off when the assembly icon **30** in the LICCON monitor turns off.
▶ If the function „Exceedance of shut-off limits of the LICCON overload protection“ does not turn off after pressing the set up key **D** once, then press the set up key **D** again until the assembly icon **30** in the LICCON monitor turns off.

The function „Exceedance of shut-off limits of the LICCON overload protection“ has / was shut off:
– The assembly icon **30** in the LICCON monitor turns off.
– The working speed is possibly reduced until all master switches (MS1, MS2, MS3) are in the zero position at the same time.

▶ Make sure that the assembly icon **30** no longer appears in the LICCON monitor.
▶ Carry out crane movements in such a way that no repeated shut-off by the LICCON overload protection occurs.

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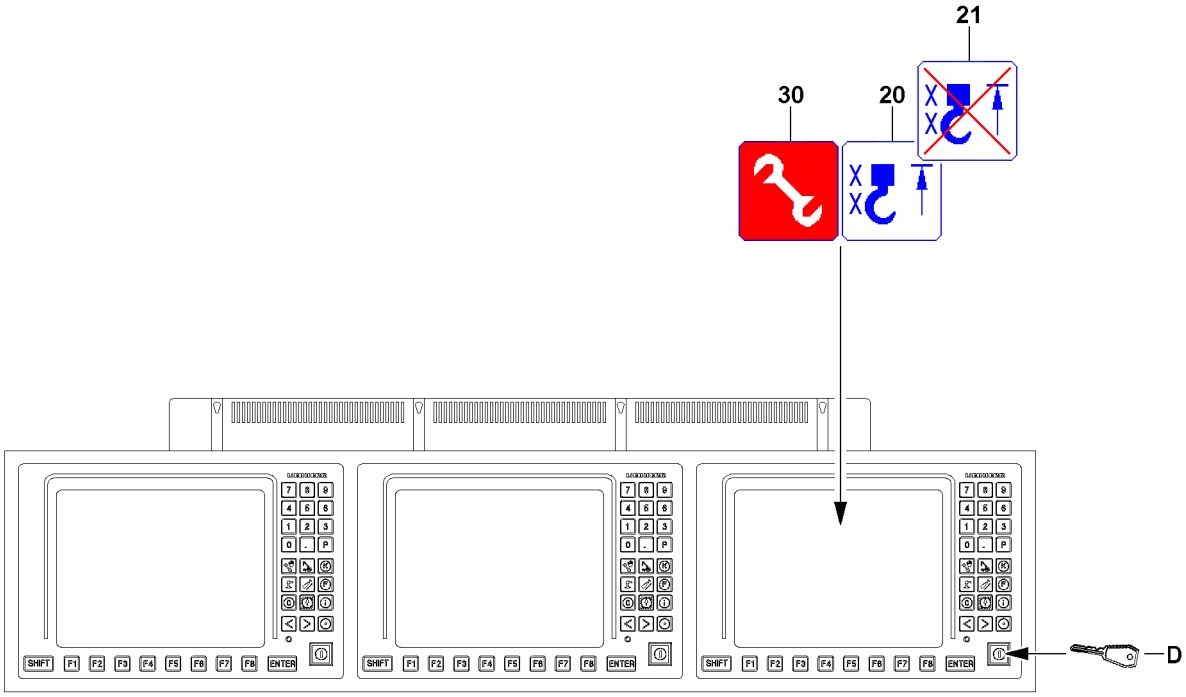

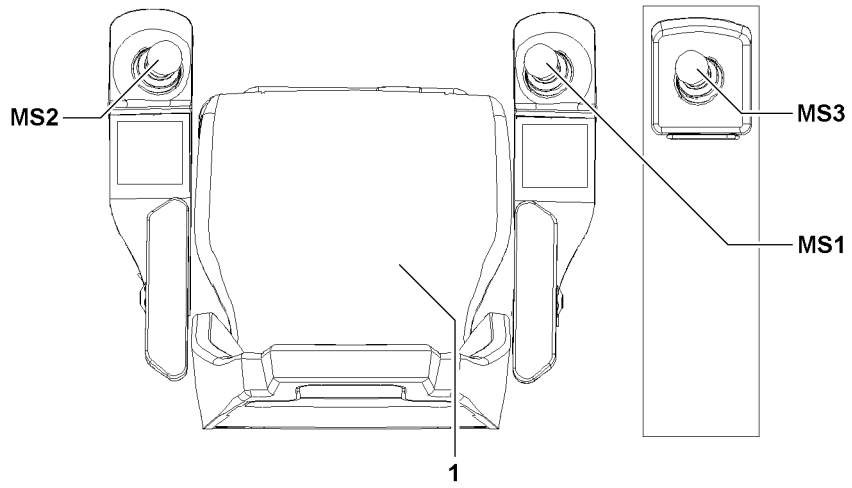

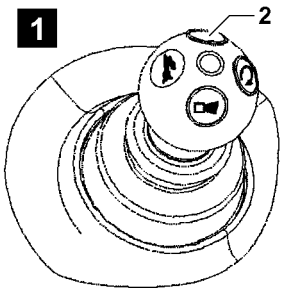

MS1
MS2
MS3

Fig.115289

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2.4 Bypassing the *hoist top* shut-off

WARNING
Improper use of the function „Bypass of hoist top shut-off“!
- ▶ The function „Bypass of hoist top shut-off“ may never be used to increase the lifting height during crane operation.

WARNING
Property damage and falling load!
If the function „Bypass of hoist top shut off“ is activated, there is the danger that the hook (hook block / load hook) is pulled against the pulley head.
This danger exists especially when the hoist winch is continued to be spooled up and for crane movements which have an influence on the hoist rope, for example luffing the boom, the auxiliary boom / accessory or the derrick boom.
Property damage and falling load can result.
Personnel can be severely injured or killed.
- ▶ The function „Bypass of hoist top shut-off“ may only be carried out by an authorized person, along with a guide. The guide must be in direct contact with the crane operator and must continually monitor the distance between the hook block / load hook and the boom head.
- ▶ Carry out all crane movements with utmost caution.

Note
- ▶ A bypass of the *hoist top* shut-off is only possible when the shut-off has already occurred due to a triggered hoist limit switch.
- ▶ With actuated set up key **D** (assembly icon **30** appears in the LICCON monitor) if a hoist limit switch is triggered, then there is a new shut-off of crane movements.
- ▶ For assembly purposes or in emergency cases, if the activation of the function „Bypass of hoist top shut-off“ **and** activation of the function „Exceedance of shut-off limits of the LICCON overload protection“ is necessary, then the set up key **D** must be actuated until the icon **21** and assembly icon **30** appear.

Spooling the hoist winch up was turned off because the hook (hook block / load hook) has touched a hoist limit switch weight during the upward movement and the affected hoist limit switch was triggered.

Make sure that the following prerequisites are met:
- – A *hoist top* shut-off has occurred, the *hoist top* icon **20** appears in the LICCON monitor.
- – Either the seat contact button **1** or one of the buttons **2** (illustration **1**) of the master switches (MS1, MS2, MS3) is actuated.
- – All master switches (MS1, MS2, MS3) are in the zero position (not deflected).

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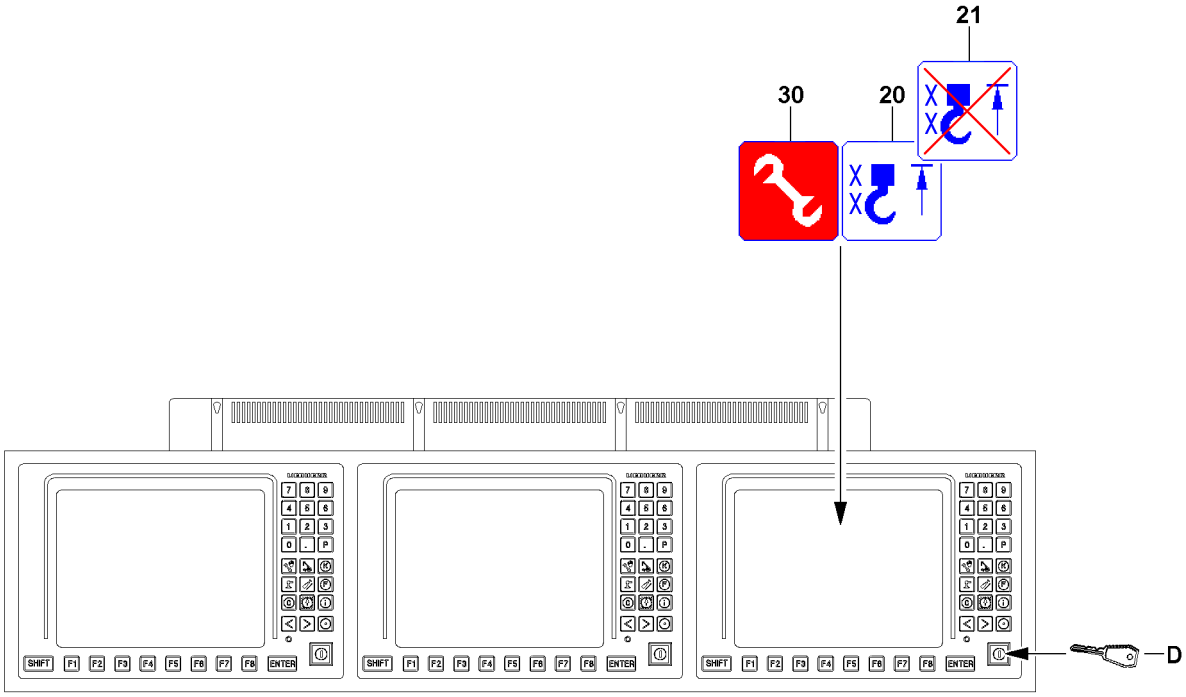

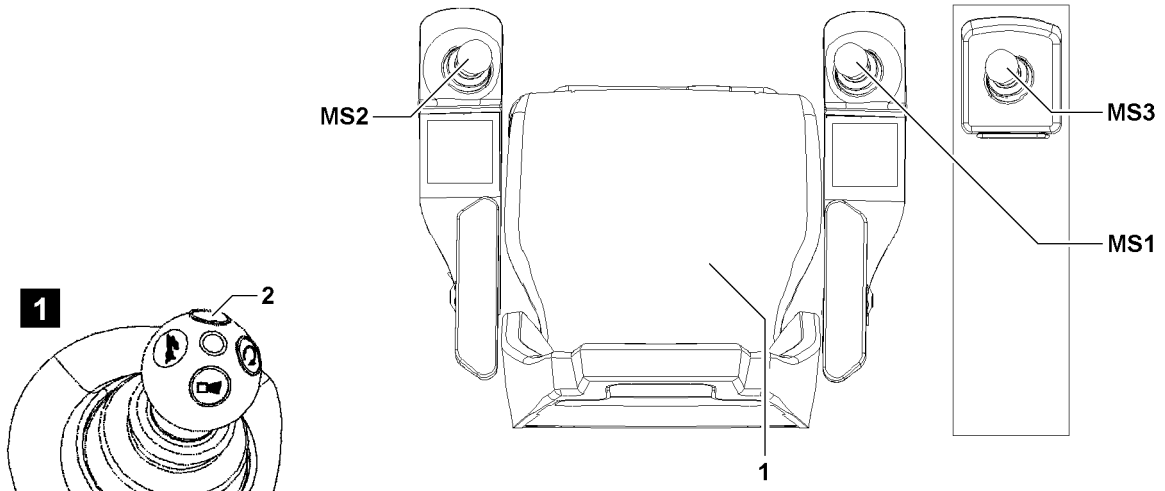

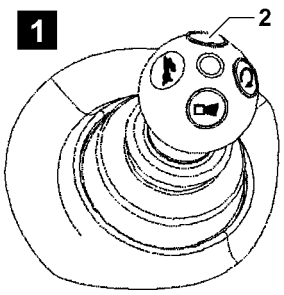

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– To bypass the *hoist top* shut-off, a combined actuation of the set up key **D** and at least one master switch is required.

▶ Turn the set up key **D** to the right (touching).

Result:

– The assembly icon **30** (assembly operation) appears in the LICCON monitor.
– The *hoist top* icon **20** in the LICCON monitor changes to the icon **21**.

Within 10 seconds, if the master switch to lift the hoist gear is deflected, the hoist limit switches are bypassed. The bypass of the *hoist top* shut-off remains active only as long as the master switch is deflected.

▶ Carry out a crane movement with utmost caution and by taking the safety guidelines into account.

The function „Bypass of the hoist top shut-off“ turns off:
– If the set up key **D** is actuated again.
– When no master switch (MS1, MS2, MS3) was deflected for 10 seconds.
– When neither the seat contact button **1** nor one of the buttons **2** of the master switches (MS1, MS2, MS3) is actuated.
– If there is no longer a shut-off of a hoist limit switch.

The function „Bypass of the hoist top shut-off“ has / was turned off:
– The assembly icon **30** (assembly operation) in the LICCON monitor turns off.
– The icon **21** on the LICCON monitor turns off.

▶ Make sure that the assembly icon or the assembly icon **30** (assembly operation) as well as the icon **21** no longer appear in the LICCON monitor.
▶ Carry out the crane movements in such a way that no repeated *hoist top* shut-off occurs.

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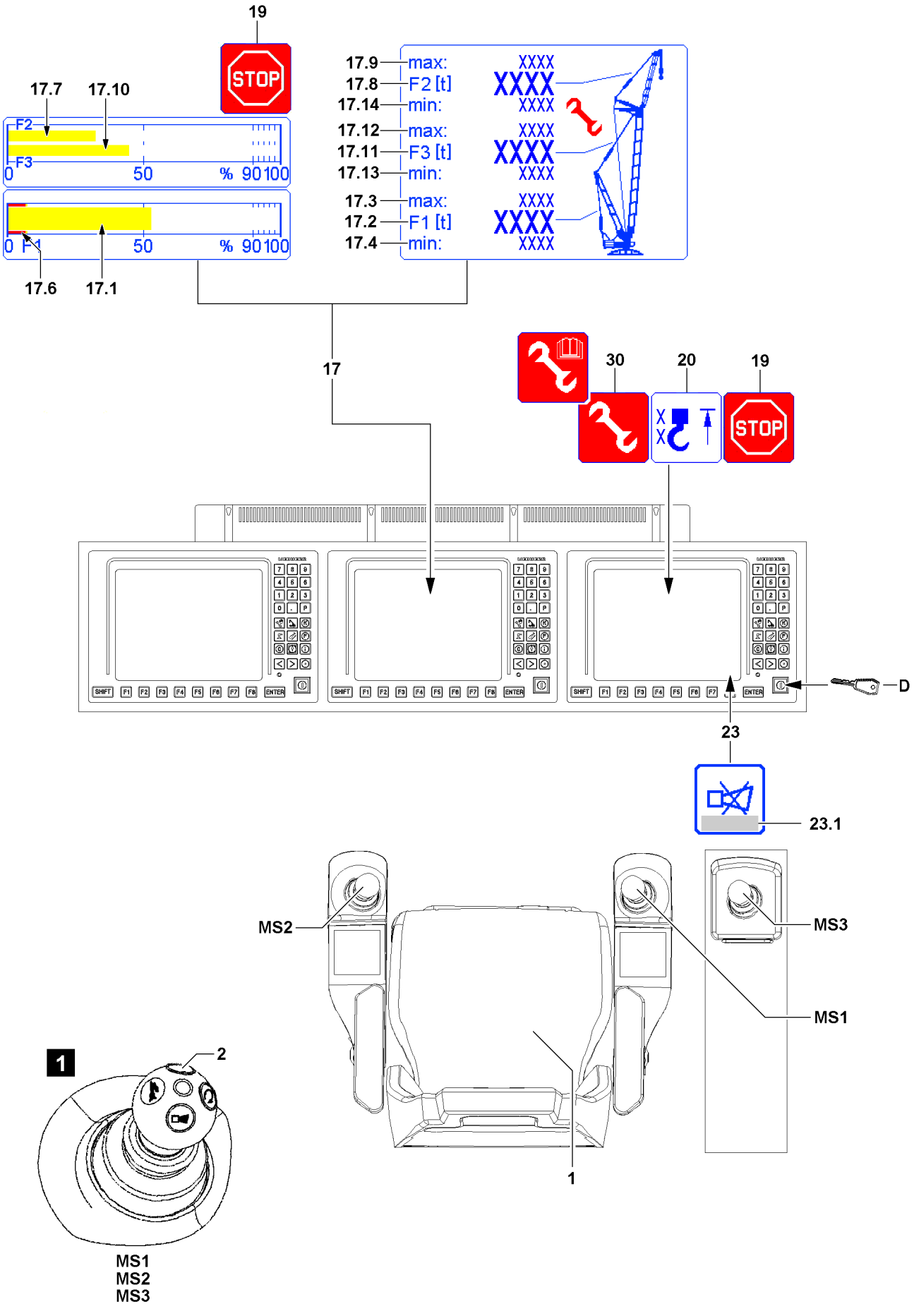

Fig.122457

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2.5 Carrying out the erection / take down procedures

To carry out the erection / take down procedures and assembly procedures, the LICCON overload protection can be bypassed by the set up key **D**.

Note

- ▶ If the crane is in the range „No load chart available“ then there is a shut-off of the crane control by the LICCON overload protection. The icon **19** appears in the LICCON monitor.
- ▶ By pressing the set up key **D** all erection / take down procedures and assembly procedures can be carried out according to the specifications in the crane documentation.

WARNING

Danger of accident during erection / take down procedures!
If the specifications of the crane documentation are not observed, the crane can collapse, the boom can break off or the crane can topple over.
Personnel can be severely injured or killed.

- ▶ Make sure to adhere to all specifications in the crane documentation.
- ▶ Make sure to observe the data in the crane documentation (for example erection / take-down charts and assembly instructions).
- ▶ Press the set up key **D** only when the set up configuration has been entered correctly in the LICCON computer system and matches the actual situation.

WARNING

Damage, overload and toppling of the crane!
If the permissible values of the F-load display **17** are exceeded / fallen below, then the crane can be damaged or overloaded and topple over.
As long as the set up boom system is not completely assembled and not all sensors, which are required for this operating mode are electrically connected, no maximum forces and minimum forces are displayed in the F-load display **17**.
In these cases it must be determined with the assembly drawing which maximum forces are permissible in the F-load display **17**.
These maximum forces must be monitored by the crane operator and may not be exceeded during set up / take down of the crane.

- ▶ The crane operator must ensure that the permissible values of the F-load display **17** are not exceeded / fallen below.
- ▶ Observe and adhere to the maximum forces for the F-load display **17** from the assembly drawings.

Display area of F-load display **17**:

- F1-load display
  The force determined on test point 1 is generally described as $F1_{actual}$.
- F2-load display
  The force determined on test point 2 is generally described as $F2_{actual}$.
  Note: Appears only for the corresponding boom system.
  The F2-utilization bar **17.7** only appears in assembly operation (no load chart available and set up key **D** actuated).
- F3-load display
  The force determined on test point 3 is generally described as $F3_{actual}$.
  Note: Appears only for the corresponding boom system.
  The F3-utilization bar **17.10** only appears in assembly operation (no load chart available and set up key **D** actuated).

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Note

In the F-load display **17**, the force ratio is shown as number values as well as a bar display (called F-bar display).

The permissible maximum value corresponds to 100 % in the bar display.

- The F1-utilization bar **17.1** shows the relationship $F1_{actual}$ **17.2** to $F1_{max}$ **17.3**.
- The value $F1_{min}$ **17.4** corresponds to the $F1_{min}$-STOP-bar **17.6**.
- The F2-utilization bar **17.7** shows the relationship $F2_{actual}$ **17.8** to $F2_{max}$ **17.9**.
- The F3-utilization bar **17.10** shows the relationship $F3_{actual}$ **17.11** to $F3_{max}$ **17.12**.
- The value $F3_{min}$ **17.13** appears solely in special situations, for example during the erection of the derrick boom. The value $F2_{min}$ **17.14** appears solely for certain crane types in special situations. If no minimum values F_{min} appear, then the data in the crane documentation (for example erection / take-down charts and assembly instructions) must be observed.
- When leaving the range „load chart available“ the display of the assembly icon **30** changes.

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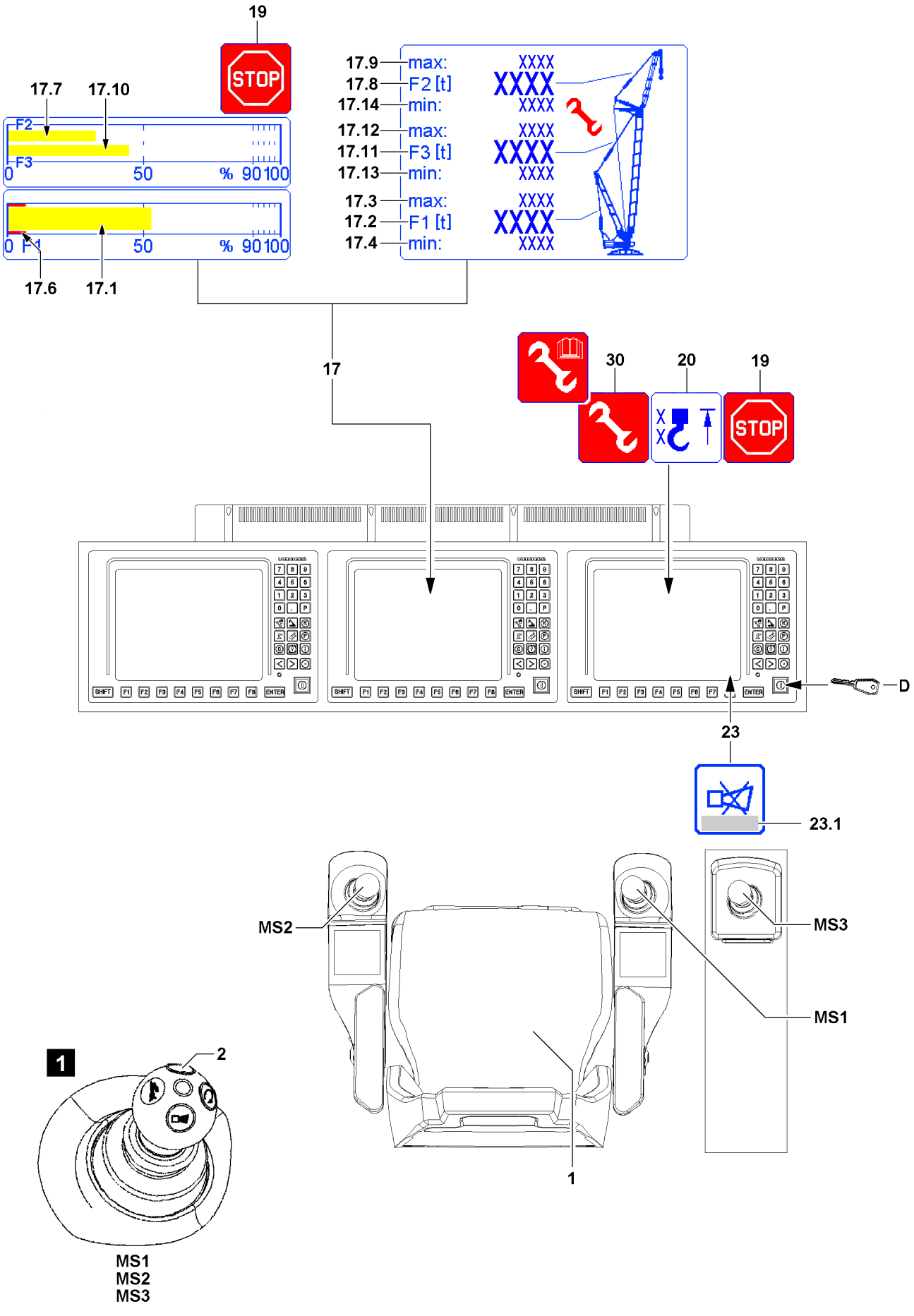

Fig.122457

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2.5.1 Carrying out erection procedures

Make sure that the following prerequisites are met:
- The set up configuration corresponds to the specifications in the crane documentation.
- The set up configuration has been entered correctly into the LICCON computer system.
- All master switches (MS1, MS2, MS3) are in the zero position (not deflected).
- Either the seat contact button **1** or one of the buttons **2** (illustration **1**) of the master switches (MS1, MS2, MS3) is actuated.

Note

▶ Depending on the situation, the *hoist top* shut-off (icon **20** appears) must be bypassed at the same time.

▶ Turn the set up key **D** to the right (touching).

Result:

- The assembly icon **30** appears.
- The erection procedure can be carried out.

Problem remedy

The functionality of the set up key **D** is disabled by the crane control?

▶ Pay attention to notes regarding error messages **23.1** occurring in the *horn* icon **23**.
▶ Check the electrical connections.
▶ Check if all sensors or dummy plugs with integrated electric have been connected properly.

▶ Luff the boom according to the specifications of the crane documentation.
▶ Monitor the F-load display **17**, all values must be within the minimum values and the maximum values.

Problem remedy

The erection / take down procedure cannot be carried out due to exceeding of the minimum or maximum values?

▶ See section „Minimum values or maximum values of F-load display reached“.

The „Bypass of the LICCON overload protection“ via the set up key **D** turns off:
- If the set up key **D** is actuated again.
- When an range with existing load chart is reached (erection procedure).
- If all master switches (MS1, MS2, MS3) are in the zero position for 10 seconds (with „Load chart available“).
- When neither the seat contact button **1** nor one of the buttons **2** of the master switches (MS1, MS2, MS3) is actuated.

The function „Exceedance of shut-off limits of the LICCON overload protection“ has / was shut off:
- The assembly icon **30** in the LICCON monitor turns off.

▶ After completion of the erection / take down procedures, make sure that the assembly icon **30** no longer appears in the LICCON monitor.

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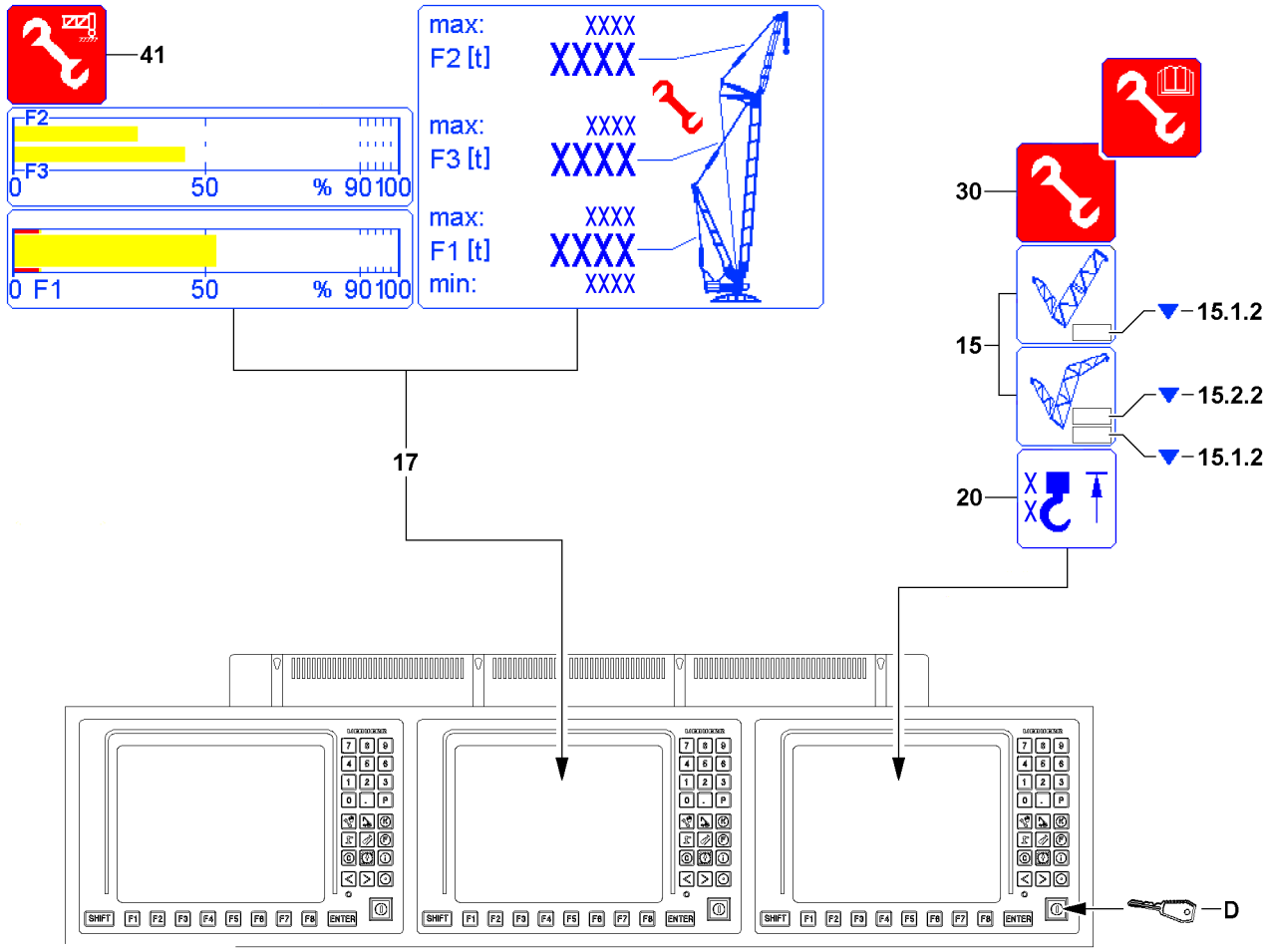

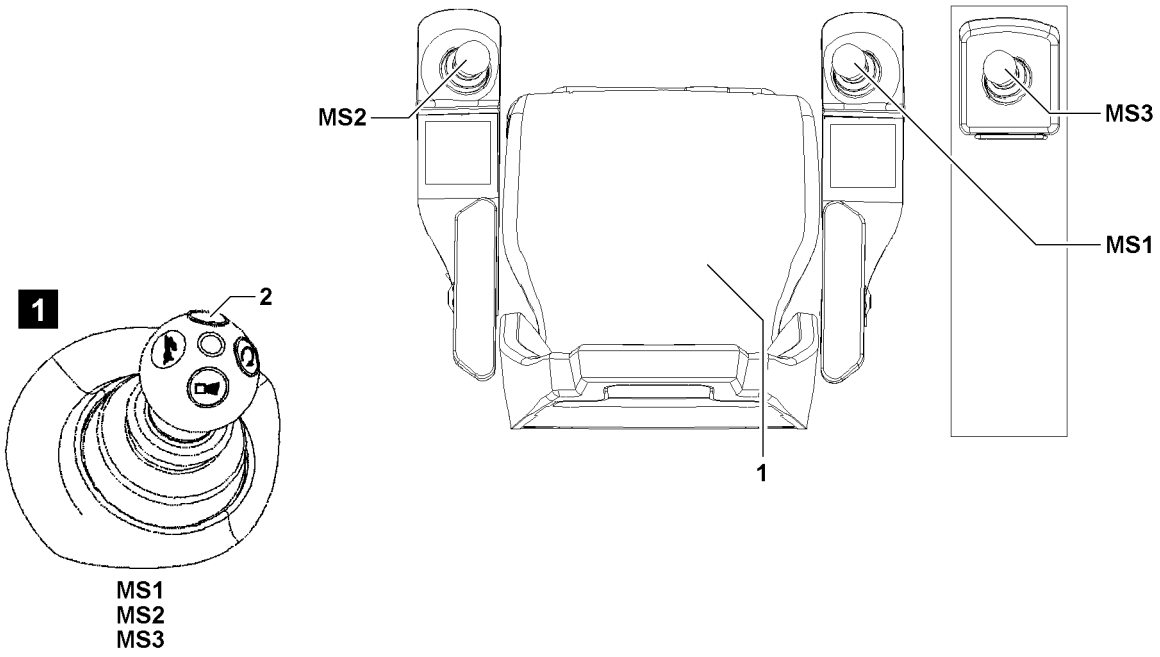

Fig.125391

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2.5.2 Carrying out take down procedures

WARNING
Danger of accidents when taking the boom system down!
When the shut-off *luffing the main boom / auxiliary boom / accessory down* is bypassed, then the LICCON overload protection as a whole is deactivated, bypassed or limited.
The main boom and / or auxiliary boom / accessory can be luffed from the range of the load chart.
In case of deviations from the specifications of the crane documentation, severe accidents can be the result.
Personnel can be severely injured or killed.
▶ Always proceed according to the specifications of the crane documentation.
▶ Carry out all crane movements with utmost caution.

Make sure that the following prerequisites are met:
– With installed main boom / auxiliary boom / accessory: In the icon **15** the arrow **15.1.2** or arrow **15.2.2** appears and the LICCON overload protection has shut off the crane movement.
– Either the seat contact button **1** or one of the buttons **2** (illustration **1**) of the master switches (MS1, MS2, MS3) is actuated.
– All master switches (MS1, MS2, MS3) are in the zero position (not deflected).
– There is no load on the hook (hook block / load hook).
– If necessary, the hook (hook block / load hook) is placed on the ground.
– The set up configuration corresponds to the specifications in the crane documentation.
– The set up configuration has been entered correctly into the LICCON computer system.

Note
▶ When leaving the range „load chart available“, the limit values and utilization displays for value F2 and value F3 will possibly appear.
▶ When leaving the range „load chart available“ the display of the assembly icon **30** changes.

▶ Turn the set up key **D** to the right (touching).

Result:

– The assembly icon **30** appears in the LICCON monitor.
– The take down procedure can be carried out.

▶ Luff the boom according to the specifications of the crane documentation.
▶ Monitor the F-load display **17**, all values must be within the minimum values and the maximum values.

Problem remedy
The erection / take down procedure cannot be carried out due to exceeding of the minimum or maximum values?
▶ See section „Minimum values or maximum values of F-load display reached“.

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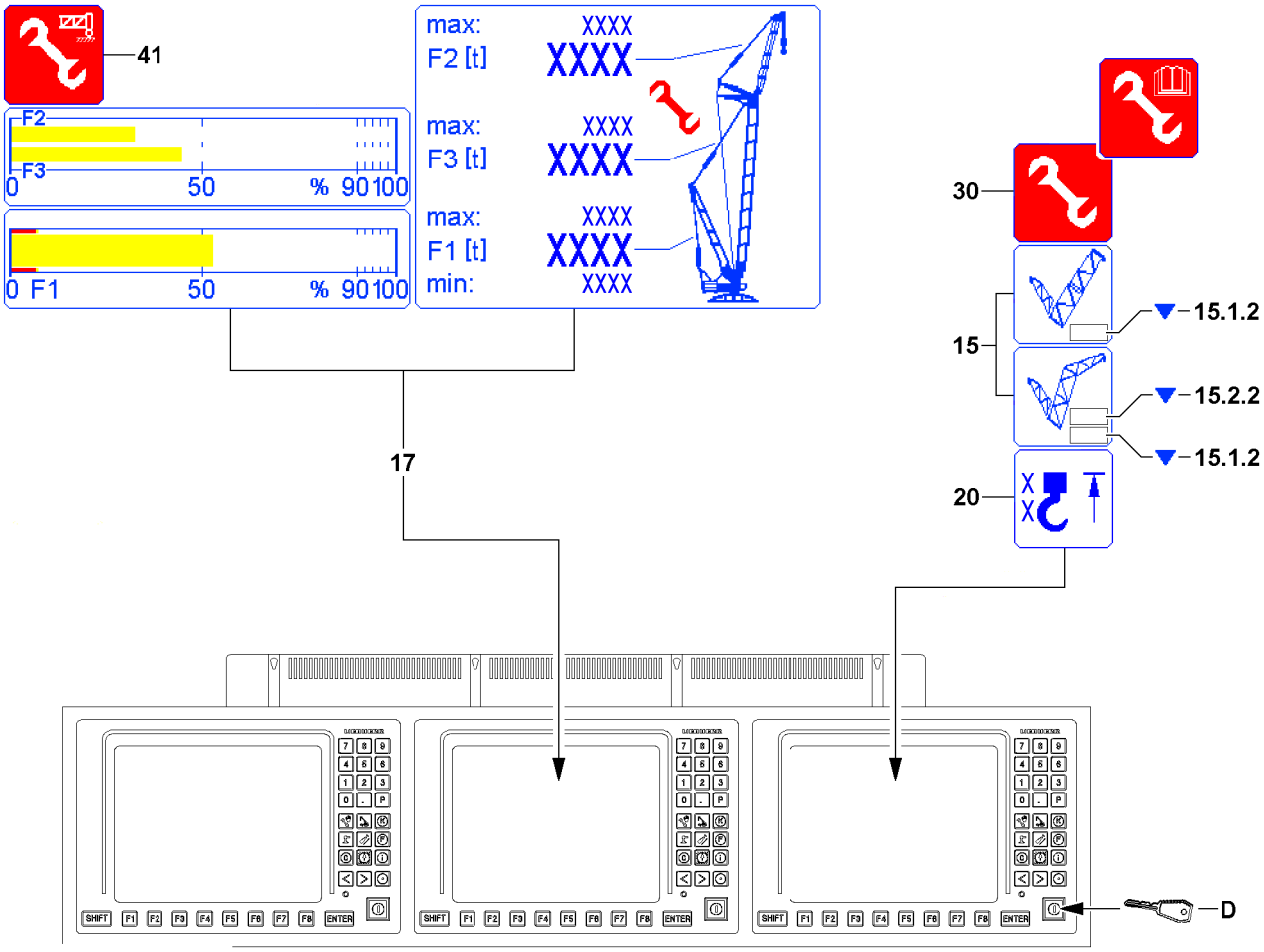

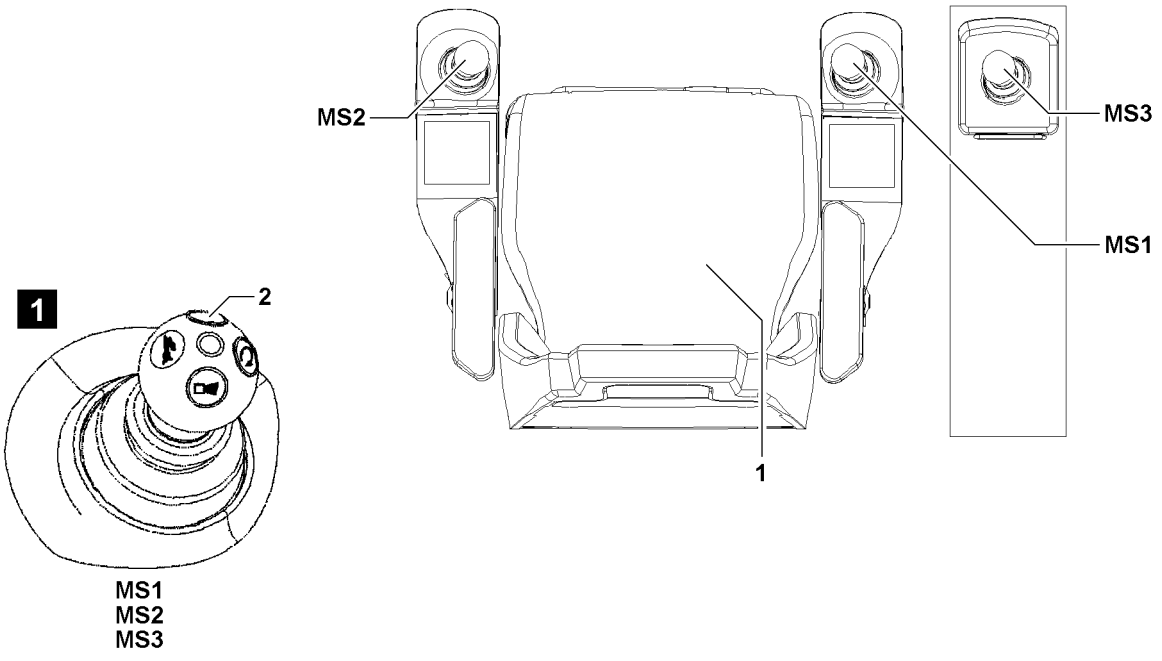

Fig.125391

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Note

▶ Depending on the situation, the *hoist top* shut-off (icon **20** appears) must be bypassed at the same time.

The „Bypass of the LICCON overload protection“ via the set up key **D** turns off:
– If the set up key **D** is actuated again.
– When neither the seat contact button **1** nor one of the buttons **2** of the master switches (MS1, MS2, MS3) is actuated.
– When an area with existing load chart is reached.

The bypass of the LICCON overload protection is / was turned off:
– The assembly icon **30** in the LICCON monitor turns off.

▶ Make sure that the assembly icon **30** no longer appears in the LICCON monitor.

2.5.3 Carrying out the assembly procedures

WARNING
Danger of accident during assembly procedures!
In case of deviations from the specifications of the crane documentation for the assembly procedures, severe accidents can be the result.
Personnel can be severely injured or killed.
▶ Always proceed according to the specifications of the crane documentation.
▶ **If you cannot proceed according to the crane documentation, contact Liebherr Service before carrying out any subsequent steps and agree on the procedure.**

Make sure that the following prerequisites are met:
– The set up configuration corresponds to the specifications in the crane documentation.
– The set up configuration has been entered correctly into the LICCON computer system.

▶ Actuate the set up key **D** only according to the corresponding specifications in the crane documentation.

2.5.4 Key button *Boom on the ground*

With the aid of the key button *Boom on the ground*, a shut-off can be bypassed in the lowest angle range of the boom, when:
– The boom has contact with the ground.
– At least 12.5 % of the boom weight is taken up by the ground contact.

Make sure that the following prerequisites are met:
– The set up configuration corresponds to the specifications in the crane documentation.
– The set up configuration has been entered correctly into the LICCON computer system.

▶ Actuate the key button *Boom on the ground* and erect / take-down the boom.

Result:

– Icon **41** appears as long as the shut-off is bypassed.

Note

▶ The key button *Boom on the ground* is on the instrument panel, see Crane operating instructions, chapter 4.01.

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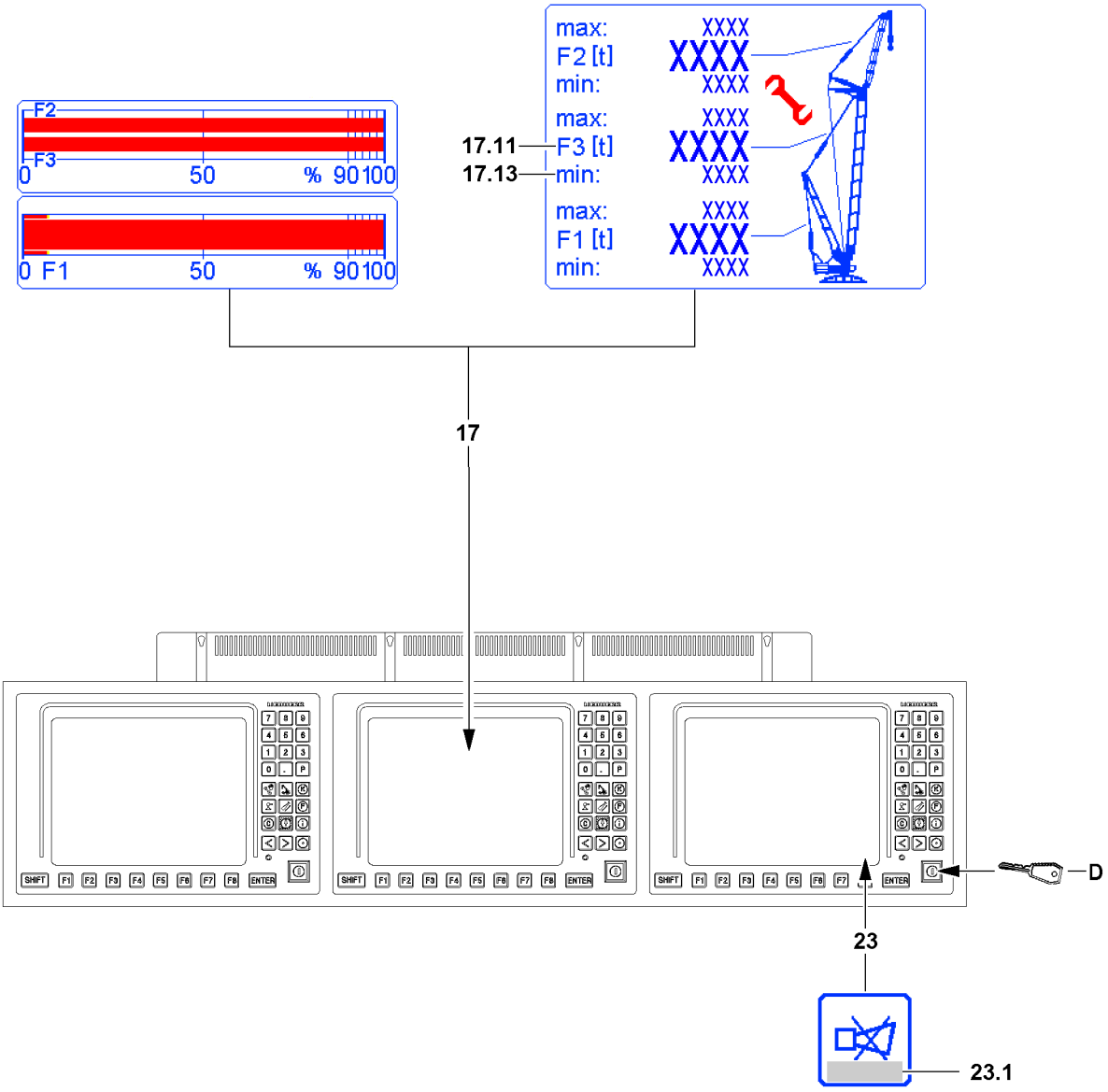

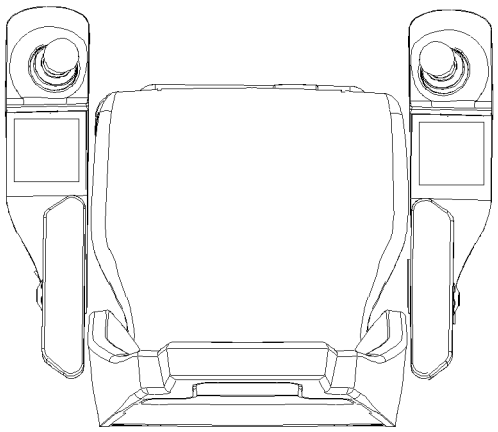

Fig.122458

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2.6 Minimum values or maximum values of F-load display reached

Note

▶ The display and assignment of the F-load display **17** can deviate depending on the set up configuration, operating condition and configuration of the crane, see Crane operating instructions, chapter 4.02.

In the F-load display **17** the minimum and maximum values were reached.

Make sure that the following prerequisites are met:
- The crane is assembled according to the specifications in the crane documentation.
- A valid set up configuration has been entered on the LICCON computer system (Set up program).
- The actual set up configuration has been entered on the LICCON computer system (Set up program).
- The hook block / load hook is correctly installed and reeved in.
- All attachment parts and guy rods on the boom system, which are not needed, have been removed (weight).
- The boom system is free of snow and ice (weight).
- The wind influence on the crane is not too great.
- The local conditions (terrain incline) are in the permissible range.
- The notes regarding error messages **23.1** appearing in the *horn* icon **23** were observed.

2.6.1 Improvement of force ratio in the guying of the boom system

▶ Check if a crane movement was initiated, which leads to an improvement of the force ratio in the F-load display **17**.

Note

In the permissible framework of specifications of the crane documentation, a positive influence of the force ratio in the F-load display **17** can be reached by:
- ▶ Changing the pulled derrick ballast.
- ▶ Changing the derrick ballast radius (luffing the derrick boom up / down).
- ▶ Erecting the main boom: Carry the hook (hook block / load hook) along.
- ▶ Erection of the main boom with installed luffing jib: Spool the control winch for the luffing jib out to shift the weight of the guy rods more favorably.
- ▶ In difficult local conditions (terrain incline): Support the placed down boom system to obtain more favorable angle conditions.
- ▶ In difficult local conditions (terrain incline): Support the placed down boom system to reduce flexation.

2.6.2 Minimum value F3-load display during erection of the derrick boom fallen below

If the guying between the derrick boom and the main boom is not sufficiently tensioned, then it is possible that the value $F3_{min}$ **17.13** is fallen below. The value $F3_{min}$ **17.13** appears possibly only during the erection procedure of the derrick boom in steep boom position.

Note

▶ By targeted spooling winch 3 up / out during the erection procedure, the guying between the derrick boom and the main boom can be slightly pretensioned depending on the circumstances and the value $F3_{actual}$ **17.11** can be increased / held.

▶ Pretension the guying slightly between the derrick boom and the main boom so that the value $F3_{min}$ **17.13** is not fallen below. A collision of the luffing pulley block / guy rods with the crane (for example during the erection procedure of the derrick boom) may not occur.

When $F3_{min}$ **17.13** was fallen below and the movements winch 3 and winch 4 are fully or partially shut-off:

▶ Press the set up key **D** again at activated assembly operation.

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Result:

– The value for $F3_{min}$ **17.13** is reduced slightly once.

▶ Spool winch 3 up to increase the value $F3_{actual}$ **17.11**.

Problem remedy

The value for $F3_{min}$ **17.13** is fallen below again:
It is not possible to reduce the value for $F3_{min}$ **17.13** again.

▶ By spooling out winch 4 the derrick boom can be moved forward until the $F3_{min}$ **17.13** is masked again and winch 3 can be spooled up / out again.

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5 Equipment

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5.01 Technical safety instructions for assembly and disassembly

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1 Equipment

1.1 Checking the steel structures

All components part of the crane scope of delivery must be checked regularly together with the crane.

If equipment or components are assembled that are part of the delivery scope of another crane: Prior to first time use, check load bearing crane structures, especially steel structures, see chapter 8.01.

1.2 Checking the labeling

WARNING
Labeling **not** legible or **not** present!
Components, especially guy rods, can be mixed up.
Death, severe bodily injuries, property damage.
▶ Do **not** continue to use the components, especially the guy rods.

2 Rope pulleys

WARNING
Danger of crushing due to rotating rope pulleys!
Arms and legs can be caught and crushed or severed between the rope pulley and the rope due to rotating rope pulleys.
▶ It is prohibited to touch the ropes or rope pulleys during operation.
▶ Adhere to the safety distance to ropes and rotating rope pulleys.

3 Ropes

WARNING
Danger of accident!
▶ The ropes must be checked by an expert before assembly and checks must be performed at regular intervals in order to detect possible damage or wear and tear at an early stage. See chapter 8.04.

The ropes must be taken down immediately if any of the following damage is detected:
– Breakage of a strand
– Wire breaks
– Broken wire nests
– Reduction in the rope diameter by 10 % or more of the nominal size
– Rope deformations

3.1 Placing the hoist rope or the control rope

In order to guarantee safety and operating characteristics, only original Liebherr replacement parts or parts approved by Liebherr may be used.

NOTICE
Damage to the hoist rope or the control rope!
If a hoist rope or control rope is placed with worn rope pulleys, damage can occur.
▶ Before placing a rope, check the rope pulleys. See chapter 8.01.
▶ Replace worn or damaged rope pulleys.

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3.2 Minimum rope coils

NOTICE
If the following notes are not observed, the cam limit switch / winch speed sensor must be readjusted!
- ▶ When the hoist rope is spooled up, the end of the hoist rope must remain in front of the winch and may not be pulled over the winch.
- ▶ Pull the hoist rope end never under the winch by spooling the winch up.
- ▶ Pull the hoist rope never off from the „stationary“ winch.
- ▶ The winch speed sensor must also be readjusted, if it is determined during operation or when changing the hoist rope that the winch does not shut off when the minimum rope coils are reached.

3.2.1 Cranes with cam limit switch

The cam limit switch is adjusted at the factory that it turns off before the minimum rope coils are reached (three hoist rope coils on the winch).

WARNING
Danger of accident due to falling load!
If the following instructions are not observed, the hoist rope end attachment may be torn out, causing the load to topple.
- ▶ If a new hoist rope is used, the cam limit switch must be reset.
- ▶ The cam limit switch must be adjusted so that it turns off when only 3 hoist rope coils remain on the winch.

3.2.2 Cranes with winch speed sensor

The winch speed sensor is adjusted at the factory that it turns off before the minimum rope coils are reached (four hoist rope coils on the winch). If used properly, the winch turn sensor will not need readjustment.

WARNING
Danger of accident due to falling load!
If the following instructions are not observed, the hoist rope end attachment may be torn out, causing the load to topple.
- ▶ If a new hoist rope is placed, the winch speed sensor must be checked.
- ▶ The winch speed sensor must be set to turn off when only 4 hoist rope coils remain on the winch.

4 Fiber guy ropes

Note
- ▶ Depending on the crane type and equipment, the fiber guy ropes have different diameters and lengths as boom guying and as auxiliary guying.
- ▶ Fiber guy ropes are subjected to high loads and therefore must be checked regularly.

WARNING
Load can be ripped off!
Death, severe bodily injuries, property damage.
- ▶ The ropes must be checked by an expert before assembly and checks must be performed at regular intervals in order to detect possible damage or wear and tear at an early stage. See chapter 8.16.
- ▶ Notes regarding the proper transport of the fiber guy ropes, see chapter 2.04.

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5 Control measures before crane operation

WARNING
The crane can topple over!
If the following control measures and the crane-specific additional controls are not carried out before crane operation or if they are not carried out sufficiently, then accidents can occur.
The crane can topple over, be overloaded or damaged.
Loose parts, aids or ice can fall down from the boom or the crane superstructure.
Death, severe bodily injuries, property damage.

- ▶ Crane operation with safety equipment that is **not** functioning correctly is strictly prohibited.
- ▶ Start crane operation only after all safety equipment have been checked and are functioning correctly.
- ▶ Start crane operation only if the overload protection has been set according to the data in the load chart.
- ▶ Start crane operation only if the crane is properly supported and horizontally aligned.
- ▶ Only start crane operation after making sure that there are not loose parts on the boom, crane superstructure or crane chassis.
- ▶ Only start crane operation after making sure that there is no snow, frost or ice on the boom.
- ▶ Only start crane operation after making sure that all specifications, crane conditions and / or properties that are checked and required during the extensive control measures and additional controls have also been completely fulfilled.

WARNING
Interruption of crane operation!
If the following specifications for interruption of crane operation are not observed, accidents can occur.

- ▶ If the crane operator leaves the crane cab even if for just a short time, the crane must be secured to prevent unauthorized access.
- ▶ Before starting to work again with the crane, the crane operator is obligated to check the operating mode settings and to reset them, if necessary.

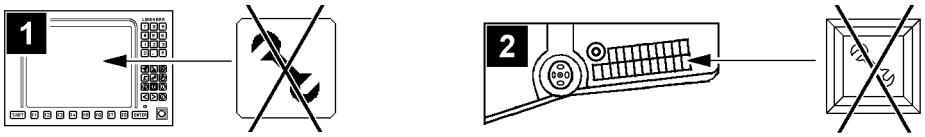

Fig.113437: Control displays

Make sure that the following prerequisites are met:
- The overload protection is not bypassed.
- No assembly operation is activated.

5.1 General controls before crane operation

- Make sure that no visible damage is present on the crane.
- Make sure that there are no loose parts on the boom, crane chassis and crane superstructure.
- Make sure that all hoist and control ropes are free of snow, frost and ice.
- Make sure that the boom system is free of snow, frost and ice.
- Make sure that exposed rope pulleys are free of snow, frost and ice.
- Make sure that the cable / rope drums as well as the limit switches are free of snow and ice.
- Make sure that the cylinders are free of ice.
- Make sure that the gear ring of the slewing ring connection is clean and greased.
- Make sure that the air supply to the oil and water cooler is clear.
- Make sure that steps, ladders and platforms are in the correct position for crane operation.
- Make sure that all tool boxes, compartments, coverings, covers and cabinet doors are closed.
- Make sure that no persons or objects are within the danger zone of the crane.
- Make sure that the crane is standing on level, load bearing ground.
- Make sure that the crane is sufficiently supported depending on the load case and the ground conditions.

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- Make sure that there is a sufficient safety distance to excavations and slopes.
- Make sure that no obstacles are within the working range of the crane, which obstruct the required crane movements.
- Make sure that the crane has sufficient distance to live power lines.
- Make sure that the LICCON overload protection is set according to the data in the load chart.
- Make sure that the overload protection is set according to the actual set up configuration of the crane.
- Make sure that the electrical connections, the connector plug, the pull release, the cables and the protective insulation function. Replace missing or defective parts.
- Make sure that the cable routings on the electrical connections are seated tightly. If necessary, tighten loose screw connections.
- Make sure that the existing safety equipment is functioning.
- Make sure that the overload protection is functioning.
- Make sure that the hoist limit switches are functioning.
- Make sure that the limit switch boom „steepest position“ is functioning.
- Make sure that the wind speed sensor easily moves and is functioning.

5.2 Additional controls for cranes with crane support

- Make sure that the folding / sliding beams are secured with pins to prevent them from sliding.
- Make sure that the support plates are secured in the operating position.
- Make sure that the crane is properly supported.
- Make sure that the crane is horizontally aligned.
- Make sure that the axle suspension is blocked (mobile crane).
- Make sure that the tires have no contact to the ground (mobile crane).
- Make sure that the track chains are secured to prevent them from sagging (crawler crane).

5.3 Additional controls for cranes on tires on the front and supported on the rear

- Make sure that the rear folding / sliding beams are secured with pins to prevent them from sliding.
- Make sure that the rear support plates are secured in the operating position.
- Make sure that the crane is properly supported on the rear.
- Make sure that the axle pressure compensation is correctly switched.
- Make sure that the axle suspension is blocked.
- Make sure that the tires of the rear axle group have no contact with the ground.
- Make sure that a sufficient tire pressure is present in the tires.
- Make sure that the ground for the front axle group is sufficiently level and has a sufficient load bearing capacity.

5.4 Additional controls for cranes supported on the front and on tires on the rear

- Make sure that the front folding / sliding beams are secured with pins to prevent them from sliding.
- Make sure that the front support plates are secured in the operating position.
- Make sure that the crane is properly supported on the front.
- Make sure that the axle pressure compensation is correctly switched.
- Make sure that the axle suspension is blocked.
- Make sure that the tires of the front axle group have no contact with the ground.
- Make sure that a sufficient tire pressure is present in the tires.
- Make sure that the ground for the rear axle group is sufficiently level and has a sufficient load bearing capacity.

5.5 Additional controls for freestanding crane operation (on tires)

- Make sure that all prerequisites for freestanding crane operation are met.
- Make sure that sufficient tire pressure is in all tires for crane operation on tires.

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- Make sure that the ground is sufficiently level for crane operation on tires and has a sufficient load bearing capacity.

5.6 Additional controls for cranes with a derrick boom

- Make sure that the shut-off via the limit switch - derrick is functioning.
- Make sure that the entire slewing range of the suspended ballast / ballast trailer is free of personnel and obstacles.

5.7 Additional controls for cranes with luffing auxiliary boom / accessories

- Make sure that the shut-off via the limit switch luffing auxiliary boom / accessories „steepest position“ is functioning.
- Make sure that the shut-off via the limit switch luffing auxiliary boom / accessories „lowest position“ is functioning.
- Make sure that the shut-off via the limit switch flap in „steepest position“ position is functioning.
- Make sure that the pendulum of the mechanical relapse retainer moves easily over the entire slewing range and is functioning.

5.8 Additional controls for certain crawler cranes

For existing crawler assembly key button:
- Make sure that the crawler assembly key button is turned off.

6 Relapse cylinders

6.1 Block position of the relapse cylinders when setting down the load

NOTICE
Damage to the boom or the relapse cylinders!
If the block position of the relapse cylinders is triggered by the boom or the derrick with attached, freely suspended load, then there is a danger of damaging the boom or the relapse cylinders when setting the load on the ground. By setting down the load, the crane is relieved, and this movement causes the boom system to move to the rear.
There is no shut-off of the hoist gear lowering function.
▶ Actuate the opposite direction of movement which caused the block position and eliminate the block position.

7 Pneumatic springs

Pneumatic springs are installed on various crane components to simplify the assembly of these components.

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WARNING
Danger of crushing!
Defective pneumatic springs no longer provide the supporting properties on the movable components.
Components can fall down.
Death, severe bodily injuries, property damage.
- ▶ Always check pneumatic springs for damage before actuating the corresponding components.
- ▶ Do not use components with defective pneumatic springs. Replace defective pneumatic springs immediately.
- ▶ Make sure that no persons or objects are in the movement range of the moving components which is supported by the pneumatic spring.
- ▶ It is strictly prohibited to remain or place any objects in the movement or other danger zone of the moving crane components which are supported by the pneumatic spring.

8 Manual rope winches

Manual rope winches are installed on various components to simplify the assembly or disassembly of these components.

WARNING
Danger of crushing!
Defective manual rope winches no longer provide the supporting action on the movable components.
Components can fall down.
Death, severe bodily injuries, property damage.
- ▶ Always check manual rope winches for external and functional damage before actuating the respective components.
- ▶ Check the rope of the manual rope winch for damage.
- ▶ At least two rope coils must always remain on the rope drum.
- ▶ Do not use components with defective manual rope winches. Replace defective manual rope winches.
- ▶ It is strictly prohibited for personnel or objects to remain within the movement range of the components, which are supported by the manual rope winch.
- ▶ It is prohibited for personnel or objects to remain within the danger zone of the moving components.

9 Weights

Note
- ▶ The weight of each component is specified in the chapter 1.03 or the respective chapter in the Crane operating instructions or is stated on the tag attached to the corresponding component.
- ▶ If components are pushed into one another (for example the boom intermediate sections) or folded together (for example the folding jib), then the total weight is given by the sum of the individual components.

NOTICE
False estimation of weights
- ▶ Contact the Service department at **Liebherr-Werk Ehingen GmbH** if the weight of the respective component is not stated on the tag or in the Crane operating instructions.
- ▶ Use an auxiliary crane with sufficient load carrying capacity including judicious reserve.

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10 Guy rods

WARNING
The boom can break off!
The arrangement of the guy rods for the boom or boom systems is stipulated in the rod plan. If the arrangement of the guy rods according to the rod plan is not observed, the crane can collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ Always carry out the arrangement of the guy rods according to the rod plan.
- ▶ If an auxiliary guying is required for a certain boom length, then it must always be installed according to the rod plan on the position defined in the rod plan.

WARNING
Unutilized guy rods on boom!
If guy rods are on the lattice sections which are not used for operation, then there is a danger of accident.
Unused guy rods can loosen up and fall down.
Death, severe bodily injuries, property damage.
The load chart is invalid.
The load display of the LICCON computer system shows an incorrect value.
The weight of the boom is too heavy for erection.
- ▶ Disassemble and remove the guy rods that are not needed on the transport retainers before erecting the boom.

Note
- ▶ Inspection and maintenance of guy rods, see chapter 8.15.
- ▶ In reference to the guy rods, observe section „Erection / take-down“.

10.1 Guy rods for telescopic cranes with luffing lattice jib

This section applies only to cranes with a telescopic boom and luffing lattice jib.

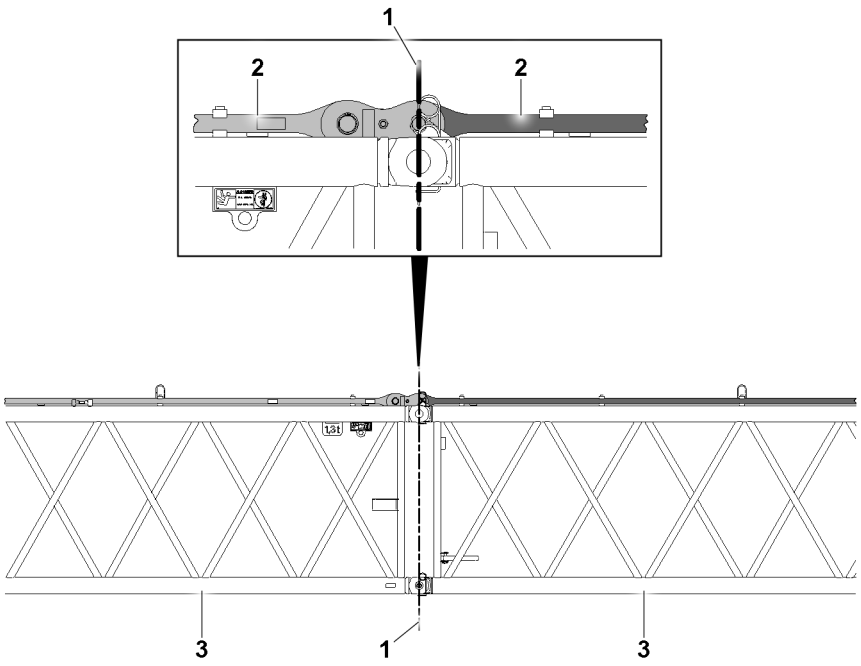

Fig.152299: Lattice section pin level

1 Pin level **2** Guy rods **3** Lattice section

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If guy rods **2** are assembled, then close the guy rods **2** in the pin level **1** of the lattice sections **3**. In this way it can be determined if the correct guy rods **2** are assembled.

To completely check the guying, the requirements of the **rod plan**, the **assembly drawings** and the **operating instructions** must be observed.

11 Auxiliary guying

The auxiliary guying is of significant importance for safe crane operation.

The auxiliary guying is a deciding factor in relieving the boom, or the boom system during erection and take-down as well as during crane operation.

WARNING
The crane can topple over!
If the auxiliary guying is not installed or not installed on the position specified in the rod plan, then the crane can collapse, the boom can break off or the crane can topple over.
- ▶ If an auxiliary guying is specified in the rod plan for the required boom length, then it must be installed on the respective position.
- ▶ Make sure that the auxiliary guying is always completely installed and that all pins are properly pinned and secured.

12 Bypassing the overload protection

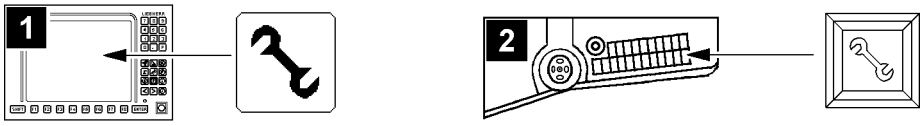

Fig.113438: Bypassing the overload protection

– Illustration **1**: LICCON monitor (only certain crane types).
– Illustration **2**: Indicator light „Assembly“ in instrument panel crane cab (only certain crane types).

The overload protection is considered bypassed for:
– All types of assembly operations.
– All types of exceeded shut off limits of the overload protection.
– All types of emergency operation.
– All types of crane operation with deactivated or defective sensors and limit switches.
– All types of deviation from specified set up configuration of the crane.

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DANGER
Increased danger of accident due to bypass of the overload protection!
Proper and destined use of the crane is ensured due to the construction of the overload protection system and observance of the information in the Crane operating instructions. All **sensibly foreseeable erroneous operations** of the crane have been taken into consideration.
Impermissible crane operation with bypassed overload protection – with the aim of increasing the maximum load bearing capacity of the crane above the rated value in the load chart or of extending the designated working range of the crane – does not constitute a **reasonably foreseeable erroneous operation**, rather **deliberate improper use with high danger of accident**.
The possible risks and consequences of such improper use are detailed in the Crane operating instructions.
Such deliberate improper use can neither be prevented by means of the structural design nor by means of information in the Crane operating instructions.
- ▶ Bypass the overload protection only according to the Crane operating instructions.
- ▶ Exceed the shut off limits of the overload protection only according to the Crane operating instructions.
- ▶ Any other use of the crane with bypassed overload protection than that described in the Crane operating instructions is prohibited.

If the maximum permissible load moment is exceeded, the overload protection turns all load moment increasing crane movements off.

This shut-off can be bypassed or exceeded various ways, for example:
- Exceeding the shut off limits (utilization more than 100 % or leaving the load chart).
- Activating an assembly operation.
- Activating an emergency operation.

The displays of the LICCON overload protection remain functioning when all associated sensors and limit switches are active and a load chart is available.

WARNING
Increased danger of accident due to bypass of the overload protection!
If the overload protection is bypassed, there is no longer any protection against crane overload.
In the event of improper use, the crane could collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.
This could result in significant property damage.
- ▶ It is only permitted to bypass the overload protection for assembly or in emergencies.
- ▶ The bypass of the overload protection may only be carried out by persons who are aware of the effects of their acts.
- ▶ Bypassing the overload protection requires the presence of a person authorized by the crane operator and must be performed with utmost caution.
- ▶ Crane operation is strictly prohibited when the overload protection is bypassed.

12.1 Bypassing the LICCON overload protection

Note
- ▶ Applies only for cranes with LICCON overload protection.

Depending on the crane version, one or more operating elements are available to bypass the overload protection:
- Button in the control panel.
- Key button on the LICCON monitor.
- Key button in the instrument panel.
- Key button in the control cabinet.
- Sensor for transponder on the crane cab.

The functions of the operating elements are described in chapter 4.20.

- ▶ Actuate the respective operating element.

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Result:

– The LICCON overload protection is bypassed / inactive.
– The „Assembly“ icon appears on the LICCON monitor.
– Depending on the circumstances, acoustic and / or optical warning signals (blinkers, flashing lights, bells and horns) sound.

If the LICCON overload protection is to be reactivated:
▶ No longer actuate the respective operating element or reset.

Result:

– The LICCON overload protection is active.
– The „Assembly“ icon no longer appears on the LICCON monitor.
– The acoustic and / or optical warning signals which were triggered by the bypass are turned off again.

12.2 Bypassing the PAT overload protection

Note
▶ Applies only for cranes with PAT overload protection.

▶ Actuate the bypass key button and turn the PAT overload protection off.

Result:

– The PAT overload protection is bypassed / inactive.

▶ Actuate the bypass key button and turn the PAT overload protection on.

Result:

– The PAT overload protection is active.

13 Bypassing the hoist top shut-off

Note
▶ Applies only for cranes with hoist limit switch.

If the hook block touches the hoist limit switch weight during upward movement, the hoist limit switch is activated. The „Spool up winches“, „Luff boom down“ and „Telescope the telescopic boom out“ crane movements are turned off. The shut-off can be bypassed.

WARNING
Danger of accident due to bypass of hoist top shut-off!
When bypassing the hoist top shut-off, there is a danger that the hook block may be pulled against the pulley head when continuing to lift or luffing down the boom. This may damage the pulleys and cause the loads to fall.
▶ The bypass of the hoist top shut-off in crane operation with a load may only be carried out by a person authorized by the crane operator with the aid of a „Guide“. The guide must be in direct contact with the crane operator and must continually monitor the distance between the hook block and the boom head.
▶ Carry out all crane movements with maximum caution and minimum speed.

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14 Pin connections

WARNING
Pin connections **not** lubricated!
If pins or pin connections are not properly greased or lubricated before assembly, then they can corrode.
The pins can be stuck in the pin bores and be damaged.
During the unpinning procedure, the pins can suddenly release.
Death, severe bodily injuries, property damage.
- ▶ Make sure that all pins, which are not supplied with grease via the central lubrication system are sufficiently greased before assembly.
- ▶ Make sure that all lube points, which are equipped with a grease fitting, are properly greased at assembly and according to the respective interval specification.
- ▶ Never insert or unpin pins by force.

WARNING
Pin **not** secured to prevent it from loosening up by itself!
The pin connection could loosen up suddenly.
Death, severe bodily injuries, property damage.
- ▶ Secure all pins with retaining elements against loosening up by itself.

WARNING
Distorted pin!
Angular pull or excessive or low hoisting force of the auxiliary crane may result in distortion of the pins.
Distorted parts can suddenly fly off when the pins are unpinned.
Death, severe bodily injuries, property damage.
- ▶ When the pins are unpinned, the lifting force of the auxiliary crane must be adapted to the weight of the components being lifted.
- ▶ Do **not** unpin difficult to remove pins by force.
- ▶ Remedy the cause of the distortion.

14.1 Pinning the collar pin

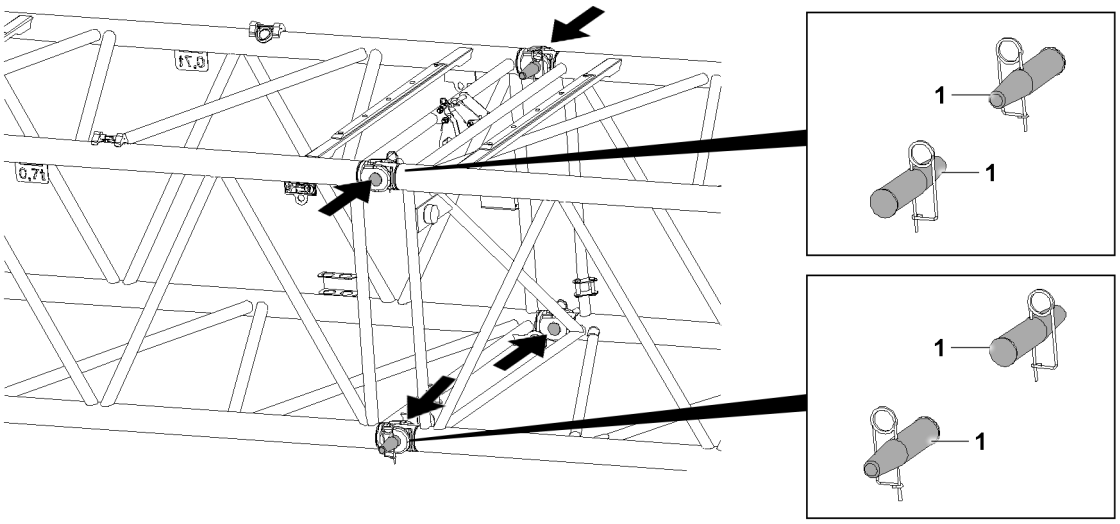

Fig.143114: Pinning the collar pin

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WARNING
The collar pin is incorrectly pinned!
Death, severe bodily injuries, property damage.
- ▶ Insert or unpin both pins at the same horizontal level, i.e. **left and right**.
- ▶ Pin the upper collar pin **1** from the **outside to the inside** and unpin from the **inside to the outside**.
- ▶ Pin the lower collar pin **1** from the **inside to the outside** and unpin from the **outside to inside**.

14.2 Assembling the double cone pins horizontally

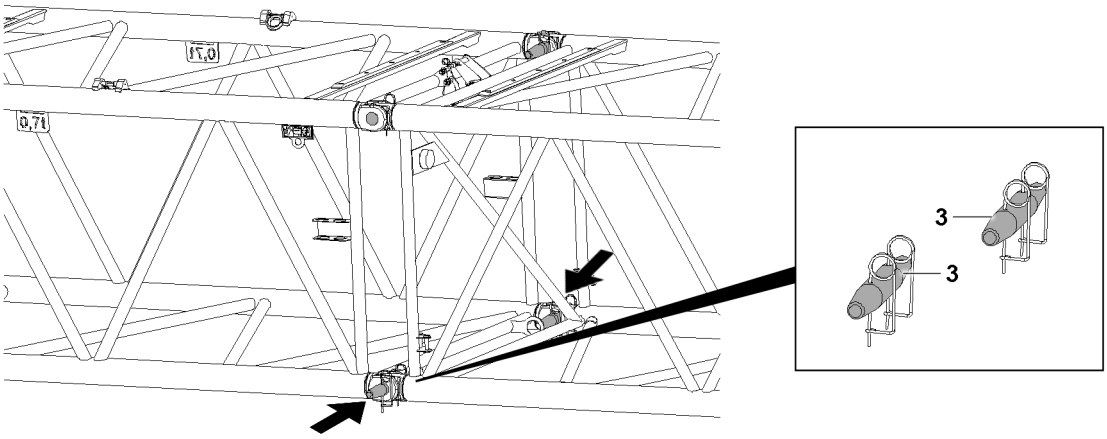

Fig.143115: Pinning the double cone pins horizontally

WARNING
Double cone pins incorrectly pinned!
Death, severe bodily injuries, property damage.
- ▶ Insert or unpin both pins at the same horizontal level, i.e. **left and right**.
- ▶ Pin and unpin the horizontally installable double cone pins **3** from the **outside to the inside**.

14.3 Assembling the double cone pins vertically

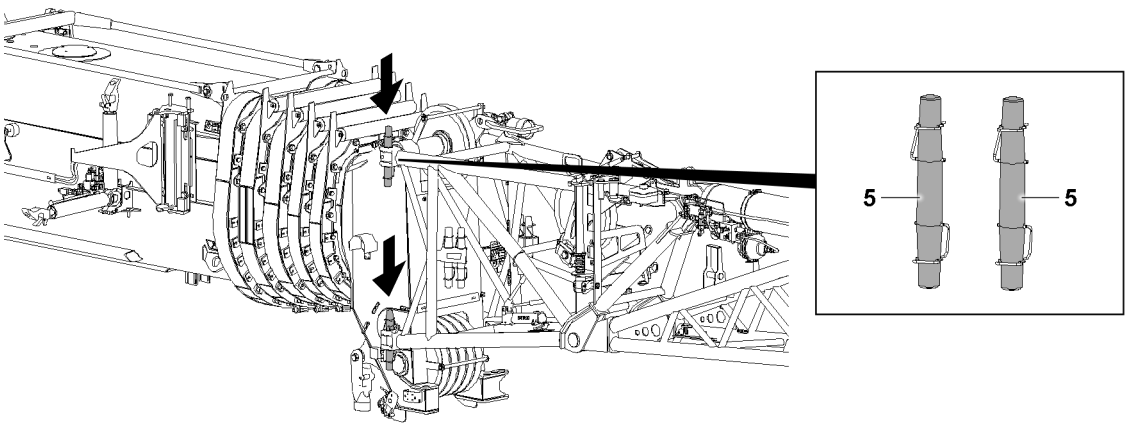

Fig.143116: Assembling the double cone pins vertically

WARNING
Double cone pins incorrectly pinned!
Death, severe bodily injuries, property damage.
- ▶ Pin and unpin the vertically installable double cone pins **5** from the **top to the bottom**.

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14.4 Impact protection

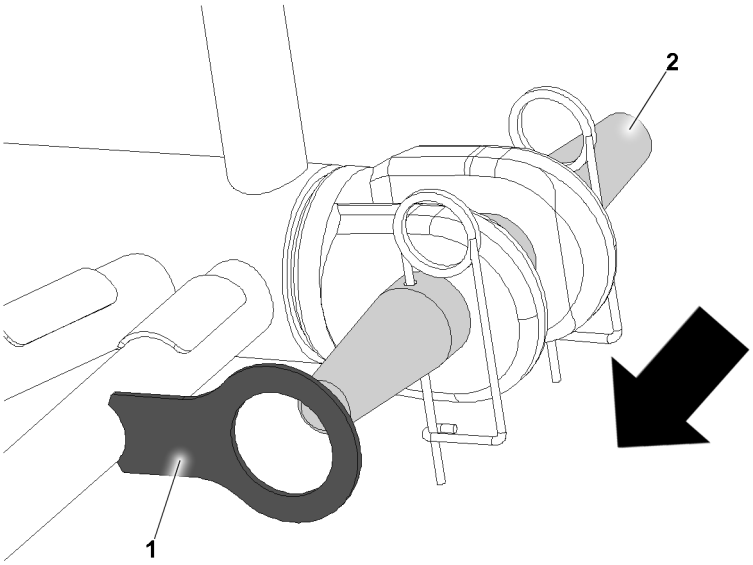

Fig.148194: Lattice section impact protection

Impact protection **1** is installed on certain lattice sections. The impact protection **1** should prevent the pins from being unpinned from the **inside to the outside**.

If impact protection **1** is installed:
- ▶ Only use double cone pins **2**.
- ▶ Only pin and unpin the double cone pins **2** from the **outside to the inside**.

15 Retaining elements

15.1 Checking the retaining elements

Retaining elements are used to secure the pins. Due to mechanical damage / distortion, the function of the retaining elements can be compromised. In addition, the spring force of the retaining elements can be reduced significantly. Do **not** re-use retaining elements if there is insufficient spring force. The pin retainer must be secured with a correctly **functioning** retaining element.

WARNING
Mechanical damage or deformation of the retaining element!
The retaining elements can fail.
The pin can unpin by itself.
Death, severe bodily injury, property damage.
- ▶ Use exclusively functioning retaining elements in a proper condition.
- ▶ Replace defective retaining elements.

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15.2 Overview of the retaining elements

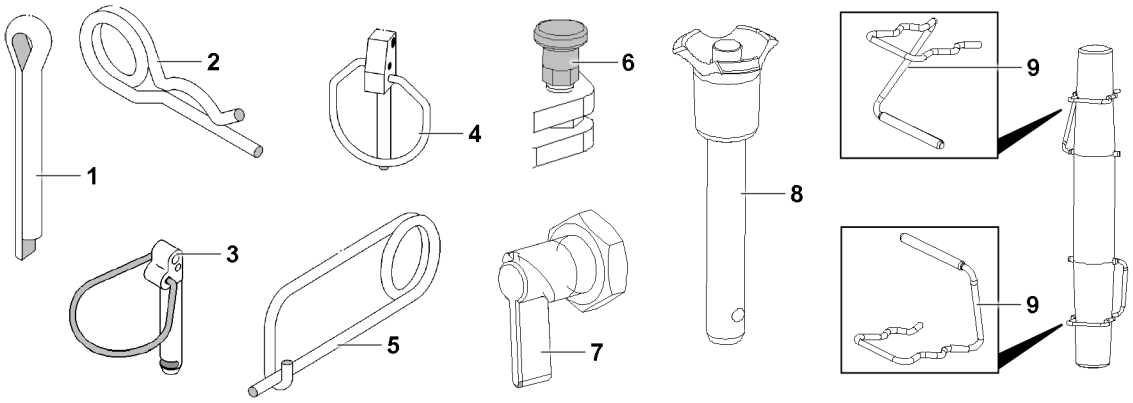

Fig.143102: Retaining elements

1 Split pin
2 Cotter pin
3 Safety locking pin
4 Linch pin
5 Spring retainer
6 Detent pin
7 Latch
8 Ball locking pin
9 Retaining clip

15.3 Split pin

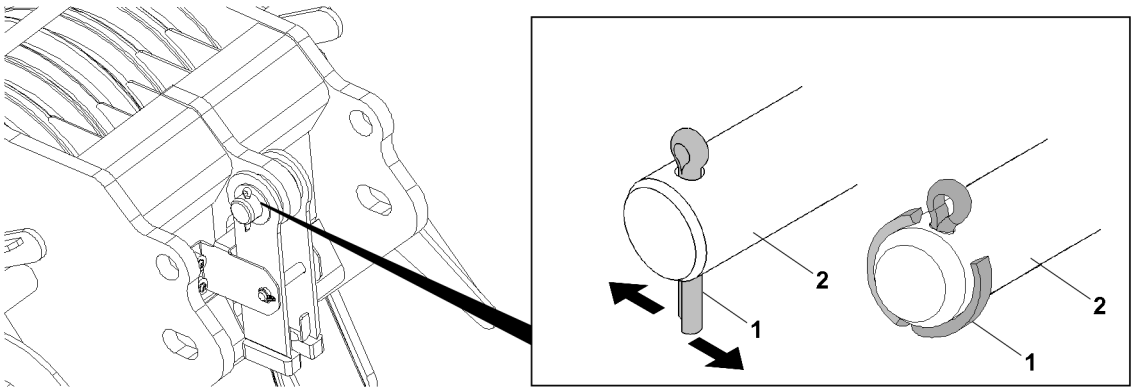

Fig.143105: Split pin

1 Split pin
2 Pin

WARNING
Multiple use of a split pin **1**!
The split pin **1** can break.
▶ Assemble the split pin **1** only once.
▶ Use a correctly sized split pin **1**.

▶ Secure the pin **2**: Insert the split pin **1**.
▶ Bend the end of the split pin **1** toward the outside.

Problem remedy
Split pin **1** defective!
▶ Replace the split pin **1**.

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15.4 Cotter pin

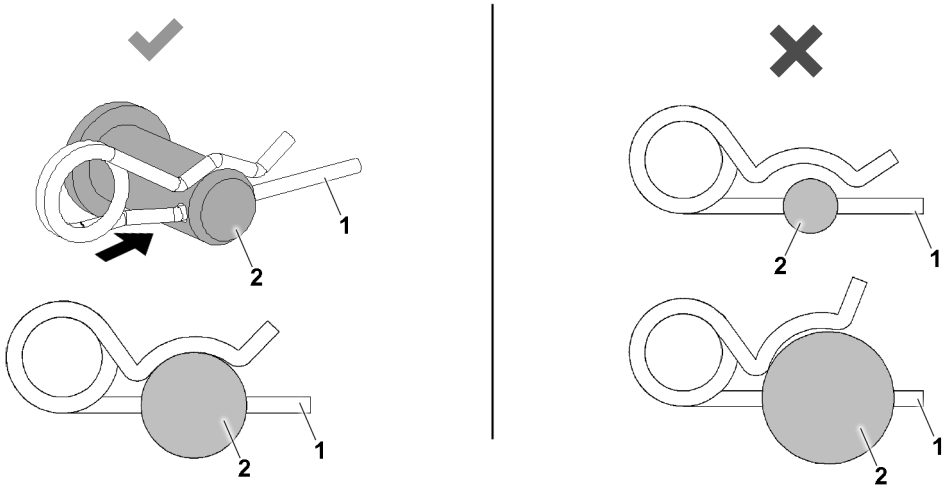

Fig.143106: Cotter pin, correct and incorrect dimensions

1 Cotter pin **2** Pin

WARNING
Improper dimensions of the cotter pin **1**!
The cotter pin **1** can loosen up by itself.
▶ Use a correctly sized cotter pin **1**.

▶ Secure the pin **2**: Insert the cotter pin **1**.

Problem remedy
Spring tension is too low?
The cotter pin **1** is defective.
▶ Replace the cotter pin **1**.

15.5 Safety locking pin

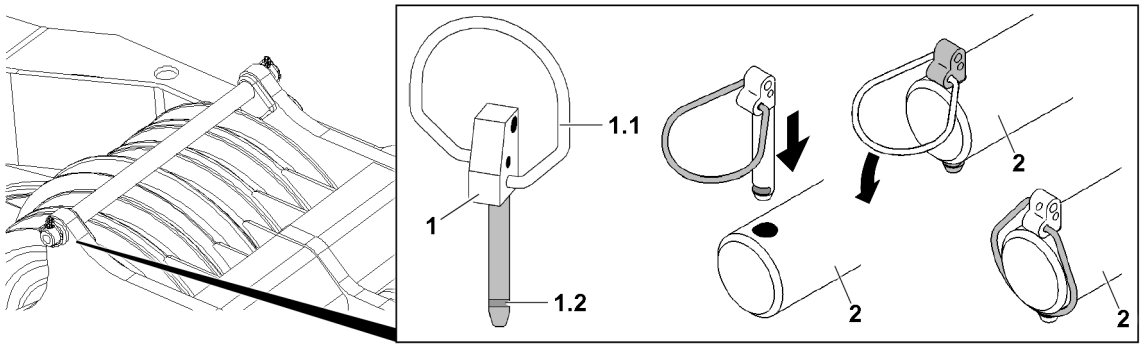

Fig.143103: Safety locking pin

1 Safety locking pin **1.2** Groove
1.1 Spring clip **2** Pin

Increased effort is necessary for opening the safety locking pin **1**.

WARNING
Spring clip **1.1 not** engaged!
The safety locking pin **1** can loosen up by itself.
▶ Engage the spring clip **1.1** completely in the groove **1.2**.

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▶ Secure the pin **2**: Insert the safety locking pin **1**.
▶ Close the spring clip **1.1** and engage it completely in the groove **1.2**.

Problem remedy
The spring clip **1.1** does **not** engage completely?
Tension of the spring clip **1.1** is too low.
▶ Replace the safety locking pin **1**.

15.6 Linch pin

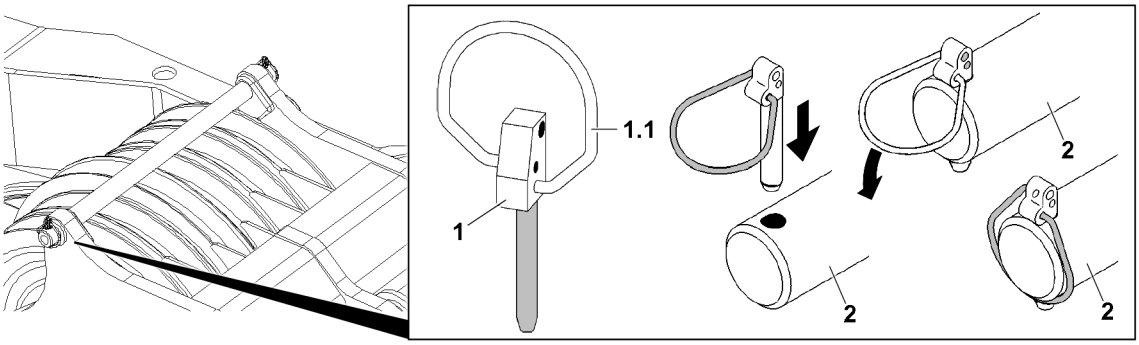

Fig.143104: Linch pin

1 Safety locking pin
1.1 Spring clip
2 Pin

WARNING
The linch pin **1** is **not** completely closed!
The locking pin **1** can loosen up by itself.
▶ Close the spring clip **1.1** completely.

▶ Secure the pin **2**: Insert the locking pin **1**.
▶ Close the spring clip **1.1** completely.

Problem remedy
The spring clip **1.1** does not close completely?
Tension of the spring clip **1.1** is too low.
▶ Replace the locking pin **1**.

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15.7 Spring retainer

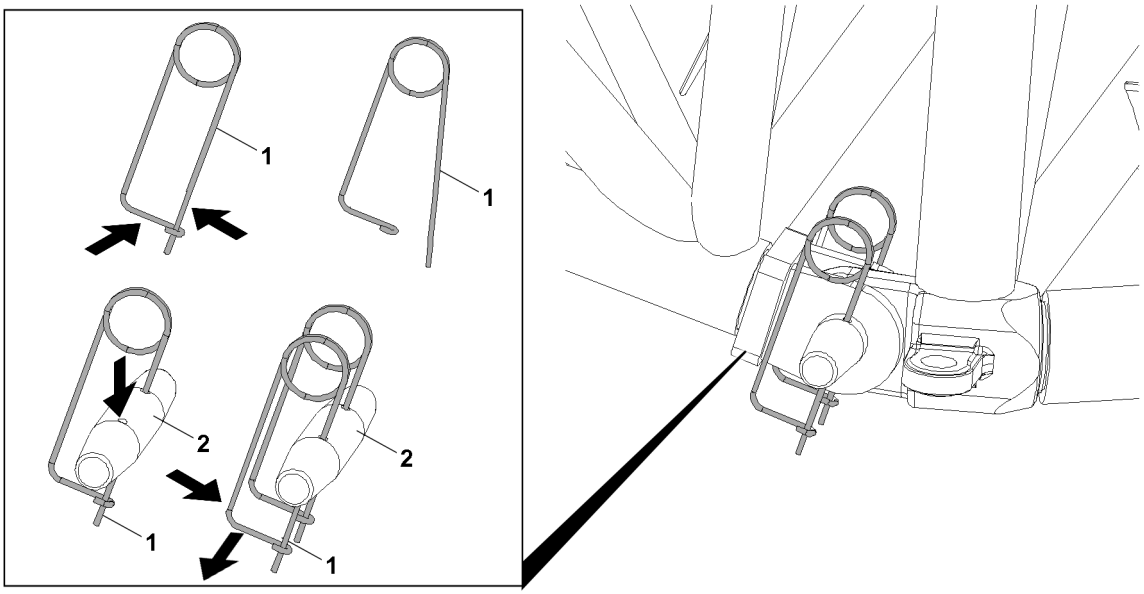

Fig.143108: Spring retainer

1 Spring retainer

WARNING
The spring retainer **1** is **not** closed!
The spring retainer **1** can loosen up by itself.
▶ Close the spring retainer **1**.

▶ Secure the pin **2**: Insert the spring retainer **1**.
▶ Close the spring retainer **1**.

Problem remedy
Spring tension is too low?
The spring retainer **1** is defective.
▶ Replace the spring retainer **1**.

15.8 Detent pin

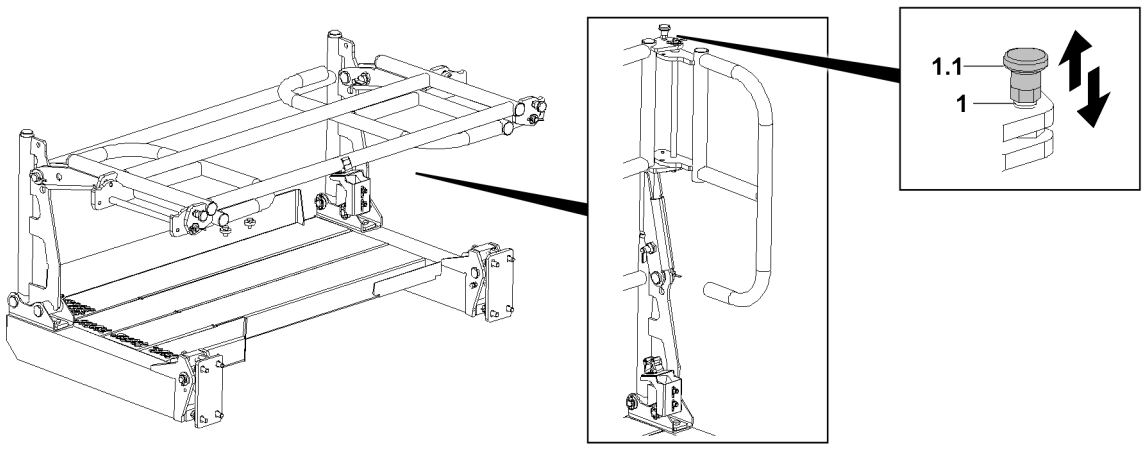

Fig.143110: Detent pin

1 Detent pin

1.1 Handle

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WARNING
The handle **1.1** is **not** locked!
The detent pin **1** can loosen up by itself.
▶ Lock the detent pin **1**.

▶ Pull the handle **1.1**.

Result:
– The detent pin **1** is unlocked.

▶ Insert the detent pin **1**: Release the handle **1.1**.

Result:
– The detent pin **1** is pinned.

Problem remedy
The handle **1.1** cannot be pulled.
The detent pin **1** is defective.
▶ Replace the detent pin **1**.

15.9 Latch

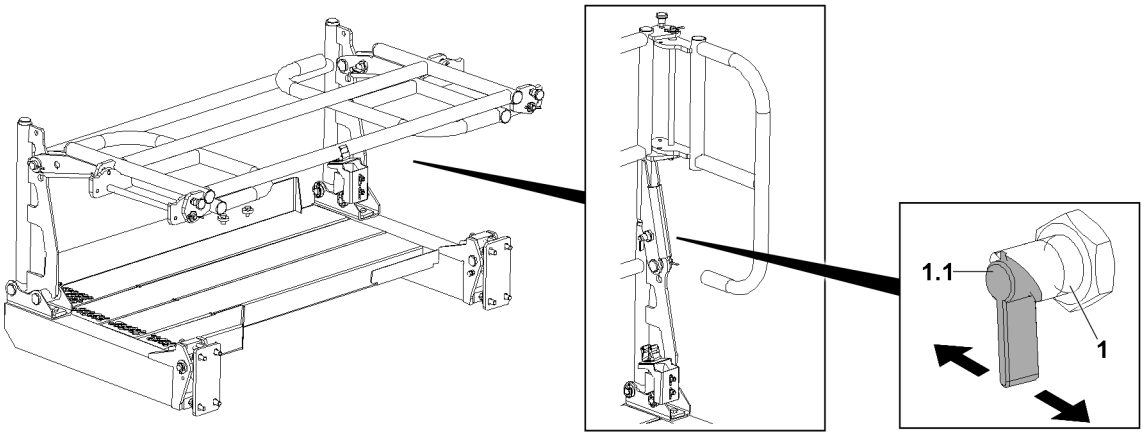

Fig.143111: Latch

1 Latch **1.1** Lever

WARNING
The latch **1** is **not** locked!
The latch **1** can loosen up by itself.
▶ Lock the latch **1**.

▶ Operate the lever **1.1**.

Result:
– The latch **1** is unlocked.

▶ Pin the latch **1**: Release the lever **1.1** and swing the railing until the latch is pinned.

Problem remedy
The lever **1.1** cannot be actuated?
The latch **1** is defective.
▶ Replace the latch **1**.

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15.10 Ball locking pin

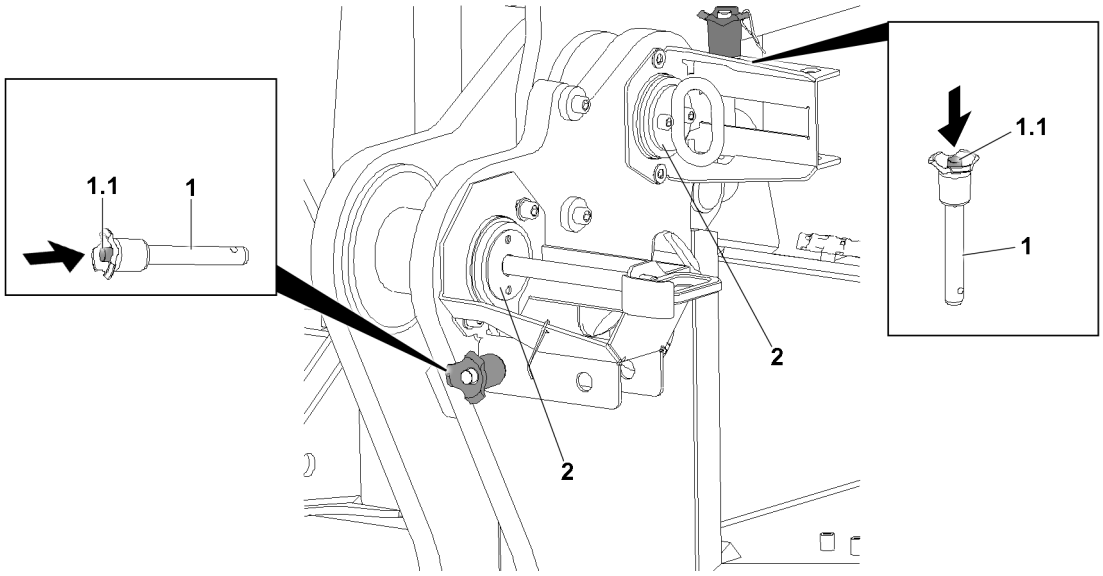

Fig.143109: Ball locking pin

1 Ball locking pin
1.1 Press button
2 Pin

WARNING
The ball locking pin **1** is **not** locked!
The ball locking pin **1** can loosen up by itself.
▶ Lock the ball locking pin **1**.

▶ Secure the pin **2**: Actuate the press button **1.1**.

Result:
– The ball locking pin **1** is unlocked.

▶ Pin the ball locking pin **1** and release the press button **1.1**.

Result:
– The ball locking pin **1** is pinned and secured.

Problem remedy
The press button **1.1** cannot be actuated?
The ball locking pin **1** is defective.
▶ Replace the ball locking pin **1**.

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15.11 Retaining clips

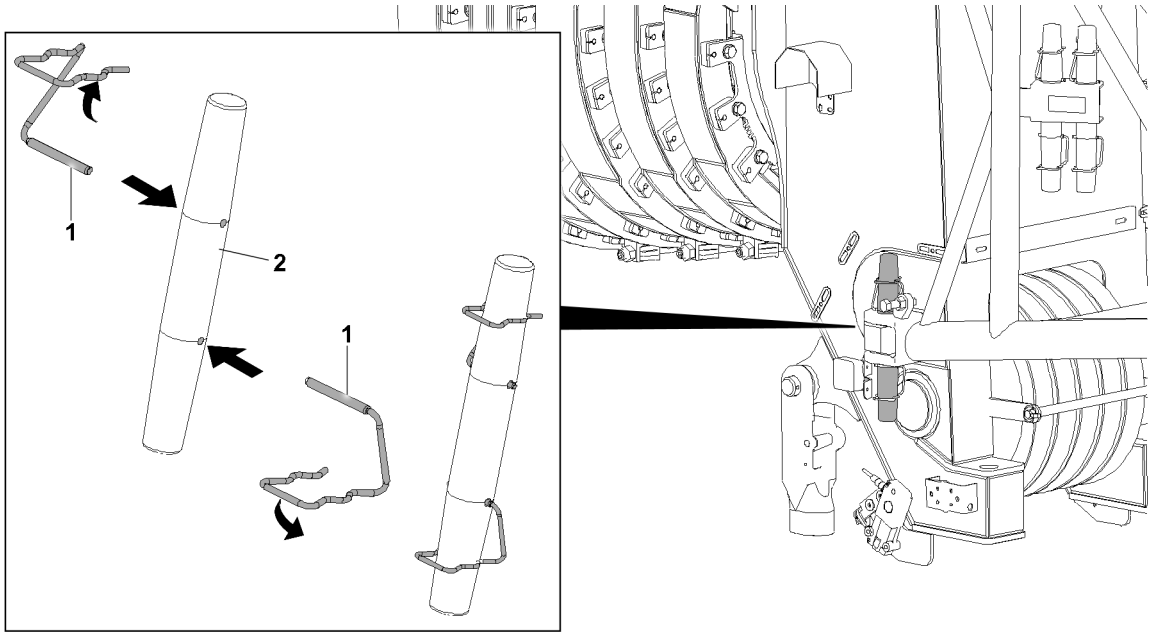

*Fig.143107: Retaining clips **1***

1 Retaining clip **2** Pin

WARNING
Incorrect retaining element!
Shearing off of the retaining element.
- ▶ To secure the folding jib pinning: Use retaining clips **1**.
- ▶ The use of other retaining elements is **prohibited**.

WARNING
Retaining clip **not** engaged!
The retaining clip **1** can loosen up by itself.
- ▶ Engage the retaining clip **1**.

- ▶ Secure the pin **2**: Insert the retaining clip **1**.
- ▶ Engage the retaining clip **1**.

Problem remedy
Retaining clip **1** defective?
The spring force of the retaining clip **1** is too low.
- ▶ Replace the retaining clip **1**.

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16 Assembling / disassembling

WARNING
Danger of fatal injury due to incorrect assembly or disassembly!
The assembly / disassembly of lattice sections and / or components may never be performed by untrained personnel.
An erroneous assembly / disassembly of lattice sections and / or components can cause damage on load carrying crane structures.
Crane components can fail due to improper assembly / disassembly.
Death, severe bodily injuries, property damage.

- ▶ Make sure that the assembly / disassembly of lattice sections and / or components is carried out only by authorized and trained expert personnel.
- ▶ Make sure that the fastening equipment on lattice sections and / or components is always fastened properly.
- ▶ Make sure that lattice sections and / or components are always properly pinned and secured at assembly.
- ▶ For assembly / disassembly of individual components, also observe the chapters relating to those components.
- ▶ The boom combinations must be assembled according to the separately supplied rod plans.
- ▶ All components which must be transported separately must be transported with suitable auxiliary cranes and fastening equipment near ground level.

WARNING
Failure of auxiliary winch!

- ▶ Only use the auxiliary winch (assembly or reeving winch) for assembly and not to lift loads.
- ▶ Lifting of loads with the auxiliary winch is prohibited.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.

- ▶ Make sure that personnel cannot be caught by components.
- ▶ Make sure that the crane is horizontally aligned.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.
- ▶ During assembly / disassembly no one may be in the dangerous area around or underneath the suspended components before the load has been secured.

Part of the category „Aids for working at a height“ are, for example:

- Lifting platforms
- Scaffolding
- Auxiliary cranes
- Ladders

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WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ When closing or opening boom systems during boom assembly or boom disassembly, no persons may remain on the boom system or in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping and walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane driver of the main crane must be in voice contact with the crane driver / crane drivers of the auxiliary crane / auxiliary cranes.
- ▶ For all assembly work, the crane driver of the main crane must be in voice contact with the assembly personnel.
- ▶ For assembly tasks, the crane driver may only initiate crane movements when the responsible guide has explicitly released the movement.

DANGER
The components can fall down!
If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not disengage the auxiliary crane and the fastening equipment until the respective component is pinned and secured.

WARNING
The components can fall down!
If the corresponding component is unpinned without being secured by an auxiliary crane, the corresponding component can fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not unpin the components until they are secured by an auxiliary crane.

WARNING
Falling components and tools!
Whenever working at a height, for example on the crane or on an aerial platform, components or tools can fall down.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the danger zone under the work area is blocked off and marked and that no personnel is located within it.

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16.1 Assembly drawings

WARNING
Use of assembly drawings!
Due to sole use of assembly drawings, dangerous situations can arise up to toppling of the crane.
Death, severe bodily injuries, property damage.
- ▶ Assembly drawings should only be considered to be **additional** and **supplementary** information.
- ▶ The respective chapters in the crane operating instructions are decisive for the assembly and disassembly of crane structures, lattice sections or crane components.
- ▶ The detailed information and danger notes in the respective chapters must be observed.

16.2 Guiding crane structures, lattice sections or crane components

WARNING
Danger due to oscillating load!
During the assembly of crane structures, lattice sections or crane components with the auxiliary crane, they can start to swing back and forth.
Death, severe bodily injuries, property damage.
- ▶ To guide and position crane structures, lattice sections or crane components always use a guide rope.
- ▶ Make sure that there are no persons or obstacles within the danger zone.
- ▶ Make sure that the guide rope is long enough.

16.3 Assembling / disassembling of electrical lines

WARNING
The crane can topple over!
If mechanical crane components, which have electrical connections are not immediately electrically connected after assembly then the limit switches and / or electrical sensors are not functioning.
Safety relevant shut offs are not recognized by the LICCON computer system.
Any errors or safety relevant messages which might occur are not shown on the LICCON computer system.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the electrical connections are made immediately after installation of the respective crane components on the crane.
- ▶ Make sure that the procedure to make the electrical connections to the boom end sections in the respective assembly and set up chapters are observed.

NOTICE
Danger of damage to the electrical connections!
If the following measures are not adhered to, the electrical connections can be damaged.
- ▶ Do not plug in the plug connection or unplug them under tension.
- ▶ Do not pinch or crush electrical connections.

When pulling the cable out:
- ▶ Hold the plug and not the cable. Do not pull on the cable to release the plug connection.
- ▶ Relieve the electrical connections in operating condition.
- ▶ In case of defective or faulty electrical lines, contact Customer Service at Liebherr-Werk Ehingen GmbH.

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WARNING
Malfunction if dummy plugs are not installed!
If the dummy plugs on the non-required electrical connections are not installed, then malfunctions or functional limitations can occur on the crane.
- ▶ Make sure that all non-required electrical connections, which have a dummy plug, are closed off with dummy plugs.
- ▶ Pay attention to the Electrical wiring diagram.

NOTICE
Property damage due to dirt and / or corrosion!
The plug connections are only protected when plugged in. If the plug connections are not plugged in, then the contact surfaces can corrode.
This could result in malfunctions.
- ▶ Always plug or screw the plug connections together properly.
- ▶ Keep plug connections clean and dry. Clean contact surfaces provide the best signal transfer.
- ▶ Close off the plug connections that are not used with dust caps.

- ▶ Establish the electrical connections to the installed crane components properly.
- ▶ As a rule, close off on-required electrical connections (for example of accessories which are not installed) with the respective dummy plugs.
- ▶ Properly close off electrical connections, which have no dummy plugs, with the corresponding protective dust or cover caps.

If a pull release for the cable drum is present:
- ▶ Hang the pull release in on the fixed point and relieve the plug connections from the pull strain.

After installing the plug connections:
- ▶ Check all plug connections for proper connection.

If a plug connection is not properly connected:
- ▶ Plug or screw the plug connection together properly.

After removing the plug connections:
- ▶ Protect the electrical connections with protective dust or cover caps or place them in intended storage retainers.
- ▶ After unplugging the electrical plug connections, install the dummy plugs, see Electrical wiring diagram.

If locking brackets are present:
- ▶ Close the locking bracket.

16.4 Assembling / disassembling of hydraulic lines

When connecting and releasing hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

WARNING
Danger of accident due to loss of pressure or leakage!
Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.
Death, severe bodily injuries, property damage.
- ▶ Check the quick couplings after assembly for correct connection.
- ▶ Make sure that the sleeve and plug are bolted with the knurled nut after assembly.

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WARNING
Pressure in the hydraulic lines!
If the pressure supply is not interrupted before releasing the hydraulic lines, the hydraulic oil can escape with high pressure.
Death, severe bodily injuries, property damage.
▶ Release the pressure in the hydraulic system before releasing. Interrupt the pressure supply and wait for a short time.

▶ Release the pressure in the hydraulic system before connecting or disconnecting: Turn the engine off and wait for a short time.
▶ Connect the coupling components (sleeve and connector) and screw together with the knurled nut.
▶ Tighten the hydraulic coupling by hand. Turn the knurled nut until it reaches a tangible, fixed stop position.

16.5 Bypassing at crawler assembly / disassembly

Note
▶ Applies only for cranes with crawler assembly key button.

WARNING
High danger of accident in case of actuated crawler assembly key button!
If the crawler assembly key button is actuated, the overload protection is bypassed. No shut-off at overload will occur in assembly operation nor in crane operation.
In the event of misuse, the crane can topple over.
Death, severe bodily injuries, property damage.
▶ The crawler assembly key button may only be actuated for assembly tasks.
▶ All other usage of the crawler assembly key button other than as described in the operating instructions is prohibited.
▶ Crane operation with the crawler assembly key button enabled is strictly prohibited.

16.5.1 Activating the bypass at crawler assembly and crawler disassembly

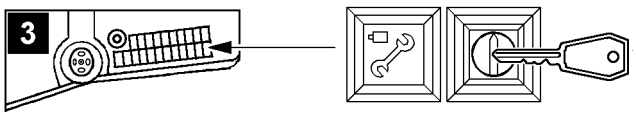

Fig.113441: Activating the bypass

– Illustration **3**: Crawler assembly key button and indicator light *Crawler assembly* with touch function *Crawler assembly off*

▶ Actuate the crawler assembly key button.

Result:

– The LICCON overload protection is inactive.
– The indicator light *Crawler assembly* lights up.

16.5.2 Deactivating the bypass at crawler assembly and crawler disassembly

Make sure that the following prerequisites are met:
– The LICCON overload protection is bypassed / inactive and the „Bypass at assembly and disassembly“ is activated.
– The *crawler assembly* indicator light illuminates.

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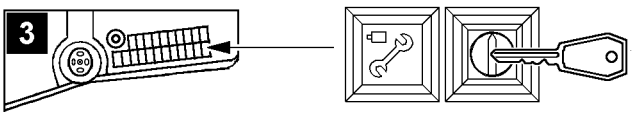

Fig.113441: Deactivating the bypass

If the bypass at crawler assembly is to be turned off:

▶ Turn the crawler assembly off by pressing the off button *Crawler assembly off*.

Result:

– The indicator light in the button *Crawler assembly* turns off.

16.6 Bypassing at assembly / disassembly

Depending on the crane version, the „Bypass at assembly and disassembly“ is activated by:

– The set up button (key button) on the LICCON monitor.
– The assembly key button in the instrument panel.

Note

▶ Applies only for cranes with LICCON overload protection.
▶ Indicator light *Assembly* is only present in the instrument panel for certain crane types.

WARNING

High danger of accident at crane operation with activated „Bypass at assembly and disassembly“!
At activated „Bypass at assembly and disassembly“ the overload protection and possibly bypassed hoist limit switches.
In the event of improper use, the crane could collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.

▶ The activation of the „Bypass at assembly and disassembly“ is only permissible for assembly and disassembly purposes.
▶ All other usage of the „Bypass at assembly and disassembly“ other than as described in the operating instructions is prohibited.
▶ The „Bypass at assembly and disassembly“ may only be activated by persons who are aware of the consequences of a bypass.
▶ Crane operation with activated „Bypass at assembly and disassembly“ is strictly prohibited.
▶ The „Bypass at assembly and disassembly“ must be deactivated immediately after assembly and disassembly work.
▶ The crane operator or a person authorized by him must make sure that no misuse of the bypass device is possible (remove the key and store it safely, if necessary).

16.6.1 Activating the bypass at assembly and disassembly

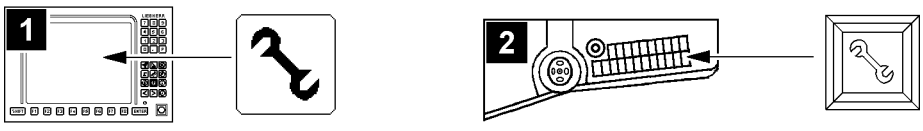

Fig.113438: Activating the bypass at assembly and disassembly

– Illustration **1**: LICCON monitor (only certain crane types).
– Illustration **2**: Indicator light „Assembly“ in instrument panel crane cab (only certain crane types).

▶ Actuate the respective operating element.

Result:

– The LICCON overload protection is bypassed / inactive and the „Bypass at assembly and disassembly“ is activated.

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– The „Assembly“ icon appears in the LICCON monitor and / or the indicator light „Assembly“ in the instrument panel lights up.
– Depending on the circumstances, acoustic and / or optical warning signals (blinkers, flashing lights, bells and horns) sound.

16.6.2 Bypassing at assembly and disassembly

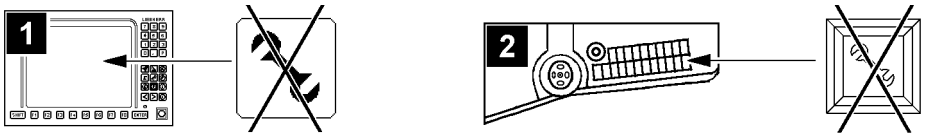

Fig.113437: Bypassing at assembly and disassembly

▶ No longer actuate the respective operating element or reset.

Result:

– The LICCON overload protection is active and the „Bypass at assembly and disassembly“ is deactivated.
– The „Assembly“ icon turns off in the LICCON monitor and / or the indicator light „Assembly“ in the instrument panel no longer lights up.
– The acoustic and / or optical warning signals which were triggered by the bypass are turned off again.

16.7 Actuation of winch and / or crane movements during assembly / disassembly

Note

▶ The winches and / or crane movements can be controlled from the crane cab or, depending on the crane set up configuration, with the Bluetooth™ Terminal (BTT) or the radio remote control*.
▶ Observe the chapter 4.05, chapter 5.31 and chapter 6.08.

WARNING

Uncoordinated procedure for assembly tasks!
Death, severe bodily injuries, property damage.

▶ Before starting the assembly tasks, define the course of action and agree on all steps with all involved personnel.
▶ Monitor all steps and continuously check the course of action.
▶ In the case of unforeseen events, stop the course of action and agree on the new situation with all involved personnel.
▶ Make sure that winches and / or crane movements are only controlled by people who are aware of the effects on the crane and / or boom system as well as the connected dangers.
▶ Make sure that no persons, objects or obstacles are within the danger zone of the crane.
▶ Prewarn persons within the surrounding area of the crane, for example via a horn signal.
▶ Perform all winch and / or crane movements anticipatorily and at a low speed.

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16.8 Assembling / disassembling the counterweight

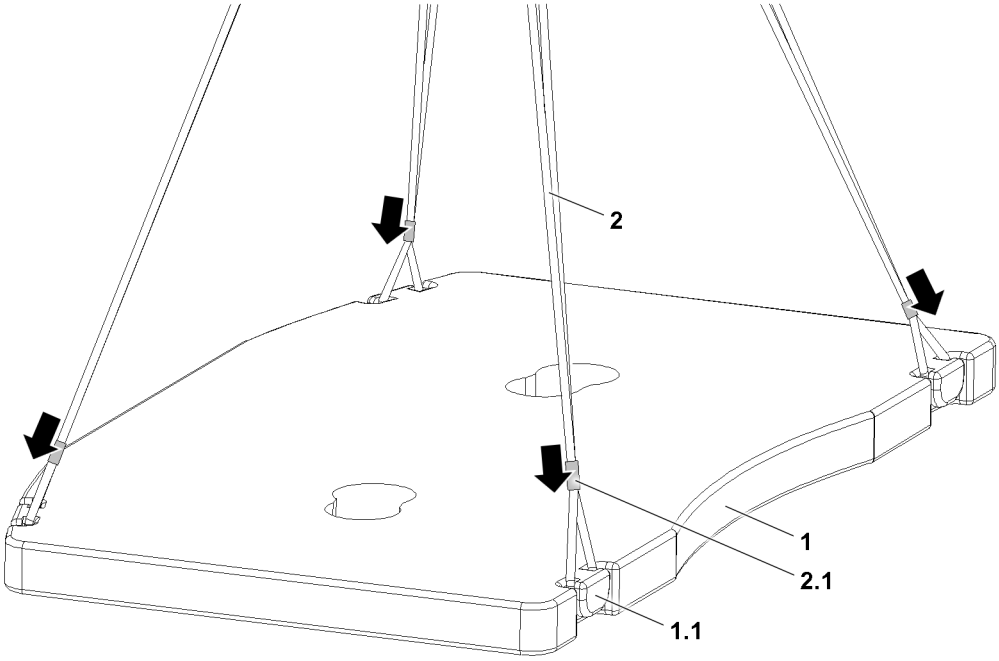

Fig.152587: Grommets and cable laid fastening rope

16.8.1 Grommets and cable laid fastening rope

Use the supplied fastening ropes **2** only for set up work on the crane.

The fastening ropes **2** are marked with the maximum load bearing capacity.

WARNING
Fastening ropes used incorrectly!
The fastening ropes can fail. The load call fall down.
- ▶ Do **not** exceed the load bearing capacity or the fastening ropes **2** when lifting the counterweight.
- ▶ **Never** fasten the fastening ropes **2** to the red marked impact points.
- ▶ **Never** cross or twist the fastening ropes **2**.

Depending on the structural form of the counterweight **1**, use two, three or four fastening ropes **2**.

- ▶ Lay the fastening rope **2** around the bitts **1.1** of the counterweight **1** to be lifted.
- ▶ Until the fastening ropes **2** are positioned firmly on the fastening points: Push the mobile ferrules **2.1** in the direction of the fastening point of the counterweight **1**.

16.9 Assembling / disassembling the booms

WARNING
The crane can topple over!
Angular pull can overload the crane.
Overload can cause destruction of the crane or cause it to topple over.
Death, severe bodily injuries, property damage.
- ▶ The hook block must always be attached (hooked) vertically over the center of gravity of the load to be lifted.
- ▶ Angular pull is prohibited

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Fig.113444: Danger of accident during assembly / disassembly

WARNING
Danger of accident at assembly / disassembly of booms!
When you disassemble unsecured or unsupported booms, they can fall down.
Death, severe bodily injuries, property damage.
- ▶ Never unpin the pins under unsecured or unsupported booms.
- ▶ Never unpin the connector pins on unsecured or unsupported booms.
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms.
- ▶ Secure the pins in the bearing points and in the racks.
- ▶ The railing must be horizontal during the assembly and disassembly of the booms.
- ▶ Do not lean the ladder against the component being disassembled.

Make sure that the following prerequisites are met for the closing assembly:
- – If parts of the equipment (for example lattice sections) are not in contact with the ground during assembly / disassembly, then they must be supported with suitable, stable materials.
- – Take down the parts of the equipment with rope pulleys in such a way that the rope pulleys are not damaged.
- – During disassembly make sure that the auxiliary crane can lift the load vertically.
- – Have an auxiliary crane with sufficient load bearing capacity available to be able to hold the load at the corresponding radius.

16.10 Fastening positions for assembly / disassembly of the lattice jib

WARNING
Danger of fatal accidents due falling components!
The maximum permissible tensile load on the fastening eye is engraved on the fastening eye.
The maximum permissible fastening load of the respective components can differ to the maximum permissible tensile load of the fastening eye.
Components can be damaged at overload and fall down during lifting.
- ▶ Observe the maximum permissible fastening load according to the operating instructions and the tags on the components.
- ▶ Fasten the lattice jib only according to the following descriptions.
- ▶ Do not overload the components.

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16.10.1 Closing the end section

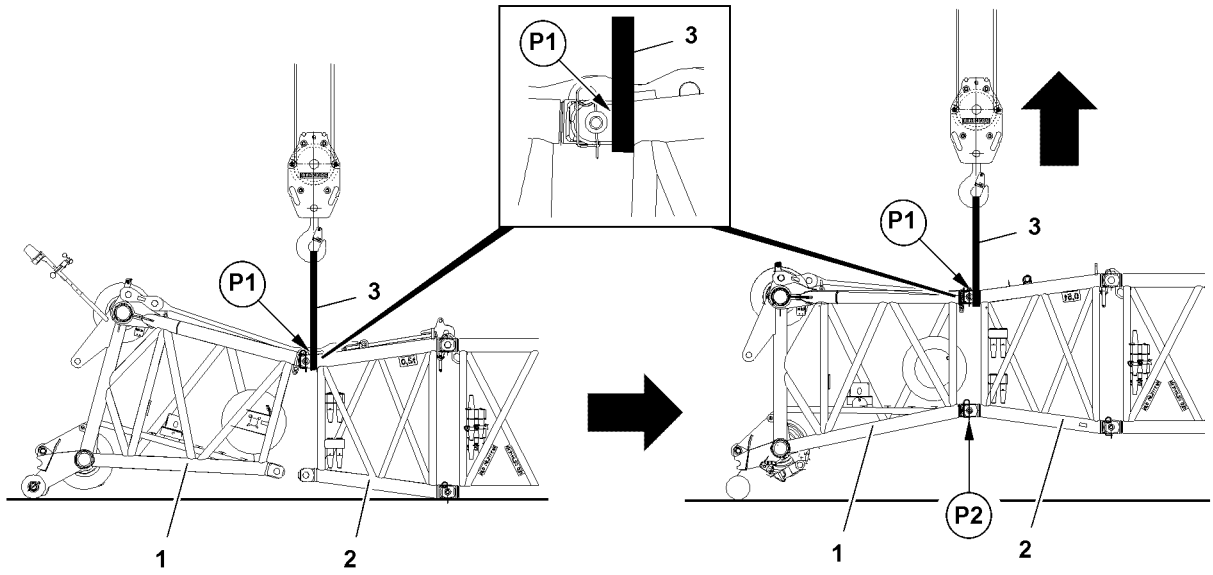

Fig.117840: Closing the end section

For closing the end section, observe the following:
- Use textile type fastening equipment **3**.
- Loop the textile type fastening equipment **3** on the left and right around on the pin points.

Before fastening:
- ▶ Check the position of the spring retainers and correct, if necessary.
- ▶ Fasten the textile type fastening equipment **3** on the upper pin points **P1** between the end section **1** and the pinned components **2**.
- ▶ Lift the lattice jib until the lower pin points **P2** align between the end section **1** and components **2**.
- ▶ Pin the end section **1** and components **2** on the lower pin points **P2** on the left and right.

After pinning:
- ▶ Remove the textile type fastening equipment **3**.

16.10.2 Taking the lattice jib down into the roller cart

Note
- ▶ The following illustrations are examples and may not match your crane exactly.

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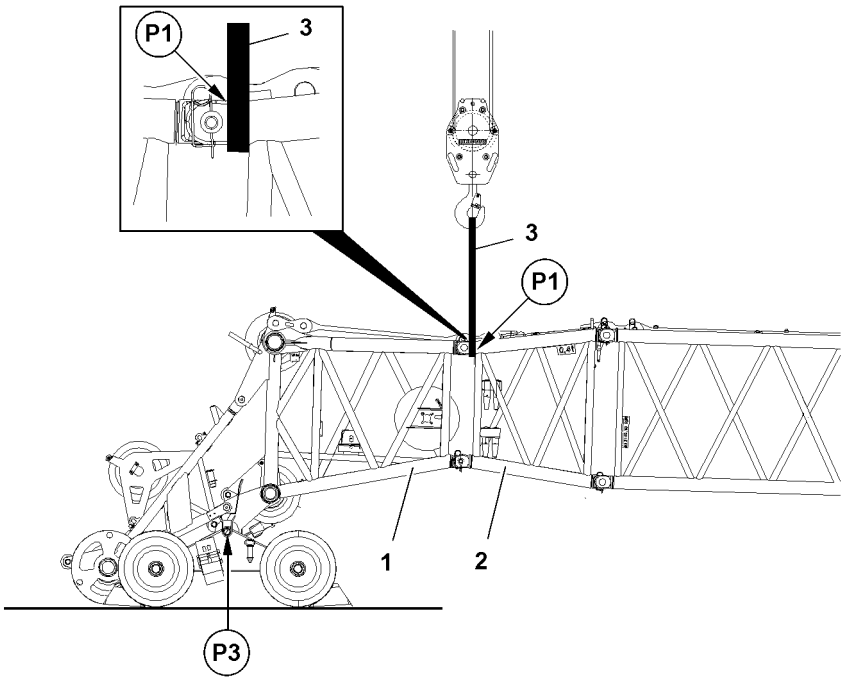

Fig.117842: Taking the lattice jib down into the roller cart (telescopic crane with lattice jib)

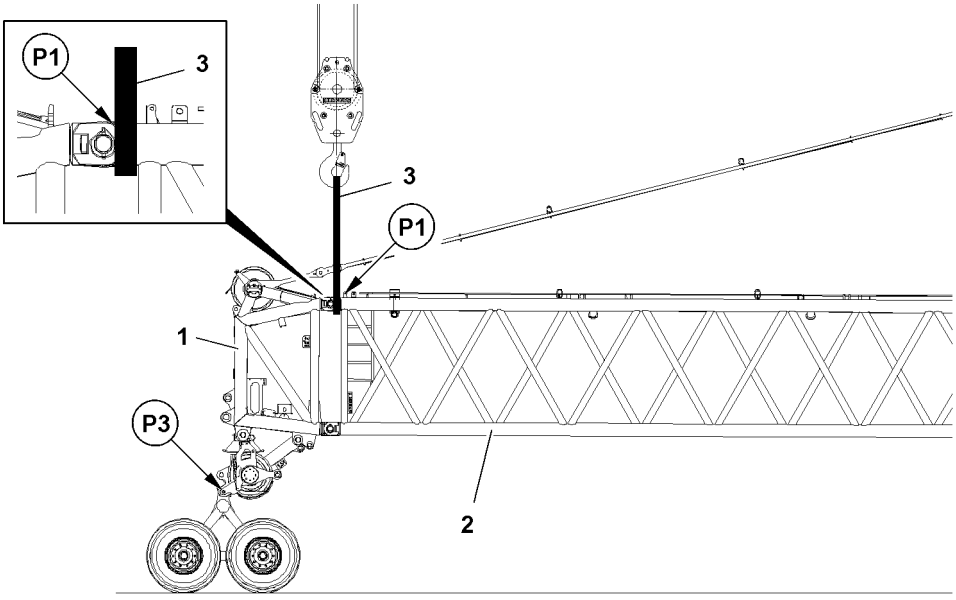

Fig.121550: Taking the lattice jib down into the roller cart (crane with lattice mast)

When taking it down into the roller cart, observe the following:
- The end section **1** is completely assembled.
- Use textile type fastening equipment **3**.
- Loop the textile type fastening equipment **3** on the left and right around on the pin points.

Before fastening:
- ▶ Check the position of the spring retainers and correct, if necessary.
- ▶ Fasten the textile type fastening equipment **3** on the upper pin points **P1** between the end section **1** and the pinned components **2**.
- ▶ Lift the lattice jib and take it down in the roller cart **4**.
- ▶ Pin the end section **1** with the roller cart **4** on the pin points **P3** on the left and right.
- ▶ Remove the textile type fastening equipment **3**.

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Note
▶ The disassembly and removal of the pulley cart **4** is handled accordingly.

16.10.3 Opening the end section

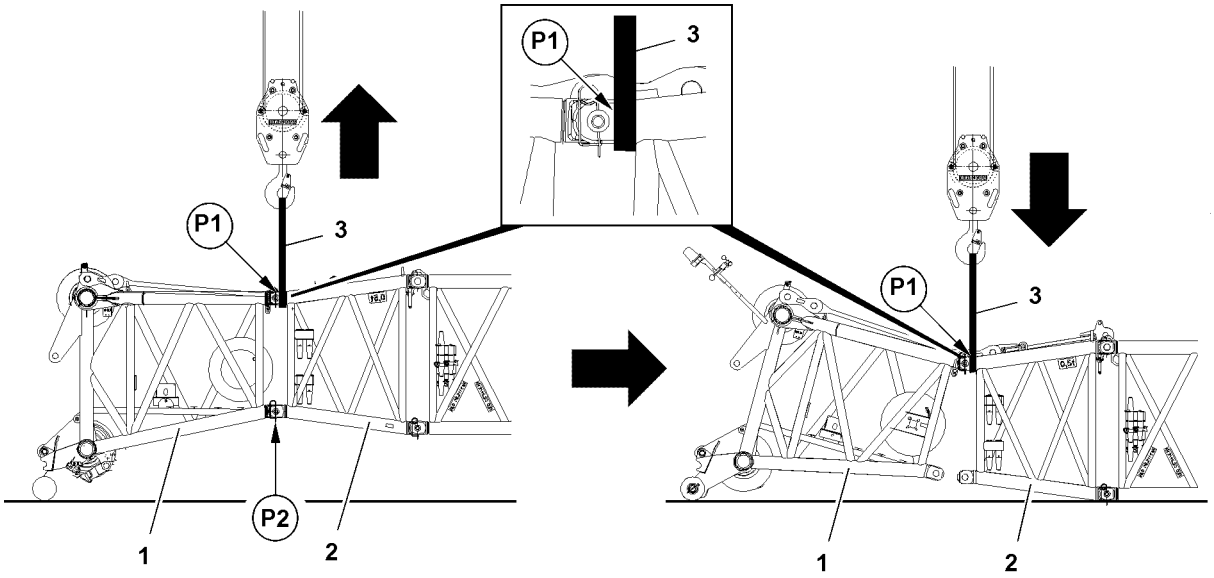

Fig.117841: Opening the end section

For opening the end section, observe the following:
- The roller cart is disassembled and removed.
- Use textile type fastening equipment **3**.
- Loop the textile type fastening equipment **3** on the left and right around on the pin points.

Before fastening:
▶ Check the position of the spring retainers and correct, if necessary.
▶ Fasten the textile type fastening equipment **3** on the upper pin points **P1** between the end section **1** and the pinned components **2**.
▶ Lift the lattice jib and relieve the pins on the lower pin points **P2**.
▶ Unpin the end section **1** and components **2** on the lower pin points **P2** on the left and right.
▶ Take the lattice jib down onto the ground.
▶ Remove the textile type fastening equipment **3**.

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16.10.4 Holding the luffing lattice jib

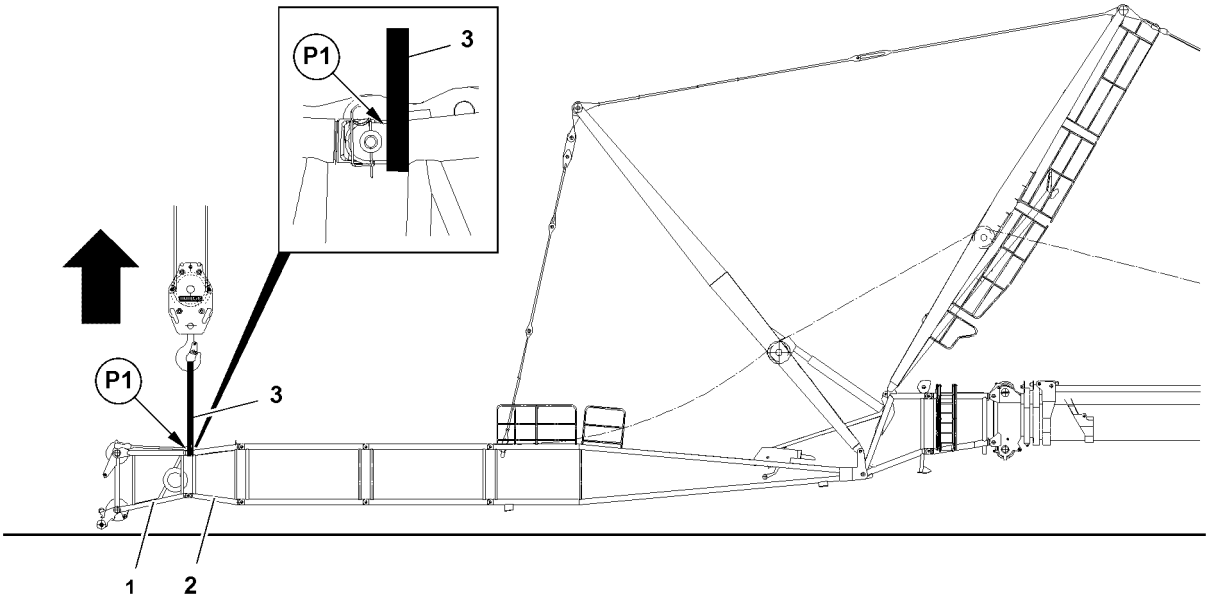

Fig.117843: Holding the luffing lattice jib

To be able to install or remove the guy rods and "flying assembly", the luffing lattice jib must be held on the upper pin points **P1**.

When holding the luffing lattice jib, observe the following:
- The lattice jib has been completely assembled.
- Use textile type fastening equipment **3**.
- Loop the textile type fastening equipment **3** on the left and right around on the pin points.

Before fastening:
- ▶ Check the position of the spring retainers and correct, if necessary.
- ▶ Fasten the textile type fastening equipment **3** on the upper pin points **P1** between the end section **1** and the pinned components **2**.
- ▶ Lift the lattice jib and install the guy rods.

When the guy rods are installed:
- ▶ Remove the textile type fastening equipment **3**.

Note
- ▶ The removal of the guy rods is handled accordingly.

16.10.5 Assembling the fixed lattice jib on the TF-adapter

WARNING
Mortal danger if the lattice jib tilts over!
Due to unfavorable center of gravity, only certain lattice jib lengths can be installed / removed as an assembled lattice jib.
If a lattice jib length cannot be installed / removed as an assembled lattice jib, then they must be installed / removed individually in flying mode.
- ▶ Check if the respective lattice jib length can be installed / removed as an assembled lattice jib. See charts in chapter 5.01.10.

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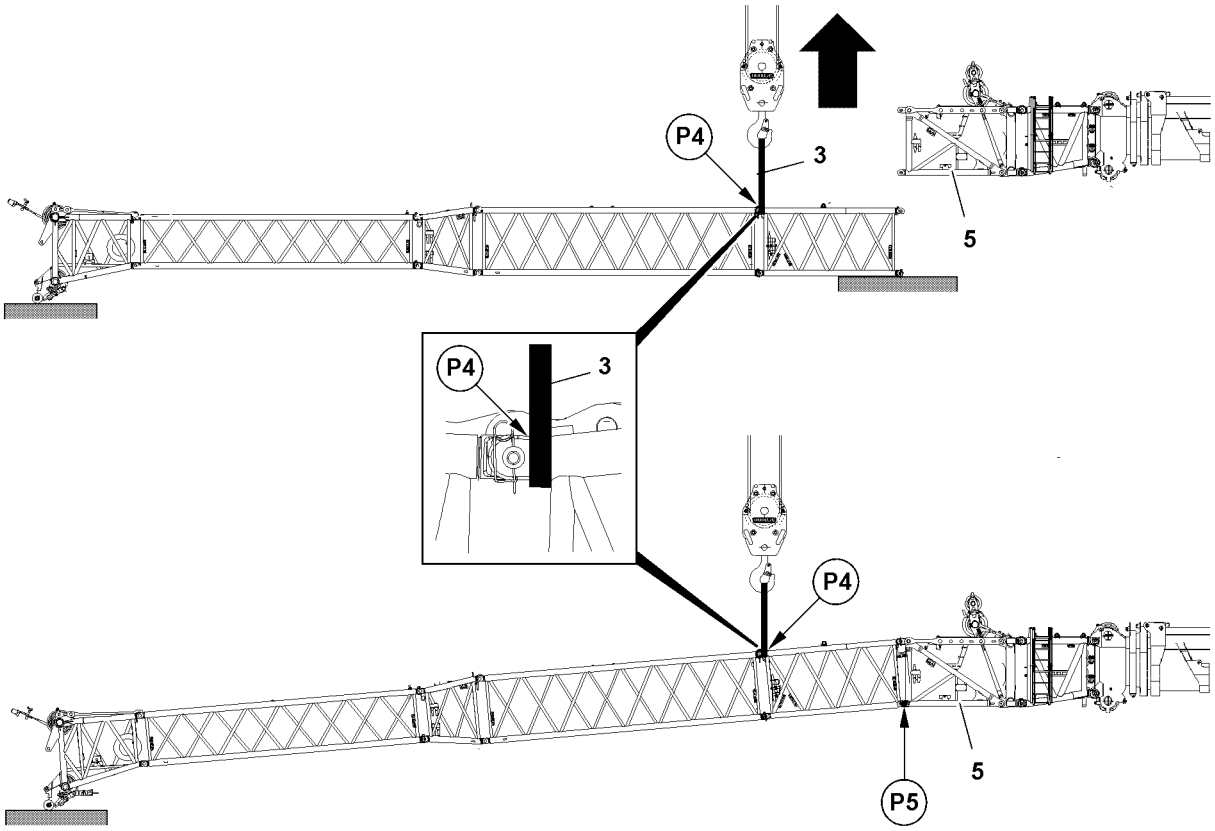

Fig.117844: Assembling the lattice jib on the TF-adapter

For installation on the TF-adapter, observe the following:
- The lattice jib has been assembled.
- The TF-adapter **5** is assembled.
- Use textile type fastening equipment **3**.
- Loop the textile type fastening equipment **3** on the left and right around on the pin points.

Before fastening:
▶ Check the position of the spring retainers and correct, if necessary.

Fasten between the lattice sections, which are installed directly on the TF-adapter.

▶ Fasten the textile type fastening equipment **3** on the upper pin points **P4**.
▶ Lift the lattice jib and affix on the lower pin point **P5** on the TF-adapter **5**.
▶ Pin the lattice jib on the lower pin point **P5** with the TF-adapter **5**.

After pinning:
▶ Remove the textile type fastening equipment **3**.

WARNING
Mortal danger if the lattice jib tilts over!
▶ Make sure to always observe the permissible lattice jib length at disassembly.

▶ Disassemble accordingly.

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16.10.6 Closing the fixed lattice jib

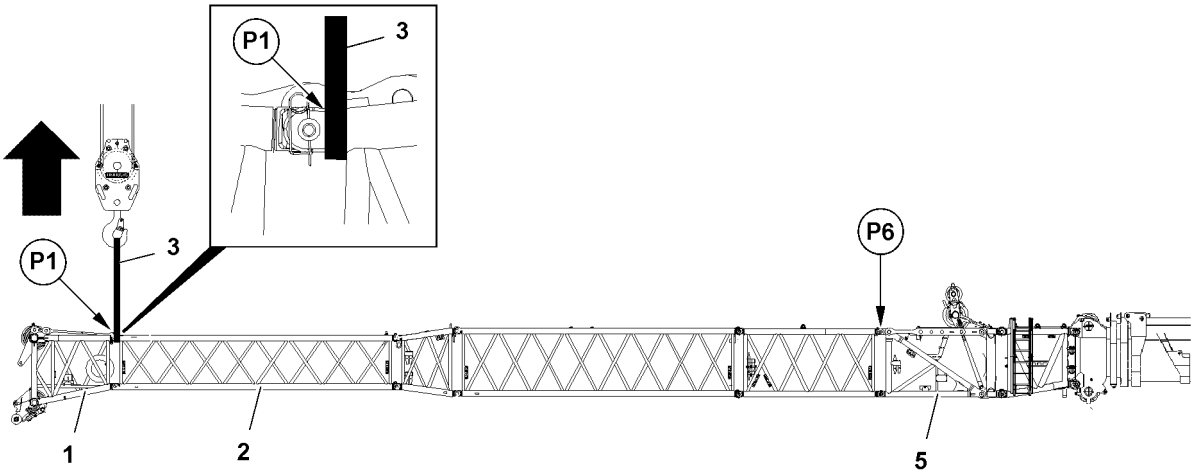

Fig.117850: Closing the lattice jib

For installation on the TF-adapter, observe the following:
- The lattice jib is pinned on the lower pin points of the TF-adapter **5**.
- Use textile type fastening equipment **3**.
- Loop the textile type fastening equipment **3** on the left and right around on the pin points.

Before fastening:
- ▶ Check the position of the spring retainers and correct, if necessary.
- ▶ Fasten the textile type fastening equipment **3** on the upper pin points **P1** between the end section **1** and the pinned components **2**.
- ▶ Lift the lattice jib and affix on the upper pin point **P6** on the TF-adapter **5**.
- ▶ Pin the lattice jib on the upper pin point **P6** with the TF-adapter **5**.

After pinning:
- ▶ Remove the textile type fastening equipment **3**.

Note
- ▶ Disassemble accordingly.

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16.10.7 Angle adjustment on the fixed lattice jib with mechanical adjustment

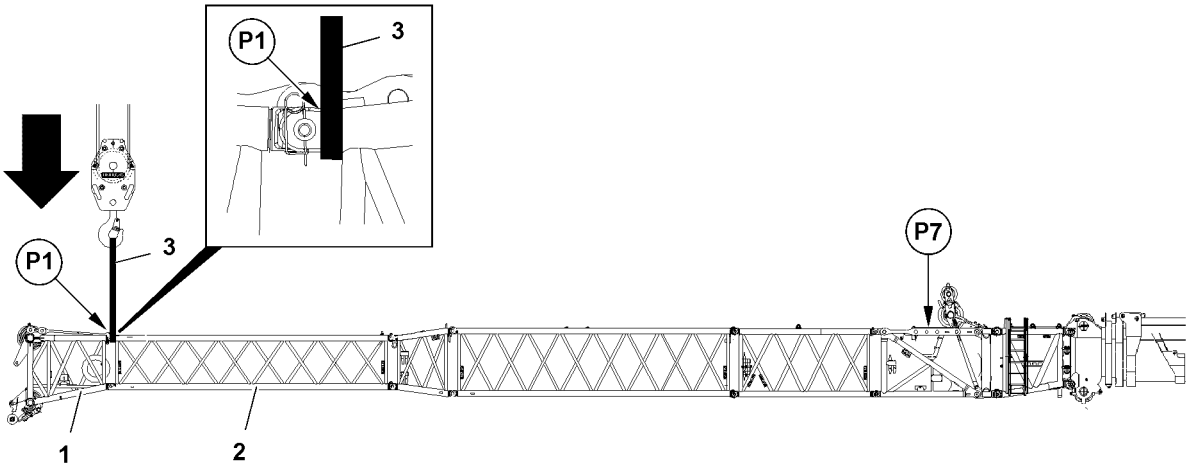

Fig.117851: Angle adjustment on the fixed lattice jib

For the angle adjustment on the fixed lattice jib, observe the following:
- The lattice jib has been completely assembled.
- Use textile type fastening equipment **3**.
- Loop the textile type fastening equipment **3** on the left and right around on the pin points.

Before fastening:
- ▶ Check the position of the spring retainers and correct, if necessary.
- ▶ Fasten the textile type fastening equipment **3** on the upper pin points **P1** between the end section **1** and the pinned components **2**.
- ▶ Lift the lattice jib and relieve the pins on the angle adjustment **P7**.
- ▶ Unpin the angle adjustment **P7**, see chapter 5.03.
- ▶ Set and pin a New angle on the angle adjustment **P7**, see chapter 5.03.
- ▶ Lower the lattice jib.

After lowering:
- ▶ Remove the textile type fastening equipment **3**.

16.10.8 Loading the preassembled lattice jib

For loading the lattice jib, observe the following:
- The lattice jib has been preassembled.
- Use textile type fastening equipment.
- Loop the textile type fastening equipment on the left and right around on the pin points.

Before fastening:
- ▶ Check the position of the spring retainers and correct, if necessary.
- ▶ Fasten the preassembled lattice jib according to the fastening points, chapter 5.03.

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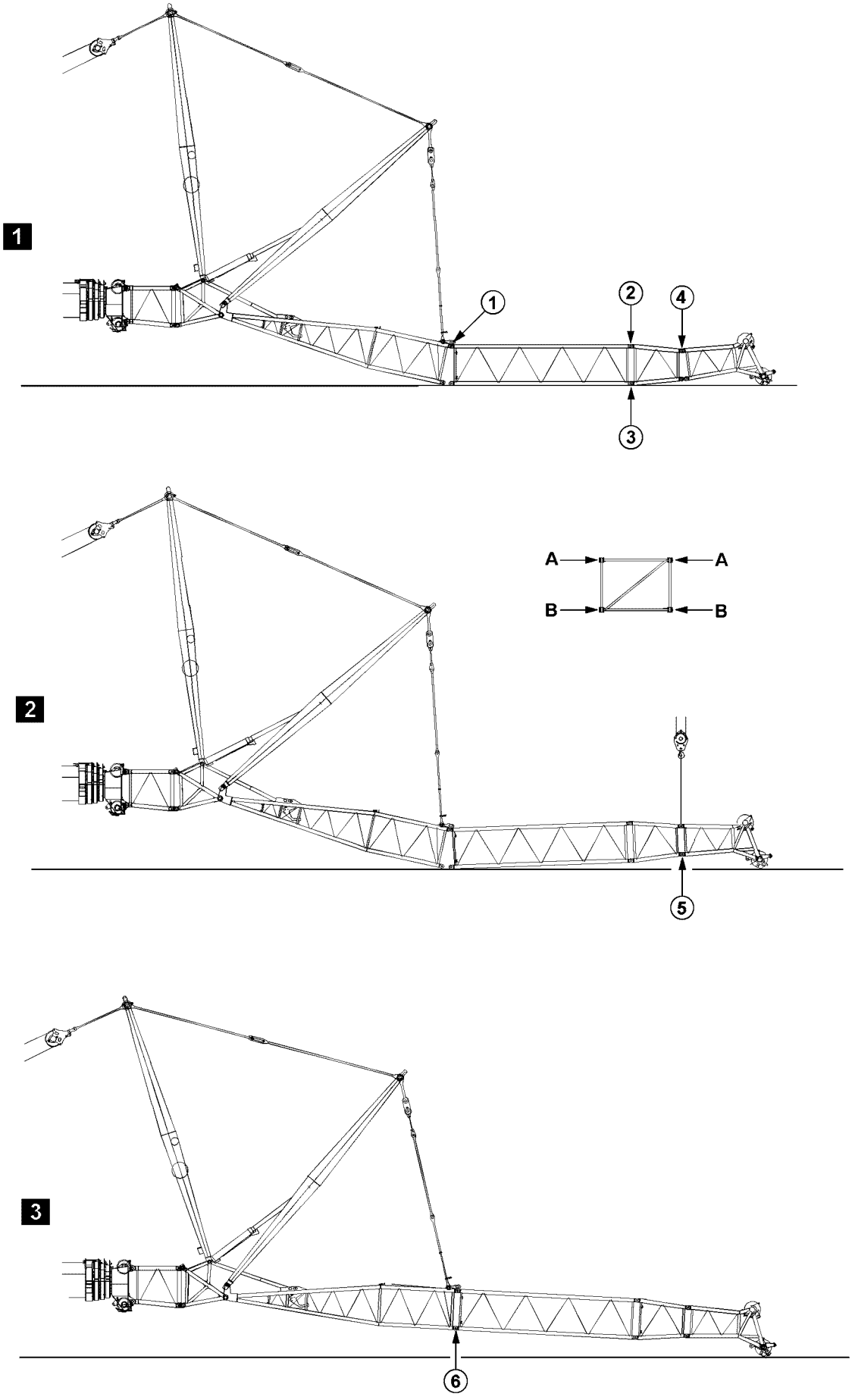

Fig.197718: Example of cranes with a telescopic boom

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16.11 Assembling / disassembling the lattice sections on telescopic cranes with a luffing lattice jib

16.11.1 Assembling the lattice sections on a luffing lattice jib

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Danger of fatal injury when assembling auxiliary booms!
If the pins are not pinned in the given sequence, then lattice sections may suddenly fold down or fall down.
Death, severe bodily injuries, property damage.
▶ Pins must be pinned in the order specified.

▶ Pin and secure pins at both sides (level **A**) at point **1**, illustration **1**.
▶ Pin and secure pins at both sides (level **A**) at point **2**, illustration **1**.
▶ Pin and secure pins at both sides (level **B**) at point **3**, illustration **1**.
▶ Pin and secure pins at both sides (level **A**) at point **4**, illustration **1**.
▶ Close the end section with the auxiliary crane, illustration **2**.
▶ Pin and secure pins at both sides (level **B**) at point **5**, illustration **2**.
▶ Lift the lattice sections, illustration **3**.
▶ Pin and secure pins at both sides (level **B**) at point **6**, illustration **3**.

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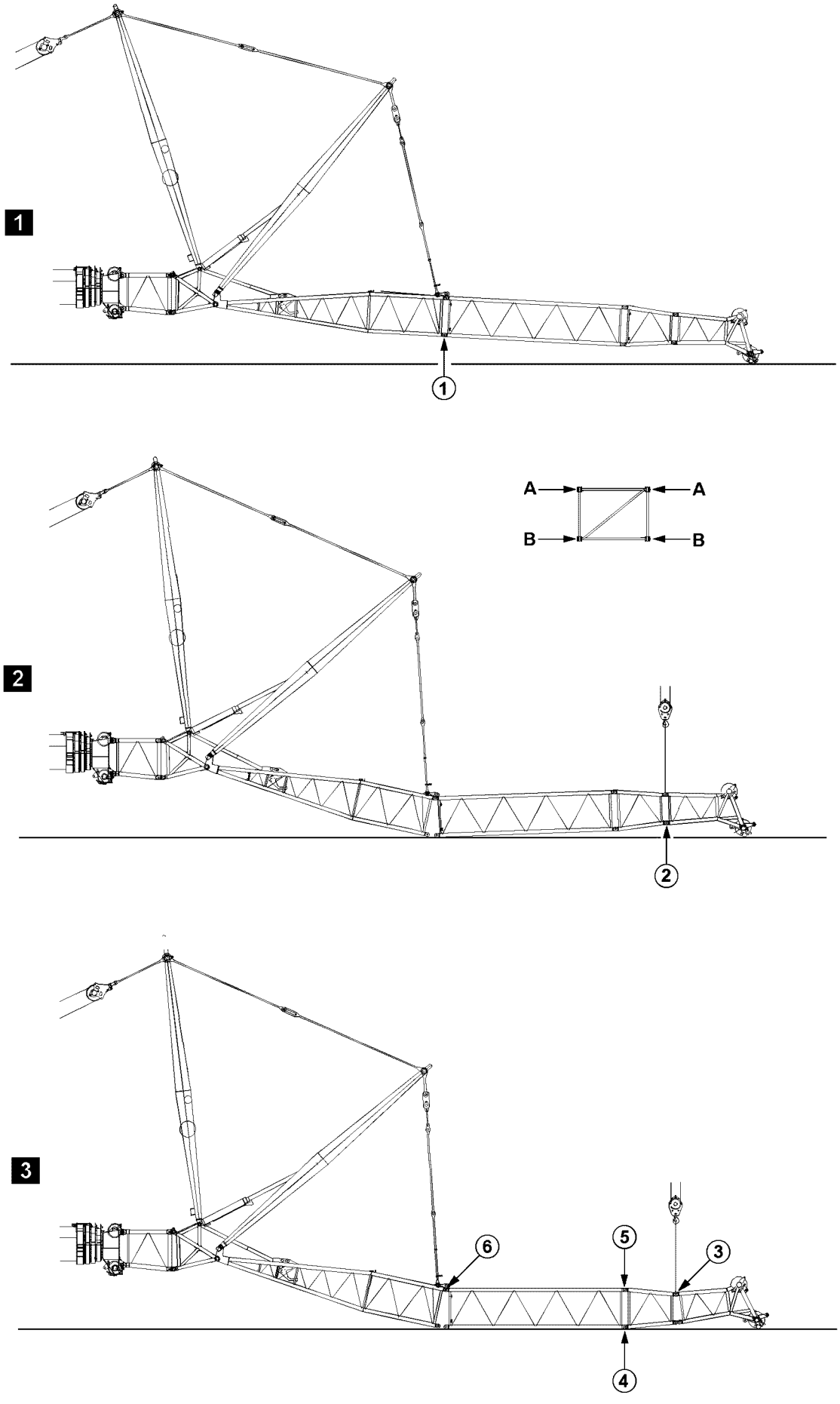

Fig.197719: Example of cranes with a telescopic boom

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16.11.2 Disassembling the lattice sections on a luffing lattice jib

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Danger of fatal injury when disassembling auxiliary booms!
If the pins are not unpinned in the given sequence, then lattice sections may suddenly fold down or fall down.
Death, severe bodily injuries, property damage.
▶ Pins must be unpinned in the specified order.

▶ Luff the boom down until the end section touches the ground slightly, illustration **1**.
▶ Guy the boom with NA-frame I, illustration **1**.
▶ Release and unpin the pins on both sides (level **B**) at point **1**, illustration **1**.
▶ Open the boom with the NA-frame I and completely take down the boom, illustration **2**.
▶ Lift the end section with the auxiliary crane, illustration **2**.
▶ Release and unpin the pins on both sides (level **B**) at point **2**, illustration **2**.
▶ Release and unpin the pins on both sides (level **A**) at point **3**, illustration **3**.
▶ Release and unpin the pins on both sides (level **B**) at point **4**, illustration **3**.
▶ Release and unpin the pins on both sides (level **A**) at point **5**, illustration **3**.
▶ Release and unpin the pins on both sides (level **A**) at point **6**, illustration **3**.

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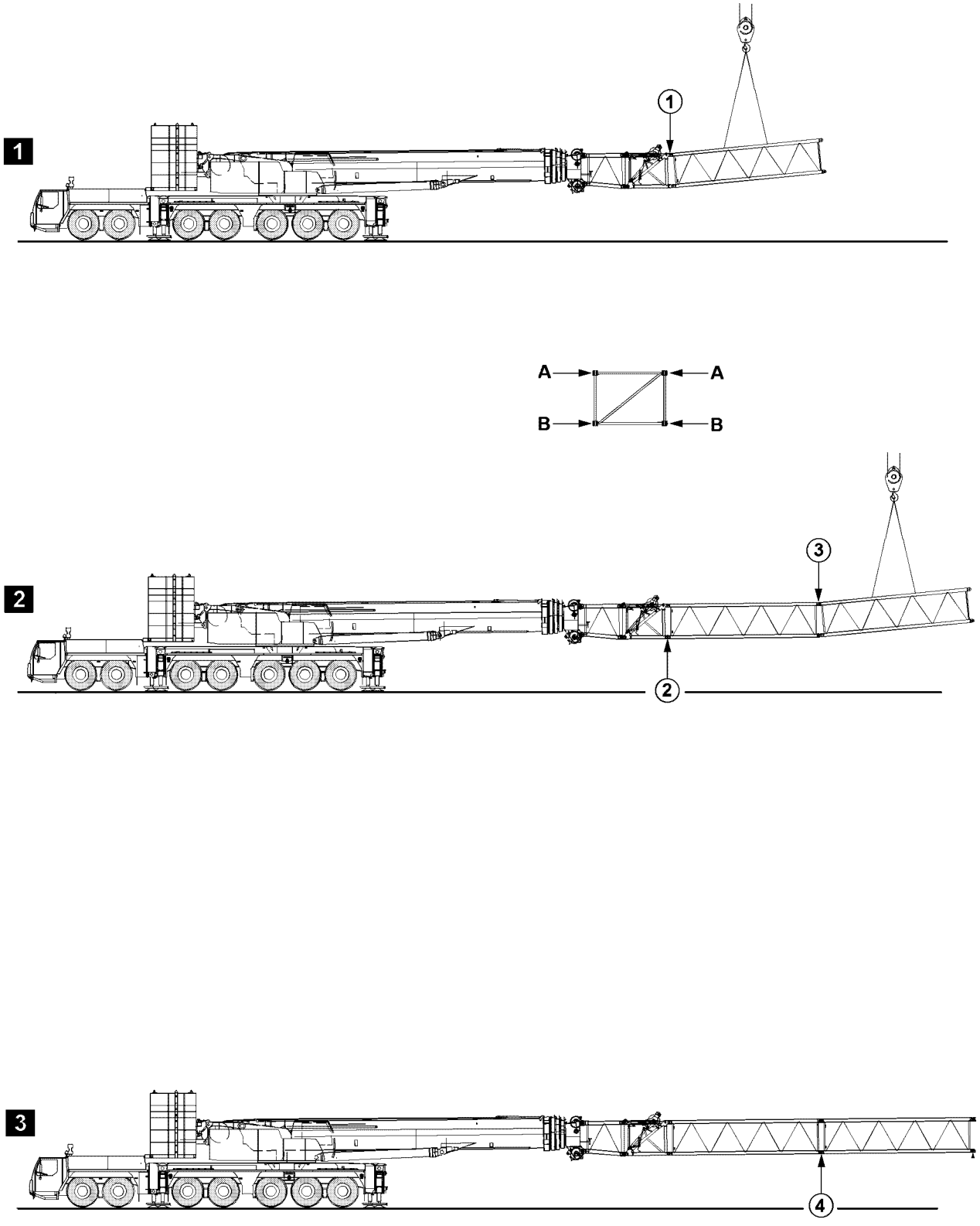

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Fig.197705: Example of cranes with a telescopic boom

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16.12 Assembling / disassembling the lattice sections on telescopic cranes with an auxiliary boom, with an auxiliary crane

16.12.1 Assembling the lattice sections on an auxiliary boom with an auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Danger of fatal injury when assembling auxiliary booms!
If the pins are not pinned in the given sequence, then lattice sections may suddenly fold down or fall down.
Death, severe bodily injuries, property damage.
▶ Pins must be pinned in the order specified.

▶ Pin and secure pins at both sides (level **A**) at point **1**, illustration **1**.
▶ Pin and secure pins at both sides (level **B**) at point **2**, illustration **2**.
▶ Pin and secure pins at both sides (level **A**) at point **3**, illustration **2**.
▶ Pin and secure pins at both sides (level **B**) at point **4**, illustration **3**.

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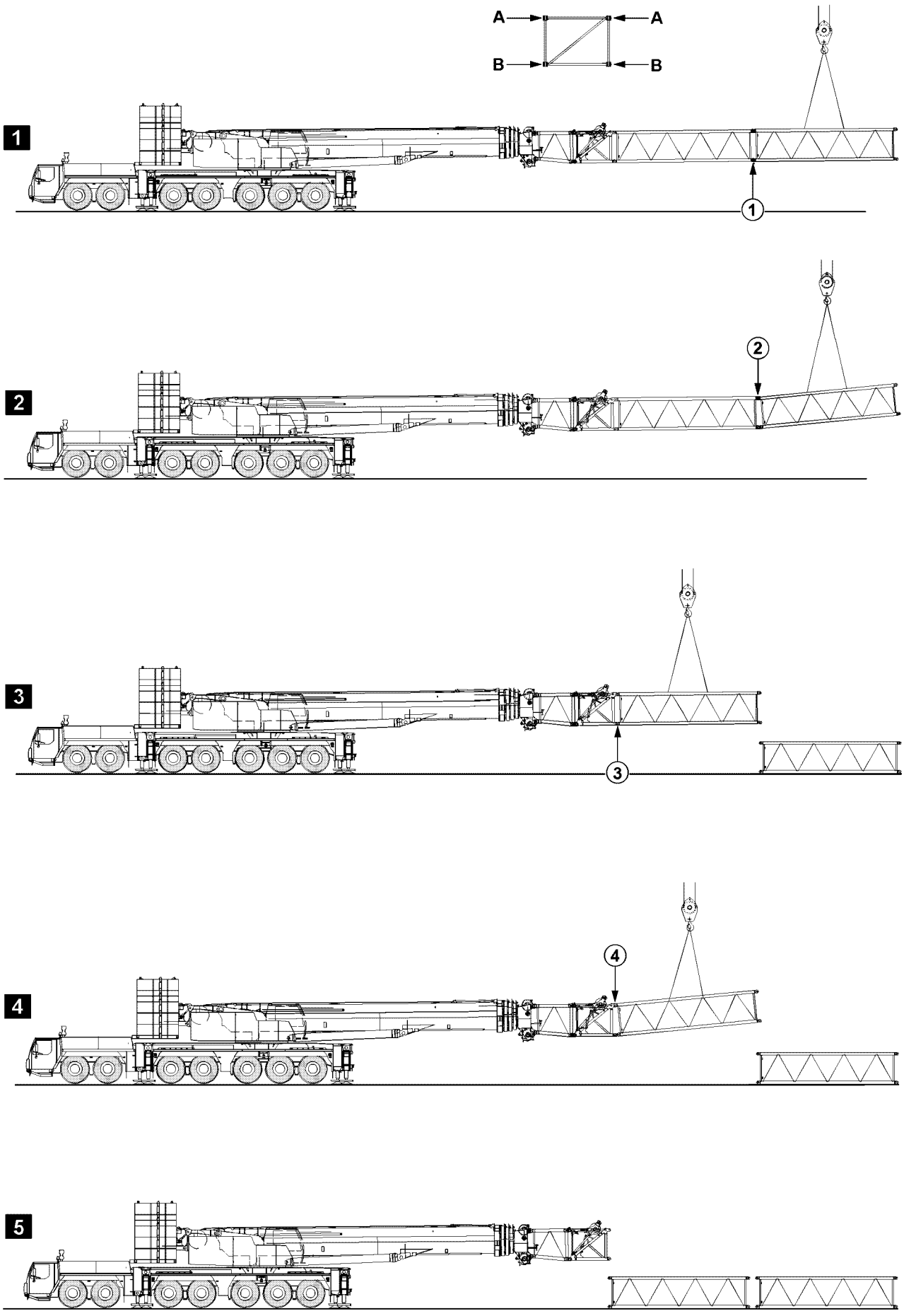

Fig.105510: Example of cranes with a telescopic boom

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16.12.2 Disassembling the lattice sections on an auxiliary boom with an auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Danger of fatal injury when disassembling auxiliary booms!
If the pins are not unpinned in the given sequence, then lattice sections may suddenly fold down or fall down.
Death, severe bodily injuries, property damage.
▶ Pins must be unpinned in the specified order.

▶ Release and unpin the pins on both sides (level **B**) at point **1**, illustration **1**.
▶ Release and unpin the pins on both sides (level **A**) at point **2**, illustration **2**.
▶ Release and unpin the pins on both sides (level **B**) at point **3**, illustration **3**.
▶ Release and unpin the pins on both sides (level **A**) at point **4**, illustration **4**.

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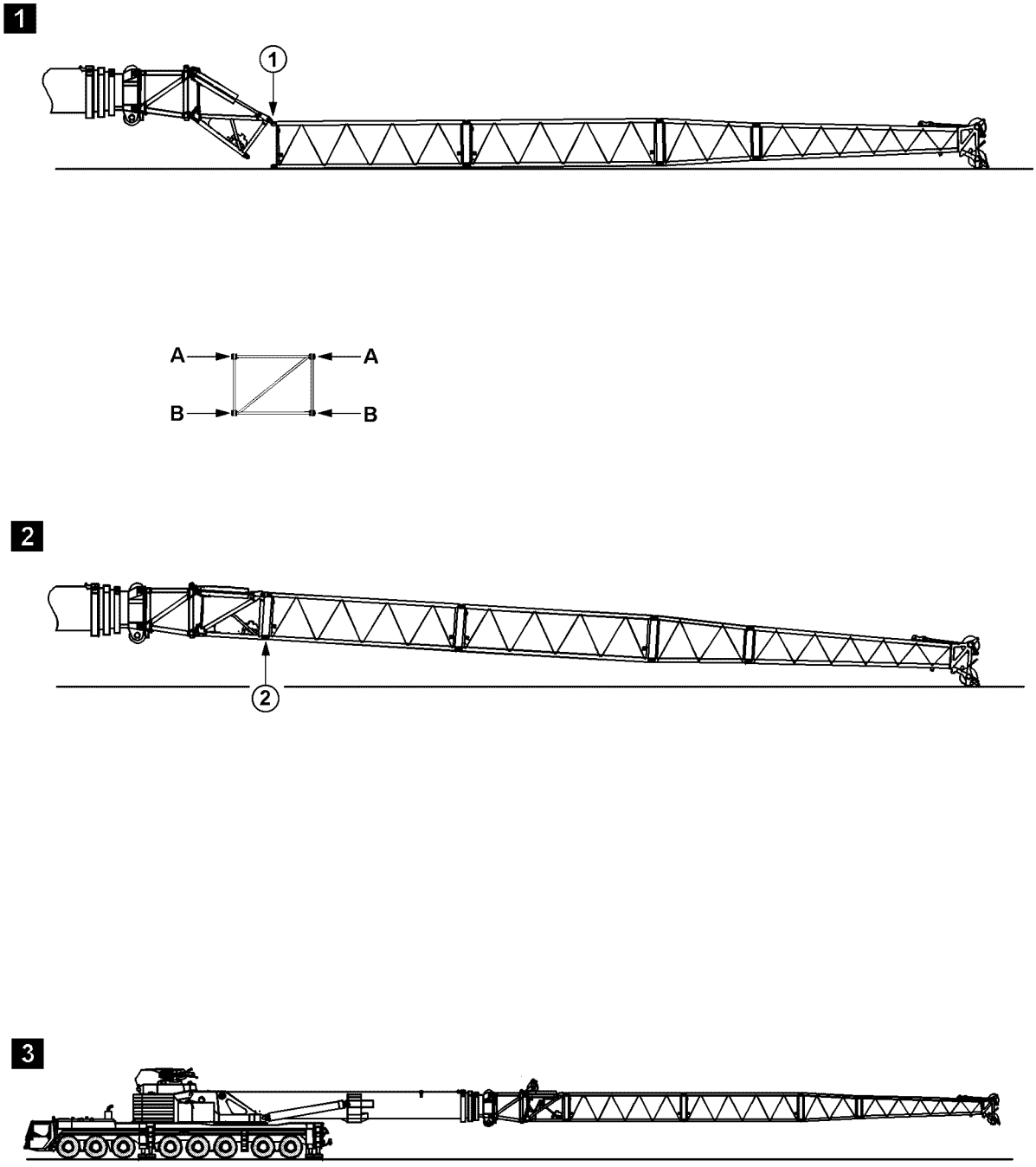

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Fig.197712: Example of cranes with a telescopic boom

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16.13 Assembling / disassembling the lattice sections on telescopic cranes with an auxiliary boom, without an auxiliary crane

16.13.1 Assembling the lattice sections on an auxiliary boom without an auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Danger of fatal injury when assembling auxiliary booms!
If the pins are not pinned in the given sequence, then lattice sections may suddenly fold down or fall down.
Death, severe bodily injuries, property damage.
▶ Pins must be pinned in the order specified.

For cranes with hydraulic angle adjustment and self-supporting auxiliary boom, the assembly / disassembly of additional lattice sections may be performed using the crane itself.

In order to do so, proceed as follows.

▶ Assemble the lattice sections to the required length.
▶ Pin and secure pins at both sides (level **A**) at point **1**, illustration **1**.
▶ Close the auxiliary boom until the pins can be pinned at point **2**, illustration **2**.
▶ Pin and secure pins at both sides (level **B**) at point **2**, illustration **2**.

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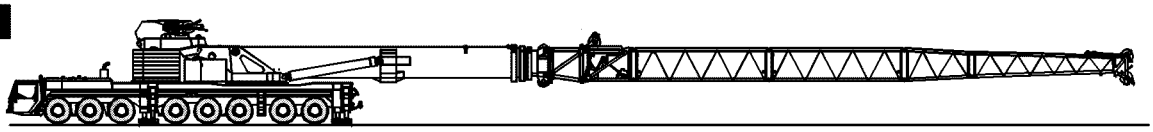
1



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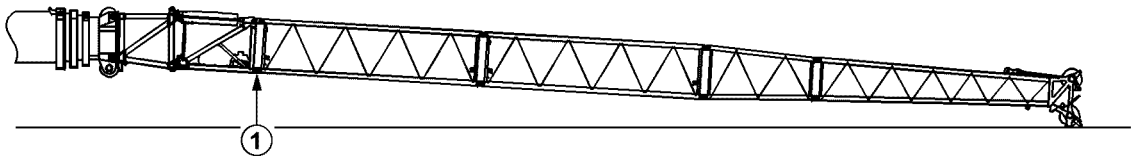

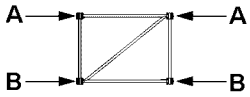

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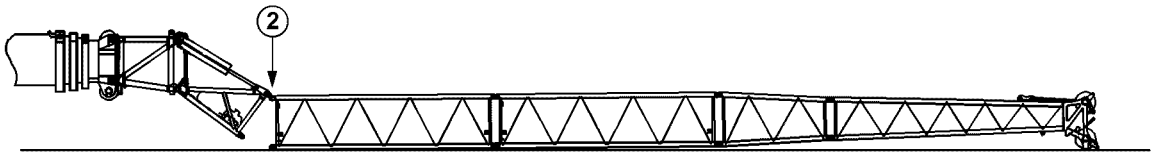

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Fig.197713: Example of cranes with a telescopic boom

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16.13.2 Disassembling the lattice sections on an auxiliary boom without an auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Danger of fatal injury when disassembling auxiliary booms!
If the pins are not unpinned in the given sequence, then lattice sections may suddenly fold down or fall down.
Death, severe bodily injuries, property damage.
▶ Pins must be unpinned in the specified order.

For cranes with hydraulic angle adjustment and self-supporting auxiliary boom, the assembly / disassembly of additional lattice sections may be performed using the crane itself.

In order to do so, proceed as follows.

NOTICE
Damage of hydraulic cylinders on the TF-adapter!
▶ As soon as the lattice jib is placed, stop the luff down movement.
▶ It is prohibited to set down the fixed lattice jib „hard“.

▶ Luff the main boom down until the end section touches the ground slightly, illustration **2**.

If it is not possible to luff down that far:
▶ Adjust the TF-adapter until the end section touches the ground slightly, illustration **2**.
▶ Release and unpin the pins on both sides (level **B**) at point **1**, illustration **2**.

NOTICE
Damage of hydraulic cylinders on the TF-adapter.
▶ As soon as the lattice jib is placed, stop the opening movement.

▶ Open the auxiliary boom until the lattice sections to be removed are laying completely on the ground, illustration **3**.
▶ Release and unpin the pins on both sides (level **A**) at point **2**, illustration **3**.
▶ Completely remove the auxiliary boom.

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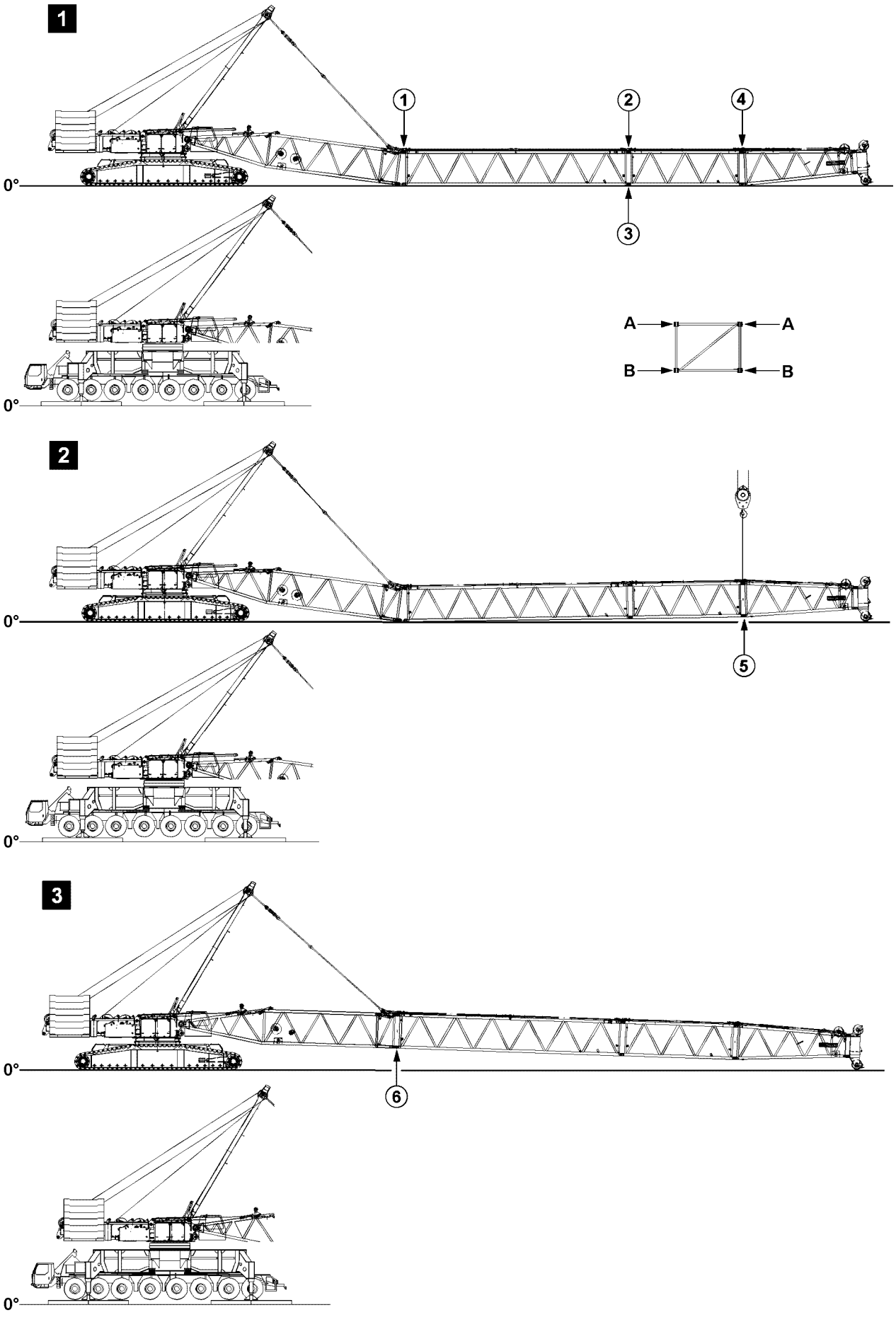

Fig.121633: Example of cranes with a lattice mast boom

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16.14 Assembling / disassembling of lattice sections for lattice mast cranes

16.14.1 Assembling lattice sections

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Danger of fatal injury when assembling booms!
If the pins are not pinned in the given sequence, then lattice sections may suddenly fold down or fall down.
Death, severe bodily injuries, property damage.
▶ Pins must be pinned in the order specified.

- ▶ Pin and secure pins at both sides (level **A**) at point **1**, illustration **1**.
- ▶ Pin and secure pins at both sides (level **A**) at point **2**, illustration **1**.
- ▶ Pin and secure pins at both sides (level **B**) at point **3**, illustration **1**.
- ▶ Pin and secure pins at both sides (level **A**) at point **4**, illustration **1**.
- ▶ Lift the end section with the auxiliary crane, illustration **2**.
- ▶ Pin and secure pins at both sides (level **B**) at point **5**, illustration **2**.
- ▶ Close the boom system with the SA-frame, illustration **3**.
- ▶ Pin and secure pins at both sides (level **B**) at point **6**, illustration **3**.

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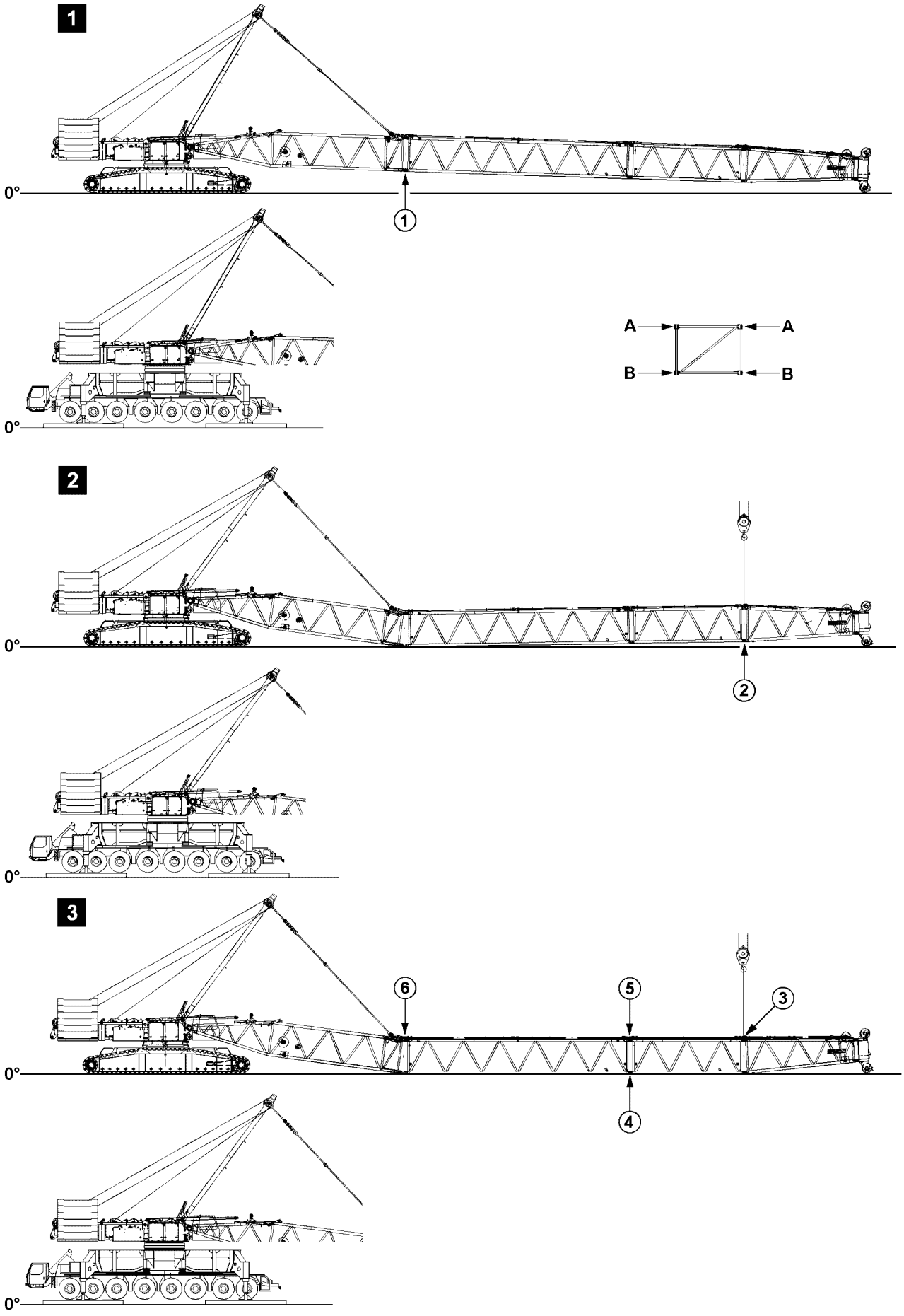

Fig.121634: Example of cranes with a lattice mast boom

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16.14.2 Disassembling lattice sections

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Danger of fatal injury when disassembling booms!
If the pins are not unpinned in the given sequence, then lattice sections may suddenly fold down or fall down.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the SA-frame guying is tensioned before the pins are unpinned in point **1**, see illustration **1**.
- ▶ Pins must be unpinned in the specified order.

- ▶ Luff the boom down until the end section touches the ground slightly, illustration **1**.
- ▶ Guy the boom with SA-frame, illustration **1**.
- ▶ Release and unpin the pins on both sides (level **B**) at point **1**, illustration **1**.
- ▶ Open the boom system with the SA-frame, illustration **2**.
- ▶ Take the lattice sections down completely, illustration **2**.
- ▶ Lift the end section with the auxiliary crane, illustration **2**.
- ▶ Release and unpin the pins on both sides (level **B**) at point **2**, illustration **2**.
- ▶ Release and unpin the pins on both sides (level **A**) at point **3**, illustration **3**.
- ▶ Release and unpin the pins on both sides (level **B**) at point **4**, illustration **3**.
- ▶ Release and unpin the pins on both sides (level **A**) at point **5**, illustration **3**.
- ▶ Release and unpin the pins on both sides (level **A**) at point **6**, illustration **3**.

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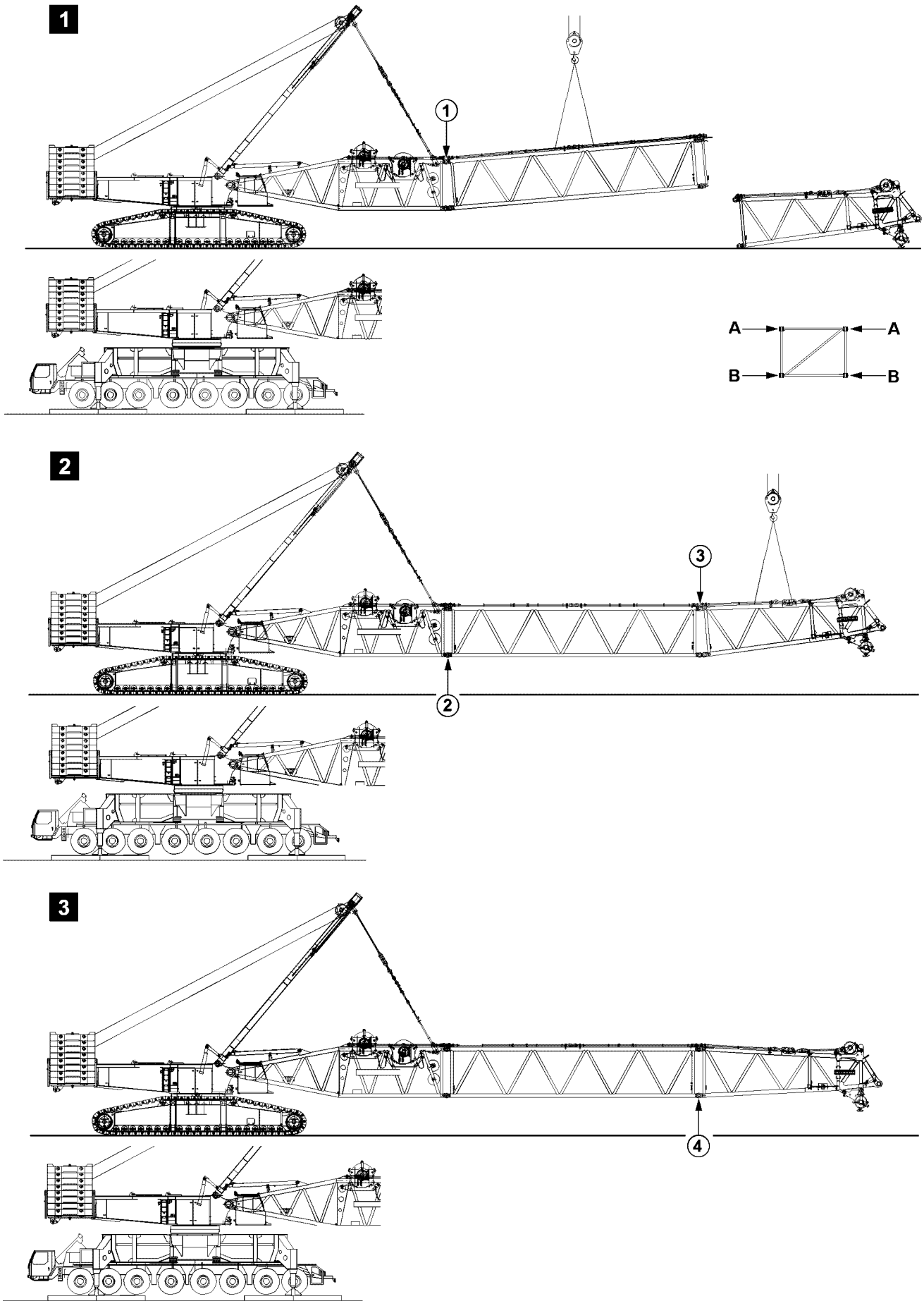

Fig.198182: Example of cranes with a lattice mast boom

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16.15 Flying assembly / disassembly of lattice sections

16.15.1 Flying assembly of lattice sections

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Danger of fatal injury when assembling booms!
If the pins are not pinned in the given sequence, then lattice sections may suddenly fold down or fall down.
Death, severe bodily injuries, property damage.
▶ Pins must be pinned in the order specified.

▶ Pin and secure pins at both sides (level **A**) at point **1**, illustration **1**.
▶ Pin and secure pins at both sides (level **B**) at point **2**, illustration **2**.
▶ Pin and secure pins at both sides (level **A**) at point **3**, illustration **2**.
▶ Pin and secure pins at both sides (level **B**) at point **4**, illustration **3**.

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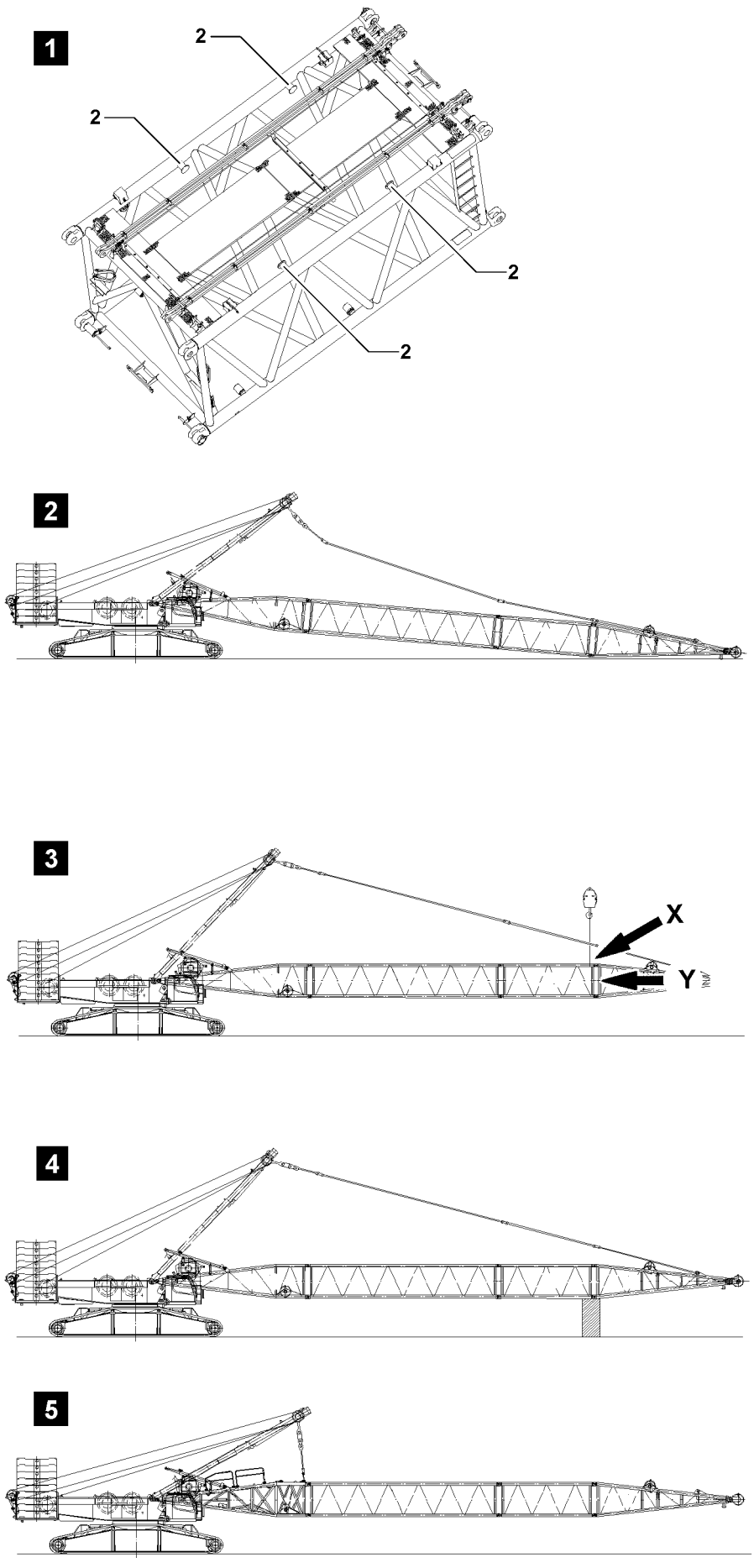

Fig.111448: Guying the pivot section with the SA-frame

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16.15.2 Flying disassembly of lattice sections

The illustrations serve as examples. The illustrations may differ depending on the crane.

The flying disassembly of lattice sections can be used on:
– Derrick boom
– Main boom

Make sure that the following prerequisite is met:
– Before guying the pivot section, secure the boom properly to prevent it from falling down.

Guying the pivot section in flying mode with the SA-frame

There are three ways to change the guying point for flying disassembly:
– Take down the boom on the ground.
– Secure the boom with the auxiliary crane.
– Support the boom.

▶ Take down the boom on the ground, see illustration **2**.
or

WARNING
Lattice section incorrectly attached!
If the fastening equipment is attached on the bitts **2** when securing the boom, then the bitts will be overloaded. The lattice section will be damaged.
The boom can fall down.
Death, severe bodily injuries, property damage.

If an auxiliary crane is used to secure the boom for flying disassembly:
▶ Do **not** fasten the lattice section on the bitts **2**, see illustration **1**.
▶ Attach the fastening equipment in the area of point **P1** on both sides on the lattice section, see detail **X**.
▶ Make sure that the long fastening equipment is used, so that the angle between the cross section of the lattice section and guyed fastening equipment is at least 60°, see detail **Y**.

Secure the boom with the auxiliary crane, see illustration **3**.
or

WARNING
Falling boom!
If the boom is not properly and securely supported from below, then the boom can fall down.
▶ Support the boom properly and safely with suitable material.

Support the boom, see illustration **4**.

Result:

– The guy rods can be disassembled.

▶ Take down, secure and disassemble the guy rods.
▶ Pin and secure the guy rods SA-frame on the pivot section.
▶ Tighten the guy rods SA-frame until the boom is in horizontal position.

Result:

– Pivot section is guyed in flying mode with the SA-frame, see illustration **5**.
– The lattice sections can be disassembled in flying mode.

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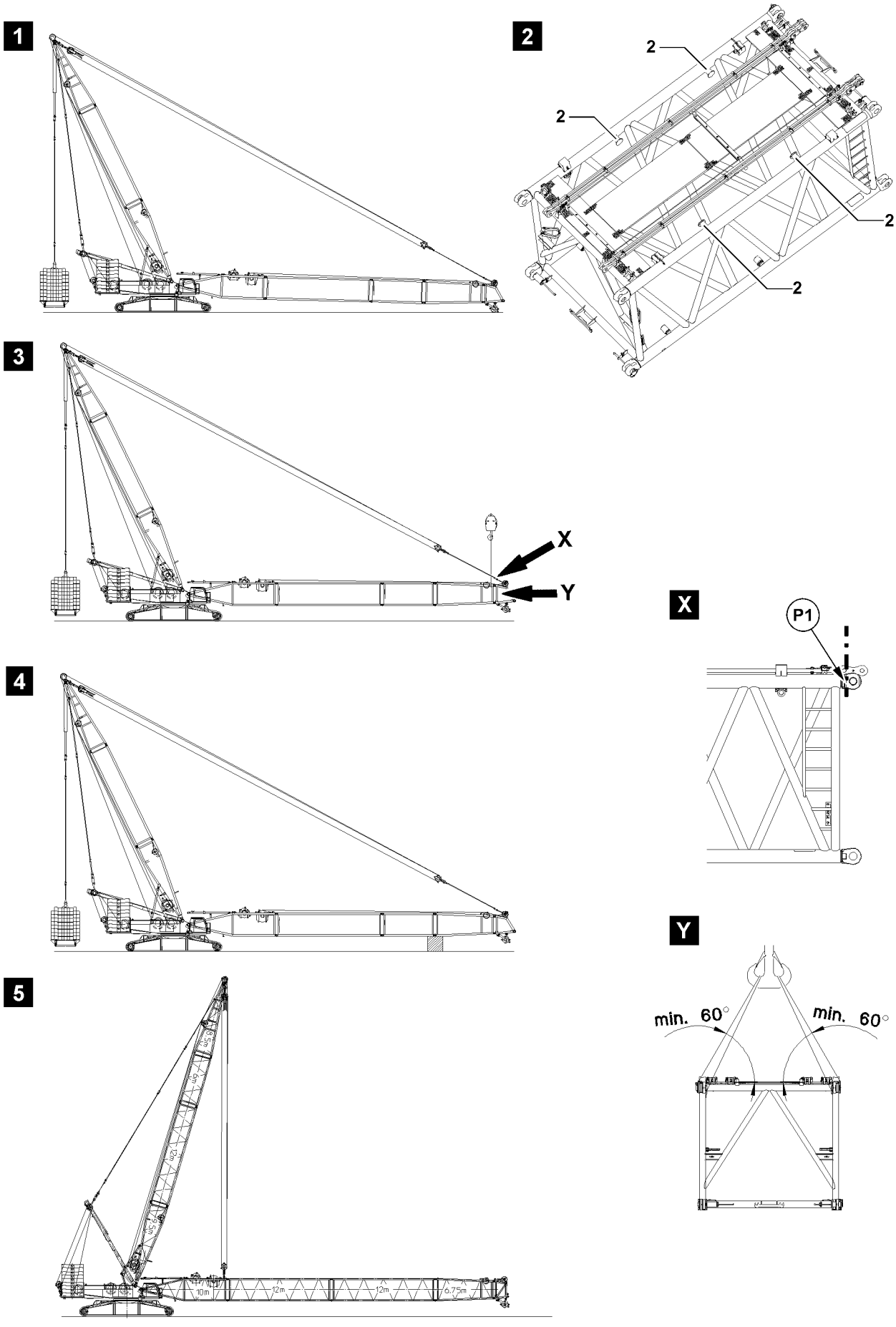

Fig.111449: Guying the pivot section with the derrick boom

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Guying the pivot section in flying mode with the derrick boom

There are three ways to change the guying point for flying disassembly:
- Take down the boom on the ground.
- Secure the boom with the auxiliary crane.
- Support the boom.

▶ Take down the boom on the ground, see illustration **1**.
or

WARNING
Lattice section incorrectly attached!
If the fastening equipment is attached on the bitts **2** when securing the boom, then the bitts will be overloaded. The lattice section will be damaged.
The boom can fall down.
Death, severe bodily injuries, property damage.

If the auxiliary crane is used to secure the boom for flying disassembly:
▶ Do **not** fasten the lattice section on the bitts **2**, see illustration **2**.
▶ Attach the fastening equipment in the area of point **P1** on both sides on the lattice section, see detail **X**.
▶ Make sure that the long fastening equipment is used, so that the angle between the cross section of the lattice section and guyed fastening equipment is at least 60°, see detail **Y**.

Secure the boom with the auxiliary crane, see illustration **3**.
or

WARNING
Falling boom!
If the boom is not properly supported from below, then the boom can fall down.
▶ Support the boom properly and safely with suitable material.

Support the boom, see illustration **4**.

Result:

- The guy rods can be disassembled.

▶ Take down, secure and disassemble the guy rods.
▶ Pin and secure the luffing pulley block on the pivot section.
▶ Tighten the control rope until the boom is in horizontal position.

Result:

- Pivot section is guyed in flying mode with the derrick boom, see illustration **5**.
- The lattice sections can be disassembled in flying mode.

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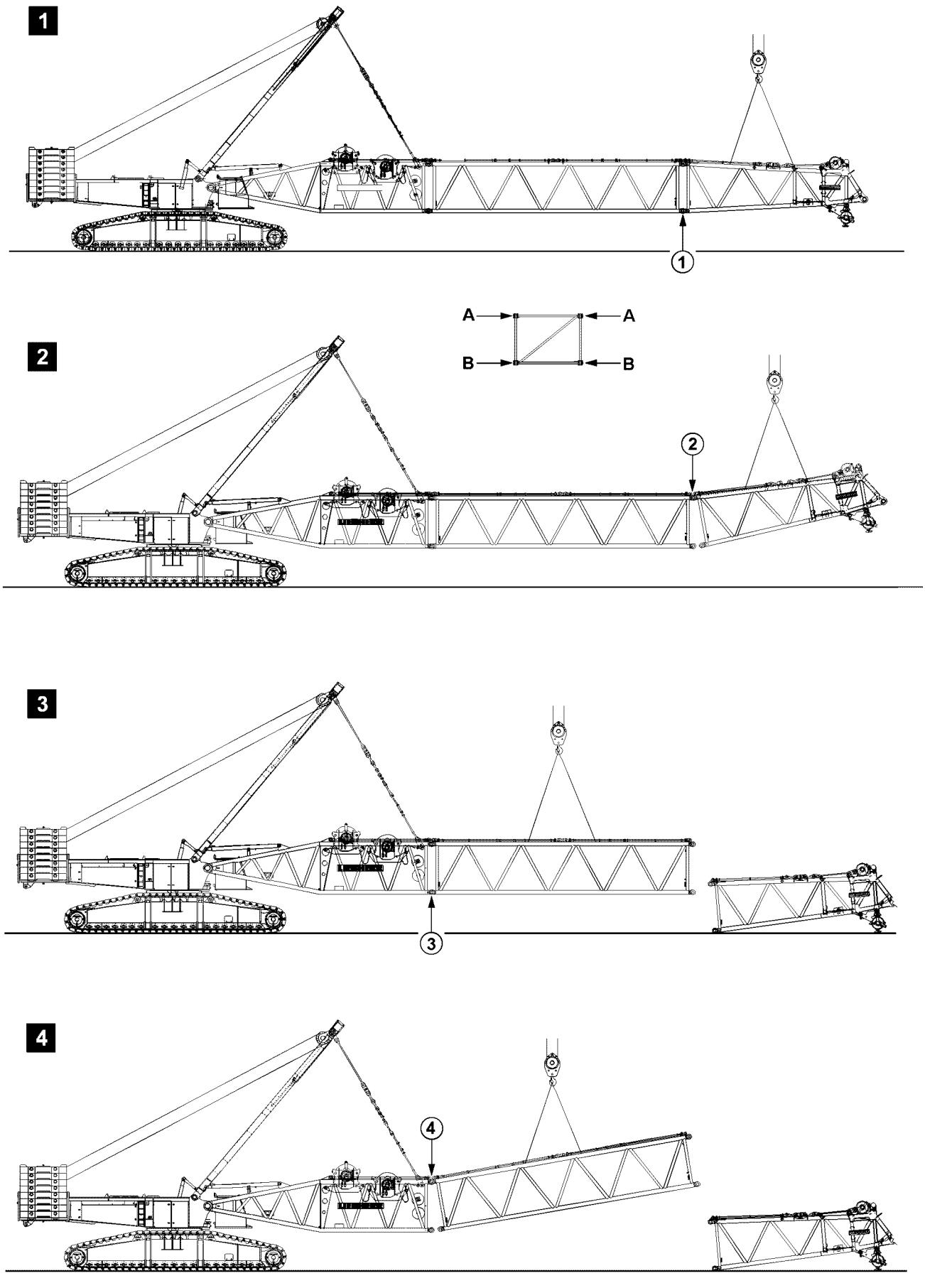

Fig.105511: Example of cranes with a lattice mast boom

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Unpinning the lattice components

WARNING
Danger of fatal injury when disassembling booms!
If the pins are not unpinned in the given sequence, then lattice sections may suddenly fold down or fall down.
Death, severe bodily injuries, property damage.
▶ Pins must be unpinned in the specified order.

▶ Release and unpin the pins on both sides (level **B**) at point **1**, illustration **1**.
▶ Release and unpin the pins on both sides (level **A**) at point **2**, illustration **2**.
▶ Release and unpin the pins on both sides (level **B**) at point **3**, illustration **3**.
▶ Release and unpin the pins on both sides (level **A**) at point **4**, illustration **4**.

16.16 Assembling / disassembling of boom systems for supporting on ascending terrain (assembly / disassembly schematic)

Note
▶ The following assembly steps are simplified and are examples and may not match your crane exactly.

WARNING
Danger of fatal injury when assembling / disassembling booms!
If the pins are not pinned / unpinned in the specified sequence, then lattice sections may suddenly fold down or fall down.
Death, severe bodily injuries, property damage.
▶ Pin / unpin pins in the specified sequence, see section „Assembly of lattice sections“.
▶ Observe all safety technical notes in section „Assembly / disassembly“.
▶ Make sure that there is no personnel in the danger zone.

WARNING
Horizontal movement of the boom!
▶ Make sure that there is no personnel in the danger zone.

16.16.1 Assembling the boom systems on ascending terrain

Make sure that the following prerequisites are met:
– An auxiliary crane with sufficient load bearing capacity is available.

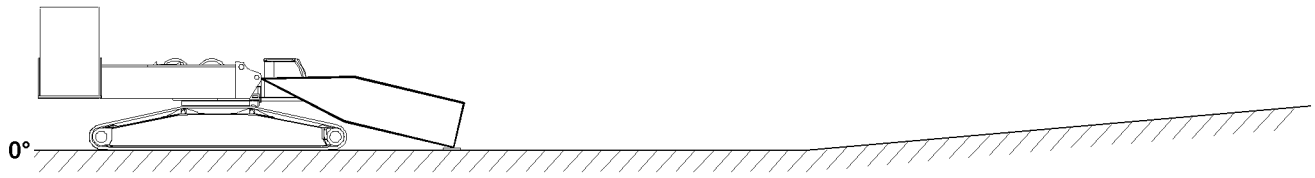

Fig.121635: Boom - pivot section installed on the turntable and taken down on the ground

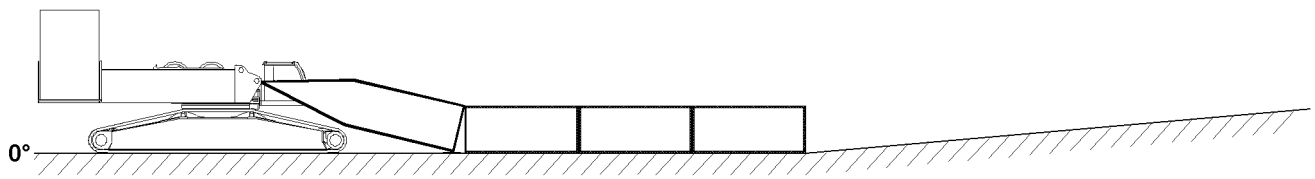

Fig.121636: Boom - intermediate sections installed on the boom - pivot section and taken down on the ground

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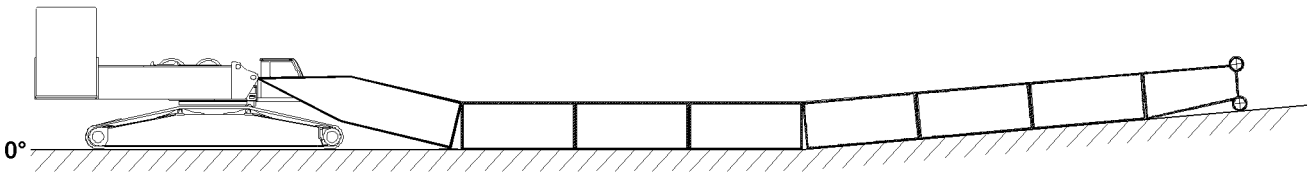

Fig.121637: Boom - intermediate sections installed and taken down on ascending terrain

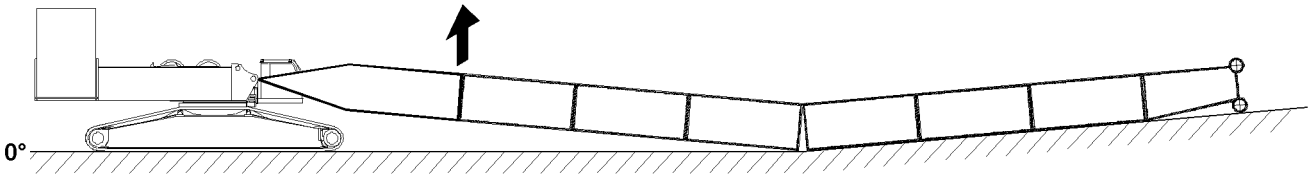

Fig.121638: Lifting and close the boom system in the area of the boom - pivot section

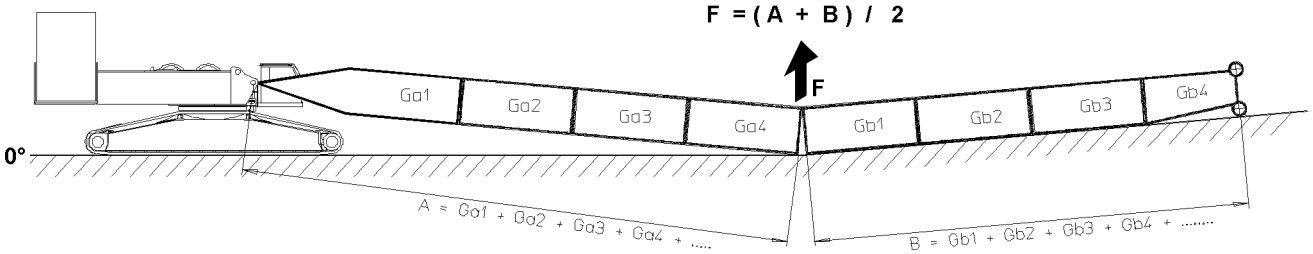

Fig.145512: Calculation of force for the closing procedure of the boom system

Note

- ▶ The abbreviations Ga1, Ga2, ... and Gb1, Gb2, ... are for the weights of the individual lattice sections.
- ▶ The weights of the lattice sections are noted on the welded on weight tags on the lattice sections.

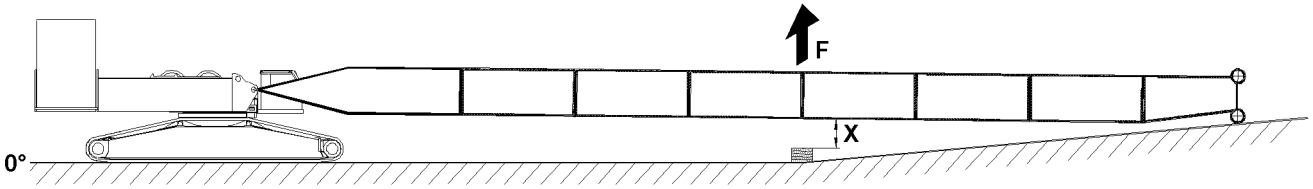

Fig.121639: Lifting and close the boom system // Support the boom system

Note

- ▶ The height of the substructure or the dimension **X** is noted on the respective boom assembly chapter, see chapter 5.38 or chapter 5.39.
- ▶ If the dimension **X** is not available in chapter 5.38 or chapter 5.39, see the separately supplied drawing „Support assembly drawing“.

- ▶ Support the boom system properly after the closing procedure.

16.16.2 Disassembling boom systems on ascending terrain

Make sure that the following prerequisites are met:

– An auxiliary crane with sufficient load bearing capacity is available.

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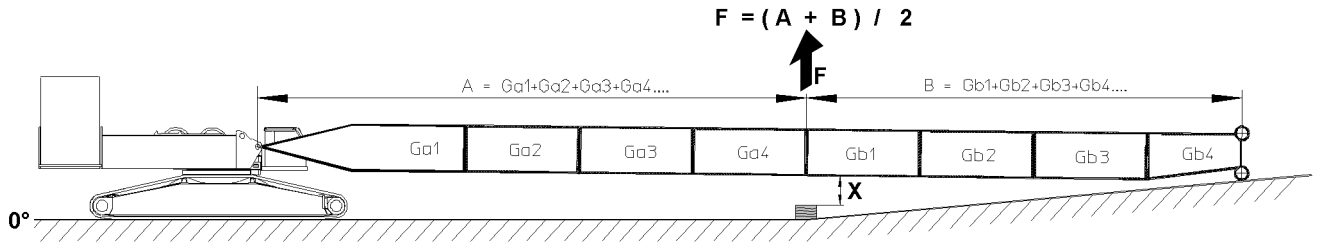

Fig.145513: Calculation of force for opening the boom system // Lift the boom system // Remove the substructure // Open the boom system

Note

- The abbreviations Ga1, Ga2, ... and Gb1, Gb2, ... are for the weights of the individual lattice sections.
- The weights of the lattice sections are noted on the welded on weight tags on the lattice sections.

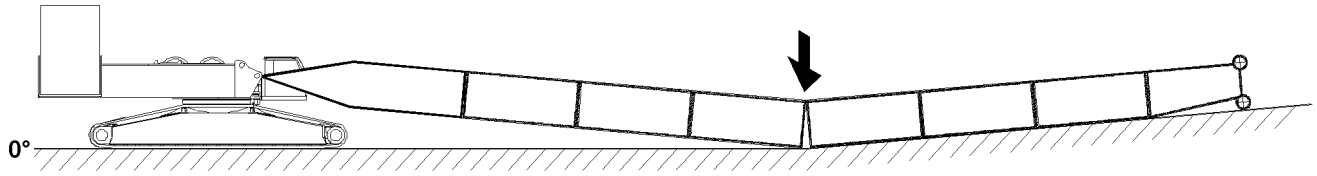

Fig.121657: Taking the boom system down

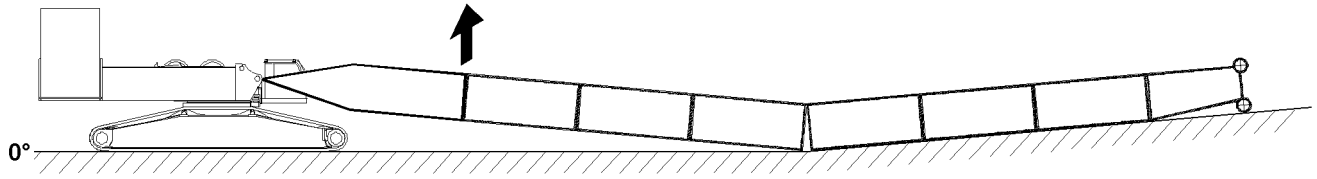

Fig.121652: Lifting and opening the boom system

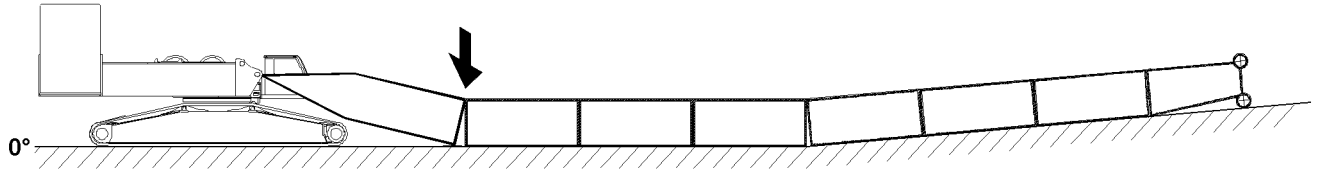

Fig.121653: Taking the boom system down

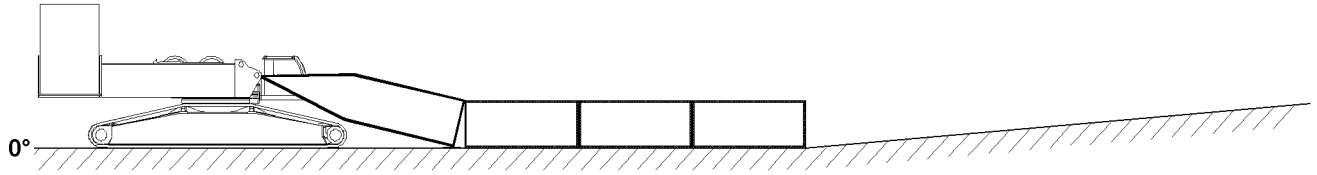

Fig.121636: Disassembling and removing the boom - intermediate sections with the end section

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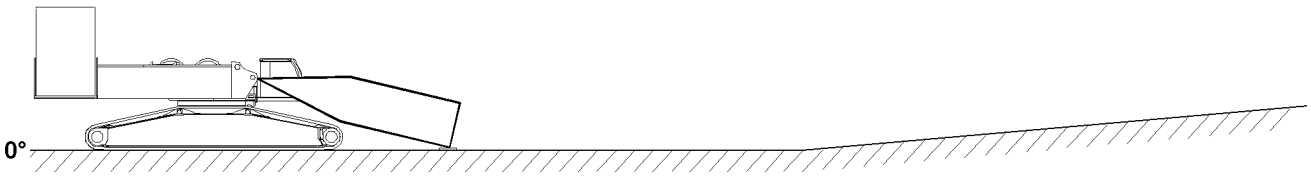

Fig.121635: Disassembling and removing the boom - intermediate sections to the boom - pivot section

▶ Disassemble and remove the boom - pivot section.

16.17 Assembling / disassembling of boom systems for supporting on descending terrain (assembly / disassembly schematic)

Note

▶ The following assembly steps are simplified and are examples and may not match your crane exactly.

WARNING

Danger of fatal injury when assembling / disassembling booms!
If the pins are not pinned / unpinned in the specified sequence, then lattice sections may suddenly fold down or fall down.
Death, severe bodily injuries, property damage.

▶ Pin / unpin pins in the specified sequence, see section „Assembly of lattice sections“.
▶ Observe all safety technical notes in section „Assembly / disassembly“.
▶ Make sure that there is no personnel in the danger zone.

16.17.1 Assembling the boom systems on descending terrain

Make sure that the following prerequisites are met:
– The lattice sections are properly assembled.
– An auxiliary crane with sufficient load bearing capacity is available.

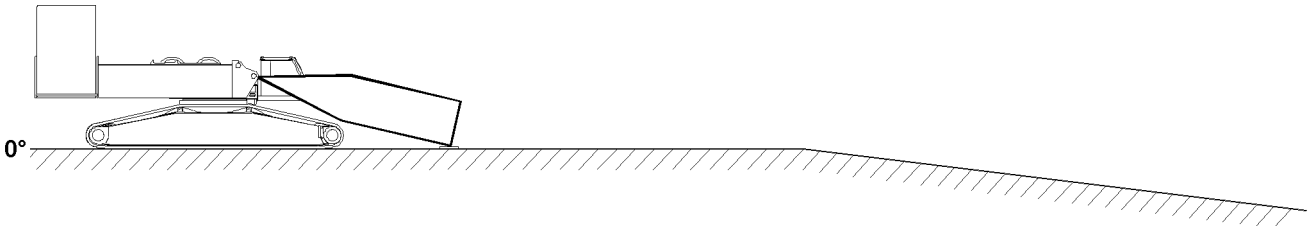

Fig.121640: Boom - pivot section installed on the turntable and taken down on the ground

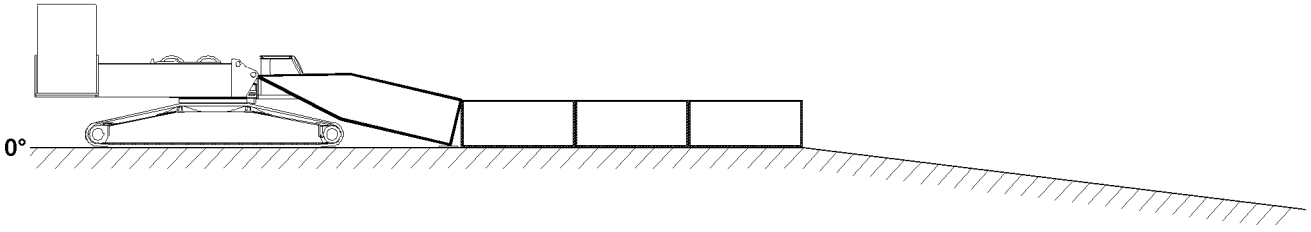

Fig.121641: Boom - intermediate sections installed on the boom - pivot section and taken down on the ground

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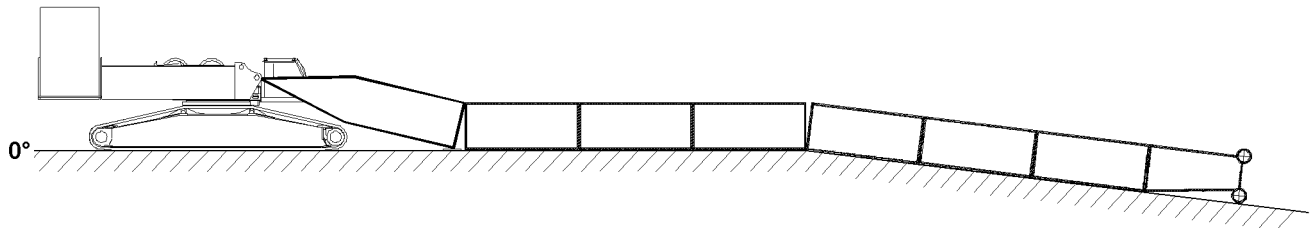

Fig.121642: Boom - intermediate sections installed and taken down on descending terrain

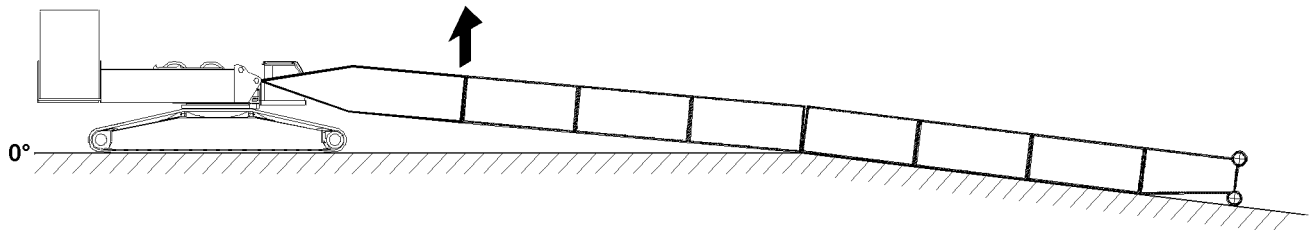

Fig.121643: Lifting and close the boom system in the area of the boom - pivot section

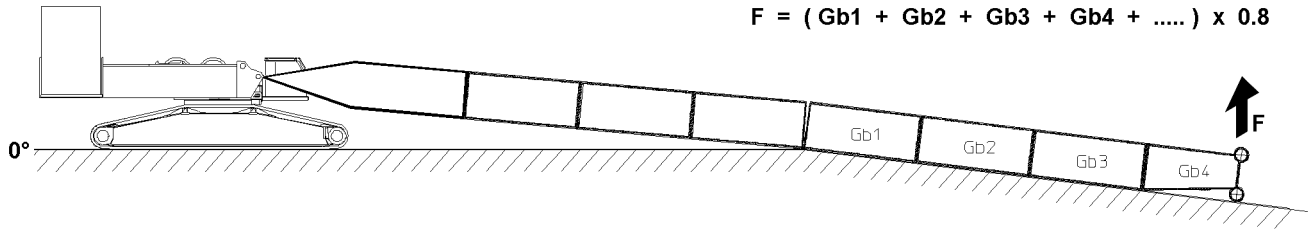

Fig.145514: Calculation of force for the closing procedure of the boom system

Note
- ▶ The abbreviations Gb1, Gb2, ... are for the weights of the individual lattice sections.
- ▶ The weights of the lattice sections are noted on the welded on weight tags on the lattice sections.

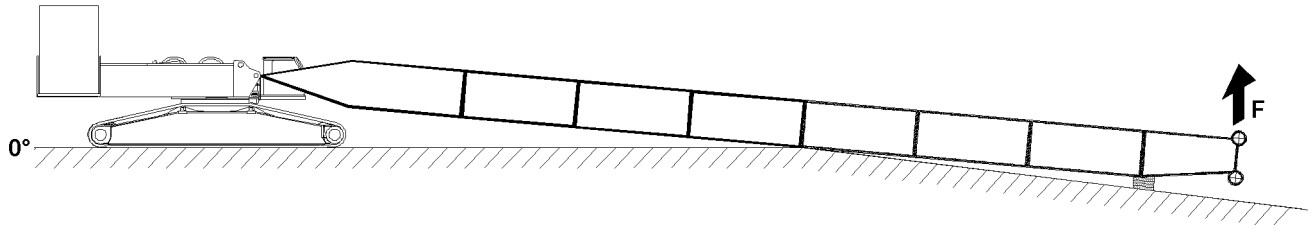

Fig.121644: Lifting and close the boom system // Support the boom system

Note
- ▶ The height of the substructure depends on the lay of the terrain and the resulting incline of the boom system.

- ▶ Support the boom system properly after the closing procedure.

16.17.2 Disassembling boom systems on descending terrain

Make sure that the following prerequisite is met:
- An auxiliary crane with sufficient load bearing capacity is available.

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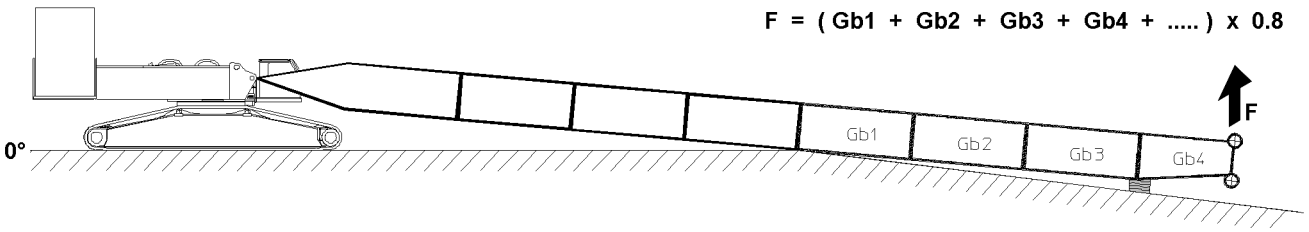

Fig.145515: Calculation of force for opening the boom system // Lift the boom system // Remove the substructure // Open the boom system

Note

- The abbreviations Gb1, Gb2, ... are for the weights of the individual lattice sections.
- The weights of the lattice sections are noted on the welded on weight tags on the lattice sections.

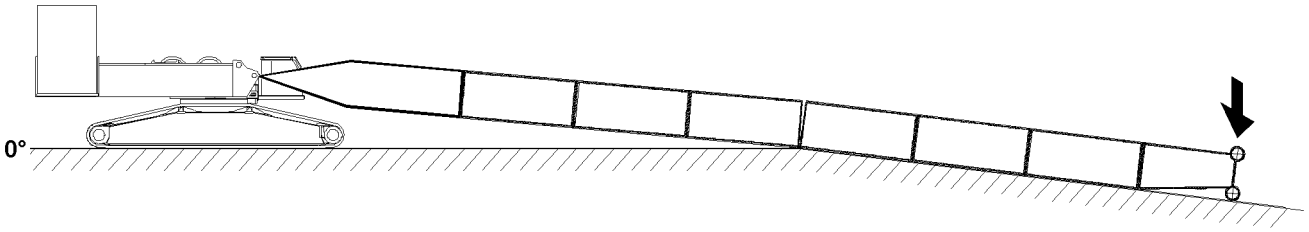

Fig.121658: Taking the boom system down

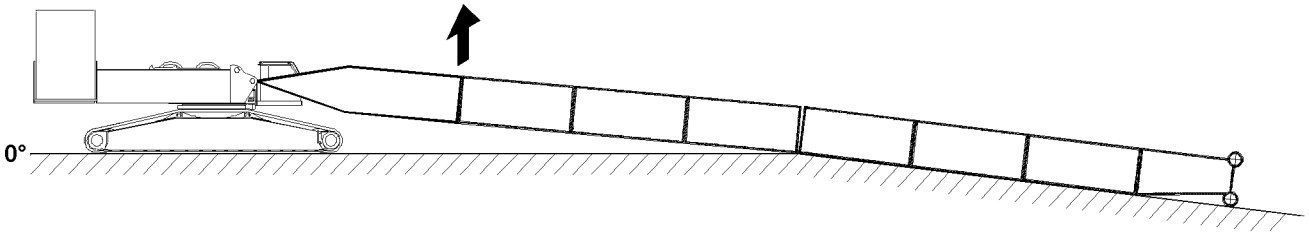

Fig.121655: Lifting and opening the boom system

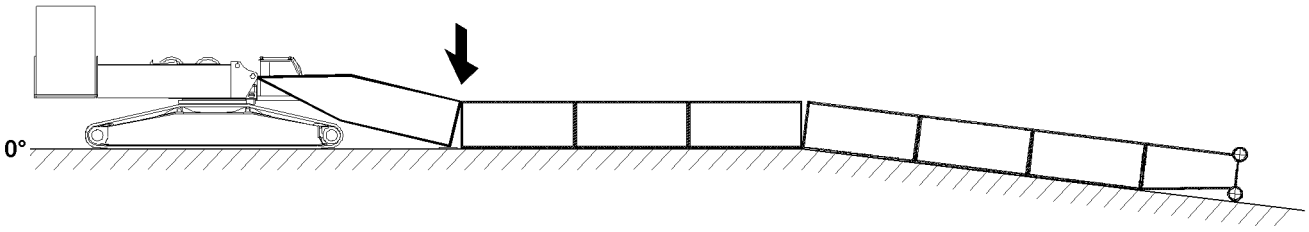

Fig.121656: Taking the boom system down

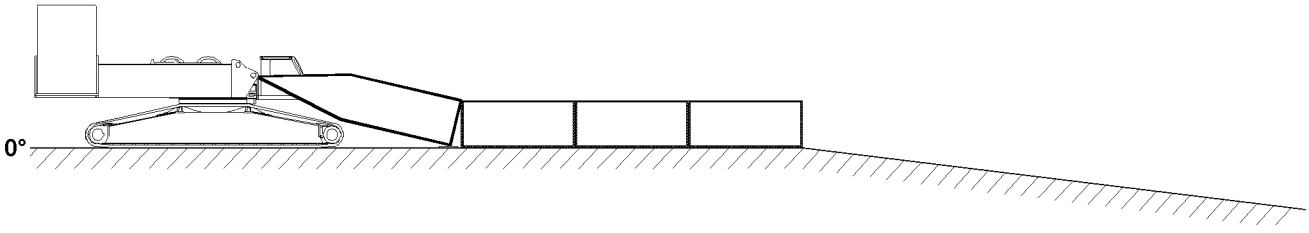

Fig.121641: Disassembling and removing the boom - intermediate sections with the end section

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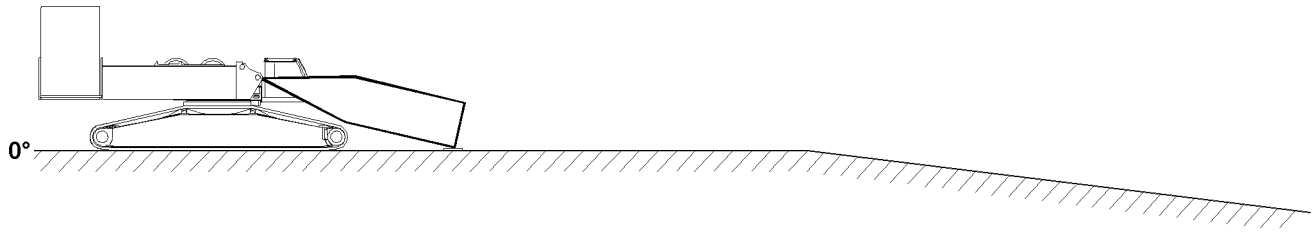

Fig.121640: Disassembling and removing the boom - intermediate sections to the boom - pivot section

▶ Disassemble and remove the boom - pivot section.

17 Erecting / taking-down

WARNING
The crane can topple over!
Due to an unforeseen occurrence, for example: Sudden strong wind or storm can lead to dangerous operating situations, up to toppling the crane.
Death, severe bodily injuries, property damage.
▶ The boom must be able to be taken down at any time with its current equipment, observe the erection and take-down charts. Observe the job planner.
▶ The counterweights and / or ballasts required for this must always be in direct vicinity of the crane.
▶ The crane operator must ensure that the required counterweight and / or the required ballast is carried along when driving the crane with the equipment in place and that the boom can be placed down at any time.

WARNING
Danger of fatal injury!
▶ Incorrectly installed or non-functioning limit switches as well as falling parts (pins, cotter pins, ice etc.) can cause accidents.

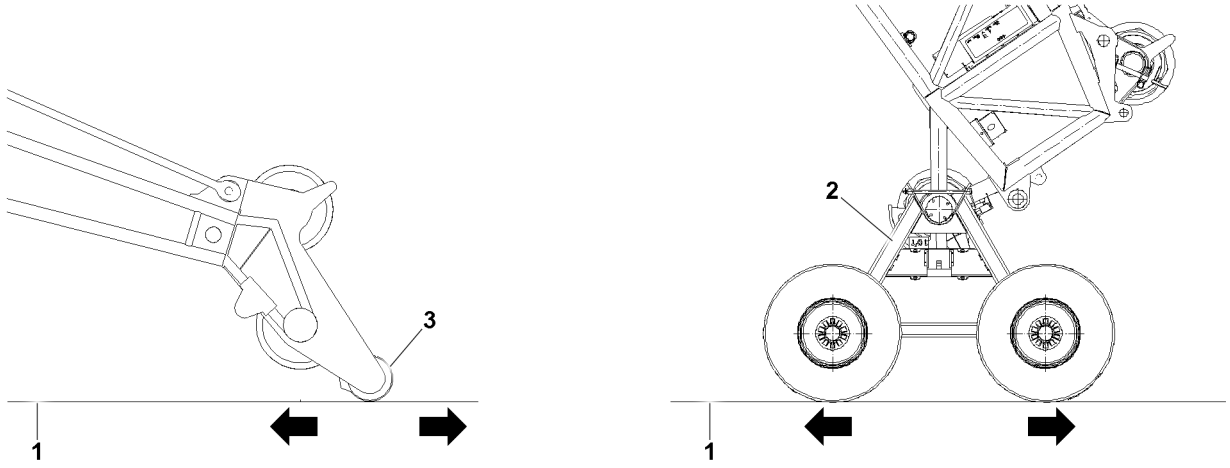

Fig.152357: Roller cart road or lattice head track roller

1 Road **2** Roller cart **3** Lattice head track roller

When erecting or taking down with the aid of a roller cart **2** or a lattice head track roller **3**, make sure that the following prerequisites are met:
– The road **1** is level.
– The road **1** is of sufficient load bearing capacity.
– The road **1** is free of obstacles.
– The road **1** is free of persons.

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17.1 Erecting / taking down with mobile cranes

Make sure that the following prerequisites are met:
- The crane is properly supported.
- The crane is horizontally aligned.
- The counterweight has been installed on the turntable according to the load chart or the erection / take down charts.
- In the case of cranes with derrick ballast: The derrick ballast (suspended ballast or ballast trailer ballast) is installed according to the load chart or the erection / take down charts.
- For cranes with a telescopic boom: The telescopic boom is telescoped in all the way.
- The boom has been installed according to the load chart and the Crane operating instructions.
- The hoist rope has been correctly placed in the rope pulleys and prevented from jumping out with the rope retaining pins.
- All limit switches have been correctly assembled and are fully operational.
- All pin connections are secured.
- No persons in the danger zone.
- No loose parts on the boom or the auxiliary boom.
- The exposed rope pulleys are free of snow and ice.
- The boom and its components (limit switches, cable drums, airplane warning light, wind speed sensor etc.) must be kept free of ice and snow.

▶ Check if all prerequisites have been met.

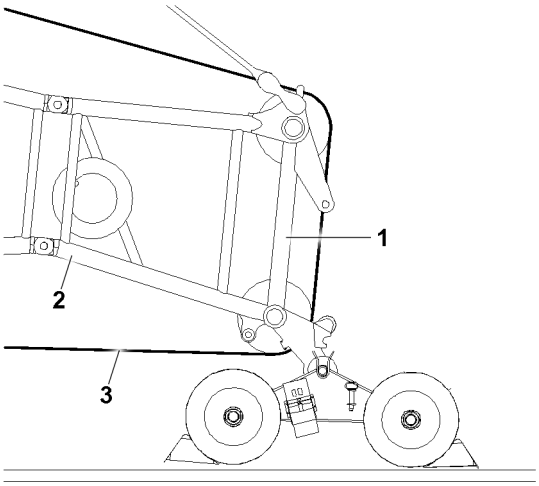

Fig.152358: Securing the hoist rope on the head of the lattice jib

When the luffing lattice jib is erected or taken down **angled**, then the hoist rope must be secured **prior to reeving in** or **after reeving out** the hook block.

Before the hook block is reeved in or after the hook block is reeved out, it is possible that the hoist rope is pulled out of the head of the lattice jib. Therefore the hoist rope must be secured by a hemp rope.

WARNING
Hoist rope not secured!
The hoist rope can run back in the direction of the hoist winch after reeving out or reeving in the hook block.
▶ Secure the hoist rope with the hemp rope.

▶ Fasten the hemp rope with Prusik knots to the hoist rope **3**.
▶ Fasten the hemp rope with the other end on the corner bar pipe **2** of the head **1** of the lattice jib with tie knots.

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17.2 Erecting / taking down with crawler cranes

Make sure that the following prerequisites are met:
- Comply with the maximum permissible incline of the crane specified in the load chart manual.
- For cranes with a support: The crane is properly supported.
- For cranes with a support: The crane is horizontally aligned.
- The counterweight has been installed on the turntable according to the load chart.
- The central ballast is installed according to the load chart.
- The counterweight is installed according to the load chart or the erection / take down charts.
- In the case of cranes with derrick ballast: The derrick ballast (suspended ballast or ballast trailer ballast) is installed according to the load chart or the erection / take down charts.
- For cranes with a telescopic boom: The telescopic boom is telescoped in all the way.
- The boom has been installed according to the load chart and the Crane operating instructions.
- The hoist rope has been correctly placed in the rope pulleys and prevented from jumping out with the rope retaining pins.
- All limit switches have been correctly assembled and are fully operational.
- All pin connections are secured.
- No persons in the danger zone.
- No loose parts on the boom or the auxiliary boom.
- The exposed rope pulleys are free of snow and ice.
- The boom and its components (limit switches, cable drums, airplane warning light, wind speed sensor etc.) must be kept free of ice and snow.

▶ Check if all prerequisites have been met.

17.3 Rigging the guy rods on lattice booms on placed down boom system

WARNING
Danger of fatal injury due to damaged guy rods!
If the boom system is placed on the ground or a load bearing substructure in strong wind or longer downtime, the guy rods can be damaged due to wind influence on the boom guying. This wind influenced oscillations can lead to fatigue on the guy rods.
As a result, the guy rods could break or rip off under load - for example when erecting the boom system or in crane operation. The boom system can therefore fall uncontrolled forward onto the ground.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the guy rods are taken down completely on the lattice sections and relieved when the boom systems are taken down on the ground.
- ▶ Make sure that freely suspended guy rods are rigged on the lattice boom.
- ▶ Make sure that the upper pulley block is rigged on the lattice boom in Derrick operating modes.
- ▶ Make sure, that the guying on the luffing lattice jib is removed on lattice mast cranes.
- ▶ Make sure that the guy rods are inspected before resuming crane operation and that no damage or cracks are present.
- ▶ Make sure that the maintenance intervals of the guy rods are adhered to.

Note
- ▶ In case of strong wind or longer downtimes of the crane, the boom system must be placed on the ground or on a load bearing substructure.
- ▶ The guying must be relieved and the guy rods must be placed on the transport receptacles.
- ▶ The following illustrations are examples and may not match your crane exactly.

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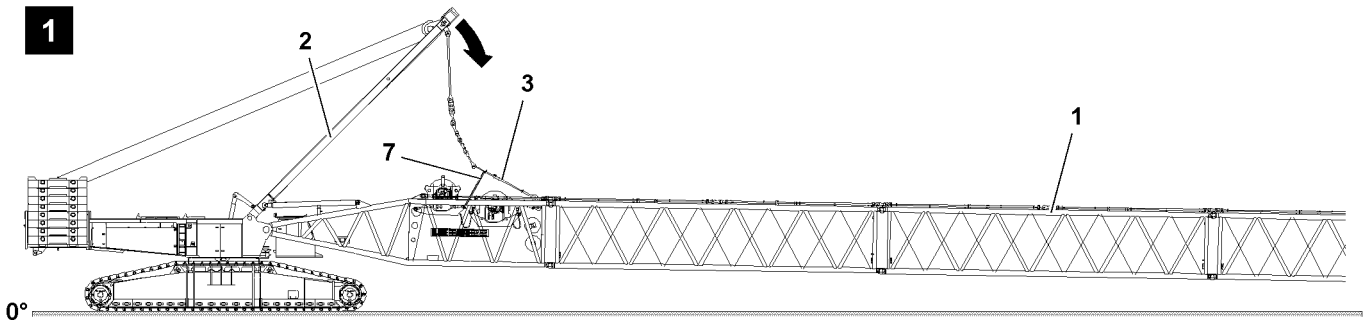

Fig.120722: Guying placed in transport receptacle and SA-frame guying relieved

- ▶ Take the guy rods down on the lattice sections **1**: Luff the SA-frame **2** down to the front until the guying is placed completely in the transport receptacles on the lattice sections and the SA-frame guying **3** is relieved, see illustration **1**.
- ▶ To minimize side oscillation of the SA-frame guying **3** due to wind influence: Rig the SA-frame guying **3** with suitable rigging straps / ropes **7** against the boom, see illustration **1**.

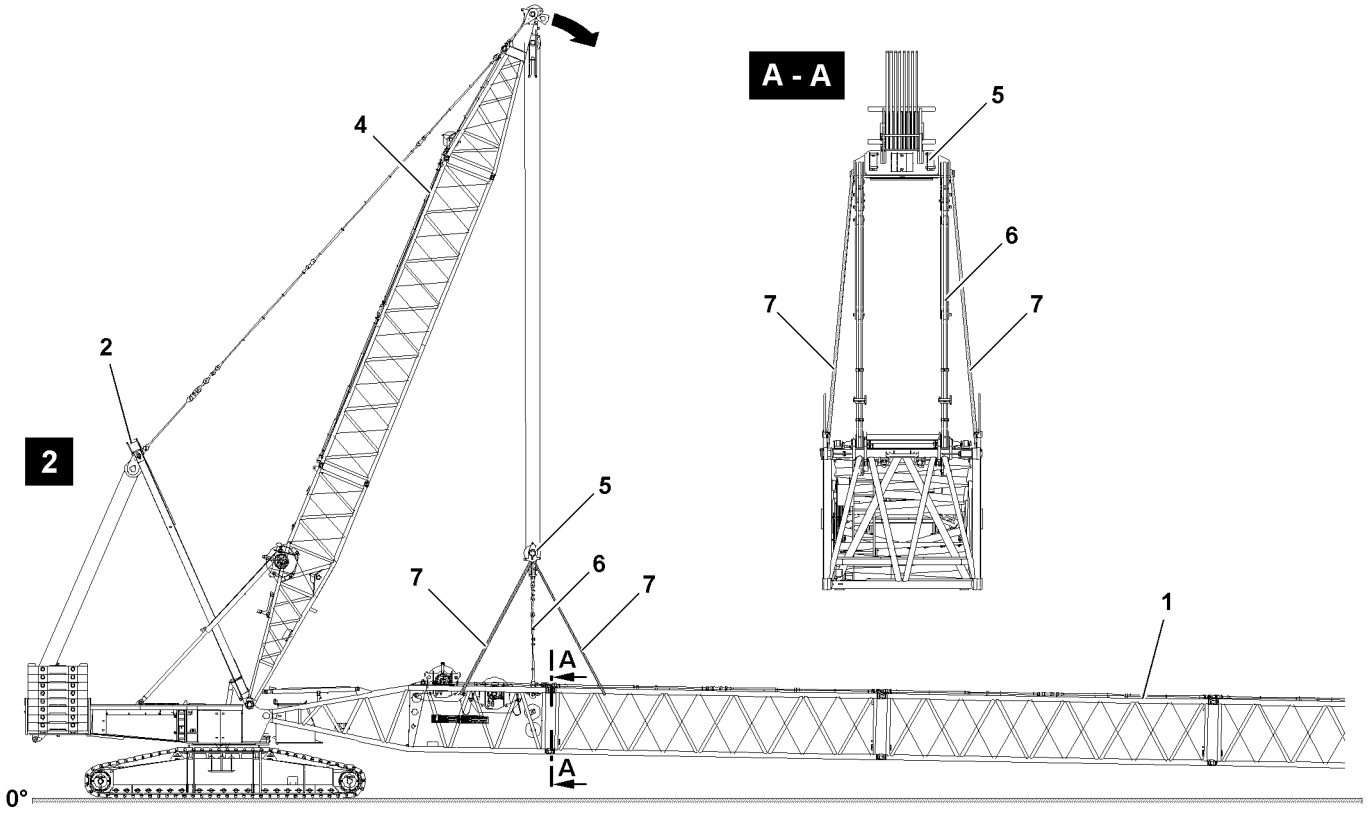

Fig.120771: Guying placed in transport receptacle and upper pulley block rigged against the boom

- ▶ Take the boom system down and - if present - release the derrick guying to the derrick ballast.
- ▶ Take the guy rods down on the lattice sections **1**: Luff the D-boom **4** down to the front until the main boom guying is placed completely in the transport receptacles on the lattice sections and the upper pulley block **5** is positioned over the S-pivot section, see illustration **2**.
- ▶ To minimize side oscillation of the upper pulley block **5** due to wind influence: Rig the upper pulley block **5** with suitable rigging straps / ropes **7** against the boom, see illustration **2**.

For lattice mast cranes with luffing lattice jib the following applies:

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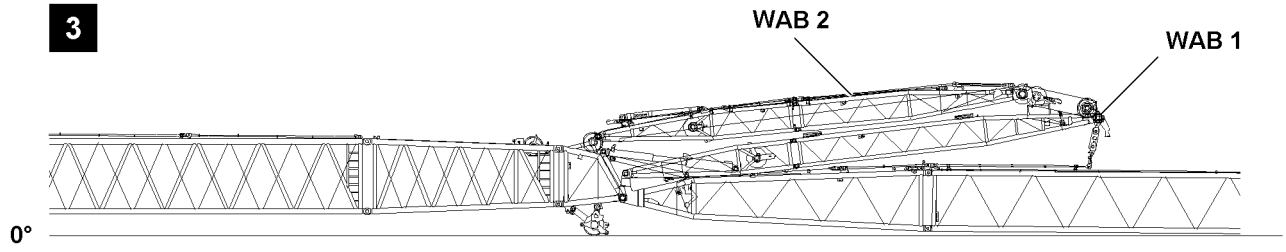

Fig.120821: Guying in transport receptacle(s) and WA-frames placed down to the front (example crane with lattice mast)

WARNING
Danger of accident when removing the W-guying!
When taking down and removing the guying dangerous situations can arise.
▶ Make sure that the danger notes in the respective chapter of the Crane operating instructions are observed.

▶ Remove the guy rods on the luffing lattice jib and take them down into the transport receptacles.
▶ Take the WA-frames (WA-frame 1 **WAB 1** and WA-frame 2 **WAB 2**) down to the front.

For telescopic cranes with luffing lattice jib the following applies:

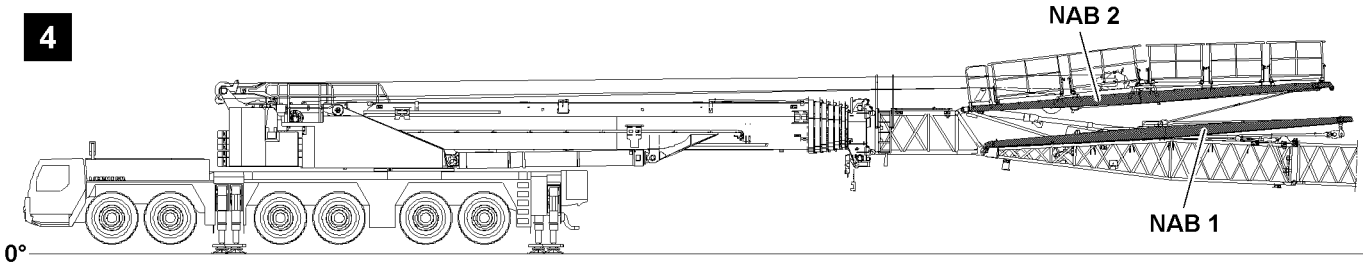

Fig.121261: Guying in transport receptacle(s) and NA-frames placed down to the front (example telescopic crane)

WARNING
Danger of accident when taking the NA-frames down!
When taking the guy rods as well as the NA-frames down dangerous situations can arise.
▶ Make sure that the danger notes in the respective chapter of the Crane operating instructions are observed.

▶ Spool the jib control winch out and take the NA-frames down to the front so that the guy rods are relieved.

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5.02 SA-frame

1	Safety	2
2	Function and actuation	3
3	Erecting the SA-frame	4
4	Taking the SA-frame down onto the turntable	8

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1 Safety

Before accessing the crane, observe the safety instructions.

- General safety information: See chapter 2.04.
- Information regarding personal protective equipment: See chapter 2.04.
- Information regarding the use of ladders: See chapter 2.04.10.
- Information regarding available hook points: See chapter 2.06.

WARNING
Slippery surfaces, lack of stability!
Death, severe bodily injuries, property damage.

- ▶ Keep ladders, walking surfaces, stairs and stepping surfaces free of objects and obstacles.
- ▶ Only step on ladders, stairs, walking surfaces and stepping surfaces with sufficiently clear height.
- ▶ Only step on ladders, stairs, walking surfaces and stepping surfaces with clean shoes.
- ▶ Keep ladders, stairs, walking surfaces and stepping surfaces free of heavy dirt, snow and ice.
- ▶ Stepping on ladders, stairs, walking surfaces and stepping surfaces by persons, including tools and equipment, weighing more than 150 kg is prohibited.
- ▶ Do **not** step on damaged ladders, stairs, walking surfaces and stepping surfaces and replace them immediately.
- ▶ Do **not** trip over attachment parts.
- ▶ Personnel must wear an approved fall arrest system and protective equipment before performing any work on the crane superstructure.

When fall protection equipment is **not** in the assembly / disassembly position or personnel is on **non**-walking surfaces and stepping surfaces:

- ▶ Personnel must hook themselves to the hook points and safety ropes with an approved fall arrest system to prevent falling.

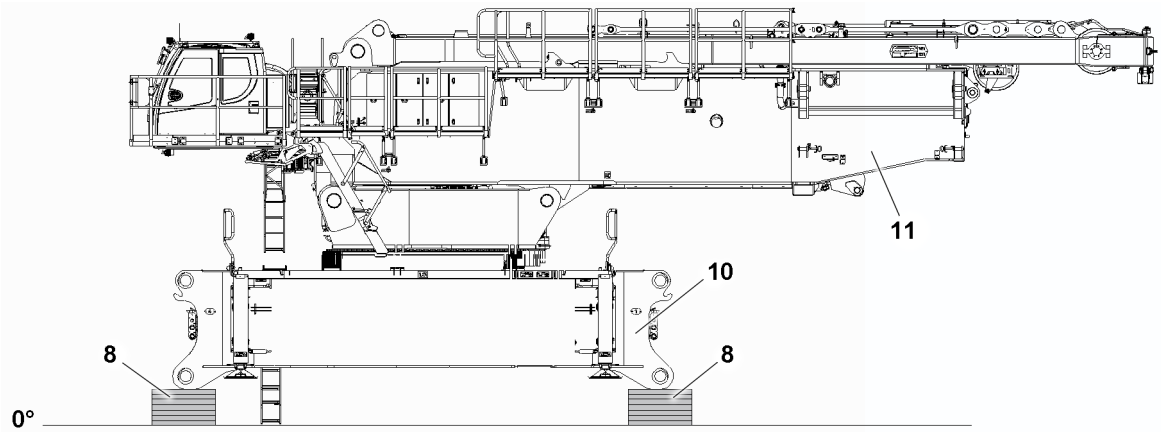

*Fig.154253: The crane is lying with the crawler center section **10** on the substructure **8***

DANGER
The crane can topple over!
When the crawler center section **10** lies on the substructure **8** and the crane turntable **11** is turned, the crane can fall over.
Death, severe bodily injuries, property damage.

- ▶ Turning the turntable **11** is **prohibited**.

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2 Function and actuation

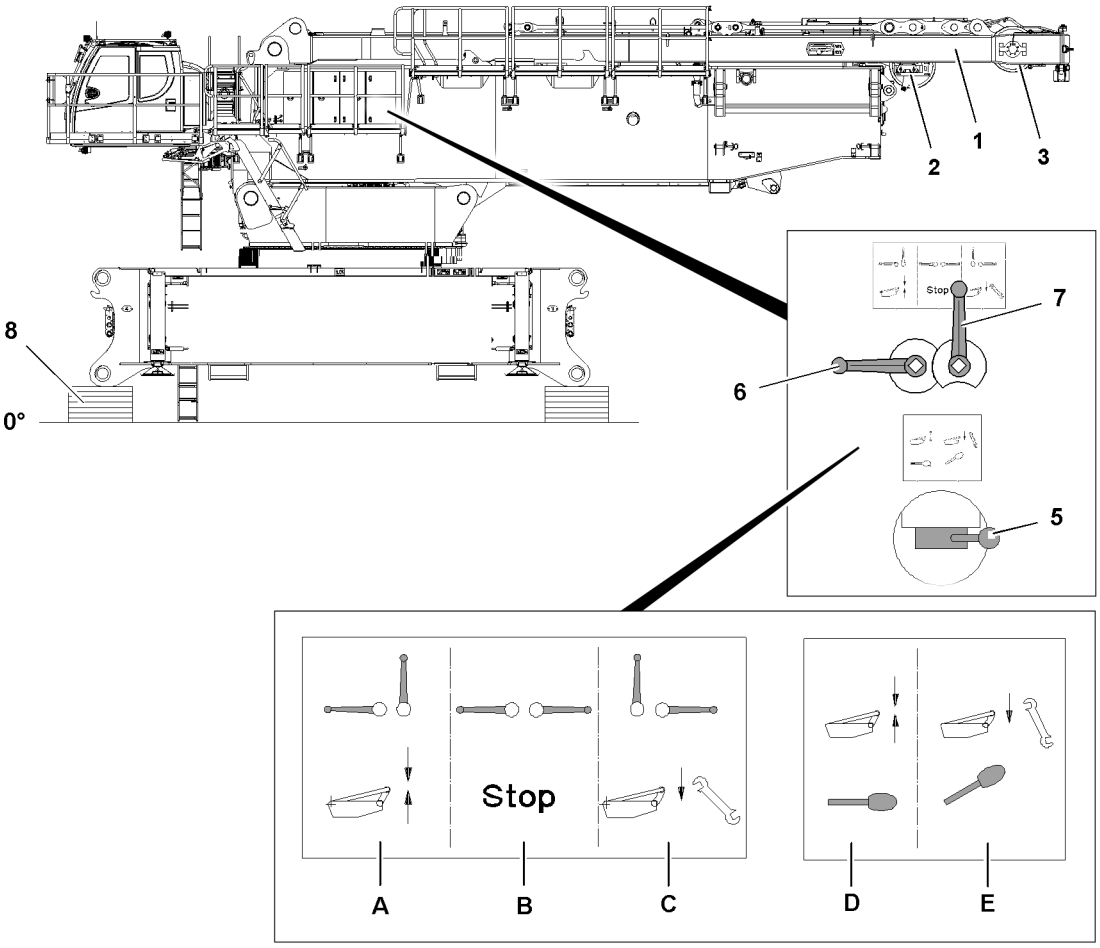

*Fig.154219: Crane with SA-frame **1** and ball valves for operation*

Note

- The SA-frame is used in assembly operation to install the crawler travel gear, see chapter 3.01.
- In addition, the SA-frame is used during assembly operation for closing the boom systems and for guying the boom during the flying assembly of lattice sections, see chapter 5.05 and chapter 5.38.

Switch positions of ball valves (ball valve **6 /** ball valve **7)**		
Switch position	Function	Use
A	Erecting the SA-frame	Assembly and crane operation
B	SA-frame stop, cylinder stop	Block erection cylinder
C	Lower the SA-frame	Lower the SA-frame into transport position

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Switch position Hand lever **5**		
Switch position	Function	Use
D[1)]	Erecting the SA-frame	Assembly, crane operation
E[2)]	Lower the SA-frame	Lower the SA-frame into transport position

1) Hand lever **5** is in zero / basic position (not actuated)
2) Ball valve **6** and ball valve **7** are in switch position **C**

3 Erecting the SA-frame

3.1 Erection procedure

Make sure that the following prerequisites are met:
- The crawler center section is lying on the substructures **8**.
- The SA-frame **1** is in the transport position.
- There is no counterweight on the turntable.
- Winch 4 **W IV** is reeved on the roller set **3** of the SA-frame **1**.
- The engine is running.
- The shut off limits of the LICCON overload protection are exceeded, see chapter 4.02.
- The SA-operating mode has been set and confirmed on the LICCON computer system.

WARNING
Danger of accident when exceeding the LICCON overload protection!
If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against overload.
Due to erroneous operation or deliberate misuse, the crane could collapse, the SA-frame can collapse or the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ The function „Exceedance of the LICCON overload protection“ may only be activated or used in emergencies and for assembly purposes.
- ▶ The function „Exceedance of the LICCON overload protection“ may only be activated or used by an authorized person who knows the effects of the bypass exactly.
- ▶ The „Exceedance of the LICCON overload protection“ may only be carried out „anticipatorily“ and with utmost caution.
- ▶ The „Exceedance of the LICCON overload protection“ is only permissible if the set up configuration of the crane has been entered correctly into the LICCON computer system and has been confirmed.

NOTICE
Danger of slack rope formation!
If winch 4 is spooled out too quickly during the erection procedure of the SA-frame **1**, slack rope can form.
- ▶ The intake rope of winch 4 **W IV** must be tensioned during the entire erection procedure.
- ▶ The spool out speed of winch 4 **W IV** must be matched to the erection speed of the erection cylinder **4**.

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WARNING
Independent lowering of the SA-frame!
Due to incorrect ball valve positions during the erection procedure, the SA-frame **1** can lower backward by itself.
Death, severe bodily injuries, property damage.
- ▶ Ball valve **6** and ball valve **7** must be in position **A** during assembly and crane operation.
- ▶ Ball valve position **C** „lower“ and ball valve position **B** „stop“ are only permissible when lowering the SA-frame onto the turntable (transport position).
- ▶ Avoid slack rope formation.

▶ Set the ball valve **6** and ball valve **7** in position **A**.

Result:

– The SA-frame **1** is pushed upward by the erection cylinders **4** until the ropes are tensioned between the pulley support **2** and the roller set **3**.

NOTICE
Damage to ropes!
- ▶ Inspect the rope pulleys visually.
- ▶ The ropes must be laying correctly in the corresponding rope pulleys.

Note
- ▶ Functions of master switch MS1, see chapter 4.05.

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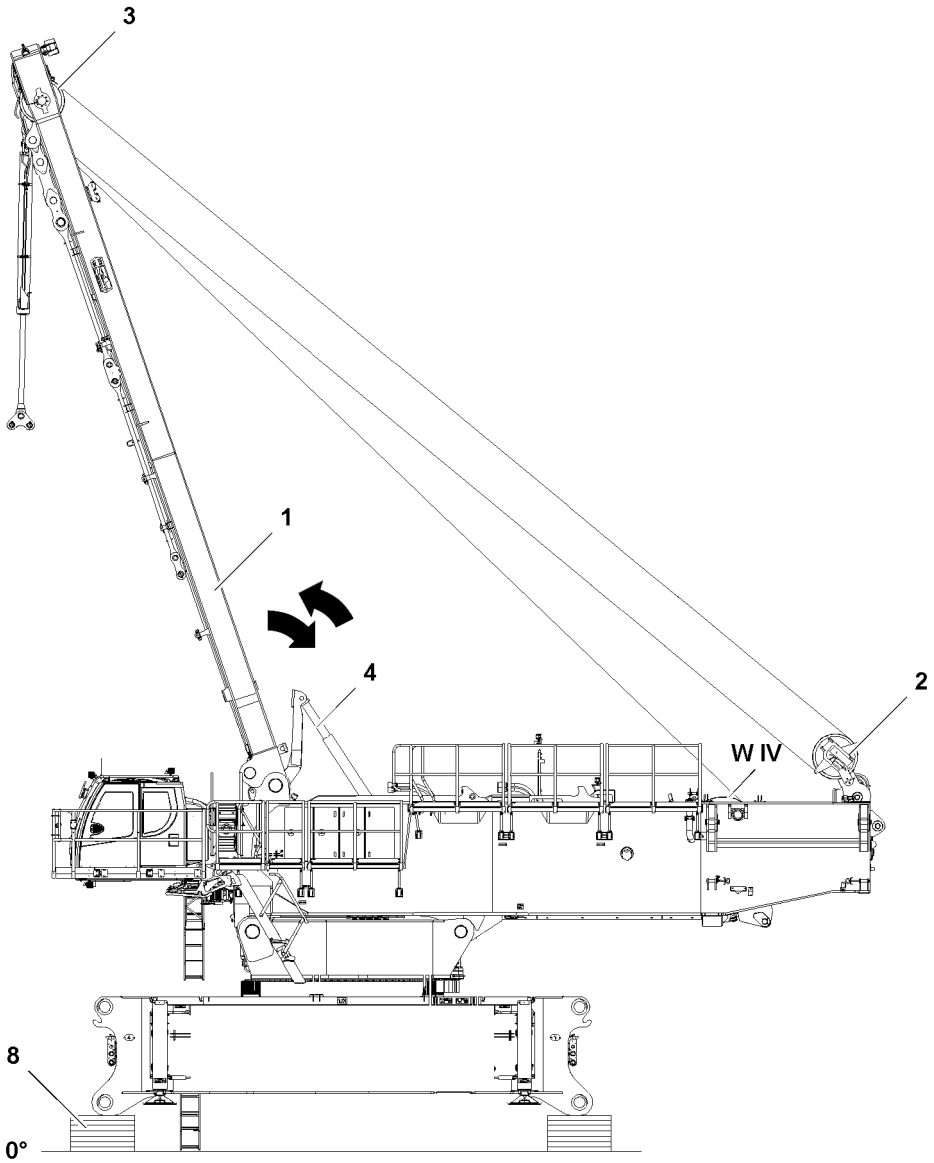

*Fig.154225: Erecting the SA-frame **1***

▶ Move master switch MS1 in direction X+.

Result:

– Winch 4 spools out and the SA-frame **1** is erected forward by the erection cylinders **4**.
– The „???“ turn off and the SA-operating mode is shown.

▶ Move master switch MS1 in direction X+.

Result:

– The SA-frame is lowered to the front and is now in the operating range of SA-operating mode.

WARNING
The crane can topple over!
If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against overload.
Due to erroneous operation or deliberate misuse, the crane could collapse, the SA-frame can collapse or the crane can topple over.
Death, severe bodily injuries, property damage.
▶ When the operating range is reached, turn off / deactivate the function „Exceedance of the LICCON overload protection“ immediately.

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▶ Turn off / deactivate the function „Exceedance of the LICCON overload protection“ immediately.

Result:

– The LICCON overload protection is active.

Note

▶ Due to the own weight of the SA-frame and by spooling out winch 4 **W IV** simultaneously, the SA-frame is lowered to the front.
▶ When the SA-frame leaves the operating range, an error message appears on the LICCON monitor and LMB stop is initiated.
▶ „Spooling out“ winch 4 **W IV** is turned off.
▶ „Luffing down“ the SA-frame is blocked.
▶ „Luffing up“ the SA-frame is only possible when the shut off limits of the LICCON overload protection are exceeded.
▶ If the minimum or maximum pressure is reached in the erection cylinders, winch 4 **W IV** turns off. An error is shown.

WARNING

Danger of accident!
The ball valve **6** and ball valve **7** must be in position **A** during assembly and crane operation.
Ball valve position **C** and ball valve position **B** are only permissible when lowering the SA-frame onto the turntable (transport position).
Death, severe bodily injuries, property damage.
▶ Secure the ball valves immediately after assembly with a lock to prevent unauthorized access.

▶ Secure the ball valves.

Note

▶ The limit switch functions must be checked individually for the erection of the SA-frame.

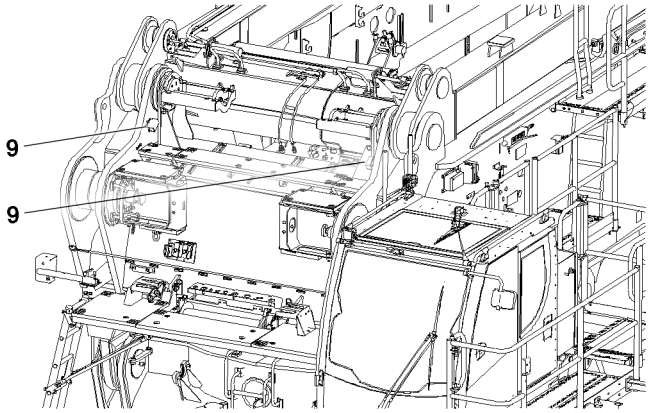

Fig.154226

▶ Cover the limit switches **9** individually with a metal plate.

Result:

– The spool out function of winch 4 turns off.

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4 Taking the SA-frame down onto the turntable

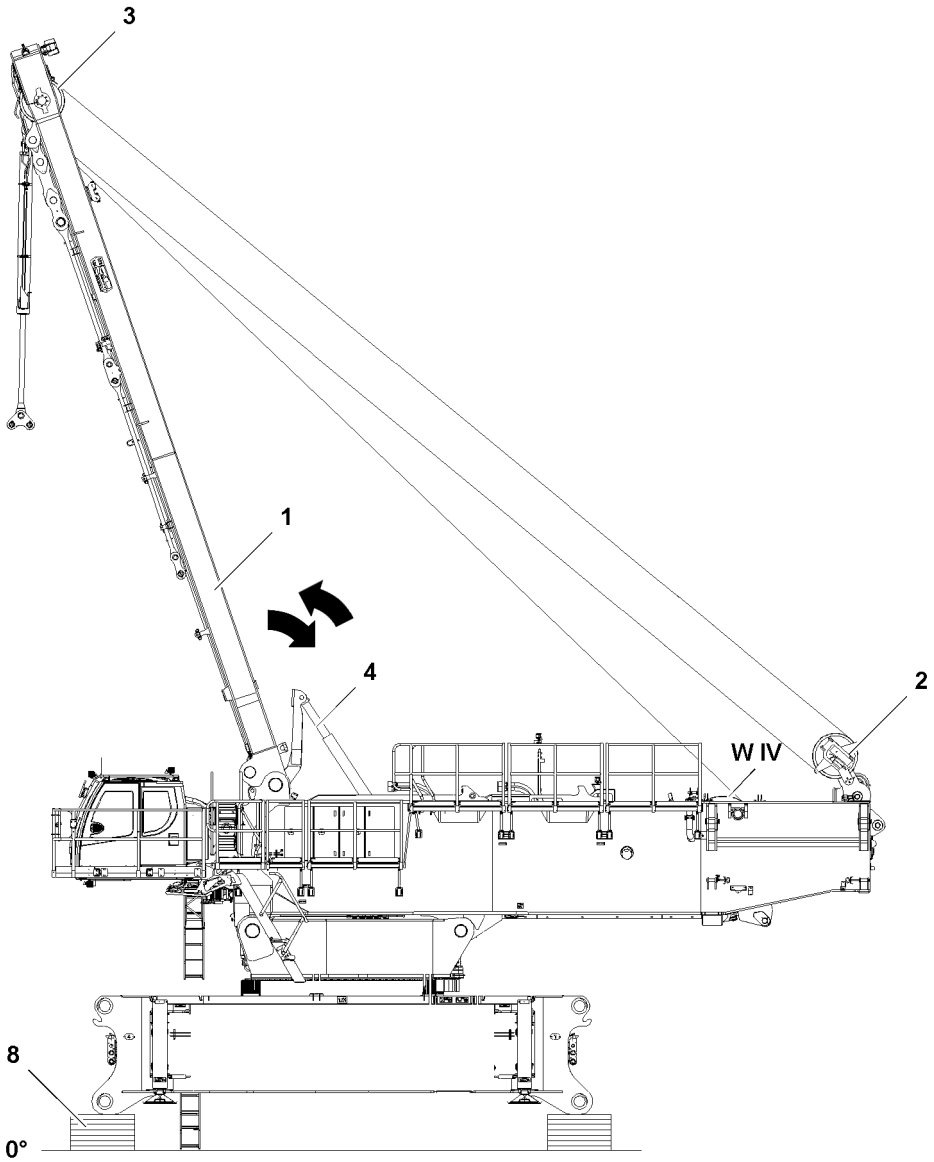

Fig.154225

4.1 Take down procedure

Make sure that the following prerequisites are met:
- The SA-operating mode has been set and confirmed on the LICCON computer system.
- The ball valve **6** and ball valve **7** are in position **A**.
- The SA-frame is in the operating range.

Note
▶ Functions of master switch MS1, see chapter 4.05.

▶ Move master switch MS1 in direction X-.

Result:

– Winch 4 **W IV** spools up.
– The SA-frame is pulled back against the pressure in the erection cylinders.

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Note

- ▶ When the SA-frame leaves the operating range when luffing up, an **error message** and **LMB STOP** is shown on the LICCON monitor.
- ▶ Spooling up of winch 4 **W IV** is turned off.

WARNING

Danger of accident when exceeding the LICCON overload protection!
If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against overload.
Due to erroneous operation or deliberate misuse, the crane could collapse, the SA-frame can collapse or the crane can topple over.
Death, severe bodily injuries, property damage.

- ▶ The function „Exceedance of the LICCON overload protection“ may only be activated or used in emergencies and for assembly purposes.
- ▶ The function „Exceedance of the LICCON overload protection“ may only be activated or used by an authorized person who knows the effects of the bypass exactly.
- ▶ The „Exceedance of the LICCON overload protection“ may only be carried out „anticipatorily“ and with utmost caution.
- ▶ The „Exceedance of the LICCON overload protection“ is only permissible if the set up configuration of the crane has been entered correctly into the LICCON computer system and has been confirmed.

- ▶ Exceeding the LICCON overload protection, see chapter 4.02.

Result:

– No further protection against overload of the crane is present.
– The assembly icon appears on the LICCON monitor, see chapter 4.02.

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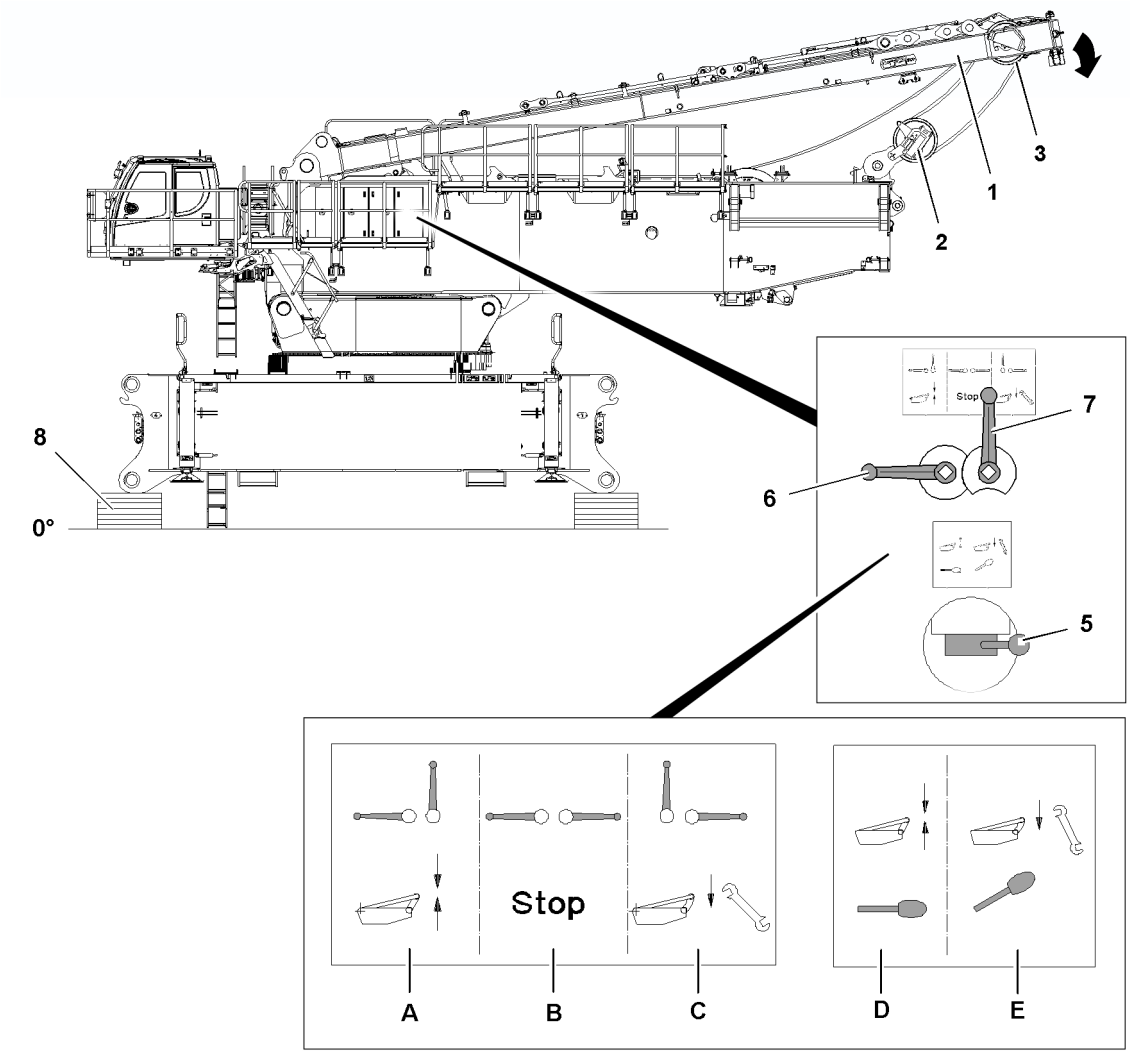

*Fig.154227: Lowering the SA-frame **1** in the direction of the turntable*

WARNING
Danger of fatal injury due to the SA-frame!
Death, severe bodily injuries, property damage.
▶ Make sure that no persons or objects are within the danger zone.

WARNING
Independent lowering of the SA-frame!
Due to an incorrect ball valve position, the SA-frame can lower backward by itself and destroy crane components.
It can result in slack rope formation.
Death, severe bodily injuries, property damage.
▶ The ball valve **6** and ball valve **7** must be in position **A** during assembly and crane operation.
▶ The ball valve position **C** and ball valve position **B** are only permissible when lowering the SA-frame onto the turntable (transport position).

Note
▶ Functions of master switch MS1, see chapter 4.05.

When the LICCON overload protection is exceeded:
▶ Move master switch MS1 in direction X-.

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Result:

– Due to the own weight of the SA-frame **1** and by spooling up winch 4 simultaneously, the SA-frame is lowered to the rear against the pressure in the erection cylinders **4**.

Note

▶ Spooling up of winch 4 is shut off from an angle of the SA-frame of approx. 170°.

NOTICE

Damage to the crane!

The ball valve position **B** and the ball valve position **C** are only permissible when lowering the SA-frame from 170° onto the turntable (transport position).

▶ If this is not observed, parts of the crane will be destroyed.

NOTICE

SA-frame damage!

At a forward incline of the crane, the SA-frame and / or the rope pulleys can be damaged before the shut-off is reached.

▶ Make sure that the SA-frame and the rope pulleys are not moved together too far.

▶ Always use a guide when taking the SA-frame down.

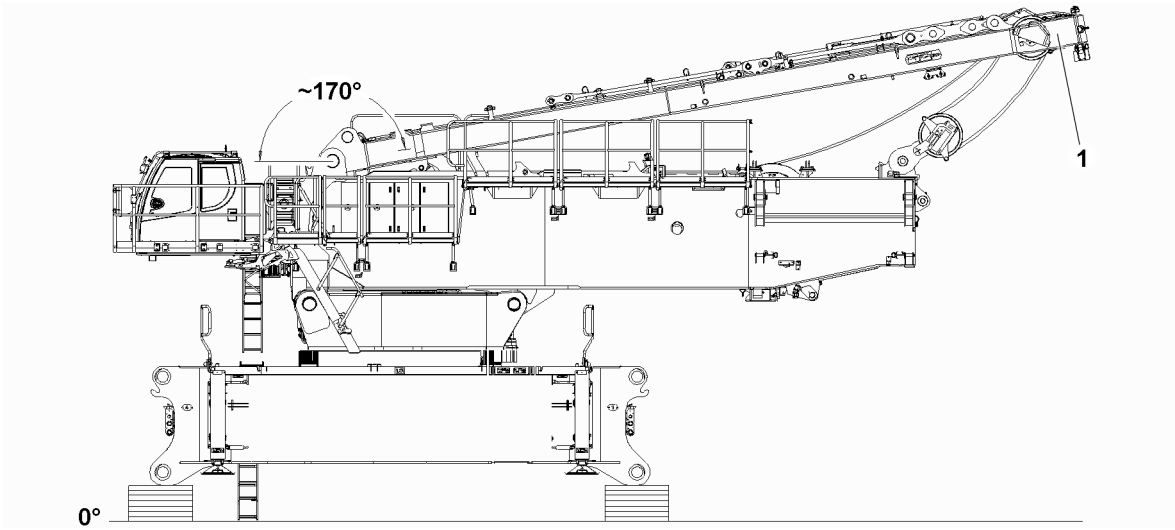

*Fig.154218: Taking the SA-frame **1** down onto the turntable*

When the SA-frame has reached an angle of approx. 170° and winch 4 is turned off:

▶ Turn off / deactivate the „Exceedance of the LICCON overload protection“ function.

Result:

– The LICCON overload protection is active.

– Winch 4 can be actuated again.

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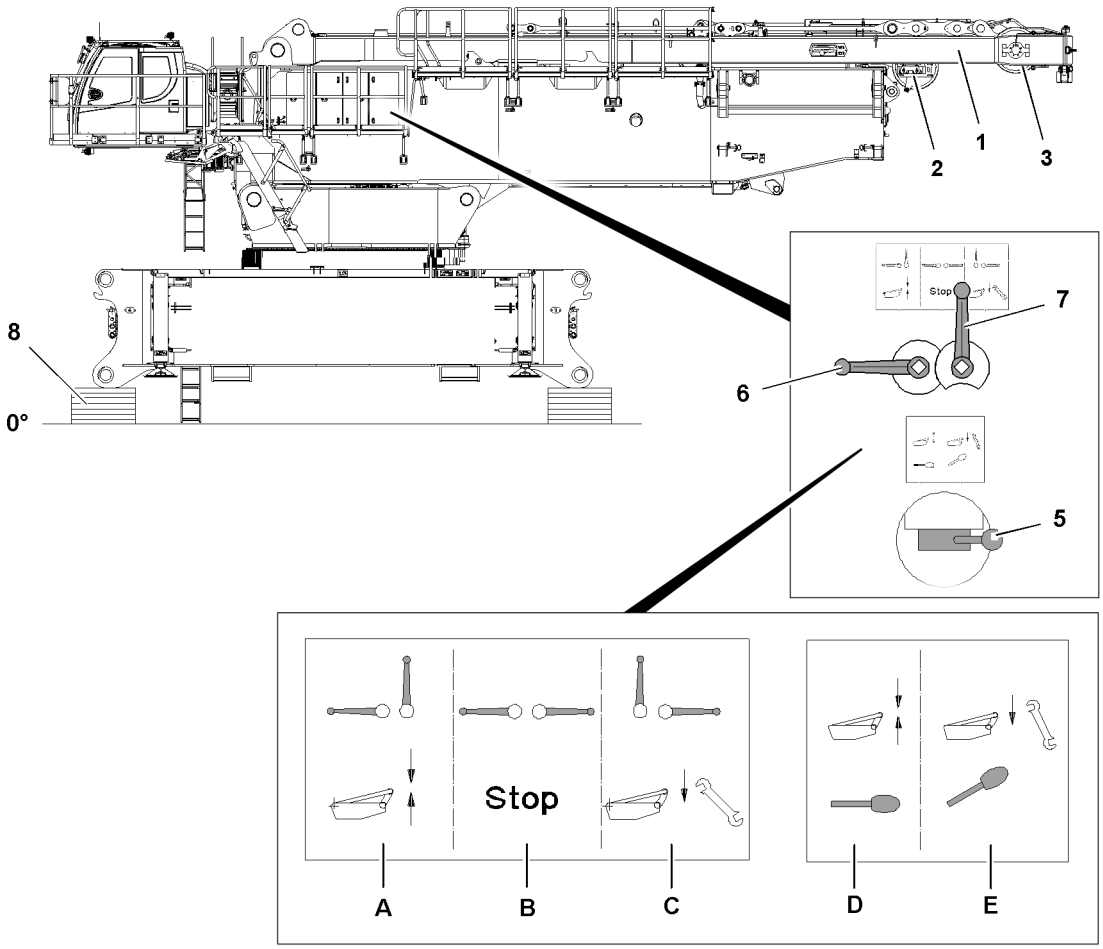

Fig.154219

▶ Lower the SA-frame **1** onto the turntable: Move the hand lever **5** to position **E**.

Result:

– The erection cylinders retract.
– The SA-frame **1** lowers.

When the SA-frame **1** is lowered completely on the turntable:

▶ Return the hand lever **5** to zero position **D** and set the ball valve **6** and ball valve **7** to position **B** and secure.
▶ Secure the ball valves immediately after assembly with a lock to prevent unauthorized access.

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5.03 Boom systems

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2	Arrangement of intermediate sections and guy rods on the booms / boom systems	2
3	Auxiliary guying	5
4	Fiber guy rope auxiliary guying	13

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1 Boom components

Note

- For boom components including associated system dimensions, lengths and component weights refer to chapter 1.03.

2 Arrangement of intermediate sections and guy rods on the booms / boom systems

Note

- The following description is an example and may not exactly match your crane.
- Lengths, weights and system dimensions of the intermediate sections are examples and may differ from the data on your crane.
- For exact crane data, and for the arrangement of intermediate sections and guy rods, refer to the respective rod plan.
- For dimensions and weights of crane components, see chapter 1.03 as well as the weight signs on the corresponding components.

WARNING

The boom can break off!

The arrangement of the intermediate sections on booms or boom systems are based on extensive static calculations.

If the arrangement of the intermediate sections according to the rod plan is not observed, the crane can collapse, the boom can break off or the crane can topple over.

If the arrangement of the guy rods according to the rod plan is not observed, the crane can collapse, the boom can break off or the crane can topple over.

Death, severe bodily injuries, property damage.

- Only arrange the intermediate sections according to the rod plan.
- Only arrange the guy rods according to the rod plan.

If an auxiliary guying is required for a certain boom length:

- Only assemble the auxiliary guying according to the rod plan in the position defined in the rod plan.

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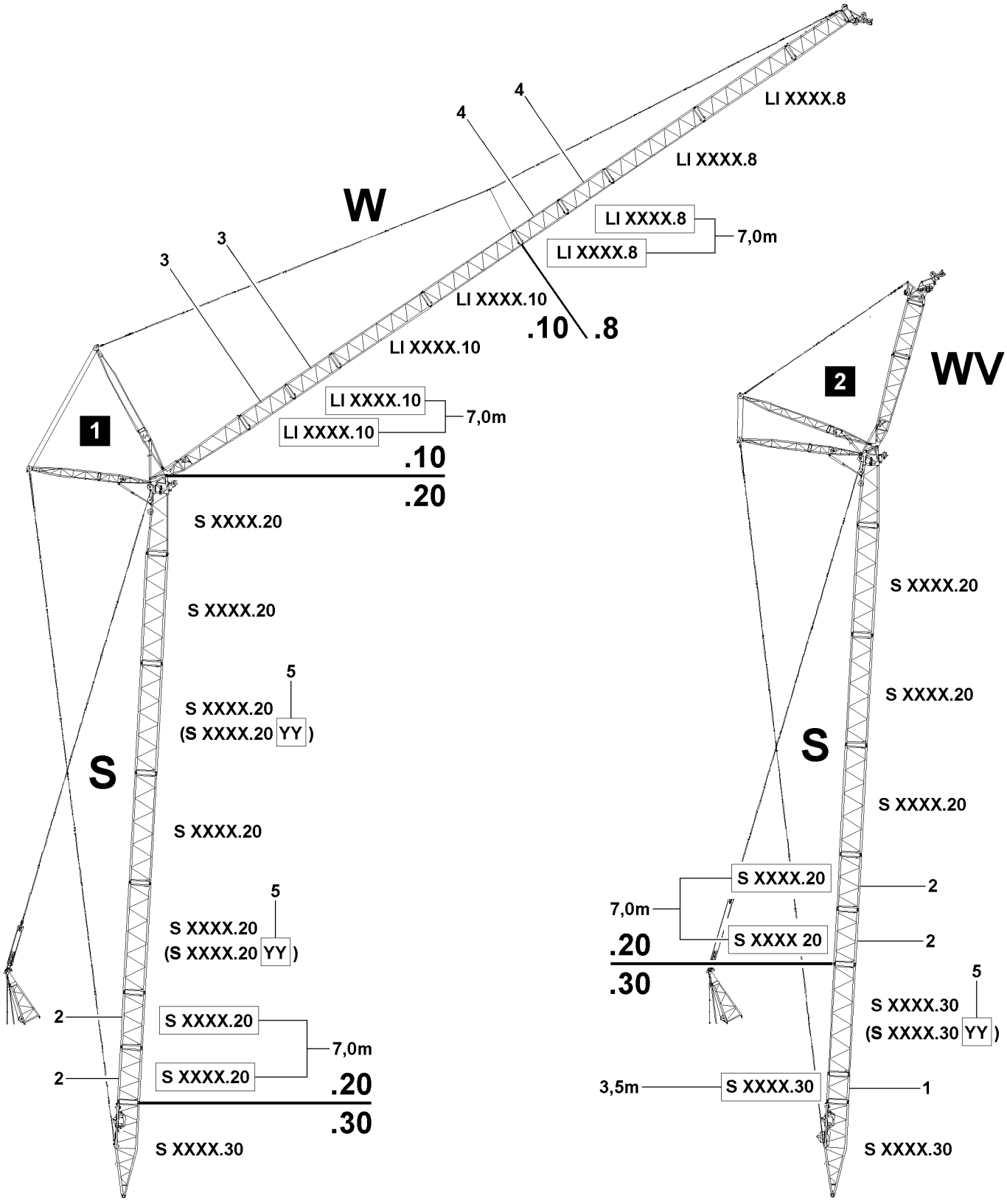

Fig.151885: Arrangement of intermediate sections and the guy rods

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System dimensions and assignment			
Position	**System**	**Heavy**	**Light**
1	S XXXX **.30**	X	
2	S XXXX **.20**		X
3	LI XXXX **.10**	X	
4	LI XXXX **.8**		X
5	S XXXX **.40** YY	X	

General specifications for the configuration of booms or boom systems:

- With the same system dimension, two short intermediate sections with a length of 3.0 m (3.5 m) are heavier than one single intermediate section with a length of 6.0 m (7.0 m).
- With the same system dimension, two short intermediate sections with a length of 6.0 m (7.0 m) are heavier than one single intermediate section with a length of 12.0 m (14.0 m).
- With the same system dimension, two short intermediate sections with a length of 3.0 m (3.5 m) can be replaced by one single intermediate section with a length of 6.0 m (7.0 m).
- With the same system dimension, two short intermediate sections with a length of 6.0 m (7.0 m) can be replaced by one single intermediate section with a length of 12.0 m (14.0 m).
- For intermediate sections with the same system dimension but different lengths, always install the short intermediate sections on the bottom in the boom, due to their weight, in direction of the slewing ring connection, see illustration **1** and illustration **2**.
- The heavier one intermediate section is, the higher is the value of the last two digits on the system dimension plate.
- Pay attention to the last two letters following the letter combinations (YY) **5** on the last two letters on the system dimension plate and observe them.

2.1 Arrangement of the intermediate sections

WARNING
Danger of accidents due to incorrectly assembled intermediate sections!
Death, severe bodily injuries, property damage.

- ▶ Any other arrangement of the intermediate sections than specified in the operating instructions or the rod plans is prohibited.
- ▶ There is the danger that intermediate sections are mixed up, they are differently sized and do **not** differ externally.
- ▶ The intermediate sections differ externally only by the welded on plates (.8, .10, .12, .16, .20, .25, .30, .40 **YY**).
- ▶ When assembling the boom, it must be ensured that the intermediate sections are only arranged and installed according to their description as indicated on the rod plan.
- ▶ Observe and adhere to the additional letter combinations (YY) **5** on the system dimension plate of the intermediate sections at assembly of the intermediate sections.

WARNING
Arrangement of the intermediate sections!
If the arrangement of the intermediate sections is not carried out according to the rod plan, then the boom can be overloaded, bend down and break off.
Death, severe bodily injuries, property damage.

- ▶ For intermediate sections with the same system dimension but different length the shorter intermediate sections must always be installed on the bottom in the boom, in direction of the slewing ring connection, except if another installation position is specified in the rod plan.
- ▶ Adhere to the specifications in the rod plan in any case.

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2.2 Arrangement of the guy rods

WARNING
Danger of accidents due to incorrectly assembled guy rods!
Death, severe bodily injuries, property damage.
- ▶ Any other arrangement of the guy rods than specified in the operating instructions or the rod plans is prohibited.
- ▶ When assembly the boom / boom system, only arrange and install the guy rods according to their description in the rod plan.

WARNING
Arrangement of the guy rods!
If the arrangement of the guy rods is not carried out according to the rod plan, then the boom can be overloaded, bend down and break off.
Death, severe bodily injuries, property damage.
- ▶ Adhere to the specifications in the rod plan in any case.

3 Auxiliary guying

Note
- ▶ The following descriptions and illustrations are examples and may not match your crane exactly.
- ▶ For exact crane data refer to the respective rod plan.
- ▶ In the case of questions: Contact Customer Service at Liebherr-Werk Ehingen GmbH.

The auxiliary guying, in regards to safe crane operation - especially for long boom systems - is of vital importance.

The auxiliary guying is a deciding factor in relieving the boom, or the boom system during erection and take-down as well as during crane operation.

Guy ropes with different lengths are used in the different auxiliary guyings.

The assembly of the auxiliary guying between the boom guying and the boom system is implemented using different lugs, cross brackets and connecting lugs.

Note
- ▶ The boom lengths, for which an auxiliary guying is required in addition to a boom guying, can be seen in the rod plan.

Depending on the crane type and boom length:
- ▶ Assembling the auxiliary guying: Remove the standard lugs and install the tension lugs **12**.

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WARNING
The crane can topple over!
If the auxiliary guying is not installed or not installed on the position specified in the rod plan, then the crane can collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.

- ▶ Only assemble the auxiliary guying in the position specified in the rod plan.
- ▶ Make sure that the auxiliary guying is always completely installed and that all pins are properly pinned and secured.
- ▶ Assemble the auxiliary guying together with the boom guying when the boom / boom system is laying on the floor.
- ▶ **or:**
- ▶ Assemble the auxiliary guying together with the boom guying when the boom / boom system is laying on a load bearing substructure.
- ▶ **or:**
- ▶ Assemble the auxiliary guying together with the boom guying when the boom / boom system is securely held by the auxiliary crane.

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3.1 Assembling the auxiliary guying on the main boom

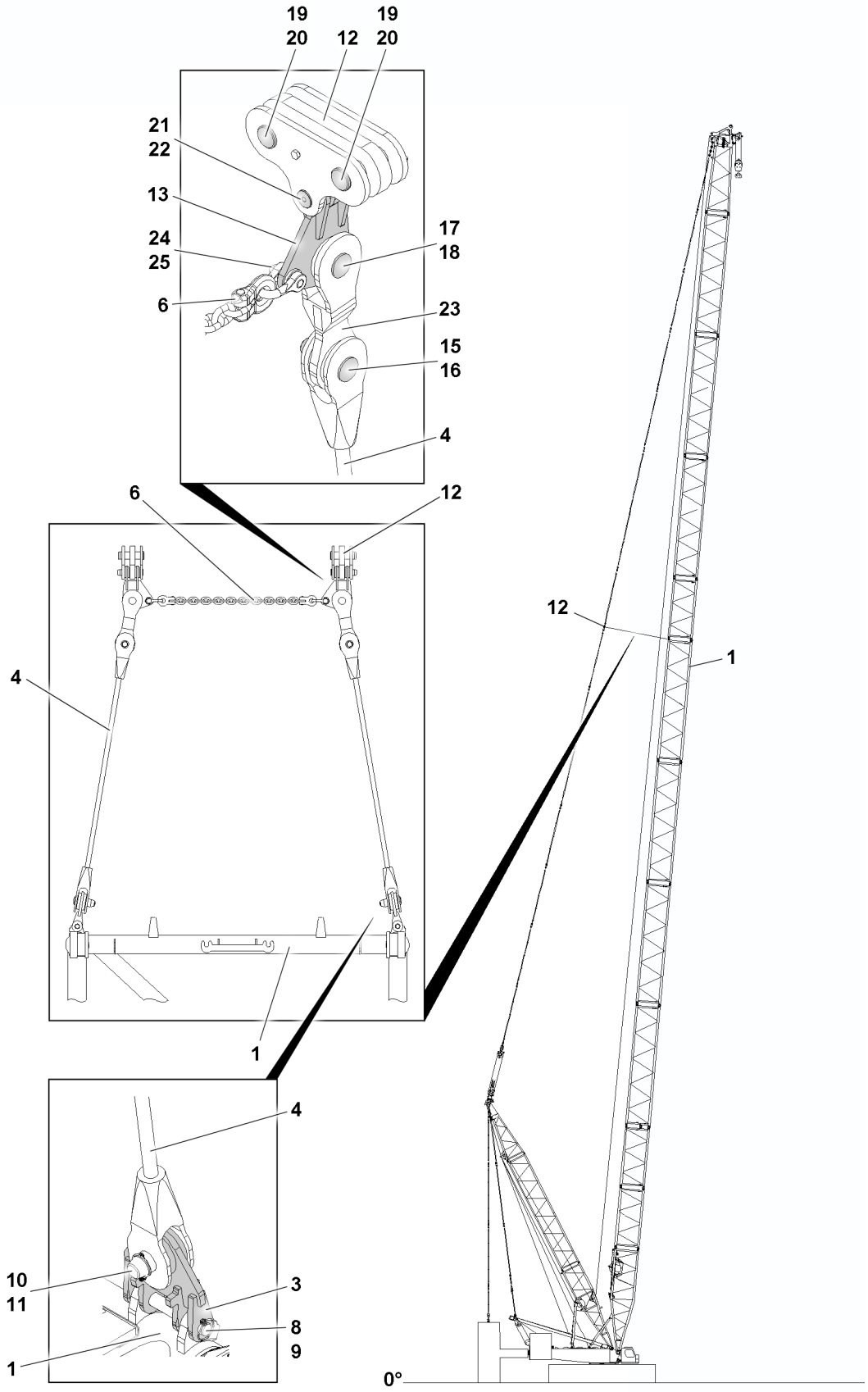

Fig.153507: „Long“ auxiliary guying on the main boom

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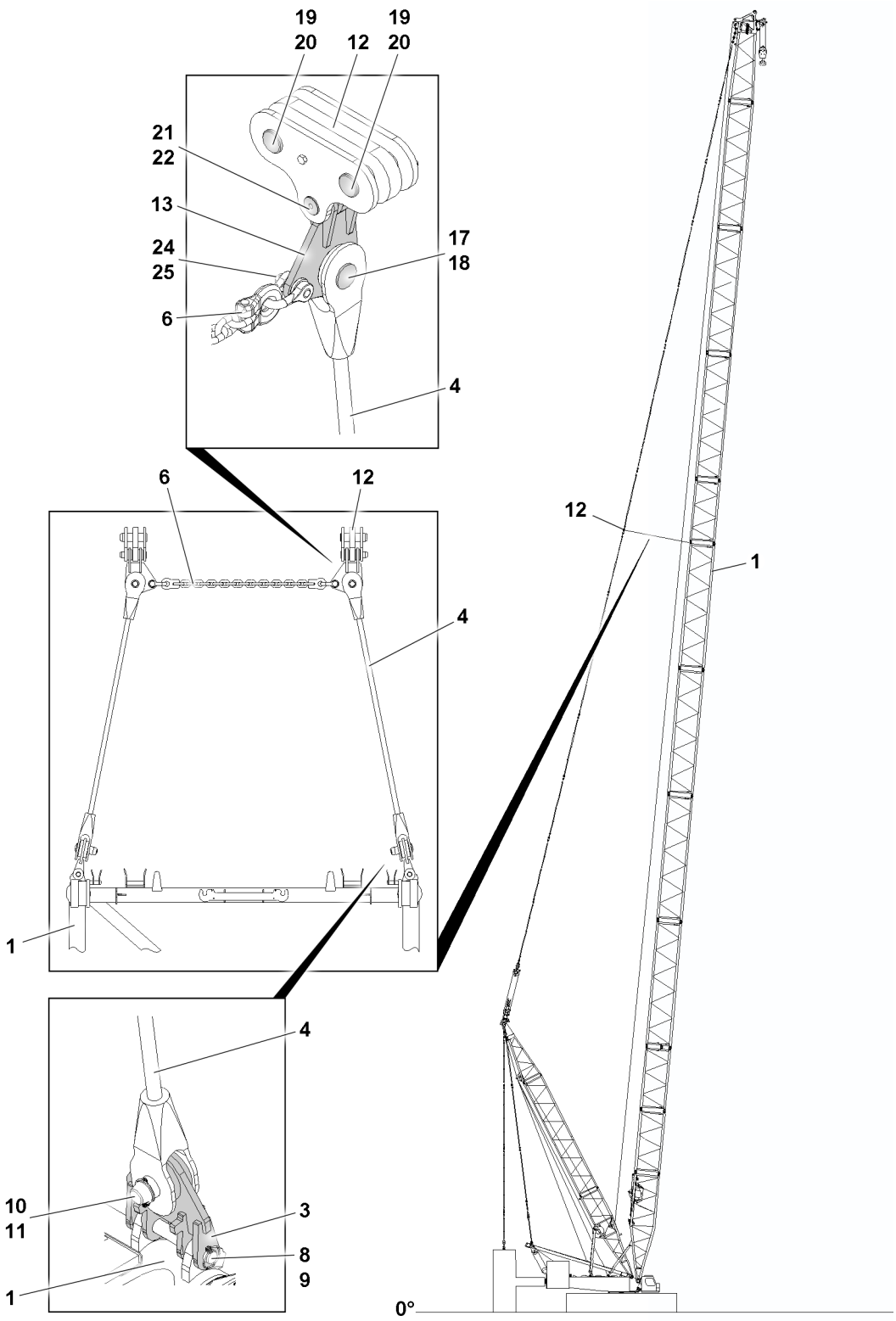

Fig.153603: „Short“ auxiliary guying on the main boom

1	Intermediate section [1]	**11**	Retaining element	**19**	Pin
3	Connecting lug	**12**	Tension lug	**20**	Retaining element
4	Guy rope [2]	**13**	Cross bracket	**21**	Pin
6	Chain	**15**	Pin	**22**	Retaining element
8	Pin	**16**	Retaining element	**23**	Lug
9	Retaining element	**17**	Pin	**24**	Shackle
10	Pin	**18**	Retaining element	**25**	Screw pin

[1] for the exact designation of the intermediate section: see the rod plan

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[2)] for the exact designation of the guy rope: see the rod plan

The tension lugs **12** must be installed in the boom guying instead of standard lugs. The auxiliary guying is installed on the tension lugs **12**.

Make sure that the following prerequisites are met:
- The standard lugs are have been disassembled in the boom guying.
- The tension lugs **12** are installed properly on both sides in the boom guying instead of standard lugs.
- The tension lugs **12** are pinned properly together with pins **19** in the boom guying and secured with a retaining element **20**.
- The connecting lug **3** is pinned on both sides on the intermediate section **1** with pins **8** a secured with a retaining element **9**.

▶ Pin the cross bracket **13** on the tension lug **12**: Insert the pin **21** and properly secure with the retaining element **22**.

In the case of a longer auxiliary guying:
▶ Pin the lug **23** on the cross bracket **13** with a pin **17** and secure properly with the retaining element **18**.
▶ Install the guy rope **4**: Pin the guy rope **4** on the lug **23** with a pin **15** and secure with the retaining element **16**.
or

In the case of a shorter auxiliary guying:
Install the guy rope **4**: Pin the guy rope **4** on the cross bracket **13** with a pin **17** and secure properly with the retaining element **18**.

If the guy rope **4** is properly pinned and secured on both sides to the lug **23** or both sides to the cross bracket **13**:
▶ Pin the guy rope **4** on the connecting lug **3** with a pin **10** and secure with the retaining element **11**.

Install the chain **6** between the cross brackets **13**:
▶ Properly install the chain **6** to the left and right on the cross brackets **13** with a shackle **24** and screw pin **25**.

WARNING
The crane can topple over!
If the chain **6** is not installed in connection with the auxiliary guying, then the boom guying can be damaged, the boom can break off and the crane can topple over.
Death, severe bodily injuries, property damage.
▶ Only assemble the auxiliary guying in the position specified in the rod plan.
▶ If a chain **6** is specified in the rod plan, then it must always be installed in connection with the auxiliary guying, otherwise the guy rods will be pulled apart.

▶ Recheck the proper and complete assembly of the auxiliary guying before erecting the boom / boom system.

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3.2 Assembling the auxiliary guying on the W-boom

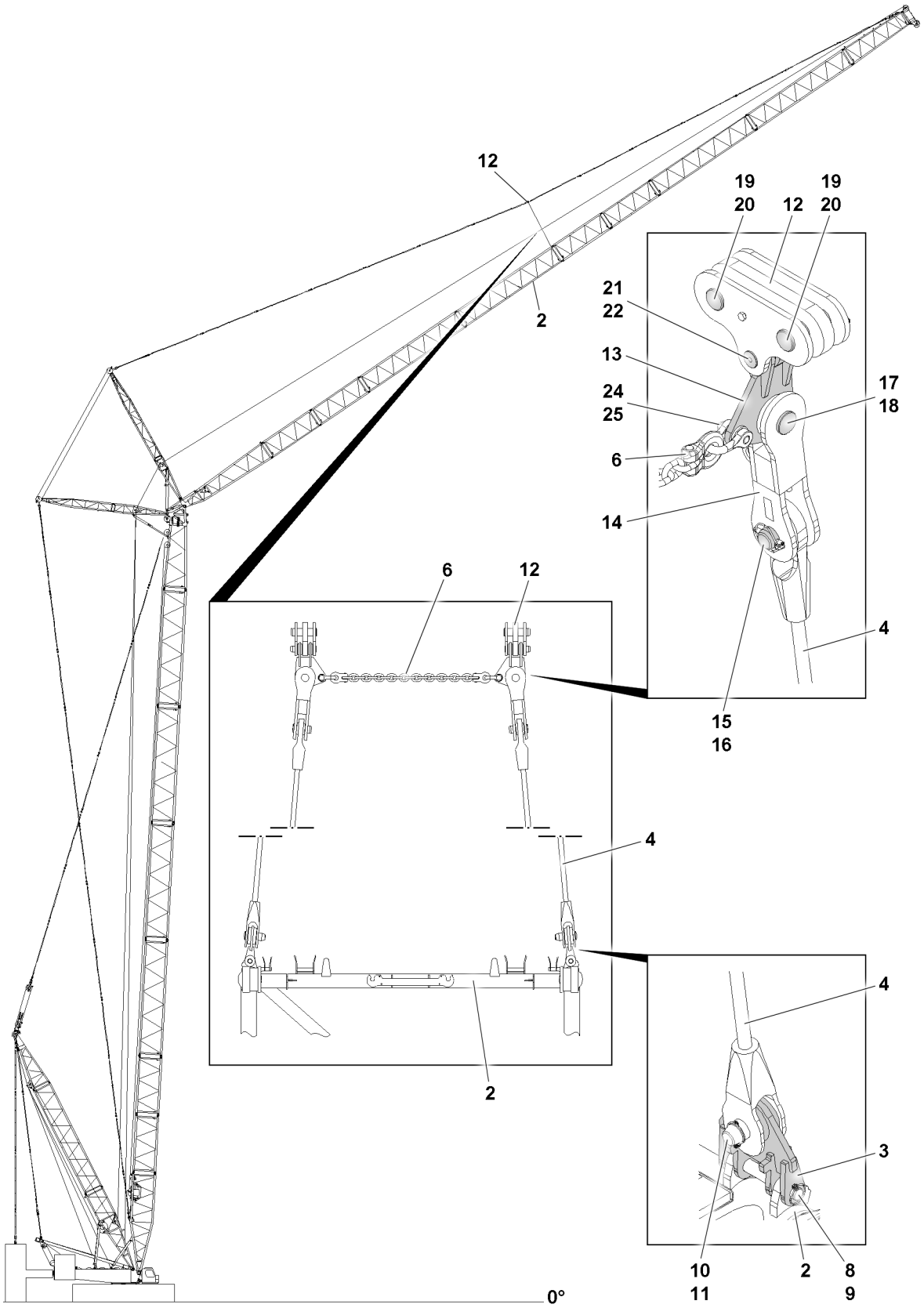

Fig.153508: Auxiliary guying on the W- boom

2 Intermediate section [1)] **11** Retaining element **18** Retaining element

For continuation of legend for illustrations, see next page

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3	Connecting lug	**12**	Tension lug	**19**	Pin
4	Guy rope [2)]	**13**	Cross bracket	**20**	Retaining element
6	Chain	**14**	Cross bracket	**21**	Pin
8	Pin	**15**	Pin	**22**	Retaining element
9	Retaining element	**16**	Retaining element	**24**	Shackle
10	Pin	**17**	Pin	**25**	Screw pin

[1)] for the exact designation of the intermediate section: see the rod plan
[2)] for the exact designation of the guy rope: see the rod plan

The tension lugs **12** must be installed in the boom guying instead of standard lugs. The auxiliary guying is installed on the tension lugs **12**.

Make sure that the following prerequisites are met:
- The standard lugs are have been disassembled in the boom guying.
- The tension lugs **12** are installed properly on both sides in the boom guying instead of standard lugs.
- The tension lugs **12** are pinned properly together with pins **19** in the boom guying and secured with a retaining element **20**.
- The connecting lug **3** is pinned on both sides on the intermediate section **2** with pins **8** a secured with a retaining element **9**.

▶ Pin the cross bracket **13** on the tension lug **12**: Insert the pin **21** and properly secure with the retaining element **22**.
▶ Pin the cross bracket **14** on the cross bracket **13** with a pin **17** and secure properly with the retaining element **18**.
▶ Install the guy rope **4**: Pin the guy rope **4** on the cross bracket **14** with a pin **15** and secure with the retaining element **16**.

If the guy rope **4** is properly pinned and secured on both sides to the cross bracket **14**:
▶ Pin the guy rope **4** on the connecting lug **3** with a pin **10** and secure with the retaining element **11**.

Install the chain **6** between the cross brackets **13**:
▶ Properly install the chain **6** to the left and right on the cross bracket **13** with a shackle **24** and screw pin **25**.

WARNING
The crane can topple over!
If the chain **6** is not installed in connection with the auxiliary guying, then the boom guying can be damaged, the boom can break off and the crane can topple over.
Death, severe bodily injuries, property damage.
▶ Only assemble the auxiliary guying in the position specified in the rod plan.
▶ If a chain **6** is specified in the rod plan, then it must always be installed in connection with the auxiliary guying, otherwise the guy rods will be pulled apart.

▶ Recheck the proper and complete assembly of the auxiliary guying before erecting the boom / boom system.

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Fig.195219

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4 Fiber guy rope auxiliary guying

Note

- ▶ The auxiliary guying made out of fiber guy ropes are not available for all crane types.
- ▶ The following descriptions and illustrations are examples and may not match your crane exactly.
- ▶ For exact crane data refer to the respective rod plan.
- ▶ In the case of questions: Contact Customer Service at Liebherr-Werk Ehingen GmbH.

NOTICE

Damage to the fiber guy ropes!
If the fiber guy ropes are kinked, turned or damaged, they must be taken down and may no longer be used. Damaged fiber guy ropes can rip.
Death, severe bodily injuries, property damage.

- ▶ Never installed twisted fiber guy ropes.
- ▶ Observe the notes regarding the transport of the fiber guy ropes, see chapter 2.04.

The auxiliary guying, in regards to safe crane operation - especially for long boom systems - is of vital importance.

The auxiliary guying is a deciding factor in relieving the boom, or the boom system during erection and take-down as well as during crane operation.

Guy ropes with different lengths are used in the different auxiliary guyings.

The installation of the auxiliary guying between the boom guying and the boom system is implemented using different lugs, cross brackets or connecting lugs.

Note

- ▶ The boom lengths, for which an auxiliary guying is required in addition to a boom guying, can be seen in the rod plan.

Depending on the crane type and boom length:

- ▶ Assembling the auxiliary guying: Remove the standard lugs and install the tension lugs **12**.

WARNING

The crane can topple over!
If the auxiliary guying is not installed or not installed on the position specified in the rod plan, then the crane can collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.

- ▶ Only assemble the auxiliary guying in the position specified in the rod plan.
- ▶ Make sure that the auxiliary guying is always completely installed and that all pins are properly pinned and secured.
- ▶ Assemble the auxiliary guying together with the boom guying when the boom / boom system is laying on the floor.
- ▶ **or:**
- ▶ Assemble the auxiliary guying together with the boom guying when the boom / boom system is laying on a load bearing substructure.
- ▶ **or:**
- ▶ Assemble the auxiliary guying together with the boom guying when the boom / boom system is securely held by the auxiliary crane.

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4.1 Assembling the auxiliary guying on the main boom

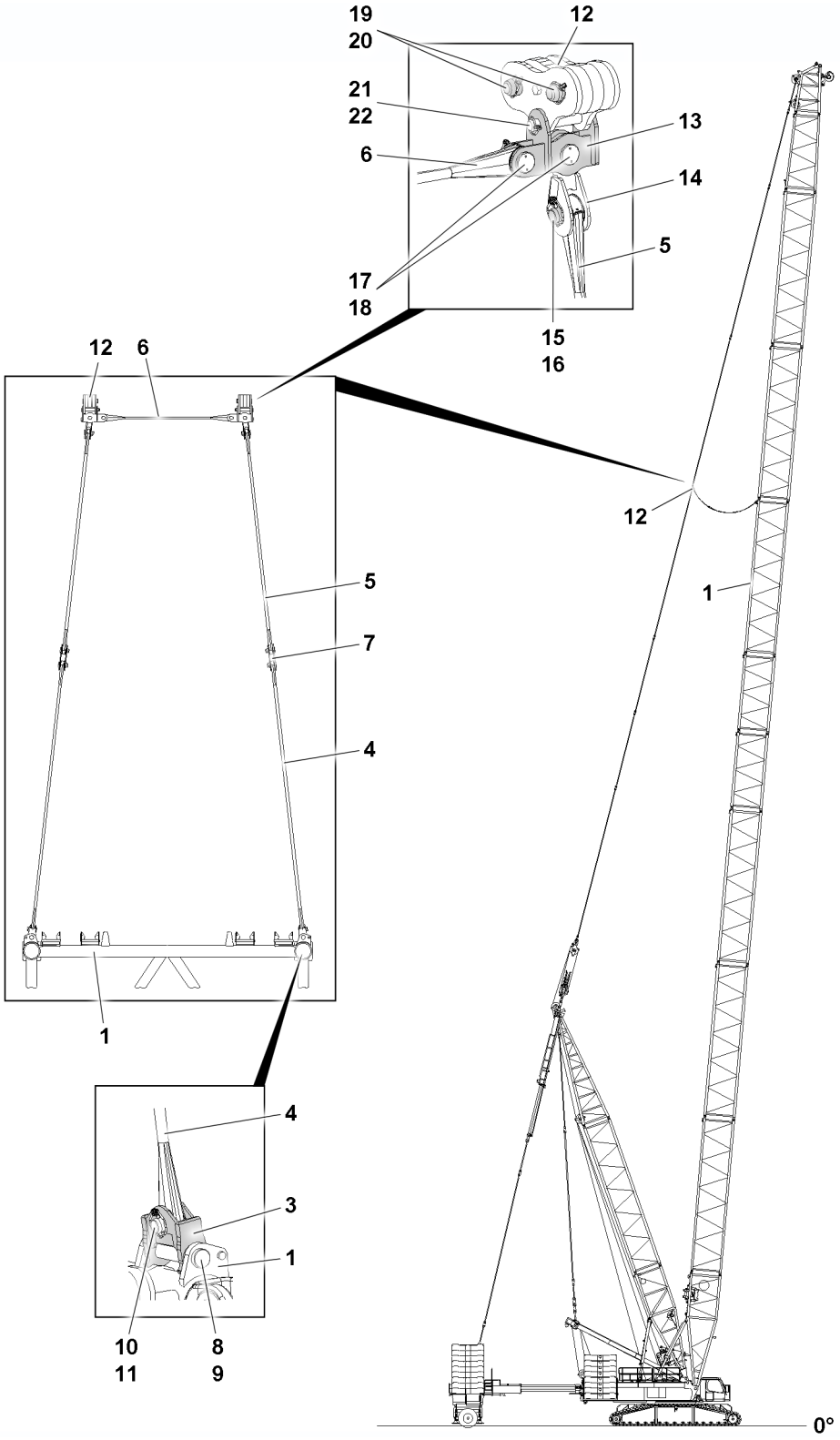

Fig.153504: Auxiliary guying on the main boom

1 Intermediate section [1)]
3 Connecting lug
4 Fiber guy rope [2)]
5 Fiber guy rope [2)]
9 Retaining element
10 Pin
11 Retaining element
12 Tension lug
16 Retaining element
17 Pin
18 Retaining element
19 Pin

For continuation of legend for illustrations, see next page

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6	Fiber guy rope [2]	**13**	Cross bracket	**20**	Retaining element
7	Connector bracket	**14**	Cross bracket	**21**	Pin
8	Pin	**15**	Pin	**22**	Retaining element

[1] for the exact designation of the intermediate section: See the rod plan
[2] for the exact designation of the guy rope: See the rod plan

The tension lugs **12** must be installed in the boom guying instead of standard lugs. The auxiliary guying is installed on the tension lugs **12**.

Make sure that the following prerequisites are met:
- The standard lugs are have been disassembled in the boom guying.
- The tension lugs **12** are installed properly on both sides in the boom guying instead of standard lugs.
- The tension lugs **12** are pinned properly together with pins **19** in the boom guying and secured with a retaining element **20**.
- The connecting lug **3** is pinned on both sides on the intermediate section **1** with pins **8** a secured with a retaining element **9**.

▶ Pin the cross bracket **13** on the tension lug **12**: Insert the pin **21** and properly secure with the retaining element **22**.
▶ Pin the cross bracket **14** on the cross bracket **13** with a pin **17** and secure properly with the retaining element **18**.
▶ Install the guy rope **5**: Pin the guy rope **5** on the cross bracket **14** with a pin **15** and secure with the retaining element **16**.

If the guy rope **5** is properly pinned and secured on both sides to the cross bracket **14**:
▶ Properly pin and secure the guy rope **4** with the connecting bracket **7** to the guy rope **5**.
▶ Pin the guy rope **4** on the connecting lug **3** with a pin **10** and secure with the retaining element **11**.

Install the guy rope **6** between the cross brackets **13**:
▶ Pin the guy rope **6** to the left and right on the cross bracket **13** with a pin **17** and secure properly with the retaining element **18**.

WARNING
The crane can topple over!
If the guy rope **6** is not installed in connection with the auxiliary guying, then the boom guying can be damaged, the boom can break off and the crane can topple over.
Death, severe bodily injuries, property damage.
▶ Only assemble the auxiliary guying in the position specified in the rod plan.
▶ If a guy rope **6** is specified in the rod plan, then it must always be installed in connection with the auxiliary guying, otherwise the guy rods will be pulled apart.

▶ Recheck the proper and complete assembly of the auxiliary guying before erecting the boom / boom system.

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4.2 Assembling the auxiliary guying on the W-boom

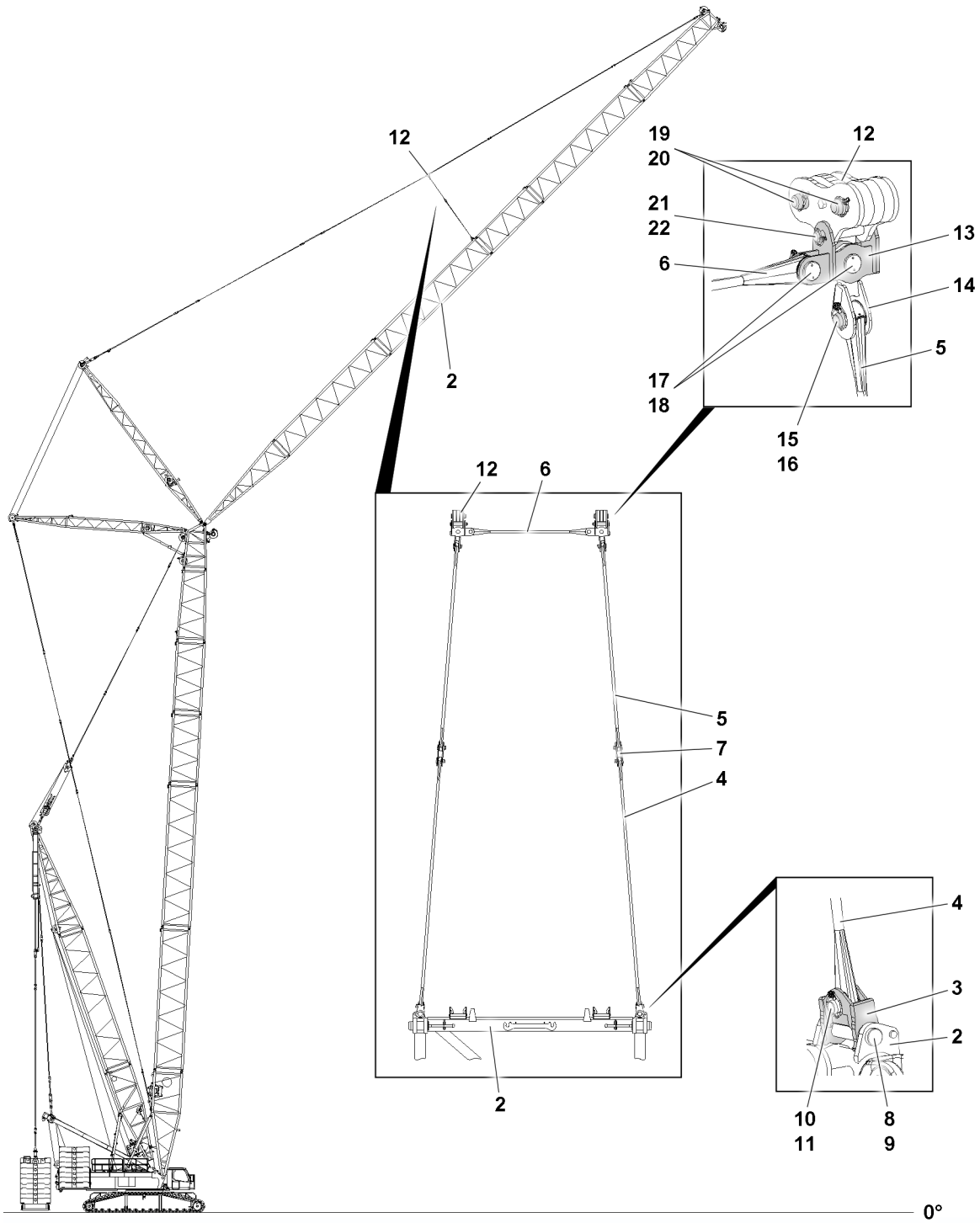

Fig.153505: Auxiliary guying on the W- boom

2	Intermediate section [1]	**9**	Retaining element	**16**	Retaining element
3	Connecting lug	**10**	Pin	**17**	Pin
4	Fiber guy rope [2]	**11**	Retaining element	**18**	Retaining element
5	Fiber guy rope [2]	**12**	Tension lug	**19**	Pin
6	Fiber guy rope [2]	**13**	Cross bracket	**20**	Retaining element
7	Connector bracket	**14**	Cross bracket	**21**	Pin
8	Pin	**15**	Pin	**22**	Retaining element

[1] for the exact designation of the intermediate section: See the rod plan

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[2)] for the exact designation of the guy rope: See the rod plan

The tension lugs **12** must be installed in the boom guying instead of standard lugs. The auxiliary guying is installed on the tension lugs **12**.

Make sure that the following prerequisites are met:
- The standard lugs are have been disassembled in the boom guying.
- The tension lugs **12** are installed properly on both sides in the boom guying instead of standard lugs.
- The tension lugs **12** are pinned properly together with pins **19** in the boom guying and secured with a retaining element **20**.
- The connecting lug **3** is pinned on both sides on the intermediate section **1** with pins **8** a secured with a retaining element **9**.

▶ Pin the cross bracket **13** on the tension lug **12**: Insert the pin **21** and properly secure with the retaining element **22**.
▶ Pin the cross bracket **14** on the cross bracket **13** with a pin **17** and secure properly with the retaining element **18**.
▶ Install the guy rope **5**: Pin the guy rope **5** on the cross bracket **14** with a pin **15** and secure with the retaining element **16**.

If the guy rope **5** is properly pinned and secured on both sides to the cross bracket **14**:
▶ Properly pin and secure the guy rope **4** with the connecting bracket **7** to the guy rope **5**.
▶ Pin the guy rope **4** on the connecting lug **3** with a pin **10** and secure with the retaining element **11**.

Install the guy rope **6** between the cross brackets **13**:
▶ Pin the guy rope **6** to the left and right on the cross bracket **13** with a pin **17** and secure properly with the retaining element **18**.

WARNING
The crane can topple over!
If the guy rope **6** is not installed in connection with the auxiliary guying, then the boom guying can be damaged, the boom can break off and the crane can topple over.
Death, severe bodily injuries, property damage.
▶ Only assemble the auxiliary guying in the position specified in the rod plan.
▶ If a guy rope **6** is specified in the rod plan, then it must always be installed in connection with the auxiliary guying, otherwise the guy rods will be pulled apart.

▶ Recheck the proper and complete assembly of the auxiliary guying before erecting the boom / boom system.

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5.05 D-boom

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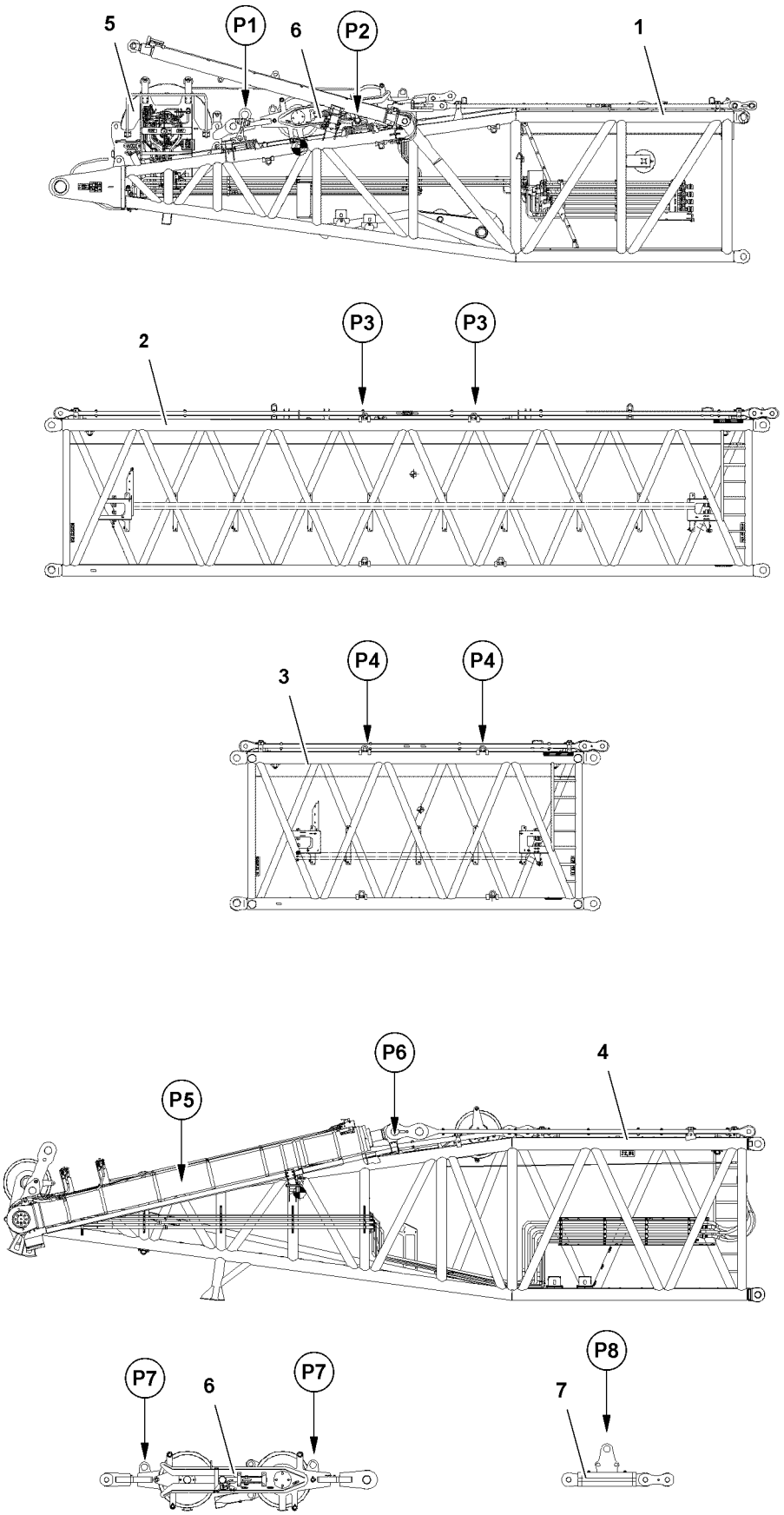

Fig.116964

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1 Component overview

Note
▶ The assembly sections are marked with their own weight.

Note
▶ Dimensions and weights, see the Crane operating instructions, chapter 1.03.

Position	Component
1	D-pivot section
2	D-intermediate section 2825.20 12 m
3	D-intermediate section 2825.25 6 m
4	D-end section
5	Winch 3
6	S-luffing pulley block
7	Auxiliary weight

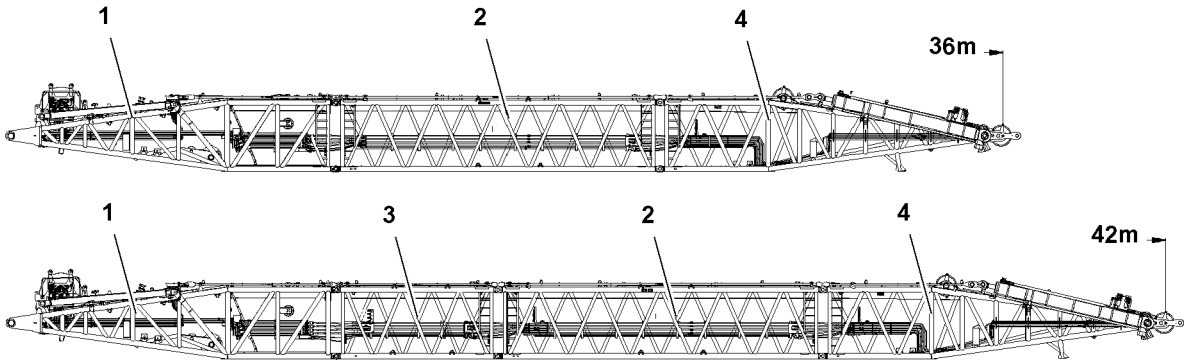

Fig.116965: Derrick boom combination

2 Fastening points for derrick components

WARNING
Component incorrectly fastened!
Death, severe bodily injuries, property damage.
▶ Fasten the components only on the intended fastening points on both sides.
▶ Fastening of components and description of fastening points, see Crane operating instructions, chapter 5.01.

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2.1 Fastening points D-pivot section

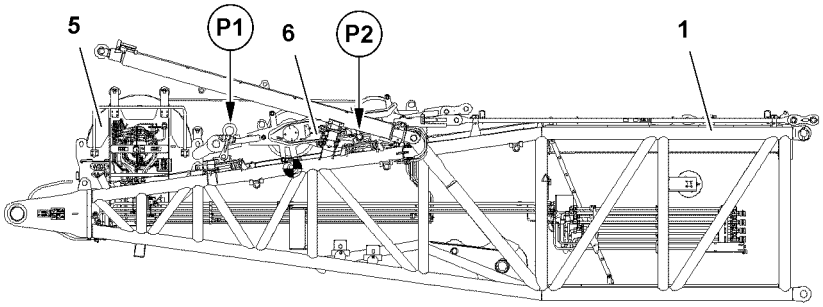

Fig.122782: Fastening points D-pivot section

Fastening points	
P1 and P2	D-pivot section

2.2 Fastening points D-intermediate section 2825.20 12 m

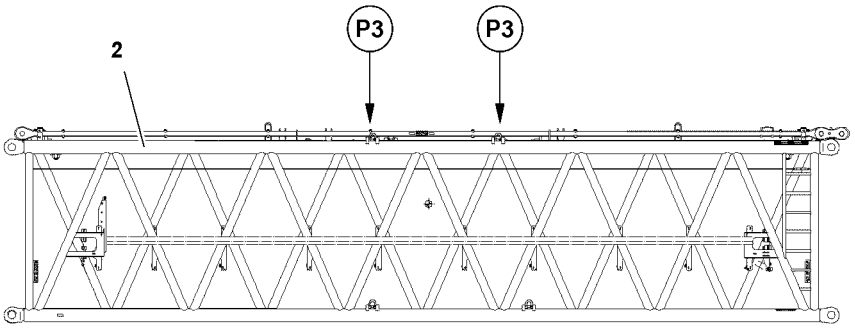

Fig.122783: Fastening points D-intermediate section 2825.20 12 m

Fastening points	
P3	D-intermediate section 2825.20 12 m

2.3 Fastening points D-intermediate section 2825.25 6 m

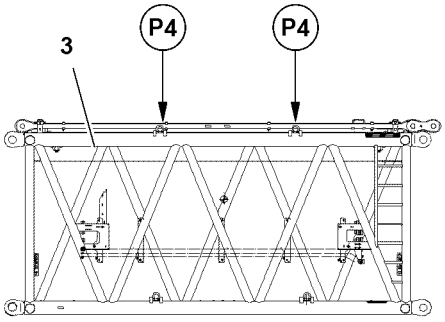

Fig.122784: Fastening points D-intermediate section 2825.25 6 m

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Fastening points	
P4	D-intermediate section 2825.25 6 m

2.4 Fastening points D-end section

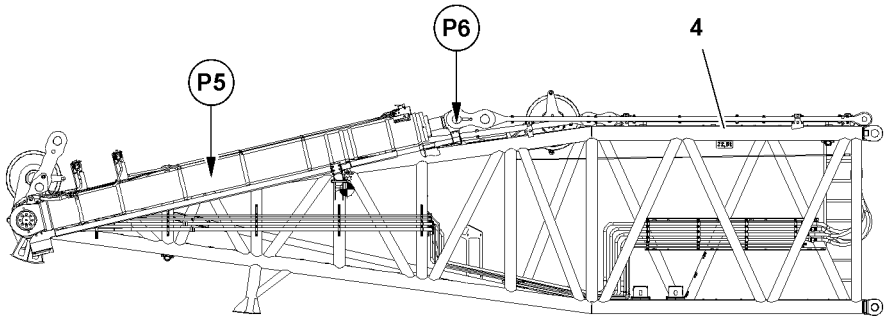

Fig.122785: Fastening points D-end section

Fastening points	
P5 and P6	D-end section

2.5 Fastening points S-luffing pulley block

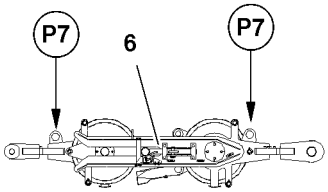

Fig.122786: Fastening points S-luffing pulley block

Fastening points	
P7	S-luffing pulley block

2.6 Fastening points Auxiliary weight

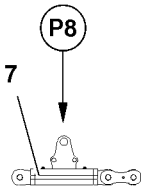

Fig.122787: Fastening points Auxiliary weight

Fastening points	
P8	Auxiliary weight

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Fig.195219

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3 D-boom assembly on the crane

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
If this is not observed, assembly personnel could fall and be killed or seriously injured.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

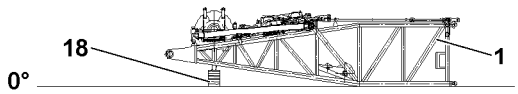

Fig.144113: D-pivot section with substructure

WARNING
Danger of tipping over!
If the D-pivot section is placed on the ground before assembly, then it must be supported accordingly.
If the D-pivot section is not supported, then it can tip forward.
Death, severe bodily injuries, property damage.
- ▶ Only set the D-pivot section **1** down on a proper substructure **18**.

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DANGER
The components can fall down!
If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel.
▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

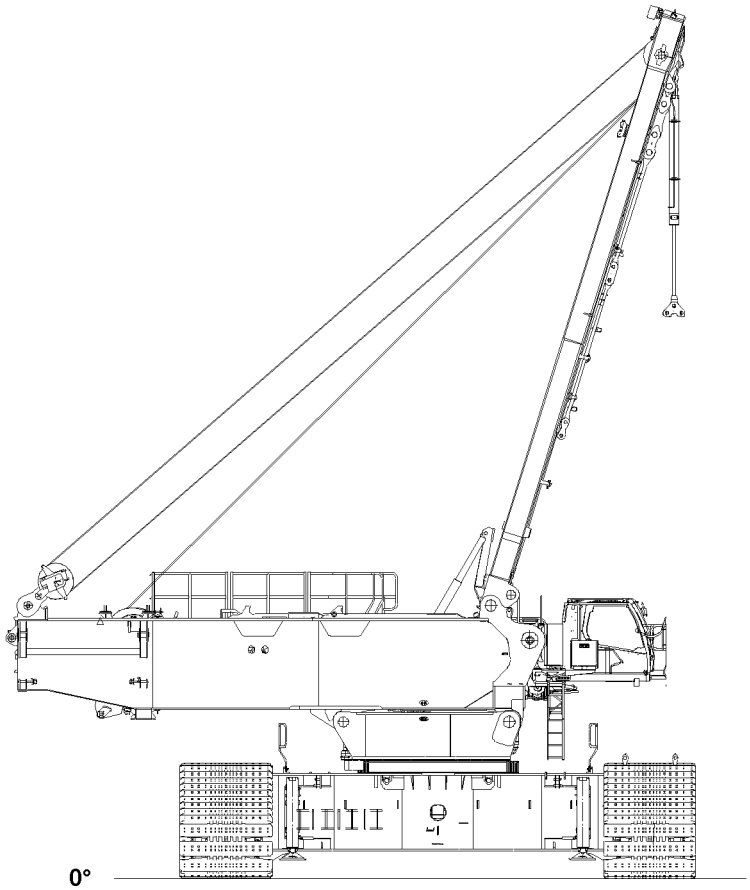

Fig.122720

WARNING
The lattice sections can fall down!
If the lattice sections are not pinned and secured correctly, then they can fall down and fatally injure personnel.
▶ Pin or unpin both pins at the same horizontal level, i.e. **left and right**.
▶ Do not stand under the lattice sections or within the entire danger zone during the pinning and unpinning procedure of the boom.
▶ Safely secure the pins in the storage locations as well as in the receptacles.
▶ It is prohibited to lean the auxiliary ladder against the component being disassembled.

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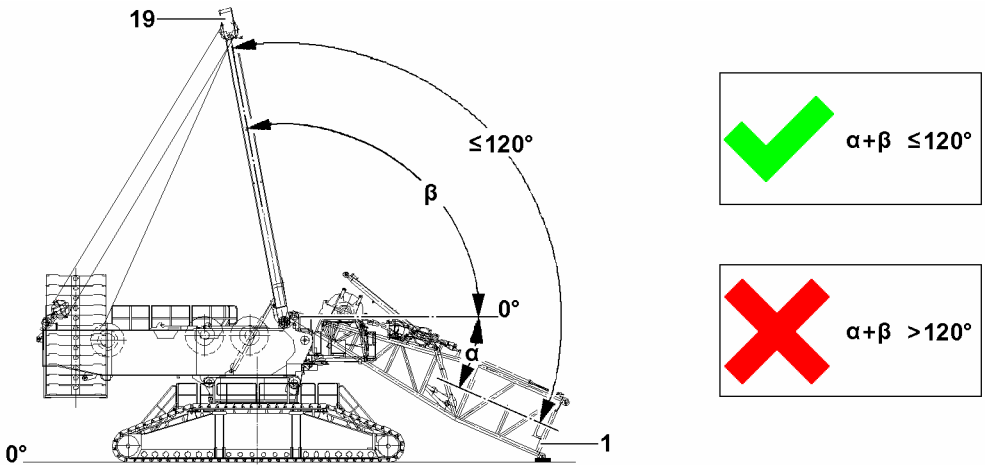

Fig.144110: The difference angle between the D-pivot section and the SA-frame may not exceed 120°

NOTICE
Damage of derrick boom and SA-frame!
Upon assembly / disassembly, if a difference angle between the D-pivot section **1** and the SA-frame **19** of 120° is exceeded, this can cause damage.
▶ Make sure that an angle of more than 120° is never reached between the SA-frame **19** and the D-pivot section **1**.

NOTICE
Damage of derrick boom and SA-frame!
If the SA-frame is pulled by winch 4 (intake gear) to the rear in direction of the turntable, then the derrick boom and the SA-frame can be severely damaged.
Expensive and extensive repairs can result.
▶ As long as the guying between the SA-frame and the assembled D-pivot section or between the SA-frame and the assembled D-boom is **not** assembled and guyed, do not pull the SA-frame to the rear in direction of the turntable.

Note
▶ The assembly and disassembly of the derrick boom with 36 m corresponds to the assembly and disassembly of the derrick boom with 42 m , but without the derrick auxiliary guying.
▶ The assembly and disassembly of the derrick boom is described based on the example of the derrick boom with 42 m.

Make sure that the following prerequisites are met:
– The crane is horizontally aligned.
– An auxiliary crane is available.
– An assembly scaffolding / work platform is available.
– The required counterweight is installed, see the Crane operating instructions, chapter 3.06.
– The target set up configuration (completely erected crane) is set in the set up program.
– No main boom is assembled on the turntable.
– The assembly cylinder on the SA-frame is pinned and secured in the transport position.

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3.1 Turning the turntable into the assembly position

DANGER
The crane can topple over!
If the following conditions are not met before turning the turntable - **without** installed D-boom, the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ Observe the specifications in the erection and take-down charts.
- ▶ Observe the assembly conditions for operation on crawlers, see Crane operating instructions, chapter 3.06.

▶ Turn the turntable in lengthwise direction of the crawler travel gear.

3.2 Exceeding the shut off limits of the LICCON overload protection for assembly operation

WARNING
Danger of accident due to function „Exceeding the shut-off limits of the LICCON overload protection“.
If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload.
Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ is only permissible in emergencies and for assembly purposes.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ may only be actuated by persons who know the effects of their actions regarding the function „Exceeding the shut off limits of the LICCON overload protection“.
- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ requires the presence of an authorized person and must be performed with utmost caution.
- ▶ Crane operation with activated function „Exceedance of shut off limits of the LICCON overload protection“ is prohibited.

▶ Exceeding the shut off limits of the LICCON overload protection: Engage assembly operation.

Result:

– The shut off limits of the LICCON overload protection are exceeded.
– The assembly icon appears on the LICCON monitor.

Note
▶ See the Crane operating instructions, chapter 4.02 and chapter 4.20.

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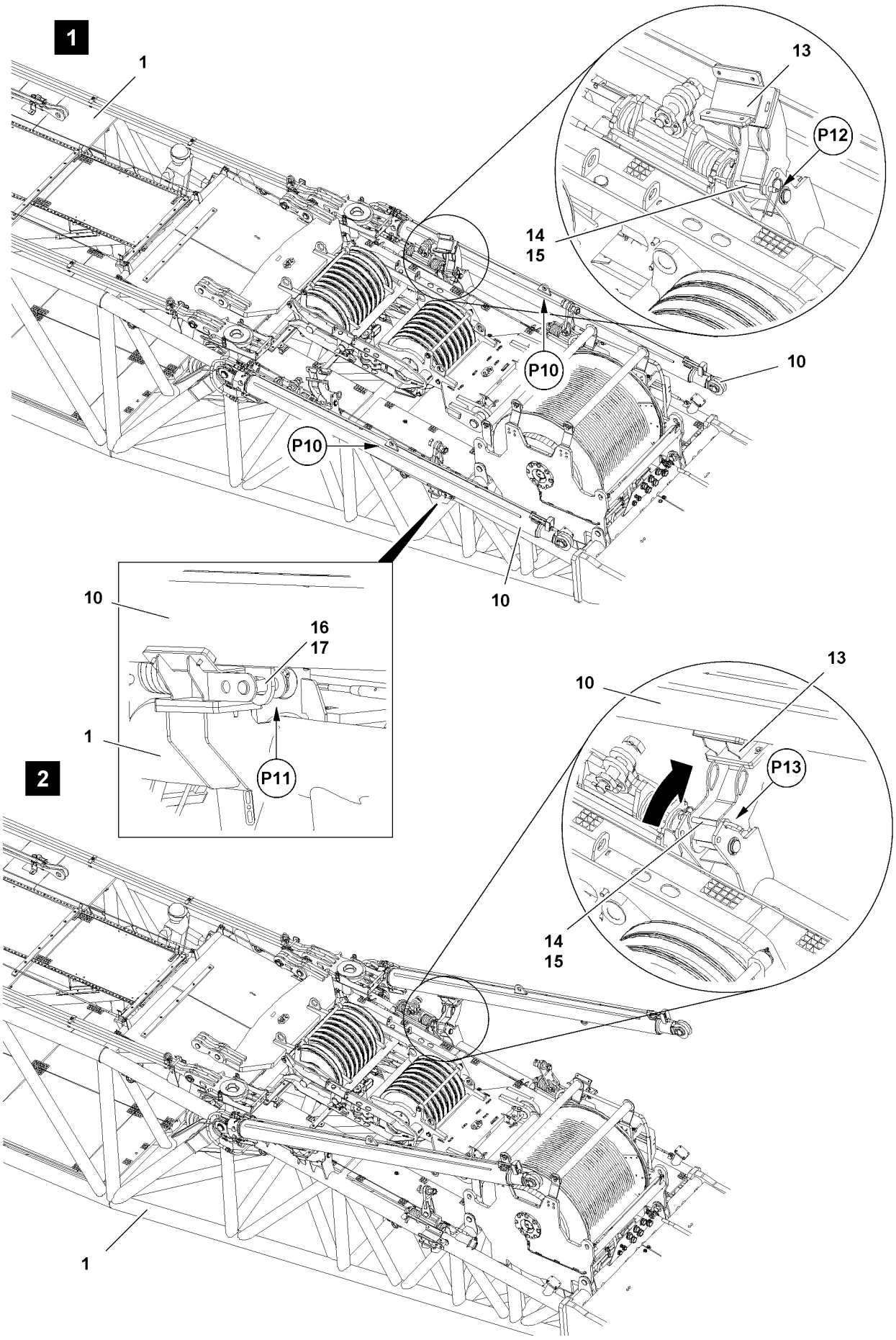

Fig.116967

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3.3 Installing the D-boom in sections

3.3.1 Erecting the D-relapse cylinder

▶ Remove the safety locking pin **17** at point **P11** and unpin the pin **16**, see illustration **1**.

Result:

– The D-relapse cylinder **10** is released.

▶ Fasten the D-relapse cylinder **10** to the auxiliary crane at point **P10**, see illustration **1**.
▶ Lift the D-relapse cylinder **10** with the auxiliary crane.
▶ Insert the pin **16** again at point **P11** and secure with the safety locking pin **17**.
▶ Remove the spring retainer **15** at point **P12** and unpin the grip pin **14**, see illustration **1**.

Result:

– The support **13** is released.

WARNING
Danger of crushed limbs!
When swinging the support **13**, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Swing the support **13** up to the stop.
▶ Insert the grip pin **14** at point **P13** and secure with the spring retainer **15**, see illustration **2**.

Result:

– The support **13** is secured in operating position.

WARNING
Danger of crushed limbs!
When placing the D-relapse cylinder **10** down, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Place the D-relapse cylinder **10** with the auxiliary crane on the support **13**.
▶ Remove the fastening equipment at point **P10**.
▶ Swing the second support into operating position.

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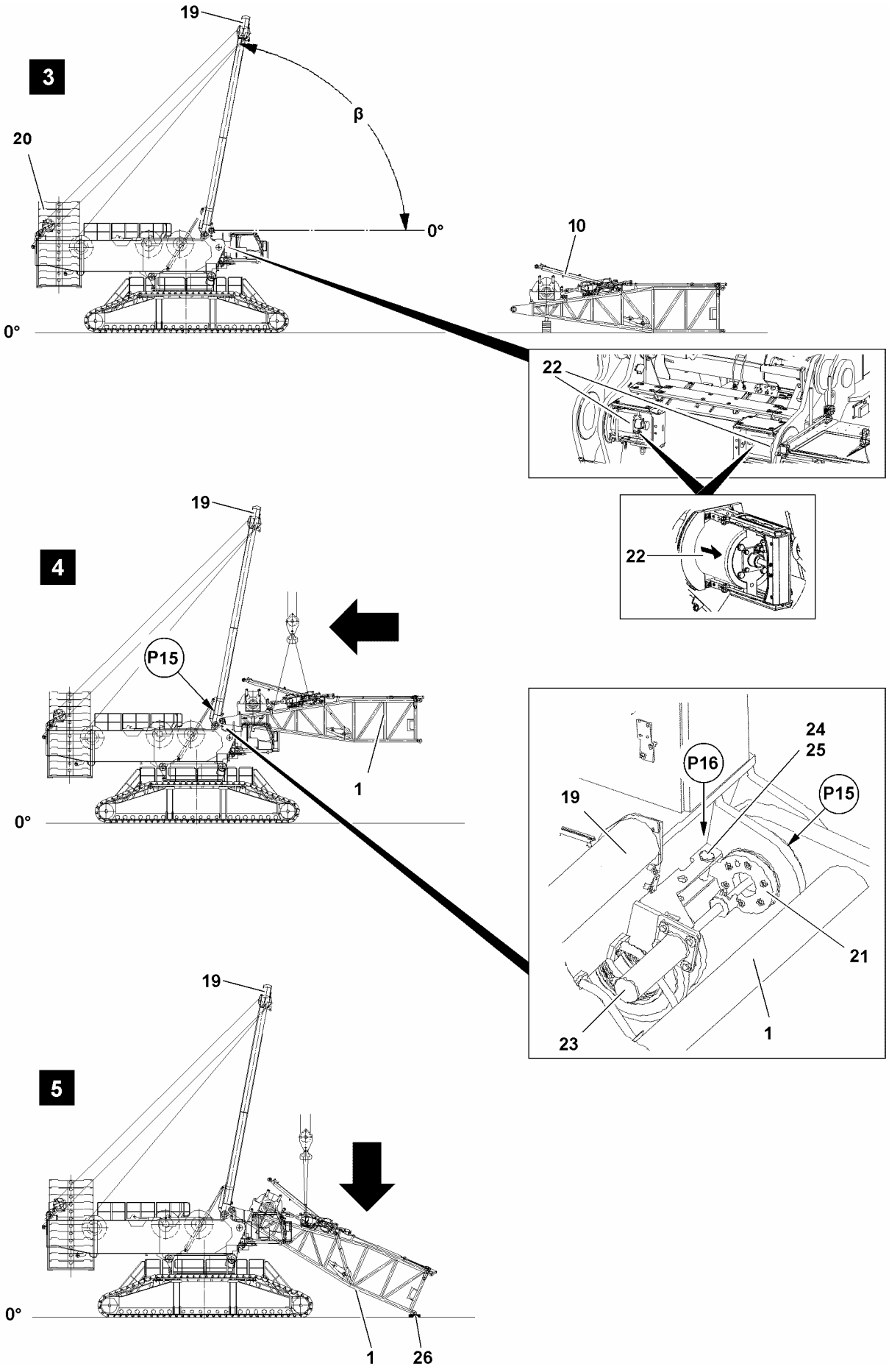

Fig.144114

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3.3.2 Pinning the D-pivot section on the SA-frame

DANGER
Danger of fatal injury due falling components!
If the pin connections are not visually inspected, the pins can loosen up by themselves and cause components to fall down.
Death, severe bodily injuries, property damage.
▶ All pins must be secured after assembly with the intended safety elements. Check visually.
▶ The guy rods must be inspected regularly, see the Crane operating instructions, chapter 8.15.

NOTICE
Danger of property damage!
If the SA-frame **19** with an installed and unguyed D-pivot section **1** is erected further than 90° (angle **β**), components can be seriously damaged.
▶ Do not erect the SA-frame **19** with an installed and unguyed D-pivot section **1** too far.

Make sure that the following prerequisites are met:
– The SA-frame **19** is erected to approx. 80° (angle **β**), see illustration **3**
– The D-relapse cylinders **10** are erected, see illustration **3**.
– The connector pins **22** on the S-pivot section are completely unpinned, see illustration **3**.
– The required counterweight **20** is installed, see the Crane operating instructions, chapter 3.06.
– The crane engine is running.

Note
▶ Fastening points, see section „Fastening points for derrick components“.

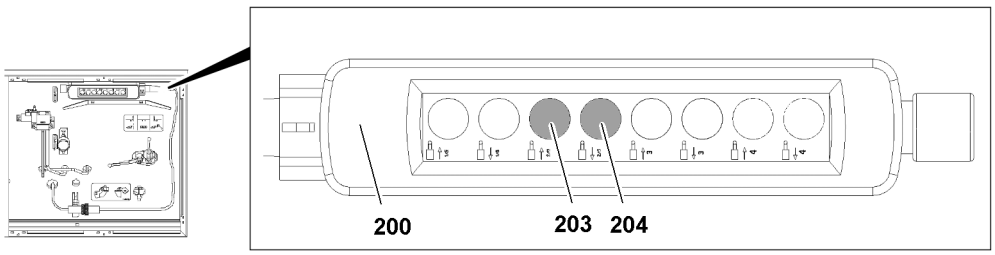

Fig.123563: Control panel

When the connector pins **21** for the D-pivot section **1** are pinned:
▶ Unpin the connector pins **21** on both sides: Press the button **204** on the control panel **200** and „hold it down“ until the connector pins **21** are completely unpinned.
▶ Fasten the D-pivot section **1** to the auxiliary crane and swing in to the pin points **P15** on the SA-frame **19**, see illustration **4**.

WARNING
Falling D-pivot section!
Due to non-secured or insufficiently secured connector pins, the D-pivot section can fall down.
Death, severe bodily injuries, property damage.
▶ The connector pins **21** must be secured after the pinning procedure on the SA-frame with the retaining pins **24**.

▶ Insert the connector pins **21** on both sides: Press the button **203** on the control panel **200** and „hold it down“ until the connector pins **21** are completely pinned, see illustration **4**.

When the connector pins **21** are completely pinned on both sides:
▶ Secure the connector pins **21** with retaining pins **24**.
▶ Insert the retaining pin **24** at point **P16** to the stop and secure with the spring retainer **25** see illustration **4**.

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NOTICE
Incorrect take-down of the D-pivot section!
Property damage can occur by incorrectly taking down the assembled D-pivot section **1**.
▶ Make sure that the D-pivot section is not placed down below the alignment level.
▶ When taking the D-pivot section down, always use a sufficiently load bearing and large enough substructure.

Note
D-pivot section substructure
If the SA-frame **19** is adjusted, also the pinned D-pivot section **1** is adjusted.
▶ Support the D-pivot section **1** so that when adjusting the SA-frame **19**, the D-pivot section **1** does not slide away from the substructure.

NOTICE
Danger of property damage!
If the pins of the S-boom are in the **pinned** position when taking the D-pivot section **1** down in the turntable, components can be severely damaged.
▶ Make sure that the pins **22** on the turntable are in **unpinned** position when taking down the D-pin **1**.

▶ Take down the D-pivot section **1** carefully with the auxiliary crane on the substructure **26**, see illustration **5**.
▶ Remove the auxiliary crane.

3.3.3 Establishing the hydraulic connections to the D-pivot section

The hydraulic connections are made with quick couplings.

NOTICE
Danger of property damage!
If the hydraulic lines are not connected with the turntable before lowering the SA-frame **19** to the front, then they will be crushed when lowering the SA-frame.
▶ Make sure, before lowering the SA-frame **19** to the front, that the hydraulic lines are connected with the turntable.

When connecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

WARNING
Pressure in the hydraulic lines!
If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.
Death, severe bodily injuries, property damage.
▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

WARNING
Loss of pressure or leakage!
Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.
▶ Check that the quick couplings have been properly connected before using the crane.

▶ Connect the coupling components (sleeve and connector) and screw together with the knurled nut.
▶ Tighten the hydraulic coupling by hand. Rotate the knurled nut until it reaches a tangible, fixed stop position.
▶ Establish the hydraulic connections, see Hydraulic diagram.

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3.3.4 Establishing the electrical connections to the D-pivot section

NOTICE
Danger of damage to the electrical connections!
If the electrical connection between the terminal box and the D-pivot section and the cable drum in the D-pivot section is established before the boom end section is installed and electrically connected, then the electric connection can be damaged.
▶ Make sure that the electric connection between the terminal box in the D-pivot section and the cable drum in the D-pivot section is only established **after** assembly and the connection of the electric wiring for the boom end section.

Note
▶ To establish the electrical connections on the D-pivot section: Use the Electric wiring diagram.

Make sure that the following prerequisite is met:
– The D-pivot section is completely assembled and placed on the substructure

▶ Establish the electrical connections.
▶ Make sure that all electrical connections to the D-pivot section have been established.

WARNING
Malfunction if dummy plugs are not installed!
If the dummy plugs on the non-required electrical connections are not installed, then malfunctions or functional limitations can occur on the crane.
▶ Make sure that all non-required electrical connections that have a dummy plug are closed off with dummy plugs.
▶ Pay attention to the Electrical wiring diagram.

▶ As a rule, close off on-required electrical connections (for example for accessories which cannot be installed) with the respective dummy plugs.

NOTICE
Property damage due to dirt and / or corrosion!
If non-required electrical connections are not closed off with the respective protective caps, then dirt and / or corrosion can damage the electrical connections.
This could result in malfunctions.
▶ Make sure that all non-required electrical connections are always closed off properly.
▶ Pay attention to the Electrical wiring diagram.

▶ Close electrical connections, which have no dummy plugs, properly off with the corresponding protective caps.

3.3.5 Lowering the SA-frame

Make sure that the following prerequisite is met:
– The hydraulic connections to the D-pivot section are established.

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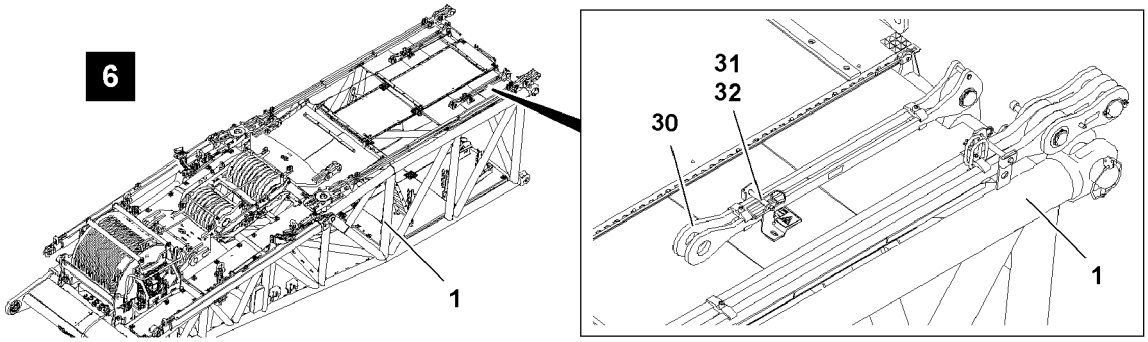

Fig.144116: Rods for flying assembly

▶ Release the rods for flying assembly **30**: Remove the spring retainer **32** and unpin the pin **31**, see illustration **6**.

7

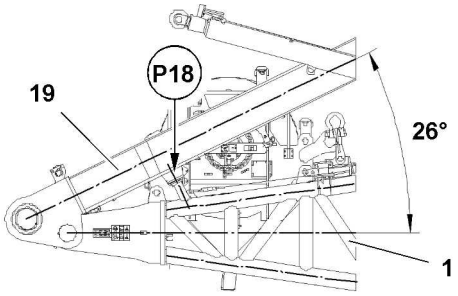

Fig.144117: SA-frame on stop D-pivot section

NOTICE
Danger of slack rope formation!
At an angle of 26° between the SA-frame and the D-pivot section, the SA-frame **19** touches at point **P18** on the stop of the D-pivot section **1**, see illustration **7**.
This block position is not monitored with control technology. If winch 4 is spooled out further in this situation, slack rope may form.
▶ Make sure that winch 4 is not spooled out any further when the block position is reached.

8

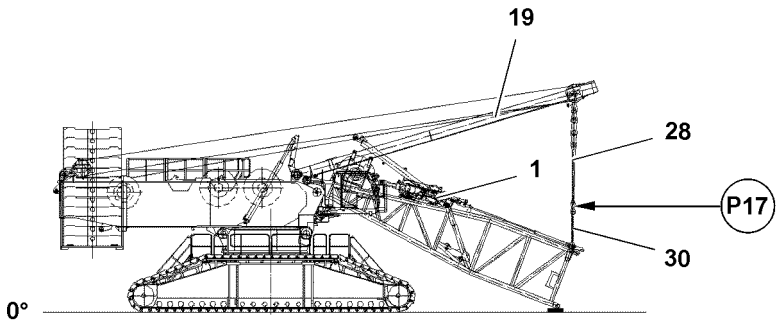

Fig.144115: SA-frame on stop D-pivot section

▶ Lower the SA-frame **19** to the front: Spool out winch 4.
▶ Connect the guy rods **28** of the SA-frame **19** with the rods for flying assembly **30** in point **P17**, see illustration **8**. Insert the pin and secure with the locking pin.
▶ Erecting the SA-frame: Spool winch 4 up until the guy rods are tensioned.

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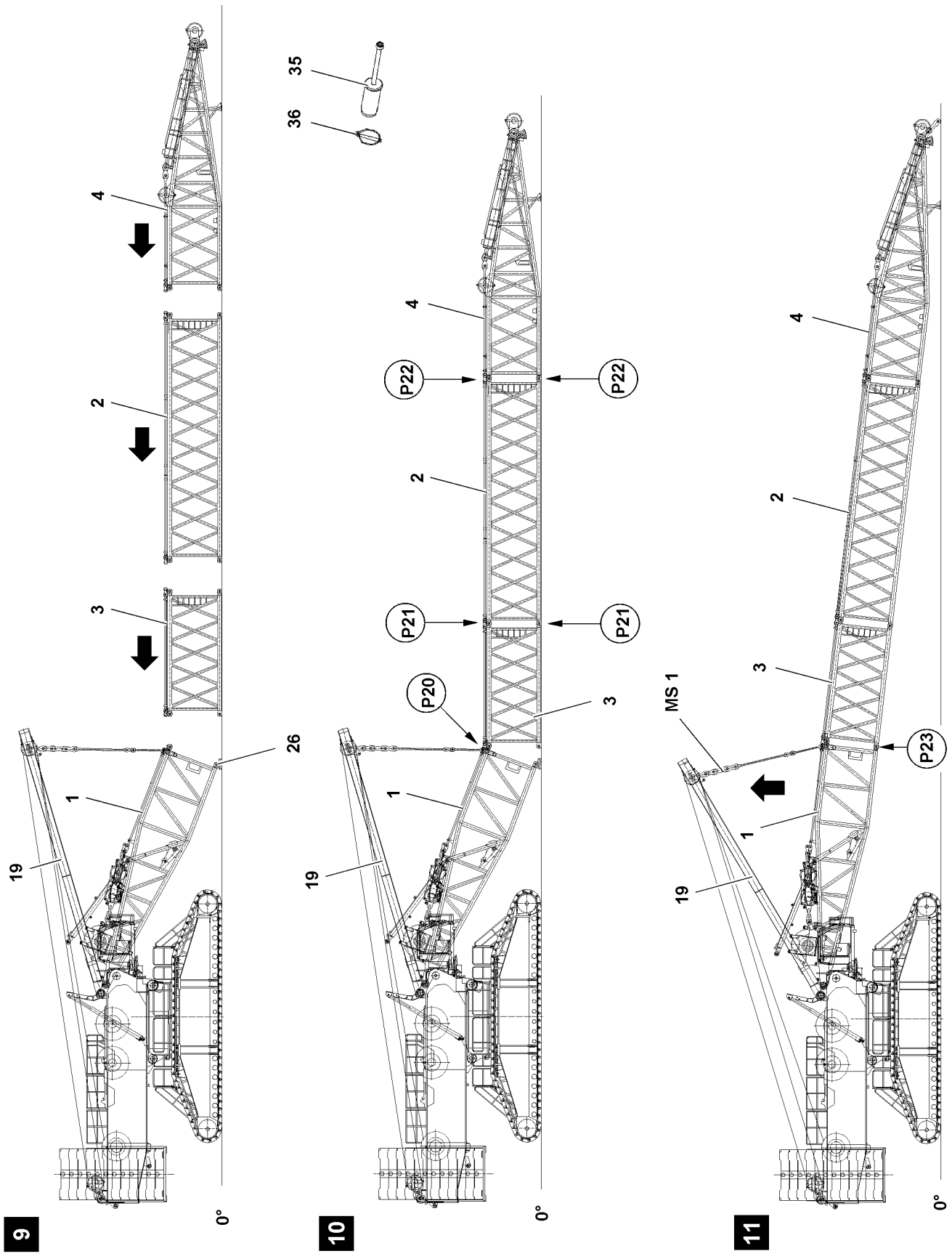

Fig.116979

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3.3.6 Assembling the D-lattice sections

Make sure that the following prerequisites are met:
- The D-pivot section is pinned and secured on the SA-frame.
- The D-pivot section is placed on the substructure **26**, see illustration **9**

Note
- ▶ Always support the D-lattice sections sufficiently for easier assembly.
- ▶ Pin and unpin the D-lattice sections with the pin pulling device, see Crane operating instructions, chapter 5.30.

Note
- ▶ Fastening points, see section „Fastening points for derrick components“.

Pin the D-intermediate section **3** on the D-pivot section **1** at point **P20** on top.

▶ Hang the D-intermediate section **3** on the auxiliary crane and align on the D-pivot section **1**.

When the pin bores on the D-pivot section **1** and on the D-intermediate section **3** align at point **P20**:
▶ Insert the pin **35** at point **P20** and secure with the locking pin **36**, see illustration **10**.
▶ Hang the D-intermediate section **2** on the auxiliary crane and align on the D-intermediate section **3**.

When the pin bores on the D-intermediate section **2** and on the D-intermediate section **3** align at points **P21**:
▶ Insert the pin **35** at the points **P21** on top and bottom and secure with locking pin **36**, see illustration **10**.
▶ Attach the D-end section **4** to the auxiliary crane and align with the D-intermediate section **2**.

When the pin bores on the D-intermediate section **2** and on the D-end section **4** align at points **P22**:
▶ Insert the pin **35** at the points **P22** on top and bottom and secure with locking pin **36**, see illustration **10**.

3.3.7 „Closing“ the D-boom

Make sure that the following prerequisites are met:
- The transport retainers for the guy rods on the SA-frame are released.
- The D-lattice sections are pinned and secured.
- The guy rods of the SA-frame are connected with the rods for flying assembly on the D-pivot section.

WARNING
Danger of accident!
▶ The maximum permissible total force on test point MS1 of 45 t may not be exceeded.

Erect the SA-frame **19** until the pin bores on the D-pivot section **1** and on the D-intermediate section **3** „on the bottom“ align at point **23**, see illustration **11**:
▶ Insert the pin **35** on both sides at point **P23** and secure with the locking pin **36**.

3.3.8 Establishing the hydraulic connections on the D-boom

The hydraulic connections are made with quick couplings.

Make sure that the following prerequisite is met:
- The D-lattice sections are pinned and secured.

When connecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

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WARNING
Pressure in the hydraulic lines!
If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.
Death, severe bodily injuries, property damage.
▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

WARNING
Loss of pressure or leakage!
Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.
▶ Check that the quick couplings have been properly connected before using the crane.

▶ Connect the coupling components (sleeve and connector) and screw together with the knurled nut.
▶ Tighten the hydraulic coupling by hand. Rotate the knurled nut until it reaches a tangible, fixed stop position.
▶ Establish the hydraulic connections, see Hydraulic diagram.

3.3.9 Establishing the electrical connections on the D-boom

Note
▶ To establish the electrical connections on the D-boom: Use the Electric wiring diagram.

▶ Establish the electrical connections.

3.3.10 Setting the ball valve on the pull cylinder to the „crane operation“ position

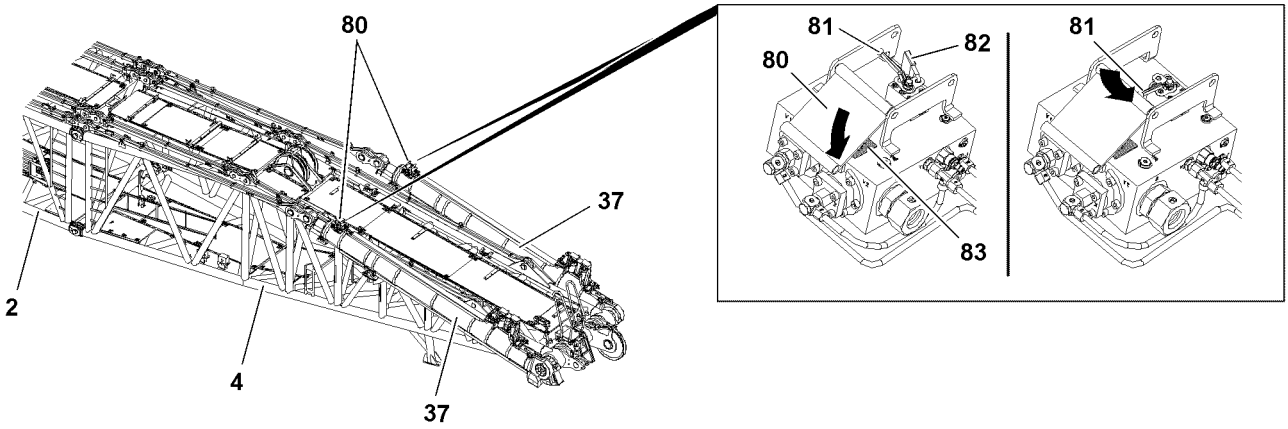

*Fig.122780: Ball valve **81** on the pull cylinder **37***

WARNING
Ball valve open!
When the ball valve is open in crane operation with derrick ballast, then the derrick ballast can lower itself uncontrolled.
The crane can topple over.
Death, severe bodily injuries, property damage.
▶ Make sure that the ball valve **81**, before starting crane operation, is in the „crane operation“ position.

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Note

▶ The following tasks must be carried out on both pull cylinders.

The ball valve **81** is located under the flap **80** on the pull cylinder **37**.

▶ Open the flap **80**.
▶ Remove the safety lock **82**.
▶ Change the ball valve **81** to the „crane operation“ position, see sign **83**.

When the ball valve **81** is in the „crane operation“ position:

▶ Attach the safety lock **82** and secure the ball valve **81** to prevent it from turning.
▶ Close the flap **80** and secure it properly.

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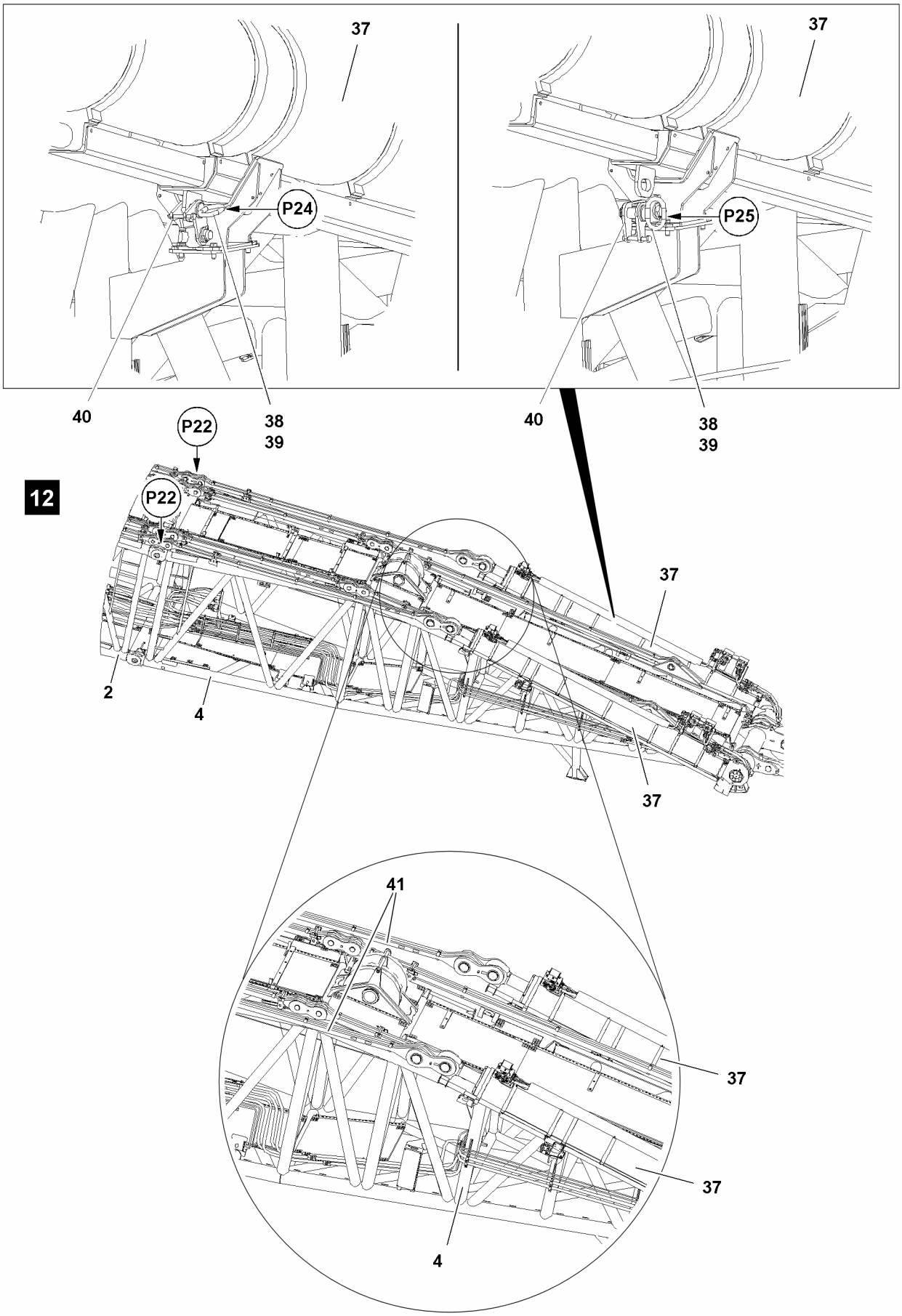

Fig.144118

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3.3.11 Releasing the pull cylinder

Both pull cylinders **37** of the D-end section **4** must be released, see illustration **12**.

▶ Remove the safety locking pin **39** at point **P24** and unpin the grip pin **38**.

Result:

– The pull cylinder **37** is released.

▶ Swing the retainer **40** downward.
▶ Secure the retainer **40**: Insert the grip pin **38** at point **P25** and secure with the safety locking pin **39**, see illustration **12**.

3.3.12 Extending the pull cylinder

To be able to unpin the guy rods **41**, the pull cylinders **37** must be extended, see illustration **12**.

Note
▶ Extend the pull cylinder (radio remote control*), see the radio remote control* operating instructions.
▶ Extend the pull cylinder (crane cab), see the Crane operating instructions, chapter 4.01.

▶ Extend the pull cylinder **37** (150-200 mm), until the guy rods of the D-end section **4** align with the guy rods of the D-intermediate section **2** on the upper points **P22**.

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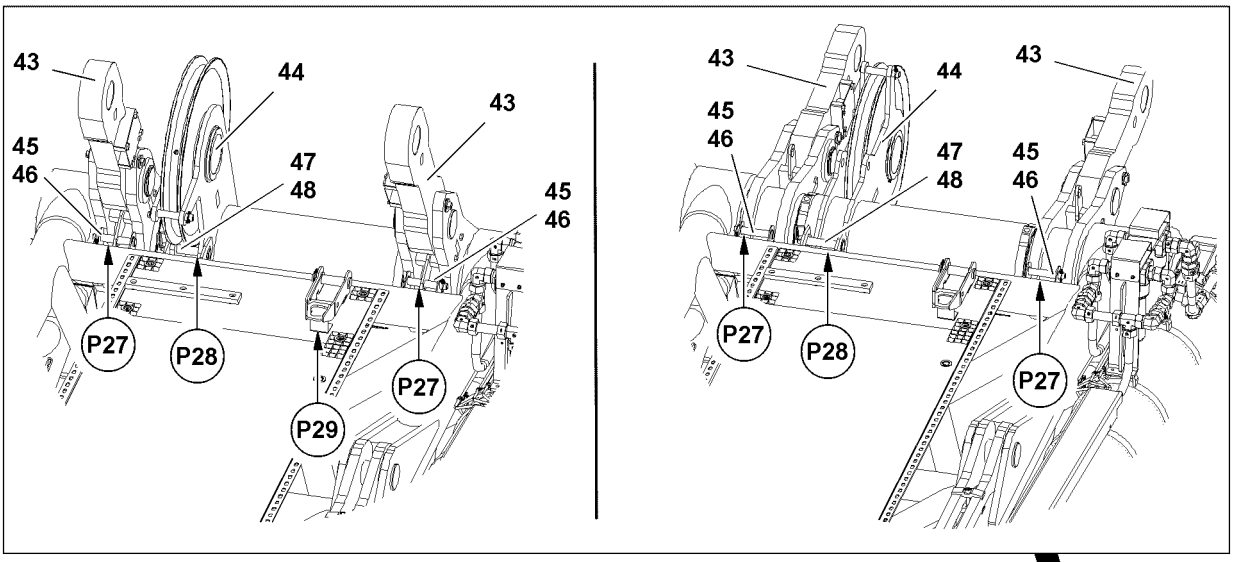

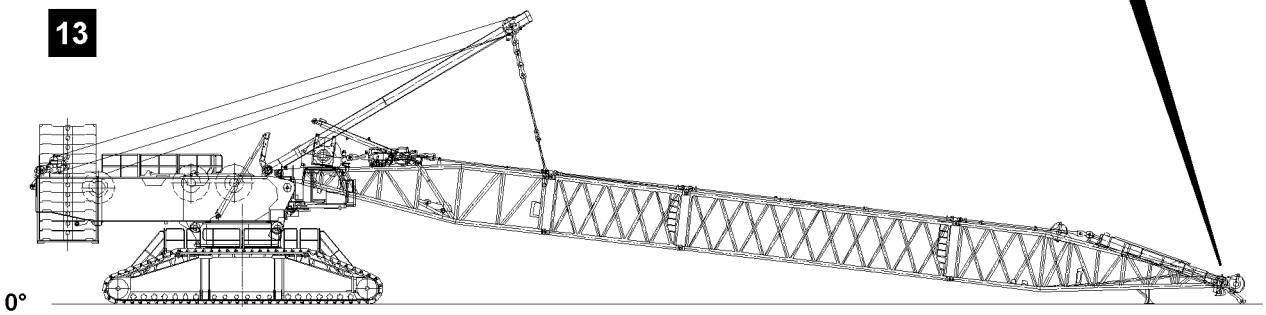

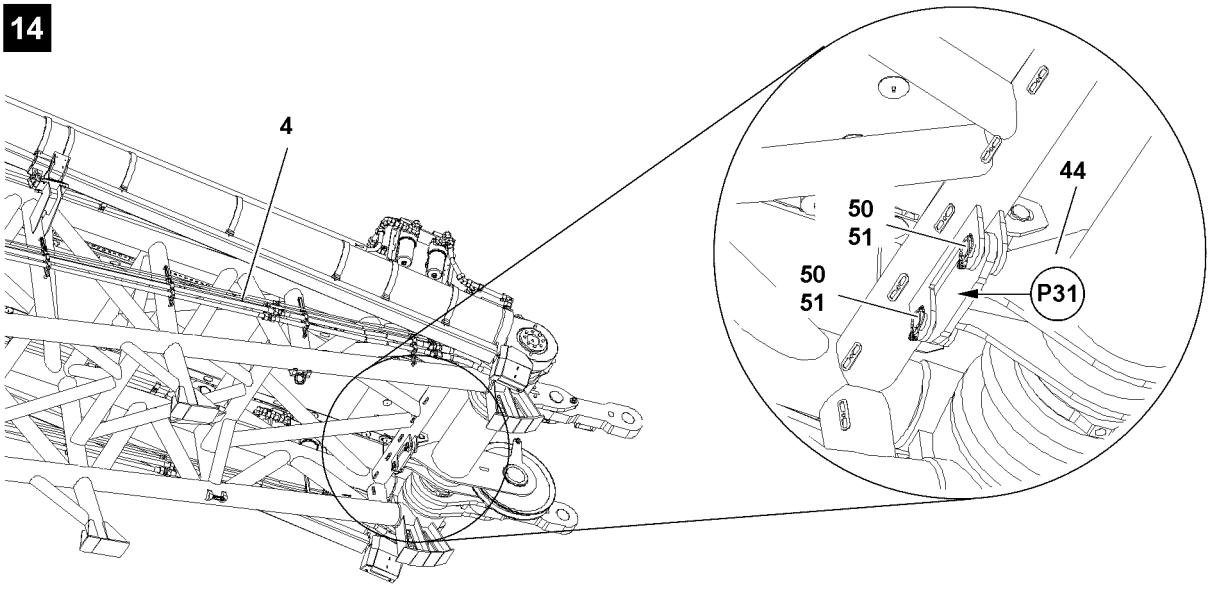

Fig.116969

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3.3.13 Bringing the pull test brackets into operating position

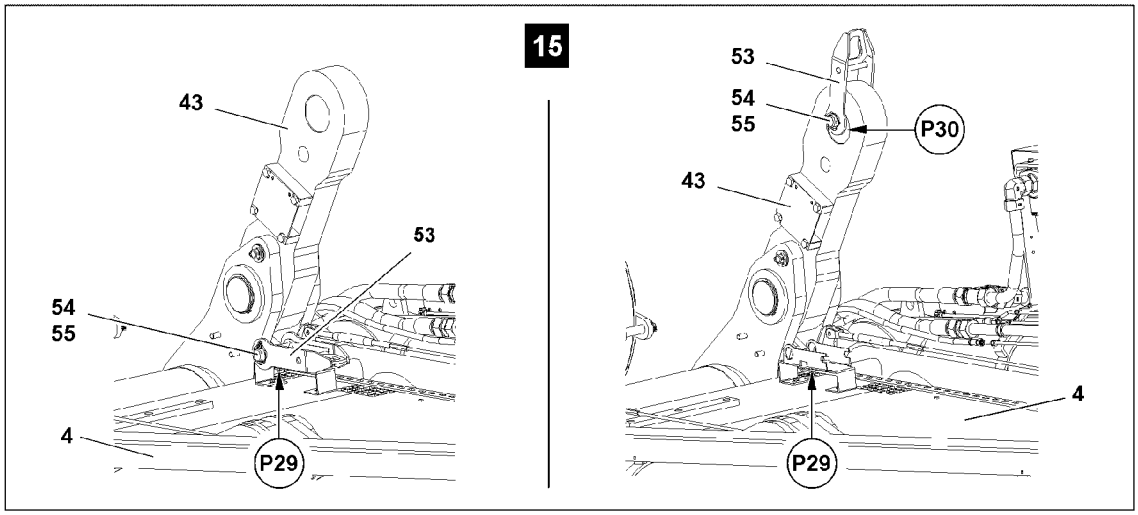

Fig.116970: Swinging the auxiliary bracket

- ▶ Remove the safety locking pin **55** at point **P29** and unpin the pin **54**, see illustration **13** and illustration **15**.
- ▶ Take the auxiliary bracket **53** from the transport retainer.

NOTICE
Danger of property damage!
- ▶ The pull test bracket **43** may only be fastened to the auxiliary crane via the auxiliary bracket **53**.

- ▶ Connect the auxiliary bracket **53** with the pull test bracket **43**: Insert the pin **54** at point **P30** and secure with the safety locking pin **55**, see illustration **15**.
- ▶ Fasten the auxiliary bracket **53** to the auxiliary crane.

WARNING
Danger of fatal injury due to the pull test bracket!
If the pull test brackets are not secure with an auxiliary crane during the swing procedure, they can swing forward due to their weight.
Death, severe bodily injuries, property damage.
- ▶ Swing the pull test bracket **43** into the operating position only with the aid of an auxiliary crane.
- ▶ Swinging the pull test bracket without an auxiliary crane is **prohibited**.

- ▶ Tension the fastening equipment.
- ▶ Remove the safety locking pin **46** on the transport retainer at point **P29** and unpin the retaining pin **45**.
- ▶ Swing the pull test bracket **43** forward with the auxiliary crane.

When the pull test bracket **43** is swung forward completely:
- ▶ Remove the auxiliary crane.
- ▶ Disconnect the auxiliary bracket **53** from the pull test bracket **43**.
- ▶ Insert the retaining pin **45** again in transport position at point **P27** and secure with the safety locking pin **46**.
- ▶ Swing the second pull test bracket **43** into the operating position.
- ▶ Fasten the auxiliary bracket **53** in transport position at point **P29**.

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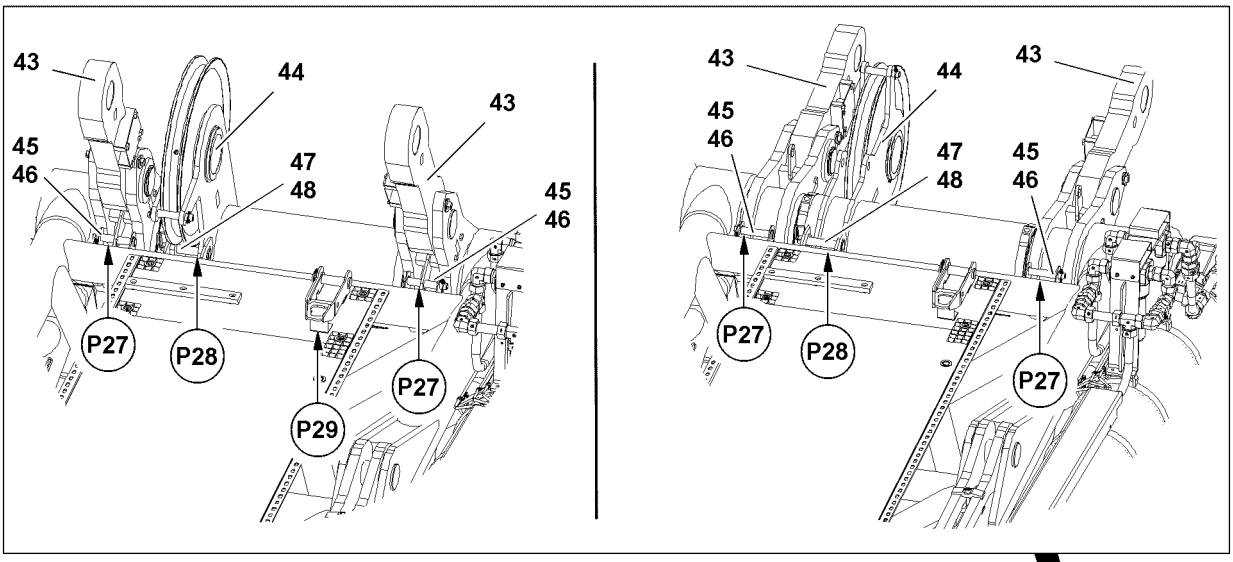

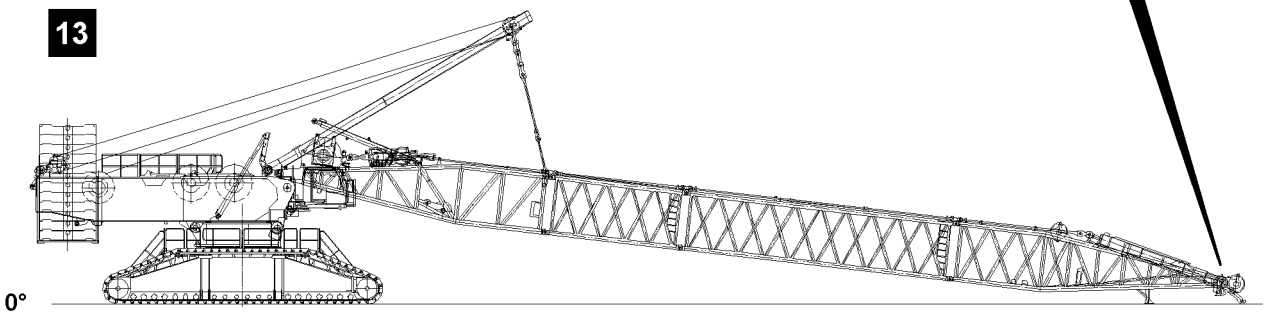

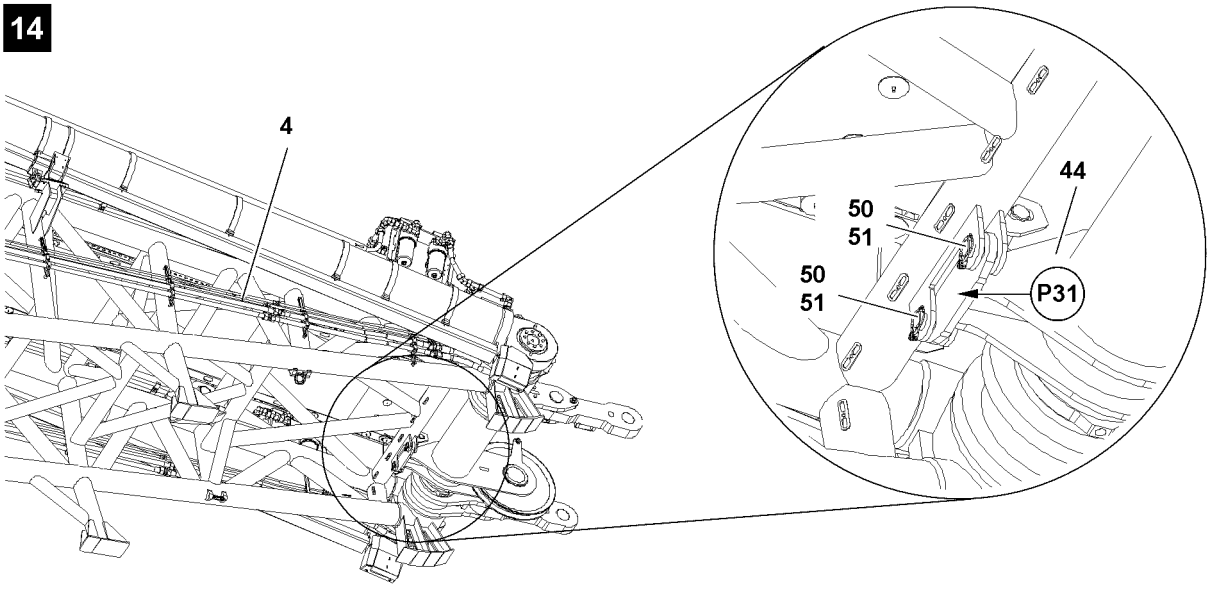

Fig.116969

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3.3.14 Bringing the pulley retainers into the operating position

WARNING
Mortal danger due to pulley retainer!
If the pulley retainer is not secure with an auxiliary crane during the swing procedure, then it can swing forward due to its weight.
Death, severe bodily injuries, property damage.
- ▶ Swing the pulley retainer **44** into operating position only with the aid of an auxiliary crane.
- ▶ Swinging the pulley retainer without an auxiliary crane is **prohibited**.

- ▶ Fasten the pulley retainer **44** to the auxiliary crane.

When the pulley retainer **44** is secured with the auxiliary crane:
- ▶ Tension the fastening equipment.
- ▶ Remove the spring retainer **48** on the transport retainer at point **P28** and unpin the retaining pin **47**, see illustration **13**.
- ▶ Remove the safety locking pin **51** at points **P31** and unpin the pin **50**, see illustration **14**.
- ▶ Swing the pulley retainer **44** forward with the auxiliary crane.

When the pulley retainer is in operating position:
- ▶ Insert the pin **50** in the operating position of the pulley retainer **44** at points **P31** and secure with the safety locking pin.
- ▶ Remove the auxiliary crane.
- ▶ Insert the retaining pin **47** again in transport position at point **P28** and secure with the spring retainer **48**.

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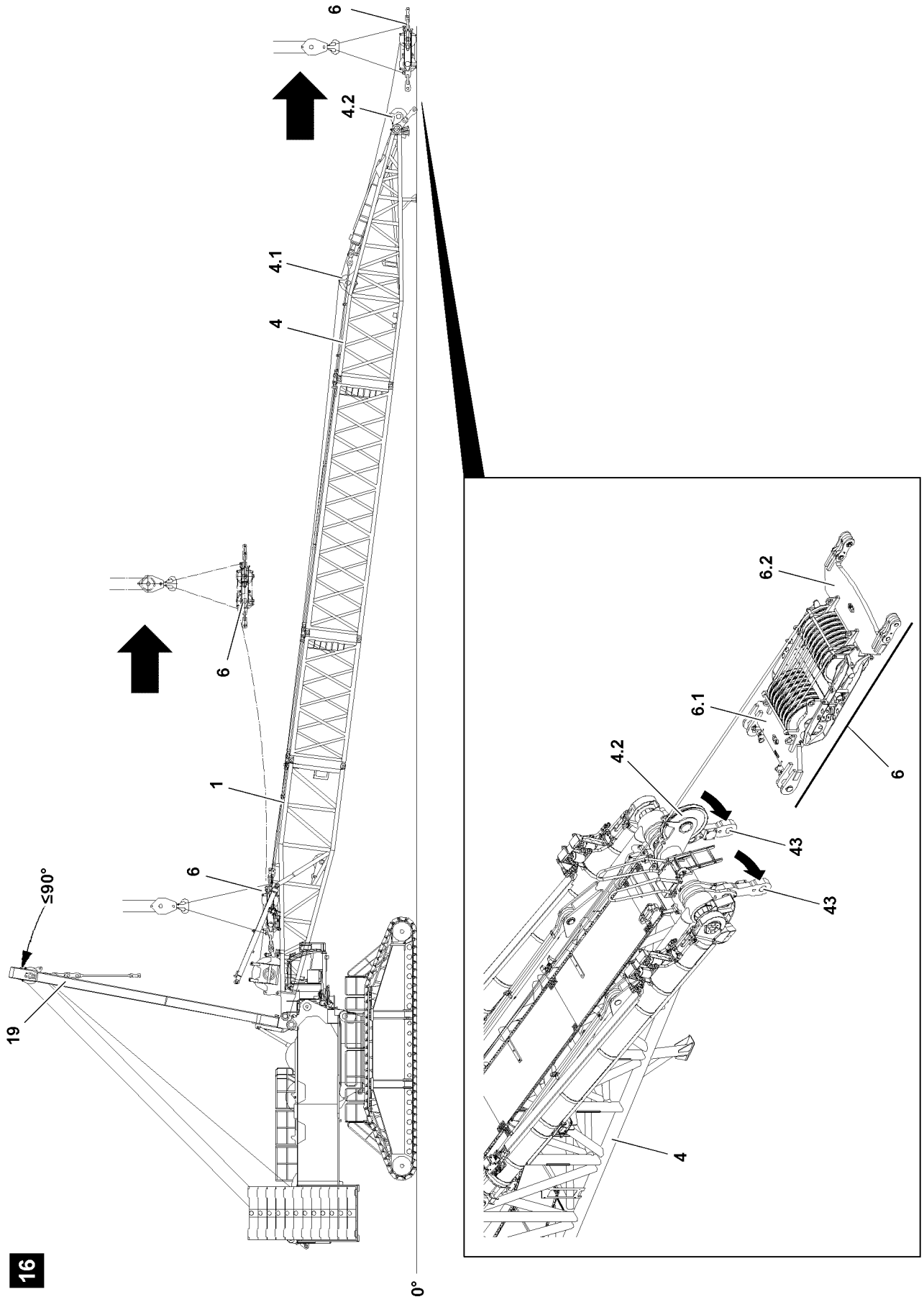

Fig.144119

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3.3.15 Pulling the luffing pulley block to the D-end section and taking it down on the ground

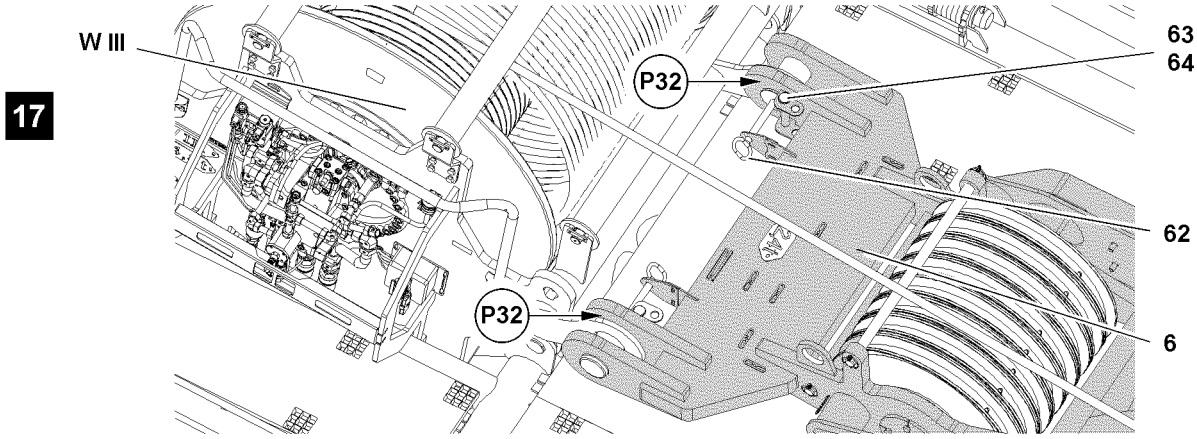

Fig.116971: Unpin the luffing pulley block on winch 3

▶ Disconnect the guy rods of the SA-frame **19** from the rods for flying assembly of the D-pivot section.

NOTICE
Danger of property damage!
If the SA-frame **19** with an installed and unguyed D-pivot section **1** is erected further than 90°, components can be seriously damaged.
▶ Do not erect the SA-frame **19** with an installed and unguyed D-pivot section **1** too far.

▶ Erect the SA-frame maximum to 90°, see illustration **16**.

WARNING
Slipping luffing pulley block!
By unpinning the luffing pulley block **6** on winch 3, the pulley block can start to slip.
Death, severe bodily injuries, property damage.
▶ The luffing pulley block must be secured by an auxiliary crane before unpinning it on winch 3.

Note
▶ Fastening points, see section „Fastening points for derrick components“.

▶ Fasten the luffing pulley block **6** to the auxiliary crane.
▶ Unpin the luffing pulley block **6** on winch 3 at point **P32**: Remove the safety locking pin **64** on both sides and unpin the retaining pin **63** on both sides, see illustration **17**.
▶ Unpin the pins **62** on both sides.

NOTICE
Rope damage!
▶ When spooling winch 3 out, make sure that no slack rope forms.

▶ Pull the luffing pulley block **6** with the auxiliary crane to the D-end section **4** while spooling out winch 3 at the same time, see illustration **16**.
▶ Take down the luffing pulley block **6** with the auxiliary crane in front of the D-end section **4**.
▶ Properly insert and secure the control rope from winch 3 on the rope pulley **4.1** and the rope pulley **4.2**.
▶ Remove the auxiliary crane.

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3.3.16 Releasing the upper pulley block on the lower pulley block

Make sure that the following prerequisites are met:
- The luffing pulley block **6** is laying on the ground or on a load-bearing substructure.
- The auxiliary crane is removed.

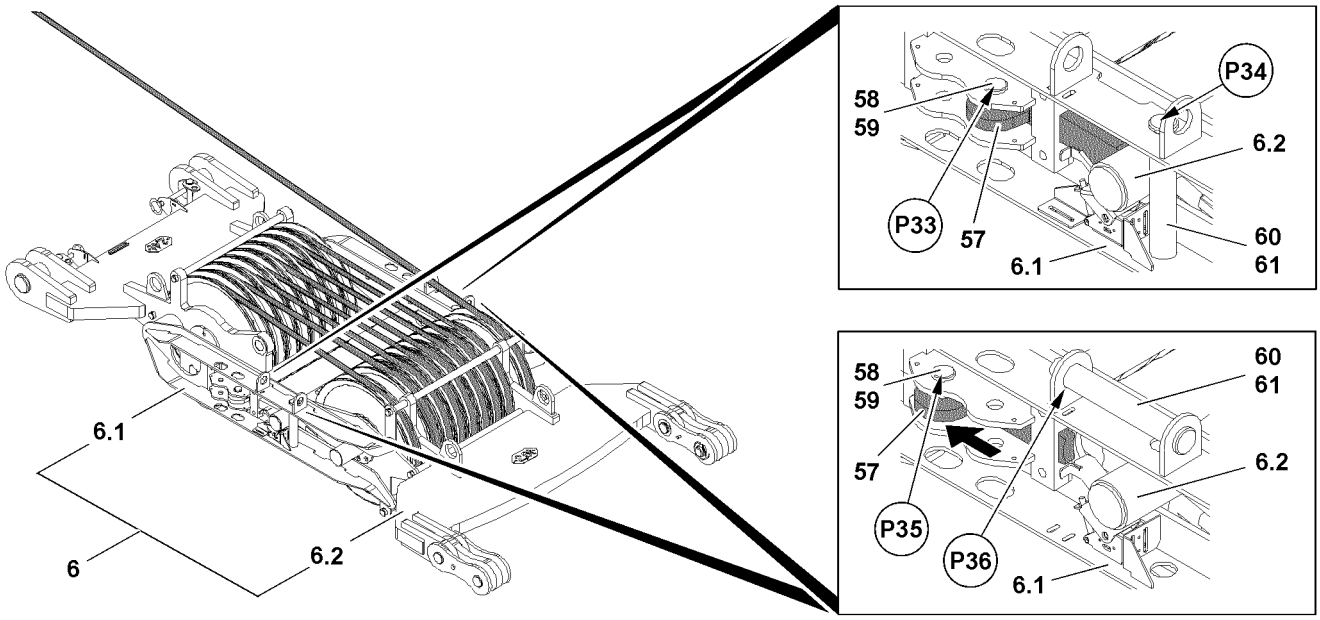

Fig.122964: Releasing the upper pulley block on the lower pulley block

▶ Remove the safety locking pin **59** on both sides at point **P33** and unpin the pin **58**.
▶ Move the latch **57** until it can be pinned at point **P35**.

When the bores align:
▶ Insert the pin **58** at point **P35** and secure with the safety locking pin **59**.
▶ Remove the safety locking pin **61** on both sides at point **P34** and unpin the pin **60**.

Result:

- The transport retainer between the upper pulley block **6.2** and the lower pulley block **6.1** is removed.

When the upper pulley block **6.2** and lower pulley block **6.1** are released:
▶ Insert the pins **60** on both sides in park position at point **P36** and secure with the safety locking pin **61**.

3.3.17 Assembling the D-guy rods

WARNING
Neglected guy rod inspection and maintenance!
If the regular inspection and maintenance of the guy rods is not carried out or is carried out only at irregular intervals, then severe accidents can occur due to existing and unrecognized damage to the guy rods.
Death, severe bodily injuries, property damage.
▶ The guy rods must be checked before every assembly, see Crane operating instructions, chapter 8.15.

Note
▶ The D-guy rods must be assembled and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods.

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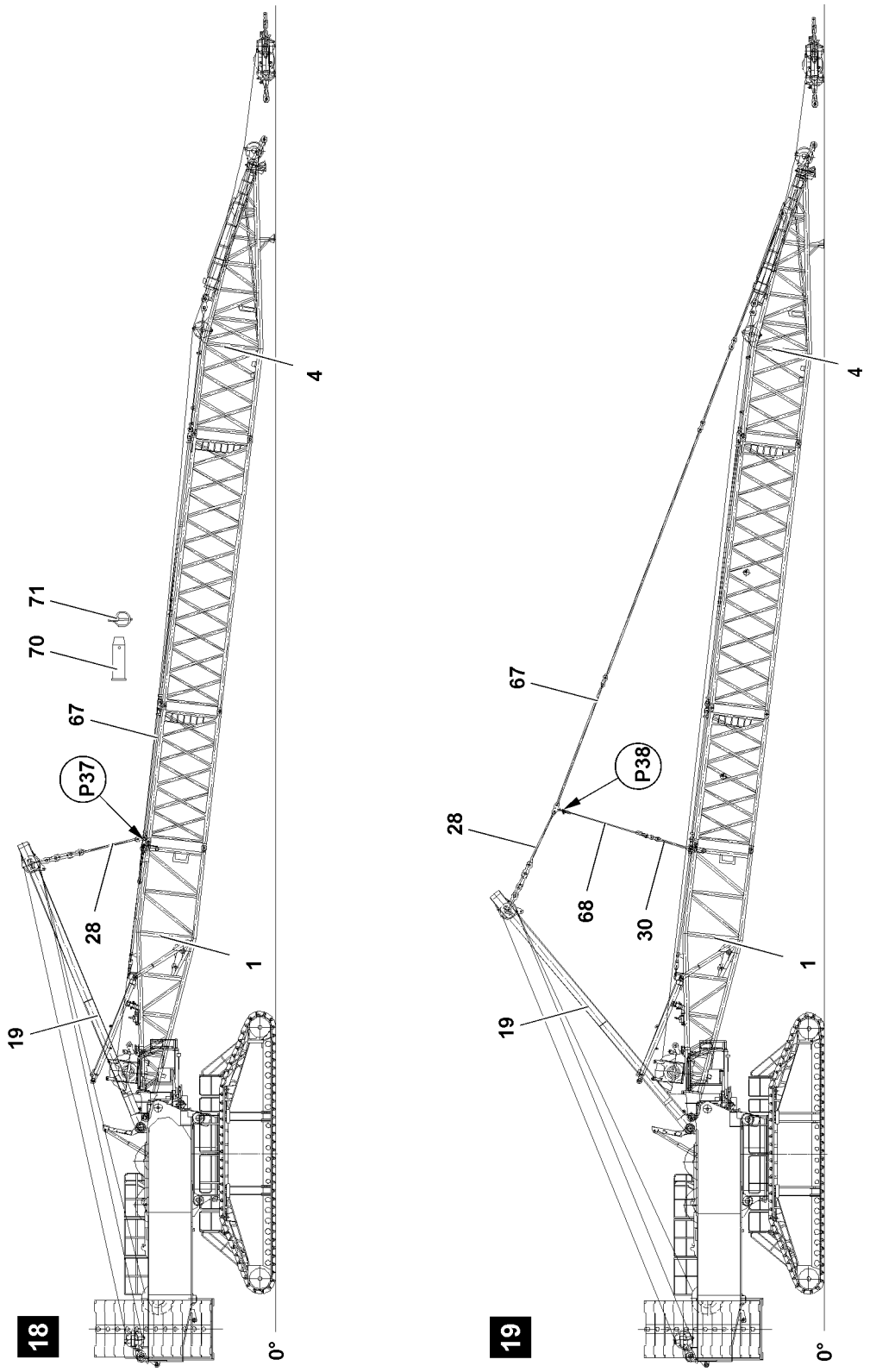

Fig.122967: Assembling the D-guy rods

The D-guy rods are taken down and secured for transport on the D-lattice sections. Before assembly, the transport retainers must be released.

- ▶ Release the transport retainers on the guy rods.
- ▶ Lower the SA-frame to the front.

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DANGER
Danger of accident!
▶ The pins **70** of the Derrick guy rods may only be pinned from the „inside“ to the „outside“.

Pin the guy rods **28** of the SA-frame with the guy rods **67** on the D-pivot section at point **P37**, see illustration **18**.

▶ Insert the pin **70** and secure with the safety locking pin **71**.

Pin the guy rods of the D-intermediate sections with each other.

▶ Insert the pin **70** and secure with the safety locking pin **71**.

Pin the guy rods of the D-intermediate sections with the guy rods on the D-end section.

▶ Insert the pin **70** and secure with the safety locking pin **71**.

Note
▶ The derrick auxiliary guying is only required / possible at a derrick boom length of 42 m.

▶ Pin the rods for flying assembly **30** of the D-pivot section **1** with the guy rope **68**: Insert the pin **70** and secure with the safety locking pin **71**, see illustration **19**.
▶ Connect the auxiliary guying with the D-guying: Insert the pin **70** at point **P38** and secure with the spring retainer **71**, see illustration **19**.

When the guy rods are pinned and secured to each other:
▶ Actuate winch 4 until the guy rods are tensioned between the SA-frame and the D-end section.

DANGER
General danger note!
If the following conditions are not met before erecting the D-boom, the hoist rope can fall down due to its own weight.
Death, severe bodily injuries, property damage.
▶ Enough hoist rope must be guided over the rope pulleys so that the hoist rope is **not** pulled back and falls down when erecting the D-boom.

21

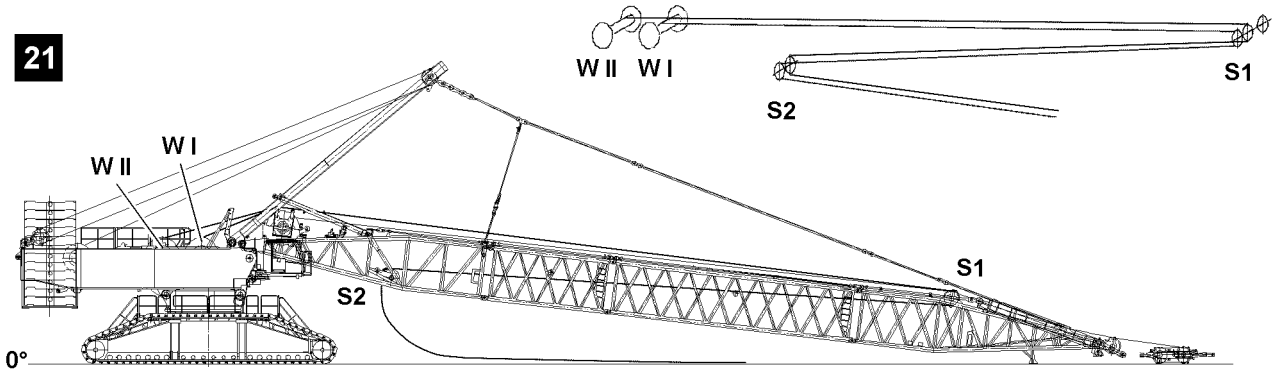

Fig.122968: Hoist rope reeving(s) on the D-boom

Note
▶ Hoist rope reevings: See the Crane operating instructions, chapter 4.06.

WARNING
Danger due to falling hoist ropes!
Death, severe bodily injuries, property damage.
▶ Make sure that the hoist ropes are properly secured when erecting the D-boom to prevent them from falling down.

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- ▶ Pull the hoist ropes over the rope pulley **S1** in the D-end section and over the rope pulley **S2** in the D-pivot section, see illustration **21**.
- ▶ Erect the D-boom.

4 Erecting the D-boom

23

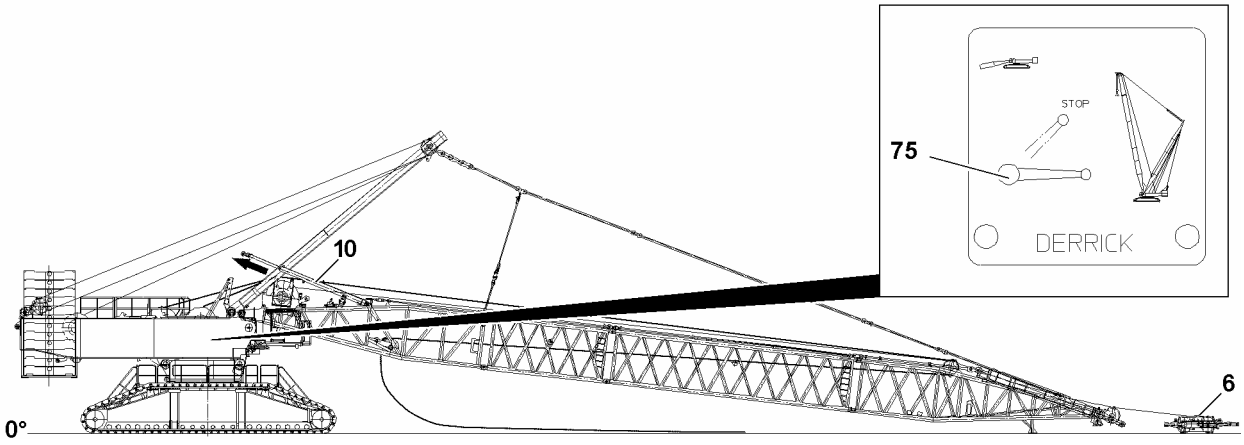

Fig.144120

DANGER
The crane can topple over!
- ▶ It is not permitted to turn the crane during the erection procedure.
- ▶ Observe the specifications in the erection and take down charts.

WARNING
The crane can topple over!
If the following conditions are not met before erecting the D-boom, the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ Observe the technical safety instructions, see the Crane operating instructions, chapter 5.01.
- ▶ Extend the D-relapse cylinder **10** before erection.
- ▶ Do not allow slack rope to build up on the control winch (winch 3).
- ▶ The ball valve cabinet must be locked. Always pull the key and hand it to an authorized person.

WARNING
Falling hoist rope!
If the hoist rope before the erection procedure is not properly secured onto the corresponding length on the D-boom, it can fall down backward on the basis of its own weight.
Death, severe bodily injuries, property damage.
- ▶ Reeve the hoist rope before the erection procedure with sufficient length on the D-boom.
- ▶ The hoist rope must be constantly monitored during erection.
- ▶ Do not step into the danger zone.

NOTICE
Damage of control rope and the luffing pulley block!
At slack guying at the derrick boom angle of 76° the luffing pulley block is laying on the D-end section.
If winch 3 is further actuated from a derrick boom angle of 76° then the D-end section or the luffing pulley block can be damaged.
- ▶ Winch 3 is therefore turned off from a derrick boom angle of 76°.
- ▶ Make sure that winch 3 is no longer actuated from a derrick boom angle of 76°.

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Make sure that the following prerequisites are met:
- The crane is horizontally aligned.
- All electrical connections have been made.
- All limit switches are functioning.
- The counterweight has been installed on the turntable according to the load chart.
- All pin connections have been secured.
- The relapse cylinders are touching the supports.
- The hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection is exceeded.
- The assembly icon is visible on the LICCON monitor.
- No personnel is within the danger zone.

4.1 Extending the D-relapse cylinder

WARNING
Danger of fatal injury due to the D-boom!
If the D-relapse cylinders **10** are not completely extended before erecting the D-boom, then the D-boom can fall backward.
Death, severe bodily injuries, property damage.
▶ The D-relapse cylinders must be extended before erection of the D-boom.
▶ The ball valve must be secured during crane operation to prevent unintended actuation.

The piston rods on the D-relapse cylinders must be completely extended prior to erection, see illustration **23**.

Ball valve positions	
Horizontal	Crane operation, extend the piston rod
Vertical	Assembly, retract the piston rod
45°	STOP (the piston rod cannot be retracted / extended)

Make sure that the following prerequisite is met:
- All hydraulic connections have been made.

▶ Move the ball valve **75** into horizontal position.

Result:

- The piston rods of the D-relapse cylinders **10** extend.

Note
▶ The ball valve is secured by closing the cabinet door and removing the key.

▶ Close the cabinet door and pull out the key.
▶ Hand the key to an authorized person.

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4.2 Erection procedure

Make sure that the following prerequisites are met:
- The piston rods of the D-relapse cylinders **10** are fully extended before erection.
- The D-guying is properly assembled and secured.
- **Only in the case of a D-boom 42 m:**, the auxiliary guying on the D-boom is properly assembled and secured.
- The control rope of winch 3 is properly placed and secured on the rope pulleys of the D-end section, see the Reeving plan.
- The control rope of winch 3 is properly reeved in on the luffing pulley block and properly secured on the rope fixed point, see the Reeving plan.
- The luffing pulley block **6** is laying on the ground with sufficient „rope reserve“.
- The connector pins between the upper pulley block and the lower pulley block are unpinned, see section „Releasing the upper pulley block on the lower pulley block“.

4.2.1 Erecting the D-boom to the horizontal

Make sure that the following prerequisites are met:
- Sufficient control rope (winch 3) is spooled out.
- The pull test brackets are folded to the front in operating position.

WARNING
The crane can topple over!
▶ It is prohibited to turn the crane superstructure during the erection procedure.
▶ Erect the D-boom carefully and at low speed maximum to the horizontal.

NOTICE
Damage of control rope and the luffing pulley block!
When lifting the D-boom, the control rope or the luffing pulley block can be damaged.
▶ When lifting the D-boom, carefully spool out winch 3 so that the luffing pulley block remains on the ground.
▶ Check the rope run on the D-end section, carry out a visual inspection.
▶ Make sure that no slack rope on winch 3 forms when lifting the D-boom.

▶ Erect the D-boom carefully and at low speed to the horizontal (0°).

4.2.2 Pinning the luffing pulley block on the pull test brackets

Note
▶ The following illustrations are shown in part without the control rope (winch 3).

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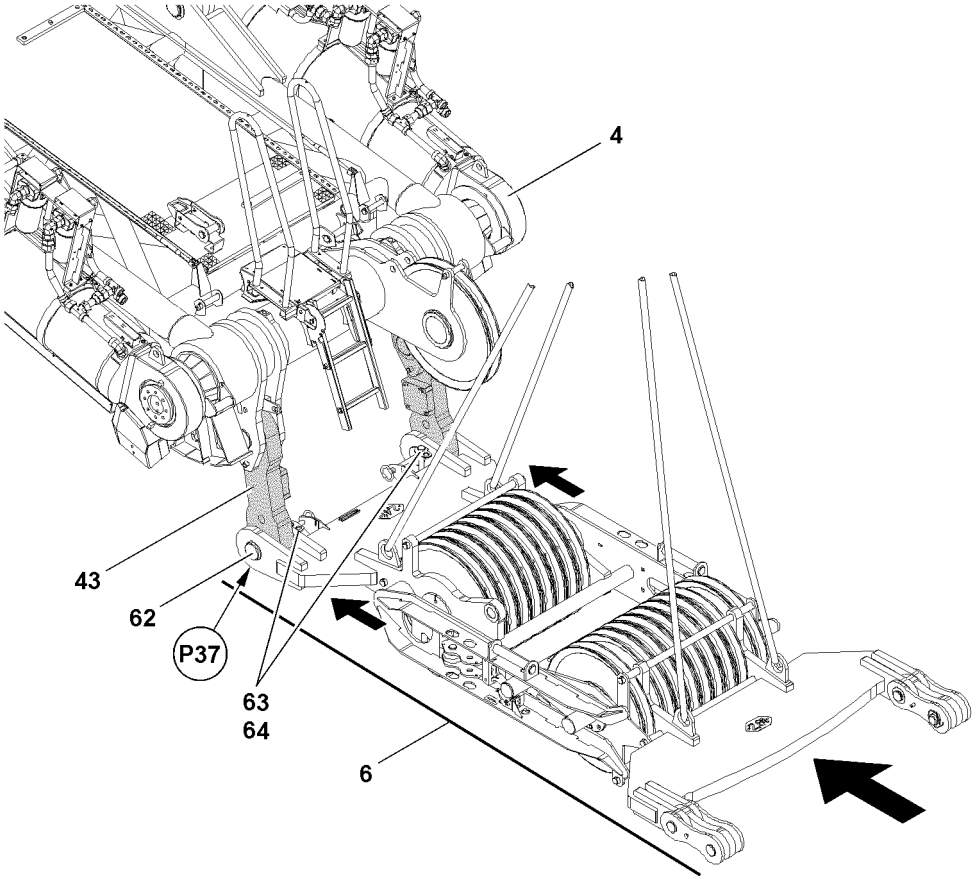

Fig.122965: Pinning the luffing pulley block on the pull test brackets

Make sure that the following prerequisites are met:
- The D-boom is erected to the horizontal position.
- The pull test brackets are in the operating position.
- The pins **62** are unpinned on both sides.

Pin the luffing pulley block **6** on the D-end section **4** with the pull test brackets **43**.

▶ Fasten the luffing pulley block **6** properly to the auxiliary crane.

NOTICE
Danger of slack rope formation!
When swinging the luffing pulley block on the D-end section in, slack rope can form on winch 3.
▶ When swinging the luffing pulley block in to the D-end section, slowly and carefully spool up winch 3.

When the luffing pulley block **6** is properly fastened to the auxiliary crane:
▶ Lift the luffing pulley block with the auxiliary crane and swing it in to the pull test brackets **43** on the D-end section **4**.
▶ Align the luffing pulley block **6** with the pull test brackets **43** until the pin bores align.
▶ Insert the pins **62** completely on both sides.

When the pins **62** are fully pinned on both sides:
▶ Insert the retaining pins **63** on both sides and secure with safety locking pin **64**.

When the pins **62** are properly secured on both sides:
▶ Lower the luffing pulley block **6** carefully with the auxiliary crane until the pulley block **6** hangs vertically.

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4.2.3 Establishing the electrical connections to the luffing pulley block

Note
▶ To establish the electrical connections on the luffing pulley block: Use the Electric wiring diagram.

▶ Establish the electrical connections.

4.2.4 Assembling the auxiliary weight on the upper pulley block

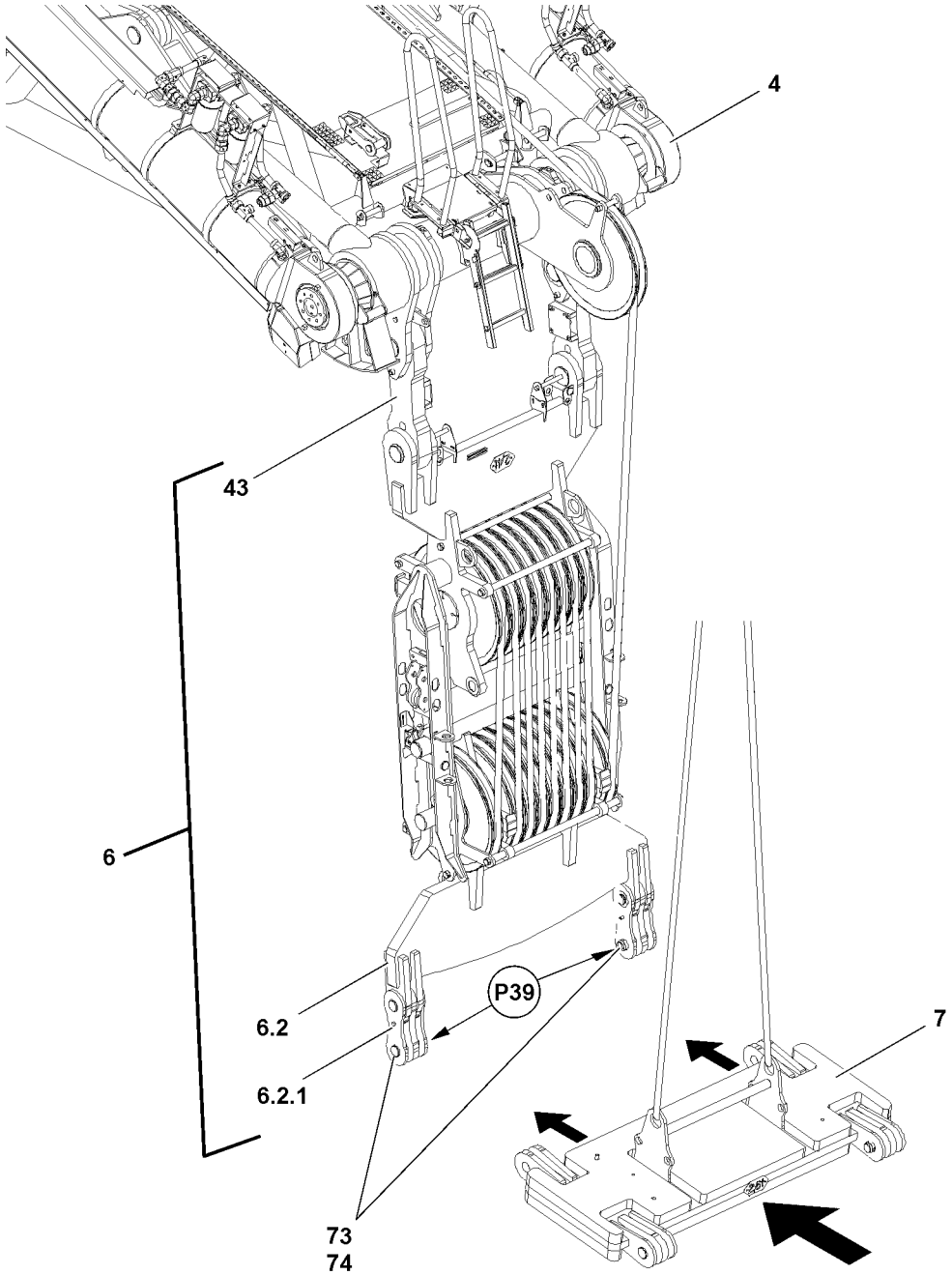

Fig.122966: Pinning the auxiliary weight on the lower pulley block

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Make sure that the following prerequisites are met:
- The luffing pulley block **6** is properly installed and secured on the pull test brackets **43**.
- The luffing pulley block hangs down vertically.
- The auxiliary crane is removed.
- The pins **73** on the brackets **6.2.1** of the upper pulley block **6.2** are unpinned on both sides.

Note
▶ Fastening points, see section „Fastening points for derrick components“.

▶ Fasten the auxiliary weight **7** to the auxiliary crane.
▶ Swing the auxiliary weight **7** in to the hanging luffing pulley block **6**.
▶ Align the auxiliary weight **7** on the brackets **6.2.1** of the upper pulley block **6.2** until the pin bores align on both sides at point **P39**.
▶ Insert the pins **73** at point **P39** on both sides and secure with the safety locking pin **74**.

When the auxiliary weight **7** is properly pinned and secured on the upper pulley block **6.2**:
▶ Lower the auxiliary weight **7** with the auxiliary crane.
▶ Remove the auxiliary crane.

4.2.5 Checking the function of the safety equipment

WARNING
Malfunctioning safety equipment!
If the function of the safety equipment is defective, personnel can be severely injured or killed.
▶ Crane operation with non-functioning safety equipment is **prohibited**.

Note
▶ The function of the individual limit switches must be checked before erection.
▶ The function of the limit switch initiators must be checked in the test system, see the separate „Diagnostics manual“.

Note
▶ If a function check on the limit switches or on the safety equipment does not lead to the desired shut-offs, then the plug connections on the connector boxes or the components themselves must be checked.
▶ If no visible connection errors or component defects can be found, contact **LIEBHERR** Service.

Make sure that the following prerequisites are met:
- All electrical connections have been made.
- The crane engine is running.
- The corresponding operating mode is set on the LICCON monitor.

Limit switch D-boom, relapse cylinder

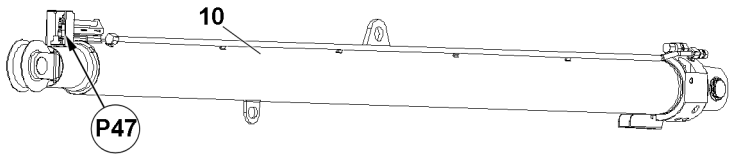

*Fig.144124: Limit switch initiators of the D-relapse cylinders **10***

Note
▶ The limit switch functions have to be checked individually before erection.

▶ Cover the limit switch initiators of the D-relapse cylinders **10** at point **P47** individually with a metal plate, see the Crane operating instructions, chapter 8.12.

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Result:

– The spooling up of winch 4 (control winch) turns off in upward movement.
– The „derrick boom angle“ icon appears on LICCON monitor 1, see the Crane operating instructions, chapter 4.02.

Luffing pulley block limit switch

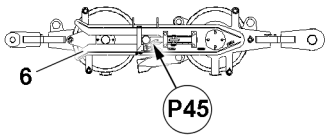

*Fig.144122: Limit switch initiators of the luffing pulley block **6***

Note
▶ The limit switch functions have to be checked individually before erection.

▶ Cover the limit switch initiators of the luffing pulley block **6** at point **P45** individually with a metal plate.

Result:

– The spooling up of winch 3 turns off.

Pull cylinder limit switch

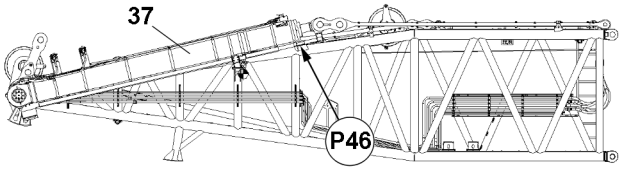

*Fig.144123: Limit switch initiators of the pull cylinders **37***

Note
▶ The limit switch functions have to be checked individually before erection.

▶ Cover the limit switch initiators of the pull cylinders **37** at point **P46** individually with a metal plate.

Result:

– The retraction of the pull cylinder is turned off.

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4.2.6 Erecting the D-boom to maximum 85°

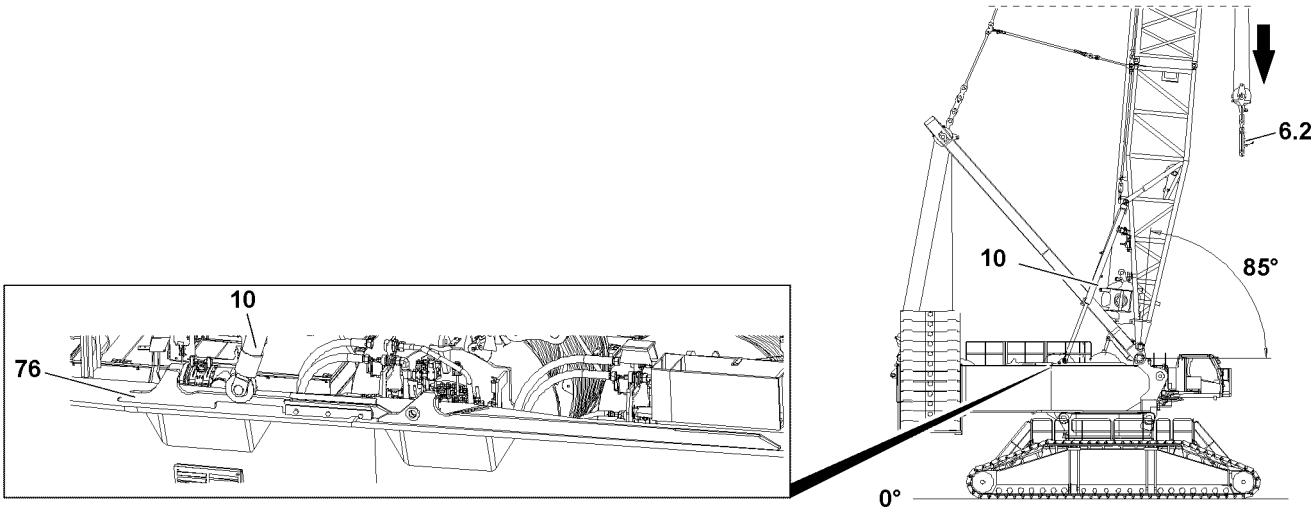

Fig.144121: Initiator limit switch

The erection of the D-boom to maximum 85° is required in order to made space in the assembly area of the S-pivot section and permit the assembly of the S-pivot section without a problem.

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ It is prohibited to turn the crane superstructure during the erection procedure.
- ▶ Make sure during the erection procedure of the D-boom that the D-relapse cylinders **10** engage in the stop rail **76** of the D-relapse retainer.
- ▶ Make sure that no slack rope forms on winch 3.
- ▶ Do not erect the D-boom further than maximum 85° to the horizontal.

NOTICE
Danger of property damage!
- ▶ Make sure that the upper pulley block **6.2** is lowered during the erection procedure of the D-boom.
- ▶ Make sure that the upper pulley block **6.2** is located at the height of the D-pivot section (see illustration), before the D-boom reaches the boom angle setting of 76°.

Note
- ▶ Winch 3 is turned off completely from a D-boom angle of 76°. It is no longer possible to lift / lower the upper pulley block **6.2**.

When luffing up the D-boom, lower the upper pulley block **6.2** continuously:
- ▶ Actuate winch 4 and erect the D-boom to an angle range of maximum 85°.

Result:

– The upper pulley block **6.2** is located at the height of the D-pivot section, see illustration

5 D-boom assembly on the ground

Note
- ▶ For D-boom assembly „on the ground“ the D-pivot section, D-intermediate sections and D-end section can be pinned and secured as a preassembled unit with the auxiliary crane directly on the SA-frame.

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WARNING
Danger of accident!
Death, severe bodily injuries, property damage.
- ▶ Assembly of the D-boom „on the ground“ is only described as an example, for the detailed assembly process, see section „Assembling the D-boom in sections“.
- ▶ Observe the danger notes in section „Assembling the D-boom in sections“.

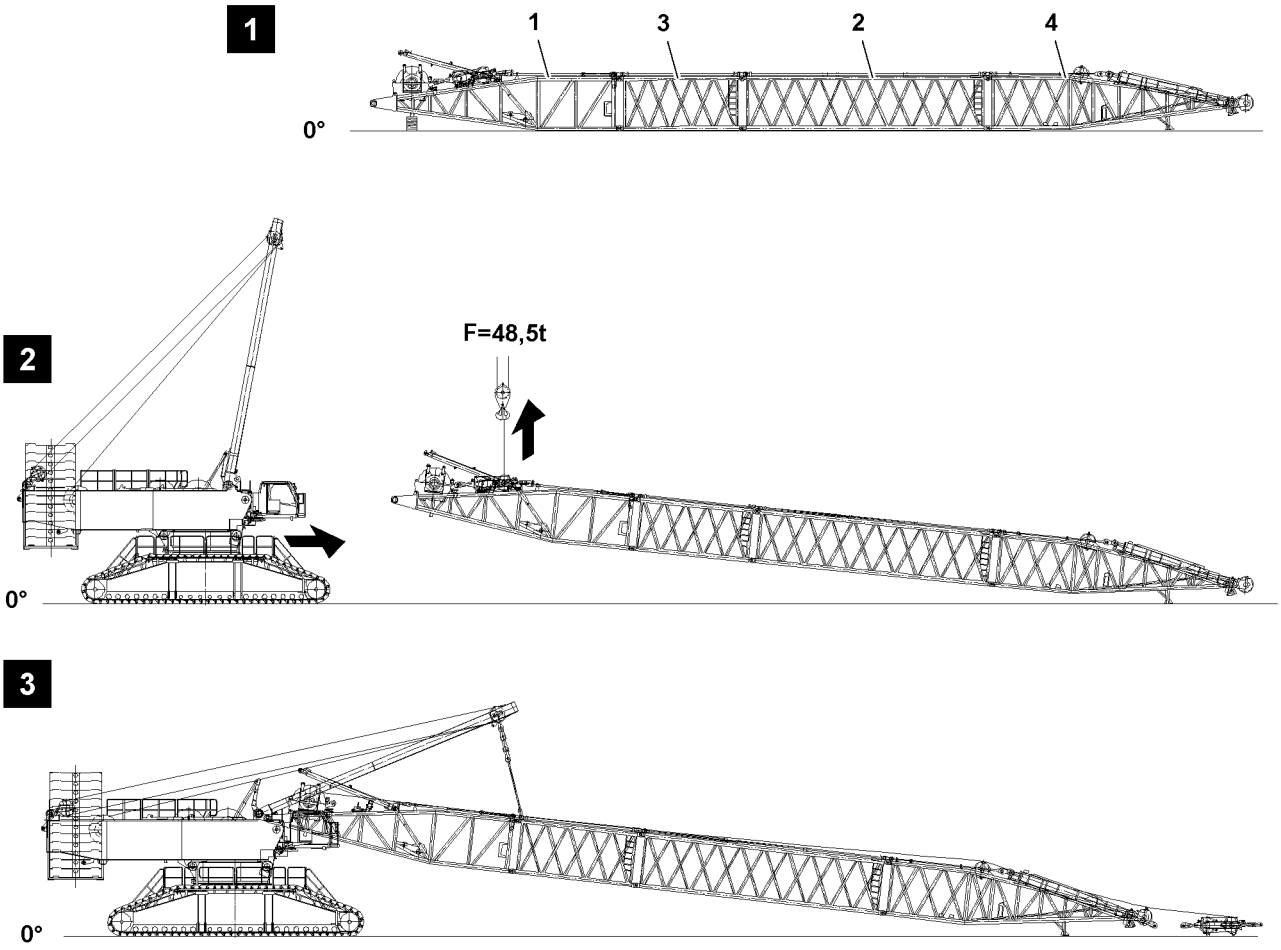

Fig.122969: Preassembling the D-boom on the ground

Make sure that the following prerequisites are met:
- The crane is horizontally aligned.
- The counterweight has been installed on the turntable according to the load chart.
- The central ballast has been installed on the turntable according to the load chart.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection settings have been compared with the actual set up configuration.

5.1 Preassembling the D-boom on the ground

WARNING
Danger due to lattice sections!
Death, severe bodily injuries, property damage.
- ▶ Make sure that the D-boom sections are properly pinned and secured.

- ▶ Pin and secure the D-pivot section, D-intermediate sections and D-end section with each other on the ground, see section „Assembling the D-boom in sections“, see illustration **1**.

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5.2 Assembling the D-boom on the SA-frame

Make sure that the following prerequisites are met:
- The travel route of the crane is level and horizontal.
- The ground in the area of the travel route is able to safely take on the weight of the crane.
- There are no persons and / or obstacles on the travel route.
- The D-relapse cylinders are in operating position.

WARNING
Driving crane!
Death, severe bodily injuries, property damage.
▶ Make sure that there are no persons or obstacles within the danger zone when driving the crane in to the D-boom.

▶ Fasten the D-boom to the auxiliary crane.
▶ Lift the D-boom with the auxiliary crane, see illustration **2**.
▶ Retract the crane carefully to the pin location, see illustration **2**.

When the pin bores between the SA-frame and the D-pivot section align, see illustration **3**:
▶ Insert the pin and secure with the spring retainer, see section „Pinning the D-pivot section on the SA-frame“.

When the D-boom is properly pinned and secured on the SA-frame:
▶ Remove the auxiliary crane on the D-boom.

NOTICE
Danger of property damage!
Damage of hydraulic lines.
▶ Make sure that the hydraulic connections from the turntable to the D-pivot section are established before the SA-frame is lowered to the front.

▶ Establish the hydraulic connections from the turntable to the D-pivot section properly.

5.3 Completing the D-boom assembly

Make sure that the following prerequisites are met:
- The D-boom is properly pinned and secured on the SA-frame.
- The hydraulic connections to the D-pivot section are properly established.

▶ Lower the SA-frame to the front and assemble the D-guying, see section „Assembling the D-guy rods“.
▶ Check the safety equipment, see section „Checking the function of the safety equipment.“
▶ Erect the boom, see section „Erecting the D-boom.“

6 Flying D-boom assembly

Note
▶ To assemble the D-boom in „flying“ mode, the D-intermediate sections and the D-end section can be pinned and secured as a preassembled unit with auxiliary cranes on the D-pivot section.

WARNING
Danger of accident!
Death, severe bodily injuries, property damage.
▶ Do not exceed the maximum permissible total force on test point MS 1 of 145 t.
▶ The assembly of the D-boom in „flying“ mode is only described as an example, for the detailed assembly process, see section „Assembling the D-boom in sections“.
▶ Observe the danger notes in section „Assembling the D-boom in sections“.

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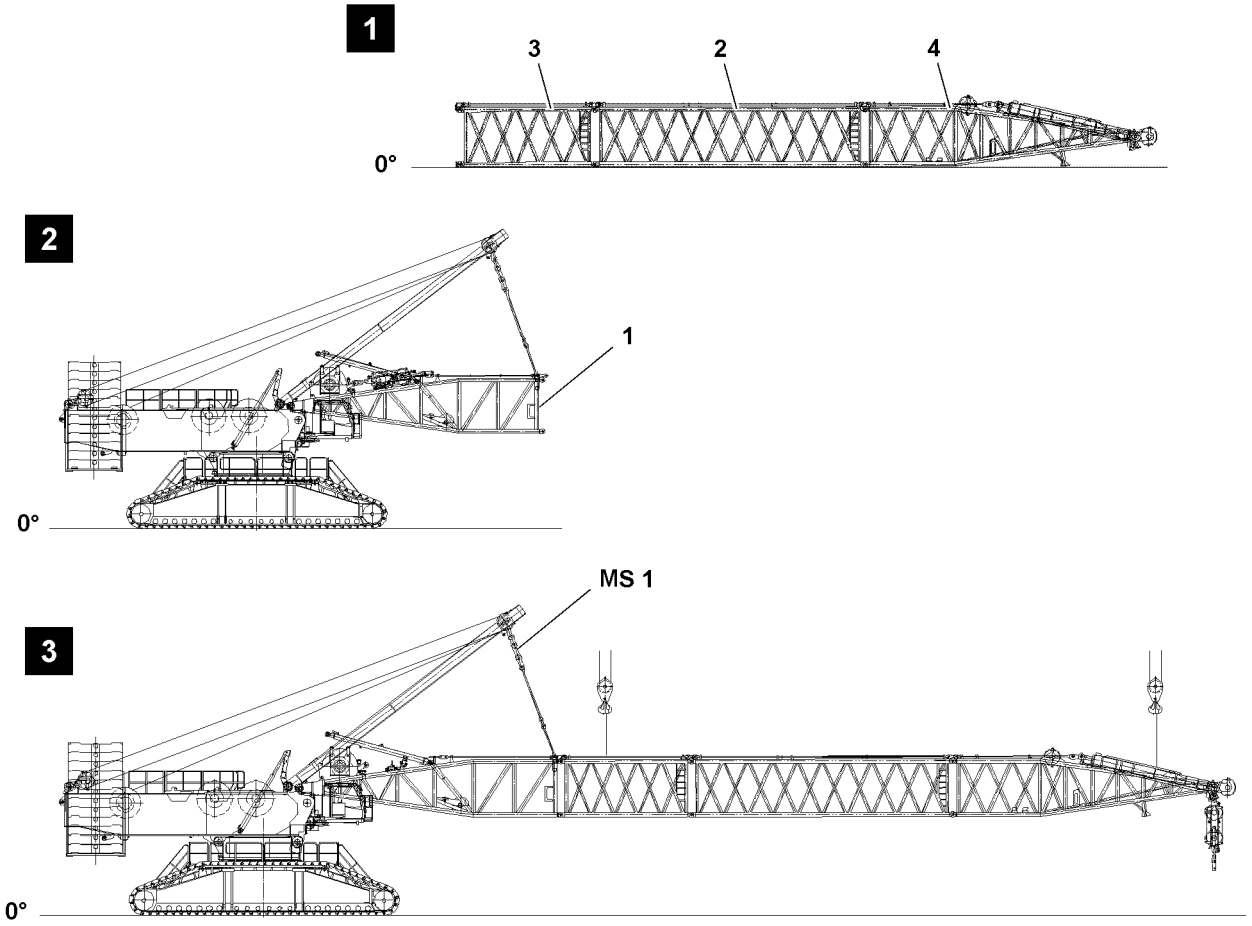

Fig.122970: Flying assembly of the D-boom

Make sure that the following prerequisites are met:
- The crane is horizontally aligned.
- The counterweight has been installed on the turntable according to the load chart.
- The central ballast has been installed on the turntable according to the load chart.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection settings have been compared with the actual set up configuration.

6.1 Preassembling the D-boom on the ground

WARNING
Danger due to lattice sections!
Death, severe bodily injuries, property damage.
▶ Make sure that the D-boom sections are properly pinned and secured.

▶ Properly pin and secure the D-intermediate sections and D-end section with each other on the ground, see section „Assembling the D-boom in sections“, see illustration **1**.

6.2 Assembling the D-pivot section on the SA-frame

▶ Fasten the D-pivot section **1** to the auxiliary crane.
▶ Swing the D-pivot section **1** in with the auxiliary crane to the SA-frame.

When the pin bores between the SA-frame and the D-pivot section align:
▶ Properly pin and secure the D-pivot section **1** on the SA-frame, see section „Pinning the D-pivot section on the SA-frame“, see illustration **2**.

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NOTICE
Danger of property damage!
Damage of hydraulic lines.
▶ Make sure that the hydraulic connections from the turntable to the D-pivot section are established before the SA-frame is lowered to the front.

▶ Establish the hydraulic connections from the turntable to the D-pivot section properly.

When the D-pivot section is properly pinned and secured on the SA-frame:
▶ Lower the SA-frame to the front in direction of the D-pivot section.
▶ Assemble the flying assembly guying between the SA-frame and the D-pivot section.

When the guying between the SA-frame and the D-pivot section is properly assembled and secured:
▶ Remove the auxiliary crane on the D-pivot section **1**, see illustration **2**.

6.3 Assembling the D-boom on the D-pivot section

▶ Fasten the D-boom to the auxiliary crane.
▶ Lift the D-boom with the auxiliary crane.
▶ Swing the preassembled D-boom in to the pin points on the D-pivot section, see illustration **3**.

When the pin bores between the D-pivot section and the D-boom align:
▶ Insert the pin and secure with spring retainer, see section „Assembling the D-boom in sections“, see illustration **3**.

When the D-boom is properly pinned and secured on the D-pivot section:
▶ Remove the auxiliary crane.

6.4 Completing the D-boom assembly

Make sure that the following prerequisite is met:
– The D-boom is properly pinned and secured on the D-pivot section.

▶ Take the D-boom down on the ground or on the substructure.
▶ Lower the SA-frame to the front and assemble the D-guying, see section „Assembling the D-guy rods“.
▶ Check the safety equipment, see section „Checking the function of the safety equipment.“
▶ Erect the boom, see section „Erecting the D-boom.“

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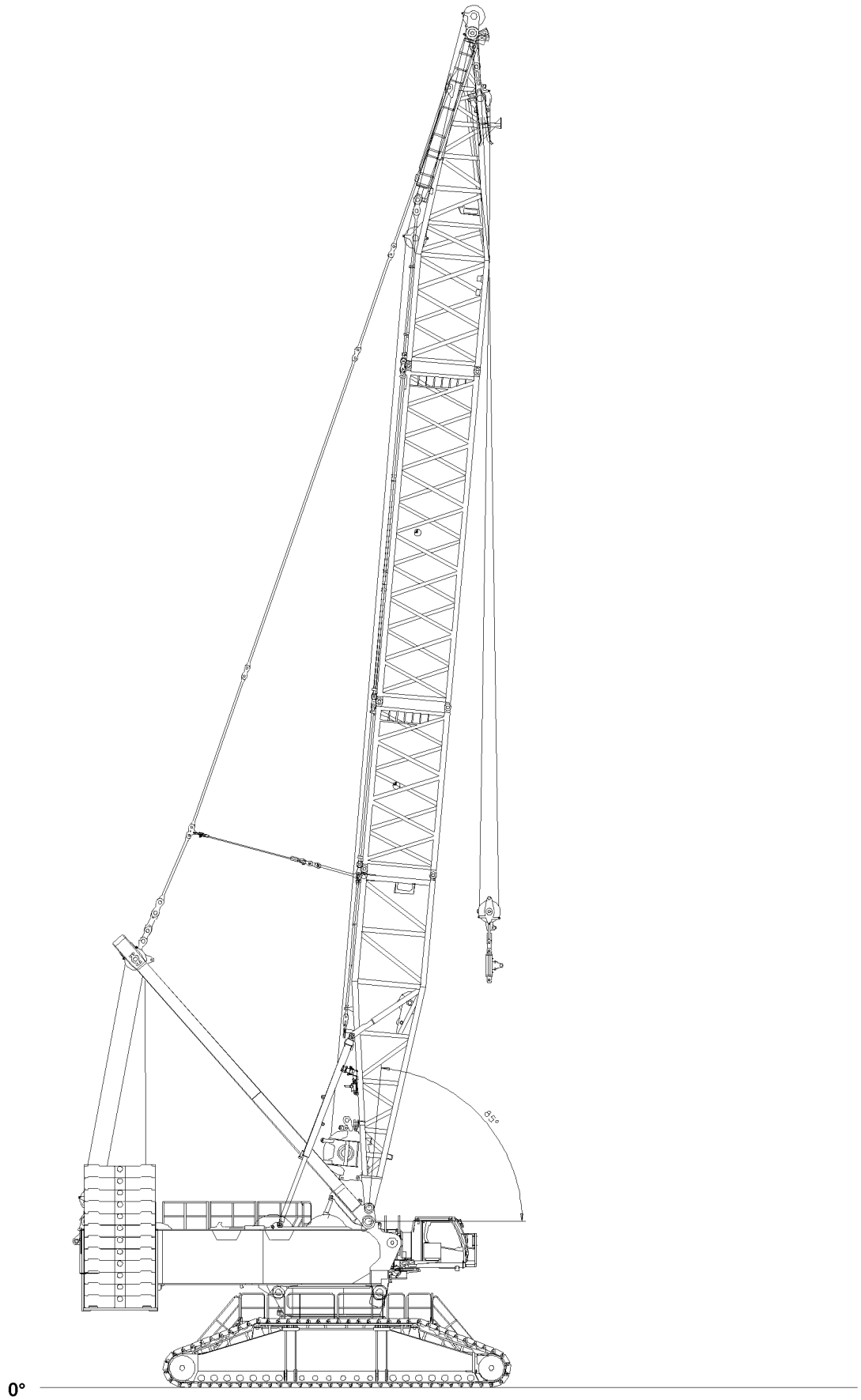

Fig.122722

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7 Disassembling

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
If this is not observed, assembly personnel could fall and be killed or seriously injured.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

WARNING
The lattice sections can fall down!
If the lattice sections are not pinned and secured correctly, then they can fall down and fatally injure personnel.
- ▶ Pin or unpin both pins at the same horizontal level, i.e. **left and right**.
- ▶ Do not stand under the lattice sections or within the entire danger zone during the pinning and unpinning procedure of the boom.
- ▶ Safely secure the pins in the storage locations as well as in the receptacles.
- ▶ It is prohibited to lean the auxiliary ladder against the component being disassembled.

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Note

- ▶ The assembly and disassembly of the derrick boom with 36 m corresponds to the assembly and disassembly of the derrick boom with 42 m , but without the derrick auxiliary guying.
- ▶ The assembly and disassembly of the derrick boom is described based on the example of the derrick boom with 42 m.

Make sure that the following prerequisites are met:

- The crane is horizontally aligned.
- An auxiliary crane is available.
- An assembly scaffolding / work platform is available.
- The counterweight has been installed on the turntable according to the load chart.
- The central ballast has been attached according to the load chart.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection settings have been compared with the actual set up configuration.
- The main boom has been removed.

7.1 Turning the turntable to the disassembly position

DANGER

The crane can topple over!

Death, severe bodily injuries, property damage.

- ▶ After disassembly of the D-boom, observe the assembly conditions for operation on crawlers, see Crane operating instructions, chapter 3.06.

▶ Turn the turntable in lengthwise direction of the crawler travel gear.

7.2 Exceeding the shut off limits of the LICCON overload protection for assembly operation

WARNING

Danger of accident due to function „Exceedance of shut-off limits of the LICCON overload protection“!

If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload.

Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.

Death, severe bodily injuries, property damage.

- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ is only permissible in emergencies and for assembly purposes.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ may only be actuated by persons who know the effects of their actions regarding the function „Exceeding the shut off limits of the LICCON overload protection“.
- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ requires the presence of an authorized person and must be performed with utmost caution.
- ▶ Crane operation with activated function „Exceedance of shut off limits of the LICCON overload protection“ is prohibited.

▶ Exceeding the shut off limits of the LICCON overload protection: Engage assembly operation.

Result:

- The shut off limits of the LICCON overload protection are exceeded.
- The assembly icon appears on the LICCON monitor.

Note

- ▶ See the Crane operating instructions, chapter 4.02 and chapter 4.20.

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7.3 Removing the D-boom in sections

WARNING
Falling boom!
If the D-boom is not properly supported before disassembly or held with an auxiliary crane, then the D-boom can fall down when it is unpinned.
Death, severe bodily injuries, property damage.
▶ Before supporting the D-boom, the ground condition must be checked regarding load bearing capacity and level.

If the ground condition is not classified as sufficient:
▶ Support the D-boom properly and safely with suitable material.

7.3.1 Luffing the D-boom down

NOTICE
Damage to the luffing pulley block!
If the D-boom is lowered too quickly „forward“, significant damage can occur on the luffing pulley block and on the D-end section.
▶ Lower the D-boom forward carefully and at a slow speed.
▶ Make sure that the upper pulley block **6.2** does not run on the ground when lowering the D-boom.
▶ Make sure that the upper pulley block **6.2** does not collide uncontrolled with the lower pulley block **6.1** when spooling up winch 3.

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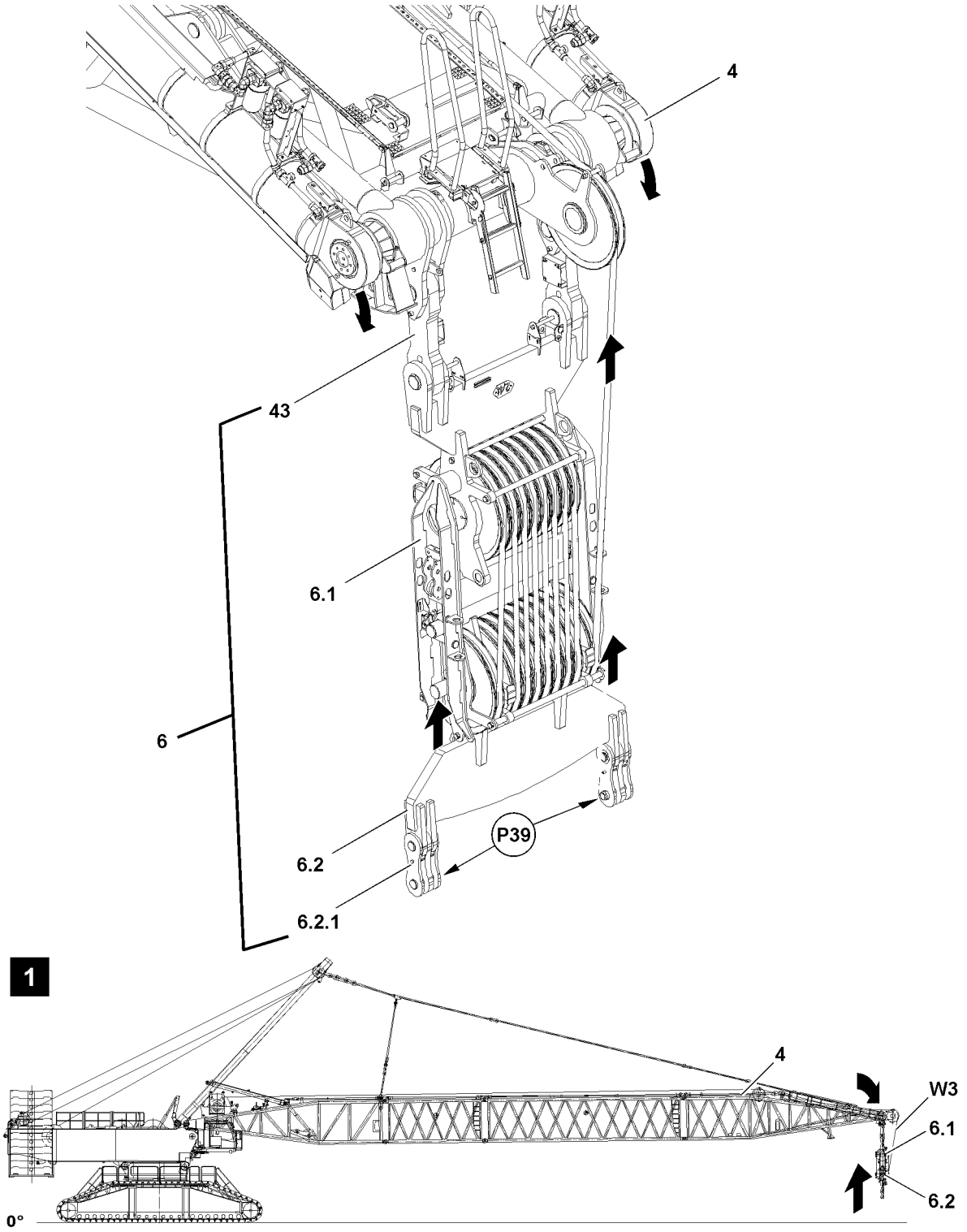

Fig.123558: Luffing the D-boom down and spool up winch 3

▶ Lower the D-boom to the front to the horizontal and spool winch 3 up at the same time, see illustration **1**.

When the upper pulley block **6.2** approaches the lower pulley block **6.1**:

▶ Align the upper pulley block **6.2** on the bracket of the lower pulley block **6.1**.

When the upper pulley block is aligned:

▶ Move the upper pulley block **6.2** in by spooling up winch 3 in the link to the limit switches.

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Result:

– „Lift“ winch 3 (pulling the luffing pulley block together) turns off.
– „Lower“ winch 4 (luffing the D-boom down) turns off.

▶ Pin the luffing pulley block **6** for transport, see section „Pinning the upper pulley block with the lower pulley block“.

7.3.2 Pinning the upper pulley block with the lower pulley block

Make sure that the following prerequisites are met:
– The luffing pulley block hangs in a reeved in condition on the D-end section.
– The pin **60** is in park position at point **P36**.

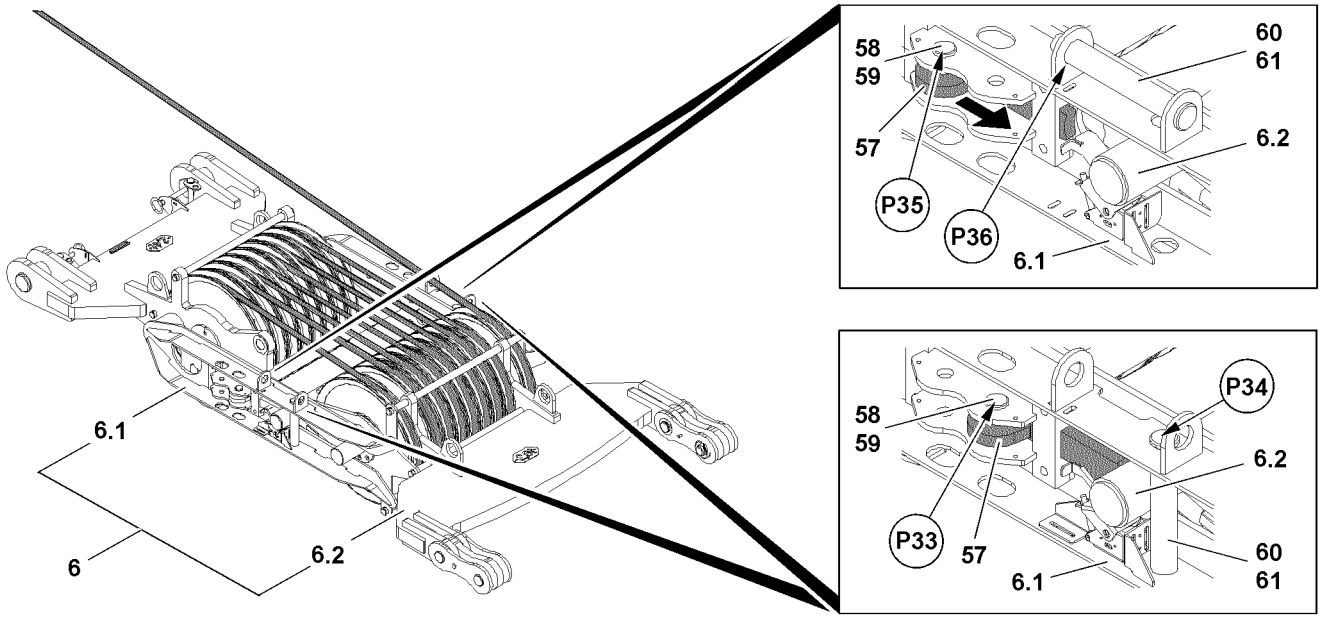

Fig.123559: Pinning the upper pulley block with the lower pulley block for transport

The upper pulley block **6.2** must be pinned with the lower pulley block **6.1** before the complete luffing pulley block **6** can be placed in the transport receptacle on the D-pivot section.

▶ Remove the safety locking pin **59** at point **P35** and unpin the pin **58** on both sides.
▶ Move the latch **57** until it can be pinned at point **P33**.
▶ Insert the pins **58** on both sides at point **P33** and secure with the safety locking pin **59**.

NOTICE
Danger of property damage on the luffing pulley block!
If the D-boom is luffed down too fast and winch 3 is spooled up too fast, then significant property damage can occur on the upper as well as the lower pulley block.
▶ Carry out all crane movements slowly and with utmost caution.

▶ Unpin the pins **60** in park position on both sides: Release the safety locking pin **61** and unpin the pin **60** at point **P36**.
▶ Insert the pin **60** on both sides on the bracket of the lower pulley block **6.1** at point **P34** and secure with the safety locking pin **61**.

Result:

– The upper pulley block **6.2** is connected with the lower pulley block **6.1** and now forms the „transport unit“ luffing pulley block **6**.

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Problem remedy

The pin **60** cannot be inserted at point **P34**?

- ▶ Fasten the upper pulley block **6.2** on both sides to the auxiliary crane and lift carefully to the stop on the latch **57**.
- ▶ Insert the pin **60** on both sides on the bracket of the lower pulley block **6.1** at point **P34** and secure with the safety locking pin **61**.

7.3.3 Disconnecting the electrical connections to the luffing pulley block

Make sure that the following prerequisites are met:

- The D-boom is in the „horizontal“ position.
- The upper pulley block **6.2** has been secured to the lower pulley block **6.1** on both sides with pins **60**.

Note

- ▶ Disconnect the electrical connections, use the Electric wiring diagram.

- ▶ Disconnect the electrical connections from the luffing pulley block to the terminal box on the D-end section.

When the electrical connections from the luffing pulley block to the terminal box are disconnected:

- ▶ Close the electrical connections off properly with dummy plugs, protective caps or caps.

7.3.4 Unpinning the luffing pulley block and taking it down on the ground

Make sure that the following prerequisites are met:

- The electrical connections to the luffing pulley block are disconnected.
- The dummy plugs are properly assembled.
- An auxiliary crane is on hand.

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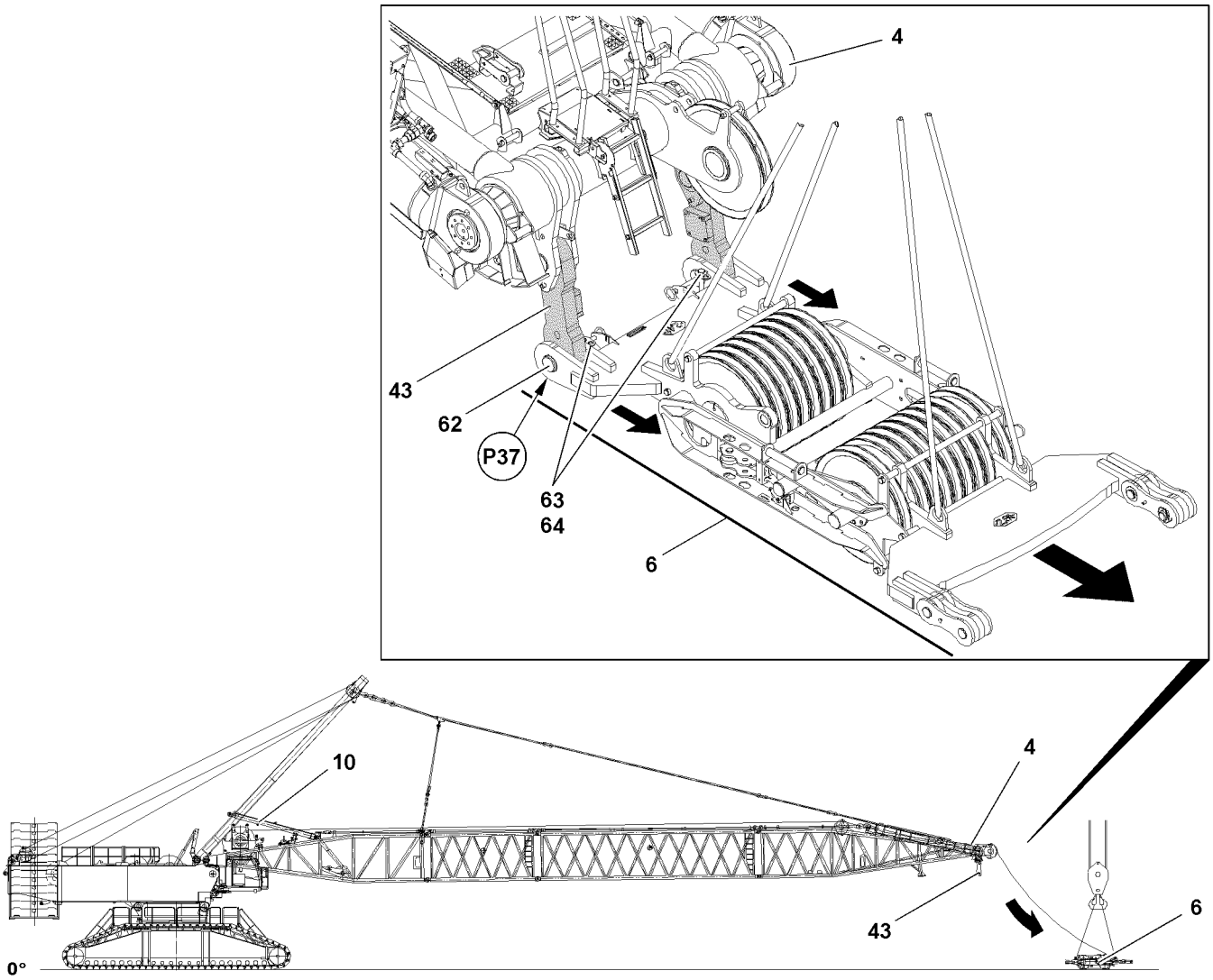

Fig.123560: Unpin the luffing pulley block on the pull test brackets and take it down on the ground

- ▶ Fasten the luffing pulley block **6** properly to the auxiliary crane.
- ▶ Lift the luffing pulley block **6** with the auxiliary crane to the horizontal.

Disassemble the luffing pulley block **6** on the pull test brackets **43** and take it down on the ground at a sufficient distance.

When the luffing pulley block **6** hangs horizontally on the auxiliary crane:

- ▶ Remove the safety locking pin **64** at point **P37** and unpin the pin **63** on both sides.
- ▶ Unpin the pins **62** on both sides.

Result:

– The luffing pulley block **6** is unpinned.

NOTICE

Danger of slack rope formation!

- ▶ Make sure that no slack rope on winch 3 forms when swinging the luffing pulley block out.

When the luffing pulley block **6** is unpinned on both sides:

- ▶ Swing the luffing pulley block **6** out with the auxiliary crane and spool winch 3 out at the same time.
- ▶ Take the luffing pulley block **6** down on the ground with the auxiliary crane.
- ▶ Remove the auxiliary crane.

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7.3.5 Bringing the pulley retainer on the D-end section into transport position

Make sure that the following prerequisite is met:
– The luffing pulley block is disassembled on the D-end section and taken down on the ground.

▶ Unpin the pulley retainer **44** in the operating position: Remove the safety locking pin **51** at point **P31** and unpin the pin **50** on both sides.
▶ Unpin the retaining pin **47** in the transport position of the pulley retainer **44** at point **P28**: Remove the spring retainer **48** and unpin the retaining pin **47**.

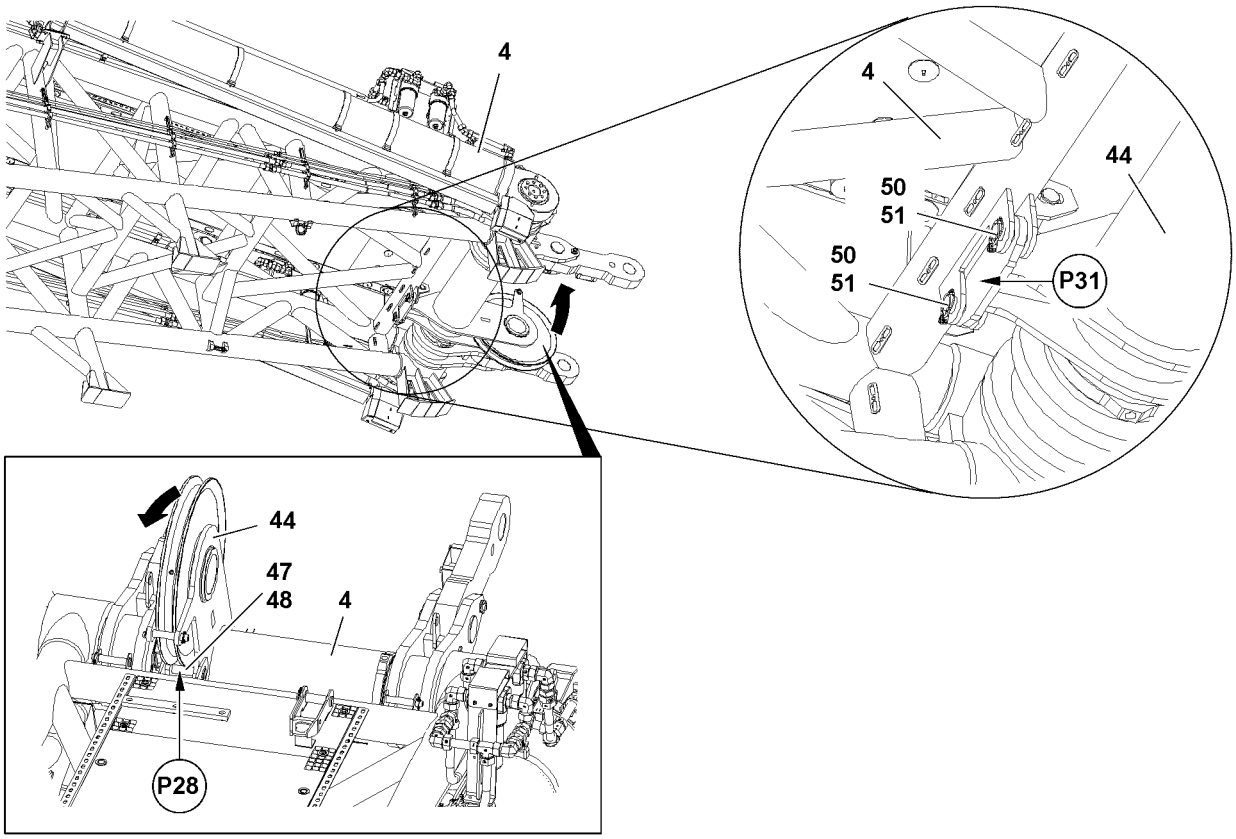

Fig.123561: Bringing the pulley retainer into the transport position

WARNING
Mortal danger due to pulley retainer!
If the pulley retainer is not secured with an auxiliary crane during the swing procedure, it can swing forward with a large momentum due to its weight.
Death, severe bodily injuries, property damage.
▶ Swing the pulley retainer into transport position only with the aid of an auxiliary crane.
▶ Swinging the pulley retainer without an auxiliary crane is **prohibited**.

▶ Fasten the pulley retainer **44** to the auxiliary crane.
▶ Swing the pulley retainer **44** upward with the auxiliary crane into transport position.

When the pulley retainer **44** is in transport position:
▶ Insert the retaining pin **47** at point **P28** and secure with the spring retainer **48**.

When the pulley retainer **44** is pinned and secured in the transport position:
▶ Remove the auxiliary crane.
▶ Insert the pin **50** again on both sides at point **P31** and secure with the safety locking pin **51**.

7.3.6 Bringing the pull test brackets into transport position

▶ Remove the safety locking pin **55** at point **P29** and unpin the pin **54**.

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▶ Take the auxiliary bracket **53** from the transport retainer.

NOTICE
Danger of property damage!
▶ The pull test bracket **43** may only be lifted with the auxiliary crane via the auxiliary bracket **53**.

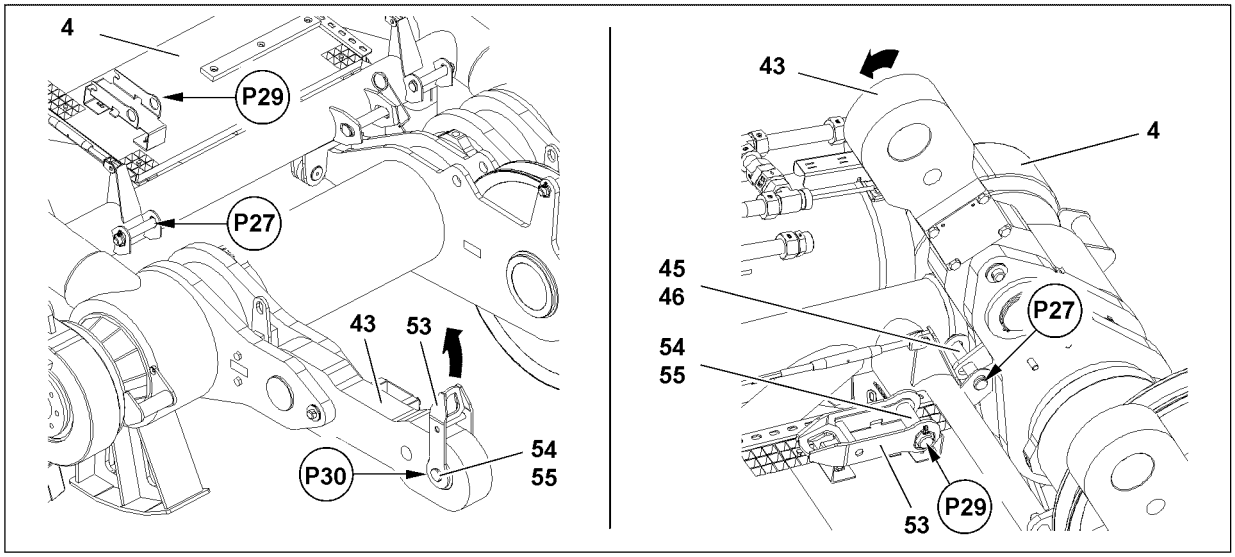

Fig.123562: Bringing the pull test brackets into transport position

▶ Connect the auxiliary bracket **53** with the pull test bracket **43**: Insert the pin **54** at point **P30** and secure with the safety locking pin **55**.
▶ Fasten the auxiliary bracket to the auxiliary crane.

WARNING
Danger of fatal injury due to the pull test bracket!
If the pull test bracket **43** is not secured with an auxiliary crane during the swing procedure, then it can swing forward due to its weight.
Death, severe bodily injuries, property damage.
▶ Swing the pull test bracket **43** into operating position or transport position only with the aid of an auxiliary crane.
▶ Swinging the pull test bracket without an auxiliary crane is **prohibited**.

▶ Tension the fastening equipment carefully.
▶ Remove the safety locking pin **46** on the transport retainer at point **P27** and unpin the retaining pin **45**.
▶ Swing the pull test bracket **43** to the rear with the auxiliary crane until it can be pinned at point **P27**.
▶ Insert the retaining pin **45** in the transport position at point **P27** and secure with the safety locking pin **46**.

When the pull test bracket is secured:
▶ Remove the auxiliary crane.
▶ Disconnect the auxiliary bracket **53** from the pull test bracket **43**.
▶ Swing the second pull test bracket into the transport position.
▶ Fasten the auxiliary bracket **53** in transport position at point **P29**.

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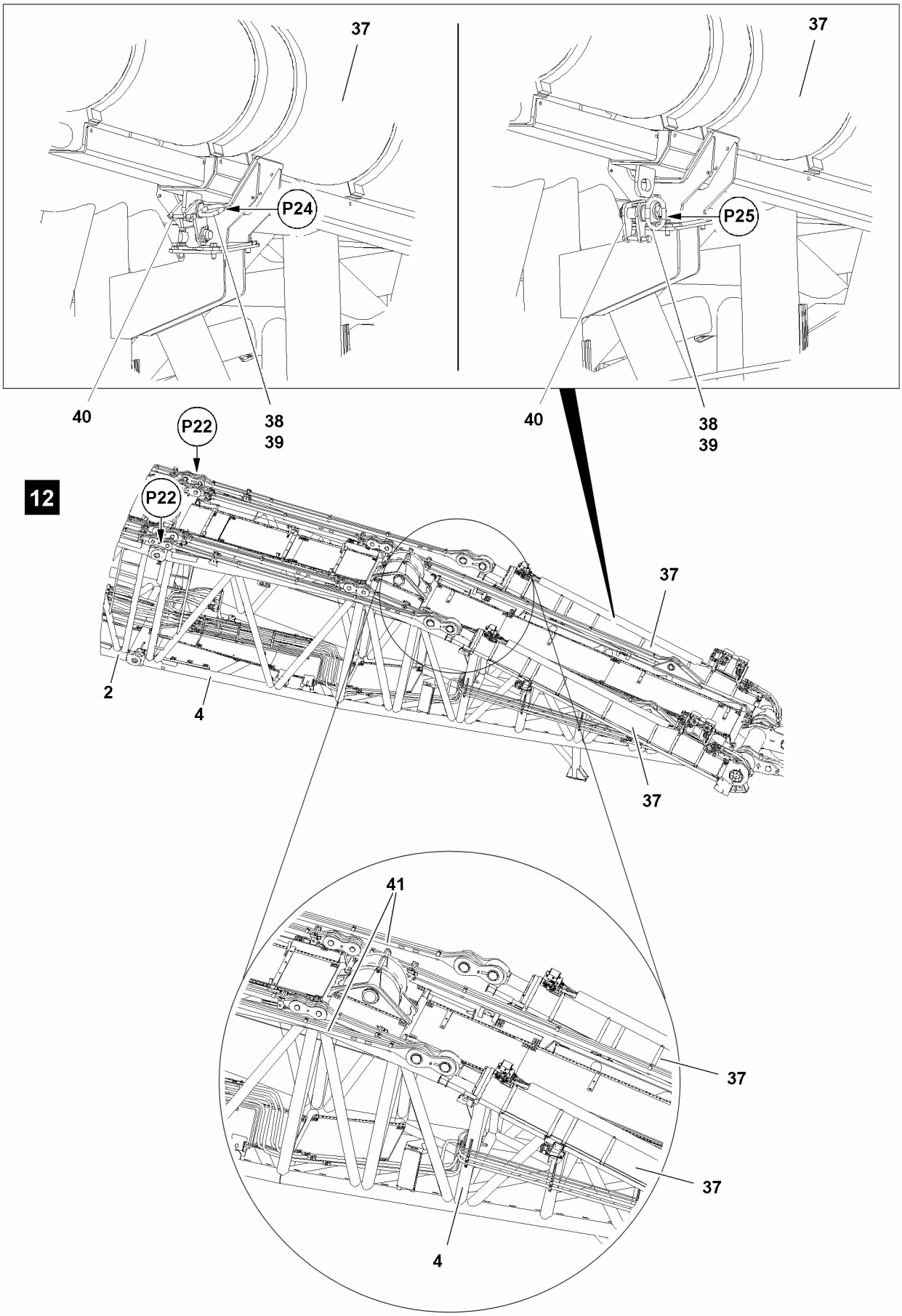

Fig.144118

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7.3.7 Retracting and securing the pull cylinder

Make sure that the following prerequisite is met:
- The guy rods are taken down.
- The guy rods are separated at point **P22**.

Note
- ▶ The pull cylinders can only be retracted completely when the angle of the D-boom is less than 5°.
- ▶ Retract the pull cylinder (radio remote control*****), see the radio remote control***** operating instructions.
- ▶ Retract the pull cylinder (crane cab), see the Crane operating instructions, chapter 4.01.

Both pull cylinders **37** must be completely retracted and secured.

- ▶ Retract the pull cylinder **37** completely.
- ▶ Remove the safety locking pin **39** at point **P25** and unpin the grip pin **38**, see illustration **13**.
- ▶ Swing the retainer **40** upward, see illustration **12**.
- ▶ Insert the grip pin **38** at point **P24** and secure with the safety locking pin **39**, see illustration **12**.

Result:

- The pull cylinder **37** is secured in transport position.

7.3.8 Setting the ball valve on the pull cylinder to the „transport and storage“ position

Note
- ▶ The following tasks must be carried out on both pull cylinders.

The ball valve **81** is located under the flap **80** on the pull cylinder **37**.

- ▶ Open the flap **80**.

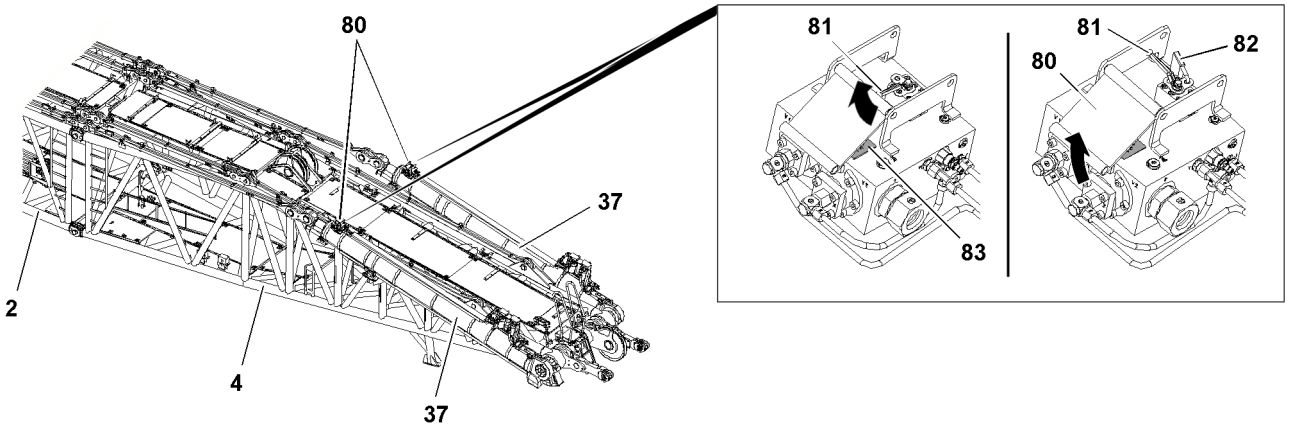

*Fig.122781: Ball valve **81** on the pull cylinder **37***

- ▶ Change the ball valve **81** to the „transport and storage“ position, see sign **83**.

When the ball valve **81** is in the „transport and storage“ position:
- ▶ Attach the safety lock **82** and secure the ball valve **81** to prevent it from turning.
- ▶ Store the key safely.
- ▶ Close the flap **80** and secure it properly.

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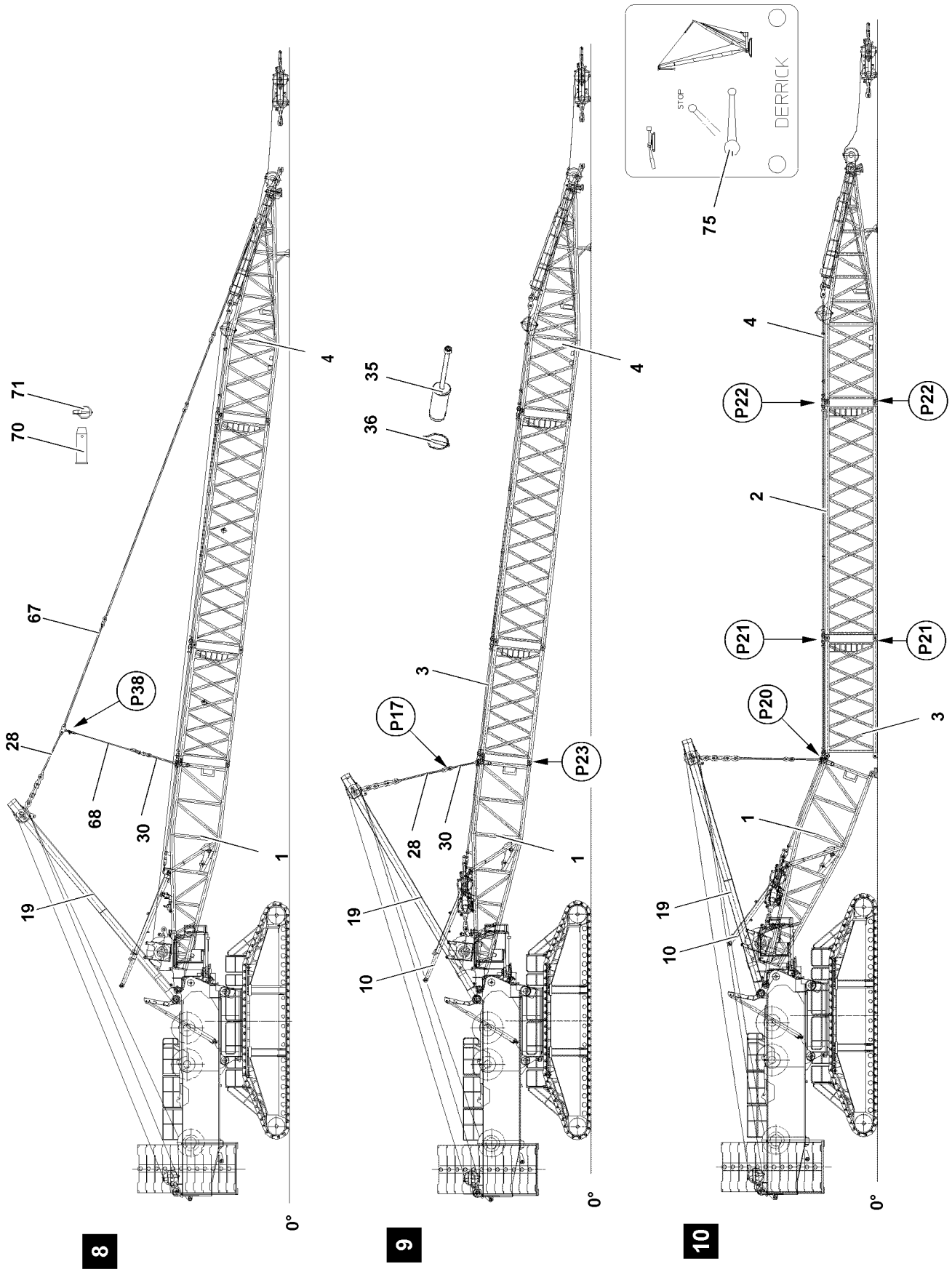

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Fig.123557

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7.3.9 Disassembling the D-guy rods

- ▶ Place the guy rods into the transport retainers of the D-intermediate sections: Lower the SA-frame to the front.
- ▶ Pin and secure the guy rods **67** in the transport retainers.
- ▶ Unpin the guy rods **28** of the SA-frame and the guy rods **67** of the D-intermediate section: Remove the safety locking pin **71** and unpin the pin **70**.
- ▶ Unpin the guy rope **68** at point **P38** and remove, see illustration **8**.

7.3.10 Reeving the hoist rope out

- ▶ Reeve out the hoist ropes: Spool up winch 1 and winch 2.

7.3.11 Disconnecting the hydraulic connections on the D-boom

The hydraulic connections are made with quick couplings.

When disconnecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

WARNING
Pressure in the hydraulic lines!
If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.
Death, severe bodily injuries, property damage.
- ▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

- ▶ Release the hydraulic coupling by hand.
- ▶ Disconnect the hydraulic connections, see Hydraulic diagram.
- ▶ Protect the hydraulic connections from contamination with caps.

7.3.12 Disconnecting the electrical connections on the D-boom

- ▶ Disconnect the electrical connections, see Electric wiring diagram.
- ▶ Close the electrical connections off properly with dummy plugs or protective caps.

7.3.13 „Opening“ the D-boom and taking it down

NOTICE
Danger of property damage!
If the pins of the S-boom are in the **pinned** position when taking the D-pivot section down in the turntable, components can be severely damaged.
- ▶ Make sure that the pins on the turntable are in the **unpinned** position.

Note
- ▶ For disassembly of the D-boom, the guying of the guy rods **28** of the SA-frame **19** must be pinned with the rods for flying assembly **30** on the D-pivot section so that the D-boom can be lowered over the SA-frame and removed.

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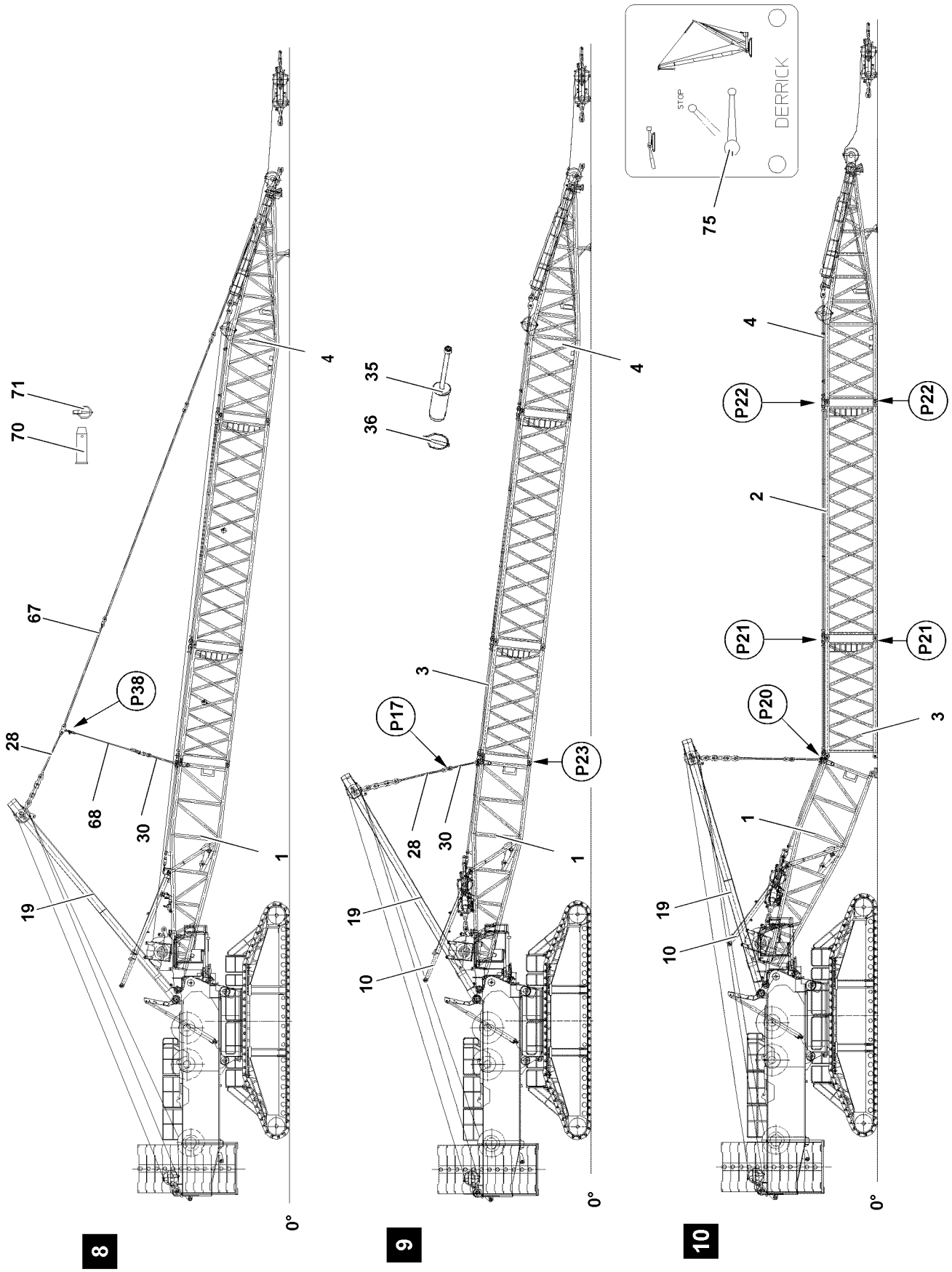

Fig.123557

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When the boom guying between the guy rods **28** of the SA-frame and the guy rods **67** of the D-intermediate section is unpinned:

- ▶ Pin the guy rods of the SA-frame **19** and the rods for flying assembly **30** of the D-pivot section **1** at point **P17,**, insert the pins and secure with safety locking pins, see illustration **9**.
- ▶ Luff the SA-frame **19** up until the guying between the SA-frame and the D-pivot section is tensioned.

WARNING
Falling D-boom!
When unpinning the D-boom on the D-pivot section, the D-boom can fall down.
Death, severe bodily injuries, property damage.

- ▶ It is prohibited for anyone to remain under the D-boom during the unpinning procedure.
- ▶ Make sure that the D-boom is safely held by the guying.

- ▶ Unpin the D-pivot section **1** on the D-intermediate section **3**: Release the safety locking pins **36** on both sides at point **P23** and unpin the pins **35**.

When the pins **35** are unpinned on both sides at point **P23**:

- ▶ Luff the SA-frame down and take the D-boom down on the ground, see illustration **10**.
- ▶ Luff the SA-frame down until the guying is relieved.
- ▶ Unpin the guying: Release and unpin the pin.

NOTICE
Danger of property damage!
If the SA-frame **19** with an installed and unguyed D-pivot section **1** is erected further than 90°, components can be seriously damaged.

- ▶ Do not erect the SA-frame **19** with an installed and unguyed D-pivot section **1** too far.

- ▶ Luff the SA-frame up to maximum 90°.

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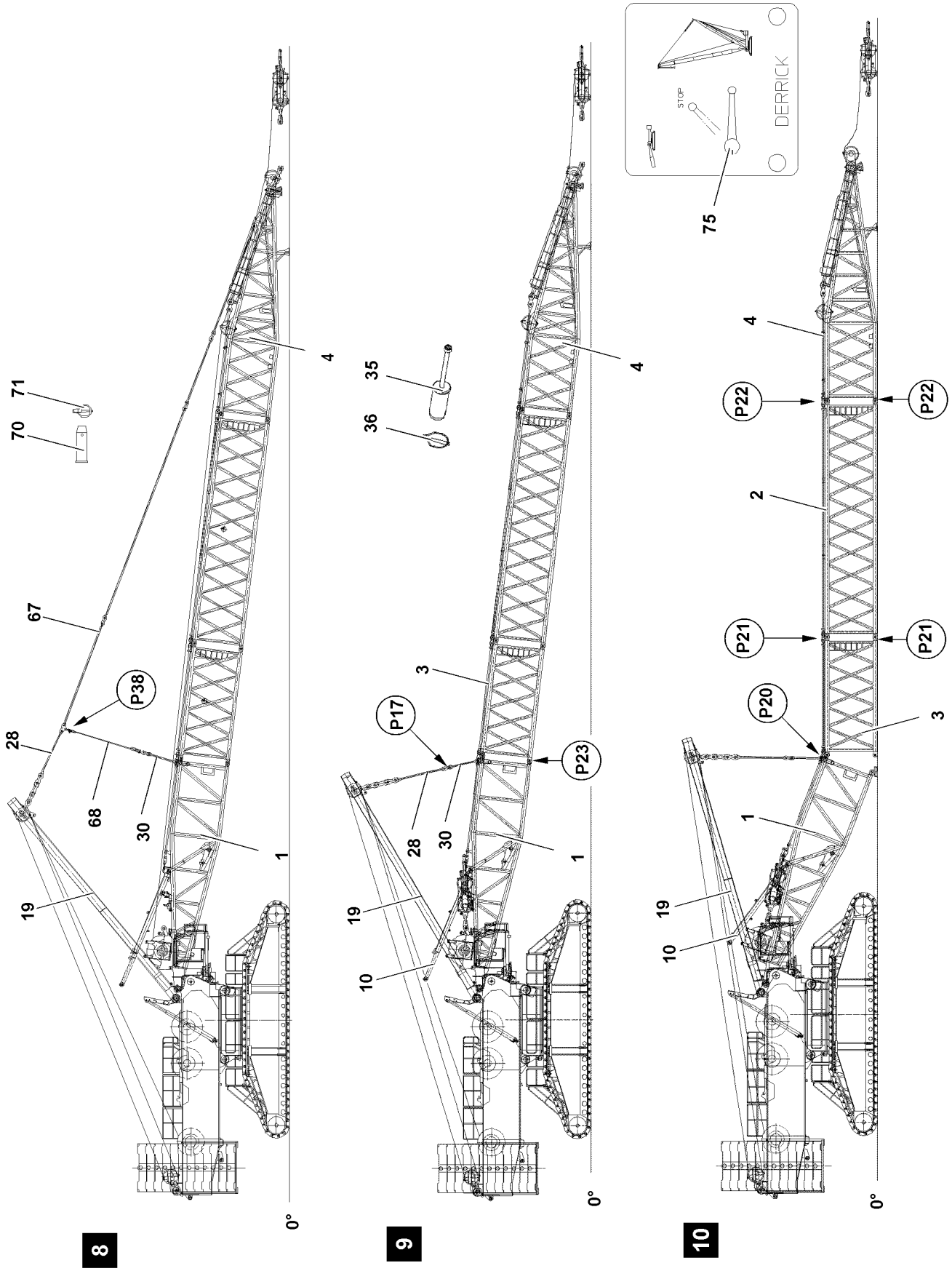

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Fig.123557

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7.3.14 Retracting the D-relapse cylinder

WARNING
Danger of fatal injury due to the D-boom!
Death, severe bodily injuries, property damage.
▶ The ball valve must be secured during crane operation to prevent unintended actuation.

The piston rod on the D-relapse cylinder **10** must be retracted by actuating the ball valve **75**, see illustration **10**.

Ball valve positions	
Horizontal	Crane operation, extend the piston rod
Vertical	Assembly, retract the piston rod
45°	STOP (the piston rod cannot be retracted / extended)

Make sure that the following prerequisite is met:
– All hydraulic connections have been made.

▶ Move the ball valve **75** into vertical position.

Result:

– The piston rods of the D-relapse cylinders **10** retract.

Note
▶ The ball valve is secured by closing the cabinet door and removing the key.

▶ Close the cabinet door and pull out the key.
▶ Hand the key to an authorized person.

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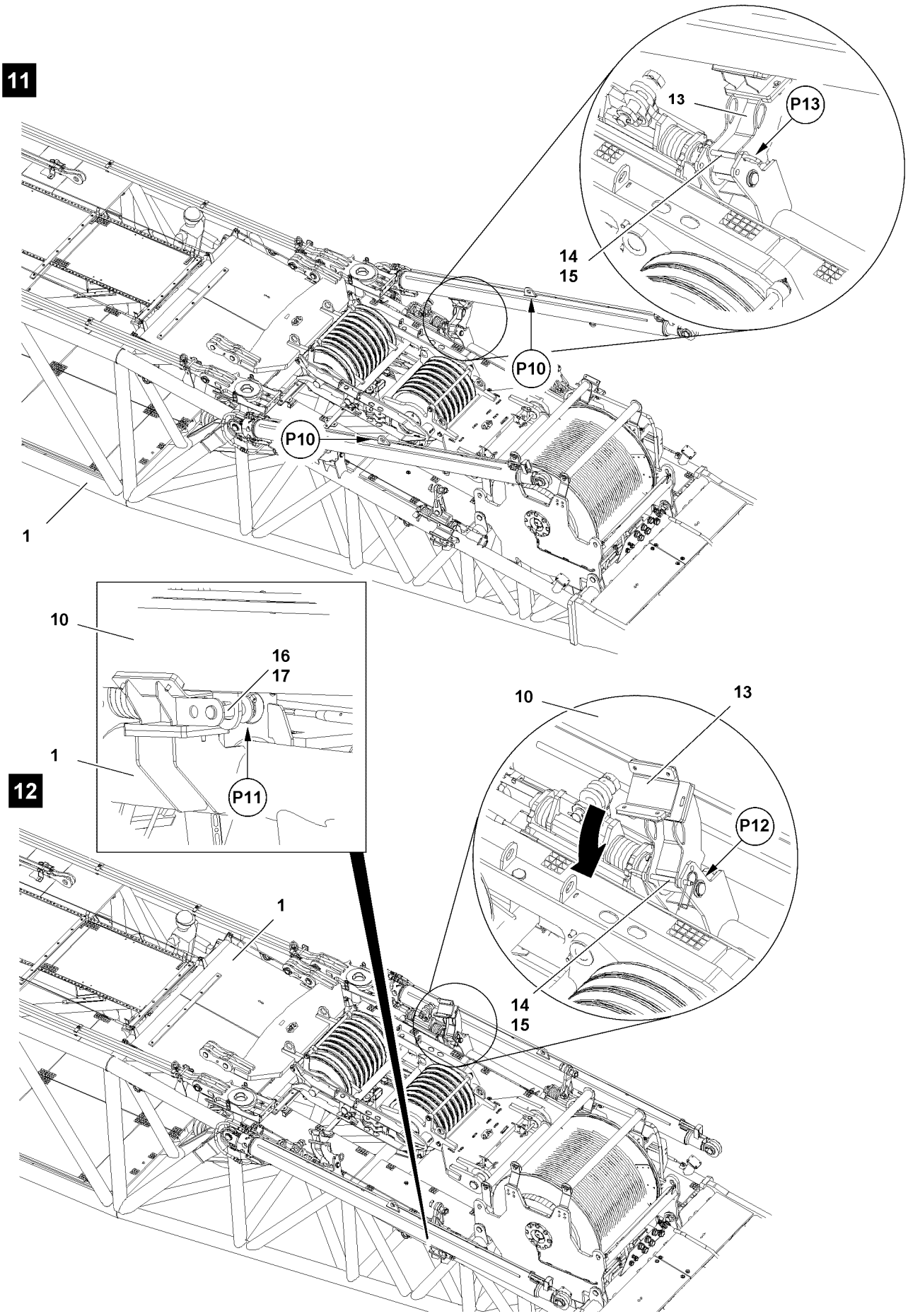

Fig.116973

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7.3.15 Taking the D-relapse cylinder down and securing it

- ▶ Remove the safety locking pin **17** at point **P11** and unpin the pin **16**, see illustration **12**.
- ▶ Fasten the D-relapse cylinder **10** to the auxiliary crane at point **P10**, see illustration **11**.
- ▶ Lift the D-relapse cylinder with the auxiliary crane.
- ▶ Remove the spring retainer **15** at point **P13** and unpin the grip pin **14**, see illustration **11**.

WARNING
Danger of crushed limbs!
When swinging the support **13**, fingers and hands can be crushed.
- ▶ Do not reach with your hands into the danger zone.

- ▶ Swing the support **13** down to the stop.
- ▶ Insert the grip pin **14** at point **P12** and secure with the spring retainer **15**, see illustration **12**.

Result:

– The support **13** is secured in the transport position.

WARNING
Danger of crushed limbs!
When placing the D-relapse cylinder **10** down, fingers and hands can be crushed.
- ▶ Do not reach with your hands into the danger zone.

- ▶ Take the D-relapse cylinder **10** down with the auxiliary crane.
- ▶ Remove the fastening equipment at point **P10**.
- ▶ Insert the pin **16** at point **P11** and secure with the safety locking pin **17**.

Result:

– The D-relapse cylinder **10** is secured in the transport position.

- ▶ Swing the second support into operating position.

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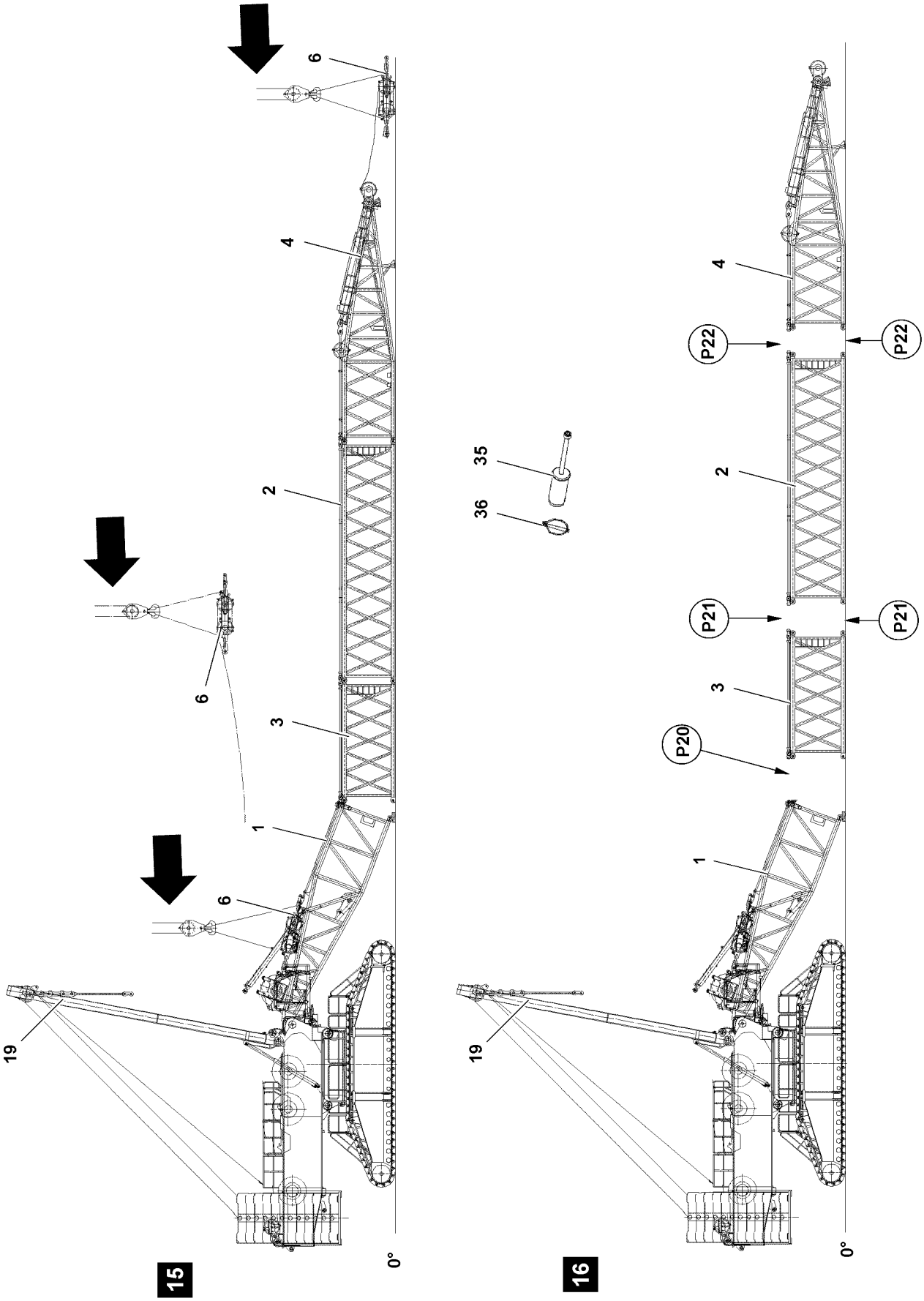

Fig.116993

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7.3.16 Taking the luffing pulley block down into the transport receptacle on the D-pivot section

Make sure that the following prerequisites are met:
- The lower and the upper pulley block are pinned together as a „transport unit“ luffing pulley block **6**.
- The rope retaining pins on the D-end section are released and unpinned.
- The guy rods are taken down in the transport retainers and secured.
- The SA-frame is luffed up to approx. 100°.
- The D-boom is laying fully on the ground (on the substructure).
- The electrical connections are disconnected.
- The electrical connections are closed off with dummy plugs, protective caps or caps.

▶ Fasten the luffing pulley block **6** to the auxiliary crane.
▶ Tension the fastening equipment between the luffing pulley block and the hook block of the auxiliary crane.

NOTICE
Slack rope formation!
▶ Hold the control rope of winch 3 always slightly tensioned.

▶ Pull the luffing pulley block **6** with the auxiliary crane to the D-pivot section while spooling up winch 3 at the same time, see illustration **15**.

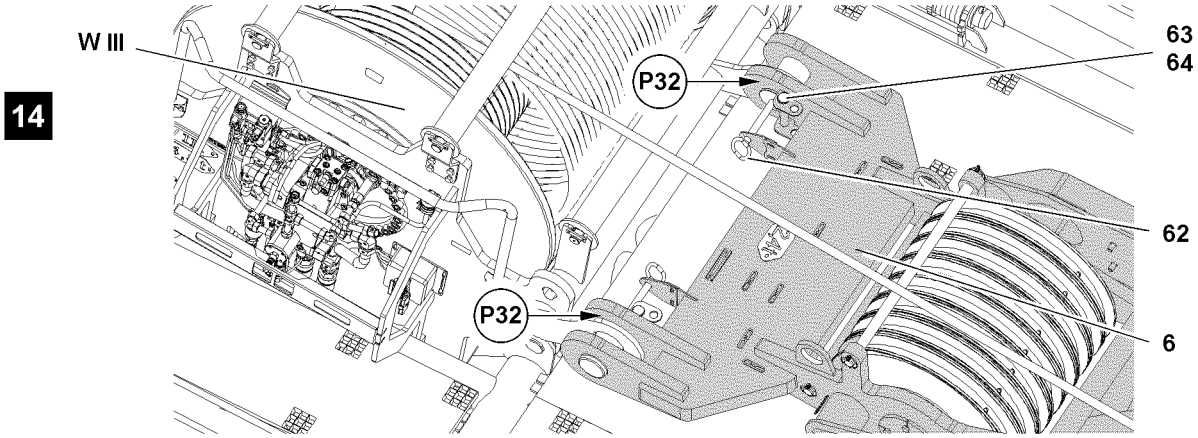

Fig.116994: Pinning the luffing pulley block

▶ Place the luffing pulley block **6** in the transport receptacle on the D-pivot section.
▶ Pin and secure the luffing pulley block **6** on the D-pivot section with winch 3 at point **P32**: Insert the pin **62** and secure with the retaining pin **63** and spring retainer **64**, see illustration **14**.

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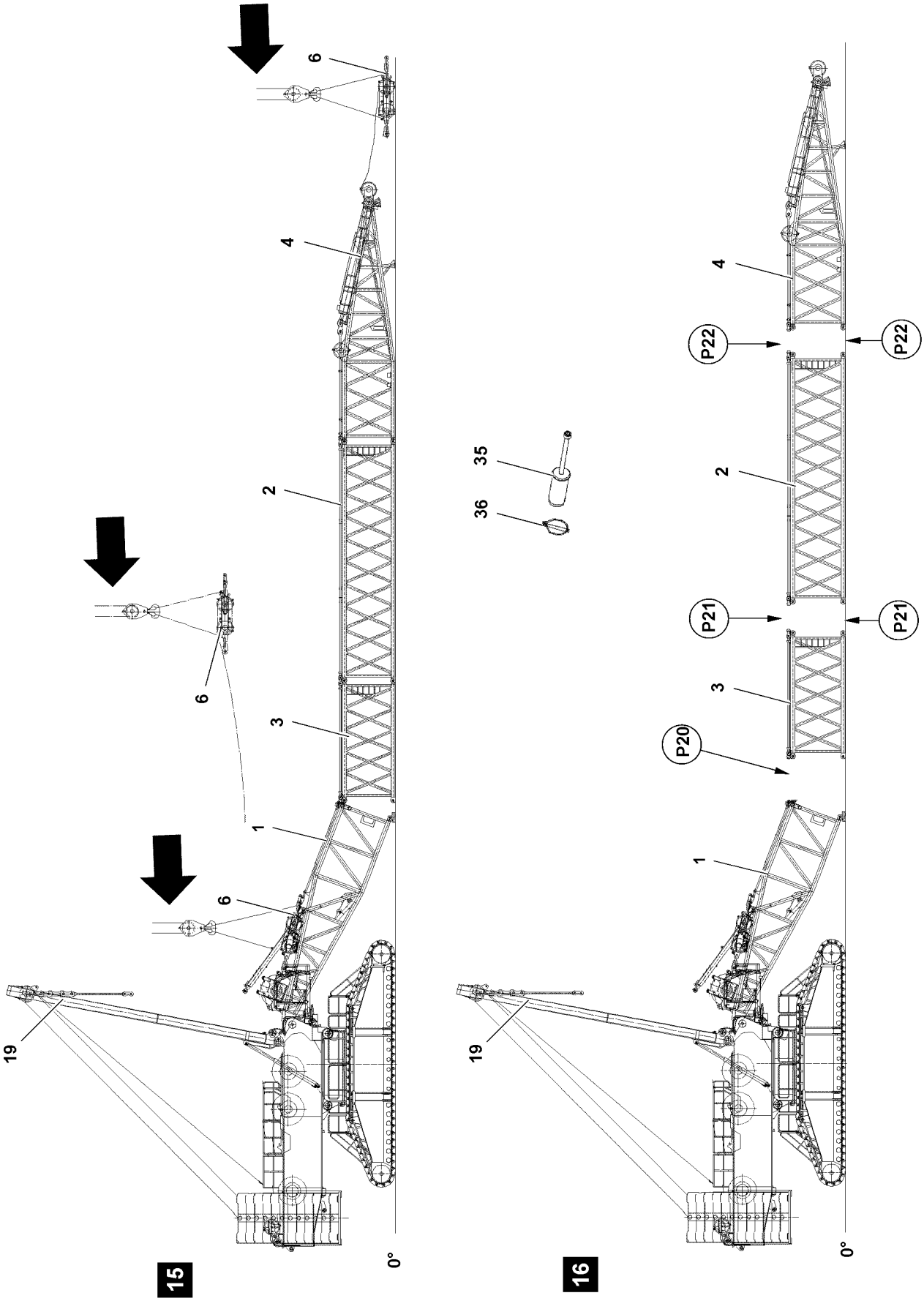

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Fig.116993

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7.3.17 Disassembling the D-lattice sections

WARNING
Tipping lattice sections!
When the lattice sections are unpinned, they can tip over, depending on the ground or the substructure.
Death, severe bodily injuries, property damage.
- ▶ The lattice sections must be safely held by the auxiliary crane before unpinning them.
- ▶ The fastening equipment must be tensioned before unpinning.

Note
- ▶ Always support the D-lattice sections sufficiently for easier disassembly.
- ▶ Pin and unpin the D-lattice sections with the pin pulling device, see Crane operating instructions, chapter 5.30.

Note
- ▶ Fastening points, see section „Fastening points for derrick components“.

Make sure that the following prerequisite is met:
– The luffing pulley block is pinned and secured on winch 3.

▶ Fasten the D-end section **4** to the auxiliary crane.

When the D-end section is being held by the auxiliary crane:
- ▶ Release the pin **35** at points **P22** and unpin.
- ▶ Remove the D-end section with the auxiliary crane, see illustration **16**.
- ▶ Fasten the D-intermediate section **2** to the auxiliary crane.

When the D-intermediate section is being held by the auxiliary crane:
- ▶ Release the pin **35** at points **P21** and unpin.
- ▶ Remove the D-intermediate section with the auxiliary crane, see illustration **16**.
- ▶ Fasten the D-intermediate section **3** to the auxiliary crane.

When the D-intermediate section is being held by the auxiliary crane:
- ▶ Release the pin **35** at point **P20** and unpin.
- ▶ Remove the D-intermediate section with the auxiliary crane, see illustration **16**.

7.3.18 Disconnecting the hydraulic connections to the D-pivot section

The hydraulic connections are made with quick couplings.

When disconnecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

WARNING
Pressure in the hydraulic lines!
If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.
Death, severe bodily injuries, property damage.
- ▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

- ▶ Release the hydraulic coupling by hand.
- ▶ Disconnect the hydraulic connections, see Hydraulic diagram.
- ▶ Protect the hydraulic connections from contamination with caps.

7.3.19 Disconnecting the electrical connections to the D-pivot section

- ▶ Disconnect the electrical connections, see Electric wiring diagram.
- ▶ Close the electrical connections off properly with dummy plugs or protective caps.

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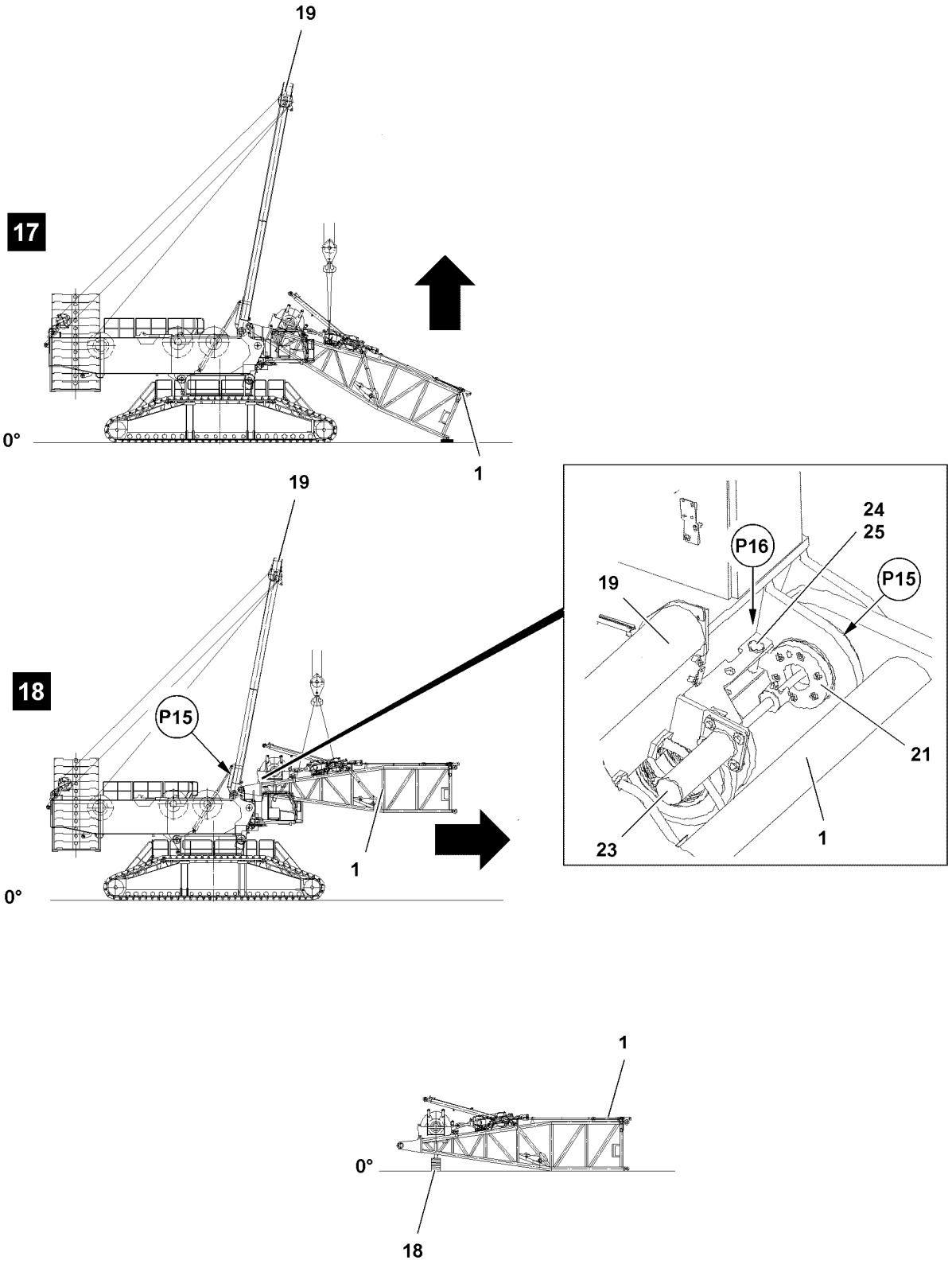

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Fig.116995

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7.3.20 Unpinning the D-pivot section on the SA-frame

Make sure that the following prerequisites are met:
- The D-lattice sections are removed.
- The crane engine is running.

▶ Fasten the D-pivot section **1** to the auxiliary crane.
▶ Lift the D-pivot section **1** with the auxiliary crane off the ground, see illustration **17**.

When the D-pivot section **1** is lifted off the ground:
▶ Release the electrical and hydraulic connections from the turntable to the D-pivot section, see section „Disconnecting the hydraulic and electrical connections“.
▶ Release the connector pin **21**: Remove the spring retainer **25** at point **P16** and unpin the retaining pin **24**, see illustration **18**.

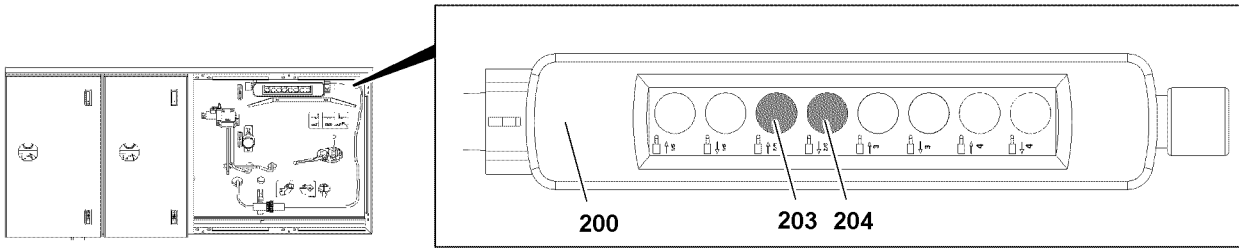

Fig.123564: Control panel

▶ Unpin the connector pins **21** with the hydraulic pin pulling device at point **P15**.
▶ Unpin the connector pins **21** on both sides: Press the button **204** on the control panel **200** and „hold it down“ until the connector pins **21** are completely unpinned.

WARNING
Danger of tipping over!
If the D-pivot section is taken down on the ground, then it must be supported accordingly.
If the D-pivot section is not properly supported, then it can tip forward.
Death, severe bodily injuries, property damage.
▶ Support properly.
▶ Only set the D-pivot section **1** down on a proper substructure **18**.

▶ Remove the D-pivot section with the auxiliary crane and put it down on the substructure **18**.

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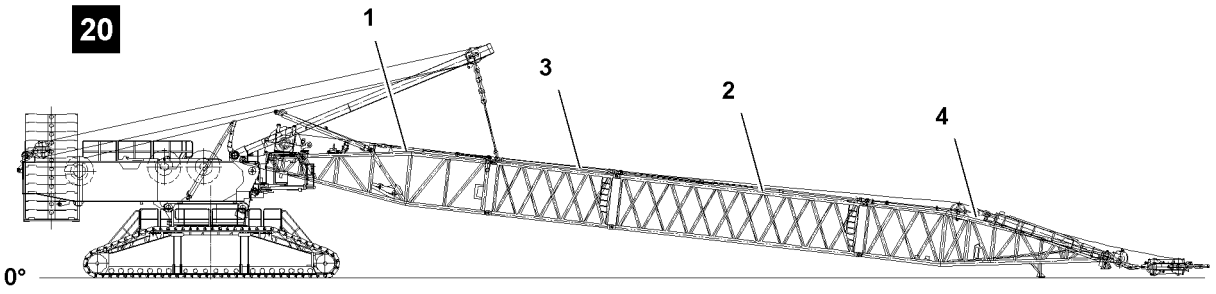

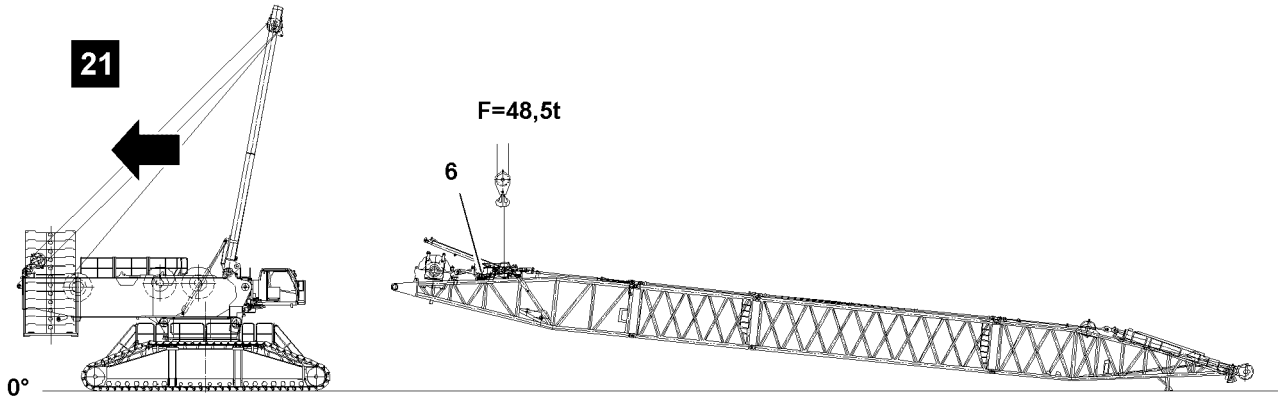

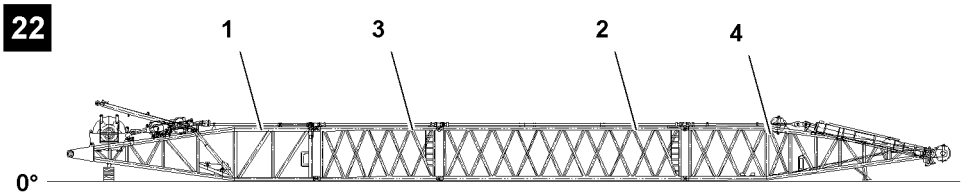

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Fig.116997

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8 D-boom disassembly on the ground

8.1 Disassembling the D-boom on the ground

Note

▶ For disassembly „on the ground“, the D-pivot section, D-intermediate sections and D-end section can be unpinned and removed as a preassembled unit directly on the crane.

WARNING

Danger of accident!

If the following conditions are not observed, personnel can be severely injured or killed.

▶ Disassembly of the D-boom „on the ground“ is only described as an example, for the detailed disassembly process, see section „Disassembling the D-boom in sections“.

Make sure that the following prerequisites are met:

- The crane is properly supported and horizontally aligned.
- The counterweight has been installed on the turntable according to the load chart.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection settings have been compared with the actual set up configuration.
- The hydraulic and electrical connections are disconnected.
- The luffing pulley block is pinned and secured on the D-pivot section.
- The hoist ropes are reeved out.

▶ Erect the SA-frame.
▶ Fasten the D-boom to the auxiliary crane.
▶ Tension the fastening equipment.
▶ Unpin the D-boom: Unpin the pin on the SA-frame, see section „Disassembling the D-boom in sections.“

When the D-boom is unpinned:

▶ Move the crane carefully away from the pin location, see illustration **21**.
▶ Take the D-boom down on the ground with the auxiliary crane, see illustration **22**.
▶ Disassemble the D-lattice sections, see section „Disassembling the D-boom in sections.“

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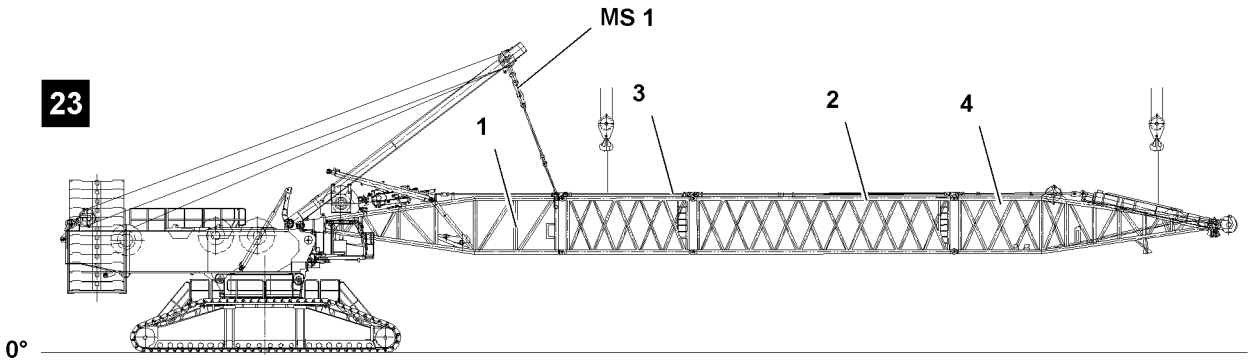

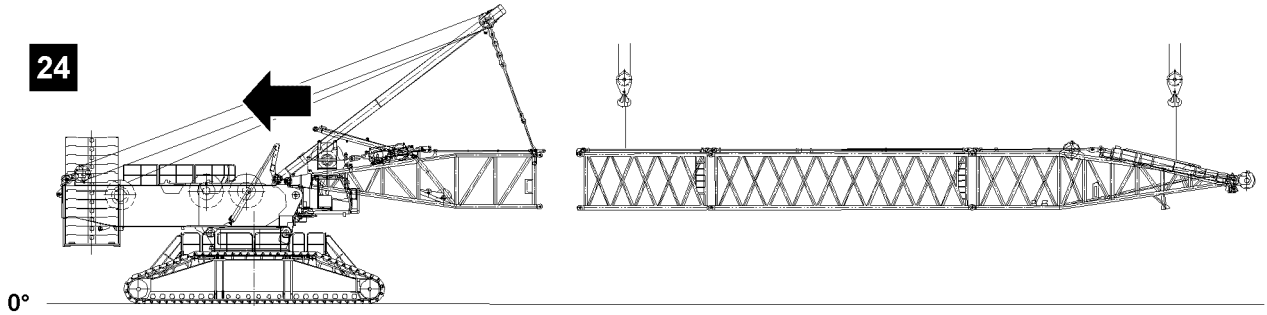

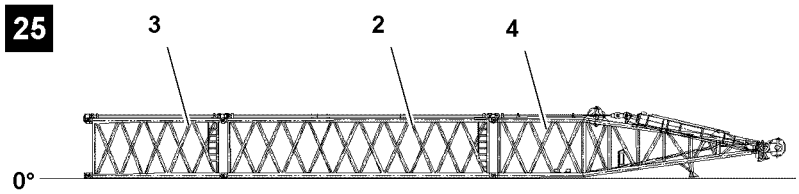

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Fig.116998

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9 Flying D-boom disassembly

9.1 Flying disassembly of the D-boom

Note

▶ For „flying“ disassembly, the D-intermediate sections and D-end section can be unpinned and removed as a preassembled unit with auxiliary cranes on the D-pivot section.

WARNING

Danger of accident!

If the following conditions are not met, personnel can be severely injured or killed.

▶ The maximum permissible total force on test point MS1 of -145 t may not be exceeded.

▶ Disassembly of the D-boom in „flying mode“ is only described as an example, for the detailed disassembly process, see section „Disassembling the D-boom in sections“.

Make sure that the following prerequisites are met:

– The crane is properly supported and horizontally aligned.
– The counterweight has been installed on the turntable according to the load chart.
– The LICCON overload protection has been set according to the data in the load chart.
– The LICCON overload protection settings have been compared with the actual set up configuration.
– The hydraulic and electrical connections are disconnected.
– The hoist ropes are reeved out.

▶ Fasten the D-boom to the auxiliary cranes, see illustration **23**.

▶ Tension the fastening equipment.

▶ Unpin the D-boom on the D-pivot section: Unpin the pin, see section „Disassembling the D-boom in sections.“

When the D-boom is unpinned:

▶ Move the crane carefully away from the pin location, see illustration **24**.

▶ Take the D-boom down on the ground with the auxiliary cranes, see illustration **25**.

▶ Disassemble the D-lattice sections, see section „Disassembling the D-boom in sections.“

▶ Take the D-pivot section down and remove it, see section „Disassembling the D-boom in sections.“

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5.07 SW/SDW boom combination

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Fig.195219

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1 Component overview

Note
▶ The assembly sections are marked with their own weight.

Note
▶ Dimensions and weights, see the Crane operating instructions, chapter 1.03.

1.1 Assembly unit I

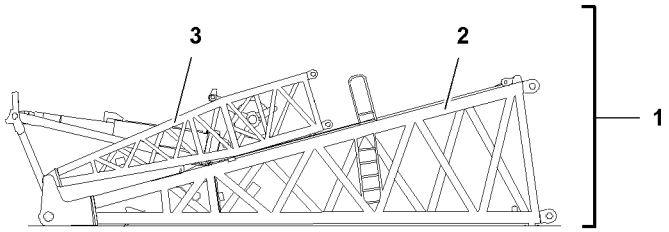

Fig.124286: Assembly unit I

Position	Component
1	Assembly unit I
2	W-pivot section
3	WA-frame 1, pivot section

1.2 Assembly unit II

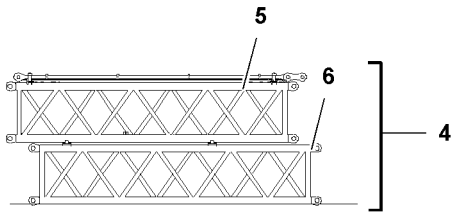

Fig.124287: Assembly unit II

Position	Component
4	Assembly unit II
5	WA-frame 2 intermediate section
6	WA-frame 1 intermediate section

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1.3 Assembly unit III

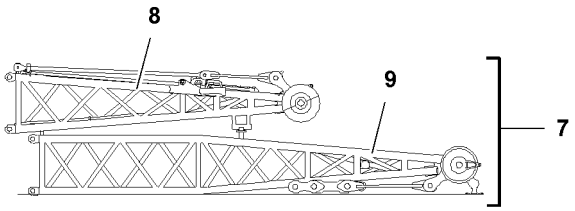

Fig.124288: Assembly unit III

Position	Component
7	Assembly unit III
8	WA-frame 2, end section
9	WA-frame 1, end section

1.4 Assembly unit IV

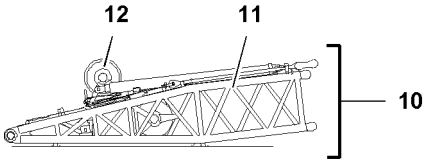

Fig.124289: Assembly unit IV

Position	Component
10	Assembly unit IV
11	WA-frame 2, pivot section
12	Change over pulley

1.5 S-intermediate section 12 m

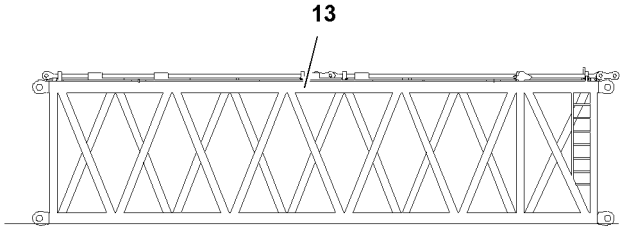

Fig.124290: S-intermediate section 12 m

Position	Component
13	S-intermediate section 12 m

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1.6 SL-reducer section

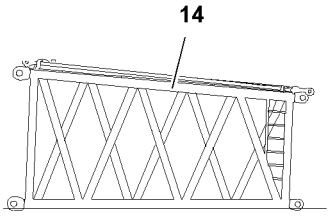

Fig.124291: SL-reducer section

Position	Component
14	SL-reducer section

1.7 L-intermediate section 12 m

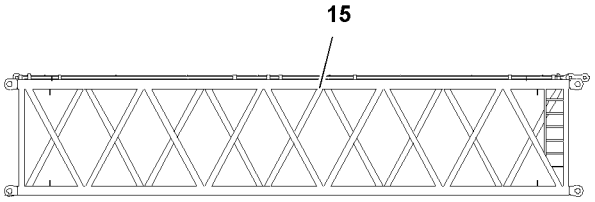

Fig.124292: L-intermediate section 12 m

Position	Component
15	L-intermediate section 12 m

1.8 L-end section

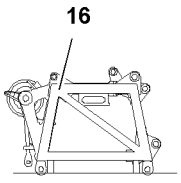

Fig.124293: L-end section

Position	Component
16	L-end section

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2 Fastening points

WARNING
Lattice component not properly fastened!
If the lattice component is not properly fastened on the specified fastening positions, then the lattice component can fall down.
Death, severe bodily injuries, property damage.
▶ Make sure that the fastening equipment is properly fastened on the specified fastening positions.

WARNING
Selection of incorrect fastening equipment!
Death, severe bodily injuries, property damage.
▶ Select fastening equipment according to the weight labels on the respective crane components.

2.1 Fastening points Assembly unit I

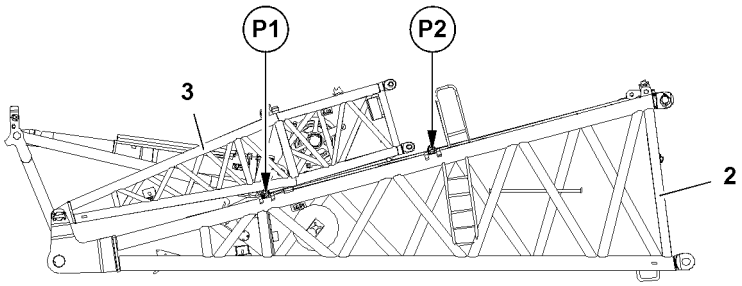

Fig.122181: Fastening points Assembly unit I

Fastening points	
P1 and P2	Assembly unit I

2.2 Fastening points Assembly unit II

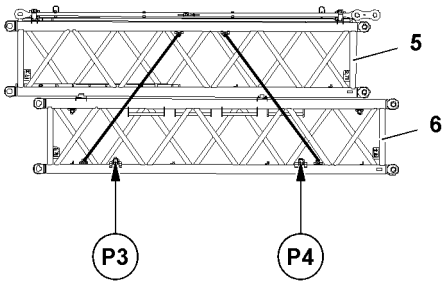

Fig.117015: Fastening points Assembly unit II

Fastening points	
P3 and P4	Assembly unit II

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2.3 Fastening points Assembly unit III

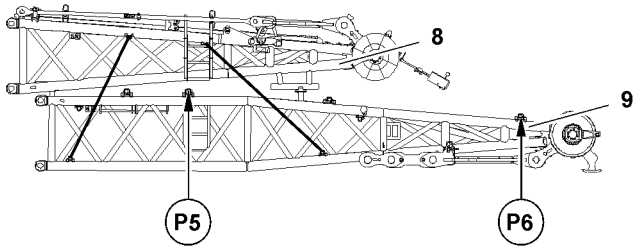

Fig.117016: Fastening points Assembly unit III

Fastening points	
P5 and P6	Assembly unit III

2.4 Fastening points Assembly unit IV

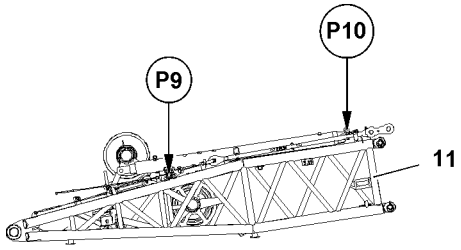

Fig.117017: Fastening points Assembly unit IV

Fastening points	
P9 and P10	Assembly unit IV

2.5 Fastening points Assembly unit V

Note

▶ Assembly unit V consists of the assembled assembly unit II and assembly unit III.

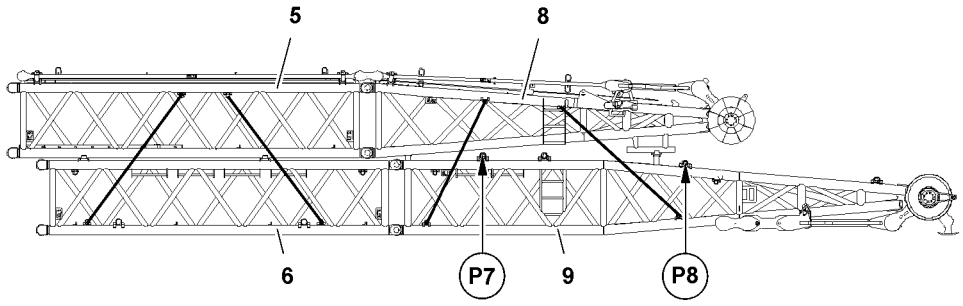

Fig.117022: Fastening points Assembly unit V

Fastening points	
P7 and P8	Assembly unit V

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2.6 Fastening points S-intermediate section 12 m

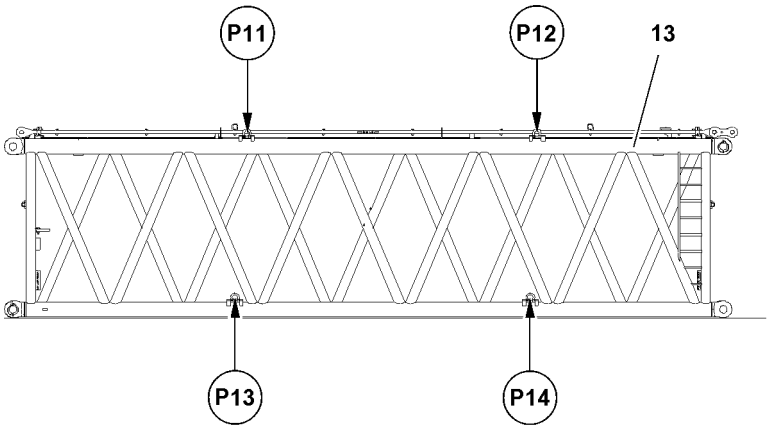

Fig.117018: Fastening points S-intermediate section 12 m

Fastening points	
(P11 and P12) **or** (P13 and P14)	S-intermediate section 12 m

2.7 Fastening points SL-reducer section

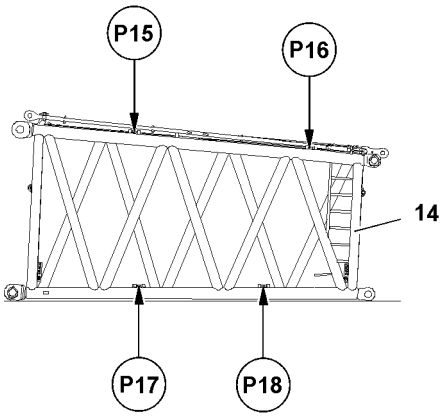

Fig.117019: Fastening points SL-reducer section

Fastening points	
(P15 and P16) **or** (P17 and P18)	SL-reducer section

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2.8 Fastening points L-intermediate section 12 m

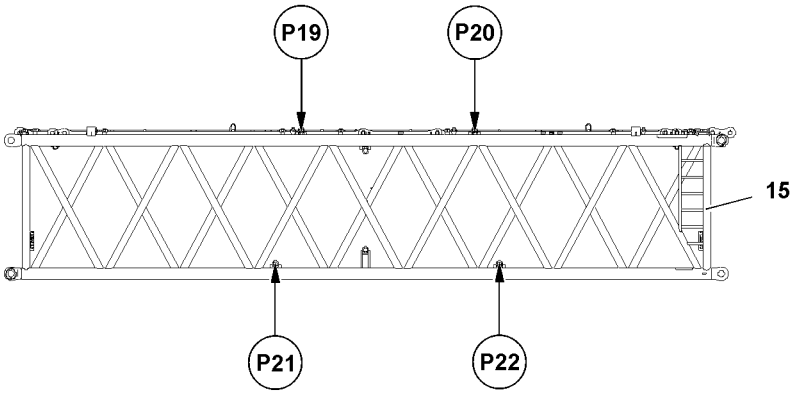

Fig.117020: Fastening points L-intermediate section 12 m

Fastening points	
(P19 and P20) **or** (P21 and P22)	L-intermediate section 12 m

2.9 Fastening points L-end section

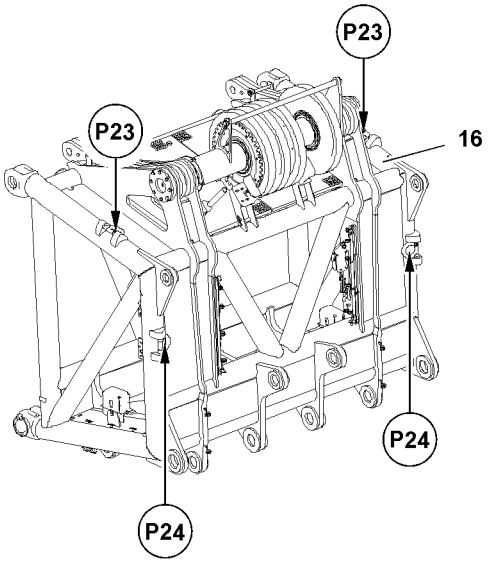

Fig.117021: Fastening points L-end section

Fastening points	
P23 **or** P24	L-end section

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2.10 Fastening points Change over pulley

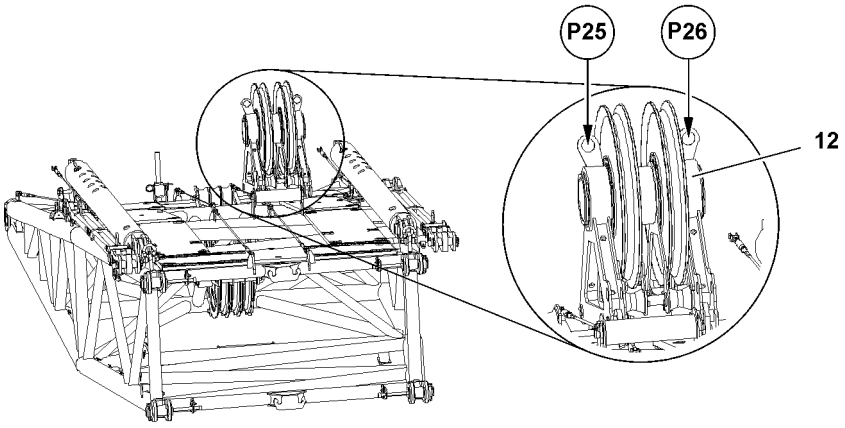

Fig.117023: Fastening points Change over pulley

Fastening points	
P25 and P26	Change over pulley

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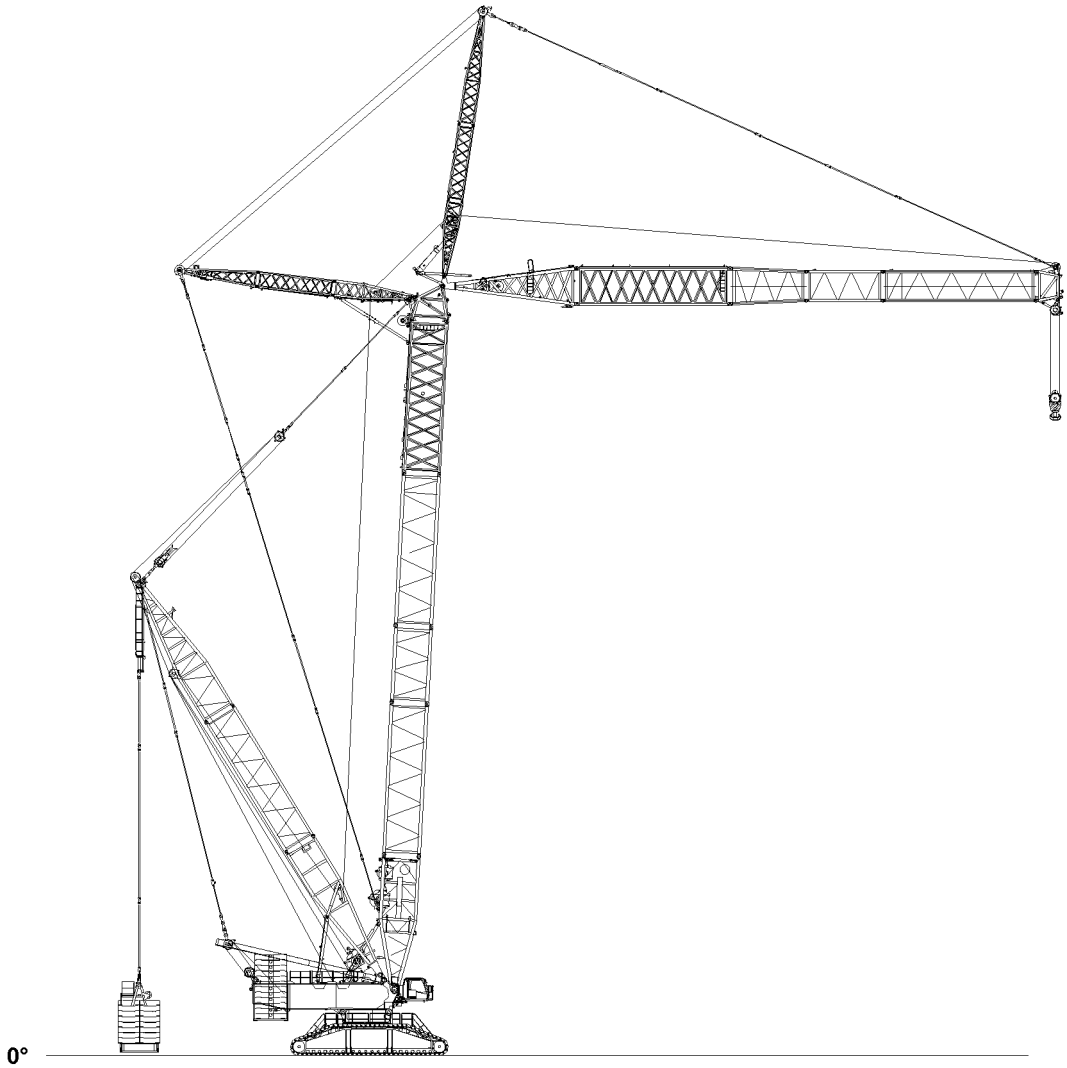

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Fig.121038: Assembling

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3 Assembling

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.

- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ When closing or opening boom systems during boom assembly or boom disassembly, no persons may remain on the boom system or in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane driver of the main crane must be in voice contact with the crane driver / crane drivers of the auxiliary crane / auxiliary cranes.
- ▶ For assembly tasks, the crane driver may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
The lattice sections can fall down!
If the lattice sections are not pinned and secured correctly, then they can fall down.
Death, severe bodily injuries, property damage.

- ▶ Pin or unpin both pins at the same horizontal level, i.e. **left and right**.
- ▶ Do not stand under the lattice sections or within the entire danger zone during the pinning and unpinning procedure of the boom.
- ▶ Safely secure the pins in the storage locations as well as in the receptacles.
- ▶ It is prohibited to lean the auxiliary ladder against the component being disassembled.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.

- ▶ Make sure that personnel cannot be caught by components.
- ▶ Make sure that the crane is horizontally aligned.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

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WARNING
Danger of accident!
If no guide is present during assembly work who has voice connection to the crane operator as well as to the drivers of the auxiliary units, then there is a great danger of accidents.
Crane movements, which are carried out without the approval of the guide, can cause accidents.
Death, severe bodily injuries, property damage.
▶ For all assembly work, observe the instructions of the guide.
▶ Make sure that the danger zone can be seen completely by the crane operator and / or the guide.

DANGER
The components can fall down!
Death, severe bodily injuries, property damage.
▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

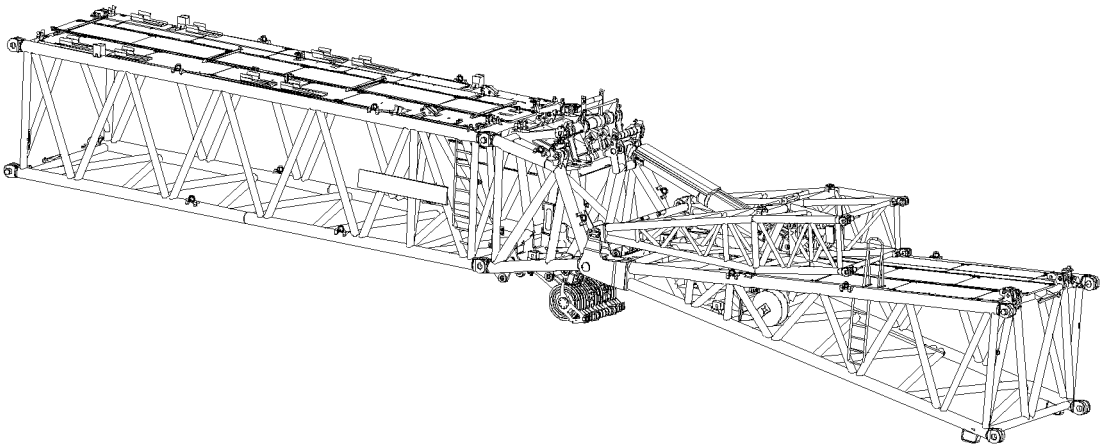

Fig.122798: Assembly - W-assembly unit

WARNING
Collision between S-end section and W-pivot section!
During the entire assembly procedure it must be ensured that the S-end section does not collide with the W-pivot section.
Death, severe bodily injuries, property damage.
▶ Make sure that no collision occurs during assembly.

Make sure that the following prerequisites are met:
- The crane is placed on ground with a sufficient load bearing capacity.
- The crane is horizontally aligned.
- The S-boom is completely assembled and aligned in horizontal direction.
- The counterweight is attached on the turntable according to the load chart and placed on the suspended ballast / ballast trailer.
- The LICCON overload protection has been set according to the data in the load chart.
- All electrical connections on the S-boom have been established.
- The limit switches have been checked for their mechanical function.
- An auxiliary crane is available.

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3.1 Assembling the WA-frames

3.1.1 Exceeding the LICCON overload protection for assembly

WARNING
Danger of accident due to function „Exceedance of shut-off limits of the LICCON overload protection“!
If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload.
Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.

- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ is only permissible in emergencies and for assembly purposes.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ may only be actuated by persons who know the effects of their actions regarding the function „Exceeding the shut off limits of the LICCON overload protection“.
- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ requires the presence of an authorized person and must be performed with utmost caution.
- ▶ Crane operation with activated function „Exceedance of shut off limits of the LICCON overload protection“ is prohibited.

▶ Exceeding the shut off limits of the LICCON overload protection: Engage assembly operation.

Result:

– The shut off limits of the LICCON overload protection are exceeded.
– The assembly icon appears on the LICCON monitor.

Note
▶ See Crane operating instructions, chapter 4.02.

3.1.2 Preparatory work

Assembling the change over pulley

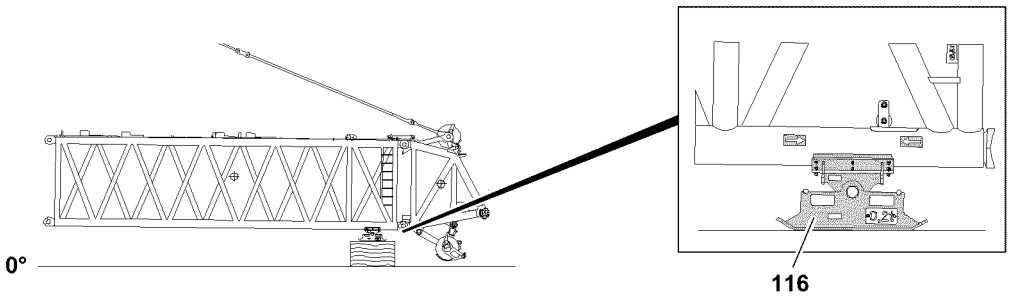

Fig.121049: Assembling the change over pulley - substructure

Make sure that the following prerequisites are met:
– The main boom is aligned parallel to the ground.
– The main boom is placed on the substructure.
– The assembly shoe **116** is set within the arrows.
– An auxiliary crane is available.

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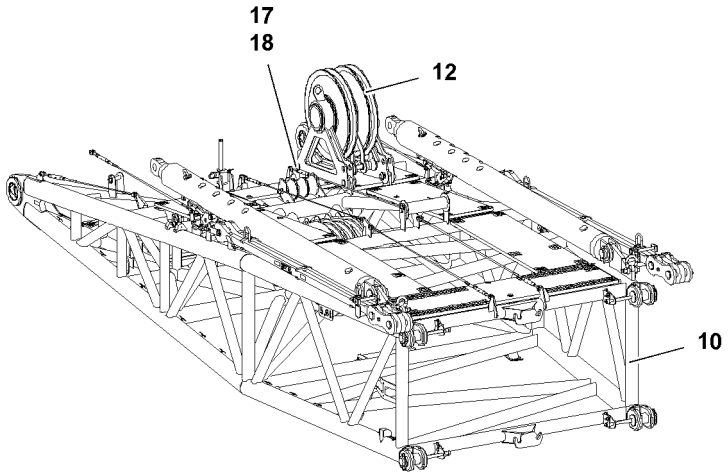

Fig.121046: Assembling the change over pulley - Unpinning the change over pulley

- ▶ Fasten the change over pulley **12** to the auxiliary crane, see section „Fastening points“.
- ▶ Unpin the change over pulley **12** on the assembly unit IV **10**: Remove the four safety locking pins **18** and unpin the pins **17**.

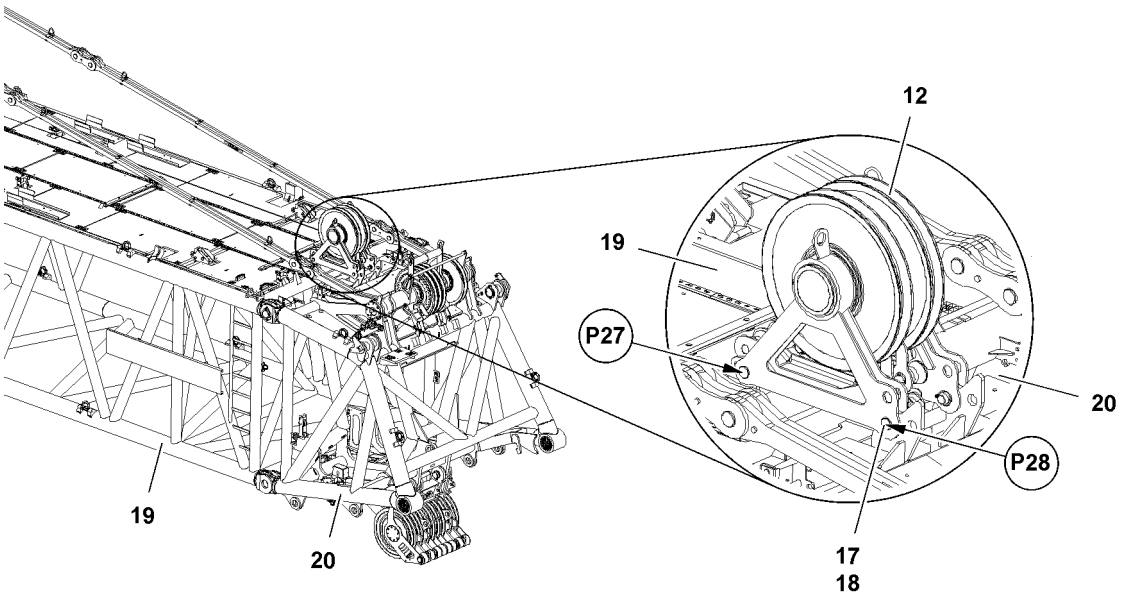

Fig.117025: Assembling the change over pulley - Assembling the change over pulley in the assembly position

- ▶ Lift the change over pulley **12** with the auxiliary crane and position it on the S-end section **20** so it can be pinned on points **P27** and points **P28**.
- ▶ Pin the change over pulley **12** with the S-end section **20**: Insert the pins **17** on both sides on points **P28** and secure with safety locking pins **18**.
- ▶ Pin the change over pulley **12** with the S-adapter **19**: Insert the pins **17** on both sides on points **P27** and secure with safety locking pins **18**.

Placing additional guy rods

Note

- ▶ Depending on the set up configuration, additional guy rods are required. Check the rod plan for the required guy rods.

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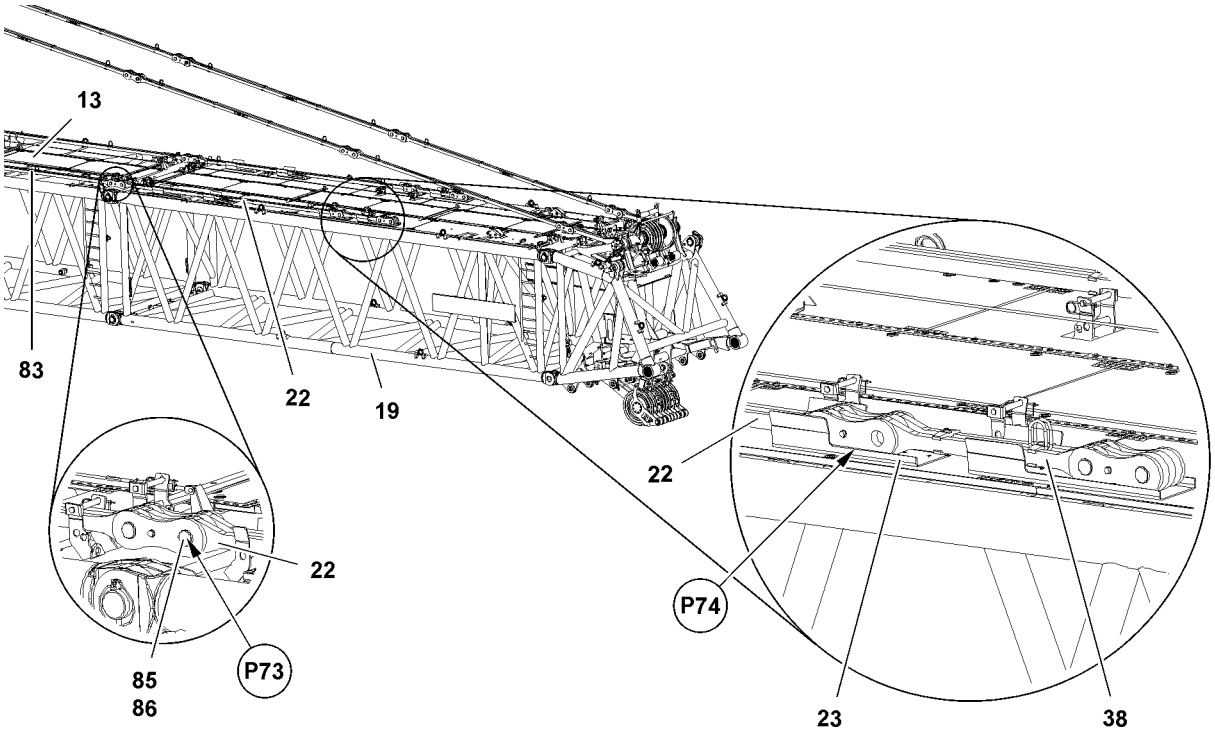

Fig.117027: Placing additional guy rods - Short WA-frames

When the short WA-frames are installed:

▶ Place 6 m guy rods **22** on both sides and pin with the guy rods **83** of the S-intermediate section **13**: Insert the pins **85** on both sides on points **P73** and secure with safety locking pins **86**.

When the short WA-frames are installed and additional guy rods **38** are required:

▶ Place additional guy rods **38** on point **P74** on both sides on the rack **23** of the S-adapter **19**.

▶ Pin and secure the guy rods **38** on both sides with the 6 m guy rods **22**.

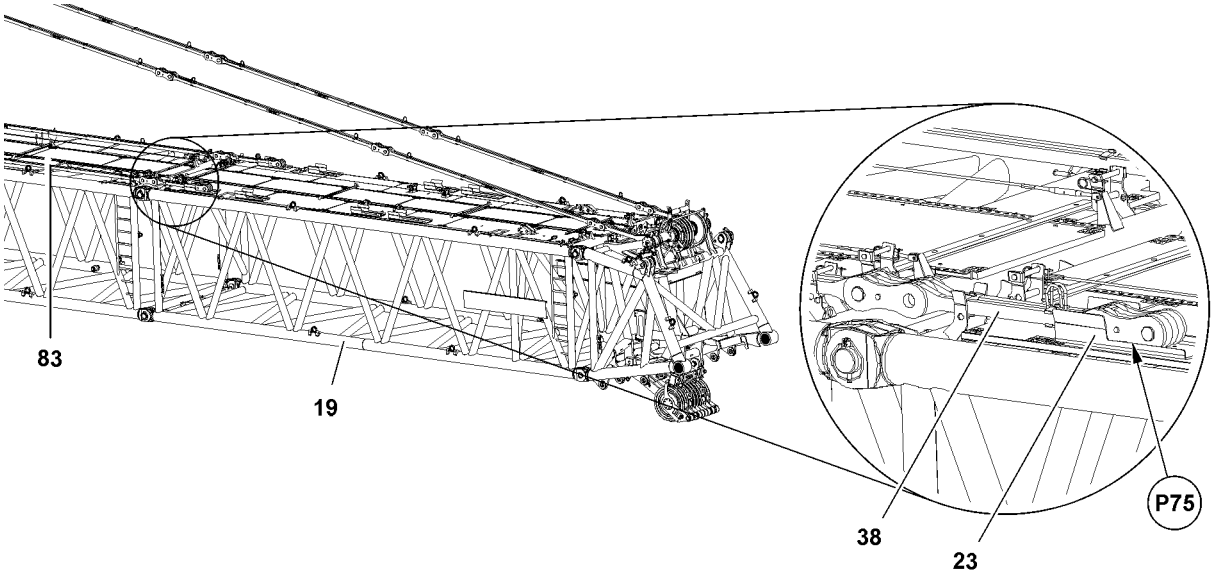

Fig.117051: Placing additional guy rods - Long WA-frames

When the long WA-frames are installed and additional guy rods **38** are required:

▶ Place additional guy rods **38** on point **P75** on both sides on the rack **23** of the S-adapter **19**.

▶ Pin the guy rods **38** on both sides with the guy rods **83** and secure.

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Installing the wind speed sensor

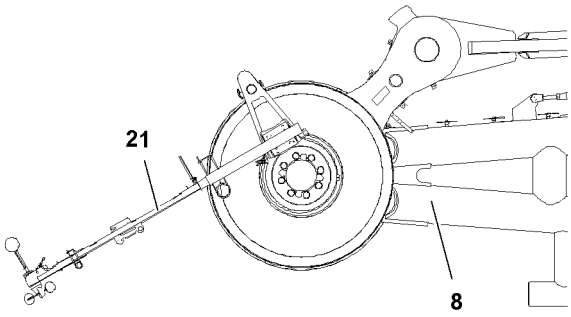

Fig.117026: Installing the wind speed sensor

▶ Install the wind sensor **21** on WA-frame 2 end section **8**.

Assembling the WA-frame intermediate sections with the WA-frame end sections

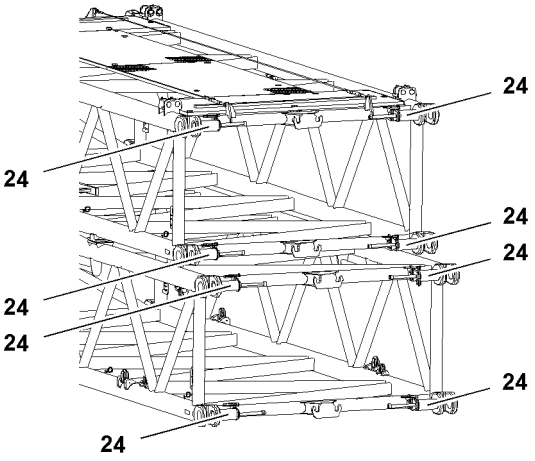

Fig.117028: Assembling the WA-frame intermediate sections with the WA-frame end sections - pin points

Note

▶ If the long WA-frames are required, the intermediate sections are installed first with the end sections. For the short WA-frames this step is not required.

Make sure that the following prerequisites are met:
- The WA-frame intermediate sections (assembly unit II) are on hand.
- All pins **24** on the WA-frame intermediate sections are unpinned.
- An auxiliary crane is available.

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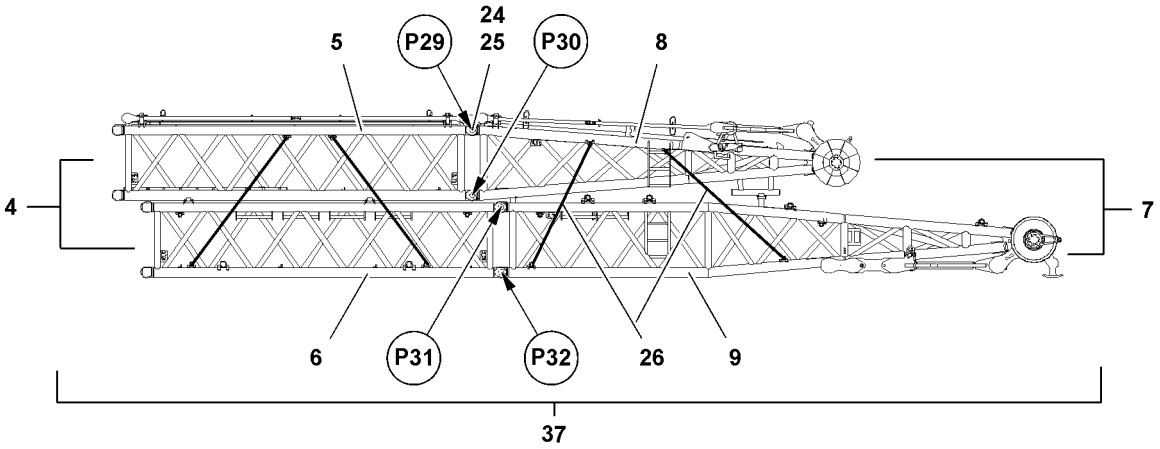

Fig.121047: Assembling the WA-frame intermediate sections with the WA-frame end sections - Assembly procedure

Note

▶ The WA-frame components are pinned with the pin pulling cylinder, see Crane operating instructions, chapter 5.30.

▶ Attach the auxiliary crane on assembly unit III **7**, see section „Fastening points“.
▶ Lift assembly unit III **7** and position it in such a way that it can be pinned on both sides on point **P29**.
▶ Pin assembly unit III **7** with assembly unit II **4**: Insert the pins **24** on both sides on point **P29** and secure with safety locking pin **25**.
▶ Pin assembly unit III **7** with assembly unit II **4**: Insert the pins **24** on both sides on point **P30** and secure with safety locking pin **25**.
▶ Pin assembly unit III **7** with assembly unit II **4**: Insert the pins **24** on both sides on point **P31** and secure with safety locking pin **25**.
▶ Pin assembly unit III **7** with assembly unit II **4**: Insert the pins **24** on both sides on point **P32** and secure with safety locking pin **25**.

Result:

– Assembly unit V **37** completed for assembly.

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3.1.3 Assembling assembly unit I on the S-end section

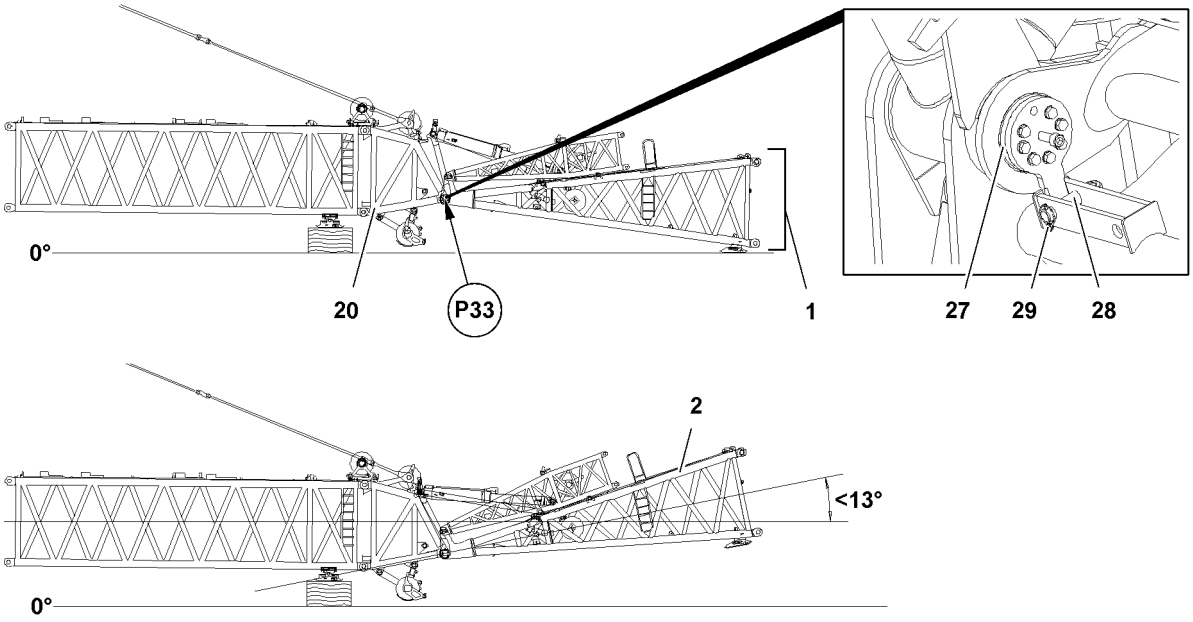

Fig.121050: Assembling assembly unit I on the S-end section - pinning procedure of W-pivot section

Make sure that the following prerequisites are met:
- The main boom is aligned parallel to the ground to 0°.
- The pins **27** on point **P33** are completely unpinned on both sides.
- An auxiliary crane is available.
- The pin pulling cylinder is installed on point **P33** in center detent position.

WARNING
Exceeding the maximum angle between the main boom and the W-pivot section!
If the maximum angle of 13° between the main boom and the W-pivot section is exceeded, a collision will occur. Damaged crane components can cause an accident later during operation.
Death, severe bodily injuries, property damage.
▶ Make sure that the angle between the main boom and the W-pivot section is always less than 13°.

WARNING
Danger of crushing!
If any persons are within the danger zone while lifting the load or during the pin procedure, then these persons can be severely injured or killed.
▶ Make sure, when swinging the W-pivot section in to the pin points, that no persons are within the danger zone.
▶ Swinging the load is prohibited.
▶ Make sure that no personnel is within the danger zone when operating the pin pulling device.
▶ Operate the pin pulling device with utmost caution from the pin pulling aggregate.

▶ Fasten the assembly unit I **1** to the auxiliary crane, see section „Fastening points“.

The assembly unit I **1** can not be installed, when the angle between the W-pivot section **2** and S-boom is larger than 13°.

▶ Position the assembly unit I **1** in such a way that the S-end section **20** can be pinned on point **P33**.

Note
▶ The assembly unit I **1** is pinned with the pin pulling cylinder, see Crane operating instructions, chapter 5.30.

Since the stroke of the pin pulling cylinder is not sufficient it must be reset to insert the pin completely.

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- ▶ Pin the assembly unit I **1** with the S-end section **20**: Insert the pins **27** on both sides on point **P33** with the pin pulling device and secure with retaining elements (pin **28** and safety locking pin **29**).
- ▶ Place the assembly unit I **1** with the auxiliary crane on the ground.
- ▶ Remove the auxiliary crane.

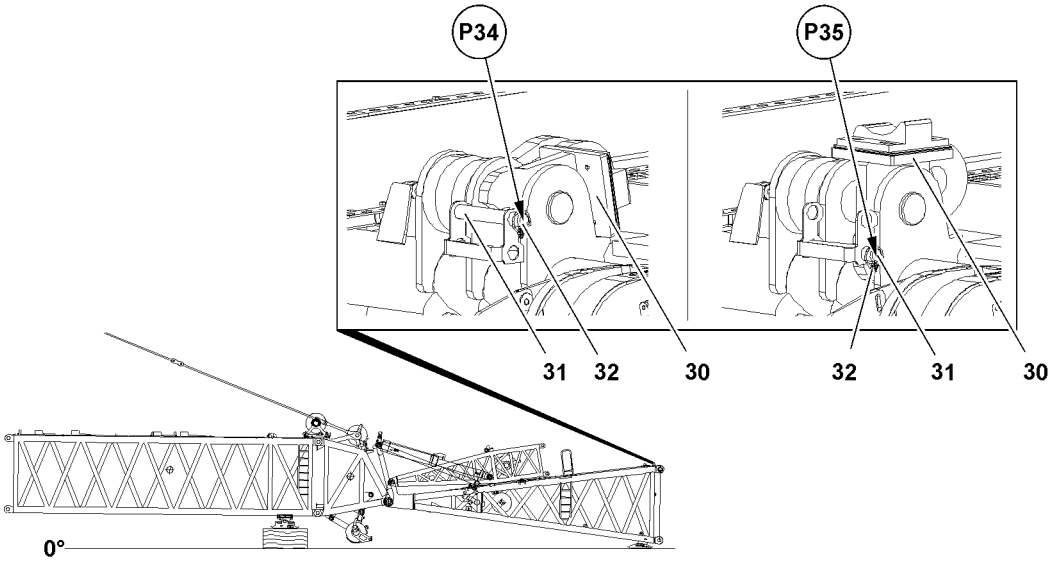

Fig.121051: Assembling the assembly unit I on the S-end section - Installing the racks in operating position

- ▶ Release the rack **30** in transport position: Release the pin **31** on point **P34** and unpin.
- ▶ Align the placement surfaces upward.
- ▶ Secure the rack **30** in operating position: Insert the pin **31** on point **P35** and secure with safety locking pin **32**.
- ▶ Repeat the procedure the same way for the second rack **30**.

3.1.4 Aligning the assembly unit I on the S-end section

Make sure that the following prerequisite is met:
- The assembly unit I **1** is fully assembled.

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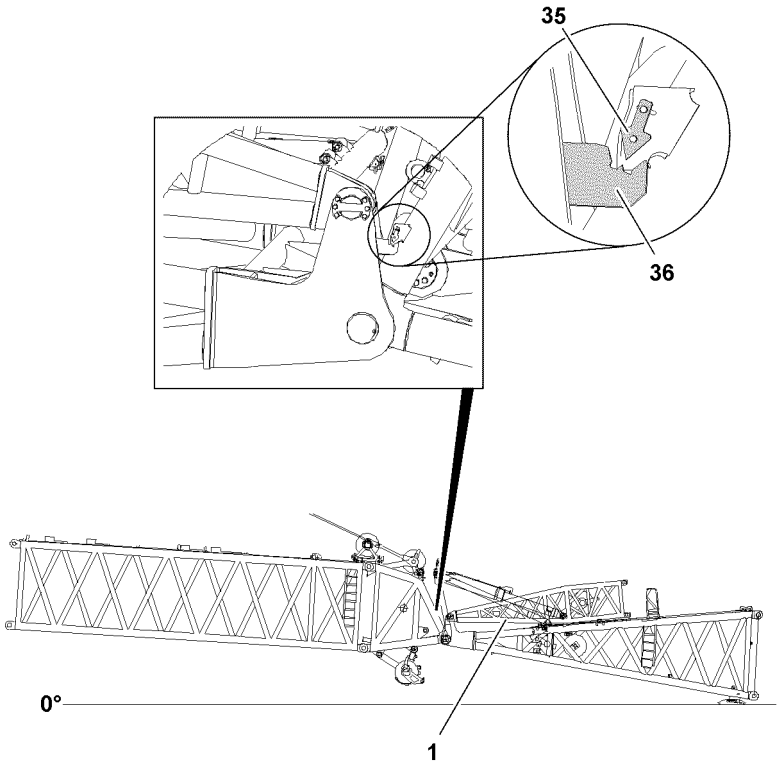

Fig.121043: Aligning the assembly unit I on the S-end section - positioning

WARNING
Damage of crane due to incorrect position of the WA-frame 2 pivot section **11**!
If the mark **35** and the mark **36** do not align, then crane components can be damaged and cause an accident later during operation.
Death, severe bodily injuries, property damage.
▶ Make sure that the mark **35** and the mark **36** align.

▶ Check if the mark **35** and mark **36** are aligned.

Problem remedy
The mark **35** does not align with the mark **36**?
▶ Lift or lower the main boom until the mark **35** and the mark **36** align.

3.1.5 Establishing the electrical connections to the assembly unit I

Note
▶ To establish the electrical connections to the terminal box on the W-assembly unit: Pay attention to the Electrical wiring diagram.

Make sure that the following prerequisite is met:
– The W-assembly unit is fully assembled.

WARNING
Malfunction if dummy plugs are not installed!
If the dummy plugs on the non-required electrical connections are not installed, then malfunctions or functional limitations can occur on the crane.
▶ Make sure that all non-required electrical connections that have a dummy plug are closed off with dummy plugs.
▶ Pay attention to the Electrical wiring diagram.

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▶ As a rule, close off on-required electrical connections (for example for accessories which cannot be installed) with the respective dummy plugs.

NOTICE
Property damage due to dirt and / or corrosion!
If non-required electrical connections are not closed off with the respective protective caps, then dirt and / or corrosion can damage the electrical connections.
This could result in malfunctions.
▶ Make sure that all non-required electrical connections are always closed off properly.
▶ Pay attention to the Electrical wiring diagram.

▶ Close electrical connections, which have no dummy plugs, properly off with the corresponding protective caps.
▶ Establish the electrical connections to the W-pivot section.
▶ Establish the electrical connections to the WA-frame 1 pivot section.
▶ Make sure that all electrical connections to the W-assembly unit have been established.

3.1.6 Assembling the WA-frames

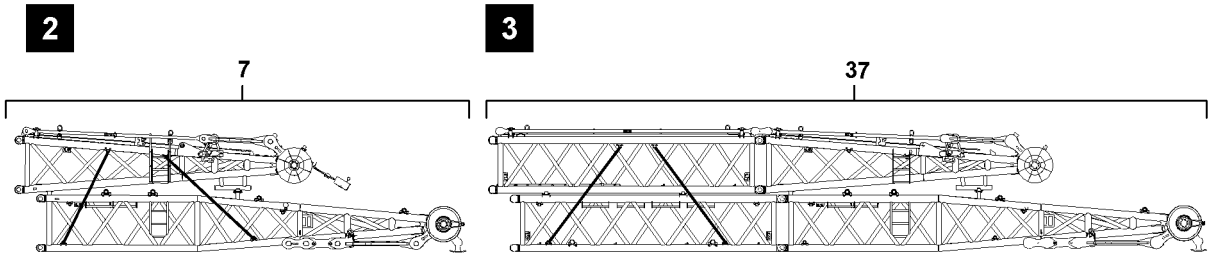

Fig.121044: Assembling the WA-frames - prerequisites

Make sure that the following prerequisites are met:
– The pins **24** are completely unpinned on both sides at point **P39** and point **P40**.
– The assembly unit I is fully assembled.
– An auxiliary crane is available.
– The mark **35** and the mark **36** align.
– When the short WA-frames are installed, then the assembly unit III **7** is rigged on both WA-frame end sections, see illustration **2**.
– When the long WA-frames are installed, then the assembly unit V **37** is completely installed.
– When the long WA-frames are installed, then the assembly unit V **37** is rigged on both WA-frame intermediate sections, see illustration **3**.

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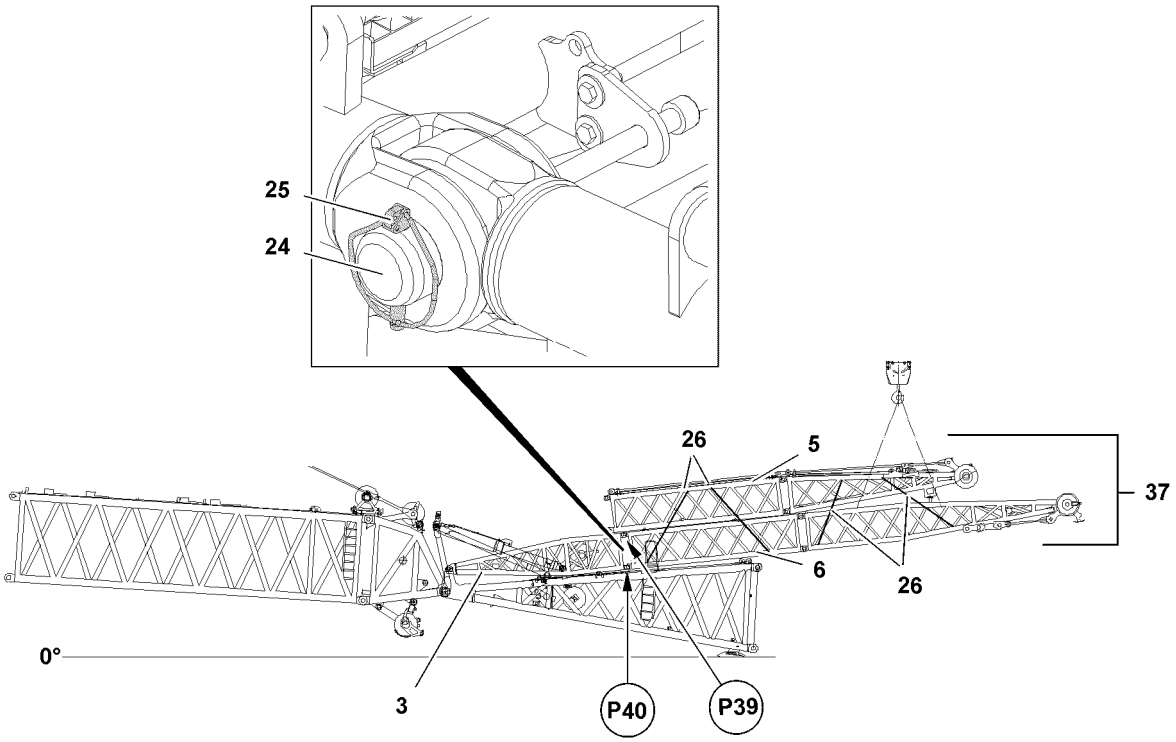

Fig.121041: Assembling the WA-frames - pinning procedure

Note

▶ The assembly procedure is described as an example on the long WA-frames. The assembly procedure for the short WA-frames is handled the same way.

▶ Fasten the assembly unit V **37** to the auxiliary crane, see section „Fastening points“.
▶ Install the pin pulling device on point **P39**.
▶ Lift the assembly unit V **37** with the auxiliary crane and position it in such a way that it can be pinned on point **P39**.
▶ Pin the assembly unit V **37** with WA-frame 1 pivot section **3**: Insert the pins **24** on both sides on point **P39** and secure with safety locking pin **25**.
▶ Lift the assembly unit V **37** with the auxiliary crane until it can be pinned on point **P40**.
▶ Pin the assembly unit V **37** with WA-frame 1 pivot section **3**: Insert the pins **24** on both sides on point **P40** and secure with safety locking pin **25**.
▶ Remove the auxiliary crane.

WARNING
Removed tension belts!
Death, severe bodily injuries, property damage.
▶ Loosen the transport tension belts **26** but do not remove them.

▶ Loosen the transport tension belts **26**.

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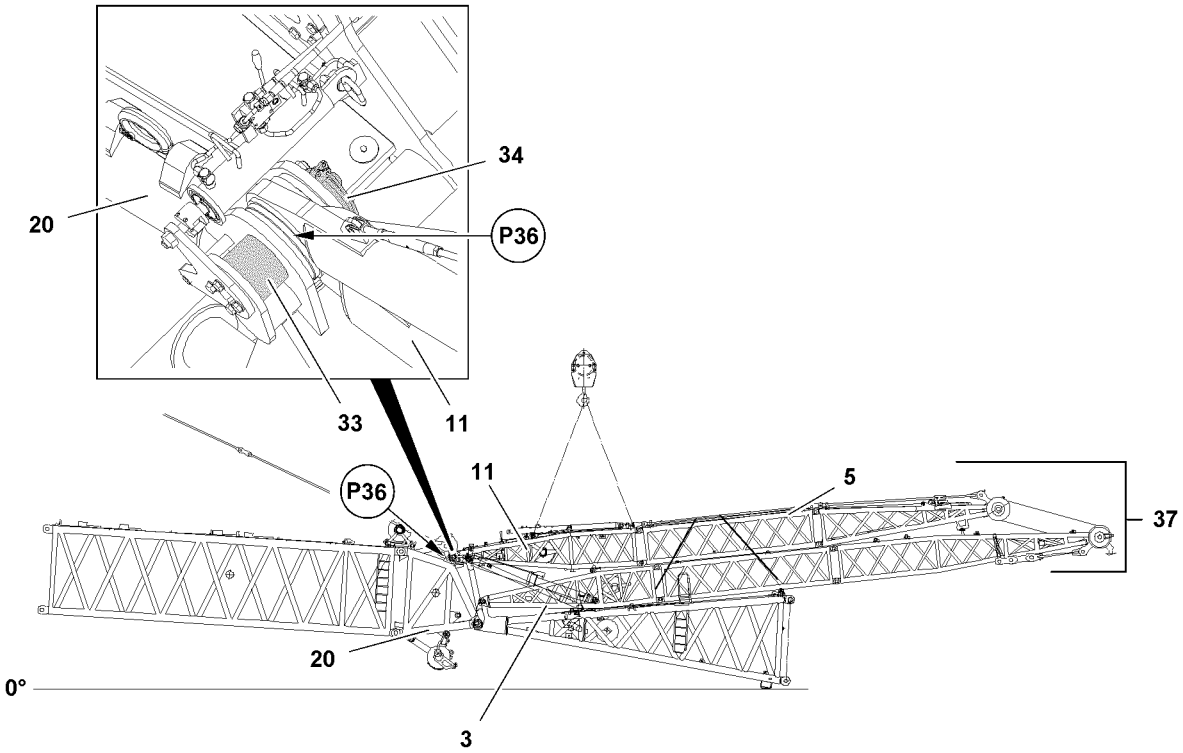

Fig.121042: Assembling the WA-frames - pinning procedure

- ▶ Fasten the WA-frame 2 pivot section **11** to the auxiliary crane, see section „Fastening points“.
- ▶ Position the WA-frame 2 pivot section **11** in such a way that it can be pinned on both sides on point **P36** of the S-end section **20**.

Note

- ▶ The WA-frame 2 pivot section **11** is pinned with the pin pulling cylinder, see Crane operating instructions, chapter 5.30.

When the pin points of the WA-frame 2 pivot section **11** align with those of the S-end section **20**:

- ▶ Pin the WA-frame 2 pivot section **11** with the S-end section **20**: Insert the pins **33** on both sides on point **P36** and secure with safety locking pin **34**.
- ▶ Lay the WA-frame 2 pivot section **11** completely down with auxiliary crane.
- ▶ Remove the auxiliary crane.

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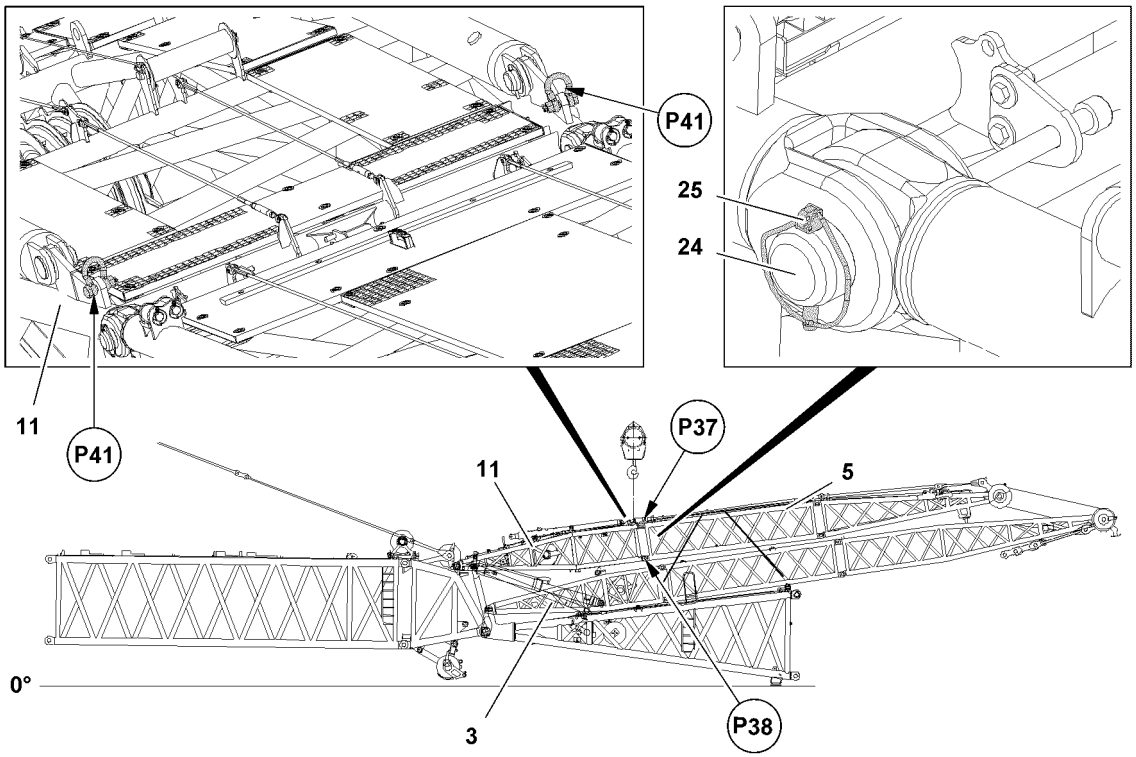

Fig.121045: Assembling the WA-frames - pinning procedure

- ▶ Lower the main boom until the pin bores align on point **P37**.
- ▶ Pin the assembly unit V **37** with WA-frame 2 pivot section **11**: Insert the pins **24** on both sides on point **P37** and secure with safety locking pin **25**.
- ▶ Remove the auxiliary crane on assembly unit V **37**.
- ▶ Remove all transport tension belts **26** between WA-frame 1 intermediate section **6** and WA-frame 2 intermediate section **5**.
- ▶ Install the pin pulling device on point **P38**.
- ▶ Fasten the auxiliary crane on both sides on points **P41** of the WA-frame 2 pivot section **11**.

DANGER
Do not stay in danger zone!
Death, severe bodily injuries, property damage.
- ▶ While the WA-frame 2 is lifted, it is prohibited for anyone to remain in the danger zone.

- ▶ Lift the WA-frame 2 pivot section **11** with the auxiliary crane until the pin bores on point **P38** align.
- ▶ Pin the assembly unit V **37** with WA-frame 2 pivot section **11**: Insert the pins **24** on both sides on point **P38** and secure with safety locking pin **25**.
- ▶ Remove the auxiliary crane.

Note
- ▶ To establish the electrical connections, observe the Electric wiring diagram.

- ▶ Establish the electrical connections to the WA-frame 2 pivot section.
- ▶ Establish the electrical connections to the WA-frame 1 end section.

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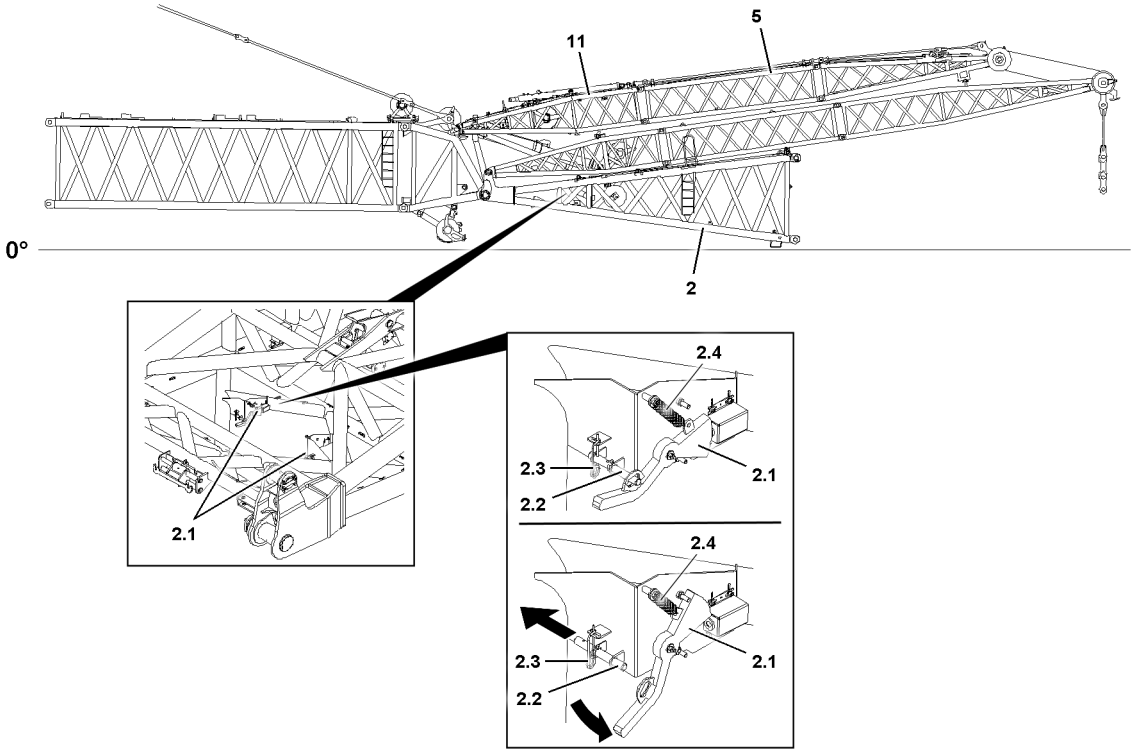

Fig.124282: Bringing the cantilevers „jib down“ into operating position

Bring the cantilevers **2.1** „jib down“ into operating position by removing the transport retaining pins on both sides.

WARNING
Spring actuated component!
When releasing the cantilever **2.1** it moves suddenly and at high speed down due to the pull spring **2.4**.
Limbs can be crushed or severed.
▶ Before unpinning the cantilever **2.1**, hold the cantilever **2.1** with one hand.

▶ Remove the spring retainer **2.3**.
▶ Hold the cantilever **2.1** with one hand.

When the cantilever **2.1** is held safely:
▶ Unpin the pin **2.2** in direction of the arrow to the stop.
▶ Move the cantilever **2.1** in the spring loaded direction (operating position).

When the cantilever **2.1** is in operating position:
▶ Release the cantilever **2.1**.
▶ Insert the pin **2.2** with spring retainer in position „unpinned“.

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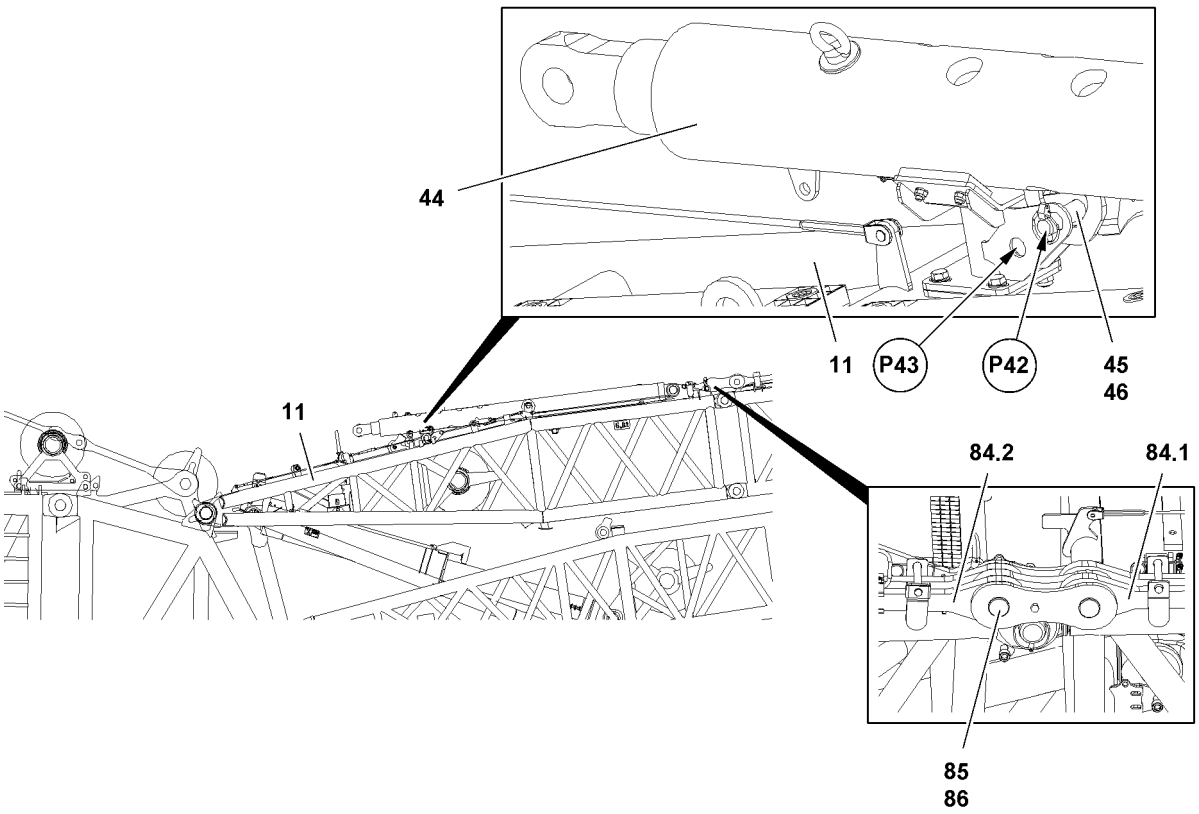

Fig.117038: Assembling WA-frames - Releasing the transport retainer of the relapse support and pinning the guy rods

- ▶ Unpin the relapse supports **44** on both sides on WA-frame 2 pivot section **11**: Release pins **45** on points **P42** and unpin.
- ▶ Insert the pins **45** on both sides in park position on point **P43** and secure with safety locking pin **46**.
- ▶ Pin the guy rods **84.1** with the guy rods **84.2**: Insert the pins **85** on both sides and secure with safety locking pin **86**.

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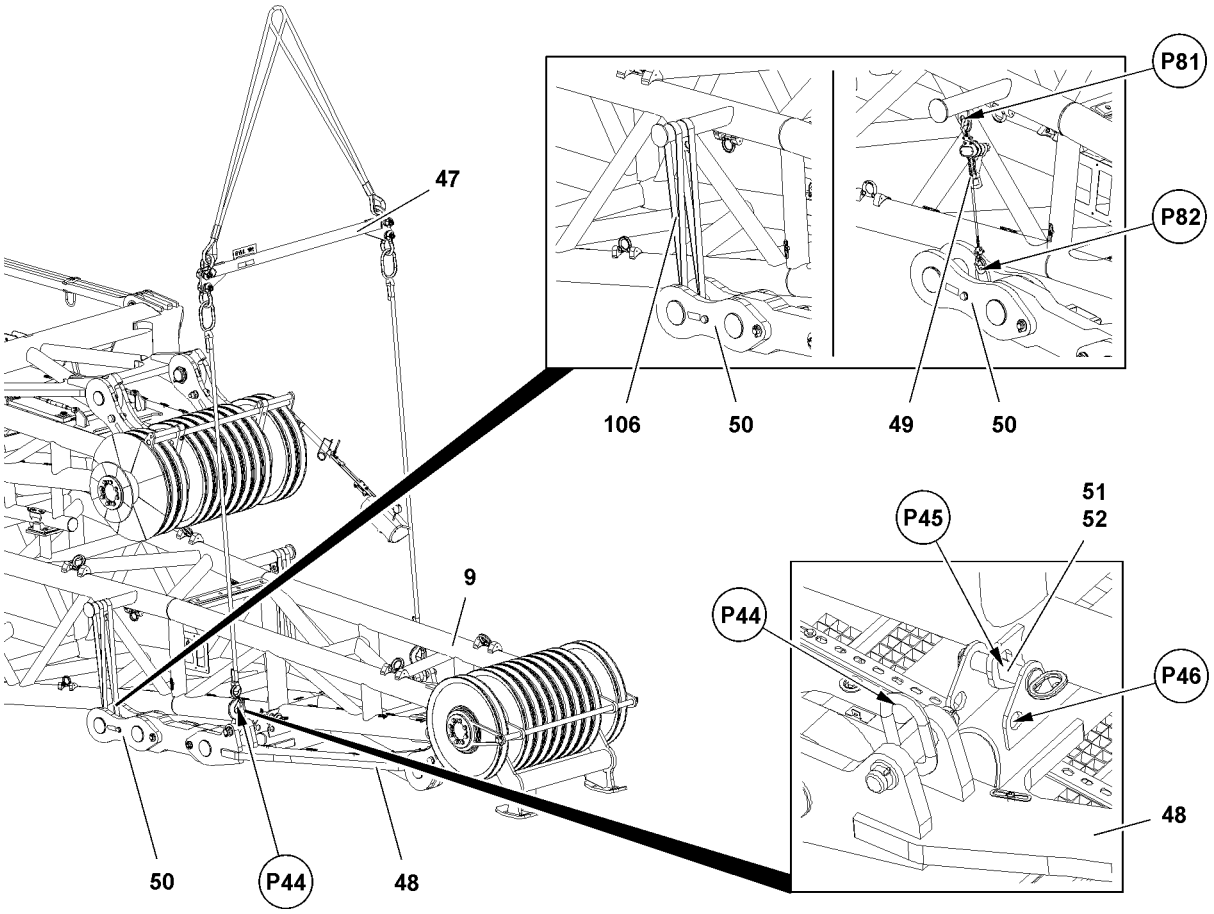

Fig.117039: Assembling the WA-frames - Lowering the WA-frame 1 swing

To lower the brackets **50**, use the chain pulls **49**.

- ▶ Hang the chain pull **49** on point **P81** and point **P82**.
- ▶ Tighten the chain pull **49** until the round sling **106** is loose and can be removed.
- ▶ Remove the round sling **106**.
- ▶ Lower the bracket **50** with the chain pull **49**.
- ▶ Remove the chain pull **49**.
- ▶ Repeat the procedure on the other side the same way as described above.
- ▶ Attach the cross beam **47** on both sides on points **P44**.
- ▶ Tighten the fastening equipment of the cross beam **47** until the pins **51** have some play.
- ▶ Unpin the swing **48** on the WA-frame 1 end section **9**: Release the pins **51** on both sides on point **P45** and unpin.
- ▶ Insert the pins **51** on both sides in the park position on point **P46** and secure with safety locking pin **52**.
- ▶ Lower the swing **48**.
- ▶ Remove the cross beam **47**.

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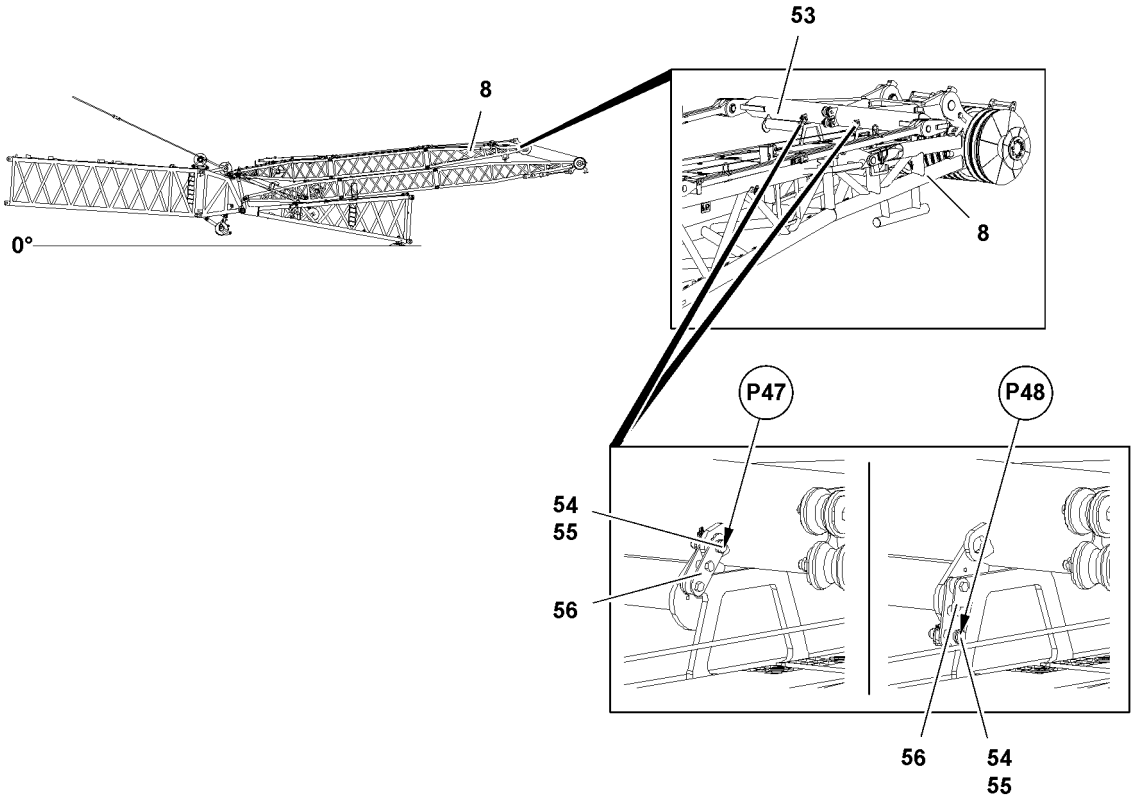

Fig.117041: Assembling the WA-frames - Releasing the transport retainer for the WA-frame 2 cross beam

- ▶ Unpin the cross beam **53** on the WA-frame 2 end section **8**: Release the pins **54** on both sides on points **P47** and unpin.
- ▶ Fold the brackets **56** down.
- ▶ Insert the pin **54** in park position: Insert the pins **54** on both sides on points **P48** and secure with safety locking pins **55**.

Result:

▷ The transport retainer for the cross beam **53** is completely released.

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3.2 Reeving the W-control rope in and pulling the hoist ropes forward to the S-end section

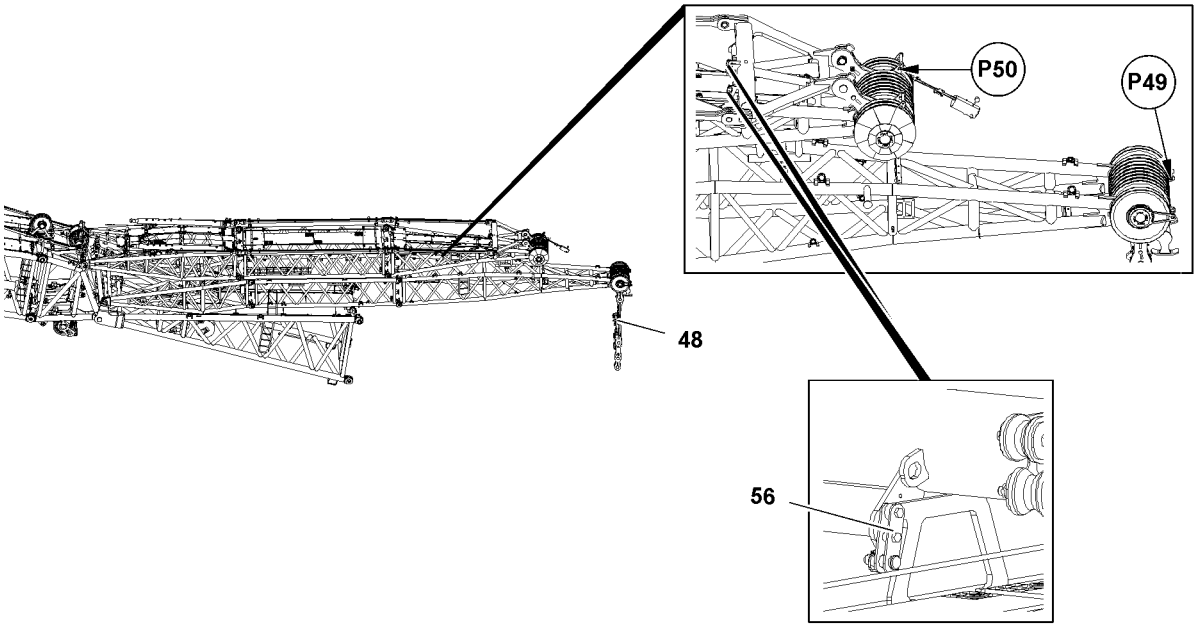

Fig.117042: Reeving the W-control rope in and pulling the hoist ropes forward to the S-end section - Prerequisites

NOTICE
Slack rope formation!
Due to slack rope formation, the hoist rope and the W-control rope can be damaged.
This could result in high property damage.
▶ When spooling the hoist rope or the W-control rope up or out, allow no slack rope formation.
▶ When spooling up or out, hold the hoist rope and the W-control rope taut.

WARNING
Danger of accident!
Death, severe bodily injuries, property damage.
▶ It is prohibited to remain within the danger zone of the running ropes.
▶ Radio contact is available between crane operator and assembly personnel.

Make sure that the following prerequisite is met:
– The WA-frames are completely assembled.
– The swing **48** of WA-frame 1 is in operating position.
– The transport retainers **56** of the swing of WA-frame 2 are completely released.
– The rope guard of WA-frame 1 end section is removed on point **P49**.
– The rope guard of WA-frame 2 end section is removed on point **P50**.

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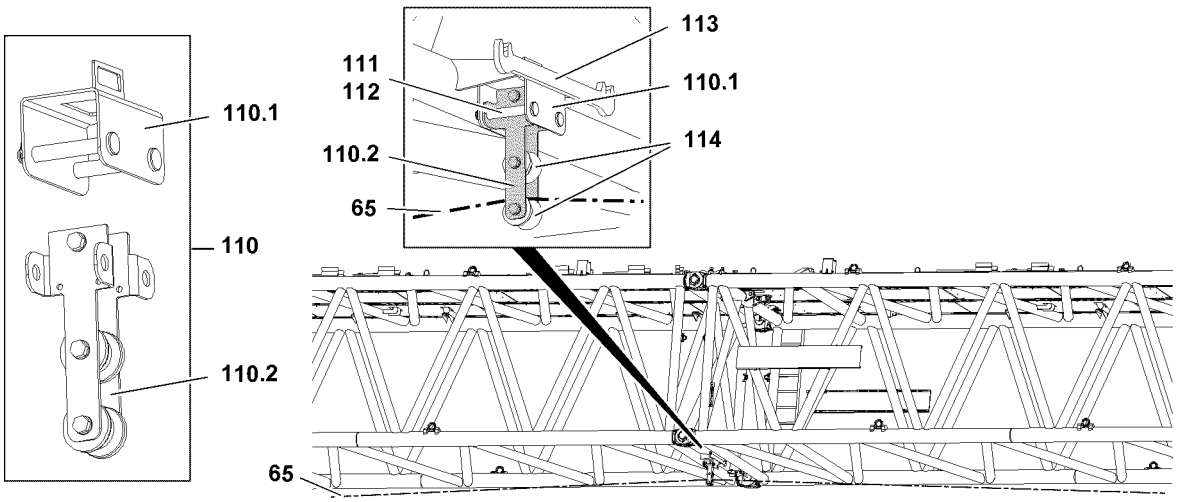

Fig.121048: Reeving the W-control rope in and pulling the hoist ropes forward to the S-end section - Installing the complete retainer

Note

- The complete retainer **110** is part of the assembly aid.
- Position the complete retainer **110** in the S-boom in such a way that the auxiliary rope does not scrape on the S-boom when pulling it in.

- Take the complete retainer **110** apart: Remove the safety locking pin **112** and unpin the pin **113**.
- Set the part **110.1** in the retainer **113** for the pin pulling device.
- Position the part **110.2** on part **110.1** so that they can be pinned with each other.

When the pin bores align:

- Insert the pin **113** and secure with the safety locking pin **112**.
- Pull the auxiliary rope **65** forward to the complete retainer **110**.
- Guide the auxiliary rope **65** between the change over pulleys **114**.

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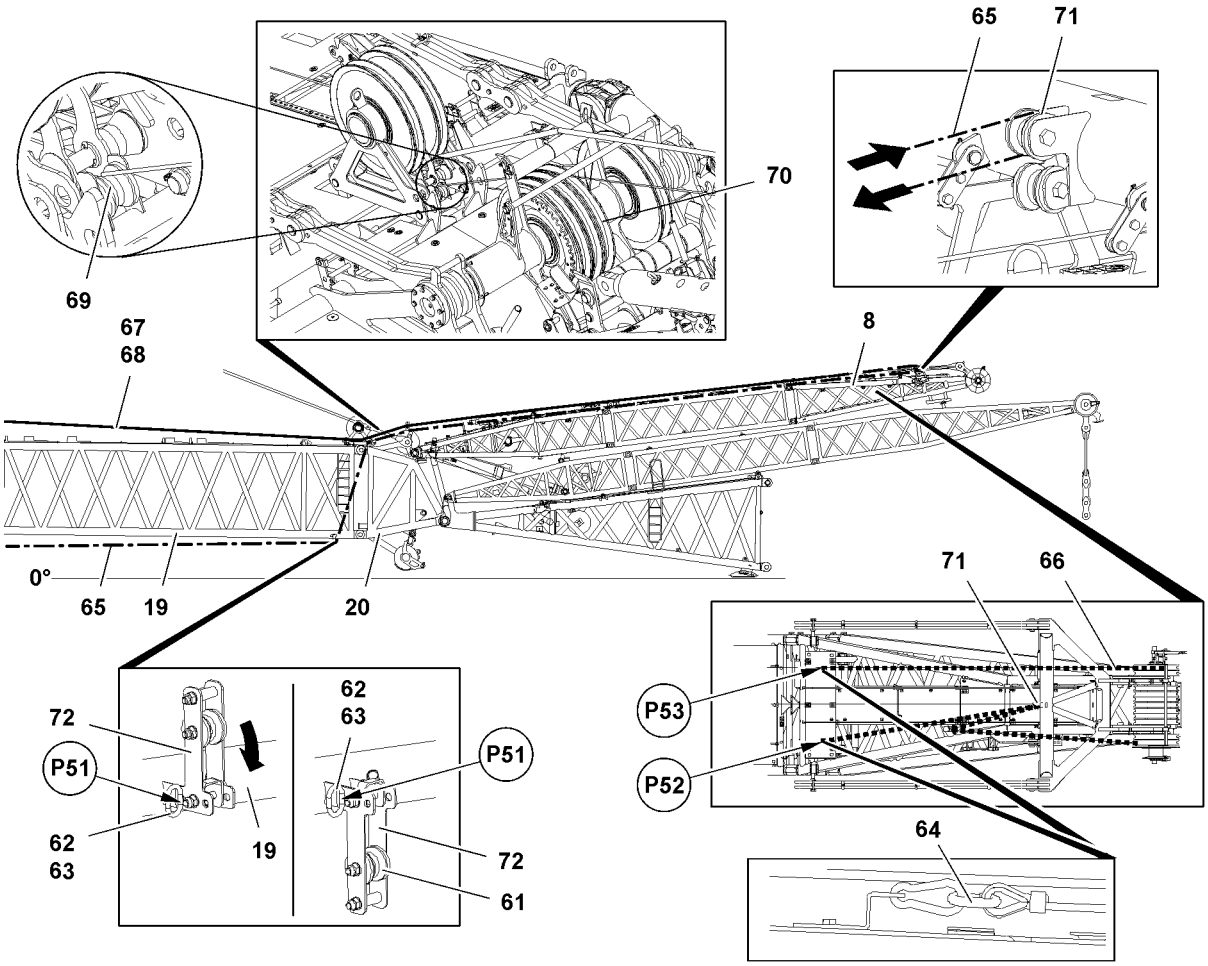

Fig.117043: Reeving the W-control rope in and pulling the hoist ropes forward to the S-end section - Assembly procedure

- ▶ Unpin the change over pulley retainer **72** on S-adapter **19**: Release the pin **62** on point **P51** and unpin.
- ▶ Swing the change over pulley retainer **72** downward.
- ▶ Pin the change over pulley retainer **72** with the S-adapter **19**: Insert the pin **62** on point **P51** and secure with safety locking pin **63**.
- ▶ Pull the auxiliary rope **65** forward to the change over pulley **61**.
- ▶ Guide the auxiliary rope **65** over the change over pulley **61**.
- ▶ Guide the auxiliary rope **65** over the change over pulley **69**.
- ▶ Guide the auxiliary rope **65** over the end pulley **70**.
- ▶ Pull the auxiliary rope **65** to the change over pulley **71** of the WA-frame 2 end section **8**.
- ▶ Remove the forerunner rope **66** on point **P52**.
- ▶ Remove the forerunner rope **66** from the change over pulley **71**.

The auxiliary rope **65** is guided in from top.

- ▶ Guide the auxiliary rope **65** over the upper change over pulley **71**.
- ▶ Pull the auxiliary rope **65** to winch 1.
- ▶ Connect the auxiliary rope **65** with the hoist rope **68**: Place the connecting link **64** in between hoist rope **68** and auxiliary rope **65**.
- ▶ Pull the hoist rope **68** forward with the aid of the auxiliary rope **65** to the S-end section **20**.
- ▶ Remove the auxiliary rope **65** from the hoist rope **68**.

When a second hoist rope **68** is required:

- ▶ Pull the second hoist rope **68** the same way to the S-end section **20** as described before.
- ▶ Pull the auxiliary rope **65** to winch 5.

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- ▶ Connect the auxiliary rope **65** with the W-control rope **67**: Place the connecting link **64** in between W-control rope **67** and auxiliary rope **65**.
- ▶ Pull the W-control rope **67** with the aid of the auxiliary rope **65** to park position (point **P53**) of the forerunner rope **66**.
- ▶ Remove the auxiliary rope **65** from the W-control rope **67**.
- ▶ Remove the auxiliary rope **65** from the upper change over pulley **71** and position it in such a way that the end of the auxiliary rope **65** is laying on point **P52**.
- ▶ Remove the forerunner rope **66** on park position (point **P53**).

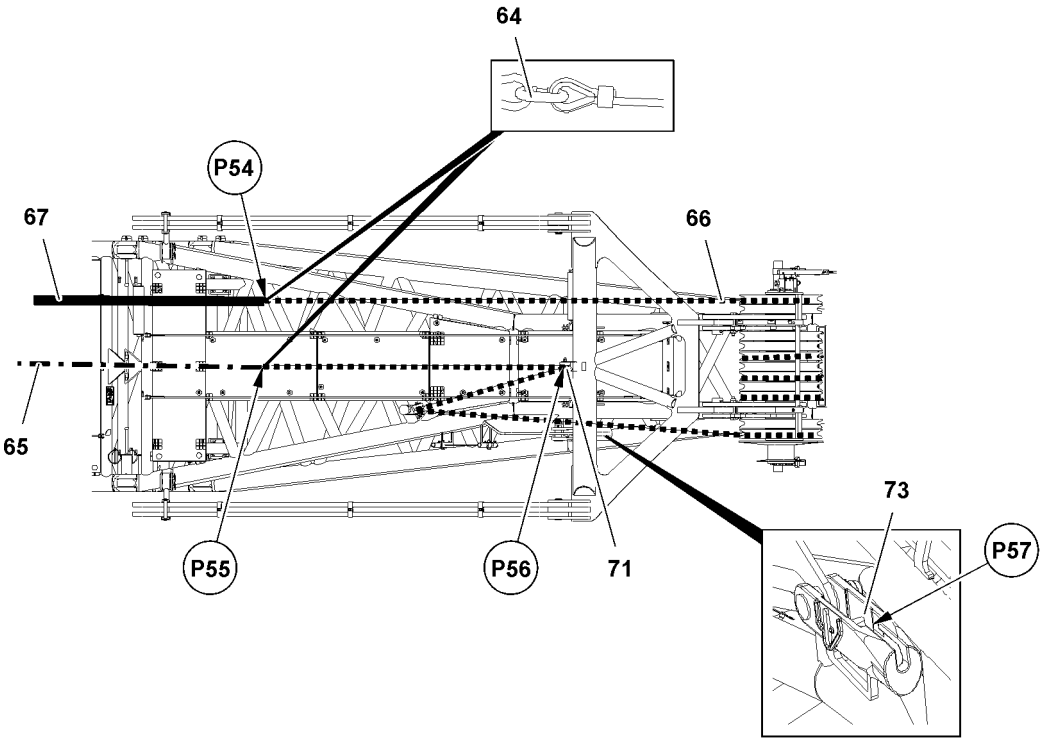

Fig.117044: Reeving the W-control rope in and pulling the hoist ropes forward to the S-end section - Pulling in the W-control rope

- ▶ Connect the forerunner rope **66** with the W-control rope **67**: Place the connecting link **64** in on point **P54** between the forerunner rope **66** and W-control rope **67**.
- ▶ Place the forerunner rope **66** on point **P56** over the upper change over pulley **71**.
- ▶ Connect the forerunner rope **66** with the auxiliary rope **65**: Place the connecting link **64** in on point **P55** between the forerunner rope **66** and auxiliary rope **65**.
- ▶ Pull the auxiliary rope **65** in and slowly spool the W-control rope **67** out until it can be affixed in the rope lock **73** on point **P57**.

WARNING
Danger of crushing if winch 5 moves!
If the W-control rope winch (winch 5) is actuated while affixing the W-control rope **67**, personnel can be severely injured or killed.
Fingers, hands and arms can be crushed or severed.
- ▶ Do not actuate winch 5 during the assembly procedure.
- ▶ Radio contact is available between crane operator and assembly personnel.

- ▶ Affix the W-control rope **67** on point **P57** on the rope lock **73**.

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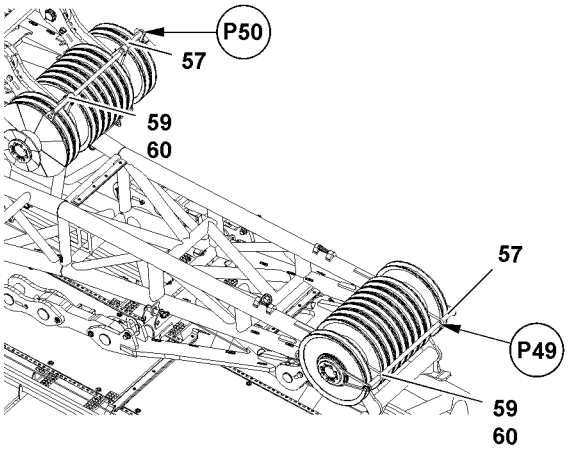

Fig.117046: Reeving the W-control rope in and pulling the hoist ropes forward to the S-end section - Installing the rope guard

▶ Install the rope guard **57** on point **P49** and point **P50** and secure with retaining elements (pin **59** and safety locking pin **60**).

3.3 Checking the limit switches for the relapse cylinder for function

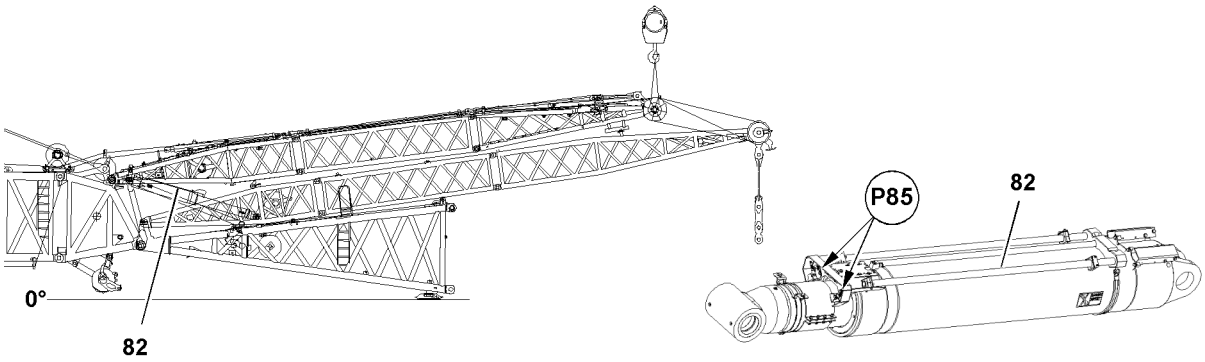

Fig.117070: Checking the limit switches for the relapse cylinder for function

NOTICE
Damage to relapse cylinder **82**!
Before erecting the WA-frame 1, the electrical connection for the limit switches of the relapse cylinder **82** must be established. If this is **NOT** the case, the WA-frame 1 can be pulled back over the mechanical stop of the relapse cylinder **82**, which may damage the relapse cylinder **82**.
▶ Establish the electrical connection for the limit switches of the relapse cylinder **82**.

▶ Make sure that the electrical connection for the limit switches of the relapse cylinder **82** is established.
▶ Cover the limit switch initiators of the relapse cylinder **82** individually at points **P85** with a metal plate.

Result:

– The icon appears on the LICCON monitor.
– The **spool up function** of the W-control winch turns off.

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3.4 Guying and erecting the WA-frame 2

Make sure that the following prerequisites are met:
- The WA-frame 2 is laying on WA-frame 1.
- The W-control rope is fully assembled.
- The limit switches were checked for proper function.
- The pressure of the relapse cylinder was checked.

3.4.1 Assembling the erection ropes

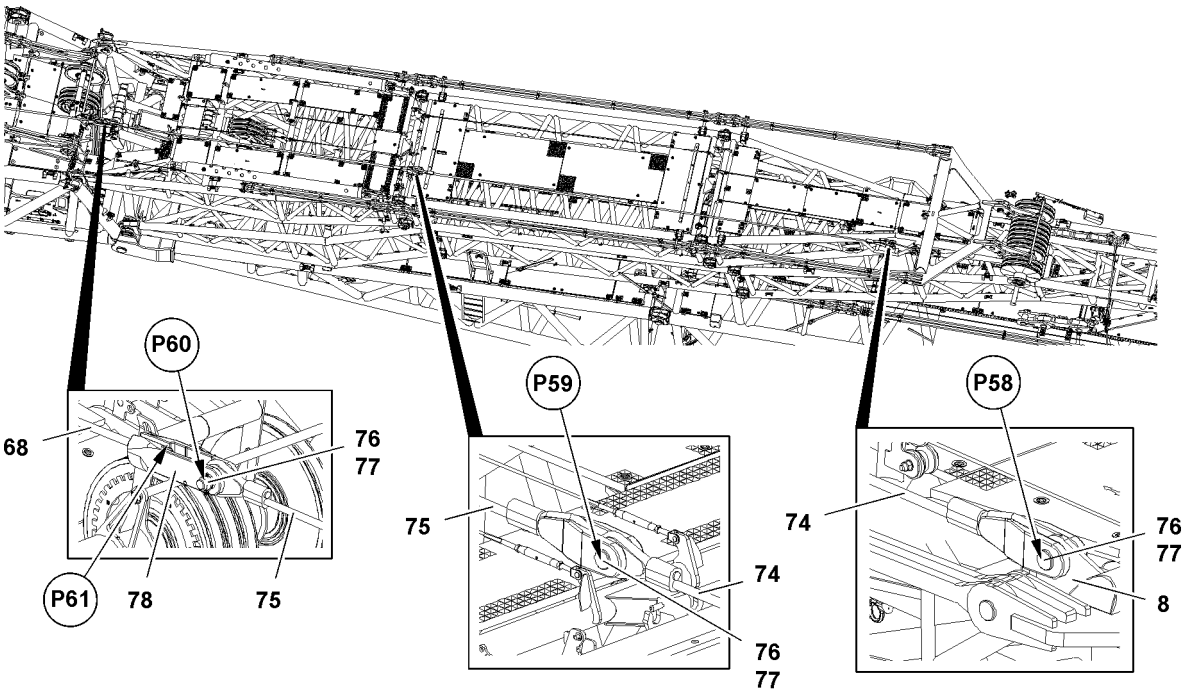

Fig.117045: Assembling the erection ropes

- ▶ Place a 9.3 m erection rope **74** on the WA-frame 2 to be able to pin on point **P58**.
- ▶ Pin the 9.3 m erection rope **74** with the WA-frame 2 end section **8**: Insert the pin **76** on point **P58** and secure with safety locking pin **77**.

Note
- ▶ For short WA-frames, the 6 m erection rope is not installed.

- ▶ Place a 6 m erection rope **75** lengthwise on the WA-frame 2 to be able to pin on point **P59**.
- ▶ Pin the 6 m erection rope **75** with the 9.3 m erection rope **74**: Insert the pin **76** on point **P59** and secure with safety locking pin **77**.
- ▶ Pin the rope lock **78** with the 6 m erection rope **75**: Insert the pin **76** on point **P60** and secure with safety locking pin **77**.
- ▶ Affix the hoist rope **68** on point **P61** in rope lock **78**.

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3.4.2 Opening the transport retainers of the guy rods

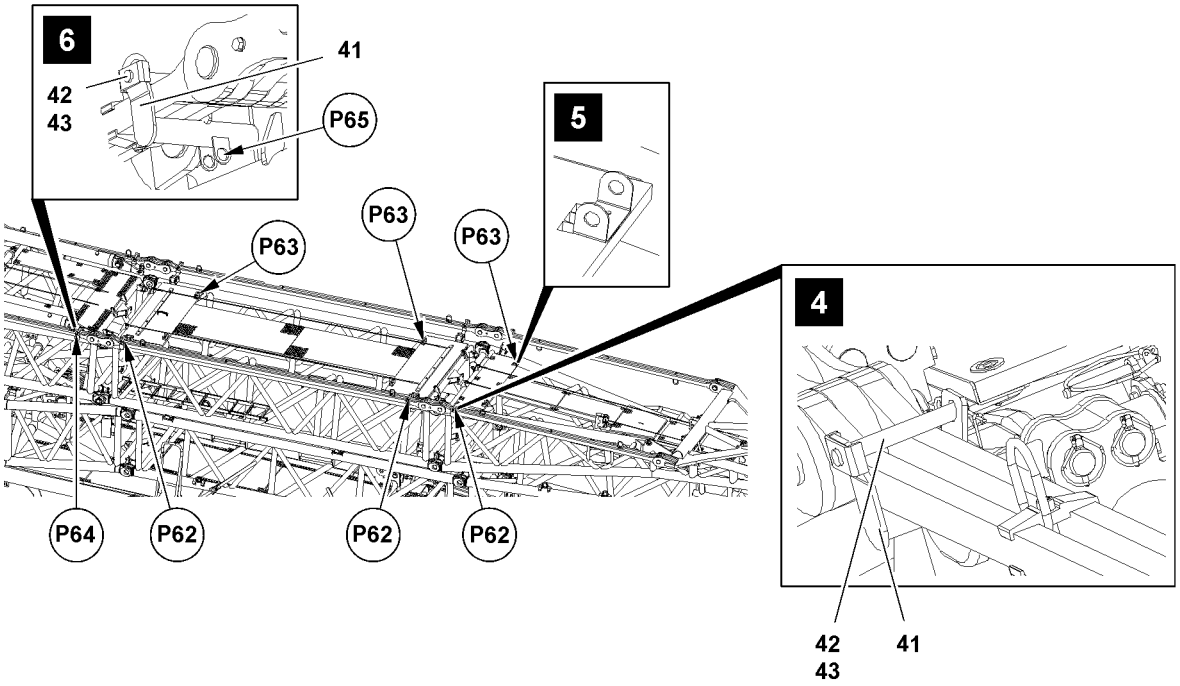

Fig.117037: Opening the transport retainers of the guy rods

- ▶ Open the transport retainers **41** (illustration **4**) on points **P62** on both sides: Remove the safety locking pin **43** and unpin the pin **42**.
- ▶ Insert the pins **42** on both sides on points **P63** in park positions (illustration **5**).
- ▶ Open the transport retainers **41** (illustration **6**) on both sides on point **P64**: Remove the safety locking pin **43** and unpin the pin **42**.
- ▶ Insert the pins **42** in park positions (point **P65**) and secure with safety locking pin **43**.

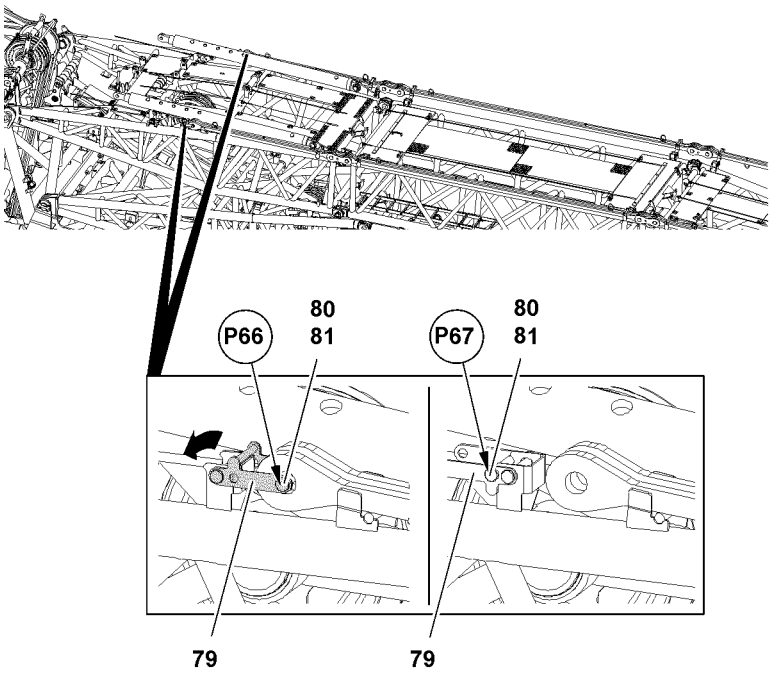

Fig.117047: Opening the transport retainers of the guy rods

- ▶ Release the pins **80** on both sides on points **P66** and unpin.

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- ▶ Fold the transport retainer **79** over.
- ▶ Secure the transport retainer **79** in park position: Insert the pins **80** on both sides on points **P67** and secure with safety locking pins **81**.

3.4.3 Erecting the WA-frame 2

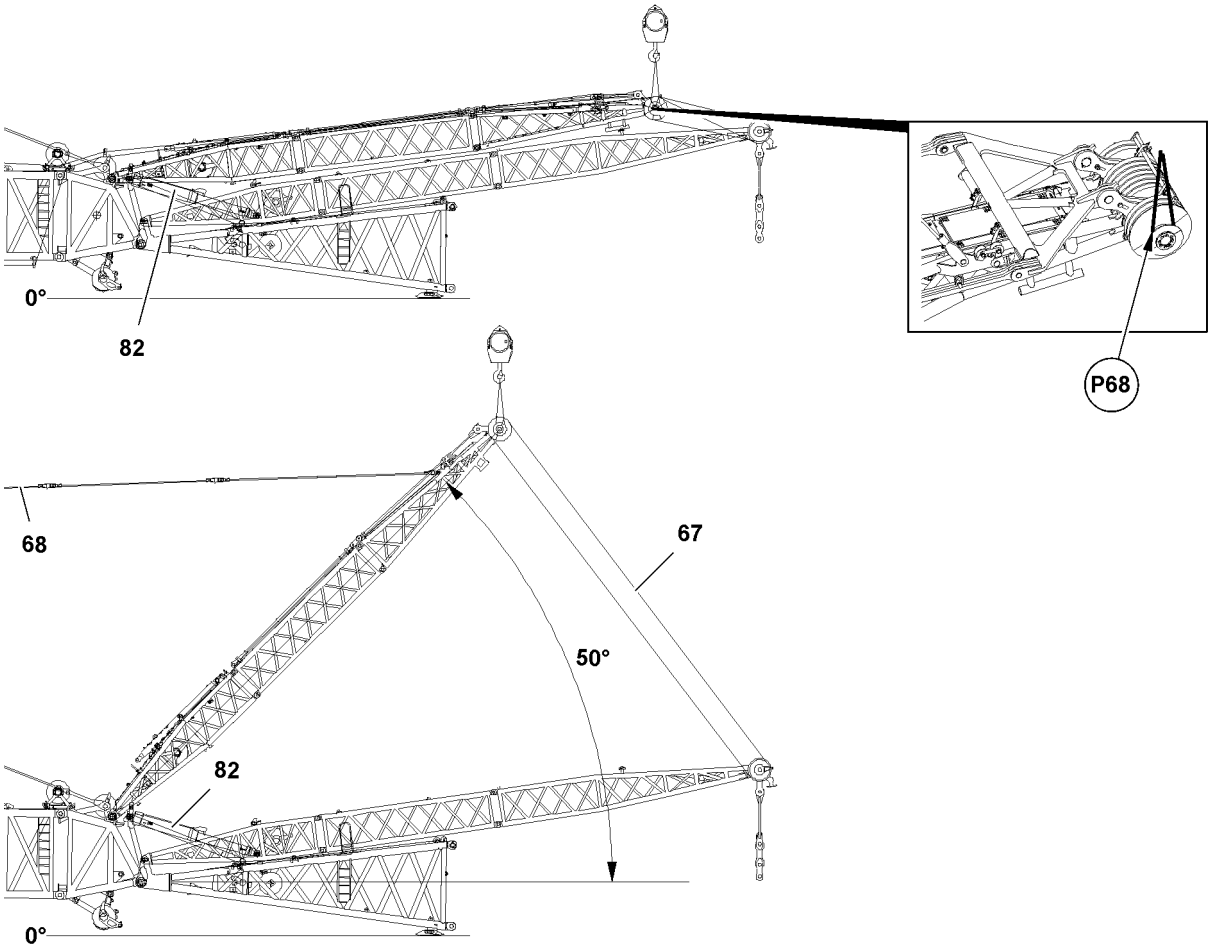

Fig.121053: Erecting the WA-frame 2 - Erection procedure 50°

- ▶ Fasten the auxiliary crane on point **P68**.

WARNING
Danger of accident!
Up to an angle of 50°, the WA-frame 2 may only be lifted with an auxiliary crane. The hoist rope **68** may not be subjected to a load.
If the following notes are not observed and adhered to, personnel can be severely injured or killed.

- ▶ It is prohibited to remain in the danger zone.
- ▶ Maintain a safe distance.
- ▶ The spooling procedure must be monitored by a guide.
- ▶ Lift the WA-frame 2 only with the auxiliary crane to approx. 50°.
- ▶ Allow no slack rope formation on the W-control rope and on the hoist rope.
- ▶ Make sure that the WA-frame 1 remains in a position during the entire erection procedure in which the W-control rope is tensioned.
- ▶ During the entire assembly procedure, the WA-frame 1 must be raised with the W-control rope **67** to approx. 15° so that the relapse cylinder **82** is under pressure.

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NOTICE
Slack rope formation!
Due to slack rope formation, the hoist rope **68** and the W-control rope **67** can be damaged.
This could result in high property damage.
- ▶ When spooling the hoist rope **68** or the W-control rope **67** up or out, allow no slack rope formation.
- ▶ When spooling up or out, hold the hoist rope **68** and the W-control rope **67** taut.

- ▶ Lift the WA-frame 2 solely with the auxiliary crane to approx. 50° and simultaneously spool the hoist rope **68** up and the W-control rope **67** out.

When the WA-frame 2 has reached an approximate angle of 50°:
- ▶ Tension the hoist rope **68** until the WA-frame is held by the hoist rope **68**.
- ▶ Remove the auxiliary crane.
- ▶ Lift the WA-frame 2 with the hoist rope to about 90° and simultaneously spool out the W-control rope.

3.4.4 Long WA-frames: Pining the guy rods with each other and installing the relapse supports in operating position

WARNING
Danger of accident!
If the following notes are not observed and adhered to, personnel can be severely injured or killed.
- ▶ It is prohibited to remain in the danger zone.
- ▶ Maintain a safe distance.
- ▶ The spooling procedure must be monitored by a guide.
- ▶ Allow no slack rope formation on the W-control rope and on the hoist rope.
- ▶ Make sure that the WA-frame 1 remains in a position during the entire erection procedure in which the W-control rope is tensioned.
- ▶ During the entire assembly procedure, raise the WA-frame 1 with the W-control rope **67** to approx. 15° so that the relapse cylinder **82** is under pressure.

Make sure that the following prerequisites are met:
- – The long version of the WA-frame is installed.
- – The WA-frame 2 is held by the hoist rope.
- – The function of the relapse cylinder is ensured.
- – The required guy rods are installed according to the rod plan.
- – The transport retainers of the guy rods on the WA-frame 2 are unpinned.
- – The transport retainer of the relapse support is unpinned.

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Pinning the guy rods with each other

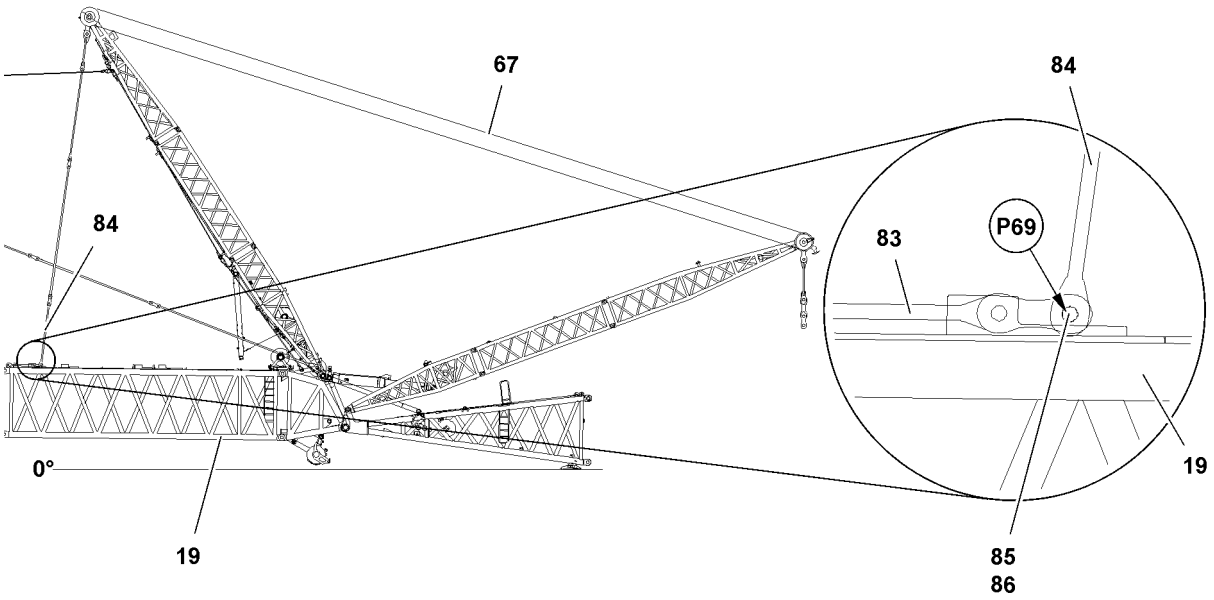

Fig.117049: Long WA-frames: Pinning the guy rods with each other

The WA-frame is pulled back until the hanging guy rods **84** are positioned in such a way that the guy rods **83** of the S-adapter **19** can be installed. This position is approx. at 120°.

- ▶ Lift the WA-frame 2 by spooling up the hoist rope and simultaneously spooling out the W-control rope **67** until the guy rods **84** can be pinned with the guy rods **83**.
- ▶ Pin the guy rods **84** with the guy rods **83**: Insert the pins **85** on both sides on points **P69** and secure with safety locking pins **86**.

Installing the relapse supports in operating position

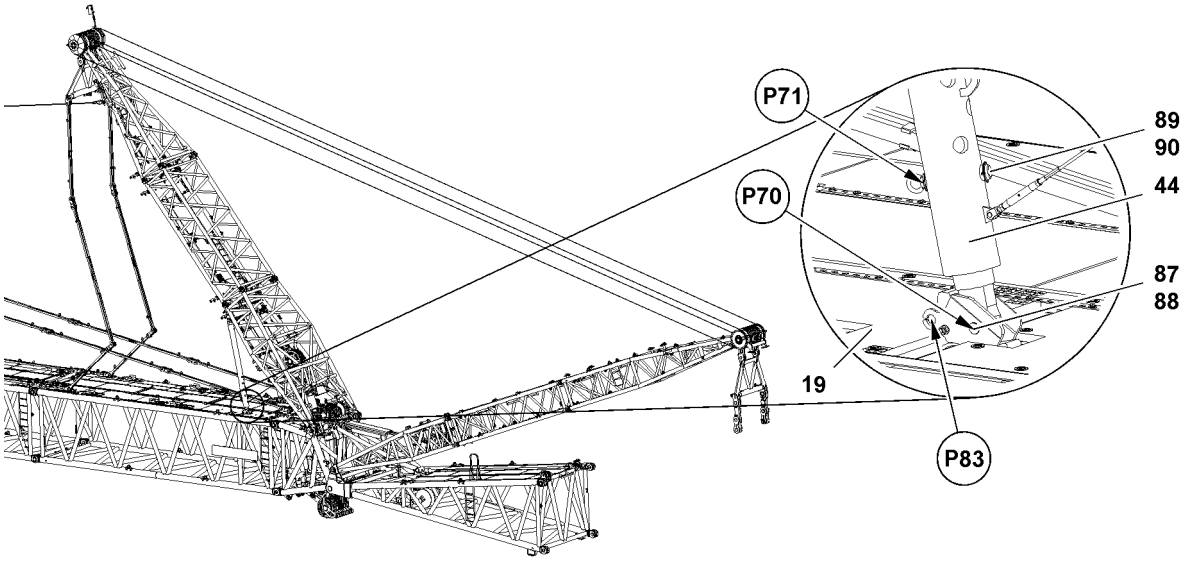

Fig.117050: Long WA-frames: Installing the relapse supports in operating position

Make sure that the following prerequisite is met:

- The pins **87** are pinned in park positions (point **P83**)

- ▶ Align the WA-frame 2 with the hoist winch in such a way that the relapse supports **44** can be pinned on point **P70**.

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- ▶ Pin the relapse supports **44** with the S-adapter **19**: Insert the pins **87** on both sides on points **P70** and secure with safety locking pins **88**.
- ▶ Release and unpin the locking pin **90** on both relapse supports **44** on points **P71**.

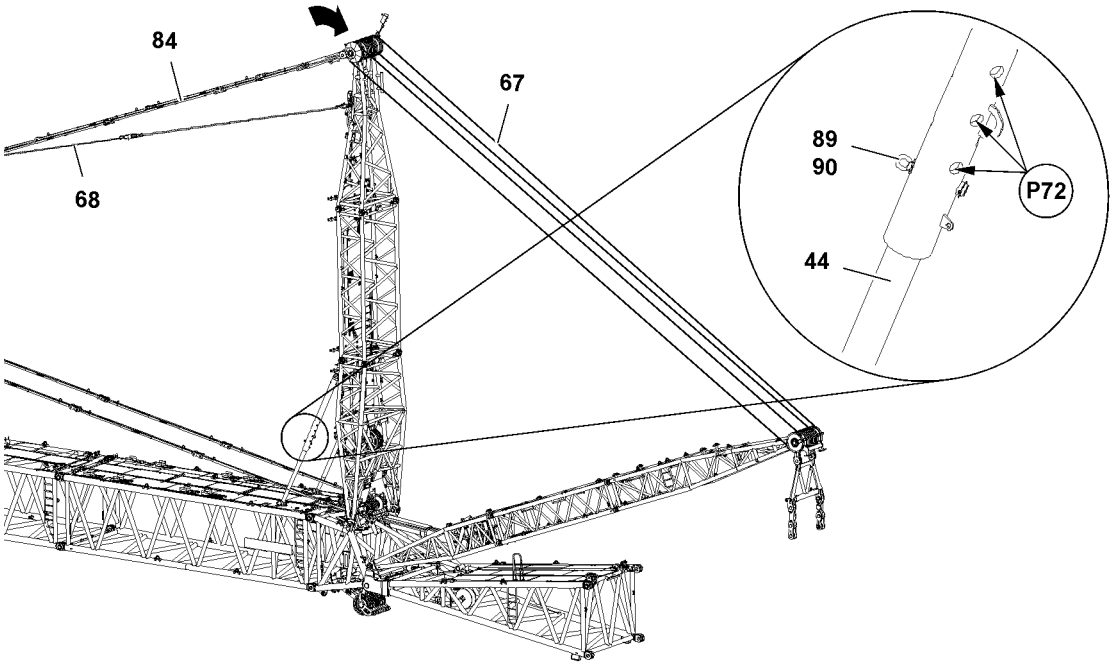

Fig.117052: Long WA-frames: Installing the relapse support with locking pins in operating position

- ▶ Erect WA-frame 2 with W-control rope **67** and at the same time, spool the hoist rope **68** out until the guy rods **84** are tensioned.

The locking pins **89** must be set in such a way that the relapse supports **44** are pinned in the maximum possible length.

When the guy rods **84** are tensioned:

- ▶ Secure the locking pins **89** on both sides as far down as possible on the points **P72** and secure with the safety locking pin **90**.

3.4.5 Short WA-frames: Assembling the relapse supports in operating position and pinning the guy rods with each other

WARNING
Danger of accident!
If the following notes are not observed and adhered to, personnel can be severely injured or killed.

- ▶ It is prohibited to remain in the danger zone.
- ▶ Maintain a safe distance.
- ▶ The spooling procedure must be monitored by a guide.
- ▶ Allow no slack rope formation on the W-control rope and on the hoist rope.
- ▶ Make sure that the WA-frame 1 remains in a position during the entire erection procedure in which the W-control rope is tensioned.
- ▶ During the entire assembly procedure, raise the WA-frame 1 with the W-control rope **67** to approx. 15° so that the relapse cylinder **82** is under pressure.

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Make sure that the following prerequisites are met:
- The short version of the WA-frame is installed.
- The WA-frame 2 is held by the hoist rope.
- The function of the relapse cylinder is ensured.
- The required guy rods are installed according to the rod plan.
- The transport retainers of the guy rods on the WA-frame 2 are unpinned.
- The transport retainer of the relapse support is unpinned.
- The pins for the relapse supports on the pin point of the S-adapter are pinned in park position.

Pinning the relapse supports on the S-adapter

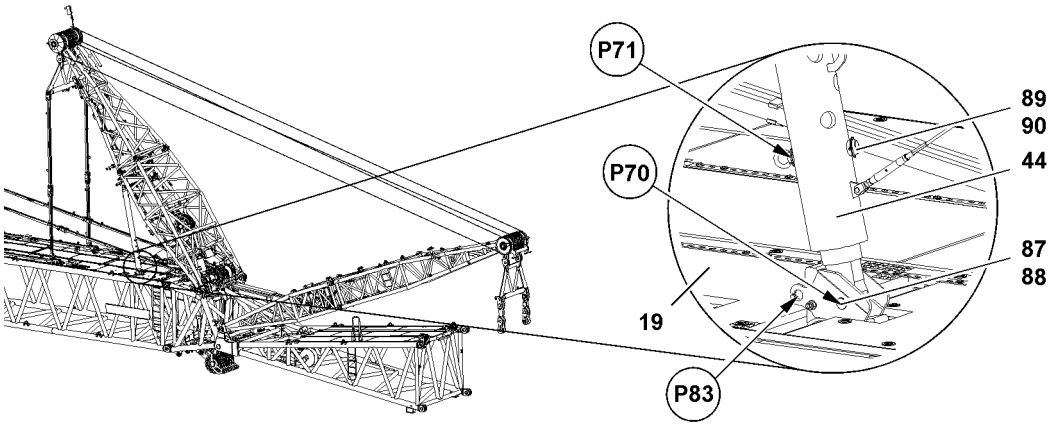

Fig.117053: Short WA-frames: Pinning the relapse supports on the S-adapter

Make sure that the following prerequisite is met:
- The pins **53** are pinned in park positions (point **P83**)

▶ Align the WA-frame 2 with the hoist winch in such a way that the relapse supports **44** can be pinned on point **P70**.
▶ Pin the relapse supports **44** with the S-adapter **19**: Insert the pins **87** on both sides on points **P70** and secure with safety locking pins **88**.
▶ Release and unpin the locking pin **90** on both relapse supports **44** on points **P71**.

Pinning the guy rods with each other

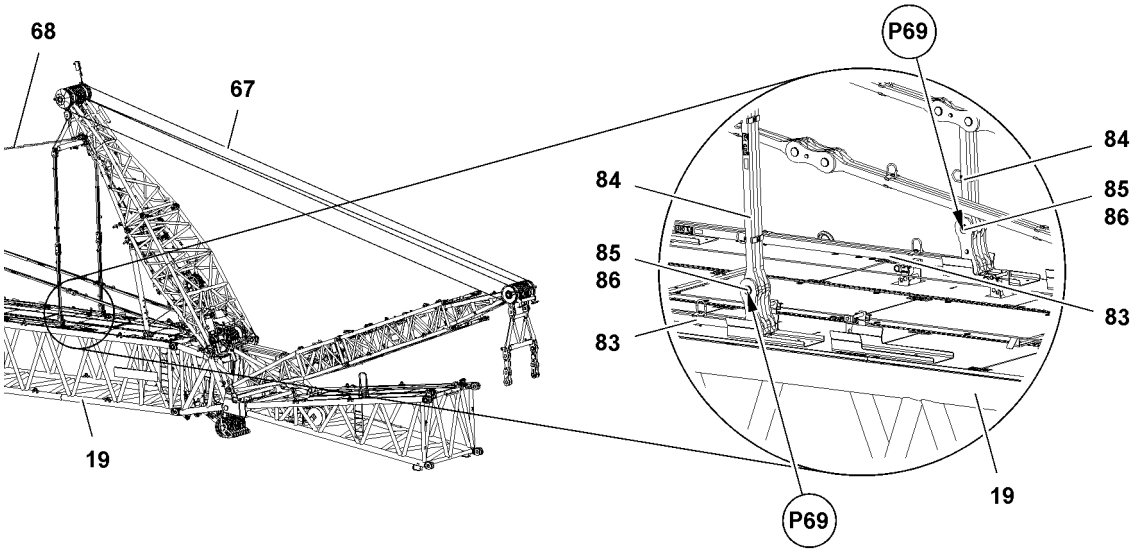

Fig.117054: Short WA-frames: Pinning the guy rods with each other

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- ▶ Fasten the guy rods to the auxiliary crane.
- ▶ Position the guy rods **83** with the auxiliary crane in such a way that pinning on point **P69** is possible.
- ▶ Pin the guy rods **84** with the guy rods **83**: Insert the pin **85** on point **P69** and secure with safety locking pin **86**.
- ▶ Repeat the procedure on the other side for the guy rods the same way as described above.

Installing the relapse supports in operating position

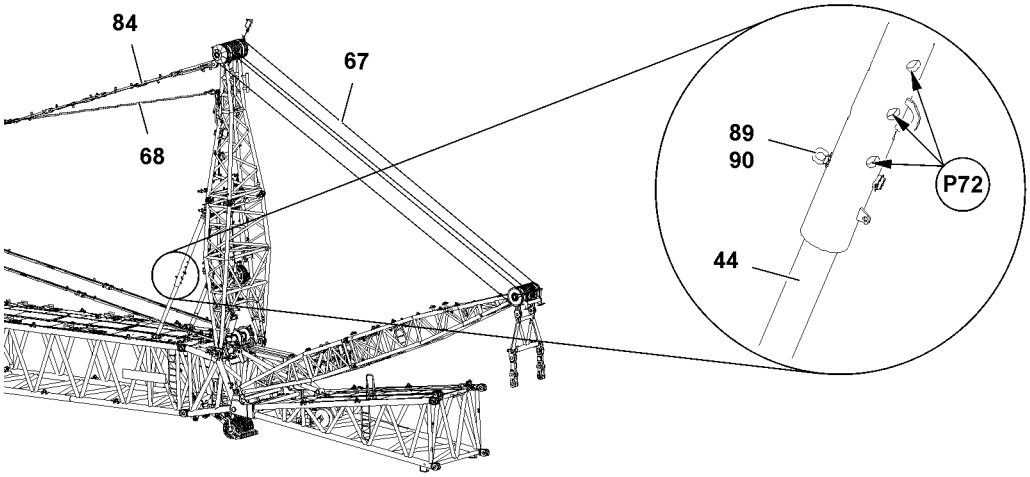

Fig.117055: Short WA-frames: Installing the relapse supports in operating position

The locking pins **89** must be set in such a way that the relapse supports **44** are pinned in the maximum possible length.

- ▶ Erect WA-frame 2 with W-control rope **67** and at the same time, spool the hoist rope **68** out until the guy rods **84** are tensioned.

When the guy rods **84** are tensioned:

- ▶ Secure the locking pins **89** on both sides as far down as possible one of the points **P72** and secure with safety locking pin **90**.

3.5 Securing the ropes in park position

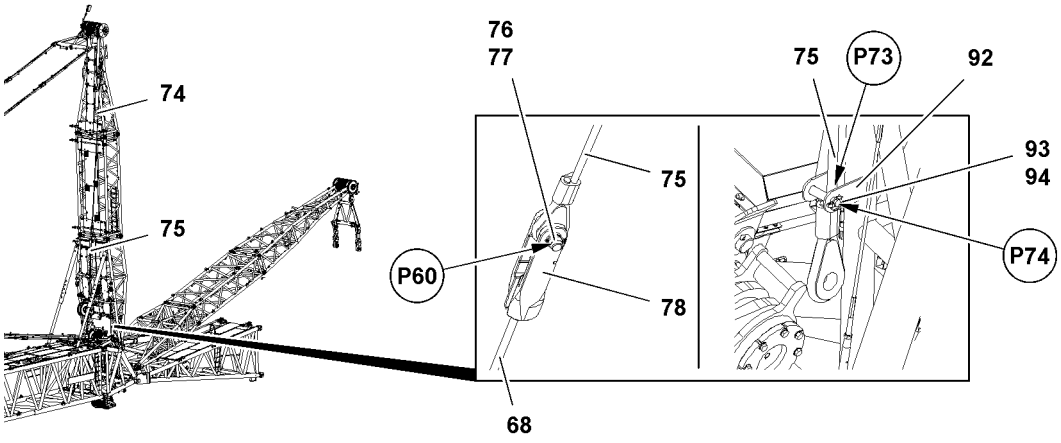

Fig.117056: Securing the ropes in park position

- ▶ Lower the 6 m erection rope **75** and 9.3 m erection rope **74** with the hoist winch.
- ▶ Remove the hoist rope **68** from the rope lock **78**.
- ▶ Remove the safety locking pin **77** on point **P60** and unpin the pin **76**.

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- ▶ Remove the rope lock **78**.
- ▶ Remove the safety locking pin **94** on point **P74** and unpin the pin **93**.
- ▶ Place the 6 m erection rope **75** on point **P73** in the retainer **92**.
- ▶ Insert the pin **93** on point **P74** and secure with safety locking pin **94**.

Result:

– The 6 m erection rope **75** and the 9.3 m erection rope **74** are secured in park position.

3.6 Pulling the hoist ropes forward to the W-pivot section

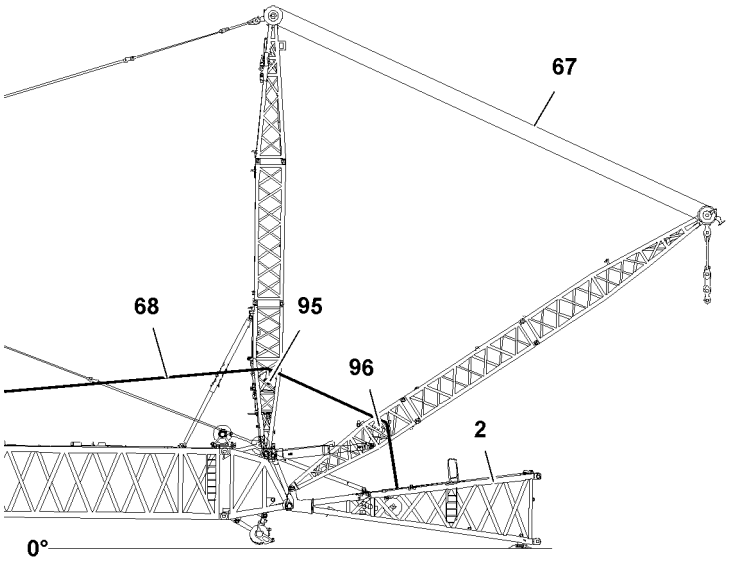

Fig.117057: Pulling the hoist ropes forward to the W-pivot section

NOTICE
Slack rope formation!
Due to slack rope formation, the hoist rope **68** and the W-control rope **67** can be damaged.
This could result in high property damage.
- ▶ When spooling the hoist rope **68** or the W-control rope **67** up or out, allow no slack rope formation.
- ▶ When spooling up or out, hold the hoist rope **68** and the W-control rope **67** taut.

WARNING
Danger of accident!
Death, severe bodily injuries, property damage.
- ▶ It is prohibited to remain within the danger zone of the running ropes.
- ▶ Radio contact is available between crane operator and assembly personnel.

- ▶ Pull the hoist rope **68** over the change over pulley **95** and change over pulley **96** and place down on the W-pivot section **2**.

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3.7 Assembling the WA-frame 1 guy rods

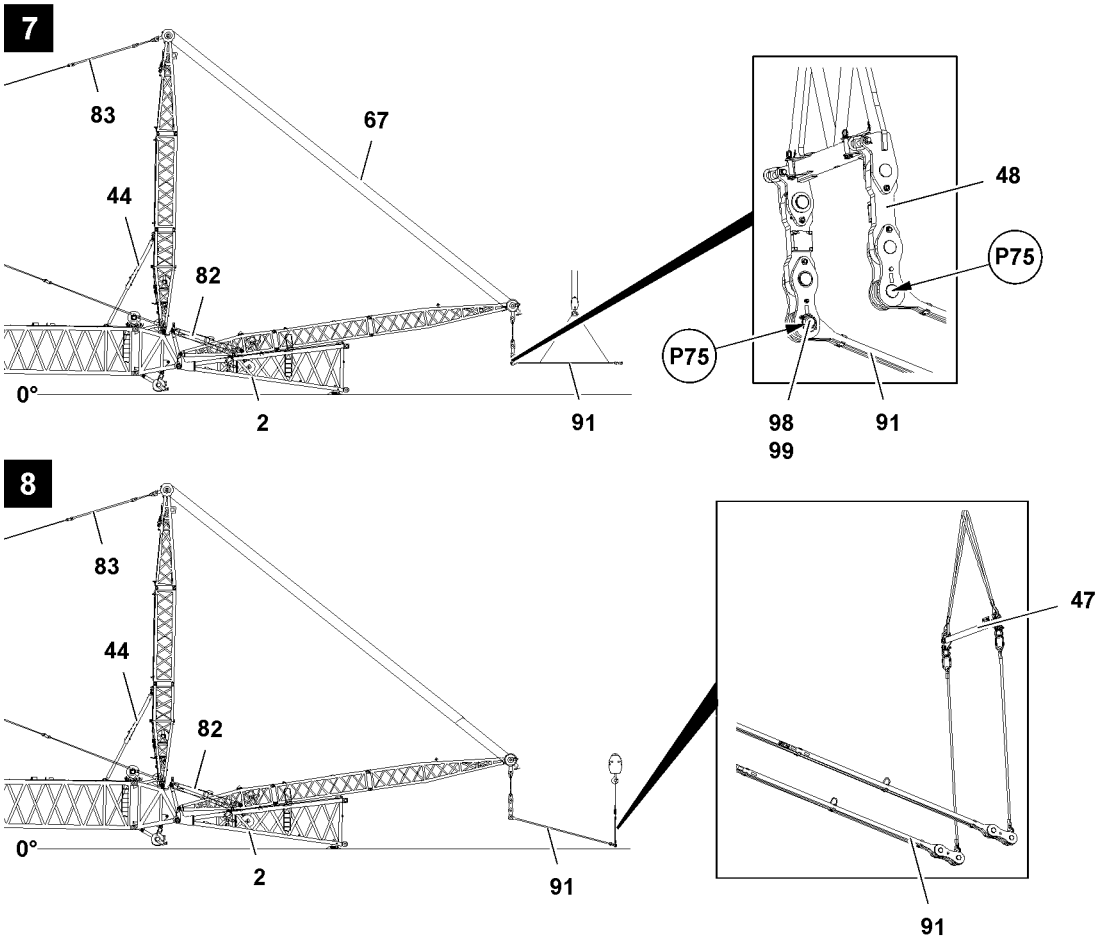

Fig.117058: Assembling the WA-frame 1 guy rods

Make sure that the following prerequisites are met:
- The WA-frame 2 guying **83** is completely assembled.
- The relapse supports **44** are installed in operating position.
- The WA-frame 1 is laying on the W-pivot section **2**.
- The function of the relapse cylinder **82** is ensured

Select the required guy rods according to the rod plan and install with the auxiliary crane.

▶ Fasten the guy rods **91** to the auxiliary crane.
▶ Lift the guy rods **91** with the auxiliary crane and pin on the swing **48**: Insert the pins **98** on both sides on points **P75** and secure with safety locking pin **99**, see illustration **7**.
▶ Place the guy rods **91** down with the auxiliary crane.
▶ Fasten the cross beam **47** on the guy rods **91**, see illustration **8**.

When erecting the WA-frame 1, the guy rods **91** are carried along by the auxiliary crane and the cross beam **47** so that the guy rods **91** are not laying on the ground.

▶ Erect the WA-frame 1 via the W-control rope **67** until the guy rods **91** hang vertically.

If additional guy rods **91** must be installed according to the rod plan:
▶ Install the guy rods **91** the same way as described before.

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3.8 Assembling the W-lattice jib on the W-pivot section

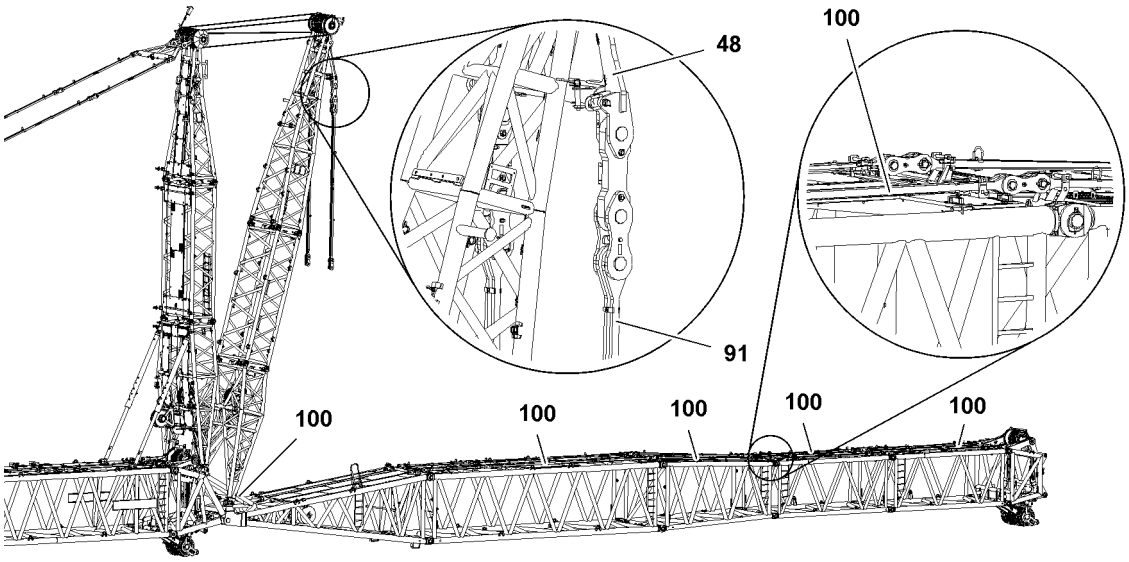

Fig.117059: Assembling the W-lattice jib on the W-pivot section

WARNING
Danger of crushing for people in the load zone!
If personnel are located between the load to be lifted and a possible interfering edge when lifting a load, personnel can be severely injured or killed.
- ▶ Before lifting the load it must be ensured that there are no persons within the danger zone.
- ▶ It is prohibited to remain in the danger zone.
- ▶ It is prohibited for anyone to be under the load.
- ▶ Maintain a safe distance.
- ▶ Swinging the load is prohibited.
- ▶ Exercise extreme caution when lifting a load.

DANGER
General danger notes!
- ▶ Support the W-lattice jib at assembly and disassembly properly with the assembly shoes, see Crane operating instructions, chapter 5.62.
- ▶ All pins must be secured after the assembly.
- ▶ The guy rods must be checked regularly, see Crane operating instructions, chapter 8.15.

DANGER
Overload of boom!
If several lattice sections are preassembled after the W-pivot section, which exceed the total length of 37.5 m , then the lattice sections will be overloaded.
Death, severe bodily injuries, property damage.
- ▶ Assemble lattice sections to a total length of maximum 37.5 m , without supporting them again.

Note
- ▶ During assembly of the W-lattice jib, adhere to the pin sequence, see Crane operating instructions, chapter 5.01.

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Make sure that the following prerequisites are met:
- The guy rods **91** are installed on the swing **48**.
- The function of the relapse cylinder **82** is ensured.
- The WA-frame 2 is guyed.
- The required guy rods **100** are laying on the lattice sections to be installed.

To pin the W-lattice jib with the pin pulling device, see Crane operating instructions, chapter 5.30.

The assembly of the W-lattice jib is the same as the assembly of the boom, see Crane operating instructions, chapter 5.39.

Refer to the rod plan for the sequence and the number of the individual lattice sections.

▶ Assemble the W-lattice jib to the required length.

3.9 Assembling the WA-frame 1 guy rods

3.9.1 Long WA-frames: Pinning the guy rods with each other

Assembling the 9 m guy rod and 3 m guy rod

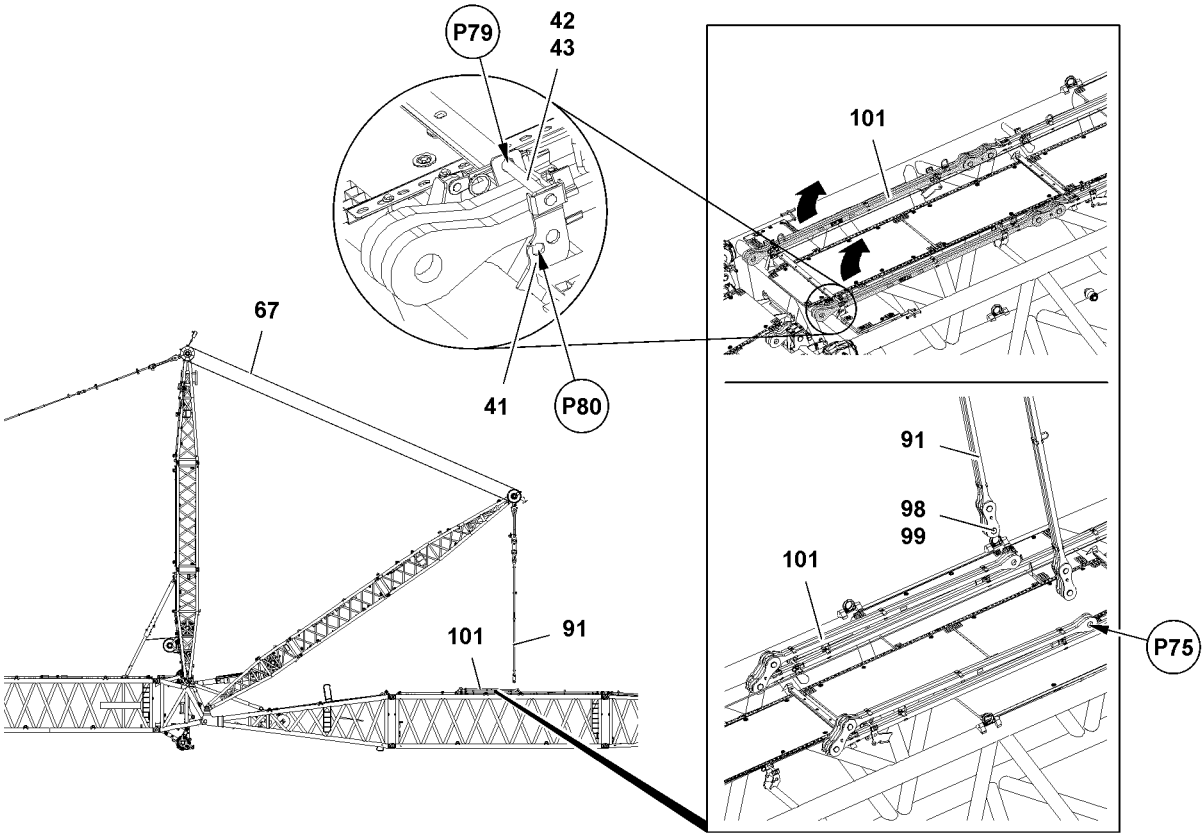

Fig.117061: Long WA-frames: Assembling the 9 m guy rod and 3 m guy rod

▶ Open all transport retainers **41**: Remove the spring retainer **43** on both sides on points **P79** and unpin the pin **42**.
▶ Insert the pins **42** on both sides on points **P80** in park position and secure with spring retainer **43**.
▶ Fold the 3 m guy rods **101** over.
▶ Lower the WA-frame 1 via the W-control rope **67** until the guy rods **91** can be pinned with the guy rods **101**.
▶ Pin the guy rods **91** with the guy rods **101**: Insert the pins **98** on both sides on point **P75** and secure with safety locking pin **99**.

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Assembling the 12 m guy rod

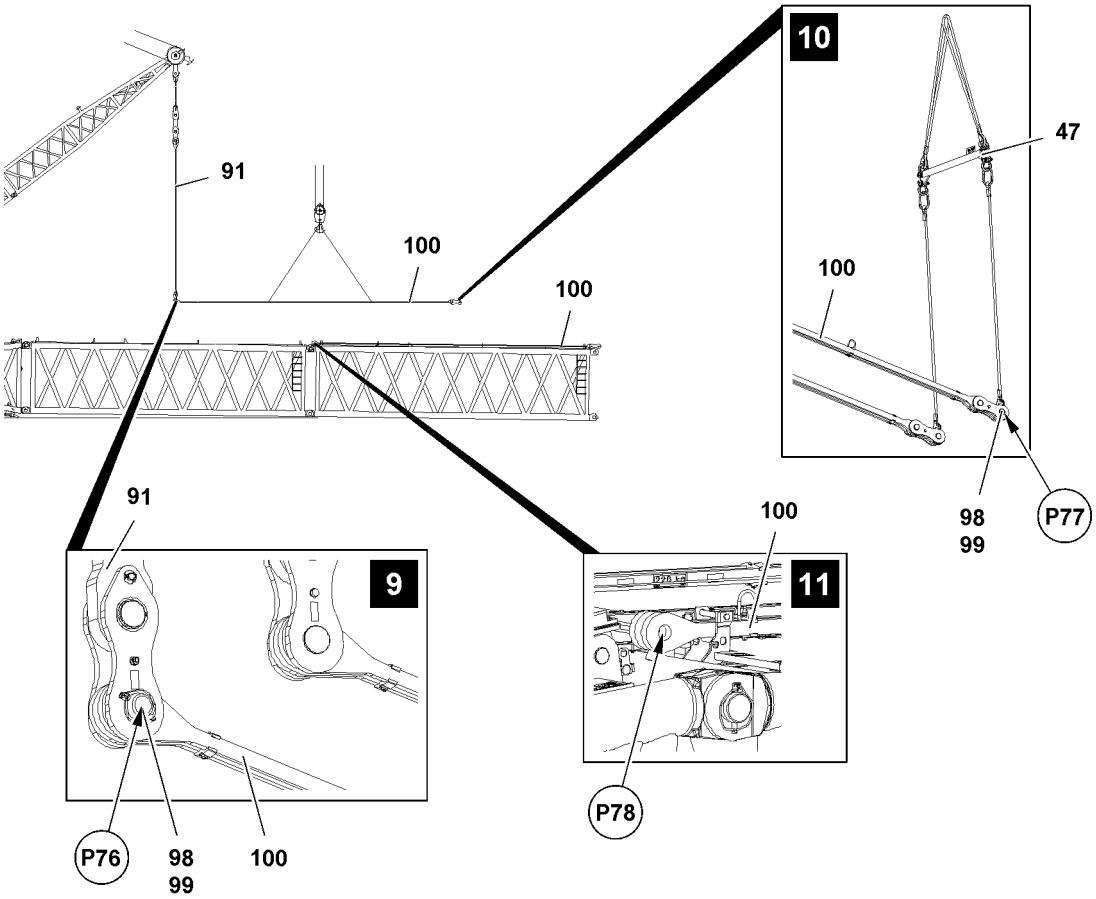

Fig.117060: Long WA-frames: Assembling the 12 m guy rods

Fasten the guy rods **100** on the auxiliary crane which are laying on the first intermediate section after the W-pivot section.

- ▶ Fasten the guy rod **100** to the auxiliary crane.
- ▶ Lift the guy rod **100** with the auxiliary crane and position it in such a way that it can be pinned on point **P76**, see illustration **9**.
- ▶ Pin the guy rod **100** with the guy rod **91**: Insert the pin **98** on point **P76** and secure with safety locking pin **99**, see illustration **9**.
- ▶ Place the guy rod **100** down on the lattice section.
- ▶ Remove the auxiliary crane.
- ▶ Repeat the procedure the same way for the second guy rod **100**.
- ▶ Pin the cross beam **47** on both sides on points **P77** with guy rods **100**, see illustration **10**.
- ▶ Lift the WA-frame 1 and carry the guy rods **100** along with the auxiliary crane and the cross beam until the guy rods **100** can be pinned with the guy rods **100** on point **P78**, see illustration **11**.
- ▶ Pin the guy rods **100** with the guy rods **100**: Insert the pins **98** on both sides on points **P78** and secure with safety locking pin **99**, see illustration **11**.

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3.9.2 Short WA-frames: Pinning the guy rods with each other

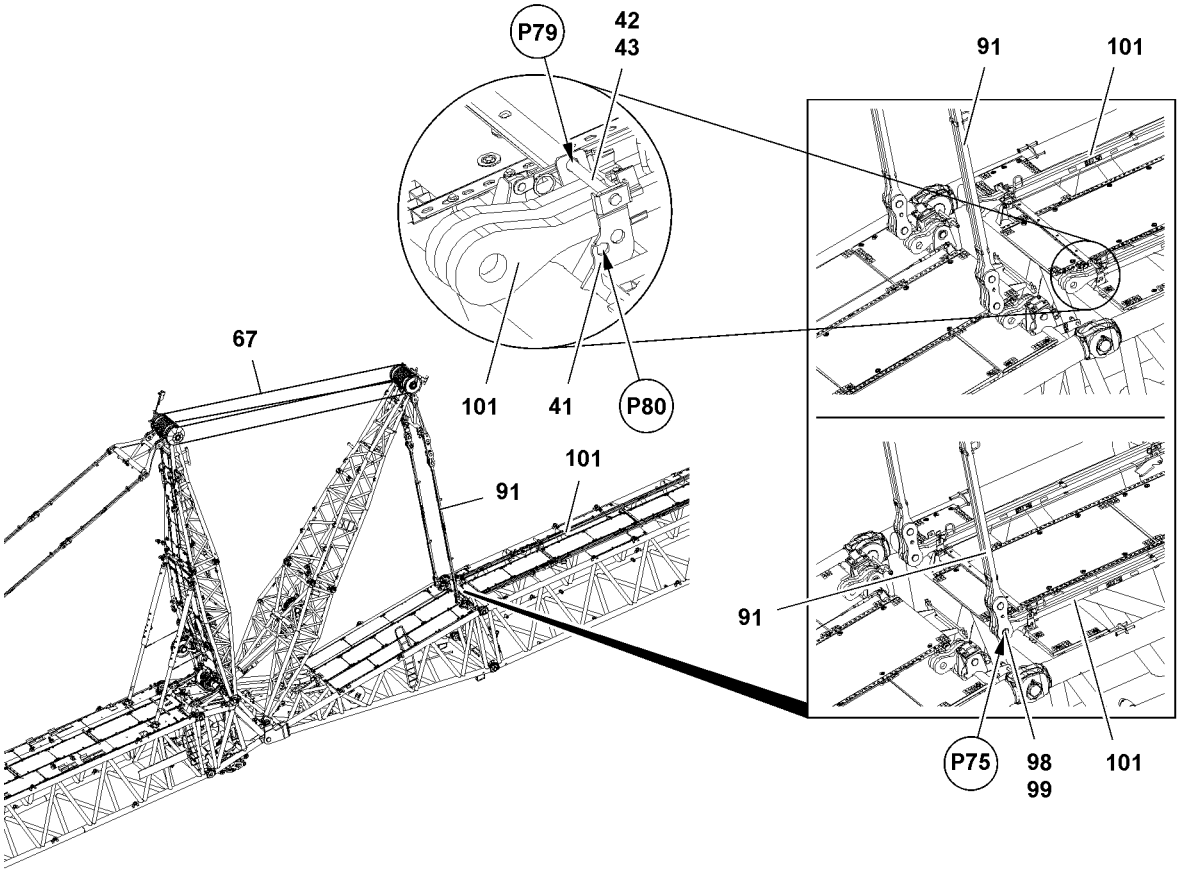

Fig.117062: Short WA-frames: Pinning the guy rods with each other

- ▶ Lower the WA-frame 1 via the W-control rope **67** until the guy rods **91** can be pinned with the guy rods **101**.
- ▶ Open all transport retainers **41**: Remove the spring retainer **43** on both sides on points **P79** and unpin the pin **42**.
- ▶ Insert the pins **42** on both sides on points **P80** in park position and secure with spring retainer **43**.
- ▶ Pin the guy rods **91** with the guy rods **101**: Insert the pins **98** on both sides on point **P75** and secure with safety locking pin **99**.

3.9.3 Installing the auxiliary guying

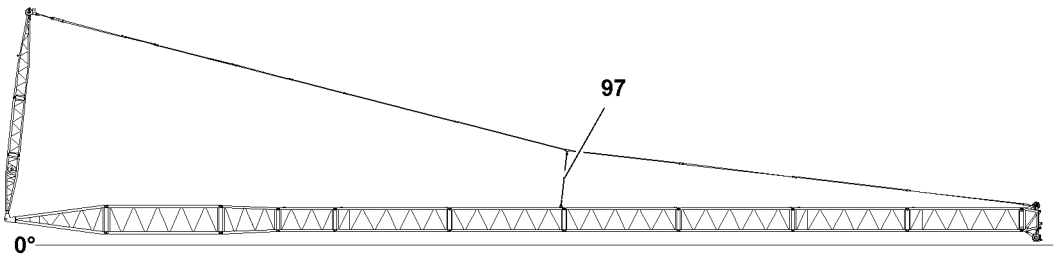

Fig.117064: Installing the auxiliary guying

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Note

- ▶ Auxiliary guying **97** is not required for every system. Refer to the rod plans if an auxiliary guying **97** is required.
- ▶ Assembly of the auxiliary guying **97**, see rod plans. The numbering on the rod plans must be identical to the numbering on the guy rods.
- ▶ For assembly procedure of auxiliary guying **97**, see Crane operating instructions, chapter 5.03.

- ▶ Lower the WA-frame 1 until the auxiliary guying **97** can be installed.
- ▶ Assembling the auxiliary guying **97**, see Crane operating instructions, chapter 5.03.

3.10 Erecting the WA-frame 1

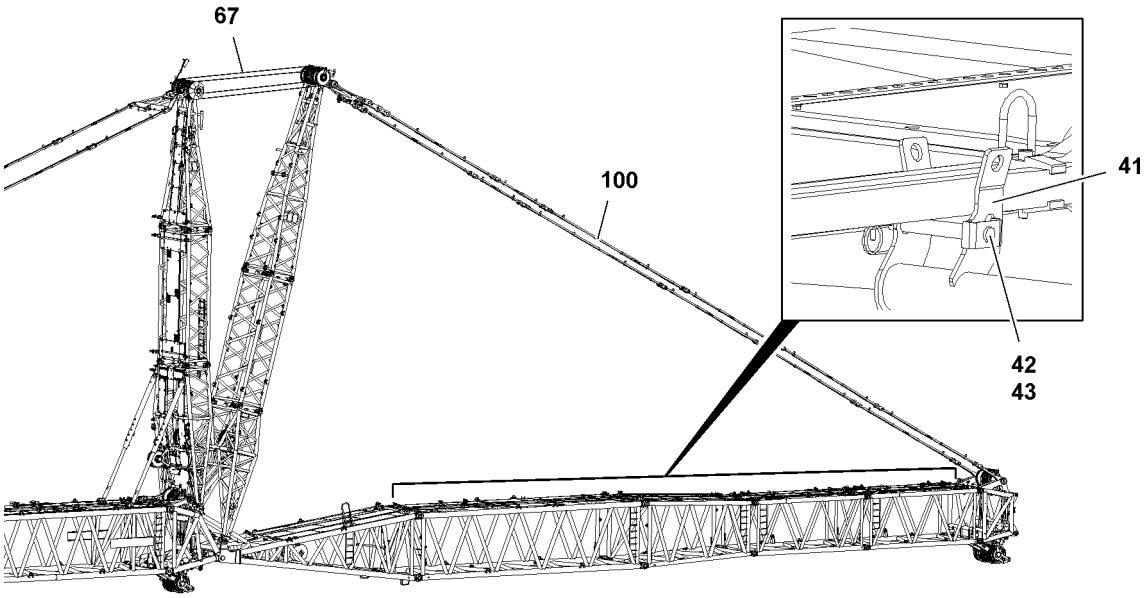

Fig.117063: Erecting the WA-frame 1

Make sure that the following prerequisites are met:

- The function of the relapse cylinder is ensured.
- All pins **42** of the transport retainers **41** are in park position and are secured with spring retainers **43**.

- ▶ Erect the WA-frame 1 with W-control rope **67** until the guy rods **100** are tensioned or the WA-frame 1 is moved to block.

3.11 Installing the roller set

Note

- ▶ The assembly of the roller set is described in the Crane operating instructions, chapter 5.14.

When the roller set is properly installed on the end section:

- ▶ Route the hoist limit switch from the end section forward on the roller set, observe the Electrical wiring diagram.

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3.12 Assembling the roller cart on the W-lattice jib

3.12.1 Preparing the assembly of the roller cart

Make sure that the following prerequisites are met:
- The W-lattice jib is fully assembled.
- The W-guying is properly installed.
- The WA-frame 1 is erected.
- The roller set is assembled on the L-end section.
- An auxiliary crane with sufficient load bearing capacity is available.
- The W-lattice jib is properly fastened on the auxiliary crane, see Crane operating instructions, chapter 5.01.

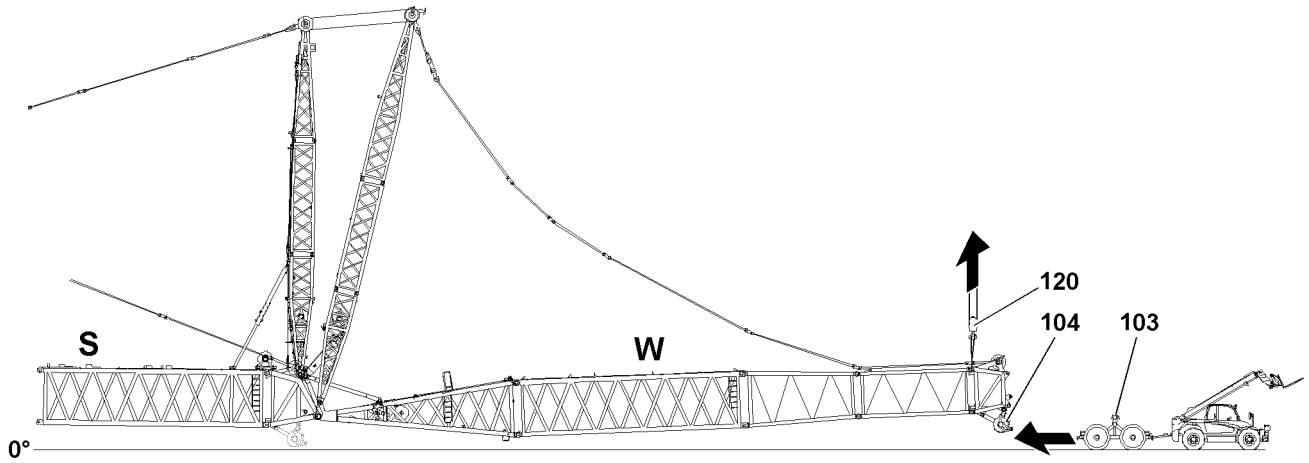

*Fig.122225: Position the roller cart **103** on the roller set **104***

WARNING
Danger of accident due to W-lattice jib.
Death, severe bodily injuries, property damage.
- ▶ Make sure that an auxiliary crane with sufficient load bearing capacity is available for the assembly tasks. Observe the head weights of the W-lattice jibs, see the following charts.
- ▶ Make sure that the W-lattice jib is properly fastened on the auxiliary crane, see Crane operating instructions, chapter 5.01.
- ▶ Improvisations are prohibited.

- ▶ Lift the W-lattice jib with the auxiliary crane.
- ▶ Position the roller cart **103** under the roller set **104**.

3.12.2 Head weights W-lattice jib

	Lattice jib length W					
	18 m	**24 m**	**30 m**	**36 m**	**42 m**	**48 m**
Head weight for W	18 t	20 t	23 t	25 t	27 t	28 t

	Lattice jib length W					
	54 m	**60 m**	**66 m**	**72 m**	**78 m**	**84 m**
Head weight for W	30 t	31 t	33 t	35 t	37 t	38 t

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	Lattice jib length W					
	90 m	**96 m**	**102 m**	**108 m**	**114 m**	**—**
Head weight for W	40 t	41 t	43 t	45 t	47 t	—

3.12.3 Head weights W1-lattice jib

	Lattice jib length W1					
	18 m	**24 m**	**30 m**	**36 m**	**42 m**	**48 m**
Head weight for W1	18 t	20 t	23 t	25 t	27 t	28 t

	Lattice jib length W1					
	54 m	**60 m**	**66 m**	**72 m**	**78 m**	**84 m**
Head weight for W1	30 t	31 t	33 t	34 t	36 t	38 t

3.12.4 Head weights W2-lattice jib

	Lattice jib length W2					
	18 m	**24 m**	**30 m**	**36 m**	**42 m**	**48 m**
Head weight for W2	18 t	22 t	23 t	26 t	29 t	32 t

	Lattice jib length W2					
	54 m	**60 m**	**66 m**	**72 m**	**78 m**	**84 m**
Head weight for W2	34 t	37 t	37 t	40 t	43 t	46 t

	Lattice jib length W2					
	90 m	**96 m**	**—**	**—**	**—**	**—**
Head weight for W2	49 t	52 t	—	—	—	—

3.12.5 Head weights W3-lattice jib

	Lattice jib length W3					
	18 m	**24 m**	**30 m**	**36 m**	**42 m**	**48 m**
Head weight for W3	18 t	22 t	26 t	29 t	31 t	34 t

	Lattice jib length W3					
	54 m	**60 m**	**66 m**	**72 m**	**78 m**	**84 m**
Head weight for W3	35 t	38 t	38 t	41 t	44 t	46 t

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	Lattice jib length W3					
	90 m	96 m	—	—	—	—
Head weight for W3	50 t	52 t	—	—	—	—

3.12.6 Installing the roller cart

▶ Lift the W-lattice jib with the auxiliary crane off the ground.

Note

▶ The assembly of the roller cart is described in the Crane operating instructions, chapter 5.61.

▶ Install the roller cart properly.

3.13 Pulling the hoist ropes in

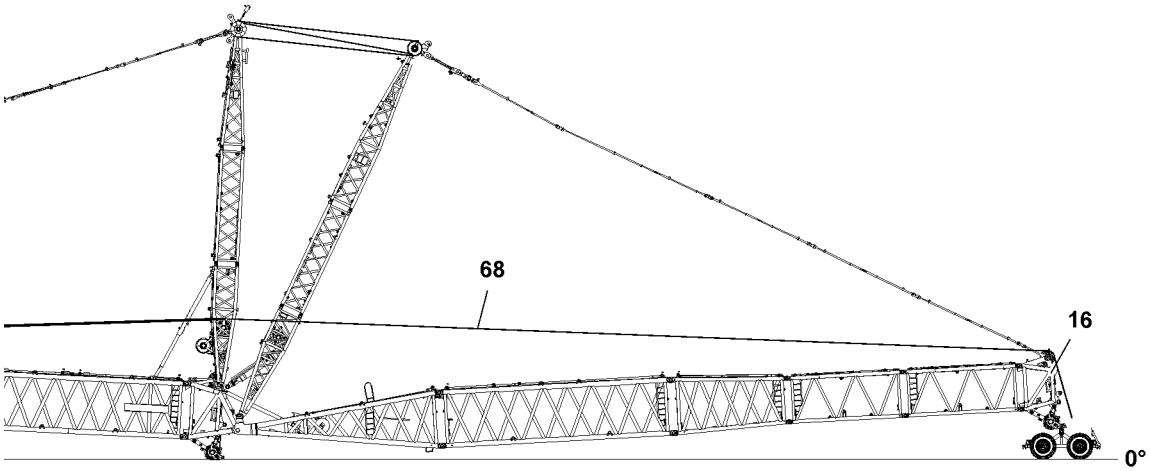

Fig.117065: Pulling the hoist ropes in

NOTICE

Slack rope formation!
Due to slack rope formation, the hoist rope **68** and the W-control rope **67** can be damaged.
This could result in high property damage.

▶ When spooling the hoist rope **68** or the W-control rope **67** up or out, allow no slack rope formation.
▶ When spooling up or out, hold the hoist rope **68** and the W-control rope **67** taut.

WARNING

Danger of accident!
Death, severe bodily injuries, property damage.

▶ It is prohibited to remain within the danger zone of the running ropes.
▶ Radio contact is available between crane operator and assembly personnel.

▶ Spool the hoist rope **68** out and pull it to the L-end section **16**, see Reeving plan.

If additional hoist ropes **68** are used:

▶ Pull the hoist ropes **68** the same way to the L-end section **16** as described before.

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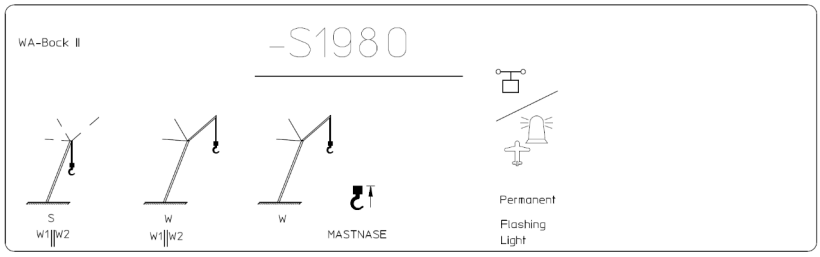
3.14 Establishing the electrical connections on the end section of the W-boom

Make sure that the following prerequisites are met:
- The W-boom is properly assembled on the ground and secured.
- The W-guy rods are completely assembled and are in operating position.
- The electrical connections to the S-end section have been established.
- The airplane warning light, wind speed sensor and all sensors are properly installed and secured on the L-end section.
- The hoist limit switches are properly installed and secured on the pulley head / pulley heads.



-X1980.S **-X1980W.S**

Fig.124470: Terminal box „-S1980“

Note
Before erecting the crane it must be ensured on which end section the parallel operation with winch 1 and winch 2 is operated, pay attention to the Electric wiring diagram.
- ▶ At parallel operation of the S-end section, connect the cable „W1911A“ in the terminal box „-S1980“ in socket „**-X1980.S**“.
- ▶ At parallel operation of the W-end section, connect the cable „W1911A“ in the terminal box „-S1980“ in socket „**-X1980W.S**“.

NOTICE
Danger of damage to the electrical connections!
If the electrical connection from the terminal box on the W-pivot section to the cable drum on the W-pivot section is established first before the connection from the cable drum to the terminal box on the L-end section, then the electrical connection will be damaged when spooling out the cable drum.
- ▶ Establish first the electrical connection from the cable drum on the W-pivot section to the terminal box on the L-end section and then the electrical connection from the terminal box on the W-pivot section to the cable drum.

Note
- ▶ To establish the electrical connections on the end section of the W-boom: Pay attention to the Electrical wiring diagram.

- ▶ Establish the electrical connections.
- ▶ Make sure that all electrical connections on the boom are established.

WARNING
Malfunction if dummy plugs are not installed!
If the dummy plugs on the non-required electrical connections are not installed, then malfunctions or functional limitations can occur on the crane.
- ▶ Make sure that all non-required electrical connections that have a dummy plug are closed off with dummy plugs.
- ▶ Pay attention to the Electrical wiring diagram.

- ▶ As a rule, close off on-required electrical connections (for example for accessories which cannot be installed) with the respective dummy plugs.

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NOTICE
Property damage due to dirt and / or corrosion!
If non-required electrical connections are not closed off with the respective protective caps, then dirt and / or corrosion can damage the electrical connections.
This could result in malfunctions.
▶ Make sure that all non-required electrical connections are always closed off properly.
▶ Pay attention to the Electrical wiring diagram.

▶ Close electrical connections, which have no dummy plugs, properly off with the corresponding protective caps.

3.15 Checking the function of the safety equipment

Make sure that the following prerequisites are met:
– All electrical connections have been established.
– The appropriate operating mode is set.

3.15.1 Wind speed sensor*

▶ Check the movement and the function of the wind speed sensor.

3.15.2 Airplane warning light*

▶ Turn the airplane warning light on and visually check the function.

3.15.3 Oscillation guard

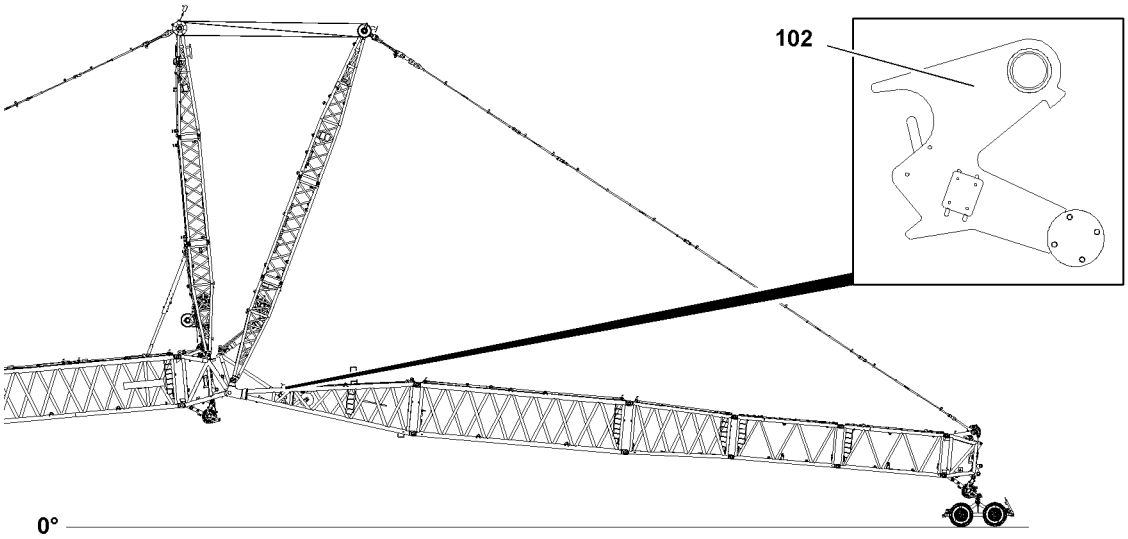

Fig.117066: Oscillation guard

DANGER
Danger of tipping over if the oscillation guard is hard to move!
If the oscillation guard **102** is hard to move, the mechanical relapse retainer will no longer function.
The W-lattice jib can tip backwards uncontrolled and cause the crane to topple over.
▶ Crane operation with hard to move oscillation guard **102** is prohibited.

▶ Check the oscillation guard **102** for easy movement.

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3.15.4 Limit switch, general

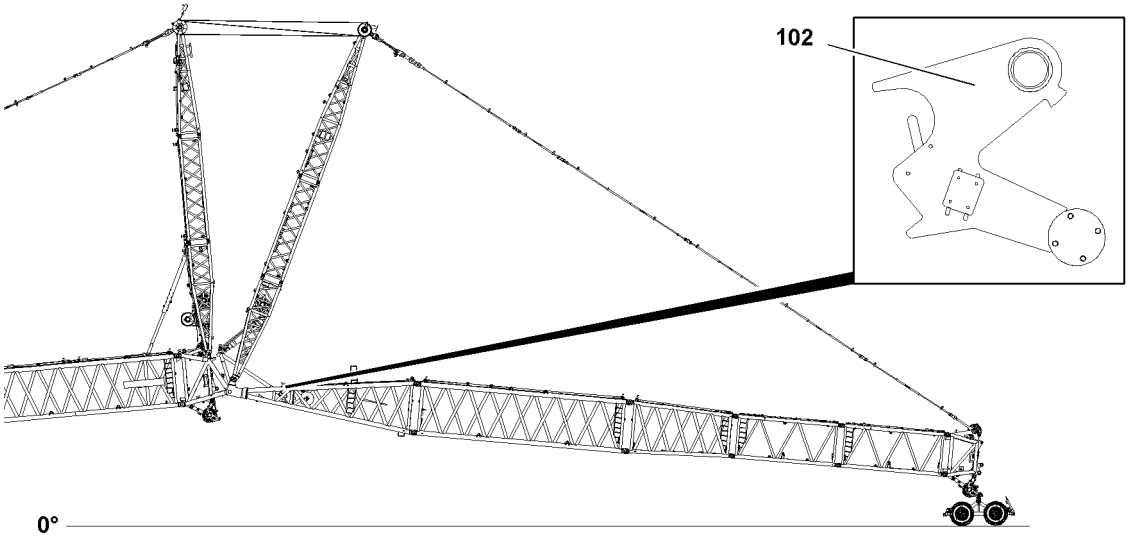

Fig.117066: Limit switch, general

WARNING
The crane control does not turn off in time!
▶ The limit switch functions have to be checked individually before erection.

Note
▶ The limit switch initiators are checked manually as follows.
▶ Check the limit switch initiators, see also Crane operating instructions, chapter 8.12.

3.15.5 Hoist limit switch

When replacing or changing the hoist limit switch (HES), the HES must have the correct bus address and the correct software version in order to be recognized again by the bus system (LSB).

▶ Actuate the hoist limit switch manually.

Result:

– The icon appears on the LICCON monitor.
– The **spool up** function of the hoist winch turns off.

3.15.6 Limit switch on relapse cylinder, „W-lattice jib steepest position“

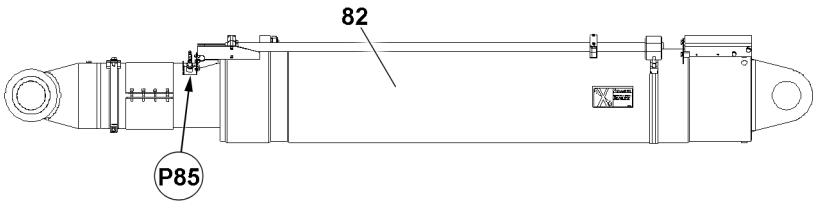

Fig.124472: Limit switch on relapse cylinder

▶ Cover the limit switch initiators „W-lattice jib steepest position“ at points **P85** individually with a metal plate.

Result:

– The icon appears on the LICCON monitor.
– The **spool up function** of the W-control winch turns off.

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3.15.7 Limit switch on W-pivot section

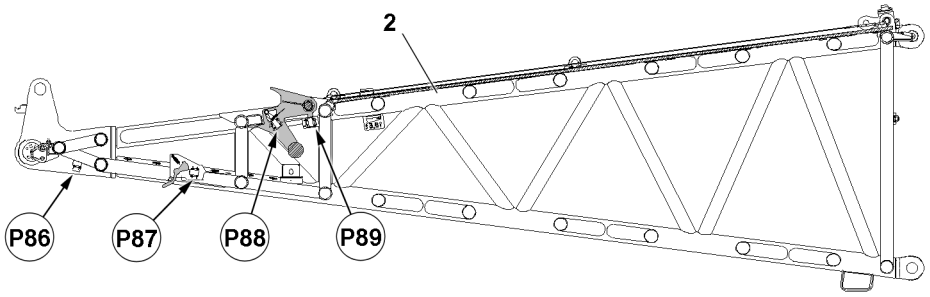

Fig.124471: Limit switch on W-pivot section

Limit switch on W-pivot section, position „W-lattice jib on bottom 45°“, S-boom without roller set

▶ Cover the limit switch initiators „W-lattice jib bottom 45°“ at points **P86** individually with a metal plate.

Result:

– The icon appears on the LICCON monitor.
– The **spool up function** of the W-control winch turns off.

Limit switch on W-pivot section, position „W-lattice jib on bottom 80°“, S-boom with roller set

▶ Cover the limit switch initiators „W-lattice jib bottom 80°“ at points **P87** individually with a metal plate.

Result:

– The icon appears on the LICCON monitor.
– The **spool out function** of the W-control winch turns off.

Limit switch on flap, position „W-lattice jib in steepest position“, mechanical relapse support in flap

▶ Cover the limit switch initiators „W-lattice jib steepest position“ at points **P88** individually with a metal plate.

Result:

– The icon appears on the LICCON monitor.
– The **spool up function** of the W-control winch turns off.

Limit switch on W-pivot section, position „flap in position“

▶ Cover the limit switch initiators „flap in position“ individually at points **P89** with a metal plate.

Result:

– The icon appears on the LICCON monitor.
– The **spool up function** of the W-control winch turns off.

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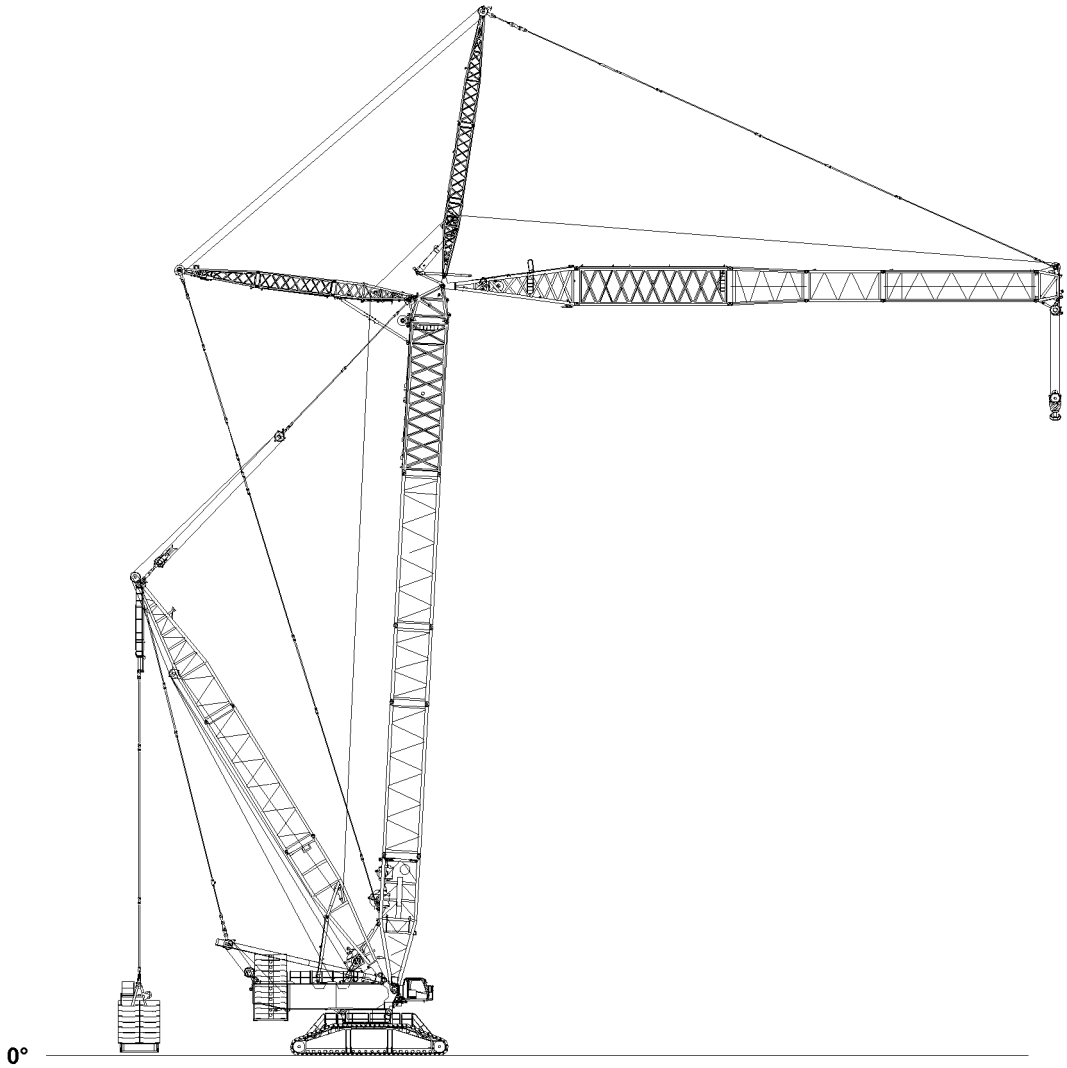

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Fig.121038: Erecting the boom

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4 Erecting the boom

DANGER
The crane can topple over!
- ▶ It is not permitted to turn the crane during erection.
- ▶ Observe the technical safety instructions, see Crane operating instructions, chapter 5.01.
- ▶ Observe the specifications in the erection and take-down charts.
- ▶ Extend the relapse cylinder before erection.

DANGER
Tipping lattice jib!
If the easy movement on the pendulum of the mechanical relapse support is not checked before erection or not reestablished, if necessary, then the mechanical relapse support will not engage in the steep lattice jib position. As a result, the lattice jib can tip to the rear.
Death, severe bodily injuries, property damage.
- ▶ Check the easy movement of the pendulum of the mechanical relapse support before erection.
- ▶ If the pendulum does not move easily: Make the pendulum easy to move.

WARNING
The crane can topple over!
If the following conditions are not met before erecting the boom, the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ The lattice jib must roll on the ground with its entire weight.
- ▶ Spool the lattice jib adjustment out in such that guy rods sag slightly.
- ▶ Do not allow slack rope to form on the W-control winch.

WARNING
Unutilized guy rods on boom!
If guy rods are on the lattice sections which are not used for operation, then there is a danger of accidents.
Death, severe bodily injuries, property damage.
Guy rods can fall down.
The load chart is invalid.
The load display of the LICCON computer system shows the incorrect value.
- ▶ Removed unutilized guy rods before erecting the boom.

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Make sure that the following prerequisites are met:
- The W-lattice jib is fully assembled.
- The roller cart is assembled on the L-end section.
- The crane is horizontally aligned.
- The guy rods are properly assembled.
- The guy rods which are not required have been removed from the lattice sections.
- All electrical connections have been made.
- All hydraulic connections have been made.
- The function checks were carried out properly.
- All limit switches and warning devices are functioning.
- Crane ballasting (counterweight, central ballast, derrick ballast and / or auxiliary ballast) is carried out according to the load charts and / or the erection and take-down charts.
- The crane has been set up according to the load charts and / or the erection and take-down charts.
- The LICCON overload protection has been set according to the data in the load charts and / or the erection and take-down charts.
- The LICCON overload protection settings have been checked for completeness and correctness.
- Assembly operation of the crane control is activated: the assembly icon is visible on the LICCON monitor.
- All pin connections have been secured.
- The hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins.
- The hoist rope has been pulled with the respective length over the L-end section.
- There are no loose parts on the boom system.
- The boom system and the safety equipment are free from snow, frost and ice.
- No personnel or obstacles are within the danger zone.

4.1 Erection procedure

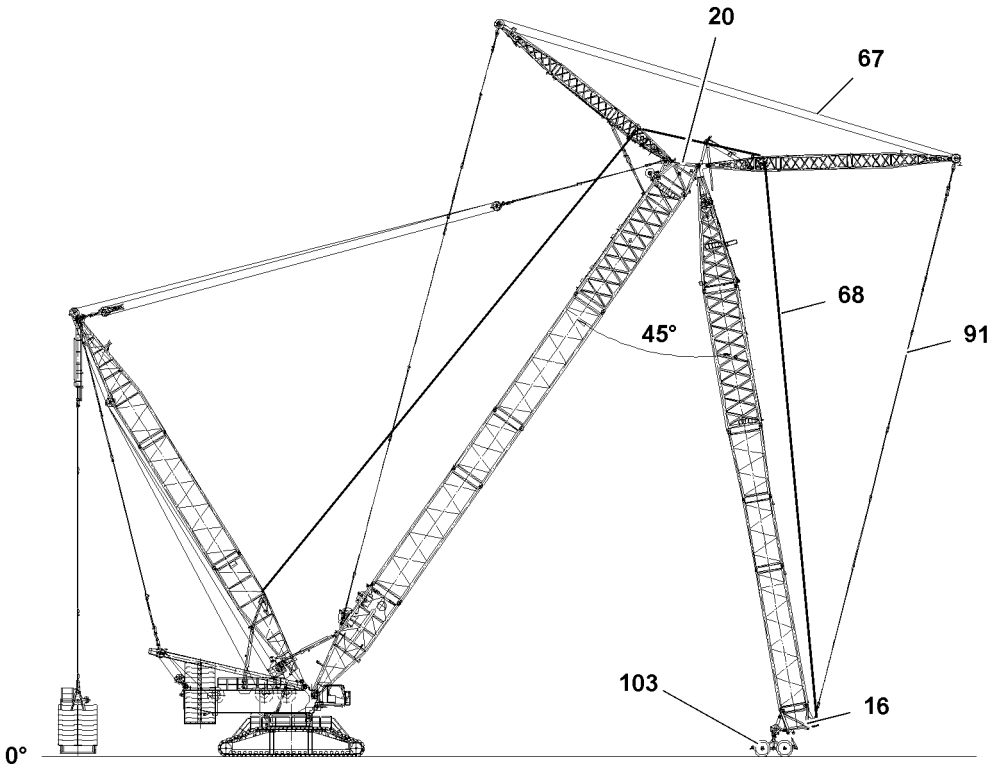

Fig.122177: Erection procedure

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WARNING
Falling hoist rope!
If the hoist rope **68** is not pulled with the respective length over the L-end section **16** before the erection procedure, then it can fall backward due to its own weight.
Death, severe bodily injuries, property damage.
- ▶ Pull the hoist rope **68** before the erection procedure with sufficient length over the L-end section **16** and place on the ground.
- ▶ During the erection walk along with the roller cart and constantly monitor the hoist rope: The hoist rope may not lift off the ground.
- ▶ The hoist rope **68** must be constantly monitored during erection.
- ▶ Do not step into the danger zone.

DANGER
The crane can topple over!
Death, severe bodily injuries, property damage.

When the roller cart **103** is installed on the L-end section **16** and the guy rods **91** are tensioned:
- ▶ Spool the W-lattice jib control up until the guy rods **91** hang through slightly.

While the S-boom is luffed down:
- ▶ Spool the W-lattice jib control up in such a way that the guy rods **91** always hang through slightly.
- ▶ The W-lattice jib must roll on the ground with its entire weight.
- ▶ Allow no slack rope formation on the W-control rope **67**.

Note
- ▶ Depending on the set up configuration of the boom system, one of the following listed erection variations must be selected.

4.1.1 Erecting the boom system without a roller set on the S-end section

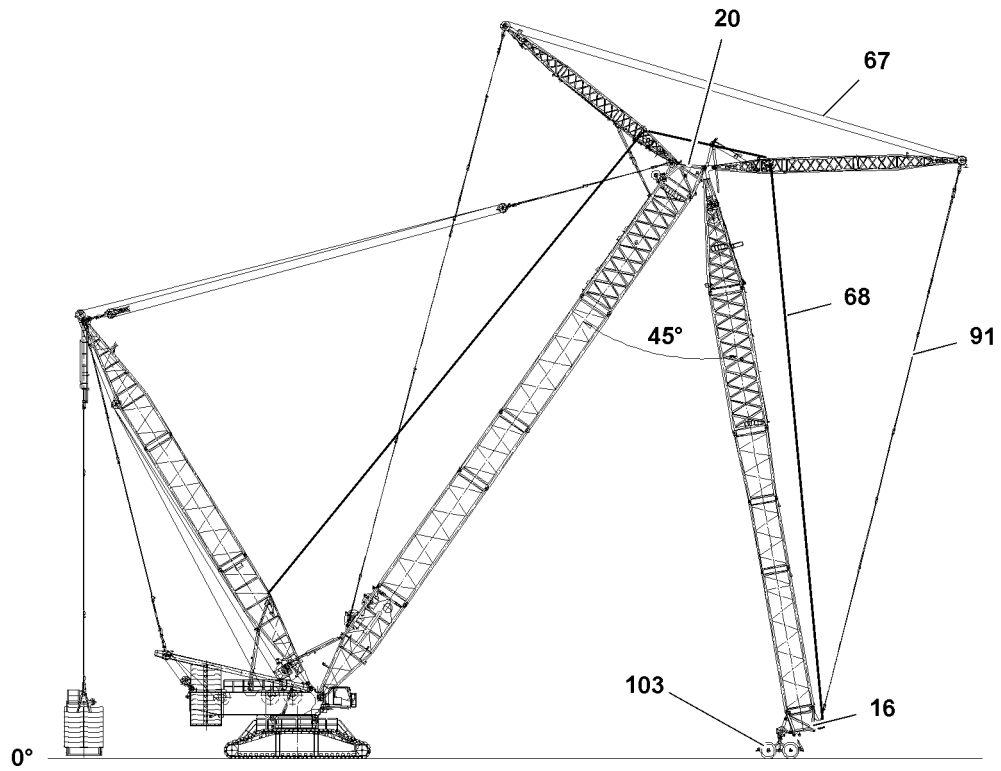

Fig.122177: Erecting the boom system without a roller set on the S-end section

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When **NO** roller set **104** is installed on the S-end section **20**:

▶ Luff up the S-boom and simultaneously spool the W-control winch out to keep the lattice jib with the L-end section **16** placed on the roller cart **103** on the ground. Continue with this process until the S-boom and the W-lattice jib form an angle of approximately 45°, **Switch position W-lattice jib down** or until the W-boom points down almost vertically or until the WA-frame 1 is in **bottom** position.

Problem remedy

The erection procedure was turned off as a result of falling below the value $F3_{min}$?

▶ See the Crane operating instructions, chapter 4.02 and chapter 4.20.

4.1.2 Erecting the boom system without a roller set on the S-end section and long W-lattice jib

Note

▶ On this boom system, the W-lattice jib is significantly longer than the S-boom.

When **NO** roller set **104** is installed on the S-end section **20**, without illustration:

▶ Luff up the S-boom and simultaneously spool the W-control winch out to keep the lattice jib with the L-end section **16** placed on the roller cart **103** on the ground. Carry out this procedure until the S-boom has reached the 87° position.

Problem remedy

The erection procedure was turned off as a result of falling below the value $F3_{min}$?

▶ See the Crane operating instructions, chapter 4.02 and chapter 4.20.

4.1.3 Erecting the boom system with a roller set on the S-end section

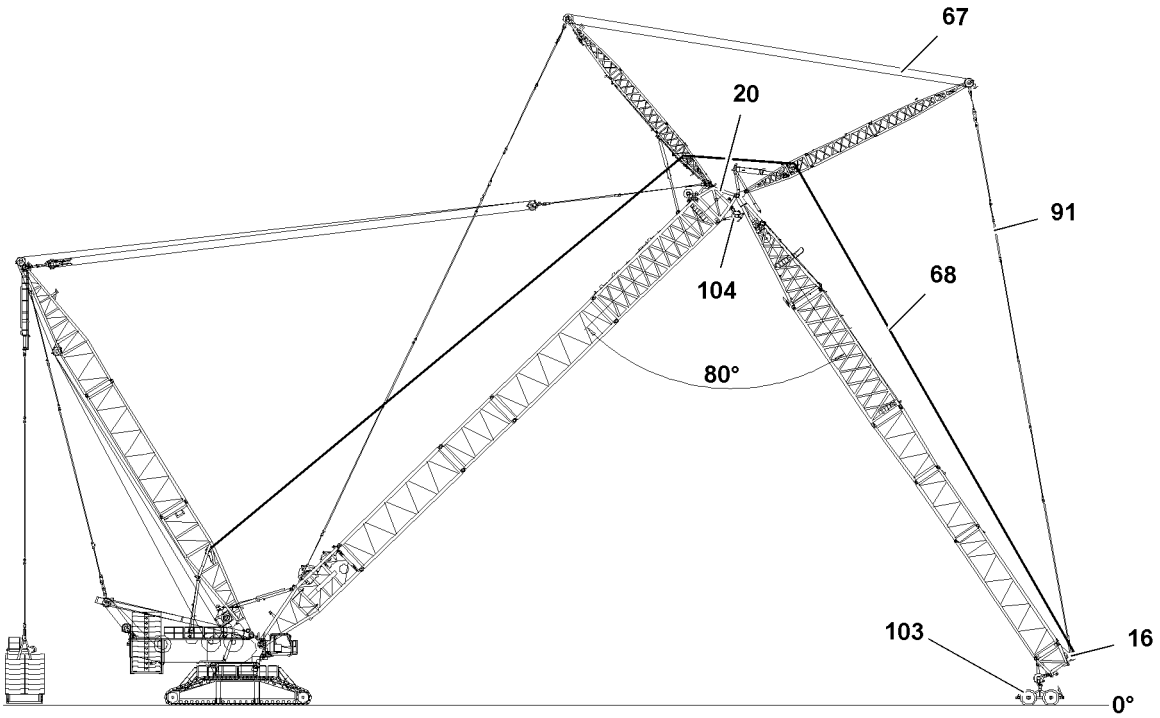

Fig.122178: Erecting the boom system with a roller set on the S-end section

When **ONE** roller set **104** is installed on the S-end section **20**:

▶ Luff up the S-boom and simultaneously spool the W-control winch out to keep the lattice jib with the L-end section **16** placed on the roller cart **103** on the ground. Continue with this process until the S-boom and the W-lattice jib form an angle of approximately 80°, **Switch position W-lattice jib**

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down or until the W-boom points down almost vertically or until the WA-frame 1 is in **bottom** position.

Problem remedy

The erection procedure was turned off as a result of falling below the value $F3_{min}$?

▶ See the Crane operating instructions, chapter 4.02 and chapter 4.20.

4.1.4 Continuing the erection procedure

Make sure that the following prerequisite is met:

– The L-end section of the W-lattice jib is placed in the roller cart

▶ Release and remove the roller cart **103**, see Crane operating instructions, chapter 5.61.

▶ Luff the S-boom up until the L-end section **16** is over the hook block **105**.

WARNING

Danger of accident due to side wind!

If the slewing gear brake is released after reeving in / reeving out the hook block / load hook, then the crane can turn uncontrolled if there is a strong side wind.

Death, severe bodily injuries, property damage.

The crane can collide with close-by structures or objects.

▶ Make sure that the current wind speed does not exceed the values from the wind speed chart when releasing the slewing gear brake.

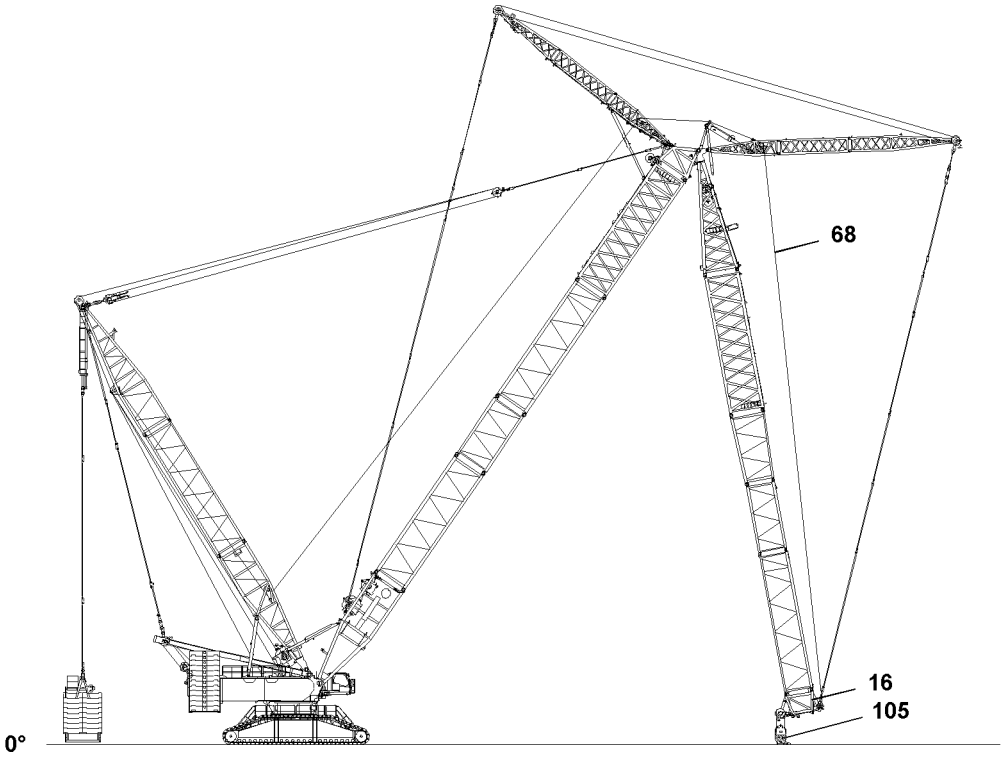

Fig.144149: Reeving in the hook block / load hook

▶ Reeve in the hook block **105** properly, see Crane operating instructions, chapter 4.06 and reeving plan.

or

Pin the load hook, see Crane operating instructions, chapter 4.06.

▶ Check the actual load on the LICCON monitor.

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Problem remedy

The actual load on the LICCON monitor is greater than 0.0 t.

▶ Observe the notes for input of hook block weight, see Crane operating instructions, chapter 4.02.

▶ Attach the hoist limit switch weight.

▶ Enter the weight of the hook block **105** in the LICCON computer system.

NOTICE

Damage to crane!

▶ Operate the hoist rope only when the W-boom is in horizontal position.

▶ Luff up the S-boom to the operating position.

WARNING

The crane can topple over!

In crane operation with exceeded LICCON overload protection, the crane can topple over.

Death, severe bodily injuries, property damage.

▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook.

If required in the erection and take down chart:

▶ Carry the hook block **105** along with the auxiliary crane.

Note

▶ When the lowest operating position of the W-lattice jib is reached, the set load chart of the LICCON overload protection is activated.

▶ In the maximum load icon appears a load number in „t“ instead of the display „???“.

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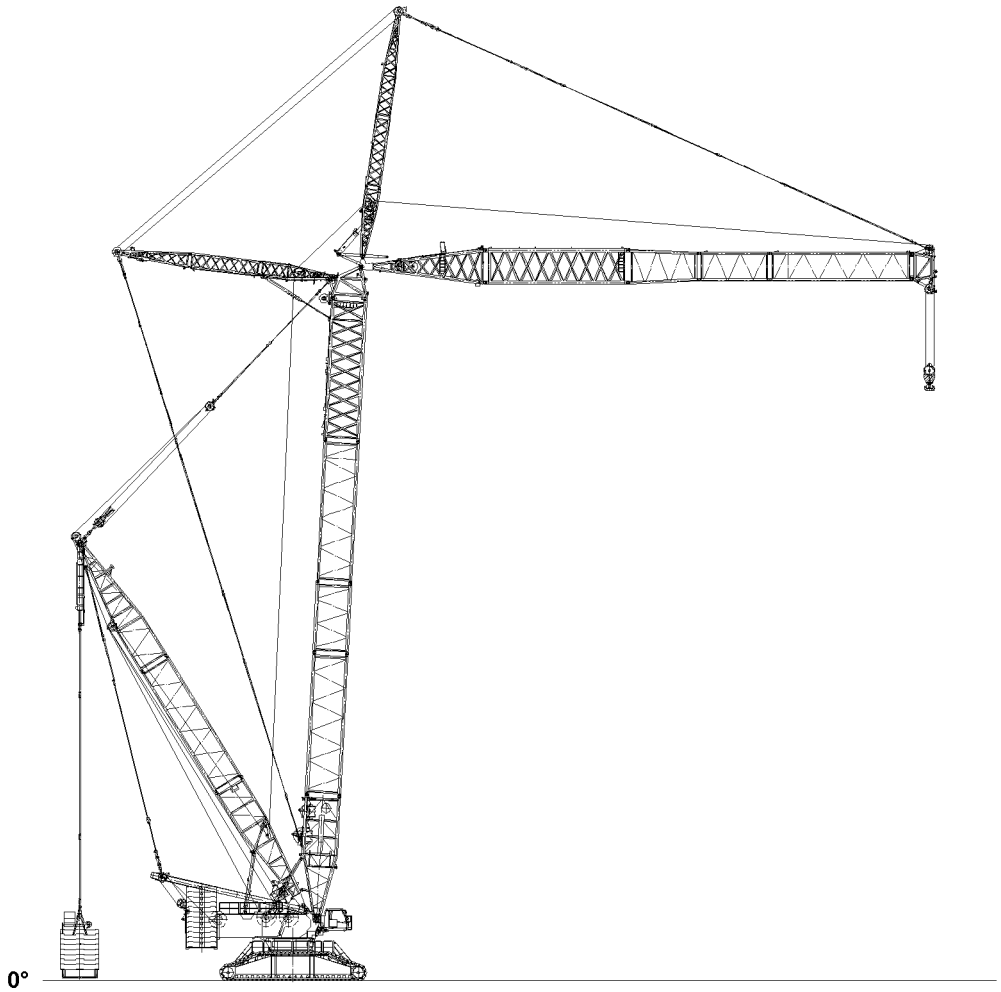

Fig.122180

▶ Luff the boom up to the lowest operating position.

When the boom has reached the lowest operating position:
▶ Make sure that the assembly icon on the LICCON monitor turns off.

Result:

– The LICCON overload protection is active.

▶ Luff the boom up to the required main boom angle according to the load chart.

5 Crane operation

Note
▶ Observe the notes, see Crane operating instructions, chapter 4.05, Crane operating instructions, chapter 4.08 and Crane operating instructions, chapter 5.01.

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Make sure that the following prerequisites are met:
- The LICCON overload protection is active.
- The LICCON overload protection has been set according to the data in the load chart.
- The main boom is in the specified angle position according to the load chart.

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ Check the horizontal position of the crane before and during operation.
- ▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset if necessary before resuming crane operation.

5.1 Checking the settings

- ▶ Check the function of the overload protection by running against the operating positions „on top“ and „bottom“.
- ▶ Check the hoist limit switch by running against the hoist limit switch weight.

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6 Disassembling

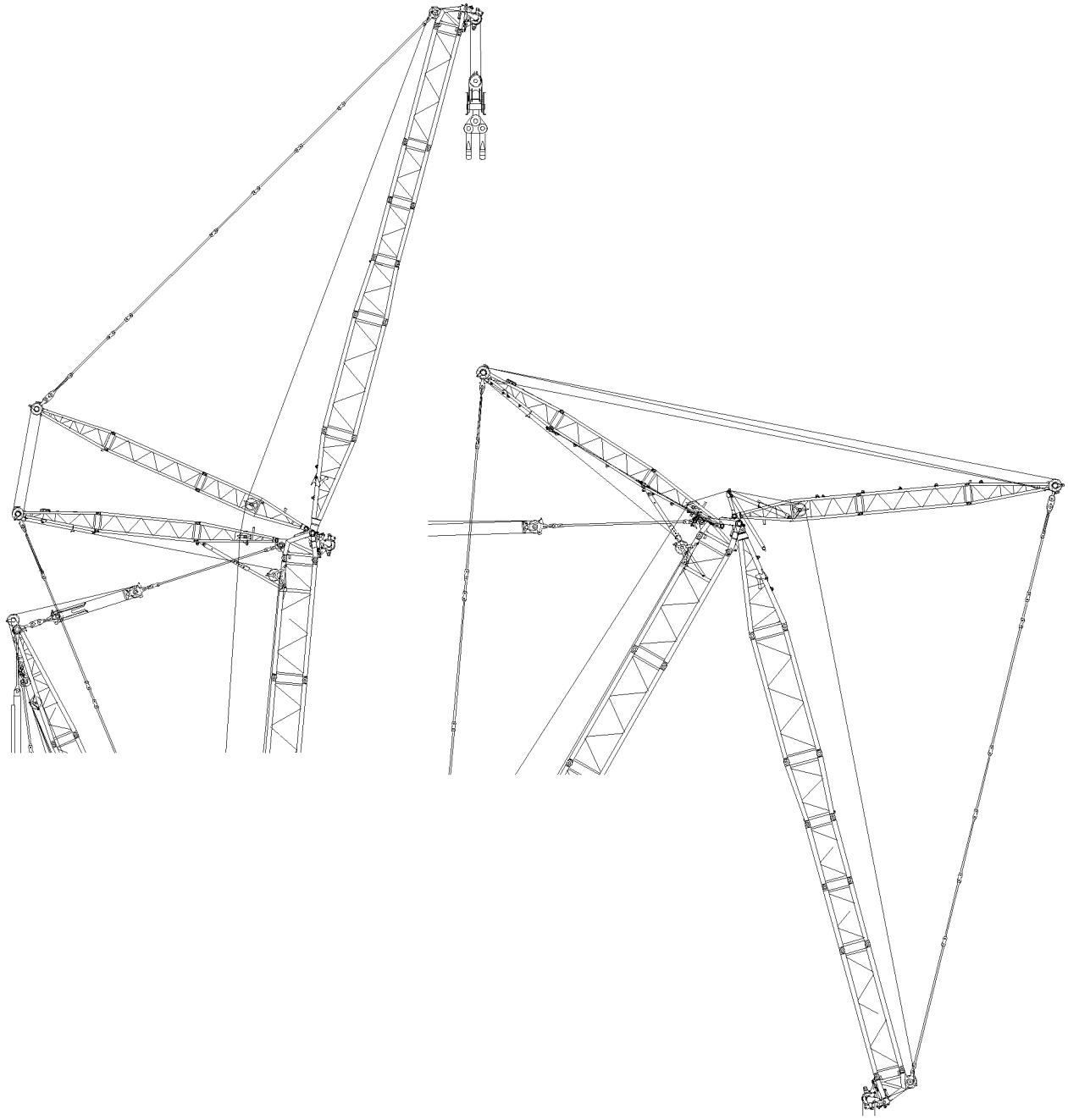

Fig.116106: Disassembling

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WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ When closing or opening boom systems during boom assembly or boom disassembly, no persons may remain on the boom system or in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane driver of the main crane must be in voice contact with the crane driver / crane drivers of the auxiliary crane / auxiliary cranes.
- ▶ For assembly tasks, the crane driver may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
The lattice sections can fall down!
If the lattice sections are not pinned and secured correctly, then they can fall down.
Death, severe bodily injuries, property damage.
- ▶ Pin or unpin both pins at the same horizontal level, i.e. **left and right**.
- ▶ Do not stand under the lattice sections or within the entire danger zone during the pinning and unpinning procedure of the boom.
- ▶ Safely secure the pins in the storage locations as well as in the receptacles.
- ▶ It is prohibited to lean the auxiliary ladder against the component being disassembled.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ Make sure that the crane is horizontally aligned.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

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WARNING
Danger of accident!
If no guide is present during assembly work who has voice connection to the crane operator as well as to the drivers of the auxiliary units, then there is a great danger of accidents.
Crane movements, which are carried out without the approval of the guide, can cause accidents.
Death, severe bodily injuries, property damage.
▶ For all assembly work, observe the instructions of the guide.
▶ Make sure that the danger zone can be seen completely by the crane operator and / or the guide.

DANGER
The components can fall down!
If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned and secured, the corresponding component can fall down and fatally injure personnel.
▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

6.1 Taking down the boom

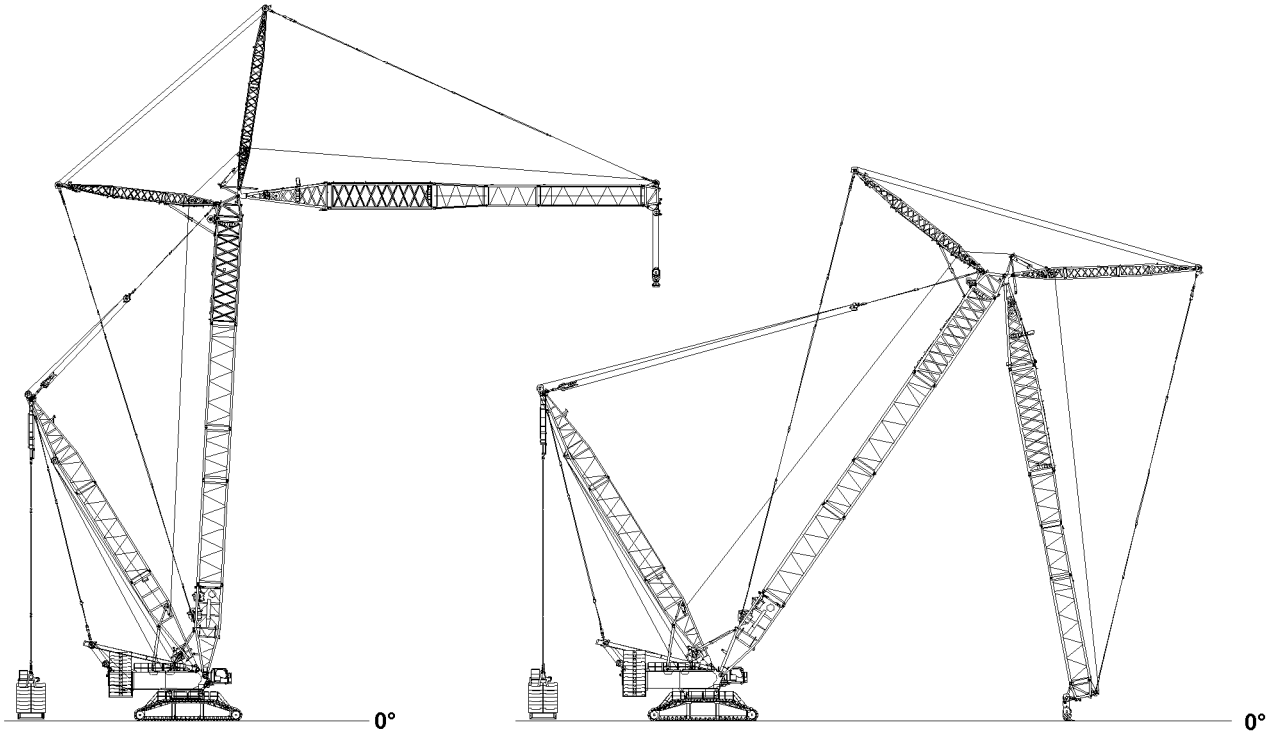

Fig.144150: Taking down the boom

DANGER
The crane can topple over!
If the following conditions are not met before taking down the boom, the crane can topple over and fatally injure personnel.
▶ Observe the technical safety instructions, see Crane operating instructions, chapter 5.01.
▶ Observe the specifications in the erection and take-down charts.

Make sure that the following prerequisite is met:
– The S-boom is in the steepest position

▶ Luff the W-lattice jib down to the **lowest** operating position.

When the lowest operating position is reached the luff down movement is shut off.

The load value in the „maximum load“ icon disappears and question marks appear (????).

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The following alarm functions become active:

– „STOP“
– „Horn“ and acoustical signal

WARNING
Danger of accident due to function „Exceedance of shut-off limits of the LICCON overload protection“!
If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload.
Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.

▶ The function „Exceedance of shut off limits of the LICCON overload protection“ is only permissible in emergencies and for assembly purposes.
▶ The function „Exceeding the shut off limits of the LICCON overload protection“ may only be actuated by persons who know the effects of their actions regarding the function „Exceeding the shut off limits of the LICCON overload protection“.
▶ The function „Exceedance of shut off limits of the LICCON overload protection“ requires the presence of an authorized person and must be performed with utmost caution.
▶ Crane operation with activated function „Exceedance of shut off limits of the LICCON overload protection“ is prohibited.

When the W-lattice jib has reached the „lowest“ operating position:
▶ Exceeding the shut off limits of the LICCON overload protection: Engage assembly operation.

Result:

– The shut off limits of the LICCON overload protection are exceeded.
– The assembly icon appears on the LICCON monitor.

Note
▶ See the Crane operating instructions, chapter 4.02.

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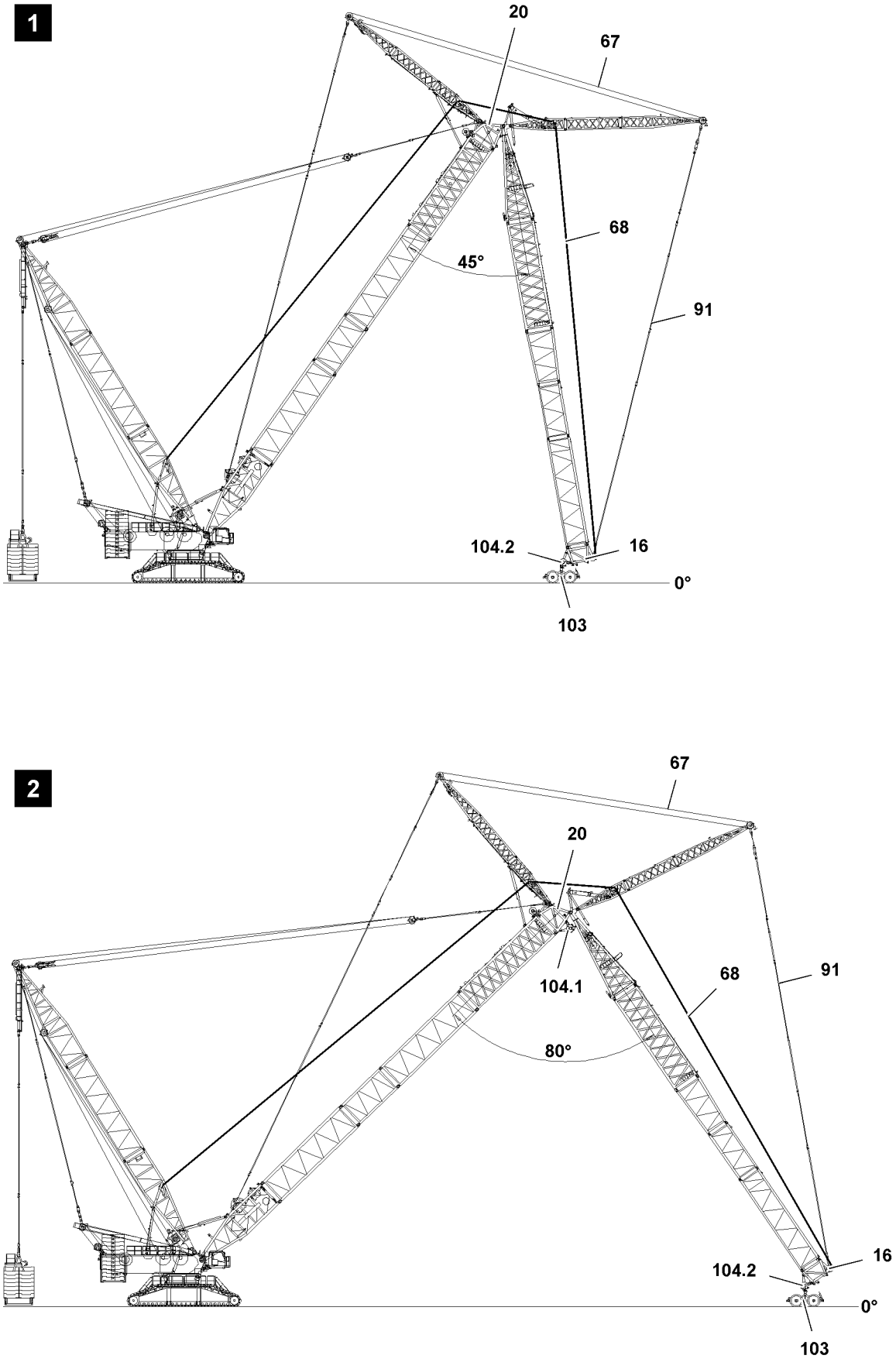

Fig.117072: Taking the boom down - Luff down procedure

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When **NO** roller set **104.1** is installed on the S-end section **20**, see illustration **1**:

▶ Luff down the W-lattice jib until an angle of approximately 45° is reached between the S-boom and the W-lattice jib or the hook block touches the ground.

Result:

– The switch position „W-lattice jib bottom“ is reached.
– The luff down procedure of the W-lattice jib will be ended.

When **ONE** roller set **104.1** is installed on the S-end section **20**, see illustration **2**:

▶ Luff down the W-lattice jib until an angle of approximately 80° is reached between the S-boom and the W-lattice jib or the hook block touches the ground.

Result:

– The switch position „W-lattice jib bottom“ is reached.
– The luff down procedure of the W-lattice jib will be ended.

NOTICE
Damage to crane!
When the hoist rope **68** is not spooled out during the luff down procedure, a collision of the hook block with the L-end section **16** can occur.
This could result in high property damage.

▶ Luff down the S-boom and simultaneously spool the hoist winch out to prevent the hook block from colliding with the L-end section **16**.

▶ Luff the S-boom down until the hook block touches the ground.
▶ Remove the hoist limit switch weight and reeve the hook block out.
▶ Luff the S-boom down until the placement pins can be installed on the roller set **104.2**.
▶ Place the roller set **104.2** on the roller cart **103**.
▶ Install the roller set **104.2** on the roller cart **103**, see Crane operating instructions, chapter 5.61.

DANGER
The crane can topple over!
Death, severe bodily injuries, property damage.

When the roller cart **103** is installed on the L-end section **16** and the guy rods **91** are tensioned:

▶ Spool the W-lattice jib control out until the guy rods **91** hang through slightly.

While the S-boom is luffed down:

▶ Spool the W-lattice jib control out in such a way that the guy rods **91** always hang through slightly.
▶ The W-lattice jib must roll on the ground with its entire weight.
▶ Allow no slack rope formation on the W-control rope **67**.

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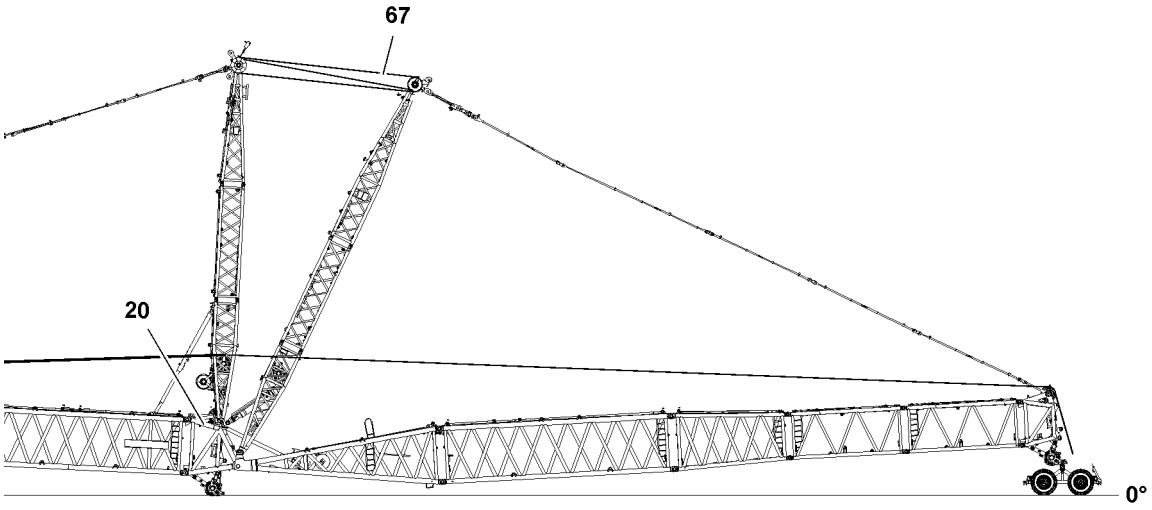

Fig.117073: Taking the boom down — Luffing the S-boom down

▶ Luff the S-boom down and spool the W-control rope **67** up simultaneously until the S-end section **20** is laying on the substructure on the ground.

6.2 Removing the hoist ropes

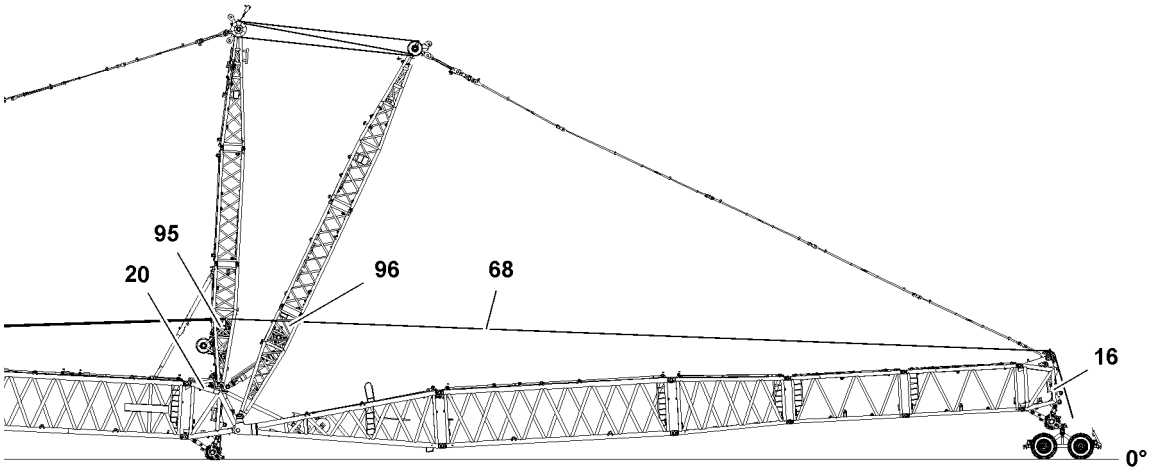

Fig.117078: Removing the hoist ropes

Make sure that the following prerequisite is met:
– All rope retainers are removed on the L-end section **16**.

NOTICE
Slack rope formation!
The hoist rope **68** can be damaged if slack rope forms.
This could result in high property damage.
▶ When spooling the hoist rope **68** up or out, allow no slack rope formation.
▶ Hold the hoist rope **68** taut when spooling it up or out.

WARNING
Danger of accident!
Death, severe bodily injuries, property damage.
▶ It is prohibited to remain within the danger zone of the running ropes.
▶ Radio contact is available between crane operator and assembly personnel.

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- ▶ Slowly spool the hoist rope **68** up and pull it over the rope pulley **96** and the rope pulley **95** which are within the WA-frames.
- ▶ Spool the hoist rope **68** up until the end of the rope can be placed down on the S-end section **20**.
- ▶ Take the hoist rope **68** down.
- ▶ Secure the hoist rope **68** to prevent it from falling.

If additional hoist ropes **68** must be removed:

- ▶ Remove the hoist ropes **68** the same way as described before.

6.3 Removing the auxiliary guying

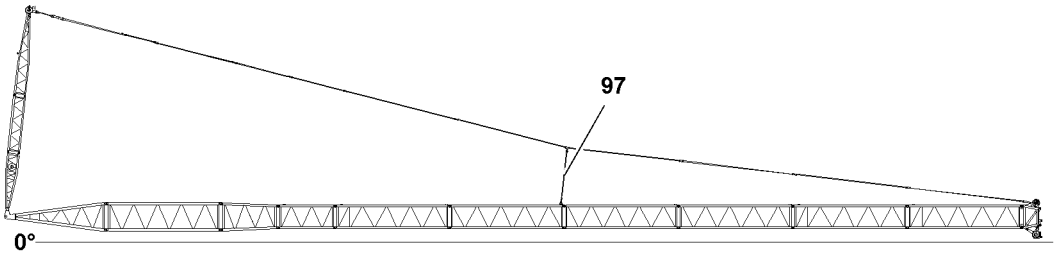

Fig.117064: Removing the auxiliary guying

When one auxiliary guying **97** is installed:

- ▶ Lower the WA-frame 1 until the auxiliary guying **97** can be removed.
- ▶ For disassembly of the auxiliary guying **97**, see Crane operating instructions, chapter 5.03.

6.4 Releasing the WA-frame 1 guy rods

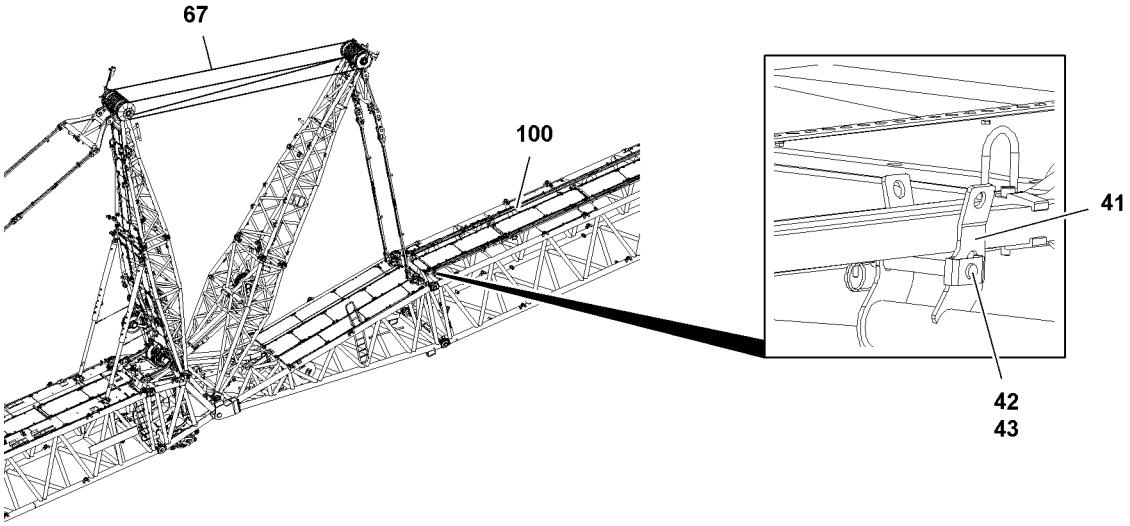

Fig.117074: Releasing the WA-frame 1 guy rods

Make sure that the following prerequisites are met:

- The function of the relapse cylinder is ensured.
- All pins **42** of the transport retainers **41** are in park position and are secured with spring retainers **43**.

- ▶ Place the WA-frame 1 down with the W-control rope **67** until the guy rods **100** are laying on the W-boom.

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6.5 Removing the WA-frame 1 guying

6.5.1 Long WA-frames: Unpinning the guy rods

Disassembling the 9 m guy rod

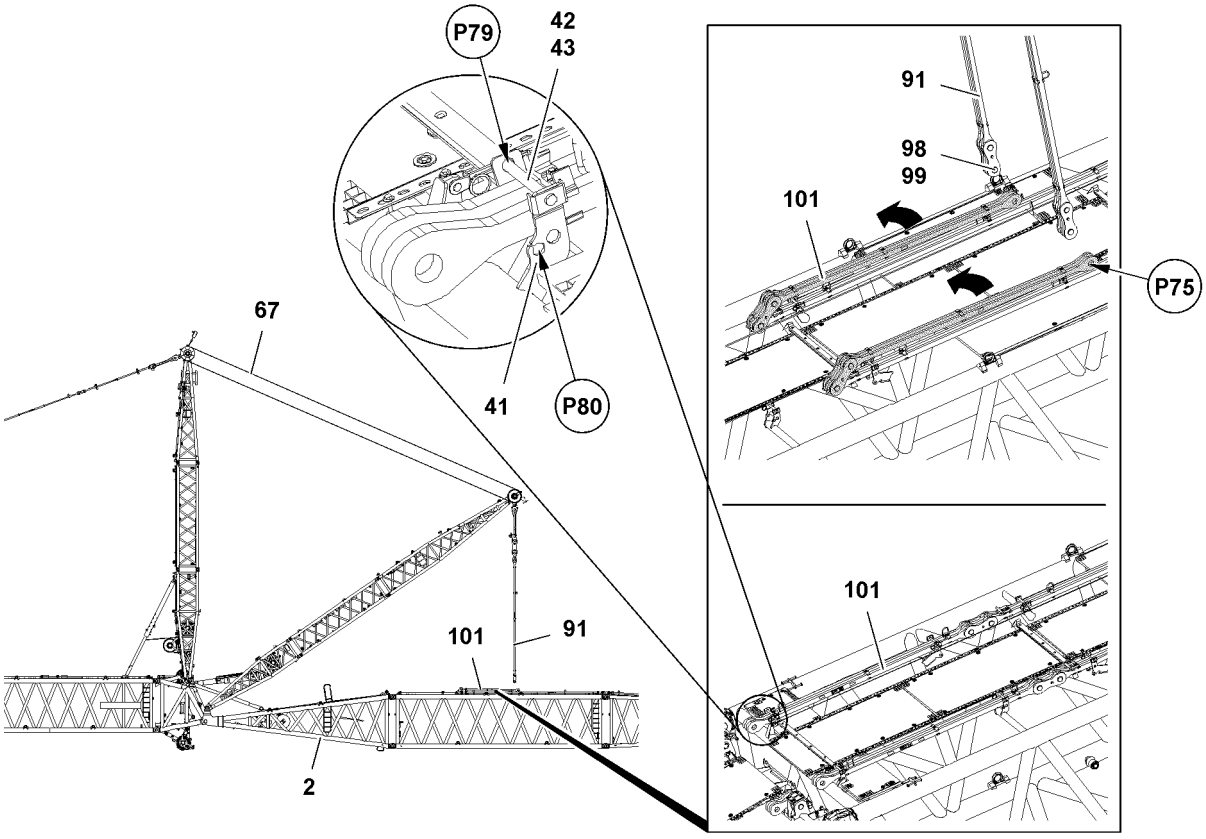

Fig.117076: Disassembling the 9 m guy rod

- ▶ Lower the WA-frame 1 via the W-control rope **67** until the guy rods **91** on the 3 m guy rods **101** can be unpinned on points **P75**.
- ▶ Unpin the 3 m guy rods **101** on guy rods **91**: Remove the safety locking pins **99** on both sides on points **P75** and unpin the pins **98**.
- ▶ Erect the WA-frame 1 until the guy rods **91** hang over the W-pivot section **2**.
- ▶ Fold the 3 m guy rods **101** over.
- ▶ Close all transport retainers **41** on the W-boom: Release and remove the pins **42** on both sides in park positions (point **P80**). Insert the pins **42** on both sides on points **P79** and secure with spring retainer **43**, see illustration **4**.

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Disassembling the 12 m guy rod

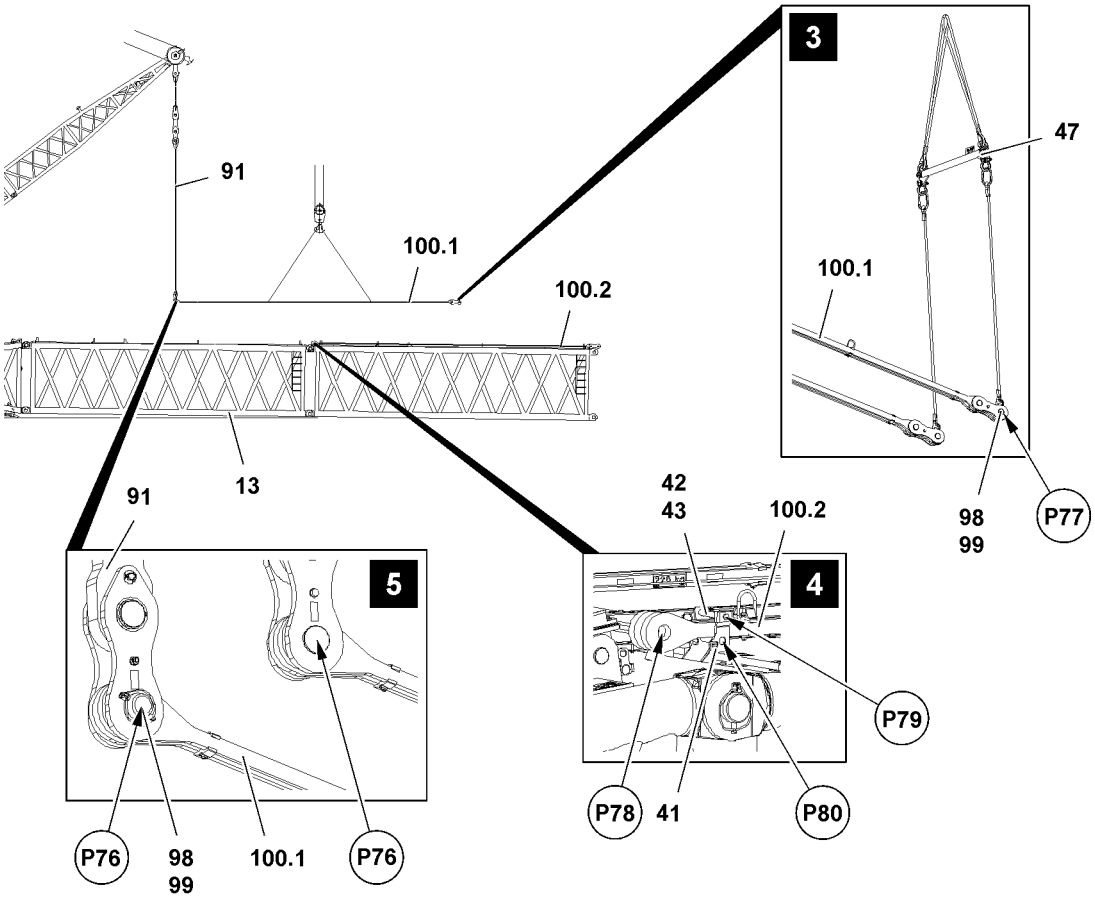

Fig.117075: Disassembling the 12 m guy rod

- ▶ Unpin the guy rods **100.1** on the guy rods **100.2**: Release the pins **98** on both sides on points **P78** and unpin, see illustration **4**.
- ▶ Pin the cross beam **47** on both sides on points **P77** with guy rods **100.1**, see illustration **3**.
- ▶ Lift the guy rods **100.1** with the cross beam **47** until they are horizontal.
- ▶ Lower the WA-frame 1 and carry the guy rods **100.1** along with the cross beam **47** until the guy rods **100.1** are laying on the lattice section.
- ▶ Unpin the cross beam **47** on both sides on points **P77**.
- ▶ Remove the cross beam **47**.
- ▶ Unpin guy rod **100.1** on guy rod **91**: Remove the safety locking pins **99** on both sides and unpin the pins **98** on points **P76**, see illustration **5**.
- ▶ Fasten the guy rod **100.1** to the auxiliary crane.
- ▶ Take the guy rod **100.1** down with the auxiliary crane on the S-intermediate section **13** in such a way that all transport retainers **41** can be closed.
- ▶ Remove the auxiliary crane.
- ▶ Close all transport retainers **41** on the W-boom: Release and remove the pins **42** on both sides in park positions (point **P80**). Then insert the pins **42** on both sides on points **P79** and secure with spring retainers **43**.

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6.5.2 Short WA-frames: Disassembling the guy rods

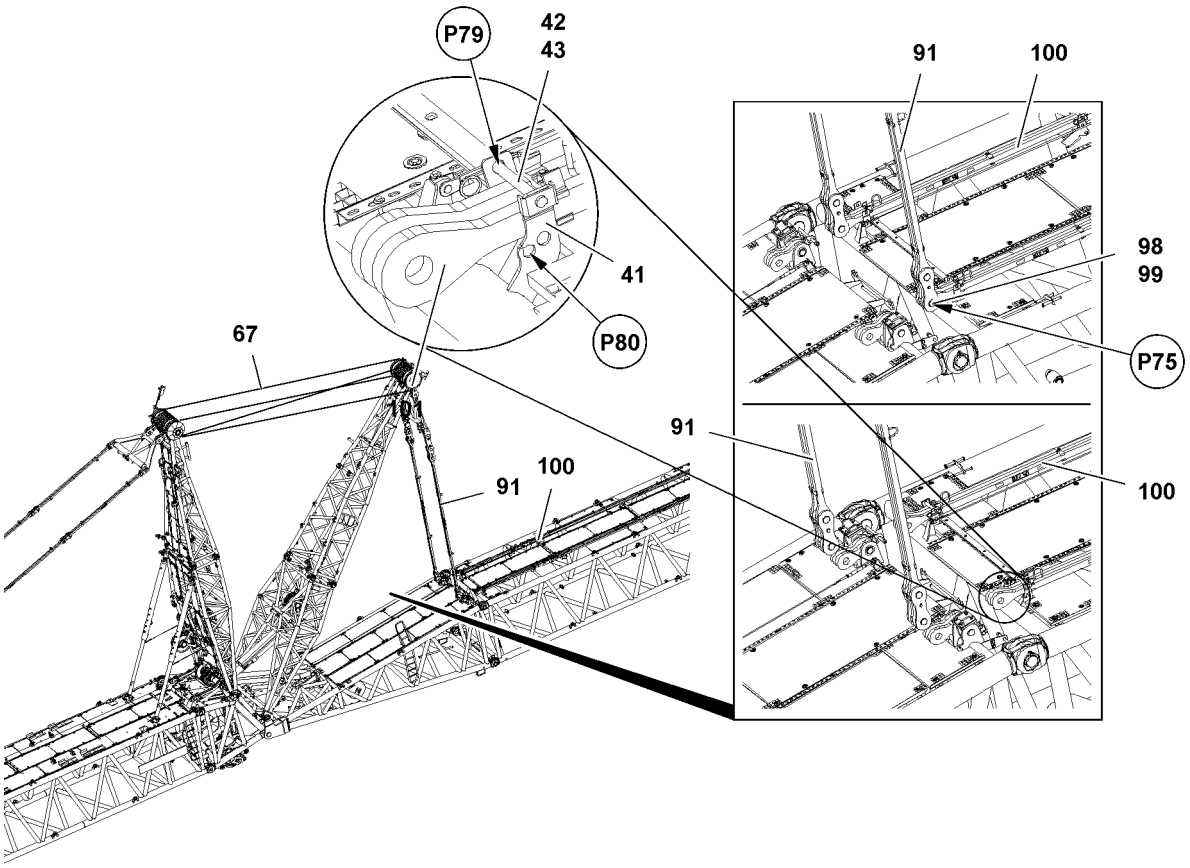

Fig.117077: Short WA-frames: Disassembling the guy rods

- ▶ Lower the WA-frame 1 via the W-control rope **67** until the guy rods **91** can be unpinned on the guy rods **100** and on points **P75**.
- ▶ Unpin the guy rods **100** on the guy rods **91**: Remove the safety locking pins **99** on both sides and unpin the pins **98** on points **P75**.
- ▶ Close all transport retainers **41** on the W-boom: Release and remove the pins **42** on both sides in park positions (point **P80**). Then insert the pins **42** on both sides on points **P79** and secure with spring retainers **43**.

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6.6 Disassembling the W-lattice jib

6.6.1 Disassembling the roller cart on the W-lattice jib

Preparing the disassembly of the roll cart

Make sure that the following prerequisites are met:
- The W-guying is properly removed.
- An auxiliary crane with sufficient load bearing capacity is available.
- The W-lattice jib is properly fastened on the auxiliary crane, see Crane operating instructions, chapter 5.01.

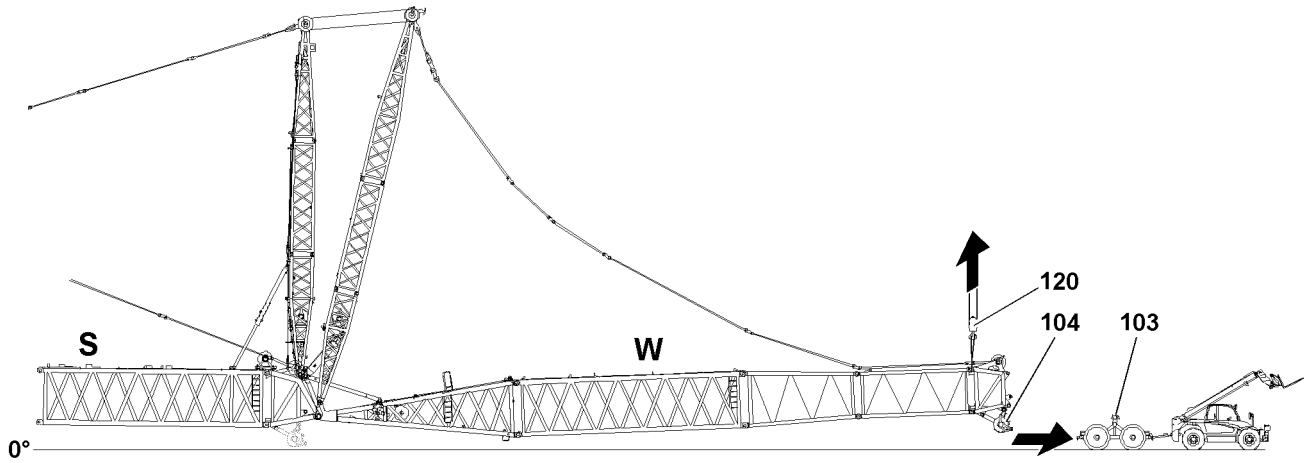

*Fig.122226: Removing the roller cart **103** on the roller set **104***

WARNING
Danger of accident due to W-lattice jib.
Death, severe bodily injuries, property damage.
- ▶ Make sure that an auxiliary crane with sufficient load bearing capacity is available for the disassembly tasks. Observe the head weights of the W-lattice sections, see charts in section „Assembling the roller cart on the W-lattice jib“.
- ▶ Make sure that the W-lattice jib is properly fastened on the auxiliary crane, see Crane operating instructions, chapter 5.01.
- ▶ Improvisations are prohibited.

- ▶ Lift the W-lattice jib with the auxiliary crane.
- ▶ Remove the roller cart **103** on the roller set **104**.

Disassembling the roller cart

- ▶ Lift the W-lattice jib with the auxiliary crane off the ground.

Note
- ▶ The disassembly of the roller cart is described in the Crane operating instructions, chapter 5.61.

- ▶ Remove the roller cart properly.

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6.6.2 Disconnecting the electrical connections

NOTICE
Damage to cable drum or cable!
If the electrical connection between the terminal box W-pivot section and cable drum is not separated before spooling up the cable drum, the electrical connection will be damaged.
If the cable of the cable drum is not properly spooled up on the cable drum after unplugging on the L-end section, then the cable drum or the cable can be significantly damaged.
- ▶ Release the electrical connection first from the terminal box of the W-pivot section to the cable drum and then the electrical connection from the cable drum to the L-end section.
- ▶ After unplugging, spool the cable onto the cable drum.

- ▶ Disconnect the electrical connections.
- ▶ After unplugging, spool the cable onto the cable drum and secure it to prevent it from spooling out inadvertently.
- ▶ Secure the cable: Reestablish the electrical connection between the terminal box and the cable drum on the W-pivot section.

NOTICE
Property damage due to dirt and / or corrosion!
If non-required electrical connections are not closed off with the respective protective caps, then dirt and / or corrosion can damage the electrical connections.
This could result in malfunctions.
- ▶ Make sure that all non-required electrical connections are always closed off properly.
- ▶ Pay attention to the Electrical wiring diagram.

- ▶ Close electrical connections, which have no dummy plugs, properly off with the corresponding protective caps.
- ▶ Secure all electrical connections with protective caps to prevent any dirt infiltration.

6.6.3 Disassembling the roller set

Note
- ▶ The disassembly of the roller set is described in the Crane operating instructions, chapter 5.14.

DANGER
Overload of boom!
If several lattice sections are located preassembled after the W-pivot section, which exceed the total length of 37.5 m , then the lattice sections will be overloaded.
Death, severe bodily injuries, property damage.
- ▶ Place lattice sections down to a total length of maximum 37.5 m , without supporting them.

- ▶ Route the hoist limit switch from the end section to the roller set, observe the Electrical wiring diagram.
- ▶ Disassemble the roller set.

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6.6.4 Disassembling the W-lattice jib to the W-pivot section

WARNING
Danger of crushing for people in the load zone!
If personnel are located between the load to be lifted and a possible interfering edge when lifting a load, personnel can be severely injured or killed.
- ▶ Before lifting the load it must be ensured that there are no persons within the danger zone.
- ▶ It is prohibited to remain in the danger zone.
- ▶ It is prohibited for anyone to be under the load.
- ▶ Maintain a safe distance.
- ▶ Swinging the load is prohibited.
- ▶ Exercise extreme caution when lifting a load.

DANGER
General danger notes!
- ▶ Support the W-lattice jib at assembly and disassembly properly with the assembly shoes, see Crane operating instructions, chapter 5.62.
- ▶ All pins must be secured after the assembly.
- ▶ The guy rods must be checked regularly, see Crane operating instructions, chapter 8.15.

DANGER
Overload of boom!
If several lattice sections are located preassembled after the W-pivot section, which exceed the total length of 37.5 m , then the lattice sections will be overloaded.
Death, severe bodily injuries, property damage.
- ▶ Place lattice sections down to a total length of maximum 37.5 m , without supporting them.

Note
- ▶ During disassembly of the W-lattice jib, adhere to the unpinning sequence, see Crane operating instructions, chapter 5.01.

To unpin the W-lattice jib with the pin pulling device, see Crane operating instructions, chapter 5.30.

The disassembly of the W-lattice jib is the same as the disassembly of the S-boom, see Crane operating instructions, chapter 5.39.

- ▶ Disassemble the W-lattice jib to the W-pivot section.

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6.7 Disassembling the WA-frame 1 guy rods

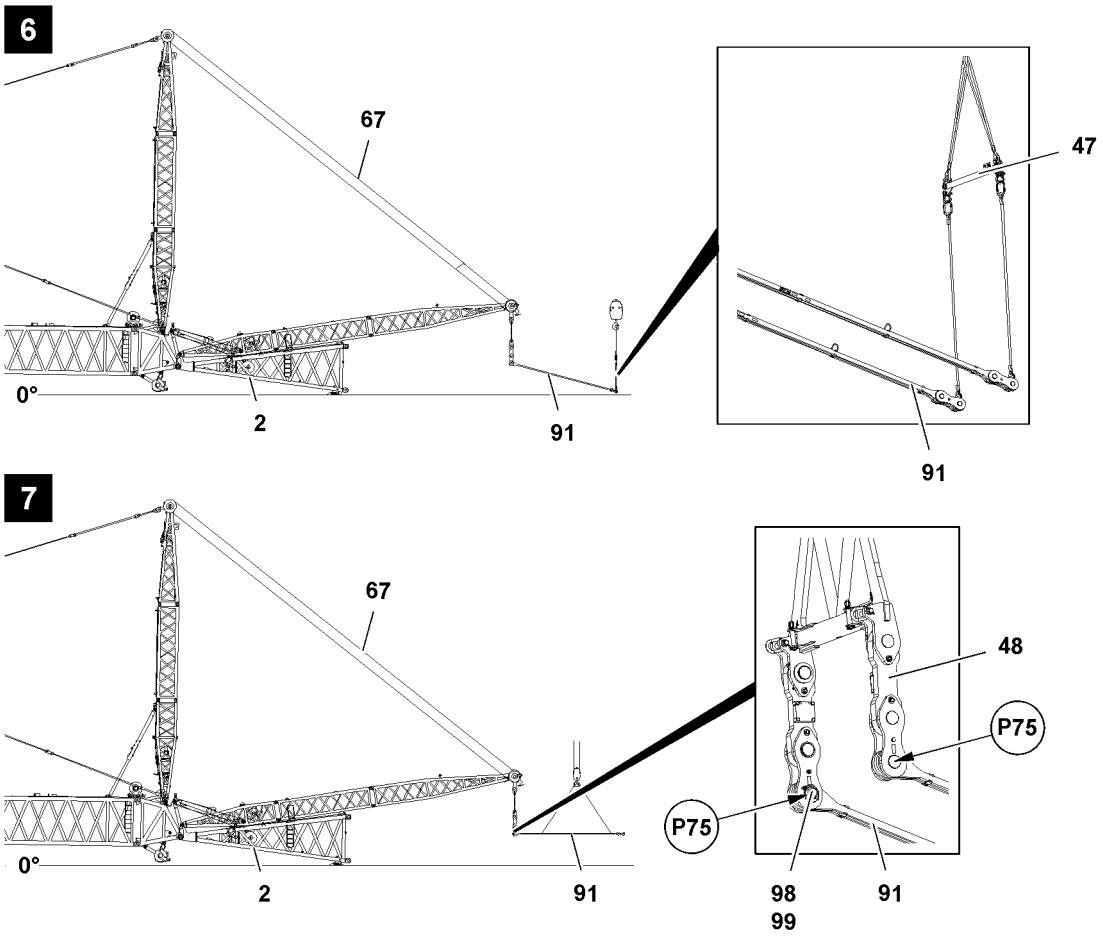

Fig.117079: Disassembling the WA-frame 1 guy rods

Make sure that the following prerequisite is met:
– The guy rods **91** hang vertically on the WA-frame 1.

▶ Pin the cross beam **47** on both sides with the guy rods **91**, see illustration **6**.

NOTICE
Slack rope formation!
The W-control rope **67** can be damaged if there is slack rope.
This could result in high property damage.
▶ When spooling the W-control rope **67** up or out, allow no slack rope formation.
▶ When spooling up or out, hold the W-control rope **67** taut.

▶ Lower the WA-frame 1 and carry the guy rods **91** along with the cross beam **47** until the WA-frame 1 is laying on the W-pivot section **2**.
▶ Unpin and remove the cross beam **47**.
▶ Fasten the guy rods **91** to the auxiliary crane.
▶ Unpin the guy rods **91** on the swing **48**: Remove the safety locking pins **99** on both sides and unpin the pins **98** on points **P75**, see illustration **7**.
▶ Take the guy rod **91** down with the auxiliary crane in a suitable storage location.
▶ Remove the auxiliary crane.

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6.8 Placing the WA-frame 2 down

WARNING
Danger of accident!
If the following notes are not observed and adhered to, personnel can be severely injured or killed.
- ▶ It is prohibited to remain in the danger zone.
- ▶ Maintain a safe distance.
- ▶ The spooling procedure must be monitored by a guide.
- ▶ Allow no slack rope formation on the W-control rope and on the hoist rope.
- ▶ Make sure that the WA-frame 1 remains in a position during the entire erection procedure in which the W-control rope is tensioned.
- ▶ During the entire disassembly procedure, raise the WA-frame 1 with the W-control rope to approx. 15° so that the relapse cylinder is under pressure.

NOTICE
Slack rope formation!
The hoist rope can be damaged if slack rope forms.
This could result in high property damage.
- ▶ When spooling the hoist rope up or out, allow no slack rope formation.
- ▶ Hold the hoist rope taut when spooling it up or out.

WARNING
Danger of accident!
Death, severe bodily injuries, property damage.
- ▶ It is prohibited to remain within the danger zone of the running ropes.
- ▶ Radio contact is available between crane operator and assembly personnel.

Make sure that the following prerequisites are met:
- – The function of the relapse cylinder is ensured.
- – All guy rods on the WA-frame 1 are removed.
- – The W-boom is fully disassembled.

6.8.1 Installing the hoist rope on the erection ropes

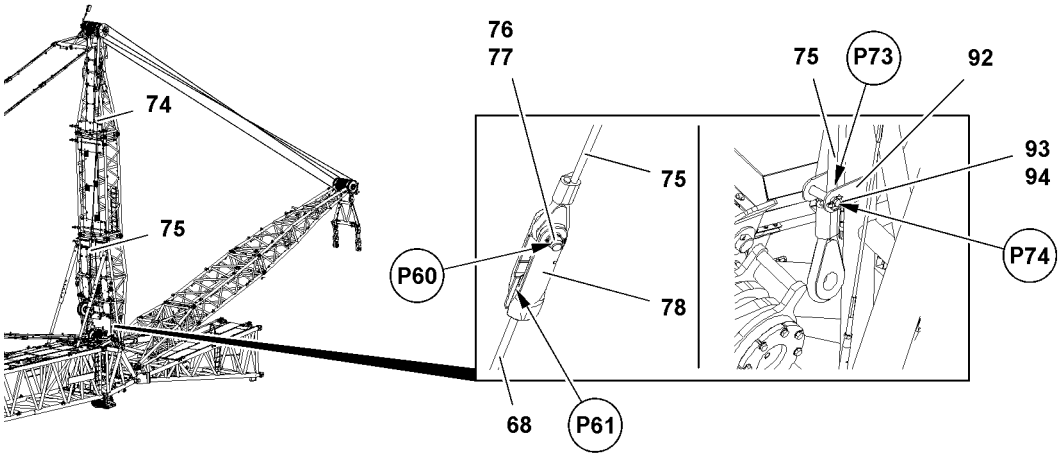

Fig.117080: Installing the hoist rope on the erection ropes

- ▶ Remove the safety locking pin **94** on point **P74** and unpin the pin **93**.
- ▶ Take the 6 m erection rope **75** on point **P73** from the retainer **92**.
- ▶ Insert the pin **93** on point **P74** and secure with safety locking pin **94**.
- ▶ Pin the rope lock **78** with the 6 m erection rope **75**: Insert the pin **76** on point **P60** and secure with safety locking pin **77**.
- ▶ Affix the hoist rope **68** on point **P61** in rope lock **78**.

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▶ Pull the hoist rope **68** in until the hoist rope **68** and the erection ropes are slightly tensioned.

6.8.2 Long WA-frames: Installing the relapse supports in transport position and removing the guy rods

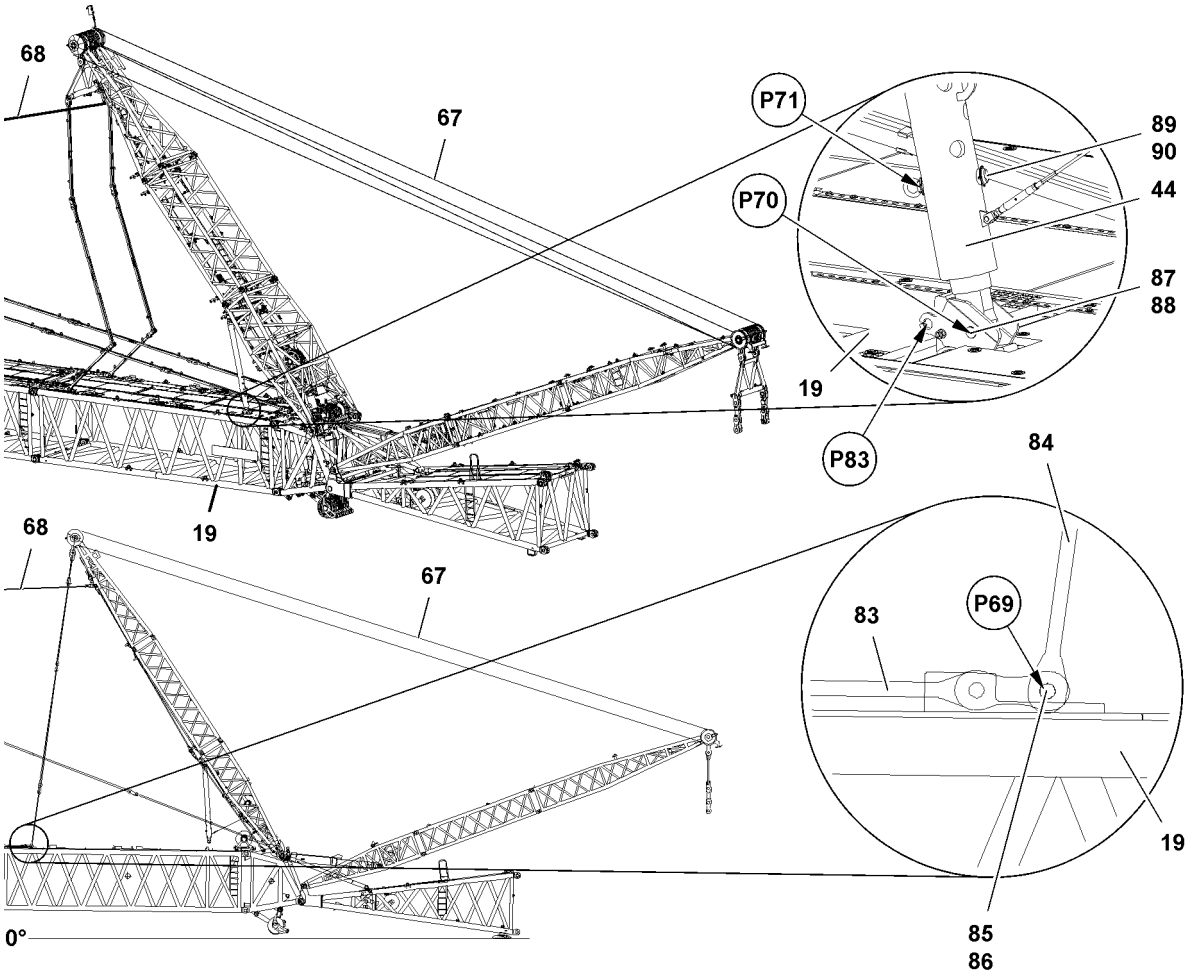

Fig.117081: Long WA-frames: Installing the relapse supports in transport position and removing the guy rods

Make sure that the following prerequisites are met:
- The function of the relapse cylinder is ensured.
- The WA-frame 1 is approx. at 15°.
- The W-control rope is tensioned.

▶ Release and unpin the locking pins **89** on both sides.
▶ Pull the WA-frame 2 back with the hoist rope **68** and simultaneously spool the W-control rope **67** out until the relapse supports **44** are completely pushed together and the locking pins **89** can be pinned at point **P71**.
▶ Insert the locking pins **89** on both sides on points **P71** and secure with safety locking pins **90**.
▶ Unpin the relapse supports **44** on the S-adapter **19**: Release the pins **87** on both sides on points **P70** and unpin.
▶ Insert the pins **87** on both sides in park position (point **P83**) and secure with safety locking pin **88**.
▶ Erect the WA-frame 2 until the guy rods **84** can be unpinned on points **P69**.
▶ Unpin the guy rods **84** on the guy rods **83**: Release the pins **85** on both sides on points **P69** and unpin.
▶ Erect the WA-frame 2 to approx. 90°.

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6.8.3 Short WA-frames: Removing the guy rods and installing the relapse supports in the transport position

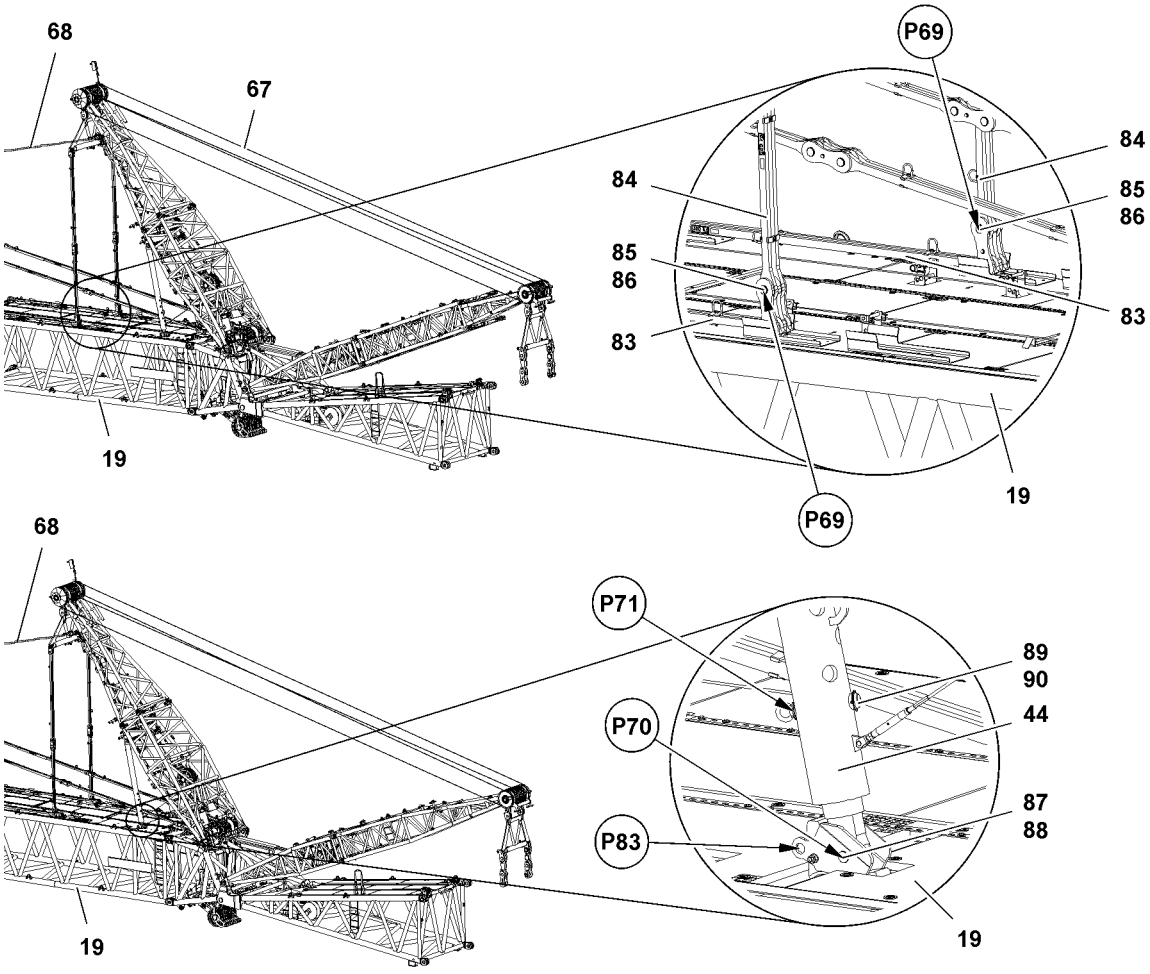

Fig.117082: Short WA-frames: Removing the guy rods and installing the relapse supports in the transport position

Make sure that the following prerequisites are met:
- The function of the relapse cylinder is ensured.
- The WA-frame 1 is approx. at 15°.
- The W-control rope is tensioned.
- An auxiliary crane is available.

▶ Release and unpin the locking pins **89** on both sides.
▶ Pull the WA-frame 2 back with the hoist rope **68** and simultaneously spool out the W-control rope **67** until the guy rods **84** can be unpinned on points **P69**.
▶ Fasten the guy rods **83** to the auxiliary crane.
▶ Unpin the guy rods **84** on the guy rods **83**: Release the pins **85** on both sides on points **P69** and unpin.
▶ Place the guy rods **83** down with the auxiliary crane.
▶ Pull the WA-frame 2 back with the hoist rope **68** and simultaneously spool the W-control rope **67** out until the relapse supports **44** are completely pushed together and the locking pins **89** can be pinned at point **P71**.
▶ Insert the locking pins **89** on both sides on points **P71** and secure with safety locking pins **90**.
▶ Unpin the relapse supports **44** on the S-adapter **19**: Release the pins **87** on both sides on points **P70** and unpin.
▶ Insert the pins **87** on both sides in park position (point **P83**) and secure with safety locking pin **88**.
▶ Erect the WA-frame 2 to approx. 90°.

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6.8.4 Placing the WA-frame 2 on WA-frame 1

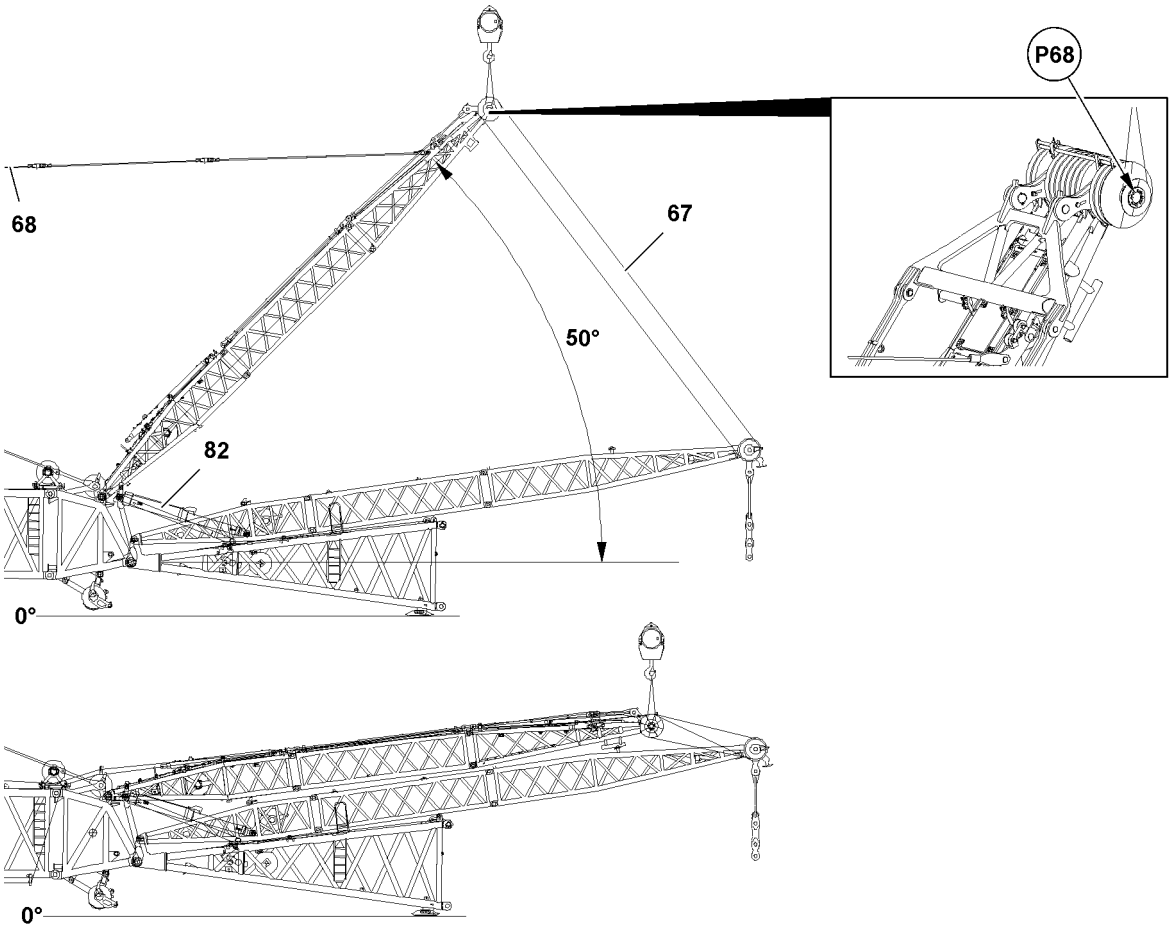

Fig.121054: Placing the WA-frame 2 on WA-frame 1

WARNING
Danger of accident!
Up to an angle of 50°, WA-frame 2 may only be held with an auxiliary crane. The hoist rope **68** may not be subjected to a load.
If the following notes are not observed and adhered to, personnel can be severely injured or killed.

- ▶ It is prohibited to remain in the danger zone.
- ▶ Maintain a safe distance.
- ▶ The spooling procedure must be monitored by a guide.
- ▶ From an angle of less than 50°, take the WA-frame 2 down only with an auxiliary crane.
- ▶ Make sure that the WA-frame 1 remains in a position during the entire erection procedure in which the W-control rope is tensioned.
- ▶ During the entire disassembly procedure, raise the WA-frame 1 with the W-control rope **67** to approx. 15° so that the relapse cylinder **82** is under pressure.

NOTICE
Slack rope formation!
Due to slack rope formation, the hoist rope **68** and the W-control rope **67** can be damaged.
This could result in high property damage.

- ▶ When spooling the hoist rope **68** or the W-control rope **67** up or out, allow no slack rope formation.
- ▶ When spooling up or out, hold the hoist rope **68** and the W-control rope **67** taut.

- ▶ Luff the WA-frame 2 down until an angle of approx. 50° is reached: Spool the W-control rope **67** up and simultaneously spool out the hoist rope **68**.
- ▶ Fasten the auxiliary crane on point **P68** and tension with fastening equipment.

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- ▶ Relieve the hoist rope **68**.
- ▶ Place the WA-frame 2 only with the auxiliary crane on the WA-frame 1: Spool the W-control rope **67** up and simultaneously spool out the hoist rope **68**.

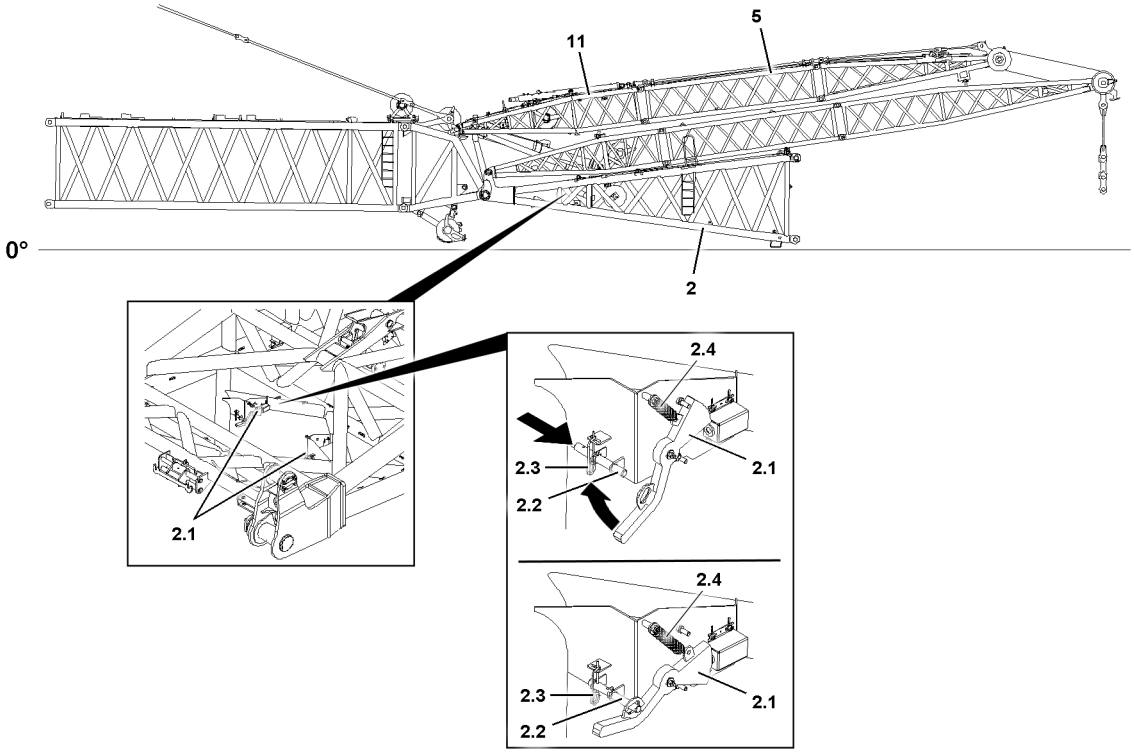

Fig.124283: Bringing the cantilevers „jib down“ into the transport position

Bring the cantilevers **2.1** „jib down“ into the transport position by pinning the transport retaining pins on both sides.

WARNING
Spring actuated component!
When pinning the cantilever **2.1** in the transport position, the cantilever can move down suddenly and at a high speed due to the pull spring **2.4**.
Limbs can be crushed or severed.
- ▶ Make sure, before releasing the cantilever **2.1** in the transport position, that the pin **2.2** is properly pinned and secured.

- ▶ Remove the spring retainer **2.3**.
- ▶ Hold the cantilever **2.1** with one hand.
- ▶ Pull the cantilever **2.1** up to the stop.

When the cantilever **2.1** touches on the stop „on top“:
- ▶ Insert the pin **2.2** in direction of the arrow to the stop.

When the cantilever **2.1** is pinned in the transport position:
- ▶ Secure the cantilever **2.1** in the „pinned“ position with spring retainer **2.3**.

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6.8.5 Securing the relapse supports on the WA-frame 2

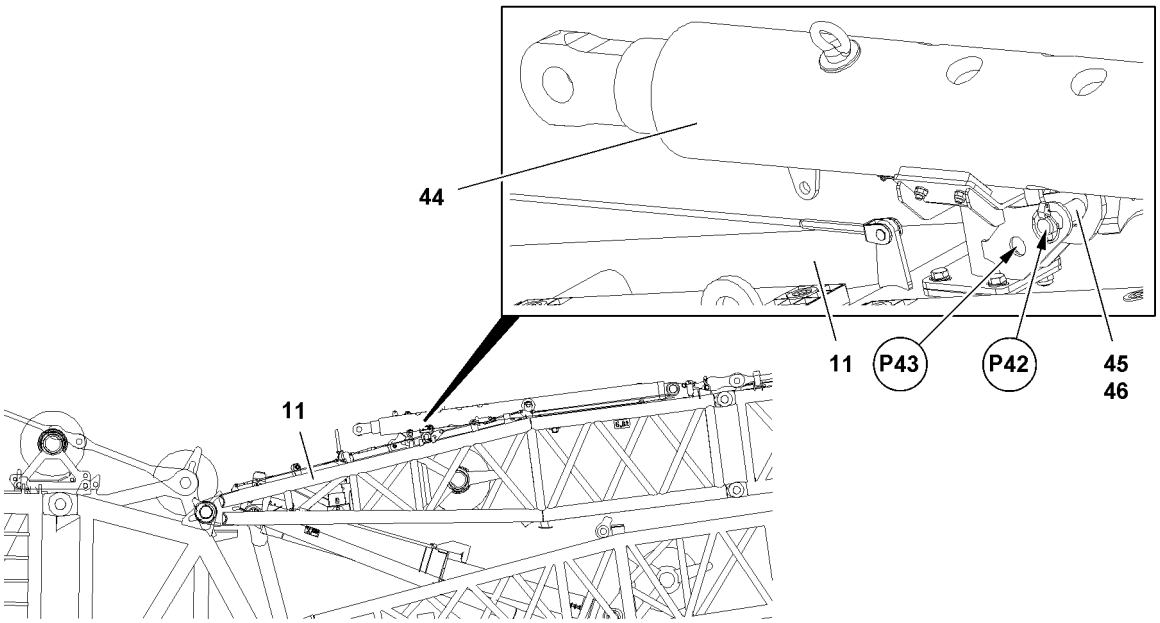

Fig.117084: Securing the relapse supports on the WA-frame 2

- ▶ Release the pins **45** on both sides on park position (point **P43**) and unpin.
- ▶ Pin the relapse supports **44** with WA-frame 2 pivot section **11**: Insert the pins **45** on both sides on points **P42** and secure with safety locking pins **46**.

6.8.6 Closing the transport retainers of the guy rods

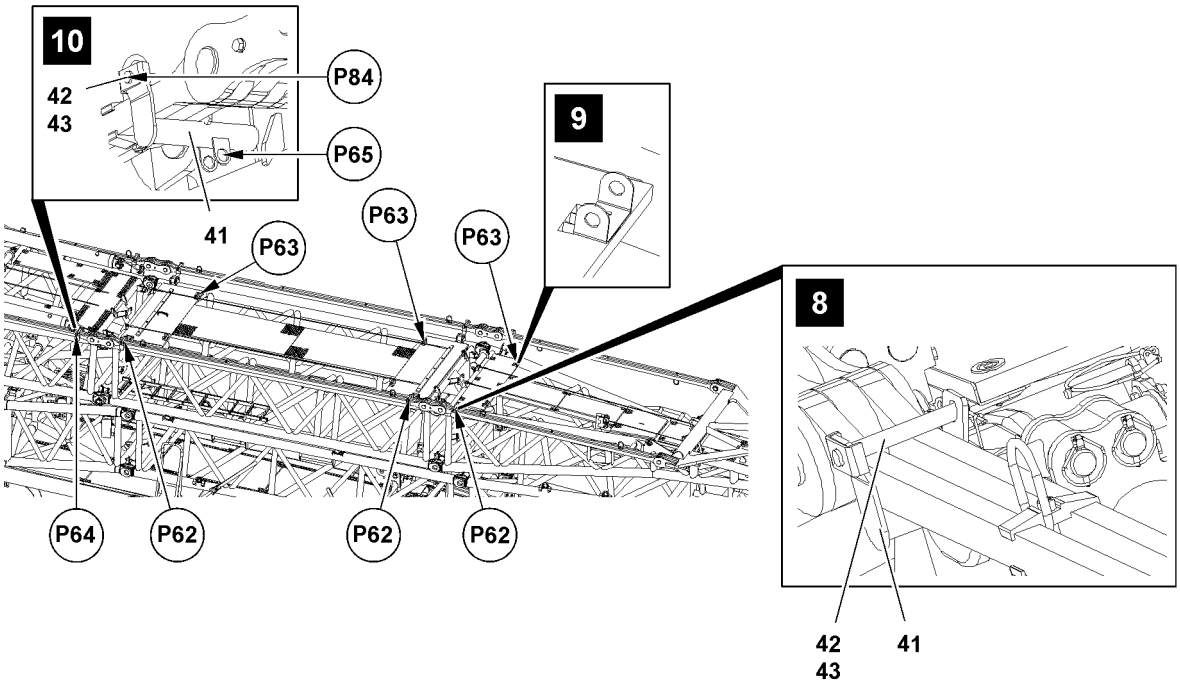

Fig.117085: Closing the transport retainers of the guy rods - Placement surfaces

- ▶ Release the pins **42** on both sides on park positions (points **P63**) and unpin, see illustration **9**.
- ▶ Close the transport retainers **41** on points **P62** on both sides: Insert the pin **42** and secure with the safety locking pin **43**, see illustration **8**.

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- ▶ Release the pins **42** on both sides on points **P65** on park positions (point **P65**) and unpin, see illustration **10**.
- ▶ Close the transport retainers **41** on points **P64** on both sides: Insert the pins **42** on both sides on points **P84** and secure with safety locking pin **43**, see illustration **10**.

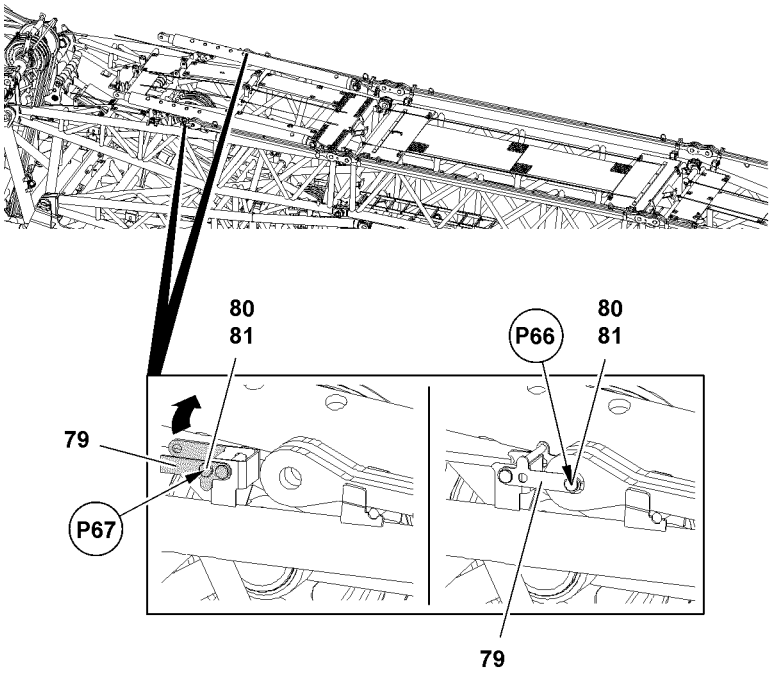

Fig.117086: Closing the transport retainers of the guy rods - Securing the guy rod end

- ▶ Release the pins **80** on both sides on points **P67** and unpin.
- ▶ Fold the transport retainer **79** over.
- ▶ Close the transport retainer **79**: Insert the pins **80** on both sides on points **P66** and secure with safety locking pins **81**.

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6.8.7 Closing the transport retainer of the cross beam

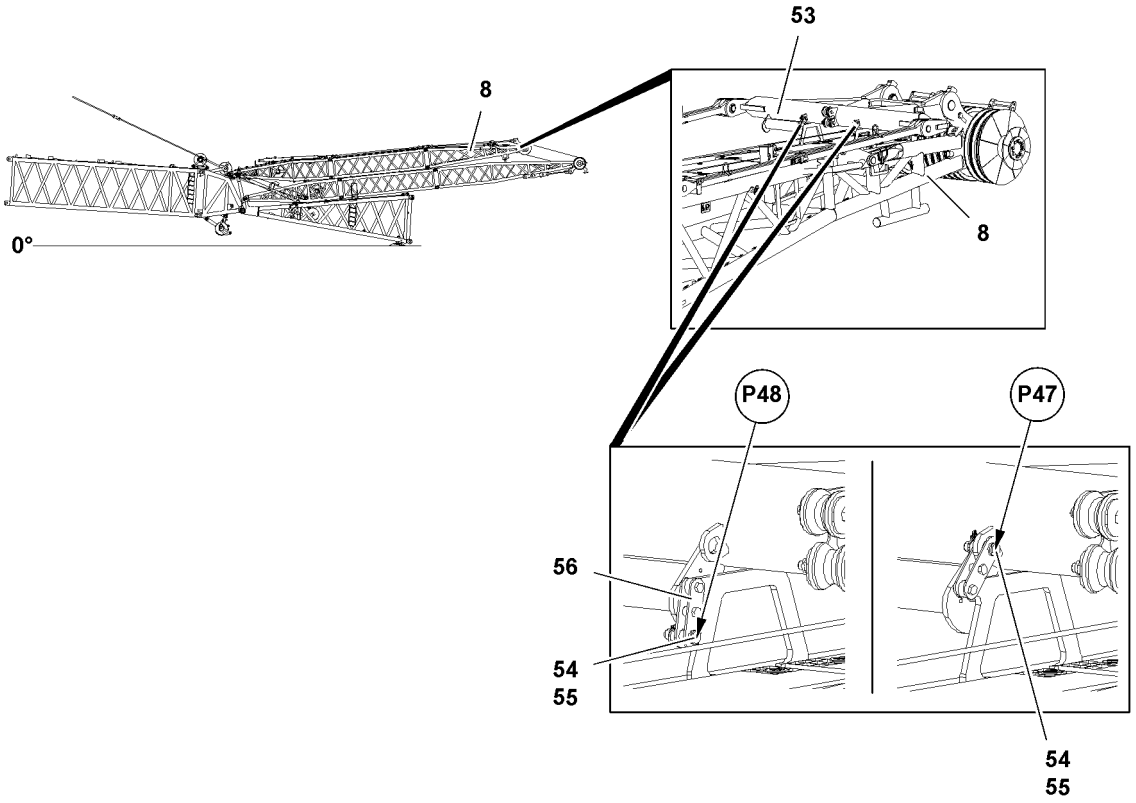

Fig.117087: Closing the transport retainer of the cross beam

- ▶ Release the pins **54** on both sides on points **P48** and unpin.
- ▶ Fold the brackets **56** up.
- ▶ Close the transport retainer: Insert the pins **54** on both sides on points **P47** and secure with safety locking pins **55**.

Result:

▷ The cross beam **53** is completely secured.

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6.9 Disassembling the WA-frames

6.9.1 Removing the erection ropes

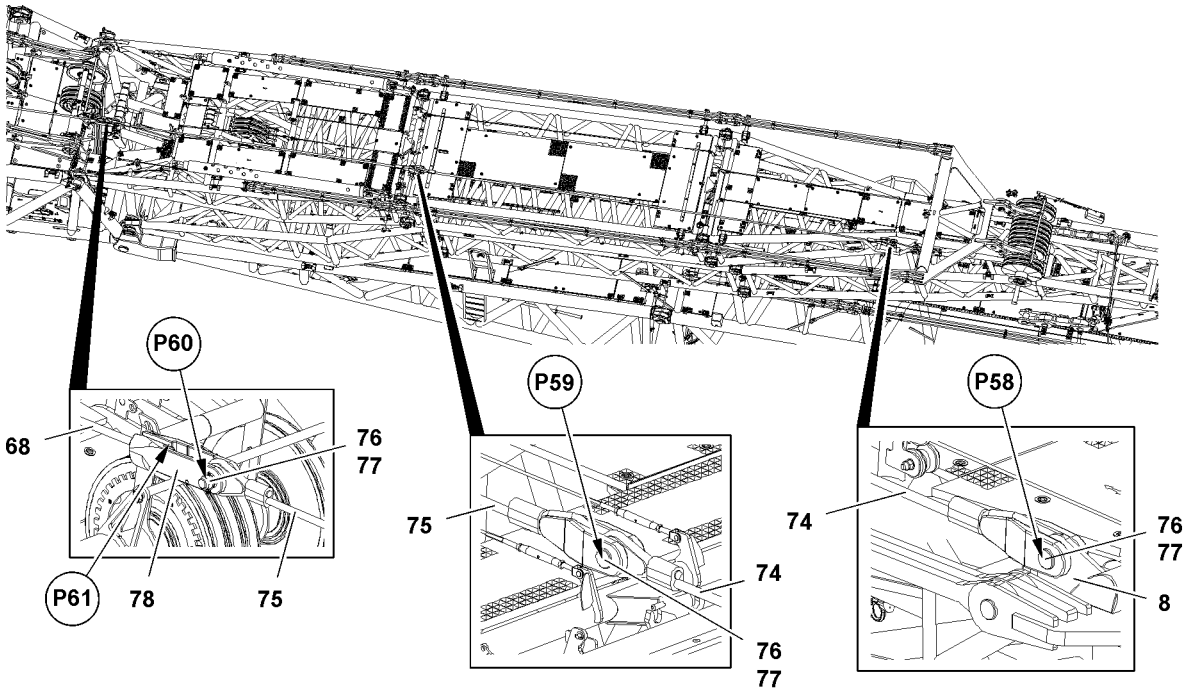

Fig.117088: Removing the erection ropes

- ▶ Remove the hoist rope **68** on point **P61** of the rope lock **78**.
- ▶ Unpin the rope lock **78** on the 6 m erection rope **75**: Release the pin **76** on point **P60** and unpin.
- ▶ Unpin the 6 m erection rope **75** on the 9.3 m erection rope **74**: Release the pin **76** on point **P59** and unpin.
- ▶ Unpin the 9.3 m erection rope **74** on the WA-frame 2 end section **8**: Release the pin **76** on point **P58** and unpin.
- ▶ Take the 6 m erection rope **75** and 9,3 m erection rope **74** down with the auxiliary crane in a suitable location.

6.9.2 Removing the W-control rope and hoist ropes

NOTICE
Slack rope formation!
Due to slack rope formation, the hoist rope and the W-control rope can be damaged.
This could result in high property damage.
- ▶ When spooling the hoist rope or the W-control rope up or out, allow no slack rope formation.
- ▶ When spooling up or out, hold the hoist rope and the W-control rope taut.

WARNING
Danger of accident!
Death, severe bodily injuries, property damage.
- ▶ It is prohibited to remain within the danger zone of the running ropes.
- ▶ Radio contact is available between crane operator and assembly personnel.

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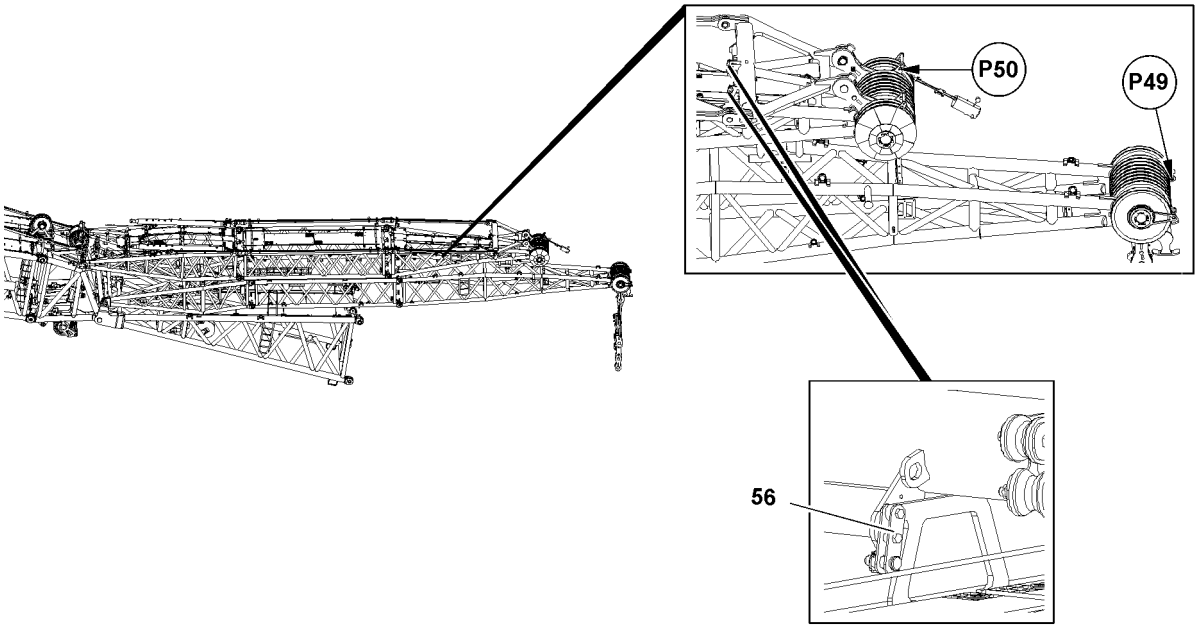

Fig.117089: Removing the W-control rope and hoist ropes - Prerequisites

Make sure that the following prerequisites are met:
- The transport retainers **56** of the swing of WA-frame 2 are closed.
- The rope guard of WA-frame 1 end section is removed on point **P49**.
- The rope guard of WA-frame 2 end section is removed on point **P50**.

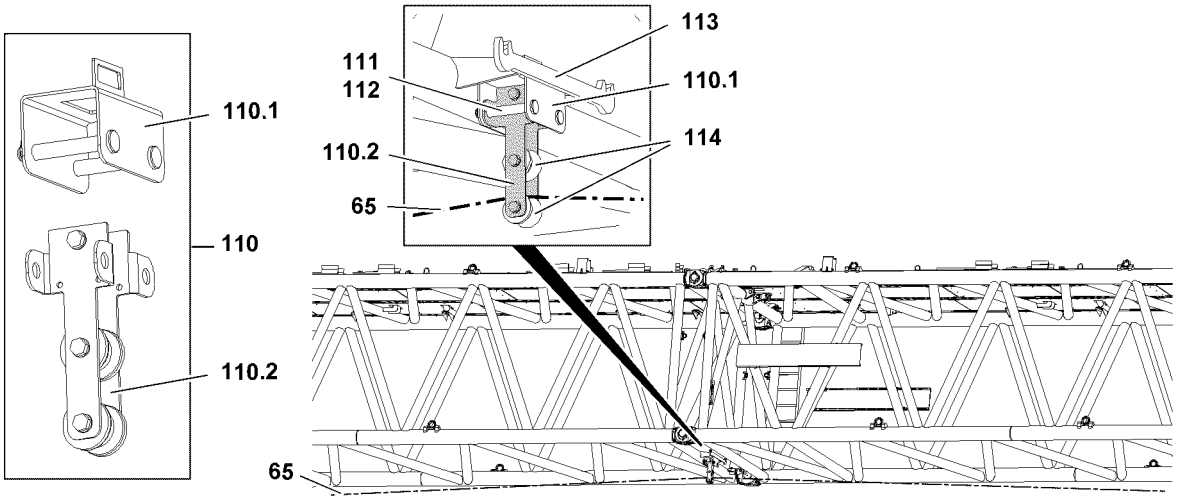

Fig.121048: Reeving the W-control rope in and pulling the hoist ropes forward to the S-end section - Installing the complete retainer

Note
- ▶ The complete retainer **110** is part of the assembly aid.
- ▶ Position the complete retainer **110** in the S-boom in such a way that the auxiliary rope does not scrape on the S-boom when pulling it in.

- ▶ Take the complete retainer **110** apart: Remove the safety locking pin **112** and unpin the pin **113**.
- ▶ Set the part **110.1** in the retainer **113** for the pin pulling device.
- ▶ Position the part **110.2** on part **110.1** so that they can be pinned with each other.

When the pin bores align:
- ▶ Insert the pin **113** and secure with the safety locking pin **112**.
- ▶ Pull the auxiliary rope **65** forward to the complete retainer **110**.

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▶ Guide the auxiliary rope **65** between the change over pulleys **114**.

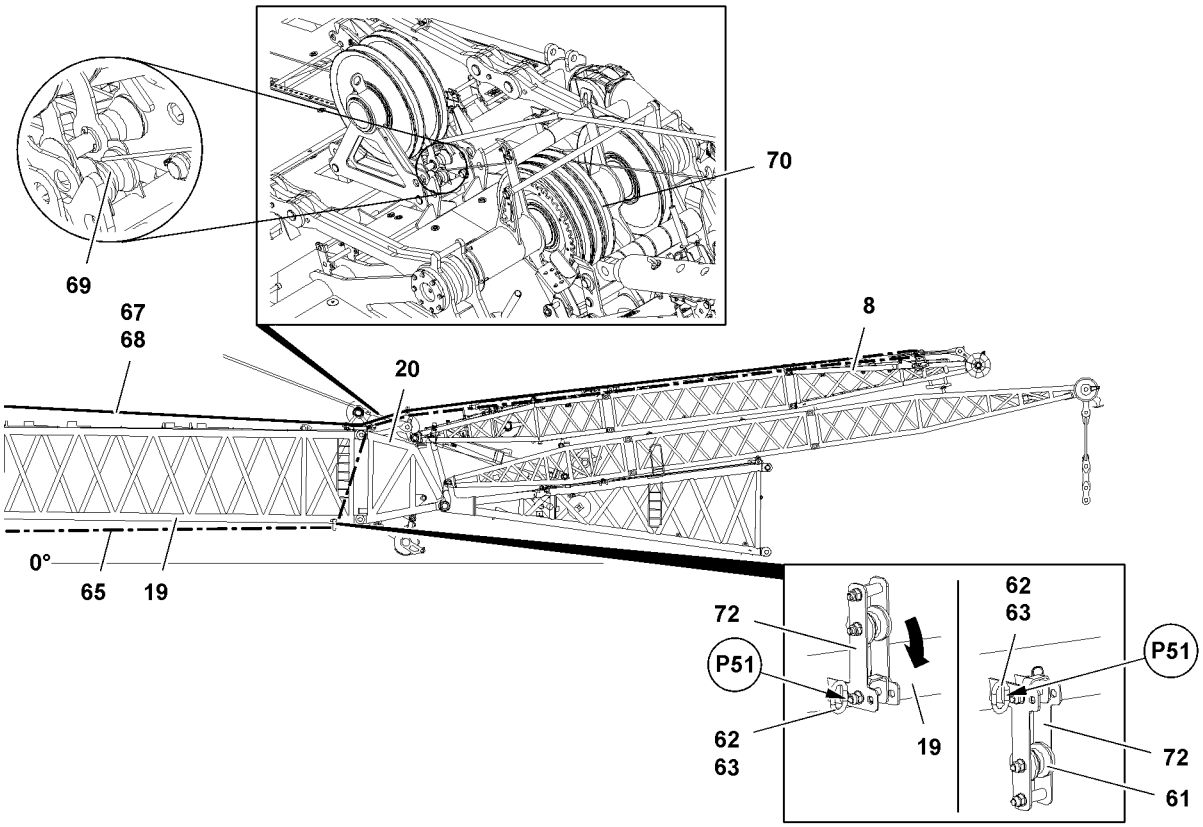

Fig.117090: Disassembling the W-control rope and hoist ropes - Installing the auxiliary rope

▶ Unpin the change over pulley retainer **72** on S-adapter **19**: Release the pin **62** on point **P51** and unpin.
▶ Swing the change over pulley retainer **72** downward.
▶ Pin the change over pulley retainer **72** with the S-adapter **19**: Insert the pin **62** on point **P51** and secure with safety locking pin **63**.
▶ Pull the auxiliary rope **65** forward to the change over pulley **61**.
▶ Guide the auxiliary rope **65** over the change over pulley **61**.
▶ Guide the auxiliary rope **65** over the change over pulley **69**.
▶ Guide the auxiliary rope **65** over the end pulley **70**.

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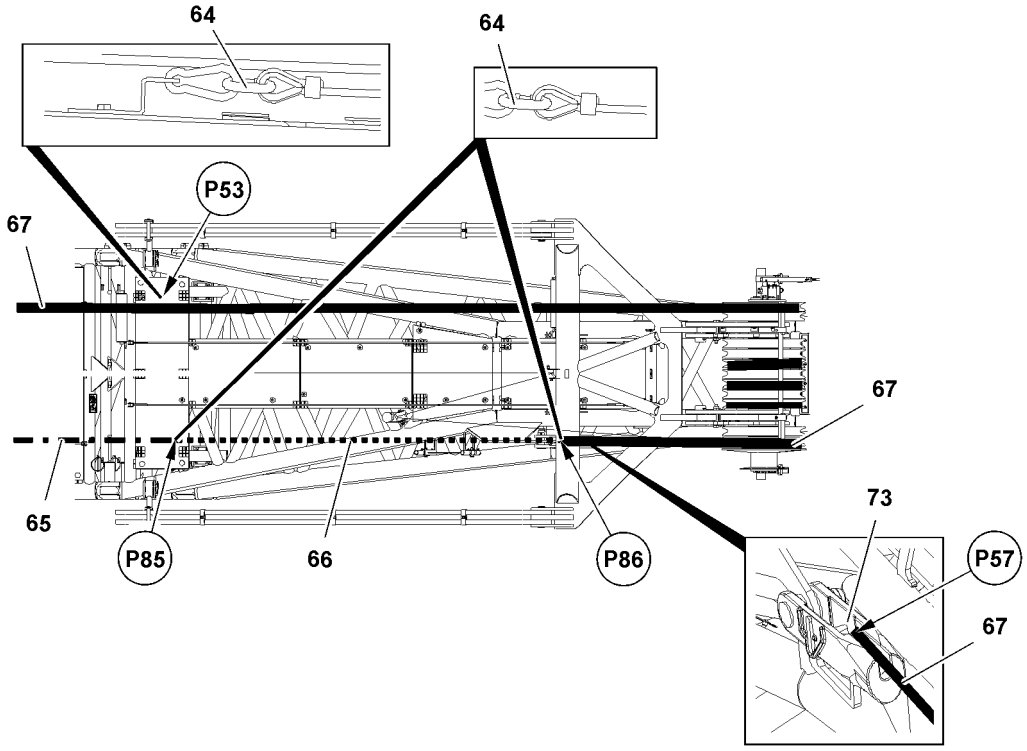

Fig.117091: Disassembling the W-control rope and hoist ropes - Pulling in the W-control rope

- ▶ Connect the forerunner rope **66** with the auxiliary rope **65**: Place the connecting link **64** in on point **P85** between the forerunner rope **66** and auxiliary rope **65**.

WARNING
Danger of crushing if winch 5 moves!
If the W-control rope winch (winch 5) is actuated while releasing the W-control rope **67**, personnel can be severely injured or killed.
Fingers, hands and arms can be crushed or severed.

- ▶ Do not actuate winch 5 during the disassembly procedure.
- ▶ Radio contact is available between crane operator and assembly personnel.

- ▶ Remove the W-control rope **67** on point **P57** on the rope lock **73**.
- ▶ Connect the forerunner rope **66** with the W-control rope **67**: Place the connecting link **64** in on point **P86** between the forerunner rope **66** and W-control rope **67**.
- ▶ Slowly pull the W-control rope **67** in and counter with the auxiliary rope **65** until the forerunner rope **66** can be attached on point **P53**.
- ▶ Remove the forerunner rope **66** from the W-control rope **67**.
- ▶ Install the forerunner rope **66** on park position (point **P53**).

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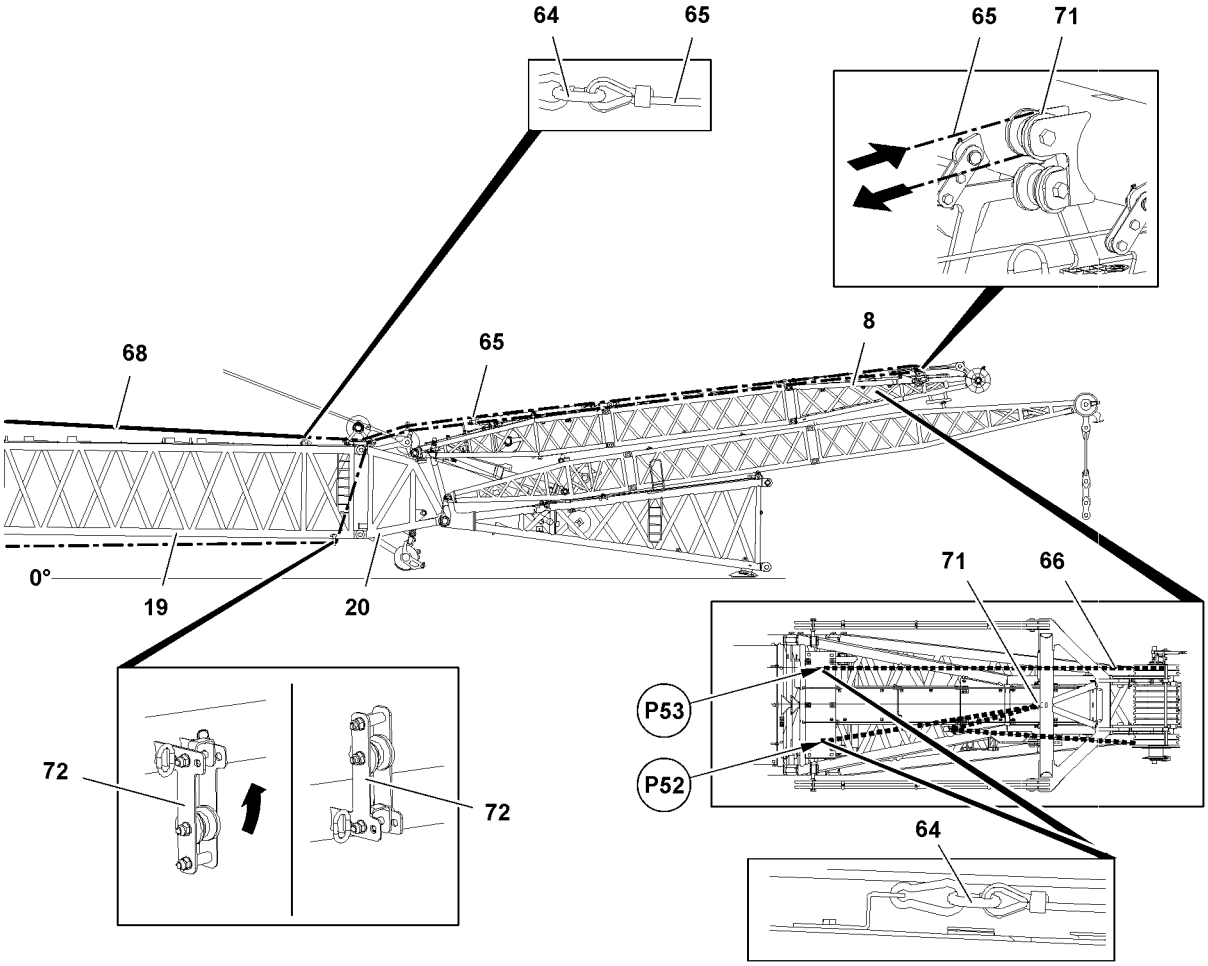

Fig.117092: Disassembling the W-control rope and hoist ropes - Pulling in the hoist ropes

- ▶ Remove the forerunner rope **66** on the auxiliary rope **65**.
- ▶ Place the forerunner rope **66** in such a way that the upper change over pulley **71** can be covered with the auxiliary rope **65**.
- ▶ Pull the auxiliary rope **65** to the change over pulley **71** of the WA-frame 2 end section **8**.

The auxiliary rope **65** is guided in from top.

- ▶ Guide the auxiliary rope **65** over the upper change over pulley **71**.
- ▶ Pull the auxiliary rope **65** to the hoist rope end.
- ▶ Connect the auxiliary rope **65** with the hoist rope **68**: Place the connecting link **64** in between hoist rope **68** and auxiliary rope **65**.
- ▶ Pull the hoist rope **68** back to the hoist winch and counter with the auxiliary rope **65**.
- ▶ Remove the auxiliary rope **65** on the hoist rope **68**.

When a second hoist rope **68** must be pulled back:

- ▶ Pull the second hoist rope **68** back to the hoist winch the same way as described before.
- ▶ Spool the auxiliary rope **65** up on the auxiliary winch.
- ▶ Place the forerunner rope **66** over the change over pulley **71**.
- ▶ Install the forerunner rope **66** on park position (point **P52**).
- ▶ Install the change over pulley retainer **72** in the park position.

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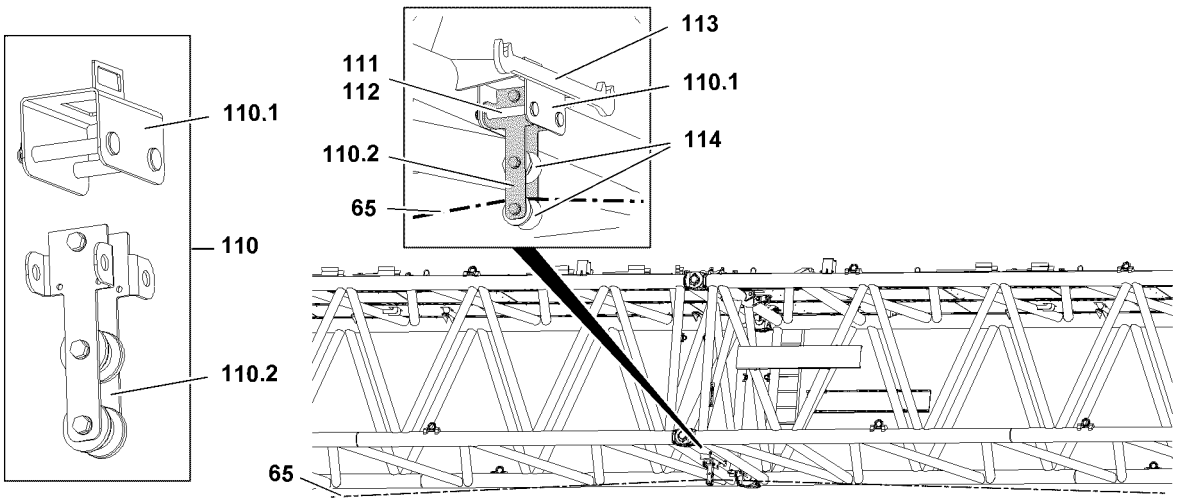

Fig.121048: Disassembling the W-control rope and hoist ropes - Removing the complete retainer

Note

▶ The complete retainer **110** is part of the assembly aid.

▶ Remove the safety locking pin **112** and unpin the pin **113**.
▶ Remove the part **110.2**.
▶ Remove the part **110.1** from the retainer **113** for the pin pulling device.
▶ Assemble the complete retainer **110** again: Position the part **110.2** on part **110.1** so that they can be pinned with each other.

When the pin bores align:

▶ Insert the pin **113** and secure with the safety locking pin **112**.

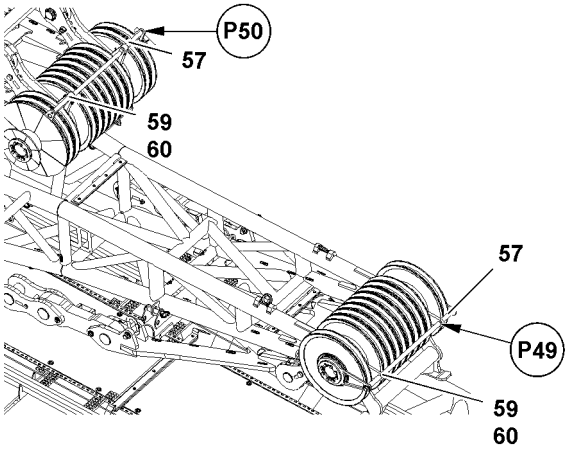

Fig.117093: Disassembling the W-control rope and hoist ropes - Installing the rope guard

▶ Install the rope guard **57** on point **P49** and point **P50** and secure with retaining elements (pin **59** and safety locking pin **60**).

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6.9.3 Pinning the swing from the WA-frame 1 in transport position

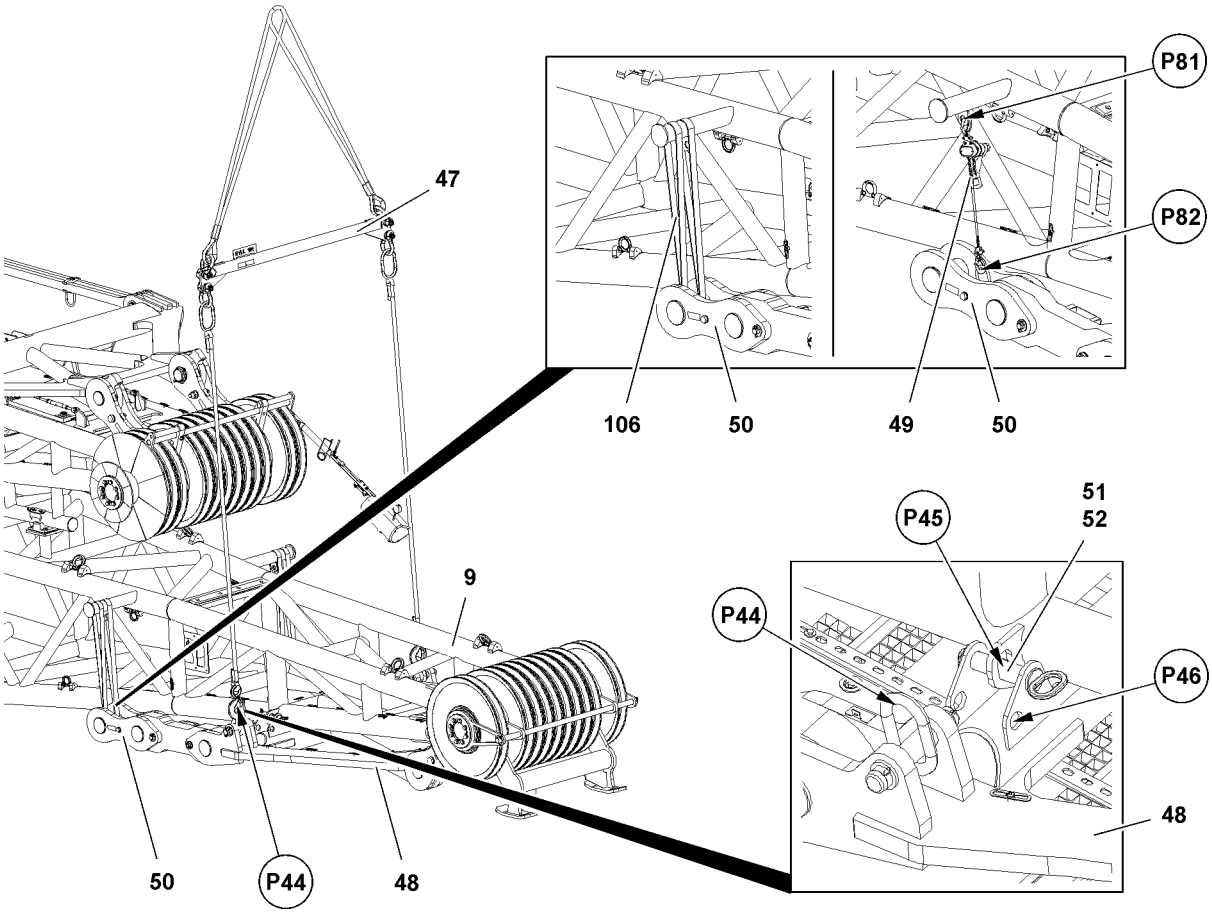

Fig.117094: Pinning the swing from the WA-frame 1 in transport position

- ▶ Attach the cross beam **47** on both sides on points **P44**.
- ▶ Lift the swing **48** with the cross beam **47** until the swing **48** can be pinned on both sides on points **P45**.
- ▶ Release pins **51** on both sides on park position (point **P46**) and unpin.
- ▶ Pin the swing **48** with the WA-frame 1 end section **9**: Insert the pins **51** on both sides on point **P45** and secure with safety locking pin **52**.

To secure the brackets **50**, use the chain pulls **49**.

- ▶ Hang the chain pull **49** on point **P81** and point **P82**.
- ▶ Tighten the chain pull **49** until the round sling **106** can be placed.
- ▶ Place the round sling **106**.
- ▶ Lower the bracket **50** with the chain pull **49**.
- ▶ Remove the chain pull **49**.
- ▶ Repeat the procedure on the other side the same way as described above.
- ▶ Remove the cross beam **47**.

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6.9.4 Disassembling the assembly unit V

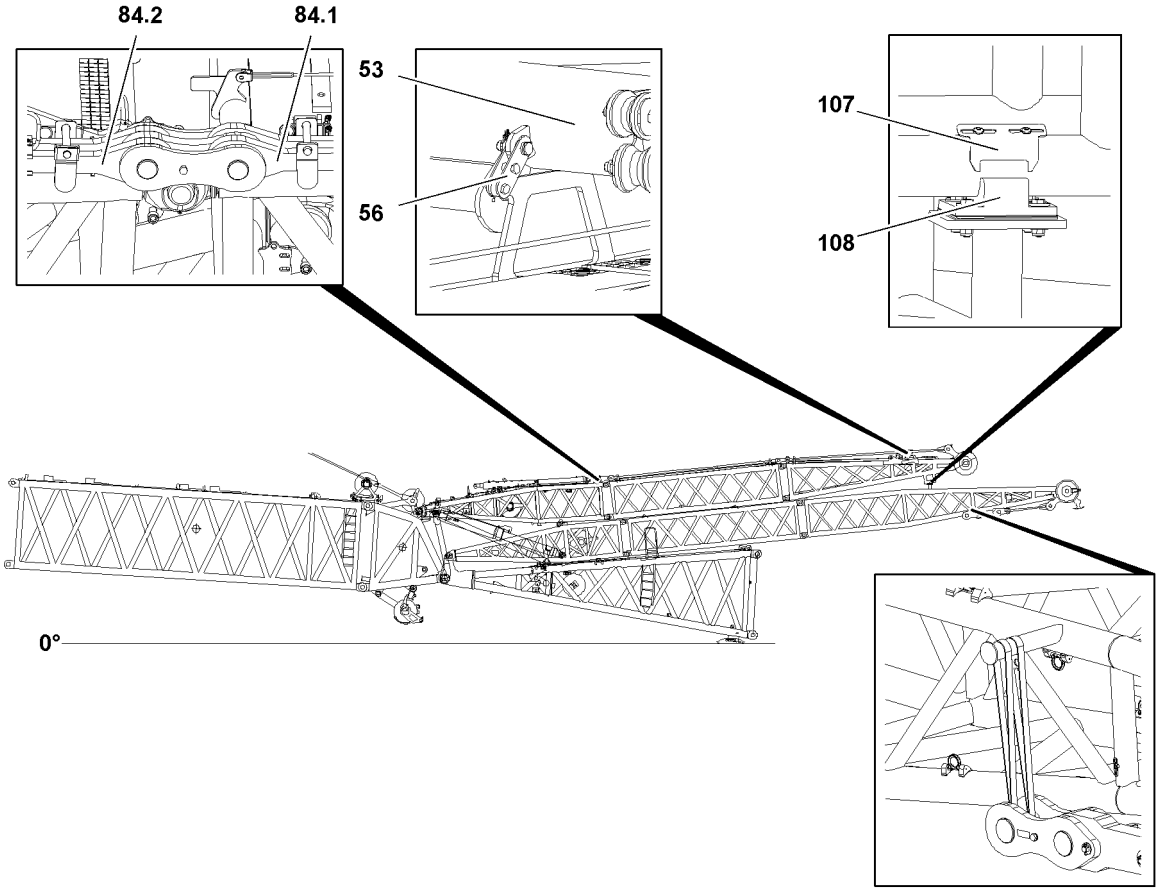

Fig.117095: Disassembling the assembly unit V - Prerequisites

Make sure that the following prerequisites are met:
- The transport retainers **56** of the cross beam **53** of WA-frame 2 are closed.
- The swing **48** of WA-frame 1 is pinned and secured with round slings.
- The guy rods **84.2** are unpinned from guy rods **84.1**.
- All transport retainers of the guy rods **84** on the WA-frame 2 are closed.
- The mark **107** and the mark **108** align.

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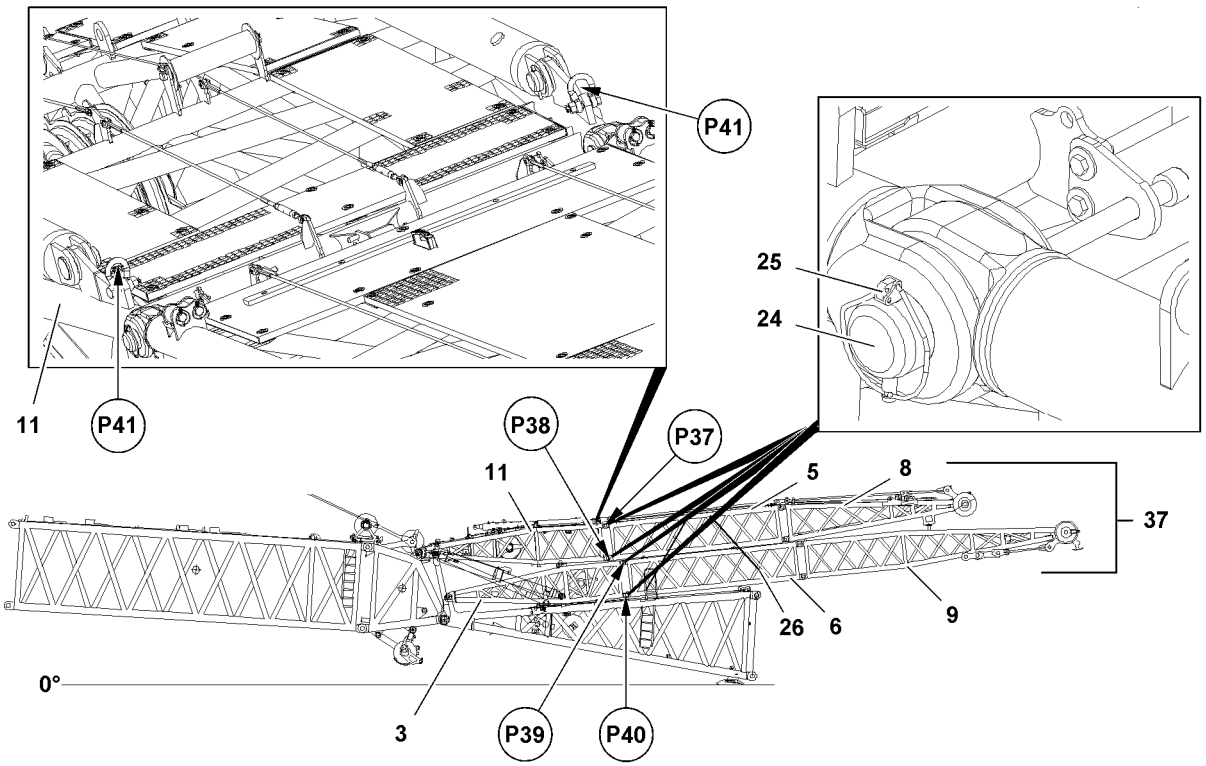

Fig.117096: Disassembling the assembly unit V - Disassembly procedure

Note

▶ The disassembly procedure is described as an example on the long WA-frames. The disassembly procedure for the short WA-frames is handled the same way.

▶ Fasten the auxiliary crane on both sides on points **P41** of the WA-frame 2 pivot section **11**.

DANGER

Do not stay in danger zone!

Death, severe bodily injuries, property damage.

▶ While the WA-frame 2 is lowered, it is prohibited for anyone to remain in the danger zone.

▶ Tension the fastening equipment until the WA-frame 2 is being held.
▶ Install the pin pulling device on point **P38**.
▶ Unpin the WA-frame 2 intermediate section **5** on WA-frame 2 pivot section **11**: Release the pins **24** on both sides on point **P38** and unpin.
▶ Take the WA-frame 2 pivot section **11** down with the auxiliary crane until the WA-frame 2 intermediate section **5** is laying on the WA-frame 1 intermediate section **6**.
▶ Remove the auxiliary crane on points **P41**.

When the long WA-frames are installed:

▶ Place all transport tension belts **26** between WA-frame 1 intermediate section **6** and WA-frame 2 intermediate section **5** and tension.

When the short WA-frames are installed:

▶ Place all transport tension belts **26** between WA-frame 1 end section **9** and WA-frame 2 end section **8** and tension.
▶ Unpin the WA-frame 2 intermediate section on WA-frame 2 pivot section **11**: Release the pins **24** on both sides on point **P37** and unpin.
▶ Fasten the assembly unit V **37** to the auxiliary crane, see section „Fastening points“.
▶ Tension the fastening equipment until the assembly unit V **37** is being held.
▶ Install the pin pulling device on point **P40**.
▶ Unpin the assembly unit V **37** on WA-frame 1 pivot section **3**: Release the pins **24** on both sides on point **P40** and unpin.

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- ▶ Install the pin pulling device on point **P39**.
- ▶ Unpin the assembly unit V **37** on WA-frame 1 pivot section **3**: Release the pins **24** on both sides on point **P39** and unpin.
- ▶ Lift the assembly unit V **37** with the auxiliary crane and take it down on a suitable storage location.
- ▶ Remove the auxiliary crane.

6.9.5 Disassembling the WA-frame 2 pivot section

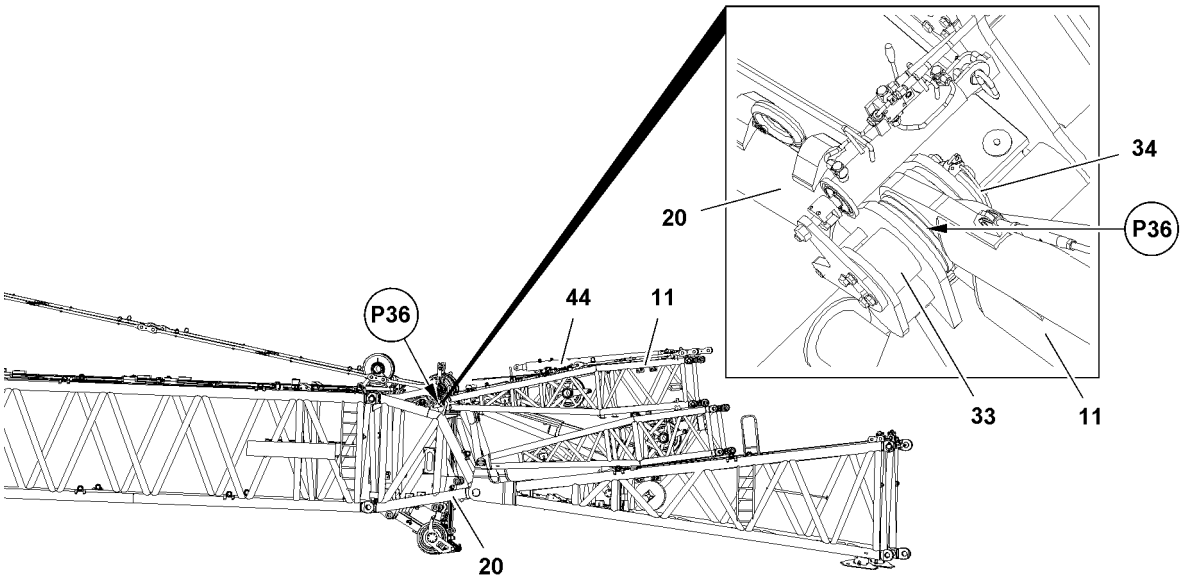

Fig.117097: Disassembling the WA-frame 2 pivot section

Make sure that the following prerequisites are met:
- The assembly unit V is completely removed.
- The relapse supports **44** are secured.
- The guy rods on the WA-frame 2 pivot section **11** are secured.

- ▶ Fasten the WA-frame 2 pivot section **11** to the auxiliary crane, see section „Fastening points“.

Note
- ▶ The WA-frame 2 pivot section **11** is unpinned with the pin pulling cylinder, see Crane operating instructions, chapter 5.30.

- ▶ Unpin the WA-frame 2 pivot section **11** on the S-end section **20**: Release the pins **33** on both sides on points **P36** and unpin.
- ▶ Take the WA-frame 2 pivot section **11** down with the auxiliary crane in a suitable storage location.
- ▶ Remove the auxiliary crane.

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6.9.6 Disassembling the assembly unit I on the S-end section

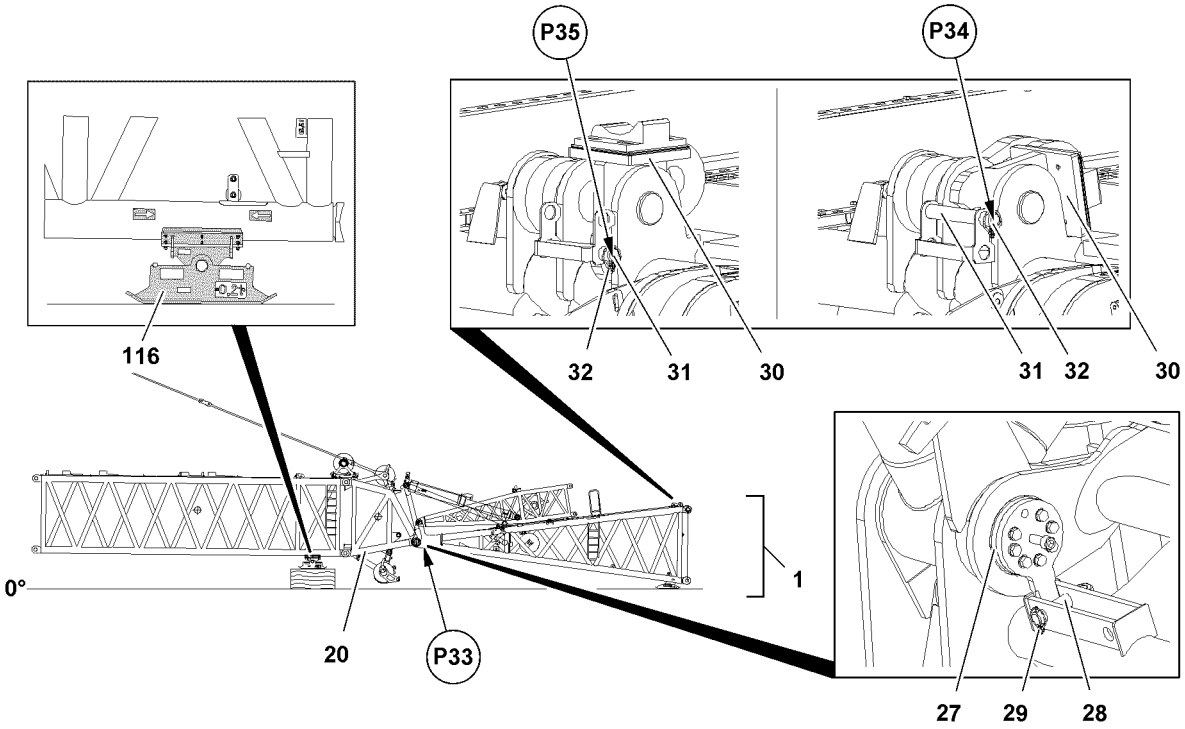

Fig.121052: Disassembling the assembly unit I on the S-end section

Make sure that the following prerequisites are met:
- The main boom is aligned parallel to the ground.
- The main boom is placed on the substructure.
- The assembly shoe **116** is set within the arrows.
- The WA-frame 2 pivot section is completely disassembled.
- The pin pulling cylinder is installed on point **P33** in front detent position
- An auxiliary crane is available.

▶ Release the rack **30** in operating position: Release the pin **31** on point **P35** and unpin.
▶ Align the placement surfaces to the side.
▶ Secure the rack **30** in transport position: Insert the pin **31** on point **P34** and secure with safety locking pin **32**.
▶ Repeat the procedure the same way for the second rack **30**.
▶ Fasten the assembly unit I **1** to the auxiliary crane, see section „Fastening points“.

Note
▶ The assembly unit I **1** is unpinned with the pin pulling cylinders, see Crane operating instructions, chapter 5.30.

The stroke of the pin pulling cylinder is not sufficient and it must be reset to insert the pin completely.

▶ Unpin the assembly unit I **1** on the S-end section **20**: Release the pins **27** on both sides on points **P33** and unpin with the pin pulling device.

WARNING
Danger of crushing!
Death, severe bodily injuries, property damage.
▶ Make sure, when swinging the W-pivot section in to the pin points, that no persons are within the danger zone.
▶ Swinging the load is prohibited.
▶ Make sure that no personnel is within the danger zone when operating the pin pulling device.
▶ Operate the pin pulling device with utmost caution from the pin pulling aggregate.

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▶ Take the assembly unit I **1** down with the auxiliary crane in a suitable storage location.
▶ Remove the auxiliary crane.

6.9.7 Final tasks

Removing the wind speed sensor

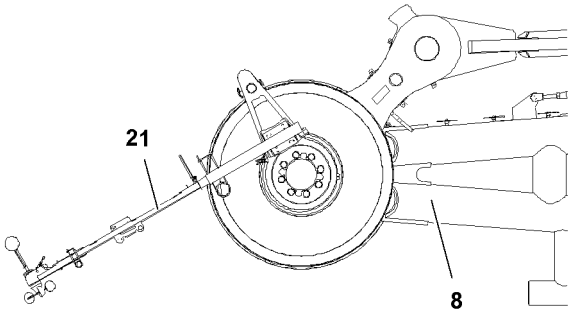

Fig.117026: Removing the wind speed sensor

▶ Remove the wind sensor **21** on WA-frame 2 end section **8**.

Disassembling the WA-frame end sections on the WA-frame intermediate sections

Note
▶ If the short WA-frames are installed, then this step is not required.

Make sure that the following prerequisite is met:
– An auxiliary crane is available.

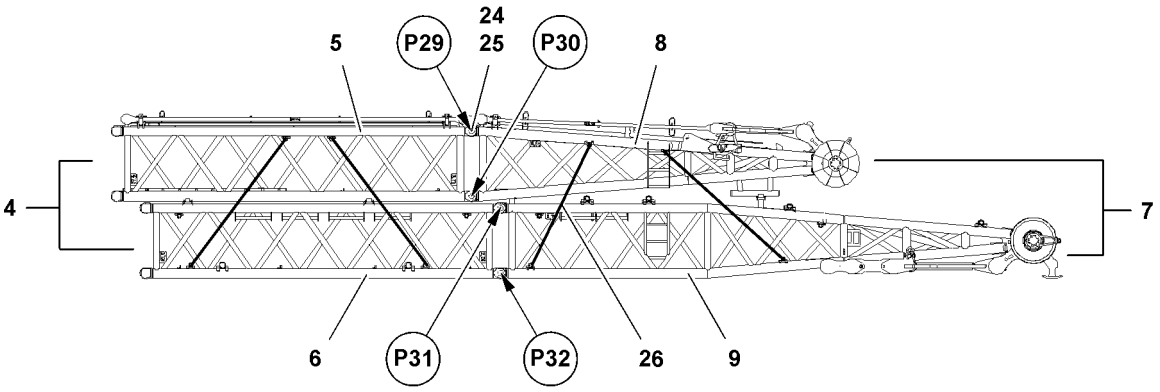

Fig.117029: Disassembling the WA-frame end sections on the WA-frame intermediate sections

WARNING
Missing tension belts!
Death, severe bodily injuries, property damage.
▶ The transport tension belts **26** between WA-frame 1 intermediate section **6** and WA-frame 2 intermediate section **5** must be tensioned.
▶ The transport tension belts **26** between WA-frame 1 end section **6** and WA-frame 2 end section **5** must be tensioned.

▶ Install all transport tension belts **26** on assembly unit III **7** (WA-frame 1 end section **9** and WA-frame 2 end section **8**).

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Note

▶ The WA-frame components are unpinned with the pin pulling cylinders, see Crane operating instructions, chapter 5.30.

▶ Attach the auxiliary crane on assembly unit III **7**, see section „Fastening points“.
▶ Unpin the assembly unit III **7** on assembly unit II **4**: Release the pins **24** on both sides on points **P32** and unpin.
▶ Unpin the assembly unit III **7** on assembly unit II **4**: Release the pins **24** on both sides on points **P31** and unpin.
▶ Unpin the assembly unit III **7** on assembly unit II **4**: Release the pins **24** on both sides on points **P30** and unpin.
▶ Unpin the assembly unit III **7** on assembly unit II **4**: Release the pins **24** on both sides on points **P29** and unpin.
▶ Lift the assembly unit III **7** with the auxiliary crane and take it down in a suitable storage location.

Removing additional guy rods

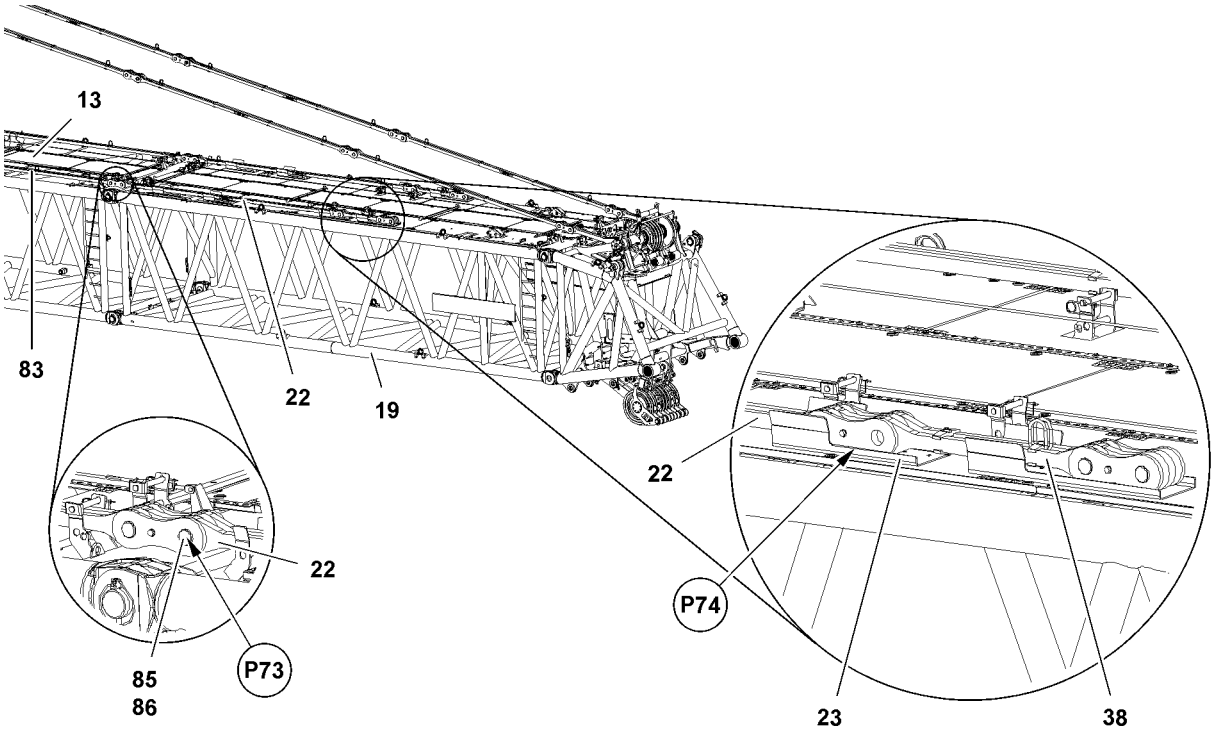

Fig.117027: Removing additional guy rods - Short WA-frames

When the short WA-frames were installed:

▶ Unpin the 6 m guy rods **22** on both sides on the guy rods **83** of the S-intermediate section **13**: Release pins **85** on both sides on points **P73** and unpin.

When the short WA-frames with additional guy rods **38** were installed:

▶ Unpin the guy rods **38** on both sides on the 6 m guy rods **22**: Release pins **85** on both sides on points **P74** and unpin.

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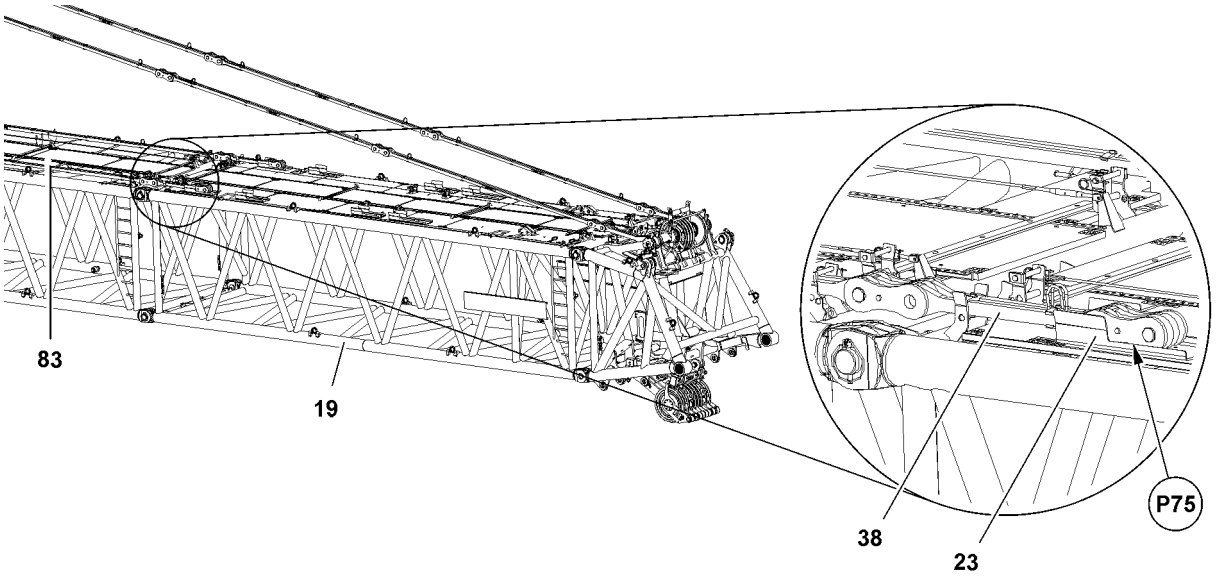

Fig.117051: Removing additional guy rods - Long WA-frames

When the long WA-frames with additional guy rods **38** were installed:

- ▶ Unpin the guy rods **38** on both sides on the guy rods **83**. Release pins **85** on both sides on points **P75** and unpin.
- ▶ Fasten all additional guy rods to the auxiliary crane and remove.

Installing the change over pulley in the transport position

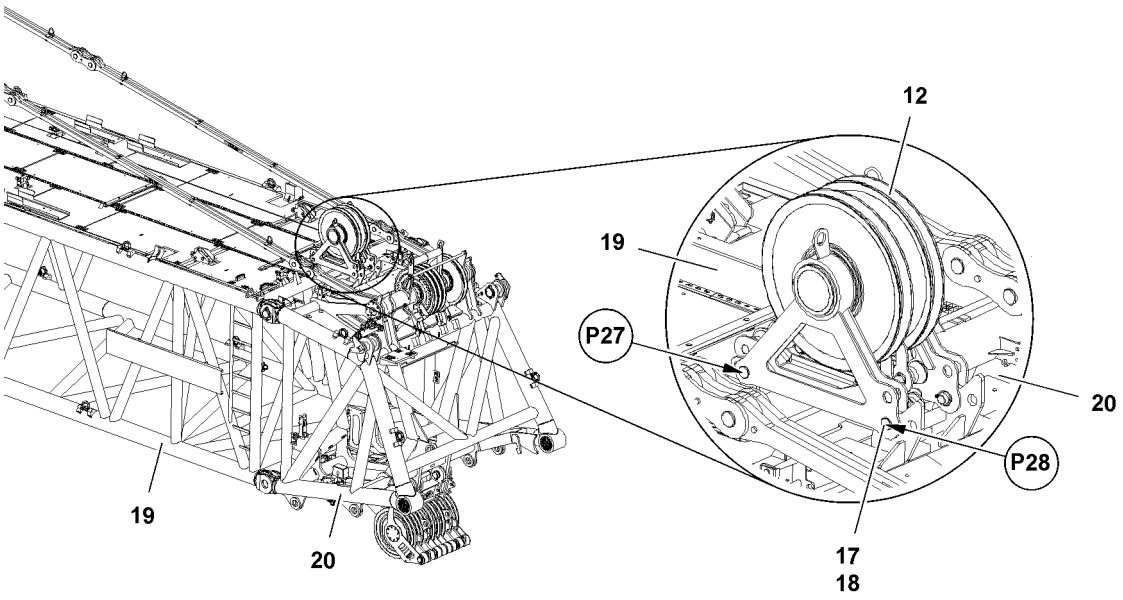

Fig.117025: Installing the change over pulley in the transport position - Unpinning the change over pulley in the operating position

- ▶ Fasten the change over pulley **12** to the auxiliary crane, see section „Fastening points“.
- ▶ Unpin the change over pulley **12** on the S-adapter **19**: Release pins **17** on both sides on points **P27** and unpin.
- ▶ Unpin the change over pulley **12** on the S-end section **20**: Release pins **17** on both sides on points **P28** and unpin.

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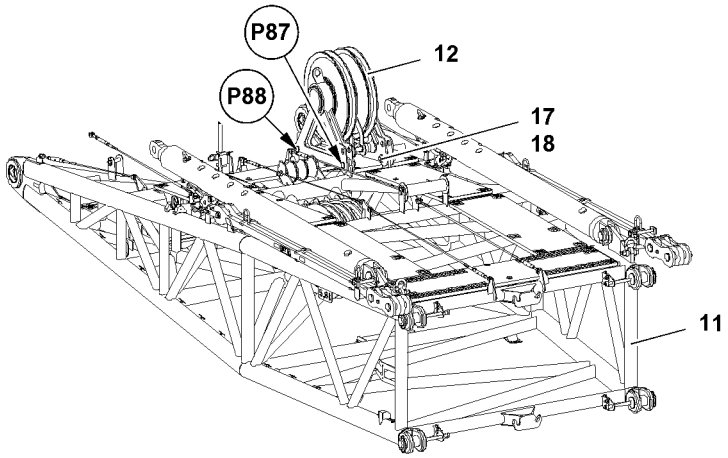

Fig.117099: Installing the change over pulley in the transport position - Pinning the change over pulley in the transport position

- ▶ Lift the change over pulley **12** with the auxiliary crane and position it on the WA-frame 2 pivot section **11** so it can be pinned on points **P87** and points **P88**.
- ▶ Pin the change over pulley **12** on the WA-frame 2 pivot section **11**: Insert the four pins **17** and secure with the safety locking pin **18**.

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5.10 Boom nose lattice boom

1	Component overview	3
2	Fastening points for boom nose 32 t	4
3	Installing the boom nose 32 t	7
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5	Disassembling the 32 t boom nose	23

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Fig.195219

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1 Component overview

Note
- ▶ The boom nose is marked with its own weight.
- ▶ Dimensions and weights, see Crane operating instructions, chapter 1.03.

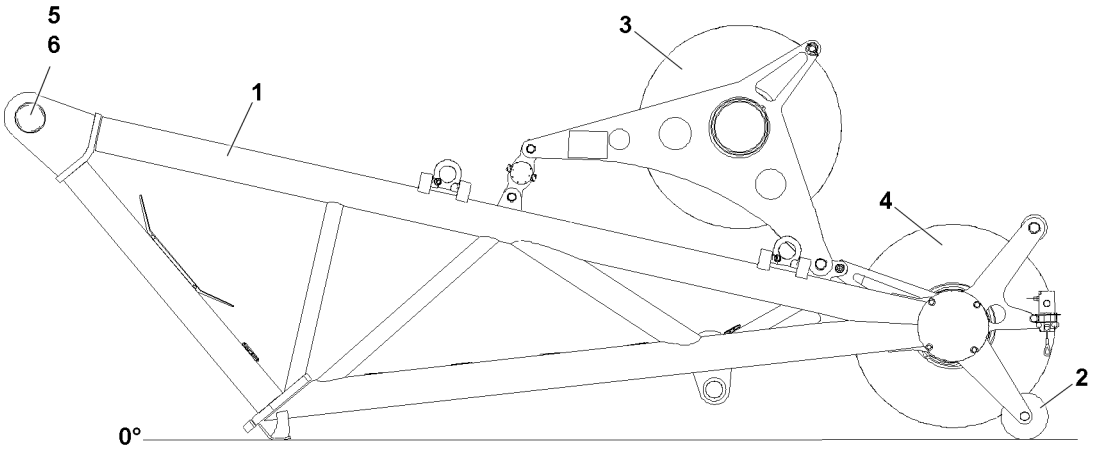

Fig.124473: Boom nose 32 t

Position	Component
1	Boom nose 32 t
2	Base roller
3	Rope pulley I
4	Rope pulley II
5	Pin
6	Safety locking pin

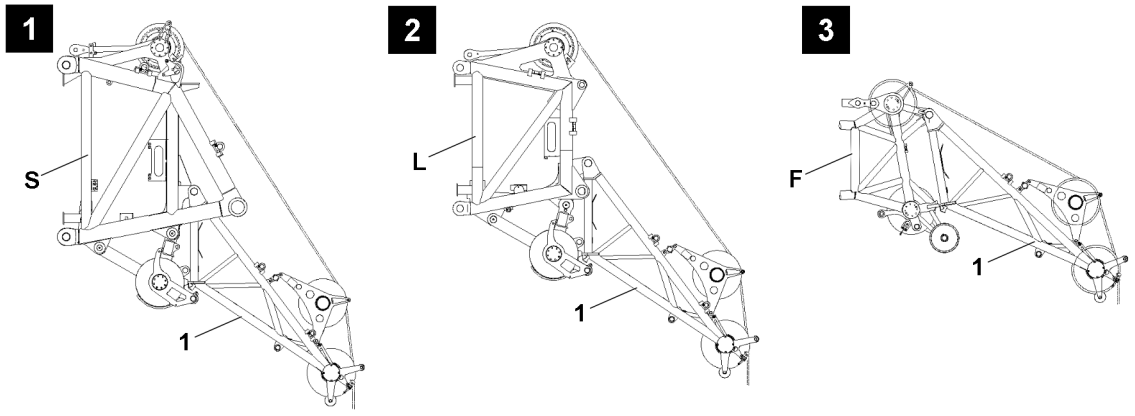

Fig.124475: Installation possibilities of the boom nose

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Installation possibilities of the boom nose	
Illustration	**Boom**
1	S-boom with end section
2	L-boom with end section
3	F-jib with end section

WARNING
Load capacity of boom nose!
For boom variation with F-jib, the permissible load capacity of the boom nose is limited to 20 t.
Death, severe bodily injuries, property damage.
▶ Make sure that the load capacity of the boom nose does not exceed 20 t.

2 Fastening points for boom nose 32 t

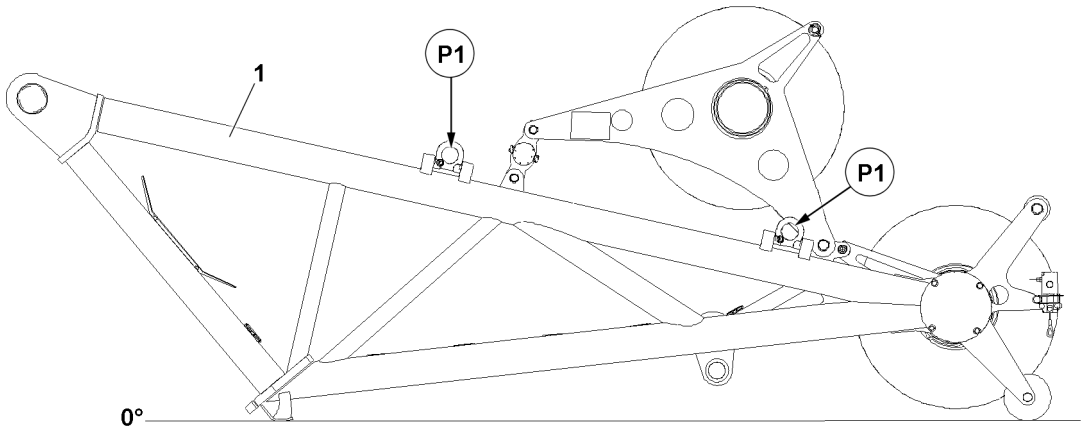

Fig.124474

WARNING
Component incorrectly fastened!
Death, severe bodily injuries, property damage.
▶ Fasten the components only on the intended fastening points on both sides.
▶ Fastening of components and description of fastening points, see Crane operating instructions, chapter 5.01.

Fastening points	
P1 and **P2**	Boom nose

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Fig.195219

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3 Installing the boom nose 32 t

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not disengage the auxiliary crane until the corresponding component is pinned and secured.

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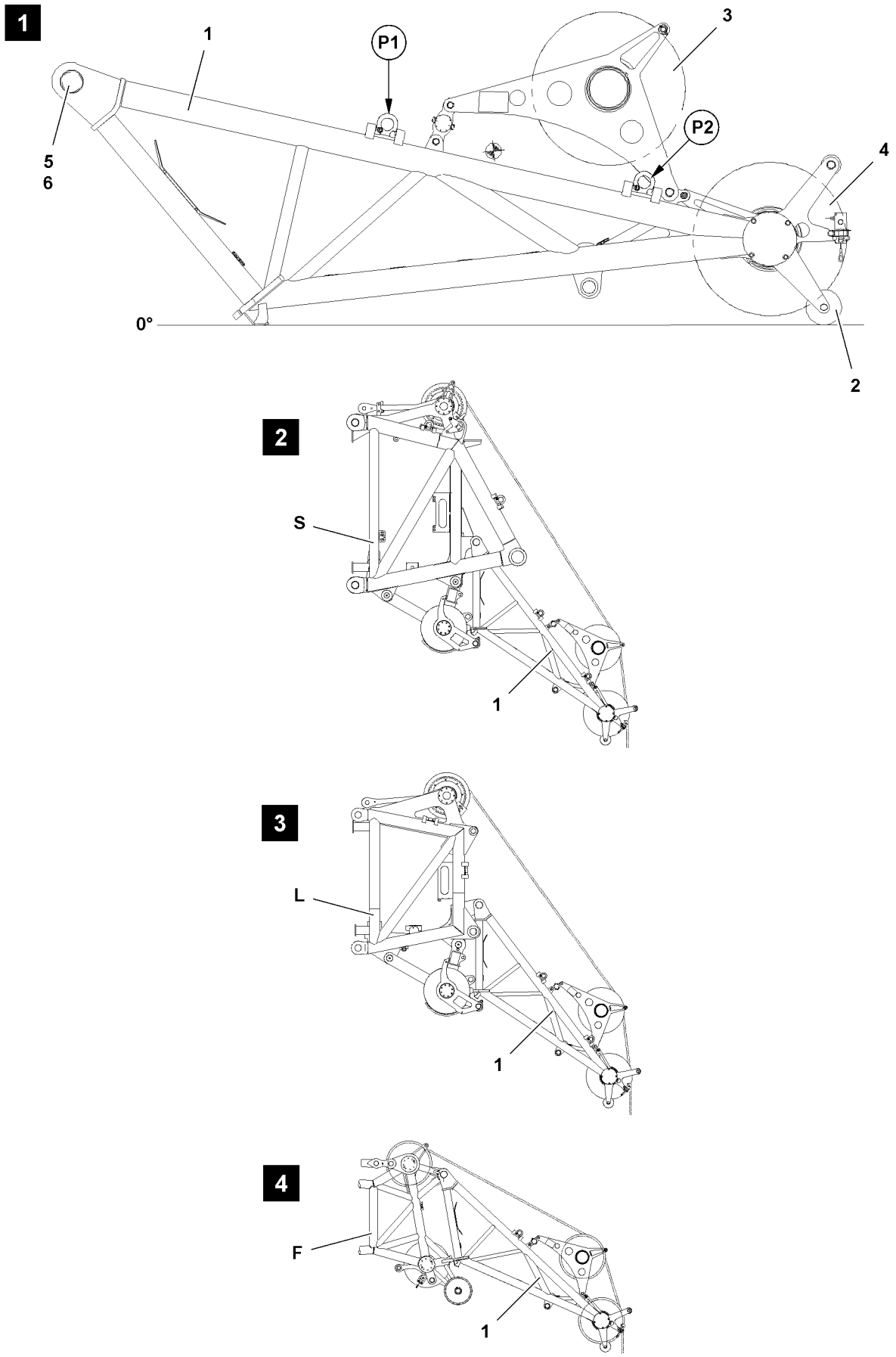

Fig.119036

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WARNING
Danger of accident due to function „Exceeding the shut off limits of the LICCON overload safety device“!
If the shut off limits of the LICCON overload safety device are exceeded, there is no additional protection against crane overload.
Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.

- ▶ The function „Exceeding the shut off limits of the LICCON overload safety device“ is only permissible in emergencies and for assembly purposes.
- ▶ The function „Exceeding the shut off limits of the LICCON overload safety device“ may only be actuated by persons who know the effects of their actions regarding the function „Exceeding the shut off limits of the LICCON overload safety device“.
- ▶ The function „Exceeding the shut off limits of the LICCON overload safety device“ requires the presence of an authorized person and must be performed with utmost caution.
- ▶ Crane operation with activated function „Exceeding the shut off limits of the LICCON overload safety device“ is prohibited.

Make sure that the following prerequisites are met:

- The crane is aligned in horizontal direction.
- The boom including the respective end section are installed.
- The boom is placed on a load-bearing support.
- The counterweight has been installed on the turntable according to the load chart.
- The LICCON overload safety device has been set according to the data in the load chart.
- The LICCON overload safety device is exceeded.
- The assembly icon is visible on the LICCON monitor.
- An auxiliary crane is available.

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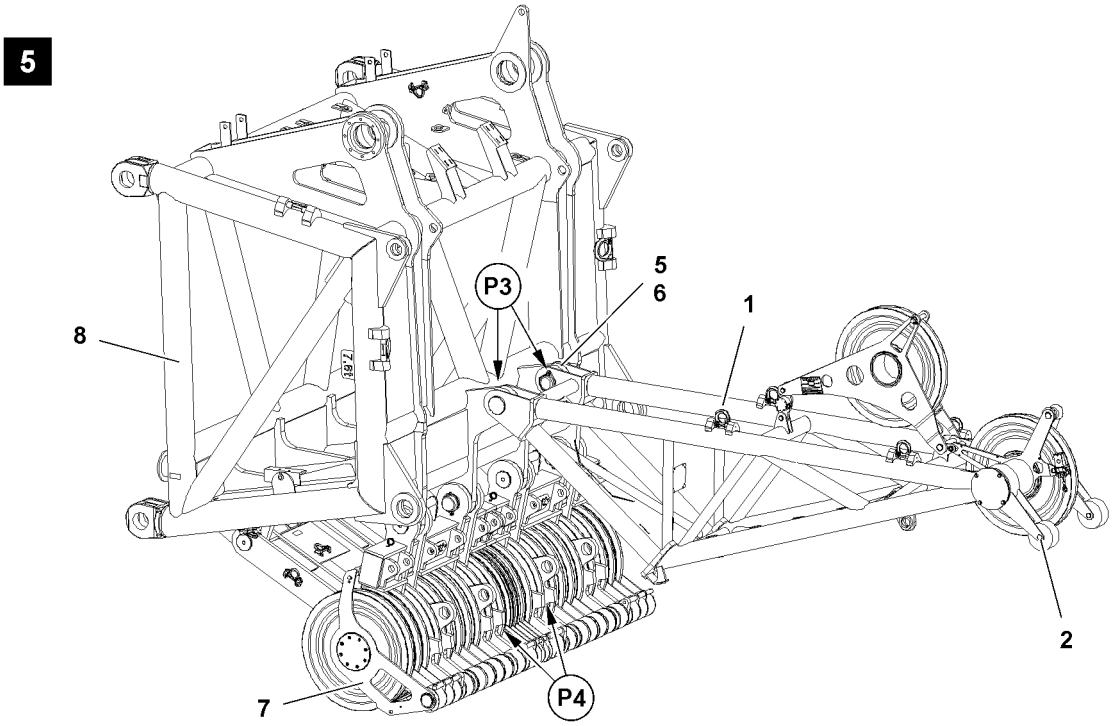

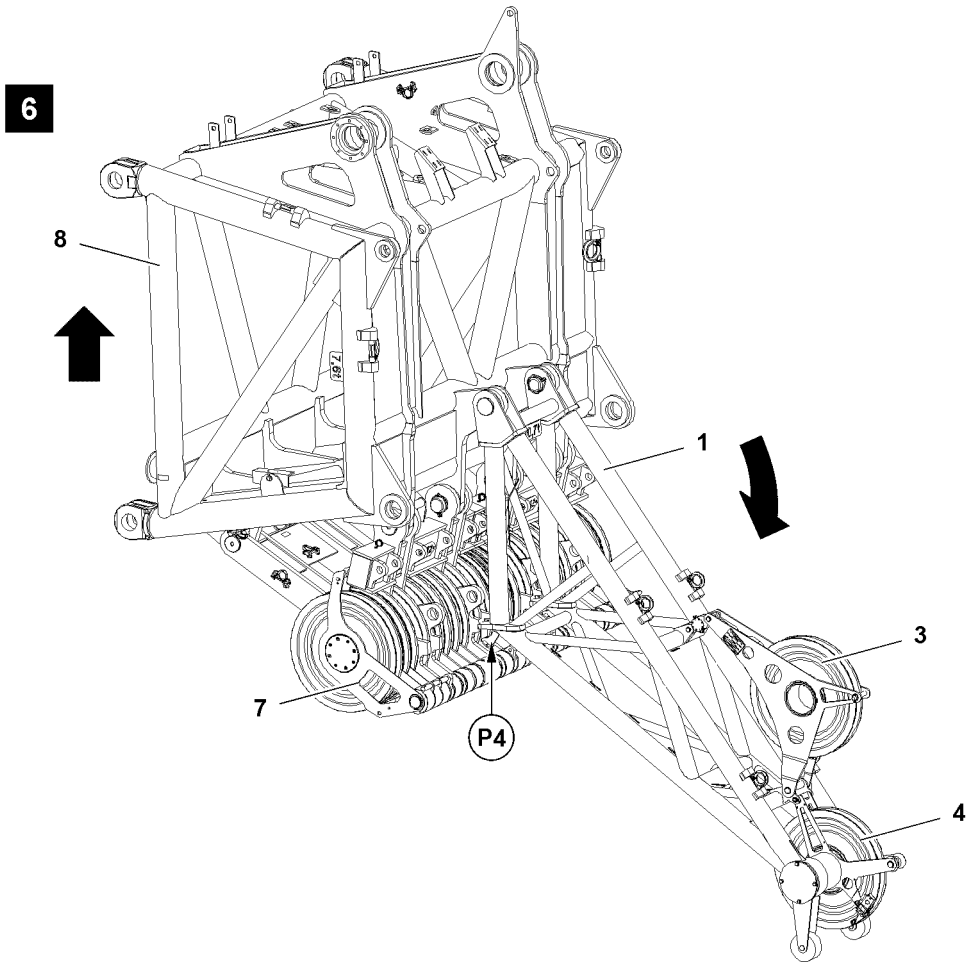

Fig.119037

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3.1 Assembly procedure

Make sure that the following prerequisite is met:
– The boom end section is laying on the ground.

Note
▶ For assembly of the boom nose on the end section, the assembly procedure and the process are identical for all boom variations.
▶ The assembly of the boom nose is described therefore on a variation with L-boom.

▶ Attach the boom nose **1** on the auxiliary crane.
▶ Lift the boom nose **1** with the auxiliary crane and swing it to the boom end section **8**.
▶ Position the boom nose **1** at points **P3**, see illustration **5**.

WARNING
The pins can loosen up by themselves!
If the pins are not secured with the safety locking pins, the axles can release during crane operation.
This can cause the crane to topple over.
Death, severe bodily injuries, property damage.
▶ Make sure that all pins are inserted and secured.

The boom nose is pinned on two points.

▶ Pin the boom nose **1** at points **P3** with the boom end section **8 „on top“**: Insert the pin **5** and secure with safety locking pin **6**, see illustration **5**.
▶ Place the boom nose **1** with the auxiliary crane on the base rollers **2** on the ground.
▶ Remove the auxiliary crane.

Note
▶ Reeve in the hoist rope according to the Reeving plan, see Reeving plan.

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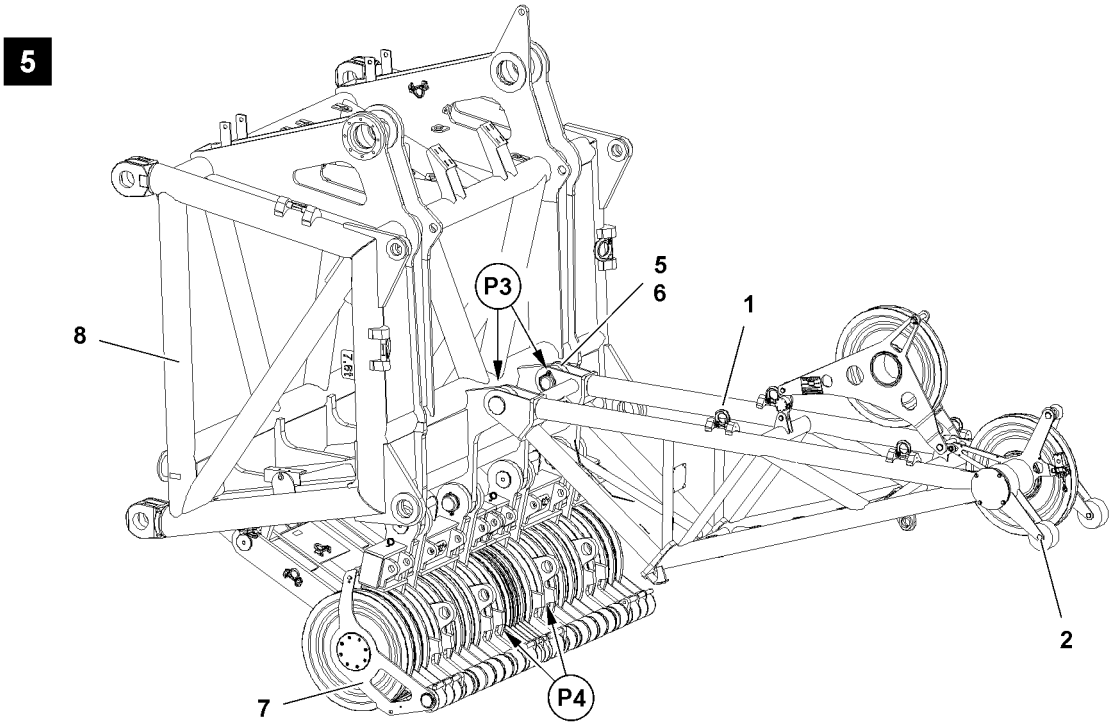

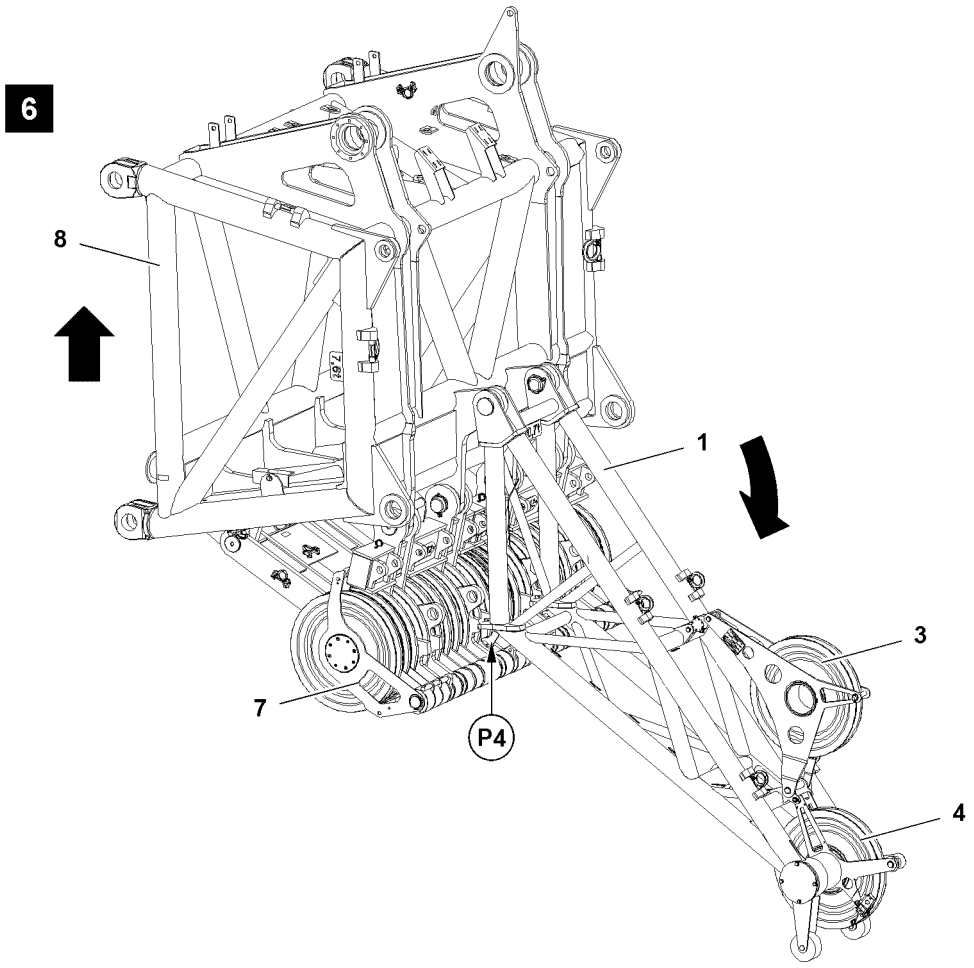

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- ▶ Pull the hoist rope over the rope pulley I **3** and rope pulley II **4**.
- ▶ Luff the boom up until the boom nose **1** is touching on the boom end section **8 „on the bottom“** in the receptacle at points **P4**, see illustration **5** and illustration **6**.

WARNING
Falling hoist rope!
If the hoist rope is not properly secured with a corresponding length on the boom nose before the erection procedure, then it can fall backward due to its own weight.
Death, severe bodily injuries, property damage.
- ▶ Reeve in the hoist rope with sufficient length on the boom nose before the erection process.
- ▶ The hoist rope must be constantly monitored during erection.
- ▶ Do not step into the danger zone.

WARNING
Danger of accident due to side wind!
If the slewing gear brake is released after reeving / unreeving the hook block / the load hook, then the crane can turn uncontrolled in strong side wind.
Death, severe bodily injuries, property damage.
The crane can collide with close-by structures or objects.
- ▶ Make sure that the current wind speed does not exceed the values from the wind speed chart when releasing the slewing gear brake.

- ▶ Apply the slewing gear brake before reeving in the hook block.
- ▶ Reeve the hook block properly and attach the hoist limit switch weight.

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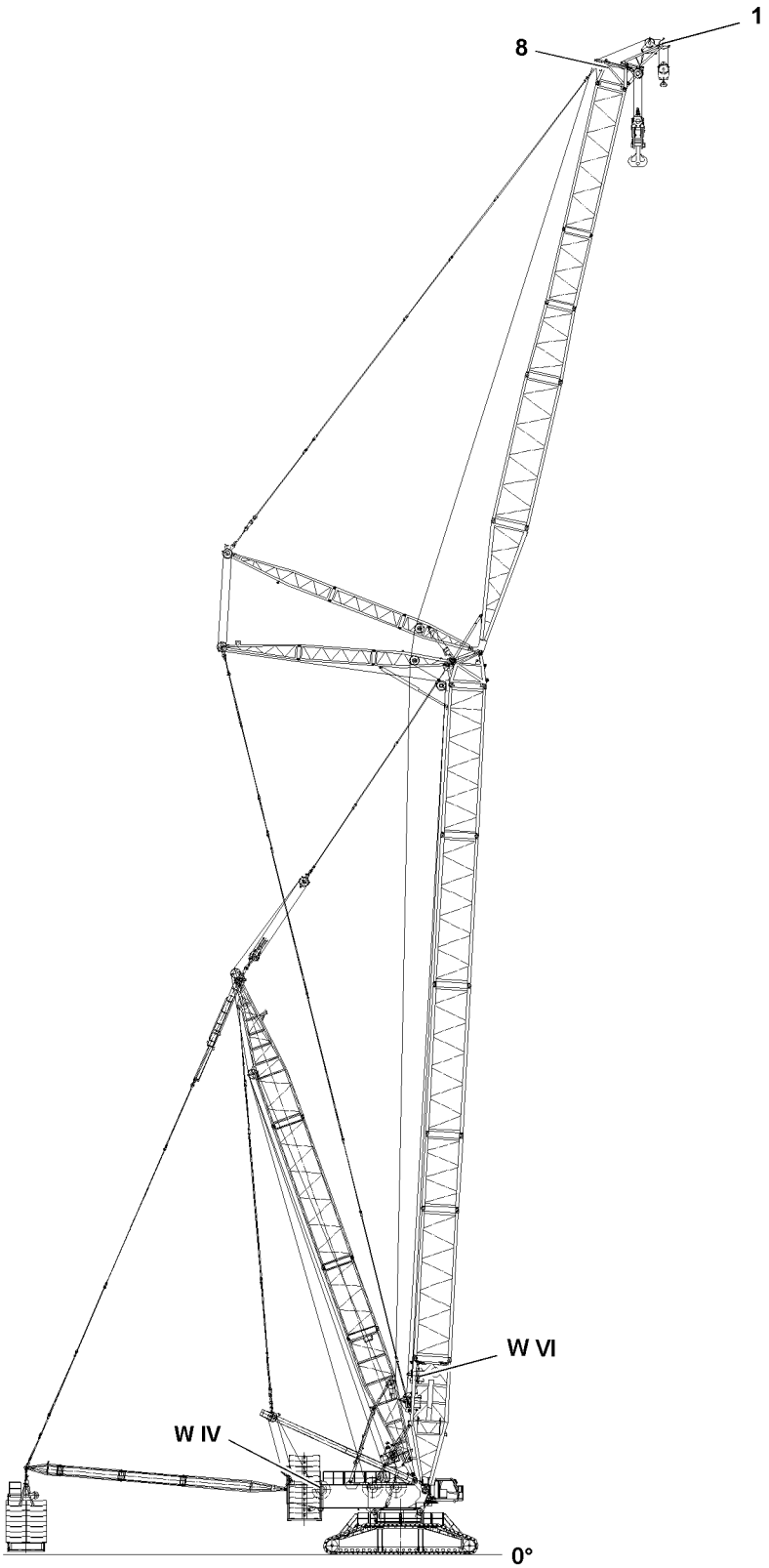

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Fig.119038

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3.2 Establishing the electrical connections

NOTICE
Damage to the electrical connection on the cable drum!
If the electrical connection from the cable drum on the L-pivot section to the terminal box on the L-pivot section is established first before the connection to the terminal box on the respective end section, then the electrical connection can be damaged when spooling out the cable drum.
▶ Establish first the electrical connection from the cable drum in the L-pivot section to the terminal box on the respective end section and then the electrical connection from the terminal box in the L-pivot section to the cable drum in the L-pivot section.

Note
▶ To establish the electrical connections, see Electric wiring diagram.

Make sure that the following prerequisites are met:
– The boom is fully assembled.
– The airplane warning light and the wind speed sensor are assembled.

▶ Establish the electrical connections.
▶ Make sure that all electrical connections on the boom are established.

3.3 Function check

WARNING
Non-functioning safety equipment!
If the function of the safety equipment is defective, personnel can be severely injured or killed.
▶ Crane operation with non-functioning safety equipment is **prohibited**.

Note
▶ The function of the individual limit switches must be checked before erection.
▶ The function of the limit switch initiators must be checked in the test system, see Diagnostics manual.

Note
▶ If a function check on the limit switches or on the safety equipment does not lead to the desired shut offs, then the plug connections on the terminal boxes or the components itself must be checked.
▶ If no visible connection errors or component defects can be found, contact **LIEBHERR** Service.

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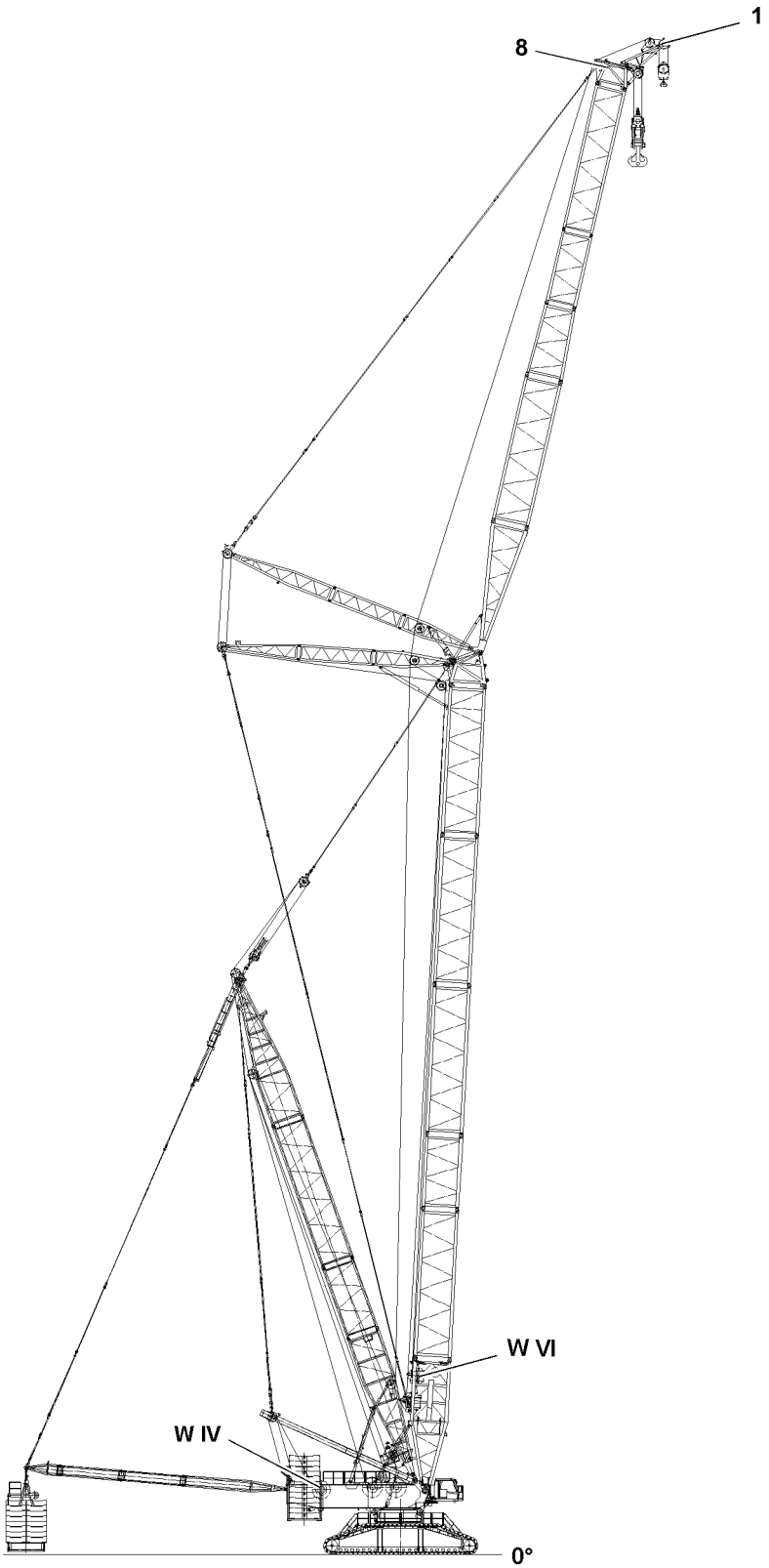

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Make sure that the following prerequisites are met:
- All electrical connections have been made.
- The crane engine is running.
- The corresponding operating mode is set on the LICCON monitor.

3.3.1 Checking the wind speed sensor

▶ Check the movement and the function of the wind speed sensor.

3.3.2 Checking the airplane warning light

▶ Turn the airplane warning light on.
▶ Check the function visually.

3.3.3 Checking the hoist limit switch on the pulley head

Note
▶ When replacing or changing a hoist limit switch (HES), the corresponding hoist limit switch must have the correct bus address and the correct software version in order to be detected again by the bus system (LSB).

▶ Actuate the hoist limit switch manually on the pulley head.

Result:

- The spool up function of the hoist winch turns off.
- The icon „Hoist top“ appears on the LICCON monitor 0.
- The limit switch is functioning.

3.3.4 Checking the limit switches in general

Note
▶ The limit switch functions have to be checked individually before erection.
▶ To check the limit switches, see corresponding chapter for respective boom system in the Crane operating instructions.

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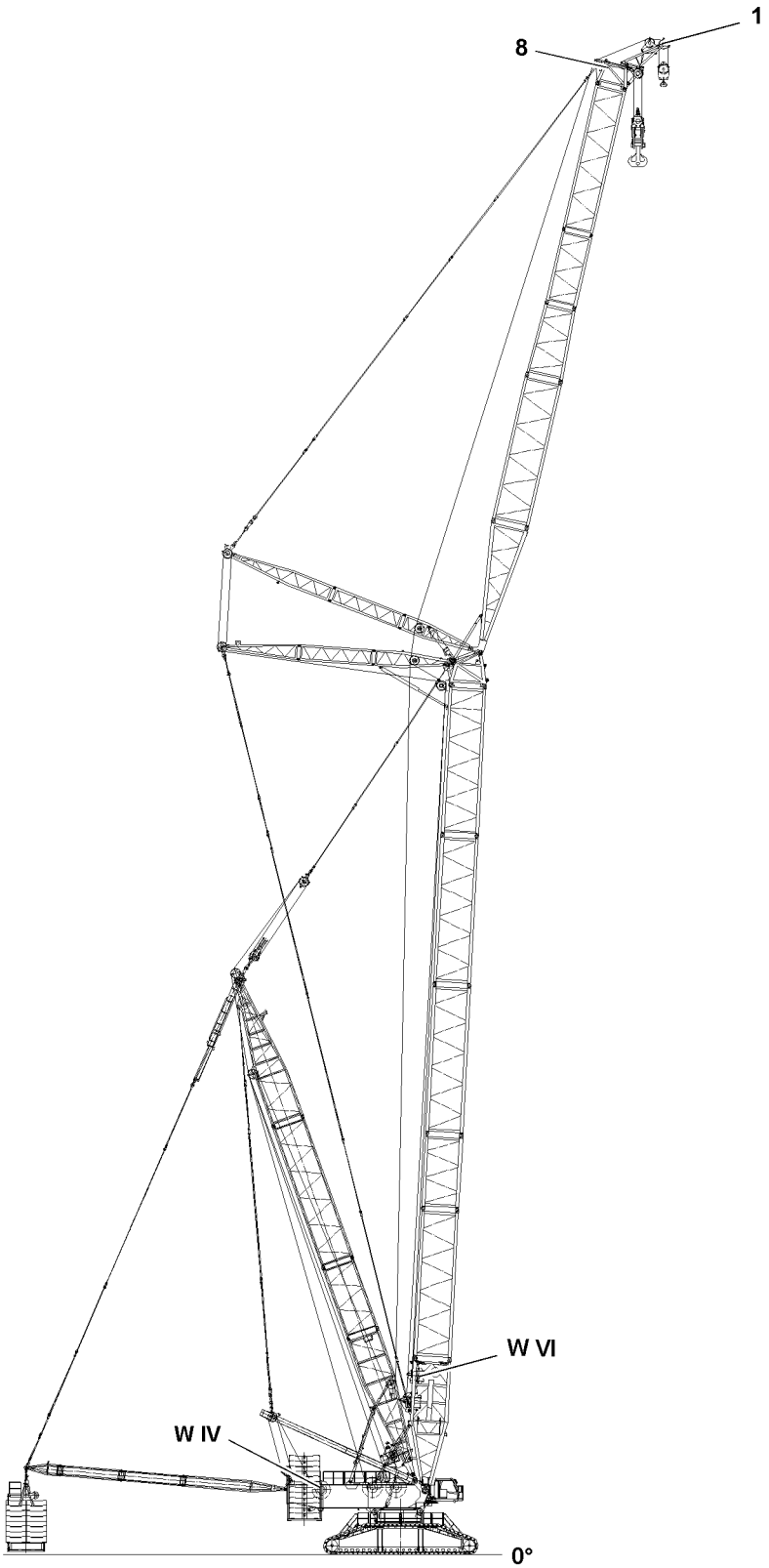

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Fig.119038

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3.4 Erecting the boom

WARNING
The crane can topple over!
If the following conditions are not met before erecting the boom, the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ Observe and adhere to the safety technical notes, see Crane operating instructions, chapter 5.01.
- ▶ Observe the specifications in the erection and take down charts.
- ▶ Extend the relapse cylinder before erection.

Make sure that the following prerequisite is met:
– The LICCON overload safety device is exceeded.

WARNING
The crane can topple over!
In crane operation with exceeded LICCON overload safety device, the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook.

Note
- ▶ When the lowest operating position of the boom is reached, the set load chart of the LICCON overload safety device is activated.
- ▶ In the maximum load icon appears a load number in „t“ instead of the display „???“.

- ▶ Luff the S-boom up to the lowest operating position.
- ▶ When the boom has reached the lowest operating position: Make sure that the assembly icon turns off on the LICCON monitor.

Result:

– The LICCON overload safety device is active.

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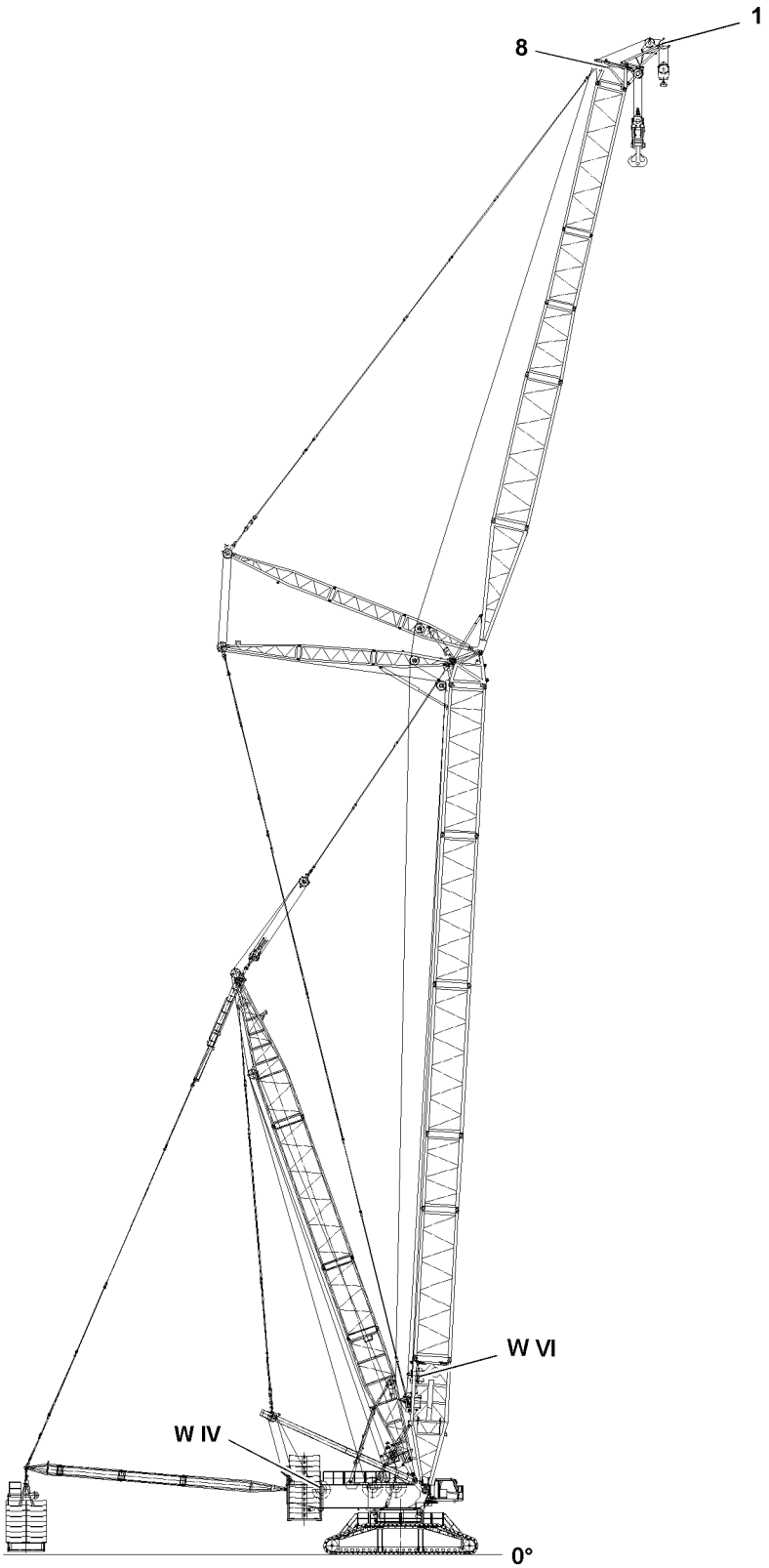

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Fig.119038

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4 Crane operation

Observe the instructions in chapter 4.05, chapter 4.08 and chapter 5.01.

Make sure that the following prerequisites are met:
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload safety device is active.
- The assembly icon on the LICCON monitor is off, see Crane operating instructions, chapter 4.02.

WARNING
Load reduction!
During crane operation with installed boom nose, the value in the load charts is reduced by the own weight of the boom nose.
Death, severe bodily injuries, property damage.
▶ Observe the load charts.

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
▶ Check the horizontal position of the crane before and during operation.
▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset, if necessary, before resuming crane operation.

4.1 Checking the settings

▶ Check the function of the overload protection by running against the operating positions on top and bottom.
▶ Check the hoist limit switch by running against the hoist limit switch weight.
▶ Check the function of the force test bracket on the boom nose.

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Fig.195219

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5 Disassembling the 32 t boom nose

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not disengage the auxiliary crane until the corresponding component is pinned and secured.

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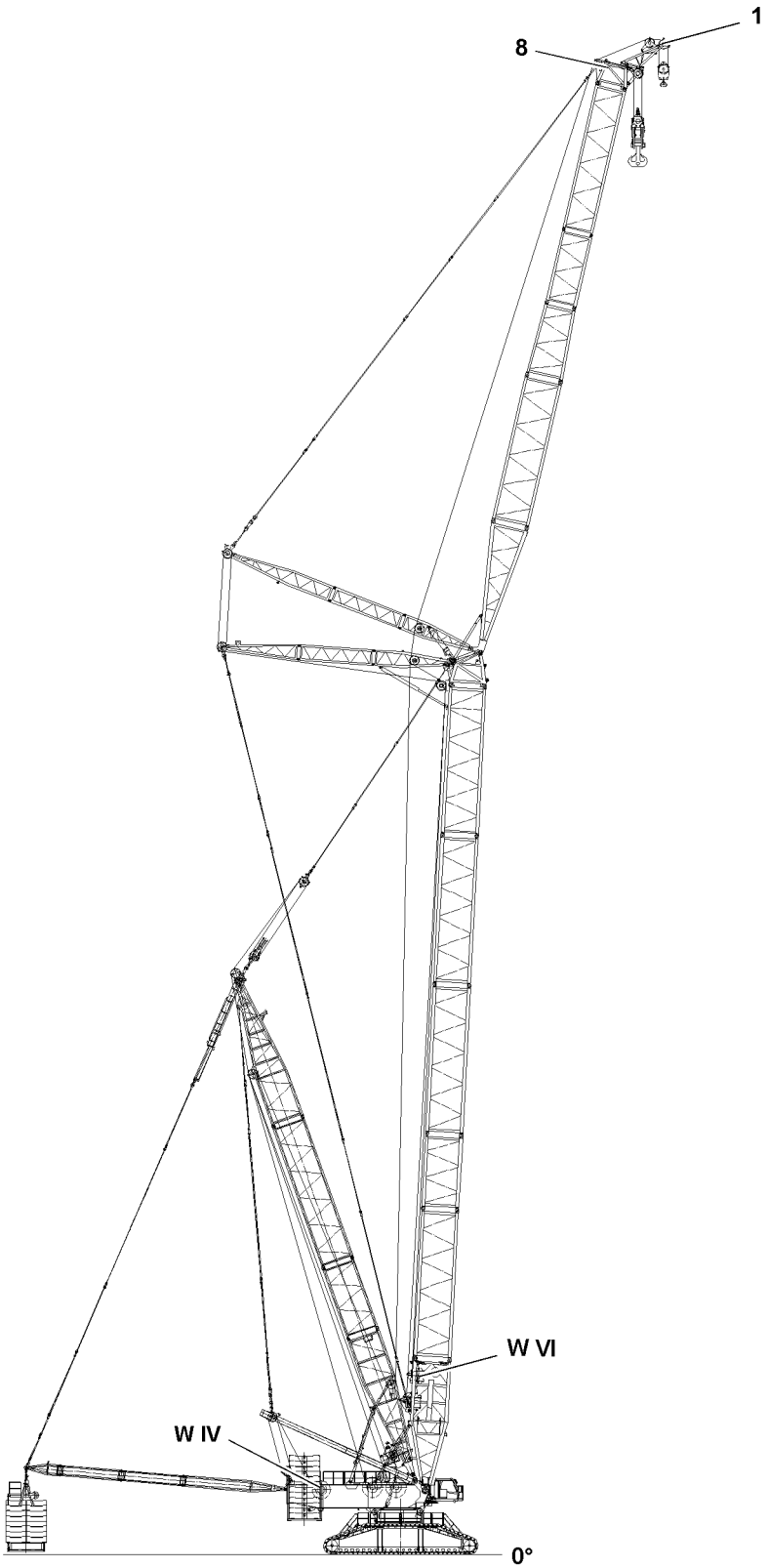

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WARNING
Danger of accident due to function „Exceeding the shut off limits of the LICCON overload safety device“!
If the shut off limits of the LICCON overload safety device are exceeded, there is no additional protection against crane overload.
Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.

- ▶ The function „Exceeding the shut off limits of the LICCON overload safety device“ is only permissible in emergencies and for assembly purposes.
- ▶ The function „Exceeding the shut off limits of the LICCON overload safety device“ may only be actuated by persons who know the effects of their actions regarding the function „Exceeding the shut off limits of the LICCON overload safety device“.
- ▶ The function „Exceeding the shut off limits of the LICCON overload safety device“ requires the presence of an authorized person and must be performed with utmost caution.
- ▶ Crane operation with activated function „Exceeding the shut off limits of the LICCON overload safety device“ is prohibited.

Make sure that the following prerequisites are met:

- The crane is properly supported and horizontally aligned.
- An auxiliary crane is available.
- The counterweight has been installed on the turntable according to the load chart.
- The LICCON overload safety device has been set according to the data in the load chart.
- The LICCON overload safety device settings have been compared with the actual set up configuration.

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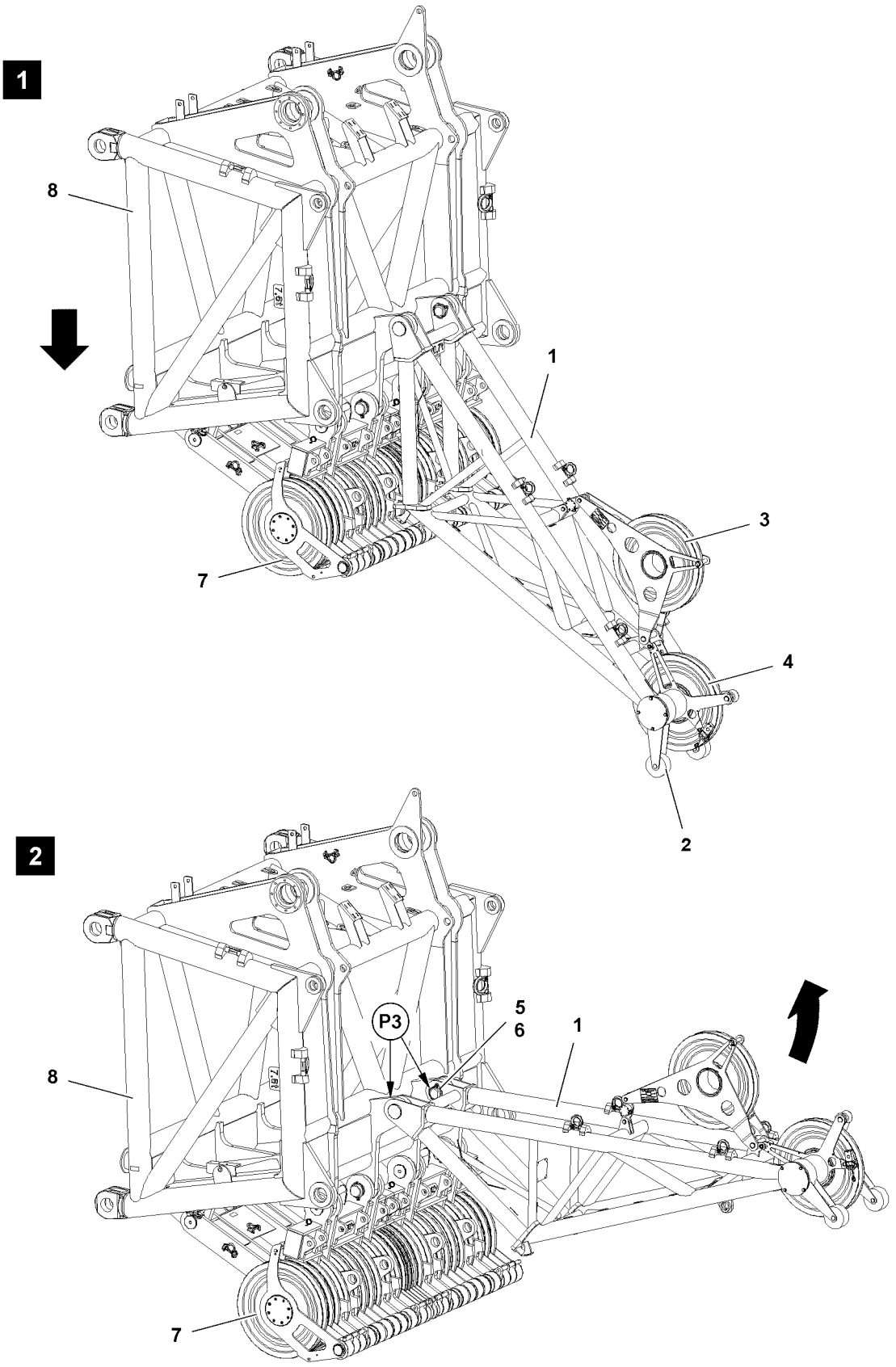

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Fig.119039

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5.1 Placing the boom down

WARNING
The crane can topple over!
If the following conditions are not met before taking down the boom, the crane can topple over and fatally injure personnel.
Death, severe bodily injuries, property damage.
- ▶ Observe and adhere to the safety technical notes, see Crane operating instructions, chapter 5.01.
- ▶ Observe the specifications in the erection and take down charts.

NOTICE
Damage of boom components!
Taking down the boom system can lead to a collision between the hook block and the pulley head.
Boom components can be severely damaged.
- ▶ Luff the boom system down at the same time and spool the hoist winch out.

WARNING
The crane can topple over!
If the danger notes for take down of the boom or the boom systems in the following chapters are not observed, then the crane can topple over.
Death, severe bodily injuries, property damage.

Boom nose assembled on the end section:
- ▶ Observe and adhere to the danger notes in the Crane operating instructions, chapter 5.38, chapter 5.39 or chapter 5.07.

- ▶ Luff the boom down according to the instructions in the above chapters.

WARNING
Danger of accident due to function „Exceeding the shut off limits of the LICCON overload safety device“!
If the shut off limits of the LICCON overload safety device are exceeded, there is no additional protection against crane overload.
Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ The function „Exceeding the shut off limits of the LICCON overload safety device“ is only permissible in emergencies and for assembly purposes.
- ▶ The function „Exceeding the shut off limits of the LICCON overload safety device“ may only be actuated by persons who know the effects of their actions regarding the function „Exceeding the shut off limits of the LICCON overload safety device“.
- ▶ The function „Exceeding the shut off limits of the LICCON overload safety device“ requires the presence of an authorized person and must be performed with utmost caution.
- ▶ Crane operation with activated function „Exceeding the shut off limits of the LICCON overload safety device“ is prohibited.

- ▶ At the same time, spool the hoist winch out and luff the boom down until the hook block touches the ground.
- ▶ Remove the hoist limit switch weight and unreeve the hook block.
- ▶ Luff the boom down until the end section and the boom nose are laying on the base rollers **2** on the ground, see illustration **1**.
- ▶ Remove the hoist rope.

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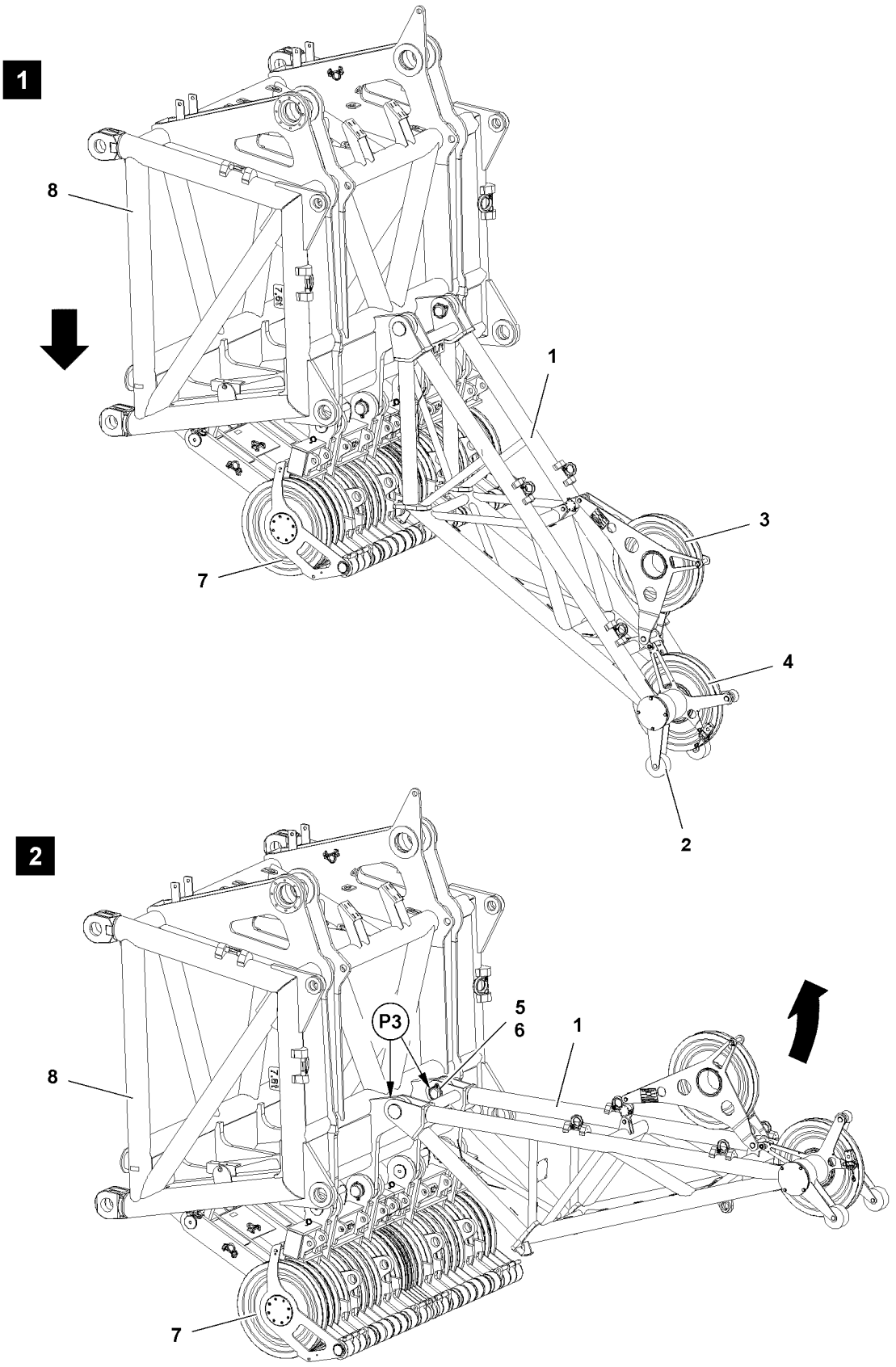

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Fig.119039

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5.2 Disconnecting the electrical connections

Make sure that the following prerequisite is met:
– The boom is properly placed down as specified.

NOTICE
Damage to the electrical connections on the cable drum!
If the electrical connection from the cable drum on the L-pivot section to the terminal box on the respective end section is disconnected and spooled up, then the electrical connection from the cable drum to the terminal box on the L-pivot section can be damaged.
▶ Disconnect the electrical connection from the cable drum to the terminal box on the L-pivot section first and then the electrical connection from the terminal box to the respective end section.

▶ Store the cable from the terminal box on the L-pivot section properly.
▶ Spool the cable drum up and secure it to prevent inadvertent spooling out.

5.3 Disassembly procedure

Make sure that the following prerequisites are met:
– The boom end section and the boom nose are laying on the ground.
– The electrical connections are properly disconnected.

▶ Attach the boom nose **1** on the auxiliary crane.
▶ Swing the boom nose **1** with the auxiliary crane up, see illustration **2**.

The boom nose is pinned on two points.

▶ Release the safety locking pin **6 „on top“** at points **P3** and unpin the pin **5** on the end section **8**, see illustration **2**.
▶ Remove the boom nose **1** with the auxiliary crane and place it on the ground.
▶ Remove the auxiliary crane.

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5.13 SLF-boom combination

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Fig.195219

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1 Component overview

Note
▶ The assembly sections are marked with their own weight.

Note
▶ Dimensions and weights, see the Crane operating instructions, chapter 1.03.

1.1 F-pivot section

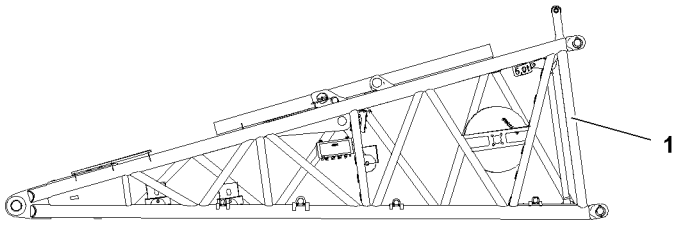

Fig.124501: F-pivot section

Position	Component
1	F-pivot section

1.2 F-end section

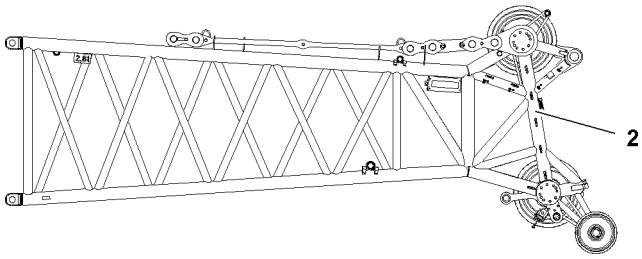

Fig.124503: F-end section

Position	Component
2	F-end section

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1.3 F-intermediate section 6 m

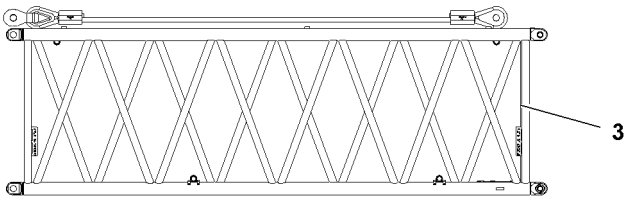

Fig.124505: F-intermediate section 6 m

Position	Component
3	F-intermediate section 6 m

1.4 F-intermediate section 12 m

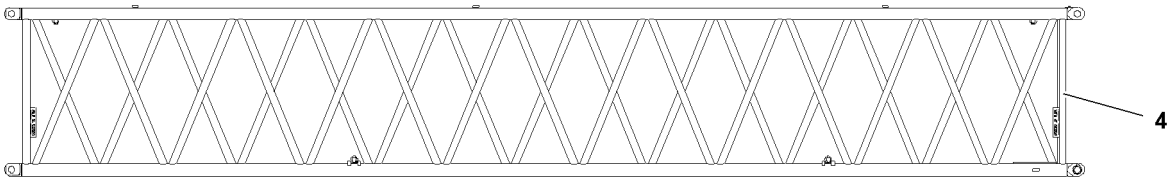

Fig.124507: F-intermediate section 12 m

Position	Component
4	F-intermediate section 12 m

1.5 F-assembly unit

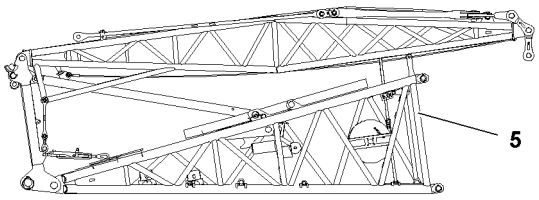

Fig.124509: F-assembly unit

Position	Component
5	F-assembly unit

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1.6 F-assembly unit with F-end section

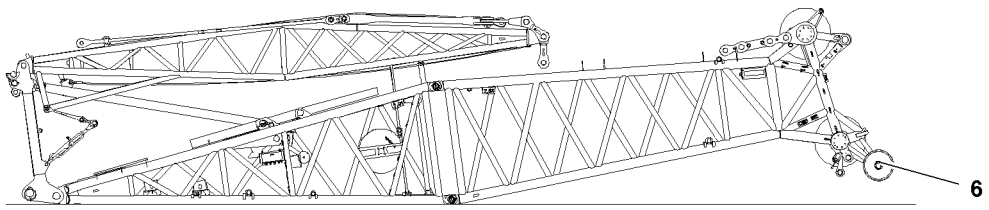

Fig.127641: F-assembly unit with F-end section

Position	Component
6	F-assembly unit with F-end section

2 Fastening points for the F-jib

WARNING
Falling lattice sections!
Death, severe bodily injuries, property damage.
- ▶ Make sure that the lattice sections are properly fastened on the respective fastening points.
- ▶ Make sure that the fastening equipment has the appropriate length and a sufficient load bearing capacity.
- ▶ Pay attention and adhere to the labels on the fastening points on the lattice sections and crane components.

2.1 F-pivot section

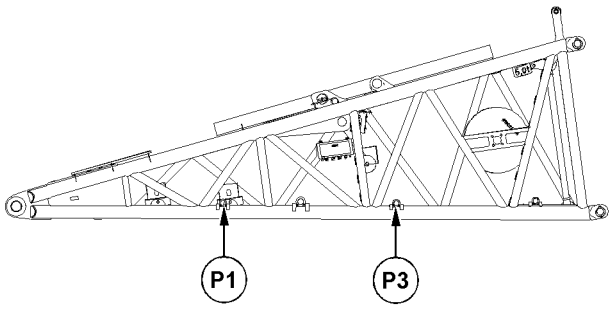

Fig.127913: F-pivot section

Fastening points	
P1 and **P3**	F-pivot section

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2.2 F-end section

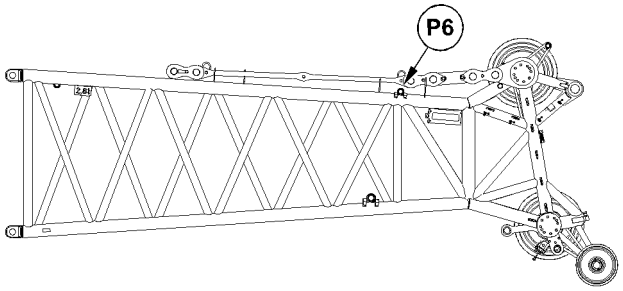

Fig.127914: F-end section

Fastening points	
P6	F-end section

2.3 F-intermediate section 6 m

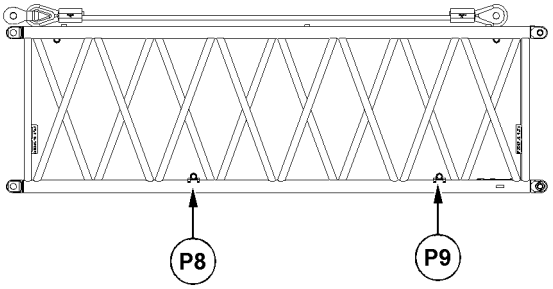

Fig.124506: F-intermediate section 6 m

Fastening points	
P8 and **P9**	F-intermediate section 6 m

2.4 F-intermediate section 12 m

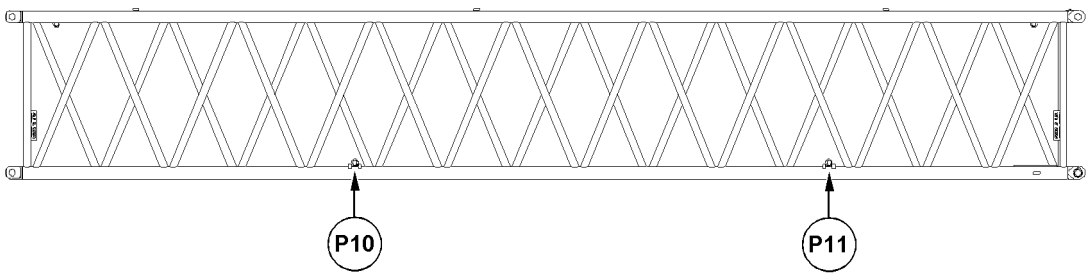

Fig.124508: F-intermediate section 12 m

Fastening points	
P10 and **P11**	F-intermediate section 12 m

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2.5 F-assembly unit

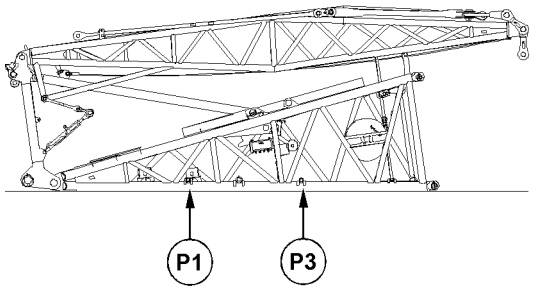

Fig.127642: F-assembly unit

Fastening points	
P1 and **P3**	F-assembly unit

2.6 F-assembly unit with F-end section

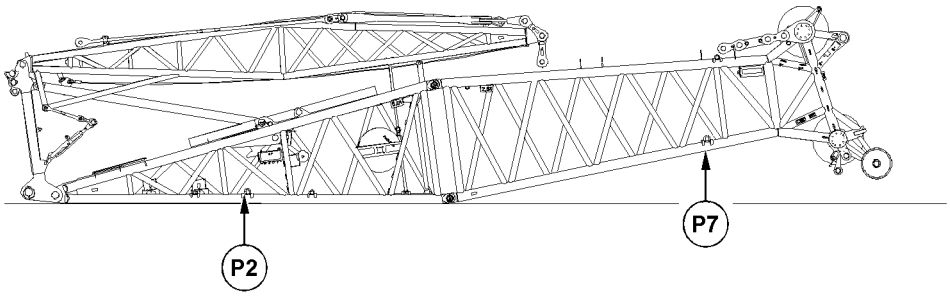

Fig.127643: F-assembly unit with F-end section

Fastening points	
P2 and **P7**	F-assembly unit with F-end section

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3 Assembling the F-jib

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ It is prohibited to lean the auxiliary ladder against the component being disassembled.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

WARNING
The lattice sections can fall down!
If the lattice sections are not pinned and secured correctly, then they can fall down and fatally injure personnel.
- ▶ Pin or unpin both pins at the same horizontal level, i.e. **left and right**.
- ▶ Do not stand under the lattice sections or within the entire danger zone during the pinning and unpinning procedure of the boom.
- ▶ Safely secure the pins in the storage locations as well as in the receptacles.
- ▶ It is prohibited to lean the auxiliary ladder against the component being disassembled.

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Note
- ▶ The F-jib is **not** adjustable during crane operation.
- ▶ This crane can be equipped with an F-jib. The F-jib can be assembled at an angle of 10°, 15° or 30° to the SL-boom. Lengths of 12 m to 42 m are possible.
- ▶ The assembly and disassembly of the F-jibs from 12 m to 42 m is described using the example of only one length.

Make sure that the following prerequisites are met:
- The SL-boom is installed and luffed down to the substructure.
- The L-end section **or** the F-connector head is installed, pinned and secured on the SL-boom.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection settings have been compared with the actual set up configuration.
- The LICCON overload protection is exceeded.
- The assembly icon is visible on the LICCON monitor.

3.1 Assembling the F-jib — assembly variants

Note
- ▶ The F-jib can be assembled, depending on the required operating mode for the crane application, either on the L-end section or on the F-connector head.
- ▶ Observe and adhere to the Rod plan.

WARNING
Maximum permissible assembly lengths!
If the maximum permissible assembly lengths are not complied with when assembling the F-jib, then dangerous situations can arise.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the maximum permissible assembly lengths are adhered to.

WARNING
Non-compliance with the assembly descriptions!
Death, severe bodily injuries, property damage.
- ▶ The following assembly variants are possible depending on the circumstances at the job site!
- ▶ The F-jib must always be assembled in accordance with the respective description in the respective section.
- ▶ Make sure that the danger notes in the respective assembly description are observed.

3.1.1 Assembly variant V1

Assembling the F-jib in parts
- For assembly variant V1, the F-jib is assembled in individual parts.

3.1.2 Assembly variant V2

Assemble the complete F-jib (maximum length of 12 m) on the ground
- For assembly variant V2, assembly takes place using a hoist rope.

3.1.3 Assembly variant V3

Assemble the complete F-jib (maximum length of 12 m) in flying mode
- For assembly variant V3, flying assembly takes place using the assembly winch rope.

3.1.4 Assembly variant V4

Assemble the complete F-jib (maximum length of 12 m) in flying mode
- For assembly variant V4, flying assembly takes place using a hoist rope.

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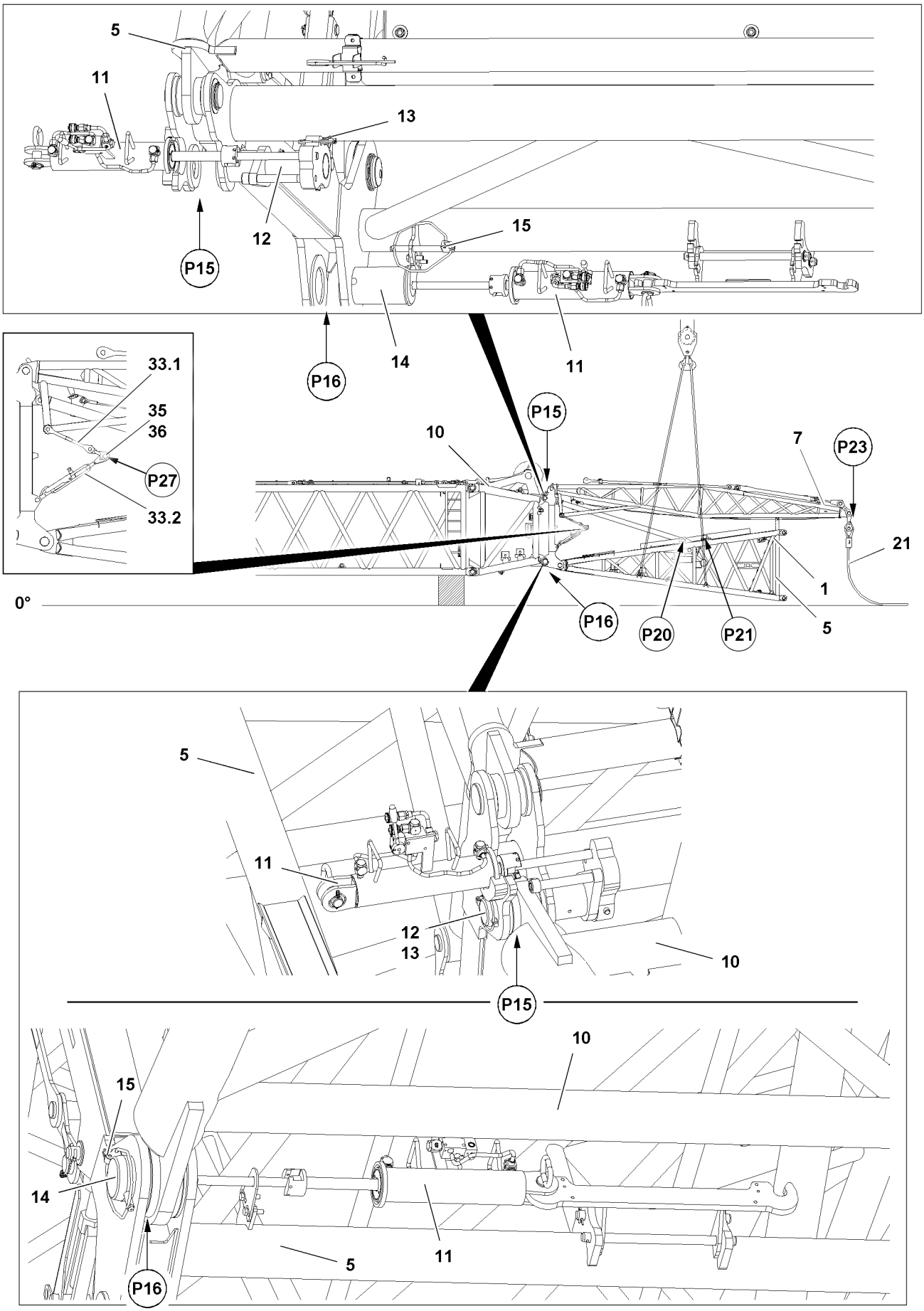

Fig.127477

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4 Assembly variation V1 — Assembling the F-jib in parts

4.1 Assembling the F-assembly unit

- ▶ Fasten the F-assembly unit **5** to the auxiliary crane.
- ▶ Remove the rigging belts between the F-pivot section **1** and FA-frame **7**.

The F-assembly unit **5** is pinned four times on L-end section or on the F-connector head. Every pin point is present on both sides of the component on one level.

- ▶ Set the pin pulling cylinder **11** at pin point **P15** and unpin the pin **12**.
- ▶ Set the pin pulling cylinder **11** at pin point **P16** and unpin the pin **14**.
- ▶ Position the F-assembly unit **5** with the auxiliary crane on the L-end section or on the F-connector head so that it can be pinned at point **P15** and at point **P16**.
- ▶ Set the pin pulling cylinder **11** at pin point **P15** and pin the pin **12** on both sides.

When the pins **12** are completely pinned:

- ▶ Secure the pins **12** with retaining elements **13** on both sides.

WARNING
Crushing / shearing of limbs!
While performing boom system assembly tasks, limbs can be crushed and / or sheared off.
Death, severe bodily injuries, property damage.

- ▶ Make sure that no crane movements are performed while pinning in the area of the lower pin points **P16**.

- ▶ Set the pin pulling cylinder **11** at pin point **P16** and pin the pin **14** on both sides.

When the pins **14** are completely pinned:

- ▶ Secure the pins **14** with retaining elements **15** on both sides.

4.2 Releasing the F-relapse support

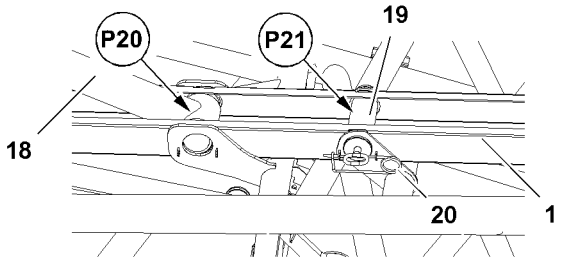

Fig.127478: F-relapse support in the transport position

Release the F-relapse support **18** from the transport position:

- ▶ Remove the retaining element **20** at point **P20** and unpin the pin **19**.
- ▶ Insert pin **19** in the stop position at point **P21** and secure with retaining element **20**.

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4.3 Separating the FA-frame relapse retainers

WARNING
Falling and swinging FA-frame relapse retainer!
The FA-frame relapse retainer consists of guy rods **33.1** and a turnbuckle **33.2**.
The guy rod **33.1** of the FA-frame relapse retainer can fall down due to its own weight during unpinning.
The guy turnbuckle **33.2** of the FA-frame relapse retainer can fall down due to its own weight during unpinning.
Death, severe bodily injuries, property damage.
- ▶ Make sure when unpinning the FA-frame relapse retainer, the guy rods **33.1** and turnbuckle **33.2** are safely held.
- ▶ Assembly personnel must be at the side of the assembly unit.

NOTICE
Danger of property damage!
If the FA-frame relapse retainers are not separated, then they will be damaged during erection of the FA-frame.
- ▶ Make sure that the FA-frame relapse retainers are separated during the erection of the FA-frame.

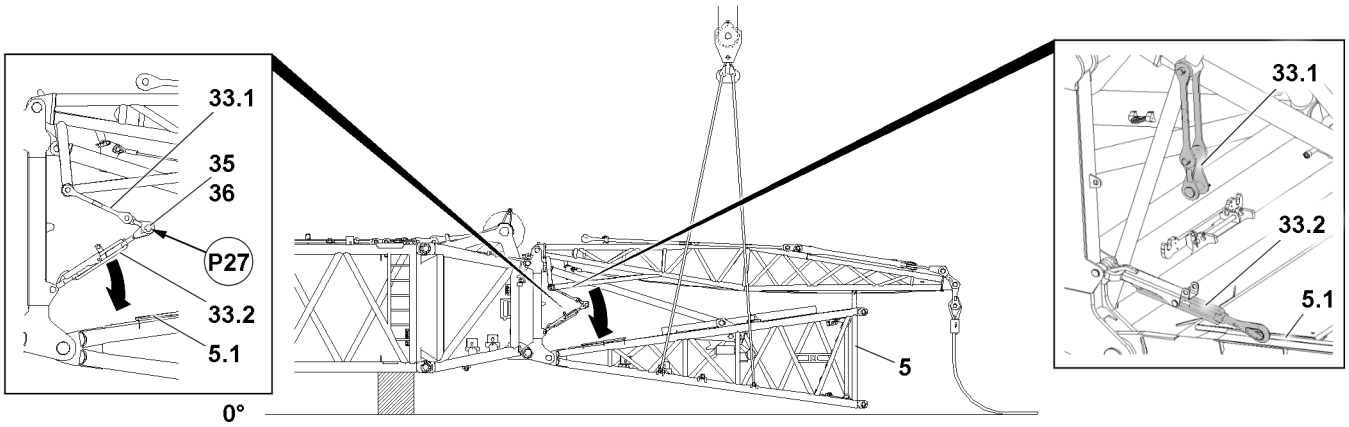

Fig.127481: Separating the FA-frame relapse retainers

Separate the FA-frame relapse retainer **33** at point **P27**:

- ▶ Remove the retaining element **36** at point **P27** and unpin the pin **35**.
- ▶ Place the turnbuckle **33.2** in the receptacle **5.1**.
- ▶ Guide the guy rods **33.1** after the position *downward* and let them hang.
- ▶ Insert the pin **35** again at point **P27** and secure with the retaining element **36**.

When the FA-frame relapse retainer **33** is separated:
- ▶ Slowly lower the F-pivot section **5**.
- ▶ Remove the auxiliary crane.

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4.4 Assembling the F-guy ropes

WARNING
F-guy ropes ripping off!
If the F-guy ropes **21** are installed twisted in longitudinal axis, then the load bearing capacity can be significantly reduced as a result and the F-guy ropes can rip off.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the F-guy ropes **21** are **never** kinked, knotted or twisted.
- ▶ Make sure the kinked, knotted or twisted F-guy ropes **21** are **never** installed.
- ▶ Make sure that F-guy ropes **21** are never pulled over the ground or sharp edges.
- ▶ Make sure that no damaged F-guy ropes **21** are being installed.
- ▶ Make sure that the numbering in the rod plan is identical to the numbering on the F-guy ropes.
- ▶ Make sure that the maximum bending radius of **20** x rope diameter on the F-guy ropes **21** is **never** fallen below.
- ▶ Check the F-guy ropes before every assembly.
- ▶ When using fiber guy ropes: Inspect the fiber guy rods regularly, see Crane operating instructions, chapter 8.16.

Connect the F-guy ropes **21** with the brackets **22** of the FA-frame **7**.

- ▶ Fasten the F-guy rope **21** to the auxiliary crane and swing it in from the transport device directly to the assembly position.

WARNING
Load can be ripped off!
If the F-guy ropes are installed / assembled with a twist in the longitudinal axis, then the load bearing capacity is significantly reduced.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the F-guy ropes are not twisted at assembly. Pay attention to the twist display - marker line along the longitudinal axis of the rope braid.

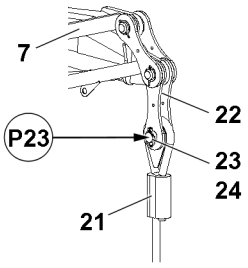

*Fig.127479: Pinning the F-guy rope **21** on the FA-frame*

- ▶ Pin the F-guy rope **21**: Insert the pin **23** at point **P23** and secure with the retaining element **24**.

When the first F-guy rope **21** is properly installed and secured:
- ▶ Assemble the second F-guy rope **21**.

4.5 Preparing the rope pulley retainer for the assembly of the F-jib

WARNING
Falling rope pulley retainer!
The rope pulley retainer **25** can fall down due to its own weight when unpinning it.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the rope pulley retainer **25** is held during unpinning.

Release the rope pulley retainer **25** from the FA-frame **7**:

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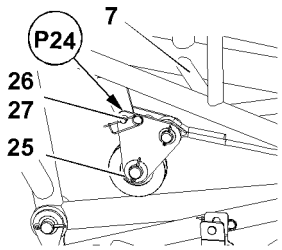

*Fig.127480: Releasing the rope pulley retainer **25** from the FA-frame **7***

- ▶ Remove the retaining element **27** at point **P24** and unpin the pin **26**.
- ▶ Take the rope pulley retainer **25** down with the rope on the open end of the F-assembly unit.

4.6 Erecting the FA-frame

WARNING
Automatic swinging of the FA-frame!
If the fastening rope **16** on the FA-frame **7** is not held under tension during assembly, the FA-frame **7** can swing suddenly to the side.
Death, severe bodily injury, property damage.
- ▶ Make sure that there are no persons within the danger zone.
- ▶ Make sure that the fastening rope **16** never sags during assembly / disassembly operations.

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Make sure that the following prerequisite is met:
– The FA-frame relapse retainers **33** are separated.

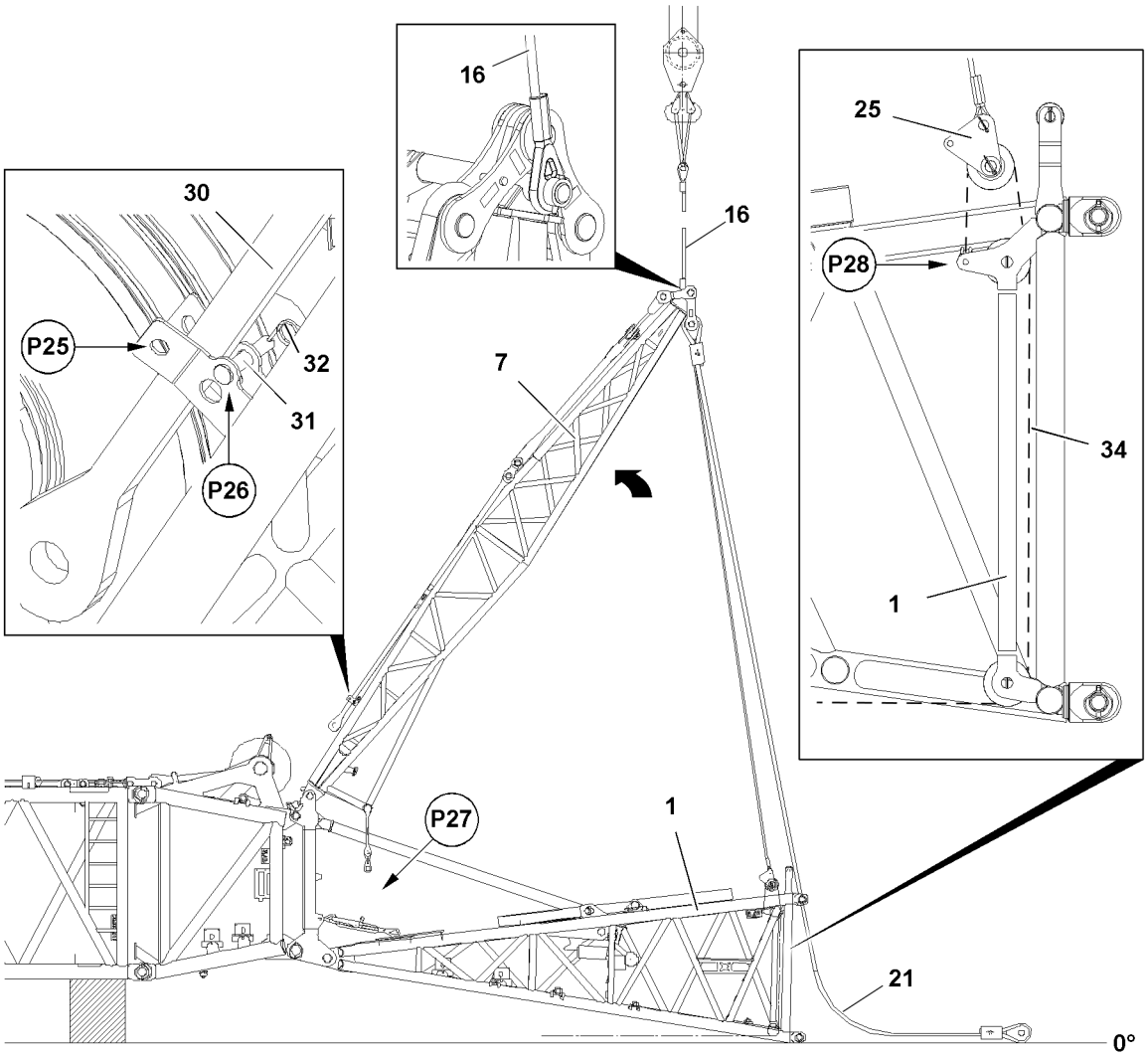

Fig.127482: Erecting the FA-frame

- ▶ Release the fastening rope **16** from the transport retainer on the FA-frame **7**.
- ▶ Fasten the FA-frame **7** with the fastening rope **16** to the auxiliary crane.
- ▶ Lift FA-frame **7** with auxiliary crane.
- ▶ Reeve the assembly winch rope **34** at the rope pulley retainer **25** and secure on the F-pivot section **1** at point **P28**.

Release the FAB-guy rods **30** on both sides:

- ▶ Remove the retaining element **32** at point **P25** and unpin the pin **31**.
- ▶ Insert the pin **31** at point **P26** in the park position and secure with the retaining element **32**.

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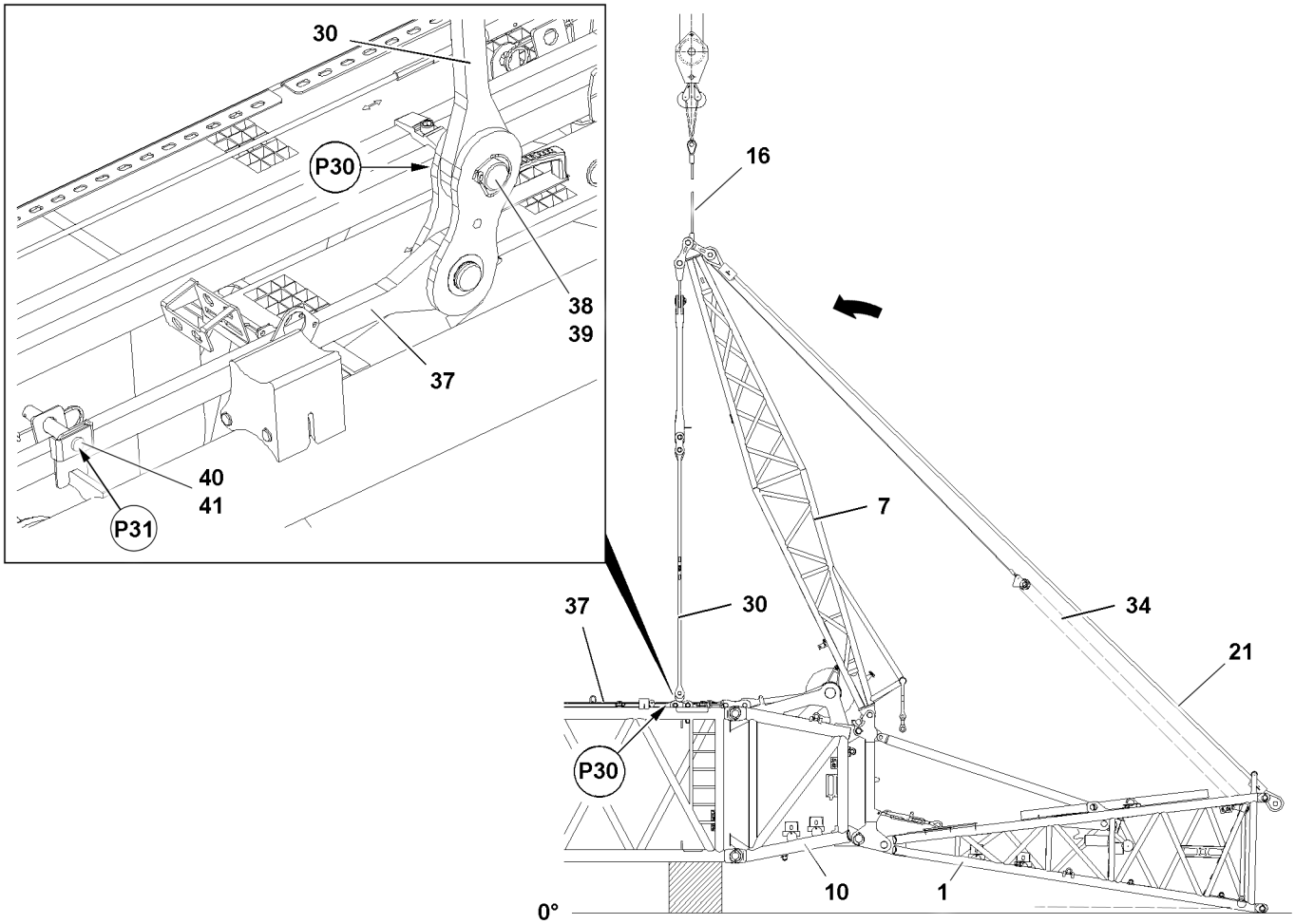

Fig.127483: Pinning the FAB-guy rods

NOTICE
Danger of property damage!
When swinging the FA-frame **7** in the direction of the main boom, damage may occur to the FA-frame **7**, the F-connector head **10**, as well as the rope pulley retainer **25**.

- ▶ Make sure that a guide supervises the swinging process of the FA-frame.
- ▶ Make sure that the guide is constantly in visual and acoustic contact with the crane operator!
- ▶ Make sure that the assembly winch rope **34** is spooled out during the swinging process of the FA-frame **7**.

- ▶ Carefully swing the FA-frame **7** with the auxiliary crane in direction of the main boom and spool the assembly winch rope **34** out at the same time until it can be pinned at point **P30**.

Pin the FAB-guy rods **30** with the FAB-guy rods **37** of the L-intermediate section:

- ▶ Insert the pin **38** at point **P30** and secure with the retaining element **39**.

Release the FAB-guy rods **37** in the transport receptacle:

- ▶ Remove the retaining element **41** at points **P31** and unpin pin **40**.

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4.7 Placing the FA-frame in the operating position

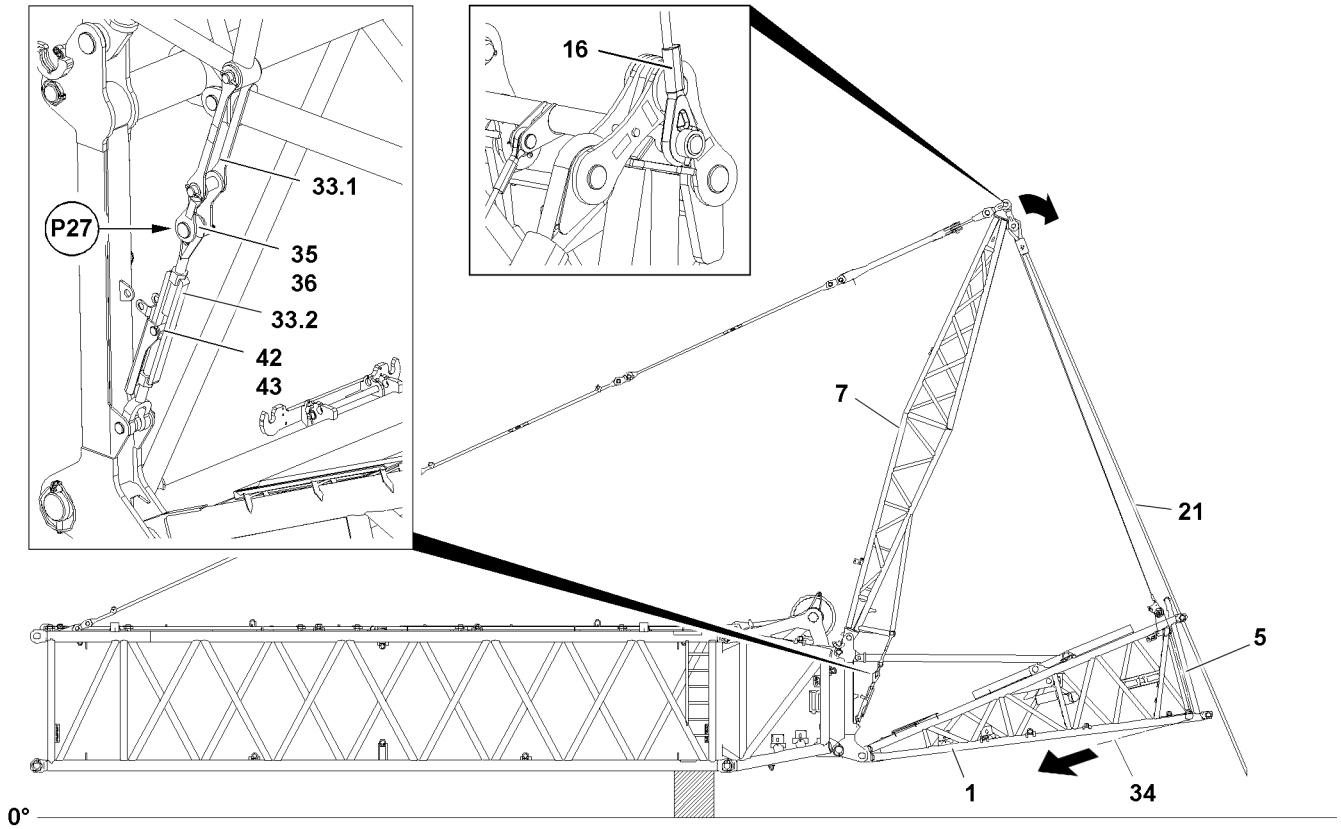

Fig.127644: Bringing the FA-frame into operating position

Make sure that the following prerequisite is met:
- The FAB-guy rods are properly pinned and secured.

▶ Pull the FA-frame **7** with the assembly winch rope **34** in direction of the F-pivot section **1**.

Pin the FA-frame relapse retainer **33**:
▶ Pin the rods **33.1** and turnbuckle **33.2** at point **P27** with pin **35** and secure properly with the retaining element **36**.

When the FA-frame relapse retainer **33** is properly pinned and secured:
▶ Fasten the turnbuckle evenly on both sides and secure it to prevent turning.
▶ Insert the pin **42** and secure it with the retaining element **43**.

Result:

– The turnbuckle is secured to prevent it from twisting in crane operation.
– Affix the FA-frame **7** in the operating position

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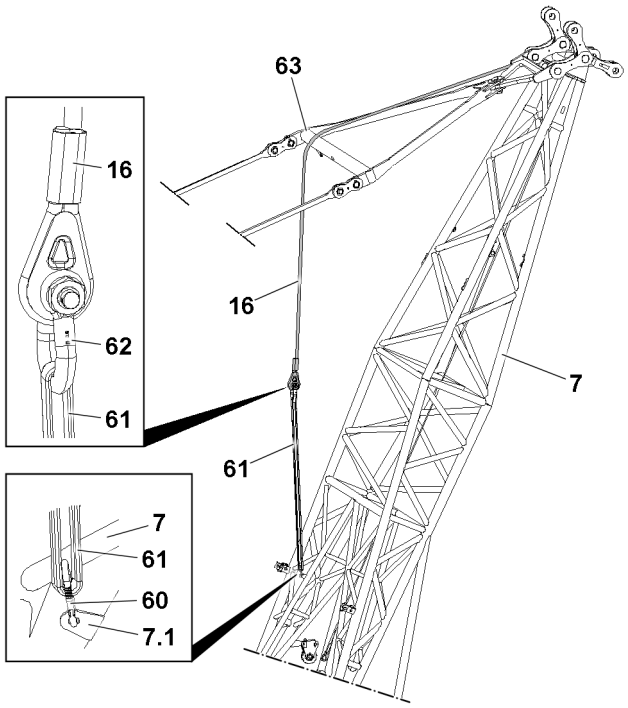

Fig.124500: Securing the fastening rope on the FA-frame for crane operation

NOTICE
Swinging fastening rope!
If the fastening rope **16** is not properly secured, then the fastening rope **16** can start to swing back and forth in crane operation and damage components.

▶ Make sure that the fastening rope **16** is properly secured on the FA-frame before starting to work with the crane.

▶ Place the fastening rope **16** over the linkage **63**.
▶ Connect the fastening rope **16** with the roundsling **61** with the shackle **62**.
▶ Fasten the roundsling **61** with the carabiner **60** on bracket **7.1** of the FA-frame.

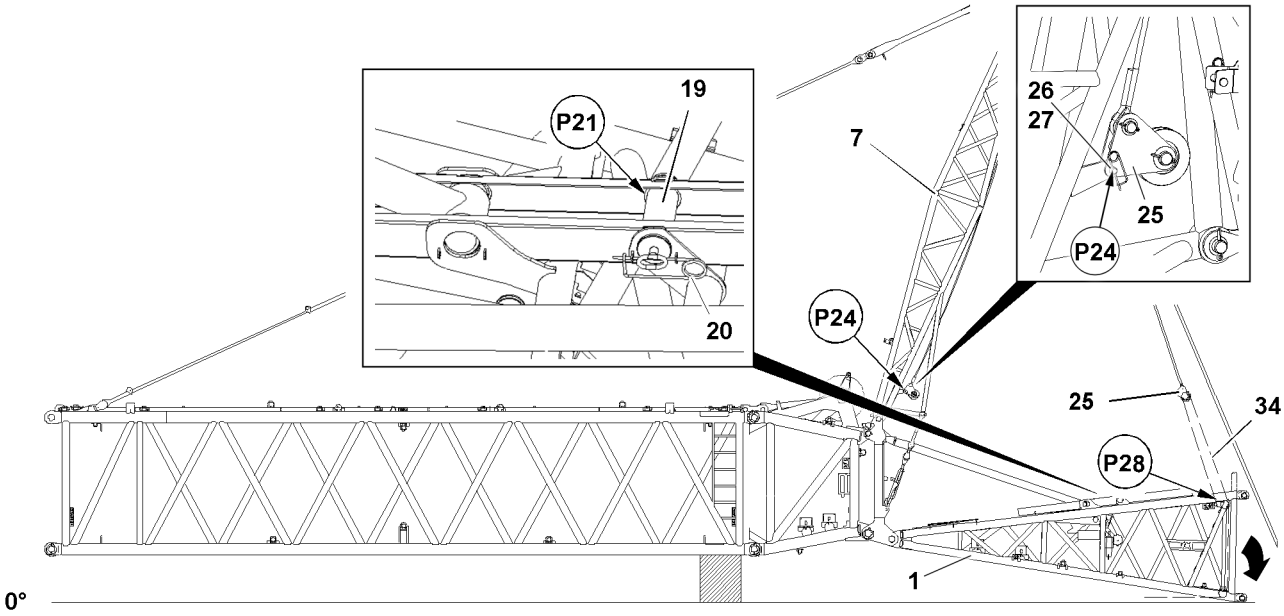

Fig.127645: Placing the F-pivot section on the ground

Lower the F-pivot section **1**:

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- ▶ Spool out the assembly winch rope **34**.
- ▶ Release and reeve out the assembly winch rope **34** at point **P28**.

Pin the rope pulley retainer **25** on the FA-frame **7**:

- ▶ Insert the pin **26** at point **P24** and secure with the retaining element **27**.
- ▶ Leave the pin **19** for the crane operation in the stop position **P21**.

4.8 Assembling the lattice sections

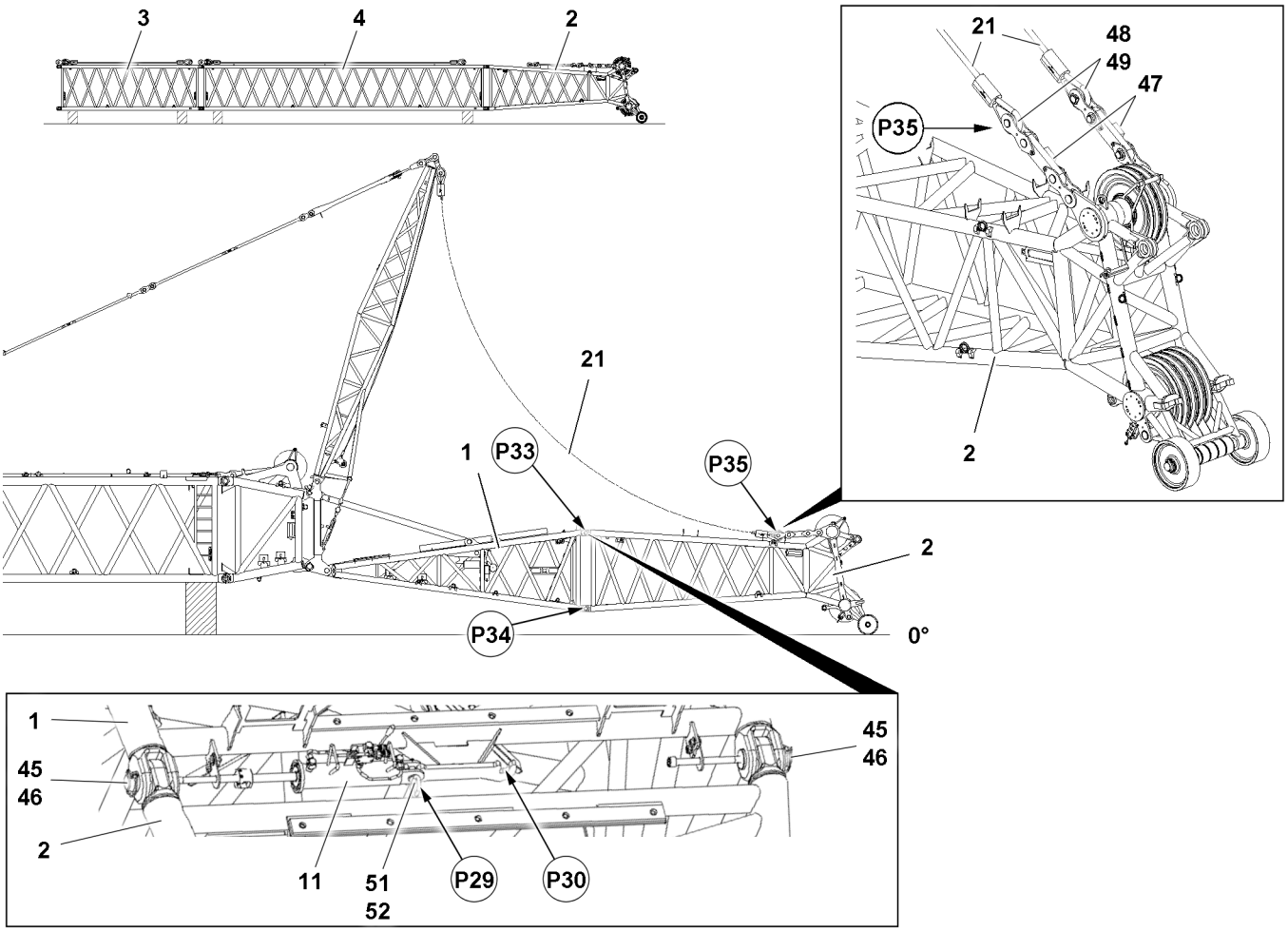

Fig.127647: Assembling the lattice sections

- ▶ Properly install the F-end section **2** and also the F-intermediate sections (F-intermediate section **3** and / or F-intermediate section **4**) to the auxiliary crane and pin on the F-pivot section **1**.

The F-end section **2** is pinned four times on F-pivot section **1**. Every pin point is present on both sides of the component on one level.

- ▶ Insert the pin pulling cylinder **11** at point **P29** / point **P30** in the pin pulling device.
- ▶ Insert the pins **45** at the pin point **P33** on both sides.
- ▶ Secure the pins **45** on both sides with the retaining element **46**.

Note

- ▶ Procedure for pinning the lattice sections on the pin points **P34** is identical as the process for pinning on pin points **P33**.

- ▶ Insert the pin **45** at pin point **P34** on both sides and secure.

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Note

- If the F-intermediate sections are installed, then the additional guy ropes for the F-intermediate sections must be assembled, pinned and secured.
- For the combination of the guy rope refer to the rod plan.

- Pin the F-guy ropes **21** on the F-end section **2** at point **P35** with pin **48** and secure with the retaining element **49**.

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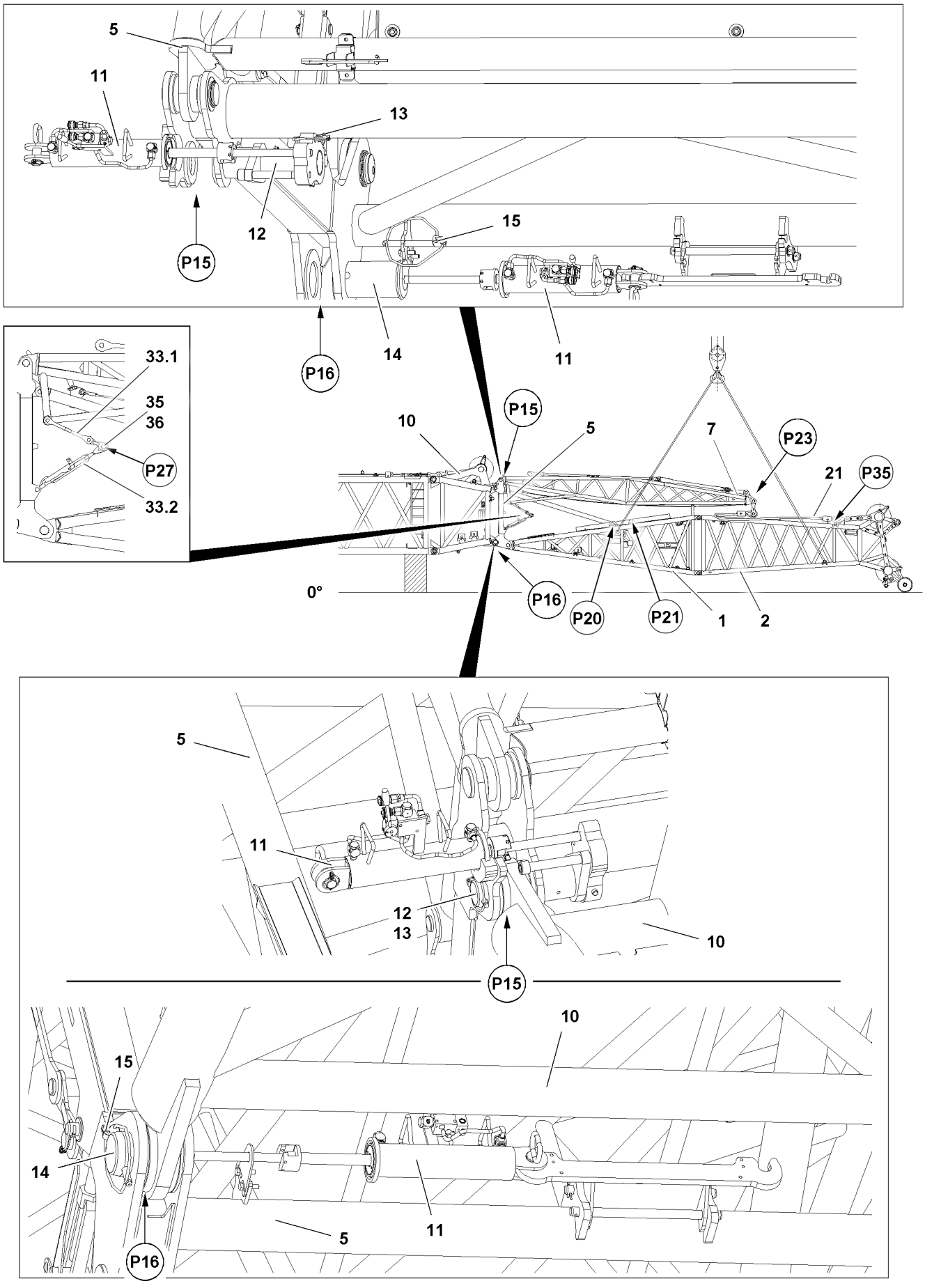

Fig.127646

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5 Assembly variant V2 — Assembling the complete F-jib (maximum length of 12 m) on the ground

WARNING
Impermissible F-assembly length(s)!
Death, severe bodily injuries, property damage.
- ▶ Make sure that the assembly of the F-jib as a complete F-assembly unit with the F-end section does not exceed 12 m.
- ▶ During assembly, no hook block may be reeved on the F-jib!

5.1 Assembling the F-assembly unit with F-end section

- ▶ Fasten the F-assembly unit **5** with the F-end section **6** to the auxiliary crane.
- ▶ Remove the rigging belts between the F-pivot section **1** and FA-frame **7**.

The F-assembly unit **5** is pinned four times on L-end section or on the F-connector head. Every pin point is present on both sides of the component on one level.

- ▶ Set the pin pulling cylinder **11** at pin point **P15** and unpin the pin **12**.
- ▶ Set the pin pulling cylinder **11** at pin point **P16** and unpin the pin **14**.
- ▶ Position the F-assembly unit **5** with the F-end section **6** with the auxiliary crane on the L-end section or on the F-connector head so that it can be pinned at point **P15** and at point **P16**.
- ▶ Set the pin pulling cylinder **11** at pin point **P15** and pin the pin **12** on both sides.

When the pins **12** are completely pinned:
- ▶ Secure the pins **12** with retaining elements **13** on both sides.

WARNING
Crushing / shearing of limbs!
While performing boom system assembly tasks, limbs can be crushed and / or sheared off.
Death, severe bodily injuries, property damage.
- ▶ Make sure that no crane movements are performed while pinning in the area of the lower pin points **P16**.

- ▶ Set the pin pulling cylinder **11** at pin point **P16** and pin the pin **14** on both sides.

When the pins **14** are completely pinned:
- ▶ Secure the pins **14** with retaining elements **15** on both sides.
- ▶ Remove the auxiliary crane.

5.2 Assembling the F-guy ropes

- ▶ Make sure that the two F-guy ropes **21** are properly pinned and secured with the brackets of the FA-frame **7** and the F-end section **2** at point **P23** and point **P35**.

5.3 Releasing the F-relapse support

Release the F-relapse support **18** from the transport position:

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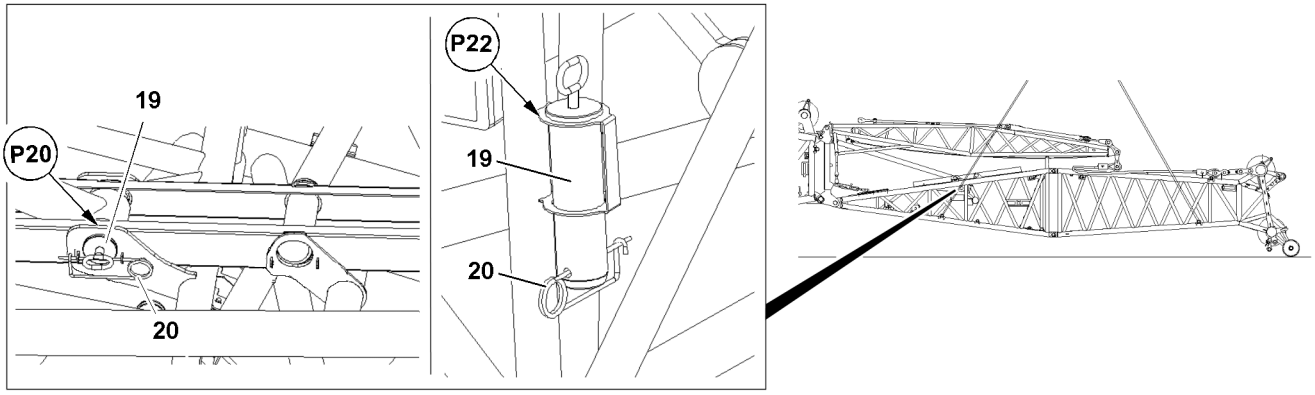

Fig.127649: Position of the F-relapse support

- ▶ Remove the retaining element **20** at point **P20** and unpin the pin **19**.
- ▶ Insert pin **19** in the park position at point **P22** and secure with retaining element **20**.

5.4 Separating the FA-frame relapse retainers

WARNING
Falling and swinging FA-frame relapse retainer!
The FA-frame relapse retainer consists of guy rods **33.1** and a turnbuckle **33.2**.
The guy rod **33.1** of the FA-frame relapse retainer can fall down due to its own weight during unpinning.
The guy turnbuckle **33.2** of the FA-frame relapse retainer can fall down due to its own weight during unpinning.
Death, severe bodily injuries, property damage.
- ▶ Make sure when unpinning the FA-frame relapse retainer, the guy rods **33.1** and turnbuckle **33.2** are safely held.
- ▶ Assembly personnel must be at the side of the assembly unit.

NOTICE
Danger of property damage!
If the FA-frame relapse retainers are not separated, then they will be damaged when pulling up the F-jib.
- ▶ Make sure that the FA-frame relapse retainers are separated during the erection of the FA-frame.

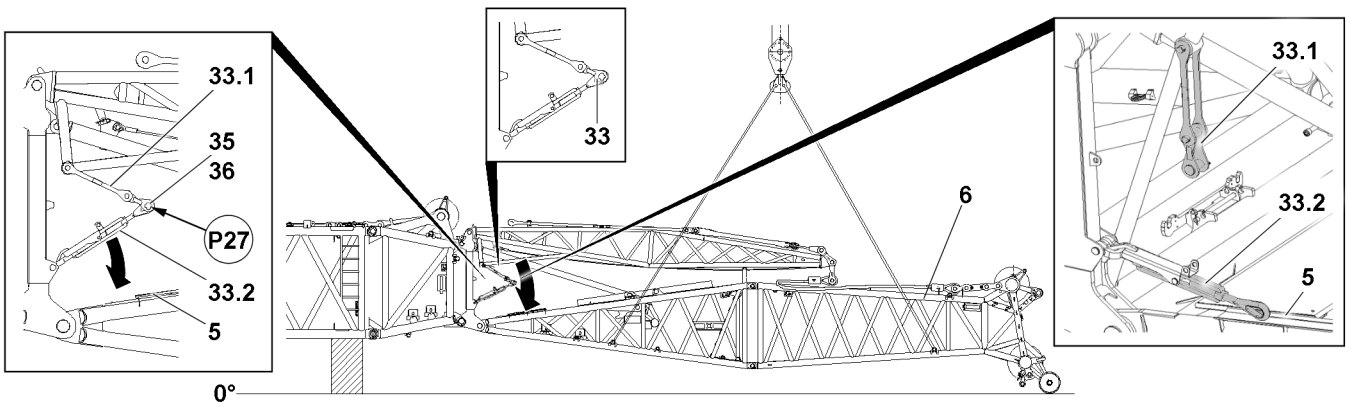

Fig.127648: Separating the FA-frame relapse retainers

Separate the FA-frame relapse retainer **33** at point **P27**:

- ▶ Remove the retaining element **36** at point **P27** and unpin the pin **35**.
- ▶ Place the turnbuckle **33.2** in the receptacle **5.1**.
- ▶ Guide the guy rods **33.1** after the position *downward* and let them hang.

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▶ Insert the pin **35** again at point **P27** and secure with the retaining element **36**.

When the FA-frame relapse retainer **33** is separated:

▶ Lower the F-jib slowly on the ground.

5.5 Erecting the FA-frame

NOTICE

Danger of property damage!

If the FA-frame relapse retainers **33** are not separated, then they will be damaged during erection of the FA-frame.

▶ Make sure that the FA-frame relapse retainers **33** are separated during the erection of the FA-frame.

Make sure that the following prerequisites are met:

– The F-guy ropes are properly installed and secured between the FA-frame and the F-end section.
– The FA-frame relapse retainer is separated.

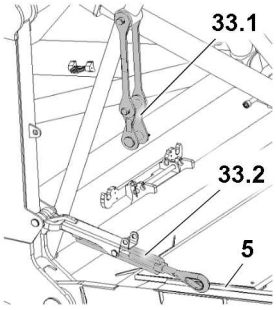

Fig.127650: Separated FA-frame relapse retainer

▶ Fasten the auxiliary crane properly to the eyehooks of the F-end section **6**.

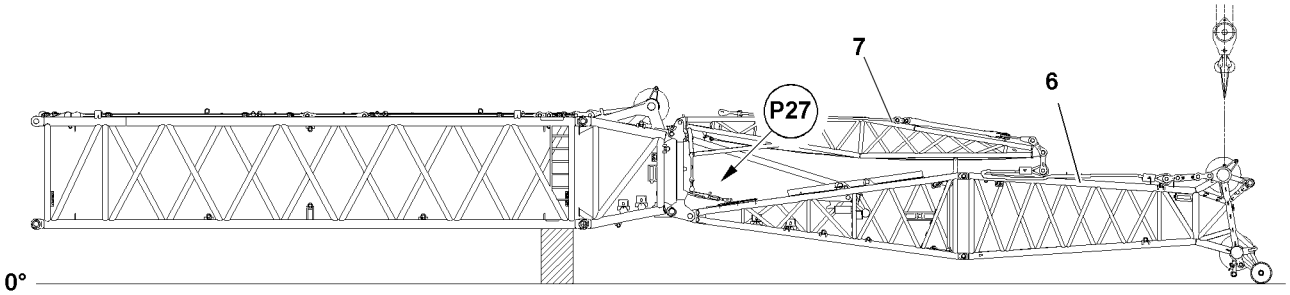

Fig.127671: Fastening the F-end section to the auxiliary crane.

▶ Pull up the F-assembly unit with the auxiliary crane on the F-end section **6** until the angle between the FA-frame **7** and the horizontal is at least 40°.

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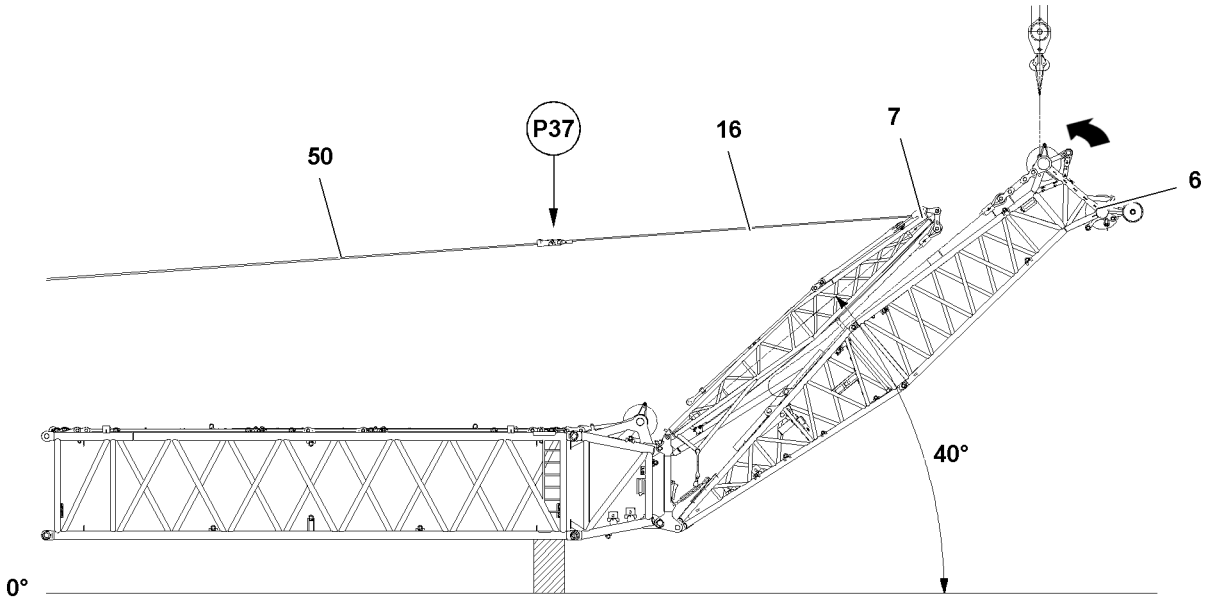

Fig.127672: Lifting the F-assembly unit on the F-end section

- ▶ Connect the fastening rope **16** of the FA-frame **7** using the link of the hoist rope **50** at point **P37** with the hoist rope **50**.
- ▶ Spool up the hoist rope **50** until the FA-frame **7** is held in the 40° position by the hoist rope.

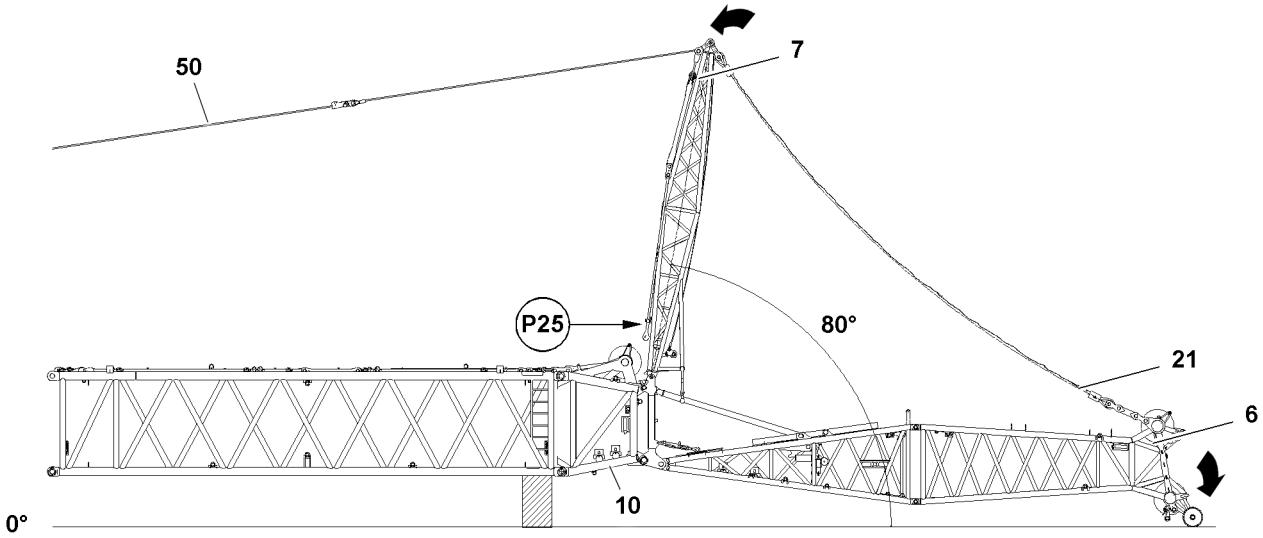

Fig.127673: Lowering the F-jib with the auxiliary crane

- ▶ Lower the F-jib with the auxiliary crane to the horizontal.

NOTICE
Danger of property damage!
When swinging the FA-frame **7** in direction of the main boom there is a danger of collision of the FA-frame with the attachment parts of the L-end section or the F-connector head.
- ▶ When swinging the FA-frame, a guide must be used.
- ▶ The guide must be in constant visual and acoustic contact with the crane operator.

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NOTICE

Hoist rope contact with cross binders of the main boom auxiliary guying!

- ▶ Make sure that the hoist rope does not scrape the cross binder of the main boom auxiliary guying when erecting the FA-frame.

If the hoist rope scrapes:

- ▶ Place the main boom on the ground or on a load bearing substructure.
- ▶ Release the main boom guying and unhook the cross binder of the auxiliary guying.

- ▶ Pull the FA-frame **7** further with the hoist rope **50** in direction of the main boom until the angle between the FA-frame **7** and the horizontal is maximum 80°.

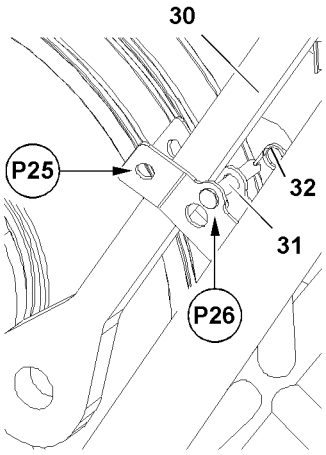

Fig.127674: Released FAB-guy rods

Release the FAB-guy rods **30** in the transport retainers on both sides:

- ▶ Remove the retaining element **32** at point **P25** and unpin the pin **31**.
- ▶ Insert the pin **31** at point **P26** in the park position and secure with the retaining element **32**.
- ▶ Lower the F-jib with the auxiliary crane until the F-guy ropes **21** are tensioned.
- ▶ Unhook and remove the fastening equipment (fastening rope) of the auxiliary crane.

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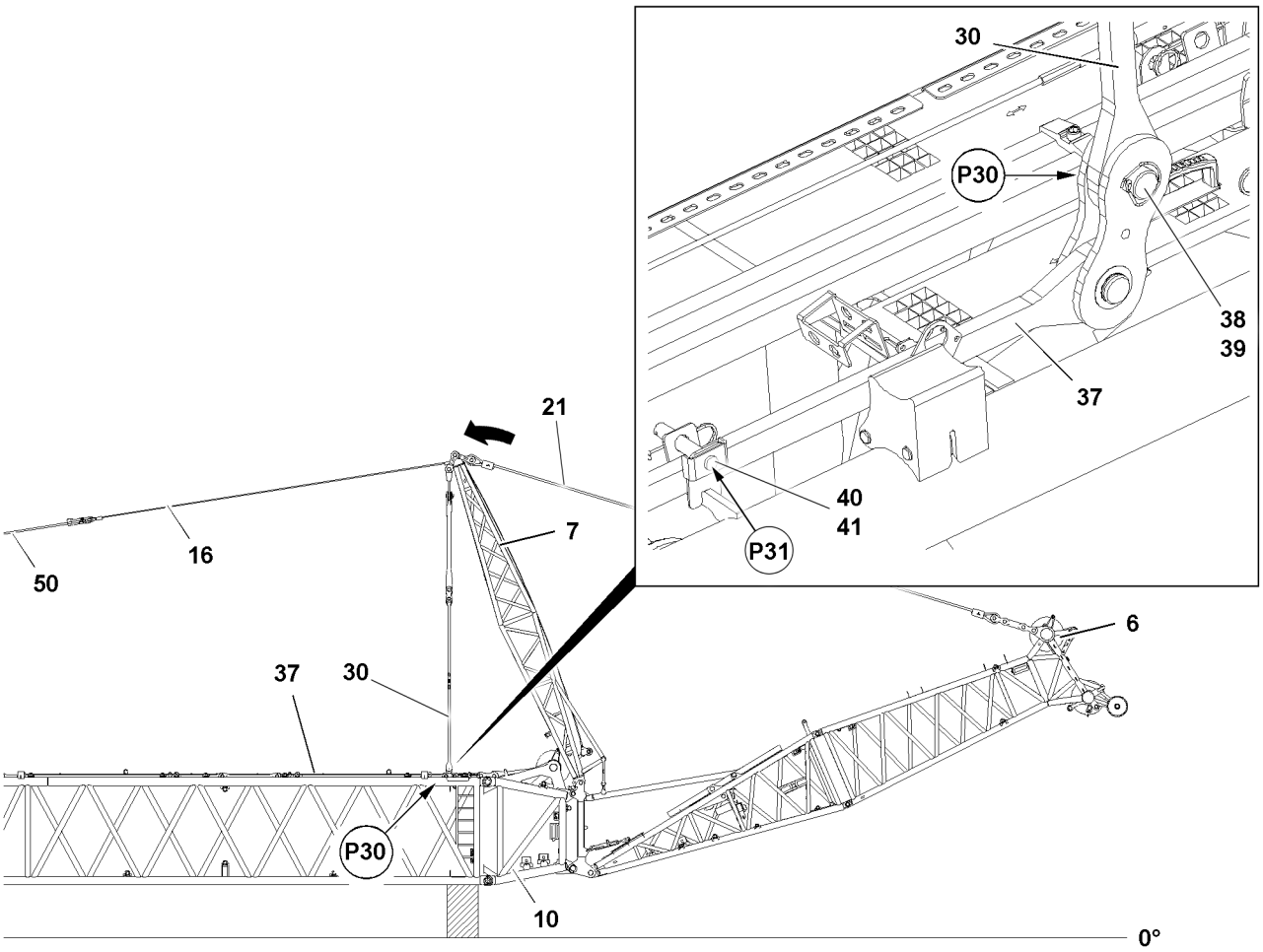

Fig.127675: Pinning the FAB-guy rods

▶ Continue to swing the FA-frame **7** further with the hoist rope **50** in direction of the main boom until it can be pinned at point **P30**.

Pin the FAB-guy rods **30** with the FAB-guy rods **37** of the L-intermediate section:

▶ Insert the pin **38** at point **P30** and secure with the retaining element **39**.

Release the FAB-guy rods **37** in the transport receptacle:

▶ Remove the retaining element **41** at points **P31** and unpin pin **40**.

5.6 Placing the FA-frame in the operating position

Make sure that the following prerequisite is met:
– The FAB-guy rods are properly pinned and secured.

NOTICE
Danger of slack rope formation!
▶ When spooling the hoist rope out, make sure that no slack rope forms.

▶ Lower the FA-frame **7** to the operating position (to the front): Spool out the hoist rope **50** up until the FAB-guying is tensioned.
▶ Continue to spool out the hoist rope until the fastening rope **16** is completely relieved.
▶ Separate the hoist rope **50** and the fastening rope **16**.

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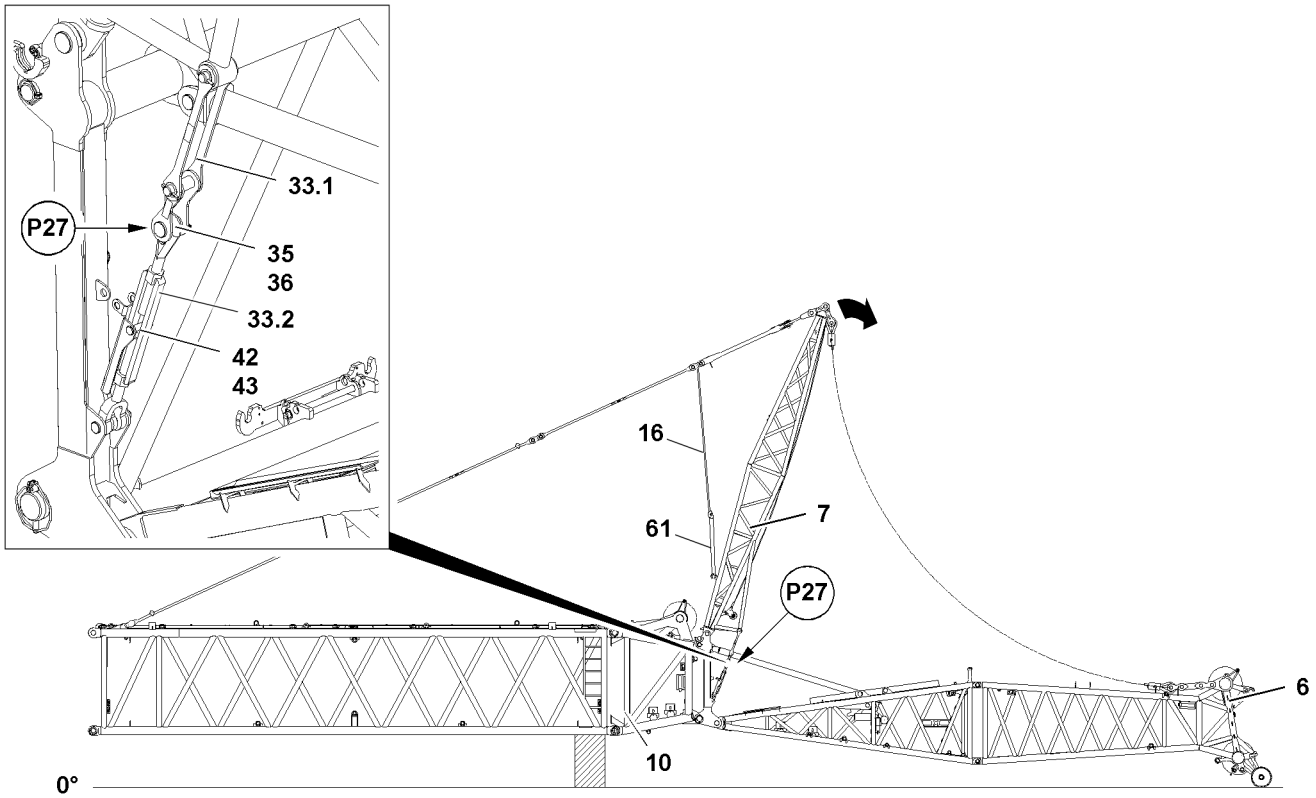

Fig.127676: Bringing the FA-frame into operating position // Assembling the FA-frame relapse retainer

Pin the FA-frame relapse retainer **33**:

▶ Pin the rods **33.1** and turnbuckle **33.2** at point **P27** with pin **35** and secure properly with the retaining element **36**.

When the FA-frame relapse retainer **33** is properly pinned and secured:

▶ Fasten the turnbuckle evenly on both sides and secure it to prevent turning.

▶ Insert the pin **42** and secure it with the retaining element **43**.

Result:

– The turnbuckle is secured to prevent it from twisting in crane operation.

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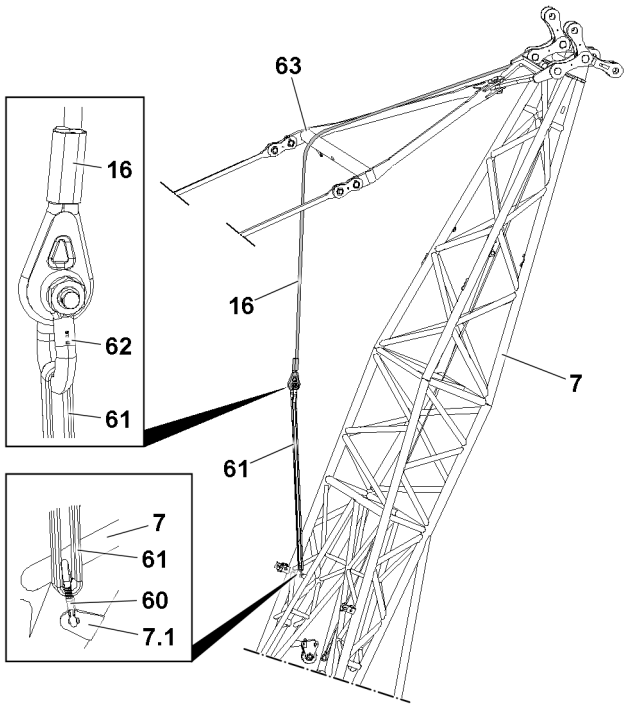

Fig.124500: Securing the fastening rope on the FA-frame for crane operation

NOTICE
Swinging fastening rope!
If the fastening rope **16** is not properly secured, then the fastening rope **16** can start to swing back and forth in crane operation and damage components.

▶ Make sure that the fastening rope **16** is properly secured on the FA-frame before starting to work with the crane.

▶ Place the fastening rope **16** over the linkage **63**.
▶ Connect the fastening rope **16** with the roundsling **61** with the shackle **62**.
▶ Fasten the roundsling **61** with the carabiner **60** on bracket **7.1** of the FA-frame.

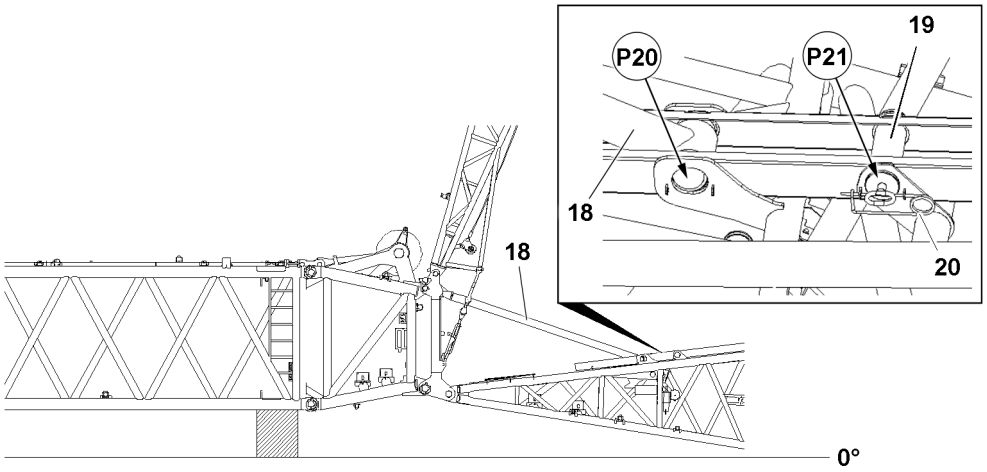

*Fig.127677: Inserting pin **19** of the F-relapse retainer in the stop position and securing*

▶ Insert the pin **19** for crane operation in the stop position **P21** and secure properly.
▶ Properly hang the cross binder of the main boom auxiliary guying and secure.

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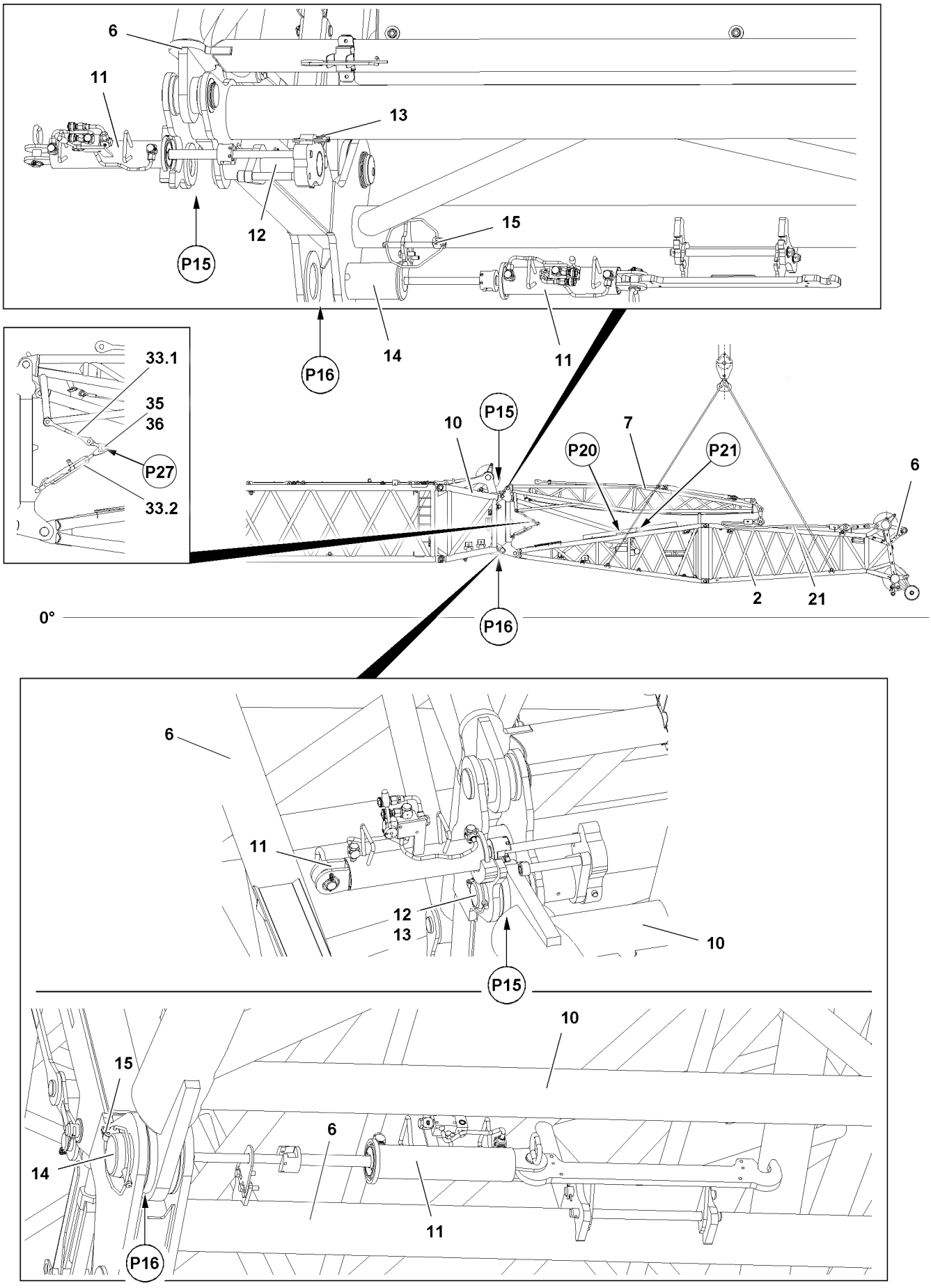

Fig.127678

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6 Assembly variant V3 — Assembling the complete F-jib (maximum length of 12 m) in flying mode

WARNING
Impermissible F-assembly length(s)!
Death, severe bodily injuries, property damage.
- ▶ Make sure that the flying assembly length of the F-jib as a complete F-assembly unit with the F-end section does not exceed 12 m.
- ▶ During assembly, no hook block may be reeved on the F-jib!

6.1 Assembling the F-assembly unit with F-end section

- ▶ Fasten the F-assembly unit with the F-end section **6** to the auxiliary crane.
- ▶ Remove the rigging belts between the F-pivot section **1** and FA-frame **7**.

The F-assembly unit **6** is pinned four times on L-end section or on the F-connector head. Every pin point is present on both sides of the component on one level.

- ▶ Set the pin pulling cylinder **11** at pin point **P15** and unpin the pin **12**.
- ▶ Set the pin pulling cylinder **11** at pin point **P16** and unpin the pin **14**.
- ▶ Position the F-assembly unit with the F-end section **6** with the auxiliary crane on the L-end section or on the F-connector head so that it can be pinned at point **P15** and at point **P16**.
- ▶ Set the pin pulling cylinder **11** at pin point **P15** and pin the pin **12**.
- ▶ Secure the pins **12** with retaining elements **13** on both sides.

WARNING
Crushing / shearing of limbs!
While performing boom system assembly tasks, limbs can be crushed and / or sheared off.
Death, severe bodily injuries, property damage.
- ▶ Make sure that no crane movements are performed while pinning in the area of the lower pin points **P16**.

- ▶ Set the pin pulling cylinder **11** at pin point **P16** and pin the pin **14**.

When the pins **14** are fully pinned on both sides:
- ▶ Secure the pins **14** with retaining elements **15** on both sides.

6.2 F-relapse support

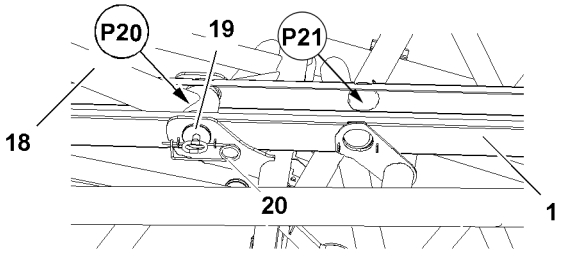

Fig.127680: Pinned F-relapse support

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WARNING
Automatic swinging of the F-jib!
If the pin **19** of the F-relapse support is unpinned at point **P20**, before the F-guy rope **21** is properly assembled and secured, the F-jib could fall down by itself.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the F-relapse support remains pinned at point **P20** until the F-guy rope **21** is properly pinned and secured on the FA-frame **7** and on the F-end section **6**.
- ▶ Do **not** unpin the F-relapse support **18** at point **P20**.

- ▶ Make sure that the F-relapse support **18** is properly pinned and secured in the transport position at point **P20** with pin **19**.

6.3 Separating the FA-frame relapse retainers

WARNING
Falling and swinging FA-frame relapse retainer!
The FA-frame relapse retainer consists of guy rods **33.1** and a turnbuckle **33.2**.
The guy rod **33.1** of the FA-frame relapse retainer can fall down due to its own weight during unpinning.
The guy turnbuckle **33.2** of the FA-frame relapse retainer can fall down due to its own weight during unpinning.
Death, severe bodily injuries, property damage.
- ▶ Make sure when unpinning the FA-frame relapse retainer, the guy rods **33.1** and turnbuckle **33.2** are safely held.
- ▶ Assembly personnel must be at the side of the assembly unit.

NOTICE
Danger of property damage!
If the FA-frame relapse retainers are not separated, then they will be damaged during erection of the FA-frame.
- ▶ Make sure that the FA-frame relapse retainers are separated during the erection of the FA-frame.

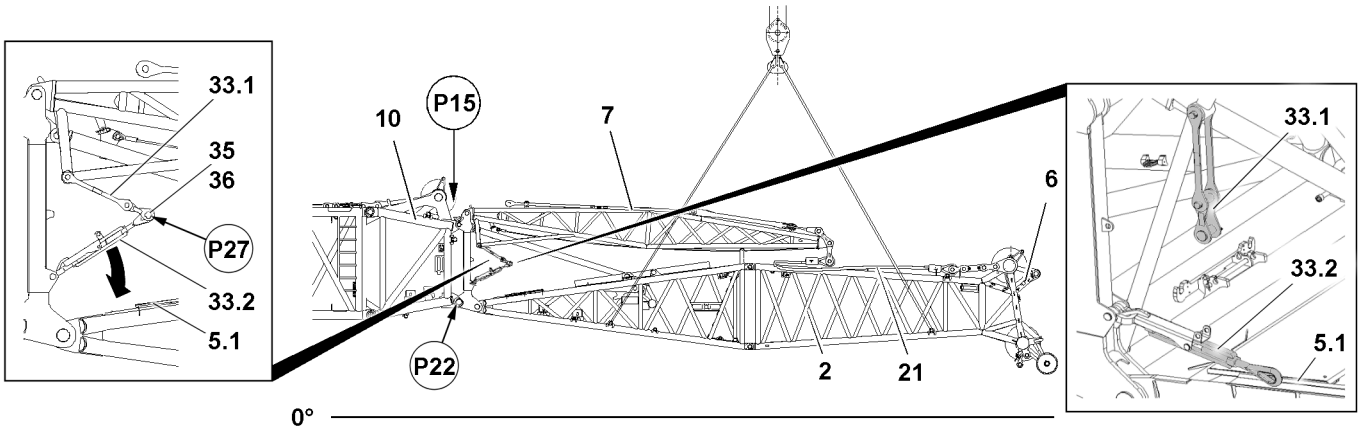

Fig.127679: Separating the FA-frame relapse retainers

Separate the FA-frame relapse retainer **33** at point **P27**:

- ▶ Remove the retaining element **36** at point **P27** and unpin the pin **35**.
- ▶ Place the turnbuckle **33.2** in the receptacle **5.1**.
- ▶ Guide the guy rods **33.1** after the position *downward* and let them hang.
- ▶ Insert the pin **35** again at point **P27** and secure with the retaining element **36**.

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6.4 Preparing the rope pulley retainer for the assembly of the F-jib

WARNING
Falling rope pulley retainer!
The rope pulley retainer **25** can fall down due to its own weight when unpinning it.
Death, severe bodily injuries, property damage.
▶ Make sure that the assembly winch rope **25** is secured against falling down when unpinning.

Release the rope pulley retainer **25** from the FA-frame **7**:

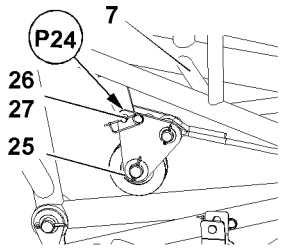

*Fig.127480: Releasing the rope pulley retainer **25** from the FA-frame:*

▶ Remove the retaining element **27** at point **P24** and unpin the pin **26**.
▶ Take the rope pulley retainer **25** down with the rope on the open end of the F-assembly unit.

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6.5 Erecting the FA-frame

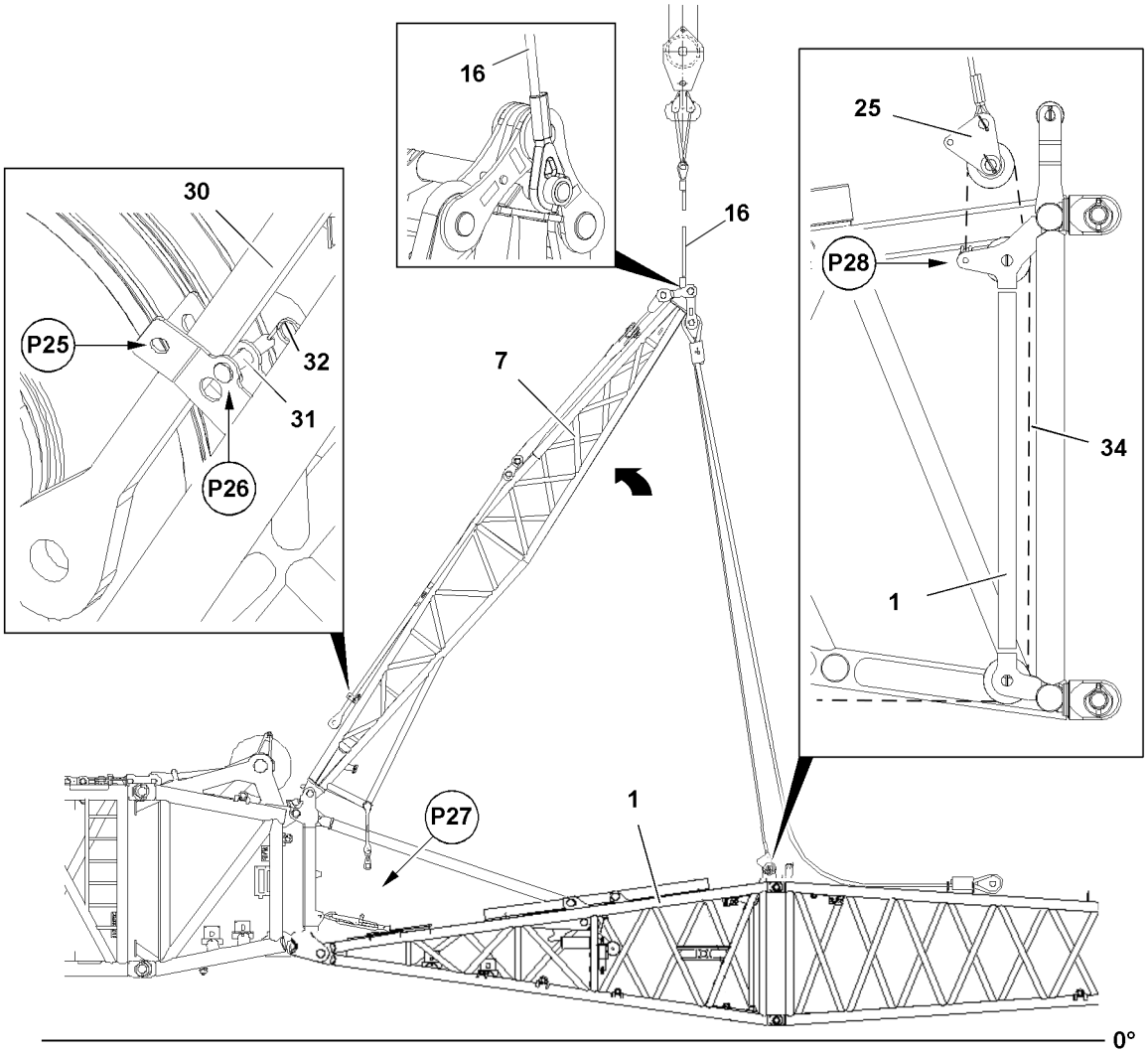

Fig.127681: Erecting the FA-frame

Make sure that the following prerequisite is met:
– The FA-frame relapse retainers **33** are separated at point **P27**.

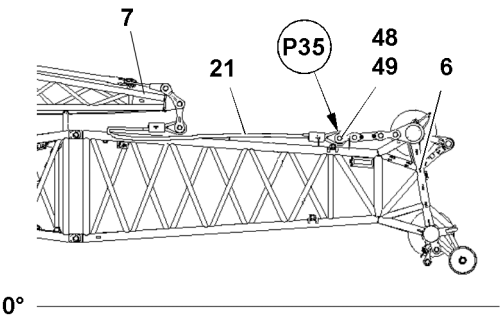

*Fig.127683: Releasing the F-guy rope **21** on the F-end section **6** at point **P35***

- ▶ Unpin the F-guy rope **21** on the F-end section at point **P35**: Remove the retaining element **49** on both sides and unpin the pin **48** on both sides.
- ▶ Release the fastening rope **16** in the transport position on the FA-frame **7**.
- ▶ Fasten the FA-frame **7** with the fastening rope **16** to the auxiliary crane.
- ▶ Lift FA-frame **7** with auxiliary crane.

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▶ Reeve the assembly winch rope **34** at the rope pulley retainer **25** and secure on the F-pivot section **1** at point **P28**.

Release the FA-guy rods **30** on both sides:

▶ Remove the retaining element **32** at point **P25** and unpin the pin **31**.
▶ Insert the pin **31** at point **P26** in the park position and secure with the retaining element **32**.

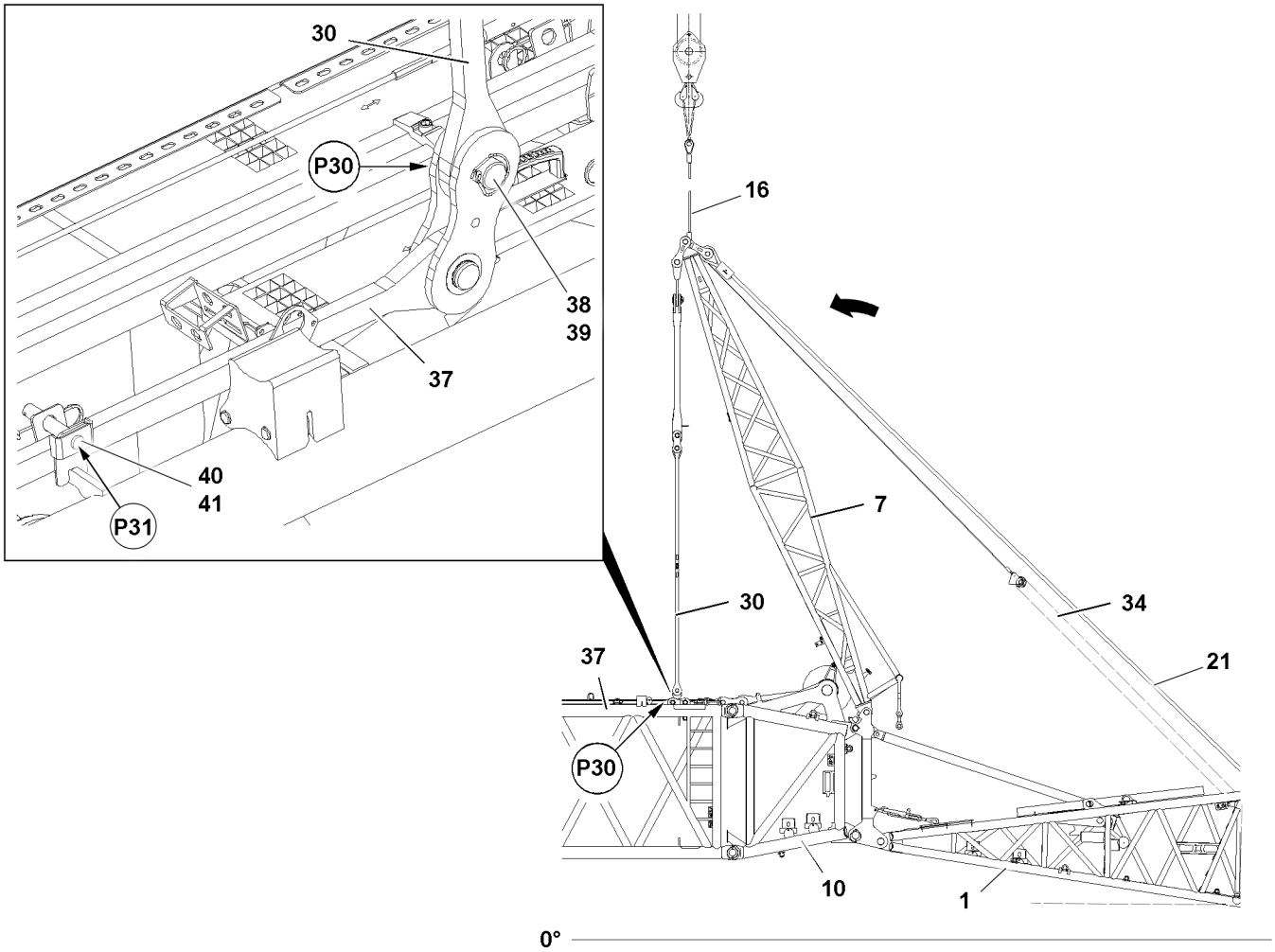

Fig.127684: Pinning the FAB-guy rods

NOTICE
Danger of property damage!
When swinging the FA-frame **7** in the direction of the main boom, damage may occur to the FA-frame, the F-connector head **10** or the L-end section **10**, as well as the rope pulley retainer **25**.
▶ Make sure that a guide supervises the swinging process of the FA-frame.
▶ Make sure that the guide is constantly in visual and acoustic contact with the crane operator!
▶ Make sure that the assembly winch rope **34** is spooled out during the swinging process of the FA-frame **7**.

▶ Carefully swing the FA-frame **7** with the auxiliary crane in direction of the main boom and spool the assembly winch rope **34** out at the same time until it can be pinned at point **P30**.

Pin the FAB-guy rods **30** with the FAB-guy rods **37** of the L-intermediate section:

▶ Insert the pin **38** at point **P30** and secure with the retaining element **39**.

Release the FAB-guy rods **37** in the transport receptacle:

▶ Remove the retaining element **41** at points **P31** and unpin pin **40**.

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6.6 Placing the FA-frame in the operating position

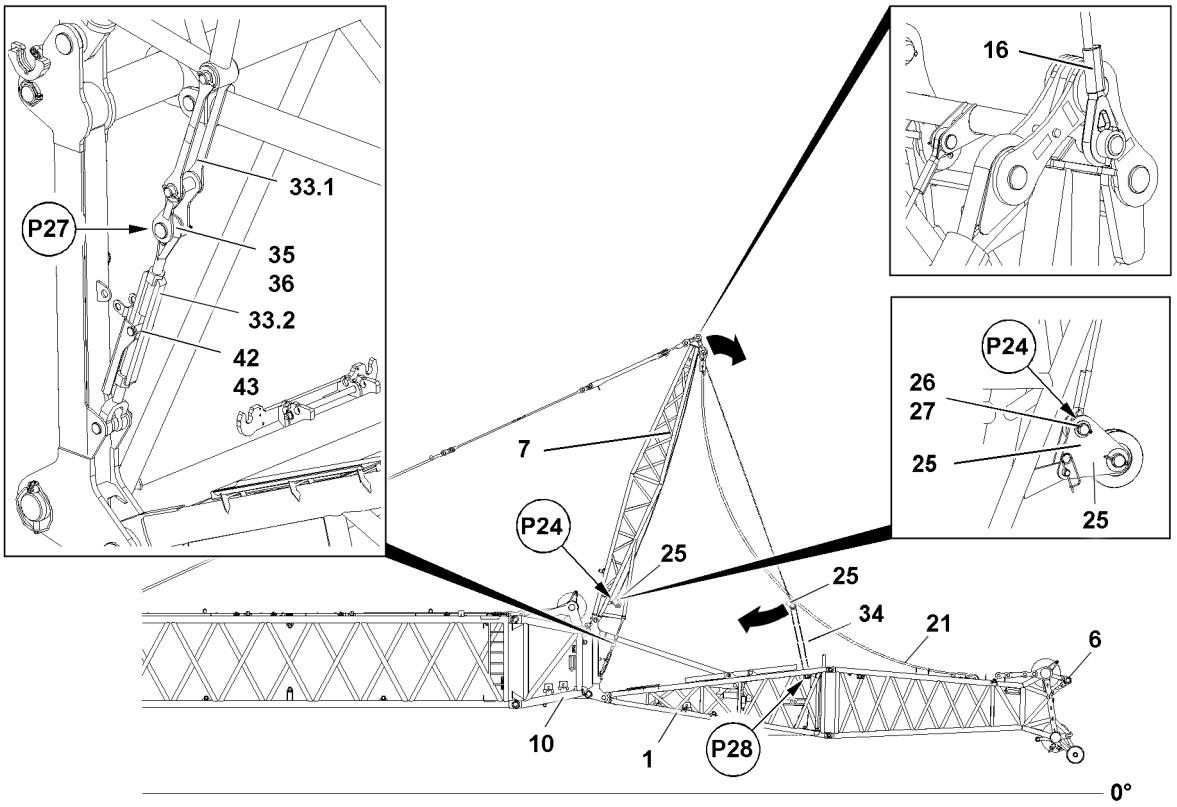

Fig.127685: Bringing the FA-frame into operating position

Make sure that the following prerequisite is met:
– The FAB-guy rods are properly pinned and secured.

▶ Pull the FA-frame **7** with the assembly winch rope **34** in direction of the F-pivot section **1**.
▶ Pin the FA-frame relapse retainer **33**:
▶ Pin the rods **33.1** and turnbuckle **33.2** at point **P27** with pin **35** and secure properly with the retaining element **36**.

When the FA-frame relapse retainer **33** is properly pinned and secured:
▶ Fasten the turnbuckle evenly on both sides and secure it to prevent turning.
▶ Insert the pin **42** and secure it with the retaining element.

Result:

– The turnbuckle is secured to prevent it from twisting in crane operation.
– Affix the FA-frame **7** in the operating position.

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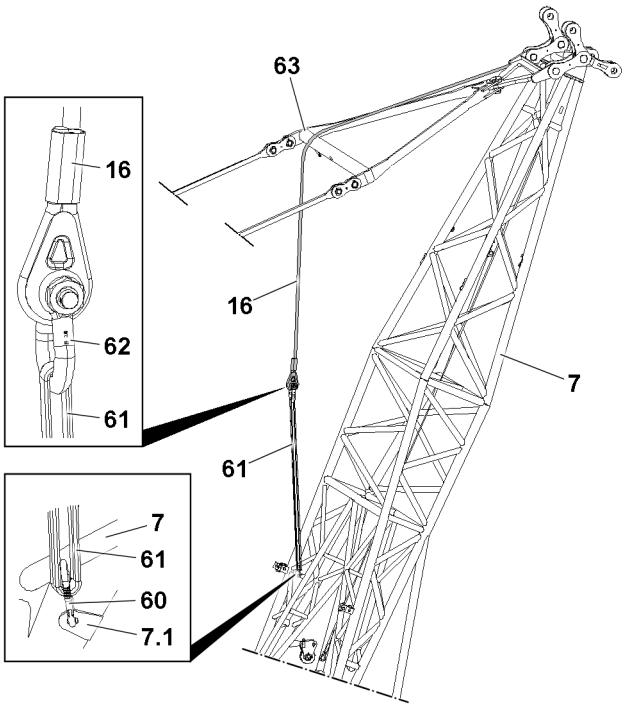

Fig.124500: Securing the fastening rope on the FA-frame for crane operation

NOTICE
Swinging fastening rope!
If the fastening rope **16** is not properly secured, then the fastening rope **16** can start to swing back and forth in crane operation and damage components.

▶ Make sure that the fastening rope **16** is properly secured on the FA-frame before starting to work with the crane.

▶ Place the fastening rope **16** over the linkage **63**.
▶ Connect the fastening rope **16** with the roundsling **61** with the shackle **62**.
▶ Fasten the roundsling **61** with the carabiner **60** on bracket **7.1** of the FA-frame.

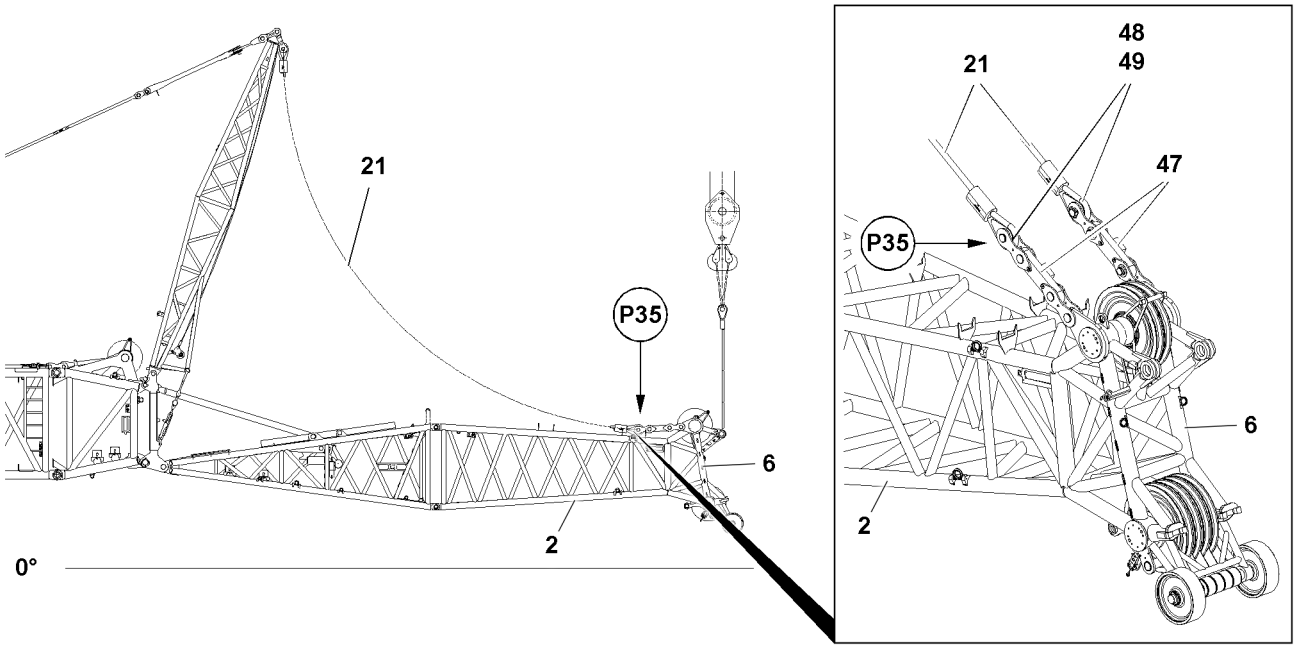

Fig.127686: Assembling the F-guy rope on the F-end section

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- ▶ Fasten the F-jib **2** to the auxiliary crane.
- ▶ Carefully tension the fastening equipment.

When the fastening equipment is tensioned:

- ▶ Release and reeve out the assembly winch rope **34** at point **P28**.

Pin the rope pulley retainer **25** on the FA-frame **7**:

- ▶ Insert the pin **26** at point **P24** and secure with the retaining element **27**.
- ▶ Pin the F-guy ropes **21** on the F-end section **2** at point **P35** with pin **48** and secure with the retaining element **49**.

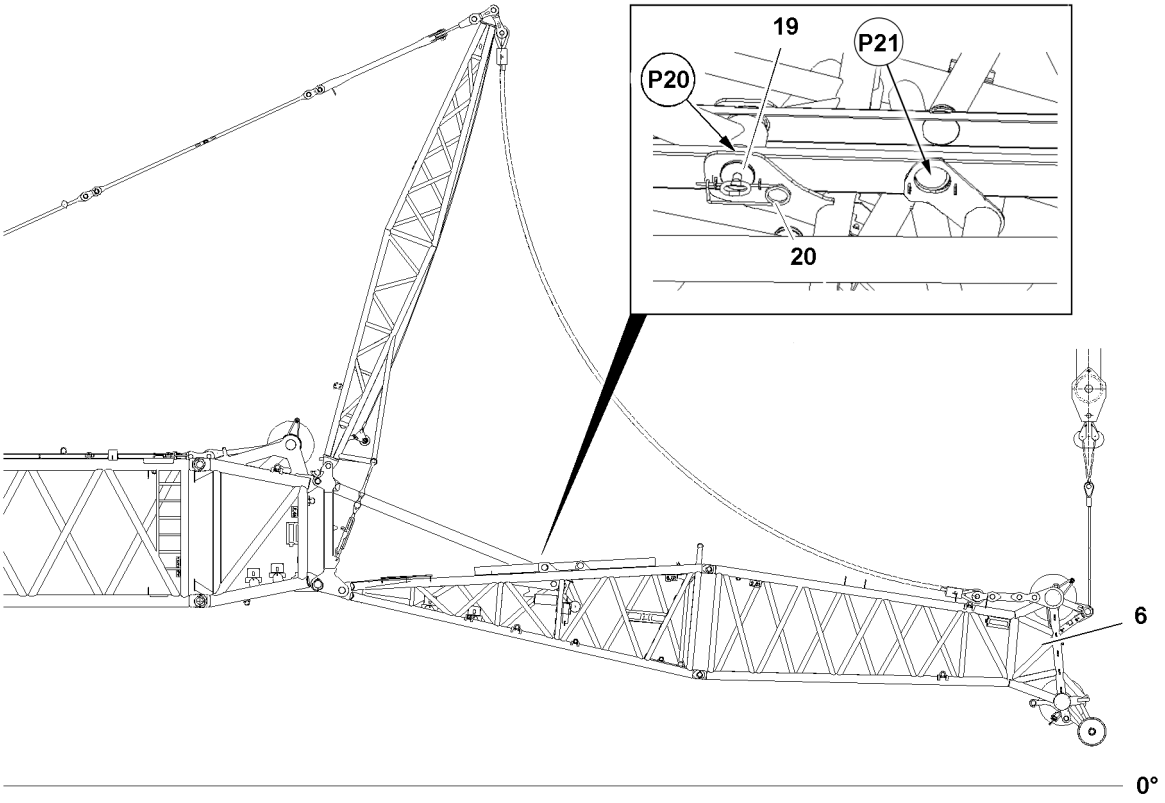

Fig.127687: Unpinning the F-relapse support

Unpin the F-relapse support **18** in the transport position.

When the F-jib **6** is safely held by the auxiliary crane:

- ▶ Remove the retaining element **20** at point **P20** and unpin the pin **19**.
- ▶ Insert the pin **19** in the stop position at point **P21** and secure with retaining element **20**.
- ▶ Lower the F-assembly unit **6** slowly on the ground with the auxiliary crane.

When the F-jib is laying on the ground:

- ▶ Remove the auxiliary crane.

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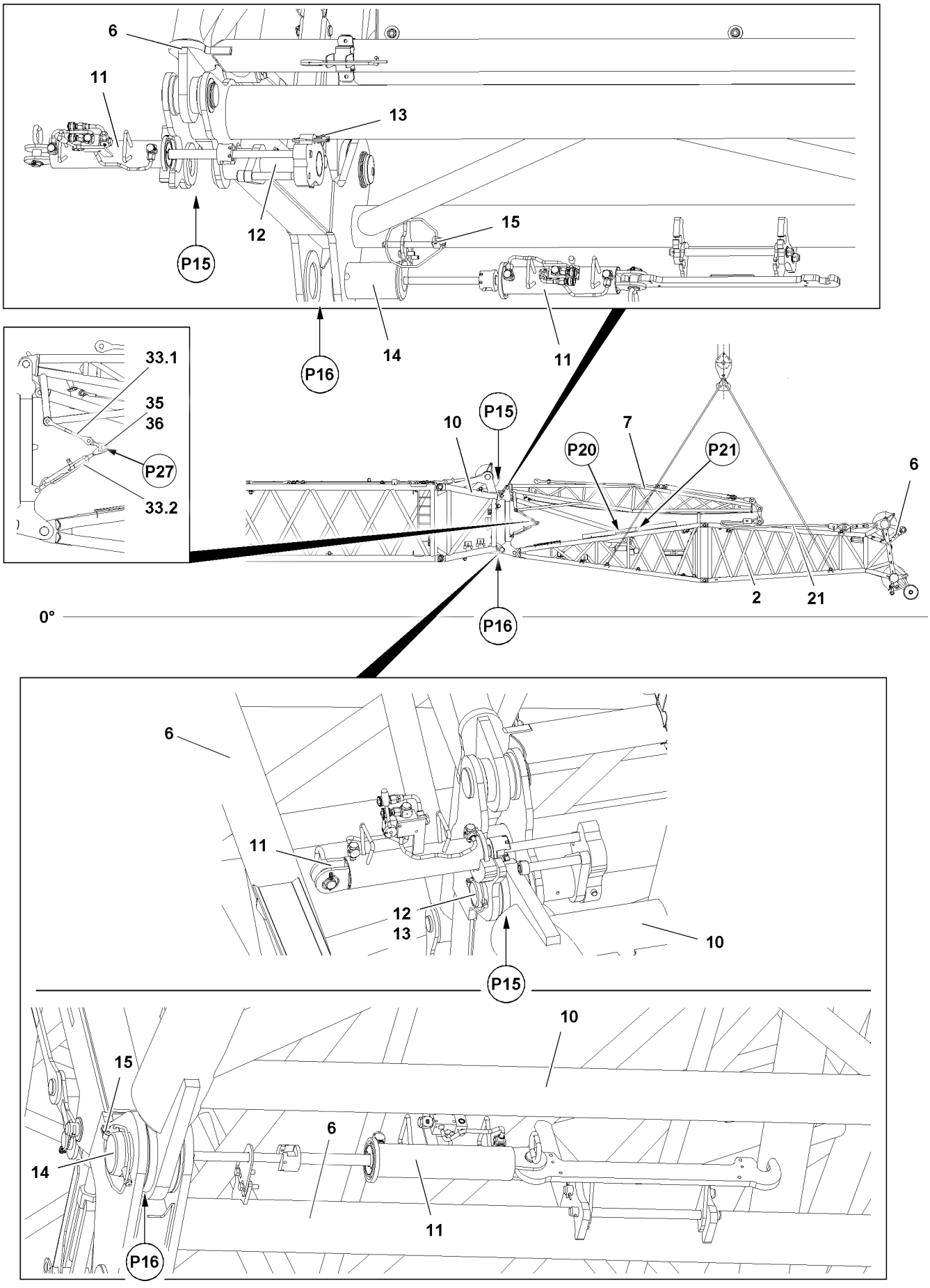

Fig.127678

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7 Assembly variant V4 — Assembling the complete F-jib (maximum length of 12 m) in flying mode

WARNING
Impermissible F-assembly length(s)!
Death, severe bodily injuries, property damage.
- ▶ Make sure that the assembly of the F-jib as a complete F-assembly unit with the F-end section does not exceed 12 m.
- ▶ During assembly, no hook block may be reeved on the F-jib!

7.1 Assembling the F-assembly unit with F-end section

- ▶ Fasten the F-assembly unit with the F-end section **6** to the auxiliary crane.
- ▶ Remove the rigging belts between the F-pivot section **1** and FA-frame **7**.

The F-assembly unit is pinned four times on L-end section or on the F-connector head. Every pin point is present on both sides of the component on one level.

- ▶ Set the pin pulling cylinder **11** at pin point **P15** and unpin the pin **12**.
- ▶ Set the pin pulling cylinder **11** at pin point **P16** and unpin the pin **14**.
- ▶ Position the F-assembly unit **5** with the F-end section **6** with the auxiliary crane on the L-end section or on the F-connector head so that it can be pinned at point **P15** and at point **P16**.
- ▶ Set the pin pulling cylinder **11** at pin point **P15** and pin the pin **12** on both sides.

When the pins **12** are completely pinned:
- ▶ Secure the pins **12** with retaining elements **13** on both sides.

WARNING
Crushing / shearing of limbs!
While performing boom system assembly tasks, limbs can be crushed and / or sheared off.
Death, severe bodily injuries, property damage.
- ▶ Make sure that no crane movements are performed while pinning in the area of the lower pin points **P16**.

- ▶ Set the pin pulling cylinder **11** at pin point **P16** and pin the pin **14** on both sides.

When the pins **14** are completely pinned:
- ▶ Secure the pins **14** with retaining elements **15** on both sides.
- ▶ Remove the auxiliary crane.

7.2 Assembling the F-guy ropes

- ▶ Make sure that the F-guy ropes **21** are properly pinned and secured with the brackets of the FA-frame **7** and the F-end section **2** at point **P23** and point **P35**.

7.3 Releasing the F-relapse support

Make sure that the following prerequisites are met:
- – The F-assembly unit **6** is properly pinned and secured on L-end section or on the F-connector head with the F-end section.
- – The F-guy ropes **21** are properly pinned and secured between the FA-frame **7** and the F-end section **2**.
- – The F-jib is, on the F-end section **2**, properly fastened on the auxiliary crane.

Release the F-relapse support **18** from the transport position.

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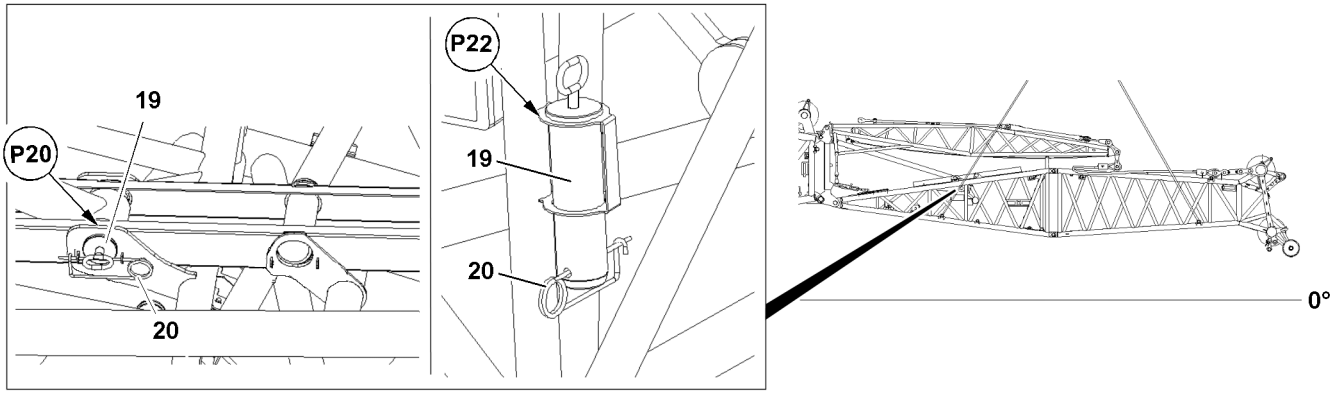

Fig.127912: Position of the F-relapse support

If the prerequisites for releasing the F-relapse support are fulfilled:

- ▶ Remove the retaining element **20** at point **P20** and unpin the pin **19**.
- ▶ Insert pin **19** in the park position at point **P22** and secure with retaining element **20**.

7.4 Separating the FA-frame relapse retainers

Note

- ▶ Separate the „FA-frame relapse retainer“, see description of assembly variant V2.

WARNING

Nonobservance of safety guidelines!
If the safety guidelines are not observed, dangerous situations can arise.
Death, severe bodily injuries, property damage.

- ▶ Make sure that all danger notes in the section „Separating the FA-frame relapse retainer“ are observed.

7.5 Erecting the FA-frame

Note

- ▶ Erect the „FA-frame“, see description of assembly variant V2.

WARNING

Nonobservance of safety guidelines!
If the safety guidelines are not observed, dangerous situations can arise.
Death, severe bodily injuries, property damage.

- ▶ Make sure that all danger notes in the section „Erecting the FA-frame“ are observed.

7.6 Placing the FA-frame in the operating position

Note

- ▶ Place the „FA-frame in the operating position“, see description of assembly variant V2.

WARNING

Nonobservance of safety guidelines!
If the safety guidelines are not observed, dangerous situations can arise.
Death, severe bodily injuries, property damage.

- ▶ Make sure that all danger notes in the section „Placing the FA-frame in the operating position“ are observed.

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8 Establishing the electrical connections

Make sure that the following prerequisites are met:
- The F-jib is completely assembled.
- The airplane warning light and the wind speed sensor are installed.

NOTICE
Damage to the electrical connection on the cable drum!
If the electrical connection from the cable drum on the F-pivot section to the terminal box on the L-end section or on the F-connector head is established first before the connection to the terminal box on the F-end section, the electrical connection can be damaged when spooling out the cable drum.
▶ Establish the electrical connection from the cable drum on the F-pivot section to the terminal box on the F-end section first and then the electrical connection from the terminal box on the F-connector head or on the L-end section to the cable drum on the F-pivot section.

Note
▶ Establish the electrical connections to the F-jib, see Electrical wiring diagram.

▶ Establish the electrical connections.
▶ Make sure that all electrical connections on the boom are established.

9 Checking the function of the safety equipment

WARNING
Malfunctioning safety equipment!
Death, severe bodily injuries, property damage.
▶ Crane operation with non-functioning safety equipment is **prohibited**.

Note
▶ The function of the individual limit switches must be checked before erection of the boom system.
▶ The function of the limit switch initiators must be checked in the test system, see the „Diagnostics manual“.

Note
▶ If a function check on the limit switches or on the safety equipment does not lead to the desired shut-offs, then the plug connections on the connector boxes or the components themselves must be checked. If no visible connection errors or component defects can be found, contact **Liebherr** Service.

Make sure that the following prerequisites are met:
- All electrical connections have been made.
- The crane engine is running.
- The corresponding operating mode is set on the LICCON monitor.

9.1 Checking the wind speed sensor

▶ Check the movement and the function of the wind speed sensor.

9.2 Checking the airplane warning light

▶ Turn the airplane warning light on in the crane operator's cab, see Crane operating instructions, chapter 4.01.
▶ Check the function visually.

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9.3 Checking the hoist limit switch on the pulley head

Note

▶ When replacing or changing a hoist limit switch (HES), the corresponding hoist limit switch must have the correct bus address and the correct software version in order to be detected again by the bus system (LSB).

▶ Actuate the hoist limit switch manually on the pulley head.

Result:

– The spool up function of the hoist winch turns off.
– The icon „Hoist top“ appears on the LICCON monitor 0.
– The limit switch is functioning.

9.4 Checking the limit switches in general

Note

▶ The limit switch functions have to be checked individually before erection.
▶ To check the limit switches, see corresponding chapter in the Crane operating instructions.

10 Erecting the boom

WARNING
The crane can topple over!
For certain boom lengths, the mechanical auxiliary supports must be assembled, see Erection and take down charts.
Death, severe bodily injuries, property damage.
▶ Observe the specifications in the erection and take down charts.

WARNING
The crane can topple over!
If the following conditions are not met before erecting the boom, the crane can topple over.
Death, severe bodily injuries, property damage.
▶ Observe the technical safety instructions, see the Crane operating instructions, chapter 5.01.
▶ Extend the relapse cylinder before erection.
▶ Do not allow slack rope formation on the control winch.

WARNING
Falling hoist rope!
If the hoist rope before the erection procedure is not properly secured onto the end section, it can fall down backward on the basis of its own weight.
Death, severe bodily injuries, property damage.
▶ Secure the hoist rope properly on the end section before the erection procedure.

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Make sure that the following prerequisites are met:
- The crane is horizontally aligned.
- The guy rods are properly assembled.
- The guy rods which are not required have been removed from the lattice sections.
- All electrical connections have been made.
- All hydraulic connections have been made.
- The function checks were carried out properly.
- All limit switches and warning devices are functioning.
- Crane ballasting (counterweight, central ballast, derrick ballast and / or auxiliary ballast) is carried out according to the load charts and / or the erection and take-down charts
- The crane has been set up according to the load charts and / or the erection and take-down charts.
- The LICCON overload protection has been set according to the data in the load charts and / or the erection and take-down charts.
- The LICCON overload protection settings have been checked for completeness and correctness.
- Assembly operation of the crane control is activated: the assembly icon is visible on the LICCON monitor.
- All pin connections have been secured.
- The hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins.
- There are no loose parts on the boom system.
- The boom system and the safety equipment are free from snow, frost and ice.
- No personnel or obstacles are within the danger zone.

10.1 Erection procedure

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ It is prohibited to turn the crane superstructure while erecting the boom.
- ▶ Observe the data in the Erection and take down charts.

10.1.1 Reeving in the hook block

Make sure that the following prerequisites are met:
- The crane is horizontally aligned.
- The slewing gear brake is applied.

WARNING
Danger of accident due to side wind!
If the slewing gear brake is released after reeving in / reeving out the hook block / load hook, then the crane can turn uncontrolled if there is a strong side wind.
Death, severe bodily injuries, property damage.
The crane can collide with close-by structures or objects.
- ▶ Make sure that the current wind speed does not exceed the values from the wind speed chart when releasing the slewing gear brake.

- ▶ Luff up the boom until the F-jib lifts off the ground.
- ▶ Reeve in the hook block properly, see Crane operating instructions, chapter 4.06 and the separate reeving plans.
- ▶ Properly secure the hoist rope on the rope fixed point, see the Crane operating instructions, chapter 4.06.
- ▶ Attach the hoist limit switch weight, see the Crane operating instructions, chapter 4.06.

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10.1.2 Erecting the boom

DANGER
The crane can topple over!
Death, severe bodily injuries, property damage.
▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook.

Note
▶ When the lowest operating position of the boom is reached, the set load chart of the LICCON overload protection is activated.
▶ In the maximum load icon appears a load number in „t“ instead of the display „???“.

▶ Luff the boom up to the lowest operating position.

When the boom has reached the lowest operating position:
▶ Make sure that the assembly icon on the LICCON monitor turns off.

Result:

– The LICCON overload protection is active.

11 Operating the crane

11.1 Preparing for crane operation

Note
▶ Observe the notes, see Crane operating instructions, chapter 4.05, chapter 4.08 and chapter 5.01.

Make sure that the following prerequisites are met:
– The LICCON overload protection is active.
– The LICCON overload protection has been set according to the data in the load chart.

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
▶ Check the horizontal position of the crane before and during operation.
▶ If the crane operator leaves the crane cab, even for a short time, the operating mode setting must be checked and reset, if necessary, before resuming crane operation.

11.2 Checking the settings

▶ Check the function of the overload protection by running against the operating positions „on top“ and „bottom“.
▶ Check the hoist limit switch by running against the hoist limit switch weight.

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12 Disassembling the F-jib

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ It is prohibited to lean the auxiliary ladder against the component being disassembled.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

WARNING
The components can fall down!
If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

WARNING
The lattice sections can fall down!
If the lattice sections are not pinned and secured correctly, then they can fall down.
Death, severe bodily injuries, property damage.
- ▶ Pin or unpin both pins at the same horizontal level, i.e. **left and right**.
- ▶ Do not stand under the lattice sections or within the entire danger zone during the pinning and unpinning procedure of the boom.
- ▶ Safely secure the pins in the storage locations as well as in the receptacles.
- ▶ It is prohibited to lean the auxiliary ladder against the component being disassembled.

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Make sure that the following prerequisites are met:
- The S-boom is luffed down to the „lowest“ operating position.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection is exceeded.
- The assembly icon is visible on the LICCON monitor.
- The auxiliary crane is available.

12.1 Taking the S-boom down

WARNING
The crane can topple over!
If the following conditions are not met before taking down the boom, the crane can topple over.
Death, severe bodily injuries, property damage.
▶ Observe the technical safety instructions, see the Crane operating instructions, chapter 5.01.
▶ Observe the specifications in the erection and take-down charts.

NOTICE
Damage of boom components!
Taking down the boom system can lead to a collision between the hook block and the pulley head.
Boom components can be severely damaged.
▶ Luff the boom system down and at the same time spool the hoist winch out.

12.1.1 Luffing the S-boom down

Note
▶ The luff down movement is turned off as soon as the lowest operating position is reached.
▶ When the lowest operating position of the S-boom is reached, the load display in the maximum load icon turns off and instead of the load display appears the display „???“.
▶ In the crane operating screen appear alarm functions.

▶ Luff the S-boom down to the „lowest“ operating position.

Result:

- The luff down movement is turned off.
- The „STOP“ icon appears on the LICCON monitor.
- The horn icon appears on the LICCON monitor.

WARNING
The crane can topple over!
In assembly operation the LICCON overload protection is deactivated.
In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.
▶ Activate the assembly operation only when the consequences are known.
▶ Enter the set up configuration correctly into the LICCON computer system.
▶ Observe the erection / take down charts.
▶ Crane operation with deactivated LICCON overload protection is prohibited.
▶ In assembly operation only load torque reducing crane movements may be carried out until a permissible operating and load range.
▶ The crane operator carries complete and sole responsibility for his actions if the LICCON overload protection is deactivated.

When the boom has reached the „lowest“ operating position:
▶ Activate assembly operation, see Crane operating instructions, chapter 4.02.

Result:

- The LICCON overload protection is deactivated.

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– The assembly icon appears on the LICCON monitor.

▶ At the same time, luff down the boom system and spool out the hoist winch until the hook block touches the ground.

When the hook block touches the ground:
▶ Properly take down / set down the hook block onto the floor or a suitable substructure.

When the hook block is properly set down:
▶ Remove the hoist limit switch weight.
▶ Reeve out the hook block, see Crane operating instructions, chapter 4.06.
▶ Carefully spool the hoist rope up.
▶ Remove the hook block with the auxiliary crane.

NOTICE
Damage to the boom system!
▶ Make sure that the boom system is carefully luffed down at a slow speed.
▶ When the F-jib comes into contact with the ground, carefully luff the boom system down further until the main boom lies on a load bearing substructure.

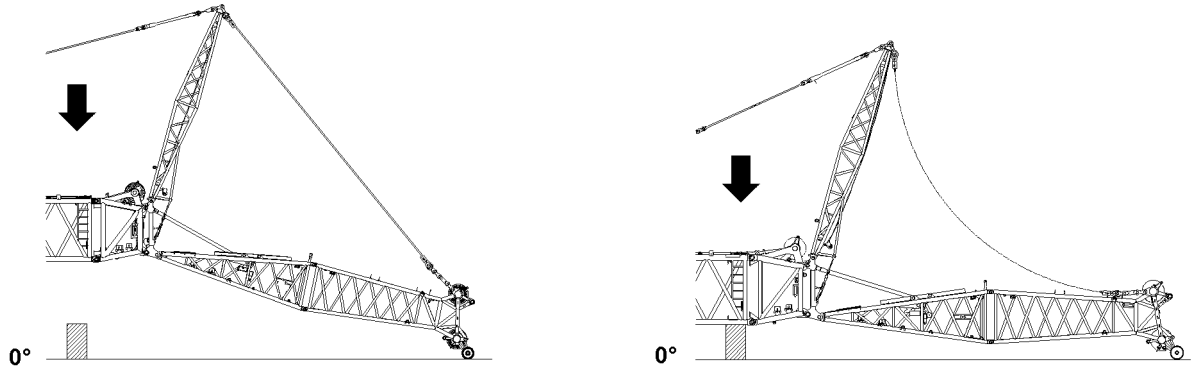

Fig.120188: Taking the boom system down

When the hook block is removed under the F-jib:
▶ Carefully luff the boom system down until the F-jib comes into contact with the ground.

12.2 Disconnecting the electrical connections

Make sure that the following prerequisite is met:
– The boom system is properly taken down.

NOTICE
Damage to the electrical connection on the cable drum!
If the electrical connection between the F-connector head or the L-end section **and** the F-pivot section is not separated before spooling up the cable drum, the electrical connection will be damaged.
If the cable of the cable drum is not properly spooled up on the cable drum after unplugging the F-end section, then the cable drum or the cable can be significantly damaged.
▶ Disconnect the electrical connection from the cable drum on the F-pivot section to the terminal box on the L-connector head or the L-end section first **and** then the electrical connection from the terminal box on the F-end section to the cable drum.
▶ After unplugging, spool up the cable onto the cable drum.

▶ Properly disconnect the electrical connections.
▶ After unplugging, spool up the cable onto the cable drum and secure it to prevent it from spooling out inadvertently.
▶ Secure the cable: Reestablish the electrical connection between the F-connector head or the L-end section and the cable drum.

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12.3 Disassembling the F-jib in parts

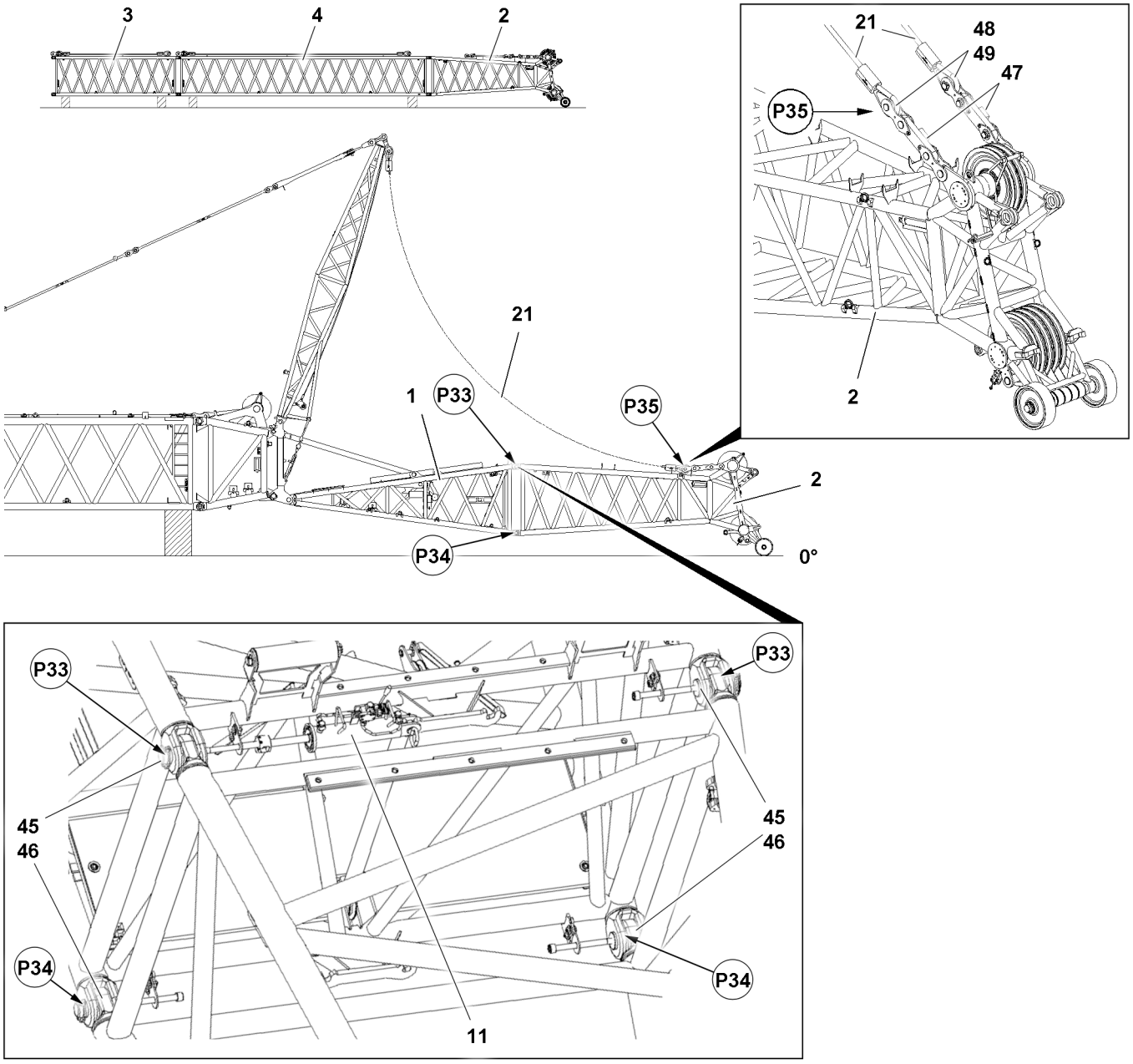

Fig.127688: Disassembling the lattice sections

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12.3.1 Disassembling the lattice sections

WARNING
F-guy ropes ripping off!
If the F-guy ropes **21** are installed twisted in longitudinal axis, then the load bearing capacity can be significantly reduced as a result and the F-guy ropes can rip off.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the F-guy ropes **21** are **never** kinked, knotted or twisted.
- ▶ Make sure the kinked, knotted or twisted F-guy ropes **21** are **never** installed.
- ▶ Make sure that F-guy ropes **21** are never pulled over the ground or sharp edges.
- ▶ Make sure that no damaged F-guy ropes **21** are being installed.
- ▶ Make sure that the numbering in the rod plan is identical to the numbering on the F-guy ropes.
- ▶ Make sure that the maximum bending radius of **20** x rope diameter on the F-guy ropes **21** is **never** fallen below.
- ▶ Check the F-guy ropes before every assembly.
- ▶ When using fiber guy ropes: Inspect the fiber guy rods regularly, see Crane operating instructions, chapter 8.16.

Unpin the F-guy ropes **21** at point **P35** on the F-end section **2**:

- ▶ Remove the retaining element **49** and unpin the pin **48**.

Note
- ▶ If F-intermediate sections are installed on the F-jib, then the additional guy ropes for the F-intermediate sections must be removed.

- ▶ Fasten the F-end section **2** and the F-intermediate sections (if applicable) to the auxiliary crane and disassemble.

The F-end section **2** is pinned four times on F-pivot section **1**. Every pin point is present on both sides of the component on one level.

- ▶ Remove the retaining element **46** at the pin point **P34**.
- ▶ Set the pin pulling cylinder **11** at pin point **P34** and unpin the pin **45**.
- ▶ Remove the retaining element **46** at the pin point **P33**.
- ▶ Set the pin pulling cylinder **11** at pin point **P33** and unpin the pin **45**.

When all connector pins are properly unpinned:
- ▶ Swing out the F-end section **2** and the F-intermediate section (if applicable) with the auxiliary crane and take it down on a load bearing substructure.
- ▶ Take the F-pivot section **1** down on the ground or on a load bearing substructure.

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12.3.2 Unpinning the guy rods

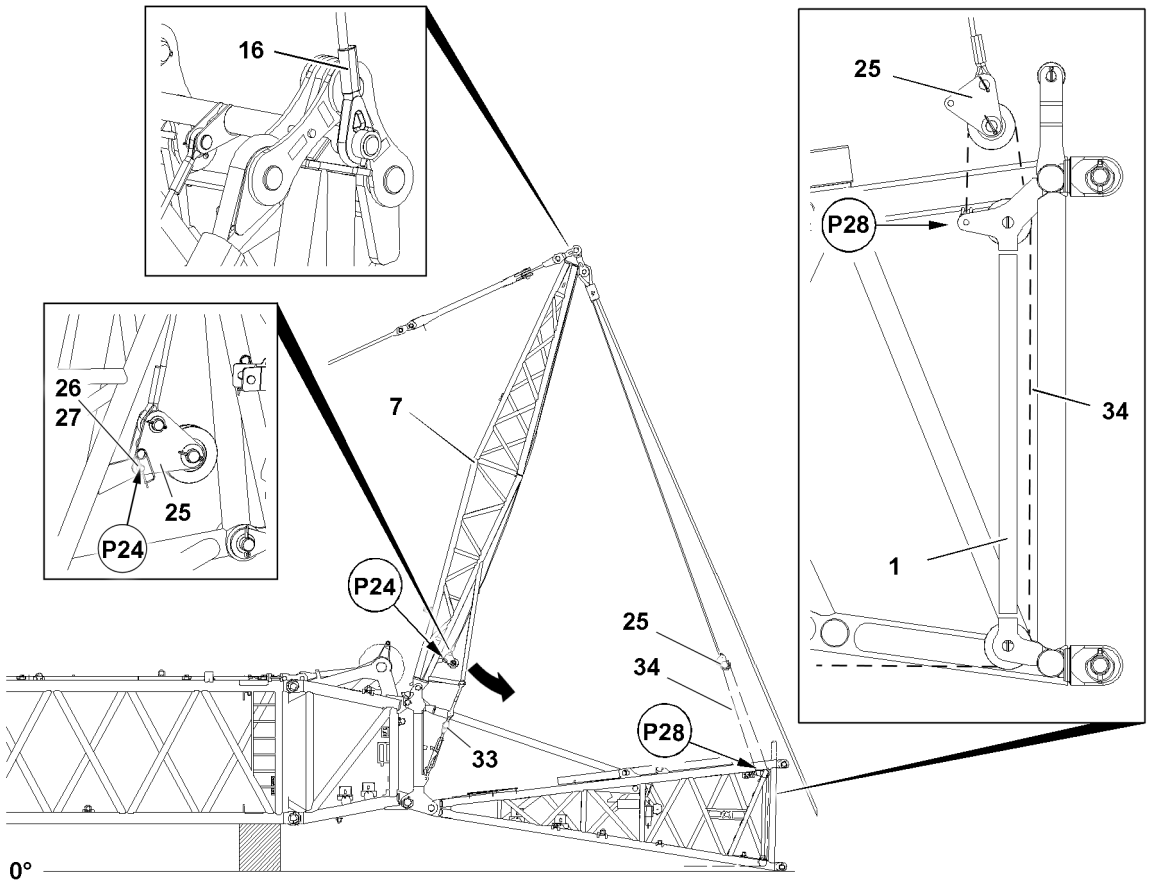

Fig.127690

- ▶ Release the fastening rope **16** on the FA-frame **7**.
- ▶ Fasten the fastening rope **16** to the auxiliary crane.
- ▶ Position the auxiliary crane over the FA-frame **7** and carefully tension the fastening rope **16**.

WARNING
Swinging rope pulley retainer!
The rope pulley retainer **25** can swing due to its own weight when unpinning it.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the rope pulley retainer **25** is held during unpinning.

Release the rope pulley retainer **25** on the FA-frame: **7**

- ▶ Remove the retaining element **27** at point **P24** and unpin the pin **26**.
- ▶ Swing the rope pulley retainer **25** to point **P28**.
- ▶ Reeve the assembly winch rope **34** on the rope pulley retainer **25** and secure on the F-pivot section **1** at point **P28**.

NOTICE
Danger of property damage!
If the FA-frame relapse retainers **33** are not separated, then they will be damaged during erection of the FA-frame **7**.
- ▶ Make sure that the FA-frame relapse retainers are properly separated during the erection of the FA-frame.

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WARNING
Falling and swinging FA-frame relapse retainer!
The FA-frame relapse retainer consists of guy rods **33.1** and a turnbuckle **33.2**.
The guy rod **33.1** of the FA-frame relapse retainer can fall down due to its own weight during unpinning.
The guy turnbuckle **33.2** of the FA-frame relapse retainer can fall down due to its own weight during unpinning.
Death, severe bodily injuries, property damage.
- ▶ Make sure when unpinning the FA-frame relapse retainer, the guy rods **33.1** and turnbuckle **33.2** are safely held.
- ▶ Assembly personnel must be at the side of the assembly unit.

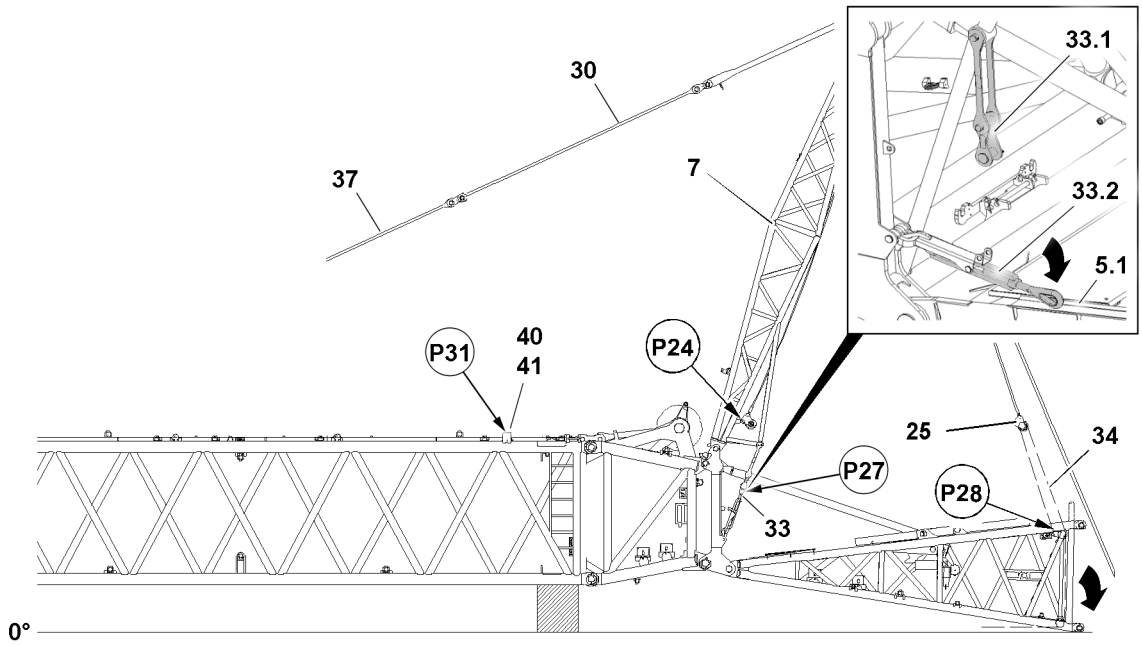

Fig.127689: Separating the FA-frame relapse retainers

Separate the FA-frame relapse retainer at point **P27**:

- ▶ Carefully spool up assembly winch rope **34**.

Result:

– The F-pivot section is pulled in the direction of the FA-frame **7** and lifted off the ground.
– The FA-frame relapse retainer **33** is relieved.

When the FA-frame relapse retainer **33** is relieved:
- ▶ Remove the retaining element **36** at point **P27** and unpin the pin **35**.
- ▶ Take down the FA-frame relapse retainer.
- ▶ Insert the pin **35** again at point **P27** and secure with the retaining element **36**.

Unpin the retaining pin in the transport receptacle for the FAB-guy rods.

- ▶ Remove the retaining element **41** at point **P31** and unpin the pin **40**.

Result:

– The FAB-guy rods **37** can be placed on the LI-intermediate section.

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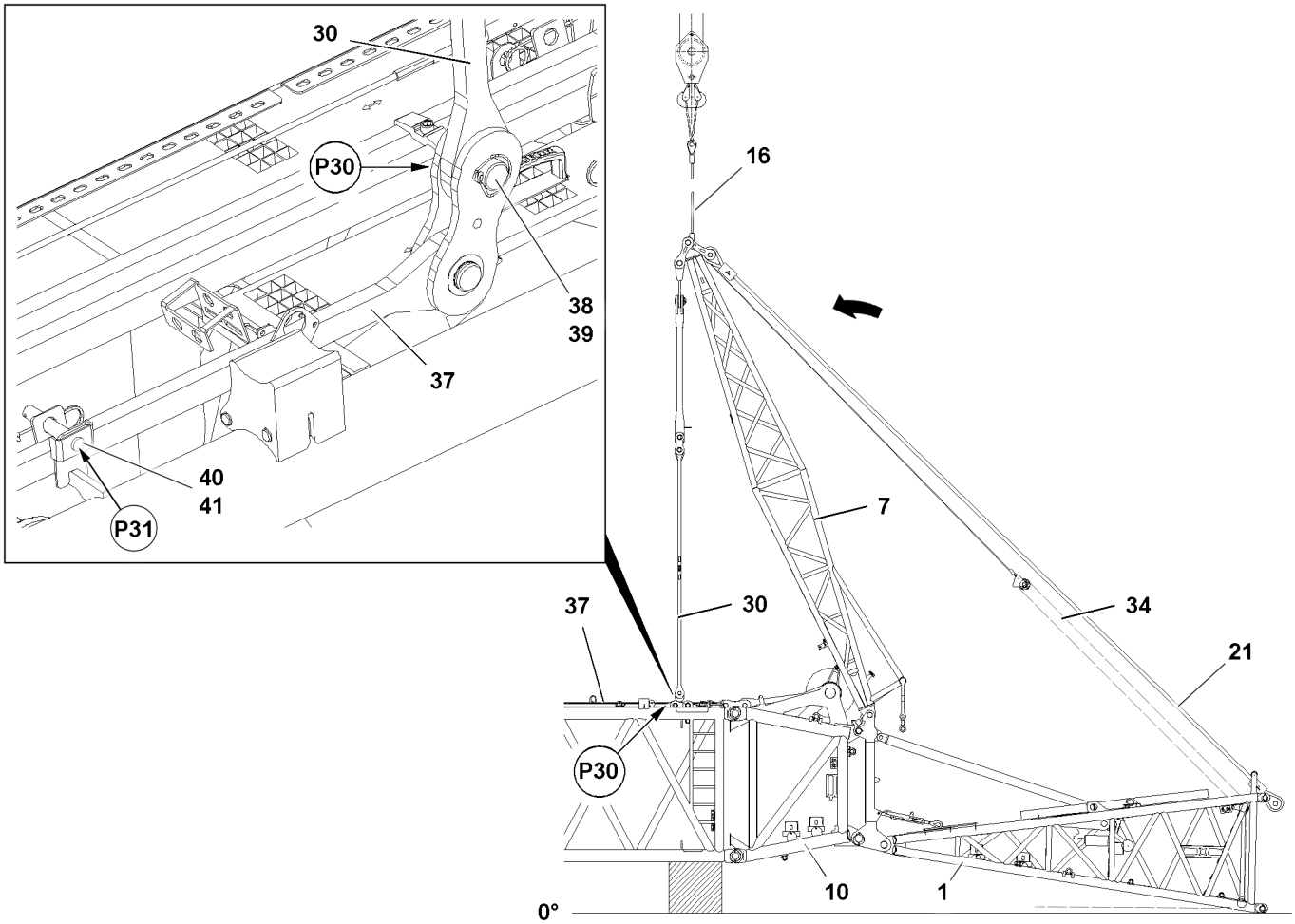

Fig.127483: Unpinning the FAB-guy rods

NOTICE
Danger of property damage!
When swinging the FA-frame **7** in the direction of the main boom, damage may occur to the FA-frame **7**, the F-connector head **10**, as well as the rope pulley retainer **25**.
- ▶ Make sure that a guide supervises the swinging process of the FA-frame.
- ▶ Make sure that the guide is constantly in visual and acoustic contact with the crane operator!
- ▶ Make sure that the assembly winch rope **34** is spooled out during the swinging process of the FA-frame.

▶ Carefully swing the FA-frame **7** with the auxiliary crane in direction of the main boom and spool out the assembly winch rope **34** at the same time until it can be unpinned at point **P30**.

Unpin the FAB-guy rods **30** from the FAB-guy rods **37**:

▶ Remove the retaining element **39** at point **P30** and unpin the pin **38**.

Secure the FAB-guy rods **37** in the transport receptacles:

▶ Insert the pin **40** at point **P31** and secure with the retaining element **41**.

WARNING
Automatic swinging of the FA-frame!
If the fastening rope **16** on the FA-frame **7** is not held under tension during assembly, the FA-frame **7** can swing suddenly to the side.
Death, severe bodily injury, property damage.
- ▶ Make sure that there are no persons within the danger zone.
- ▶ Make sure that the fastening rope **16** never sags during assembly / disassembly operations.

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▶ Pull the FA-frame **7** with the assembly winch rope **34** forward in the direction of the F-pivot section until the FAB-guy rods **30** lie on the FA-frame **7**.

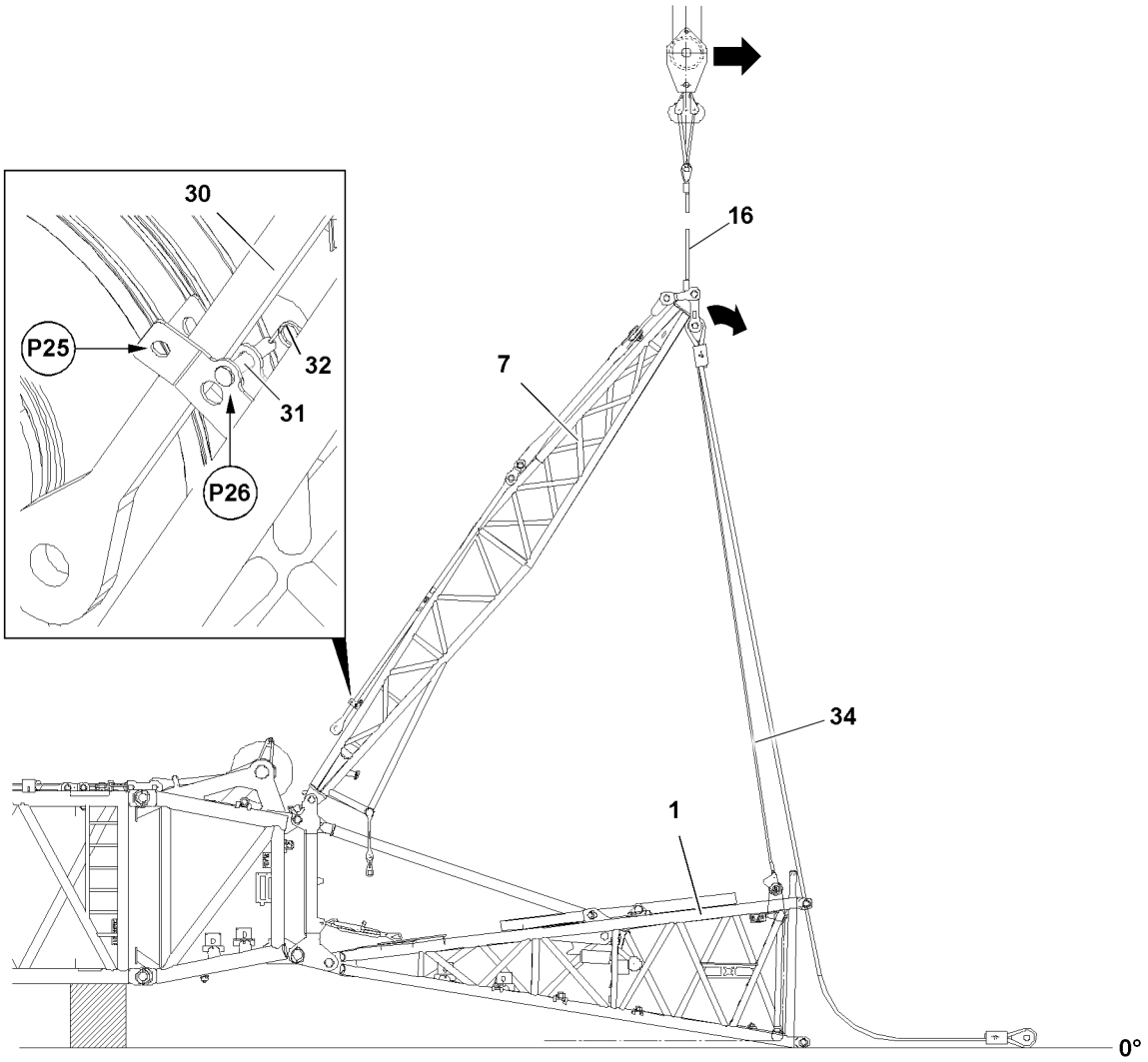

*Fig.127691: Swinging the FA-frame **7** in direction of the F-pivot section **1** and securing the FAB-guy rods*

▶ Pull the FA-frame **7** with the assembly winch rope **34** in direction of the F-pivot section **1**.
▶ Guide the auxiliary crane.

Secure the FAB-guy rods **30** on both sides:

When the FAB-guy rods **30** lie on the transport receptacles:
▶ Remove the retaining element **32** at point **P26** on both sides and unpin the pin **31** from the park position.
▶ Insert the pins **31** at point **P25** on both sides and secure with the retaining element **32**.

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12.3.3 Taking the FA-frame down

NOTICE
Damage to the fiber guy ropes!
Depending on the degree of severity, a damaged fiber guy rope can rip off in crane operation.
- ▶ Make sure that the fiber guy ropes **21** are not kinked, crushed or damaged in any other way when taking down the FA-frame **7**.
- ▶ If visible slight damage is determined on a fiber guy rope **21**, observe the Crane operating instructions, chapter 8.16 and thoroughly inspect the rope.
- ▶ Make sure that a damaged fiber guy rope will only continued to be used, depending on the scope of the damage, after it has been thoroughly inspected and released by the rope manufacturer.

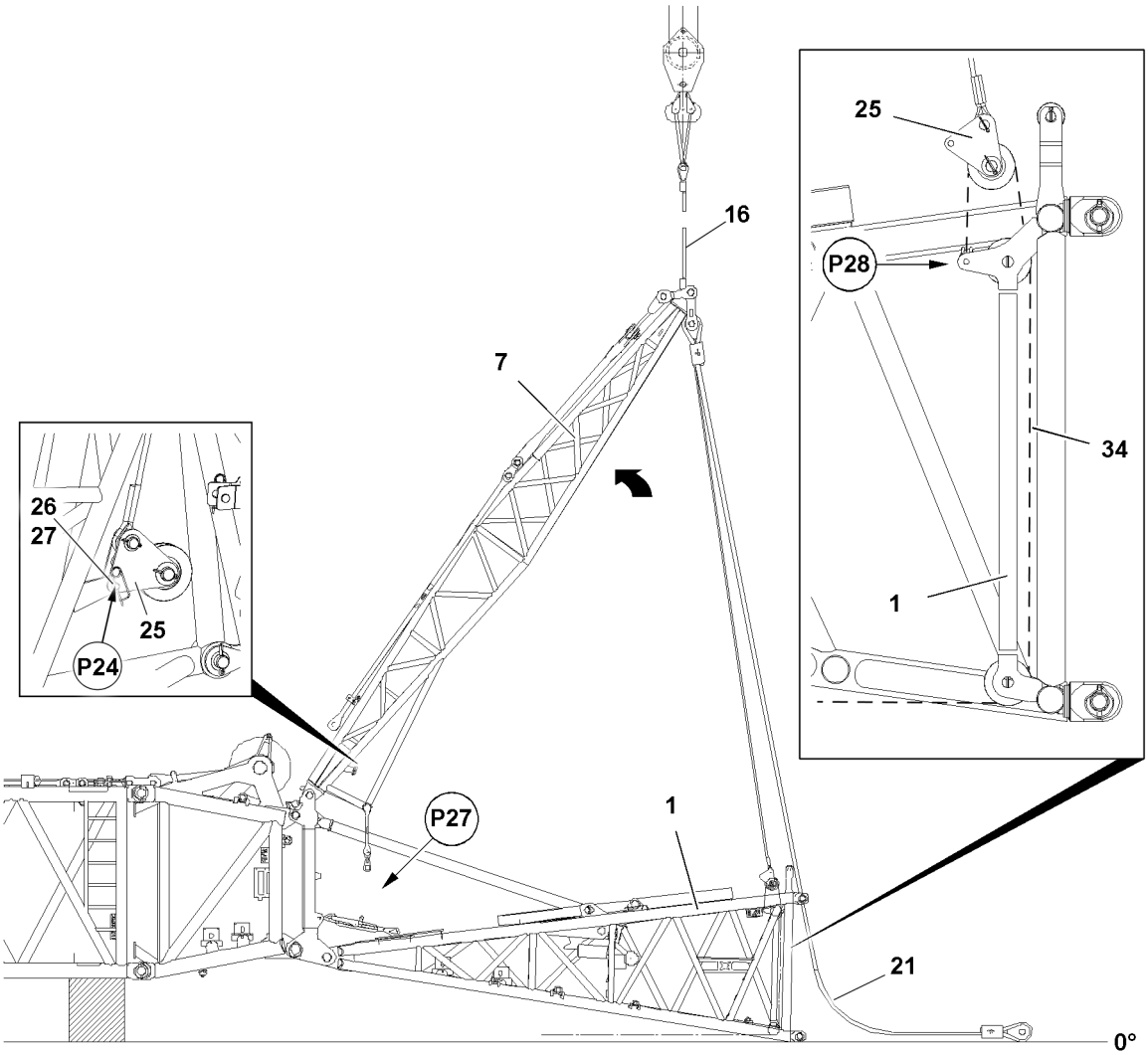

Fig.127692

- ▶ Release and reeve out the assembly winch rope **34** at point **P28**.

Pin the rope pulley retainer **25** on the FA-frame **7**:

- ▶ Insert the pin **26** at point **P24** and secure with the retaining element **27**.
- ▶ Spool the assembly winch rope **34** up.
- ▶ Take down the FA-frame **7** with the auxiliary crane on the F-pivot section **1**.
- ▶ Remove the auxiliary crane.

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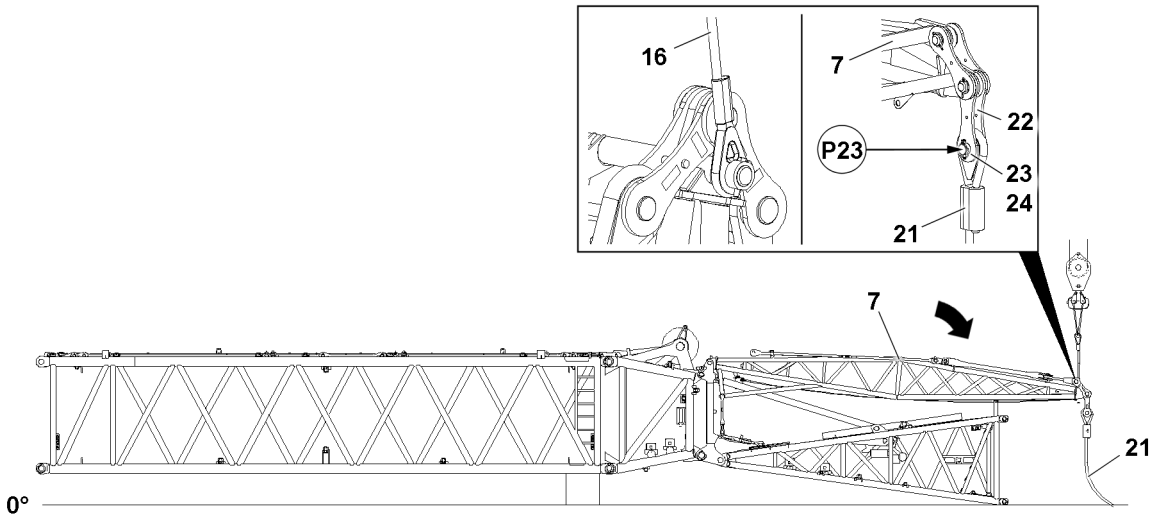

Fig.127693: Position of the F-relapse support

▶ Attach the fastening rope **16** on the FA-frame **7**.

Unpin F-guy ropes **21** at point **P23** on the F-frame **7**:

▶ Remove the retaining element **24** and unpin the pin **23**.

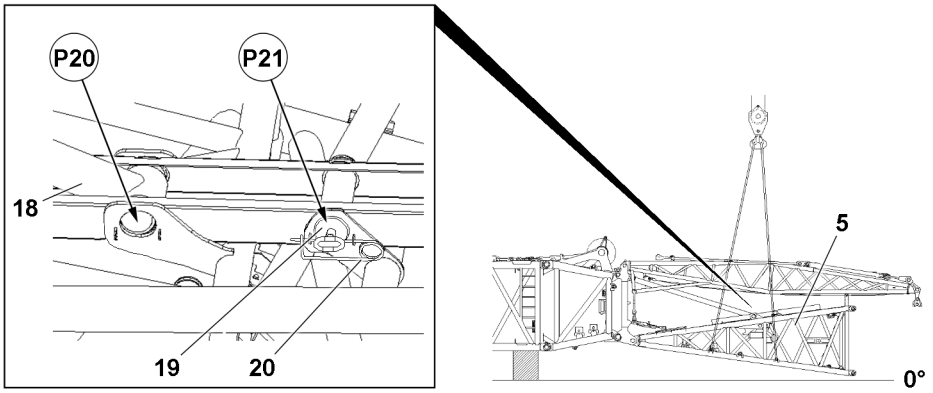

Fig.127694: Position of the F-relapse support

▶ Fasten the F-assembly unit **5** to the auxiliary crane.
▶ Lift the F-assembly unit **5** with the auxiliary crane until the F-relapse support **18** can be pinned at point **P20** in transport position.
▶ Remove the retaining element **20** at point **P21** and unpin the pin **19**.

Secure the F-relapse support **18** in the transport position:

▶ Insert the pin **19** at point **P20** and secure with the retaining element **20**.

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12.3.4 Disassembling the F-assembly unit

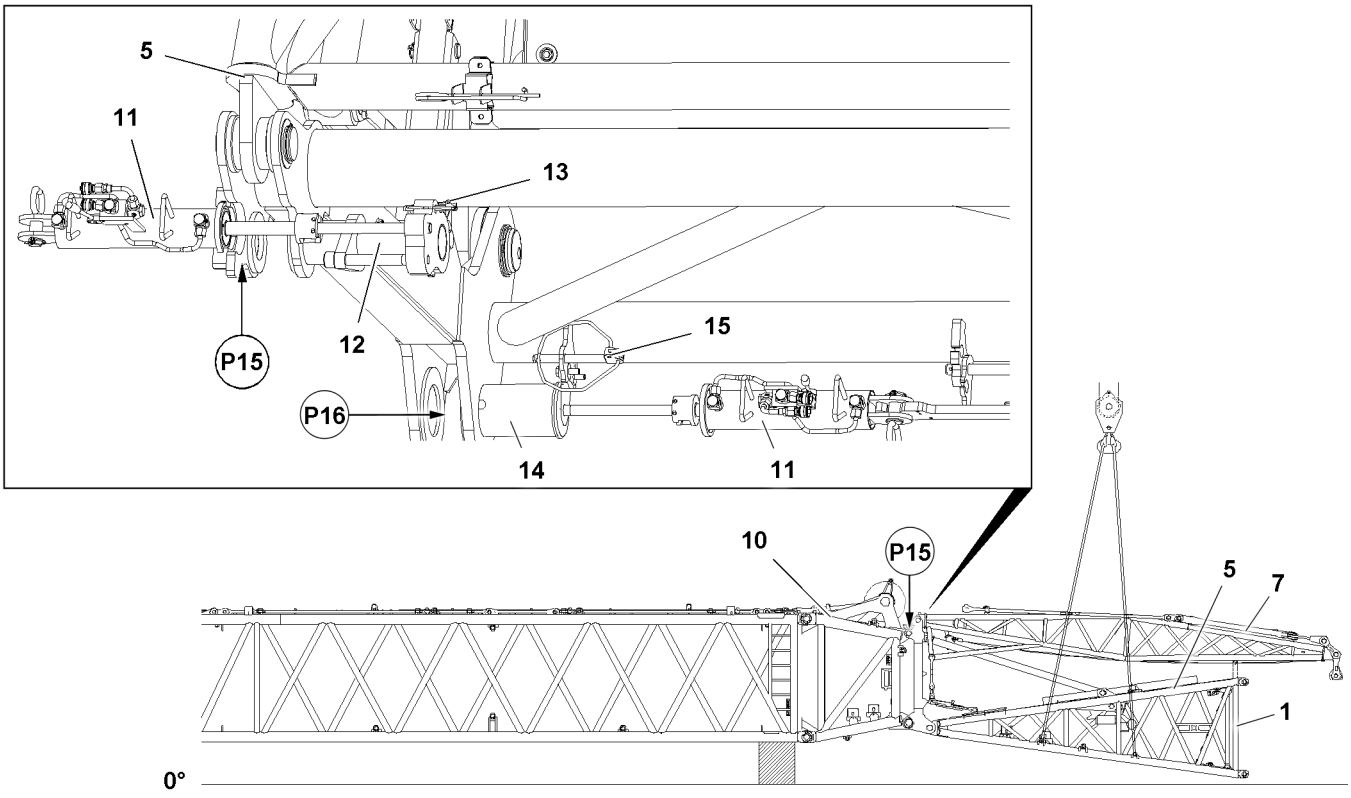

*Fig.127695: Unpinning the F-assembly unit **5** at point **P15**.*

Make sure that the following prerequisite is met:
- The F-assembly unit **5** is properly fastened on the auxiliary crane.
- The fastening equipment is tensioned.

▶ Release the pins **12** at point **P15** on both sides: Remove the retaining element **13**.
▶ Properly hang the pin pulling cylinder **11** in the pin pulling device at point **P15**.

When the pin pulling cylinder **11** is properly hung in the pin pulling device:
▶ Unpin the pins **12** on both sides.

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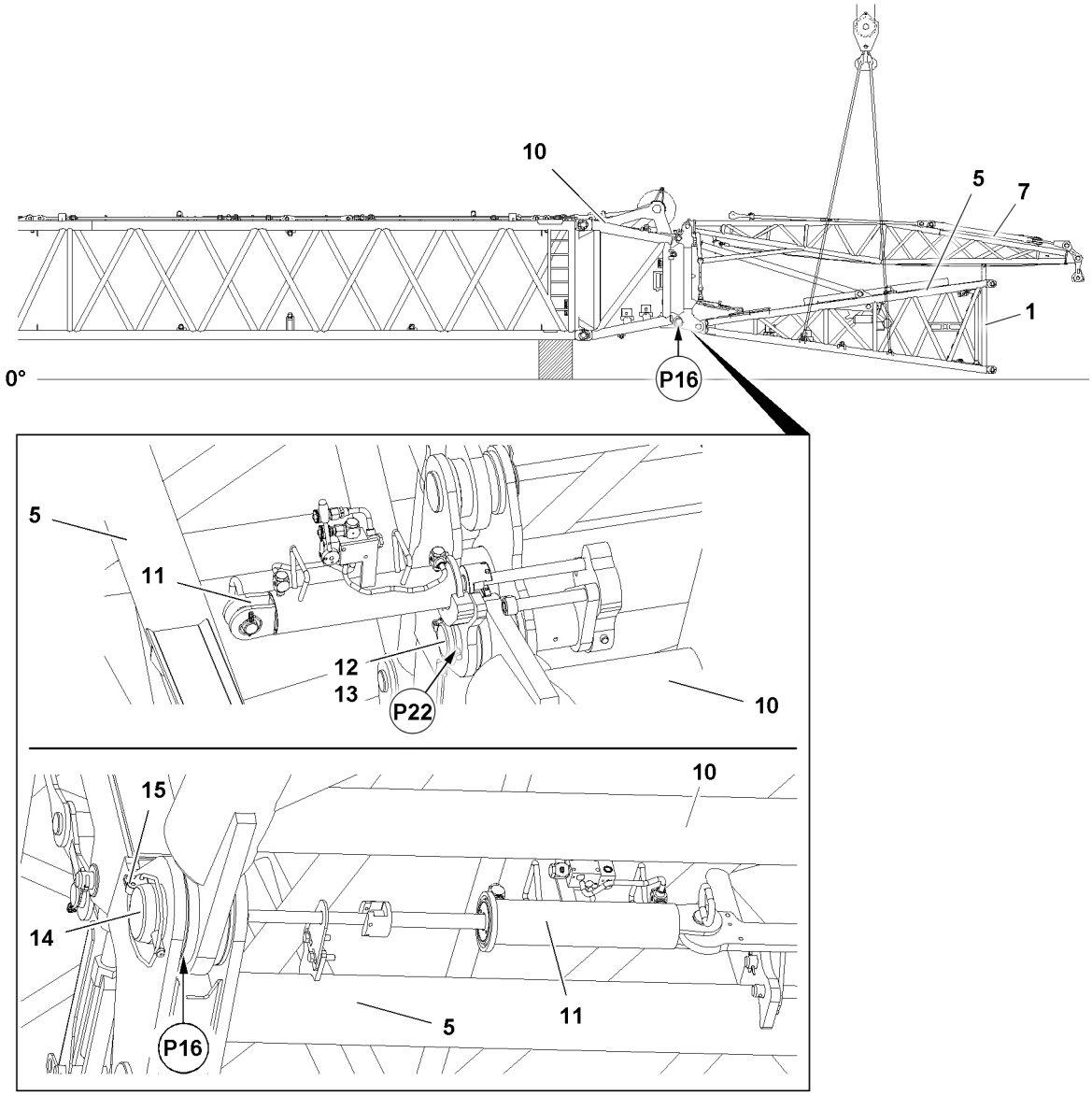

*Fig.127901: Unpinning the F-assembly unit **5** at point **P16**.*

- ▶ Release the pins **14** at point **P16** on both sides: Remove the retaining element **13**.
- ▶ Properly hang the pin pulling cylinder **11** in the pin pulling device at point **P15**.

When the pin pulling cylinder **11** is properly hung in the pin pulling device:

- ▶ Unpin the pins **14** on both sides.

If the pin **12** and pin **14** are unpinned on both sides:

- ▶ Swing out the F-assembly unit **5** with the auxiliary crane and take it down on the ground or on a load bearing substructure.
- ▶ Attach the rigging belts between the F-pivot section **1** and FA-frame **7**.
- ▶ Reinsert the pin **14** at point **P16** and point **12** at point **P15** and secure.

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12.4 Disassembling the F-jib completely as the F-assembly unit with the F-end section (maximum length 12 m)

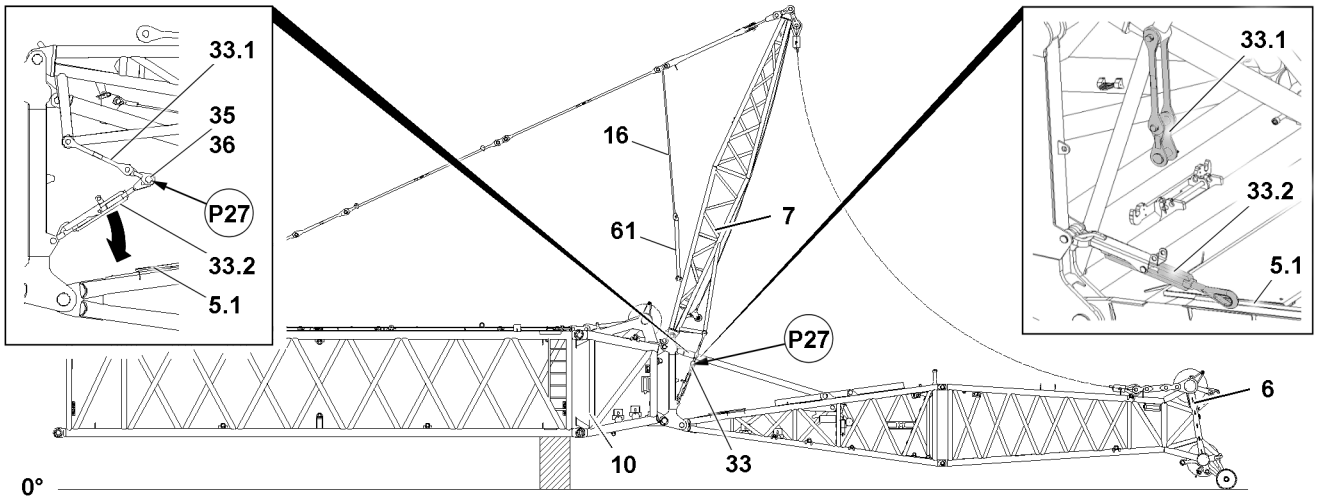

Fig.127902: Disassembling the F-jib

WARNING
Impermissible assembly length(s)!
Death, severe bodily injuries, property damage.
- ▶ Make sure that the assembly of the F-jib as a complete F-assembly unit with the F-end section does not exceed 12 m.
- ▶ During disassembly, no hook block may be reeved on the F-jib.

12.4.1 Unpinning the FAB-guy rods

NOTICE
Damage of F-relapse support!
If the pin **19** is not unpinned before disassembling the FAB-guy rods from the stop position **P21**, the F-relapse retainer can be damaged.
- ▶ Make sure that the pin **19** is unpinned before disassembling the FAB-guy rods from the stop position **P21**.

- ▶ Unpin the pin **19** from the stop position **P21** and insert it in the park position at point **P22** and secure.

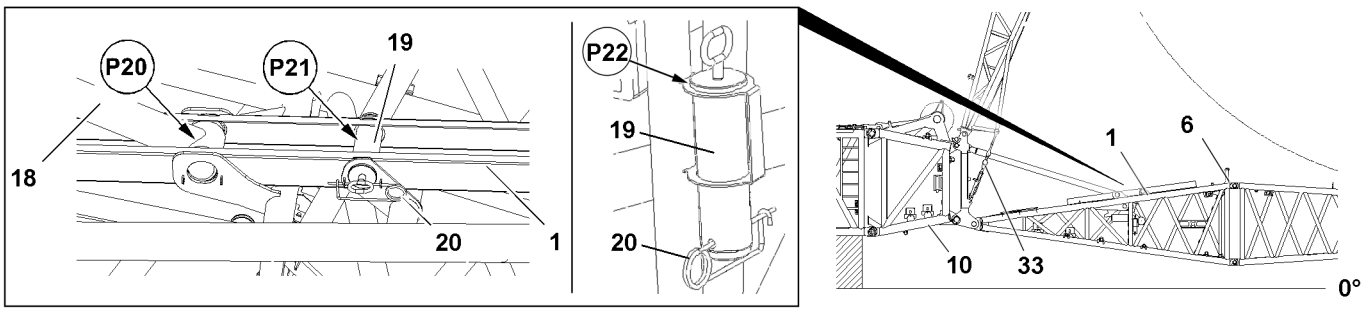

Fig.127907

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NOTICE
Danger of property damage!
If the FA-frame relapse retainers **33** are not separated, then they will be damaged during erection of the FA-frame.
▶ Make sure that the FA-frame relapse retainers are separated during the erection of the FA-frame.

WARNING
Falling and swinging FA-frame relapse retainer!
The FA-frame relapse retainer consists of guy rods **33.1** and a turnbuckle **33.2**.
The guy rod **33.1** of the FA-frame relapse retainer can fall down due to its own weight during unpinning.
The guy turnbuckle **33.2** of the FA-frame relapse retainer can fall down due to its own weight during unpinning.
Death, severe bodily injuries, property damage.
▶ Make sure when unpinning the FA-frame relapse retainer, the guy rods **33.1** and turnbuckle **33.2** are safely held.
▶ Assembly personnel must be at the side of the assembly unit.

Separate the FA-frame relapse retainer **33** at point **P27**:

▶ Remove the retaining element **36** at point **P27** and unpin the pin **35**.
▶ Place the turnbuckle **33.2** in the receptacle **5.1**.
▶ Insert the pin **35** again at point **P27** and secure with the retaining element **36**.

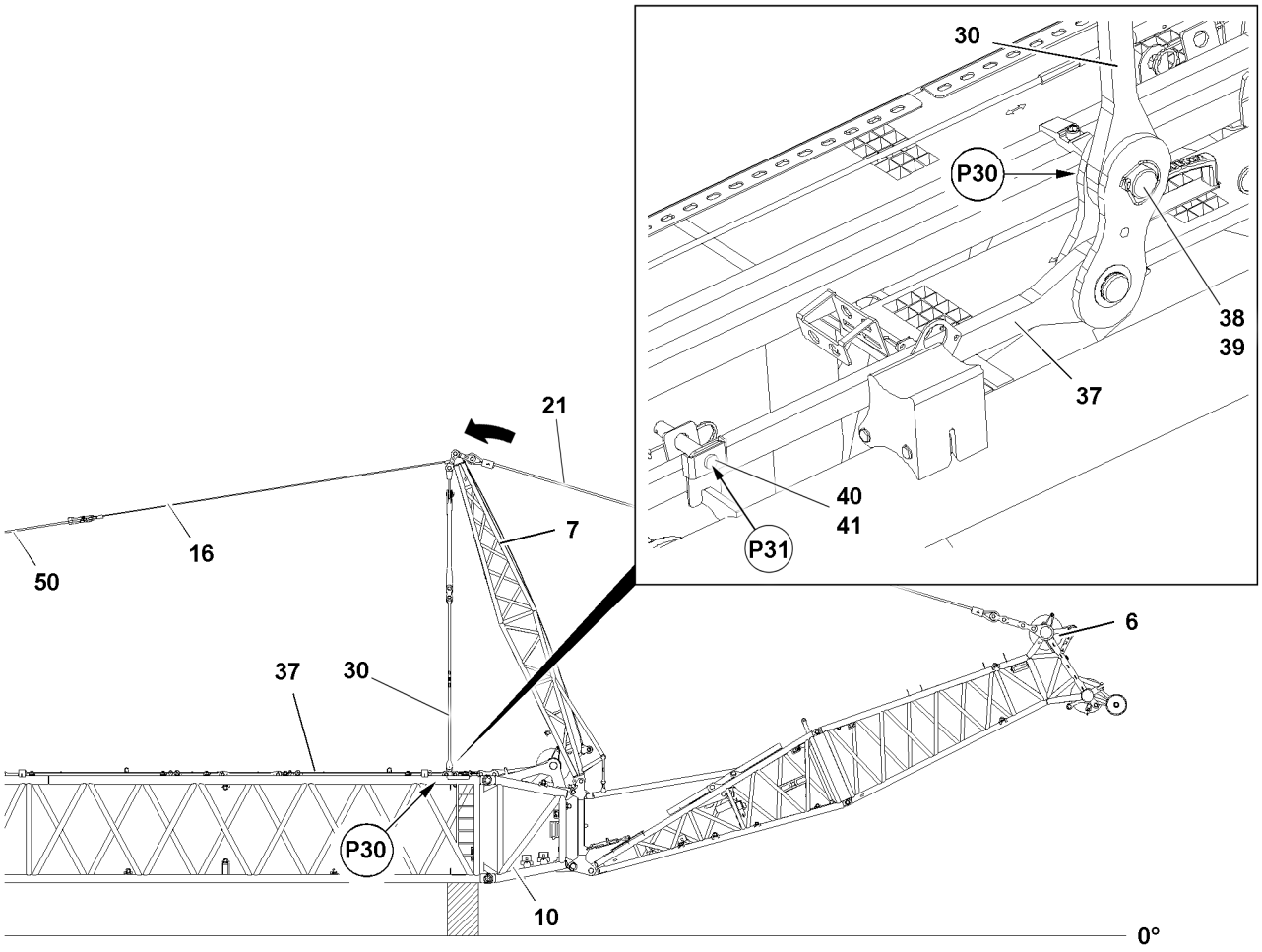

*Fig.127675: Taking the guy rods **37** down in the transport retainers*

▶ Release the fastening rope **16** on the FA-frame **7**.
▶ Connect the fastening rope **16** of the FA-frame **7** using the link with the hoist rope **50**.

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▶ Remove the retaining element **41** at point **P31** and unpin the pin **40**.

NOTICE
Danger of property damage!
When swinging the FA-frame **7** in direction of the main boom there is a danger of collision of the FA-frame with the attachment parts of the L-end section **10** or the F-connector head.
▶ When swinging the FA-frame, a guide must be used.
▶ The guide must be in constant visual and acoustic contact with the crane operator.

▶ Spool the hoist rope **50** up until the FAB-guy rods **37** are completely in the transport receptacles.

When the FAB-guy rods **37** are completely in the transport receptacles:
▶ Insert the pin **40** at point **P31** and secure with the retaining element **41**.

Result:

– The FAB-guy rods **37** are secured in the transport receptacles:

When the FAB-guy rods **37** are properly secured in the transport receptacles:
▶ Separate the FA-guy rods **37** at point **P30**: Release and unpin the pin **38**.

12.4.2 Taking the FA-frame down

NOTICE
Damage to the fiber guy ropes!
Depending on the degree of severity, a damaged fiber guy rope can rip off in crane operation.
▶ Make sure that the fiber guy ropes **21** are not kinked, crushed or damaged in any other way when taking down the FA-frame **7**.
▶ If visible slight damage is determined on a fiber guy rope **21**, observe the Crane operating instructions, chapter 8.16 and thoroughly inspect the rope.
▶ Make sure that a damaged fiber guy rope will only continued to be used, depending on the scope of the damage, after it has been thoroughly inspected and released by the rope manufacturer.

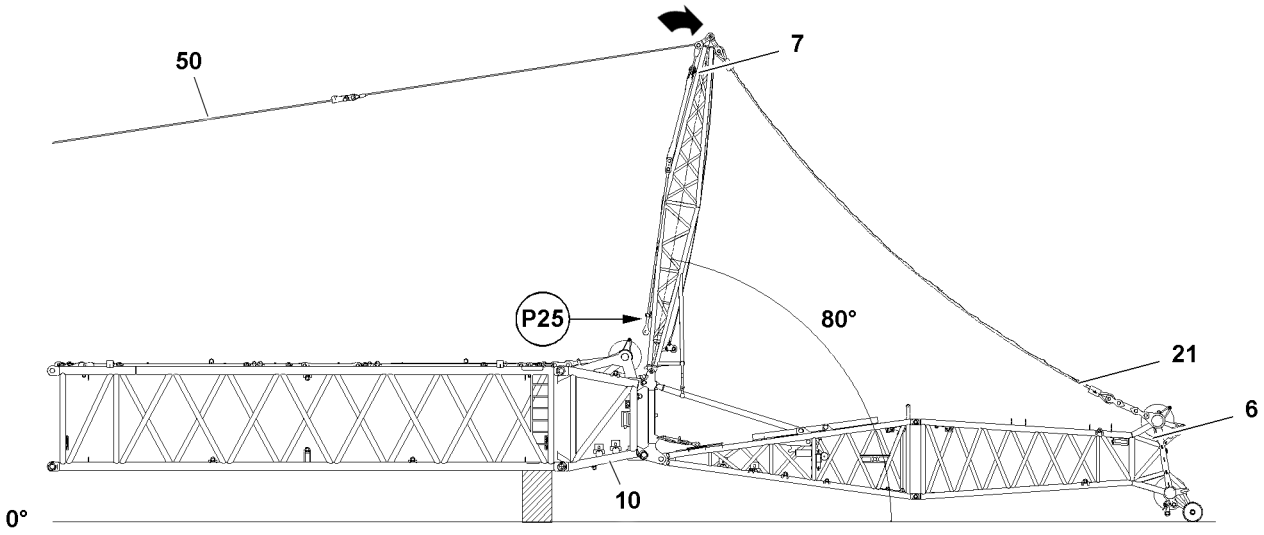

*Fig.127904: Lowering the FA-frame **7** to the front in direction of the F-pivot section*

Make sure that the following prerequisites are met:
– The FAB-guy rods are separated.
– The FAB-guy rods **37** are properly pinned and secured in the transport retainers

▶ Lower the FA-frame **7** with the hoist rope **50** in direction of the F-jib until the angle between the FA-frame and the horizontal is approx. 80° and the F-jib lies on the ground.

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Result:

– The FAB-guy rods **30** rest in the transport receptacle on the FA-frame **7**.

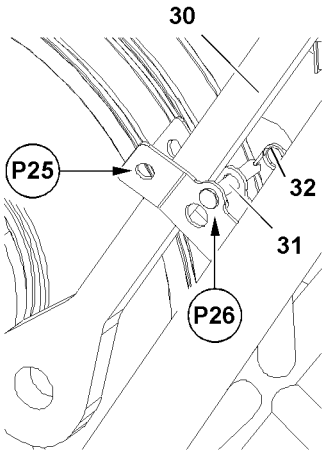

Fig.127674: Securing the FAB-guy rods on the FA-frame

Secure the FAB-guy rods **30** on both sides:

- ▶ Remove the retaining element **32** at point **P30** and unpin the pin **31** from the park position.
- ▶ Insert the pins **31** at point **P25** and secure with the retaining element **32**.
- ▶ Lower the FA-frame **7** with the hoist rope **50** in direction of the F-jib until the angle between the FA-frame **7** and the horizontal is approx. 40°.
- ▶ Fasten the F-jib properly to the auxiliary crane.
- ▶ Pull up the F-jib with the auxiliary crane to the FA-frame **7**.

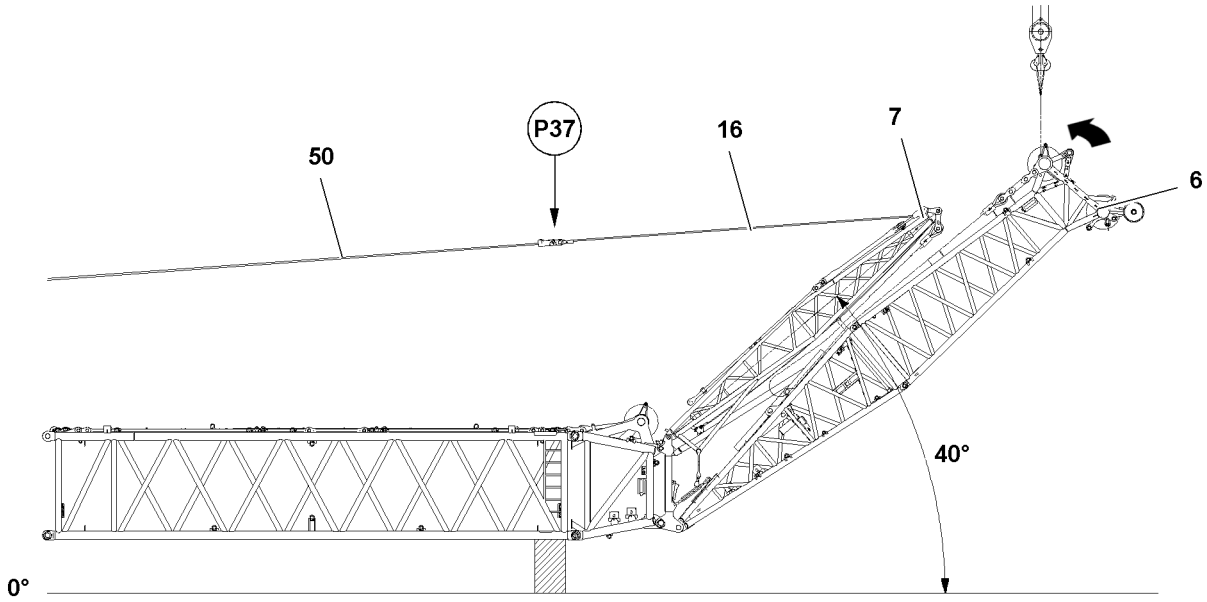

Fig.127672: Lifting the assembly unit on the F-end section

NOTICE
Danger of slack rope formation!
When spooling the hoist rope **50** out, slack rope can form.
- ▶ When spooling out the hoist rope **50**, make sure there is no slack rope.

When the F-jib is safely held with the auxiliary crane:
- ▶ Spool the hoist rope **50** out until the hoist rope **50** is relieved.
- ▶ Separate the hoist rope **50** and the fastening rope **16**.

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- ▶ Fasten the fastening rope **16** on the transport retainer on the FA-frame **7**.
- ▶ Take down the F-assembly unit **6** on the ground with the auxiliary crane.

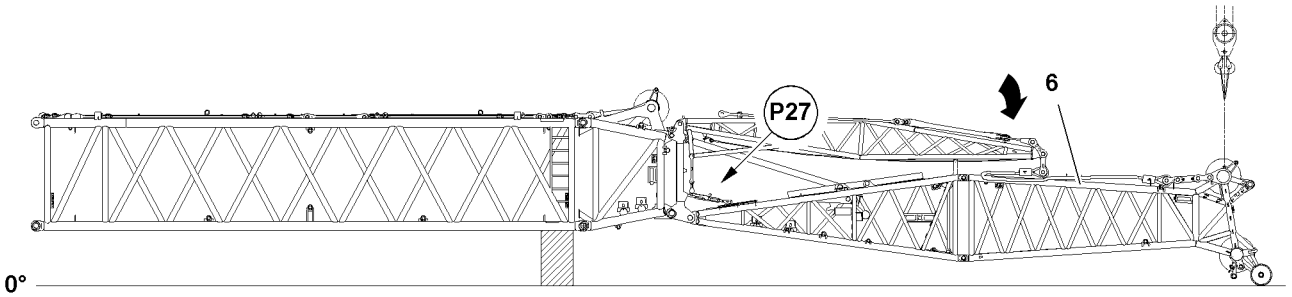

Fig.127906: Taking down the F-assembly unit on the ground with the auxiliary crane.

- ▶ Remove the auxiliary crane on the F-end section.

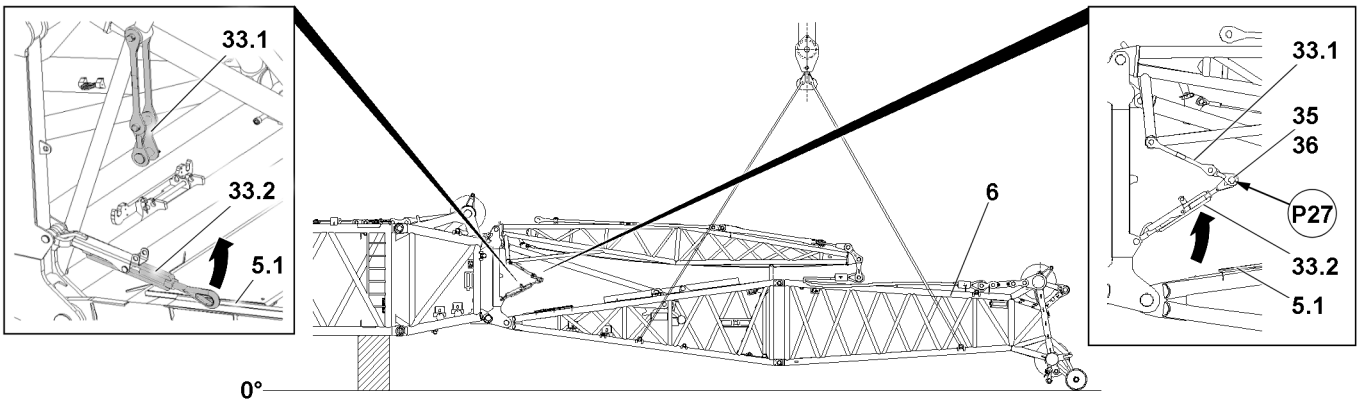

Fig.127905

- ▶ Fasten the F-assembly unit **6** with the F-end section on the corresponding fastening points for the assembly, see section Fastening points.

When the F-assembly unit **6** is properly fastened with the F-end section on the fastening points on the auxiliary crane:

- ▶ Lift the F-assembly unit **6** with the auxiliary crane until the pin bores of the F-relapse support **18** align on the pin point **P20**.
- ▶ Pin the FA-frame relapse retainer **33** on both sides: Pin the guy rod **33.1** with the turnbuckle **33.2** at point **P27** with pin **35** and secure with the retaining element **36**.

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12.4.3 Disassembling the F-assembly unit with F-end section

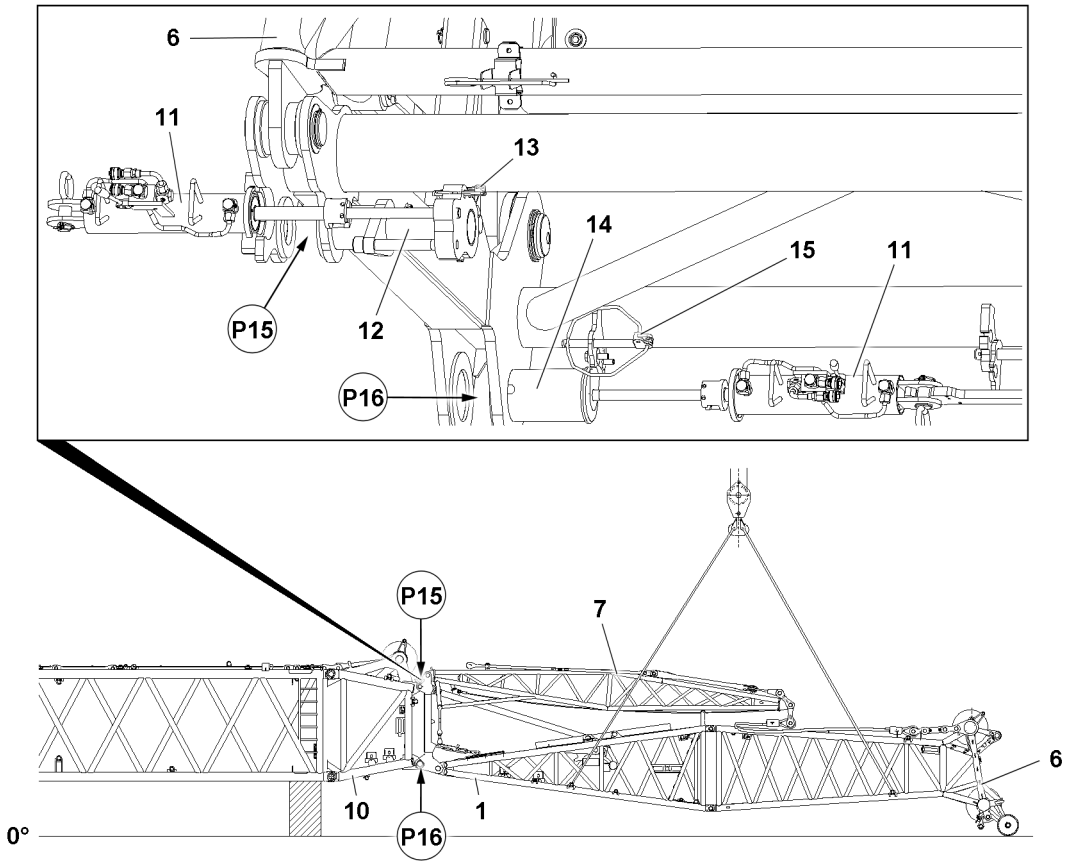

*Fig.127909: Unpinning the F-assembly unit with the F-end section **6** on the L-end section or on the F-connector head on top*

▶ Lift the F-assembly unit with the F-end section **6** with the auxiliary crane until the pin bore of the F-relapse support **18** can be pinned at point **P20** in the transport position.

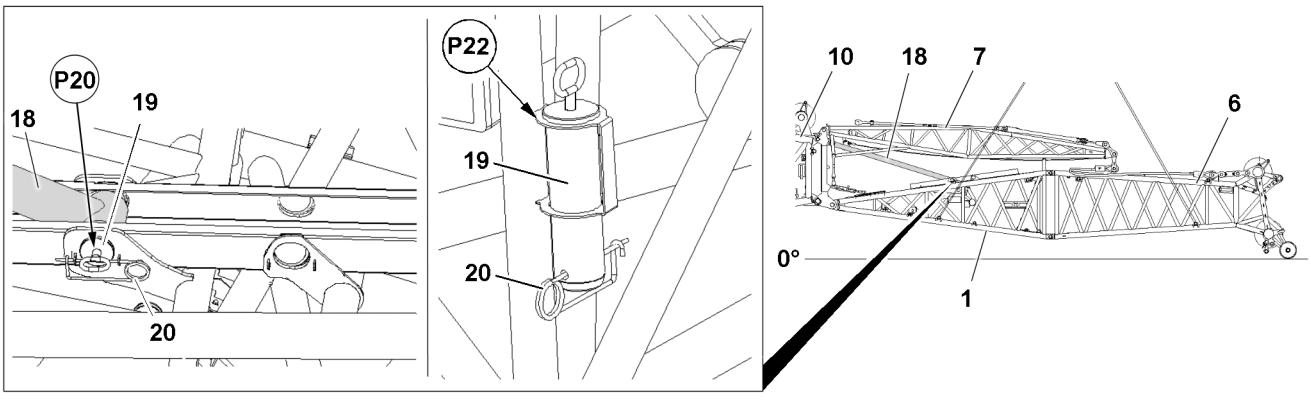

*Fig.127908: Pinning the F-relapse support **18** in the transport position*

When the pin bore of the F-relapse support **18** aligns with the pin hole at point **P20**:

▶ Remove the retaining element **20** at point **P22** and unpin the pin **19**

Secure the F-relapse support **18** in the transport position:

▶ Insert the pin **19** at point **P20** and secure with the retaining element **20**.

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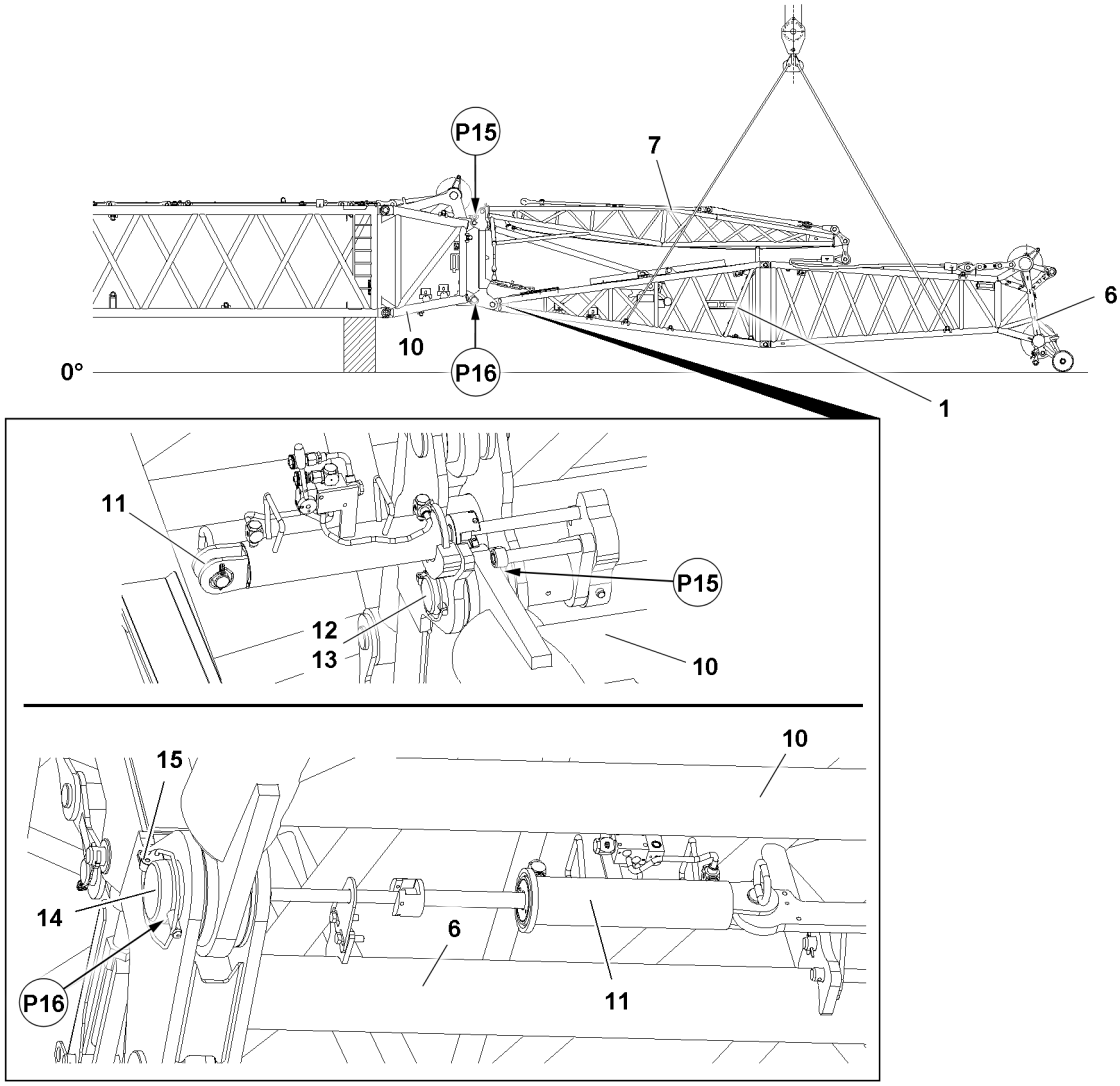

*Fig.127910: Unpinning the F-assembly unit with the F-end section **6** on the L-end section or on the F-connector head on the bottom*

When the F-assembly unit with the F-end section **6** is safely held in position by the auxiliary crane:

- ▶ Release pins **14** on both sides: Remove the retaining element **15**.
- ▶ Set the pin pulling cylinder **11** at pin point **P16** and unpin the pin **14**.
- ▶ Release the pin **12** at point **P15**: Remove the retaining element **13**.
- ▶ Set the pin pulling cylinder **11** at pin point **P15** and unpin the pin **12**.

When all four pins between the F-assembly unit with the F-end section **6** and L-end section or F-connector head are unpinned:

- ▶ Swing out the F-assembly unit with F-end section **6** with the auxiliary crane and take it down.
- ▶ Remove the auxiliary crane.
- ▶ Attach the rigging belts properly between the F-pivot section **1** and FA-frame **7**.
- ▶ Tighten the rigging belts.
- ▶ Insert the pin **12** at point **P15** on both sides and secure.
- ▶ Insert the pin **14** at point **P16** on both sides and secure.

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5.13.10 SLF-boom combination

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8	Disassembling the F-jib	33

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1 Component overview

Note
▶ The assembly sections are marked with their own weight.

Note
▶ Dimensions and weights, see chapter 1.03.

1.1 F-pivot section

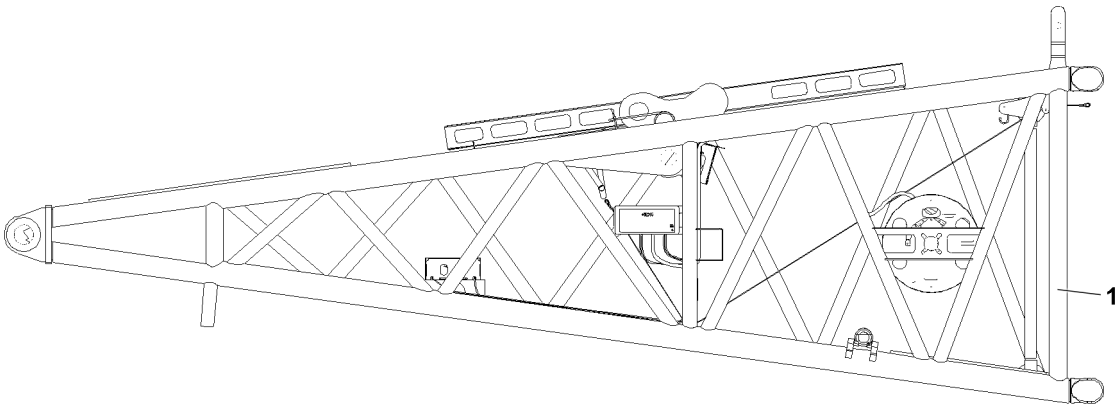

Fig.153171: F-pivot section

Position	Component
1	F-pivot section

1.2 F-intermediate section 3 m

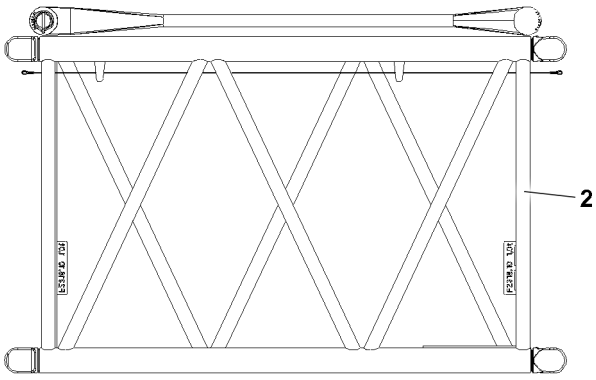

Fig.153172: F-intermediate section 3 m

Position	Component
2	F-intermediate section 3 m

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1.3 F-intermediate section 6 m

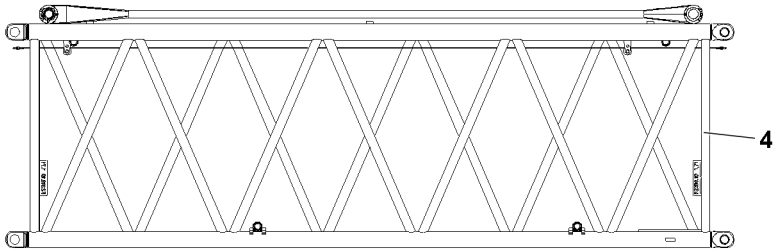

Fig.153174: F-intermediate section 6 m

Position	Component
4	F-intermediate section 6 m

1.4 F-intermediate section 12 m

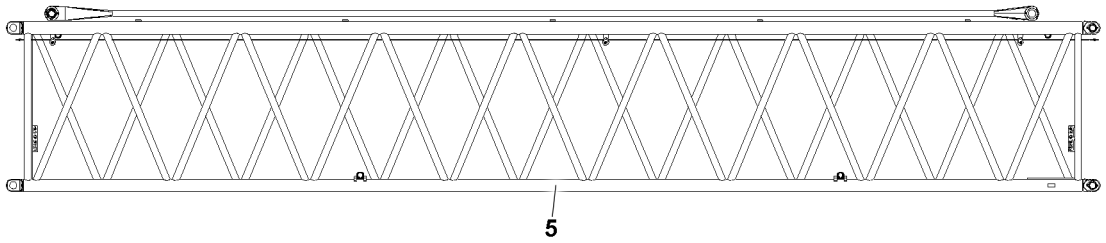

Fig.153175: F-intermediate section 12 m

Position	Component
5	F-intermediate section 12 m

1.5 F-end section

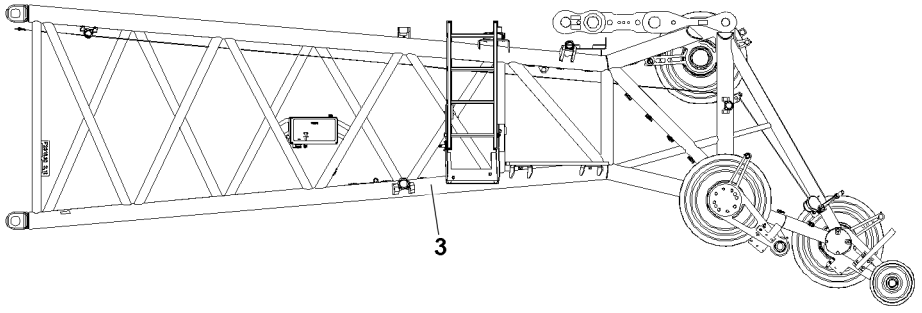

Fig.153173: F-end section

Position	Component
3	F-end section

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1.6 F-assembly unit

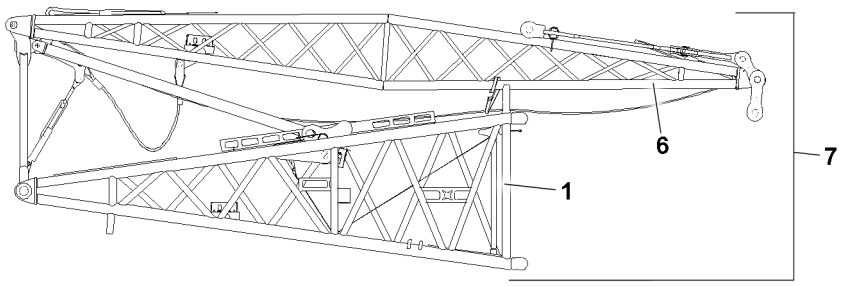

Fig.153176: F-assembly unit

Position	Component
1	F-pivot section
6	FA-frame
7	F-assembly unit

2 F-jib fastening points

WARNING
Falling lattice sections!
Death, severe bodily injuries, property damage.
- ▶ Make sure that the lattice sections are properly fastened on the respective fastening points.
- ▶ Make sure that the fastening equipment has the appropriate length and a sufficient load bearing capacity.
- ▶ Pay attention and adhere to the labels on the fastening points on the lattice sections and crane components.

Note
- ▶ The recommended length for the fastening equipment is 6 m.

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2.1 F-pivot section

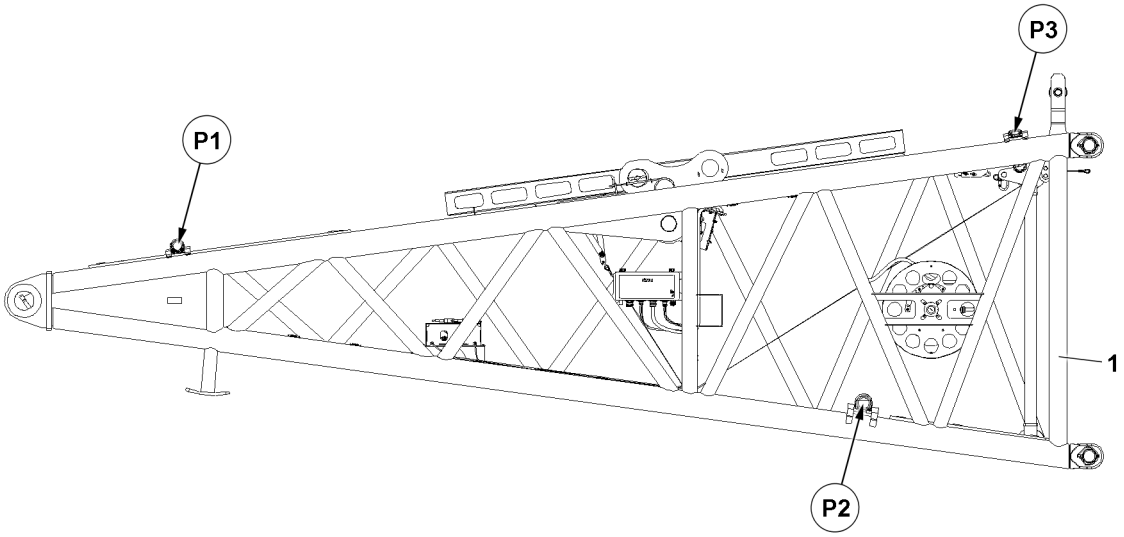

Fig.153177: F-pivot section

Fastening points	
P1 and **P2**	F-pivot section
P3	„Close“ or „open“ the F-jib

2.2 F-intermediate section 3 m

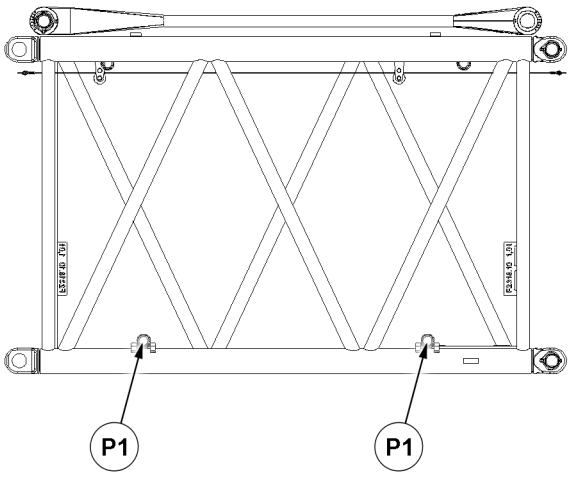

Fig.153178: F-intermediate section 3 m

Fastening points	
P1	F-intermediate section 3 m

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2.3 F-intermediate section 6 m

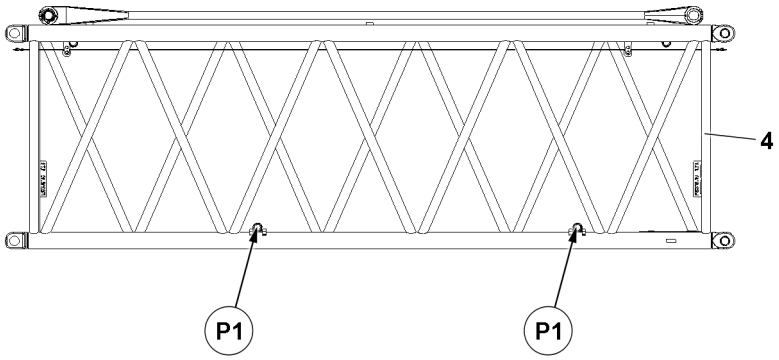

Fig.153179: F-intermediate section 6 m

Fastening points	
P1	F-intermediate section 6 m

2.4 F-intermediate section 12 m

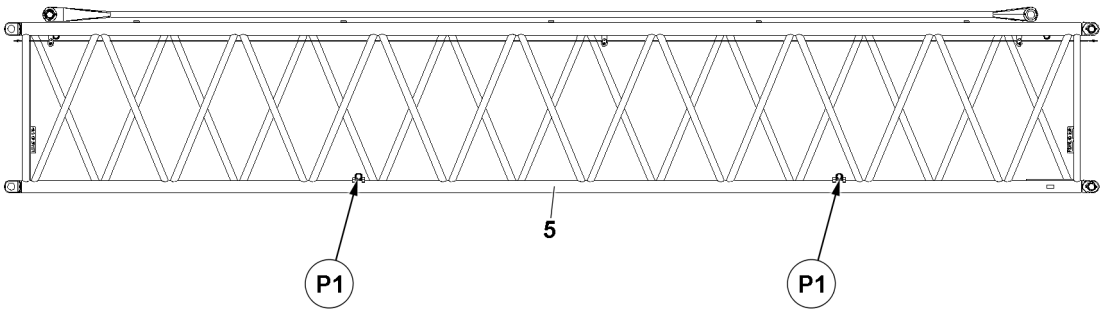

Fig.153180: F-intermediate section 12 m

Fastening points	
P1	F-intermediate section 12 m

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2.5 F-end section

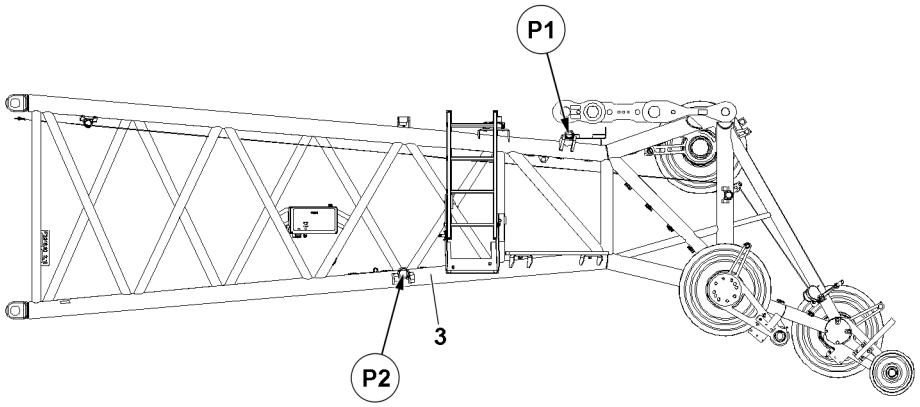

Fig.153181: F-end section

Fastening points	
P1	F-end section
P2	F-jib (12 m)

2.6 F-assembly unit

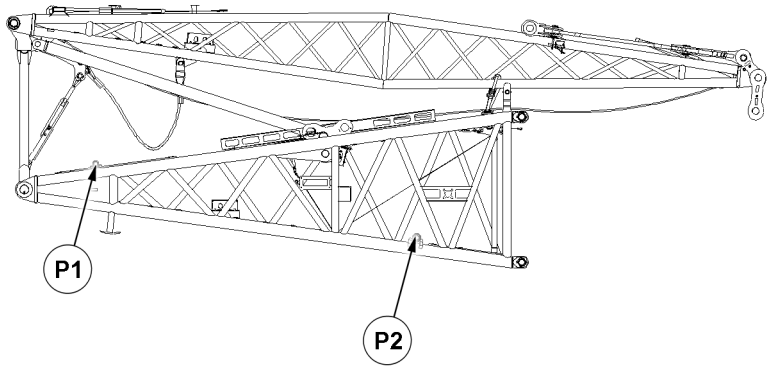

Fig.153182: F-assembly unit

Fastening points	
P1 and **P2**	F-assembly unit

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2.7 F-jib

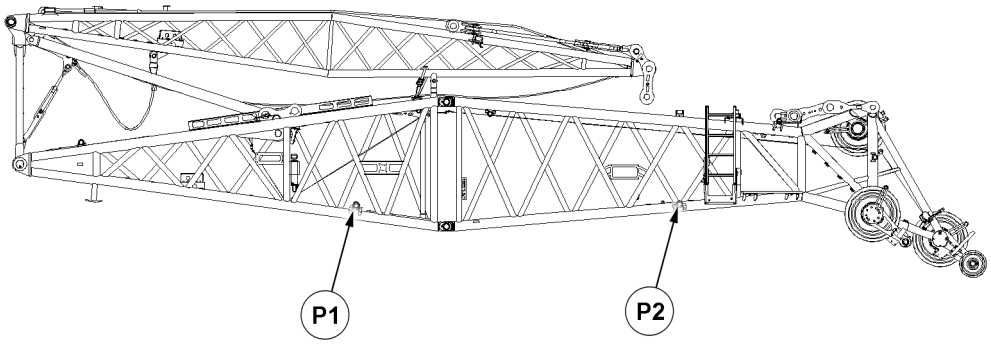

Fig.153183: F-assembly unit with F-end section

Fastening points	
P1 and **P2**	F-jib (12 m)

3 Assembling the F-jib

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.

- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ When closing or opening boom systems during boom assembly or boom disassembly, no persons may remain on the boom system or in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow, frost and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane driver of the main crane must be in voice contact with the crane driver / crane drivers of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane driver may only initiate crane movements when the responsible guide has explicitly released the movement.

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WARNING
Working without aids!
Death, severe bodily injuries, property damage.
When assembling and disassembling crane components with the auxiliary crane, they can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
Do not disengage the auxiliary crane until the component is completely pinned and secured!
Death, severe bodily injuries, property damage.
If a component is disengaged from the auxiliary crane before it is pinned, then it can fall.
- ▶ Do not disengage the auxiliary crane until the component is pinned and secured.

WARNING
Incorrect or incomplete pinning!
Death, severe bodily injuries, property damage.
If the lattice sections are not pinned and secured correctly, then they can fall down.
- ▶ Insert or unpin both pins on the same horizontal level, i.e. **left and right**.
- ▶ Do not stand under the lattice sections or within the entire danger zone during the pinning and unpinning procedure of the boom.
- ▶ Safely secure the pins in the storage locations as well as in the receptacles.

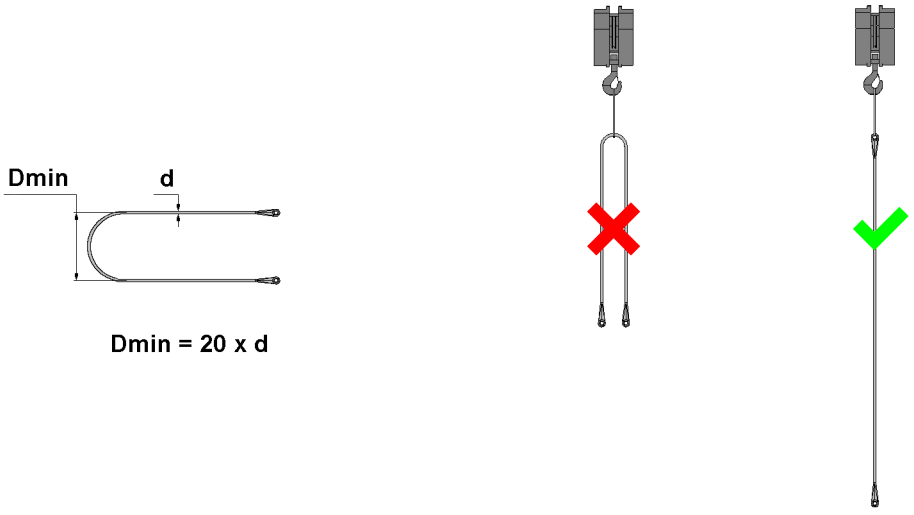

Fig.153258: Attaching the fiber guy ropes

Minimum diameter **Dmin**

Rope diameter **d**

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WARNING
Incorrect handling of the fiber guy ropes!
If the fiber guy ropes are installed twisted on the longitudinal axis, then the load bearing capacity can be significantly reduced as a result and the fiber guy ropes can rip off.
If the fiber guy ropes are installed twisted on the longitudinal axis, then the load bearing capacity can be significantly reduced as a result and the fiber guy ropes can rip off.
Death, severe bodily injuries, property damage.

- ▶ Make sure that the fiber guy ropes are **never** kinked, knotted or twisted.
- ▶ Make sure the kinked, knotted or twisted fiber guy ropes are **never** installed.
- ▶ Make sure that the fiber guy ropes are never pulled over the ground or sharp edges.
- ▶ Make sure that no damaged fiber guy ropes are installed.
- ▶ Make sure that the numbering in the rod plan is identical to the numbering on the fiber guy ropes.
- ▶ Make sure that minimum bending diameter of **20** x rope diameter on the fiber guy ropes is **never** fallen below.
- ▶ Make sure that the operating temperature of the fiber guy rope of -40 °C to +60 °C is not fallen below / exceeded.
- ▶ Check the fiber guy ropes before every assembly.
- ▶ When using fiber guy ropes: Inspect the fiber guy ropes regularly, see chapter 8.16.
- ▶ Make sure that the fiber guy ropes are not twisted upon assembly. Pay attention to the twist display - marker line along the longitudinal axis of the rope braid.

WARNING
Incorrect storage and transport of the fiber guy ropes!
If the following prerequisites for storage and transport are not observed, then the load bearing capacity can be significantly reduced and the fiber guy ropes can rip off.
Death, severe bodily injuries, property damage.

- ▶ Make sure that minimum bending diameter during storage and transport of **20** x rope diameter on the fiber guy ropes is **never** fallen below.
- ▶ Make sure that the fiber guy ropes are **not** kicked or knotted during storage and transport.
- ▶ Make sure that the fiber guy ropes are **not** twisted during storage and transport. Pay attention to the twist display - marker line along the longitudinal axis of the rope braid.
- ▶ Make sure that the fiber guy ropes do **not** lie over sharp edges during storage and transport.
- ▶ Make sure that the fiber guy ropes are **not** in contact with chemicals or acids during storage and transport.
- ▶ Make sure that the fiber guy ropes are **not** stored or transported together with other components.
- ▶ Store and transport the fiber guy ropes in the provided transport box.
- ▶ For the transport of the fiber guy ropes, see chapter 2.04.

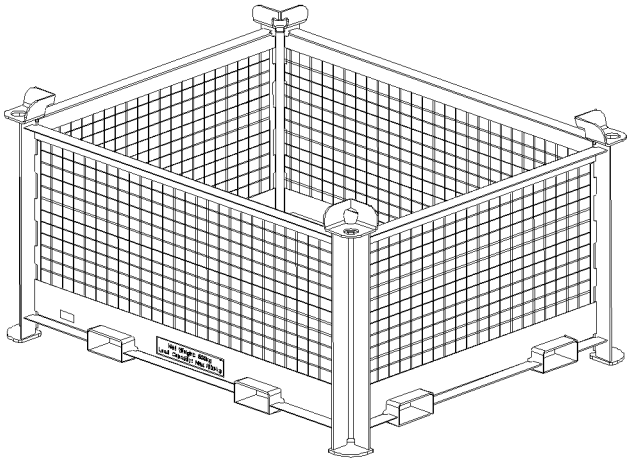

Fig.153259: Transport box for fiber guy ropes

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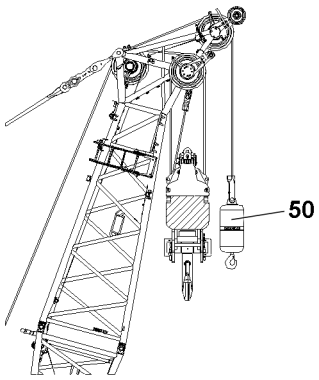

Fig.153260: Using the load hook on the boom nose

50 Load hook

NOTICE
Use of an incorrect load hook!
Collision and damage to the boom nose.
▶ Make sure that only the load hook **50** may be attached to the integrated boom nose.

WARNING
Suspended hook block during assembly!
Death, severe bodily injuries, property damage.
▶ During assembly, no hook block may be attached to the F-jib.

Note
▶ The F-jib is **not** adjustable during crane operation.
▶ The F-jib can be assembled at an angle of 10°; 15°, 20° to the SL-boom.
▶ Lengths of 12 m to 39 m are possible.
▶ The assembly and disassembly of the F-jibs is described based on a 12 m jib.
▶ Observe and adhere to the Rod plan.

Make sure that the following prerequisites are met:
– The crane is completely supported and horizontally aligned.
– The derrick boom is installed with the required length on the crane, see chapter 5.05.
– The SL-boom combination is installed with the required length on the crane and taken down on the ground or on the substructure.
– All WA-frame guy rods have been removed on the SL-boom combination.
– The suspended ballast pallet is near the crane.
– The suspended ballast pallet is aligned with the center of rotation of the crane.
– The suspended ballast is placed on the suspended ballast pallet according to the erection and take-down chart.
– The LICCON overload protection has been set according to the data in the load chart.
– The LICCON overload protection settings match the actual set up configuration of the crane.
– The LICCON overload protection is exceeded.
– The assembly icon is visible on the LICCON monitor.
– All unnecessary function keys and manual control levers are blocked on the radio remote control, see chapter 5.31 and chapter 6.08.
– An auxiliary crane is available.

3.1 Assembling the F2-jib

WARNING
Maximum permissible assembly lengths exceeded!
Death, severe bodily injuries, property damage.
▶ Observe the maximum permissible assembly lengths.

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3.1.1 Assembling the F-assembly unit

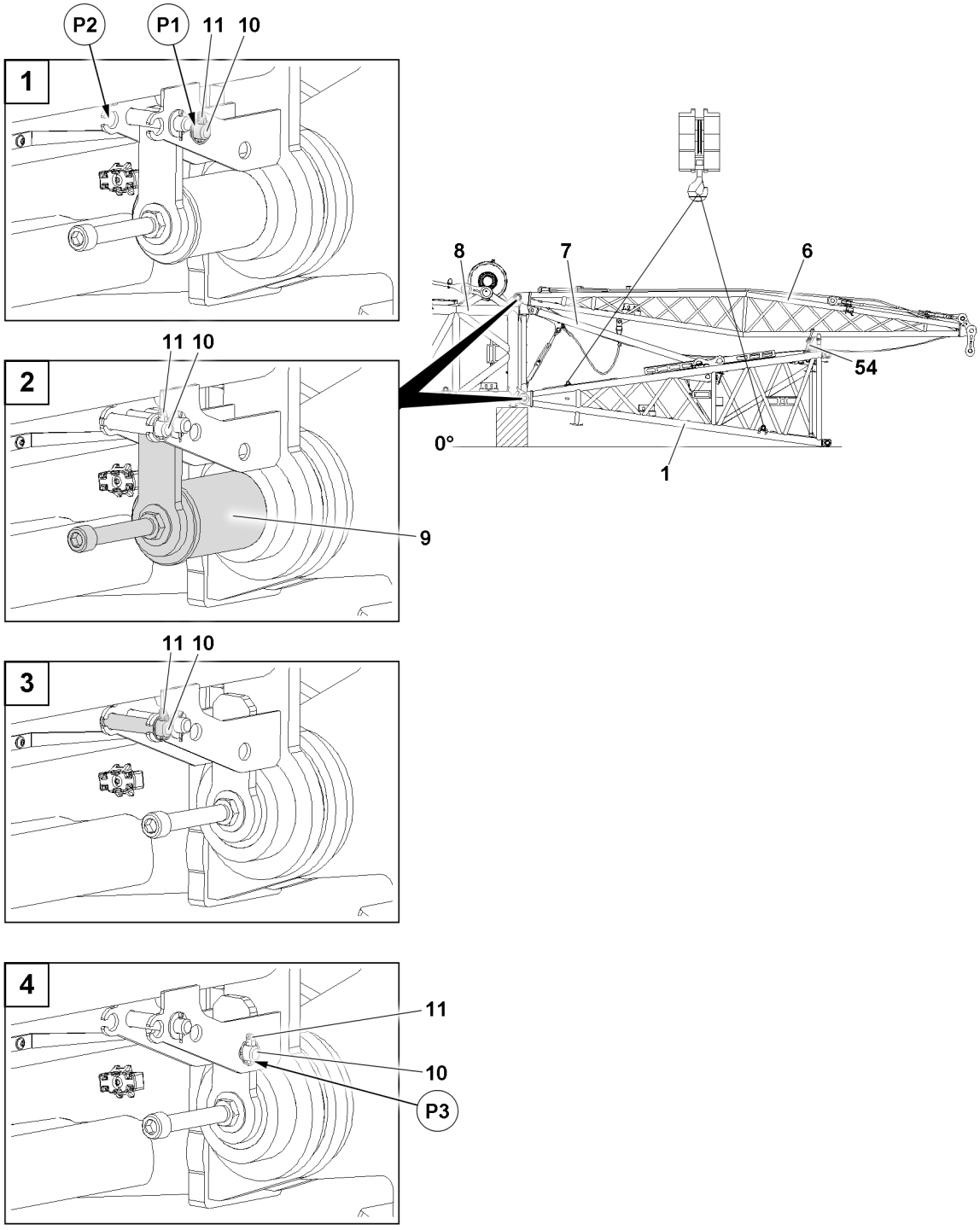

Fig.153184: Pinning the F-assembly unit

1 F-pivot section
6 FA-frame
7 F-assembly unit
8 F-connector head
9 Pin
10 Retaining pin
11 Retaining element
54 Rigging belt

▶ Fasten the F-assembly unit **7** to the auxiliary crane.
▶ Remove the rigging belts **54** between the F-pivot section **1** and the FA-frame **6**.

The F-assembly unit **7** is pinned four times on F-connector head **8**. Every pin point is present on both sides of the component on one level.

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First the two pins **9** at the top are inserted and then both pins **9** at the bottom.

The pinning procedure is described based on one pin **9** as an example. The pinning procedure takes place in the same manner for all four pin points.

▶ Position the F-assembly unit **7** with the auxiliary crane on the F-connector head **8** so that it can be pinned in the pin locations.

WARNING
Crane movements while pinning!
Death, severe bodily injuries, property damage.
▶ Make sure that no crane movements are performed while pinning in the area of the lower pin points.

▶ Remove the retaining element **11**. in position **P1** and unpin the retaining pin **10**.
▶ Insert the retaining pin **10** in the park position **P2** and secure with the retaining element **11**.
▶ Insert the pin **9**.
▶ Release the retaining pin **10** and unpin in the park position **P2**.
▶ Insert the retaining pin **10** in the retaining position **P3** and secure with the retaining element **11**.
▶ Insert the pins **10** on both sides and secure with the retaining element **11**.

3.1.2 Releasing the F-relapse support

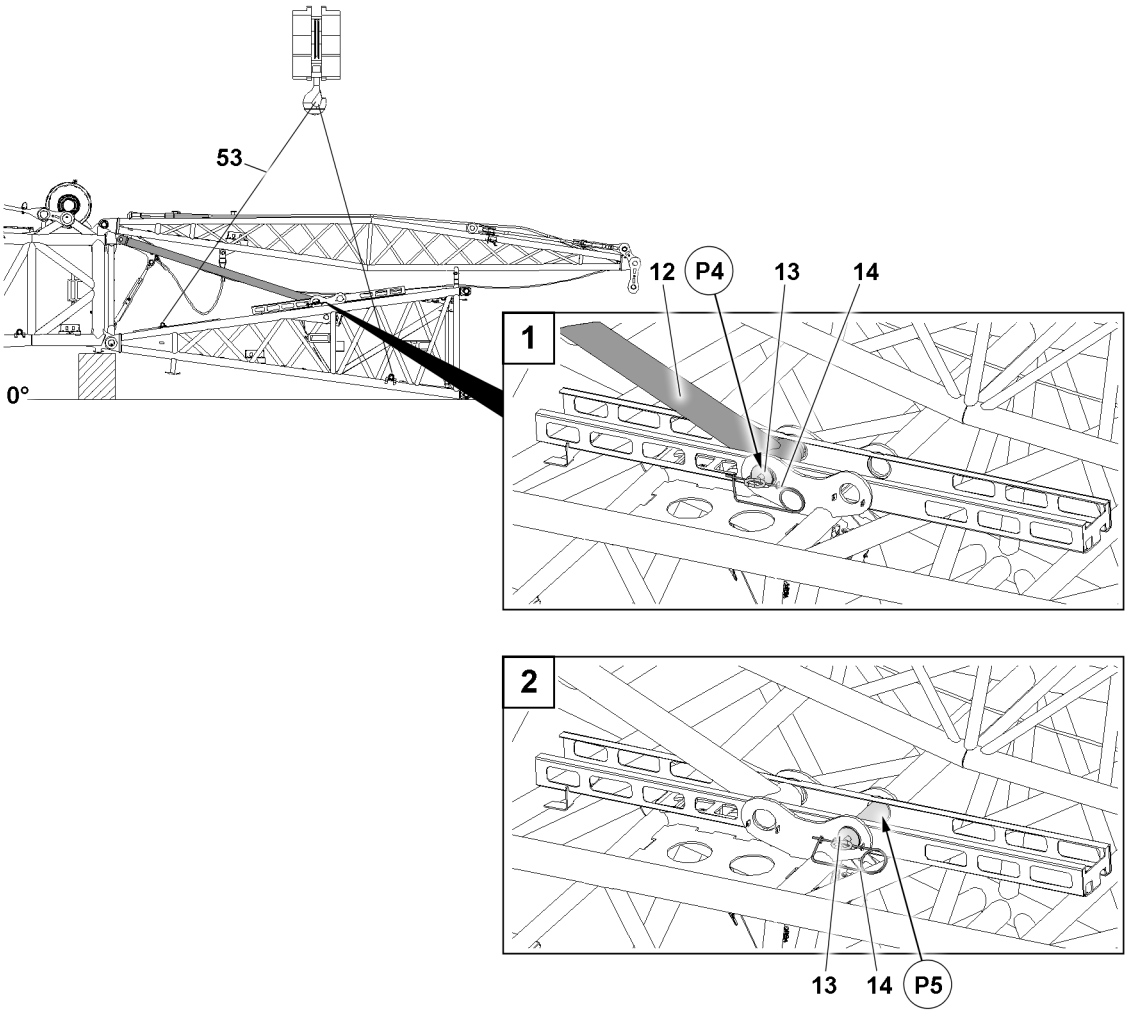

Fig.153185: F-relapse support and FA-frame relapse retainer in the transport position

12 F-relapse support
13 Pin
14 Retaining element

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Release the F-relapse support **12** from the transport position **P4**:

- ▶ Remove the retaining element **14** in the transport position **P4** and unpin the pin **13**.
- ▶ Insert the pin **13** in the stop position **P5** and secure with the retaining element **14**.

When the F-relapse support **12** is released:

- ▶ Slowly lower the F-assembly unit.
- ▶ Remove the fastening equipment **53**.
- ▶ Remove the auxiliary crane.

3.1.3 Separating the FA-frame relapse retainer

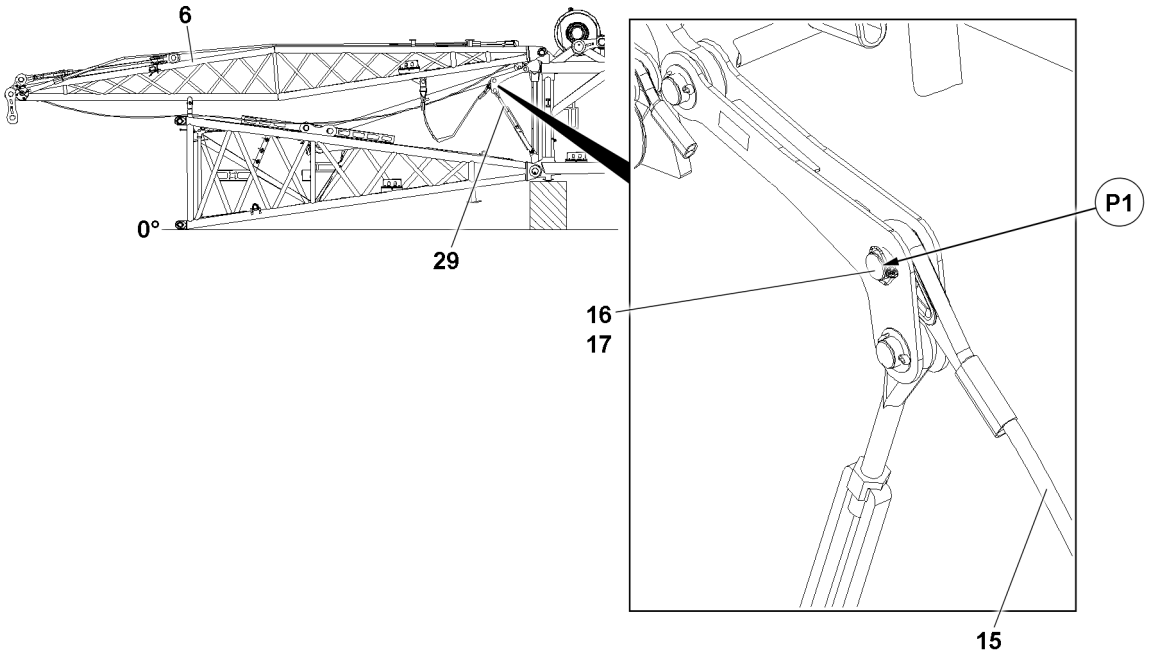

Fig.153186: Separating the FA-frame relapse retainer

6	FA-frame	**16**	Pin
15	Guy rope	**17**	Retaining element

WARNING
Unsecured guy rope **15**!
The guy rope **15** of the FA-frame relapse retainer **29** can fall down due to its own weight when unpinning.
Death, severe bodily injuries, property damage.

- ▶ Make sure when unpinning the FA-frame relapse retainer **29**, that the guy rope **15** is safely held.
- ▶ Assembly personnel must be to the side of the assembly unit.

NOTICE
The FA-frame relapse retainer is not separated!
Property damage.
If the guy rope **15** of the FA-frame relapse retainer **29** is not separated, then it will be damaged during erection of the FA-frame **6**.

- ▶ Make sure that the guy rope **15** of the FA-frame relapse retainer **29** is separated during the erection of the FA-frame **6**.

Separate the FA-frame relapse retainer **29**:

- ▶ Remove the retaining element **17**.
- ▶ Unpin the pin **16** in position **P1**.
- ▶ Take the guy rope **15** down.
- ▶ Insert the pin **16** in position **P1**.

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▶ Secure the pin **16** with the retaining element **17**.

3.1.4 Preparing the rope pulley retainer for assembly of the F-jib

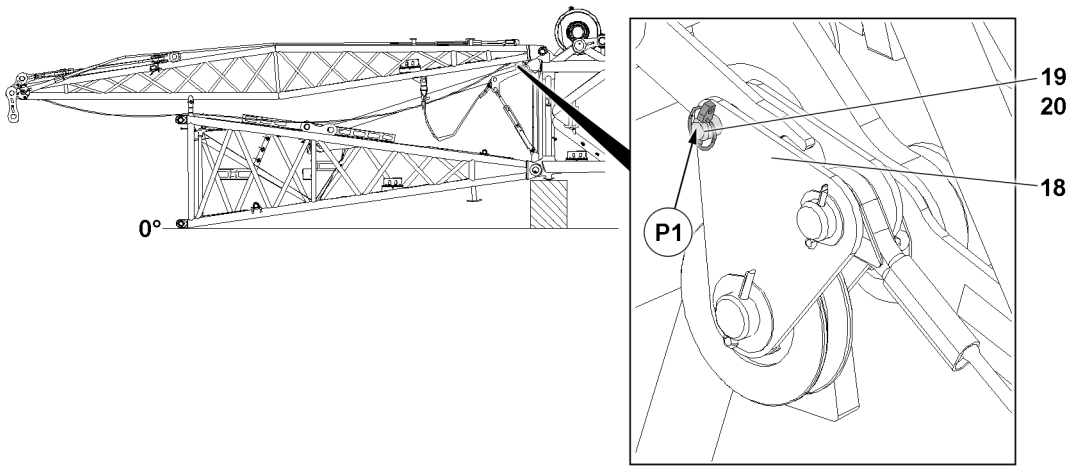

Fig.153187: Rope pulley retainer in the transport position

18 Rope pulley retainer
19 Pin
20 Retaining element

WARNING
Falling rope pulley retainer **18**!
The rope pulley retainer **18** can fall down due to its own weight when unpinning it.
Death, severe bodily injuries, property damage.
▶ Make sure that the rope pulley retainer **18** is held during unpinning.
▶ Assembly personnel must be to the side of the assembly unit.

Releasing the rope pulley retainer **18** from the FA-frame:

▶ Remove the retaining element **20** and unpin the pin **19**.

When the rope pulley retainer **18** is released from the FA-frame **6**:
▶ Insert the pin **19** in position **P1** and secure with the retaining element **20**.
▶ Take the rope pulley retainer **18** down with the rope on the open end of the F-assembly unit.

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3.1.5 Assembling the F-guy ropes and the FAB-guy ropes

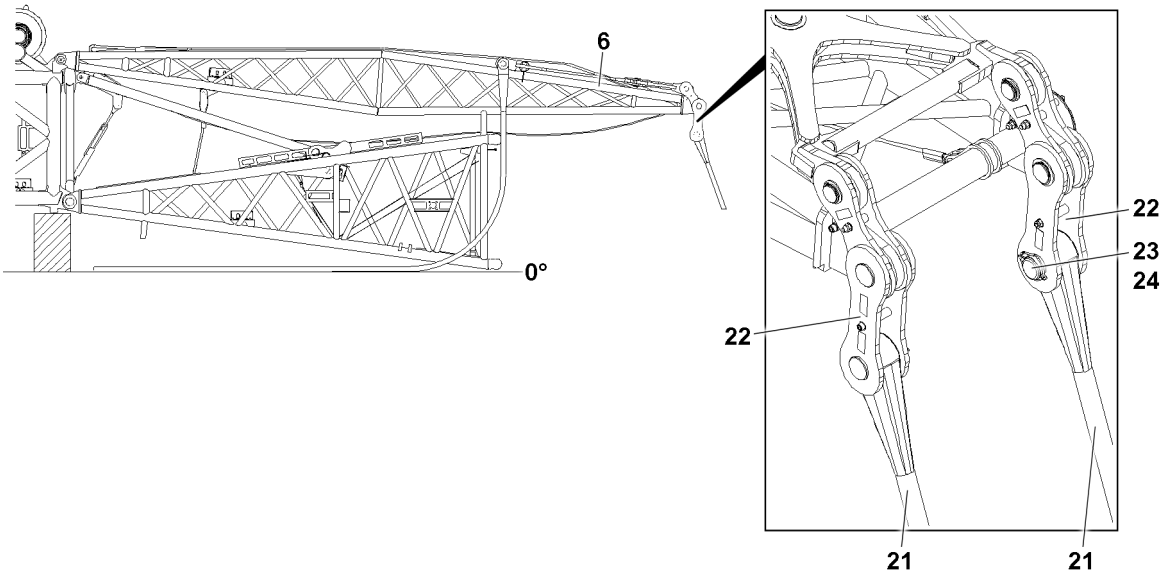

Fig.153188: F-guy ropes

6 FA-frame
21 F-guy rope
22 Bracket
23 Pin
24 Retaining element

Note
- ▶ The assembly of the F-guy rope **21** is described based on the example of one side.
- ▶ The assembly applies in the same way for both sides.

- ▶ Position the F-guy rope **21** such that it can be pinned to the bracket **22** of the FA frame **6**.
- ▶ Pin the F-guy rope **21** to the bracket **22**: Insert the pin **23** and secure it with the retaining element **24**.

When the first F-guy rope **21** is assembled and secured:
- ▶ Assemble the second F-guy rope **21**.
- ▶ Take down the free ends of the F-guy ropes **21** to the side of the boom.

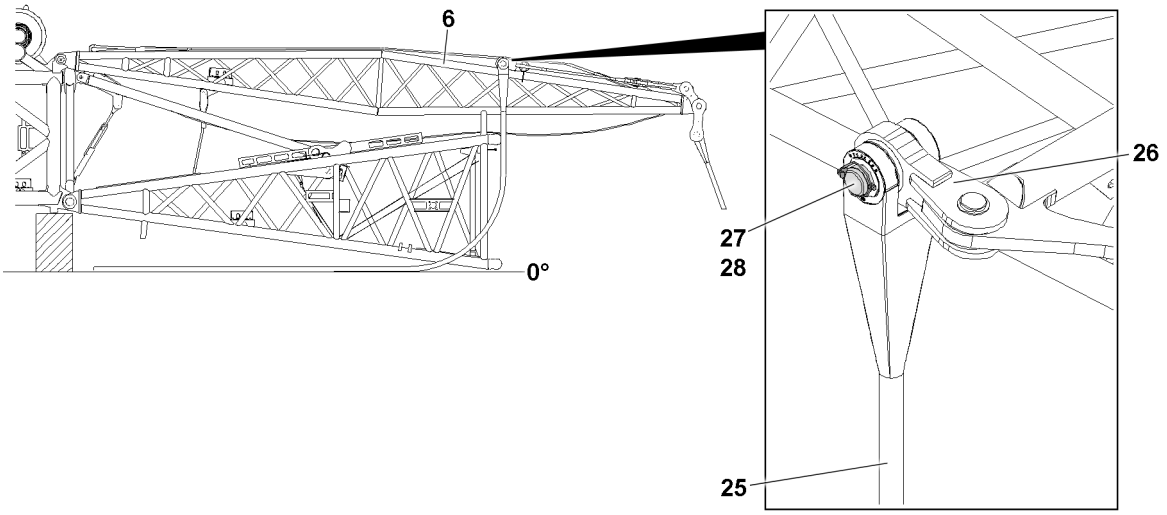

Fig.153189: FAB-guy rope

6 FA-frame
27 Pin

For continuation of legend for illustrations, see next page

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25 FAB-guy rope
26 Rocker
28 Retaining element

Note
- The assembly of the FAB-guy rope **25** is described based on the example of one side.
- The assembly applies in the same way for both sides.

- Position the FAB-guy rope **25** such that it can be pinned to the rocker **26** of the FA frame **6**.
- Pin the FAB-guy rope **25** with the rocker **26**: Insert the pin **27** and secure it with the retaining element **28**.

When the first FAB-guy rope **25** is properly assembled and secured:
- Pin the second FAB-guy rope **25** with the rocker **26**.
- Take down the free ends of the FAB-guy ropes **25** to the side of the boom.
- Take down the FAB-guy ropes **25** of the S-intermediate section according to the rod plan onto the boom and pin.

3.1.6 Erecting the FA-frame

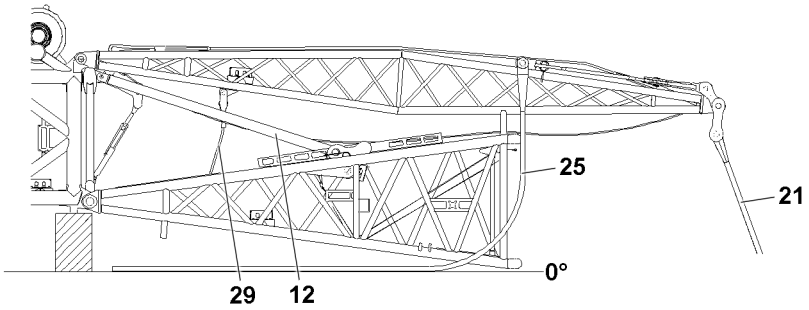

Fig.153190: Erecting the FA-frame — Prerequisites

12 F-relapse support
21 F-guy rope
25 FAB-guy rope
29 FA-frame relapse retainer

Make sure that the following prerequisites are met:
- The FA-frame relapse retainer **29** is separated.
- The F-relapse support **12** is released.
- The F-guy ropes **21** and FAB-guy ropes **25** are assembled.
- The rope pulley retainer is released from the FA-frame.
- The rigging belts between the F-pivot section and the FA-frame are removed.

Setting the flap „downward“

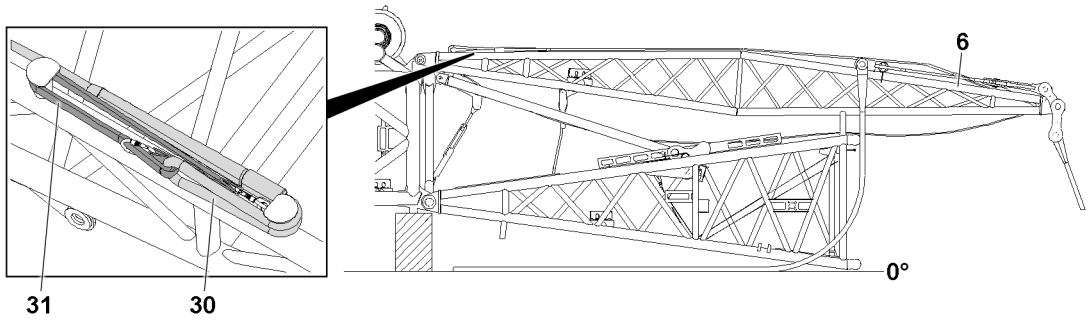

Fig.153191: Setting the „flap“ downward – Removing the fastening rope from the transport position

6 FA-frame
30 Fastening rope
31 Belt

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WARNING
Relaxed fastening rope **30**!
If the fastening rope **30** on the FA-frame **6** is not kept tensioned during assembly, the FA-frame **6** can swing suddenly to the side.
Death, severe bodily injury, property damage.
- ▶ Make sure that there are no persons within the danger zone.
- ▶ Make sure that the fastening rope **30** is tensioned during assembly / disassembly operations.

- ▶ Release the belt **31** from the fastening rope **30**.
- ▶ Remove the fastening rope **30** from the transport position.
- ▶ Fasten the FA-frame **6** with the fastening rope **30** to the auxiliary crane.

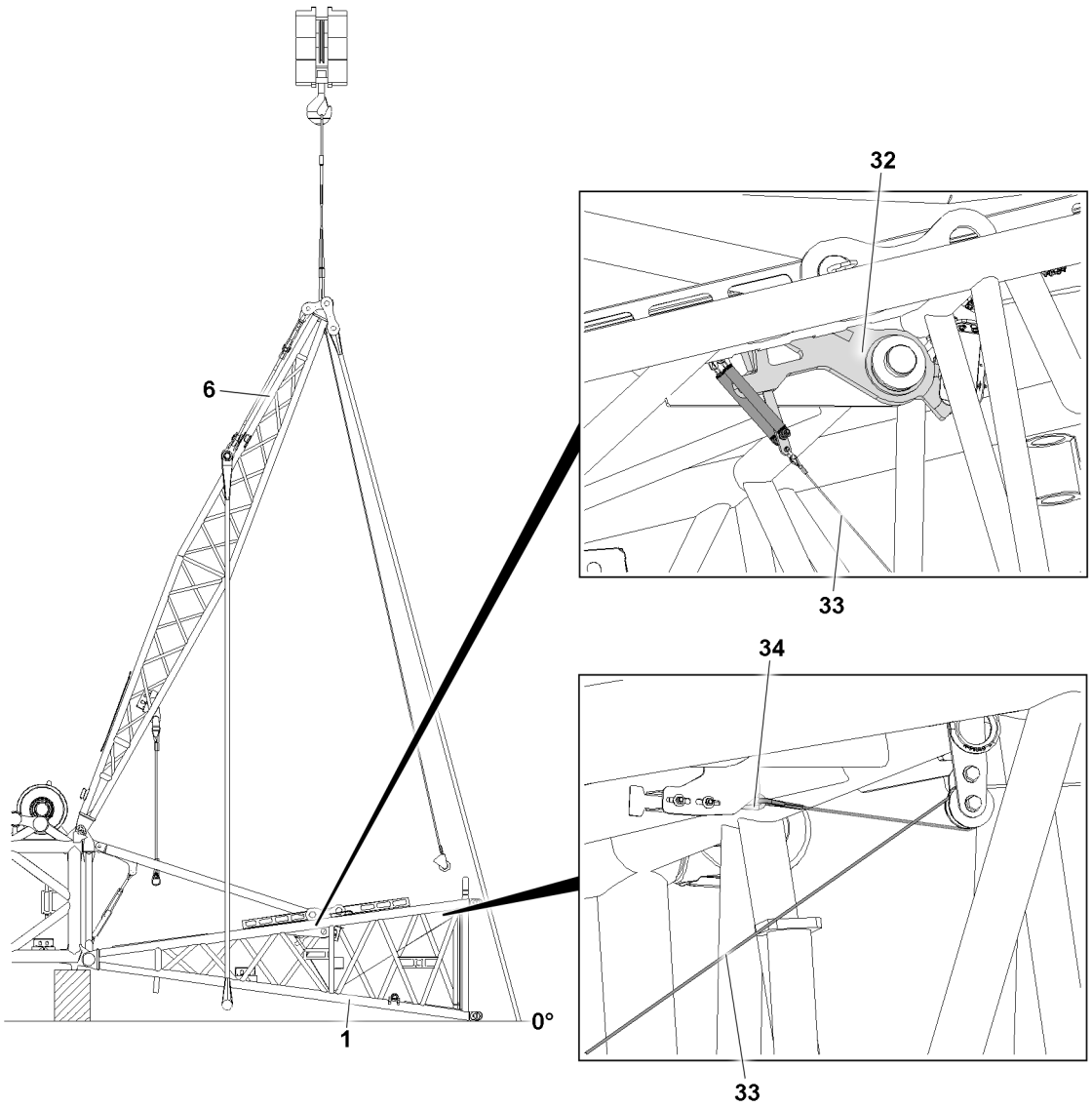

Fig.153192: Setting the „flap“ downward – lifting the FA-frame with the auxiliary crane

1 F-pivot section
6 FA-frame
32 Flap
33 Control rope
34 Hook closure

- ▶ Lift the FA-frame **6** with the auxiliary crane.
- ▶ Pull the flap **32** on the F-pivot section **1** with the control rope **33** „downwards“ and fix it with the hook closure **34**.

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Connecting the assembly winch rope with the rope pulley retainer

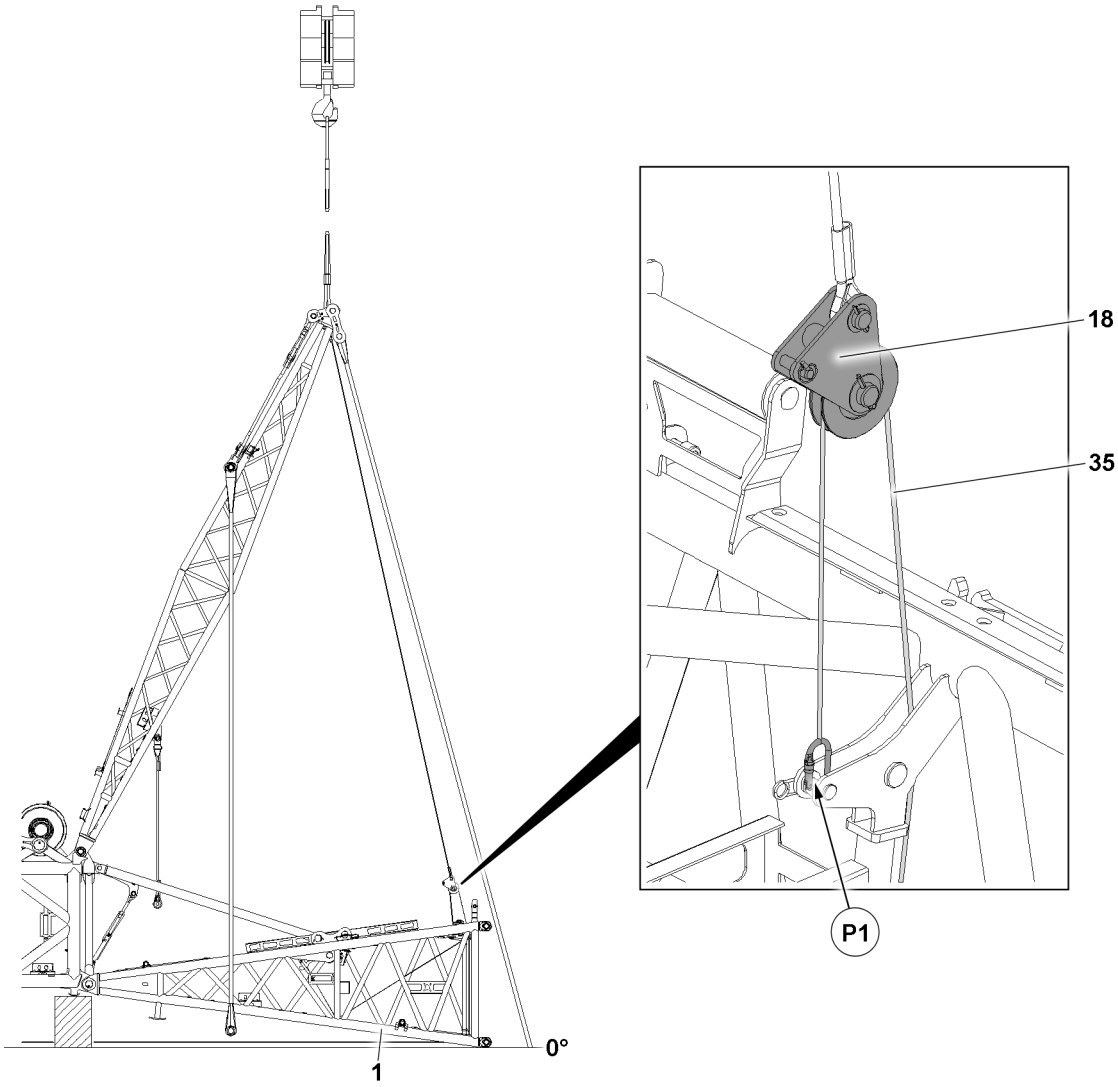

Fig.153193: Assembly winch rope with rope pulley retainer

1 F-pivot section
18 Rope pulley retainer
35 Assembly winch rope

▶ Reeve in the assembly winch rope **35** to the rope pulley retainer **18** and secure in position **P1** to the F-pivot section **1**.

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Pinning the FAB-guy ropes with the brackets of the L-intermediate section

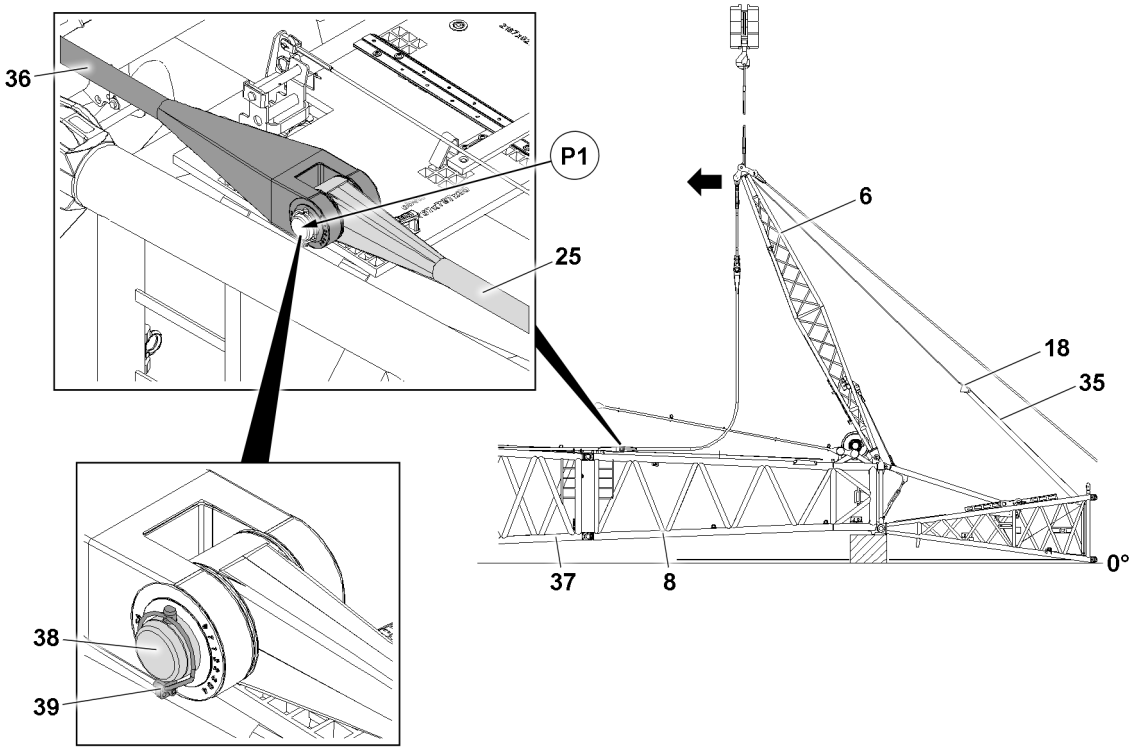

Fig.153194: Pinning the FAB-guy ropes with the brackets of the L-intermediate section

6 FA-frame
8 F-connector head
18 Rope pulley retainer
25 FAB-guy rope
35 Assembly winch rope
36 FAB-guy rope
37 L-intermediate section
38 Pin
39 Retaining element

NOTICE
Danger of property damage!
When swinging the FA-frame **6** in the direction of the main boom, damage may occur to the FA-frame **6**, the F-connector head **8**, as well as the rope pulley retainer **18**.

- ▶ Make sure that a guide supervises the swinging process of the FA-frame **6**.
- ▶ Make sure that the guide is constantly in visual and acoustic contact with the crane operator.
- ▶ Make sure that the assembly winch rope **35** is spooled out during the swinging process of the FA-frame **6**.

- ▶ Carefully swing the FA-frame **6** with the auxiliary crane in direction of the main boom and spool out the assembly winch rope **35** out at the same time until it can be pinned in the pin location **P1**.
- ▶ Align the FAB-guy rope **25** with the FAB-guy rope **36** of the L-intermediate section **37** such that it can be pinned.

Pin the FAB-guy rope **25** with the FAB-guy rope **36** of the L-intermediate section **37**:

- ▶ Insert the pin **38** and secure it with the retaining element **39**.
- ▶ Pin the second FAB-guy rope **25** on the opposite side the same way as described before.

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3.1.7 Setting the FA-frame in the operating position

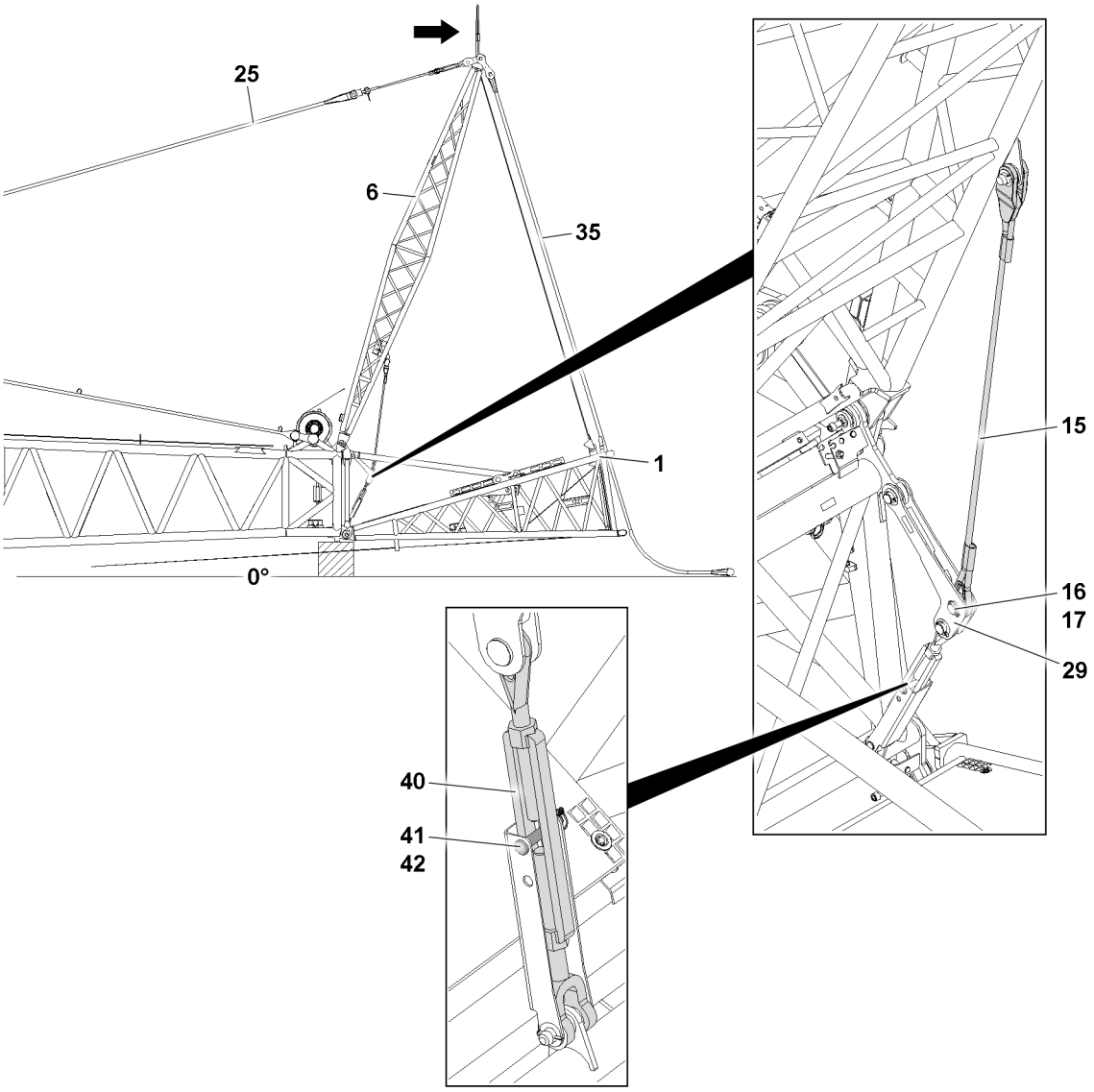

Fig.153195: Bringing the FA-frame into operating position

1 F-pivot section
6 FA-frame
15 Guy rope
16 Pin
17 Retaining element
25 FAB-guy rope
29 FA-frame relapse retainer
35 Assembly winch rope
40 Turnbuckle
41 Pin
42 Retaining element

Make sure that the following prerequisite is met:
– The FAB-guy ropes **25** are properly pinned and secured.

▶ Pull the FA-frame **6** with the assembly winch rope **35** in direction of the F-pivot section **1**.

Connect the guy rope **15** with the FA-frame relapse retainer **29**:
▶ Position the guy rope **15** such that it can be pinned to the FA-frame relapse retainer **29**.
▶ Insert the pin **16** and secure it with the retaining element **17**.

When the FA-frame relapse retainer **29** is properly pinned and secured:
▶ Tighten the turnbuckle **40** and secure it with the pin **41** and retaining element **42** to prevent it from twisting.

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Result:

– The turnbuckle **40** is secured to prevent it from twisting during crane operation.
– The FA-frame **6** is fixed in the operating position.

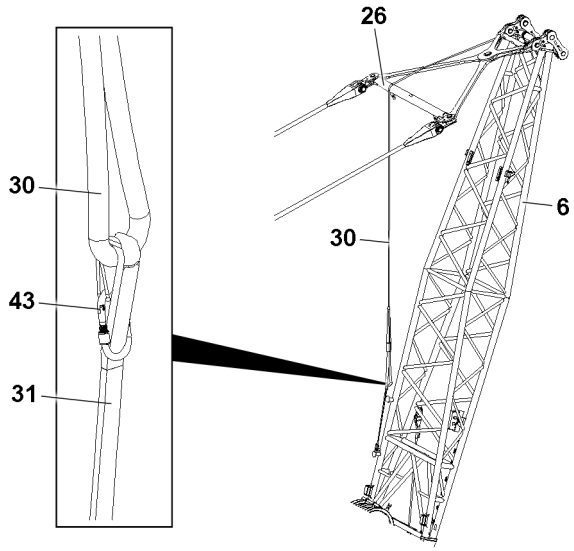

Fig.153196: Securing the fastening rope on the FA-frame for crane operation

6 FA-frame
26 Rocker
30 Fastening rope
31 Belt
43 Carabiner

NOTICE
Unsecured fastening rope **30**!
If the fastening rope **30** is not properly secured, then the fastening rope **30** can remain hanging on the crane components during crane operation.
The fastening rope **30** will be damaged.
▶ Make sure that the fastening rope **30** is secured to the FA-frame **6** before starting to work with the crane.

NOTICE
Secure the fastening rope **30** with the carabiner **43** to the belt **31**!
Damage to the fastening rope **30**.
▶ Connect the belt **31** through a loop with the fastening rope.

▶ Place the fastening rope **30** over the linkage **26**.
▶ Fasten the belt **31** with the carabiner **43** to the fastening rope **30**.

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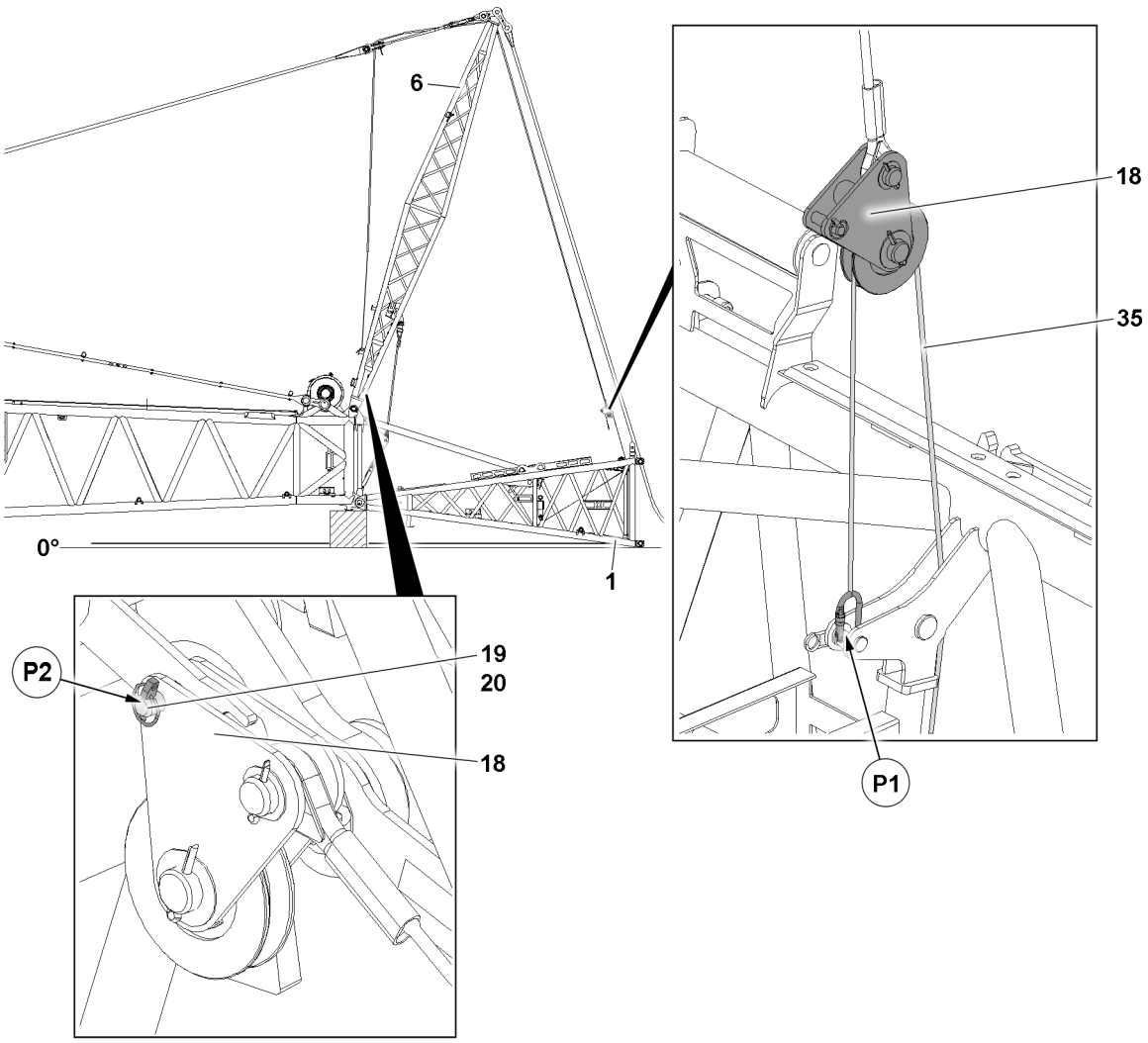

Fig.153197: Taking the F-pivot section down on the ground

1 F-pivot section
6 FA-frame
18 Rope pulley retainer
19 Pin
20 Retaining element
35 Assembly winch rope

Taking the F-pivot section **1** down on the ground:

- ▶ Spool the assembly winch rope **35** out until the F-pivot section **1** is lying on the ground and the assembly winch rope **35** is slightly relaxed.
- ▶ Release and reeve out the assembly winch rope **35** in position **P1**.

Swing the rope pulley retainer **18** to the FA-frame **6** and pin in position **P2**:

- ▶ Insert the pin **19** and secure it with the retaining element **20**.

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3.1.8 Inserting the connector pin of the F-pivot section and F-relapse support in the park position

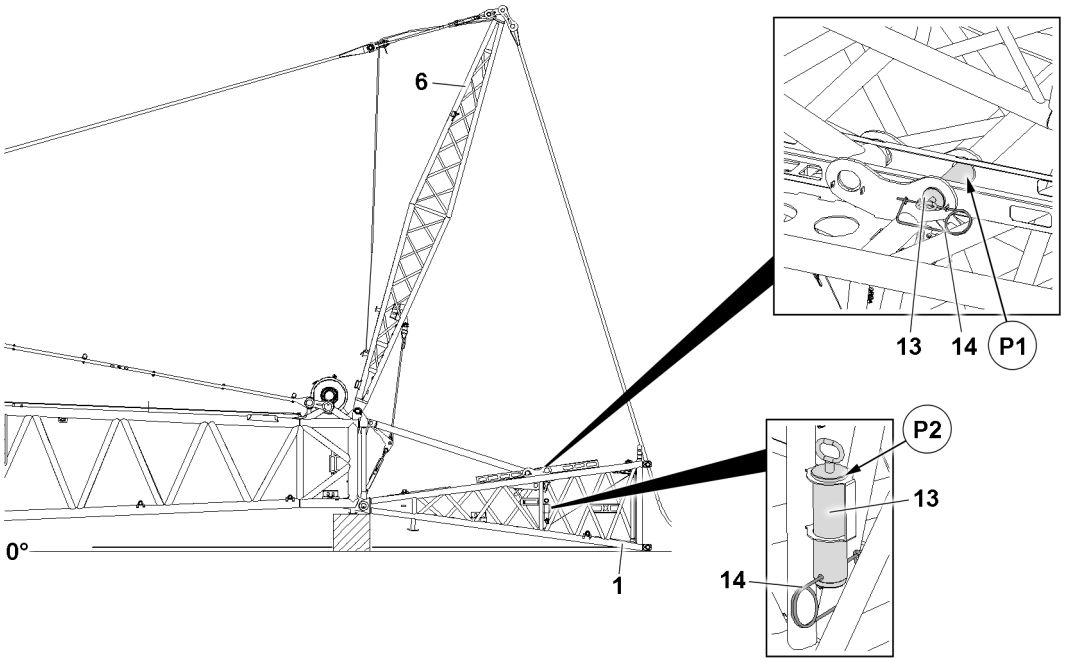

Fig.153198: Inserting the connector pin of the F-pivot section and F-relapse support in the park position

1 F-pivot section
6 FA-frame
13 Pin
14 Retaining element

Make sure that the following prerequisite is met:
– The FA-frame **6** is in the operating position.

Release the pin **13** out of the fastening position **P1**:

▶ Remove the retaining element **14** and unpin the pin **13**.
▶ Insert the pin **13** in the transport position **P2** and secure with the retaining element **14**.

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3.1.9 Assembling the lattice sections

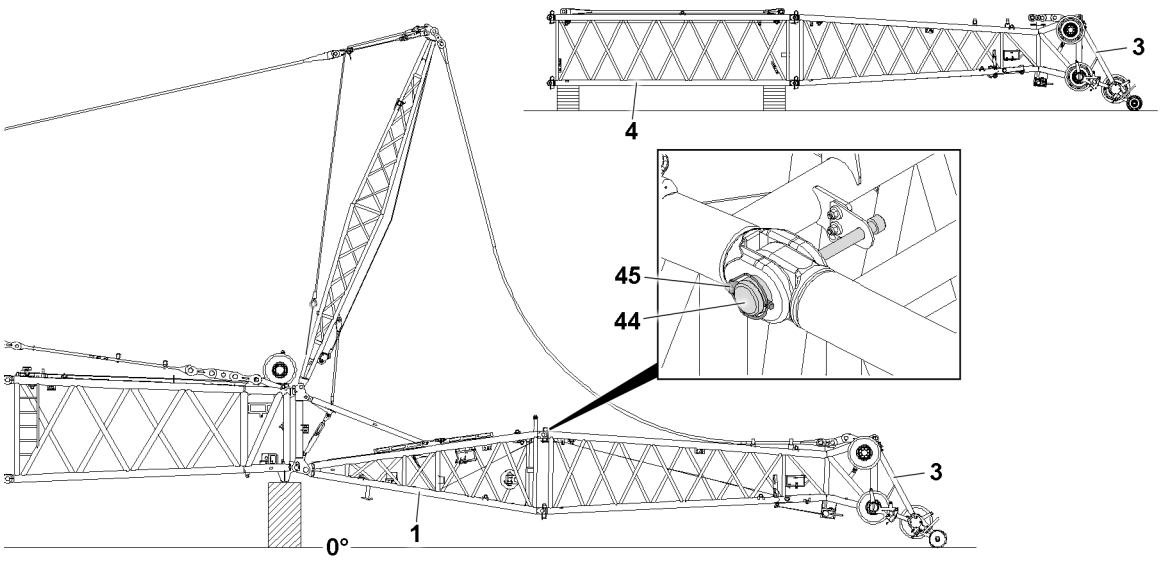

Fig.153199: Assembling the lattice sections — Pin procedure

1 F-pivot section
3 F-end section
4 F-Intermediate section
44 Pin
45 Retaining element

▶ Fasten the F-end section **3** and if necessary the F-intermediate sections **4** to the auxiliary crane and install and pin on the F-pivot section **1**.

The F-end section **3** is pinned four times to the F-pivot section **1**. Every pin point is present on both sides of the component on one level.

▶ Insert the pin **44** in the pin points on both sides and secure with the retaining element **45**.

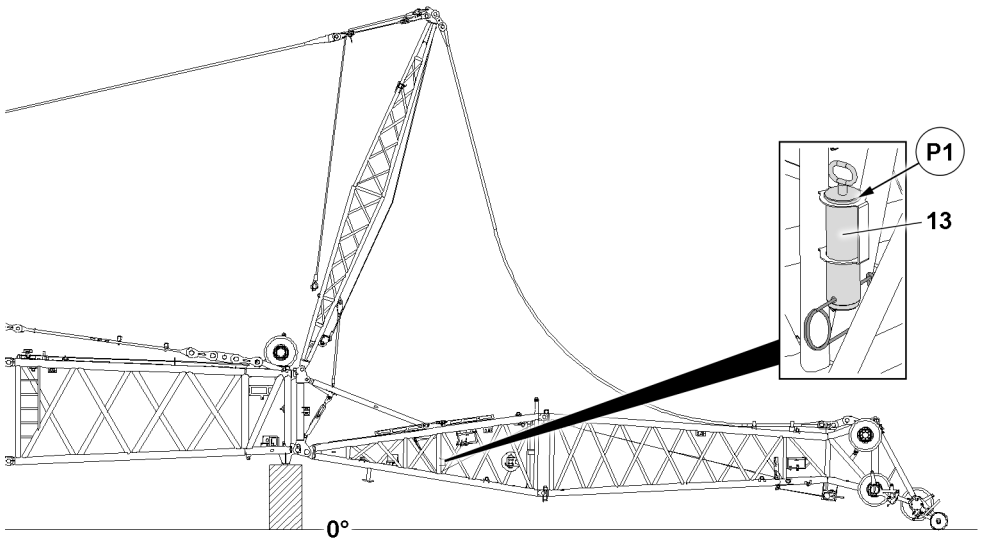

Fig.153200: Assembling the lattice sections – relapse support pin in the transport position

13 Pin

Note
▶ The pin **13** remains pinned in the transport position **P1** during crane operation.

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Note

- ▶ If F-intermediate sections are installed, then the additional guy ropes for the F-intermediate sections must be assembled, pinned and secured.
- ▶ Refer to the rod plan for the combination of the guy ropes.

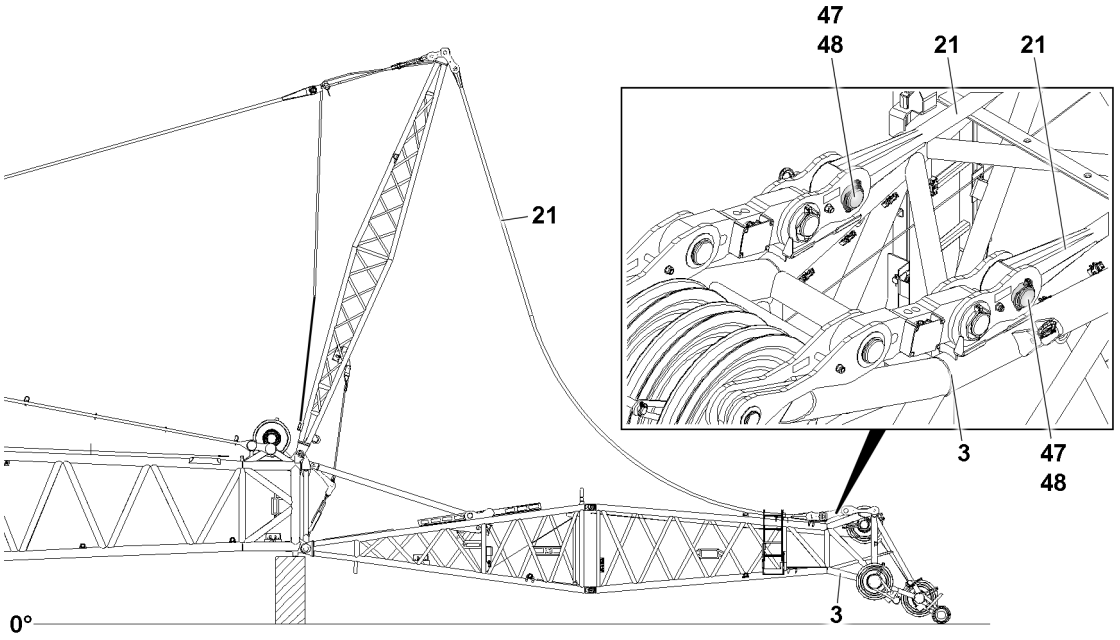

Fig.153202: Assembling the lattice sections – assembling the F-guy ropes

3	F-end section	**47**	Pin
21	F-guy rope	**48**	Retaining element

Pin the F-guy rope **21** with the brackets **46** of the F-end section **3**:

- ▶ Insert the pin **47** and secure it with the retaining element **48**.
- ▶ Pin the second F-guy rope **21** in the same way.

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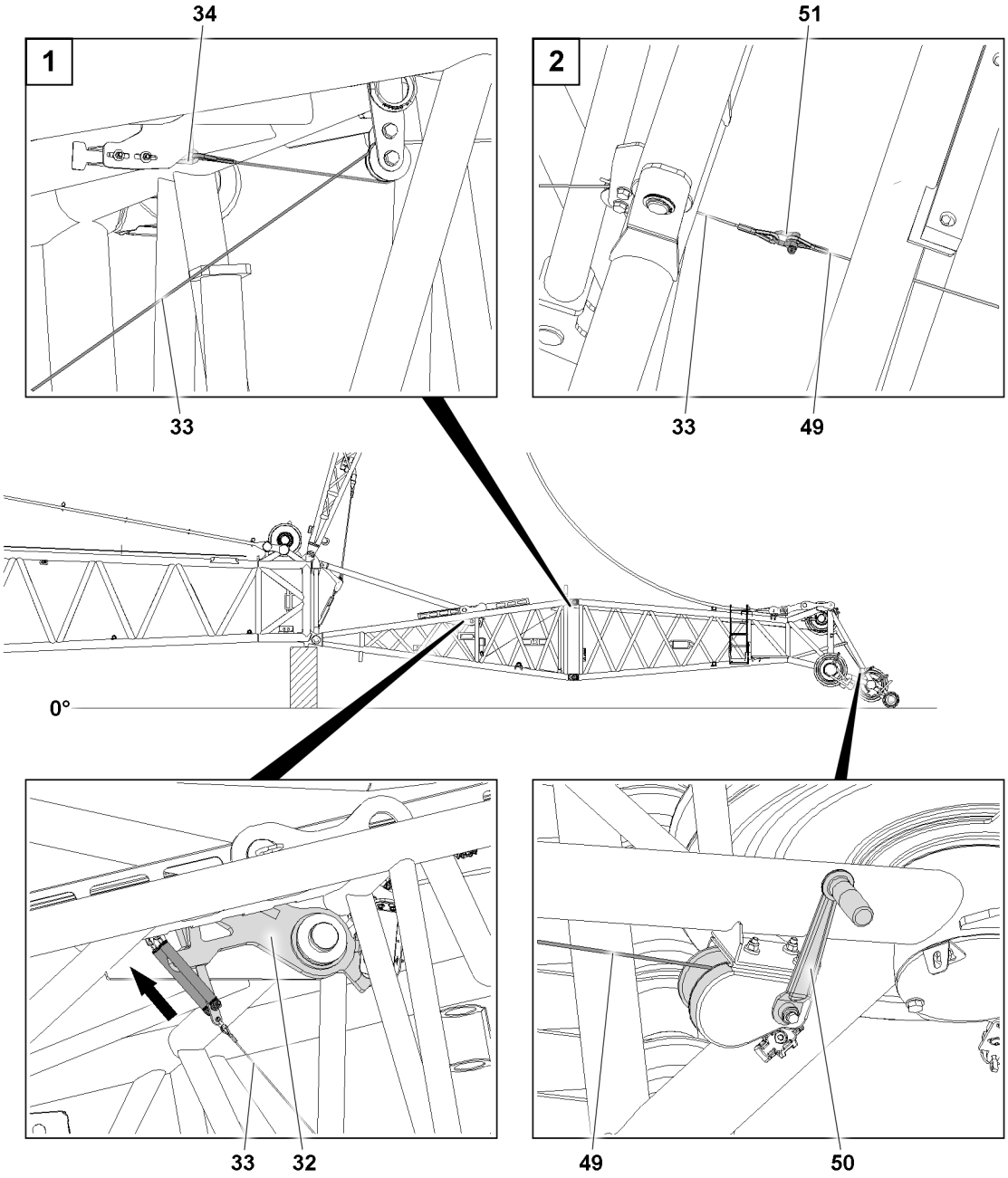

Fig.153201: Assembling the lattice sections – Pulling the flap down

32 Flap
33 Control rope
34 Hook closure
49 Control rope
50 Manual rope winch
51 Shackle

Connect the control rope **33** of the flap **32** with the control rope **49** of the manual rope winch **50**:

- ▶ Release the control rope **33** on the hook closure **34**.
- ▶ Connect the control rope **33** through the shackle **51** with the control rope **49** of the manual rope winch **50**.
- ▶ Pull the flap **32** with the aid of the manual rope winch **50** „downwards“.

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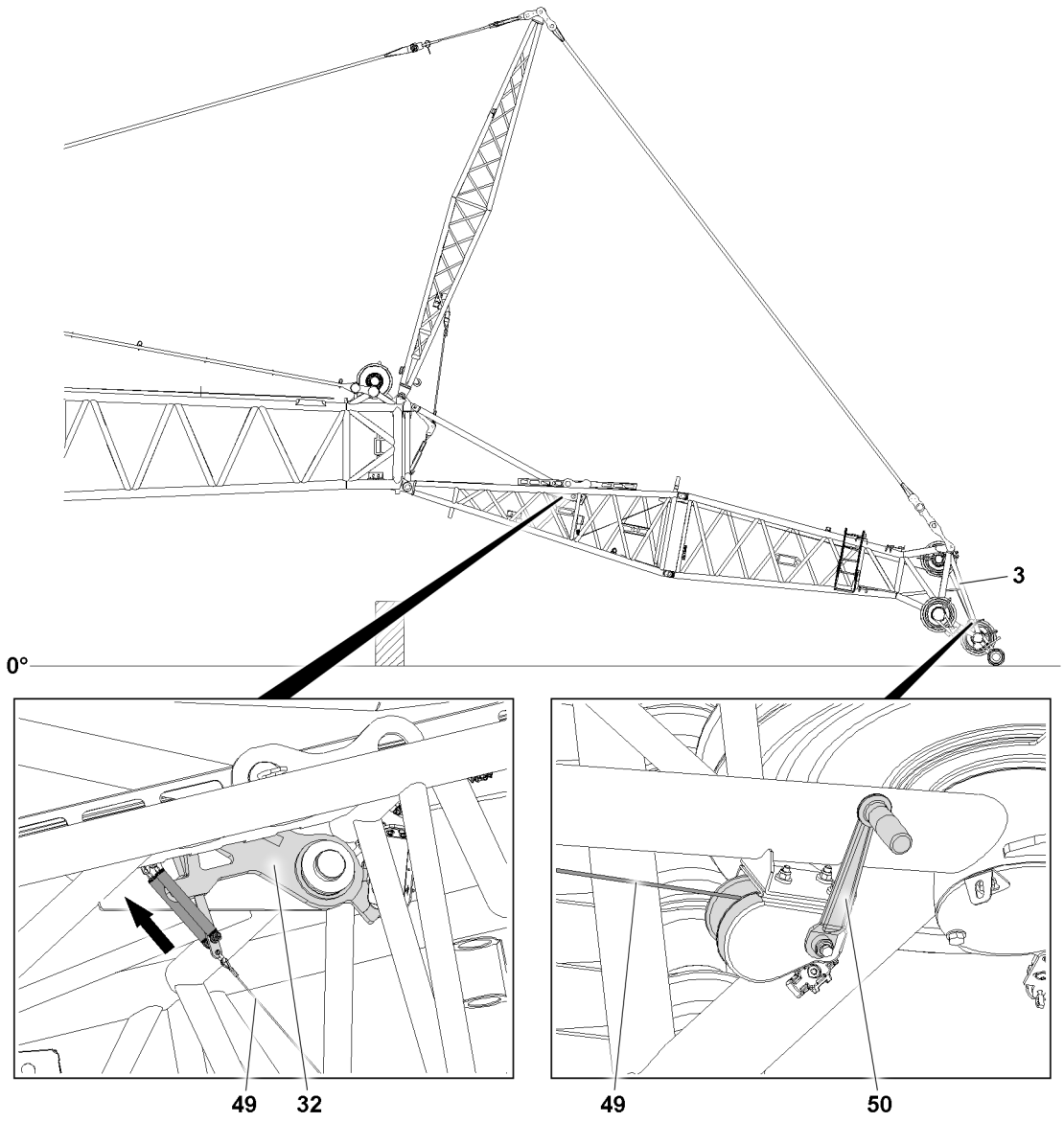

Fig.153203: Assembling the lattice sections – Flap in the operating position

3 F-jib
32 Flap
49 Control rope
50 Manual rope winch

WARNING
Flap in the „bottom“ assembly position!
If the flap **32** is not in the „top“ assembly position, then the jib can fall backward in an uncontrolled manner when erecting the boom system and during crane operation.
Death, severe bodily injuries, property damage.
▶ Make sure that the flap **32** is in the „top“ operating position immediately before lifting the F-end section or when erecting the boom.

▶ Lift the main boom.

Immediately after the F-jib **3** lifts off the ground:
▶ Check if the flap **32** is in the „top“ operating position.

If the flap is **not** in the „top“ operating position:
▶ Actuate the manual rope winch **50** and spool out the control rope **49**.

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4 Establishing the electrical connections

Make sure that the following prerequisites are met:
- The F-jib is completely assembled.
- The airplane warning light and the wind speed sensor are installed.

NOTICE
Damage to the electrical connection on the cable drum!
If the electrical connection from the cable drum on the F-pivot section to the terminal box on the L-end section or on the F-connector head is established first before the connection to the terminal box on the F-end section, the electrical connection can be damaged when spooling out the cable drum.
▶ Establish the electrical connection from the cable drum on the F-pivot section to the terminal box on the F-end section first and then the electrical connection from the terminal box on the F-connector head or on the L-end section to the cable drum on the F-pivot section.

Note
▶ Establish the electrical connections to the F-jib, see Electrical wiring diagram.

▶ Establish the electrical connections.
▶ Make sure that all electrical connections on the boom are established.

5 Checking the function of the safety equipment

WARNING
Malfunctioning safety equipment!
Death, severe bodily injuries, property damage.
▶ Crane operation with non-functioning safety equipment is **prohibited**.

Note
▶ The function of the individual limit switches must be checked before erection of the boom system.
▶ The function of the limit switch initiators must be checked in the test system, see the „Diagnostics manual“.

Note
▶ If a function check on the limit switches or on the safety equipment does not lead to the desired shut offs, then the plug connections on the connector boxes or the components itself must be checked. If no visible connection errors or component defects can be found, contact **Liebherr** Service.

Make sure that the following prerequisites are met:
- All electrical connections have been made.
- The crane engine is running.
- The corresponding operating mode is set on the LICCON monitor.

5.1 Checking the wind speed sensor

▶ Check the movement and the function of the wind speed sensor.

5.2 Checking the airplane warning light

▶ Turn on the airplane warning light in the crane cab, see chapter 4.01.
▶ Check the function visually.

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5.3 Checking the hoist limit switch on the pulley head

Note

▶ When replacing or changing a hoist limit switch (HES), the corresponding hoist limit switch must have the correct bus address and the correct software version in order to be detected again by the bus system (LSB).

▶ Actuate the hoist limit switch manually on the pulley head.

Result:

– The spool up function of the hoist winch turns off.
– The icon „Hoist top“ appears on the LICCON monitor 0.
– The limit switch is functioning.

5.4 Checking the limit switches in general

Note

▶ The limit switch functions have to be checked individually before erection.
▶ To check the limit switches, see corresponding chapter.

6 Erecting the boom

WARNING
The crane can topple over!
For certain boom lengths, the mechanical auxiliary supports must be assembled, see Erection and take down charts.
Death, severe bodily injuries, property damage.
▶ Observe the specifications in the erection and take-down charts.

WARNING
The crane can topple over!
If the following conditions are not met before erecting the boom, the crane can topple over.
Death, severe bodily injuries, property damage.
▶ Observe the technical safety instructions, see chapter 5.01.
▶ Extend the relapse cylinder before erection.
▶ Do not allow slack rope formation on the control winch.

WARNING
Falling hoist rope!
If the hoist rope before the erection procedure is not properly secured onto the end section, it can fall down backward on the basis of its own weight.
Death, severe bodily injuries, property damage.
▶ Secure the hoist rope properly on the end section before the erection procedure.

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Make sure that the following prerequisites are met:
- The crane is horizontally aligned.
- All electrical connections have been established.
- All limit switches are functioning.
- The central ballast is placed according to the data in the erection and take-down charts.
- The counterweight has been installed to the turntable according to the data in the erection and take-down charts.
- All pin connections are secured.
- The hoist rope has been correctly inserted in the rope pulleys and is prevented from jumping out with the rope retaining pins.
- There are no loose parts on the boom.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection settings have been compared with the actual set up configuration.
- The LICCON overload protection is exceeded.
- The assembly icon is visible on the LICCON monitor.

6.1 Erection procedure

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
▶ It is prohibited to turn the crane superstructure while erecting the boom.
▶ Observe the data in the Erection and take down charts.

6.1.1 Reeving the hook block in

Make sure that the following prerequisites are met:
- The crane is horizontally aligned.
- The slewing gear brake is applied.

WARNING
Danger of accident due to side wind!
If the slewing gear brake is released after reeving in / reeving out the hook block / the load hook, then the crane can turn uncontrolled in strong side wind.
Death, severe bodily injuries, property damage.
The crane can collide with near-by structures or objects.
▶ Make sure that the current wind speed does not exceed the values from the wind speed chart when releasing the slewing gear brake.

▶ Luff up the boom until the F-jib lifts off the ground.
▶ Reeve in the hook block properly, see chapter 4.06 and the separate reeving plans.
▶ Properly secure the hoist rope to the rope fixed point, see chapter 4.06.
▶ Attach the hoist limit switch weight, see chapter 4.06.

6.1.2 Erecting the boom

DANGER
The crane can topple over!
Death, severe bodily injuries, property damage.
▶ The boom radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook.

Note
▶ When the lowest operating position of the boom is reached, the set load chart of the LICCON overload protection is activated.
▶ In the maximum load icon, a load number appears in „t“ instead of the display „???“.

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▶ Luff the boom up to the lowest operating position.

When the boom has reached the lowest operating position:
▶ Make sure that the assembly icon on the LICCON monitor turns off.

Result:

– The LICCON overload protection is active.

7 Operating the crane

7.1 Preparing for crane operation

Note
▶ Observe the notes, see chapter 4.05, chapter 4.08 and chapter 5.01.

Make sure that the following prerequisites are met:
– The LICCON overload protection is active.
– The LICCON overload protection has been set according to the data in the load chart.

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
▶ Check the horizontal position of the crane before and during operation.
▶ If the crane operator leaves the crane cab, even for a short time, the operating mode setting must be checked and reset, if necessary, before resuming crane operation.

7.2 Checking the settings

▶ Check the function of the overload protection by running against the operating positions „on top“ and „bottom“.
▶ Check the hoist limit switch by running against the hoist limit switch weight.

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8 Disassembling the F-jib

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ It is prohibited to lean the ladder against the component being disassembled.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

WARNING
The components can fall down!
If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

WARNING
The lattice sections can fall down!
If the lattice sections are not pinned and secured correctly, then they can fall down.
Death, severe bodily injuries, property damage.
- ▶ Insert or unpin both pins on the same horizontal level, i.e. **left and right**.
- ▶ Do not stand under the lattice sections or within the entire danger zone during the pinning and unpinning procedure of the boom.
- ▶ Safely secure the pins in the storage locations as well as in the receptacles.
- ▶ It is prohibited to lean the ladder against the component being disassembled.

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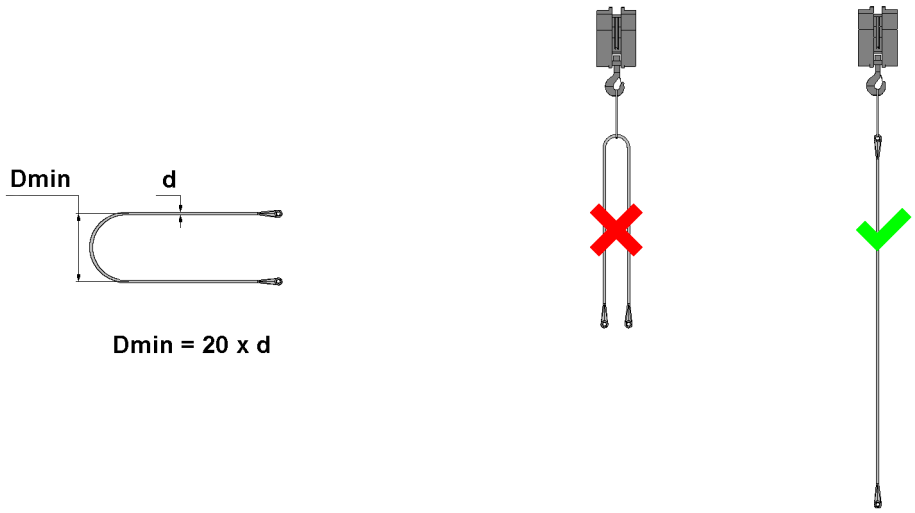

Fig.153258: Attaching the fiber guy ropes

WARNING
Incorrect handling of the fiber guy ropes!
If the fiber guy ropes are installed twisted on the longitudinal axis, then the load bearing capacity can be significantly reduced as a result and the fiber guy ropes can rip off.
Death, severe bodily injuries, property damage.

- ▶ Make sure that the fiber guy ropes are **never** kinked, knotted or twisted.
- ▶ Make sure the kinked, knotted or twisted fiber guy ropes are **never** installed.
- ▶ Make sure that the fiber guy ropes are never pulled over the ground or sharp edges.
- ▶ Make sure that no damaged fiber guy ropes are installed.
- ▶ Make sure that the numbering in the rod plan is identical to the numbering on the fiber guy ropes.
- ▶ Make sure that minimum bending diameter of **20** x rope diameter on the fiber guy ropes is **never** fallen below.
- ▶ Check the fiber guy ropes before every assembly.
- ▶ When using fiber guy ropes: Inspect the fiber guy ropes regularly, see chapter 8.16.
- ▶ Make sure that the fiber guy ropes are not twisted upon assembly. Pay attention to the twist display - marker line along the longitudinal axis of the rope braid.

WARNING
Damage to the fiber guy ropes during storage and transport!
If the following prerequisites for storage and transport are not observed, then the load bearing capacity can be significantly reduced and the fiber guy ropes can rip off.
Death, severe bodily injuries, property damage.

- ▶ Make sure that minimum bending diameter during storage and transport of **20** x rope diameter on the fiber guy ropes is **never** fallen below.
- ▶ Make sure that the fiber guy ropes are **not** kicked or knotted during storage and transport.
- ▶ Make sure that the fiber guy ropes are **not** twisted during storage and transport. Pay attention to the twist display - marker line along the longitudinal axis of the rope braid.
- ▶ Make sure that the fiber guy ropes do **not** lie over sharp edges during storage and transport.
- ▶ Make sure that the fiber guy ropes are **not** in contact with chemicals or acids during storage and transport.
- ▶ Make sure that the fiber guy ropes are **not** stored or transported together with other components.
- ▶ Store and transport the fiber guy ropes in a closed wooden crate.
- ▶ For the transport of the fiber guy ropes, see chapter 2.04.

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Make sure that the following prerequisites are met:
- The S-boom is luffed down to the „lowest“ operating position.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection is exceeded.
- The assembly icon is visible on the LICCON monitor.
- All unnecessary function keys and manual control levers are blocked on the radio remote control, see chapter 5.31 and chapter 6.08.
- An auxiliary crane is on hand.

8.1 Taking the S-boom down

WARNING
The crane can topple over!
If the following conditions are not met before taking down the boom, the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ Observe the technical safety instructions, see chapter 5.01.
- ▶ Observe the specifications in the erection and take-down charts.
- ▶ During disassembly, no hook block may be reeved on the F-jib.

NOTICE
Damage to boom components!
Taking down the boom system can lead to a collision between the hook block and the pulley head.
The boom components can be severely damaged.
- ▶ Luff the boom system down at the same time and spool the hoist winch out.

8.1.1 Luffing the S-boom down

Note
- ▶ The luff down movement is turned off as soon as the lowest operating position is reached.
- ▶ When the lowest operating position of the S-boom is reached, the load display in the maximum load icon turns off and instead of the load display appears the display „???“.
- ▶ Alarm functions appear on the crane operation screen.

▶ Luff the S-boom down to the „lowest“ operating position.

Result:

- The luff down movement is turned off.
- The „STOP“ icon appears on the LICCON monitor.
- The horn icon appears on the LICCON monitor.

WARNING
The crane can topple over!
In assembly operation the LICCON overload protection is deactivated.
In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ Activate the assembly operation only when the consequences are known.
- ▶ Enter the set up configuration correctly into the LICCON computer system.
- ▶ Observe the erection / take down charts.
- ▶ Crane operation with deactivated LICCON overload protection is prohibited.
- ▶ In assembly operation only load torque reducing crane movements may be carried out until a permissible operating and load range.
- ▶ The crane operator carries complete and sole responsibility for his actions if the LICCON overload protection is deactivated.

When the boom has reached the „lowest“ operating position:
- ▶ Activate assembly operation, see chapter 4.02.

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Result:

– The LICCON overload protection is deactivated.
– The assembly icon appears on the LICCON monitor.

▶ At the same time, luff down the boom system and spool out the hoist winch until the hook block touches the ground.

When the hook block touches the ground:
▶ Properly take down / set down the hook block onto the floor or a suitable substructure.

When the hook block is properly set down:
▶ Disassemble the hoist limit switch weight.
▶ Reeve out the hook block, see chapter 4.06.
▶ Carefully spool the hoist rope up.
▶ Remove the hook block with the auxiliary crane.

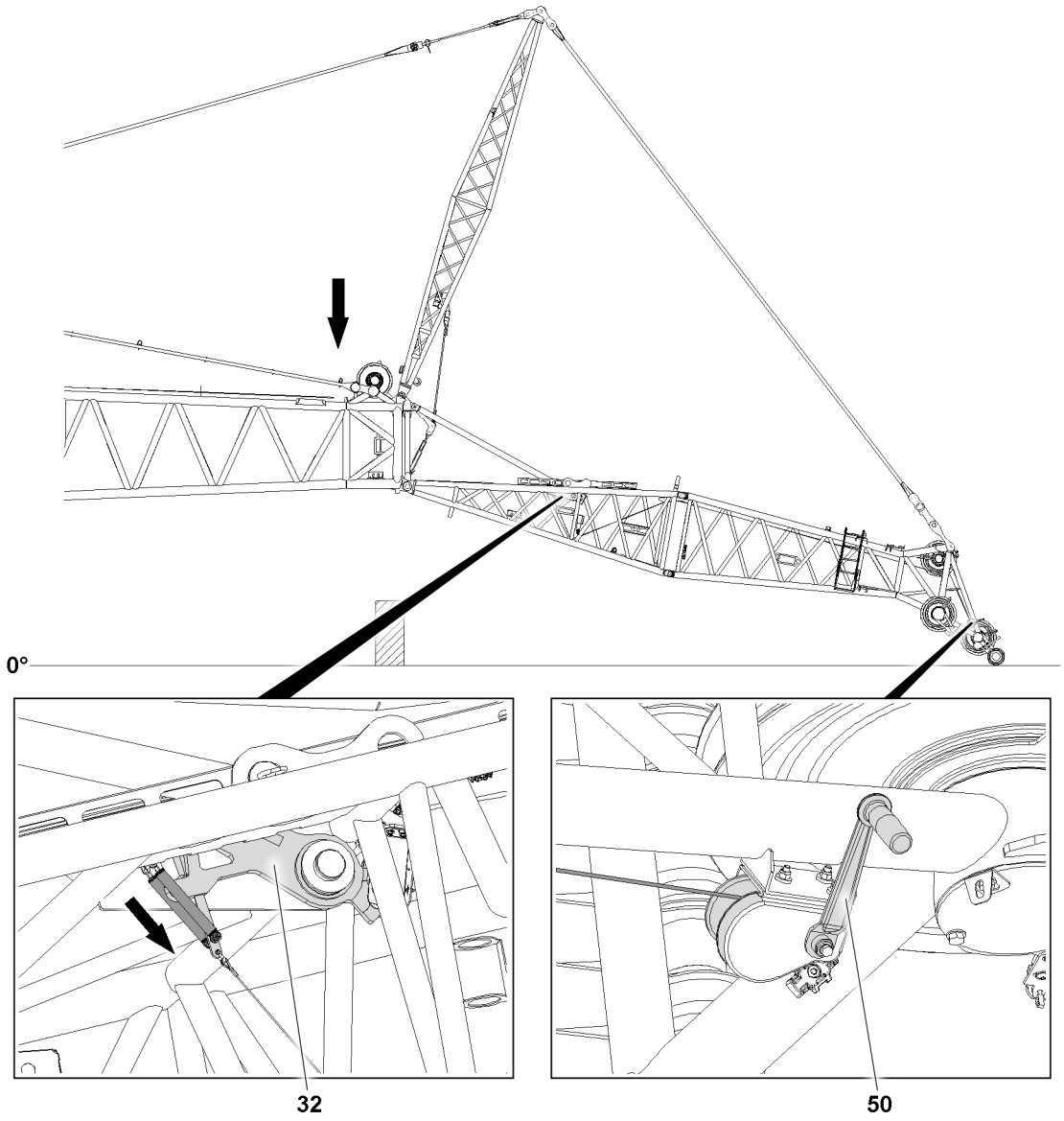

Fig.153237: Taking the boom system down

32 Flap

50 Manual rope winch

When the hook block is removed below the F-jib:
▶ Carefully luff the boom system down until the F-jib comes into contact with the ground.

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NOTICE
The flap **32** is in the wrong position!
If the flap **32** is not in the „bottom“ position, the components will be damaged when taking down the F-jib.
▶ Make sure that the flap **32** is in „down“ position immediately before taking down the F-jib.

▶ Pull the flap **32** with the aid of the manual rope winch **50** „downwards“.

NOTICE
Careless take-down of the F-jib
Property damage!
▶ Make sure that the boom system is carefully luffed down at a slow speed.
▶ When the F-jib comes into contact with the ground, carefully luff the beam system down further until the main boom lies on a load bearing substructure.

▶ Take the boom system down on the substructure.

8.2 Disconnecting the electrical connections

Make sure that the following prerequisite is met:
– The boom system is properly taken down.

NOTICE
Damage to the electrical connection on the cable drum!
If the electrical connection between the F-connector head or the L-end section **and** the F-pivot section is not separated before spooling up the cable drum, the electrical connection will be damaged.
If the cable of the cable drum is not properly spooled up on the cable drum after unplugging the F-end section, then the cable drum or the cable can be significantly damaged.
▶ Disconnect the electrical connection from the cable drum on the F-pivot section to the terminal box on the L-connector head or the L-end section first **and** then the electrical connection from the terminal box on the F-end section to the cable drum.
▶ After unplugging, spool up the cable onto the cable drum.

▶ Properly disconnect the electrical connections, see the Electric wiring diagram.
▶ After unplugging, spool up the cable onto the cable drum and secure it to prevent it from spooling out inadvertently.
▶ Secure the cable: Reestablish the electrical connection between the F-connector head or the L-end section and the cable drum.
▶ Close the electrical connections off properly with dummy plugs or protective caps.

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8.3 Disassembling the F2-jib

8.3.1 Disassembling the lattice sections

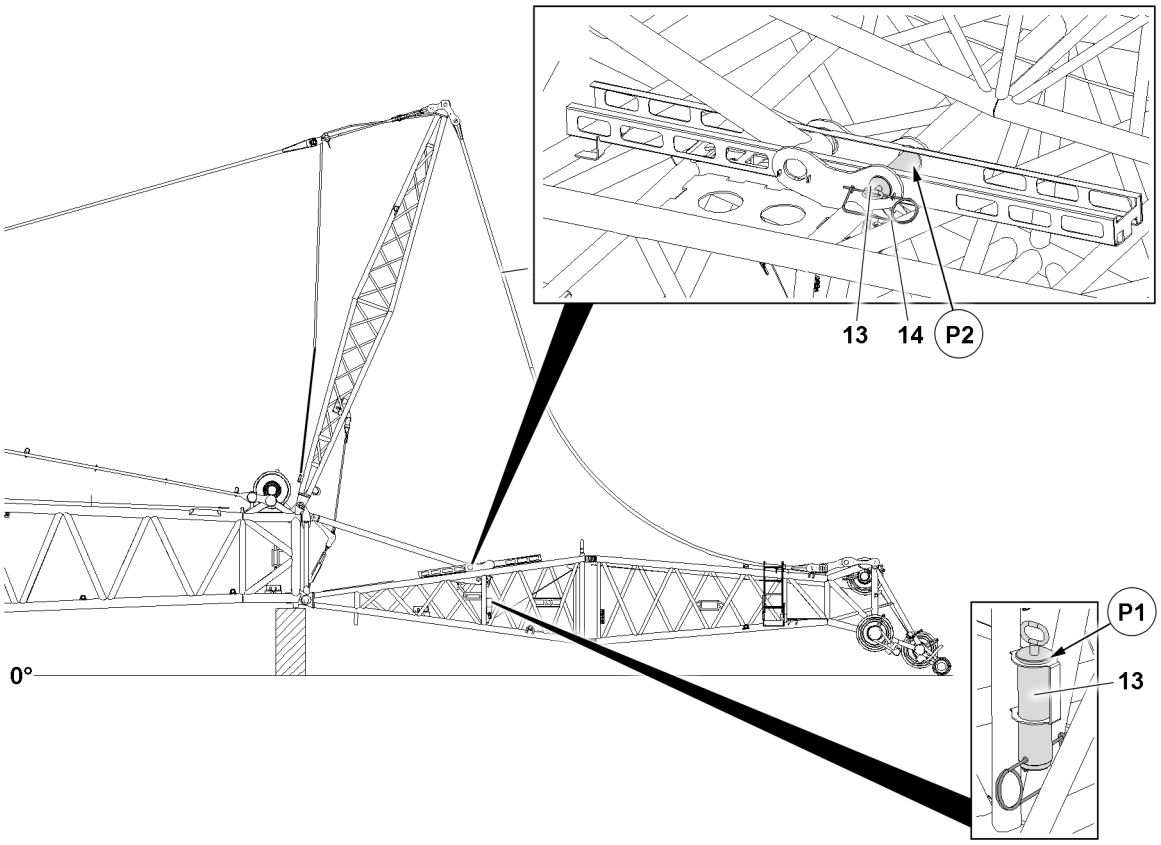

Fig.153256: Disassembling the lattice sections – Inserting the pin in the fastening position

13 Pin **14** Retaining element

- ▶ Unpin the pin **13** from the transport position **P1**.
- ▶ Insert the pin **13** in the fastening position **P2**.
- ▶ Secure the pin **13** with the retaining element **14**.

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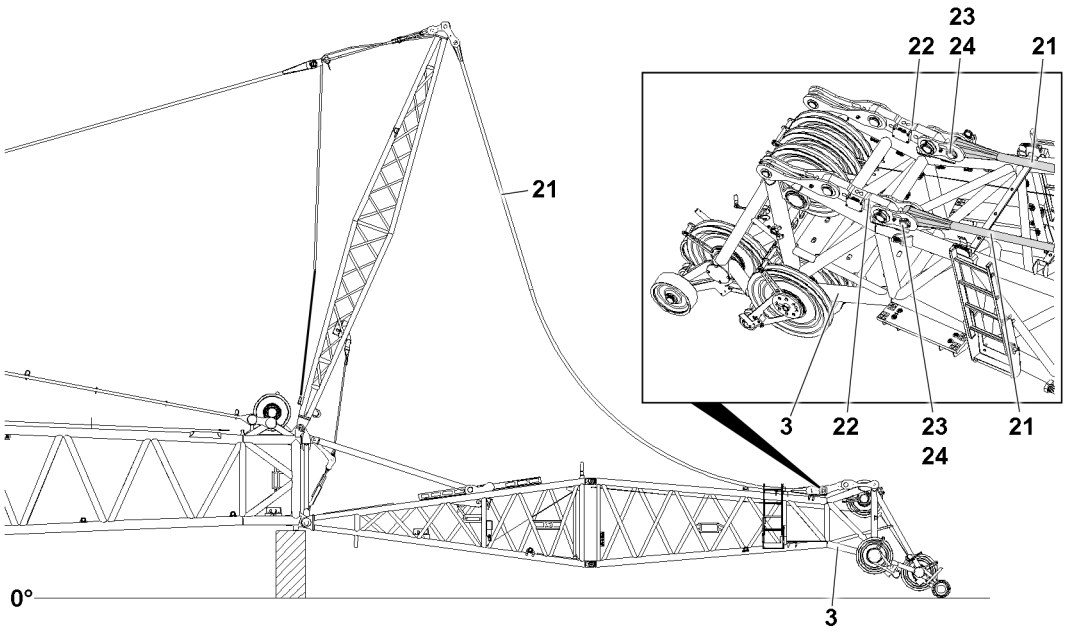

Fig.153238: Disassembling the lattice sections – Unpinning the F-guy ropes

3 F-end section
21 F-guy rope
22 Bracket
23 Pin
24 Retaining element

Unpin the F-guy rope **21** with the brackets **22** of the F-end section **3**:

- ▶ Remove the retaining element **24** and unpin the pin **23**.
- ▶ Take the F-guy rope **21** down to the side of the boom.
- ▶ Unpin the second F-guy rope **21** and take it down to the side of the boom.

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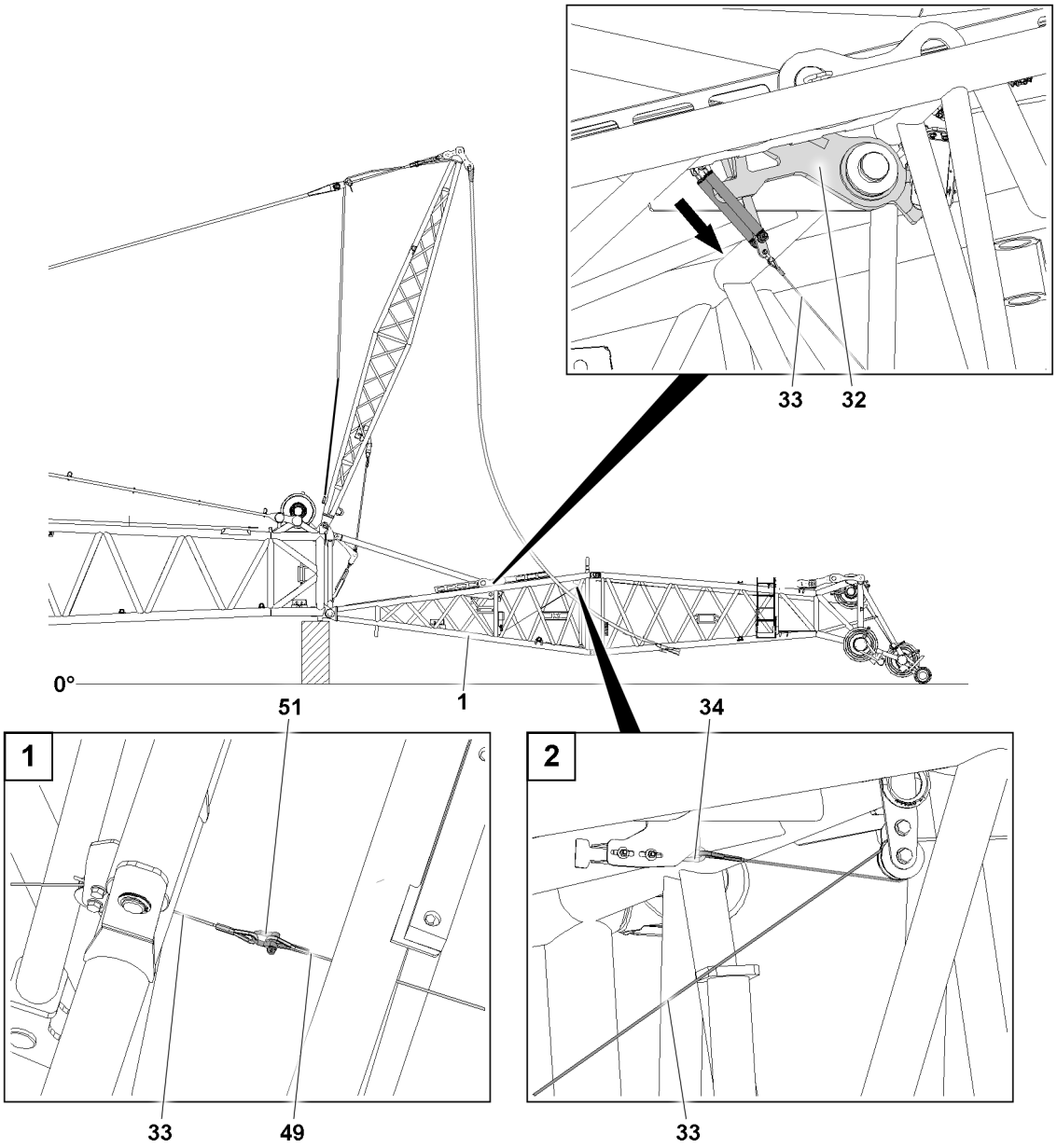

Fig.153239: Disassembling the lattice sections – Fixing the flap at the „bottom“

1 F-pivot section
32 Flap
33 Control rope
34 Hook closure
49 Control rope
51 Shackle

Disconnect the control rope **33** of the flap **32** from the control rope **49** of the manual rope winch:

- ▶ Open the shackle **51**.
- ▶ Pull the flap **32** on the F-pivot section **1** with the control rope **33** „downwards“ and fix it to the hook closure **34**.

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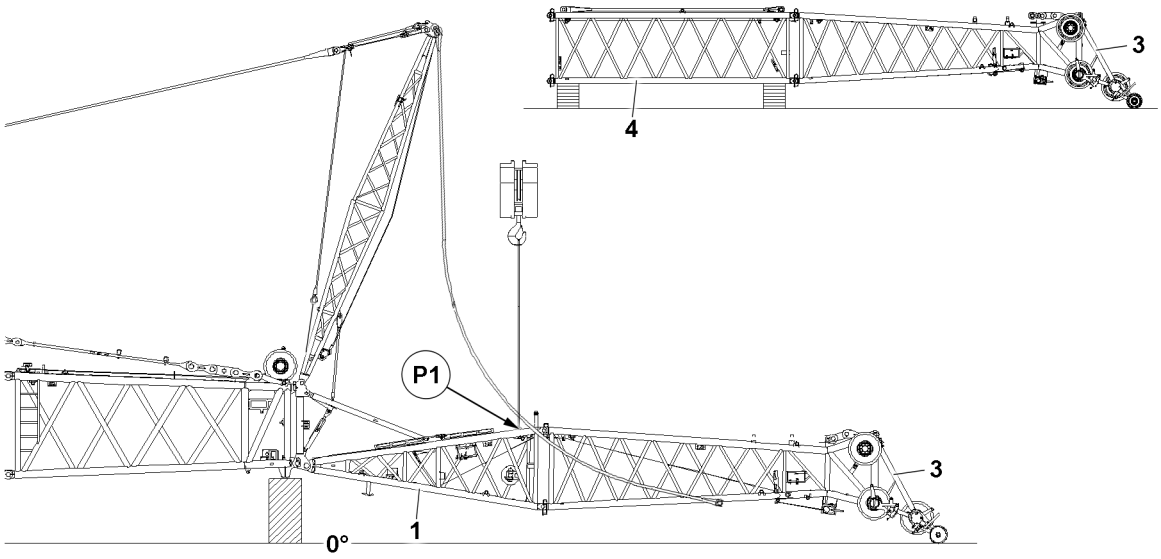

Fig.153240: Disassembling the lattice sections – Unpinning the F-end section

1 F-pivot section
3 F-end section
4 F-Intermediate section

Note

▶ If F-intermediate sections **4** are installed on the F-jib, then the additional guy ropes for the F-intermediate sections must be disassembled.

The F-end section **3** is pinned four times to the F-pivot section **1**. Every pin location is present on both sides of the component on one level.

▶ Fasten the auxiliary crane in position **P1** of the F-pivot section **1**, see section „Fastening points for the F-jib“.

WARNING

The F-jib is not held securely by the auxiliary crane!
When unpinning the F-jib on the F-pivot section **1**, the F-jib can fall down.
Death, severe bodily injuries, property damage.

▶ It is prohibited for anyone to remain under the F-jib during the unpinning procedure.
▶ Make sure that the F-pivot section **1** is safely held by the auxiliary crane.

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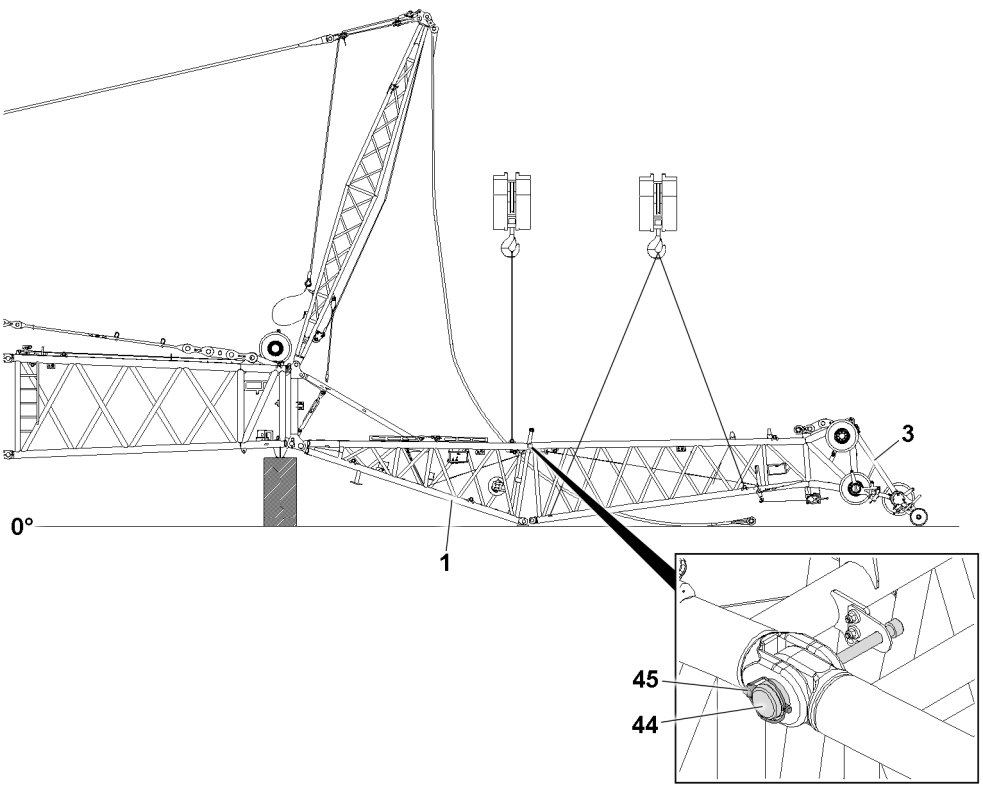

Fig.153241: Unpinning the F-end section – unpinning procedure

1	F-pivot section	**44**	Pin
3	F-end section	**45**	Retaining element

When the F-pivot section is safely held by the auxiliary crane:

- ▶ Release and unpin the F-pivot section **1** and F-end section **3** on the „bottom“ on both sides: Remove the retaining element **45** and unpin the pin **44**.
- ▶ „Open“ the F-jib: Carefully take down the F-pivot section **1** on the substructure.
- ▶ Remove the auxiliary crane.
- ▶ Fasten the F-end section **3** to the auxiliary crane.

WARNING
Unsecured lattice sections!
When the lattice sections are unpinned, they can tip over, depending on the ground or the substructure.
Death, severe bodily injuries, property damage.

- ▶ The lattice sections must be safely held by the auxiliary crane before unpinning them.
- ▶ The fastening equipment must be tensioned before unpinning.
- ▶ It is prohibited to remain in the danger zone.

- ▶ Release and unpin the F-pivot section **1** and F-end section **3** on the „top“ on both sides: Remove the retaining element **45** and unpin the pin **44**.

When all connector pins are unpinned:

- ▶ Swing out the F-end section **3** and the F-intermediate section (if applicable) with the auxiliary crane and take it down on a load bearing substructure.
- ▶ Remove the auxiliary crane.

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8.3.2 Disassembling the FAB-guy rope

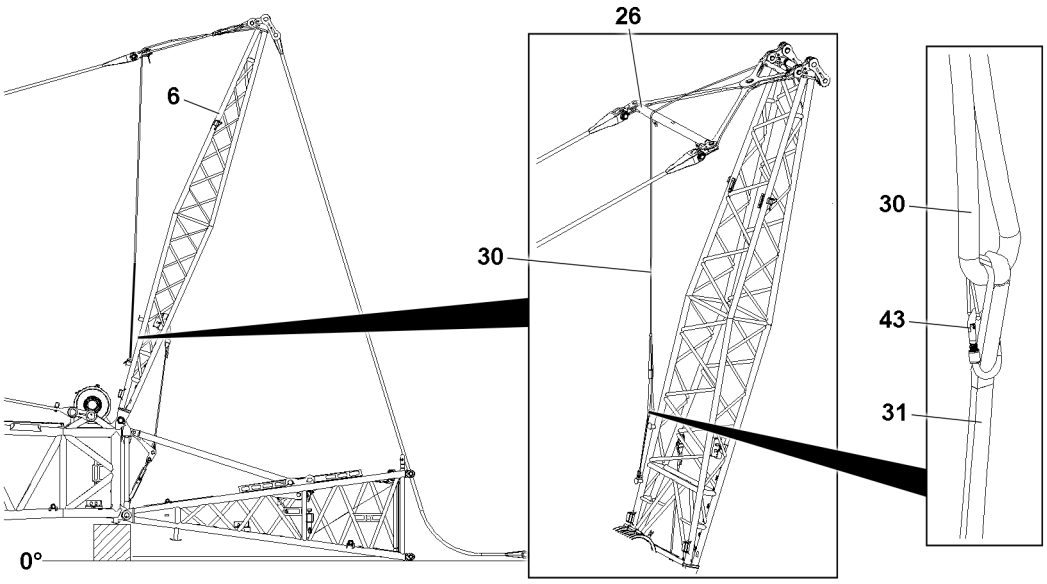

Fig.153242: Disassembling the FAB-guy rope – Releasing the fastening rope on the FA-frame

6 FA-frame
26 Rocker
30 Fastening rope
31 Belt
43 Carabiner

▶ Release the fastening rope **30** on the FA-frame **6**.

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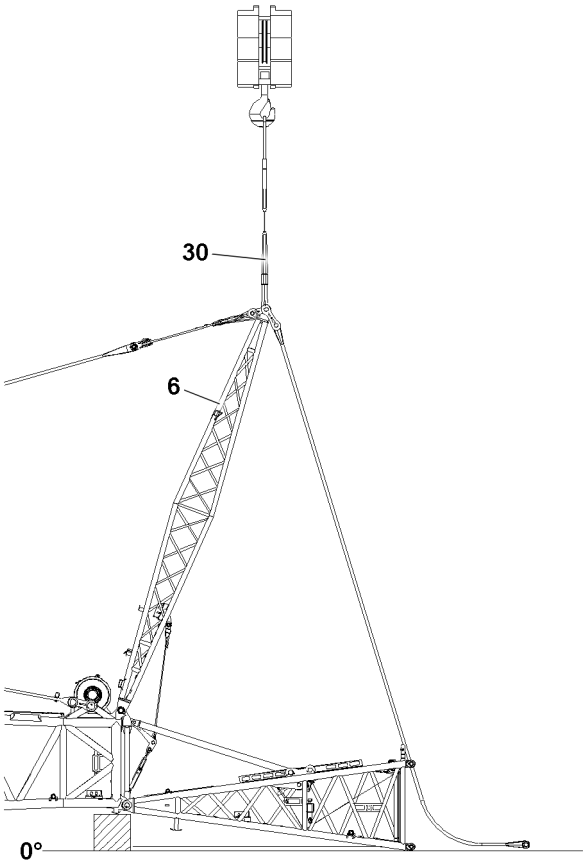

Fig.153243: Disassembling the FAB-guy rope – Fastening the fastening rope to the auxiliary crane

6 FA-frame **30** Fastening rope

▶ Fasten the fastening rope **30** to the auxiliary crane.
▶ Position the auxiliary crane over the FA-frame **6** and carefully tension the fastening rope **30**.

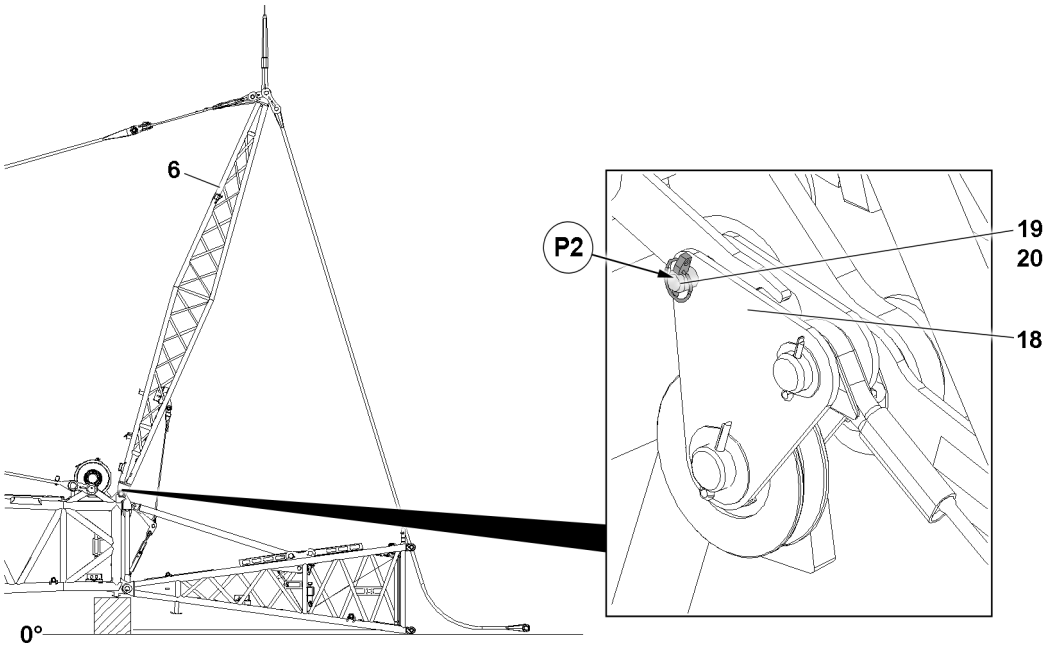

Fig.153244: Disassembling the FAB-guy rope – Fastening the fastening rope to the auxiliary crane

6 FA-frame **19** Pin
18 Rope pulley retainer **20** Retaining element

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WARNING
Swinging rope pulley retainer!
The rope pulley retainer **18** can swing due to its own weight when unpinning it.
Death, severe bodily injuries, property damage.
▶ Make sure that the rope pulley retainer **18** is held during unpinning.

Release the rope pulley retainer **18** in position **P2** from the FA-frame **6**:

▶ Remove the retaining element **20** and unpin the pin **19**.

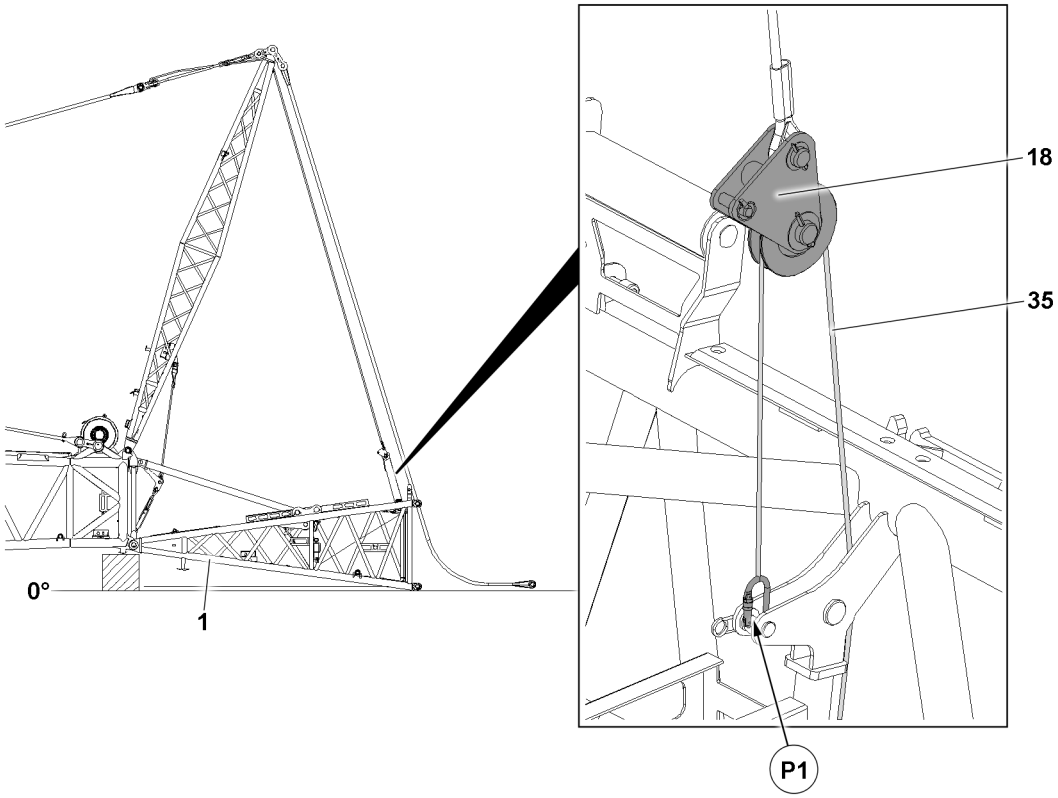

Fig.153245: Disassembling the FAB-guy rope – Assembling the rope pulley retainer to the F-pivot section

1 F-pivot section
18 Rope pulley retainer
35 Assembly winch rope

▶ Reeve in the assembly winch rope **35** to the rope pulley retainer **18** and secure on the F-pivot section **1**.

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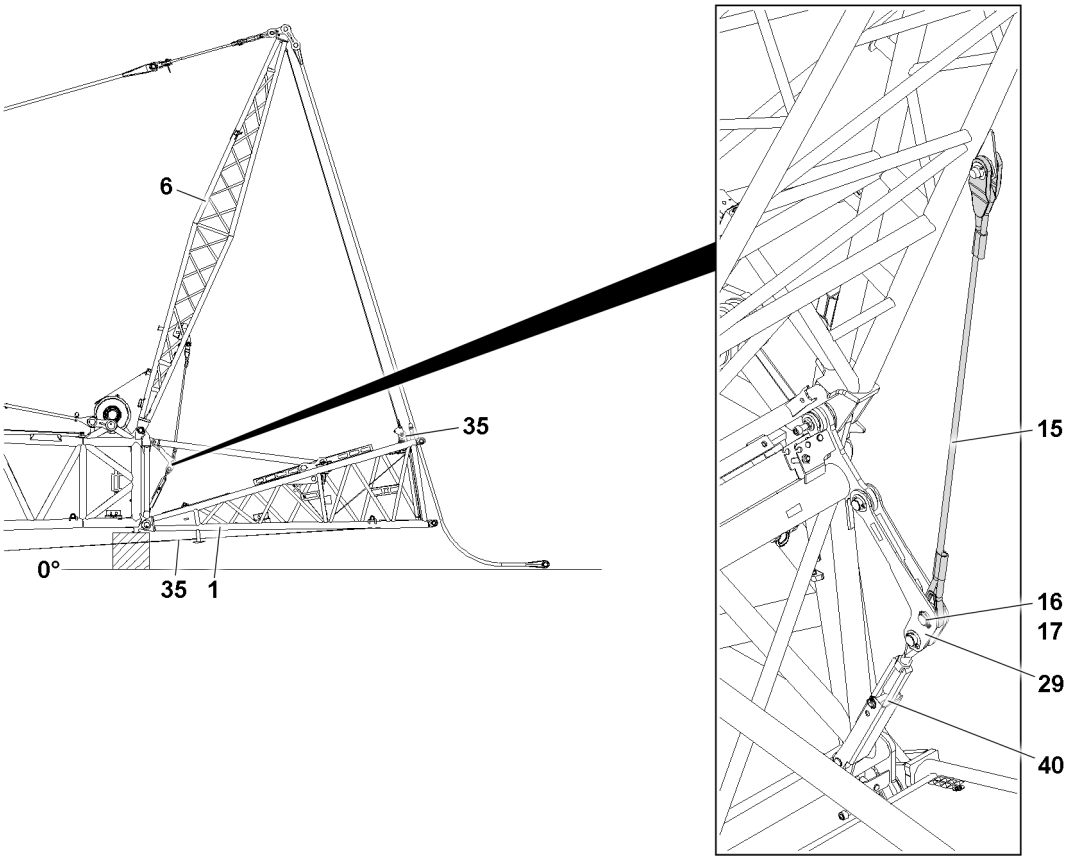

Fig.153246: Disassembling the FAB-guy rope – Releasing the guy rope from the FA-frame relapse retainer

1 F-pivot section
6 FA-frame
15 Guy rope
16 Pin
17 Retaining element
29 FA-frame relapse retainer
35 Assembly winch rope
40 Turnbuckle

NOTICE
The FA-frame relapse retainer **29** is not separated when erecting the FA-frame **6**!
If the FA-frame relapse retainer **29** is not separated, the FA-frame relapse retainer **29** can be damaged when erecting the FA-frame **6**.
▶ Make sure that the FA-frame relapse retainer **29** is properly separated during the erection of the FA-frame **6**.

WARNING
The guy rope **15** of the FA-frame relapse retainer **29** is not securely held!
The FA-frame relapse retainer **29** consists of a guy rope **15** and a turnbuckle **40**.
The guy rope **15** of the FA-frame relapse retainer **29** can swing forward due to its own weight during unpinning.
Death, severe bodily injuries, property damage.
▶ Make sure when unpinning the FA-frame relapse retainer **29**, that the guy rope **15** is safely held.
▶ Assembly personnel must be to the side of the assembly unit.

Separate the FA-frame relapse retainer:

▶ Spool up the assembly winch rope **35** carefully.

Result:

– The F-pivot section **1** is pulled in the direction of the FA-frame **6** and lifted off the ground.
– The FA-frame relapse retainer **29** is relieved.

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When the FA-frame relapse retainer **29** is relieved:

- ▶ Remove the retaining element **17** and unpin the pin **16**.
- ▶ Remove the guy rope **15**.
- ▶ Reinsert the pin **16** in the FA-frame relapse retainer **29** and secure with the retaining element **17**.
- ▶ Spool out the assembly winch rope **8** carefully.

Result:

– The F-pivot section **1** is taken down on the ground.

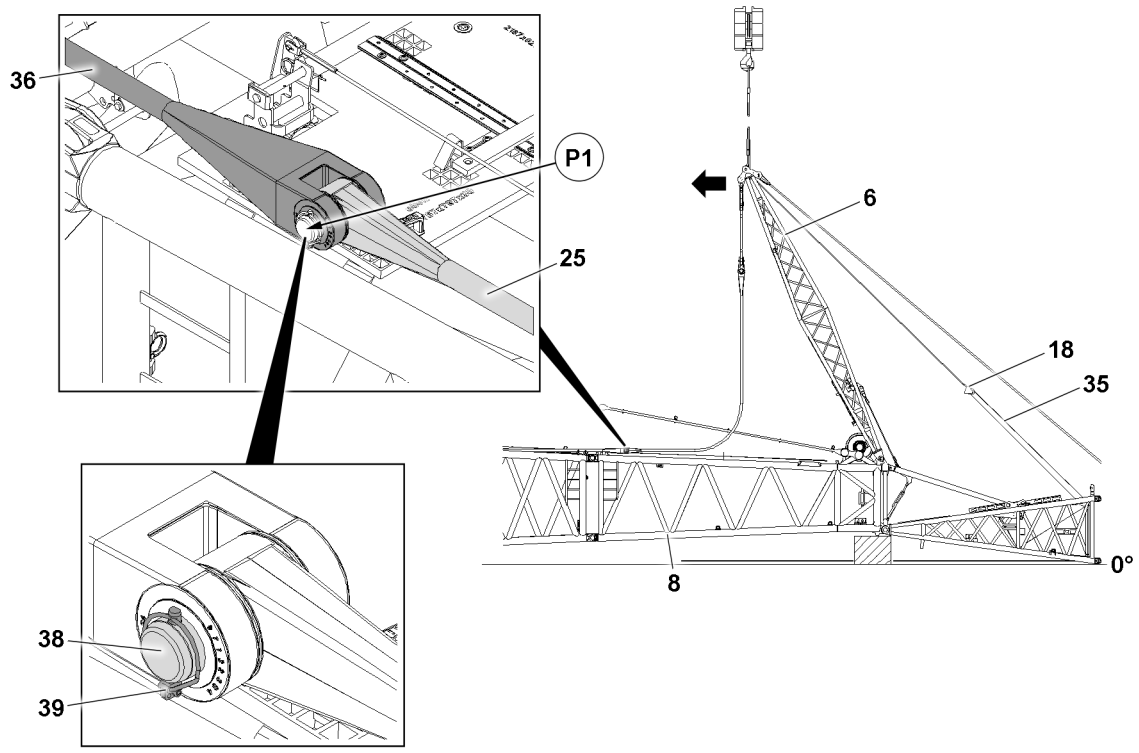

Fig.153247: Disassembling the FAB-guy rope – Unpinning the FAB-guy rope

6 FA-frame
8 F-connector head
18 Rope pulley retainer
25 FAB-guy rope
35 Assembly winch rope
36 FAB-guy rope
38 Pin
39 Retaining element

NOTICE

Danger of property damage!

When swinging the FA-frame **6** in the direction of the main boom, damage may occur to the FA-frame **6**, the F-connector head **8**, as well as the rope pulley retainer **18**.

- ▶ Make sure that a guide supervises the swinging process of the FA-frame **6**.
- ▶ Make sure that the guide is constantly in visual and acoustic contact with the crane operator.
- ▶ Make sure that the assembly winch rope **35** is spooled out during the swinging process of the FA-frame **6**.

- ▶ Carefully swing the FA-frame **6** with the auxiliary crane in direction of the main boom and spool out the assembly winch rope **35** at the same time until the FAB-guy rope **25** can be unpinned.

Unpin the FAB-guy rope **25** from the FAB-guy rope **36**:

- ▶ Remove the retaining element **39**.
- ▶ Unpin the pin **38**.
- ▶ Take down the FAB-guy rope **25** to the side of the boom.
- ▶ Unpin the second FAB-guy rope **25** in the same way.

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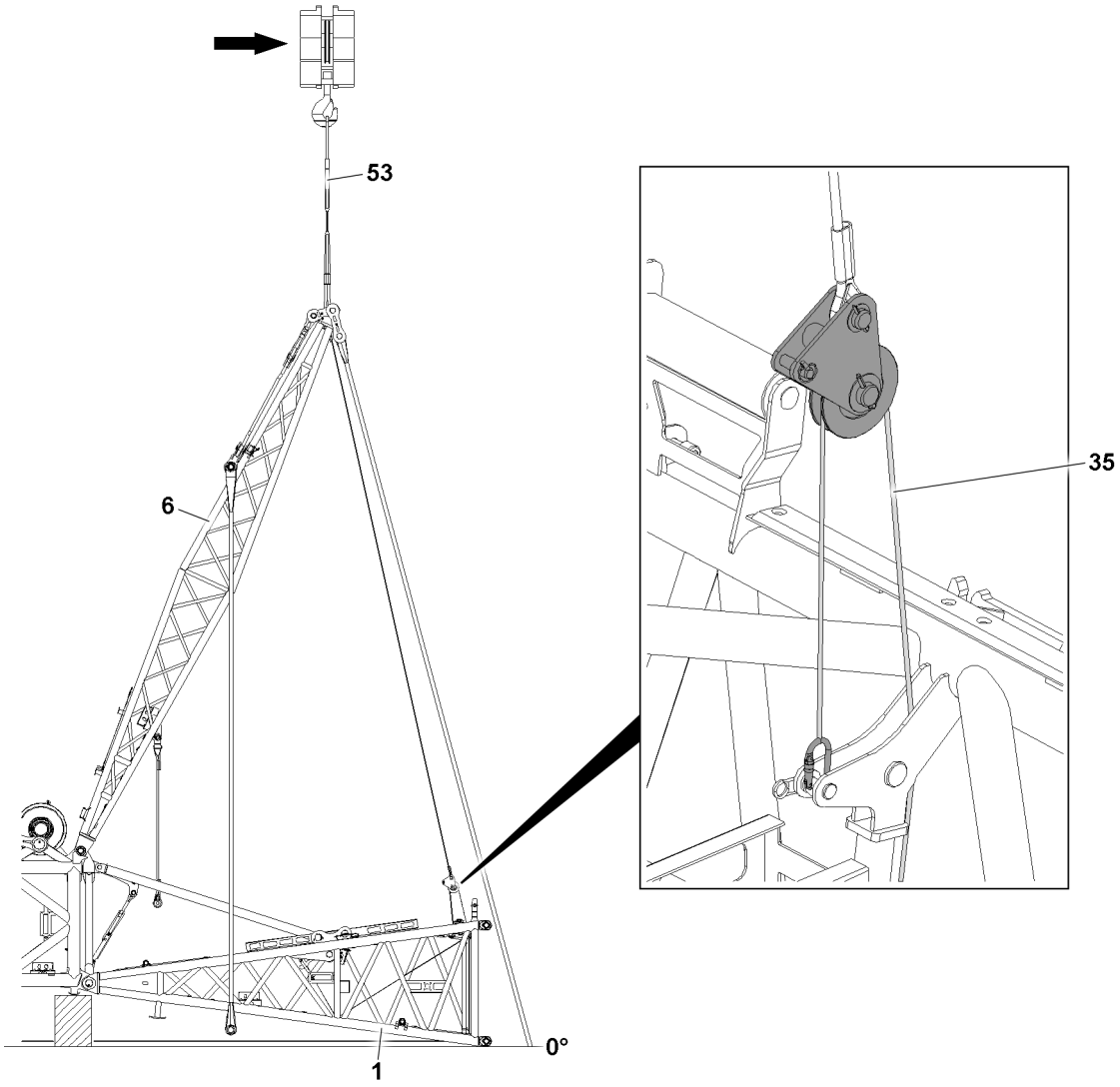

Fig.153248: Disassembling the FAB-guy rope – Pulling the FA-frame in direction of the F-pivot section

1 F-pivot section
6 FA-frame
35 Assembly winch rope
53 Fastening rope

WARNING
Sagging fastening rope!
If the fastening rope **53** on the FA-frame **6** is not kept tensioned during assembly / disassembly operations, the FA-frame **6** can swing down suddenly.
Death, severe bodily injury, property damage.
- ▶ Make sure that there are no persons within the danger zone.
- ▶ Make sure that the fastening rope **53** is tensioned during assembly / disassembly operations.

- ▶ Pull the FA-frame **6** with the assembly winch rope **35** in direction of the F-pivot section **1**.
- ▶ Spool up the assembly winch rope **35** carefully.
- ▶ Guide the auxiliary crane.
- ▶ Lower the FA-frame **6** to 40°.

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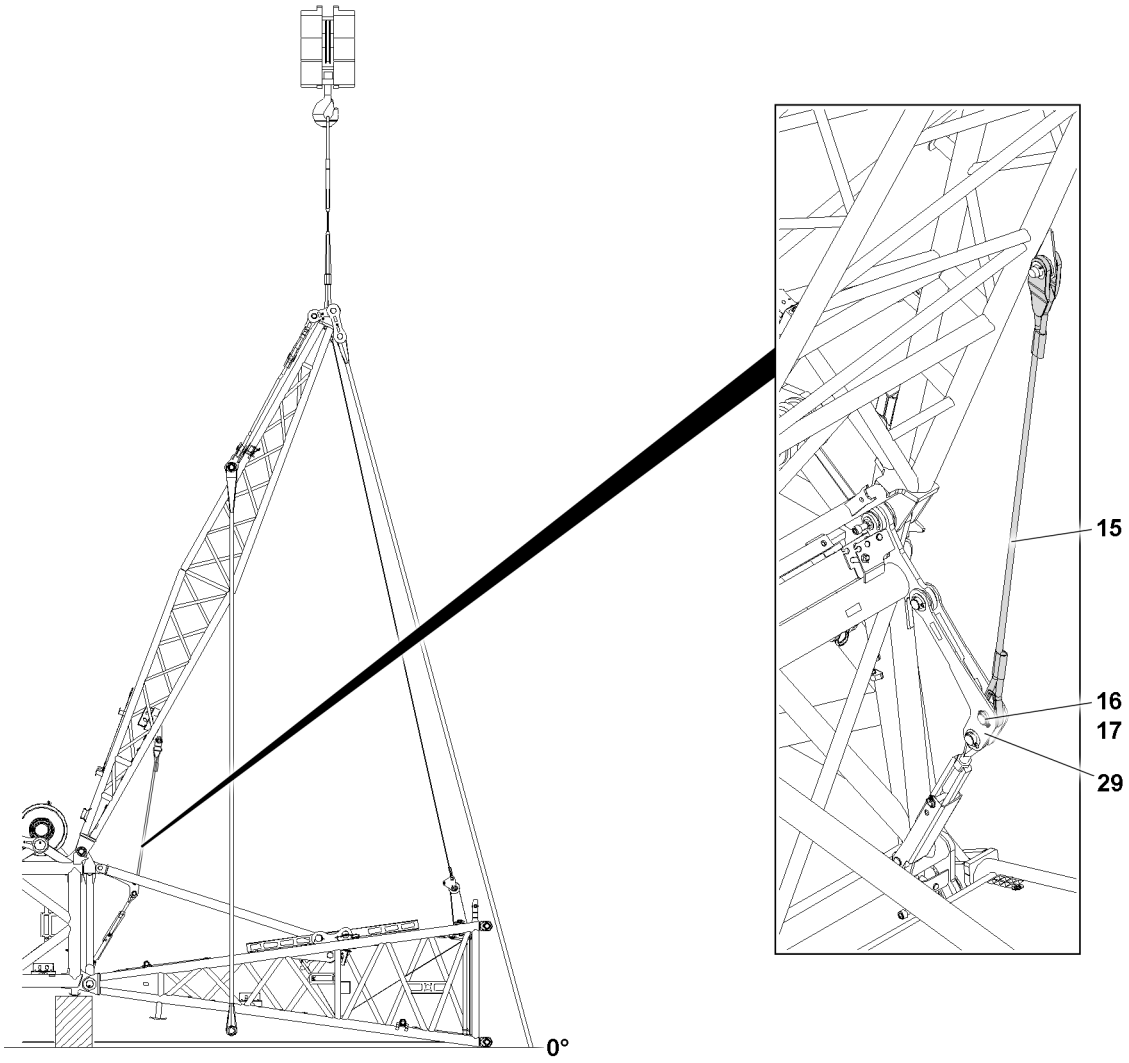

Fig.153249: Disassembling the FAB-guy rope – Connecting the FA-frame relapse retainer

15 Guy rope
16 Pin
17 Retaining element
29 FA-frame relapse retainer

Connect the FA-frame relapse retainer **29**:

- ▶ Position the guy rope **15** such that it can be pinned to the FA-frame relapse retainer.
- ▶ Insert the pin **16**.
- ▶ Secure the pin **16** with the retaining element **17**.

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8.3.3 Taking the FA-frame down

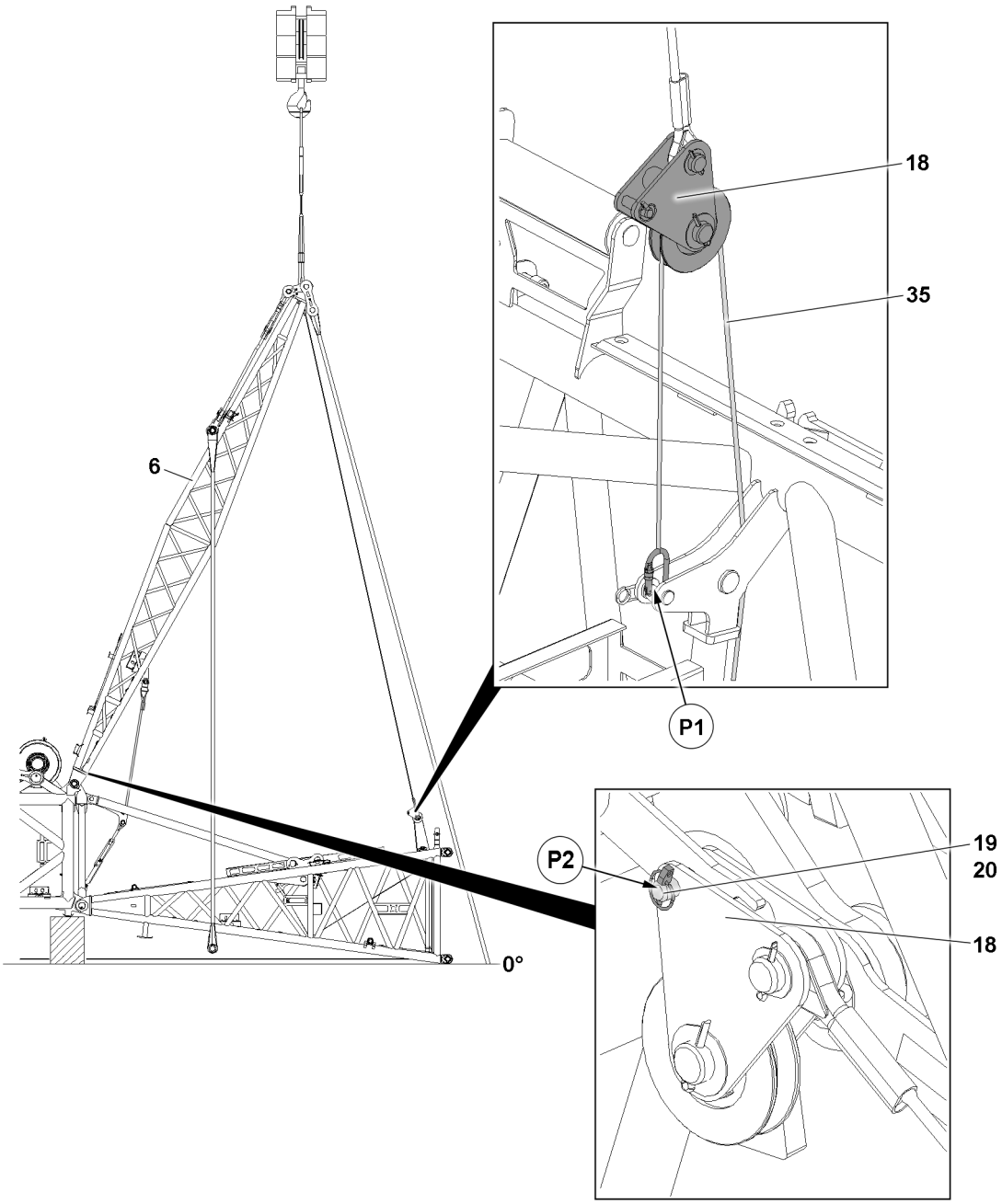

Fig.153250: Taking the FA-frame down – Pinning the rope pulley retainer to the FA-frame

6 FA-frame
18 Rope pulley retainer
19 Pin
20 Retaining element
35 Assembly winch rope

Make sure that the following prerequisite is met:
– The FA-frame **6** is lowered to 40°.

▶ Release the assembly winch rope **35** on position **P1**.
▶ Position the rope pulley retainer **18** such that the rope pulley retainer **18** can be pinned in position **P2** of the FA-frame:
▶ Insert the pin **19**.
▶ Secure the pin **19** with the retaining element **20**.
▶ Spool up the assembly winch rope **8**.

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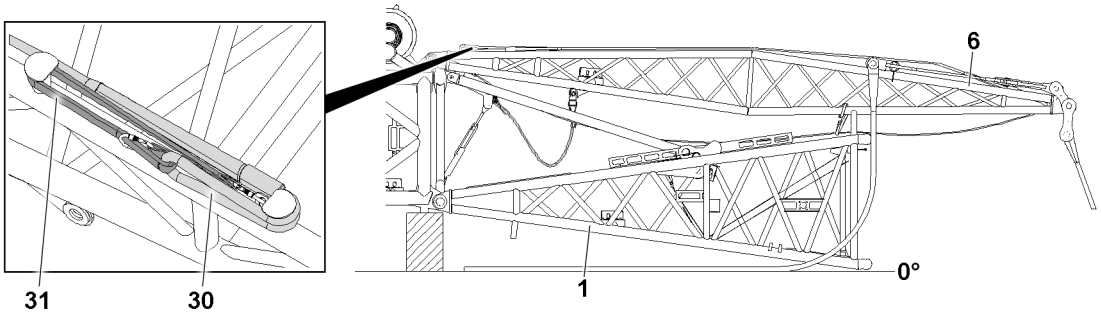

Fig.153251: Taking the FA-frame down – Fastening the fastening rope on the FA-frame to the FA-frame

1 F-pivot section
6 FA-frame
30 Fastening rope
31 Belt

NOTICE
Fastening rope **30** secured with the carabiner to the belt **31**!
Damage to the fastening rope **30**.
▶ Connect the belt **31** through a loop with the fastening rope **30**.

NOTICE
Damage to the fiber guy ropes!
Depending on the degree of severity, a damaged fiber guy rope can rip off in crane operation.
▶ Make sure that the fiber guy ropes are not kinked, crushed or damaged in any other way when taking down the FA-frame.
▶ If visible slight damage is determined on a fiber guy rope, observe chapter 8.16 and thoroughly inspect the rope.
▶ Make sure that a damaged fiber guy rope will only continued to be used, depending on the scope of the damage, after it has been thoroughly inspected and released by the rope manufacturer.

▶ Take down the FA-frame **6** with the auxiliary crane on the F-pivot section **1**.
▶ Remove the auxiliary crane.
▶ Attach the fastening rope **30** with the belt **31** to the FA-frame **6**.

8.3.4 Disassembling the FAB-guy rope

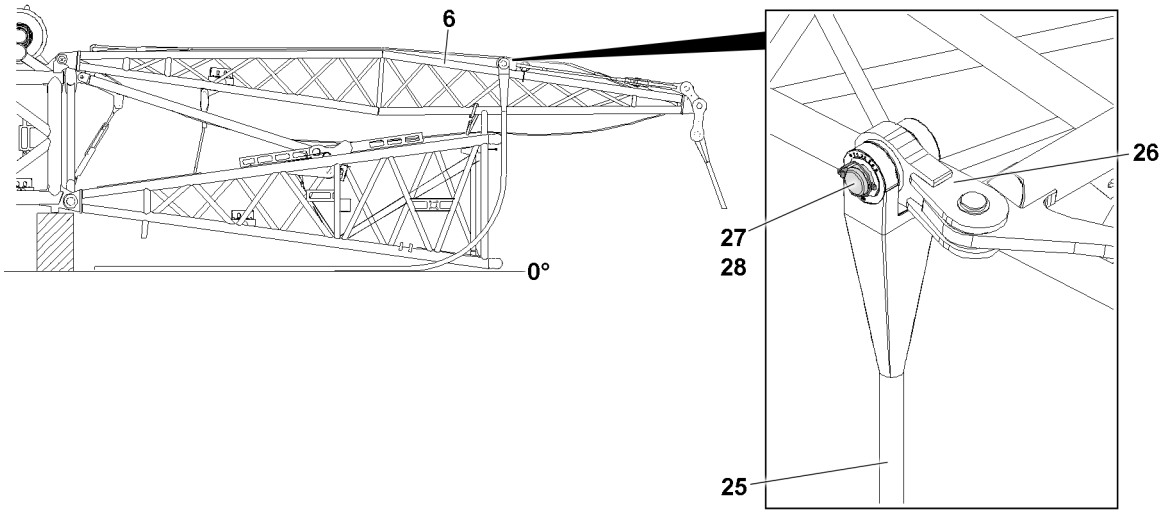

Fig.153252: Disassembling the FAB-guy rope

6 FA-frame
27 Pin
For continuation of legend for illustrations, see next page

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25 FAB-guy rope
26 Rocker
28 Retaining element

Unpin the FAB-guy rope **25** from the rocker **26** on the FA-frame **6**:

- ▶ Remove the retaining element **28**.
- ▶ Unpin the pin **27**.
- ▶ Take the FAB-guy rope **25** down.
- ▶ Unpin the second FAB-guy rope **25**.

8.3.5 Disassembling the F-guy rope

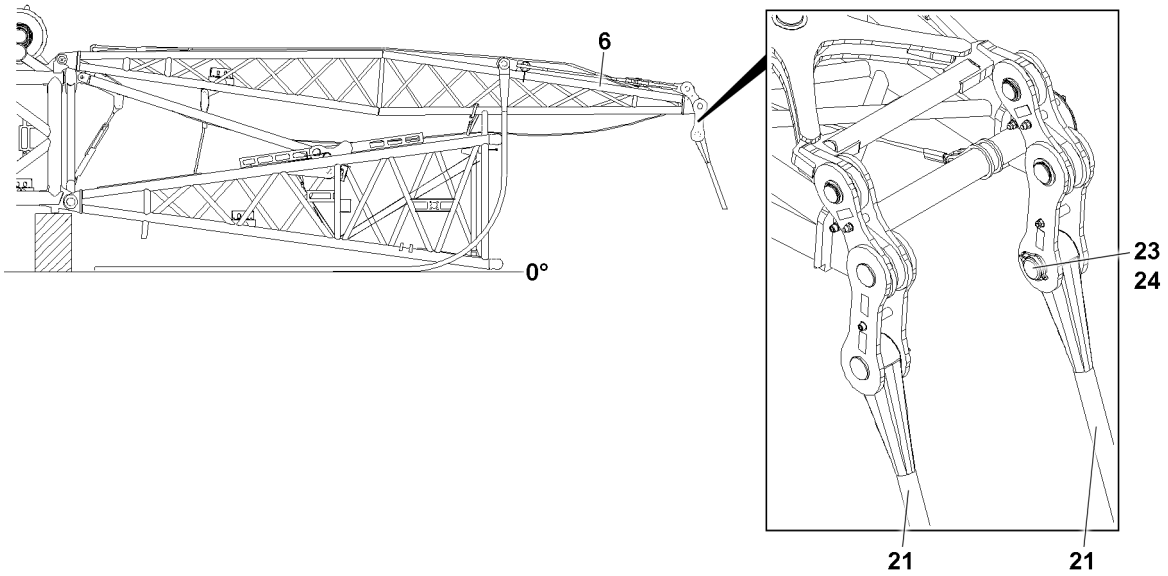

Fig.153253: Disassembling the F-guy rope

6 FA-frame
21 F-guy rope
23 Pin
24 Retaining element

Unpin the F-guy rope **21** with brackets on the FA-frame **6**:

- ▶ Remove the retaining element **24**.
- ▶ Unpin the pin **23**.
- ▶ Take the F-guy rope **21** down.
- ▶ Unpin the second F-guy rope **21** in the same way.

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8.3.6 Assembling the F-relapse support in the transport position

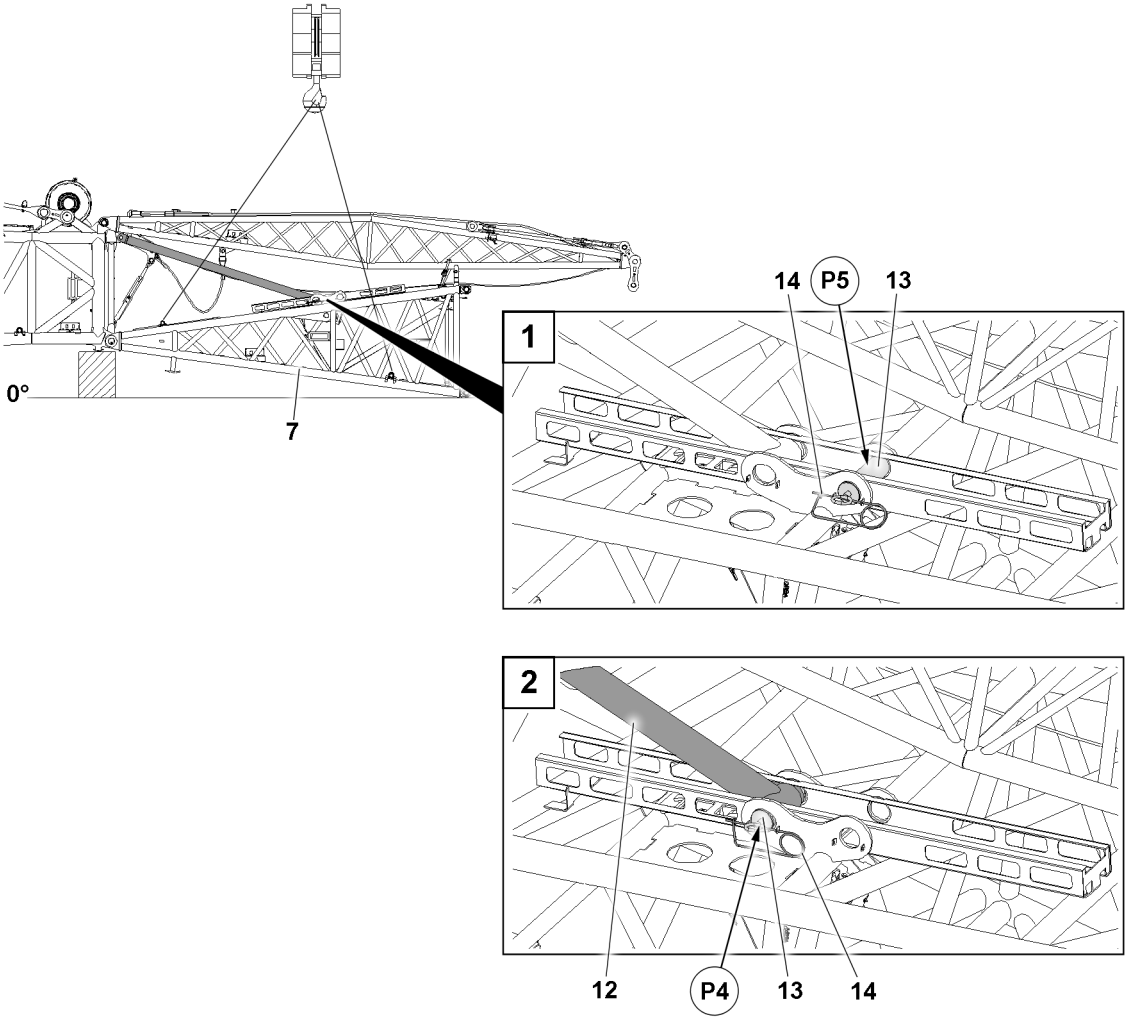

Fig.153254: Assembling the F-relapse support in the transport position

7 F-assembly unit
12 F-relapse support
13 Pin
14 Retaining element

▶ Fasten the F-assembly unit **7** to the auxiliary crane.
▶ Lift the F-assembly unit **7** with the auxiliary crane until the F-relapse support **12** can be pinned in the transport position **P4**.
▶ Remove the retaining element **14** in point **P5** and unpin the pin **13**.

Secure the F-relapse support **12** in the transport position **P4**:

▶ Insert the pin **13** in the transport position **P4** and secure with the retaining element **14**.

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8.3.7 Disassembling the F-assembly unit

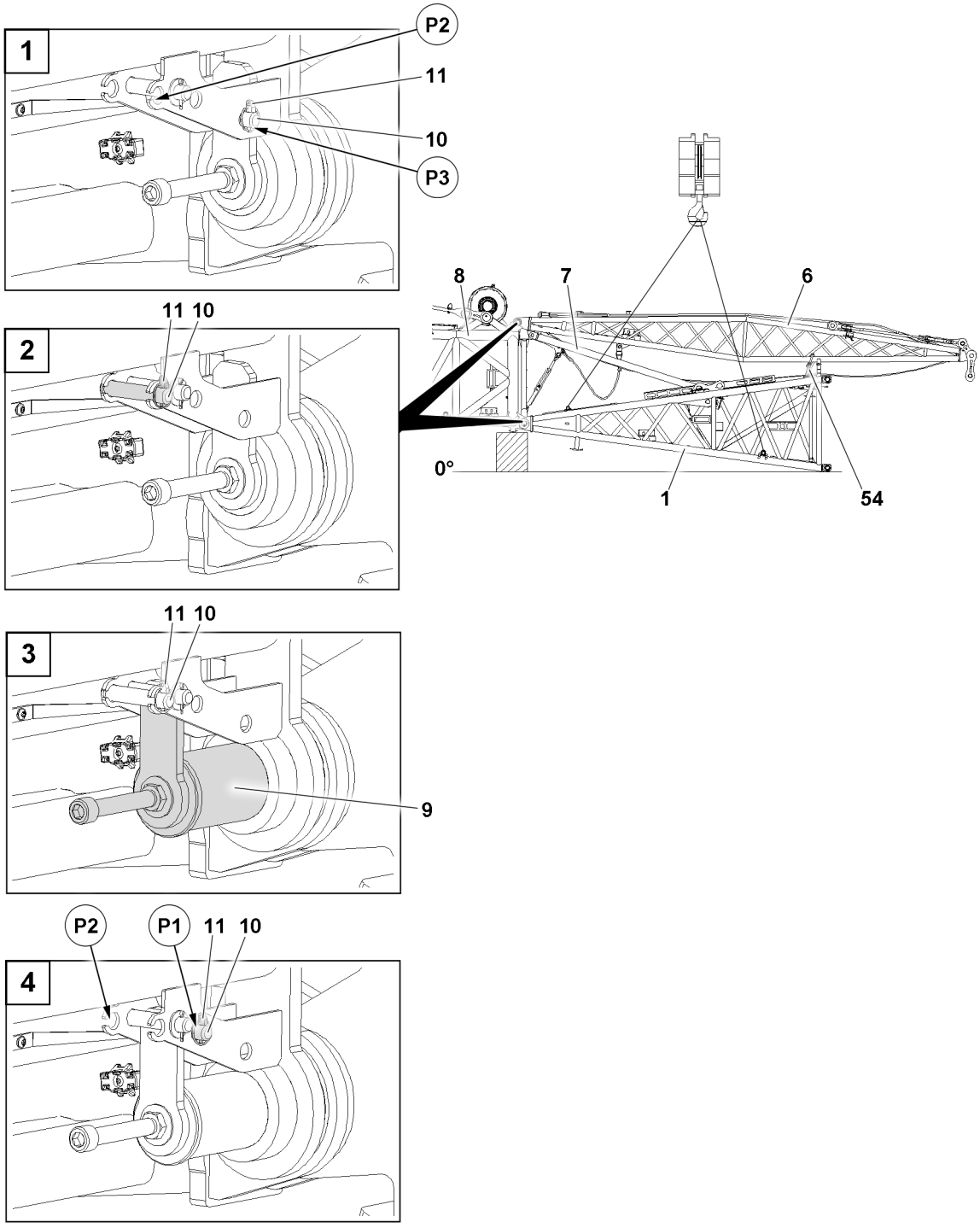

Fig.153257: Disassembling the F-assembly unit – Unpinning the F-assembly unit

1 F-pivot section
6 FA-frame
7 F-assembly unit
8 F-connector head
9 Pin
10 Pin
11 Retaining element
54 Rigging belt

Make sure that the following prerequisites are met:
- The F-assembly unit **7** is properly fastened to the auxiliary crane.
- The fastening equipment is tensioned.

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The F-assembly unit **7** is unpinned four times on F-connector head **8**. Every pin point is present on both sides of the component on one level.

First the two pins **9** at the bottom are unpinned and then both pins **9** at the top.

The unpinning procedure is described based on one pin **9** as an example. The unpinning procedure takes place in the same manner for all four pins **9**.

- ▶ Remove the retaining element **11** on both sides from positions **P3**.
- ▶ Unpin the pins **10** on both sides in positions **P3**.
- ▶ Insert the pin **10** in the park position **P2**.
- ▶ Secure the pin **10** in park position **P2** with the retaining element **11**.
- ▶ Unpin the pin **9**.
- ▶ Release the pin **10** in the park position **P2**.
- ▶ Unpin the pin **10** in the park position **P2**.
- ▶ Insert the pin **10** in position **P1**.
- ▶ Secure the pin **10** with the retaining element **11**.

When all pins of the are properly unpinned on both sides:

- ▶ Swing out the F-assembly unit **7** with the auxiliary crane and take it down on the ground or on a load bearing substructure.
- ▶ Attach the rigging belts **54** between the F-pivot section **1** and FA-frame **6**.

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5.14 Roller set

1	Roller sets overview	3
2	Component overview	3
3	Fastening points for roller set	4
4	Assembly rack for roller set	4
5	Combinations End section - Roller set	5
6	Assembling the roller set / roller sets	6
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Fig.195219

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1 Roller sets overview

Note
- ▶ The roller sets are marked with their own weight.
- ▶ Dimensions and weights, see Crane operating instructions, chapter 1.03.

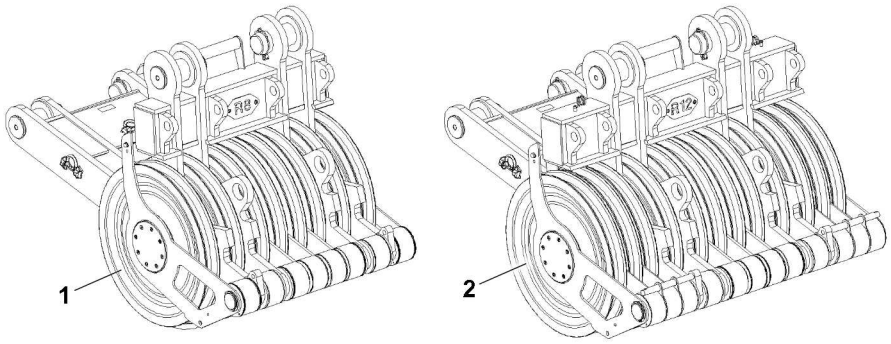

Fig.124476: Roller sets overview

Position	Component	Description
1	Roller set 350 t	R8
2	Roller set 400 t	R12

Roller sets overview

2 Component overview

Note
- ▶ Component view is shown as an example on one roller set R8 350 t.

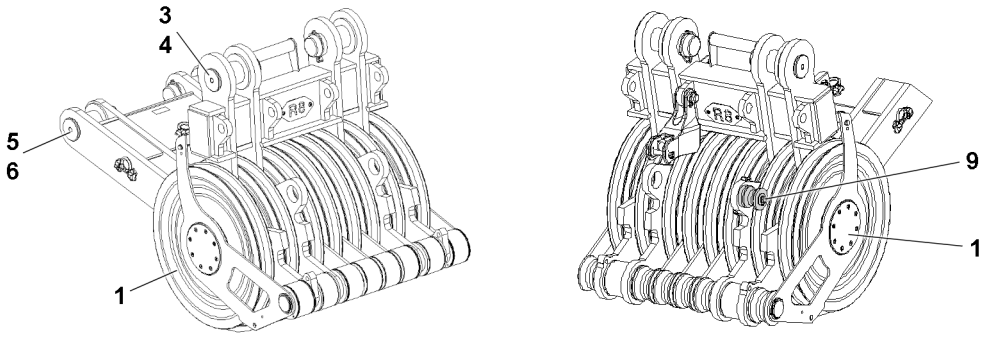

Fig.144157: Component overview roller set

Position	Component
1	Roller set R8
3	Connector pin
4	Retaining element

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Position	Component
5	Connector pin
6	Retaining element
9	Rope guide pulley

Component overview roller set R8 350 t

3 Fastening points for roller set

WARNING
Component incorrectly fastened!
Life-threatening situations can arise due to improper or incorrect attachment of the corresponding components.
Death, severe bodily injuries, property damage.
- ▶ Fasten the components only on the intended fastening points on both sides.
- ▶ Fastening of components and description of fastening points, see Crane operating instructions, chapter 5.01.

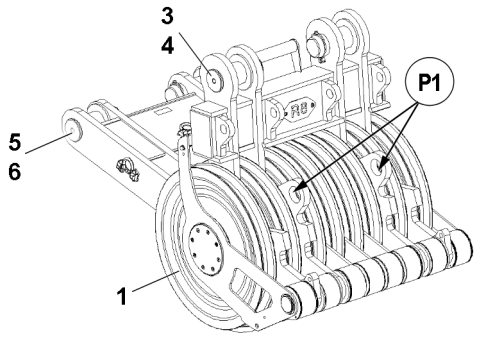

Fig.124477: Fastening points roller set R8 350 t

Point	Component
P1	Roller set R8

Fastening points roller set R8 350 t

4 Assembly rack for roller set

The assembly rack **9** is used for the simple and safe assembly of the roller set **1** on the boom head.

WARNING
Falling components!
Death, severe bodily injuries, property damage.
- ▶ Make sure that the roller set is properly placed and secured in the assembly rack **9**.
- ▶ Make sure that the assembly rack **9** is picked up properly with the forklift and secured against “slipping”.

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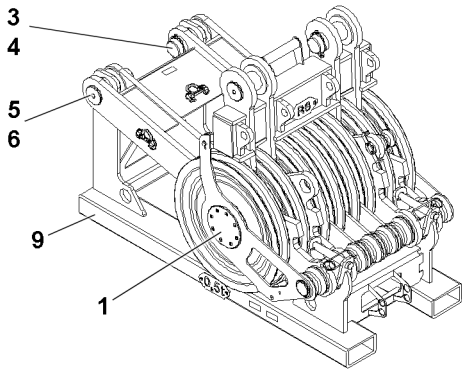

*Fig.144158: Roller set R8 350 t **1** placed in the assembly rack **9***

5 Combinations End section - Roller set

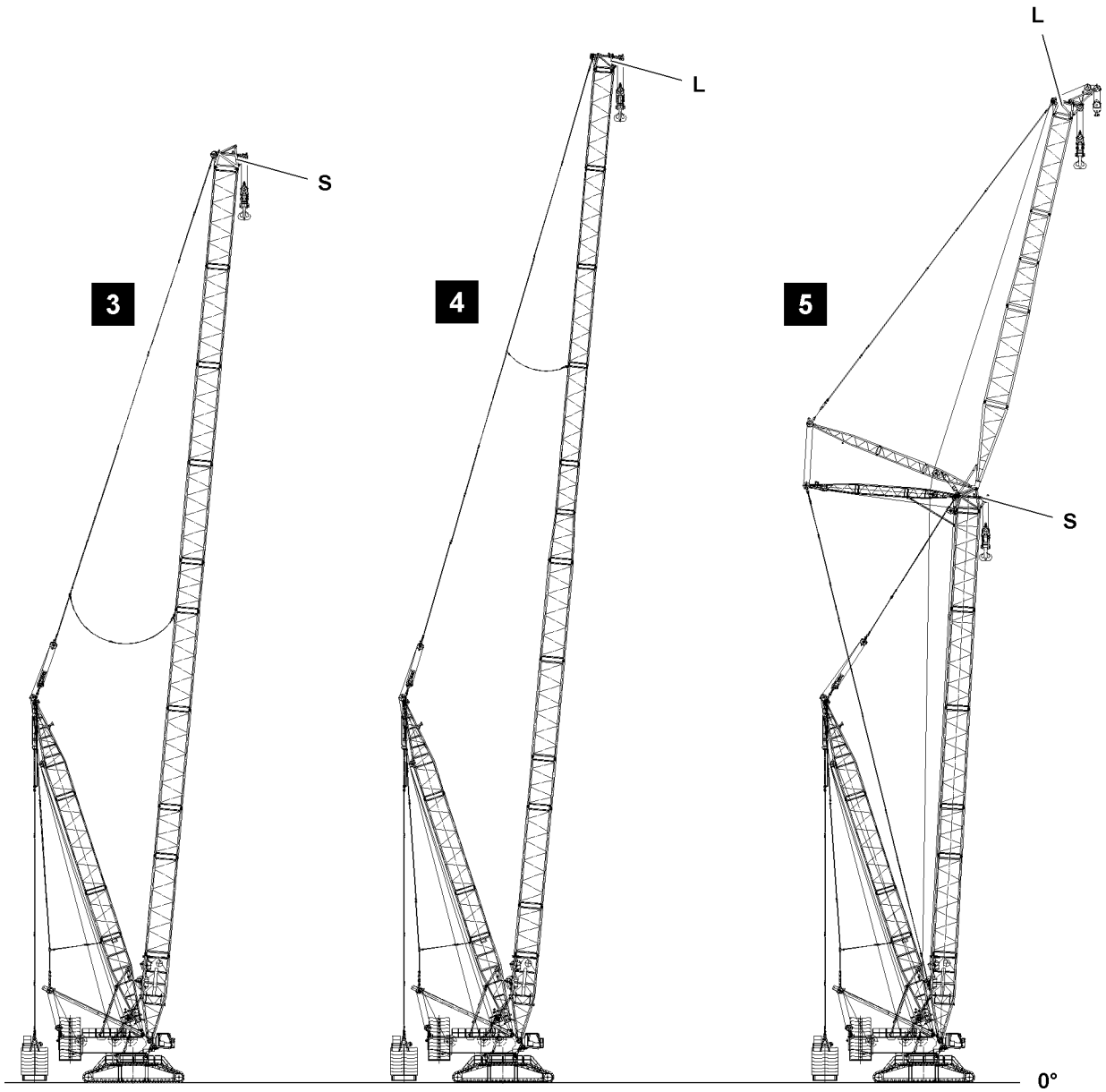

Fig.119042: Boom systems (example)

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	Roller sets				
S-end section	R8	R12	R8+R8	R8+R12	R8+R8+R12

*Combination S-end section 1000 t with roller sets, see illustration **3***

	Roller sets				
L-end section	R8	R12	R8+R8	R8+R12	—

*Combination L-end section 650 t with roller sets, see illustration **4***

	Roller sets				
L-end section	R8	R8+R8	R8	R8	R8+R8
S-end section	—	—	R8	R12	R12

*Combination S-end section 1000 t and L-end section 650 t with roller sets, see illustration **5***

	Roller sets				
L-end section	R8	R8+R12	R8+R12	R12	R12
S-end section	R8+R12	—	R8	—	R8

*Combination S-end section 1000 t and L-end section 650 t with roller sets, see illustration **5***

	Roller sets				
L-end section	R12	—	—	—	—
S-end section	R8+R8	—	—	—	—

*Combination S-end section 1000 t and L-end section 650 t with roller sets, see illustration **5***

6 Assembling the roller set / roller sets

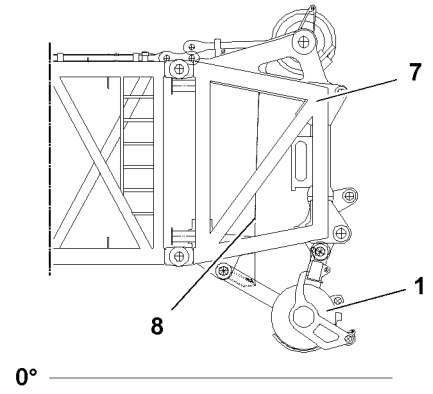

*Fig.144151: Assembling roller set / roller sets **1***

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WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ It is prohibited to lean the auxiliary ladder against the component being disassembled.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.
Death, severe bodily injuries, property damage.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

WARNING
Falling roller sets!
If the roller sets are not pinned and secured correctly, then they can fall down.
Death, severe bodily injuries, property damage.
- ▶ Pin or unpin both pins, which are laying in one horizontal level.
- ▶ It is prohibited to stand under the roller sets or within the complete danger zone during the pinning and unpinning procedure of the roller sets.
- ▶ Safely secure the pins in the storage locations as well as in the receptacles.

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WARNING
Overload of boom system!
If only one roller set is used and the roller set is assembled off center of the end section, then the boom system can be overloaded.
Death, severe bodily injuries, property damage.
▶ Observe the installation position of the roller set / the roller sets on the respective boom end section, see Reeving plan.

WARNING
The crane can topple over!
If the roller set / roller sets are improperly assembled, the crane can topple over.
Death, severe bodily injuries, property damage.
▶ Select roller set / roller sets according to the operating modes, as specified in the load charts.
▶ Observe the Erection and take down charts.
▶ Observe the load charts.
▶ Pay attention to the description on the roller sets.

6.1 Assembling the roller sets R8/R12 on the L- or S-end section

Note
▶ The assembly / disassembly of the roller sets R8 or R12 is identical and is described on the example of roller set R8.
▶ The assembly / disassembly of the roller sets on the L-end section or on the S-end section is identical and is described on the example of the L-end section.

Note
▶ For the assembly / disassembly of the roller sets on the main boom, the main boom can be held by it's own main boom guying. But Liebherr-Werk Ehingen GmbH recommends to additionally secure the main boom at assembly of the roller sets with an auxiliary crane with sufficient load bearing capacity.
▶ For the assembly / disassembly of the roller sets on the luffing lattice jib (W-boom), the W-boom **must** be supported with materials with a load bearing capacity. If supporting is not possible: Lift the W-boom with the auxiliary crane with sufficient load bearing capacity. Observe the following danger notes.

WARNING
Working under suspended load!
The boom can fall down.
Death, severe bodily injuries, property damage.
▶ Make sure that the auxiliary crane **10** is properly supported and horizontally aligned.
▶ Make sure that the utilization of the **auxiliary crane 10** is **maximum 90 %**.
▶ Make sure that the motor of the auxiliary crane **10** is turned off for assembly of the roller sets.

WARNING
Impermissible fastening equipment!
The boom can fall down.
Death, severe bodily injuries, property damage.
▶ Use only inspected fastening equipment.

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Make sure that the following prerequisites are met:
- The crane is horizontally aligned.
- The L-end section **7** is approx. 2.00 m above the ground.
- The boom system is supported with materials with load bearing capacity.
- **or**
- The boom system is safely held by the auxiliary crane **10**.
- An assembly scaffolding / work platform is available.
- The connector pins are unpinned on the roller set R8 **1** at points **P2** and at points **P4**.

6.1.1 Installing roller set R8 with the forklift and assembly rack

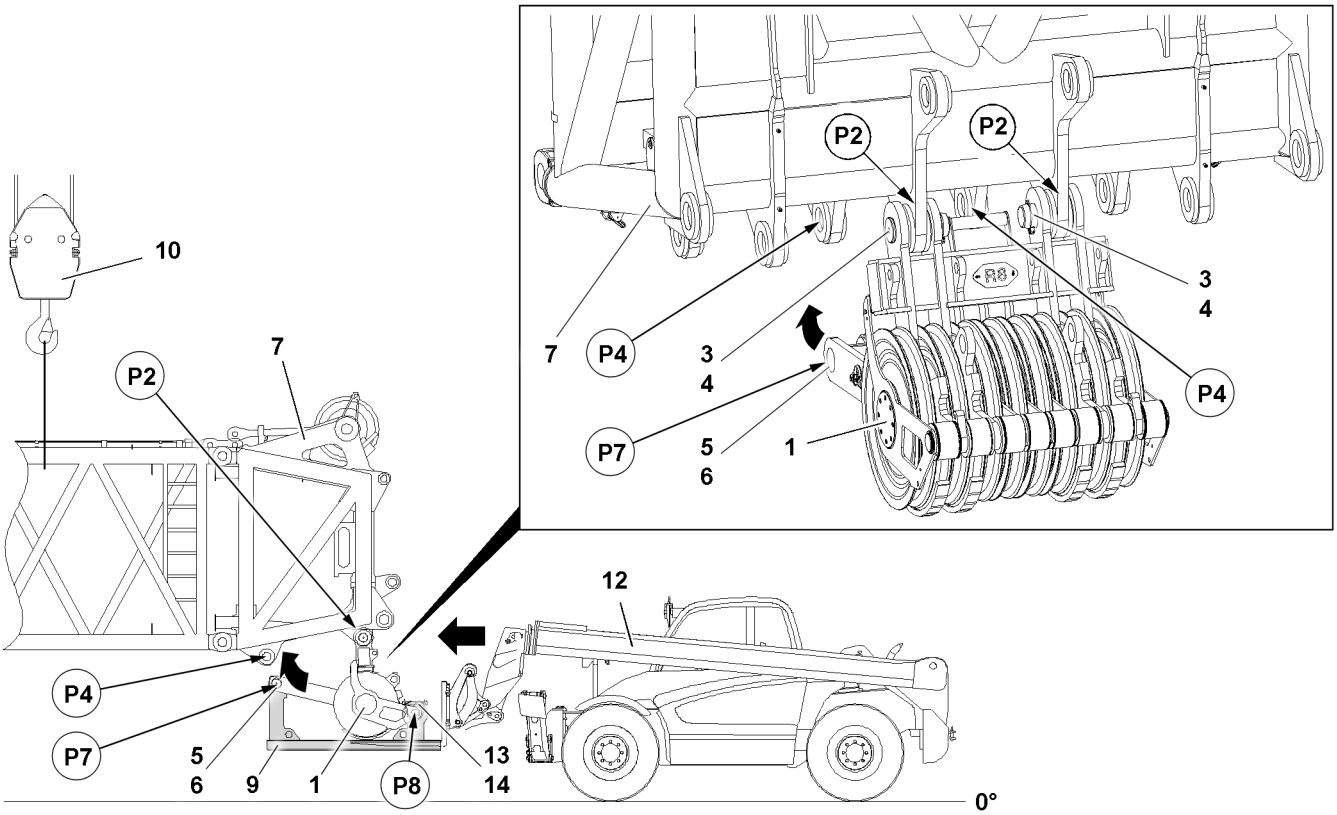

*Fig.144155: Installing roller set R8 **1** with the forklift and assembly rack **9***

Make sure that the following prerequisites are met:
- A forklift **12** is available.
- Roller set **1** is properly placed and secured in the assembly rack **9**.

▶ Retract the forklift **12** properly in the receptacles of the assembly rack **9**.
▶ Lift the roller set R8 **1** with the forklift **12** and retract it into the pin points **P2**.
▶ Align the roller set R8 **1** with the forklift **12** on the pin bores at points **P2**.

The roller set R8 **1** is pinned on four points.

▶ Pin the roller set R8 **1** at points **P2** on the L-end section **7** twice: Insert connector pin **3** on both sides and secure with the retaining element **4**.

NOTICE
Danger of property damage!
If the roller set is moved uncontrolled with the forklift to the pin position, crane components can be damaged.
▶ Make sure that a guide supervises the assembly procedure.

When the roller set R8 **1** is properly pinned on the pin points **P2** and secured with connector pins **3**:
▶ Release and unpin the connector pin **5** on the assembly rack **9**.

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When the connector pins **5** are properly unpinned on the assembly rack **9**:

▶ Drive the forklift forward until the pin bores **P4** on the L-end section **7** align with the pin bores of the roller set **P7**.

▶ Insert connector pin **5** on both sides and secure with the retaining element **6**.

Result:

– Roller set R8 **1** is properly installed and secured on the L-end section **7**.

▶ Release and unpin the pin **13** on the assembly rack **9** at point **P8** on both sides.

When the pins **13** are released and unpinned on both sides:

▶ Lower and extend the assembly rack **9** with the forklift.

Note

▶ At assembly, pay attention to the correct position of the hoist limit switch, see Electric wiring diagram.

▶ Install the hoist limit switch and hoist limit switch weight on the roller set R8 **1** properly.

6.1.2 Installing the roller set R8 with the auxiliary crane

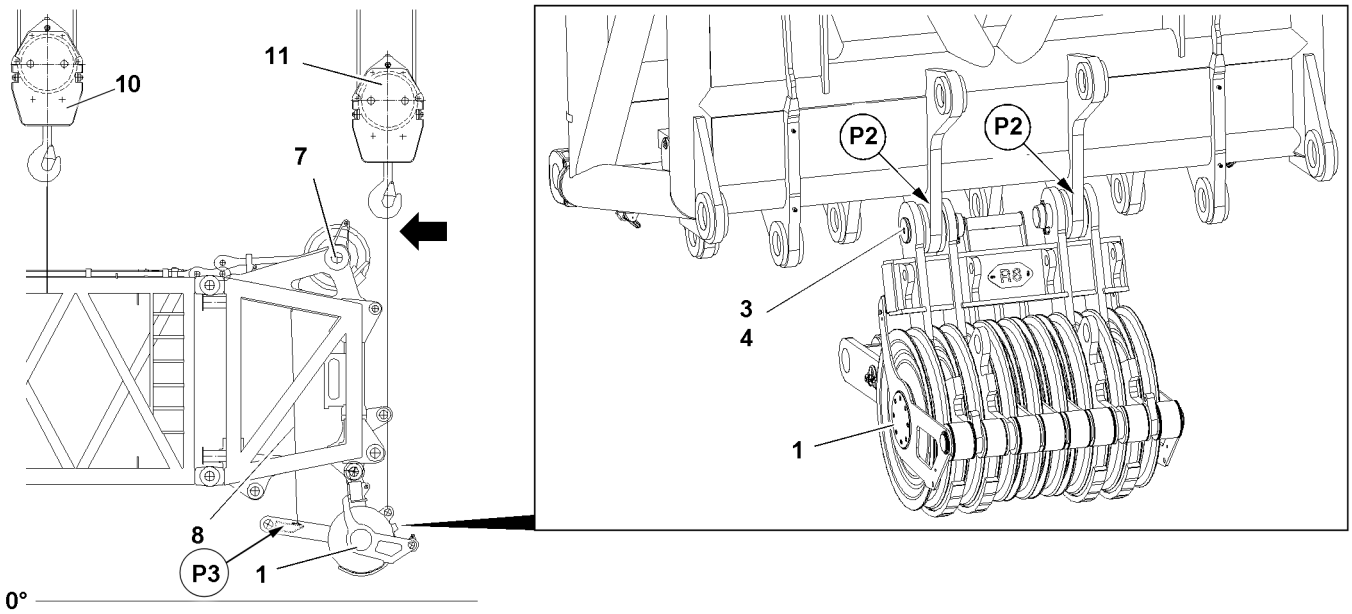

Fig.144153: Installing the roller set R8 with the auxiliary crane

Make sure that the following prerequisite is met:

– A second auxiliary crane **11** is available.

▶ Fasten the roller set R8 **1** on the auxiliary crane **11** and swing it to the pin points **P2**.

▶ Align the roller set R8 **1** with the auxiliary crane **11** on the pin bores at points **P2**.

The roller set R8 **1** is pinned on four points.

▶ Pin the roller set R8 **1** at points **P2** with the L-end section **7** twice: Insert the connecting pin **3** and secure it with a retaining element **4**.

When the roller set R8 **1** is pinned and secured:

▶ Remove the auxiliary crane **11**.

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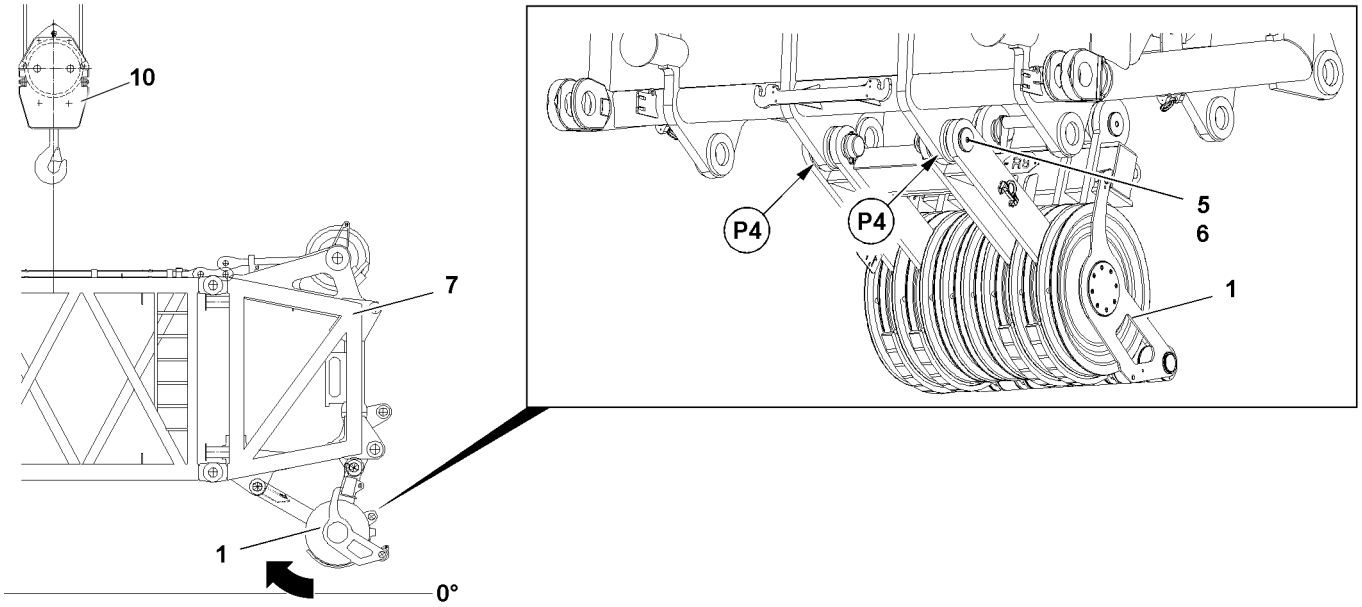

Fig.144154

- ▶ Connect the roller set R8 **1** with the manual chain pull **8** at point **P3**.
- ▶ Swing the roller set R8 **1** with the manual chain pull **8** to the pin bores at points **P4**.
- ▶ Pin the roller set R8 **1** at points **P4** with the L-end section **7** twice: Insert the connecting pin **5** and secure it with a retaining element **6**.
- ▶ Release the manual chain pull **8** at point **P3** and remove.

Note

- ▶ At assembly, pay attention to the correct position of the hoist limit switch, see Electric wiring diagram.

- ▶ Install the hoist limit switch and hoist limit switch weight on the roller set R8 **1** properly.

6.2 Installing the rope guide pulley on the roller set / roller sets

NOTICE

Danger of property damage!

If the rope guide pulleys are not correctly installed, the steel structure of the roller set can be damaged when erecting the boom system and while spooling out the hoist rope.

- ▶ Make sure that the rope guide pulley(s) are properly installed on the roller set before erecting the boom system.
- ▶ Observe the installation direction of the rope guide pulley(s).

Note

- ▶ The following illustrations are examples and may not match your crane exactly.
- ▶ The following illustrations show the roller set R8 / roller sets R8.
- ▶ The use of the rope guide pulley(s) on roller set R12 / roller sets R12 is identical to its use on roller sets R8.

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Make sure that the following prerequisites are met:
- The roller set / the roller sets are properly installed and secured on the boom head.
- The hoist limit switch and hoist limit switch weight are assembled.

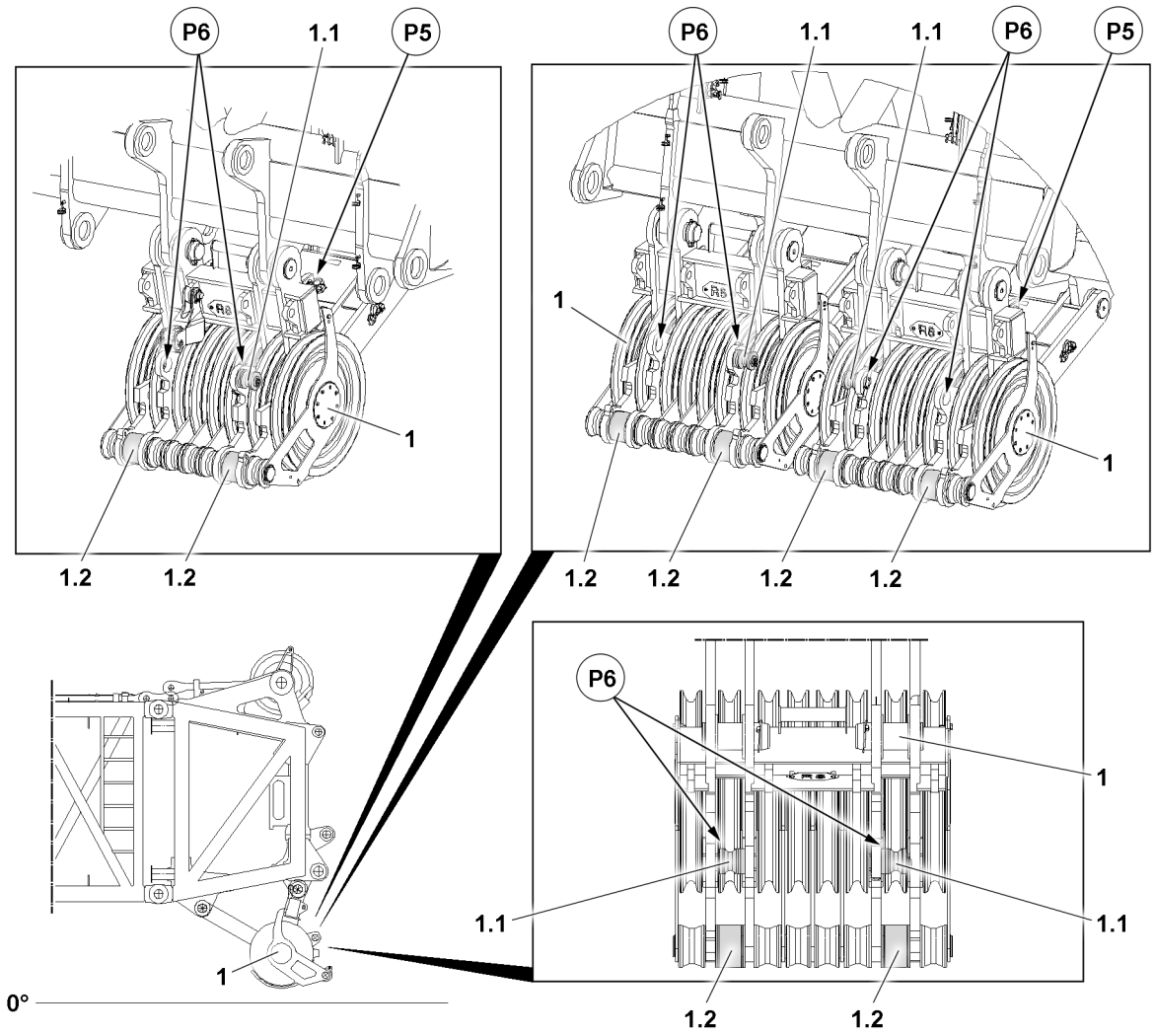

*Fig.144023: Installing the rope guide pulley(s) **1.1** on the roller set **1***

6.2.1 Reeving the hoist rope / installing the rope guide pulley

NOTICE
Incorrectly installed rope guide pulley!
- ▶ Make sure that the rope guide pulley(s) are again properly installed on the roller set after reeving in the hoist rope.
- ▶ The rope guide pulley **1.1** must be installed respectively over the pulley **1.2**.

To reeve in the hoist rope, the rope guide pulley on the roller set must be unpinned out of the operating position **P6** and pinned in the parking position **P5**.

- ▶ Release the rope guide pulley **1.1** on point **P6** and remove.
- ▶ Insert the rope guide pulley **1.1** on point **P5** in the park position and secure.
- ▶ Reeve in the hoist rope correctly, see the Reeving plan.

When the hoist rope is properly reeved:
- ▶ Release the rope guide pulley **1.1** on point **P5** in the park position and remove.
- ▶ Insert the rope guide pulley **1.1** on point **P6** and secure.

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7 Removing the roller set / roller sets

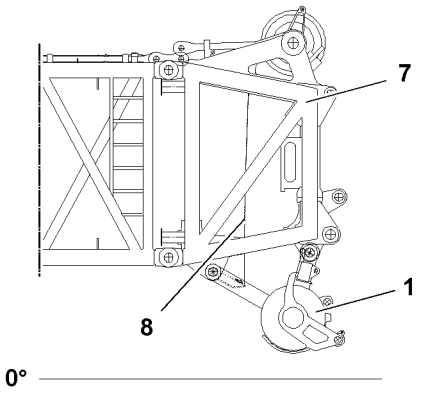

Fig.144151: Removing the roller set / roller sets

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.

- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ It is prohibited to lean the auxiliary ladder against the component being disassembled.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.

- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

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DANGER
The components can fall down!
If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.
Death, severe bodily injuries, property damage.
▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

7.1 Removing the rope guide pulley on the roller set / roller sets

Make sure that the following prerequisites are met:
– The L-end section is approx. 2.00 m above the ground.
– The boom system is supported with materials with load bearing capacity.
– The pulley head of the L-end sections is located above the hook block.
– **or**
– The boom system is safely held by the auxiliary crane.
– An assembly scaffolding / work platform is available.

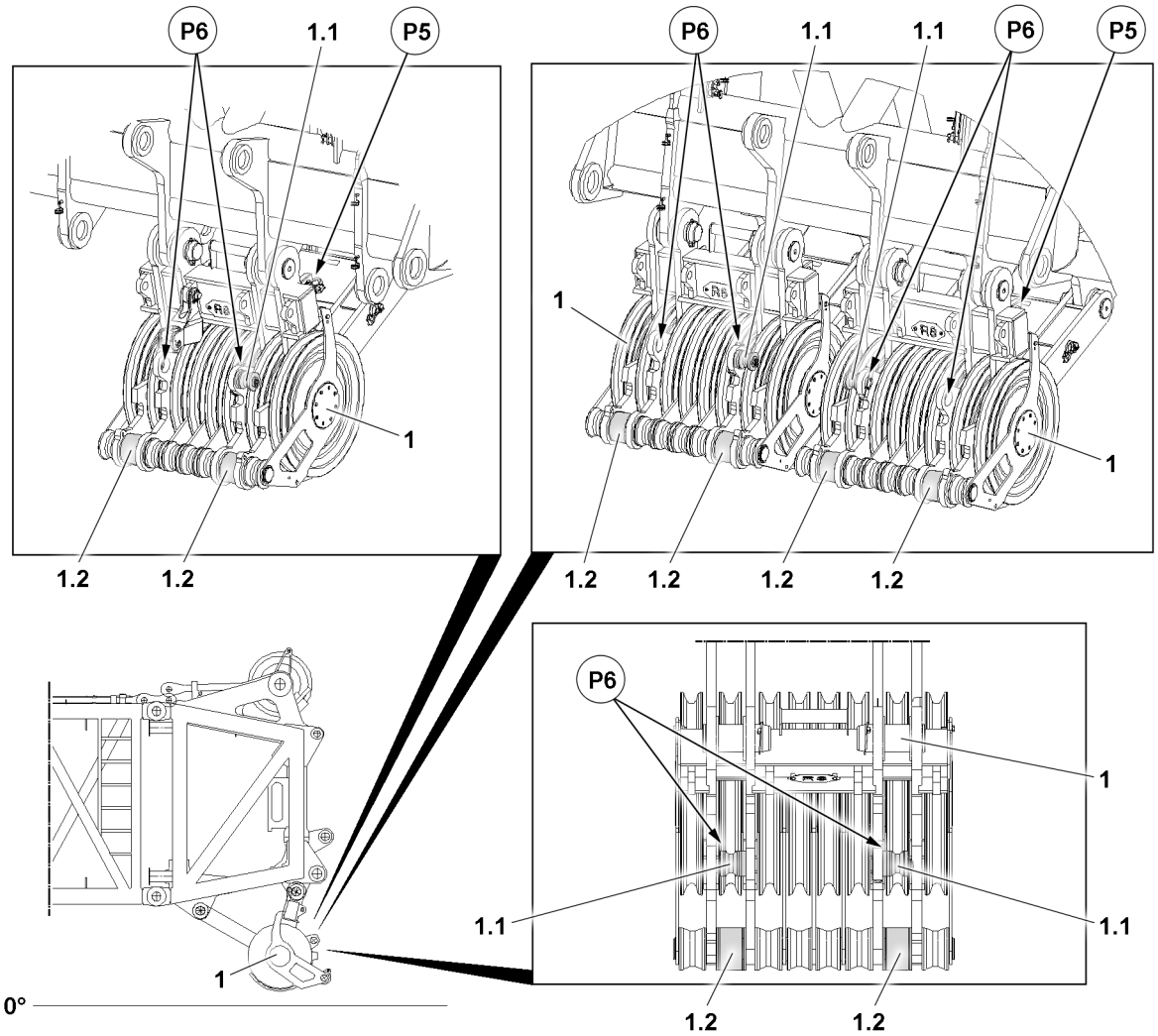

*Fig.144023: Removing the rope guide pulley(s) **1.1** on the roller set **1***

7.1.1 Reeving out the hoist rope / removing the rope guide pulley

To reeve out the hoist rope, the rope guide pulley on the roller set must be unpinned out of the operating position **P6** and pinned in the parking position **P5**.

▶ Release the rope guide pulley **1.1** on point **P6** and remove.

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- ▶ Insert the rope guide pulley **1.1** on point **P5** in the park position and secure.
- ▶ Reeve the hoist rope out correctly.

When the hoist rope is properly reeved out:

- ▶ Release the rope guide pulley **1.1** on point **P5** in the park position and remove.
- ▶ Insert the rope guide pulley **1.1** on point **P6** and secure.

7.2 Disassembling the roller sets R8/R12 on the L- or S-end section

Note

- ▶ The assembly / disassembly of the roller sets R8 or R12 is identical and is described on the example of roller set R8.
- ▶ The assembly / disassembly of the roller sets on the L-end section or on the S-end section is identical and is described on the example of the L-end section.

Note

- ▶ For the assembly / disassembly of the roller sets on the main boom, the main boom can be held by it's own main boom guying. But Liebherr-Werk Ehingen GmbH recommends to additionally secure the main boom at assembly of the roller sets with an auxiliary crane with sufficient load bearing capacity.
- ▶ For the assembly / disassembly of the roller sets on the luffing lattice jib (W-boom), the W-boom **must** be supported with materials with a load bearing capacity. If supporting is not possible: Lift the W-boom with the auxiliary crane with sufficient load bearing capacity. Observe the following danger notes.

WARNING
Working under suspended load!
The boom can fall down.
Death, severe bodily injuries, property damage.

- ▶ Make sure that the auxiliary crane **10** is properly supported and horizontally aligned.
- ▶ Make sure that the utilization of the auxiliary crane **10** is maximum 90 %.
- ▶ Make sure that the motor of the auxiliary crane **10** is turned off during assembly of the roller sets.

WARNING
Impermissible fastening equipment!
The boom can fall down.
Death, severe bodily injuries, property damage.

- ▶ Use only inspected fastening equipment.

Make sure that the following prerequisites are met:

- The crane is horizontally aligned.
- The L-end section **7** is approx. 2.00 m above the ground.
- The boom system is supported with materials with load bearing capacity.
- **or**
- The boom system is safely held by the auxiliary crane **10**.
- An assembly scaffolding / work platform is available.
- The hoist rope has been reeved out.

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7.2.1 Removing roller set R8 with the forklift and assembly rack

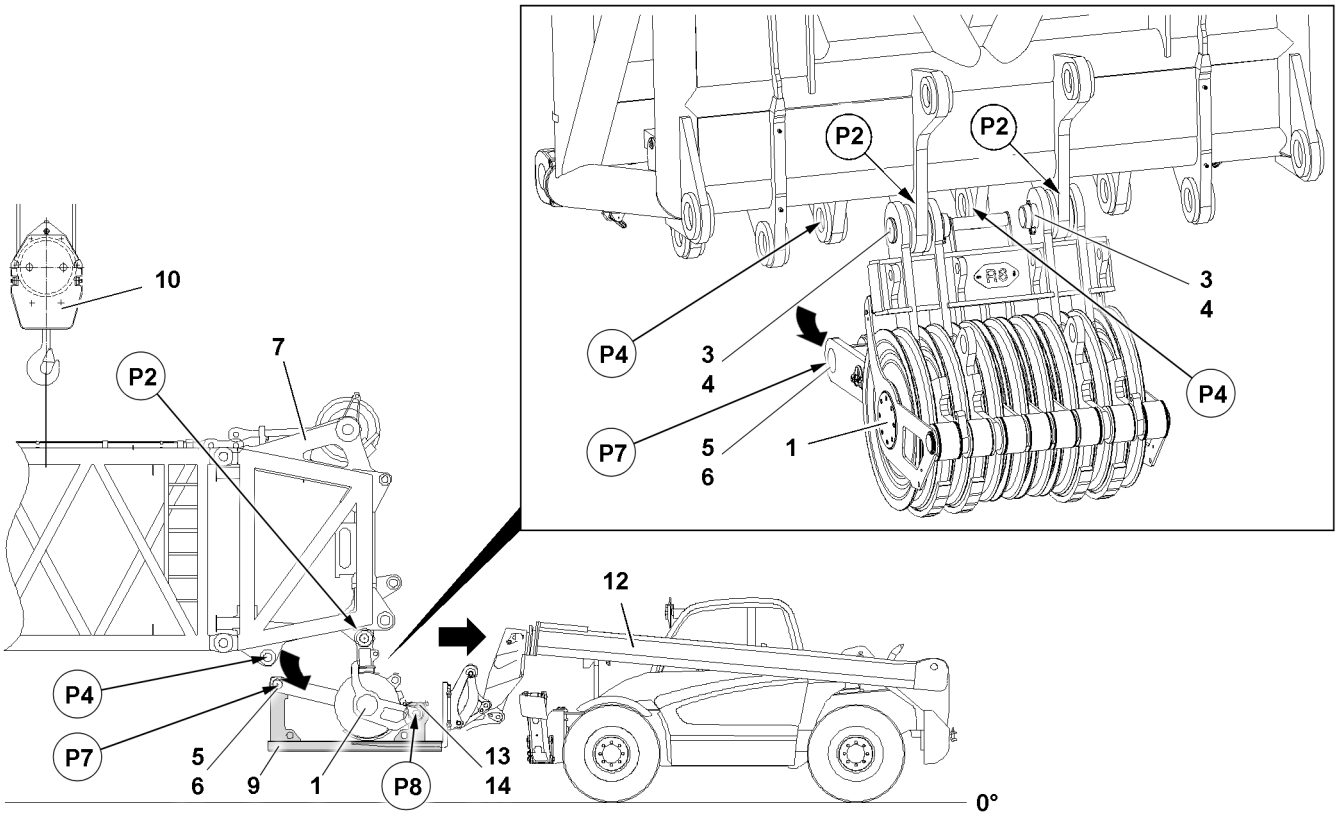

*Fig.144160: Removing roller set R8 **1** with the forklift and assembly rack **9***

Make sure that the following prerequisites are met:
- A forklift **12** is available.
- The assembly rack **9** is available.
- The hoist limit switch weight and the hoist limit switch are properly removed on roller set R8 **1**.

▶ Retract the forklift **12** properly in the receptacles of the assembly rack **9**.
▶ Align the assembly rack **9** with the forklift **12** under the roller set **1**.
▶ Lift the assembly rack **9** with the forklift **12** and roller set **1** on the receptacles at point **P8**.

When the roller set **1** is properly pinned and secured in the receptacles of the assembly rack **9**:
▶ Unpin the roller set R8 **1** on the pin points **P4** on both sides.

When the roller set R8 **1** is properly unpinned on the pin points **P4**:
▶ Move the forklift **12** away from the L-end section slowly.

Result:

- The roller set R8 **1** lowers into the receptacles of the assembly rack **9**.

▶ Secure roller set R8 **1** in the receptacles of the assembly rack **9**.

When the roller set R8 **1** is completely lowered into the receptacles of the assembly rack **9**:
▶ Release and unpin the roller set R8 **1** on the points **P2** on the L-end section **7** on both sides.

When the roller set R8 **1** is properly unpinned on the pin points **P2** on both sides:
▶ Lower the assembly receptacle **9** with the forklift and extend the forklift.

7.2.2 Removing the roller set R8 with the auxiliary crane

Make sure that the following prerequisite is met:
- A second auxiliary crane **11** is available.

▶ Disassemble the hoist limit switch weight and hoist limit switch.

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▶ Connect the roller set R8 **1** with the manual chain pull **8** at point **P3**.

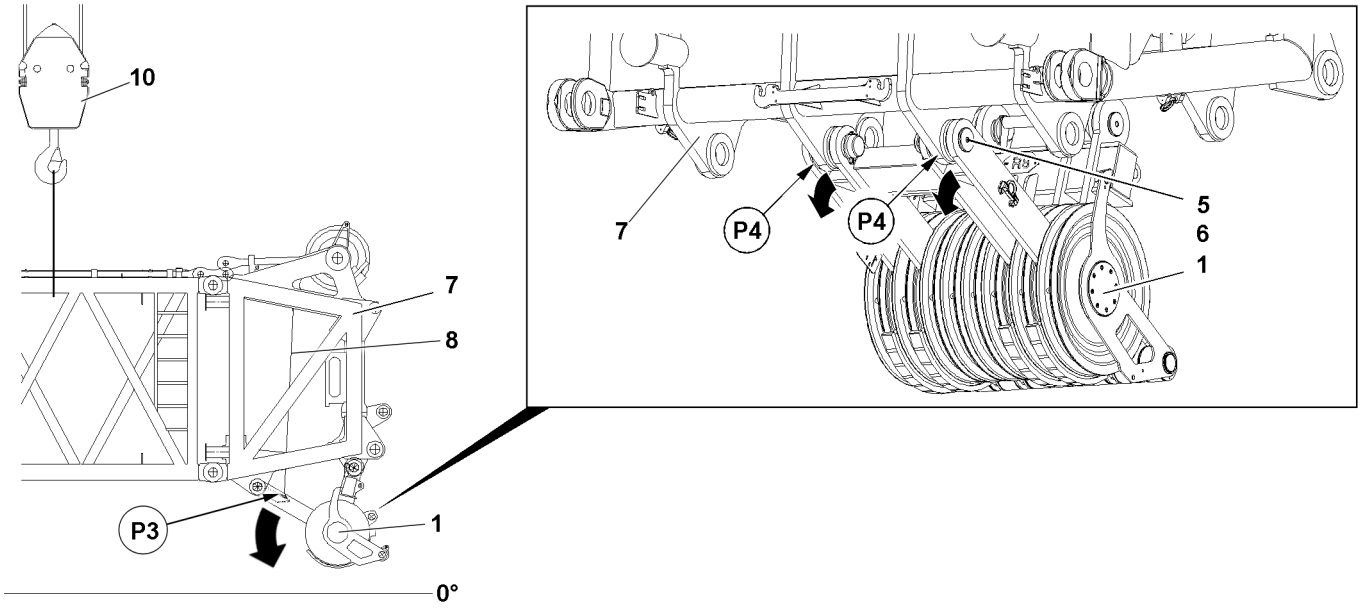

Fig.144162

WARNING
Roller set swinging down!
The roller set R8 **1** can swing down by itself due to its own weight when unpinning on points **P4**.
Death, severe bodily injuries, property damage.

▶ Make sure, before unpinning, that the roller set R8 **1** is connected with the manual chain pull **8** at point **P3**.
▶ Do not reach with your hands into the danger zone.

▶ Unpin the roller set R8 **1** at points **P4** from the L-end section **7** twice: Remove the retaining element **6** and unpin the connecting pin **5**.
▶ Swing the roller set R8 **1** with the manual chain pull **8** down.
▶ Release the manual chain pull **8** at point **P3** and remove.

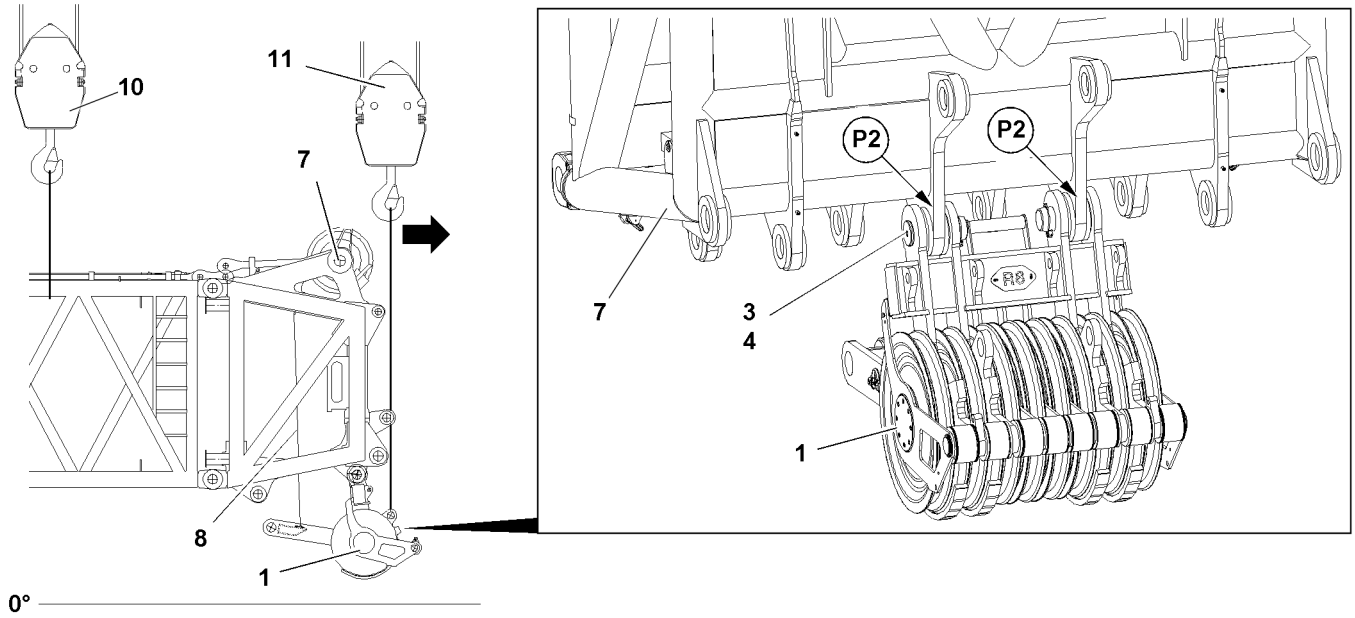

Fig.144161: Removing the roller set on the L-end section

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▶ Fasten the roller set R8 **1** on the auxiliary crane **11**.

WARNING
Roller set falling down!
The roller set R8 **1** can fall down by itself due to its own weight when unpinning at points **P2**.
Death, severe bodily injuries, property damage.
▶ Make sure, before unpinning, that the roller set R8 **1** is held with the auxiliary crane **11**.

When the roller set R8 **1** is safely held by the auxiliary crane **11**:
▶ Unpin the roller set R8 **1** at points **P2** from the L-end section **7** twice: Remove the retaining element **4** and unpin the connecting pin **3**.
▶ Remove roller set R8 **1** with the auxiliary crane **11** and place down.
▶ Remove the auxiliary crane **11**.

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5.19 Hook blocks

1	Hook blocks	3
2	Radio sending unit for the incline display hook block	3
3	Procedure in case of slack rope	3

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Fig.195219

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1 Hook blocks

Note
▶ For assembly and disassembly of hook blocks, see the separate operating instructions.

2 Radio sending unit for the incline display hook block

Note
▶ For the assembly and disassembly of the radio sending unit observe the Crane operating instructions, chapter 5.19.10.

3 Procedure in case of slack rope

Note
▶ If the hook block can no longer be lowered due to slack rope formation, then the following steps must be carried out!

3.1 Spooling up loose hoist rope

▶ Spool up loose hoist rope between the boom head and the wind carefully onto the winch.

Note
▶ A slight rope slack must remain between the boom head and the winch!

3.2 Luffing the boom down

NOTICE
Danger of collision!
When luffing the boom down, the hoist rope length can shorten and pull the hook block against the boom head.
▶ Monitor the distance of the hook block to the boom head.

▶ Luff the boom down carefully.

Result:

– The hoist rope between the boom head and the winch is tensioned.

3.3 Lowering the hook block

▶ Lower the hook block carefully with the hoist gear.

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5.19.10 Hook block incline sensors

1	Assembling the receiver-incline sensor*	3
2	Assembling the sending unit-incline sensor* on the hook block	6

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Fig.195219

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1 Assembling the receiver-incline sensor*

The installation of the radio receiver on the respective boom head is required to provide an additional aid for the crane driver in parallel operation of winch 1 and winch 2 (1II2) to manually monitor the incline of the hook block via the incline display in the respective winch icons.

Note

- ▶ The assembly of the radio receiver is described in this chapter as an example and may not apply exactly to your crane.
- ▶ The representation of the various mounting positions of the radio receiver are examples and may not apply exactly to your crane.
- ▶ Depending on the crane type and / or equipment, the assembly plate of the radio receiver may be constructed with a different design, see variation 1 and variation 2.

Note

- ▶ When using the radio receiver, the sender batteries must be sufficiently charged.

Note

- ▶ The LICCON computer system monitors in parallel operation the incline / incline position of the hook block, see the Crane operating instructions chapter 4.02 and chapter 4.05.

WARNING

Load ripping off!

If the hook block gets into an impermissible incline / incline position in parallel operation of winch 1 and winch 2 (1II2), then the hook block can be overloaded.

Death, severe bodily injuries, property damage.

- ▶ Make sure that the radio receiver is properly installed on the boom head / lattice section.
- ▶ Make sure that the incline display in the LICCON computer system is constantly monitored in crane operation, see Crane operating instructions, chapter 4.02.

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1.1 Variation 1: Installing / removing the radio receiver on the boom end section / lattice section

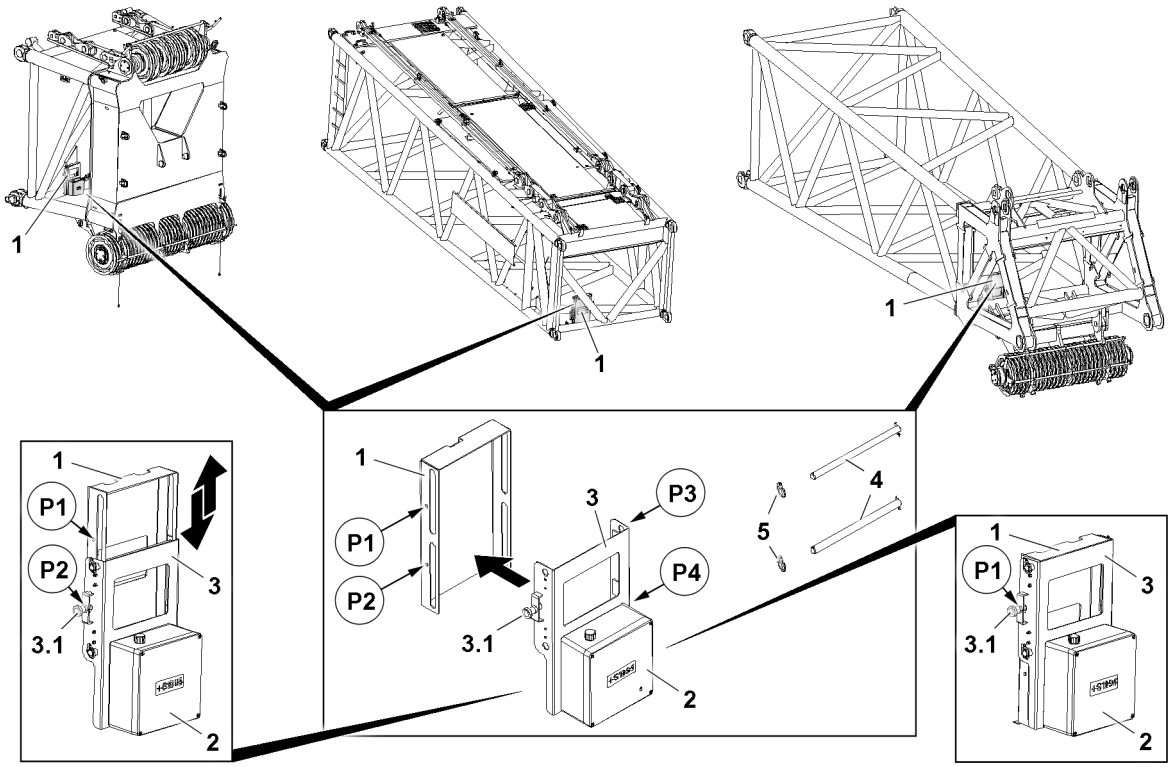

*Fig.128140: Variation 1: Installing the radio receiver **2** on the boom end section / lattice section*

Point **P1** = transport position lock

Point **P2** = operating position lock

The radio receiver **2** is screwed firmly with the assembly plate **3**.

If the assembly plate **3** is assembled properly on the boom end section / lattice section, then the radio receiver **2** can be moved and locked twice within the slotted holes on the support **1**.

1.1.1 Assembling the radio receiver

▶ Pull the detent pin **3.1** on the assembly plate **3** and position and hold the radio receiver **2** with the assembly plate **3** on the support **1**.

When the assembly plate **3** is properly set on the support **1**:

▶ Release the detent pin **3.1** and make sure that the detent pin **3.1** is properly locked in point **P1**.

▶ Properly insert the pins **4** at the points (point **P3** and point **P4**) and secure with the retaining element **5**.

Result:

– The radio receiver **2** is properly pinned and secured on the support **1**.
– The radio receiver **2** is properly locked in the transport position at point **P1**.

When the radio receiver **2** is properly pinned and locked:

▶ Connect the radio receiver **2** electrically, see Electric wiring diagram.

NOTICE
Damage of the radio receiver **2**!

▶ Make sure that the radio receiver **2**, when handling and / or placing down the respective boom end section / lattice section on the ground, is always in the transport position, see the section „Bringing the radio receiver to the transport position from the operating position“.

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▶ Protect the radio receiver **2** from damage.

1.1.2 Bringing the radio receiver to the operating position from the transport position

WARNING
Interruption of radio connection!
If the radio receiver **2** is left in the transport position during crane operation, the radio connection can break off.
▶ Make sure that the radio receiver **2** is in the operating position during crane operation.

The radio receiver **2** must be brought to the operating position before erecting the boom system and locked at point **P2**.

▶ Hold the radio receiver **2**, pull the detent pin **3.1** and slowly lower the radio receiver **2** in the operating position until the detent pin **3.1** engages at point **P2**.

Result:

– The radio receiver **2** is in the operating position.

1.1.3 Bringing the radio receiver to the transport position from the operating position

The radio receiver **2** must be brought to the transport position before disassembling the boom system and locked at point **P1**.

▶ Hold the radio receiver **2**, pull the detent pin **3.1** and slowly push the radio receiver **2** up to the transport position until the detent pin **3.1** engages at point **P1**.

Result:

– The radio receiver **2** is in the transport position.

1.1.4 Disassembling the radio receiver

▶ Disconnect the electrical connection between the terminal box and the radio receiver **2**.
▶ Properly store the electrical connection.

When the electrical connection is properly disconnected:
▶ Remove the retaining element **5** on the pins **4**.
▶ Hold the radio receiver **2** and unpin the pin **4**.
▶ Pull the detent pin **3.1** lift the radio receiver **2** with the assembly plate **3** from the support **1**.
▶ Insert the pin **4** on the assembly plate **3** and secure properly with the retaining element **5**.

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1.2 Variation 2: Installing the radio receiver on the boom end section

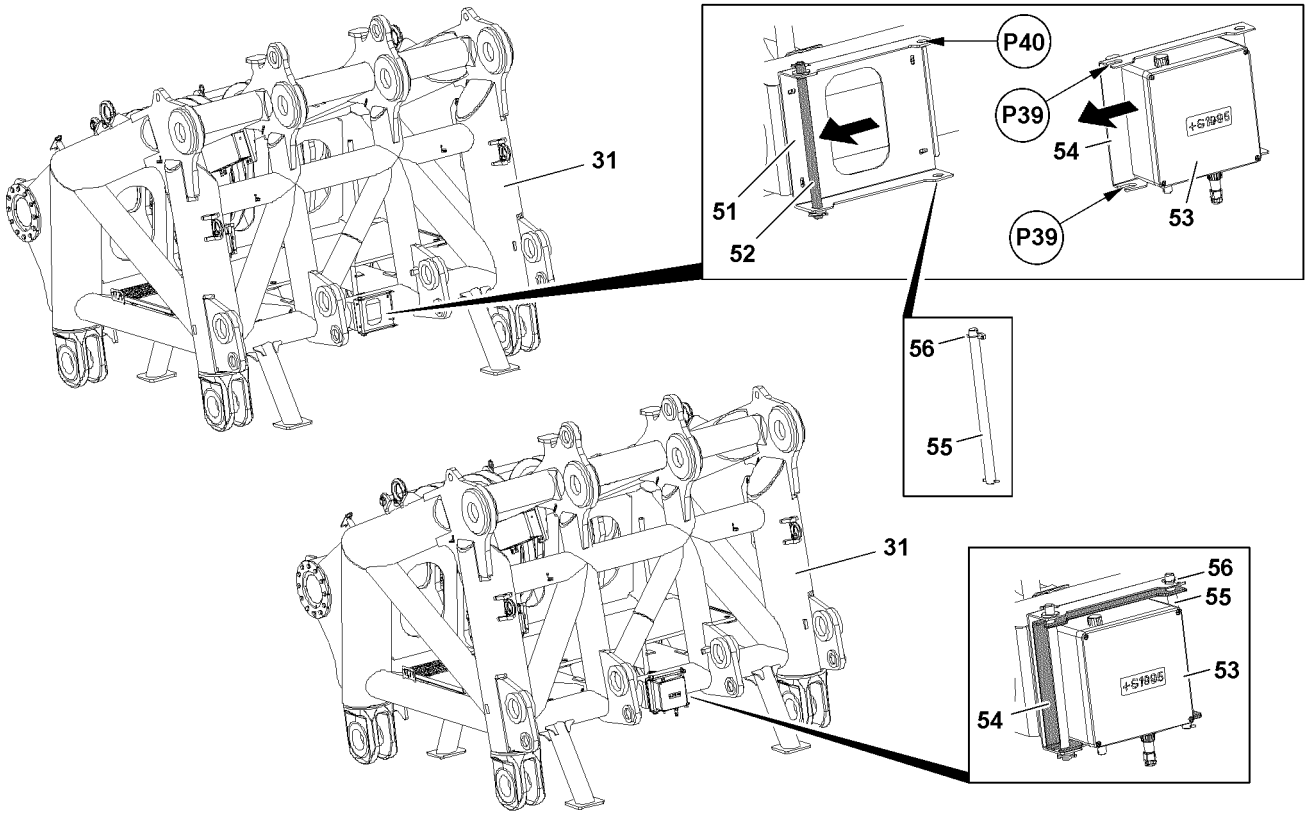

*Fig.120089: Variation 2: **53**Installing the radio receiver **53** on the boom end section*

The radio receiver **53** is screwed on the assembly plate **54**.

▶ Move the assembly plate **54** of the radio receiver **53** with the fork connections at point **P39** on the axle **52** of the retainer **51**.

When the assembly plate **54** of the radio receiver **53** is properly in the retainer **51**:

▶ Insert the pin **55** at point **P40** and secure properly with the locking pin **56**.

▶ Connect the radio receiver **53** electrically, see Electric wiring diagram.

NOTICE

Damage of the radio receiver **53**!

▶ Make sure that the radio receiver **53** is not damaged when handling and / or setting down the respective boom head on the ground.

▶ Protect the radio receiver **53** from damage.

2 Assembling the sending unit-incline sensor* on the hook block

So that the inclination of the hook block can be recorded in parallel operation by the crane control, the radio sending unit must be properly assembled on the hook block.

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Note

- The assembly of the radio sending unit is described in this chapter as an example and may not apply exactly to your crane.
- The representation of the various mounting positions of the hook blocks are examples and may not apply exactly to your crane.

Note

- The LICCON computer system monitors in parallel operation the incline / incline position of the hook block, see the Crane operating instructions chapter 4.02 and chapter 4.05.

WARNING

Load ripping off!

If the hook block gets into an impermissible incline / incline position in parallel operation of winch 1 and winch 2 (1II2), then the hook block can be overloaded.

Death, severe bodily injuries, property damage.

- Make sure that the radio sending unit is properly installed on the hook block.
- Make sure that the incline display in the LICCON computer system is constantly monitored in crane operation, see Crane operating instructions, chapter 4.02.

2.1 Assembling the radio sending unit on the hook block

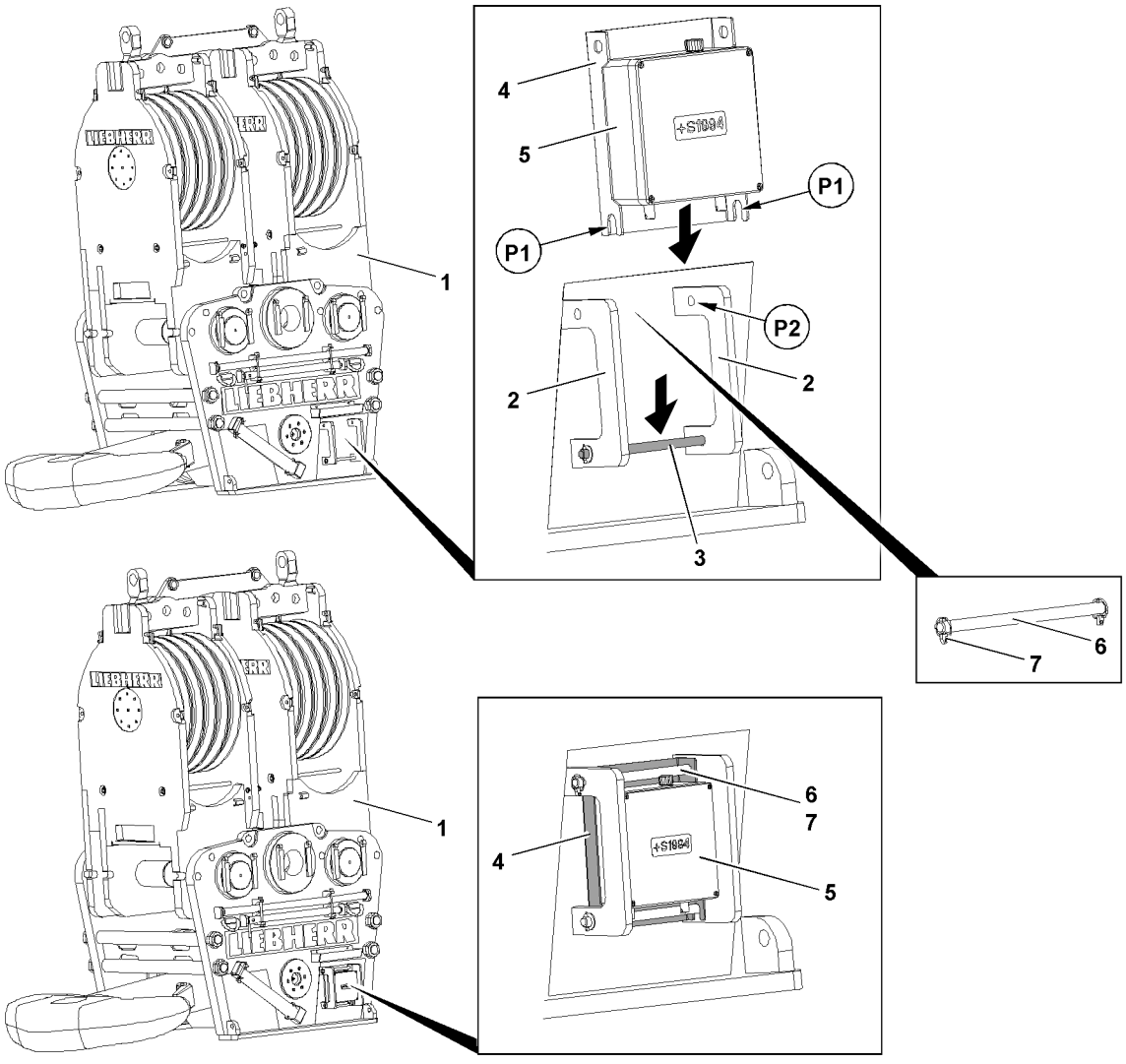

*Fig.120141: Assembly of the radio sending unit **5** on the hook block*

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The installation of the radio sending unit **5** on the respective hook block is required to be able to ensure in parallel operation of winch 1 and winch 2 (1II2) via the incline display in the respective winch icons that the hook block does not get into an impermissible incline position.

Make sure that the following prerequisites are met:
- The hook block is standing on the ground.
- The hook block has the required retainer **2** for the assembly of the radio sending unit.
- The radio sending unit batteries are sufficiently charged.

Note
▶ An impermissible incline position of the hook block in parallel operation of winch 1 and winch 2 (1II2) does **not** result in a **shut-off** of winch movements by the LICCON computer system.

WARNING
Load ripping off!
If the hook block gets into an impermissible incline position in parallel operation of winch 1 and winch 2 (1II2), then the hook block can be overloaded.
The load can rip off and fall down.
Death, severe bodily injuries, property damage.
▶ Make sure that the radio sending unit **5** is properly installed on the hook block.
▶ Make sure that the incline display in the LICCON computer system is constantly monitored in crane operation, see Crane operating instructions, chapter 4.02.

Note
▶ The assembly of the radio sending unit **5** on the respective hook block is described as an example.
▶ The example assembly of the radio sending unit **5** is identical to the assembly of the radio sending unit **5** on additional hook blocks approved for parallel operation.

The radio sending unit **5** is screwed on the assembly plate **4**.

▶ Move the assembly plate **4** of the radio sending unit **5** with the fork connections at point **P1** on the axle **3** of the retainer **2**.

When the assembly plate **4** of the radio sending unit **5** is properly in the retainer **2**:
▶ Insert the pin **6** at point **P2** and secure properly with the locking pin **7**.

NOTICE
Damage of the radio sending unit **5**!
▶ Make sure that the radio sending unit **5** is not damaged when handling with the hook block.

▶ Protect the radio sending unit **5** from damage.

2.2 Disassembling the radio sending unit on the hook block

Make sure that the following prerequisite is met:
- The hook block is standing on the ground.

▶ Release the radio sending unit **5**: Remove the locking pin **7** and unpin the pin **6** at point **P2**.
▶ Lift the radio sending unit **5** and store it properly.
▶ Insert the pin **6** again at point **P2** and secure properly with locking pin **7**.

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5.30 Pin pulling device

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2	Hydraulic oil level	4
3	Pinning and unpinning with pin pulling device	4

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1 Pin pulling device

The pin pulling device consists of the hydraulic aggregate and the pin pulling cylinders. The connector pins on the crawler crane and on the lattice sections are pinned and unpinned with these pin pulling cylinders.

There are three different variations of pin pulling aggregates.

Note

▶ Operate the hydraulic aggregate, see the Operating and maintenance instructions for the Hydraulic aggregate.

1.1 Pin pulling aggregate on wheels with „emergency control“ function

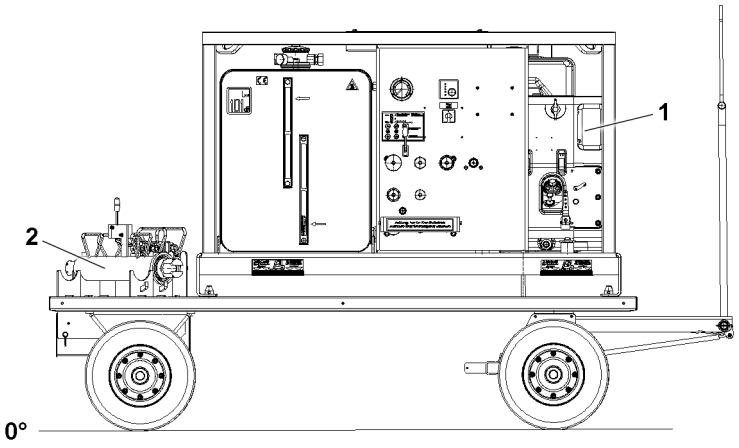

Fig.151398: Pin pulling aggregate on wheels with „emergency control“ function

1 Pin pulling aggregate **2** Pin pulling cylinder

1.2 Pin pulling aggregate on wheels without „emergency control“ function

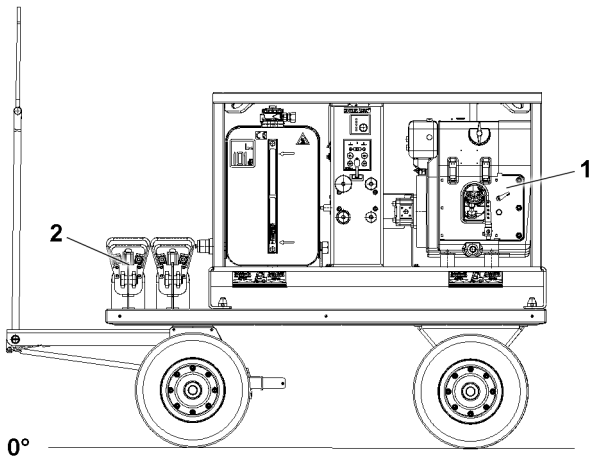

Fig.151399: Pin pulling aggregate on wheels without „emergency control“ function

1 Pin pulling aggregate **2** Pin pulling cylinder

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1.3 Pin pulling aggregate on crawler

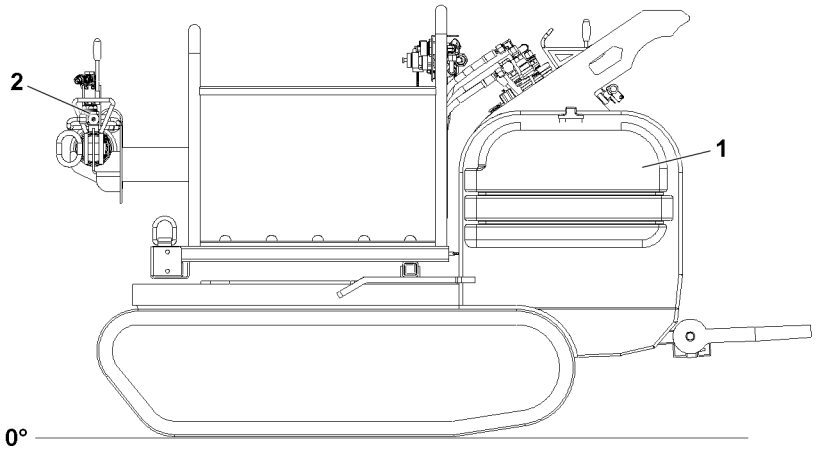

Fig.151400: Pin pulling aggregate on crawler

1 Pin pulling aggregate
2 Pin pulling cylinder

1.4 Pin pulling cylinder

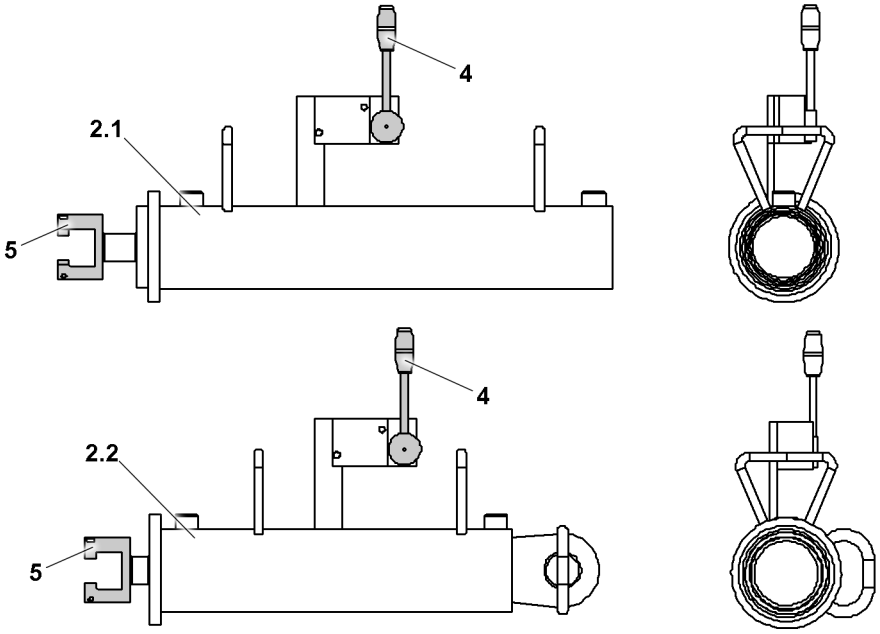

Fig.151402: Pin pulling cylinders

2.1 Pin pulling cylinder for the chassis
2.2 Pin pulling cylinder for the lattice sections
4 Lever
5 Piston rod head

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2 Hydraulic oil level

Note

- ▶ The hydraulic oil tank is filled when starting the hydraulic aggregate.
- ▶ Check the hydraulic oil level, see Operating and maintenance instructions for the Hydraulic aggregate.

NOTICE

Emerging hydraulic oil!

When the hydraulic aggregate is changed and / or the operational crane hydraulic is connected, then there is a danger that the hydraulic oil is supplied during the working process into the hydraulic tank circuit and thus forwarded into the hydraulic tank of the hydraulic aggregate.

The forwarded hydraulic oil quantity exceeds the tank volume of the hydraulic aggregate. Hydraulic oil runs over and contaminates the environment.

- ▶ Make sure that the hydraulic aggregate is separated from the hydraulic circuit of the crane before hydraulic components are actuated via the crane hydraulic.
- ▶ Make sure, before the hydraulic aggregate is separated from the crane, that the working process is ended with the same hydraulic aggregate.
- ▶ Make sure that the same amount of hydraulic oil is in the hydraulic oil tank of the hydraulic aggregate after use in comparison to before use.

3 Pinning and unpinning with pin pulling device

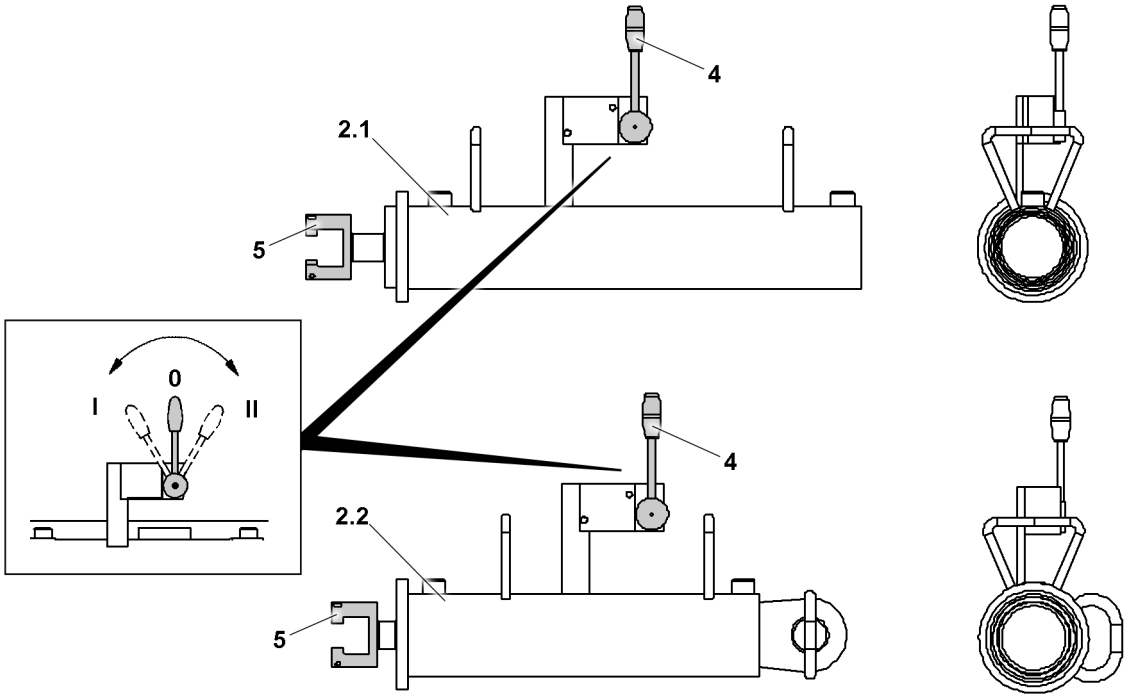

Fig.151401: Pinning and unpinning with the pin pulling device

Note

- ▶ The pin pulling cylinder **2.1** is used for pinning and unpinning on the chassis.
- ▶ The pin pulling cylinder **2.2** is used for pinning and unpinning on the lattice sections.

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Note

▶ Operate the hydraulic aggregate, see the Operating and maintenance instructions for the hydraulic aggregate.

Note

▶ **0-position**: Neutral position.
▶ **I-position**: Insert the pin.
▶ **II-position**: Unpin the pin.

DANGER

Danger of accident!
When you disassemble unsecured or unsupported crane parts, they can fall down!
Personnel can be severely injured or killed!

▶ Never stand **under** unsecured or unsupported crane parts and unpin the pins!
▶ Never unpin the connector pins on unsecured or unsupported booms!
▶ Do not stand under the crane parts or within the complete danger zone during the pinning and unpinning procedure!
▶ Do not lean the ladder against the crane part being disassembled!

WARNING

Pressure in the hydraulic lines!
If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure!
Personnel can be severely injured or killed!

▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time!

WARNING

Loss of pressure or leakage!
Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure!

▶ Check that the quick couplings have been properly connected before using the crane!
▶ Connect the coupling components (sleeve and connector) and screw together with the knurled nut!
▶ Tighten the hydraulic coupling by hand. Turn the knurled nut until it reaches a tangible, fixed stop position!

3.1 Pinning and unpinning the pins with the pin pulling cylinder 2.1

3.1.1 Preparatory work

Make sure that the following prerequisites are met:

– The hydraulic aggregate **1** is not yet started.
– The lever **4** is in **0-position**.

▶ Connect the hydraulic hoses of the required pin pulling cylinder on the pin pulling aggregate **1**.
▶ Hang the pin pulling cylinder in the retainer on the component.
▶ Connect the piston rod head **5** with the screw on the pin.

3.1.2 Pinning or unpinning pins

▶ Start the hydraulic aggregate **1**.
▶ Set the engine rpm on the hydraulic aggregate **1**.
▶ Operate the lever **4** on the pin pulling cylinder **2.1**.
▶ Pin or unpin the pin.

Result:

– The piston rod of the pin pulling cylinder **2.1** retracts or extends.

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3.2 Pinning and unpinning the pins with the pin pulling cylinder 2.2

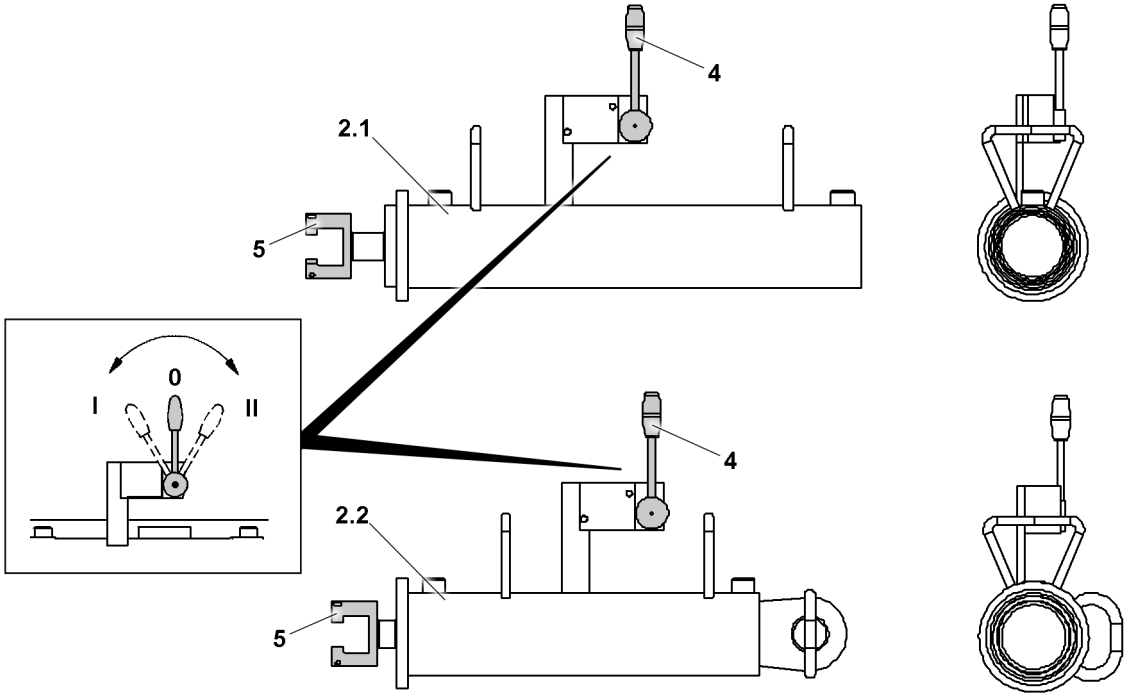

Fig.151401: Pinning and unpinning with the pin pulling device

3.2.1 Preparatory work

Make sure that the following prerequisites are met:
- The hydraulic aggregate **1** is not yet started.
- The lever **4** is in **0-position**.

▶ Connect the hydraulic hoses of the required pin pulling cylinder on the pin pulling aggregate **1**.
▶ Hang and pin the pin pulling cylinder in the retainer on the component.
▶ Connect the piston rod head **5** with the screw on the pin.

3.2.2 Pinning or unpinning pins

Note
▶ The pin pulling cylinder **2.2** is actuated for safety reasons on the hydraulic aggregate **1**!
▶ Before pinning and unpinning the lattice sections, engage the lever **4** in **I-position** or **II-position**.

▶ Engage the lever **4** on the pin pulling cylinder **2.2** in **position I** or **position II**.
▶ Start the hydraulic aggregate **1**.
▶ Set the engine rpm on the hydraulic aggregate **1**.
▶ Operate the change over lever on the hydraulic aggregate **1**.

Result:

– The piston rod of the pin pulling cylinder **2.2** retracts or extends.

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5.31 Bluetooth Terminal (BTT)

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5	*Crane cab / stepladder* menu	29
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Fig.195219

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1 Display / operating element BTT

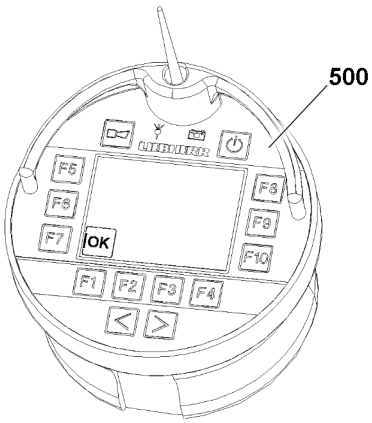

Fig.124478

Note
- ▶ The Bluetooth Terminal is referred to as BTT in the description.
- ▶ The Bluetooth Basis is referred to as BTB in the description.

The BTT is a combined display / operating element for the crane. Selected crane movements can be carried out. The data exchange is made via the BTB on the crane. The data exchange can also be made wireless as well as via a connector cable.

The BTT is operated using function keys F1 - F10 and two changeover buttons

Note
- ▶ The illustrations or icons on the screen display of the BTT are only examples.
- ▶ They may differ from the crane.

Via the BTT **500** you can call up various menus. Various crane functions can be selected or preselected, turned on or off, or directly activated in these menus.

If the turned on BTT is pulled from the charging cradle, the following menu points can be selected:
- – *Engine operation* menu
- – *Crane cab* menu
  - • Swinging the crane cab
  - • Positioning the stepladder

The operation of the BTT **500** via the function keys and changeover buttons:
- – Function keys
  - • The function of the function keys is menu dependent. For exact description, see the respective menu section.
- – Changeover buttons
  - • The function of the changeover buttons is menu dependent. For exact description, see the respective menu section.

NOTICE
Destruction of the BTT!
- ▶ Under no circumstances clean the BTT **500** with a jet of water or a steam cleaner.

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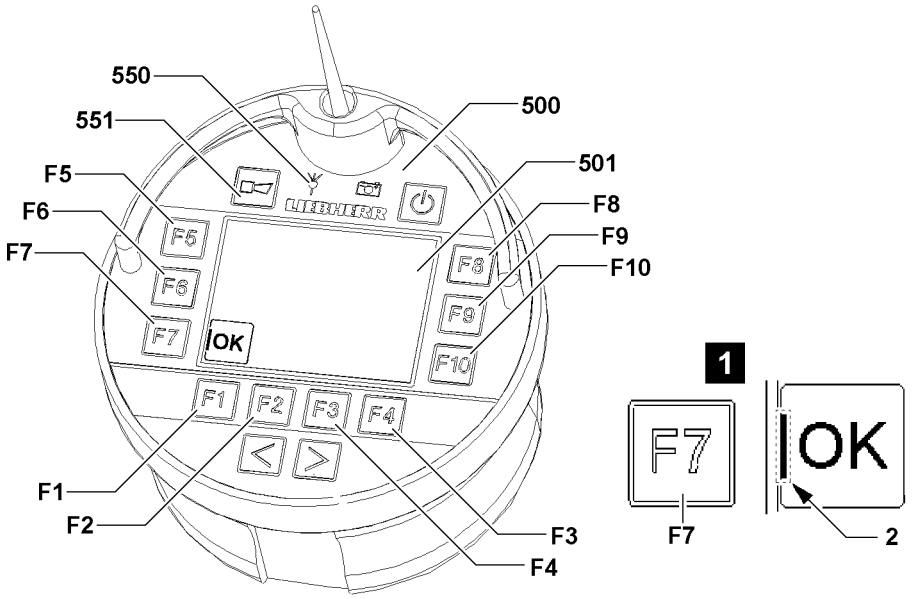

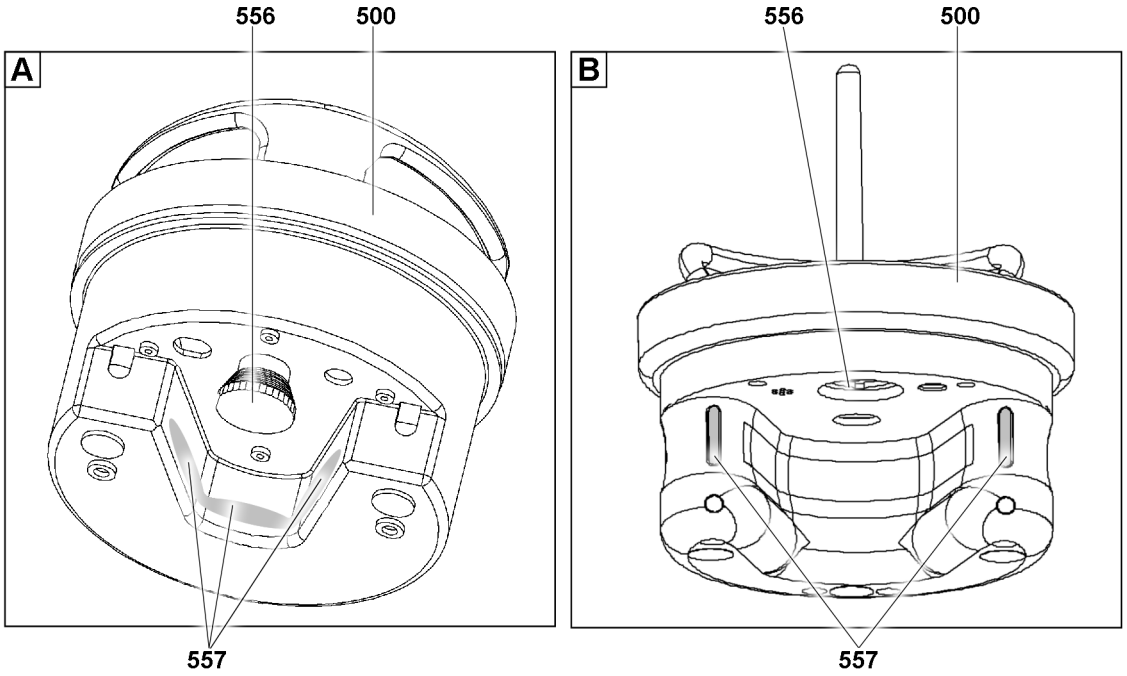

Fig.146318

A 2-hand keypad: On the inner surface

B 2-hand keypad: Button on the front side of the curvature

Note

▶ One of the described BTTs is used depending on the delivery condition of the crane.

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1.1 Important information about the BTT

The following important information must be observed for operation with the BTT **500**:

- The machine number on the data tag of the crane cab must match the machine number on the BTT display **501**.
- The BTT can only be turned on when the EMERGENCY STOP switch **556** on the rear of the BTT is **not** actuated.
- The rechargeable battery of the BTT is only charged if the EMERGENCY STOP switch **556** on the rear of the BTT is **not** actuated when plugging it into the charging module.
- When a function is selected via a function key, the corresponding icon is surrounded with a black border. In some case, additional icons are shown on the BTT display.
- The operation of the BTT must be made with two hands for safety reasons, see section „Release of button block on the BTT“.
- During crane operation via the BTT **500**, the complete crane must be in the field of visibility of the operator.
- Before any movement, which is controlled via the BTT **500**, the horn **551** must be actuated.
- As soon as the reception of the radio signal deteriorates, the indicator light **550** lights up orange.
- The range of the radio signal can fluctuate due to local conditions.
- If the radio contact between the BTT **500** and the BTB is interrupted or the EMERGENCY STOP switch **556** on the rear of the BTT **500** is actuated, the crane movement stops.
- Keep the BTT **500** and the charging module clean.
- Protect the BTT **500** from direct sun exposure.
- Protect the BTT **500** from dirt and moisture.

Note

Function keys **F1** to **F10**

▶ Icons are assigned to the individual function keys. A small bar **2** marks the assigned button, see illustration **1**: Example for function key **F7**.

1.2 Releasing the button block on the BTT

To prevent inadvertent crane operation, movements to be carried out on the BTT are secured by a button block. The 2-Hand keypad **557** can be activated by finger touch. The button block is removed.

After selecting a function, the actual movement (operation) is only released after activation of the 2-hand keypad **557**. Released icons are highlighted with the color **purple**.

If the icon is released and the respective function key is pressed, the movement is carried out.

Note

▶ The actuation of the 2-hand keypad **557** is stored for 30 seconds. If no movement is actuated within these 30 seconds or if the 2-hand keypad **557** is actuated again, then the button block is activated and a signal tone sounds.

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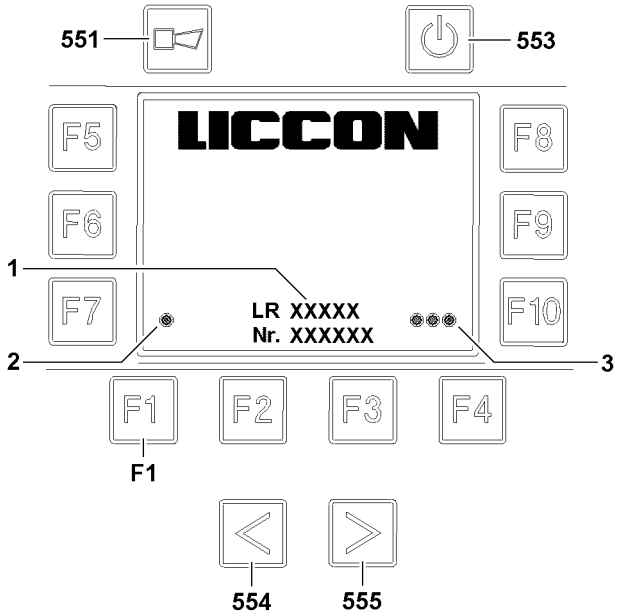

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Fig.119599

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1.3 Connecting the BTB and the BTT

Note

▶ If crane type and crane number **2** do not match, a connection between BTB and BTT is not possible.

To be able to control the crane via the BTT a connection to the BTB must be established.

The connection is based on a pairing process and code comparison.

1.3.1 Pairing process

If the BTT is plugged into the charging module when the ignition is turned on, then a pairing process is carried out automatically with the BTB.

Carry out the pairing process by hand:

To do so, the turned on BTT must be plugged into the charging module. Various connecting parameters are compared and checked for a match via an infrared interface.

When the pairing process is completed successfully, the indicator light **1** lights up green.

Note

▶ If the pairing process does not run successfully, contact your **Liebherr Service location** or **Liebherr-Werk Ehingen**.

1.3.2 Code calibration

If the BTT is plugged into the charging module when the ignition is turned on, then the code calibration is made automatically.

Carry out the code calibration by hand:

One after the other, press the button **554**, then the button **555** and then the function key **F1**.

When the code calibration is completed successfully, all indicator lights **3** light up green.

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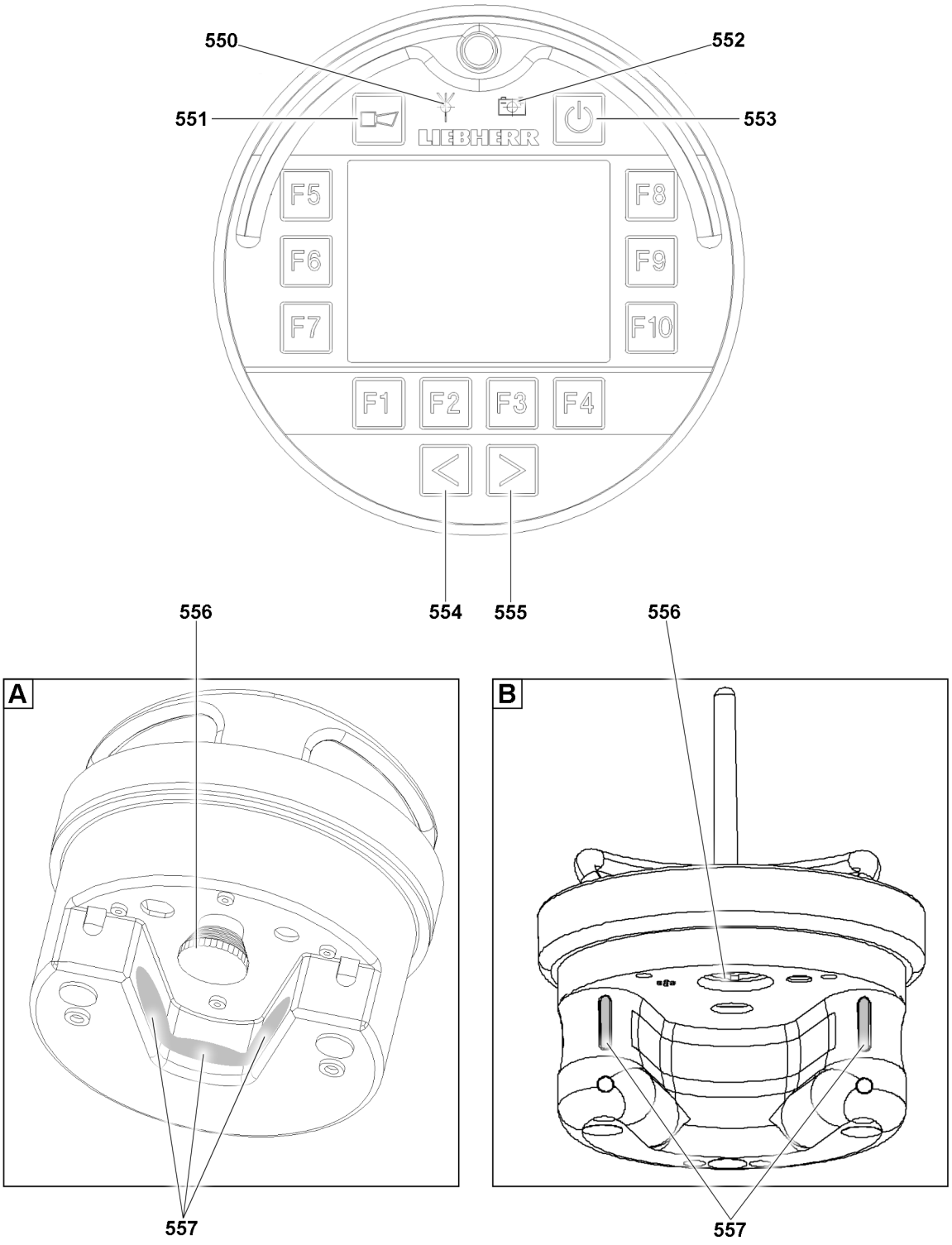

Fig.146316

A 2-hand keypad: On the inner surface

B 2-hand keypad: Button on the front side of the curvature

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1.4 General information regarding the BTT

550 Indicator light

Transmission signal for BTT:
- Green: Transmission signal ok
- Yellow: Transmission signal about to be lost
- Red: Transmission signal not available

551 Button
- Operate the acoustic signal of the crane (horn)

552 Indicator light

Charge condition of the rechargeable battery on the BTT:
- Green: Rechargeable battery fully charged
- Yellow: Rechargeable battery almost discharged
- Red: Rechargeable battery discharged

Note

▶ To recharge the rechargeable battery, the BTT **500** must be plugged into the charging cradle.

553 Button
- ON / OFF button: Turn the BTT on / off
- ON / OFF button: End stand-by of the BTT

554 Button
- Changeover button (menu dependent)

555 Button
- Changeover button (menu dependent)

556 EMERGENCY STOP switch
- **Note:** The EMERGENCY STOP switch **556** is on the underside of the BTT.

557 2-hand keypad
- **Note:** The 2-hand keypad **557** must be actuated in order to be able to actuate a movement with the BTT.

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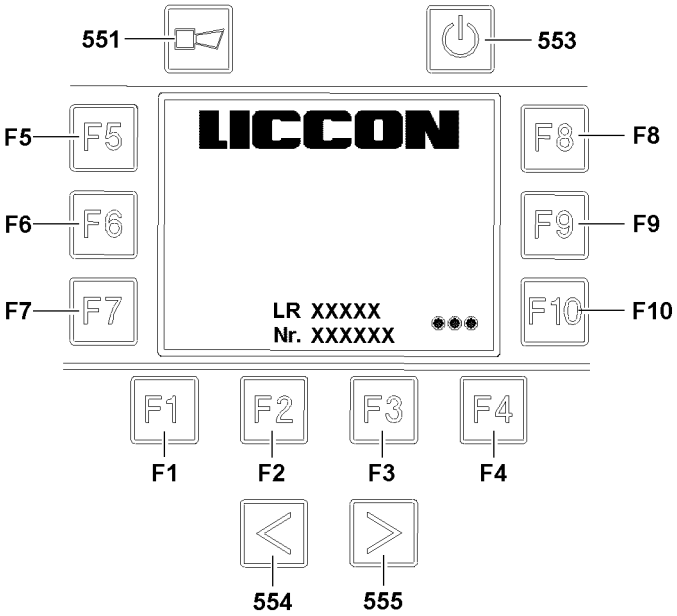

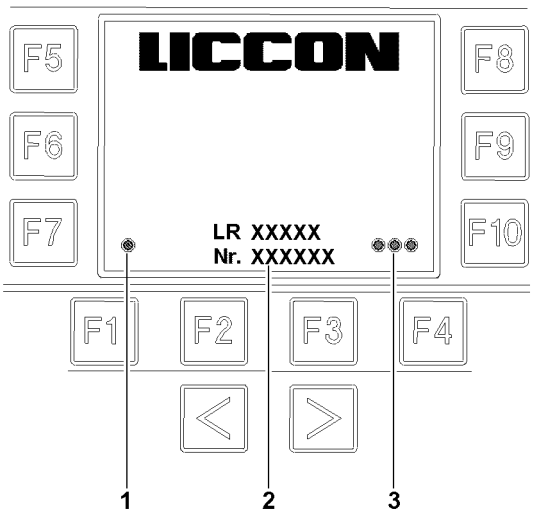

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Fig.119600

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1.5 Start screen BTT

1.5.1 Icon explanation Start screen BTT

1 Indicator light

Status display connection to BTT receiver
- Yellow / red: not connected
- Yellow: Transmission signal being build up or severed
- Green / magenta: Connection prepared
- Green: Connection established
- Red: No connection between BTT and BTB
  Note: If necessary, the pairing process must be repeated, see section „Connecting the BTB and BTT“

2 Crane type and crane number

3 Indicator lights

Condition display Code entry:
- Green: Code entry OK
- Red: No code entered, code entry incorrect

F1- F10 Function key
- **Note**: Once the code has been successfully entered, press any function key **F1-F10** to switch back to the selection overview.

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2 Start menu of the BTT

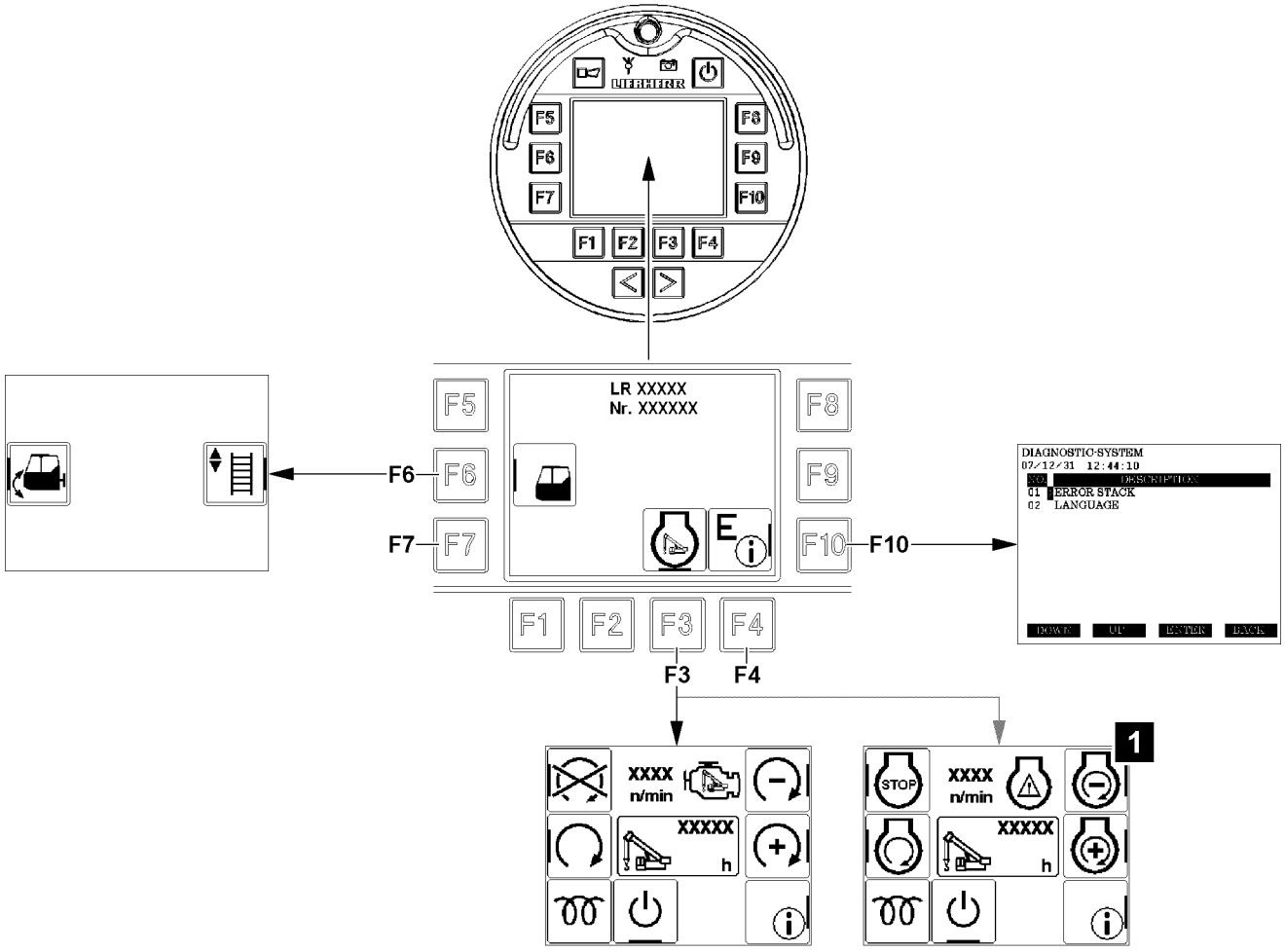

Fig.123749

F3		*Engine operation* menu[1)]
	>> **F1**	-Back to the start menu-
	>> **F2**	Turn the ignition crane superstructure on / off[2)]
	>> **F5**	Turn the engine off
	>> **F6**	Turn the engine on
	>> **F8**	Decrease engine rpm
	>> **F9**	Increase the engine rpm
	>> **F10**	Call up the test system

1) Illustration of individual icons can vary, depending on the crane programming, see example illustration **1**.
2) Function only available for certain crane types.

F4	Turn off the disengageable acoustic warning signal
	Note: After an error message of the LICCON computer system the BTT issues an *acoustic warning signal*. Depending on the error message (for example operating error or system error), the warning signal can be turned off directly via the **F4** function key or it remains and additional steps are required.

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F5		*Crane cab / stepladder* menu
	>> **F1**	-Back to the start menu-
	>> **F6**	Swinging the crane cab
	>> **F9**	Positioning the stepladder [2)]

2) Function only available for certain crane types.

F10	Test system
	Note: The test system can be called up at any time. If an error message of the LICCON computer system is present, then an error text can be viewed.

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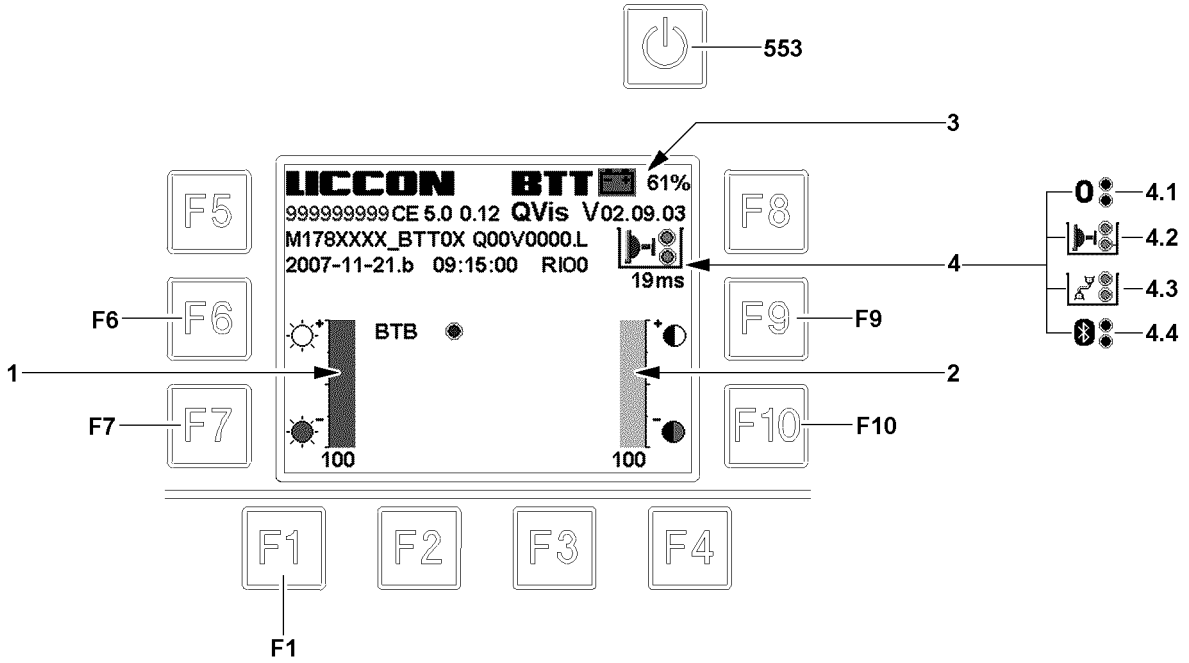

Fig.117976

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3 Settings and status displays on the BTT

Settings can be made and status displays can be read on the BTT system screen.

3.1 Calling up / closing the system screen

Make sure that the following prerequisite is met:
- The start menu is displayed.

▶ Select the system screen: Press the button **553** momentarily until the system screen appears (max. 1 second).

Note
▶ When the button **553** is pressed too long, the BTT turns off.

▶ To switch back to the start menu: Press the function key **F1**.

3.2 Setting the brightness on the BTT display

The current setting stage for brightness can be read on the bar diagram **1**.

▶ BTT display brighter: Press the function key **F6**.
▶ BTT display darker: Press the function key **F7**.

3.3 Setting the contrast on the BTT display

Note
▶ Only available for certain crane types.

The current setting stage for the contrast can be read on the bar diagram **2**.

▶ BTT display more contrast: Press the function key **F9**.
▶ BTT display less contrast: Press the function key **F10**.

3.4 Determining the exact charge condition of the rechargeable battery

The exact charge condition of the rechargeable battery can be read on the charge condition display **3**.

▶ Read the charge condition, if necessary recharge the BTT by inserting it in the charging bay.

3.5 Checking the connection type

The connection type can be read on the connection type display **4**.

▶ Read the connection type.

Result:

- **4.1** No connection
- Infrared **4.2** (only in the charging bay)
- **4.3** Cable
- **4.4** tooth

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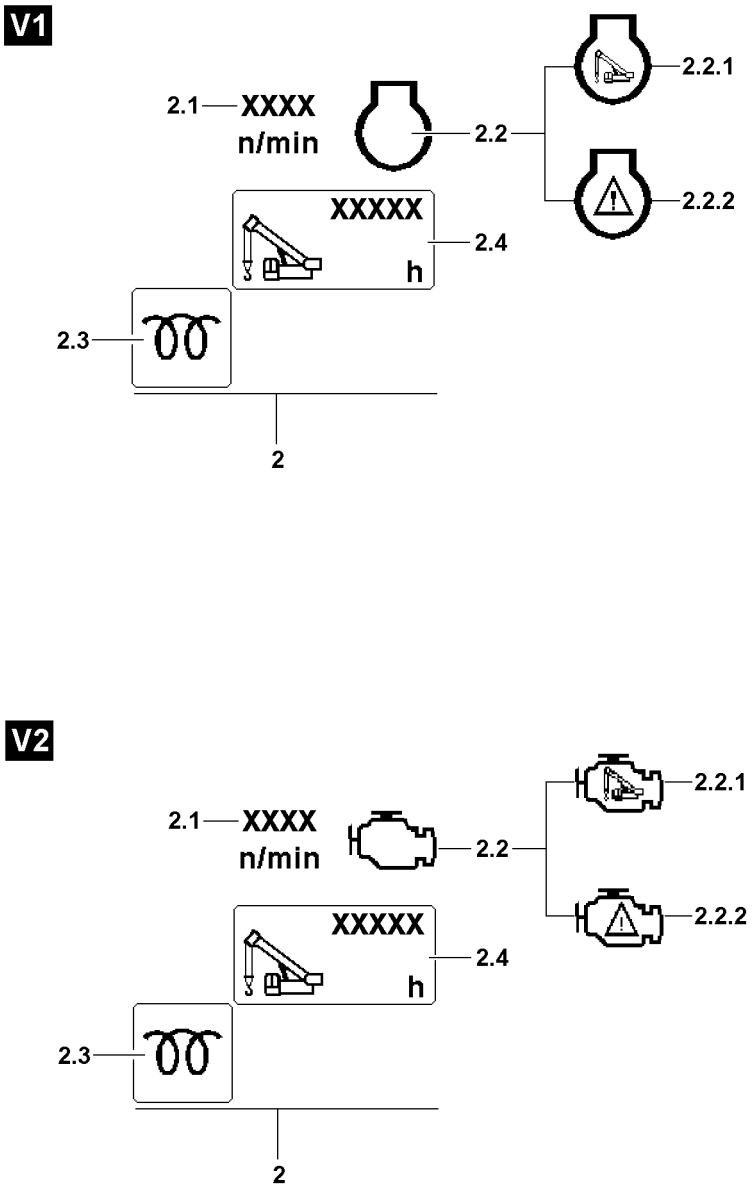

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Fig.122498

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4 *Engine operation* menu

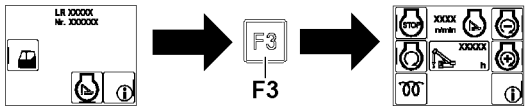

Fig.119602: Switching from the start menu to the engine operation menu

Note
The depiction of the *Engine operation* icons **2** depends on the crane programming.
▶ Either the variation **V1** or variation **V2** icons appear.

4.1 Icon explanation in *Engine operation* menu

2 *Engine operation* icons

2.1 Engine rpm
- Actual engine rpm

2.2 Engine monitoring
- If icon **2.2.1** appears, then there is no engine warning present.
- If warning icon **2.2.2** appears, then an engine warning is present.
- **NOTICE:**
  Call up *Engine* monitoring functions and evaluate.

2.3 Control display
- The control display lights up green: The crane superstructure engine is ready to start.
- The control display lights up yellow: Crane superstructure engine preheating is active.
- The control display lights up red: The crane superstructure engine is not ready to start.

2.4 Operating hour meter
- Operating hours of crane engine

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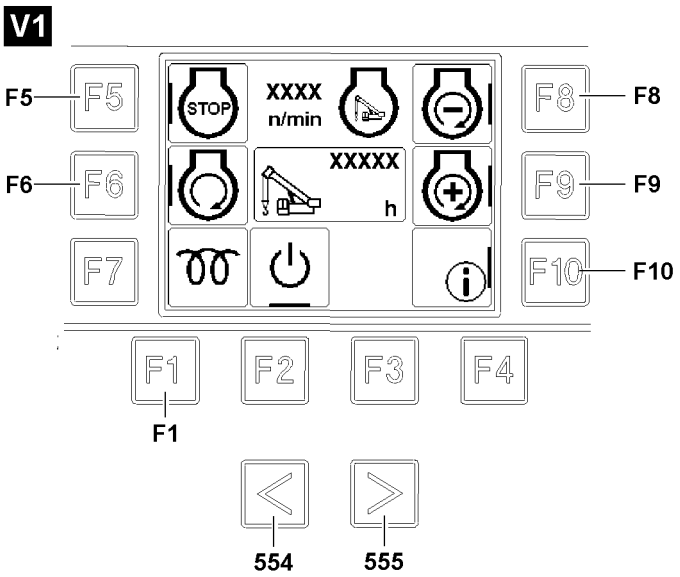

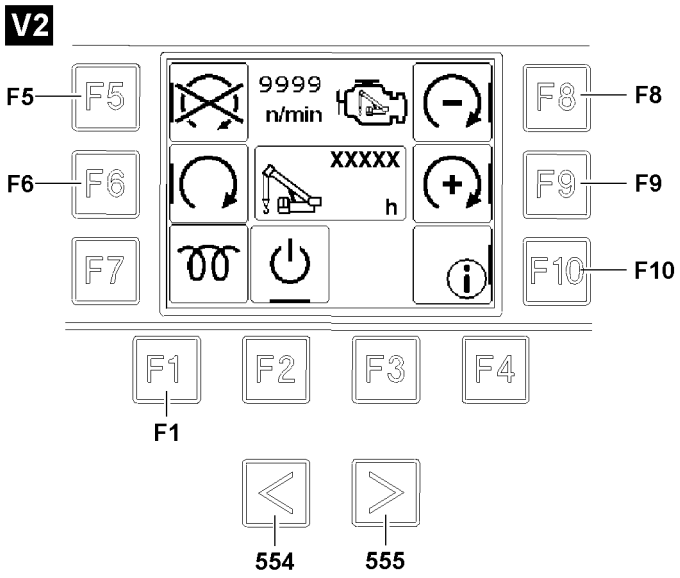

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Fig.122499

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4.2 The function keys

Note
The depiction of the *Engine operation* icons depends on the crane programming.
▶ Either the variation **V1** or variation **V2** icons appear.

554 Button
- Call up *Engine* monitoring functions

555 Button
- Call up *Engine* monitoring functions

F1 Function key
- Back to the start menu

F2 Function key
- Turn the ignition crane chassis on / off
- **Note**: Appears only for certain crane types

F5 Function key
- Press momentarily (less than 0.5 seconds): Reset settings in the *Engine operation* menu
- Press long: Turn the engine off
- **Note**: The control release must have been made by touching the 2-Hand keypad in the rear of the BTT, see section „Release of button block on BTT“.

F6 Function key
- Turn the engine on

F8 Function key
- Decrease engine rpm
- **Note**: The control release must have been made by touching the 2-Hand keypad in the rear of the BTT, see section „Release of button block on BTT“.

F9 Function key
- Increase the engine rpm
- **Note**: The control release must have been made by touching the 2-Hand keypad in the rear of the BTT, see section „Release of button block on BTT“.

F10 Function key
- Change to test system

4.3 *Engine* monitoring functions

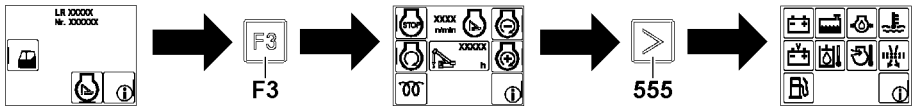

Fig.119603: Change from the start menu to the Engine monitoring functions:

WARNING
Messages / warnings of the engine monitoring functions ignored!
If messages / warnings of the engine monitoring functions are ignored, problems can occur.
If problems are not immediately rectified, the crane can fail and dangerous situations may occur.
Personal injury and property damage can result.
▶ Remedy the problem immediately.

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WARNING
Triggers power reduction or start block of the engine!
If the urea level is too low or if there is a malfunction in the exhaust aftertreatment, then a power reduction or starting block of the engine can be triggered.
The crane operation, assembly operation and travel operation can be limited or disabled.
▶ Replenish the Urea level in time.
▶ Remedy the faulty function of the exhaust aftertreatment immediately.
▶ Observe any valid national / regional regulations and the vehicle configuration.

Messages / warnings of the engine monitoring functions can be displayed by:
– warning symbols
and / or
– audio warnings
and / or
– automatic, situation-related switching to the engine monitoring functions

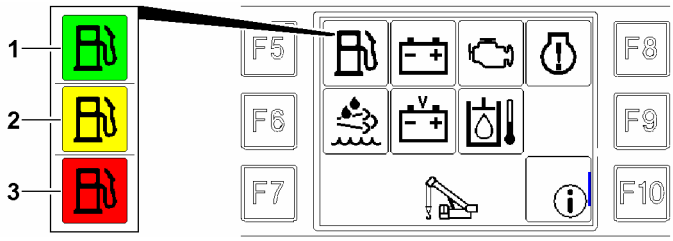

Fig.128017: Example for the colors in the icons

The colors in the icons for the engine monitoring functions mean:
– If a function is highlighted **green** (example icon **1**), then the function is operating correctly.
– If a function is highlighted **orange** (example icon **2**), then the respective function has a problem. An advance warning is active for the *Engine monitoring functions*.
– If a function is highlighted **red** (example icon **3**), then the respective function has a problem. A warning is active for the *Engine monitoring functions*.

4.3.1 Function keys in the Engine monitoring functions

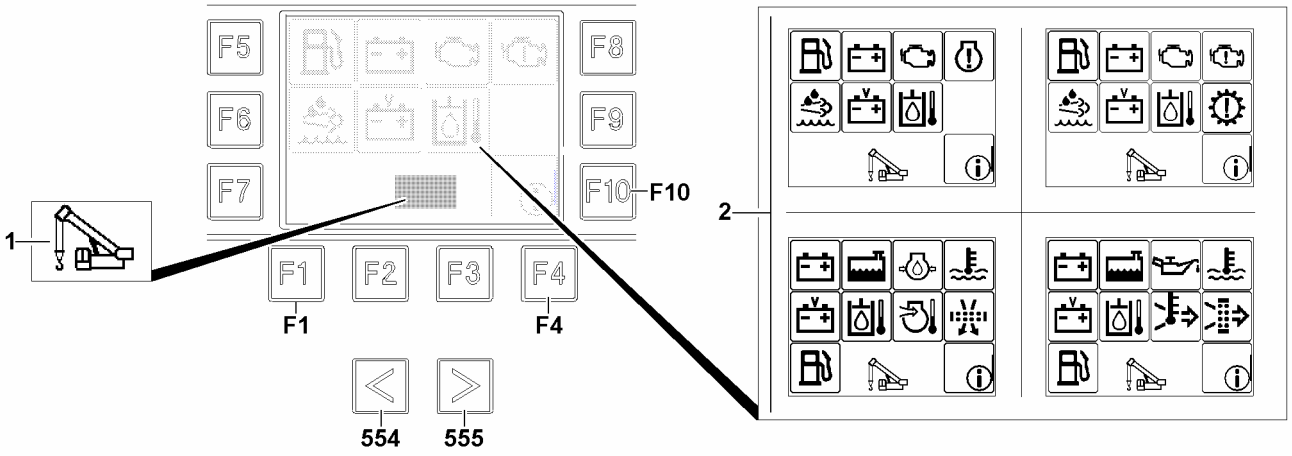

Fig.128018: Engine monitoring functions function keys

1 *Crane superstructure* icon

Depending on the crane type, the depiction of the *Engine monitoring function* icons **2** can vary.

554 Button
• Call up the *Engine operation* menu

555 Button
• Call up the *Engine operation* menu

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F1 Function key
- Back to the start menu

F4 Function key
- After an error message: turn off the disengageable *acoustic warning signal* of the BTT

F10 Function key
- Change to test system

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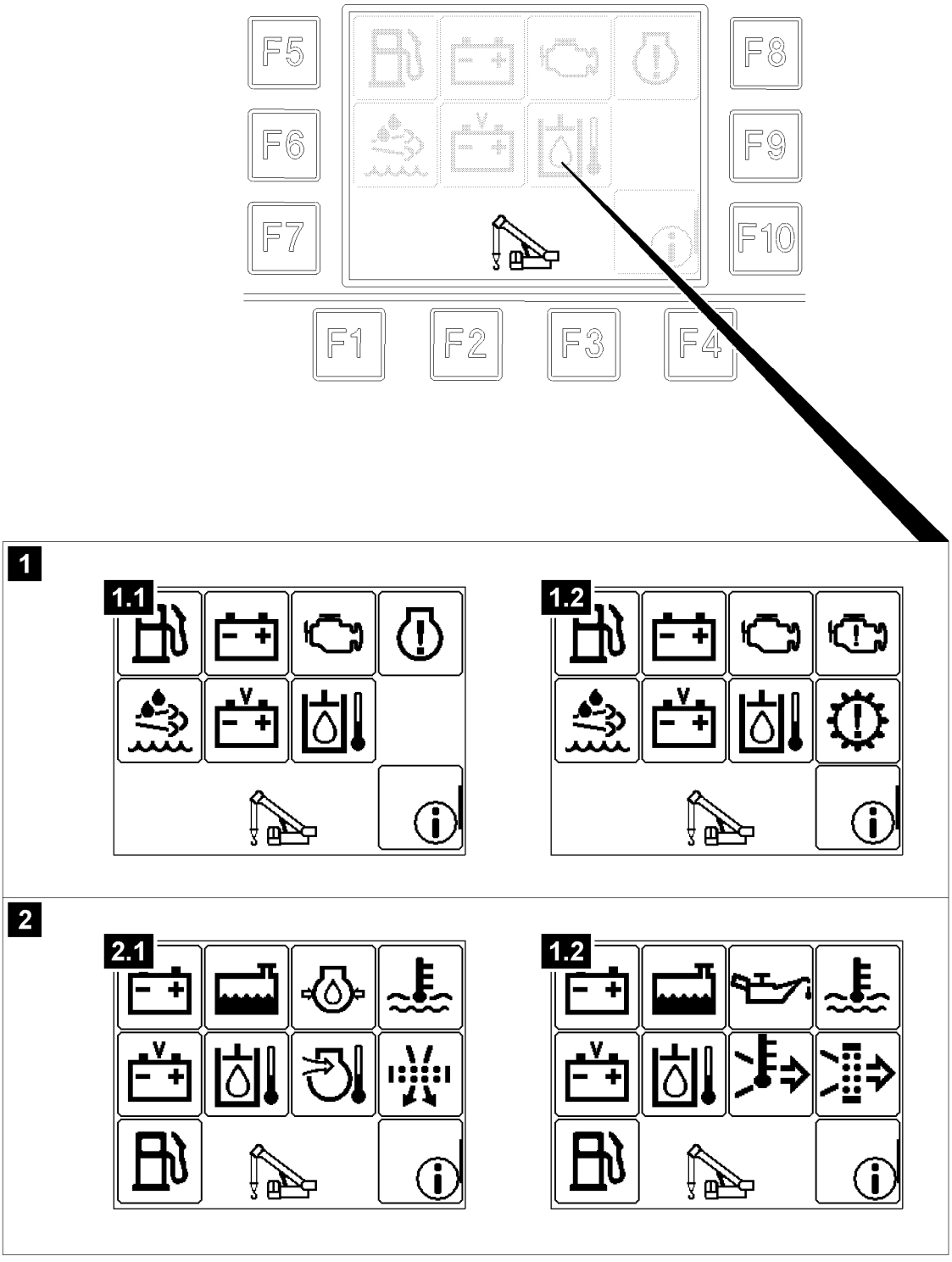

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Fig.122500

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4.3.2 Icons in the Engine monitoring functions

Note

- ▶ Engines **with SCR system** for exhaust aftertreatment - Display in BTT display, see illustrations **1**. Depending on the crane programming, either the illustration **1.1** or illustration **1.2** icon appears.
- ▶ Engines **without SCR system** - Display in BTT display, see illustrations **2**. Depending on the crane programming, either the illustration **2.1** or illustration **2.2** icon appears.
- ▶ If a function is highlighted **green**, this function is operating correctly.
- ▶ If a function is highlighted **red** or **orange**, then there is a problem with this function.

Note

The scope of the monitoring functions depends on the crane type and crane configuration.
The depiction of the icon depends on the crane programming. If two icons are depicted for one function, then only one of the two appears.

- ▶ Not all crane types have all listed monitoring functions.

	Fuel reserve
Green:	Fuel reserve is at the fill level, an exact display value can be seen on the LICCON monitor
Yellow:	Fuel reserve is short, check the display value on the LICCON monitor and add to the fuel reserve if necessary
Red:	Fuel reserve low / depleted / system error **NOTICE!** Immediately bring the crane to a standstill, turn the engine off and remedy the problem (add to the fuel reserve immediately / remedy the system error). Pay attention to the error message.

	Coolant temperature
Green:	Coolant temperature OK
Red:	Coolant temperature **too high** / system error **NOTICE!** Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Pay attention to the error message.

/	**Engine oil pressure**
Green:	Engine oil pressure OK (engine on)
Red:	Engine oil pressure too low (engine on) / system error **NOTICE!** Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Pay attention to the error message.

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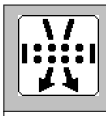
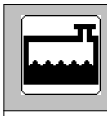
 /	**Air filter Engine**
Green:	Air filter OK (engine on)
Yellow / red	Air filter dirty (engine on) / system error **NOTICE!** Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Pay attention to the error message.

	Charge control display (alternator)
Green:	Charge control OK (engine on)
Red:	Charge control has a problem (engine on) / system error **NOTICE!**: Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Pay attention to the error message.

	Urea tank / exhaust aftertreatment [1]
Green:	Urea reserve sufficient, an exact display value can be seen on the LICCON monitor
Yellow	The urea is low or erroneous function of exhaust aftertreatment **Advance warning**! Add urea or remedy the erroneous function of the exhaust aftertreatment Pay attention to the error message.
Yellow / red:	Urea level too low or malfunction / problem of exhaust aftertreatment system / system error **NOTICE!** Add urea or remedy the malfunction / problem of the exhaust aftertreatment. Under some circumstances a power reduction or start block of the engine [2] is triggered, pay attention to the error message

1) Valid only for engines which are equipped with an SCR system with exhaust aftertreatment.
2) The type and scope of a power reduction of the engine depends on the respectively valid national / regional regulations and the crane configuration. The engine can possibly no longer be started (start block).

	**Coolant level**
Green:	Coolant level OK
Red:	Insufficient coolant / system error **NOTICE!**: Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Pay attention to the error message.

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/	**Charge air temperature**
Green:	Charge air temperature OK
Red:	Charge air temperature too high / system error **NOTICE!**: Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Pay attention to the error message.

	Hydraulic oil temperature
Green:	Hydraulic oil temperature OK
Red:	Hydraulic oil temperature too high / system error **NOTICE!**: Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Pay attention to the error message.

	Battery voltage
Green:	Battery voltage OK
Red:	On-board power supply over / undervoltage / system error **NOTICE!**: Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Pay attention to the error message.

/	**Engine oil level**
Green:	Engine oil level OK
Blue	The engine oil level can not be checked here on the display, call up the individual indicator light
Red:	Engine oil level not OK / System error **NOTICE!**: Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Call up individual indicator lights and adjust the engine oil according to the display - pay attention to error message.

	Hydraulic oil [3)]
Green:	Leak oil filter OK (engine on) / hydraulic oil temperature [3)] OK / hydraulic oil level [3)] OK
Red:	Leak oil filter dirty (engine on) / hydraulic oil temperature [3)] too high / hydraulic oil level [3)] too low / system error **NOTICE!** Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Pay attention to the error message.

3) Only for certain crane types.

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	Hydraulic oil level
Green:	Hydraulic oil level OK
Red:	Hydraulic oil level too low / error / system error **NOTICE!**: Immediately bring the crane to a standstill, turn the engine off and remedy the problem. Pay attention to the error message.

	Exhaust aftertreatment[1)]
Green:	Exhaust aftertreatment OK
Yellow / red:	Malfunction Exhaust aftertreatment or Urea level too low / system error **NOTICE!** Add urea or remedy the malfunction / problem of the exhaust aftertreatment. Under some circumstances a power reduction or start block of the engine [2)] is triggered, pay attention to the error message

1) Valid only for engines which are equipped with an SCR system with exhaust aftertreatment.
2) The type and scope of a power reduction of the engine depends on the respectively valid national / regional regulations and the crane configuration. The engine can possibly no longer be started (start block).

/	**Collective warning**
Green:	No warning messages present
Generally at yellow or red:	A warning is present / system error **NOTICE!** Determine the cause with the error message or in the LICCON monitor and observe the following description.
Yellow:	Air intake opening / air filter dirty **NOTICE!** Turn the engine off immediately and remedy the problem, pay attention to the error message.
Red:	Engine oil pressure too low or too high **NOTICE!** Turn the engine off immediately and remedy the problem, pay attention to the error message.
Red:	Engine oil level too low or too high **NOTICE!** Call up engine oil level display in the LICCON monitor and match the engine oil according to the display, see chapter 4.02. Pay attention to the error message.
Red:	Coolant level too low **NOTICE!** Turn the engine off and add coolant, see chapter 7.04 or chapter 7.05. Pay attention to the error message.
Red:	Coolant temperature too high **NOTICE!** Bring the coolant temperature into a permissible range, turn the engine off if necessary. Pay attention to the error message.
Red:	Charge air temperature too high **NOTICE!** Bring the charge air temperature into a permissible range, turn the engine off if necessary. Pay attention to the error message.

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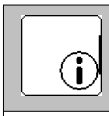	**Information field**
B / E:	If a *B (operating error)* or *E (system error)* appears in the information field, then at least one error message is present. Call up and evaluate the error message by pressing function key F10 on the BTT, see also Diagnostics Manual.

Note

Triggers power reduction or start block of the engine

If the urea level is too low or if there is a malfunction / problem in the exhaust aftertreatment, then a power reduction or starting block of the engine can be triggered.

The crane operation and travel operation can be limited or disabled.

- ▶ Replenish the Urea level in time.
- ▶ Remedy the malfunction / problem of the exhaust aftertreatment immediately.
- ▶ Observe any valid national / regional regulations and the crane configuration.

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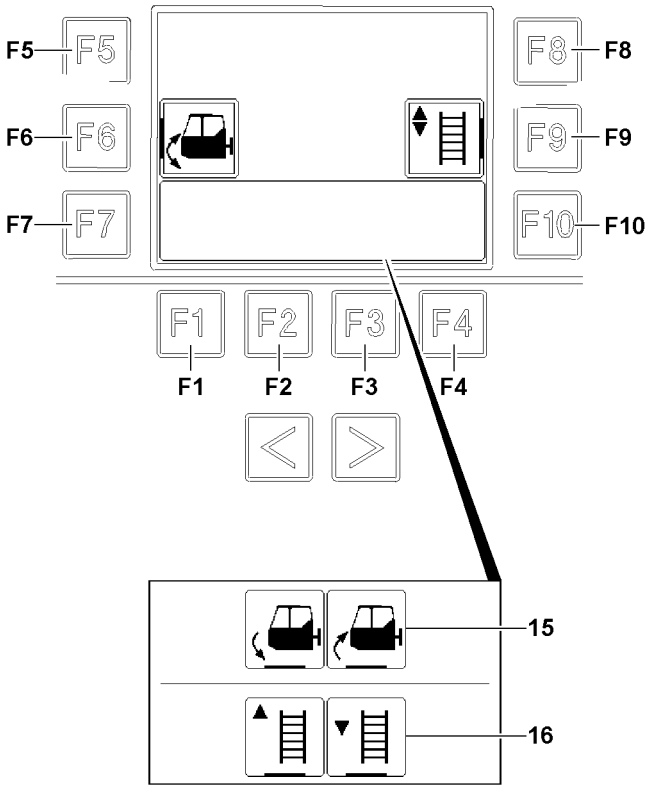

Fig.118723

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5 *Crane cab / stepladder* menu

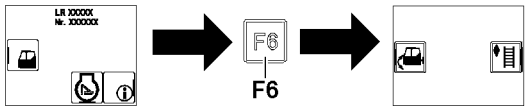

Fig.119604: Changing from start menu to Crane cab / stepladder menu

5.1 Function keys in *Crane cab / stepladder* menu

554 Key
- Call up engine operation

555 Key
- Call up engine operation

F1 Function key
- Back to the start menu

F2 Function key
- -No function-

F2 Function key
- -No function-

F3 Function key
- -No function-

F5 Function key
- -No function-

F6 Function key
- Selection / deselection of swinging the crane cab
- After selection, the operating icons **15** appear additionally

F7 Function key
- -No function-

F8 Function key
- -No function-

F9 Function key
- Selection / deselection of positioning the stepladder
- After selection, the operating icons **16** appear additionally
- **Note**: Function only available for certain crane types

F10 Function key
- -No function-

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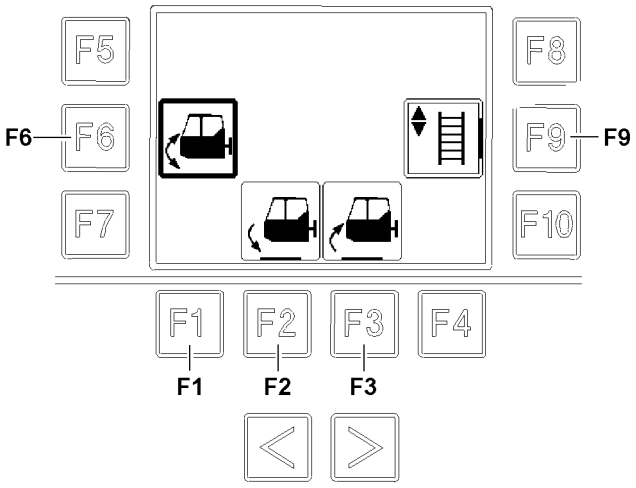

Fig.118726

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5.2 Swinging the crane cab

– **Selection / deselection of swinging the crane cab:**
  • Press the function key **F6**
    • **Result**: When the selection has been made, the border on the icon on the right of function key **F6** is bold. The icons above the function key **F2** and function key **F3** appear.

– **Control release:**
  • The control release is made by touching the 2-Hand keyboard in the rear of the BTT, see section „Release of button block on BTT“.
  • After completed control release, the icons over the function key **F2** and function key **F3** are highlighted in purple.

Note

▶ To control the functions, a control release must be issued: The corresponding icons must be highlighted in purple.

– **Swing the crane cab out:**
  • Press the function key **F2**

– **Swing the crane cab in:**
  • Press the function key **F3**

– **Leave the menu:**
  • Press the function key **F1**

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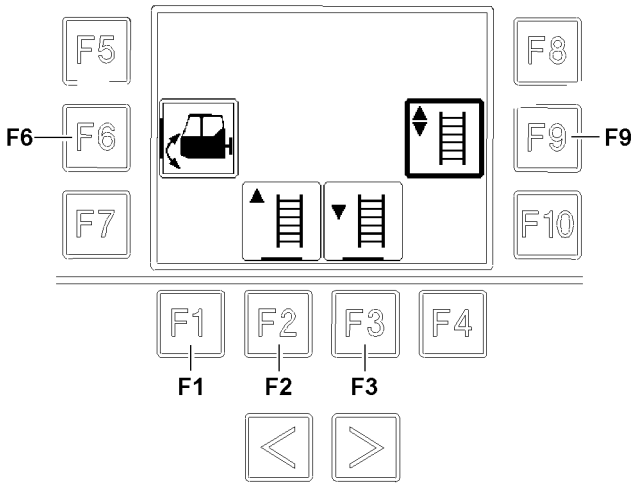

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Fig.118727

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5.3 Positioning the stepladder

Note
▶ Function only available for certain crane types.

– **Selection / deselection of positioning the stepladder:**
  • Press the function key **F9**
    • **Result**: When the selection has been made, the border on the icon on the right of function key **F9** is bold. The icons above the function key **F2** and function key **F3** appear.

– **Control release:**
  • The control release is made by touching the 2-Hand keyboard in the rear of the BTT, see section „Release of button block on BTT“
  • After completed control release, the icons over the function key **F2** and function key **F3** are highlighted in purple.

Note
▶ To control the functions, a control release must be issued: The corresponding icons must be highlighted in purple.

– **Stepladder up:**
  • Press the function key **F2**

– **Stepladder down:**
  • Press the function key **F3**

– **Leave the menu:**
  • Press the function key **F1**

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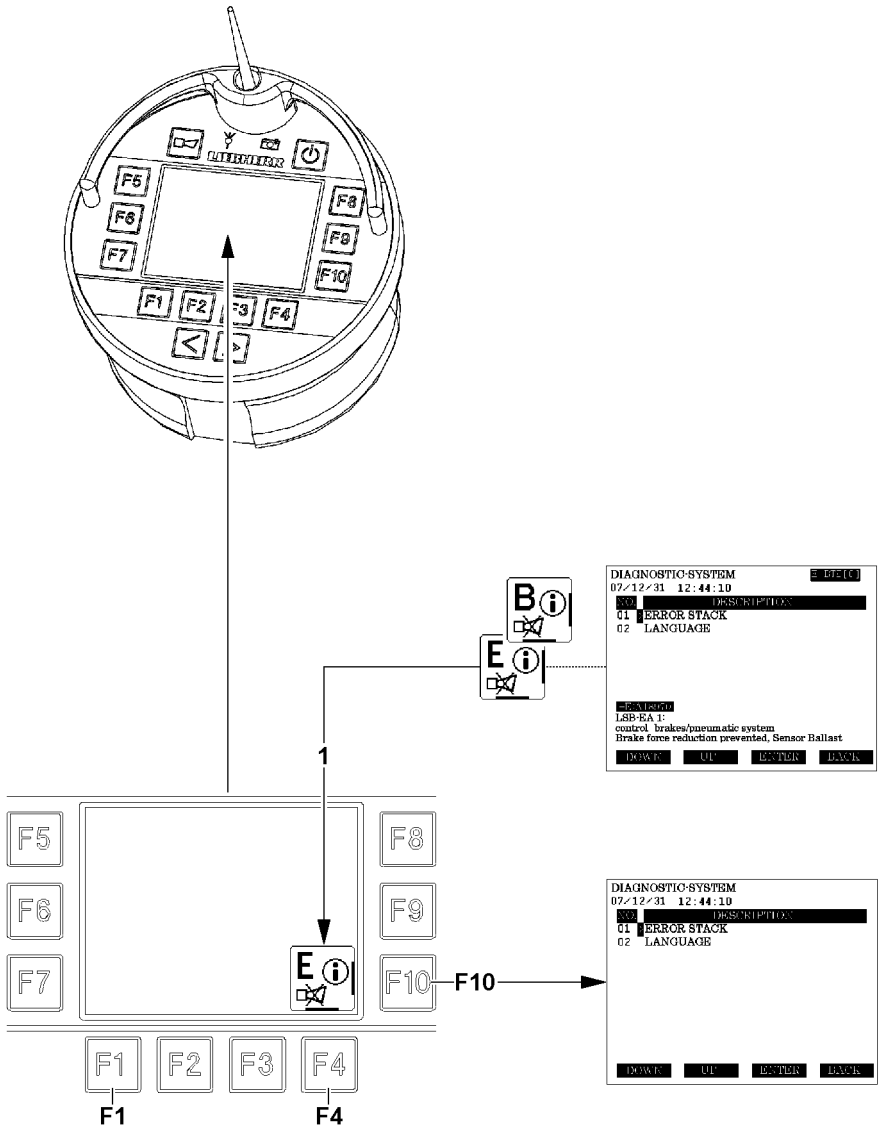

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Fig.117975

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6 *Test system* menu

If an error message is issued for the LICCON control:
– a „B“ or „E“ is shown in the information field **1**, see illustration
– an acoustic warning signal of the radio remote control is issued

6.1 Function keys in the *Test system* menu

F1 Function key
- Back to the start menu

F4 Function key
- When a note for an error message appears and a horn is shown in the information field **1**:
  Press 1x: acoustic warning signal of the radio remote control, which can be shut off, is shut off in the case of operating / system errors
  Press 2x: Call up the test system

F10 Function key
- Call up the test system

6.2 Operating the test system

– **Turn the acoustic warning signal off:**
  - Press the function key **F4**.
    - **Result**: The disengageable acoustic warning signal of the radio remote control is shut off in the case of an operating / system error.
– **Call up the test system:**
  - Press the function key **F4** again.
    or
  - Press the function key **F10**.
    - **Result**: Start page of test system is called up.
– **Close the test system:**
  - Press the function key **F1**.

Note
▶ For a detailed description of the test system, see the Diagnostics Manual.

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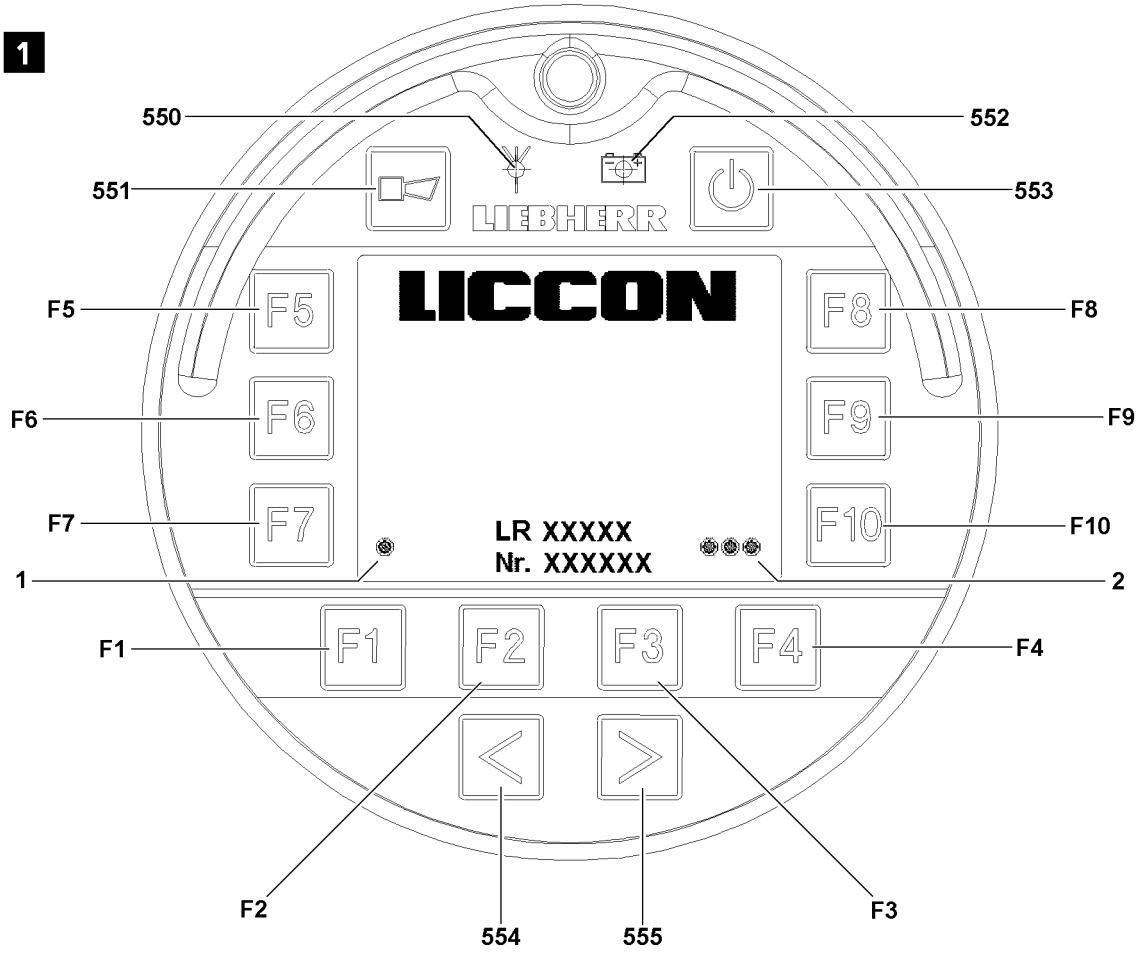
1



2

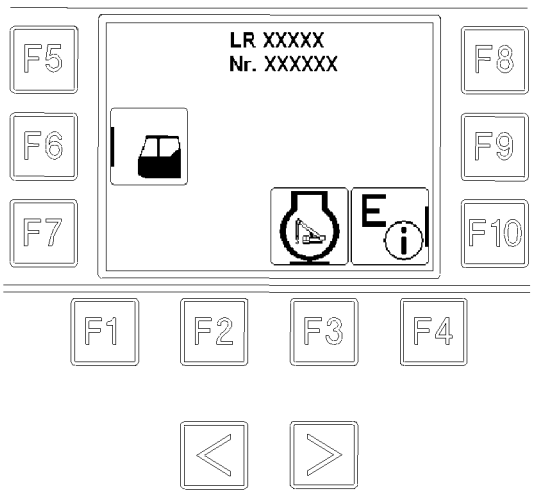


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Fig.119605

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7 BTT operation

There are two ways to turn the BTT:
- Turning the BTT on using the ignition switch
- Turning the BTT on using the ON / OFF button

7.1 Turning the BTT on using the ignition switch

Make sure that the following prerequisite is met:
- The BTT is in the charging cradle.

▶ Turn the ignition for the crane engine on: Actuate the ignition switch, see Crane operating instructions, chapter 4.01.

Result:

– The BTT turns itself on.
– After completion of the starting procedure, the indicator light **550** and indicator light **552** light up green, see illustration **1**.
– The start screen is shown before the display changes to the start menu, see illustration **2**.

7.2 Turning the BTT on using the ON / OFF button

Make sure that the following prerequisite is met:
- The BTT is pulled off the charging cradle

▶ Turn the ignition for the crane engine on: Actuate the ignition switch, see Crane operating instructions, chapter 4.01.
▶ Turn the BTT on: Press the button **553** (ON / OFF button).

Result:

– The BTT turns itself on.
– The indicator light **550** and indicator light **552** light up in orange.
– The start screen is displayed, see illustration **1**.

▶ Enter the turn on key sequence: Press button **554**, then button **555** and then function key **F1**.

Result:

– The indicator light **550** and indicator light **552** light up in green.
– The indicator light **1** and indicator light **2** light up green.
– The connection between the BTT and the receiver is established.

▶ Press any function key.

Result:

– The start menu of the BTT appears on the BTT, see illustration **2**.

▶ Select the menu with the appropriate function key, see the relevant technical chapter.

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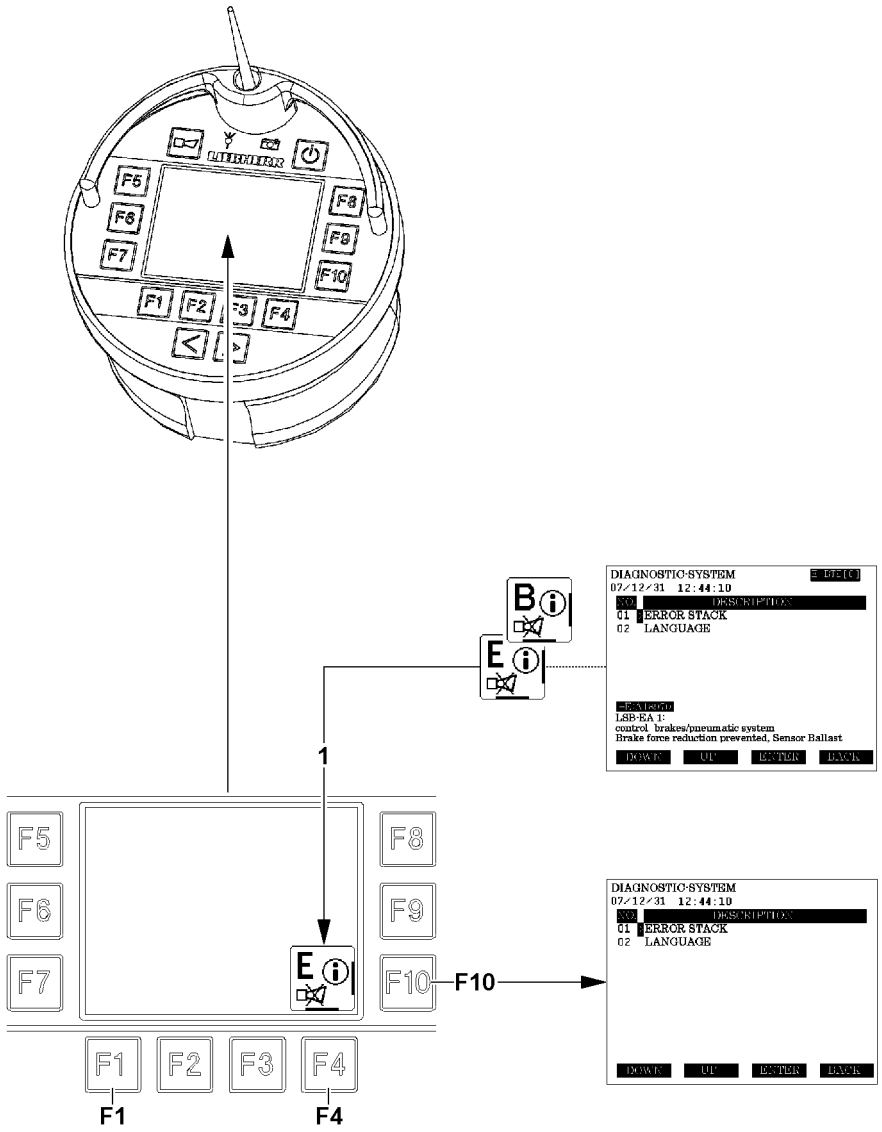

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Fig.117975

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8 Measures in case of problems

8.1 Did an error message occur?

If an event occurs that leads to the display of an error message, a „B“ or „E“ is shown in the icon **1**, see illustration.

WARNING
Danger of accident!
If the displayed errors in the icon **1** are ignored, there is a danger of accidents.
▶ Take the crane out of operation and remedy the cause of the error.
▶ Do not put the crane back into operation before the cause of the error has been remedied.

▶ Press the function key **F4**.

Result:

– The disengageable acoustic warning signal of the radio remote control is shut off in the case of an operating / system error.

▶ Press the function key **F10**.

Result:

– The *Test system* program (error determination screen) is called up.

Note
▶ To be able to find the cause of the problem, the error or errors must be read in the error determination screen / error stack of the BTT **500**, see Diagnostics manual.

Close the *Test system* program (error determination screen):

▶ Press the function key **F1**.

Result:

– The *Test system* program (error determination screen) is closed.

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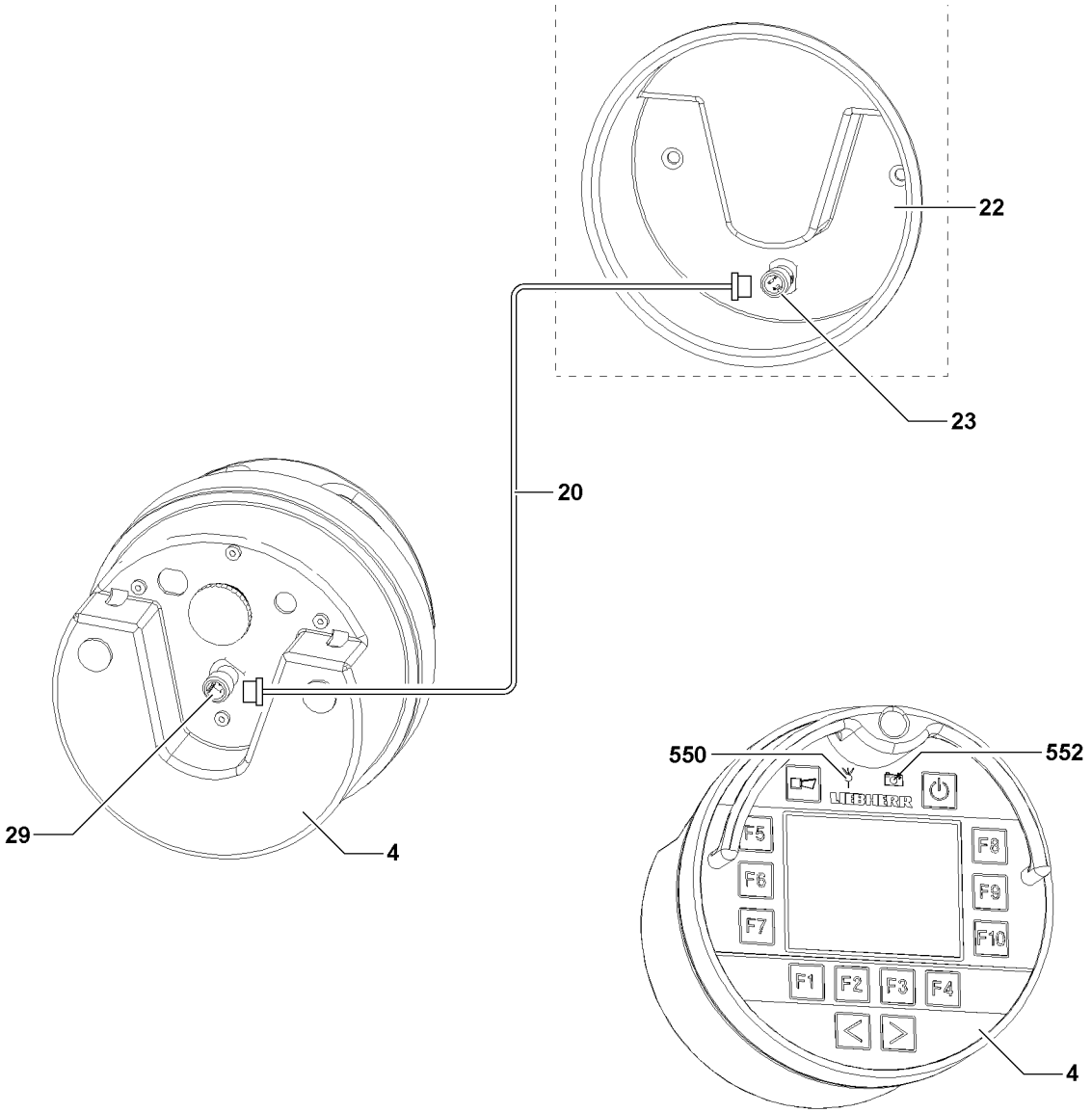

Fig.112952

8.2 The BTT display remains dark?

Note

- ▶ The charge condition indicator light **552** shows the charge condition.
- ▶ Indicator light Transmission signal **550** shows the quality of the radio contact connection.

When the indicator light charge condition **552** does not light up or lights up red:

- ▶ Plug the BTT **4** into the charging module **22**.

When the LED **552** does not light up with the BTT **4** plugged in or the BTT **4** cannot be turned on:

- ▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

8.3 Is the radio connection faulty?

If the radio contact connection to the BTT **4** is faulty or interrupted (Indicator light Transmission signal **550** lights up red), then it can be bypassed with line **20**.

The radio connection to the BTT **4** can become faulty or interrupted through the following occurrences:

- – By interference signals from a nearby radio tower.

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- The radio module on the BTT **4** or on the BTB is defective
- The rechargeable battery in the BTT **4** is discharged.
- Due to bad selection of the placement location by the operator.

8.3.1 Bypassing the radio connection

Make sure that the following prerequisites are met:
- The line **20** to bypass the radio communication has been removed from the control cabinet of the crane cab.
- The BTT **4** has been removed from the charging module **22** and is turned on.
- The caps on the plug connection **23** and the plug connection **29** have been removed.

▶ Screw the line **20** on the charging module **22** onto the plug connection **23**.
▶ Screw the line **20** on the BTT **4** onto the plug connection **29**.

Result:

– The radio communication is bypassed.

Note
If the BTT **4** does not turn on, even though the line **20** is connected with the charging module **22**, then the rechargeable battery may be defective.
▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

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5.35.10 Derrick ballast - ballast trailer

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Fig.195219

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1 Product description

This chapter describes the following derrick ballast variations:
- Ballast trailer
  Ballasting consisting of ballast plates on a ballast trailer.

This crane type has additional derrick ballast variations, which will be described in other chapters of these operating instructions:
- Suspended ballast *special design*: Ballast Constant
  Ballasting consisting of directly suspended ballast plates (without a ballast pallet)
- Suspended ballast
  Ballasting consisting of ballast plates on a ballast pallet
- Suspended ballast *special design*: Ballasting LTR crane and / or ballast plates
  Ballasting consisting of an LTR crane and / or ballast plates on a ballast pallet

Note
Designation of the ballast types
- ▶ The suspended ballast and the ballast trailer are generally described as derrick ballast.
- ▶ The ballast installed on the turntable is generally referred to as the counterweight.
- ▶ The ballast installed on the crawler travel gear is generally referred to as the central ballast.

1.1 Function

The D-guying contains two pull cylinders (pull cylinder A and pull cylinder B). These pull cylinders are used to pull, lift or lower the derrick ballast.

All relevant data regarding the derrick ballast is displayed on the LICCON monitors.

The required derrick ballast radius is set using the telescopeable ballast trailer guide.

In addition, the setting range of the ballast trailer guide can be changed by inserting or removing intermediate sections.

Possible ballast trailer radius: 13 m to 30 m.

The ballast trailer has steering, and has the following steering programs:
- Towing, circular travel, parallel travel, manual corrective steering and manual operation

The two wheel sets of the ballast trailer are oscillating mounted.

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2 Component overview

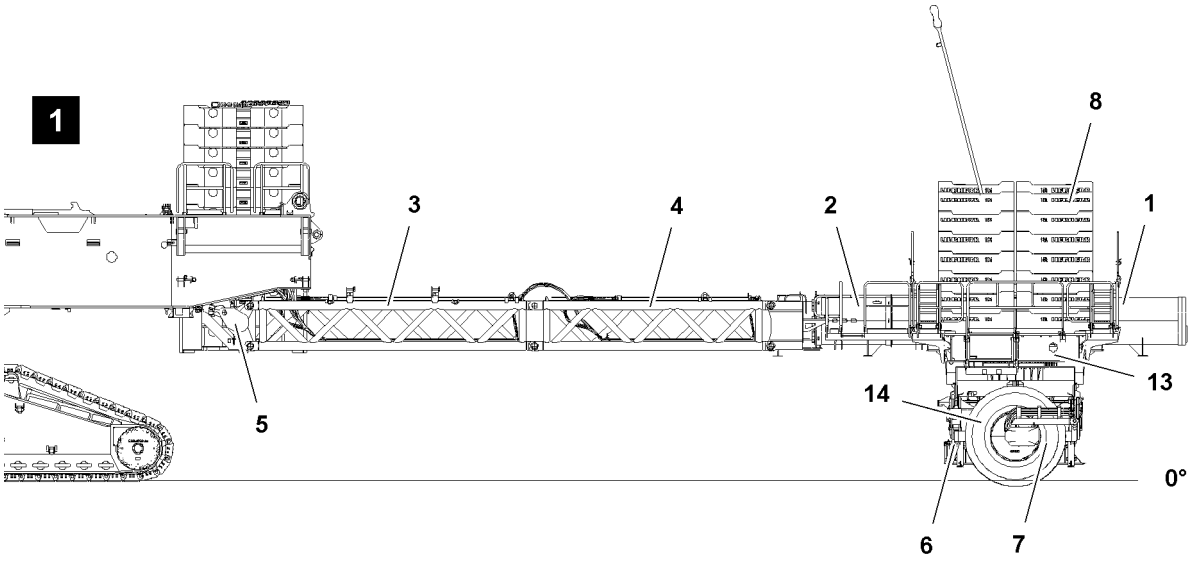

Fig.120219: Component overview

Note
- ▶ The assembly sections are marked with their own weight.
- ▶ Dimensions and weights, see chapter 1.03.

Position	Component
1	Ballast trailer (frame **13**)
2	Ballast trailer guide
3	Intermediate section 6 m
4	Intermediate section 5 m
5	Adapter
6	Support
7	Wheel set
8	Ballast plates

Component overview

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3 Fastening points

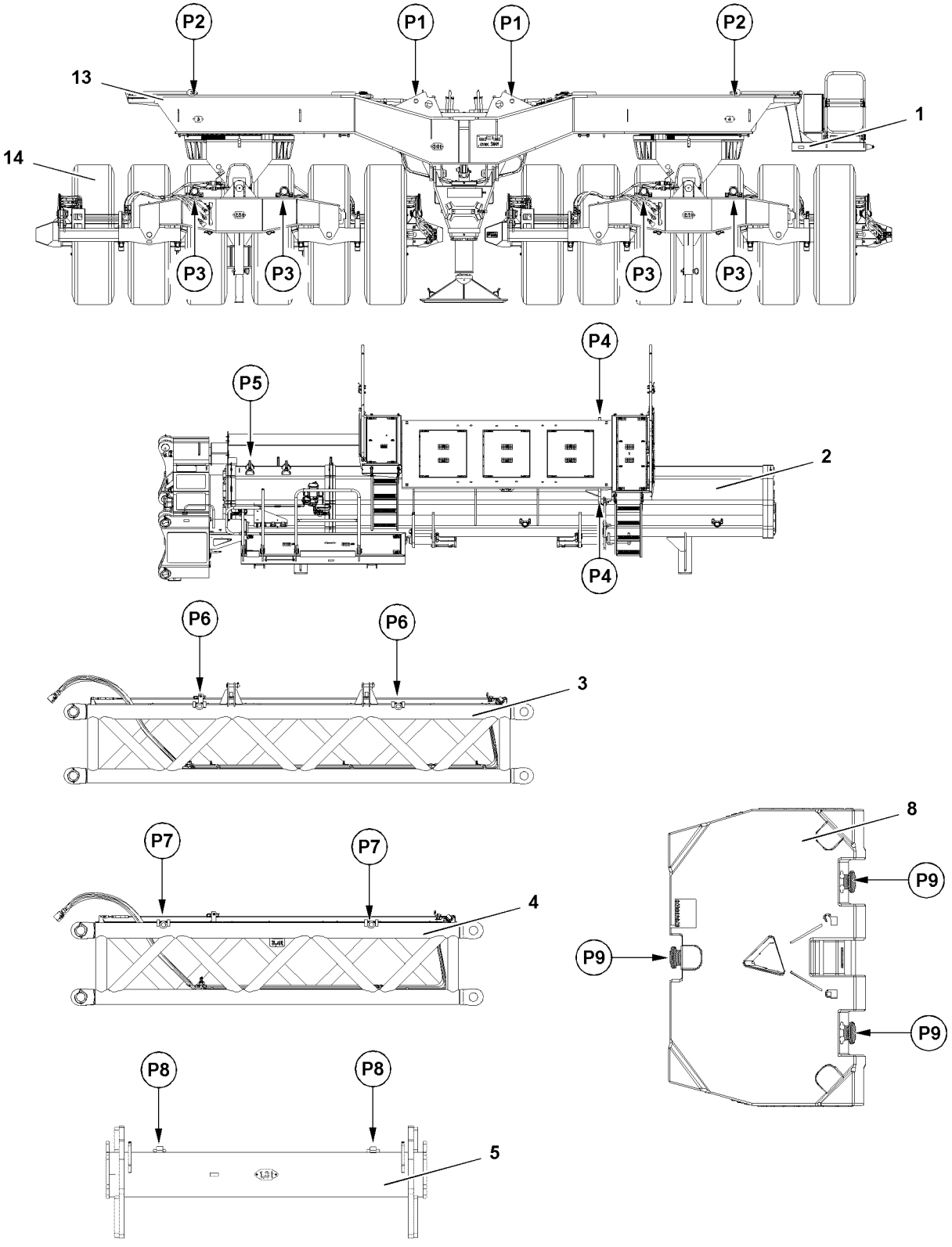

Fig.120224: Fastening points

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WARNING
Component incorrectly fastened!
Life-threatening situations can arise due to improper or incorrect attachment of the corresponding components.
Death, severe bodily injuries, property damage.
▶ Fasten the components only on the intended fastening points on both sides.
▶ Fastening of components and description of fastening points, see chapter 5.01.

Fastening points	
P1 and **P2**	Ballast trailer **1**
P3	Wheel set **14**
P4 and **P5**	Ballast trailer guide **2**
P6	Intermediate section **3**
P7	Intermediate section **4**
P8	Adapter **5**
P9	Ballast plate **8**

Fastening points

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4 Ballast trailer radii

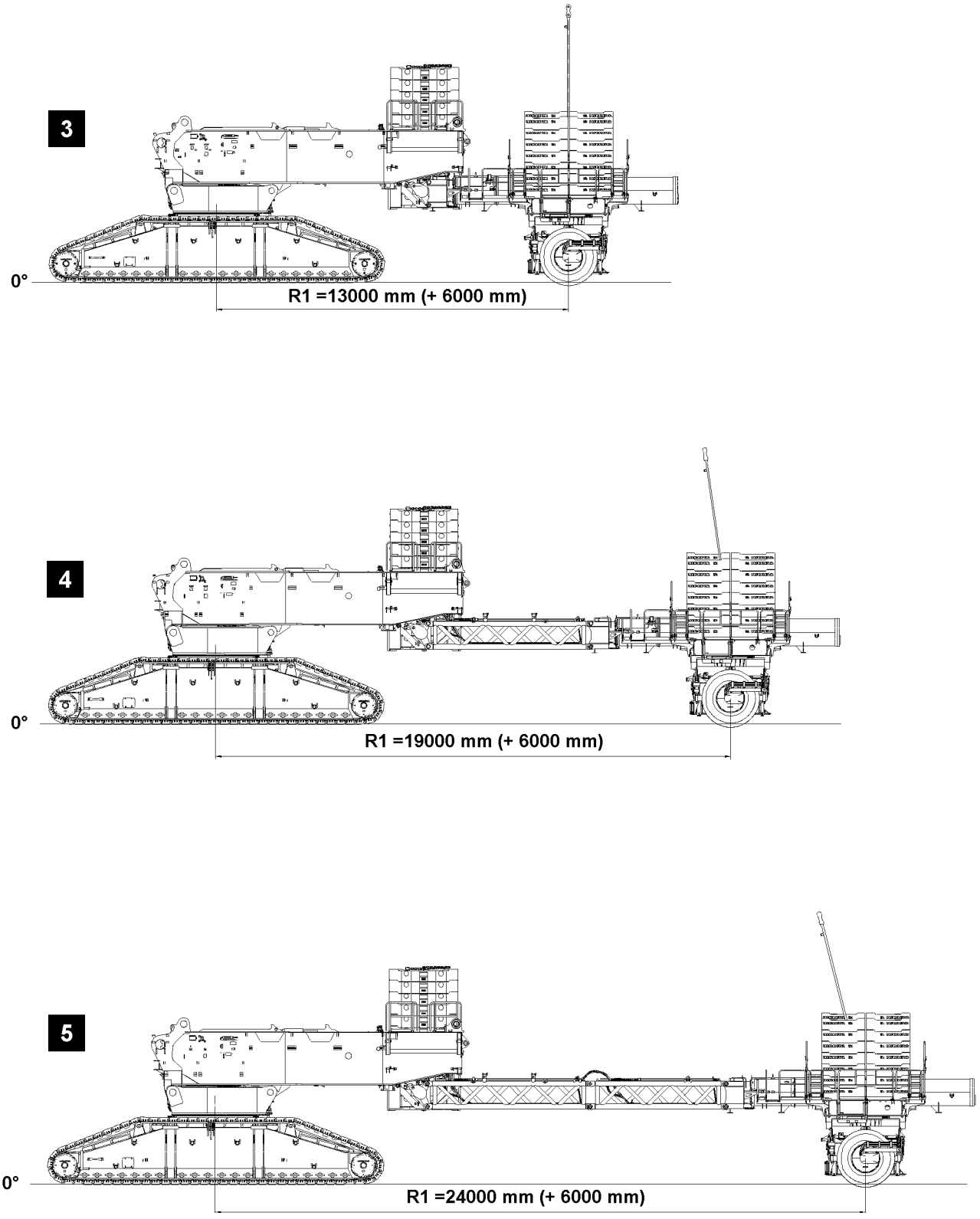

Fig.120218: Ballast trailer radii

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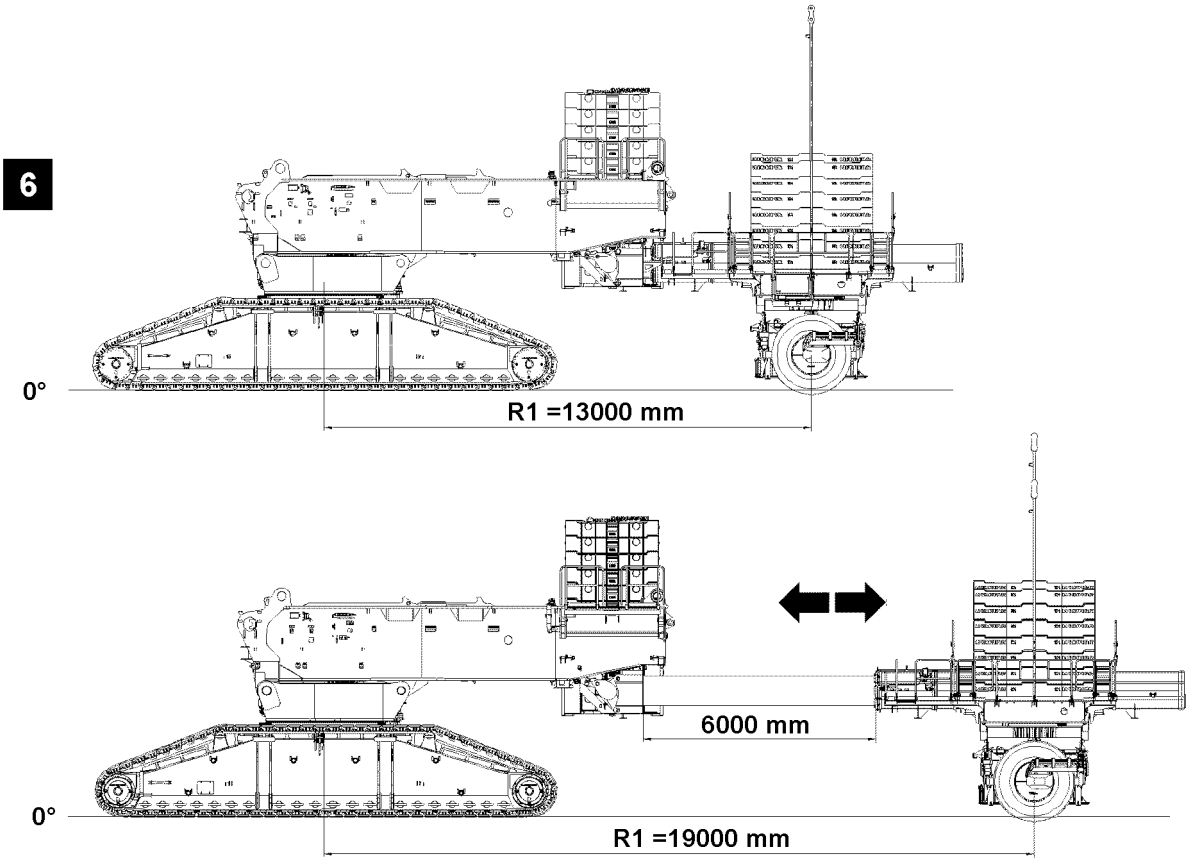

Fig.120220: Telescoping the ballast trailer

	Ballast trailer	Intermediate section 6 m	Intermediate section 5 m
36 m derrick boom	1	1	0
Derrick boom 42 m	1	1	1

Derrick boom and counterweight combination

	Ballast trailer radius = R1	Intermediate section 6 m	Intermediate section 5 m
Radius range 1	13000 mm + 6000 mm	0	0
Radius range 2	19000 mm + 6000 mm	1	0
Radius range 3	24000 mm + 6000 mm	1	1

Radius ranges

Ballast trailer radius = R1 can be reached by adjusting the telescopeable guide and by installation of an intermediate section of 13 m to 30 m , see illustration **3** to illustration **6** and chart.

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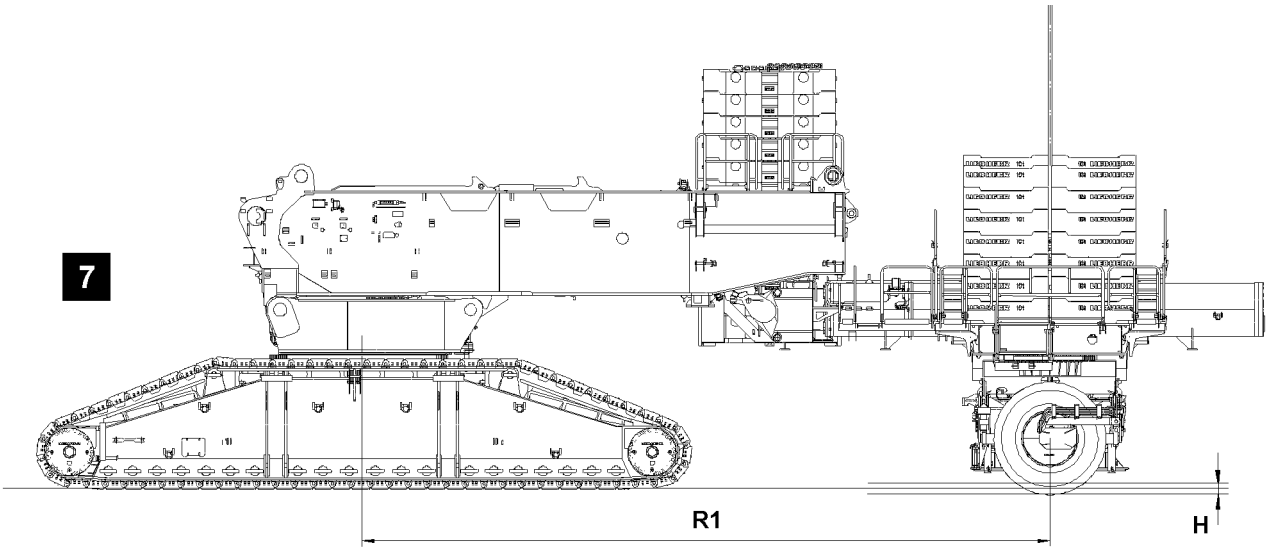
5 Stability and tipping safety



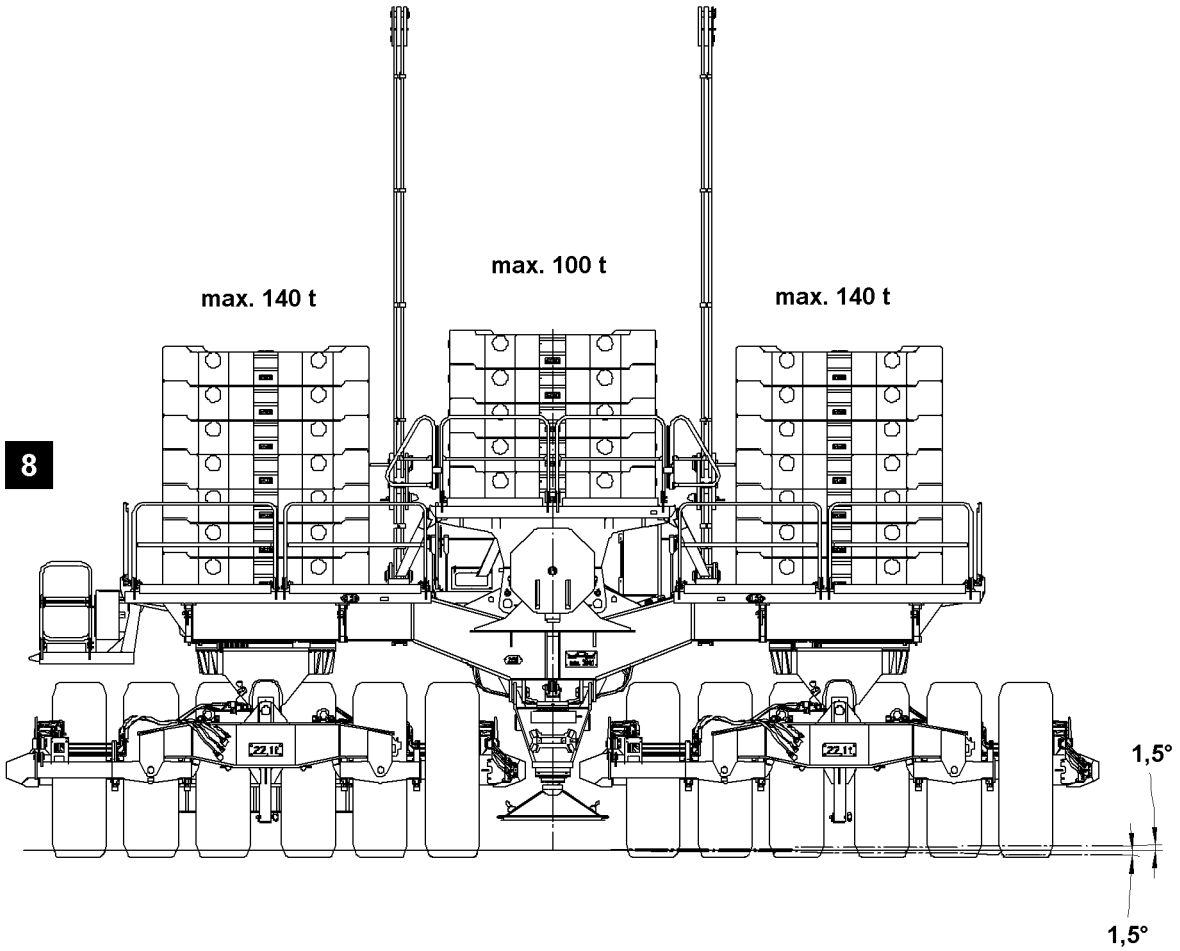


Fig.120221: Uneven ground

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5.1 Uneven ground

WARNING
The crane can topple over!
If the maximum permissible values for the uneven ground are exceeded, then the crane can topple over.
Death, severe bodily injuries, property damage.
▶ The permissible ground unevenness may not be exceeded.

Ballast trailer radius = R1	Level difference = H
13000 mm	+50/-200 mm
19000 mm	+100/-400 mm
25000 mm	+150/-500 mm
30000 mm	+200/-500 mm

Permissible level difference

Permissible level difference between crane placement surface and ballast trailer placement surface, see chart and illustration **7**.

WARNING
The crane can topple over!
If the maximum permissible side incline of the ballast trailer is exceeded, the crane can topple over.
Death, severe bodily injuries, property damage.
▶ Do not exceed the maximum permissible side incline of the ballast trailer.

Permissible side incline of the ballast trailer is +/-1.5°, see illustration **8**.

WARNING
Toppling crane or ballast trailer!
If the maximum permissible weight of the ballast plates is exceeded, the crane or the ballast trailer can topple over.
Death, severe bodily injuries, property damage.
▶ The permissible total weight of the ballast plates may not be exceeded.

The permissible total weight of the ballast plates is 380 t , see illustration **8**.

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5.2 Stopping the ballast trailer

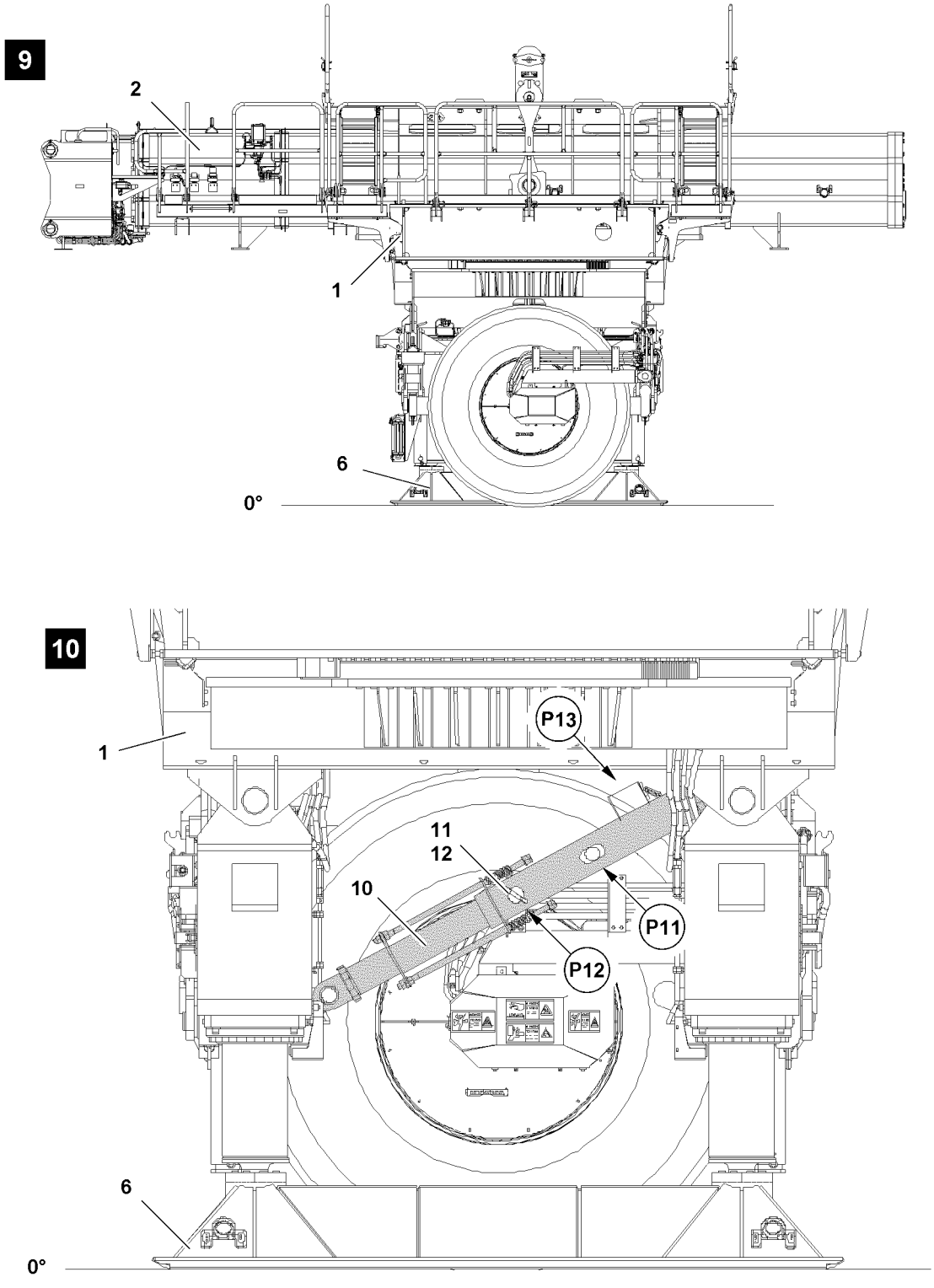

Fig.120223: Ballast trailer support

Make sure that the following prerequisites are met, see illustration **9**:
- The ballast trailer guide is hydraulically fully retracted.
- The ballast trailer is supported and horizontally aligned.

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WARNING
Ballast trailer tipping danger!
If the ballast trailer is not installed on the turntable and the ballast trailer guide is not fully retracted, the ballast trailer can tip over.
Death, severe bodily injuries, property damage.

- ▶ Before removal of the ballast trailer on the turntable, the locking pin **11** must be pinned on strut **10** of the ballast trailer at point **P12** and secured with the spring retainer **12**, see illustration **10**.
- ▶ The ballast trailer guide must be retracted completely before stopping the ballast trailer.
- ▶ The support **6** is extended to the point where the tires are relieved, see illustration **9** and illustration **10**.

Listed in the following chart are the possible pin points on the strut **10**, see illustration **10**:

- Pin point **P11**: When the support is actuated, while the ballast trailer is pinned on the crane (for example: Lift to turn the wheel sets).
- Pin point **P12**: When the ballast trailer is to be separated from the crane (for example: for transport).
- Pin point **P13**: Park position.

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6 Operating elements on the control panels

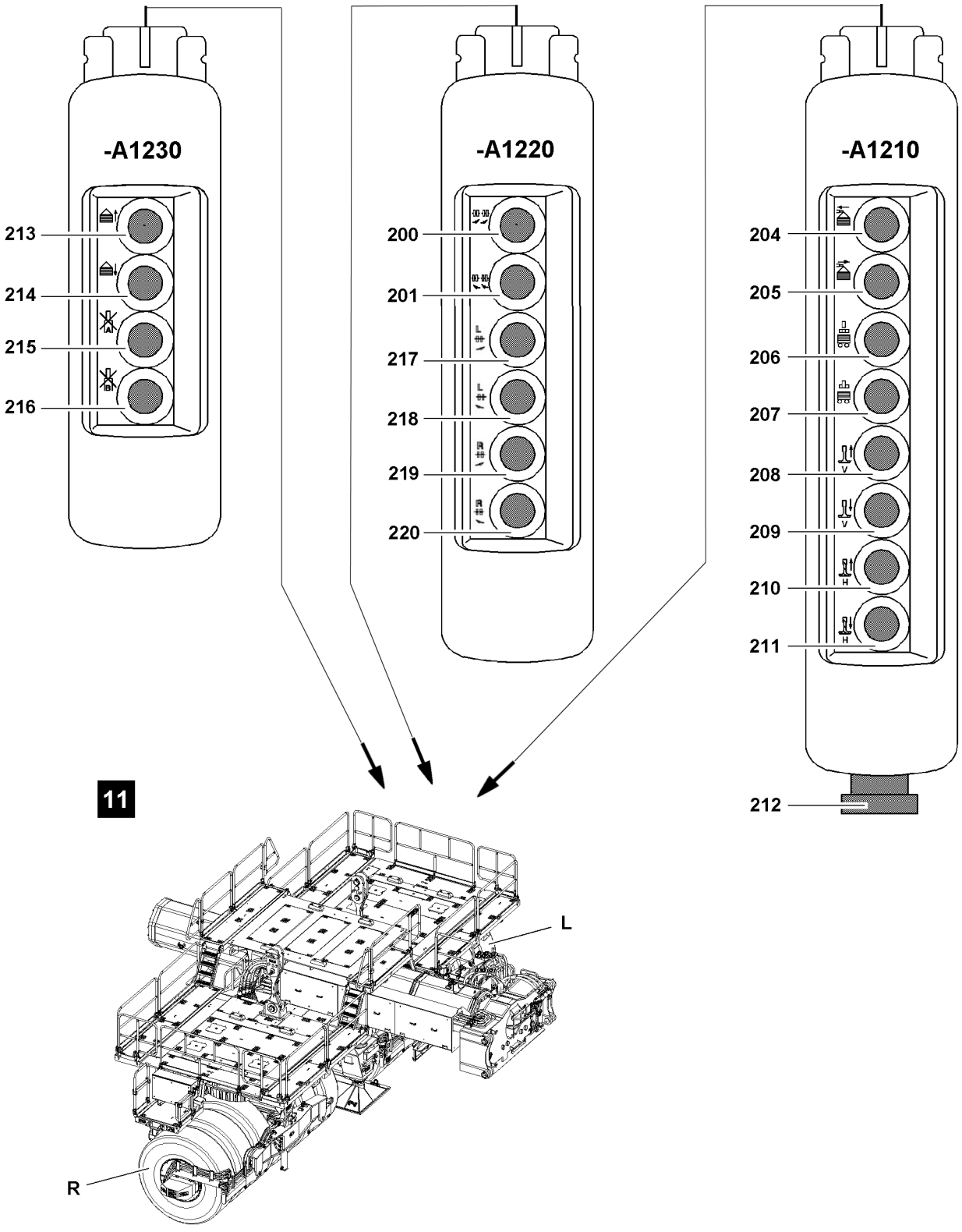

Fig.126313: Control panels

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Control panel - A1220		
200	Button	• Corrective steering, turn wheel sets to left
201	Button	• Corrective steering, turn wheel sets to right
217	Button	• Turn the wheel set on the left side „L“ to the right
218	Button	• Turn the wheel set on the left side „L“ to the left
		• Manual operation for assembly or emergency operation
219	Button	• Turn the wheel set on the right side „R“ to the right
220	Button	• Turn the wheel set on the right side „R“ to the left
		• Manual operation for assembly or emergency operation

The designation „R“ or „L“ on the wheel sets refers to the travel direction of the crane, see illustration **11**:
- „R“ - Right wheel set
- „L“ - Left wheel set

Control panel - A1210		
204	Button	• Ballast trailer, move the guide cylinder in
205	Button	• Ballast trailer, move the guide cylinder out
206	Button	• Ballast trailer on turntable - unpin
207	Button	• Ballast trailer on turntable - pin
208	Button	• Retracting the front support cylinder
209	Button	• Extending the front support cylinder
210	Button	• Move the rear support cylinder in
211	Button	• Move the rear support cylinder out
212	Switch	• **EMERGENCY OFF**

Control panel - A1230		
213	Button	• Retract both pull cylinders, lift the ballast trailer
214	Button	• Extend both pull cylinders, lower the ballast trailer
215	Button	• Stop pull cylinder A
		Note: The button **213** or button **214** must be pressed.
216	Button	• Stop pull cylinder B
		Note: The button **213** or button **214** must be pressed.

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7 Assembling / disassembling the ballast trailer with the BTT-E

Note

▶ During the assembly / disassembly of the ballast trailer, various functions can be controlled using the BTT-E (radio remote control). See the radio remote control operating instructions.

WARNING

The crane can topple over!

Death, severe bodily injuries, property damage.

▶ Make sure that all danger notes are observed during radio operation.

▶ Make sure that there are no persons within the crane danger zone.

8 Pre-assembling the ballast trailer

WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.

If this is not observed, the assembly personnel can fall down.

Death, severe bodily injuries, property damage.

▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.

▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see chapter 2.04.

▶ If fall protection equipment is available, then it must be used, see chapter 2.06.

▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.

▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.

▶ Only step on the aids, ladders and catwalks with clean shoes.

▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.

▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.

▶ Remaining on a suspended load is prohibited.

▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.

▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.

▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING

Danger of impact / crushing!

When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.

When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.

Death, severe bodily injuries, property damage.

▶ Make sure that personnel cannot be caught by components.

▶ When working in danger zones: Use aids to protect limbs.

▶ Guide components with suitable aids to minimize oscillation.

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DANGER
The components can fall down!
If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel.
▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

WARNING
Ballast trailer tipping danger!
Due to improperly carried out assembly or improper assembly conditions, the ballast trailer can tip over.
Death, severe bodily injuries, property damage.
▶ The assembly of the ballast trailer may only be carried out by authorized personnel.
▶ Carry out the assembly of the ballast trailer only on level ground of sufficient load bearing capacity.
▶ The ballast trailer has **no** brake system. The ballast trailer must be supported with the support cylinders if it is **not** pinned on the turntable.

Note
▶ Park the ballast trailer for assembly of the ballast trailer guide on level ground with sufficient load bearing capacity in the vicinity of the crane.
▶ Observe the safety guidelines, see chapter 2.15.

Make sure that the following prerequisites are met:
– The ground is level and of sufficient load carrying capacity.
– An auxiliary crane is available.

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8.1 Assembling the frame on the wheel sets

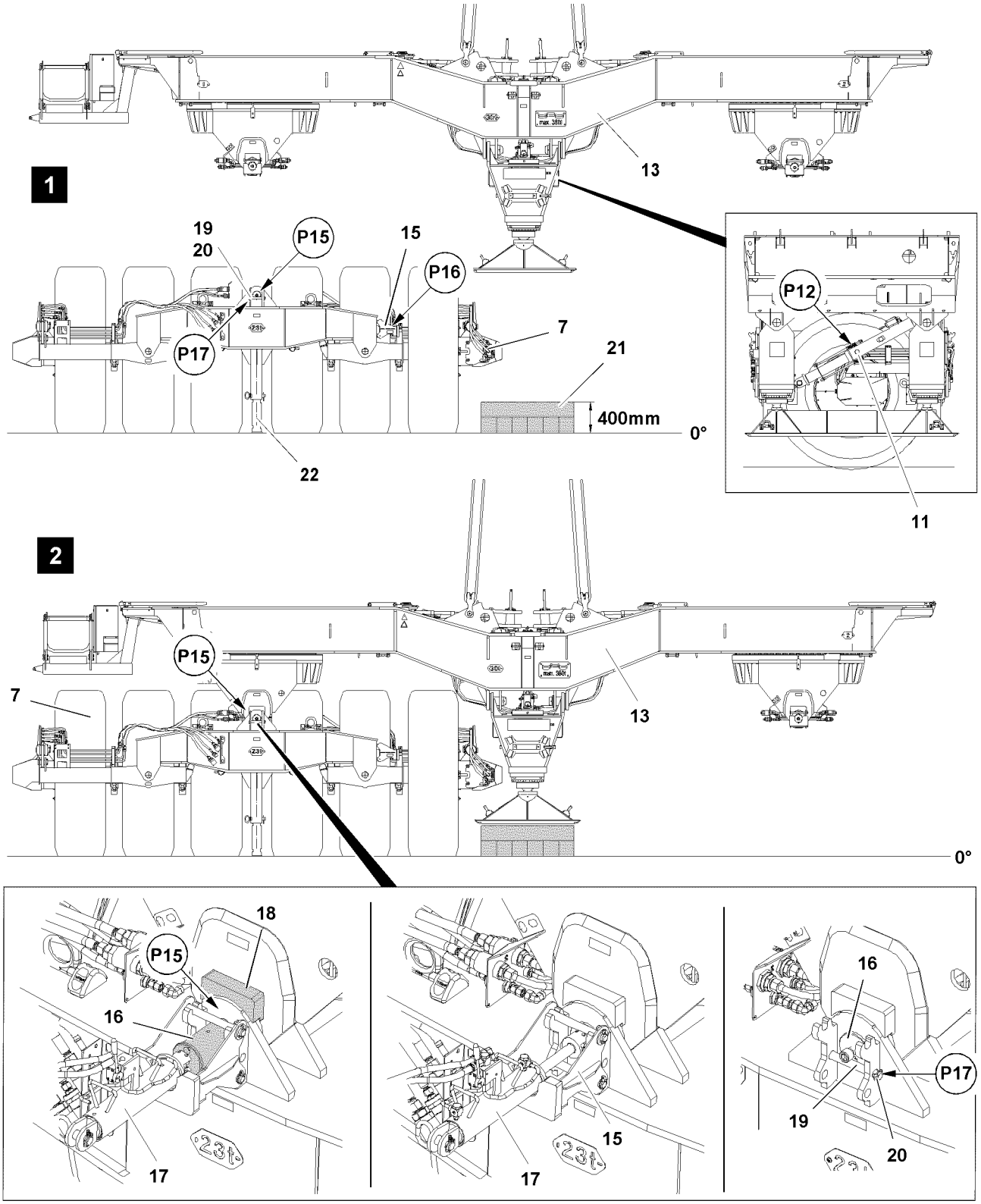

Fig.121986: Assembling the first wheel set

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8.1.1 Assembling the first wheel set

Note

- ▶ Frame and wheel set are pinned with each other on two pin points **P15**.
- ▶ The pinning procedure is described based on the example of one pin point.

- ▶ Fasten the first wheel set **7** to the auxiliary crane and set it down on level ground, see illustration **1**.
- ▶ Pull the extendable auxiliary supports **22** out and secure, see illustration **1**.

Result:

– The first wheel set **7** is secured to prevent it from tipping over.

- ▶ Remove the auxiliary crane.
- ▶ Remove the safety locking pin **20** at point **P17** and unpin the pin **19**, see illustration **1**.
- ▶ Release the retainer **15** for pin pulling device **17** at point **P16**.
- ▶ Hang the retainer **15** up at pin point **P15** and secure, see illustration **1** and illustration **2**.
- ▶ Build up the substructure **21** for frame **13** approx. 400 mm high, see illustration **1**.
- ▶ Fasten the frame **13** to the auxiliary crane.
- ▶ Swing the frame **13** with the auxiliary crane to the pin points **P15**.
- ▶ Align the frame **13** with centerings **18** at points **P15** and set it on the wheel set **7**.
- ▶ Insert the pin **16** with the pin pulling device **17** at point **P15**, see illustration **2**.
- ▶ Remove the retainer **15** and fasten at point **P16**.
- ▶ Insert the pin **19** at point **P17** and secure with the safety locking pin **20**, see illustration **2**.

Result:

– The pin **16** is secured.

WARNING
Danger of tipping over!
If the locking pin **11** is not inserted at point **P12**, the ballast trailer can tip over.
Death, severe bodily injuries, property damage.

- ▶ Make sure that the locking pin **11** is pinned and secured at point **P12** before setting down the frame **13**.

- ▶ Insert the locking pin **11** at point **P12** and secure.
- ▶ Set the frame **13** with the auxiliary crane on the substructure **21**.
- ▶ Remove the auxiliary crane.

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8.1.2 Assembling the second wheel set

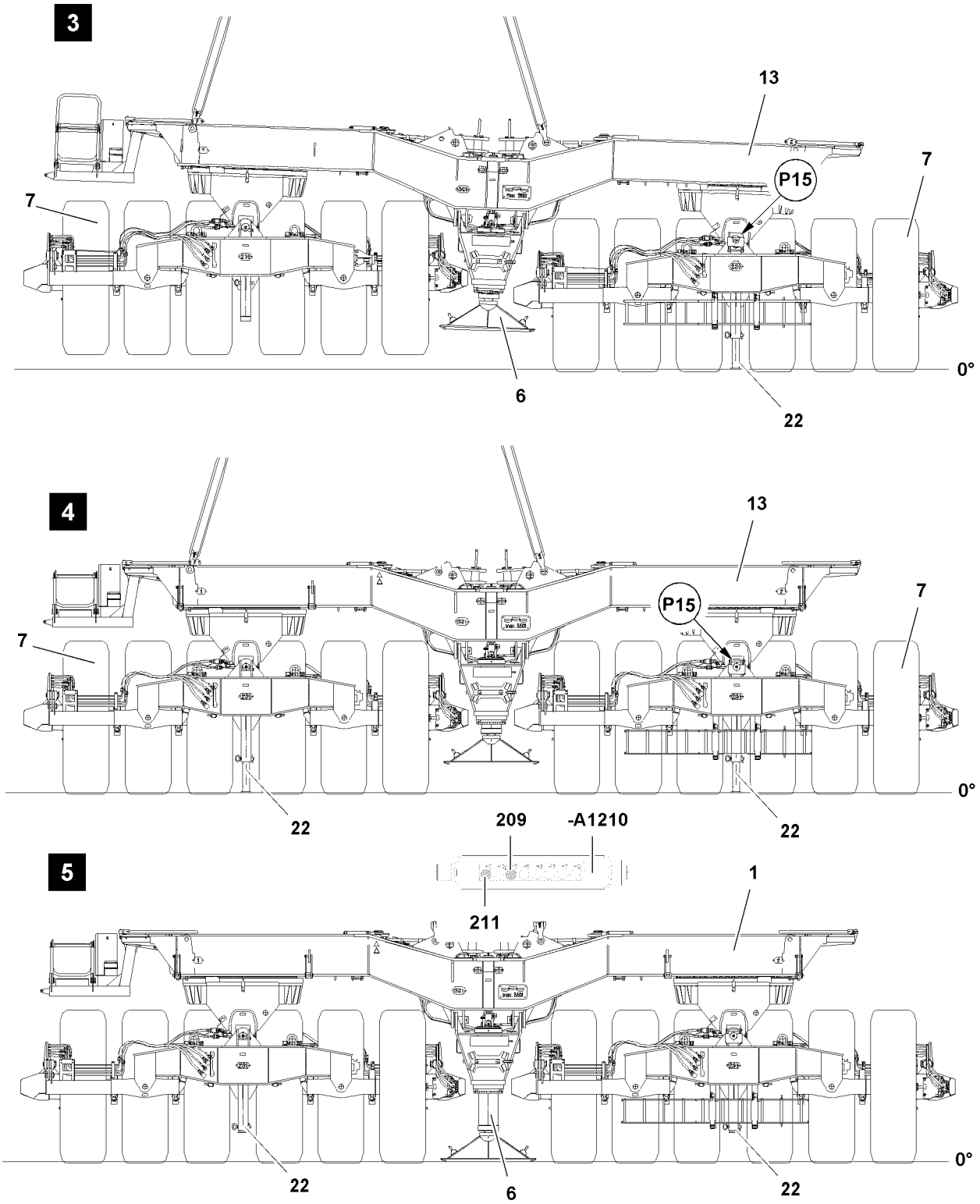

Fig.121987: Assembling the second wheel set

Make sure that the following prerequisite is met:
- The first wheel set is pinned and secured with frame.

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Note
- ▶ The assembly of the first wheel set is identical to the assembly of the second wheel set.
- ▶ Setting down the second wheel set, see section „Assembling the first wheel set“.

▶ Fasten the second wheel set **7** to the auxiliary crane and set it down on level ground.
▶ Secure the second wheel set **7** to prevent it from tipping over, see illustration **3**.

When the second wheel set **7** is set up and secured to prevent it from tipping over:
▶ Fasten the frame **13** with the first wheel set **7** to the auxiliary crane, see illustration **3**.
▶ Swing the frame **13** with the first wheel set **7** to the pin points **P15**.

Note
- ▶ The assembly of the first wheel set is identical to the assembly of the second wheel set.
- ▶ Assembly of the second wheel set, see section „Assembling the first wheel set“.

▶ Align the frames **13** with the first wheel set **7** with centerings at points **P15** and set it on the second wheel set **7**, see illustration **3**.
▶ Pin and secure the frames **13** together with the first wheel set **7** and second wheel set **7**, see section „Assembling the first wheel set“.

When the frames **13** are pinned and secured together with the first wheel set **7** and second wheel set **7**:
▶ Set the ballast trailer down, see illustration **4**.
▶ Pull the extendable auxiliary supports **22** out of the first wheel set **7** and secure, see illustration **4**.
▶ Relieve the fastening equipment.
▶ Connect the ballast trailer on the external hydraulic system.
or
Connect the ballast trailer using the electrical extension cable and the hydraulic extension hoses to the crane turntable, see the electric wiring diagram and the hydraulic diagram.

When the electrical and hydraulic connections have been established:
▶ Press the button **209** and button **211** on the control panel **-A1210**.

Result:

– The support **6** extends.

▶ Extend the support **6** until the tires are relieved, see illustration **5**.

Result:

– The ballast trailer **1** is secured to prevent it from tipping over.

▶ Move the extendable auxiliary supports **22** in on both wheel sets **7** and secure, see illustration **5**.
▶ Remove the fastening equipment.

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8.1.3 Installing the extension ladder on the ballast trailer

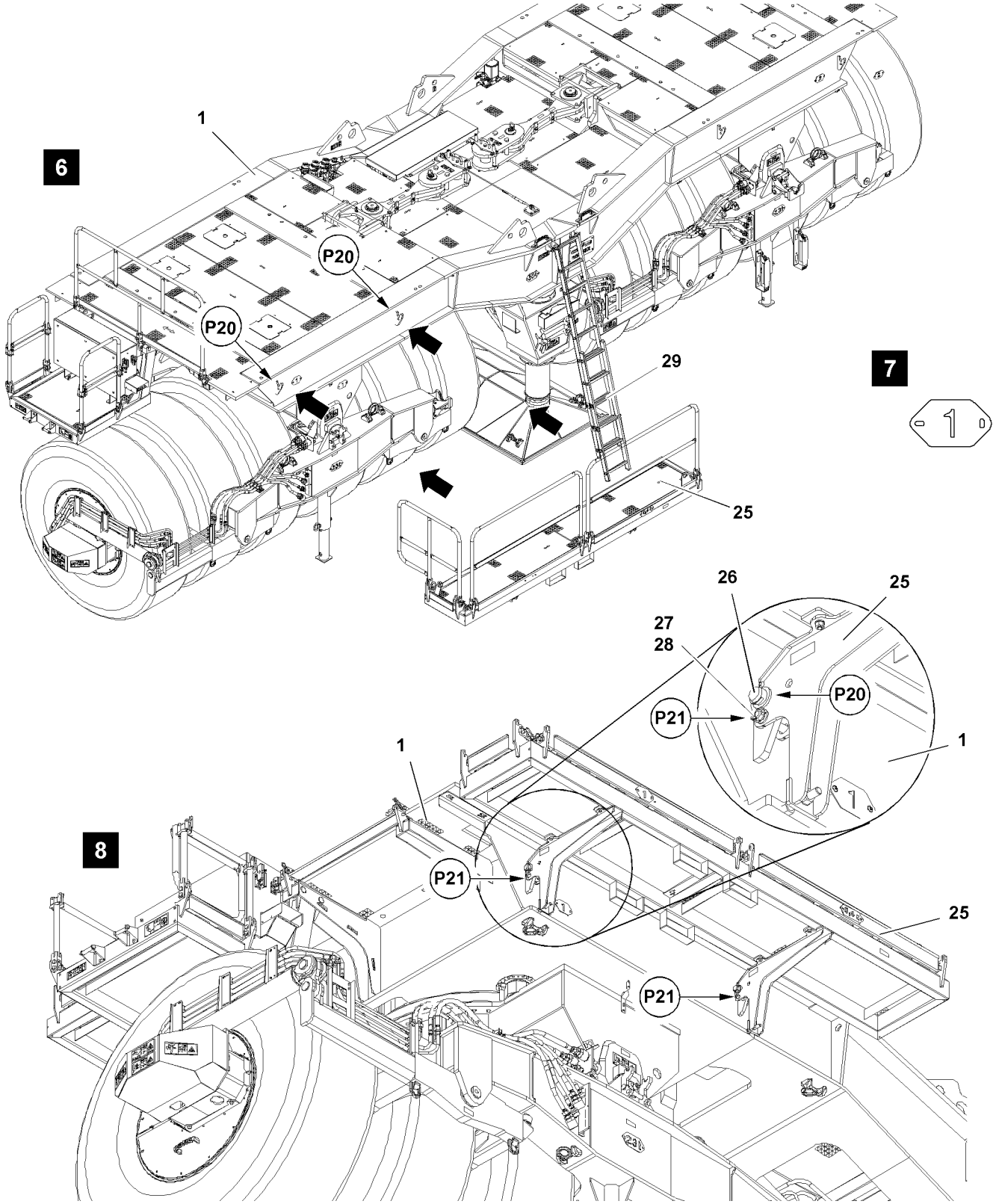

Fig.120225: Assembling the platforms

Note

- ▶ Position of extension ladder **29** see illustration **6**.
- ▶ Assembly of the extension ladder **29**, see chapter 2.06.

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8.1.4 Establishing the connections

Establishing the hydraulic connection

DANGER
Danger of accident due to loss of pressure or leakage!
Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.
▶ Check that the quick couplings have been properly connected before using the crane.

▶ Release the pressure in the hydraulic system before connecting or disconnecting: Turn the engine off and wait a short time.
▶ Connect the coupling components (sleeve and connector) and screw together with the knurled nut.
▶ Tighten the hydraulic coupling by hand: Rotate the knurled nut until it reaches a tangible, fixed stop position.

Establishing the electrical connection

▶ Establish the electrical connections, see the Electric wiring diagram.

8.1.5 Assembling the platforms

Note
▶ The ballast trailer is equipped with four separate platforms.
▶ The ballast trailer sides and platforms **25** are marked with numbers, see illustration **7**.
▶ Pay attention to identification on ballast trailer and on platform at assembly.

Note
▶ The assembly of the platforms is described on the example of one platform.

▶ Fasten the platform **25** to the auxiliary crane.
▶ Swing the platform **25** with the auxiliary crane to the points **P20**.
▶ Hang the platform **25** with pins **26** at points **P20** on ballast trailer.

The platform **25** is pinned on two points:

▶ Insert the pin **27** at point **P21** and secure with the safety locking pin **28**, see illustration **8**.
▶ Remove the auxiliary crane.
▶ Install all platforms on the ballast trailer.

8.1.6 Installing the railing on the ballast trailer

Note
▶ Railing assembly, see chapter 2.06.

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8.1.7 Erecting the pull brackets

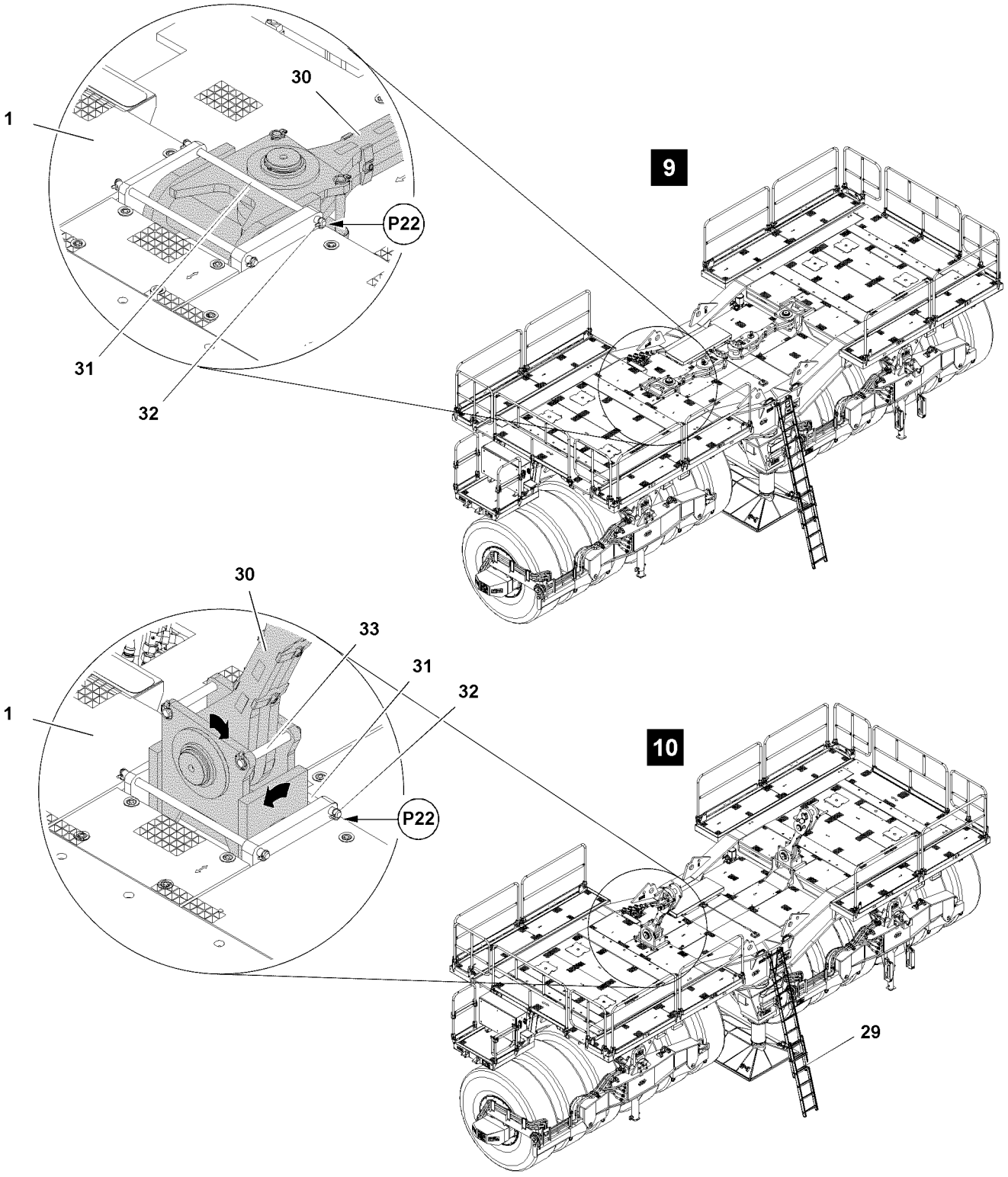

Fig.120226: Erecting the pull brackets

- ▶ Fasten the pull bracket **30** to the auxiliary crane.
- ▶ Release the pull bracket **30** from transport position: Remove the safety locking pin **32** at point **P22** and unpin the pin **31**, see illustration **9**.
- ▶ Raise the pull bracket **30** with the auxiliary crane.

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▶ Secure the pull bracket **30** in operating position: Insert the pin **31** at point **P22** and secure with safety locking pin **32**, see illustration **10**.

WARNING
Swinging pull bracket!
When releasing the pull bracket from the auxiliary crane, it can swing uncontrolled forward or backward.
Death, severe bodily injuries, property damage.
▶ Make sure that pull bracket **30** is first placed on pin **33** and then released from the auxiliary crane.

▶ Swing the pull bracket **30** with the auxiliary crane until it is placed on the pin **33**, see illustration **10**.
▶ Remove the auxiliary crane.
▶ Erect the second pull bracket.

8.1.8 Removing the extension ladder on the ballast trailer

Note
▶ Position of extension ladder **29** see illustration **10**.
▶ Disassembly of the extension ladder **29**, see chapter 2.06.

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8.2 Assembling the ballast trailer guide

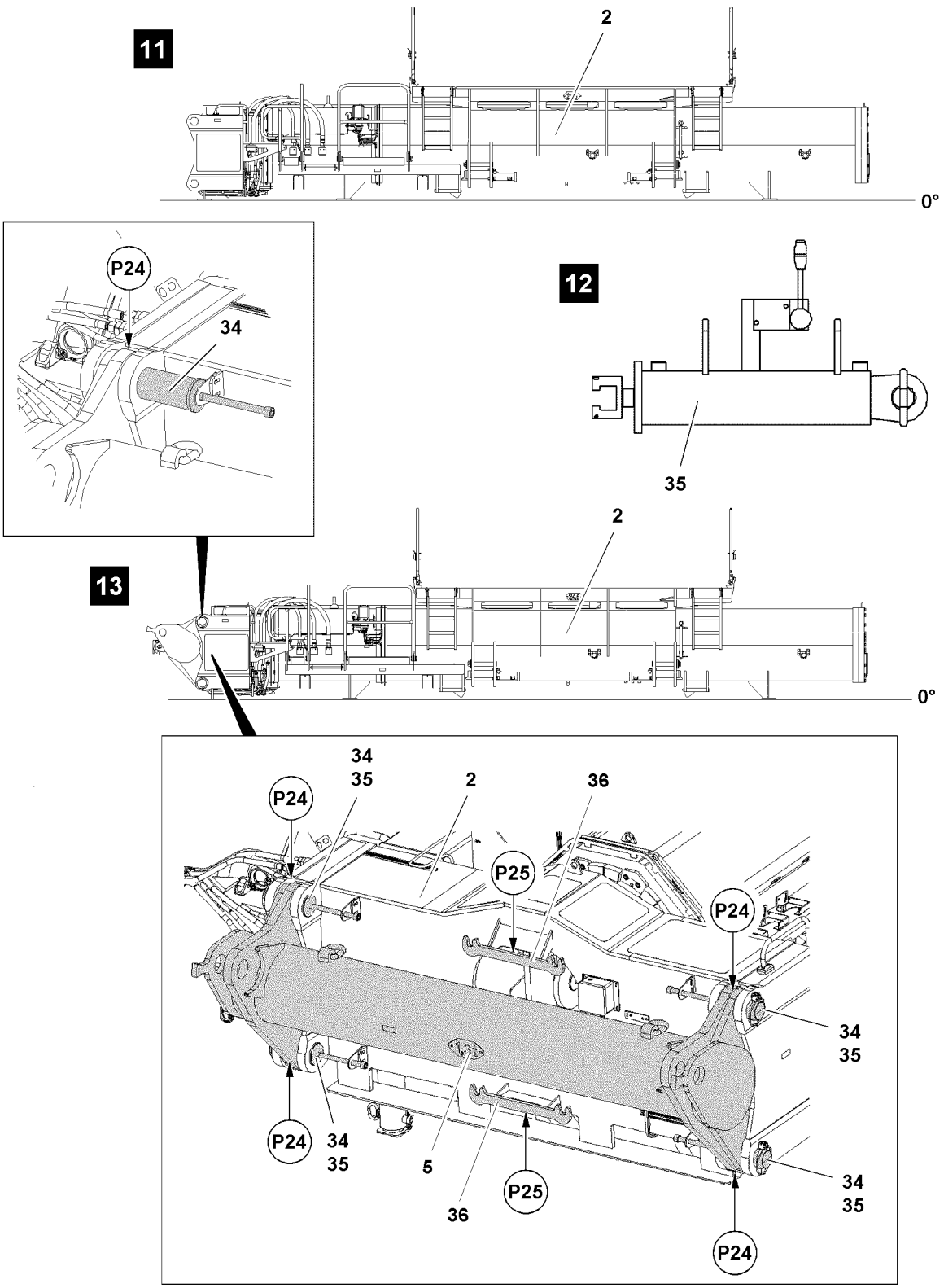

Fig.120228: Assembling the ballast trailer guide with ballast trailer radius 13-19 m

Make sure that the following prerequisites are met:
- The ballast trailer guide **2** is moved in all the way see illustration **11**.
- The connector pins **34** are unpinned.
- The ballast trailer guide **2** is laying on the ground, see illustration **11**.

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8.2.1 Installing the ladder and railing on the ballast trailer guide

Note
- ▶ Position of ladder and railing, see illustration **11**.
- ▶ For the assembly of the ladder and the railing, see chapter 2.06.

8.2.2 Assembling the ballast trailer guide with ballast trailer radius 13-19 m

▶ Fasten the adapter **5** to the auxiliary crane.

WARNING
Danger of crushed limbs!
When aligning the adapter, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

The adapter **5** is pinned four times on the ballast trailer guide. Every pin point is present on both sides of the component on one level.

▶ Swing the adapter **5** with the auxiliary crane to the pin points **P24**, see illustration **13**.
▶ Hang the pin pulling cylinder **35** on the retainer **36** at point **P25** and on the screw head, see illustration **12** and illustration **13**.
▶ Establish the hydraulic connection of the pin pulling cylinder **35**, see chapter 5.30.

When the pin bores align:
▶ Actuate the lever on the pin pulling cylinder **35** and insert the connector pin **34**.

WARNING
The connector pins can loosen up by themselves!
If the pins are not secured with the safety locking pins, the pins can release during crane operation.
This can cause the crane to topple over.
Death, severe bodily injuries, property damage.
▶ Make sure that connector pins are inserted and secured.

▶ Secure the connector pins **34** with safety locking pins **35**, see illustration **13**.

When all four connector pins **34** are pinned in and secured:
▶ Remove the auxiliary crane.

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8.2.3 Assembling the ballast trailer guide with ballast trailer radius 19-25 m

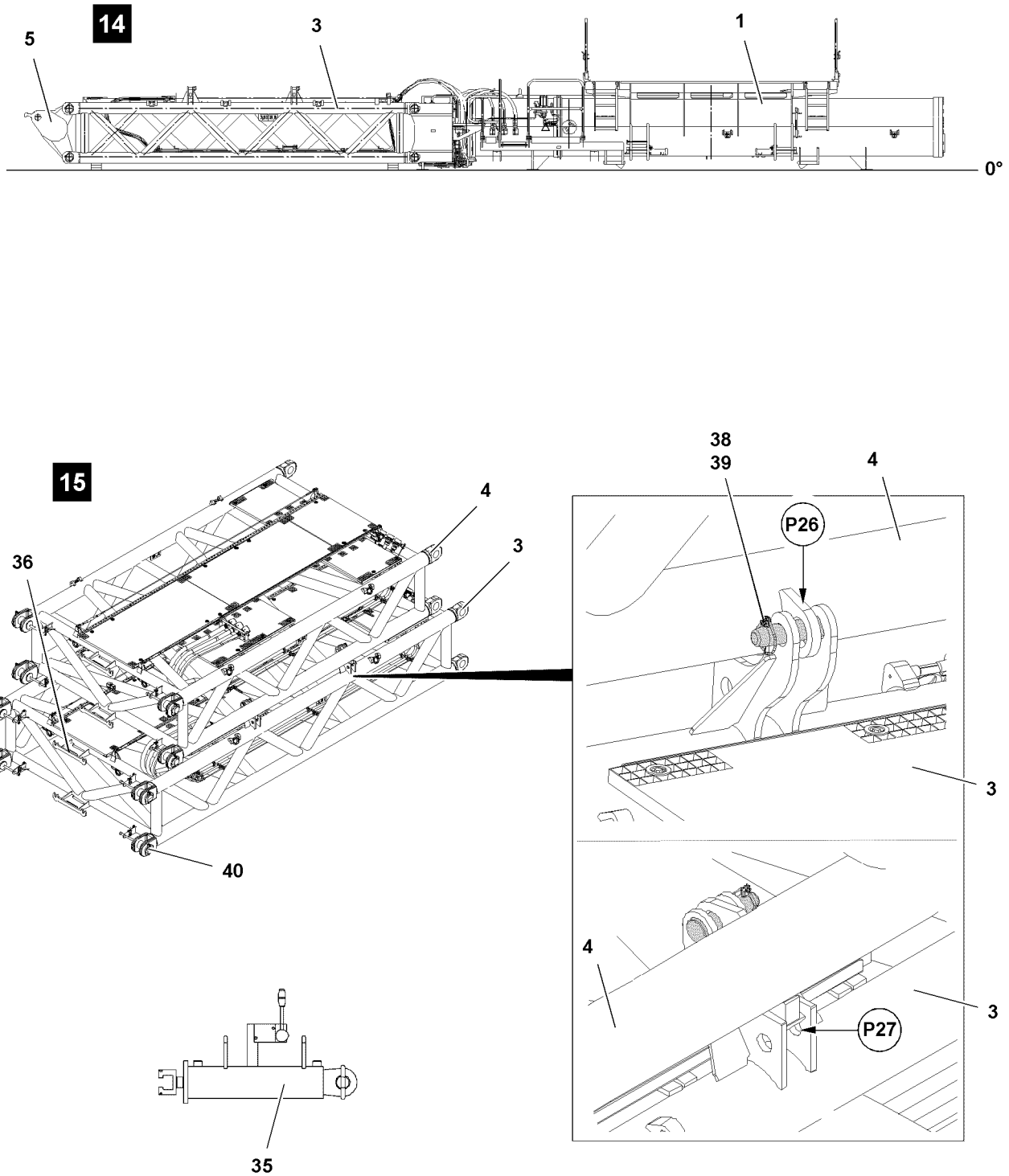

Fig.121988: Assembling the ballast trailer guide with ballast trailer radius 19-25 m

The intermediate sections are pinned with each other on four points in transport position. The unpinning procedure is described on the example for one pin, see illustration **15**.

- ▶ Fasten the intermediate section **4** to the auxiliary crane.
- ▶ Remove the safety locking pin **39** at point **P26** and unpin the pin **38**, see illustration **15**.

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- ▶ Insert the pin **38** in park position at point **P27** and secure with safety locking pin **39**, see illustration **15**.
- ▶ Lift the intermediate section **4** with the crane and remove.
- ▶ Hang the pin pulling cylinder **35** on the retainer **36** and on the screw head, see illustration **15**.
- ▶ Establish the hydraulic connection of the pin pulling cylinder **35**, see chapter 5.30.
- ▶ Release the connector pin **40**.
- ▶ Actuate the lever on the pin pulling cylinder **35** and unpin the connector pin **40**.
- ▶ Fasten the intermediate section **3** to the auxiliary crane.
- ▶ Lift the intermediate section **3** with the crane and swing it to the ballast trailer guide **1**, see illustration **14**.

Note

- ▶ Pinning the intermediate section **3** on the ballast trailer guide **1** is identical with pinning the adapter **5** on the ballast trailer guide **1**.
- ▶ For pin procedure, see section „Assembling the ballast trailer guide with ballast trailer radius 13–19 m “.

The intermediate section **3** is pinned four times on the ballast trailer guide **1**.

- ▶ Pin the intermediate section **3** on ballast trailer guide **1**, see illustration **14**.

Note

- ▶ Pinning the adapter **5** on the intermediate section **3** is identical with pinning the adapter **5** on the ballast trailer guide **1**.
- ▶ For pin procedure, see section „Assembling the ballast trailer guide with ballast trailer radius 13–19 m “.

The adapter **5** is pinned four times on the intermediate section **3**.

- ▶ Pin the adapter **5** on intermediate section **3**, see illustration **14**.

8.2.4 Establishing the connections

Establishing the hydraulic connection

DANGER

Danger of accident due to loss of pressure or leakage!
Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.

- ▶ Check that the quick couplings have been properly connected before using the crane.

- ▶ Release the pressure in the hydraulic system before connecting or disconnecting: Turn the engine off and wait a short time.
- ▶ Connect the coupling components (sleeve and connector) and screw together with the knurled nut.
- ▶ Tighten the hydraulic coupling by hand: Rotate the knurled nut until it reaches a tangible, fixed stop position.

Establishing the electrical connection

- ▶ Establish the electrical connections, see the Electric wiring diagram.

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8.2.5 Assembling the ballast trailer guide with ballast trailer radius 24-30 m

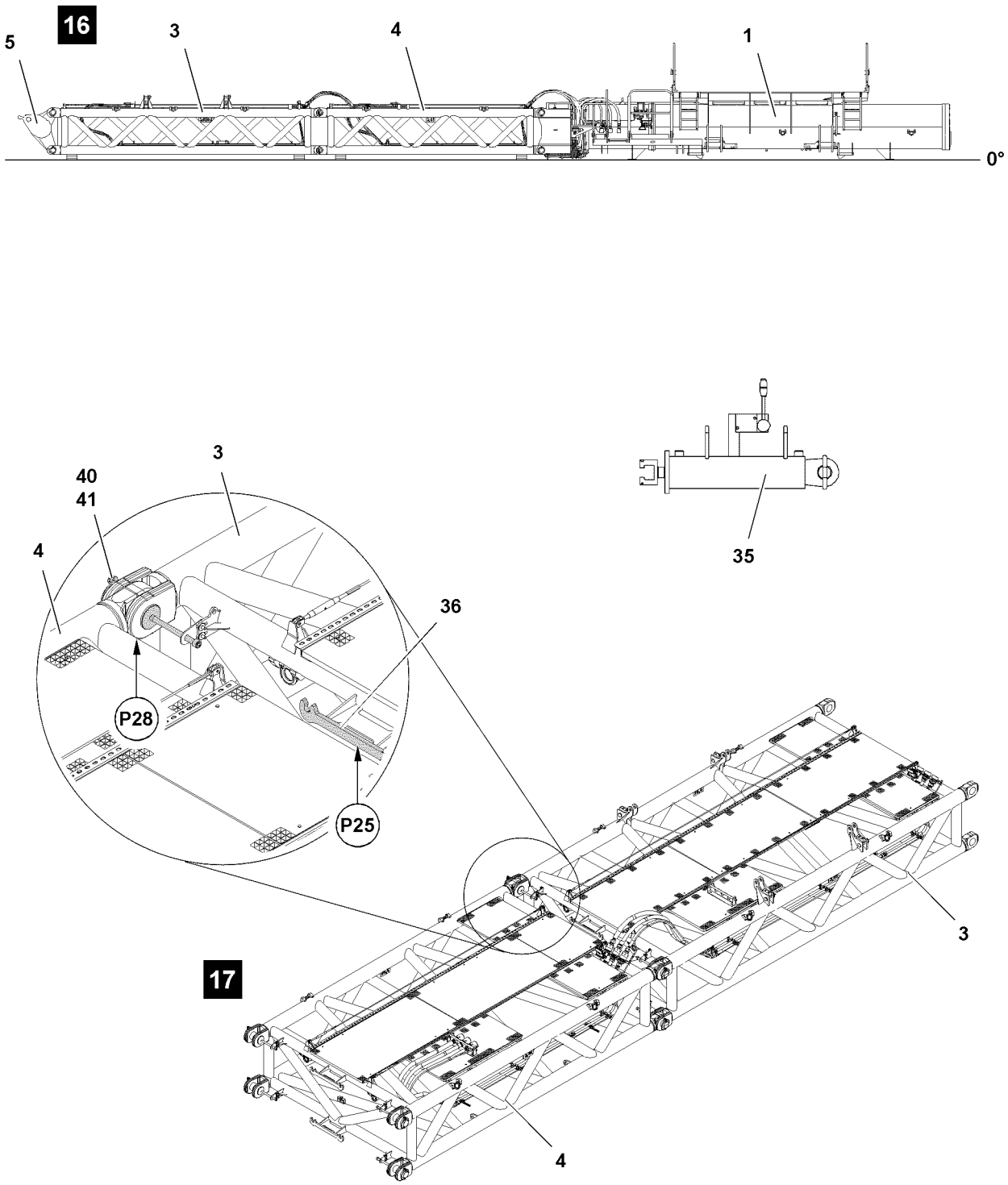

Fig.120229: Assembling the ballast trailer guide with ballast trailer radius 24-30 m

The intermediate sections are pinned with each other on four points in transport position.

- ▶ Fasten the intermediate section **4** to the auxiliary crane.
- ▶ Unpin the intermediate section **4** and lift with the crane, see section „Assembling the ballast trailer guide with ballast trailer radius 19-25 m “.

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▶ Swing the intermediate section **4** to the pin points **P28** on the intermediate section **3**.

The intermediate section **4** is pinned four times on the intermediate section **3**. Every pin point is present on both sides of the component on one level.

▶ Align the intermediate section **4** with the crane so that the pin bores are aligned.
▶ Hang the pin pulling cylinder **35** on the retainer **36** at point **25** and on the screw head, see illustration **17**.

When the pin bores align:
▶ Actuate the lever on the pin pulling cylinder **35** and insert the connector pin **40**.

WARNING
The connector pins can loosen up by themselves!
If the pins are not secured with the safety locking pins, the axles can release during crane operation.
This can cause the crane to topple over.
Death, severe bodily injuries, property damage.
▶ Make sure that connector pins are inserted and secured.

▶ Secure the connector pins **40** with safety locking pins **41**, see illustration **17**.

When all four connector pins **40** are pinned in and secured at pin points **P28**:
▶ Remove the auxiliary crane.
▶ Fasten the intermediate section **3** and intermediate section **4** to the auxiliary crane, lift and swing to the ballast trailer guide **1**, see illustration **16**.

Note
▶ Pinning the extension (intermediate section **3** and intermediate section **4**) on the ballast trailer guide **1** is identical with pinning the adapter **5** on ballast trailer guide **1**.
▶ For pin procedure, see section „Assembling the ballast trailer guide with ballast trailer radius 13–19 m “.

The extension is pinned four times on the ballast trailer guide **1**.

▶ Pin the extension on ballast trailer guide **1**, see illustration **16**

Note
▶ Pinning the adapter **5** on the intermediate section **3** is identical with pinning the adapter **5** on the ballast trailer guide **1**.
▶ For pin procedure, see section „Assembling the ballast trailer guide with ballast trailer radius 13–19 m “.

The adapter **5** is pinned four times on the intermediate section **3**.

▶ Pin the adapter **5** on intermediate section **3**, see illustration **16**.

8.2.6 Establishing the connections

Note
▶ Making the connections, see section „Assembling the ballast trailer guide with ballast trailer radius 19-25 m “.

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8.3 Assembling the ballast trailer guide on the ballast trailer

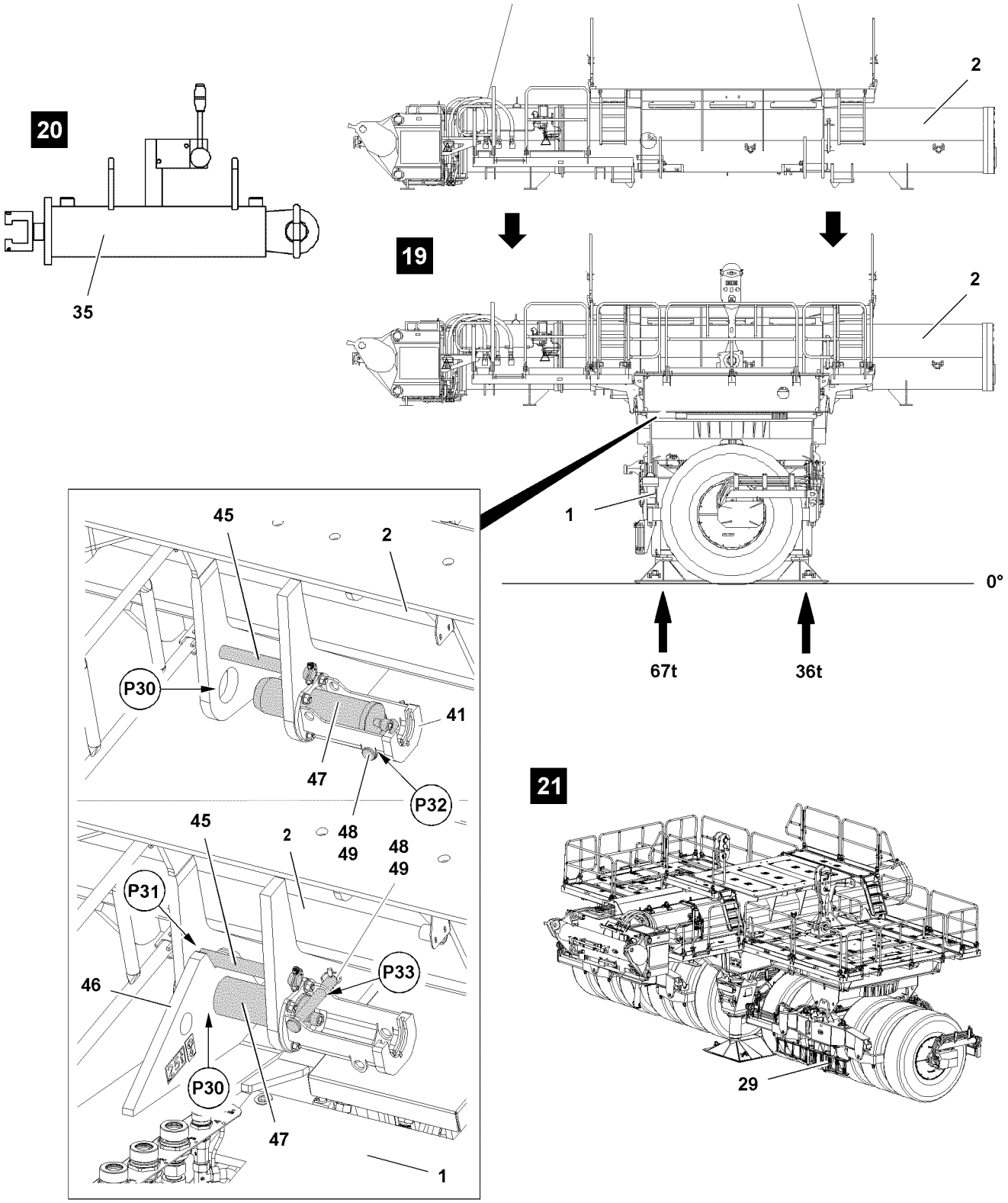

Fig.120227: Assembling the ballast trailer guide

Make sure that the following prerequisite is met:

- The locking pin is pinned and secured in the strut at point **P12**, see section „Ballast trailer not installed on the turntable“

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8.3.1 Installing the extension ladder on the ballast trailer guide

Note

- ▶ Position of extension ladder **29**, see illustration **21**.
- ▶ Assembly of the extension ladder **29**, see chapter 2.06.

8.3.2 Assembling the ballast trailer guide with ballast trailer radius 13-19 m on the ballast trailer

WARNING

Danger of fatal injury due to tipping ballast trailer!
If the ballast trailer is insufficiently ballasted, then the ballast trailer can tip over when placing the ballast trailer guide **2**.
Death, severe bodily injuries, property damage.

- ▶ Make sure that the ballast trailer guide **2** is telescoped in.
- ▶ Make sure, at assembly of the ballast trailer guide **2**, that the ballast trailer is ballasted according to the corresponding ballast trailer radius, see the following chart.
- ▶ Make sure that the ground is prepared according to the ground pressure, see illustration **19**.

	Ballast trailer radius R 13-19 m
Weight of the ballast plates (min)	0 t

Minimum weight of ballast plates

- ▶ Fasten the ballast trailer guide **2** to the auxiliary crane and swing in to the pin points **P30** on the ballast frame **1**, see illustration **19**.
- ▶ Lower the ballast trailer guide **2** with the auxiliary crane until the pins **45** are laying on the receptacle **46** of the ballast trailer at point **P31**, see illustration **19**.
- ▶ Hang the pin pulling cylinder **35**, see illustration **20**, on the retainer **50** and on the screw head.
- ▶ Establish the hydraulic connection of the pin pulling cylinder **35** to the hydraulic aggregate, see chapter 5.30.

When the ballast trailer guide **2** is lying completely on the receptacles **46** and the pin bores align, see illustration **19**:

- ▶ Actuate the lever on the pin pulling cylinder **35** and insert the connector pin **47** at point **P30**.

WARNING

Danger of fatal injury due to tipping ballast trailer!
Due to unsecured or insufficiently secured connector pins, the ballast trailer guide can loosen up from the ballast frame and the ballast trailer can tip over.
Death, severe bodily injuries, property damage.

- ▶ Make sure before starting any crane work with the ballast trailer, that all **four** connector pins **47** are properly pinned and secured.

- ▶ Secure the connector pin **47**: Insert the retaining pin **48** at point **P33** and secure with the safety locking pin **49**, see illustration **19**.

When all four connector pins **47** are pinned in and secured:

- ▶ Remove the auxiliary crane.

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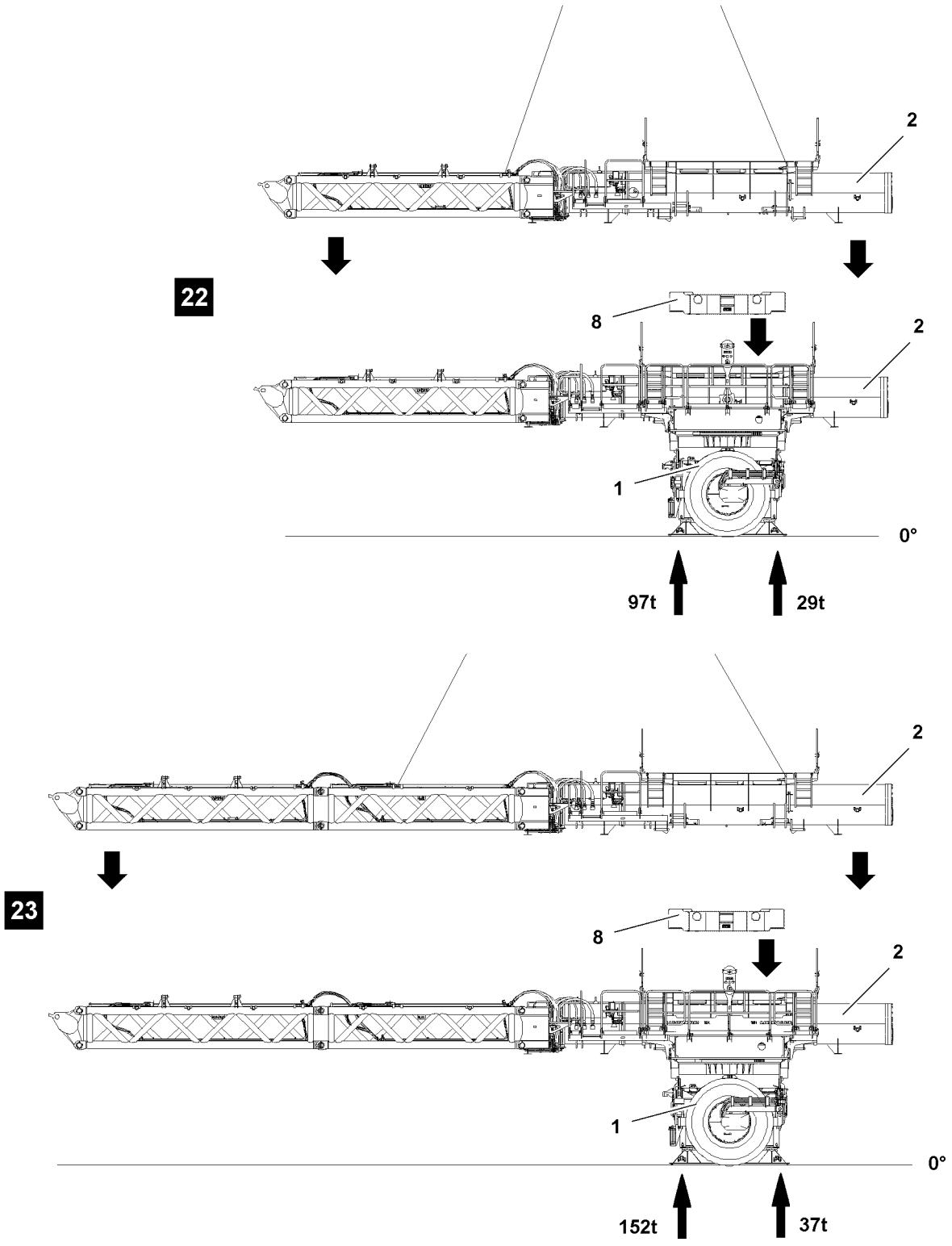

Fig.121989: Assembling the ballast trailer guide

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8.3.3 Assembling the ballast trailer guide with ballast trailer radius 19–25 m or with ballast trailer radius 24–30 m on the ballast trailer

WARNING
Danger of fatal injury due to tipping ballast trailer!
If the ballast trailer is insufficiently ballasted, then the ballast trailer can tip over when placing the ballast trailer guide **2**.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the ballast trailer guide **2** is telescoped in.
- ▶ Make sure, at disassembly of the ballast trailer guide **2**, that the ballast trailer is ballasted according to the corresponding ballast trailer radius, see the following chart.
- ▶ Make sure that the ground is prepared according to the ground pressure, see illustration **22** and illustration **23**.

	Ballast trailer radius R 19-25 m	Ballast trailer radius R 24-30 m
Weight of the ballast plates (min)	20 t	80 t

Minimum weight of ballast plates

Note
- ▶ The assembly of the ballast trailer guide **2** with ballast trailer radius 19–25 m **or** with ballast trailer radius 24–30 m on the ballast trailer is identical with the assembly of the ballast trailer guide **2** with ballast trailer radius 13–19 m.
- ▶ For assembly of the ballast trailer guide **2** with ballast trailer radius 19–25 m **or** with ballast trailer radius 24–30 m , see section „Assembling the ballast trailer guide with ballast trailer radius 13–19 m on ballast trailer“.

- ▶ To ballast the ballast trailer **1**, see section „Ballasting the ballast trailer“.
- ▶ Fasten the ballast trailer guide **2** to the auxiliary crane and swing in to the pin points on the ballast frame **1**, see illustration **22** or illustration **23**.
- ▶ Pin and secure the ballast trailer guide **2** with ballast trailer **1**, see illustration **22** or illustration **23**.

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9 Assembling the ballast trailer on the turntable

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
If this is not observed, the assembly personnel can fall down.
Death, severe bodily injuries, property damage.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

WARNING
Ballast trailer tipping danger!
Due to improperly carried out assembly or improper assembly conditions, the ballast trailer can tip over.
Death, severe bodily injuries, property damage.
- ▶ The assembly of the ballast trailer may only be carried out by authorized personnel.
- ▶ Carry out the assembly of the ballast trailer only on level ground of sufficient load bearing capacity.
- ▶ The ballast trailer has **no** brake system. The ballast trailer must be supported with the support cylinders if it is **not** pinned on the turntable.

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Note

- ▶ Park the ballast trailer for assembly of the ballast trailer guide on level ground with sufficient load bearing capacity in the vicinity of the crane.
- ▶ Observe the safety guidelines, see chapter 2.15.

Make sure that the following prerequisites are met:

- The counterweight has been installed on the turntable according to the load chart.
- The ballast trailer is ballasted according to the assembly conditions, see section „Assembly conditions ballast trailer“.
- The locking pin is pinned and secured in the strut at point **P12**, see section „Ballast trailer not installed on the turntable“.

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9.1 Installing the ballast trailer on the turntable

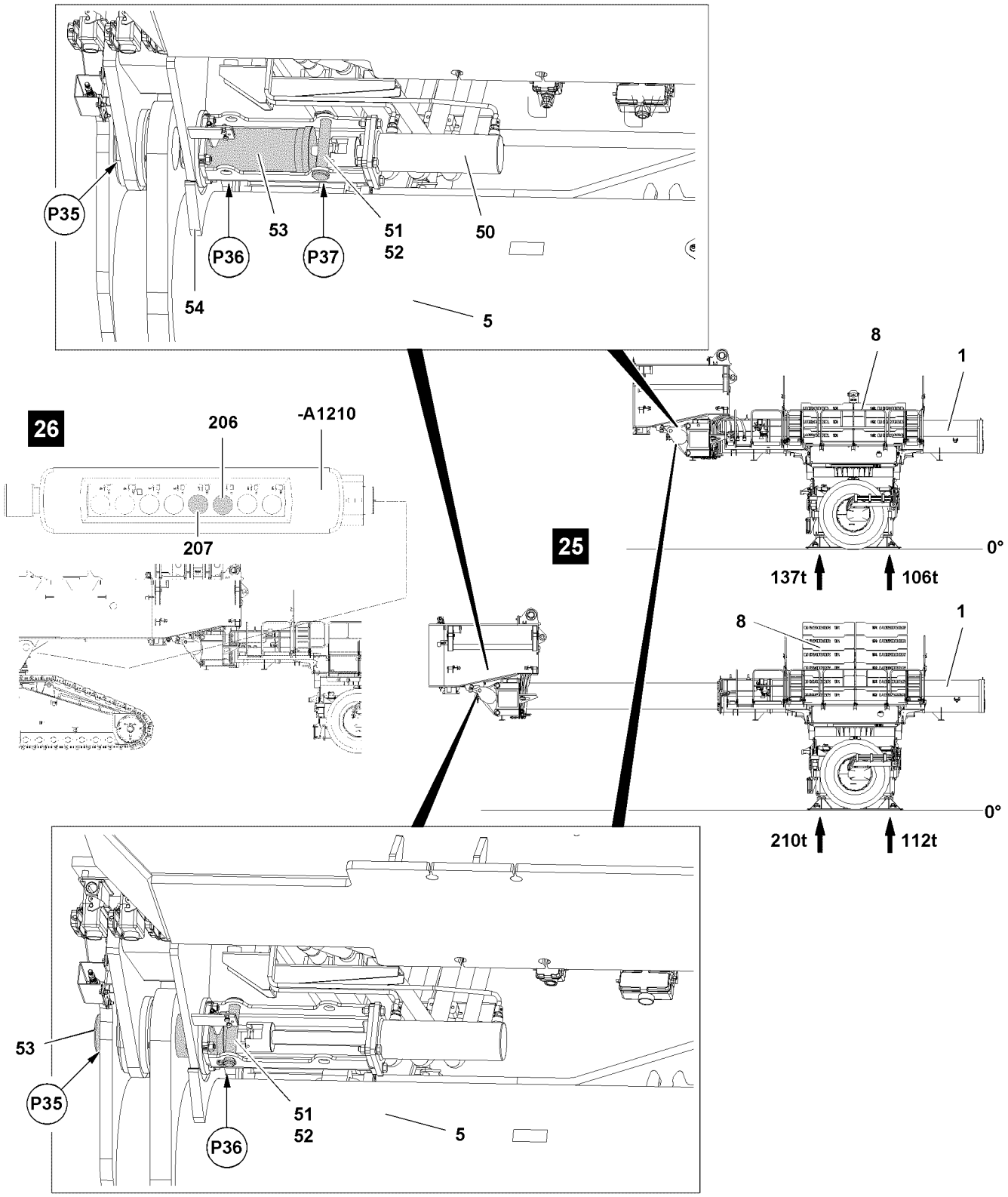

Fig.121018: Pinning the ballast trailer on the turntable

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9.1.1 Pinning the ballast trailer on the turntable

WARNING
Danger of fatal injury due to tipping ballast trailer!
If the ballast trailer is insufficiently ballasted, then the ballast trailer can tip over when pinning the ballast trailer guide **2** on the turntable.
Death, severe bodily injuries, property damage.
▶ Make sure, when pinning the ballast trailer guide **2**, that the ballast trailer is ballasted with appropriately selected ballast trailer radius, see chart.
▶ Make sure that the ground is prepared according to the ground pressure, see illustration **25**.

	Ballast trailer radius R 13-19 m		**Ballast trailer radius R 19-25 m**		**Ballast trailer radius R 24-30 m**	
	R 13 m	R 19 m	R 19 m	R 25 m	R 24 m	R 30 m
Weight of the ballast plates (min)	140 t	220 t	180 t	280 t	240 t	Not permissible

Minimum weight of ballast plates

Make sure that the following prerequisites are met:
– The ballast trailer is supported and ballasted symmetrically according to the ballast trailer radius.
– The adapter is pinned.
– The locking pin is pinned and secured in the strut at point **P12**, see section „Ballast trailer not installed on the turntable“.

Pinning the ballast trailer with ballast trailer radius 13–19 m on the turntable

▶ To ballast the ballast trailer **1**, see section „Ballasting the ballast trailer“.

NOTICE
Damage to the pin pulling device!
If the connector pins **53** are not unpinned before the pinning procedure, the pin pulling device can be damaged.
▶ Make sure that the connector pins **53** are released and unpinned before pinning.

Release and unpin the connector pins **53** on both sides:

▶ Remove the safety locking pin **52** at point **P36** and unpin the retaining pin **51**, see illustration **25**.
▶ Insert the retaining pin **51** at point **P37**.
▶ Press button **206** on the control panel **-A1210**, see illustration **26**.

Result:

– The pin pulling cylinders **50** retract.
– The connector pins **53** move in and the ballast trailer can be aligned on the turntable.

▶ Move the crane to the pin points on the ballast trailer guide.

Note
▶ To be able to align the pin bores between the turntable and the ballast trailer guide, it may be necessary to „swing“ the turntable somewhat, check visually.

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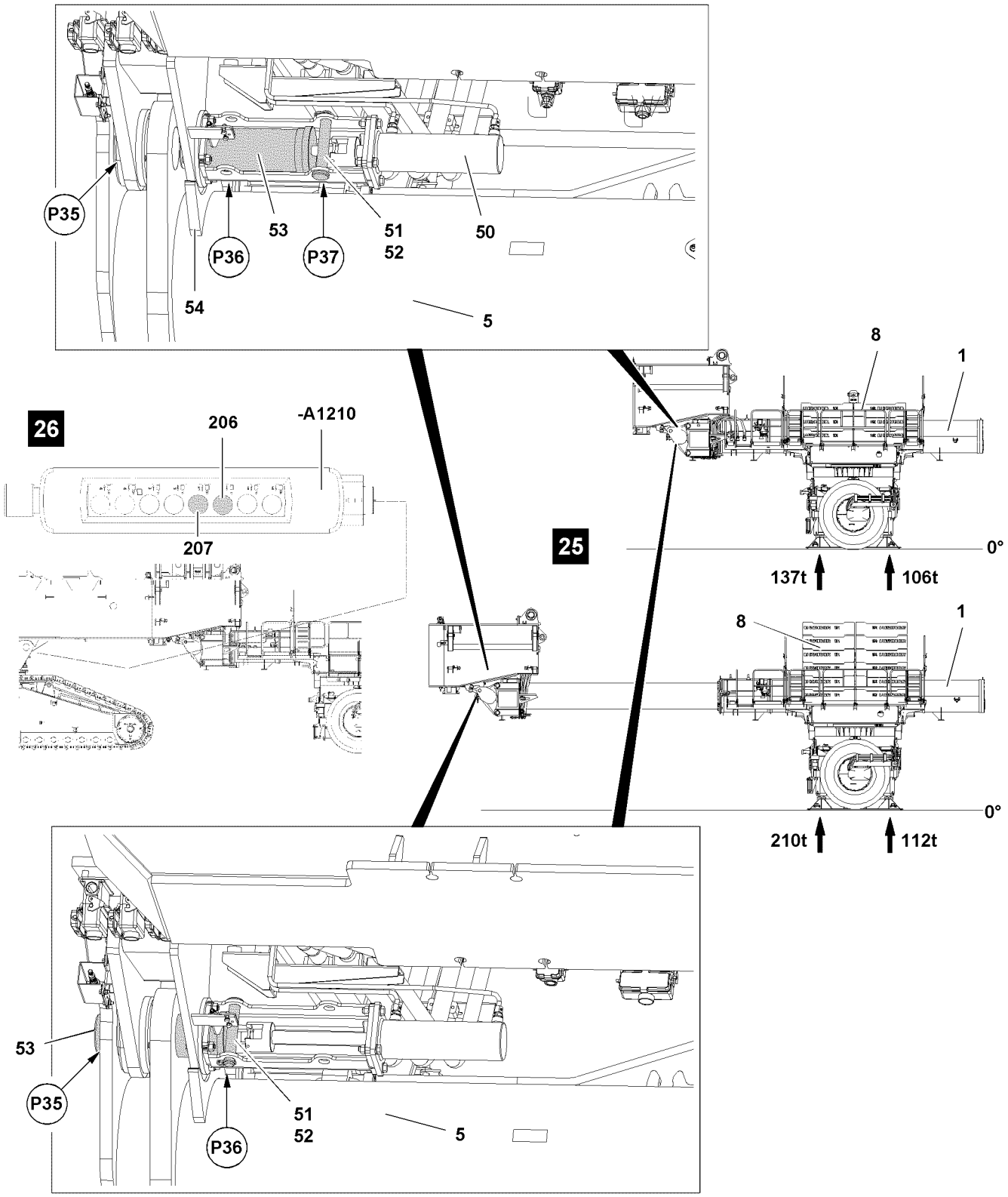

Fig.121018: Pinning the ballast trailer on the turntable

DANGER
Danger due to operating error!
When „swinging“ the turntable, severe accidents can occur.
Death, severe bodily injuries, property damage.
- ▶ Initiate all movements with utmost caution and at the least possible speed.
- ▶ It is prohibited to stand in the danger zone while „swinging“.

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▶ Place the ballast trailer on the centerings **54** of the turntable by lifting or lowering it, see illustration **25**.

Result:

– Align the pin bores.

Pin the ballast trailer with the turntable:

▶ Press button **207** on the control panel **-A1210**, see illustration **26**.

Result:

– The pin pulling cylinders **50** move out.
– The connector pins **53** move out and the ballast trailer is pinned on the turntable.

Note

▶ The crane control system recognized with the left and right limit switch initiators of the pin points, if the connector pins **47** on the turntable are fully pinned.
▶ If both connector pins **53** are fully and correctly pinned, the crane control, via the limit switch initiators receives the message, „Ballast trailer installed on left“ and „Ballast trailer installed on right. “Which means: The turntable can no longer be turned and the crawler cannot be moved.
▶ After pinning, it must be checked again if the electrical and hydraulic connector lines are fully and correctly connected.
▶ The control release for the crane is only made when the wheels sets are in one of the required positions, „Circular travel“, „Travelling“ or „Parallel travel“.

DANGER

Danger due to operating error!
If only one connector pin **53** is pinned and if the crane control therefore has only one message „Ballast trailer installed“ from a limit switch initiator, then the turntable can be turned anyway and the crane can be moved.
Death, severe bodily injuries, property damage.
The crane or the ballast trailer can be severely damaged.
▶ All movements are to be operated with extreme caution and at the smallest possible speed.

Secure the connector pin **53**:

▶ Unpin retaining pin **51** at point **P37**.
▶ Insert the retaining pin **52** at point **P36** and secure with safety locking pin **52**, see illustration **25**.

Problem remedy

The second connector pin **53** cannot be pinned?
You did not align the ballast trailer exactly before assembly.
▶ Slightly lift or lower the ballast trailer via the support cylinder.
▶ Carefully telescope the ballast trailer guide in or out.
▶ Carefully swing the turntable after.

When the second pin bore aligns between the turntable and ballast trailer guide align:
▶ Pin the second connector pin **53**.

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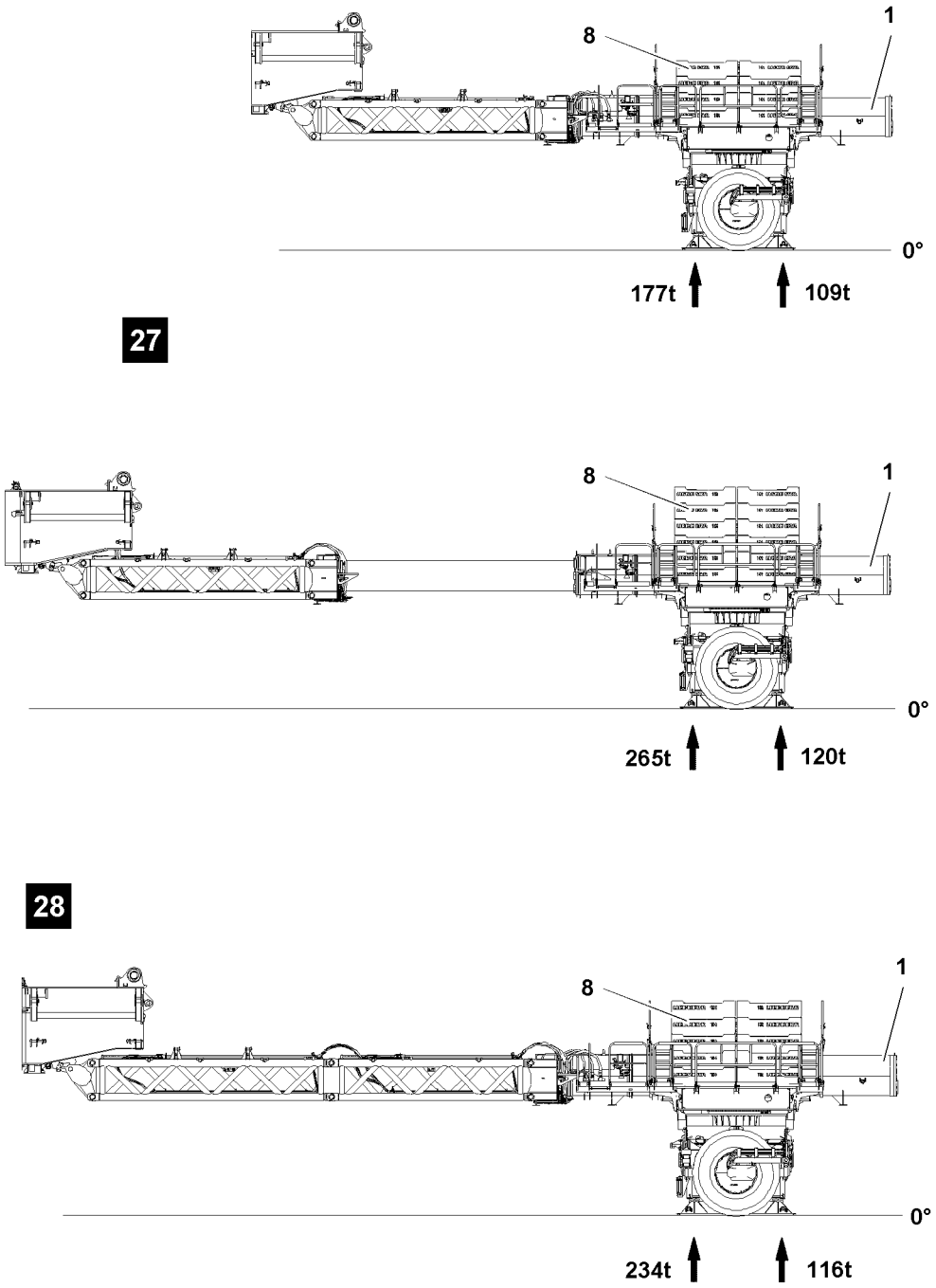

Fig.121990: Pinning the ballast trailer on the turntable

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Pinning the ballast trailer with ballast trailer radius 19–25 m on the turntable or pin the ballast trailer with ballast trailer radius 24–30 m on the turntable

WARNING
Danger of fatal injury due to tipping ballast trailer!
If the ballast trailer is insufficiently ballasted, then the ballast trailer can tip over when pinning the ballast trailer guide **2** on the turntable.
Death, severe bodily injuries, property damage.
- ▶ Make sure, when pinning the ballast trailer guide **2**, that the ballast trailer is ballasted with appropriately selected ballast trailer radius, see chart.
- ▶ Make sure that the ground is prepared according to the ground pressure, see illustration **27** and see illustration **28**.

	Ballast trailer radius R 13-19 m		**Ballast trailer radius R 19-25 m**		**Ballast trailer radius R 24-30 m**	
	R 13 m	R 19 m	R 19 m	R 25 m	R 24 m	R 30 m
Weight of the ballast plates (min)	140 t	220 t	180 t	280 t	240 t	Not permissible

Minimum weight of ballast plates

Make sure that the following prerequisites are met:
- The ballast trailer is supported and ballasted symmetrically according to the ballast trailer radius.
- The adapter is pinned.
- The locking pin is pinned and secured in the strut at point **P12**, see section „Ballast trailer not installed on the turntable“.

Note
- ▶ The pinning of the ballast trailer **1** with ballast trailer radius 19–25 m **or** with ballast trailer radius 24–30 m on the turntable is identical with the pinning of the ballast trailer **1** with ballast trailer radius 13–19 m.
- ▶ Pinning the ballast trailer **1** with ballast trailer radius 19–25 m **or** with ballast trailer radius 24–30 m , see section „Pinning the ballast trailer with ballast trailer radius 13–19 m on turntable“.

- ▶ To ballast the ballast trailer **1**, see section „Ballasting the ballast trailer“.
- ▶ Pin and secure the ballast trailer **1** with turntable, see illustration **27** or illustration **28**.

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9.1.2 Assembling the ballast trailer guying

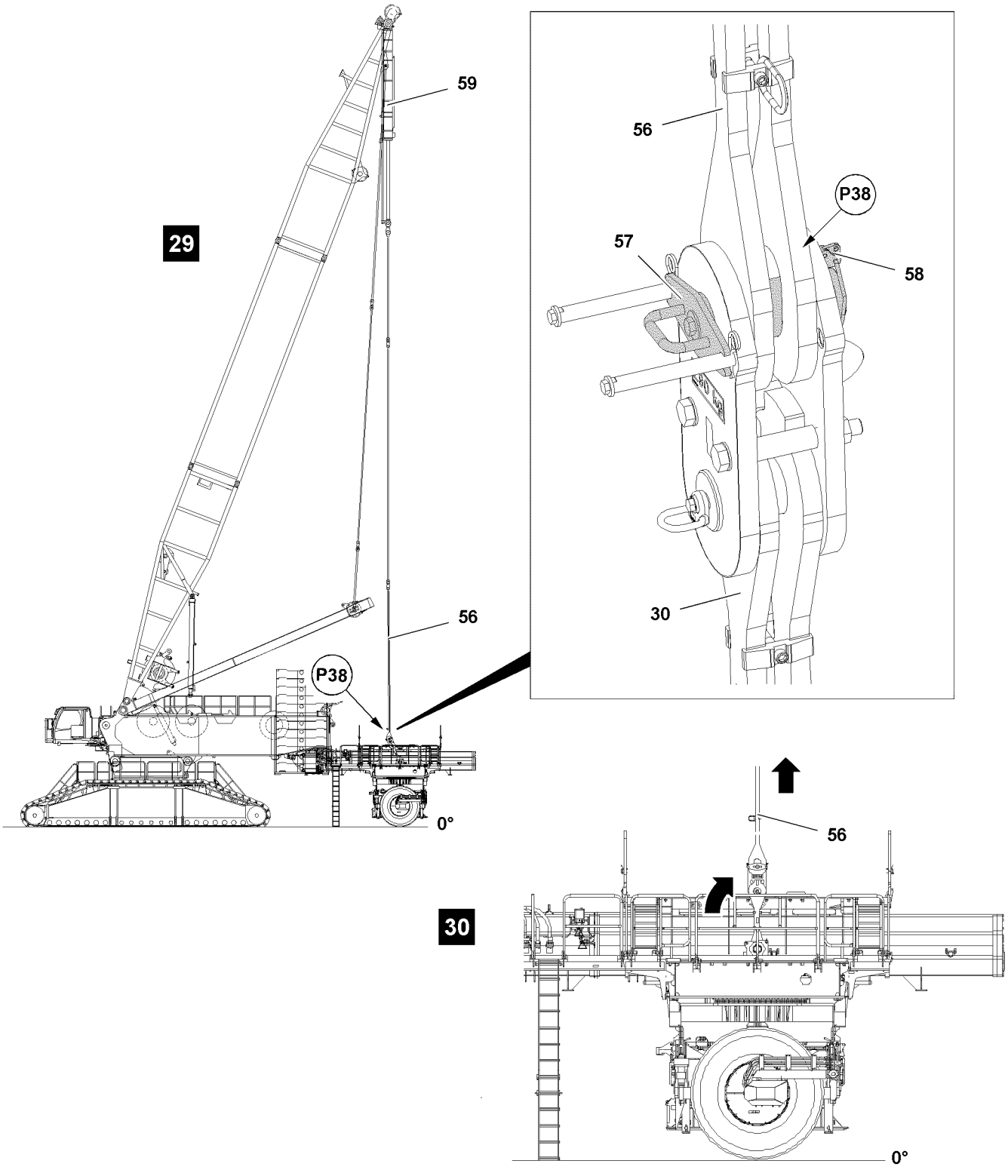

Fig.120232: Ballast trailer guying

Note

▶ The ballast trailer guy rods must be assembled and secured according to the data in the Rod plan. The numbering in the rod plan must be identical to the numbering on the guy rods.

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Note
- ▶ Set the derrick boom and the derrick ballast to the same radius.
- ▶ If this is not possible, pull the guy rods **56** with the auxiliary crane to the pin point.

Make sure that the following prerequisites are met:
- – The pull brackets **30** on the ballast trailer are in operating position and pinned and secured, see section „Erecting the pull brackets“.
- – The guy rods **56** on the derrick boom are pinned and secured.

The guy rods **53** of the derrick boom are to be pinned with the pull brackets **30** on the ballast trailer. The connector pins **57** are held in „pulled“ condition by the Allen screws, see illustration **29**.

- ▶ Unpin the connector pin **57**: Remove the safety locking pin **58** and unpin connector pins **57** on both sides.
- ▶ Position the guy rods **56** over the pull brackets **30** by extending the pull cylinders **59**.

Note
Retract / extend the pull cylinder **59**
- ▶ Control the pull cylinders **59** from the crane cab or with the control panel, see section „lifting and lowering the ballast trailer with the pull cylinders“.
- ▶ Operate the pull cylinder **59** with the radio remote control, see the „radio remote control operating instructions“.

- ▶ Align the guy rods **56** on the pull brackets **30** at point **P38**.
- ▶ Pin the guy rods **56** on both sides with the pull brackets **30**, point **P38**: Insert the connector pins **57**.
- ▶ Secure the connector pins **57** with safety locking pins **58**, see illustration **29**.
- ▶ When the guy rods **56** are pinned and secured with the pull brackets **30** on both sides:
- ▶ Retract the pull cylinder **59**.

Result:

– The ballast trailer guying is tensioned, see illustration **30**.

9.2 Establishing the electrical connection from the ballast trailer to the turntable

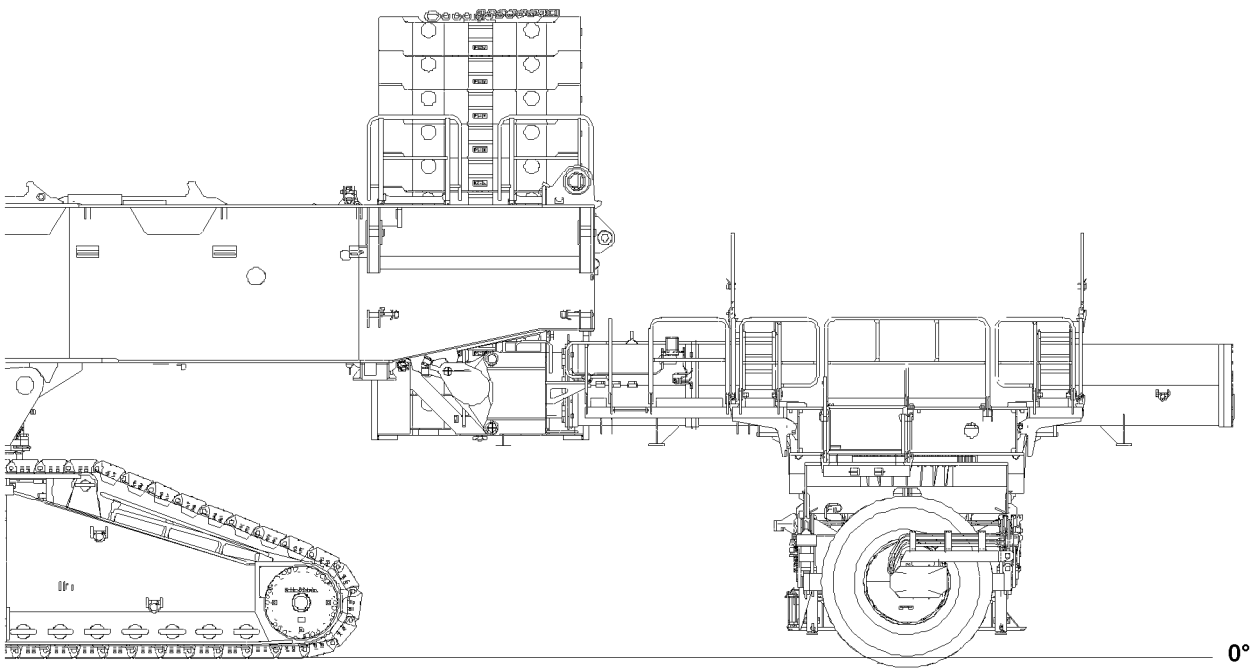

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Fig.121017: Ballast trailer

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Note

- For assembly of the ballast trailer, the electrical connection from the ballast trailer to the turntable must be established to be able to control the support cylinders, if necessary.
- The „Ballast UP / DOWN“ release is independent of whether the ballast trailer is attached, providing the conditions in the shut off diagram are fulfilled.
- The „Ballast UP“ release allows the retraction of the pull cylinder and support cylinder.
- The „Ballast DOWN“ release allows the extension of the pull cylinder and support cylinder.
- This means that the support cylinder and the pull cylinder can be moved, even if the „Ballast trailer pinned“ signal is not yet present.

Note

- Establish the electrical connections, see the Electric wiring diagram.

- Establish the electrical connections.

9.3 Establishing the hydraulic connection from the ballast trailer to the turntable

When connecting and releasing hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

DANGER

Danger of accident due to loss of pressure or leakage!
Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.

- Check that the quick couplings have been properly connected before using the crane.

- Release the pressure in the hydraulic system before connecting or disconnecting: Turn the engine off and wait a short time.
- Connect the coupling components (sleeve and connector) and screw together with the knurled nut.
- Tighten the hydraulic coupling by hand: Rotate the knurled nut until it reaches a tangible, fixed stop position.

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9.4 Retracting the support cylinders

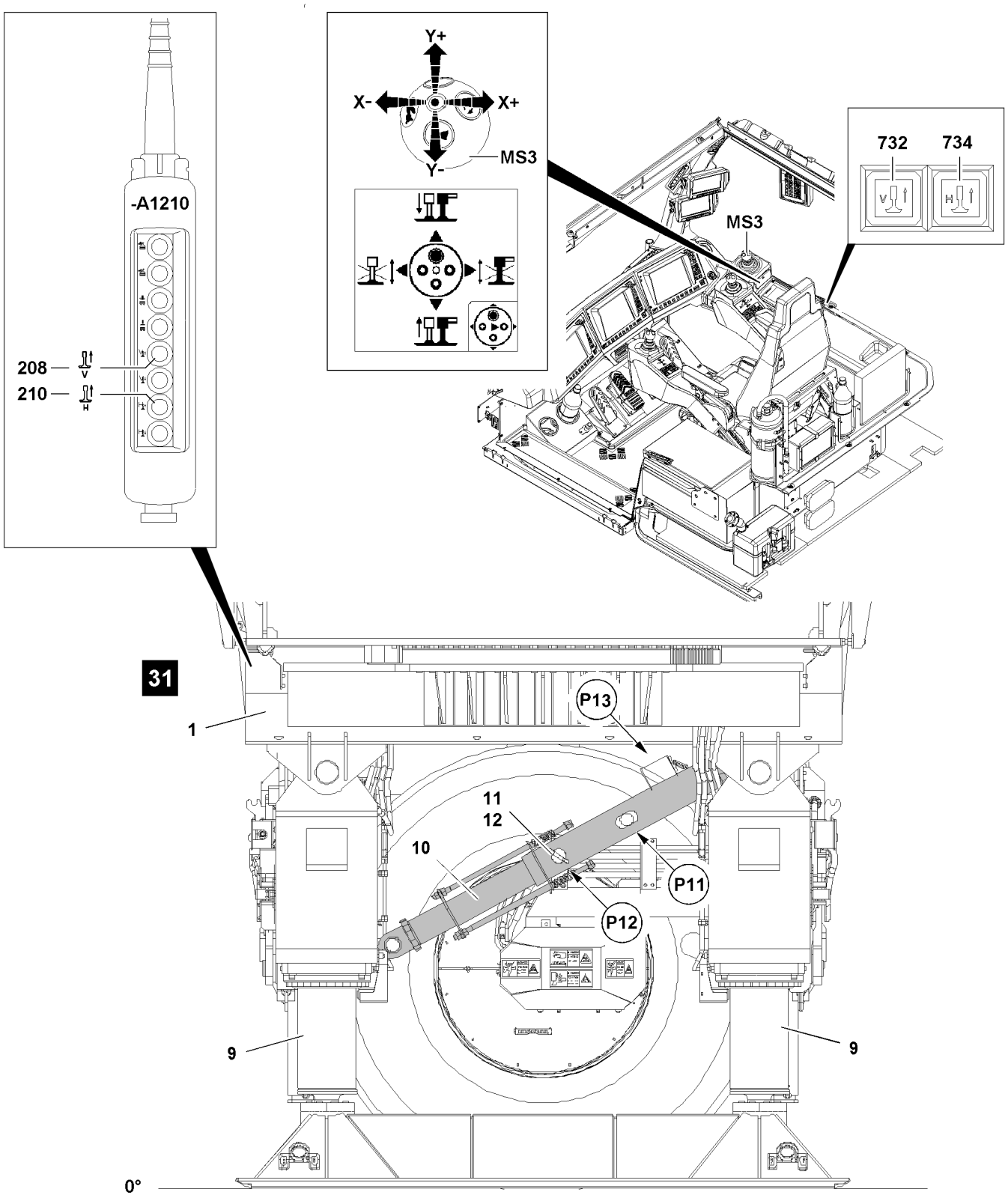

Fig.144130: Ballast trailer support

The support cylinders **9** can be retracted via the control panel **-A1210**, or via the corresponding button on the instrument panel of the crane cab.

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Note

▶ When the pinning procedure between the ballast trailer and the turntable is completed, move the support cylinders **9** in, see illustration **31**.

Make sure that the following prerequisites are met:
- The ballast trailer is pinned and secured on the turntable on both sides.
- The electrical and hydraulic connections are connected.

Retract the support cylinders 9 completely on the front and rear:

▶ Press the button **732** and button **734** in the crane cab, see illustration **31**.
or
Press the button **208** and button **210** on the control panel **-A1210**, see illustration **31**.
or

When the corresponding master switch assignment is selected:
Move the master switch 3 **MS3** in direction **Y-**.

Result:

– The support cylinders **9** retract.

Note

▶ The locking pin **11** can only be unpinned if the support cylinders **9** are relieved.

When the support cylinders **9** are relieved:
▶ Release and unpin the locking pin **11** on the strut **10** at point **P12**, see illustration **31**.
▶ Insert the locking pin **11** at point **P11** and secure with spring retainer **12**, see illustration **31**.

NOTICE
Damage of the ballast trailer!
If the following notes are not observed, the support cylinders of the ballast trailer can be significantly damaged.
▶ Unpin the locking pins **11** as soon as the ballast trailer is assembled on the turntable and the support is relieved.
▶ When the ballast trailer is assembled and ballasted on the turntable, then the locking pin **11 must** be unpinned so that the level between the strut **10** and the support cylinders **9** can be adjusted.
▶ Supporting the ballasted ballast trailer with pinned strut **10** at point **P12** is prohibited.

▶ Retract the support cylinders **9** completely.

Result:

– A visual display appears on LICCON monitor LM2.

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9.5 Ballasting the ballast trailer

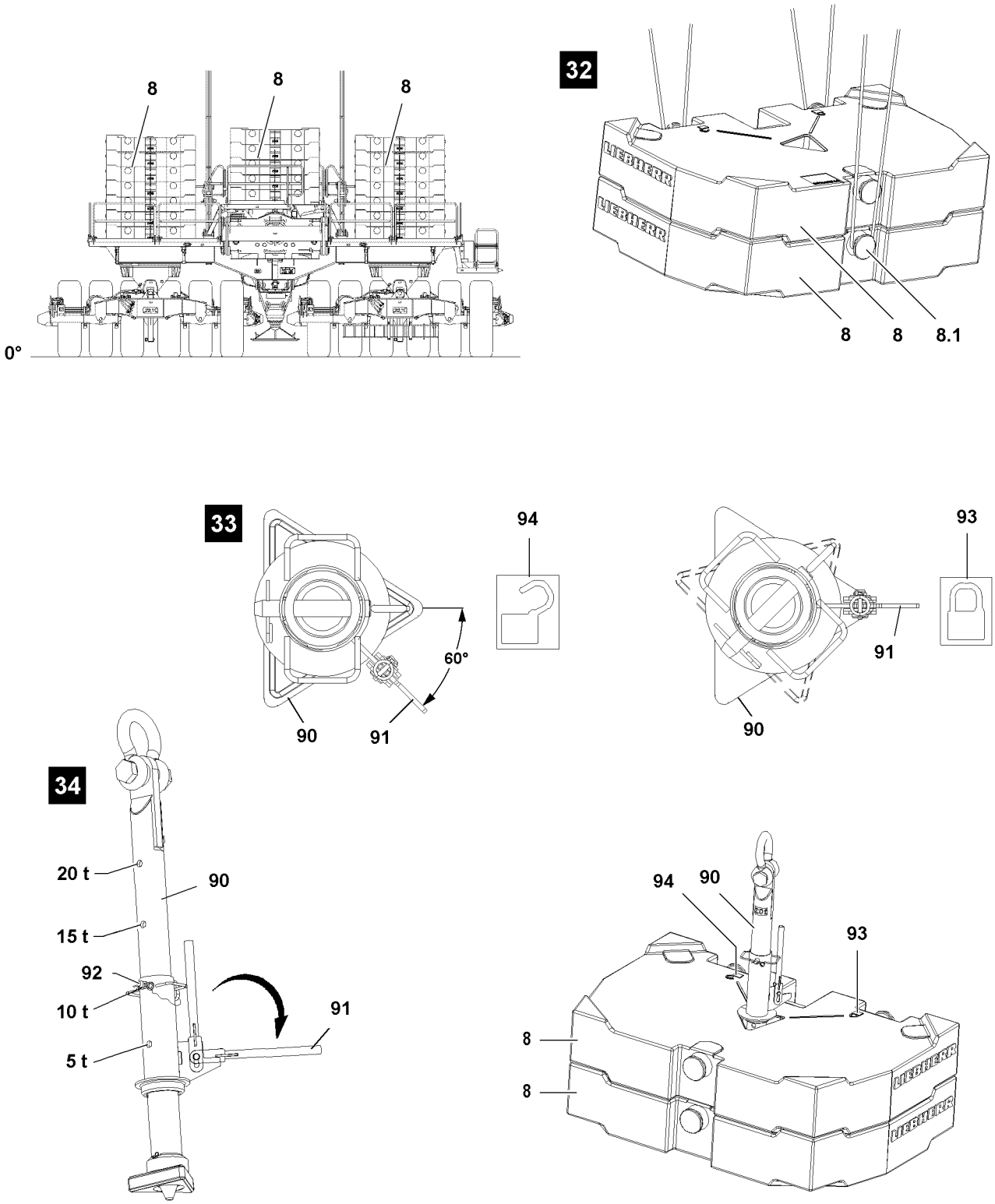

Fig.120230: Stacking the ballast plates on the ballast trailer

Note

▶ The ballast plates are marked with their own weights.

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WARNING
The crane can topple over!
If the following danger notes are not observed, the ballast plates or the ballast stack can slip on the ballast trailer and fall down.
The crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ The ground on which the ballast trailer is ballasted must be level and have adequate load-bearing capacity.
- ▶ Always place the ballast plates symmetrically, in reference to the longitudinal axis.
- ▶ The outer ballast stacks must always weigh the same and be the same height after ballasting.
- ▶ The ballast stacks may only be stacked to three times the height of the ballast plate width.
- ▶ The outer ballast stacks can differ in stack height from the inner ballast stacks.
- ▶ The maximum permissible total weight of the ballast trailer may not exceed 450 t.
- ▶ Secure all ballast plates so they cannot move and fall down.
- ▶ Replace damaged ballast plates immediately with new ballast plates.

Make sure that the following prerequisites are met:
- – The ballast trailer is pinned and secured on the turntable on both sides.
- – The ballast trailer is properly pinned and secured to the Derrick ballast guying.
- – An auxiliary crane is on hand.

9.5.1 Stacking the ballast plates on the ballast trailer, fastening system „Twistlock“

WARNING
Danger of accident!
If more than the permissible two ballast plates are lifted with the receptacle stud, the receptacle stud will be overloaded and can be damaged.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the ballast plates are placed correctly in the centerings.
- ▶ Replace damaged ballast plates.

To stack the ballast plate(s) **8**, use the receptacle stud **90**.

Before the receptacle stud **90** is guided into the ballast plates, it must be ensured that the length of the receptacle stud is set correctly. The length of the receptacle stud **90** can be adjusted with the pin **92**, see illustration **34**.

If the length of the receptacle stud **90** is to be adjusted:
- ▶ Release and unpin the pin **92**.
- ▶ Adjust the length of the receptacle stud by moving the receptacle stud **90**, see illustration **34**.
- ▶ Insert the pin **92** and secure with the spring retainer.
- ▶ Fasten the receptacle stud **90** to the auxiliary crane and guide it into the ballast plate(s).
- ▶ Pull the lever **91** up and fold it down.
- ▶ Turn the lever **91** by 60° until the lever points to the icon **93**, see illustration **33**.

Result:

- – The receptacle stud **90** is locked with the ballast plate.

- ▶ Lift always one ballast plate with the receptacle stud **90** and place it carefully on the centerings on the ballast trailer or on another ballast plate **8**.
- ▶ Turn the lever **91** by 60° until the lever **91** points to the icon **94**, see illustration **33**.

Result:

- – The receptacle stud **90** is unlocked.

- ▶ Carefully pull the receptacle stud **90** from the ballast plate.
- ▶ Stack the ballast plates **8** according to the load chart, observe the danger notes.

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9.5.2 Stacking the ballast plates on the ballast trailer, fastening points: Bitt

WARNING
Falling ballast plates!
If more than the permissible loads are lifted, then the bitts **8.1** are overloaded and the ballast plates can fall down.
Death, severe bodily injuries, property damage.
- ▶ Lift no more than maximum 20 t with the ropes, 3 fastening points.
- ▶ Replace damaged ballast plates immediately.

WARNING
Incorrect handling of the fastening equipment!
If fastening equipment cannot be attached correctly and if it is not secured sufficiently to prevent it from loosening up, loads can fall down.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the fastening equipment is correctly attached on the bitts **8.1** and that it is secured sufficiently to prevent it from loosening up.

Note
- ▶ Place the ballast plates individually or as a ballast assembly, maximum 20 t.
- ▶ The weight difference between the outer ballast stacks no more than maximum 20 t.
- ▶ 20 t ballast assembly, see illustration **32**.

- ▶ Use the auxiliary crane to evenly distribute the ballast plates **8** on the ballast trailer and center them on the centering points.
- ▶ Stack the ballast plates according to the load chart.

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10 Working with the ballast trailer

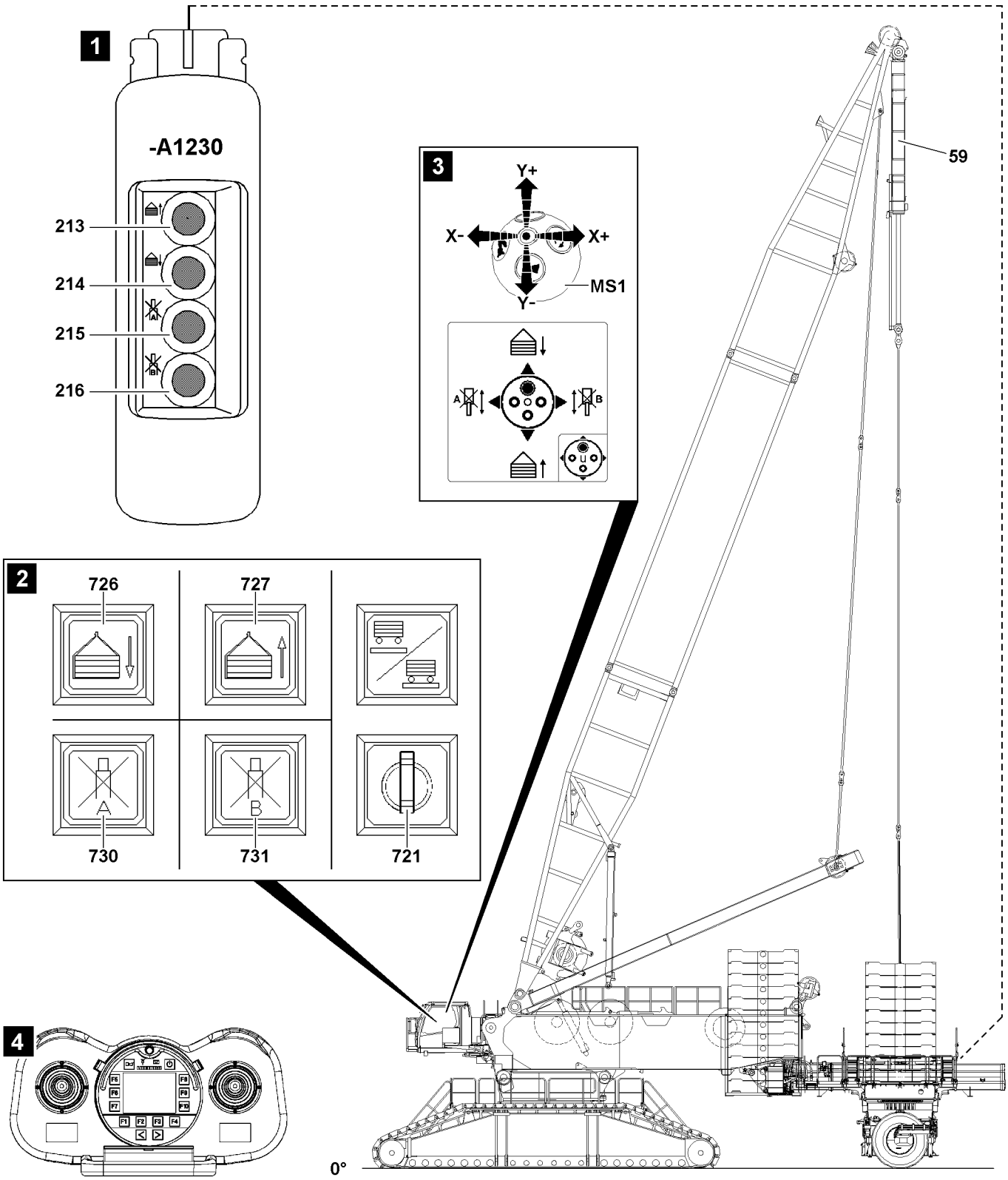

Fig.144131

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10.1 Lifting and lowering the ballast trailer with the pull cylinders

The pull cylinders **59** in the derrick ballast guying can be operated in different ways:
- Operation with control panel -A1230, see illustration **1**
- Operation with operating buttons on the instrument panel, see illustration **2**
- Operation with master switch **MS1** in the corresponding master switch assignment, see illustration **3**
  - Select the master switch assignment for master switch MS1, see chapter 4.01.

There is an additional operating option in assembly operation:
- Operation with the radio remote control (BTT-E), see illustration **4**
  - Operation with the manual control lever in the corresponding assembly menu, see the radio remote control operating instructions.

Note
- ▶ If the ballast trailer is raised or lowered using the pull cylinder **59**, then the horizontal alignment of the ballast trailer is automatically regulated by both length sensors of the pull cylinder **59**.
- ▶ For a ballast utilization of **more than** or **equal to** 90 percent, the level sensor regulates the pull cylinder **59** to a difference of 1 cm.
- ▶ With a ballast utilization of **less than** 90 percent, the level sensor monitors the ballast trailer level to ± 2.5°. This makes it possible to set the ballast trailer down to a ground slope of 2.5°.
- ▶ As soon as the ballast trailer has been lifted completely off the ground and hangs freely, by turning on the “Derrick ballast lifted” function (key button **721**), the turning and driving functions can be released independently of the steering program.
- ▶ From a ground slope of ± 1.5°, driving with the ballast trailer is no longer possible or only with limits.

DANGER
Danger of accident!
Death, severe bodily injuries, property damage.
- ▶ When lifting or lowering the ballast trailer, pay attention to the horizontal alignment of the ballast trailer.
- ▶ When lifting or lowering the ballast trailer, the forces in the ballast guyings must be regularly checked on the LICCON monitor. If the difference of forces between „derrick ballast guying A“ and „derrick ballast guying B“ is too large, an acoustic warning sounds and the values on the LICCON monitor blink, see section „Differential force monitoring of ballast guying“.
- ▶ When adjusting the pull cylinder **59** manually (block pull cylinder A or pull cylinder B) the regulation is deactivated and the ballast trailer can be inclined within the limited angle range. This is only permitted when setting down the ballast trailer on uneven ground and applying utmost caution.

WARNING
The crane can topple over!
If the ballast trailer is lifted off the ground past the **maximum permissible** 250 mm , then the crane can topple over to the rear if the load rips off.
Death, severe bodily injuries, property damage.
- ▶ Do not lift the ballast trailer by more than 250 mm off the ground.

10.1.1 Lifting the ballast trailer

- ▶ Press the button **727**.
  or
  Press the button **213**.
  or
  Deflect the master switch **MS1** in direction **Y-**.

Result:

- The piston rods of the pull cylinder **59** (pull cylinder A and pull cylinder B) retract together.

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– The ballast trailer is raised.

10.1.2 Lowering the ballast trailer

▶ Press the button **726**.
or
Press the button **214**.
or
Deflect the master switch **MS1** in direction **Y+**.

Result:

– The piston rods of the pull cylinder **59** (pull cylinder A and pull cylinder B) extend together.
– The ballast trailer is lowered.

10.1.3 Equalizing the ballast trailer position

The position of the ballast trailer can be equalized with different extension lengths of the pull cylinders **59** (pull cylinder A and pull cylinder B).

Block the pull cylinder (A) when lifting:

▶ Press the button **727** and the button **730**.
or
Press the button **213** and the button **215**.
or
Deflect the master switch **MS1** diagonally in direction **X-** and direction **Y-**.

Result:

– The piston rod of the pull cylinder (A) stops.
– The piston rod of pull cylinder (B) moves in.
– Side (B) of the ballast trailer lifts up.

Block the pull cylinder (B) when lifting:

▶ Press the button **727** and the button **731**.
or
Press the button **213** and the button **216**.
or
Deflect the master switch **MS1** diagonally in direction **X+** and direction **Y-**.

Result:

– The piston rod of the pull cylinder (B) stops.
– The piston rod of pull cylinder (A) moves in.
– Side (A) of the ballast trailer lifts up.

Block the pull cylinder (A) when lowering:

▶ Press the button **726** and the button **730**.
or
Press the button **214** and the button **215**.
or
Deflect the master switch **MS1** diagonally in direction **X-** and direction **Y+**.

Result:

– The piston rod of the pull cylinder (A) stops.
– The piston rod of pull cylinder (B) moves out.
– Side (B) of the ballast trailer lowers.

Block the pull cylinder (B) when lowering:

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▶ Press the button **726** and the button **731**.
or
Press the button **214** and the button **216**.
or
Deflect the master switch **MS1** diagonally in direction **X+** and direction **Y+**.

Result:

– The piston rod of the pull cylinder (B) stops.
– The piston rod of pull cylinder (A) moves out.
– Side (A) of the ballast trailer lowers.

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10.2 Setting the ballast trailer radii

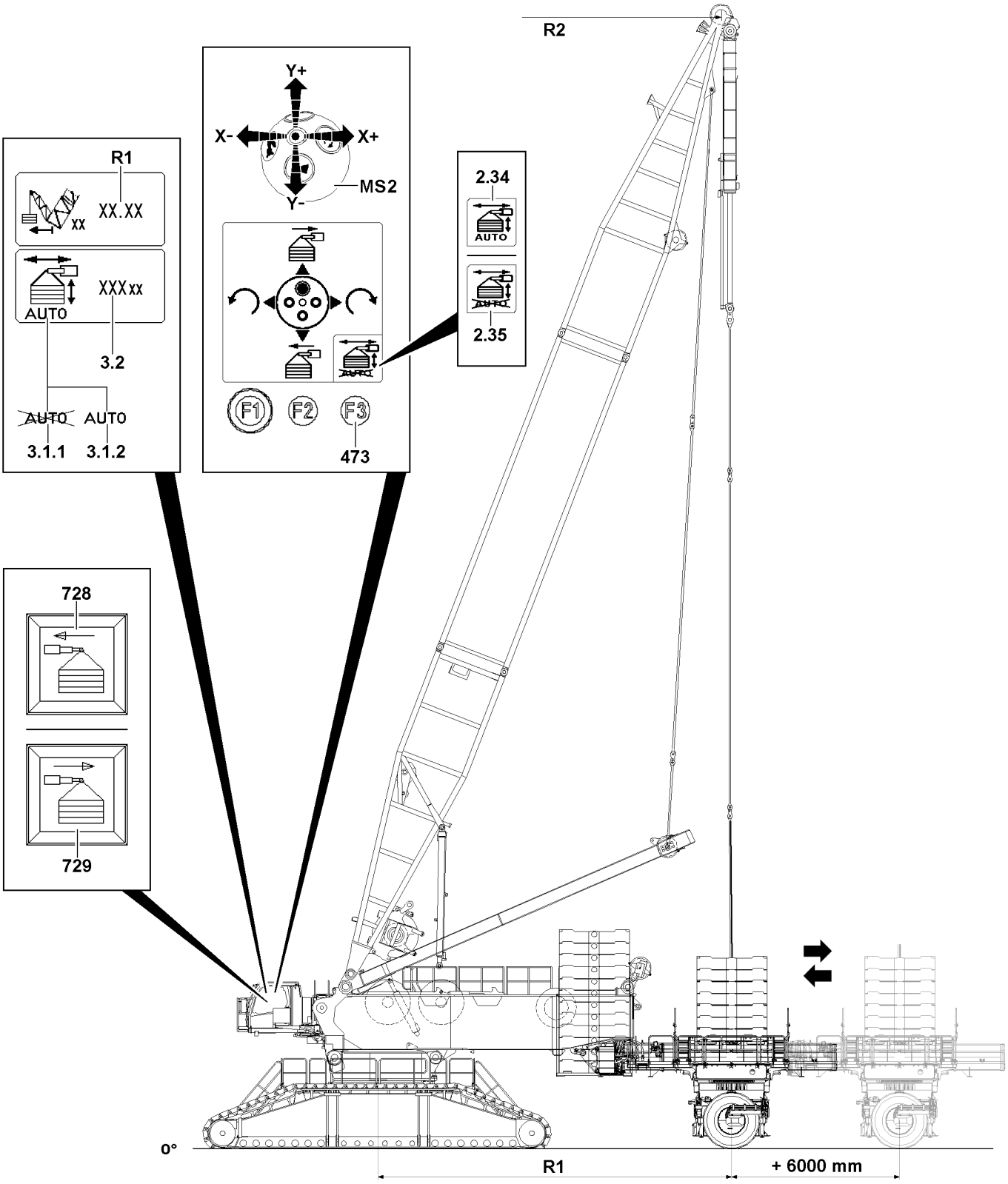

Fig.144132

The ballast trailer radius can be adjusted steplessly across a path of 6000 mm.

The ballast trailer is equipped with a telescopeable ballast trailer guide. This allows the derrick ballast radius to be adjusted to suit the environment or type of lifting work. The set derrick ballast radius **R1** is displayed on the LICCON monitor.

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Pay attention to the difference between the derrick ballast radius **R1** and the derrick radius **R2**.

The ballast trailer radius can be adjusted:
- With master switch MS2 (crane cab)
  - Manual adjustment
  - Ballast automatic
- With the operating buttons on the instrument panel (crane cab)
  - Manual adjustment only
- With control panel -A1230
  - Manual adjustment only
  - See section „Operating elements on the control panels“.
- With the radio remote control (BTT-E)
  - Manual adjustment only
  - See the radio remote control operating instructions

Note
- ▶ The release for telescoping the ballast trailer guide out and in is only given when the wheel sets are in „towing“ mode, see section „Towing“.
- ▶ If the ballast trailer is supported for assembly on the turntable, then it is possible to telescope the ballast trailer guide out and in with reduced pressure.
- ▶ When telescoping the ballast trailer guide out, monitor the derrick ballast radius **R1** on the LICCON monitor constantly.
- ▶ The crane operator may not blindly rely on the derrick ballast radius measurement, he must think for himself and check if the length sensor measure functions correctly, see chapter 4.02.

10.2.1 Telescoping the ballast trailer guide out

By telescoping the ballast trailer guide out, the ballast trailer radius is enlarged.

Make sure that the following prerequisite is met:
- The wheel sets of the ballast trailer are in the „Towing“ position

Telescoping the ballast trailer guide out with the ballast automatic

Make sure that the following prerequisite is met:
- The master switch **MS2** has the master switch assignment to control the ballast automatic, see illustration.

▶ Press the F3 key **473**.

Result:

- The *ballast automatic can be turned on* icon **2.34** disappears, the *ballast automatic can be turned off* icon **2.35** appears.
- The ballast automatic status **3.1.2** appears.
- The ballast automatic is activated.

▶ Deflect the master switch **MS2** in direction **Y-**.

Result:

- The ballast trailer guide moves out.
- The ballast automatic regulates the pull cylinder automatically in order to keep the saved value **3.2** (depending on the situation F1-force or ballast trailer incline).

To turn the ballast automatic back off:

▶ Press the F3 key **473** again **473**

Result:

- The *ballast automatic can be turned off* icon **2.35** disappears, the *ballast automatic can be turned on* icon **2.34** appears.

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– The ballast automatic status **3.1.1** appears.
– The ballast automatic is turned off.

Telescoping the ballast trailer guide out manually (operating buttons in the instrument panel)

▶ Press the button **729**.

Result:

– The ballast trailer guide moves out.

▶ Observe the force display in the derrick guying $F1_{min}$-$F1_{max}$ and the ballast trailer incline.

Telescoping the ballast trailer guide out manually (master switch MS2)

Make sure that the following prerequisite is met:
– Ballast automatic is turned off, the ballast automatic status **3.1.1** appears.

▶ Deflect the master switch **MS2** in direction **Y-**.

Result:

– The ballast trailer guide moves out.

▶ Observe the force display in the derrick guying $F1_{min}$-$F1_{max}$ and the ballast trailer incline.

10.2.2 Telescoping the ballast trailer guide in

By telescoping the ballast trailer guide in, the ballast trailer radius is reduced.

Make sure that the following prerequisite is met:
– The wheel sets of the ballast trailer are in the „Towing“ position.

Telescoping the ballast trailer guide in with the ballast automatic

Make sure that the following prerequisite is met:
– The master switch **MS2** has the master switch assignment to control the ballast automatic, see illustration.

▶ Press the F3 key **473**.

Result:

– The *ballast automatic can be turned on* icon **2.34** disappears, the *ballast automatic can be turned off* icon **2.35** appears.
– The ballast automatic status **3.1.2** appears.
– The ballast automatic is activated.

▶ Deflect the master switch **MS2** in direction **Y+**.

Result:

– The ballast trailer guide moves in.
– The ballast automatic regulates the pull cylinder automatically in order to keep the saved value **3.2** (depending on the situation F1-force or ballast trailer incline).

To turn the ballast automatic back off:

▶ Press the F3 key **473** again

Result:

– The *ballast automatic can be turned off* icon **2.35** disappears, the *ballast automatic can be turned on* icon **2.34** appears.
– The ballast automatic status **3.1.1** appears.
– The ballast automatic is turned off.

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Telescoping the ballast trailer guide in manually (operating buttons in the instrument panel)

▶ Press the button **728**.

Result:

– The ballast trailer guide moves in.

▶ Observe the force display in the derrick guying $F1_{min}$-$F1_{max}$ and the ballast trailer incline.

Telescoping the ballast trailer guide in manually (master switch MS2)

Make sure that the following prerequisite is met:
– Ballast automatic is turned off, the ballast automatic status **3.1.1** appears.

▶ Deflect the master switch **MS2** in direction **Y+**.

Result:

– The ballast trailer guide moves in.

▶ Observe the force display in the derrick guying $F1_{min}$-$F1_{max}$ and the ballast trailer incline.

10.3 Steering programs

WARNING
Danger when moving the wheel sets on the ballast trailer!
Death, severe bodily injuries, property damage.
▶ The crane operator as well as any operating personnel must make sure that there are no persons in the danger zone.
▶ It is prohibited for anyone to remain between the wheel sets for all setting / adjustment work on the ballast trailer.
▶ It is prohibited to anyone to remain between the wheel sets when selecting the various steering programs.

10.3.1 Overview of the steering programs

The crane has the following computer controlled steering programs.

Towing steering program

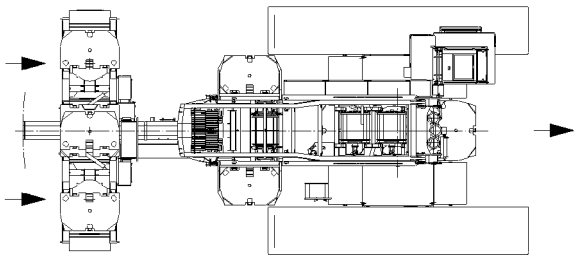

Fig.144284: Example for crane in the Towing steering program

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Parallel travel steering program

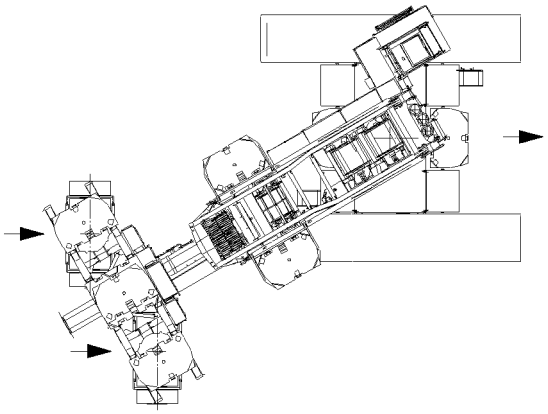

Fig.144285: Example for crane in the Parallel travel steering program

Circular travel steering program

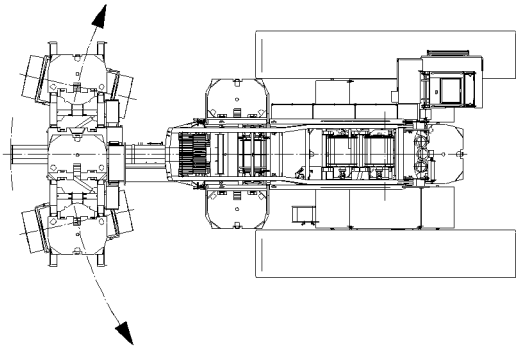

Fig.144286: Example for crane in the Circular travel steering program

Corrective steering steering program

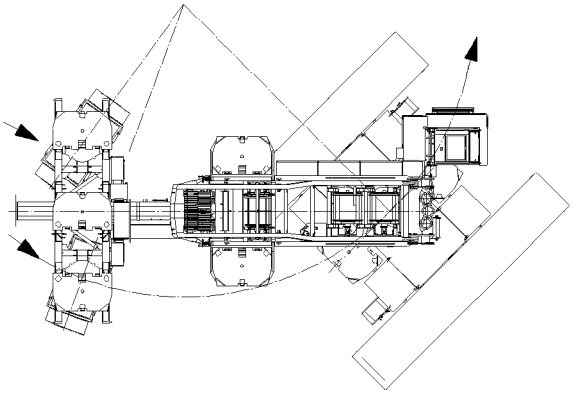

Fig.144287: Example for crane in the „Corrective steering“ steering program

10.3.2 Selecting the steering program

If an incorrect steering program is activated on the ballast trailer, necessary crane functions cannot be carried out and / or controlled.

In order to carry out necessary crane functions, the following is necessary:

- either all steering programs must be deactivated (all steering program indicator lights are off)

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or:

- a certain steering program must be activated (steering program indicator light on)

In order to operate the crane functions, it may be necessary to activate the necessary steering program for the desired crane function.

- Driving the crawler requires towing steering program
- Telescoping the ballast trailer guide in / out requires the towing steering program
- Turning the turntable requires circular travel steering program

10.3.3 Wheel set adjustment procedure for the steering programs

The adjustment procedure for the various steering programs is identical.

Pressing the steering program buttons automatically adjust the wheel sets.

The wheel sets are steered correctively from the crane cab, or from the control panel on the ballast trailer.

The manual change of the wheel sets for assembly purposes is only possible with control panel on the ballast trailer.

Note

- ▶ If the ballast trailer is **not loaded**, the wheel sets can be adjusted without relieving the tires.
- ▶ If the ballast trailer is **loaded**, the ballast trailer must be raised first with the support cylinders until the tires are relieved.

10.3.4 Supporting the ballast trailer to align the wheel sets with the support cylinders

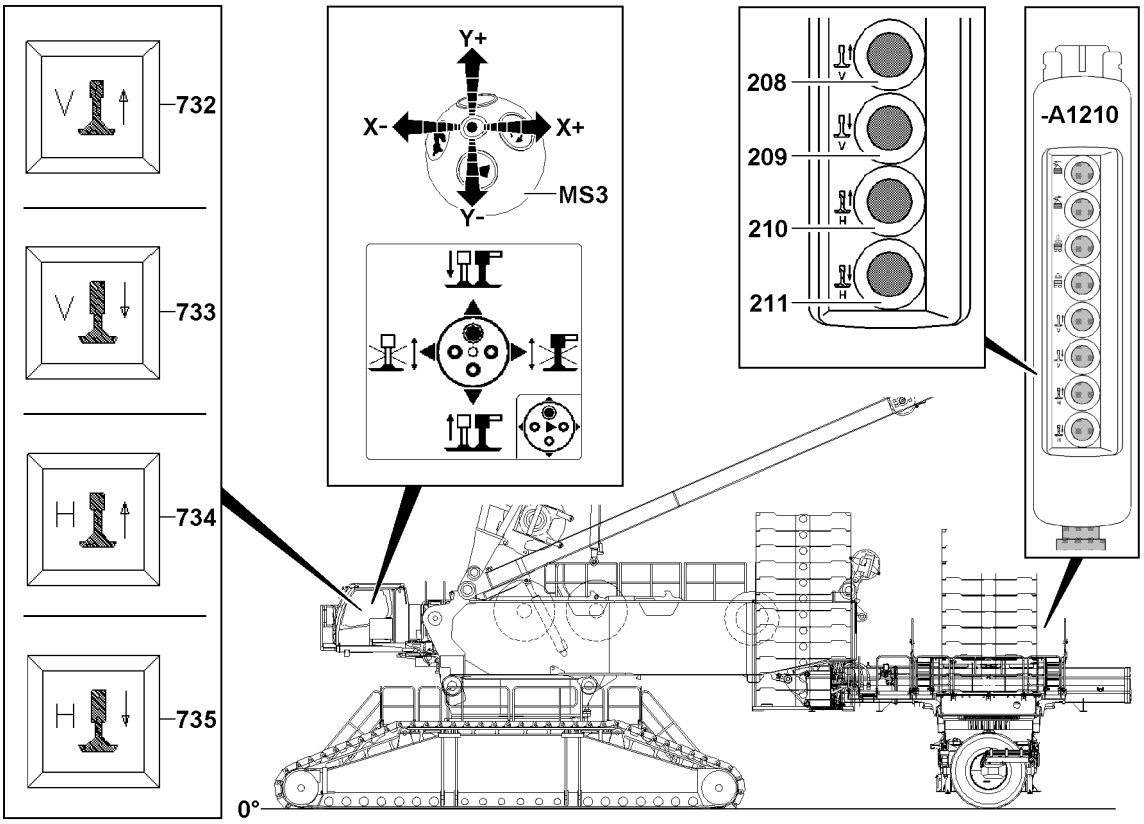

Fig.144135

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DANGER
Danger of accident due to crane overload!
By raising the ballast trailer with the support cylinders, the force at test point 1 (MS1) can increase to the permissible maximum value. The extension of the support cylinders is then turned off.
▶ Monitor the display of test point 1 (F1-force) on the LICCON monitor and stop the extending of the support cylinders in time before the shut-off, see chapter 4.02.

Note
Ballast trailer support cylinders extended until the maximum value of test point 1 (F1-Kraft) is reached:

Release the test point 1 (F1-force):
▶ If possible, for example: Increase the pulled derrick ballast or luff up the main boom / accessory or place down the load.

Note
▶ By selecting the corresponding master switch assignment, the support cylinders of the ballast trailer can also be operated with the master switch **MS3**.

Lifting the ballast trailer with the support cylinders

Note
▶ The support cylinders of the ballast trailer must always be moved out evenly.
▶ Keep the actual value test point 1 (F1-force) in the permissible range.

▶ Press the button **733** and button **735** in the crane cab.
or
Press the button **209** and button **211** on the control panel **-A1210**.
or
Move the master switch **MS3** forward (direction **Y+**).

Operating the support cylinders individually

To compensate for the incline position or uneven ground, the support cylinders can be operated individually.

Retracting the front support cylinder

▶ Press the button **732** in the crane cab.
or
Press the button **208** on the control panel **-A1210**.
or
Move the master switch **MS3** to the left rear (direction **X-Y-**).

Extending the front support cylinder

▶ Press the button **733** in the crane cab.
or
Press the button **209** on the control panel **-A1210**.
or
Move the master switch **MS3** to the left front (direction **X-Y+**).

Retracting the rear support cylinder

▶ Press the button **734** in the crane cab.
or
Press the button **210** on the control panel **-A1210**.
or
Move the master switch **MS3** to the right rear (direction **X+Y-**).

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Extending the rear support cylinder

▶ Press the button **735** in the crane cab.
or
Press the button **211** on the control panel **-A1210**.
or
Move the master switch **MS3** to the right front (direction **X+Y+**).

Lowering the ballast trailer with the support cylinders

Note
▶ The support cylinders of the ballast trailer must always be moved in evenly.

Retract the support cylinders completely on the front and rear:

▶ Press the button **732** and button **734** in the crane cab.
or
Press the button **208** and button **210** on the control panel **-A1210**.
or
Move the master switch **MS3** to the rear (direction **Y-**).

Result:

– The support cylinders retract.

▶ Fully retract both support cylinders.

Result:

– A visual display appears on LICCON monitor LM2.

10.3.5 Towing

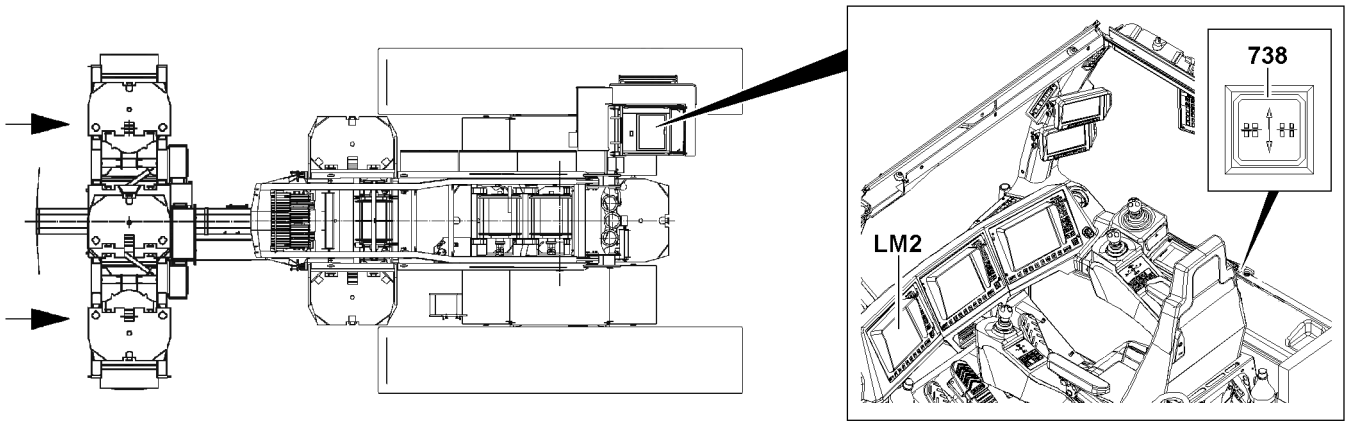

Fig.144136

Aligning the wheel sets in the towing position

Make sure that the following prerequisite is met:
– The ballast trailer is raised via the support cylinders to the point where the wheel sets are relieved.

▶ Press the button **738**.

Result:

– The wheel sets of the ballast trailer are aligned in towing position.
– During the turning procedure of the wheel sets, the indicator light in the button **738 blinks**.
– When the towing position is reached, the indicator light in the button **738 lights up**.
– A visual display appears on the LICCON monitor **LM2**.

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Note

- ▶ The release to drive the crane in the „Towing“ steering program is only made when both wheel sets are in the travel direction (neutral position) and the support cylinders are fully retracted.
- ▶ Check the settings of the wheel sets and the support cylinders before driving the crane.

- ▶ Retract the support cylinders completely, see section „Supporting the ballast trailer to align the wheel sets with the support cylinders.“
- ▶ Check the visual display on the LICCON monitor **LM2**.

Note

- ▶ If one of the wheel sets deviates from the specified angle, the indicator light in the button **738** blinks and the wheel sets must be aligned again.

When the indicator light in the button **738** blinks.:

- ▶ Check the parallel position of the wheel sets on the visual display on the LICCON monitor **LM2**.
- ▶ Re-aligning the wheel sets in the towing position.

Corrective steering of the wheel sets

Observe the special section „Corrective steering“.

NOTICE

Damage of the ballast trailer!

Through corrective steering of wheel sets while at a standstill, the ballast trailer can be damaged.

- ▶ If the ballast trailer is ballasted, the corrective steering of the wheel sets at a standstill is **prohibited**.
- ▶ When the ballast trailer is ballasted, the corrective steering of the wheel sets is only permissible while driving.
- ▶ Monitor the distortion of the tires.

Note

- ▶ Changing from the steering program „Towing“ into the steering program „Corrective steering“ and back is possible while driving the crawler!
- ▶ If the steering program „Corrective steering“ is switched into the steering program „Towing operation“ then the indicator light **blinks** on the „button“ **738** until the towing operation position of the wheel sets is reached.
- ▶ If one of the wheel sets deviates from the specified limit angle, the „indicator light in the button“ **738** blinks and the wheel sets must be reset as described above.
- ▶ **In general, the following applies:** The wheel sets only move if either the button **741**, the button **740**, or the button **738** in the crane cab, or the button **200** or the button **201** on the control panel is pressed in the respective steering program or if the crawler is driven.

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10.3.6 Circular travel

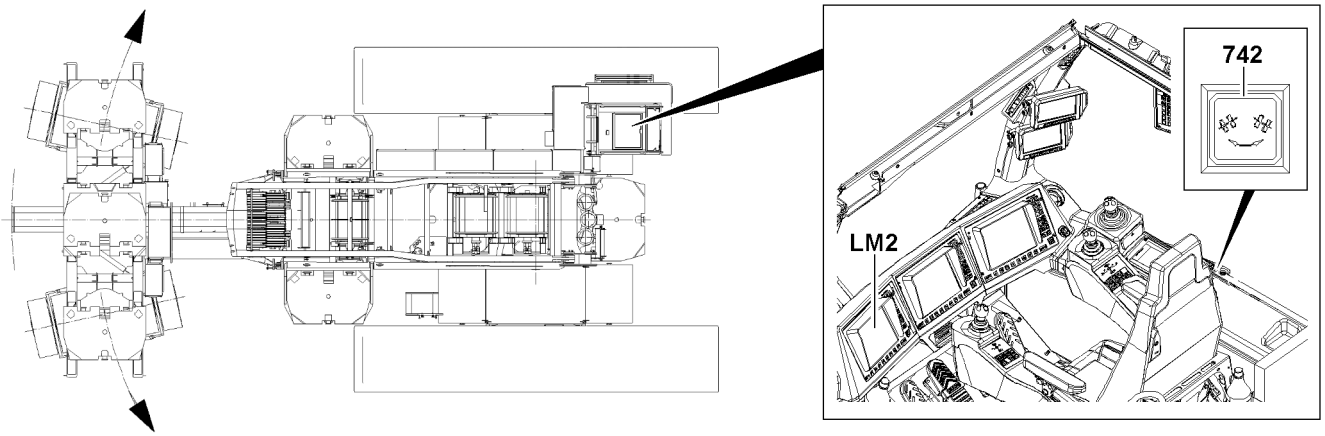

Fig.144137

Make sure that the following prerequisite is met:
– The ballast trailer guide is telescoped out to the required derrick ballast radius.

Aligning the wheel sets in the circular travel position

Make sure that the following prerequisite is met:
– The ballast trailer is raised via the support cylinders to the point where the wheel sets are relieved.

▶ Press the button **742**.

Result:

– The ballast trailer wheel sets are aligned in the circular travel position.
– During the turning procedure of the wheel sets, the indicator light in the button **742 blinks**.
– When the circular travel position is reached, the indicator light in the button **742 lights up**.
– A visual display appears on the LICCON monitor **LM2**.

Note
▶ The release for turning the turntable in the „Circular travel“ steering program is only made when both wheel sets are in the turning position (circular travel) and the support cylinders are completely retracted.
▶ Check the settings for the wheel sets and support cylinders before inspecting turning of the turntable.

▶ Retract the support cylinders completely, see section „Supporting the ballast trailer to align the wheel sets with the support cylinders.“
▶ Check the visual display on the LICCON monitor **LM2**.

Note
▶ If one of the wheel sets deviates from the specified angle, the indicator light in the button **742** blinks and the wheel sets must be aligned again.

When the indicator light in the button **742** blinks.:
▶ Check the circular travel position of the wheel sets on the visual display on the LICCON monitor **LM2**.
▶ Re-aligning the wheel sets in the circular travel position.

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10.3.7 Parallel travel

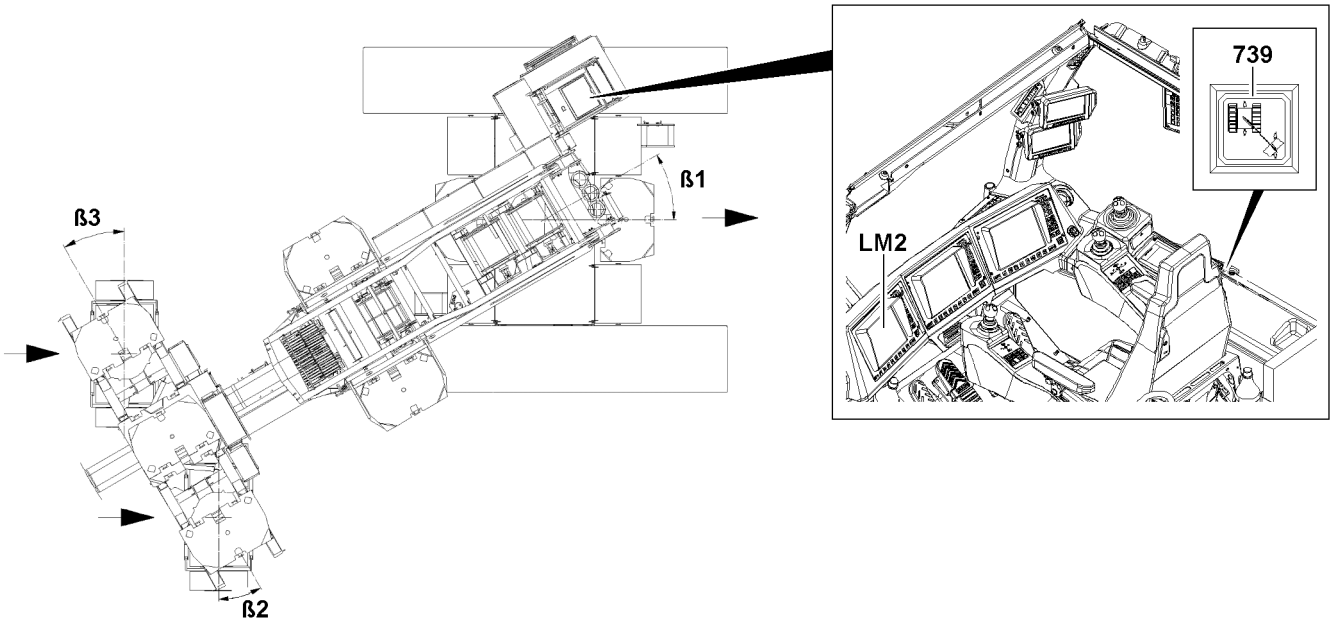

Fig.144138

NOTICE
Danger of damage to the crane and the ballast trailer!
Due to steering movements on the crawler track during parallel travel, the crane and the ballast trailer can be significantly damaged.
- ▶ For parallel travel, steering the crawler track is **prohibited**.
- ▶ Driving the crane in parallel travel is only permissible when „Parallel travel crawler“ is selected, otherwise there is no release of the travel gear.
- ▶ For parallel travel, the side tire distortion on the wheel sets must be observed by an instructed person over the entire travel route of the crane. If the tires distort by more than 100 mm , then the position of the wheel sets must be corrected.

Note
- ▶ Independently of whether the ballast trailer stands on the ground or is lifted off the ground, the wheel sets must always stand in a „Parallel travel“ position.
- ▶ In deviating position for the wheel sets, the control turns itself off.
- ▶ To drive the crane with the ballast trailer in the parallel travel steering program, „parallel travel crawler operation“ must be selected on the crane.

Note
- ▶ The travel drive of the crawler is locked until the wheel sets are in the parallel travel position.
- ▶ When driving the crawler, the slewing gear brake of the crane remains applied, the hydraulic coasting is opened.
- ▶ If the angles $ß_2$ and $ß_3$ deviate in relation to $ß_1$ by more than the permissible tolerance, the crawler travel gear is stopped, the indicator light in the button **739** blinks.
- ▶ Only through renewed alignment of the wheel sets to the required specified angle can the crawler travel gear be driven again.
- ▶ If „Crawler Parallel travel“ is selected, the crawler and the ballast trailer move straight forward on appropriate terrain.

Aligning the wheel sets in the parallel travel position

Make sure that the following prerequisite is met:
– The ballast trailer is raised via the support cylinders to the point where the wheel sets are relieved.

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▶ Press the button **739**.

Result:

– The ballast trailer wheel sets are aligned in the parallel travel position.
– During the turning procedure of the wheel sets, the indicator light in the button **739 blinks**.
– When the parallel travel position is reached, the indicator light in the button **739 lights up**.
– A visual display appears on the LICCON monitor **LM2**.

▶ Retract the support cylinders completely, see section „Supporting the ballast trailer to align the wheel sets with the support cylinders.“
▶ Check the visual display on the LICCON monitor **LM2**.

Note

▶ If one of the wheel sets deviates from the specified angle, the indicator light in the button **739** blinks and the wheel sets must be aligned again.

When the indicator light in the button **739** blinks.:

▶ Check the parallel position of the wheel sets on the visual display on the LICCON monitor **LM2**.
▶ Re-aligning the wheel sets in the parallel travel position.

10.3.8 Corrective steering

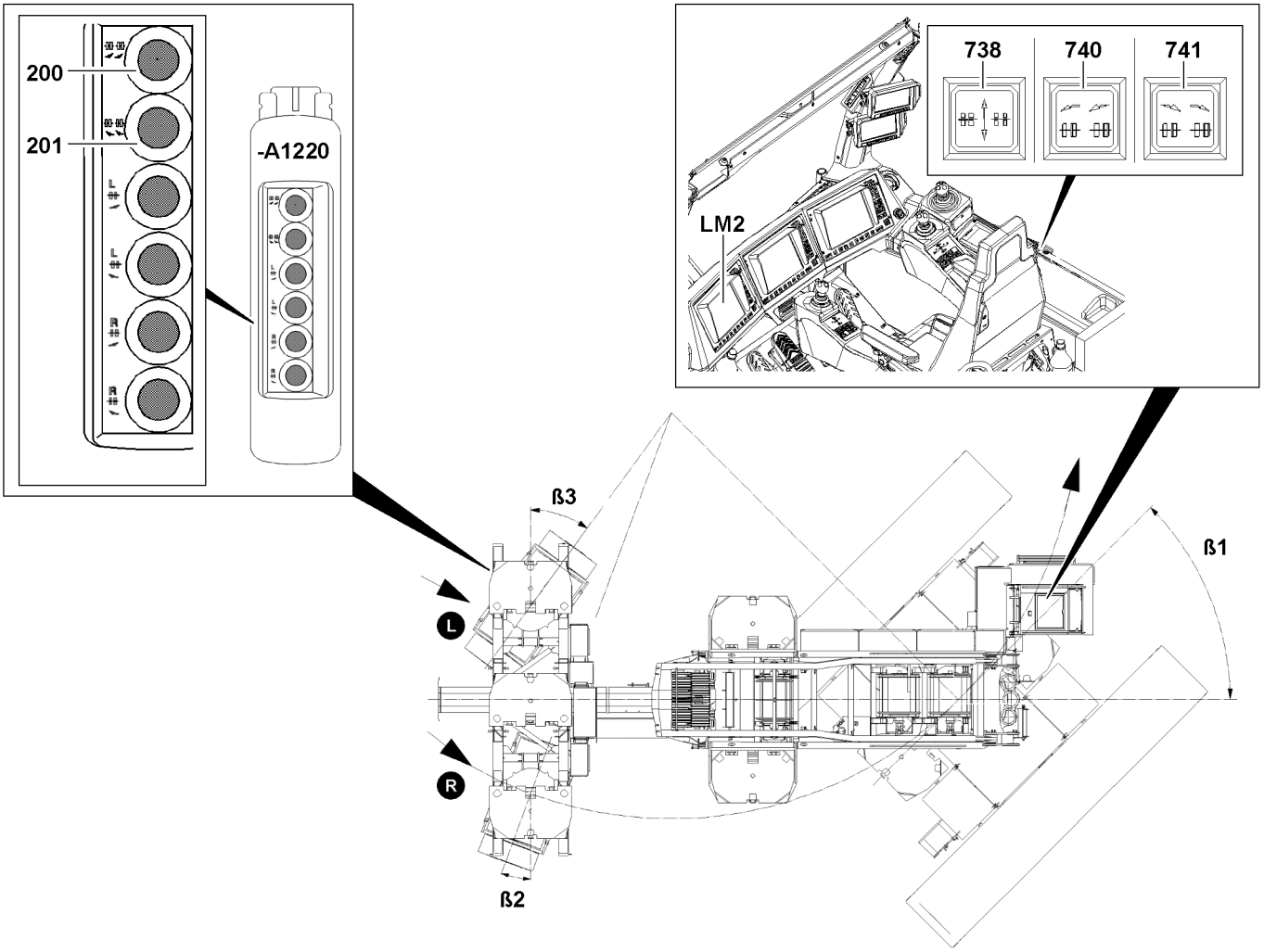

Fig.144139

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Make sure that the following prerequisite is met:
- Crawler operation is turned on.

Observe the special section „Towing“.

Steering and corrective steering of the wheel sets

Make sure that the following prerequisites are met:
- The steering program „Towing“ is selected **and** the wheel sets are in the towing position.
- Control light in button **738** illuminates.

Turn wheel sets to the right:

▶ Press the button **741** in the crane cab.
or
Press the button **200** on the control panel **-A1220**.

Turn wheel sets to the left:

▶ Press the button **740** in the crane cab.
or
Press the button **201** on the control panel **-A1220**.

The right wheel set is regulated by the computer-controlled steering program so that there is always a center steering position. The angle $ß_1$ is determined by the travel of the crawler and the angle $ß_3$ is determined by the steering of the operator, whereby the angle $ß_2$ is continually corrected. Switching from the steering program „Corrective steering“ into the steering program „Towing“ and back, after achieving the towing position, is possible while driving the crawler! If the steering program „Corrective steering“ is selected from the steering program „Towing“ the indicator light in the button **741** and the indicator light in the button **740** lights up.

Note
- ▶ The left wheel set can be steered to the specified limit angle $ß_3$. It is not possible to steer beyond this limit angle.
- ▶ The right wheel set is corrected to follow the center steering position. If the right correctively steered wheel set cannot follow the left wheel set, then the left wheel set is stopped until the right correctively steered wheel set has caught up.
- ▶ If the right wheel set still deviates from the specified limit angle, the indicator light in the button **741** and the indicator light in the button **740** blinks and you must begin again with „Towing“.
- ▶ If the crawler is driven and exceeds the angle $ß_1$ the turntable automatically switches the specified value into the steering program „Towing“. The axles are swung back to the initial towing position (0° or 180°). The indicator light in the button **741**, the indicator light in the button **740** and the indicator light in the button **738** blink.
- ▶ When the towing position is reached, manual corrective steering can continue. The indicator light in the button **738** lights up, also a visual display appears on the LICCON monitor LM2.
- ▶ **In general, the following applies:** The wheel sets only move during corrective steering if either the button **741** or the button **740** from the crane cab, **or** the button **200** or the button **201** on the control panel is pressed in the respective steering program or if the crawler is driven.

▶ Check the settings.

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10.3.9 Wheel set manual operation for assembly / emergency operation

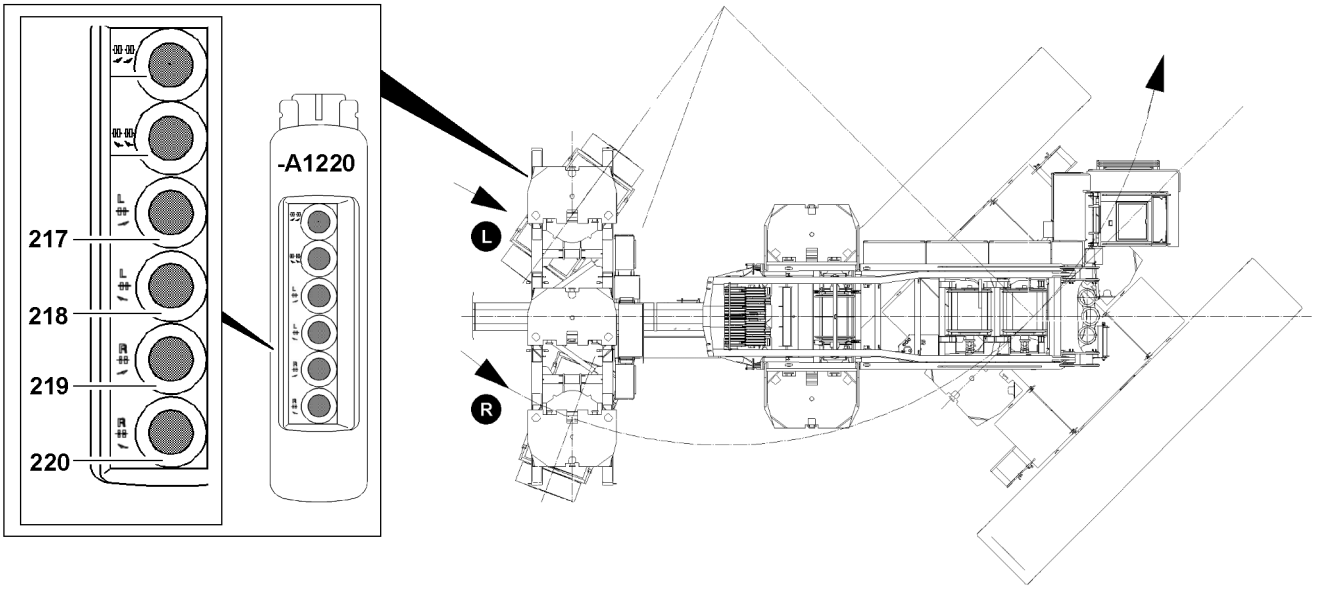

Fig.144141

The ballast trailer is equipped with a program which allows for each wheel set to be turned individually at assembly / emergency operation.

Make sure that the following prerequisite is met:
– The ballast trailer is raised via the support cylinders to the point where the wheel sets are relieved.

Turning the wheel sets individually

To set the wheel sets, the buttons on the control panel **-A1220** must be pressed.

▶ Press the button **217** on the control panel **-A1220**.

Result:

– Turn left wheel set to right.

▶ Press the button **218** on the control panel **-A1220**.

Result:

– Turn left wheel set to the left.

▶ Press the button **219** on the control panel **-A1220**.

Result:

– Turn right wheel set to right.

▶ Press the button **220** on the control panel **-A1220**.

Result:

– Turn right wheel set to the left.

10.3.10 Deactivating steering programs for assembly / disassembly purposes

If an incorrect steering program is activated on the ballast trailer, crane functions that are necessary for assembly / disassembly purposes may not be carried out and / or controlled.

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Note

- When both ballast trailer guide / turntable connection pins are correctly pinned, both limit switches are actuated. If the limit switches are actuated, only the crane functions released by the steering program can be carried out. If the correct steering program is not selected, certain crane movements are not possible.
- If the ballast trailer guide / turntable connection pin points do not align, the crane and the ballast trailer must be aligned with each other correctly.

WARNING

Ballast trailer guide / turntable connection only partially pinned!
If only one pin of the ballast trailer guide / turntable connection is correctly pinned, crane function monitoring is limited.
If no steering program is turned on, the turntable can be turned, the crane can be driven and the ballast trailer guide can be telescoped.
It is possible to operate the crane incorrectly and damage it.

- The crane driver is responsible for ensuring compliance with the specifications of the operating instructions regarding ballast trailer assembly / disassembly.
- Always carry out the crane movements with extreme caution and at the lowest possible speed.

In order to carry out crane functions necessary for assembly / disassembly purposes, the following is necessary:

- either all steering programs must be deactivated (all steering program indicator lights are off)
  or:
- a certain steering program must be activated (steering program indicator light on)
- Turning the turntable requires circular travel, driving the crane and telescoping the ballast trailer guide require towing

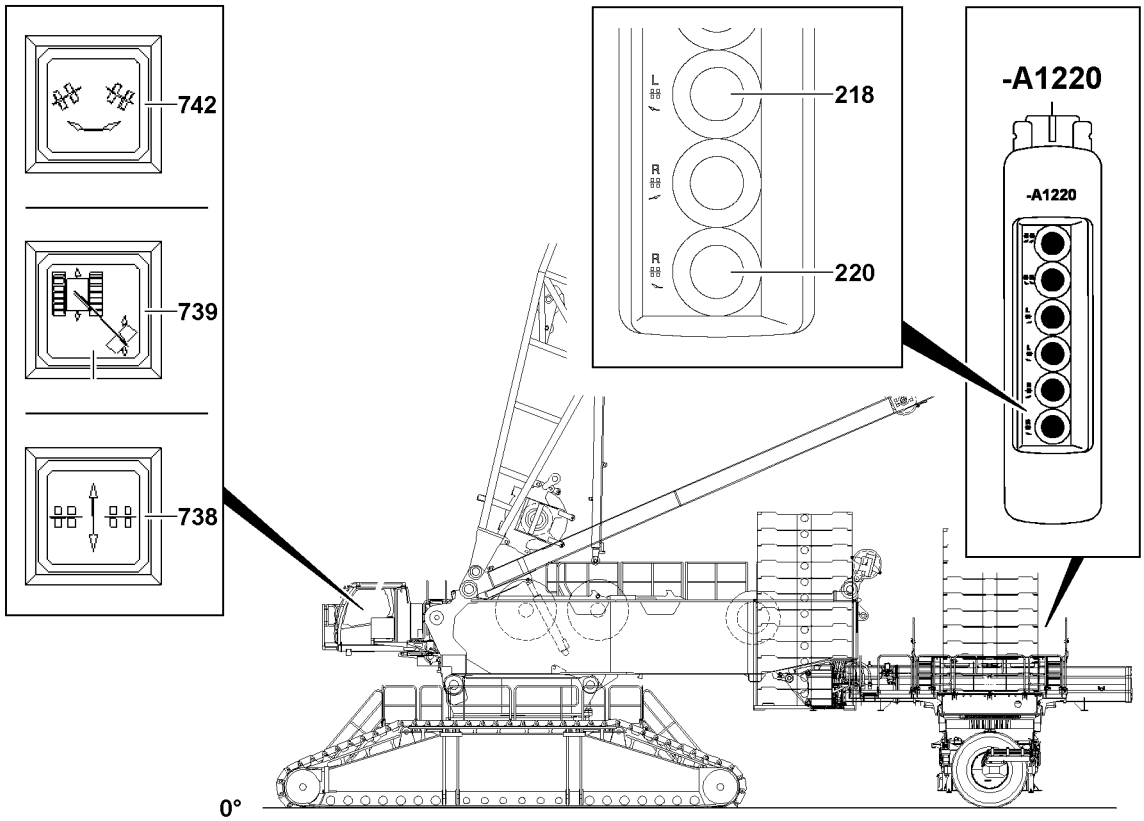

Fig.144134

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Note
Deactivate a steering program (crane cab)
No steering program is activated when there is no illuminated steering program indicator light.
- ▶ Crane cab: A steering program is deactivated by briefly pressing (less than one second) a button for another steering program. If the indicator light of another steering program lights up permanently as a result, then this steering program is active and must also be turned off.
- ▶ Control panel **-A1220**: Press the button **218** or button **220** to switch to manual operation and deactivate all steering programs.

Deactivating the towing steering program

On the control panel **-A1220**:

▶ Briefly press the button **218** or button **220** (for one second).

Result:

– The towing steering program is deactivated.
– No steering program is active.

or:

In the crane cab:

▶ Briefly press the *circular travel* button **742** (less than one second).

Result:

– When the *towing* button **738** indicator light is off: The towing steering program is deactivated.
– The *circular travel* button **742** indicator light must also remain off. Otherwise, deactivate the circular travel steering program.

Deactivating the parallel travel steering program

On the control panel **-A1220**:

▶ Briefly press the button **218** or button **220** (for one second).

Result:

– The parallel travel steering program is deactivated.
– No steering program is active.

or:

In the crane cab:

▶ Briefly press the *circular travel* button **742** (less than one second).

Result:

– When the *parallel travel* button **739** indicator light is off: The parallel travel steering program is deactivated.
– The *circular travel* button **742** indicator light must also remain off. Otherwise, deactivate the circular travel steering program.

Deactivating the circular travel steering program

On the control panel **-A1220**:

▶ Briefly press the button **218** or button **220** (for one second).

Result:

– The circular travel steering program is deactivated.
– No steering program is active.

or:

In the crane cab:

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▶ Briefly press the *towing* button **738** (less than one second).

Result:

– When the *circular travel* button **742** indicator light is off: The circular travel steering program is deactivated.
– The *towing* button **738** indicator light must also remain off. Otherwise, deactivate the towing steering program.

10.4 Driving the ballast trailer

When the ballast trailer has ground contact, it is driven using various crane movements / steering programs:
– Through towing when driving the crane
– Through parallel travel when driving the crane
– Through circular travel when turning the crane superstructure
– Through corrective steering when driving the crane

Note
▶ It is only permitted to drive the ballast trailer on level ground capable of supporting the load.
▶ Driving over obstacles is not permitted.

DANGER
The crane can topple over!
In case of non-permissible level difference between the ballast trailer travel route and the crane position level, the entire crane system can be pulled back suddenly.
The relapse cylinders can thereby run into the mechanical block position and be significantly damaged.
The crane can topple over.
Death, severe bodily injuries, property damage.
▶ Do not exceed or fall below the permissible level difference between the ballast trailer roadway and the crane placement level.

NOTICE
Piston rod on block!
If the piston rod of the extension cylinder is already on block through telescoping out or in of the ballast trailer guide, there is no pressure protection. In this situation, the pressure relief valves on the piston and ring side are ineffective.
The extension cylinder can be significantly damaged.
▶ It is prohibited to move the piston rod in or out up to the block position.

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10.4.1 Safety guidelines

Case 1: The boom system is pulled to the rear

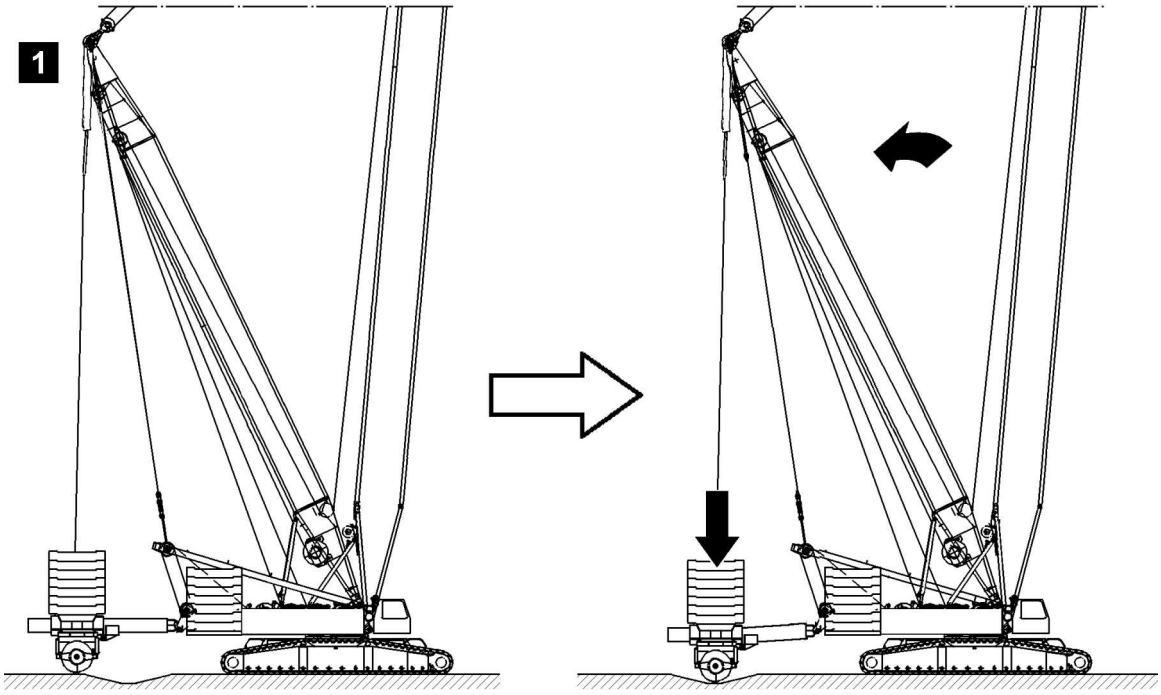

Fig.144148

Example illustration **1**: When driving the crane or turning the crane superstructure, the ballast trailer lowers due to the level differences (depressions). In this way, the crane stays at its level. As a result, the entire boom system can pull back in an uncontrolled manner.

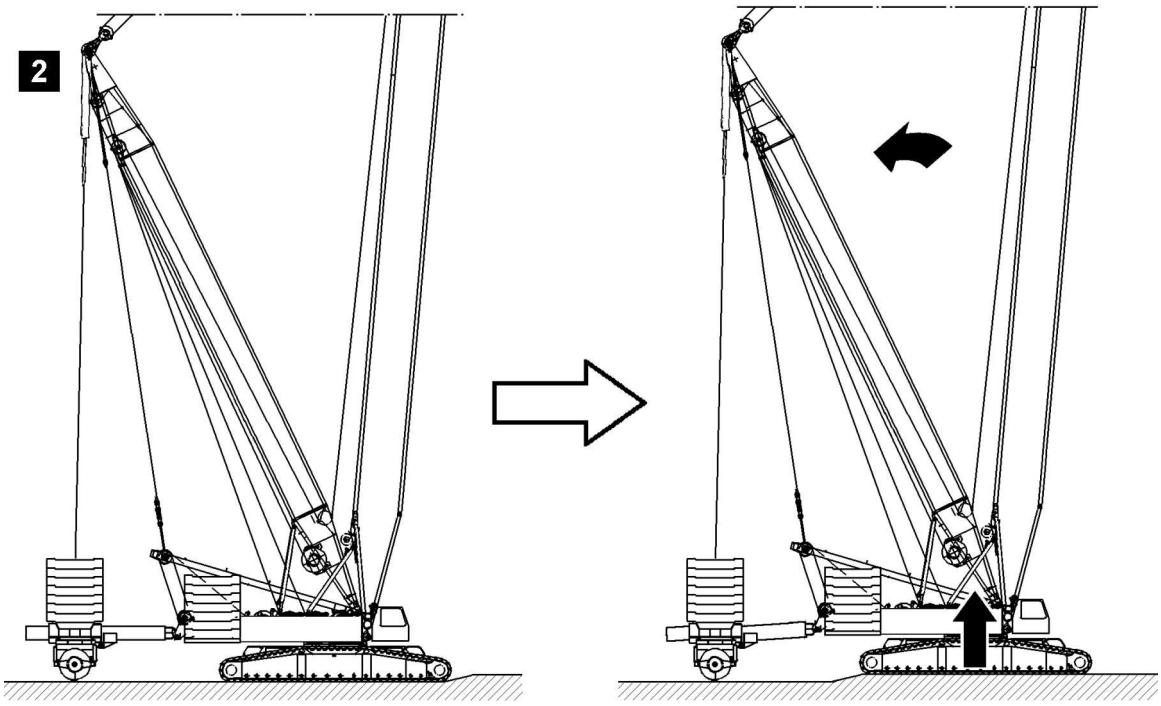

Fig.145921

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Example illustration **2**: When driving the crane, the crane lifts up due to the level differences (elevations). In this way, the ballast trailer stays at its level. As a result, the entire boom system can pull back in an uncontrolled manner.

Examples of possible consequences of a pulled back boom system:
- In the case of a steeply positioned boom system, block positions / damage to the relapse cylinder can result
- The minimum force $F1^{min}$ (test point 1) may not be fallen below
- The force in the ballast trailer guying increases, the pulled derrick ballast lifts up
- The limit angles of the load chart can be exceeded

Note
- ▶ Due to the shut offs „Main boom relapse cylinder on block“ or „Derrick relapse cylinder on block“, in crane operation with ballast trailer, the „driving the crawler“ and „crane superstructure turning“ movements are automatically turned off.
- ▶ Due to the shut-off „minimum force F1 (test point 1) fallen below“, in crane operation with ballast trailer, the „driving the crawler“ and „turning“ movements are **not** turned off.

Case 2: The ballast trailer guying is relieved

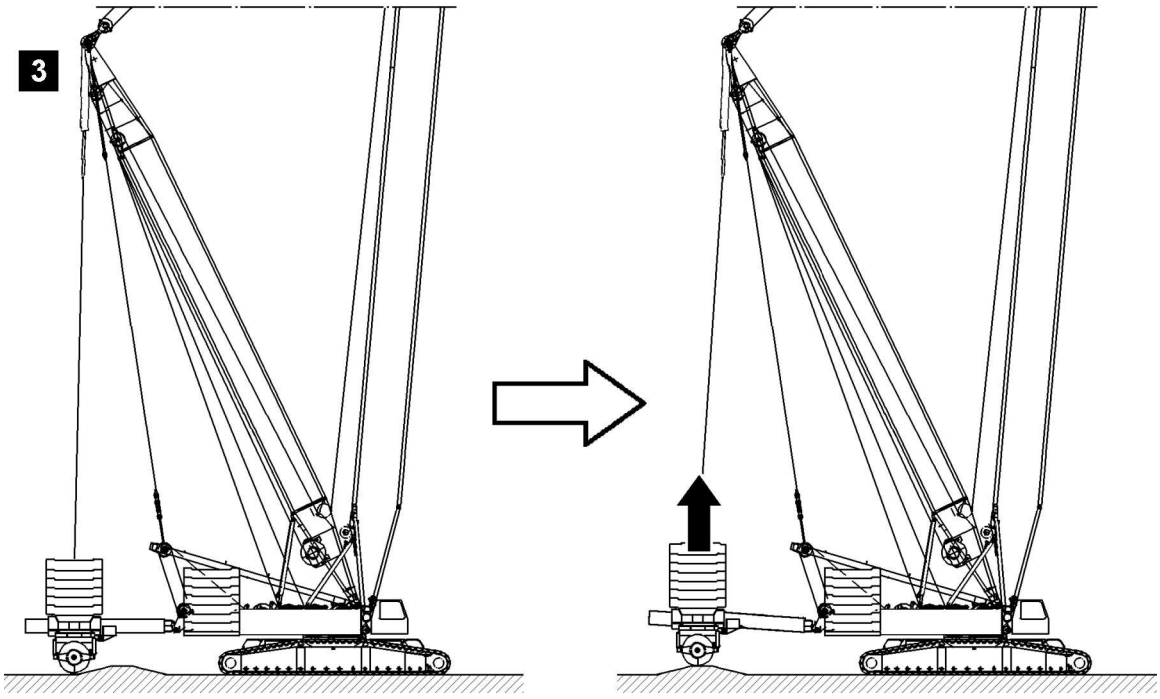

Fig.145923

Example illustration **3**: When driving the crane or turning the crane superstructure, the ballast trailer lifts up due to the level differences (elevations). In this way, the crane stays at its level. As a result, the ballast trailer guying is released in an uncontrolled manner.

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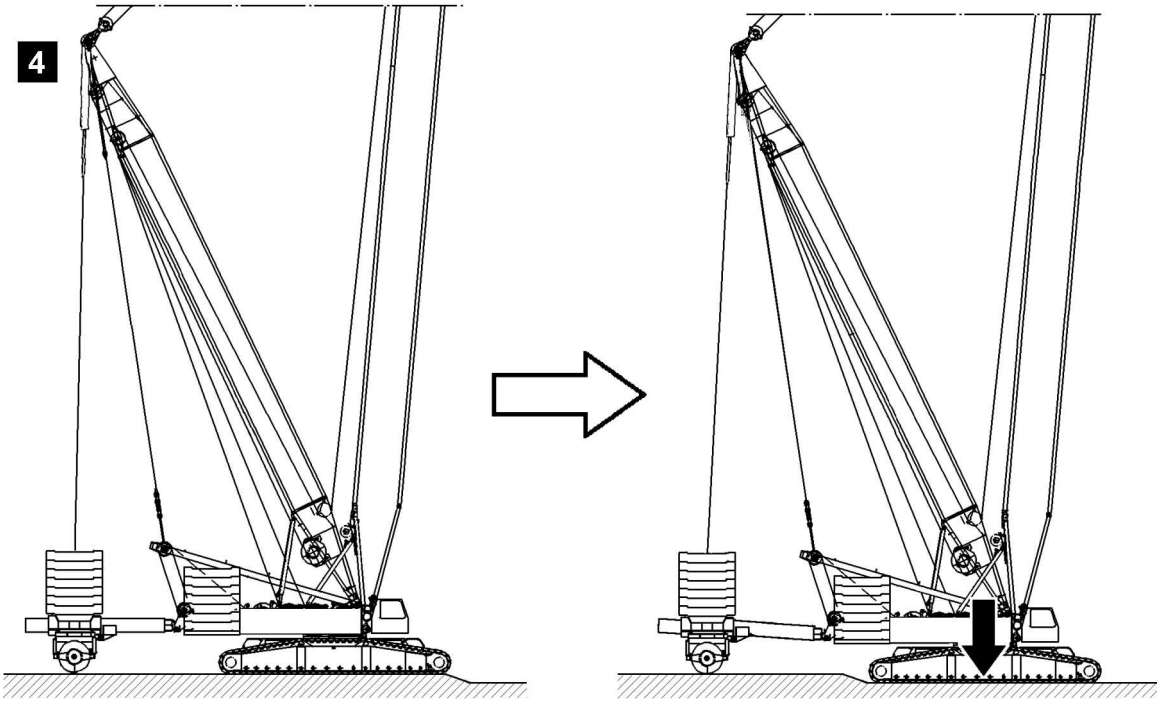

Fig.145924

Example illustration **4**: When driving the crane, the crane is lowered due to the level differences (depressions). In this way, the ballast trailer stays at its level. As a result, the ballast trailer guying is released in an uncontrolled manner.

Examples of possible consequences of a releasing the ballast trailer guying:
- The maximum force $F1^{max}$ (test point 1) can be exceeded
- The limit angles of the load chart can be exceeded

Note

▶ Due to the shut-off „maximum force $F1^{max}$ (test point 1) exceeded“, in crane operation with ballast trailer, the „driving the crawler“ and „turning“ movements are **not** turned off.

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Case 3: The load torque is increased

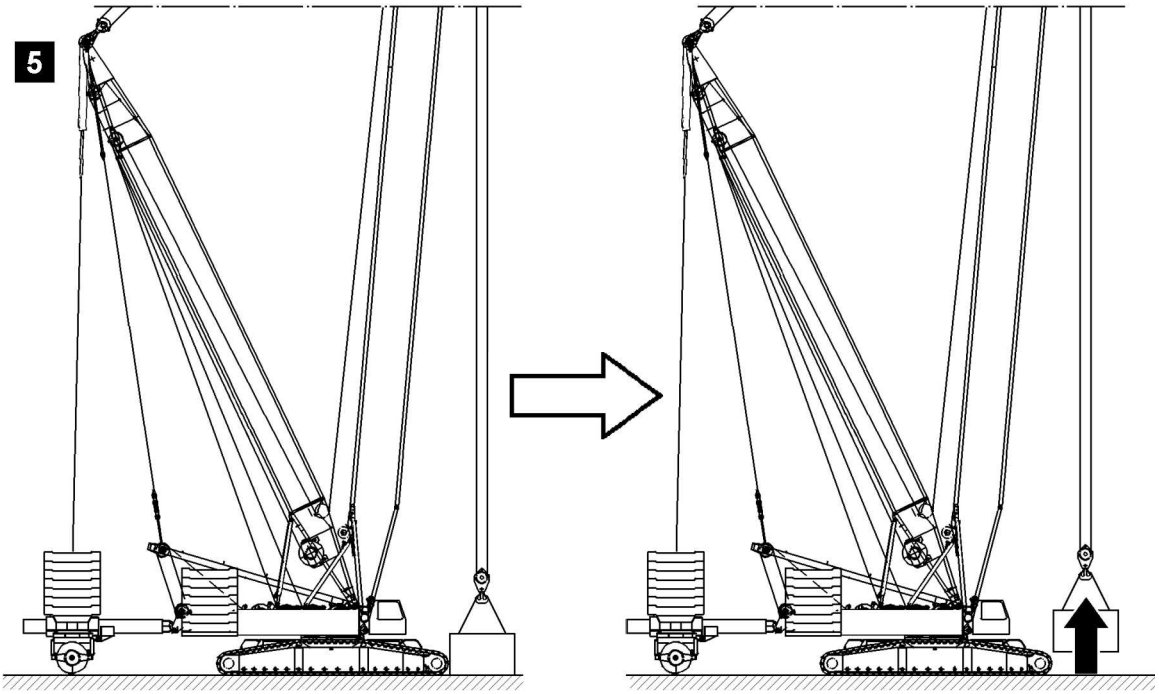

Fig.145925

Example illustration **5**: The load torque is increased when picking up the load. The crane and boom system are loaded more.

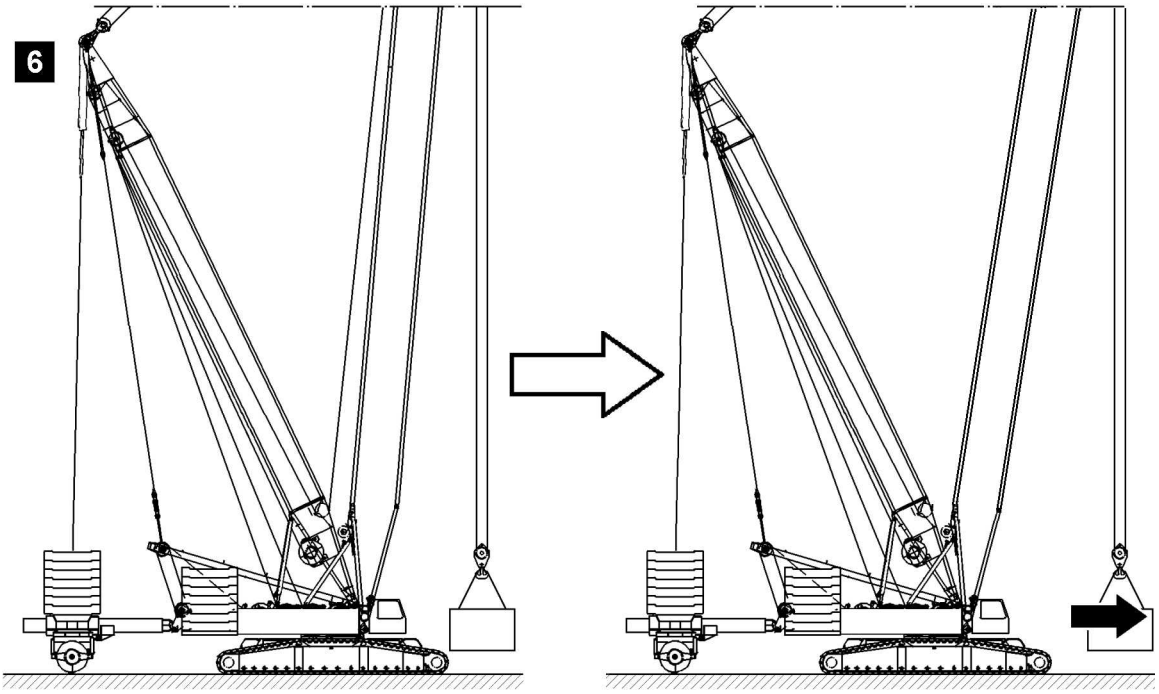

Fig.145928

Example illustration **6**: The load torque is increased when the boom radius of the load is increased. The crane and boom system are loaded.

Examples of possible consequences of an increased load torque:
- The maximum force $F1^{max}$ (test point 1) can be exceeded
- The force in the ballast trailer guying increases, the pulled derrick ballast lifts up
- The limit angles of the load chart can be exceeded

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Note

▶ Due to the shut-off „maximum force F1 ^{max} (test point 1) exceeded“, in crane operation with ballast trailer, the „driving the crawler“ and „turning“ movements are **not** turned off.

Case 4: The load torque is decreased

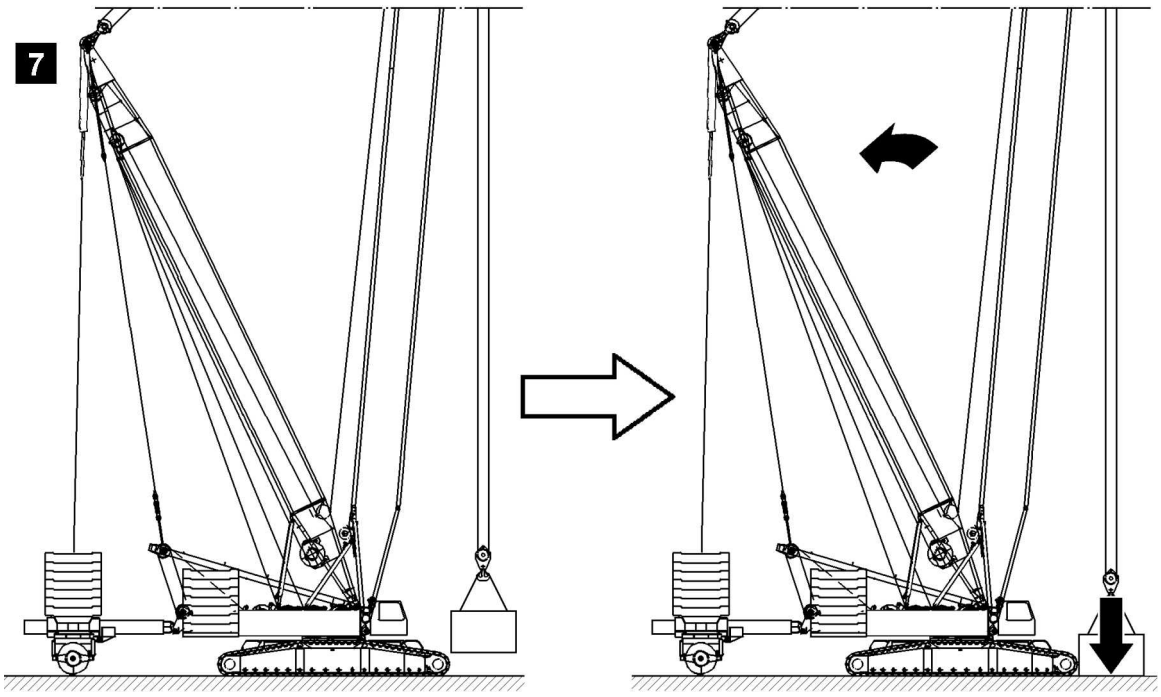

Fig.145922

Example illustration **7**: When the load is set down, the crane and boom system are relieved. The load torque is decreased. As a result, the boom system can move backward.

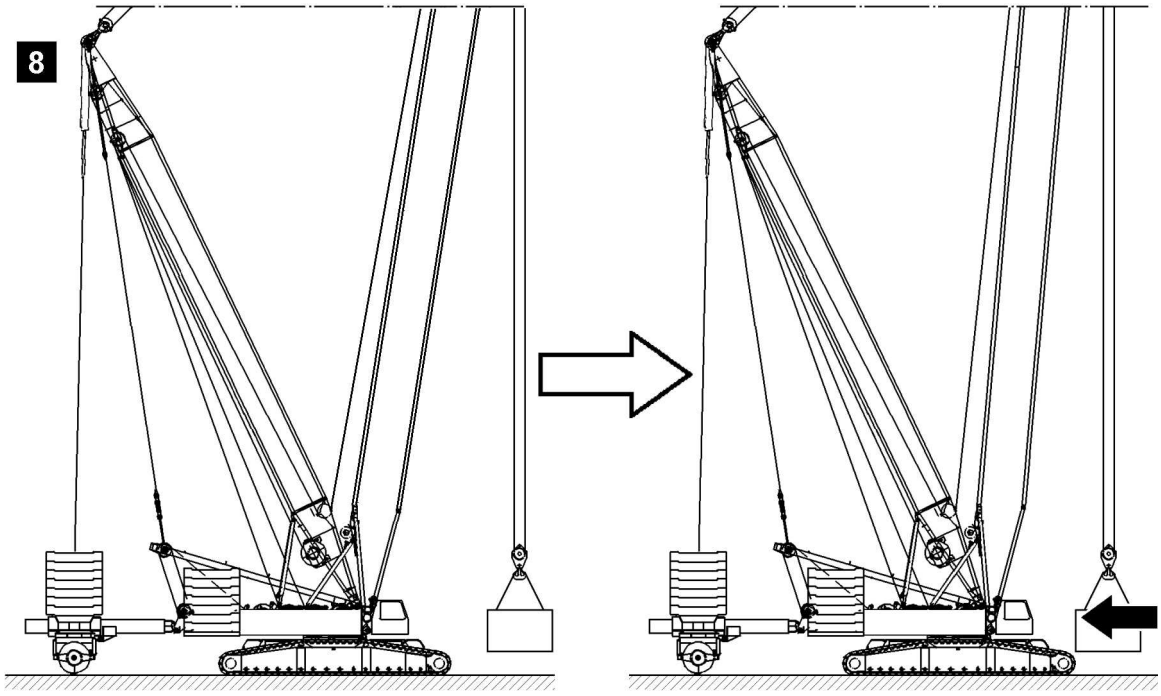

Fig.145929

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Example illustration **8**: When decreasing the load boom radius, the crane and boom system are relieved. The load torque is decreased. The crane and boom system are loaded less by the load.

Examples of possible consequences of an decreased load torque:
- The minimum force $F1^{min}$ (test point 1) can be fallen below
- The pulled derrick ballast is reduced
- The limit angles of the load chart can be exceeded

10.4.2 Test point 1 (F1-Load display)

WARNING
Danger of accident when driving the crane with load and ballast trailer!
When driving the crane with a load - this also applies for „circular travel“ - and the ballast trailer is raised due to ground unevenness, the force on test point 1 (F1-load display) increases immediately and the crane will be overloaded.
If the ballast trailer sinks while driving due ground unevenness, the force on test point 1 (F1-load display) drops and the ballast trailer lifts off the ground, or the entire boom system is pulled backward.
The crane can topple over and personnel can be severely injured or killed.
- ▶ The crane operator must constantly observe the displays on the LICCON monitor while driving the crane.
- ▶ The crane operator must act anticipatorily. Already when an advance warning on test point 1 (F1-load display) occurs, he must act accordingly: By actuating the pull cylinders of the derrick ballast, correct the load / force on test point 1 (F1-load display) until it is in a permissible operating range. The permissible extension lengths of the pull cylinders must be observed.

10.4.3 Relapse cylinder

When the steepest operating position of the main boom is reached, luffing up is turned off by the LICCON overload protection in all operating modes.

Note
- ▶ However, in certain cases the movement of the entire crane system to the rear can cause the relapse cylinders to mechanically latch in the block position.

Block position relapse cylinders

NOTICE
Damage to the relapse cylinder and the boom!
Through level difference between the ballast trailer and crane route, the boom can suddenly be pulled backward and the relapse cylinder can go into the block position.
The relapse cylinder or the boom can be damaged.
- ▶ Make sure before taking up the travel mode, or before turning the crane superstructure, that the travel route of the crane or the ballast trailer circular path is even and capable of supporting the load.

In normal crane operation without bypass of the LICCON overload protection, a block position is not possible. Should a block position still occur, the movement is shut off and the boom limitation icon shown on the operating screen indicates which block position has been started up.

With this boom limitation icon it is to be determined which limit switch on which relapse cylinder has been actuated. Reverse the last movement which was carried out until the corresponding limit switch is released again.

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10.4.4 Maximum permissible ground unevenness

WARNING
The crane can topple over!
By exceeding the maximum permissible value for ground unevenness while driving the crane, the crane can topple.
Death, severe bodily injuries, property damage.
▶ The permissible ground unevenness may not be exceeded.

Level change between placement surface of the crane and the ballast trailer during towing, parallel and circular travel may not exceed a maximum permissible value.

Note
▶ The level difference of the ballast trailer route in relation to the crane routing during **towing** and **parallel travel**, may be no more than ± 250 mm - with a constant uphill or downhill slope over a 20 m route.
▶ The level difference of the ballast trailer route in relation to the crane route during **circular travel** may be no more than ± 250 mm - with a constant uphill or downhill slope over a 90° slewing range.
▶ Regardless of the level difference, the permissible side incline of the crane and / or the ballast trailer must be adhered to.

Compensating for ground unevenness

The maximum permissible ground unevenness can be compensated by lifting and lowering the ballast trailer.

Note
▶ See section „Lifting and lowering the ballast trailer with the pull cylinders“.

Ballast trailer drive

Note
▶ Only on crane types with a ballast trailer drive*.

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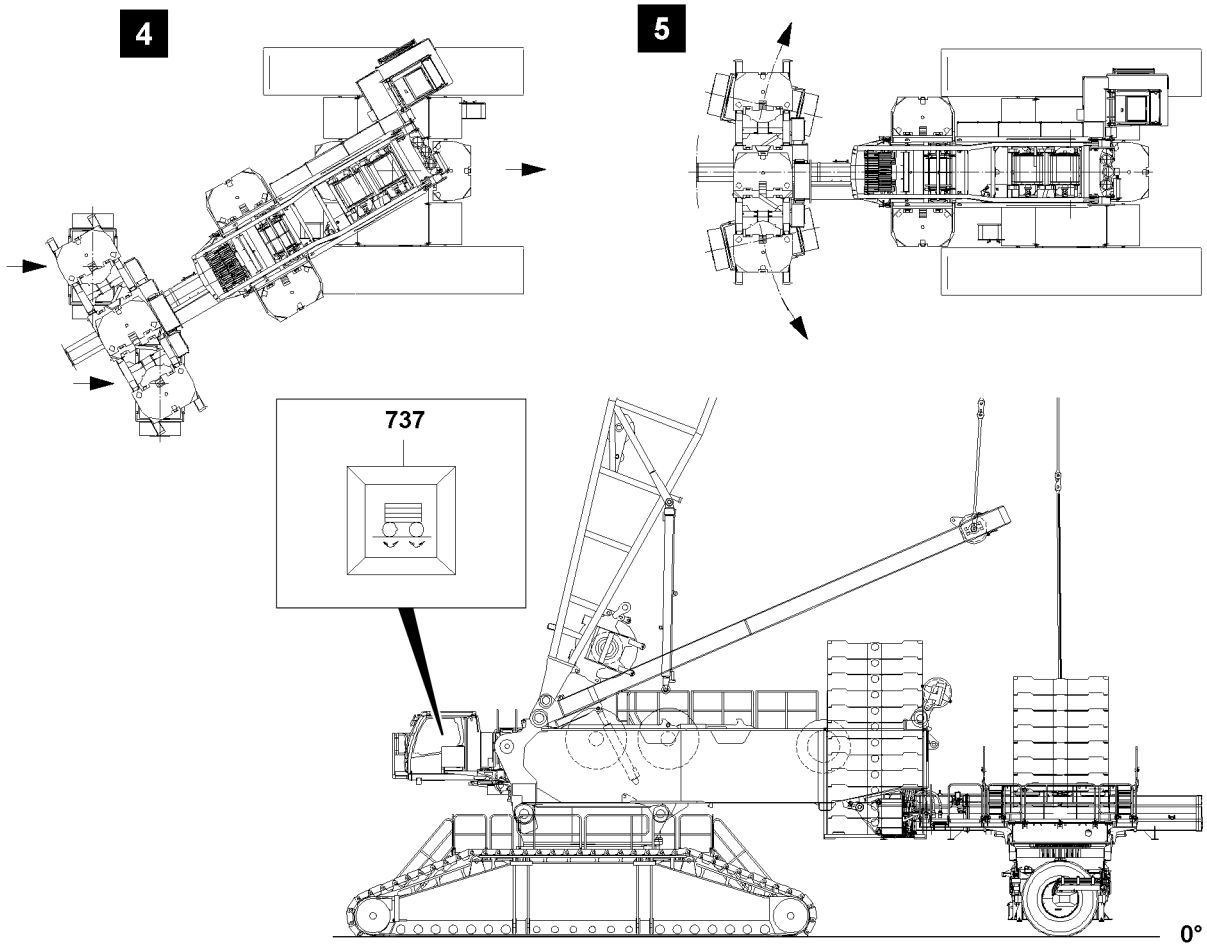

Fig.120242

A ballast trailer is equipped with a wheel set with its own drive. The drive is added in the crane cab.

The drive is a proportionally adjustable drive which is regulated depending on the turning or travel speed.

If the ballast utilization is more than 90 %, then the drive is turned off to prevent the wheels from slipping.

Note

- ▶ The addition of the drive is only possible in circular and parallel travel, see illustration **4** and illustration **5**.
- ▶ The additional drive may be required when driving over uneven ground.

If the road surface is level, no additional drive is required.

Add the drive only when no turning / travel movement occurs when the control lever is deflected.

Turn the drive on with the switch **737** in the crane cab.

Note

- ▶ Turn the drive off as soon as the unlevel ground has been passed.

- ▶ Turn the drive off with switch **737** in the crane operator's cab.

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10.4.5 *Derrick ballast lifted off* key button

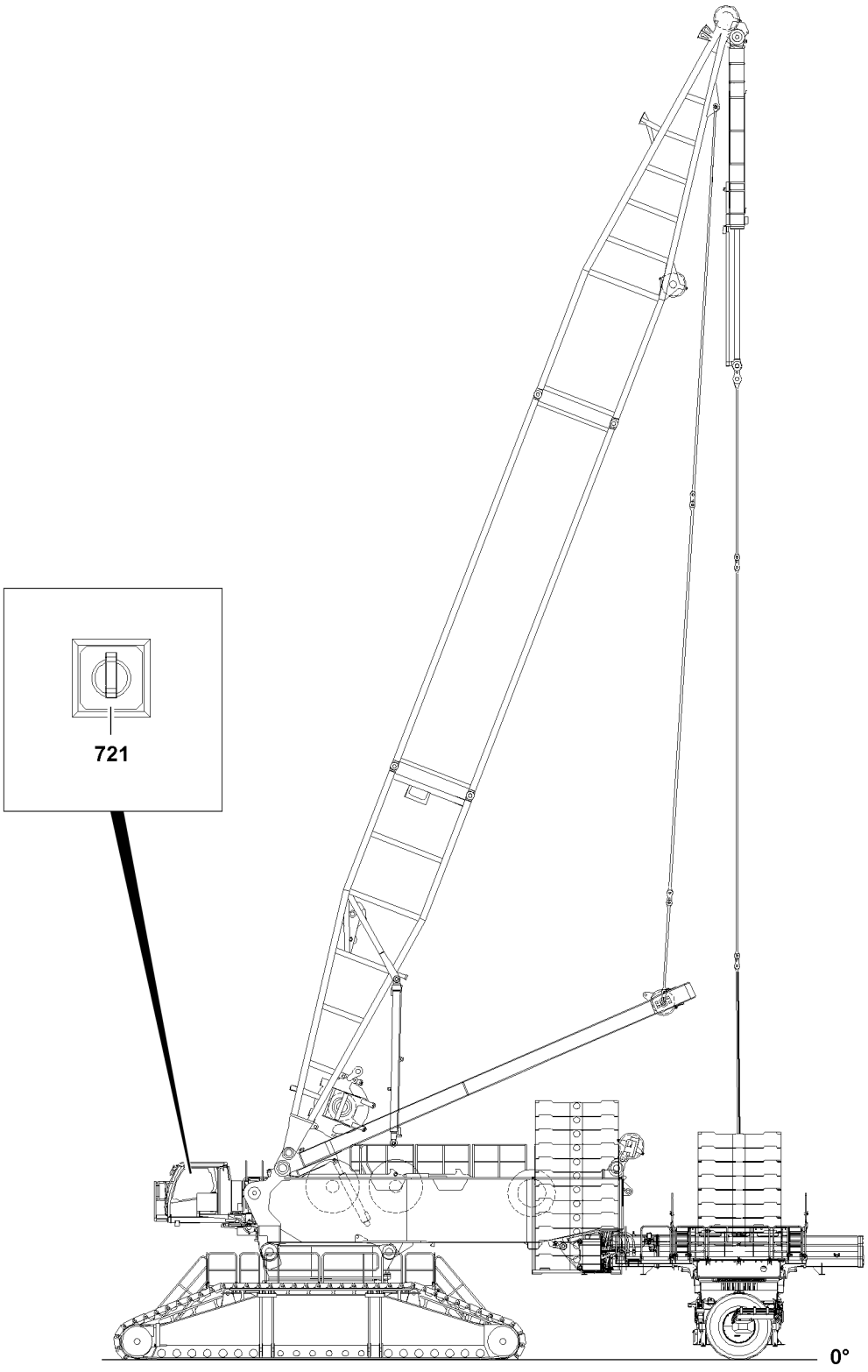

Fig.120243

With „driving the crawler“ and *derrick ballast lifted* key button **721** not pressed, that is „ballast trailer not lifted“, the slewing gear brake as well as the hydraulic slewing gear coasting are opened. When proceeding with „driving the crawler“ with **lifted off ballast trailer** (constant visual check), the *derrick ballast lifted* key button **721** must be used to turn on the „derrick ballast lifted“ function.

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DANGER
Danger of accident!
If the ballast trailer is lifted off the ground during „driving the crawler“ in the „towing“ steering program, the danger exists that the wind turns the turntable to the side.
- ▶ After lifting the ballast trailer off, the derrick ballast lifted **721** *key button* must be turned on immediately, so that the slewing gear brake remains closed for „driving the crawler“, however the hydraulic coasting remains open.
- ▶ However, if the wheel sets of the ballast trailer are not aligned accordingly, the ballast trailer or the crane will be damaged.

NOTICE
Danger of accidents when turning or driving!
If the lifted off ballast trailer scrapes on the ground - with the *derrick ballast lifted* key button **721** turned on - when turning or driving the crane, then the ballast trailer and the crane can be significantly damaged.
- ▶ If the ballast trailer has been lifted off the ground and *derrick ballast lifted* key button **721** is actuated, then it must be checked that the wheels do **not scrape on the ground**. An instructed person must check visually.
- ▶ It is prohibited to remain in the danger zone.

Note
- ▶ If the ballast trailer is suspended above the ground, the wheel sets can be in any position. If the „derrick ballast lifted“ function is turned on, the crane turning and driving are possible.

Note
- ▶ When the „derrick ballast lifted“ function is turned on, it is possible to turn the turntable or to drive the crane even though the wheel sets of the ballast trailer are not set to „Circular travel“, „Towing“ or „Parallel travel“.

Activate the „Derrick ballast lifted“function:

- ▶ Press the *derrick ballast lifted* key button **721**.

Result:

– A visual display appears on LICCON monitor LM2.

Note
- ▶ A visual display on the LICCON monitor LM2 shows the current status.

Turn off the „Derrick ballast lifted“function:

- ▶ Press the *derrick ballast lifted* key button **721** again.

Result:

– A visual display appears on LICCON monitor LM2.

10.4.6 Defined ballast trailer operation

DANGER
Danger of accident!
If the ballast trailer is operated in an undefined condition, it can result in severe accidents up to toppling of the crane.
Death, severe bodily injuries, property damage.
- ▶ The ballast trailer must always be in a defined condition.
- ▶ Operation of the ballast trailer in an undefined state is prohibited.

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The ballast trailer may not raised or set down when driving, rather this be done **before** starting to travel.

Ballast trailer lifted off

„Ballast trailer defined lifted from the ground“ means:

The ballast trailer is lifted from the ground and the *derrick ballast lifted* key button **721** is pressed. This does **not** open the slewing gear brake when „driving the crawler“. If should be ensured that the wind cannot turn the turntable.

Make sure that the following prerequisites are met:
- The ballast trailer has been completely lifted off the ground.
- The *derrick ballast lifted* key button **721** is pressed.
- A visual display appears on LICCON monitor LM2.

Ballast trailer on the ground

„Ballast trailer defined on the ground“ means:

That the ballast trailer and its residual load are resting on the ballast trailer tires and the *derrick ballast lifted* key button **721** is **not** pressed. This residual load is large enough to prevent the wind from turning the turntable, if the slewing gear brake is opened when actuating „Crawler travel“.

Make sure that the following prerequisites are met:
- The ballast trailer is positioned with a residual load on the ground.
- The *derrick ballast lifted* key button **721** is **not** pressed.

10.4.7 Undefined ballast trailer operation

DANGER
Danger of accident!
If the ballast trailer is operated in an undefined condition, it can result in severe accidents up to toppling of the crane.
Death, severe bodily injuries, property damage.
▶ The ballast trailer must always be in a defined condition.
▶ Operation of the ballast trailer in an undefined state is prohibited.

Ballast trailer lifted off

Note
▶ Only operate the ballast trailer in a defined condition.

„Ballast trailer undefined lifted off the ground“ means:

That the ballast trailer with a residual load of approx 1 t is placed on the ballast trailer tires and the *derrick ballast lifted* key button **721** is pressed. As a result, the slewing gear brake does **not** open when cornering the „crawler“ and the ballast trailer tires or the slewing gear brake slip.

Ballast trailer on the ground

Note
▶ Only operate the ballast trailer in a defined condition.

DANGER
Swinging load!
Severe accidents can occur due to swinging loads.
Death, severe bodily injuries, property damage.
▶ Operation of the ballast trailer in an undefined state is prohibited.

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„Ballast trailer undefined on the ground“ means: That the ballast trailer with a residual load of approx 1 t is placed on the ballast trailer tires and the *derrick ballast lifted* key button **721** is **not** pressed. This residual load is so small that the wind can turn the turntable, if the slewing gear brake opens when actuating „Crawler travel“.

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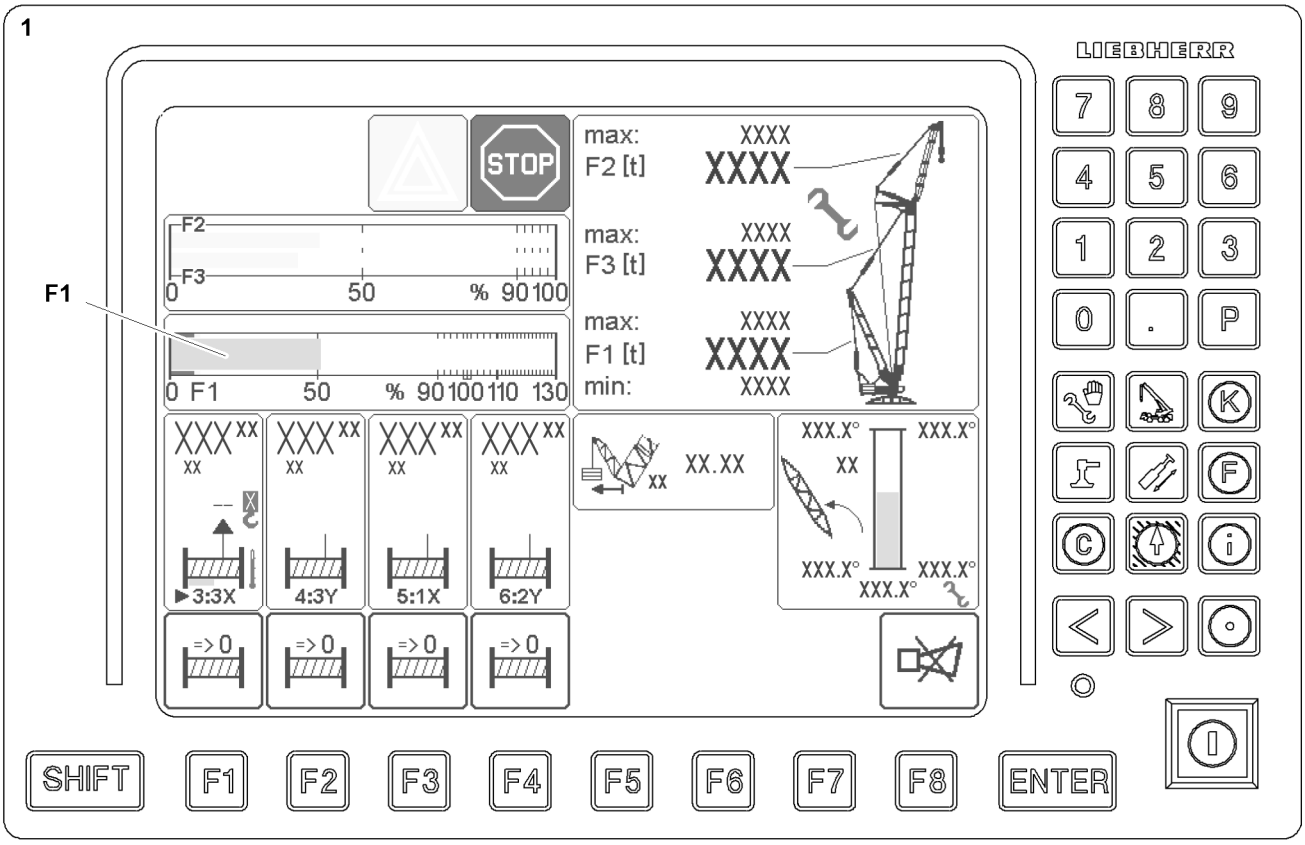
10.5 Crane operation with the derrick ballast



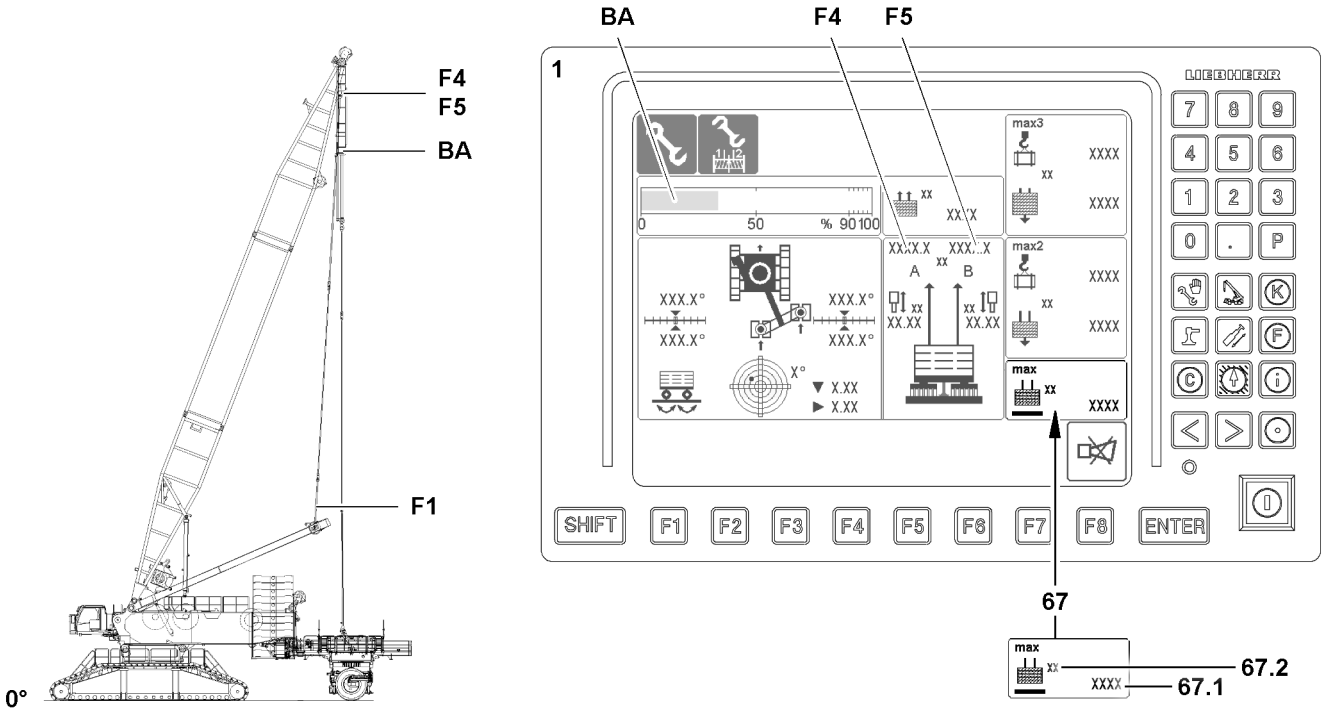


Fig.146971

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10.5.1 Safety guidelines

Note

- ▶ The test points must be checked for function before taking on crane operation.
- ▶ The weight of the load to be lifted must be known.
- ▶ There may be no obstacles within the slewing range of the crane, the suspended derrick ballast and the load.
- ▶ The lift off of the derrick ballast must be monitored by the crane operator or a guide.
- ▶ Before setting down the load and the suspended derrick ballast, the crane operator must make sure that a safe placement is ensured.
- ▶ The placement level of the ballast trailer, at the end of the load lift, must be level, horizontal and have sufficient load bearing capacity to safely take on the weight of the ballast trailer.

DANGER

Danger of accidents due to angular pull!
The crane can topple over by angular pulling of the load.
Death, severe bodily injuries, property damage.

- ▶ Angular pull is prohibited.
- ▶ When taking up the load, it must be ensured that the derrick ballast, the center of rotation of the turntable and the load are in one line.

When lifting the load, the guying between the derrick ballast and derrick end section must be relieved to the point where the actual force F1 ($F1_{actual}$) is larger than the F1 minimum force ($F1_{min}$).

DANGER

Danger of accident!
If the guying between the SA-frame and the derrick end section is without force ($F1\text{-}_{min}$ is fallen below), then this can lead to uncontrolled movements of the boom system and cause the crane to topple over.

- ▶ The guying between the SA-frame and the derrick end section, test point 1 **F1**, may never be without power.
- ▶ The F1-minimum force ($F1_{min}$) may not be fallen below.

10.5.2 LICCON overload protection

On cranes with derrick ballast, during operation also under load, by increasing or reducing the derrick ballast, the maximum load or the minimum load required for the balance of the crane, can be increased or decreased.

Note

- ▶ The suspended ballast and the ballast trailer are generally referred to as the **derrick ballast**.
- ▶ The fixed compensation weight that is installed on the turntable is generally referred to as the **counterweight**.

Make sure that the following prerequisites are met:

- The required derrick ballast according the load chart is placed and exactly entered and confirmed in the LICCON overload protection.
- The D-boom is in crane operating position.

Presettings

- ▶ Set the LICCON overload protection according to the data in the load chart and confirm.

Note

- ▶ Enter the actually present derrick ballast weight in the LICCON overload protection.
- ▶ Enter the actually present reeving in the LICCON overload protection.

- ▶ Enter the derrick ballast weight and derrick ballast radius into the LICCON overload protection, see chapter 4.02 and chapter 4.03.

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DANGER
Danger of accident due to set-up parameters!
Dangerous operational situations can occur due to an incorrect ballast entry.
Death, severe bodily injuries, property damage.
- ▶ The set derrick ballast must match the actually placed derrick ballast weight.
- ▶ All settings carried out in the „Set up“ program must agree with the actual settings on the crane.

▶ Check the settings.

Crane operation

Note
- ▶ For crane operation with derrick ballast, the data must be observed and adhered to, see chapter 4.02.

WARNING
Danger of toppling the crane!
The jerky execution / braking of turning maneuvers can cause the load or suspended derrick ballast to swing.
This can cause the boom to break or the crane to topple over.
Death, severe bodily injuries, property damage.
- ▶ There may be no persons or obstacles within the slewing range of the crane and the ballast trailer.
- ▶ While turning, a guide must watch the main boom, D-boom and derrick ballast for a danger of collision.
- ▶ The turning movement or braking must be initiated extremely carefully when turning with a load and suspended derrick ballast.

Note
- ▶ For crane operation, observe the section „lifting and lowering the ballast trailer with pull cylinders“ and „ballasting guying differential force monitoring“.

▶ Observe the extension condition of the pull cylinder and the inclination of the ballast trailer.

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10.5.3 Determination of forces in operating mode with derrick ballast

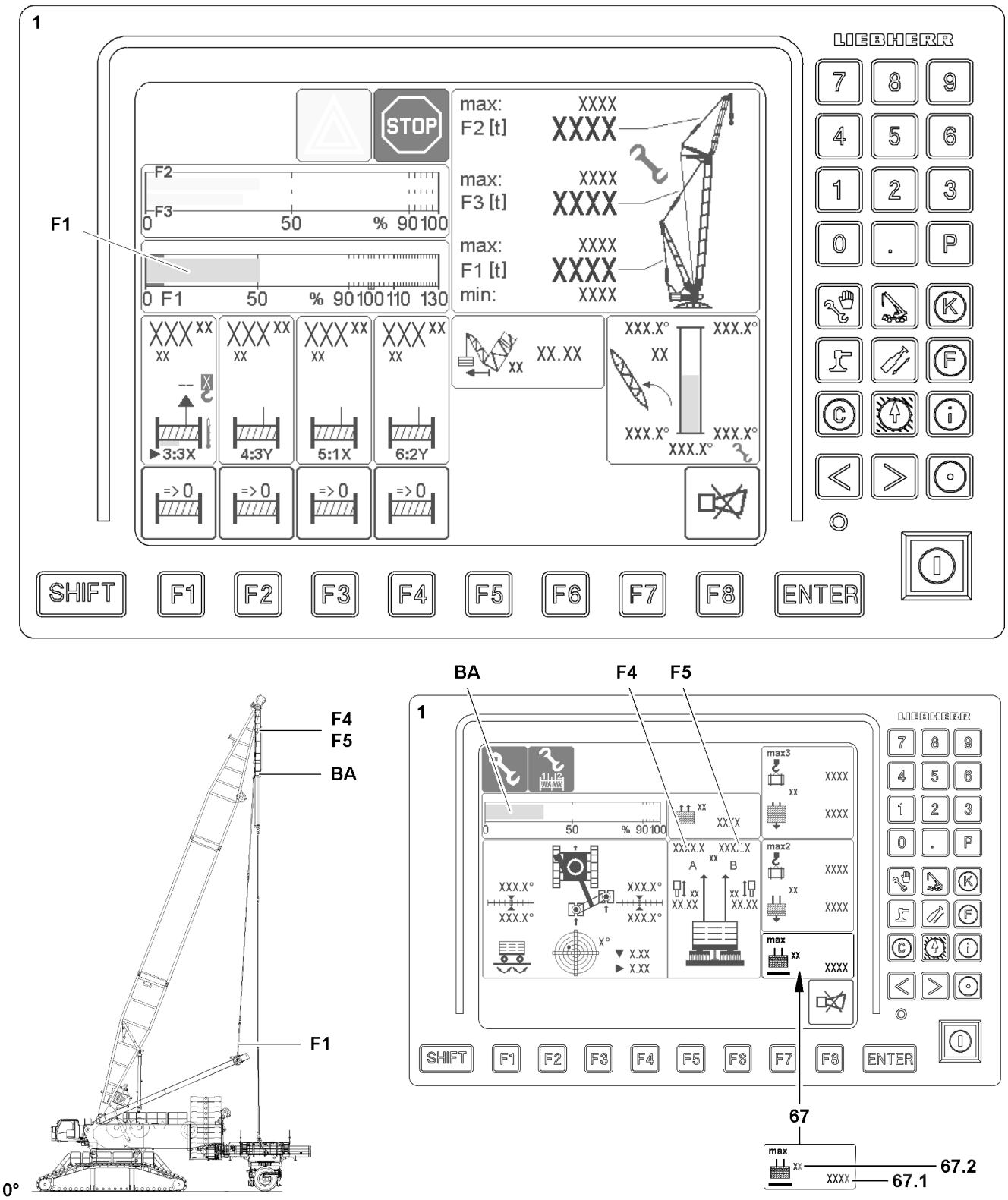

Fig.146971

In all operating modes with derrick ballast, the load is divided between the guy rods from the derrick head to the SA-frame (F1) and the derrick ballast (F4/5).

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Note
▶ See chapter 4.02.

Force F1 (test point 1) between guying SA-frame - derrick end section

The force F1 (test point 1) is determined in the guy rods from the SA-frame to the derrick head by 2 force test boxes and is shown on the LICCON monitor as total force of the guying.

From the „Operating force“ (F1) and the „Maximum operating force“ ($F1_{max\text{-}operation}$) results the F1-utilization. This is shown on the LICCON monitor on the utilization bar in percent.

Force F4/F5 (test point 4/5) guying derrick ballast - derrick end section

The forces F4/F5 (test point 4/5) are effective in the guy rods from the derrick ballast to the derrick head.

The existing forces in the guy rods (A = left and B = right) are calculated from the several pressure sensors, which are installed on the pull cylinders and shown in the LICCON monitor as individual forces.

The pulled ballast is calculated from the forces of the individual guyings, which means the part of the ballast pulled up by the guying. The remaining part is laying on the ground. The derrick ballast utilization results from the pulled ballast and the placed ballast. This is shown on the LICCON monitor with a utilization bar (BA in %).

Pull cylinder on block

DANGER
The crane can topple over!
By completely moving one or both pull cylinders in (block position moved in), the pressure increases strongly on the ring surface of the pull cylinder and the ballast weighing of the currently pulled derrick ballast is incorrectly calculated and displayed.
Death, severe bodily injuries, property damage.
▶ If the pull cylinders are „retracted“ in the block position, **crane operation is explicitly prohibited**.
▶ The forces in the derrick ballast guying A and B must be carefully monitored on the LICCON monitor.
▶ Potentially occurring error messages must be observed.

Maximum liftable derrick ballast

The *maximum liftable derrick ballast* **67** refers to the current crane condition and indicates the maximum derrick ballast that can be lifted off the ground with the pull cylinder or off the suspended ballast palette in case of the VarioTray without falling below the $F1_{min}$ force.

– **67** *Maximum liftable derrick ballast* icon
– **67.1** Maximum liftable derrick ballast
  • Maximum derrick ballast
– **67.2** Measuring unit
  • Measuring unit for display values in the *Pulled derrick ballast* icon **67**: [t] or [lb]

Monitoring of minimum force F1

If more than 50 percent of the set derrick ballast is being pulled (ballast utilization bar > 50 percent) and the minimum force $F1_{min}$ (test point 1) is fallen below, all crane movements that **increase load torque** are turned off.

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DANGER
Danger of accident!
It is prohibited to fall below the minimum force $F1_{min}$ (test point 1) if more than 50 % of the derrick ballast is pulled. If this is not observed, in case of loose guying from test point 1 (F1) and **derrick ballast on the ground**, the derrick ballast can suddenly lift off the ground due to the increased load moment and the boom system can suddenly move forward. This causes the load to swing back and forth too much, which could damage the boom and the crane.
▶ Do not fall below the minimum force - $F1_{min}$.

If more than 90 % of the set derrick ballast is being pulled (ballast utilization bar greater than 90 %) and the force drops below the minimum value $F1_{min}$ (test point 1) fall below, all crane **movements that increase the load moment** and all **crane movements that decrease the load moment** are turned off. This also turns the „spooling winch out“ movement of the hoist winches off.

DANGER
Danger of accident!
It is prohibited to fall below the minimum force $F1_{min}$ (test point 1) if more than 90 % of the derrick ballast is pulled. If this is not observed and the load torque is decreased when the guying is slack at test point 1 (F1) and the derrick ballast is suspended, the derrick ballast can drop to the ground, causing the boom system to move backwards. As a result, the relapse cylinders can be pressed on the block and be overloaded. There is the danger that the cylinders of the relapse cylinders on the boom and D-boom will be damaged.
▶ Do not fall below the minimum force - $F1_{min}$.

Note
▶ By switching on the assembly operation, the test point 1 - minimum force ($F1_{min}$) is reduced by a few tons, which allows one to reverse the movement and drive out from the situation in which the $F1_{min}$ shut-off occurred.
▶ This is the only exception on the crane, where, after a shut off, a load torque increasing movement can still be driven by activating the assembly operation.

DANGER
Danger of accident!
If the LICCON overload protection is bypassed / exceeded, there is no further protection against crane overload.
There is an increased danger of accidents.
Death, severe bodily injuries, property damage.
▶ The crane driver bears the complete and sole responsibility when bypassing the LICCON overload protection.

After a shut-off via $F1_{min}$, the force F1 on test point 1 must be increased by a movement. This can be obtained for example by reducing the pulled ballast. The LICCON overload protection is / exceeded and the F1-force continues to drop below the minimum force $F1_{min}$ which was reduced by bypass / exceedance, then the $F1_{min}$ shut off can no longer be bypassed.

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10.5.4 Overload monitoring in operating mode with derrick ballast

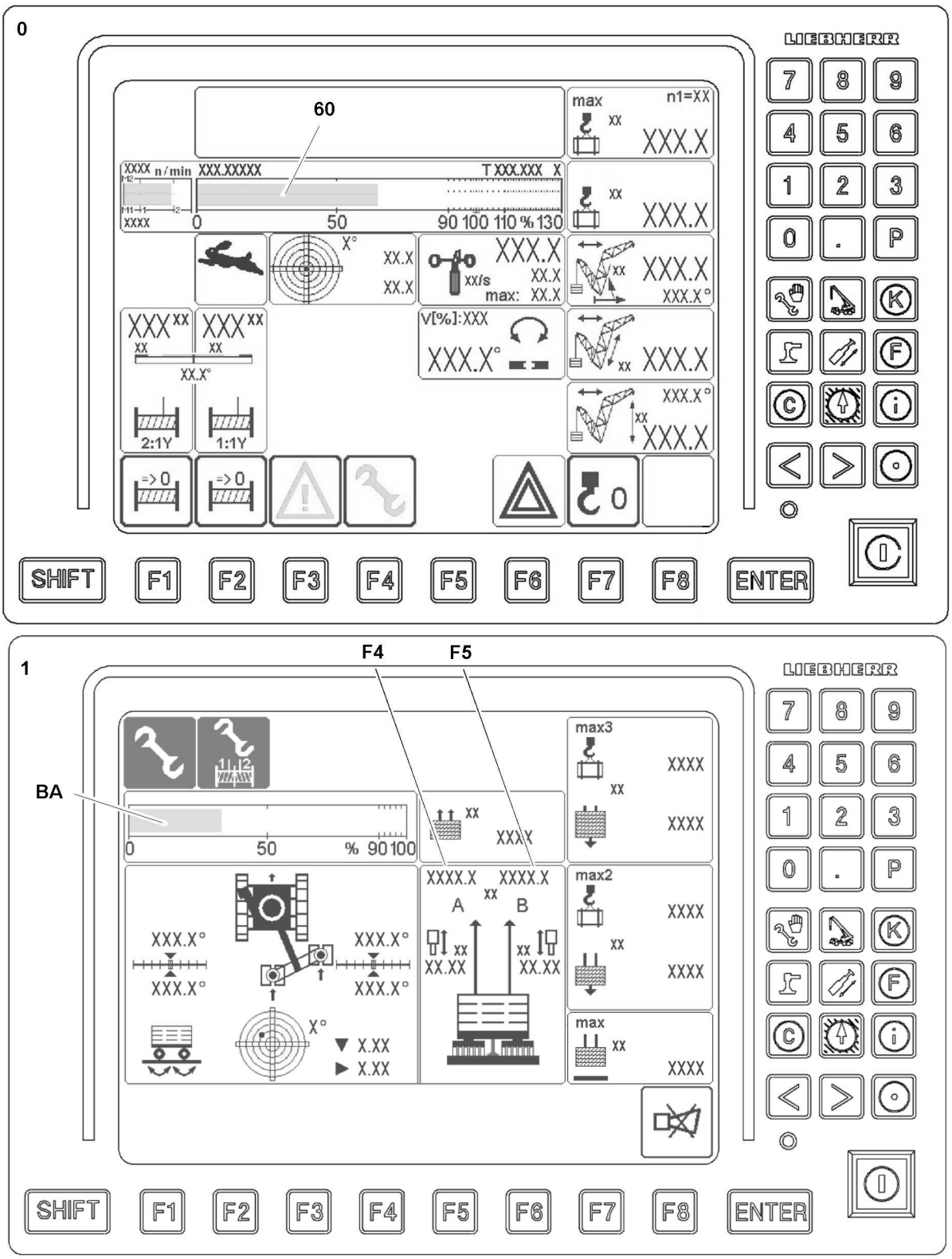

Fig.146970

In operating modes with derrick ballast, the „maximum load for the current crane condition“ is monitored two ways:

1. Monitoring of maximum load on the LICCON monitor 0
2. Monitoring of test point 1-operational maximum force LICCON monitor 1.

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Monitoring of maximum load on the LICCON monitor 0

It monitors the „maximum load according to load chart and reeving“.

In operating modes with derrick ballast, this is the maximum load of the current crane condition. It is shown on LICCON monitor 0. The current utilization of the crane results from the load utilization bar (1) on LICCON monitor 0.

If the load utilization bar reaches 90 %, an advance warning is given in the form of a „notice icon“ and a „SHORT HORN“ on LICCON monitor 0.

At 100 % on the load utilization bar, the shut-off of all load moment increasing movements with the „stop icon“ and the acoustical warning „HORN“ occurs on LICCON monitor 0.

Note

- ▶ The „maximum load of the current crane condition“ can possibly be increased further, refer to section „utilization conditions“.

Monitoring of test point 1-operational maximum force (= $F1_{max}$ operation)

It is shown on LICCON monitor 1. When F1 is greater than $F1_{max\text{-}shut\text{-}off\ value}$, a shut off of all movements which could increase load torque occurs with the „stop icon“ and the acoustic warning „HORN“ by LICCON monitor 1.

Note

- ▶ The maximum load can be safely monitored by the „LICCON overload protection“ itself.
- ▶ The „$F1_{max}$ monitoring“ is an additional monitoring function, which prevents the overload of the crane parallel to the „LICCON overload protection“.
- ▶ When the permissible maximum load can not be lifted because a „$F1_{max}$ shut-off“ has stopped the crane before, then the current „F1-force“ must be reduced by increasing the pulled ballast.
- ▶ Make sure that the ballast weighing and the shut off to the maximum load function reliably.

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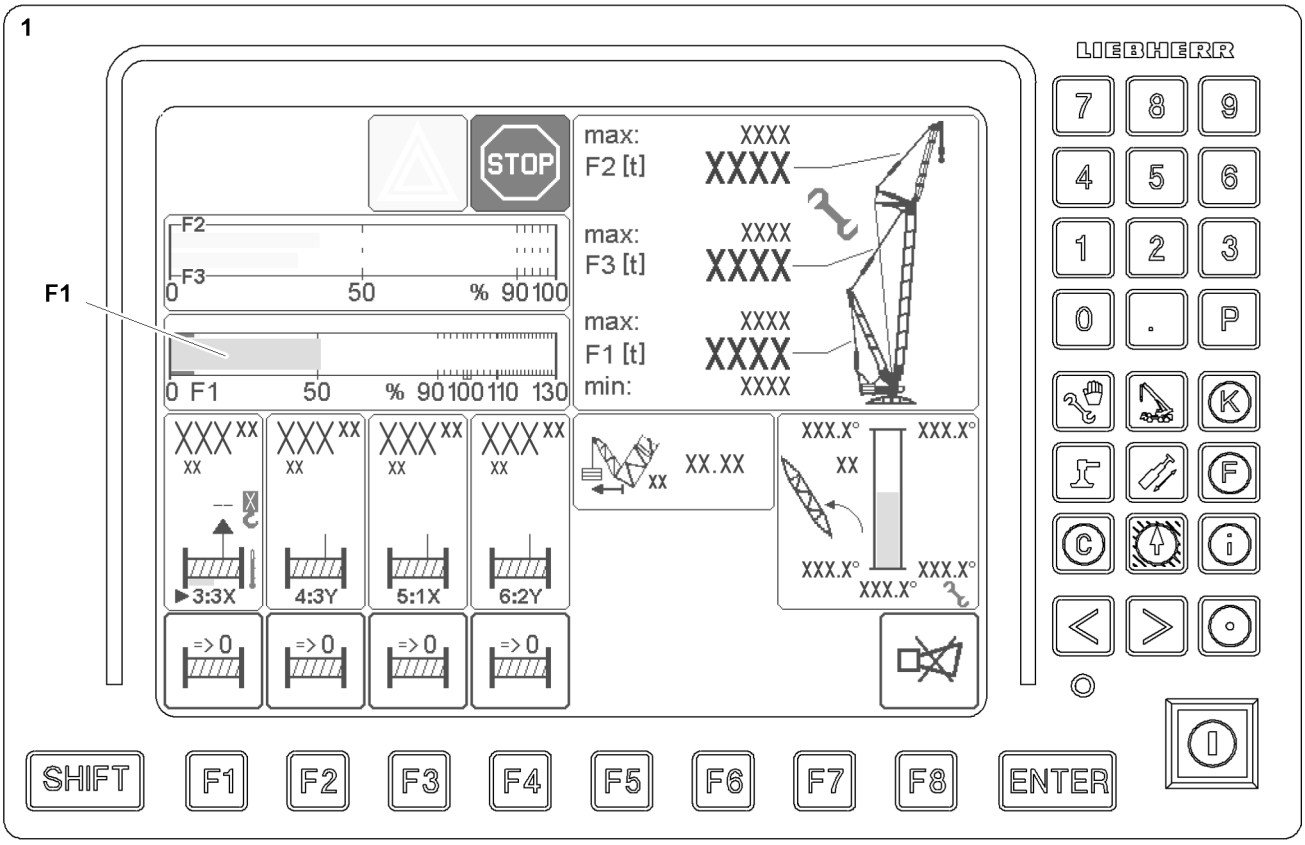

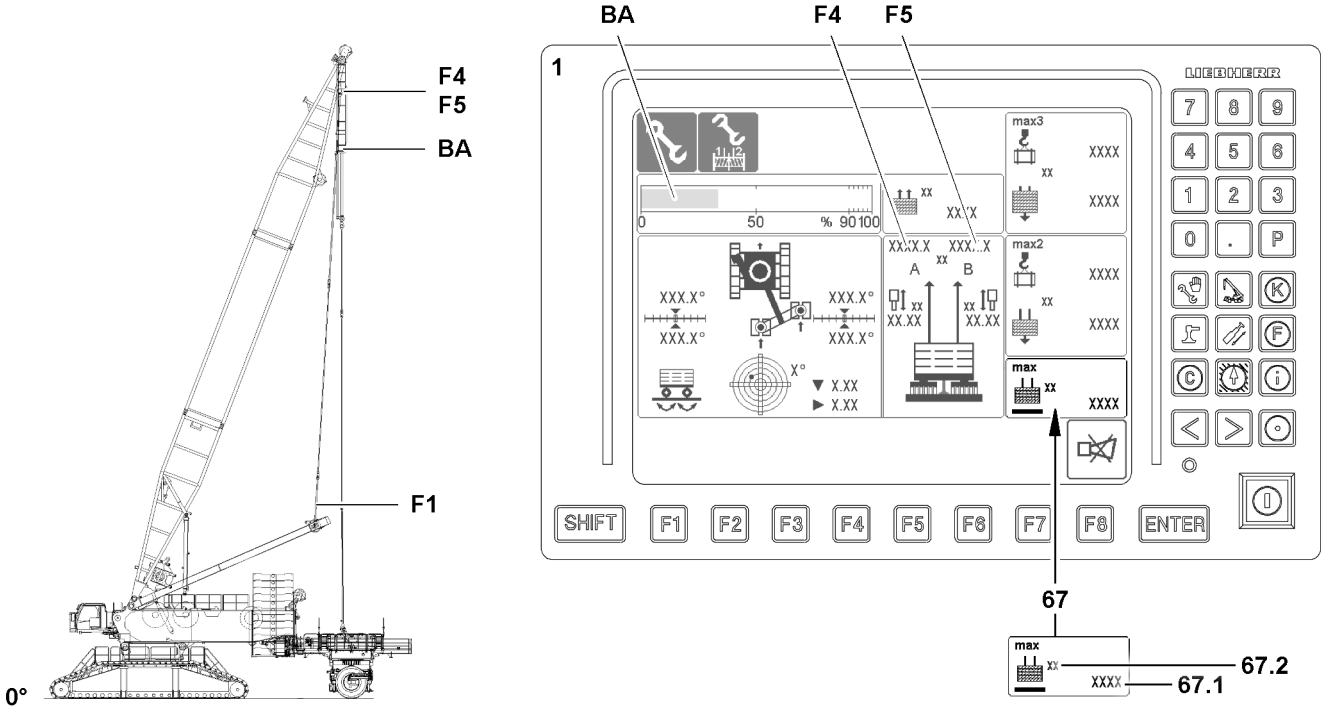

Fig.146971

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WARNING
Danger of accident!
- ▶ The test point 1-Operation-Maximum force not only depends on the current set up configuration but also on the force measured with the pressure sensors in the pull cylinders.
- ▶ If the pulled derrick ballast is larger, then the maximum permissible $F1_{max}$ force is generally reduced and vice versa.
- ▶ Monitor the ballast weighing and the value for the pulled derrick ballast exactly.

DANGER
The crane can topple over!
If the pulled derrick ballast value has been incorrectly determined and is too low, the calculated $F1_{max}$ may be too high and the crane could be overloaded or topple over without this becoming evident.
- ▶ Carefully monitor the displays on the LICCON monitor.

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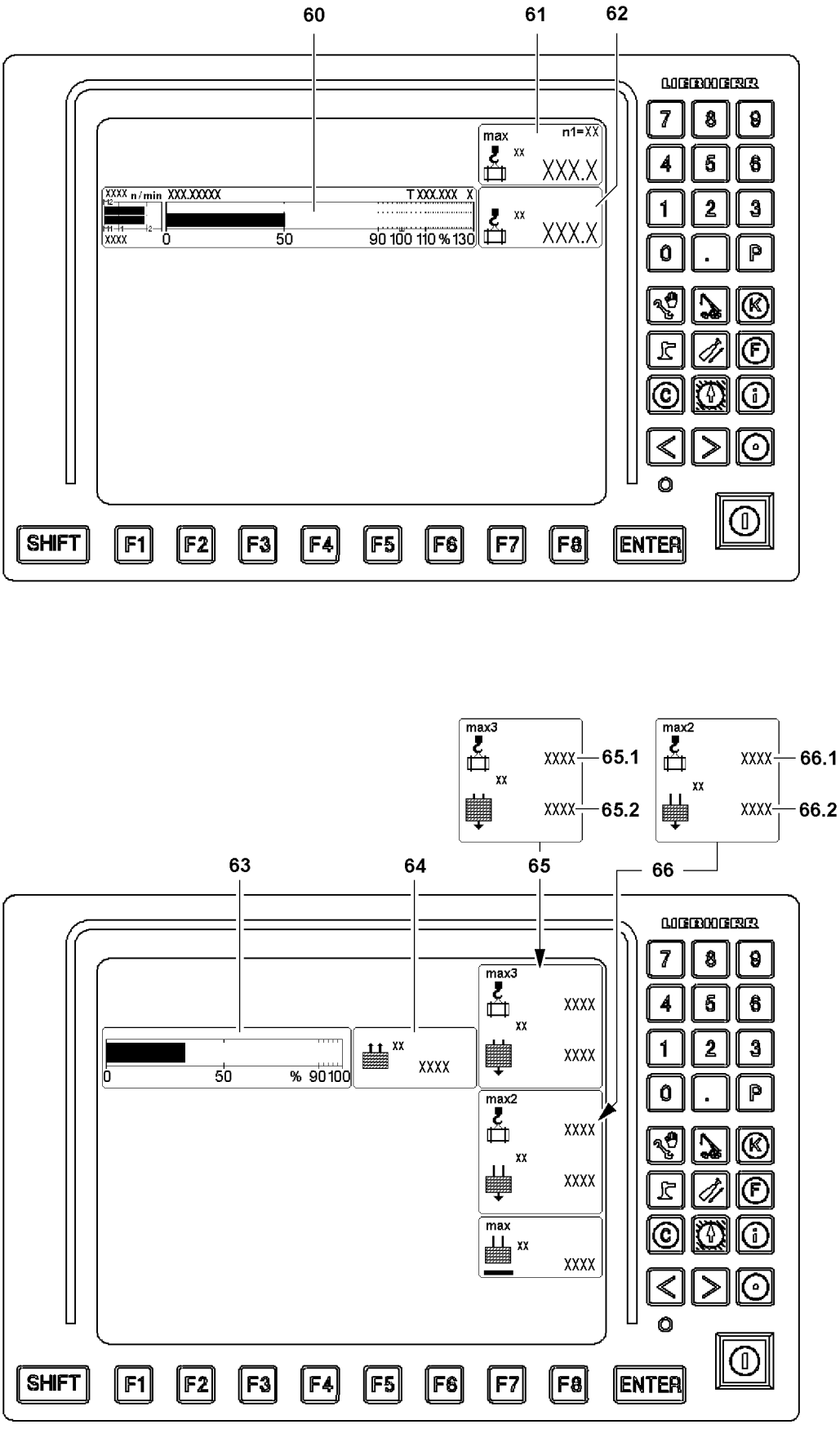

Fig.146969

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Utilization conditions

The current percentage utilization of the crane is displayed as „bar diagram utilization“ **61** in the right LICCON monitor.

Additional displays:
- **66** „Load max2“ icon
  - Currently placed derrick ballast = BA_{placed} (Input value in set up program) **66.2**
  - Possible load with currently placed derrick ballast = $Load_{max2}$ **66.1**
- **65** „Load max3“ icon
  - Maximum derrick ballast according to load chart = BA_{max} **65.2** (Highest value in Set up program)
  - Possible load with maximum derrick ballast according to load chart = $Load_{max3}$ **65.1**

Maximum load, right LICCON monitor:
- The maximum load in the current operating condition is reached when the utilization bar shows 100 % in the „bar diagram utilization“ **60**.
  This is the case when the „utilization of the crane according to the load chart and reeving“ reaches 100 % (Values in icon „Maximum load“ **61** and in icon „actual“ **62** are equal).
  When the „Maximum load“ **61** is smaller or the same as the $load_{max2}$ **66.1**, then an increase might possibly be obtained:
  - By increasing the pulled derrick ballast BA_{pulled} **64**, if the utilization bar derrick ballast **63** is not yet at 100 % (derrick ballast not suspended).
  - By increasing the derrick ballast when the BA_{placed} **66.2** is smaller than BA_{max} **65.2**.
  - By changing the derrick ballast radius within the permissible range, see load chart manual or LICCON job planner.

max2-load, icon „load max2“ **66**:
- The highest possible load in current operating condition **„max2-load“** is reached when in the „bar diagram utilization“ **60** 100 % is shown **and** the utilization bar derrick ballast **63** is at 100 % (Derrick ballast is completely lifted off the ground).
  This is the case when the value in icon „Actual load“ **62** is the same as the $load_{max2}$ **66.1**.
  When the $load_{max2}$ **66.1** is smaller or the same as the $load_{max3}$ **65.1**, then an increase might possibly be obtained:
  - By increasing the derrick ballast by loading additional ballast plates (increase BA_{placed} **66.2** to BA_{max} **65.2**).

max3-load, icon „load max3“ **65**:
- The highest possible load at the maximum derrick ballast in current operating condition **„max3-load“** is reached when the „bar diagram utilization“ **60** displays 100 % **and** the utilization bar derrick ballast **63** is at 100 % (Derrick ballast according to load chart is placed and is completely lifted off the ground).
  This is the case when the value in icon „Actual load“ **62** is the same as the $load_{max3}$ **65.1**.
- The maximum derrick ballast according to the load chart is placed and completely pulled. Further increase of the derrick ballast is impermissible.

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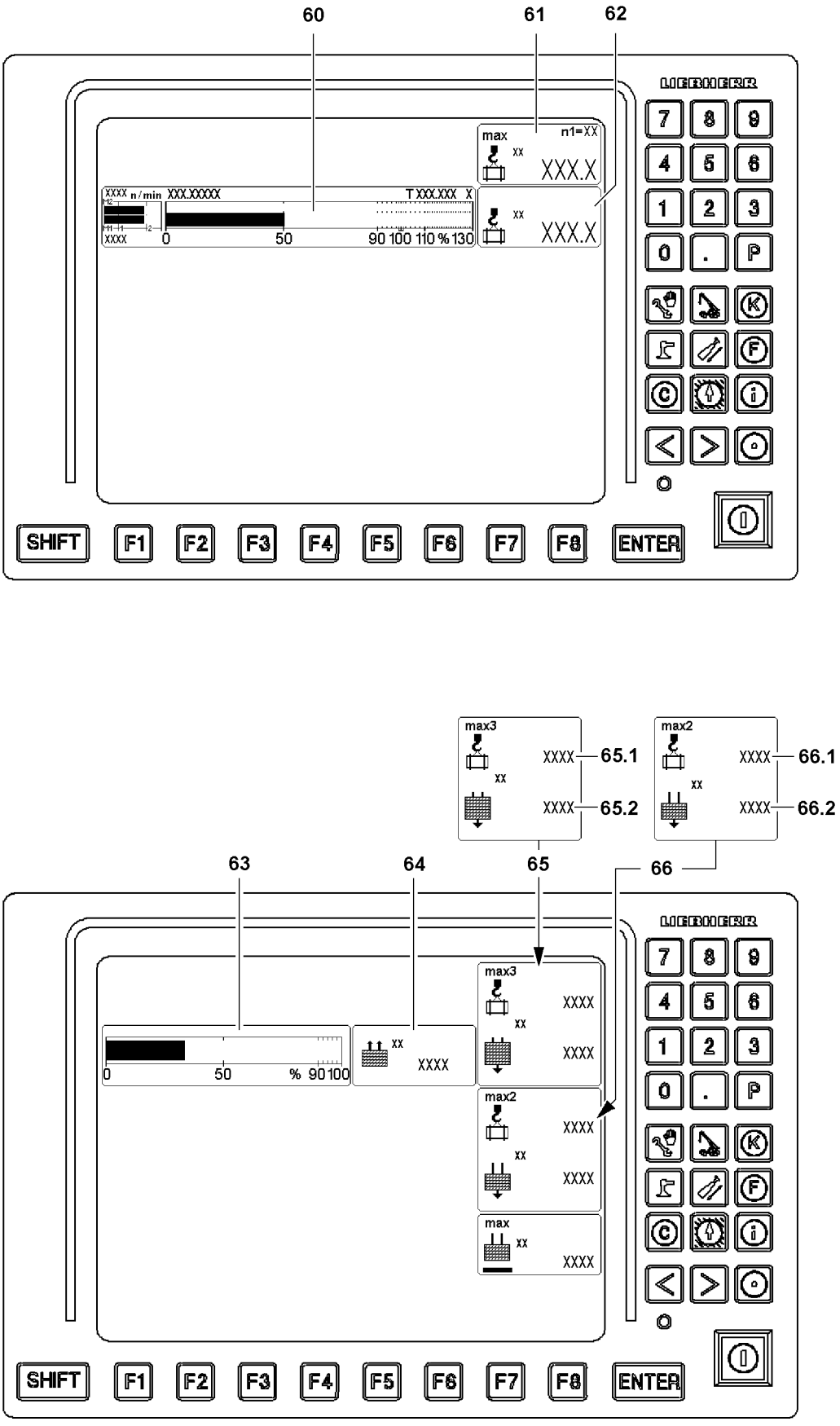

Fig.146969

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The bypass of the maximum load according to the load chart and reeving (crane utilization bar **60 is at 100 percent) can be bypassed by activating the assembly operation.**

Activate assembly operation, see chapter 4.02.

Note

▶ The test point 1-assembly - maximum force shut-off (= F1 max-assembly) cannot be bypassed.

WARNING

Danger of accident when bypassing / exceeding the LICCON overload protection!
If the shut off limits of the LICCON overload protection are bypassed / exceeded, there is no additional protection against overload.
Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.

▶ The function „Exceedance of shut off limits of the LICCON overload protection“ may only be activated or used in emergencies and for assembly purposes.
▶ The function „Exceedance of shut off limits of the LICCON overload protection“ may only be activated or used by an authorized person who knows the effects of the bypass exactly.
▶ The „Exceedance of the shut off limits of the LICCON overload protection“ may only be carried out „anticipatorily“ and with utmost caution!
▶ The „Exceedance of shut off limits of the LICCON overload protection“ is only permissible if the set up configuration of the crane has been entered correctly into the LICCON computer system and has been confirmed.

10.5.5 Checking the length sensor value on the ballast trailer

CAUTION

Danger of accident!
If the derrick ballast radius is measured incorrectly, the false radius value will result in the calculated maximum lifted load and F1-Operation-max-force being too high.
The crane will be overloaded unnoticed and can topple over.
Death, severe bodily injuries, property damage.

▶ The crane driver may not rely blindly on the derrick ballast radius measurement, but he must think for himself and check, if the measurement is still working correctly.
▶ If the derrick ballast is fully telescoped out or in, the display „Derrick ballast radius“ must show almost the end position of the radius 13 m or 19 m.
▶ Depending on the installed intermediate sections, the end positions also change.

Note

▶ When telescoping the ballast trailer guide, the indicator must change the display „Derrick ballast radius“ on the LICCON monitor corresponding to the movement of the derrick ballast. If this is not the case, the crane operator can immediately recognize that if the length sensor rope drum jams when spooling in or out.
▶ When telescoping out and in and no length change on the rope length sensor occurs, then an error is issued.
▶ If a length change is recognized without actuation, then the pressure supply for the ballast trailer is turned off, the error must be remedied.

▶ When telescoping the derrick ballast in and out, the „Derrick ballast radius“ display must be observed carefully on the LICCON monitor.

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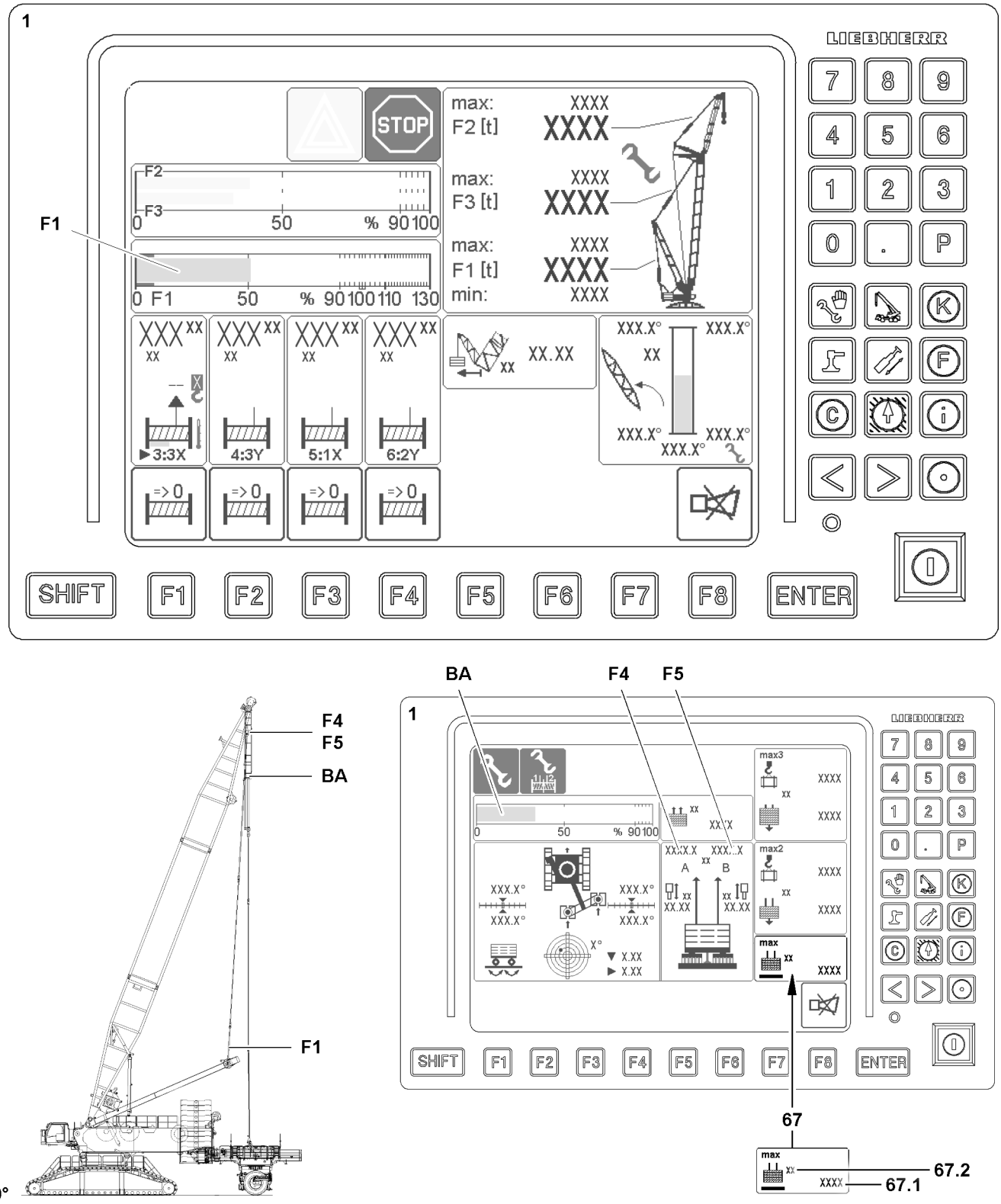

Fig.146971

10.5.6 Difference force monitoring of ballast guying

In operating modes with derrick ballast, the difference between the forces on derrick guying A and B is monitored on LICCON monitor 1. If the difference exceeds a permissible value, an acoustic warning is issued and the two force values blink.

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WARNING
Danger of accident due to damaged crane components!
Too high a difference in the derrick ballast guying A and B can have the result that the derrick ballast moves in an impermissible inclined position, and thereby the derrick end section, the ballast guide or other crane components may be damaged.
Death, severe bodily injuries, property damage.
▶ The forces in the derrick ballast guying A and B must be carefully monitored on the LICCON monitor.

Exceeding the limit value can have the following causes:
– Picking up the load by:
Relieving the tires on the ballast trailer or flexing of the turntable.
– The ground under the derrick ballast is uneven.
– The crane is leaning to one side.
– The derrick ballast is loaded one-sided.
– The force measurement in one derrick ballast guying is incorrect.

The crane driver must recognize the correct cause and take countermeasures:
– Error message appears.
– The error, which caused the one-sided force, must be remedied.
– The following measures are permitted providing the ground is only slightly uneven:
Lock one pull cylinder and with the other pull cylinder lift the derrick ballast or „Derrick ballast lower“ activate until the difference between the forces A and B is smaller.
– If the sensor values are implausible: Check if the pressure sensors for the ballast weighing supply plausible values and replace them, if necessary.

11 Disassembling the ballast trailer

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
If this is not observed, the assembly personnel can fall down.
Death, severe bodily injuries, property damage.
▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see chapter 2.04.
▶ If fall protection equipment is available, then it must be used, see chapter 2.06.
▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
▶ Only step on the aids, ladders and catwalks with clean shoes.
▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
▶ Remaining on a suspended load is prohibited.
▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

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WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

WARNING
The crane can topple over!
If the following danger notes are not observed, the ballast plates or the ballast stack can slip on the ballast trailer and fall down.
The crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ The ground on which the ballast trailer is ballasted must be level and have adequate load-bearing capacity.
- ▶ Remove the ballast plates always symmetrically, in reference to the longitudinal axis.
- ▶ The outer ballast stacks must always weigh the same and be the same height after ballasting.
- ▶ The maximum permissible weight of the ballast trailer is 450 t.
- ▶ Secure all ballast plates so they cannot move and fall down during take down.
- ▶ Replace damaged ballast plates immediately with new ballast plates.

WARNING
Ballast trailer tipping danger!
Due to improperly carried out assembly or improper assembly conditions, the ballast trailer can tip over.
Death, severe bodily injuries, property damage.
- ▶ The assembly of the ballast trailer may only be carried out by authorized personnel.
- ▶ The ballast trailer has **no** brake system. The ballast trailer must be supported with the support cylinders if it is **not** pinned on the turntable.
- ▶ Before unpinning the ballast trailer on the turntable it must be ensured that the stability and tipping safety of the ballast trailer is ensured, see section „Stability and tipping safety for ballast trailers not assembled on the turntable“.

Note
- ▶ Observe the information in the erection and take-down charts when taking down the boom equipment.

Make sure that the following prerequisites are met:
- The boom equipment is placed down.
- An auxiliary crane and a lifting platform are available.
- The ballast retainers are removed.
- The ballast trailer steering program(s) are deactivated, see section „Deactivating steering programs for assembly / disassembly purposes“.

11.1 Installing the extension ladder on the ballast trailer guide

Note
- ▶ Assembly of the extension ladder, see chapter 2.06.

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11.2 Ballasting the ballast trailer down

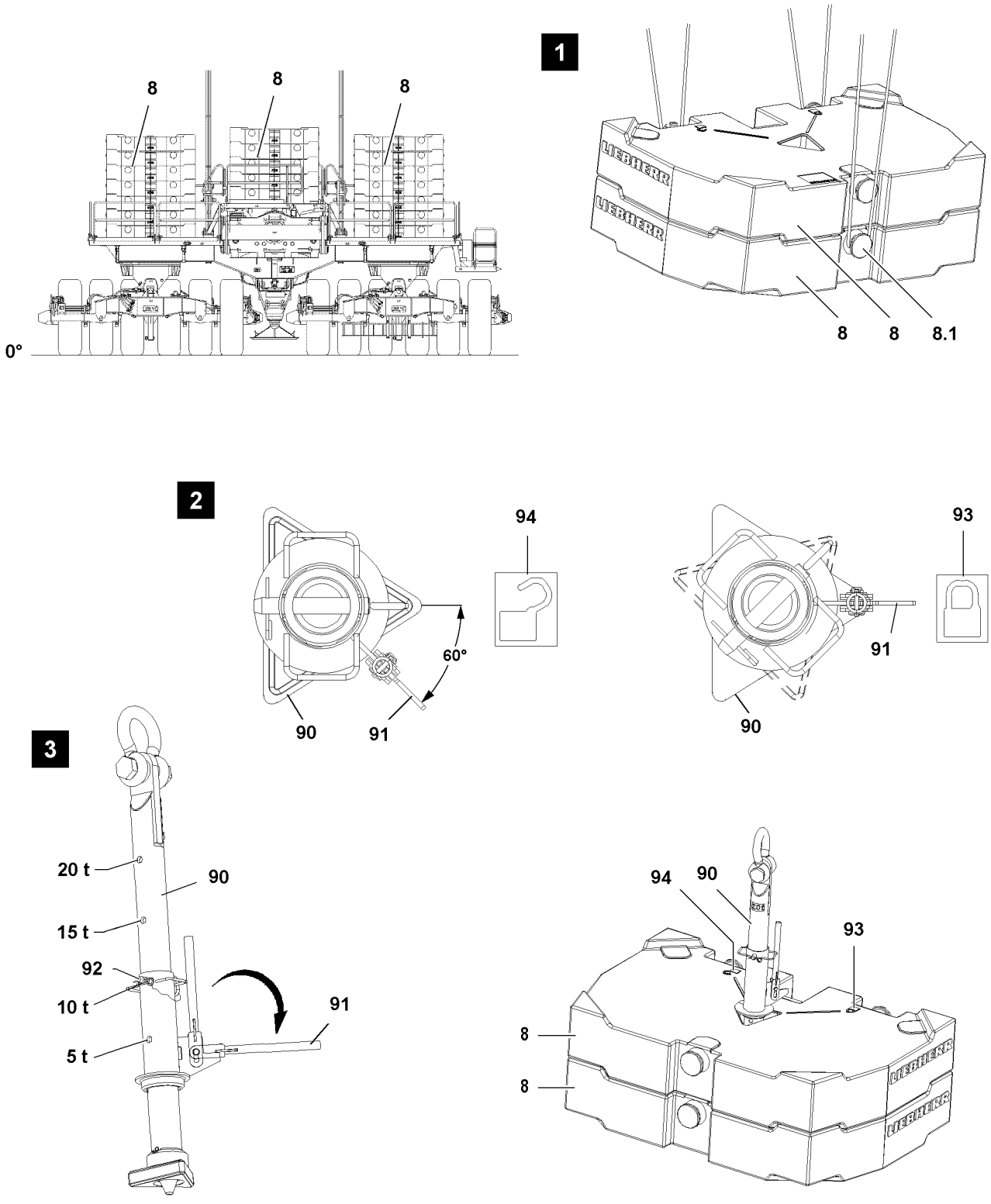

Fig.121945: Ballast plates

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WARNING
Toppling ballast trailer!
Death, severe bodily injuries, property damage.
▶ Make sure that only a quantity of ballast plates are removed from the ballast trailer in order to guarantee **at all times** the stationary stability of the ballast trailer after unpinning on the turntable.

WARNING
The crane can topple over!
If more than 20 t are removed with one lift from a ballast stack or if the ballast is removed asymmetrically, then the crane can topple over.
Death, severe bodily injuries, property damage.
▶ A weight difference between the right and left ballast stack of more than 20 t * is prohibited.
▶ Alternately remove no more than maximum 20 t ballast assemblies from the ballast stack, symmetrically on the left and right.

Note
▶ The ballast plates are marked with their own weights.

11.2.1 Removing the ballast plates, fastening system: „Twistlock“

DANGER
Danger of accident!
If more than the permissible two ballast plates are lifted with the receptacle stud, the receptacle stud will be overloaded and can be damaged.
Death, severe bodily injuries, property damage.
▶ Make sure that the ballast plates are placed correctly in the centerings.
▶ Replace damaged ballast plates.

To remove the ballast plate(s) **8**, use the receptacle stud **90**.

Before the receptacle stud **90** is guided into the ballast plates, it must be ensured that the length of the receptacle stud **90** is set correctly. The length of the receptacle stud **90** can be adjusted with the pin **92**, see illustration **3**.

If the length of the receptacle stud **90** is to be adjusted:
▶ Release and unpin the pin **92**.
▶ Adjust the length of the receptacle stud by moving the receptacle stud **90**.
▶ Insert the pin **92** and secure with the spring retainer.
▶ Attach the receptacle stud **90** on the auxiliary crane and guide it into the ballast plate(s).
▶ Pull the lever **91** up and fold it down.
▶ Turn the lever **91** by 60° until the lever **91** points to the icon **93**. See illustration **2**.

Result:

– The receptacle stud **90** is locked with the ballast plate.

▶ Lift the ballast plate with the receptacle stud **90** and remove it from the ballast stack or the ballast pallet.
▶ Turn the lever **91** by 60° until the lever **91** points to the icon **94**. See illustration **2**.

Result:

– The receptacle stud **90** is unlocked from the ballast plate.

▶ Carefully pull the receptacle stud **90** from the ballast plate.
▶ Alternately remove the ballast plates on both sides.

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11.2.2 Removing the ballast plates, fastening points: Bitt

WARNING
Falling ballast plates!
If more than the permissible loads are lifted, then the bitts **8.1** are overloaded and the ballast plates can fall down.
Death, severe bodily injuries, property damage.
- ▶ Lift no more than maximum 20 t with the ropes, 3 fastening points.
- ▶ Replace damaged ballast plates immediately.

WARNING
Incorrect handling of the fastening equipment!
If fastening equipment cannot be attached correctly and if it is not secured sufficiently to prevent it from loosening up, loads can fall down.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the fastening equipment is correctly attached on the bitts **8.1** and that it is secured sufficiently to prevent it from loosening up.

Note
- ▶ Remove the ballast plates individually or as a ballast assembly, maximum 20 t.
- ▶ The weight difference between the outer ballast stacks no more than maximum 20 t.
- ▶ 20 t ballast assembly, see illustration **1**.

- ▶ Lift the ballast plate **8** or ballast assembly, see illustration **1** and remove it from the ballast stack or the ballast pallet.

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11.3 Supporting the ballast trailer

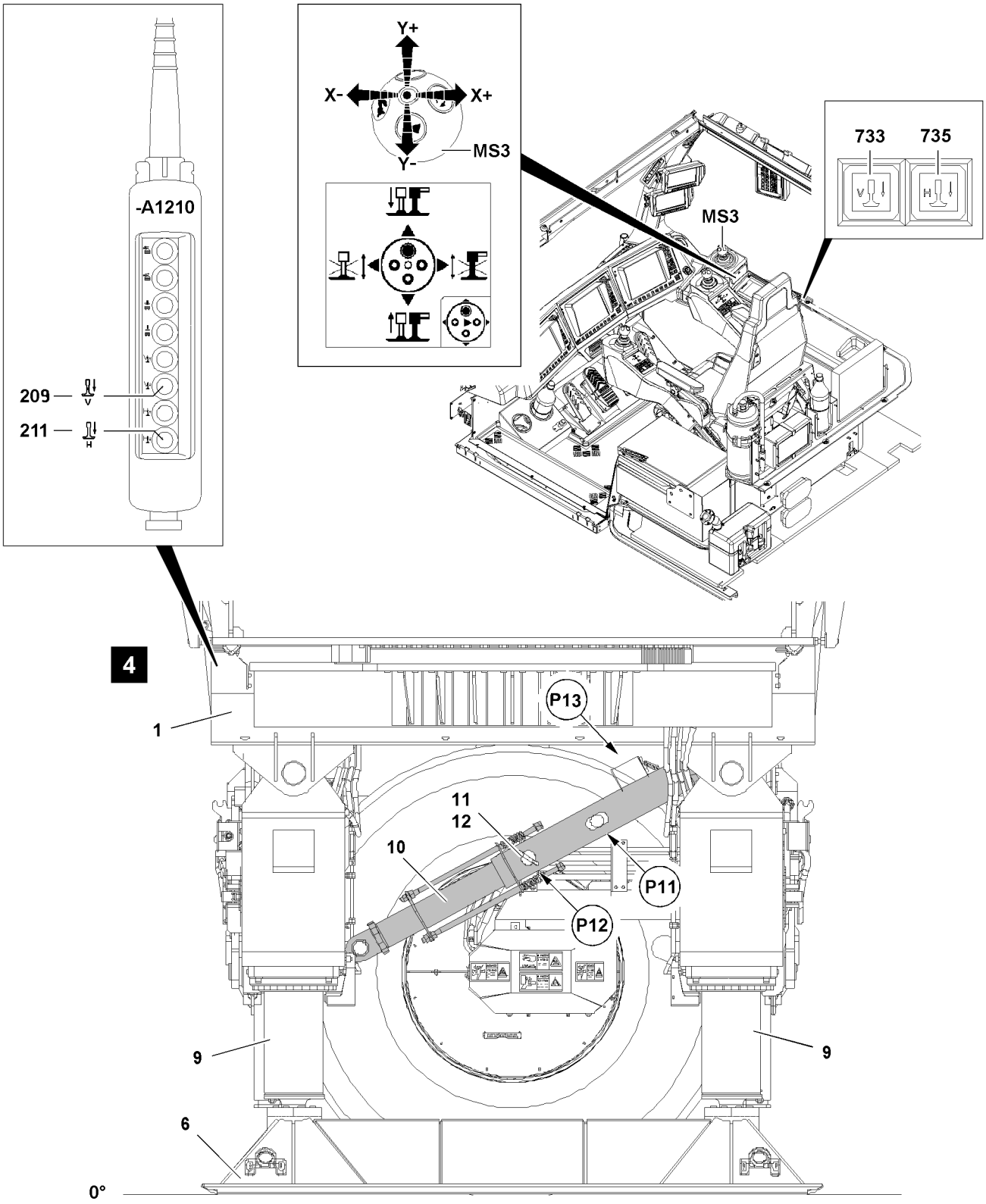

Fig.145926: Ballast trailer support

The support cylinders **9** can be operated via the control panel **-A1210**, or via the corresponding button on the instrument panel of the crane cab.

The ballast trailer must be supported before unpinning it from the turntable.

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Make sure that the following prerequisites are met:
- Pay attention to the „assembly condition of the ballast trailer“.
- The ballast trailer guide is retracted until the shut-off caused by the control.
- The crane is horizontally aligned.

11.3.1 Pinning the strut on the ballast trailer

WARNING
Ballast trailer tipping danger!
If the ballast trailer is not installed on the turntable and the ballast trailer guide is not fully retracted, the ballast trailer can tip over.
Death, severe bodily injuries, property damage.
- ▶ Before removal of the ballast trailer on the turntable, the locking pin **11** must be pinned on strut **10** of the ballast trailer at point **P12** and secured with the spring retainer **12**, see illustration **4**.
- ▶ The support **6** is extended to the point where the tires are relieved, see illustration **4**.

- ▶ Release the locking pin **11** at point **P11** and unpin.
- ▶ Insert the locking pin **11** in transport position at point **P12** and secure with spring retainer **12**, see illustration **4**.

11.3.2 Extending the support cylinders

Move the front and rear support cylinders out:

- ▶ Press the button **733** and button **735** in the crane cab.
  or
  Press the button **209** and button **211** on the control panel **-A1210**.
  or

When the corresponding master switch assignment is selected:
Move the master switch **MS3** in direction **Y+**.
- ▶ Visually inspect the extended support cylinder.

11.4 Removing the ballast trailer on the turntable

11.4.1 Extending the supply lines between the turntable and the ballast trailer

Depending on the local circumstances at the job location of the crane, it may be necessary when assembling / disassembling the ballast trailer to extend the electrical lines between the turntable and the ballast trailer with the extension lines.

This can ensure that after unpinning the ballast trailer guides from the turntable, they can be retracted enough so that the slewing range of the turntable is not limited by the ballast trailer guide.

WARNING
Danger of accident due to loss of pressure or leakage!
Death, severe bodily injuries, property damage.
- ▶ Make sure that the specifications for establishing and disconnecting hydraulic and electrical connections are observed.

- ▶ Assemble the electrical extension lines between the turntable and the ballast trailer.
- ▶ Assemble the hydraulic extension lines between the turntable and the ballast trailer.

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11.4.2 Disassembling the ballast trailer guying

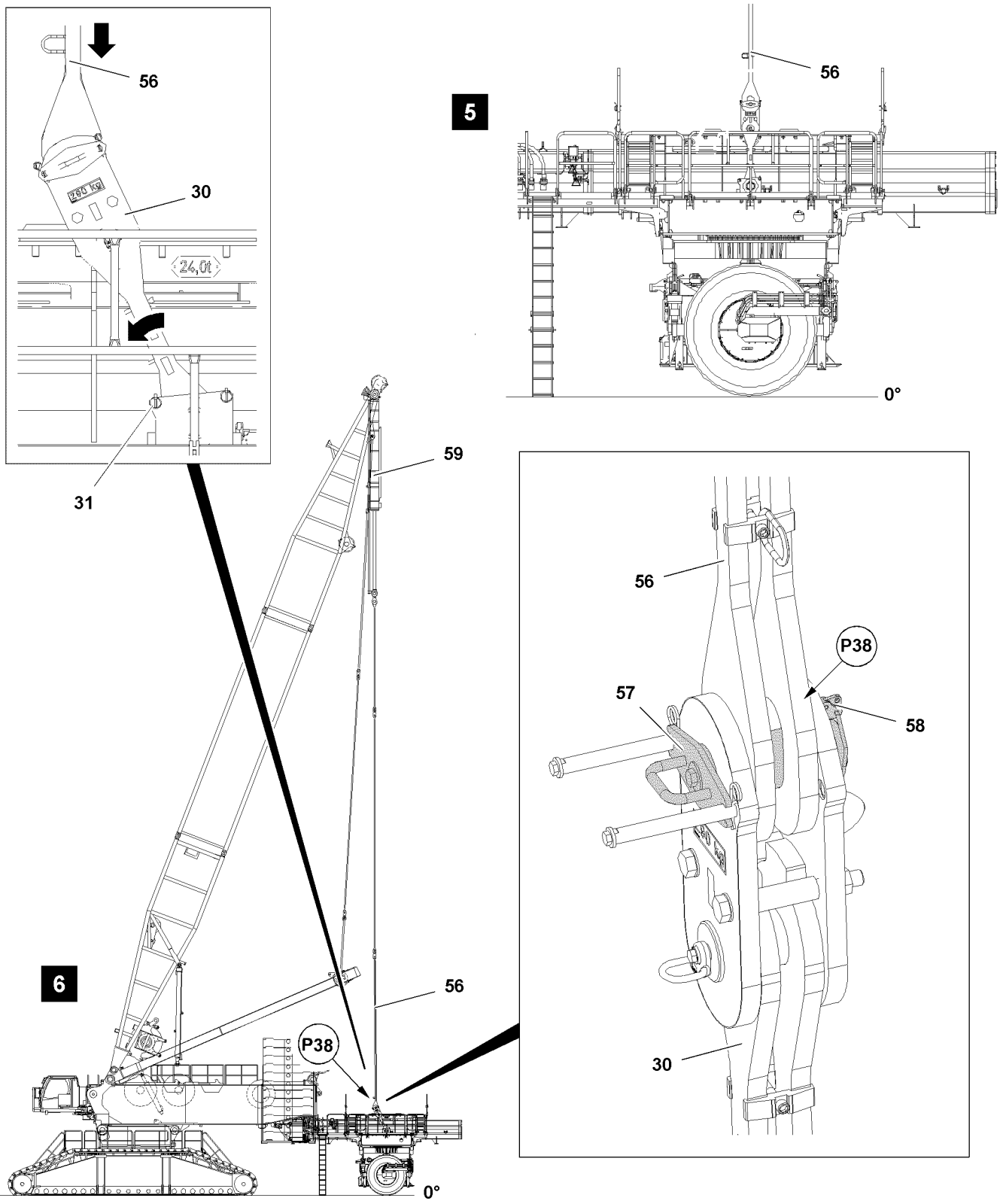

Fig.121014: Ballast trailer guying

Unpinning the guy rods

Make sure that the following prerequisite is met:
- The guy rods are relieved.

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▶ Extend the pull cylinder **59** until the pull brackets **30** are placed on the pin **31**, see illustration **6**.

Note
Retract / extend the pull cylinder **59**
▶ Control the pull cylinders **59** from the crane cab or with the control panel, see section „lifting and lowering the ballast trailer with the pull cylinders“.
▶ Operate the pull cylinder **59** with the radio remote control, see the „radio remote control operating instructions“.

The guy rods **56** of the derrick boom are to be unpinned on the pull brackets **30**. The connector pins **57** are held in „pulled“ condition by the cylinder screws of the pin guide, see illustration **6**.

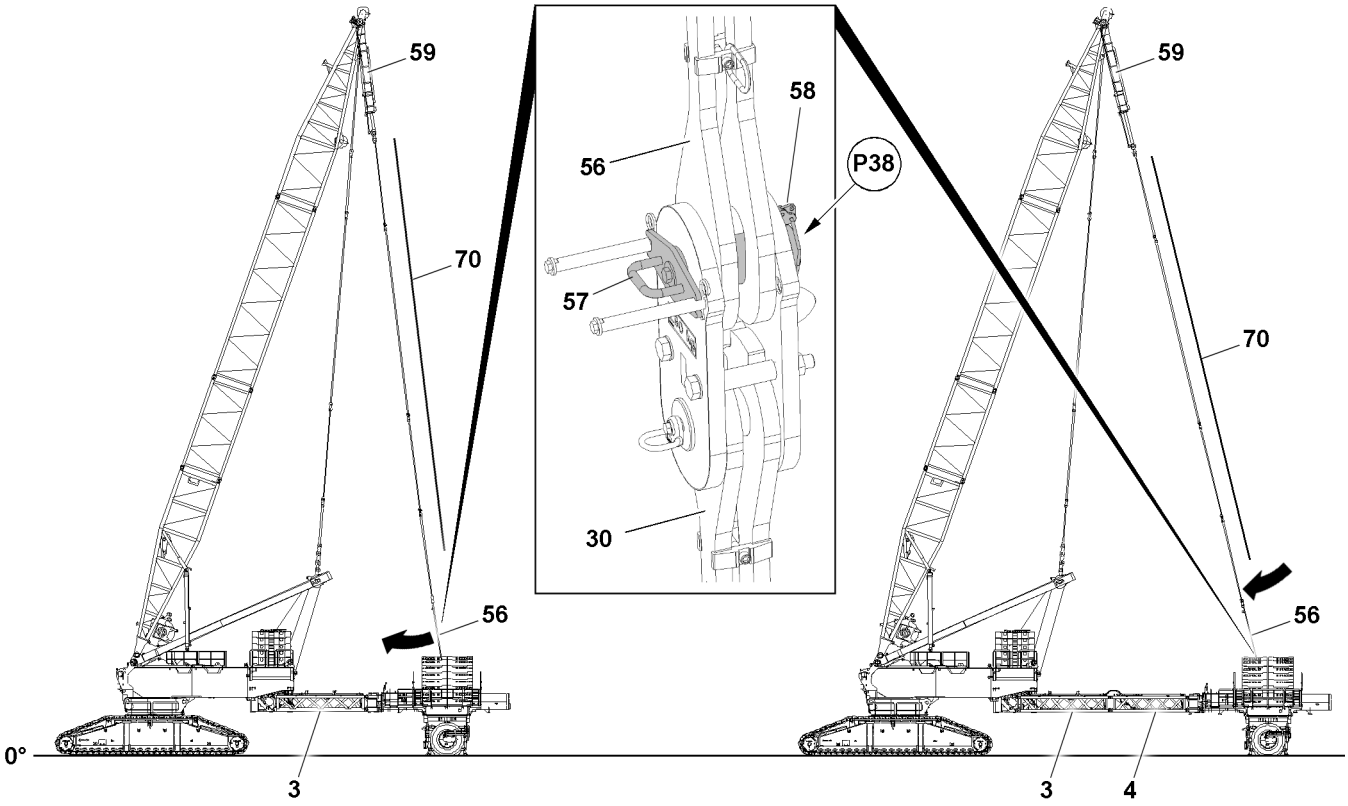

*Fig.144265: Unpinning the guying **70** on the pull brackets **30***

WARNING
Danger of accident due to oscillating guy rods!
The guying **70** can sway during the unpinning procedure.
Death, severe bodily injuries, property damage.
▶ Before unpinning the guying, set the derrick ballast to the derrick boom radius by retracting the ballast trailer guide.
▶ If this is not possible due to the extension(s) mounted on the ballast trailer guide, use the auxiliary crane to properly secure the guying **70** on the pull brackets **30** before unpinning.
▶ Use the auxiliary crane to slowly and carefully swing the unpinned guying **70** in the direction of the derrick boom until the guying **70** hangs vertically.

If the derrick ballast radius does not correspond to the derrick boom radius:
▶ Use the auxiliary crane to properly secure the guying **70** just above the pull brackets **30**.

When the first guying is secured with the auxiliary crane:
▶ Unpin the guy rods **56** at point **P38** on the pull brackets **30**: Remove the safety locking pin **58** and unpin the connector pin **57**.

When the guy rods **56** are properly unpinned:
▶ Use the auxiliary crane to swing the guying **70** in a vertical position to the derrick boom.

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When the guying **70** is in a vertical position:

- ▶ Insert the connector pin **57** again and secure with safety locking pin **58**.
- ▶ Properly disassemble and take-down the guy rods **56** on the guying **70**.
- ▶ Retract the pull cylinder **59** and pull up the guying **70**.

When the first guying is unpinned at point **P38** and hangs vertically on the derrick boom head:

- ▶ Remove the auxiliary crane.

Note

- ▶ The second guying is unpinned in an identical manner to the unpinning procedure used for the first guying.

- ▶ Properly unpin the second guying.

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11.4.3 Unpinning the ballast trailer on the turntable

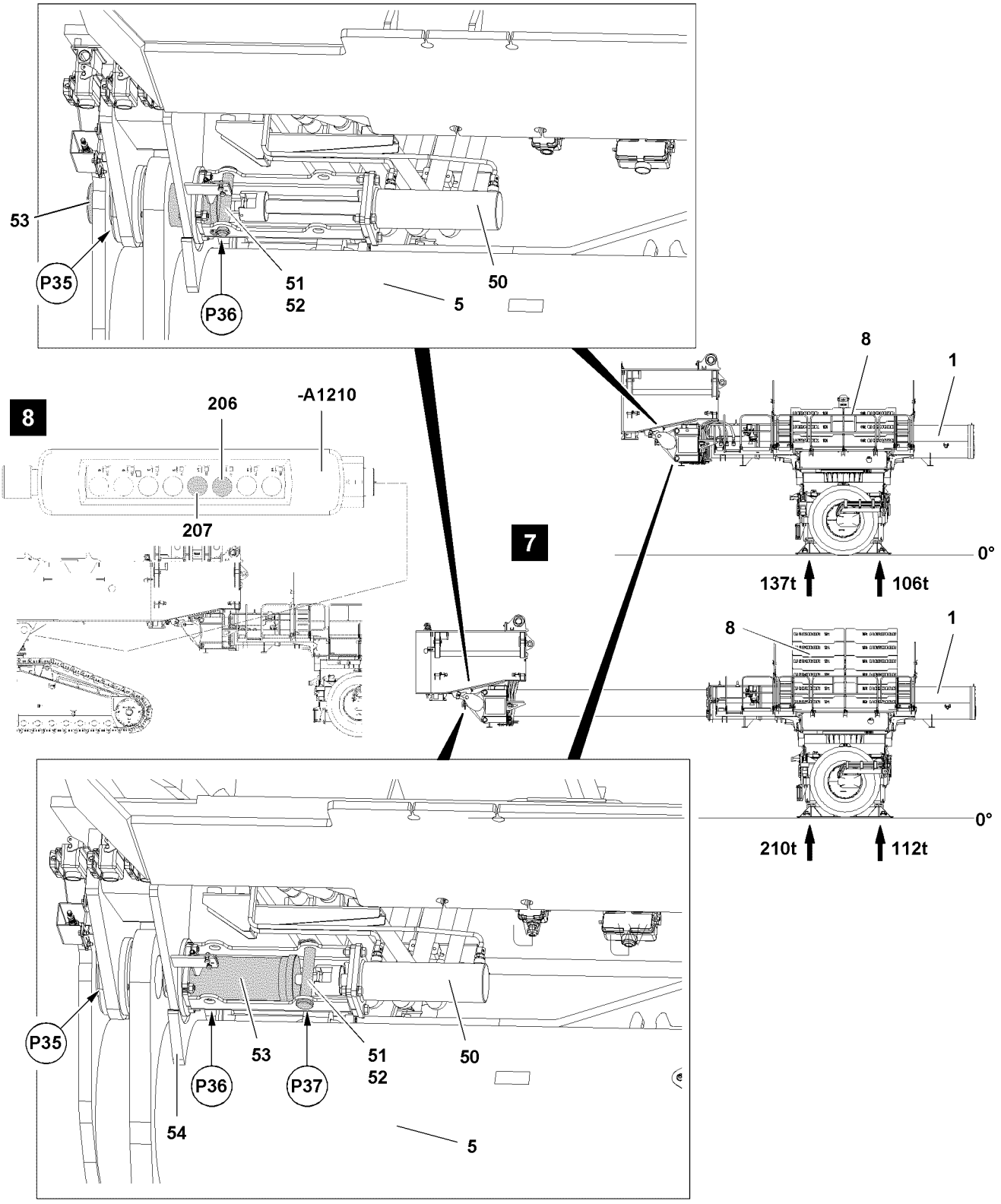

Fig.121020: Unpinning the ballast trailer on the turntable

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Unpinning the ballast trailer with ballast trailer radius 13–19 m on the turntable

WARNING
Danger of fatal injury due to tipping ballast trailer!
If the ballast trailer is insufficiently ballasted, then the ballast trailer can tip over when unpinning the ballast trailer guide **2** on the turntable.
Death, severe bodily injuries, property damage.
- ▶ Make sure, when unpinning the ballast trailer guide **2**, that the ballast trailer is ballasted with appropriately selected ballast trailer radius, see chart.
- ▶ Make sure that the ground is prepared according to the ground pressure, see illustration **7**.

	Ballast trailer radius R 13-19 m	
	R 13 m	R 19 m
Weight of the ballast plates (min)	140 t	220 t

Minimum weight of ballast plates

Make sure that the following prerequisites are met:
- The ballast trailer is supported.
- The ballast trailer is ballasted symmetrically according to the ballast trailer radius.
- The locking pin **11** on the strut **10** is pinned in transport position at point **P12** and secured with spring retainer **12**.

Release the connector pins **53** on both sides and unpin at point **P35**:

- ▶ Remove the safety locking pin **52** at point **P36** and unpin the retaining pin **51**, see illustration **7**.
- ▶ Insert the retaining pin **51** at point **P37** and secure.
- ▶ Press button **206** on the control panel **-A1210**, see illustration **8**.

Result:

- The pin pulling cylinders **50** retract.
- The connector pins **53** are unpinned on the turntable.

Note
- ▶ For disassembly of the ballast trailer, if the functions „turning" or "driving" are required to unpin the ballast trailer, the respective active ballast trailer operating mode „turning released", „driving released" or „parallel driving released" must be deactivated.
- ▶ When the ballast trailer is installed the stated releases are not activated, i.e. turning and driving the crane is possible until both limit switches report that the ballast trailer is pinned.

NOTICE
Damage to the ballast trailer or to the turntable!
When unpinning the ballast trailer, only one connector pin **53** can be unpinned on the turntable due to distortions, (signal „Ballast trailer installed" is no longer present), then the crane control no longer recognizes that the ballast trailer is installed, even though the ballast trailer is still connected with the turntable via the second connector pin **53**.
Due to the missing signal, „Ballast trailer installed", it is possible to turn the turntable, to drive the crane or to telescope the ballast trailer guide out or in.
This could significantly damage the crane or the ballast trailer.
- ▶ All crane movements are to be limited to a „minimum degree" and must be driven with extreme caution and the least possible speed.
- ▶ After unpinning of the second connector pin **53**, it must again be checked of both connector pins are completely unpinned.

- ▶ Perform a visual inspection.

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When both connector pins are unpinned:
▶ Remove the crane.

Unpinning the ballast trailer with ballast trailer radius 19–25 m on the turntable or unpinning the ballast trailer with ballast trailer radius 24–30 m on the turntable

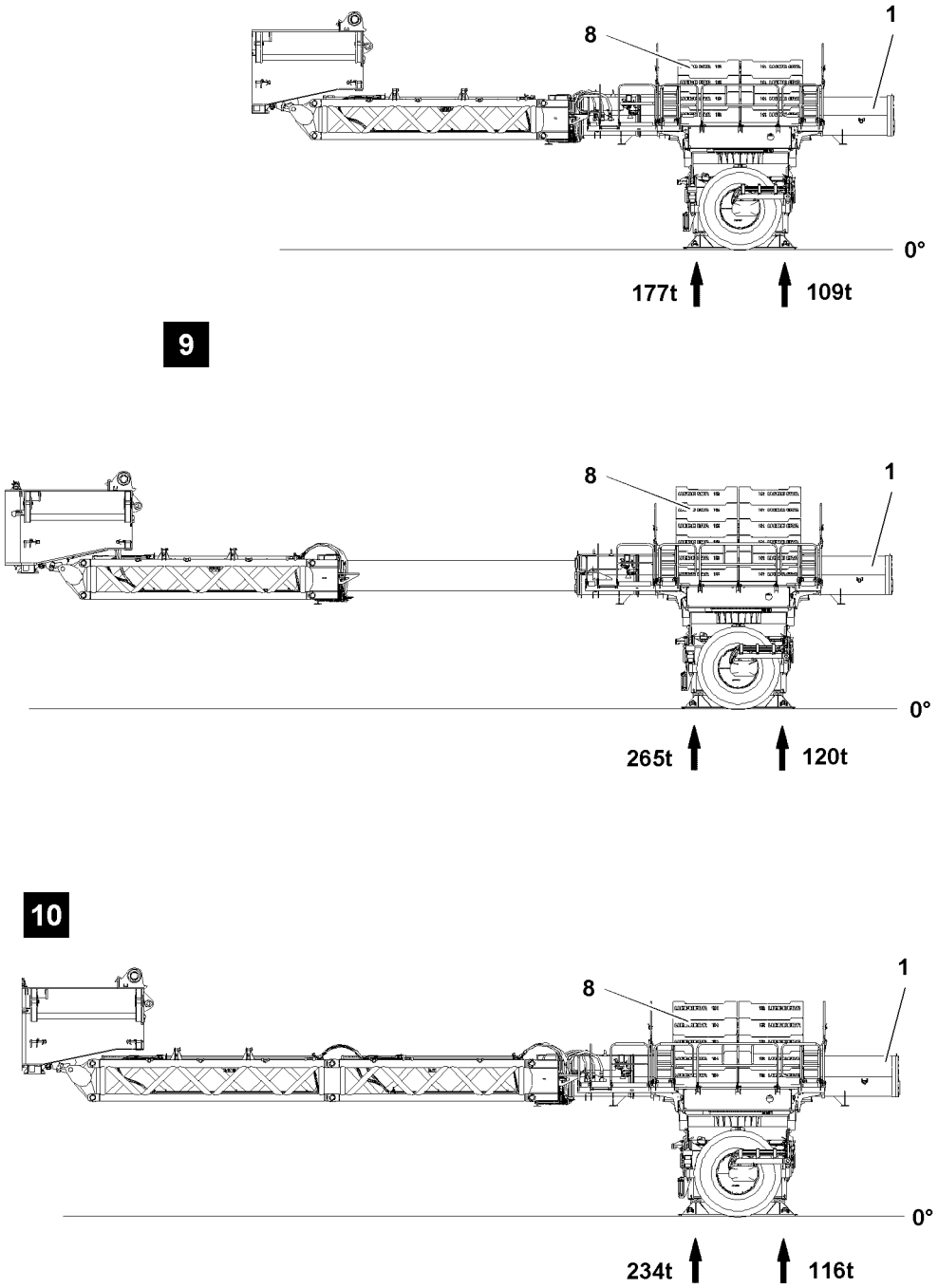

Fig.121991: Unpinning the ballast trailer on the turntable

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WARNING
Danger of fatal injury due to tipping ballast trailer!
If the ballast trailer is insufficiently ballasted, then the ballast trailer can tip over when unpinning the ballast trailer guide **2** on the turntable.
Death, severe bodily injuries, property damage.
- ▶ Make sure, when unpinning the ballast trailer guide **2**, that the ballast trailer is ballasted with appropriately selected ballast trailer radius, see chart.
- ▶ Make sure that the ground is prepared according to the ground pressure, see illustration **7**.

	Ballast trailer radius R 19-25 m		**Ballast trailer radius R 24-30 m**	
	R 19 m	R 25 m	R 24 m	R 30 m
Weight of the ballast plates (min)	180 t	280 t	240 t	Not permissible

Minimum weight of ballast plates

Make sure that the following prerequisites are met:
- The ballast trailer is supported.
- The ballast trailer is ballasted symmetrically according to the ballast trailer radius.
- The locking pin **11** on the strut **10** is pinned in transport position at point **P12** and secured with spring retainer **12**.

Note
- ▶ The pinning of the ballast trailer **1** with ballast trailer radius 19–25 m **or** with ballast trailer radius 24–30 m on the turntable is identical with the unpinning of the ballast trailer **1** with ballast trailer radius 13–19 m.
- ▶ Unpinning the ballast trailer **1** with ballast trailer radius 19–25 m **or** with ballast trailer radius 24–30 m , see section „Unpinning the ballast trailer with ballast trailer radius 13–19 m on turntable“.

- ▶ Unpin the ballast trailer **1** on the turntable.

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11.5 Releasing the electrical connection from the ballast trailer to the turntable

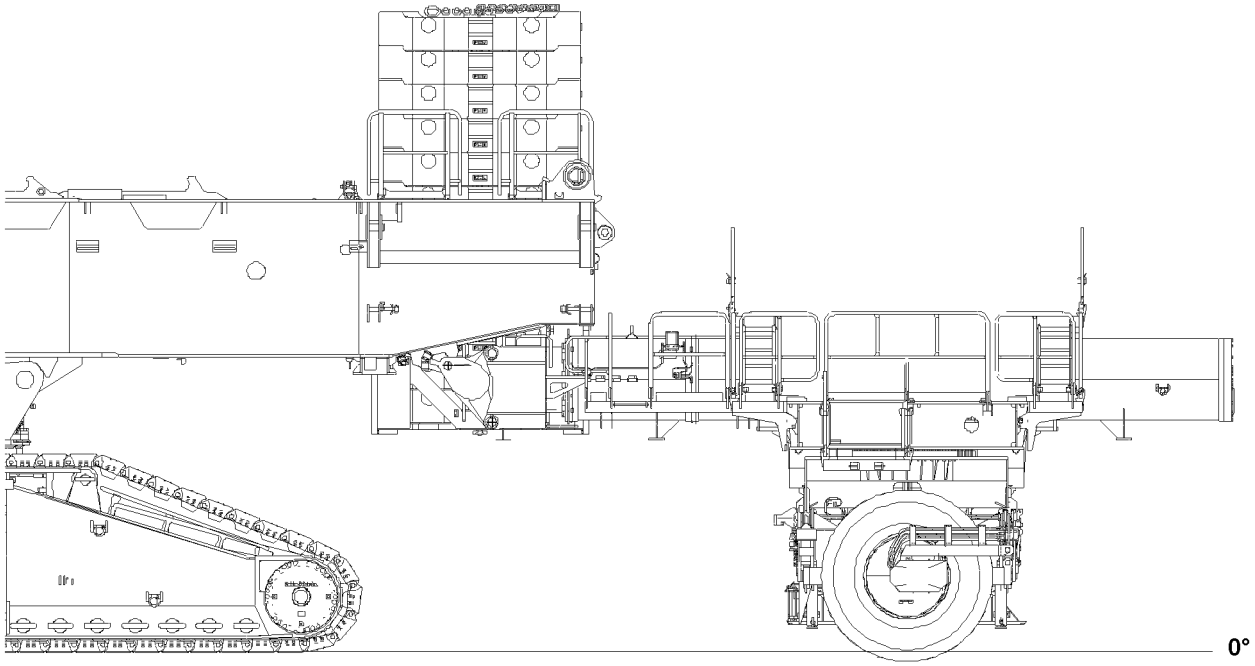

Fig.121017

Make sure that the following prerequisite is met:
– The ballast trailer is supported.

Note
▶ Disconnect the electrical connections, see Electric wiring diagram.

▶ Disconnect the electrical connections and store properly on the ballast trailer.

11.6 Releasing the hydraulic connections from the ballast trailer to the turntable

When connecting and releasing hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

DANGER
Danger of accident due to loss of pressure or leakage.
Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.
▶ Check that the quick couplings have been properly connected before using the crane.

▶ Release the pressure in the hydraulic system before connecting or disconnecting. Turn the engine off and wait for short time.
▶ Install the coupling components (sleeve and connector) with the knurled nut.
▶ Disconnect the coupling sections.
▶ Store hydraulic hoses on the ballast trailer properly.
▶ Protect the coupling sections with caps to prevent contamination and damage.

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12 Removing the ballast trailer

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
If this is not observed, the assembly personnel can fall down.
Death, severe bodily injuries, property damage.

- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.

- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

WARNING
The crane can topple over!
If the following danger notes are not observed, the ballast plates or the ballast stack can slip on the ballast trailer and fall down.
The crane can topple over.
Death, severe bodily injuries, property damage.

- ▶ The ground on which the ballast trailer is ballasted must be level and have adequate load-bearing capacity.
- ▶ Remove the ballast plates always symmetrically, in reference to the longitudinal axis.
- ▶ The outer ballast stacks must always weigh the same and be the same height after ballasting.
- ▶ The maximum permissible weight of the ballast trailer is 450 t.
- ▶ Secure all ballast plates so they cannot move and fall down during take down.
- ▶ Replace damaged ballast plates immediately with new ballast plates.

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WARNING
Ballast trailer tipping danger!
Due to improperly carried out assembly or improper assembly conditions, the ballast trailer can tip over.
Death, severe bodily injuries, property damage.
- ▶ The assembly of the ballast trailer may only be carried out by authorized personnel.
- ▶ The ballast trailer has **no** brake system. The ballast trailer must be supported with the support cylinders if it is **not** pinned on the turntable.
- ▶ Before unpinning the ballast trailer on the turntable it must be ensured that the stability and tipping safety of the ballast trailer is ensured, see section „Stability and tipping safety for ballast trailers not assembled on the turntable“.

Note
- ▶ Observe the information in the erection and take-down charts when taking down the boom equipment.

Make sure that the following prerequisites are met:
- The ballast trailer is in a level and horizontal position.
- The ballast trailer is properly supported.
- The ballast trailer guide is fully retracted.
- The ballast plates are completely removed from the ballast trailer.
- The ballast retainers are removed.

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12.1 Removing the ballast trailer guide on the ballast trailer

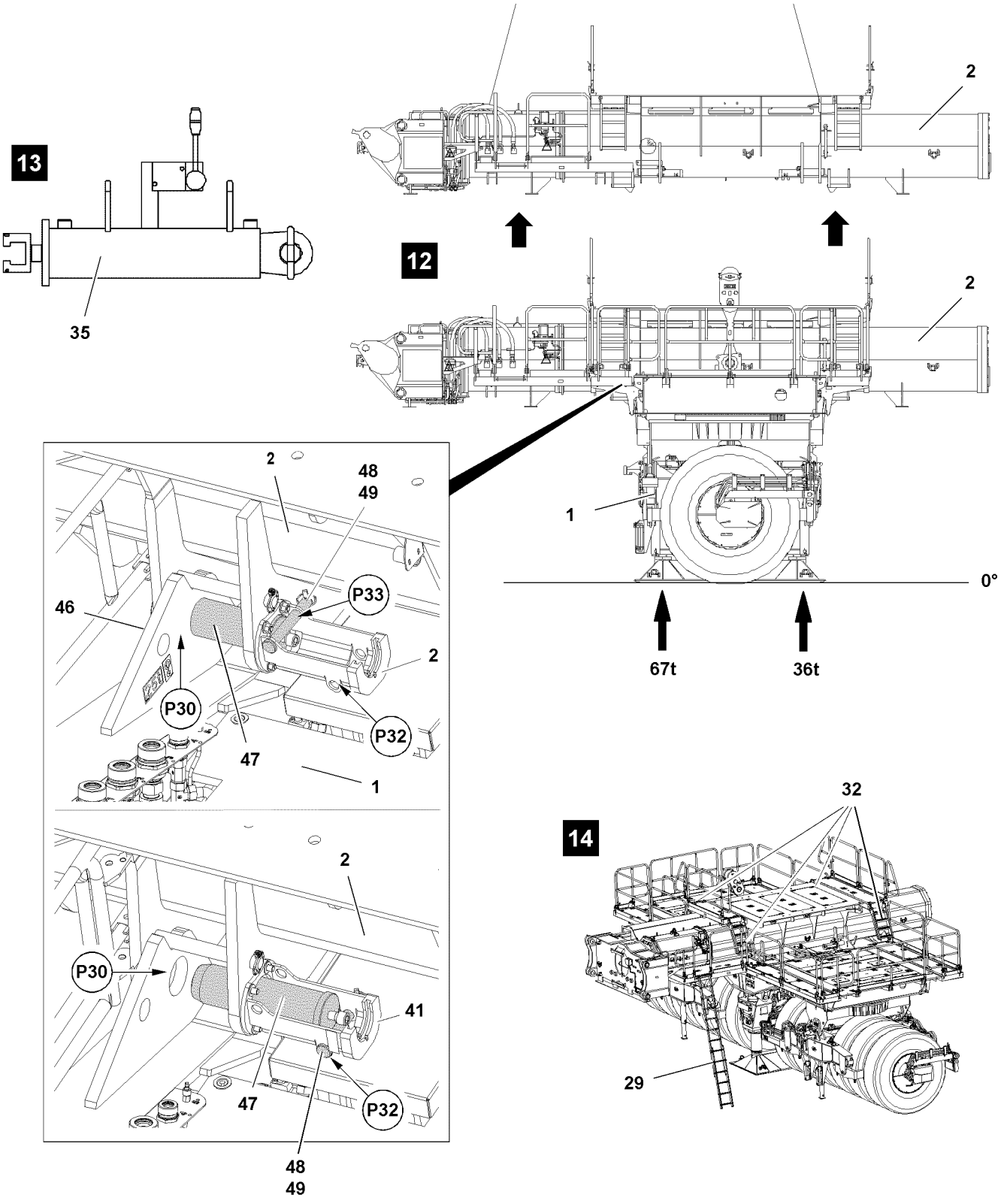

Fig.121022: Disassembling the ballast trailer guide

Make sure that the following prerequisite is met:
- The ballast trailer is supported.

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12.1.1 Installing the extension ladder on the ballast trailer guide

Note

- ▶ Position of extension ladder **29**, see illustration **14**.
- ▶ Assembly of the extension ladder **29**, see chapter 2.06.

12.1.2 Disassembling the ballast trailer guide with ballast trailer radius 13-19 m on the ballast trailer

WARNING

Danger of fatal injury due to tipping ballast trailer!
If the ballast trailer is insufficiently ballasted, then the ballast trailer can tip over disassembly of the ballast trailer guide **2**.
Death, severe bodily injuries, property damage.

- ▶ Make sure that the ballast trailer guide **2** is telescoped in.
- ▶ Make sure, at disassembly of the ballast trailer guide **2**, that the ballast trailer is ballasted according to the ballast trailer radius, see the following chart.
- ▶ Make sure that the ground is prepared according to the ground pressure, see illustration **19**.

	Ballast trailer radius R 13-19 m
Weight of the ballast plates (min)	0 t

Minimum weight of ballast plates

- ▶ Fasten the ballast trailer guide **2** to the auxiliary crane, see illustration **12**.
- ▶ Remove the safety locking pin **49** at point **P33** and unpin the retaining pin **48**.

Result:

– The connector pin **47** is released.

- ▶ Insert the retaining pin **48** at point **P33** and secure with safety locking pin **49**.
- ▶ Hang the pin pulling cylinder **35**, see illustration **13**, on the retainer **50** and on the screw head.
- ▶ Establish the hydraulic connection of the pin pulling cylinder **35** to the hydraulic aggregate, see chapter 5.30.
- ▶ Actuate the lever on the pin pulling cylinder **35** and unpin the connector pin **47** at point **P30**.
- ▶ Unpin all four connector pins **47**.

When all four connector pins **47** are unpinned:

- ▶ Lift the ballast trailer guide **2** with auxiliary crane and remove.

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12.1.3 Disassembling the ballast trailer guide with ballast trailer radius 19–25 m or with ballast trailer radius 24–30 m on the ballast trailer

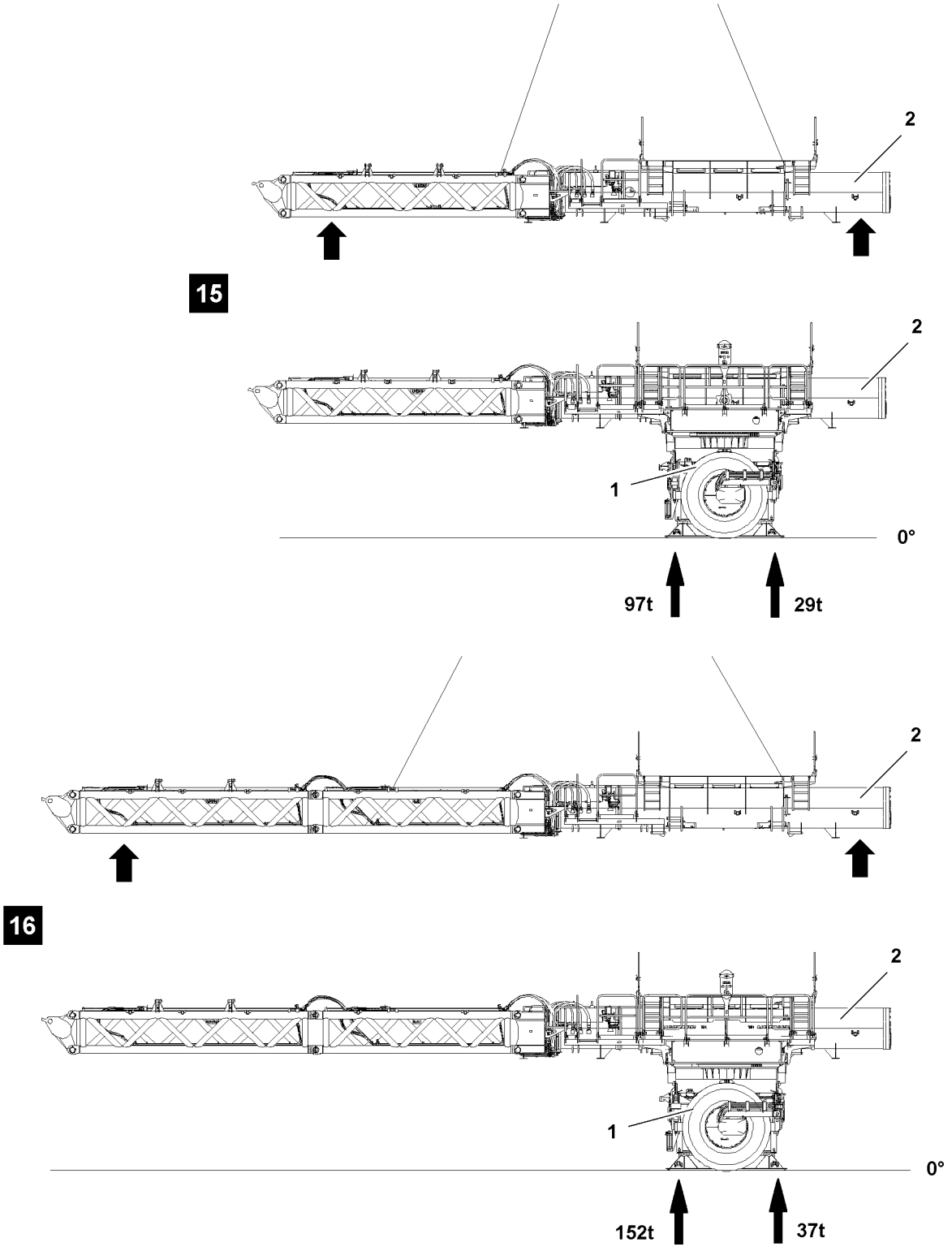

Fig.121992: Disassembling the ballast trailer guide

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WARNING
Danger of fatal injury due to tipping ballast trailer!
If the ballast trailer is insufficiently ballasted, then the ballast trailer can tip over disassembly of the ballast trailer guide **2**.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the ballast trailer guide **2** is telescoped in.
- ▶ Make sure, at disassembly of the ballast trailer guide **2**, that the ballast trailer is ballasted according to the ballast trailer radius, see the following chart.
- ▶ Make sure that the ground is prepared according to the ground pressure, see illustration **15** and illustration **16**.

	Ballast trailer radius R 19-25 m	**Ballast trailer radius R 24-30 m**
Weight of the ballast plates (min)	20 t	80 t

Minimum weight of ballast plates

Note
- ▶ The disassembly of the ballast trailer guide **2** with ballast trailer radius 19–25 m **or** with ballast trailer radius 24–30 m on the ballast trailer is identical with the disassembly of the ballast trailer guide **2** with ballast trailer radius 13–19 m.

Note
- ▶ For disassembly of the ballast trailer guide **2** with ballast trailer radius 19–25 m **or** with ballast trailer radius 24–30 m , see section „Disassembling the ballast trailer guide with ballast trailer radius 13–19 m on ballast trailer“.

- ▶ Fasten the ballast trailer guide **2** to the auxiliary crane, see illustration **15** or illustration **16**.
- ▶ Unpin the ballast trailer guide **2** on ballast trailer **1**, see illustration **15** or illustration **16**.

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12.2 Placing the pull brackets down

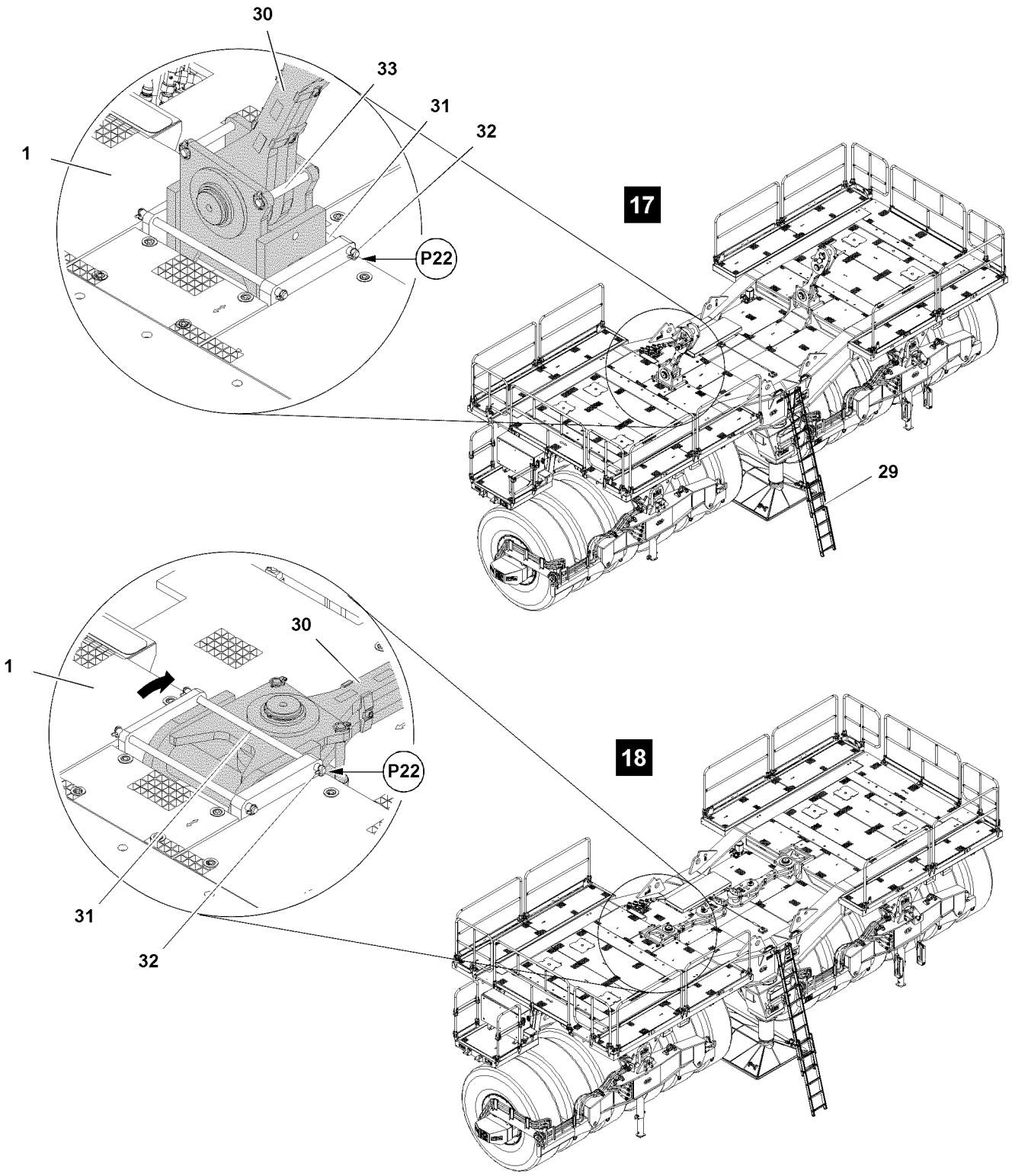

Fig.121015: Placing the pull brackets down

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12.2.1 Installing the extension ladder on the ballast trailer

Note
- ▶ Position of extension ladder **29** see illustration **17**.
- ▶ Assembly of the extension ladder **29**, see chapter 2.06.

12.2.2 Placing the pull brackets down

Make sure that the following prerequisites are met:
- The guy rods are unpinned.
- The ballast trailer guide has been disassembled.

▶ Fasten the pull bracket **30** to the auxiliary crane.

WARNING
Pull bracket swinging down!
The pull bracket **20** can swing down by itself due to its own weight when unpinning the pin **31**.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the pull bracket is held by the auxiliary crane during unpinning.
- ▶ Make sure that no persons reach into the danger zone during the entire procedure.

- ▶ Release the pull bracket **30** from operating position: Remove the safety locking pin **32** at point **P22** and unpin the pin **31**, see illustration **17**.
- ▶ Place the pull bracket **30** down with the auxiliary crane.
- ▶ Secure the pull bracket **30** in transport position: Insert the pin **31** at point **P22** and secure with safety locking pin **32**, see illustration **18**.
- ▶ Remove the auxiliary crane.
- ▶ Take down the second pull bracket.

12.2.3 Removing the railing on the ballast trailer

Note
- ▶ Disassembly of the railing, see chapter 2.06.

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12.3 Disassembling the platforms

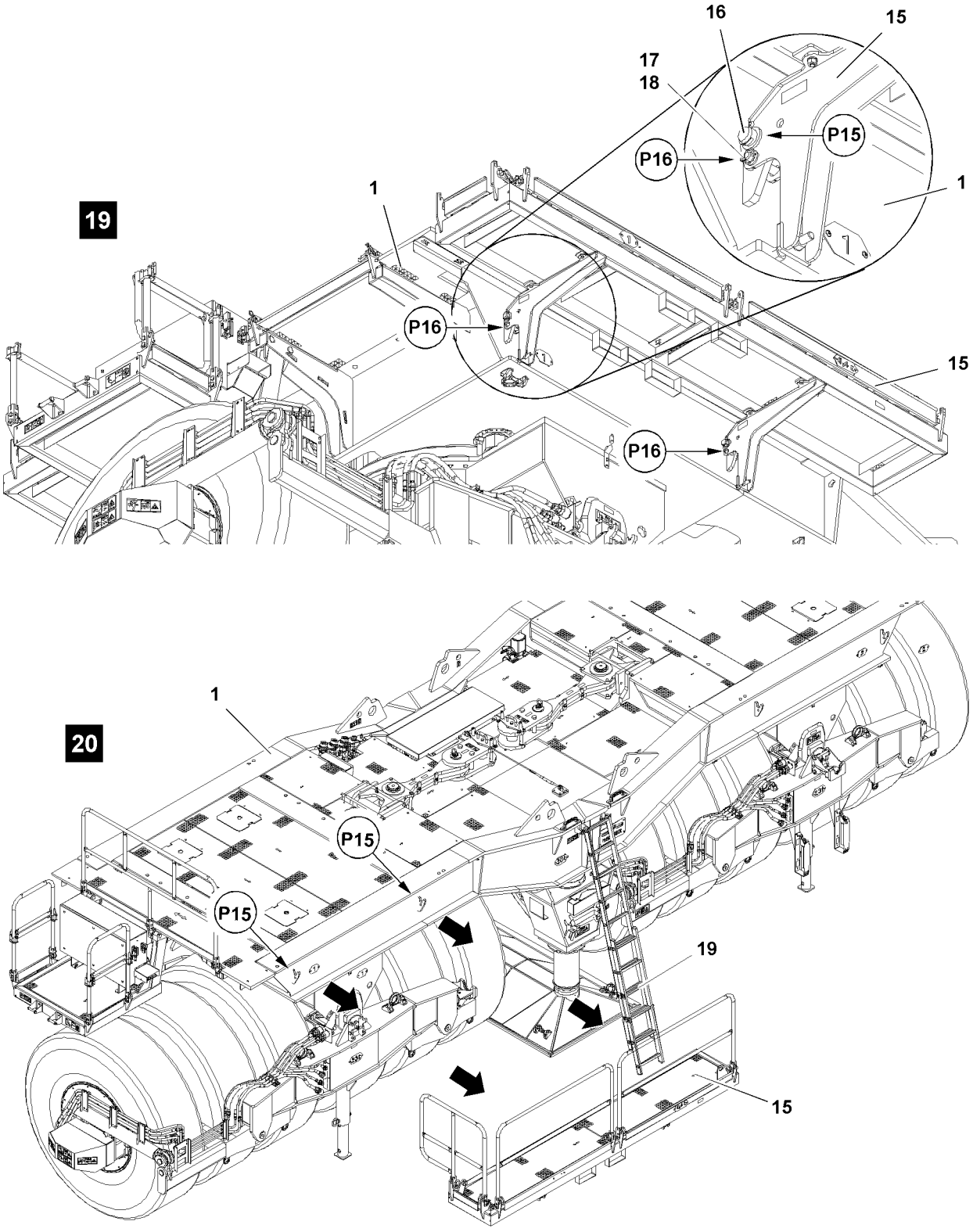

Fig.121944: Disassembling the platforms

Note

- ▶ The ballast trailer is equipped with four separate platforms.
- ▶ The ballast trailer sides and platforms **15** are marked with numbers.

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Note

▶ The disassembly of the platforms is described on the example of one platform.

▶ Fasten the platform **15** to the auxiliary crane.

The platform **15** is pinned on two points:

When the platform is safely held by the auxiliary crane:

▶ Remove the safety locking pin **18** at point **P16** and unpin the pin **17**, see illustration **19**.
▶ Unhook the platform **15** with the auxiliary crane at points **P15** on the ballast trailer, see illustration **20**.
▶ Swing the platform **15** with the auxiliary crane and place it down.
▶ Remove the auxiliary crane.
▶ Remove all platforms on the ballast trailer.

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12.4 Disassembling the ballast trailer guide

12.4.1 Disassembling the ballast trailer guide with ballast trailer radius 13-19 m

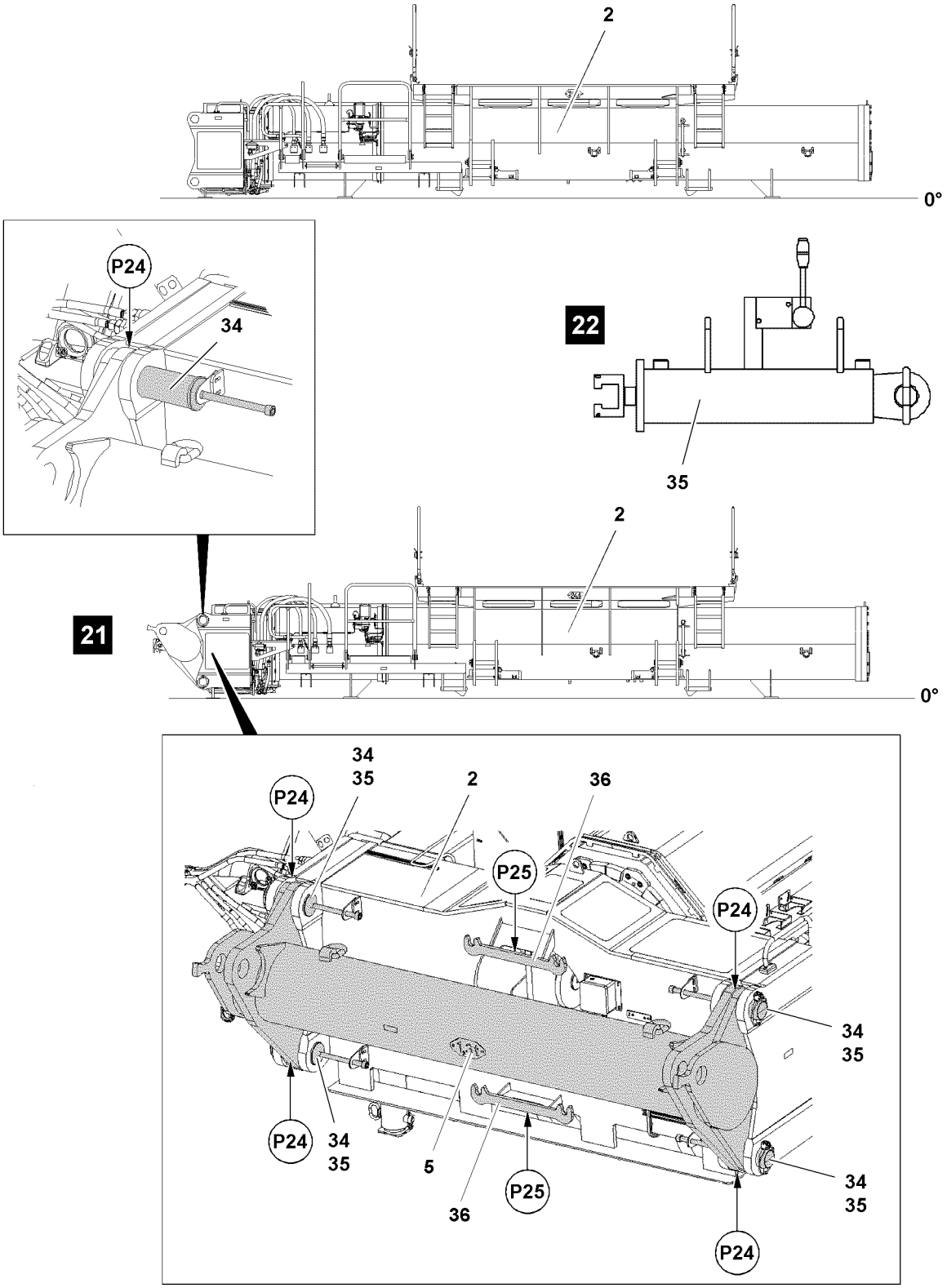

Fig.121021: Disassembling of ballast trailer guide with ballast trailer radius 13-19 m

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Make sure that the following prerequisites are met:
- The ballast trailer guide **2** is moved in all the way see illustration **21**.
- The ballast trailer guide **2** is laying on the ground, see illustration **21**.

▶ Fasten the adapter **5** to the auxiliary crane.

WARNING
Danger of crushed limbs!
When unpinning the adapter, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

The adapter **5** is pinned four times on the ballast trailer guide. Every pin point is present on both sides of the component on one level.

▶ Hang the pin pulling cylinder **35** on the retainer **36** at point **25** and on the screw head, see illustration **21**.
▶ Establish the hydraulic connection of the pin pulling cylinder **35**, see chapter 5.30.
▶ Release the connector pin **34** at point **P24**: Remove the safety locking pin **35**.
▶ Actuate the lever on the pin pulling cylinder **35** and unpin the connector pin **34**, see illustration **21**.
▶ Unpin all connector pins.

When all four connector pins **34** are unpinned:
▶ Remove the adapter **5** with the auxiliary crane and place down.
▶ Remove the auxiliary crane.

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12.4.2 Disconnecting the connections

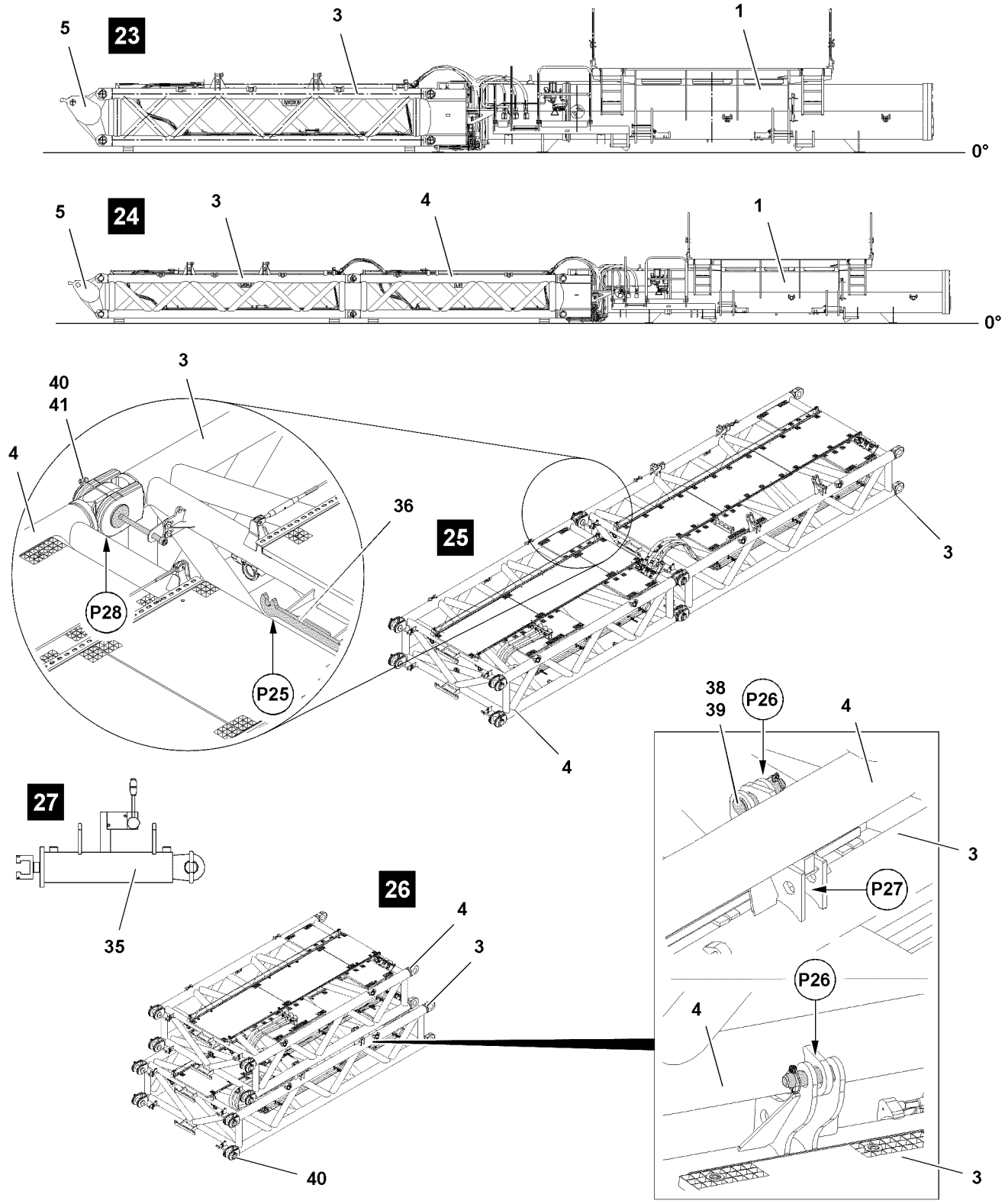

Fig.121993: Disassembling the ballast trailer guide with ballast trailer radius 19–25 m or ballast trailer guide with ballast trailer radius 24–30 m

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Disconnecting the hydraulic connections

The hydraulic connections are made with quick couplings.

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When disconnecting hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

WARNING
Pressure in the hydraulic lines!
If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.
Death, severe bodily injuries, property damage.
▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

▶ Release the hydraulic coupling by hand.
▶ Disconnect the hydraulic connections, see Hydraulic diagram.
▶ Protect the hydraulic connections from contamination with caps.

Disconnecting the electrical connections

▶ Disconnect the electrical connections, see Electric wiring diagram.

Disconnecting the connection to the central lubrication system

▶ Disconnect the connection to the central lubrication system.
▶ Protect the connections of the central lubrication system with caps from contamination.

12.4.3 Disassembling the ballast trailer guide with ballast trailer radius 19-25 m

Note
▶ Unpinning the adapter **5** on the intermediate section **3** is identical with unpinning the adapter **5** on the ballast trailer guide **1**.
▶ For unpinning procedure, see section „Disassembling the ballast trailer guide with ballast trailer radius 13–19 m “.

▶ Remove the adapter **5**.

Intermediate section **3** is pinned on four points. The unpinning procedure is described on the example for one pin, see illustration **23**.

▶ Fasten the intermediate section **3** to the auxiliary crane.

Note
▶ Unpinning the intermediate section **3** on the ballast trailer guide **2** is identical with unpinning the adapter **5** on the ballast trailer guide **2**.
▶ For unpinning procedure, see section „Disassembling the ballast trailer guide with ballast trailer radius 13–19 m “.

▶ Disassemble the intermediate section **3**.

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12.4.4 Disassembling the ballast trailer guide with ballast trailer radius 24-30 m

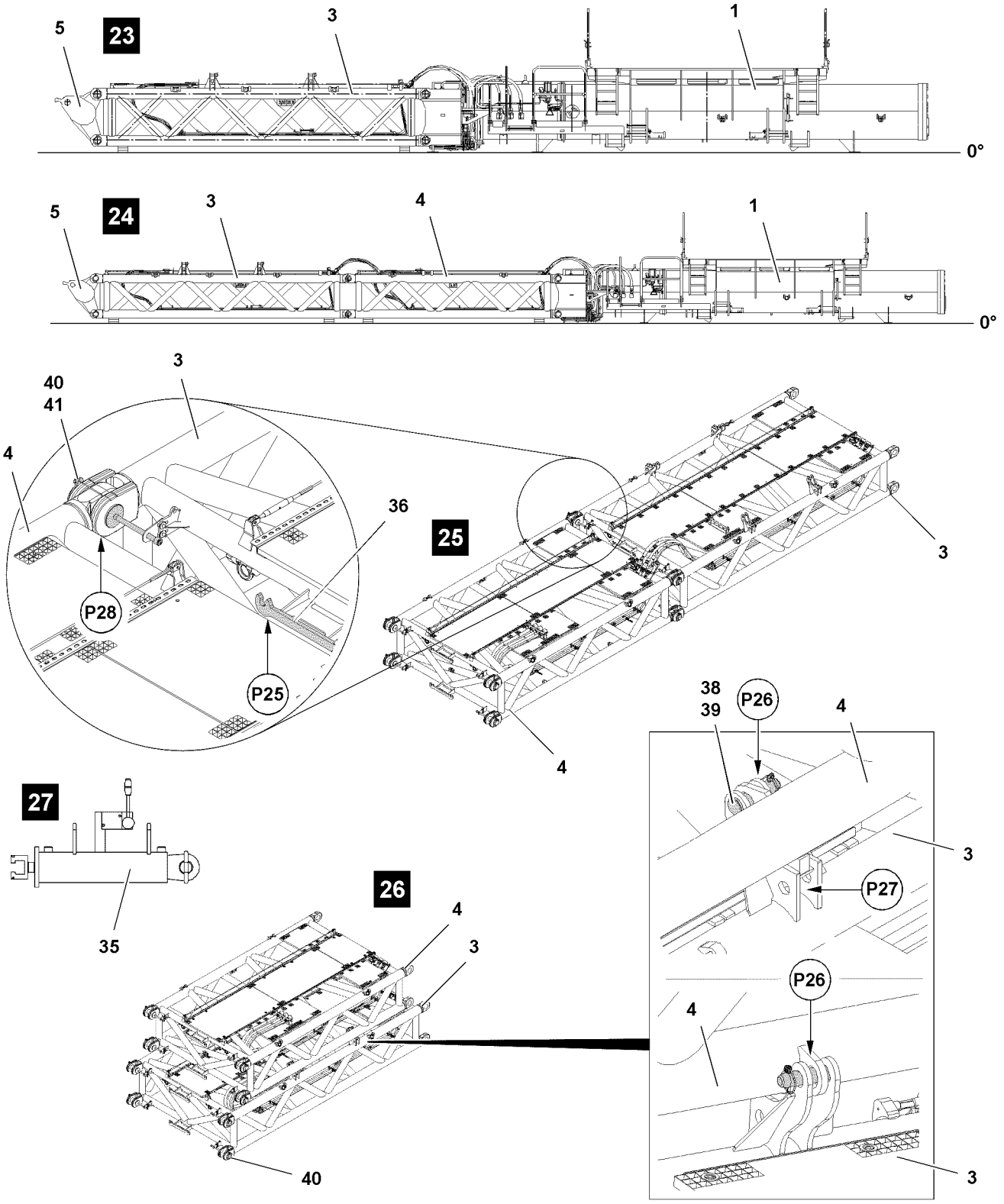

Fig.121993: Disassembling the ballast trailer guide with ballast trailer radius 19–25 m or ballast trailer guide with ballast trailer radius 24–30 m

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Note

▶ Disconnect the connections, see section „Disassembling the ballast trailer guide with ballast trailer radius 19-25 m “.

Note

▶ Unpinning the adapter **5** on the intermediate section **3** is identical with unpinning the adapter **5** on the ballast trailer guide **1**.
▶ For unpinning procedure, see section „Disassembling the ballast trailer guide with ballast trailer radius 13–19 m “.

▶ Remove the adapter **5**.

The intermediate section **4** is pinned four times on the intermediate section **3**. Every pin point is present on both sides of the component on one level, see illustration **24**.

▶ Fasten the intermediate section **4** to the auxiliary crane.
▶ Hang the pin pulling cylinder **35** on the retainer **36** at point **25** and on the screw head, see illustration **25**.
▶ Remove the safety locking pin **41** at point **P28**, see illustration **25**.
▶ Actuate the lever on the pin pulling cylinder **35** and unpin the connector pin **40**.
▶ Remove the intermediate section **4** with the auxiliary crane.

Intermediate section **3** is pinned on four points. The unpinning procedure is described on the example for one pin, see illustration **26**.

▶ Fasten the intermediate section **3** to the auxiliary crane.

Note

▶ Unpinning the intermediate section **3** on the ballast trailer guide **1** is identical with unpinning the adapter **5** on the ballast trailer guide **1**.
▶ For unpinning procedure, see section „Disassembling the ballast trailer guide with ballast trailer radius 13–19 m “.

▶ Disassemble the intermediate section **3**.
▶ Place the intermediate section **4** on intermediate section **3** in transport position, see illustration **26**.

When the pin bores align at point **P26**:

▶ Unpin the pin **38** from park position at point **P27**.
▶ Insert the pin **38** at point **P26** and secure with the safety locking pin **39**, see illustration **26**.

Result:

– The intermediate section **3** is pinned and secured with intermediate section **4** in transport position.

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12.5 Disassembling the frame

12.5.1 Disassembling the first wheel set

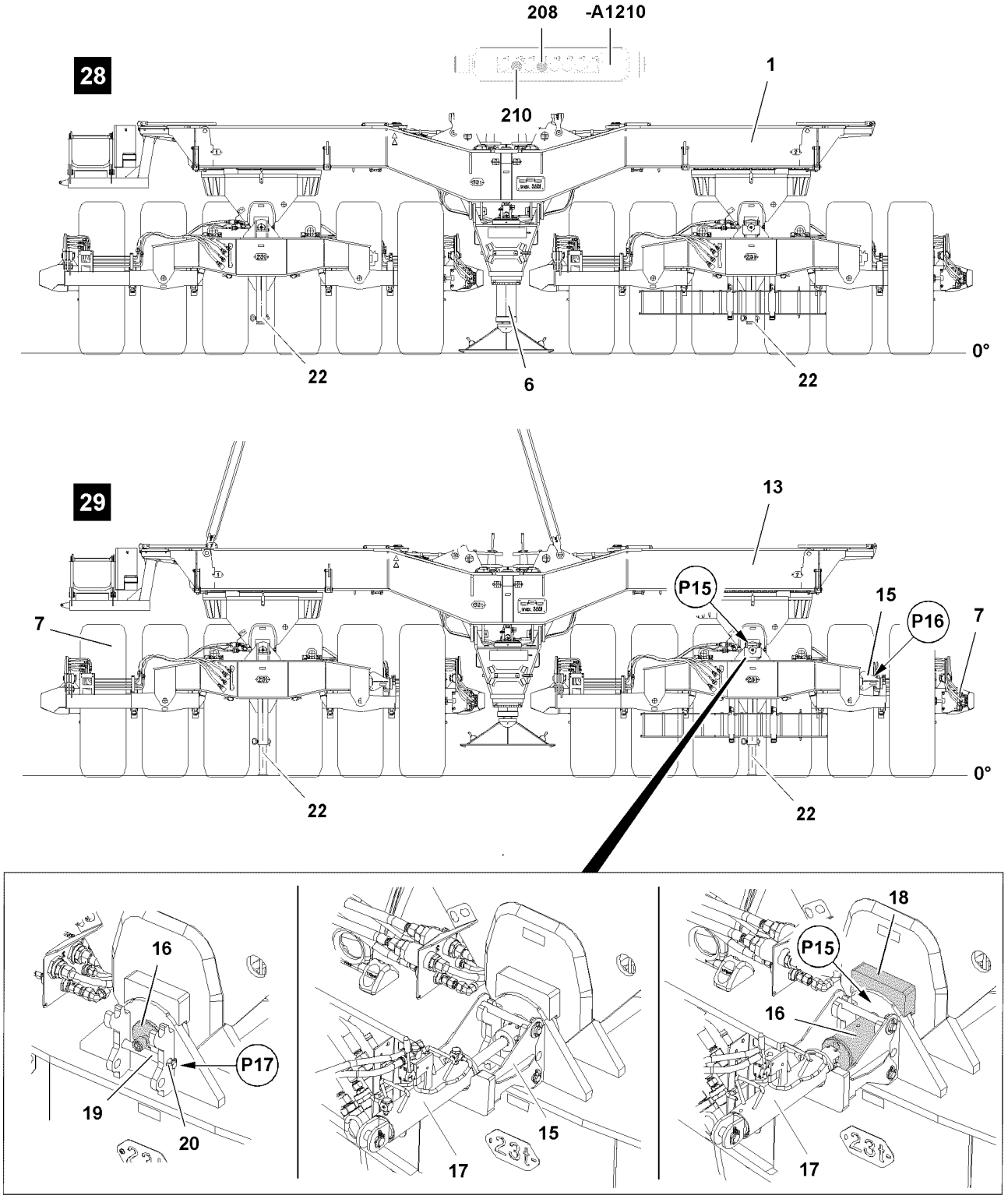

Fig.121994: Disassembling the first wheel set

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Make sure that the following prerequisites are met:
- The ground must be level and have adequate load bearing capacity.
- An auxiliary crane is available.

▶ Pull the extendable auxiliary supports **22** out and secure, see illustration **28**.
▶ Connect the ballast trailer on the external hydraulic aggregate.
or
Connect the ballast trailer using the electrical extension cable and the hydraulic extension hoses to the crane turntable, see the electric wiring diagram and the hydraulic diagram.
▶ Fasten the frame **13** to the auxiliary crane, see illustration **29**.

When extendable auxiliary supports **22** are extended and secured:
▶ Press the button **208** and button **210** on the control panel **-A1210**.

Result:

– The support **6** retracts.

Note
▶ Frame and wheel set are pinned with each other on two pin points **P15**.
▶ The pinning procedure is described based on the example of one pin point.

▶ Remove the safety locking pin **20** at point **P17** and unpin the pin **19**, see illustration **29**.
▶ Release the retainer **15** for pin pulling device **17** at point **P16**.
▶ Hang the retainer **15** up at pin point **P15** and secure, see illustration **29**.
▶ Unpin the pin **16** with the pin pulling device **17** at point **P15**, see illustration **29**.

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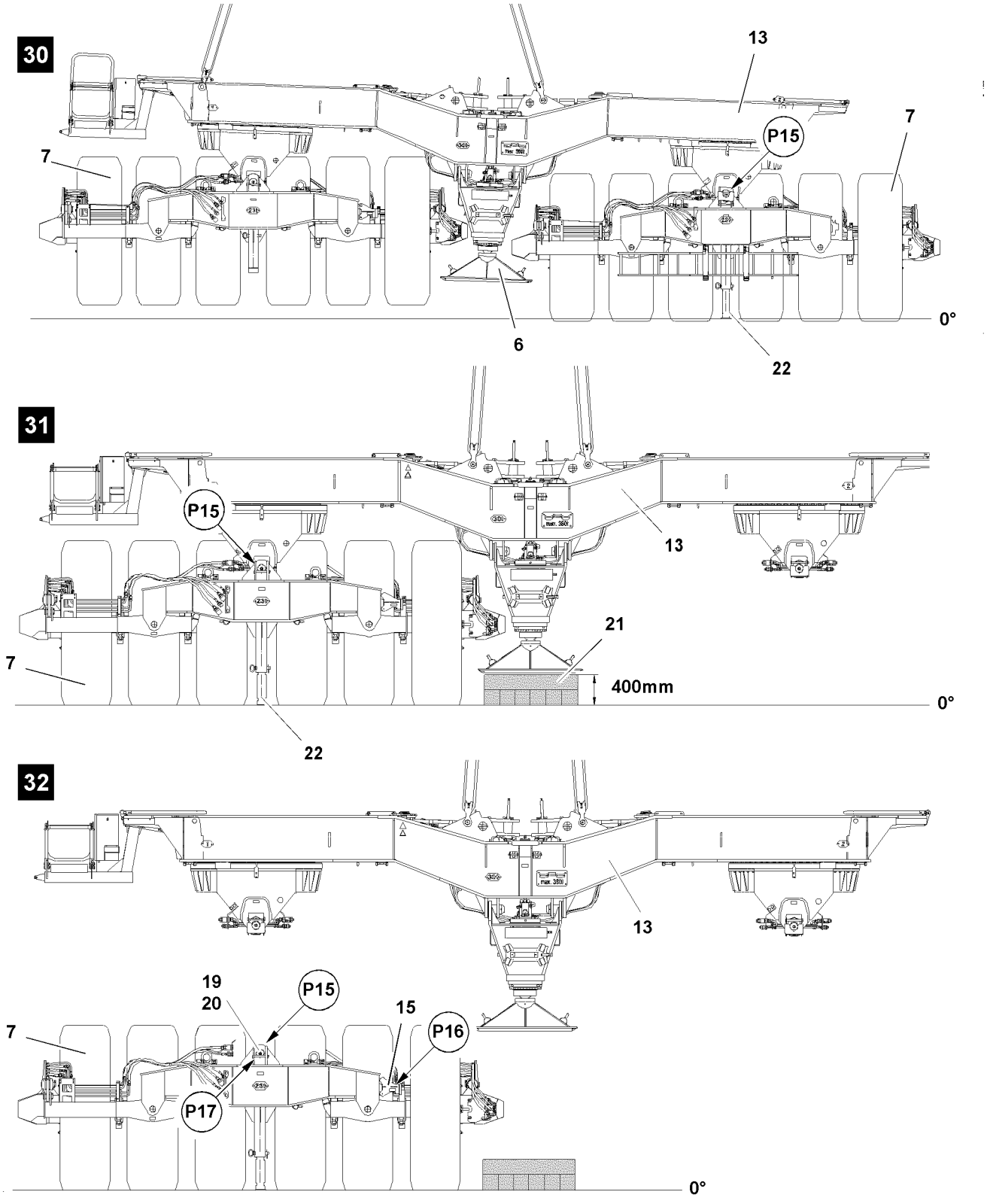

Fig.121995: Disassembling the second wheel set

- ▶ Build up the substructure **21** for frame **13** approx. 400 mm high, see illustration **31**.
- ▶ Lift the frame **13** with the first wheel set **7** with the auxiliary crane and set it down on level ground and on the substructure **21**, see illustration **31**.
- ▶ Insert the pin **16** with the pin pulling device **17** again at point **P15** for transport.
- ▶ Remove the retainer **15** and fasten again at point **P16**.

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12.5.2 Disassembling the second wheel set

Make sure that the following prerequisite is met:
- The frame with the first wheel set is placed on the substructure and is secured to prevent it from tipping over.

▶ Fasten the frame **13** to the auxiliary crane, see illustration **31**.

Note
▶ The disassembly of the first wheel set is identical with the disassembly of the second wheel set.
▶ Disassembly of the second wheel set, see section „Disassembling the first wheel set“.

▶ Unpin the frame **13** at point **P15**.
▶ Lift the frame **13** with the auxiliary crane and set it down on level ground.

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13 Emergency operation in case of a defective control module of the ballast trailer control

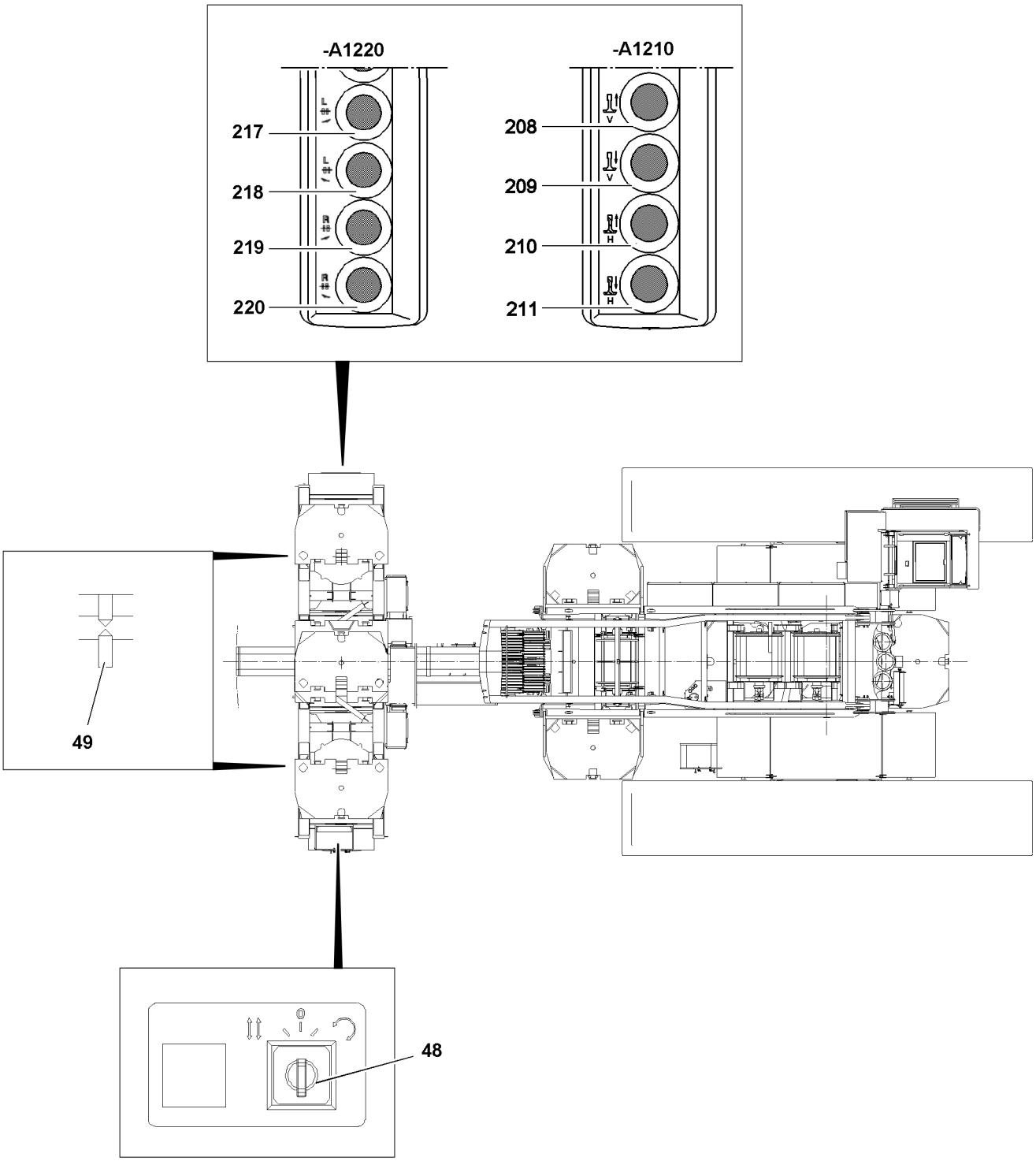

Fig.121013: Emergency operation of ballast trailer

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13.1 Emergency operation of ballast trailer

In case of a defect in the control module of the ballast trailer control, the electronic steering of the ballast trailer can no longer be actuated.

The signals „Towing“ and „circular travel“ are no longer transmitted by the ballast trailer control to the crane control.

However, by actuating the key switch **48** in the control cabinet on the ballast trailer, the ballast trailer control can be bypassed.

Key switch positions
- 0 (center) = no emergency operation
- I (left) = emergency operation towing
- II (right) = emergency operation circular travel

NOTICE
Damage of the ballast trailer!
By activating the key switch **48** the signal „Towing“ or „Circular travel“ is released in the crane control, even though the wheel sets could potentially be incorrectly aligned.
This can result in severe damage on the ballast trailer or on the crane.
- ▶ Operate the key switch **48** only if the electronic fails.
- ▶ Before driving the crane, check the alignment of the wheel sets.
- ▶ All travel movements may only be conducted with utmost caution, minimum acceleration and careful braking.
- ▶ If the key switch **48** is activated, then the crane operator bears the full and sole responsibility for his actions.

WARNING
Danger of accident due to faulty operation!
If the key switch **48** is activated, there is an increased danger of accidents due to the bypassed ballast trailer control.
Death, severe bodily injuries, property damage.
- ▶ It is prohibited to remain within the danger zone of the ballast trailer.
- ▶ The alignment of wheel sets is to be monitored manually, visual inspection.
- ▶ Emergency operation should only be carried out by authorized personnel. They must be aware of all related supervisory tasks and hazards.
- ▶ If the key switch **48** is activated, then the crane operator bears the full and sole responsibility for his actions.

13.2 Emergency operation - towing

Make sure that the following prerequisites are met:
- The ballast trailer is properly assembled.
- Crawler operation is activated.

13.2.1 Lifting the ballast trailer with the support cylinders

Note
- ▶ The support cylinders of the ballast trailer must always be moved out evenly.

Move the front and rear support cylinders out:

- ▶ Press the button **209** and the button **211**.

13.2.2 Aligning the wheel sets in the towing position

To be able to align the wheel sets in towing position, the ballast trailer must be lifted with the support cylinders.

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Make sure that the following prerequisite is met:
– The ballast trailer is raised via the support cylinders to the point where the wheel sets are relieved.

▶ Turn the key switch **48** on the ballast trailer to the „left“.

Note
▶ By activating the key switch **48** into position „left“, the order „Towing“ is passed on to the crane and emergency operation is turned on.

When the wheel sets are relieved:
▶ Press the button **217** or button **218** on the control panel **-A1220** and align the left wheel set into towing position.
▶ Press the button **219** or button **220** on the control panel **-A1220** and align the right wheel set into towing position.
▶ Check the settings.

13.2.3 Lowering the ballast trailer with the support cylinders

Note
▶ The support cylinders of the ballast trailer must always be moved in evenly.

Retract the support cylinders completely on the front and rear:

▶ Press the button **208** and the button **210**.

Result:

– The support cylinders retract.

▶ Retract the support cylinders completely.

13.2.4 Towing

Make sure that the following prerequisite is met:
– The wheel sets are in the towing position.

NOTICE
Damage of the ballast trailer!
If the angle settings on the wheel sets are not monitored during driving in emergency operation, it can lead to significant damage on the wheel sets.
▶ The angle alignment **49** on the wheel sets must be constantly checked.
▶ Constantly monitor the alignment of the wheel sets while driving.
▶ If the wheel sets become excessively deformed, then they must be realigned.

13.3 Emergency operation - circular travel

Make sure that the following prerequisite is met:
– The ballast trailer is properly assembled.

13.3.1 Lifting the ballast trailer with the support cylinders

Note
▶ The support cylinders of the ballast trailer must always be moved out evenly.

Move the front and rear support cylinders out:

▶ Press the button **209** and the button **211**.

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13.3.2 Aligning the wheel sets in the circular travel position

To be able to align the wheel sets in circular travel position the ballast trailer must be lifted with the support cylinders.

Make sure that the following prerequisite is met:
– The ballast trailer is raised via the support cylinders to the point where the wheel sets are relieved.

▶ Turn the key switch **48** on the ballast trailer to the „right“.

Note
▶ By actuating the key switch **48** in position „right“, the command „Circular travel“ is transmitted to the crane and emergency operation is turned on.
▶ During emergency operation the support can only be actuated from the control panel **-A1210** on the ballast trailer.

When the wheel sets are relieved:
▶ Press the button **217** or button **218** on the control panel **-A1220** and align the left wheel set into circular driving position.
▶ Press the button **219** or button **220** on the control panel **-A1220** and align the right wheel set into circular driving position.
▶ Check the settings.

13.3.3 Lowering the ballast trailer with the support cylinders

Note
▶ The support cylinders of the ballast trailer must always be moved in evenly.

Retract the support cylinders completely on the front and rear:

▶ Press the button **208** and the button **210**.

Result:

– The support cylinders retract.

▶ Retract the support cylinders completely.

13.3.4 Circular travel

Make sure that the following prerequisite is met:
– The wheel sets are in the circular travel position.

NOTICE
Damage of the ballast trailer!
If the angle settings on the wheel sets are not monitored during driving in emergency operation, it can lead to significant damage on the wheel sets.
▶ The angle alignment **49** on the wheel sets must be constantly checked.
▶ Constantly monitor the alignment of the wheel sets while driving.
▶ If the wheel sets become excessively deformed, then they must be realigned.

14 Maintenance intervals / maintenance instructions for the ballast trailer

Note
▶ See chapter 7.02.50 and chapter 7.04.50.

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5.36.10 Derrick ballast - suspended ballast

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Fig.195219

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1 Product description

This chapter describes the following derrick ballast variations:
- Suspended ballast
  Ballasting consisting of ballast plates on a ballast pallet

This crane type has additional derrick ballast variations, which will be described in other chapters of these operating instructions:
- Suspended ballast *special design*: Ballast Constant
  Ballasting consisting of directly suspended ballast plates (without a ballast pallet)
- Ballast trailer
  Ballasting consisting of ballast plates on a ballast trailer
- Suspended ballast *special design*: Ballasting LTR crane and / or ballast plates
  Ballasting consisting of an LTR crane and / or ballast plates on a ballast pallet

Note
Designation of the ballast types
- ▶ The suspended ballast and the ballast trailer are generally described as derrick ballast.
- ▶ The ballast installed on the turntable is generally referred to as the counterweight.
- ▶ The ballast installed on the crawler travel gear is generally referred to as the central ballast.

1.1 Function

The D-guying contains two pull cylinders (pull cylinder A and pull cylinder B). These pull cylinders are used to pull, lift or lower the derrick ballast.

All relevant data regarding the derrick ballast is displayed on the LICCON monitors.

1.2 Variations

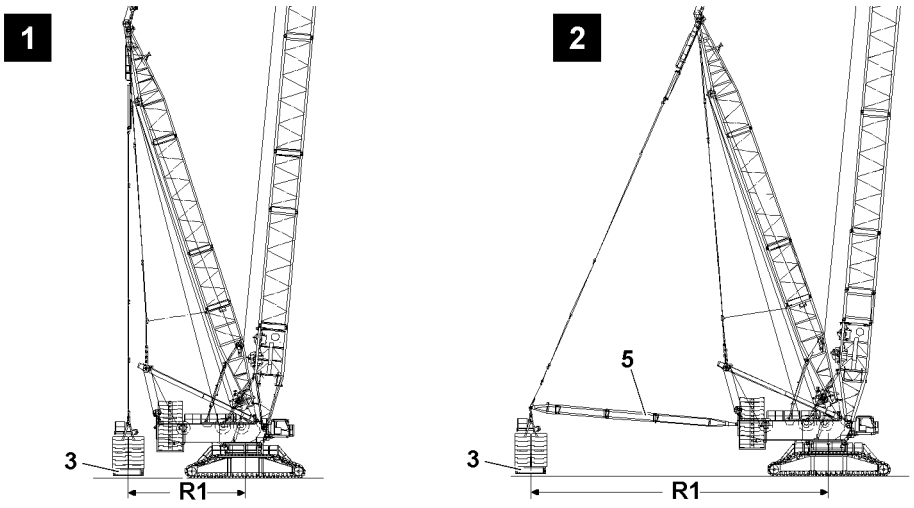

Fig.145947: Suspended ballast variations

LR 11000 has two suspended ballast variations:
- Ballast pallet **3 without** suspended ballast guide, see illustration **1**
  - The derrick ballast radius **R1** can be set by adjusting the derrick boom.
- Ballast pallet **3 with** suspended ballast guide **5**, see illustration **2**.
  - The derrick ballast radius **R1** requires the conversion of the suspended ballast guide **5**.

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2 Component overview

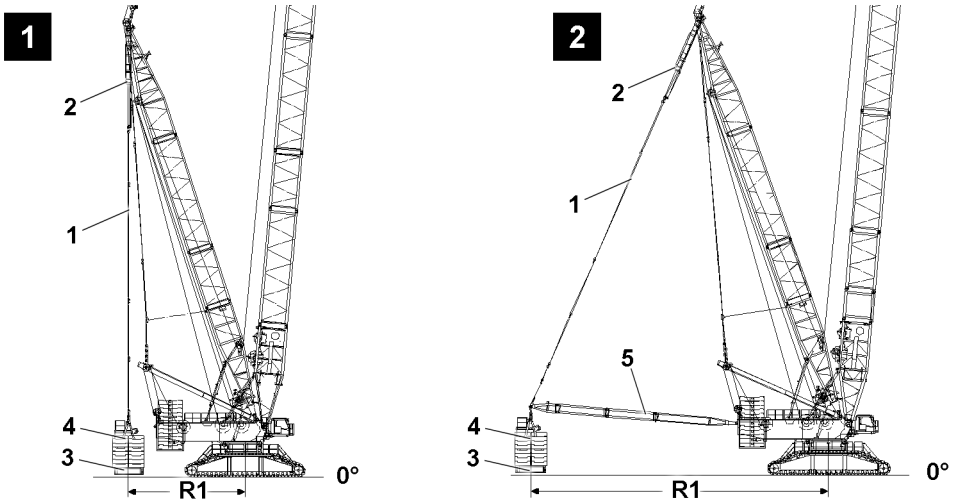

Fig.124479: Suspended ballast variations

Note

- ▶ The assembly sections are marked with their own weight.
- ▶ Dimensions and weights, see the Crane operating instructions, chapter 1.03.

Position	Component
1	D-guying
2	Pull cylinder
3	Ballast pallet
4	Ballast plates
5	Suspended ballast guide B2

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2.1 Component overview - Ballast pallet

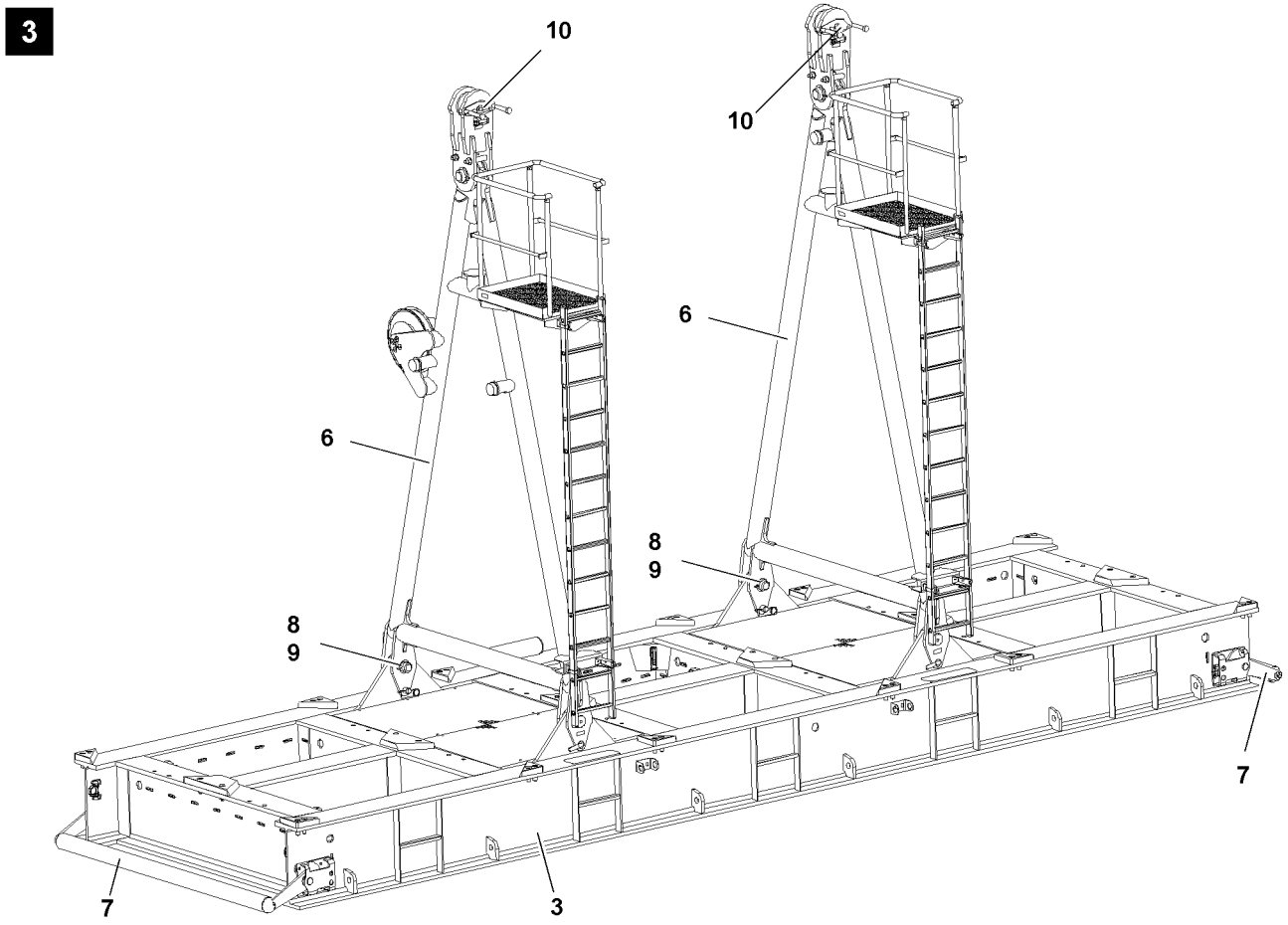

Fig.145950: Ballast pallet operating position

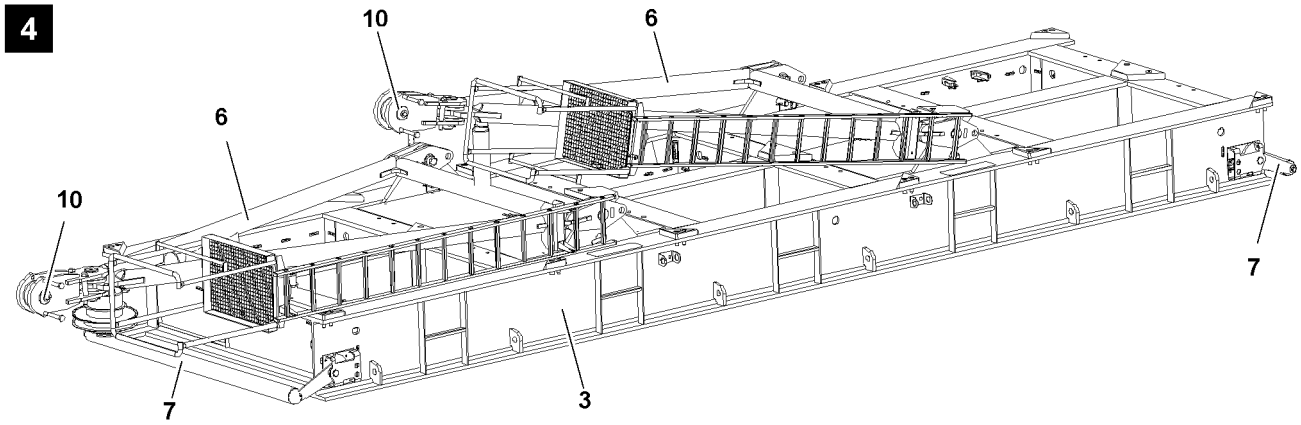

Fig.145951: Ballast pallet transport position

Note

- ▶ The assembly sections are marked with their own weight.
- ▶ Dimensions and weights, see the Crane operating instructions, chapter 1.03.

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2.1.1 Ballast pallet

Position	Component
3	Ballast pallet
6	Erection rack
7	Ground contact roller
8	Retaining pin
9	Safety spring
10	Connector pin

2.1.2 Lashing lugs

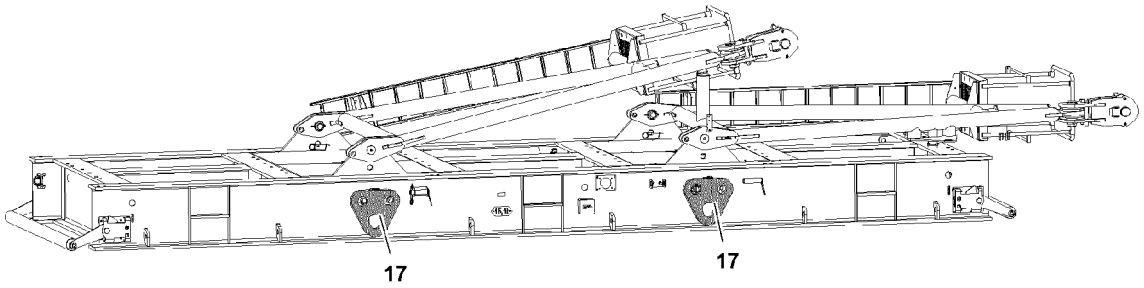

Fig.119014: Lashing lugs

Position	Component
17	Lashing lugs

Note
▶ Lashing lugs for fastening and transferring the ballast pallet with the auxiliary crane.

2.2 Component overview Suspended ballast guide

Note
▶ The assembly sections are marked with their own weight.
▶ Dimensions and weights, see the Crane operating instructions, chapter 1.03.

2.2.1 Pivot section

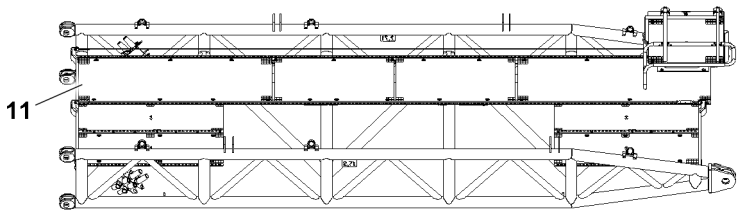

Fig.124480: Pivot section

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Position	Component
11	Pivot section

2.2.2 Intermediate section

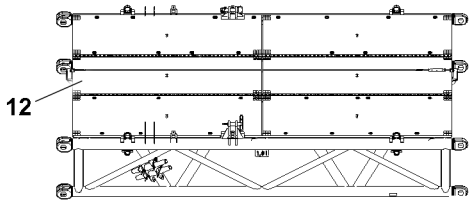

Fig.124481: Intermediate section

Position	Component
12	Intermediate section

2.2.3 Intermediate section

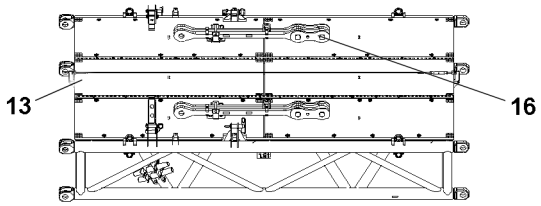

Fig.124482: Intermediate section

Position	Component
13	Intermediate section
16	Pull rods

2.2.4 End section

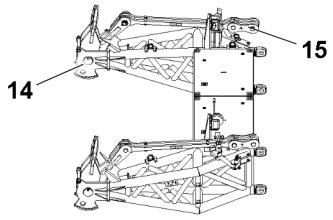

Fig.124483: End section

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Position	Component
14	End section
15	Pull rods - end section

2.2.5 Suspended ballast guide „Transport position“

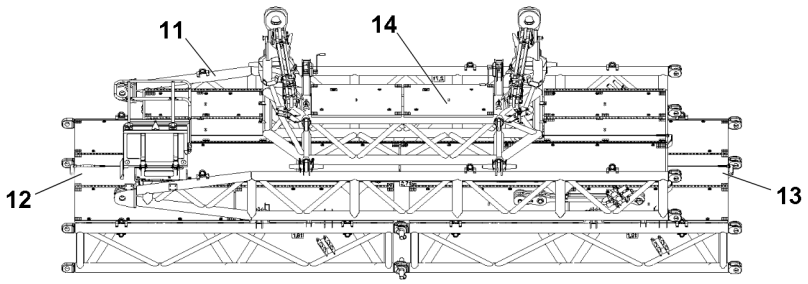

Fig.124484: Suspended ballast guide „Transport position“

Note
▶ Transport position, see illustration.

3 Fastening points

WARNING
Falling lattice sections!
Death, severe bodily injuries, property damage.
▶ Make sure that the lattice sections are properly fastened on the respective fastening points.
▶ Make sure that the fastening equipment has the appropriate length and a sufficient load bearing capacity.
▶ Pay attention and adhere to the labels on the fastening points on the lattice sections and crane components.

3.1 Fastening points for suspended ballast components

3.1.1 Ballast pallet

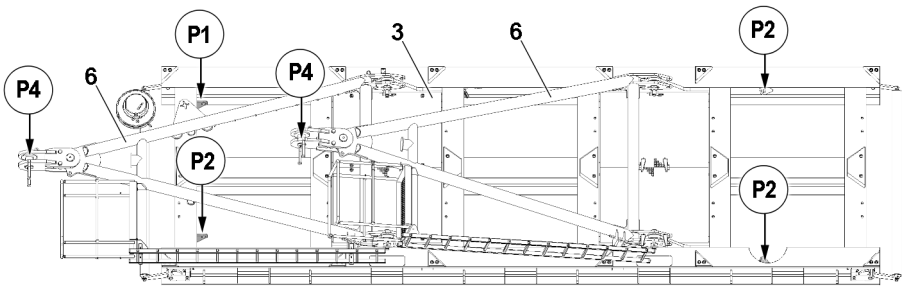

Fig.124490: Ballast pallet

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Fastening points	
P1 and **P2**	Ballast pallet
P4	Erection rack

3.1.2 Ballast plates

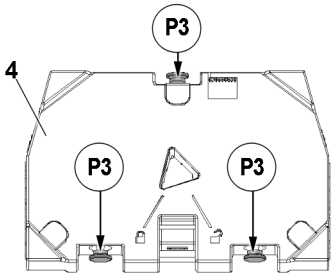

Fig.124491: Ballast plates

Fastening points	
P3	Ballast plates

3.2 Fastening points for suspended ballast guide components

3.2.1 End section

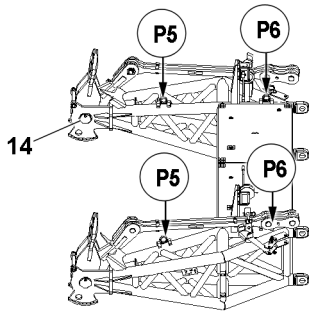

Fig.124488: End section

Fastening points	
P5 and **P6**	End section

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3.2.2 Intermediate section

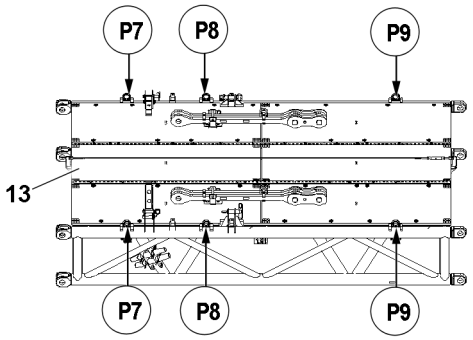

Fig.124487: Intermediate section

Fastening points	
P7 and **P9**	Intermediate section

3.2.3 Intermediate section

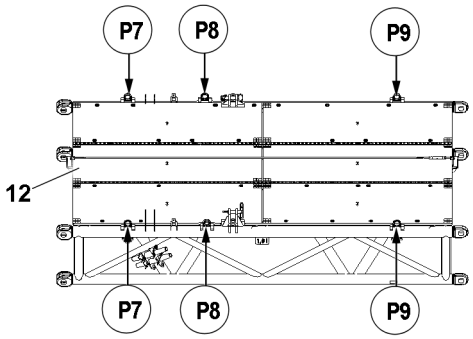

Fig.124486: Intermediate section

Fastening points	
P7 and **P9**	Intermediate section

3.2.4 Pivot section

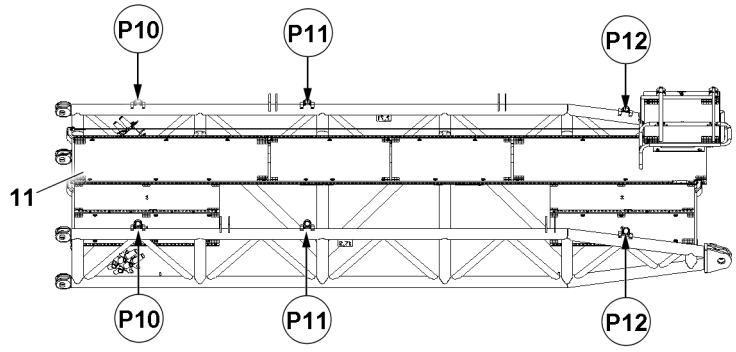

Fig.124485: Pivot section

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Fastening points	
P10 and **P12**	Pivot section

3.3 Suspended ballast guide (transport)

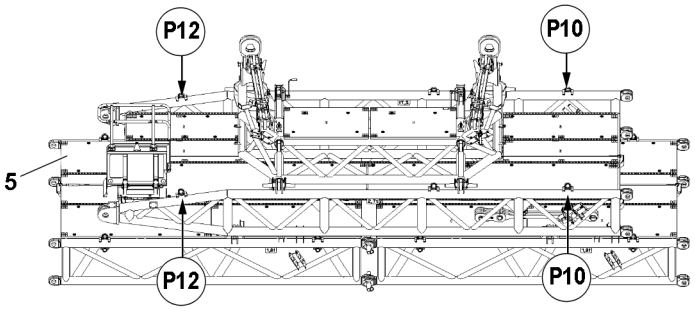

Fig.124489: Suspended ballast guide (transport)

Fastening points	
P10 and **P12**	Suspended ballast guide (transport)

3.4 Suspended ballast guide (assembly)

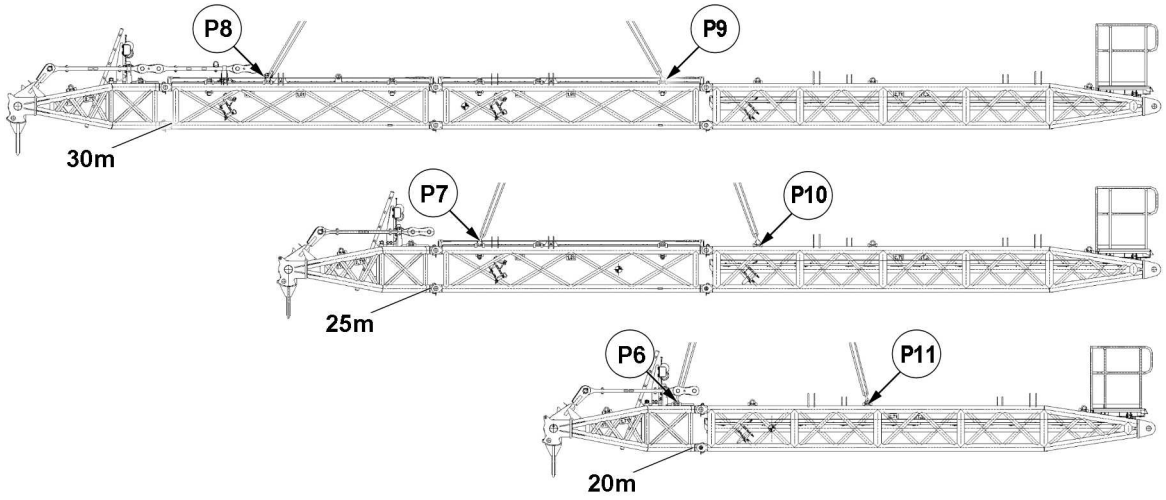

Fig.124492: Suspended ballast guide (assembly)

Fastening points	
P8 and **P9**	Suspended ballast guide 30 m
P7 and **P10**	Suspended ballast guide 25 m
P6 and **P11**	Suspended ballast guide 20 m

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4 Pull cylinder extension conditions

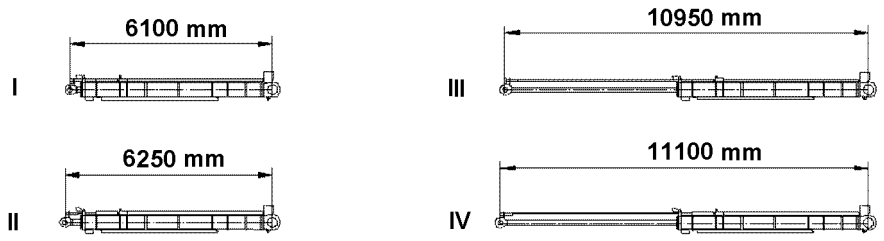

Fig.119003: Pull cylinder extension conditions

Extension conditions	
I	Block position „Retracted“
II	Switch position „Retracted“
III	Switch position „Extended“
IV	Block position „Extended“

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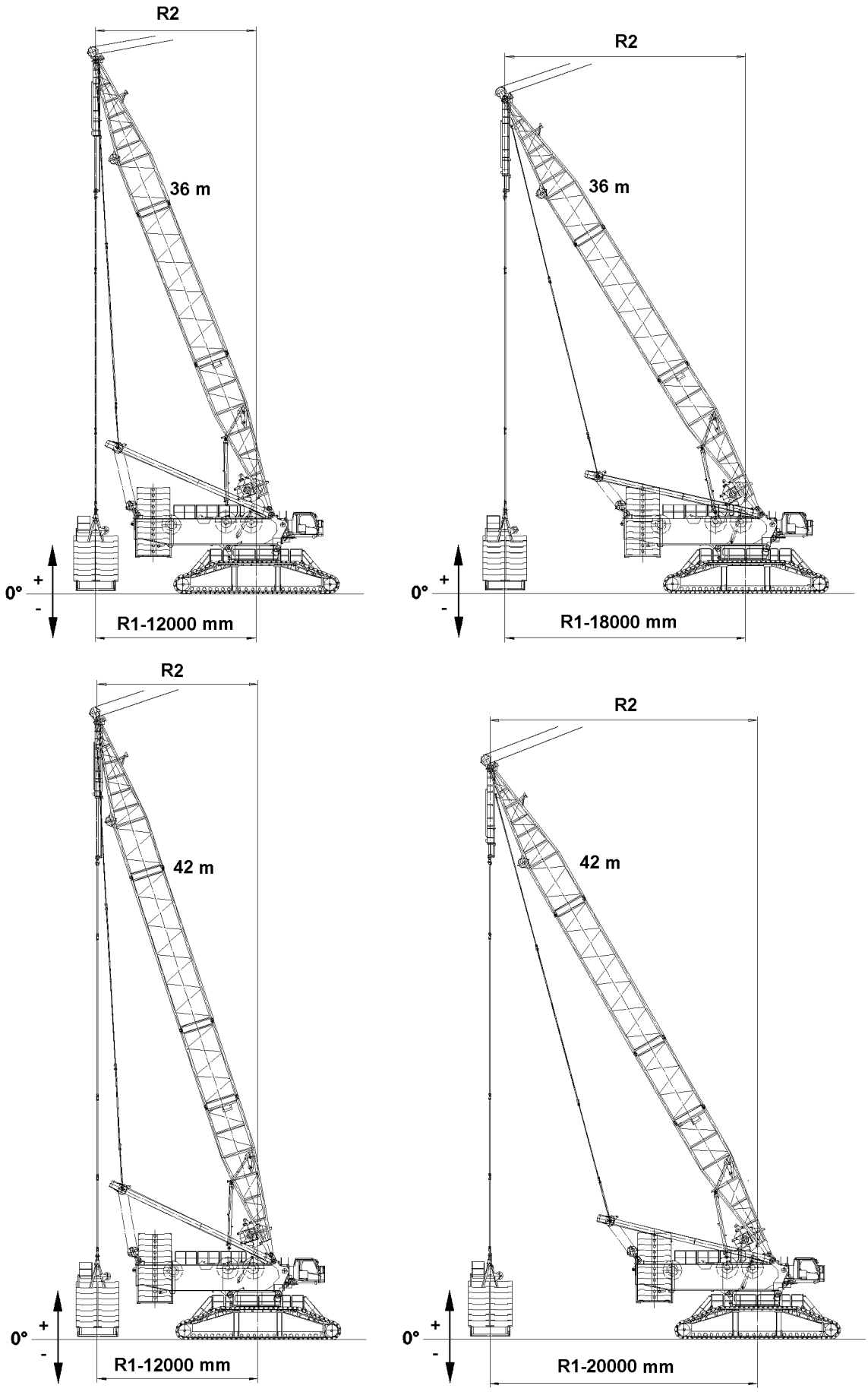

Fig.119004

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5 Derrick ballast radii

5.1 Derrick ballast without suspended ballast guide

5.1.1 36 m derrick boom

Note
- ▶ **No** suspended ballast guide is installed between the turntable and the ballast pallet.
- ▶ The derrick ballast radius **R1** and the derrick radius **R2** are identical, see illustration.

With the 36 m derrick, the following derrick ballast radii are possible: R1= 12 m and R1 =18 m.

Radius R1 = 12 m	
Above base	+3896 mm
Below base	-804 mm

Radius R1 = 18 m	
Above base	+919 mm
Below base	-3781 mm

5.1.2 Derrick boom 42 m

Note
- ▶ **No** suspended ballast guide is installed between the turntable and the ballast pallet.
- ▶ The derrick ballast radius **R1** and the derrick radius **R2** are identical, see illustration.

With the 42 m derrick, the following derrick ballast radii are possible: R1= 12 m and R1= 20 m.

Radius R1 = 12 m	
Above base	+4261 mm
Below base	-439 mm

Radius R1 = 20 m	
Above base	+709 mm
Below base	-3991 mm

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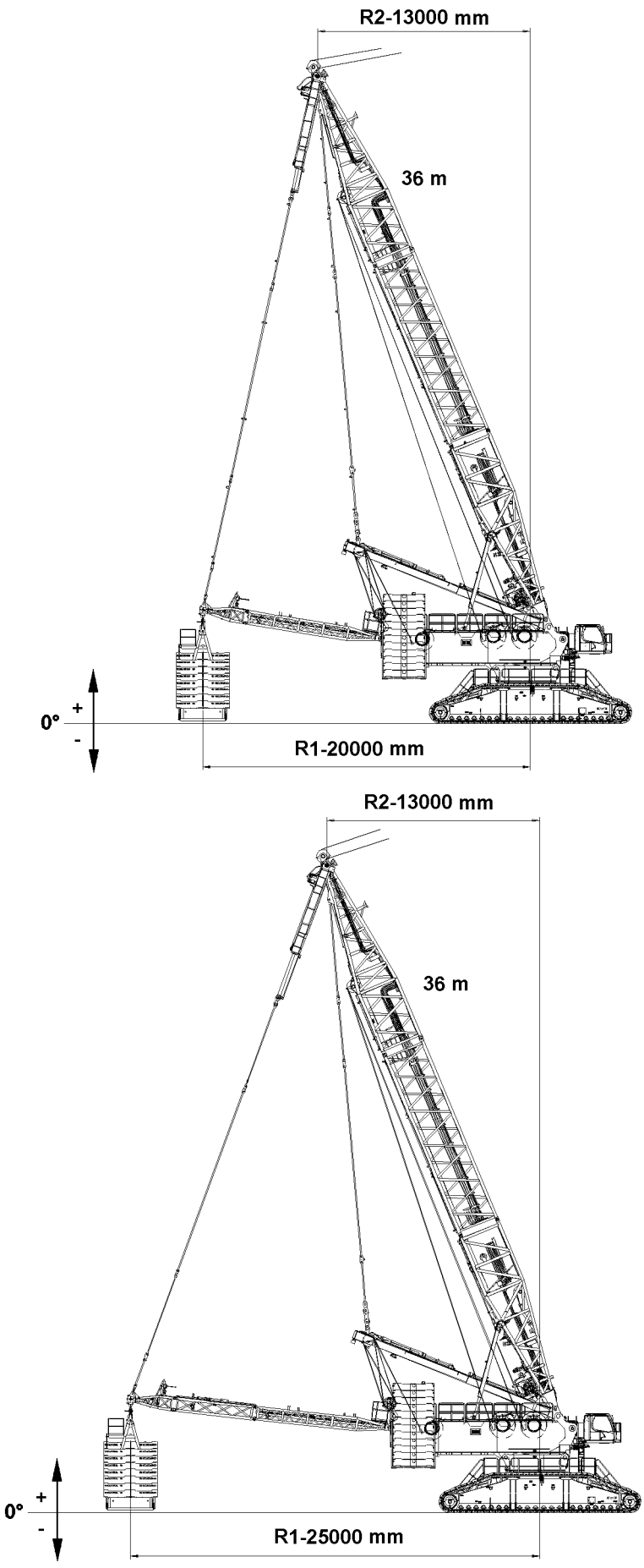

Fig.120208

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5.2 Derrick ballast with suspended ballast guide

5.2.1 36 m derrick boom

Note

- ▶ **One** suspended ballast guide is installed between the turntable and the ballast pallet.
- ▶ The derrick ballast radius **R1** and the derrick radius **R2** are **not** identical, see illustration.

Derrick radius with the 36 m derrick is R2= 13 m.

With the 36 m derrick, the following derrick ballast radii are possible: R1= 20 m and R1=25 m.

Radius R1 = 20 m	
Above base	+1000 mm
Below base	-1000 mm

Radius R1 = 25 m	
Above base	+1000 mm
Below base	-1000 mm

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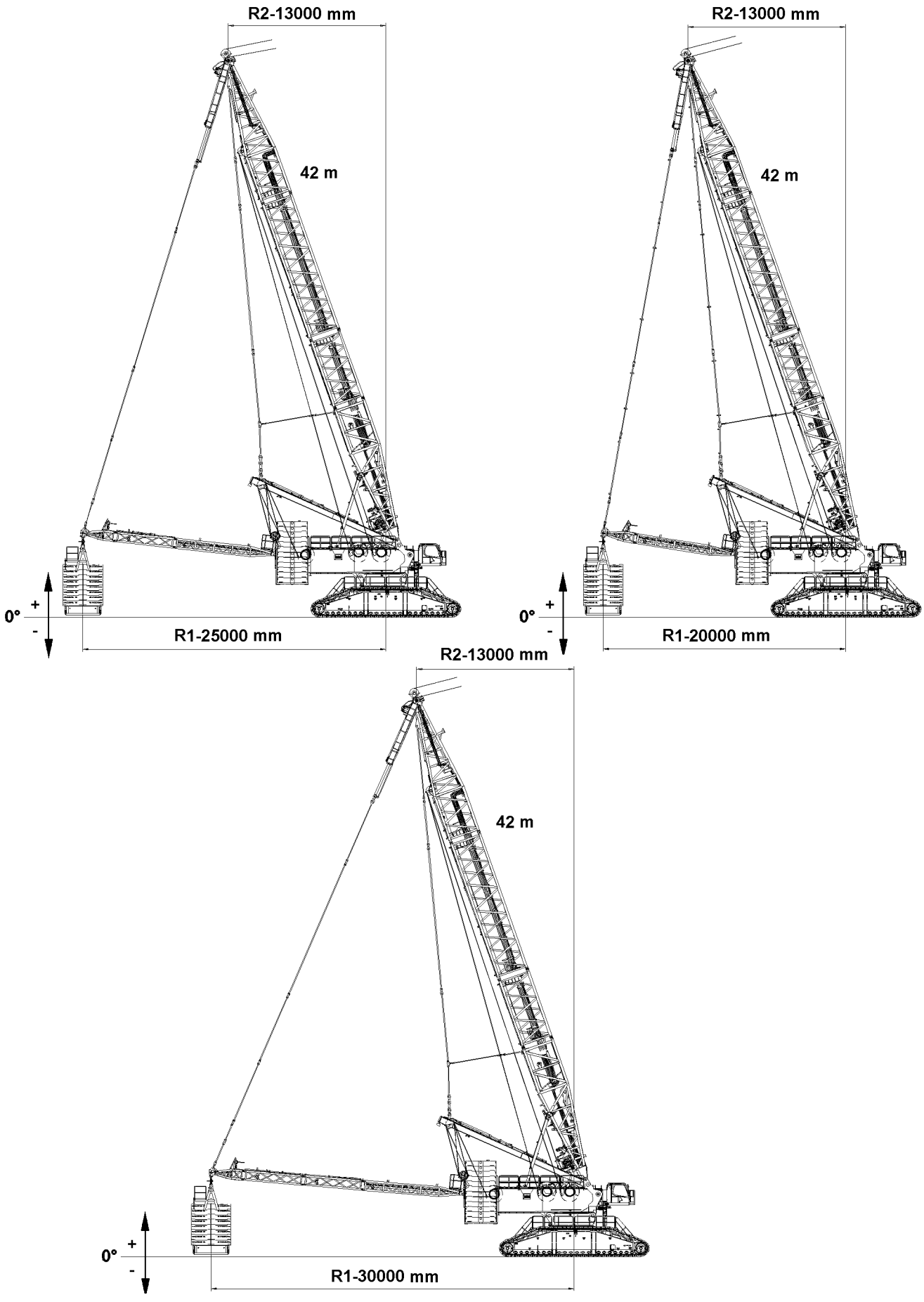

Fig.120209

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5.2.2 Derrick boom 42 m

Note

- ▶ **One** suspended ballast guide is installed between the turntable and the ballast pallet.
- ▶ The derrick ballast radius **R1** and the derrick radius **R2** are **not** identical, see illustration.

Derrick radius with the 42 m derrick is R2= 13 m.

With the 42 m derrick, the following derrick ballast radii are possible: R1= 20 m , R1= 25 m and R1= 30 m.

Radius R1 = 20 m	
Above base	+1000 mm
Below base	-1000 mm

Radius R1 = 25 m	
Above base	+1000 mm
Below base	-1000 mm

Radius R1 = 30 m	
Above base	+1000 mm
Below base	-1000 mm

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Fig.195219

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6 Assembling the suspended ballast

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.

- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.

- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel.

- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

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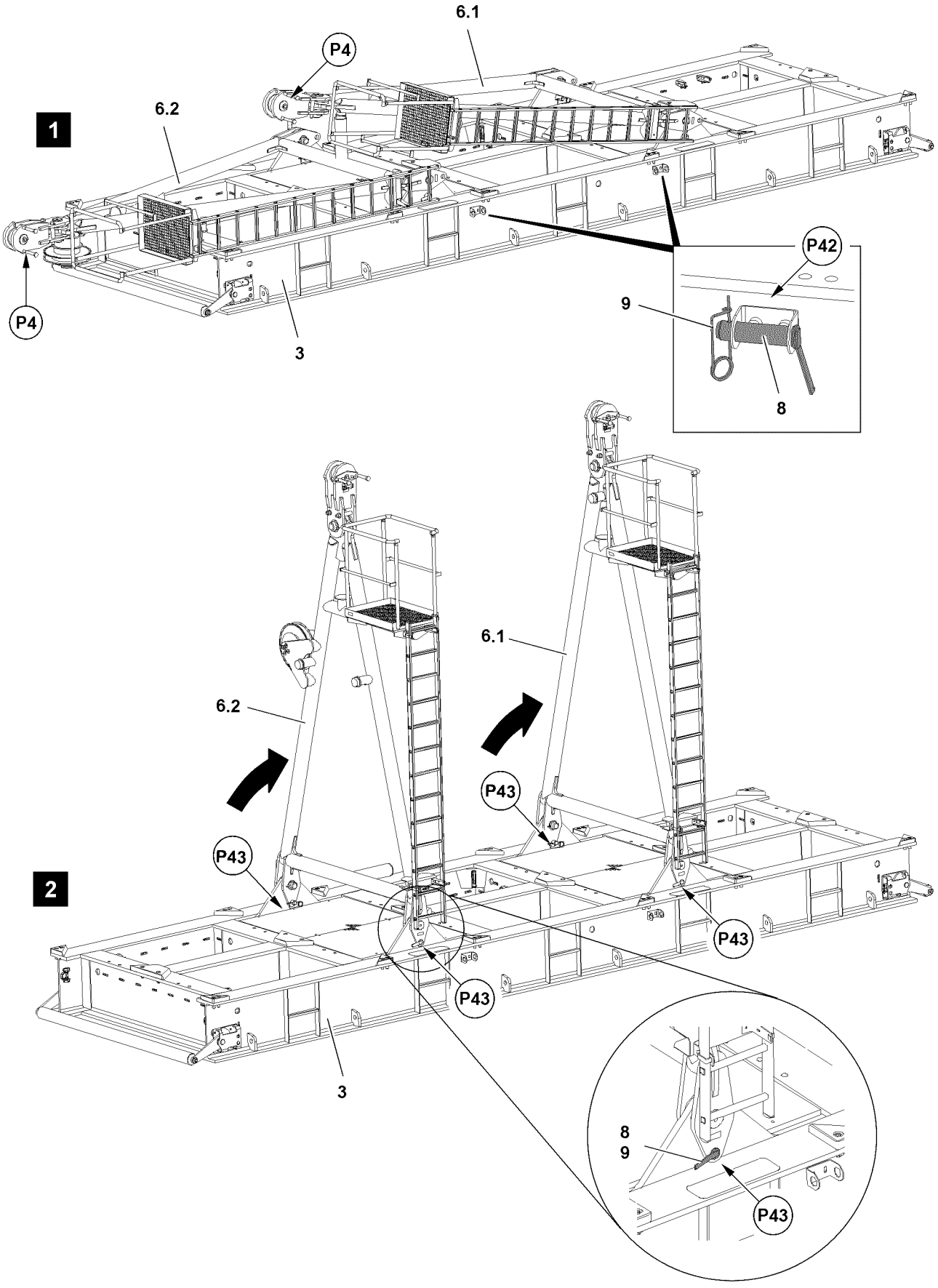

Fig.120206

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Make sure that the following prerequisites are met:
- The crane is properly supported and horizontally aligned.
- An auxiliary crane is available.
- The derrick is properly assembled on the turntable.
- The boom is properly assembled on the turntable.
- The derrick is in the crane operating position.
- The boom is laying on the substructure on the ground.
- The central ballast has been installed on the turntable according to the load chart.
- The counterweight has been installed on the turntable according to the load chart.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection settings have been compared with the actual set up configuration.

6.1 Installing the ballast pallet

DANGER
Danger of accident during assembly / disassembly of the erection racks!
The disassembly of unsecured or unsupported erection racks can cause the erection racks to fall down and kill or severely injure personnel.
- ▶ Never unpin the retaining pins under unsecured or unsupported erection racks.
- ▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure.

6.1.1 Setting the ballast pallet in the assembly position

▶ Set the derrick to the required radius.

Note
▶ Fastening points, see section „Fastening points for suspended ballast parts“.

▶ Hang the ballast pallet **3** on the auxiliary crane and position it within the slewing range of the crane under the guy rods on the derrick.

Note
▶ Set down the ballast pallet **3** in the lengthwise direction of the turntable for easier assembly to the guy rods.

▶ Align the ballast pallet **3** horizontally.

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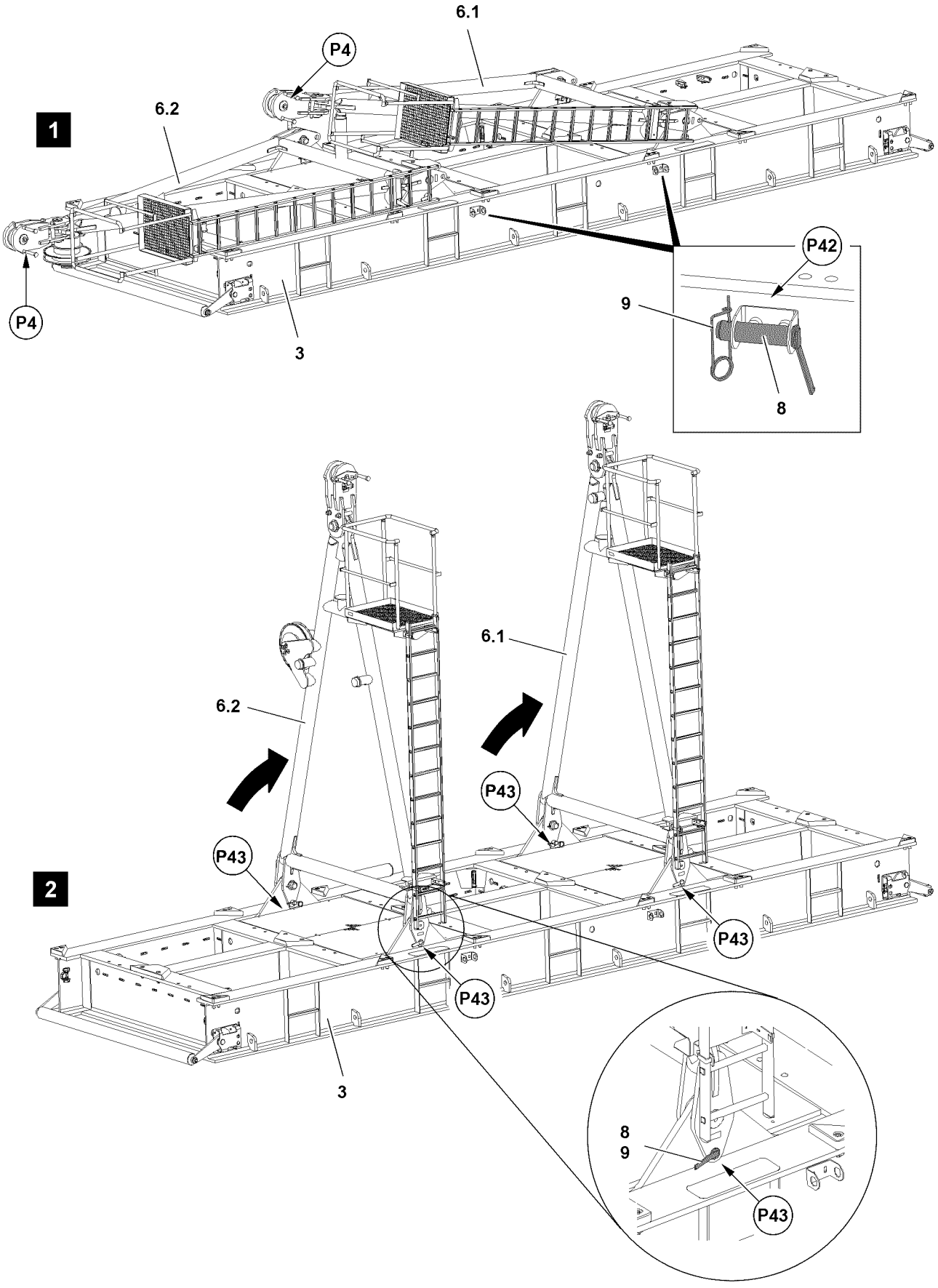

Fig.120206

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6.1.2 Erecting the erection racks

Note

▶ The assembly of the erection racks is described based on the example of one erection rack.

The erection rack is pinned on two points. The pin procedure is described for one pin as an example.

▶ Hang the erection rack **6.1** on the auxiliary crane at point **P4**, see illustration **1**.
▶ Remove the spring retainer **9** on both sides at point **P42** and unpin the retaining pin **8** from the park position, see illustration **1**.

DANGER

Danger of accident during assembly / disassembly of the erection racks!
The erection racks must hang securely on the auxiliary crane, otherwise they could fall down and kill or severely injure personnel.

▶ The two erection racks must be locked and secured in a vertical position with retaining pins **8**. Only then may the auxiliary crane be removed.
▶ Never unpin the retaining pins of unsecured or unsupported erection racks.
▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure.

▶ Position the erection rack **6.1** vertically with the auxiliary crane, see illustration **2**.
▶ Insert the retaining pin **8** at point **P43** on both sides and secure with the spring retainer **9** see illustration **2**.

When the erection rack is set up and secured:

▶ Remove the auxiliary crane.
▶ Erect the second erection rack **6.2**.

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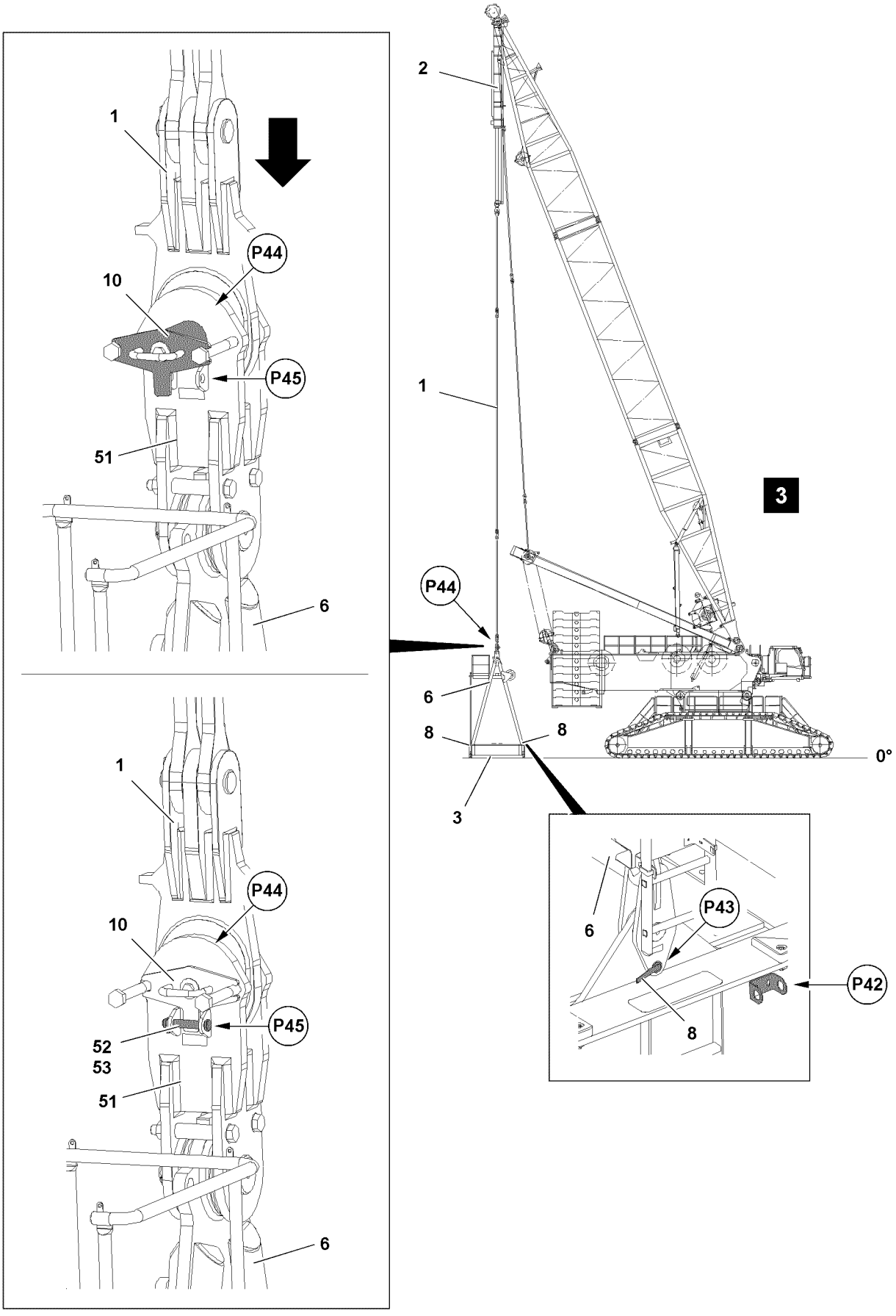

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Fig.119006

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6.2 Assembling the D-guy rods on the erection racks

Make sure that the following prerequisites are met:
- The guy rods hang above the brackets of the erection racks.
- The erection racks are set up and secured with retaining pins.
- The derrick is set to the required radius.

▶ Remove the safety locking pin **53** at point **P45** and unpin the retaining pin **52**.
▶ Unpin the connector pin **10** at point **P44**, see illustration **3**.
▶ Position the guy rods **1**, by extending the piston rods on the pull cylinders **2**, between the brackets **51** of the erection rack **6**.

Note
Retract / extend the pull cylinder **2**
▶ Control the pull cylinders **2** from the crane cab, see the section „Lifting and lowering the derrick ballast using the pull cylinders“.
▶ Operate the pull cylinder **2** with the radio remote control, see the „radio remote control operating instructions“.

▶ Pin the guy rods **1** on the brackets **51** and secure.
▶ Insert the connector pin **10** at point **P44**.

WARNING
Danger of accident!
If the connector pins are not secured with the retaining pin, then they can loosen up by themselves during crane operation.
This can cause the crane to topple over.
Death, severe bodily injuries, property damage.
▶ Make sure that the connector pins are secured.

▶ Insert the retaining pin **52** at point **P45** and secure with the safety locking pin **53**, see illustration **3**.
▶ Pin the second erection rack on the D-guy rod **1**.

WARNING
Uncontrolled oscillation of the ballast pallet!
When the ballast plate **3** is raised, it can start to swing.
Death, severe bodily injuries, property damage.
▶ It is prohibited to remain in the danger zone.
▶ Secure the ballast pallet with auxiliary rope.

▶ Lift the empty ballast pallet **3** with the pull cylinders **2** and set down again.

Result:

– The ballast pallet **3** is thereby precisely placed vertically under the derrick head.

▶ Align the ballast pallet **3** horizontally.

NOTICE
Damage to the retaining pins!
If the retaining pins **8** are not unpinned before crane operation, then they can be damaged in crane operation.
▶ Unpin the retaining pins **8** before starting crane operation.

When the ballast pallet **3** is pinned and secured on the D-guying:
▶ Release and unpin the retaining pins **8** on the erection racks on both sides.
▶ Insert and secure the retaining pin **8** at point **P42** in the park position, see illustration **3**.

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6.3 Establishing the electrical connection from the suspended ballast to the turntable

Note

▶ Establish the electrical connections from the suspended ballast to the turntable, see Electric wiring diagram.

▶ Establish the electrical connections.

7 Assembling the suspended ballast with suspended ballast guide

WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.

Death, severe bodily injuries, property damage.

▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
▶ Only step on the aids, ladders and catwalks with clean shoes.
▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
▶ Remaining on a suspended load is prohibited.
▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING

Danger of impact / crushing!

When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.

When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.

Death, severe bodily injuries, property damage.

▶ Make sure that personnel cannot be caught by components.
▶ When working in danger zones: Use aids to protect limbs.
▶ Guide components with suitable aids to minimize oscillation.

DANGER

The components can fall down!

If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel.

▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

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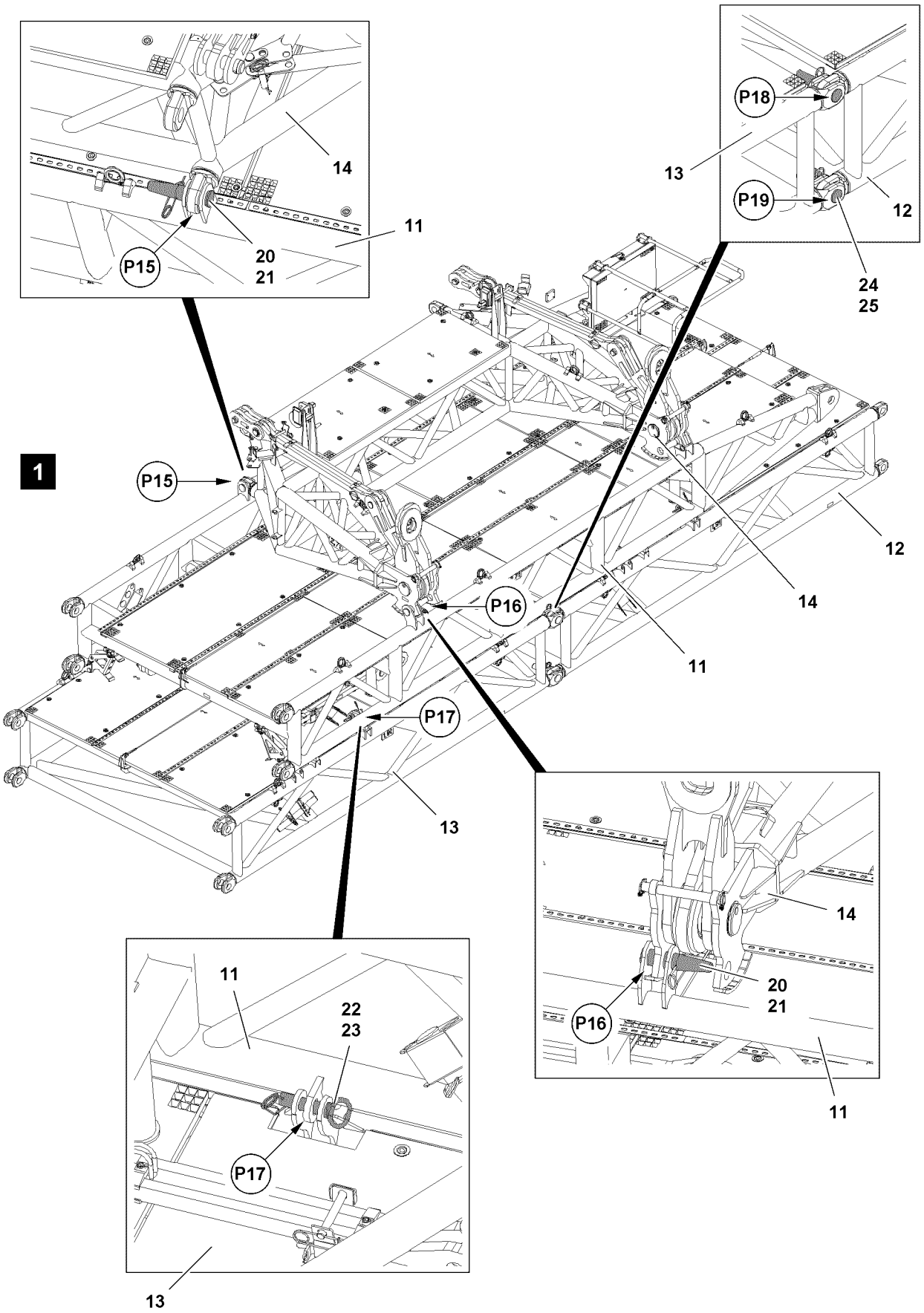

Fig.122801

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Make sure that the following prerequisites are met:
- The crane is properly supported and horizontally aligned.
- An auxiliary crane is available.
- The boom and the derrick are installed on the turntable.
- The boom and the derrick are in the crane operating position.
- The counterweight has been installed on the turntable according to the load chart.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection settings have been compared with the actual set up configuration.

7.1 Assembling the suspended ballast guide

The suspended ballast guide makes different derrick ballast radii possible.

The derrick ballast radius determines the number of intermediate section, which must be installed.

Derrick ballast radius	Number of intermediate sections
20 m	0
25 m	1
30 m	2

7.1.1 Removing the transport unit

Make sure that the following prerequisite is met:
- The transport unit is on the transport vehicle.

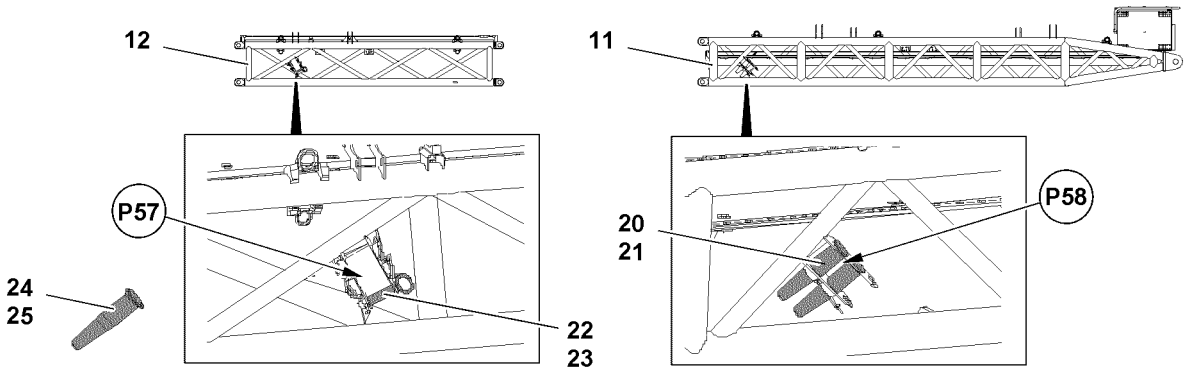

Fig.122802: Park position for pin

Note
- ▶ Park position **P57** for pin **24** and pin **22**.
- ▶ Park position **P58** for pin **20**.

WARNING
Falling pins!
Death, severe bodily injuries, property damage.
- ▶ Make sure that all pins are properly secured in the park positions with the respective retaining elements.

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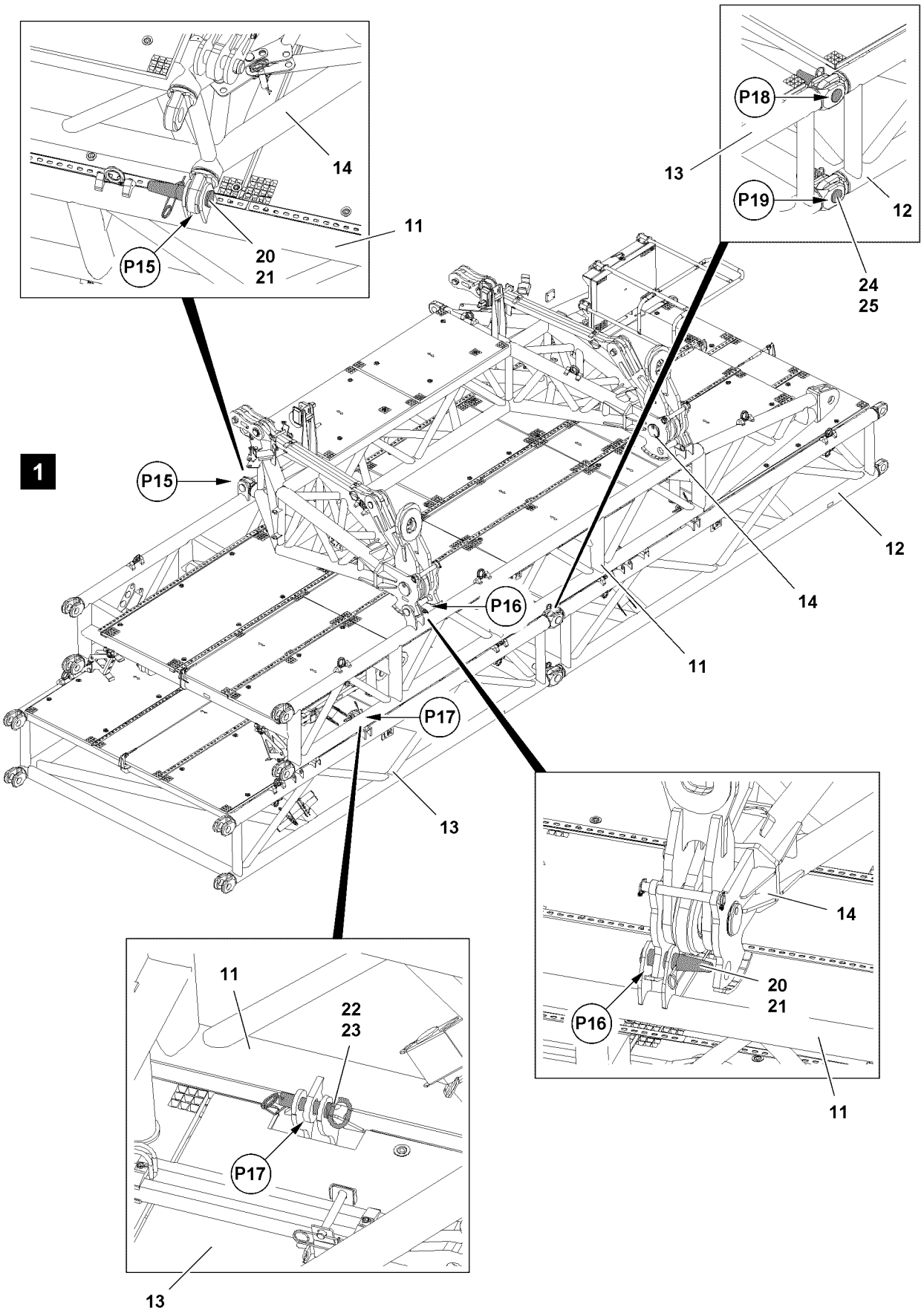

Fig.122801

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Disassembling the end section

▶ Release and remove the riggings on the transport vehicle.

The end section is unpinned at four points. Every point is present on both sides of the component on one level, see illustration **1**.

▶ Fasten the auxiliary crane to the end section **14**.
▶ Unpin the end section **14** at points **P15**: Remove spring retainers **21** and unpin pins **20**.
▶ Unpin the end section **14** at points **P16**: Remove spring retainers **21** and unpin pins **20**.
▶ Take the end section **14** down on the ground with the auxiliary crane.

Disassembling the pivot section

The pivot section is unpinned at four points. Every point is present on both sides of the component on one level, see illustration **1**.

▶ Fasten the auxiliary crane to the pivot section **11**.
▶ Unpin the pivot section **11** at points **P17**: Remove spring retainers **23** and unpin pins **22**.
▶ Take the pivot section **11** down on the ground with the auxiliary crane.

Disassembling the intermediate section

For a suspended ballast with a 25 m suspended ballast radius, the intermediate sections must be unpinned apart. The intermediate section is unpinned on four points. Every point is present on both sides of the component on one level, see illustration **1**.

▶ Fasten the auxiliary crane on intermediate section **12**.
▶ Unpin the intermediate section **12** at points **P19**: Remove spring retainers **25** and unpin pins **24**.
▶ Unpin the intermediate section **12** at points **P18**: Remove spring retainers **25** and unpin pins **24**.
▶ Take the intermediate section **12** down on the ground with the auxiliary.

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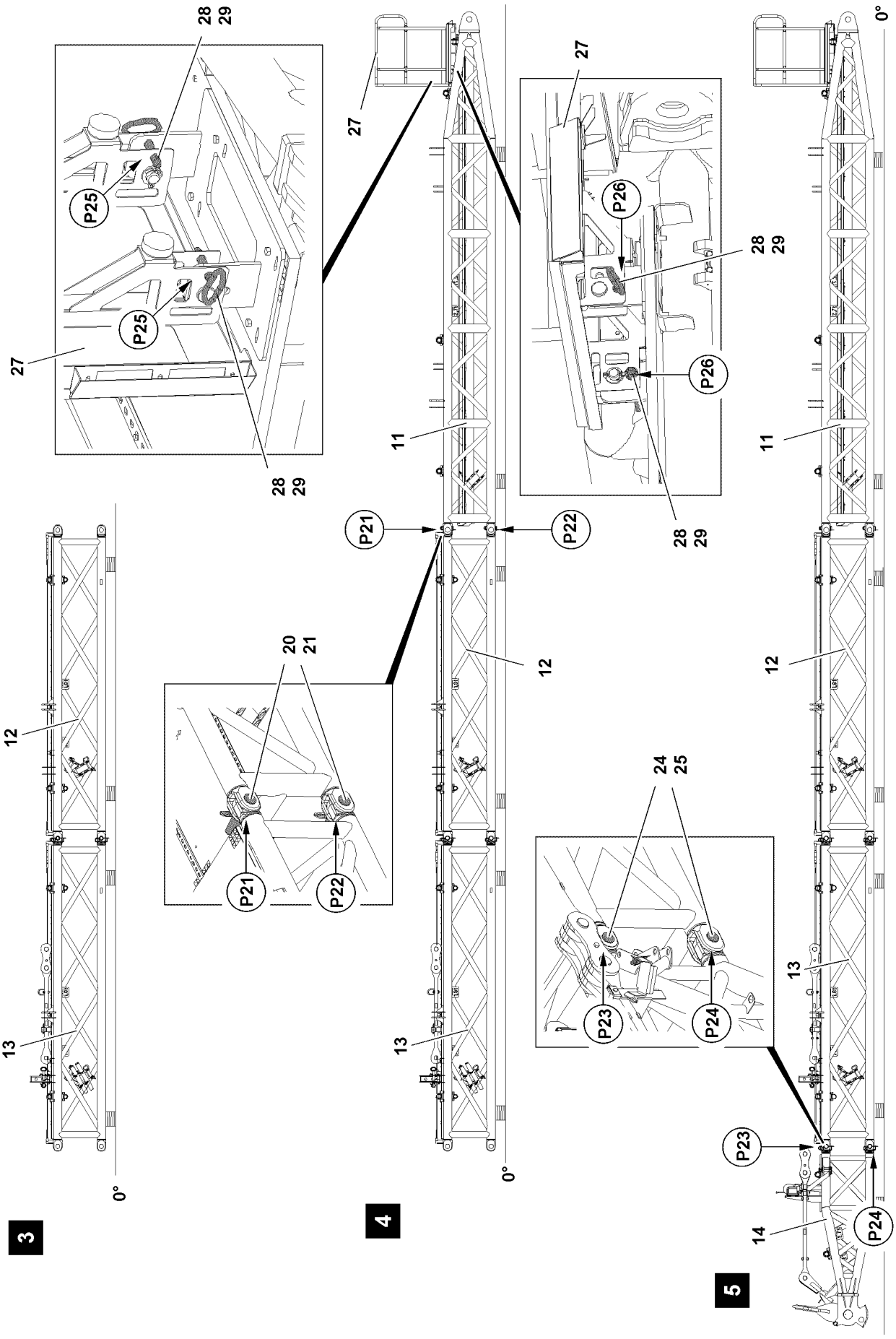

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Fig.122803

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7.1.2 Assembling the suspended ballast guide with a suspended ballast radius of 30 m

Note

▶ The assembly of the suspended ballast guide is described based on the example of a suspended ballast guide with a 30 m suspended ballast radius.

Make sure that the following prerequisites are met:
- The pivot section has been removed from the transport unit.
- The end section has been removed from the transport unit.

Assembling the intermediate sections

For the suspended ballast guide with a 30 m suspended ballast radius only two intermediate sections are installed.

▶ Support the ground in such a way that the intermediate sections can be placed down horizontally.
▶ Place the intermediate sections with the auxiliary crane on the substructure, see illustration **3**.
▶ Remove the fastening equipment.

Assembling the pivot section

▶ Fasten the pivot section **11** to the auxiliary crane.
▶ Position the pivot section **11** with the auxiliary crane on the intermediate section **12** at point **P21** until the pin points align.
▶ Support the pivot section **11**.

The pivot section and the intermediate section are pinned together in four points. Every point is present on both sides of the component on one level, see illustration **4**.

▶ Pin the pivot section **11** on both sides at point **P21** with the intermediate section **12**: Insert the pins **20** and secure with the spring retainers **21**.
▶ Pin the pivot section **11** on both sides at point **P22** with the intermediate section **12**: Insert the pins **20** and secure with the spring retainers **21**.
▶ Remove the fastening equipment.

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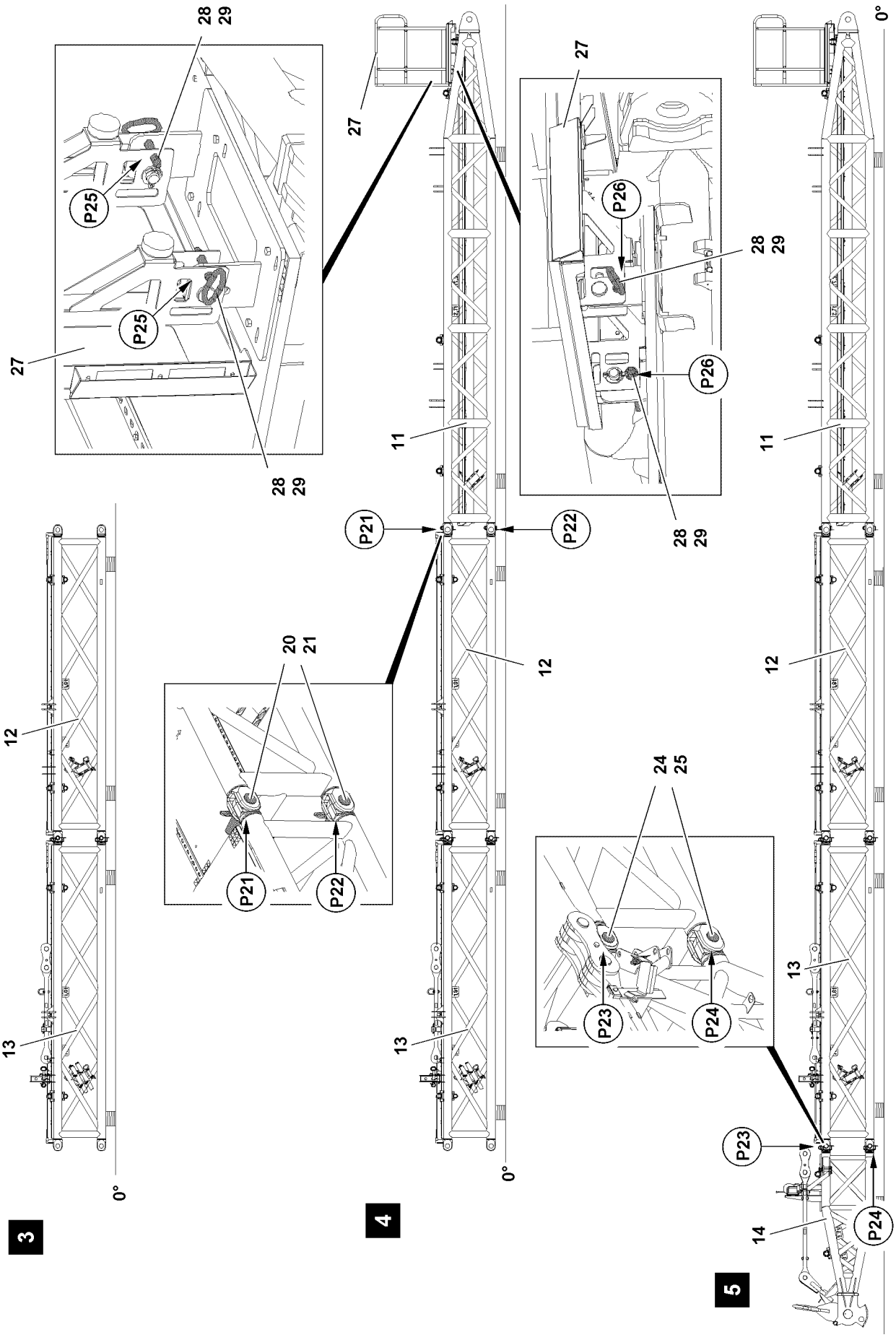

Fig.122803

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▶ Fasten the platform **27** to the auxiliary crane.

WARNING
Platform swinging down!
The platform can swing down by itself due to its own weight when unpinning it at points **P25**.
Death, severe bodily injuries, property damage.
Fingers and hands can be crushed.
▶ Make sure that the platform is safely held by the auxiliary crane.
▶ Do not reach with your hands into the danger zone.
▶ Use personal protective equipment.

▶ Set the platform **27** into operating position, see illustration **4**: Remove the safety locking pin **29** at points **P25** and unpin the grip pin **28**.
▶ Swing the platform **27** with the auxiliary crane.
▶ Insert the grip pin **28** at points **P26** and secure with safety locking pin **29**.
▶ Remove the auxiliary crane.

Assembling the end section

▶ Fasten the end section **14** to the auxiliary crane.
▶ Position the end section **14** with the auxiliary crane on the intermediate section **13** at point **P23** until the pin points align.
▶ Support the end section **14**.

The end section and the intermediate section are pinned together in four points. Every point is present on both sides of the component on one level, see illustration **5**.

▶ Pin the end section **14** on both sides at point **P23** with the intermediate section **13**: Insert the pins **24** and secure with the spring retainers **25**.
▶ Pin the end section **14** on both sides at point **P24** with the intermediate section **13**: Insert the pins **24** and secure with the spring retainers **25**.
▶ Remove the fastening equipment.

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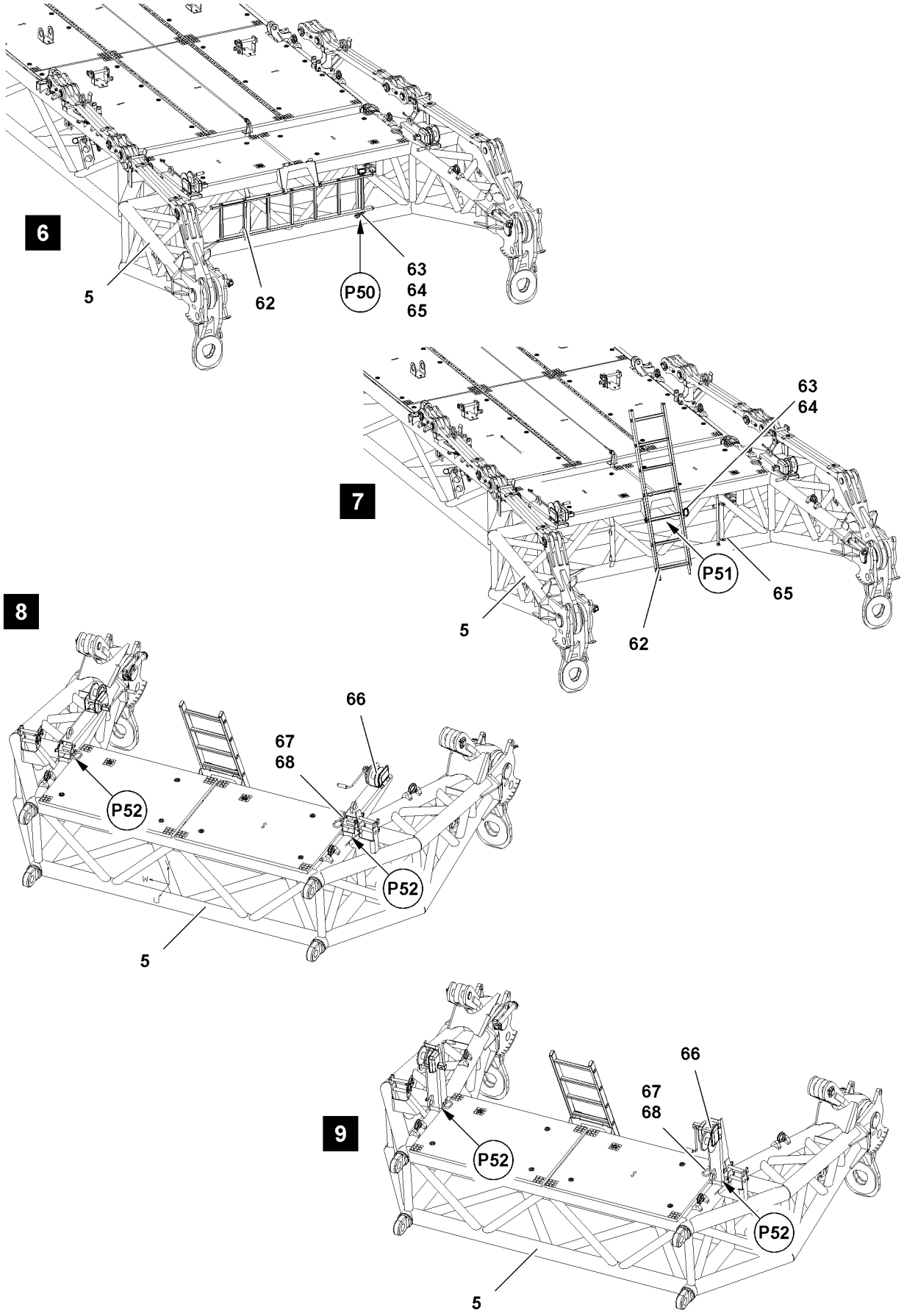

Fig.120205

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Assembling the ladder

WARNING
Falling ladder!
The ladder can fall down by itself due to its own weight when it is unpinned.
Death, severe bodily injuries, property damage.
Fingers and hands can be crushed.
- ▶ When unpinning the pin connection, hold the ladder.
- ▶ Do not reach with your hands into the danger zone.

- ▶ Release the ladder **62** from the transport retainer: Remove the lock **65** at point **P50** and unpin the grip pin **63**, see illustration **6**.
- ▶ Remove the safety locking pin **64** at point **P50** from park position, see illustration **6**.
- ▶ Attach the lock **65** at point **P50** in the park position, see illustration **6**.

WARNING
Danger of crushed limbs!
When hanging the ladder up, fingers and hands can be crushed.
- ▶ Do not reach with your hands into the danger zone.

- ▶ Get the ladder **62** from the transport retainer and hang it up at point **P51**, see illustration **7**.
- ▶ Secure the ladder **62** in operating position: Insert the grip pin **63** at point **P51** and secure with safety locking pin **64**, see illustration **7**.

Assembling the manual rope winch

- ▶ Release the manual rope winch **66** from the transport position: Remove the safety locking pin **68** at point **P52** and unpin the grip pin **67**, see illustration **8**.

WARNING
Danger of crushed limbs!
When setting up the manual rope winch, fingers and hands can be crushed.
- ▶ Do not reach with your hands into the danger zone.

WARNING
Falling manual rope winch!
The manual rope winch can fall down by itself due to its own weight when setting it up.
Death, severe bodily injuries, property damage.
Fingers and hands can be crushed.
- ▶ When unpinning the pin connection, hold the ladder.
- ▶ Do not reach with your hands into the danger zone.

- ▶ Set up the manual rope winch **66**, see illustration **9**.
- ▶ Secure the manual rope winch **66** in operating position: Insert the grip pin **67** at point **P52** and secure with safety locking pin **68**, see illustration **9**.

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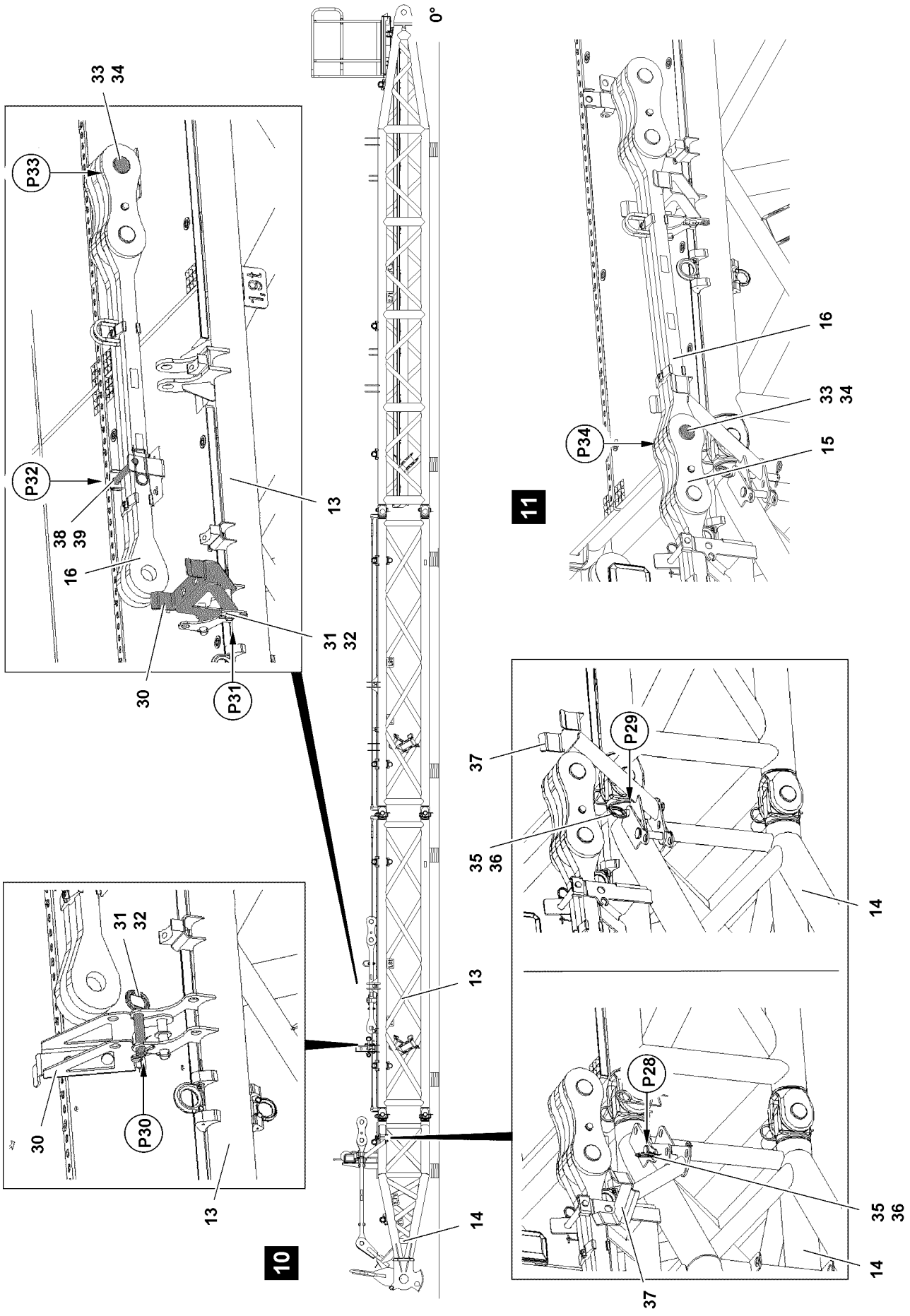

Fig.122804

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Assembling the pull rods

▶ Release the bracket **37** from the transport position: Remove the spring retainer **36** at point **P28** and unpin the socket pin **35**, see illustration **10**.

WARNING
When swinging the bracket, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Swing the bracket **37** until it can be pinned at point **P29**.
▶ Insert the socket pins **35** at point **P29** and secure with spring retainer **36**, see illustration **10**.

Result:

– The bracket **37** is secured in the operating position.

▶ Release the retainer **30** from the transport position: Remove the spring retainer **32** at point **P30** and unpin the socket pin **31**, see illustration **10**.

WARNING
When swinging the retainer, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Swing the retainer **30** until it can be pinned at point **P31**.
▶ Secure the retainer **30** in operating position: Insert the socket pins **31** at point **P31** and secure with spring retainer **32**, see illustration **10**.

Result:

– The retainer **30** is secured in the operating position.

▶ Release the pull rods **16** from the transport position: Remove the spring retainer **39** at point **P32** and unpin the pin **38**, see illustration **10**.
▶ Remove the safety locking pin **34** at point **P33** and unpin the pin **33**, see illustration **10**.
▶ Fasten the auxiliary crane to the pull rod **16**.
▶ Place the pull rod **16** down with the auxiliary crane in operating position on the retainer **30** and align at point **P34** on bores, see illustration **11**.
▶ Pin the pull rod **16** with the pull rod end section **15**: Insert the pin **33** at point **P34** and secure with the safety locking pin **34**, see illustration **11**.
▶ Remove the auxiliary crane.
▶ Insert the pin **38** in park position and secure with spring retainer **39**.
▶ Release the pull rod **15** from the transport position.

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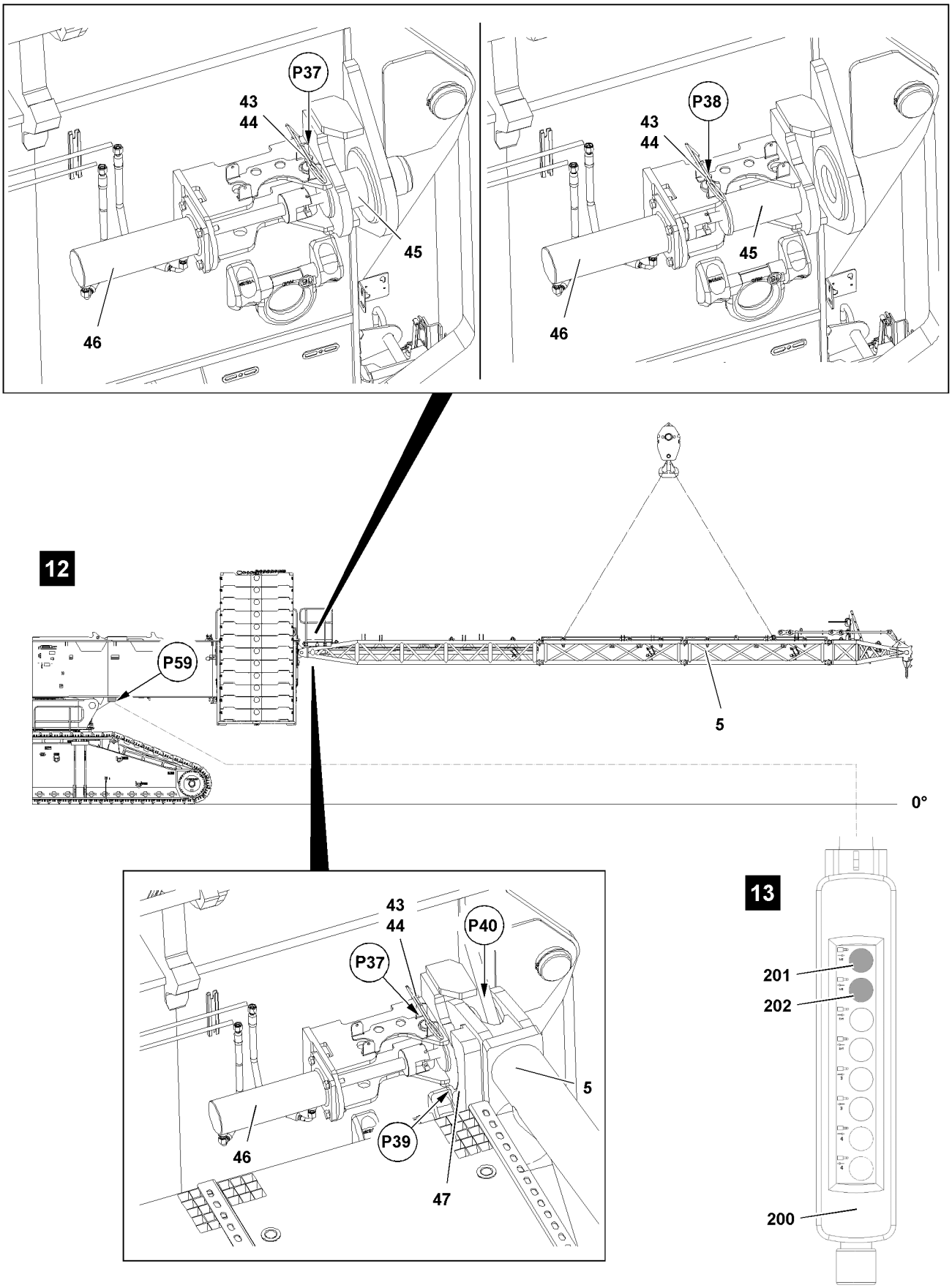

Fig.122805

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Swinging the brackets

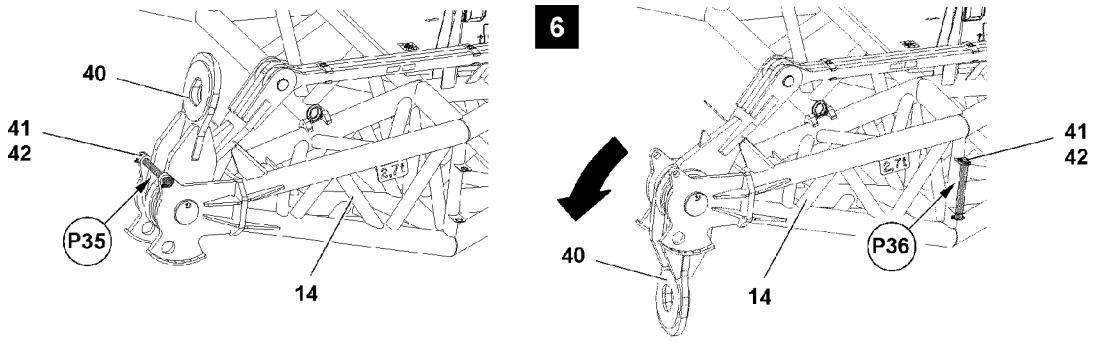

Fig.119028: Swinging the bracket

▶ Fasten the bracket **40** to the auxiliary crane.

WARNING
Bracket swinging down!
The bracket can swing down by itself due to its own weight when unpinning it at point **P25**, see illustration.
Death, severe bodily injuries, property damage.
Fingers and hands can be crushed.
▶ Make sure that the platform is held by the auxiliary crane.
▶ Do not reach with your hands into the danger zone.

▶ Remove the safety locking pin **42** at point **P35** and unpin the pin **41**, see illustration **14**.
▶ Swing the bracket **40** downward with the auxiliary crane.
▶ Insert the pin **41** in park position at point **P36** and secure with safety locking pin **42**, see illustration **14**.

7.1.3 Assembling the suspended ballast guide on the turntable frame

Make sure that the following prerequisites are met:
– A lifting platform or other aids are available.
– An auxiliary crane is available.
– The control panel is connected on the „turntable rear“ socket , point **P59**.

The suspended ballast guide **5** is pinned on two points. The pin procedure is described for one pin as an example:

▶ Release the pin **45**: Remove the spring retainer **44** at point **P37** and unpin the retaining pin **43**, see illustration **12**.
▶ Insert the retaining pin **43** at point **P38** and secure with spring retainer **44** see illustration **12**.
▶ Plug the control panel on the turntable in on the rear, see illustration **13**.
▶ Unpin the pin **45**: Press button **202** on the control panel **200**, see illustration **13**.

Result:

– The pin **45** moves out.

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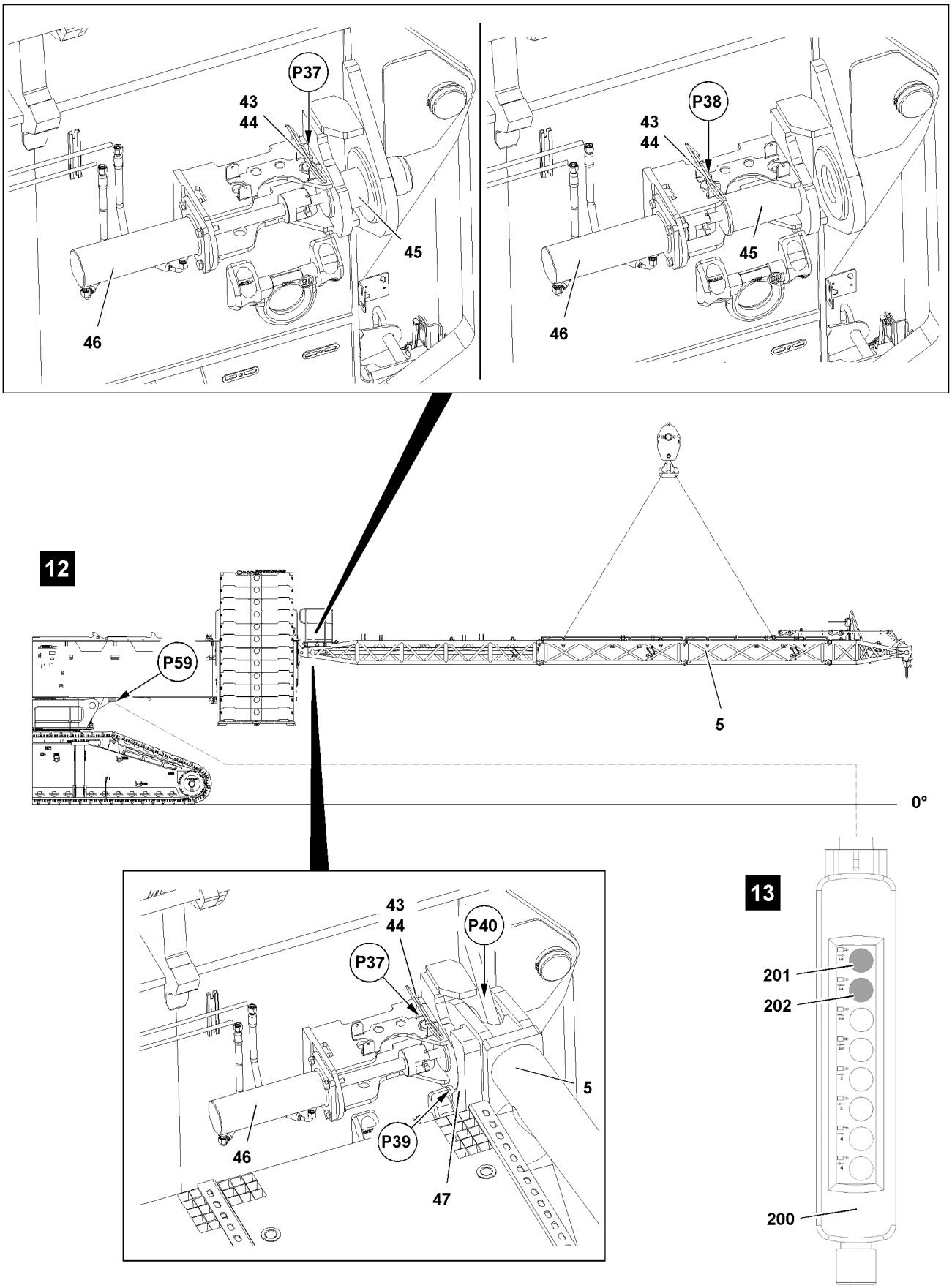

Fig.122805

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▶ Attach the suspended ballast guide **5** on the auxiliary crane.
▶ Lift the suspended ballast guide **5** to the pin points **P40** on the rear of the turntable, see illustration **12**.
▶ Set the suspended ballast guide **5** on the centering **47** on points **P39** of the turntable, see illustration **12**.

Result:

– Align the pin bores.

▶ Insert the pin **45**: Press button **201** on the control panel **200**, see illustration **13**.

Result:

– The pin **45** moves in.

WARNING
Danger of accident!
If the pins are not secured with the retaining pin, then the connector pins can loosen up by themselves during crane operation.
This can cause the crane to topple over.
Death, severe bodily injuries, property damage.
▶ Make sure that the connector pins are secured.

▶ Secure the pin **45**: Insert the retaining pin **43** at point **P37** and secure with spring retainer **44** see illustration **12**.

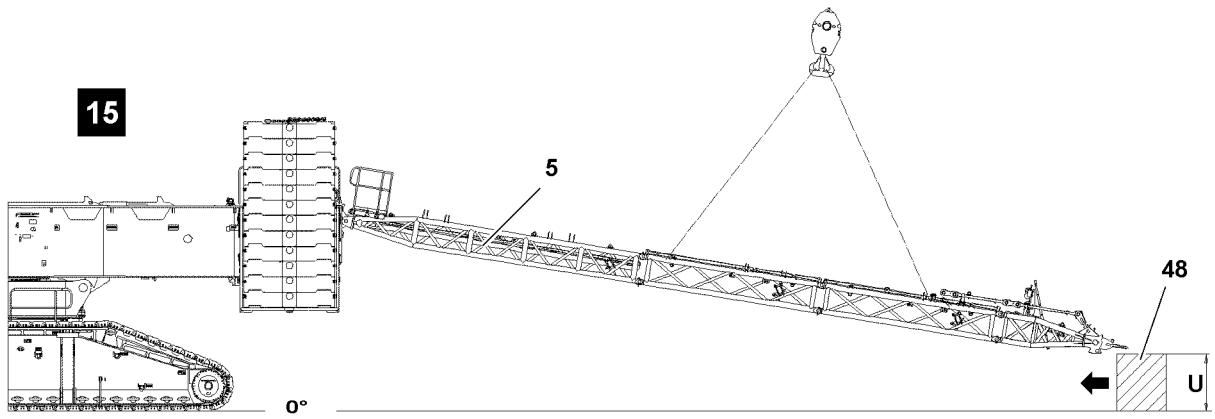

Fig.120203: Substructure

Suspended ballast guide	R30	R25	R20
Substructure height „U“	0 m	1.6 m	2.0 m

▶ Take the suspended ballast guide **5** down on the substructure with the auxiliary crane, see illustration **15** and chart.

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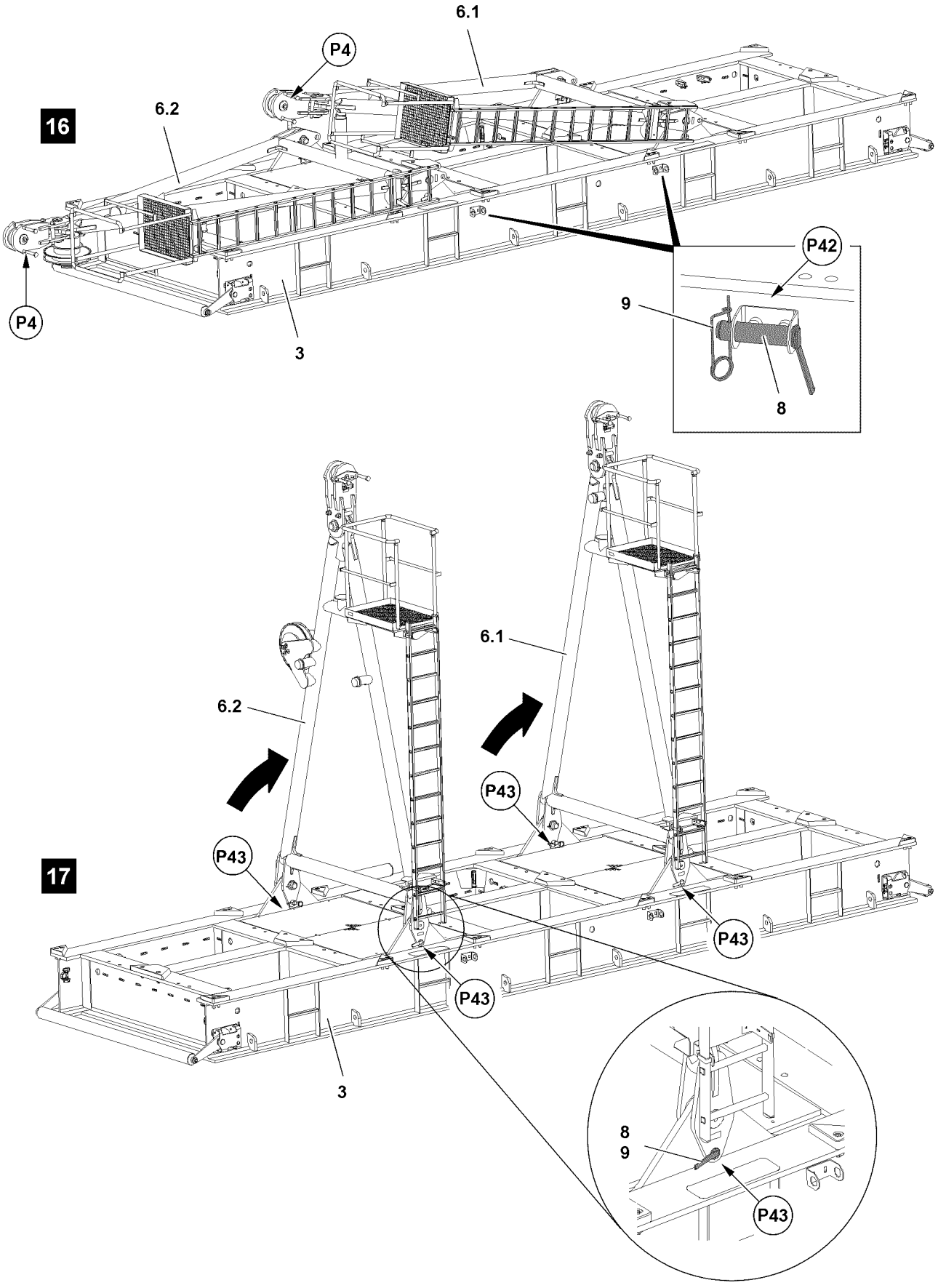

Fig.119005

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7.2 Installing the ballast pallet

DANGER
Danger of accident during assembly / disassembly of the erection racks!
The disassembly of unsecured or unsupported erection racks can cause the erection racks to fall down and kill or severely injure personnel.
- ▶ Never unpin the retaining pins under unsecured or unsupported erection racks.
- ▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure.

7.2.1 Setting the ballast pallet in the assembly position

- ▶ Set the derrick to the required radius.

Note
- ▶ Fastening points, see section „Fastening points for suspended ballast parts“.

- ▶ Hang the ballast pallet **3** on the auxiliary crane and position it within the slewing range of the crane under the guy rods on the derrick.

Note
- ▶ Set down the ballast pallet **3** in the lengthwise direction of the turntable for easier assembly to the guy rods.

- ▶ Align the ballast pallet **3** horizontally.

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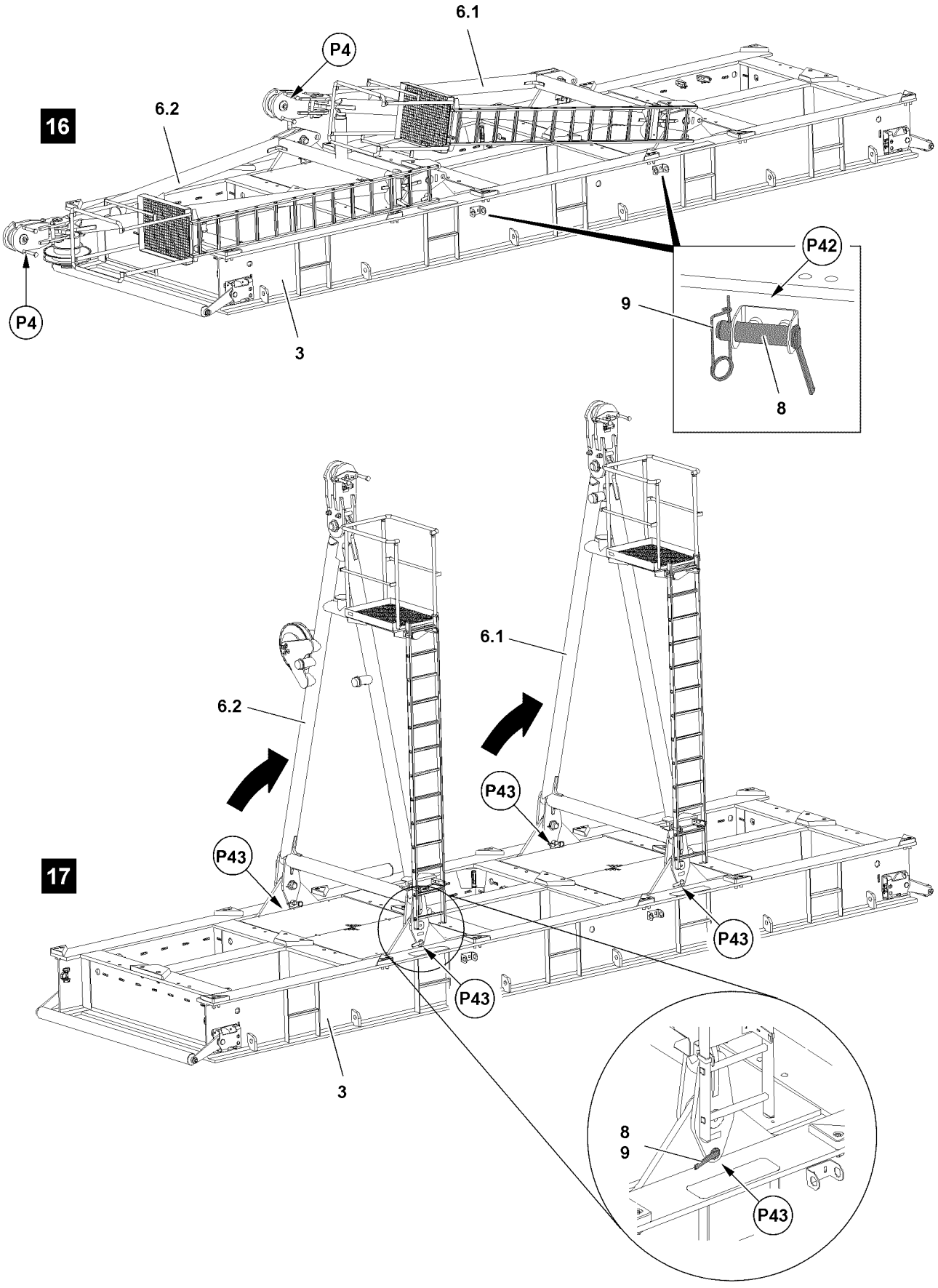

Fig.119005

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7.2.2 Erecting the erection racks

Note

▶ The assembly of the erection racks is described based on the example of one erection rack.

The erection rack is pinned on two points. The pin procedure is described for one pin as an example.

▶ Hang the erection rack **6.1** on the auxiliary crane at point **P4**, see illustration **16**.
▶ Remove the spring retainer **9** on both sides at point **P42** and unpin the retaining pin **8** from the park position.

DANGER

Danger of accident during assembly / disassembly of the erection racks!
The erection racks must hang securely on the auxiliary crane, otherwise they could fall down and kill or severely injure personnel.

▶ The two erection racks must be locked and secured in a vertical position with retaining pins **8**. Only then may the auxiliary crane be removed.
▶ Never unpin the retaining pins of unsecured or unsupported erection racks.
▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure.

▶ Position the erection rack **6.1** vertically with the auxiliary crane, see illustration **13**.
▶ Insert the retaining pin **8** at point **P43** on both sides and secure with the spring retainer **9** see illustration **17**.

When the erection rack **6.1** is set up and secured:

▶ Remove the auxiliary crane.
▶ Erect the second erection rack **6.2**.

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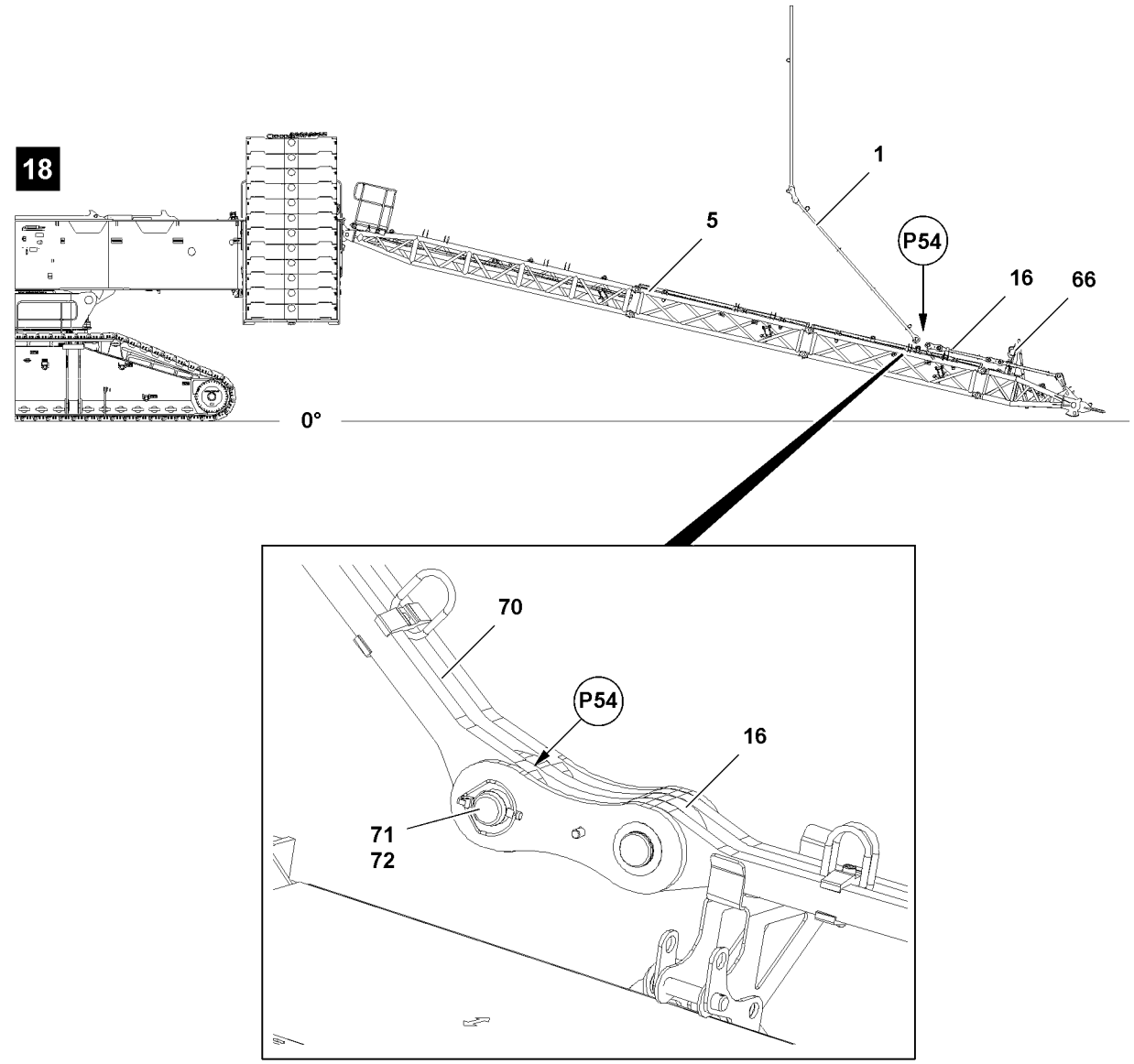

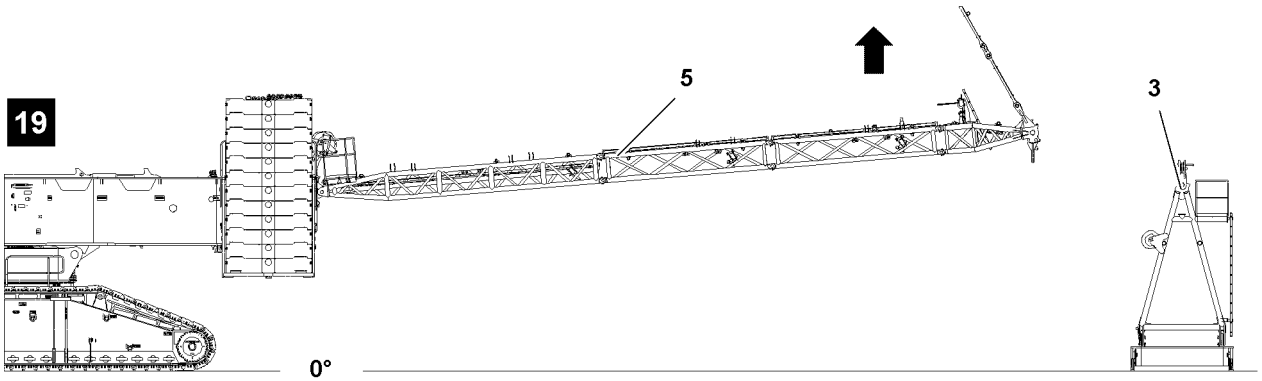

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Fig.120204

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7.3 Pinning the suspended ballast guide with the ballast pallet

Make sure that the following prerequisites are met:
- The D-guy rods hang over the lugs of the suspended ballast guide.
- The manual rope winches are set up and secured.
- The erection racks are set up and secured with retaining pins.

7.3.1 Pinning the D-guy rods with the pull rods of the suspended ballast guide

▶ Connect the rope of the manual rope winch **66** with the D-guy rods **1**.

The D-guy rods **1** are pinned on both sides on the suspended ballast guide **5**. The pin procedure is described on the example for one D-guy rod.

▶ Pull the D-guy rods **1** with the manual rope winch **66** to the pull rods **16** and luff the derrick down at the same time until it can be pinned on point **P54**.

WARNING
Danger of accident!
If the connector pins are not secured with the retaining pin, then they can loosen up by themselves during crane operation.
This can cause the crane to topple over.
Death, severe bodily injuries, property damage.
▶ Make sure that the connector pins are secured.

When the pin bores align:
▶ Insert the pin **71** at point **P54** and secure with the safety locking pin **72**, see illustration **18**.
▶ Lift the suspended ballast guide **4** with the derrick, see illustration **19**.

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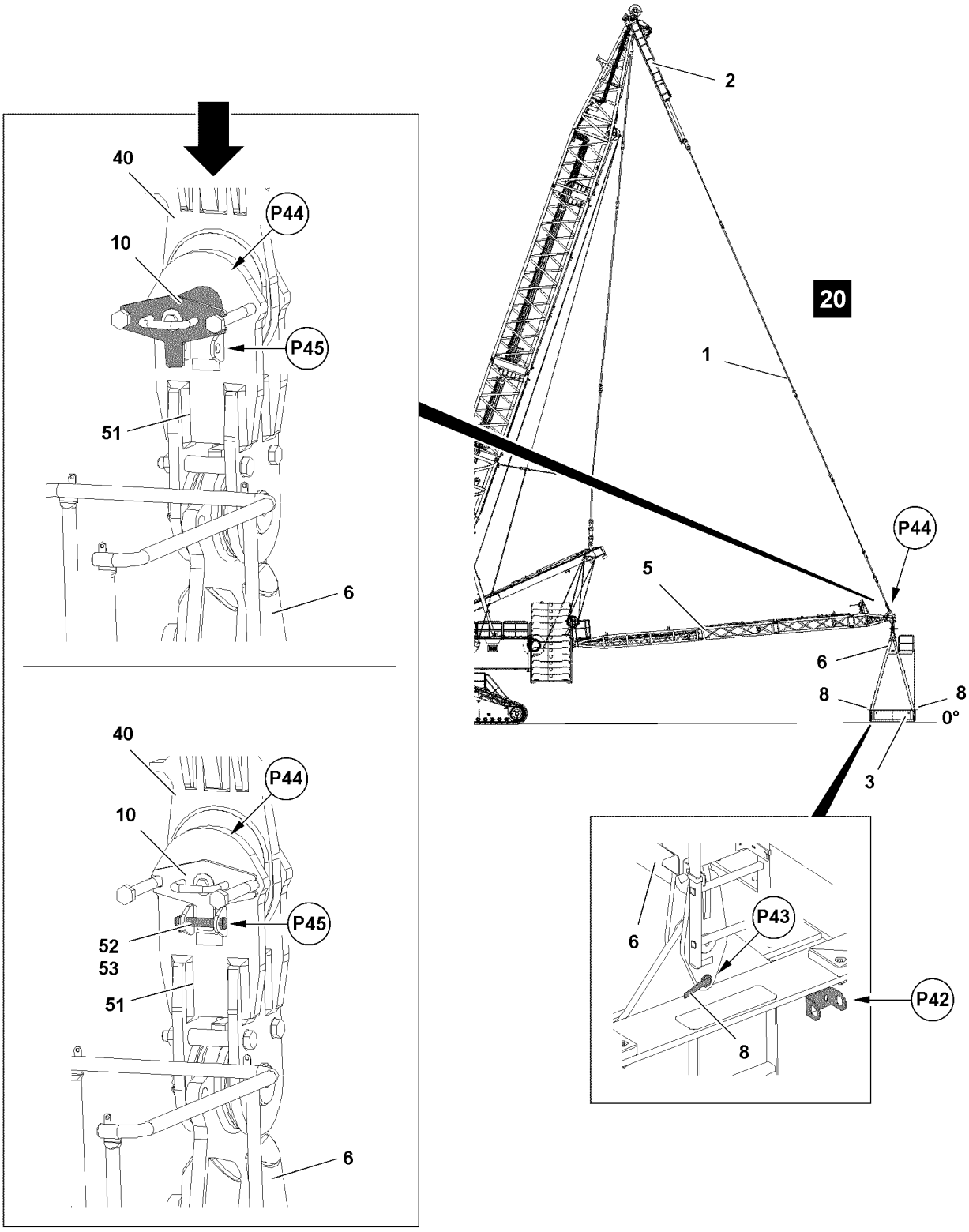

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Fig.120207

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7.3.2 Pinning the suspended ballast guide on the ballast pallet

Make sure that the following prerequisite is met:
– The derrick is set to the required radius.

The ballast pallet **3** is pinned in two points. The pin procedure is described for one pin as an example.

▶ Position the suspended ballast guide **5** over the ballast pallet **3**.
▶ Remove the safety locking pin **53** at point **P45** and unpin the retaining pin **52**.
▶ Unpin the connector pin **10** at point **P44**.
▶ Lower the brackets **40** of the suspended ballast guide by extending the piston rods on the pull cylinders **2** into the brackets **51** until the pin bores align.

Note
Retract / extend the pull cylinder **2**
▶ Control the pull cylinders **2** from the crane cab, see the section „Lifting and lowering the derrick ballast using the pull cylinders“.
▶ Operate the pull cylinder **2** with the radio remote control, see the „radio remote control operating instructions“.

Pin and secure the brackets **40** on the brackets **51**, see illustration **20**.

▶ Insert the connector pin **10** at point **P44**.

WARNING
Danger of accident!
If the connector pins are not secured with the retaining pin, then they can loosen up by themselves during crane operation.
This can cause the crane to topple over.
Death, severe bodily injuries, property damage.
▶ Make sure that the connector pins are secured.

▶ Insert the retaining pin **52** at point **P45** and secure with the safety locking pin **53**, see illustration **20**.
▶ Pin the second erection rack **7** on the suspended ballast guide **5**.

WARNING
Uncontrolled oscillation of the ballast pallet!
When the ballast plate **3** is raised, it can start to swing.
Death, severe bodily injuries, property damage.
▶ It is prohibited to remain in the danger zone.
▶ Secure the ballast pallet with auxiliary rope.

▶ Lift the empty ballast pallet **3** with the pull cylinders **2** and set down again.

Result:

– The ballast pallet **3** is vertically aligned.

▶ Align the ballast pallet **3** horizontally.

NOTICE
Damage to the retaining pins!
If the retaining pins **8** are not unpinned before crane operation, then they can be damaged in crane operation.
▶ Unpin the retaining pins **8** before starting crane operation.

When the ballast pallet **3** is pinned and secured on the suspended ballast guide:
▶ Release and unpin the retaining pins **8** on the erection racks on both side on points **P43**.
▶ Insert and secure the retaining pin **8** at point **P42** in the park position, see illustration **20**.

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7.4 Establishing the electrical connection from the suspended ballast to the turntable

Note

▶ Establish the electrical connections from the suspended ballast to the turntable, see Electric wiring diagram.

▶ Establish the electrical connections.

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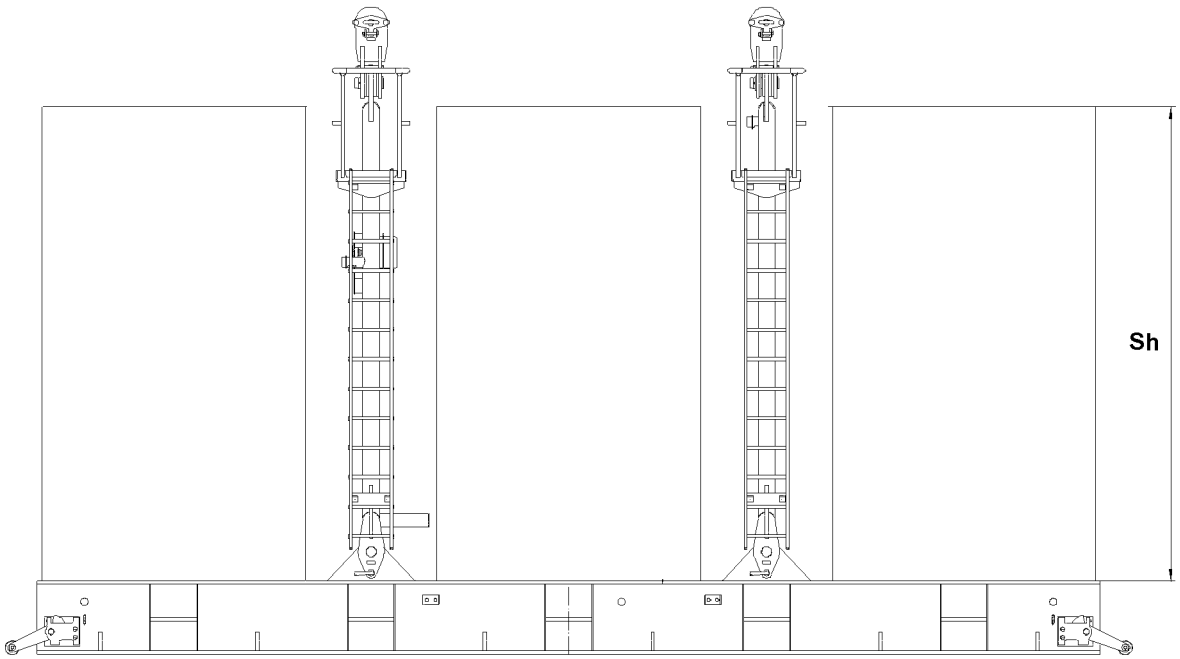

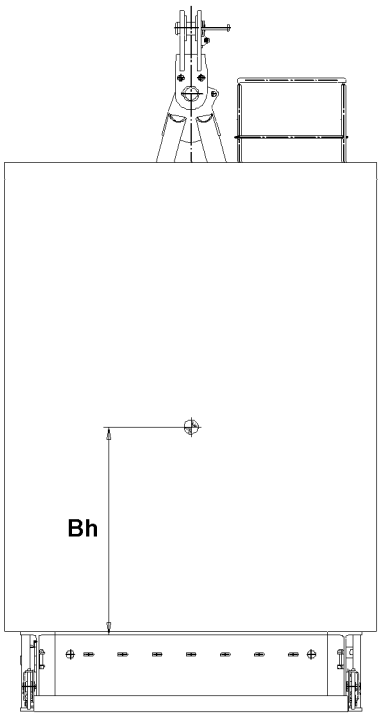

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Fig.119007

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8 Ballasting the ballast pallet

WARNING
The crane can topple over!
If the following danger notes are not observed, the ballast plates or the ballast stack can slip on the ballast pallet and fall down.
The crane can topple over.
Death, severe bodily injuries, property damage.

- ▶ The ground on which the ballast pallet is ballasted must be level and have an adequate load bearing capacity.
- ▶ Always place the ballast plates symmetrically, in reference to the longitudinal axis.
- ▶ Do **not** start with the two outer ballast stacks. For ballasting, start in the center.
- ▶ For ballasting, at first only maximum 20 t ballast may be placed per stack.
- ▶ After the first ballast plate is placed, the difference per stack may be maximum 25 t.
- ▶ For ballasting with double stacks, the difference between front and rear may be maximum 10 t for a double stack.
- ▶ The outer ballast stacks must always weigh the same and be the same height after ballasting.
- ▶ The two center ballast stacks must always weigh the same and be the same height after ballasting.
- ▶ The outer ballast stacks can differ in stack height from the inner ballast stacks.
- ▶ The maximum permissible ballast center of gravity height **Bh** of 2000 mm may not be exceeded.
- ▶ The permissible stack height **Sh** of 4500 mm may not be exceeded.
- ▶ The maximum permissible total weight of the suspended ballast may **not** exceed 455 t.
- ▶ Secure all ballast plates so they cannot move and fall down.
- ▶ Replace damaged ballast plates immediately with new ballast plates.

Make sure that the following prerequisites are met:

- – The ballast pallet is properly assembled and secured on the D-guying.
- – An auxiliary crane is available.

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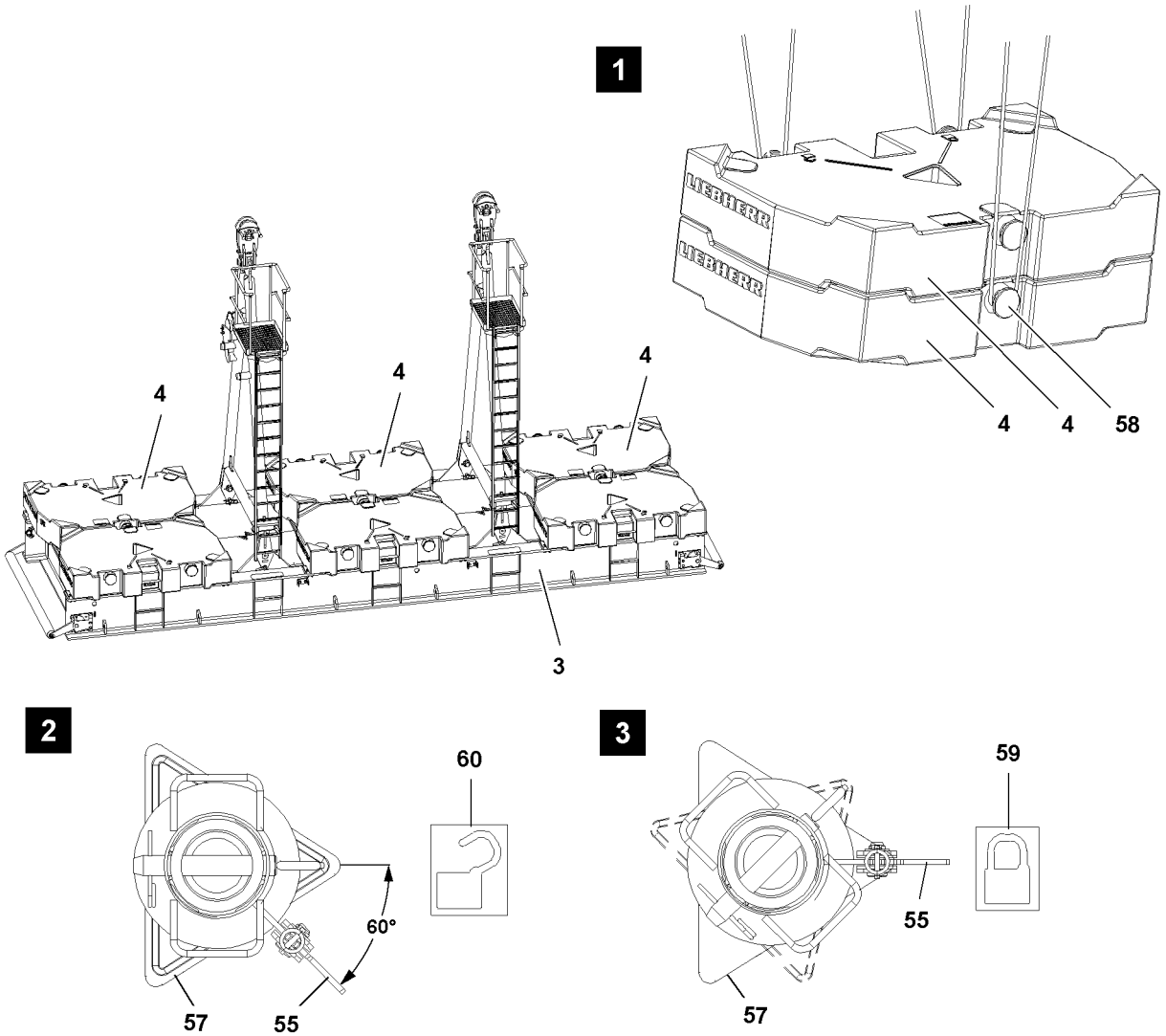

Fig.119008

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8.1 Placing the ballast plates, fastening system: „Twistlock“

WARNING
Danger of accident!
If more than the permissible two ballast plates are lifted with the receptacle stud, the receptacle stud will be overloaded and can be damaged.
Death, severe bodily injuries, property damage.
▶ Make sure that the ballast plates are placed correctly in the centerings.
▶ Replace damaged ballast plates.

To stack the ballast plate(s) **4**, use the receptacle stud **54**.

Before the receptacle stud **54** is guided into the ballast plates, it must be ensured that the length of the receptacle stud **54** is set correctly. The length of the receptacle stud **54** can be adjusted with the pin **56**.

If the length of the receptacle stud **54** is to be adjusted:
▶ Release and unpin the pin **56**.
▶ Adjust the length of the receptacle stud by moving the receptacle stud **54**, see illustration **4**.
▶ Insert the pin **56** and secure with the spring retainer.
▶ Fasten the receptacle stud **54** to the auxiliary crane and guide it into the ballast plate(s).
▶ Pull the lever **55** up and fold it down.
▶ Turn the lever **55** by 60° until the lever **55** points to the icon **59**, see illustration **2** and illustration **3**.

Result:

– The receptacle stud **54** is locked with the ballast plate.

▶ Lift always one ballast plate with the receptacle stud **54** and take it down carefully on the outer centerings of the ballast pallet **3**.

When the ballast plate has been taken down on the outer centerings of the ballast pallet **4**:
▶ Turn the lever **55** by 60° until the lever **55** points to the icon **60**, see illustration **2**.

Result:

– The receptacle stud **54** is unlocked.

▶ Carefully pull the receptacle stud **54** from the ballast plate.
▶ Stack the ballast plates according to the load chart, observe the danger notes.

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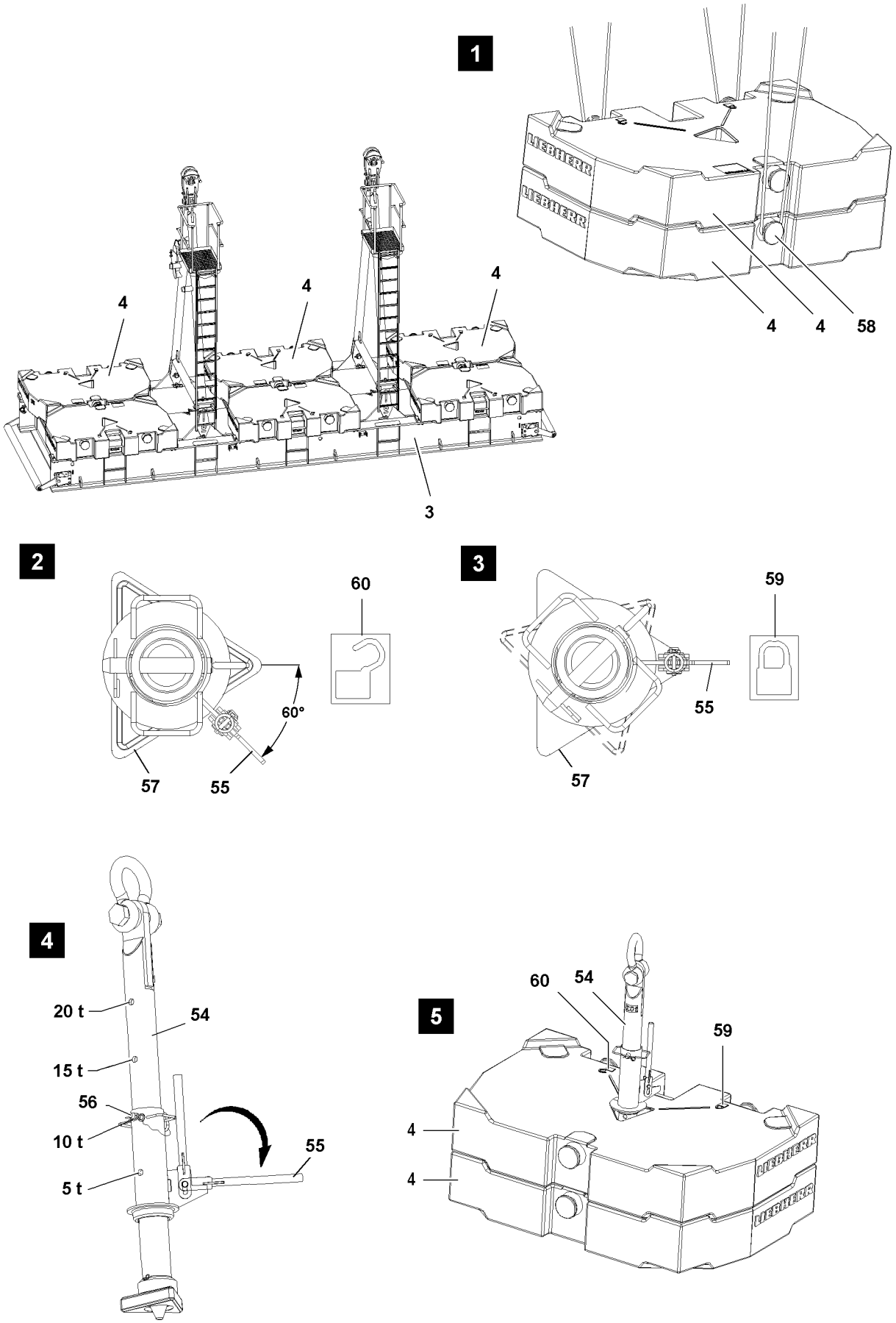

Fig.119008

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8.2 Placing the ballast plates, fastening points: „Bitt“

WARNING
Falling ballast plates!
If more than the permissible loads are lifted, then the bitts **58** are overloaded and the ballast plates can fall down.
Death, severe bodily injuries, property damage.
- ▶ Lift no more than maximum 20 t with the ropes, 3 fastening points.
- ▶ Replace damaged ballast plates immediately.

WARNING
Incorrect handling of the fastening equipment!
If fastening equipment is not attached correctly and if it is not secured sufficiently to prevent it from loosening up, loads can fall down.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the fastening equipment is correctly attached on the bitts **58** and that it is secured sufficiently to prevent it from loosening up.

Note
- ▶ Place the ballast plates individually or as a ballast assembly, maximum 20 t.
- ▶ 20 t ballast assembly, see illustration **1**.

- ▶ Place always only one ballast plate on the outer centerings on the ballast pallet.

When a ballast plate has been placed on the outer centerings of the ballast pallet:
- ▶ Place the ballast plates individually or as an assembly of maximum two plates alternately on the left and right with the auxiliary crane.
- ▶ Stack the ballast plates according to the load chart, observe the danger notes.

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9 Crane operation with the derrick ballast

9.1 Function check of the ground contact switch

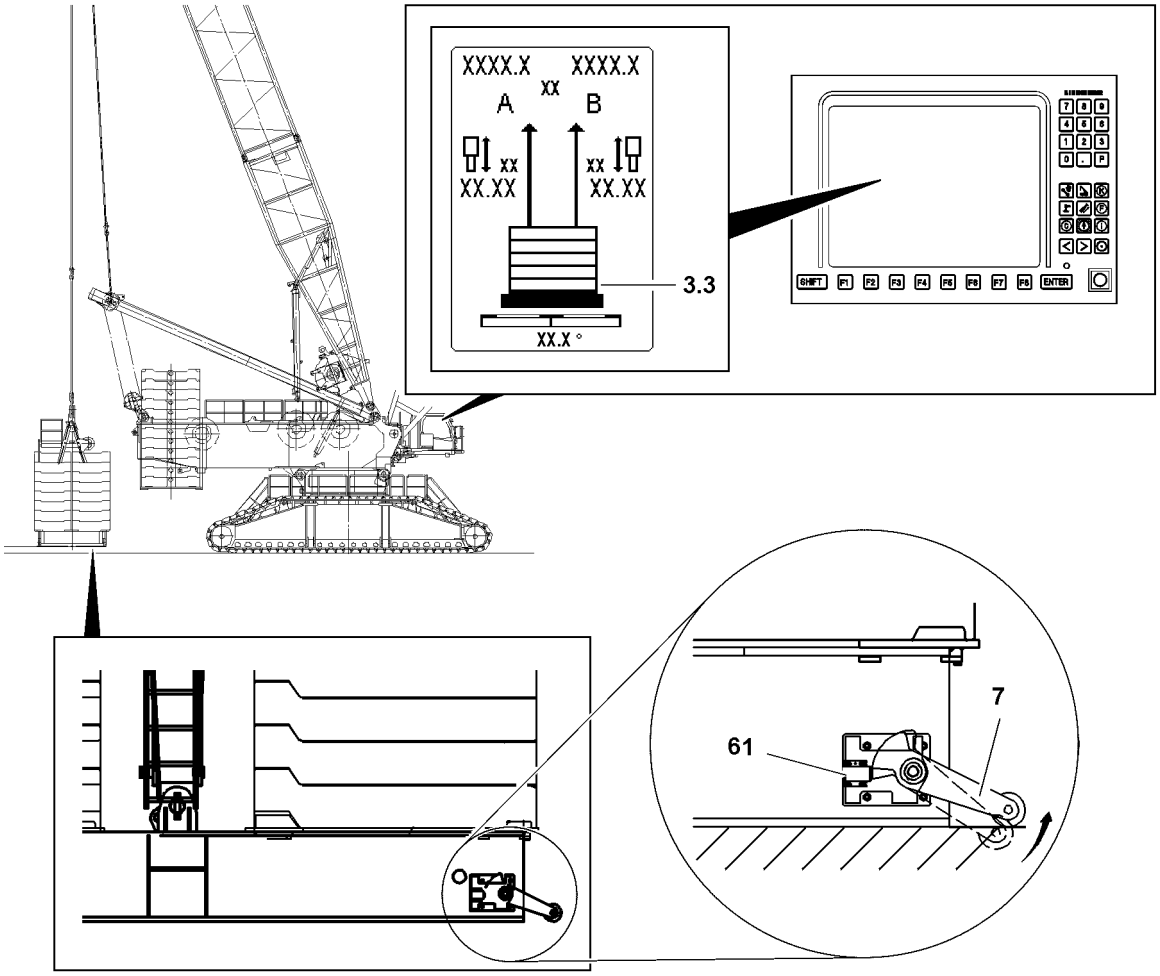

Fig.145935

Make sure that the following prerequisites are met:
- The electrical connection between the derrick ballast and the turntable has been established.
- The cable drum pull release is fastened to the turntable.

DANGER
Danger of accident if the derrick ballast touches the ground unintentionally!
If the terrain is very uneven, the danger exists that the derrick ballast rests on the ground even if a ground contact switch **61** was not actuated.

▶ If the ballast pallet touches the ground, **at least one** ground contact switch **61** must be actuated via the ground contact roller **7**.

▶ Check the ease of movement of the ground contact roller **7**.
▶ Manually operate the ground contact roller **7**.

Result:

- The ground contact switch **61** is actuated.
- The LICCON monitor displays derrick ballast has ground contact **3.3** - the „turning the turntable“ and „driving the crawler“ crane movements are deactivated.

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9.2 Lifting and lowering the derrick ballast using the pull cylinders

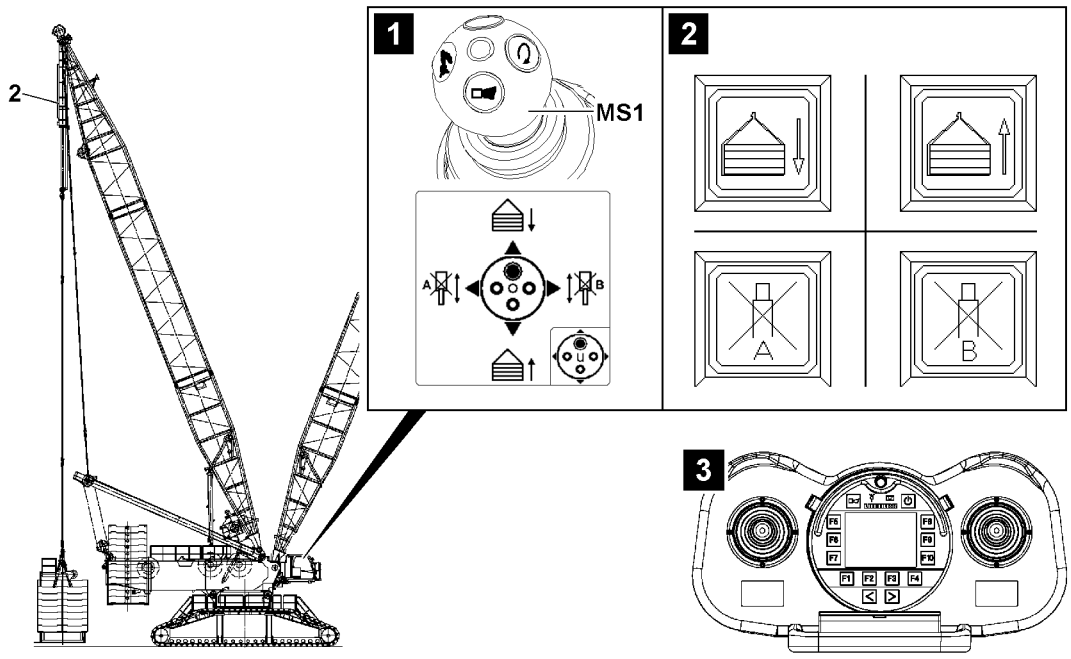

Fig.145937

The pull cylinders **2** in the derrick ballast guying can be operated in different ways:
- Operation with master switch **MS1** in the corresponding master switch assignment, see illustration **1**
  - Select the master switch assignment for master switch MS1, see chapter 4.01.
- Operation with operating buttons on the instrument panel, see illustration **2**

There is an additional operating option in assembly operation:
- Operation with the radio remote control (BTT-E), see illustration **3**
  - Operation with the manual control lever in the corresponding assembly menu, see the radio remote control operating instructions.

Note
- ▶ If the derrick ballast is raised or lowered using the pull cylinder **2**, then the horizontal alignment of the derrick ballast is automatically regulated by both length sensors of the pull cylinder **2**.
- ▶ For a ballast utilization of **more than** or **equal to** 90 percent, the level sensor regulates the pull cylinder **2** to a difference of 1 cm.
- ▶ With a ballast utilization of **less than** 90 percent, the level sensor monitors the derrick ballast level to ± 2.5°. This makes it possible to set the derrick ballast down up to a ground slope of 2.5°.

DANGER
Danger of accident!
If the following notes are not observed, personnel can be severely injured or killed.
In addition, this can result damage to the derrick ballast.
- ▶ Pay attention to the horizontal alignment of the derrick ballast when lifting and lowering the derrick ballast.
- ▶ When lifting and lowering the derrick ballast, check the forces in the D-guyings regularly on LICCON monitor 1. If the difference of forces between „derrick ballast guying A“ and „derrick ballast guying B“ is too large, an acoustic warning sounds and the values on the LICCON monitor 1 blink, see section „Differential force monitoring of Derrick ballast guying“.
- ▶ When adjusting manually (block pull cylinder A or pull cylinder B) the regulation is deactivated and the derrick ballast can be inclined within the limited angle range. This is exclusively permitted when setting down the derrick ballast on uneven ground and only by observing utmost caution.

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WARNING
The crane can topple over!
If the suspended ballast is lifted off the ground past the **maximum permissible** 250 mm , then the crane can topple over to the rear if the load rips off.
Death, severe bodily injuries, property damage.
▶ Do not lift the suspended ballast by more than 250 mm off the ground.

During crane operation with derrick ballast the required maximum / minimum load can be actively influenced.

This is made possible by increasing or reducing the derrick ballast. Depending on the situation, this procedure is also possible under load.

Note
▶ The suspended ballast and the ballast trailer are generally referred to as the **derrick ballast**.
▶ The fixed compensation weight that is installed on the turntable is generally referred to as the **counterweight**.
▶ Additional personnel to carry out crane operation is generally referred to as **guide**.

▶ Operate the crane function to lift and lower the derrick ballast, see section „Carrying out crane movements“

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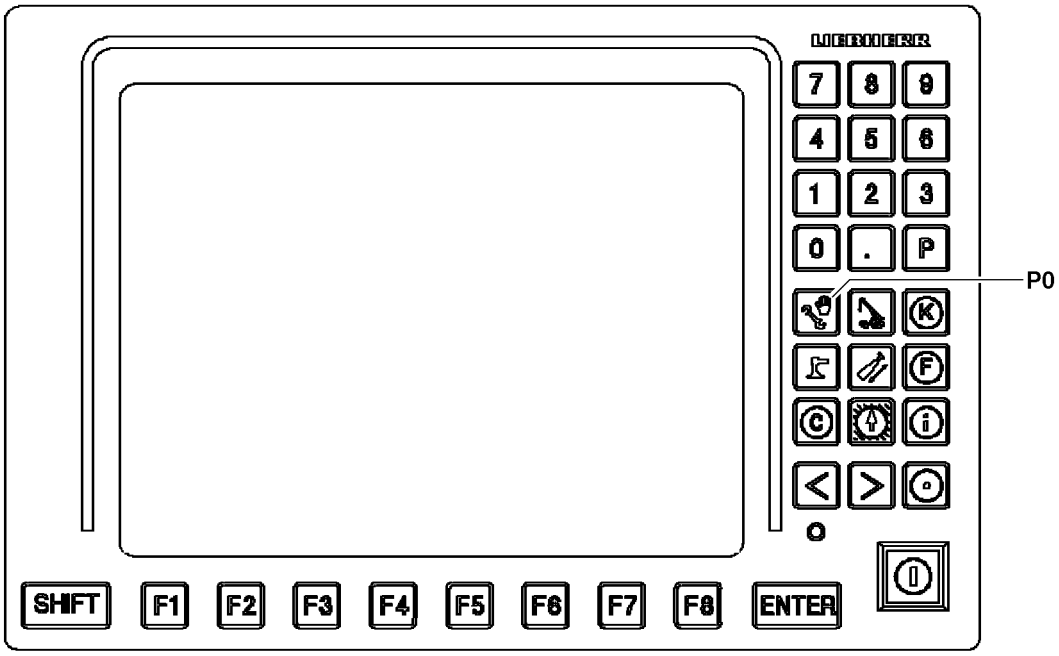

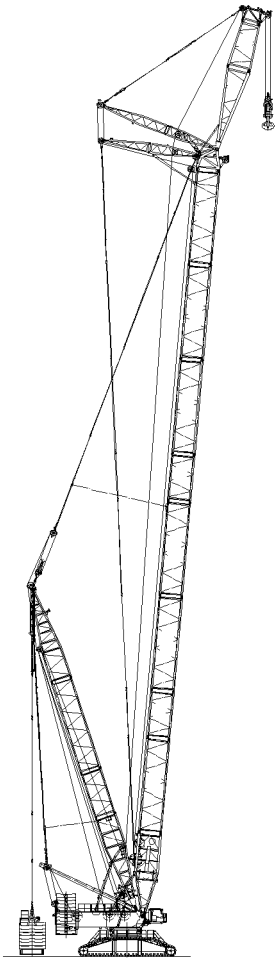

Fig.122800

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9.3 Checking the settings of the LICCON overload protection

Make sure that the following prerequisites are met:
- The derrick ballast is placed according to the load chart.
- The actual placed derrick ballast has been entered and confirmed in the Set up program, see Crane operating instructions, chapter 4.02.
- The derrick boom is in operating position.

WARNING
Incorrectly set overload protection!
If the actual set up configuration of the crane deviates from the entries and settings in the Set up program, then the overload protection is not correctly set.
An incorrectly set overload protection calculates the actual load incorrectly and transmits faulty display values.
The crane can be overloaded unnoticed and topple over.
This could result in serious accidents.
▶ The entries and settings in the set up program must match the actual set up configuration of the crane.

Note
▶ Set the LICCON overload protection in the set up program, see Crane operating instructions, chapter 4.02.

▶ Press the program key **P0**.

Result:

– The Set up program is called up.

▶ In the monitor display of the Set up program check if the LICCON overload protection is set according to the data in the load chart and the actual set up configuration of the crane, see example illustration.

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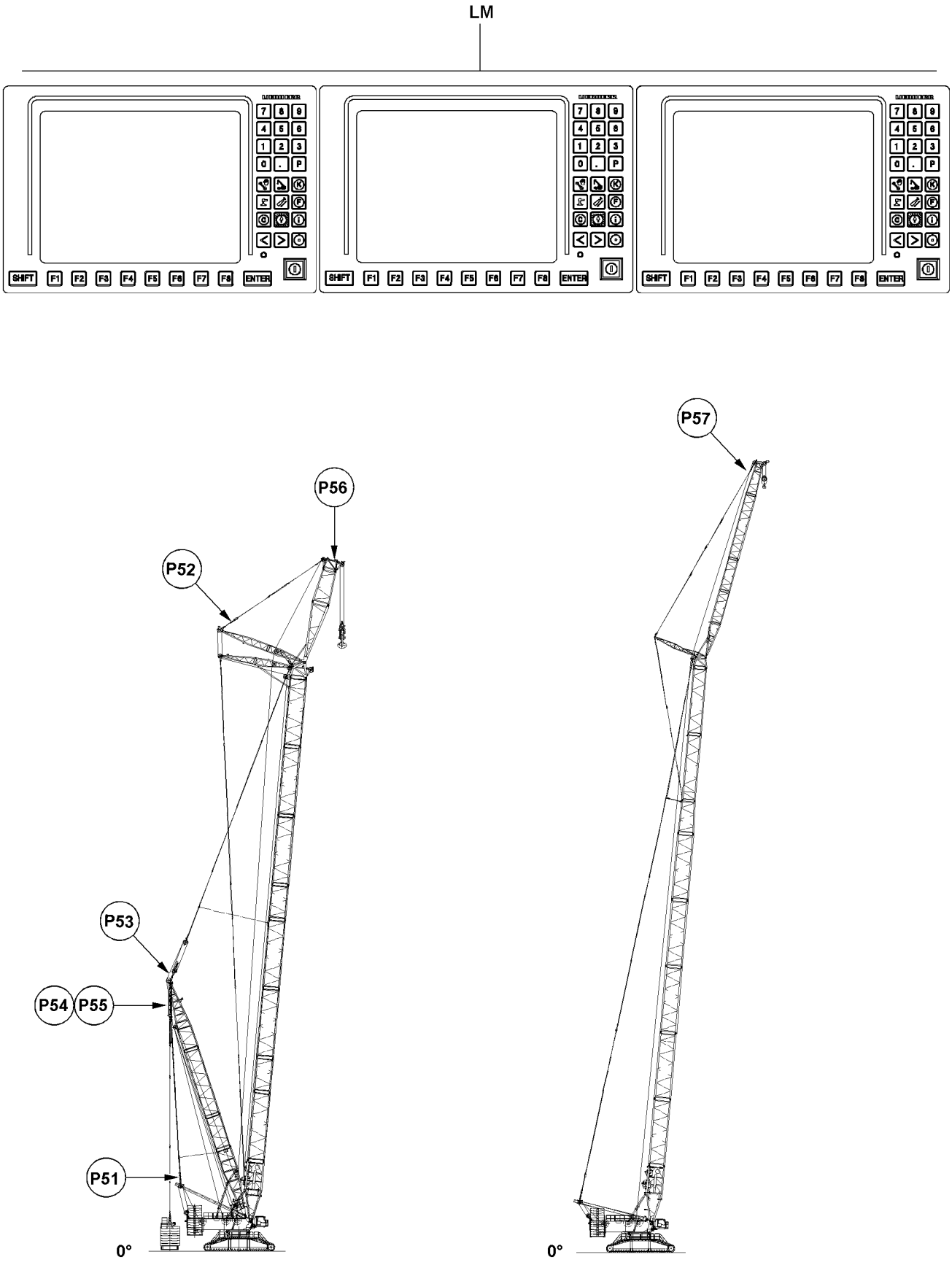

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Fig.122806

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9.4 F-load display for operating modes with derrick ballast

Assignment of test points for operating modes with derrick ballast:

– Force in the guying between A-frame and derrick head:
  - Test point 1 on point **P51** = force F1
  - The display is made in the F-load display in the center LICCON monitor **LM**.
– Force in the guying between WA-frame and accessory head:
  - Test point 2 on point **P52** = force F2
  - The display is made in the F-load display in the center LICCON monitor **LM**.
    Note: Only for the respective boom system.
– Force in the guying between the main boom head and the derrick head:
  - Test point 3 on point **P53** = force F3
  - The display is made in the F-load display in the center LICCON monitor **LM**.
– Force in the guying between derrick ballast and derrick head:
  - Test point 4/5 on point **P54/55** = force F4/5
  - The display is made in the display of the derrick ballast in the left LICCON monitor **LM**.
– Force on the pressure test bracket boom nose:
  - Test point 6 on point **P56** = force F6
  - The display is made in the actual load display in the right LICCON monitor **LM**.
    Note: Only with existing boom nose.
– Force in the guying between the FA-frame and the accessory head:
  - Test point 11 on point **P57** = force 11
  - The display is made in the actual load display in the center LICCON monitor **LM**.
    Note: Only for the respective boom system

Note

▶ For a detailed description of the displays for crane operation with derrick ballast, see the Crane operating instructions, chapter 4.02.

WARNING

Overloading / toppling of the crane!
If the permissible display values of the F-load display are exceeded / fallen below, then the crane can be overloaded.
This could result in serious accidents.

▶ Observe and adhere to the display values on the LICCON monitors.
▶ Observe and adhere to the specifications regarding the limit values on the assembly drawings.

Note

The values of the F-load display depend on the set up configuration of the crane and the crane geometry.
The values of the F-load display change continuously when the crane is moved.

▶ Monitor the F-load display continuously.

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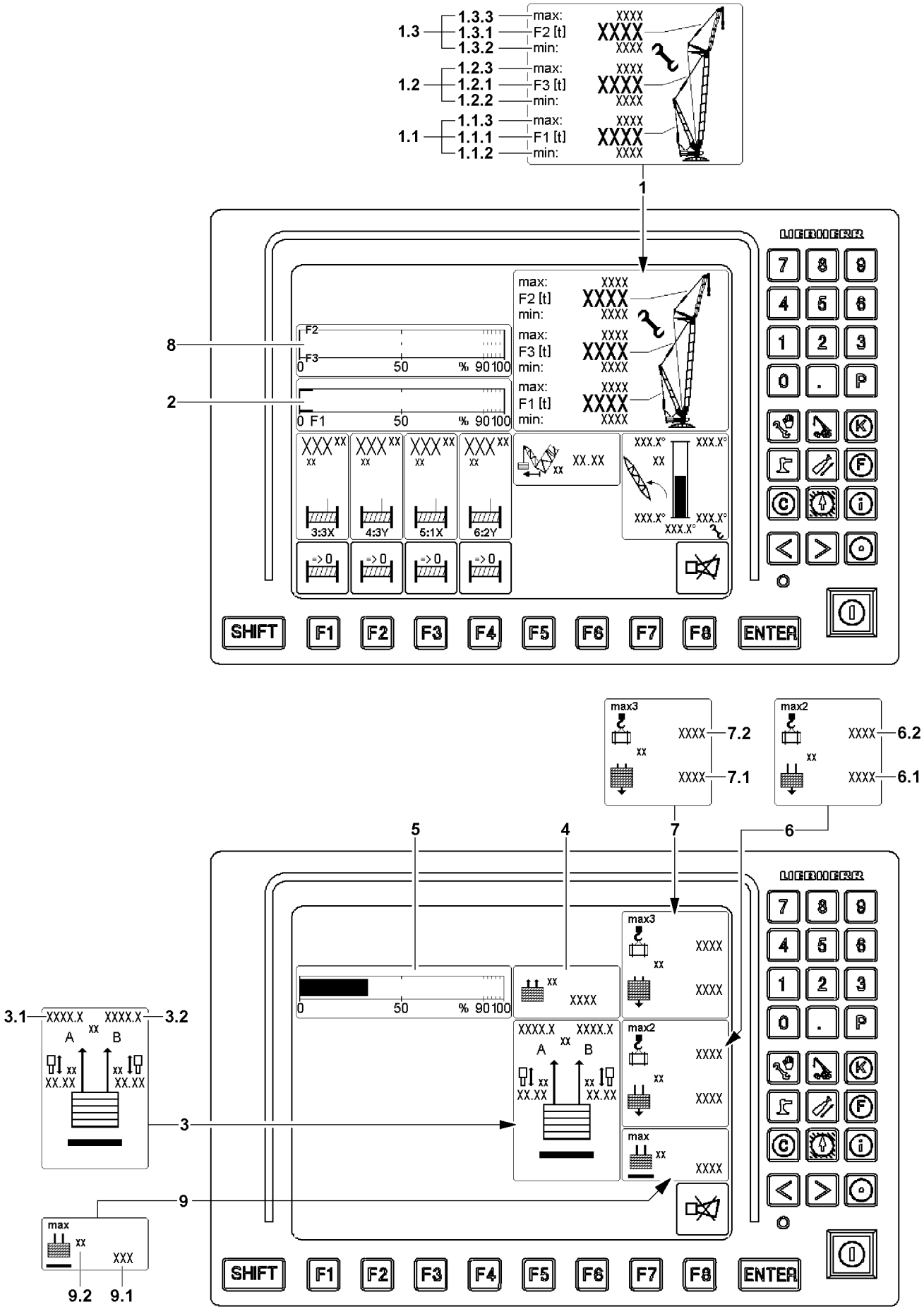

Fig.146968

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9.4.1 Force F1 (test point 1)

The force F1 (test point MS1) is determined in the guying between the A-frame and the derrick head and displayed in the LICCON monitor as operating force $F1_{actual}$.

Display values of force F1 (test point MS1) on the F-load display **1**:
- F1-maximum ($F1_{max}$) **1.1.3** = maximum value F1-force
- F1-actual value ($F1_{actual}$) **1.1.1** = actual value F1-force (operating force F1)
- F1-minimum ($F1_{min}$) **1.1.2** = minimum value F1-force

Structure of the F1-utilization bar **2**:
- Ratio of operating force $F1_{actual}$ to F1 maximum force

9.4.2 Force F2 (test point 2) and force F3 (test point 3)

The force F2 (test point 2) is determined between the WA-frame and the accessory head and displayed in the LICCON monitor as operating force $F2_{actual}$. A display is made only with the respective boom system.

The force F3 (test point 3) is determined between the main boom head and the derrick head and displayed in the LICCON monitor as operating force $F3_{actual}$.

Display values of force F2 (test point MS2) in the F-load display **1**:
- F2-maximum ($F2_{max}$) **1.3.3** = maximum value F2-force
- F2-actual value ($F2_{actual}$) **1.3.1** = actual value F2-force (operating force F2)
- F2-minimum ($F2_{min}$) **1.3.2** = minimum value F2-force

Display values of force F3 (test point MS3) in the F-load display **1**:
- F3-maximum ($F3_{max}$) **1.2.3** = maximum value F3-force
- F3-actual value ($F3_{actual}$) **1.2.1** = actual value F3-force (operating force F3)
- F3-minimum ($F3_{min}$) **1.2.2** = minimum value F3-force

Composition of the F2 / F3-utilization bar **8**:
- Ratio of operating force $F2_{actual}$ to F2 maximum force $F2_{max}$
- Ratio of operating force $F3_{actual}$ to F3 maximum force $F3_{max}$
- The F2/F3-utilization bars **8** appear only in assembly operation

In crane operation, the display values are displayed clearly for information. A special monitoring does not occur.

In assembly operation the display values are monitored. The limit values may not be exceeded.

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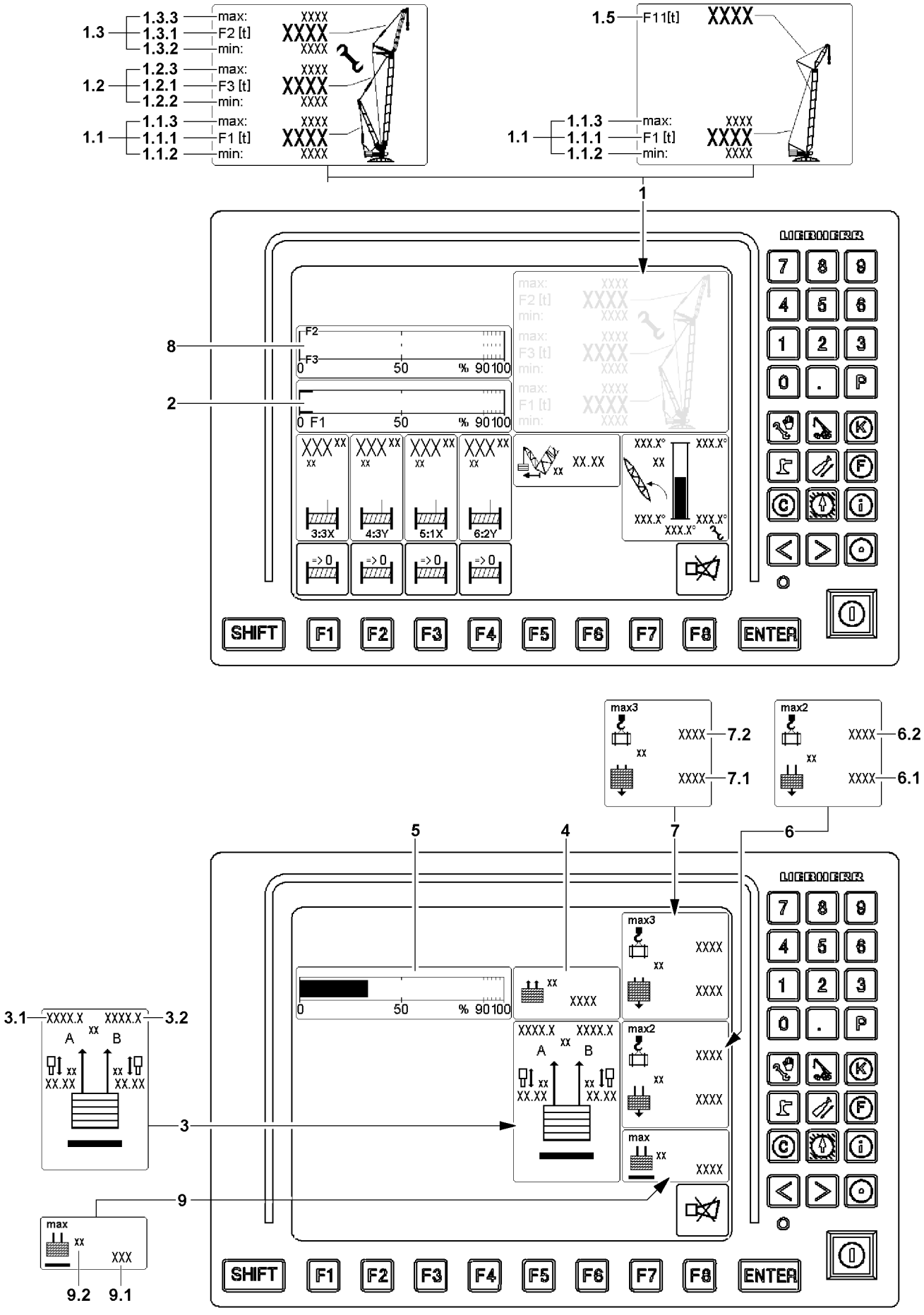

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9.4.3 Force F4/5 (test point 4/5)

The forces F4/5 (test point 4/5) are effective in the guy rods from the derrick ballast to the derrick head.

The existing forces in the guy rods are calculated from four pressure sensors, which are installed on the pull cylinders.

Test points guying A (left) are:
- Test point 4A = pressure sensor ring surface left (force F4A)
- Test point 5A = pressure sensor piston surface left (force F5A)

Test points guying B (right) are:
- Test point 4B = pressure sensor ring surface right (force F4B)
- Test point 5B = pressure sensor piston surface right (force F5B)

Display values of force F4/5 (test point 4/5) in icon Guying derrick ballast **3**:
- Force in the derrick ballast guying A **3.1**
- Force in the derrick ballast guying B **3.2**

Display values derrick ballast:
- Currently pulled derrick ballast = BA_{pulled} **4**
- Current utilization of derrick ballast = Utilization bar derrick ballast **5**
- Currently placed derrick ballast = BA_{placed} **6.1**

From the sum of derrick ballast guying A **3.1** and derrick ballast guying B **3.2** is the pulled derrick ballast BA_{pulled} **4** calculated.

If the ballast still has ground contact, then only that part of the ballast is displayed which is pulled up by the D-guying. The remaining part is laying correspondingly on the ground.

Composition of utilization bar derrick ballast **5**:
- Ratio of pulled derrick ballast (BA_{pulled} **4**) to placed derrick ballast (BA_{placed} **6.1**)

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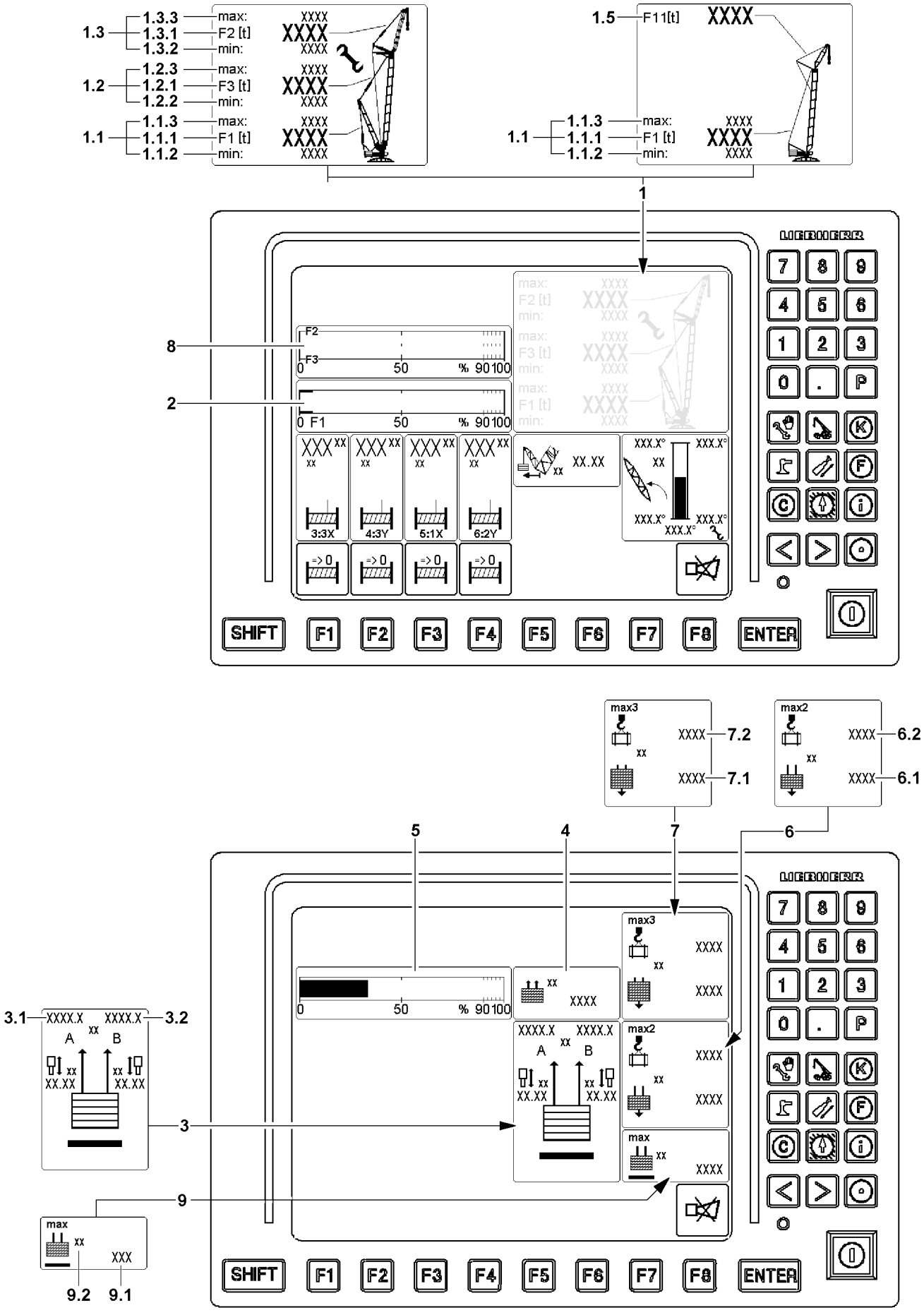

Fig.146967

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9.4.4 Maximum liftable derrick ballast

The *maximum liftable derrick ballast* **9** refers to the current crane condition and indicates the maximum derrick ballast that can be lifted off the ground with the pull cylinder or off the suspended ballast palette in case of the VarioTray without falling below the $F1_{min}$ force.

- **9** *Maximum liftable derrick ballast* icon
- **9.1** Maximum liftable derrick ballast
  - Maximum derrick ballast
- **9.2** Measuring unit
  - Measuring unit for display values in the *Pulled derrick ballast* icon **9**: [t] or [lb]

9.4.5 Force F11 (test point 11)

Force in the guying between the FA-frame and the accessory head:

Display values of force F11 (test point MS11) on the F-load display **1**:
- F11-actual value ($F11_{actual}$) **1.5** = actual value F11-force (operating force F11)

9.4.6 Additional displays

- „Load max2“ icon **6** (see section „Utilization conditions“)
- Currently placed derrick ballast = BA_{placed} (Input value in set up program) **6.1**
- Possible load with currently placed derrick ballast = $Load_{max2}$ **6.2**
- „Load max3“icon **7** (see section „Utilization conditions“)
- Maximum derrick ballast according to load chart = BA_{max} **7.1** (Highest value in Set up program)
- Possible load with maximum derrick ballast according to load chart = $Load_{max3}$ **7.2**

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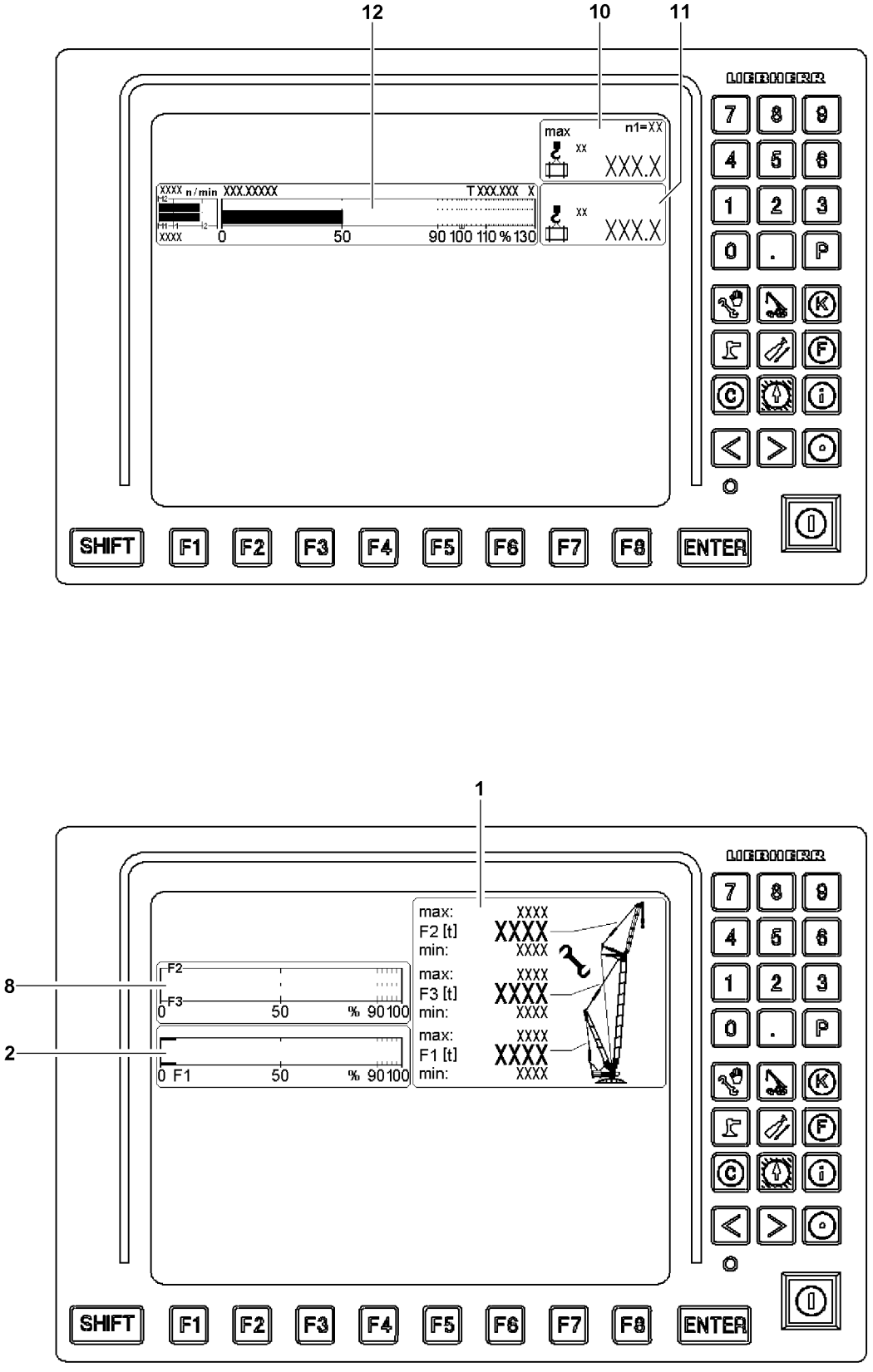

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9.5 Monitoring of crane utilization in operating modes with derrick ballast

Note
- ▶ The icon illustrations of the LICCON monitors are examples and may not match your crane.
- ▶ The icon illustrations of the LICCON monitors can deviate in number, arrangement and depiction of the icons on your crane.
- ▶ Observe the Crane operating instructions, chapter 4.02.

WARNING
Incorrect display values!
If the display values do not increase correspondingly when lifting known weights, an erroneous display value may be present.
If the crane is operated with erroneous display values, then the crane can be overloaded.
This could result in serious accidents.
- ▶ When lifting the hook block off the ground check if the display value for the actual load increases correspondingly.
- ▶ When lifting the derrick ballast off the ground check if the display value for the pulled derrick ballast (BA_{pulled}) increases correspondingly.
- ▶ When lifting the load off the ground check if the display value for the actual load increases correspondingly.

In operating modes with derrick ballast, the monitoring of the crane utilization includes, among others:
1. Monitoring of load torque
   Via the „Maximum load“ icon **10**, „Actual load“ icon **11** and the „utilization bar diagram“ **12**.
2. Utilization conditions
   Support the crane driver with additional display values.
3. Monitor the F-load display **1**.
   Supported by the F1-utilization bar **2** and possibly the F2/F3-utilization bar **8**.

9.5.1 Monitoring of load torque

It monitors the „maximum load according to the load chart and reeving“.

In crane operation, the actual load is compared with the maximum load which may be lifted in the current crane configuration. The display of the values is made in the icon „Maximum load“ **10** and in icon „actual load“ **11**. The current percentage utilization is displayed as „bar diagram utilization“ **12** in the right LICCON monitor.

The color of the utilization bar in the „bar diagram utilization“ **12** also displays the crane utilization:
- – Utilization bar blue / green (below 90 %): Utilization in permissible range
- – Utilization bar yellow (90 % to 100 %): Advance warning. - Utilization just before impermissible range
- – Utilization bar red (above 100 %): Warning. - Utilization in impermissible range

Note
- ▶ Procedure for optimum utilization of „maximum load according to load chart and reeving“, see section „Utilization conditions“.

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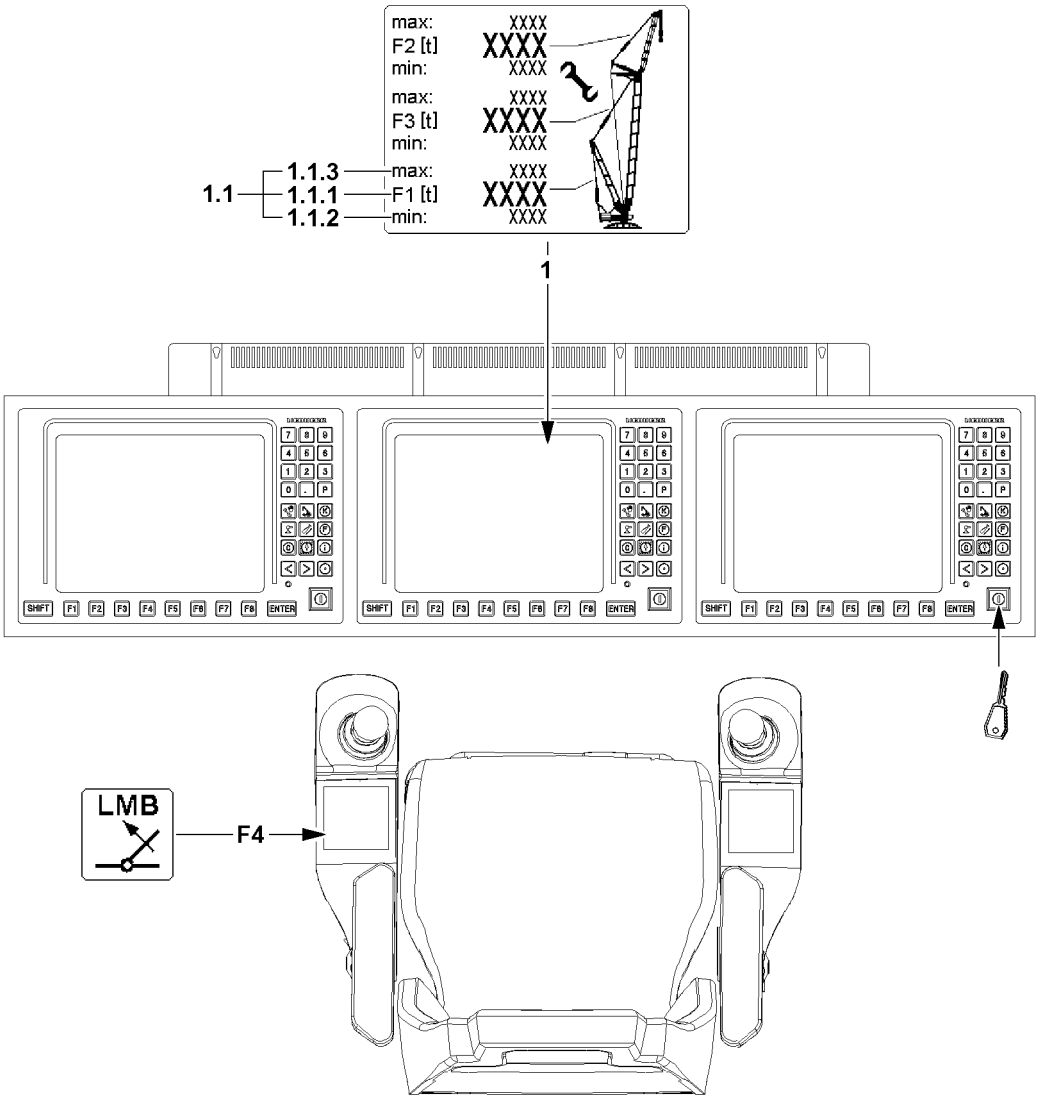

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Fig.122809

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WARNING
Access the functionality of the LICCON overload protection!
When accessing the functionality of the LICCON overload protection by activating assembly operation, the LICCON overload protection is totally deactivated, bypassed or limited.
It is possible to exceed several shut-off limits of the LICCON overload protection simultaneously or one after the other.
It is possible to carry out crane movements, which are not monitored by the LICCON overload protection.
Without the LICCON overload protection, no additional protection against overload of the crane via the crane control is present.
This could result in serious accidents.
- ▶ When accessing the functionality of the LICCON overload protection, take into account that the LICCON overload protection is deactivated totally or is limited.
- ▶ When accessing the functionality of the LICCON overload protection, the Crane operating instructions, chapter 4.02 must be observed.

WARNING
The crane can topple over!
In assembly operation the LICCON overload protection is deactivated.
In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over.
Personnel can be killed.
This could result in high property damage.
- ▶ Activate the assembly operation only when the consequences are known.
- ▶ Enter the set up configuration correctly into the LICCON computer system.
- ▶ Observe the erection / take down charts.
- ▶ Crane operation with deactivated LICCON overload protection is prohibited.
- ▶ In assembly operation only load torque reducing crane movements may be carried out until a permissible operating and load range.
- ▶ The crane operator carries complete and sole responsibility for his actions if the LICCON overload protection is deactivated.

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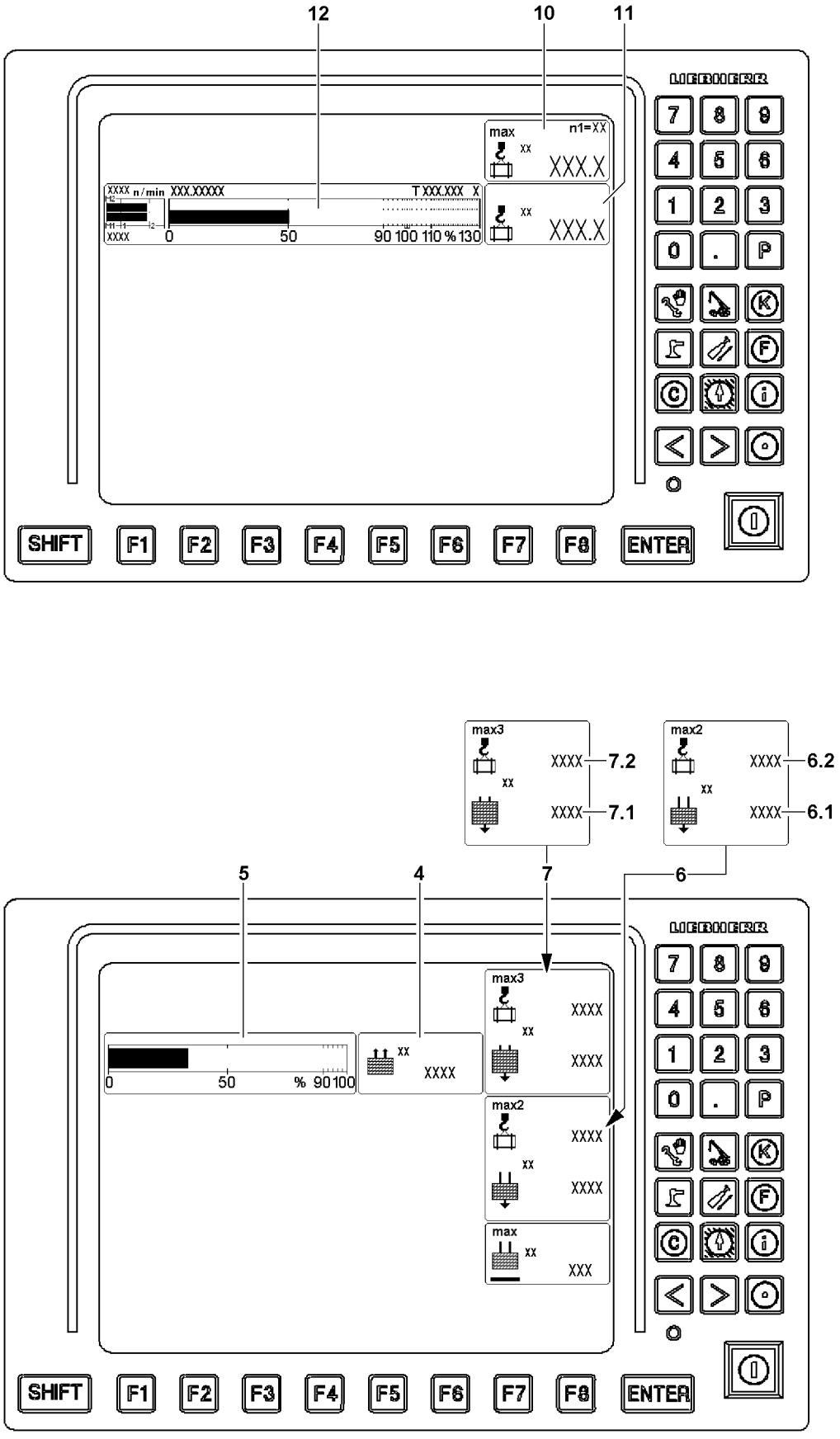

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Fig.146966

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9.5.2 Utilization conditions

The current percentage utilization of the crane is displayed as „bar diagram utilization“ **10** in the right LICCON monitor.

Additional displays:
- **6** „Load max2“ icon
  - Currently placed derrick ballast = BA_{placed} (Input value in set up program) **6.1**
  - Possible load with currently placed derrick ballast = $Load_{max2}$ **6.2**
- **7** „Load max3“ icon
  - Maximum derrick ballast according to load chart = BA_{max} **7.1** (Highest value in Set up program)
  - Possible load with maximum derrick ballast according to load chart = $Load_{max3}$ **7.2**

Maximum load, right LICCON monitor:
- The maximum load in the current operating condition is reached when the utilization bar shows 100 % in the „bar diagram utilization“ **12**.
  This is the case when the „utilization of the crane according to the load chart and reeving“ reaches 100 % (Values in icon „Maximum load“ **10** and in icon „actual“ **11** are equal).
  When the „Maximum load“ **10** is smaller or the same as the $load_{max2}$ **6.2**, then an increase might possibly be obtained:
  - By increasing the pulled derrick ballast BA_{pulled} **4**, if the utilization bar derrick ballast **5** is not yet at 100 % (derrick ballast not suspended).
  - By increasing the derrick ballast when the BA_{placed} **6.1** is smaller than BA_{max} **7.1**.
  - By changing the derrick ballast radius within the permissible range, see load chart manual or LICCON job planner.

max2-load, icon „load max2“ **6**:
- The highest possible load in current operating condition **„max2-load“** is reached when in the „bar diagram utilization“ **12** 100 % is shown **and** the utilization bar derrick ballast **5** is at 100 % (Derrick ballast is completely lifted off the ground).
  This is the case when the value in icon „Actual load“ **11** is the same as the $load_{max2}$ **6.2**.
  When the $load_{max2}$ **6.2** is smaller or the same as the $load_{max3}$ **7.2**, then an increase might possibly be obtained:
  - By increasing the derrick ballast by loading additional ballast plates (increase BA_{placed} **6.1** to BA_{max} **7.1**).

max3-load, icon „load max3“ **7**:
- The highest possible load at the maximum derrick ballast in current operating condition **„max3-load“** is reached when the „bar diagram utilization“ **12** displays 100 % **and** the utilization bar derrick ballast **5** is at 100 % (Derrick ballast according to load chart is placed and is completely lifted off the ground).
  This is the case when the value in icon „Actual load“ **11** is the same as the $load_{max3}$ **7.2**.
- The maximum derrick ballast according to the load chart is placed and completely pulled. Further increase of the derrick ballast is impermissible.

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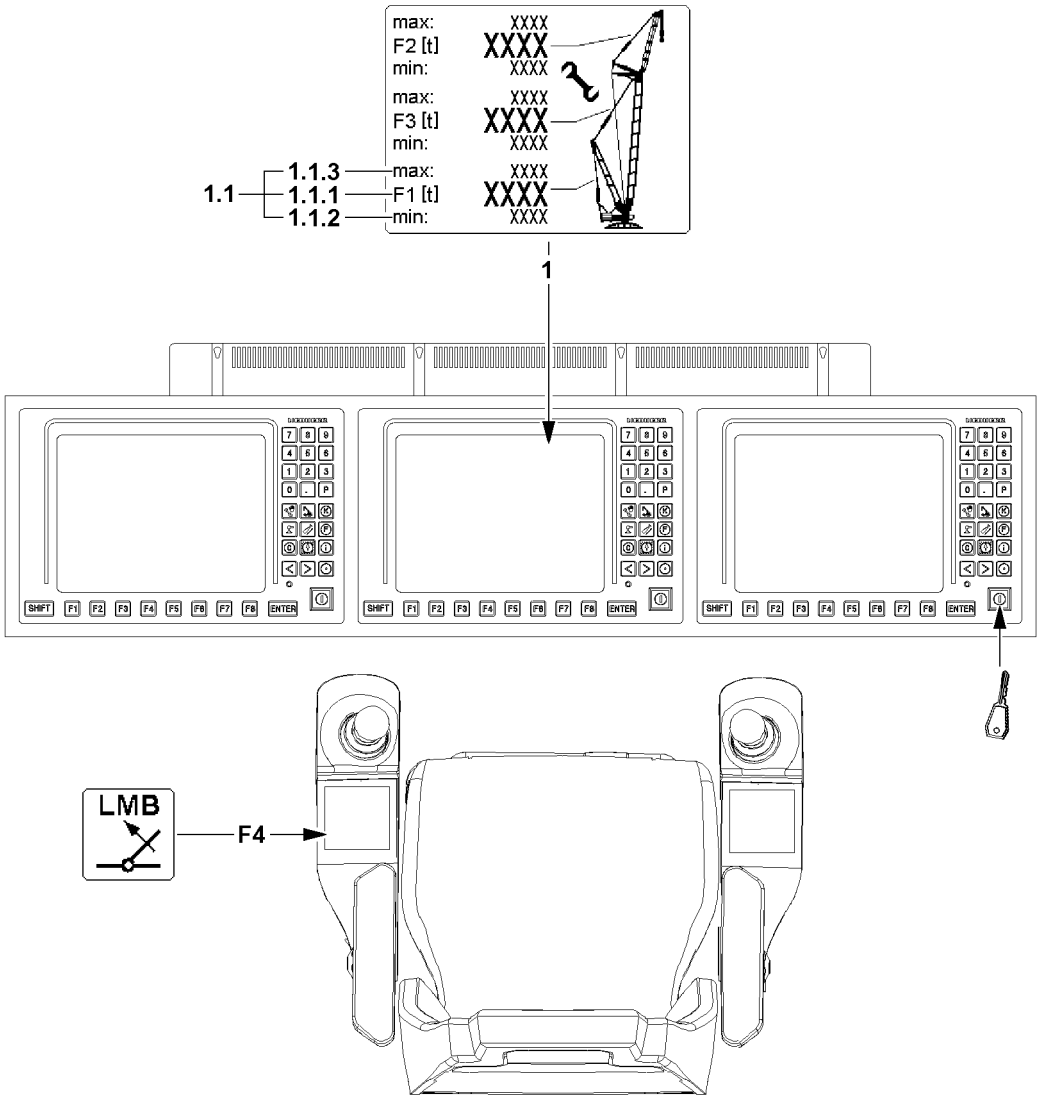

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9.5.3 Monitoring of F1-maximum force

Display values of force F1 (test point MS1) on the F-load display **1**:
- F1-maximum ($F1_{max}$) **1.1.3** = maximum value F1-force
- F1-actual value ($F1_{actual}$) **1.1.1** = actual value F1-force (operating force F1)
- F1-minimum ($F1_{min}$) **1.1.2** = minimum value F1-force

The display values of force F1 (test point 1) are displayed permanently in the LICCON monitor. At F1-actual value ($F1_{actual}$) **1.1.1** larger F1-maximum ($F1_{max}$) **1.1.3** a shut off of all load moment increasing movements occurs.

WARNING
Access the functionality of the LICCON overload protection!
When accessing the functionality of the LICCON overload protection by activating assembly operation, the LICCON overload protection is totally deactivated, bypassed or limited.
It is possible to exceed several shut-off limits of the LICCON overload protection simultaneously or one after the other.
It is possible to carry out crane movements, which are not monitored by the LICCON overload protection.
Without the LICCON overload protection, no additional protection against overload of the crane via the crane control is present.
This could result in serious accidents.
- ▶ When accessing the functionality of the LICCON overload protection, take into account that the LICCON overload protection is deactivated totally or is limited.
- ▶ When accessing the functionality of the LICCON overload protection, the Crane operating instructions, chapter 4.02 must be observed.

Note
The limit value for the F1-maximum force depends not only on the set up configuration and the crane geometry, but also from the pulled derrick ballast.
- ▶ If the pulled derrick ballast is larger, then the limit value for the F1-minimum force is generally reduced.
- ▶ If the pulled derrick ballast is smaller, then the limit value for the F1-maximum force is generally increased.

Note
By engaging the assembly operation the limit value for the F1-maximum force can be exceeded by a few tons. This makes it possible to reset a crane movement, which has caused the shut off.
- ▶ Reset triggered shut off by reverse crane movement.

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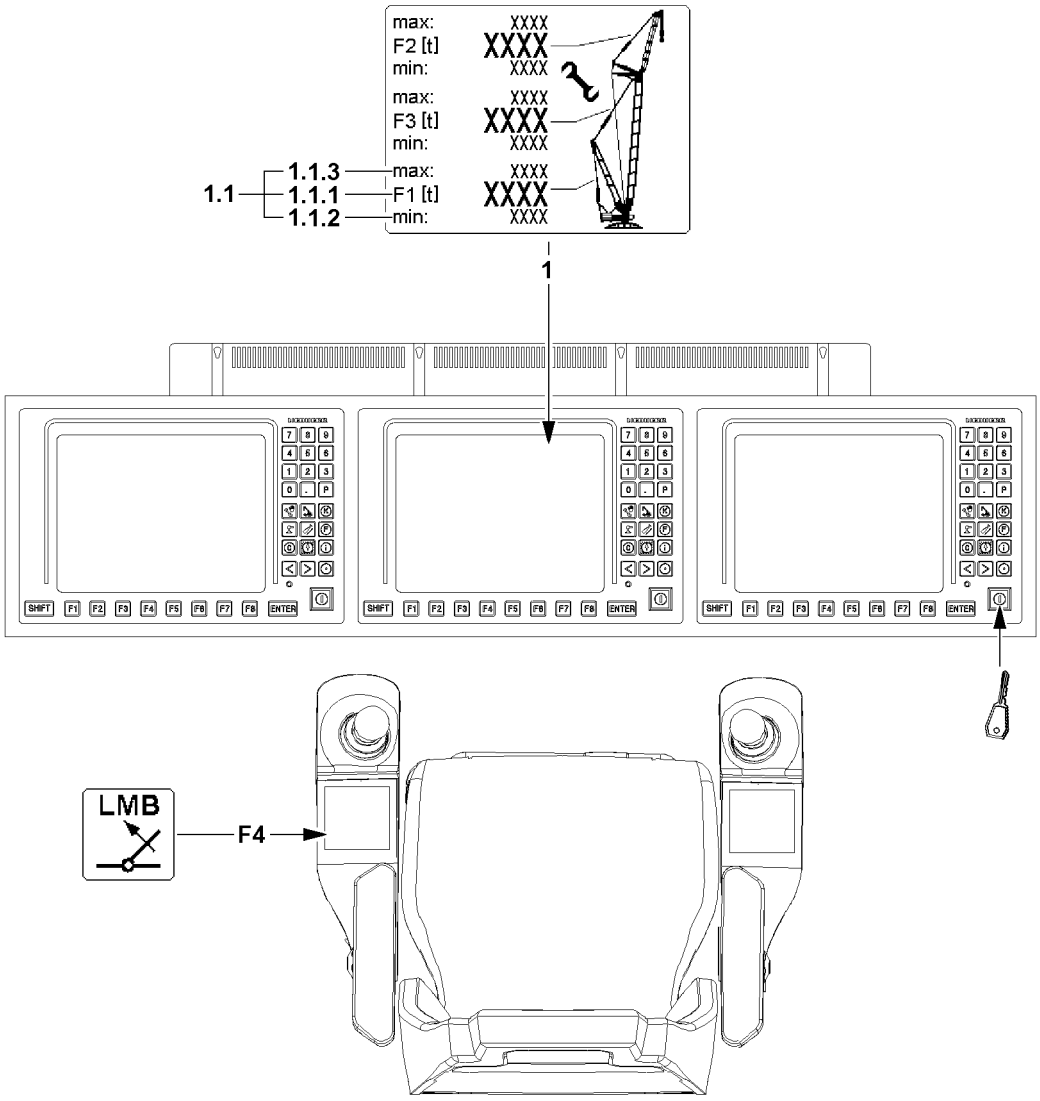

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9.5.4 Monitoring of F1-minimum force

Display values of force F1 (test point MS1) on the F-load display **1**:
- F1-maximum ($F1_{max}$) **1.1.3** = maximum value F1-force
- F1-actual value ($F1_{actual}$) **1.1.1** = actual value F1-force (operating force F1)
- F1-minimum ($F1_{min}$) **1.1.2** = minimum value F1-force

WARNING
Uncontrolled movements of the boom system!
If the guying between the A-frame and the derrick head (test point 1) becomes powerless, then this can lead to uncontrollable movements of the boom system.
This could result in serious accidents.
- ▶ The guying between the A-frame and the derrick head (test point 1) may never be without power.
- ▶ Relieve the D-guying between the derrick head and the derrick ballast to the point where the F1-actual value ($F1_{actual}$) **1.1.1** is larger than the F1-minimum ($F1_{min}$) **1.1.2**.

WARNING
Access the functionality of the LICCON overload protection!
When accessing the functionality of the LICCON overload protection by activating assembly operation, the LICCON overload protection is totally deactivated, bypassed or limited.
It is possible to exceed several shut-off limits of the LICCON overload protection simultaneously or one after the other.
It is possible to carry out crane movements, which are not monitored by the LICCON overload protection.
Without the LICCON overload protection, no additional protection against overload of the crane via the crane control is present.
This could result in serious accidents.
- ▶ When accessing the functionality of the LICCON overload protection, take into account that the LICCON overload protection is deactivated totally or is limited.
- ▶ When accessing the functionality of the LICCON overload protection, the Crane operating instructions, chapter 4.02 must be observed.

Note
By engaging the assembly operation the limit value for the F1-minimum force can be fallen below by a few tons. This makes it possible to reset a crane movement, which has caused the shut off.
- ▶ Reset triggered shut off by reverse crane movement.

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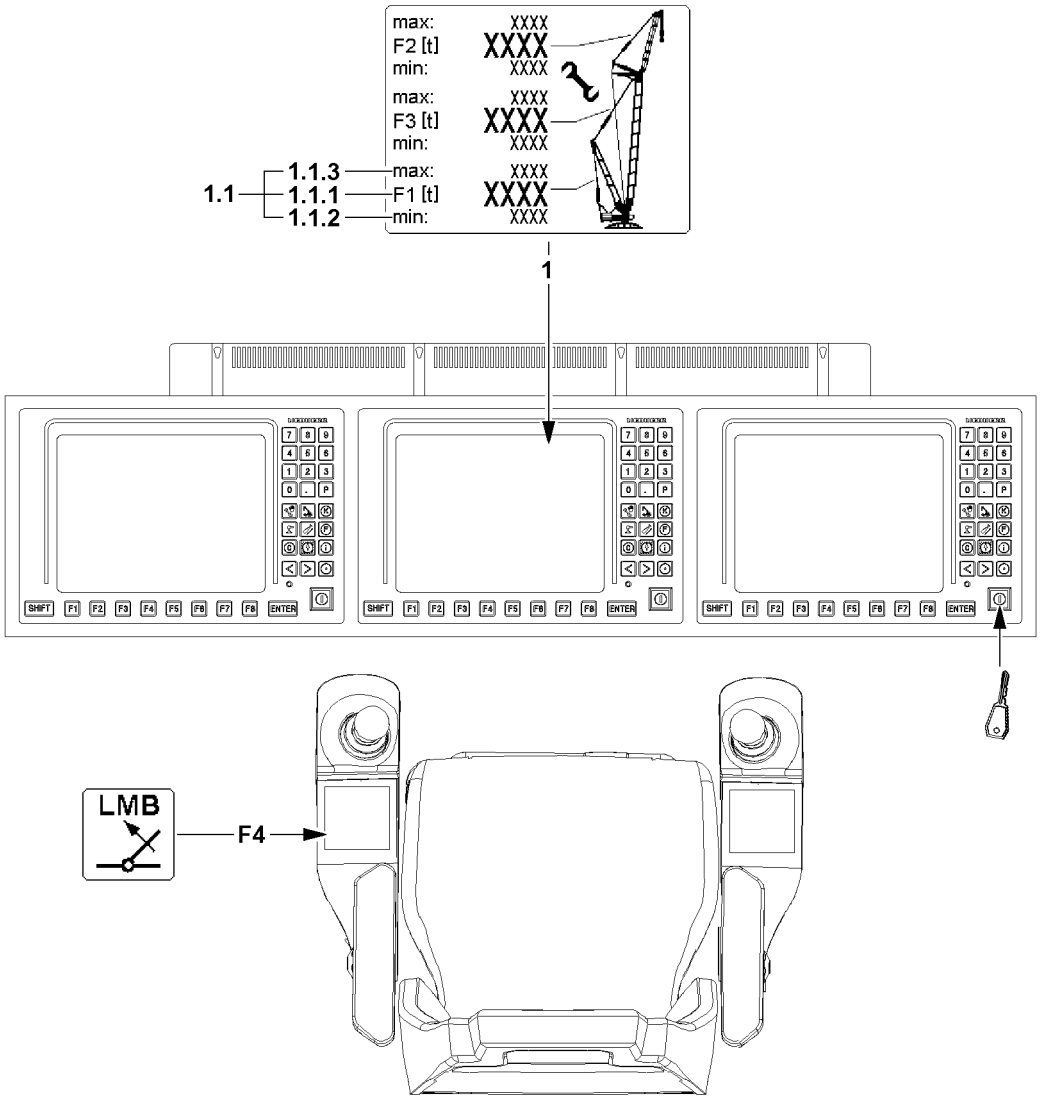

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WARNING
Autonomous movement of the boom system at increase of load torque!
If the F1-minimum force is fallen below, the guying between the A-frame and the derrick head can become powerless.
If the guying between the A-frame and the derrick head is powerless and the „Derrick ballast is on the ground“ at the same the derrick ballast can suddenly lift off the ground due to increase of the load torque.
As a result, the boom system can move forward suddenly. Strong oscillating movements of the derrick ballast and load can be the result.
The crane can be overloaded and severe accidents can be the result.
▶ Hold the F1-actual value ($F1_{actual}$) **1.1.1** above the F1-minimum ($F1_{min}$) **1.1.2**.
▶ It is prohibited to fall below the F1-minimum force.

WARNING
Autonomous movement of the boom system at decrease of load torque!
If the F1-minimum force is fallen below, the guying between the A-frame and the derrick head can become powerless.
If the guying between the A-frame and the derrick head is powerless and the „derrick ballast is suspended“ at the same time, the derrick ballast can suddenly set down on the ground due to decrease of the load torque.
As a result, the boom system can move suddenly backward. As a result, the relapse cylinders can be pressed on the block, be overloaded and damaged. Strong oscillating movements of the derrick ballast and load can be the result.
The crane can be overloaded and severe accidents can be the result.
▶ Hold the F1-actual value ($F1_{actual}$) **1.1.1** above the F1-minimum ($F1_{min}$) **1.1.2**.
▶ It is prohibited to fall below the F1-minimum force ($F1_{min}$).

The following applies:
– After a shut off due to falling below the F1-minimum ($F1_{min}$) **1.1.2** the F1-actual value ($F1_{actual}$) **1.1.1** must be increased by a crane movement. If the derrick ballast is suspended, this can be achieved by setting down the ballast.
– When picking up the load, the D-guying between the derrick ballast and the derrick head must be relieved to the point where the F1-actual value ($F1_{actual}$) **1.1.1** is greater than the F1-minimum ($F1_{min}$) **1.1.2**.
– When increasing the load torque, and the limit value F1-minimum ($F1_{min}$) **1.1.2** is fallen below, an already set down derrick ballast can lose contact with the ground and lift off.
– When decreasing the load torque, and the limit value F1-minimum ($F1_{min}$) **1.1.2** is fallen below, an already „suspended derrick ballast“ can set down on the ground.
– If the assembly operation is activated and the F1-force continues to drop below the minimum force $F1_{min}$, then the $F1_{min}$ shut off can no longer be bypassed.

Limitations from 50 % pulled derrick ballast

If more than 50 % of the set derrick ballast is being pulled (utilization bar derrick ballast **5** larger than 50 %) and the F1-minimum ($F1_{min}$) **1.1.2** is fallen below at the same time, all crane movements that increase load torque are turned off.

Limitations from 90 % pulled derrick ballast

If more than 90 % of the set derrick ballast is being pulled (utilization bar derrick ballast **5** larger than 90 %) and the F1-minimum ($F1_{min}$) **1.1.2** is fallen below at the same time, all crane movements that increase load torque and all crane movements that decrease load torque are turned off. This also turns off the „spooling out“ movement of the winch.

9.6 Monitoring of pull cylinders on block position

The pull cylinders (also called ballast lift cylinders) of the derrick ballast are equipped with length sensors and limit switches for monitoring.

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In crane operation, the monitoring of the pull cylinders on block position is always active. If there is the danger of a block position, then only that direction of the pull cylinders can be moved which improves the condition. The other direction is unbypassably blocked. As long as the length sensors and the limit switches function correctly, the pull cylinders cannot get into a block position.

WARNING
Problem at monitoring of pull cylinders!
If the length sensors or limit switches are defective or missing, then the monitoring of the pull cylinders is not active.
Without monitoring, the pull cylinders can be moved without restriction, as a result, a block position is possible.
At a block position, the pressure measurements of the pull cylinders become inexact and the values are incorrectly calculated.
The overload protection calculates the actual load incorrectly and transmits faulty display values.
The crane can be overloaded and topple over.
This could result in serious accidents.
▶ Observe the display values and possible error messages.
▶ If length sensors or limit switches are defective or missing, monitor the pull cylinders manually.

The following applies:
– The display values of the pull cylinders must function and be plausible.

9.7 Monitoring the lateral incline of the ballast pallet

The ballast pallet is equipped with an incline sensor for monitoring.

The monitoring to ± 2.5° lateral incline of the ballast pallet is always active. If a lateral incline of ± 2.5° is reached, then only those directions of the pull cylinders can be moved which improve the condition. The other directions are unbypassably blocked. The ballast can be set down for that reason only to a maximum incline of the terrain of 2.5°.

WARNING
Defective incline sensor!
If an incline sensor is defective or missing, the monitoring of the lateral incline of the suspended ballast is not active.
The pull cylinders can be moved without restriction and the derrick ballast can be overturned as a result.
This could result in serious accidents.
▶ Observe the display values and possible error messages.
▶ If an incline sensor is defective, monitor the lateral incline of the derrick ballast manually.

The following applies:
– The display values of the lateral incline of the derrick ballast must function and be plausible.

9.8 Differential force monitoring for derrick ballast-guying

In operating modes with derrick ballast the forces of the derrick ballast guyings A and B are displayed in the LICCON monitor.

WARNING
Danger of accident!
If the forces in the derrick ballast guyings A and B are too high, then this can lead to an overload of the crane. Components can fail and severe accidents can be the result.
▶ Load the derrick ballast guyings A and B evenly.

After reaching the specified limit value of the difference force threshold, the displays of the pulled ballast of pull cylinder A and B blink and become red, the function ballast up / down is stopped. The difference force must be lowered again.

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If the difference of the forces of the derrick ballast guyings A and B exceeds the limit value, then this can have various causes:
- Flexing of the turntable.
- The ground under the derrick ballast is uneven.
- The crane is leaning to one side.
- The derrick ballast is loaded one-sided.
- The force measurement in one D-guying is incorrect.

The crane driver must recognize the correct cause and take countermeasures:
- The error, which caused the one-sided force, must be remedied.
- If the sensor values are implausible: Stop crane operation and find the cause and remedy it.

9.8.1 Bypassing the shut off of the function ballast up / down

- The following measures are permitted providing the ground is only slightly uneven:
  Control the individual pull cylinders in such a way that the difference between the forces becomes smaller. Ensure that the derrick ballast is not tilted at an inadmissible angle with respect to the crane, otherwise the derrick ballast guide and attachments will be damaged.

▶ Carry out the following: Activate assembly operation, see Crane operating instructions, chapter 4.02.

Result:

- The shut off of the function ballast up / down is bypassed.
- On the left LICCON monitor appears an assembly icon.

▶ Press the button Ballast „up“ or button Ballast „down“ **and** the stop button on the desired side at the same time, see section „Lifting / setting down / equalizing the derrick ballast“.

Problem remedy
The display of the entire pulled ballast is shown blinking red. An LMB-Stop was triggered. All crane functions were stopped.
The crane driver has moved the pull cylinders into the incorrect direction and further exceeded the limit value for the difference force threshold.
▶ Move the pull cylinders again into the correct (other) direction and align the ballast in such a way that the displays of the pulled ballast of pull cylinder A and B are again in the permissible range.

▶ Activate assembly operation again.

Result:

- The shut off of the function ballast up / down is bypassed again.
- All other crane functions are still suppressed.

▶ Move the pull cylinders into the correct direction.

DANGER
Overload of crane!
If the pull cylinders are moved into the incorrect direction after a new bypass of the function ballast up / down, the crane will be overloaded.
This could result in serious accidents.
▶ Monitor the display values and move the pull cylinders in the correct direction (values of pull cylinder A and B become closer).
▶ If unsure: Contact Liebherr Service.

▶ Find the error and remedy it which caused the shut off of the function „Ballast up / down“.

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9.9 Carrying out crane movements

Note

▶ For an overview of the displays in the LICCON monitors, see Crane operating instructions, chapter 4.02.

WARNING

Incorrect display values!

If the display values do not increase correspondingly when lifting known weights, an erroneous display value may be present.

If the crane is operated with erroneous display values, then the crane can be overloaded.

This could result in serious accidents.

▶ When lifting the hook block off the ground check if the display value for the actual load increases correspondingly.

▶ When lifting the derrick ballast off the ground check if the display value for the pulled derrick ballast BA_{pulled} increases correspondingly.

▶ When lifting the load off the ground check if the display value for the actual load increases correspondingly.

WARNING

The crane can topple over!

The jerky execution or braking of turning maneuvers can cause the load and / or suspended ballast to swing.

If the load and / or the suspended ballast collides with obstacles then the crane can be damaged or impeded.

Oscillating movements, damage or impediments can cause the crane to topple over.

This could result in serious accidents.

▶ Initiate or slow down crane movements with load and / or suspended derrick ballast extremely sensitively.

▶ There may be no persons and / or objects within the working range / danger zone of the crane.

▶ During crane operation additional personnel (guide) must monitor and secure the working range / danger zone of the crane from a safe position.

WARNING

Danger of accident due to unsafe ground!

If the crane is operated on insufficient ground, there is a danger of accident.

▶ The ground in the entire working area of the crane must be level and of sufficient load carrying capacity, in order to be able to securely accept the encountered surface pressures.

▶ Before setting down the load or the derrick ballast, the crane operator must make sure that the intended placement surface is suitable. A safe set down of load and derrick ballast must be ensured.

WARNING

Uncontrolled movements of the boom system!

If the guying between the A-frame and the derrick head (test point 1) becomes powerless, then this can lead to uncontrolled movements of the boom system.

This could result in serious accidents.

▶ The guying between the A-frame and the derrick head (test point 1) may never be without power.

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WARNING
Danger of accidents due to angular pull!
Due to angular pull of load or derrick ballast impermissible side forces are directed into the crane.
Impermissible side forces can cause failure of the components or a dangerous change of the center of gravity of the crane and / or load, among others.
Crane and load can be severely damaged and topple over.
This could result in serious accidents.
▶ Before taking on a load or the derrick ballast, make sure that the derrick ballast, the center of rotation of the turntable and the load are on one line.

WARNING
The crane can topple over!
If the derrick ballast is lifted by more than 0.25 m above the ground, then the crane can fall over to the rear if the load rips off.
▶ Do not lift derrick ballast more than 0.25 m from the ground.

Make sure that the following prerequisites are met:
- The test points must be checked before crane operation for functionality.
- The weight of the load to be lifted must be known.
- The support surface / placement surface of the derrick ballast may be maximum 0.25 m above / below the support surface of the crane.
- The support surface /placement surface of the derrick ballast must be level, horizontal and of sufficient load bearing capacity.
- The support surface / placement surface of the derrick ballast must be able to safely absorb the surface pressure.
- There may not be any obstacles in the slewing range of the crane, derrick ballast and load.
- Additional personnel is instructed to monitor and secure the working range / danger zone of the crane from a safe distance.
- A permanent acoustic / visual connection between the crane operator and the additional personnel is available.
- A guide or the crane driver must monitor the lifting and setting down of the derrick ballast and the load.
- The lifted derrick ballast is monitored by a guide or the crane operator.

The following applies:
- When taking up the load, the D-guying between the derrick ballast and the derrick head must be relieved so that the operating force $F1_{actual}$ is larger than the limit value for the F1-minimum force.
- Before taking up the load or the derrick ballast, make sure that the following components are on one line:
  - the load
  - the center of rotation of the turntable
  - the derrick ballast

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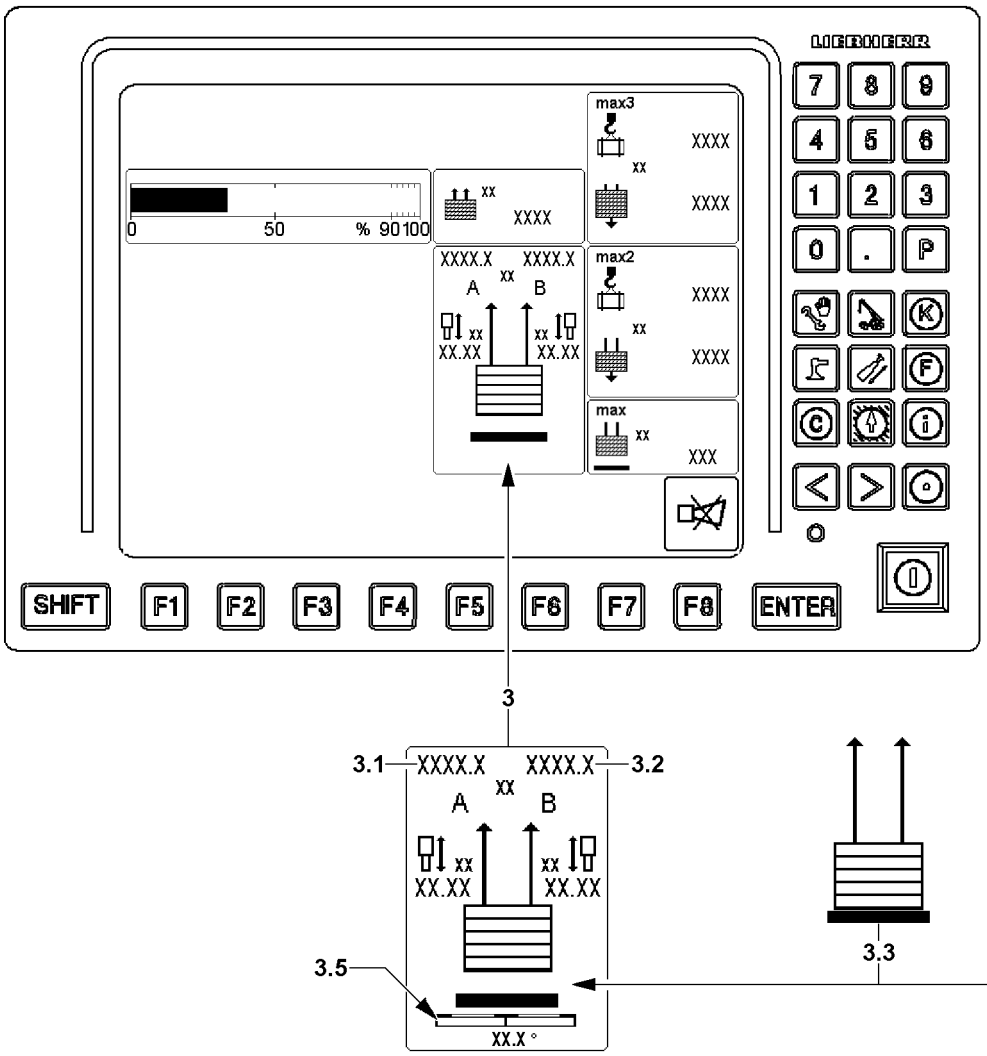

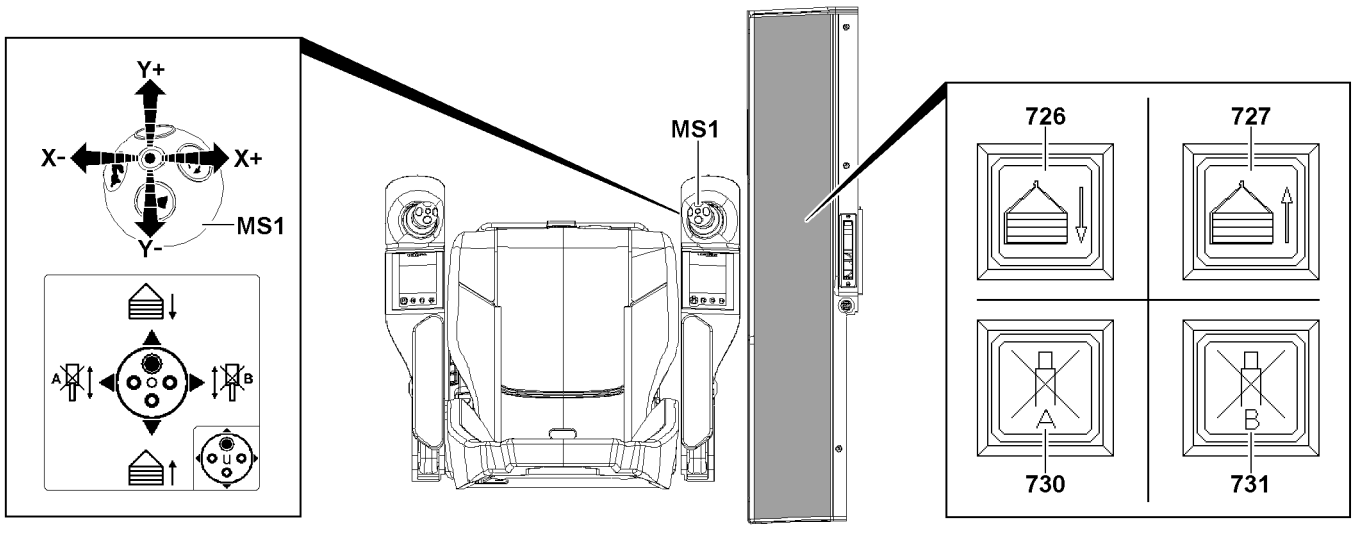

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Fig.146965

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9.9.1 Lifting / setting down the derrick ballast

WARNING
Danger of accident!
The placement surface for the ballast pallet must be level, horizontal and of sufficient load bearing capacity, otherwise the ballast pallet can tip over.
This could result in serious accidents.

- ▶ Check the incline of the crane during the set down procedure.
- ▶ Check the incline of the ballast pallet with the incline display **3.5**.
- ▶ Monitor the difference forces (derrick ballast guying A **3.1** to derrick ballast guying B **3.2**).
- ▶ It is strictly prohibited for anyone to stand under the ballast pallet or within the entire danger zone during the set down procedure.

The lifting and set down of the derrick ballast is monitored by the LICCON computer system. Normally the crane operator does not have to do anything. However, if corrective measures or preventative measures should be necessary, observe the following section „Equalizing the derrick ballast“.

Lifting the derrick ballast

- ▶ Lift the derrick ballast: Press the button **727**.
  or
  Deflect the master switch **MS1** in direction **Y-**.

Result:

- – The piston rods of the pull cylinders retract together.
- – The derrick ballast is raised.
- – The ballast pallet loses all ground contact:
  The ground contact switches are no longer actuated, the „Derrick ballast lifted off“ icon **3.4** appears.
  The „turning the turntable“ and „driving the crawler“ crane movements are released.

Lowering the derrick ballast

- ▶ Lower the derrick ballast: Press the button **726**.
  or
  Deflect the master switch **MS1** in direction **Y+**.

Result:

- – The piston rods of the pull cylinders extend together.
- – The derrick ballast is countersunk
- – When the ballast pallet touches the ground:
  The ground contact switches are actuated, the „Derrick ballast has ground contact“ icon **3.3** appears.
  The „turning the turntable“ and „driving the crawler“ crane movements are blocked.

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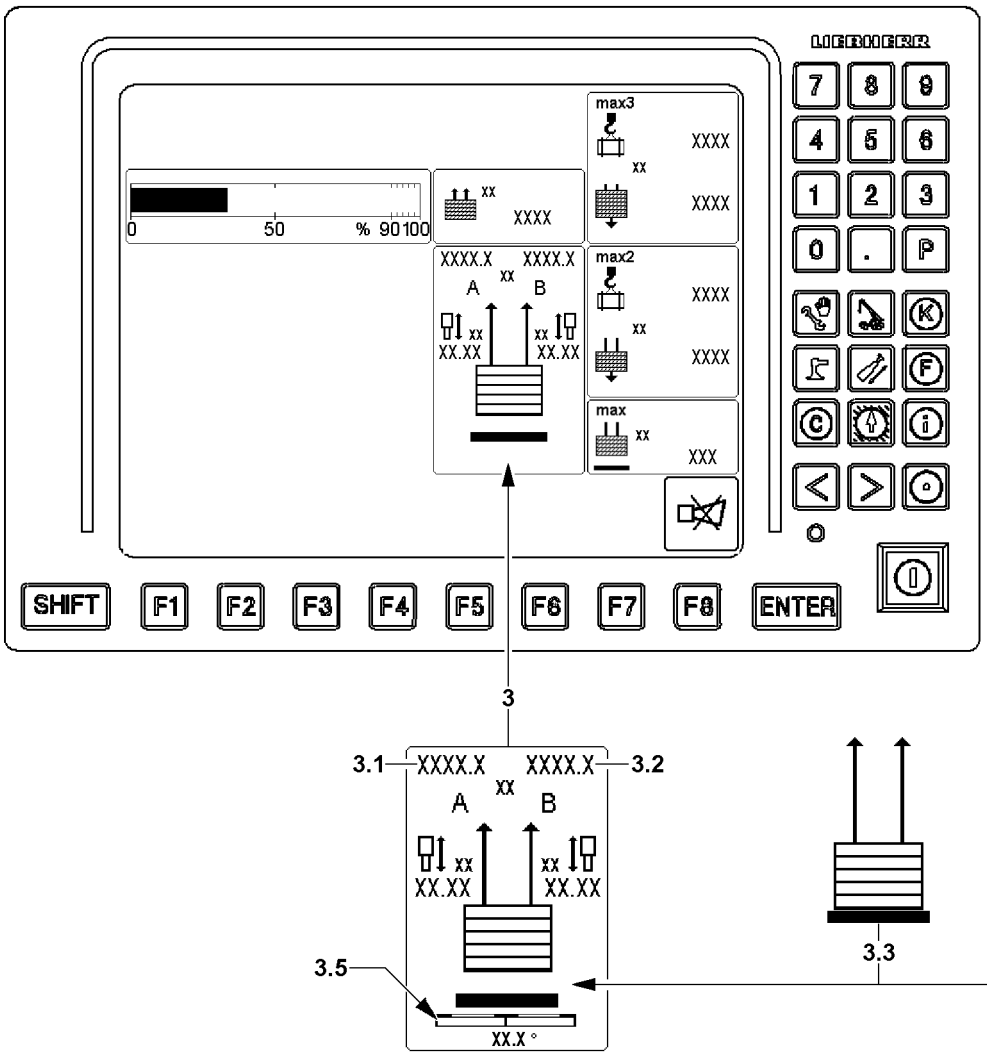

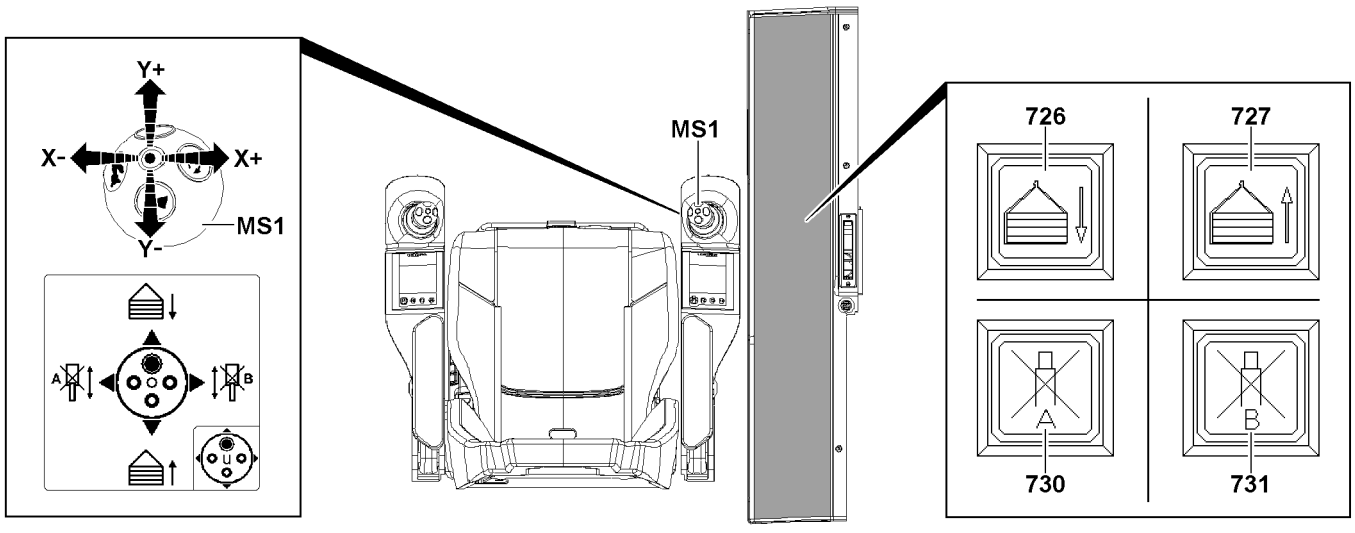

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Fig.146965

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9.9.2 Equalizing the derrick ballast

WARNING
Danger of accident!
The placement surface for the ballast pallet must be level, horizontal and of sufficient load bearing capacity, otherwise the ballast pallet can tip over.
This could result in serious accidents.

- ▶ Check the incline of the crane during the set down procedure.
- ▶ Check the incline of the ballast pallet with the incline display **3.5**.
- ▶ Monitor the difference forces (derrick ballast guying A **3.1** to derrick ballast guying B **3.2**).
- ▶ It is strictly prohibited for anyone to stand under the ballast pallet or within the entire danger zone during the set down procedure.

If a limit value in the difference force monitoring (Ratio of derrick ballast guying A **3.1** to derrick ballast guying B **3.2**) or the incline display **3.5** is exceeded, the derrick ballast must be equalized.

Block the pull cylinder (A) when lifting:

- ▶ Press the button **727** and the button **730**.
  or
  Deflect the master switch **MS1** diagonally in direction **X-** and direction **Y-**.

Result:

- The piston rod of the pull cylinder (A) stops.
- The piston rod of pull cylinder (B) moves in.
- Side (B) of the derrick ballast lifts up.

Block the pull cylinder (B) when lifting:

- ▶ Press the button **727** and the button **731**.
  or
  Deflect the master switch **MS1** diagonally in direction **X+** and direction **Y-**.

Result:

- The piston rod of the pull cylinder (B) stops.
- The piston rod of pull cylinder (A) moves in.
- Side (A) of the derrick ballast lifts up.

Block the pull cylinder (A) when lowering:

- ▶ Press the button **726** and the button **730**.
  or
  Deflect the master switch **MS1** diagonally in direction **X-** and direction **Y+**.

Result:

- The piston rod of the pull cylinder (A) stops.
- The piston rod of pull cylinder (B) moves out.
- Side (B) of the derrick ballast lowers.

Block the pull cylinder (B) when lowering:

- ▶ Press the button **726** and the button **731**.
  or
  Deflect the master switch **MS1** diagonally in direction **X+** and direction **Y+**.

Result:

- The piston rod of the pull cylinder (B) stops.
- The piston rod of pull cylinder (A) moves out.
- Side (A) of the derrick ballast lowers.

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10 Crawler operation with derrick ballast

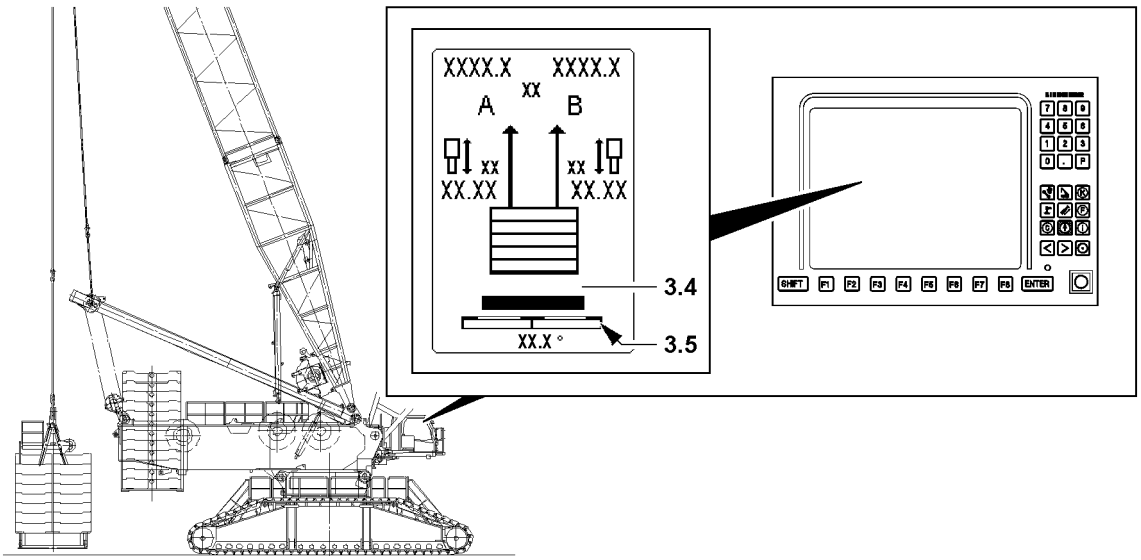

Fig.145934

Note

- Driving the crawler crane, see the Crane operating instructions, chapter 4.10.
- Release for driving the crawler takes place when all 4 ground contact rollers are no longer in contact with the ground.

10.1 Driving the crawler

Driving with suspended derrick ballast.

WARNING

Prerequisites for driving are not met, load or derrick ballast are oscillating too much!
If the specifications from the Crane operating instructions, chapter 4.10 are not observed, there is a danger of accident.
If the suspended load or the suspended derrick ballast starts to swing too much, then the crane operator can lose control over the crane.
If the following prerequisites are not observed, the crane can topple over.
This could result in serious accidents.

- Observe the specifications in the Crane operating instructions, chapter 4.10.
- Do not exceed the maximum permissible driving speed of the crawler.
- Avoid jerky driving movements.
- Avoid oscillation of the suspended load and the suspended derrick ballast. Turn and drive slowly.
- The attached load and suspended derrick ballast must be secured to prevent it from swinging. If oscillating movements should occur, set the load / derrick ballast as fast as possible down on the ground. Hereby pay attention to the limit values of the load moment display and the F-load display.
- Steering the crawler with a suspended load and / or installed derrick ballast is prohibited.
- Uphill and downhill inclines and lateral inclines may only be driven within the permissible angle range.

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Make sure that the following prerequisites are met:
- Observe the specifications in the Crane operating instructions, chapter 4.10.
- Pay special attention to the limitations for crawler operation with derrick ballast.
- The ground is suitable for crawler operation with derrick ballast.
- The ground can safely take on the resulting surface pressure.
- The derrick ballast is lifted off the ground.
- The „Derrick ballast lifted off“ icon **3.4** appears on the LICCON monitor.
- The derrick ballast is horizontally aligned (observe the incline display **3.5**).

11 Disassembling the suspended ballast

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

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Make sure that the following prerequisites are met:
- The crane is properly supported and horizontally aligned.
- An auxiliary crane is available.
- The counterweight has been installed on the turntable according to the load chart.
- The maximum ground unevenness for the placement surface of the derrick ballast is ±1°.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection settings have been compared with the actual set up configuration.

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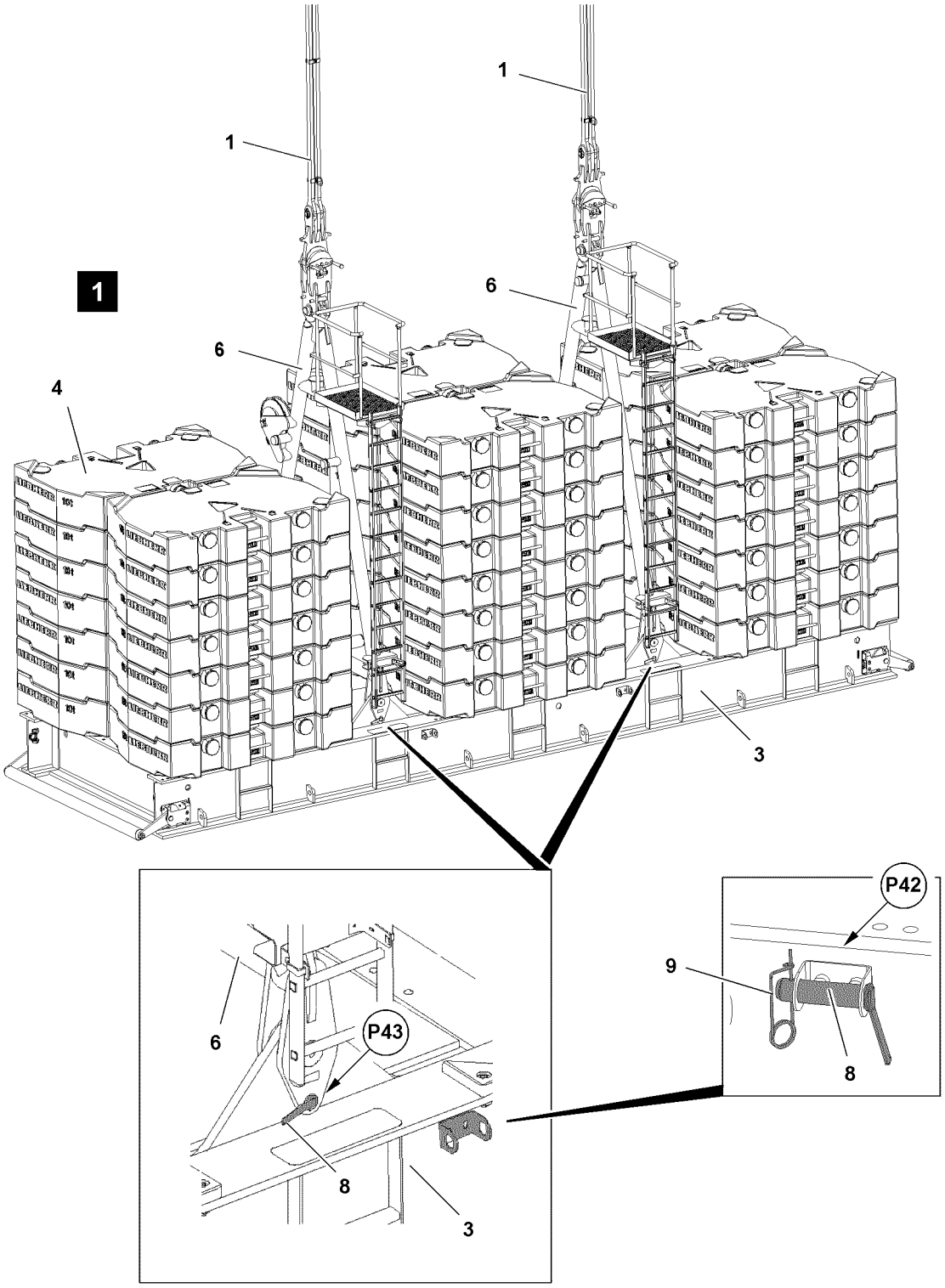

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Fig.119010

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11.1 Securing the erection racks to prevent them from folding down

DANGER
Falling erection racks!
If the erection racks are not secured with retaining pins, then they will fall down uncontrolled when unpinning the guy rods.
Death, severe bodily injuries, property damage.

- ▶ The two erection racks must be locked and secured in a vertical position with retaining pins **8**. Only then may the guy rods be removed.
- ▶ It is prohibited for anyone to remain under the erection racks as well as within the entire danger zone.

Make sure that the following prerequisite is met:

– The suspended ballast is positioned on the ground.

- ▶ Remove the spring retainer **9** at point **P42** and unpin the retaining pin **8** from the park position.
- ▶ Insert the retaining pin **8** at point **P43** and secure with spring retainer **9**.

Result:

– The erection racks **6** are secured, see illustration **1**.

11.2 Disconnecting the electrical connections

Note

- ▶ Disconnect the electrical connections from the suspended ballast to the turntable, see Electric wiring diagram.

- ▶ Disconnect the electrical connections.

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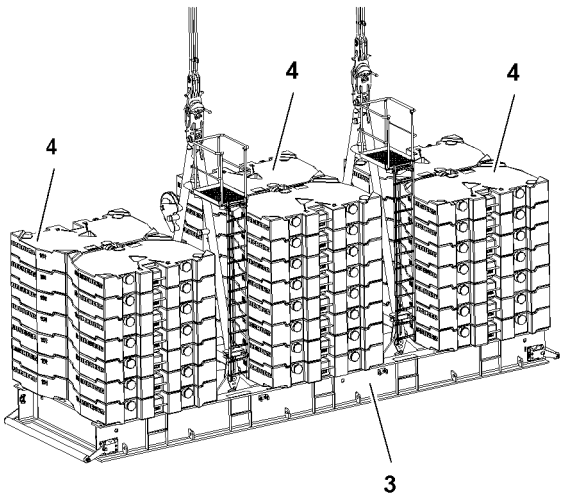

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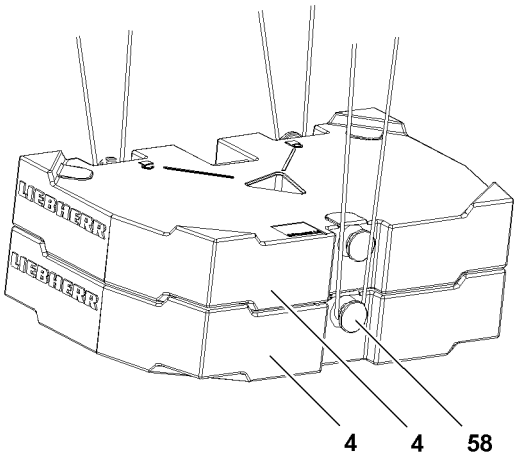

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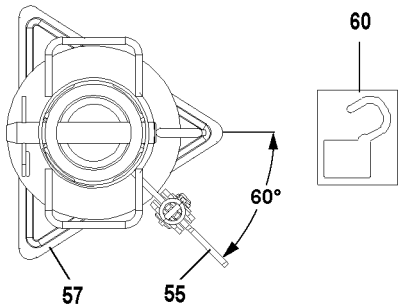

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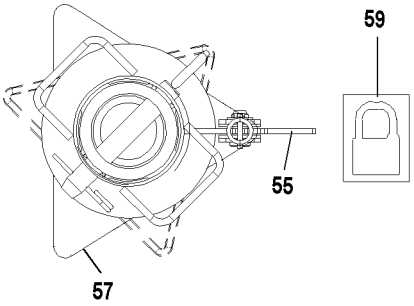

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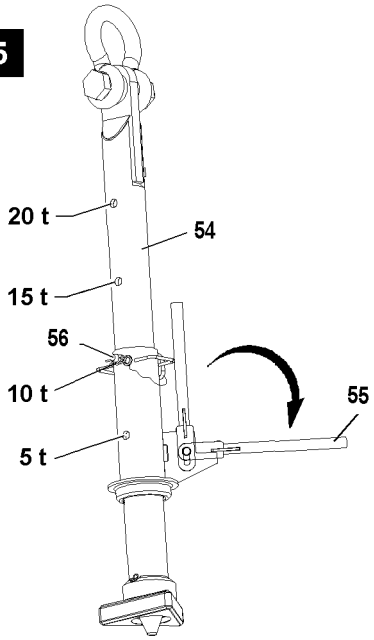

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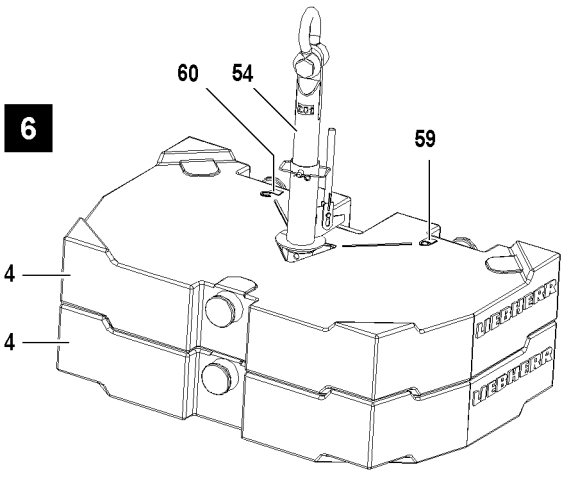

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Fig.119011

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11.3 Ballasting the ballast pallet off

11.3.1 Removing the ballast plates, fastening system: „Twistlock“

WARNING
Danger of accident!
If more than the permissible two ballast plates are lifted with the receptacle stud, the receptacle stud will be overloaded and can be damaged.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the ballast plates are placed correctly in the centerings.
- ▶ Replace damaged ballast plates.

To lift off the ballast plate(s) **4**, use the receptacle stud **54**.

Before the receptacle stud **54** is guided into the ballast plates, it must be ensured that the length of the receptacle stud **54** is set correctly. The length of the receptacle stud **54** can be adjusted with the pin **56**.

If the length of the receptacle stud **54** is to be adjusted:
- ▶ Release and unpin the pin **56**.
- ▶ Adjust the length of the receptacle stud by moving the receptacle stud **54**, see illustration **5**.
- ▶ Insert the pin **56** and secure with the spring retainer.
- ▶ Fasten the receptacle stud **54** to the auxiliary crane and guide it into the ballast plate(s).
- ▶ Pull the lever **54** up and fold it down.
- ▶ Turn the lever **55** by 60° until the lever **55** points to the icon **59**, see illustration **3** and illustration **4**.

Result:

– The receptacle stud **54** is locked with the ballast plate.

- ▶ Lift the ballast plate with the receptacle stud **54** and remove it carefully from the ballast stack or the ballast pallet.
- ▶ Turn the lever **55** by 60° until the lever **55** points to the icon **60**, see illustration **6**.

Result:

– The receptacle stud **54** is unlocked.

- ▶ Carefully pull the receptacle stud **54** from the ballast plate.
- ▶ Alternately remove the ballast plates on both sides.

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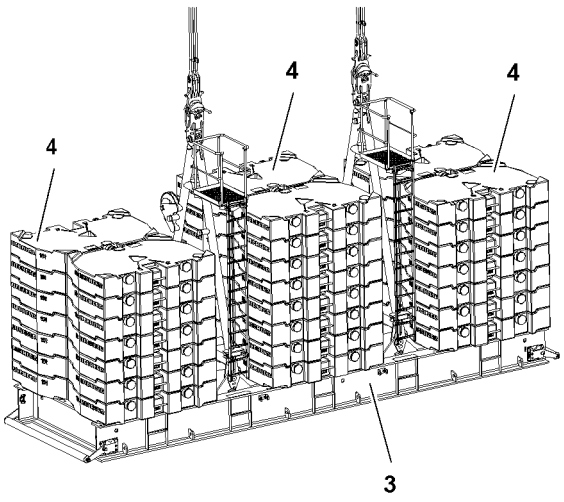

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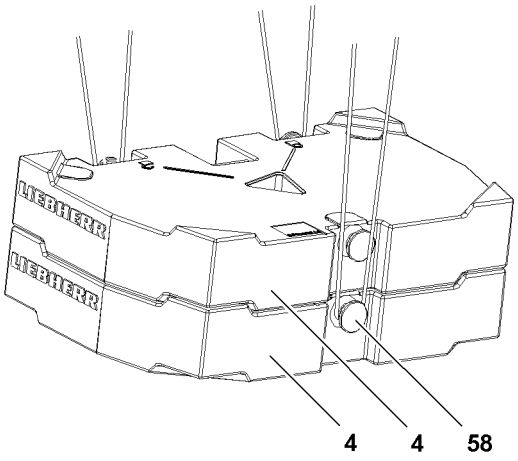

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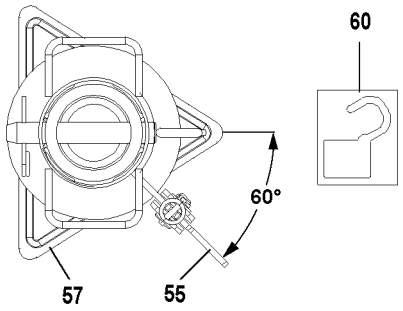

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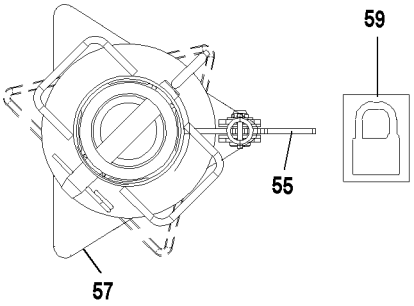

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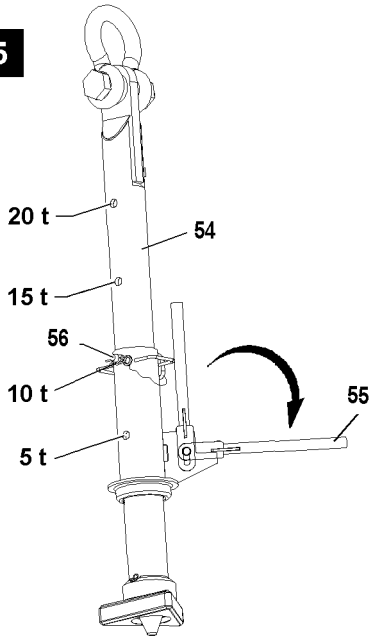

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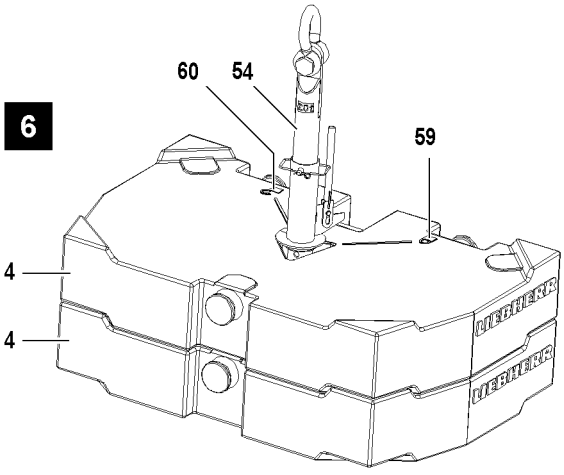

Fig.119011

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11.3.2 Removing the ballast plates, fastening system: „Bitt“

WARNING
Falling ballast plates!
If more than the permissible loads are lifted, then the bitts **58** are overloaded and the ballast plates can fall down.
Death, severe bodily injuries, property damage.
- ▶ Lift no more than maximum 20 t with the ropes, 3 fastening points.
- ▶ Replace damaged ballast plates immediately.

WARNING
Incorrect handling of the fastening equipment!
If the fastening equipment is not attached correctly and if it is not secured sufficiently to prevent it from loosening up, loads can fall down.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the fastening equipment is correctly attached on the bitts **58** and that it is secured sufficiently to prevent it from loosening up.

Note
- ▶ Lift the ballast plates off individually or as an assembly, maximum 20 t.
- ▶ 20 t ballast assembly, see illustration **2**.

- ▶ Lift the ballast plates **4** off individually or as an assembly of maximum two plates alternately on the left and right with the auxiliary crane.

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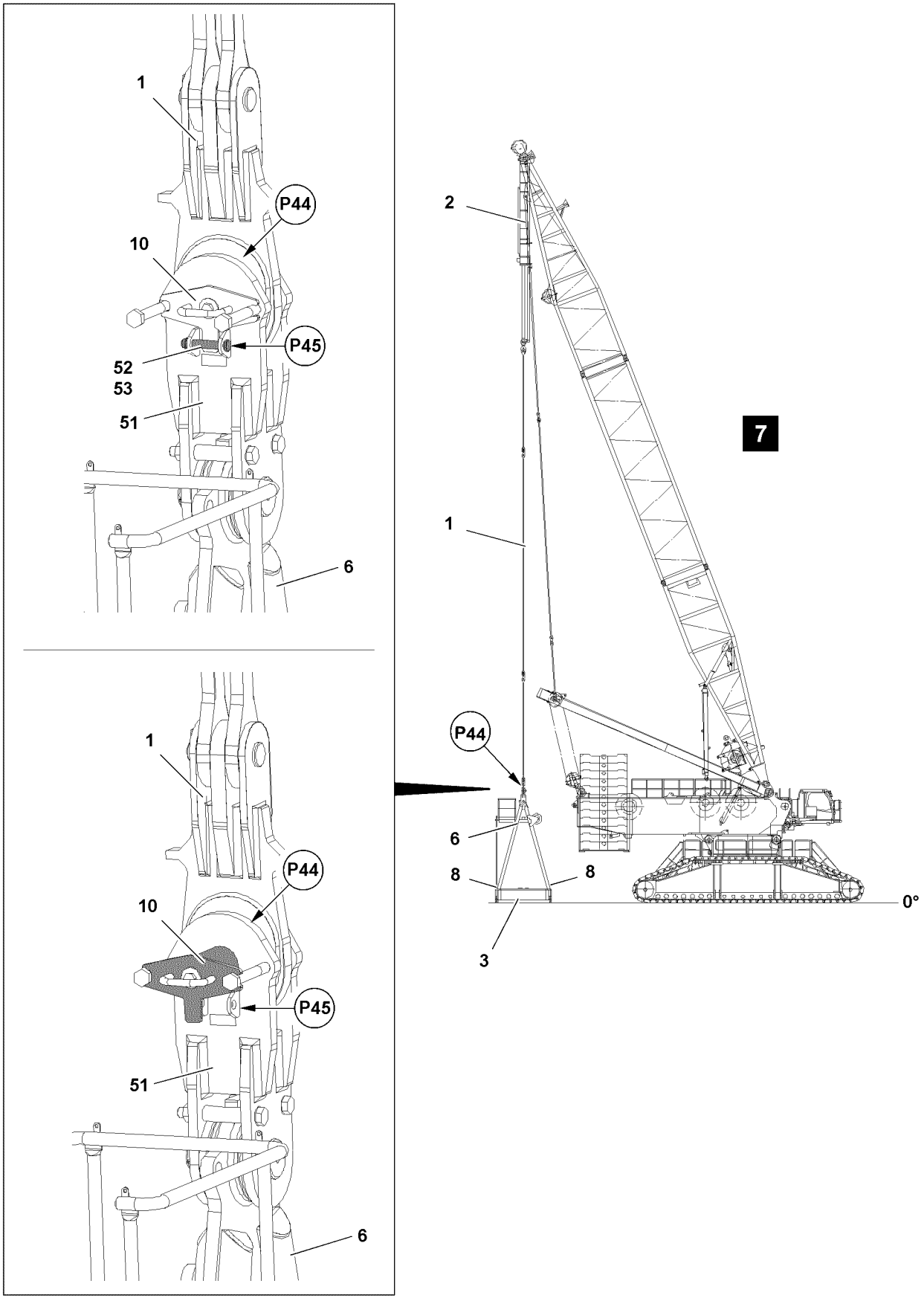

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Fig.119012

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11.4 Disassembling the guy rods from the erection racks

DANGER
Falling erection racks!
If the erection racks are not secured with retaining pins, then they will fall down uncontrolled when unpinning the guy rods.
Death, severe bodily injuries, property damage.

- ▶ The two erection racks must be locked and secured in a vertical position with retaining pins **8**. Only then may the guy rods be removed.
- ▶ It is prohibited for anyone to remain under the erection racks as well as within the entire danger zone.

Make sure that the following prerequisites are met:

- – The erection racks are secured.
- – The ballast plates are removed.

- ▶ Remove the safety locking pin **53** at point **P45** and unpin the retaining pin **52**.
- ▶ Unpin the connector pin **10** at point **P44**, see illustration **7**.
- ▶ Drive out the guy rods **1** out by retracting the piston rods on the pull cylinders **2** from the brackets **51** of the erection rack **6**.

Note
Retract / extend the pull cylinder **2**

- ▶ Control the pull cylinders **2** from the crane cab, see the section „Lifting and lowering the derrick ballast using the pull cylinders“.
- ▶ Operate the pull cylinder **2** with the radio remote control, see the „radio remote control operating instructions“.

- ▶ Insert the connector pin **10** again at point **P44**.
- ▶ Insert the retaining pin **52** at point **P45** and secure with the safety locking pin **53**, see illustration **7**.

Result:

- – The connector pin **10** is secured.

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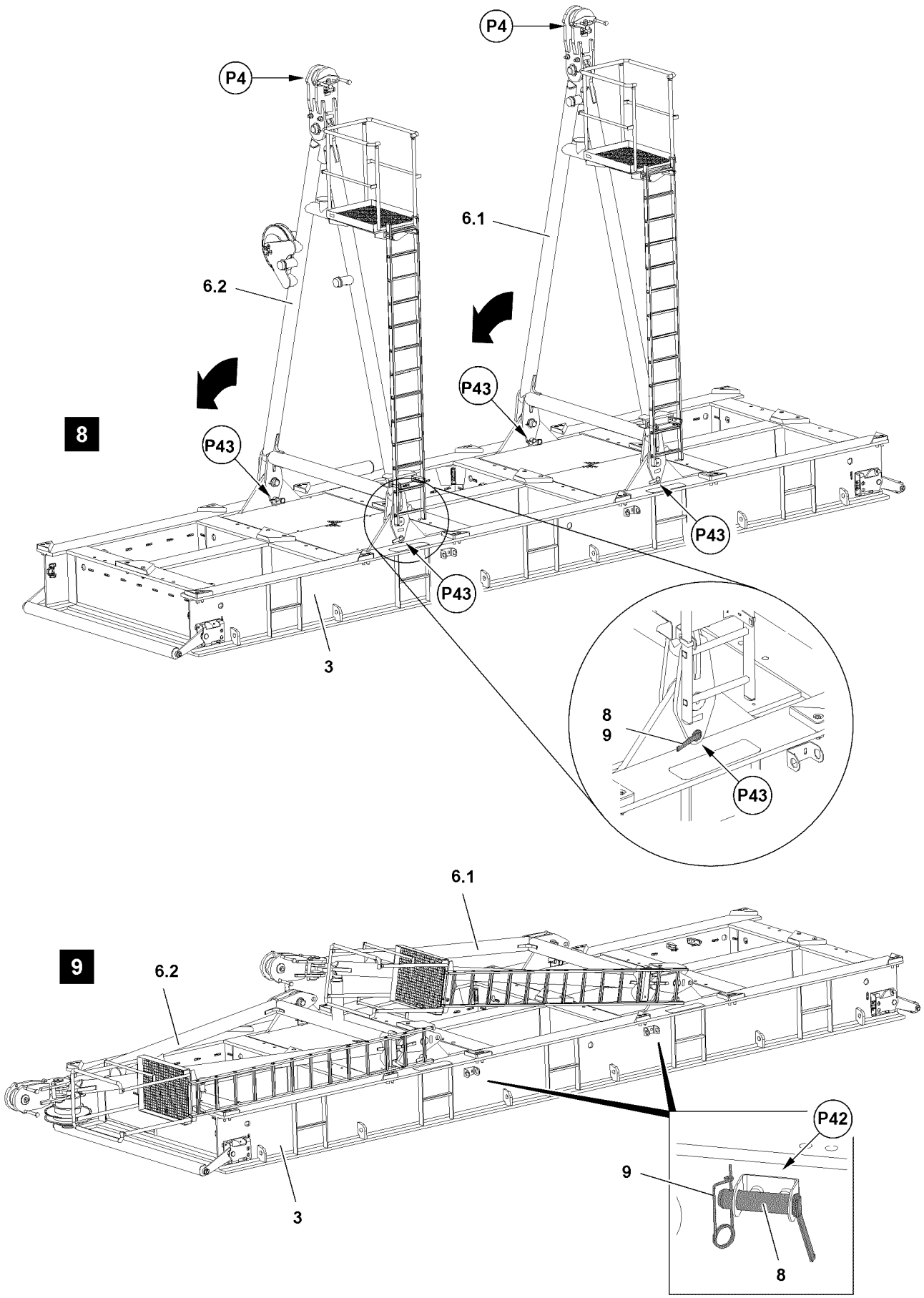

Fig.119013

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11.5 Removing the ballast pallet

Note

▶ The disassembly of the erection racks is described based on the example of one erection rack.

The erection rack is unpinned on two points. The unpinning procedure is described for one pin as an example.

▶ Hang the erection rack **6.2** on the auxiliary crane at point **P4**, see illustration **8**.

DANGER

Danger of accident during assembly / disassembly of the erection racks!
The erection racks must hang securely on the auxiliary crane, otherwise they could fall down and kill or severely injure personnel.

▶ Make sure that the erection rack hangs safely on the auxiliary crane.
▶ Never unpin the retaining pins of unsecured or unsupported erection racks.
▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure.

When the erection rack is safely held by the auxiliary crane:

▶ Remove the spring retainer **9** on both sides at point **P43** and unpin the retaining pin **8**.
▶ Lower the erection rack **6.2** with the auxiliary crane until the rubber cushion touches the frame, see illustration **9**.
▶ Insert the retaining pin **8** at point **P42** on both sides and secure with spring retainer **9** in park position, see illustration **9**.
▶ Remove the auxiliary crane.
▶ Lower the second erection rack **6.1** with the auxiliary crane until the rubber cushion touches the erection rack **6.2**, see illustration **9**.

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Fig.195219

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12 Disassembling the suspended ballast with the suspended ballast guide

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

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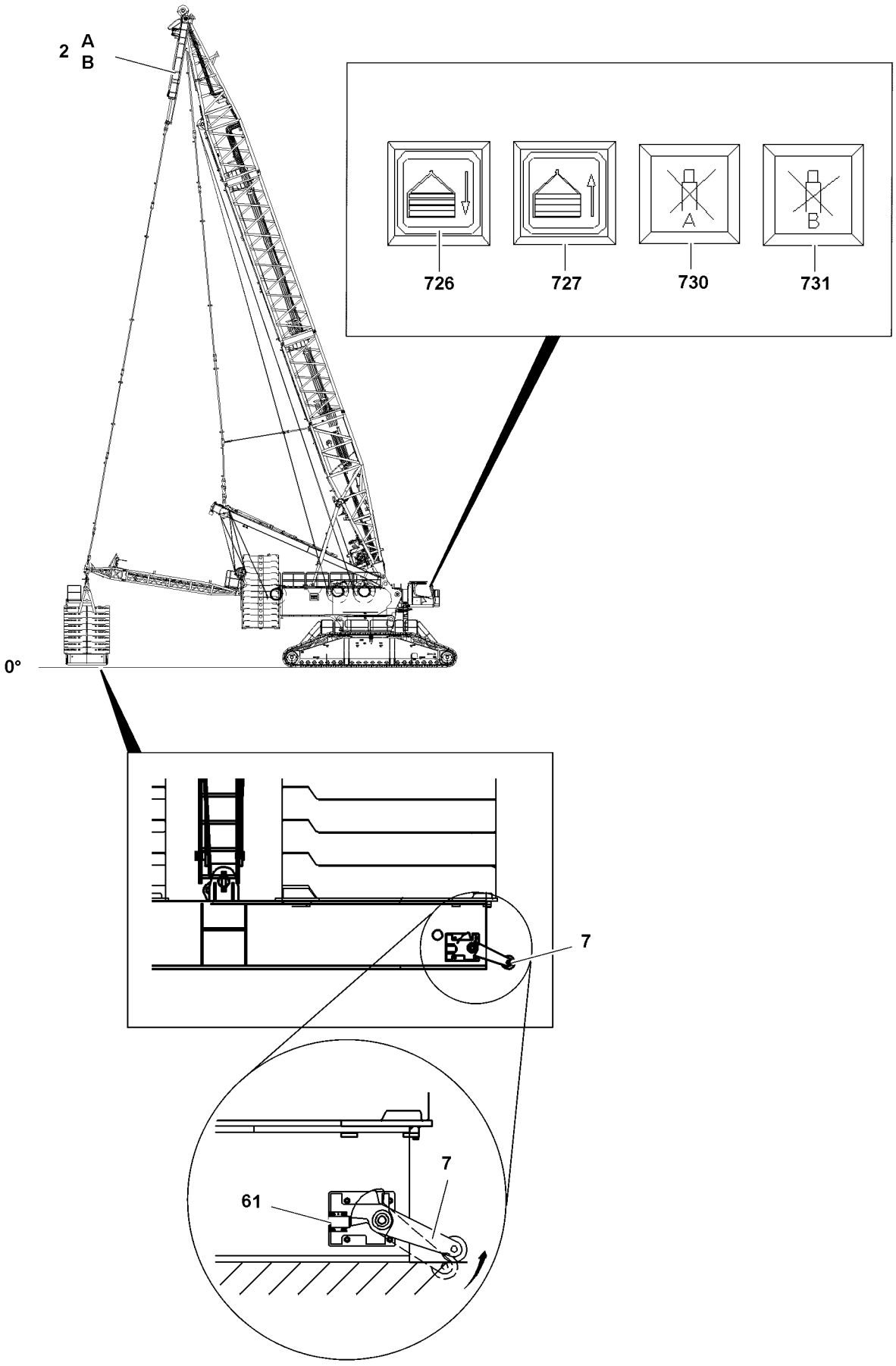

Fig.120210

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Make sure that the following prerequisites are met:
- The crane is properly supported and horizontally aligned.
- An auxiliary crane is available.
- The counterweight has been installed on the turntable according to the load chart.
- The maximum ground unevenness for the placement surface of the derrick ballast is ±1°.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection settings have been compared with the actual set up configuration.

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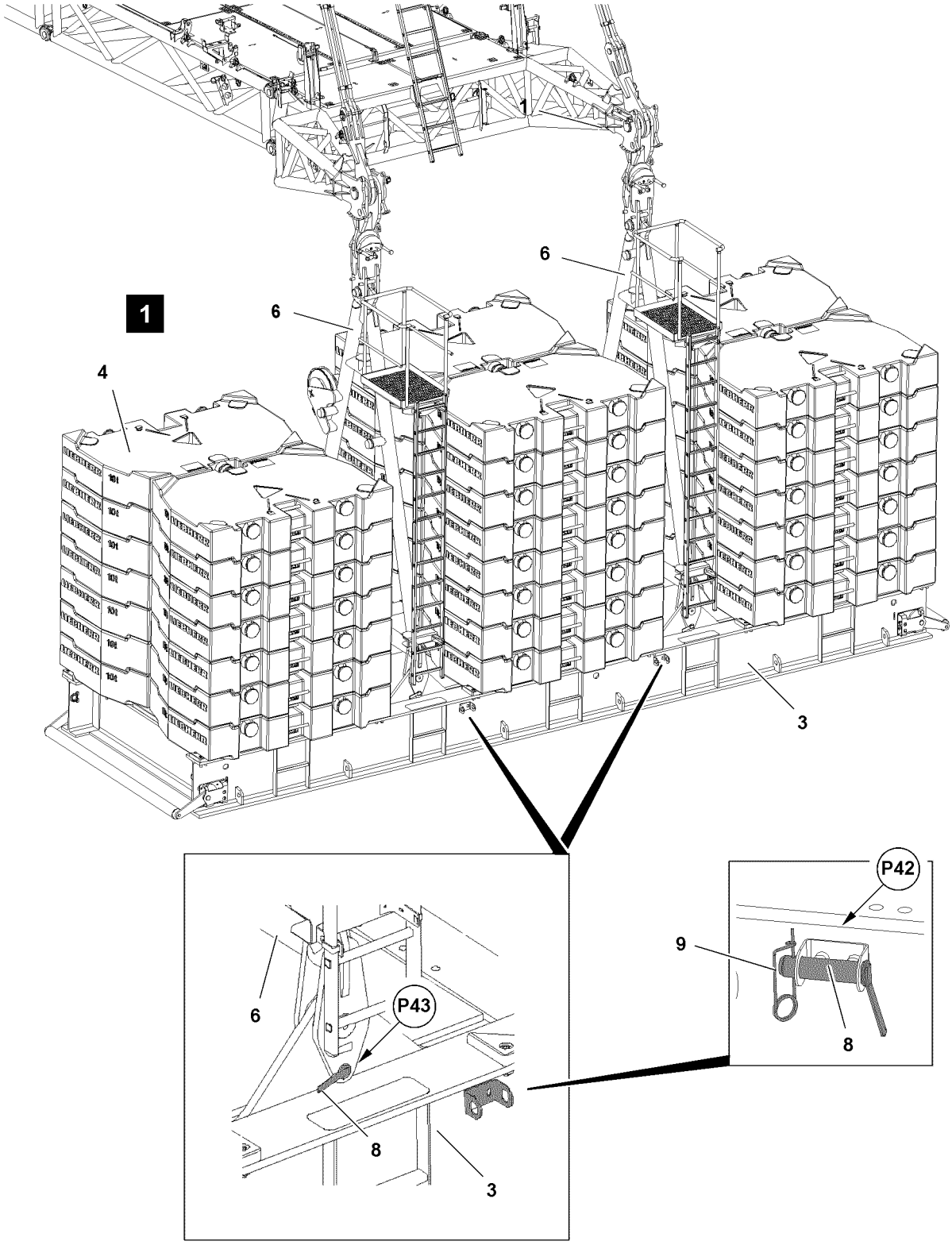

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Fig.120211

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12.1 Securing the erection racks to prevent them from folding down

DANGER
Falling erection racks!
If the erection racks are not secured with retaining pins, then they will fall down uncontrolled when unpinning the guy rods.
Death, severe bodily injuries, property damage.

- ▶ The two erection racks must be locked and secured in a vertical position with retaining pins **8**. Only then may the guy rods be removed.
- ▶ It is prohibited for anyone to remain under the erection racks as well as within the entire danger zone.

Make sure that the following prerequisite is met:

– The suspended ballast is positioned on the ground.

- ▶ Remove the spring retainer **9** at point **P42** and unpin the retaining pin **8** from the park position.
- ▶ Insert the retaining pin **8** at point **P43** and secure with spring retainer **9**.

Result:

– The erection racks **6** are secured, see illustration **1**.

12.2 Disconnecting the electrical connections

Note

- ▶ Disconnect the electrical connections from the suspended ballast to the turntable, see Electric wiring diagram.

- ▶ Disconnect the electrical connections.

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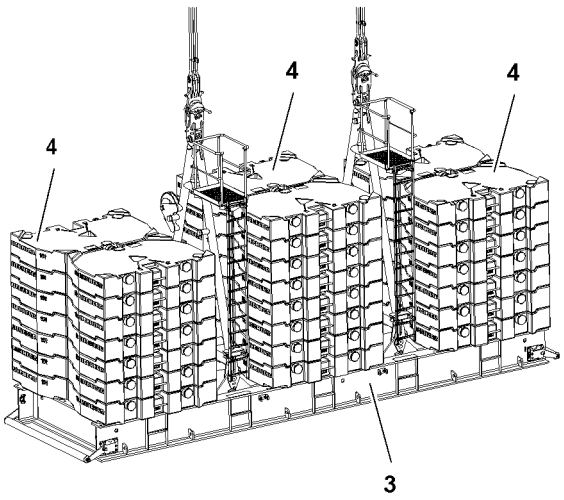

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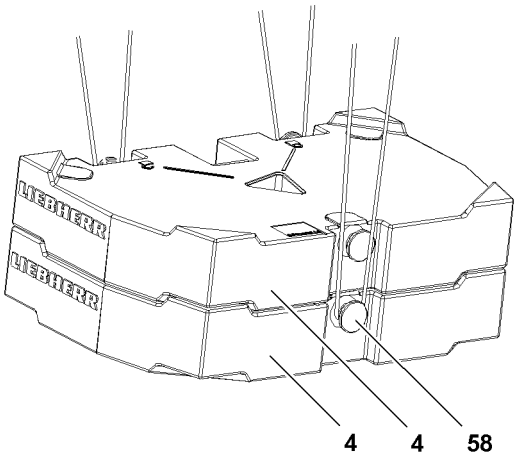

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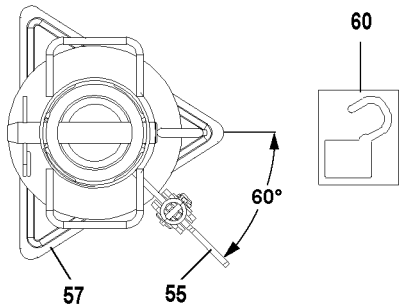

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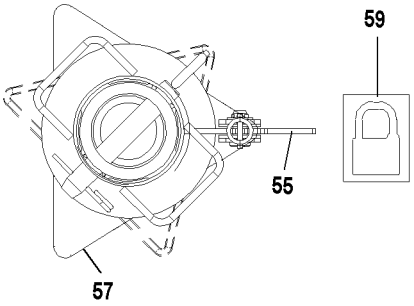

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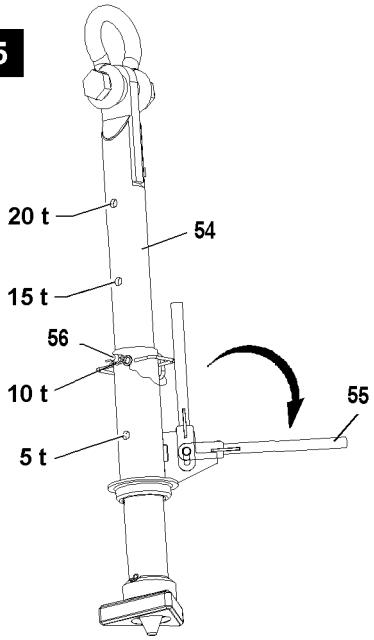

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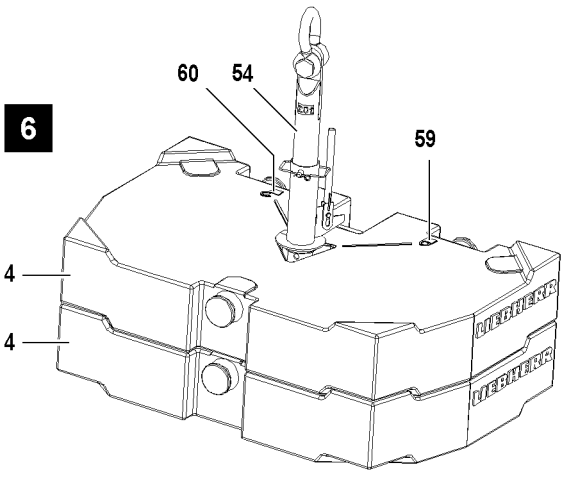

Fig.119011

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12.3 Ballasting the ballast pallet off

12.3.1 Removing the ballast plates, fastening system: „Twistlock“

WARNING
Danger of accident!
If more than the permissible two ballast plates are lifted with the receptacle stud, the receptacle stud will be overloaded and can be damaged.
Death, severe bodily injuries, property damage.
▶ Make sure that the ballast plates are placed correctly in the centerings.
▶ Replace damaged ballast plates.

To lift off the ballast plate(s) **4**, use the receptacle stud **54**.

Before the receptacle stud **54** is guided into the ballast plates, it must be ensured that the length of the receptacle stud **54** is set correctly. The length of the receptacle stud **54** can be adjusted with the pin **56**.

If the length of the receptacle stud **54** is to be adjusted:
▶ Release and unpin the pin **56**.
▶ Adjust the length of the receptacle stud by moving the receptacle stud **54**, see illustration **5**.
▶ Insert the pin **56** and secure with the spring retainer.
▶ Fasten the receptacle stud **54** to the auxiliary crane and guide it into the ballast plate(s).
▶ Pull the lever **54** up and fold it down.
▶ Turn the lever **55** by 60° until the lever **55** points to the icon **59**, see illustration **3** and illustration **4**.

Result:

– The receptacle stud **54** is locked with the ballast plate.

▶ Lift the ballast plate with the receptacle stud **54** and remove it carefully from the ballast stack or the ballast pallet.
▶ Turn the lever **55** by 60° until the lever **55** points to the icon **60**, see illustration **6**.

Result:

– The receptacle stud **54** is unlocked.

▶ Carefully pull the receptacle stud **54** from the ballast plate.
▶ Alternately remove the ballast plates on both sides.

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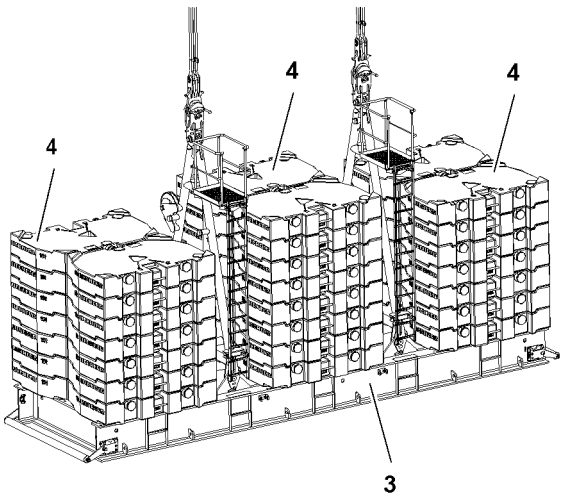

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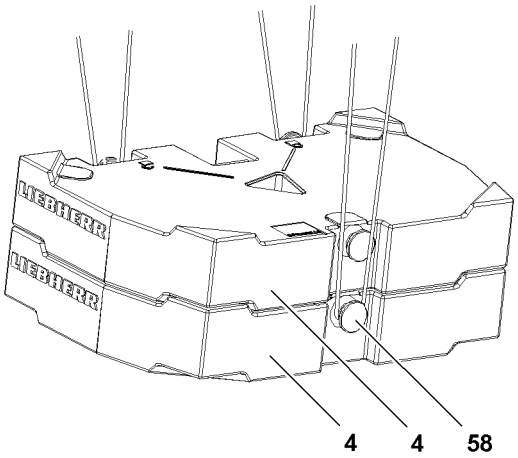

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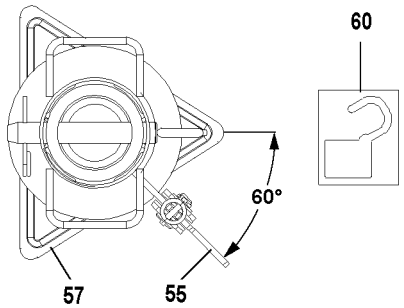

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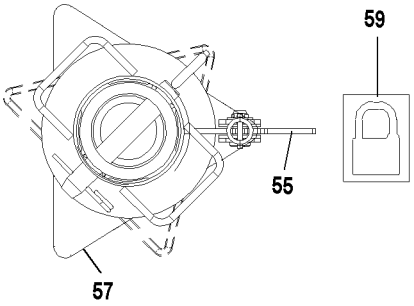

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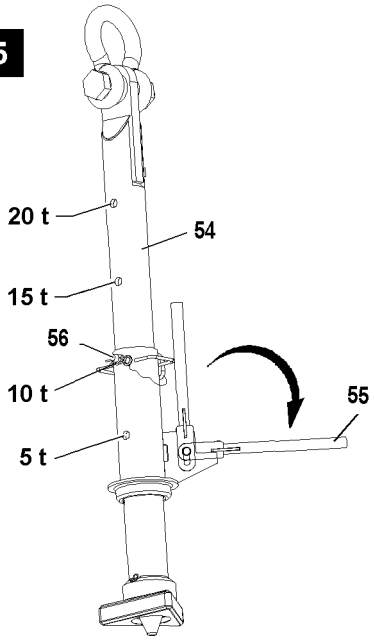

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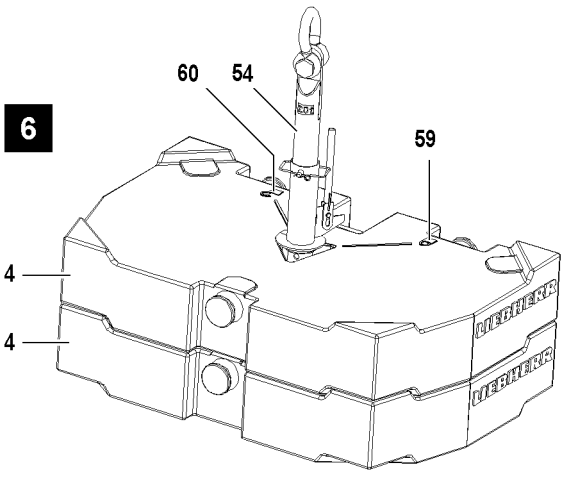

Fig.119011

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12.3.2 Removing the ballast plates, fastening system: „Bitt“

WARNING
Falling ballast plates!
If more than the permissible loads are lifted, then the bitts **58** are overloaded and the ballast plates can fall down.
Death, severe bodily injuries, property damage.
- ▶ Lift no more than maximum 20 t with the ropes, 3 fastening points.
- ▶ Replace damaged ballast plates immediately.

WARNING
Incorrect handling of the fastening equipment!
If the fastening equipment is not attached correctly and if it is not secured sufficiently to prevent it from loosening up, loads can fall down.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the fastening equipment is correctly attached on the bitts **58** and that it is secured sufficiently to prevent it from loosening up.

Note
- ▶ Lift the ballast plates off individually or as an assembly, maximum 20 t.
- ▶ 20 t ballast assembly, see illustration **2**.

- ▶ Lift the ballast plates **4** off individually or as an assembly of maximum two plates alternately on the left and right with the auxiliary crane.

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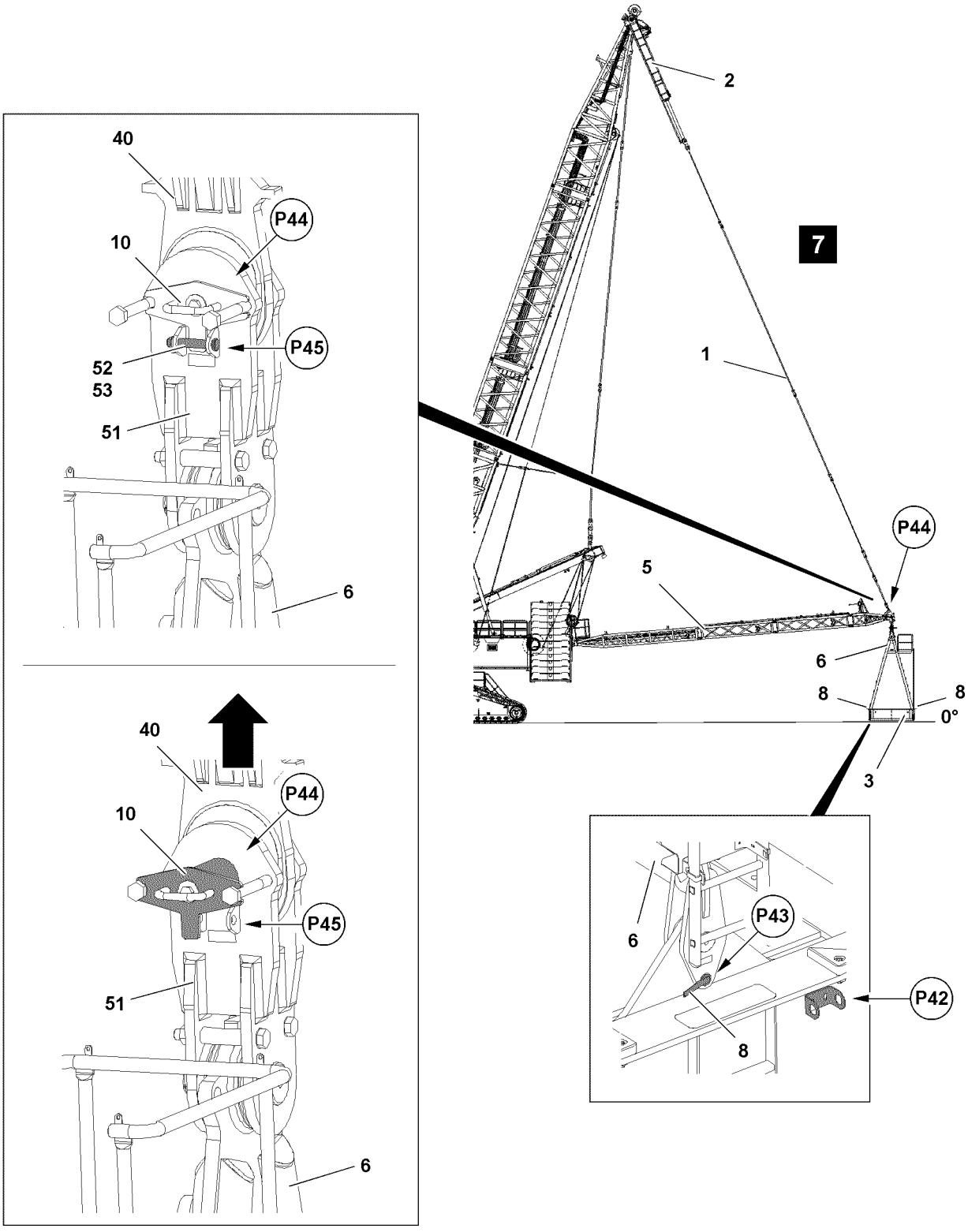

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Fig.120212

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12.4 Disassembling the suspended ballast guide on the erection racks

DANGER
Falling erection racks!
If the erection racks are not secured with retaining pins, then they will fall down uncontrolled when unpinning the guy rods.
Death, severe bodily injuries, property damage.
- ▶ The two erection racks must be locked and secured in a vertical position with retaining pins. Only then may the guy rods be removed.
- ▶ It is prohibited for anyone to remain under the erection racks as well as within the entire danger zone.

Make sure that the following prerequisites are met:
- – The erection racks are secured.
- – The ballast plates are removed.

- ▶ Remove the safety locking pin **53** at point **P45** and unpin the retaining pin **52**.
- ▶ Unpin the connector pin **10** at point **P44**, see illustration **7**.
- ▶ Drive out the guy rods **1** out by retracting the piston rods on the pull cylinders **2** from the brackets **51** of the erection rack **6**.

Note
Retract / extend the pull cylinder **2**
- ▶ Control the pull cylinders **2** from the crane cab, see the section „Lifting and lowering the derrick ballast using the pull cylinders“.
- ▶ Operate the pull cylinder **2** with the radio remote control, see the „radio remote control operating instructions“.

- ▶ Insert the connector pin **10** again at point **P44**.
- ▶ Insert the retaining pin **52** at point **P45** and secure with the safety locking pin **53**, see illustration **7**.

Result:

- – The connector pin **10** is secured.

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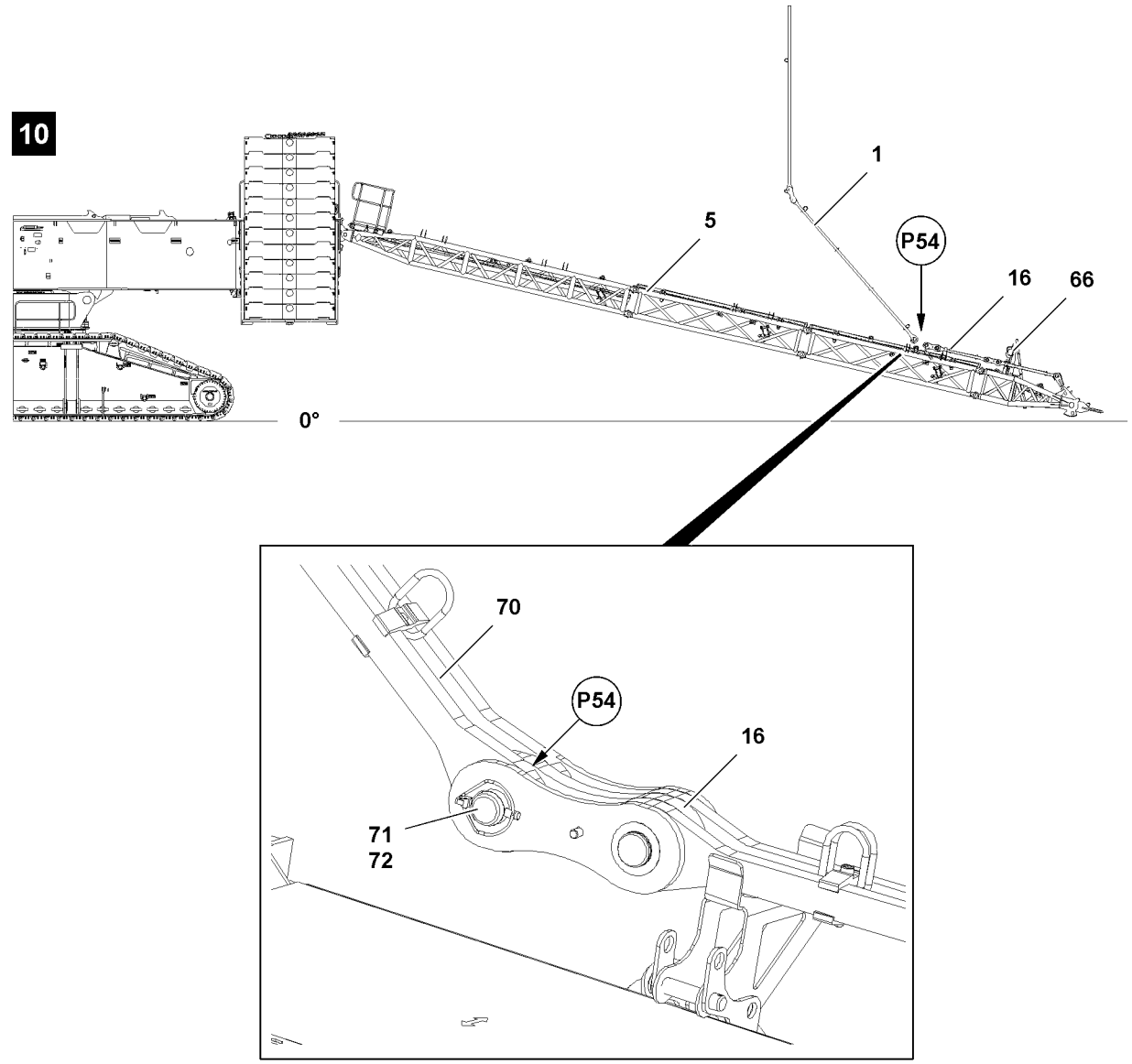

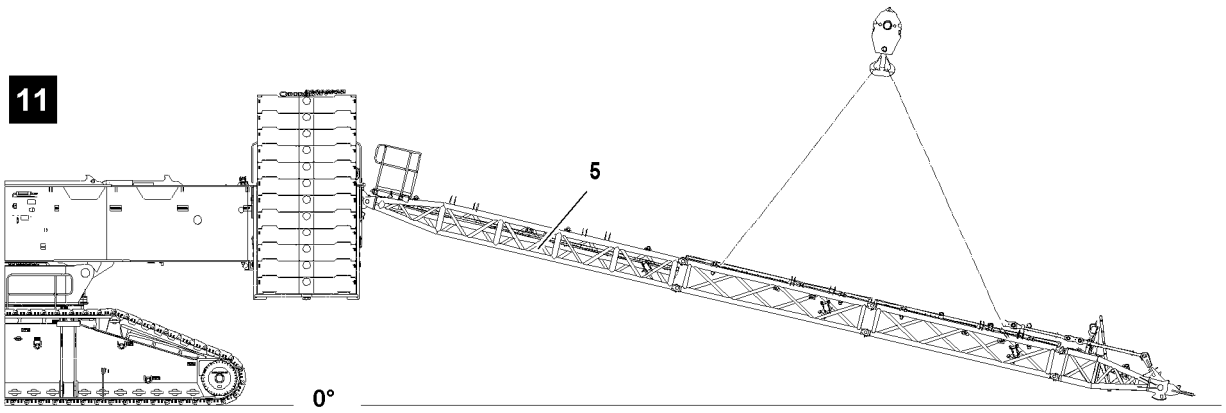

Fig.120215

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12.5 Disassembling the suspended ballast guide

Derrick ballast radius	Number of intermediate sections
20 m	0
25 m	1
30 m	2

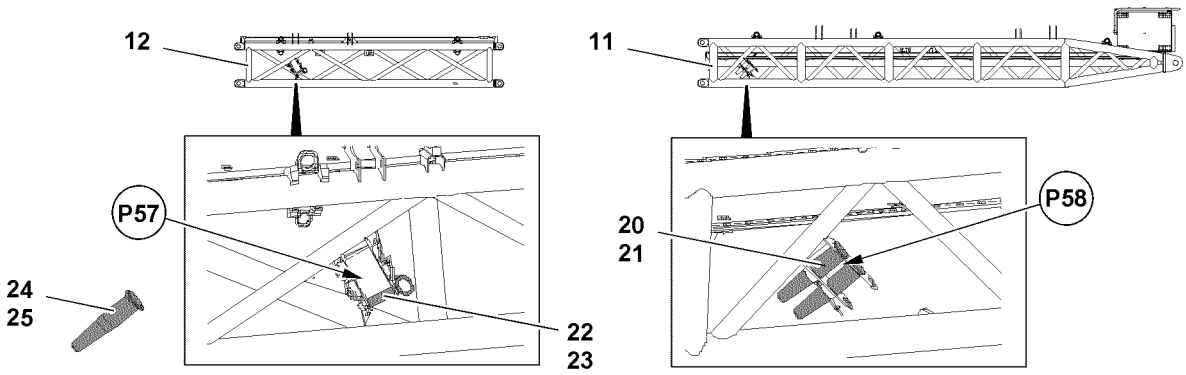

Fig.122802: Park position for pin

Note

- ▶ Park position **P57** for pin **24** and pin **22**.
- ▶ Park position **P58** for pin **20**.

WARNING

Falling pins!

Death, severe bodily injuries, property damage.

- ▶ Make sure that all pins are properly secured in the park positions with the respective retaining elements.

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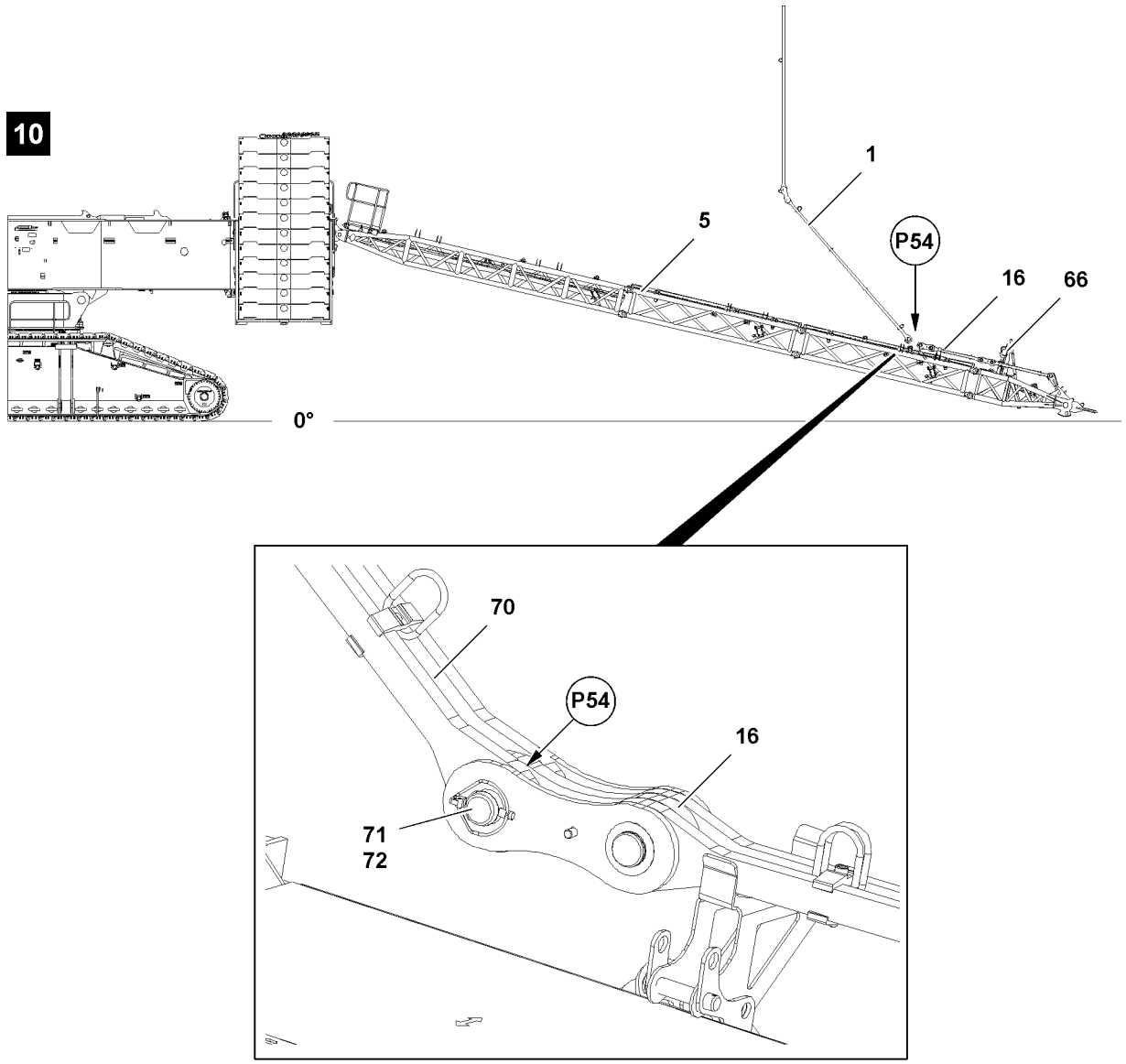

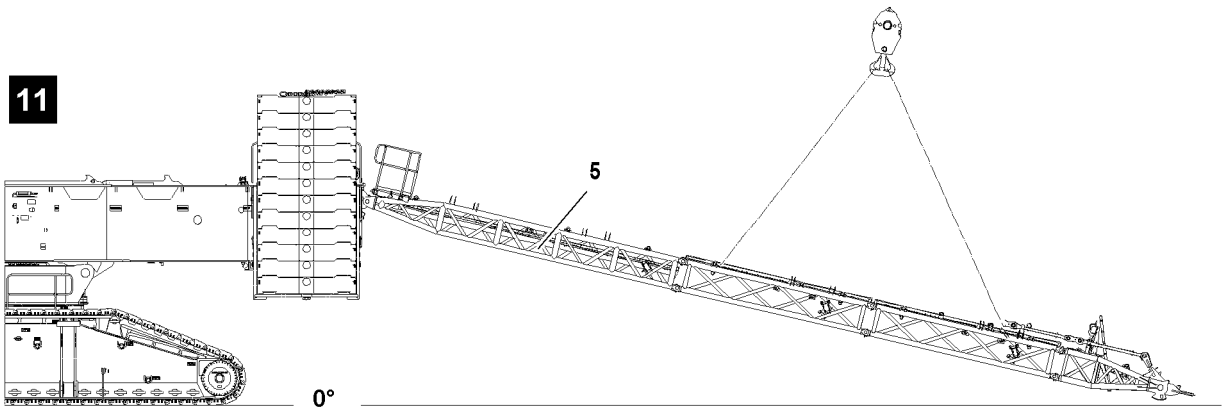

Fig.120215

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12.5.1 Unpinning the pull rods of the suspended ballast guide from the D-guy rods

Make sure that the following prerequisite is met:
– The suspended ballast guide is separated from the suspended ballast.

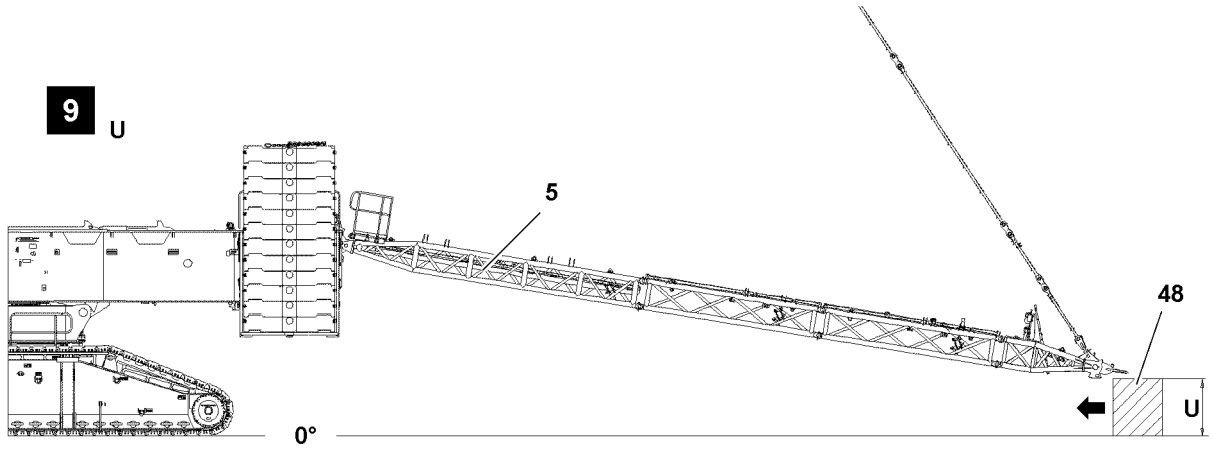

Fig.120214: Substructure

Suspended ballast guide	R30	R25	R20
Substructure height „U“	0 m	1.6 m	2.0 m

When the suspended ballast guide **5** is separated from the suspended ballast:
▶ Drive the crane away from the suspended ballast.
▶ Take the suspended ballast guide **5** down with the derrick onto the substructure **48**, see illustration **9** and chart.
▶ Connect the rope of the manual rope winch **66** with the D-guy rods **1**.

The D-guy rods **1** are pinned on both sides on the suspended ballast guide **5**. The unpinning procedure is described on the example for one D-guy rod.

WARNING
Swinging D-guy rods!
When unpinning the D-guy rods **1** at point **P54** they swing uncontrolled in the direction of the turntable.
Death, severe bodily injuries, property damage.
▶ Make sure that the D-guy rods are secured with the manual rope winches before unpinning.

▶ Remove the safety locking pin **72** at point **P54** and unpin the pin **71**, see illustration **10**.
▶ Swing the D-guy rods **1** with the aid of the manual rope winch **66** and simultaneously luff up the derrick in direction of the turntable.

When the D-guy rods **1** hang vertically:
▶ Remove the rope of the manual rope winch **66** and spool it up.
▶ Fasten the suspended ballast guide **5** to the auxiliary crane, see illustration **11**.

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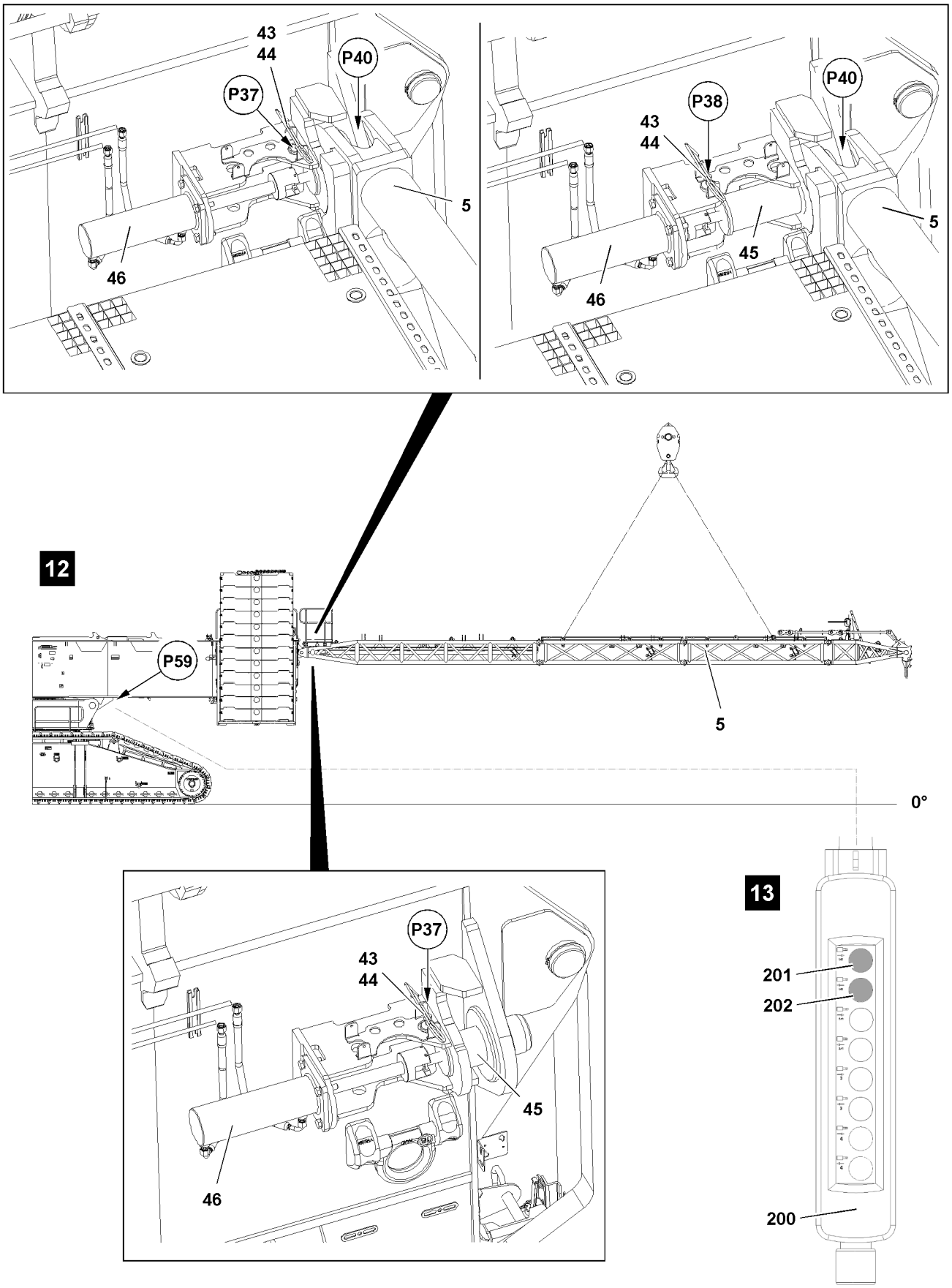

Fig.120216

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12.5.2 Disassembling the suspended ballast guide on the turntable frame

Make sure that the following prerequisites are met:
- The suspended ballast guide is fastened to the auxiliary crane.
- The control panel is connected on the „turntable rear“ socket , point **P59**.

▶ Swing the suspended ballast guide **5** to the horizontal.

The suspended ballast guide **5** is pinned on two points **P40**. The unpinning procedure is described for one pin as an example:

▶ Release the pin **45**: Remove the spring retainer **44** at point **P37** and unpin the retaining pin **43**, see illustration **12**.

▶ Insert the retaining pin **43** at point **P38** and secure with spring retainer **44**.

When the suspended ballast guide **5** is safely held by the auxiliary crane:

▶ Unpin the pin **45**: Press button **202** on the control panel **200**, see illustration **13**.

Result:

– The pin **45** moves out.

When both pins **45** are unpinned:

▶ Remove the suspended ballast guide **5** from the pin points on the rear of the turntable and place it on the substructure.

▶ Insert the pins **45** again: Press button **201** on the control panel **200**, see illustration **13**.

Result:

– The pin **45** moves in.

▶ Secure the pin **45**: Insert the retaining pin **43** at point **P37** and secure with spring retainer **44** see illustration **12**.

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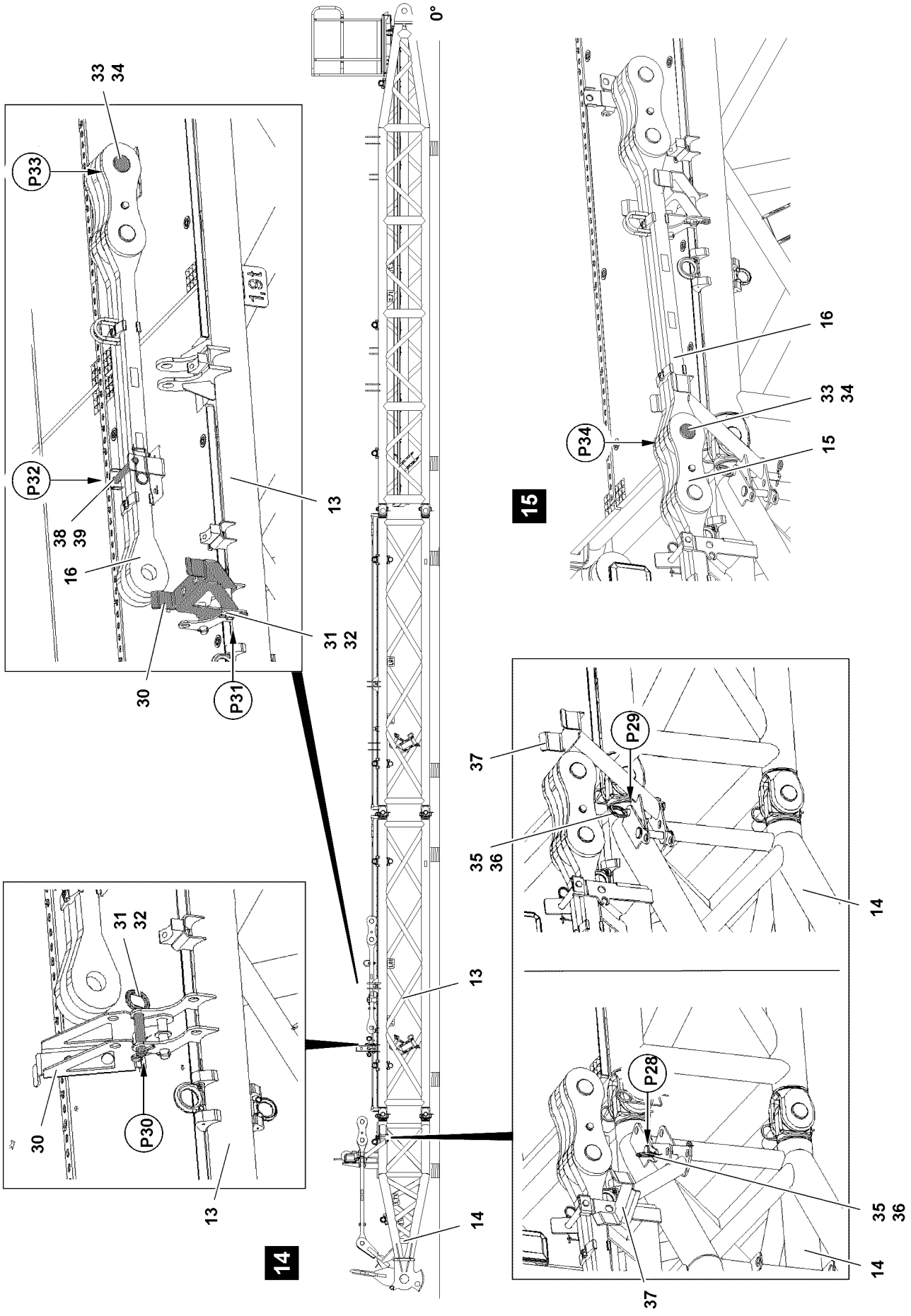

Fig.122951

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12.5.3 Disassembling the suspended ballast guide with 30 m suspended ballast radius

Note

▶ The disassembly of the suspended ballast guide is described based on the example of one suspended ballast guide with a 30 m suspended ballast radius.

Swinging the brackets

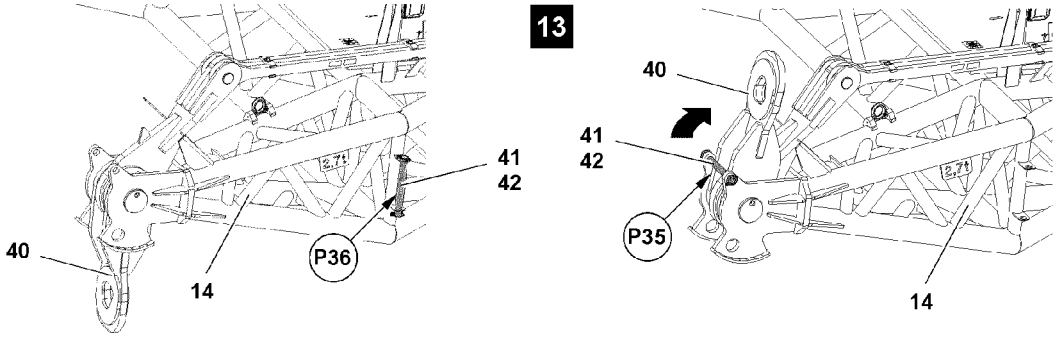

Fig.119029: Swinging the bracket

▶ Fasten the bracket **40** to the auxiliary crane.

WARNING

Bracket swinging down!

The bracket can swing down by itself due to its own weight when pinning it, see illustration.

Death, severe bodily injuries, property damage.

Fingers and hands can be crushed.

▶ Make sure that the platform is held by the auxiliary crane.

▶ Do not reach with your hands into the danger zone.

▶ Remove the safety locking pin **42** at point **P36** and unpin the pin **41**, see illustration **16**.

▶ Swing the bracket **40** upward with the auxiliary crane.

▶ Insert the pin **41** in park position at point **P35** and secure with safety locking pin **42**, see illustration **16**.

Disassembling the pull rods

▶ Fasten the auxiliary crane to the pull rod **16**.

▶ Unpin the pull rod **16** from the pull rod end section **15**: Remove the safety locking pin **34** at point **P34** and unpin the pin **33**, see illustration **15**.

▶ Lift the pull rod **16** with the auxiliary crane and take it down in transport position at point **P32** and point **P33**.

▶ Insert the pin **33** at point **P33** and secure with safety locking pin **34**.

▶ Insert the pin **38** on point **P32** and secure with spring retainer **39**.

Result:

– The pull rod **16** is secured in the transport position, see illustration **14**.

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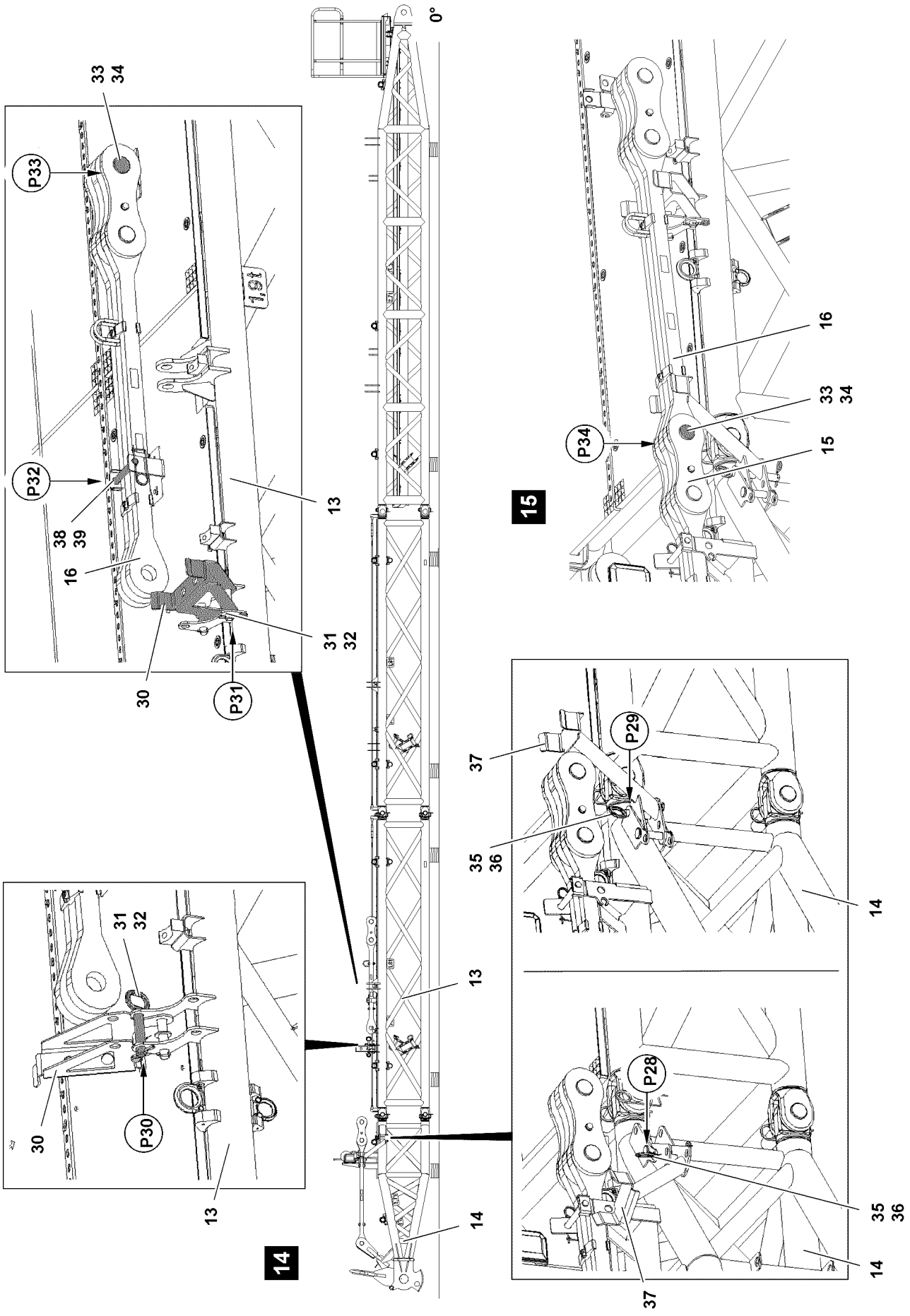

Fig.122951

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▶ Release the retainer **30** from operating position: Remove the spring retainer **32** at point **P31** and unpin the socket pin **31**, see illustration **14**.

WARNING
When swinging the retainer, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Swing the retainer **30** until it can be pinned at point **P30**.
▶ Insert the socket pin **31** at point **P30** and secure with spring retainer **32**.

Result:

– The retainer **30** is secured in the transport position, see illustration **14**.

▶ Release the bracket **37** from operating position: Remove the spring retainer **36** at point **P29** and unpin the socket pin **35**, see illustration **14**.

WARNING
When swinging the bracket, fingers and hands can be crushed!
▶ Do not reach with your hands into the danger zone.

▶ Swing the bracket **37** until it can be pinned at point **P28**.
▶ Insert the socket pin **35** at point **P28** and secure with spring retainer **36**.

Result:

– The bracket **37** is secured in the transport position, see illustration **14**.

▶ Secure the pull rod **15** in transport position.

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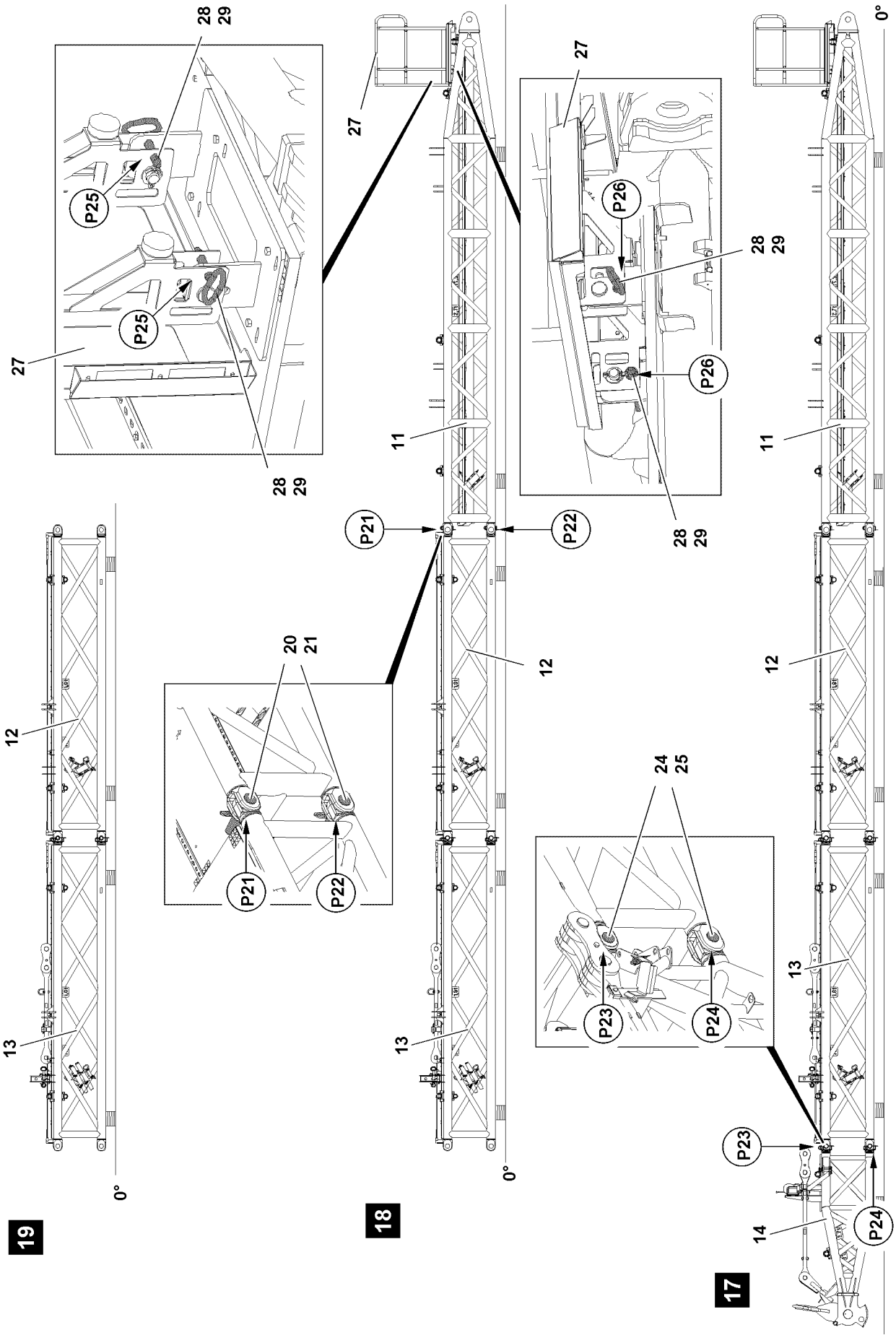

Fig.122952

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Disassembling the end section

▶ Fasten the end section **14** to the auxiliary crane.

The end section and the intermediate section are pinned together in four points. Every point is present on both sides of the component on one level, see illustration **17**.

▶ Unpin the end section **14** on both sides at point **P24**: Remove spring retainers **25** and unpin pins **24**.
▶ Unpin the end section **14** on both sides at point **P23**: Remove spring retainers **25** and unpin pins **24**.
▶ Remove the end section **14** with the auxiliary crane.
▶ Remove the fastening equipment.

Disassembling the pivot section

▶ Fasten the platform **27** to the auxiliary crane.
▶ Set the platform **27** in the transport position, see illustration **18**: Remove the safety locking pin **29** at points **P26** and unpin the grip pin **28**.

WARNING
Platform swinging down!
The platform can swing down by itself due to its own weight when pinning it, see illustration.
Death, severe bodily injuries, property damage.
Fingers and hands can be crushed.
▶ Make sure that the platform is held by the auxiliary crane.
▶ Do not reach with your hands into the danger zone.
▶ Use personal protective equipment.

▶ Swing the platform **27** with the auxiliary crane.
▶ Insert the grip pin **28** at points **P25** and secure with safety locking pin **29**.
▶ Remove the auxiliary crane.
▶ Fasten the pivot section **11** to the auxiliary crane.

The pivot section and the intermediate section are pinned together in four points. Every point is present on both sides of the component on one level, see illustration **18**.

▶ Unpin the pivot section **11** on both sides at point **P22**: Remove spring retainers **21** and unpin pins **20**.
▶ Unpin the pivot section **11** on both sides at point **P21**: Remove spring retainers **21** and unpin pins **20**.
▶ Remove the pivot section **11** with the auxiliary crane.
▶ Remove the fastening equipment.

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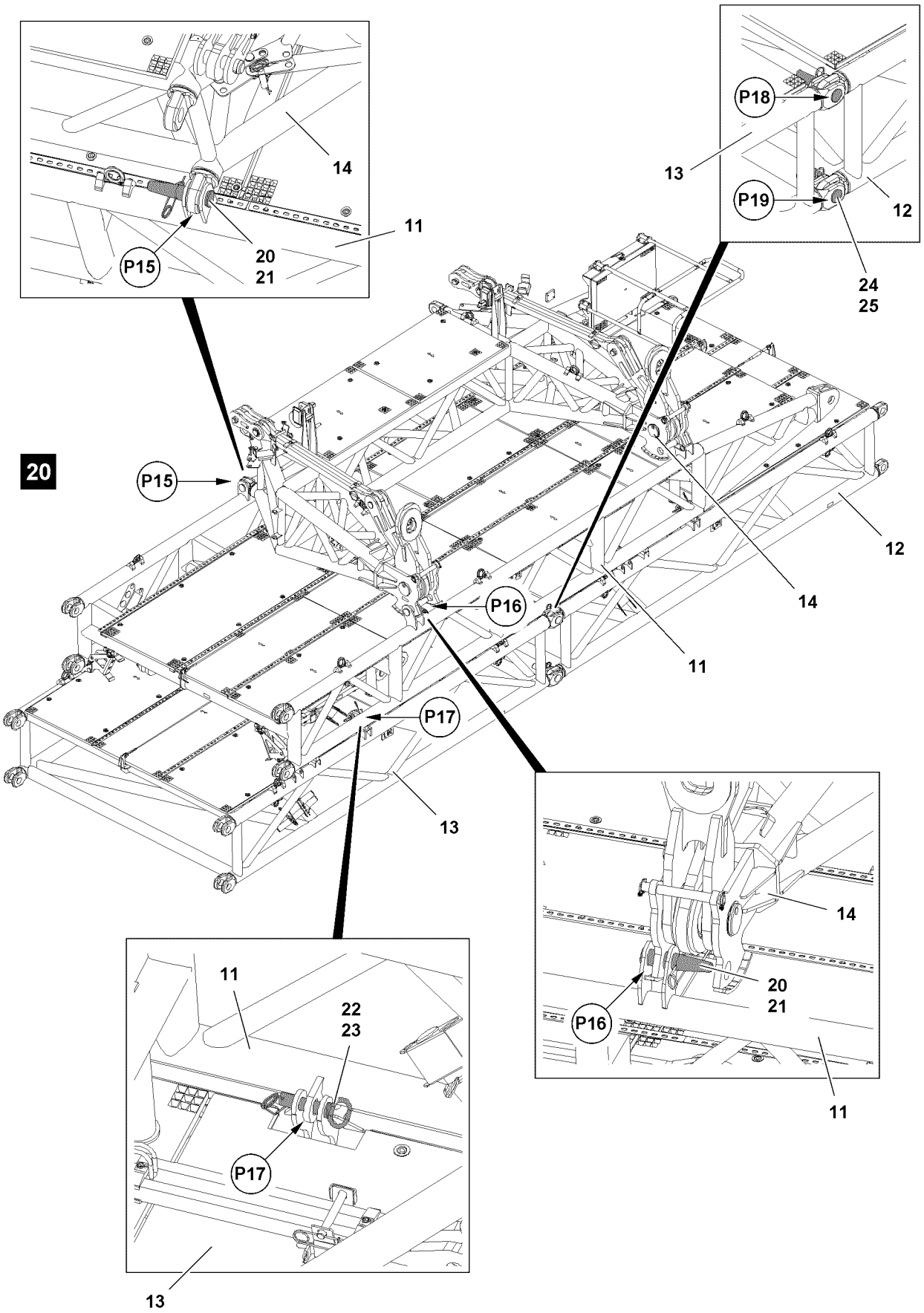

Fig.122953

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12.5.4 Installing the suspended ballast guide as a transport unit

Make sure that the following prerequisites are met:
- The pivot section has been removed.
- The end section has been removed.
- The platform has been placed down.
- The pull rods are placed down and secured.
- The retainer and the bracket are secured in transport position.

Assembling the intermediate sections

For the suspended ballast guide as a transport unit, only two intermediate sections are installed.

▶ Fasten the intermediate section **13** to the auxiliary crane.
▶ Position the intermediate section **13** with the auxiliary crane on the intermediate section **12** at point **P18** until the pin points align.

The intermediate section **13** and intermediate section **12** are pinned together on four points. Every point is present on both sides of the component on one level, see illustration **20**.

▶ Pin the intermediate section **13** on both sides at point **P18** with the intermediate section **12**: Insert the pins **24** and secure with the spring retainers **25**.
▶ Pin the intermediate section **13** on both sides at point **P19** with the intermediate section **12**: Insert the pins **24** and secure with the spring retainers **25**.
▶ Remove the fastening equipment.

Assembling the pivot section

The pivot section is pinned at four points. Every point is present on both sides of the component on one level.

▶ Fasten the auxiliary crane to the pivot section **11**.
▶ Position the pivot section **11** with the auxiliary crane on the intermediate section **12** and intermediate section **13** at point **P17** until the pin points align, see illustration.
▶ Pin the pivot section **11** at points **P17**: Insert the pins **22** and secure with spring retainers **23**, see illustration **20**.
▶ Remove the fastening equipment.

Assembling the end section

The end section is pinned at four points. Every point is present on both sides of the component on one level.

▶ Fasten the auxiliary crane to the end section **14**.
▶ Position the end section **14** with the auxiliary crane on the pivot section **11** at point **P15** and point **P16** until the pin points align, see illustration **20**.
▶ Pin the end section **14** at points **P15**: Insert the pins **20** and secure with spring retainers **21**, see illustration **20**.
▶ Pin the end section **14** at points **P16**: Insert the pins **20** and secure with spring retainers **21**, see illustration **20**.
▶ Remove the fastening equipment.

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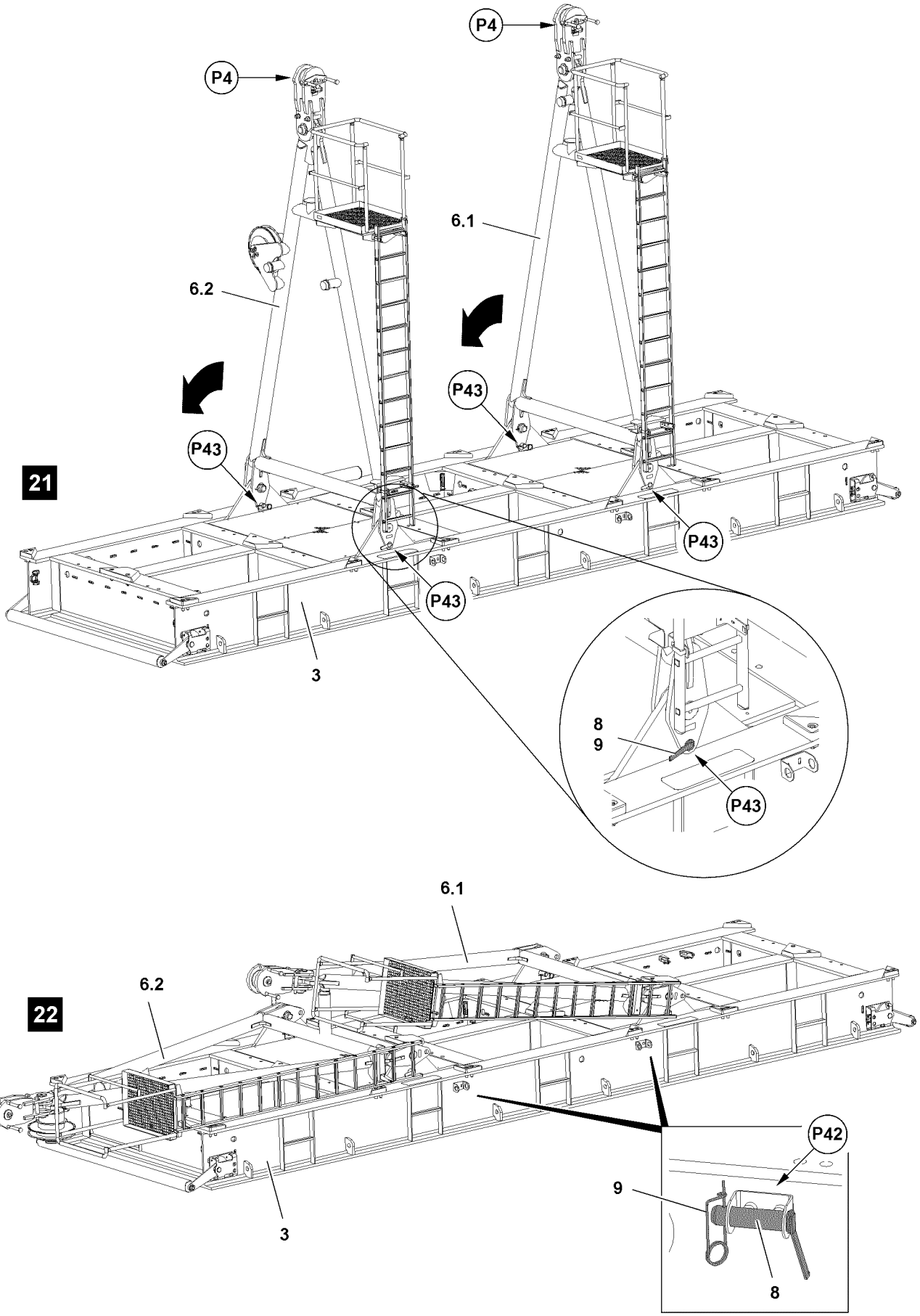

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Fig.120217

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13 Removing the ballast pallet

Note

▶ The disassembly of the erection racks is described based on the example of one erection rack.

The erection rack is unpinned on two points. The unpinning procedure is described for one pin as an example.

▶ Hang the erection rack **6.2** on the auxiliary crane at point **P4**, see illustration **21**.

DANGER

Danger of accident during assembly / disassembly of the erection racks!
The erection racks must hang securely on the auxiliary crane, otherwise they could fall down and kill or severely injure personnel.

▶ Make sure that the erection rack hangs safely on the auxiliary crane.
▶ Never unpin the retaining pins of unsecured or unsupported erection racks.
▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure.

When the erection rack is safely held by the auxiliary crane:

▶ Remove the spring retainer **9** on both sides at point **P43** and unpin the retaining pin **8**.
▶ Lower the erection rack **6.2** with the auxiliary crane until the rubber cushion touches the frame, see illustration **22**.
▶ Insert the retaining pin **8** at point **P42** on both sides and secure with spring retainer **9** in park position, see illustration **22**.
▶ Remove the auxiliary crane.
▶ Lower the second erection rack **6.1** with the auxiliary crane until the rubber cushion touches the erection rack **6.2**, see illustration **22**.

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5.36.20 Derrick ballast - suspended ballast - special design LTR

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Fig.195219

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1 Product description

This chapter describes the following derrick ballast variations:
- Suspended ballast *special design*: Ballasting LTR crane and / or ballast plates
  Ballasting consisting of an LTR crane and / or ballast plates on a ballast pallet

This crane type has additional derrick ballast variations, which will be described in other chapters of these operating instructions:
- Suspended ballast *special design*: Ballast Constant
  Ballasting consisting of directly suspended ballast plates (without a ballast pallet)
- Ballast trailer
  Ballasting consisting of ballast plates on a ballast trailer
- Suspended ballast
  Ballasting consisting of ballast plates on a ballast pallet

Note
Designation of the ballast types
- ▶ The suspended ballast and the ballast trailer are generally described as derrick ballast.
- ▶ The ballast installed on the turntable is generally referred to as the counterweight.
- ▶ The ballast installed on the crawler travel gear is generally referred to as the central ballast.

1.1 Function

The D-guying contains two pull cylinders (pull cylinder A and pull cylinder B). These pull cylinders are used to pull, lift or lower the derrick ballast.

All relevant data regarding the derrick ballast is displayed on the LICCON monitors.

Ballast pallet for ballasting with LTR:
- It is a special ballast pallet for taking on an LTR crane as a suspended ballast
- Differs from the standard ballast pallet. The standard ballast pallet can only be ballasted with ballast plates.

The following crane types can be utilized as suspended ballast:
- LTR 1100
- LTR 1220

Variations for ballasting:
- LTR 1220 and ballast plates
- LTR 1100 and ballast plates
- Solely ballast plates

Permissible ballast plates:
- Ballast plates 10 t
- Ballast plates 12.5 t

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1.2 Variations

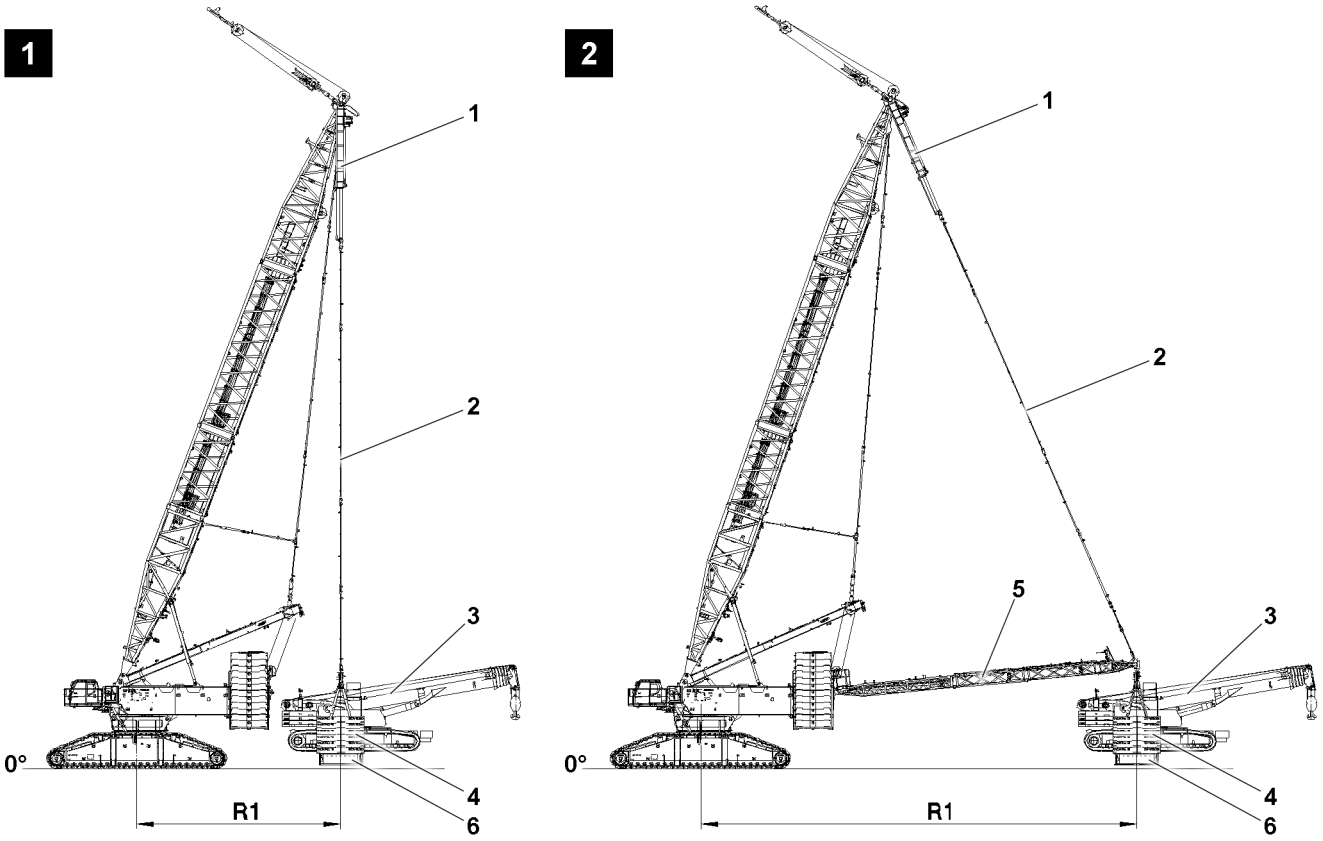

Fig.124995: Variations

The suspended ballast can be assembled with suspended ballast guide or without suspended ballast guide.

Derrick ballast variations:
- Derrick ballast **without** suspended ballast guide, see illustration **1**
  - The derrick ballast radius **R1** can be set by adjusting the derrick boom.
- Derrick ballast **with** suspended ballast guide **5**, illustration **2**
  - The derrick ballast radius **R1** requires the conversion of the suspended ballast guide **5**.

1.3 Maximum ballast

Set up configuration of LTR:
- Set up configuration (central ballast, counterweight) of the LTR can be variably adjusted.
- The following charts refer to the maximum set up configuration of the LTR on the ballast pallet.

1.3.1 Suspended ballast with LTR 1220

Position	Weight
Ballast pallet with cross beam	22 t
LTR 1220 with 70 t counterweight and 20 t central ballast	190 t
Ballast of ballast plates 10 t , maximum	240 t
Suspended ballast, total maximum	452 t

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1.3.2 Suspended ballast with LTR 1100

Position	Weight
Ballast pallet with cross beam	22 t
LTR 1100 with 32 t counterweight and 15 t central ballast	108 t
Ballast of ballast plates 10 t , maximum	320 t
Suspended ballast, total maximum	450 t

2 Usage

2.1 Intended use

Use suspended ballast with LTR solely for:
- Erecting the boom system
- Taking down the boom system

2.2 Non-designated use

Do **not** use suspended ballast with LTR for:
- Erection / take-down of a luffing lattice jib (W-system)
- Crane operation with erected boom system
- Crane operation with a luffing lattice jib (W-system)
- Driving with a crawler

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3 Component overview

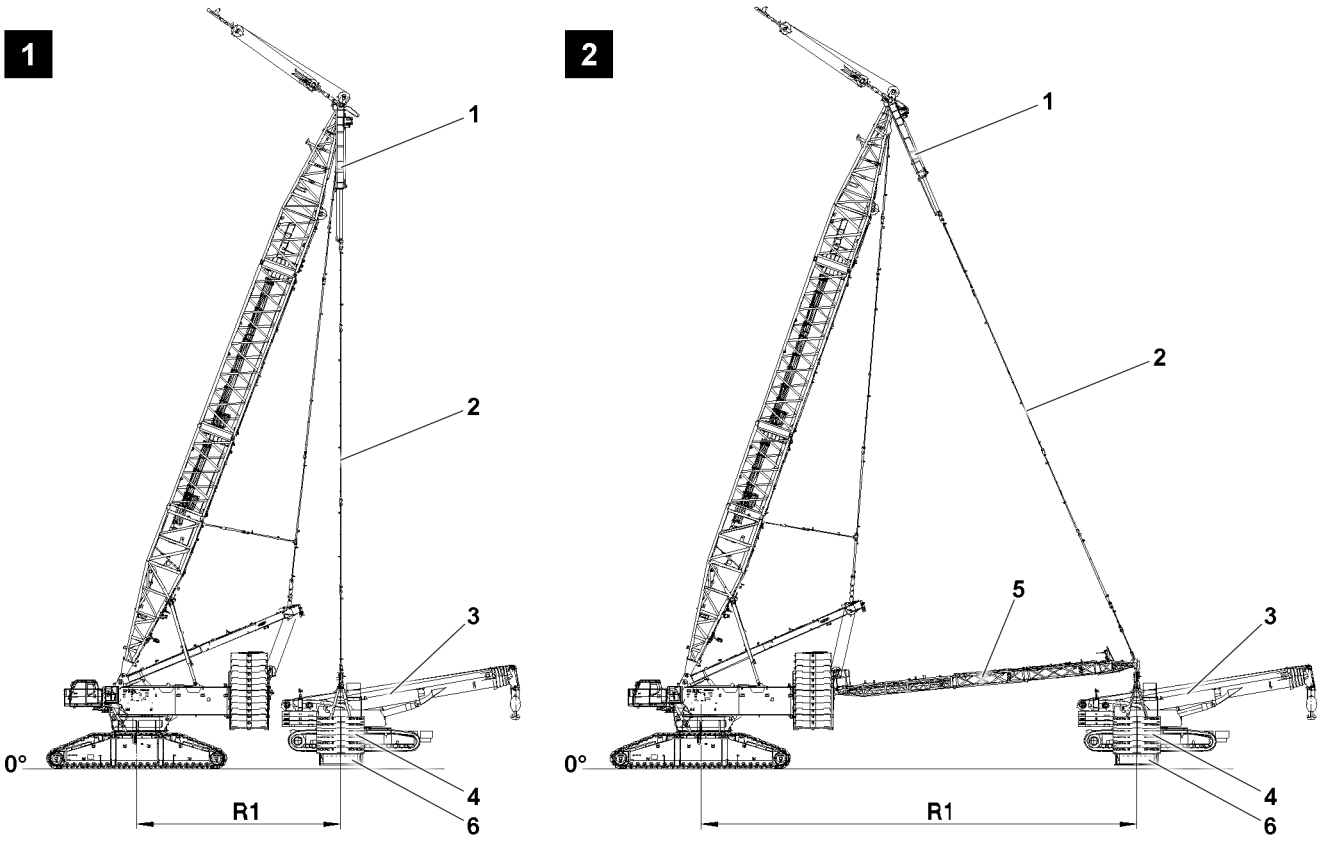

Fig.124995: Component overview Derrick ballast variations

1 Pull cylinder
2 D-guying
3 LTR
4 Ballast plates
5 Suspended ballast guide B2
6 Ballast pallet

3.1 Ballast pallet and ballast plates

Note
- ▶ The assembly sections are marked with their own weight.
- ▶ Dimensions and weights, see the Crane operating instructions, chapter 1.03.

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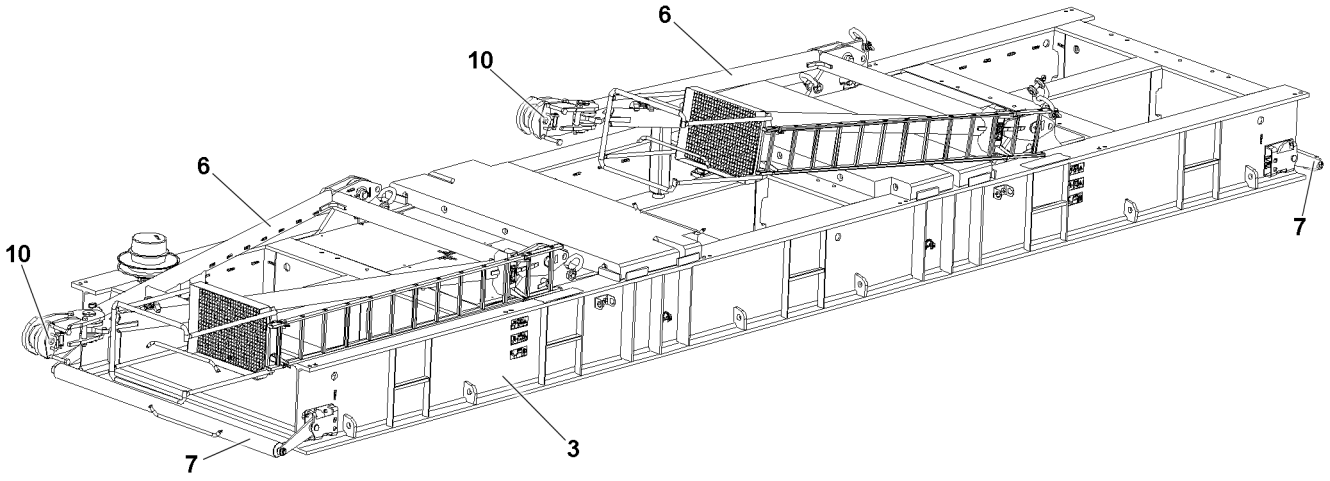

Fig.124997: Ballast pallet, transport position

3 Ballast pallet
6 Erection rack
7 Ground contact roller
10 Connector pin

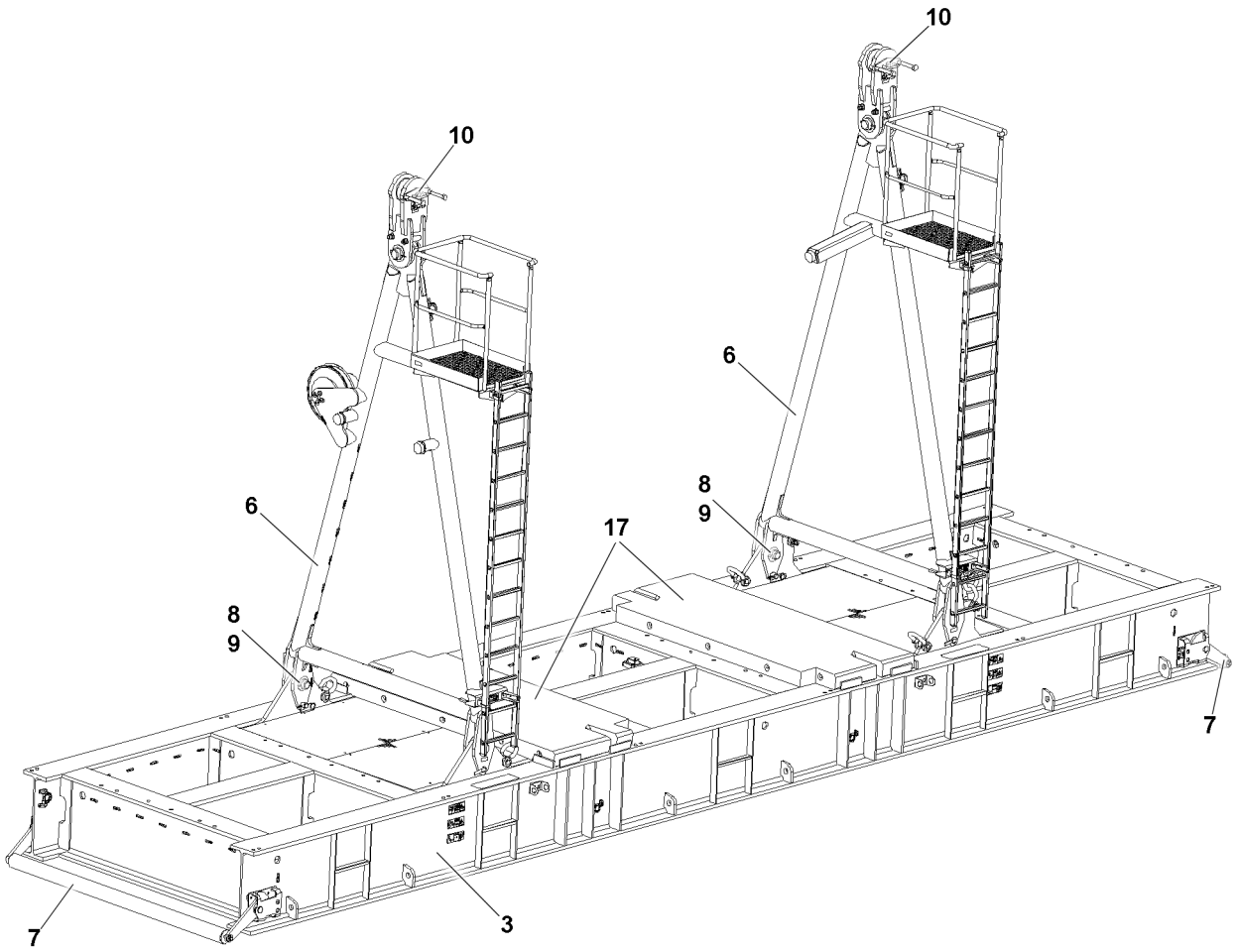

Fig.124996: Ballast pallet, operating position

3 Ballast pallet
6 Erection rack
7 Ground contact roller
8 Retaining pin
9 Safety spring
10 Connector pin
17 Mat, removable

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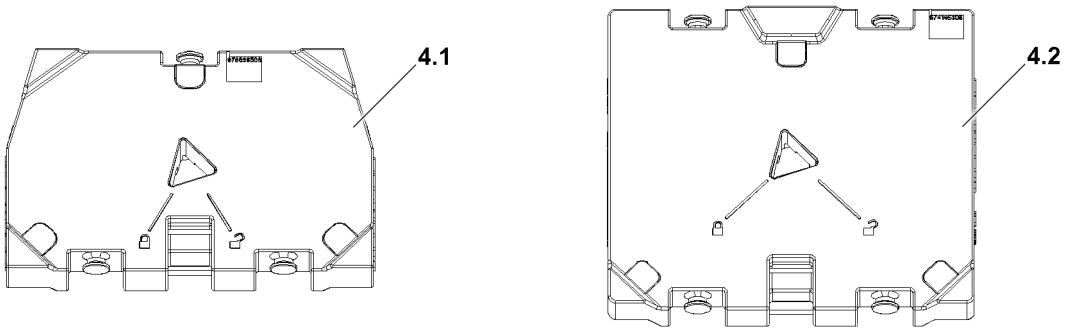

Fig.126480

4.1 10 t ballast plate

4.2 Ballast plate 12.5 t

3.2 Suspended ballast guide*

Note

- The assembly sections are marked with their own weight.
- Dimensions and weights, see the Crane operating instructions, chapter 1.03.

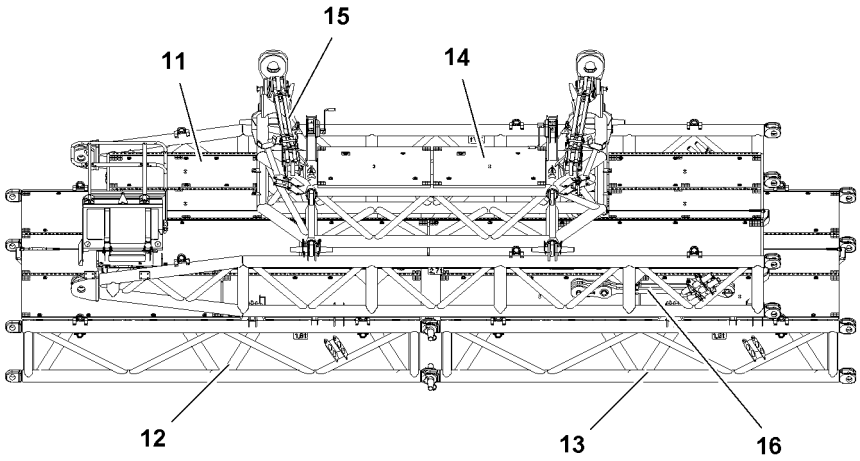

Fig.126059: Transport position

11 Pivot section
12 Intermediate section
13 Intermediate section
14 End section
15 Pull rods - end section
16 Pull rods

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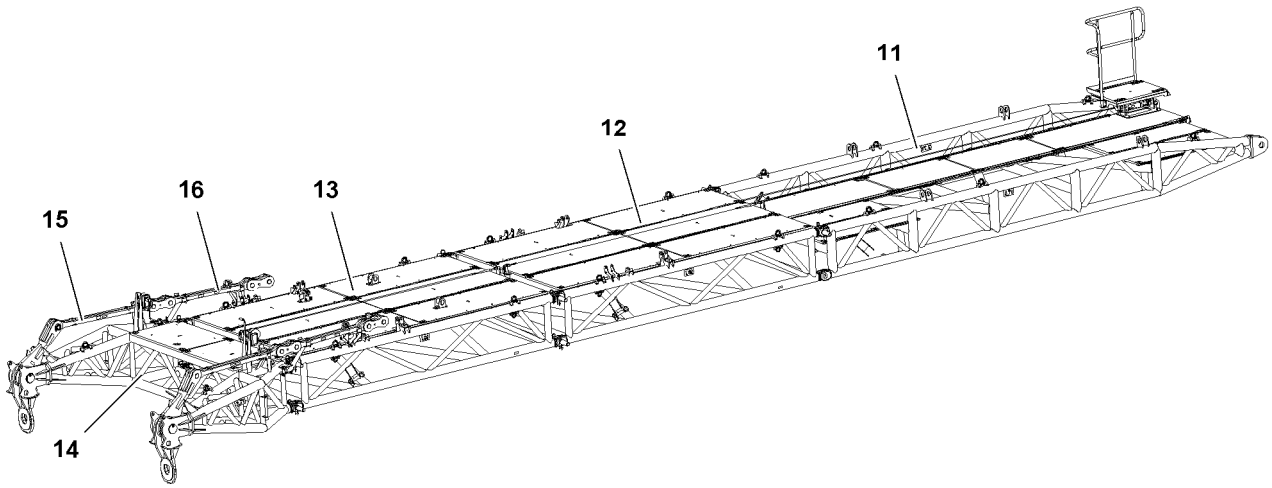

Fig.124999: Operating position

11 Pivot section
12 Intermediate section
13 Intermediate section
14 End section
15 Pull rods - end section
16 Pull rods

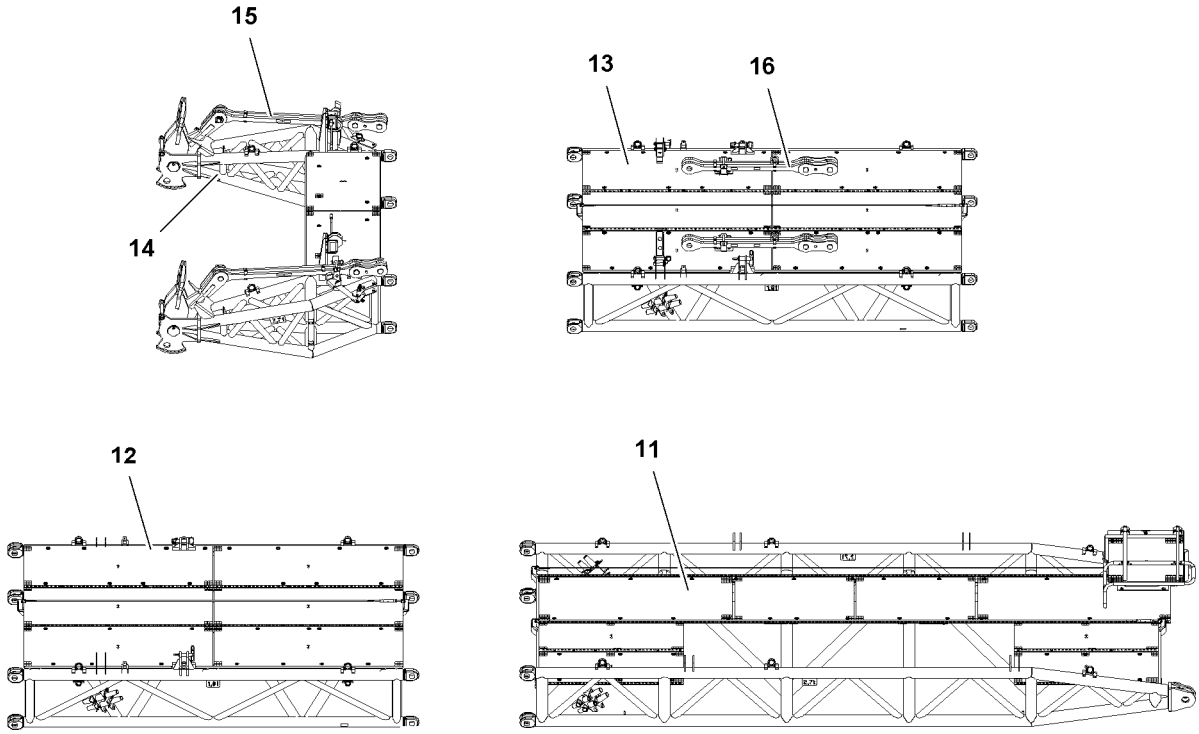

Fig.124998: Component overview

11 Pivot section
12 Intermediate section
13 Intermediate section
14 End section
15 Pull rods - end section
16 Pull rods

3.3 Auxiliary parts

Note

- The assembly sections are marked with their own weight.
- Dimensions and weights, see the Crane operating instructions, chapter 1.03.

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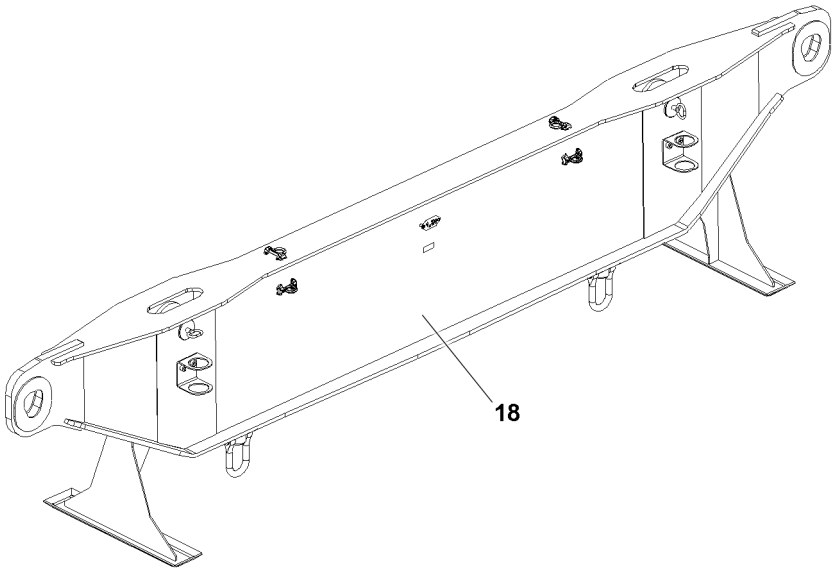

Fig.124993

18 Cross beam

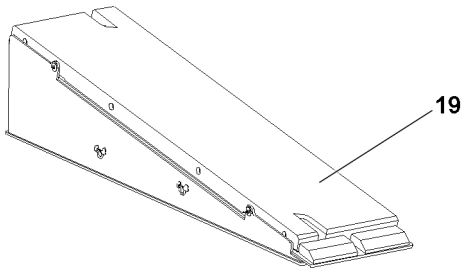

Fig.124994

19 Ramp

4 Fastening points for suspended ballast components

4.1 Ballast pallet and ballast plates

WARNING
Component incorrectly fastened!
Life-threatening situations can arise due to improper or incorrect attachment of the corresponding components.
Death, severe injury, property damage.
- ▶ Fasten the components only on the intended fastening points on both sides.
- ▶ Fastening of components and description of fastening points, see Crane operating instructions, chapter 5.01.

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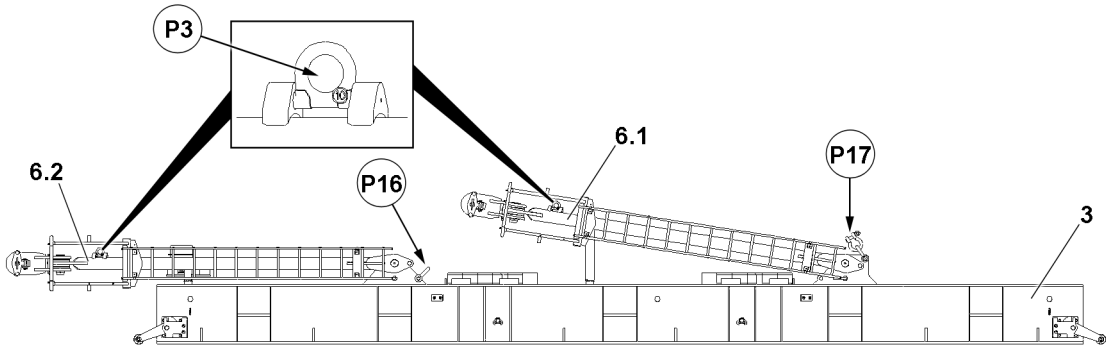

Fig.126065

3 Ballast pallet, transport position

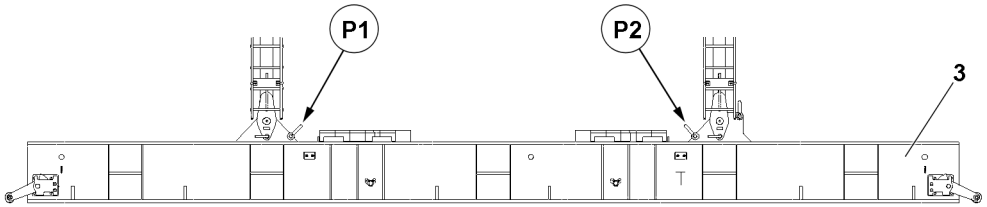

Fig.126066

3 Ballast pallet, operating position

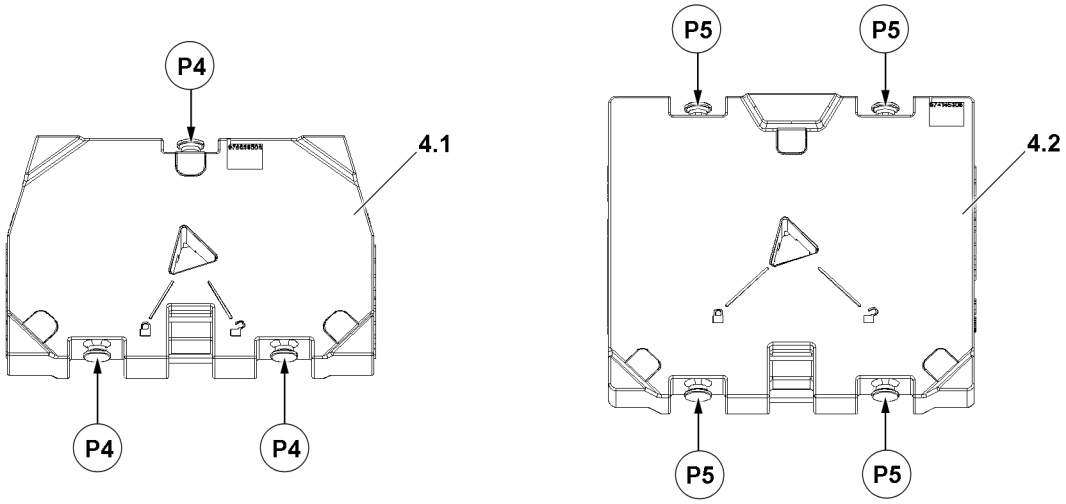

Fig.126067

4.1 10 t ballast plate

4.2 Ballast plate 12.5 t

Fastening points	
P16 and **P17**	Ballast pallet **3**, transport position
P1 and **P2**	Ballast pallet **3**, operating position
P3	Erection rack **6.1** and erection rack **6.2**
P4	Ballast plate **4.1**
P5	Ballast plate **4.2**

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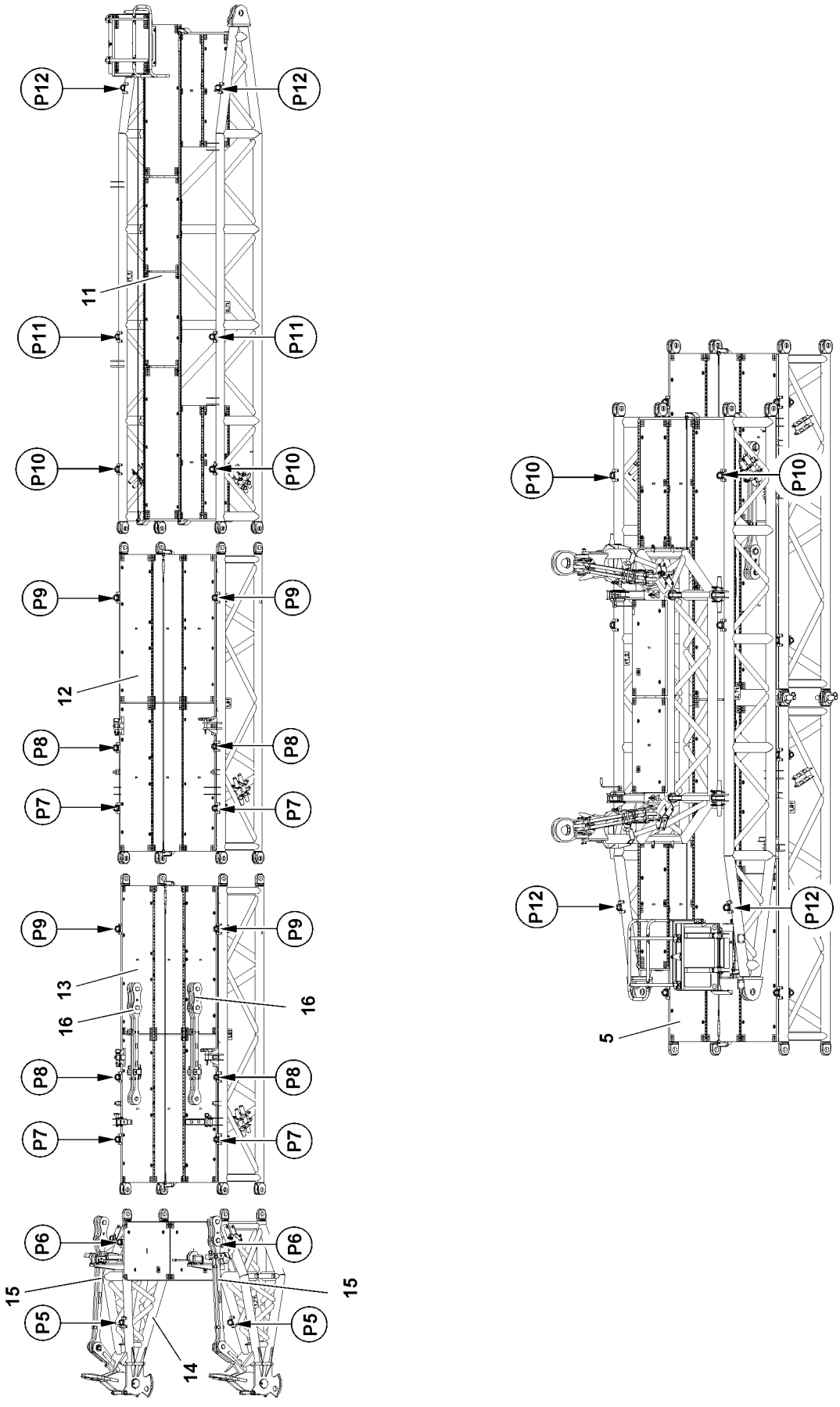

Fig.119023

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4.2 Suspended ballast guide*

4.2.1 Fastening points for lattice sections

WARNING
Component incorrectly fastened!
Life-threatening situations can arise due to improper or incorrect attachment of the corresponding components.
Death, severe injury, property damage.
- ▶ Fasten the components only on the intended fastening points on both sides.
- ▶ Fastening of components and description of fastening points, see Crane operating instructions, chapter 5.01.

Fastening points	
P5 and **P6**	End section **14**
P7 and **P9**	Intermediate section **13**
P7 and **P9**	Intermediate section **12**
P10 and **P12**	Pivot section **11**
P10 and **P12**	Suspended ballast guide (transport) **5**

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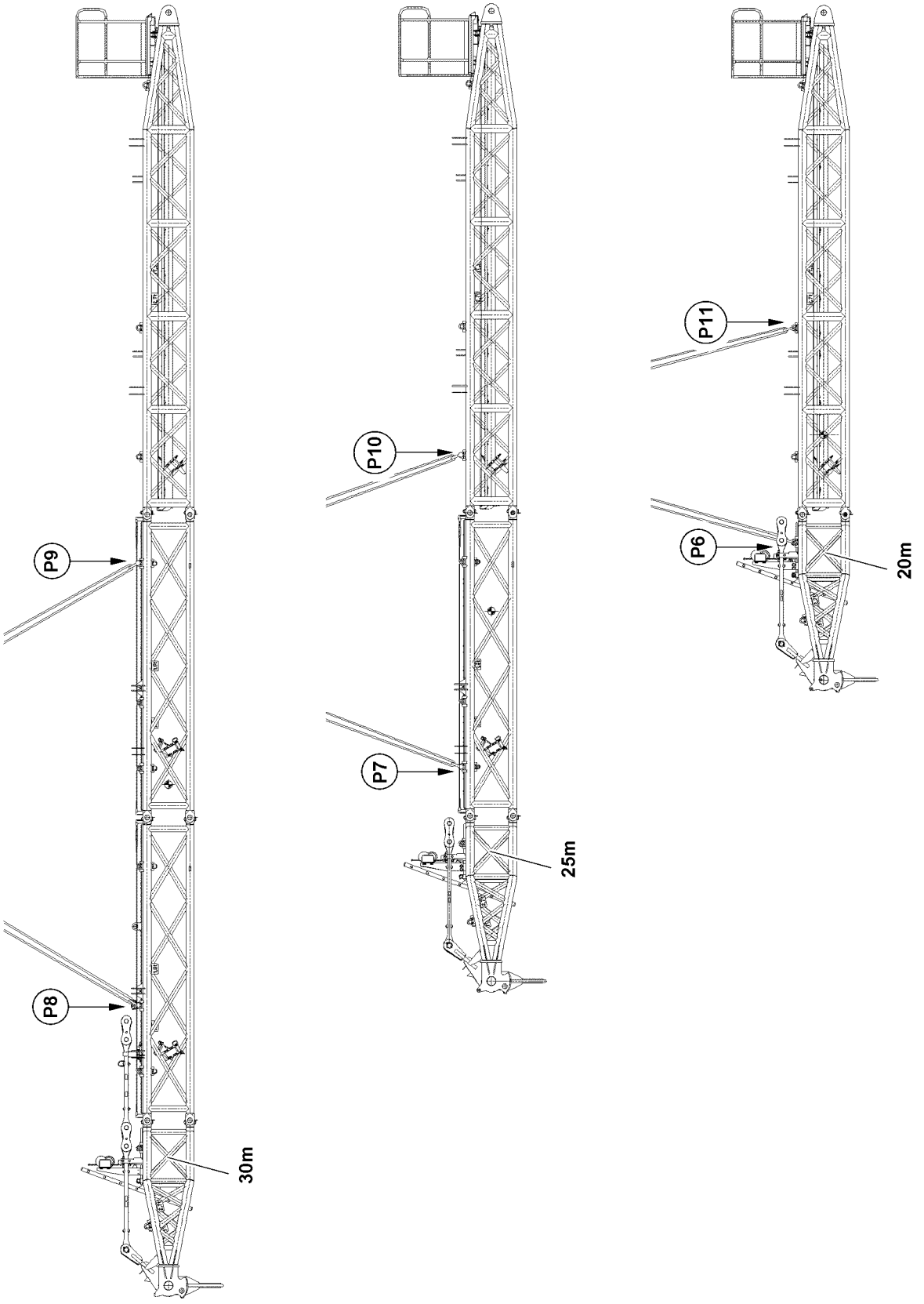

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Fig.119084

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4.2.2 Fastening points suspended ballast guide

WARNING
Component incorrectly fastened!
Life-threatening situations can arise due to improper or incorrect attachment of the corresponding components.
Death, severe injury, property damage.
- ▶ Fasten the components only on the intended fastening points on both sides.
- ▶ Fastening of components and description of fastening points, see Crane operating instructions, chapter 5.01.

Fastening points	
P8 and **P9**	Suspended ballast guide 30 m
P7 and **P10**	Suspended ballast guide 25 m
P6 and **P11**	Suspended ballast guide 20 m

4.3 Auxiliary parts

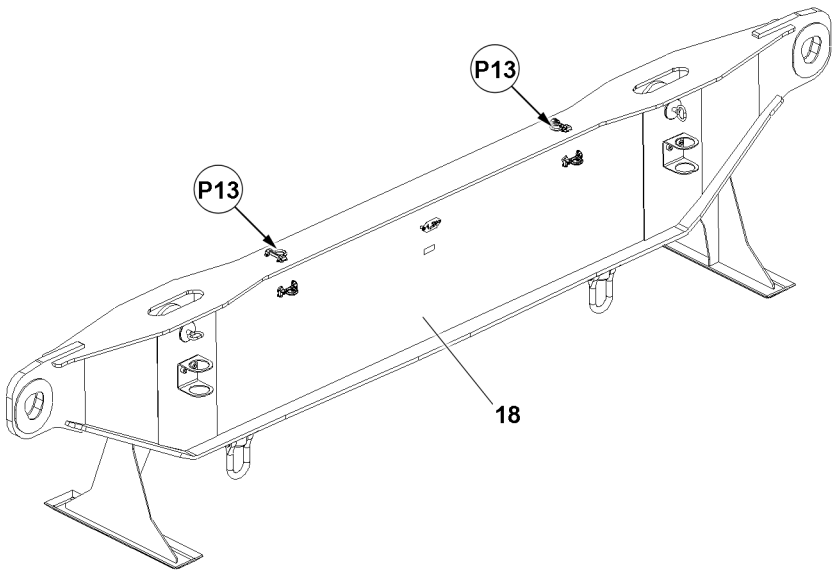

Fig.126060

18 Cross beam

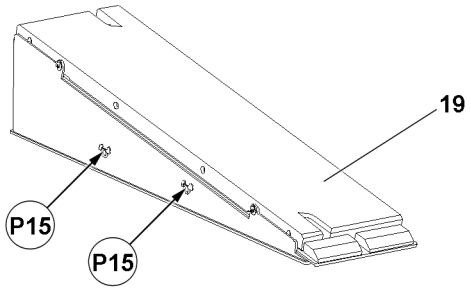

Fig.126061

19 Ramp

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Fastening points	
P13	Cross beam
P15	Ramp

5 Pull cylinder extension conditions

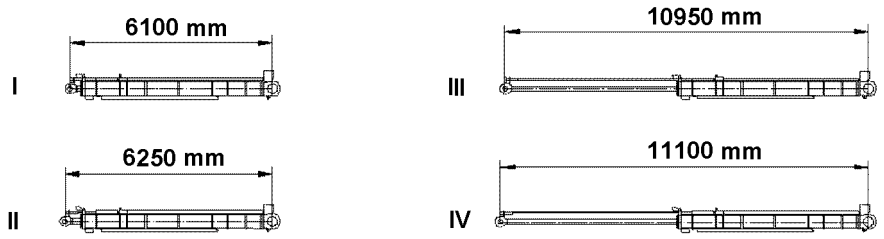

Fig.119003: Pull cylinder extension conditions

Extension conditions	
I	Block position „Retracted“
II	Switch position „Retracted“
III	Switch position „Extended“
IV	Block position „Extended“

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6 Derrick ballast radii

6.1 Derrick ballast without suspended ballast guide

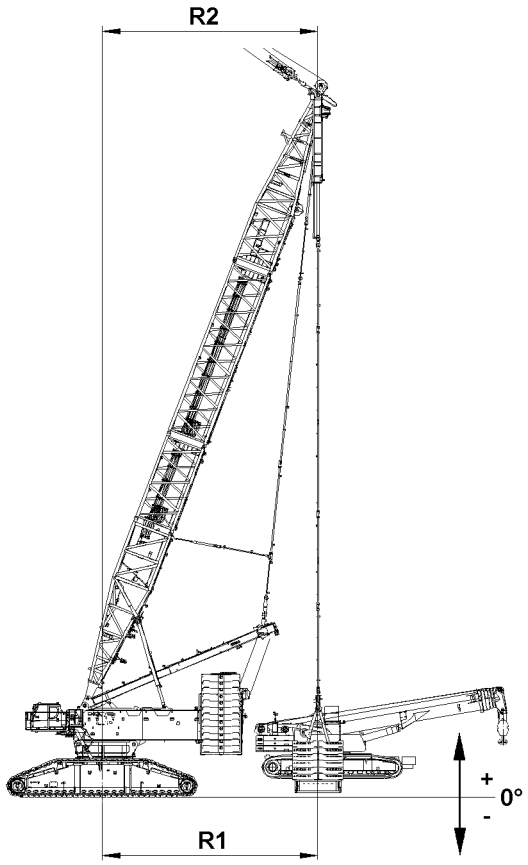

Fig.126477: Derrick ballast radii without suspended ballast guide

Note
- ▶ **No** suspended ballast guide is installed between the turntable and the ballast pallet.
- ▶ The derrick ballast radius **R1** and the derrick radius **R2** are identical.

Note
- ▶ Depending on the LRT in use, the minimum ballast radius of 12 m can **not** be set.

6.1.1 36 m derrick boom

With the 36 m derrick, the following derrick ballast radii are possible: R1= 12 m and R1 =18 m.

Radius R1 = 12 m	
Above base	+3696 mm
Below base	-1004 mm

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Radius R1 = 18 m	
Above base	+719 mm
Below base	-3981 mm

6.1.2 Derrick boom 42 m

With the 42 m derrick, the following derrick ballast radii are possible: R1= 12 m and R1= 20 m.

Radius R1 = 12 m	
Above base	+4061 mm
Below base	-639 mm

Radius R1 = 20 m	
Above base	+509 mm
Below base	-4191 mm

6.2 Derrick ballast with suspended ballast guide

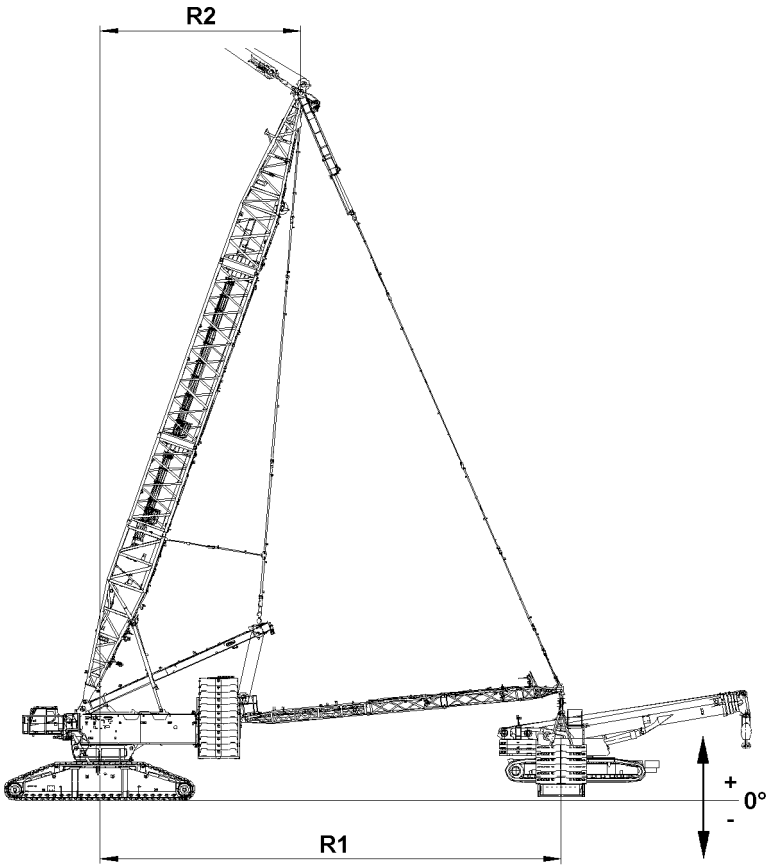

Fig.126478: Derrick ballast radii with suspended ballast guide

Note

- ▶ **One** suspended ballast guide is installed between the turntable and the ballast pallet.
- ▶ The derrick ballast radius **R1** and the derrick radius **R2** are **not** identical.

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6.2.1 36 m derrick boom

Derrick radius with the 36 m derrick is R2= 13 m.

With the 36 m derrick, the following derrick ballast radii are possible: R1= 20 m and R1=25 m.

Radius R1 = 20 m	
Above base	+800 mm
Below base	-1200 mm

Radius R1 = 25 m	
Above base	+800 mm
Below base	-1200 mm

6.2.2 Derrick boom 42 m

Derrick radius with the 42 m derrick is R2= 13 m.

With the 42 m derrick, the following derrick ballast radii are possible: R1= 20 m , R1= 25 m and R1= 30 m.

Radius R1 = 20 m	
Above base	+800 mm
Below base	-1200 mm

Radius R1 = 25 m	
Above base	+800 mm
Below base	-1200 mm

Radius R1 = 30 m	
Above base	+800 mm
Below base	-1200 mm

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7 Assembling without suspended ballast guide

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe injury, property damage.

- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

When the assembly personnel is within the danger zone of the crane:

- ▶ A guide and / or the crane operator must be able to see the entire danger zone.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Personnel can be caught and severely injured or killed.

- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel.

- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

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Make sure that the following prerequisites are met:
- The crane is horizontally aligned.
- The ground is level and of sufficient load bearing capacity.
- An auxiliary crane is available.
- Main boom and derrick are installed on the turntable.
- The derrick is in the crane operating position.
- Main boom is assembled, guying is tensioned.
- The counterweight has been installed on the turntable according to the load charts and the erection charts.
- The LICCON overload protection has been set according to the data in the load charts and erection charts.
- The LICCON overload protection settings have been compared with the actual set up configuration.

7.1 Assembling the cross beam

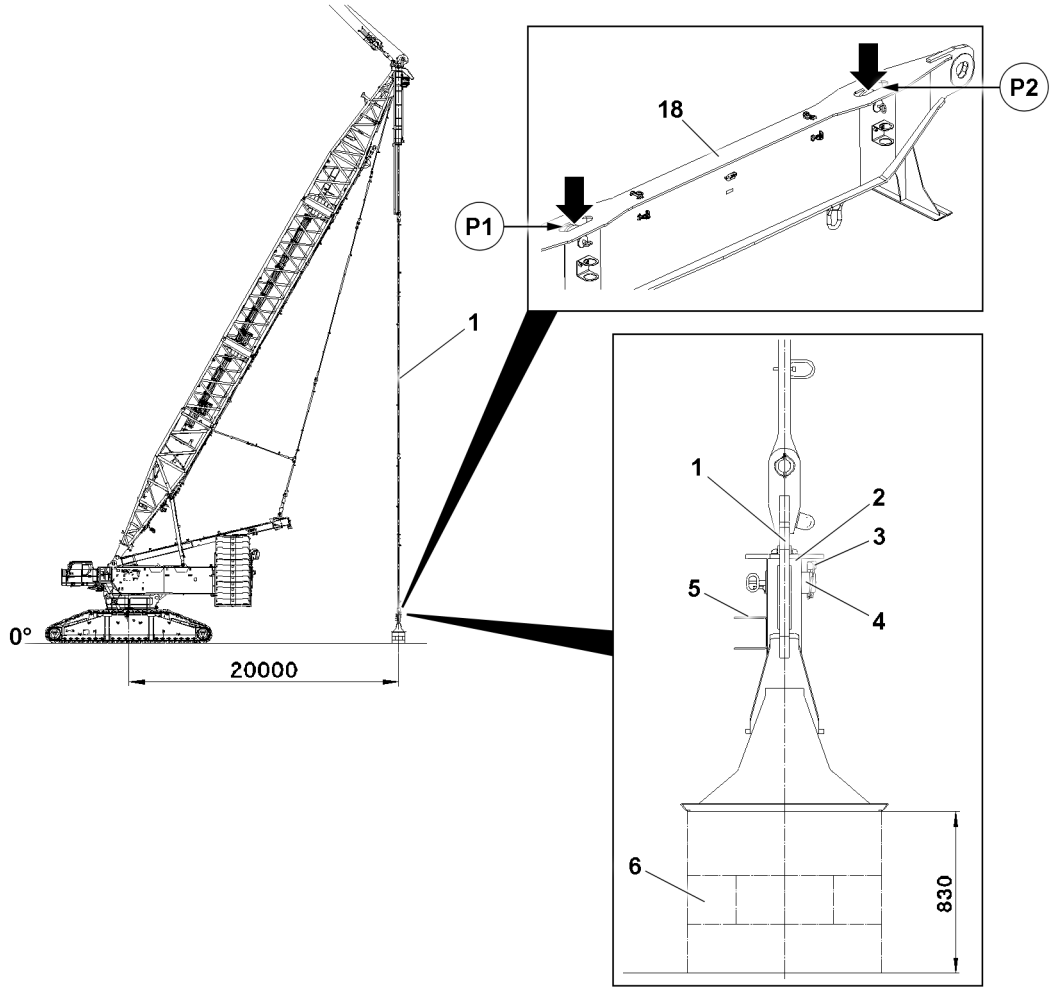

Fig.124981: Cross beam

▶ Set the derrick radius to 20 m.

The substructure **6** must be at least 830 mm above the crane placement surface.

▶ Position the substructure **6** under D-guy rods **1**.

Note

▶ Fastening points, see section „Fastening points for suspended ballast parts“.

▶ Fasten the cross beam **18** with fastening equipment to the auxiliary crane.
▶ Set the cross beam **18** on the substructure **6**.

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- ▶ Release and unpin the pin **4** in transport retainer **5**.
- ▶ Extend the pull cylinder until the D-guy rods **1** can be pinned on point **P1** and on point **P2** with the cross beam.

Note
Retract / extend the pull cylinder
- ▶ Control the pull cylinders from the crane cab, see the section „Lifting and lowering the derrick ballast using the pull cylinders“.
- ▶ Operate the pull cylinder with the radio remote control, see the „radio remote control operating instructions“.

- ▶ Pin the D-guy rods **1** with the cross beam: Insert the pins **4** and secure with locking pins **3**.
- ▶ Lift the cross beam: Retract the pull cylinder.

7.2 Setting the ballast pallet in the assembly position

- ▶ Set the derrick to the required radius.

Note
- ▶ Fastening points, see section „Fastening points for suspended ballast parts“.

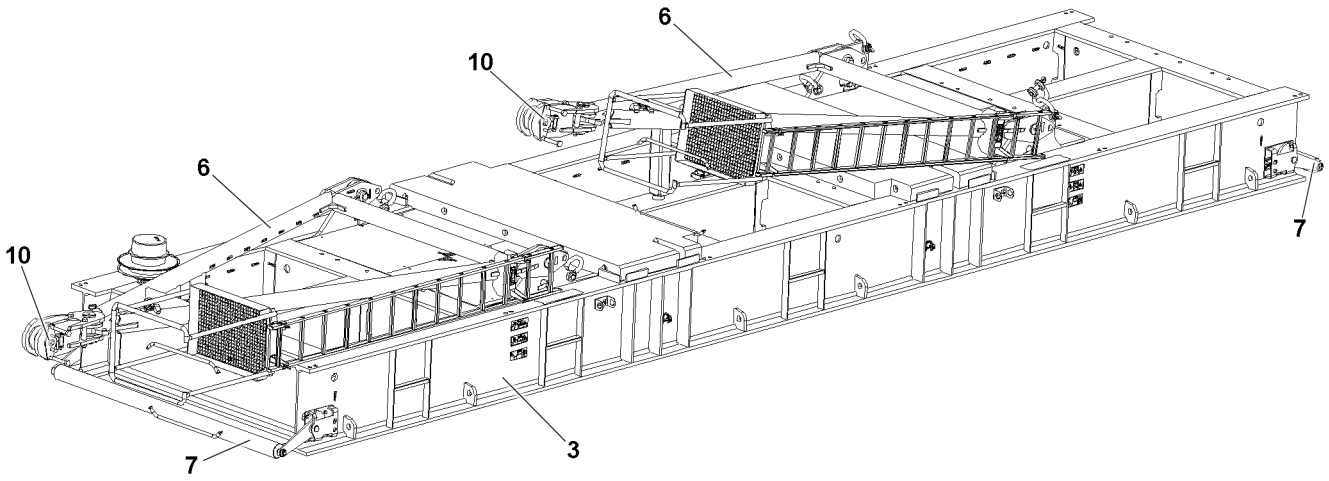

Fig.124997: Ballast pallet, transport position

- ▶ Fasten the ballast pallet **3** with fastening equipment to the auxiliary crane.
- ▶ Position the ballast pallet **3** in the slewing range of the crane under the guy rods on the derrick.

Note
- ▶ Set the ballast pallet **3** for easier assembly of the guy rods in lengthwise direction of the turntable.

- ▶ Align the ballast pallet **3** horizontally.

7.3 Erecting the erection racks

Note
- ▶ The assembly of the erection racks is described based on the example of one erection rack.

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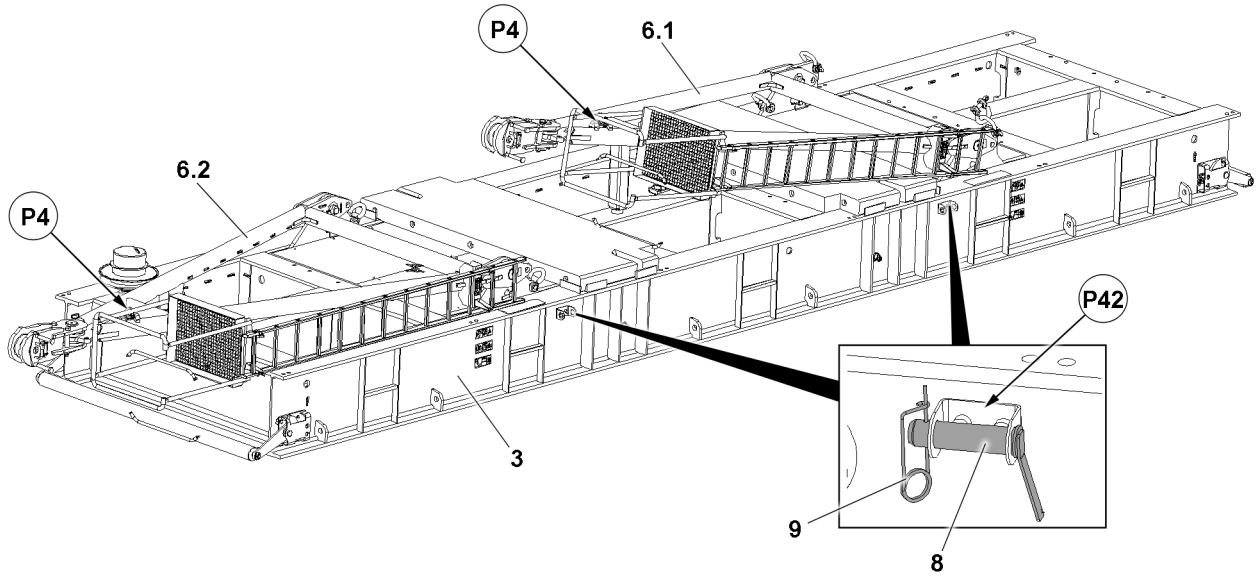

Fig.126063: Ballast pallet, transport position

The erection rack is pinned on two points. The pin procedure is described for one pin as an example.

- ▶ Fasten the erection rack **6.1** with fastening equipment to the auxiliary crane, point **P4**.
- ▶ Remove the spring retainer **9** on both sides on points **P42** and unpin the retaining pin **8** from the park position.

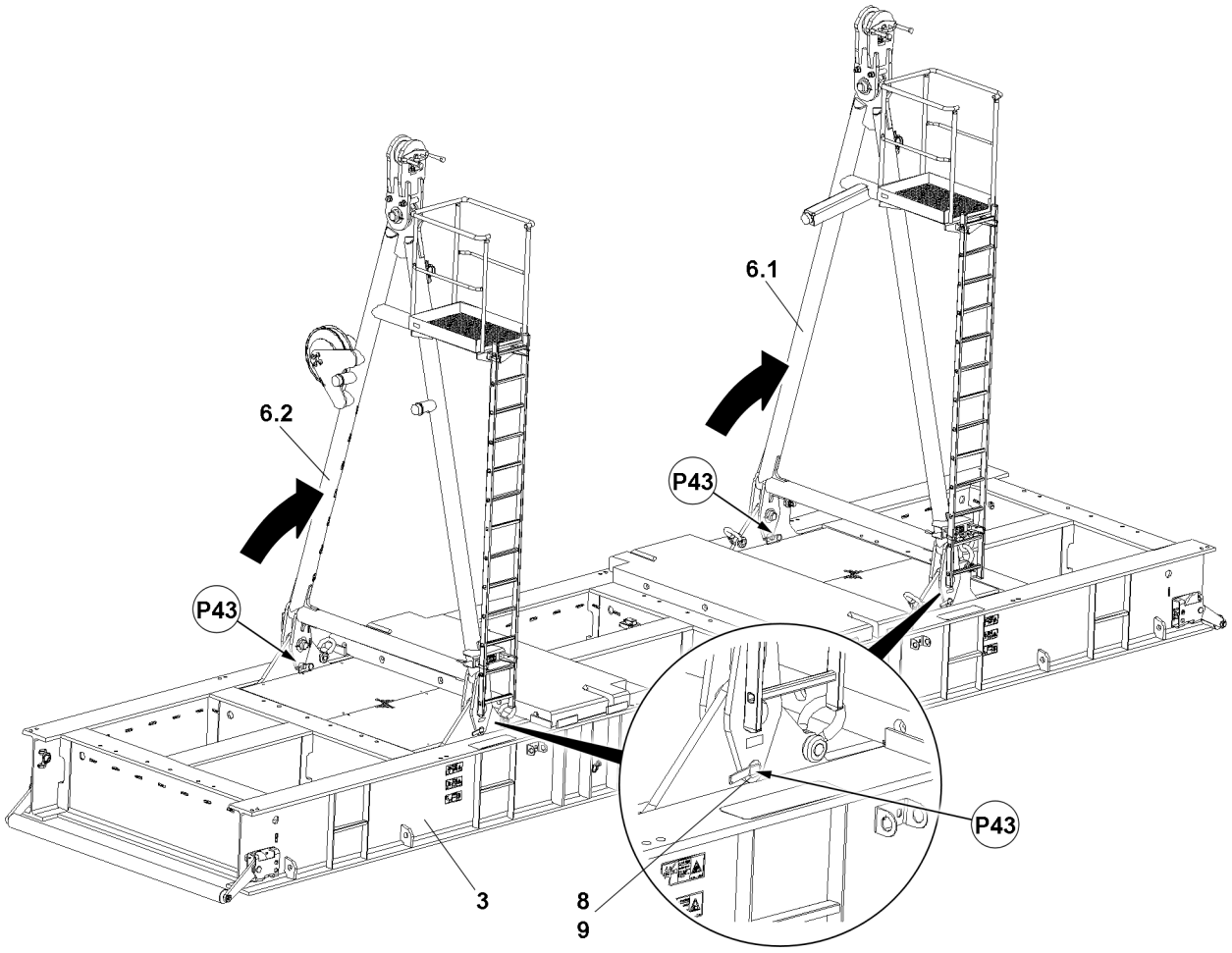

Fig.126064: Ballast pallet, operating position

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DANGER
Unsecured erection racks!
Toppling erection racks. Death, severe bodily injuries, property damage.
- ▶ Secure the erection racks after erection with the auxiliary crane.
- ▶ When both erection racks are locked and secured in a vertical position with retaining pins **8**: Remove the auxiliary crane.
- ▶ Never unpin the retaining pins from unsecured erection racks.
- ▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure.

- ▶ Set the erection rack **6.1** vertically with the auxiliary crane.
- ▶ Insert the retaining pin **8** at point **P43** on both sides and secure with spring retainer **9**.

When the erection rack is erected and secured:
- ▶ Remove the auxiliary crane.
- ▶ Erect the second erection rack **6.2** and secure with retaining pin **8**.

7.4 Pinning the ballast pallet with cross beam

Make sure that the following prerequisites are met:
- – Ballast pallet is in assembly position.
- – Erection racks are erected and secured to prevent them from folding down.

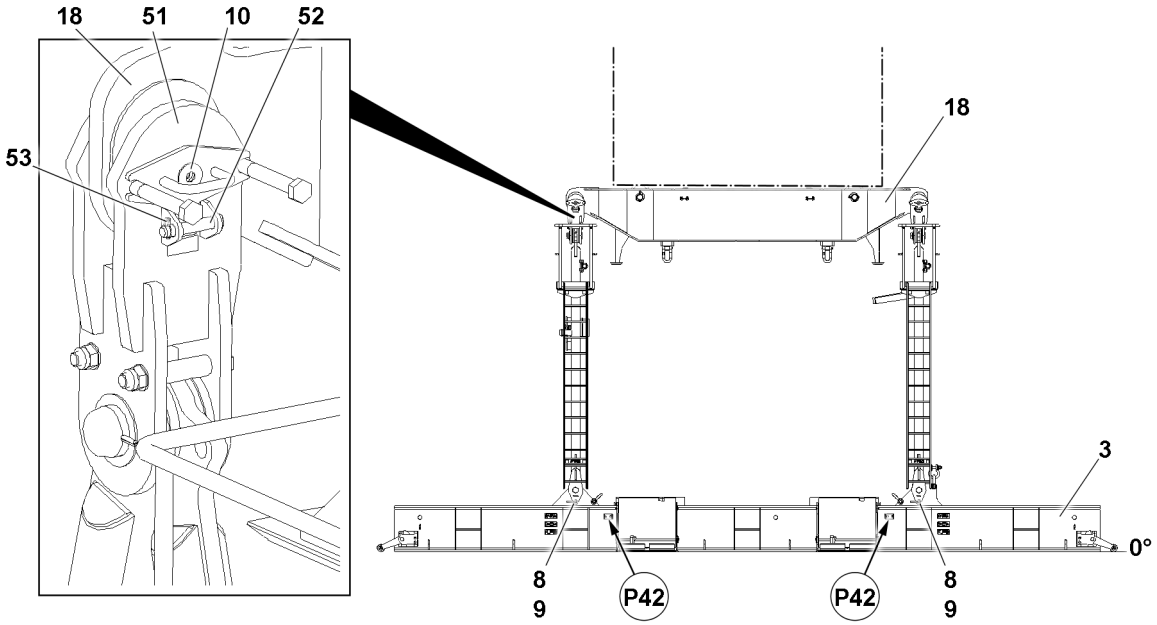

Fig.126062: Ballast pallet with cross beam

- ▶ Move the pull cylinder out until the pin bores align on bracket **51** and on cross beam **18**.

Note
Retract / extend the pull cylinder
- ▶ Control the pull cylinders from the crane cab, see the section „Lifting and lowering the derrick ballast using the pull cylinders“.
- ▶ Operate the pull cylinder with the radio remote control, see the „radio remote control operating instructions“.

Pins **10** must be pinned and secured on both erection racks.

When the pin bores align:
- ▶ Insert the pin **10**.
- ▶ Secure the pin **10**: Insert the pin **52** and secure with the locking pin **53**.

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NOTICE
Retaining pins are inserted!
Damage to the retaining pins.
▶ Unpin the retaining pins **8** before lifting the ballast pallet.

When both erection racks are pinned and secured on the cross beam:
▶ Release the retaining pins **9** on both erection racks and unpin.
▶ Insert the retaining pins **9** on the both sides on points **P42** in park position and secure with spring retainer **9**.

WARNING
Uncontrolled oscillation of the ballast pallet!
When the ballast pallet **3** is raised, it can start to swing.
Death, severe injury, property damage.
▶ It is prohibited to remain in the danger zone.
▶ Secure the ballast pallet with auxiliary rope.

By lifting and balancing itself, the ballast pallet **3** is placed exactly vertically under the derrick head.

▶ Lift the ballast pallet **3** with the pull cylinders and let it balance itself.
▶ Set the ballast pallet **3** on the ground.
▶ Relieve the derrick guying completely.

7.5 Establishing the electrical connection from the suspended ballast to the turntable

Note
▶ Establish the electrical connections from the suspended ballast to the turntable, see Electric wiring diagram.

▶ Establish the electrical connections.

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8 Assembly with suspended ballast guide*

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe injury, property damage.

- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

When the assembly personnel is within the danger zone of the crane:

- ▶ A guide and / or the crane operator must be able to see the entire danger zone.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Personnel can be caught and severely injured or killed.

- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel.

- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

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Make sure that the following prerequisites are met:
- The crane is horizontally aligned.
- An auxiliary crane is available.
- The ground is level and of sufficient load bearing capacity.
- Main boom and derrick are installed on the turntable.
- The derrick is in the crane operating position.
- Main boom is assembled, guying is tensioned.
- The counterweight has been installed on the turntable according to the load chart.
- The LICCON overload protection has been set according to the data in the load charts and erection charts.
- The LICCON overload protection settings have been compared with the actual set up configuration.

8.1 Assembling the suspended ballast guide

The suspended ballast guide makes different derrick ballast radii possible.

The derrick ballast radius determines the number of intermediate section, which must be installed.

Derrick ballast radius	Number of intermediate sections
20 m	0
25 m	1
30 m	2

8.1.1 Removing the transport unit

Make sure that the following prerequisite is met:
- The transport unit is on the transport vehicle.

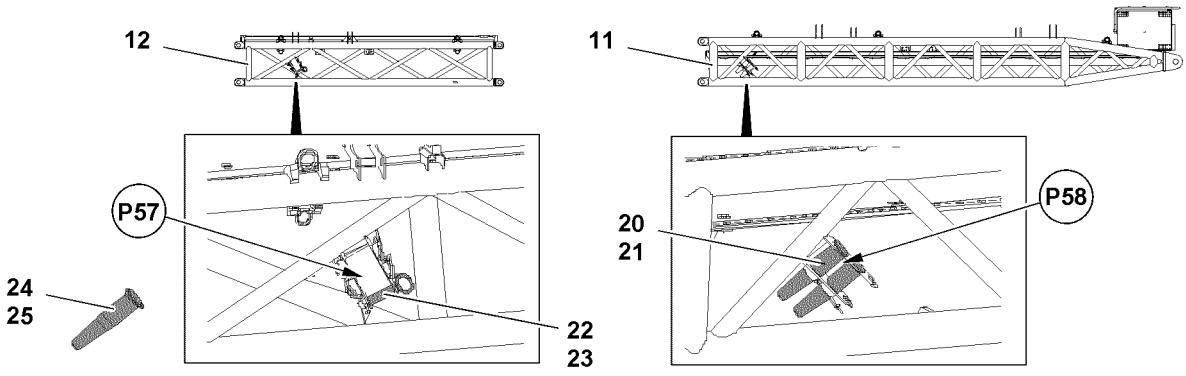

Fig.122802: Park position for pin

Note
- ▶ Park position **P57** for pin **24** and pin **22**.
- ▶ Park position **P58** for pin **20**.

WARNING
Falling pins!
Death, severe injury, property damage.
- ▶ Make sure that all pins are properly secured in the park positions with the respective retaining elements.

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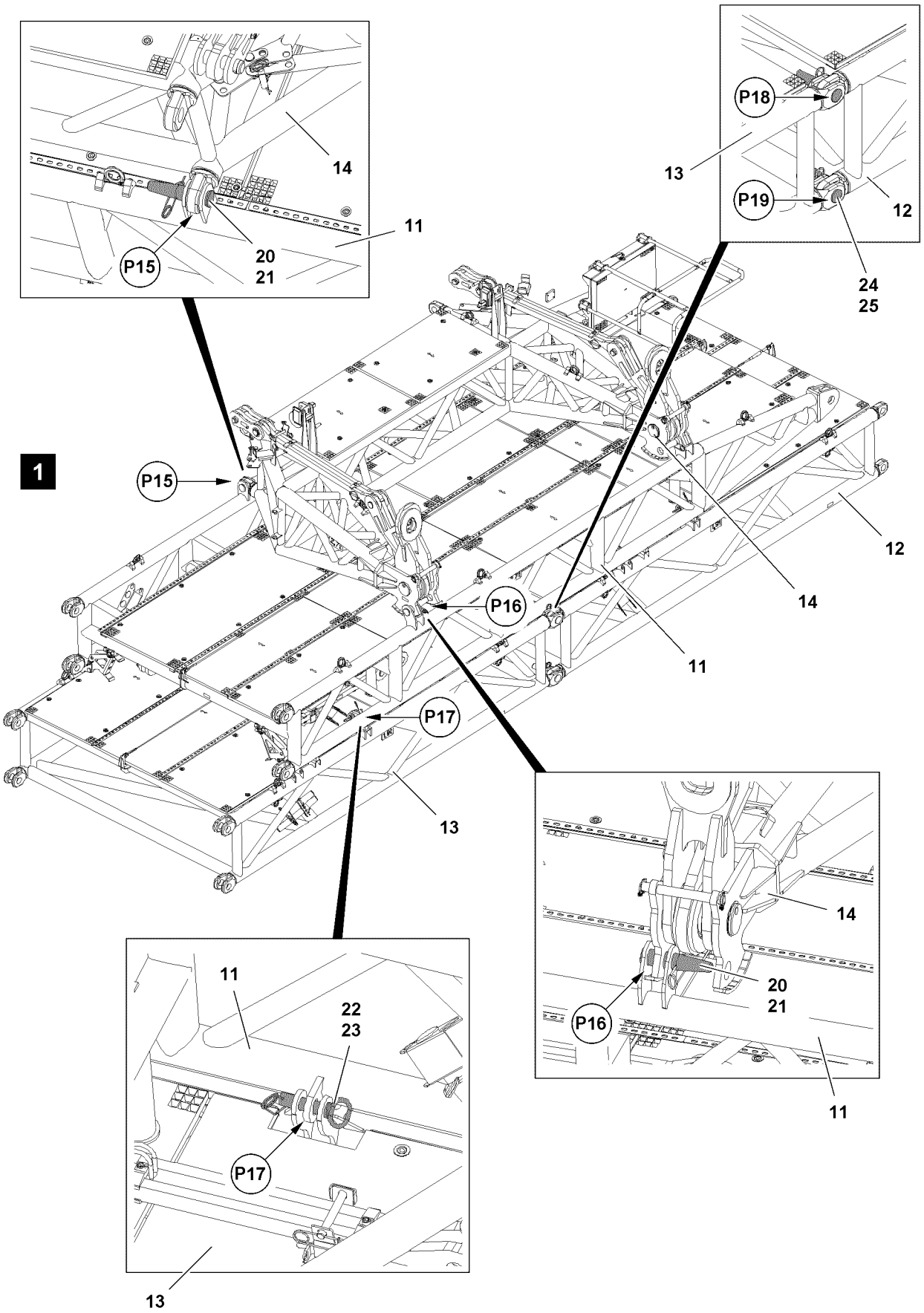

Fig.122801

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Disassembling the end section

▶ Release and remove the riggings on the transport vehicle.

The end section is unpinned at four points. Every point is present on both sides of the component on one level, see illustration **1**.

▶ Fasten the auxiliary crane to the end section **14**.
▶ Unpin the end section **14** at points **P15**: Remove spring retainers **21** and unpin pins **20**.
▶ Unpin the end section **14** at points **P16**: Remove spring retainers **21** and unpin pins **20**.
▶ Place the end section **14** with the auxiliary crane on the ground.

Disassembling the pivot section

The pivot section is unpinned at four points. Every point is present on both sides of the component on one level, see illustration **1**.

▶ Fasten the auxiliary crane to the pivot section **11**.
▶ Unpin the pivot section **11** at points **P17**: Remove spring retainers **23** and unpin pins **22**.
▶ Place the pivot section **11** with the auxiliary crane on the ground.

Disassembling the intermediate section

For a suspended ballast with a 25 m suspended ballast radius, the intermediate sections must be unpinned apart. The intermediate section is unpinned on four points. Every point is present on both sides of the component on one level, see illustration **1**.

▶ Fasten the auxiliary crane on intermediate section **12**.
▶ Unpin the intermediate section **12** at points **P19**: Remove spring retainers **25** and unpin pins **24**.
▶ Unpin the intermediate section **12** at points **P18**: Remove spring retainers **25** and unpin pins **24**.
▶ Place the intermediate section **12** with the auxiliary crane on the ground.

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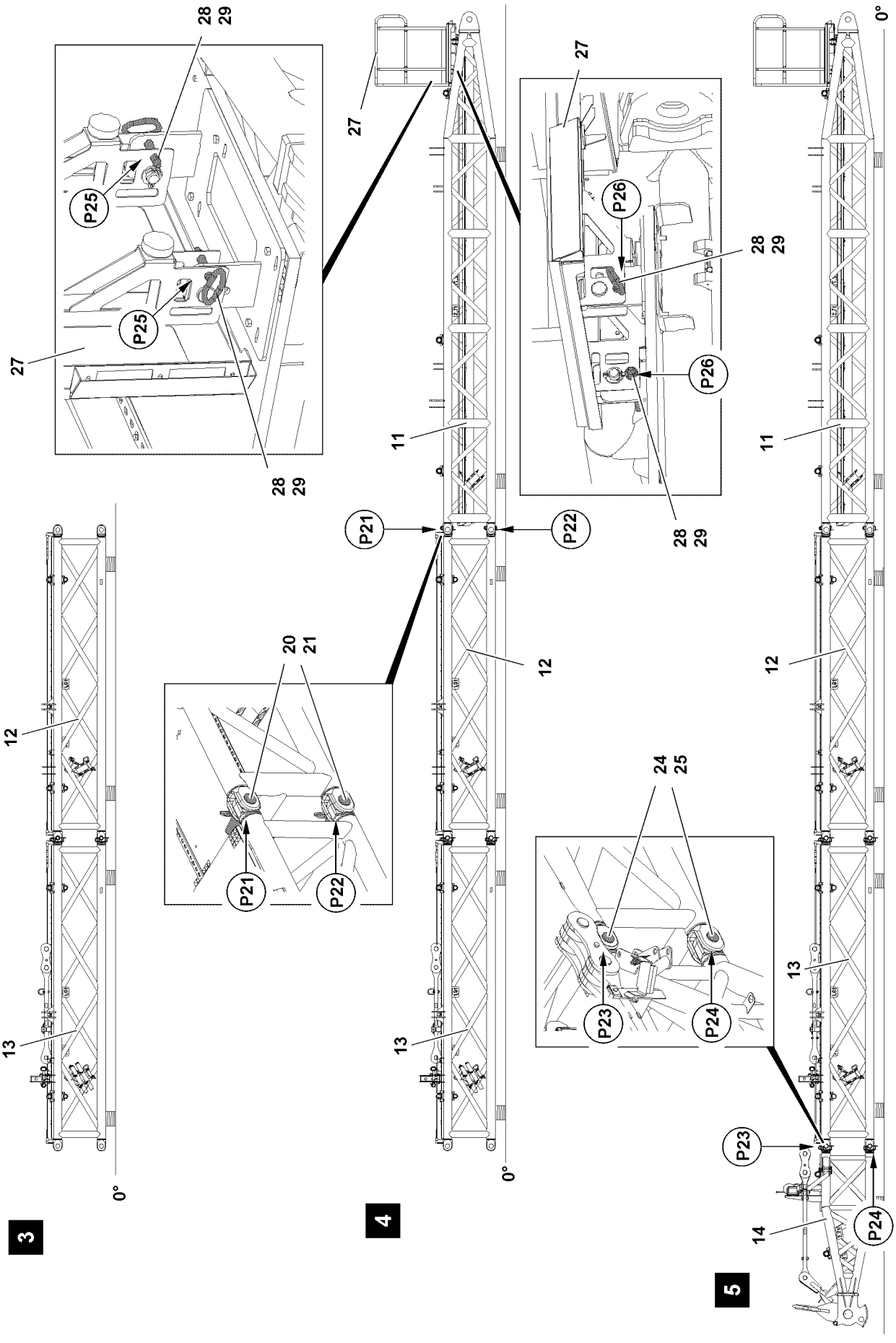

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Fig.122803

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8.1.2 Assembling the suspended ballast guide

Note

▶ The assembly of the suspended ballast guide is described based on the example of a suspended ballast guide with a 30 m suspended ballast radius.

Make sure that the following prerequisites are met:
- The pivot section has been removed from the transport unit.
- The end section has been removed from the transport unit.

Assembling the intermediate sections

For the suspended ballast guide with a 30 m suspended ballast radius only two intermediate sections are installed.

▶ Support the ground in such a way that the intermediate sections can be placed down horizontally.
▶ Place the intermediate sections with the auxiliary crane on the substructure, see illustration **3**.
▶ Remove the fastening equipment.

Assembling the pivot section

▶ Fasten the pivot section **11** to the auxiliary crane.
▶ Position the pivot section **11** with the auxiliary crane on the intermediate section **12** at point **P21** until the pin points align.
▶ Support the pivot section **11**.

The pivot section and the intermediate section are pinned together in four points. Every point is present on both sides of the component on one level, see illustration **4**.

▶ Pin the pivot section **11** on both sides at point **P21** with the intermediate section **12**: Insert the pins **20** and secure with the spring retainers **21**.
▶ Pin the pivot section **11** on both sides at point **P22** with the intermediate section **12**: Insert the pins **20** and secure with the spring retainers **21**.
▶ Remove the fastening equipment.

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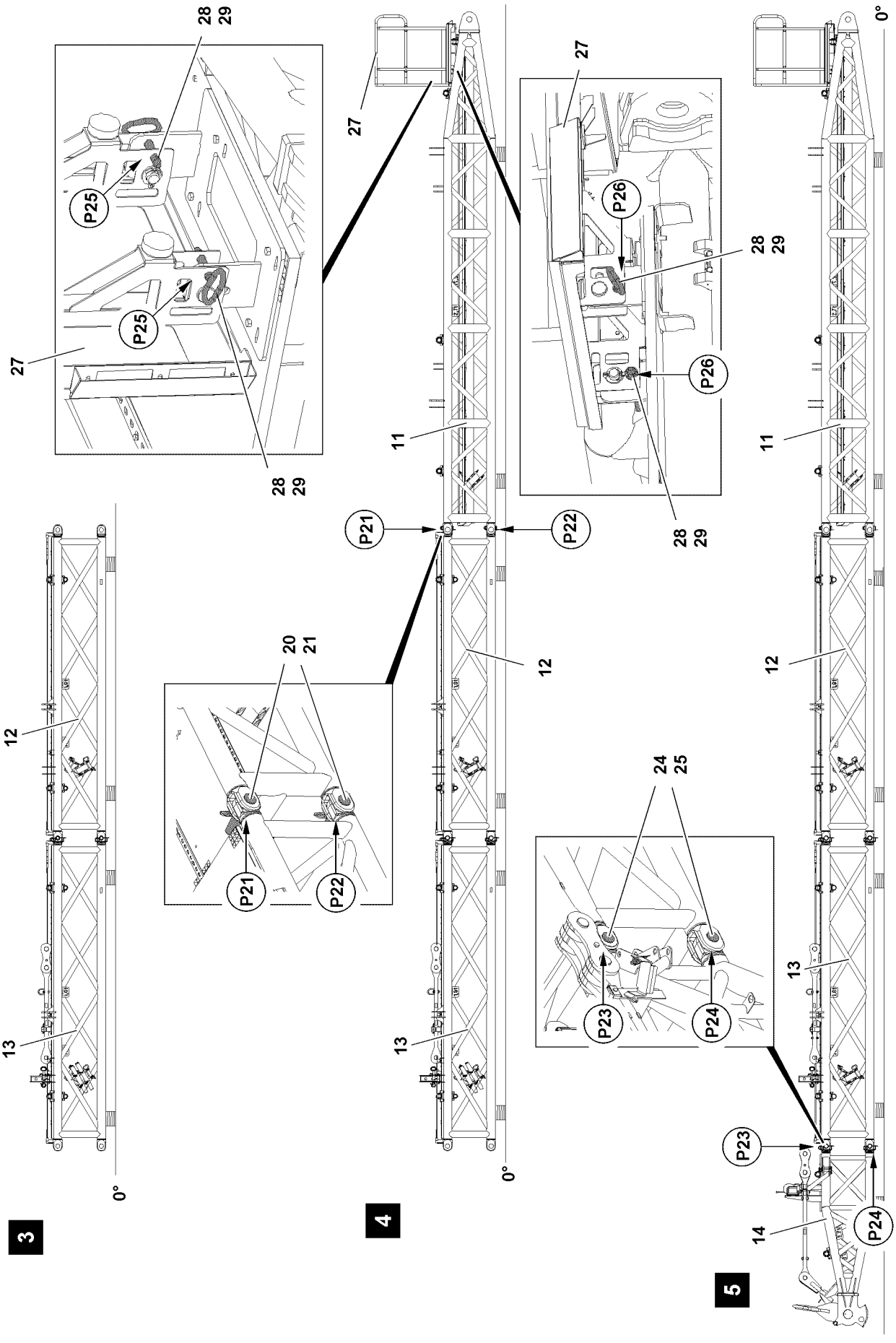

Fig.122803

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▶ Fasten the platform **27** to the auxiliary crane.

WARNING
Platform swinging down!
The platform can swing down by itself due to its own weight when unpinning it at points **P25**.
Death, severe injury, property damage.
Fingers and hands can be crushed.
▶ Make sure that the platform is safely held by the auxiliary crane.
▶ Do not reach with your hands into the danger zone.
▶ Use personal protective equipment.

▶ Set the platform **27** into operating position, see illustration **4**: Remove the safety locking pin **29** at points **P25** and unpin the grip pin **28**.
▶ Swing the platform **27** with the auxiliary crane.
▶ Insert the grip pin **28** at points **P26** and secure with safety locking pin **29**.
▶ Remove the auxiliary crane.

Assembling the end section

▶ Fasten the end section **14** to the auxiliary crane.
▶ Position the end section **14** with the auxiliary crane on the intermediate section **13** at point **P23** until the pin points align.
▶ Support the end section **14**.

The end section and the intermediate section are pinned together in four points. Every point is present on both sides of the component on one level, see illustration **5**.

▶ Pin the end section **14** on both sides at point **P23** with the intermediate section **13**: Insert the pins **24** and secure with the spring retainers **25**.
▶ Pin the end section **14** on both sides at point **P24** with the intermediate section **13**: Insert the pins **24** and secure with the spring retainers **25**.
▶ Remove the fastening equipment.

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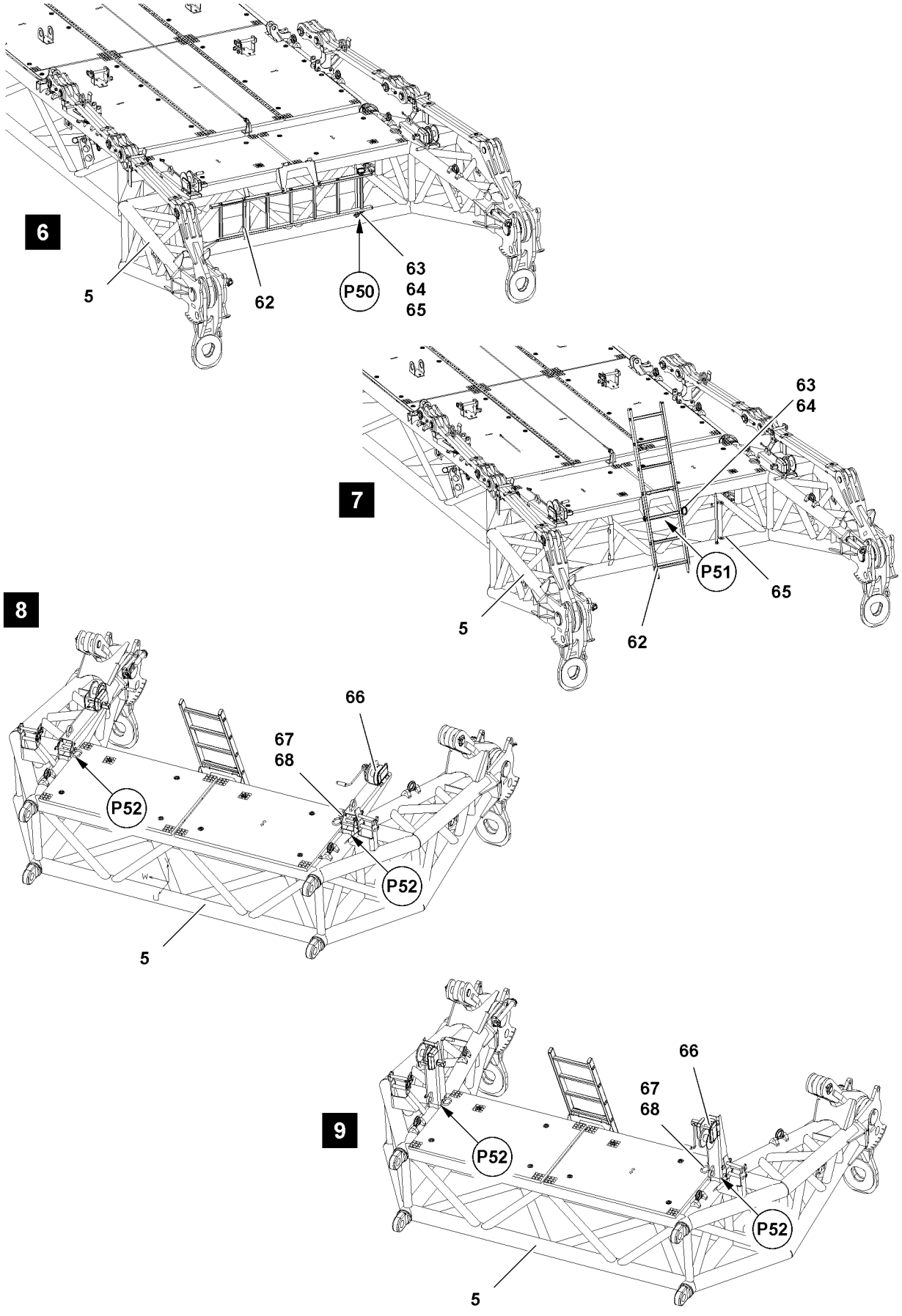

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Fig.120205

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Assembling the ladder

WARNING
Falling ladder!
The ladder can fall down by itself due to its own weight when it is unpinned.
Death, severe injury, property damage.
Fingers and hands can be crushed.
- ▶ When unpinning the pin connection, hold the ladder.
- ▶ Do not reach with your hands into the danger zone.

- ▶ Release the ladder **62** from the transport retainer: Remove the lock **65** at point **P50** and unpin the grip pin **63**, see illustration **6**.
- ▶ Remove the safety locking pin **64** at point **P50** from park position, see illustration **6**.
- ▶ Attach the lock **65** at point **P50** in the park position, see illustration **6**.

WARNING
Danger of crushed limbs!
When hanging the ladder up, fingers and hands can be crushed.
- ▶ Do not reach with your hands into the danger zone.

- ▶ Get the ladder **62** from the transport retainer and hang it up at point **P51**, see illustration **7**.
- ▶ Secure the ladder **62** in operating position: Insert the grip pin **63** at point **P51** and secure with safety locking pin **64**, see illustration **7**.

Assembling the manual rope winch

- ▶ Release the manual rope winch **66** from the transport position: Remove the safety locking pin **68** at point **P52** and unpin the grip pin **67**, see illustration **8**.

WARNING
Danger of crushed limbs!
When setting up the manual rope winch, fingers and hands can be crushed.
- ▶ Do not reach with your hands into the danger zone.

WARNING
Falling manual rope winch!
The manual rope winch can fall down by itself due to its own weight when setting it up.
Death, severe injury, property damage.
Fingers and hands can be crushed.
- ▶ When unpinning the pin connection, hold the ladder.
- ▶ Do not reach with your hands into the danger zone.

- ▶ Set up the manual rope winch **66**, see illustration **9**.
- ▶ Secure the manual rope winch **66** in operating position: Insert the grip pin **67** at point **P52** and secure with safety locking pin **68**, see illustration **9**.

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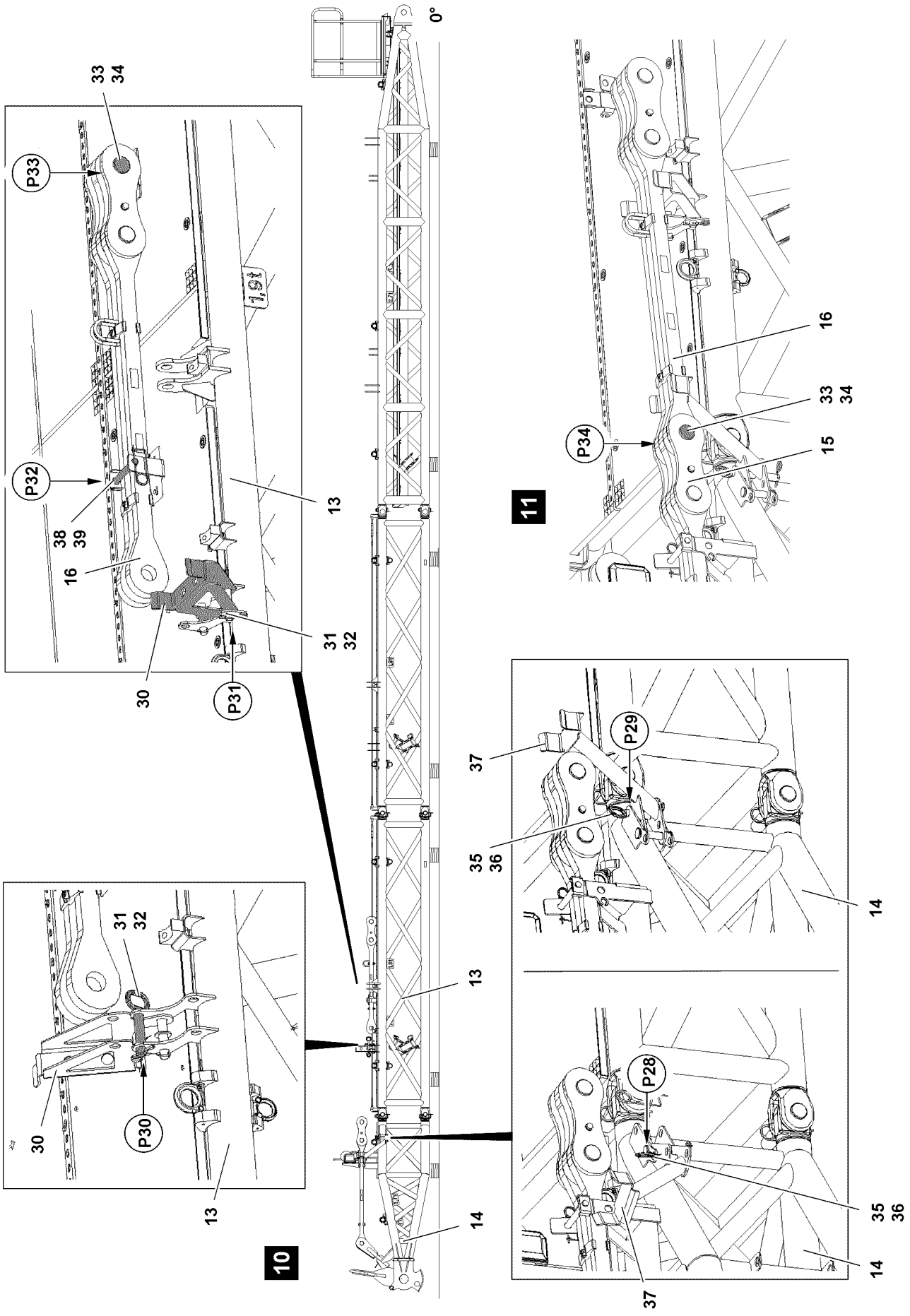

Fig.122804

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Assembling the pull rods

▶ Release the bracket **37** from the transport position: Remove the spring retainer **36** at point **P28** and unpin the socket pin **35**, see illustration **10**.

WARNING
When swinging the bracket, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Swing the bracket **37** until it can be pinned at point **P29**.
▶ Insert the socket pins **35** at point **P29** and secure with spring retainer **36**, see illustration **10**.

Result:

– The bracket **37** is secured in the operating position.

▶ Release the retainer **30** from the transport position: Remove the spring retainer **32** at point **P30** and unpin the socket pin **31**, see illustration **10**.

WARNING
When swinging the retainer, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Swing the retainer **30** until it can be pinned at point **P31**.
▶ Secure the retainer **30** in operating position: Insert the socket pins **31** at point **P31** and secure with spring retainer **32**, see illustration **10**.

Result:

– The retainer **30** is secured in the operating position.

▶ Release the pull rods **16** from the transport position: Remove the spring retainer **39** at point **P32** and unpin the pin **38**, see illustration **10**.
▶ Remove the safety locking pin **34** at point **P33** and unpin the pin **33**, see illustration **10**.
▶ Fasten the auxiliary crane to the pull rod **16**.
▶ Place the pull rod **16** down with the auxiliary crane in operating position on the retainer **30** and align at point **P34** on bores, see illustration **11**.
▶ Pin the pull rod **16** with the pull rod end section **15**: Insert the pin **33** at point **P34** and secure with the safety locking pin **34**, see illustration **11**.
▶ Remove the auxiliary crane.
▶ Insert the pin **38** in park position and secure with spring retainer **39**.
▶ Release the pull rod **15** from the transport position.

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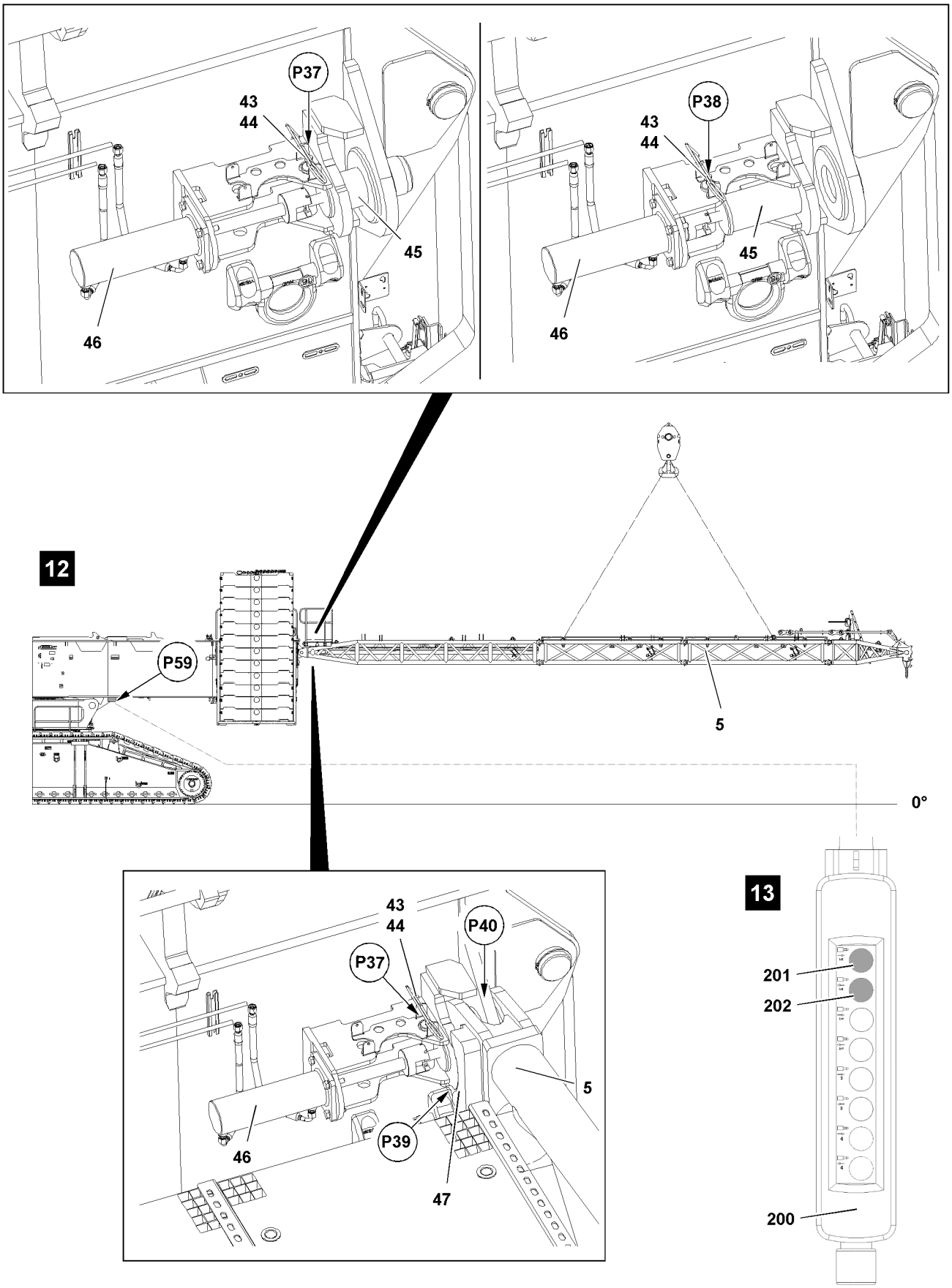

Fig.122805

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Swinging the brackets

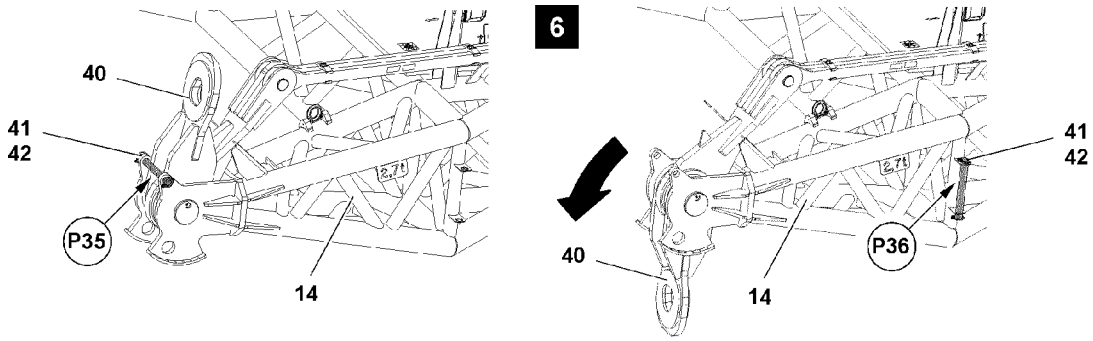

Fig.119028: Swinging the bracket

▶ Fasten the bracket **40** to the auxiliary crane.

WARNING
Bracket swinging down!
The bracket can swing down by itself due to its own weight when unpinning it at point **P25**, see illustration.
Death, severe injury, property damage.
Fingers and hands can be crushed.
▶ Make sure that the platform is held by the auxiliary crane.
▶ Do not reach with your hands into the danger zone.

▶ Remove the safety locking pin **42** at point **P35** and unpin the pin **41**, see illustration **6**.
▶ Swing the bracket **40** downward with the auxiliary crane.
▶ Insert the pin **41** in park position at point **P36** and secure with safety locking pin **42**, see illustration **6**.

8.1.3 Assembling the suspended ballast guide on the turntable frame

Make sure that the following prerequisites are met:
– A lifting platform or other aids are available.
– An auxiliary crane is available.
– The control panel is connected on the „turntable rear“ socket , point **P59**.

The suspended ballast guide **5** is pinned on two points. The pin procedure is described for one pin as an example:

▶ Release the pin **45**: Remove the spring retainer **44** at point **P37** and unpin the retaining pin **43**, see illustration **12**.
▶ Insert the retaining pin **43** at point **P38** and secure with spring retainer **44** see illustration **12**.
▶ Unpin the pin **45**: Press button **202** on the control panel **200**, see illustration **13**.

Result:

– The pin **45** moves out.

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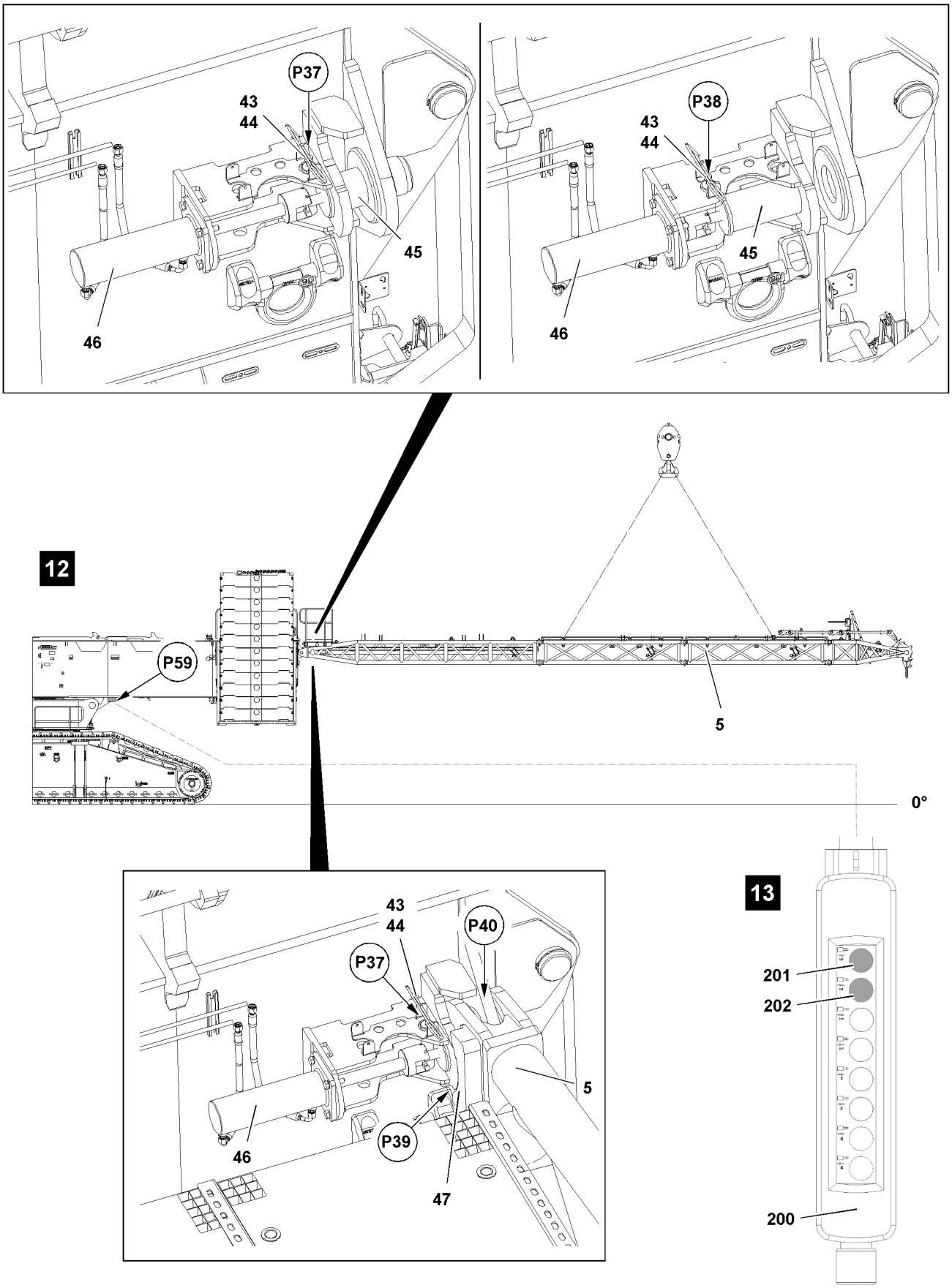

Fig.122805

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▶ Attach the suspended ballast guide **5** on the auxiliary crane.
▶ Lift the suspended ballast guide **5** to the pin points **P40** on the rear of the turntable, see illustration **12**.
▶ Set the suspended ballast guide **5** on the centering **47** on points **P39** of the turntable, see illustration **12**.

Result:

– Align the pin bores.

▶ Insert the pin **45**: Press button **201** on the control panel **200**, see illustration **13**.

Result:

– The pin **45** moves in.

WARNING
Danger of accident!
If the pins are not secured with the retaining pin, then the connector pins can loosen up by themselves during crane operation.
This can cause the crane to topple over.
Death, severe injury, property damage.
▶ Make sure that the connector pins are secured.

▶ Secure the pin **45**: Insert the retaining pin **43** at point **P37** and secure with spring retainer **44** see illustration **12**.

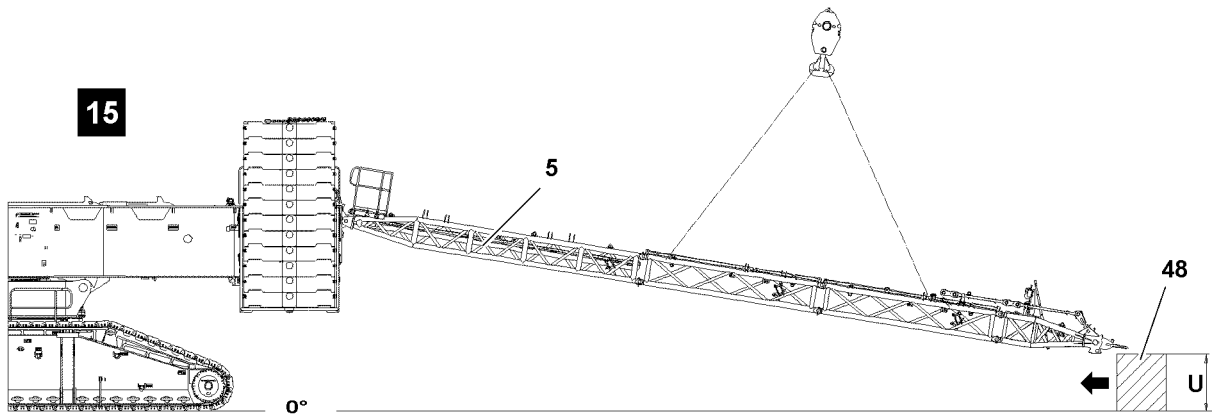

Fig.120203: Substructure, example

Suspended ballast guide	R30	R25	R20
Substructure height „U“	0 m	1.6 m	2.0 m

When R25 or R20 is installed:
▶ Establish a substructure and place the suspended ballast guide **5** with the auxiliary crane on the substructure, see illustration **15**.

When R30 is installed:
▶ Place the suspended ballast guide **5** with the auxiliary crane on the ground.

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8.2 Pinning the D-guy rods with the pull rods of the suspended ballast guide

Make sure that the following prerequisites are met:
- The D-guy rods hang over the lugs of the suspended ballast guide.
- The manual rope winches are set up and secured.

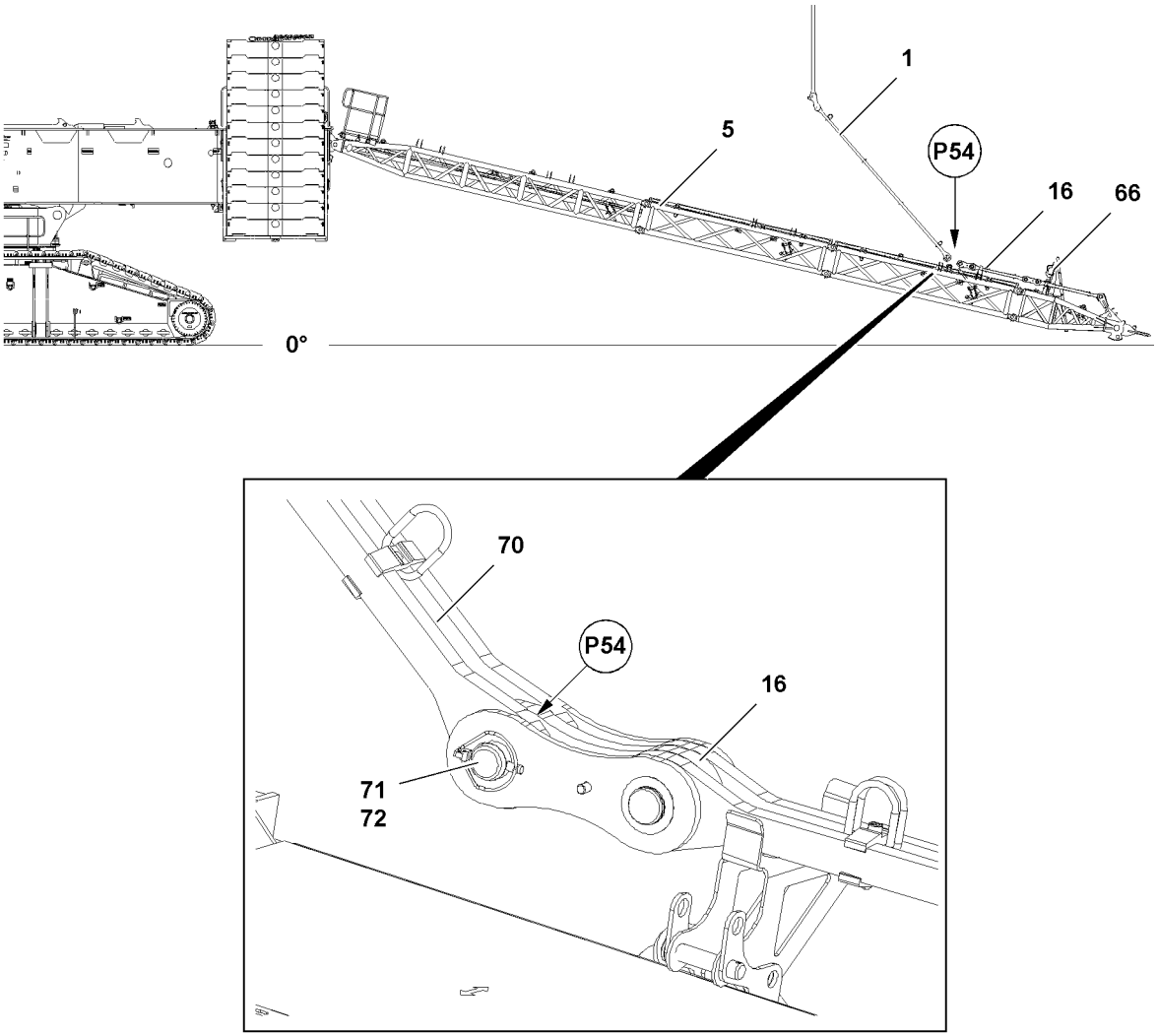

Fig.126068

▶ Connect the rope of the manual rope winch **66** with the D-guy rods **1**.

The D-guy rods **1** are pinned on both sides on the suspended ballast guide **5**. The pin procedure is described on the example for one D-guy rod.

▶ Pull the D-guy rods **1** with the manual rope winch **66** to the pull rods **16** and luff the derrick down at the same time until it can be pinned on point **P54**.

WARNING
Danger of accident!
If the connector pins are not secured with the retaining pin, then they can loosen up by themselves during crane operation.
This can cause the crane to topple over.
Death, severe injury, property damage.
▶ Make sure that the connector pins are secured.

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When the pin bores align:

▶ Insert the pin **71** at point **P54** and secure with safety locking pin **72**.

▶ Lift the suspended ballast guide **5** with the derrick.

8.3 Assembling the cross beam on the suspended ballast guide

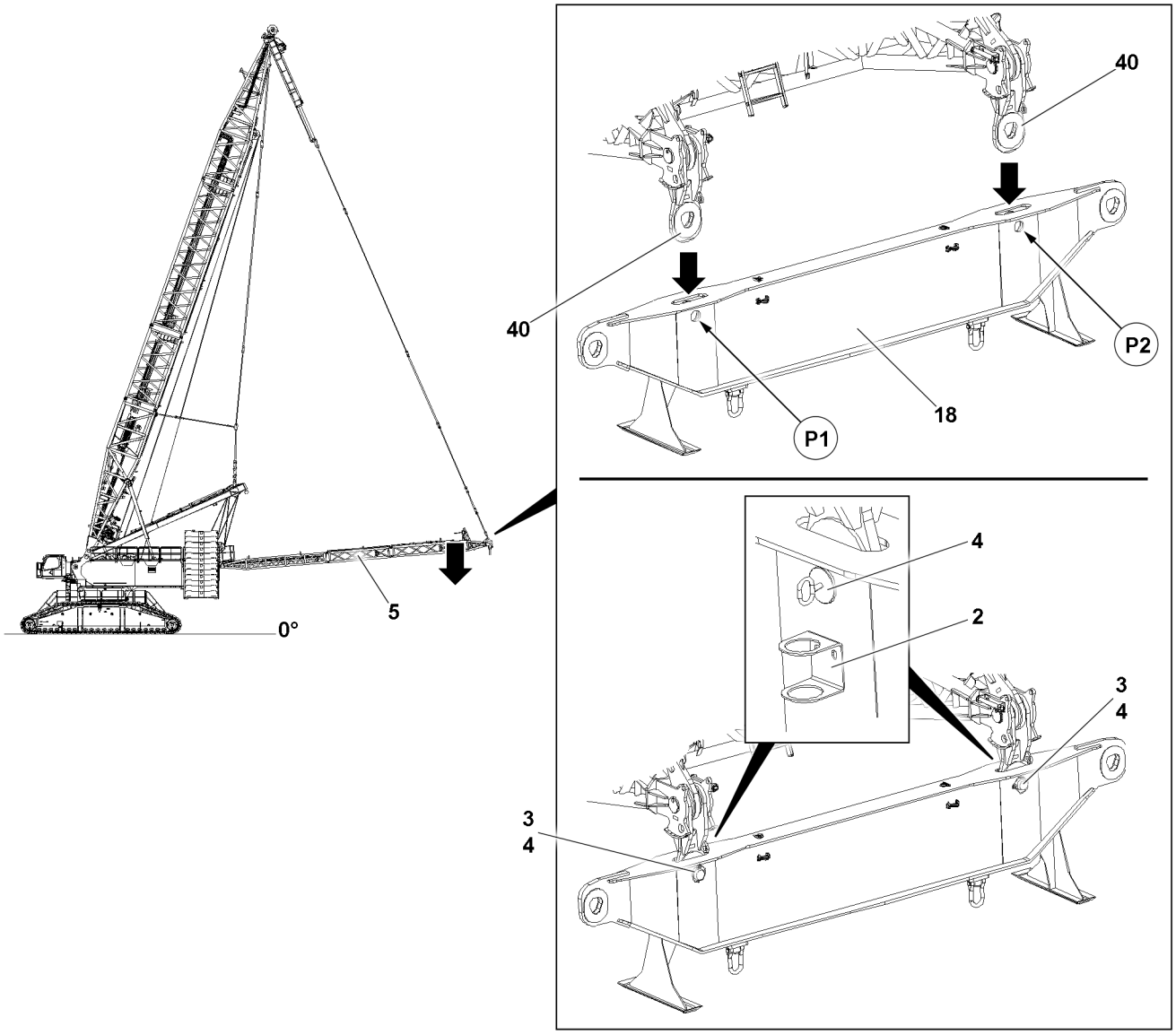

Fig.126069: Cross beam on suspended ballast guide

Make sure that the following prerequisites are met:

– The suspended ballast guide is completely installed and pinned with D-guy rods.

▶ Position the cross beam **18** under brackets **40** on the ground.

The suspended ballast guide is lowered by:

– Extending the pull cylinder to the switch position.

– Luffing the derrick boom down.

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Note
Retract / extend the pull cylinder
- ▶ Control the pull cylinders from the crane cab, see the section „Lifting and lowering the derrick ballast using the pull cylinders“.
- ▶ Operate the pull cylinder with the radio remote control, see the „radio remote control operating instructions“.

- ▶ Lower the suspended ballast guide **5** until the brackets **40** can be pinned with the cross beam **18** on point **P1** and point **P2**.
- ▶ Release and unpin the pin **4** in transport retainer **2**.
- ▶ Pin the brackets **40** with the cross beam **18**: Insert the pins **4** and secure with locking pins **3**.
- ▶ Lift the cross beam **18**: Lift the suspended ballast guide.

8.4 Setting the ballast pallet in the assembly position

- ▶ Set the derrick to the required radius.

Note
- ▶ Fastening points, see section „Fastening points for suspended ballast parts“.

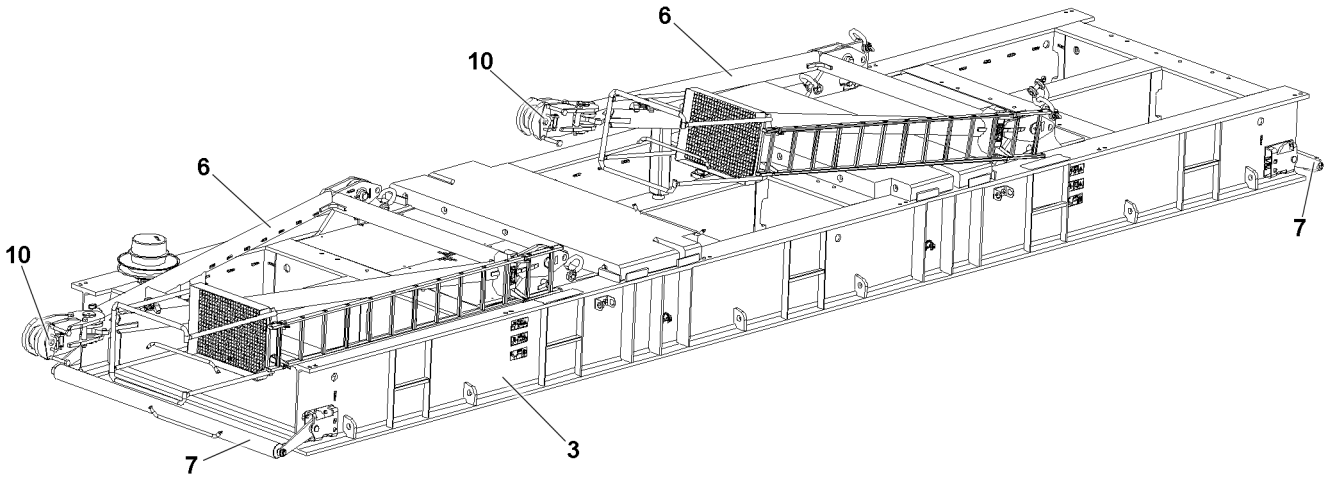

Fig.124997: Ballast pallet, transport position

- ▶ Fasten the ballast pallet **3** with fastening equipment to the auxiliary crane.
- ▶ Position the ballast pallet **3** in the slewing range of the crane under the guy rods on the derrick.

Note
- ▶ Set the ballast pallet **3** for easier assembly of the guy rods in lengthwise direction of the turntable.

- ▶ Align the ballast pallet **3** horizontally.

8.5 Erecting the erection racks

Note
- ▶ The assembly of the erection racks is described based on the example of one erection rack.

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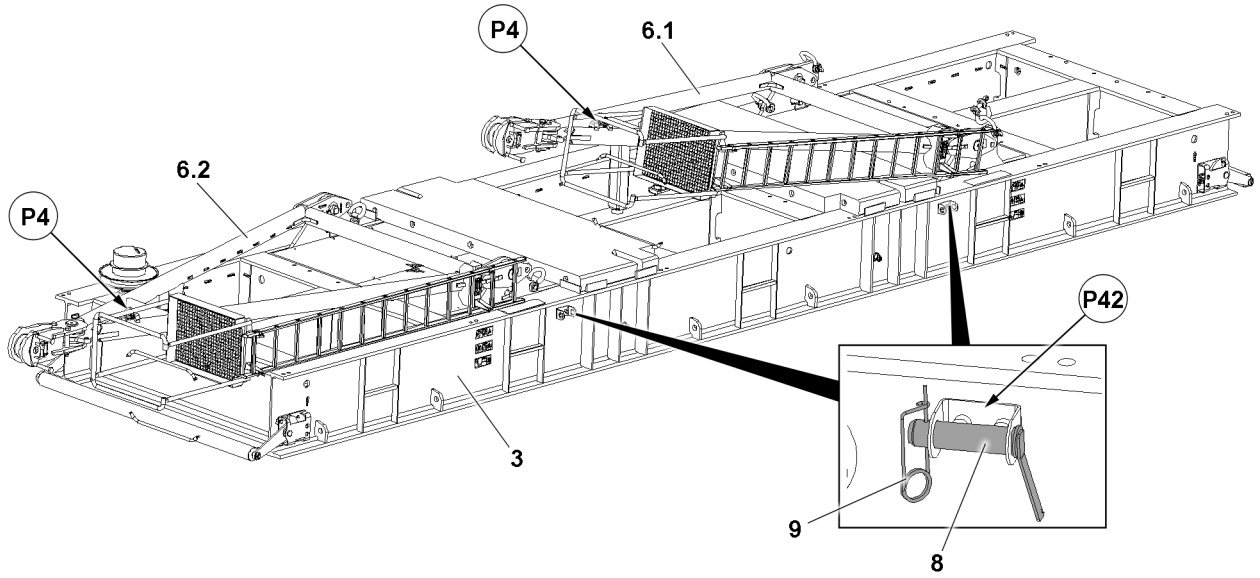

Fig.126063: Ballast pallet, transport position

The erection rack is pinned on two points. The pin procedure is described for one pin as an example.

- ▶ Fasten the erection rack **6.1** with fastening equipment to the auxiliary crane, point **P4**.
- ▶ Remove the spring retainer **9** on both sides on points **P42** and unpin the retaining pin **8** from the park position.

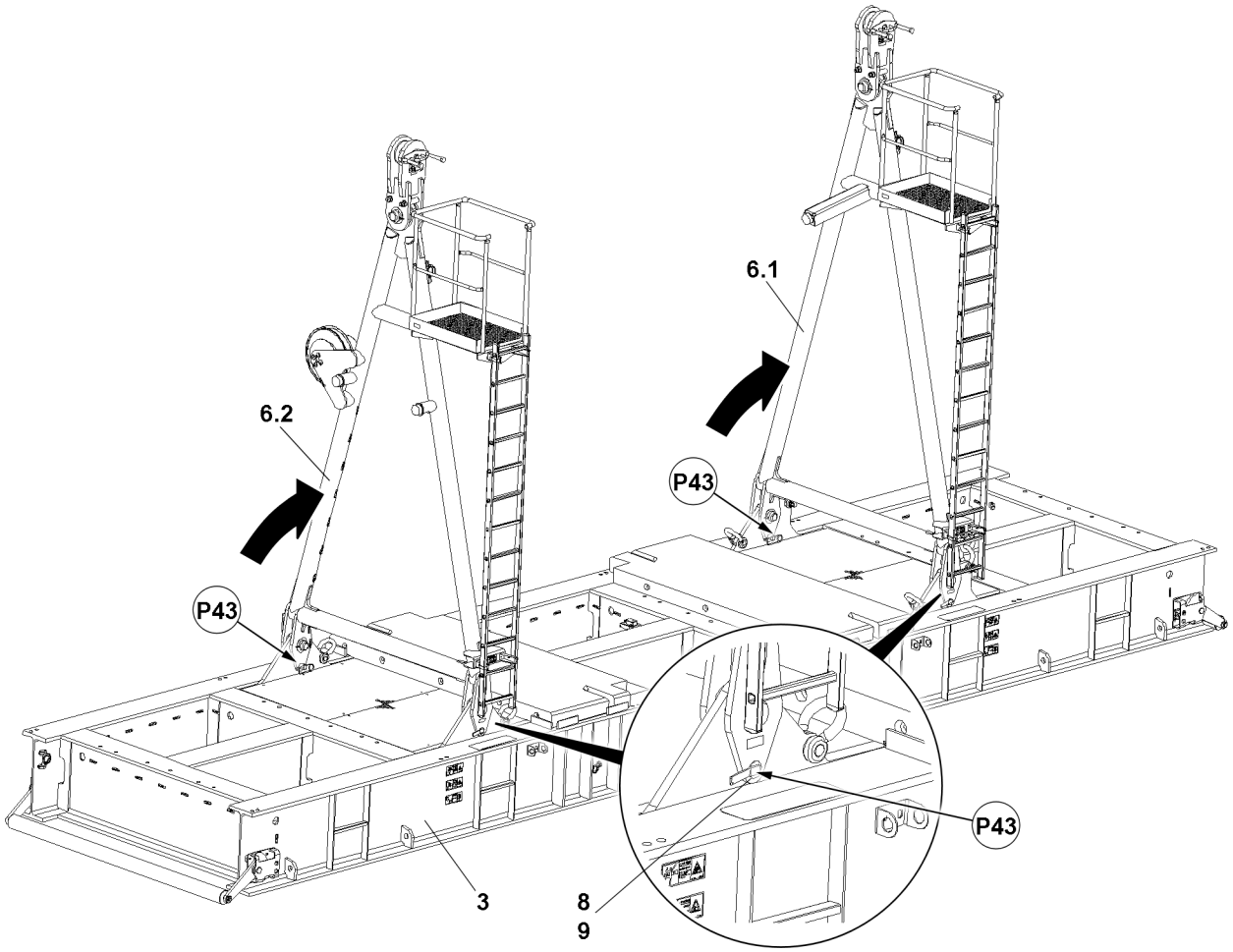

Fig.126064: Ballast pallet, operating position

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DANGER
Unsecured erection racks!
Toppling erection racks. Death, severe bodily injuries, property damage.
- ▶ Secure the erection racks after erection with the auxiliary crane.
- ▶ When both erection racks are locked and secured in a vertical position with retaining pins **8**: Remove the auxiliary crane.
- ▶ Never unpin the retaining pins from unsecured erection racks.
- ▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure.

- ▶ Set the erection rack **6.1** vertically with the auxiliary crane.
- ▶ Insert the retaining pin **8** at point **P43** on both sides and secure with spring retainer **9**.

When the erection rack is erected and secured:
- ▶ Remove the auxiliary crane.
- ▶ Erect the second erection rack **6.2** and secure with retaining pin **8**.

8.6 Pinning the ballast pallet with cross beam

Make sure that the following prerequisites are met:
- – Ballast pallet is in assembly position.
- – Erection racks are erected and secured to prevent them from folding down.

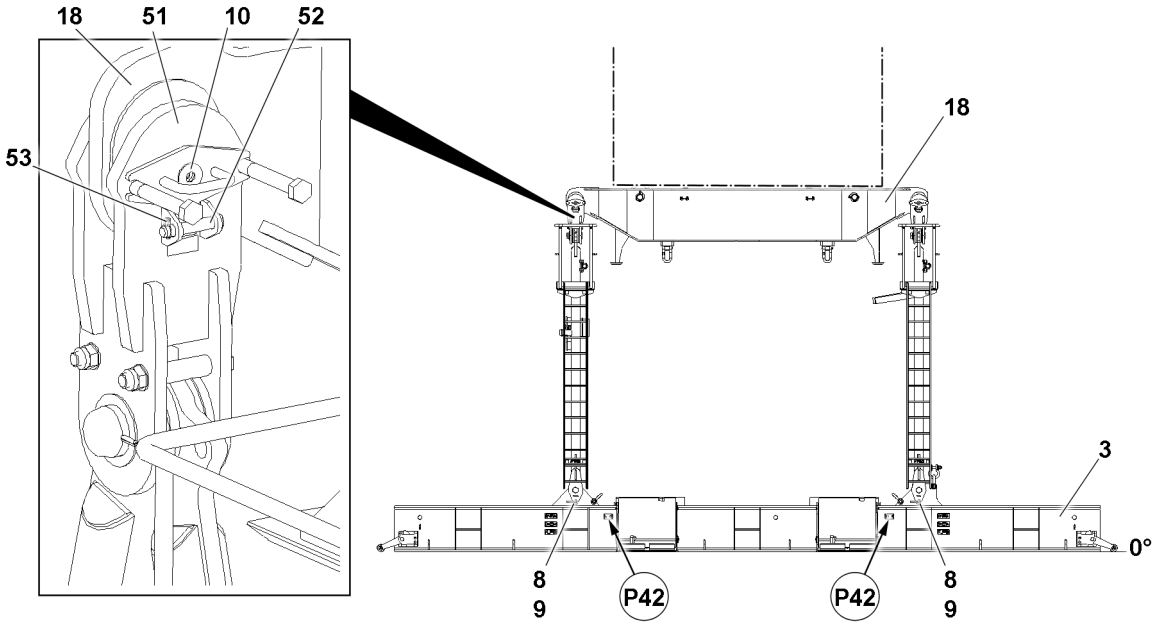

Fig.126062: Ballast pallet with cross beam

- ▶ Move the pull cylinder out until the pin bores align on bracket **51** and on cross beam **18**.

Pins **10** must be pinned and secured on both erection racks.

Note
Retract / extend the pull cylinder
- ▶ Control the pull cylinders from the crane cab, see the section „Lifting and lowering the derrick ballast using the pull cylinders“.
- ▶ Operate the pull cylinder with the radio remote control, see the „radio remote control operating instructions“.

When the pin bores align:
- ▶ Insert the pin **10**.
- ▶ Secure the pin **10**: Insert the pin **52** and secure with the locking pin **53**.

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NOTICE
Retaining pins are inserted!
Damage to the retaining pins.
▶ Unpin the retaining pins **8** before lifting the ballast pallet.

When both erection racks are pinned and secured on the cross beam:
▶ Release the retaining pins **9** on both erection racks and unpin.
▶ Insert the retaining pins **9** on the both sides on points **P42** in park position and secure with spring retainer **9**.

WARNING
Uncontrolled oscillation of the ballast pallet!
When the ballast pallet **3** is raised, it can start to swing.
Death, severe injury, property damage.
▶ It is prohibited to remain in the danger zone.
▶ Secure the ballast pallet with auxiliary rope.

By lifting and balancing itself, the ballast pallet **3** is placed exactly vertically under the derrick head.

▶ Lift the ballast pallet **3** with the pull cylinders and let it balance itself.
▶ Set the ballast pallet **3** on the ground.
▶ Relieve the derrick guying completely.

8.7 Establishing the electrical connection from the suspended ballast to the turntable

Note
▶ Establish the electrical connections from the suspended ballast to the turntable, see Electric wiring diagram.

▶ Establish the electrical connections.

9 Ballasting the ballast pallet

9.1 Ballast variation

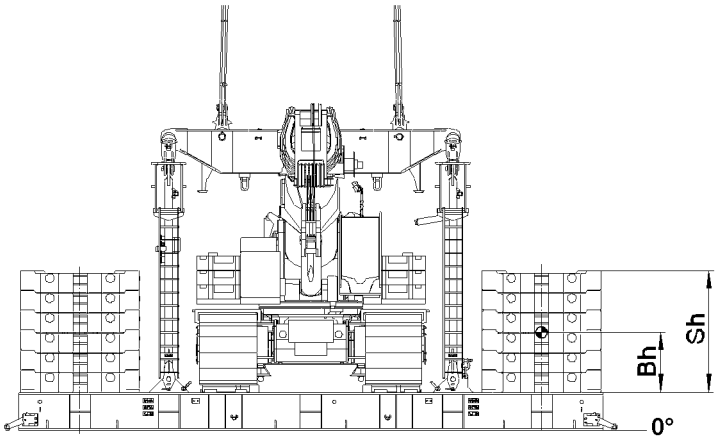

Fig.124988: Ballast pallet with LTR 1220

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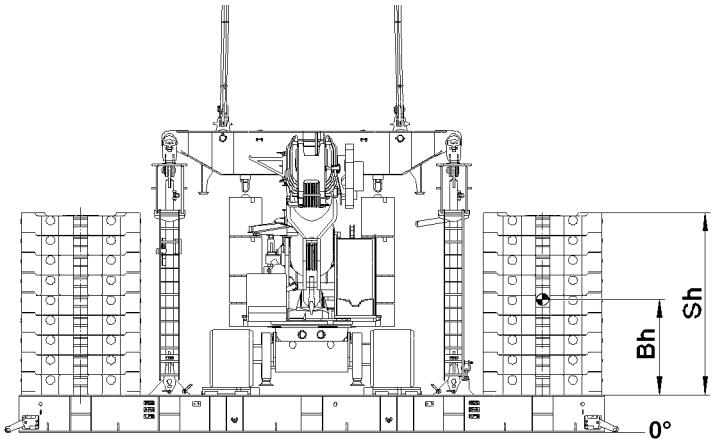

Fig.124987: Ballast pallet with LTR 1100

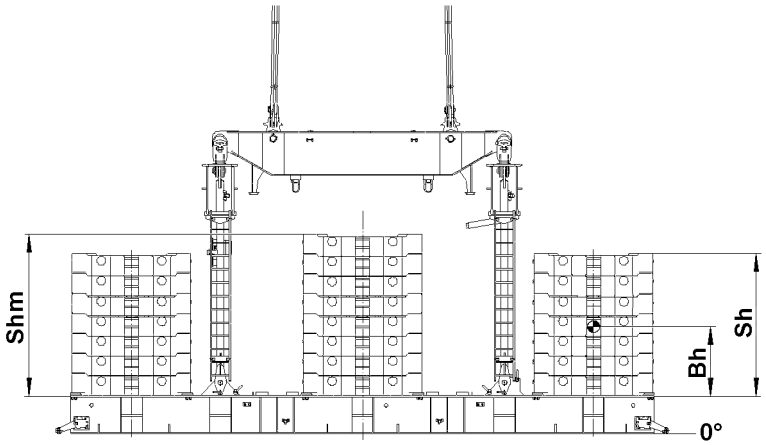

Fig.126073: Ballast pallet solely with ballast plates

9.2 Ballasting rules

WARNING
Impermissible ballasting, impermissible geometry of the ballast!
Slipping and falling ballast stacks.
The crane can topple over. Death, severe bodily injuries, property damage.
▶ The maximum permissible ballast center of gravity height **Bh** of 2000 mm above the upper belt may **not** be exceeded.

When ballasting in the center of the ballast pallet:
▶ Do **not** exceed the permissible stack height **Shm** of 4000 mm.

When the outer stacks are ballasted:
▶ Do **not** exceed the permissible stack height **Sh** of 4500 mm.
▶ Do **not** exceed the maximum permissible total weight of the suspended ballast of 455 t.
▶ Secure all ballast plates so they cannot move and fall down.
▶ Replace damaged ballast plates immediately with new ballast plates.
▶ Observe and comply with the rules for ballasting.

Rules for ballasting:
– Do **not** start with the two outer ballast stacks. Start ballasting in the center.
– Suspended ballast with LTR: First move LTR on ballast pallet.
– Always place the ballast plates symmetrically, in reference to the longitudinal axis.
– The outer ballast stacks must always weigh the same and always be the same height after ballasting.

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- Ballasting with double stacks: The difference between front and rear may be no more than maximum 10 t for a double stack.
- First place only maximum 20 t ballast per stack.
- After the first ballast plates are placed, the difference between the stacks may be a maximum of 25 t.

Make sure that the following prerequisites are met:
- The ground on which the ballast pallet is ballasted is level and adequately load-bearing.
- The ballast pallet is properly assembled. The erection racks are secured.
- The ballast pallet is standing on the ground.
- An auxiliary crane is on hand.

9.3 Determining the position LTR on the ballast pallet

LTR 1220 and LTR 1100 must be in certain positions of the ballast pallet.

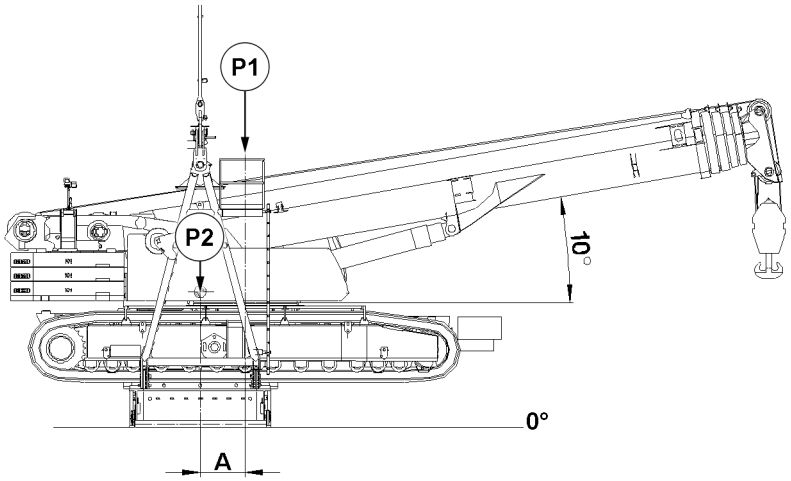

Fig.124990: Position LTR 1220 on ballast pallet

Distance **A** in the chart is valid solely for the following set up configurations, depending on the crane type:
- LTR 1220: 70 t ballast and 20 t central ballast.
- LTR 1100: 32 t ballast and 15 t central ballast.

A is the distance between the center of rotation LTR on point **P1** and the center of ballast pallet on point **P2**.

	LTR 1220	LTR 1100
Distance A	1000 mm ±150 mm	900 mm ±150 mm

Distance A depending on the crane type

When the set up configuration of the LTR deviates:
▶ Read the value for the center of gravity of the LTR from the LICCON display *Center of gravity* and adhere to it when positioning on the ballast pallet.

9.4 Moving the LTR on the ballast pallet

Make sure that the following prerequisites are met:
- The derrick guying is completely relieved.
- The telescopic boom is completely telescoped in and luffed to 10°.
- Position LTR on the ballast pallet is determined.

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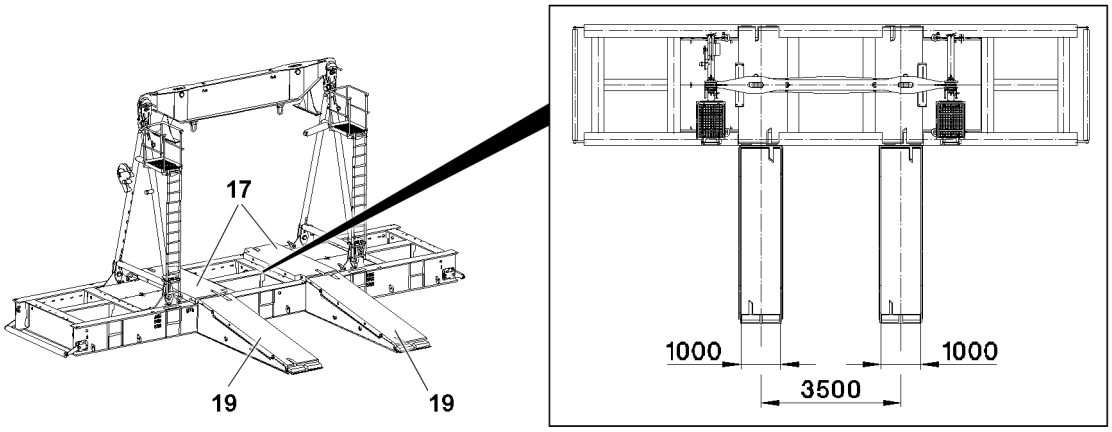

Fig.124986: Ramps on ballast pallet

- ▶ Make sure that mats **17** are positioned on the ballast pallet.
- ▶ Position ramps **19** on the ballast pallet.

	LTR 1220	LTR 1100
Track width	3500 mm	3400 mm

Track width depending on the crane type

- ▶ Set the track width LTR.

NOTICE
Camera support is in operating position!
Damage of camera support.
- ▶ Before moving on the ballast pallet: Fold the camera support in.

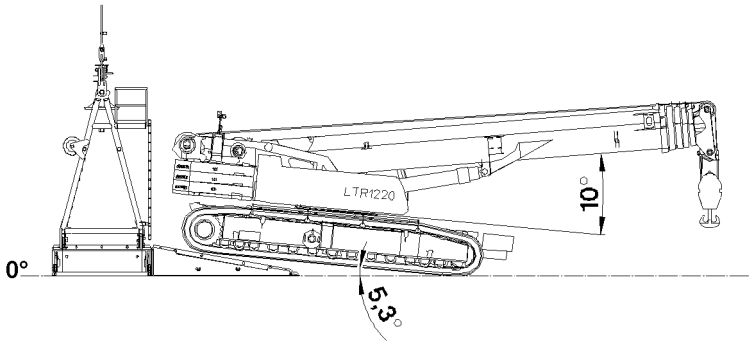

Fig.124983: LTR on ramp

- ▶ Move the LTR on the ramp

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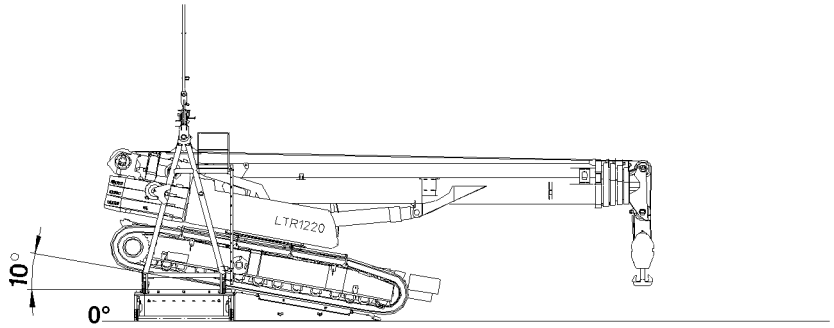

Fig.124984: LTR on tipping point

▶ Move LTR on tipping point.

LTR 1220 and LTR 1100 must be in certain positions of the ballast pallet.

WARNING
Position of LTR on ballast pallet is impermissible!
The crane can topple over. Death, severe bodily injuries, property damage.
▶ Make sure that the center of gravity of the LTR in travel direction is maximum ± 150 mm outside the center of the ballast pallet (±2.5° incline): Adhere to the distance **A**. See section „Determining the position of the LTR on the ballast pallet“.

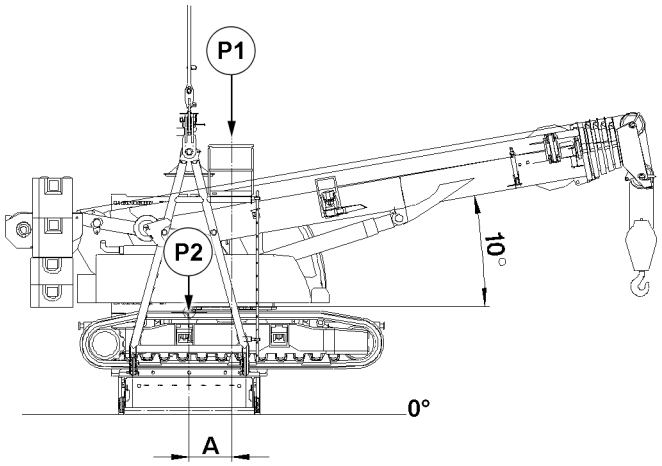

Fig.124989: Position LTR 1100 on ballast pallet

▶ Position the LTR on the ballast pallet: Establish distance **A**.

9.5 Placing the ballast plates, fastening system: „Twistlock“

Make sure that the following prerequisites are met:
– Ballasting **without** LTR: Mats on ballast pallet are removed.
– Centerings are installed on the ballast pallet depending on the ballast plates.
– Rules for ballasting are complied with.

WARNING
Receptacle stud **not** permissible for ballast plates!
Overload and damage of the receptacle stud. Death, severe injury, property damage.
▶ Use a permissible receptacle stud for ballast plates 10 t.
▶ Use a permissible receptacle stud for ballast plates 12.5 t.
▶ Replace damaged receptacle stud.

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WARNING
More than two ballast plates lifted with the receptacle stud!
Overload and damage of the receptacle stud. Death, severe injury, property damage.
- ▶ Lift maximum two ballast plates with receptacle stud.
- ▶ Make sure that the ballast plates are placed correctly in the centerings of the receptacle stud.
- ▶ Replace damaged ballast plates.

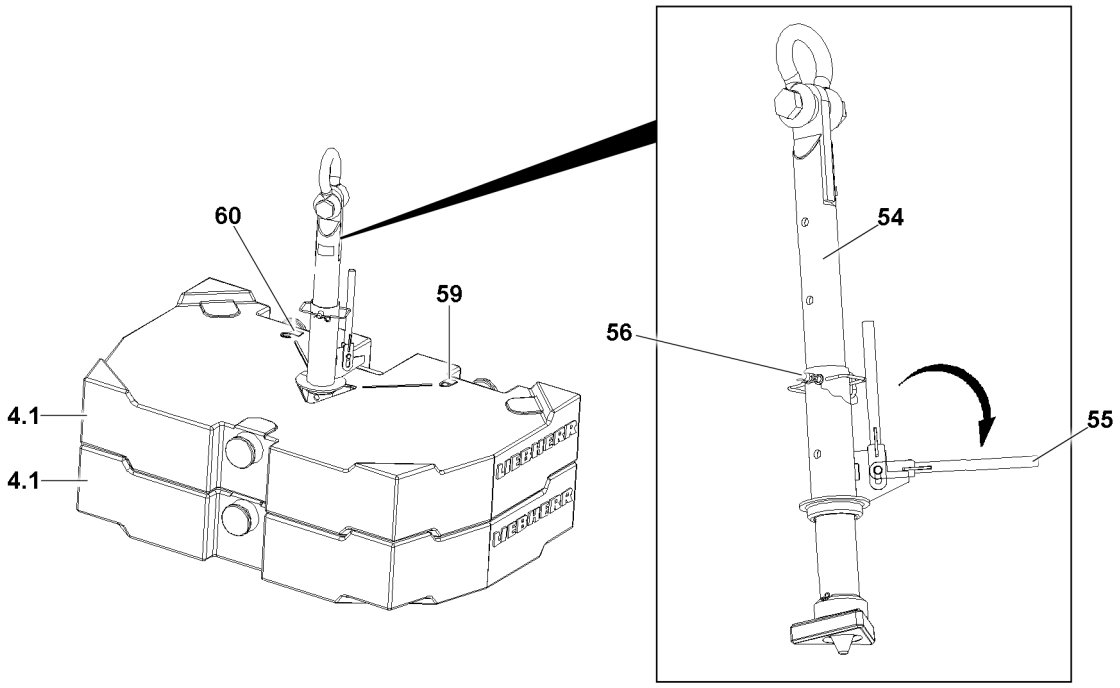

*Fig.126074: Receptacle stud with two 10 t ballast plates **4.1***

Ballast plates can be placed individually or as an assembly of maximum two ballast plates.

Before the receptacle stud **54** is guided into the ballast plates, it must be ensured that the length of the receptacle stud **54** is set correctly. The length of the receptacle stud **54** can be adjusted with the pin **56**.

- ▶ Release and unpin the pin **56**.
- ▶ Adjust the length of the receptacle stud by moving the receptacle stud **54**.
- ▶ Insert the pin **56** and secure with the spring retainer.
- ▶ Attach the receptacle stud **54** with fastening equipment on the auxiliary crane and guide it into the ballast plate(s).
- ▶ Pull the lever **55** up and fold it down.

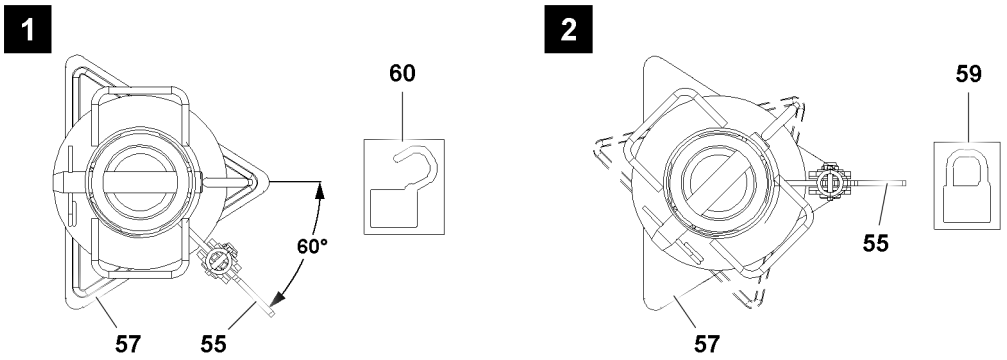

*Fig.126075: Receptacle stud overhead view, positions lever **55***

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▶ Turn the lever **55** by 60°, see illustration **1** until the lever **55** points on the icon **59**, illustration **2**.

Result:

– The receptacle stud **54** is locked with the ballast plate.

▶ Lift the ballast plate individually or as an assembly with the auxiliary crane and place it carefully on the centerings of the ballast pallet or on another ballast plate.

When the ballast plate is placed:
▶ Turn the lever **75** by 60° until the lever **75** points to the icon **60**, see illustration **1**.

Result:

– The receptacle stud is unlocked.

▶ Carefully pull the receptacle stud **54** from the ballast plate.
▶ Place the number of ballast plates according to the erection charts and the load charts.

9.6 Placing the ballast plates, fastening points: „Bitt“

Make sure that the following prerequisites are met:
– Ballasting **without** LTR: Mats on ballast pallet are removed.
– Centerings for ballast plates are installed on the ballast pallet.
– Rules for ballasting are complied with.

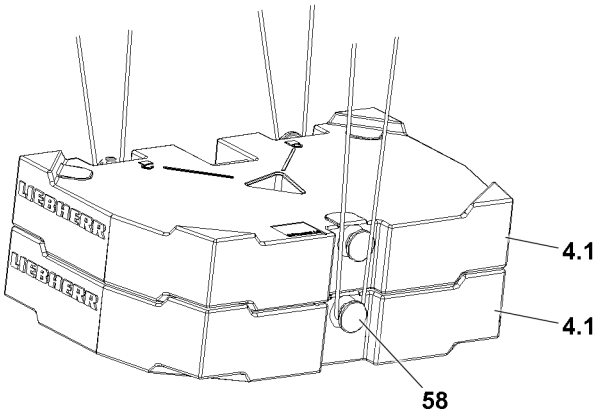

Fig.126076: Ballast assembly with two ballast plates 10 t ***4.1***

WARNING
Exceeding permissible load!
Overload Bitt **58** Falling ballast plates.
Death, severe injury, property damage.

When 10 t ballast plates are used:
▶ Lift no more than maximum 20 t with ropes, three fastening points.

When 12.5 t ballast plates are used:
▶ Lift no more than maximum 25 t with ropes, four fastening points.
▶ Replace damaged ballast plates immediately.

WARNING
Fastening equipment is **not** properly fastened and **not** secured sufficiently to prevent it from releasing!
Falling ballast plates. Death, severe bodily injuries, property damage.
▶ Attach the fastening equipment properly on bitts **58** and secure it to prevent it from releasing.

Ballast plates can be placed individually or as an assembly of maximum two ballast plates.

▶ Lift the ballast plate individually or as an assembly with the auxiliary crane and place it carefully on the centerings of the ballast pallet or on another ballast plate.

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▶ Place the number of ballast plates according to the erection charts and the load charts.

10 Crane operation with the derrick ballast

10.1 Function check of the ground contact switch

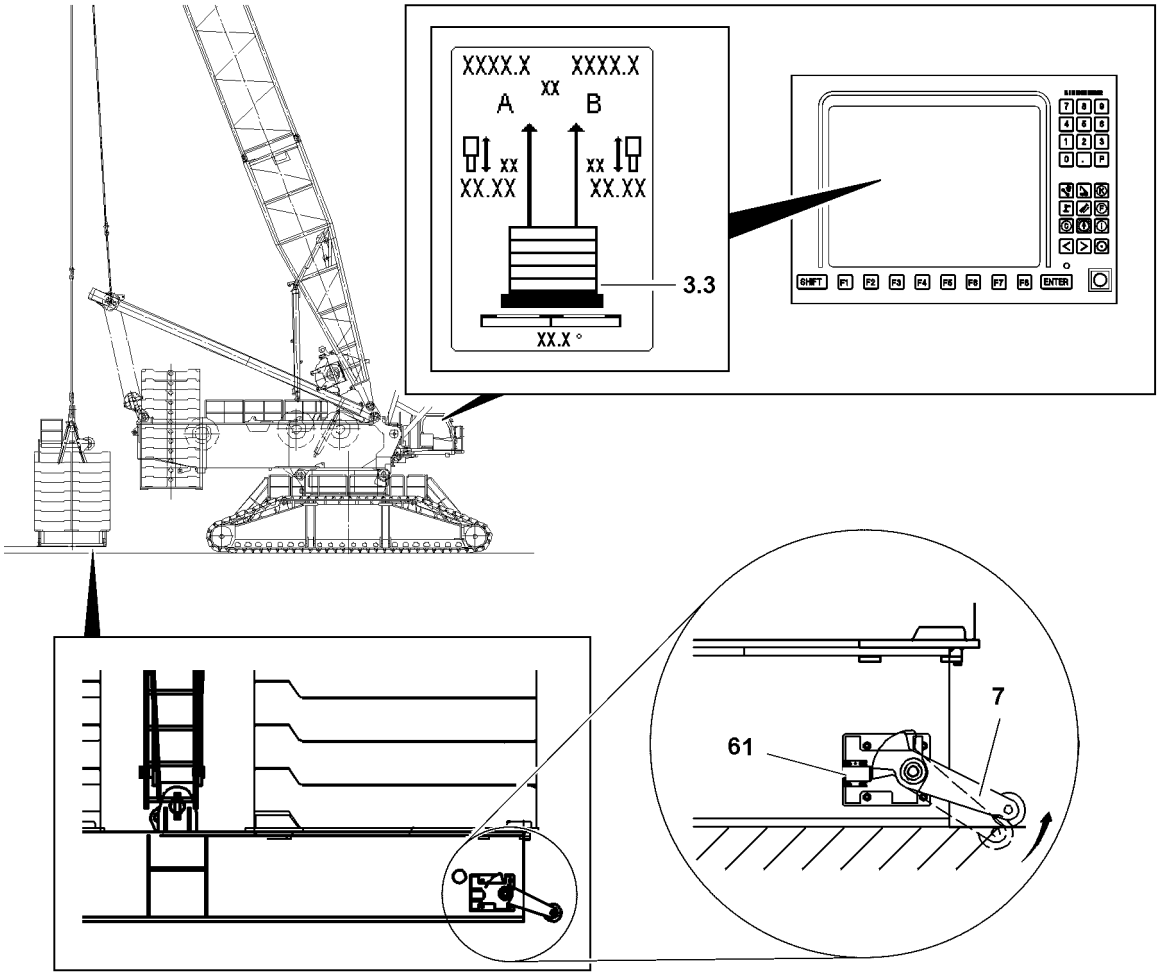

Fig.145935

Make sure that the following prerequisites are met:
– The electrical connection between the derrick ballast and the turntable has been established.
– The cable drum pull release is fastened to the turntable.

DANGER
Danger of accident if the derrick ballast touches the ground unintentionally!
If the terrain is very uneven, the danger exists that the derrick ballast rests on the ground even if a ground contact switch **61** was not actuated.
▶ If the ballast pallet touches the ground, **at least one** ground contact switch **61** must be actuated via the ground contact roller **7**.

▶ Check the ease of movement of the ground contact roller **7**.
▶ Manually operate the ground contact roller **7**.

Result:

– The ground contact switch **61** is actuated.
– The LICCON monitor displays derrick ballast has ground contact **3.3** - the „turning the turntable“ and „driving the crawler“ crane movements are deactivated.

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10.2 Lifting and lowering the derrick ballast using the pull cylinders

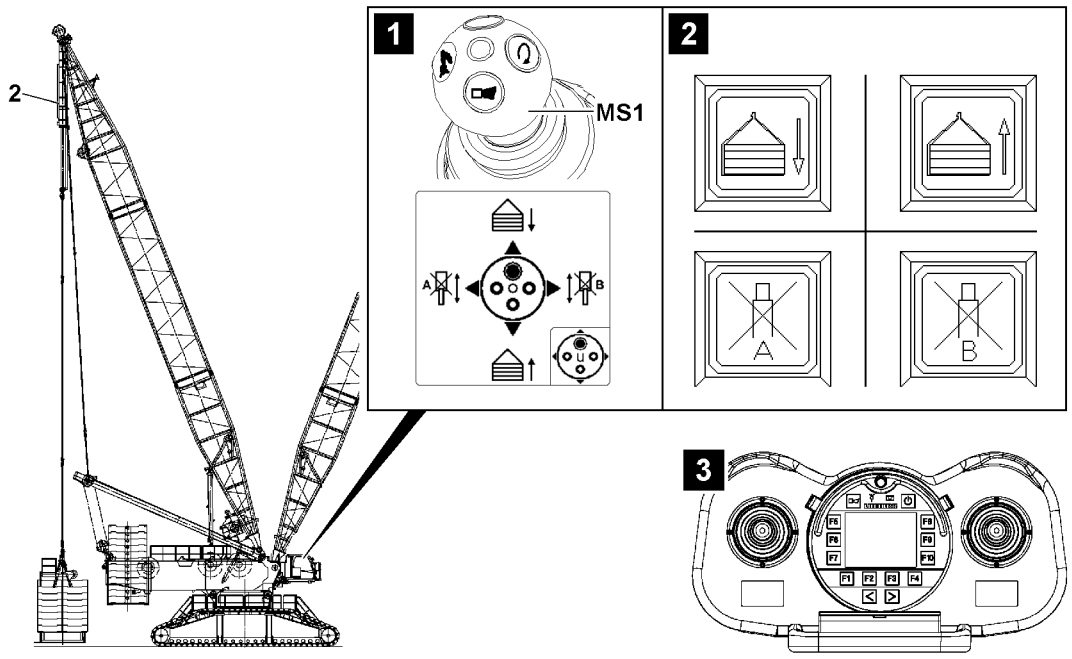

Fig.145937

The pull cylinders **2** in the derrick ballast guying can be operated in different ways:
- Operation with master switch **MS1** in the corresponding master switch assignment, see illustration **1**
  - Select the master switch assignment for master switch MS1, see chapter 4.01.
- Operation with operating buttons on the instrument panel, see illustration **2**

There is an additional operating option in assembly operation:
- Operation with the radio remote control (BTT-E), see illustration **3**
  - Operation with the manual control lever in the corresponding assembly menu, see the radio remote control operating instructions.

Note
- ▶ If the derrick ballast is raised or lowered using the pull cylinder **2**, then the horizontal alignment of the derrick ballast is automatically regulated by both length sensors of the pull cylinder **2**.
- ▶ For a ballast utilization of **more than** or **equal to** 90 percent, the level sensor regulates the pull cylinder **2** to a difference of 1 cm.
- ▶ With a ballast utilization of **less than** 90 percent, the level sensor monitors the derrick ballast level to ± 2.5°. This makes it possible to set the derrick ballast down up to a ground slope of 2.5°.

DANGER
Danger of accident!
If the following notes are not observed, personnel can be severely injured or killed.
In addition, this can result damage to the derrick ballast.
- ▶ Pay attention to the horizontal alignment of the derrick ballast when lifting and lowering the derrick ballast.
- ▶ When lifting and lowering the derrick ballast, check the forces in the D-guyings regularly on LICCON monitor 1. If the difference of forces between „derrick ballast guying A“ and „derrick ballast guying B“ is too large, an acoustic warning sounds and the values on the LICCON monitor 1 blink, see section „Differential force monitoring of Derrick ballast guying“.
- ▶ When adjusting manually (block pull cylinder A or pull cylinder B) the regulation is deactivated and the derrick ballast can be inclined within the limited angle range. This is exclusively permitted when setting down the derrick ballast on uneven ground and only by observing utmost caution.

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During crane operation with derrick ballast the required maximum / minimum load can be actively influenced.

This is made possible by increasing or reducing the derrick ballast. Depending on the situation, this procedure is also possible under load.

Note

- The suspended ballast and the ballast trailer are generally referred to as the **derrick ballast**.
- The fixed compensation weight that is installed on the turntable is generally referred to as the **counterweight**.
- Additional personnel to carry out crane operation is generally referred to as **guide**.

- Operate the crane function to lift and lower the derrick ballast, see section „Carrying out crane movements“

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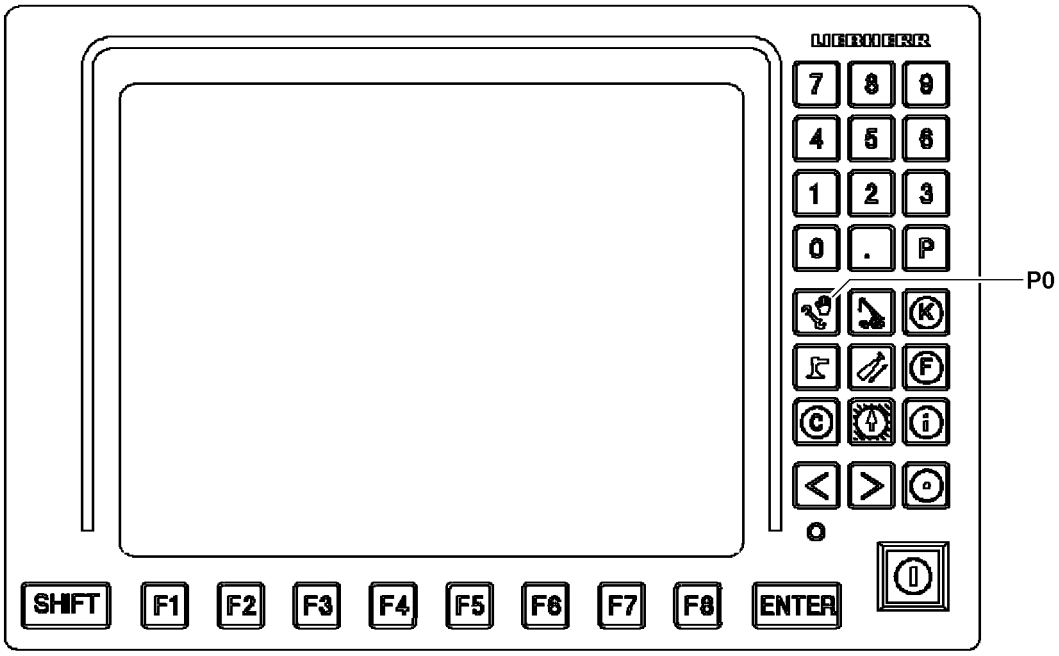

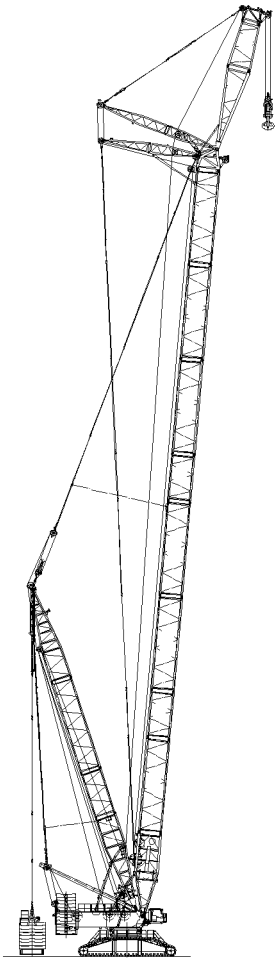

Fig.122800

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10.3 Checking the settings of the LICCON overload protection

Make sure that the following prerequisites are met:
- The derrick ballast is placed according to the load chart.
- The actual placed derrick ballast has been entered and confirmed in the Set up program, see Crane operating instructions, chapter 4.02.
- The derrick boom is in operating position.

WARNING
Incorrectly set overload protection!
If the actual set up configuration of the crane deviates from the entries and settings in the Set up program, then the overload protection is not correctly set.
An incorrectly set overload protection calculates the actual load incorrectly and transmits faulty display values.
The crane can be overloaded unnoticed and topple over.
This could result in serious accidents.
▶ The entries and settings in the set up program must match the actual set up configuration of the crane.

Note
▶ Set the LICCON overload protection in the set up program, see Crane operating instructions, chapter 4.02.

▶ Press the program key **P0**.

Result:

– The Set up program is called up.

▶ In the monitor display of the Set up program check if the LICCON overload protection is set according to the data in the load chart and the actual set up configuration of the crane, see example illustration.

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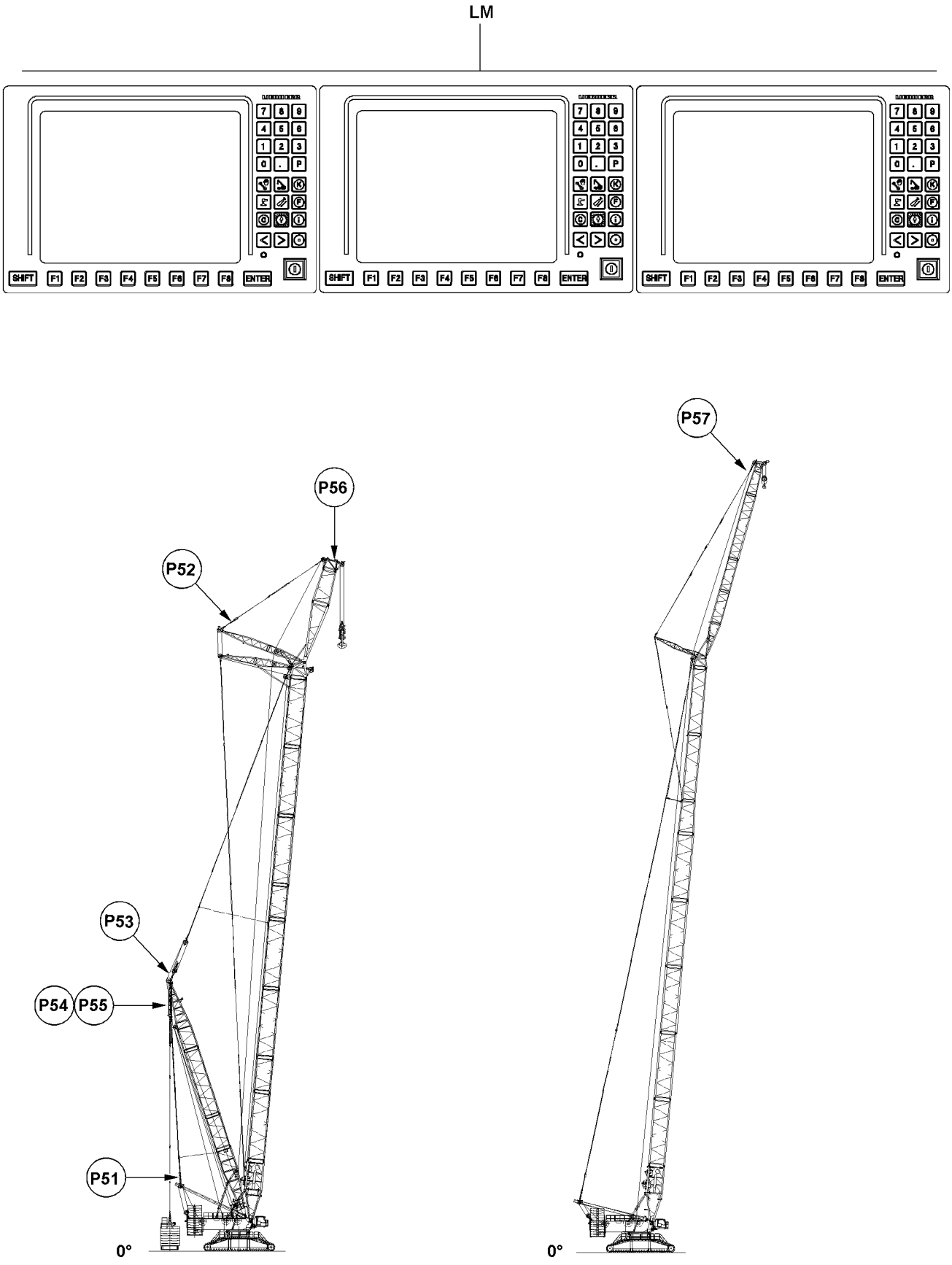

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Fig.122806

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10.4 F-load display for operating modes with derrick ballast

Assignment of test points for operating modes with derrick ballast:

– Force in the guying between A-frame and derrick head:
  - Test point 1 on point **P51** = force F1
  - The display is made in the F-load display in the center LICCON monitor **LM**.
– Force in the guying between WA-frame and accessory head:
  - Test point 2 on point **P52** = force F2
  - The display is made in the F-load display in the center LICCON monitor **LM**.
    Note: Only for the respective boom system.
– Force in the guying between the main boom head and the derrick head:
  - Test point 3 on point **P53** = force F3
  - The display is made in the F-load display in the center LICCON monitor **LM**.
– Force in the guying between derrick ballast and derrick head:
  - Test point 4/5 on point **P54/55** = force F4/5
  - The display is made in the display of the derrick ballast in the left LICCON monitor **LM**.
– Force on the pressure test bracket boom nose:
  - Test point 6 on point **P56** = force F6
  - The display is made in the actual load display in the right LICCON monitor **LM**.
    Note: Only with existing boom nose.
– Force in the guying between the FA-frame and the accessory head:
  - Test point 11 on point **P57** = force 11
  - The display is made in the actual load display in the center LICCON monitor **LM**.
    Note: Only for the respective boom system

Note

▶ For a detailed description of the displays for crane operation with derrick ballast, see the Crane operating instructions, chapter 4.02.

WARNING

Overloading / toppling of the crane!
If the permissible display values of the F-load display are exceeded / fallen below, then the crane can be overloaded.
This could result in serious accidents.

▶ Observe and adhere to the display values on the LICCON monitors.
▶ Observe and adhere to the specifications regarding the limit values on the assembly drawings.

Note

The values of the F-load display depend on the set up configuration of the crane and the crane geometry.
The values of the F-load display change continuously when the crane is moved.

▶ Monitor the F-load display continuously.

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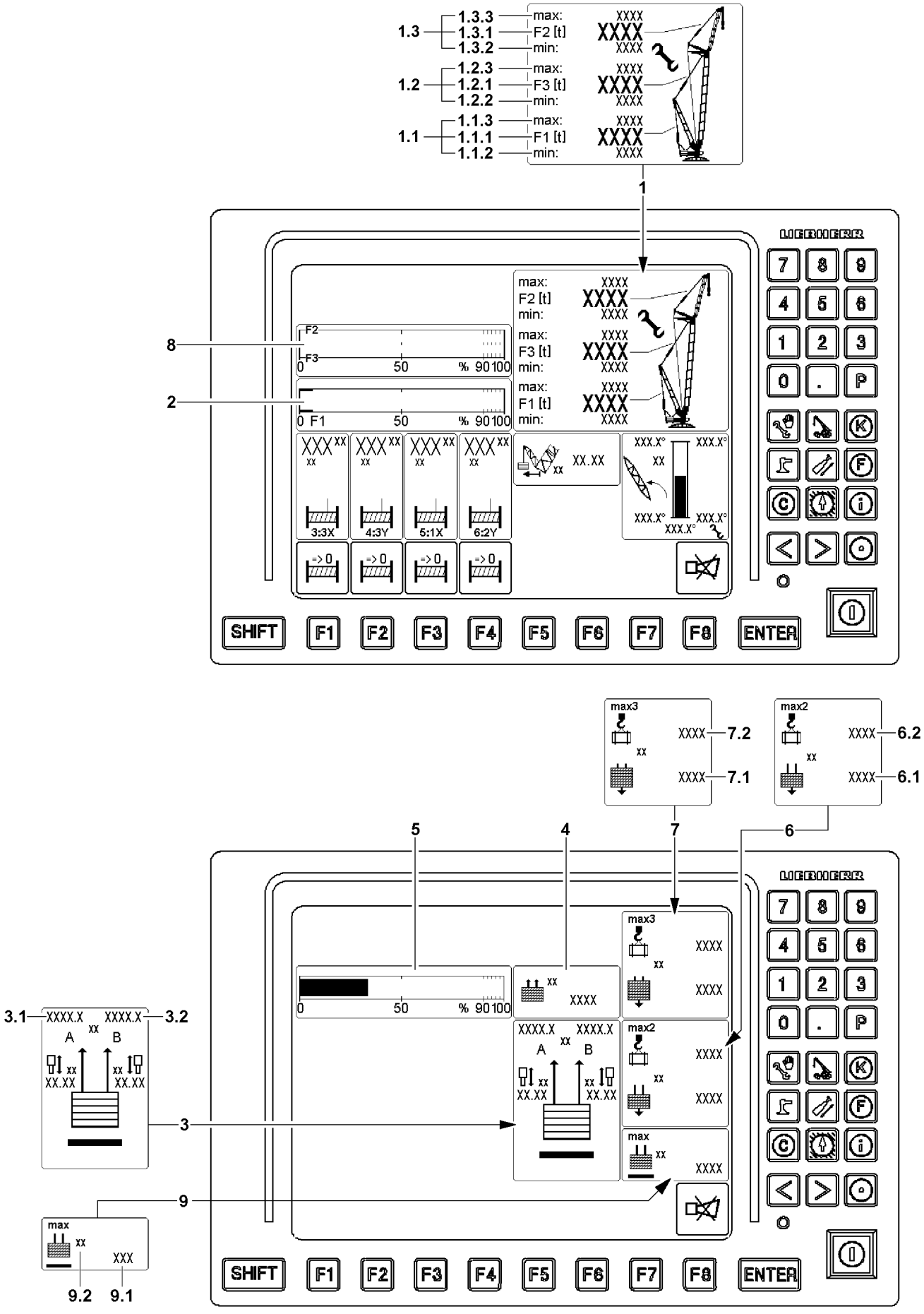

Fig.146968

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10.4.1 Force F1 (test point 1)

The force F1 (test point MS1) is determined in the guying between the A-frame and the derrick head and displayed in the LICCON monitor as operating force $F1_{actual}$.

Display values of force F1 (test point MS1) on the F-load display **1**:
- F1-maximum ($F1_{max}$) **1.1.3** = maximum value F1-force
- F1-actual value ($F1_{actual}$) **1.1.1** = actual value F1-force (operating force F1)
- F1-minimum ($F1_{min}$) **1.1.2** = minimum value F1-force

Structure of the F1-utilization bar **2**:
- Ratio of operating force $F1_{actual}$ to F1 maximum force

10.4.2 Force F2 (test point 2) and force F3 (test point 3)

The force F2 (test point 2) is determined between the WA-frame and the accessory head and displayed in the LICCON monitor as operating force $F2_{actual}$. A display is made only with the respective boom system.

The force F3 (test point 3) is determined between the main boom head and the derrick head and displayed in the LICCON monitor as operating force $F3_{actual}$.

Display values of force F2 (test point MS2) in the F-load display **1**:
- F2-maximum ($F2_{max}$) **1.3.3** = maximum value F2-force
- F2-actual value ($F2_{actual}$) **1.3.1** = actual value F2-force (operating force F2)
- F2-minimum ($F2_{min}$) **1.3.2** = minimum value F2-force

Display values of force F3 (test point MS3) in the F-load display **1**:
- F3-maximum ($F3_{max}$) **1.2.3** = maximum value F3-force
- F3-actual value ($F3_{actual}$) **1.2.1** = actual value F3-force (operating force F3)
- F3-minimum ($F3_{min}$) **1.2.2** = minimum value F3-force

Composition of the F2 / F3-utilization bar **8**:
- Ratio of operating force $F2_{actual}$ to F2 maximum force $F2_{max}$
- Ratio of operating force $F3_{actual}$ to F3 maximum force $F3_{max}$
- The F2/F3-utilization bars **8** appear only in assembly operation

In crane operation, the display values are displayed clearly for information. A special monitoring does not occur.

In assembly operation the display values are monitored. The limit values may not be exceeded.

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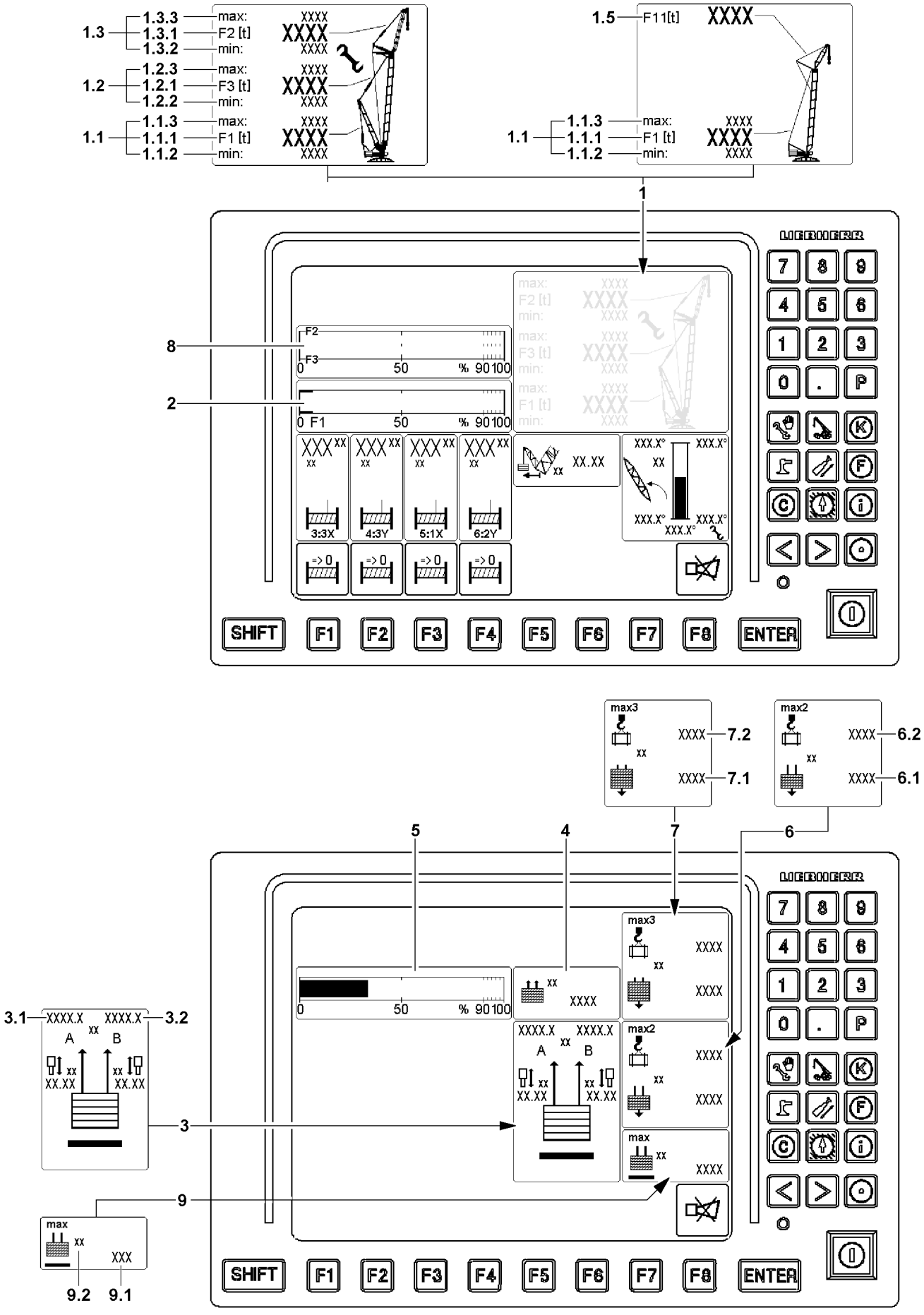

Fig.146967

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10.4.3 Force F4/5 (test point 4/5)

The forces F4/5 (test point 4/5) are effective in the guy rods from the derrick ballast to the derrick head.

The existing forces in the guy rods are calculated from four pressure sensors, which are installed on the pull cylinders.

Test points guying A (left) are:
- Test point 4A = pressure sensor ring surface left (force F4A)
- Test point 5A = pressure sensor piston surface left (force F5A)

Test points guying B (right) are:
- Test point 4B = pressure sensor ring surface right (force F4B)
- Test point 5B = pressure sensor piston surface right (force F5B)

Display values of force F4/5 (test point 4/5) in icon Guying derrick ballast **3**:
- Force in the derrick ballast guying A **3.1**
- Force in the derrick ballast guying B **3.2**

Display values derrick ballast:
- Currently pulled derrick ballast = BA_{pulled} **4**
- Current utilization of derrick ballast = Utilization bar derrick ballast **5**
- Currently placed derrick ballast = BA_{placed} **6.1**

From the sum of derrick ballast guying A **3.1** and derrick ballast guying B **3.2** is the pulled derrick ballast BA_{pulled} **4** calculated.

If the ballast still has ground contact, then only that part of the ballast is displayed which is pulled up by the D-guying. The remaining part is laying correspondingly on the ground.

Composition of utilization bar derrick ballast **5**:
- Ratio of pulled derrick ballast (BA_{pulled} **4**) to placed derrick ballast (BA_{placed} **6.1**)

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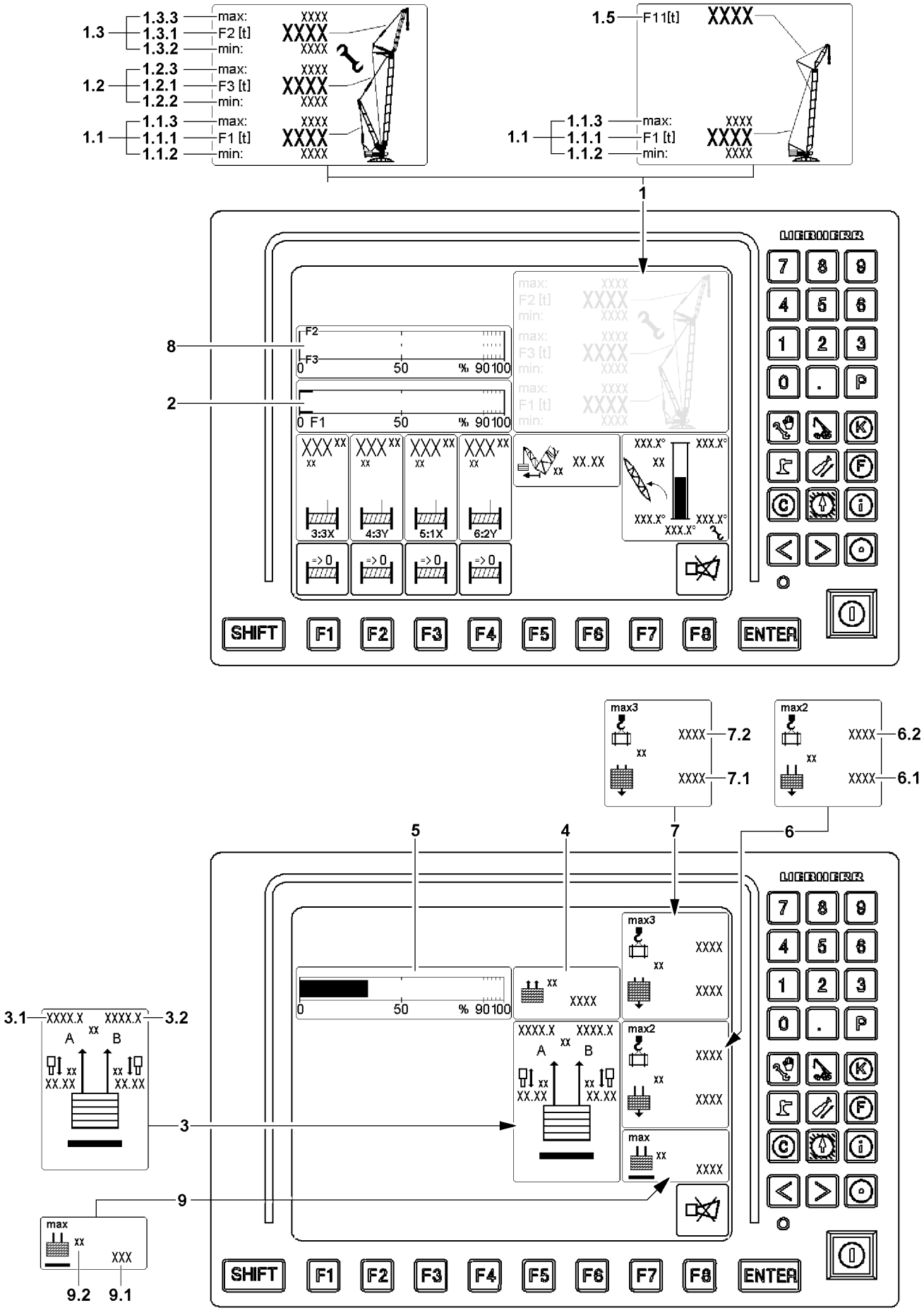

Fig.146967

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10.4.4 Maximum liftable derrick ballast

The *maximum liftable derrick ballast* **9** refers to the current crane condition and indicates the maximum derrick ballast that can be lifted off the ground with the pull cylinder or off the suspended ballast palette in case of the VarioTray without falling below the $F1_{min}$ force.

- **9** *Maximum liftable derrick ballast* icon
- **9.1** Maximum liftable derrick ballast
  - Maximum derrick ballast
- **9.2** Measuring unit
  - Measuring unit for display values in the *Pulled derrick ballast* icon **9**: [t] or [lb]

10.4.5 Force F11 (test point 11)

Force in the guying between the FA-frame and the accessory head:

Display values of force F11 (test point MS11) on the F-load display **1**:
- F11-actual value ($F11_{actual}$) **1.5** = actual value F11-force (operating force F11)

10.4.6 Additional displays

- „Load max2“ icon **6** (see section „Utilization conditions“)
- Currently placed derrick ballast = BA_{placed} (Input value in set up program) **6.1**
- Possible load with currently placed derrick ballast = $Load_{max2}$ **6.2**
- „Load max3“icon **7** (see section „Utilization conditions“)
- Maximum derrick ballast according to load chart = BA_{max} **7.1** (Highest value in Set up program)
- Possible load with maximum derrick ballast according to load chart = $Load_{max3}$ **7.2**

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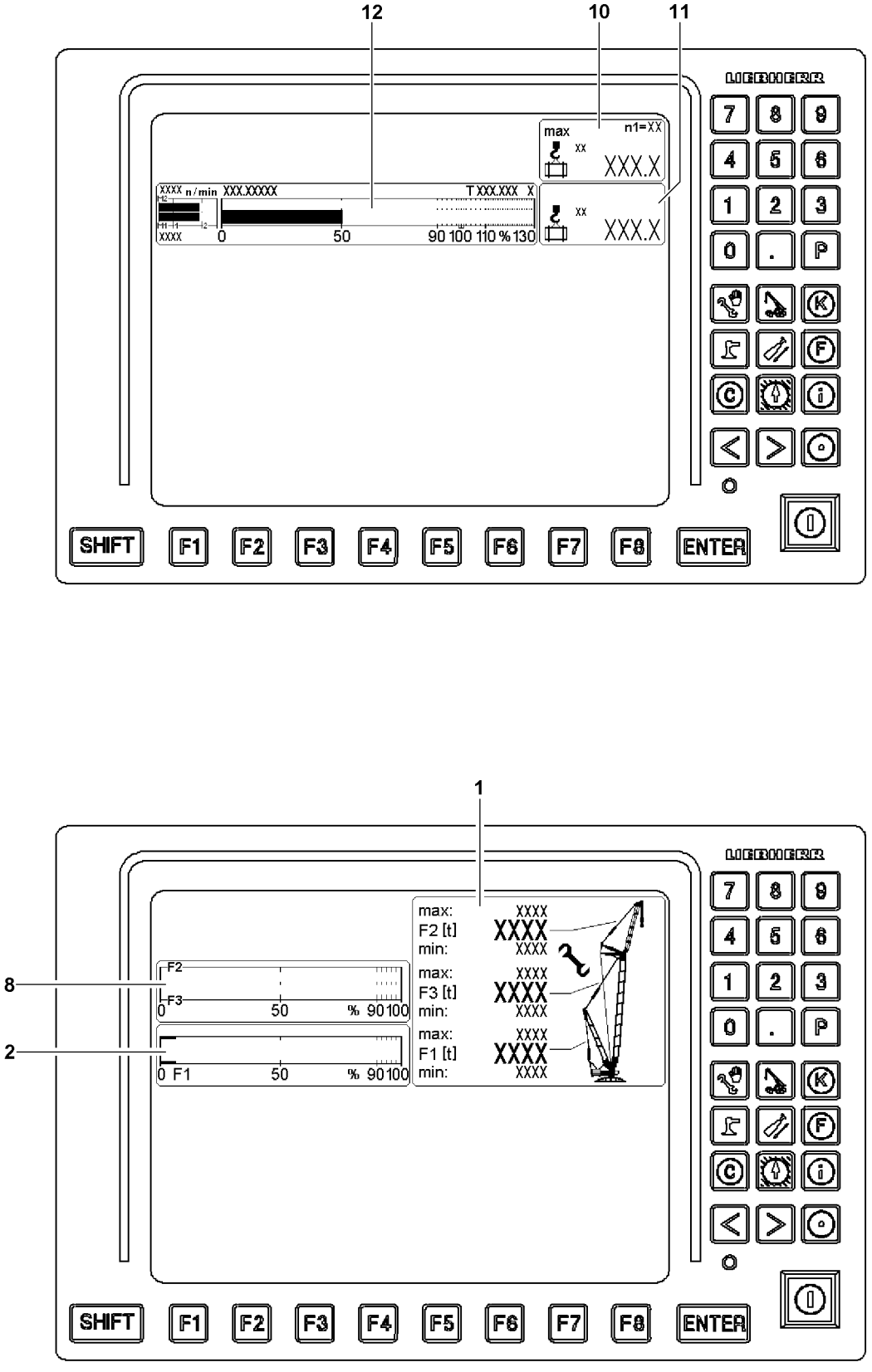

Fig.122808

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10.5 Monitoring of crane utilization in operating modes with derrick ballast

Note

- ▶ The icon illustrations of the LICCON monitors are examples and may not match your crane.
- ▶ The icon illustrations of the LICCON monitors can deviate in number, arrangement and depiction of the icons on your crane.
- ▶ Observe the Crane operating instructions, chapter 4.02.

WARNING

Incorrect display values!

If the display values do not increase correspondingly when lifting known weights, an erroneous display value may be present.

If the crane is operated with erroneous display values, then the crane can be overloaded.

This could result in serious accidents.

- ▶ When lifting the hook block off the ground check if the display value for the actual load increases correspondingly.
- ▶ When lifting the derrick ballast off the ground check if the display value for the pulled derrick ballast (BA_{pulled}) increases correspondingly.
- ▶ When lifting the load off the ground check if the display value for the actual load increases correspondingly.

In operating modes with derrick ballast, the monitoring of the crane utilization includes, among others:

1. Monitoring of load torque
   Via the „Maximum load“ icon **10**, „Actual load“ icon **11** and the „utilization bar diagram“ **12**.
2. Utilization conditions
   Support the crane driver with additional display values.
3. Monitor the F-load display **1**.
   Supported by the F1-utilization bar **2** and possibly the F2/F3-utilization bar **8**.

10.5.1 Monitoring of load torque

It monitors the „maximum load according to the load chart and reeving“.

In crane operation, the actual load is compared with the maximum load which may be lifted in the current crane configuration. The display of the values is made in the icon „Maximum load“ **10** and in icon „actual load“ **11**. The current percentage utilization is displayed as „bar diagram utilization“ **12** in the right LICCON monitor.

The color of the utilization bar in the „bar diagram utilization“ **12** also displays the crane utilization:

- Utilization bar blue / green (below 90 %): Utilization in permissible range
- Utilization bar yellow (90 % to 100 %): Advance warning. - Utilization just before impermissible range
- Utilization bar red (above 100 %): Warning. - Utilization in impermissible range

Note

- ▶ Procedure for optimum utilization of „maximum load according to load chart and reeving“, see section „Utilization conditions“.

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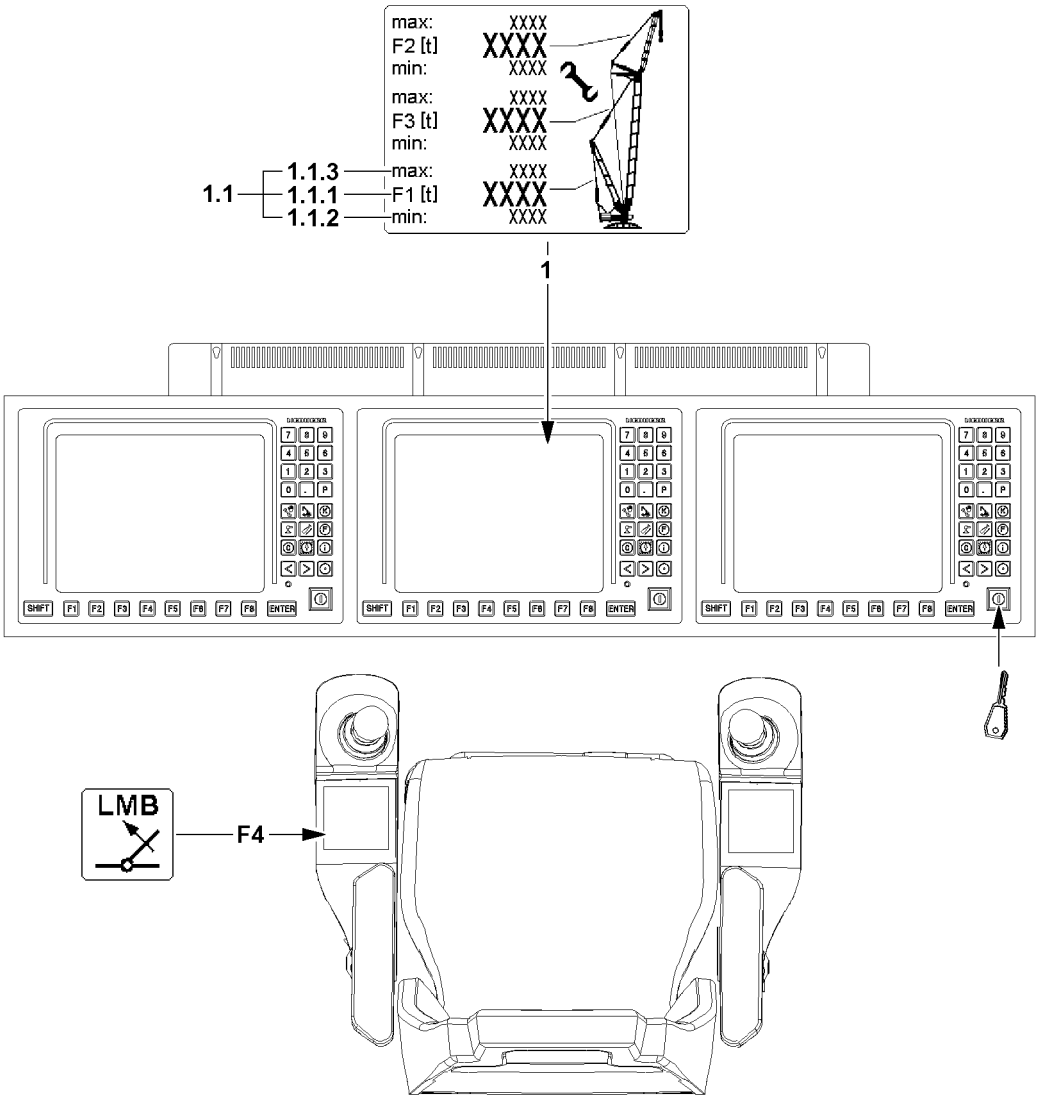

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Fig.122809

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WARNING
Access the functionality of the LICCON overload protection!
When accessing the functionality of the LICCON overload protection by activating assembly operation, the LICCON overload protection is totally deactivated, bypassed or limited.
It is possible to exceed several shut-off limits of the LICCON overload protection simultaneously or one after the other.
It is possible to carry out crane movements, which are not monitored by the LICCON overload protection.
Without the LICCON overload protection, no additional protection against overload of the crane via the crane control is present.
This could result in serious accidents.
- ▶ When accessing the functionality of the LICCON overload protection, take into account that the LICCON overload protection is deactivated totally or is limited.
- ▶ When accessing the functionality of the LICCON overload protection, the Crane operating instructions, chapter 4.02 must be observed.

WARNING
The crane can topple over!
In assembly operation the LICCON overload protection is deactivated.
In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over.
Personnel can be killed.
This could result in high property damage.
- ▶ Activate the assembly operation only when the consequences are known.
- ▶ Enter the set up configuration correctly into the LICCON computer system.
- ▶ Observe the erection / take down charts.
- ▶ Crane operation with deactivated LICCON overload protection is prohibited.
- ▶ In assembly operation only load torque reducing crane movements may be carried out until a permissible operating and load range.
- ▶ The crane operator carries complete and sole responsibility for his actions if the LICCON overload protection is deactivated.

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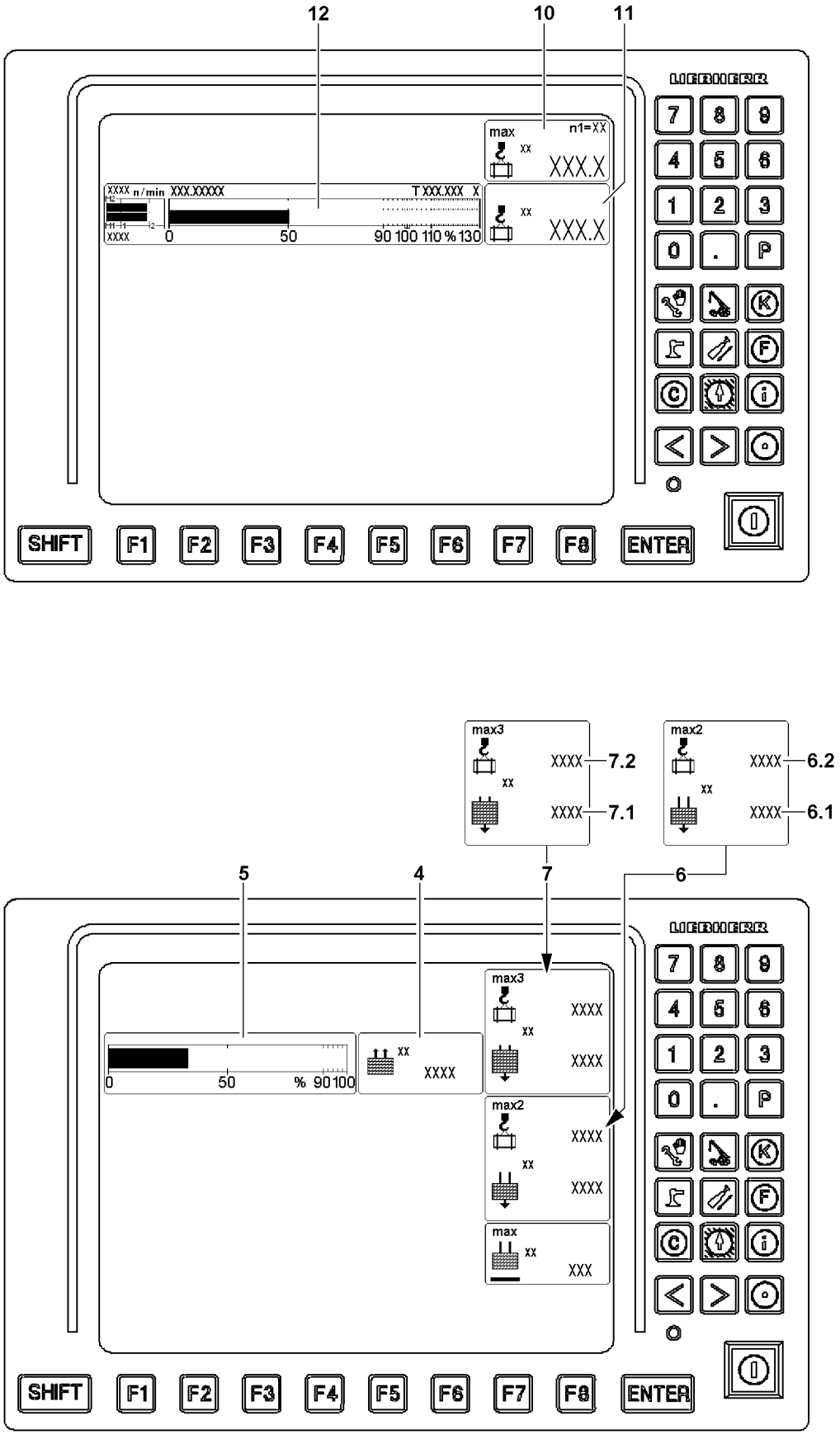

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Fig.146966

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10.5.2 Utilization conditions

The current percentage utilization of the crane is displayed as „bar diagram utilization“ **10** in the right LICCON monitor.

Additional displays:
- **6** „Load max2“ icon
  - Currently placed derrick ballast = BA_{placed} (Input value in set up program) **6.1**
  - Possible load with currently placed derrick ballast = $Load_{max2}$ **6.2**
- **7** „Load max3“ icon
  - Maximum derrick ballast according to load chart = BA_{max} **7.1** (Highest value in Set up program)
  - Possible load with maximum derrick ballast according to load chart = $Load_{max3}$ **7.2**

Maximum load, right LICCON monitor:
- The maximum load in the current operating condition is reached when the utilization bar shows 100 % in the „bar diagram utilization“ **12**.
  This is the case when the „utilization of the crane according to the load chart and reeving“ reaches 100 % (Values in icon „Maximum load“ **10** and in icon „actual“ **11** are equal).
  When the „Maximum load“ **10** is smaller or the same as the $load_{max2}$ **6.2**, then an increase might possibly be obtained:
  - By increasing the pulled derrick ballast BA_{pulled} **4**, if the utilization bar derrick ballast **5** is not yet at 100 % (derrick ballast not suspended).
  - By increasing the derrick ballast when the BA_{placed} **6.1** is smaller than BA_{max} **7.1**.
  - By changing the derrick ballast radius within the permissible range, see load chart manual or LICCON job planner.

max2-load, icon „load max2“ **6**:
- The highest possible load in current operating condition **„max2-load“** is reached when in the „bar diagram utilization“ **12** 100 % is shown **and** the utilization bar derrick ballast **5** is at 100 % (Derrick ballast is completely lifted off the ground).
  This is the case when the value in icon „Actual load“ **11** is the same as the $load_{max2}$ **6.2**.
  When the $load_{max2}$ **6.2** is smaller or the same as the $load_{max3}$ **7.2**, then an increase might possibly be obtained:
  - By increasing the derrick ballast by loading additional ballast plates (increase BA_{placed} **6.1** to BA_{max} **7.1**).

max3-load, icon „load max3“ **7**:
- The highest possible load at the maximum derrick ballast in current operating condition **„max3-load“** is reached when the „bar diagram utilization“ **12** displays 100 % **and** the utilization bar derrick ballast **5** is at 100 % (Derrick ballast according to load chart is placed and is completely lifted off the ground).
  This is the case when the value in icon „Actual load“ **11** is the same as the $load_{max3}$ **7.2**.
- The maximum derrick ballast according to the load chart is placed and completely pulled. Further increase of the derrick ballast is impermissible.

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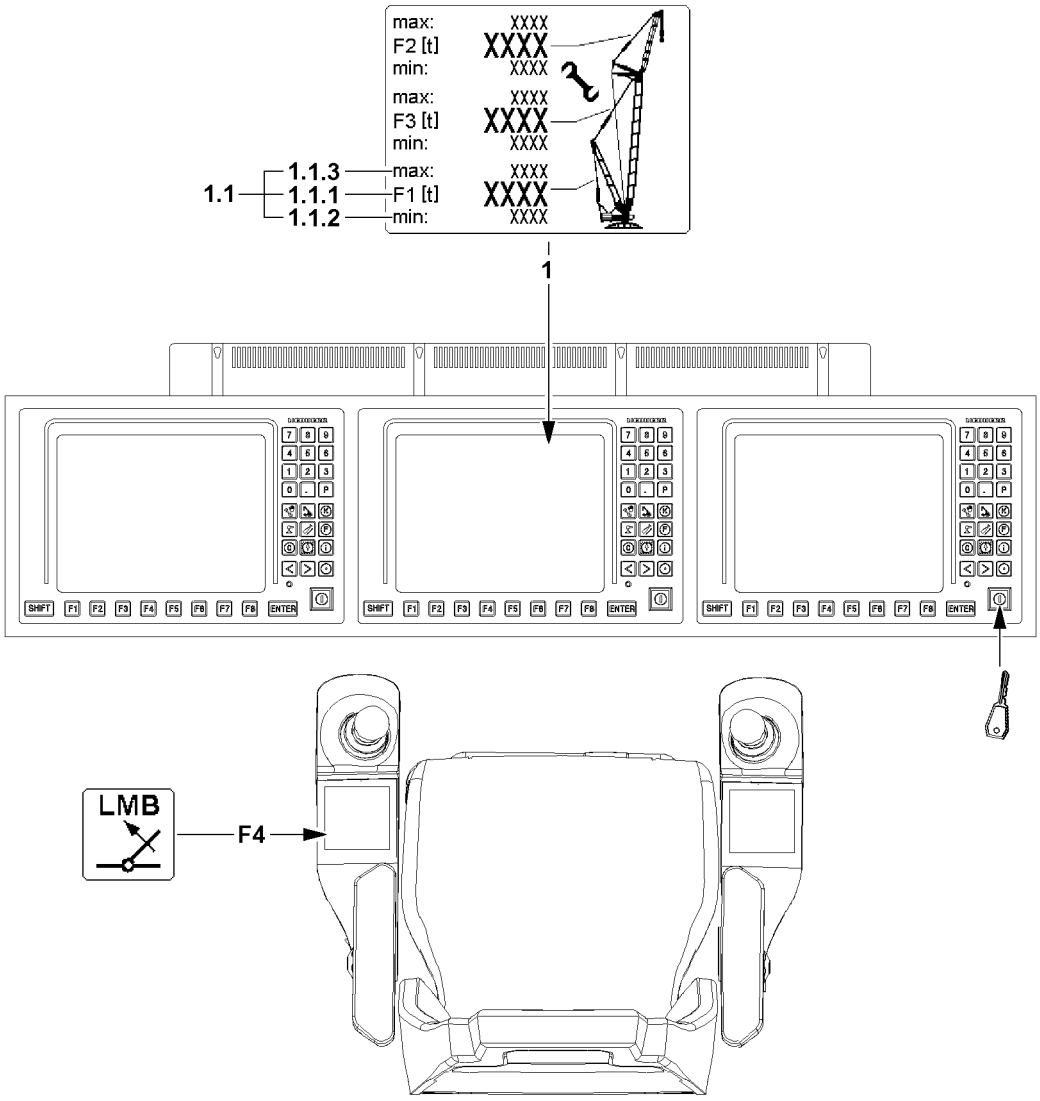

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10.5.3 Monitoring of F1-maximum force

Display values of force F1 (test point MS1) on the F-load display **1**:
- F1-maximum ($F1_{max}$) **1.1.3** = maximum value F1-force
- F1-actual value ($F1_{actual}$) **1.1.1** = actual value F1-force (operating force F1)
- F1-minimum ($F1_{min}$) **1.1.2** = minimum value F1-force

The display values of force F1 (test point 1) are displayed permanently in the LICCON monitor. At F1-actual value ($F1_{actual}$) **1.1.1** larger F1-maximum ($F1_{max}$) **1.1.3** a shut off of all load moment increasing movements occurs.

WARNING
Access the functionality of the LICCON overload protection!
When accessing the functionality of the LICCON overload protection by activating assembly operation, the LICCON overload protection is totally deactivated, bypassed or limited.
It is possible to exceed several shut-off limits of the LICCON overload protection simultaneously or one after the other.
It is possible to carry out crane movements, which are not monitored by the LICCON overload protection.
Without the LICCON overload protection, no additional protection against overload of the crane via the crane control is present.
This could result in serious accidents.
- ▶ When accessing the functionality of the LICCON overload protection, take into account that the LICCON overload protection is deactivated totally or is limited.
- ▶ When accessing the functionality of the LICCON overload protection, the Crane operating instructions, chapter 4.02 must be observed.

Note
The limit value for the F1-maximum force depends not only on the set up configuration and the crane geometry, but also from the pulled derrick ballast.
- ▶ If the pulled derrick ballast is larger, then the limit value for the F1-minimum force is generally reduced.
- ▶ If the pulled derrick ballast is smaller, then the limit value for the F1-maximum force is generally increased.

Note
By engaging the assembly operation the limit value for the F1-maximum force can be exceeded by a few tons. This makes it possible to reset a crane movement, which has caused the shut off.
- ▶ Reset triggered shut off by reverse crane movement.

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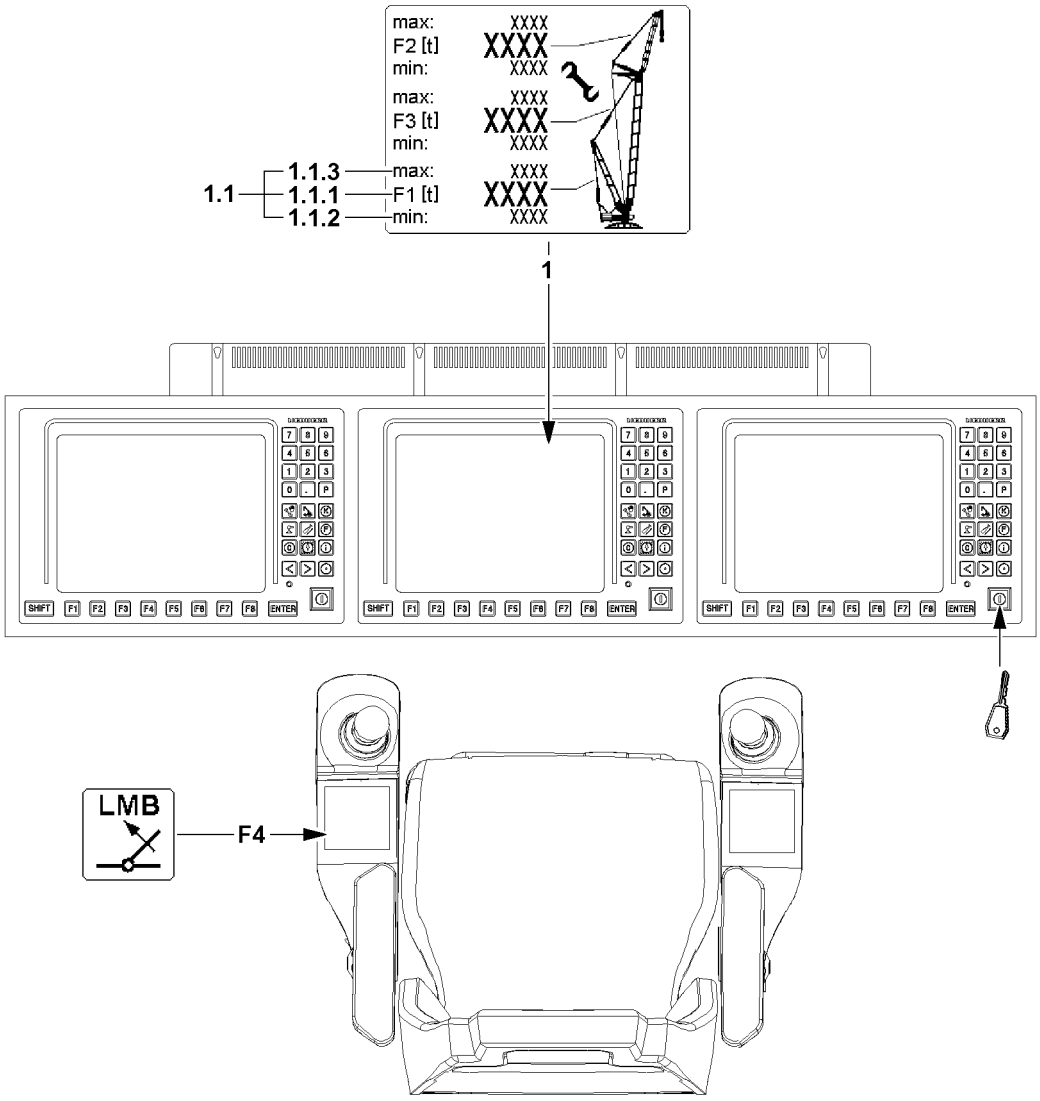

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10.5.4 Monitoring of F1-minimum force

Display values of force F1 (test point MS1) on the F-load display **1**:
- F1-maximum ($F1_{max}$) **1.1.3** = maximum value F1-force
- F1-actual value ($F1_{actual}$) **1.1.1** = actual value F1-force (operating force F1)
- F1-minimum ($F1_{min}$) **1.1.2** = minimum value F1-force

WARNING
Uncontrolled movements of the boom system!
If the guying between the A-frame and the derrick head (test point 1) becomes powerless, then this can lead to uncontrollable movements of the boom system.
This could result in serious accidents.
- ▶ The guying between the A-frame and the derrick head (test point 1) may never be without power.
- ▶ Relieve the D-guying between the derrick head and the derrick ballast to the point where the F1-actual value ($F1_{actual}$) **1.1.1** is larger than the F1-minimum ($F1_{min}$) **1.1.2**.

WARNING
Access the functionality of the LICCON overload protection!
When accessing the functionality of the LICCON overload protection by activating assembly operation, the LICCON overload protection is totally deactivated, bypassed or limited.
It is possible to exceed several shut-off limits of the LICCON overload protection simultaneously or one after the other.
It is possible to carry out crane movements, which are not monitored by the LICCON overload protection.
Without the LICCON overload protection, no additional protection against overload of the crane via the crane control is present.
This could result in serious accidents.
- ▶ When accessing the functionality of the LICCON overload protection, take into account that the LICCON overload protection is deactivated totally or is limited.
- ▶ When accessing the functionality of the LICCON overload protection, the Crane operating instructions, chapter 4.02 must be observed.

Note
By engaging the assembly operation the limit value for the F1-minimum force can be fallen below by a few tons. This makes it possible to reset a crane movement, which has caused the shut off.
- ▶ Reset triggered shut off by reverse crane movement.

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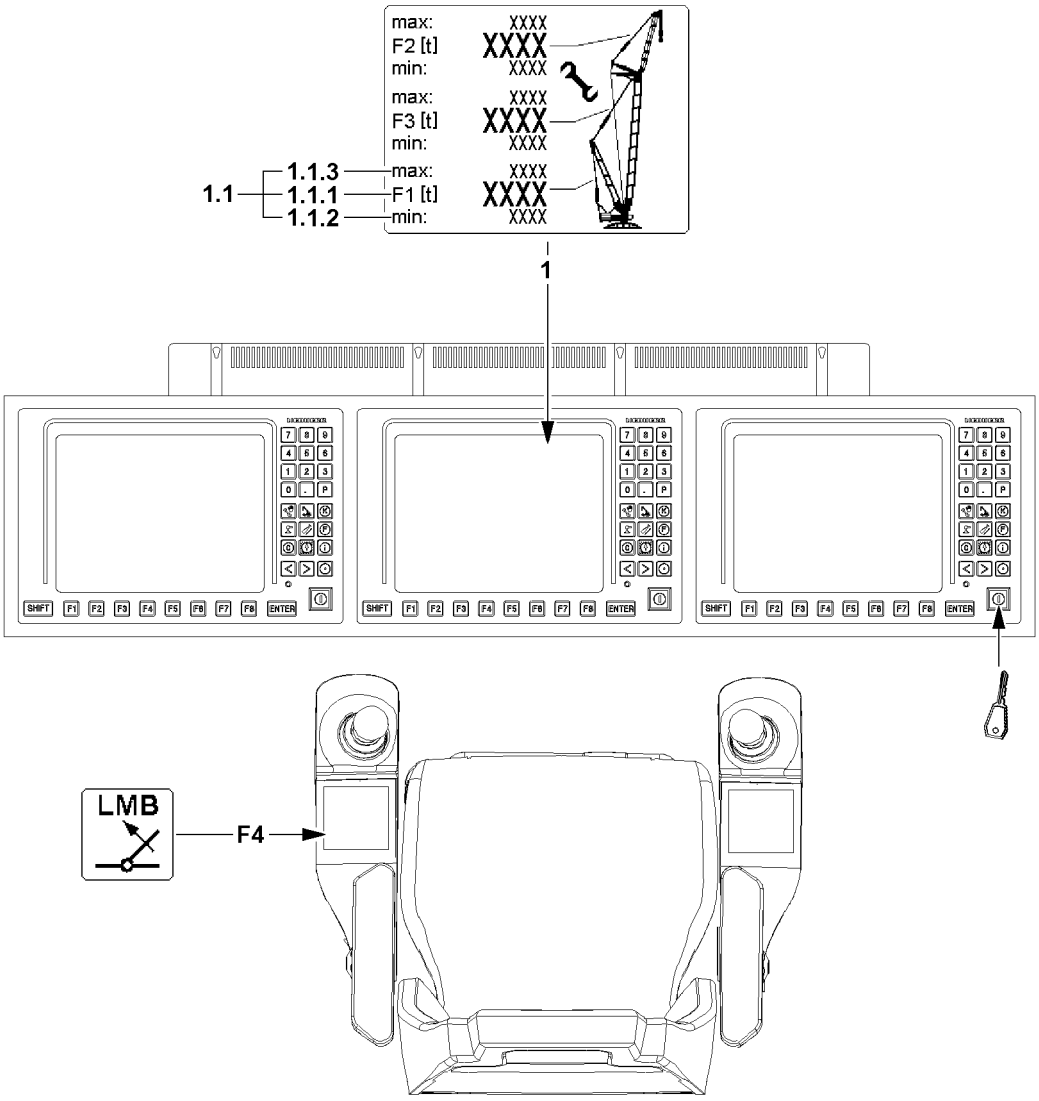

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WARNING
Autonomous movement of the boom system at increase of load torque!
If the F1-minimum force is fallen below, the guying between the A-frame and the derrick head can become powerless.
If the guying between the A-frame and the derrick head is powerless and the „Derrick ballast is on the ground“ at the same the derrick ballast can suddenly lift off the ground due to increase of the load torque.
As a result, the boom system can move forward suddenly. Strong oscillating movements of the derrick ballast and load can be the result.
The crane can be overloaded and severe accidents can be the result.
▶ Hold the F1-actual value ($F1_{actual}$) **1.1.1** above the F1-minimum ($F1_{min}$) **1.1.2**.
▶ It is prohibited to fall below the F1-minimum force.

WARNING
Autonomous movement of the boom system at decrease of load torque!
If the F1-minimum force is fallen below, the guying between the A-frame and the derrick head can become powerless.
If the guying between the A-frame and the derrick head is powerless and the „derrick ballast is suspended“ at the same time, the derrick ballast can suddenly set down on the ground due to decrease of the load torque.
As a result, the boom system can move suddenly backward. As a result, the relapse cylinders can be pressed on the block, be overloaded and damaged. Strong oscillating movements of the derrick ballast and load can be the result.
The crane can be overloaded and severe accidents can be the result.
▶ Hold the F1-actual value ($F1_{actual}$) **1.1.1** above the F1-minimum ($F1_{min}$) **1.1.2**.
▶ It is prohibited to fall below the F1-minimum force ($F1_{min}$).

The following applies:
– After a shut off due to falling below the F1-minimum ($F1_{min}$) **1.1.2** the F1-actual value ($F1_{actual}$) **1.1.1** must be increased by a crane movement. If the derrick ballast is suspended, this can be achieved by setting down the ballast.
– When picking up the load, the D-guying between the derrick ballast and the derrick head must be relieved to the point where the F1-actual value ($F1_{actual}$) **1.1.1** is greater than the F1-minimum ($F1_{min}$) **1.1.2**.
– When increasing the load torque, and the limit value F1-minimum ($F1_{min}$) **1.1.2** is fallen below, an already set down derrick ballast can lose contact with the ground and lift off.
– When decreasing the load torque, and the limit value F1-minimum ($F1_{min}$) **1.1.2** is fallen below, an already „suspended derrick ballast“ can set down on the ground.
– If the assembly operation is activated and the F1-force continues to drop below the minimum force $F1_{min}$, then the $F1_{min}$ shut off can no longer be bypassed.

Limitations from 50 % pulled derrick ballast

If more than 50 % of the set derrick ballast is being pulled (utilization bar derrick ballast **5** larger than 50 %) and the F1-minimum ($F1_{min}$) **1.1.2** is fallen below at the same time, all crane movements that increase load torque are turned off.

Limitations from 90 % pulled derrick ballast

If more than 90 % of the set derrick ballast is being pulled (utilization bar derrick ballast **5** larger than 90 %) and the F1-minimum ($F1_{min}$) **1.1.2** is fallen below at the same time, all crane movements that increase load torque and all crane movements that decrease load torque are turned off. This also turns off the „spooling out“ movement of the winch.

10.6 Monitoring of pull cylinders on block position

The pull cylinders (also called ballast lift cylinders) of the derrick ballast are equipped with length sensors and limit switches for monitoring.

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In crane operation, the monitoring of the pull cylinders on block position is always active. If there is the danger of a block position, then only that direction of the pull cylinders can be moved which improves the condition. The other direction is unbypassably blocked. As long as the length sensors and the limit switches function correctly, the pull cylinders cannot get into a block position.

WARNING
Problem at monitoring of pull cylinders!
If the length sensors or limit switches are defective or missing, then the monitoring of the pull cylinders is not active.
Without monitoring, the pull cylinders can be moved without restriction, as a result, a block position is possible.
At a block position, the pressure measurements of the pull cylinders become inexact and the values are incorrectly calculated.
The overload protection calculates the actual load incorrectly and transmits faulty display values.
The crane can be overloaded and topple over.
This could result in serious accidents.
▶ Observe the display values and possible error messages.
▶ If length sensors or limit switches are defective or missing, monitor the pull cylinders manually.

The following applies:
– The display values of the pull cylinders must function and be plausible.

10.7 Monitoring the lateral incline of the ballast pallet

The ballast pallet is equipped with an incline sensor for monitoring.

The monitoring to ± 2.5° lateral incline of the ballast pallet is always active. If a lateral incline of ± 2.5° is reached, then only those directions of the pull cylinders can be moved which improve the condition. The other directions are unbypassably blocked. The ballast can be set down for that reason only to a maximum incline of the terrain of 2.5°.

WARNING
Defective incline sensor!
If an incline sensor is defective or missing, the monitoring of the lateral incline of the suspended ballast is not active.
The pull cylinders can be moved without restriction and the derrick ballast can be overturned as a result.
This could result in serious accidents.
▶ Observe the display values and possible error messages.
▶ If an incline sensor is defective, monitor the lateral incline of the derrick ballast manually.

The following applies:
– The display values of the lateral incline of the derrick ballast must function and be plausible.

10.8 Differential force monitoring for derrick ballast-guying

In operating modes with derrick ballast the forces of the derrick ballast guyings A and B are displayed in the LICCON monitor.

WARNING
Danger of accident!
If the forces in the derrick ballast guyings A and B are too high, then this can lead to an overload of the crane. Components can fail and severe accidents can be the result.
▶ Load the derrick ballast guyings A and B evenly.

After reaching the specified limit value of the difference force threshold, the displays of the pulled ballast of pull cylinder A and B blink and become red, the function ballast up / down is stopped. The difference force must be lowered again.

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If the difference of the forces of the derrick ballast guyings A and B exceeds the limit value, then this can have various causes:
- Flexing of the turntable.
- The ground under the derrick ballast is uneven.
- The crane is leaning to one side.
- The derrick ballast is loaded one-sided.
- The force measurement in one D-guying is incorrect.

The crane driver must recognize the correct cause and take countermeasures:
- The error, which caused the one-sided force, must be remedied.
- If the sensor values are implausible: Stop crane operation and find the cause and remedy it.

10.8.1 Bypassing the shut off of the function ballast up / down

- The following measures are permitted providing the ground is only slightly uneven:
  Control the individual pull cylinders in such a way that the difference between the forces becomes smaller. Ensure that the derrick ballast is not tilted at an inadmissible angle with respect to the crane, otherwise the derrick ballast guide and attachments will be damaged.

▶ Carry out the following: Activate assembly operation, see Crane operating instructions, chapter 4.02.

Result:

- The shut off of the function ballast up / down is bypassed.
- On the left LICCON monitor appears an assembly icon.

▶ Press the button Ballast „up“ or button Ballast „down“ **and** the stop button on the desired side at the same time, see section „Carrying out crane movement“.

Problem remedy
The display of the entire pulled ballast is shown blinking red. An LMB-Stop was triggered. All crane functions were stopped.
The crane driver has moved the pull cylinders into the incorrect direction and further exceeded the limit value for the difference force threshold.
▶ Move the pull cylinders again into the correct (other) direction and align the ballast in such a way that the displays of the pulled ballast of pull cylinder A and B are again in the permissible range.

▶ Activate assembly operation again.

Result:

- The shut off of the function ballast up / down is bypassed again.
- All other crane functions are still suppressed.

▶ Move the pull cylinders into the correct direction.

DANGER
Overload of crane!
If the pull cylinders are moved into the incorrect direction after a new bypass of the function ballast up / down, the crane will be overloaded.
This could result in serious accidents.
▶ Monitor the display values and move the pull cylinders in the correct direction (values of pull cylinder A and B become closer).
▶ If unsure: Contact Liebherr Service.

▶ Find the error and remedy it which caused the shut off of the function „Ballast up / down“.

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10.9 Carrying out crane movements

Note

▶ For an overview of the displays in the LICCON monitors, see Crane operating instructions, chapter 4.02.

WARNING

Incorrect display values!

If the display values do not increase correspondingly when lifting known weights, an erroneous display value may be present.

If the crane is operated with erroneous display values, then the crane can be overloaded.

This could result in serious accidents.

▶ When lifting the hook block off the ground check if the display value for the actual load increases correspondingly.

▶ When lifting the derrick ballast off the ground check if the display value for the pulled derrick ballast BA_{pulled} increases correspondingly.

▶ When lifting the load off the ground check if the display value for the actual load increases correspondingly.

WARNING

The crane can topple over!

The jerky execution or braking of turning maneuvers can cause the load and / or suspended ballast to swing.

If the load and / or the suspended ballast collides with obstacles then the crane can be damaged or impeded.

Oscillating movements, damage or impediments can cause the crane to topple over.

This could result in serious accidents.

▶ Initiate or slow down crane movements with load and / or suspended derrick ballast extremely sensitively.

▶ There may be no persons and / or objects within the working range / danger zone of the crane.

▶ During crane operation additional personnel (guide) must monitor and secure the working range / danger zone of the crane from a safe position.

WARNING

Danger of accident due to unsafe ground!

If the crane is operated on insufficient ground, there is a danger of accident.

▶ The ground in the entire working area of the crane must be level and of sufficient load carrying capacity, in order to be able to securely accept the encountered surface pressures.

▶ Before setting down the load or the derrick ballast, the crane operator must make sure that the intended placement surface is suitable. A safe set down of load and derrick ballast must be ensured.

WARNING

Uncontrolled movements of the boom system!

If the guying between the A-frame and the derrick head (test point 1) becomes powerless, then this can lead to uncontrolled movements of the boom system.

This could result in serious accidents.

▶ The guying between the A-frame and the derrick head (test point 1) may never be without power.

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WARNING
Danger of accidents due to angular pull!
Due to angular pull of load or derrick ballast impermissible side forces are directed into the crane.
Impermissible side forces can cause failure of the components or a dangerous change of the center of gravity of the crane and / or load, among others.
Crane and load can be severely damaged and topple over.
This could result in serious accidents.
▶ Before taking on a load or the derrick ballast, make sure that the derrick ballast, the center of rotation of the turntable and the load are on one line.

WARNING
The crane can topple over!
If the derrick ballast is lifted by more than 0.25 m above the ground, then the crane can fall over to the rear if the load rips off.
▶ Do not lift derrick ballast more than 0.25 m from the ground.

Make sure that the following prerequisites are met:
- The test points must be checked before crane operation for functionality.
- The weight of the load to be lifted must be known.
- The support surface / placement surface of the derrick ballast may be maximum 0.25 m above / below the support surface of the crane.
- The support surface /placement surface of the derrick ballast must be level, horizontal and of sufficient load bearing capacity.
- The support surface / placement surface of the derrick ballast must be able to safely absorb the surface pressure.
- There may not be any obstacles in the slewing range of the crane, derrick ballast and load.
- Additional personnel is instructed to monitor and secure the working range / danger zone of the crane from a safe distance.
- A permanent acoustic / visual connection between the crane operator and the additional personnel is available.
- A guide or the crane driver must monitor the lifting and setting down of the derrick ballast and the load.
- The lifted derrick ballast is monitored by a guide or the crane operator.

The following applies:
- When taking up the load, the D-guying between the derrick ballast and the derrick head must be relieved so that the operating force $F1_{actual}$ is larger than the limit value for the F1-minimum force.
- Before taking up the load or the derrick ballast, make sure that the following components are on one line:
  - The load
  - The center of rotation of the turntable
  - The derrick ballast

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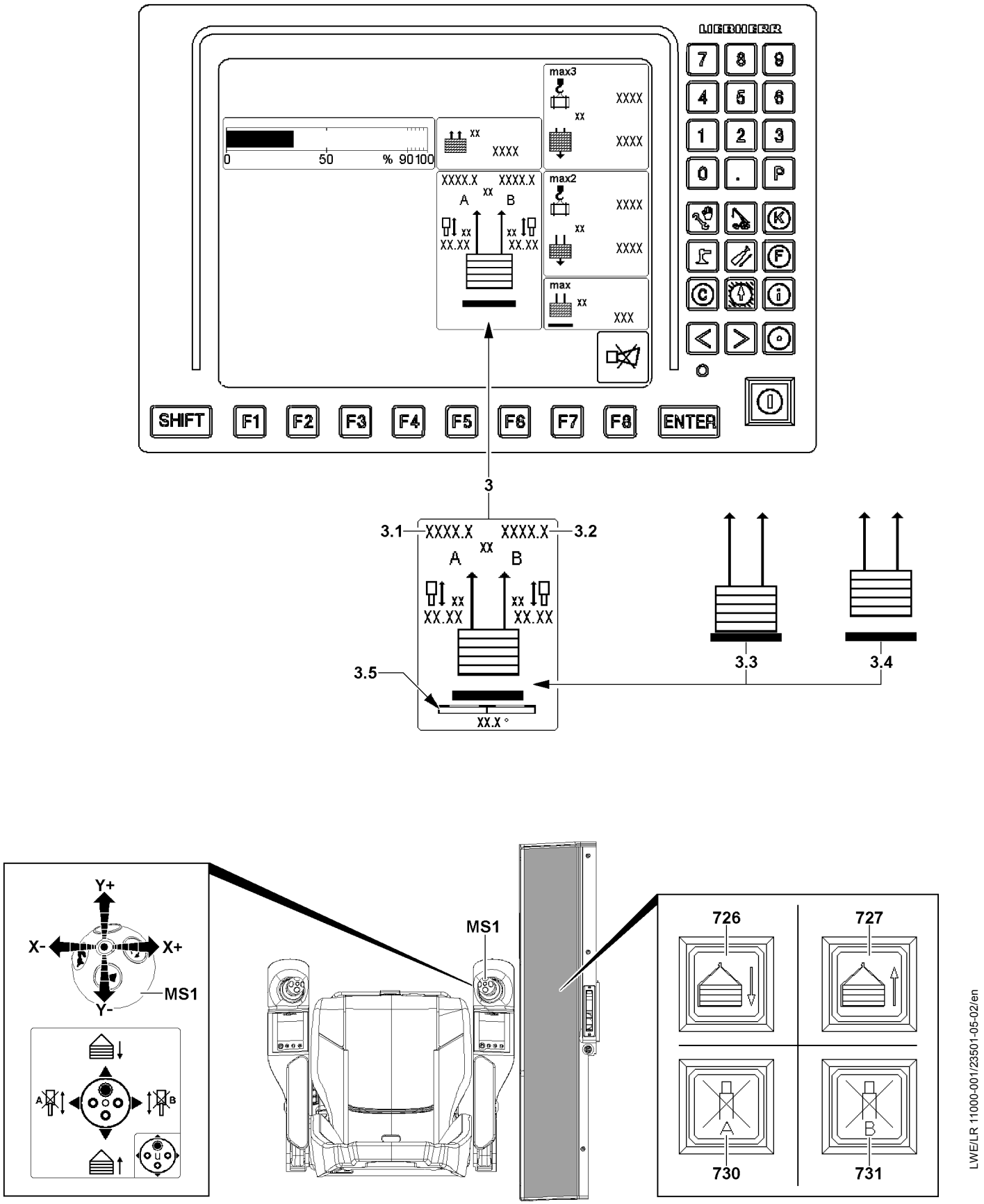

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10.9.1 Lifting / setting down the derrick ballast

WARNING
Danger of accident!
The placement surface for the ballast pallet must be level, horizontal and of sufficient load bearing capacity, otherwise the ballast pallet can tip over.
This could result in serious accidents.

- ▶ Check the incline of the crane during the set down procedure.
- ▶ Check the incline of the ballast pallet with the incline display **3.5**.
- ▶ Monitor the difference forces (derrick ballast guying A **3.1** to derrick ballast guying B **3.2**).
- ▶ It is strictly prohibited for anyone to stand under the ballast pallet or within the entire danger zone during the set down procedure.

The lifting and set down of the derrick ballast is monitored by the LICCON computer system. Normally the crane operator does not have to do anything. However, if corrective measures or preventative measures should be necessary, observe the following section „Equalizing the derrick ballast“.

Lifting the derrick ballast

- ▶ Lift the derrick ballast: Press the button **727**.
  or
  Deflect the master switch **MS1** in direction **Y-**.

Result:

- – The piston rods of the pull cylinders retract together.
- – The derrick ballast is raised.
- – The ballast pallet loses all ground contact:
  The ground contact switches are no longer actuated, the „Derrick ballast lifted off“ icon **3.4** appears.
  The „turning the turntable“ and „driving the crawler“ crane movements are released.

Lowering the derrick ballast

- ▶ Lower the derrick ballast: Press the button **726**.
  or
  Deflect the master switch **MS1** in direction **Y+**.

Result:

- – The piston rods of the pull cylinders extend together.
- – The derrick ballast is countersunk
- – When the ballast pallet touches the ground:
  The ground contact switches are actuated, the „Derrick ballast has ground contact“ icon **3.3** appears.
  The „turning the turntable“ and „driving the crawler“ crane movements are blocked.

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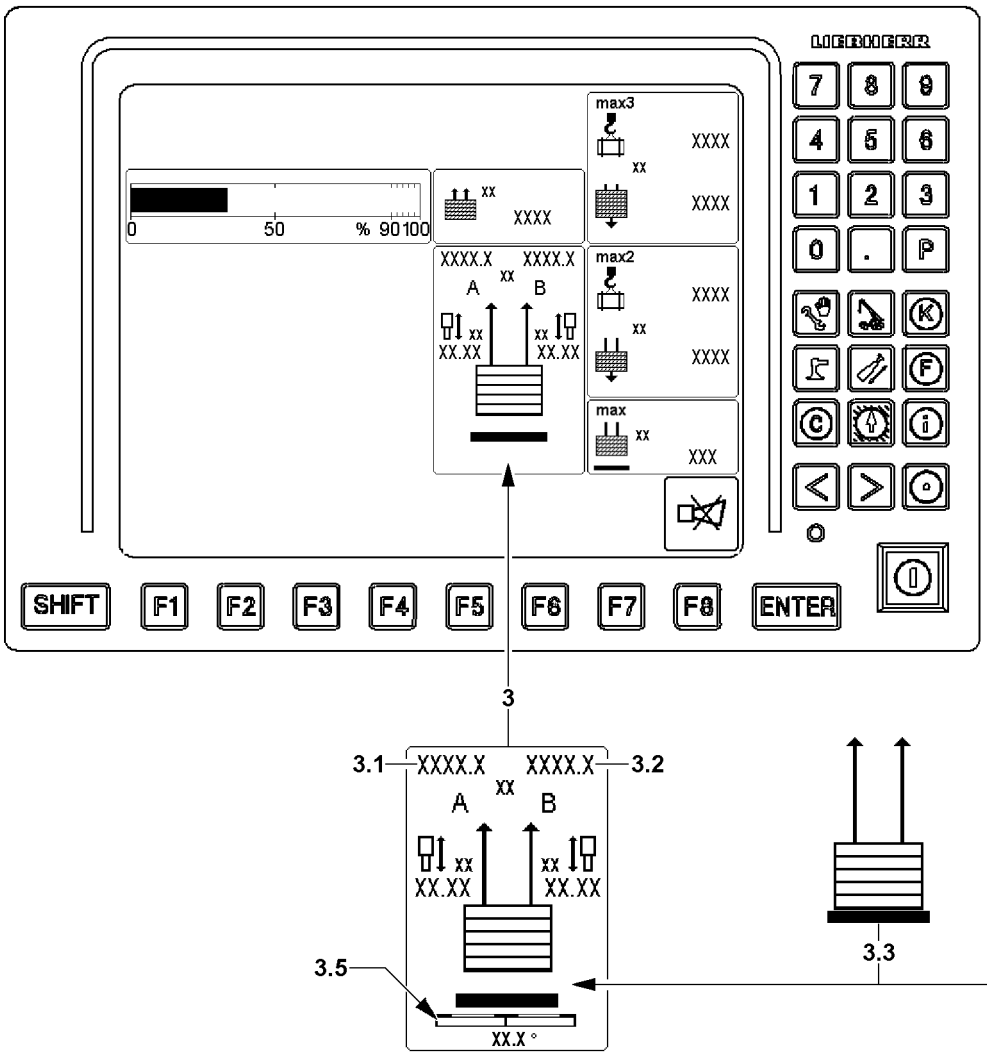

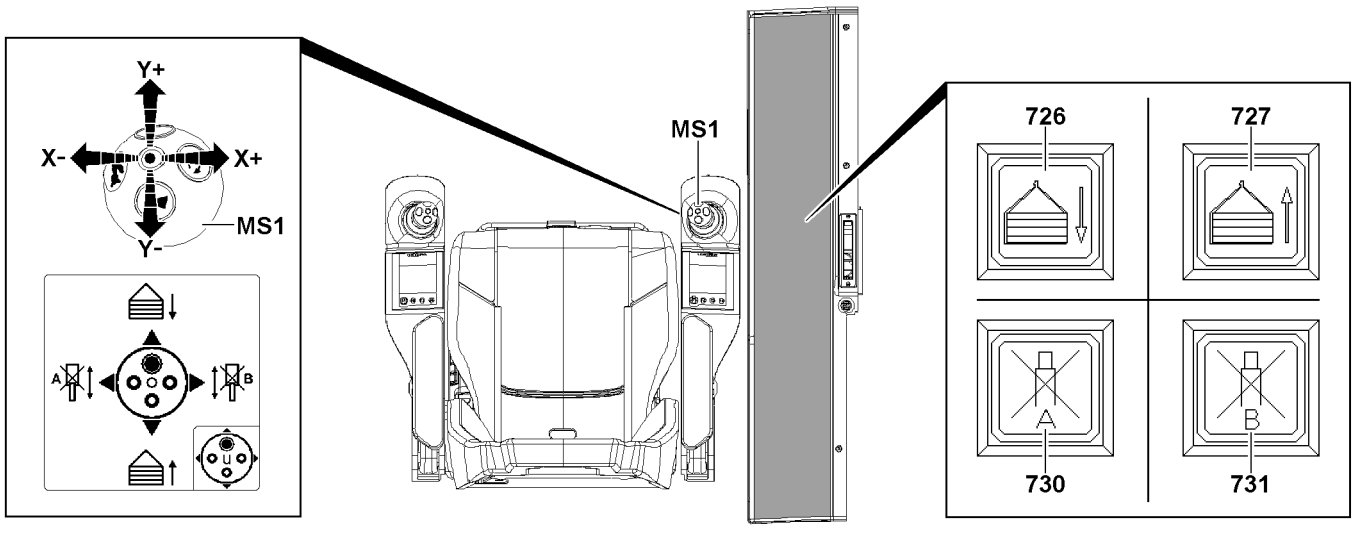

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10.9.2 Equalizing the derrick ballast

WARNING
Danger of accident!
The placement surface for the ballast pallet must be level, horizontal and of sufficient load bearing capacity, otherwise the ballast pallet can tip over.
This could result in serious accidents.

- ▶ Check the incline of the crane during the set down procedure.
- ▶ Check the incline of the ballast pallet with the incline display **3.5**.
- ▶ Monitor the difference forces (derrick ballast guying A **3.1** to derrick ballast guying B **3.2**).
- ▶ It is strictly prohibited for anyone to stand under the ballast pallet or within the entire danger zone during the set down procedure.

If a limit value in the difference force monitoring (Ratio of derrick ballast guying A **3.1** to derrick ballast guying B **3.2**) or the incline display **3.5** is exceeded, the derrick ballast must be equalized.

Block the pull cylinder (A) when lifting:

- ▶ Press the button **727** and the button **730**.
  or
  Deflect the master switch **MS1** diagonally in direction **X-** and direction **Y-**.

Result:

- The piston rod of the pull cylinder (A) stops.
- The piston rod of pull cylinder (B) moves in.
- Side (B) of the derrick ballast lifts up.

Block the pull cylinder (B) when lifting:

- ▶ Press the button **727** and the button **731**.
  or
  Deflect the master switch **MS1** diagonally in direction **X+** and direction **Y-**.

Result:

- The piston rod of the pull cylinder (B) stops.
- The piston rod of pull cylinder (A) moves in.
- Side (A) of the derrick ballast lifts up.

Block the pull cylinder (A) when lowering:

- ▶ Press the button **726** and the button **730**.
  or
  Deflect the master switch **MS1** diagonally in direction **X-** and direction **Y+**.

Result:

- The piston rod of the pull cylinder (A) stops.
- The piston rod of pull cylinder (B) moves out.
- Side (B) of the derrick ballast lowers.

Block the pull cylinder (B) when lowering:

- ▶ Press the button **726** and the button **731**.
  or
  Deflect the master switch **MS1** diagonally in direction **X+** and direction **Y+**.

Result:

- The piston rod of the pull cylinder (B) stops.
- The piston rod of pull cylinder (A) moves out.
- Side (A) of the derrick ballast lowers.

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11 Crawler operation with derrick ballast

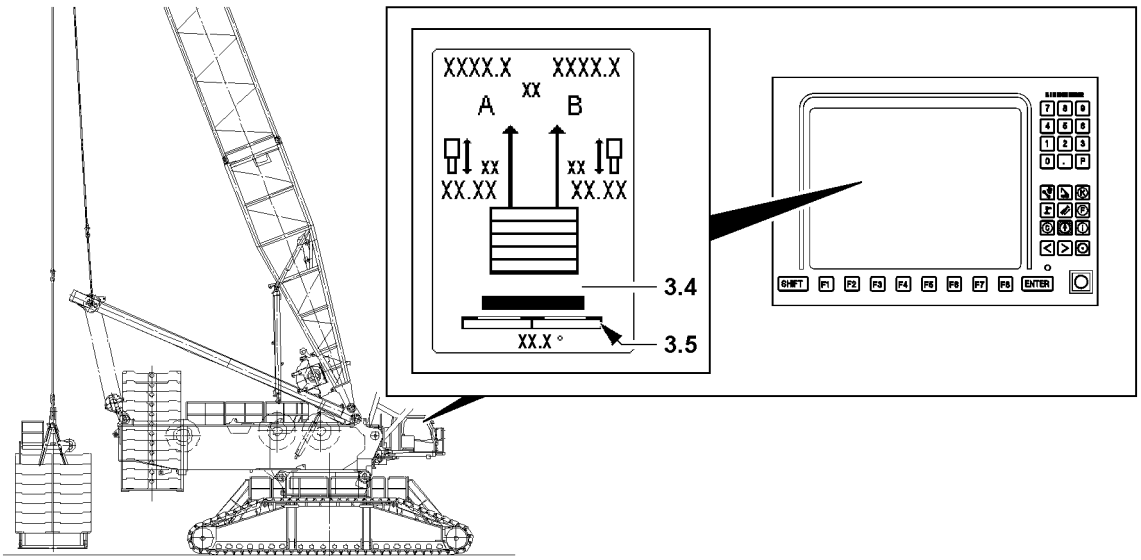

Fig.145934

Note

- Driving the crawler crane, see the Crane operating instructions, chapter 4.10.
- Release for driving the crawler takes place when all 4 ground contact rollers are no longer in contact with the ground.

11.1 Driving the crawler

Driving with suspended derrick ballast.

WARNING

Prerequisites for driving are not met, load or derrick ballast are oscillating too much!
If the specifications from the Crane operating instructions, chapter 4.10 are not observed, there is a danger of accident.
If the suspended load or the suspended derrick ballast starts to swing too much, then the crane operator can lose control over the crane.
If the following prerequisites are not observed, the crane can topple over.
This could result in serious accidents.

- Observe the specifications in the Crane operating instructions, chapter 4.10.
- Do not exceed the maximum permissible driving speed of the crawler.
- Avoid jerky driving movements.
- Avoid oscillation of the suspended load and the suspended derrick ballast. Turn and drive slowly.
- The attached load and suspended derrick ballast must be secured to prevent it from swinging. If oscillating movements should occur, set the load / derrick ballast as fast as possible down on the ground. Hereby pay attention to the limit values of the load moment display and the F-load display.
- Steering the crawler with a suspended load and / or installed derrick ballast is prohibited.
- Uphill and downhill inclines and lateral inclines may only be driven within the permissible angle range.

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Make sure that the following prerequisites are met:
- Observe the specifications in the Crane operating instructions, chapter 4.10.
- Pay special attention to the limitations for crawler operation with derrick ballast.
- The ground is suitable for crawler operation with derrick ballast.
- The ground can safely take on the resulting surface pressure.
- The derrick ballast is lifted off the ground.
- The „Derrick ballast lifted off“ icon **3.4** appears on the LICCON monitor.
- The derrick ballast is horizontally aligned (observe the incline display **3.5**).

12 Disassembling, ballasted ballast pallet

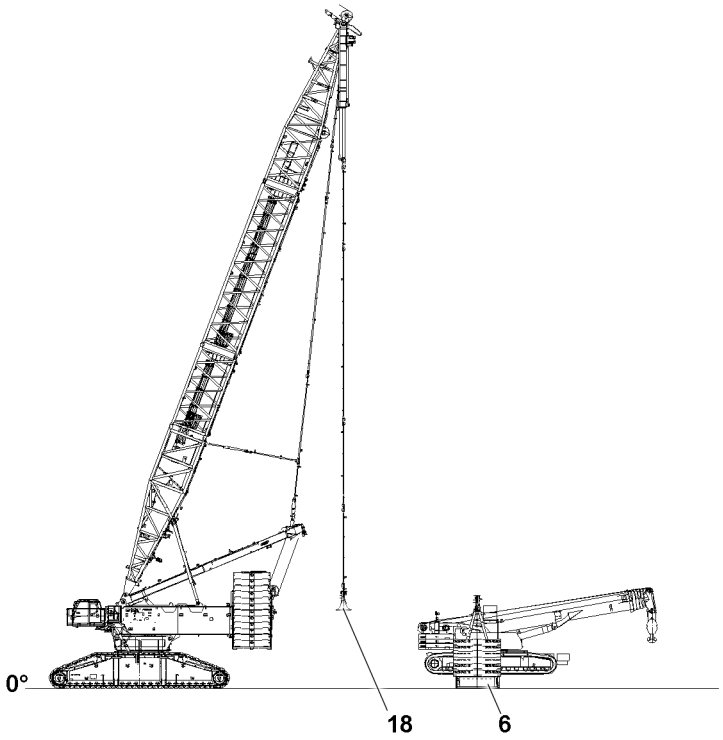

Fig.126488: Ballast pallet set down ballasted

The ballasted ballast pallet **6** can be unpinned and set down after erection or take down of the boom system on the cross beam **18**.

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WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe injury, property damage.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Personnel can be caught and severely injured or killed.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

Make sure that the following prerequisites are met:
- The crane is horizontally aligned.
- The ground is level and of sufficient load bearing capacity.
- The counterweight has been installed on the turntable according to the load charts and take down charts.
- The maximum ground unevenness for the placement surface of the derrick ballast is plus / minus 1°.
- The LICCON overload protection has been set according to the data in the load charts and take down charts.
- The LICCON overload protection settings have been compared with the actual set up configuration.
- An auxiliary crane is available.
- The ballast pallet is standing on the ground.
- D-guy rods are completely relieved.

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12.1 Disconnecting the electrical connections

Note

▶ Disconnect the electrical connections from the suspended ballast to the turntable, see Electric wiring diagram.

▶ Disconnect the electrical connections.

12.2 Securing the erection racks to prevent them from folding over

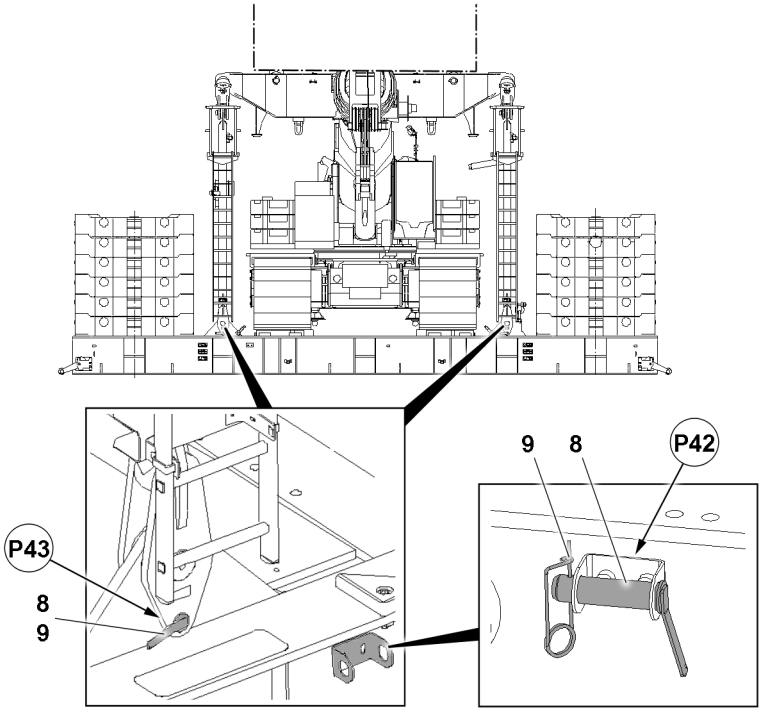

Fig.126072: Ballast pallet, retaining pins

DANGER

Unsecured erection racks!

Toppling erection racks. Death, severe bodily injuries, property damage.

▶ Secure both erection racks with retaining pins **8** to prevent them from tipping.

▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure.

▶ Remove the spring retainer **9** at point **P42** and unpin the retaining pin **8** from the park position.

▶ Insert the retaining pin **8** at point **P43** and secure with spring retainer **9**.

12.3 Unpinning the ballast pallet on the cross beam

WARNING

Ballast pallet unpinned on impermissible position!

Death, severe bodily injuries, property damage.

▶ Do **not** unpin the ballasted ballast pallet on the guy rods.

▶ Unpin the ballasted ballast pallet solely on the cross beam.

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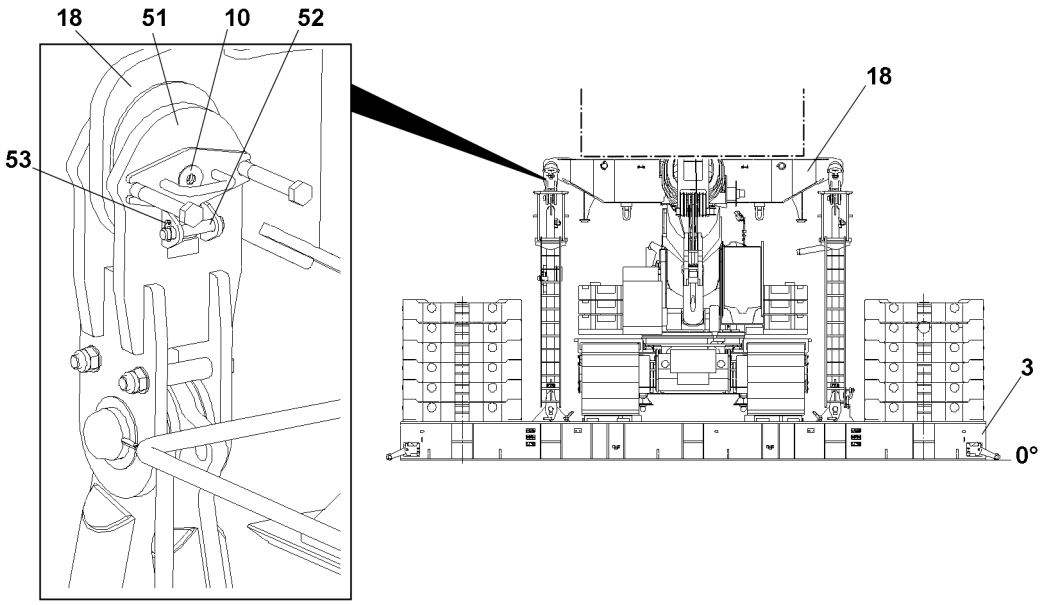

Fig.126487: Ballast pallet, cross beam

Pins **10** must be unpinned und released on both erection racks.

- ▶ Release the pin **10**: Remove the spring retainer **53** and unpin the pin **52**.
- ▶ Unpin the pin **10**.
- ▶ Retract the pull cylinder: Lift the cross beam **18** until the ballast pallet is standing freely.

Note
Retract / extend the pull cylinder

- ▶ Control the pull cylinders from the crane cab, see the section „Lifting and lowering the derrick ballast using the pull cylinders“.
- ▶ Operate the pull cylinder with the radio remote control, see the „radio remote control operating instructions“.

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13 Disassembling, complete

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe injury, property damage.

- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Personnel can be caught and severely injured or killed.

- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel.

- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

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Make sure that the following prerequisites are met:
- The crane is horizontally aligned.
- The ground is level and of sufficient load bearing capacity.
- The counterweight has been installed on the turntable according to the load charts and take down charts.
- The maximum ground unevenness for the placement surface of the derrick ballast is plus / minus 1°.
- The LICCON overload protection has been set according to the data in the load charts and take down charts.
- The LICCON overload protection settings have been compared with the actual set up configuration.
- An auxiliary crane is available.
- The ballast pallet is standing on the ground.
- D-guy rods are completely relieved.

13.1 Disconnecting the electrical connections

Note
▶ Disconnect the electrical connections from the suspended ballast to the turntable, see Electric wiring diagram.

▶ Disconnect the electrical connections.

13.2 Securing the erection racks to prevent them from folding over

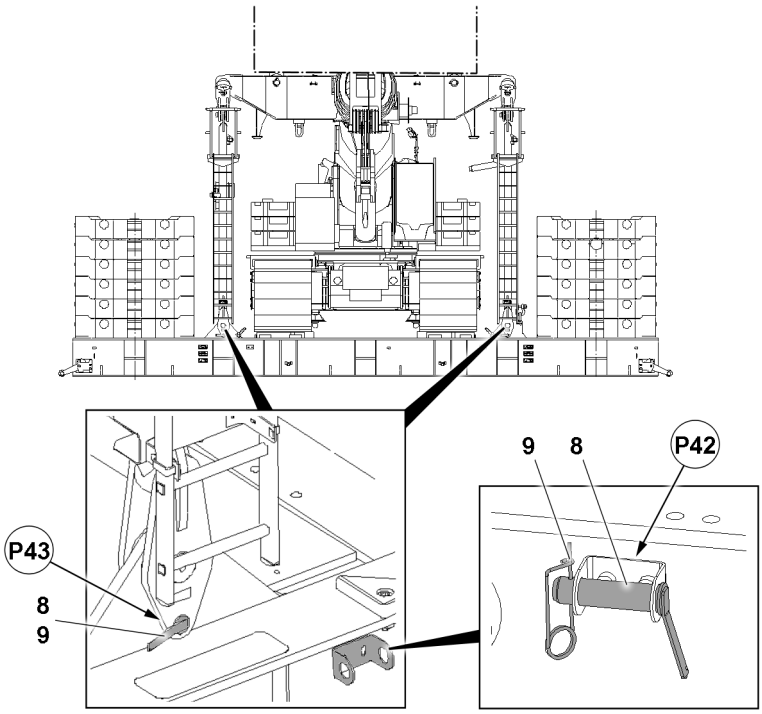

Fig.126072

DANGER
Unsecured erection racks!
Toppling erection racks. Death, severe bodily injuries, property damage.
▶ Secure both erection racks with retaining pins **8** to prevent them from tipping.
▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure.

▶ Remove the spring retainer **9** at point **P42** and unpin the retaining pin **8** from the park position.

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▶ Insert the retaining pin **8** at point **P43** and secure with spring retainer **9**.

13.3 Ballasting the ballast pallet off

13.3.1 Unballasting rules

WARNING
Impermissible ballasting, impermissible geometry of the ballast!
Slipping and falling ballast stacks.
The crane can topple over. Death, severe bodily injuries, property damage.
▶ Replace damaged ballast plates immediately with new ballast plates.
▶ Observe and comply with the rules for ballasting.

Rules for unballasting:
– Do **not** start in the center. Start unballasting on the outer ballast stacks.
– Suspended ballast with LTR: Unballast first the ballast plates.
– Remove the ballast plates always symmetrically, in reference to the longitudinal axis.
– The outer ballast stacks must always weigh the same and always be the same height after unballasting.
– Unballasting with double stacks: The difference between front and rear may be no more than maximum 10 t for a double stack.
– Remove the ballast until only a maximum of 20 t ballast are placed per stack.
– The difference between the stacks may be no more than maximum 25 t.

Make sure that the following prerequisites are met:
– The erection racks are secured to prevent them from folding over.

13.3.2 Removing the ballast plates, fastening system: „Twistlock“

Make sure that the following prerequisites are met:
– Rules for ballasting are complied with.

WARNING
Receptacle stud **not** permissible for ballast plates!
Overload and damage of the receptacle stud. Death, severe injury, property damage.
▶ Use a permissible receptacle stud for ballast plates 10 t.
▶ Use a permissible receptacle stud for ballast plates 12.5 t.
▶ Replace damaged receptacle stud.

WARNING
More than two ballast plates lifted with the receptacle stud!
Overload and damage of the receptacle stud. Death, severe injury, property damage.
▶ Lift maximum two ballast plates with receptacle stud.
▶ Make sure that the ballast plates are placed correctly in the centerings of the receptacle stud.
▶ Replace damaged ballast plates.

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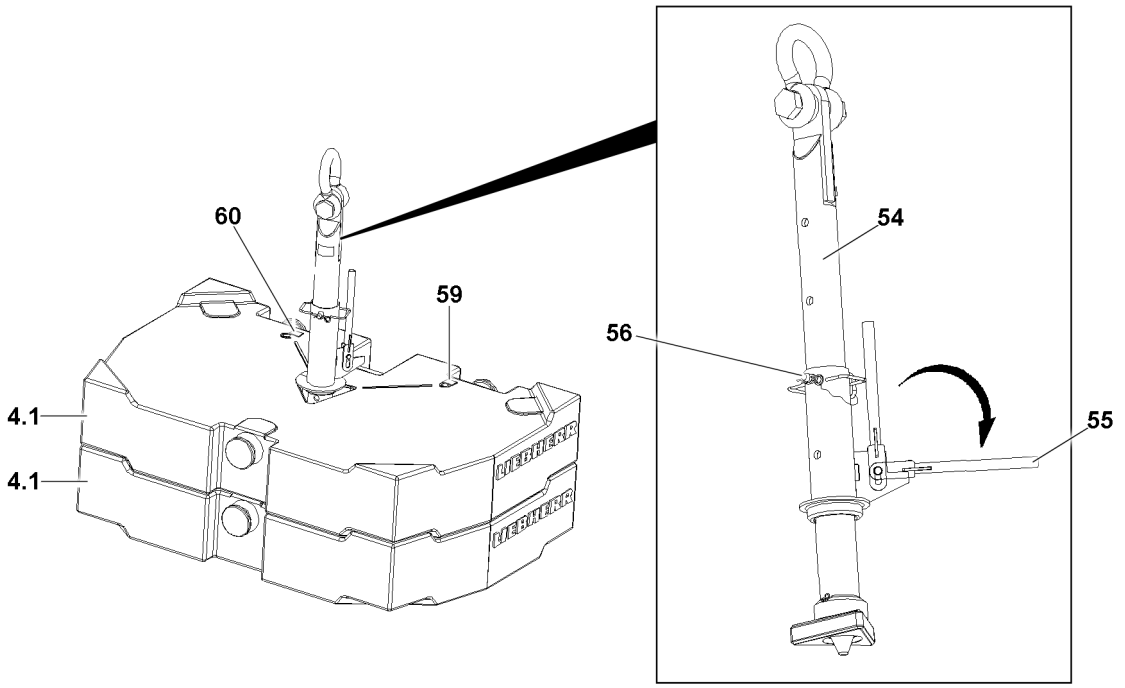

*Fig.126074: Receptacle stud with two 10 t ballast plates **4.1***

Ballast plates can be removed individually or as an assembly of maximum two ballast plates.

Before the receptacle stud **54** is guided into the ballast plates, it must be ensured that the length of the receptacle stud **54** is set correctly. The length of the receptacle stud **54** can be adjusted with the pin **56**.

- ▶ Release and unpin the pin **56**.
- ▶ Adjust the length of the receptacle stud by moving the receptacle stud **54**.
- ▶ Insert the pin **56** and secure with the spring retainer.
- ▶ Attach the receptacle stud **54** with fastening equipment on the auxiliary crane and guide it into the ballast plates.
- ▶ Pull the lever **55** up and fold it down.

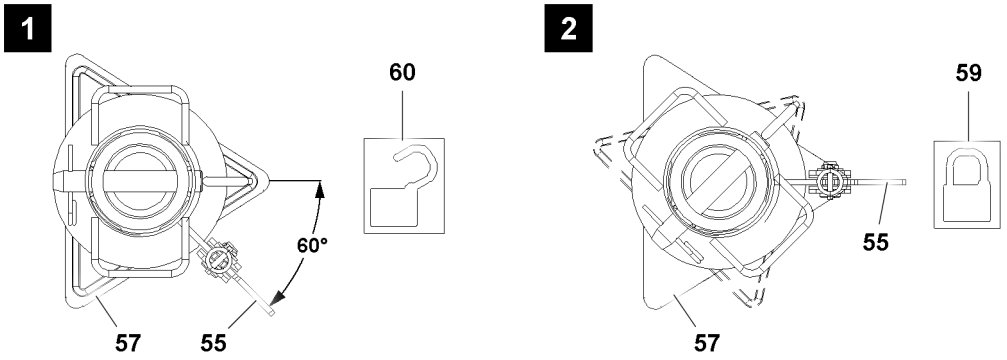

*Fig.126075: Receptacle stud overhead view, positions lever **55***

- ▶ Turn the lever **55** by 60°, see illustration **1** until the lever **55** points on the icon **59**, illustration **2**.

Result:

– The receptacle stud **54** is locked with the ballast plate.

- ▶ Lift the ballast plate individually or as an assembly with the auxiliary crane and remove it carefully from the ballast stack or from the ballast pallet.

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When the ballast plate is laying on the ground:

▶ Turn the lever **75** by 60° until the lever **75** points to the icon **60**, see illustration **1**.

Result:

– The receptacle stud is unlocked.

▶ Carefully pull the receptacle stud **54** from the ballast plate.
▶ Remove the ballast plates.

13.3.3 Removing the ballast plates, fastening points: „Bitt“

– Rules for unballasting are complied with.

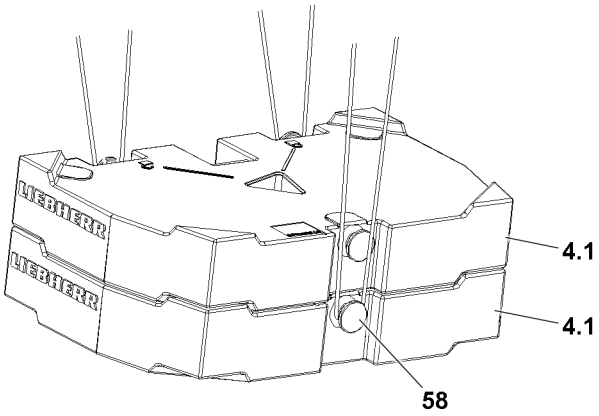

*Fig.126076: Ballast assembly with two ballast plates 10 t **4.1***

WARNING
Exceeding permissible load!
Overload Bitt **58** Falling ballast plates.
Death, severe injury, property damage.

When 10 t ballast plates are used:

▶ Lift no more than maximum 20 t with ropes, three fastening points.

When 12.5 t ballast plates are used:

▶ Lift no more than maximum 25 t with ropes, four fastening points.
▶ Replace damaged ballast plates immediately.

WARNING
Fastening equipment is **not** properly fastened and **not** secured sufficiently to prevent it from releasing!
Falling ballast plates. Death, severe bodily injuries, property damage.

▶ Attach the fastening equipment properly on bitts **58** and secure it to prevent it from releasing.

Ballast plates can be placed individually or as an assembly of maximum two ballast plates.

▶ Lift the ballast plate individually or as an assembly with the auxiliary crane and remove it carefully from the ballast stack or from the ballast pallet.

13.3.4 Moving the LTR from the ballast pallet

Make sure that the following prerequisites are met:

– The derrick guying is completely relieved.
– The telescopic boom is luffed up to 10° position.

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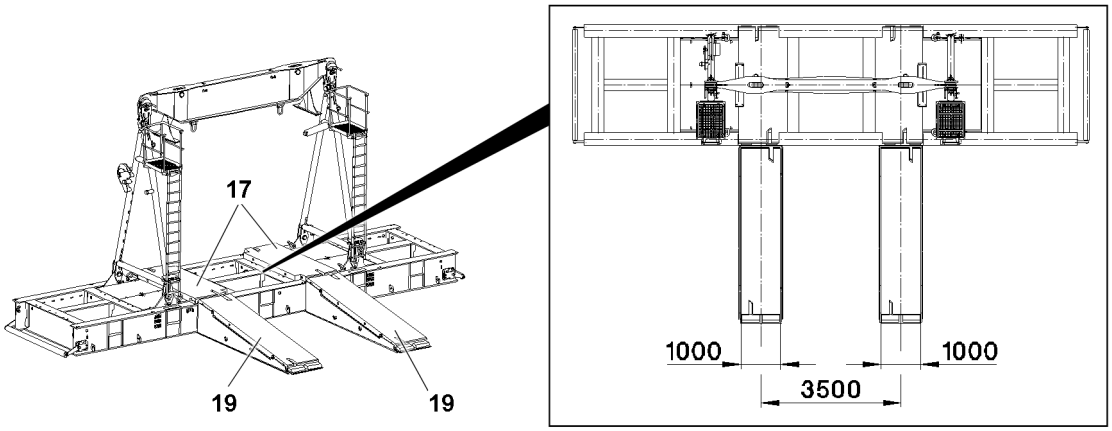

Fig.124986: Ramps on ballast pallet

▶ Position ramps **1** on the ballast pallet.

NOTICE
Camera support is in operating position!
Damage of camera support.
▶ Before moving off on the ballast pallet: Fold the camera support in.

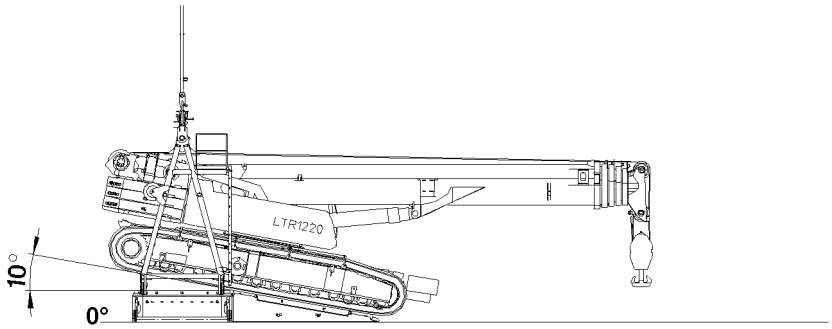

Fig.124984: LTR on tipping point

▶ Move LTR on tipping point.

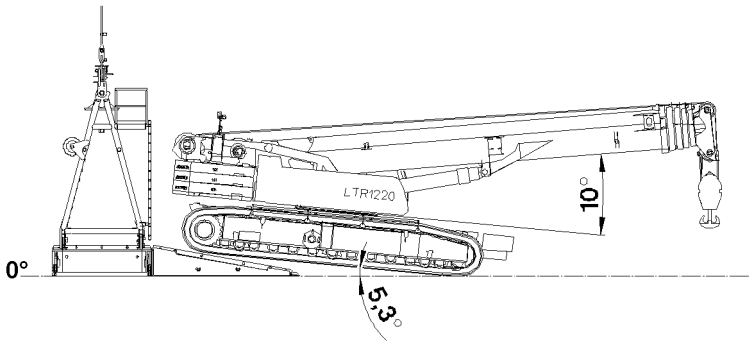

Fig.124983: LTR on ramp

▶ Move the LTR from the ramp.

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13.4 Unpinning the ballast pallet on the cross beam

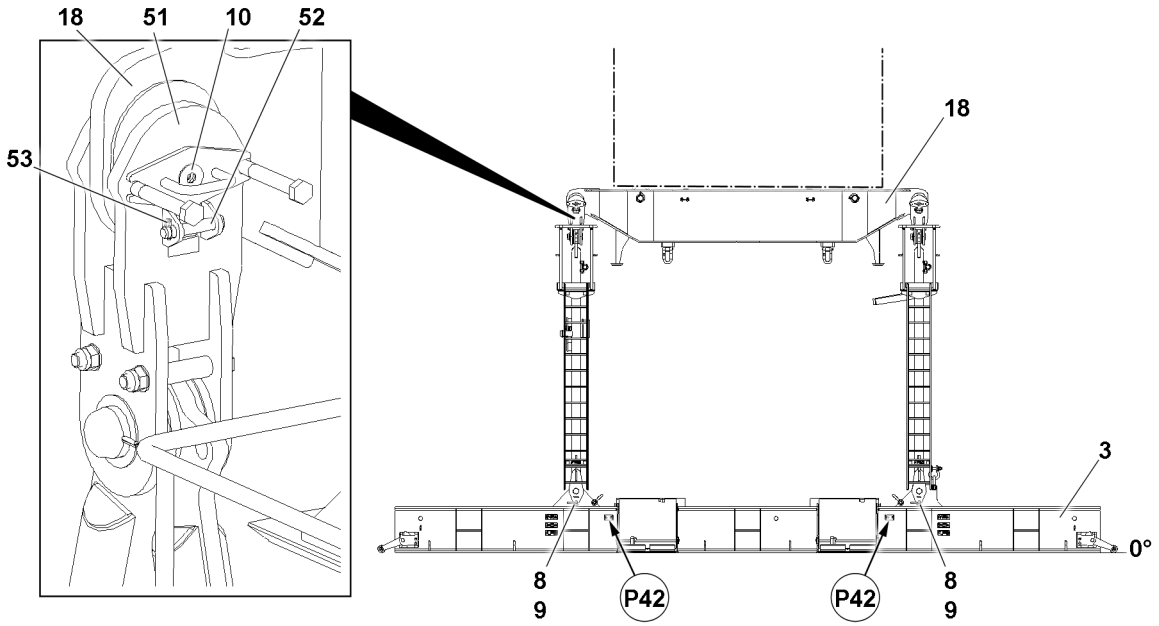

Fig.126062: Ballast pallet with cross beam

Pins **10** must be unpinned und released on both erection racks.

- ▶ Release the pin **10**: Remove the spring retainer **53** and unpin the pin **52**.
- ▶ Unpin the pin **10**.
- ▶ Retract the pull cylinder: Lift the cross beam **18** until the ballast pallet is standing freely.

Note

Retract / extend the pull cylinder

- ▶ Control the pull cylinders from the crane cab, see the section „Lifting and lowering the derrick ballast using the pull cylinders“.
- ▶ Operate the pull cylinder with the radio remote control, see the „radio remote control operating instructions“.

13.5 Taking down the erection racks

Note

- ▶ The disassembly of the erection racks is described based on the example of one erection rack.

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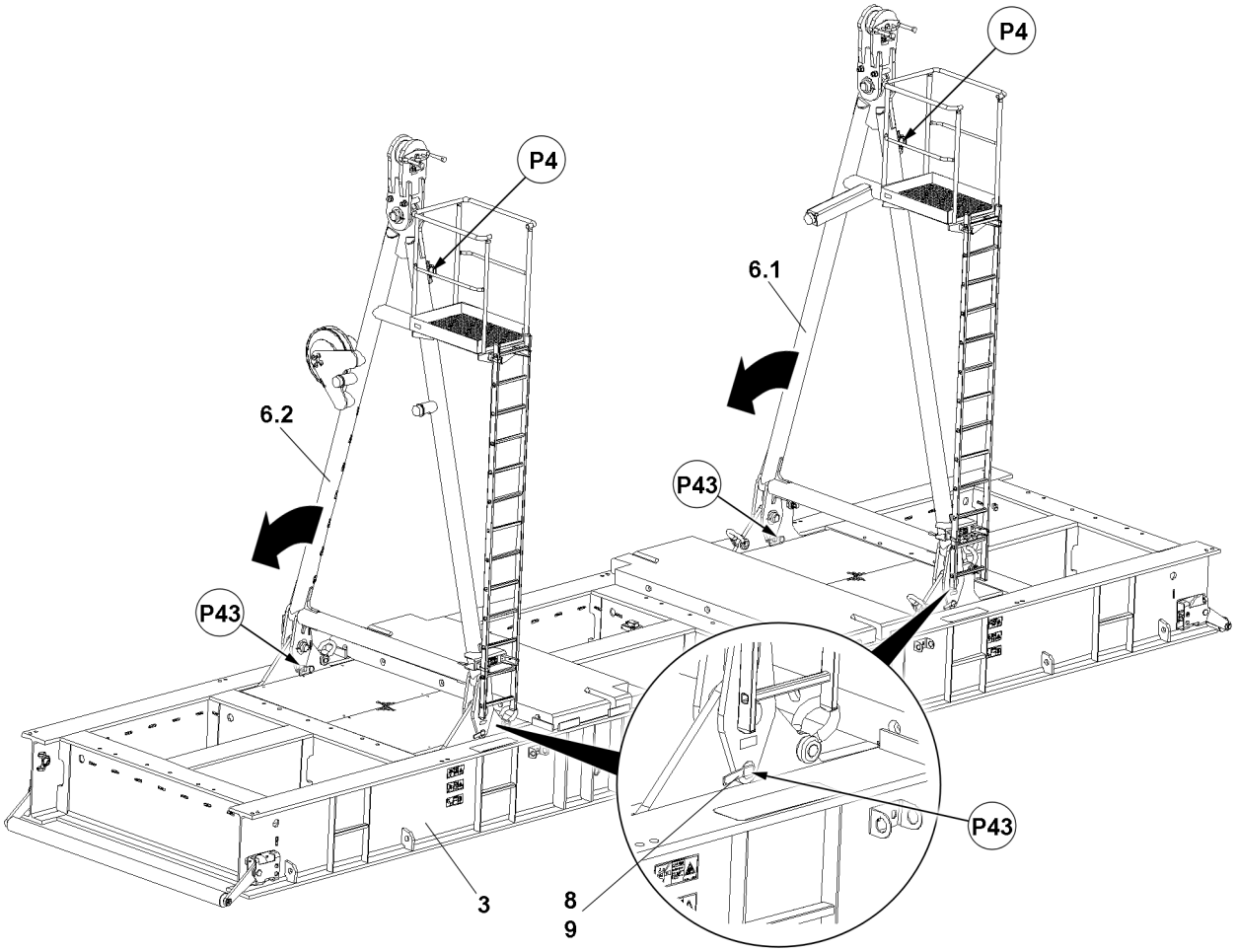

Fig.126078: Ballast pallet, transport position

The erection rack is unpinned on two points. The unpinning procedure is described for one pin as an example.

▶ Hang the erection rack **6.2** on the auxiliary crane at point **P4**.

DANGER
Danger of accident during assembly / disassembly of the erection racks!
The erection racks must hang securely on the auxiliary crane, otherwise they could fall down and kill or severely injure personnel.
▶ Make sure that the erection rack hangs safely on the auxiliary crane.
▶ Never unpin the retaining pins of unsecured or unsupported erection racks.
▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure.

When the erection rack is safely held by the auxiliary crane:
▶ Remove the spring retainer **9** on both sides at point **P43** and unpin the retaining pin **8**.

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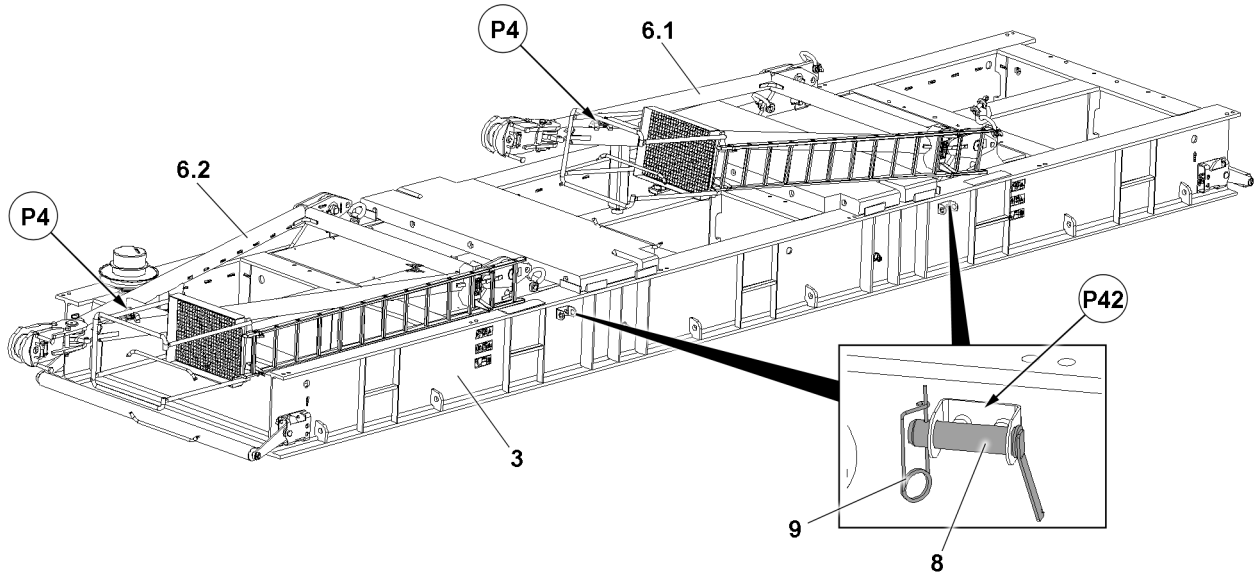

Fig.126063: Ballast pallet, transport position

- ▶ Lower the erection rack **6.2** with the auxiliary crane until the rubber cushions touch the frame.
- ▶ Insert the retaining pin **8** at point **P42** on both sides and secure with spring retainer **9** in park position.
- ▶ Remove the auxiliary crane.
- ▶ Lower the second erection rack **6.1** with the auxiliary crane until the rubber cushion touches the erection rack **6.2**.

13.6 Removing the ballast pallet

Note

- ▶ Fastening points, see section „Fastening points for suspended ballast parts“.

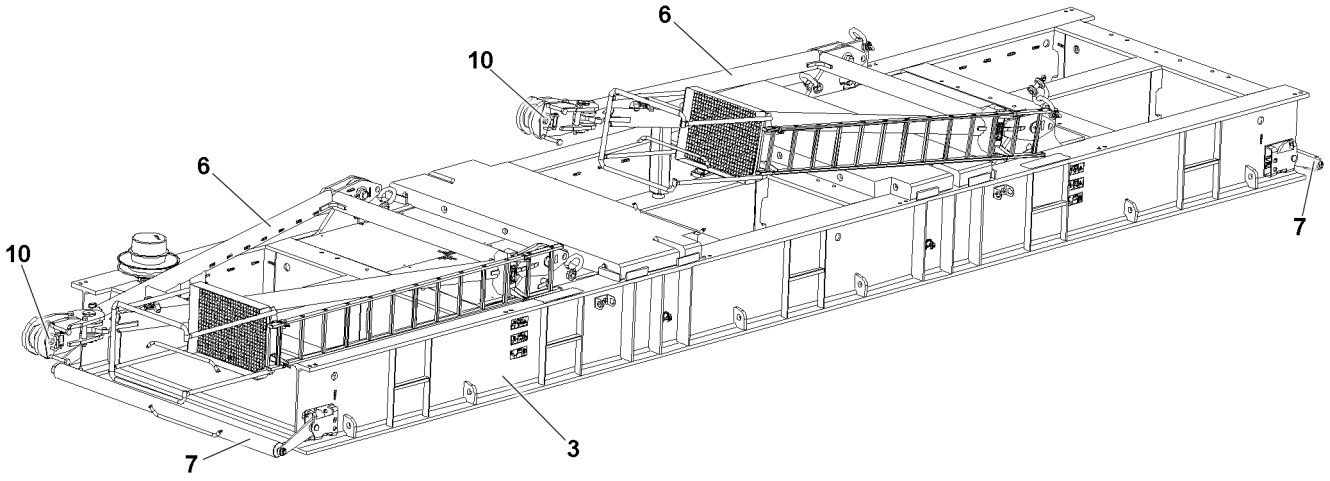

Fig.124997: Ballast pallet, transport position

- ▶ Fasten the ballast pallet **3** with fastening equipment to the auxiliary crane.
- ▶ Remove the ballast pallet **3** with the auxiliary crane.

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13.7 Disassembling without suspended ballast guide

13.7.1 Disassembling the cross beam

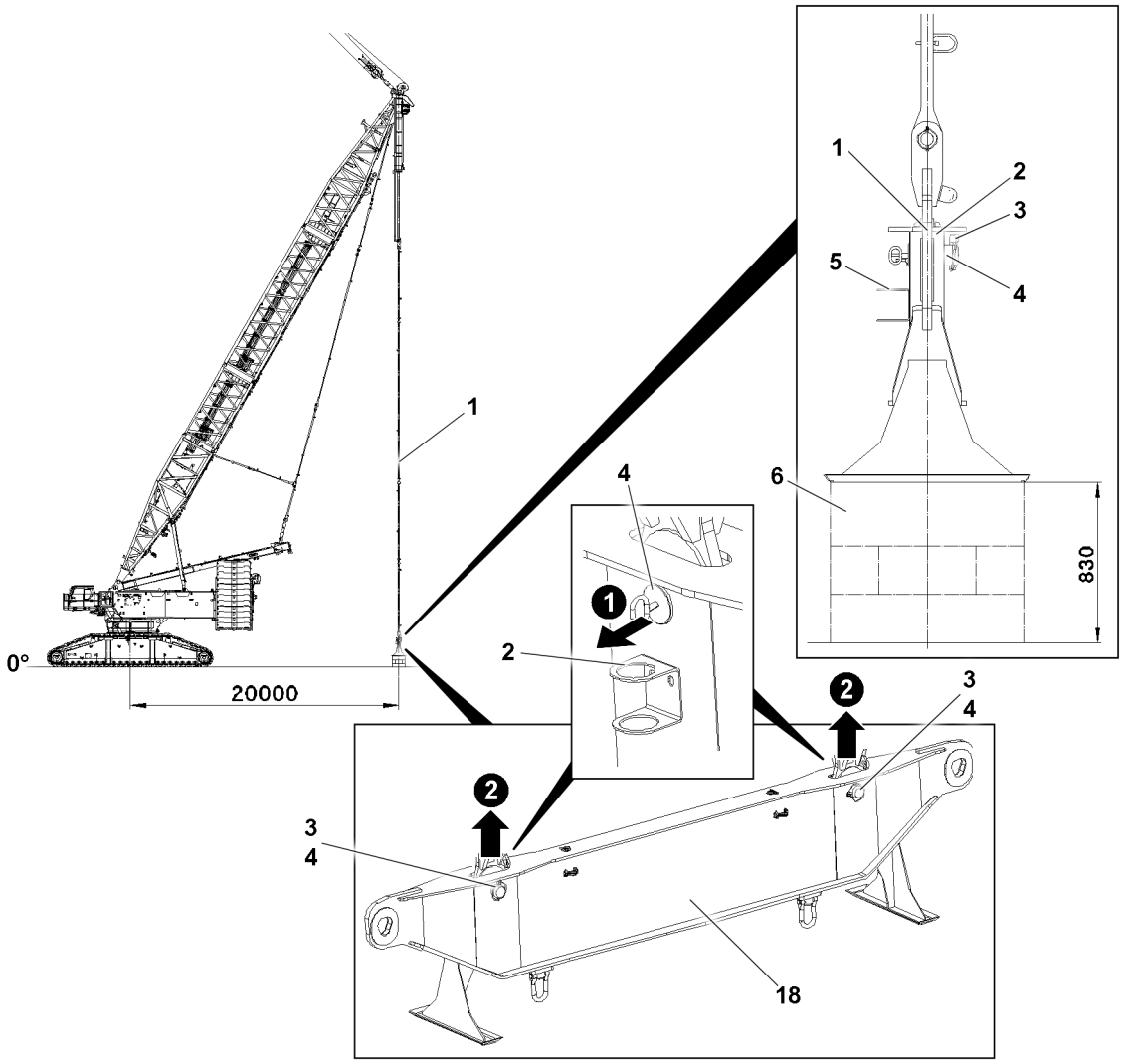

Fig.126481: Cross beam

▶ Set the derrick radius to 20 m.

The substructure **6** must be at least 830 mm above the crane placement surface.

▶ Position the substructure **6** under cross beam **18**.
▶ Set the cross beam **18** on the substructure **6**: Extend the pull cylinder.

Note
Retract / extend the pull cylinder
▶ Control the pull cylinders from the crane cab, see the section „Lifting and lowering the derrick ballast using the pull cylinders“.
▶ Operate the pull cylinder with the radio remote control, see the „radio remote control operating instructions“.

▶ Unpin the cross beam on the D-guy rods **1**: Remove the locking pin **3** and unpin the pin **4**.
▶ Insert the pin **4** in the transportation retainer **5** and secure.
▶ Lift the guy rods: Retract the pull cylinder.

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Note

▶ Fastening points, see section „Fastening points for suspended ballast parts“.

▶ Fasten the cross beam **18** with fastening equipment to the auxiliary crane and remove.

13.8 Disassembling with suspended ballast guide*

13.8.1 Disassembling the suspended ballast with the suspended ballast guide

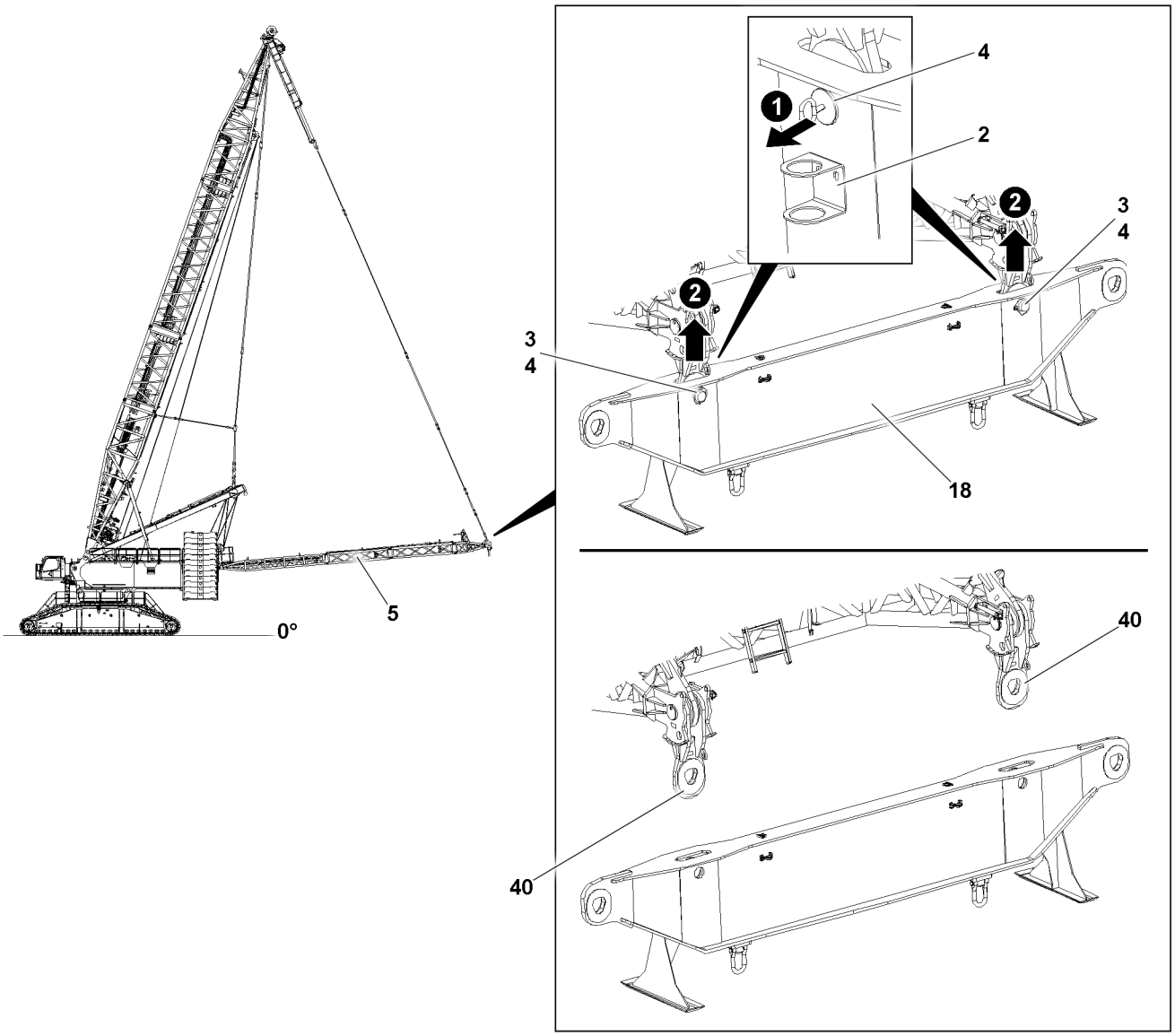

Fig.126479: Cross beam and suspended ballast guide

The suspended ballast guide **5** is lowered by:
– Extending the pull cylinder to the switch position.
– Luffing the derrick boom down.

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Note
Retract / extend the pull cylinder
- ▶ Control the pull cylinders from the crane cab, see the section „Lifting and lowering the derrick ballast using the pull cylinders“.
- ▶ Operate the pull cylinder with the radio remote control, see the „radio remote control operating instructions“.

- ▶ Set the cross beam **18** on the ground: Lower the suspended ballast guide **5**.
- ▶ Remove the locking pin **3** and unpin the pin **4**.
- ▶ Insert the pin **4** in the transport retainer **2** and secure with locking pin **3**.
- ▶ Remove the brackets **40** from the cross beam: Lift the suspended ballast guide **5**.
- ▶ Remove the cross beam **18** with the auxiliary crane.

13.8.2 Disassembling the suspended ballast guide

Derrick ballast radius	Number of intermediate sections
20 m	0
25 m	1
30 m	2

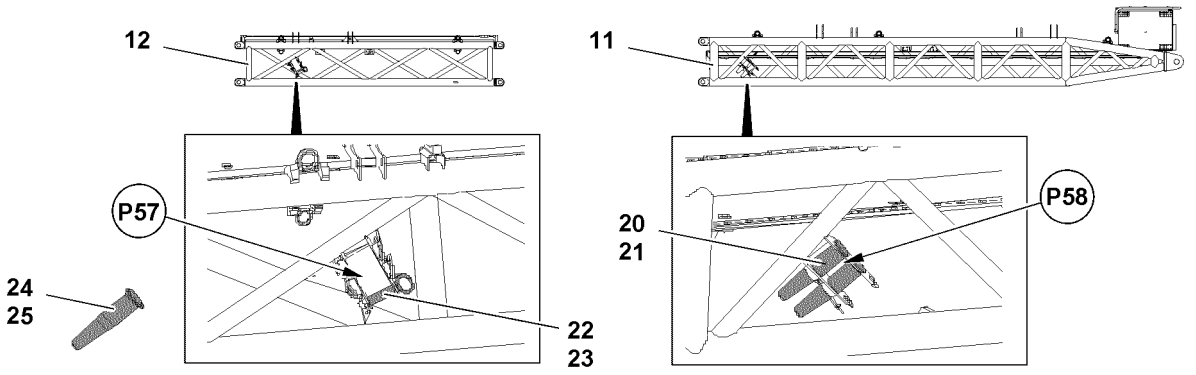

Fig.122802: Park position for pin

Note
- ▶ Park position **P57** for pin **24** and pin **22**.
- ▶ Park position **P58** for pin **20**.

WARNING
Falling pins!
Death, severe injury, property damage.
- ▶ Make sure that all pins are properly secured in the park positions with the respective retaining elements.

Unpinning the pull rods of the suspended ballast guide from the D-guy rods

Make sure that the following prerequisites are met:
- – The cross beam is disassembled and removed.

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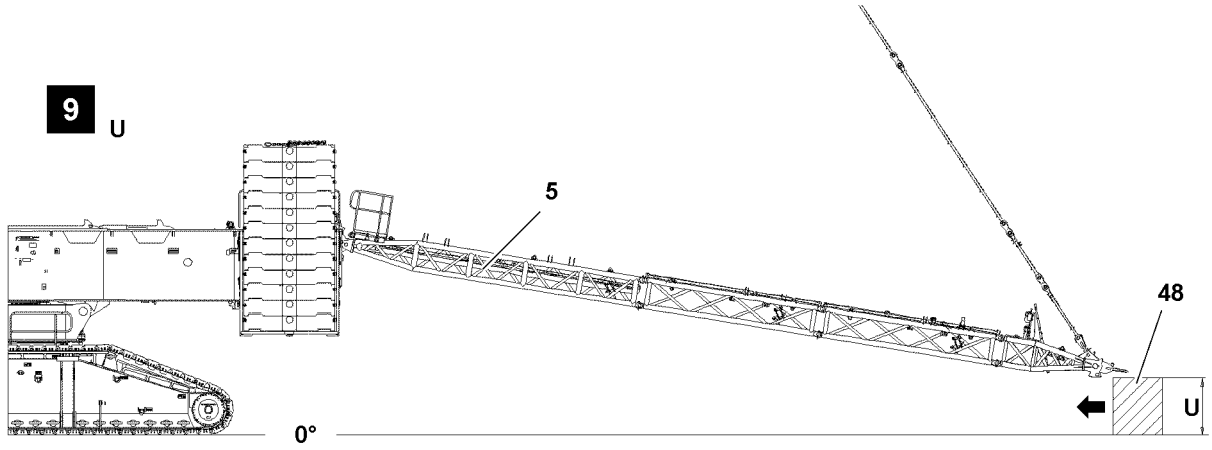

Fig.120214: Substructure, example

Suspended ballast guide	R30	R25	R20
Substructure height „U“	0 m	1.6 m	2.0 m

When R25 or R20 is removed:

▶ Establish a substructure and place the suspended ballast guide **5** with the auxiliary crane on the substructure, see illustration **9**.

When R30 is removed:

▶ Place the suspended ballast guide **5** with the auxiliary crane on the ground.

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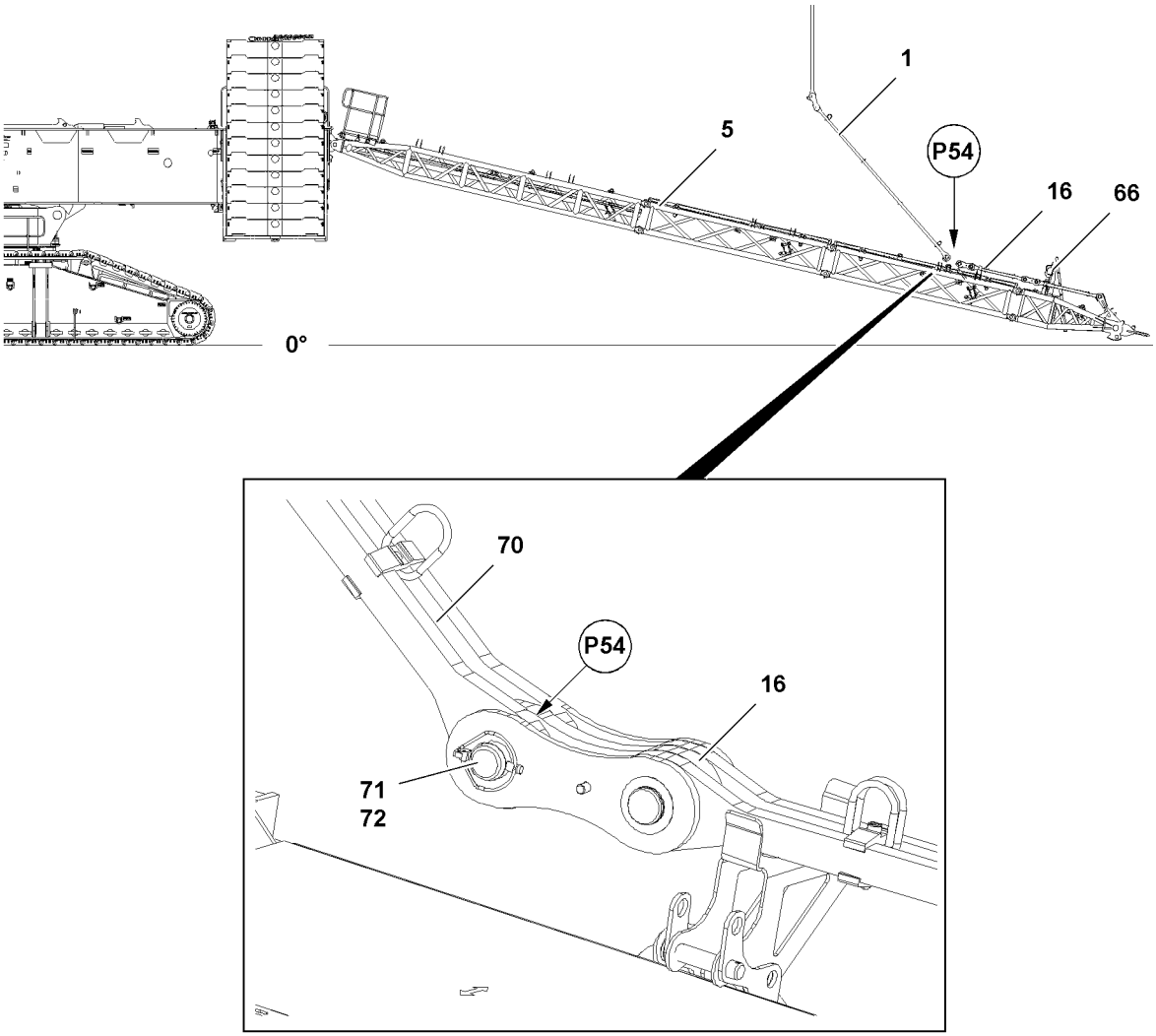

Fig.126068: D-guy rods

▶ Connect the rope of the manual rope winch **66** with the D-guy rods **1**.

The D-guy rods **1** are pinned on both sides on the suspended ballast guide **5**. The unpinning procedure is described on the example for one D-guy rod.

WARNING
Swinging D-guy rods!
When unpinning the D-guy rods **1** at point **P54** then they swing uncontrolled into direction of the turntable.
Personnel can be injured or killed.
▶ Make sure that the D-guy rods are secured with the manual rope winches before unpinning.

▶ Remove the safety locking pin **72** at point **P54** and unpin the pin **71**.
▶ Swing the D-guy rods **1** with the aid of the manual rope winch **66** and simultaneous luffing up the derrick boom in direction of the turntable.

When the D-guy rods **1** hang vertically:
▶ Remove the rope of the manual rope winch **66** and spool it up.
▶ Attach the suspended ballast guide **5** with fastening equipment on the auxiliary crane.

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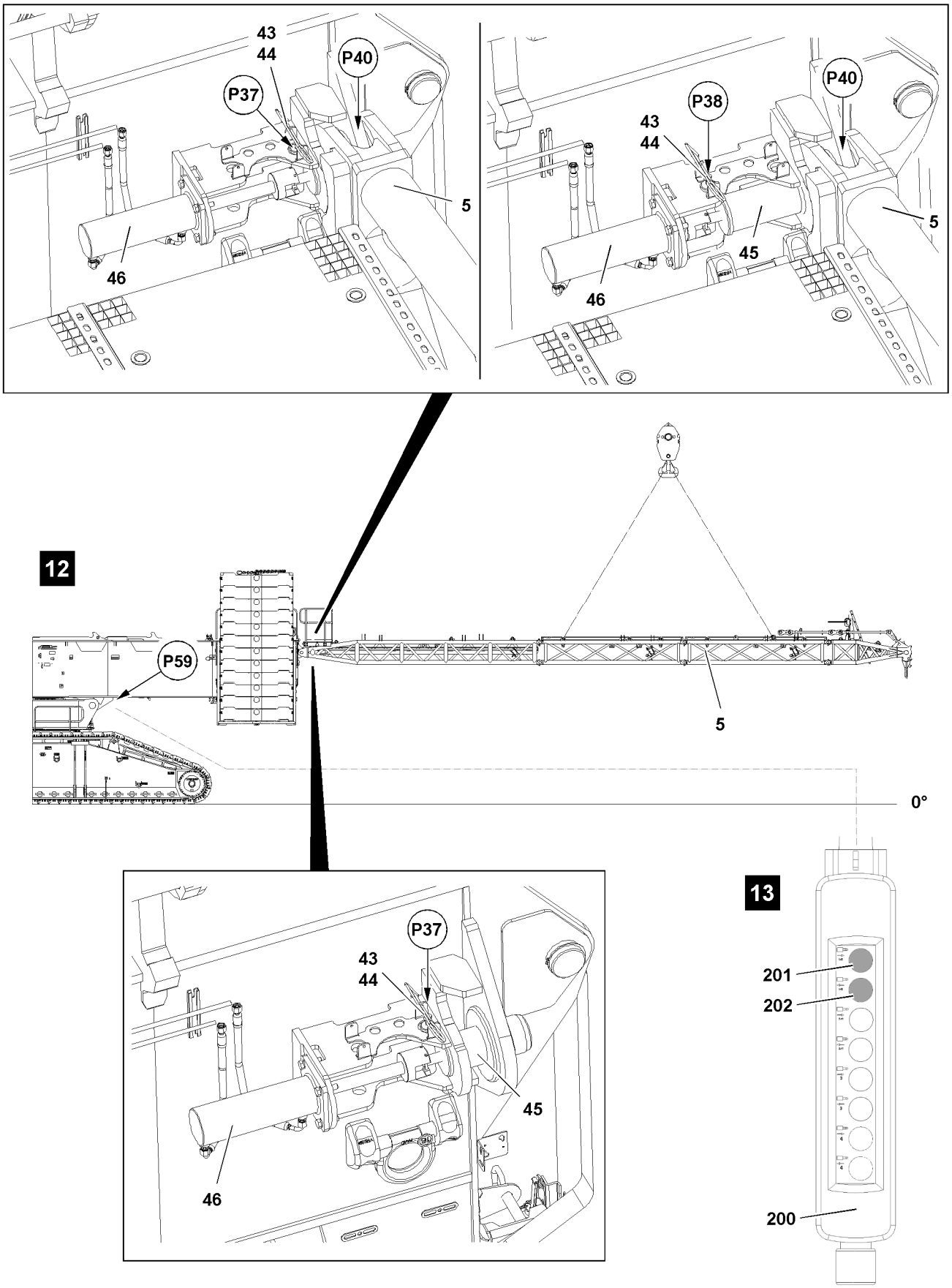

Fig.120216

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Disassembling the suspended ballast guide on the turntable frame

Make sure that the following prerequisites are met:
- The suspended ballast guide is fastened on the auxiliary crane with fastening equipment.
- The control panel is connected on the socket „turntable rear“.

▶ Swing the suspended ballast guide **5** to the horizontal.

The suspended ballast guide **5** is pinned on two points **P40**. The unpinning procedure is described for one pin as an example:
▶ Release the pin **45**: Remove the spring retainer **44** at point **P37** and unpin the retaining pin **43**, see illustration **12**.
▶ Insert the retaining pin **43** at point **P38** and secure with spring retainer **44**.

When the suspended ballast guide **5** is safely held by the auxiliary crane:
▶ Unpin the pin **45**: Press button **202** on the control panel **200**, see illustration **13**.

Result:

– The pin **45** moves out.

When both pins **45** are unpinned:
▶ Remove the suspended ballast guide **5** from the pin points on the rear of the turntable and place it on the substructure.
▶ Insert the pins **45** again: Press button **201** on the control panel **200**, see illustration **13**.

Result:

– The pin **45** moves in.

▶ Secure the pin **45**: Insert the retaining pin **43** at point **P37** and secure with spring retainer **44** see illustration **12**.

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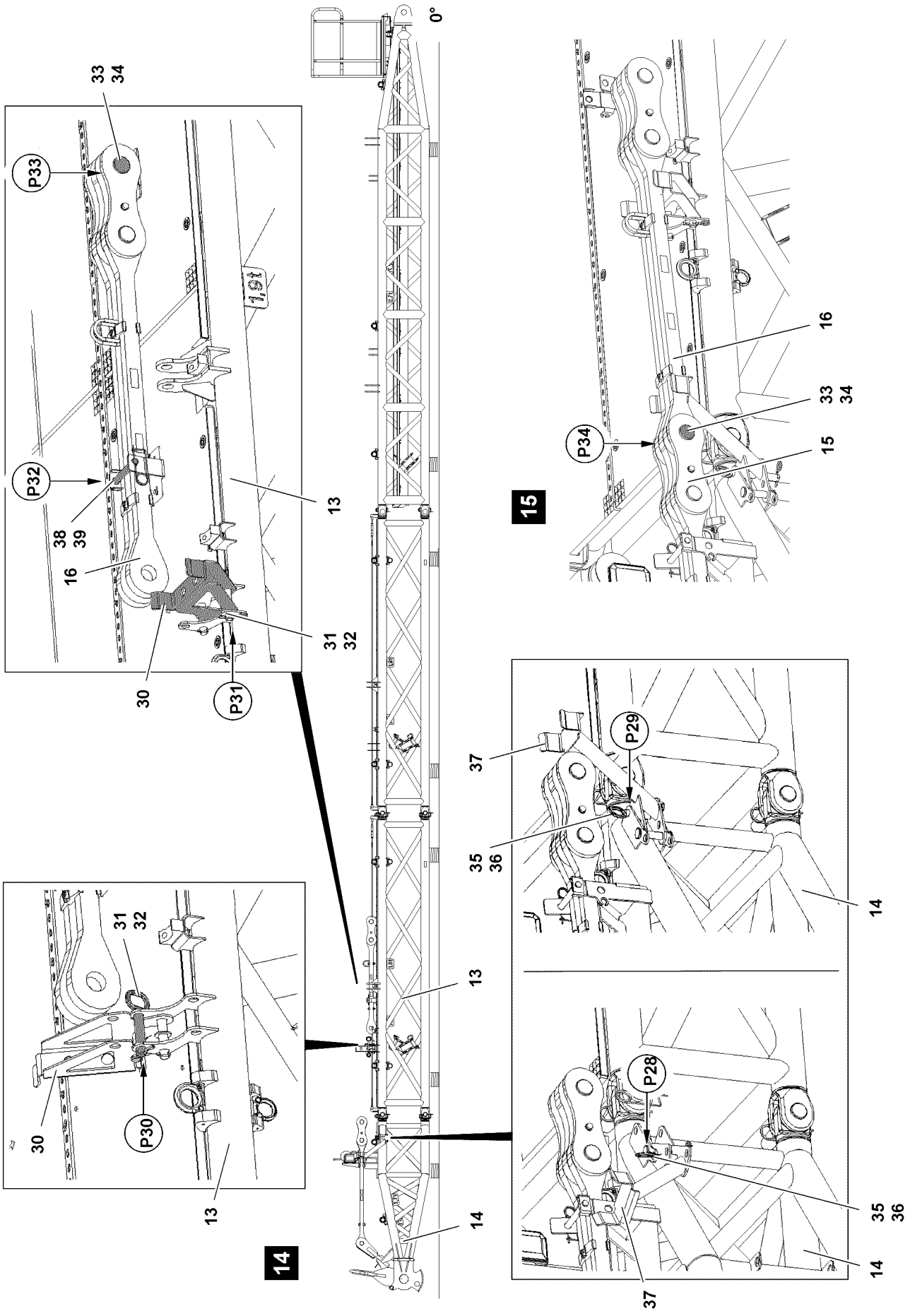

Fig.122951

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Disassembling the suspended ballast guide

Note

▶ The disassembly of the suspended ballast guide is described based on the example of one suspended ballast guide with a 30 m suspended ballast radius.

Swinging the brackets

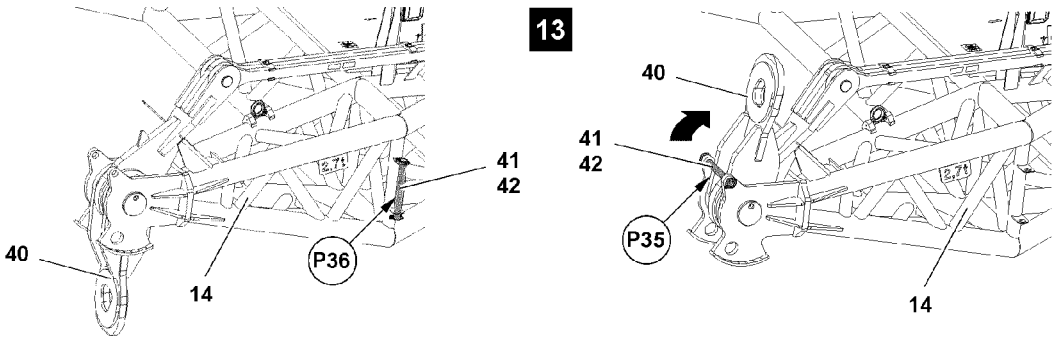

Fig.119029: Swinging the bracket

▶ Fasten the bracket **40** with fastening equipment to the auxiliary crane.

WARNING

Bracket swinging down!

The bracket can swing down by itself due to its own weight when pinning it, see illustration.

Death, severe injury, property damage.

Fingers and hands can be crushed.

▶ Make sure that the platform is held by the auxiliary crane.

▶ Do not reach with your hands into the danger zone.

▶ Remove the safety locking pin **42** at point **P36** and unpin the pin **41**, see illustration **16**.

▶ Swing the bracket **40** upward with the auxiliary crane.

▶ Insert the pin **41** in park position at point **P35** and secure with safety locking pin **42**, see illustration **16**.

Disassembling the pull rods

▶ Fasten the pull rod **16** with fastening equipment to the auxiliary crane.

▶ Unpin the pull rod **16** from the pull rod end section **15**: Remove the safety locking pin **34** at point **P34** and unpin the pin **33**, see illustration **15**.

▶ Lift the pull rod **16** with the auxiliary crane and take it down in transport position at point **P32** and point **P33**.

▶ Insert the pin **33** at point **P33** and secure with safety locking pin **34**.

▶ Insert the pin **38** on point **P32** and secure with spring retainer **39**.

Result:

– The pull rod **16** is secured in the transport position, see illustration **14**.

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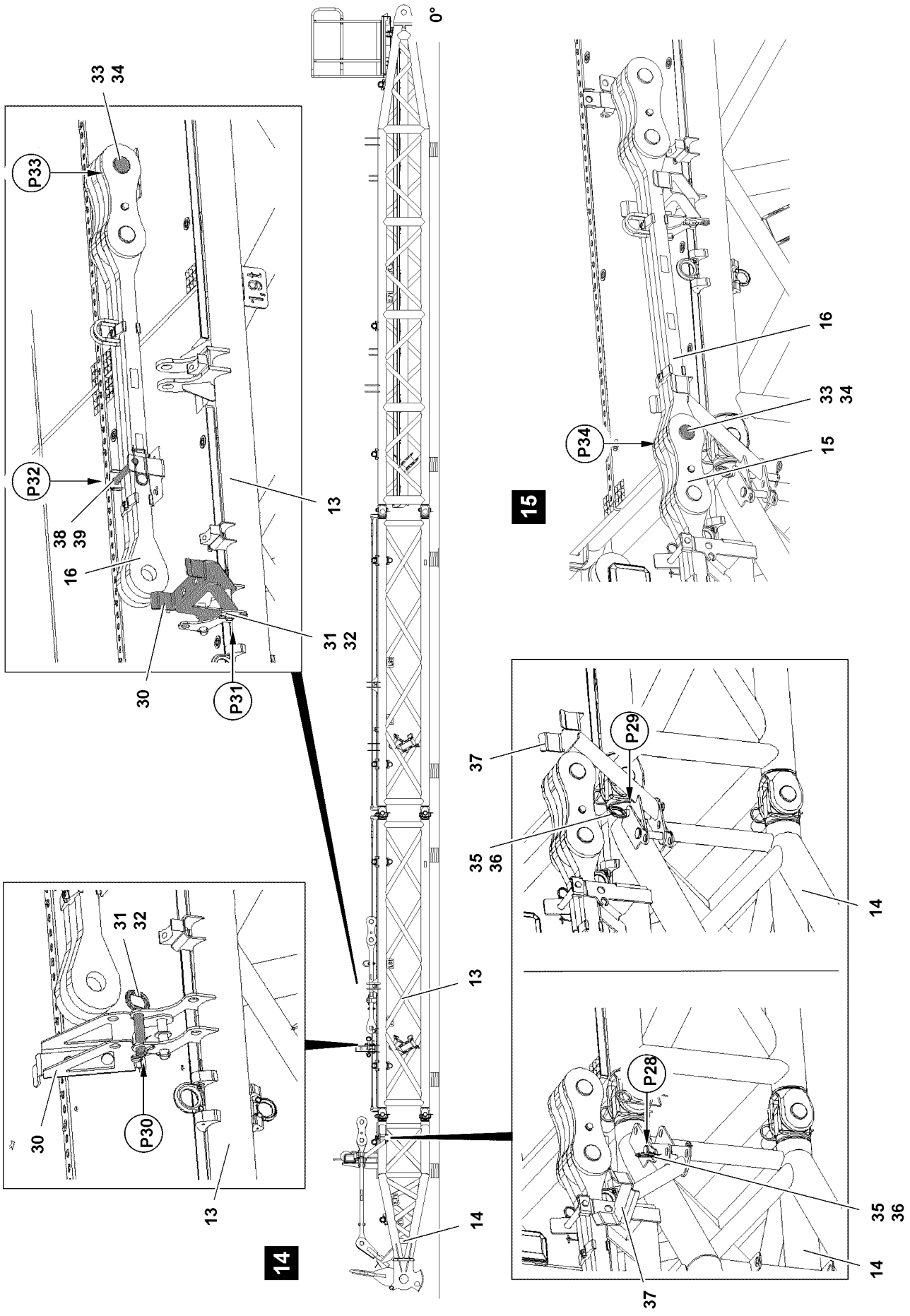

Fig.122951

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▶ Release the retainer **30** from operating position: Remove the spring retainer **32** at point **P31** and unpin the socket pin **31**, see illustration **14**.

WARNING
When swinging the retainer, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Swing the retainer **30** until it can be pinned at point **P30**.
▶ Insert the socket pin **31** at point **P30** and secure with spring retainer **32**.

Result:

– The retainer **30** is secured in the transport position, see illustration **14**.

▶ Release the bracket **37** from operating position: Remove the spring retainer **36** at point **P29** and unpin the socket pin **35**, see illustration **14**.

WARNING
When swinging the bracket, fingers and hands can be crushed!
▶ Do not reach with your hands into the danger zone.

▶ Swing the bracket **37** until it can be pinned at point **P28**.
▶ Insert the socket pin **35** at point **P28** and secure with spring retainer **36**.

Result:

– The bracket **37** is secured in the transport position, see illustration **14**.

▶ Secure the pull rod **15** in transport position.

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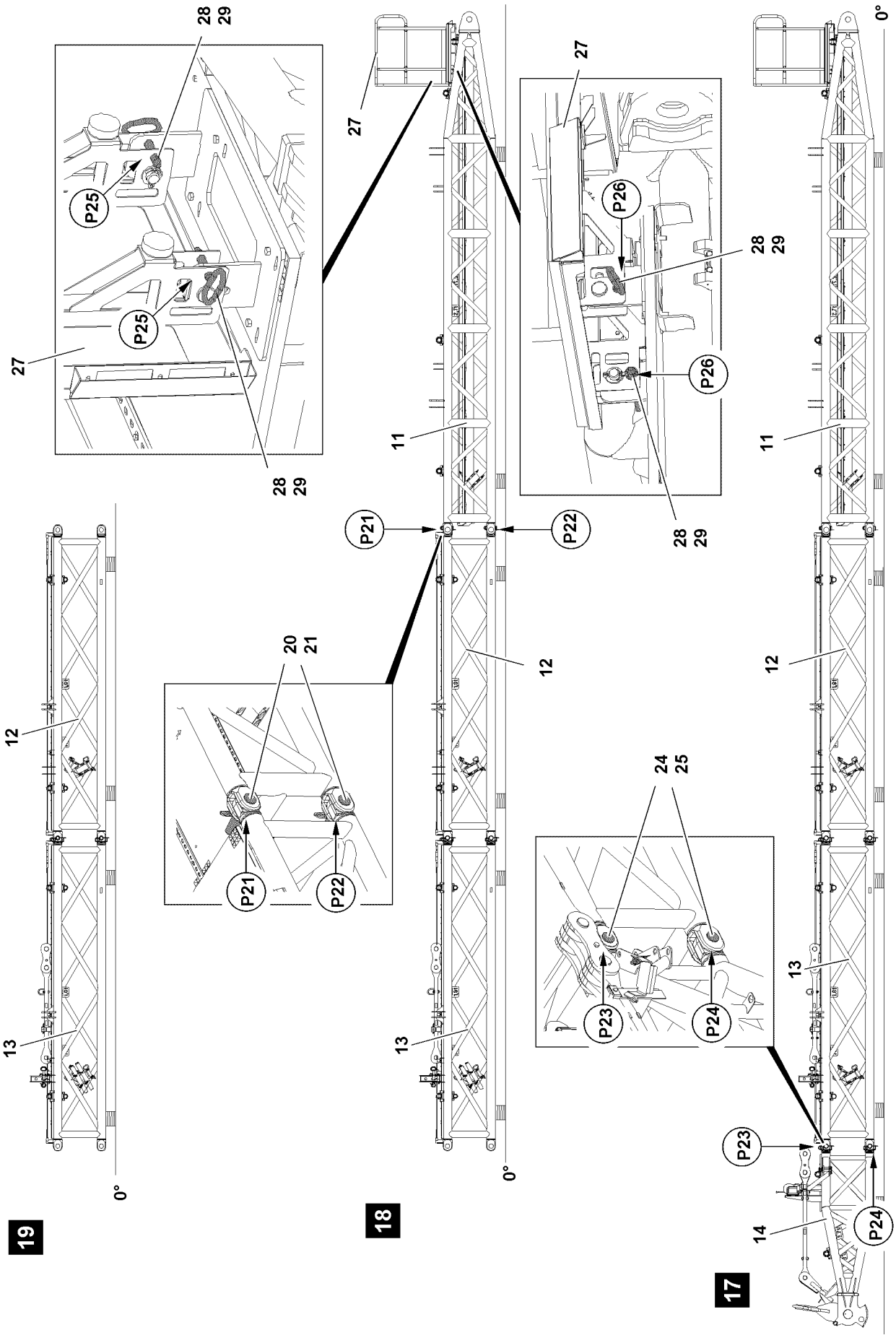

Fig.122952

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Disassembling the end section

▶ Fasten the end section **14** with fastening equipment to the auxiliary crane.

The end section and the intermediate section are pinned together in four points. Every point is present on both sides of the component on one level, see illustration **17**.

▶ Unpin the end section **14** on both sides at point **P24**: Remove spring retainers **25** and unpin pins **24**.
▶ Unpin the end section **14** on both sides at point **P23**: Remove spring retainers **25** and unpin pins **24**.
▶ Remove the end section **14** with the auxiliary crane.
▶ Remove the fastening equipment.

Disassembling the pivot section

▶ Fasten the platform **27** with fastening equipment to the auxiliary crane.
▶ Set the platform **27** in the transport position, see illustration **18**: Remove the safety locking pin **29** at points **P26** and unpin the grip pin **28**.

WARNING
Platform swinging down!
The platform can swing down by itself due to its own weight when pinning it, see illustration.
Death, severe injury, property damage.
Fingers and hands can be crushed.
▶ Make sure that the platform is held by the auxiliary crane.
▶ Do not reach with your hands into the danger zone.
▶ Use personal protective equipment.

▶ Swing the platform **27** with the auxiliary crane.
▶ Insert the grip pin **28** at points **P25** and secure with safety locking pin **29**.
▶ Remove the auxiliary crane.
▶ Fasten the pivot section **11** with fastening equipment to the auxiliary crane.

The pivot section and the intermediate section are pinned together in four points. Every point is present on both sides of the component on one level, see illustration **18**.

▶ Unpin the pivot section **11** on both sides at point **P22**: Remove spring retainers **21** and unpin pins **20**.
▶ Unpin the pivot section **11** on both sides at point **P21**: Remove spring retainers **21** and unpin pins **20**.
▶ Remove the pivot section **11** with the auxiliary crane.
▶ Remove the fastening equipment.

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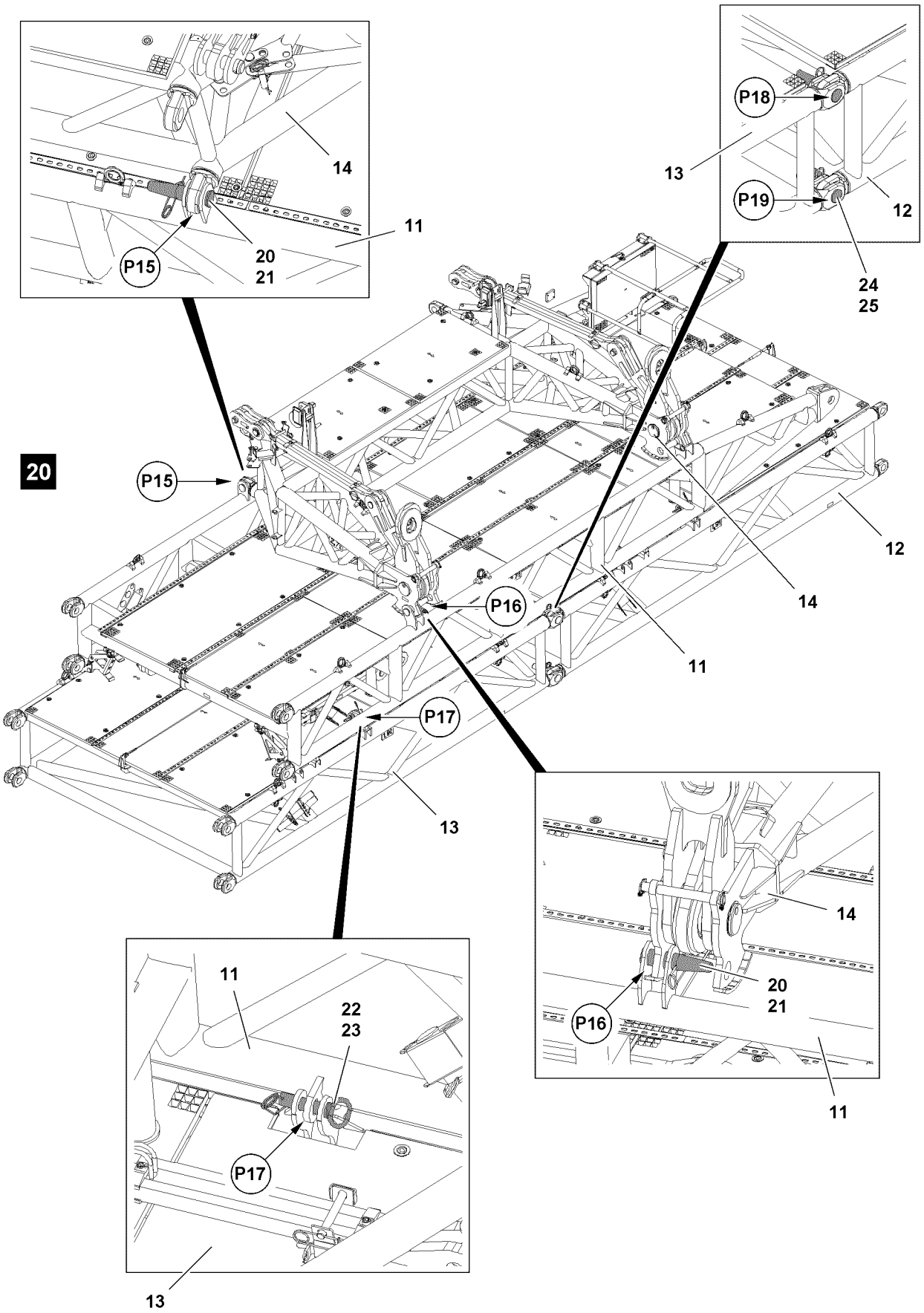

Fig.122953

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Installing the suspended ballast guide as a transport unit

Make sure that the following prerequisites are met:
- The pivot section has been removed.
- The end section has been removed.
- The platform has been placed down.
- The pull rods are placed down and secured.
- The retainer and the bracket are secured in transport position.

Assembling the intermediate sections

For the suspended ballast guide as a transport unit, only two intermediate sections are installed.

▶ Fasten the intermediate section **13** with fastening equipment to the auxiliary crane.
▶ Position the intermediate section **13** with the auxiliary crane on the intermediate section **12** at point **P18** until the pin points align.

The intermediate section **13** and intermediate section **12** are pinned together on four points. Every point is present on both sides of the component on one level, see illustration **20**.

▶ Pin the intermediate section **13** on both sides at point **P18** with the intermediate section **12**: Insert the pins **24** and secure with the spring retainers **25**.
▶ Pin the intermediate section **13** on both sides at point **P19** with the intermediate section **12**: Insert the pins **24** and secure with the spring retainers **25**.
▶ Remove the fastening equipment.

Assembling the pivot section

The pivot section is pinned at four points. Every point is present on both sides of the component on one level.

▶ Fasten the auxiliary crane to the pivot section **11**.
▶ Position the pivot section **11** with the auxiliary crane on the intermediate section **12** and intermediate section **13** at point **P17** until the pin points align, see illustration.
▶ Pin the pivot section **11** at points **P17**: Insert the pins **22** and secure with spring retainers **23**, see illustration **20**.
▶ Remove the fastening equipment.

Assembling the end section

The end section is pinned at four points. Every point is present on both sides of the component on one level.

▶ Fasten the end section **14** with fastening equipment to the auxiliary crane.
▶ Position the end section **14** with the auxiliary crane on the pivot section **11** at point **P15** and point **P16** until the pin points align, see illustration **20**.
▶ Pin the end section **14** at points **P15**: Insert the pins **20** and secure with spring retainers **21**, see illustration **20**.
▶ Pin the end section **14** at points **P16**: Insert the pins **20** and secure with spring retainers **21**, see illustration **20**.
▶ Remove the fastening equipment.

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5.36.30 Derrick ballast - suspended ballast - special design Ballast Constant (BC)

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4	Derrick ballast radii	7
5	Pull cylinder extension conditions	8
6	Assembly	9
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Fig.195219

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1 Product description

This chapter describes the following derrick ballast variations:
- Suspended ballast *special design*: Ballast Constant
  Ballasting consisting of directly suspended ballast plates (with / without cross beam)

This crane type has additional derrick ballast variations, which will be described in other chapters of these operating instructions:
- Ballast trailer
  Ballasting consisting of ballast plates on a ballast trailer
  Permissible ballast plates: Ballast plates 10 t
  Ballast Constant is assembled without a suspended ballast guide.
  Ballast Constant is assembled without a ballast pallet.
- Suspended ballast
  Ballasting consisting of ballast plates on a ballast pallet
- Suspended ballast *special design*: Ballasting LTR crane and / or ballast plates
  Ballasting consisting of an LTR crane and / or ballast plates on a ballast pallet

Note
Designation of the ballast types
- ▶ The suspended ballast and the ballast trailer are generally described as derrick ballast.
- ▶ The ballast installed on the turntable is generally referred to as the counterweight.
- ▶ The ballast installed on the crawler travel gear is generally referred to as the central ballast.

1.1 Function

The D-guying contains two pull cylinders (pull cylinder A and pull cylinder B). After assembly on the ground, the derrick ballast is raised for crane operation with the pull cylinders

All relevant data regarding the derrick ballast is displayed on the LICCON monitors.

The required derrick ballast radius is set by adjusting the derrick boom.

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1.2 Variations

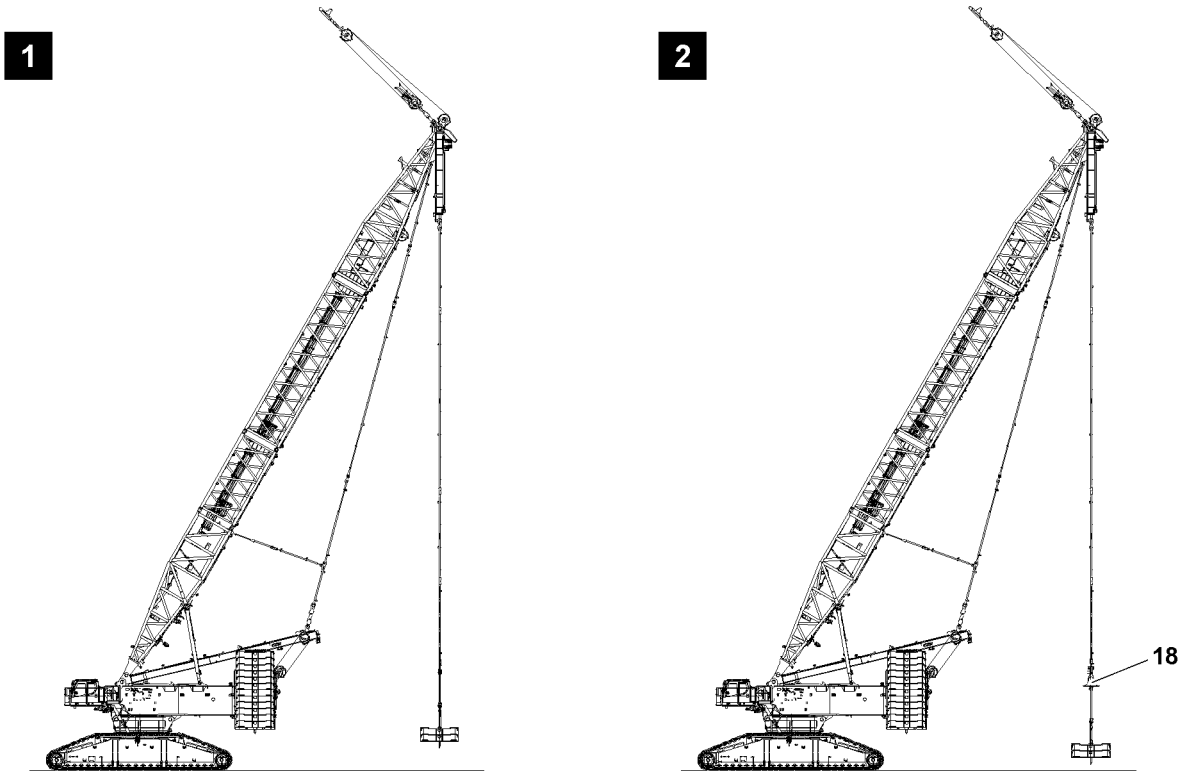

Fig.145946: Ballast Constant, variations

Ballast Constant can be assembled without a cross beam **or** with a cross beam **18**.

Variations for Ballast Constant:
- **Without** cross beam, see illustration **1**
- **With** cross beam, illustration **2**

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2 Component overview

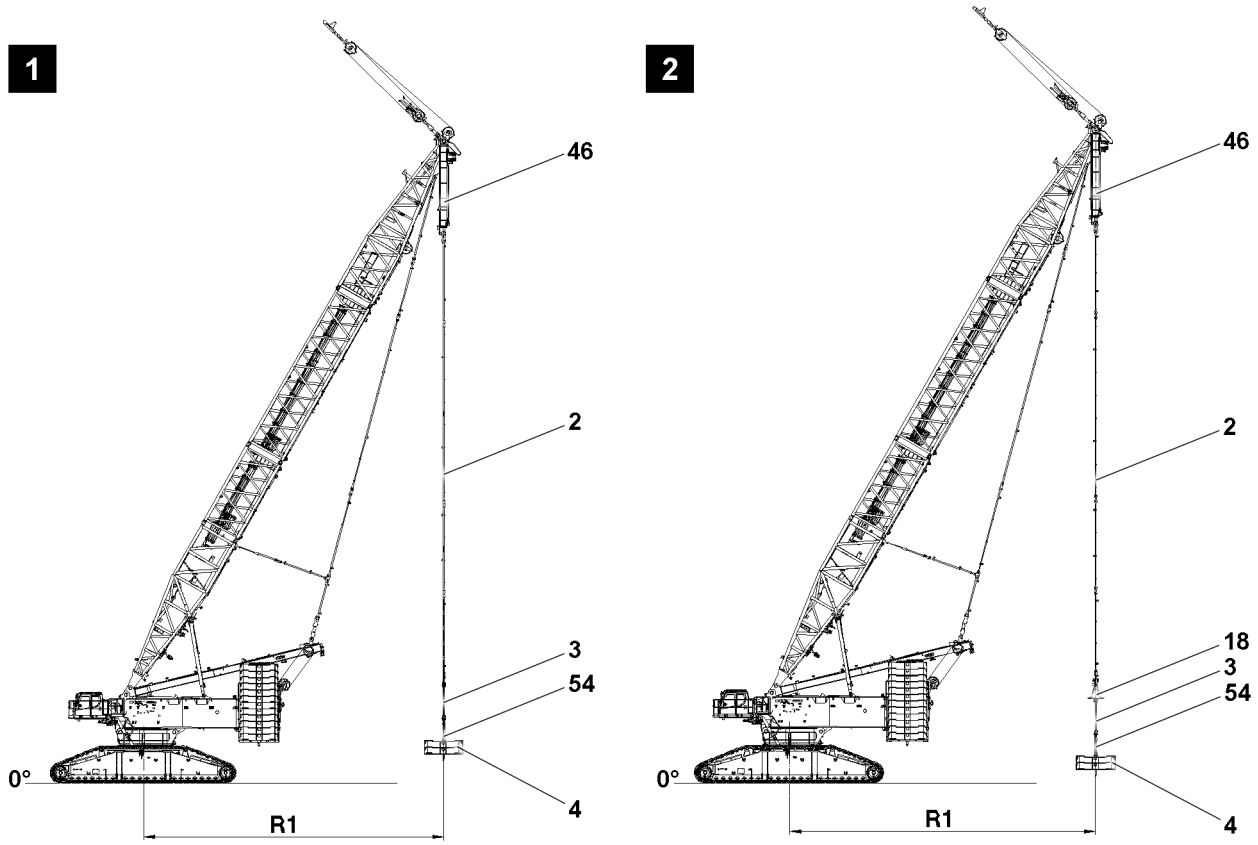

Fig.145949: Ballast Constant, component overview

46 Pull cylinder
2 D-guying
18 Cross beam
3 Supplied fastening equipment
54 Receptacle stud
4 Ballast plates

2.1 Fastening equipment

Supplied fastening equipment:
- Roundslings
- Shackle

2.2 Ballast plates

Note
- ▶ The assembly sections are marked with their own weight.
- ▶ Dimensions and weights, see the Crane operating instructions, chapter 1.03.

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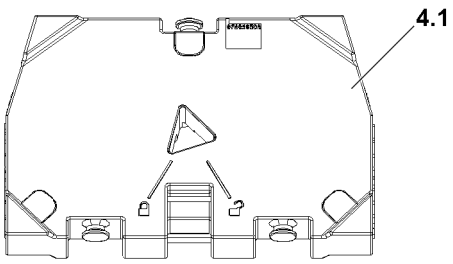

Fig.126484

4.1 10 t ballast plate

2.3 Cross beam*

Note
- ▶ The assembly sections are marked with their own weight.
- ▶ Dimensions and weights, see the Crane operating instructions, chapter 1.03.

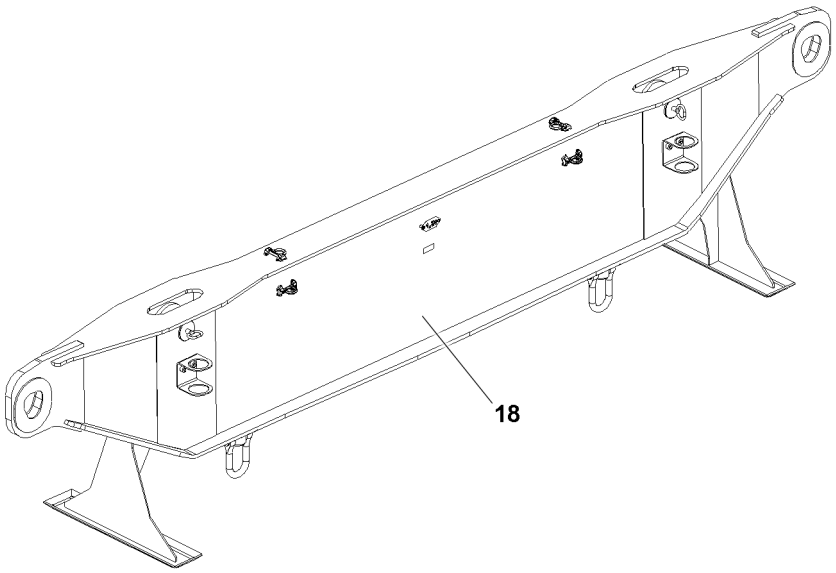

Fig.124993

18 Cross beam

3 Fastening points for suspended ballast components

3.1 Ballast plates

WARNING
Component incorrectly fastened!
Life-threatening situations can arise due to improper or incorrect attachment of the corresponding components.
Death, severe injury, property damage.
- ▶ Fasten the components only on the intended fastening points on both sides.
- ▶ Fastening of components and description of fastening points, see Crane operating instructions, chapter 5.01.

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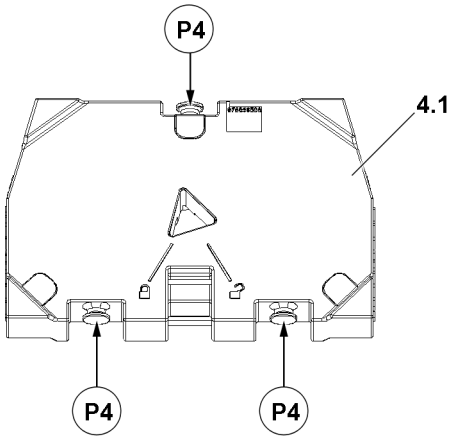

Fig.126483

Fastening points	
P4	10 t ballast plate **4.1**

3.2 Cross beam*

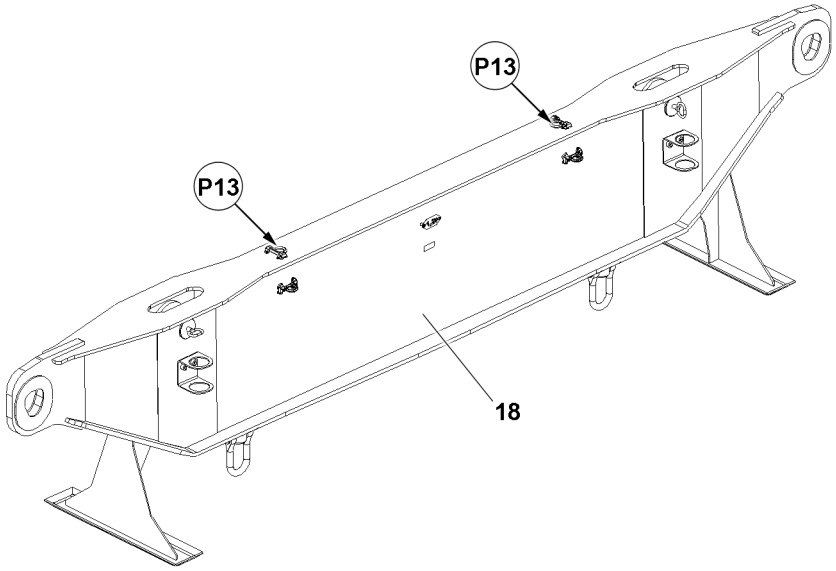

Fig.126060

Fastening points	
P13	Cross beam **18**

4 Derrick ballast radii

4.1 36 m derrick boom

With the 36 m derrick, the following derrick ballast radii are possible: R1= 12 m and R1= 18 m.

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4.2 Derrick boom 42 m

With the 42 m derrick, the following derrick ballast radii are possible: R1= 12 m and R1= 20 m.

5 Pull cylinder extension conditions

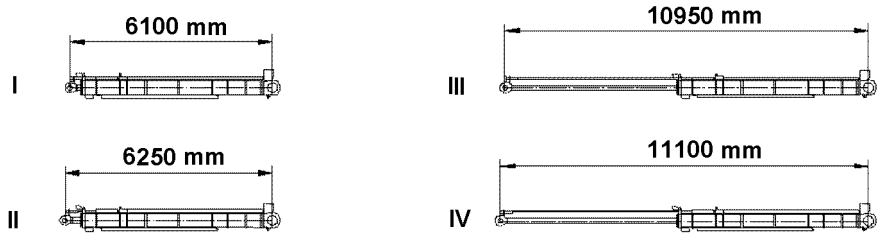

Fig.119003: Pull cylinder extension conditions

Extension conditions	
I	Block position „Retracted“
II	Switch position „Retracted“
III	Switch position „Extended“
IV	Block position „Extended“

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6 Assembly

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe injury, property damage.

- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

When the assembly personnel is within the danger zone of the crane:

- ▶ A guide and / or the crane operator must be able to see the entire danger zone.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Personnel can be caught and severely injured or killed.

- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel.

- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

Make sure that the following prerequisites are met:

- The crane is horizontally aligned.
- An auxiliary crane is available.
- The derrick is in the crane operating position.
- The main boom is in the crane operating position.
- The counterweight has been installed on the turntable according to the load chart.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection settings have been compared with the actual set up configuration.

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6.1 Ballasting

WARNING
Impermissible geometry of the ballast!
Falling ballast plates.
Death, severe bodily injuries, property damage.
▶ Replace damaged ballast plates immediately with new ballast plates.
▶ Ballast the Ballast Constant symmetrically.

Make sure that the following prerequisites are met:
– An auxiliary crane is on hand.
– Receptacle studs are on hand.

6.1.1 Picking up the ballast plates with the receptacle stud

Note
There is a specific receptacle stud for each ballast plate version.
▶ Always use the appropriate receptacle stud.

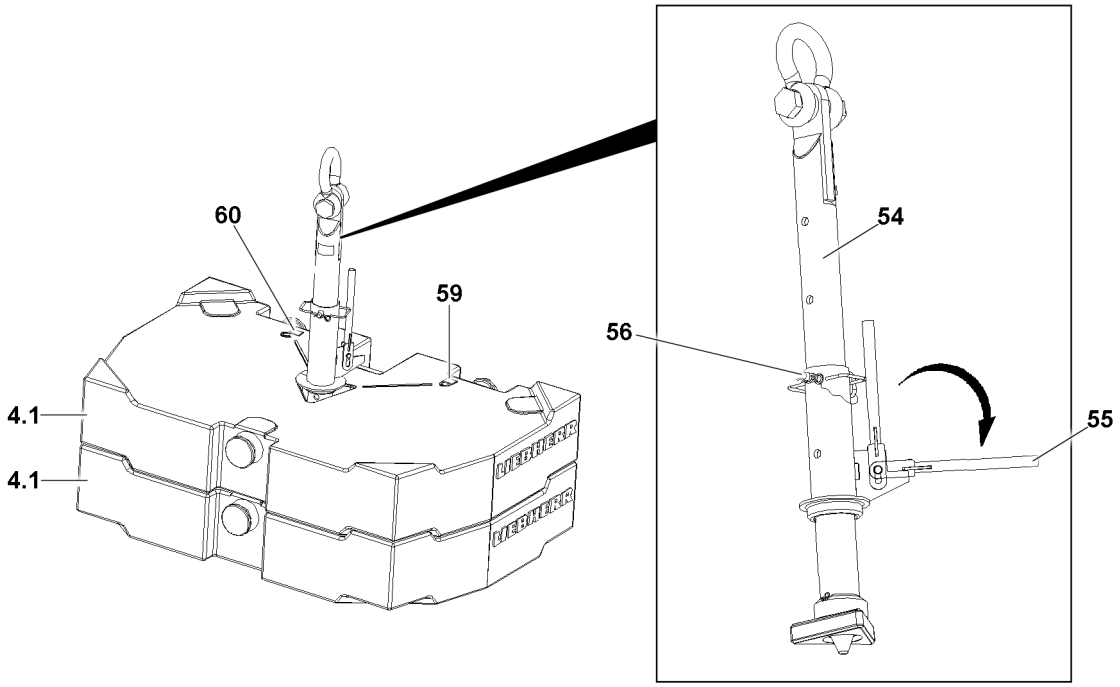

*Fig.126074: Receptacle stud **54** with two 10 t ballast plates **4.1***

WARNING
Receptacle stud **not** permissible for provided ballast plates!
Overload and damage of the receptacle stud. Death, severe injury, property damage.
▶ Only use a receptacle stud **54** for ballast plates 10 t **4.1**.

WARNING
More than two ballast plates lifted with the receptacle stud!
Overload and damage of the receptacle stud. Death, severe injury, property damage.
▶ Lift a maximum of two 10 t ballast plates **4.1** with a receptacle stud **54**.
▶ Make sure that the ballast plates are placed correctly in the centerings of the receptacle stud.

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WARNING
Danger of accident due to damaged components!
- ▶ Do not use a damaged receptacle stud **54**.
- ▶ Replace damaged ballast plates 10 t **4.1**.

Ballast plates for Ballast Constant are taken up with the receptacle stud, fastening system: „Twistlock“.

Ballast plates can be taken up individually or as an assembly of maximum two ballast plates.

Before the receptacle stud **54** is guided into the ballast plates, it must be ensured that the length of the receptacle stud **54** is set correctly. The length of the receptacle stud **54** can be adjusted with the pin **56**.

- ▶ Release and unpin the pin **56**.
- ▶ Adjust the length of the receptacle stud by moving the receptacle stud **54**.
- ▶ Insert the pin **56** and secure with the spring retainer.
- ▶ Attach the receptacle stud **54** with fastening equipment on the auxiliary crane and guide it into the ballast plate(s).
- ▶ Pull the lever **55** up and fold it down.

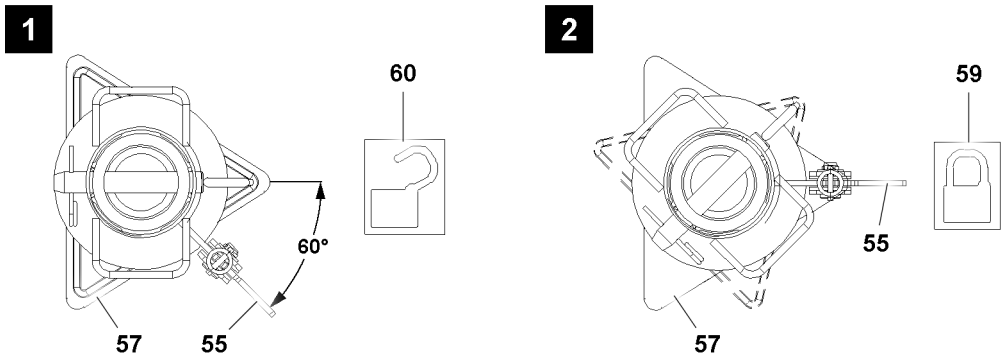

*Fig.126075: Receptacle stud overhead view, positions lever **55***

- ▶ Turn the lever **55** by 60°, see illustration **1** until the lever **55** points on the icon **59**, illustration **2**.

Result:

– The receptacle stud **54** is locked with the ballast plate.

6.2 Assembling without a cross beam

6.2.1 Fastening the ballast on the guy rods

Make sure that the following prerequisites are met:
- Ballast plates are on the receptacle stud.
- Supplied fastening equipment is on hand.

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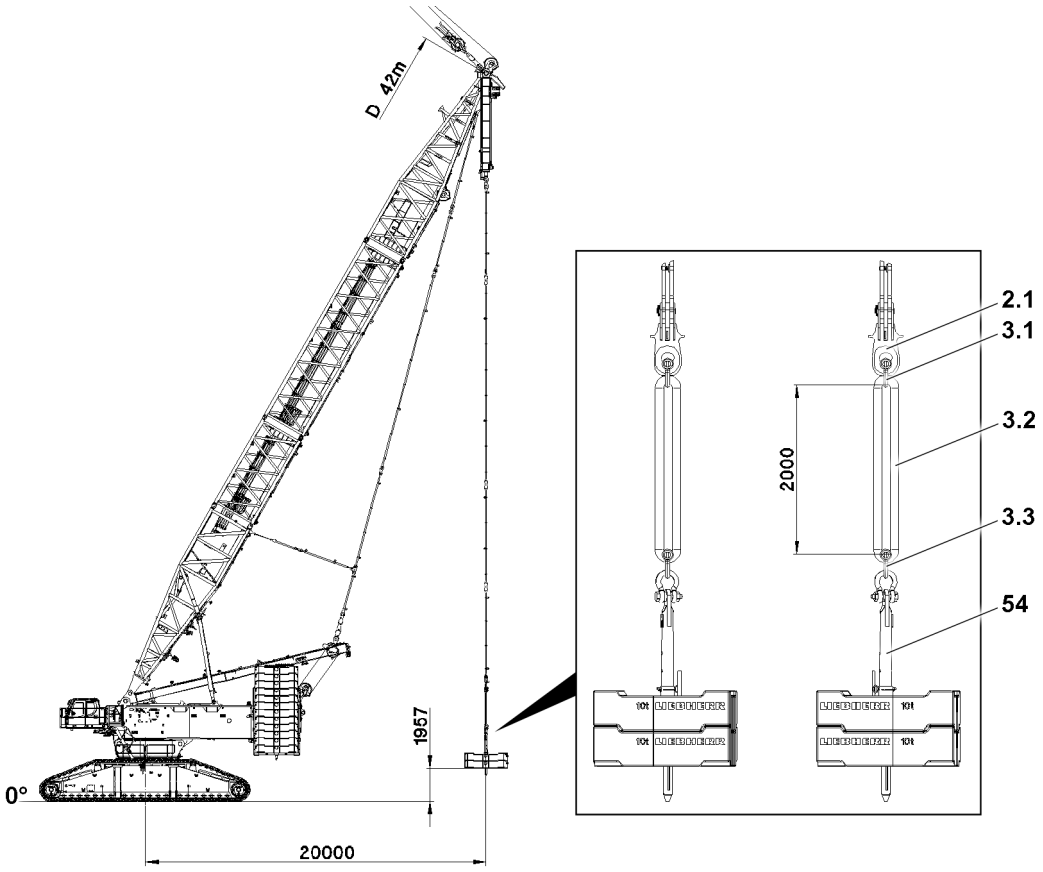

Fig.124979: Ballast Constant on the guy rods

When the derrick ballast radius is less than 15 m:

- ▶ Support the ballast plates before fastening.
- ▶ Position the ballast under the guy rods.
- ▶ Lower the guy rods until the ballast can be fastened.

The ballast must be fastened with the supplied fastening equipment.

- ▶ Fasten the receptacle stud **54** with the shackle **3.3**, roundsling **3.2** and shackle **3.1** on the bracket **2.1**.

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6.3 Assembling with a cross beam*

6.3.1 Assembling the cross beam

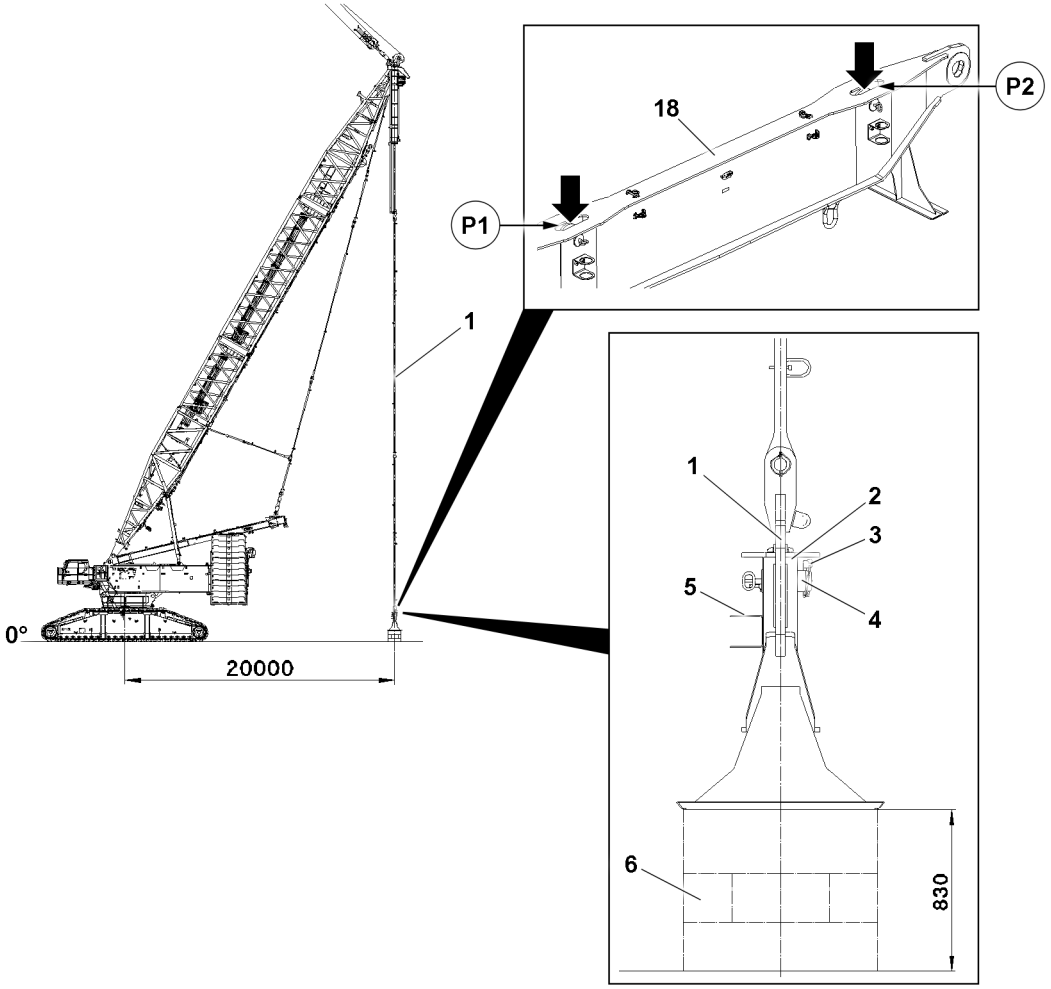

Fig.124981: Cross beam

Make sure that the following prerequisites are met:
- The ground is level and of sufficient load bearing capacity.

▶ Set the derrick radius to 20 m.

The substructure **6** must be at least 830 mm above the crane placement surface.

▶ Position the substructure **6** under D-guy rods **1**.

Note

▶ Fastening points, see section „Fastening points for suspended ballast parts“.

▶ Fasten the cross beam **18** with fastening equipment to the auxiliary crane.
▶ Set the cross beam **18** on the substructure **6**.
▶ Release and unpin the pin **4** in transport retainer **5**.
▶ Extend the pull cylinder until the D-guy rods **1** can be pinned on point **P1** and on point **P2** with the cross beam.

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Note
Retract / extend the pull cylinder
- ▶ Control the pull cylinders from the crane cab or with the control panel, see section „lifting and lowering the derrick ballast with the pull cylinders“.
- ▶ Operate the pull cylinder with the radio remote control, see the „radio remote control operating instructions“.

- ▶ Pin the D-guy rods **1** with the cross beam: Insert the pins **4** and secure with locking pins **3**.
- ▶ Lift the cross beam: Retract the pull cylinder.

6.3.2 Fastening the ballast to the cross beam

Make sure that the following prerequisites are met:
- Ballast plates are on the receptacle stud.
- Supplied fastening equipment is on hand.

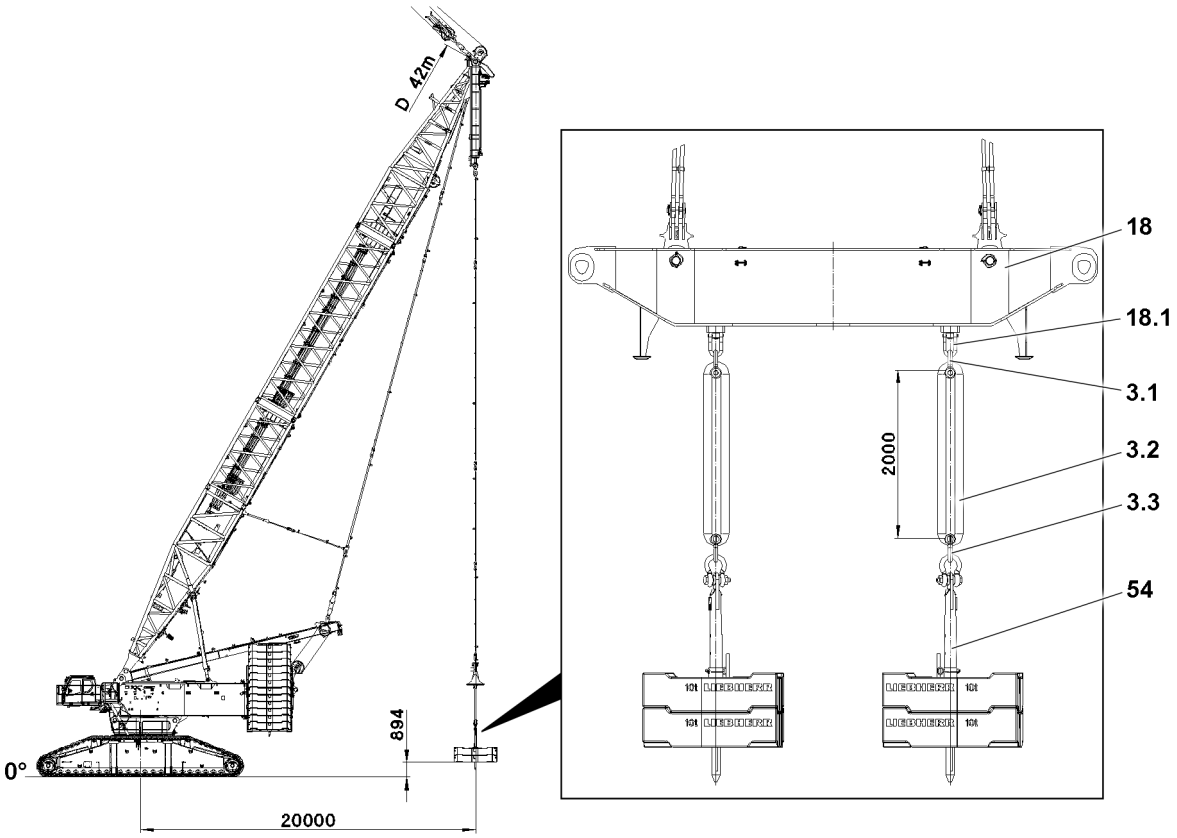

Fig.124980: Ballast Constant on the cross beam

- ▶ Position the ballast under the guy rods.
- ▶ Lower the cross beam **18** until the ballast can be fastened.

The ballast must be fastened with the supplied fastening equipment.

- ▶ Fasten the receptacle stud **54** with the shackle **3.3**, roundsling **3.2** and shackle **3.1** to the shackle **18.1**.

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7 Crane operation with the derrick ballast

7.1 Lifting and lowering the derrick ballast using the pull cylinders

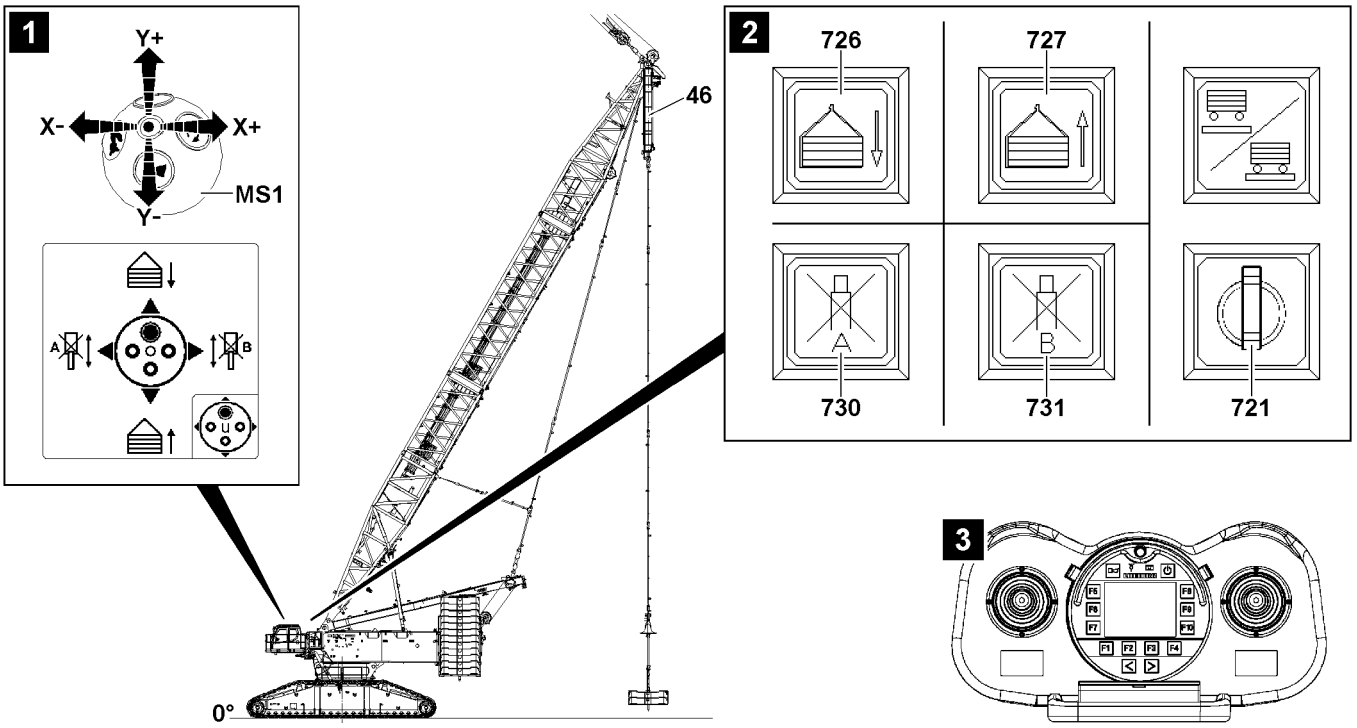

Fig.144126: Functions pull cylinder

The pull cylinders **46** in the derrick ballast guying can be operated in different ways:
- Operation with master switch **MS1** in the corresponding master switch assignment, see illustration **1**
  - Select the master switch assignment for master switch MS1, see chapter 4.01.
- Operation with operating buttons on the instrument panel, see illustration **2**

There is an additional operating option in assembly operation:
- Operation with the radio remote control (BTT-E), see illustration **3**
  - Operation with the manual control lever in the corresponding assembly menu, see the radio remote control operating instructions.

Note
- ▶ If the derrick ballast (*Ballast Constant* function) is lifted via the button **727** or lowered via the button **726**, then the horizontal alignment of the derrick ballast is automatically regulated.
- ▶ Pressing one of the stop buttons (button **730** for pull cylinder A, button **731** for pull cylinder B) stops the corresponding pull cylinder. The cylinder that is not stopped can be moved only up to a maximum difference in length between the pull cylinders of 50 cm. Both pull cylinders are stopped when this limit is reached.
- ▶ Turning and driving the crawler travel is only permissible when the derrick ballast is completely lifted off the ground and hangs freely. If this is the case, turning on the “Derrick ballast lifted” function (key button **721**) releases the turning and driving functions.
- ▶ Driving is only possible with a reduced speed to prevent the derrick ballast from swinging up.

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DANGER
Danger of accident!
If the following notes are not observed, personnel can be severely injured or killed.
In addition, this can result damage to the derrick ballast.

- ▶ Pay attention to the horizontal alignment of the derrick ballast when lifting and lowering the derrick ballast.
- ▶ When pressing the button **730** („Stop cylinder A on the derrick ballast“) or the button **731** („Stop cylinder B on the derrick ballast“), the automatic regulation is bypassed and the derrick ballast can be inclined within a limited difference in length (50 cm). This is exclusively permitted when setting down the derrick ballast on uneven ground and only by observing utmost caution.
- ▶ The lifting of the derrick ballast is not monitored by crane control. The crane driver is responsible for switching on the "derrick ballast lifted" function only when the derrick ballast is completely lifted off the ground and hanging freely.

During crane operation with derrick ballast the required maximum / minimum load can be actively influenced.

This is made possible by increasing or reducing the derrick ballast. Depending on the situation, this procedure is also possible under load.

Note

- ▶ The suspended ballast and the ballast trailer are generally referred to as the **derrick ballast**.
- ▶ The fixed compensation weight that is installed on the turntable is generally referred to as the **counterweight**.
- ▶ Additional personnel to carry out crane operation is generally referred to as **guide**.

- ▶ Operate the crane function to lift and lower the derrick ballast, see section „Carrying out crane movements“

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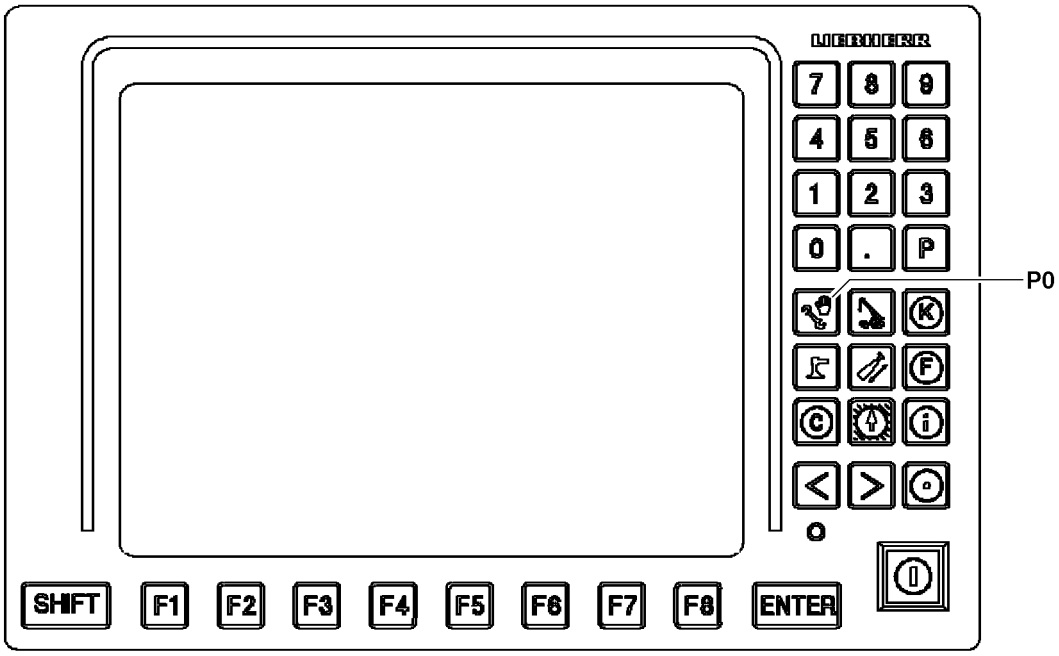

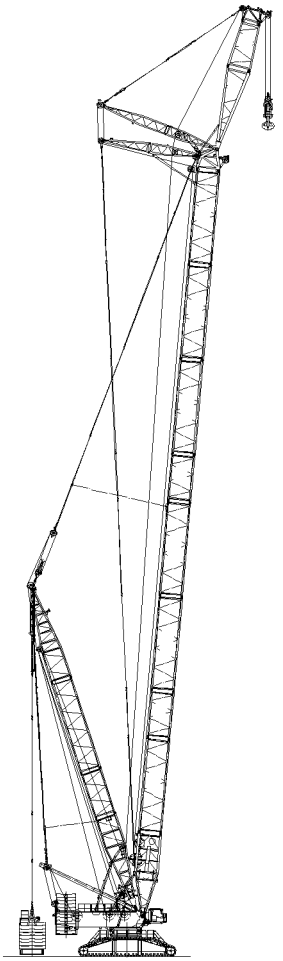

Fig.122800

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7.2 Checking the settings of the LICCON overload protection

Make sure that the following prerequisites are met:
- The derrick ballast is placed according to the load chart.
- The actual placed derrick ballast has been entered and confirmed in the Set up program, see Crane operating instructions, chapter 4.02.
- The derrick boom is in operating position.

WARNING
Incorrectly set overload protection!
If the actual set up configuration of the crane deviates from the entries and settings in the Set up program, then the overload protection is not correctly set.
An incorrectly set overload protection calculates the actual load incorrectly and transmits faulty display values.
The crane can be overloaded unnoticed and topple over.
This could result in serious accidents.
▶ The entries and settings in the set up program must match the actual set up configuration of the crane.

Note
▶ Set the LICCON overload protection in the set up program, see Crane operating instructions, chapter 4.02.

▶ Press the program key **P0**.

Result:

– The Set up program is called up.

▶ In the monitor display of the Set up program check if the LICCON overload protection is set according to the data in the load chart and the actual set up configuration of the crane, see example illustration.

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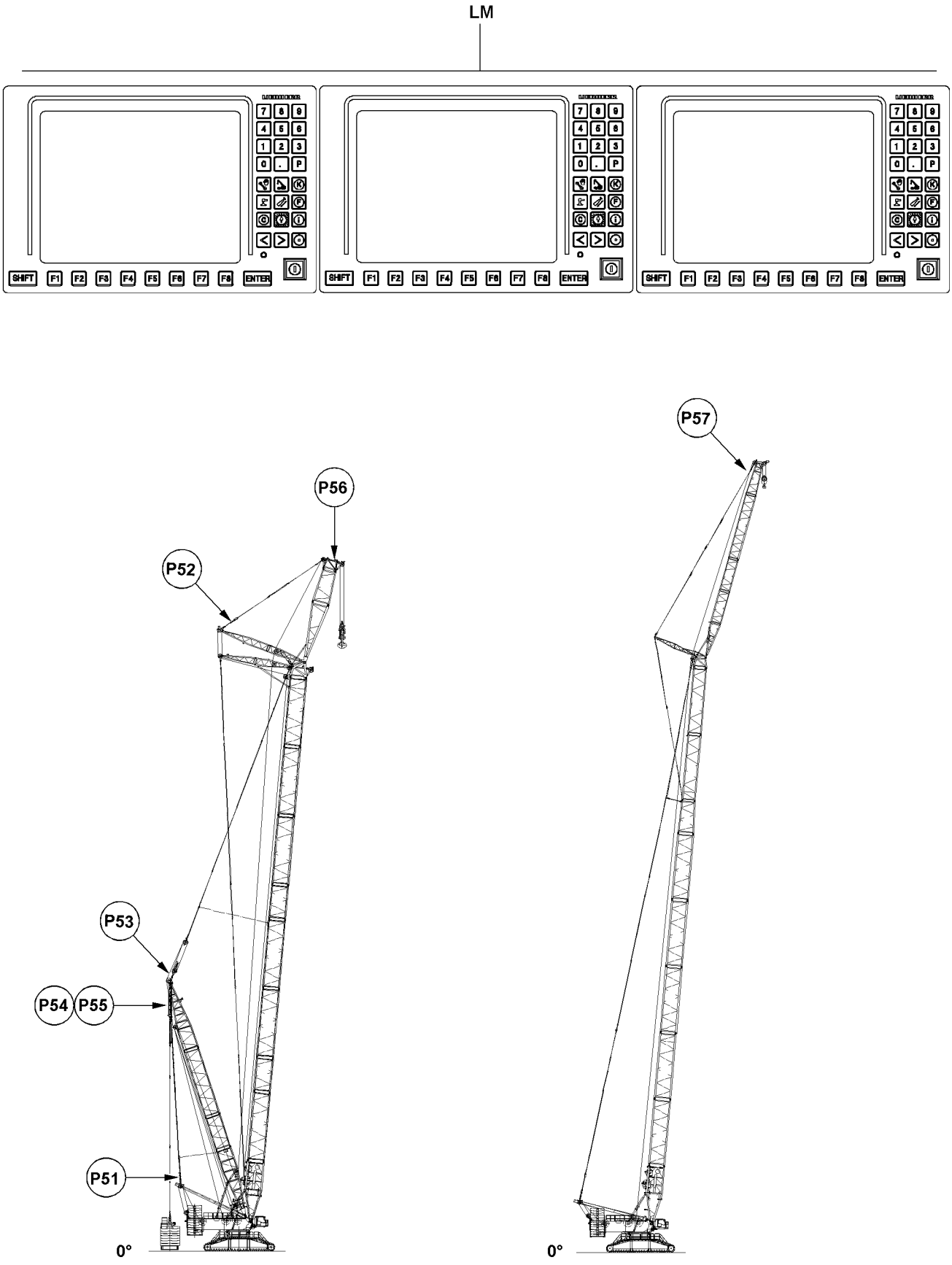

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Fig.122806

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7.3 F-load display for operating modes with derrick ballast

Assignment of test points for operating modes with derrick ballast:

– Force in the guying between A-frame and derrick head:
  - Test point 1 on point **P51** = force F1
  - The display is made in the F-load display in the center LICCON monitor **LM**.

– Force in the guying between WA-frame and accessory head:
  - Test point 2 on point **P52** = force F2
  - The display is made in the F-load display in the center LICCON monitor **LM**.
    Note: Only for the respective boom system.

– Force in the guying between the main boom head and the derrick head:
  - Test point 3 on point **P53** = force F3
  - The display is made in the F-load display in the center LICCON monitor **LM**.

– Force in the guying between derrick ballast and derrick head:
  - Test point 4/5 on point **P54/55** = force F4/5
  - The display is made in the display of the derrick ballast in the left LICCON monitor **LM**.

– Force on the pressure test bracket boom nose:
  - Test point 6 on point **P56** = force F6
  - The display is made in the actual load display in the right LICCON monitor **LM**.
    Note: Only with existing boom nose.

– Force in the guying between the FA-frame and the accessory head:
  - Test point 11 on point **P57** = force 11
  - The display is made in the actual load display in the center LICCON monitor **LM**.
    Note: Only for the respective boom system

Note

▶ For a detailed description of the displays for crane operation with derrick ballast, see the Crane operating instructions, chapter 4.02.

WARNING

Overloading / toppling of the crane!
If the permissible display values of the F-load display are exceeded / fallen below, then the crane can be overloaded.
This could result in serious accidents.

▶ Observe and adhere to the display values on the LICCON monitors.
▶ Observe and adhere to the specifications regarding the limit values on the assembly drawings.

Note

The values of the F-load display depend on the set up configuration of the crane and the crane geometry.
The values of the F-load display change continuously when the crane is moved.

▶ Monitor the F-load display continuously.

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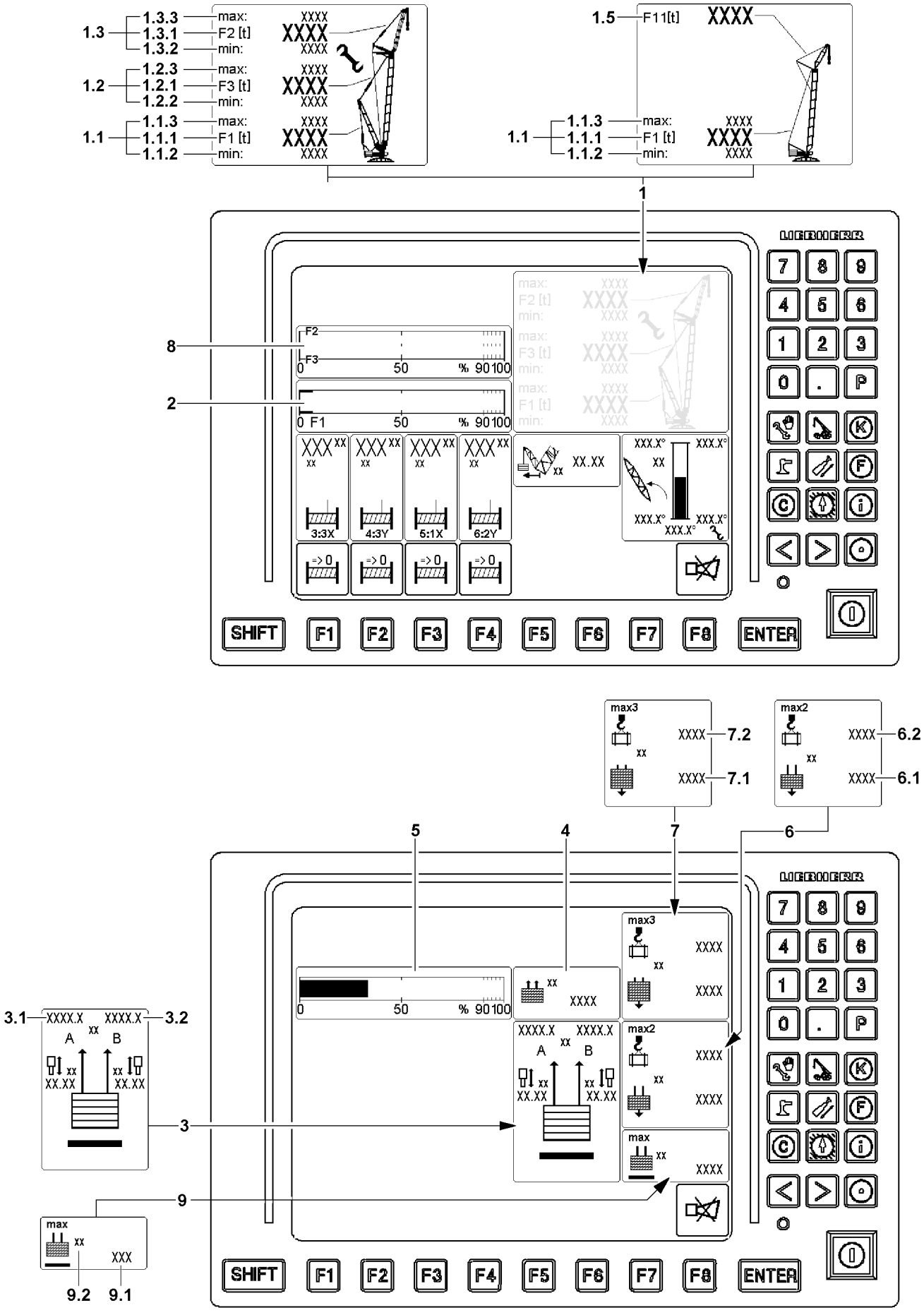

Fig.146967

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7.3.1 Force F1 (test point 1)

The force F1 (test point MS1) is determined in the guying between the A-frame and the derrick head and displayed in the LICCON monitor as operating force $F1_{actual}$.

Display values of force F1 (test point MS1) on the F-load display **1**:
- F1-maximum ($F1_{max}$) **1.1.3** = maximum value F1-force
- F1-actual value ($F1_{actual}$) **1.1.1** = actual value F1-force (operating force F1)
- F1-minimum ($F1_{min}$) **1.1.2** = minimum value F1-force

Structure of the F1-utilization bar **2**:
- Ratio of operating force $F1_{actual}$ to F1 maximum force

7.3.2 Force F2 (test point 2) and force F3 (test point 3)

The force F2 (test point 2) is determined between the WA-frame and the accessory head and displayed in the LICCON monitor as operating force $F2_{actual}$. A display is made only with the respective boom system.

The force F3 (test point 3) is determined between the main boom head and the derrick head and displayed in the LICCON monitor as operating force $F3_{actual}$.

Display values of force F2 (test point MS2) in the F-load display **1**:
- F2-maximum ($F2_{max}$) **1.3.3** = maximum value F2-force
- F2-actual value ($F2_{actual}$) **1.3.1** = actual value F2-force (operating force F2)
- F2-minimum ($F2_{min}$) **1.3.2** = minimum value F2-force

Display values of force F3 (test point MS3) in the F-load display **1**:
- F3-maximum ($F3_{max}$) **1.2.3** = maximum value F3-force
- F3-actual value ($F3_{actual}$) **1.2.1** = actual value F3-force (operating force F3)
- F3-minimum ($F3_{min}$) **1.2.2** = minimum value F3-force

Composition of the F2 / F3-utilization bar **8**:
- Ratio of operating force $F2_{actual}$ to F2 maximum force $F2_{max}$
- Ratio of operating force $F3_{actual}$ to F3 maximum force $F3_{max}$
- The F2/F3-utilization bars **8** appear only in assembly operation

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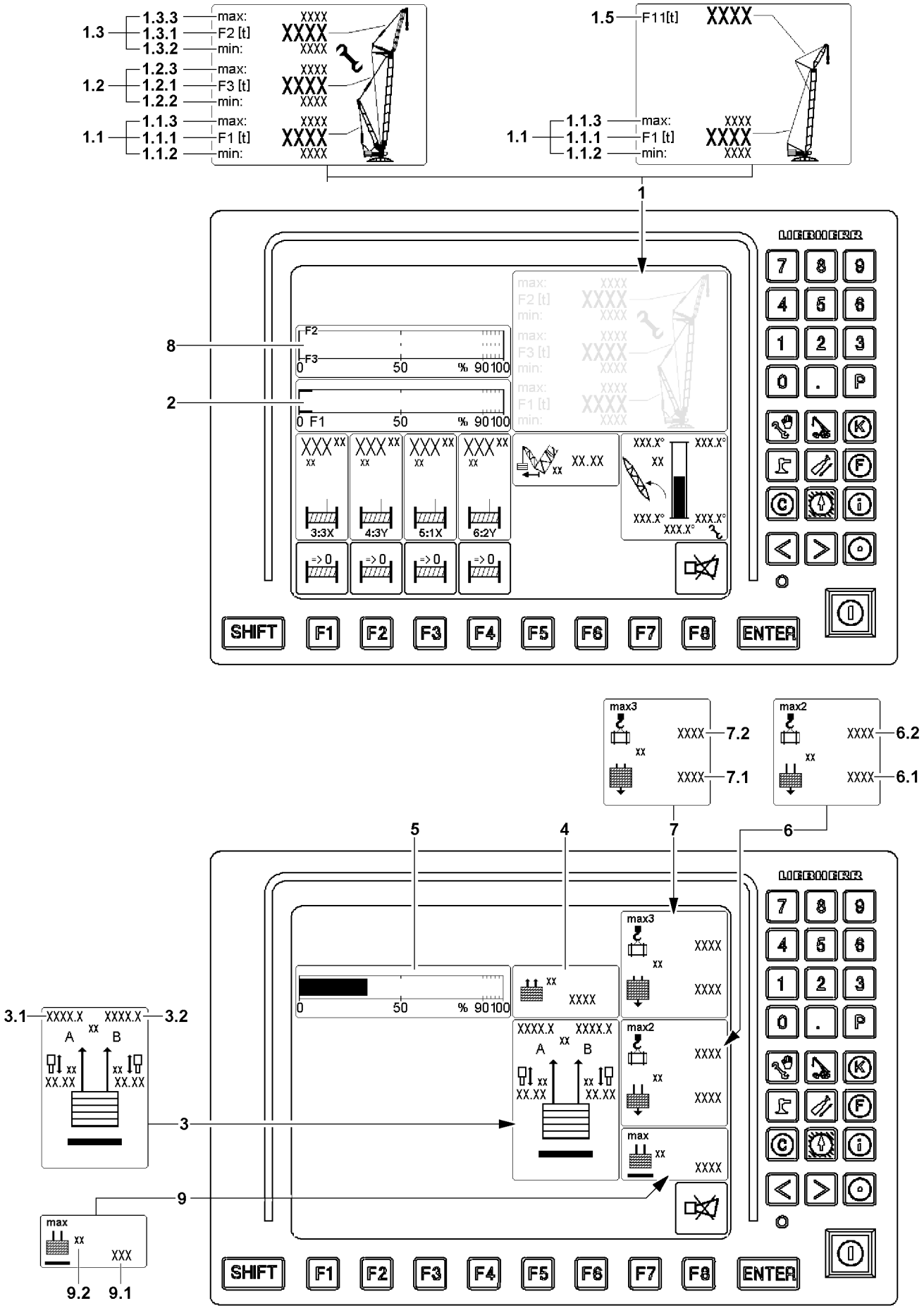

Fig.146967

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7.3.3 Force F4/5 (test point 4/5)

The forces F4/5 (test point 4/5) are effective in the guy rods from the derrick ballast to the derrick head.

The existing forces in the guy rods are calculated from four pressure sensors, which are installed on the pull cylinders.

Test points guying A (left) are:
- Test point 4A = pressure sensor ring surface left (force F4A)
- Test point 5A = pressure sensor piston surface left (force F5A)

Test points guying B (right) are:
- Test point 4B = pressure sensor ring surface right (force F4B)
- Test point 5B = pressure sensor piston surface right (force F5B)

Display values of force F4/5 (test point 4/5) in icon Guying derrick ballast **3**:
- Force in the derrick ballast guying A **3.1**
- Force in the derrick ballast guying B **3.2**

Display values derrick ballast:
- Currently pulled derrick ballast = BA_{pulled} **4**
- Current utilization of derrick ballast = Utilization bar derrick ballast **5**
- Currently placed derrick ballast = BA_{placed} **6.1**

From the sum of derrick ballast guying A **3.1** and derrick ballast guying B **3.2** is the pulled derrick ballast BA_{pulled} **4** calculated.

If the ballast still has ground contact, then only that part of the ballast is displayed which is pulled up by the D-guying. The remaining part is laying correspondingly on the ground.

Composition of utilization bar derrick ballast **5**:
- Ratio of pulled derrick ballast (BA_{pulled} **4**) to placed derrick ballast (BA_{placed} **6.1**)

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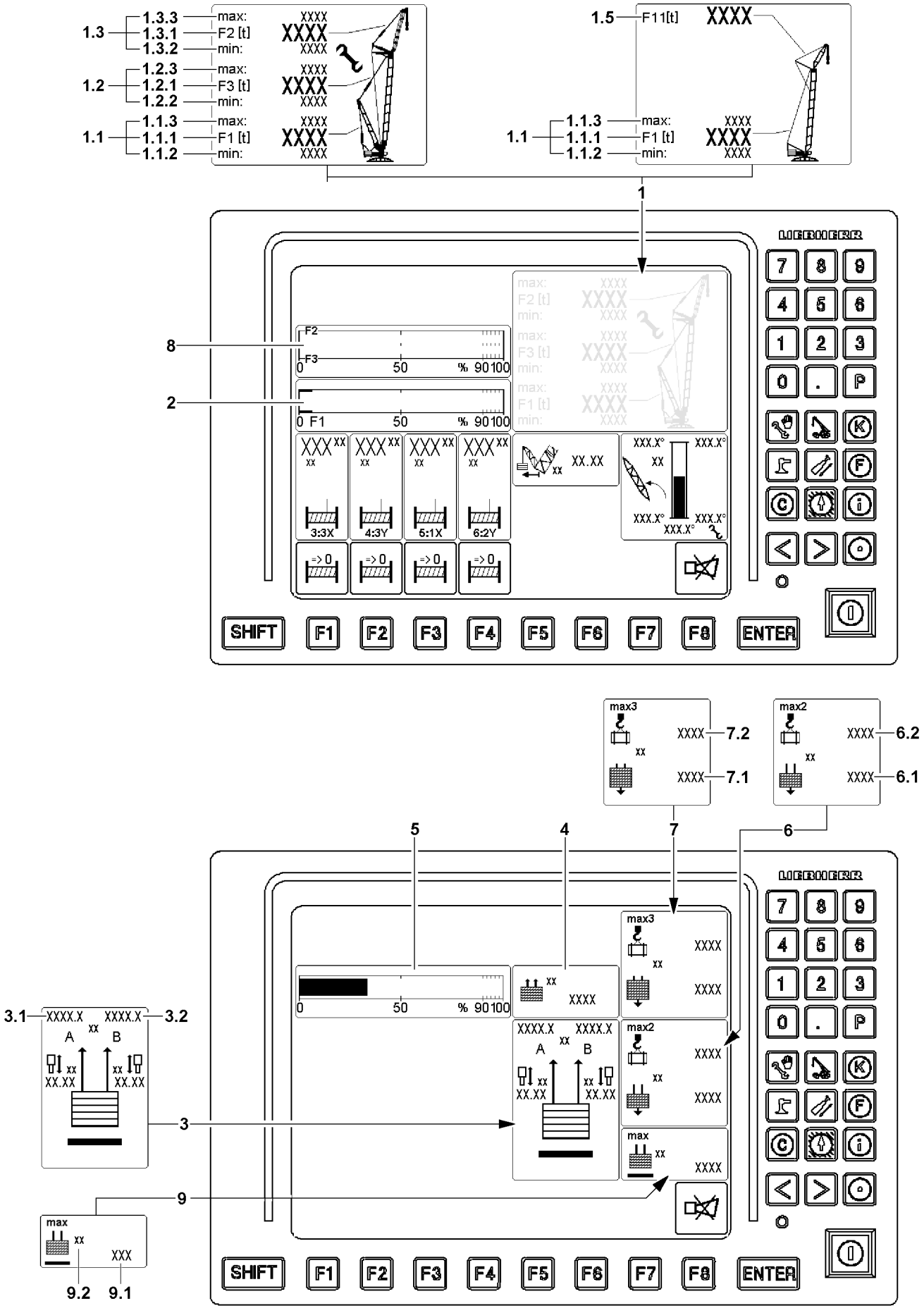

Fig.146967

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7.3.4 Maximum liftable derrick ballast

The *maximum liftable derrick ballast* **9** refers to the current crane condition and indicates the maximum derrick ballast that can be lifted off the ground with the pull cylinder or off the suspended ballast palette in case of the VarioTray without falling below the $F1_{min}$ force.

- **9** *Maximum liftable derrick ballast* icon
- **9.1** Maximum liftable derrick ballast
  - Maximum derrick ballast
- **9.2** Measuring unit
  - Measuring unit for display values in the *Pulled derrick ballast* icon **9**: [t] or [lb]

7.3.5 Force F11 (test point 11)

Force in the guying between the FA-frame and the accessory head:

Display values of force F11 (test point MS11) on the F-load display **1**:
- F11-actual value ($F11_{actual}$) **1.5** = actual value F11-force (operating force F11)

7.3.6 Additional displays

- „Load max2“ icon **6** (see section „Utilization conditions“)
- Currently placed derrick ballast = BA_{placed} (Input value in set up program) **6.1**
- Possible load with currently placed derrick ballast = $Load_{max2}$ **6.2**
- „Load max3“icon **7** (see section „Utilization conditions“)
- Maximum derrick ballast according to load chart = BA_{max} **7.1** (Highest value in Set up program)
- Possible load with maximum derrick ballast according to load chart = $Load_{max3}$ **7.2**

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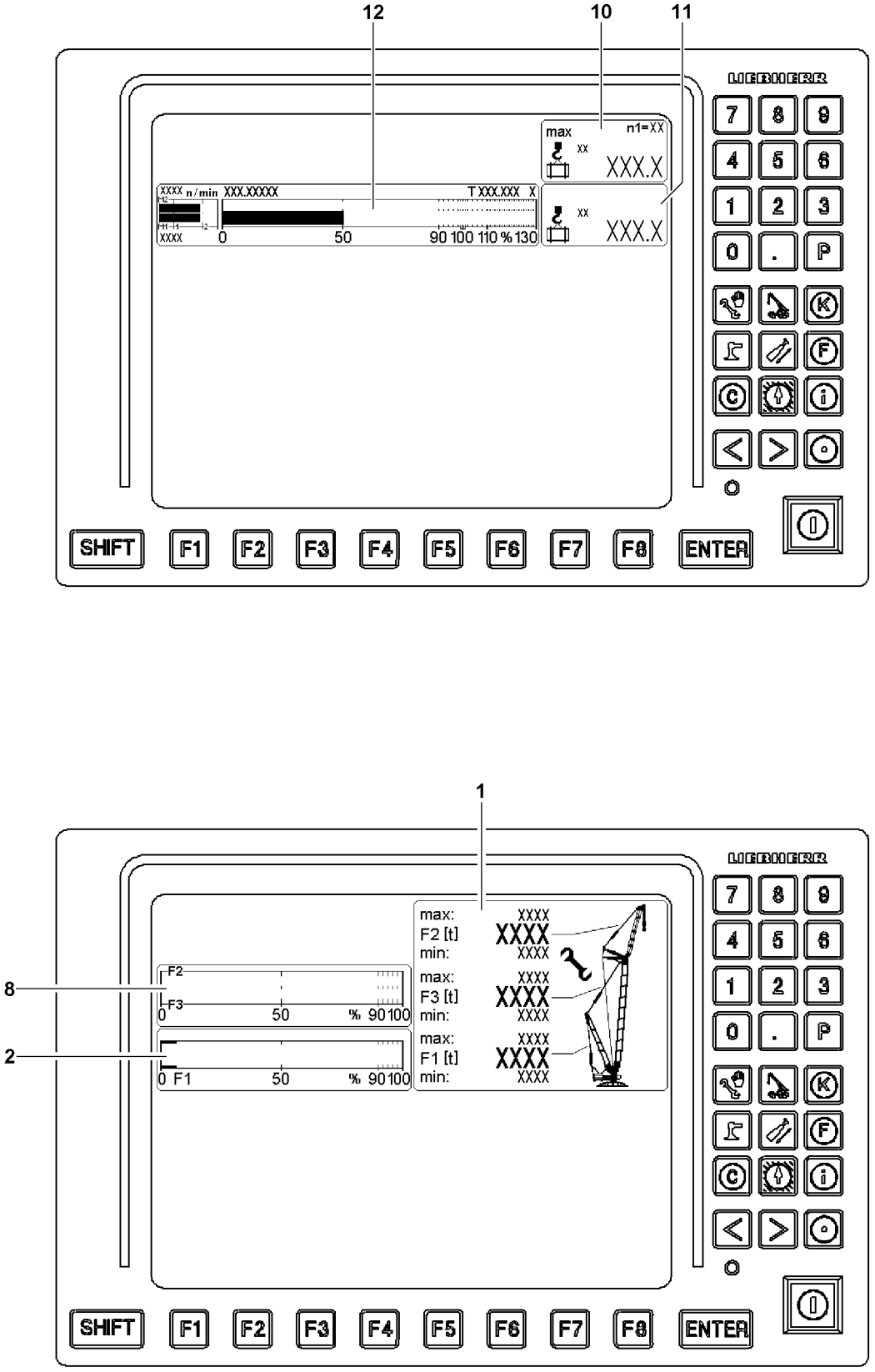

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Fig.122808

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7.4 Monitoring of crane utilization in operating modes with derrick ballast

Note
- ▶ The icon illustrations of the LICCON monitors are examples and may not match your crane.
- ▶ The icon illustrations of the LICCON monitors can deviate in number, arrangement and depiction of the icons on your crane.
- ▶ Observe the Crane operating instructions, chapter 4.02.

WARNING
Incorrect display values!
If the display values do not increase correspondingly when lifting known weights, an erroneous display value may be present.
If the crane is operated with erroneous display values, then the crane can be overloaded.
This could result in serious accidents.
- ▶ When lifting the hook block off the ground check if the display value for the actual load increases correspondingly.
- ▶ When lifting the derrick ballast off the ground check if the display value for the pulled derrick ballast (BA_{pulled}) increases correspondingly.
- ▶ When lifting the load off the ground check if the display value for the actual load increases correspondingly.

In operating modes with derrick ballast, the monitoring of the crane utilization includes, among others:
1. Monitoring of load torque
   Via the „Maximum load“ icon **10**, „Actual load“ icon **11** and the „utilization bar diagram“ **12**.
2. Utilization conditions
   Support the crane driver with additional display values.
3. Monitor the F-load display **1**.
   Supported by the F1-utilization bar **2** and possibly the F2/F3-utilization bar **8**.

7.4.1 Monitoring of load torque

It monitors the „maximum load according to the load chart and reeving“.

In crane operation, the actual load is compared with the maximum load which may be lifted in the current crane configuration. The display of the values is made in the icon „Maximum load“ **10** and in icon „actual load“ **11**. The current percentage utilization is displayed as „bar diagram utilization“ **12** in the right LICCON monitor.

The color of the utilization bar in the „bar diagram utilization“ **12** also displays the crane utilization:
- – Utilization bar blue / green (below 90 %): Utilization in permissible range
- – Utilization bar yellow (90 % to 100 %): Advance warning. - Utilization just before impermissible range
- – Utilization bar red (above 100 %): Warning. - Utilization in impermissible range

Note
- ▶ Procedure for optimum utilization of „maximum load according to load chart and reeving“, see section „Utilization conditions“.

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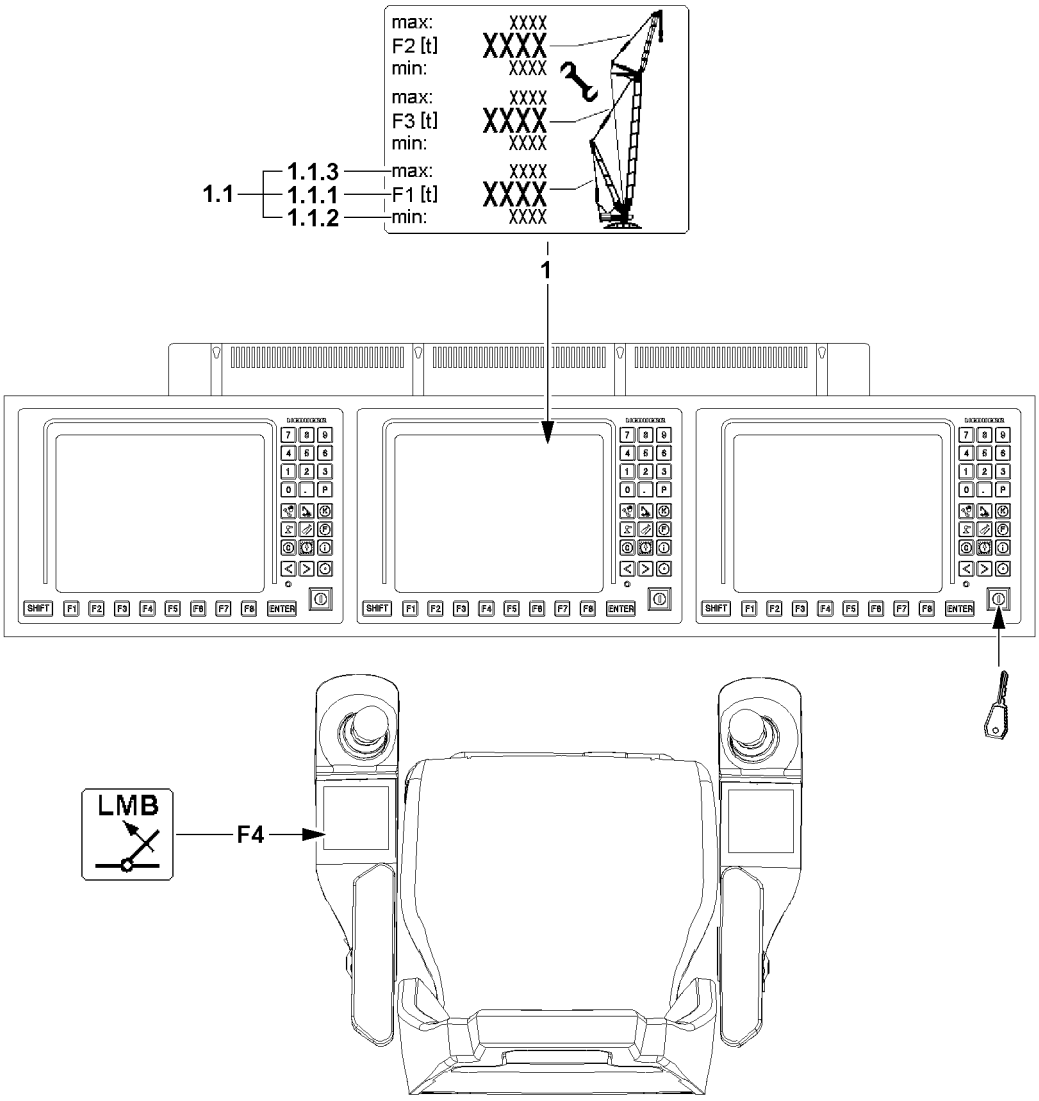

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Fig.122809

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WARNING
Access the functionality of the LICCON overload protection!
When accessing the functionality of the LICCON overload protection by activating assembly operation, the LICCON overload protection is totally deactivated, bypassed or limited.
It is possible to exceed several shut-off limits of the LICCON overload protection simultaneously or one after the other.
It is possible to carry out crane movements, which are not monitored by the LICCON overload protection.
Without the LICCON overload protection, no additional protection against overload of the crane via the crane control is present.
This could result in serious accidents.
- ▶ When accessing the functionality of the LICCON overload protection, take into account that the LICCON overload protection is deactivated totally or is limited.
- ▶ When accessing the functionality of the LICCON overload protection, the Crane operating instructions, chapter 4.02 must be observed.

WARNING
The crane can topple over!
In assembly operation the LICCON overload protection is deactivated.
In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over.
Personnel can be killed.
This could result in high property damage.
- ▶ Activate the assembly operation only when the consequences are known.
- ▶ Enter the set up configuration correctly into the LICCON computer system.
- ▶ Observe the erection / take down charts.
- ▶ Crane operation with deactivated LICCON overload protection is prohibited.
- ▶ In assembly operation only load torque reducing crane movements may be carried out until a permissible operating and load range.
- ▶ The crane operator carries complete and sole responsibility for his actions if the LICCON overload protection is deactivated.

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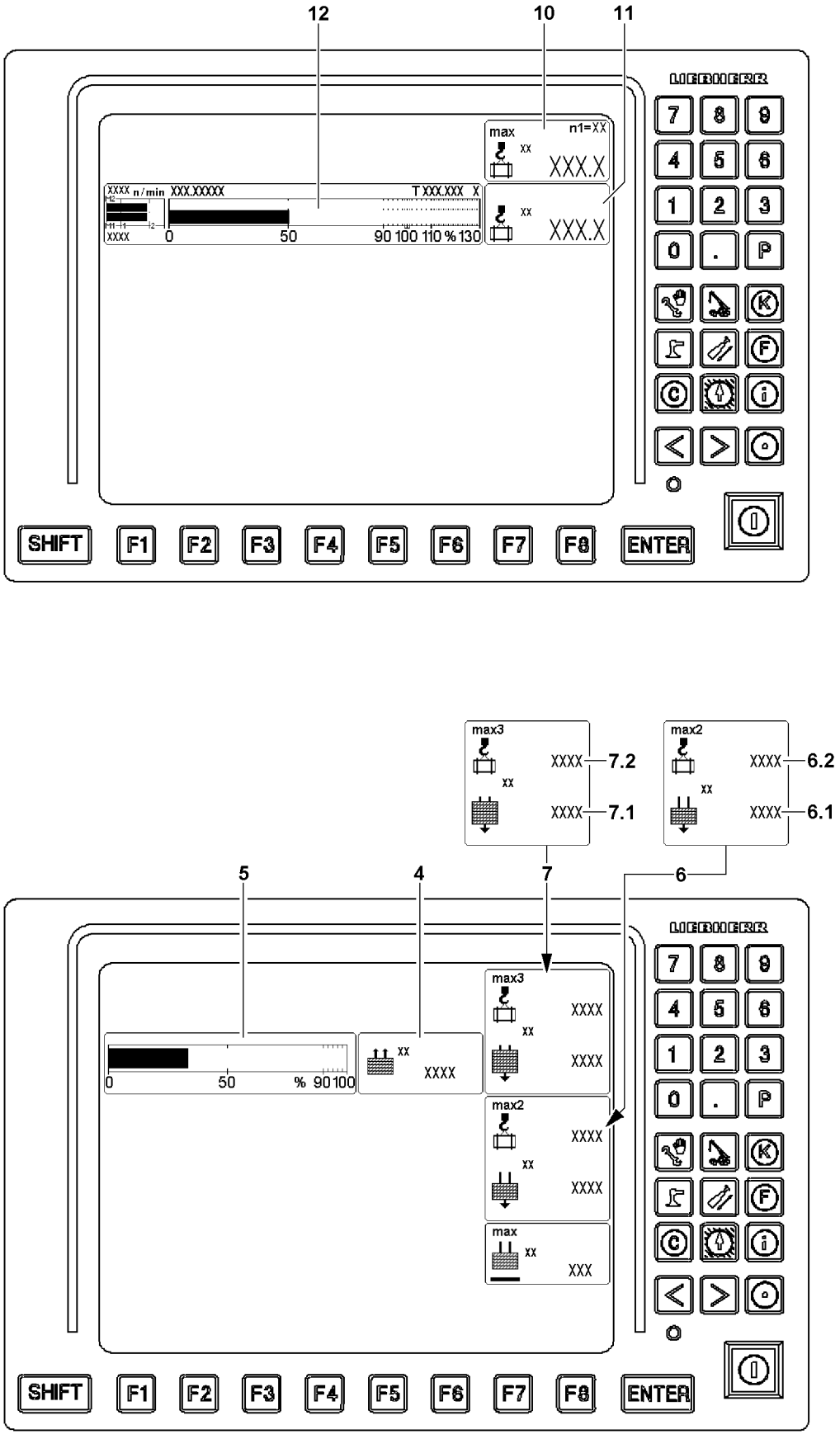

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7.4.2 Utilization conditions

The current percentage utilization of the crane is displayed as „bar diagram utilization“ **10** in the right LICCON monitor.

Additional displays:
- **6** „Load max2“ icon
  - Currently placed derrick ballast = BA_{placed} (Input value in set up program) **6.1**
  - Possible load with currently placed derrick ballast = $Load_{max2}$ **6.2**
- **7** „Load max3“ icon
  - Maximum derrick ballast according to load chart = BA_{max} **7.1** (Highest value in Set up program)
  - Possible load with maximum derrick ballast according to load chart = $Load_{max3}$ **7.2**

Maximum load, right LICCON monitor:
- The maximum load in the current operating condition is reached when the utilization bar shows 100 % in the „bar diagram utilization“ **12**.
  This is the case when the „utilization of the crane according to the load chart and reeving“ reaches 100 % (Values in icon „Maximum load“ **10** and in icon „actual“ **11** are equal).
  When the „Maximum load“ **10** is smaller or the same as the $load_{max2}$ **6.2**, then an increase might possibly be obtained:
  - By increasing the pulled derrick ballast BA_{pulled} **4**, if the utilization bar derrick ballast **5** is not yet at 100 % (derrick ballast not suspended).
  - By increasing the derrick ballast when the BA_{placed} **6.1** is smaller than BA_{max} **7.1**.
  - By changing the derrick ballast radius within the permissible range, see load chart manual or LICCON job planner.

max2-load, icon „load max2“ **6**:
- The highest possible load in current operating condition **„max2-load“** is reached when in the „bar diagram utilization“ **12** 100 % is shown **and** the utilization bar derrick ballast **5** is at 100 % (Derrick ballast is completely lifted off the ground).
  This is the case when the value in icon „Actual load“ **11** is the same as the $load_{max2}$ **6.2**.
  When the $load_{max2}$ **6.2** is smaller or the same as the $load_{max3}$ **7.2**, then an increase might possibly be obtained:
  - By increasing the derrick ballast by loading additional ballast plates (increase BA_{placed} **6.1** to BA_{max} **7.1**).

max3-load, icon „load max3“ **7**:
- The highest possible load at the maximum derrick ballast in current operating condition **„max3-load“** is reached when the „bar diagram utilization“ **12** displays 100 % **and** the utilization bar derrick ballast **5** is at 100 % (Derrick ballast according to load chart is placed and is completely lifted off the ground).
  This is the case when the value in icon „Actual load“ **11** is the same as the $load_{max3}$ **7.2**.
- The maximum derrick ballast according to the load chart is placed and completely pulled. Further increase of the derrick ballast is impermissible.

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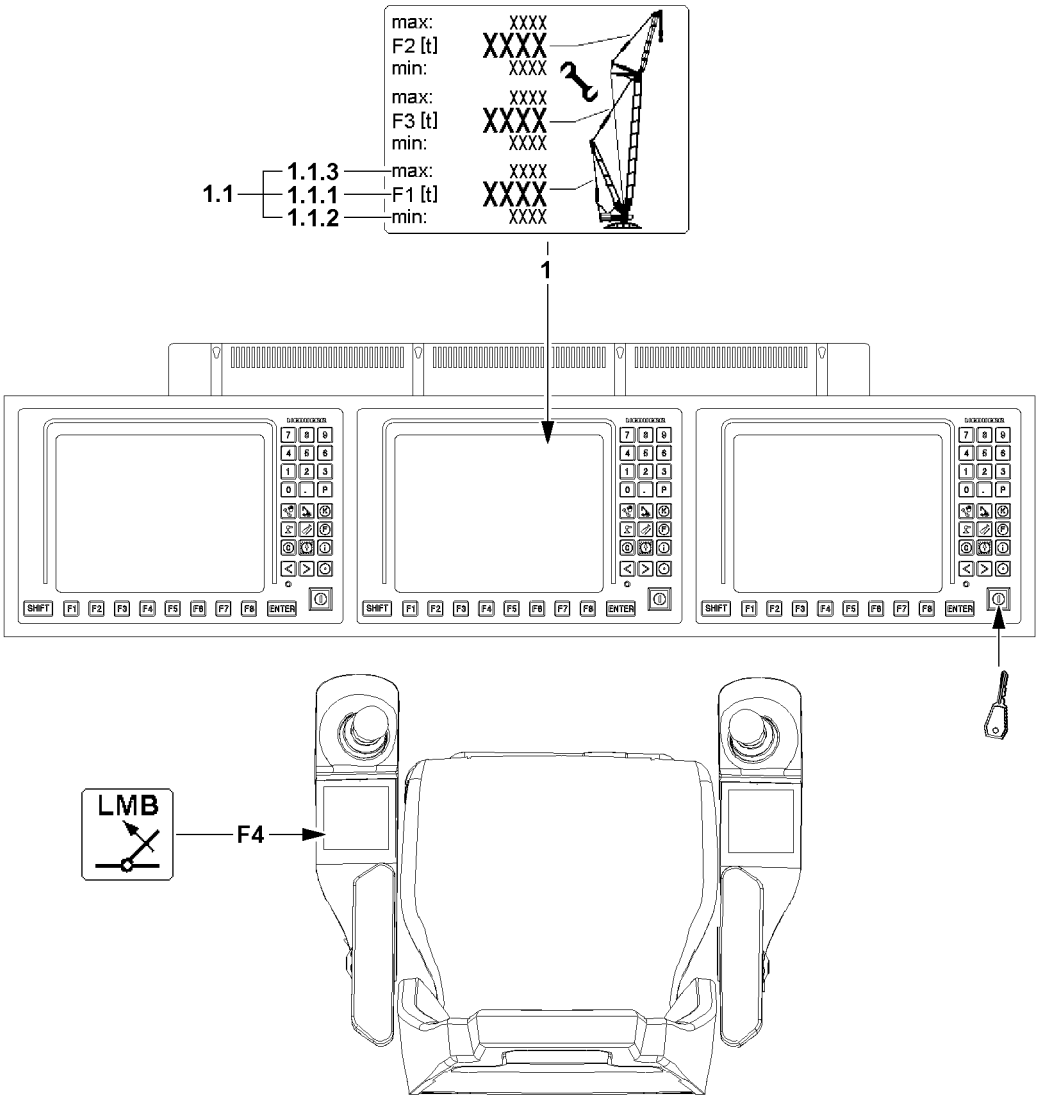

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7.4.3 Monitoring of F1-maximum force

Display values of force F1 (test point MS1) on the F-load display **1**:
- F1-maximum ($F1_{max}$) **1.1.3** = maximum value F1-force
- F1-actual value ($F1_{actual}$) **1.1.1** = actual value F1-force (operating force F1)
- F1-minimum ($F1_{min}$) **1.1.2** = minimum value F1-force

The display values of force F1 (test point 1) are displayed permanently in the LICCON monitor. At F1-actual value ($F1_{actual}$) **1.1.1** larger F1-maximum ($F1_{max}$) **1.1.3** a shut off of all load moment increasing movements occurs.

WARNING
Access the functionality of the LICCON overload protection!
When accessing the functionality of the LICCON overload protection by activating assembly operation, the LICCON overload protection is totally deactivated, bypassed or limited.
It is possible to exceed several shut-off limits of the LICCON overload protection simultaneously or one after the other.
It is possible to carry out crane movements, which are not monitored by the LICCON overload protection.
Without the LICCON overload protection, no additional protection against overload of the crane via the crane control is present.
This could result in serious accidents.
- ▶ When accessing the functionality of the LICCON overload protection, take into account that the LICCON overload protection is deactivated totally or is limited.
- ▶ When accessing the functionality of the LICCON overload protection, the Crane operating instructions, chapter 4.02 must be observed.

Note
The limit value for the F1-maximum force depends not only on the set up configuration and the crane geometry, but also from the pulled derrick ballast.
- ▶ If the pulled derrick ballast is larger, then the limit value for the F1-minimum force is generally reduced.
- ▶ If the pulled derrick ballast is smaller, then the limit value for the F1-maximum force is generally increased.

Note
By engaging the assembly operation the limit value for the F1-maximum force can be exceeded by a few tons. This makes it possible to reset a crane movement, which has caused the shut off.
- ▶ Reset triggered shut off by reverse crane movement.

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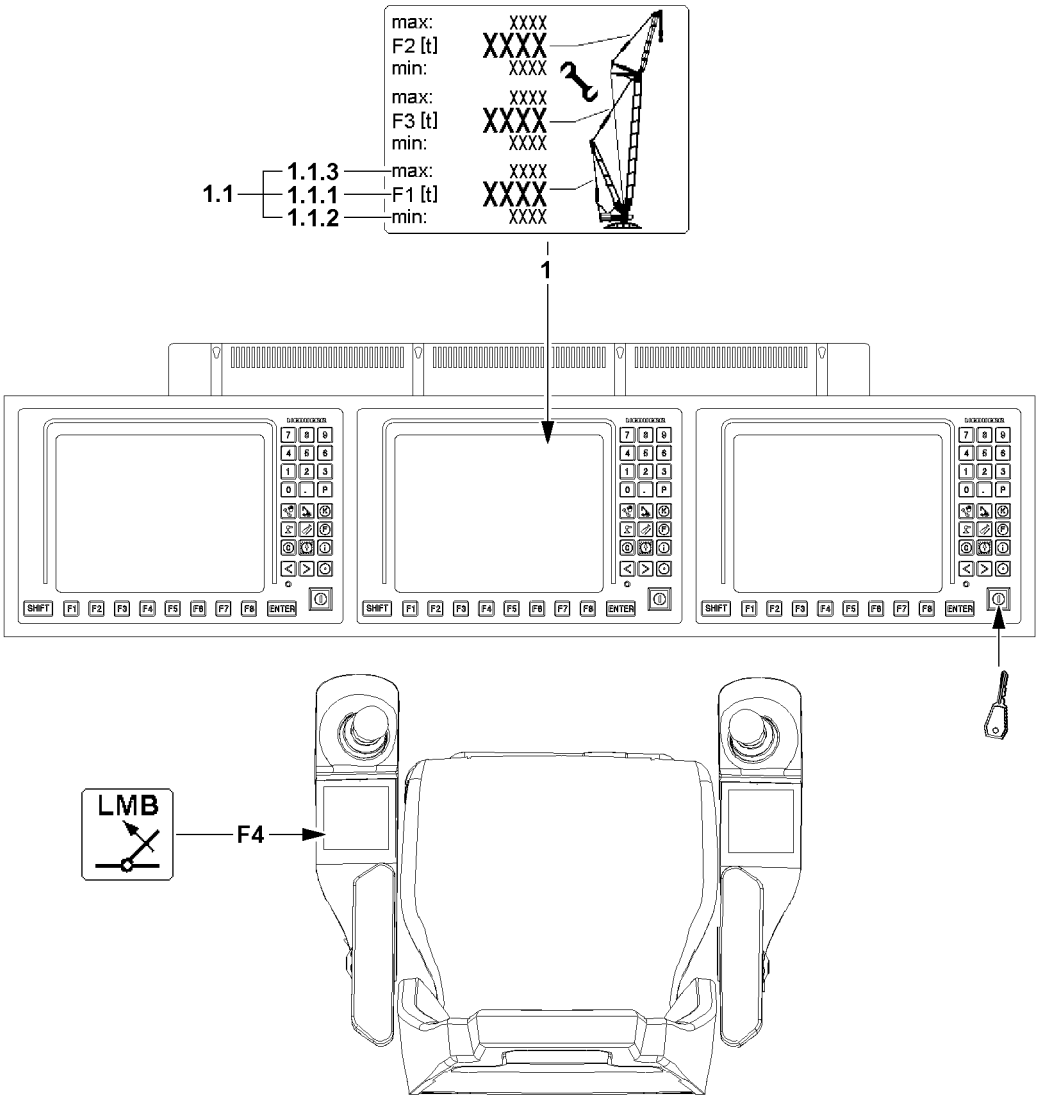

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7.4.4 Monitoring of F1-minimum force

Display values of force F1 (test point MS1) on the F-load display **1**:
- F1-maximum ($F1_{max}$) **1.1.3** = maximum value F1-force
- F1-actual value ($F1_{actual}$) **1.1.1** = actual value F1-force (operating force F1)
- F1-minimum ($F1_{min}$) **1.1.2** = minimum value F1-force

WARNING
Uncontrolled movements of the boom system!
If the guying between the A-frame and the derrick head (test point 1) becomes powerless, then this can lead to uncontrollable movements of the boom system.
This could result in serious accidents.
- ▶ The guying between the A-frame and the derrick head (test point 1) may never be without power.
- ▶ Relieve the D-guying between the derrick head and the derrick ballast to the point where the F1-actual value ($F1_{actual}$) **1.1.1** is larger than the F1-minimum ($F1_{min}$) **1.1.2**.

WARNING
Access the functionality of the LICCON overload protection!
When accessing the functionality of the LICCON overload protection by activating assembly operation, the LICCON overload protection is totally deactivated, bypassed or limited.
It is possible to exceed several shut-off limits of the LICCON overload protection simultaneously or one after the other.
It is possible to carry out crane movements, which are not monitored by the LICCON overload protection.
Without the LICCON overload protection, no additional protection against overload of the crane via the crane control is present.
This could result in serious accidents.
- ▶ When accessing the functionality of the LICCON overload protection, take into account that the LICCON overload protection is deactivated totally or is limited.
- ▶ When accessing the functionality of the LICCON overload protection, the Crane operating instructions, chapter 4.02 must be observed.

Note
By engaging the assembly operation the limit value for the F1-minimum force can be fallen below by a few tons. This makes it possible to reset a crane movement, which has caused the shut off.
- ▶ Reset triggered shut off by reverse crane movement.

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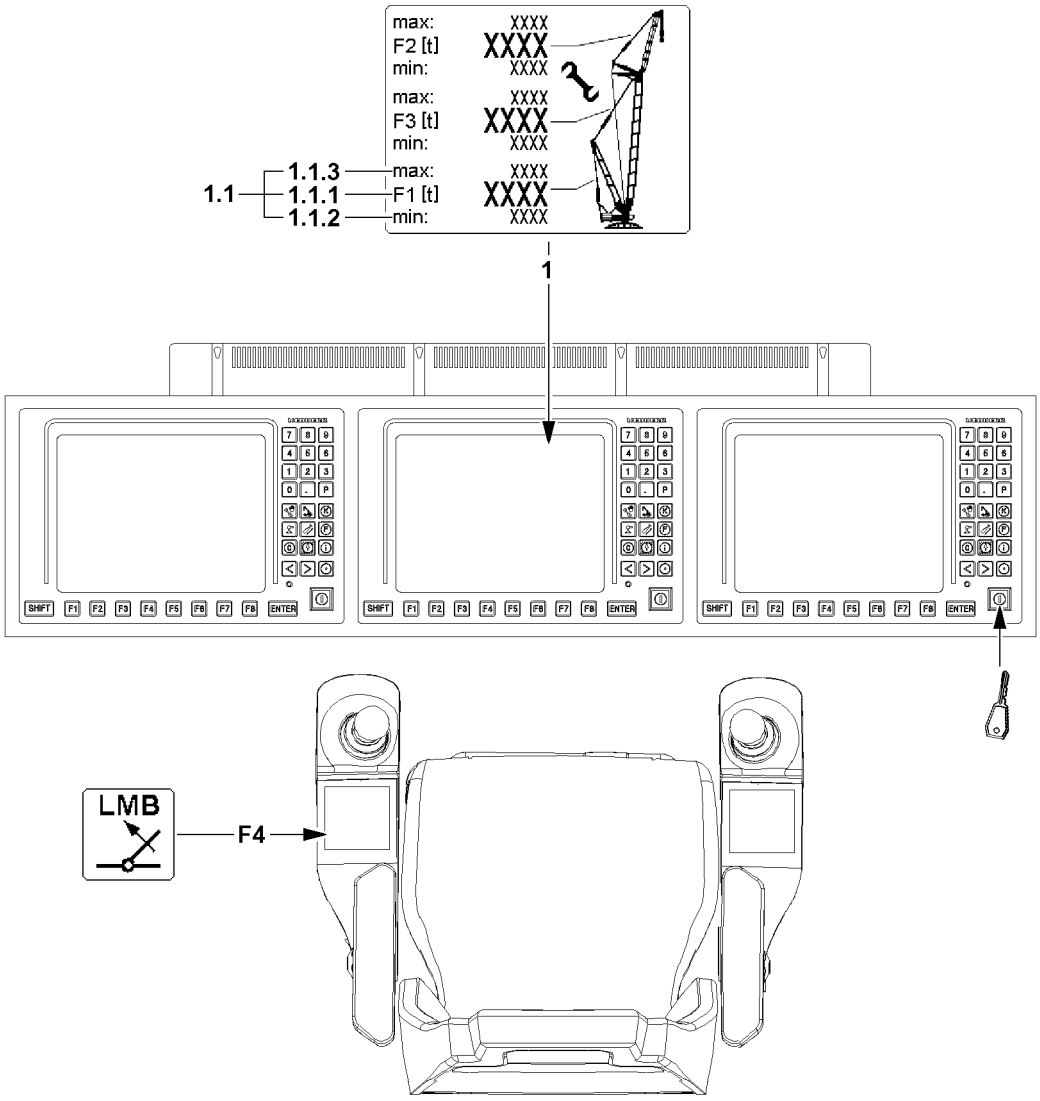

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WARNING
Autonomous movement of the boom system at increase of load torque!
If the F1-minimum force is fallen below, the guying between the A-frame and the derrick head can become powerless.
If the guying between the A-frame and the derrick head is powerless and the „Derrick ballast is on the ground“ at the same the derrick ballast can suddenly lift off the ground due to increase of the load torque.
As a result, the boom system can move forward suddenly. Strong oscillating movements of the derrick ballast and load can be the result.
The crane can be overloaded and severe accidents can be the result.
▶ Hold the F1-actual value ($F1_{actual}$) **1.1.1** above the F1-minimum ($F1_{min}$) **1.1.2**.
▶ It is prohibited to fall below the F1-minimum force.

WARNING
Autonomous movement of the boom system at decrease of load torque!
If the F1-minimum force is fallen below, the guying between the A-frame and the derrick head can become powerless.
If the guying between the A-frame and the derrick head is powerless and the „derrick ballast is suspended“ at the same time, the derrick ballast can suddenly set down on the ground due to decrease of the load torque.
As a result, the boom system can move suddenly backward. As a result, the relapse cylinders can be pressed on the block, be overloaded and damaged. Strong oscillating movements of the derrick ballast and load can be the result.
The crane can be overloaded and severe accidents can be the result.
▶ Hold the F1-actual value ($F1_{actual}$) **1.1.1** above the F1-minimum ($F1_{min}$) **1.1.2**.
▶ It is prohibited to fall below the F1-minimum force ($F1_{min}$).

The following applies:
– After a shut off due to falling below the F1-minimum ($F1_{min}$) **1.1.2** the F1-actual value ($F1_{actual}$) **1.1.1** must be increased by a crane movement. If the derrick ballast is suspended, this can be achieved by setting down the ballast.
– When picking up the load, the D-guying between the derrick ballast and the derrick head must be relieved to the point where the F1-actual value ($F1_{actual}$) **1.1.1** is greater than the F1-minimum ($F1_{min}$) **1.1.2**.
– When increasing the load torque, and the limit value F1-minimum ($F1_{min}$) **1.1.2** is fallen below, an already set down derrick ballast can lose contact with the ground and lift off.
– When decreasing the load torque, and the limit value F1-minimum ($F1_{min}$) **1.1.2** is fallen below, an already „suspended derrick ballast“ can set down on the ground.
– If the assembly operation is activated and the F1-force continues to drop below the minimum force $F1_{min}$, then the $F1_{min}$ shut off can no longer be bypassed.

Limitations from 50 % pulled derrick ballast

If more than 50 % of the set derrick ballast is being pulled (utilization bar derrick ballast **5** larger than 50 %) and the F1-minimum ($F1_{min}$) **1.1.2** is fallen below at the same time, all crane movements that increase load torque are turned off.

Limitations from 90 % pulled derrick ballast

If more than 90 % of the set derrick ballast is being pulled (utilization bar derrick ballast **5** larger than 90 %) and the F1-minimum ($F1_{min}$) **1.1.2** is fallen below at the same time, all crane movements that increase load torque and all crane movements that decrease load torque are turned off. This also turns off the „spooling out“ movement of the winch.

7.5 Monitoring of pull cylinders on block position

The pull cylinders (also called ballast lift cylinders) of the derrick ballast are equipped with length sensors and limit switches for monitoring.

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In crane operation, the monitoring of the pull cylinders on block position is always active. If there is the danger of a block position, then only that direction of the pull cylinders can be moved which improves the condition. The other direction is unbypassably blocked. As long as the length sensors and the limit switches function correctly, the pull cylinders cannot get into a block position.

WARNING
Problem at monitoring of pull cylinders!
If the length sensors or limit switches are defective or missing, then the monitoring of the pull cylinders is not active.
Without monitoring, the pull cylinders can be moved without restriction, as a result, a block position is possible.
At a block position, the pressure measurements of the pull cylinders become inexact and the values are incorrectly calculated.
The overload protection calculates the actual load incorrectly and transmits faulty display values.
The crane can be overloaded and topple over.
This could result in serious accidents.
▶ Observe the display values and possible error messages.
▶ If length sensors or limit switches are defective or missing, monitor the pull cylinders manually.

The following applies:
– The display values of the pull cylinders must function and be plausible.

7.6 Monitoring the lateral incline of the ballast pallet

The ballast pallet is equipped with an incline sensor for monitoring.

The monitoring to ± 2.5° lateral incline of the ballast pallet is always active. If a lateral incline of ± 2.5° is reached, then only those directions of the pull cylinders can be moved which improve the condition. The other directions are unbypassably blocked. The ballast can be set down for that reason only to a maximum incline of the terrain of 2.5°.

WARNING
Defective incline sensor!
If an incline sensor is defective or missing, the monitoring of the lateral incline of the suspended ballast is not active.
The pull cylinders can be moved without restriction and the derrick ballast can be overturned as a result.
This could result in serious accidents.
▶ Observe the display values and possible error messages.
▶ If an incline sensor is defective, monitor the lateral incline of the derrick ballast manually.

The following applies:
– The display values of the lateral incline of the derrick ballast must function and be plausible.

7.7 Differential force monitoring for derrick ballast-guying

In operating modes with derrick ballast the forces of the derrick ballast guyings A and B are displayed in the LICCON monitor.

WARNING
Danger of accident!
If the forces in the derrick ballast guyings A and B are too high, then this can lead to an overload of the crane. Components can fail and severe accidents can be the result.
▶ Load the derrick ballast guyings A and B evenly.

After reaching the specified limit value of the difference force threshold, the displays of the pulled ballast of pull cylinder A and B blink and become red, the function ballast up / down is stopped. The difference force must be lowered again.

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If the difference of the forces of the derrick ballast guyings A and B exceeds the limit value, then this can have various causes:
- Flexing of the turntable.
- The ground under the derrick ballast is uneven.
- The crane is leaning to one side.
- The derrick ballast is loaded one-sided.
- The force measurement in one D-guying is incorrect.

The crane driver must recognize the correct cause and take countermeasures:
- The error, which caused the one-sided force, must be remedied.
- If the sensor values are implausible: Stop crane operation and find the cause and remedy it.

7.7.1 Bypassing the shut off of the function ballast up / down

- The following measures are permitted providing the ground is only slightly uneven:
  Control the individual pull cylinders in such a way that the difference between the forces becomes smaller. Ensure that the derrick ballast is not tilted at an inadmissible angle with respect to the crane, otherwise the derrick ballast guide and attachments will be damaged.

▶ Carry out the following: Activate assembly operation, see Crane operating instructions, chapter 4.02.

Result:

- The shut off of the function ballast up / down is bypassed.
- On the left LICCON monitor appears an assembly icon.

▶ Press the button Ballast „up“ or button Ballast „down“ **and** the stop button on the desired side at the same time, see section „Lifting / setting down / equalizing the derrick ballast“.

Problem remedy
The display of the entire pulled ballast is shown blinking red. An LMB-Stop was triggered. All crane functions were stopped.
The crane driver has moved the pull cylinders into the incorrect direction and further exceeded the limit value for the difference force threshold.
▶ Move the pull cylinders again into the correct (other) direction and align the ballast in such a way that the displays of the pulled ballast of pull cylinder A and B are again in the permissible range.

▶ Activate assembly operation again.

Result:

- The shut off of the function ballast up / down is bypassed again.
- All other crane functions are still suppressed.

▶ Move the pull cylinders into the correct direction.

DANGER
Overload of crane!
If the pull cylinders are moved into the incorrect direction after a new bypass of the function ballast up / down, the crane will be overloaded.
This could result in serious accidents.
▶ Monitor the display values and move the pull cylinders in the correct direction (values of pull cylinder A and B become closer).
▶ If unsure: Contact Liebherr Service.

▶ Find the error and remedy it which caused the shut off of the function „Ballast up / down“.

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7.8 Carrying out crane movements

Note

▶ For an overview of the displays in the LICCON monitors, see Crane operating instructions, chapter 4.02.

WARNING

Incorrect display values!

If the display values do not increase correspondingly when lifting known weights, an erroneous display value may be present.

If the crane is operated with erroneous display values, then the crane can be overloaded.

This could result in serious accidents.

▶ When lifting the hook block off the ground check if the display value for the actual load increases correspondingly.

▶ When lifting the derrick ballast off the ground check if the display value for the pulled derrick ballast BA_{pulled} increases correspondingly.

▶ When lifting the load off the ground check if the display value for the actual load increases correspondingly.

WARNING

The crane can topple over!

The jerky execution or braking of turning maneuvers can cause the load and / or suspended ballast to swing.

If the load and / or the suspended ballast collides with obstacles then the crane can be damaged or impeded.

Oscillating movements, damage or impediments can cause the crane to topple over.

This could result in serious accidents.

▶ Initiate or slow down crane movements with load and / or suspended derrick ballast extremely sensitively.

▶ There may be no persons and / or objects within the working range / danger zone of the crane.

▶ During crane operation additional personnel (guide) must monitor and secure the working range / danger zone of the crane from a safe position.

WARNING

Danger of accident due to unsafe ground!

If the crane is operated on insufficient ground, there is a danger of accident.

▶ The ground in the entire working area of the crane must be level and of sufficient load carrying capacity, in order to be able to securely accept the encountered surface pressures.

▶ Before setting down the load or the derrick ballast, the crane operator must make sure that the intended placement surface is suitable. A safe set down of load and derrick ballast must be ensured.

WARNING

Uncontrolled movements of the boom system!

If the guying between the A-frame and the derrick head (test point 1) becomes powerless, then this can lead to uncontrolled movements of the boom system.

This could result in serious accidents.

▶ The guying between the A-frame and the derrick head (test point 1) may never be without power.

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WARNING
Danger of accidents due to angular pull!
Due to angular pull of load or derrick ballast impermissible side forces are directed into the crane.
Impermissible side forces can cause failure of the components or a dangerous change of the center of gravity of the crane and / or load, among others.
Crane and load can be severely damaged and topple over.
This could result in serious accidents.
▶ Before taking on a load or the derrick ballast, make sure that the derrick ballast, the center of rotation of the turntable and the load are on one line.

WARNING
Ballast Constant **not** lifted off the ground!
Ballast Constant drags on the ground and can get caught.
▶ Before crane operation: Lift the ballast Constant off the ground.

WARNING
Danger of accident!
The placement surface for the ballast plates must be level, horizontal and of sufficient load carrying capacity.
This could result in serious accidents.
▶ Check the incline of the crane during the set down procedure.
▶ It is strictly prohibited for anyone to stand under the ballast plates or within the entire danger zone during the set down procedure.

Make sure that the following prerequisites are met:
– The test points must be checked before crane operation for functionality.
– The weight of the load to be lifted must be known.
– The support surface / placement surface of the derrick ballast may be maximum 0.25 m above / below the support surface of the crane.
– The support surface /placement surface of the derrick ballast must be level, horizontal and of sufficient load bearing capacity.
– The support surface / placement surface of the derrick ballast must be able to safely absorb the surface pressure.
– There may not be any obstacles in the slewing range of the crane, derrick ballast and load.
– Additional personnel is instructed to monitor and secure the working range / danger zone of the crane from a safe distance.
– A permanent acoustic / visual connection between the crane operator and the additional personnel is available.
– A guide or the crane driver must monitor the lifting and setting down of the derrick ballast and the load.
– The lifted derrick ballast is monitored by a guide or the crane operator.

The following applies:
– When taking up the load, the D-guying between the derrick ballast and the derrick head must be relieved so that the operating force $F1_{actual}$ is larger than the limit value for the F1-minimum force.
– Before taking up the load or the derrick ballast, make sure that the following components are on one line:
  • The load
  • The center of rotation of the turntable
  • The derrick ballast

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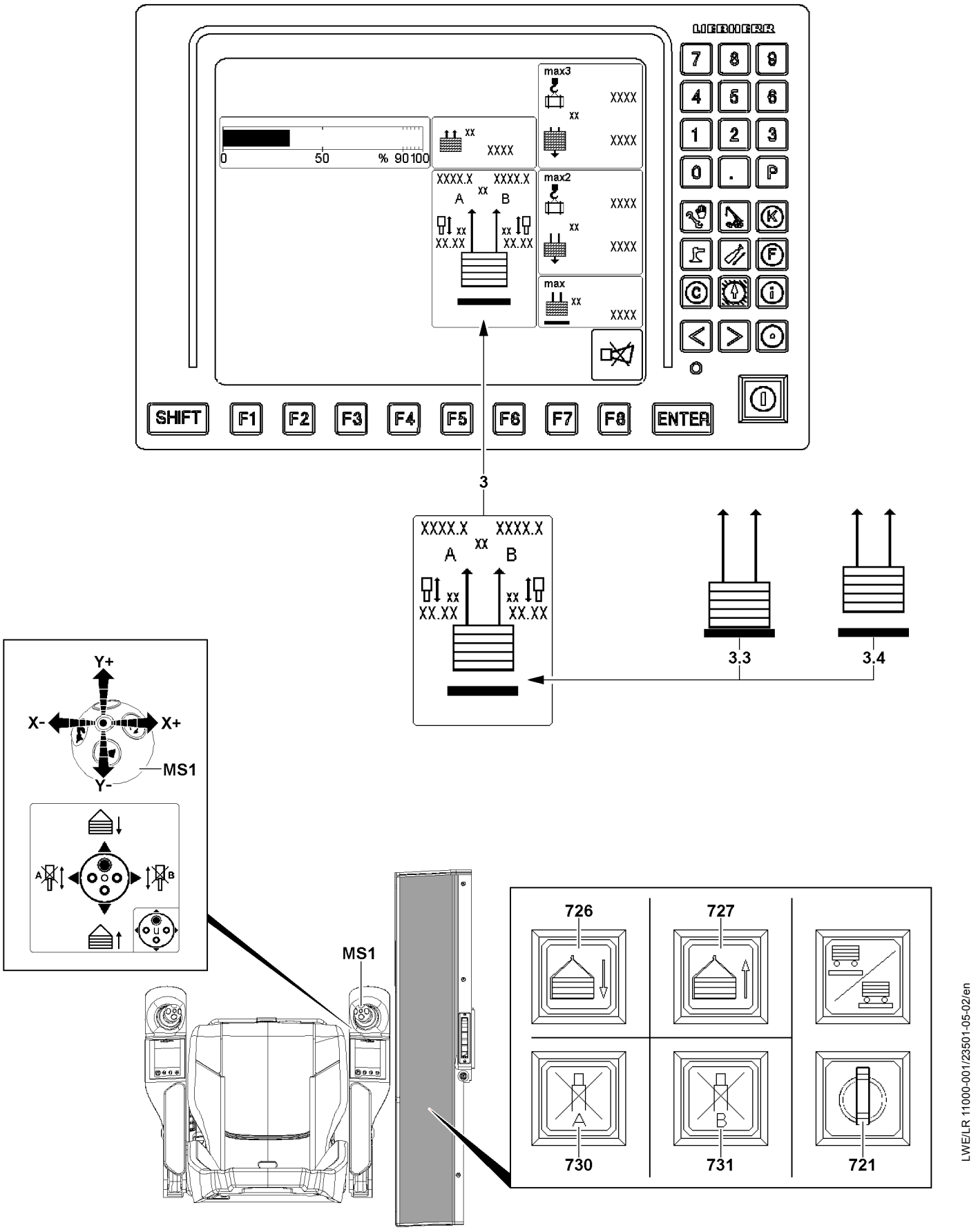

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7.8.1 Lifting / setting down the derrick ballast

The even lifting and set down of the derrick ballast is monitored by the LICCON computer system. Normally the crane operator does not have to do anything. However, if corrective measures or preventative measures should be necessary, observe the following section „Equalizing the derrick ballast“.

WARNING
The crane can topple over!
▶ Only carry out the „turning the turntable“ and „driving the crawler“ crane movements when the derrick ballast is completely lifted and hangs free.

Only when the derrick ballast is completely lifted and hangs free:
▶ The „derrick ballast lifted“ **3.4** icon may be switched on using the *derrick ballast lifted* key button **721**.

Lifting the derrick ballast

▶ Press the button **727**.
or
Deflect the master switch **MS1** in direction **Y-**.

Result:

– The piston rods of the pull cylinders retract together.
– The derrick ballast is raised.

As soon as the derrick ballast is completely lifted and hangs free:
▶ Press the *derrick ballast lifted* key button **721**.

Result:

– The „Derrick ballast lifted off“ icon **3.4** appears.
– The „turning the turntable“ and „driving the crawler“ crane movements are released.

Setting down the derrick ballast

As long as the derrick ballast is not completely lifted and hanging free:
▶ Press the *derrick ballast lifted* key button **721**.

Result:

– The „Derrick ballast has ground contact“ icon **3.3** appears.
– The „turning the turntable“ and „driving the crawler“ crane movements are blocked.

▶ Press the button **726**.
or
Deflect the master switch **MS1** in direction **Y+**.

Result:

– The piston rods of the pull cylinders extend together.
– The derrick ballast is set down.

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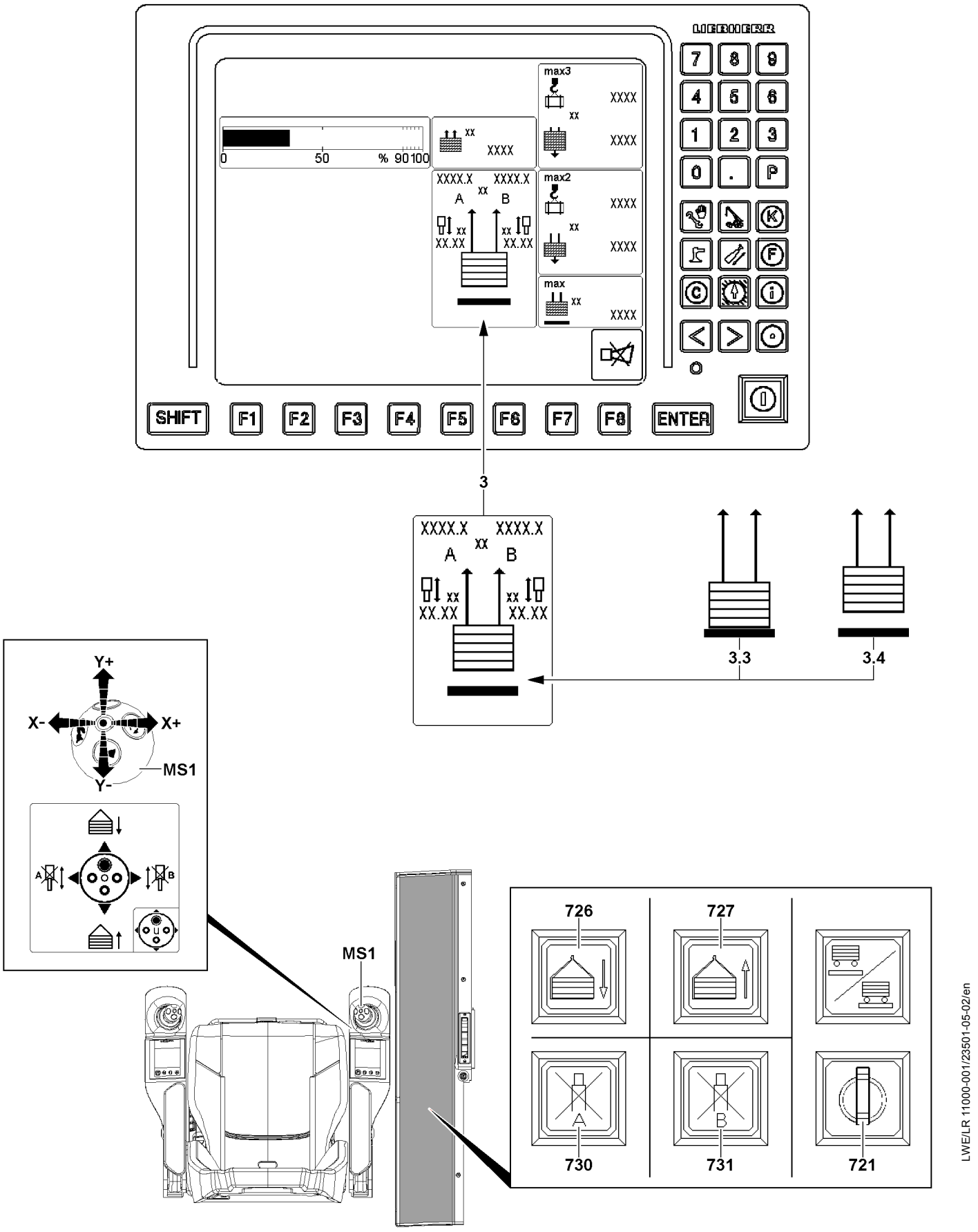

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7.8.2 Equalizing the derrick ballast

The derrick ballast can be equalized with different extension lengths of the pull cylinders.

Block the pull cylinder (A) when lifting:

▶ Press the button **727** and the button **730**.
or
Deflect the master switch **MS1** diagonally in direction **X-** and direction **Y-**.

Result:

– The piston rod of the pull cylinder (A) stops.
– The piston rod of pull cylinder (B) moves in.
– Side (B) of the derrick ballast lifts up.

Block the pull cylinder (B) when lifting:

▶ Press the button **727** and the button **731**.
or
Deflect the master switch **MS1** diagonally in direction **X+** and direction **Y-**.

Result:

– The piston rod of the pull cylinder (B) stops.
– The piston rod of pull cylinder (A) moves in.
– Side (A) of the derrick ballast lifts up.

Block the pull cylinder (A) when lowering:

▶ Press the button **726** and the button **730**.
or
Deflect the master switch **MS1** diagonally in direction **X-** and direction **Y+**.

Result:

– The piston rod of the pull cylinder (A) stops.
– The piston rod of pull cylinder (B) moves out.
– Side (B) of the derrick ballast lowers.

Block the pull cylinder (B) when lowering:

▶ Press the button **726** and the button **731**.
or
Deflect the master switch **MS1** diagonally in direction **X+** and direction **Y+**.

Result:

– The piston rod of the pull cylinder (B) stops.
– The piston rod of pull cylinder (A) moves out.
– Side (A) of the derrick ballast lowers.

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8 Crawler operation with derrick ballast

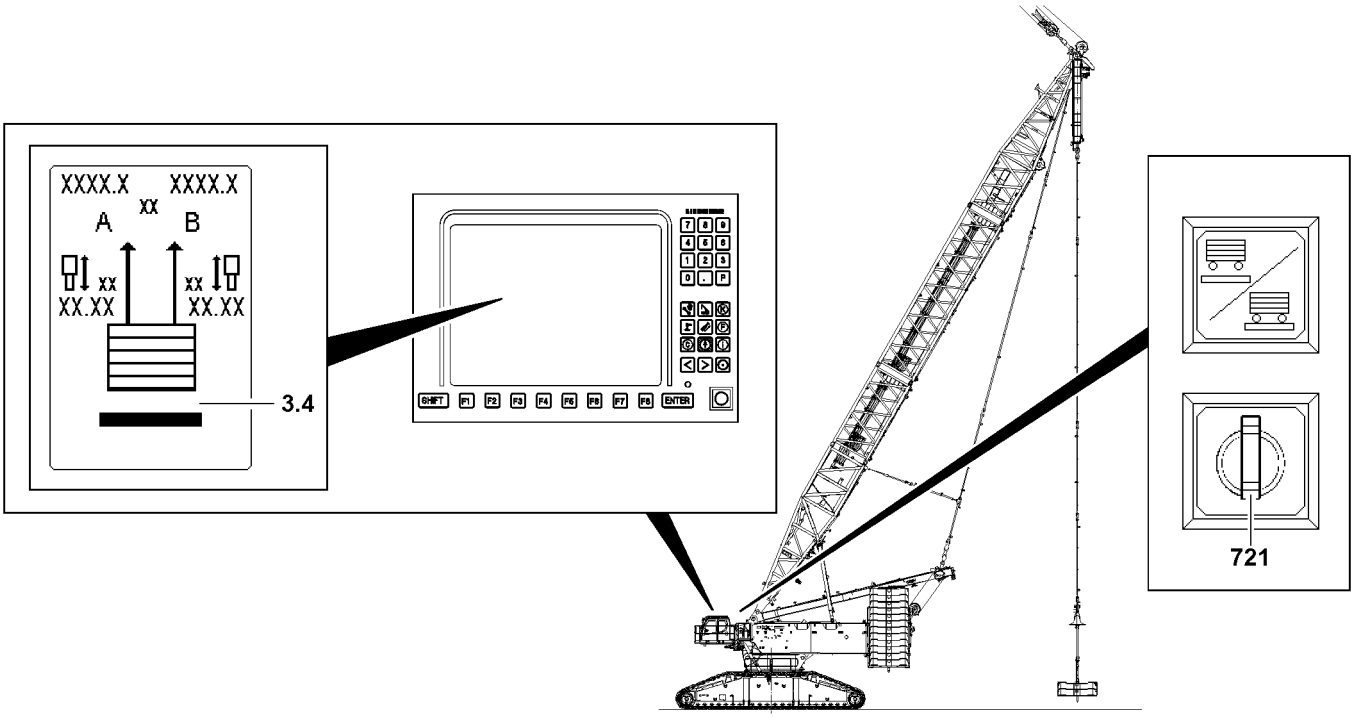

Fig.145933

WARNING
The crane can topple over!
▶ Only carry out the „turning the turntable“ and „driving the crawler“ crane movements when the derrick ballast is completely lifted and hangs free.

Only when the derrick ballast is completely lifted and hangs free:
▶ The „derrick ballast lifted“ **3.4** icon may be switched on using the *derrick ballast lifted* key button **721**.

Note
▶ Driving the crawler crane, see the Crane operating instructions, chapter 4.10.

8.1 Driving the crawler

Driving with suspended derrick ballast.

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WARNING
Suspended load or suspended derrick ballast oscillates too much! Specifications not observed!
If the specifications from the Crane operating instructions, chapter 4.10 are **not** observed, there is a danger of accident.
Death, severe bodily injuries, property damage.
- ▶ Observe the specifications in the Crane operating instructions, chapter 4.10.
- ▶ Do **not** exceed the maximum permissible driving speed of the crawler.
- ▶ Avoid jerky driving movements.
- ▶ Avoid oscillation of load and suspended derrick ballast or keep it to a minimum: Drive and turn slowly.

When oscillation movements occur:
- ▶ Set the load / derrick ballast on the ground quickly. Pay attention to the limit values of the load torque display and the F-load display.
- ▶ Steering the crawler with suspended load and / or installed derrick ballast is prohibited.
- ▶ Always observe the permissible values for uphill and downhill inclines and lateral inclines.

Make sure that the following prerequisites are met:
- – Observe the specifications in the Crane operating instructions, chapter 4.10.
- – Pay special attention to the limitations for crawler operation with derrick ballast.
- – The ground is suitable for crawler operation with derrick ballast.
- – The ground can safely take on the resulting surface pressure.
- – The derrick ballast is completely lifted off the ground and hangs free.
- – The „Derrick ballast lifted off“ icon **3.4** appears on the LICCON monitor.

9 Disassembling

Make sure that the following prerequisites are met:
- – The crane is horizontally aligned.
- – The counterweight has been installed on the turntable according to the load charts.
- – The LICCON overload protection has been set according to the data in the load charts.
- – The LICCON overload protection settings have been compared with the actual set up configuration.
- – An auxiliary crane is available.

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9.1 Disassembling without a cross beam

9.1.1 Removing the ballast on the guy rods

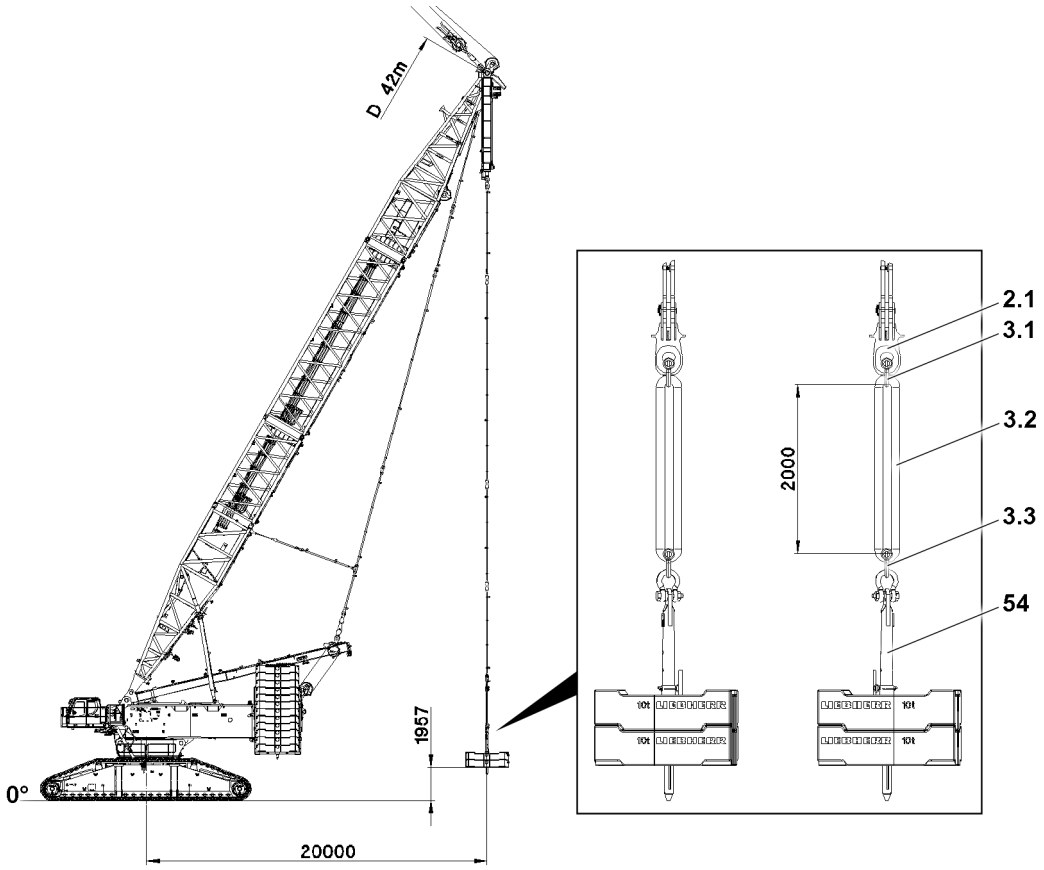

Fig.124979: Ballast Constant on the guy rods

When the derrick ballast radius is less than 15 m:

- ▶ Support the ballast plates.
- ▶ Set the ballast plate on the ground or on a substructure.
- ▶ Remove the shackle **3.3**, roundsling **3.2** and shackle **3.1**.
- ▶ Lift the guying until the ballast plates can be removed.

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9.2 Disassembling with a cross beam*

9.2.1 Removing the ballast on the cross beam

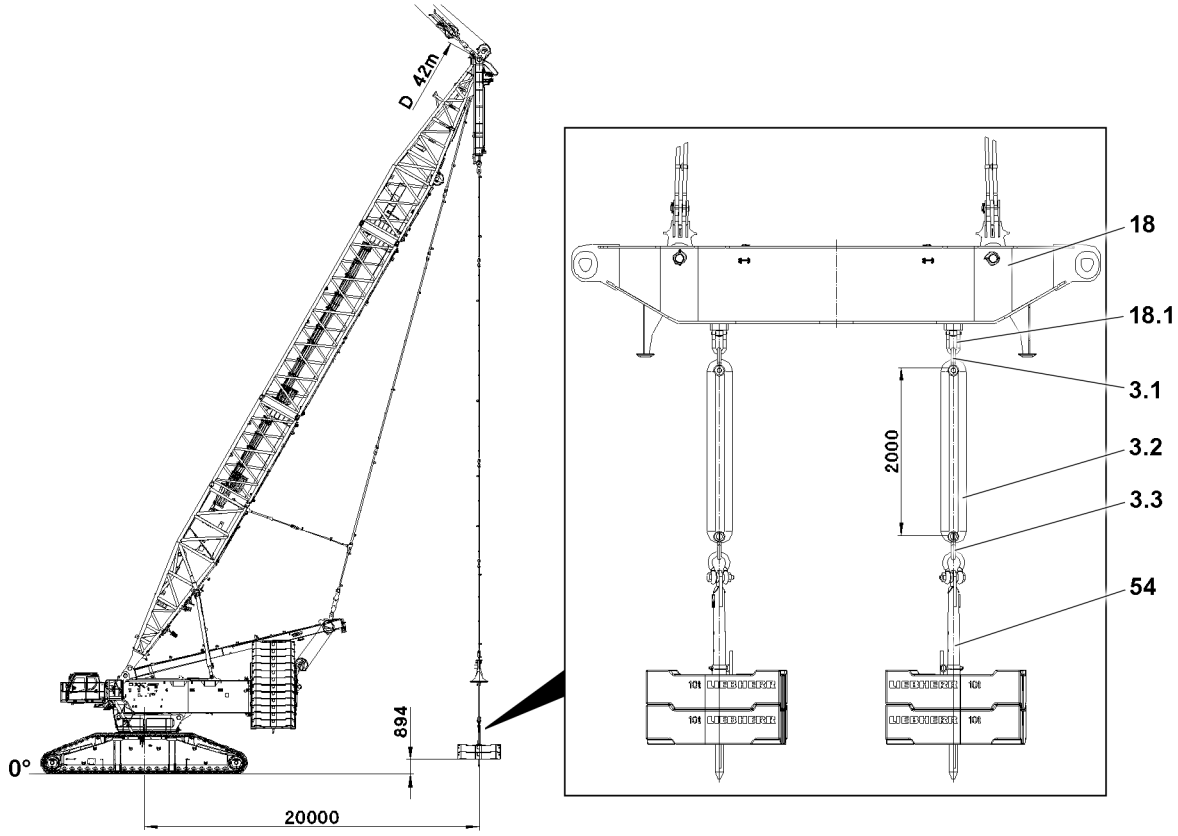

Fig.124980: Ballast Constant on the cross beam

- ▶ Set the ballast plate on the ground.
- ▶ Remove the shackle **3.3**, roundsling **3.2** and shackle **3.1**.
- ▶ Lift the guying until the ballast plates can be removed.

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9.2.2 Disassembling the cross beam

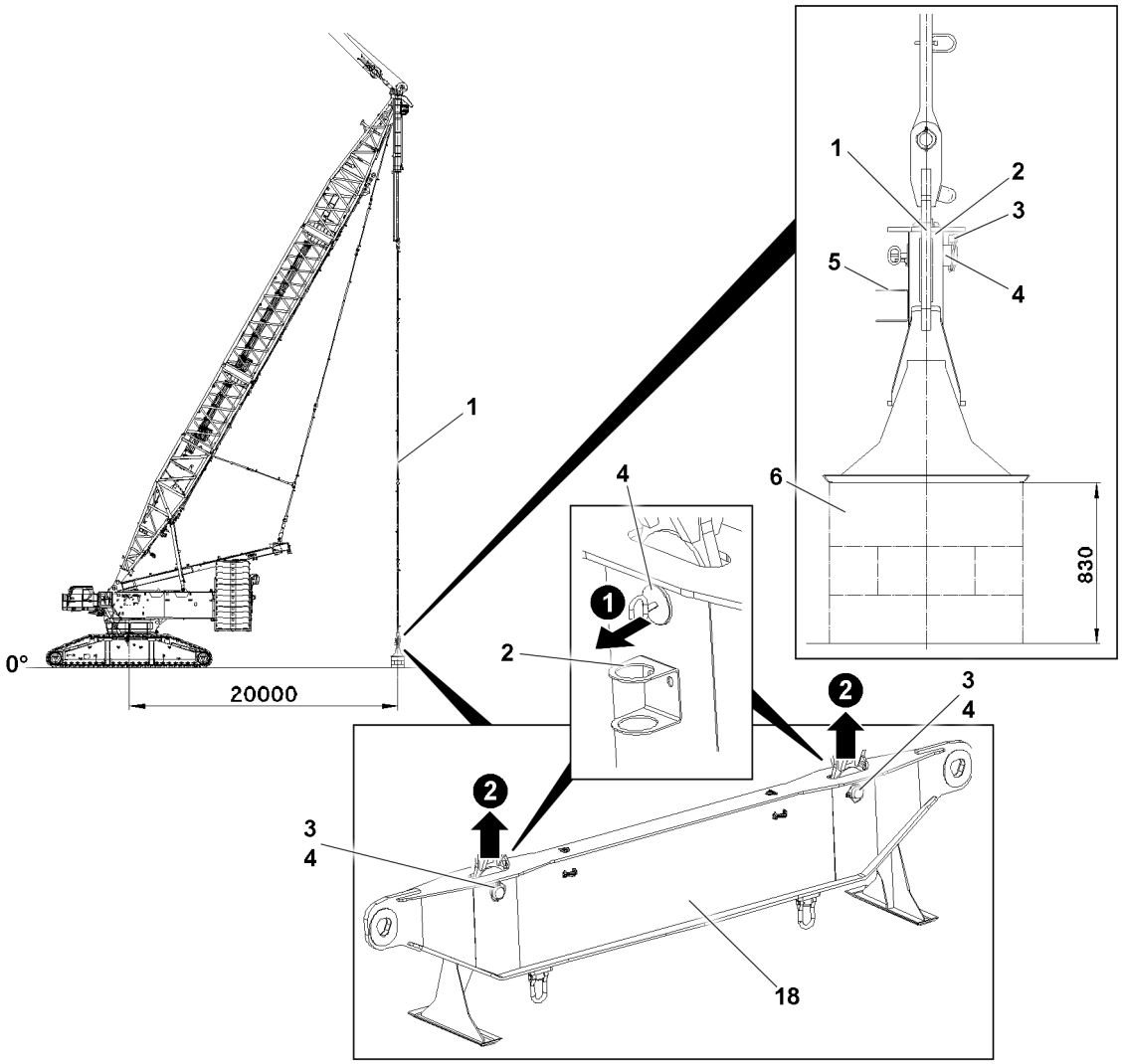

Fig.126481: Cross beam

Make sure that the following prerequisites are met:
– The ground is level and of sufficient load bearing capacity.

▶ Set the derrick radius to 20 m.

The substructure **6** must be at least 830 mm above the crane placement surface.

▶ Position the substructure **6** under cross beam **18**.
▶ Set the cross beam **18** on the substructure **6**: Extend the pull cylinder.

Note
Retract / extend the pull cylinder
▶ Control the pull cylinders from the crane cab or with the control panel, see section „lifting and lowering the derrick ballast with the pull cylinders“.
▶ Operate the pull cylinder with the radio remote control, see the „radio remote control operating instructions“.

▶ Unpin the cross beam on the D-guy rods **1**: Remove the locking pin **3** and unpin the pin **4**.
▶ Insert the pin **4** in the transportation retainer **5** and secure.
▶ Lift the guy rods: Retract the pull cylinder.

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Note

▶ Fastening points, see section „Fastening points for suspended ballast parts“.

▶ Fasten the cross beam **18** with fastening equipment to the auxiliary crane and remove.

9.3 Removing the ballast

9.3.1 Removing the receptacle stud from the ballast plates

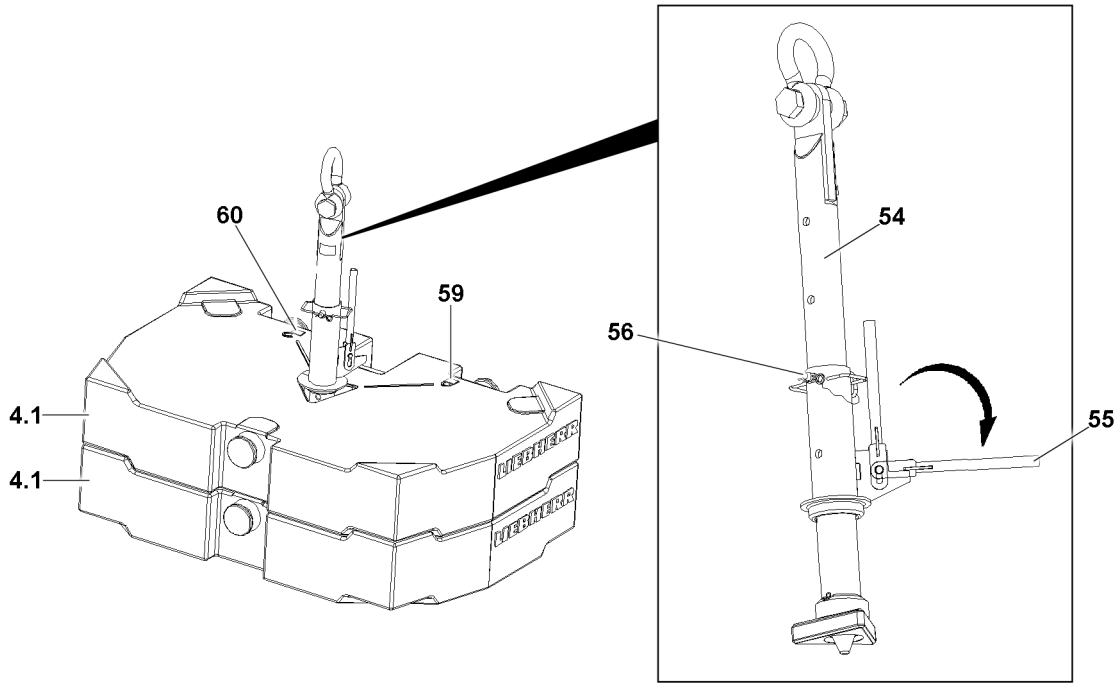

*Fig.126074: Receptacle stud with two 10 t ballast plates **4.1***

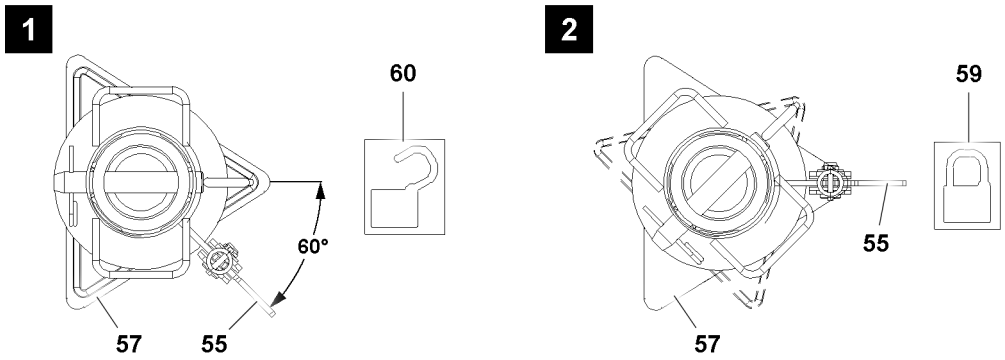

*Fig.126075: Receptacle stud overhead view, positions lever **55***

If the receptacle stud is to be removed:

▶ Turn the lever **75** by 60° until the lever **75** points to the icon **60**, see illustration **1**.

Result:

– The receptacle stud is unlocked.

▶ Carefully pull the receptacle stud **54** with the auxiliary crane from the ballast plate.

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5.36.40 Derrick ballast - suspended ballast - special design VarioTray

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5	Derrick ballast radii	13
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Fig.195219

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1 Product description

This chapter describes the following derrick ballast variations:
- Suspended ballast *special design*: Divisible ballast pallet „VarioTray“
  Ballasting consisting of ballast plates on a divisible ballast pallet

This crane type has additional derrick ballast variations, which will be described in other chapters of these operating instructions:
- Suspended ballast
  Ballasting consisting of ballast plates on a ballast pallet
- Suspended ballast *special design*: Ballast „Constant“
  Ballasting consisting of directly suspended ballast plates (without a ballast pallet)
- Ballast trailer
  Ballasting consisting of ballast plates on a ballast trailer
- Suspended ballast *special design*: Ballasting LTR crane and / or ballast plates
  Ballasting consisting of an LTR crane and / or ballast plates on a ballast pallet

Note
Designation of the ballast types
- ▶ The suspended ballast and the ballast trailer are generally described as derrick ballast.
- ▶ The ballast installed on the turntable is generally referred to as the counterweight.
- ▶ The ballast installed on the crawler travel gear is generally referred to as the central ballast.

1.1 Function

The divisible ballast pallet is referred to as the „VarioTray“.

The divisible ballast pallet „VarioTray“ provides a system for erection with a high derrick ballast and crane operation with a small derrick ballast.

If the main boom is erected, the ballast that is not needed for the crane operation can simply be decoupled. Crane is then driven only with the derrick ballast that is actually needed.

The derrick boom angle, derrick ballast, weight and utilization are shown on LICCON monitor 1.

After assembly on the ground, the derrick ballast is raised for crane operation with the hydraulic cylinders in the D-guying.

The required derrick ballast radius is set by adjusting the derrick boom.

Crane operation with derrick ballast without suspended ballast guide***** is referred to as „B operation“.

Crane operation with derrick ballast with suspended ballast guide***** is referred to as „B 2 operation“.

For crane operation with derrick ballast, see the Crane operating instructions, chapter 4.02.

The D-guying contains two pull cylinders (pull cylinder A and pull cylinder B). These pull cylinders are used to pull, lift or lower the derrick ballast.

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1.2 Variations

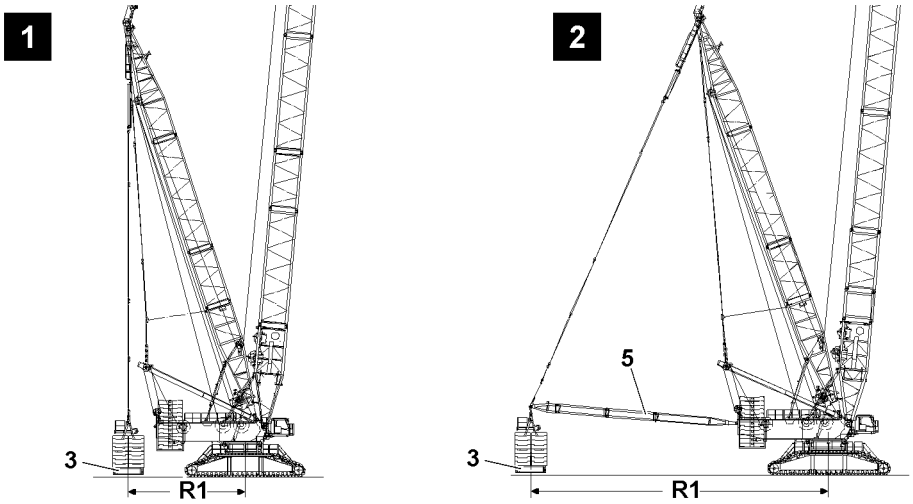

Fig.145947: Suspended ballast variations

LR 11000 has two suspended ballast variations:
- Divisible ballast pallet „VarioTray“ **3 without** suspended ballast guide, see illustration **1**
  - The derrick ballast radius **R1** can be set by adjusting the derrick boom.
- Divisible ballast pallet „VarioTray“ **3 with** suspended ballast guide **5**, see illustration **2**
  - The derrick ballast radius **R1** requires the conversion of the suspended ballast guide **5**.

2 Component overview

Note
- ▶ The assembly sections are marked with their own weight.
- ▶ Dimensions and weights, see the Crane operating instructions, chapter 1.03.

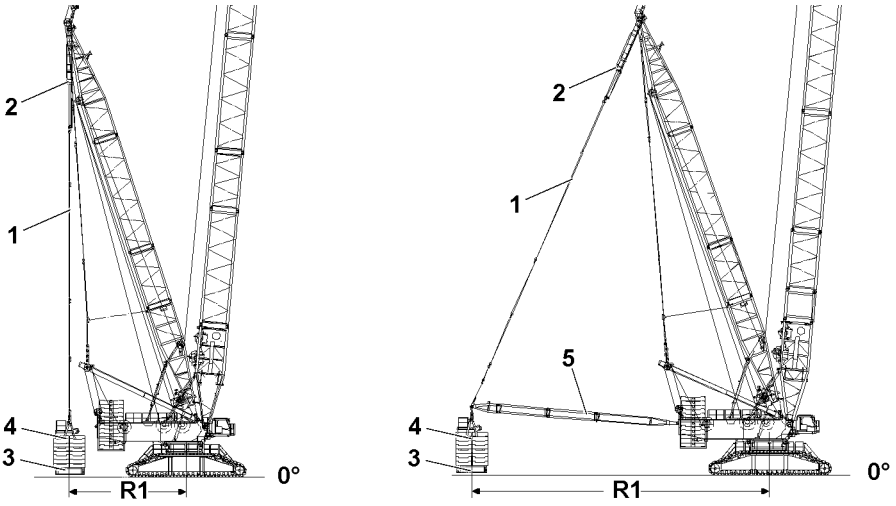

Fig.145263: Suspended ballast variations

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Position	Component
1	D-guying
2	Pull cylinder
3	Divisible ballast pallet „VarioTray“
4	Ballast plates
5	Suspended ballast guide B2

2.1 Component overview for divisible ballast pallet „VarioTray“

2.1.1 Divisible ballast pallet „VarioTray“

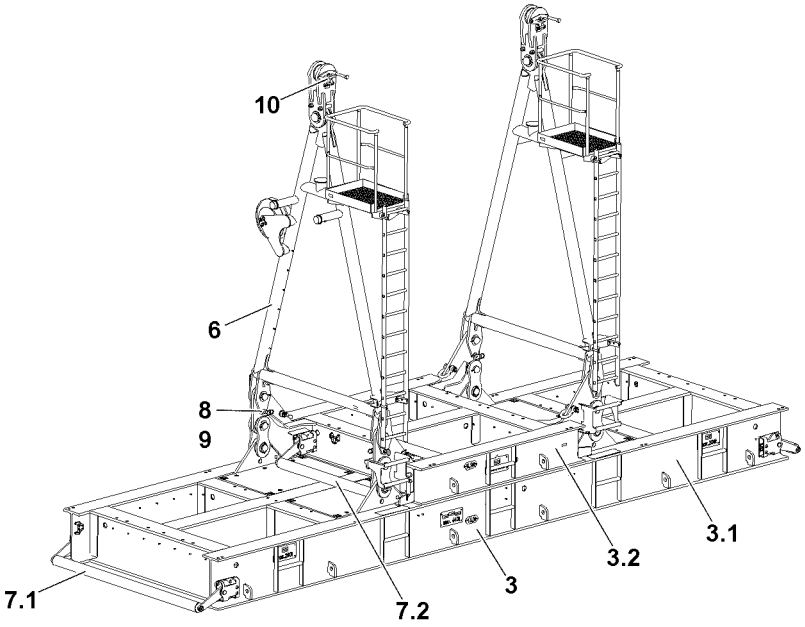

Fig.145262: Divisible ballast pallet „VarioTray“

Position	Component
3	Divisible ballast pallet „VarioTray“
3.1	Large ballast pallet
3.2	Small ballast pallet
6	Erection rack
7.1	Ground contact roller
7.2	Ground contact roller
8	Retaining pin
9	Retaining element
10	Connector pin

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2.1.2 Lashing lugs

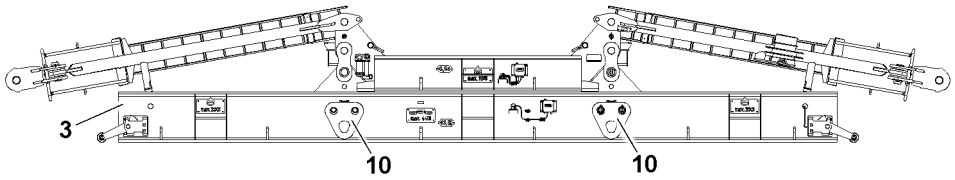

Fig.145264: Lashing lugs

Position	Component
10	Lashing lugs

Note

▶ Lashing lugs for fastening and transferring the divisible ballast pallet „VarioTray“ with the auxiliary crane.

2.2 Component overview Suspended ballast guide

2.2.1 Pivot section

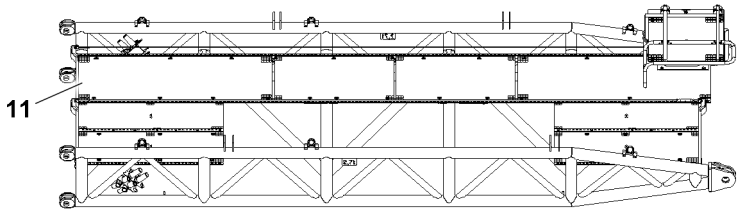

Fig.124480: Pivot section

Position	Component
11	Pivot section

2.2.2 Intermediate section

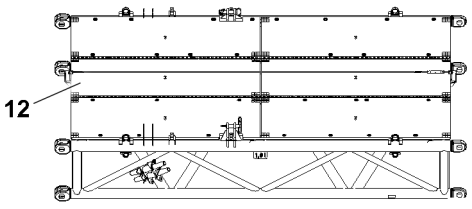

Fig.124481: Intermediate section

Position	Component
12	Intermediate section

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2.2.3 Intermediate section

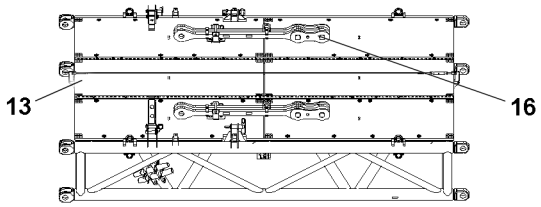

Fig.124482: Intermediate section

Position	Component
13	Intermediate section
16	Pull rods

2.2.4 End section

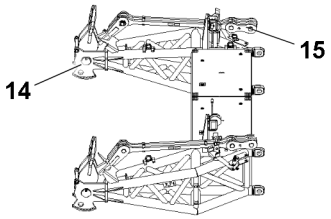

Fig.124483: End section

Position	Component
14	End section
15	Pull rods - end section

2.2.5 Suspended ballast guide „Transport position“

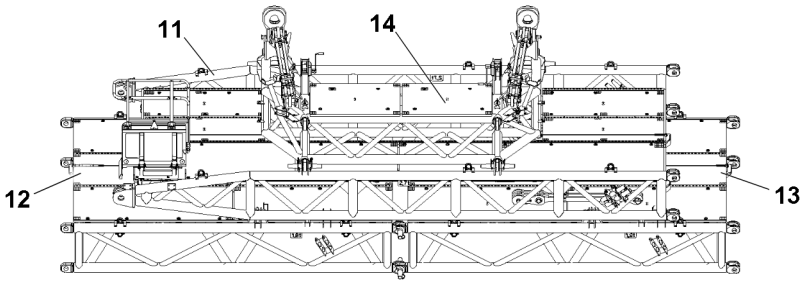

Fig.124484: Suspended ballast guide „Transport position“

Note

▶ Component, see section „Component overview Suspended ballast guide“.

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3 Fastening points

WARNING
Falling lattice sections!
Death, severe bodily injuries, property damage.
- ▶ Make sure that the lattice sections are properly fastened on the respective fastening points.
- ▶ Make sure that the fastening equipment has the appropriate length and a sufficient load bearing capacity.
- ▶ Pay attention and adhere to the labels on the fastening points on the lattice sections and crane components.

3.1 Fastening points for suspended ballast components

3.1.1 Divisible ballast pallet „VarioTray“

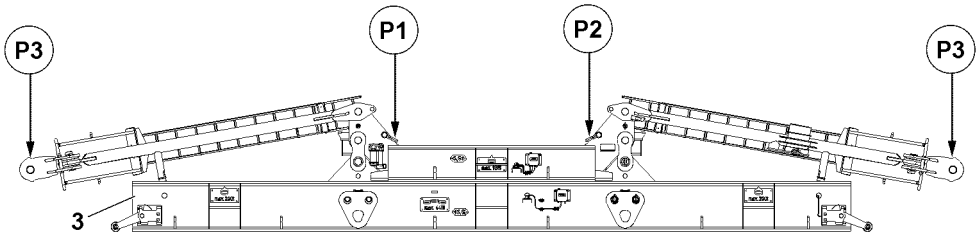

Fig.145265: Divisible ballast pallet „VarioTray“

Note
- ▶ Fastening points P1 and P2: Minimum rope length 6 m.

Fastening points	
P1 and **P2**	Divisible ballast pallet „VarioTray“
P3	Erection rack

3.1.2 Ballast plates

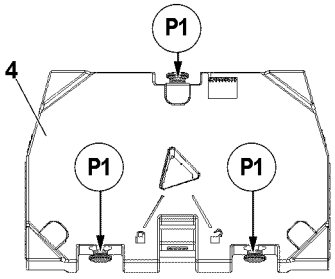

Fig.145266: Ballast plates

Fastening points	
P1	Ballast plates

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3.2 Fastening points for suspended ballast guide components

3.2.1 End section

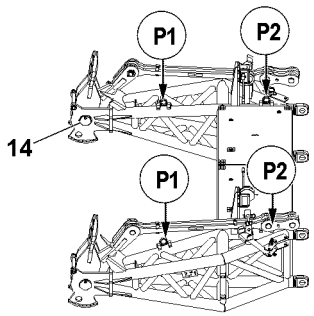

Fig.145269: End section

Fastening points	
P1 and **P2**	End section

3.2.2 Intermediate section

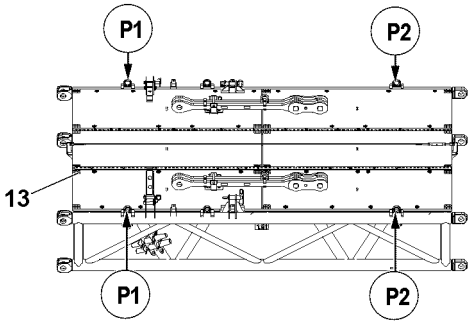

Fig.145268: Intermediate section

Fastening points	
P1 and **P2**	Intermediate section

3.2.3 Intermediate section

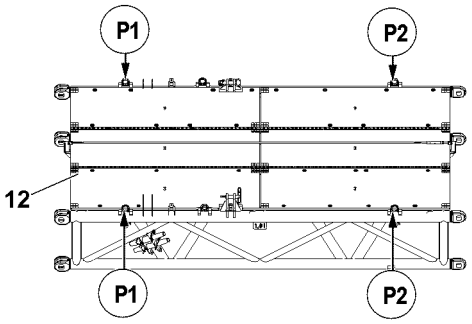

Fig.145270: Intermediate section

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Fastening points	
P1 and **P2**	Intermediate section

3.2.4 Pivot section

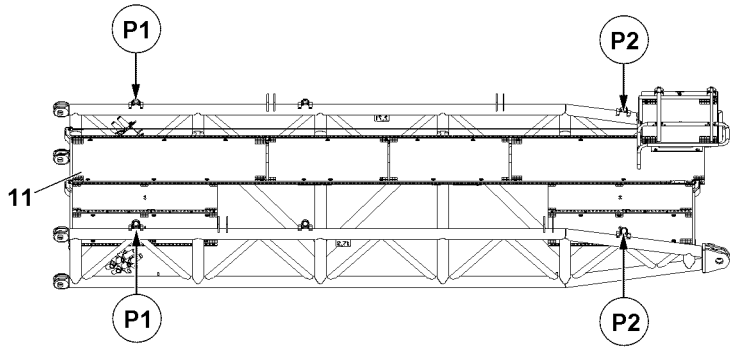

Fig.145271: Pivot section

Fastening points	
P1 and **P2**	Pivot section

3.3 Suspended ballast guide (transport)

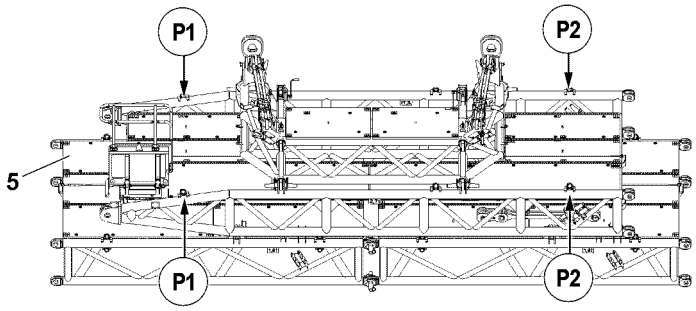

Fig.145272: Suspended ballast guide (transport)

Fastening points	
P1 and **P2**	Suspended ballast guide (transport)

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3.4 Suspended ballast guide (assembly)

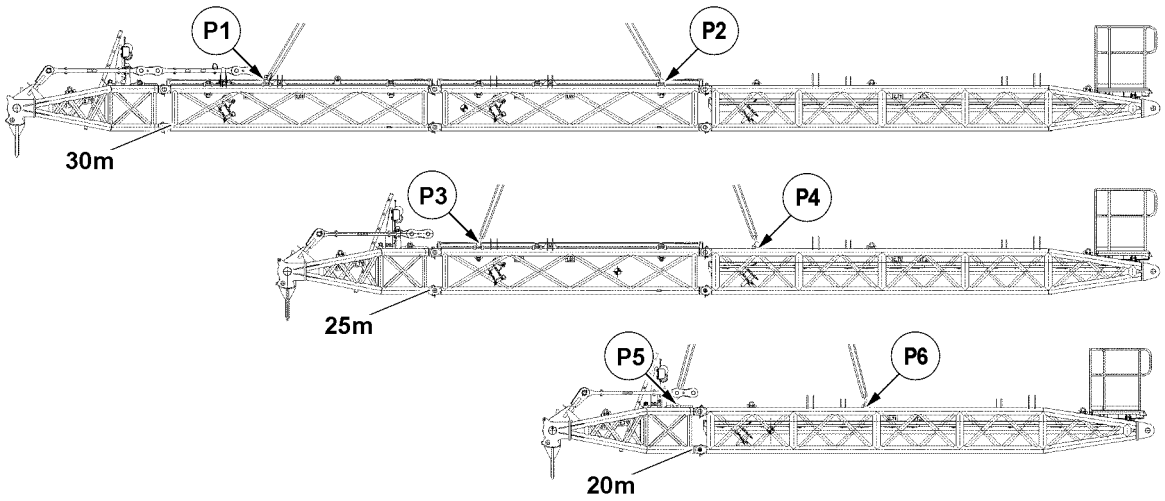

Fig.145267: Suspended ballast guide (assembly)

Fastening points	
P1 and **P2**	Suspended ballast guide 30 m
P3 and **P4**	Suspended ballast guide 25 m
P5 and **P6**	Suspended ballast guide 20 m

4 Pull cylinder extension conditions

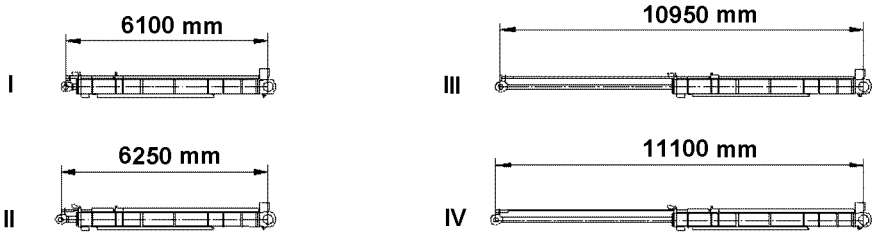

Fig.119003: Pull cylinder extension conditions

Extension conditions	
I	Block position „Retracted“
II	Switch position „Retracted“
III	Switch position „Extended“
IV	Block position „Extended“

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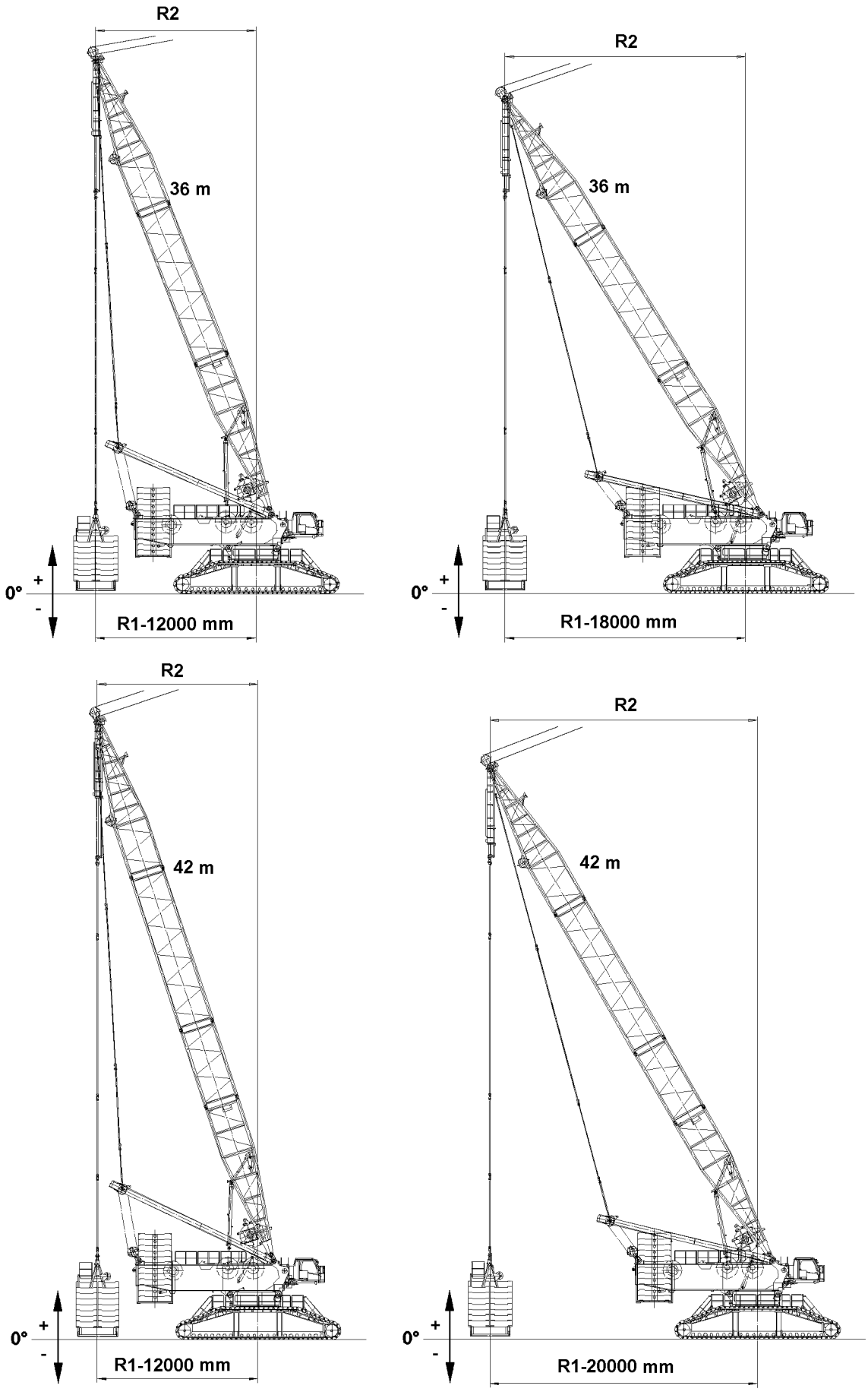

Fig.119004

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5 Derrick ballast radii

5.1 Derrick ballast without suspended ballast guide

5.1.1 36 m derrick boom

Note

- ▶ **No** suspended ballast guide is installed between the turntable and the divisible ballast pallet „VarioTray“.
- ▶ The derrick ballast radius **R1** and the derrick radius **R2** are identical, see illustration.

With the 36 m derrick, the following derrick ballast radii are possible: R1= 12 m and R1 =18 m.

Large ballast pallet (base pallet)

Radius R1 = 12 m	
Above base	+3545 mm
Below base	-1155 mm

Radius R1 = 18 m	
Above base	+569 mm
Below base	-4131 mm

Small ballast pallet (Vario-palette)

Radius R1 = 12 m	
Above base	+4245 mm
Below base	-455 mm

Radius R1 = 18 m	
Above base	+1269 mm
Below base	-3431 mm

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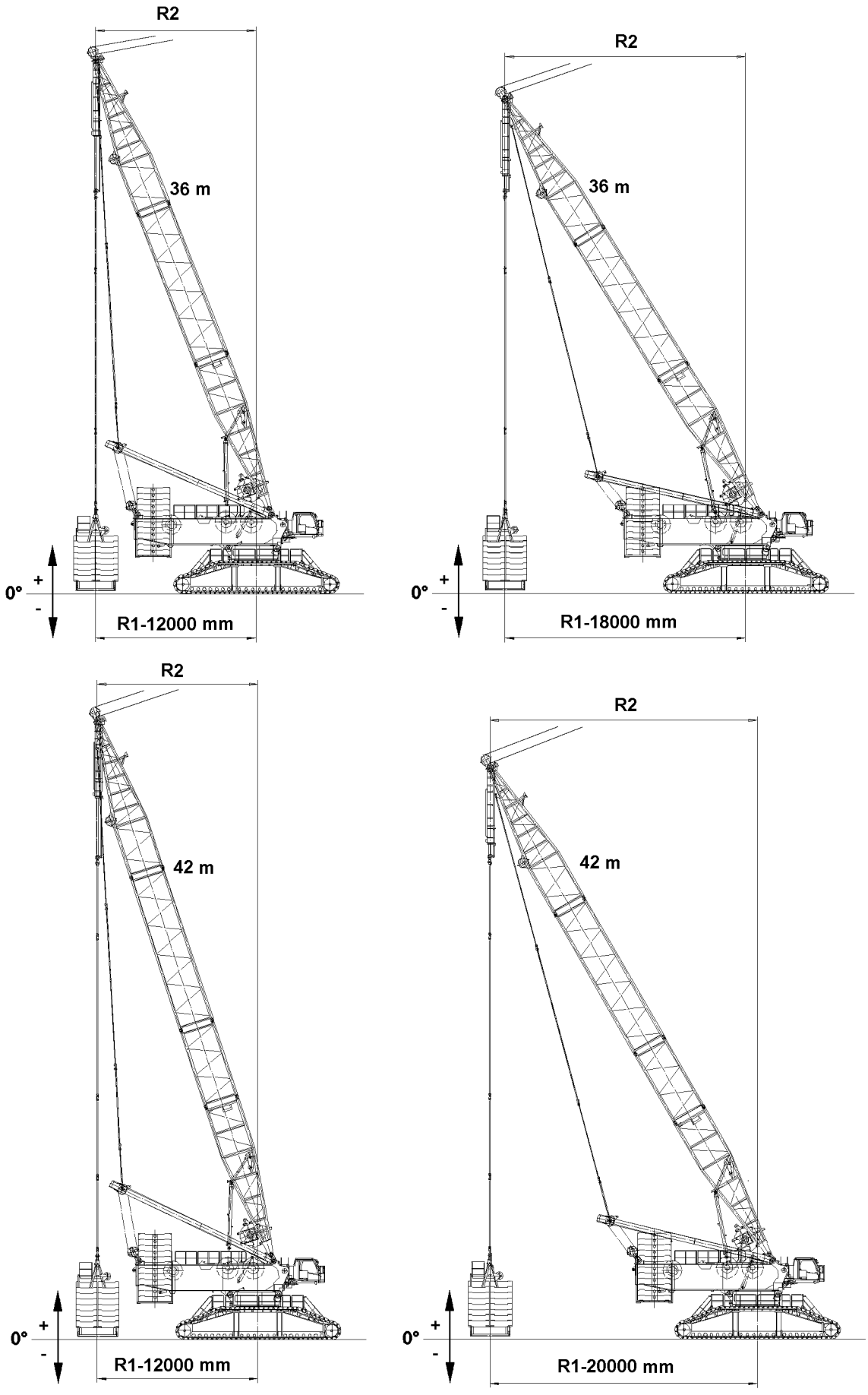

Fig.119004

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5.1.2 Derrick boom 42 m

Note

- ▶ **No** suspended ballast guide is installed between the turntable and the divisible ballast pallet „VarioTray“.
- ▶ The derrick ballast radius **R1** and the derrick radius **R2** are identical, see illustration.

With the 42 m derrick, the following derrick ballast radii are possible: R1= 12 m and R1= 20 m.

Large ballast pallet (base pallet)

Radius R1 = 12 m	
Above base	+3911 mm
Below base	-789 mm

Radius R1 = 20 m	
Above base	+539 mm
Below base	-4161 mm

Small ballast pallet (Vario-palette)

Radius R1 = 12 m	
Above base	+4611 mm
Below base	-89 mm

Radius R1 = 20 m	
Above base	+1059 mm
Below base	-3641 mm

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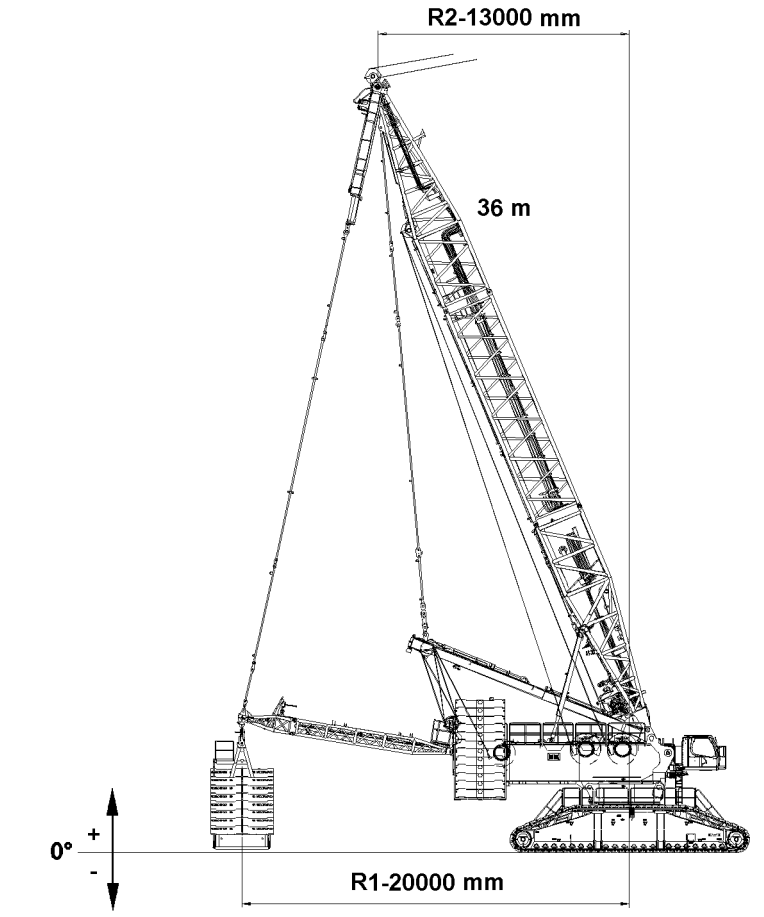

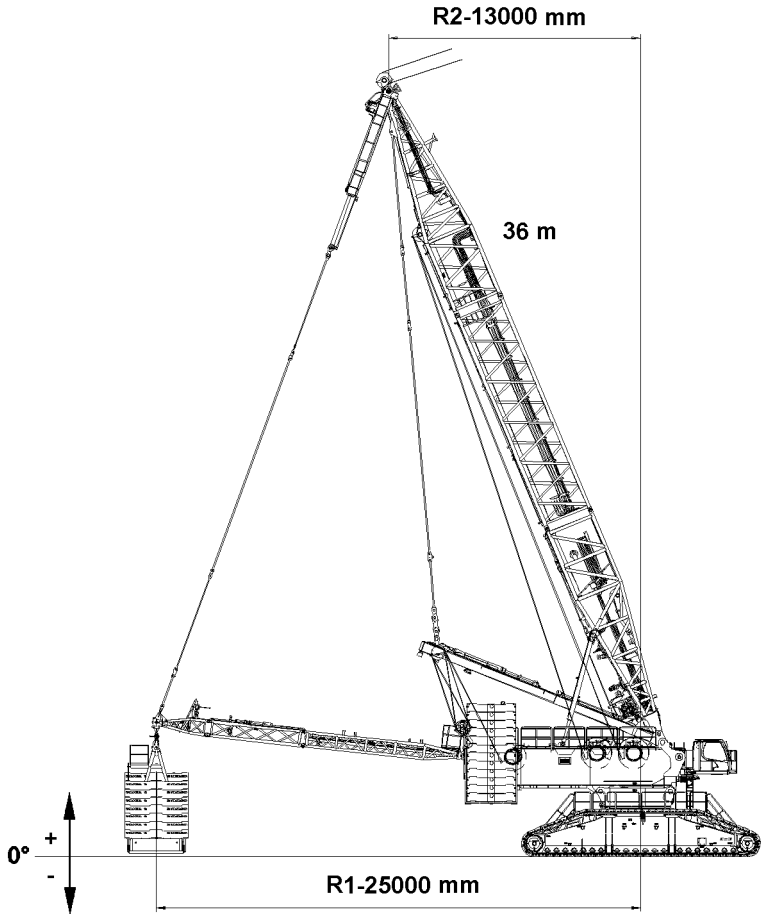

Fig.120208

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5.2 Derrick ballast with suspended ballast guide

5.2.1 36 m derrick boom

Note

- ▶ **One** suspended ballast guide is installed between the turntable and the divisible ballast pallet „VarioTray“.
- ▶ The derrick ballast radius **R1** and the derrick radius **R2** are **not** identical, see illustration.

Derrick radius with the 36 m derrick is R2= 13 m.

With the 36 m derrick, the following derrick ballast radii are possible: R1= 20 m and R1=25 m.

Radius R1 = 20 m	
Above base	+1000 mm
Below base	-1000 mm

Radius R1 = 25 m	
Above base	+1000 mm
Below base	-1000 mm

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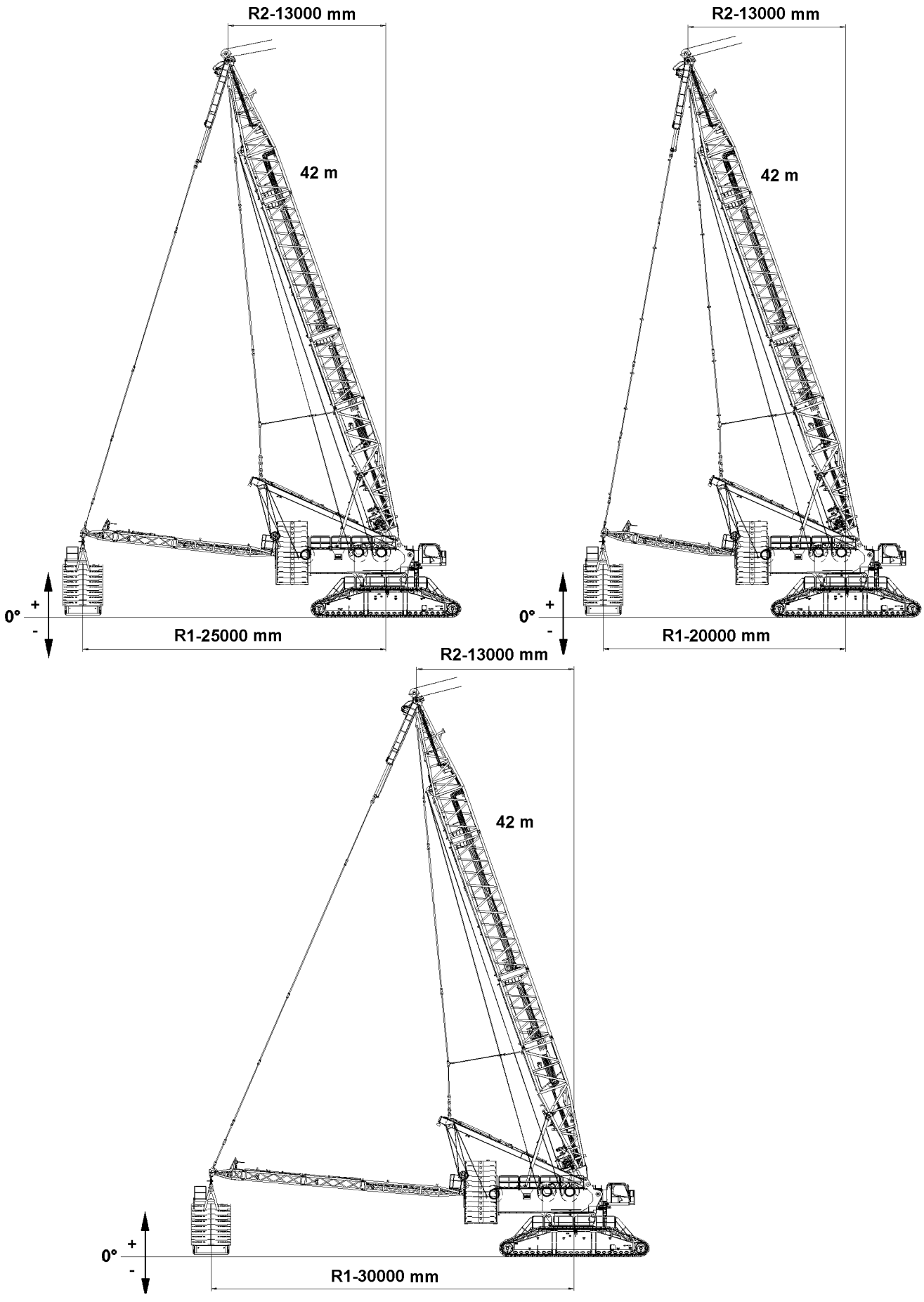

Fig.120209

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5.2.2 Derrick boom 42 m

Note

- ▶ **One** suspended ballast guide is installed between the turntable and the divisible ballast pallet „VarioTray“.
- ▶ The derrick ballast radius **R1** and the derrick radius **R2** are **not** identical, see illustration.

Derrick radius with the 42 m derrick is R2= 13 m.

With the 42 m derrick, the following derrick ballast radii are possible: R1= 20 m , R1= 25 m and R1= 30 m.

Radius R1 = 20 m	
Above base	+1000 mm
Below base	-1000 mm

Radius R1 = 25 m	
Above base	+1000 mm
Below base	-1000 mm

Radius R1 = 30 m	
Above base	+1000 mm
Below base	-1000 mm

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6 Assembly

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

7 Installing the divisible ballast pallet „VarioTray“

DANGER
Danger of accident during assembly / disassembly of the erection racks!
The disassembly of unsecured or unsupported erection racks can cause the erection racks to fall down and kill or severely injure personnel.
- ▶ Never unpin the retaining pins under unsecured or unsupported erection racks.
- ▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure.

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7.1 Setting the divisible ballast pallet „VarioTray“ into the assembly position

▶ Set the derrick to the required radius.

Note
▶ Fastening points, see section „Fastening points for suspended ballast parts“.

▶ Hang divisible ballast pallet „VarioTray“ on the auxiliary crane and position it within the slewing range of the crane under the guy rods on the derrick.

Note
▶ Set down the divisible ballast pallet „VarioTray“ in the lengthwise direction of the turntable for easier assembly to the guy rods.

▶ Align the divisible ballast pallet „VarioTray“ horizontally.

7.2 Erecting the erection racks

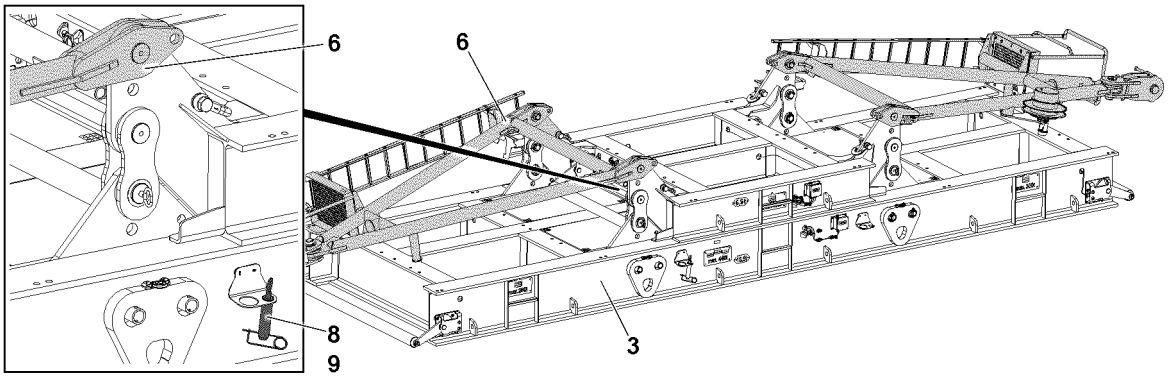

Fig.145273: Divisible ballast pallet „VarioTray“ in the transport position

Note
▶ The assembly of the erection racks is described based on the example of one erection rack.

The erection rack is pinned on two points. The pin procedure is described for one pin as an example.

▶ Hang the erection rack **6** on the auxiliary crane.
▶ Remove the retaining element **9** on both sides from the parking position and unpin the retaining pin **8**.

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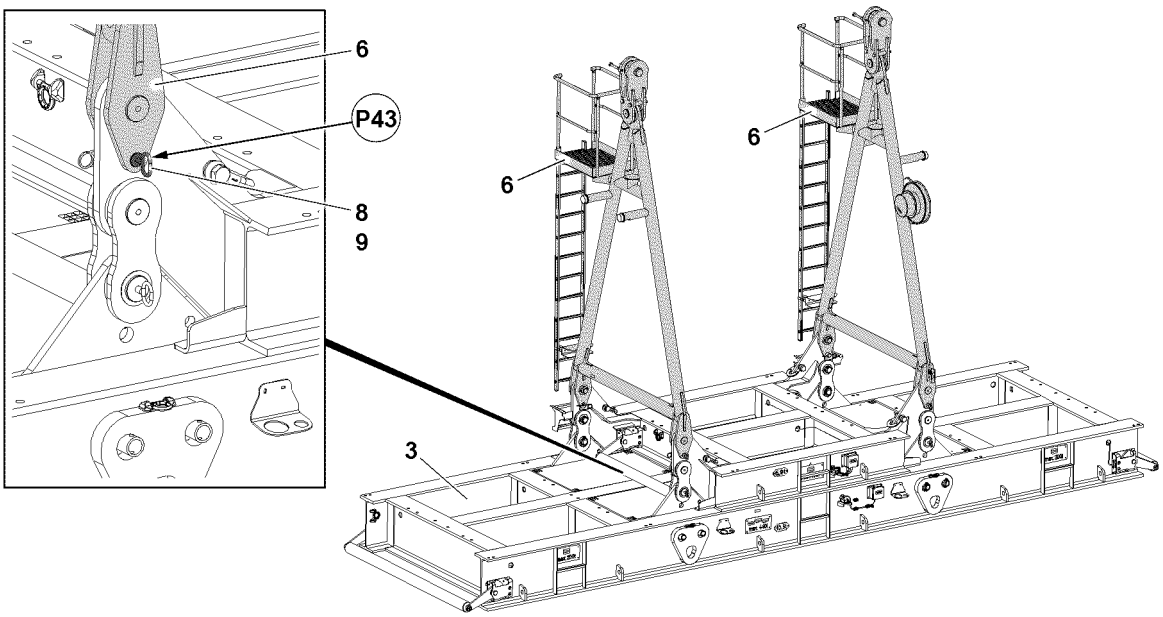

Fig.145274: Positioning the erection racks vertically

DANGER
Danger of accident during assembly / disassembly of the erection racks!
The erection racks must hang securely on the auxiliary crane, otherwise they could fall down and kill or severely injure personnel.
- ▶ The two erection racks must be locked and secured in a vertical position with retaining pins **8**. Only then may the auxiliary crane be removed.
- ▶ Never unpin the retaining pins of unsecured or unsupported erection racks.
- ▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure.

- ▶ Set the erection rack **6** vertically with the auxiliary crane.
- ▶ Insert the retaining pin **8** at point **P43** on both sides and secure with the retaining element **9**.

When the erection rack is set up and secured:
- ▶ Remove the auxiliary crane.

WARNING
Danger of accident!
The two erection racks must be locked and secured in a vertical position during crane operation, as otherwise they could fall down.
Death, severe bodily injuries, property damage.
In the case of crane operation with a divisible ballast pallet „VarioTray“, the retaining pins **8** remain pinned in point **P43**.
- ▶ Make sure that the retaining pins **8** are pinned at point **P43**.

- ▶ Erect the second erection rack **6**.

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8 Assembling the suspended ballast

Make sure that the following prerequisites are met:
- The crane is properly supported and horizontally aligned.
- An auxiliary crane is available.
- The derrick is properly assembled on the turntable.
- The boom is properly assembled on the turntable.
- The derrick is in the crane operating position.
- The boom is laying on the substructure on the ground.
- The central ballast has been installed on the turntable according to the load chart.
- The counterweight has been installed on the turntable according to the load chart.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection settings have been compared with the actual set up configuration.

8.1 Assembling the D-guy rods on the erection racks

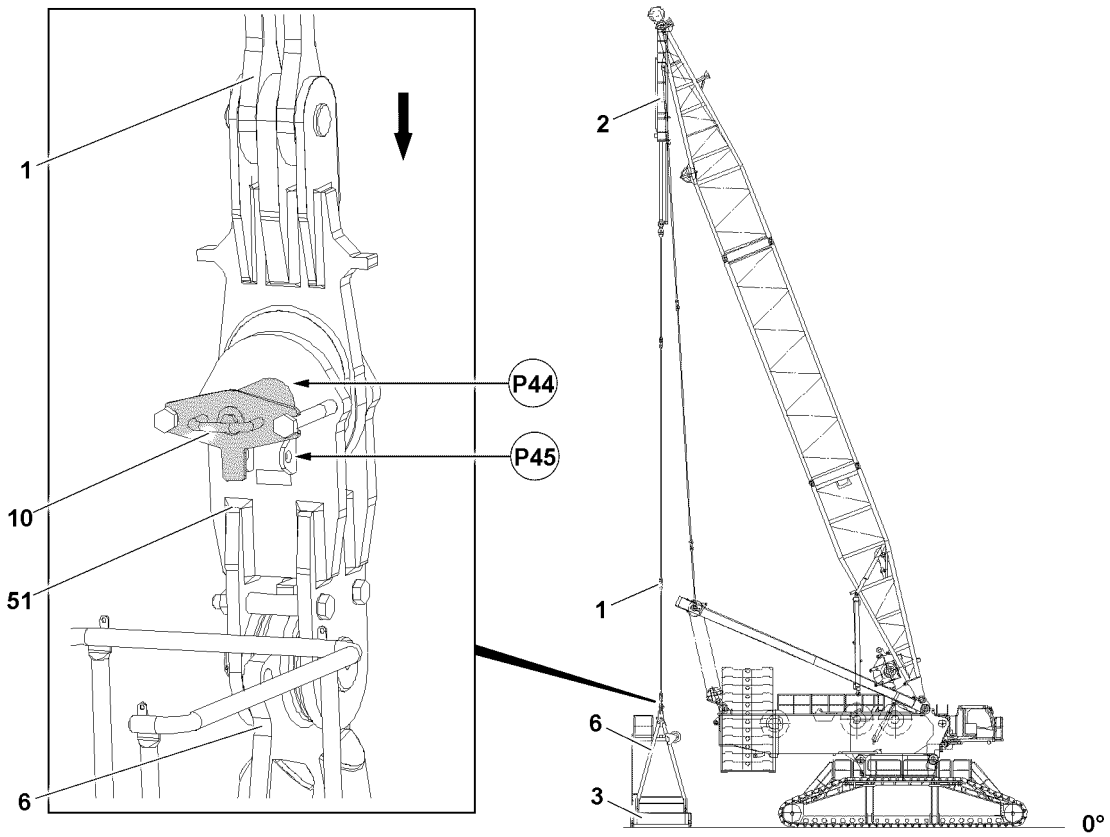

Fig.145275: Pinning procedure

Make sure that the following prerequisites are met:
- The guy rods hang over the brackets of the erection racks.
- The erection racks are erected and secured with retaining pins.
- The derrick is set to the required radius.

▶ Remove the retaining element **53** at point **P45** and unpin the retaining pin **52**.
▶ Unpin the connector pin **10** at point **P44**.
▶ Position the guy rods **1**, by extending the piston rods on the pull cylinders **2**, between the brackets **51** of the erection rack **6**.

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Note
Retract / extend the pull cylinder **2**

- ▶ Control the pull cylinders **2** from the crane cab, see the section „Lifting and lowering the derrick ballast using the pull cylinders“.
- ▶ Operate the pull cylinder **2** with the radio remote control, see the „radio remote control operating instructions“.

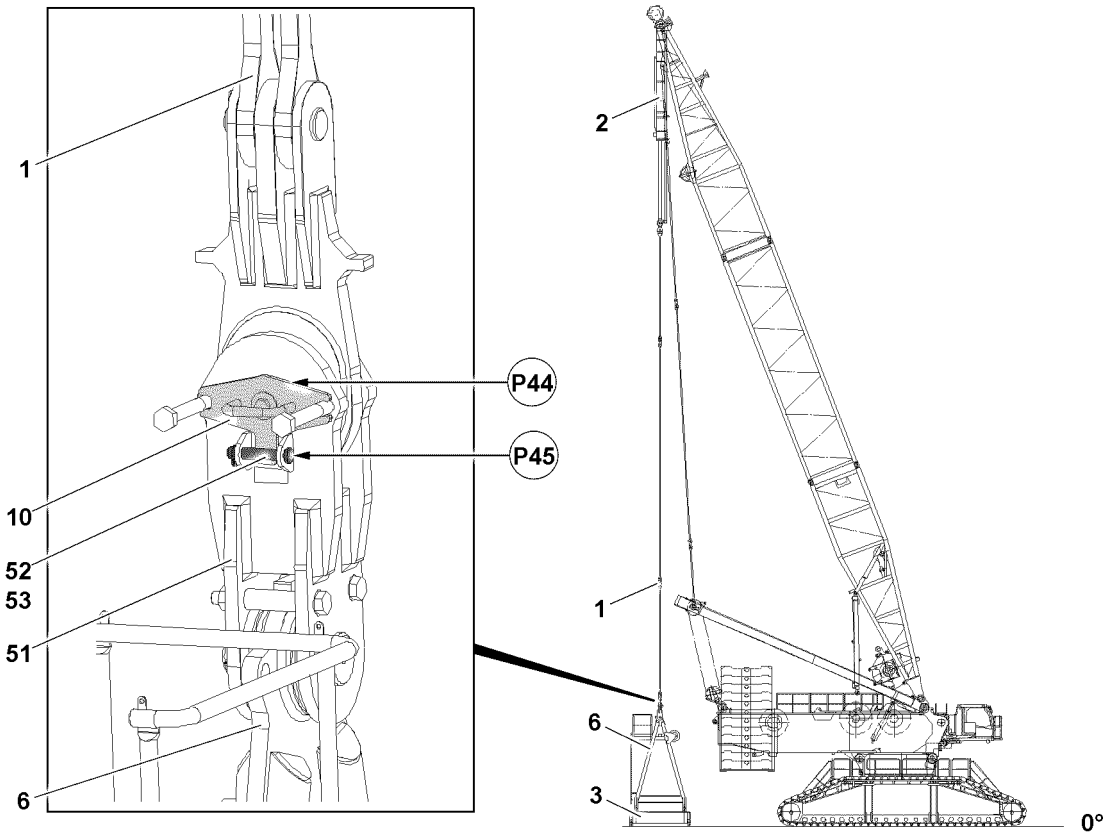

Fig.145276: Pinning procedure

- ▶ Pin the guy rods **1** on the brackets **51** and secure.
- ▶ Insert the connector pin **10** at point **P44**.

WARNING
Danger of accident!
If the connector pins are not secured with the retaining pin, then they can loosen up by themselves during crane operation.
This can cause the crane to topple over.
Death, severe bodily injuries, property damage.

- ▶ Make sure that the connector pins are secured.

- ▶ Insert the retaining pin **52** at point **P45** and secure with the retaining element **53**.
- ▶ Pin the second erection rack on the D-guy rod **1**.

WARNING
Uncontrolled swinging of the divisible ballast pallet „VarioTray“!
If the divisible ballast pallet„VarioTray“ **3** is lifted, it can start swinging.
Death, severe bodily injuries, property damage.

- ▶ It is prohibited to remain in the danger zone.
- ▶ Secure the divisible ballast pallet „VarioTray“ with an auxiliary rope.

- ▶ Lift the empty divisible ballast pallet „VarioTray“ **3** with the pull cylinders **2** and then set it down again.

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Result:

– The divisible ballast pallet „VarioTray“ **3** is thereby precisely placed vertically under the derrick head.

▶ Align the divisible ballast pallet „VarioTray“ **3** horizontally.

8.2 Establishing the electrical connection from the suspended ballast to the turntable

Note

▶ Establish the electrical connections from the suspended ballast to the turntable, see Electric wiring diagram.

▶ Establish the electrical connections.

9 Assembling the suspended ballast with suspended ballast guide

Make sure that the following prerequisites are met:
- The crane is properly supported and horizontally aligned.
- An auxiliary crane is available.
- The derrick is properly assembled on the turntable.
- The boom is properly assembled on the turntable.
- The derrick is in the crane operating position.
- The boom is laying on the substructure on the ground.
- The central ballast has been installed on the turntable according to the load chart.
- The counterweight has been installed on the turntable according to the load chart.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection settings have been compared with the actual set up configuration.

9.1 Assembling the suspended ballast guide

The suspended ballast guide makes different derrick ballast radii possible.

The derrick ballast radius determines the number of intermediate section, which must be installed.

Derrick ballast radius	Number of intermediate sections
20 m	0
25 m	1
30 m	2

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9.1.1 Removing the transport unit

Make sure that the following prerequisite is met:
– The transport unit is on the transport vehicle.

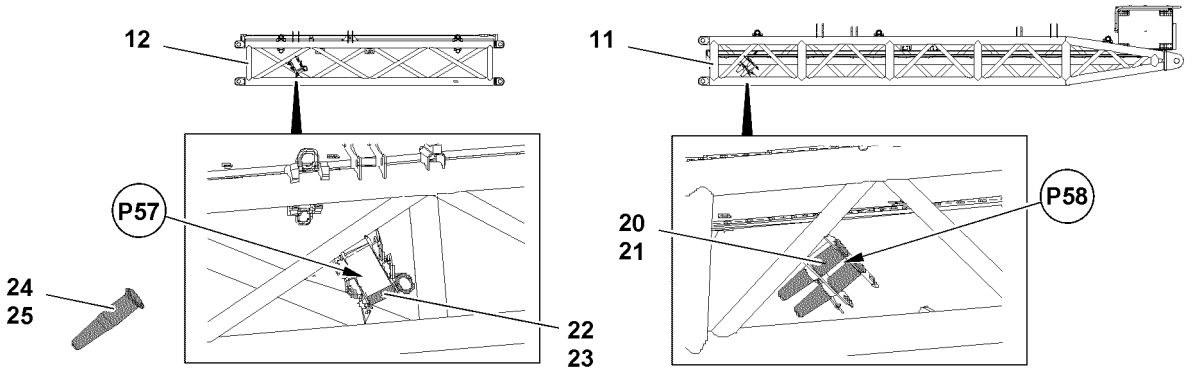

Fig.122802: Park position for pin

Note
▶ Park position **P57** for pin **24** and pin **22**.
▶ Park position **P58** for pin **20**.

WARNING
Falling pins!
Death, severe bodily injuries, property damage.
▶ Make sure that all pins are properly secured in the park positions with the respective retaining elements.

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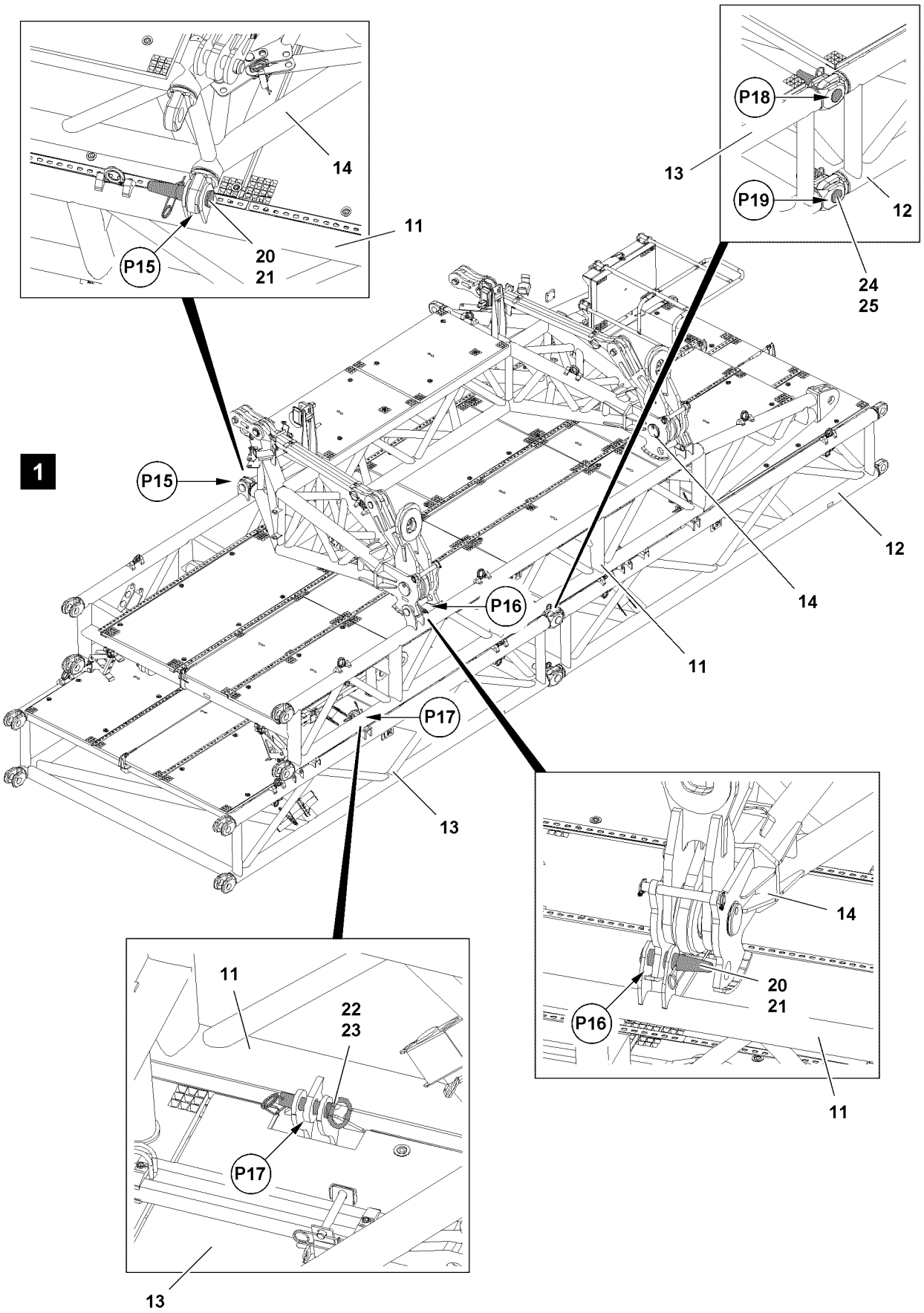

Fig.122801

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Disassembling the end section

▶ Release and remove the riggings on the transport vehicle.

The end section is unpinned at four points. Every point is present on both sides of the component on one level, see illustration **1**.

▶ Fasten the auxiliary crane to the end section **14**.
▶ Unpin the end section **14** at points **P15**: Remove the retaining element **21** and unpin the pin **20**.
▶ Unpin the end section **14** at points **P16**: Remove the retaining element **21** and unpin the pin **20**.
▶ Take the end section **14** down on the ground with the auxiliary crane.

Disassembling the pivot section

The pivot section is unpinned at four points. Every point is present on both sides of the component on one level, see illustration **1**.

▶ Fasten the auxiliary crane to the pivot section **11**.
▶ Unpin the pivot section **11** at points **P17**: Remove the retaining element **23** and unpin the pin **22**.
▶ Take the pivot section **11** down on the ground with the auxiliary crane.

Disassembling the intermediate section

For a suspended ballast with a 25 m suspended ballast radius, the intermediate sections must be unpinned apart. The intermediate section is unpinned on four points. Every point is present on both sides of the component on one level, see illustration **1**.

▶ Fasten the auxiliary crane on intermediate section **12**.
▶ Unpin the intermediate section **12** at points **P19**: Remove the retaining element **25** and unpin the pin **24**.
▶ Unpin the intermediate section **12** at points **P18**: Remove the retaining element **25** and unpin the pin **24**.
▶ Take the intermediate section **12** down on the ground with the auxiliary.

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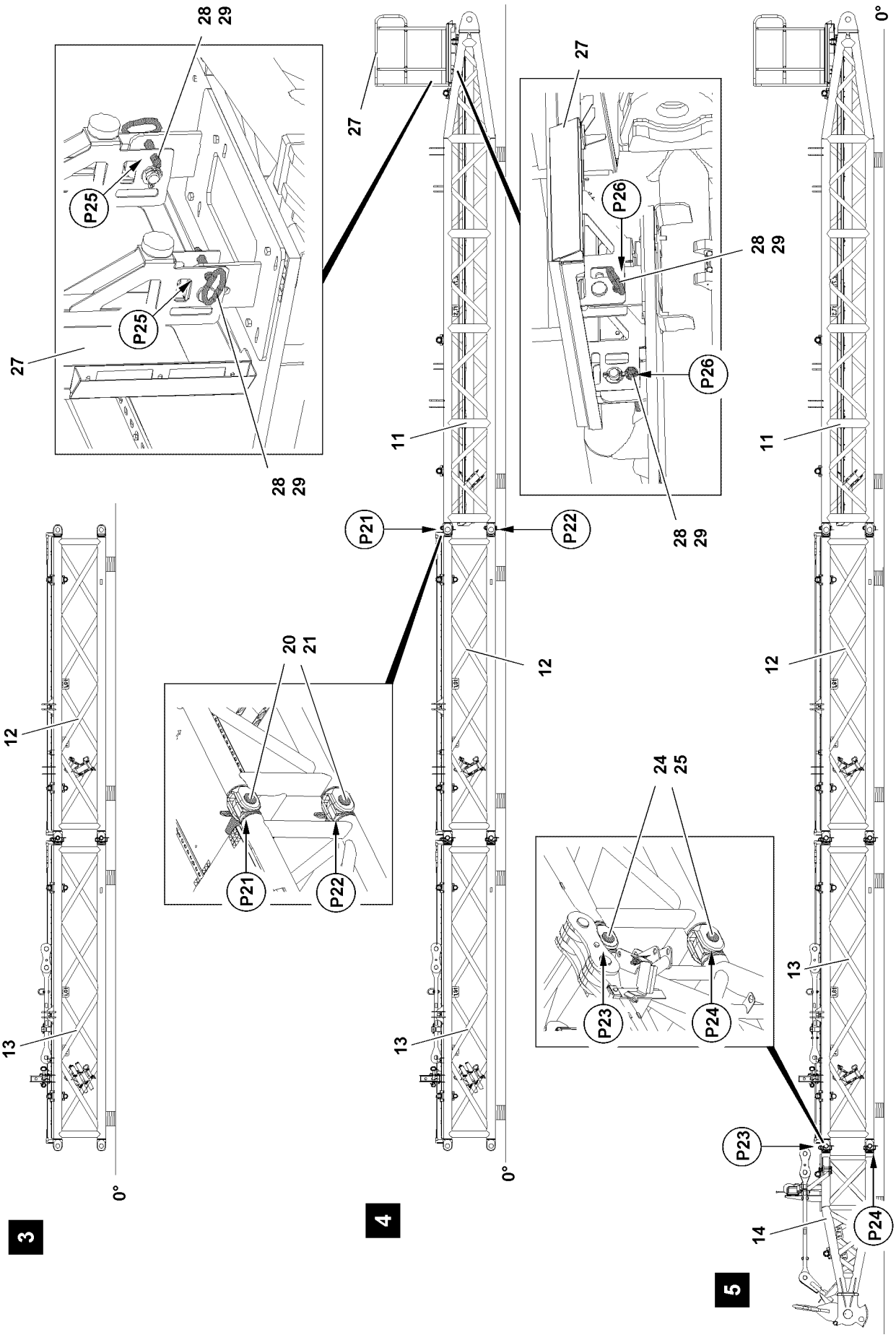

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Fig.122803

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9.1.2 Assembling the suspended ballast guide with a suspended ballast radius of 30 m

Note

▶ The assembly of the suspended ballast guide is described based on the example of a suspended ballast guide with a 30 m suspended ballast radius.

Make sure that the following prerequisites are met:
- The pivot section has been removed from the transport unit.
- The end section has been removed from the transport unit.

Assembling the intermediate sections

For the suspended ballast guide with a 30 m suspended ballast radius only two intermediate sections are installed.

▶ Support the ground in such a way that the intermediate sections can be placed down horizontally.
▶ Place the intermediate sections with the auxiliary crane on the substructure, see illustration **3**.
▶ Remove the fastening equipment.

Assembling the pivot section

▶ Fasten the pivot section **11** to the auxiliary crane.
▶ Position the pivot section **11** with the auxiliary crane on the intermediate section **12** at point **P21** until the pin points align.
▶ Support the pivot section **11**.

The pivot section and the intermediate section are pinned together in four points. Every point is present on both sides of the component on one level, see illustration **4**.

▶ Pin the pivot section **11** on both sides at point **P21** with the intermediate section **12**: Insert the pin **20** and secure it with the retaining element **21**.
▶ Pin the pivot section **11** on both sides at point **P22** with the intermediate section **12**: Insert the pin **20** and secure it with the retaining element **21**.
▶ Remove the fastening equipment.

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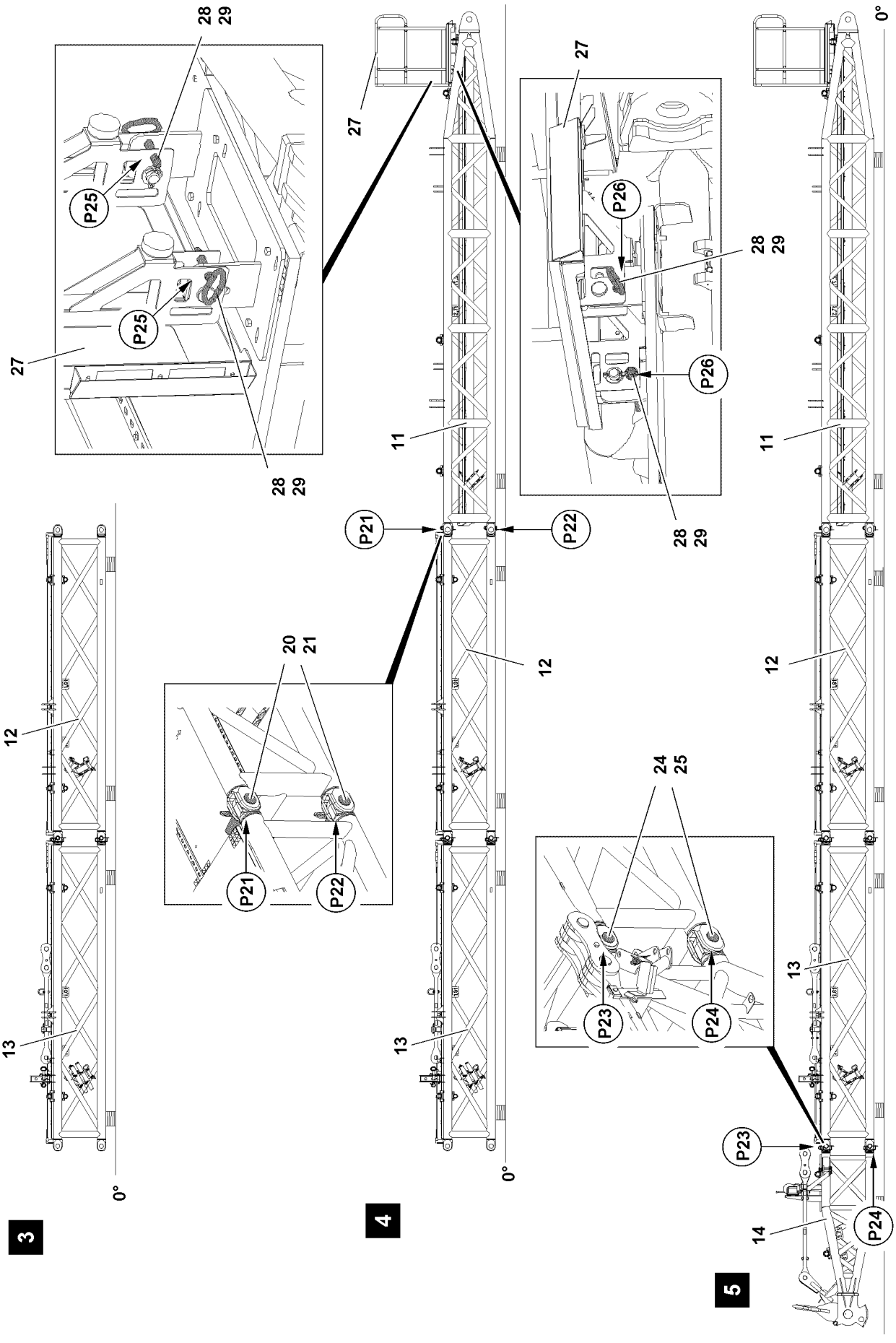

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Fig.122803

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▶ Fasten the platform **27** to the auxiliary crane.

WARNING
Platform swinging down!
The platform can swing down by itself due to its own weight when unpinning it at points **P25**.
Death, severe bodily injuries, property damage.
Fingers and hands can be crushed.
▶ Make sure that the platform is safely held by the auxiliary crane.
▶ Do not reach with your hands into the danger zone.
▶ Use personal protective equipment.

▶ Set the platform **27** into operating position, see illustration **4**: Remove the retaining element **29** at points **P25** and unpin the grip pins **28**.
▶ Swing the platform **27** with the auxiliary crane.
▶ Insert the grip pins **28** at points **P26** and secure with the retaining element **29**.
▶ Remove the auxiliary crane.

Assembling the end section

▶ Fasten the end section **14** to the auxiliary crane.
▶ Position the end section **14** with the auxiliary crane on the intermediate section **13** at point **P23** until the pin points align.
▶ Support the end section **14**.

The end section and the intermediate section are pinned together in four points. Every point is present on both sides of the component on one level, see illustration **5**.

▶ Pin the end section **14** on both sides at point **P23** with the intermediate section **13**: Insert the pin **24** and secure it with the retaining element **25**.
▶ Pin the end section **14** on both sides at point **P24** with the intermediate section **13**: Insert the pin **24** and secure it with the retaining element **25**.
▶ Remove the fastening equipment.

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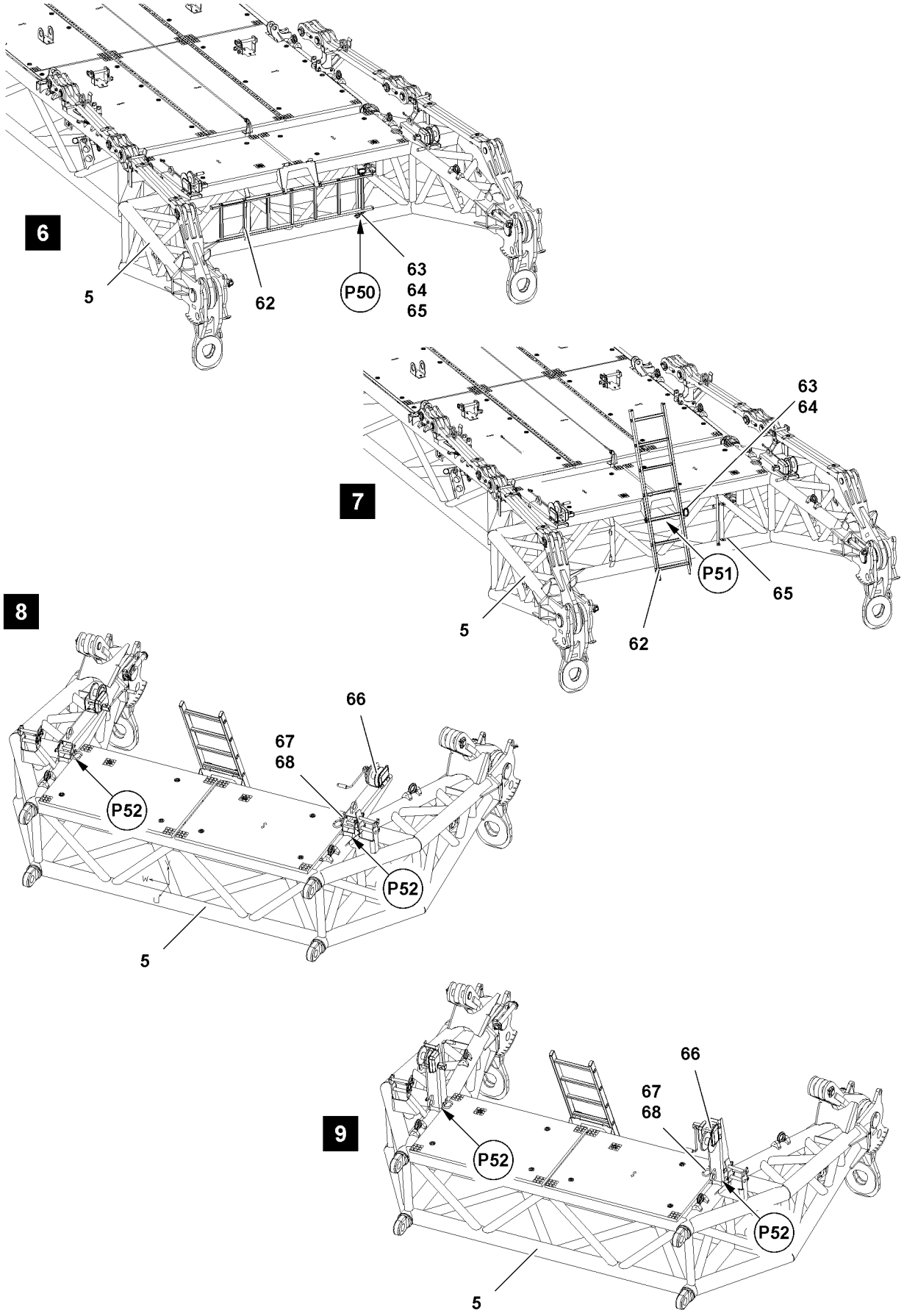

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Fig.120205

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Assembling the ladder

WARNING
Falling ladder!
The ladder can fall down by itself due to its own weight when it is unpinned.
Death, severe bodily injuries, property damage.
Fingers and hands can be crushed.
- ▶ When unpinning the pin connection, hold the ladder.
- ▶ Do not reach with your hands into the danger zone.

- ▶ Release the ladder **62** from the transport retainer: Remove the lock **65** at point **P50** and unpin the grip pin **63**, see illustration **6**.
- ▶ Remove the retaining element **64** at point **P50** from the park position, see illustration **6**.
- ▶ Attach the lock **65** at point **P50** in the park position, see illustration **6**.

WARNING
Danger of crushed limbs!
When hanging the ladder up, fingers and hands can be crushed.
- ▶ Do not reach with your hands into the danger zone.

- ▶ Get the ladder **62** from the transport retainer and hang it up at point **P51**, see illustration **7**.
- ▶ Secure the ladder **62** in operating position: Insert the grip pin **63** at point **P51** and secure with the retaining element **64**, see illustration **7**.

Assembling the manual rope winch

- ▶ Release the manual rope winch **66** from the transport position: Remove the retaining element **68** at point **P52** and unpin the grip pin **67**, see illustration **8**.

WARNING
Danger of crushed limbs!
When setting up the manual rope winch, fingers and hands can be crushed.
- ▶ Do not reach with your hands into the danger zone.

WARNING
Falling manual rope winch!
The manual rope winch can fall down by itself due to its own weight when setting it up.
Death, severe bodily injuries, property damage.
Fingers and hands can be crushed.
- ▶ When unpinning the pin connection, hold the ladder.
- ▶ Do not reach with your hands into the danger zone.

- ▶ Set up the manual rope winch **66**, see illustration **9**.
- ▶ Secure the manual rope winch **66** in operating position: Insert the grip pin **67** at point **P52** and secure with the retaining element **68**, see illustration **9**.

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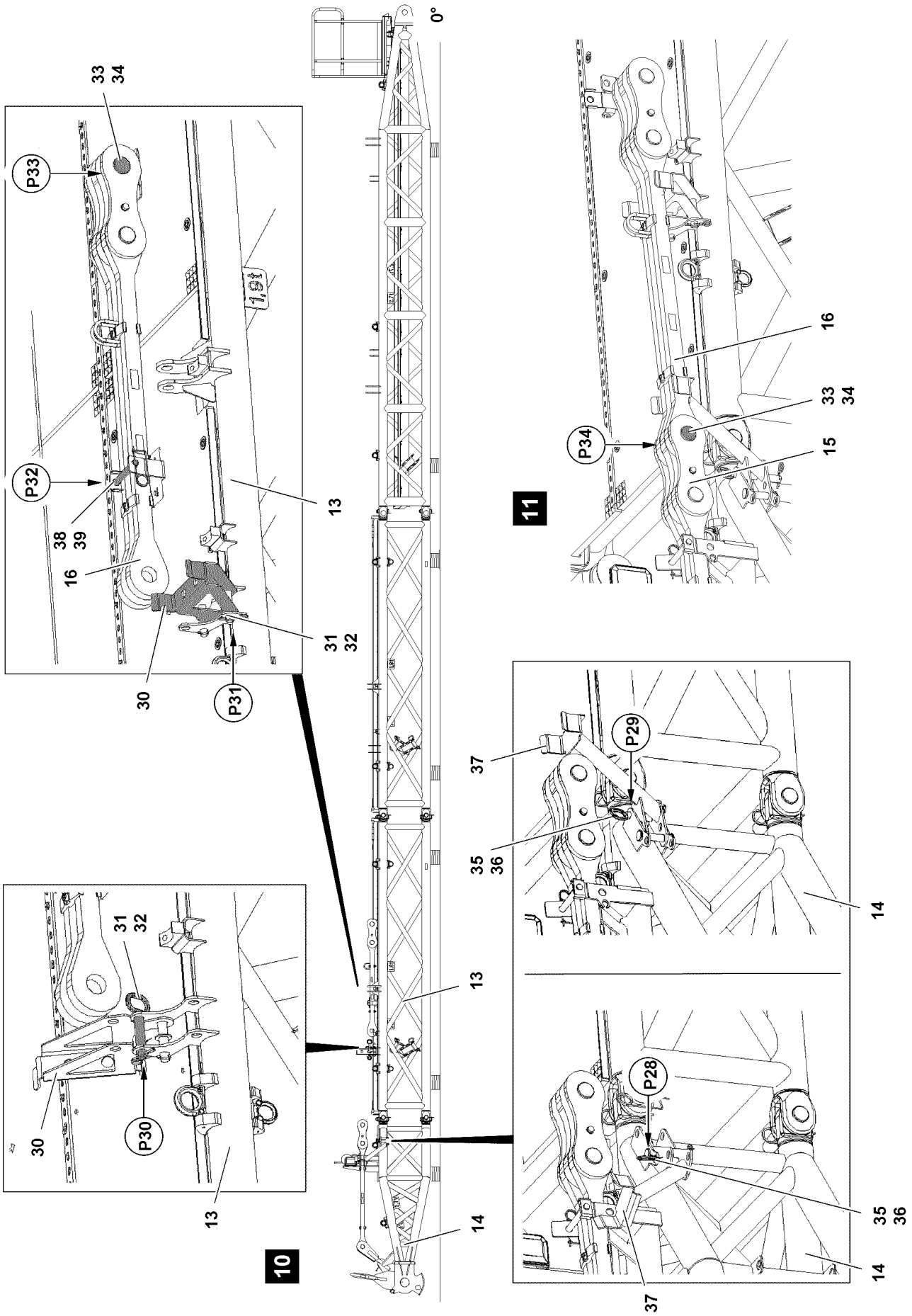

Fig.122804

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Assembling the pull rods

▶ Release the bracket **37** from the transport position: Remove the retaining element **36** at point **P28** and unpin the socket pin **35**, see illustration **10**.

WARNING
Danger of crushed limbs!
When swinging the bracket, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Swing the bracket **37** until it can be pinned at point **P29**.
▶ Insert the socket pin **35** at point **P29** and secure with the retaining element **36**, see illustration **10**.

Result:

– The bracket **37** is secured in the operating position.

▶ Release the retainer **30** from the transport position: Remove the retaining element **32** at point **P30** and unpin the socket pin **31**, see illustration **10**.

WARNING
Danger of crushed limbs!
When swinging the retainer, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Swing the retainer **30** until it can be pinned at point **P31**.
▶ Secure the retainer **30** in operating position: Insert the socket pin **31** at point **P31** and secure with the retaining element **32**, see illustration **10**.

Result:

– The retainer **30** is secured in the operating position.

▶ Release the pull rods **16** from the transport position: Remove the retaining element **39** at point **P32** and unpin the pin **38**, see illustration **10**.
▶ Remove the retaining element **34** at point **P33** and unpin the pin **33**, see illustration **10**.
▶ Fasten the auxiliary crane to the pull rod **16**.
▶ Place the pull rod **16** down with the auxiliary crane in operating position on the retainer **30** and align at point **P34** on bores, see illustration **11**.
▶ Pin the pull rod **16** with the pull rod end section **15**: Insert the pin **33** at point **P34** and secure with the retaining element **34**, see illustration **11**.
▶ Remove the auxiliary crane.
▶ Insert the pin **38** in the park position and secure with the retaining element **39**.
▶ Release the pull rod **15** from the transport position.

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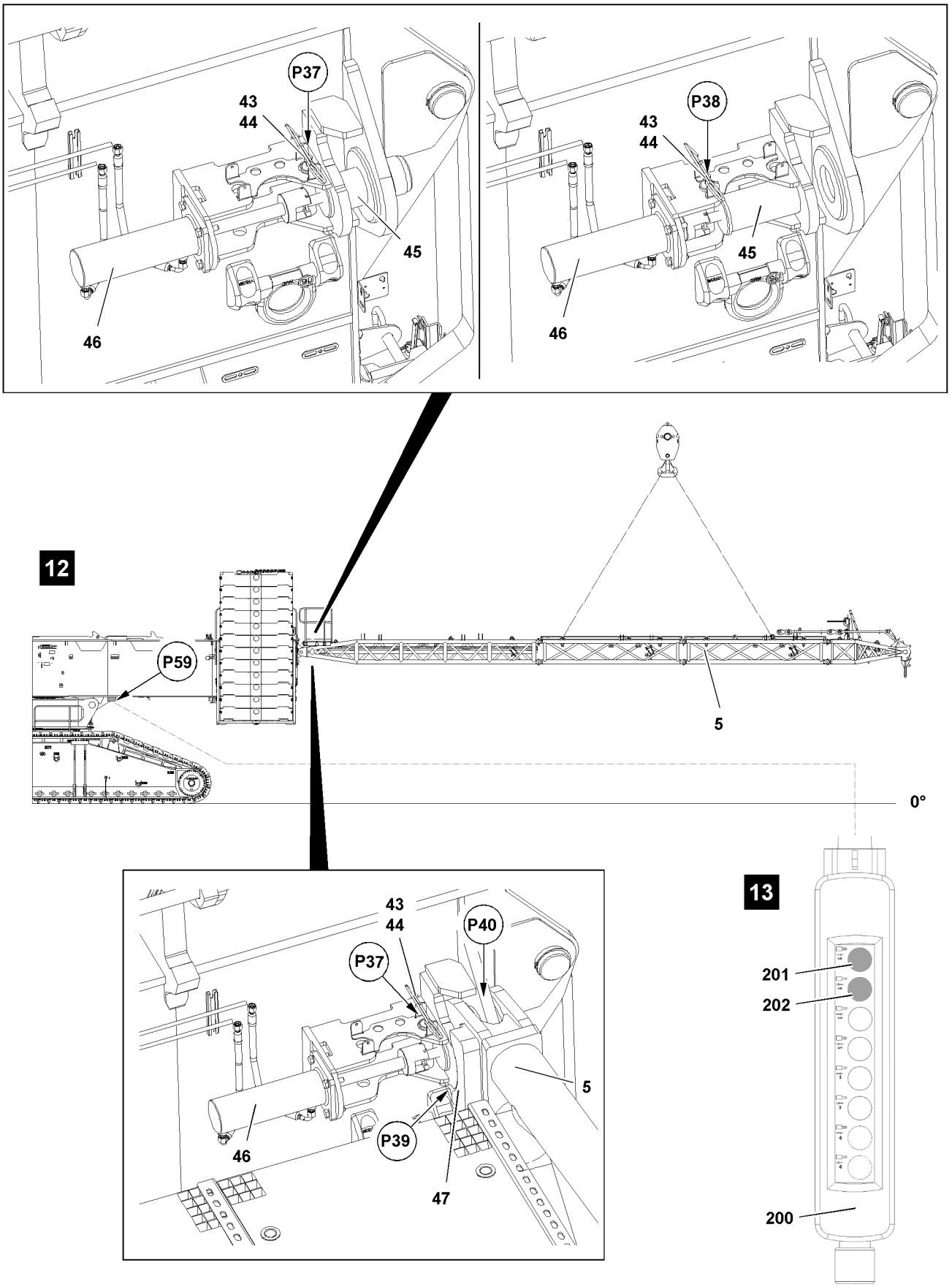

Fig.122805

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Swinging the brackets

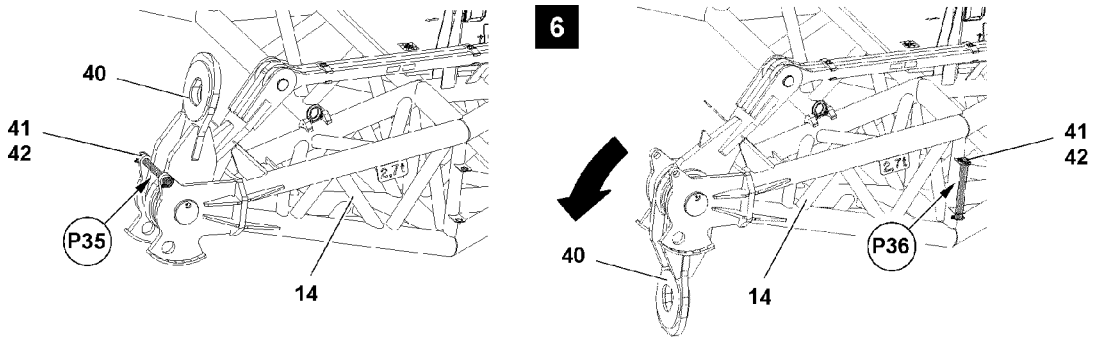

Fig.119028: Swinging the bracket

▶ Fasten the bracket **40** to the auxiliary crane.

WARNING
Bracket swinging down!
The bracket can swing down by itself due to its own weight when unpinning it at point **P25**, see illustration.
Death, severe bodily injuries, property damage.
Fingers and hands can be crushed.
▶ Make sure that the platform is held by the auxiliary crane.
▶ Do not reach with your hands into the danger zone.

▶ Remove the retaining element **42** at point **P35** and unpin the pin **41**, see illustration **14**.
▶ Swing the bracket **40** downward with the auxiliary crane.
▶ Insert the pin **41** in the park position at point **P36** and secure with the retaining element **42**, see illustration **14**.

9.1.3 Assembling the suspended ballast guide on the turntable frame

Make sure that the following prerequisites are met:
– A lifting platform or other aids are available.
– An auxiliary crane is available.
– The control panel is connected on the „rear turntable“ socket, point **P59**.

The suspended ballast guide **5** is pinned on two points. The pin procedure is described for one pin as an example:

▶ Release the pin **45**: Remove the retaining element **44** at point **P37** and unpin the retaining pin **43**, see illustration **12**.
▶ Insert the retaining pin **43** at point **P38** and secure with the retaining element **44**, see illustration **12**.
▶ Plug the control panel on the turntable in on the rear, see illustration **13**.
▶ Unpin the pin **45**: Press button **202** on the control panel **200**, see illustration **13**.

Result:

– The pin **45** moves out.

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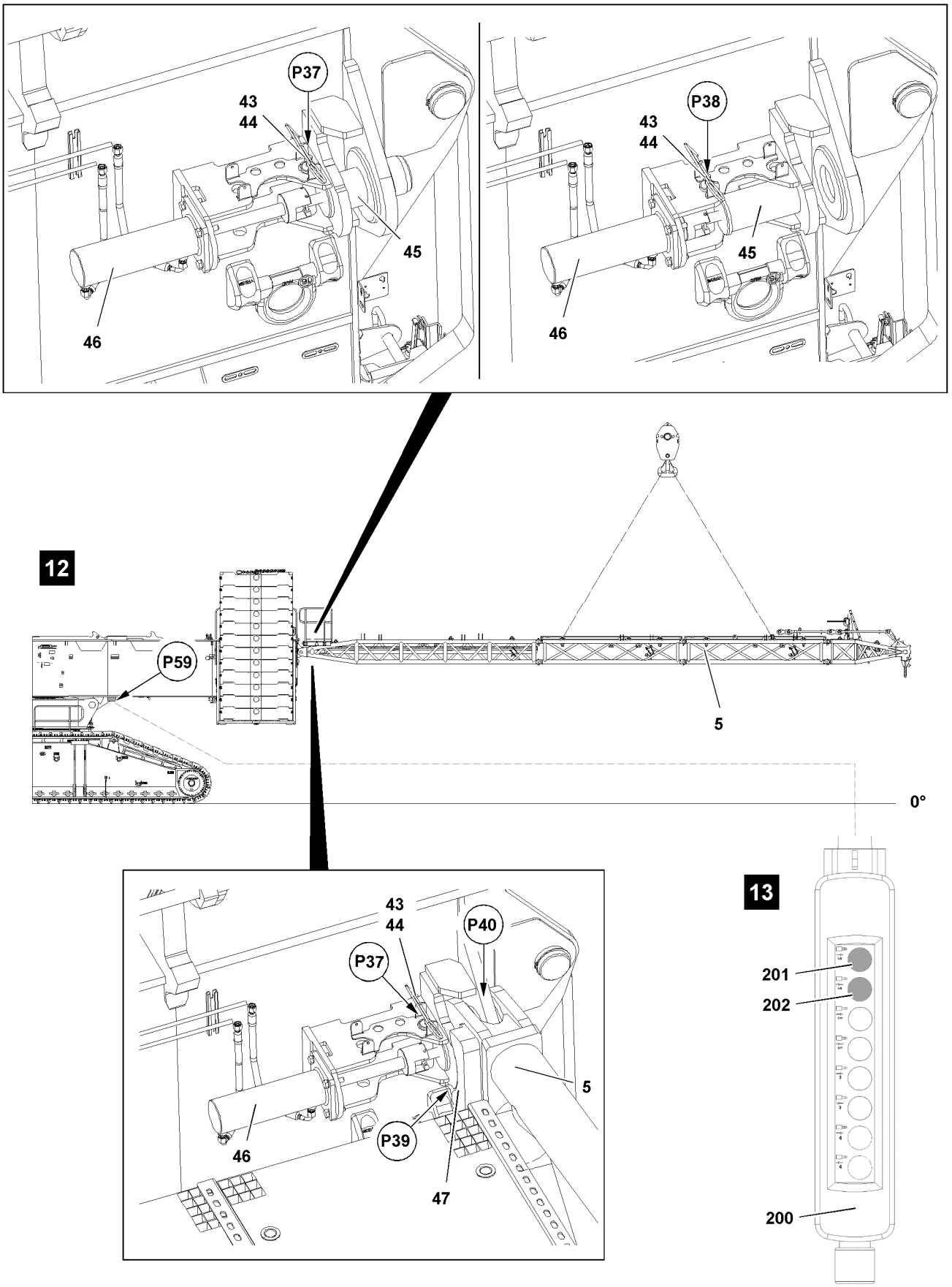

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Fig.122805

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▶ Attach the suspended ballast guide **5** on the auxiliary crane.
▶ Lift the suspended ballast guide **5** to the pin points **P40** on the rear of the turntable, see illustration **12**.
▶ Set the suspended ballast guide **5** on the centering **47** on points **P39** of the turntable, see illustration **12**.

Result:

– Align the pin bores.

▶ Insert the pin **45**: Press button **201** on the control panel **200**, see illustration **13**.

Result:

– The pin **45** moves in.

WARNING
Danger of accident!
If the pins are not secured with the retaining pin, then the connector pins can loosen up by themselves during crane operation.
This can cause the crane to topple over.
Death, severe bodily injuries, property damage.
▶ Make sure that the connector pins are secured.

▶ Secure the pin **45**: Insert the retaining pin **43** at point **P37** and secure with the retaining element **44**, see illustration **12**.

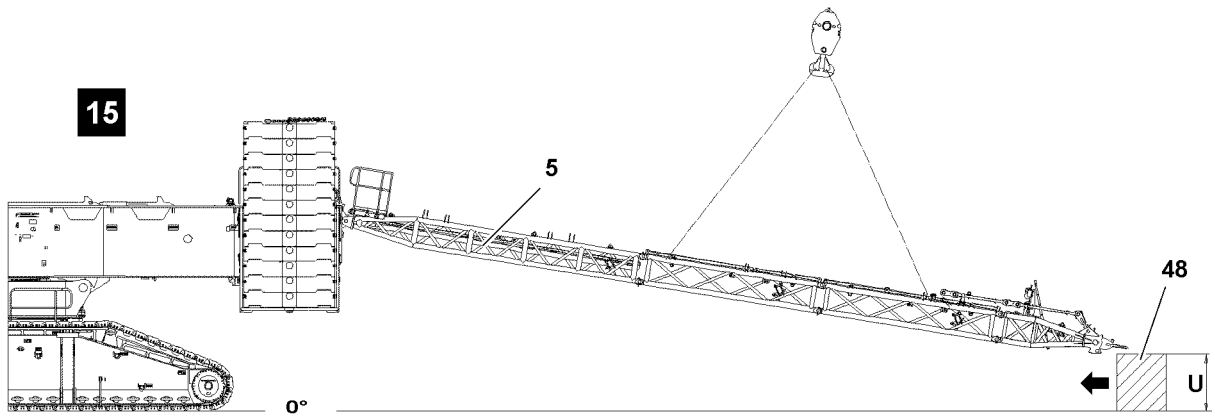

Fig.120203: Substructure

Suspended ballast guide	R30	R25	R20
Substructure height „U“	0 m	1.6 m	2.0 m

▶ Take the suspended ballast guide **5** down on the substructure with the auxiliary crane, see illustration **15** and chart.

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9.2 Pinning the suspended ballast guide with the divisible ballast pallet „VarioTray“

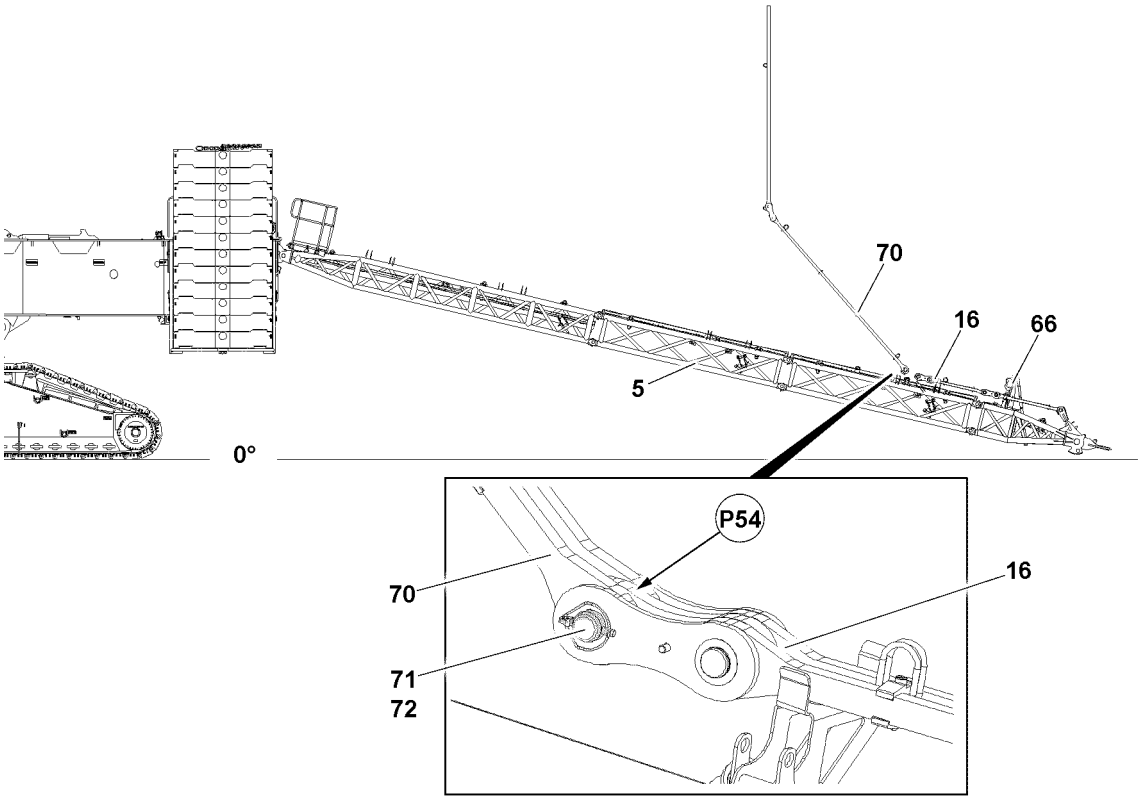

Fig.145280: Pinning the D-guy rods

Make sure that the following prerequisites are met:
- The D-guy rods hang over the brackets of the suspended ballast guide.
- The manual rope winches are set up and secured.
- The erection racks are erected and secured with retaining pins.

9.2.1 Pinning the D-guy rods with the pull rods of the suspended ballast guide

▶ Connect the rope of the manual rope winch **66** with the D-guy rods **1**.

The D-guy rods **1** are pinned on both sides on the suspended ballast guide **5**. The pin procedure is described on the example for one D-guy rod.

▶ Pull the D-guy rods **1** with the manual rope winch **66** to the pull rods **16** and luff the derrick down at the same time until it can be pinned on point **P54**.

WARNING
Danger of accident!
If the connector pins are not secured with the retaining pin, then they can loosen up by themselves during crane operation.
This can cause the crane to topple over.
Death, severe bodily injuries, property damage.
▶ Make sure that the connector pins are secured.

When the pin bores align:
▶ Pin the pin **71** in point **P54** and secure with the retaining element **72**.

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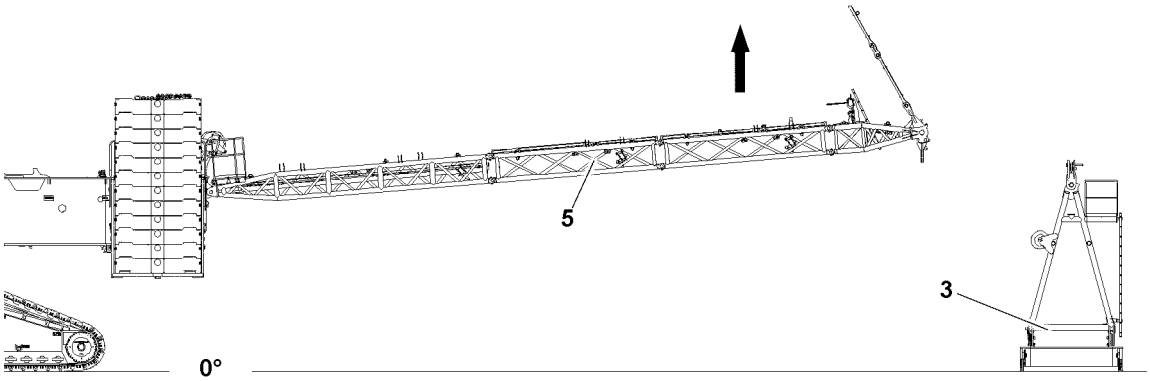

Fig.145281: Lifting the suspended ballast guide

▶ Lift the suspended ballast guide **5** with the derrick.

9.2.2 Pinning the suspended ballast guide on the divisible ballast pallet „VarioTray“

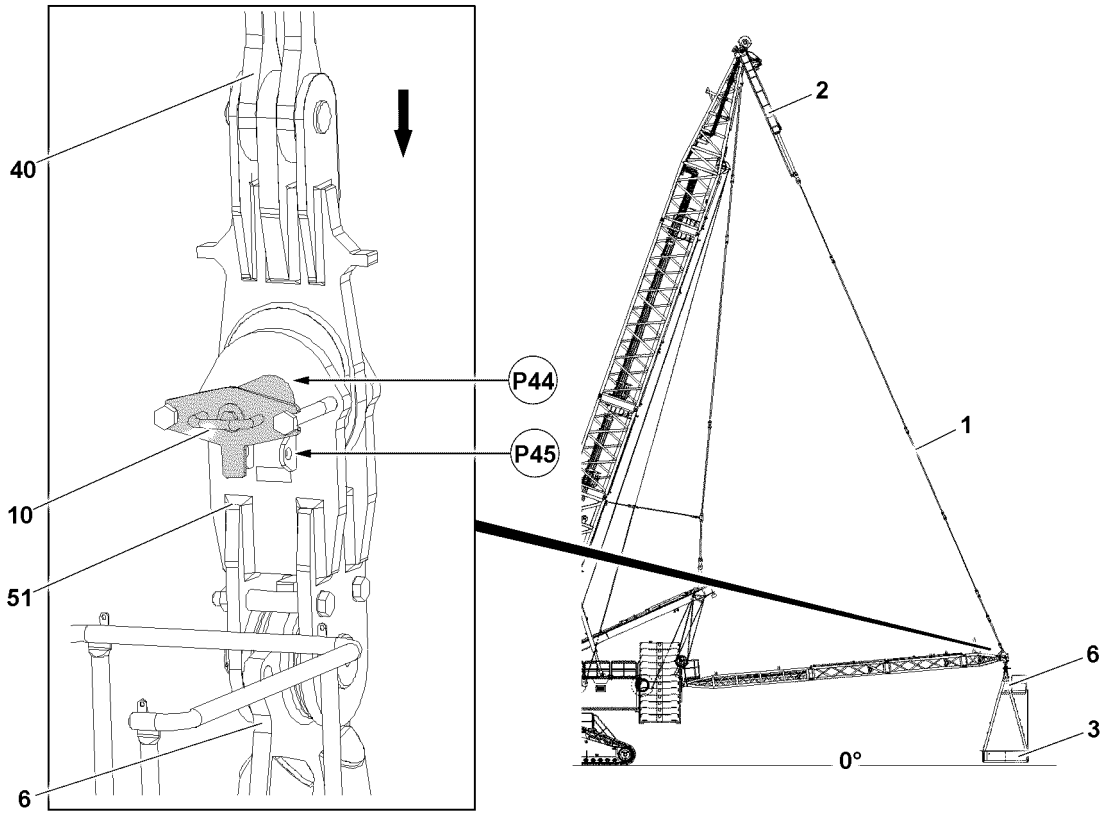

Fig.145278: Pinning procedure

Make sure that the following prerequisite is met:
– The derrick is set to the required radius.

The divisible ballast pallet„VarioTray“ **3** is pinned at two points. The pin procedure is described for one pin as an example.

▶ Position the suspended ballast guide **5** over the divisible ballast pallet „VarioTray“ **3**.
▶ Remove the retaining element **53** at point **P45** and unpin the retaining pin **52**.
▶ Unpin the connector pin **10** at point **P44**.
▶ Lower the brackets **40** of the suspended ballast guide by extending the piston rods on the pull cylinders **2** into the brackets **51** until the pin bores align.

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Note
Retract / extend the pull cylinder **2**:
- ▶ Control the pull cylinders **2** from the crane cab, see the section „Lifting and lowering the derrick ballast using the pull cylinders“.
- ▶ Operate the pull cylinder **2** with the radio remote control, see the „radio remote control operating instructions“.

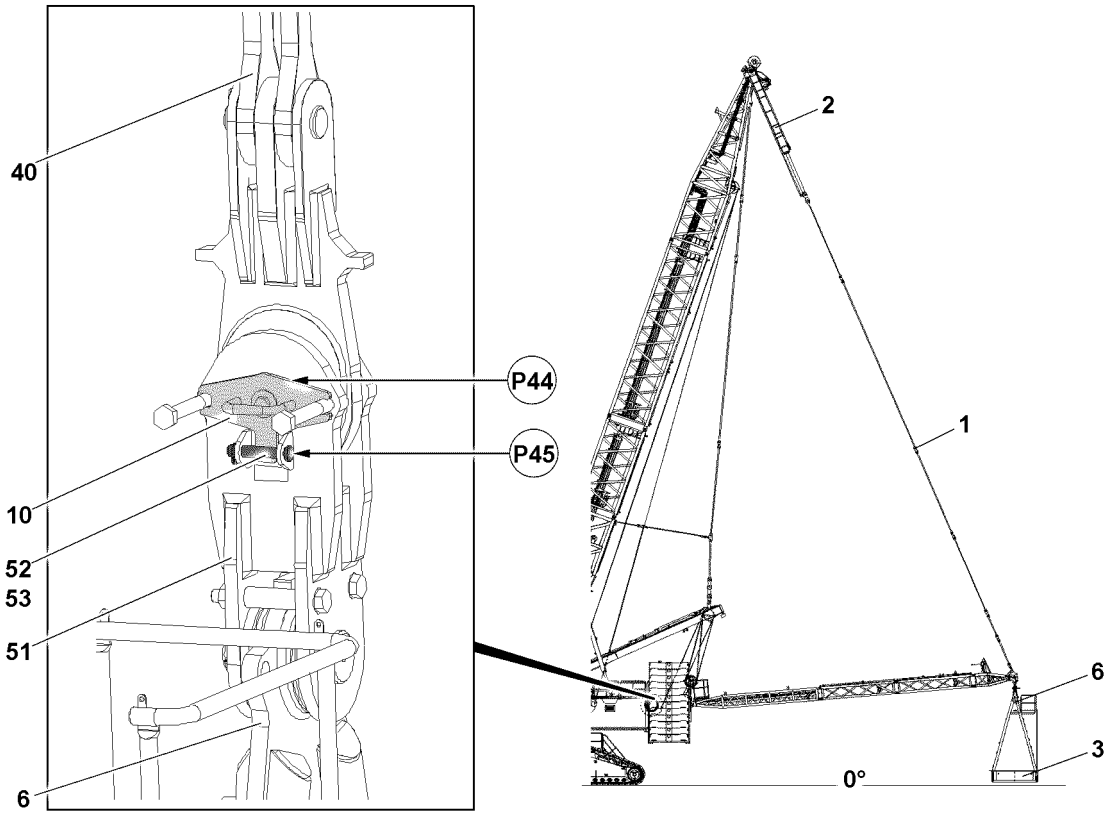

Fig.145279: Pinning procedure

Pin the brackets **40** on the brackets **51** and secure.

- ▶ Insert the connector pin **10** at point **P44**.

WARNING
Danger of accident!
If the connector pins are not secured with the retaining pin, then they can loosen up by themselves during crane operation.
This can cause the crane to topple over.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the connector pins are secured.

- ▶ Insert the retaining pin **52** at point **P45** and secure with the retaining element **53**.
- ▶ Pin the second erection rack **7** on the suspended ballast guide **5**.

WARNING
Uncontrolled swinging of the divisible ballast pallet „VarioTray“!
When the ballast plate **3** is raised, it can start to swing.
Death, severe bodily injuries, property damage.
- ▶ It is prohibited to remain in the danger zone.
- ▶ Secure the divisible ballast pallet „VarioTray“ with an auxiliary rope.

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▶ Lift the empty divisible ballast pallet „VarioTray“ **3** with the pull cylinders **2** and then set it down again.

Result:

– The divisible ballast pallet „VarioTray“ **3** is vertically aligned.

▶ Align the divisible ballast pallet „VarioTray“ **3** horizontally.

9.3 Establishing the electrical connection from the suspended ballast to the turntable

Note

▶ Establish the electrical connections from the suspended ballast to the turntable, see Electric wiring diagram.

WARNING

Malfunction if dummy plugs are not installed!

If the dummy plugs on the non-required electrical connections are not installed, then malfunctions or functional limitations can occur on the crane.

▶ Make sure that all non-required electrical connections, which have a dummy plug are closed off with dummy plugs.

▶ Pay attention to the Electrical wiring diagram.

▶ As a rule, close off on-required electrical connections (for example for accessories which cannot be installed) with the respective dummy plugs.

▶ Establish the electrical connections.

10 Ballasting the divisible ballast pallet „VarioTray“

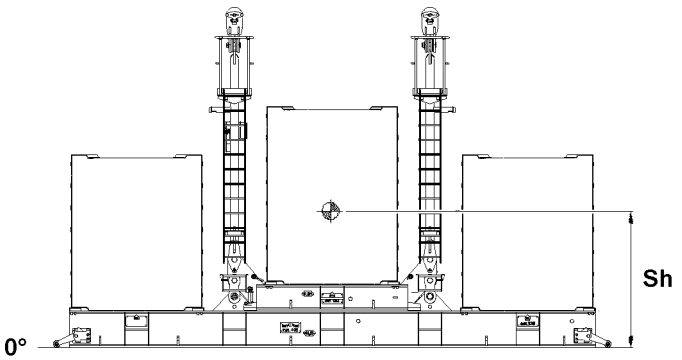

Fig.145286: Maximum permissible ballast center of gravity height

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WARNING
The crane can topple over!
If the following danger notes are not observed, the ballast plates or the ballast stack can slip on the divisible ballast pallet „VarioTray“ and fall down.
Death, severe bodily injuries, property damage.
- ▶ The ground on which the divisible ballast pallet „VarioTray“ is ballasted must be level and have adequate load bearing capacity.
- ▶ Always place the ballast plates symmetrically, in reference to the longitudinal axis.
- ▶ It is necessary to start with the two center ballast stacks.
- ▶ The difference for the center ballast stack may not be more than a maximum of one ballast plate during ballasting.
- ▶ When ballasting the two outer ballast stacks, only one ballast plate may be placed at the start of each ballast stack.
- ▶ The two outer ballast stacks may be ballasted with ballast assemblies of two ballast plates after the first ballast plate has been placed on each stack.
- ▶ The difference between both outer ballast stacks may not be more than maximum 25 t when ballasting.
- ▶ The outer ballast stacks must always weigh the same and be the same height after ballasting.
- ▶ The two center ballast stacks can have a maximum difference of 10 t after ballasting.
- ▶ The outer ballast stacks can differ in stack height from the inner ballast stacks.
- ▶ The maximum permissible ballast center of gravity height **Sh** of 2800 mm may not be exceeded.
- ▶ Secure all ballast plates so they cannot move and fall down.
- ▶ Replace damaged ballast plates immediately with new ballast plates.

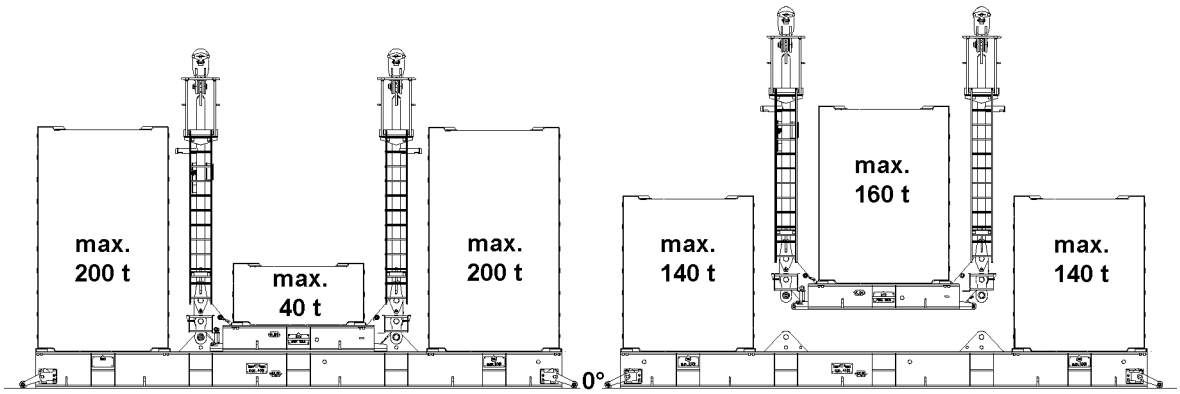

Fig.145285: Maximum permissible total weight

WARNING
The crane can topple over!
If the following danger notes are not observed, the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ The maximum permissible total weight of the entire derrick ballast may not exceed 440 t.
- ▶ The maximum permissible total weight of the entire derrick ballast may not exceed 160 t during crane operation with ballast pallet.
- ▶ Observe the weight signs on the ballast pallets.

Make sure that the following prerequisites are met:
- – The divisible ballast pallet „VarioTray“ is properly installed and secured.
- – An auxiliary crane is available.
- – The consoles for the ballast centering are properly installed and secured in operating position.

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10.1 Placing the ballast plates, fastening system: „Twistlock“

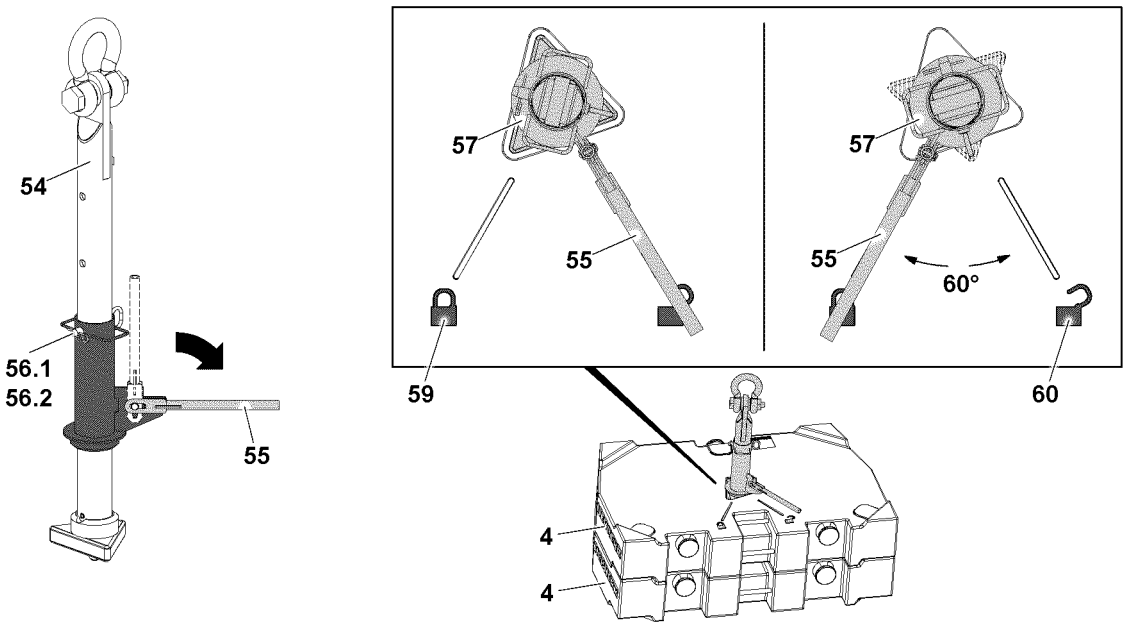

Fig.145282: Ballast plates, fastening system: „Twistlock“

WARNING
Danger of accident!
If more than the permissible two ballast plates are lifted with the receptacle stud, the receptacle stud will be overloaded and can be damaged.
Death, severe bodily injuries, property damage.
▶ Make sure that the ballast plates are placed correctly in the centerings.
▶ Replace damaged ballast plates.

To stack the ballast plate(s) **4**, use the receptacle stud **54**.

Before the receptacle stud **54** is guided into the ballast plates, it must be ensured that the length of the receptacle stud **54** is set correctly. The length of the receptacle stud **54** can be adjusted with the pin **56**.

If the length of the receptacle stud **54** is to be adjusted:
▶ Release and unpin the pin **56.1**.
▶ Adjust the length of the receptacle stud by moving the receptacle stud **54**.
▶ Insert the pin **56.1** and secure it with the retaining element **56.2**.
▶ Fasten the receptacle stud **54** to the auxiliary crane and guide it into the ballast plate(s).
▶ Pull the lever **55** up and fold it down.
▶ Turn the lever **55** by 60° until the lever **55** points to the icon **59**.

Result:

– The receptacle stud **54** is locked with the ballast plate.

▶ Lift always one ballast plate with the receptacle stud **54** and take it down carefully on the outer centerings of the divisible ballast pallet „VarioTray“ **3**.

When the ballast plate has been taken down on the outer centerings of the divisible ballast pallet„VarioTray“ **4**:
▶ Turn the lever **55** by 60° until the lever **55** points to the icon **60**.

Result:

– The receptacle stud **54** is unlocked.

▶ Carefully pull the receptacle stud **54** from the ballast plate.

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▶ Stack the ballast plates according to the load chart, observe the danger notes.

10.2 Placing the ballast plates, fastening points: „Bitt“

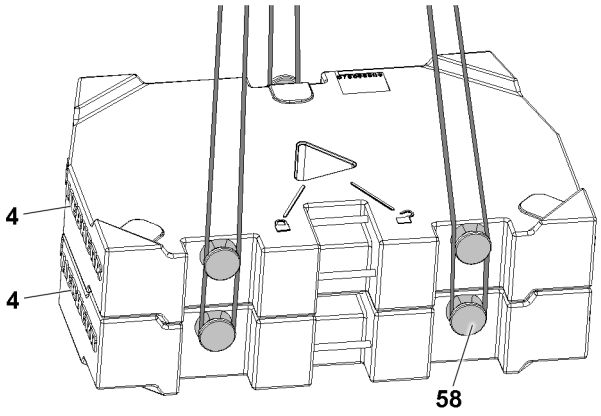

Fig.145283: Ballast plates, fastening points: „Bitt“

WARNING
Falling ballast plates!
If more than the permissible loads are lifted, then the bitts **58** are overloaded and the ballast plates can fall down.
Death, severe bodily injuries, property damage.
▶ Place the ballast plates individually or as a package, maximum 20 t , 3 fastening points.
▶ Replace damaged ballast plates immediately.

WARNING
Incorrect handling of the fastening equipment!
If fastening equipment is not attached correctly and if it is not secured sufficiently to prevent it from loosening up, loads can fall down.
Death, severe bodily injuries, property damage.
▶ Make sure that the fastening equipment is correctly attached on the bitts **58** and that it is secured sufficiently to prevent it from loosening up.

▶ Always place only one ballast plate on the outer centerings on the divisible ballast pallet „VarioTray“.

When a ballast plate has been placed on each of the outer centerings of the divisible ballast pallet „VarioTray“:
▶ Place the ballast plates individually or as an assembly of maximum two plates alternately on the left and right with the auxiliary crane.
▶ Stack the ballast plates according to the load chart, observe the danger notes.

11 Crane operation with small ballast pallet

WARNING
The crane can topple over!
If the derrick ballast is lifted past the maximum permissible 250 mm off the ground, then the crane can be topple over to the rear if the load rips off.
Death, severe bodily injuries, property damage.
▶ Make sure that the derrick ballast is not lifted more than 250 mm off the ground.

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WARNING
The crane can topple over!
During the attaching /setting down procedure, the small ballast pallet swings out past the maximum permissible 250 mm , up to 1000 mm over the ground.
If the small ballast pallet is lifted past the maximum permissible 250 mm off the ground, then the crane can be topple over to the rear if the load rips off.
Death, severe bodily injuries, property damage.
▶ Make sure that the small ballast pallet is lifted or attached from the ballast pallet **without** a load on the hook.

11.1 Setting up crane operation with the small ballast pallet

11.1.1 Disconnecting the divisible ballast pallet „VarioTray“

Make sure that the following prerequisites are met:
– The divisible ballast pallet „VarioTray“ is properly installed and secured on the derrick ballast guying or on the suspended ballast guide*.
– The electrical connection from the derrick ballast to the turntable has been established.
– The cable drum cable is plugged in on the turntable.
– The ground contact rollers must move easily.
– Ballast plates are installed on the large ballast pallet according to the load chart or the erection and take-down charts.
– Ballast plates are installed on the small ballast pallet according to the load chart or the erection and take-down charts.

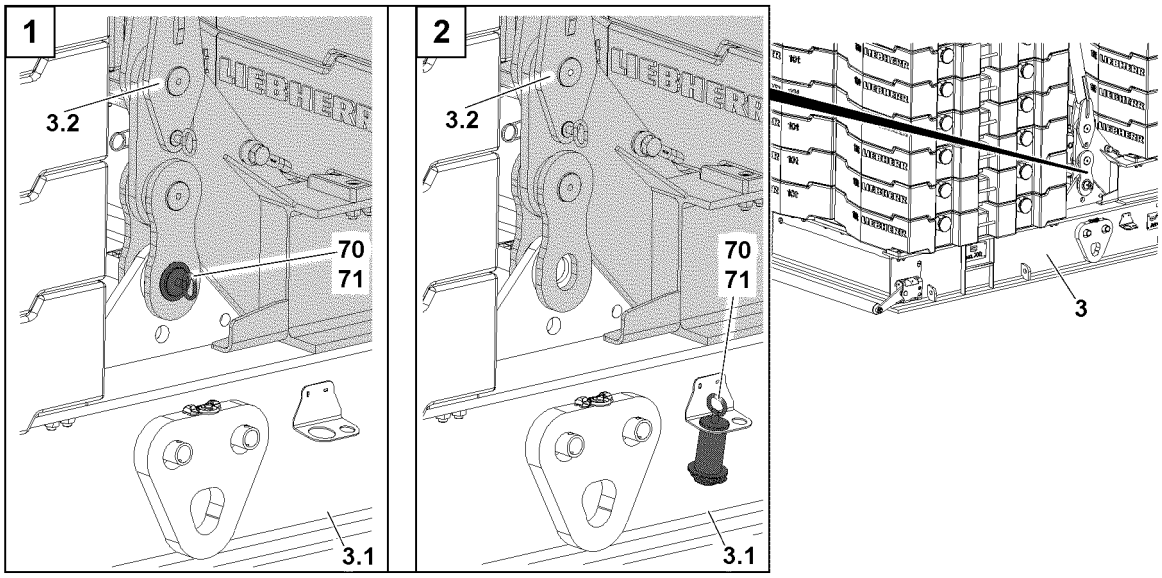

Fig.145287: Disconnecting the divisible ballast pallet „VarioTray“

▶ Disconnect electrical connections from the large ballast pallet **1.1** to the small ballast pallet **1.2**, see electric wiring diagram.
▶ Close the electrical connections off properly with dummy plugs or protective caps.

The small ballast pallet **3.2** is pinned at four points. The unpinning procedure is described for one pin as an example.

▶ Remove the retaining element **71** and unpin the connector pin **70**.

Result:

– The small ballast pallet **3.2** is disconnected from the large ballast pallet **3.1**.

▶ Pin the connector pin **70** in the parking position and secure with a retaining element **71**.

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If the erection racks must be released:

▶ Remove the retaining element and unpin the retaining pin, see section „Pinning the suspended ballast guide on the divisible ballast pallet „VarioTray““.

11.1.2 Function check before lifting the derrick ballast

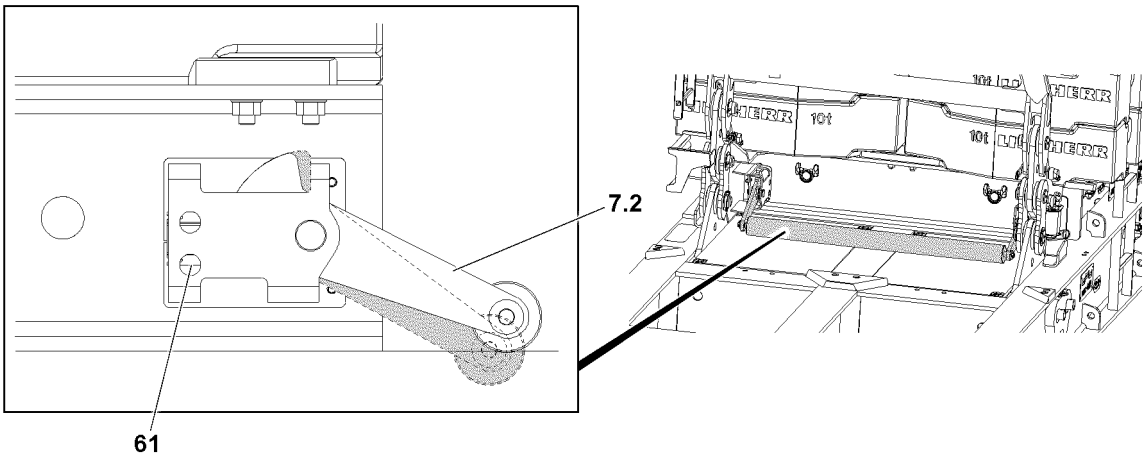

Fig.145288: Ground contact roller

Make sure that the following prerequisite is met:

– The ground contact rollers must move easily.

DANGER

Danger of accident if the derrick ballast touches the ground!

▶ If the small ballast pallet touches the ground, **at least one** ground contact switch **61** must be actuated via the ground contact roller **7.2**.

▶ The **turning the turntable** and **driving the crawler** crane movements turn off.

▶ Manually lift the ground contact roller **7.2**.

Result:

– The ground contact switch **61** is actuated.

– The **turning the turntable** and **driving the crawler** crane movements turn off.

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11.1.3 Lifting the small ballast pallet

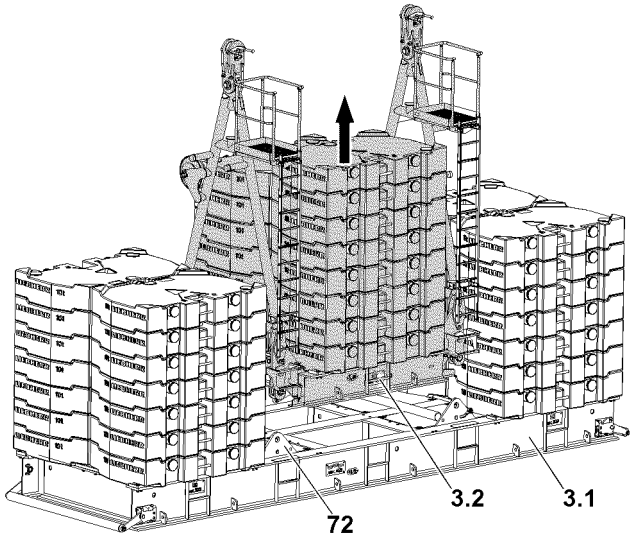

Fig.145289: Small ballast pallet

Make sure that the following prerequisite is met:
– The small ballast pallet **3.2** is disconnected from the large ballast pallet **3.1**.

WARNING
Danger of fatal injury due to tipping ballast plates!
If the crane is turned after the small ballast pallet **3.2** is lifted, the small ballast pallet **3.2** will tip over the ballast plates of the large ballast pallet **3.1**.
Death, severe bodily injuries, property damage.
▶ Make sure that the crane is never turned directly after lifting the small ballast pallet **3.2**.
▶ The large ballast pallet **3.1** must always be put down outside of the slewing range of the crane.

▶ Lift the small ballast pallet **3.2** until it is hovering over the plates **72** of the large ballast pallet **3.1**: Actuate the pull cylinder, see section „Carrying out crane movements“.

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11.2 Removing the crane operation with the small ballast pallet

11.2.1 Setting down the small ballast pallet

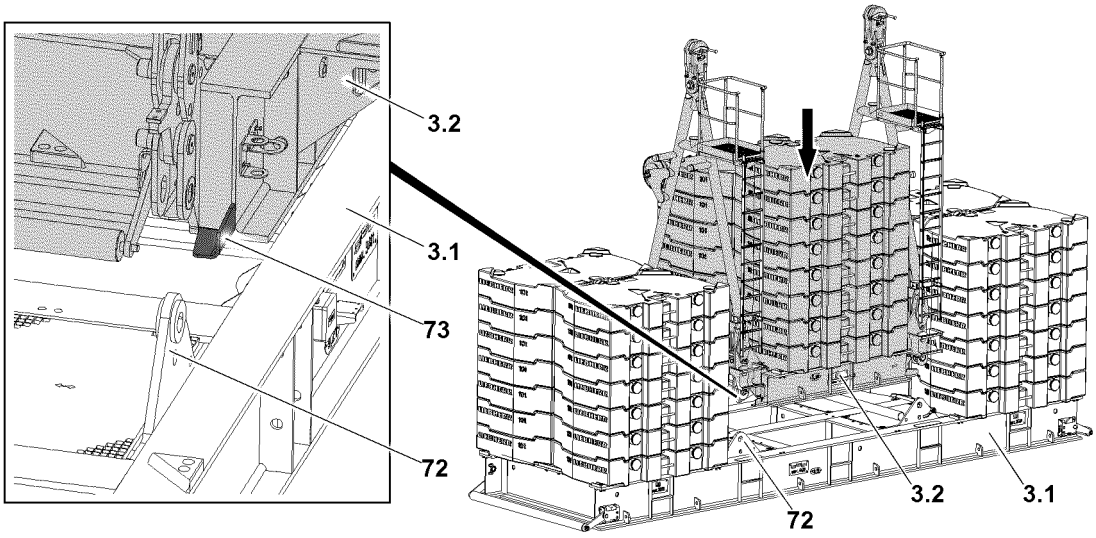

Fig.145290: Setting down the small ballast pallet

Make sure that the following prerequisites are met:
- The small ballast pallet **3.2** is located over the pin locations of the large ballast pallet **3.1**.
- The ground contact rollers must move easily.
- Ballast plates are installed on the large ballast pallet **3.1** according to the load chart or the erection and take-down charts.

WARNING
Danger of fatal injury due to tipping ballast plates!
If the crane is turned when the small ballast pallet **3.2** is being set down, the small ballast pallet **3.2** will tip over the ballast plates of the large ballast pallet **3.1**.
Death, severe bodily injuries, property damage.
▶ Make sure that the crane is never turned while the small ballast pallet **3.2** is being set down.

Note
▶ When setting down the small ballast pallet **3.2**, use the centerings **93** on the small ballast pallet **3.2** as a guide.

▶ Set down the small ballast pallet **3.2** on the large ballast pallet **3.1**: Actuate the pull cylinder, see section „Carrying out crane movements“.

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11.2.2 Connecting the divisible ballast pallet „VarioTray“

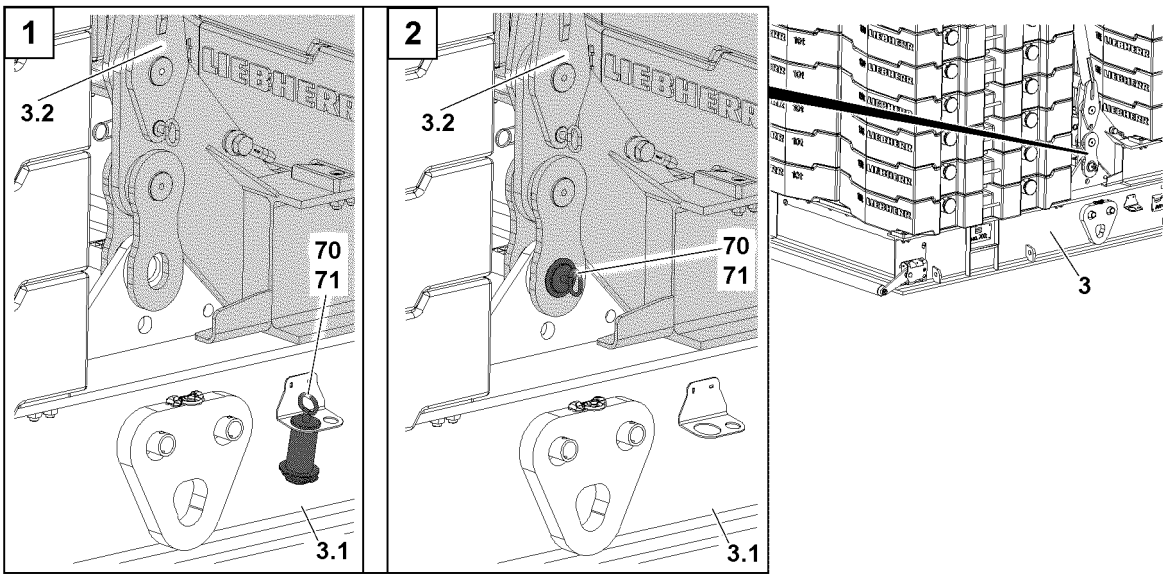

Fig.145291: Connecting the divisible ballast pallet „VarioTray“

Make sure that the following prerequisites are met:
- The small ballast pallet **3.2** is resting completely on the large ballast pallet **3.1**.
- The pin bores on the small ballast pallet **3.2** and on the large ballast pallet **3.1** align.

The small ballast pallet **3.2** is pinned at four points. The pin procedure is described for one pin as an example.

▶ Remove the retaining element **71** from the parking position and unpin the connecting pin **70**.
▶ Insert the connector pin **70** and secure it with a retaining element **71**.

Result:

– The small ballast pallet **3.2** is pinned to the large ballast pallet **3.1**.

If the erection racks must be secured:
▶ Remove the retaining element from the parking position and unpin the retaining pin, see section „Pinning the suspended ballast guide on the divisible ballast pallet „VarioTray““.
▶ Pin the retaining pin and secure with the retaining element, see section „Pinning the suspended ballast guide on the divisible ballast pallet „VarioTray““.
▶ Establish electrical connections from the large ballast pallet **3.1** to the small ballast pallet **3.2**, see the electric wiring diagram.

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12 Crane operation with the derrick ballast

12.1 Function check of the ground contact switch

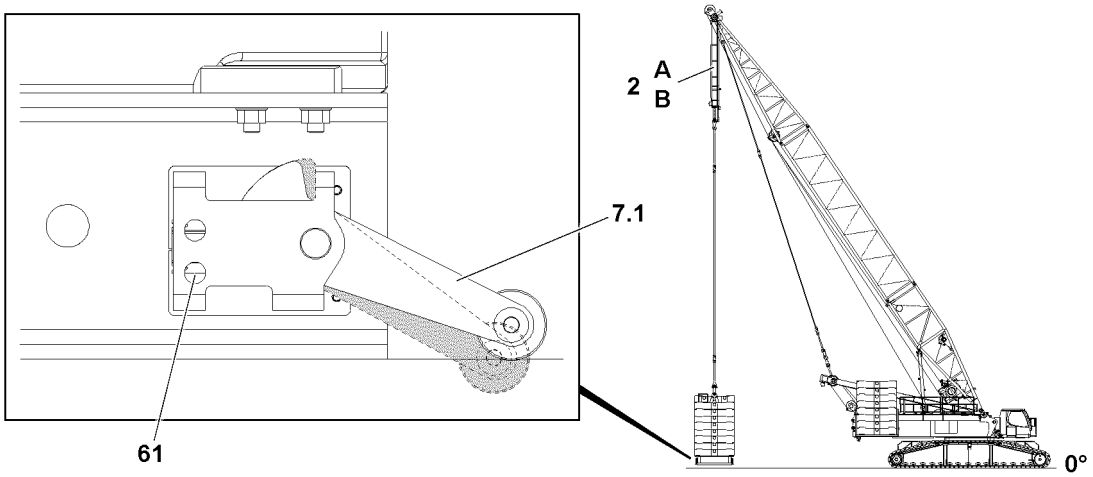

Fig.145284: Ground contact roller

Make sure that the following prerequisites are met:
- The electrical connection from the derrick ballast to the turntable has been established.
- The cable drum pull release is fastened to the turntable.
- The ground contact rollers must move easily.

DANGER
Danger of accident if the derrick ballast touches the ground!
If the terrain is very uneven, the danger exists that the derrick ballast rests on the ground even if a ground contact switch **61** was not actuated.
▶ If the divisible ballast pallet „VarioTray“ touches the ground, **at least one** ground contact switch **61** must be actuated via the ground contact roller **7.1**.

▶ Check the ease of movement of the ground contact roller **7.1**.
▶ Manually operate the ground contact roller **7.1**.

Result:

- The ground contact switch **61** is actuated.
- The LICCON monitor displays derrick ballast has ground contact - the „turning the turntable“ and „driving the crawler“ crane movements are deactivated.

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12.2 Lifting and lowering the derrick ballast using the pull cylinders

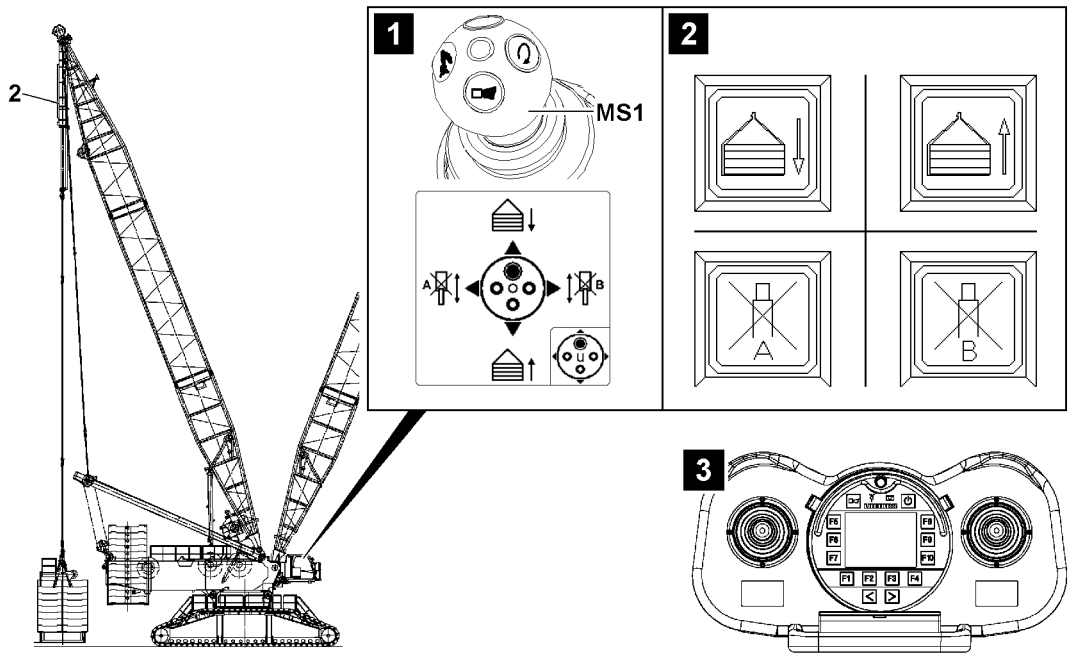

Fig.145937

The pull cylinders **2** in the derrick ballast guying can be operated in different ways:
- Operation with master switch **MS1** in the corresponding master switch assignment, see illustration **1**
  - Select the master switch assignment for master switch MS1, see chapter 4.01.
- Operation with operating buttons on the instrument panel, see illustration **2**

There is an additional operating option in assembly operation:
- Operation with the radio remote control (BTT-E), see illustration **3**
  - Operation with the manual control lever in the corresponding assembly menu, see the radio remote control operating instructions.

Note
- ▶ If the derrick ballast is raised or lowered using the pull cylinder **2**, then the horizontal alignment of the derrick ballast is automatically regulated by both length sensors of the pull cylinder **2**.
- ▶ For a ballast utilization of **more than** or **equal to** 90 percent, the level sensor regulates the pull cylinder **2** to a difference of 1 cm.
- ▶ With a ballast utilization of **less than** 90 percent, the level sensor monitors the derrick ballast level to ± 2.5°. This makes it possible to set the derrick ballast down up to a ground slope of 2.5°.

DANGER
Danger of accident!
If the following notes are not observed, personnel can be severely injured or killed.
In addition, this can result damage to the derrick ballast.
- ▶ Pay attention to the horizontal alignment of the derrick ballast when lifting and lowering the derrick ballast.
- ▶ When lifting and lowering the derrick ballast, check the forces in the D-guyings regularly on LICCON monitor 1. If the difference of forces between „derrick ballast guying A“ and „derrick ballast guying B“ is too large, an acoustic warning sounds and the values on the LICCON monitor 1 blink, see section „Differential force monitoring of Derrick ballast guying“.
- ▶ When adjusting manually (block pull cylinder A or pull cylinder B) the regulation is deactivated and the derrick ballast can be inclined within the limited angle range. This is exclusively permitted when setting down the derrick ballast on uneven ground and only by observing utmost caution.

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During crane operation with derrick ballast the required maximum / minimum load can be actively influenced.

This is made possible by increasing or reducing the derrick ballast. Depending on the situation, this procedure is also possible under load.

Note

- The suspended ballast and the ballast trailer are generally referred to as the **derrick ballast**.
- The fixed compensation weight that is installed on the turntable is generally referred to as the **counterweight**.
- Additional personnel to carry out crane operation is generally referred to as **guide**.

- Operate the crane function to lift and lower the derrick ballast, see section „Carrying out crane movements“

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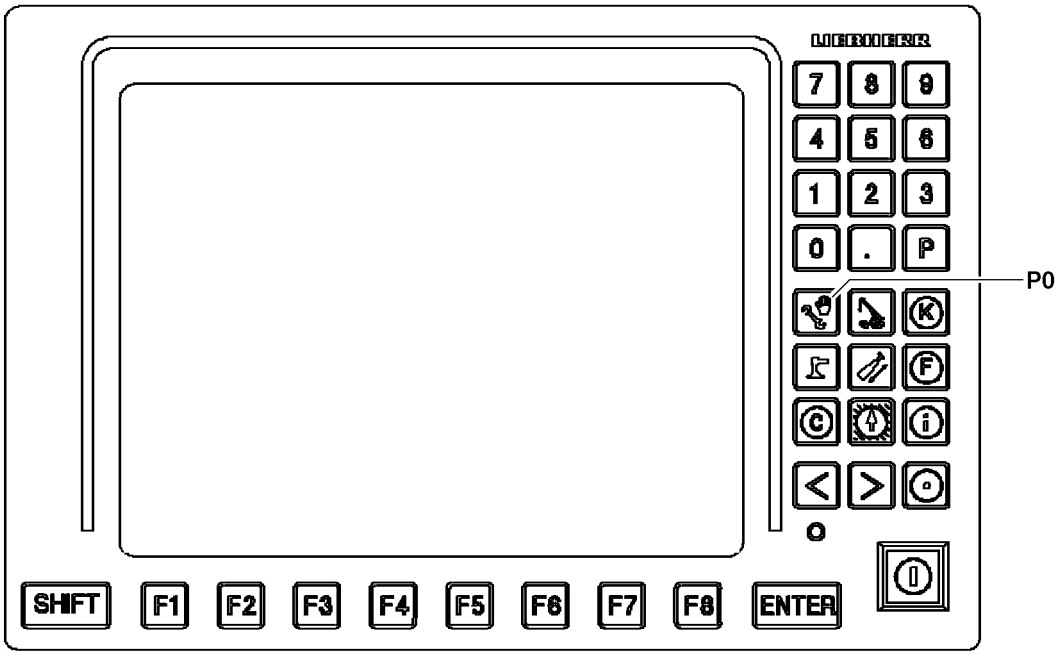

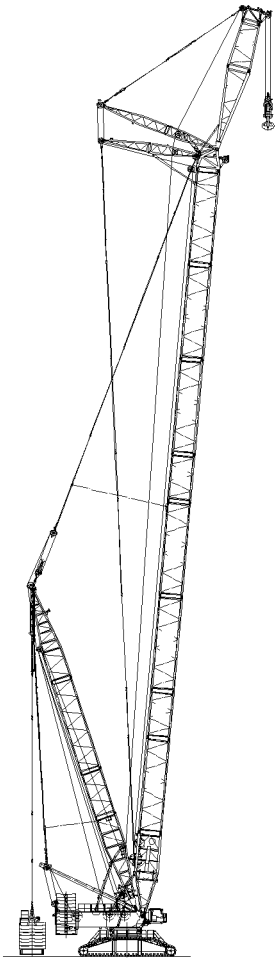

Fig.122800

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12.3 Checking the settings of the LICCON overload protection

Make sure that the following prerequisites are met:
- The derrick ballast is placed according to the load chart.
- The actual placed derrick ballast has been entered and confirmed in the Set up program, see Crane operating instructions, chapter 4.02.
- The derrick boom is in operating position.

WARNING
Incorrectly set overload protection!
If the actual set up configuration of the crane deviates from the entries and settings in the Set up program, then the overload protection is not correctly set.
An incorrectly set overload protection calculates the actual load incorrectly and transmits faulty display values.
The crane can be overloaded unnoticed and topple over.
This could result in serious accidents.
▶ The entries and settings in the set up program must match the actual set up configuration of the crane.

Note
▶ Set the LICCON overload protection in the set up program, see Crane operating instructions, chapter 4.02.

▶ Press the program key **P0**.

Result:

– The Set up program is called up.

▶ In the monitor display of the Set up program check if the LICCON overload protection is set according to the data in the load chart and the actual set up configuration of the crane, see example illustration.

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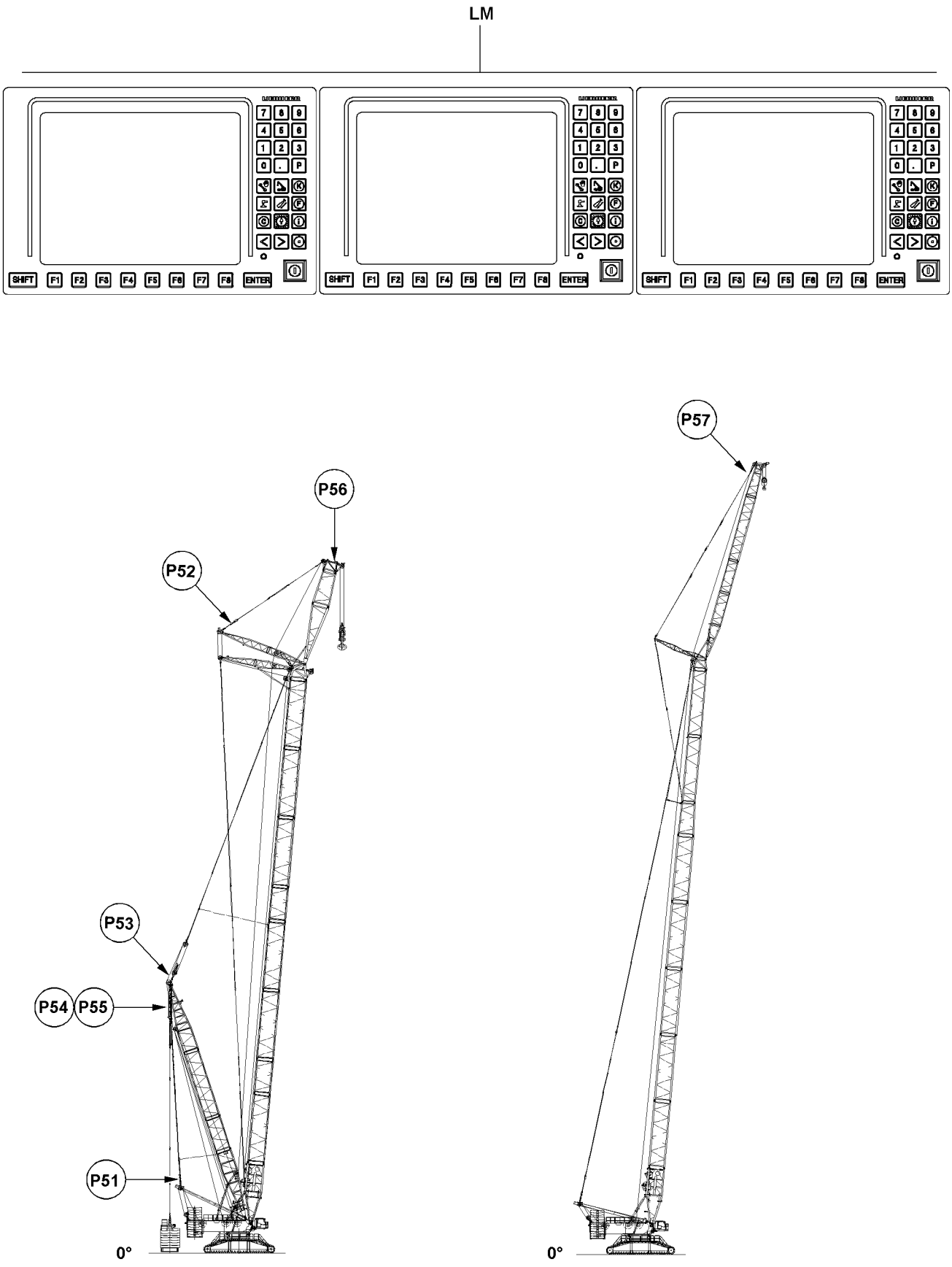

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Fig.122806

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12.4 F-load display for operating modes with derrick ballast

Assignment of test points for operating modes with derrick ballast:

– Force in the guying between A-frame and derrick head:
  - Test point 1 on point **P51** = force F1
  - The display is made in the F-load display in the center LICCON monitor **LM**.
– Force in the guying between WA-frame and accessory head:
  - Test point 2 on point **P52** = force F2
  - The display is made in the F-load display in the center LICCON monitor **LM**.
    Note: Only for the respective boom system.
– Force in the guying between the main boom head and the derrick head:
  - Test point 3 on point **P53** = force F3
  - The display is made in the F-load display in the center LICCON monitor **LM**.
– Force in the guying between derrick ballast and derrick head:
  - Test point 4/5 on point **P54/55** = force F4/5
  - The display is made in the display of the derrick ballast in the left LICCON monitor **LM**.
– Force on the pressure test bracket boom nose:
  - Test point 6 on point **P56** = force F6
  - The display is made in the actual load display in the right LICCON monitor **LM**.
    Note: Only with existing boom nose.
– Force in the guying between the FA-frame and the accessory head:
  - Test point 11 on point **P57** = force 11
  - The display is made in the actual load display in the center LICCON monitor **LM**.
    Note: Only for the respective boom system

Note

▶ For a detailed description of the displays for crane operation with derrick ballast, see the Crane operating instructions, chapter 4.02.

WARNING

Overloading / toppling of the crane!
If the permissible display values of the F-load display are exceeded / fallen below, then the crane can be overloaded.
This could result in serious accidents.

▶ Observe and adhere to the display values on the LICCON monitors.
▶ Observe and adhere to the specifications regarding the limit values on the assembly drawings.

Note

The values of the F-load display depend on the set up configuration of the crane and the crane geometry.
The values of the F-load display change continuously when the crane is moved.

▶ Monitor the F-load display continuously.

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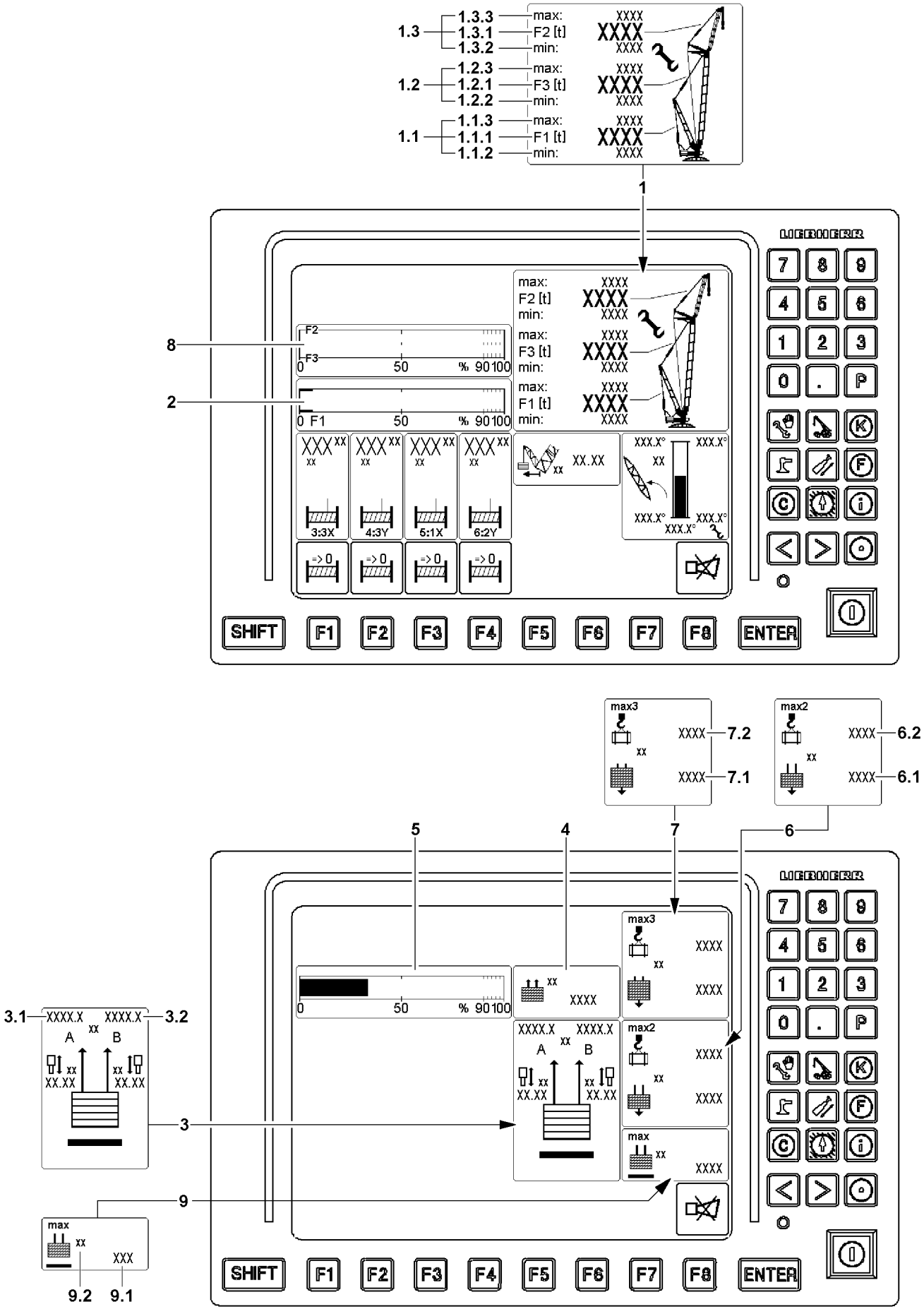

Fig.146968

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12.4.1 Force F1 (test point 1)

The force F1 (test point MS1) is determined in the guying between the A-frame and the derrick head and displayed in the LICCON monitor as operating force $F1_{actual}$.

Display values of force F1 (test point MS1) on the F-load display **1**:
- F1-maximum ($F1_{max}$) **1.1.3** = maximum value F1-force
- F1-actual value ($F1_{actual}$) **1.1.1** = actual value F1-force (operating force F1)
- F1-minimum ($F1_{min}$) **1.1.2** = minimum value F1-force

Structure of the F1-utilization bar **2**:
- Ratio of operating force $F1_{actual}$ to F1 maximum force

12.4.2 Force F2 (test point 2) and force F3 (test point 3)

The force F2 (test point 2) is determined between the WA-frame and the accessory head and displayed in the LICCON monitor as operating force $F2_{actual}$. A display is made only with the respective boom system.

The force F3 (test point 3) is determined between the main boom head and the derrick head and displayed in the LICCON monitor as operating force $F3_{actual}$.

Display values of force F2 (test point MS2) in the F-load display **1**:
- F2-maximum ($F2_{max}$) **1.3.3** = maximum value F2-force
- F2-actual value ($F2_{actual}$) **1.3.1** = actual value F2-force (operating force F2)
- F2-minimum ($F2_{min}$) **1.3.2** = minimum value F2-force

Display values of force F3 (test point MS3) in the F-load display **1**:
- F3-maximum ($F3_{max}$) **1.2.3** = maximum value F3-force
- F3-actual value ($F3_{actual}$) **1.2.1** = actual value F3-force (operating force F3)
- F3-minimum ($F3_{min}$) **1.2.2** = minimum value F3-force

Composition of the F2 / F3-utilization bar **8**:
- Ratio of operating force $F2_{actual}$ to F2 maximum force $F2_{max}$
- Ratio of operating force $F3_{actual}$ to F3 maximum force $F3_{max}$
- The F2/F3-utilization bars **8** appear only in assembly operation

In crane operation, the display values are displayed clearly for information. A special monitoring does not occur.

In assembly operation the display values are monitored. The limit values may not be exceeded.

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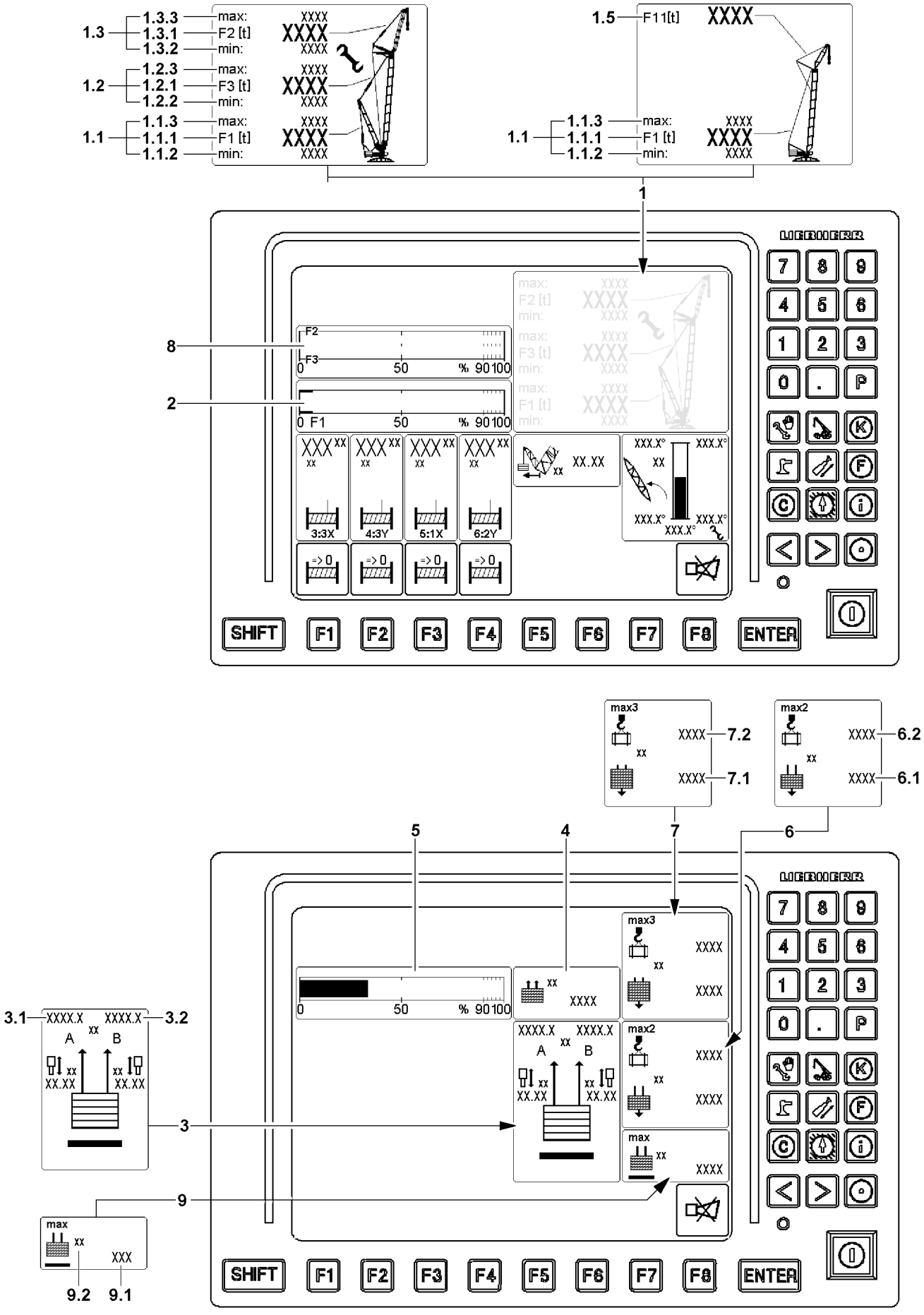

Fig.146967

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12.4.3 Force F4/5 (test point 4/5)

The forces F4/5 (test point 4/5) are effective in the guy rods from the derrick ballast to the derrick head.

The existing forces in the guy rods are calculated from four pressure sensors, which are installed on the pull cylinders.

Test points guying A (left) are:
- Test point 4A = pressure sensor ring surface left (force F4A)
- Test point 5A = pressure sensor piston surface left (force F5A)

Test points guying B (right) are:
- Test point 4B = pressure sensor ring surface right (force F4B)
- Test point 5B = pressure sensor piston surface right (force F5B)

Display values of force F4/5 (test point 4/5) in icon Guying derrick ballast **3**:
- Force in the derrick ballast guying A **3.1**
- Force in the derrick ballast guying B **3.2**

Display values derrick ballast:
- Currently pulled derrick ballast = BA_{pulled} **4**
- Current utilization of derrick ballast = Utilization bar derrick ballast **5**
- Currently placed derrick ballast = BA_{placed} **6.1**

From the sum of derrick ballast guying A **3.1** and derrick ballast guying B **3.2** is the pulled derrick ballast BA_{pulled} **4** calculated.

If the ballast still has ground contact, then only that part of the ballast is displayed which is pulled up by the D-guying. The remaining part is laying correspondingly on the ground.

Composition of utilization bar derrick ballast **5**:
- Ratio of pulled derrick ballast (BA_{pulled} **4**) to placed derrick ballast (BA_{placed} **6.1**)

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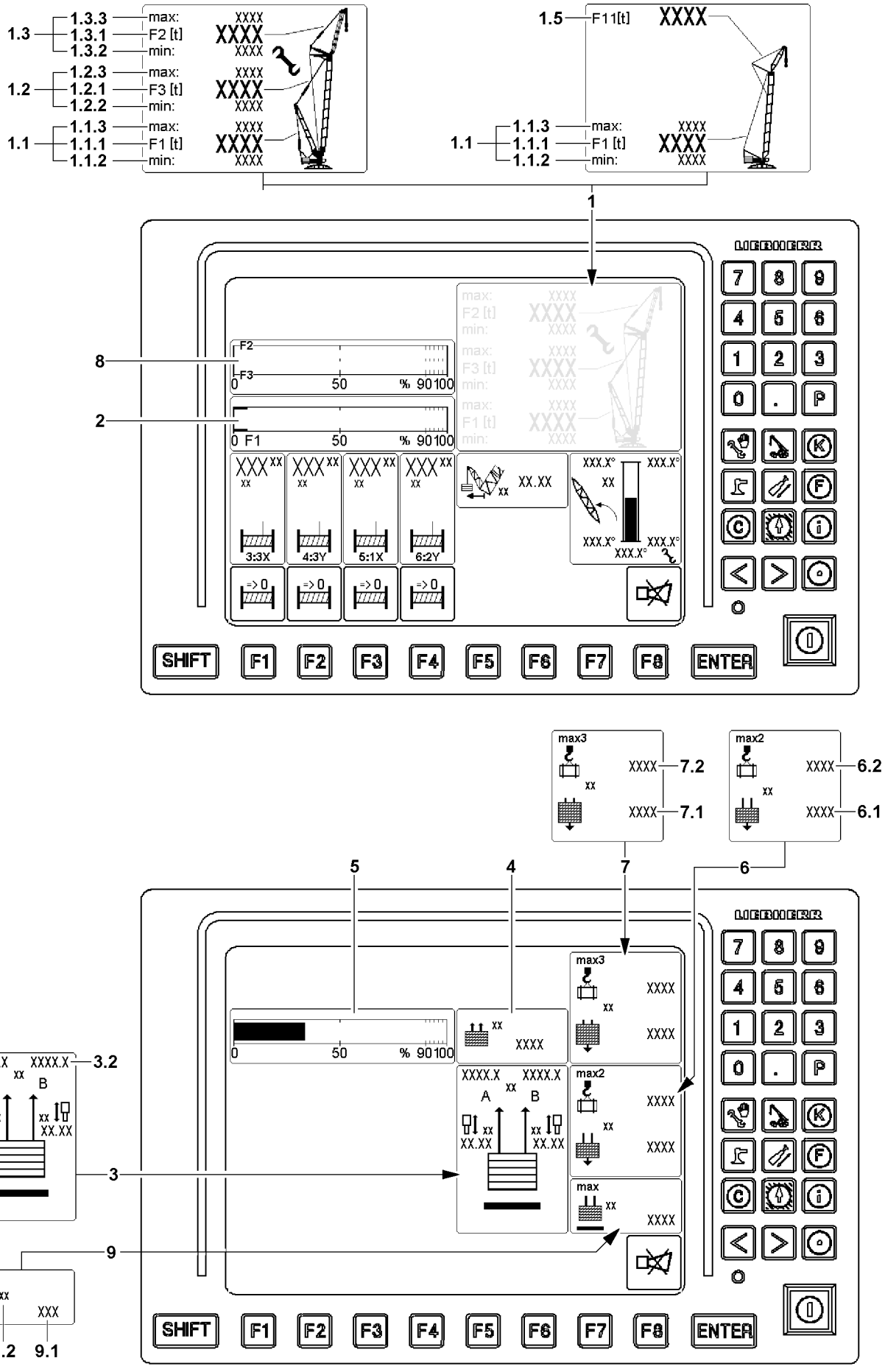

Fig.146967

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12.4.4 Maximum liftable derrick ballast

The *maximum liftable derrick ballast* **9** refers to the current crane condition and indicates the maximum derrick ballast that can be lifted off the ground with the pull cylinder or off the suspended ballast palette in case of the VarioTray without falling below the $F1_{min}$ force.

- **9** *Maximum liftable derrick ballast* icon
- **9.1** Maximum liftable derrick ballast
  - Maximum derrick ballast
- **9.2** Measuring unit
  - Measuring unit for display values in the *Pulled derrick ballast* icon **9**: [t] or [lb]

12.4.5 Force F11 (test point 11)

Force in the guying between the FA-frame and the accessory head:

Display values of force F11 (test point MS11) on the F-load display **1**:
- F11-actual value ($F11_{actual}$) **1.5** = actual value F11-force (operating force F11)

12.4.6 Additional displays

- „Load max2“ icon **6** (see section „Utilization conditions“)
- Currently placed derrick ballast = BA_{placed} (Input value in set up program) **6.1**
- Possible load with currently placed derrick ballast = $Load_{max2}$ **6.2**
- „Load max3“icon **7** (see section „Utilization conditions“)
- Maximum derrick ballast according to load chart = BA_{max} **7.1** (Highest value in Set up program)
- Possible load with maximum derrick ballast according to load chart = $Load_{max3}$ **7.2**

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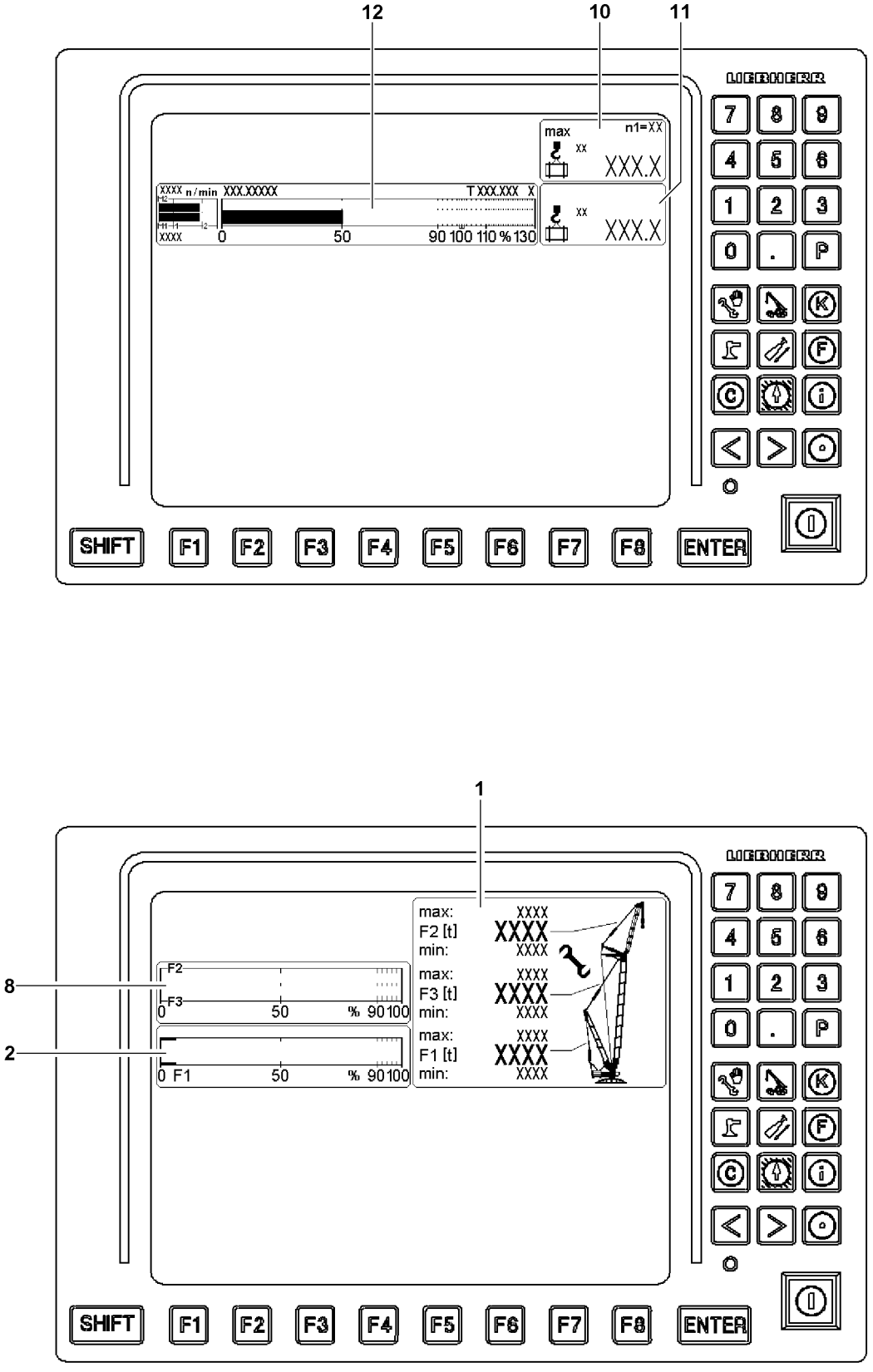

Fig.122808

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12.5 Monitoring of crane utilization in operating modes with derrick ballast

Note
- ▶ The icon illustrations of the LICCON monitors are examples and may not match your crane.
- ▶ The icon illustrations of the LICCON monitors can deviate in number, arrangement and depiction of the icons on your crane.
- ▶ Observe the Crane operating instructions, chapter 4.02.

WARNING
Incorrect display values!
If the display values do not increase correspondingly when lifting known weights, an erroneous display value may be present.
If the crane is operated with erroneous display values, then the crane can be overloaded.
This could result in serious accidents.
- ▶ When lifting the hook block off the ground check if the display value for the actual load increases correspondingly.
- ▶ When lifting the derrick ballast off the ground check if the display value for the pulled derrick ballast (BA_{pulled}) increases correspondingly.
- ▶ When lifting the load off the ground check if the display value for the actual load increases correspondingly.

In operating modes with derrick ballast, the monitoring of the crane utilization includes, among others:
1. Monitoring of load torque
   Via the „Maximum load“ icon **10**, „Actual load“ icon **11** and the „utilization bar diagram“ **12**.
2. Utilization conditions
   Support the crane driver with additional display values.
3. Monitor the F-load display **1**.
   Supported by the F1-utilization bar **2** and possibly the F2/F3-utilization bar **8**.

12.5.1 Monitoring of load torque

It monitors the „maximum load according to the load chart and reeving“.

In crane operation, the actual load is compared with the maximum load which may be lifted in the current crane configuration. The display of the values is made in the icon „Maximum load“ **10** and in icon „actual load“ **11**. The current percentage utilization is displayed as „bar diagram utilization“ **12** in the right LICCON monitor.

The color of the utilization bar in the „bar diagram utilization“ **12** also displays the crane utilization:
- – Utilization bar blue / green (below 90 %): Utilization in permissible range
- – Utilization bar yellow (90 % to 100 %): Advance warning. - Utilization just before impermissible range
- – Utilization bar red (above 100 %): Warning. - Utilization in impermissible range

Note
- ▶ Procedure for optimum utilization of „maximum load according to load chart and reeving“, see section „Utilization conditions“.

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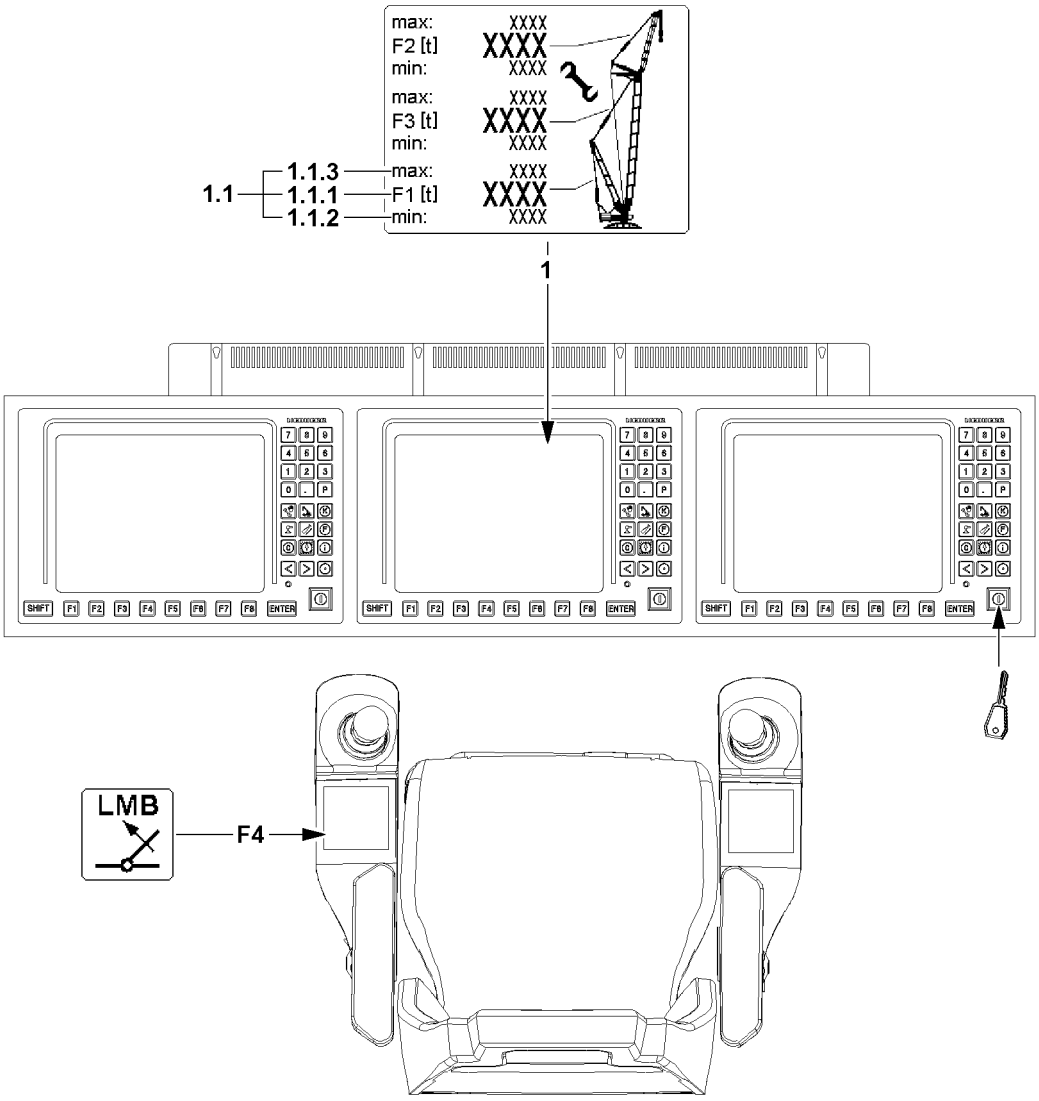

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Fig.122809

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WARNING
Access the functionality of the LICCON overload protection!
When accessing the functionality of the LICCON overload protection by activating assembly operation, the LICCON overload protection is totally deactivated, bypassed or limited.
It is possible to exceed several shut-off limits of the LICCON overload protection simultaneously or one after the other.
It is possible to carry out crane movements, which are not monitored by the LICCON overload protection.
Without the LICCON overload protection, no additional protection against overload of the crane via the crane control is present.
This could result in serious accidents.

- ▶ When accessing the functionality of the LICCON overload protection, take into account that the LICCON overload protection is deactivated totally or is limited.
- ▶ When accessing the functionality of the LICCON overload protection, the Crane operating instructions, chapter 4.02 must be observed.

WARNING
The crane can topple over!
In assembly operation the LICCON overload protection is deactivated.
In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over.
Personnel can be killed.
This could result in high property damage.

- ▶ Activate the assembly operation only when the consequences are known.
- ▶ Enter the set up configuration correctly into the LICCON computer system.
- ▶ Observe the erection / take down charts.
- ▶ Crane operation with deactivated LICCON overload protection is prohibited.
- ▶ In assembly operation only load torque reducing crane movements may be carried out until a permissible operating and load range.
- ▶ The crane operator carries complete and sole responsibility for his actions if the LICCON overload protection is deactivated.

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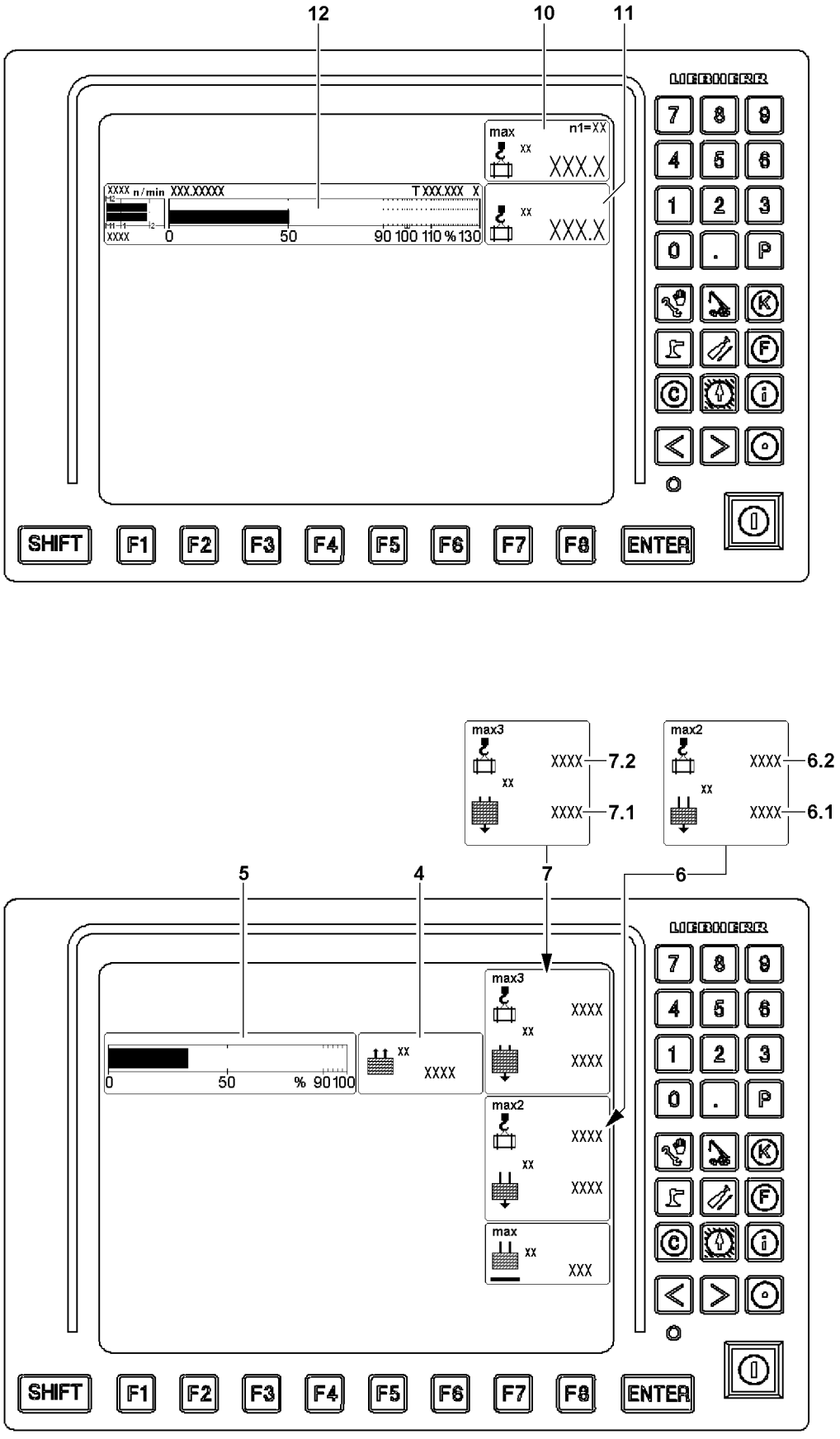

Fig.146966

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12.5.2 Utilization conditions

The current percentage utilization of the crane is displayed as „bar diagram utilization“ **10** in the right LICCON monitor.

Additional displays:
- **6** „Load max2“ icon
  - Currently placed derrick ballast = BA_{placed} (Input value in set up program) **6.1**
  - Possible load with currently placed derrick ballast = $Load_{max2}$ **6.2**
- **7** „Load max3“ icon
  - Maximum derrick ballast according to load chart = BA_{max} **7.1** (Highest value in Set up program)
  - Possible load with maximum derrick ballast according to load chart = $Load_{max3}$ **7.2**

Maximum load, right LICCON monitor:
- The maximum load in the current operating condition is reached when the utilization bar shows 100 % in the „bar diagram utilization“ **12**.
  This is the case when the „utilization of the crane according to the load chart and reeving“ reaches 100 % (Values in icon „Maximum load“ **10** and in icon „actual“ **11** are equal).
  When the „Maximum load“ **10** is smaller or the same as the $load_{max2}$ **6.2**, then an increase might possibly be obtained:
  - By increasing the pulled derrick ballast BA_{pulled} **4**, if the utilization bar derrick ballast **5** is not yet at 100 % (derrick ballast not suspended).
  - By increasing the derrick ballast when the BA_{placed} **6.1** is smaller than BA_{max} **7.1**.
  - By changing the derrick ballast radius within the permissible range, see load chart manual or LICCON job planner.

max2-load, icon „load max2“ **6**:
- The highest possible load in current operating condition **„max2-load“** is reached when in the „bar diagram utilization“ **12** 100 % is shown **and** the utilization bar derrick ballast **5** is at 100 % (Derrick ballast is completely lifted off the ground).
  This is the case when the value in icon „Actual load“ **11** is the same as the $load_{max2}$ **6.2**.
  When the $load_{max2}$ **6.2** is smaller or the same as the $load_{max3}$ **7.2**, then an increase might possibly be obtained:
  - By increasing the derrick ballast by loading additional ballast plates (increase BA_{placed} **6.1** to BA_{max} **7.1**).

max3-load, icon „load max3“ **7**:
- The highest possible load at the maximum derrick ballast in current operating condition **„max3-load“** is reached when the „bar diagram utilization“ **12** displays 100 % **and** the utilization bar derrick ballast **5** is at 100 % (Derrick ballast according to load chart is placed and is completely lifted off the ground).
  This is the case when the value in icon „Actual load“ **11** is the same as the $load_{max3}$ **7.2**.
- The maximum derrick ballast according to the load chart is placed and completely pulled. Further increase of the derrick ballast is impermissible.

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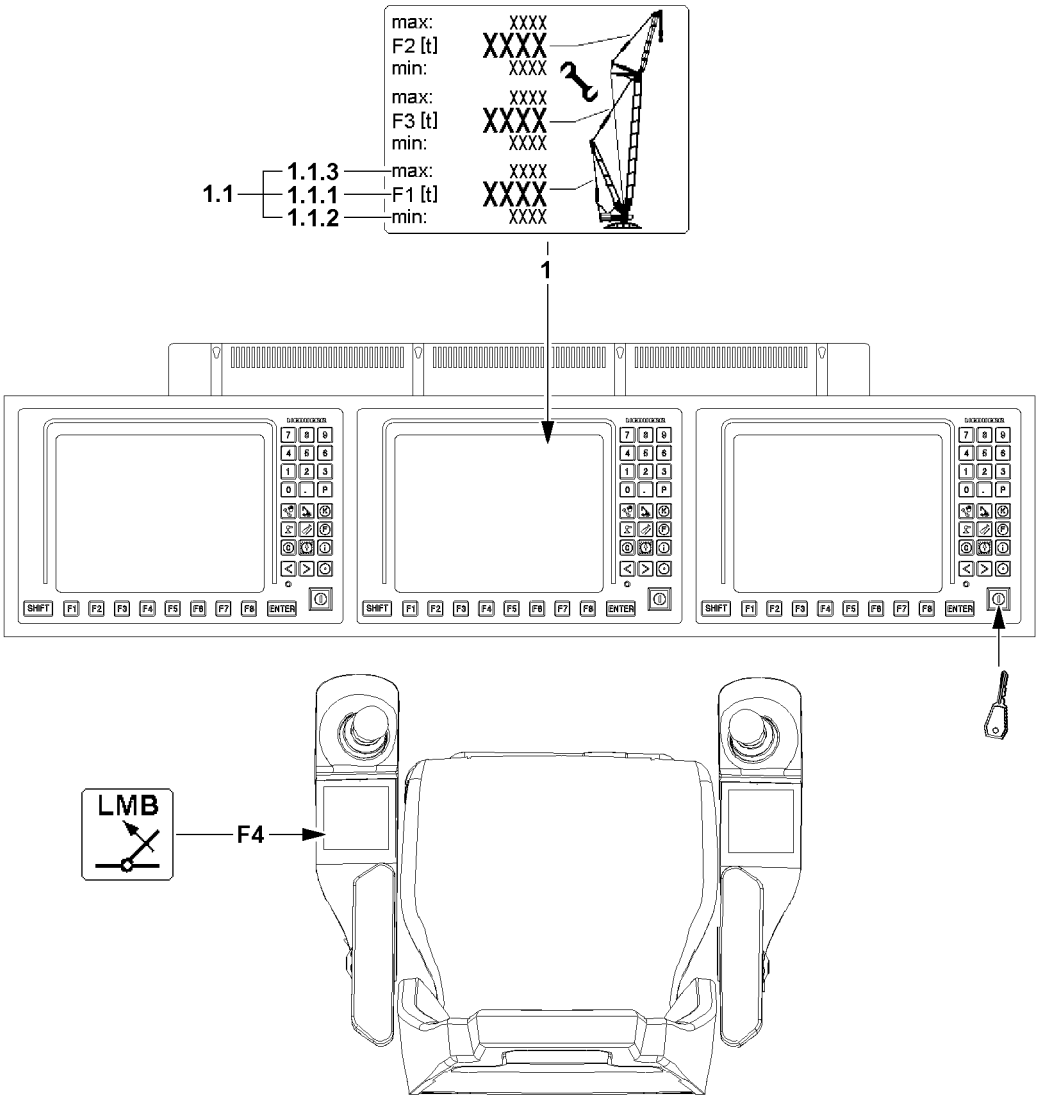

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Fig.122809

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12.5.3 Monitoring of F1-maximum force

Display values of force F1 (test point MS1) on the F-load display **1**:
- F1-maximum ($F1_{max}$) **1.1.3** = maximum value F1-force
- F1-actual value ($F1_{actual}$) **1.1.1** = actual value F1-force (operating force F1)
- F1-minimum ($F1_{min}$) **1.1.2** = minimum value F1-force

The display values of force F1 (test point 1) are displayed permanently in the LICCON monitor. At F1-actual value ($F1_{actual}$) **1.1.1** larger F1-maximum ($F1_{max}$) **1.1.3** a shut off of all load moment increasing movements occurs.

WARNING
Access the functionality of the LICCON overload protection!
When accessing the functionality of the LICCON overload protection by activating assembly operation, the LICCON overload protection is totally deactivated, bypassed or limited.
It is possible to exceed several shut-off limits of the LICCON overload protection simultaneously or one after the other.
It is possible to carry out crane movements, which are not monitored by the LICCON overload protection.
Without the LICCON overload protection, no additional protection against overload of the crane via the crane control is present.
This could result in serious accidents.
- ▶ When accessing the functionality of the LICCON overload protection, take into account that the LICCON overload protection is deactivated totally or is limited.
- ▶ When accessing the functionality of the LICCON overload protection, the Crane operating instructions, chapter 4.02 must be observed.

Note
The limit value for the F1-maximum force depends not only on the set up configuration and the crane geometry, but also from the pulled derrick ballast.
- ▶ If the pulled derrick ballast is larger, then the limit value for the F1-minimum force is generally reduced.
- ▶ If the pulled derrick ballast is smaller, then the limit value for the F1-maximum force is generally increased.

Note
By engaging the assembly operation the limit value for the F1-maximum force can be exceeded by a few tons. This makes it possible to reset a crane movement, which has caused the shut off.
- ▶ Reset triggered shut off by reverse crane movement.

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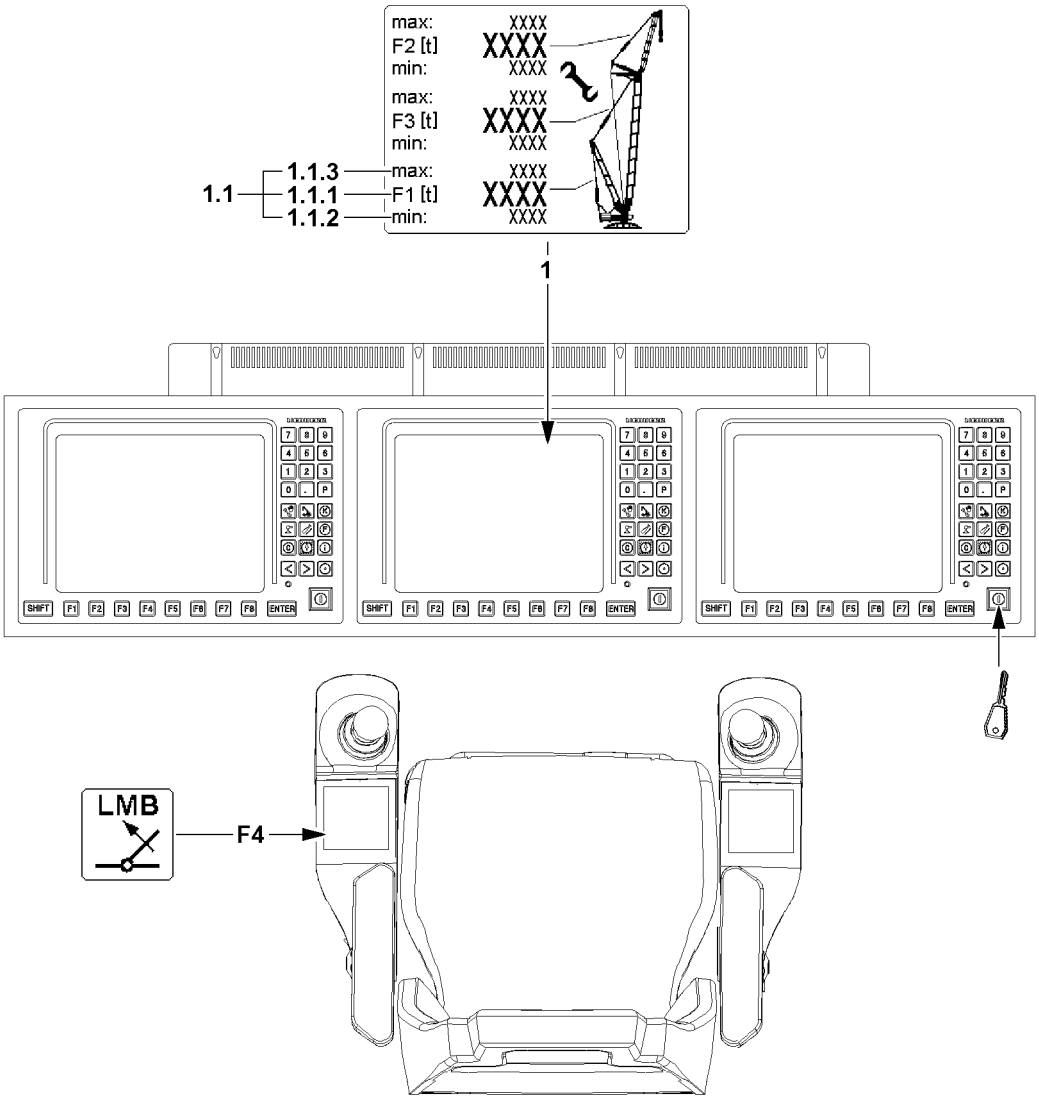

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Fig.122809

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12.5.4 Monitoring of F1-minimum force

Display values of force F1 (test point MS1) on the F-load display **1**:
- F1-maximum ($F1_{max}$) **1.1.3** = maximum value F1-force
- F1-actual value ($F1_{actual}$) **1.1.1** = actual value F1-force (operating force F1)
- F1-minimum ($F1_{min}$) **1.1.2** = minimum value F1-force

WARNING
Uncontrolled movements of the boom system!
If the guying between the A-frame and the derrick head (test point 1) becomes powerless, then this can lead to uncontrollable movements of the boom system.
This could result in serious accidents.
- ▶ The guying between the A-frame and the derrick head (test point 1) may never be without power.
- ▶ Relieve the D-guying between the derrick head and the derrick ballast to the point where the F1-actual value ($F1_{actual}$) **1.1.1** is larger than the F1-minimum ($F1_{min}$) **1.1.2**.

WARNING
Access the functionality of the LICCON overload protection!
When accessing the functionality of the LICCON overload protection by activating assembly operation, the LICCON overload protection is totally deactivated, bypassed or limited.
It is possible to exceed several shut-off limits of the LICCON overload protection simultaneously or one after the other.
It is possible to carry out crane movements, which are not monitored by the LICCON overload protection.
Without the LICCON overload protection, no additional protection against overload of the crane via the crane control is present.
This could result in serious accidents.
- ▶ When accessing the functionality of the LICCON overload protection, take into account that the LICCON overload protection is deactivated totally or is limited.
- ▶ When accessing the functionality of the LICCON overload protection, the Crane operating instructions, chapter 4.02 must be observed.

Note
By engaging the assembly operation the limit value for the F1-minimum force can be fallen below by a few tons. This makes it possible to reset a crane movement, which has caused the shut off.
- ▶ Reset triggered shut off by reverse crane movement.

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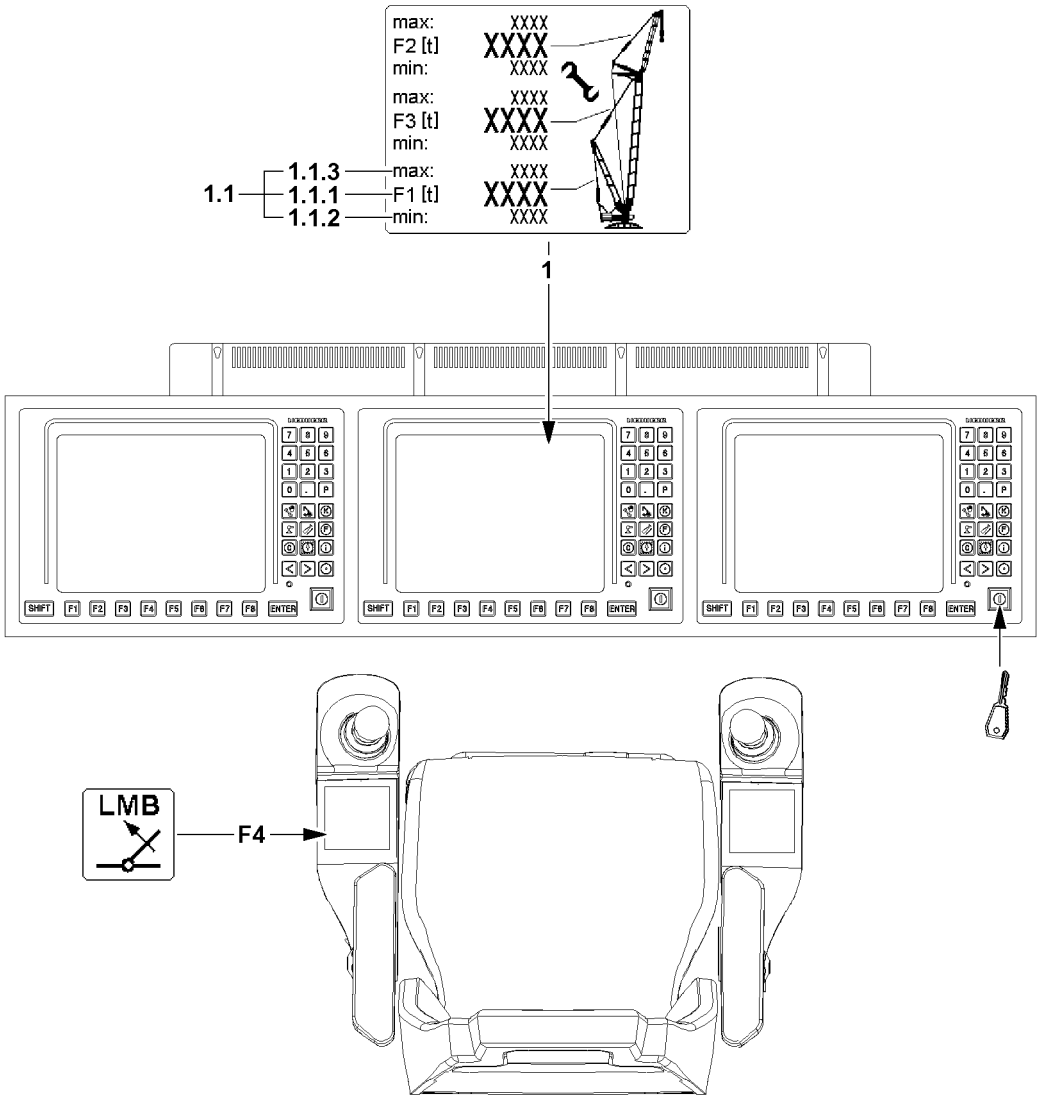

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Fig.122809

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WARNING
Autonomous movement of the boom system at increase of load torque!
If the F1-minimum force is fallen below, the guying between the A-frame and the derrick head can become powerless.
If the guying between the A-frame and the derrick head is powerless and the „Derrick ballast is on the ground“ at the same the derrick ballast can suddenly lift off the ground due to increase of the load torque.
As a result, the boom system can move forward suddenly. Strong oscillating movements of the derrick ballast and load can be the result.
The crane can be overloaded and severe accidents can be the result.
▶ Hold the F1-actual value ($F1_{actual}$) **1.1.1** above the F1-minimum ($F1_{min}$) **1.1.2**.
▶ It is prohibited to fall below the F1-minimum force.

WARNING
Autonomous movement of the boom system at decrease of load torque!
If the F1-minimum force is fallen below, the guying between the A-frame and the derrick head can become powerless.
If the guying between the A-frame and the derrick head is powerless and the „derrick ballast is suspended“ at the same time, the derrick ballast can suddenly set down on the ground due to decrease of the load torque.
As a result, the boom system can move suddenly backward. As a result, the relapse cylinders can be pressed on block, be overloaded and damaged. Strong oscillating movements of the derrick ballast and load can be the result.
The crane can be overloaded and severe accidents can be the result.
▶ Hold the F1-actual value ($F1_{actual}$) **1.1.1** above the F1-minimum ($F1_{min}$) **1.1.2**.
▶ It is prohibited to fall below the F1-minimum force ($F1_{min}$).

The following applies:
– After a shut off due to falling below the F1-minimum ($F1_{min}$) **1.1.2** the F1-actual value ($F1_{actual}$) **1.1.1** must be increased by a crane movement. If the derrick ballast is suspended, this can be achieved by setting down the ballast.
– When picking up the load, the D-guying between the derrick ballast and the derrick head must be relieved to the point where the F1-actual value ($F1_{actual}$) **1.1.1** is greater than the F1-minimum ($F1_{min}$) **1.1.2**.
– When increasing the load torque, the limit value F1-minimum ($F1_{min}$) **1.1.2** is fallen below, an already set down derrick ballast can lose contact with the ground and lift off.
– When decreasing the load torque, and the limit value F1-minimum ($F1_{min}$) **1.1.2** is fallen below, an already „suspended derrick ballast“ can set down on the ground.
– If the assembly operation is activated and the F1-force continues to drop below the minimum force $F1_{min}$, then the $F1_{min}$ shut off can no longer be bypassed.

Limitations from 50 % pulled derrick ballast

If more than 50 % of the set derrick ballast is being pulled (utilization bar derrick ballast **5** larger than 50 %) and the F1-minimum ($F1_{min}$) **1.1.2** is fallen below at the same time, all crane movements that increase load torque are turned off.

Limitations from 90 % pulled derrick ballast

If more than 90 % of the set derrick ballast is being pulled (utilization bar derrick ballast **5** larger than 90 %) and the F1-minimum ($F1_{min}$) **1.1.2** is fallen below at the same time, all crane movements that increase load torque and all crane movements that decrease load torque are turned off. This also turns off the „spooling out“ movement of the winch.

12.6 Monitoring of pull cylinders on block position

The pull cylinders (also called ballast lift cylinders) of the derrick ballast are equipped with length sensors and limit switches for monitoring.

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In crane operation, the monitoring of the pull cylinders on block position is always active. If there is the danger of a block position, then only that direction of the pull cylinders can be moved which improves the condition. The other direction is unbypassably blocked. As long as the length sensors and the limit switches function correctly, the pull cylinders cannot get into a block position.

WARNING
Problem at monitoring of pull cylinders!
If the length sensors or limit switches are defective or missing, then the monitoring of the pull cylinders is not active.
Without monitoring, the pull cylinders can be moved without restriction, as a result, a block position is possible.
At a block position, the pressure measurements of the pull cylinders become inexact and the values are incorrectly calculated.
The overload protection calculates the actual load incorrectly and transmits faulty display values.
The crane can be overloaded and topple over.
This could result in serious accidents.
▶ Observe the display values and possible error messages.
▶ If length sensors or limit switches are defective or missing, monitor the pull cylinders manually.

The following applies:
– The display values of the pull cylinders must function and be plausible.

12.7 Monitoring the lateral incline of the divisible ballast pallet „VarioTray“

The divisible ballast pallet „VarioTray“ is equipped with an incline sensor for monitoring.

The monitoring to ± 2.5° lateral incline of the divisible ballast pallet „VarioTray“ is always active. If a lateral incline of ± 2.5° is reached, then only those directions of the pull cylinders can be moved which improve the condition. The other directions are unbypassably blocked. The ballast can be set down for that reason only to a maximum incline of the terrain of 2.5°.

WARNING
Defective incline sensor!
If an incline sensor is defective or missing, the monitoring of the lateral incline of the suspended ballast is not active.
The pull cylinders can be moved without restriction and the derrick ballast can be overturned as a result.
This could result in serious accidents.
▶ Observe the display values and possible error messages.
▶ If an incline sensor is defective, monitor the lateral incline of the derrick ballast manually.

The following applies:
– The display values of the lateral incline of the derrick ballast must function and be plausible.

12.8 Differential force monitoring for derrick ballast-guying

In operating modes with derrick ballast the forces of the derrick ballast guyings A and B are displayed in the LICCON monitor.

WARNING
Danger of accident!
If the forces in the derrick ballast guyings A and B are too high, then this can lead to an overload of the crane. Components can fail and severe accidents can be the result.
▶ Load the derrick ballast guyings A and B evenly.

After reaching the specified limit value of the difference force threshold, the displays of the pulled ballast of pull cylinder A and B blink and become red, the function ballast up / down is stopped. The difference force must be lowered again.

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If the difference of the forces of the derrick ballast guyings A and B exceeds the limit value, then this can have various causes:
- Flexing of the turntable.
- The ground under the derrick ballast is uneven.
- The crane is leaning to one side.
- The derrick ballast is loaded one-sided.
- The force measurement in one D-guying is incorrect.

The crane driver must recognize the correct cause and take countermeasures:
- The error, which caused the one-sided force, must be remedied.
- If the sensor values are implausible: Stop crane operation and find the cause and remedy it.

12.8.1 Bypassing the shut off of the function ballast up / down

- The following measures are permitted providing the ground is only slightly uneven:
  Control the individual pull cylinders in such a way that the difference between the forces becomes smaller. Ensure that the derrick ballast is not tilted at an inadmissible angle with respect to the crane, otherwise the derrick ballast guide and attachments will be damaged.

▶ Carry out the following: Activate assembly operation, see Crane operating instructions, chapter 4.02.

Result:

- The shut off of the function ballast up / down is bypassed.
- On the left LICCON monitor appears an assembly icon.

▶ Press the button Ballast „up“ or button Ballast „down“ **and** the stop button on the desired side at the same time, see section „Lifting / setting down / equalizing the derrick ballast“.

Problem remedy
The display of the entire pulled ballast is shown blinking red. An LMB-Stop was triggered. All crane functions were stopped.
The crane driver has moved the pull cylinders into the incorrect direction and further exceeded the limit value for the difference force threshold.
▶ Move the pull cylinders again into the correct (other) direction and align the ballast in such a way that the displays of the pulled ballast of pull cylinder A and B are again in the permissible range.

▶ Activate assembly operation again.

Result:

- The shut off of the function ballast up / down is bypassed again.
- All other crane functions are still suppressed.

▶ Move the pull cylinders into the correct direction.

DANGER
Overload of crane!
If the pull cylinders are moved into the incorrect direction after a new bypass of the function ballast up / down, the crane will be overloaded.
This could result in serious accidents.
▶ Monitor the display values and move the pull cylinders in the correct direction (values of pull cylinder A and B become closer).
▶ If unsure: Contact Liebherr Service.

▶ Find the error and remedy it which caused the shut off of the function „Ballast up / down“.

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12.9 Carrying out crane movements

Note

▶ For an overview of the displays in the LICCON monitors, see Crane operating instructions, chapter 4.02.

WARNING

Incorrect display values!

If the display values do not increase correspondingly when lifting known weights, an erroneous display value may be present.

If the crane is operated with erroneous display values, then the crane can be overloaded.

This could result in serious accidents.

▶ When lifting the hook block off the ground check if the display value for the actual load increases correspondingly.

▶ When lifting the derrick ballast off the ground check if the display value for the pulled derrick ballast BA_{pulled} increases correspondingly.

▶ When lifting the load off the ground check if the display value for the actual load increases correspondingly.

WARNING

The crane can topple over!

The jerky execution or braking of turning maneuvers can cause the load and / or suspended ballast to swing.

If the load and / or the suspended ballast collides with obstacles then the crane can be damaged or impeded.

Oscillating movements, damage or impediments can cause the crane to topple over.

This could result in serious accidents.

▶ Initiate or slow down crane movements with load and / or suspended derrick ballast extremely sensitively.

▶ There may be no persons and / or objects within the working range / danger zone of the crane.

▶ During crane operation additional personnel (guide) must monitor and secure the working range / danger zone of the crane from a safe position.

WARNING

Danger of accident due to unsafe ground!

If the crane is operated on insufficient ground, there is a danger of accident.

▶ The ground in the entire working area of the crane must be level and of sufficient load carrying capacity, in order to be able to securely accept the encountered surface pressures.

▶ Before setting down the load or the derrick ballast, the crane operator must make sure that the intended placement surface is suitable. A safe set down of load and derrick ballast must be ensured.

WARNING

Uncontrolled movements of the boom system!

If the guying between the A-frame and the derrick head (test point 1) becomes powerless, then this can lead to uncontrolled movements of the boom system.

This could result in serious accidents.

▶ The guying between the A-frame and the derrick head (test point 1) may never be without power.

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WARNING
Danger of accidents due to angular pull!
Due to angular pull of load or derrick ballast impermissible side forces are directed into the crane.
Impermissible side forces can cause failure of the components or a dangerous change of the center of gravity of the crane and / or load, among others.
Crane and load can be severely damaged and topple over.
This could result in serious accidents.
▶ Before taking on a load or the derrick ballast, make sure that the derrick ballast, the center of rotation of the turntable and the load are on one line.

WARNING
The crane can topple over!
If the derrick ballast is lifted by more than 0.25 m above the ground, then the crane can fall over to the rear if the load rips off.
▶ Do not lift derrick ballast more than 0.25 m from the ground.

Make sure that the following prerequisites are met:
- The test points must be checked for function before crane operation.
- The weight of the load to be lifted must be known.
- The support surface / placement surface of the derrick ballast may be maximum 0.25 m above / below the support surface of the crane.
- The support surface / placement surface of the derrick ballast must be level, horizontal and of sufficient load bearing capacity.
- The support surface / placement surface of the derrick ballast must be able to safely absorb the surface pressure.
- There may not be any obstacles in the slewing range of the crane, derrick ballast and load.
- Additional personnel is instructed to monitor and secure the working range / danger zone of the crane from a safe distance.
- A permanent acoustic / visual connection between the crane operator and the additional personnel is available.
- A guide or the crane driver must monitor the lifting and setting down of the derrick ballast and the load.
- The lifted derrick ballast is monitored by a guide or the crane operator.

The following applies:
- When taking up the load, the D-guying between the derrick ballast and the derrick head must be relieved so that the operating force $F1_{actual}$ is larger than the limit value for the F1-minimum force.
- Before taking up the load or the derrick ballast, make sure that the following components are on one line:
  - The load
  - The center of rotation of the turntable
  - The derrick ballast

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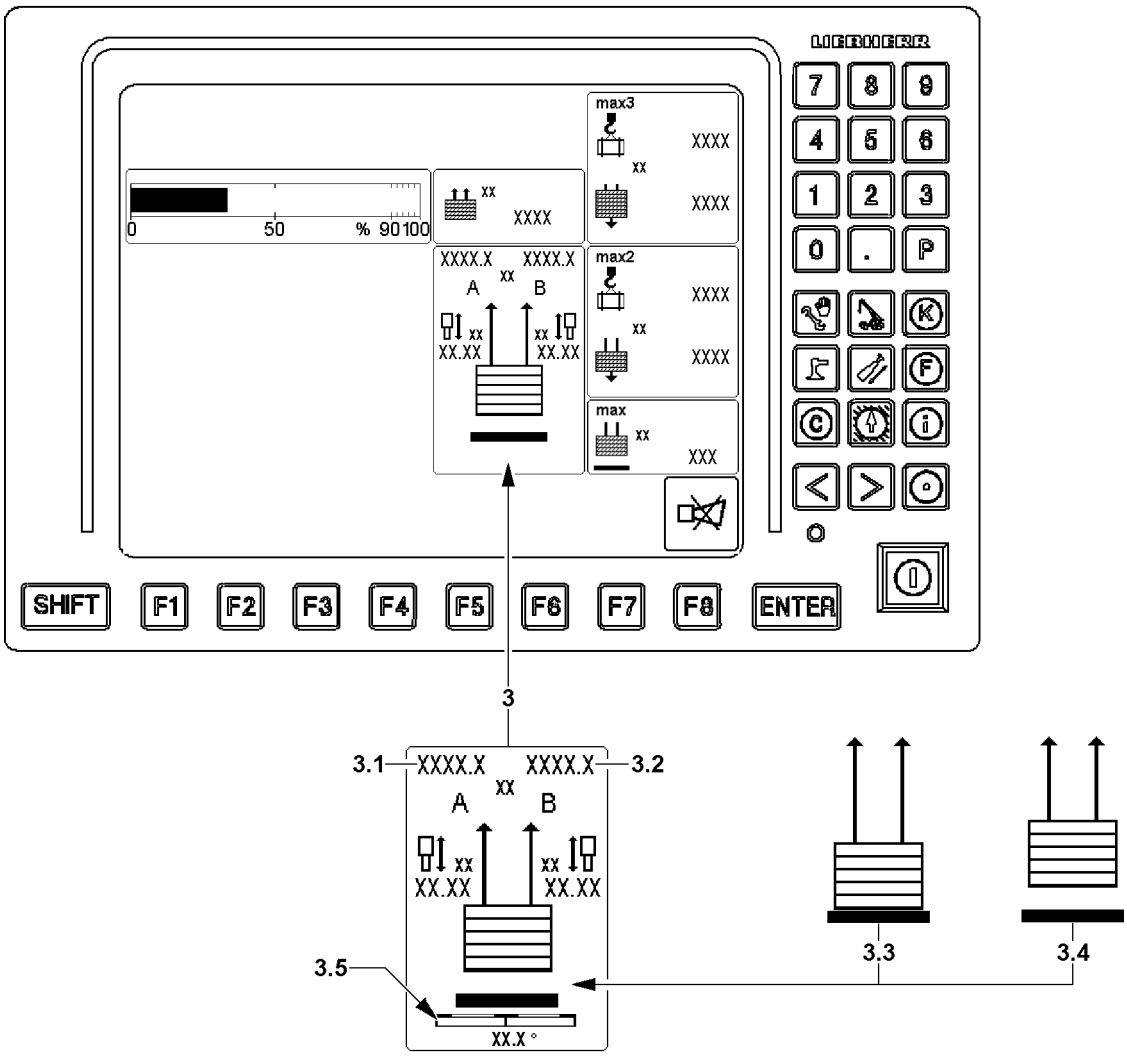

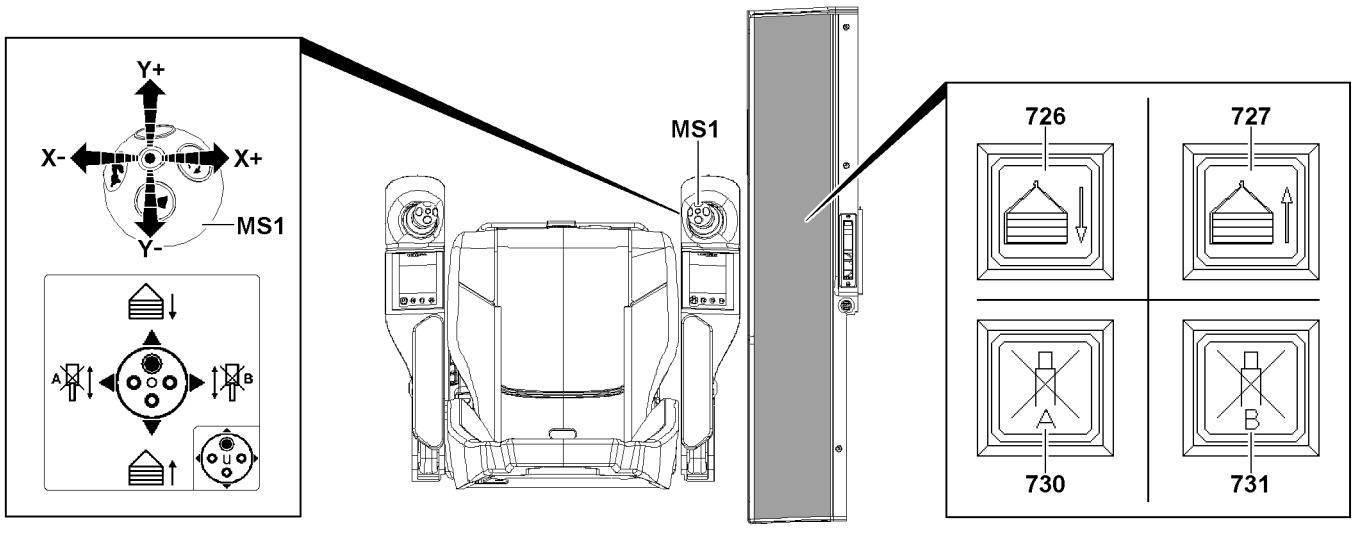

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Fig.146965

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12.9.1 Lifting / setting down the derrick ballast

WARNING
Danger of accident!
The placement surface for the divisible ballast pallet „VarioTray“ must be level, horizontal and of sufficient load bearing capacity, otherwise the divisible ballast pallet „VarioTray“ can tip over.
This could result in serious accidents.

- ▶ Check the incline of the crane during the set down procedure.
- ▶ Check the incline of the divisible ballast pallet „VarioTray“ with the incline display **3.5**.
- ▶ Monitor the difference forces (derrick ballast guying A **3.1** to derrick ballast guying B **3.2**).
- ▶ It is strictly prohibited for anyone to stand under the divisible ballast pallet „VarioTray“ or within the entire danger zone during the set down procedure.

The lifting and set down of the derrick ballast is monitored by the LICCON computer system. Normally the crane operator does not have to do anything. However, if corrective measures or preventative measures should be necessary, observe the following section „Equalizing the derrick ballast“.

Lifting the derrick ballast

- ▶ Lift the derrick ballast: Press the button **727**.
  or
  Deflect the master switch **MS1** in direction **Y-**.

Result:

- – The piston rods of the pull cylinders retract together.
- – The derrick ballast is raised.
- – The divisible ballast pallet „VarioTray“ loses all ground contact:
  The ground contact switches are no longer actuated, the „Derrick ballast lifted off“ icon **3.4** appears.
  The „turning the turntable“ and „driving the crawler“ crane movements are released.

Lowering the derrick ballast

- ▶ Lower the derrick ballast: Press the button **726**.
  or
  Deflect the master switch **MS1** in direction **Y+**.

Result:

- – The piston rods of the pull cylinders extend together.
- – The derrick ballast is countersunk
- – When the divisible ballast pallet „VarioTray“ touches the ground:
  The ground contact switches are actuated, the „Derrick ballast has ground contact“ icon **3.3** appears.
  The „turning the turntable“ and „driving the crawler“ crane movements are blocked.

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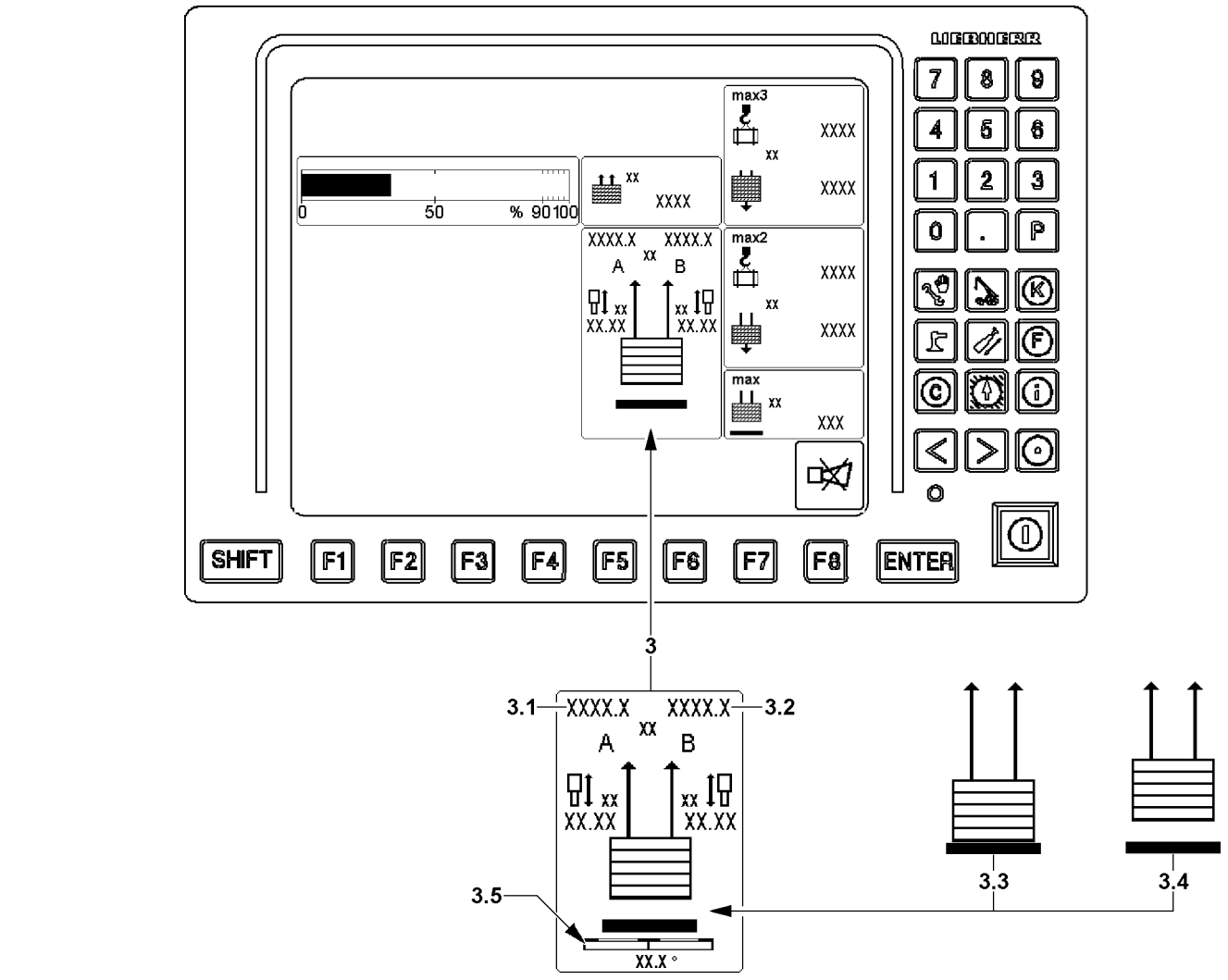

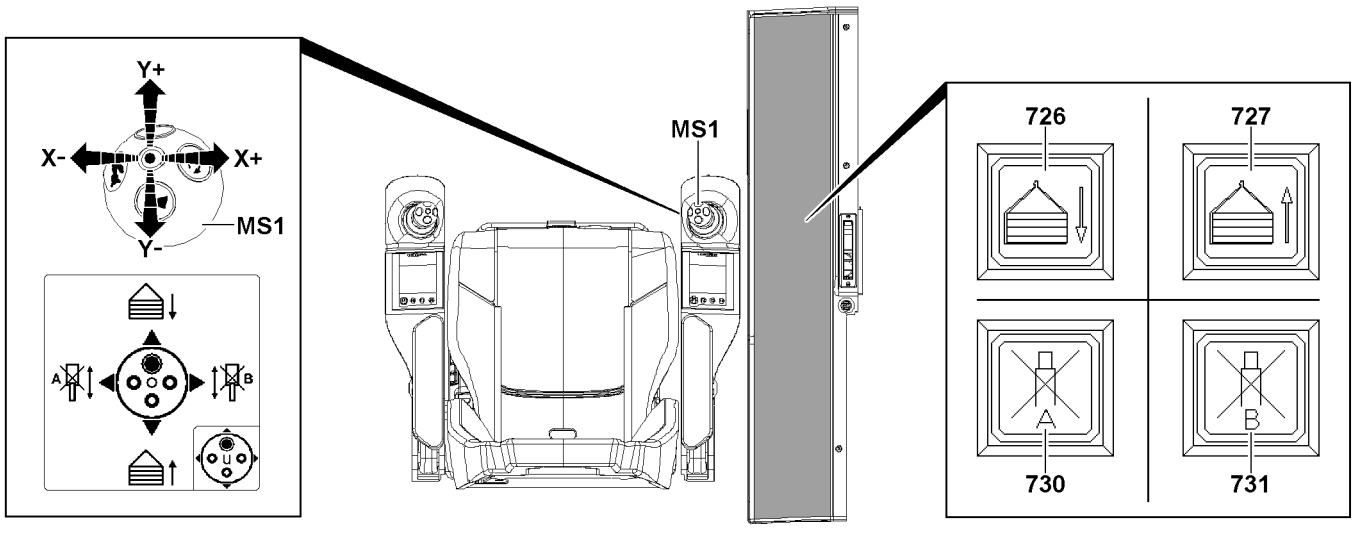

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Fig.146965

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12.9.2 Equalizing the derrick ballast

WARNING
Danger of accident!
The placement surface for the divisible ballast pallet „VarioTray“ must be level, horizontal and of sufficient load bearing capacity, otherwise the divisible ballast pallet „VarioTray“ can tip over.
This could result in serious accidents.

- ▶ Check the incline of the crane during the set down procedure.
- ▶ Check the incline of the divisible ballast pallet „VarioTray“ with the incline display **3.5**.
- ▶ Monitor the difference forces (derrick ballast guying A **3.1** to derrick ballast guying B **3.2**).
- ▶ It is strictly prohibited for anyone to stand under the divisible ballast pallet „VarioTray“ or within the entire danger zone during the set down procedure.

If a limit value in the difference force monitoring (Ratio of derrick ballast guying A **3.1** to derrick ballast guying B **3.2**) or the incline display **3.5** is exceeded, the derrick ballast must be equalized.

Block the pull cylinder (A) when lifting:

- ▶ Press the button **727** and the button **730**.
  or
  Deflect the master switch **MS1** diagonally in direction **X-** and direction **Y-**.

Result:

- – The piston rod of the pull cylinder (A) stops.
- – The piston rod of pull cylinder (B) moves in.
- – Side (B) of the derrick ballast lifts up.

Block the pull cylinder (B) when lifting:

- ▶ Press the button **727** and the button **731**.
  or
  Deflect the master switch **MS1** diagonally in direction **X+** and direction **Y-**.

Result:

- – The piston rod of the pull cylinder (B) stops.
- – The piston rod of pull cylinder (A) moves in.
- – Side (A) of the derrick ballast lifts up.

Block the pull cylinder (A) when lowering:

- ▶ Press the button **726** and the button **730**.
  or
  Deflect the master switch **MS1** diagonally in direction **X-** and direction **Y+**.

Result:

- – The piston rod of the pull cylinder (A) stops.
- – The piston rod of pull cylinder (B) moves out.
- – Side (B) of the derrick ballast lowers.

Block the pull cylinder (B) when lowering:

- ▶ Press the button **726** and the button **731**.
  or
  Deflect the master switch **MS1** diagonally in direction **X+** and direction **Y+**.

Result:

- – The piston rod of the pull cylinder (B) stops.
- – The piston rod of pull cylinder (A) moves out.
- – Side (A) of the derrick ballast lowers.

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13 Crawler operation with derrick ballast

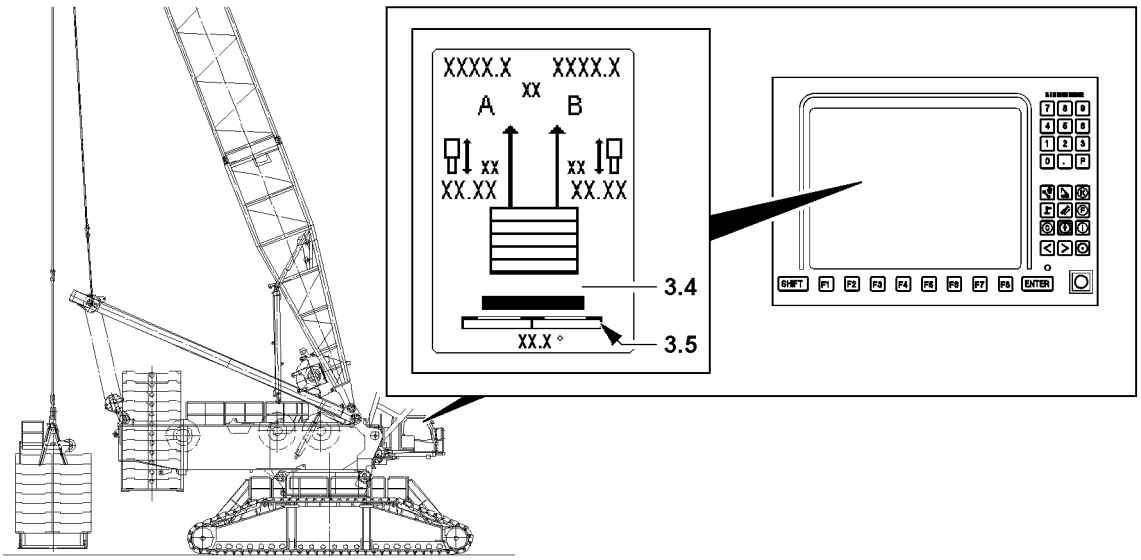

Fig.145934

Note

- Driving the crawler crane, see the Crane operating instructions, chapter 4.10.
- Release for driving the crawler takes place when all 4 ground contact rollers are no longer in contact with the ground.

13.1 Driving the crawler

Driving with suspended derrick ballast.

WARNING

Prerequisites for driving are not met, load or derrick ballast are oscillating too much!
If the specifications from the Crane operating instructions, chapter 4.10 are not observed, there is a danger of accident.
If the suspended load or the suspended derrick ballast starts to swing too much, then the crane operator can lose control over the crane.
If the following prerequisites are not observed, the crane can topple over.
This could result in serious accidents.

- Observe the specifications in the Crane operating instructions, chapter 4.10.
- Do not exceed the maximum permissible driving speed of the crawler.
- Avoid jerky driving movements.
- Avoid oscillation of the suspended load and the suspended derrick ballast. Turn and drive slowly.
- The attached load and suspended derrick ballast must be secured to prevent it from swinging. If oscillating movements should occur, set the load / derrick ballast as fast as possible down on the ground. Hereby pay attention to the limit values of the load moment display and the F-load display.
- Steering the crawler with a suspended load and / or installed derrick ballast is prohibited.
- Uphill and downhill inclines and lateral inclines may only be driven within the permissible angle range.

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Make sure that the following prerequisites are met:
- Observe the specifications in the Crane operating instructions, chapter 4.10.
- Pay special attention to the limitations for crawler operation with derrick ballast.
- The ground is suitable for crawler operation with derrick ballast.
- The ground can safely take on the resulting surface pressure.
- The derrick ballast is lifted off the ground.
- The „Derrick ballast lifted off“ icon **3.4** appears on the LICCON monitor.
- The derrick ballast is horizontally aligned (observe the incline display **3.5**).

14 Disassembling

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane operator of the main crane must be in voice contact with the crane operator / crane operators of the auxiliary crane / auxiliary cranes.
- ▶ For assembly / disassembly tasks, the crane operator may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

DANGER
The components can fall down!
If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

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DANGER
Falling erection racks!
If the erection racks are not secured with retaining pins, then they will fall down uncontrolled when unpinning the guy rods.
Death, severe bodily injuries, property damage.
- ▶ The two erection racks must be locked and secured in a vertical position with retaining pins. Only then may the guy rods be removed.
- ▶ It is prohibited for anyone to remain under the erection racks as well as within the entire danger zone.

15 Removing the ballast on the divisible ballast pallet „VarioTray“

Make sure that the following prerequisites are met:
- The crane is properly supported and horizontally aligned.
- An auxiliary crane is available.
- The counterweight has been installed on the turntable according to the load chart.
- The maximum ground unevenness for the placement surface of the derrick ballast is plus / minus 1°.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection settings have been compared with the actual set up configuration.
- The two erection racks are be locked and secured in a vertical position with retaining pins.

15.1 Setting down the derrick ballast

WARNING
Danger of toppling the ballast stack!
The placement surface for the derrick ballast must be level, horizontal and of sufficient load bearing capacity, otherwise the ballast stacks can tip over.
Death, severe bodily injuries, property damage.
- ▶ Check the horizontal position of the crane during the set down procedure.
- ▶ Check the horizontal position of the derrick ballast during the set down procedure.
- ▶ Constantly check the differential forces in the guying on LICCON monitor 1.
- ▶ It is strictly prohibited for anyone to stand under the derrick ballast or in any part of the danger zone during the set down procedure.

Make sure that the following prerequisites are met:
- The placement surface for the derrick ballast must be level, horizontal and of sufficient load bearing capacity.
- A guide or crane driver monitor the setting down of the derrick ballast and the load.

▶ Extend the piston rods, see section „Carrying out crane movements“.

Result:

– The derrick ballast is lowered.

▶ When the ballast pallet touches the ground, the ground contact switches are actuated.

Result:

– The **turning the turntable** and **driving the crawler** crane movements turn off.

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15.2 Disconnecting the electrical connections

Note

▶ Disconnect the electrical connections from the suspended ballast to the turntable, see Electric wiring diagram.

▶ Disconnect the electrical connections.
▶ Close the electrical connections off properly with dummy plugs or protective caps.

15.3 Removing the ballast on the divisible ballast pallet „VarioTray“

WARNING

The crane can topple over!
If the following danger notes are not observed, the ballast plates or the ballast stack can slip on the divisible ballast pallet „VarioTray“ and fall down.
Death, severe bodily injuries, property damage.

▶ The ground on which the ballast is removed from the divisible ballast pallet „VarioTray“ must be level and have adequate load bearing capacity.
▶ Always take down the ballast plates symmetrically, in reference to the longitudinal axis.
▶ It is necessary to start with the two outer ballast stacks.
▶ The difference for the center ballast stack may not be more than a maximum of one ballast plate while removing the ballast.
▶ The ballast on both outer ballast stacks can be removed with ballast assemblies of two ballast plates each.
▶ The difference between both outer ballast stacks may not be more than maximum 25 t when removing the ballast.
▶ Replace damaged ballast plates immediately with new ballast plates.
▶ Observe the weight signs on the ballast pallets.

15.3.1 Removing the ballast plates, fastening system: „Twistlock“

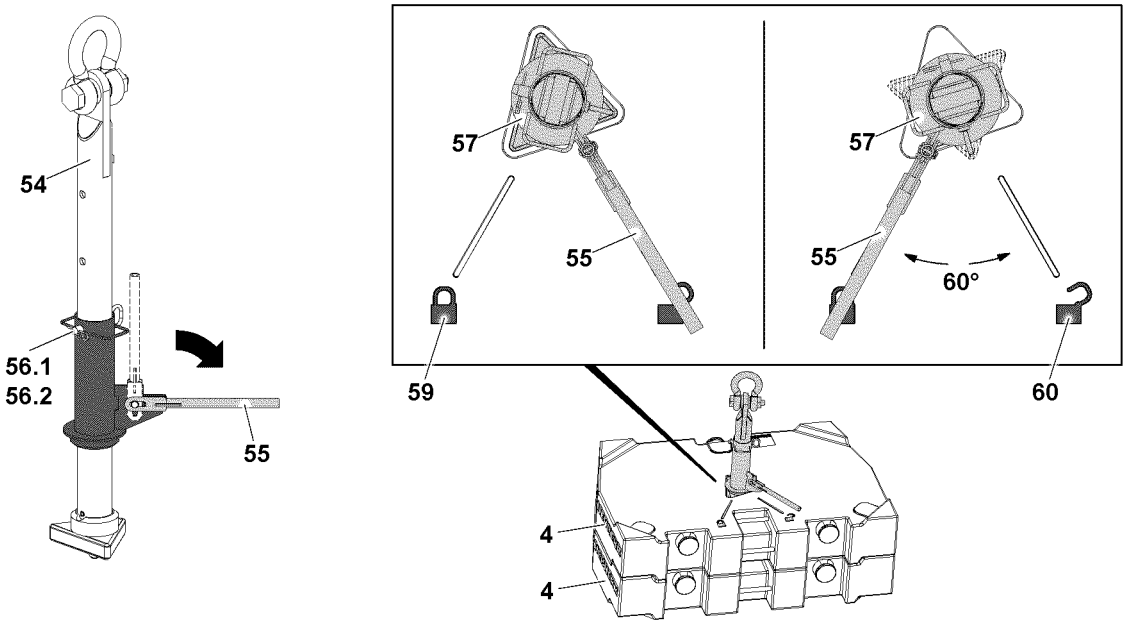

Fig.145282: Ballast plates, fastening system: „Twistlock“

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WARNING
Danger of accident!
If more than the permissible two ballast plates are lifted with the receptacle stud, the receptacle stud will be overloaded and can be damaged.
Death, severe bodily injuries, property damage.
▶ Make sure that the ballast plates are placed correctly in the centerings.
▶ Replace damaged ballast plates.

To lift off the ballast plate(s) **4**, use the receptacle stud **54**.

Before the receptacle stud **54** is guided into the ballast plates, it must be ensured that the length of the receptacle stud **54** is set correctly. The length of the receptacle stud **54** can be adjusted with the pin **56**.

If the length of the receptacle stud **54** is to be adjusted:
▶ Release and unpin the pin **56.1**.
▶ Adjust the length of the receptacle stud by moving the receptacle stud **54**.
▶ Insert the pin **56** and secure it with the retaining element **56.2**.
▶ Fasten the receptacle stud **54** to the auxiliary crane and guide it into the ballast plate(s).
▶ Pull the lever **54** up and fold it down.
▶ Turn the lever **55** by 60° until the lever **55** points to the icon **59**.

Result:

– The receptacle stud **54** is locked with the ballast plate.

▶ Lift the ballast plate with the receptacle stud **54** and remove it carefully from the ballast stack or the divisible ballast pallet „VarioTray“.
▶ Turn the lever **55** by 60° until the lever **55** points to the icon **60**.

Result:

– The receptacle stud **54** is unlocked.

▶ Carefully pull the receptacle stud **54** from the ballast plate.
▶ Alternately remove the ballast plates on both sides.

15.3.2 Removing the ballast plates, fastening system: „Bitt“

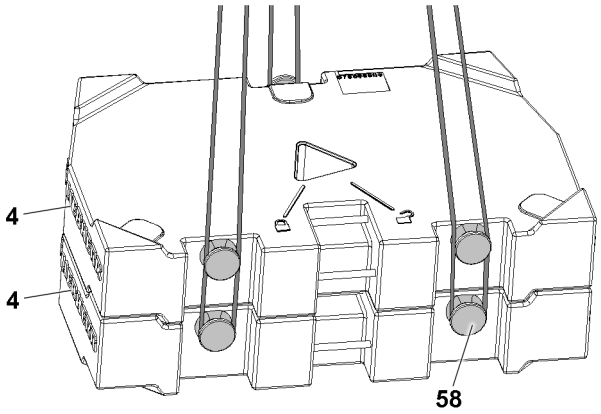

Fig.145283: Ballast plates, fastening system: „Bitt“

WARNING
Falling ballast plates!
If more than the permissible loads are lifted, then the bitts **58** are overloaded and the ballast plates can fall down.
Death, severe bodily injuries, property damage.
▶ Lift the ballast plates individually or as a package, maximum 20 t , 3 fastening points.
▶ Replace damaged ballast plates immediately.

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WARNING
Incorrect handling of the fastening equipment!
If the fastening equipment is not attached correctly and if it is not secured sufficiently to prevent it from loosening up, loads can fall down.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the fastening equipment is correctly attached on the bitts **58** and that it is secured sufficiently to prevent it from loosening up.

- ▶ Lift the ballast plates **4** off individually or as an assembly of maximum two plates alternately on the left and right with the auxiliary crane.

16 Disassembling the suspended ballast

16.1 Disassembling the guy rods from the erection racks

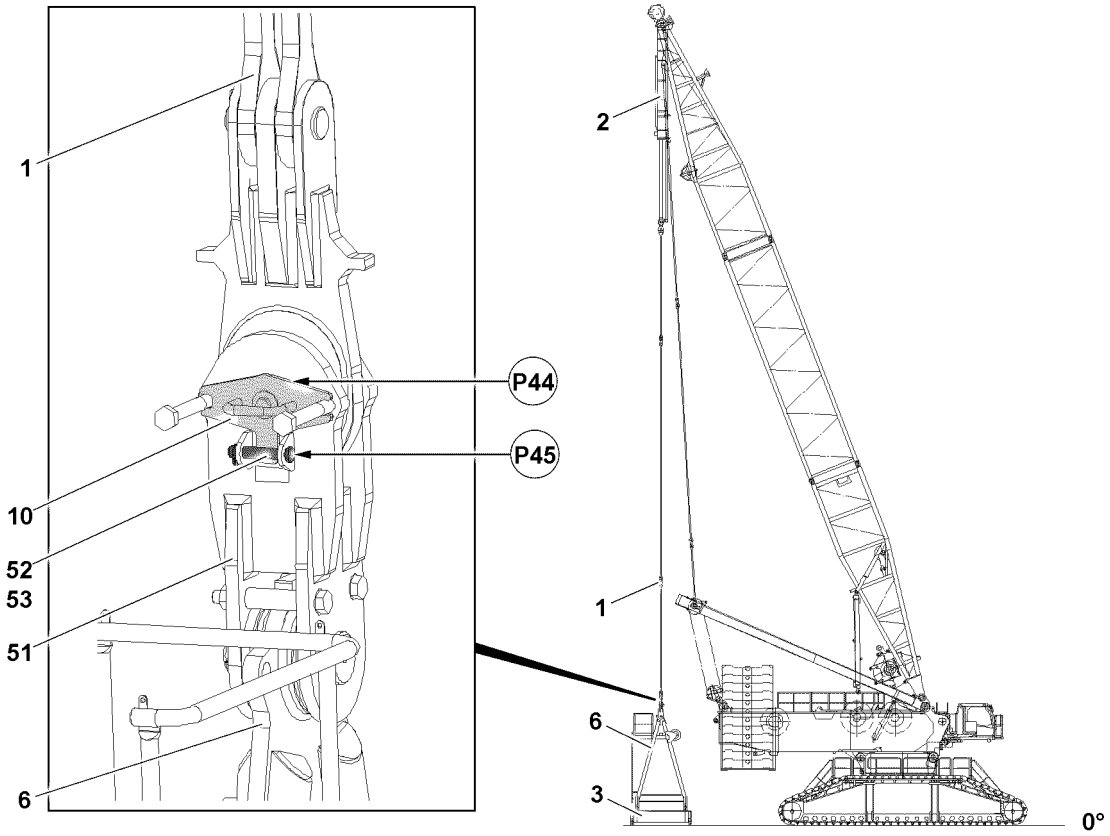

Fig.145276: Unpinning procedure

DANGER
Falling erection racks!
If the erection racks are not secured with retaining pins, then they will fall down uncontrolled when unpinning the guy rods.
Death, severe bodily injuries, property damage.
- ▶ The two erection racks must be locked and secured in a vertical position with retaining pins **8**. Only then may the guy rods be removed.
- ▶ It is prohibited for anyone to remain under the erection racks as well as within the entire danger zone.

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Make sure that the following prerequisites are met:
- The erection racks are secured.
- The ballast plates are removed.

▶ Remove the retaining element **53** at point **P45** and unpin the retaining pin **52**.
▶ Unpin the connector pin **10** at point **P44**.

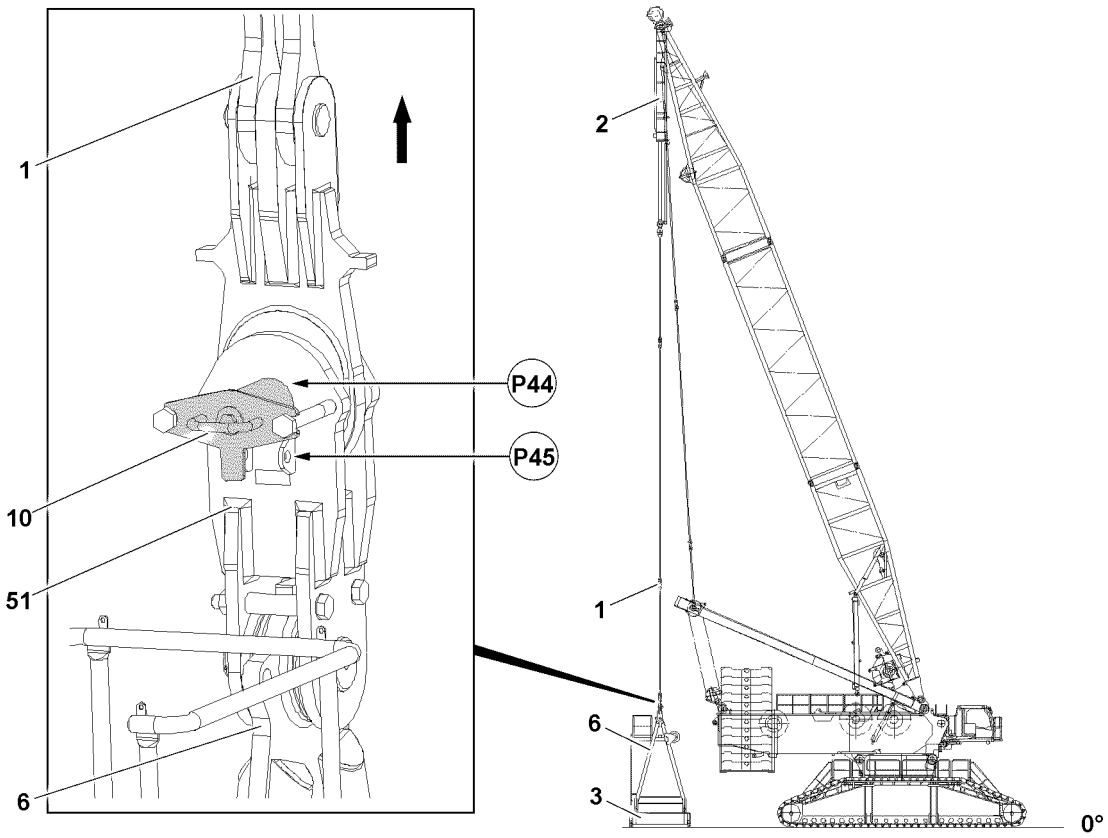

Fig.145293: Unpinning procedure

▶ Drive out the guy rods **1** out by retracting the piston rods on the pull cylinders **2** from the brackets **51** of the erection rack **6**.

Note
Retract / extend the pull cylinder **2**
▶ Control the pull cylinders **2** from the crane cab, see the section „Lifting and lowering the derrick ballast using the pull cylinders“.
▶ Operate the pull cylinder **2** with the radio remote control, see the „radio remote control operating instructions“.

▶ Insert the connector pin **10** again at point **P44**.
▶ Insert the retaining pin **52** at point **P45** and secure with the retaining element **53**.

Result:

– The connector pin **10** is secured.

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17 Disassembling the suspended ballast with the suspended ballast guide

17.1 Disassembling the suspended ballast guide on the erection racks

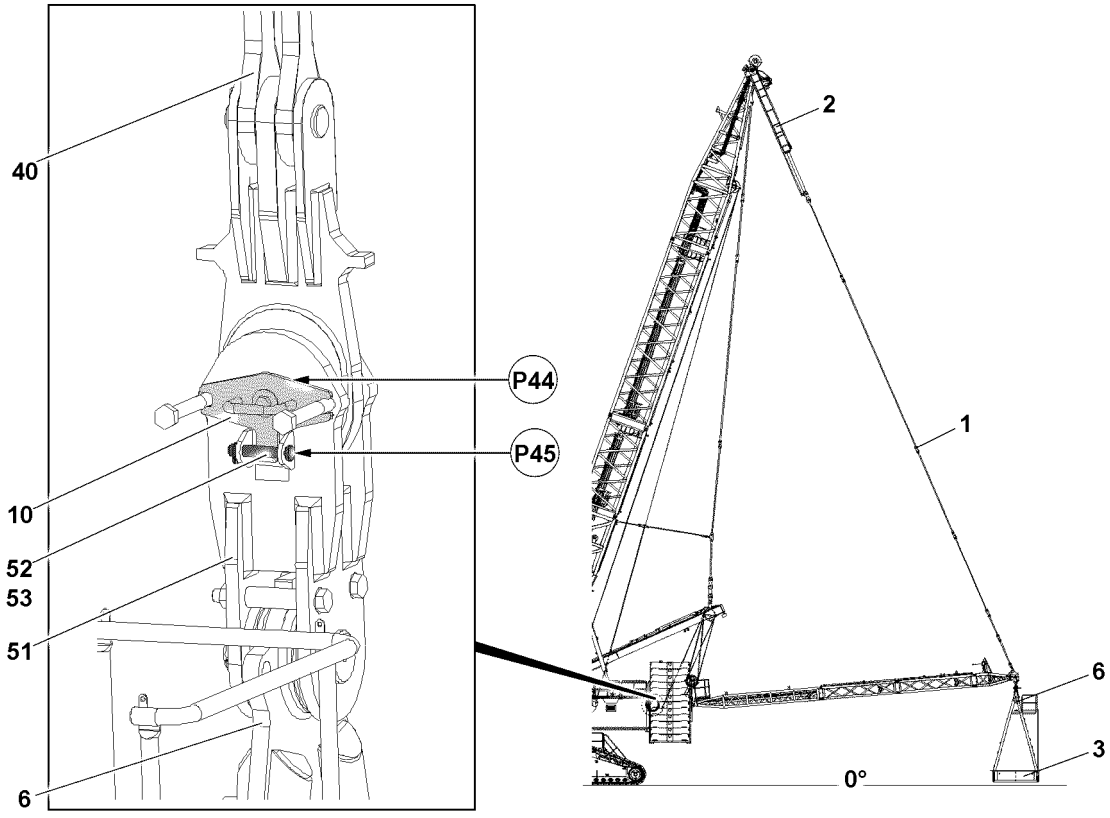

Fig.145279: Unpinning procedure

DANGER
Falling erection racks!
If the erection racks are not secured with retaining pins, then they will fall down uncontrolled when unpinning the guy rods.
Death, severe bodily injuries, property damage.
- ▶ The two erection racks must be locked and secured in a vertical position with retaining pins. Only then may the guy rods be removed.
- ▶ It is prohibited for anyone to remain under the erection racks as well as within the entire danger zone.

Make sure that the following prerequisites are met:
- The erection racks are secured.
- The ballast plates are removed.

▶ Remove the retaining element **53** at point **P45** and unpin the retaining pin **52**.
▶ Unpin the connector pin **10** at point **P44**.

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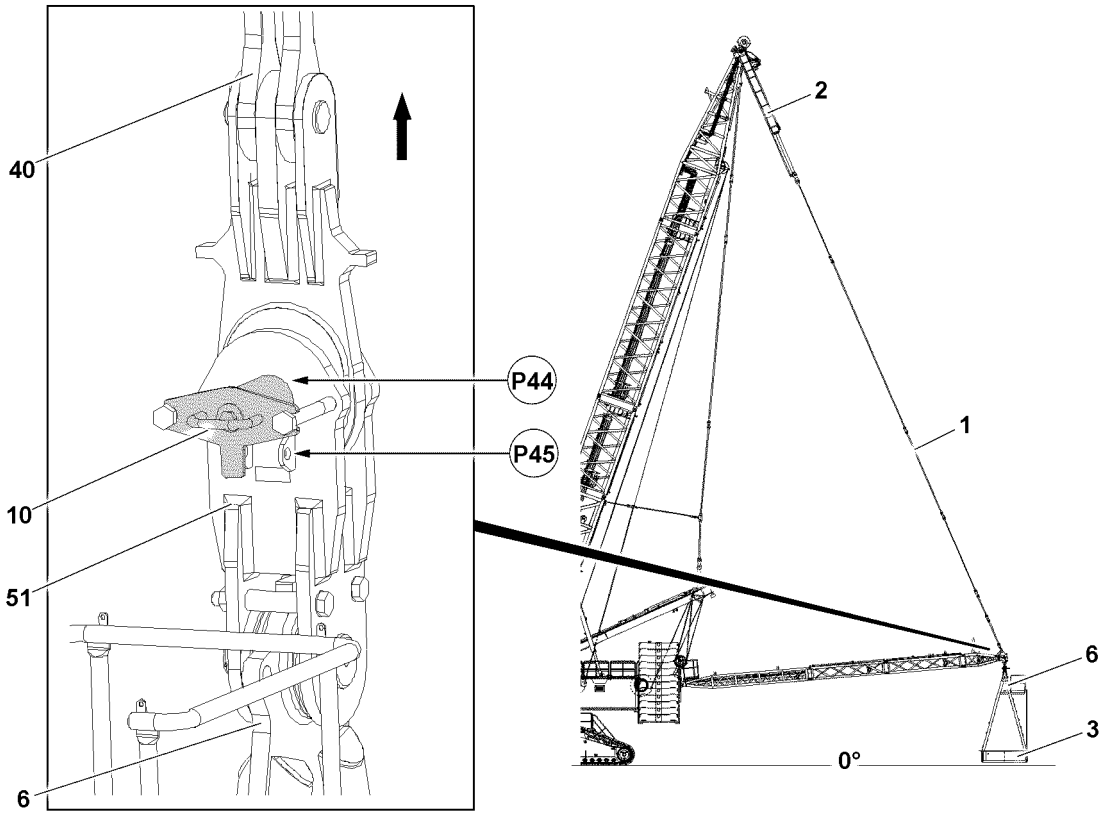

Fig.145294: Unpinning procedure

▶ Drive out the guy rods **1** out by retracting the piston rods on the pull cylinders **2** from the brackets **51** of the erection rack **6**.

Note

Retract / extend the pull cylinder **2**

▶ Control the pull cylinders **2** from the crane cab, see the section „Lifting and lowering the derrick ballast using the pull cylinders“.

▶ Operate the pull cylinder **2** with the radio remote control, see the „radio remote control operating instructions“.

▶ Insert the connector pin **10** again at point **P44**.

▶ Insert the retaining pin **52** at point **P45** and secure with the retaining element **53**.

Result:

– The connector pin **10** is secured.

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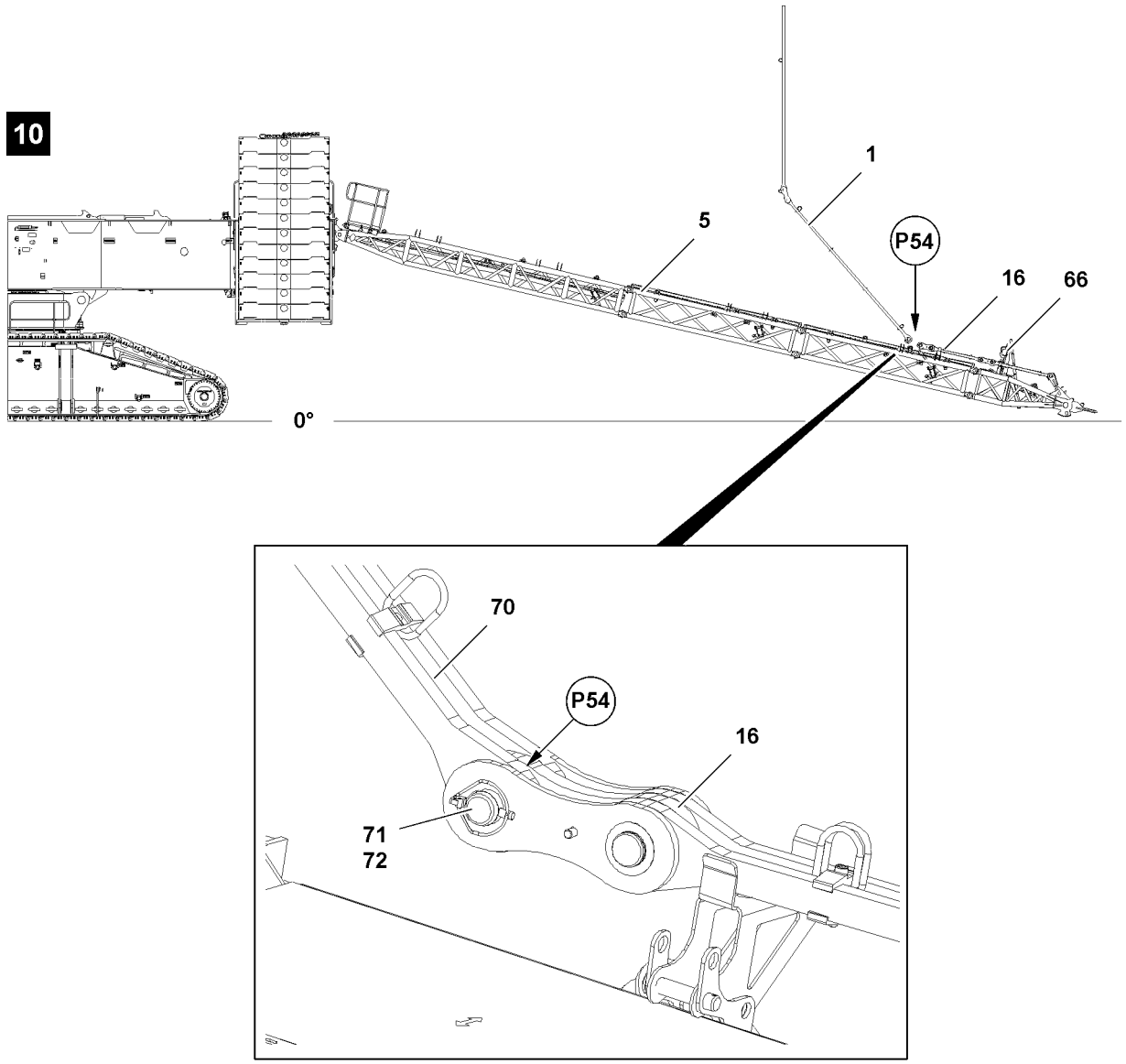

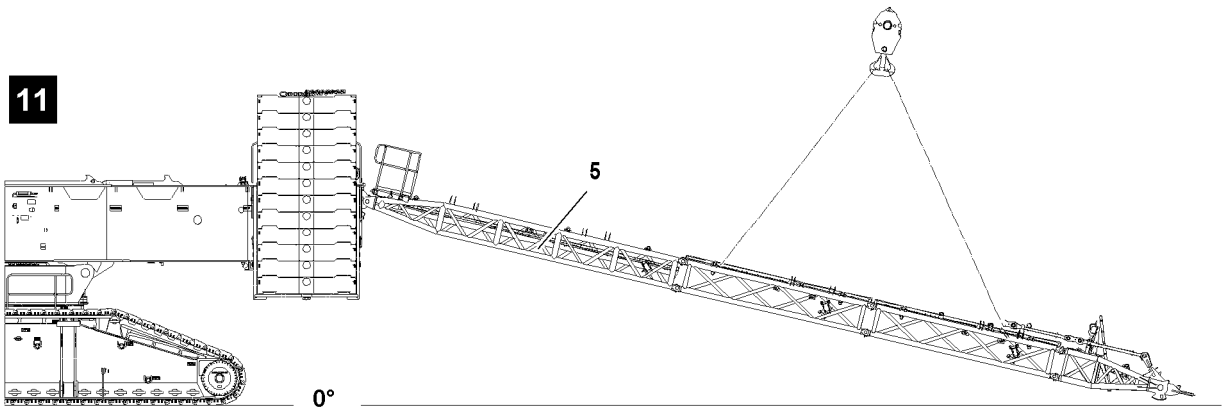

Fig.120215

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17.2 Disassembling the suspended ballast guide

Derrick ballast radius	Number of intermediate sections
20 m	0
25 m	1
30 m	2

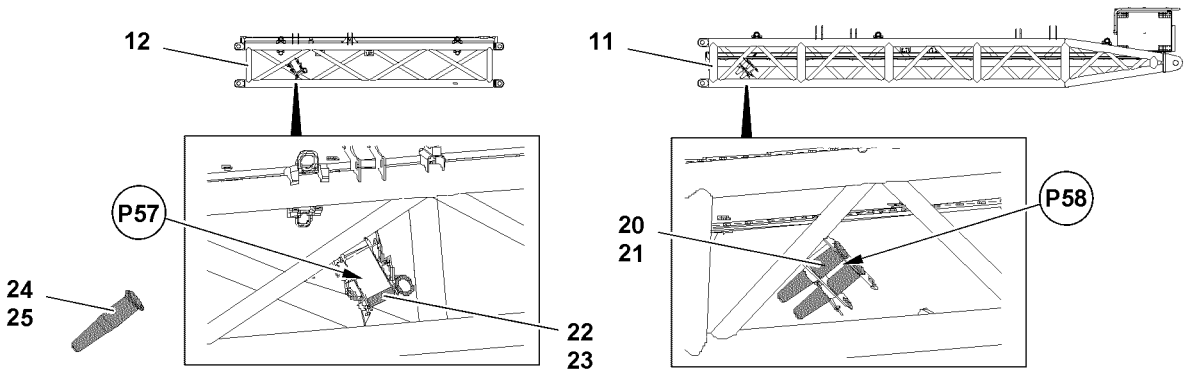

Fig.122802: Park position for pin

Note

- ▶ Park position **P57** for pin **24** and pin **22**.
- ▶ Park position **P58** for pin **20**.

WARNING

Falling pins!

Death, severe bodily injuries, property damage.

- ▶ Make sure that all pins are properly secured in the park positions with the respective retaining elements.

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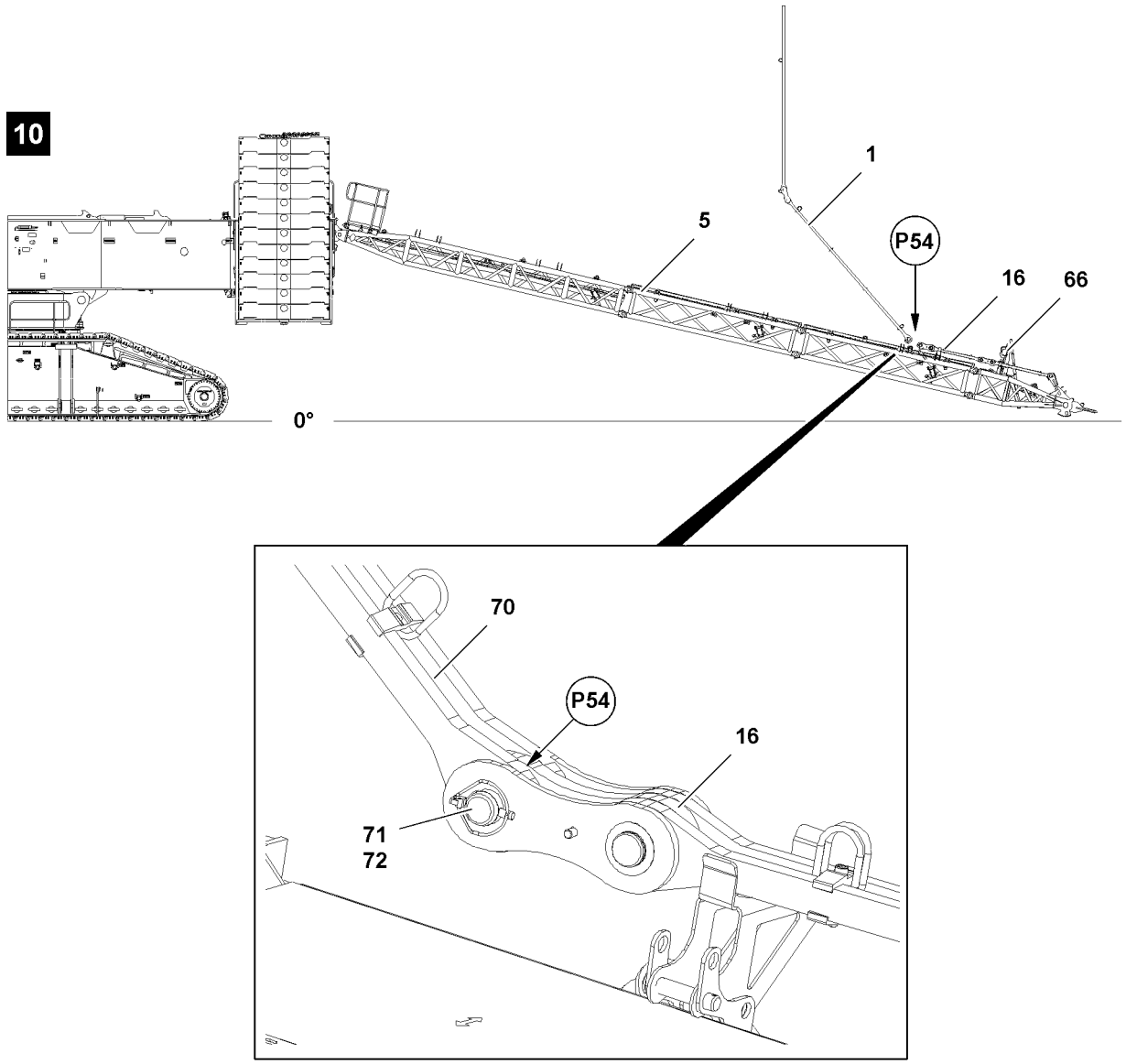

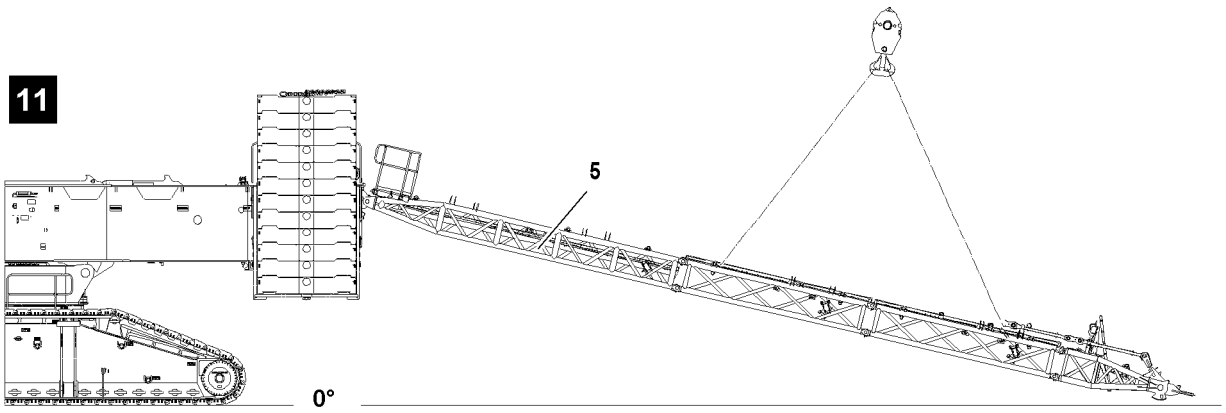

Fig.120215

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17.2.1 Unpinning the pull rods of the suspended ballast guide from the D-guy rods

Make sure that the following prerequisite is met:
– The suspended ballast guide is separated from the suspended ballast.

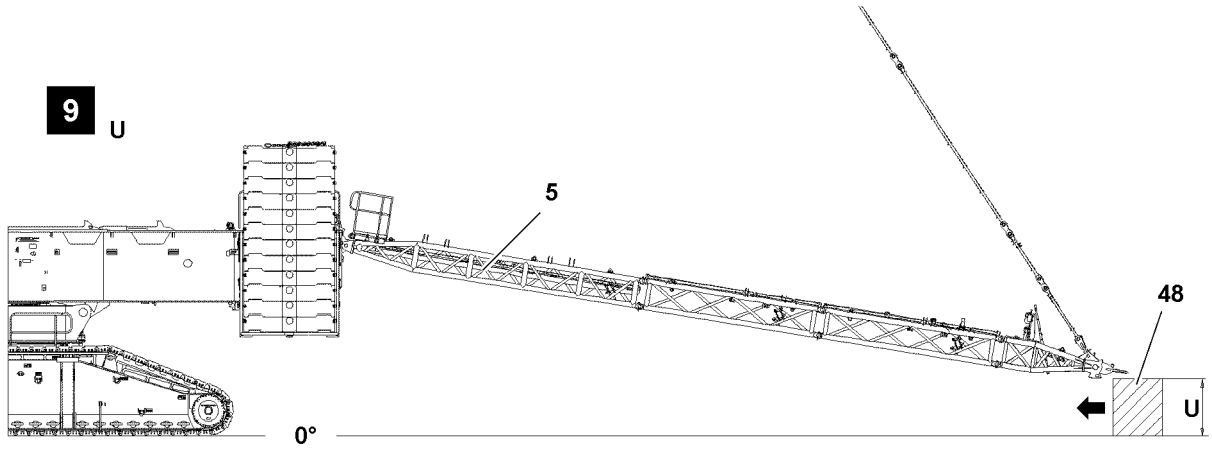

Fig.120214: Substructure

Suspended ballast guide	R30	R25	R20
Substructure height „U“	0 m	1.6 m	2.0 m

When the suspended ballast guide **5** is separated from the suspended ballast:
▶ Drive the crane away from the suspended ballast.
▶ Take the suspended ballast guide **5** down with the derrick onto the substructure **48**, see illustration **9** and chart.
▶ Connect the rope of the manual rope winch **66** with the D-guy rods **1**.

The D-guy rods **1** are pinned on both sides on the suspended ballast guide **5**. The unpinning procedure is described on the example for one D-guy rod.

WARNING
Swinging D-guy rods!
When unpinning the D-guy rods **1** at point **P54** they swing uncontrolled in the direction of the turntable.
Death, severe bodily injuries, property damage.
▶ Make sure that the D-guy rods are secured with the manual rope winches before unpinning.

▶ Remove the retaining element **72** at point **P54** and unpin the pin **71**, see illustration **10**.
▶ Swing the D-guy rods **1** with the aid of the manual rope winch **66** and simultaneously luff up the derrick in direction of the turntable.

When the D-guy rods **1** hang vertically:
▶ Remove the rope of the manual rope winch **66** and spool it up.
▶ Fasten the suspended ballast guide **5** to the auxiliary crane, see illustration **11**.

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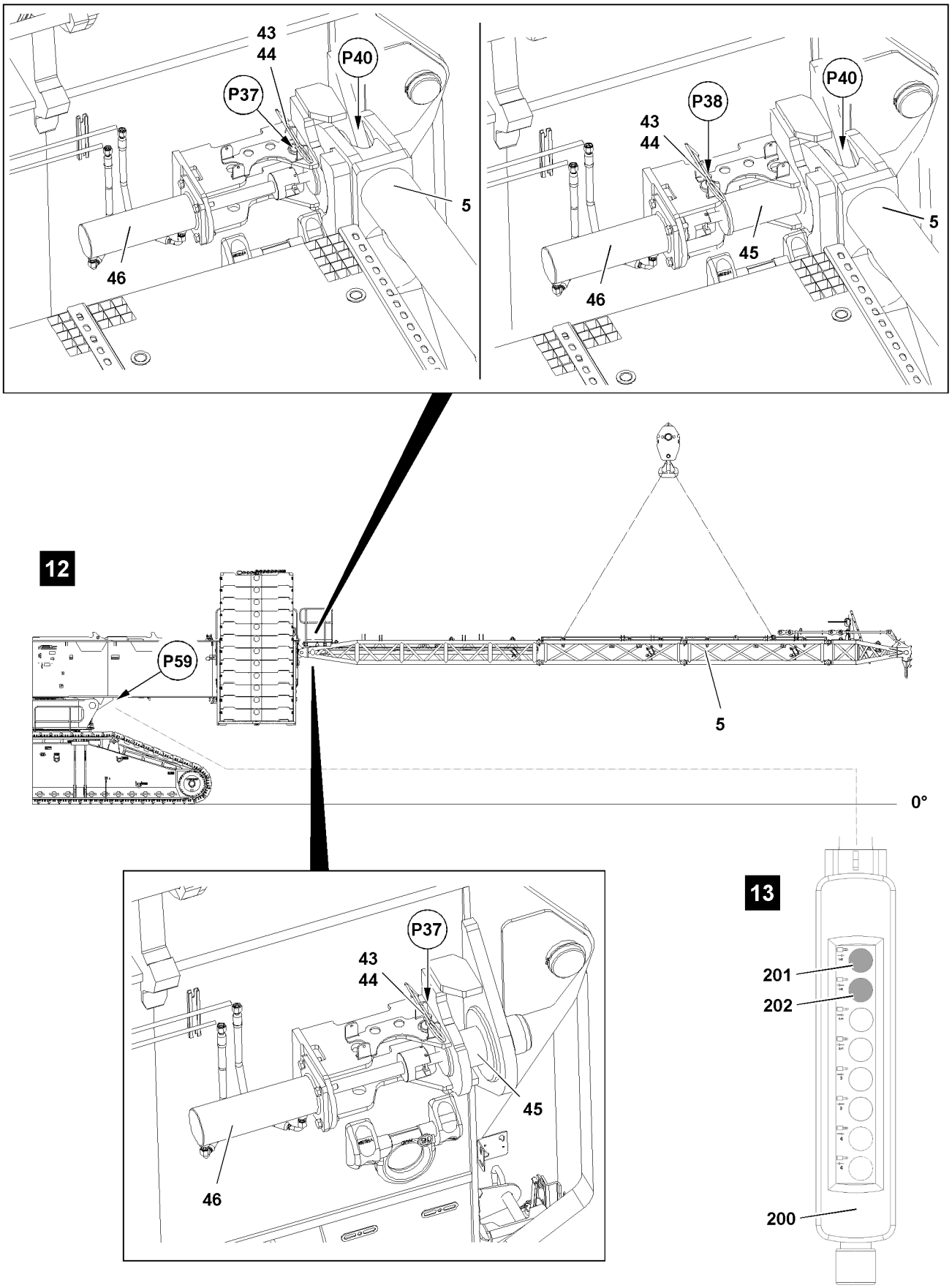

Fig.120216

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17.2.2 Disassembling the suspended ballast guide on the turntable frame

Make sure that the following prerequisites are met:
- The suspended ballast guide is fastened to the auxiliary crane.
- The control panel is connected on the „rear turntable“ socket, point **P59**.

▶ Swing the suspended ballast guide **5** to the horizontal.

The suspended ballast guide **5** is pinned on two points **P40**. The unpinning procedure is described for one pin as an example:

▶ Release the pin **45**: Remove the retaining element **44** at point **P37** and unpin the retaining pin **43**, see illustration **12**.

▶ Insert the retaining pin **43** at point **P38** and secure with the retaining element **44**.

When the suspended ballast guide **5** is safely held by the auxiliary crane:

▶ Unpin the pin **45**: Press button **202** on the control panel **200**, see illustration **13**.

Result:

– The pin **45** moves out.

When both pins **45** are unpinned:

▶ Remove the suspended ballast guide **5** from the pin points on the rear of the turntable and place it on the substructure.

▶ Insert the pins **45** again: Press button **201** on the control panel **200**, see illustration **13**.

Result:

– The pin **45** moves in.

▶ Secure the pin **45**: Insert the retaining pin **43** at point **P37** and secure with the retaining element **44**, see illustration **12**.

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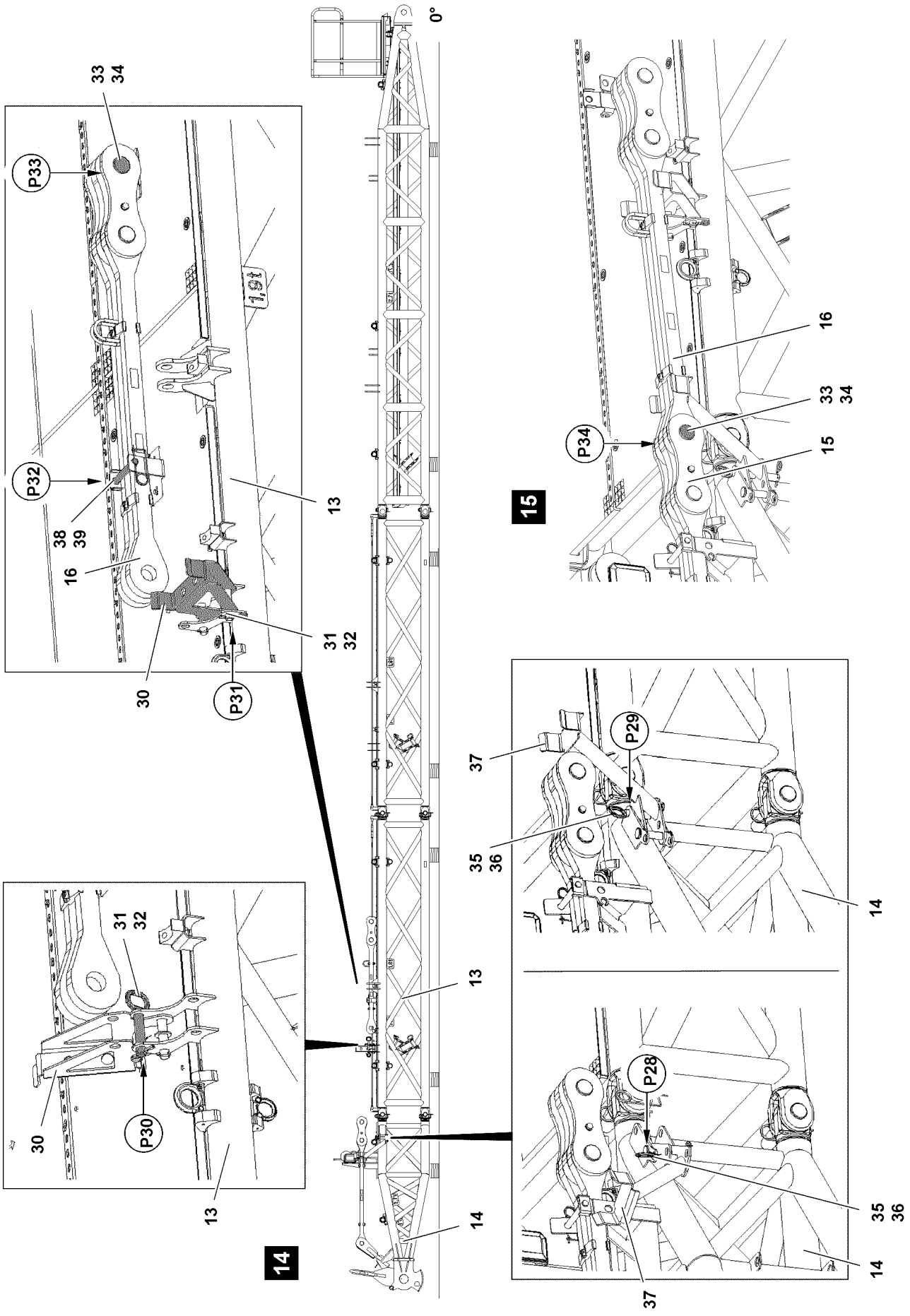

Fig.122951

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17.2.3 Disassembling the suspended ballast guide with 30 m suspended ballast radius

Note

▶ The disassembly of the suspended ballast guide is described based on the example of one suspended ballast guide with a 30 m suspended ballast radius.

Swinging the brackets

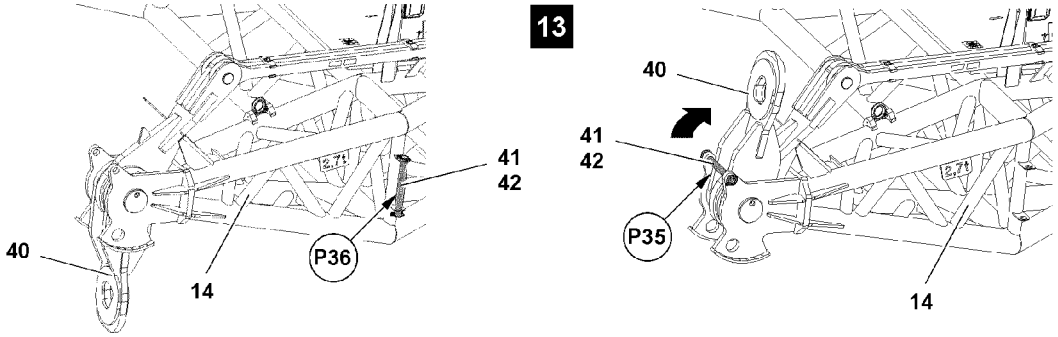

Fig.119029: Swinging the bracket

▶ Fasten the bracket **40** to the auxiliary crane.

WARNING

Bracket swinging down!

The bracket can swing down by itself due to its own weight when pinning it, see illustration.

Death, severe bodily injuries, property damage.

Fingers and hands can be crushed.

▶ Make sure that the platform is held by the auxiliary crane.

▶ Do not reach with your hands into the danger zone.

▶ Remove the retaining element **42** at point **P36** and unpin the pin **41**, see illustration **16**.

▶ Swing the bracket **40** upward with the auxiliary crane.

▶ Insert the pin **41** in the park position at point **P35** and secure with the retaining element **42**, see illustration **16**.

Disassembling the pull rods

▶ Fasten the auxiliary crane to the pull rod **16**.

▶ Unpin the pull rod **16** from the pull rod end section **15**: Remove the retaining element **34** at point **P34** and unpin the pin **33**, see illustration **15**.

▶ Lift the pull rod **16** with the auxiliary crane and take it down in transport position at point **P32** and point **P33**.

▶ Pin the pin **33** in point **P33** and secure with the retaining element **34**.

▶ Pin the pin **38** in point **P32** and secure with the retaining element **39**.

Result:

– The pull rod **16** is secured in the transport position, see illustration **14**.

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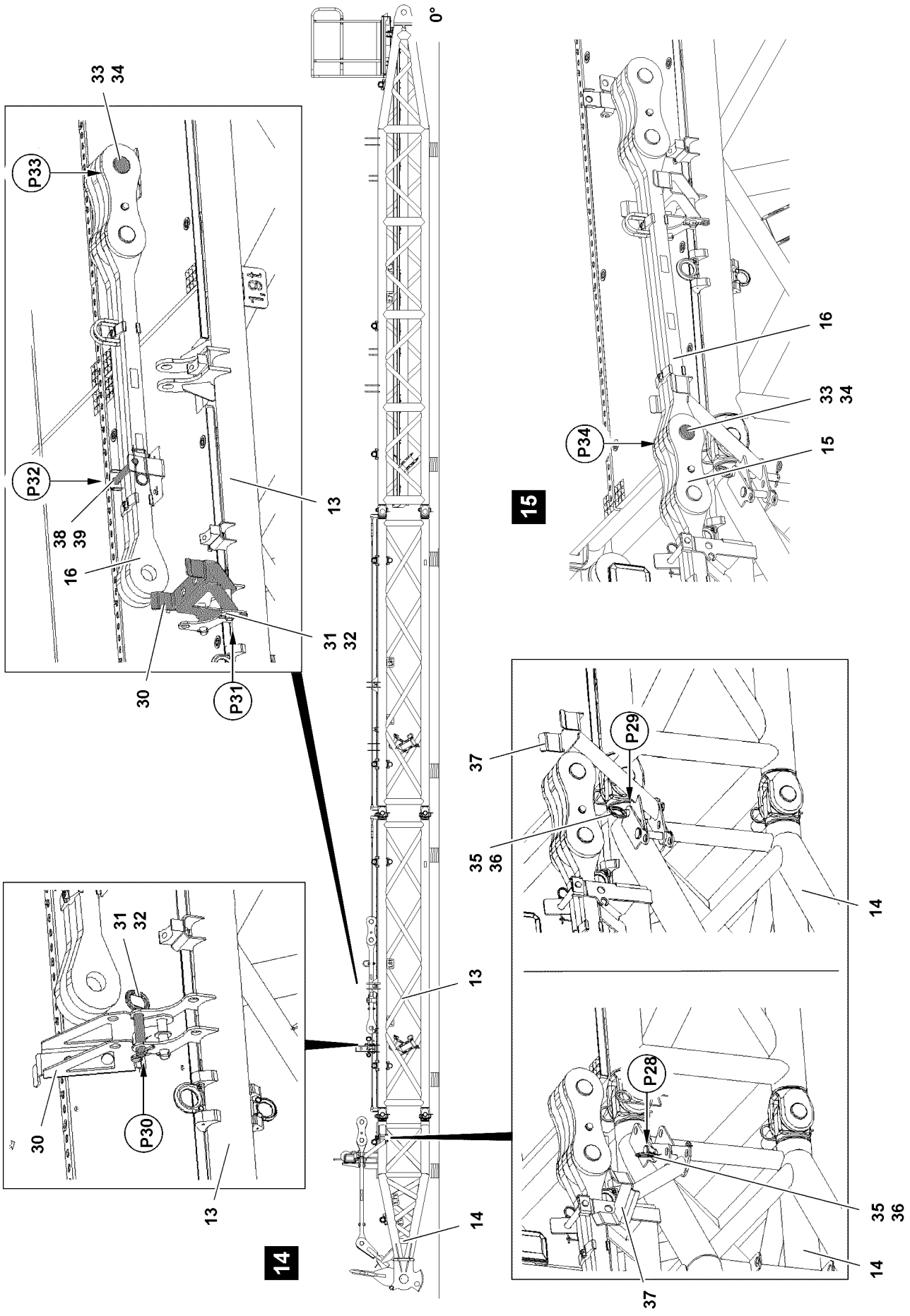

Fig.122951

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▶ Release the retainer **30** from operating position: Remove the retaining element **32** at point **P31** and unpin the socket pin **31**, see illustration **14**.

WARNING
Danger of crushed limbs!
When swinging the retainer, fingers and hands can be crushed.
▶ Do not reach with your hands into the danger zone.

▶ Swing the retainer **30** until it can be pinned at point **P30**.
▶ Pin the socket pin **31** in point **P30** and secure with the retaining element **32**.

Result:

– The retainer **30** is secured in the transport position, see illustration **14**.

▶ Release the bracket **37** from operating position: Remove the retaining element **36** at point **P29** and unpin the socket pin **35**, see illustration **14**.

WARNING
Danger of crushed limbs!
When swinging the bracket, fingers and hands can be crushed!
▶ Do not reach with your hands into the danger zone.

▶ Swing the bracket **37** until it can be pinned at point **P28**.
▶ Pin the socket pin **35** in point **P28** and secure with the retaining element **36**.

Result:

– The bracket **37** is secured in the transport position, see illustration **14**.

▶ Secure the pull rod **15** in transport position.

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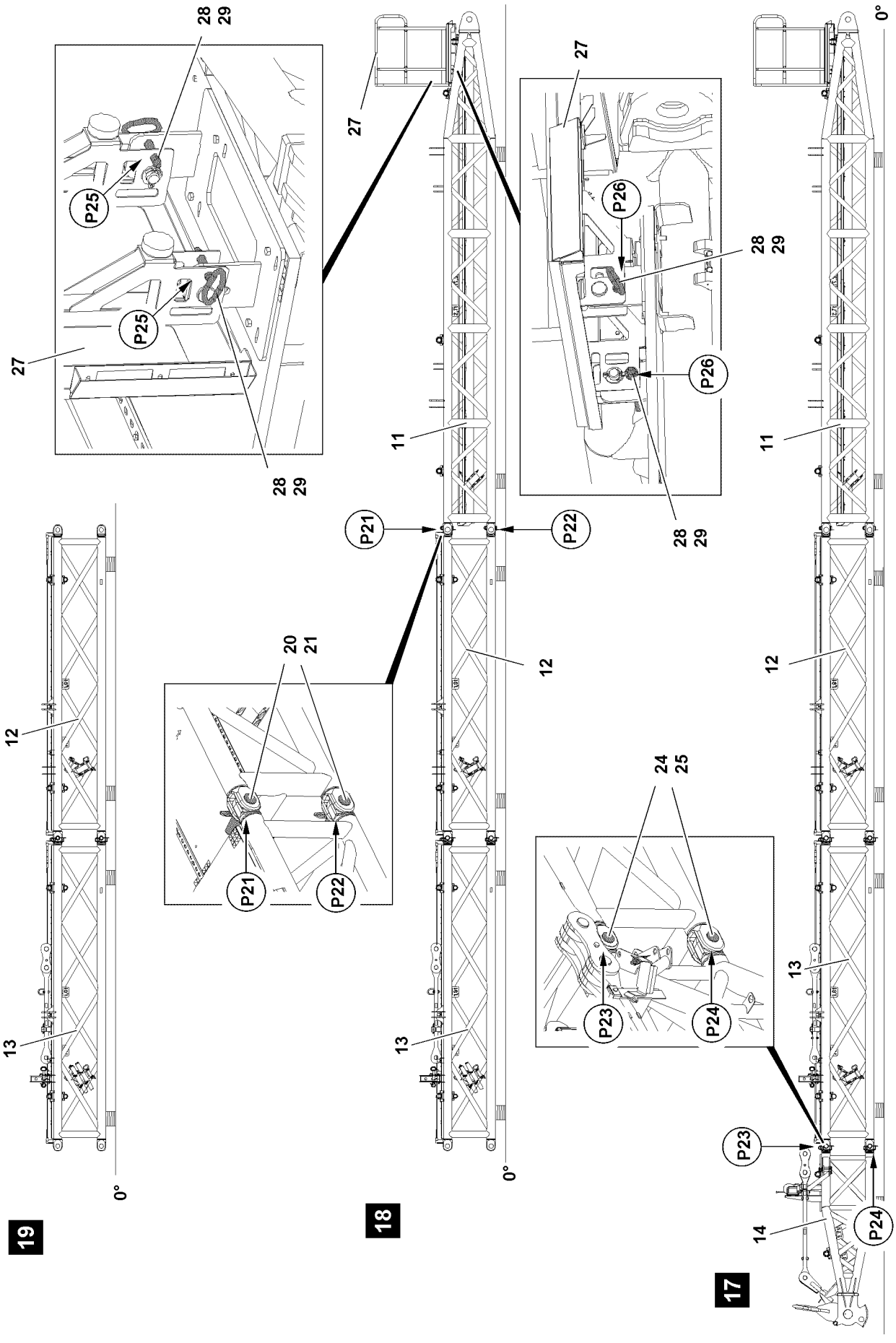

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Fig.122952

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Disassembling the end section

▶ Fasten the end section **14** to the auxiliary crane.

The end section and the intermediate section are pinned together in four points. Every point is present on both sides of the component on one level, see illustration **17**.

▶ Unpin the end section **14** on both sides at point **P24**: Remove the retaining element **25** and unpin the pin **24**.
▶ Unpin the end section **14** on both sides at point **P23**: Remove the retaining element **25** and unpin the pin **24**.
▶ Remove the end section **14** with the auxiliary crane.
▶ Remove the fastening equipment.

Disassembling the pivot section

▶ Fasten the platform **27** to the auxiliary crane.
▶ Set the platform **27** in the transport position, see illustration **18**: Remove the retaining element **29** at points **P26** and unpin the grip pins **28**.

WARNING
Platform swinging down!
The platform can swing down by itself due to its own weight when pinning it, see illustration.
Death, severe bodily injuries, property damage.
Fingers and hands can be crushed.
▶ Make sure that the platform is held by the auxiliary crane.
▶ Do not reach with your hands into the danger zone.
▶ Use personal protective equipment.

▶ Swing the platform **27** with the auxiliary crane.
▶ Insert the grip pins **28** at points **P25** and secure with the retaining element **29**.
▶ Remove the auxiliary crane.
▶ Fasten the pivot section **11** to the auxiliary crane.

The pivot section and the intermediate section are pinned together in four points. Every point is present on both sides of the component on one level, see illustration **18**.

▶ Unpin the pivot section **11** on both sides at point **P22**: Remove the retaining element **21** and unpin the pin **20**.
▶ Unpin the pivot section **11** on both sides at point **P21**: Remove the retaining element **21** and unpin the pin **20**.
▶ Remove the pivot section **11** with the auxiliary crane.
▶ Remove the fastening equipment.

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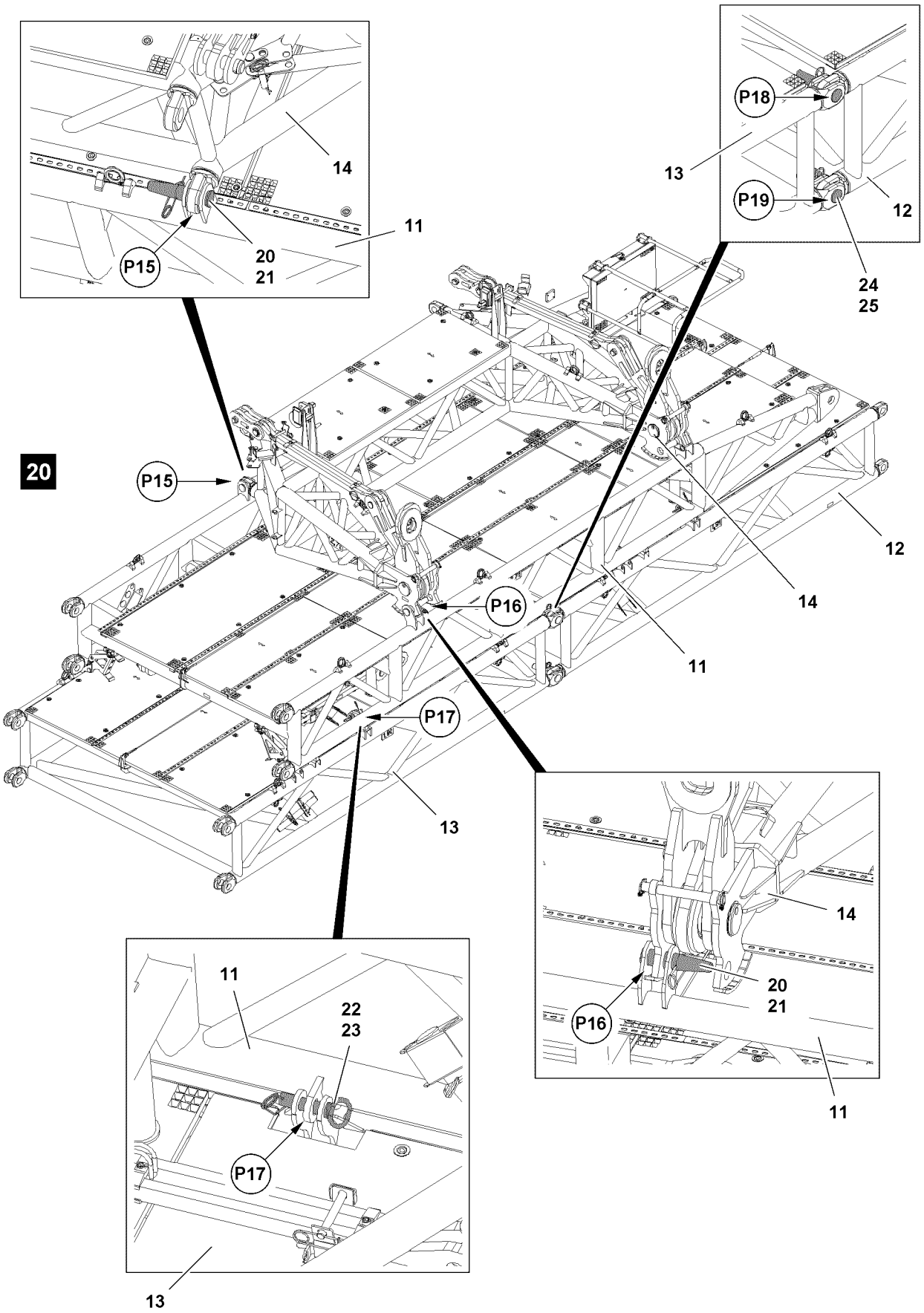

Fig.122953

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17.2.4 Installing the suspended ballast guide as a transport unit

Make sure that the following prerequisites are met:
- The pivot section is disassembled.
- The end section is disassembled.
- The platform is taken down.
- The pull rods are taken down and secured.
- The retainer and the bracket are secured in the transport position.

Assembling the intermediate sections

For the suspended ballast guide as a transport unit, only two intermediate sections are installed.

▶ Fasten the intermediate section **13** to the auxiliary crane.
▶ Position the intermediate section **13** with the auxiliary crane on the intermediate section **12** at point **P18** until the pin points align.

The intermediate section **13** and intermediate section **12** are pinned together on four points. Every point is present on both sides of the component on one level, see illustration **20**.

▶ Pin the intermediate section **13** on both sides at point **P18** with the intermediate section **12**: Insert the pins **24** and secure with the retaining elements **25**.
▶ Pin the intermediate section **13** on both sides at point **P19** with the intermediate section **12**: Insert the pins **24** and secure with the retaining elements **25**.
▶ Remove the fastening equipment.

Assembling the pivot section

The pivot section is pinned at four points. Every point is present on both sides of the component on one level.

▶ Fasten the auxiliary crane to the pivot section **11**.
▶ Position the pivot section **11** with the auxiliary crane on the intermediate section **12** and intermediate section **13** at point **P17** until the pin points align, see illustration.
▶ Pin the pivot section **11** at points **P17**: Insert the pin **22** and secure with the retaining elements **23**, see illustration **20**.
▶ Remove the fastening equipment.

Assembling the end section

The end section is pinned at four points. Every point is present on both sides of the component on one level.

▶ Fasten the auxiliary crane to the end section **14**.
▶ Position the end section **14** with the auxiliary crane on the pivot section **11** at point **P15** and point **P16** until the pin points align, see illustration **20**.
▶ Pin the end section **14** at points **P15**: Insert the pin **20** and secure with the retaining elements **21**, see illustration **20**.
▶ Pin the end section **14** at points **P16**: Insert the pin **20** and secure with the retaining elements **21**, see illustration **20**.
▶ Remove the fastening equipment.

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18 Removing the divisible ballast pallet „VarioTray“

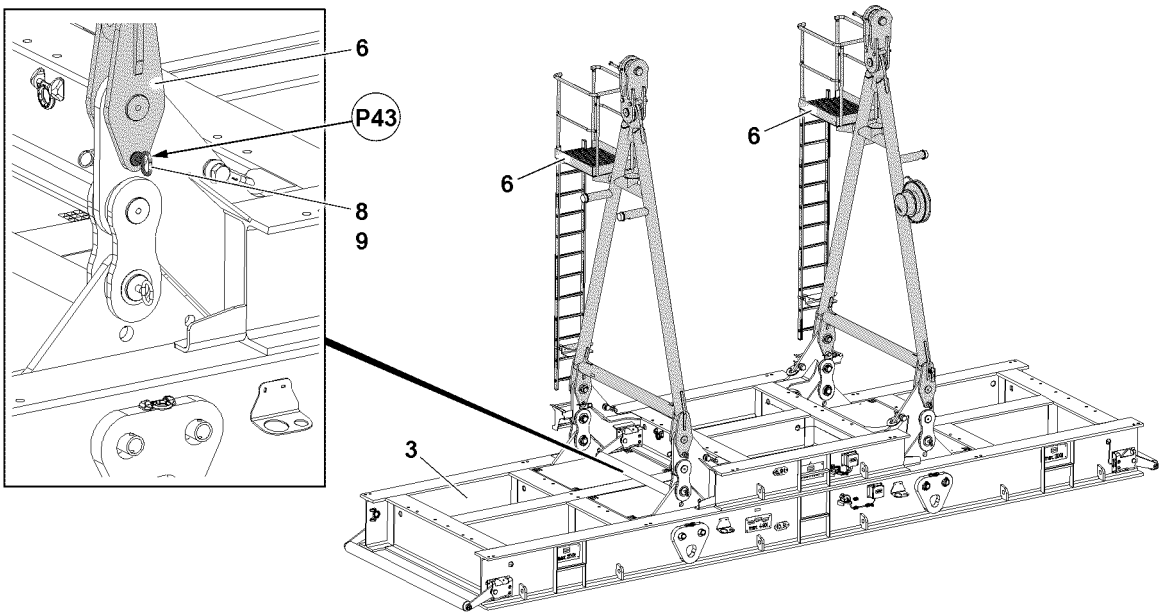

Fig.145274: Divisible ballast pallet „VarioTray“, operating position

Note

▶ The disassembly of the erection racks is described based on the example of one erection rack.

The erection rack is unpinned on two points. The unpinning procedure is described for one pin as an example.

▶ Hang the erection rack **6** on the auxiliary crane.

DANGER

Danger of accident during assembly / disassembly of the erection racks!
The erection racks must hang securely on the auxiliary crane, otherwise they could fall down and kill or severely injure personnel.

▶ Make sure that the erection rack hangs safely on the auxiliary crane.
▶ Never unpin the retaining pins of unsecured or unsupported erection racks.
▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure.

When the erection rack is safely held by the auxiliary crane:

▶ Remove the retaining element **9** on both sides at point **P43** and unpin the retaining pin **8**.

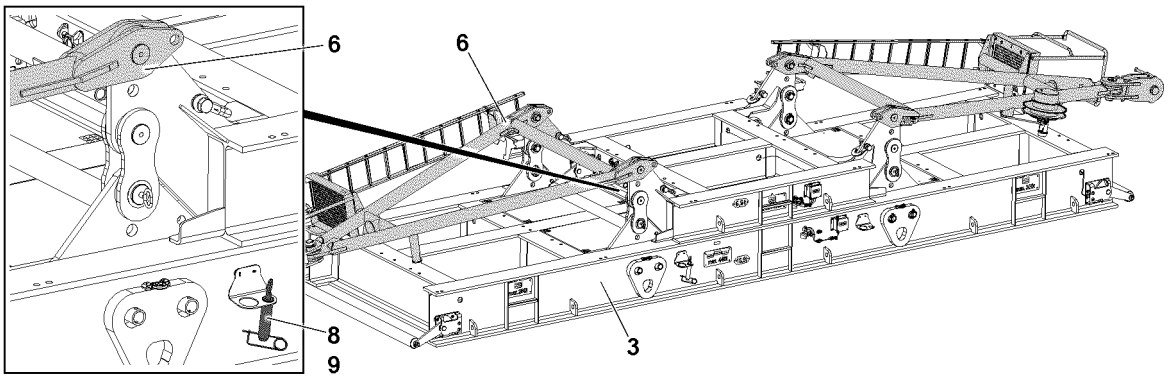

Fig.145273: Divisible ballast pallet „VarioTray“, transport position

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- ▶ Lower the erection rack **6** with the auxiliary crane until the rubber cushions touch the frame.
- ▶ Insert the retaining pin **8** on both sides in the park position and secure with the retaining element **9**.
- ▶ Remove the auxiliary crane.
- ▶ Lower the second erection rack **6** with the auxiliary crane.

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5.38 S/SL-boom

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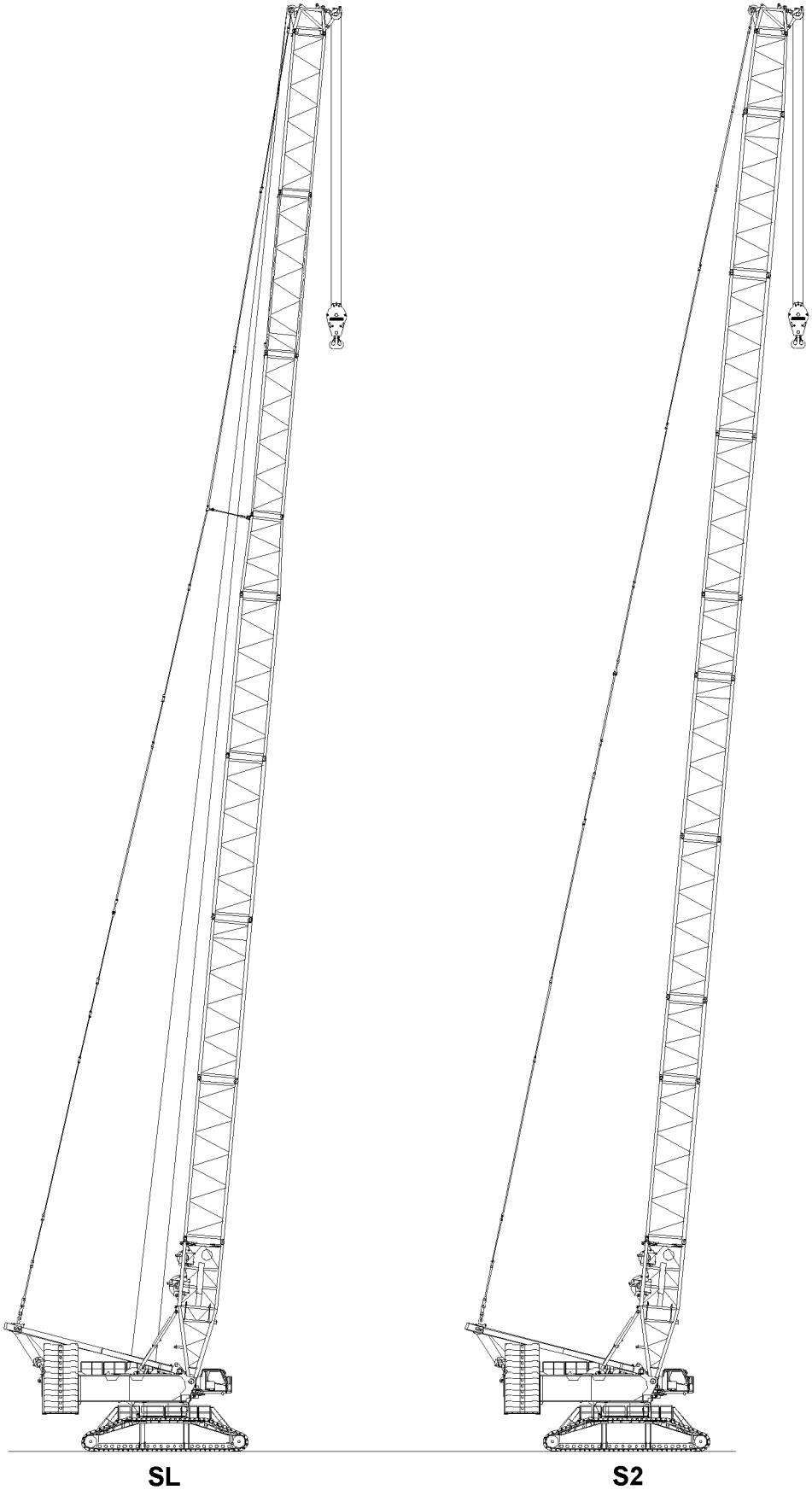

Fig.119108: S2/SL/SL3

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1 Component overview S-pivot section

Note

- The boom components (boom - lattice sections) such as S/L-intermediate sections, S-Adapter, SL-reducer section and the S/L-end sections, as well as dimensions and weights are described in the Crane operating instructions, chapter 1.03.
- For the combination of the various boom systems, refer to the Rod plan and the Crane operating instructions, chapter 5.03.

2 Fastening points

WARNING

Falling lattice sections!

Death, severe bodily injuries, property damage.

- Make sure that the lattice sections are properly fastened on the respective fastening points.
- Make sure that the fastening equipment has the appropriate length and a sufficient load bearing capacity.
- Pay attention and adhere to the labels on the fastening points on the lattice sections and crane components.

2.1 Fastening points S-pivot section

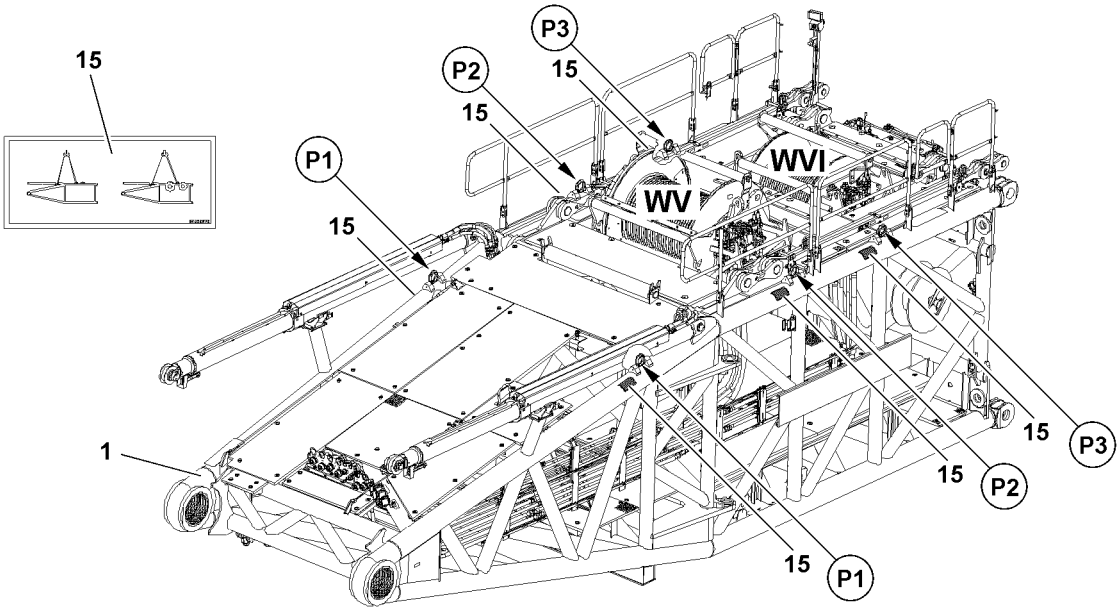

Fig.119100: Fastening points S-pivot section

Fastening points	
P1 + P2	S-pivot section without winch 5, without winch 6
P1 + P3	S-pivot section with winch 5, without winch 6
P1 + P3	S-pivot section without winch 5, with winch 6
P1 + P3	S-pivot section with winch 5, with winch 6

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2.2 Fastening points S-intermediate sections 6 m

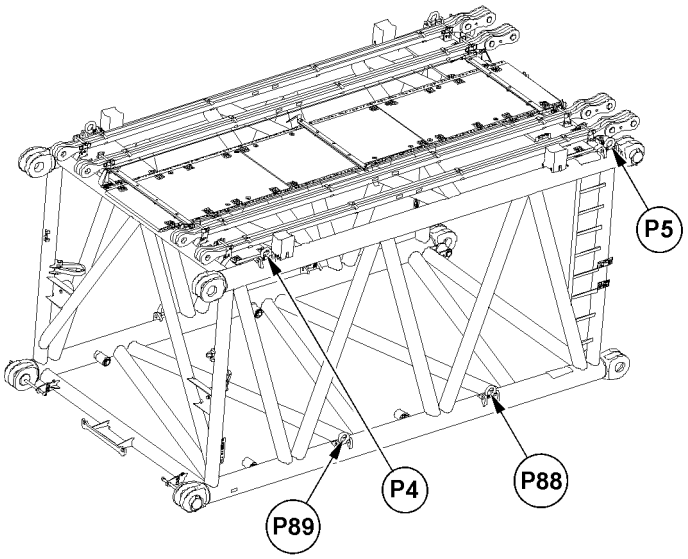

Fig.121930: Fastening points S-intermediate section 6 m

Note

- ▶ The S-intermediate sections are available in various system dimensions.
- ▶ The distance between the fastening pints can vary, depending on the respective S-intermediate section.
- ▶ The lattice section must be fastened on both sides on the fastening points.

Fastening points	
P4 + P5 **or** P88 + P89	S-intermediate section 6 m

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2.3 Fastening points S-intermediate sections 12 m / S-adapter 12 m

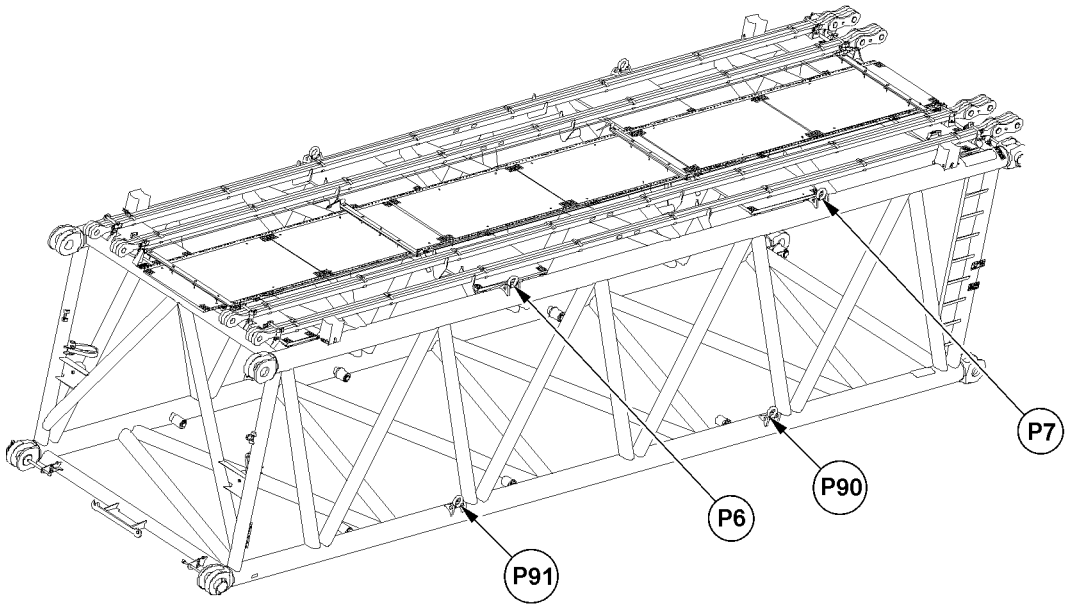

Fig.121931: Fastening points S-intermediate section 12 m / S-adapter 12 m

Note

- ▶ The S-intermediate sections are available in various system dimensions.
- ▶ The distance between the fastening pints can vary, depending on the respective S-intermediate section.
- ▶ The lattice section must be fastened on both sides on the fastening points.

Fastening points	
P6 + P7 **or** P90 + P91	Assembly S-intermediate section 12 m / S-adapter 12 m

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2.4 Fastening points SL-reducer section 6 m

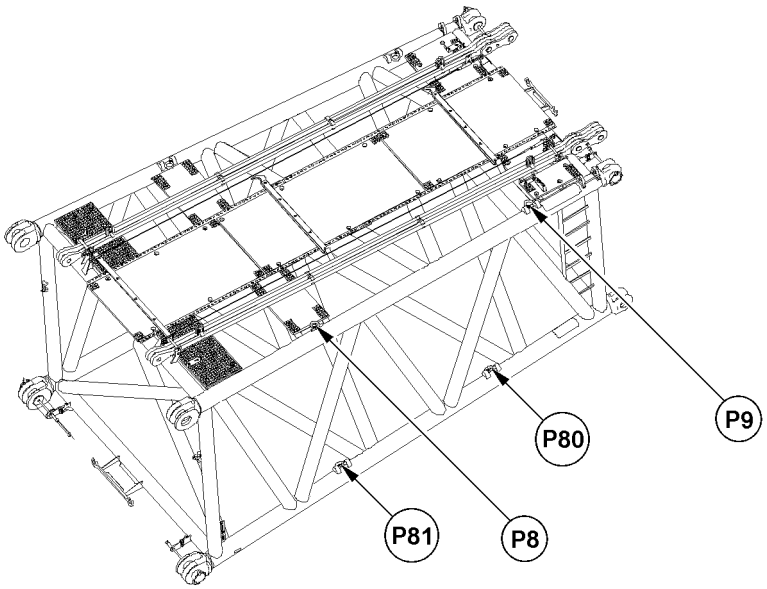

Fig.121932: Fastening points SL-reducer section 6 m

Note
▶ The lattice section must be fastened on both sides on the fastening points.

Fastening points	
P8 + P9 **or** P80 + P81	SL-reducer 6 m

2.5 Fastening points S-end section

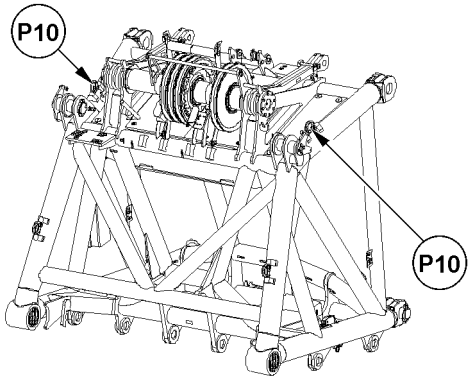

Fig.119104: Fastening points S-end section

Fastening points	
P10	Assembly S-end section

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2.6 Fastening points L-end section

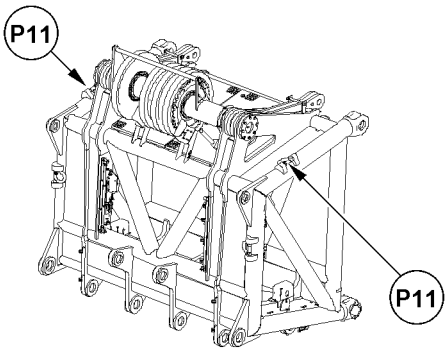

Fig.119105: Fastening points L-end section

Fastening points	
P11	Assembly L-end section

2.7 Fastening points L-intermediate sections 6 m

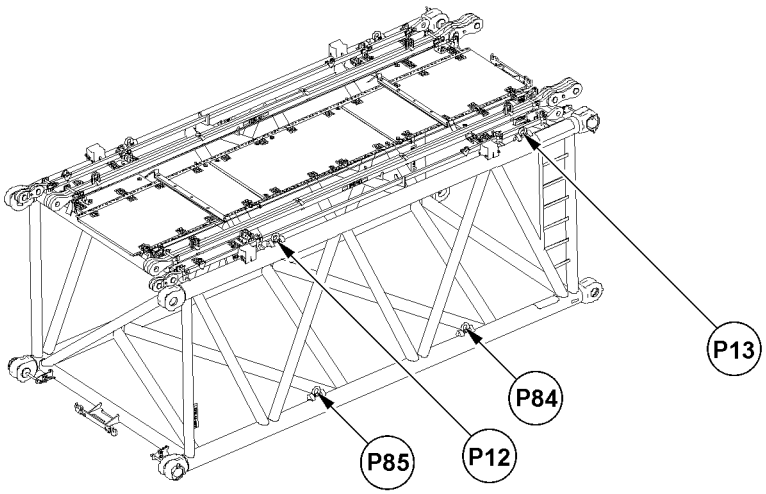

Fig.121933: Fastening points L-intermediate section 6 m

Note

- ▶ The L-intermediate sections are available in various system dimensions.
- ▶ The distance between the fastening points can vary, depending on the respective L-intermediate section.
- ▶ The lattice section must be fastened on both sides on the fastening points.

Fastening points	
P12 + P13 **or** P84 + P85	L-intermediate section 6 m

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2.8 Fastening points L-intermediate sections 12 m

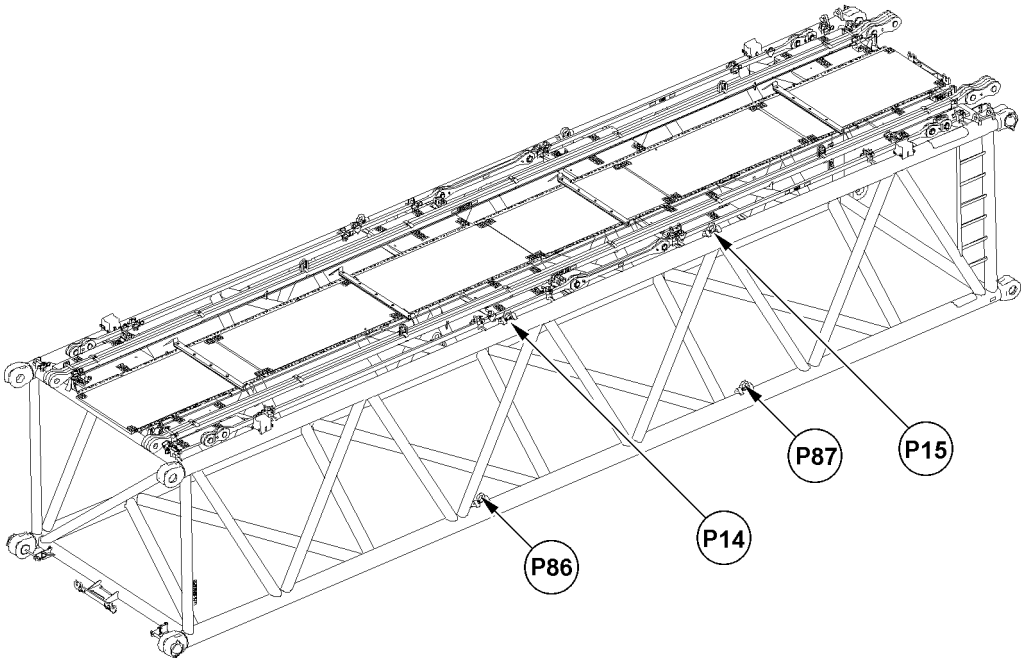

Fig.121934: Fastening points L-intermediate section 12 m

Note

- ▶ The L-intermediate sections are available in various system dimensions.
- ▶ The distance between the fastening points can vary, depending on the respective L-intermediate section.
- ▶ The lattice section must be fastened on both sides on the fastening points.

Fastening points	
P14 + P15 **or** P86 + P87	Assembly L-intermediate section 12 m

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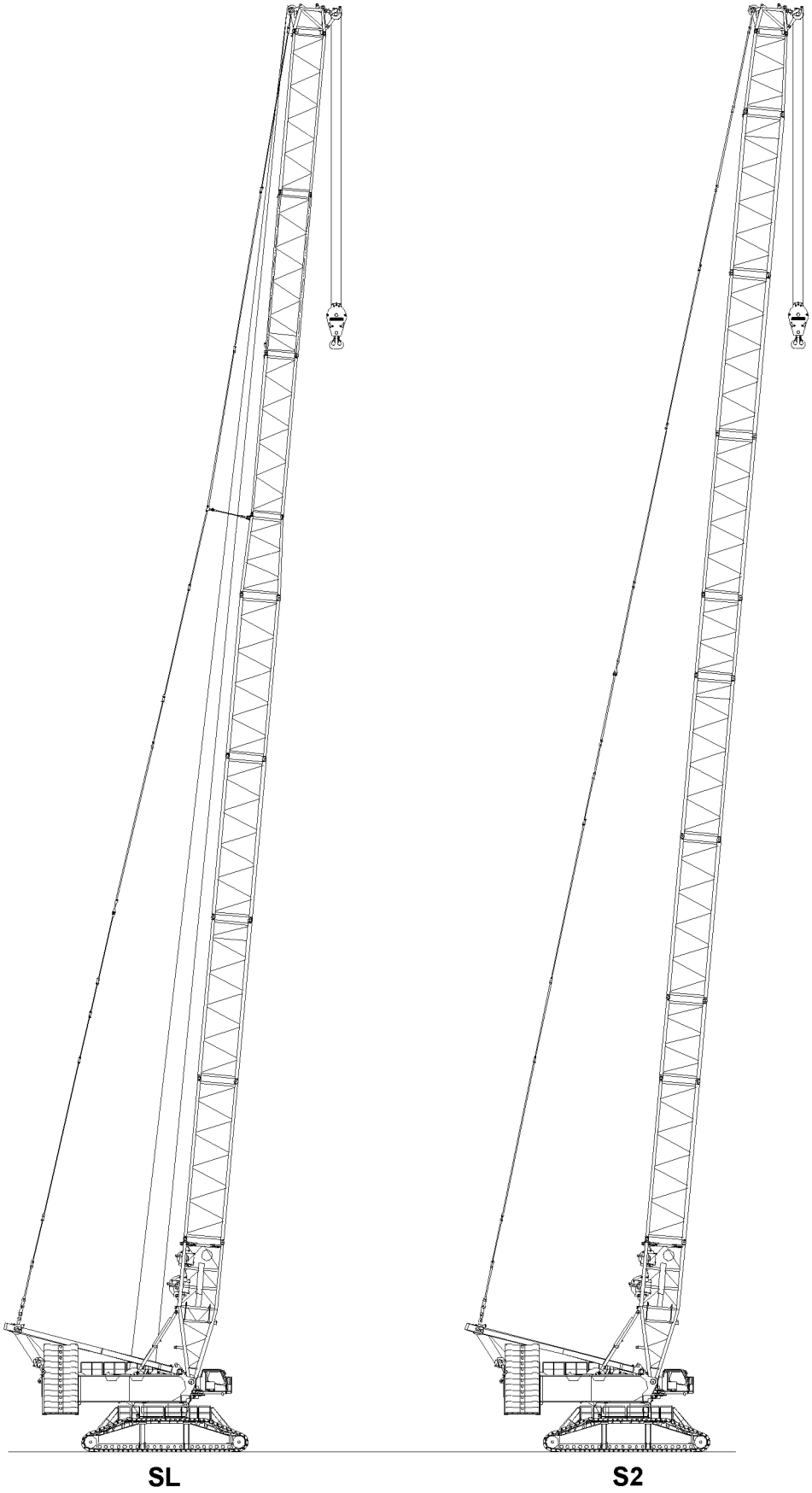

Fig.119108: S2/SL/SL3

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3 Assembly S2/SL/SL3-boom

Note

- The assembly is described on the example of the S-boom.
- For the combination of the boom lattice sections, observe and adhere to the Rod plan and the Crane operating instructions, chapter 5.03.

WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.

Death, severe bodily injuries, property damage.

- All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- When closing or opening boom systems during boom assembly or boom disassembly, no persons may remain on the boom system or in the danger zone.
- If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- Only step on the aids, ladders and catwalks with clean shoes.
- Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- Remaining on a suspended load is prohibited.
- Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- For all assembly work, the crane driver of the main crane must be in voice contact with the crane driver / crane drivers of the auxiliary crane / auxiliary cranes.
- For assembly tasks, the crane driver may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING

The lattice sections can fall down!

If the lattice sections are not pinned and secured correctly, then they can fall down.

Death, severe bodily injuries, property damage.

- Pin or unpin both pins at the same horizontal level, i.e. **left and right**.
- Do not stand under the lattice sections or within the entire danger zone during the pinning and unpinning procedure of the boom.
- Safely secure the pins in the storage locations as well as in the receptacles.
- It is prohibited to lean the auxiliary ladder against the component being disassembled.

WARNING

Danger of impact / crushing!

When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.

When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.

Death, severe bodily injuries, property damage.

- Make sure that personnel cannot be caught by components.
- Make sure that the crane is horizontally aligned.
- When working in danger zones: Use aids to protect limbs.
- Guide components with suitable aids to minimize oscillation.

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DANGER
The components can fall down!
If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.
Death, severe bodily injuries, property damage.
▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

Make sure that the following prerequisites are met:
– The ground is able to safely take on the entire operating weight of the crane including the load to be lifted.
– The crane is horizontally aligned.
– An auxiliary crane with sufficient load bearing capacity if available.
– An assembly scaffolding or a work platform is available.
– Winch 1 and winch 2 are properly installed and secured on the turntable.
– The SA-frame properly installed and secured on the turntable.
– The transport retainers for the guy rods on the SA-frame are removed.
– The central ballast has been installed on the crawler travel gear according to the load chart or the erection and take down charts.
– The counterweight has been installed on the turntable according to the load chart or the erection and take down charts.
– The LICCON overload protection has been set according to the data in the load chart.

3.1 Turning the turntable into the assembly position

WARNING
The crane can topple over!
If the following conditions are not met before turning the turntable - **without** assembled S-boom, the crane can topple over.
Death, severe bodily injuries, property damage.
▶ Observe the assembly conditions, see the Crane operating instructions, chapter 3.06.
▶ Observe the specifications in the erection and take-down charts.
▶ Observe the specifications in the load charts.

▶ Turn the turntable in lengthwise direction of the crawler travel gear.

3.2 Swinging the railing on the S-pivot section into operating position

WARNING
Danger of falling!
Death, severe bodily injuries, property damage.
▶ Assembly personnel must secure themselves for the assembly / disassembly of the railings and protective devices with an approved fall arrest system to prevent them from falling.
▶ For assembly and disassembly work, maintenance and inspection work on the S-pivot section, all railings and protective devices must be properly assembled and secured.

Make sure that the following prerequisites are met:
– The ground is able to safely take on the weight of the S-pivot section.
– The S-pivot section is laying completely on the ground.

▶ For assembly / disassembly of railings and protective devices, see Crane operating instructions, chapter 2.06.

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3.3 Exceeding the shut off limits of the LICCON overload protection for assembly operation

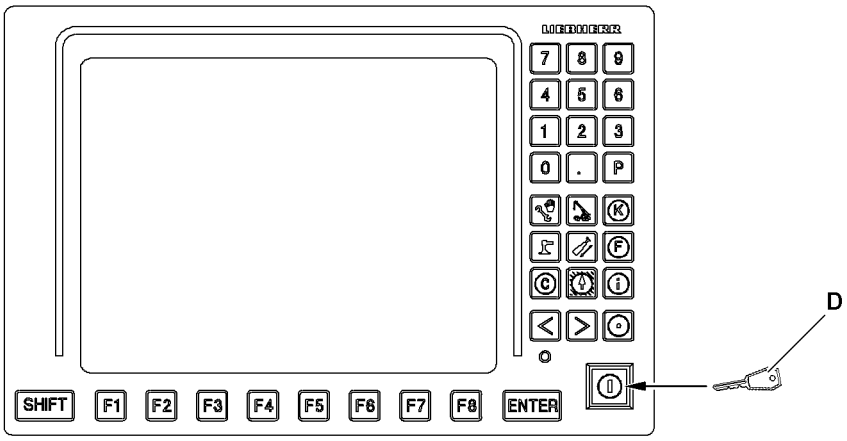

Fig.119109: LICCON monitor with assembly icon

WARNING
Danger of accident due to function „Exceedance of shut-off limits of the LICCON overload protection“!
If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload.
Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.

- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ is only permissible in emergencies and for assembly purposes.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ may only be actuated by persons who know the effects of their actions regarding the function „Exceeding the shut off limits of the LICCON overload protection“.
- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ requires the presence of an authorized person and must be performed with utmost caution.
- ▶ Crane operation with activated function „Exceedance of shut off limits of the LICCON overload protection“ is prohibited.

▶ Exceeding the shut off limits of the LICCON overload protection: Engage assembly operation.

Result:

– The shut off limits of the LICCON overload protection are exceeded.
– The assembly icon appears on the LICCON monitor.

Note
▶ See the Crane operating instructions, chapter 4.02 and chapter 4.20.

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3.4 Unpinning the S-connector pins on the turntable

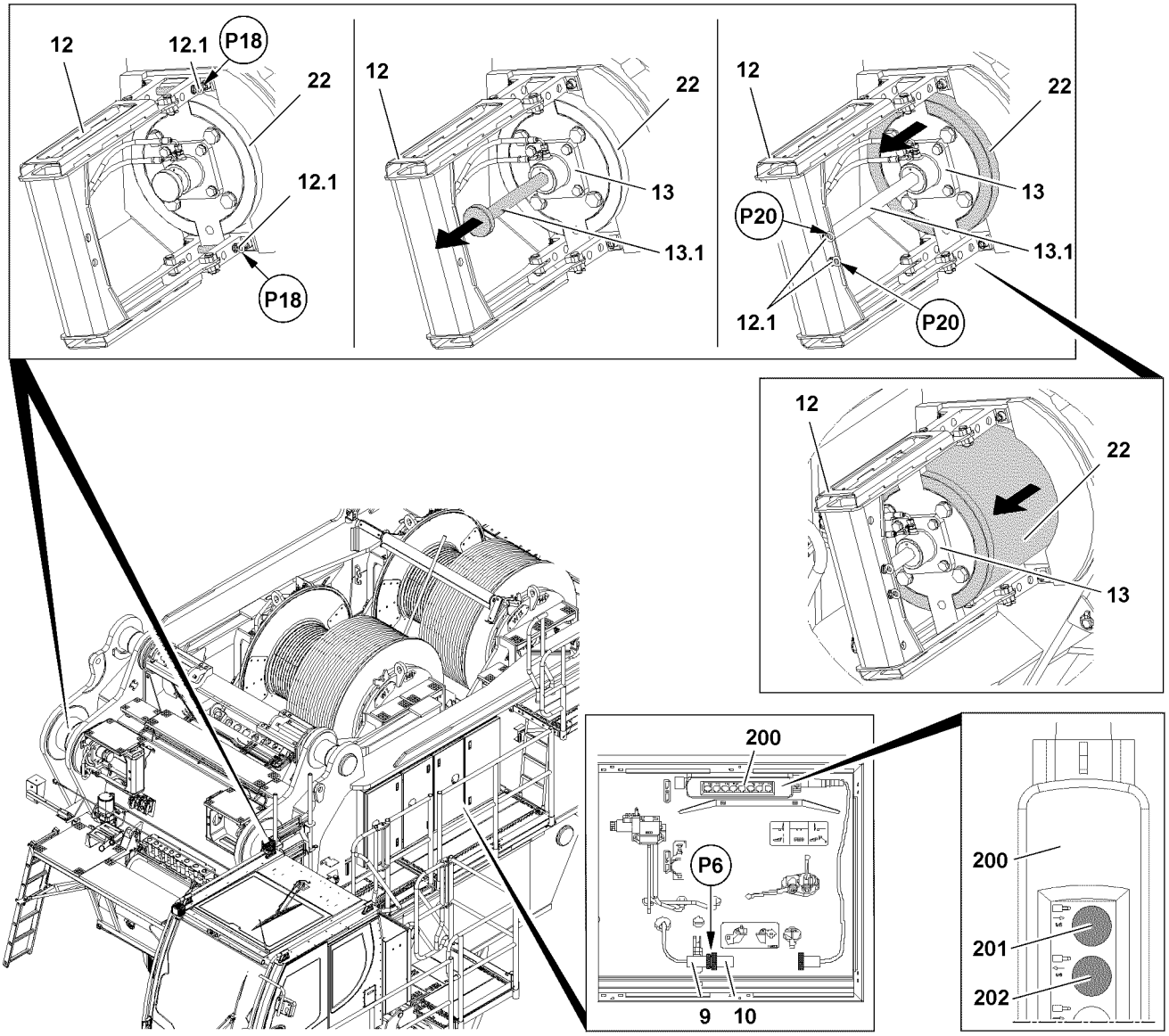

*Fig.119111: Unpinning the connector pins **22** on the turntable*

Note

- ▶ The pin pulling cylinders **13** are integrated on this crane in the S-connector pins **22**.
- ▶ Unpinning and pinning of the S-connector pins **22** can be done only in connection with the pin pulling device installed on the crane.

Make sure that the following prerequisites are met:

- The pin pulling devices **12** are installed on the pin points.
- The SA-frame is standing vertically.
- The crane engine is running.

3.4.1 Unpinning the S-connector pins

In transport condition, the S-connector pins **22** are pinned on the turntable and secured with the retaining pins **12.1**.

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WARNING
Danger of crushing!
When unpinning or pinning the S-connector pins **22**, there is a danger of crushing.
Limbs can be crushed or severed.
▶ During the unpinning or pinning procedure, make sure that no persons are within the danger zone.
▶ Do not reach into the danger zone of the pin pulling device and the connector pins.

▶ Release and unpin the retaining pins **12.1** on the points **P18** of the pin pulling device.
▶ Connect the control panel **200** at point **P6**.
▶ Extend the piston rod **13.1** of the pin pulling cylinder: Press the button **201** on the control panel **200** until the piston rods **13.1** are completely moved out on the pin pulling cylinders **13**.

When the piston rods **13.1** for the pin pulling cylinders are completely extended on both sides:
▶ Insert the retaining pin **12.1** on both sides at point **P20** and secure.

Result:

– The piston rods **13.1** of the pin pulling cylinders **13** are locked with the pressure / pull plate in the pin pulling device.

▶ Press the button **202** on the control panel **200** until the S-connector pins **22** are completely unpinned.

3.5 Assembling the S-pivot section on the turntable

NOTICE
Danger of property damage!
When swinging the S-pivot section in to the pin points on the turntable, the S-connector pins **22** or the S-pivot section can be damaged.
▶ Make sure that the S-connector pins **22** are completely unpinned before assembly of the S-pivot section.

Note
▶ Assemble the boom combinations according to the supplied Rod plans.

WARNING
The crane can topple over!
If the specifications listed below are not observed, the crane can collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.
▶ The instructions in the Crane operating instructions, chapter 5.01 and chapter 5.03 must be observed and adhered to.
▶ All pins are to be secured after assembly with the intended retaining elements.
▶ The guy rods must be inspected regularly, see the Crane operating instructions, chapter 8.15.

Make sure that the following prerequisites are met:
– The S-connector pins **22** are completely unpinned.
– The crane engine is running.

Note
▶ Select the fastening points on the S-pivot section **1** in such a way that the S-pivot section **1** hangs horizontally on the auxiliary crane at assembly. See section „Fastening points“.

▶ Fasten the S-pivot section **1** to the auxiliary crane.

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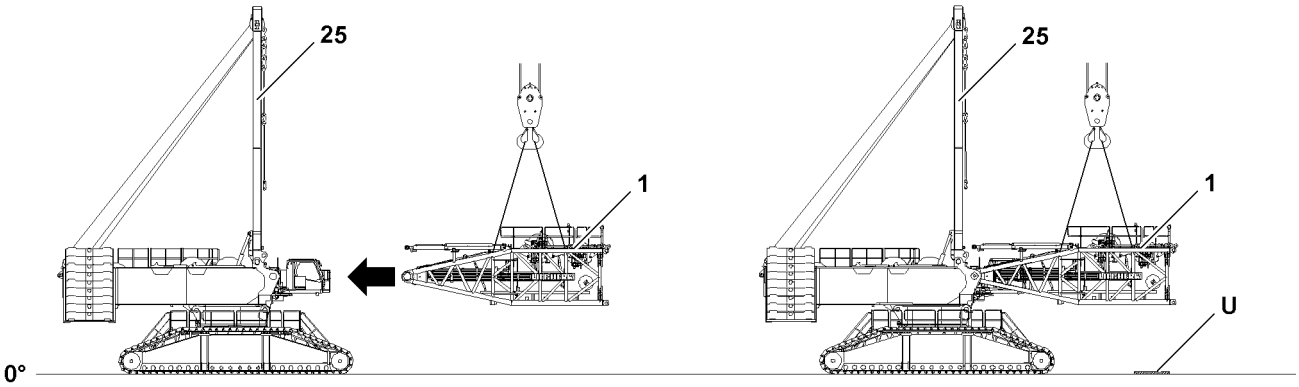

Fig.119116: Swinging the S-pivot section in on the turntable and pin

▶ Swing the S-pivot section **1** in with the auxiliary crane to the pin points on the turntable.

DANGER
Falling S-pivot section!
Death, severe bodily injuries, property damage.
▶ Secure the S-connector pins **22** between the S-pivot section **1** and the turntable after the pinning procedure immediately with the retaining pins **12.1**.

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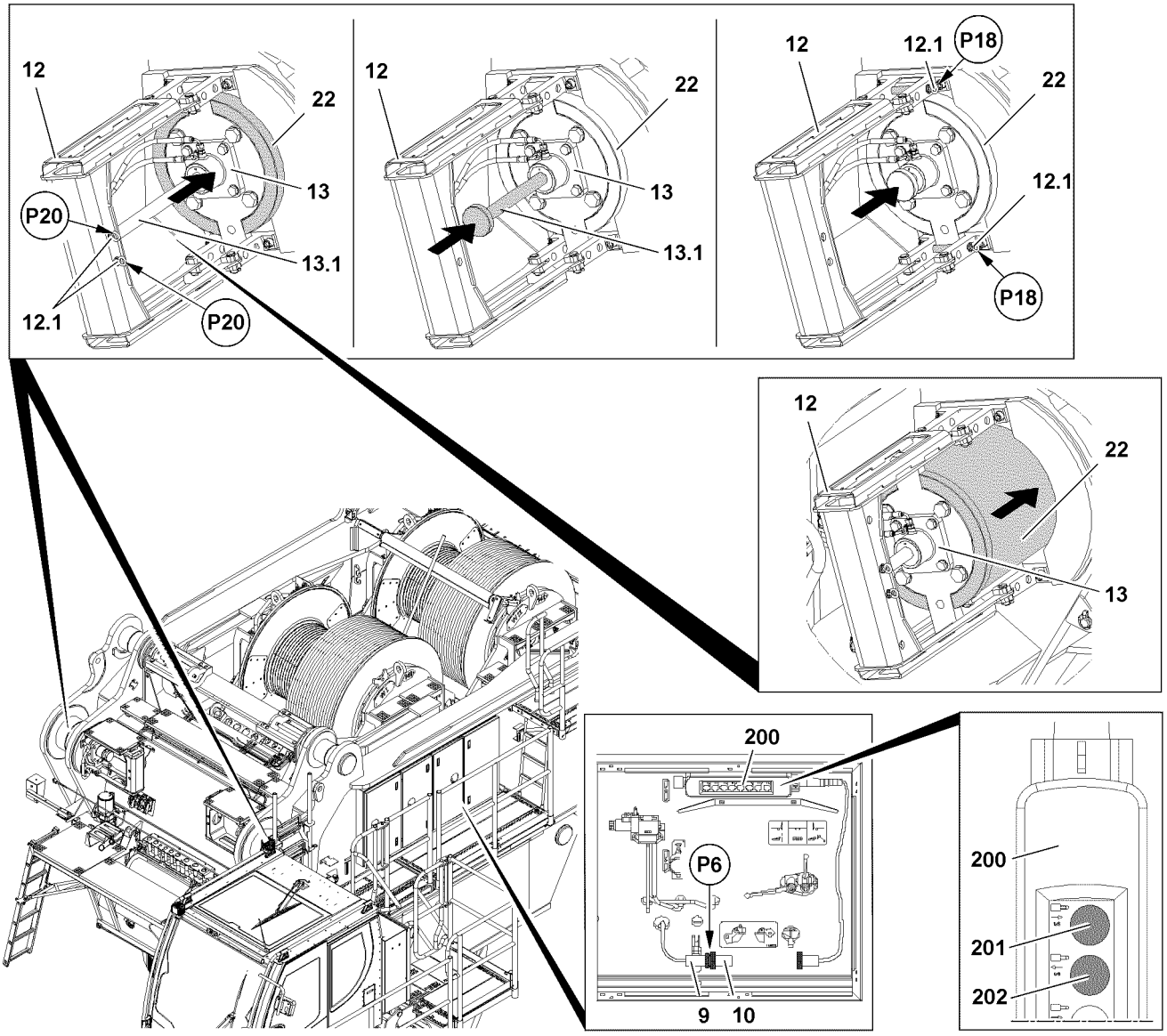

*Fig.119115: Pinning the S-pivot section on the turntable / insert connector pin **22***

When the S-pivot section is positioned in pin position:

▶ Insert the S-connector pins **22** on both sides with the pin pulling cylinder **13**: Press the button **201** on the control panel **200** until the S-connector pins **22** are completely pinned on both sides.

When the S-connector pins **22** are completely pinned on both sides:

▶ Secure the S-connector pins **22**: Unpin the retaining pins **12.1** on the pin pulling device **12** on points **P20** and insert on points **P18** and secure.

Result:

– The S-pivot section **1** is pinned and secured on the turntable.

▶ Retract the piston rods **13.1** of the pin pulling cylinders **13**: Press the button **202** on the control panel **200** until the piston rods are completely retracted on both sides.

NOTICE

Danger of property damage!

When taking down the assembled S-pivot section, the S-pivot section or the turntable can be damaged.

▶ Lower the S-pivot section **1** after assembly on the turntable carefully on the substructure **U** on the ground.

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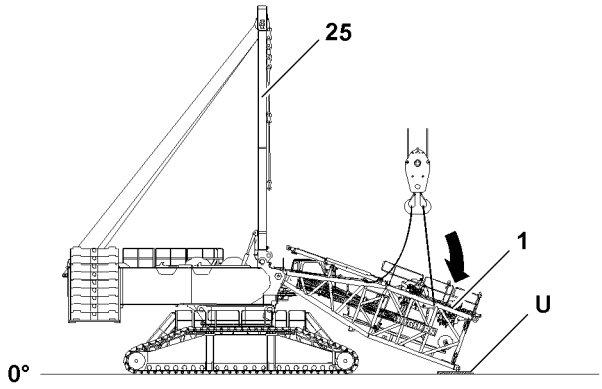

Fig.119118: Placing the S-pivot section on the substructure on the ground

▶ Lower the S-pivot section **1** carefully and at slow speed on the substructure **U** on the ground.

When the S-pivot section **1** is placed on the substructure on the ground:
▶ Remove the auxiliary crane.

3.6 Establishing the electric and hydraulic connections on the S-pivot section

3.6.1 Establishing the electrical connections

NOTICE
Danger of damage to the electrical connections!
If the electrical connection between the terminal box and the S-pivot section and the cable drum in the S-pivot section is established before the boom end section is installed and electrically connected, then the electric connection can be damaged.
▶ Make sure that the electric connection between the terminal box in the S-pivot section and the cable drum in the S-pivot section is only established **after** assembly and the connection of the electric wiring for the boom end section.

Note
▶ To establish the electrical connections on the S-pivot section: Use the Electrical wiring diagram.

Make sure that the following prerequisites are met:
– The S-pivot section is completely assembled and placed on the substructure.

▶ Establish the electrical connections.
▶ Make sure that all electrical connections to the S-pivot section have been established.

WARNING
Malfunction if dummy plugs are not installed!
If the dummy plugs on the non-required electrical connections are not installed, then malfunctions or functional limitations can occur on the crane.
▶ Make sure that all non-required electrical connections that have a dummy plug are closed off with dummy plugs.
▶ Pay attention to the Electrical wiring diagram.

▶ As a rule, close off on-required electrical connections (for example for accessories which cannot be installed) with the respective dummy plugs.

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NOTICE
Property damage due to dirt and / or corrosion!
If non-required electrical connections are not closed off with the respective protective caps, then dirt and / or corrosion can damage the electrical connections.
This could result in malfunctions.
▶ Make sure that all non-required electrical connections are always closed off properly.
▶ Pay attention to the Electrical wiring diagram.

▶ Close electrical connections, which have no dummy plugs, properly off with the corresponding protective caps.

3.6.2 Establishing the hydraulic connections

When connecting and releasing hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

DANGER
Danger of accident due to loss of pressure or leakage!
Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.
▶ Check that the quick couplings have been properly connected before using the crane.

Note
▶ To connect or release the hydraulic lines with quick couplings, see Crane operating instructions, chapter 5.01.

▶ Release the pressure in the hydraulic system before connecting or disconnecting. Turn the engine off and wait for short time.
▶ Assembling coupling components (sleeve and connector) by using knurled nut.
▶ Connect coupling components.

3.7 Assembly of winch 5 (WV) on the S-pivot section

Note
▶ The assembly of winch 5 is described in detail in the Crane operating instructions, chapter 3.07.50.

3.8 Assembly of winch 6 (WVI) on the S-pivot section

Note
▶ The assembly of winch 6 is described in detail in the Crane operating instructions, chapter 3.07.60.

3.9 Assembling the boom system on the ground

Note
▶ Liebherr-Werk Ehingen GmbH recommends supporting the intermediate sections for assembly with assembly shoes, see the Crane operating instructions, chapter 5.62.

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3.9.1 Assembling the S-intermediate section on the S-pivot section

Make sure that the following prerequisites are met:
- The S-pivot section **1** is properly pinned and secured on the turntable.
- The S-pivot section **1** is placed properly on the substructure on the ground.
- Winch 5 **WV** is properly installed on the S-pivot section **1** (if only winch 5 **WV** is required for the upcoming crane operation).
- Winch 6 **WVI** is properly installed on the S-pivot section **1** (if only winch 6 **WV** is required for the upcoming crane operation).
- The connector pins **1.1** on the S-pivot section **1** are fully unpinned.

Note

▶ The S-intermediate sections **2** are pinned with the pin pulling cylinders, see Crane operating instructions, chapter 5.30.

WARNING

General danger notes!

▶ All connector pins **1.1** are to be secured after assembly with the intended locking pins **1.2**.

Note

▶ For fastening of boom sections, observe and adhere to section „Fastening points“.

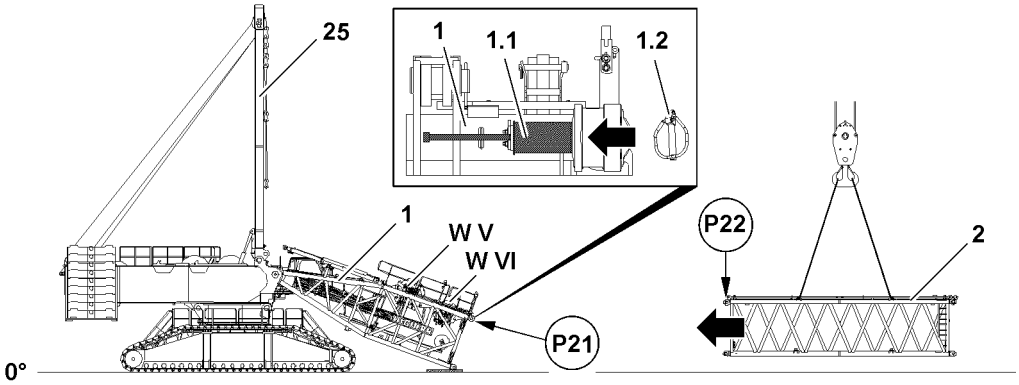

Fig.119120: Positioning the S-intermediate section on the S-pivot section

▶ Fasten the first S-intermediate section **2** to the auxiliary crane and align on the S-pivot section **1**.

When the pin bores on the S-pivot section **1** (point **P21**) and on the S-intermediate section **2** „on top“ (point **P22**) align.

▶ Insert the connector pins **1.1** with the pin pulling cylinders on both sides to the stop.

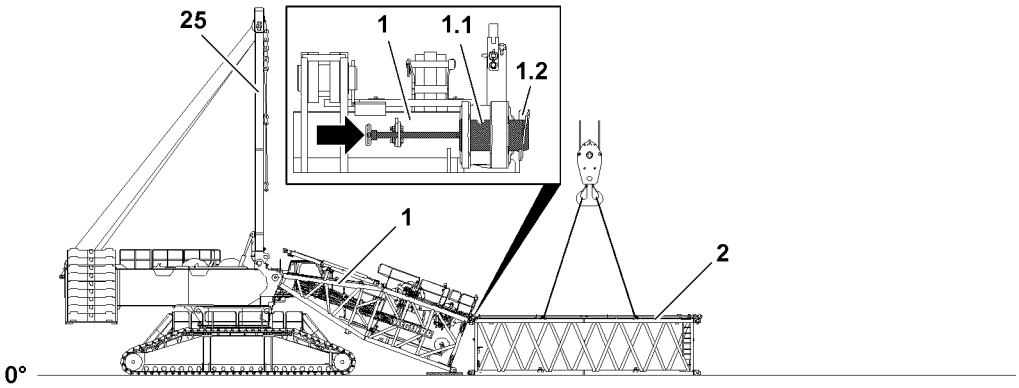

Fig.119121: Pinning the S-intermediate section on the S-pivot section

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▶ Secure the connector pin **1.1** with the locking pin **1.2**.

When the first S-intermediate section **2** is pinned and secured on the S-pivot section **1** „on top“:
▶ Lower the S-intermediate section **2** on the substructure on the ground.
▶ Remove the auxiliary crane.

3.9.2 Continuing boom assembly

Make sure that the following prerequisites are met:
– The connector pins on the S-intermediate sections **2** - in direction of the expansion of the boom system - are completely unpinned.
– The first S-intermediate section **2** is laying properly on the ground or on the substructure.

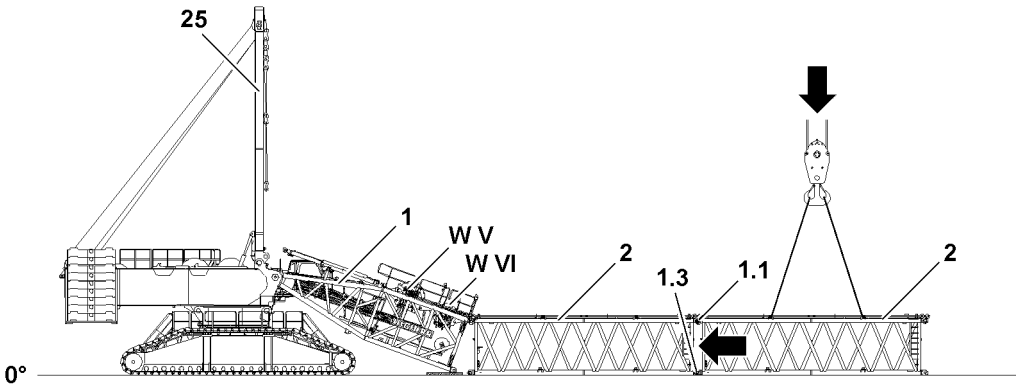

Fig.119122

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
▶ The combination of the various boom systems must be taken from the Rod plan and it must be adhered to.
▶ The instructions in the Crane operating instructions, chapter 5.01 and chapter 5.03 must be observed.
▶ Make sure that all pin connections are secured after assembly.
▶ Support the boom during assembly and disassembly with assembly shoes.

When the connector pins **1.1** on the first S-intermediate section **2** are fully unpinned:
▶ Fasten the second S-intermediate section **2** to the auxiliary crane and swing in to the pin points on the first S-intermediate section **2**.

When the pin bores between the first and the second S-intermediate section **2** align „on top“ and „on the bottom“:
▶ Insert the connector pins **1.1** „on top“ with the pin pulling cylinders on both sides to the stop and secure.

When the connector pins **1.1** „on top“ are fully pinned to the stop and secured on both sides:
▶ Insert the connector pins **1.3** „on the bottom“ with the pin pulling cylinders on both sides to the stop and secure.
▶ Continue boom assembly to the required system length.

3.9.3 Assembling the S-end section / L-end section

Note
▶ The following description is an example and will be described by means of the L-end section.
▶ The process for the S-end section is identical.

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Lifting the end section from the flatbed trailer

Make sure that the following prerequisites are met:
- The transport retainers are removed on the respective end section.
- No roller sets are installed on the end section.
- The ground is able to safely take on the weight of the respective end section.

WARNING
Danger of falling!
Death, severe bodily injuries, property damage.
▶ To fasten the end sections, use an assembly platform.

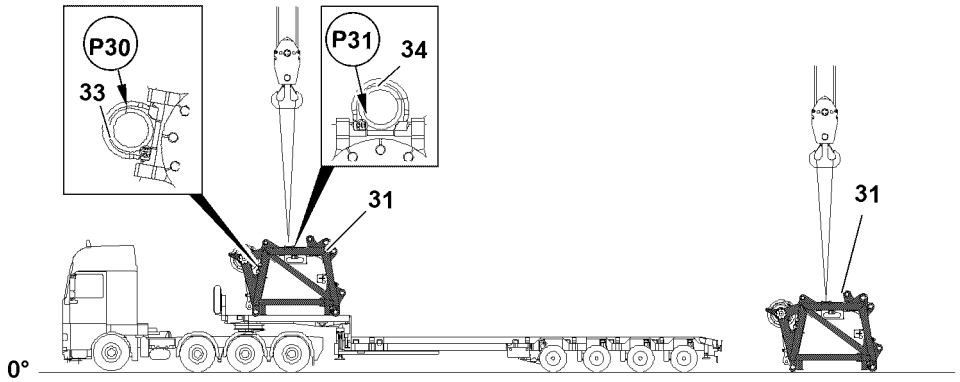

Fig.119112: Lifting the end section from the flatbed trailer

▶ Fasten the end section **31** on both sides on the eyes **34** of the fastening points **P31** on the auxiliary crane.

When the end section is properly fastened on the auxiliary crane:
▶ Carefully lift the end section with the auxiliary crane from the transport vehicle and remove the transport vehicle.
▶ Lower the end section to the ground.

Turning the end section into assembly position

The end section must be turned before assembly on the boom with two auxiliary cranes from the transport position into the assembly position.

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Make sure that the following prerequisite is met:
- **No** roller sets are installed on the end section.
- The ground on which the end section is placed is sufficiently load bearing.

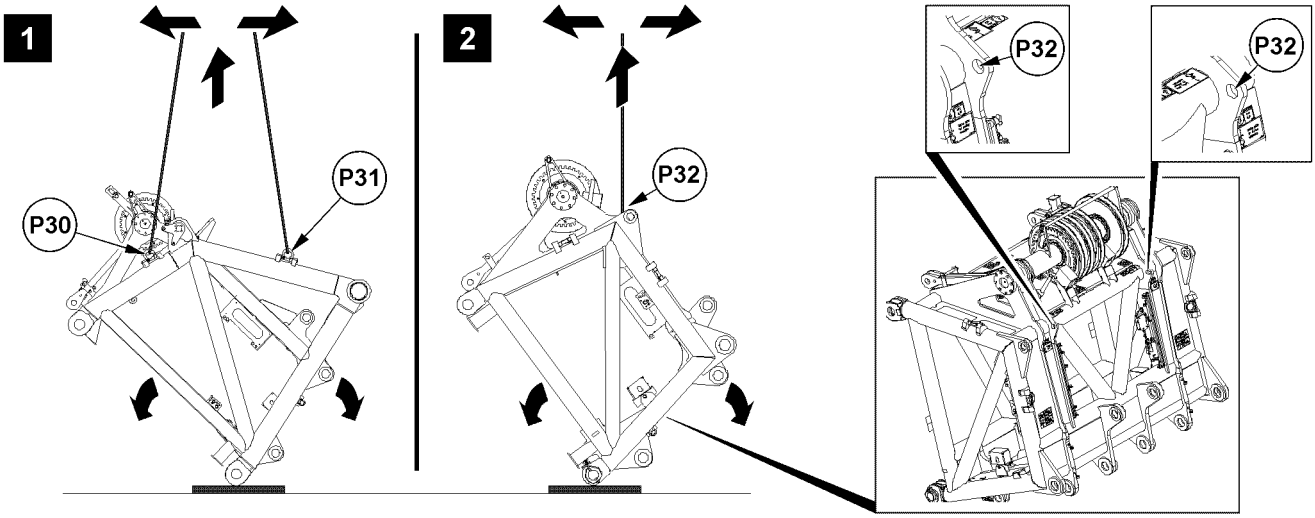

Fig.122035: Turning the end sections

Illustration 1: S-end section Illustration 2: L-end section

▶ Fasten the end section on the respective fastening points on both sides.

NOTICE
Danger of property damage!
▶ To avoid damage to the end sections: Make sure that the end sections are supported for the turning procedure.

WARNING
Tipping end section!
Death, severe bodily injuries, property damage.
▶ Make sure that there are no persons within the danger zone.
▶ Make sure that solely fastening equipment with the corresponding load bearing capacity is used.
▶ Select the fastening points to turn the end sections according to the signs on the end sections.

When the end section is properly fastened on the auxiliary crane:
▶ Lift the end section with the auxiliary crane and turn into assembly position.

When the end section is turned in assembly position:
▶ Carefully and at slow speed at the end section on the ground.

When the end section is seated completely on the ground:
▶ Remove the auxiliary crane.

Assembling the end section on the boom

Note
▶ The following description is an example and will be described by means of the L-end section.
▶ The process for the S-end section is identical.

Make sure that the following prerequisites are met:
- The boom system is assembled to the required system length.
- The connector pins on the last assembled lattice section are unpinned.
- The connector pins on the end section are unpinned.
- The fastening equipment on the end section **31** is tensioned.

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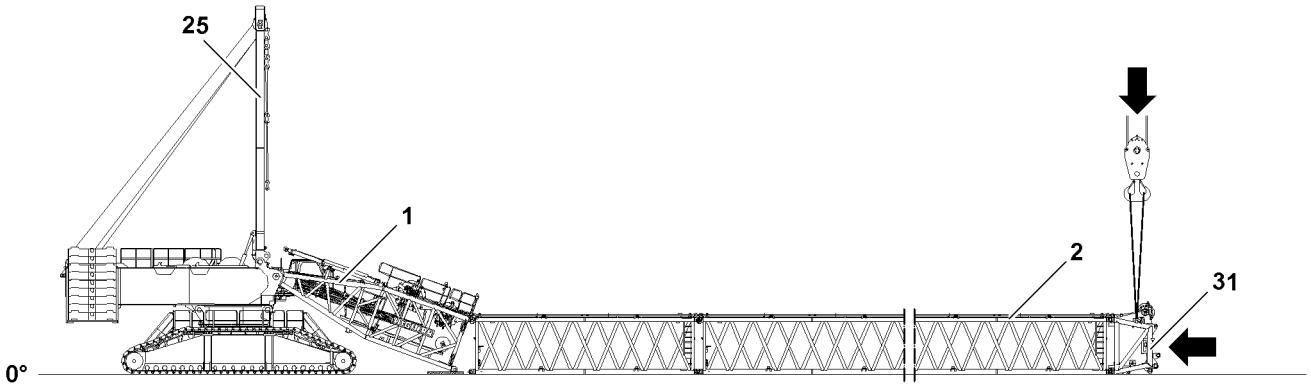

Fig.119123: Installing the end section on the boom

▶ Swing the end section **31** in with the auxiliary crane to the pin points.

When the pin bores between the end section **31** and the last installed lattice section **2** align „on top“ and „bottom“:

▶ Insert the connector pins „on top“ with the pin pulling cylinders on both sides to the stop and secure.

When the connector pins „on top“ are fully pinned to the stop and secured on both sides:

▶ Insert the connector pins „on the bottom“ with the pin pulling cylinders on both sides to the stop and secure.

When the connector pins „on top“ and „on the bottom“ are properly pinned:

▶ Secure the connector pin with the locking pin.

▶ Remove the auxiliary crane.

3.9.4 Establishing the electrical connections to the boom end section

Make sure that the following prerequisites are met:

– The S-intermediate sections are properly assembled and secured on the ground.

– The boom end section is properly assembled and secured.

NOTICE

Danger of damage to the electrical connections!

If the electrical connection from the cable drum in the S-pivot section to the terminal box on the S-pivot section is established first before the connection to the terminal box on the boom end section, then the electrical connection will be damaged when spooling out the cable drum.

▶ Establish first the electrical connection from the cable drum in the S-pivot section to the terminal box on the boom end section and then the electrical connection from the terminal box in the S-pivot section to the cable drum in the S-pivot section.

Note

▶ To establish the electrical connections on the S-boom: Use the Electrical wiring diagram.

▶ Establish the electrical connections.

▶ Make sure that all electrical connections on the boom are established.

WARNING

Malfunction if dummy plugs are not installed!

If the dummy plugs on the non-required electrical connections are not installed, then malfunctions or functional limitations can occur on the crane.

▶ Make sure that all non-required electrical connections that have a dummy plug are closed off with dummy plugs.

▶ Pay attention to the Electrical wiring diagram.

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▶ As a rule, close off on-required electrical connections (for example for accessories which cannot be installed) with the respective dummy plugs.

NOTICE
Property damage due to dirt and / or corrosion!
If non-required electrical connections are not closed off with the respective protective caps, then dirt and / or corrosion can damage the electrical connections.
This could result in malfunctions.
▶ Make sure that all non-required electrical connections are always closed off properly.
▶ Pay attention to the Electrical wiring diagram.

▶ Close electrical connections, which have no dummy plugs, properly off with the corresponding protective caps.

3.9.5 Closing the boom system

Make sure that the following prerequisites are met:
– The boom system is completely assembled.
– All lattice sections are properly pinned with each other.
– All pin connections are properly pinned and secured.

Note
▶ The actual forces on test point 1 **MS1** - which are used during the closing procedure of the boom system - are shown on LICCON monitor 1.
▶ Note the actual forces of test point 1 **MS1** and keep it ready for the disassembly of the boom system.

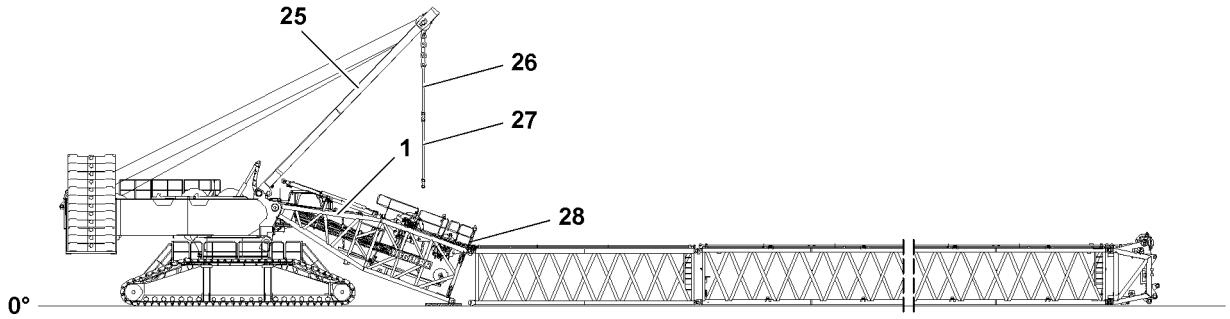

Fig.119114: Lowering the SA-frame to the front

▶ Lower the SA-frame **25** to the front until the guy rods **27** hang freely over the brackets **28** of the S-pivot section **1**.

WARNING
Neglected guy rod inspection and maintenance!
Death, severe bodily injuries, property damage.
▶ The guy rods must be checked before every assembly, see Crane operating instructions, chapter 8.15.

▶ Pin the guy rods **27** of the SA-frame with the brackets **28** of the S-pivot section: Insert the pin **27.1** on both sides and secure with locking pin **27.2**.

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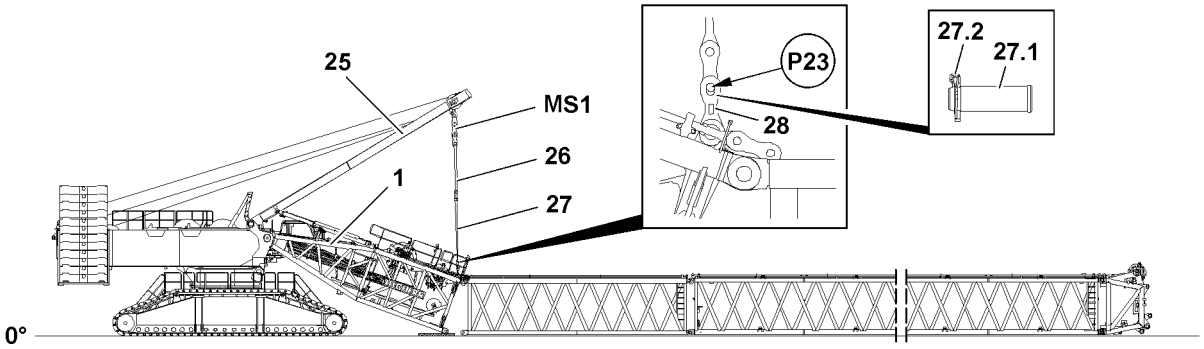

Fig.119113: Pinning the SA-frame guying on the S-pivot section

▶ Erect the SA-frame **25** until the guy rods between the SA-frame and the S-pivot section are completely tensioned.

DANGER
Overload of crane!
Death, severe bodily injuries, property damage.
▶ During the „closing procedure“ of the boom system, the maximum permissible F1-total force ($F1_{max}$) of **109 t** on test point 1 **MS1** may **not** be exceeded.
▶ The closing of different boom systems with the SA-frame **25** is only permissible up to certain maximum boom lengths, see the following chart overview.
▶ The end section may **not** lift off the ground during closing procedure of the boom system, it must be laying on the ground.
▶ Make sure that there are no persons on the boom system as well as in the danger zone during the closing procedure.

Counterweight and central ballast, see the Erection chart, depending on the boom length			
Boom system	**Maximum system length**	**MS1**	**Equipment**
S2	Maximum	109 t	- with S-guy rods
SL	Maximum	109 t	- with S-guy rods
SL3	Maximum	109 t	- with S-guy rods

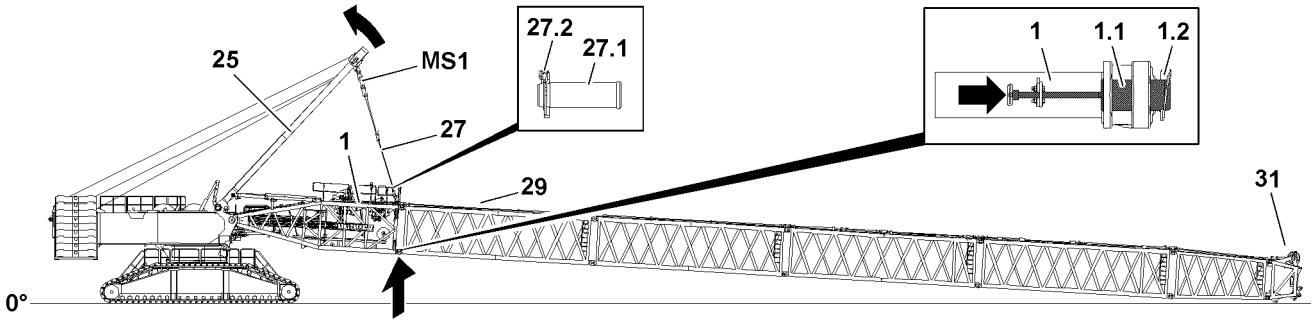

Fig.119125: Closing the boom system with the SA-frame

▶ Pull the S-pivot section **1** up with the SA-frame **25** and pin on both sides **on the bottom**: Insert the pin **1.1** and secure with the locking pin **1.2**.

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Note

- ▶ The ACTUAL force on test point **MS1** is shown on LICCON monitor 1. Note the displayed ACTUAL force.
- ▶ When **unpinning** with the same ACTUAL force on test point **MS1**, tension the guying on the SA-frame **25**.

When the boom system is closed and the pins on the S-pivot section are properly pinned and secured on the bottom:

- ▶ Relieve the guy rods between the SA-frame and S-pivot section by lowering the SA-frame **25**.

DANGER

The boom can suddenly fold down!
If the guy rods are unpinned on the S-pivot section before the lower pins **1.1** are pinned, the boom can fold down.
Death, severe bodily injuries, property damage.

- ▶ Do not unpin pins **27.1** until the lower pins **1.1** have been pinned and secured.

- ▶ Unpin the guy rods: Release and unpin the pin **27.1**.
- ▶ Pin the guy rods **27** with the guy rods **29**: Insert the pin **27.1** and secure with the locking pin **27.2**.

Pin the subsequent guy rods with each other and secure them properly.

Note

- ▶ For the combination of the various boom lattice sections refer to the Rod plan.

When the guy rods are properly pinned and secured with each other:

- ▶ Tension the boom guying.

WARNING

Unutilized guy rods on boom!
Death, severe bodily injuries, property damage.

- ▶ Non-required guy rods must be removed from the lattice sections, see Crane operating instructions, chapter 5.01.

- ▶ Remove non-required guy rods from the lattice sections.

4 Assembling the boom system in flying mode

If spatial prerequisites on the job site are limited for the assembly of the boom system, or if they are limited by buildings or similar, then the S-SL-boom can be installed in „flying mode“.

WARNING

General danger notes!
Death, severe bodily injuries, property damage.

- ▶ All pins are to be secured after assembly with the intended retaining elements.
- ▶ The guy rods must be inspected regularly, see the Crane operating instructions, chapter 8.15.
- ▶ Secure the boom with substructure or auxiliary crane, see Crane operating instructions, chapter 5.01.
- ▶ It is prohibited for anyone to remain under the booms or within the complete danger zone during the pinning and unpinning procedure of the lattice section.

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WARNING
Impermissible boom lengths guyed!
Death, severe bodily injuries, property damage.
- ▶ The maximum permissible boom lengths for the „flying“ assembly may not be exceeded.
- ▶ Pin the SA-frame guy rods with the brackets on the S-pivot section.

When the boom system is longer than the permissible flying assembly length:
- ▶ Support the boom on the end of the permissible flying assembly length or secure with an auxiliary crane, see Operating instructions, chapter 5.01.
- ▶ Observe the assembly conditions, see the Crane operating instructions, chapter 3.06.
- ▶ The data in the erection and take-down charts as well as the load charts must be adhered to.

NOTICE
Property damage!
If the pins of the guy rods are not pinned from the „inside“ to the „outside“, the hoist rope can scrape on the pins and be damaged.
- ▶ Always insert the pins of the guy rods from the „inside“ to the „outside“, see the Rod plan.

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ For the „flying“ boom assembly, the maximum permissible total force ($F1_{max}$) on test point **MS1** may **not** be exceeded.
- ▶ The „flying“ boom assembly is only permissible up to a maximum flying assembly length.
- ▶ Make sure that the maximum permissible flying assembly lengths are not exceeded, even when $F1_{max}$ (MS1) is not yet reached.
- ▶ The „actual force“ on test point 1 **MS1** is shown on LICCON monitor 1.
- ▶ Observe the assembly conditions, see the Crane operating instructions, chapter 3.06.
- ▶ The specifications in the erection and take-down charts as well as the load charts must be observed.
- ▶ For the itemization of the lattice sections refer to the Rod plan.

4.1 Assembling the S-lattice section in „flying mode“ on the S-pivot section

For the flying assembly of the boom system, the S-pivot section must be guyed with the SA-frame.

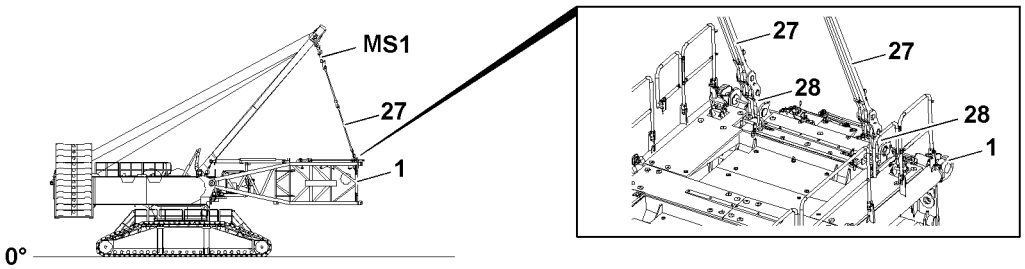

Fig.119466: Pinning the SA-frame guying on the assembly brackets on the S-pivot section

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Make sure that the following prerequisites are met:
- The electrical and hydraulic connections to the S-pivot section have been established.
- The S-pivot section is horizontally tensioned.
- An auxiliary crane with sufficient load bearing capacity if available.

WARNING
Falling components!
Death, severe bodily injuries, property damage.
- ▶ During pinning and unpinning of the intermediate sections, it is prohibited for anyone to remain **under** or **on** the components as well as within the entire danger zone.
- ▶ Before unpinning: Support the components and boom.
- ▶ Secure the pins in the storage locations and in the receptacles.
- ▶ It is prohibited to lean a ladder against the crane section that is being disassembled.

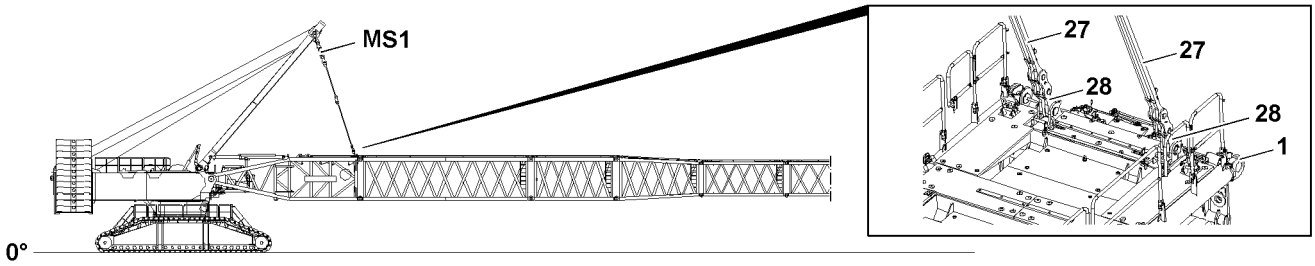

Fig.119464: Flying assembly up to maximum permissible flying assembly length

For „flying“ assembly of the intermediate sections, they can be installed individually or as preassembled boom unit on the S-pivot section **1**.

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ Make sure that the maximum permissible flying assembly lengths are **not** exceeded.
- ▶ The crane operator bears the sole and full responsibility for the observation of the maximum permissible flying assembly lengths.

- ▶ Fasten the S-intermediate section **4** or preassembled boom unit to the auxiliary crane.
- ▶ Lift the S-intermediate section **4** or preassembled boom unit with the auxiliary crane and position on the S-pivot section **1** until the pin points align.

When the pin points between the S-pivot section **1** and S-intermediate section **4** or the preassembled boom unit align „on top“ and „bottom“:
- ▶ Pin the S-intermediate section **4** or preassembled boom unit „on top“: Insert the pin **1.1** on both sides and secure with locking pin **1.2**.
- ▶ Pin the S-intermediate section **4** or preassembled boom unit „on the bottom“: Insert the pin **1.1** on both sides and secure with locking pin **1.2**.

When the pins are properly pinned and secured on both sides on „top“ and „bottom“ between the S-pivot section **1** and the S-intermediate section **4** or the preassembled boom unit:
- ▶ Remove the auxiliary crane.

If additional lattice sections are assembled:
- ▶ Assemble the lattice sections the same way as described in this section.

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4.1.1 Assembling SL-/SL3-/S2-boom systems in flying mode - without end section

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ Make sure that $F1_{max}$ (MS1) is **not** exceeded at flying assembly.
- ▶ Make sure that the maximum permissible flying assembly lengths are not exceeded, even when $F1_{max}$ (MS1) is not yet reached.
- ▶ Make sure that no hook block is reeved at flying assembly.
- ▶ Make sure that all guy rods which are not required have been removed from the lattice sections.
- ▶ Make sure that at least the required counterweight is installed on the turntable, see the following chart.
- ▶ For the ballasting of central ballast, in as far as a central ballast is required for the respective operating mode, refer to the Erection and take down charts.

Note
- ▶ $F1_{max}$ (MS1) = see the following chart

Operating mode	$F1_{max}$	Counterweight	Central ballast
SL	170 t	150 t	0 t
S2	200 t	190 t	0 t
SL3	200 t	190 t	0 t

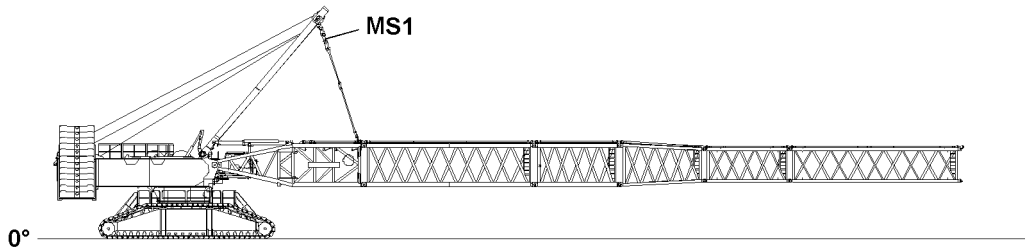

*Fig.119467: SL/SL3/S2-boom system - Flying assembly length to **maximum** 52.5 m*

- without end section - with S-guy rods - with WA-frame II guy rods

4.1.2 Assembling SL-/S2-boom systems in flying mode - with end section

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ Make sure that $F1_{max}$ (MS1) is **not** exceeded at flying assembly.
- ▶ Make sure that the maximum permissible flying assembly lengths are not exceeded, even when $F1_{max}$ (MS1) is not yet reached.
- ▶ Make sure that no hook block is reeved at flying assembly.
- ▶ Make sure that all guy rods which are not required have been removed from the lattice sections.
- ▶ Make sure that at least the required counterweight is installed on the turntable, see the following chart.

Note
- ▶ $F1_{max}$ (MS1) = see the following chart

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Operating mode	$F1_{max}$	Counterweight	Central ballast
SL	170 t	150 t	0 t
S2	200 t	190 t	0 t

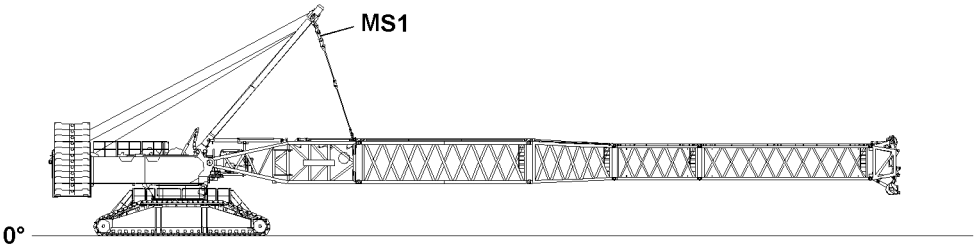

*Fig.119465: SL/S2-boom system - Flying assembly length to **maximum** 48.0 m*

- with end section
- with S-guy rods
- with WA-frame II guy rods

4.2 Assembling the S-lattice section in „flying mode“ on the S-intermediate section 12 m 3228.25 FLM

For the flying assembly of the boom system, preassemble the boom system up to the S-intermediate section 3228.25 FLM on the ground, close the boom system and change the pinning on the guy rods accordingly.

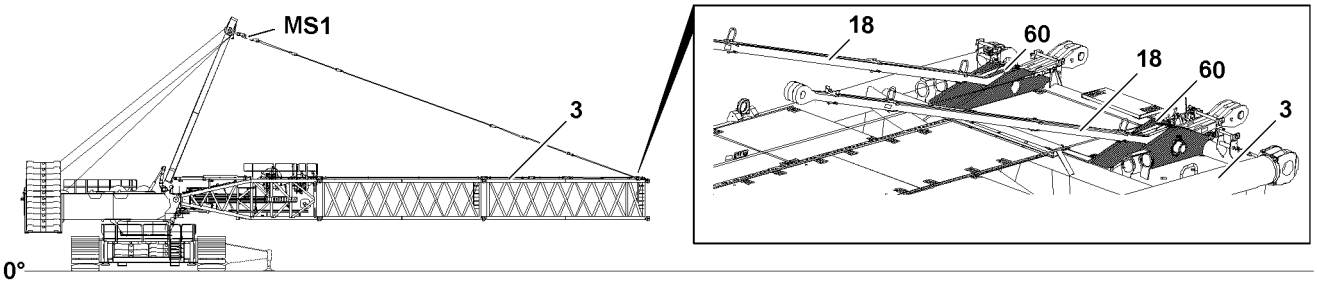

Fig.119135: Guying on assembly brackets on S-intermediate section (Flying assembly - intermediate section) pinned

WARNING
General danger notes!

- ▶ All pins are to be secured after assembly with the intended retaining elements.
- ▶ The guy rods must be inspected regularly, see the Crane operating instructions, chapter 8.15.
- ▶ Secure the boom with substructure or auxiliary crane, see Crane operating instructions, chapter 5.01.
- ▶ It is prohibited for anyone to remain under the booms or within the complete danger zone during the pinning and unpinning procedure of the lattice section.

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WARNING
Impermissible boom lengths guyed!
Death, severe bodily injuries, property damage.
- ▶ The maximum permissible boom lengths for the „flying“ assembly may not be exceeded.
- ▶ Pin the guy rods of the lattice sections, coming from the direction of the crane, with the guy rods **18** of the S-intermediate section 3228.25 FLM **3** for flying assembly.

When the boom system is longer than the permissible flying assembly length:
- ▶ Support the boom on the end of the permissible flying assembly length or secure with an auxiliary crane, see Operating instructions, chapter 5.01.
- ▶ Observe the assembly conditions, see the Crane operating instructions, chapter 3.06.
- ▶ The data in the erection and take-down charts as well as the load charts must be adhered to.

Make sure that the following prerequisites are met:
- – The electrical and hydraulic connections to the S-pivot section have been established.
- – The boom system is horizontally guyed on the S-intermediate section 3228.25 FLM **3**.
- – An auxiliary crane with sufficient load bearing capacity if available.

WARNING
Falling components!
Death, severe bodily injuries, property damage.
- ▶ During pinning and unpinning of the intermediate sections, it is prohibited for anyone to remain **under** or **on** the components as well as within the entire danger zone.
- ▶ Before unpinning: Support the components and boom.
- ▶ Secure the pins in the storage locations and in the receptacles.
- ▶ It is prohibited to lean a ladder against the crane section that is being disassembled.

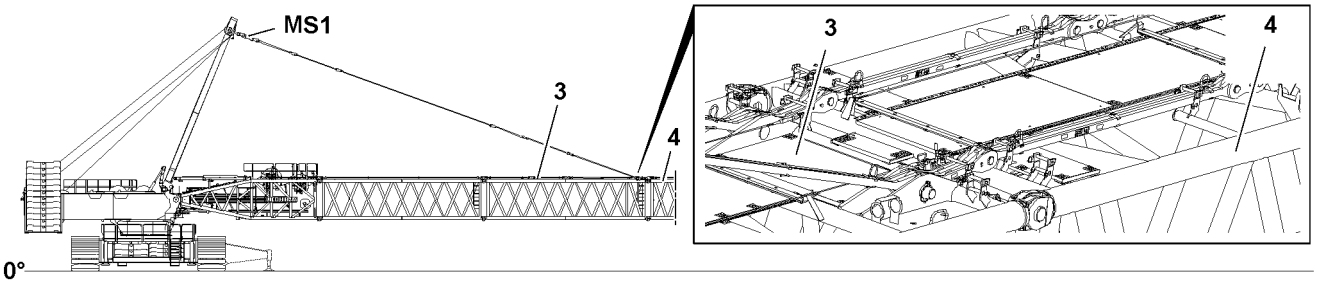

Fig.119136: Flying assembly up to maximum permissible flying assembly length

For „flying“ assembly of the intermediate sections, they can be installed individually or as preassembled boom unit on the S-intermediate section 3228.25 FLM **3**.

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ Make sure that the maximum permissible flying assembly lengths are **not** exceeded.
- ▶ The crane operator bears the sole and full responsibility for the observation of the maximum permissible flying assembly lengths.

- ▶ Fasten the S-intermediate section **4** or preassembled boom unit to the auxiliary crane.
- ▶ Lift the S-intermediate section **4** or preassembled boom unit with the auxiliary crane and position on the S-intermediate section 3228.25 FLM **3** until the pin points align.

When the pin points between the S-intermediate section 3228.25 FLM **3** and the S-intermediate section **4** on preassembled boom unit align „on top“ and „bottom“:
- ▶ Pin the S-intermediate section **4** or preassembled boom unit „on top“: Insert the pin **1.1** on both sides and secure with locking pin **1.2**.
- ▶ Pin the S-intermediate section **4** or preassembled boom unit „on the bottom“: Insert the pin **1.1** on both sides and secure with locking pin **1.2**.

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When the pins are properly pinned and secured on „top“ and „bottom“ between the S-intermediate section 3228.25 FLM **3** and the S-intermediate section **4** or the preassembled boom unit:

▶ Remove the auxiliary crane.

If additional lattice sections are assembled:

▶ Assemble the lattice sections the same way as described in this section.

4.2.1 Assembling the S2-boom system in flying mode

WARNING

The crane can topple over!

Death, severe bodily injuries, property damage.

▶ Make sure that $F1_{max}$ (MS1) is **not** exceeded at flying assembly.

▶ Make sure that the maximum permissible flying assembly lengths are not exceeded, even when $F1_{max}$ (MS1) is not yet reached.

▶ Make sure that no hook block is reeved at flying assembly.

▶ Make sure that all guy rods which are not required have been removed from the lattice sections.

▶ Make sure that a minimum of 190 t counterweight is assembled on the turntable.

▶ For the ballasting of the central ballast, refer to the erection and take down charts.

▶ To determine the required ballasting, assume a hook block weight of a minimum of 4 t in the erection and take-down charts.

Note

▶ $F1_{max}$ (MS1) = 300 t.

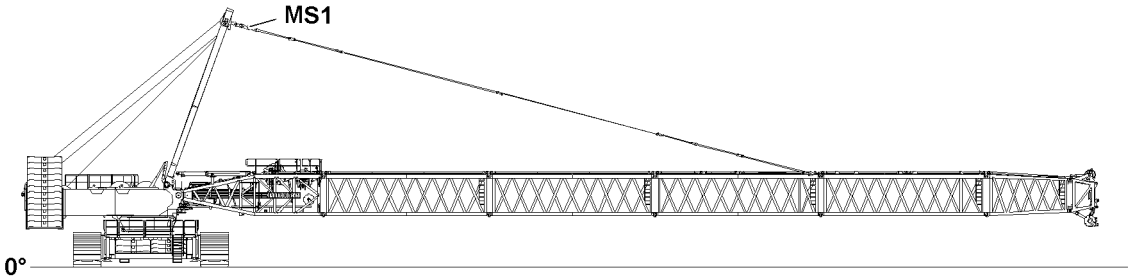

*Fig.119127: S2-boom system - Flying assembly length to **maximum** S2 66 m*

- with L-end section
- with roller sets
- with S-guy rods
- without WA-frame II guy rods

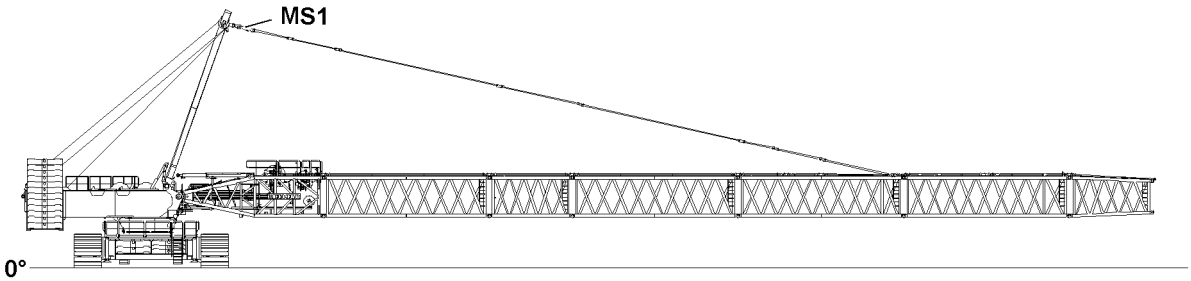

*Fig.119128: S2-boom system - Flying assembly length to **maximum** S2 72 m*

- without end section
- with S-guy rods
- without WA-frame II guy rods

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4.2.2 Assembling the SL-boom system in flying mode

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ Make sure that $F1_{max}$ (MS1) is **not** exceeded at flying assembly.
- ▶ Make sure that the maximum permissible flying assembly lengths are not exceeded, even when $F1_{max}$ (MS1) is not yet reached.
- ▶ Make sure that no hook block is reeved at flying assembly.
- ▶ Make sure that all guy rods which are not required have been removed from the lattice sections.
- ▶ Make sure that a minimum of 150 t counterweight is assembled on the turntable.
- ▶ For the ballasting of the central ballast, refer to the erection and take down charts.
- ▶ To determine the required ballasting, assume a hook block weight of a minimum of 5 t in the erection and take-down charts. When using the mechanical auxiliary support, assume a hook block weight of 7 t.

Note
- ▶ $F1_{max}$ (MS1) = 300 t.

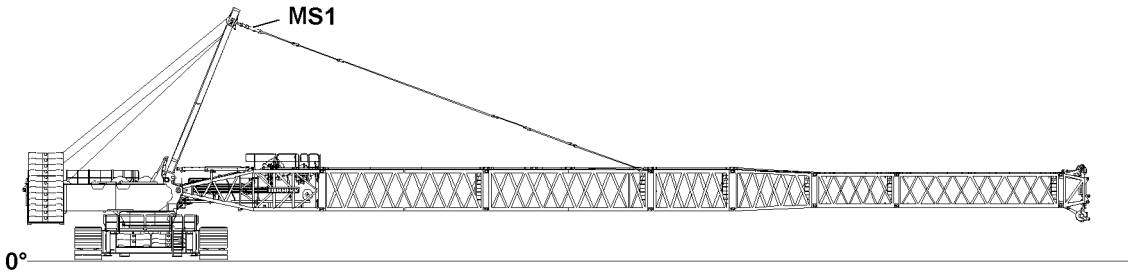

*Fig.119129: SL-boom system - Flying assembly length to **maximum** SL 66 m*

- with L-end section
- with roller sets
- with S-guy rods
- without WA-frame II guy rods

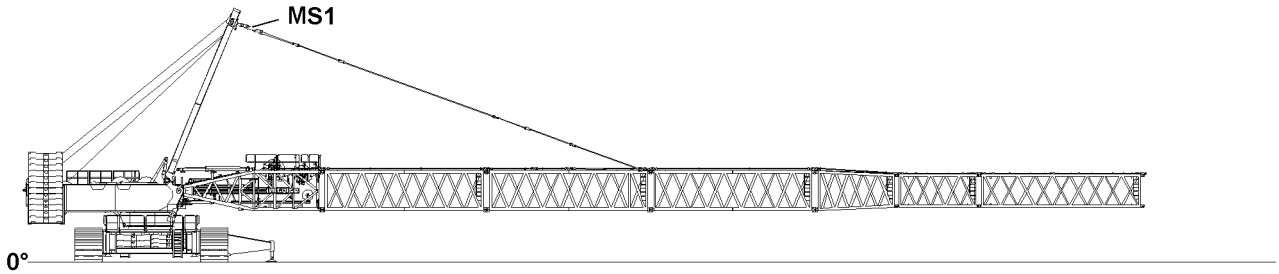

*Fig.119130: SL-boom system - Flying assembly length to **maximum** SL 72 m*

- without end section
- with S-guy rods
- without WA-frame II guy rods

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4.2.3 Assembling the SL3-boom system in flying mode

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ Make sure that $F1_{max}$ (MS1) is **not** exceeded at flying assembly.
- ▶ Make sure that the maximum permissible flying assembly lengths are not exceeded, even when $F1_{max}$ (MS1) is not yet reached.
- ▶ Make sure that no hook block is reeved at flying assembly.
- ▶ Make sure that all guy rods which are not required have been removed from the lattice sections.
- ▶ Make sure that a minimum of 210 t counterweight is assembled on the turntable.
- ▶ For ballasting of the central ballast, refer to the erection and take down charts.

Note
- ▶ $F1_{max}$ (MS1) = 300 t.

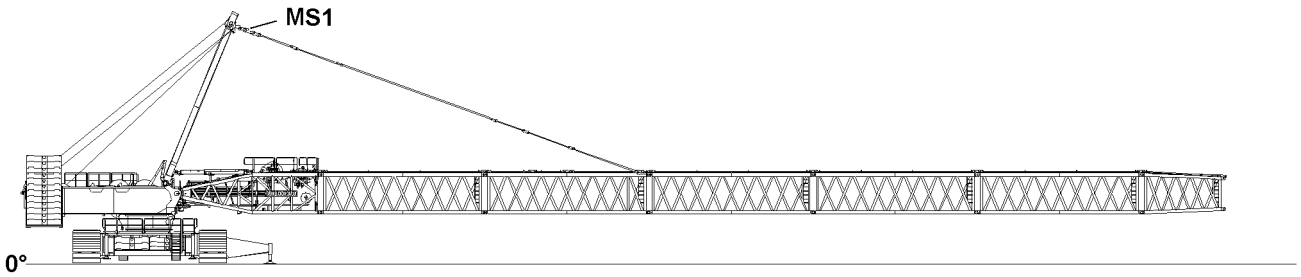

*Fig.119131: SL3- 102 m - boom system / Flying assembly length to **maximum** SL3 76.5 m*

- without end section
- with S-guy rods
- without WA-frame II guy rods

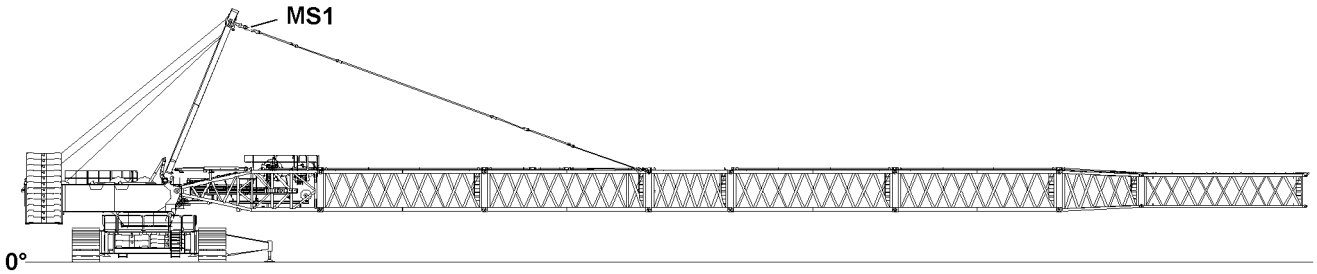

*Fig.119132: SL3- 108 m - boom system / Flying assembly length to **maximum** SL3 82.5 m*

- without end section
- with S-guy rods
- without WA-frame II guy rods

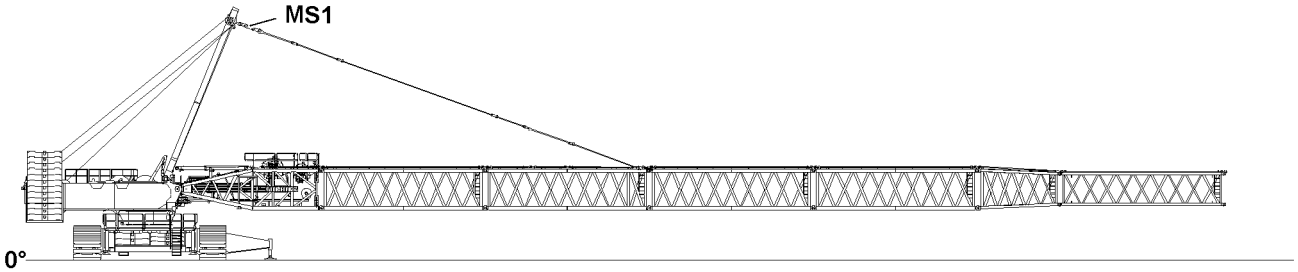

*Fig.119133: SL3- 114 m - boom system / Flying assembly length to **maximum** SL3 76.5 m*

- without end section
- with S-guy rods
- without WA-frame II guy rods

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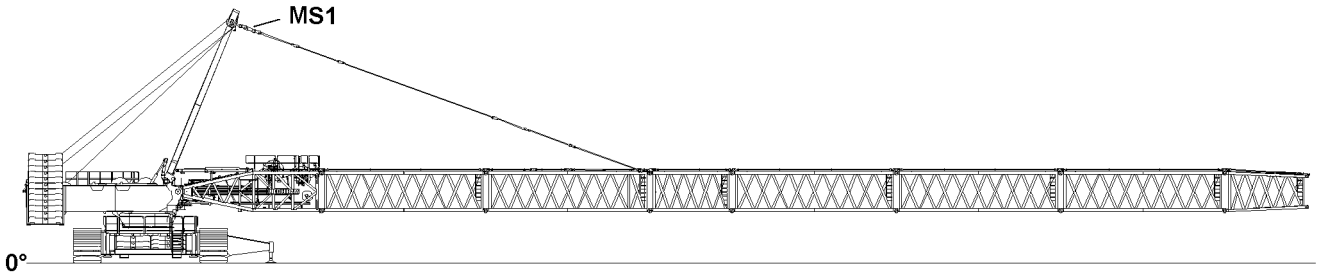

*Fig.119134: SL3- 120 m - boom system / Flying assembly length to **maximum** SL3 82.5 m*

- without end section
- with S-guy rods
- without WA-frame II guy rods

4.3 Completing the flying assembly

If the maximum permissible flying assembly length is installed and tensioned on the S-intermediate section 3228.25 FLM, the boom system must be taken down on the ground or a load bearing substructure.

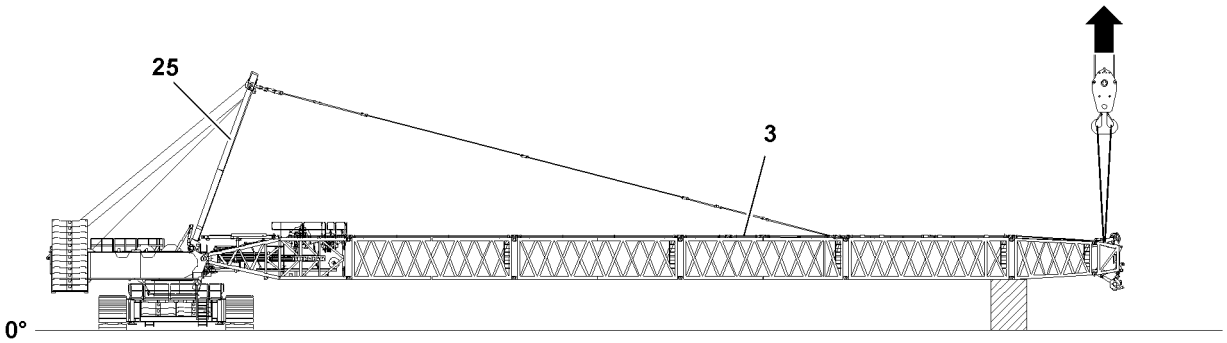

Fig.119138: Example: Boom system installed and supported up to the maximum permissible flying assembly length

Make sure that the following prerequisite is met:
– An auxiliary crane with sufficient load bearing capacity if available.

When the permissible flying assembly length is reached:
▶ Take the boom system down on the ground or on a load bearing substructure.
▶ Install the boom end section properly on the boom system.

Problem remedy
The maximum permissible flying assembly length does not correspond to the operating length?
▶ Take the boom system down on the ground.
▶ Expand the boom system on the ground to the required operating length.
▶ Close the boom system after reaching the required operating length with the auxiliary crane.

WARNING
The boom can suddenly fold down!
Death, severe bodily injuries, property damage.
▶ Before unpinning the guy rods: Support the boom system properly or take it down on the ground.
▶ Observe and adhere to the Rod plan.

When the boom system is properly taken down on the ground or supported:
▶ Relieve the guying between the SA-frame and S-intermediate section 3228.25 FLM by lowering the SA-frame.

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5 Assembling the boom combinations with substructure

If the assembly conditions for the assembly of the boom system are restricted due to the terrain on the jobsite, then it is possible to install the S-/SL-boom with a substructure.

WARNING
General danger notes!
- ▶ All pins are to be secured after assembly with the intended retaining elements.
- ▶ The guy rods must be inspected regularly, see the Crane operating instructions, chapter 8.15.
- ▶ Secure the boom with substructure or auxiliary crane, see Crane operating instructions, chapter 5.01.
- ▶ It is prohibited for anyone to remain under the booms or within the complete danger zone during the pinning and unpinning procedure of the lattice section.

NOTICE
Property damage!
If the pins of the guy rods are not pinned from the „inside“ to the „outside“, the hoist rope can scrape on the pins and be damaged.
- ▶ Always insert the pins of the guy rods from the „inside“ to the „outside“, see the Rod plan.

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ For boom assembly / disassembly with the substructure, observe chapter 5.01.
- ▶ The „actual force“ on test point 1 **MS1** is shown on LICCON monitor 1.
- ▶ Observe the assembly conditions, see the Crane operating instructions, chapter 3.06.
- ▶ The specifications in the erection and take-down charts as well as the load charts must be observed.
- ▶ For the itemization of the lattice sections refer to the Rod plan.

NOTICE
Overload of boom!
If the boom system is not properly supported at assembly, then the boom system can be overloaded. The boom system will be damaged.
- ▶ Support boom systems from a length of more than 114 m properly within the marked area: use suitable materials with sufficient load carrying capacity.
- ▶ Make sure that the dimension **X** for the maximum permissible deflection of the boom system is never exceeded.

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Make sure that the following prerequisites are met:
– Observe the danger notes and the prerequisites in section „Assembling S2/SL/SL3 boom“.

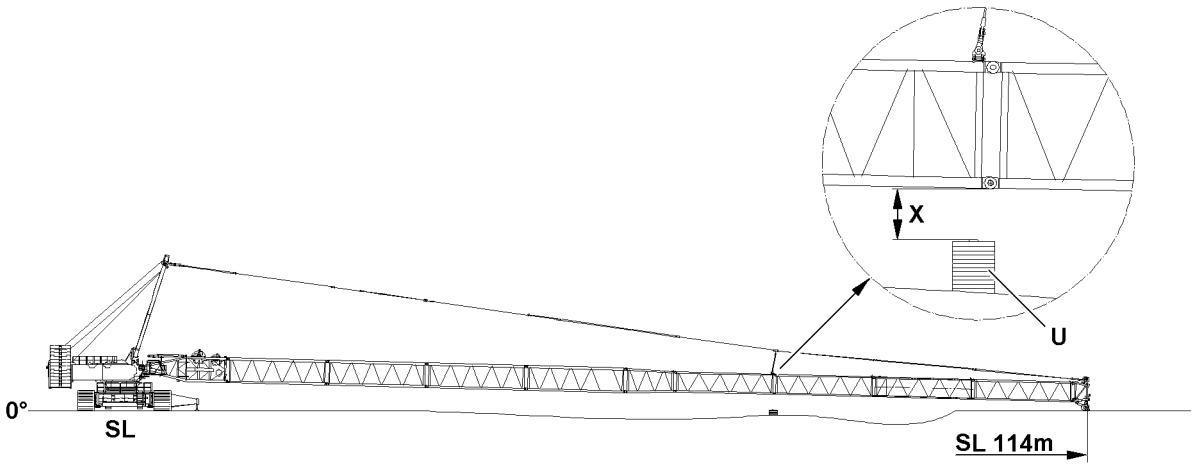

Fig.119450: Assembling the boom combination with substructure

The boom combinations must be preassembled at a suitable location.

Swing the preassembled boom combination with the auxiliary crane(s) in to the turntable, pin and secure.

▶ Preassemble the boom combination.

WARNING
Danger of accident due to boom system!
Death, severe bodily injuries, property damage.
▶ Make sure that no persons are within the danger zone of the crane and the boom system to be assembled.

▶ Swing the preassembled boom combination with the auxiliary crane (s) to the turntable.
▶ Pin and secure the boom combination with the S-pivot section on the turntable, see section „Assembling the S-pivot section on the turntable“.

When the boom system is properly installed with the S-pivot section on the turntable:
▶ Support the boom system properly before taking it down on the ground.

Operating mode	Support from length	Dimension[1] **X**
SL	114 m	1.1 m

[1] X = maximum permissible flexation of the boom system

▶ Lower the boom combination on the ground.

6 Assembling the S-guy rods

WARNING
Neglected guy rod inspection and maintenance!
Death, severe bodily injuries, property damage.
▶ Check the guy rods before every assembly, see Crane operating instructions, chapter 8.15.
▶ The S-guy rods must be assembled and secured, see Rod plan. The numbering in the rod plan must be identical to the numbering on the guy rods.
▶ Make sure that the inspection and maintenance intervals are adhered to.

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WARNING
Falling components!
Death, severe bodily injuries, property damage.
- ▶ Make sure that the intermediate sections or preassembled boom unit are properly pinned and secured on the S-pivot section.
- ▶ Make sure that the intermediate sections or preassembled boom unit is supported with suitable materials, secured with the auxiliary crane or the boom is placed on the ground.

Make sure that the following prerequisites are met:
- The boom system is closed.
- The boom is supported
- **or** the boom is held in position by the auxiliary crane
- **or** the boom is laying on the ground.
- The guying is relieved.

The guy rods are placed and secured for transport on the S-intermediate sections. Before assembly of the guy rods, release the transport retainers.

▶ Release and unpin transport retainers for the guy rods.

NOTICE
Property damage!
If the pins of the guy rods are not pinned from the „inside“ to the „outside“, the hoist rope can scrape on the pins and be damaged.
▶ Always insert the pins of the guy rods from the „inside“ to the „outside“, see the Rod plan.

- ▶ Pin the guy rods of all intermediate sections: Insert the pin from the „inside“ to the „outside“ and secure with locking pin.
- ▶ Assemble the guying according to the Rod plan, pin and secure it properly.
- ▶ Make sure that all guy rods of the boom system are pinned and secured.
- ▶ If it is required according to the Rod plan: Assemble the auxiliary guying, see Crane operating instructions, chapter 5.01 and 5.03.

WARNING
Unutilized guy rods on boom!
Death, severe bodily injuries, property damage.
▶ Non-required guy rods must be removed from the lattice sections, see Crane operating instructions, chapter 5.01.

▶ Remove non-required guy rods from the lattice sections.

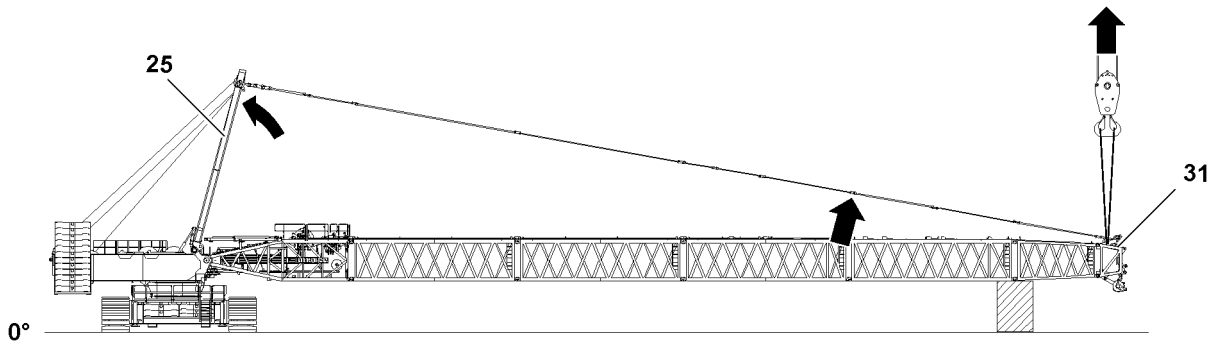

Fig.119139: Luffing the SA-frame up and tensioning the guying

▶ Erect the SA-frame **25** until the guy rods between the SA-frame **25** and end section **31** tension.

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7 Assembling the roller sets on the boom head

7.1 Assembling the roller sets

Note
▶ The assembly of the roller sets is described in the Crane operating instructions, chapter 5.14.

When the roller set / the roller sets are properly installed on the end section:
▶ Route the hoist limit switch from the end section forward on the roller set / the roller sets, pay attention and adhere to the Electrical wiring diagram.

7.2 Establishing the electrical connections on the boom end section

Make sure that the following prerequisites are met:
- The S-intermediate sections are properly assembled and secured on the ground.
- The boom end section is properly assembled and secured.
- The electrical connections to the boom end section have been established.
- The airplane warning light, wind speed sensor and all sensors are properly installed and secured on the boom end section.
- The hoist limit switches are properly installed and secured on the pulley head / pulley heads.

NOTICE
Danger of damage to the electrical connections!
If the electrical connection from the cable drum on the S-pivot section to the terminal box on the S-pivot section is established first before the connection to the terminal box on the boom end section, the electrical connection can be damaged when spooling out the cable drum.
▶ Establish first the electrical connection from the cable drum in the S-pivot section to the terminal box on the boom end section and then the electrical connection from the terminal box in the S-pivot section to the cable drum.

Note
▶ To establish the electrical connections on the S-boom: Use the Electrical wiring diagram.

▶ Establish the electrical connections.
▶ Make sure that all electrical connections on the boom are established.

WARNING
Malfunction if dummy plugs are not installed!
If the dummy plugs on the non-required electrical connections are not installed, then malfunctions or functional limitations can occur on the crane.
▶ Make sure that all non-required electrical connections that have a dummy plug are closed off with dummy plugs.
▶ Pay attention to the Electrical wiring diagram.

▶ As a rule, close off on-required electrical connections (for example for accessories which cannot be installed) with the respective dummy plugs.

NOTICE
Property damage due to dirt and / or corrosion!
If non-required electrical connections are not closed off with the respective protective caps, then dirt and / or corrosion can damage the electrical connections.
This could result in malfunctions.
▶ Make sure that all non-required electrical connections are always closed off properly.
▶ Pay attention to the Electrical wiring diagram.

▶ Close electrical connections, which have no dummy plugs, properly off with the corresponding protective caps.

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8 Performing the function checks

WARNING
Malfunctioning safety equipment!
Death, severe bodily injuries, property damage.
- ▶ Crane operation with non-functioning safety equipment is **prohibited**.
- ▶ Start crane operation only after all safety equipment have been checked and are functioning correctly.

Note
- ▶ The function of the individual limit switches must be checked before erection of the boom system.
- ▶ The function of the limit switch initiators must be checked in the test system, see the Diagnostics manual.

Note
- ▶ If a function check on the limit switches or on the safety equipment does not lead to the desired shut-offs, then the plug connections on the connector boxes or the components themselves must be checked.
- ▶ If no visible connection errors or component defects can be found, contact Liebherr Service.

Make sure that the following prerequisites are met:
- All electrical connections have been made.
- The crane engine is running.
- The corresponding operating mode is set on the LICCON monitor.
- The actuator levers of the limit switches have been checked for easy movement and are lubricated.

8.1 Wind speed sensor

- ▶ Check the movement and the function of the wind speed sensor.

8.2 Airplane warning light

- ▶ Turn the airplane warning light on, see Crane operating instructions, chapter 4.01.
- ▶ Check the function visually.

8.3 Hoist limit switch

- ▶ Actuate the hoist limit switch manually on the pulley head.

Result:

- The hoist winch turns off in upward movement.
- The hoist top icon on the LICCON monitor 0 blinks.
- The hoist limit switch is functioning.

8.4 Checking the limit switch main boom „steepest position“

Note
- ▶ The limit switch functions have to be checked individually before erection.

- ▶ Cover the limit switch initiators on the relapse cylinders of the main boom individually with a metal plate.

Result:

- The limit switch is actuated manually.
- The spool up function of winch 4 turns off.
- The icon „Boom limitation“ appears on the LICCON monitor 0.

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9 Erecting the boom

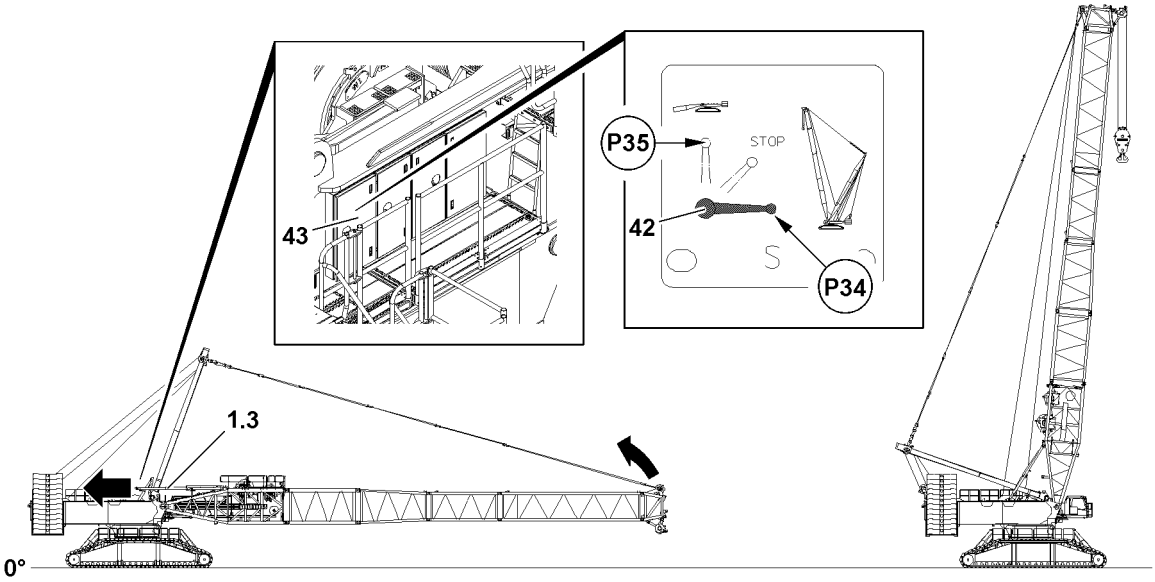

Fig.119137: Extending the relapse cylinder / erecting the boom system

WARNING
The crane can topple over!
In crane operation with bypassed LICCON overload protection, the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook.

If required in the erection and take down chart:
- ▶ Carry the hook block along with the auxiliary crane.

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ Observe the technical safety instructions, see the Crane operating instructions, chapter 5.01.
- ▶ Make sure that the relapse cylinders of the main boom are completely extended before erection of the boom combination.
- ▶ Do not allow slack rope to build up on the winch 4.

WARNING
Falling hoist rope!
Death, severe bodily injuries, property damage.
- ▶ Reeve the hoist rope before the erection procedure with a sufficient length on the roller set / the roller sets of the end section.
- ▶ The hoist rope must be constantly monitored during the erection procedure.
- ▶ Make sure that there are no persons within the danger zone.

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Make sure that the following prerequisites are met:
- The crane is horizontally aligned.
- The guy rods are properly assembled.
- The guy rods which are not required have been removed from the lattice sections.
- All electrical connections have been made.
- All hydraulic connections have been made.
- The function checks were carried out properly.
- All limit switches and warning devices are functioning.
- Crane ballasting (counterweight, central ballast, derrick ballast and / or auxiliary ballast) is carried out according to the load charts and / or the erection and take-down charts
- The crane has been set up according to the load charts and / or the erection and take-down charts.
- The LICCON overload protection has been set according to the data in the load charts and / or the erection and take-down charts.
- The LICCON overload protection settings have been checked for completeness and correctness.
- Assembly operation of the crane control is activated: the assembly icon is visible on the LICCON monitor.
- All pin connections have been secured.
- The hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins.
- There are no loose parts on the boom system.
- The boom system and the safety equipment are free from snow, frost and ice.
- No personnel or obstacles are within the danger zone.

9.1 Moving the S-relapse cylinders out

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
▶ Move the S-relapse cylinders **1.3** out completely before erecting the S-boom.
▶ Secure the ball valve **42** during crane operation to prevent inadvertent actuation.

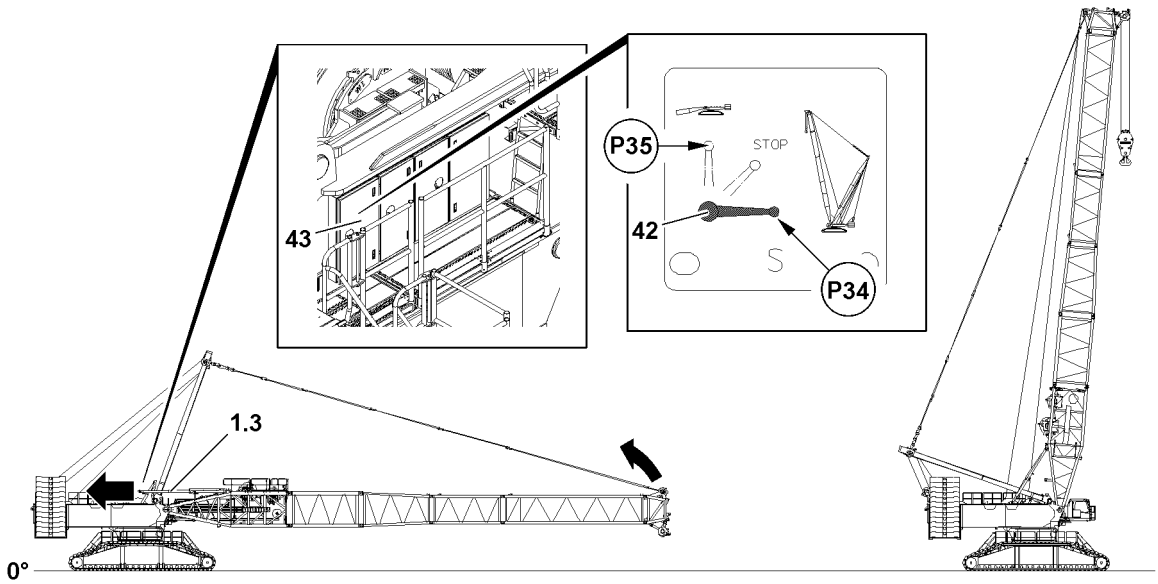

Fig.119137: Extending the relapse cylinder / erecting the boom system

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Ball valve positions	
Position (P)	Function
34	Crane operation, extend the piston rod
35	Assembly, retract the piston rod
STOP	The piston rod cannot be retracted / extended

The piston rods on the S-relapse cylinders **1.3** can be moved out with the ball valve **42**.

▶ Set the ball valve **42** to position **P34**.

Result:

– The piston rods of the S-relapse cylinders **1.3** move out.

Note

▶ The ball valve **42** is secured by closing the cabinet door **43** and removing the key.

▶ Close the cabinet door **43** and pull out the key.
▶ Hand the key to an authorized person.

9.2 Erection procedure

DANGER

The crane can topple over!

▶ It is prohibited to turn the crane superstructure while erecting the boom.
▶ Adhere to the specifications in the erection and take down charts.

Make sure that the following prerequisite is met:

– The correct hook block weight is entered on the LICCON monitor, see the Crane operating instructions, chapter 4.02.

9.2.1 Reeving in the hook block

Make sure that the following prerequisites are met:

– The crane is horizontally aligned.
– The slewing gear brake is applied.

WARNING

Danger of accident due to side wind!
If the slewing gear brake is released after reeving in / reeving out the hook block / load hook, then the crane can turn uncontrolled if there is a strong side wind.
The crane can collide with close-by structures or objects.
Death, severe bodily injuries, property damage.

▶ Make sure that the current wind speed does not exceed the values from the wind speed chart when releasing the slewing gear brake.

▶ Erect the boom until the end section lifts off the ground.

NOTICE

Danger of slack rope formation!
By spooling the hoist winch out too fast during the reeving procedure, slack rope can form.

▶ Make sure that the hoist rope is tensioned during the entire reeving procedure.

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WARNING
Falling hoist rope!
Death, severe bodily injuries, property damage.
- ▶ Reeve in the hoist rope with sufficient length on the S-boom before the erection process.
- ▶ The hoist rope must be constantly monitored during erection.
- ▶ Do not step into the danger zone.

- ▶ Reeve the hoist rope properly and secure it on the rope fixed point: Reeving, see Reeving plan.
- ▶ Pin and secure the rope retainers on the rope pulleys.
- ▶ Attach the hoist limit switch weight, see the Crane operating instructions, chapter 4.06.

9.2.2 Erecting the boom

WARNING
The crane can topple over!
In crane operation with bypassed LICCON overload protection, the crane can topple over.
There is then no additional protection against crane overload.
Death, severe bodily injuries, property damage.
- ▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook.
- ▶ Crane operation with bypassed LICCON overload protection is prohibited.

Note
- ▶ When the lowest operating position of the boom is reached, the set load chart of the LICCON overload protection is activated.
- ▶ In the maximum load icon appears a load number in „t“ instead of the display „???“.

- ▶ Luff the S-boom up to the lowest operating position.

When the S-boom has reached the lowest operating position:
- ▶ Make sure that the assembly icon on the LICCON monitor turns off.

Result:

– The LICCON overload protection is active.

10 Operating the crane

10.1 Preparing for crane operation

Note
- ▶ Observe the notes, see Crane operating instructions, chapter 4.02, chapter 4.04, chapter 4.05, chapter 4.08 and chapter 5.01.

Make sure that the following prerequisites are met:
– The LICCON overload protection is active.
– The LICCON overload protection has been set according to the data in the load chart.

WARNING
The crane can topple over!
- ▶ Check the horizontal position of the crane before and during operation.
- ▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset if necessary before resuming crane operation.

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10.1.1 Checking the settings

- ▶ Check the function of the overload protection by running against the operating positions „on top“ and „bottom“.
- ▶ Check the hoist limit switch by running against the hoist limit switch weight.

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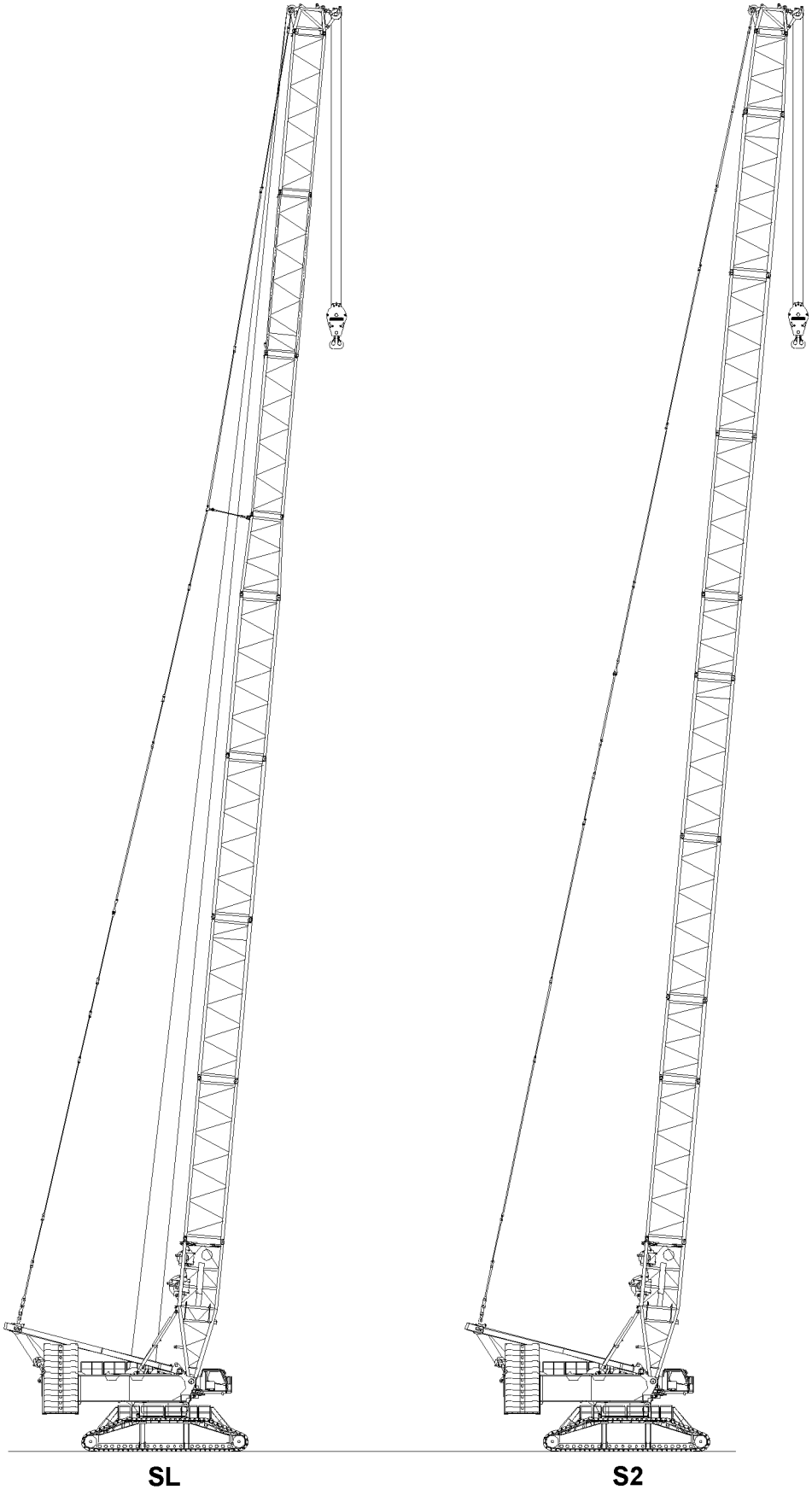

Fig.119108: S2/SL/SL3

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11 Disassembly S2/SL/SL3-boom

Note

- The disassembly is described on the example of the S-boom.
- For the combination of the boom lattice sections, observe and adhere to the Rod plan and the Crane operating instructions, chapter 5.03.

WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.

If this is not observed, assembly personnel could fall and be killed or seriously injured.

- All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- When closing or opening boom systems during boom assembly or boom disassembly, no persons may remain on the boom system or in the danger zone.
- If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- Only step on the aids, ladders and catwalks with clean shoes.
- Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- Remaining on a suspended load is prohibited.
- Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- For all assembly work, the crane driver of the main crane must be in voice contact with the crane driver / crane drivers of the auxiliary crane / auxiliary cranes.
- For assembly tasks, the crane driver may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING

The lattice sections can fall down!

Death, severe bodily injuries, property damage.

- Pin or unpin both pins at the same horizontal level, i.e. **left and right**.
- Do not stand under the lattice sections or within the entire danger zone during the pinning and unpinning procedure of the boom.
- Safely secure the pins in the storage locations as well as in the receptacles.
- It is prohibited to lean the auxiliary ladder against the component being disassembled.

WARNING

Danger of impact / crushing!

When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.

When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.

Death, severe bodily injuries, property damage.

- Make sure that personnel cannot be caught by components.
- Make sure that the crane is horizontally aligned.
- When working in danger zones: Use aids to protect limbs.
- Guide components with suitable aids to minimize oscillation.

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DANGER
The components can fall down!
Death, severe bodily injuries, property damage.
▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

Make sure that the following prerequisites are met:
– The ground is able to safely take on the total operating weight of the crane.
– The crane is horizontally aligned.
– An auxiliary crane with sufficient load bearing capacity if available.
– An assembly scaffolding or a work platform is available.
– The central ballast has been installed on the crawler travel gear according to the load chart or the erection and take down charts.
– The counterweight has been installed on the turntable according to the load chart or the erection and take down charts.
– The LICCON overload protection has been set according to the data in the load chart.

11.1 Disassembling the central ballast

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
▶ Observe the Erection and take down charts.
▶ If a central ballast is required for taking down the boom system, then leave the central ballast on the crane.

When no central ballast is required for taking down the boom system:
▶ Remove the central ballast, see Crane operating instructions, chapter 3.03.

11.2 Turning the turntable to the disassembly position

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
▶ Observe the specifications in the erection and take-down charts.
▶ Observe the data in the load charts.

▶ Turn the turntable into disassembly position according to the erection and take down charts.

11.3 Luffing the boom system down and reeving the hoist rope out

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
▶ Observe the technical safety instructions, see the Crane operating instructions, chapter 5.01.
▶ Observe the specifications in the erection and take-down charts.

NOTICE
Damage of boom components!
Taking down the boom system can lead to a collision between the hook block and the pulley head.
Boom components can be severely damaged.
▶ Luff the boom system down and at the same time spool the hoist winch out.
▶ When luffing the boom system down, the SA-frame must remain in operating position until the S-end section is laying on the ground or on a substructure or it is safely held by an auxiliary crane.

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Note

- ▶ The luff down movement is turned off as soon as the lowest operating position of the S-boom is reached.
- ▶ When the lowest operating position of the S-boom is reached, the load display in the maximum load icon turns off and instead of the load display appears the display „???“.
- ▶ In the crane operating screen appear alarm functions.

▶ Luff the S-boom down to the **lowest** operating position.

Result:

– The luff down movement is turned off.
– The „STOP“ icon appears on the LICCON monitor.
– The horn icon appears on the LICCON monitor.

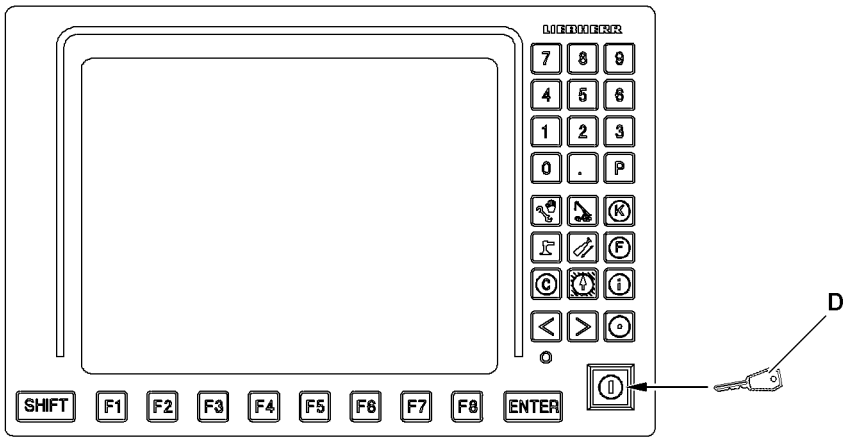

Fig.119109

WARNING

Danger of accident due to function „Exceedance of shut-off limits of the LICCON overload protection“!
If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload.
Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.

- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ is only permissible in emergencies and for assembly purposes.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ may only be actuated by persons who know the effects of their actions regarding the function „Exceeding the shut off limits of the LICCON overload protection“.
- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ requires the presence of an authorized person and must be performed with utmost caution.
- ▶ Crane operation with activated function „Exceedance of shut off limits of the LICCON overload protection“ is prohibited.

▶ Exceeding the shut off limits of the LICCON overload protection: Engage assembly operation.

Result:

– The shut off limits of the LICCON overload protection are exceeded.
– The assembly icon appears on the LICCON monitor.

Note

- ▶ See the Crane operating instructions, chapter 4.02 and chapter 4.20.

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- ▶ At the same time, spool the hoist winch out and luff the boom down until the hook block touches the ground.
- ▶ Remove the hoist limit switch weight and reeve the hook block out.
- ▶ Remove the hook block with the auxiliary crane.

When the hook block is removed under the boom head:

- ▶ Continue to luff the boom system down until the roller set / roller sets of the boom head are just above the ground.

WARNING
Spooling up of hoist rope!
Death, severe bodily injuries, property damage.

- ▶ All rope retaining pins / pipes on the S-boom are removed.
- ▶ Slowly spool up the hoist rope over the rope pulleys back to the winch.
- ▶ No one may be present in the danger zone.

NOTICE
Overspooled winch!
If the hoist rope is pulled under the winch when spooling up, then the adjustment of the winch speed sensor can change.
A new adjustment by **Liebherr Service** is required.

- ▶ Stop the winch in time, with sufficient rope reserve.
- ▶ Do not overspool the winch.

- ▶ Spool the hoist rope up.

11.4 Moving the S-relapse cylinder in

Make sure that the following prerequisite is met:

- – The crane engine is running.

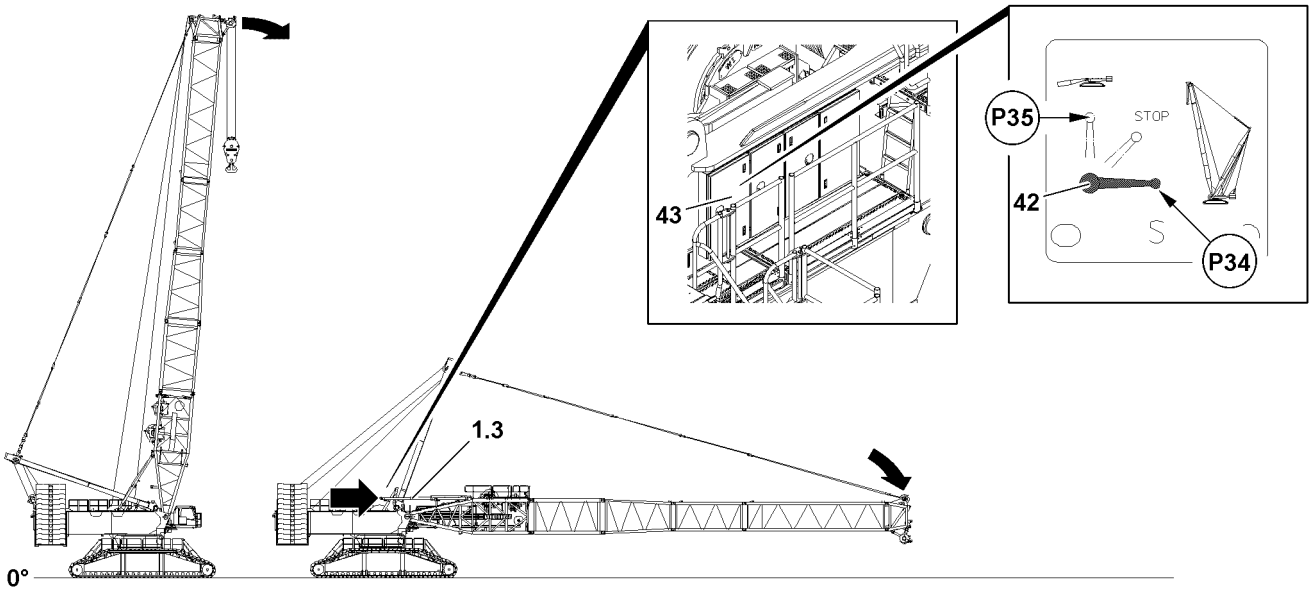

Fig.119140: Luffing the boom system down / retracting the relapse cylinder

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Ball valve positions	
Position (P)	Function
34	Crane operation, extend the piston rod
35	Assembly, retract the piston rod
STOP	The piston rod cannot be retracted / extended

The piston rods on the S-relapse cylinders **1.3** can be moved in with the ball valve **42**.

▶ Set the ball valve **42** to position **P35**.

Result:

– The piston rods of the S-relapse cylinders **1.3** move out.

Note

▶ The ball valve **42** is secured by closing the cabinet door **43** and removing the key.

▶ Close the cabinet door **43** and pull out the key.

▶ Hand the key to an authorized person.

11.5 Disassembly of the roller sets on the boom head

NOTICE

Danger of property damage!

During the disassembly of the roller sets the electrical connections to the hoist limit switches can be damaged.

▶ Remove the hoist limit switches on the roller sets.

▶ Before disassembly of the roller sets, route the hoist limit switches from the roller sets back to the end section.

Note

▶ The disassembly of the roller sets is described in the Crane operating instructions, chapter 5.14.

11.6 Placing the boom on the substructure

Make sure that the following prerequisites are met:

– The hook block is properly unreeved and removed.
– The hoist limit switch in on the end section.
– The roller set / the roller sets are removed.

NOTICE

Overload of boom!

If the boom system is not properly supported at disassembly, then the boom system can be overloaded.

The boom system will be damaged.

▶ Support boom systems from a length of more than 114 m properly within the marked area: use suitable materials with sufficient load carrying capacity, see section „Assembling the boom combinations with substructure“.

▶ Make sure that the dimension **X** for the maximum permissible deflection of the boom system is never exceeded.

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▶ Take the boom system down on the substructure.
or
Secure the boom system with the auxiliary crane in the horizontal position.
or
Take the boom system down on the ground.

11.7 Disconnecting the electrical connections on the boom end section

Make sure that the following prerequisite is met:
– The main boom is placed on the ground or is safely held by the auxiliary crane.

NOTICE
Damage to cable drum or cable!
If the cable of the cable drum is not properly spooled up on the cable drum after unplugging the S-end section, then the cable drum or the cable can be significantly damaged.
▶ Spool the cable drum up after unplugging.

▶ Spool the cable drum up and secure it to prevent inadvertent spooling out.
▶ Disconnect the electrical connections and store the plugs and cables properly.

11.8 Disassembling the guy rods

Make sure that the following prerequisites are met:
– The boom is laying on the substructure on the ground.
– The guying is relieved.
– The auxiliary guying is removed (only if present).

▶ Luff the SA-frame **25** down until the guy rods **29** are placed in the transport receptacles of the intermediate sections.
▶ Secure guy rods **29** in the transport receptacles: Insert and secure the pin.
▶ Disconnect the guy rods **27** of the SA-frame **25** from the guy rods **29** of the intermediate sections.
▶ Pin and secure the SA-frame guy rods **27** with the brackets **28** on the S-pivot section **1** at point **P23**: Use pin **27.1** and locking pin **27.2**.

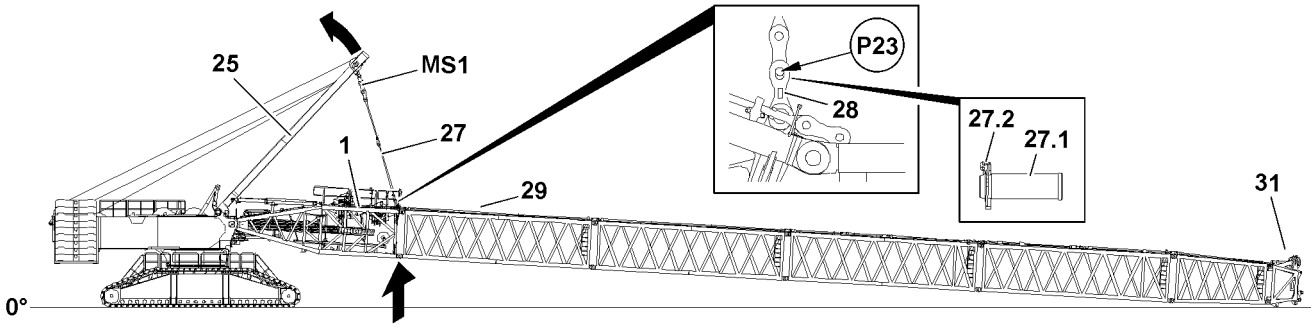

Fig.119143: Pinning the SA-frame guy rods on the S-pivot section

WARNING
The crane can topple over!
▶ Make sure that the end section of the boom system does **not** lift off the ground when tensioning the SA-frame guying.

When the SA-frame guy rods **27** are pinned with the brackets **28**:
▶ Luff the SA-frame **25** up until the SA-frame guy rods **27** are tensioned.

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11.9 Opening the boom system

Make sure that the following prerequisites are met:
- The boom system is safely held by the SA-frame.
- No personnel or obstacles are within the danger zone.

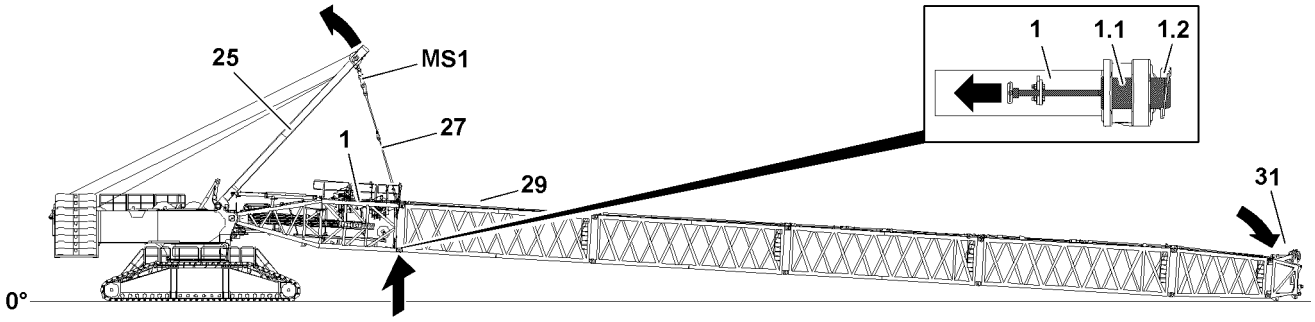

Fig.119142: Tensioning the SA-frame guying

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ Do **not** exceed the maximum permissible total force on test point 1 (MS1).
- ▶ Lifting and opening the respective boom is only permissible by observing the maximum permissible boom lengths and total forces.
- ▶ The end section may **not** lift off the ground during „opening procedure“ of the boom system.
- ▶ Make sure that there are no persons on the boom system as well as in the danger zone during the opening procedure.

Note
- ▶ The actual forces on test point 1 **MS1** - which are used during the opening - closing procedure of the boom system - are shown on LICCON monitor 1.
- ▶ Tension the guying on the test points at disassembly with the same forces as for assembly.
- ▶ For this, set the ACTUAL force at the test point 1 (MS1) measured and recorded during the assembly.
- ▶ The pins can be pulled easier and the pins and lugs are therefore not damaged.

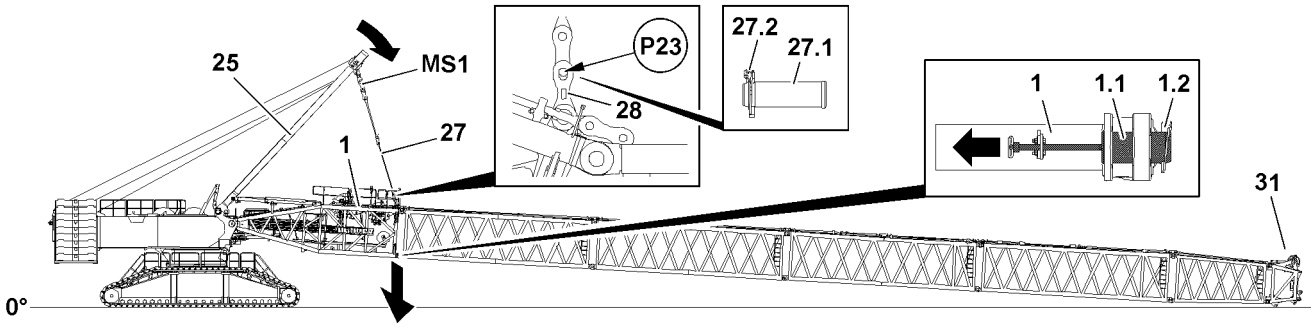

Fig.119144: Opening the boom system / lowering the SA-frame to the front

- ▶ Open the boom system: Unpin the connector pins **1.1** on both sides: Release and unpin the connector pins **1.1**.

NOTICE
Danger of property damage!
When lowering the boom system, crane components can be damaged.
- ▶ Make sure that the S-pivot section **1** is not lowered directly on the ground.
- ▶ Lower the S-pivot section **1** on the substructure when opening the boom system.

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When the connector pins **1.1** are completely unpinned:
▶ Lower the boom system carefully on the substructure on the ground.

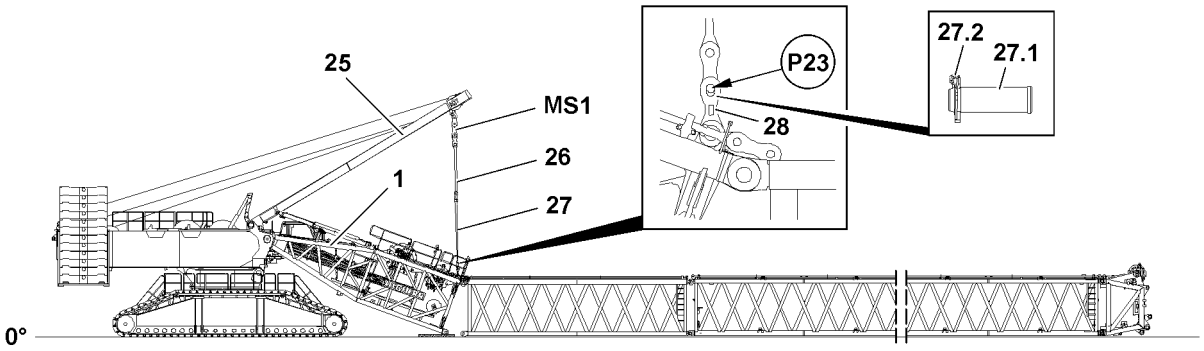

Fig.119113: Unpinning the SA-frame guying on the S-pivot section

When the S-pivot section is laying on the substructure on the ground:
▶ Unpin the guy rods **27** of the SA-frame **1** on the brackets **28**: Release and unpin the pin **27.1**.

Note
▶ Install and secure the guy rods which are not required and which have been removed at the assembly of the lattice section properly in the transport retainers of the lattice sections.

▶ Place the guy rods which are not required on the lattice sections, pin and secure.
▶ Disassemble the boom system properly.

11.10 Disassembling winch 5 (WV) on the S-pivot section

Note
▶ The disassembly of winch 5 is described in detail in the Crane operating instructions, chapter 3.07.50.

11.11 Disassembling winch 6 (WVI) on the S-pivot section

Note
▶ The disassembly of winch 6 is described in detail in the Crane operating instructions, chapter 3.07.60.

11.12 Disconnecting the electric and hydraulic connections on the S-pivot section

11.12.1 Disconnecting the electrical connections

Make sure that the following prerequisites are met:
– The boom system is opened.
– The S-pivot section is laying on the ground on the substructure.

NOTICE
Damage to cable drum or cable!
If the cable of the cable drum is not properly spooled up on the cable drum after unplugging the S-end section, then the cable drum or the cable can be significantly damaged.
▶ Spool the cable drum up after unplugging.

▶ Spool the cable drum up and secure it to prevent inadvertent spooling out.
▶ Disconnect the electrical connections and store the plugs and cables properly.

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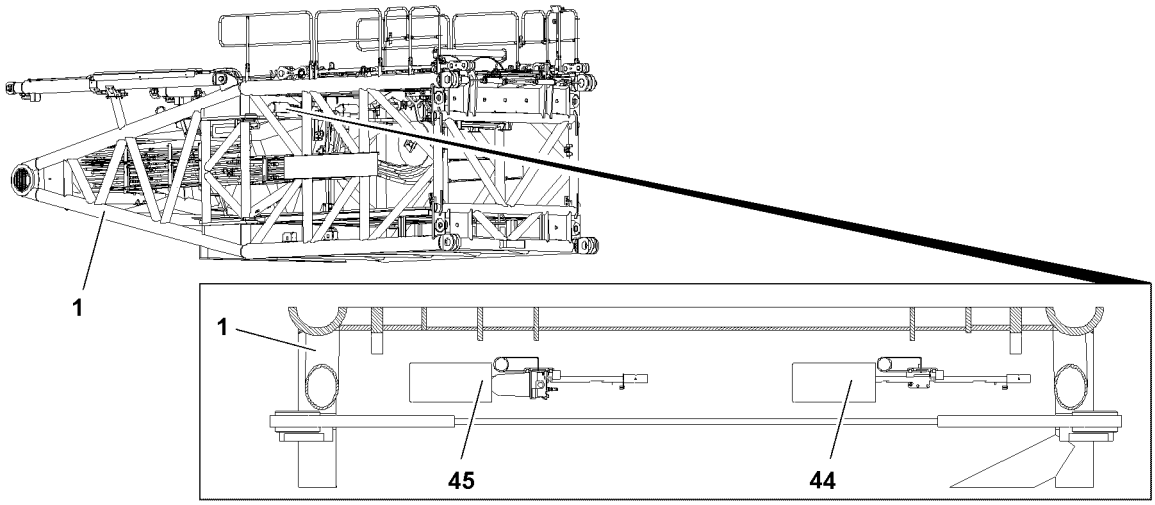

Fig.122057: Park position Wind speed sensor and airplane warning light

▶ Remove the wind speed sensor **44** and / or airplane warning light with wind speed sensor **45** on the boom end section and store it on the S-pivot section **1** properly in park position.

11.12.2 Disconnecting the hydraulic connections

When connecting and releasing hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

DANGER
Danger of accident due to loss of pressure or leakage!
Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.
Death, severe bodily injuries, property damage.
▶ Check that the quick couplings have been properly connected before using the crane.

Note
▶ To connect or release the hydraulic lines with quick couplings, see Crane operating instructions, chapter 5.01.

▶ Release the pressure in the hydraulic system before connecting or disconnecting. Turn the engine off and wait for short time.
▶ Assembling coupling components (sleeve and connector) by using knurled nut.
▶ Connect coupling components.

11.13 Disassembling the S-pivot section on the turntable

WARNING
General danger notes!
▶ Insert and secure all pins after disassembly in the intended transport receptacles.

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Make sure that the following prerequisites are met:
- The hydraulic connections to the S-pivot section are properly disconnected.
- The hydraulic connections on the S-pivot sections are properly closed off with caps.
- The electrical connections to the S-pivot section are properly disconnected.
- The electrical connections are properly closed off with dummy plugs (see Electrical wiring diagram).
- The crane engine is running.
- An auxiliary crane with sufficient load bearing capacity if available.

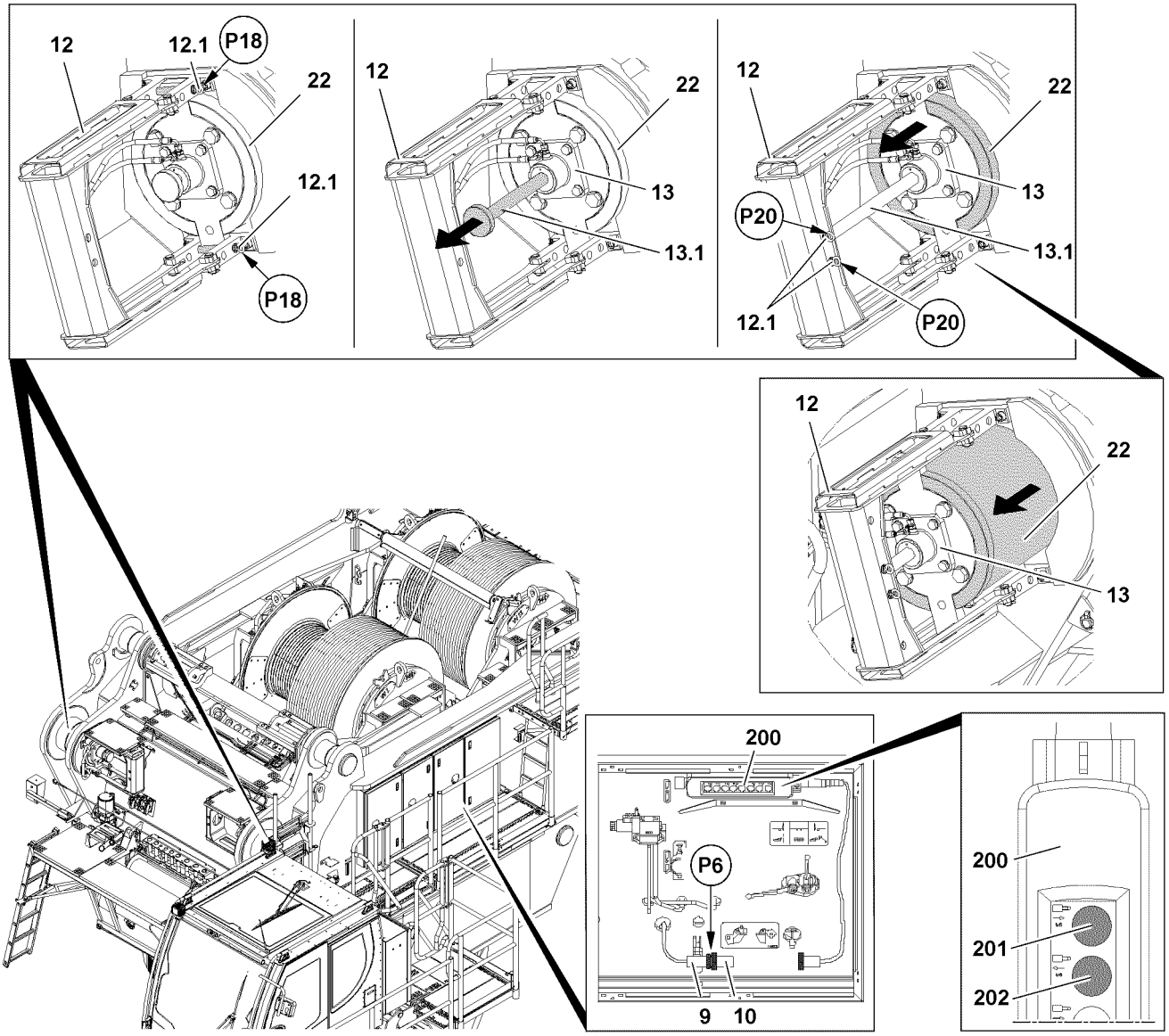

Fig.119111

Note

▶ Select the fastening points on the S-pivot section **1** in such a way that the S-pivot section **1** hangs horizontally on the auxiliary crane at disassembly. See section „Fastening points“.

▶ Attach the S-pivot section **1** properly on the auxiliary crane.

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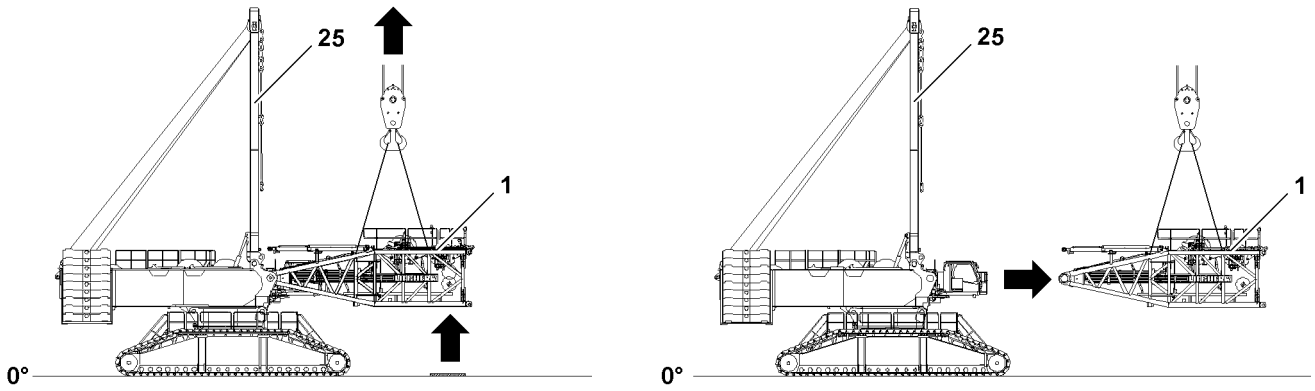

Fig.119145: Lifting the S-pivot section with the auxiliary crane horizontally / swinging the S-pivot section out from the turntable

▶ Lift the S-pivot section **1** with the auxiliary crane to the horizontal.

WARNING
Falling S-pivot section!
Death, severe bodily injuries, property damage.
▶ Make sure that the S-pivot section **1** is safely held by the auxiliary crane before unpinning the S-connector pins **22**.

Note
▶ The unpinning of the S-pivot section **1** on the turntable is described in detail in section: „Unpinning the S-connector pins on the turntable“.

When the S-pivot section is horizontally aligned and safely held by the auxiliary crane:
▶ Unpin the S-connector pins **22** on the turntable.

NOTICE
Damage of the turntable and the S-pivot section **1**!
▶ Slowly swing the S-pivot section **1** out with the auxiliary crane and at low speed on the turntable.
▶ Before placing it on the ground, support the S-pivot section **1**.

When the S-connector pins **22** on the S-pivot section **1** are fully unpinned on both sides:
▶ Swing the S-pivot section **1** out on the turntable with the auxiliary crane and place it down.
▶ Remove the auxiliary crane.

When the S-pivot section **1** is removed on the turntable:
▶ Fully insert and secure the S-connector pins **22** again.

11.14 Swinging the railing on the S-pivot section into transport position

WARNING
Danger of falling!
Death, severe bodily injuries, property damage.
▶ Assembly personnel must secure themselves for the assembly / disassembly of the railings and protective devices with an approved fall arrest system to prevent them from falling.
▶ For assembly and disassembly work, maintenance and inspection work on the S-pivot section, all railings and protective devices must be properly assembled and secured.

Make sure that the following prerequisite is met:
– The ground is able to safely take on the weight of the S-pivot section.
– The S-pivot section is laying completely on the ground.

▶ For assembly / disassembly of railings and protective devices, see Crane operating instructions, chapter 2.06.

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5.39.10 LD/SLD/SD-boom combination

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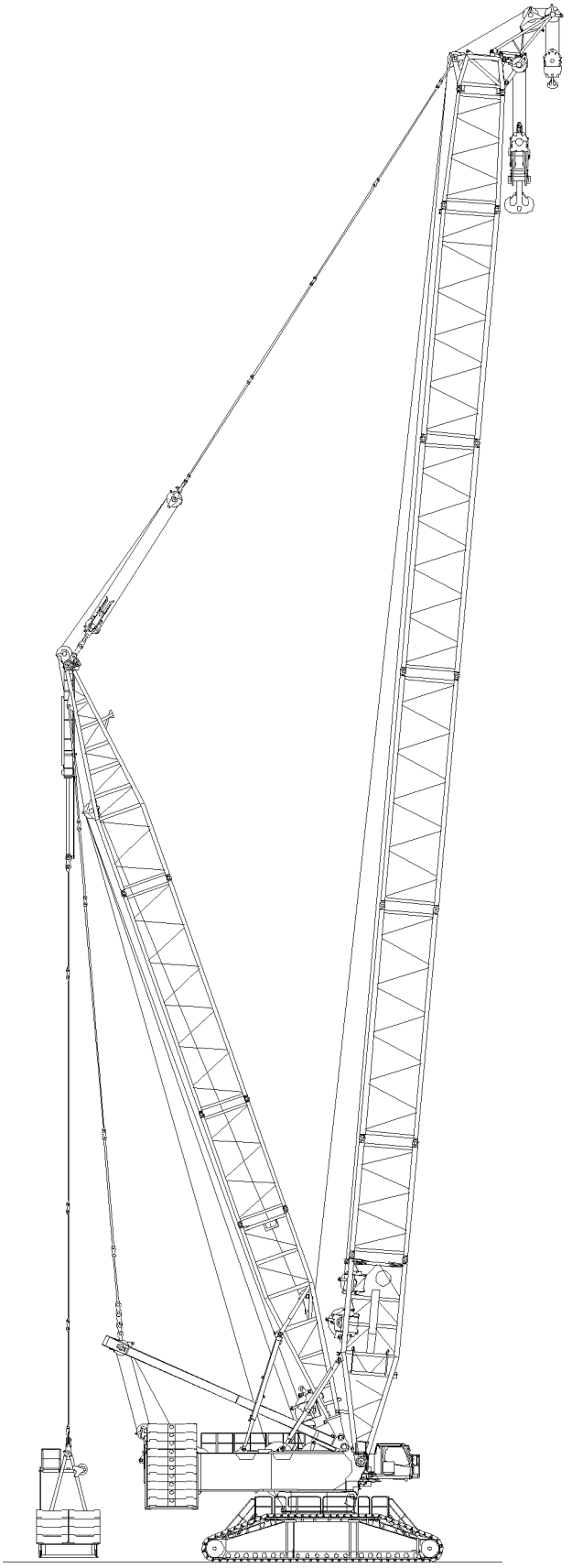

Fig.119146: SD/S2D/SL2D

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1 Component overview LD/SLD/SD boom

Note

- The boom components (boom - lattice sections) such as S/L-intermediate sections, S-Adapter, SL-reducer section and the S/L-end sections, as well as dimensions and weights are described in the Crane operating instructions, chapter 1.03.
- For the combination of the various boom systems, refer to the Rod plan and the Crane operating instructions, chapter 5.03.

2 Fastening points

WARNING
Falling lattice sections!
Death, severe bodily injuries, property damage.

- Make sure that the lattice sections are properly fastened on the respective fastening points.
- Make sure that the fastening equipment has the appropriate length and a sufficient load bearing capacity.
- Pay attention and adhere to the labels on the fastening points on the lattice sections and crane components.

2.1 Fastening points S-pivot section

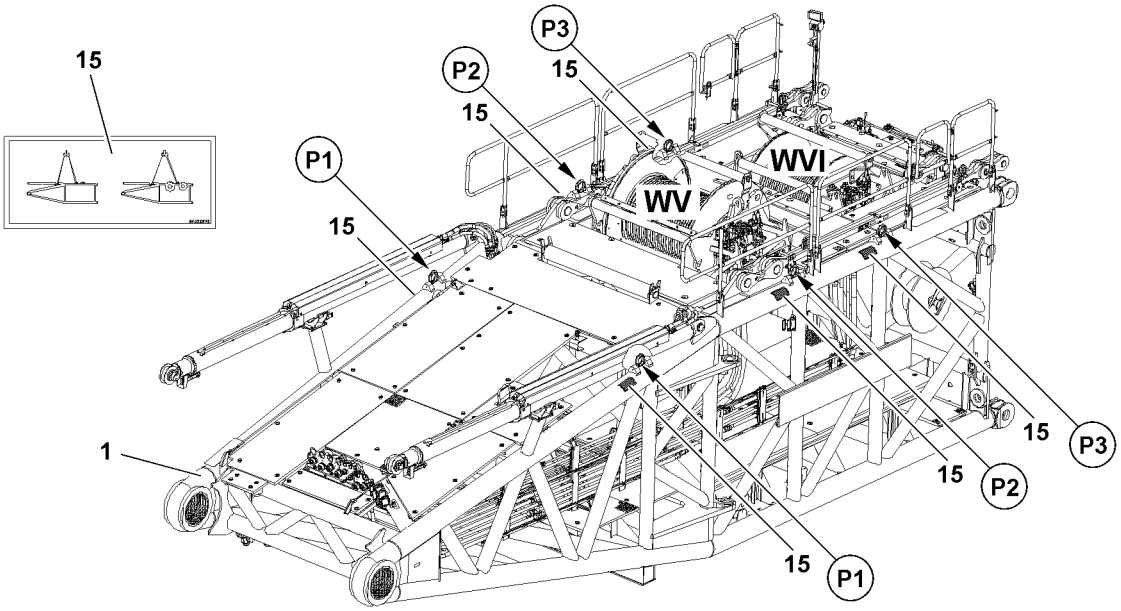

Fig.119100: Fastening points S-pivot section

Fastening points	
P1 + P2	S-pivot section without winch 5, without winch 6
P1 + P3	S-pivot section with winch 5, without winch 6
P1 + P3	S-pivot section without winch 5, with winch 6
P1 + P3	S-pivot section with winch 5, with winch 6

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2.2 Fastening points S-intermediate sections 6 m

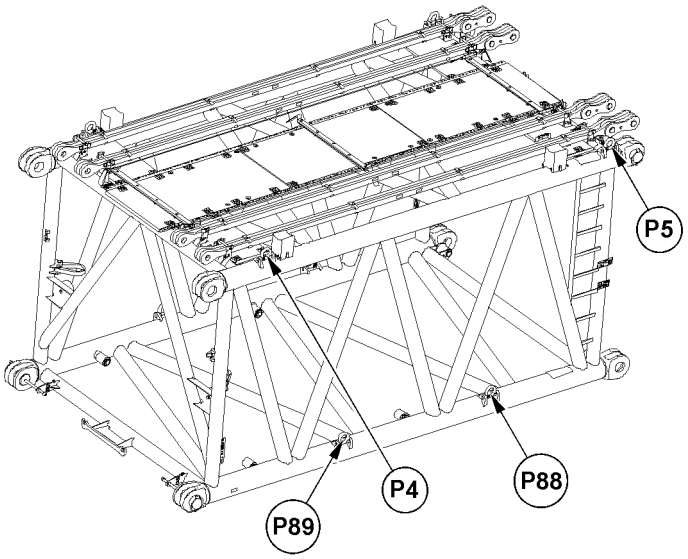

Fig.121930: Fastening points S-intermediate section 6 m

Note

- ▶ The S-intermediate sections are available in various system dimensions.
- ▶ The distance between the fastening pints can vary, depending on the respective S-intermediate section.
- ▶ The lattice section must be fastened on both sides on the fastening points.

Fastening points	
P4 + P5 **or** P88 + P89	S-intermediate section 6 m

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2.3 Fastening points S-intermediate sections 12 m / S-adapter 12 m

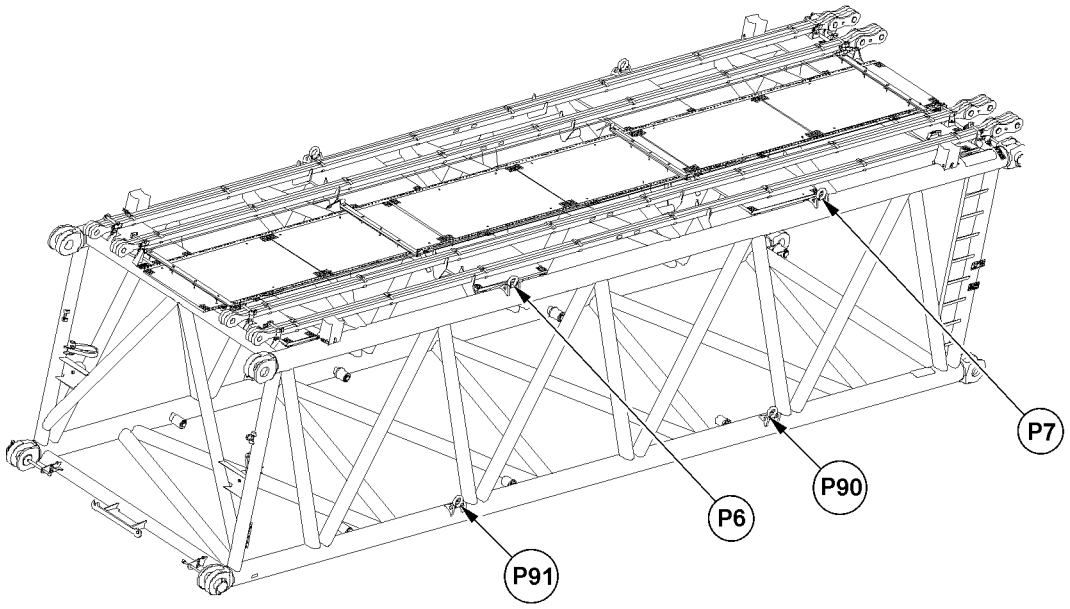

Fig.121931: Fastening points S-intermediate section 12 m / S-adapter 12 m

Note

- The S-intermediate sections are available in various system dimensions.
- The distance between the fastening pints can vary, depending on the respective S-intermediate section.
- The lattice section must be fastened on both sides on the fastening points.

Fastening points	
P6 + P7 **or** P90 + P91	Assembly S-intermediate section 12 m / S-adapter 12 m

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2.4 Fastening points SL-reducer section 6 m

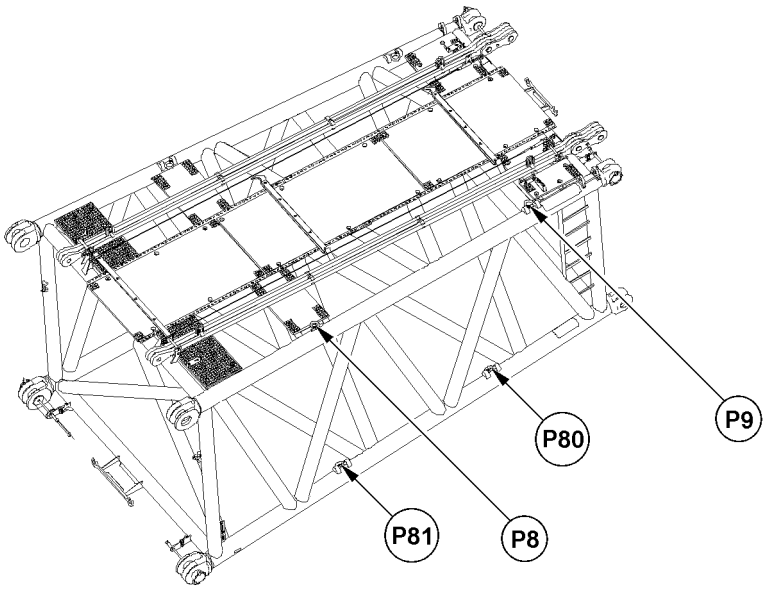

Fig.121932: Fastening points SL-reducer section 6 m

Note
▶ The lattice section must be fastened on both sides on the fastening points.

Fastening points	
P8 + P9 **or** P80 + P81	SL-reducer 6 m

2.5 Fastening points S-end section

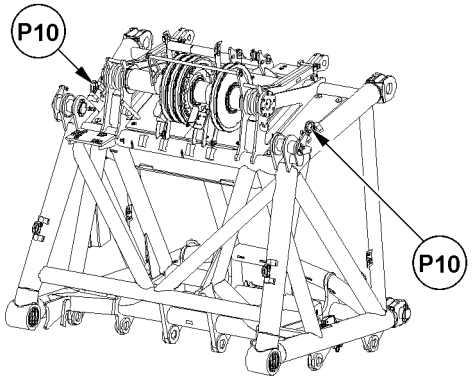

Fig.119104: Fastening points S-end section

Fastening points	
P10	Assembly S-end section

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2.6 Fastening points L-end section

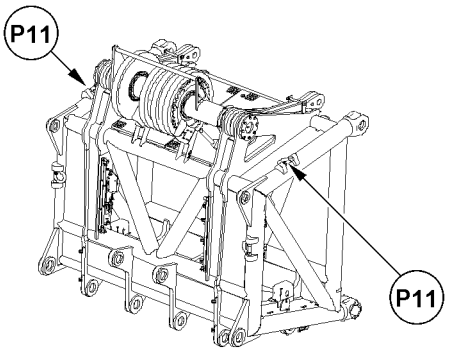

Fig.119105: Fastening points L-end section

Fastening points	
P11	Assembly L-end section

2.7 Fastening points L-intermediate sections 6 m

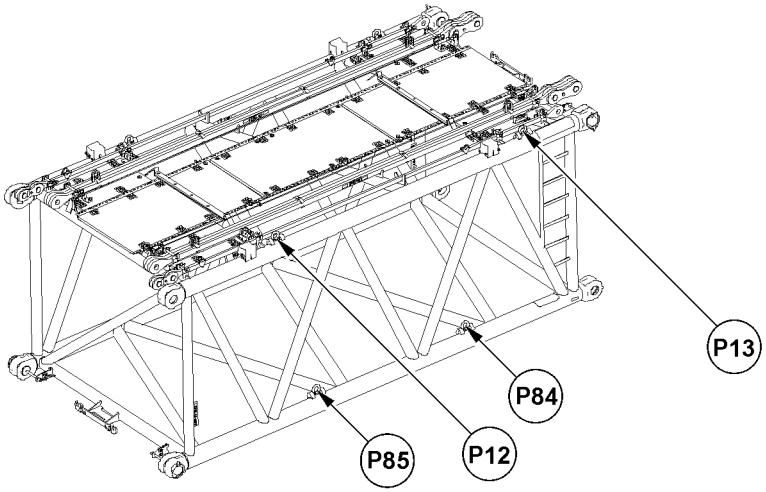

Fig.121933: Fastening points L-intermediate section 6 m

Note

- ▶ The L-intermediate sections are available in various system dimensions.
- ▶ The distance between the fastening points can vary, depending on the respective L-intermediate section.
- ▶ The lattice section must be fastened on both sides on the fastening points.

Fastening points	
P12 + P13 **or** P84 + P85	L-intermediate section 6 m

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2.8 Fastening points L-intermediate sections 12 m

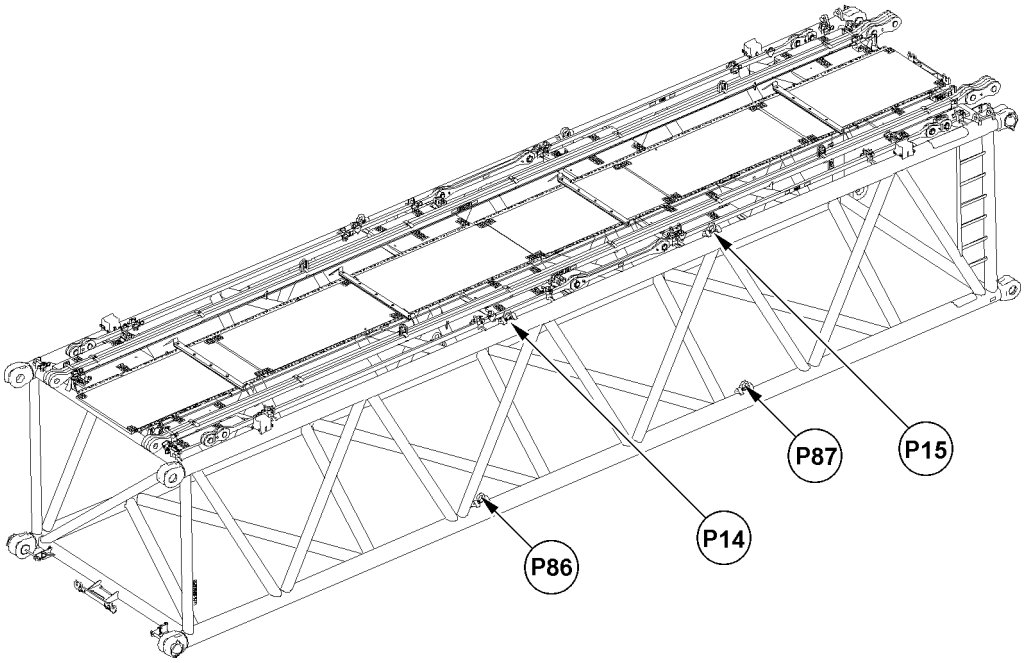

Fig.121934: Fastening points L-intermediate section 12 m

Note

- ▶ The L-intermediate sections are available in various system dimensions.
- ▶ The distance between the fastening points can vary, depending on the respective L-intermediate section.
- ▶ The lattice section must be fastened on both sides on the fastening points.

Fastening points	
P14 + P15 **or** P86 + P87	Assembly L-intermediate section 12 m

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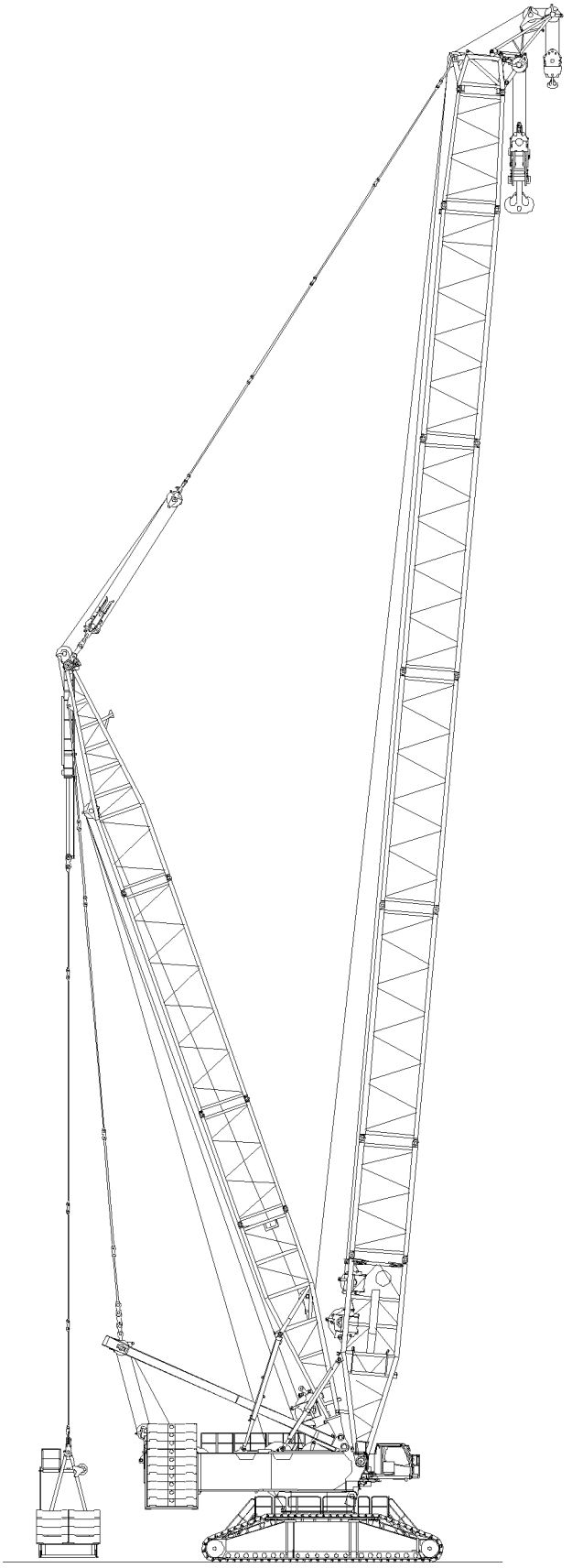

Fig.119146: SD/S2D/SL2D

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3 Assembly SD/S2D/SL2D-boom

Note

- The assembly is described on the example of the S-boom.
- For the combination of the boom lattice sections, observe and adhere to the Rod plan and the Crane operating instructions, chapter 5.03.

WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.

Death, severe bodily injuries, property damage.

- All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- When closing or opening boom systems during boom assembly or boom disassembly, no persons may remain on the boom system or in the danger zone.
- If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- Only step on the aids, ladders and catwalks with clean shoes.
- Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- Remaining on a suspended load is prohibited.
- Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- For all assembly work, the crane driver of the main crane must be in voice contact with the crane driver / crane drivers of the auxiliary crane / auxiliary cranes.
- For assembly tasks, the crane driver may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING

The lattice sections can fall down!

If the lattice sections are not pinned and secured correctly, then they can fall down.

Death, severe bodily injuries, property damage.

- Pin or unpin both pins at the same horizontal level, i.e. **left and right**.
- Do not stand under the lattice sections or within the entire danger zone during the pinning and unpinning procedure of the boom.
- Safely secure the pins in the storage locations as well as in the receptacles.
- It is prohibited to lean the auxiliary ladder against the component being disassembled.

WARNING

Danger of impact / crushing!

When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.

When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.

Death, severe bodily injuries, property damage.

- Make sure that personnel cannot be caught by components.
- Make sure that the crane is horizontally aligned.
- When working in danger zones: Use aids to protect limbs.
- Guide components with suitable aids to minimize oscillation.

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DANGER
The components can fall down!
If the corresponding component is disengaged from the auxiliary crane before the corresponding component is pinned, then the corresponding component can fall down.
Death, severe bodily injuries, property damage.
▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

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Make sure that the following prerequisites are met:
- The ground is able to safely take on the entire operating weight of the crane including the load to be lifted.
- The crane is horizontally aligned.
- The SA-frame properly installed and secured on the turntable.
- Winch 1 and winch 2 are properly installed and secured on the turntable.
- The D-boom is properly assembled and secured.
- The D-boom is erected to 85°.
- An auxiliary crane with sufficient load bearing capacity if available.
- An assembly scaffolding or a work platform is available.
- The central ballast has been installed on the crawler travel gear according to the load chart or the erection and take down charts.
- The counterweight has been installed on the turntable according to the load chart or the erection and take down charts.
- The LICCON overload protection has been set according to the data in the load chart.

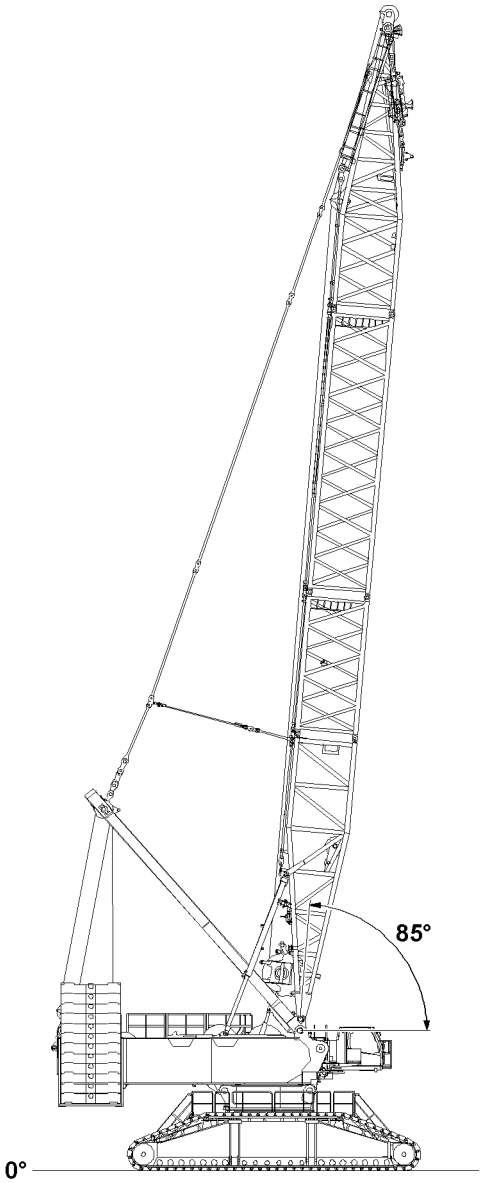

Fig.119147: Derrick boom in assembly position (85°) for S-pivot section

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3.1 Turning the turntable into the assembly position

WARNING
The crane can topple over!
If the following conditions are not met before turning the turntable - **without** assembled S-boom, the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ Observe the assembly conditions, see the Crane operating instructions, chapter 3.06.
- ▶ Observe the specifications in the erection and take-down charts.
- ▶ Observe the specifications in the load charts.

▶ Turn the turntable in lengthwise direction of the crawler travel gear.

3.2 Swinging the railing on the S-pivot section into operating position

WARNING
Danger of falling!
Death, severe bodily injuries, property damage.
- ▶ Assembly personnel must secure themselves for the assembly / disassembly of the railings and protective devices with an approved fall arrest system to prevent them from falling.
- ▶ For assembly and disassembly work, maintenance and inspection work on the S-pivot section, all railings and protective devices must be properly assembled and secured.

Make sure that the following prerequisites are met:
- The ground is able to safely take on the weight of the S-pivot section.
- The S-pivot section is laying completely on the ground.

▶ For assembly / disassembly of railings and protective devices, see Crane operating instructions, chapter 2.06.

3.3 Exceeding the shut off limits of the LICCON overload protection for assembly operation

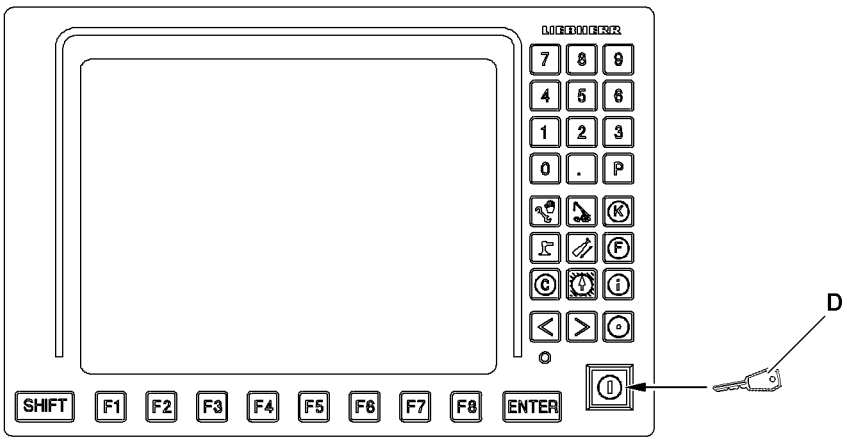

Fig.119109: LICCON monitor with assembly icon

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WARNING

Danger of accident due to function „Exceedance of shut-off limits of the LICCON overload protection“!
If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload.
Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.

- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ is only permissible in emergencies and for assembly purposes.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ may only be actuated by persons who know the effects of their actions regarding the function „Exceeding the shut off limits of the LICCON overload protection“.
- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ requires the presence of an authorized person and must be performed with utmost caution.
- ▶ Crane operation with activated function „Exceedance of shut off limits of the LICCON overload protection“ is prohibited.

▶ Exceeding the shut off limits of the LICCON overload protection: Engage assembly operation.

Result:

– The shut off limits of the LICCON overload protection are exceeded.
– The assembly icon appears on the LICCON monitor.

Note

▶ See the Crane operating instructions, chapter 4.02 and chapter 4.20.

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3.4 Unpinning the S-connector pins on the turntable

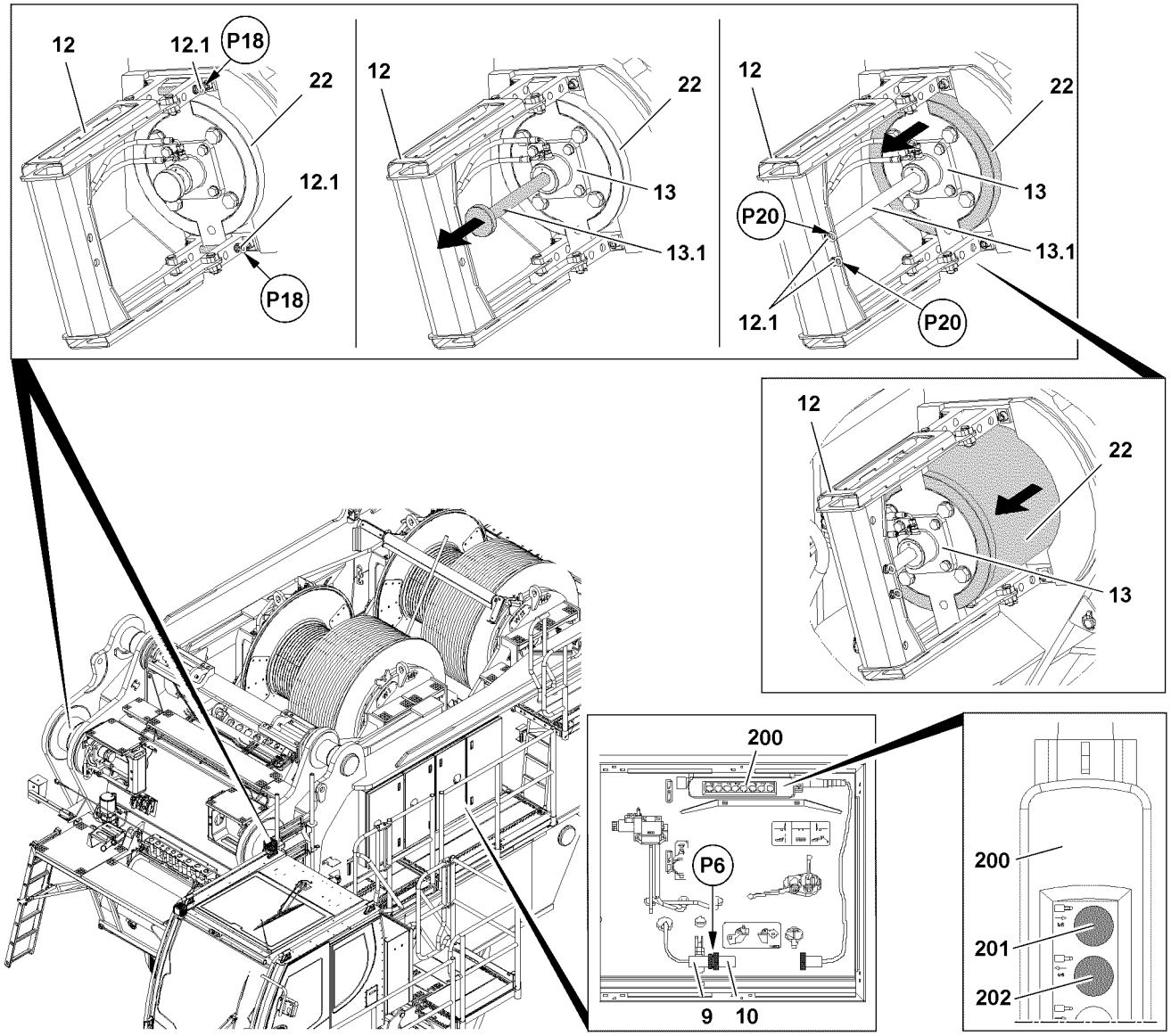

*Fig.119111: Unpinning the connector pins **22** on the turntable*

Note

- ▶ The pin pulling cylinders **13** are integrated on this crane in the S-connector pins **22**.
- ▶ Unpinning and pinning of the S-connector pins **22** can be done only in connection with the pin pulling device installed on the crane.

Make sure that the following prerequisites are met:

- The derrick boom is properly pinned and secured to the turntable.
- The derrick boom is erected to 85°.
- The pin pulling devices **12** are installed on the pin points.
- The crane engine is running.

3.4.1 Unpinning the S-connector pins

In transport condition, the S-connector pins **22** are pinned on the turntable and secured with the retaining pins **12.1**.

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WARNING
Danger of crushing!
When unpinning or pinning the S-connector pins **22**, there is a danger of crushing.
Limbs can be crushed or severed.
▶ During the unpinning or pinning procedure, make sure that no persons are within the danger zone.
▶ Do not reach into the danger zone of the pin pulling device and the connector pins.

▶ Release and unpin the retaining pins **12.1** on the points **P18** of the pin pulling device.
▶ Connect the control panel **200** at point **P6**.
▶ Extend the piston rod **13.1** of the pin pulling cylinder: Press the button **201** on the control panel **200** until the piston rods **13.1** are completely moved out on the pin pulling cylinders **13**.

When the piston rods **13.1** for the pin pulling cylinders are completely extended on both sides:
▶ Insert the retaining pin **12.1** on both sides at point **P20** and secure.

Result:

– The piston rods **13.1** of the pin pulling cylinders **13** are locked with the pressure / pull plate in the pin pulling device.

▶ Press the button **202** on the control panel **200** until the S-connector pins **22** are completely unpinned.

3.5 Assembling the S-pivot section on the turntable

NOTICE
Danger of property damage!
When swinging the S-pivot section in to the pin points on the turntable, the S-connector pins **22** or the S-pivot section can be damaged.
▶ Make sure that the S-connector pins **22** are completely unpinned before assembly of the S-pivot section.

Note
▶ Assemble the boom combinations according to the supplied Rod plans.

WARNING
The crane can topple over!
If the specifications listed below are not observed, the crane can collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.
▶ The instructions in the Crane operating instructions, chapter 5.01 and chapter 5.03 must be observed and adhered to.
▶ All pins are to be secured after assembly with the intended retaining elements.
▶ The guy rods must be inspected regularly, see the Crane operating instructions, chapter 8.15.

Make sure that the following prerequisites are met:
– The S-connector pins **22** are completely unpinned.
– The crane engine is running.

Note
▶ Select the fastening points on the S-pivot section **1** in such a way that the S-pivot section **1** hangs horizontally on the auxiliary crane at assembly. See section „Fastening points“.

▶ Fasten the S-pivot section **1** to the auxiliary crane.

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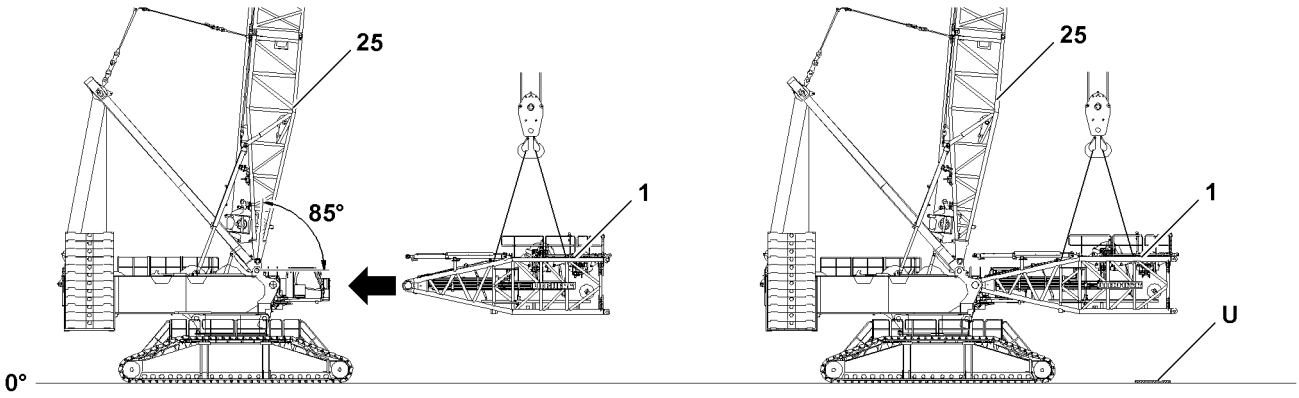

Fig.119148: Swinging the S-pivot section in with the auxiliary crane on the turntable and pin

▶ Swing the S-pivot section **1** in with the auxiliary crane to the pin points on the turntable.

DANGER
Falling S-pivot section!
Death, severe bodily injuries, property damage.
▶ Secure the S-connector pins **22** between the S-pivot section **1** and the turntable after the pinning procedure immediately with the retaining pins **12.1**.

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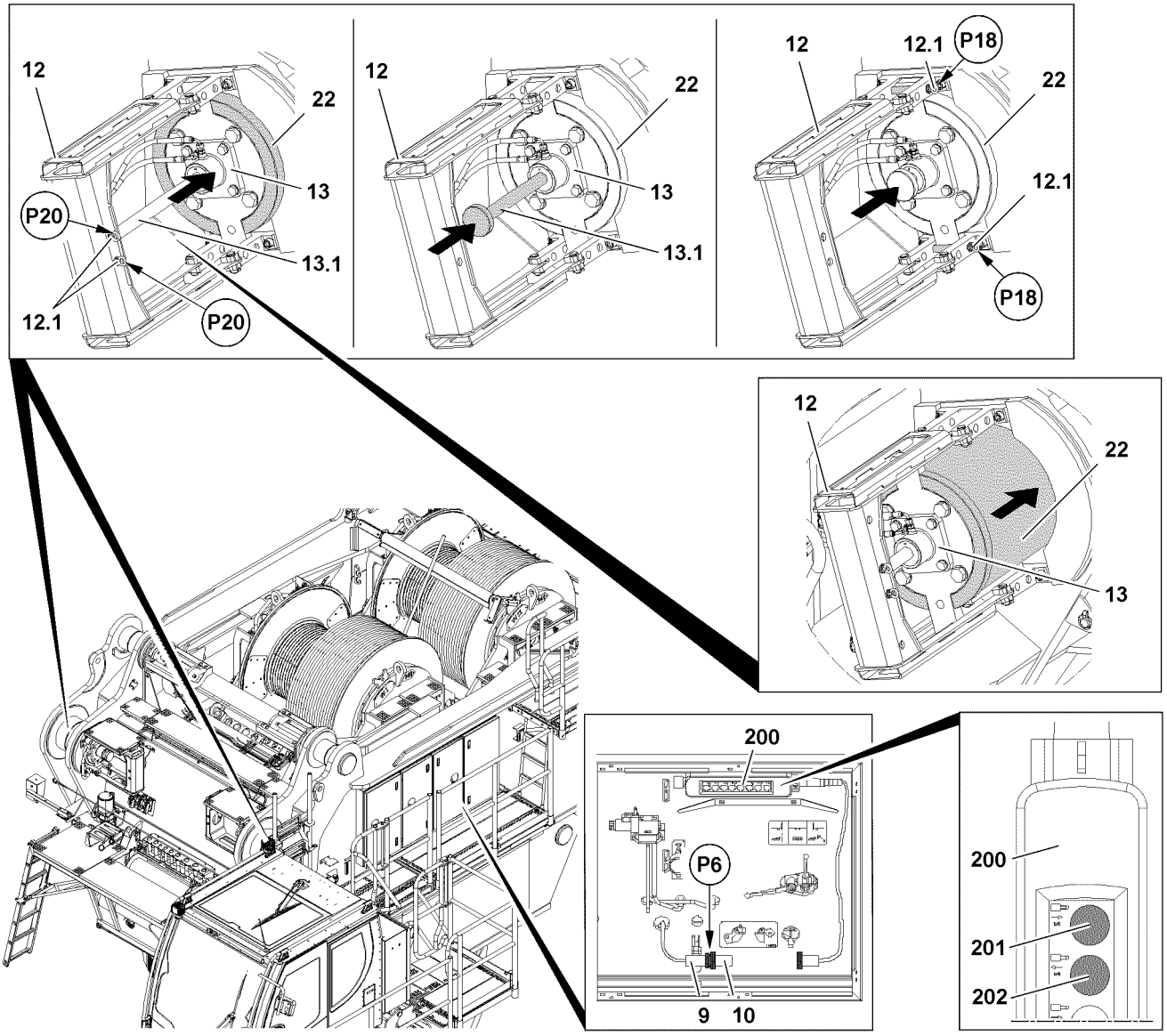

*Fig.119115: Pinning the S-pivot section on the turntable / insert connector pin **22***

When the S-pivot section is positioned in pin position:

▶ Insert the S-connector pins **22** on both sides with the pin pulling cylinder **13**: Press the button **201** on the control panel **200** until the S-connector pins **22** are completely pinned on both sides.

When the S-connector pins **22** are completely pinned on both sides:

▶ Secure the S-connector pins **22**: Unpin the retaining pins **12.1** on the pin pulling device **12** on points **P20** and insert on points **P18** and secure.

Result:

– The S-pivot section **1** is pinned and secured on the turntable.

▶ Retract the piston rods **13.1** of the pin pulling cylinders **13**: Press the button **202** on the control panel **200** until the piston rods are completely retracted on both sides.

NOTICE

Danger of property damage!

When taking down the assembled S-pivot section, the S-pivot section or the turntable can be damaged.

▶ Lower the S-pivot section **1** after assembly on the turntable carefully on the substructure **U** on the ground.

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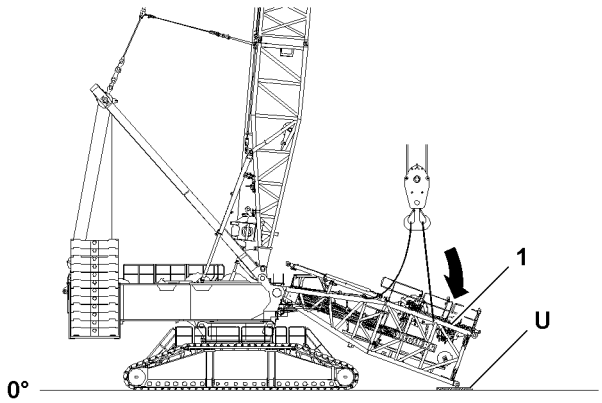

Fig.119149: Placing the S-pivot section with the auxiliary crane on the substructure on the ground

▶ Lower the S-pivot section **1** carefully and at slow speed on the substructure **U** on the ground.

When the S-pivot section **1** is placed on the substructure on the ground:
▶ Remove the auxiliary crane.

3.6 Establishing the electric and hydraulic connections on the S-pivot section

3.6.1 Establishing the electrical connections

NOTICE
Danger of damage to the electrical connections!
If the electrical connection between the terminal box and the S-pivot section and the cable drum in the S-pivot section is established before the boom end section is installed and electrically connected, then the electric connection can be damaged.
▶ Make sure that the electric connection between the terminal box in the S-pivot section and the cable drum in the S-pivot section is only established **after** assembly and the connection of the electric wiring for the boom end section.

Note
▶ To establish the electrical connections on the S-pivot section: Use the Electrical wiring diagram.

Make sure that the following prerequisites are met:
– The S-pivot section is completely assembled and placed on the substructure.

▶ Establish the electrical connections.
▶ Make sure that all electrical connections to the S-pivot section have been established.

WARNING
Malfunction if dummy plugs are not installed!
If the dummy plugs on the non-required electrical connections are not installed, then malfunctions or functional limitations can occur on the crane.
▶ Make sure that all non-required electrical connections that have a dummy plug are closed off with dummy plugs.
▶ Pay attention to the Electrical wiring diagram.

▶ As a rule, close off on-required electrical connections (for example for accessories which cannot be installed) with the respective dummy plugs.

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NOTICE
Property damage due to dirt and / or corrosion!
If non-required electrical connections are not closed off with the respective protective caps, then dirt and / or corrosion can damage the electrical connections.
This could result in malfunctions.
- ▶ Make sure that all non-required electrical connections are always closed off properly.
- ▶ Pay attention to the Electrical wiring diagram.

- ▶ Close electrical connections, which have no dummy plugs, properly off with the corresponding protective caps.

3.6.2 Establishing the hydraulic connections

When connecting and releasing hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

DANGER
Danger of accident due to loss of pressure or leakage!
Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.
- ▶ Check that the quick couplings have been properly connected before using the crane.

Note
- ▶ To connect or release the hydraulic lines with quick couplings, see Crane operating instructions, chapter 5.01.

- ▶ Release the pressure in the hydraulic system before connecting or disconnecting. Turn the engine off and wait for short time.
- ▶ Assembling coupling components (sleeve and connector) by using knurled nut.
- ▶ Connect coupling components.

3.7 Assembly of winch 5 (WV) on the S-pivot section

Note
- ▶ The assembly of winch 5 is described in detail in the Crane operating instructions, chapter 3.07.50.

3.8 Assembly of winch 6 (WVI) on the S-pivot section

Note
- ▶ The assembly of winch 6 is described in detail in the Crane operating instructions, chapter 3.07.60.

3.9 Assembling the boom system on the ground

Note
- ▶ Liebherr-Werk Ehingen GmbH recommends supporting the intermediate sections for assembly with assembly shoes, see the Crane operating instructions, chapter 5.62.

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3.9.1 Assembling the S-intermediate section on the S-pivot section

Make sure that the following prerequisites are met:
- The S-pivot section **1** is properly pinned and secured on the turntable.
- The S-pivot section **1** is placed properly on the substructure on the ground.
- Winch 5 **WV** is properly installed on the S-pivot section **1** (if only winch 5 **WV** is required for the upcoming crane operation).
- Winch 6 **WVI** is properly installed on the S-pivot section **1** (if only winch 6 **WV** is required for the upcoming crane operation).
- The connector pins **1.1** on the S-pivot section **1** are fully unpinned.

Note

▶ The S-intermediate sections **2** are pinned with the pin pulling cylinders, see Crane operating instructions, chapter 5.30.

WARNING

General danger notes!

▶ All connector pins **1.1** are to be secured after assembly with the intended locking pins **1.2**.

Note

▶ For fastening of boom sections, observe and adhere to section „Fastening points“.

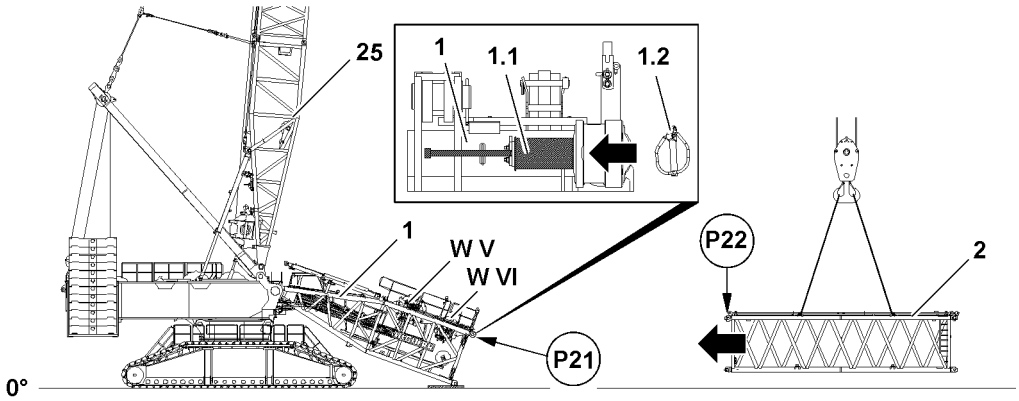

Fig.119150: Positioning the S-intermediate section on the S-pivot section

▶ Fasten the first S-intermediate section **2** to the auxiliary crane and align on the S-pivot section **1**.

When the pin bores on the S-pivot section **1** (point **P21**) and on the S-intermediate section **2** „on top“ (point **P22**) align.

▶ Insert the connector pins **1.1** with the pin pulling cylinders on both sides to the stop.

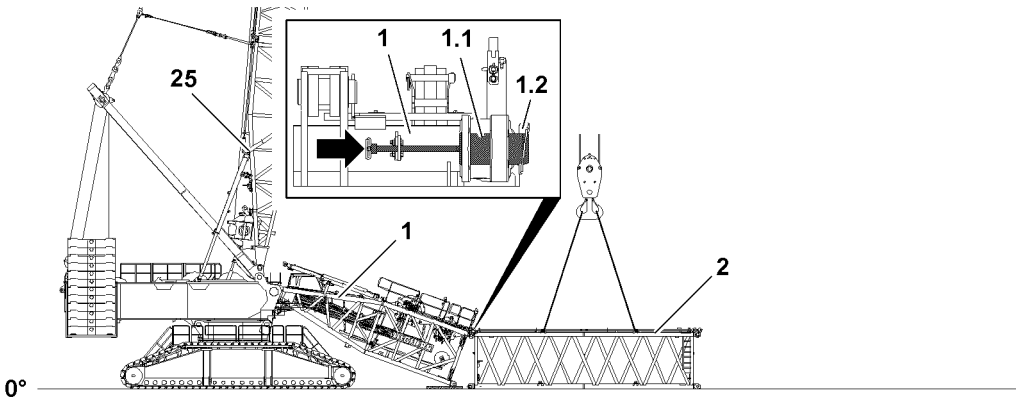

Fig.119421: Pinning the S-intermediate section on the S-pivot section

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▶ Secure the connector pin **1.1** with the locking pin **1.2**.

When the first S-intermediate section **2** is pinned and secured on the S-pivot section **1** „on top“:
▶ Lower the S-intermediate section **2** on the substructure on the ground.
▶ Remove the auxiliary crane.

3.9.2 Continuing boom assembly

Make sure that the following prerequisites are met:
– The connector pins on the S-intermediate sections **2** - in direction of the expansion of the boom system - are completely unpinned.
– The first S-intermediate section **2** is laying properly on the ground or on the substructure.

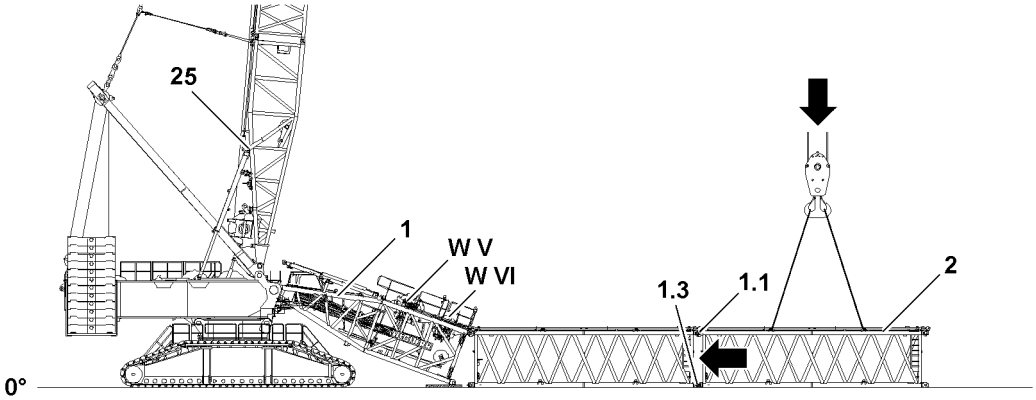

Fig.119443

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
▶ The combination of the various boom systems must be taken from the Rod plan and it must be adhered to.
▶ The instructions in the Crane operating instructions, chapter 5.01 and chapter 5.03 must be observed and adhered to.
▶ Make sure that all pin connections are secured after assembly.
▶ Support the boom during assembly and disassembly with assembly shoes.

When the connector pins **1.1** on the first S-intermediate section **2** are fully unpinned:
▶ Fasten the second S-intermediate section **2** to the auxiliary crane and swing in to the pin points on the first S-intermediate section **2**.

When the pin bores between the first and the second S-intermediate section **2** align „on top“ and „on the bottom“:
▶ Insert the connector pins **1.1** „on top“ with the pin pulling cylinders on both sides to the stop and secure.

When the connector pins **1.1** „on top“ are fully pinned to the stop and secured on both sides:
▶ Insert the connector pins **1.3** „on the bottom“ with the pin pulling cylinders on both sides to the stop and secure.
▶ Continue boom assembly to the required system length.

3.9.3 Assembling the S-end section / L-end section

Note
▶ The following description is an example and will be described by means of the L-end section.
▶ The process for the S-end section is identical.

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Lifting the end section from the flatbed trailer

Make sure that the following prerequisites are met:
- The transport retainers are removed on the respective end section.
- No roller sets are installed on the end section.
- The ground is able to safely take on the weight of the respective end section.

WARNING
Danger of falling!
Death, severe bodily injuries, property damage.
▶ To fasten the end sections, use an assembly platform.

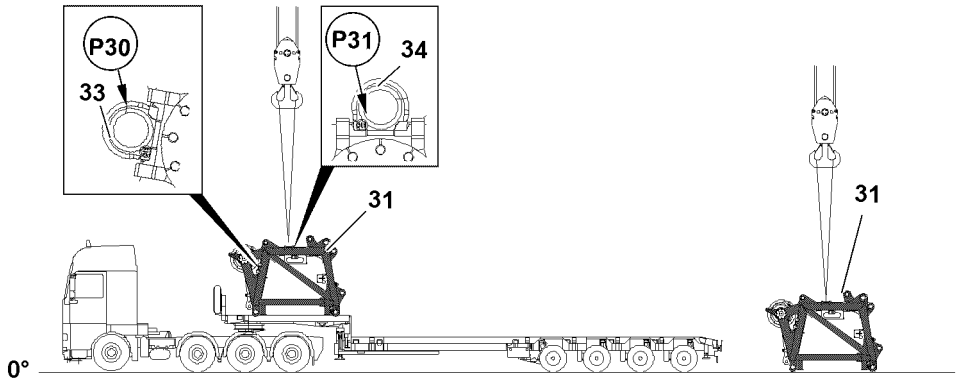

Fig.119112: Lifting the end section from the flatbed trailer

▶ Fasten the end section **31** on both sides on the eyes **34** of the fastening points **P31** on the auxiliary crane.

When the end section is properly fastened on the auxiliary crane:
▶ Carefully lift the end section with the auxiliary crane from the transport vehicle and remove the transport vehicle.
▶ Lower the end section to the ground.

Turning the end section into assembly position

The end section must be turned before assembly on the boom with two auxiliary cranes from the transport position into the assembly position.

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Make sure that the following prerequisite is met:
- **No** roller sets are installed on the end section.
- The ground on which the end section is placed is sufficiently load bearing.

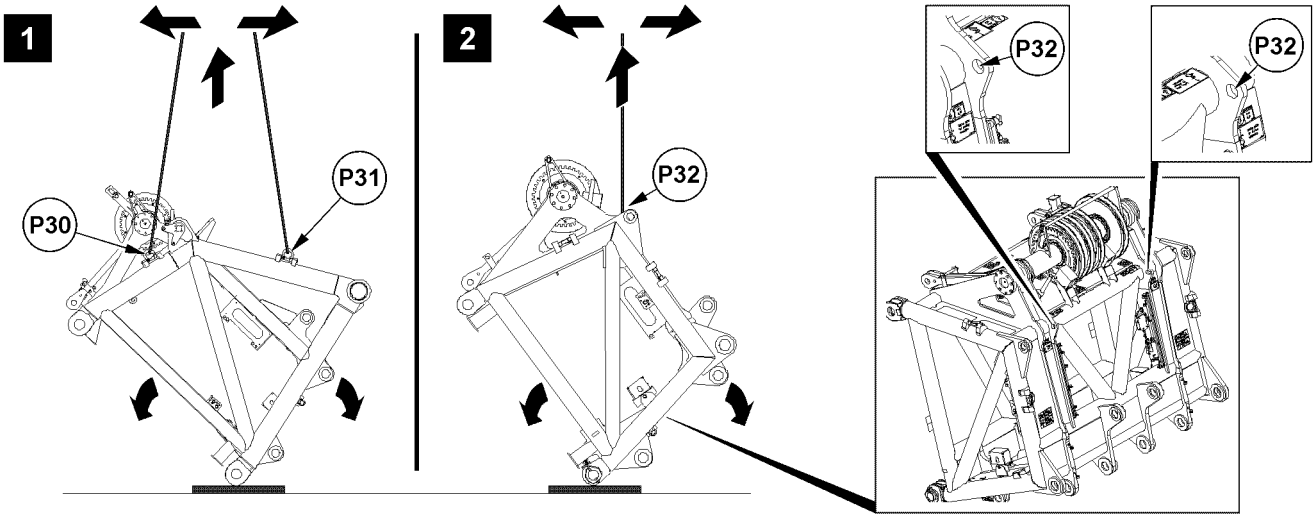

Fig.122035: Turning the end sections

Illustration 1: S-end section Illustration 2: L-end section

▶ Fasten the end section on the respective fastening points on both sides.

NOTICE
Danger of property damage!
▶ To avoid damage to the end sections: Make sure that the end sections are supported for the turning procedure.

WARNING
Tipping end section!
Death, severe bodily injuries, property damage.
▶ Make sure that there are no persons within the danger zone.
▶ Make sure that solely fastening equipment with the corresponding load bearing capacity is used.
▶ Select the fastening points to turn the end sections according to the signs on the end sections.

When the end section is properly fastened on the auxiliary crane:
▶ Lift the end section with the auxiliary crane and turn into assembly position.

When the end section is turned in assembly position:
▶ Carefully and at slow speed at the end section on the ground.

When the end section is seated completely on the ground:
▶ Remove the auxiliary crane.

Assembling the end section on the boom

Note
▶ The following description is an example and will be described by means of the L-end section.
▶ The process for the S-end section is identical.

Make sure that the following prerequisites are met:
- The boom system is assembled to the required system length.
- The connector pins on the last assembled lattice section are unpinned.
- The connector pins on the end section are unpinned.
- The fastening equipment on the end section **31** is tensioned.

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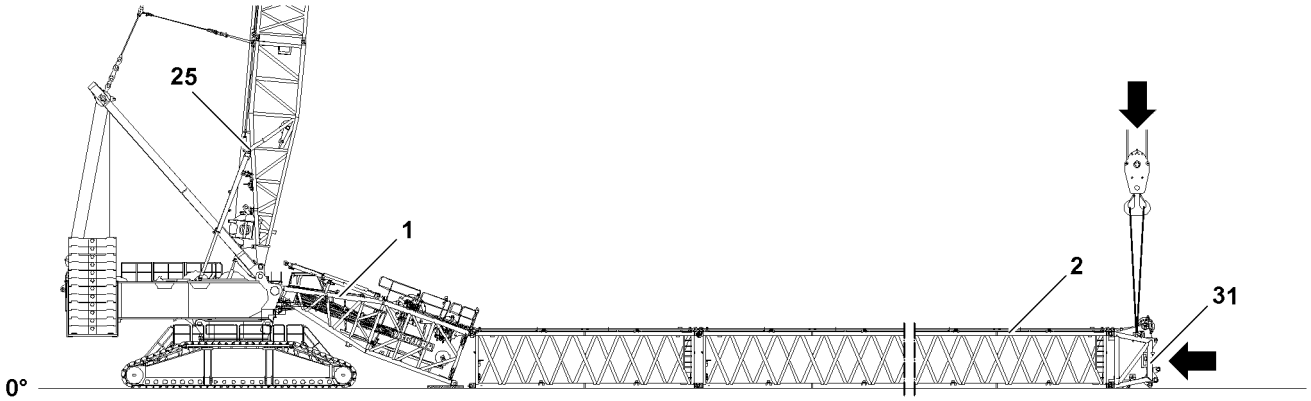

Fig.119422: Installing the end section on the boom

▶ Swing the end section **31** in with the auxiliary crane to the pin points.

When the pin bores between the end section **31** and the last installed lattice section **2** align „on top“ and „bottom“:

▶ Insert the connector pins „on top“ with the pin pulling cylinders on both sides to the stop and secure.

When the connector pins „on top“ are fully pinned to the stop and secured on both sides:

▶ Insert the connector pins „on the bottom“ with the pin pulling cylinders on both sides to the stop and secure.

When the connector pins „on top“ and „on the bottom“ are properly pinned:

▶ Secure the connector pin with the locking pin.

▶ Remove the auxiliary crane.

3.9.4 Establishing the electrical connections to the boom end section

Make sure that the following prerequisites are met:

– The S-intermediate sections are properly assembled and secured on the ground.

– The boom end section is properly assembled and secured.

NOTICE

Danger of damage to the electrical connections!

If the electrical connection from the cable drum in the S-pivot section to the terminal box on the S-pivot section is established first before the connection to the terminal box on the boom end section, then the electrical connection will be damaged when spooling out the cable drum.

▶ Establish first the electrical connection from the cable drum in the S-pivot section to the terminal box on the boom end section and then the electrical connection from the terminal box in the S-pivot section to the cable drum in the S-pivot section.

Note

▶ To establish the electrical connections on the S-boom: Use the Electrical wiring diagram.

▶ Establish the electrical connections.

▶ Make sure that all electrical connections on the boom are established.

WARNING

Malfunction if dummy plugs are not installed!

If the dummy plugs on the non-required electrical connections are not installed, then malfunctions or functional limitations can occur on the crane.

▶ Make sure that all non-required electrical connections that have a dummy plug are closed off with dummy plugs.

▶ Pay attention to the Electrical wiring diagram.

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▶ As a rule, close off on-required electrical connections (for example for accessories which cannot be installed) with the respective dummy plugs.

NOTICE
Property damage due to dirt and / or corrosion!
If non-required electrical connections are not closed off with the respective protective caps, then dirt and / or corrosion can damage the electrical connections.
This could result in malfunctions.
▶ Make sure that all non-required electrical connections are always closed off properly.
▶ Pay attention to the Electrical wiring diagram.

▶ Close electrical connections, which have no dummy plugs, properly off with the corresponding protective caps.

3.9.5 Pinning the upper pulley block on the S-pivot section

Note
Shut off Winch 3!
If the D-boom is at an angle of more than / equal to 76°, then the luffing pulley block is laying on the D-end section.
The luffing pulley block may therefore not be moved, winch 3 turns off.
▶ The upper pulley block **37** can no longer be lowered or raised.

To be able to „close“ the S-boom combination after assembly of the lattice sections, the D-boom must be positioned at an angle of less than 76°.

Lower the upper pulley block **37** until it can be pinned with the brackets **37.2** of the assembly weight **37.1** on the S-pivot section **1**.

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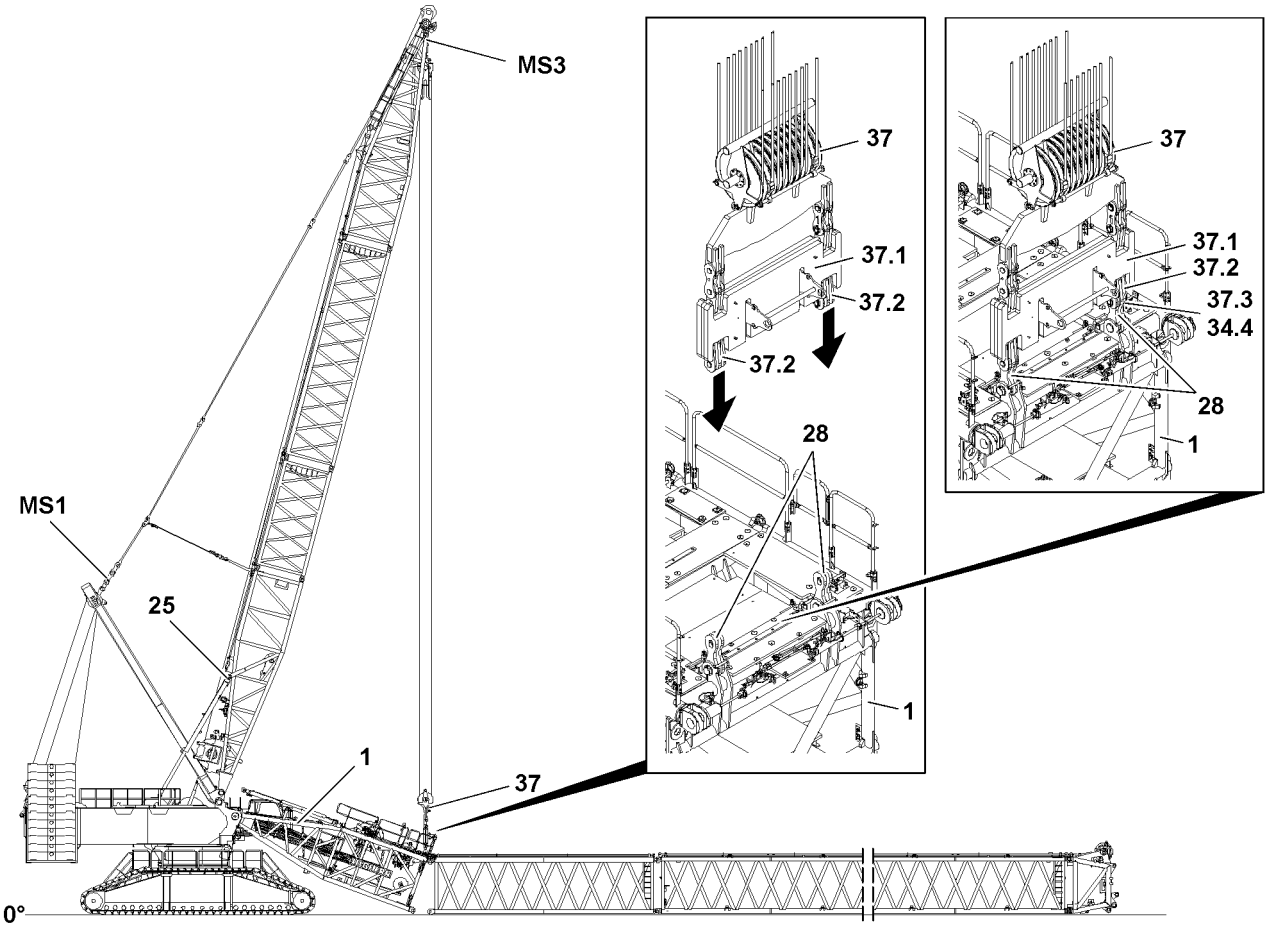

Fig.119444: Lowering the upper pulley block and pinning it on the S-pivot section

Note

▶ Luff the D-boom forward to the point where the upper pulley block **37** „stands“ vertically above the pin points **28** on the S-pivot section **1**.

Make sure that the following prerequisites are met:
- The S-pivot section **1** is laying on the ground on the substructure.
- The boom system is properly assembled and secured.
- The boom end section is properly assembled and secured.
- The assembly weight is properly installed and secured on the upper pulley block.
- The auxiliary crane is removed.

▶ Luff the D-boom down until the upper pulley block stands vertically over the brackets **28** on the S-pivot section.

▶ Lower the upper pulley block **37** until the brackets **37.2** of the assembly weight **37.1** hang over the pin points of the brackets **28**.

▶ Remove the safety locking pin **37.4** on the brackets **28** and unpin the pin **37.3**.

When the pins **37.3** are fully unpinned on both sides:

▶ Continue to lower the upper pulley block **37** until the pin bores of the brackets **37.2** align with the pin points of the brackets **28**.

When the pin bores align:

▶ Insert the pin **37.3** on both sides completely and secure with safety locking pin **37.4**.

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3.9.6 Closing the boom system

Make sure that the following prerequisites are met:
- The boom system is completely assembled.
- All lattice sections are properly pinned with each other.
- All pin connections are properly pinned and secured.
- The upper pulley block **37** is properly pinned and secured with the brackets **28** on the S-pivot section **1**.

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ During the „closing procedure“ of the boom system, the maximum permissible F3-total force of **136 t** on test point 3 **MS3** may not be exceeded.
- ▶ The end section of the corresponding S/SL-boom combination may **not** lift off the ground during the „closing procedure“.
- ▶ Make sure that there are no persons on the boom system as well as in the danger zone during the closing procedure.
- ▶ Non-required guy rods must be removed from the lattice sections, see Crane operating instructions, chapter 5.01.

Note
- ▶ The actual forces on test point 3 **MS3** - which are used during the opening - closing procedure of the S-boom system - are shown on LICCON monitor 1.
- ▶ Note the actual forces of test point 3 **MS3** and keep it ready for the disassembly of the S-boom system.
- ▶ At boom disassembly, pretension the control rope of winch 3 until the noted (assembly) actual forces of test point 3 **MS3** on the LICCON monitor are reached, so that the connector pins between the S-pivot section and the S-intermediate section can be unpinned.

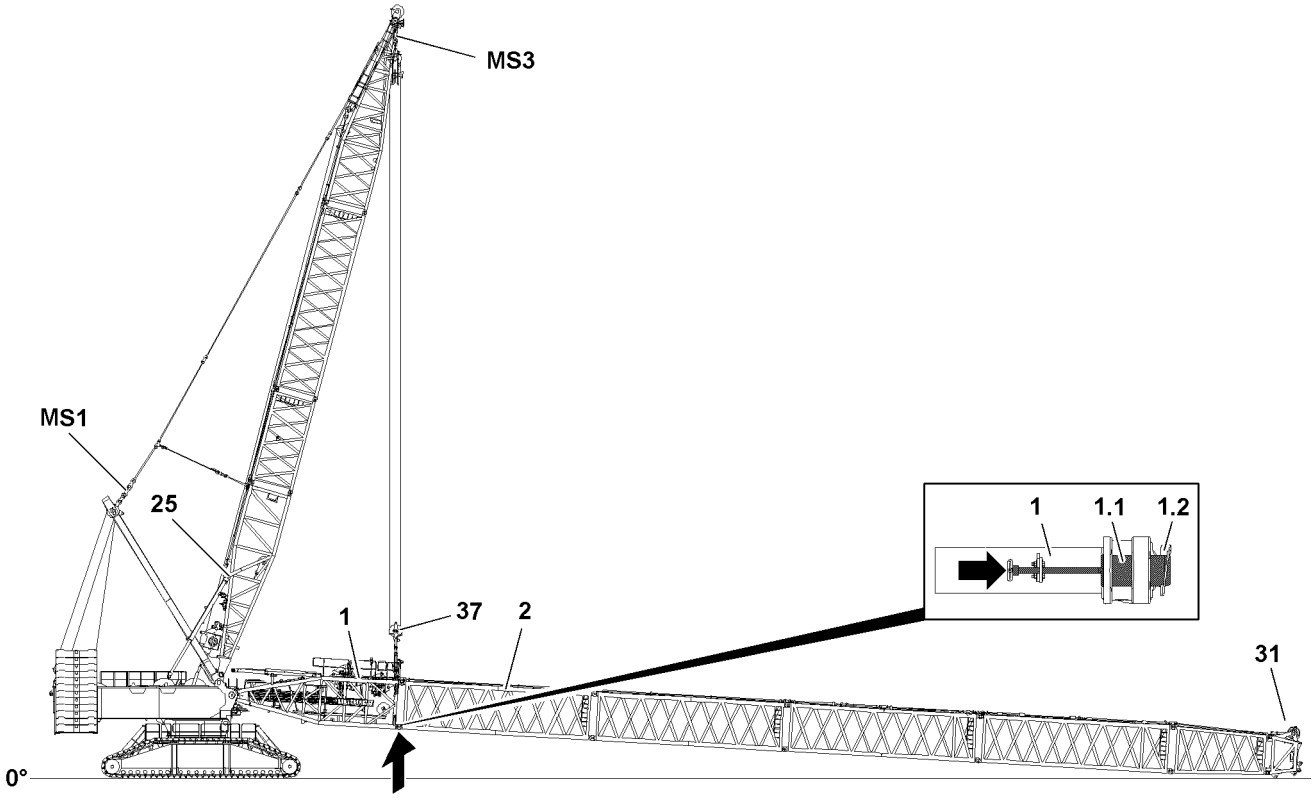

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Fig.119425: Closing the boom system and pinning on both sides „on the bottom“

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Close the SL-/S-boom combination with the upper pulley block:

- ▶ Lift the S-boom system with the upper pulley block **37** until the pin bores „on the bottom“ align.
- ▶ Insert the connector pin **1.1** „on the bottom“ and secure with the retaining pin **1.2**.

WARNING
Danger of fatal injury due to folding down of boom!
By unpinning the upper pulley block **37** on the S-pivot section **1**, the boom can suddenly fold down if the boom is not properly pinned and secured „on the bottom“.
Death, severe bodily injuries, property damage.

- ▶ It is prohibited for anyone to remain under the raised boom combination during the pinning / unpinning procedure.
- ▶ Unpin the upper pulley block **37** on the S-pivot section **1** only when it is ensured that the S-pivot section **1** is properly pinned and secured „on top“ and „bottom“ with the S-intermediate section.

When the S-boom is „closed“:

- ▶ Unpin the bracket **37.2** of the assembly weight **37.1** on bracket **28**: Release and unpin the pins **37.3** on both sides.

4 Installing the derrick ballast

If a derrick ballast is required for the flying assembly of the boom system, for erection and take down of the boom system as well as for the entire planned crane operation, install a derrick ballast according to the Crane operating instructions, chapter 5.35 or chapter 5.36.

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.

- ▶ Make sure that the derrick ballast is installed according to the erection and take down charts.
- ▶ Make sure that the derrick ballast according to the load charts is installed for the planned crane operation.

- ▶ Assemble the derrick ballast properly.
- ▶ Ballast the derrick ballast as specified.

5 Assembling the boom system in flying mode (guying on the flying assembly intermediate section)

If spatial prerequisites on the job site are limited for the assembly of the boom system, or if they are limited by buildings or similar, then the SD/S2D/SL2D-boom can be installed in „flying mode“.

WARNING
General danger notes!
Death, severe bodily injuries, property damage.

- ▶ All pins are to be secured after assembly with the intended retaining elements.
- ▶ The guy rods must be inspected regularly, see the Crane operating instructions, chapter 8.15.
- ▶ Secure the boom with substructure or auxiliary crane, see Crane operating instructions, chapter 5.01.
- ▶ It is prohibited for anyone to remain under the booms or within the complete danger zone during the pinning and unpinning procedure of the lattice section.

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WARNING
Impermissible boom lengths guyed!
Death, severe bodily injuries, property damage.
▶ The maximum permissible boom lengths for the „flying“ assembly may not be exceeded.

When the boom system to be installed is longer than the permissible flying assembly length:
▶ Support the boom on the end of the permissible flying assembly length or secure with an auxiliary crane, see Operating instructions, chapter 5.01.
▶ Observe the assembly conditions, see the Crane operating instructions, chapter 3.06.
▶ The data in the erection and take-down charts as well as the load charts must be adhered to.

NOTICE
Property damage!
If the pins of the guy rods are not pinned from the „inside“ to the „outside“, the hoist rope can scrape on the pins and be damaged.
▶ Always insert the pins of the guy rods from the „inside“ to the „outside“, see the Rod plan.

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
▶ For the „flying“ boom assembly, the maximum permissible total force at test point **MS3** may **not** be exceeded.
▶ The „flying“ boom assembly is only permissible up to a maximum flying assembly length.
▶ Make sure that the maximum permissible flying assembly length is not exceeded.
▶ The „actual force“ on test point 3 **MS3** is shown on LICCON monitor 1.
▶ Observe the assembly conditions, see the Crane operating instructions, chapter 3.06.
▶ The specifications in the erection and take-down charts as well as the load charts must be observed.
▶ For the itemization of the lattice sections refer to the Rod plan.

5.1 Installing the upper pulley block on the S-intermediate section for flying assembly

Make sure that the following prerequisites are met:
– The derrick ballast is properly installed and secured.
– The derrick ballast is properly ballasted.
– The boom system is properly assembled up to the S-intermediate section 3228.25 FLM **3**.
– The boom system is closed.
– The S-intermediate section 3228.25 FLM **3** is laying on the ground on the substructure.

NOTICE
Danger of property damage!
When luffing the D-boom down, the upper pulley block **37** can run with the assembly weight **37.1** into the S-boom system and damage the boom.
This could result in high property damage.
▶ Make sure that the assembly weight **37.1** does not run on the S-boom when luffing down the D-boom.
▶ Make sure, when luffing down the D-boom, that there is always sufficient distance between the S-boom and the assembly weight **37.1**.

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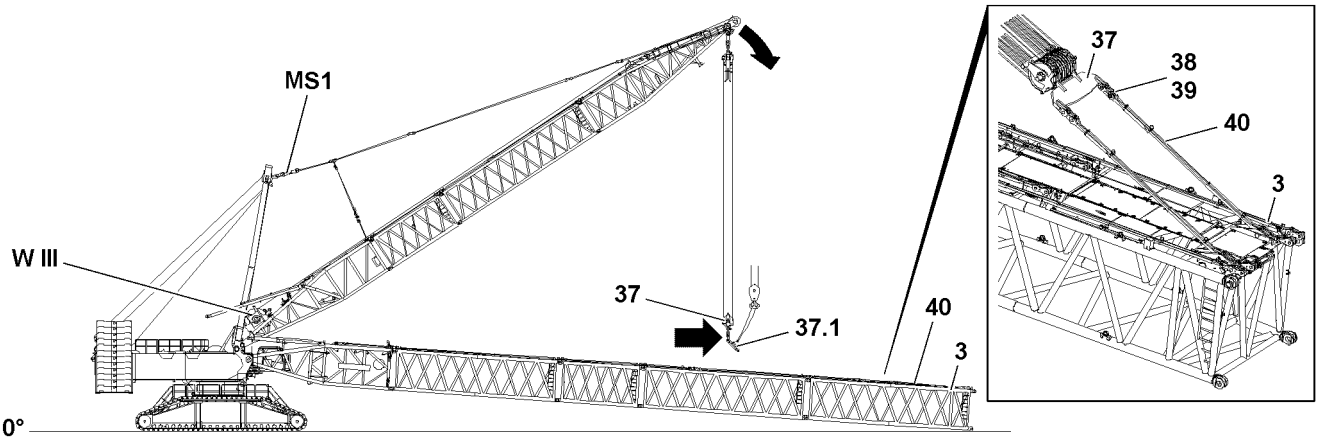

Fig.119446: Lowering the D-boom to the front and pin the upper pulley block on the S-intermediate section 3228.25 FLM

▶ Luff the D-boom down carefully to the front.

When the D-boom is in position:
▶ Lower the upper pulley block **37** until the brackets between the upper pulley block and the assembly weight **37.1** are easily accessible.
▶ Fasten the assembly weight **37.1** properly to the auxiliary crane.
▶ Lift the assembly weight **37.1** with the auxiliary crane to the horizontal.

When the assembly weight **37.1** hangs horizontally on the auxiliary crane:
▶ Release and unpin the pin between the assembly weight **37.1** and the upper pulley block **37**.
▶ Swing the assembly weight **37.1** out with the auxiliary crane and place it on a suitable substructure.
▶ Continue to luff the D-boom down until the upper pulley block **37** is positioned over the boom system.

Problem remedy
The D-boom cannot be luffed down further?
You luffed the D-boom down to the mandatory system shut off.
▶ Move the D-boom into the opposite direction from the shut off.

▶ Luff the D-boom slightly up.

Note
▶ Pull the upper pulley block **37** with the auxiliary crane in direction of the S-intermediate section 3228.25 FLM **3** and position it over the guy rods **40** in such a way that the guy rods can be safely pinned on the upper pulley block **37**.

When the upper pulley block is positioned over the guy rods:
▶ Pin and secure the guy rods **40** with the upper pulley block **37**: Insert the pin from the inside to the outside and secure with safety locking pin.

Note
▶ The S-boom must remain on the ground when erecting the D-boom and may **not** be pulled up along.

WARNING
D-boom falling to the rear!
If the relapse cylinders of the D-boom are not completely moved out before erection, then the D-boom can fall backward when erecting it into operating position.
Death, severe bodily injuries, property damage.
▶ Make sure that the relapse cylinders of the D-boom are completely moved out.

When the guy rods **40** are properly pinned and secured with the upper pulley block **37**:
▶ Erect the D-boom to operating position and at the same time, spool out winch 3 **WIII**.

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Note

- When erecting the D-boom, pay attention to the minimum force **F1** on test point 1 **MS1**.
- To avoid a shut-off of the LMB during the erection procedure on the D-boom, do not fall below the minimum force **F1** on test point 1 **MS1**.

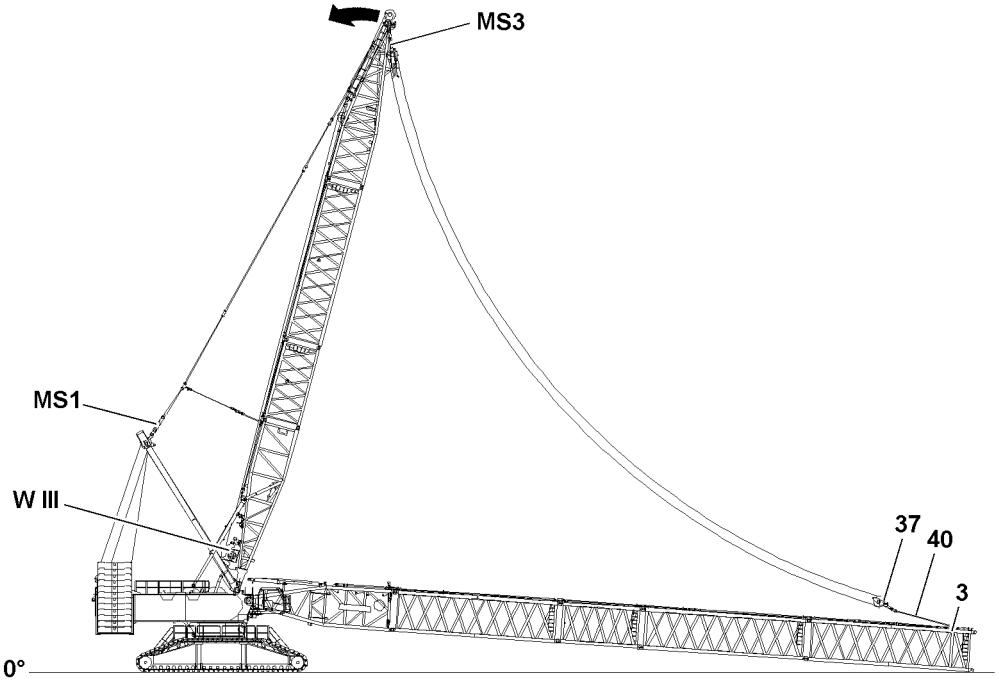

Fig.119447: Bringing the D-boom into operating position

When the D-boom has reached the operating position:

- Tension the guying carefully between the D-boom and the S-intermediate section 3228.25 FLM **3**.

When the guying is tensioned:

- Lift the boom system off the ground carefully and at a slow speed.
- Luff the boom system up to the horizontal so that the boom expansion can be installed on the S-intermediate section 3228.25 FLM **3**.

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5.2 Assembling the S-lattice section in „flying mode“ on the S-intermediate section 12 m 3228.25 FLM

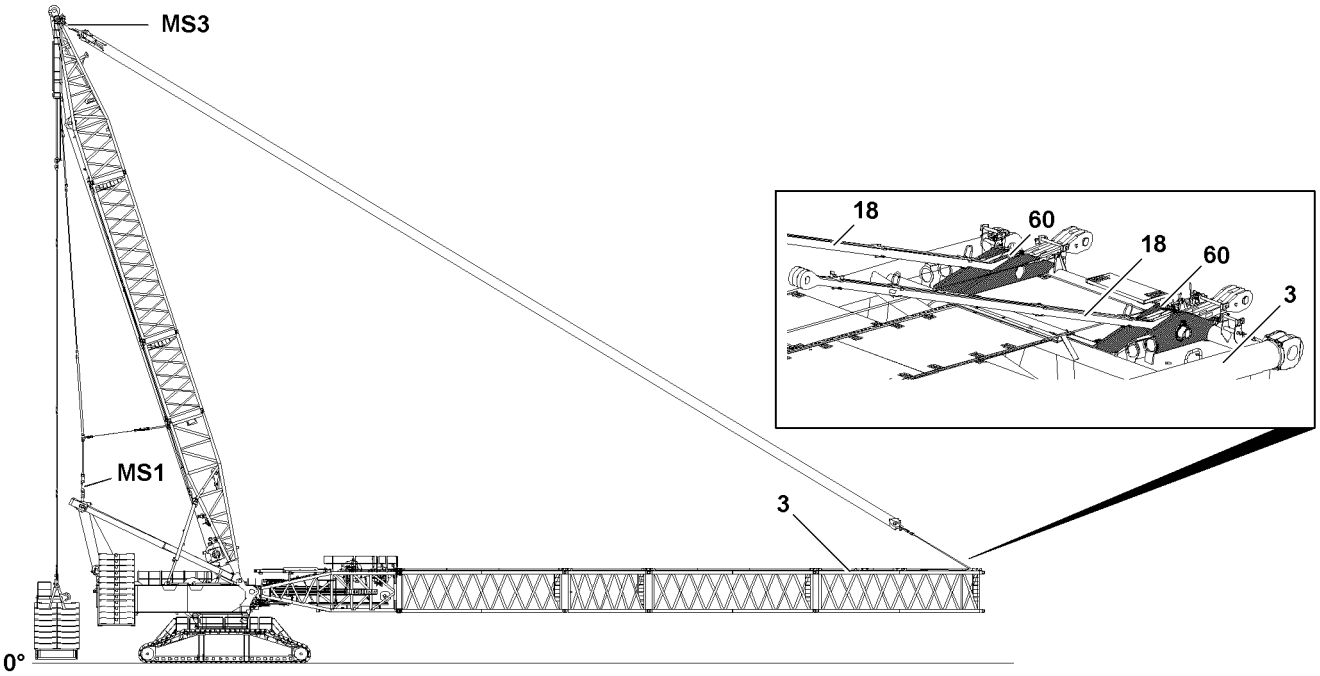

Fig.119426: Boom system on flying assembly intermediate section guyed

Make sure that the following prerequisites are met:
- The electrical and hydraulic connections to the S-pivot section have been established.
- The boom system is horizontally guyed on the S-intermediate section 12 m 3228.25 **3**.
- An auxiliary crane with sufficient load bearing capacity if available.

WARNING
Falling components!
If unsecured or non-supported components are assembled or disassembled, they can fall down.
Death, severe bodily injuries, property damage.
- ▶ During pinning and unpinning of the intermediate sections, it is prohibited for anyone to remain **under** or **on** the components as well as within the entire danger zone.
- ▶ Before unpinning: Support the components and boom.
- ▶ Secure the pins in the storage locations and in the receptacles.
- ▶ It is prohibited to lean a ladder against the crane section that is being disassembled.

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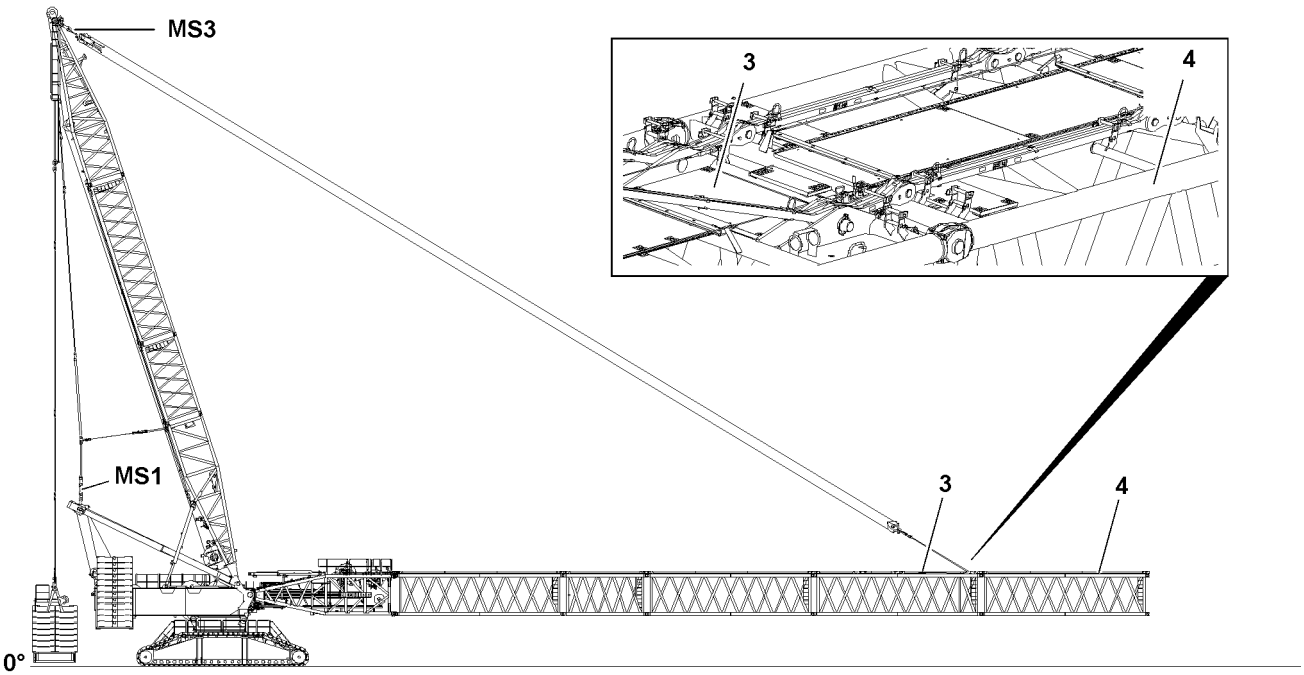

Fig.119427: Flying assembly up to maximum permissible flying assembly length

For „flying“ assembly of the intermediate sections, they can be installed individually or as preassembled boom unit on the S-intermediate section 3228.25 FLM **3**.

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ Make sure that the maximum permissible flying assembly lengths are **not** exceeded.
- ▶ The crane operator bears the sole and full responsibility for the observation of the maximum permissible flying assembly lengths.

- ▶ Fasten the S-intermediate section **4** or preassembled boom unit to the auxiliary crane.
- ▶ Lift the S-intermediate section **4** or preassembled boom unit with the auxiliary crane and position on the S-intermediate section 3228.25 FLM **3** until the pin points align.

When the pin points between the S-intermediate section 3228.25 FLM **3** and the S-intermediate section **4** on preassembled boom unit align „on top“ and „bottom“:
- ▶ Pin the S-intermediate section **4** or preassembled boom unit „on top“: Insert the pin **1.1** on both sides and secure with locking pin **1.2**.
- ▶ Pin the S-intermediate section **4** or preassembled boom unit „on the bottom“: Insert the pin **1.1** on both sides and secure with locking pin **1.2**.

When the pins are properly pinned and secured on „top“ and „bottom“ between the S-intermediate section 3228.25 FLM **3** and the S-intermediate section **4** or the preassembled boom unit:
- ▶ Remove the auxiliary crane.

If additional lattice sections are assembled:
- ▶ Assemble the lattice sections the same way as described in this section.

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5.2.1 Assembling the SDB-boom system in flying mode

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ Make sure that $F3_{max}$ (MS3) is **not** exceeded at flying assembly.
- ▶ Make sure that the maximum permissible flying assembly lengths are not exceeded, even when $F3_{max}$ (MS3) is not yet reached.
- ▶ Make sure that no hook block is reeved at flying assembly.
- ▶ Make sure that all guy rods which are not required have been removed from the lattice sections.
- ▶ For counterweight, central ballast and derrick ballast refer to the erection and take down charts. If the end section is not present, the respective boom length with the end section is to be taken into account.
- ▶ To determine the required derrick ballast, assume a hook block weight of a minimum of 13 t in the erection and take-down charts.

Note
- ▶ $F3_{max}$ (MS3) = 260 t.

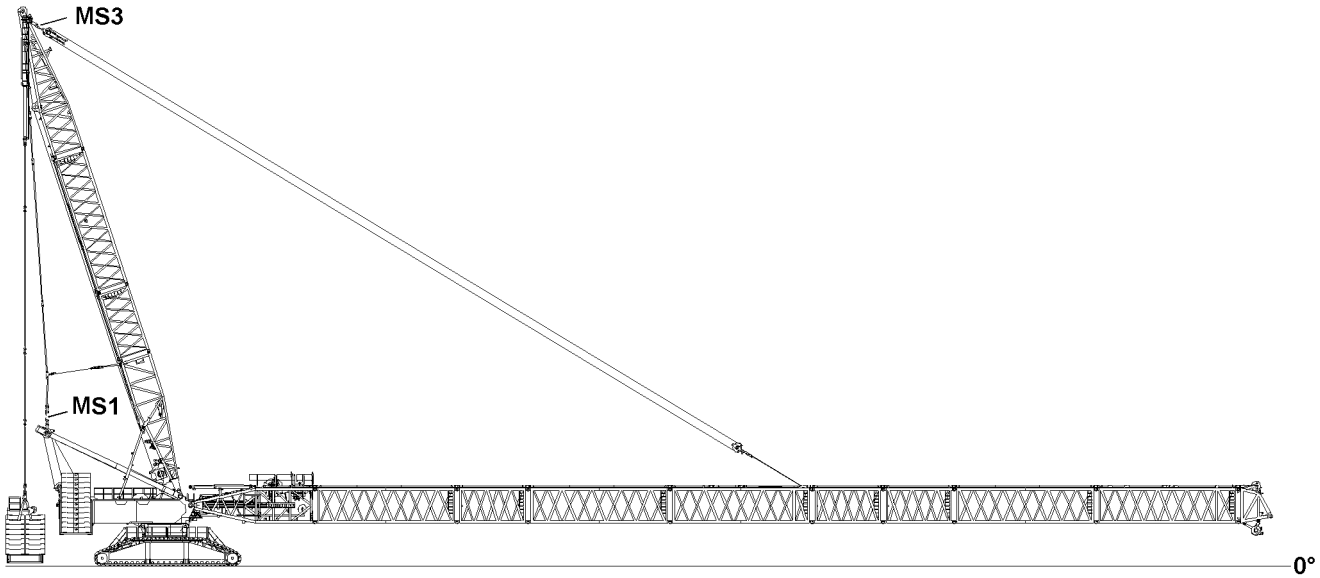

*Fig.119428: SDB-boom system - Flying assembly length to **maximum** S 90 m*

- with L-end section
- with roller sets
- with S-guy rods
- without WA-frame II guy rods

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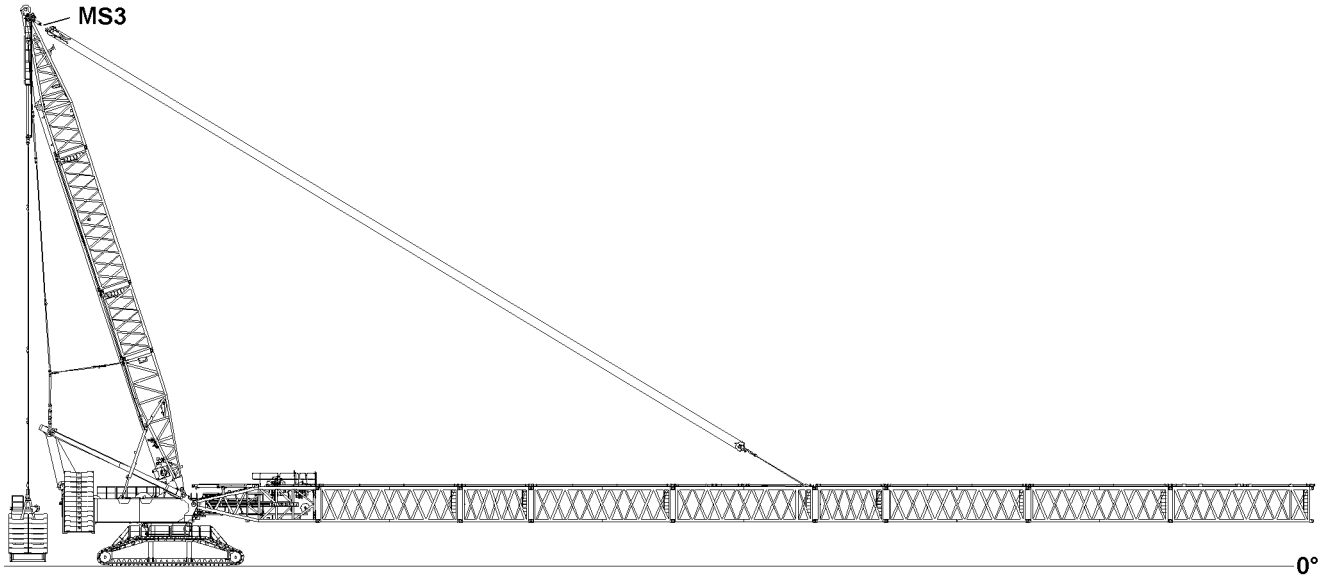

*Fig.119429: SDB-boom system - Flying assembly length to **maximum** S 96 m*

- without end section
- with S-guy rods
- without WA-frame II guy rods

5.2.2 Assembling the S2DB-boom system in flying mode

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ Make sure that $F3_{max}$ (MS3) is **not** exceeded at flying assembly.
- ▶ Make sure that the maximum permissible flying assembly lengths are not exceeded, even when $F3_{max}$ (MS3) is not yet reached.
- ▶ Make sure that no hook block is reeved at flying assembly.
- ▶ Make sure that all guy rods which are not required have been removed from the lattice sections.
- ▶ For counterweight, central ballast and derrick ballast refer to the erection and take down charts. If the end section is not present, the respective boom length with the end section is to be taken into account.
- ▶ To determine the required derrick ballast, assume a hook block weight of a minimum of 7 t in the erection and take-down charts.

Note
- ▶ $F3_{max}$ (MS3) = 260 t.

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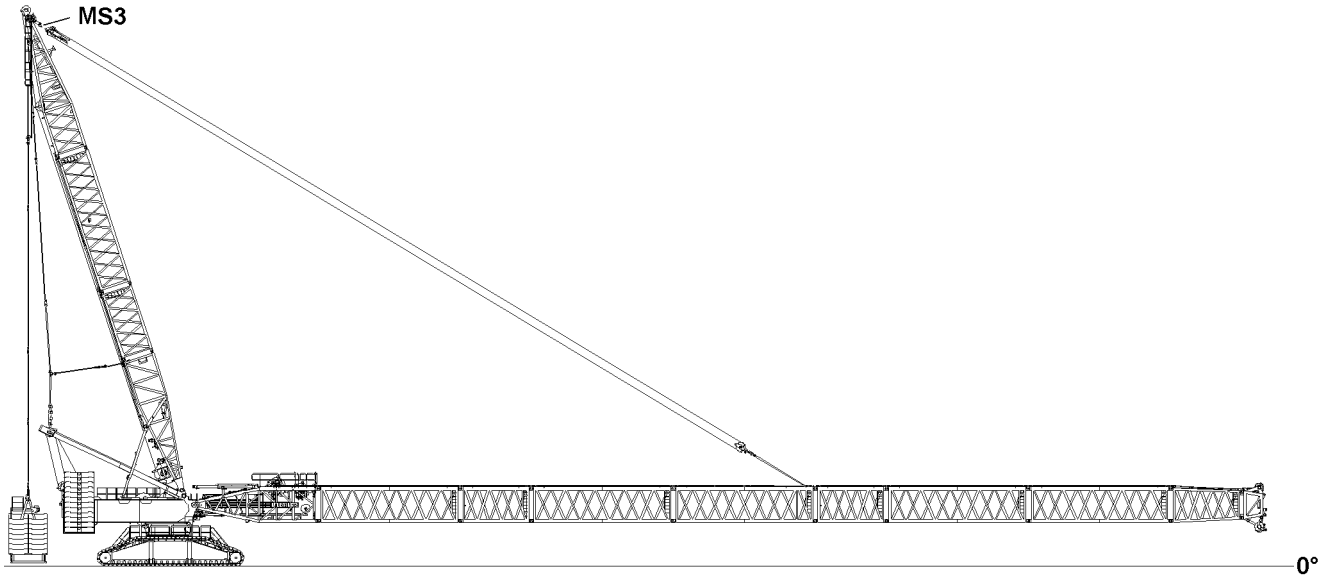

*Fig.119430: S2DB-boom system - Flying assembly length to **maximum** S2 90 m*

- with L-end section
- with roller sets
- with S-guy rods
- without WA-frame II guy rods

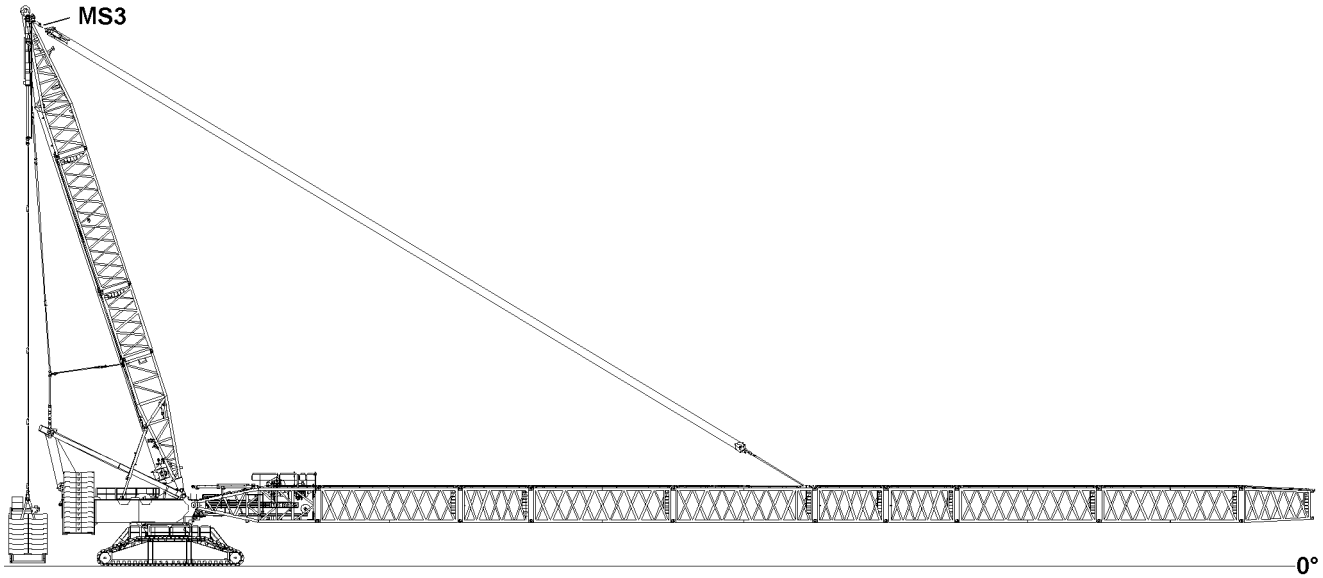

*Fig.119431: S2DB-boom system - Flying assembly length to **maximum** S2 96 m*

- without end section
- with S-guy rods
- without WA-frame II guy rods

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5.2.3 Assembling the SL2DB-boom system in flying mode

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ Make sure that $F3_{max}$ (MS3) is **not** exceeded at flying assembly.
- ▶ Make sure that the maximum permissible flying assembly lengths are not exceeded, even when $F3_{max}$ (MS3) is not yet reached.
- ▶ Make sure that no hook block is reeved at flying assembly.
- ▶ Make sure that all guy rods which are not required have been removed from the lattice sections.
- ▶ For counterweight, central ballast and derrick ballast refer to the erection and take down charts. If the end section is not present, the respective boom length with the end section is to be taken into account.
- ▶ To determine the required derrick ballast, assume a hook block weight of a minimum of 7 t in the erection and take-down charts.

Note
- ▶ $F3_{max}$ (MS3) = 260 t.

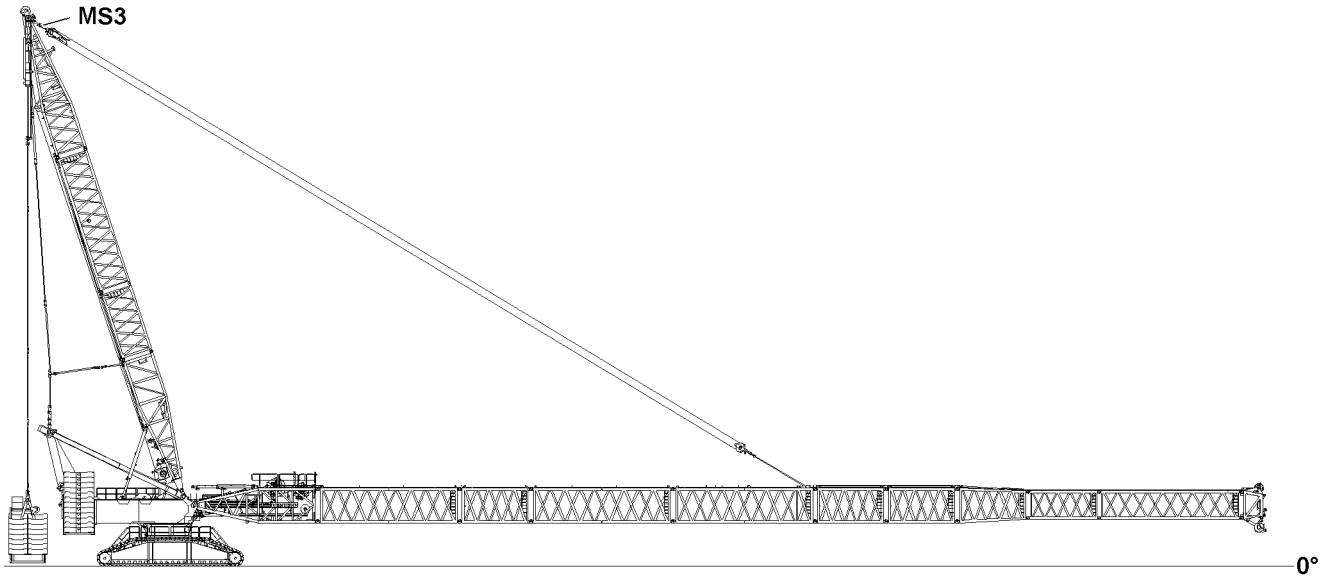

*Fig.119432: SL2DB-boom system - Flying assembly length to **maximum** SL2 90 m*

- without end section
- with S-guy rods
- without WA-frame II guy rods

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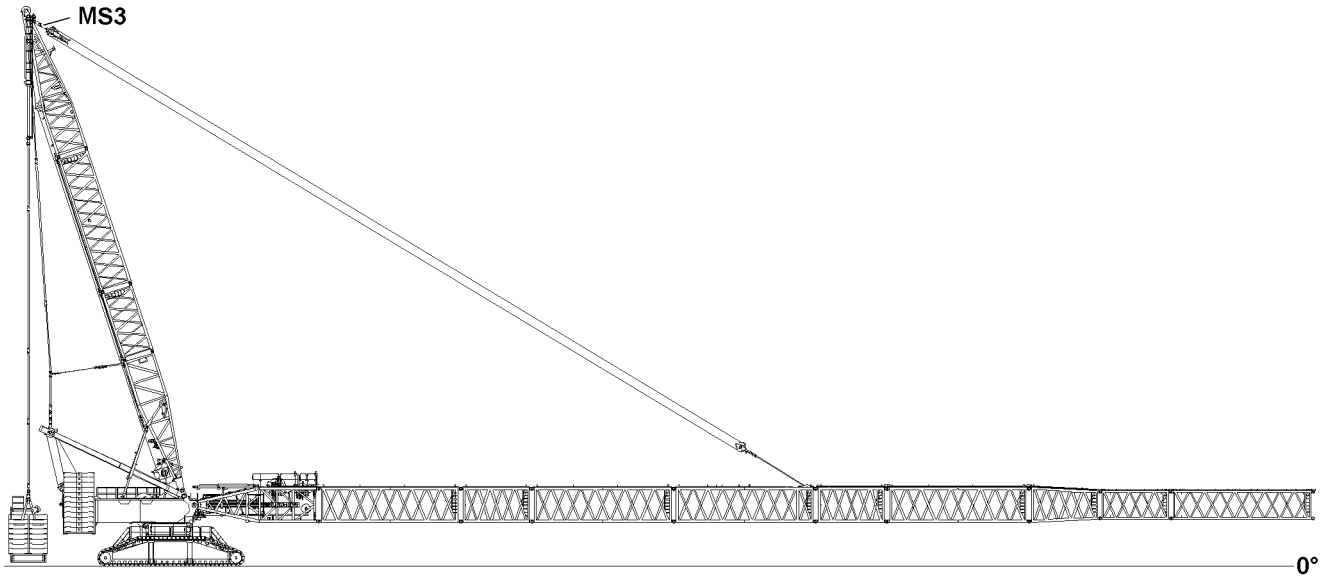

*Fig.119433: SL2DB-boom system - Flying assembly length to **maximum** SL2 96 m*

- without end section
- with S-guy rods
- without WA-frame II guy rods

5.2.4 Completing the flying assembly

If the maximum permissible flying assembly length is installed and tensioned on the S-intermediate section 3228.25 FLM, the boom system must be taken down on the ground or a load bearing substructure.

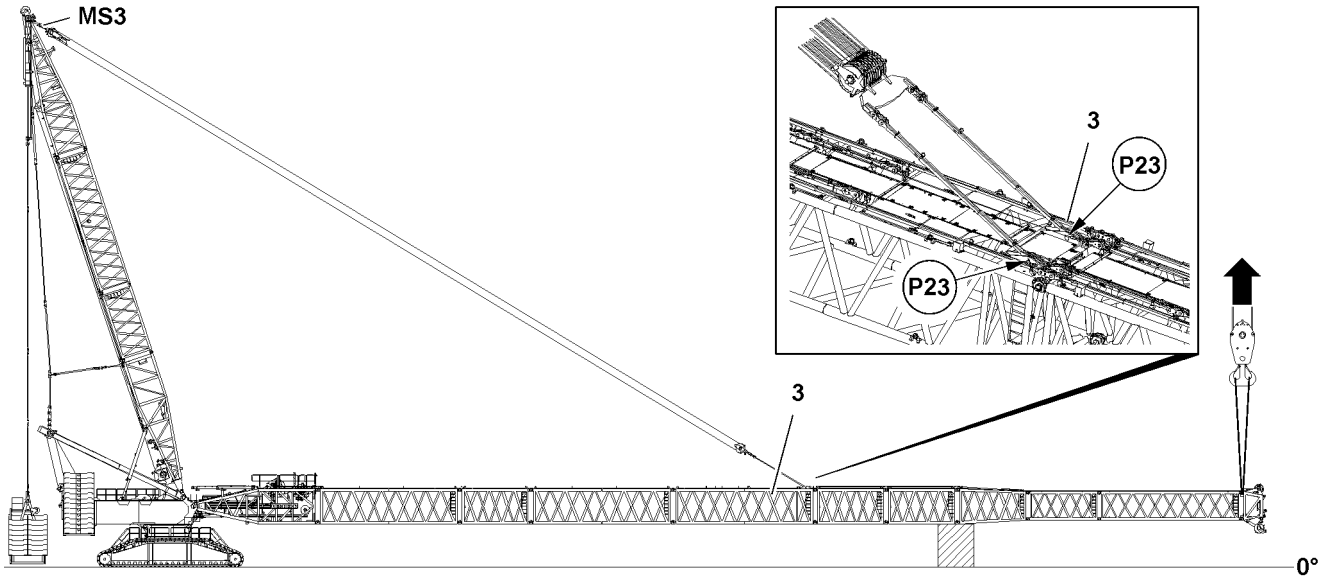

*Fig.119434: Boom system supported **or** held by an auxiliary crane*

Make sure that the following prerequisite is met:
– An auxiliary crane with sufficient load bearing capacity if available.

When the permissible flying assembly length is reached:
▶ Take the boom system down on the ground or on a load bearing substructure.
▶ Install the boom end section properly on the boom system.

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Problem remedy
The maximum permissible flying assembly length does not correspond to the operating length?
- ▶ Take the boom system down on the ground.
- ▶ Expand the boom system on the ground to the required operating length.
- ▶ Close the boom system after reaching the required operating length with the auxiliary crane.

WARNING
The boom can suddenly fold down!
Death, severe bodily injuries, property damage.
- ▶ Before unpinning the guy rods: Support the boom system properly or take it down on the ground.
- ▶ Observe and adhere to the Rod plan.

When the boom system is properly taken down on the ground or supported:
- ▶ Relieve the guying between the D-end section and the S-intermediate section 3228.25 FLM **3**.

6 Assembling the boom system in flying mode (guying on S-pivot section)

If spatial prerequisites on the job site are limited for the assembly of the boom system, or if they are limited by buildings or similar, then the SD/S2D/SL2D-boom can be installed in „flying mode“.

WARNING
General danger notes!
Death, severe bodily injuries, property damage.
- ▶ All pins are to be secured after assembly with the intended retaining elements.
- ▶ The guy rods must be inspected regularly, see the Crane operating instructions, chapter 8.15.
- ▶ Secure the boom with substructure or auxiliary crane, see Crane operating instructions, chapter 5.01.
- ▶ It is prohibited for anyone to remain under the booms or within the complete danger zone during the pinning and unpinning procedure of the lattice section.

WARNING
Impermissible boom lengths guyed!
Death, severe bodily injuries, property damage.
- ▶ The maximum permissible boom lengths for the „flying“ assembly may not be exceeded.

When the boom system to be installed is longer than the permissible flying assembly length:
- ▶ Support the boom on the end of the permissible flying assembly length or secure with an auxiliary crane, see Operating instructions, chapter 5.01.
- ▶ Observe the assembly conditions, see the Crane operating instructions, chapter 3.06.
- ▶ The data in the erection and take-down charts as well as the load charts must be adhered to.

NOTICE
Property damage!
If the pins of the guy rods are not pinned from the „inside“ to the „outside“, the hoist rope can scrape on the pins and be damaged.
- ▶ Always insert the pins of the guy rods from the „inside“ to the „outside“, see the Rod plan.

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WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ For the „flying“ boom assembly, the maximum permissible total force at test point **MS3** may **not** be exceeded.
- ▶ The „flying“ boom assembly is only permissible up to a maximum flying assembly length.
- ▶ Make sure that the maximum permissible flying assembly length is not exceeded.
- ▶ The „actual force“ on test point 3 **MS3** is shown on LICCON monitor 1.
- ▶ Observe the assembly conditions, see the Crane operating instructions, chapter 3.06.
- ▶ The specifications in the erection and take-down charts as well as the load charts must be observed.
- ▶ For the itemization of the lattice sections refer to the Rod plan.

6.1 Assembling the upper pulley block on the S-pivot section

Make sure that the following prerequisites are met:
- The derrick ballast is properly installed and secured.
- The derrick ballast is properly ballasted.
- The S-pivot section **1** is properly installed.
- The S-pivot section **1** is laying on the ground on the substructure.

NOTICE
Danger of property damage!
When luffing the D-boom down, the upper pulley block **37** can run with the assembly weight **37.1** on the S-pivot section **1** and damage the boom.
This could result in high property damage.
- ▶ Make sure that the assembly weight **37.1** does not run on the S-pivot section **1** when luffing down the D-boom.
- ▶ Make sure, when luffing down the D-boom, that there is always sufficient distance between the S-pivot section **1** and the assembly weight **37.1**.

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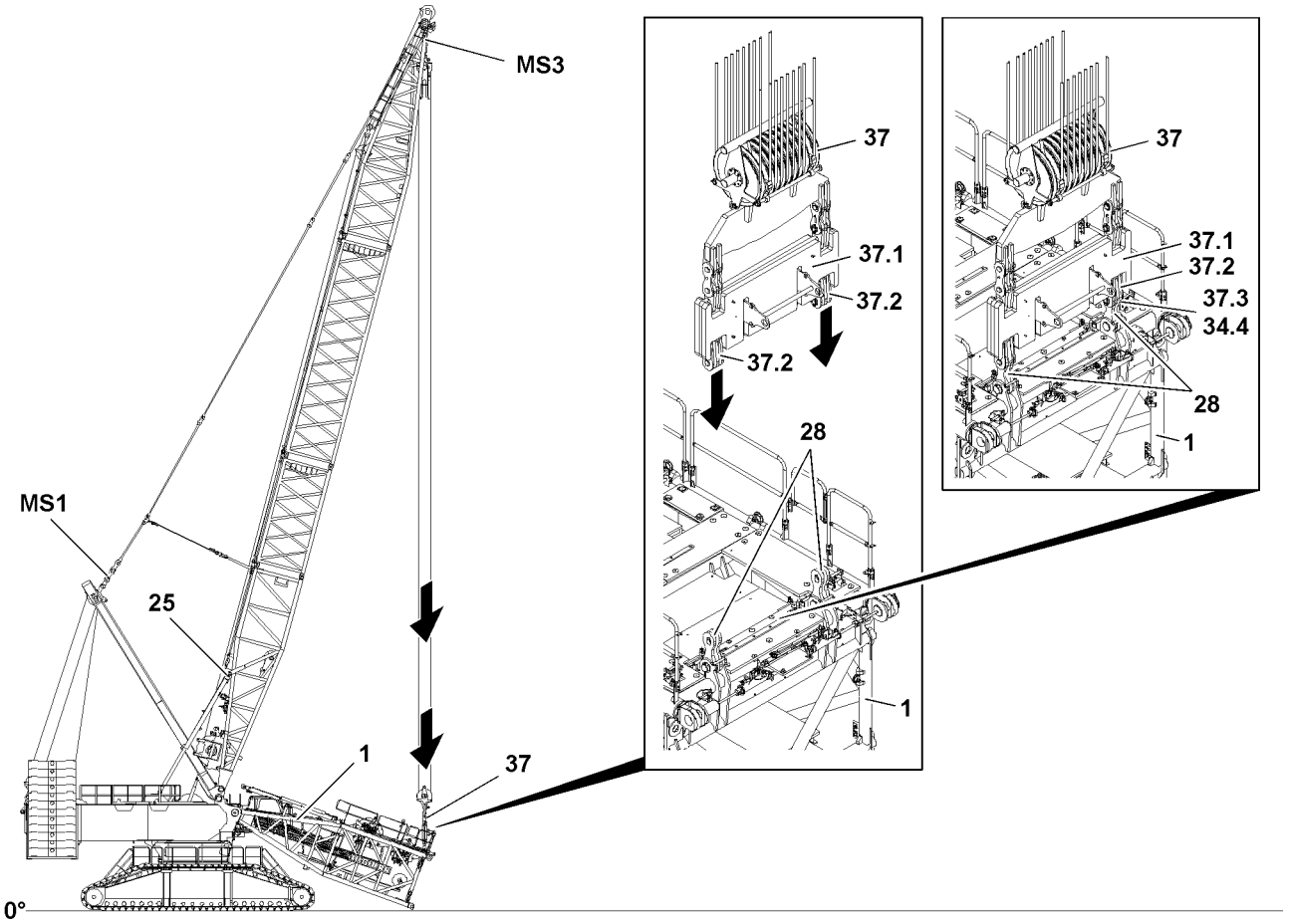

Fig.122705: Pinning the upper pulley block on the S-pivot section

- ▶ Lower the upper pulley block **37** until the brackets of the assembly weight are above the tension brackets of the S-pivot section **1**.
- ▶ Pin the brackets of the assembly weight **37.1** with the brackets of the S-pivot section **1**: Insert the pin from the inside to the outside and secure with safety locking pin.

WARNING
D-boom falling to the rear!
If the relapse cylinders of the D-boom are not completely moved out before erection, then the D-boom can fall backward when erecting it into operating position.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the relapse cylinders of the D-boom are completely moved out.

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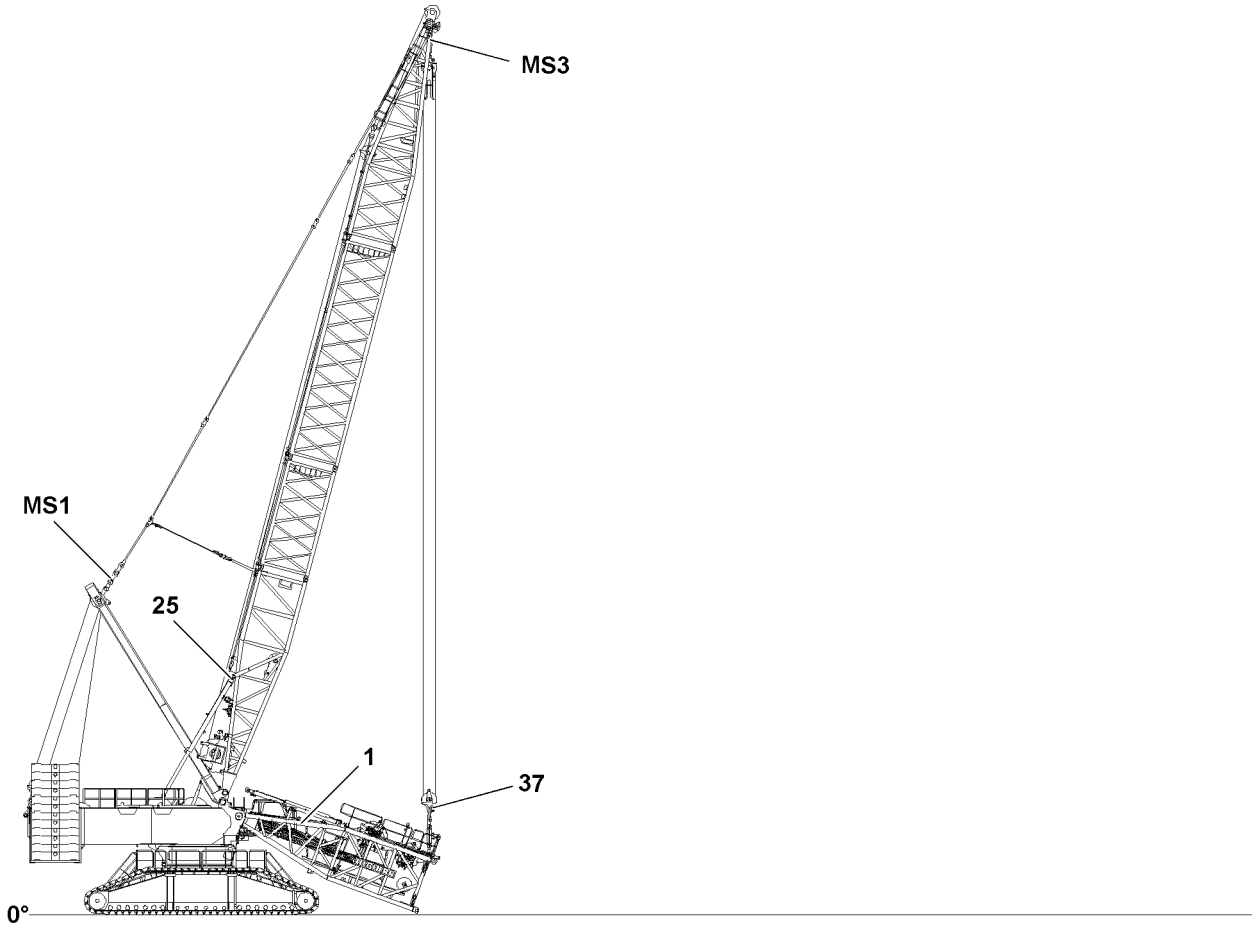

*Fig.122706: S-pivot section **1** in assembly position*

When the brackets of the assembly weight are properly pinned and secured with the brackets on the S-pivot section **1**:

▶ Tension the guying carefully between the D-boom and the S-pivot section **1**.

When the guying is tensioned:

▶ Carefully and at slow speed lift the S-pivot section **1** off the ground.

▶ Lift the S-pivot section **1** to the horizontal so that the boom expansion can be assembled on the S-pivot section **1** in flying mode.

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6.2 Assembling the S-lattice sections in „flying mode“ on the S-pivot section

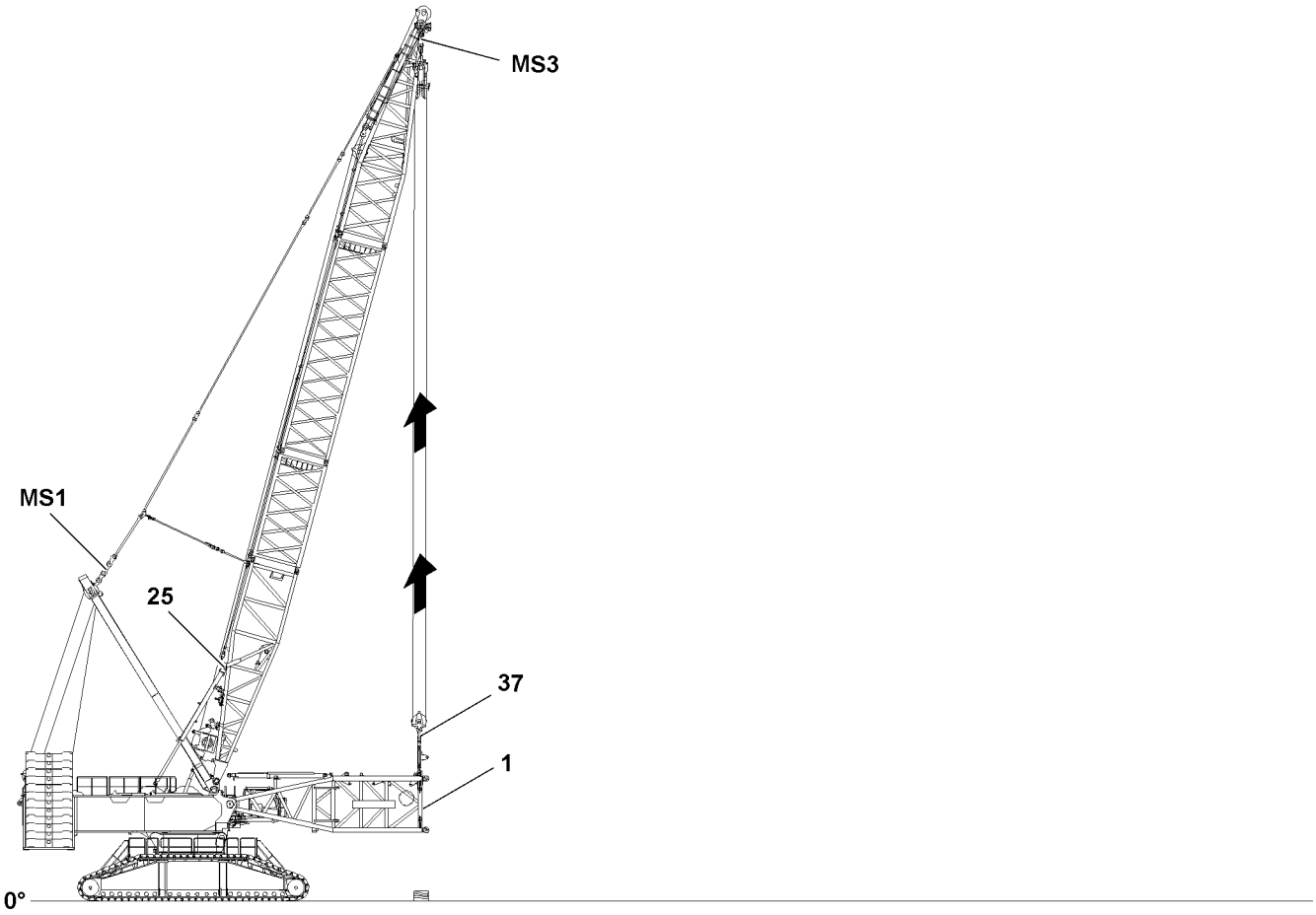

Fig.122707: S-pivot section tensioned with winch 3

Make sure that the following prerequisites are met:
- The electrical and hydraulic connections to the S-pivot section have been established.
- The S-pivot section is horizontally tensioned.
- An auxiliary crane with sufficient load bearing capacity if available.

WARNING
Falling components!
If unsecured or non-supported components are assembled or disassembled, they can fall down.
Death, severe bodily injuries, property damage.
- ▶ During pinning and unpinning of the intermediate sections, it is prohibited for anyone to remain **under** or **on** the components as well as within the entire danger zone.
- ▶ Before unpinning: Support the components and boom.
- ▶ Secure the pins in the storage locations and in the receptacles.
- ▶ It is prohibited to lean a ladder against the crane section that is being disassembled.

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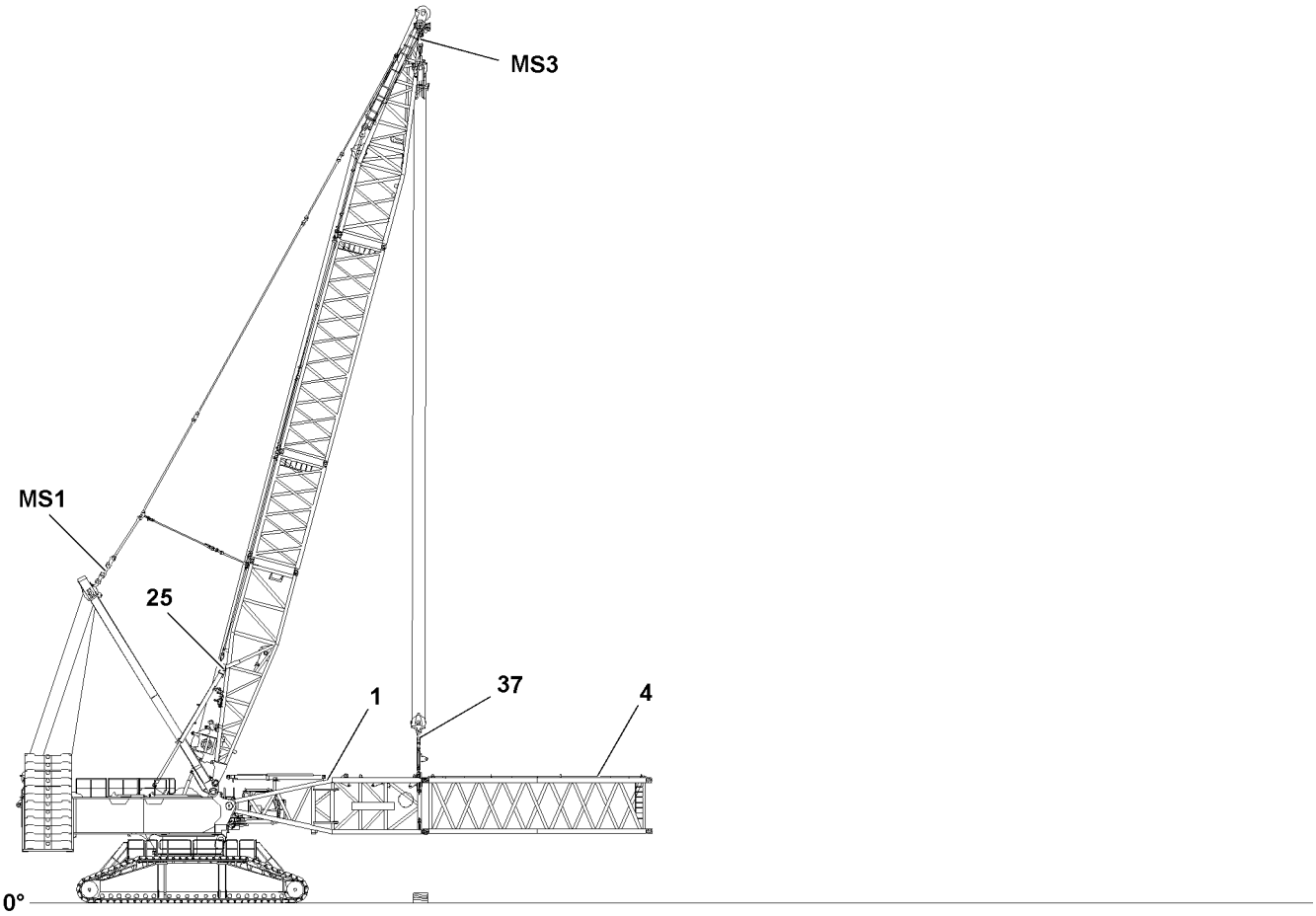

Fig.122708: Flying assembly up to maximum permissible flying assembly length

For „flying“ assembly of the intermediate sections, they can be installed individually or as preassembled boom unit on the S-pivot section.

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ Make sure that the maximum permissible flying assembly lengths are **not** exceeded.
- ▶ The crane operator bears the sole and full responsibility for the observation of the maximum permissible flying assembly lengths.

- ▶ Fasten the S-intermediate section **4** or preassembled boom unit to the auxiliary crane.
- ▶ Lift the S-intermediate section **4** or preassembled boom unit with the auxiliary crane and position on the S-pivot section until the pin points align.

When the pin points between the S-pivot section and S-intermediate section **4** or the preassembled boom unit align „on top“ and „bottom“:
- ▶ Pin the S-intermediate section **4** or preassembled boom unit „on top“: Insert the pin **1.1** on both sides and secure with locking pin **1.2**.
- ▶ Pin the S-intermediate section **4** or preassembled boom unit „on the bottom“: Insert the pin **1.1** on both sides and secure with locking pin **1.2**.

When the pins are properly pinned and secured on both sides on „top“ and „bottom“ between the S-pivot section and the S-intermediate section **4** or the preassembled boom unit:
- ▶ Remove the auxiliary crane.

If additional lattice sections are assembled:
- ▶ Assemble the lattice sections the same way as described in this section.

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6.2.1 Assembling the SD // S2D // SL2D boom system in flying mode with the end section

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ Make sure that $F3_{max}$ (MS3) is **not** exceeded at flying assembly.
- ▶ Make sure that the maximum permissible flying assembly lengths are not exceeded, even when $F3_{max}$ (MS3) is not yet reached.
- ▶ Make sure that no hook block is reeved at flying assembly.
- ▶ Make sure that all guy rods which are not required have been removed from the lattice sections.
- ▶ For counterweight and central ballast refer to the erection and take down charts.
- ▶ Observe the system configurations, see the following chart.

Note
- ▶ $F3_{max}$ (MS3) = 210 t.

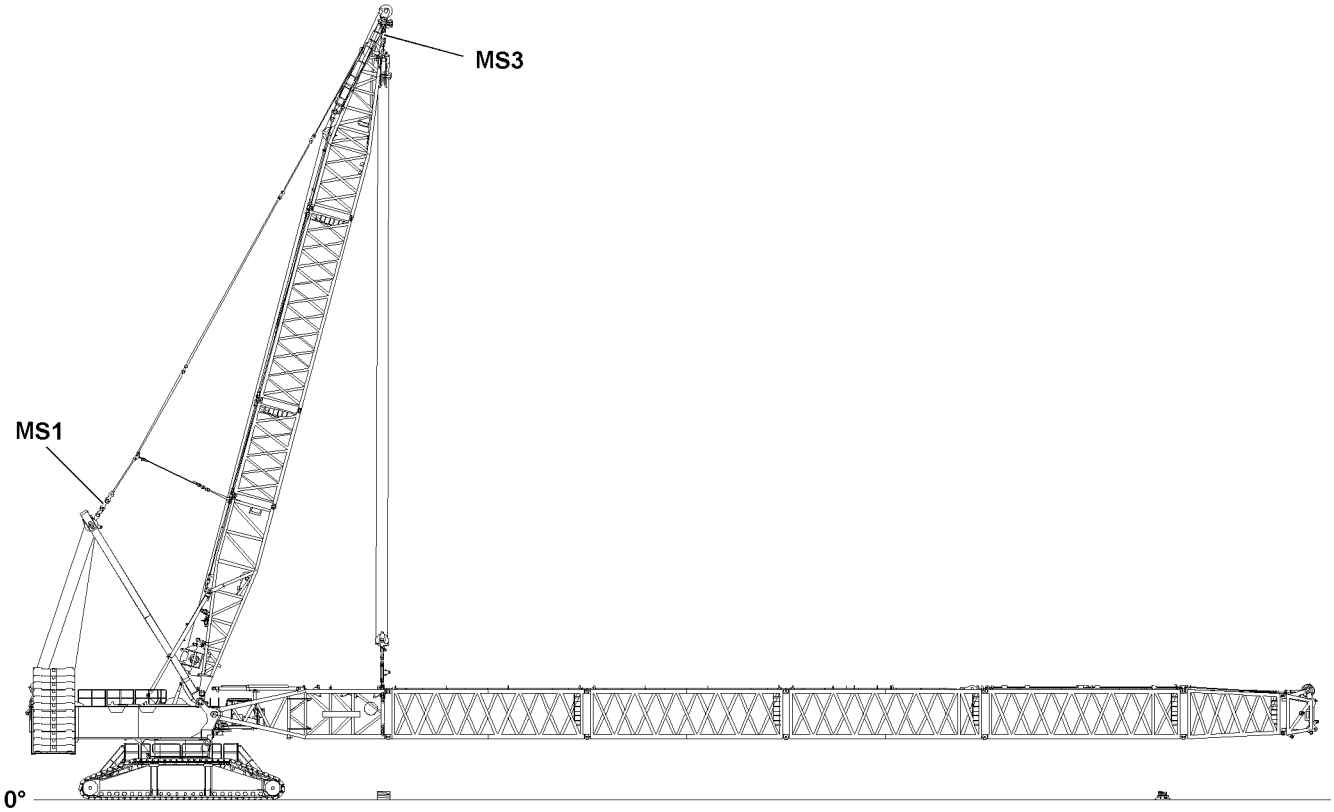

Fig.122709: SD // S2D // SL2D boom system - flying mode with end section

	System configuration for flying assembly		
	SD	S2D	SL2D
L-end section	—	X	X
S-end section	X	—	—
Roller set R8	2	—	—
Roller set R12	—	1	1
S-guying	X	X	X

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	System configuration for flying assembly		
	SD	S2D	SL2D
WAB 2-guying	—	—	—
Counterweight	210 t	170 t	170 t
Central ballast	50 t	10 t	10 t
Maximum permissible flying assembly length	48 m	48 m	54 m

6.2.2 Assembling the SD // S2D // SL2D boom system in flying mode without the end section

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ Make sure that $F3_{max}$ (MS3) is **not** exceeded at flying assembly.
- ▶ Make sure that the maximum permissible flying assembly lengths are not exceeded, even when $F3_{max}$ (MS3) is not yet reached.
- ▶ Make sure that no hook block is reeved at flying assembly.
- ▶ Make sure that all guy rods which are not required have been removed from the lattice sections.
- ▶ For counterweight and central ballast refer to the erection and take down charts. If the end section is not present, the respective boom length with the end section is to be taken into account.
- ▶ Observe the system configurations, see the following chart.

Note
- ▶ $F3_{max}$ (MS3) = 210 t.

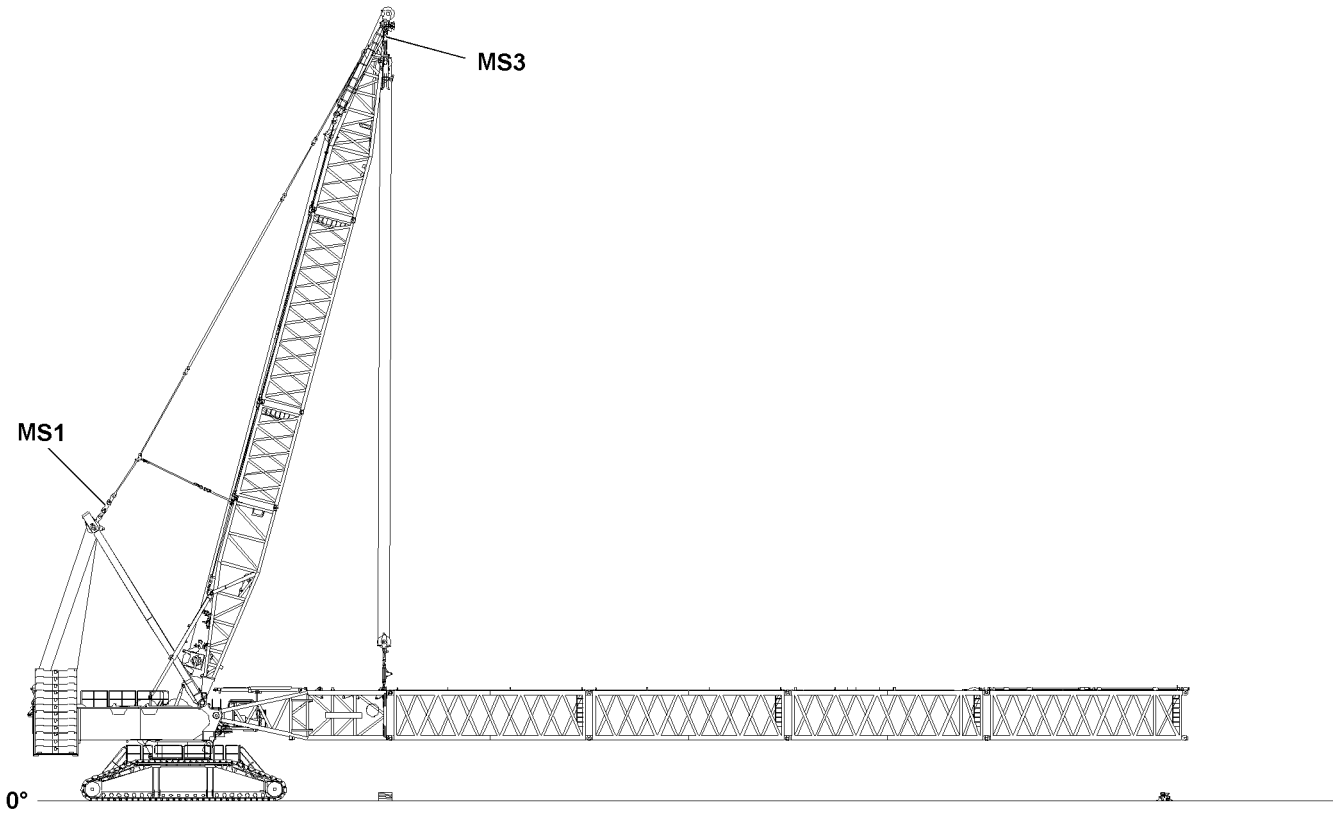

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Fig.122710: SD // S2D // SL2D boom system - flying mode without end section

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	System configuration for flying assembly		
	SD	S2D	SL2D
S-guying	X	X	X
WAB 2-guying	—	—	—
Counterweight	210 t	170 t	170 t
Central ballast	50 t	10 t	10 t
Maximum permissible flying assembly length	54 m	54 m	60 m

6.2.3 Completing the flying assembly

If the maximum permissible flying assembly length is installed and tensioned on the S-pivot section **1**, the boom system must be taken down on the ground or a load bearing substructure.

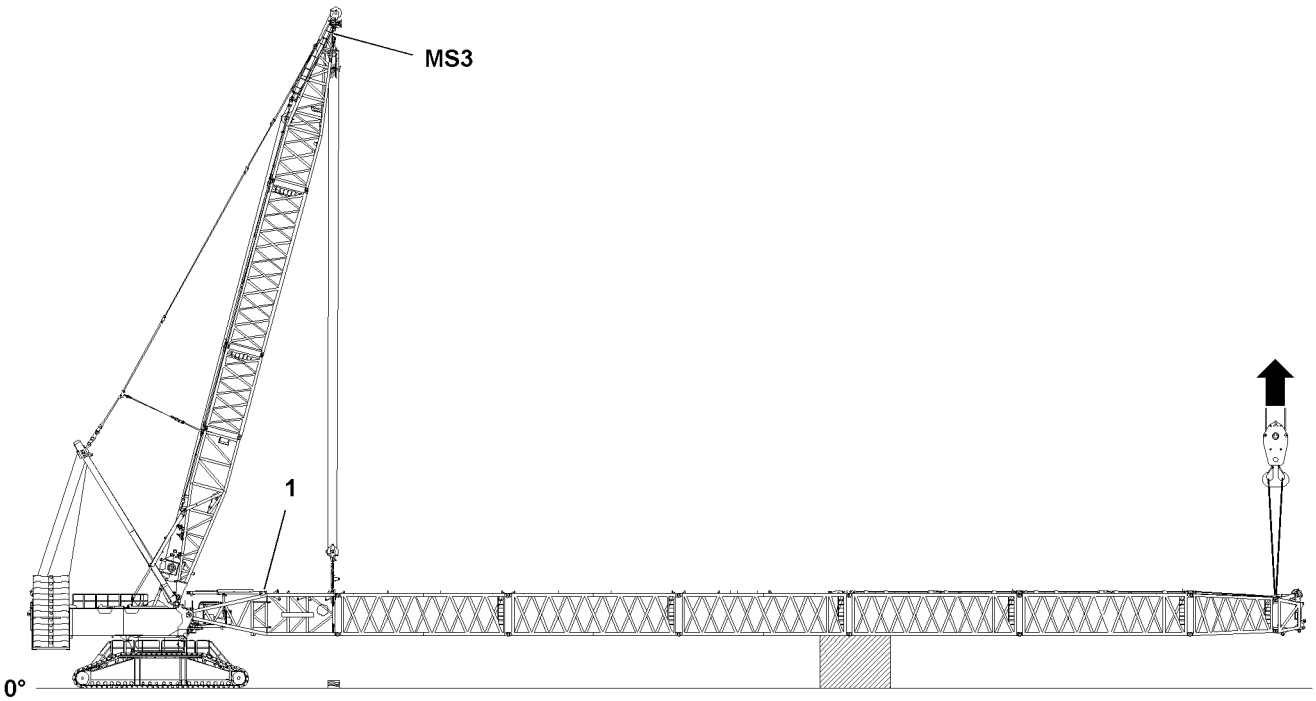

*Fig.122711: Boom system supported **or** held by an auxiliary crane*

Make sure that the following prerequisite is met:
– An auxiliary crane with sufficient load bearing capacity if available.

When the permissible flying assembly length is reached:
▶ Take the boom system down on the ground or on a load bearing substructure.
▶ Install the boom end section properly on the boom system.

Problem remedy

The maximum permissible flying assembly length does not correspond to the operating length?
▶ Take the boom system down on the ground.
▶ Expand the boom system on the ground to the required operating length.
▶ Close the boom system after reaching the required operating length with the auxiliary crane.

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WARNING
The boom can suddenly fold down!
Death, severe bodily injuries, property damage.
▶ Before unpinning the brackets on the upper pulley block: Support the boom system properly or take it down on the ground.

When the boom system is properly taken down on the ground or supported:
▶ Relieve the guying between the D-end section and the S-pivot section.

7 Assembling the boom combinations with substructure

If the assembly conditions for the assembly of the boom system are restricted due to the terrain on the jobsite, then it is possible to install the SD-/S2D-/SL2D-boom with a substructure.

WARNING
General danger notes!
▶ All pins are to be secured after assembly with the intended retaining elements.
▶ The guy rods must be inspected regularly, see the Crane operating instructions, chapter 8.15.
▶ Secure the boom with substructure or auxiliary crane, see Crane operating instructions, chapter 5.01.
▶ It is prohibited for anyone to remain under the booms or within the complete danger zone during the pinning and unpinning procedure of the lattice section.

NOTICE
Property damage!
If the pins of the guy rods are not pinned from the „inside“ to the „outside“, the hoist rope can scrape on the pins and be damaged.
▶ Always insert the pins of the guy rods from the „inside“ to the „outside“, see the Rod plan.

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
▶ For boom assembly / disassembly with the substructure, observe chapter 5.01.
▶ The „actual force“ on test point 3 **MS3** is shown on LICCON monitor 1.
▶ Observe the assembly conditions, see the Crane operating instructions, chapter 3.06.
▶ The specifications in the erection and take-down charts as well as the load charts must be observed.
▶ For the itemization of the lattice sections refer to the Rod plan.

NOTICE
Overload of boom!
If the boom is not supported before the erection procedure, then the boom will be overloaded during the erection procedure.
The boom system will be damaged.
▶ Support the SL2-boom from a length of more than 120 m.
▶ Support the S2-boom from a length of more than 138 m.
▶ Make sure that the dimension **X** for the maximum permissible deflection of the boom system is never exceeded.
▶ Support the boom with suitable materials with sufficient load carrying capacity in the marked area, see illustration.

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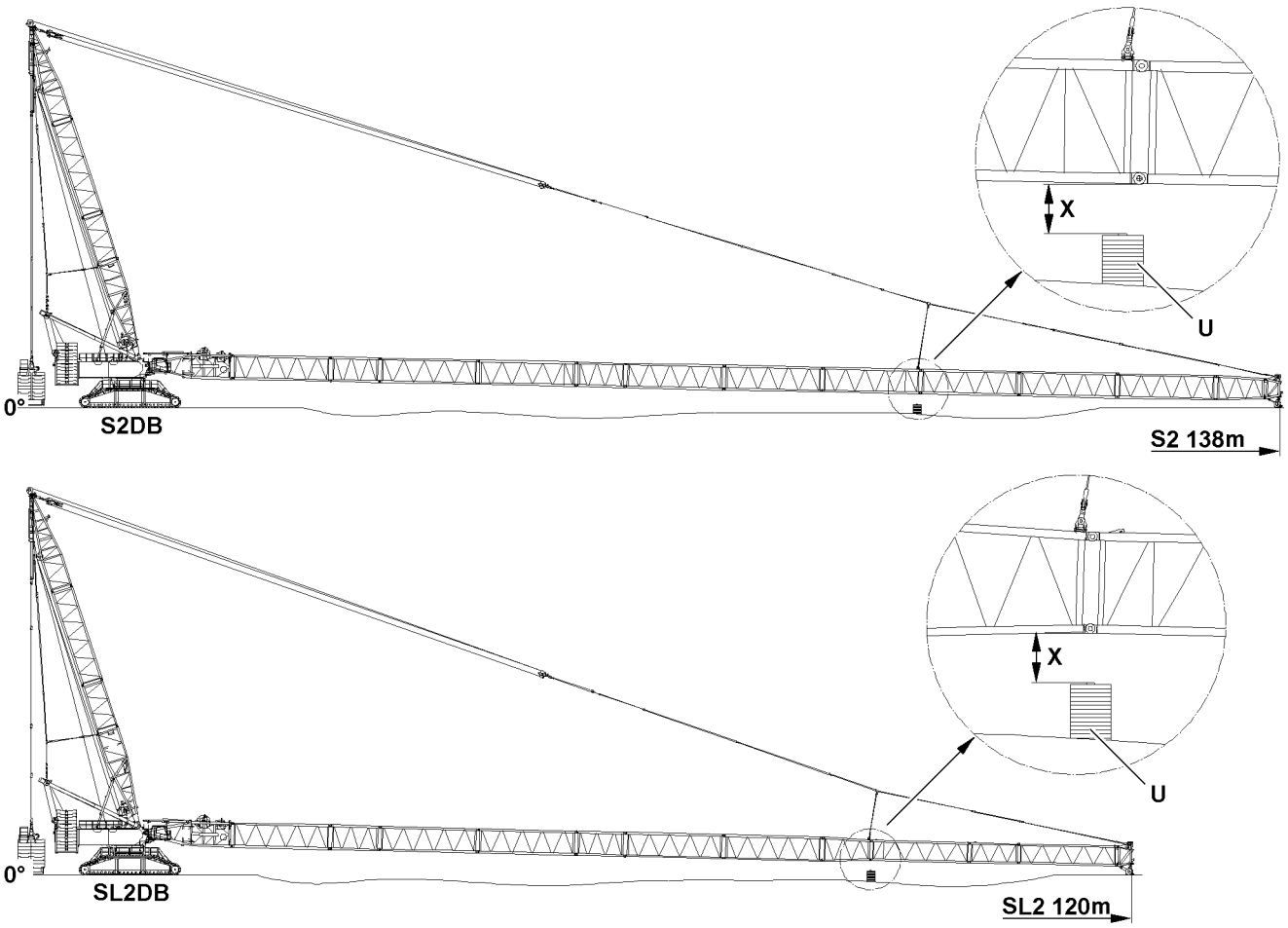

Fig.119449: Assembling the boom combinations with substructure

The boom combinations must be preassembled at a suitable location.

Swing the preassembled boom combination with the auxiliary crane(s) in to the turntable, pin and secure.

▶ Preassemble the boom combination.

WARNING
Danger of accident due to boom system!
Death, severe bodily injuries, property damage.
▶ Make sure that no persons are within the danger zone of the crane and the boom system to be assembled.

▶ Swing the preassembled boom combination with the auxiliary crane (s) to the turntable.
▶ Pin and secure the boom combination with the S-pivot section on the turntable, see section „Assembling the S-pivot section on the turntable“.

When the boom system is properly installed with the S-pivot section on the turntable:
▶ Support the boom system properly before taking it down on the ground.

Operating mode	Support from length	Dimension[1] **X**
SL2	120 m	0.9 m
S2	138 m	1.2 m

[1] X = maximum permissible flexation of the boom system

▶ Lower the boom combination on the ground.

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8 Assembling the S-guy rods

WARNING
Neglected guy rod inspection and maintenance!
Death, severe bodily injuries, property damage.
- ▶ Check the guy rods before every assembly, see Crane operating instructions, chapter 8.15.
- ▶ The S-guy rods must be assembled and secured, see Rod plan. The numbering in the rod plan must be identical to the numbering on the guy rods.
- ▶ Make sure that the inspection and maintenance intervals are adhered to.

WARNING
Falling components!
Death, severe bodily injuries, property damage.
- ▶ Make sure that the intermediate sections or preassembled boom unit are pinned and secured on the S-pivot section.
- ▶ Make sure that the intermediate sections or preassembled boom unit is supported with suitable materials, secured with the auxiliary crane or the boom is placed on the ground.

Make sure that the following prerequisites are met:
- The boom system is closed.
- The boom is supported
- **or** the boom is held in position by the auxiliary crane
- **or** the boom is laying on the ground.
- The D-boom is luffed down to the front.

Note
- ▶ The assembly of the upper pulley block on the guy rods for crane operation is according to the assembly „Assembling the upper pulley block on S-intermediate section for flying assembly“.

The guy rods are placed and secured for transport on the S-intermediate sections. Before assembly of the guy rods, release the transport retainers.

- ▶ Release and unpin transport retainers for the guy rods.

NOTICE
Property damage!
If the pins of the guy rods are not pinned from the „inside“ to the „outside“, the hoist rope can scrape on the pins and be damaged.
- ▶ Always insert the pins of the guy rods from the „inside“ to the „outside“, see the Rod plan.

- ▶ Pin the required guy rods with each other: Insert the pin from the „inside“ to the „outside“ and secure with locking pin.
- ▶ Assemble the guying according to the Rod plan, pin and secure it properly.
- ▶ Make sure that all required guy rods of the boom system are pinned and secured.
- ▶ If it is required according to the Rod plan: Assemble the auxiliary guying, see Crane operating instructions, chapter 5.01 and 5.03.

WARNING
Unutilized guy rods on boom!
If guy rods are on the lattice sections which are not required for crane operation, then there is a danger of accidents.
Death, severe bodily injuries, property damage.
- ▶ Non-required guy rods must be removed from the lattice sections, see Crane operating instructions, chapter 5.01.

- ▶ Remove non-required guy rods from the lattice sections.

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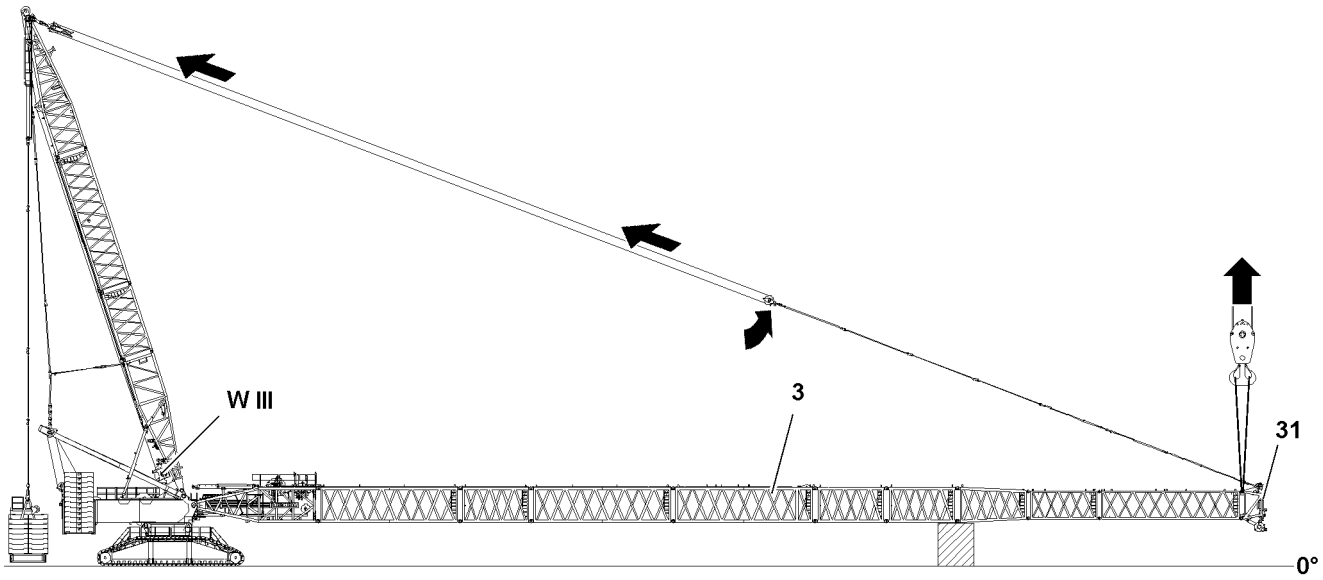

Fig.119435: Tension the boom guying with winch 3 (W III)

NOTICE
Danger of slack rope formation!
If winch 3 **WIII** is spooled out too quickly during the erection procedure of the D-boom, slack rope can form.
▶ Make sure that the rope of winch 3 **WIII** is tensioned during the entire erection procedure of the D-boom.

WARNING
Danger of accident due to boom system!
Death, severe bodily injuries, property damage.
▶ The boom system may not be raised during the erection of the D-boom in the operating position, and must remain in the initial position.

▶ Erect the D-boom in operating position and spool out winch 3 **WIII** at the same time.

When the D-boom is in operating position:
▶ Tension the main boom guying between the D-boom and the boom end section.

9 Assembling the roller sets on the boom head

9.1 Assembling the roller sets

Note
▶ The assembly of the roller sets is described in the Crane operating instructions, chapter 5.14.

When the roller set / the roller sets are properly installed on the end section:
▶ Route the hoist limit switch from the end section forward on the roller set / the roller sets, pay attention and adhere to the Electrical wiring diagram.

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9.2 Establishing the electrical connections on the boom end section

Make sure that the following prerequisites are met:
- The S-intermediate sections are properly assembled and secured on the ground.
- The boom end section is properly assembled and secured.
- The electrical connections to the boom end section have been established.
- The airplane warning light, wind speed sensor and all sensors are properly installed and secured on the boom end section.
- The hoist limit switches are properly installed and secured on the pulley head / pulley heads.

NOTICE
Danger of damage to the electrical connections!
If the electrical connection from the cable drum on the S-pivot section to the terminal box on the S-pivot section is established first before the connection to the terminal box on the boom end section, the electrical connection can be damaged when spooling out the cable drum.
▶ Establish first the electrical connection from the cable drum in the S-pivot section to the terminal box on the boom end section and then the electrical connection from the terminal box in the S-pivot section to the cable drum.

Note
▶ To establish the electrical connections on the S-boom: Use the Electrical wiring diagram.

▶ Establish the electrical connections.
▶ Make sure that all electrical connections on the boom are established.

WARNING
Malfunction if dummy plugs are not installed!
If the dummy plugs on the non-required electrical connections are not installed, then malfunctions or functional limitations can occur on the crane.
▶ Make sure that all non-required electrical connections that have a dummy plug are closed off with dummy plugs.
▶ Pay attention to the Electrical wiring diagram.

▶ As a rule, close off on-required electrical connections (for example for accessories which cannot be installed) with the respective dummy plugs.

NOTICE
Property damage due to dirt and / or corrosion!
If non-required electrical connections are not closed off with the respective protective caps, then dirt and / or corrosion can damage the electrical connections.
This could result in malfunctions.
▶ Make sure that all non-required electrical connections are always closed off properly.
▶ Pay attention to the Electrical wiring diagram.

▶ Close electrical connections, which have no dummy plugs, properly off with the corresponding protective caps.

10 Performing the function checks

WARNING
Malfunctioning safety equipment!
Death, severe bodily injuries, property damage.
▶ Crane operation with non-functioning safety equipment is **prohibited**.
▶ Start crane operation only after all safety equipment have been checked and are functioning correctly.

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Note

- ▶ The function of the individual limit switches must be checked before erection of the boom system.
- ▶ The function of the limit switch initiators must be checked in the test system, see the Diagnostics manual.

Note

- ▶ If a function check on the limit switches or on the safety equipment does not lead to the desired shut-offs, then the plug connections on the connector boxes or the components themselves must be checked.
- ▶ If no visible connection errors or component defects can be found, contact Liebherr Service.

Make sure that the following prerequisites are met:

- All electrical connections have been made.
- The crane engine is running.
- The corresponding operating mode is set on the LICCON monitor.
- The actuator levers of the limit switches have been checked for easy movement and are lubricated.

10.1 Wind speed sensor

▶ Check the movement and the function of the wind speed sensor.

10.2 Airplane warning light

▶ Turn the airplane warning light on, see Crane operating instructions, chapter 4.01.
▶ Check the function visually.

10.3 Hoist limit switch

▶ Actuate the hoist limit switch manually on the pulley head.

Result:

- The hoist winch turns off in upward movement.
- The hoist top icon on the LICCON monitor 0 blinks.
- The hoist limit switch is functioning.

10.4 Checking the limit switch main boom „steepest position“

Note

- ▶ The limit switch functions have to be checked individually before erection.

▶ Cover the limit switch initiators on the relapse cylinders of the main boom individually with a metal plate.

Result:

- The limit switch is actuated manually.
- The spool up function of winch 4 turns off.
- The icon „Boom limitation“ appears on the LICCON monitor 0.

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11 Erecting the boom

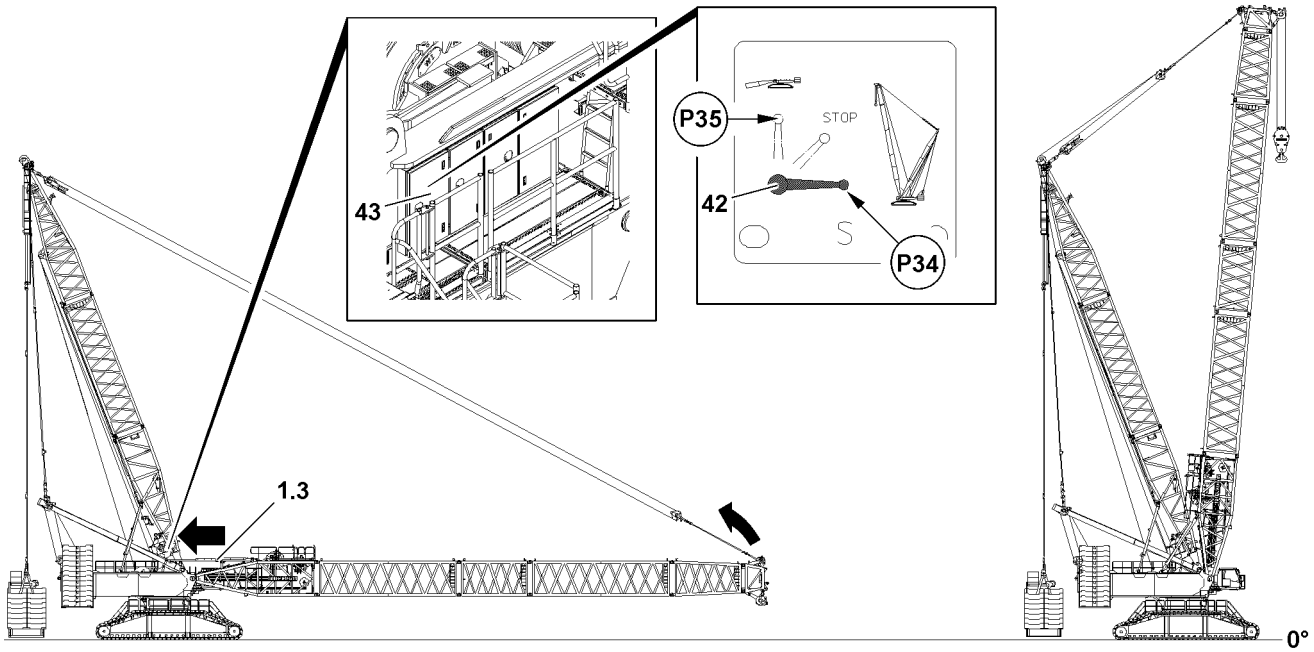

Fig.119436: Extending the relapse cylinder / erecting the boom system

WARNING
The crane can topple over!
In crane operation with bypassed LICCON overload protection, the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook.

If required in the erection and take down chart:
- ▶ Carry the hook block along with the auxiliary crane.

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ Observe the technical safety instructions, see the Crane operating instructions, chapter 5.01.
- ▶ Make sure that the relapse cylinders of the main boom are completely extended before erection of the boom combination.
- ▶ Do not allow slack rope to build up on the winch 4.

WARNING
Falling hoist rope!
Death, severe bodily injuries, property damage.
- ▶ Reeve the hoist rope before the erection procedure with a sufficient length on the roller set / the roller sets of the end section.
- ▶ The hoist rope must be constantly monitored during the erection procedure.
- ▶ Make sure that there are no persons within the danger zone.

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Make sure that the following prerequisites are met:
- The crane is horizontally aligned.
- The guy rods are properly assembled.
- The guy rods which are not required have been removed from the lattice sections.
- All electrical connections have been made.
- All hydraulic connections have been made.
- The function checks were carried out properly.
- All limit switches and warning devices are functioning.
- Crane ballasting (counterweight, central ballast, derrick ballast and / or auxiliary ballast) is carried out according to the load charts and / or the erection and take-down charts
- The crane has been set up according to the load charts and / or the erection and take-down charts.
- The LICCON overload protection has been set according to the data in the load charts and / or the erection and take-down charts.
- The LICCON overload protection settings have been checked for completeness and correctness.
- Assembly operation of the crane control is activated: the assembly icon is visible on the LICCON monitor.
- All pin connections have been secured.
- The hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins.
- There are no loose parts on the boom system.
- The boom system and the safety equipment are free from snow, frost and ice.
- No personnel or obstacles are within the danger zone.

11.1 Moving the S-relapse cylinders out

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ Move the S-relapse cylinders **1.3** out completely before erecting the S-boom.
- ▶ Secure the ball valve **42** during crane operation to prevent inadvertent actuation.

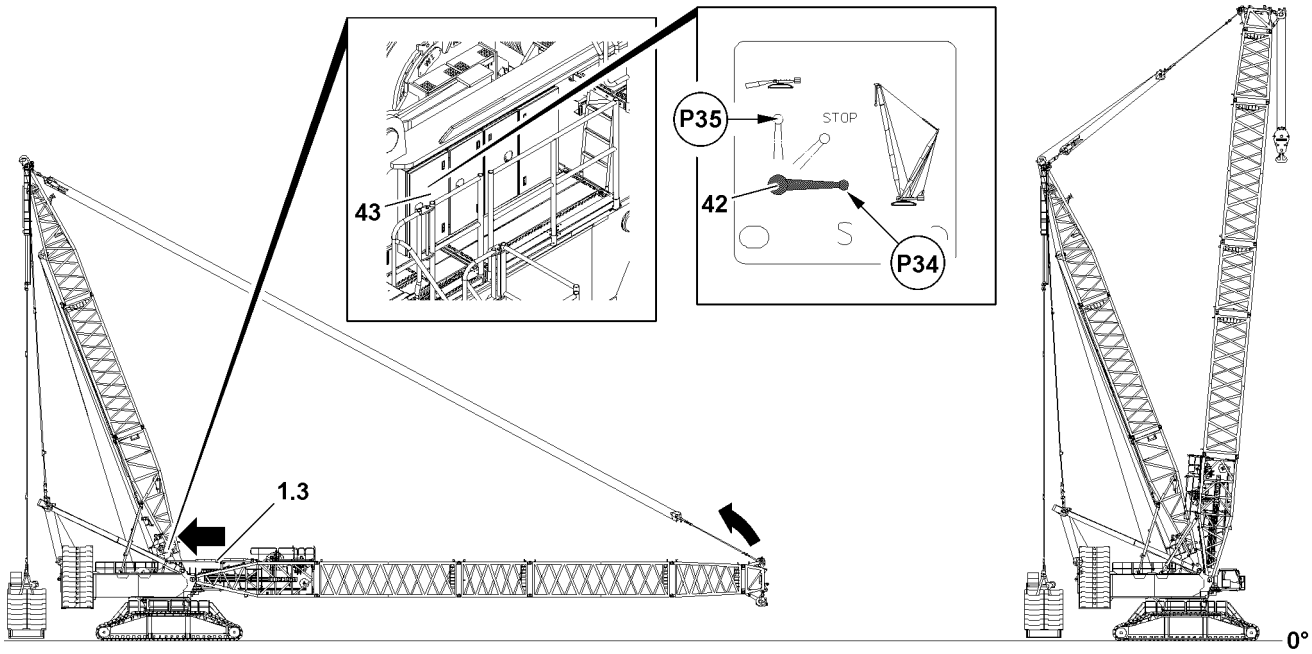

Fig.119436: Extending the relapse cylinder / erecting the boom system

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Ball valve positions	
Position (P)	Function
34	Crane operation, extend the piston rod
35	Assembly, retract the piston rod
STOP	The piston rod cannot be retracted / extended

The piston rods on the S-relapse cylinders **1.3** can be moved out with the ball valve **42**.

▶ Set the ball valve **42** to position **P34**.

Result:

– The piston rods of the S-relapse cylinders **1.3** move out.

Note

▶ The ball valve **42** is secured by closing the cabinet door **43** and removing the key.

▶ Close the cabinet door **43** and pull out the key.
▶ Hand the key to an authorized person.

11.2 Erection procedure

DANGER

The crane can topple over!

▶ It is prohibited to turn the crane superstructure while erecting the boom.
▶ Adhere to the specifications in the erection and take down charts.

Make sure that the following prerequisite is met:
– The correct hook block weight is entered on the LICCON monitor, see the Crane operating instructions, chapter 4.02.

11.2.1 Reeving in the hook block

Make sure that the following prerequisites are met:
– The crane is horizontally aligned.
– The slewing gear brake is applied.

WARNING

Danger of accident due to side wind!
If the slewing gear brake is released after reeving in / reeving out the hook block / load hook, then the crane can turn uncontrolled if there is a strong side wind.
The crane can collide with close-by structures or objects.
Death, severe bodily injuries, property damage.

▶ Make sure that the current wind speed does not exceed the values from the wind speed chart when releasing the slewing gear brake.

▶ Erect the boom until the end section lifts off the ground.

NOTICE

Danger of slack rope formation!
By spooling the hoist winch out too fast during the reeving procedure, slack rope can form.

▶ Make sure that the hoist rope is tensioned during the entire reeving procedure.

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WARNING
Falling hoist rope!
Death, severe bodily injuries, property damage.
- ▶ Reeve in the hoist rope with sufficient length on the S-boom before the erection process.
- ▶ The hoist rope must be constantly monitored during erection.
- ▶ Do not step into the danger zone.

- ▶ Reeve the hoist rope properly and secure it on the rope fixed point: Reeving, see Reeving plan.
- ▶ Pin and secure the rope retainers on the rope pulleys.
- ▶ Attach the hoist limit switch weight, see the Crane operating instructions, chapter 4.06.

11.2.2 Erecting the boom

WARNING
The crane can topple over!
In crane operation with bypassed LICCON overload protection, the crane can topple over.
There is then no additional protection against crane overload.
Death, severe bodily injuries, property damage.
- ▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook.
- ▶ Crane operation with bypassed LICCON overload protection is prohibited.

Note
- ▶ When the lowest operating position of the boom is reached, the set load chart of the LICCON overload protection is activated.
- ▶ In the maximum load icon appears a load number in „t“ instead of the display „???“.

- ▶ Luff the S-boom up to the lowest operating position.

Problem remedy
The erection procedure was turned off as a result of falling below the value $F3_{min}$?
- ▶ See the Crane operating instructions, chapter 4.02 and chapter 4.20.

When the S-boom has reached the lowest operating position:
- ▶ Make sure that the assembly icon on the LICCON monitor turns off.

Result:

– The LICCON overload protection is active.

12 Operating the crane

12.1 Preparing for crane operation

Note
- ▶ Observe the notes, see Crane operating instructions, chapter 4.02, chapter 4.04, chapter 4.05, chapter 4.08 and chapter 5.01.

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Make sure that the following prerequisites are met:
- The LICCON overload protection is active.
- The LICCON overload protection has been set according to the data in the load chart.

WARNING
The crane can topple over!
- ▶ Check the horizontal position of the crane before and during operation.
- ▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset if necessary before resuming crane operation.

12.1.1 Checking the settings

- ▶ Check the function of the overload protection by running against the operating positions „on top“ and „bottom“.
- ▶ Check the hoist limit switch by running against the hoist limit switch weight.

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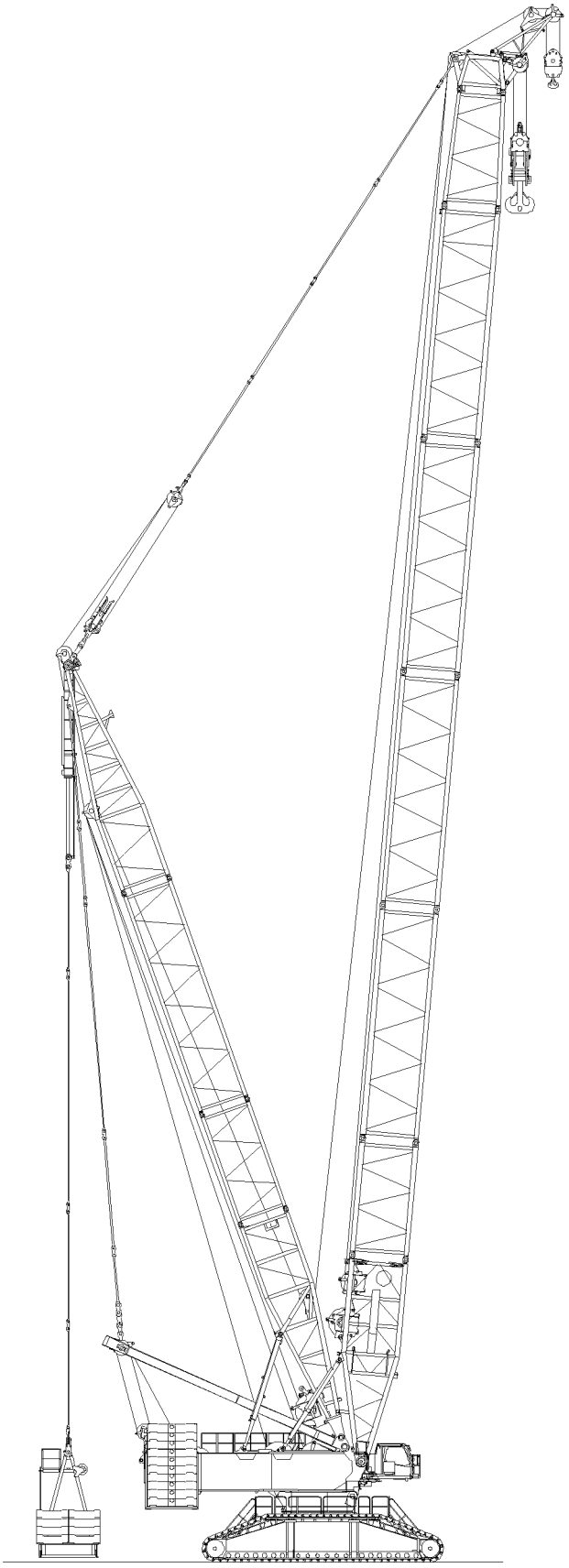

Fig.119146: SD/S2D/SL2D

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13 Disassembly SD/S2D/SL2D-boom

Note

- The disassembly is described on the example of the S-boom.
- For the combination of the boom lattice sections, observe and adhere to the Rod plan and the Crane operating instructions, chapter 5.03.

WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.

If this is not observed, assembly personnel could fall and be killed or seriously injured.

- All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- When closing or opening boom systems during boom assembly or boom disassembly, no persons may remain on the boom system or in the danger zone.
- If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- Only step on the aids, ladders and catwalks with clean shoes.
- Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- Remaining on a suspended load is prohibited.
- Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- For all assembly work, the crane driver of the main crane must be in voice contact with the crane driver / crane drivers of the auxiliary crane / auxiliary cranes.
- For assembly tasks, the crane driver may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING

The lattice sections can fall down!

Death, severe bodily injuries, property damage.

- Pin or unpin both pins at the same horizontal level, i.e. **left and right**.
- Do not stand under the lattice sections or within the entire danger zone during the pinning and unpinning procedure of the boom.
- Safely secure the pins in the storage locations as well as in the receptacles.
- It is prohibited to lean the auxiliary ladder against the component being disassembled.

WARNING

Danger of impact / crushing!

When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.

When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.

Death, severe bodily injuries, property damage.

- Make sure that personnel cannot be caught by components.
- Make sure that the crane is horizontally aligned.
- When working in danger zones: Use aids to protect limbs.
- Guide components with suitable aids to minimize oscillation.

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DANGER
The components can fall down!
Death, severe bodily injuries, property damage.
▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

Make sure that the following prerequisites are met:
– The ground is able to safely take on the total operating weight of the crane.
– The crane is horizontally aligned.
– An auxiliary crane with sufficient load bearing capacity if available.
– An assembly scaffolding or a work platform is available.
– The central ballast has been installed on the crawler travel gear according to the load chart or the erection and take down charts.
– The counterweight has been installed on the turntable according to the load chart or the erection and take down charts.
– The LICCON overload protection has been set according to the data in the load chart.

13.1 Disassembling the derrick ballast

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
▶ Observe the Erection and take down charts.
▶ If a derrick ballast is required for taking down the boom system, then leave the derrick ballast on the crane.

When no derrick ballast is required for taking down the boom system:
▶ Disassemble the derrick ballast, see Crane operating instructions, chapter 5.36.

13.2 Disassembling the central ballast

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
▶ Observe the Erection and take down charts.
▶ If a central ballast is required for taking down the boom system, then leave the central ballast on the crane.

When no central ballast is required for taking down the boom system:
▶ Remove the central ballast, see Crane operating instructions, chapter 3.03.

13.3 Turning the turntable to the disassembly position

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
▶ Observe the specifications in the erection and take-down charts.
▶ Observe the data in the load charts.

▶ Turn the turntable into disassembly position according to the erection and take down charts.

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13.4 Luffing the boom system down and reeving the hoist rope out

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ Observe the technical safety instructions, see the Crane operating instructions, chapter 5.01.
- ▶ Observe the specifications in the erection and take-down charts.

NOTICE
Damage of boom components!
Taking down the boom system can lead to a collision between the hook block and the pulley head.
Boom components can be severely damaged.
- ▶ Luff the boom system down and at the same time spool the hoist winch out.
- ▶ When luffing the boom system down, the D-boom must remain in operating position until the boom is laying on the substructure or until the boom end section is laying on the ground or is safely held by an auxiliary crane.

Note
- ▶ The luff down movement is turned off as soon as the lowest operating position of the main boom is reached.
- ▶ When the lowest operating position of the main boom is reached, the load display in the maximum load icon turns off and instead of the load display appears the display „???“.
- ▶ In the crane operating screen appear alarm functions.

▶ Luff the S-boom down to the **lowest** operating position.

Result:

– The luff down movement is turned off.
– The „STOP“ icon appears on the LICCON monitor.
– The horn icon appears on the LICCON monitor.

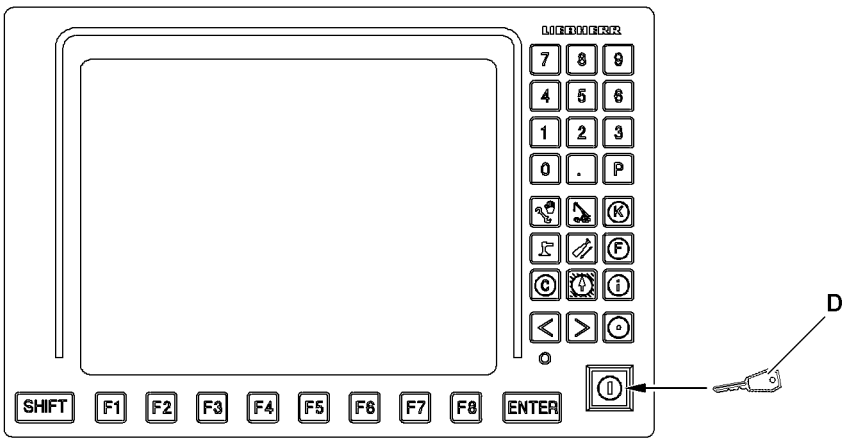

Fig.119109

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WARNING
Danger of accident due to function „Exceedance of shut-off limits of the LICCON overload protection“!
If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload.
Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ is only permissible in emergencies and for assembly purposes.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ may only be actuated by persons who know the effects of their actions regarding the function „Exceeding the shut off limits of the LICCON overload protection“.
- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ requires the presence of an authorized person and must be performed with utmost caution.
- ▶ Crane operation with activated function „Exceedance of shut off limits of the LICCON overload protection“ is prohibited.

▶ Exceeding the shut off limits of the LICCON overload protection: Engage assembly operation.

Result:

– The shut off limits of the LICCON overload protection are exceeded.
– The assembly icon appears on the LICCON monitor.

Note
▶ See the Crane operating instructions, chapter 4.02 and 4.20.

▶ At the same time, spool the hoist winch out and luff the boom system down until the hook block touches the ground.
▶ Remove the hoist limit switch weight and reeve the hook block out.
▶ Remove the hook block with the auxiliary crane.

When the hook block is removed under the boom head:
▶ Continue to luff the boom system down until the roller set / roller sets are just above the ground.

WARNING
Spooling up of hoist rope!
Death, severe bodily injuries, property damage.
- ▶ All rope retaining pins / pipes on the boom system are removed.
- ▶ Slowly spool up the hoist rope over the rope pulleys back to the winch.
- ▶ No one may be present in the danger zone.

NOTICE
Overspooled winch!
If the hoist rope is pulled under the winch when spooling up, then the adjustment of the cam limit switch can change.
A new adjustment by **Liebherr Service** is required.
- ▶ Stop the winch in time, with sufficient rope reserve.
- ▶ Do not overspool the winch.

▶ Spool the hoist rope up.

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13.5 Moving the S-relapse cylinder in

Make sure that the following prerequisite is met:
– The crane engine is running.

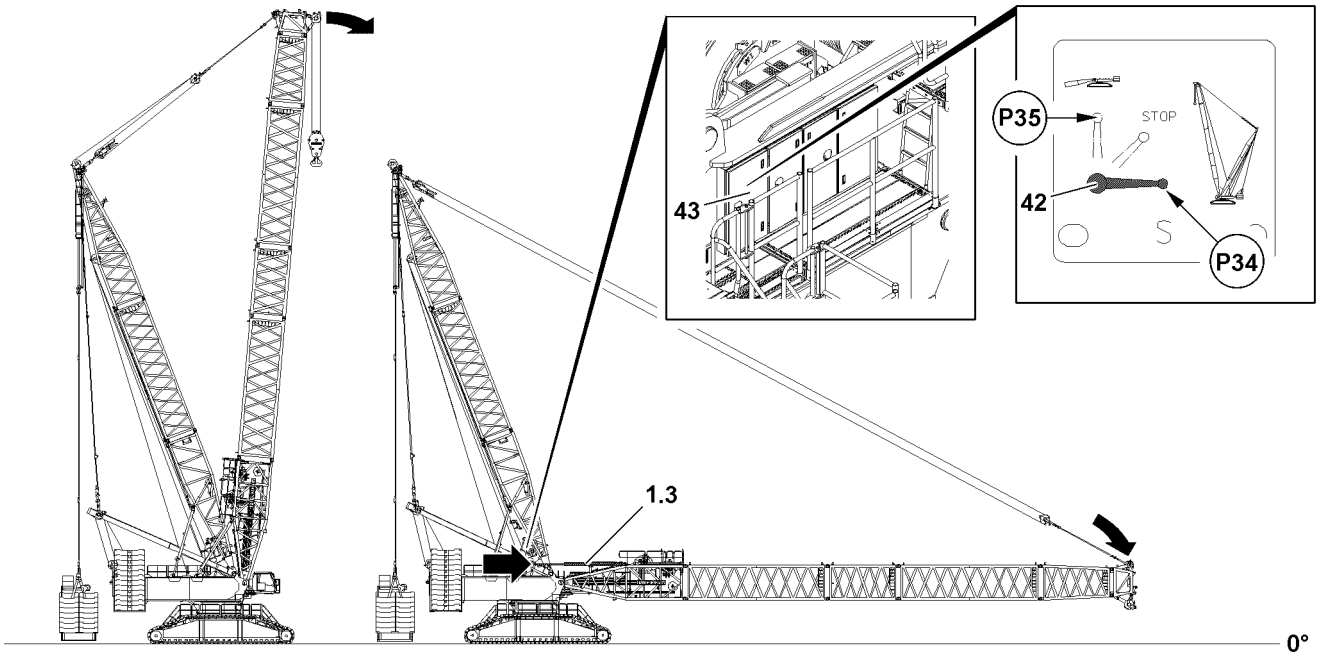

Fig.119437: Luffing the boom system down / retracting the relapse cylinder

Ball valve positions	
Position (P)	Function
34	Crane operation, extend the piston rod
35	Assembly, retract the piston rod
STOP	The piston rod cannot be retracted / extended

▶ Move the S-relapse cylinder **1.3** in: Actuate the ball valve **42** in position **P35**.

Result:

– The piston rods of the S-relapse cylinders **1.3** move in.

Note
▶ The ball valve **42** is secured by closing the cabinet door and removing the key.

▶ Close the cabinet door **43** and pull the key.
▶ Hand the key to an authorized person.

13.6 Disassembly of the roller sets on the boom head

NOTICE
Danger of property damage!
During the disassembly of the roller sets the electrical connections to the hoist limit switches can be damaged.
▶ Remove the hoist limit switches on the roller sets.

▶ Before disassembly of the roller sets, route the hoist limit switches from the roller sets back to the end section.

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Note
▶ The disassembly of the roller sets is described in the Crane operating instructions, chapter 5.14.

13.7 Placing the boom on the substructure

Make sure that the following prerequisites are met:
– The hook block is properly unreeved and removed.
– The hoist limit switch in on the end section.
– The roller set / the roller sets are removed.

NOTICE
Overload of boom!
If the boom is not supported before the take down procedure, then the boom can be overloaded during the take down procedure.
The boom system will be damaged.
▶ Support the SL2-boom from a length of more than 120 m.
▶ Support the S2-boom from a length of more than 138 m.
▶ Make sure that the dimension **X** for the maximum permissible deflection of the boom system is never exceeded.
▶ Support the boom with suitable materials with sufficient load carrying capacity in the marked area, see section „Assembling the boom combinations with the substructure“.

▶ Take the boom system down on the substructure.
or
Secure the boom system with the auxiliary crane in the horizontal position.
or
Take the boom system down on the ground.

13.8 Disconnecting the electrical connections on the boom end section

Make sure that the following prerequisite is met:
– The main boom is placed on the ground or is safely held by the auxiliary crane.

NOTICE
Damage to cable drum or cable!
If the cable of the cable drum is not properly spooled up on the cable drum after unplugging the S-end section, then the cable drum or the cable can be significantly damaged.
▶ Spool the cable drum up after unplugging.

▶ Spool the cable drum up and secure it to prevent inadvertent spooling out.
▶ Disconnect the electrical connections and store the plugs and cables properly.

13.9 Disassembling the guy rods

Make sure that the following prerequisites are met:
– The boom is laying on the substructure on the ground.
– The guying is relieved.
– The auxiliary guying is removed (only if present).

NOTICE
Danger of slack rope formation!
If the D-boom is luffed down too quickly at disassembly of the guy rods, then slack rope formation can occur.
▶ Make sure that the rope of winch 3 is tensioned during the entire luff down procedure of the D-boom.

▶ Luff the D-boom down to the front and spool up winch 3 simultaneously until the guy rods are placed in the transport receptacles of the intermediate sections.

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▶ Fasten the upper pulley block to the auxiliary crane and hold it in position with the auxiliary crane.

When the upper pulley block is safely held by the auxiliary crane:

▶ Unpin the guy rods **29** on the upper pulley block.
▶ Secure guy rods **29** in the transport receptacles of the intermediate sections: Insert and secure the pin.
▶ Spool winch 3 up carefully and guide the upper pulley block with the auxiliary crane to the D-end section.
▶ Erect the D-boom until the D-end section stands vertically over the brackets on the S-pivot section.
▶ Install the assembly weight on the upper pulley block.
▶ Pin and secure the upper pulley block properly with the brackets of the assembly weight on the bracket on the S-pivot section.

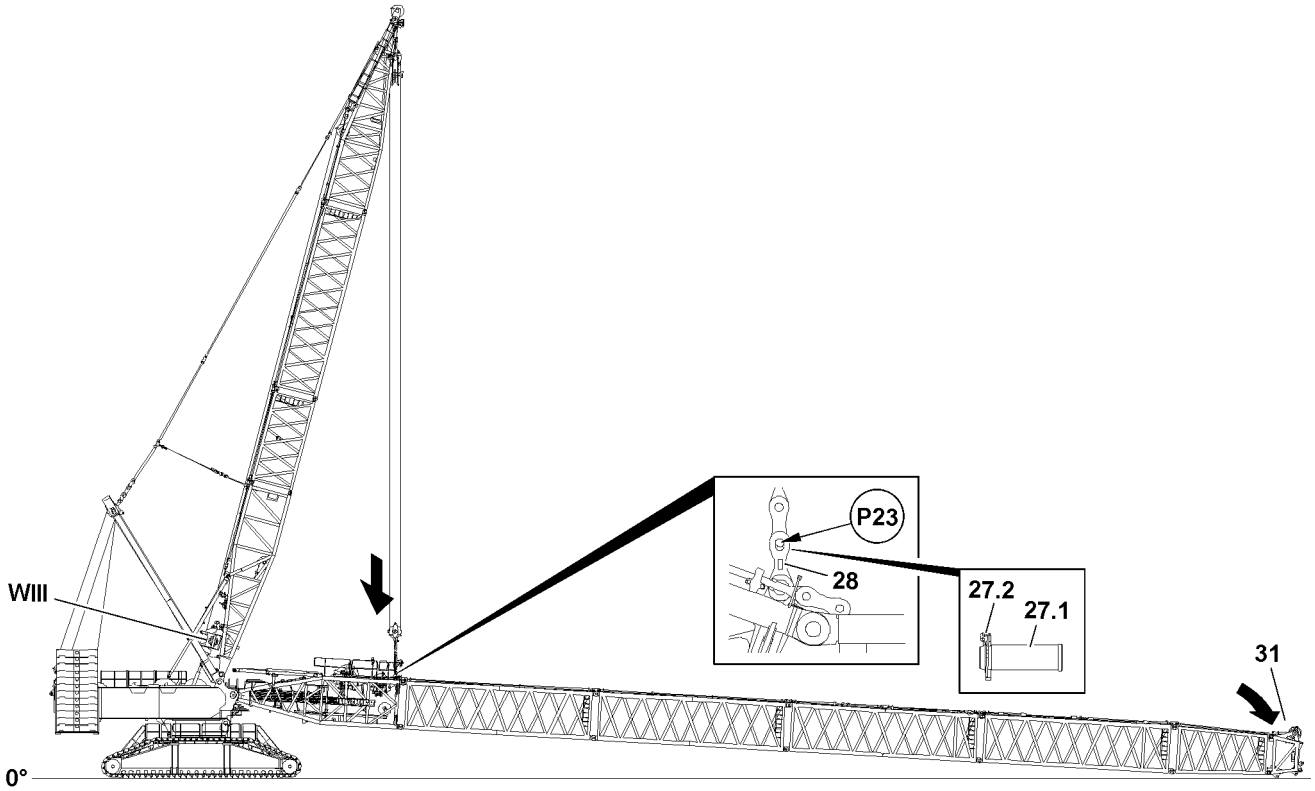

Fig.119438: Pinning the upper pulley block on the S-pivot section

▶ Tension the main boom by spooling up winch 3.

WARNING
The crane can topple over!
▶ Make sure that the end section of the boom system does **not** lift off the ground when opening the boom system.

When the brackets of the assembly weight are pinned with the brackets **28** on the S-pivot section:

▶ Spool winch 3 up until the guying is tensioned.

13.10 Opening the boom system

Make sure that the following prerequisites are met:

– The boom system is held safely by the upper pulley block.
– No personnel or obstacles are within the danger zone.

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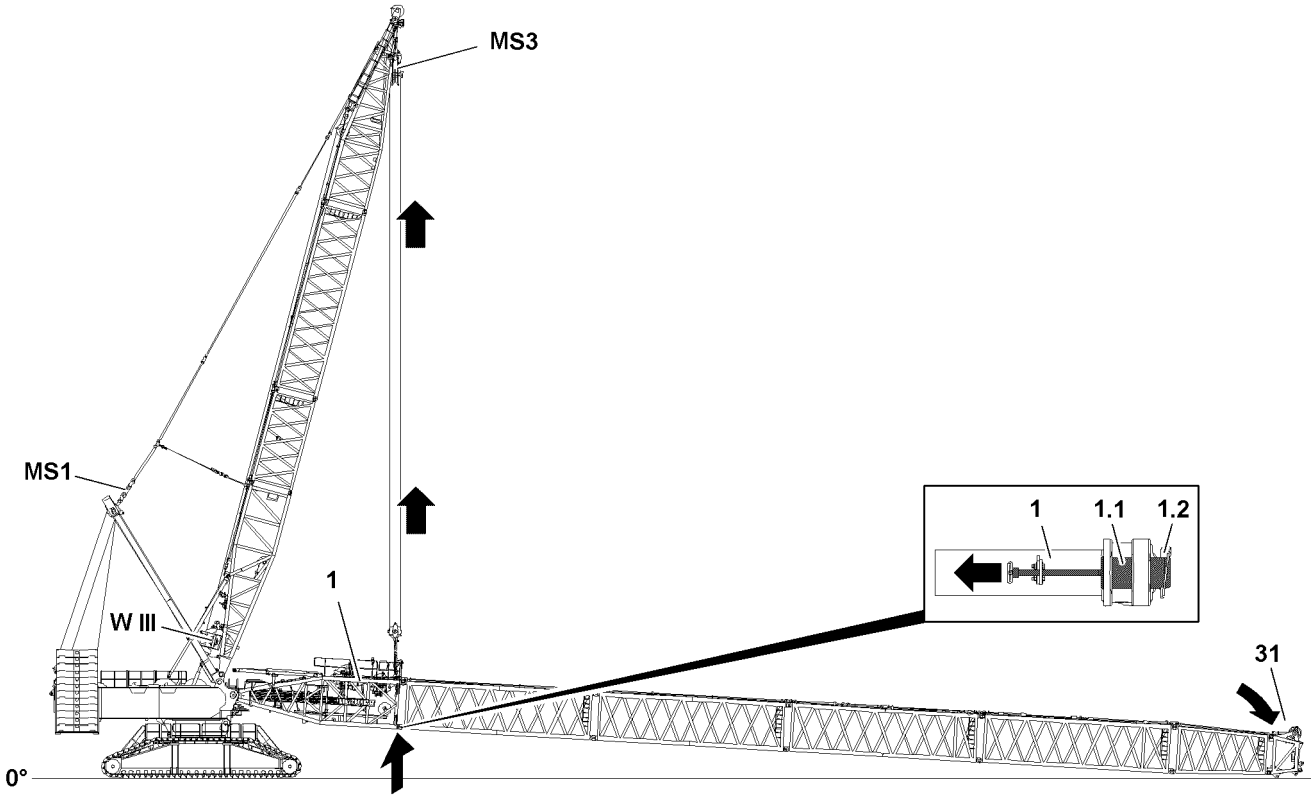

Fig.119439: Tension the guying

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ Do **not** exceed the maximum permissible total forces on test point 1 (MS1) and test point 3 (MS3).
- ▶ Lifting and opening the respective boom is only permissible by observing the maximum permissible boom lengths and total forces.
- ▶ The end section may **not** lift off the ground during „opening procedure“ of the boom system.
- ▶ Make sure that there are no persons on the boom system as well as in the danger zone during the opening procedure.

Note
- ▶ The actual forces on test point 1 **MS1** and test point 3 **MS3** - which are used during the closing procedure of the boom system - are shown on LICCON monitor 1.
- ▶ Tension the guying on the test points at disassembly with the same forces as for assembly.
- ▶ For this, refer to the ACTUAL forces on the test point 1 (MS1) and test point 3 (MS3) measured and recorded during the assembly.
- ▶ The pins can be pulled easier and the pins and lugs are therefore not damaged.

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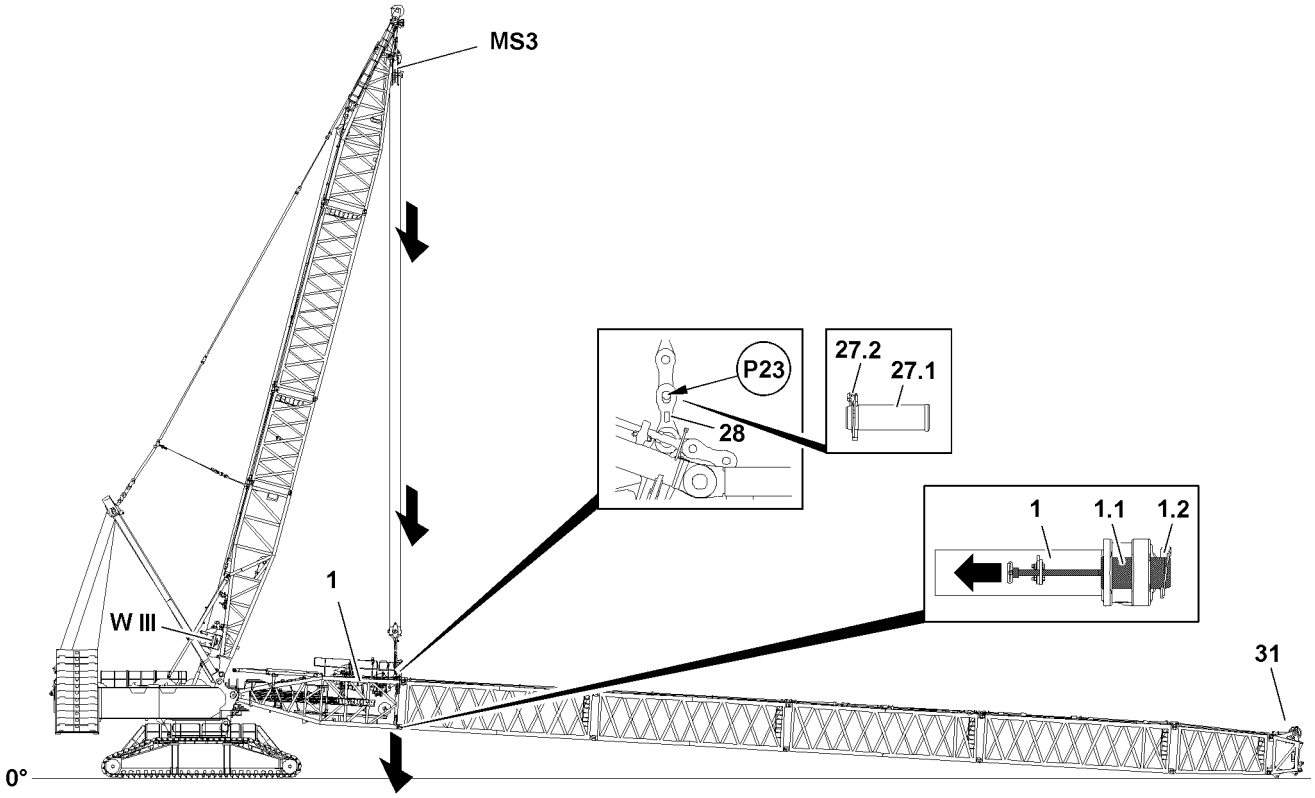

Fig.119440: Opening the boom system

▶ Open the boom system: Unpin the connector pins **1.1** on both sides „on the bottom“: Release and unpin the connector pins **1.1**.

NOTICE
Danger of property damage!
When lowering the boom system, crane components can be damaged.
▶ Make sure that the S-pivot section **1** is not lowered directly on the ground.
▶ Lower the S-pivot section **1** on the substructure when opening the boom system.

When the connector pins **1.1** are completely unpinned:
▶ Lower the boom system carefully on the substructure on the ground.

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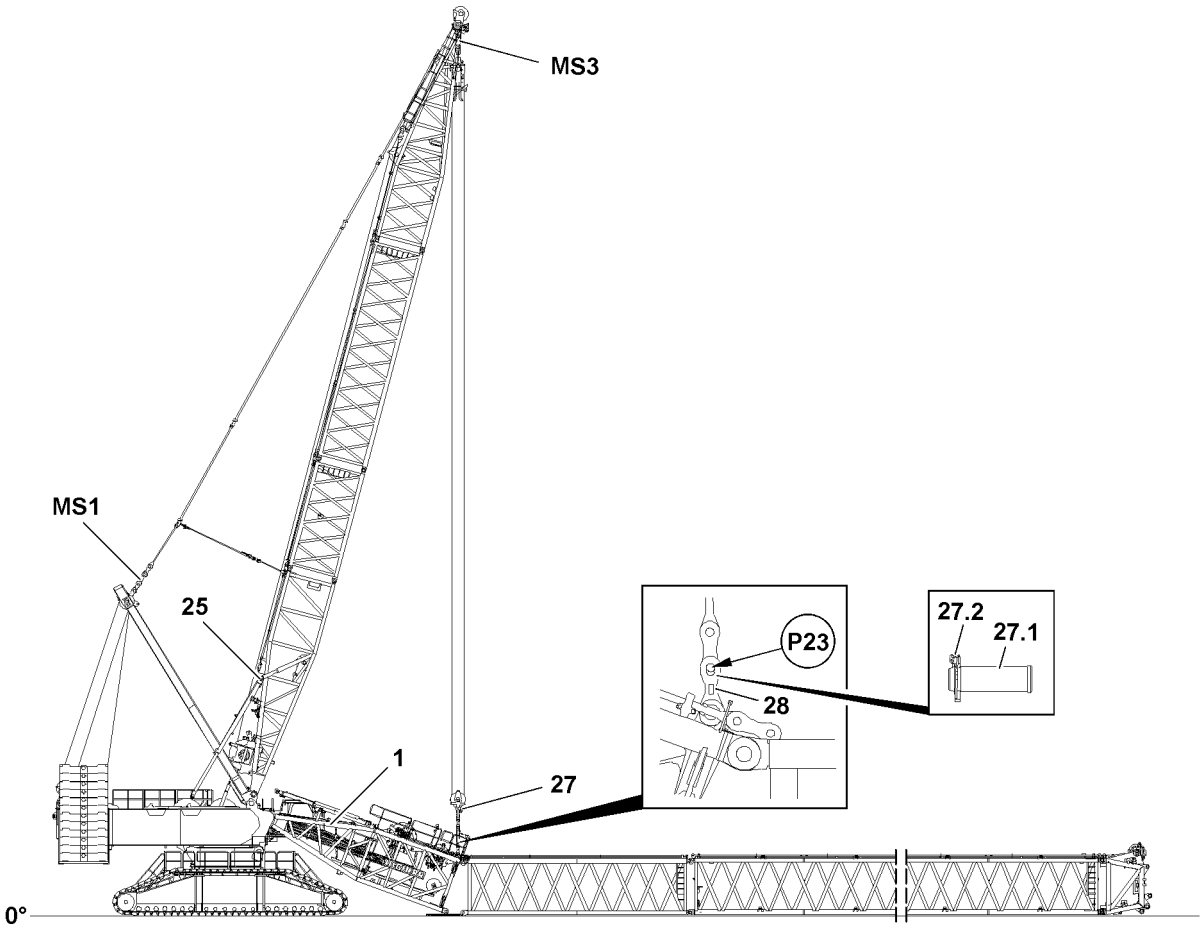

Fig.119424: Unpinning the upper pulley block on the S-pivot section

When the S-pivot section is laying on the substructure on the ground:

- ▶ Unpin the assembly weight of the upper pulley block on the brackets **28**: Release and unpin the pin **27.1**.
- ▶ Disconnect the electrical connections between the boom end section and the S-pivot section properly.

Note

- ▶ Install and secure the guy rods which are not required and which have been removed at the assembly of the lattice section properly in the transport retainers of the lattice sections.

- ▶ Place the guy rods which are not required on the lattice sections, pin and secure.
- ▶ Disassemble the boom system properly.

13.11 Disassembling winch 5 on the S-pivot section

Note

- ▶ The disassembly of winch 5 is described in the Crane operating instructions, chapter 3.07.50.

13.12 Disassembling winch 6 on the S-pivot section

Note

- ▶ The disassembly of winch 6 is described in the Crane operating instructions, chapter 3.07.60.

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13.13 Disconnecting the electric and hydraulic connections on the S-pivot section

13.13.1 Disconnecting the electrical connections

Make sure that the following prerequisites are met:
- The boom system is opened.
- The S-pivot section is laying on the ground on the substructure.

NOTICE
Damage to cable drum or cable!
If the cable of the cable drum is not properly spooled up on the cable drum after unplugging the S-end section, then the cable drum or the cable can be significantly damaged.
▶ Spool the cable drum up after unplugging.

▶ Spool the cable drum up and secure it to prevent inadvertent spooling out.
▶ Disconnect the electrical connections and store the plugs and cables properly.

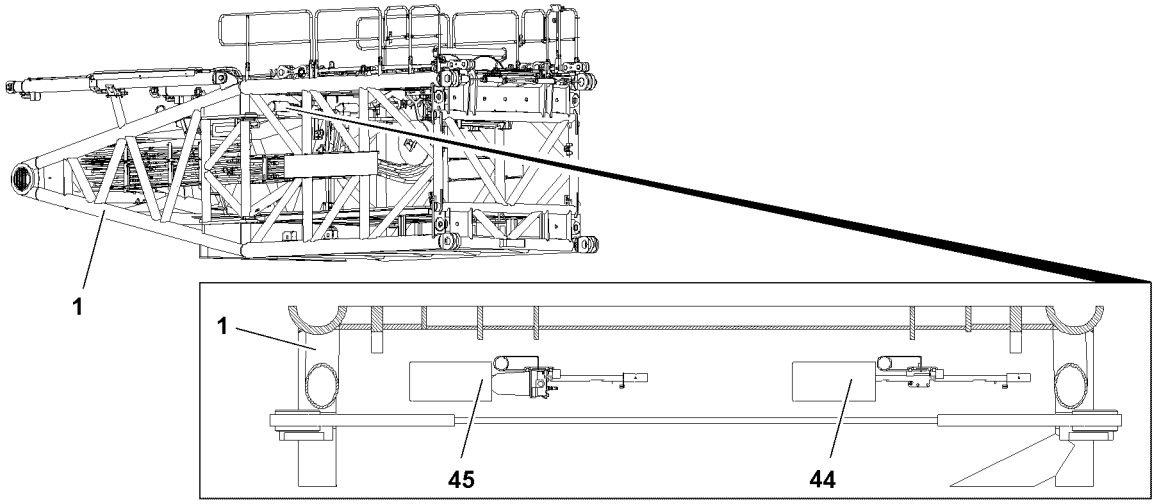

Fig.122057: Park position Wind speed sensor and airplane warning light

▶ Remove the wind speed sensor **44** and / or airplane warning light with wind speed sensor **45** on the boom end section and store it on the S-pivot section **1** properly in park position.

13.13.2 Disconnecting the hydraulic connections

When connecting and releasing hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

DANGER
Danger of accident due to loss of pressure or leakage!
Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.
Death, severe bodily injuries, property damage.
▶ Check that the quick couplings have been properly connected before using the crane.

Note
▶ To connect or release the hydraulic lines with quick couplings, see Crane operating instructions, chapter 5.01.

▶ Release the pressure in the hydraulic system before connecting or disconnecting. Turn the engine off and wait for short time.
▶ Assembling coupling components (sleeve and connector) by using knurled nut.

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▶ Connect coupling components.

13.14 Disassembling the S-pivot section on the turntable

WARNING
General danger note!
▶ Insert and secure all pins after disassembly in the intended transport receptacles.

Make sure that the following prerequisites are met:
- The hydraulic connections to the S-pivot section are properly disconnected.
- The hydraulic connections on the S-pivot sections are properly closed off with caps.
- The electrical connections to the S-pivot section are properly disconnected.
- The electrical connections are properly closed off with dummy plugs (see Electrical wiring diagram).
- The crane engine is running.
- An auxiliary crane with sufficient load bearing capacity if available.

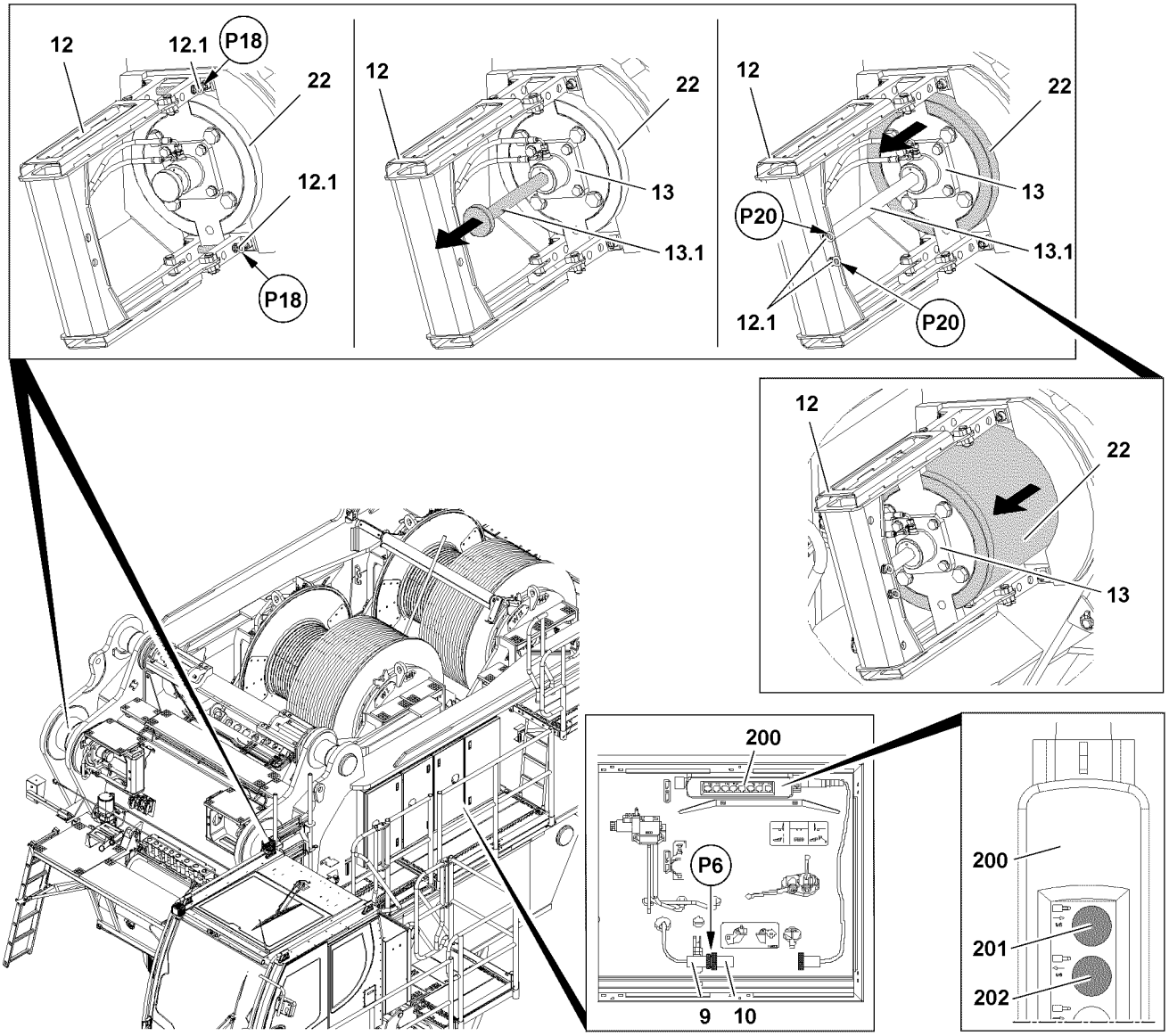

Fig.119111

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Note

▶ Select the fastening points on the S-pivot section **1** in such a way that the S-pivot section **1** hangs horizontally on the auxiliary crane at disassembly. See section „Fastening points“.

▶ Attach the S-pivot section **1** properly on the auxiliary crane.

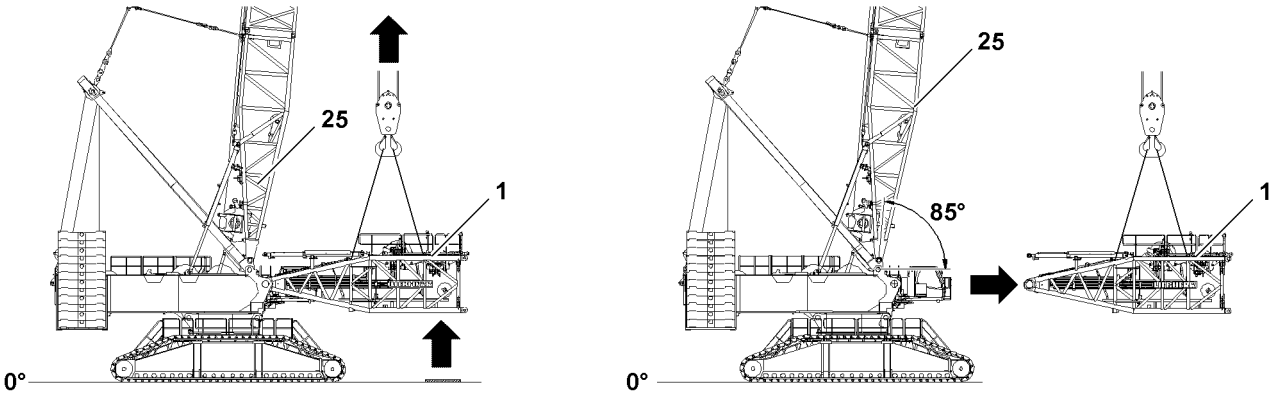

Fig.119442: Lifting the S-pivot section with the auxiliary crane horizontally / swinging the S-pivot section out from the turntable

▶ Lift the S-pivot section **1** with the auxiliary crane to the horizontal.

WARNING

Falling S-pivot section!

Death, severe bodily injuries, property damage.

▶ Make sure that the S-pivot section **1** is safely held by the auxiliary crane before unpinning the S-connector pins **22**.

Note

▶ The unpinning of the S-pivot section **1** on the turntable is described in detail in section: „Unpinning the S-connector pins on the turntable“.

When the S-pivot section is horizontally aligned and safely held by the auxiliary crane:

▶ Unpin the S-connector pins **22** on the turntable.

NOTICE

Damage of the turntable and the S-pivot section **1**!

▶ Slowly swing the S-pivot section **1** out with the auxiliary crane and at low speed on the turntable.

▶ Before placing it on the ground, support the S-pivot section **1**.

When the S-connector pins **22** on the S-pivot section **1** are fully unpinned on both sides:

▶ Swing the S-pivot section **1** out on the turntable with the auxiliary crane and place it down.

▶ Remove the auxiliary crane.

When the S-pivot section **1** is removed on the turntable:

▶ Fully insert and secure the S-connector pins **22** again.

13.15 Swinging the railing on the S-pivot section into transport position

WARNING

Danger of falling!

Death, severe bodily injuries, property damage.

▶ Assembly personnel must secure themselves for the assembly / disassembly of the railings and protective devices with an approved fall arrest system to prevent them from falling.

▶ For assembly and disassembly work, maintenance and inspection work on the S-pivot section, all railings and protective devices must be properly assembled and secured.

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Make sure that the following prerequisites are met:
- The ground is able to safely take on the weight of the S-pivot section.
- The S-pivot section is laying completely on the ground.

▶ For assembly / disassembly of railings and protective devices, see Crane operating instructions, chapter 2.06.

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5.44 PD-boom combination

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Fig.195219: PD-boom

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1 Component overview P-boom

Note

- The boom components (boom - lattice sections) such as S/L-intermediate sections, lower / upper P-adapter, cross carrier, S-adapter and the S-end section, as well as dimensions and weights are described in the Crane operating instructions, chapter 1.03.
- For the combination of the various boom systems, refer to the Rod plan and the Crane operating instructions, chapter 5.03.

2 Fastening points

WARNING
Falling lattice sections!
If the lattice sections are not properly fastened on the respective fastening points, then the lattice sections can tip over or fall down.
Death, severe bodily injuries, property damage.

- Make sure that the lattice sections are properly fastened on the respective fastening points.
- Make sure that the fastening equipment has the appropriate length and a sufficient load bearing capacity.
- Pay attention and adhere to the labels on the fastening points on the lattice sections and crane components.

2.1 Fastening points S-pivot section

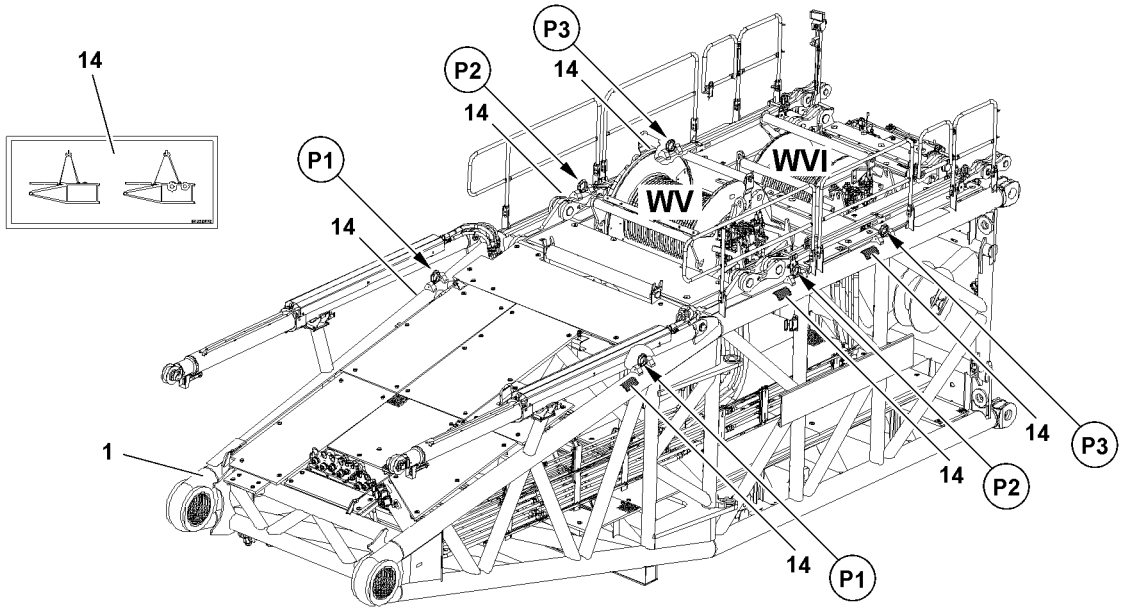

Fig.120275: Fastening points S-pivot section

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Fastening points	
P1 + P2	S-pivot section without winch 5, without winch 6
P1 + P3	S-pivot section with winch 5, without winch 6
P1 + P3	S-pivot section without winch 5, with winch 6
P1 + P3	S-pivot section with winch 5, with winch 6

2.2 Fastening points lower P-adapters

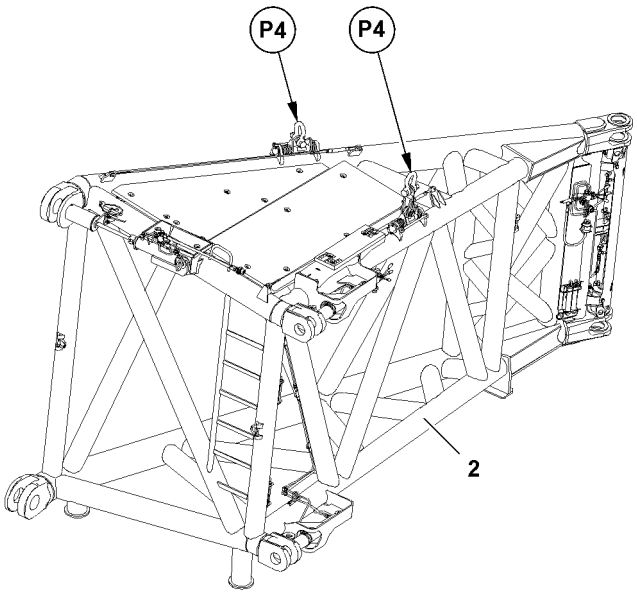

Fig.120276: Fastening points lower P-adapters

Fastening points	
P4	Lower P-adapter

2.3 Fastening points cross carrier

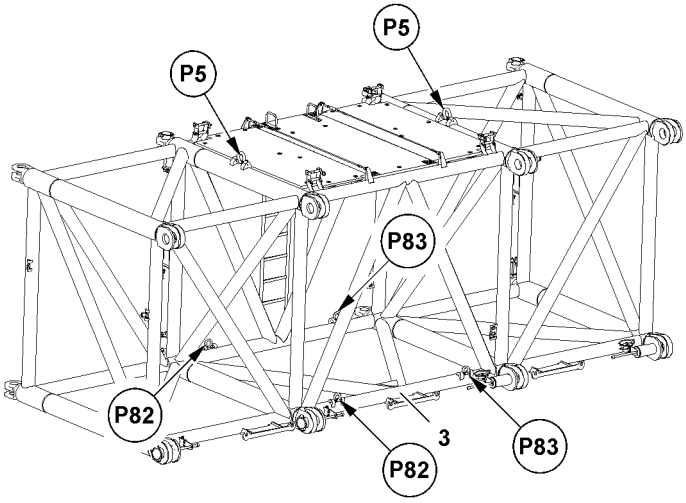

Fig.120277: Fastening points cross carrier

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Fastening points	
P5 **or** P82 + P83	Cross carrier

2.4 Fastening points L-intermediate section 6 m

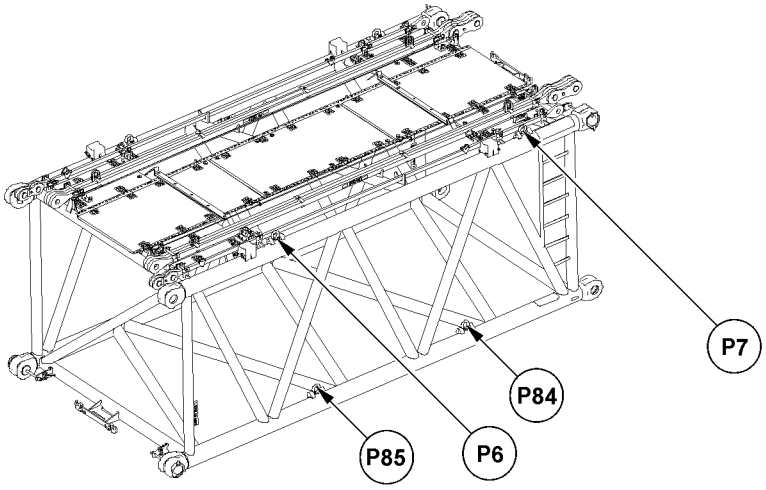

Fig.120278: Fastening points L-intermediate section 6 m

Note
- ▶ The L-intermediate sections are available in various system dimensions.
- ▶ The distance between the fastening points can vary, depending on the respective L-intermediate section.
- ▶ The lattice section must be fastened on both sides on the fastening points.

Fastening points	
P6 + P7 **or** P84 + P85	L-intermediate section 6 m

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2.5 Fastening points L-intermediate section 12 m

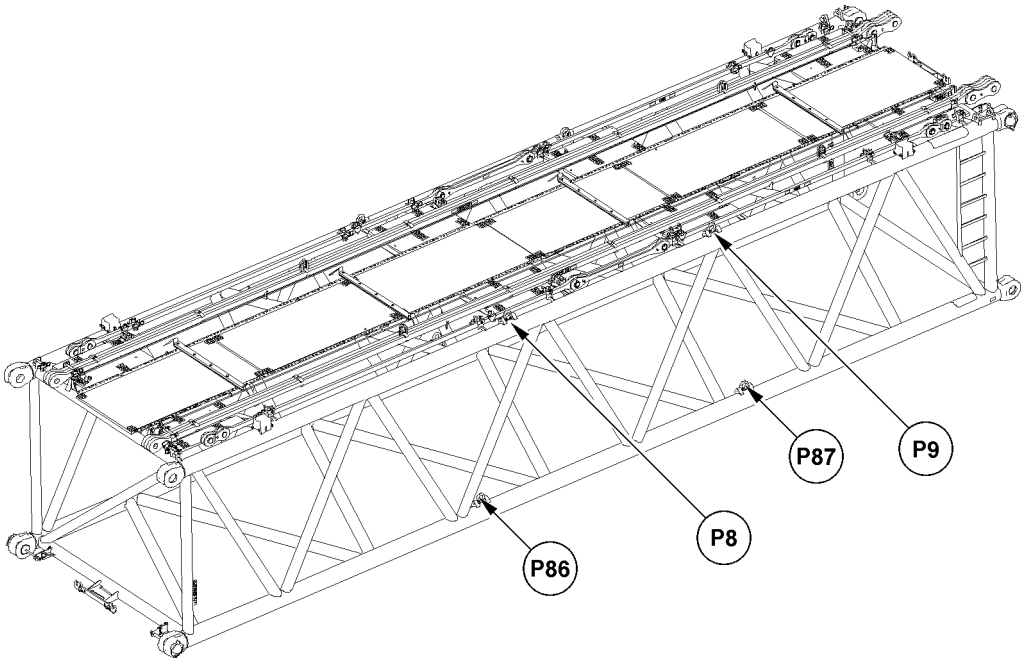

Fig.120279: Fastening points L-intermediate section 12 m

Note

- ▶ The L-intermediate sections are available in various system dimensions.
- ▶ The distance between the fastening points can vary, depending on the respective L-intermediate section.
- ▶ The lattice section must be fastened on both sides on the fastening points.

Fastening points	
P8 + P9 **or** P86 + P87	L-intermediate section 12 m

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2.6 Fastening points turned L-intermediate section 6 m / L-intermediate section 12 m

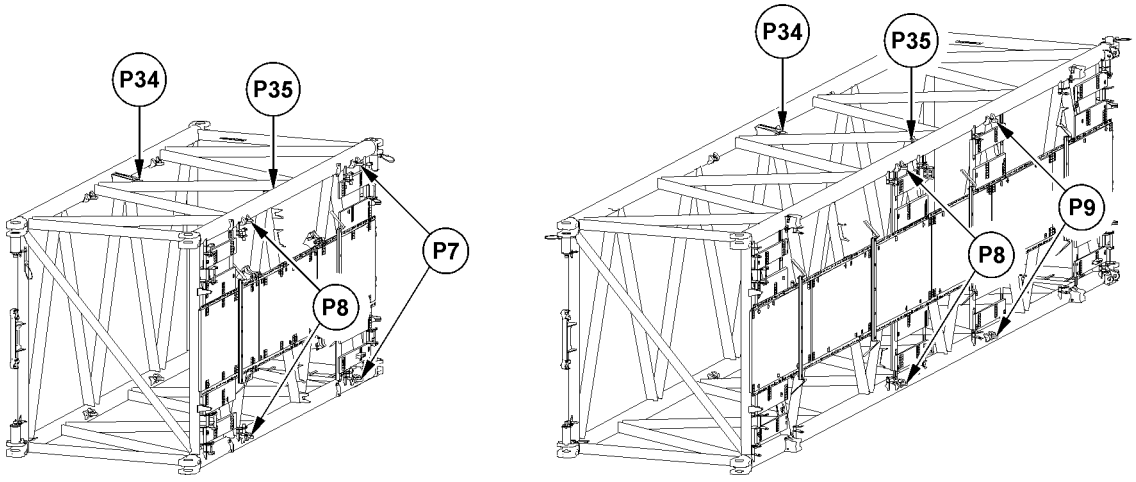

Fig.120297: Fastening points turned L-intermediate section 6 m / L-intermediate section 12 m

Note

- The L-intermediate sections are available in various system dimensions.
- The distance between the fastening points can vary, depending on the respective L-intermediate section.

Fastening points	
P6 + P7	L-intermediate section 6 m (normal location)
P8 + P9	L-intermediate section 12 m (normal location)
P34 + P35	L-intermediate section (turned)

2.7 Fastening points upper P-adapter

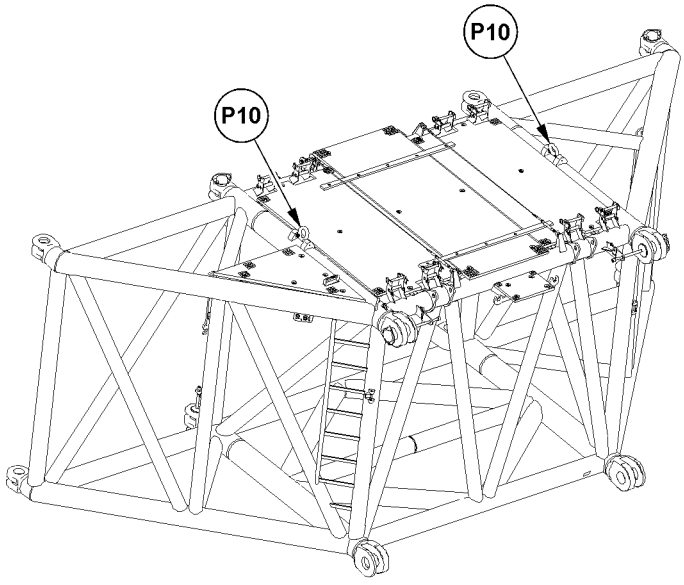

Fig.120280: Fastening points upper P-adapters

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Fastening points	
P10	Upper P-adapter

2.8 Fastening points S-intermediate section 6 m

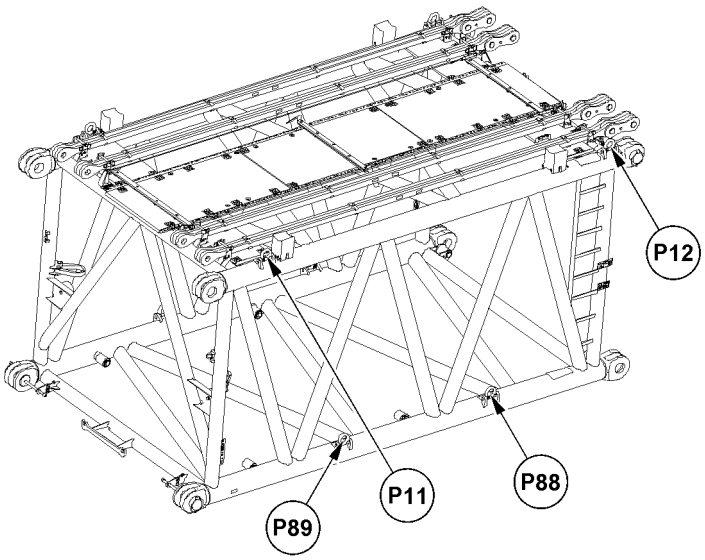

Fig.120281: Fastening points S-intermediate section 6 m

Note
- ▶ The S-intermediate sections are available in various system dimensions.
- ▶ The distance between the fastening pints can vary, depending on the respective S-intermediate section.
- ▶ The lattice section must be fastened on both sides on the fastening points.

Fastening points	
P11 + P12 **or** P88 + P89	S-intermediate section 6 m

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2.9 Fastening points S-intermediate section 12 m / S-adapter 12 m

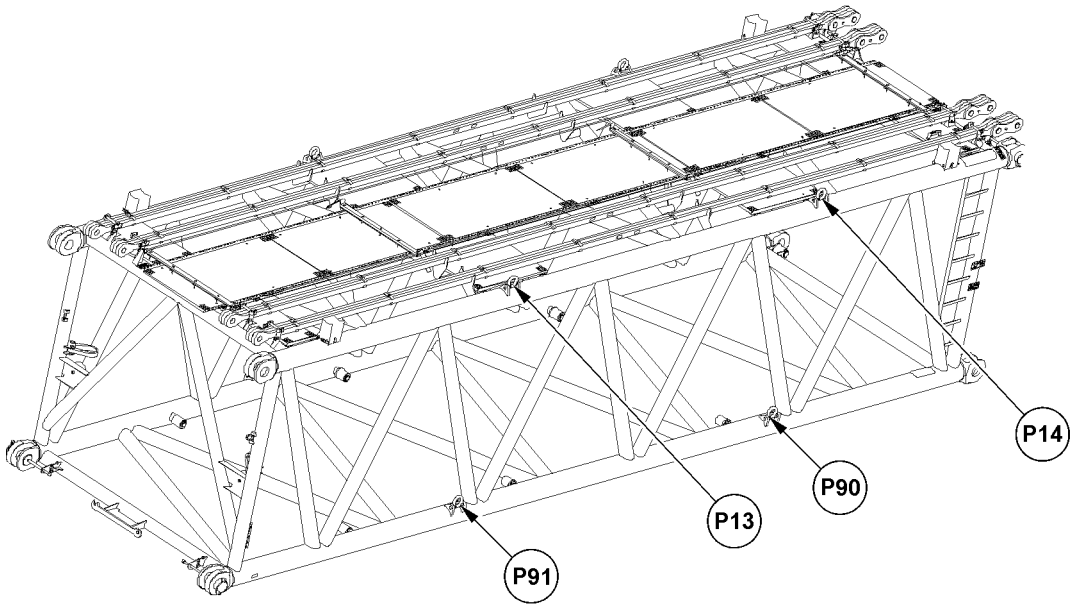

Fig.120282: Fastening points S-intermediate section 12 m / S-adapter 12 m

Note

- ▶ The S-intermediate sections are available in various system dimensions.
- ▶ The distance between the fastening pints can vary, depending on the respective S-intermediate section.
- ▶ The lattice section must be fastened on both sides on the fastening points.

Fastening points	
P13 + P14 **or** P90 + P91	S-intermediate section 12 m / S-adapter 12 m

2.10 Fastening points S-end section

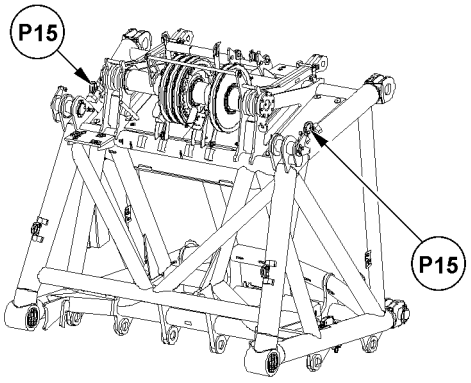

Fig.120283: Fastening points S-end section

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Fastening points	
P15	S-end section

2.11 Fastening points Transport unit Bridges

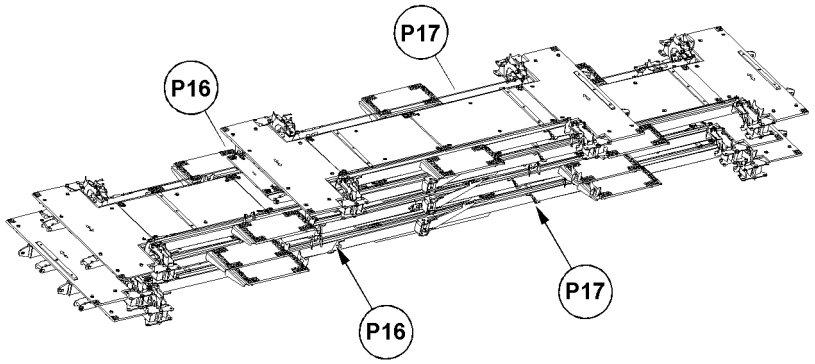

Fig.124513: Fastening points Transport unit Bridges

WARNING
Missing rigging!
Death, severe bodily injuries, property damage.
▶ Rig the transport unit bridges properly before lifting.

Fastening points	
P16 + P17	Transport unit Bridges

2.12 Fastening points Bridges 6 m

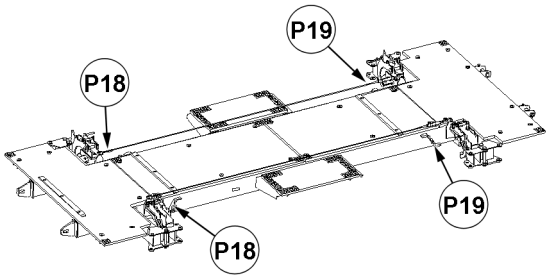

Fig.124514: Fastening points Bridges 6 m

Fastening points	
P18 + P19	Bridge 6 m

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2.13 Fastening points Bridges 12 m

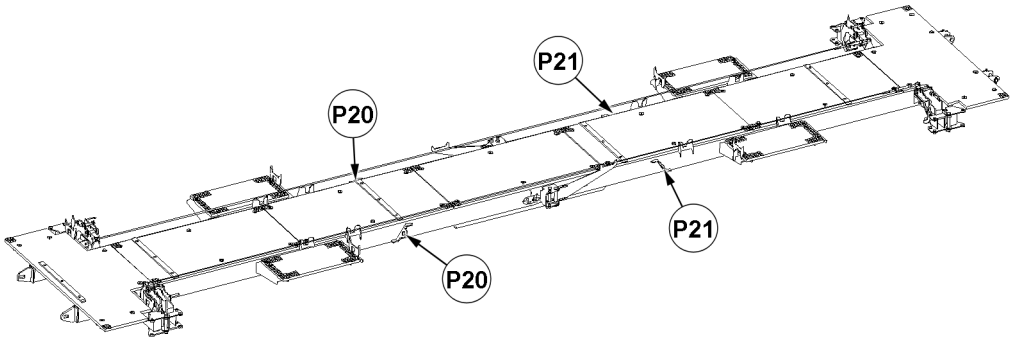

Fig.124515: Fastening points Bridges 12 m

Fastening points	
P20 + P21	Bridge 12 m

3 Installing the central ballast

If a central ballast according to the load chart is required for the planned crane operation, then install the central ballast, see Crane operating instructions, chapter 3.03.

WARNING
The crane can topple over!
If no central ballast is installed on the crane, the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the central ballast according to the load chart is installed for the planned crane operation.
- ▶ Observe the assembly conditions in the Crane operating instructions, chapter 3.06.

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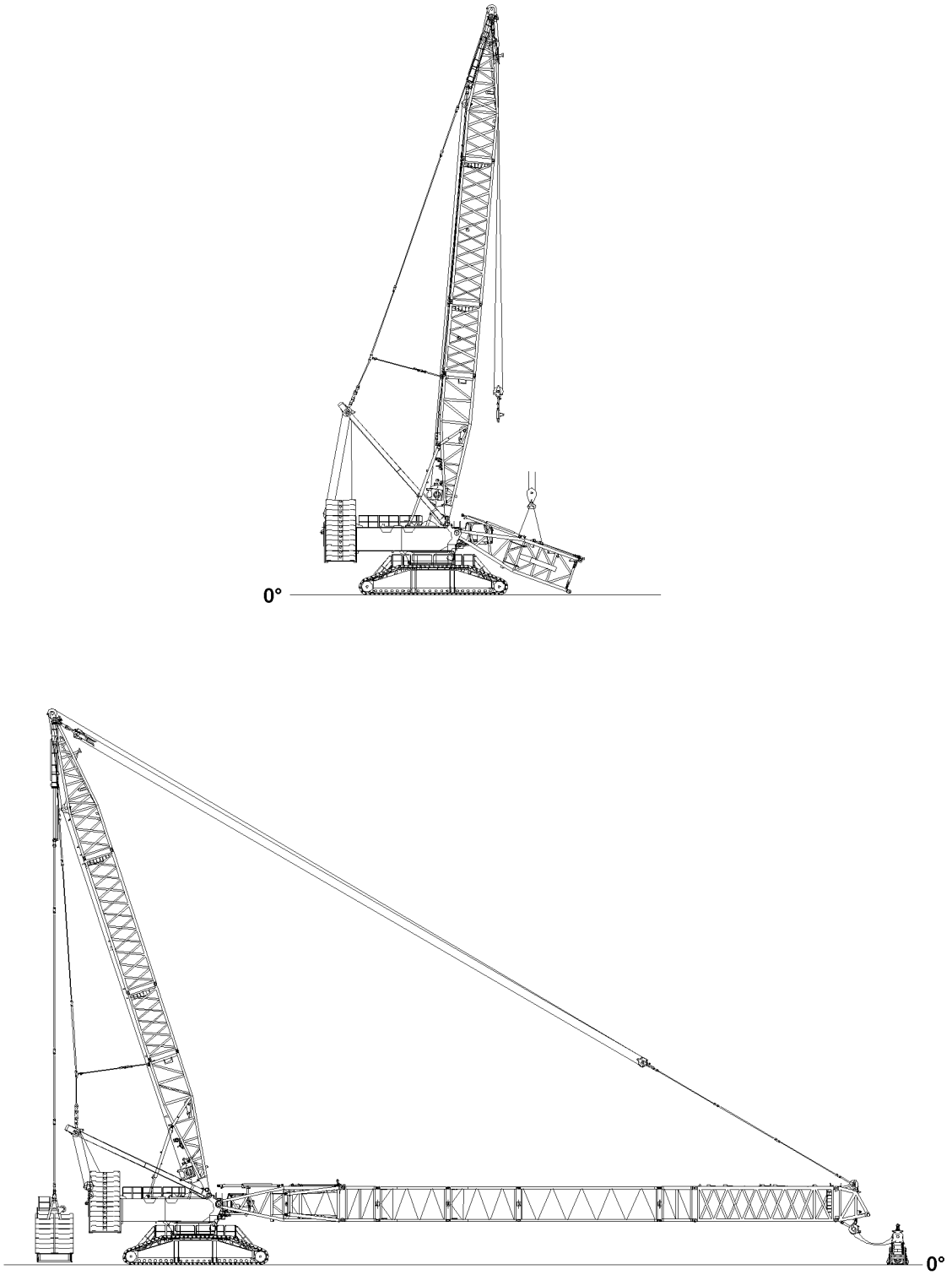

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Fig.122961: Assembly PD-boom

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4 Assembly PD-boom

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ When closing or opening boom systems during boom assembly or boom disassembly, no persons may remain on the boom system or in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane driver of the main crane must be in voice contact with the crane driver / crane drivers of the auxiliary crane / auxiliary cranes.
- ▶ For assembly tasks, the crane driver may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
The lattice sections can fall down!
If the lattice sections are not pinned and secured correctly, then they can fall down.
Death, severe bodily injuries, property damage.
- ▶ Pin or unpin both pins at the same horizontal level, i.e. **left and right**.
- ▶ Do not stand under the lattice sections or within the entire danger zone during the pinning and unpinning procedure of the boom.
- ▶ Safely secure the pins in the storage locations as well as in the receptacles.
- ▶ It is prohibited to lean the auxiliary ladder against the component being disassembled.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ Make sure that the crane is horizontally aligned.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

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WARNING
Danger of accident!
If no guide is present during assembly work who has voice connection to the crane operator as well as to the drivers of the auxiliary units, then there is a great danger of accidents.
Crane movements, which are carried out without the approval of the guide, can cause accidents.
Death, severe bodily injuries, property damage.
- ▶ For all assembly work, observe the instructions of the guide.
- ▶ Make sure that the danger zone can be seen completely by the crane operator and / or the guide.

DANGER
The components can fall down!
If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel.
- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

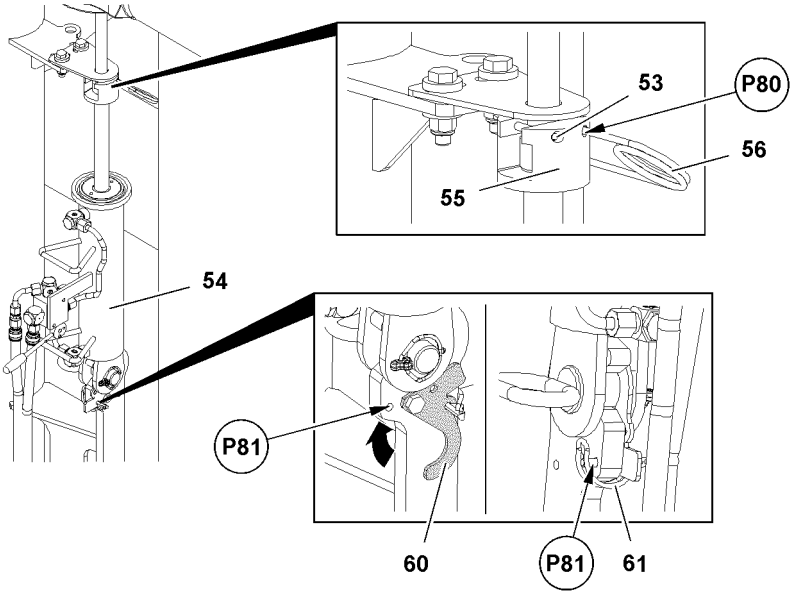

Fig.120317: Securing the pin pulling cylinder

WARNING
Unsecured pin pulling cylinder **54**!
When the claw **55** of the pin pulling cylinder **54** is not secured by a split pin **53** and a spring retainer **56**, then the pin pulling cylinder **54** can fall down.
Death, severe bodily injuries, property damage.
- ▶ Make sure that the claw **55** of the pin pulling cylinder **54** is secured on point **P80** by a spring retainer **56**.
- ▶ Make sure that the retaining plate **60** on point **P81** is pinned in operating position and secured with safety locking pin **61**.

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Make sure that the following prerequisites are met:
- The ground is able to safely take on the entire operating weight of the crane including the load to be lifted.
- The crane is horizontally aligned.
- The SA-frame properly installed and secured on the turntable.
- Winch 1 and winch 2 are properly installed and secured on the turntable.
- The D-boom is properly assembled and secured.
- The D-boom is erected to 85°.
- An auxiliary crane with sufficient load bearing capacity if available.
- An assembly scaffolding or a work platform is available.
- The central ballast has been installed on the crawler travel gear according to the load chart or the erection and take down charts.
- The counterweight has been installed on the turntable according to the load chart or the erection and take down charts.
- The LICCON overload protection has been set according to the data in the load chart.

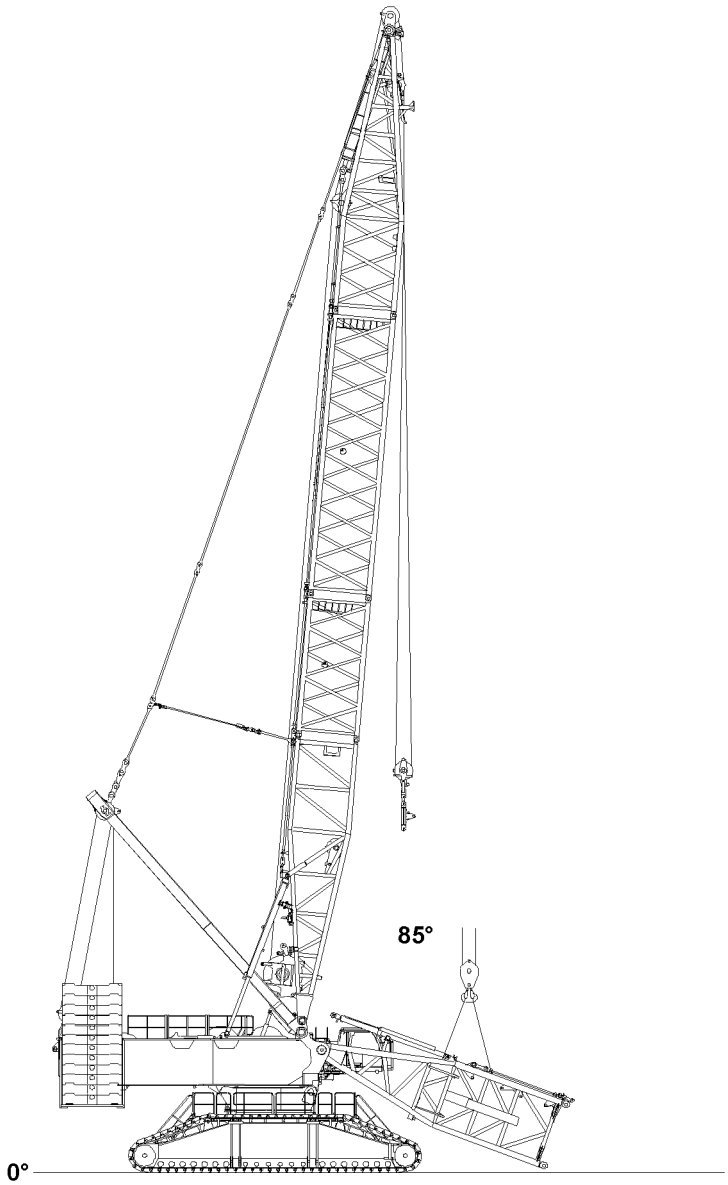

Fig.122962: Derrick boom in assembly position (85°) for S-pivot section

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4.1 Turning the turntable into the assembly position

WARNING
The crane can topple over!
If the following conditions are not met before turning the turntable - **without** assembled S-boom, the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ Observe the assembly conditions, see the Crane operating instructions, chapter 3.06.
- ▶ Observe the specifications in the erection and take down charts.
- ▶ Observe the specifications in the load charts.

▶ Turn the turntable in lengthwise direction of the crawler travel gear.

4.2 Preparatory tasks on the S-pivot section

4.2.1 Assembling the railing on the S-pivot section in operating position

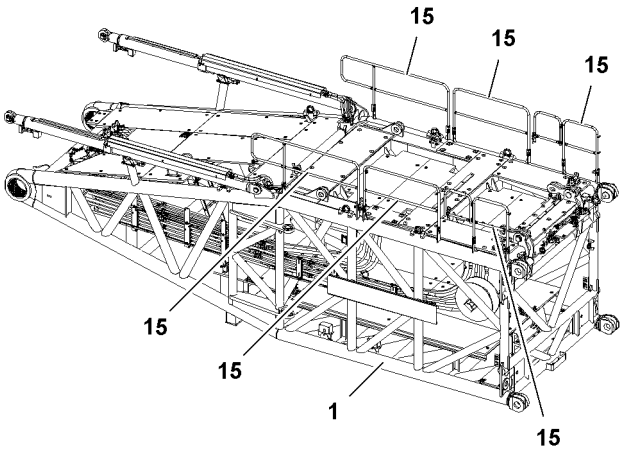

Fig.120288: Assembling the railing on the S-pivot section in operating position

WARNING
Danger of falling!
Death, severe bodily injuries, property damage.
- ▶ Assembly personnel must secure themselves for the assembly / disassembly of the railings **15** and protective devices with an approved fall arrest system to prevent them from falling.
- ▶ For assembly and disassembly work, maintenance and inspection work on the S-pivot section **1**, all railings **15** and protective devices must be properly assembled and secured.

Make sure that the following prerequisites are met:
- The ground is able to safely take on the weight of the S-pivot section **1**.
- The S-pivot section **1** is laying completely on the ground.

▶ For assembly / disassembly of railings **15** and protective devices, see Crane operating instructions, chapter 2.06.

4.2.2 Assembling the catwalk grating

WARNING
Disassembled or incompletely assembled catwalk!
Death, severe bodily injuries, property damage.
- ▶ For non-assembled winch 5 on the S-pivot section: Assemble the catwalk.
- ▶ The catwalk may only be accessed when it is pinned and secured in operating position, check visually.

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WARNING
Catwalks swung down!
Death, severe bodily injuries, property damage.
▶ For safety reasons, assemble the catwalks always with two persons.

Note
▶ If winch 5 is installed in operating position on the S-pivot section, then the removed catwalk must be pinned and secured in transport position.

Make sure that the following prerequisites are met:
– The railings are pinned in operating position and secured.
– The assembly personnel is secured to prevent them from falling.

Installing the catwalk grating in operating position

Make sure that the following prerequisite is met:
– The catwalk is in transport position.

Note
▶ For assembly of the catwalk / assembly platform, see Crane operating instructions, chapter 3.07.50.

Installing the grating in transport position

Make sure that the following prerequisite is met:
– The catwalk is in operating position.

Note
▶ For disassembly of the catwalk / assembly platform, see Crane operating instructions, chapter 3.07.50.

4.2.3 Assembly of winch 5 (WV) on the S-pivot section

Note
▶ The assembly of winch 5 is described in detail in the Crane operating instructions, chapter 3.07.50.

4.2.4 Assembly of winch 6 (WVI) on the S-pivot section

Note
▶ The assembly of winch 6 is described in detail in the Crane operating instructions, chapter 3.07.60.

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4.3 Exceeding the shut off limits of the LICCON overload protection for assembly operation

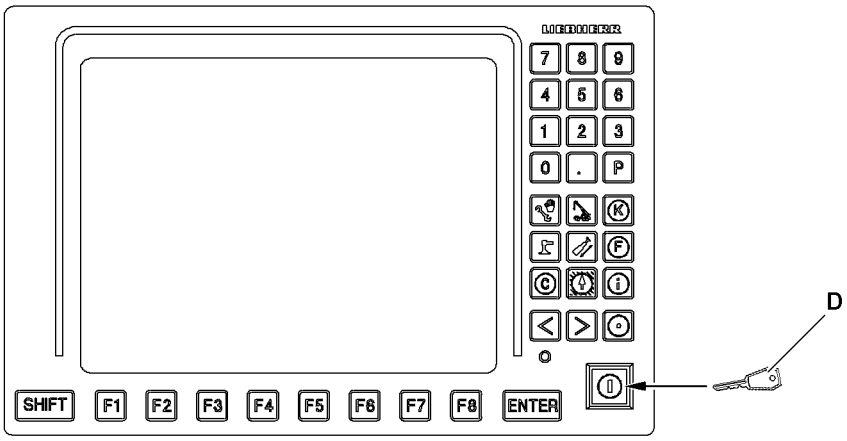

Fig.119109: Exceeding the shut off limits of the LICCON overload protection for assembly operation

WARNING
Danger of accident due to function „Exceedance of shut-off limits of the LICCON overload protection“!
If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload.
Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.

- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ is only permissible in emergencies and for assembly purposes.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ may only be actuated by persons who know the effects of their actions regarding the function „Exceeding the shut off limits of the LICCON overload protection“.
- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ requires the presence of an authorized person and must be performed with utmost caution.
- ▶ Crane operation with activated function „Exceedance of shut off limits of the LICCON overload protection“ is prohibited.

▶ Exceeding the shut off limits of the LICCON overload protection: Engage assembly operation.

Result:

– The shut off limits of the LICCON overload protection are exceeded.
– The assembly icon appears on the LICCON monitor.

Note
▶ See the Crane operating instructions, chapter 4.02 and chapter 4.20.

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4.4 Unpinning the S-connector pins on the turntable

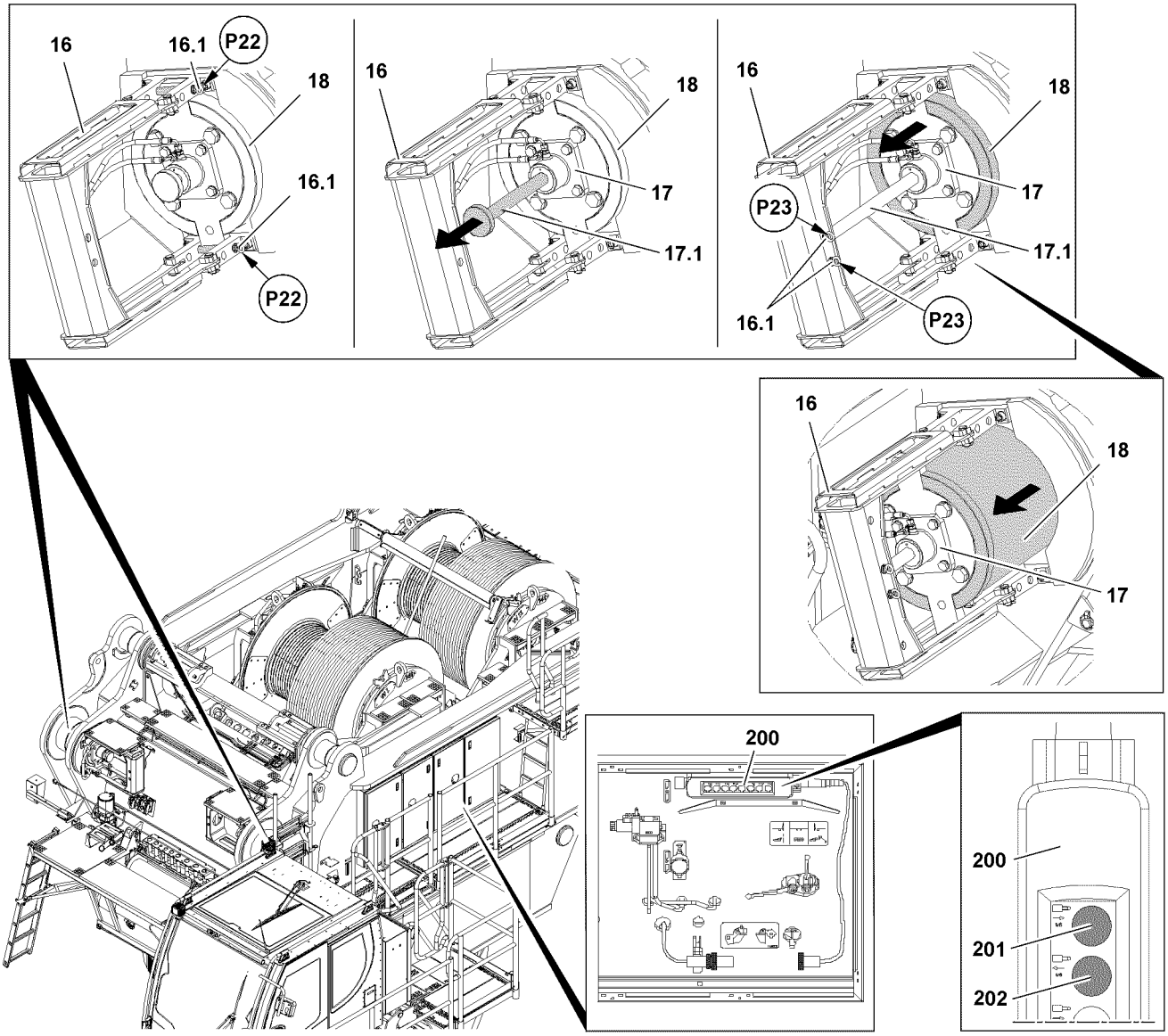

Fig.120289: Unpinning the S-connector pins on the turntable

Note

- ▶ The pin pulling cylinders **17** are integrated on this crane in the S-connector pins **18**.
- ▶ Unpinning and pinning of the S-connector pins **18** can be done only in connection with the pin pulling device installed on the crane.

Make sure that the following prerequisites are met:

- The derrick boom is properly pinned and secured to the turntable.
- The derrick boom is erected to 85°.
- The pin pulling devices **16** are installed on the pin points.
- The crane engine is running.

In transport condition, the S-connector pins **18** are pinned on the turntable and secured with the retaining pins **16.1**.

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WARNING
Danger of crushing!
When unpinning or pinning the S-connector pins **18**, there is a danger of crushing.
Limbs can be crushed or severed.
▶ During the unpinning or pinning procedure, make sure that no persons are within the danger zone.
▶ Do not reach into the danger zone of the pin pulling device and the connector pins.

▶ Release and unpin the retaining pins **16.1** on the points **P22** of the pin pulling device.
▶ Extend the piston rod **17.1** of the pin pulling cylinder **17**: Press the button **201** on the control panel **200** until the piston rods **17.1** are completely moved out on the pin pulling cylinders **17**.

When the piston rods **17.1** for the pin pulling cylinders **17** are completely extended on both sides:
▶ Insert the retaining pin **16.1** on both sides at point **P23** and secure.

Result:

– The piston rods **17.1** of the pin pulling cylinders **17** are locked with the pressure / pull plate in the pin pulling device.

▶ Press the button **202** on the control panel **200** until the S-connector pins **18** are completely unpinned.

4.5 Assembling the S-pivot section on the turntable

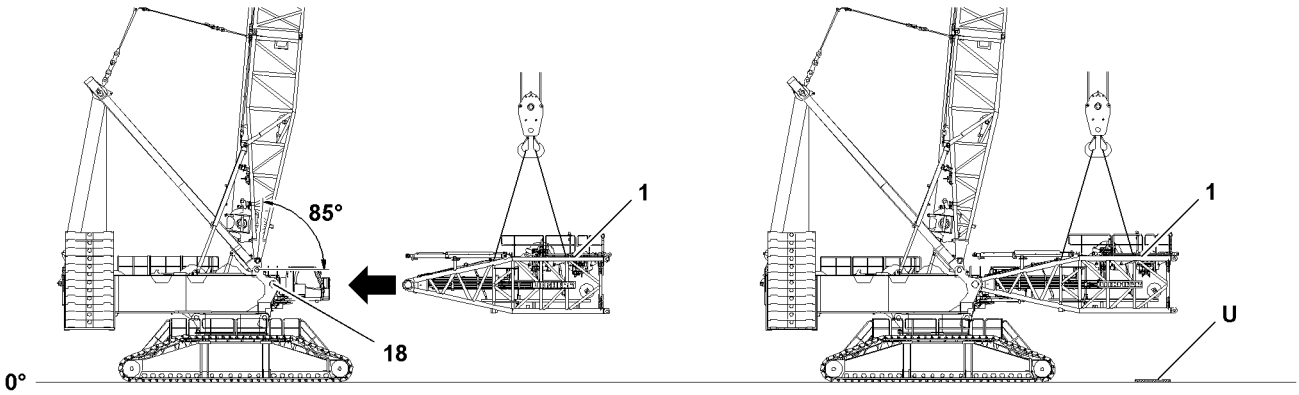

Fig.120290: Assembling the S-pivot section on the turntable - swinging the S-pivot section in

NOTICE
Danger of property damage!
When swinging the S-pivot section **1** in to the pin points on the turntable, the S-connector pins **18** or the S-pivot section **1** can be damaged.
▶ Make sure that the S-connector pins **18** are completely unpinned before assembly of the S-pivot section **1**.

Note
▶ Assemble the boom combinations according to the supplied Rod plans.

WARNING
The crane can topple over!
If the specifications listed below are not observed, the crane can collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.
▶ The instructions in the Crane operating instructions, chapter 5.01 and chapter 5.03 must be observed and adhered to.
▶ All pins are to be secured after assembly with the intended retaining elements.
▶ The guy rods must be inspected regularly, see the Crane operating instructions, chapter 8.15.

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Make sure that the following prerequisites are met:
- The S-connector pins **18** are completely unpinned.
- The derrick boom is erected to 85°.
- The crane engine is running.

Note

▶ Select the fastening points on the S-pivot section **1** in such a way that the S-pivot section **1** hangs horizontally on the auxiliary crane at assembly. See section „Fastening points“.

▶ Fasten the S-pivot section **1** to the auxiliary crane.

▶ Swing the S-pivot section **1** in with the auxiliary crane to the pin points on the turntable.

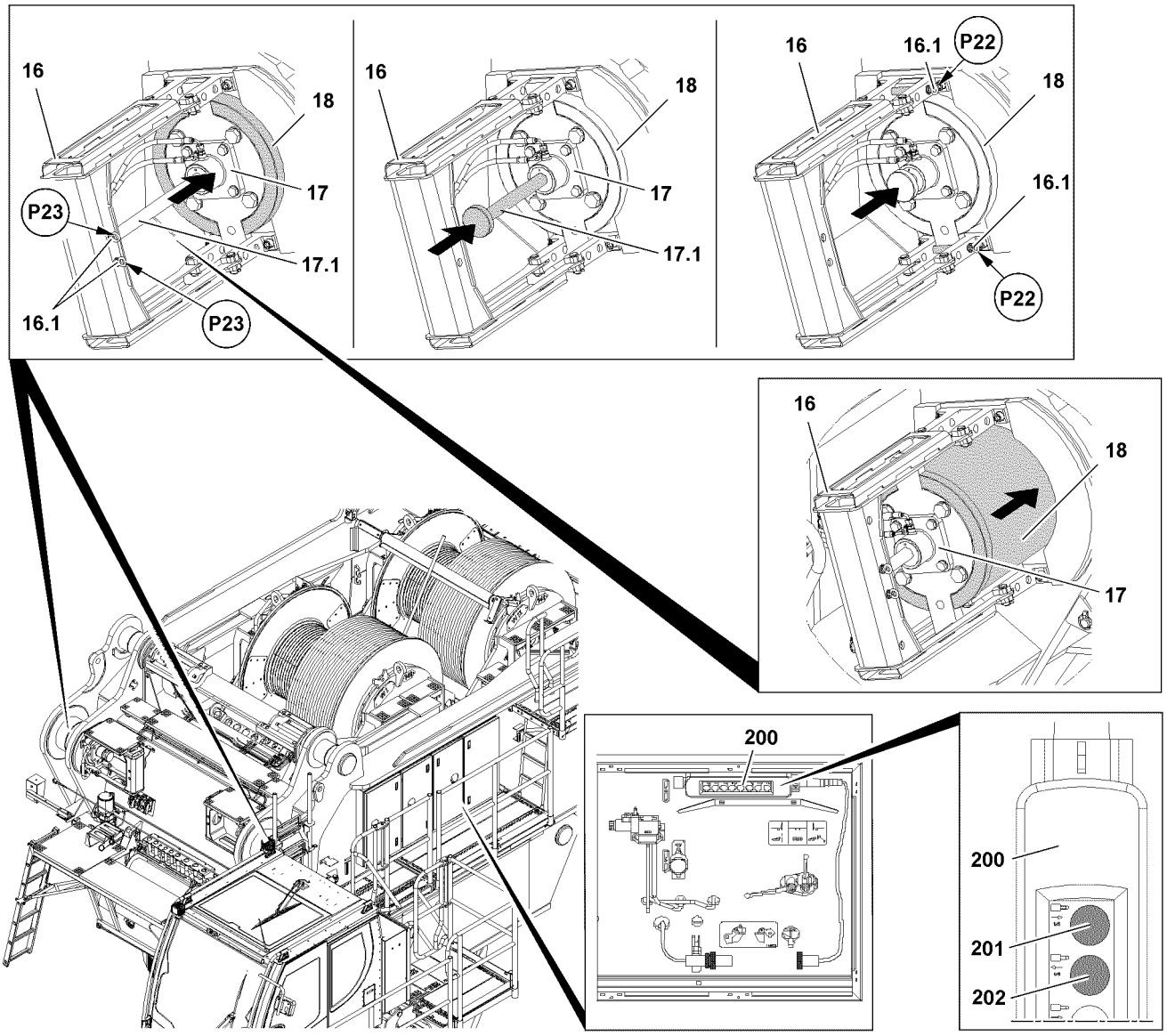

Fig.120291: Assembling the S-pivot section on the turntable - Pinning procedure

DANGER

Falling S-pivot section **1**!

Due to non-secured or insufficiently secured S-connector pins **18**, the S-pivot section **1** can fall down.

Death, severe bodily injuries, property damage.

▶ Secure the S-connector pins **18** between the S-pivot section **1** and the turntable after the pinning procedure immediately with the retaining pins **16.1**.

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When the S-pivot section is positioned in pin position:

▶ Insert the S-connector pins **18** on both sides with the pin pulling cylinder **17**: Press the button **201** on the control panel **200** until the S-connector pins **18** are completely pinned on both sides.

When the S-connector pins **18** are completely pinned on both sides:

▶ Secure the S-connector pins **18**: **16.1**Unpin the retaining pins **16.1** on the pin pulling device **16** on points **P23** and insert on points **P22** and secure.

Result:

– The S-pivot section **1** is pinned and secured on the turntable.

▶ Retract the piston rods **17.1** of the pin pulling cylinders **17**: Press the button **202** on the control panel **200** until the piston rod **17.1** is completely retracted on both sides.

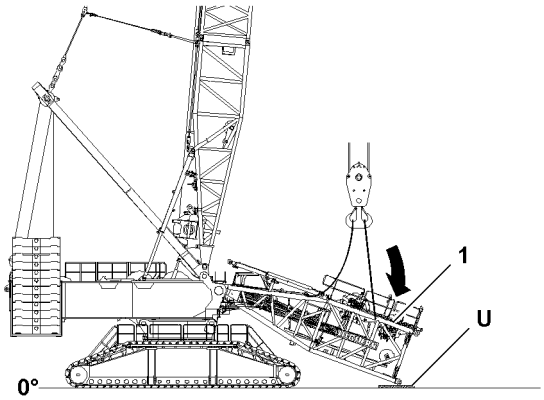

Fig.120292: Assembling the S-pivot section on the turntable - taking down the S-pivot section

NOTICE
Danger of property damage!
When taking down the assembled S-pivot section **1**, the S-pivot section **1** or the turntable can be damaged.

▶ Lower the S-pivot section **1** after assembly on the turntable carefully on the substructure **U** on the ground.

▶ Lower the S-pivot section **1** carefully and at slow speed on the substructure **U** on the ground.

When the S-pivot section **1** is placed on the substructure on the ground:

▶ Remove the auxiliary crane.

4.6 Establishing the electric and hydraulic connections on the S-pivot section

4.6.1 Establishing the electrical connections

NOTICE
Danger of damage to the electrical connections!
If the electrical connection between the terminal box and the S-pivot section and the cable drum in the S-pivot section is established before the boom end section is installed and electrically connected, then the electric connection can be damaged.

▶ Make sure that the electric connection between the terminal box in the S-pivot section and the cable drum in the S-pivot section is only established **after** assembly and the connection of the electric wiring for the boom end section.

Note

▶ To establish the electrical connections on the S-pivot section: Use the Electrical wiring diagram.

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Make sure that the following prerequisite is met:
– The S-pivot section is completely assembled and placed on the substructure.

▶ Establish the electrical connections.
▶ Make sure that all electrical connections to the S-pivot section have been established.

WARNING
Malfunction if dummy plugs are not installed!
If the dummy plugs on the non-required electrical connections are not installed, then malfunctions or functional limitations can occur on the crane.
▶ Make sure that all non-required electrical connections that have a dummy plug are closed off with dummy plugs.
▶ Pay attention to the Electrical wiring diagram.

▶ As a rule, close off on-required electrical connections (for example for accessories which cannot be installed) with the respective dummy plugs.

NOTICE
Property damage due to dirt and / or corrosion!
If non-required electrical connections are not closed off with the respective protective caps, then dirt and / or corrosion can damage the electrical connections.
This could result in malfunctions.
▶ Make sure that all non-required electrical connections are always closed off properly.
▶ Pay attention to the Electrical wiring diagram.

▶ Close electrical connections, which have no dummy plugs, properly off with the corresponding protective caps.

4.6.2 Establishing the hydraulic connections

When connecting and releasing hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

DANGER
Danger of accident due to loss of pressure or leakage!
Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.
▶ Check that the quick couplings have been properly connected before using the crane.

Note
▶ To connect or release the hydraulic lines with quick couplings, see Crane operating instructions, chapter 5.01.

▶ Release the pressure in the hydraulic system before connecting or disconnecting. Turn the engine off and wait for short time.
▶ Assembling coupling components (sleeve and connector) by using knurled nut.
▶ Connect coupling components.

4.7 Installing the lattice sections of the PD-boom

Note
▶ Observe the arrangement of the intermediate sections of the boom system, see Crane operating instructions, chapter 5.03!

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
▶ The turntable may not be turned during the assembly of the boom.

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WARNING
Danger of accident!
Death, severe bodily injuries, property damage.
- ▶ For assembly of the boom combinations, the rod plan must be observed and adhered to.
- ▶ Depending on the condition of the ground, the boom and the lattice sections must be supported from below for the assembly of the boom.
- ▶ Observe the technical safety instructions, see Crane operating instructions, chapter 5.01.

WARNING
General danger notes!
Death, severe bodily injuries, property damage.
- ▶ Support the main boom during assembly / disassembly with suitable materials.
- ▶ All pins must be secured after assembly with the intended retaining elements.
- ▶ The guy rods must be checked regularly, see the Crane operating instructions, chapter 8.15.
- ▶ The boom must be secured with the substructure or auxiliary crane, see Crane operating instructions, chapter 5.01.
- ▶ It is prohibited for anyone to remain under the booms or within the complete danger zone during the pinning and unpinning procedure of the lattice section.

Note
- ▶ For weights of lattice sections with placed guy rods, see Crane operating instructions, chapter 1.03.
- ▶ The lattice sections are pinned with the pin pulling device, see Crane operating instructions, chapter 5.30.

Make sure that the following prerequisites are met:
- – The crane is horizontally aligned.
- – An auxiliary crane with an adequate load bearing capacity is available.
- – An assembly scaffolding / work platform is available.
- – The counterweight has been installed on the turntable according to the load chart.
- – The D-boom is completely assembled and erected on the turntable, see Crane operating instructions, chapter 5.05.
- – The LICCON overload protection has been set according to the data in the load chart.
- – In the area of the parallel lattice section legs, the terrain may not slope upward.

4.7.1 Pinning the upper pulley block on the S-pivot section

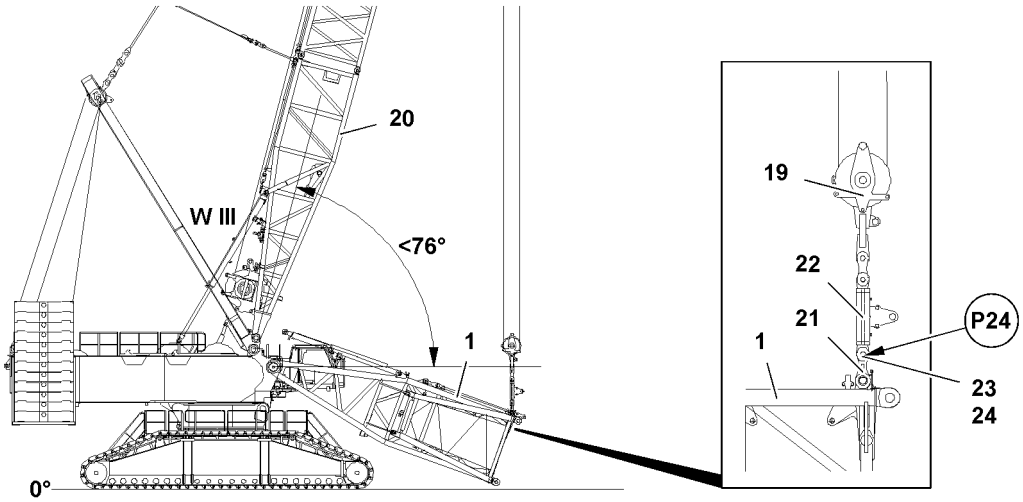

Fig.120293: Pinning the upper pulley block on the S-pivot section

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Make sure that the following prerequisites are met:
- The S-pivot section **1** is pinned and secured on the turntable.
- The S-pivot section **1** is placed on the ground on the substructure.
- The angle between the D-boom and the horizontal is less than 76°.
- The auxiliary weight is installed on the upper pulley block, see Crane operating instructions, chapter 5.05
- An auxiliary crane is available.
- The railings on the S-pivot section **1** are in operating position, see Crane operating instructions, chapter 3.07.50.
- The winch 5, if present, is installed in operating position.
- The catwalk is in operating position (only if winch 5 is not present), see Crane operating instructions, chapter 3.07.50.

To be able to lift the S-pivot section **1** to install the two lower P-adapters on the S-pivot section **1** it is necessary to connect the upper pulley block **19** with the S-pivot section **1**. To do so, the D-boom **20** is luffed forward until the upper pulley block **19** can be pinned on the brackets **21** on the S-pivot section **1**.

▶ Luff the D-boom **20** down to the front until the upper pulley block **19** hangs freely with the assembly weight **22** over the bracket **21** on the S-pivot section **1**.

Problem remedy

The control rope (winch 3 **WIII**) cannot be spooled up or out?
You are in an angle range, where the winch movement is deactivated.

▶ Luff the D-boom down forward until the angle is less than 76°.
▶ Spool the control rope out until the upper pulley block **19** hangs freely with the assembly weight **22** over the bracket **21** on the S-pivot section **1**.

▶ Pin the assembly weight **22** with the brackets **21**: Insert the pin **23** on both sides at point **P24** and secure with spring retainer **24**.
▶ Spool winch 3 **W III** up carefully until the S-pivot section **1** is aligned horizontally.

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4.7.2 Installing the lower P-adapters

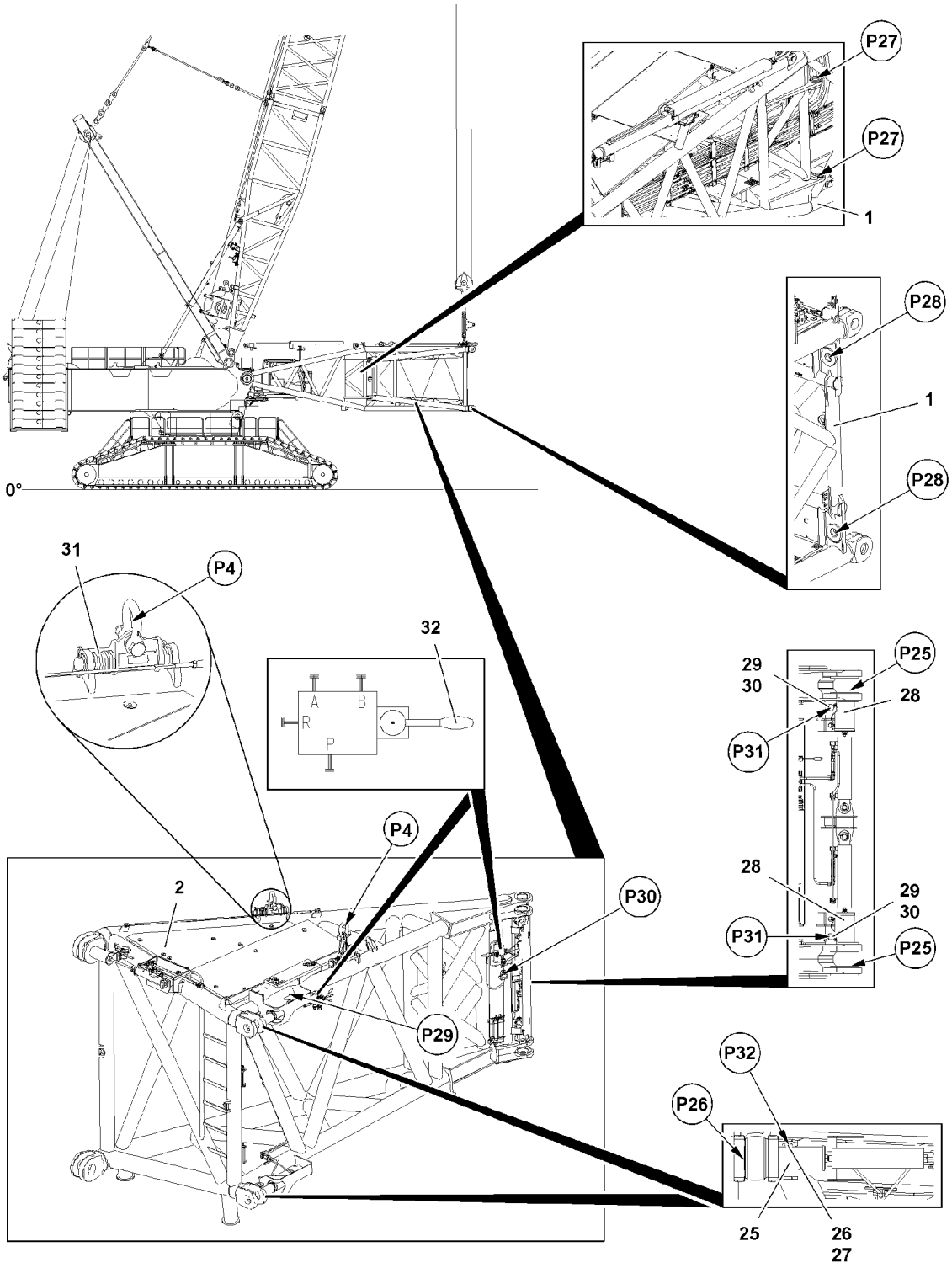

Fig.120294: Installing the lower P-adapters

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Note

▶ The hydraulic supply for the assembly of the lower P-adapters **2** is made via the external hydraulic aggregate.

WARNING

Pressure in the hydraulic lines!
If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.
Death, severe bodily injuries, property damage.

▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

Make sure that the following prerequisites are met:
- The S-pivot section **1** is horizontally aligned.
- The two pins **25** are completely unpinned on the points **P26**.
- The two pins **28** are completely unpinned on the points **P25**.
- A hydraulic aggregate is available.

The assembly is described on the example of the right, lower P-adapter **2**.

▶ Fasten the lower P-adapter **2** on both sides on the points **P4** and lift.
▶ Check if the lower P-adapter **2** hangs horizontally on the auxiliary crane.

Problem remedy

The lower P-adapter **2** does not hang horizontally on the auxiliary crane:
▶ Place the lower P-adapter **2** down.
▶ With the disks **31** adjust the center of gravity so that the lower P-adapter **2** hangs horizontally during the lifting procedure.
▶ Lift the lower P-adapter **2**.

▶ Position the lower P-adapter **2** so that the pins **28** can be pinned on points **P27**.
▶ Establish the hydraulic connection on point **P30**: Connect the coupling parts (sleeve and plug) and screw together by hand until the knurled nut is turned to a noticeable, fixed stop.
▶ Actuate the hand lever **32** until the pins **28** are completely pinned.
▶ Take both retaining pins **29** from the retainer.
▶ Insert the retaining pins **29** on points **P31** and secure with safety locking pins **30**.
▶ Disconnect the hydraulic connection on point **P30**: Install the coupling components (sleeve and connector) with the knurled nut.
▶ Install dust caps on the quick couplings.
▶ Fold the lower P-adapter **2** on the S-pivot section **1** so that the pins **25** can be pinned on points **P28**.
▶ Establish the hydraulic connection on point **P29**: Connect the coupling parts (sleeve and plug) and screw together by hand until the knurled nut is turned to a noticeable, fixed stop.
▶ Actuate the hand lever **32** until the pins **25** are completely pinned.
▶ Take both retaining pins **26** from the retainer.
▶ Insert the retaining pins **26** on points **P32** and secure with locking pins **27**.
▶ Disconnect the hydraulic connection on point **P29**: Install the coupling components (sleeve and connector) with the knurled nut.
▶ Install dust caps on the quick couplings.
▶ Remove the auxiliary crane.
▶ Install the left, lower P-adapter **2** the same way as described before.
▶ Place the S-pivot section **1** with the installed lower P-adapters **2** on the substructure.

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4.7.3 Installing the cross carrier

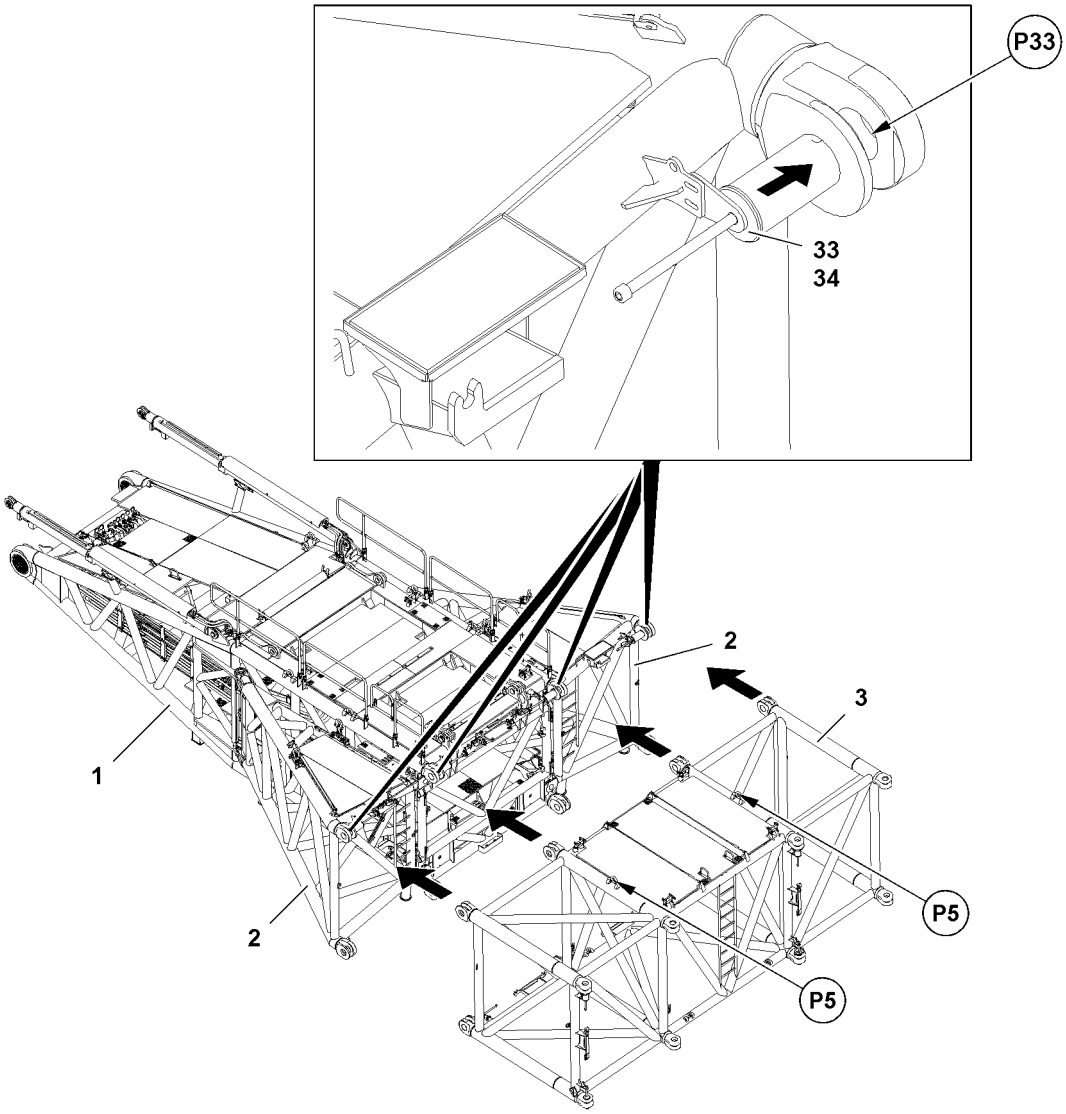

Fig.120295: Installing the cross carrier

Make sure that the following prerequisites are met:
- Both lower P-adapters **2** are properly installed on the S-pivot section **1**.
- The S-pivot section is completely installed.
- The S-pivot section **1** is placed on the ground and supported according to the assembly drawing.
- The four pins **33** are completely unpinned on position **P33**.
- A hydraulic aggregate is available.
- The upper pulley block (including assembly weight) is unpinned from the S-pivot section **1** and pulled up to approx. 4 m.

▶ Fasten the cross carrier **3** on both sides on the points **P5** and lift, see section „Fastening points“.
▶ Position the cross carrier **3** so that the pins **33** can be pinned in points **P33**.

Note
▶ The pinning or unpinning is carried out with the pin pulling device, see Crane operating instructions, chapter 5.30.

▶ Pin the cross carrier **3** with the lower P-adapters **2** and with the S-pivot section **1**: Insert all four pins **33** on points **P33** and secure each with safety folding pins **34**.

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Note

▶ If no assembly shoes are placed under the cross carrier **3** then it is not possible to install the L-intermediate sections.

▶ Place the cross carrier **3** on the ground.
▶ Remove the auxiliary crane.

4.7.4 Changing the boom: Turning the L-intermediate sections

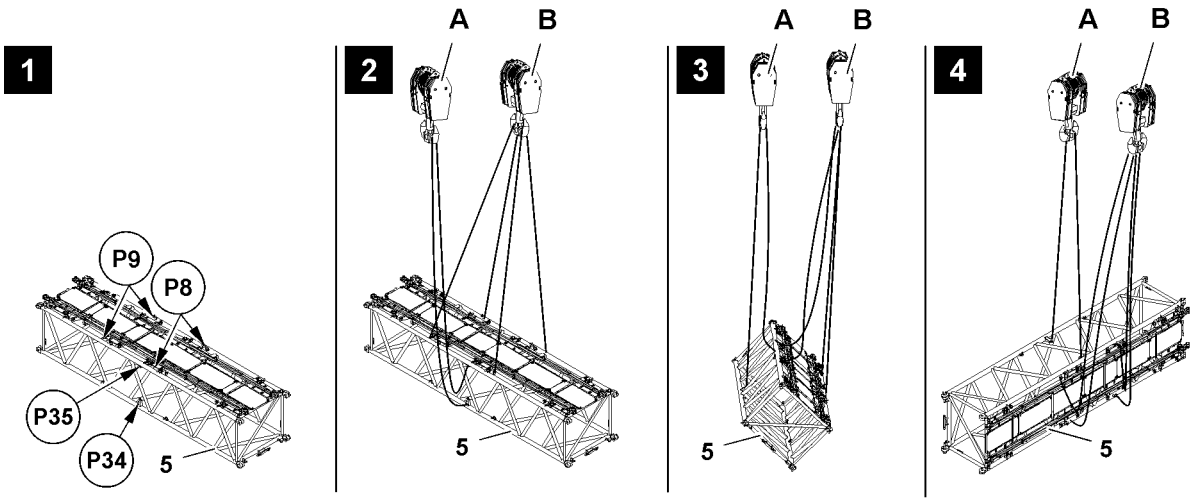

Fig.120296: Changing the boom: Turning the L-intermediate sections

Note

▶ The illustrations in this section are an example. The L-intermediate sections can look differently.
▶ For the correct fastening points, see section „Fastening points“.

This section applies only if the L-intermediate sections **5** were used previously in another boom system.

The L-intermediate sections **5** must be turned for use in the P-boom system.

Make sure that the following prerequisites are met:
– Two auxiliary cranes with sufficient load carrying capacity are available.
– No guy rods are on the L-intermediate sections **5**.

WARNING
Selection of incorrect fastening points!
Death, severe bodily injuries, property damage.
▶ It is prohibited to use the lower positioned fastening points for the turning procedure.
▶ For fastening of crane / boom sections, observe and adhere to section „Fastening points“.

WARNING
Turning in excessive height!
Death, severe bodily injuries, property damage.
▶ Make sure that there are no persons within the danger zone.
▶ Turn the L-intermediate sections **5** as close as possible near the ground without them touching the ground.

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WARNING
Placed guy rods!
Death, severe bodily injuries, property damage.
▶ Make sure that no guy rods are laying on the L-intermediate sections which are to be turned.

▶ Fasten the first L-intermediate section **5** on both auxiliary cranes: Fasten the auxiliary crane **A** on point **P34** and point **P35** and fasten the auxiliary crane **B** on points **P8** and points **P9**, see illustration **1**.
▶ Relieve the fastening equipment completely from the auxiliary crane **A**, see illustration **2**.

When the fastening equipment is completely relieved from the auxiliary crane **A**:
▶ Lift the L-intermediate section **5** with the auxiliary crane **B**, see illustration **2**.
▶ Turn the L-intermediate section **5** by 90°: Lift the L-intermediate section **5** slowly with the auxiliary crane **A** and lower simultaneously with the auxiliary crane **B** until the L-intermediate section **5** is lifted completely by the auxiliary crane **A**, see illustration **3** and illustration **4**.
▶ Relieve the fastening equipment completely on auxiliary crane **B**.

When the fastening equipment is completely relieved on the auxiliary crane **B**:
▶ Place the L-intermediate section **5** with the auxiliary crane **A** on the ground.
▶ Remove the fastening equipment from auxiliary crane **B** and on points **P8** and points **P9**.
▶ Remove the fastening equipment from auxiliary crane **A** and on point **P34** and point **P35**.
▶ Carry out the procedure the same way as was described before for all required L-intermediate sections **5**.

4.7.5 Assembling the L-intermediate sections on the cross carrier

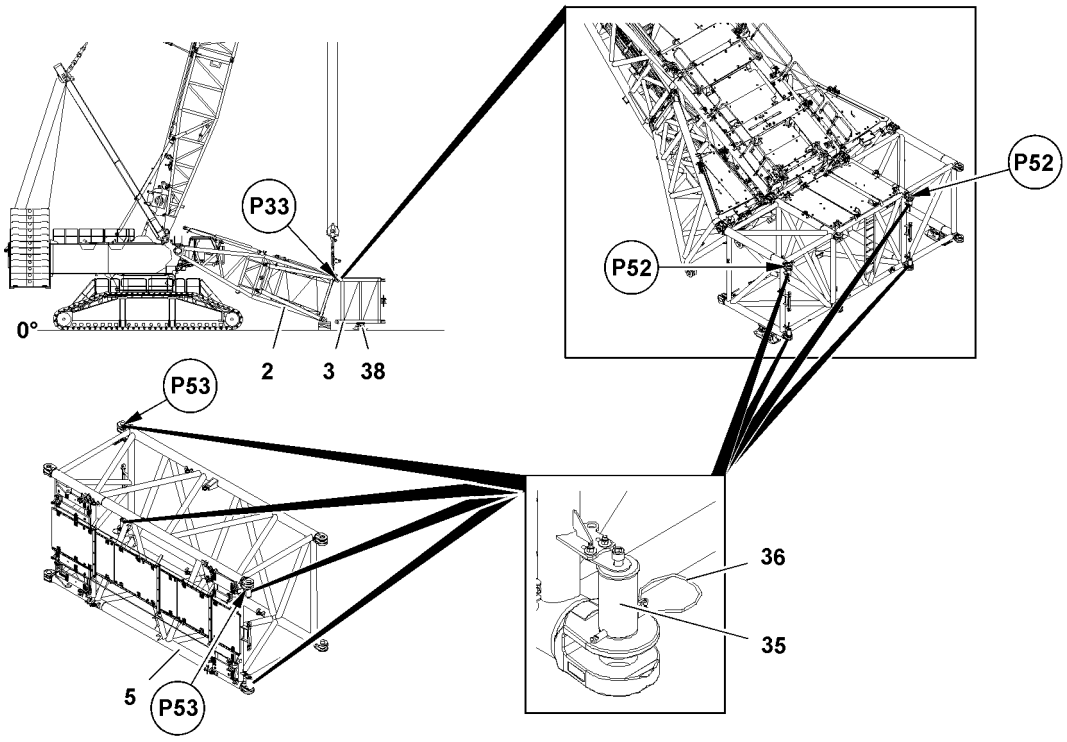

Fig.120306: Assembling the L-intermediate sections on the cross carrier - Pin points

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Make sure that the following prerequisites are met:
- The cross carrier **3** is properly pinned and secured on points **P33** of the lower P-adapter **2**.
- The cross carrier **3** is properly placed on the assembly shoes **38**.
- On the cross carrier **3** the pins **35** are completely unpinned on top and bottom on points **P52**.
- On all required L-intermediate sections **5** the pins **35** are completely unpinned on top and bottom on points **P53**.
- On the cross carrier and on the L-intermediate sections the pins are secured on the lower pin points with safety locking pins to prevent them from falling down.
- The fastening equipment is removed on the cross carrier **3**.
- The L-intermediate sections **5** are placed down in such a way that it can be pinned without further turning.
- Two auxiliary cranes are provided.

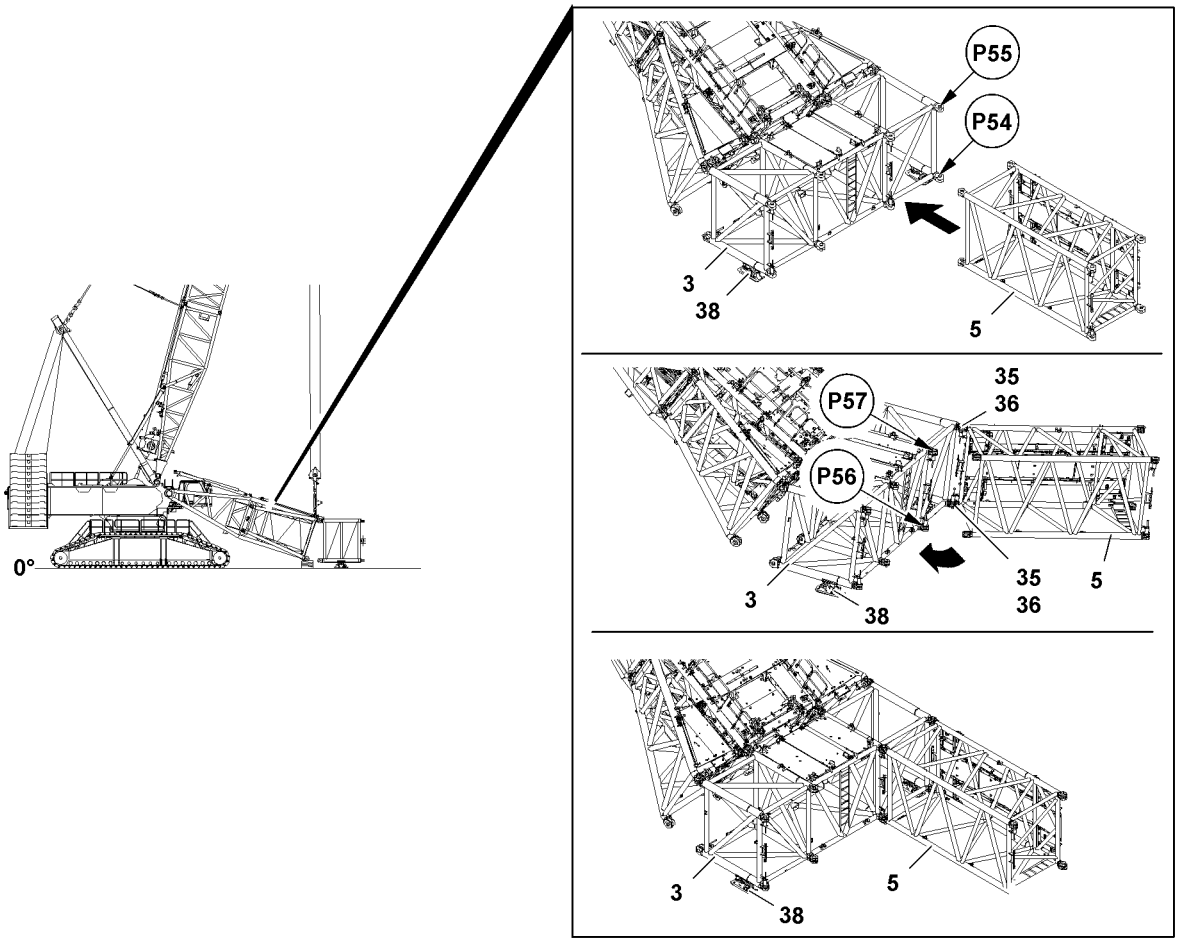

Fig.120307: Assembling the L-intermediate sections on the cross carrier - Assembly procedure

Note
- ▶ The assembly is described for the left lattice section leg.
- ▶ The combination of the various boom systems must be taken from the Rod plan and it must be adhered to.

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Note

- ▶ The L-intermediate sections **5** are pinned with the pin pulling device on the cross carrier **3** and the subsequent L-intermediate sections **5**, see Crane operating instructions, chapter 5.30.
- ▶ For easier assembly / disassembly of the L-intermediate sections **5**, the last installed L-intermediate section **5** must always be supported with the supplied assembly shoes **38**, see Crane operating instructions, chapter 5.62.
- ▶ On all L-intermediate sections **5** which are installed, the gratings are on the outside of the P-boom.

The L-intermediate sections **5** have to pinned and secured on both sides each of the cross carrier **3**.

- ▶ Lift the L-intermediate section **5** with the auxiliary crane.
- ▶ Position the L-intermediate section **5** on the cross carrier **3** in such a way that it can be pinned on point **P54** and point **P55**.

When the pin bores on the cross carrier **3** and on the L-intermediate section **5** align on point **P54** and point **P55**:

- ▶ Pin the cross carrier **3** with the L-intermediate section **5**: Insert the pins **35** with the pin pulling device on point **P54** and point **P55** to the stop and secure with safety locking pin **36**.
- ▶ Fold the L-intermediate section **5** in so that it can be pinned on point **P56** and point **P57**.
- ▶ Repeat the pinning procedure on point **P56** and point **P57** the same way as described before.
- ▶ Remove the auxiliary crane.
- ▶ Place the assembly shoes **38** properly under the L-intermediate section **5**, see Crane operating instructions, chapter 5.62.

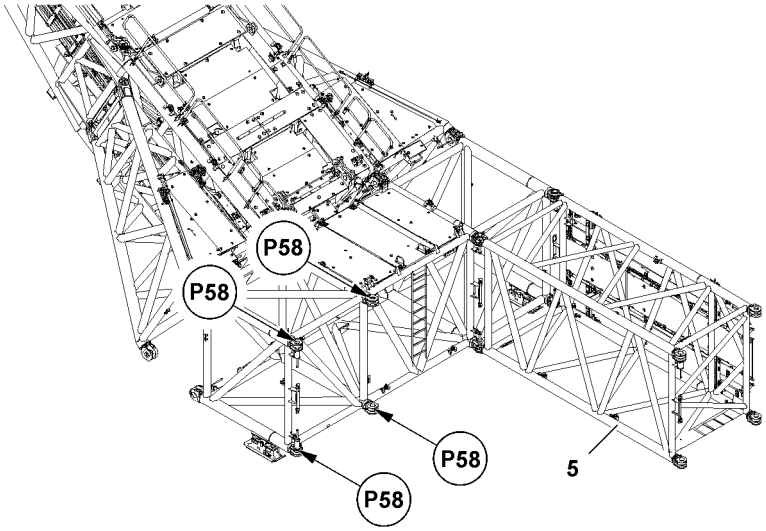

Fig.120308: Assembling the L-intermediate sections on the cross carrier - Pin points for the second strand

WARNING

The crane can topple over!

If the rod plans and the data in the Crane operating instructions, chapter 5.03 are not observed, this can cause the crane to collapse, the boom to break off or the crane to topple over.

Death, severe bodily injuries, property damage.

- ▶ The combination of the various boom systems must be taken from the Rod plan and it must be adhered to.
- ▶ Observe and adhere to the instructions in the Crane operating instructions, chapter 5.03.

- ▶ Assemble the L-intermediate section **5** on points **P58** of the cross carrier the same way as described before.

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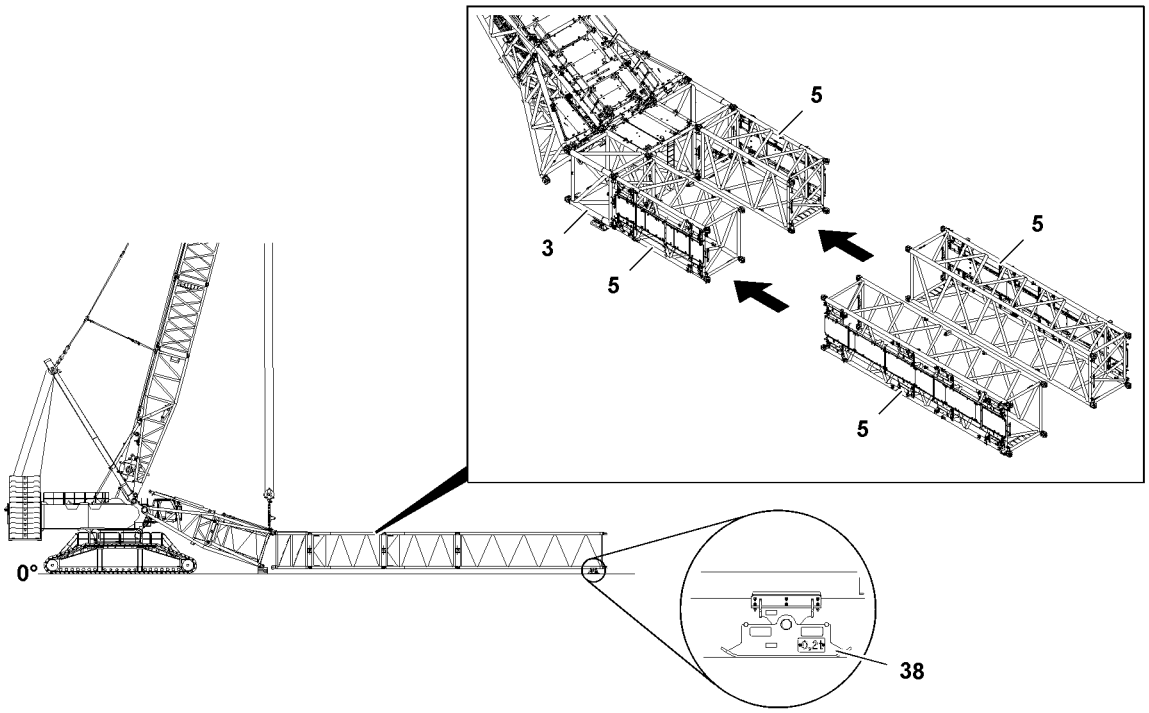

Fig.120309: Assembling the L-intermediate sections on the cross carrier - Assembly of additional L-intermediate sections

Depending on the system length, a different number of L-intermediate sections **5** is used.

Refer to the rod plan for the number and sequence of the L-intermediate sections **5**.

The assembly between the L-intermediate sections **5** is identical with the previously described assembly between the cross carrier **3** and an L-intermediate section **5**.

WARNING
Changing the assembly shoes **38**!
If the assembly shoes **38** are not changed over under the last assembled L-intermediate section **5**, the L-intermediate sections **5** can be overloaded and damaged.
An accident can occur during crane operation due to a damaged or previously overloaded lattice section.
Death, severe bodily injuries, property damage.
▶ Place the assembly shoes **38** properly under the last installed L-intermediate section **5**, see Crane operating instructions, chapter 5.62.

▶ Assemble the parallel section of the boom system to the required length.

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4.7.6 Assembling the upper P-adapter on the L-intermediate sections

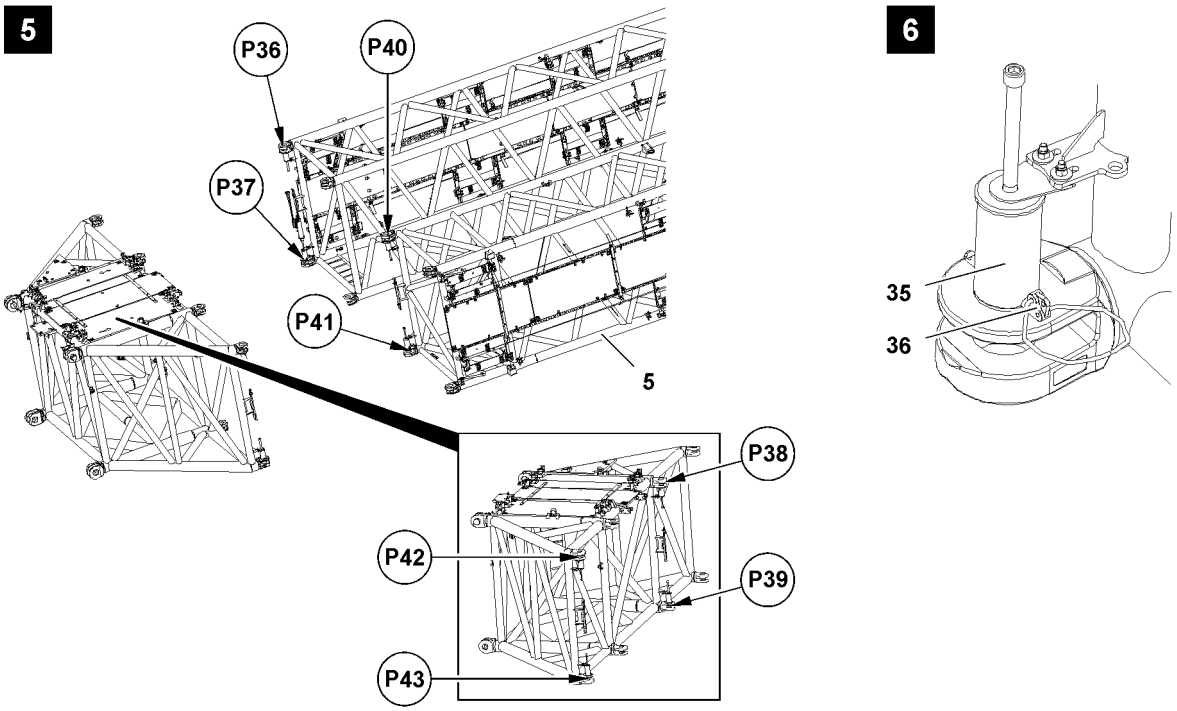

Fig.120298: Assembling the upper P-adapter on the L-intermediate sections - Pin points

Make sure that the following prerequisites are met:
- The parallel section of the P-boom is assembled to the desired length.
- The assembly shoes are properly supported under the L-intermediate sections **5**.
- The connector pins **35** are completely unpinned on point **P36**, point **P37**, point **P38**, point **P39**, point **P40**, point **P41**, point **P42**, point **P43** of the L-intermediate sections **5**, see illustration **5**.
- The connector pins **35** on point **P37**, point **P39**, point **P41** and point **P43** are secured in unpinned position with safety locking pins **36**, see illustration **6**
- The pin pulling device is installed on point **P37**.
- A second auxiliary crane with sufficient load carrying capacity is available.

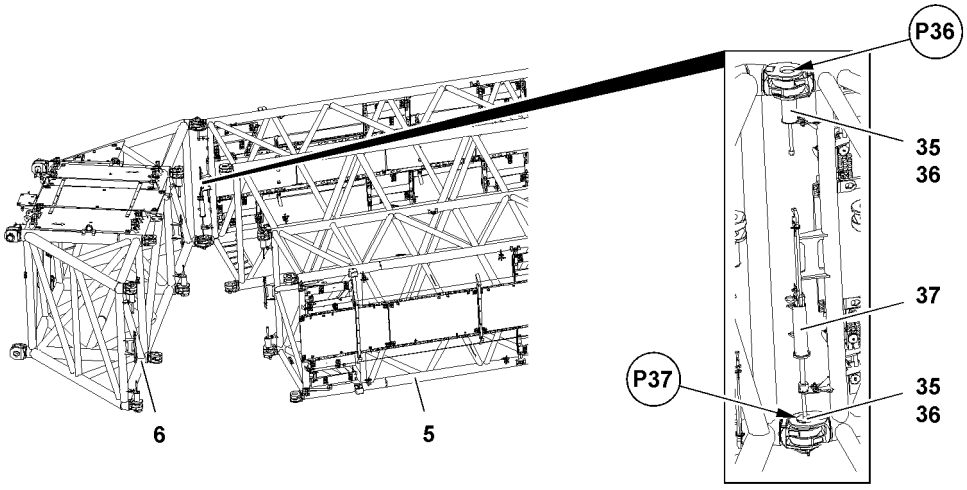

Fig.120299: Assembling the upper P-adapter on the L-intermediate sections - Positioning procedure

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Note

▶ The pinning or unpinning is carried out with the pin pulling device **10**, see the Crane operating instructions, chapter 5.30.

The upper P-adapter **6** must be pinned and secured on both L-intermediate sections **5**.

The upper P-adapter **6** must be pinned and secured on both sides on the respective L-intermediate section **5**.

▶ Fasten the upper P-adapter **6** to the auxiliary crane, see section „Fastening points“.
▶ Lift and position the upper P-adapter **6** in such a way that it can be pinned on point **P36** and point **P37**.

When the pin bores on the upper P-Adapter **6** and on the L-intermediate section **5** align on point **P36** and point **P37**:

▶ Pin the upper P-adapter **6** with the L-intermediate section **5**: Insert the pins **35** with the pin pulling device **37** on point **P37** to the stop and secure with safety locking pin **36**.
▶ Install the pin pulling device **37** on the upper pin point.
▶ Pin the upper P-adapter **6** with the L-intermediate section **5**: Insert the pins **35** with the pin pulling device **37** on point **P36** to the stop and secure with safety locking pin **36**.

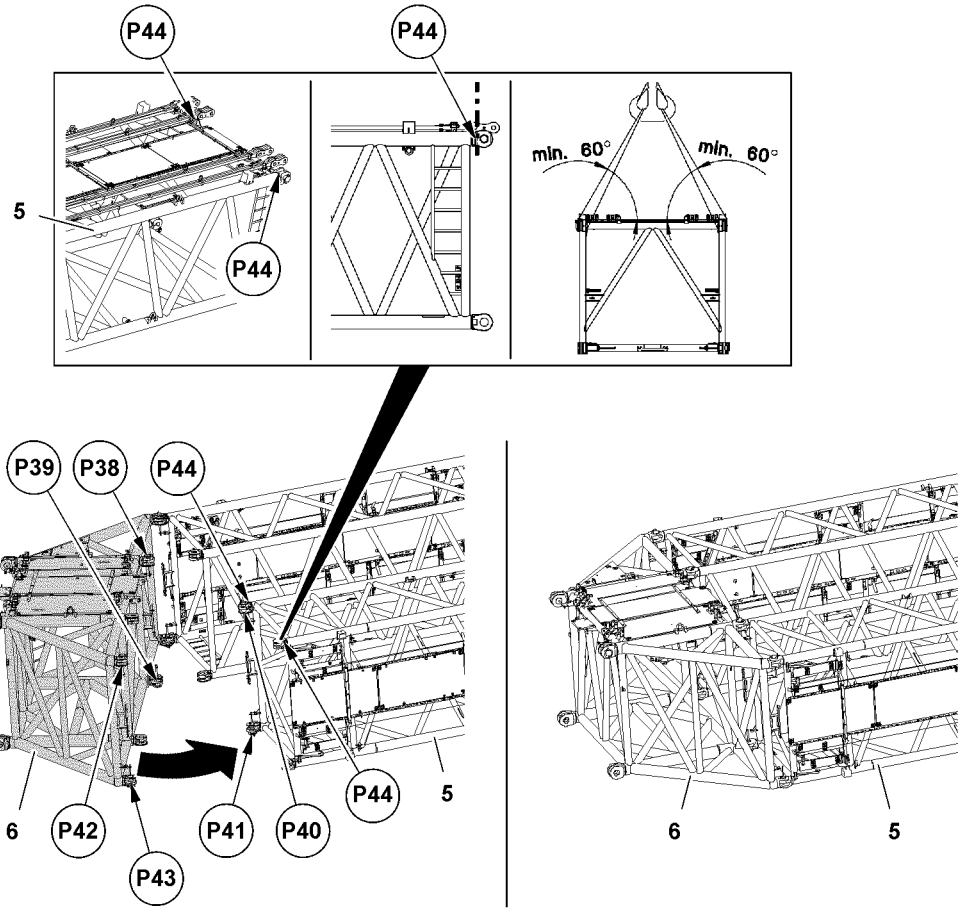

Fig.120300: Assembling the upper P-adapter on the L-intermediate sections - Assembling the upper P-adapter completely

To be able to fold the upper P-adapter **6** in, the free L-strand is fastened on points **P44** and lifted and positioned with the second auxiliary crane.

▶ Fold the upper P-adapter **6** in and position the free lattice section leg with the auxiliary crane in such a way that it can be pinned on point **P38**, point **P39**, point **P40**, point **P41**, point **P42** and point **P43**.
▶ Repeat the pinning procedure on point **P38**, point **P39**, point **P40**, point **P41**, point **P42** and point **P43** the same way as was described before.

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▶ Remove the auxiliary crane.

4.7.7 Assembling the S-intermediate sections / S-adapter / S-end section on the upper P-adapter

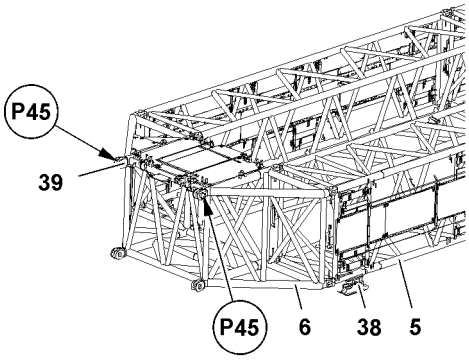

Fig.120301: Assembling the S-intermediate sections / S-adapter / S-end section on the upper P-adapter — Pin points

Make sure that the following prerequisites are met:
- The upper P-adapter **6** is completely installed on the L-intermediate sections **5**.
- The pins **39** on the points **P45** are completely unpinned.
- The L-intermediate sections **5** are laying properly on the assembly shoes **38**.

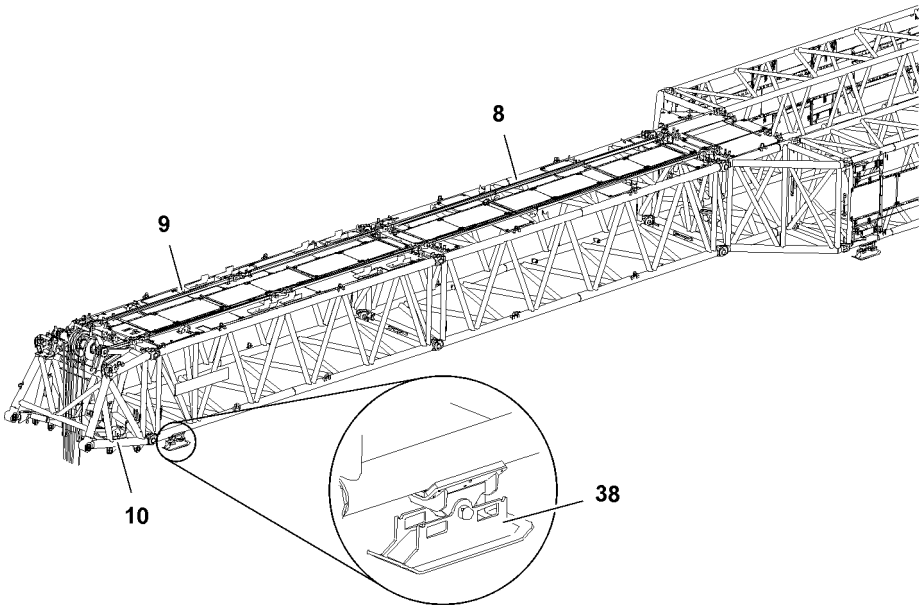

Fig.120302: Assembling the S-intermediate sections / S-adapter / S-end section on the upper P-adapter — Changing the assembly shoes

WARNING
The crane can topple over!
If the rod plans and the data in the Crane operating instructions, chapter 5.03 are not observed, this can cause the crane to collapse, the boom to break off or the crane to topple over.
Death, severe bodily injuries, property damage.
▶ The combination of the various boom systems must be taken from the Rod plan and it must be adhered to.
▶ Observe and adhere to the instructions in the Crane operating instructions, chapter 5.03.

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WARNING
Changing the assembly shoes **38**!
If the assembly shoes **38** are not changed over under the last assembled S-intermediate section, the S-intermediate sections can be overloaded and damaged.
An accident can occur during crane operation due to a damaged or previously overloaded lattice section.
Death, severe bodily injuries, property damage.
▶ Place the assembly shoes **38** properly under the last assembled S-intermediate section, see section „Changing the assembly shoes at assembly“.

Note
▶ The assembly of the S-intermediate section **8**, the S-adapter **9** and the S-end section **10** is described in detail in the Crane operating instructions, chapter 5.39. The assembly described there is an example from the S-pivot section on. Carry out the assembly of the S-boom section leg the same way, starting from the upper P-adapter.

▶ Assembling the S-boom section leg, see Crane operating instructions, chapter 5.39.

4.7.8 Installing the bridges

Note
▶ The P-boom system is shown in the following illustration solely for the purpose of providing a clearer illustration, in the „closed“ condition.
▶ The illustration of the P-boom with installed bridges, the platform as well as the rod receptacles in the operating position should make the installation situation and the arrangement of the components in the P-boom system clearer.

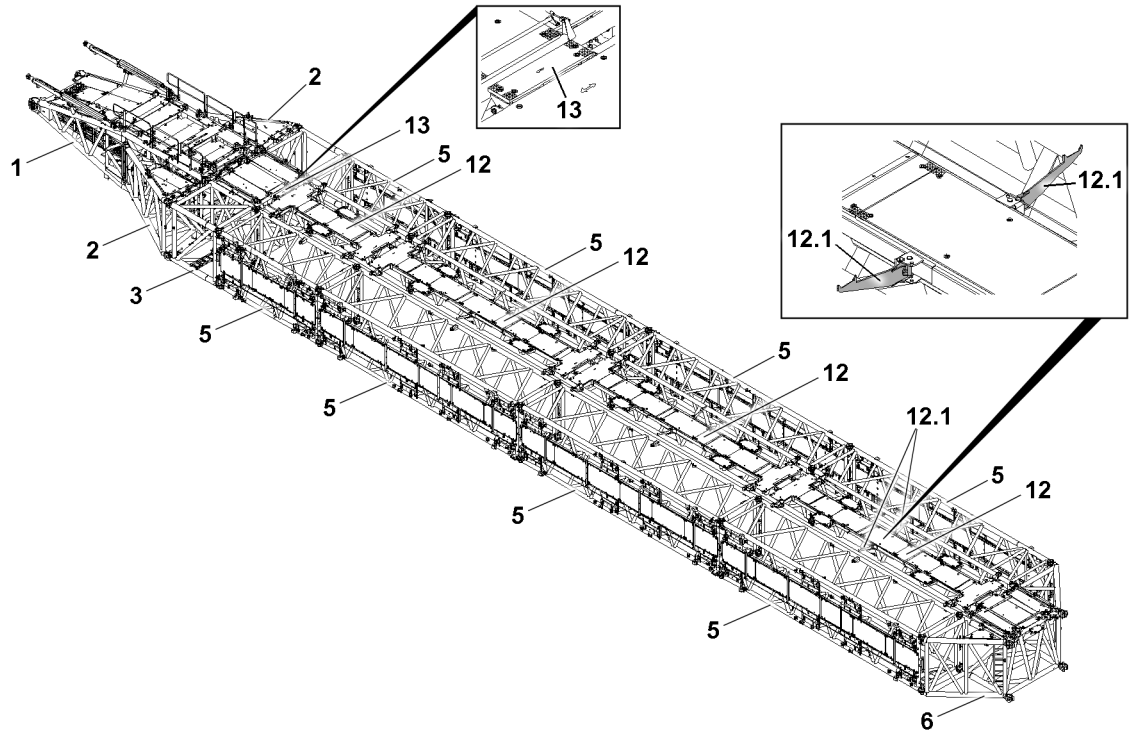

Fig.124517: P-boom system

1 S-pivot section
2 P-adapter bottom
3 Cross carrier
5 L-intermediate section
6 P-adapter top
12 Bridge
12.1 Rod receptacle
13 Platform

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Note

- ▶ The following descriptions are an example for the installation of all bridges **12**.
- ▶ The number of bridges **12** used varies, depending on the main boom length, check the rod plan.

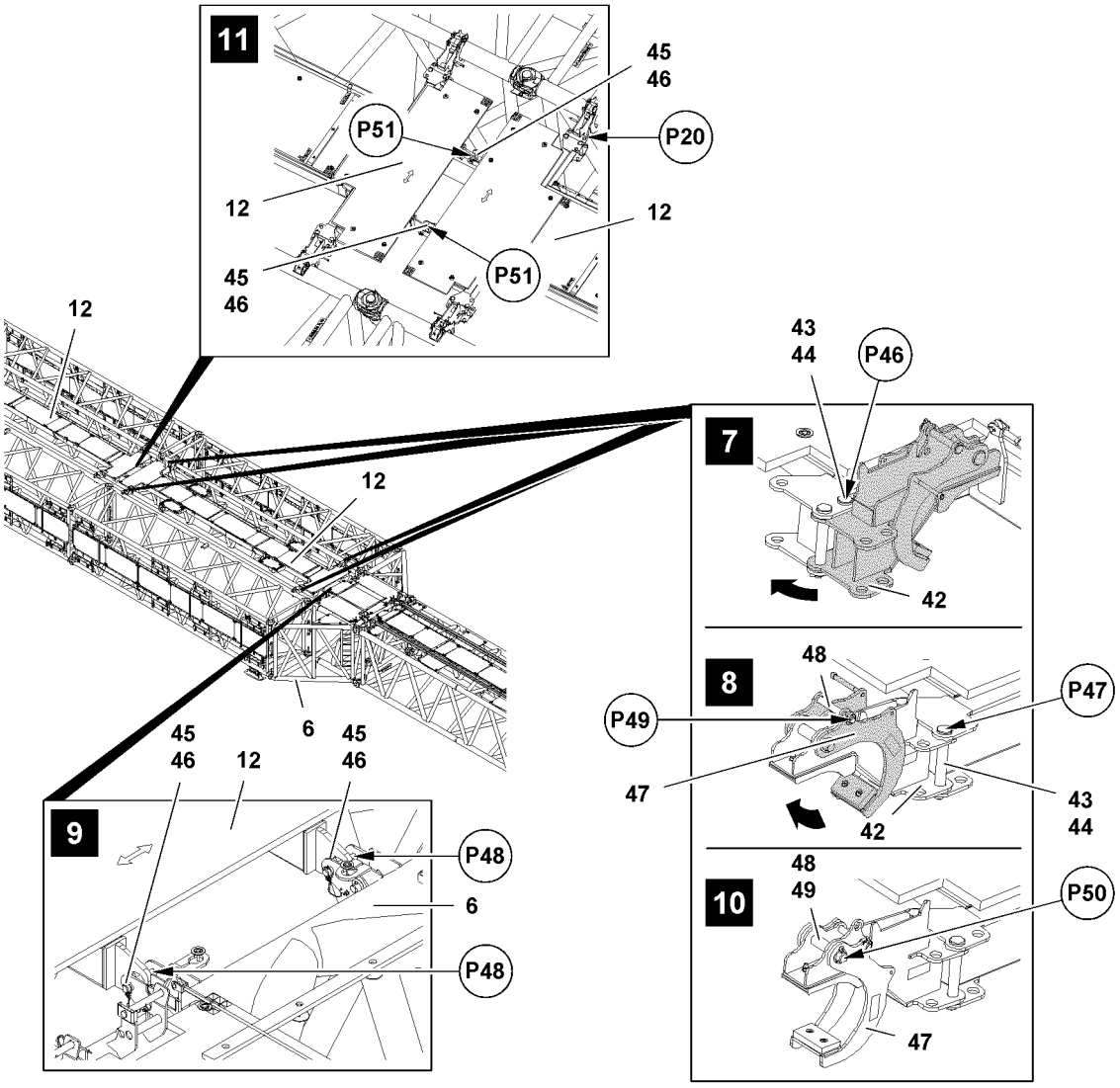

Fig.120303: Installing the bridges - Assembling the bridges on the P-boom

WARNING

Danger of falling!

- ▶ Make sure that the assembly personnel is secured with the supplied fall arrest system to prevent them from falling when installing the bridges.

Make sure that the following prerequisite is met:

– The P-boom system is completely assembled.

- ▶ Unpin the folding brackets **42** on the four points **P46** in transport position: Release and unpin the pin **43**, see illustration **7**.
- ▶ Swing the folding brackets **42** from transport position into operating position.
- ▶ Pin the folding brackets **42** on the four points **P47** in operating position: Insert the pin **43** and secure with the safety locking pin **44**, see illustration **8**.

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WARNING
Falling bridge!
If not all four folding brackets **42** are installed before placing in operating position, then the bridge can fall down later.
Death, severe bodily injuries, property damage.
▶ Make sure that all four folding brackets **42** are pinned and secured in operating position before placing.

▶ Fasten the bridge **12** to the auxiliary crane, see section „Fastening points“.
▶ Lift the bridge **12** with the auxiliary crane and position it in such a way that it can be pinned on points **P48** with the upper P-adapter **6**, see illustration **9**.
▶ Pin the bridge **12** with the upper P-adapter **6**: Insert the pins **45** on both sides on points **P48** and secure with safety locking pin **46**, see illustration **9**.
▶ Unpin the retaining brackets **47** on the four points **P49** in transport position: Release and unpin the pin **48**, see illustration **8**.
▶ Fold the retaining plates **47** down and secure on points **P50** in operating position: Insert the pin **48** and secure with the safety locking pin **49**, see illustration **10**.
▶ Remove the auxiliary crane.

Subsequent bridges **12** are installed the same way as described before.

▶ Pin the bridge **12** with the bridge **12**: Insert the pins **45** on both sides on points **P51** and secure with safety locking pin **46**, see illustration **11**.

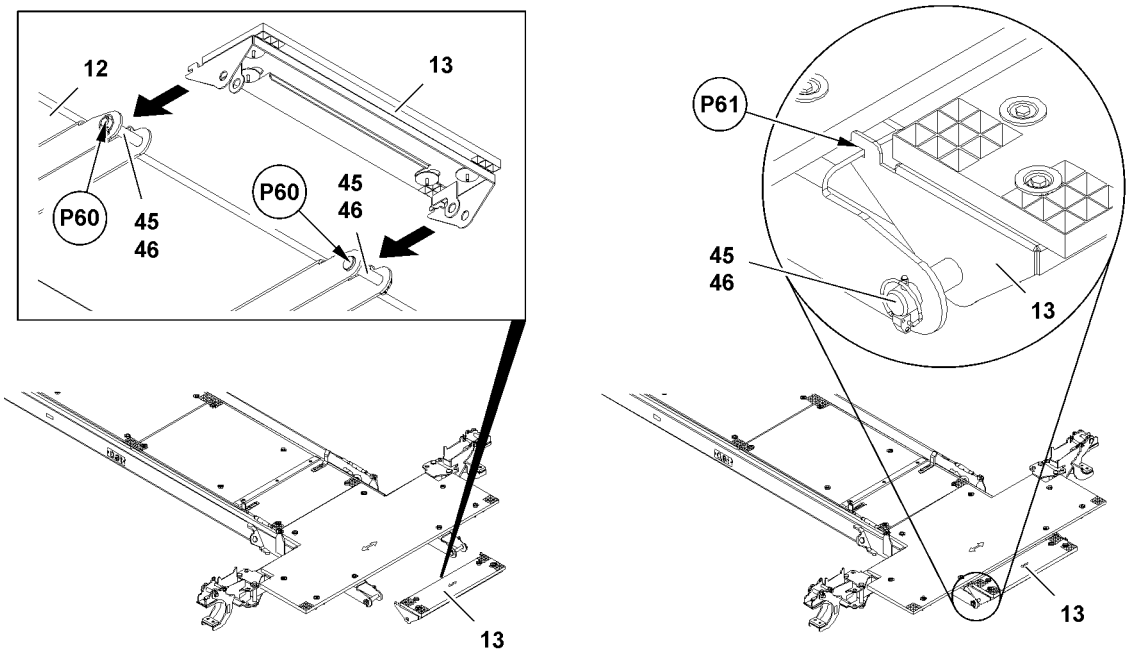

Fig.120311: Assembling the platform on the bridge

Note
▶ On the last bridge **12** which ends on the cross carrier **3**, install the platform **13** before fastening on the auxiliary crane.

▶ Release pins **45** on points **P60** and unpin.
▶ Position the platform **13** in such a way that it is affixed on both sides on points **P61** and can be pinned on points **P60**.
▶ Pin the platform **13** with the bridge **12**: Insert the pins **45** on both sides on points **P60** and secure with safety locking pins **46**.

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4.7.9 Bringing the rod receptacle into operating position

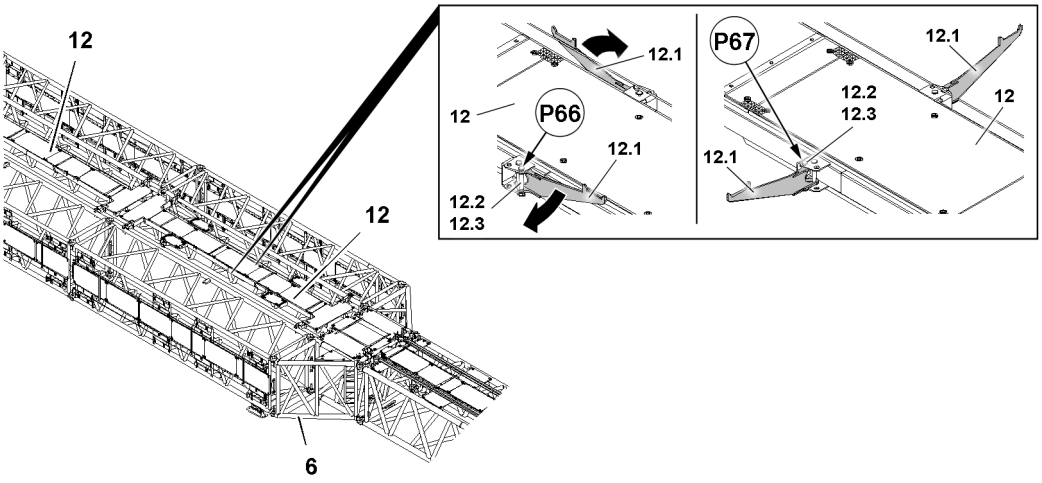

Fig.124516: Bringing the rod receptacle into operating position

The 12 m bridges **12** are equipped with a swingable rod receptacle **12.1**. The rod receptacle **12.1** is required for the assembly of the S-guy rods, but only on the last bridge before the P-adapter on top **6**.

Make sure that the following prerequisites are met:
- The bridges **12** are properly assembled.
- The bridge **12** with the installed platform **13** is properly assembled.

Note
- ▶ The description of the procedure „Bringing the rod receptacle into operating position“ is an example and is described via one rod receptacle **12.1**.
- ▶ The procedure for the rod receptacle on the opposite side is identical.

- ▶ Unpin the rod receptacle **12.1** at point **P66**: Remove the locking pin **12.3** and unpin the pin **12.2**.
- ▶ Swing the rod receptacle **12.1** outward.

When the rod receptacle **12.1** is in operating position:
- ▶ Pin the rod receptacle **12.1** in operating position: Insert the pin **12.2** at point **P67** and secure with the locking pin **12.3**.

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4.7.10 Closing the boom system

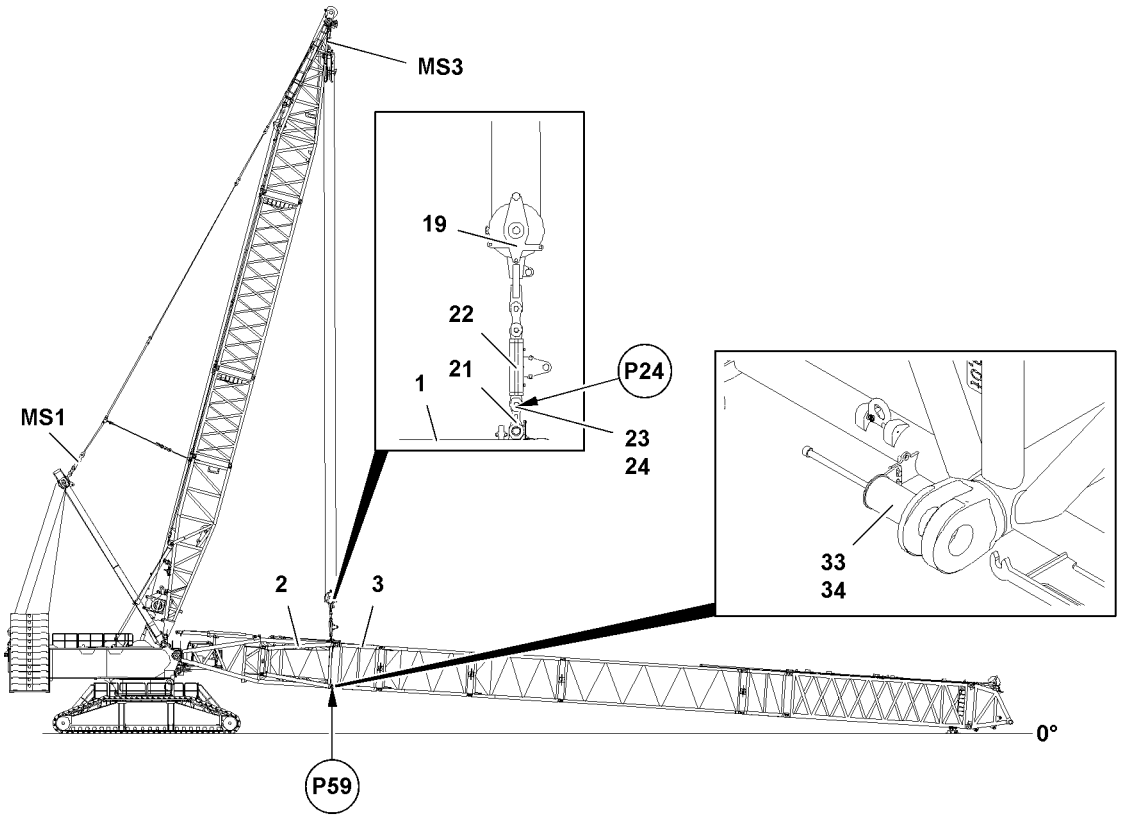

Fig.120310: Closing the boom system

Make sure that the following prerequisites are met:
- The boom system is completely assembled.
- The boom system is supported, if necessary.
- All lattice sections are properly pinned with each other.
- All pin connections are properly pinned and secured.
- All required guy rods are laying on the boom according to the rod plan and are secured to prevent them from falling down.
- The upper pulley block **19** (including assembly weight **22**) is completely pinned and secured with the brackets **21** on the S-pivot section **1**.

WARNING
The crane can topple over!
If the following conditions are not met, the crane can topple over or be significantly damaged.
Death, severe bodily injuries, property damage.
- ▶ During the „closing procedure“ of the boom system, the maximum permissible F3-total force of **136 t** on test point 3 **MS3** may not be exceeded.
- ▶ During the „closing procedure“ of the boom system observe the values in the erection chart.
- ▶ The end section of the corresponding PD-boom combination may **not** lift off the ground during the „Closing procedure“.
- ▶ Make sure that there are no persons on the boom system as well as in the danger zone during the closing procedure.
- ▶ Non-required guy rods must be removed from the lattice sections, see Crane operating instructions, chapter 5.01.

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Note

- ▶ The actual forces on test point 3 **MS3** - which are used during the closing procedure of the PD-boom system - are shown on LICCON monitor 1.
- ▶ Note the actual forces of test point 3 **MS3** and keep it ready for the disassembly of the PD-boom system.
- ▶ At boom disassembly, pretension the control rope of winch 3 until the noted (assembly) actual forces of test point 3 **MS3** on the LICCON monitor are reached, so that the connector pins between the lower P-adapters and the cross carriers can be unpinned.

Close the PD-boom combination with the upper pulley block **19**:

- ▶ Lift the PD-boom system with the upper pulley block **19** until the four pin bores align at points **P59**.
- ▶ Pin the cross carrier **3** with the P-adapter: Insert the four connector pins **33** and secure with the safety locking pins **34**.

WARNING

Mortal danger if upper pulley block is unpinned to soon!
By unpinning the upper pulley block **19** on the S-pivot section **1**, the boom can suddenly fold down if the boom is not properly pinned and secured „on the bottom“.
Death, severe bodily injuries, property damage.

- ▶ It is prohibited for anyone to remain under the raised boom combination during the pinning / unpinning procedure.
- ▶ Unpin the upper pulley block **19** on the S-pivot section **1** only when it is ensured that the lower P-adapters are properly pinned and secured „on top“ and „bottom“ with the cross carrier.

When the S-boom is „closed“:

- ▶ Unpin the bracket of the assembly weight **22** on bracket **21**: Release and unpin the pins **23** on both sides.

4.7.11 Installing the suspended ballast

If a derrick ballast according to the load chart is required for the planned crane operation, then install the derrick ballast, see Crane operating instructions, chapter 5.36.

WARNING

The crane can topple over!
If no derrick ballast is installed on the crane, the crane can topple over.
Death, severe bodily injuries, property damage.

- ▶ Make sure that the derrick ballast according to the load chart is installed for the planned crane operation.

5 Assembling the boom combinations with substructure

If the assembly conditions for the assembly of the boom system are restricted due to the terrain on the jobsite, then it is possible to install the PD-boom with a substructure.

WARNING

General danger notes!

- ▶ All pins are to be secured after assembly with the intended retaining elements.
- ▶ The guy rods must be inspected regularly, see the Crane operating instructions, chapter 8.15.
- ▶ Secure the boom with substructure or auxiliary crane, see Crane operating instructions, chapter 5.01.
- ▶ It is prohibited for anyone to remain under the booms or within the complete danger zone during the pinning and unpinning procedure of the lattice section.

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NOTICE
Property damage!
If the pins of the guy rods are not pinned from the „inside“ to the „outside“, the hoist rope can scrape on the pins and be damaged.
▶ Always insert the pins of the guy rods from the „inside“ to the „outside“, see the Rod plan.

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
▶ For boom assembly / disassembly with the substructure, observe chapter 5.01.
▶ The „actual force“ on test point 3 **MS3** is shown on LICCON monitor 1.
▶ Observe the assembly conditions, see the Crane operating instructions, chapter 3.06.
▶ The specifications in the erection and take-down charts as well as the load charts must be observed.
▶ For the itemization of the lattice sections refer to the Rod plan.

NOTICE
Overload of boom!
If the boom is not supported before the erection procedure, then the boom will be overloaded during the erection procedure.
The boom system will be damaged.
▶ Support the PD-boom from a length of more than 120 m.
▶ Make sure that the dimension **X** for the maximum permissible flexation of the boom system is never exceeded.
▶ Support the boom with suitable materials with sufficient load carrying capacity in the marked area, see illustration.

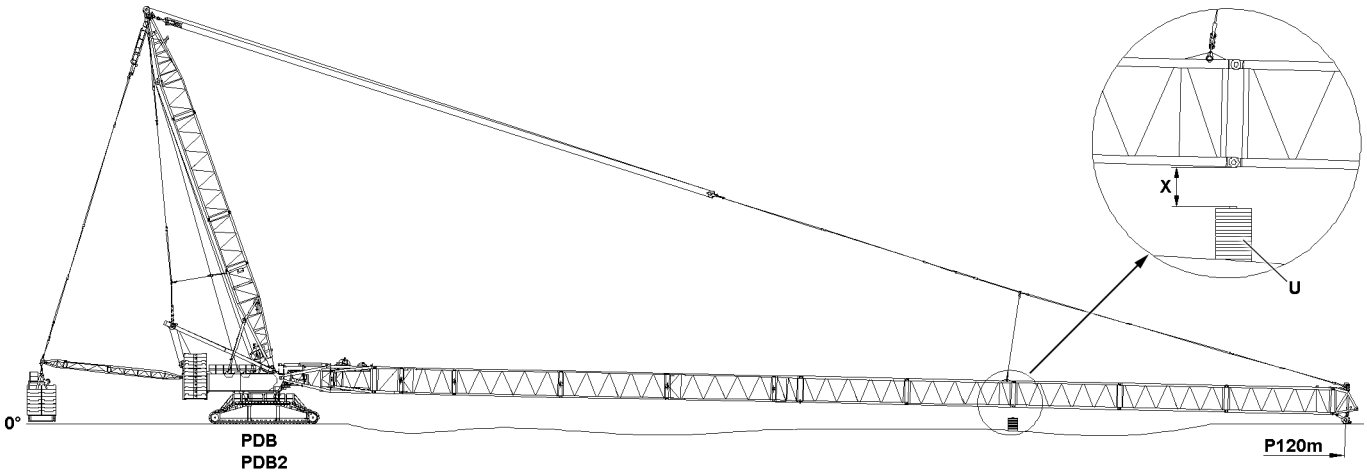

Fig.124521: Assembling the PD-boom with substructure

The PD-boom combination must be preassembled at a suitable location.

Swing the preassembled boom combination with the auxiliary crane(s) in to the turntable, pin and secure.

▶ Preassemble the boom combination.

WARNING
Danger of accident due to boom system!
Death, severe bodily injuries, property damage.
▶ Make sure that no persons are within the danger zone of the crane and the boom system to be assembled.

▶ Swing the preassembled boom combination with the auxiliary crane (s) to the turntable.

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▶ Pin and secure the boom combination with the S-pivot section on the turntable, see section „Assembling the S-pivot section on the turntable“.

When the boom system is properly installed with the S-pivot section on the turntable:
▶ Support the boom system properly before taking it down on the ground.

Operating mode	Support from length	Dimension[1] **X**
PD	120 m	1.1 m

[1] X = maximum permissible flexation of the boom system

▶ Lower the boom combination on the ground.

6 Assembling the guy rods

WARNING
Neglected guy rod inspection and maintenance!
If the regular inspection and maintenance of the guy rods is not carried out or is carried out only at irregular intervals, then severe accidents can occur due to existing and unrecognized damage to the guy rods.
Death, severe bodily injuries, property damage.
▶ Check the guy rods before every assembly, see Crane operating instructions, chapter 8.15.
▶ The guy rods must be installed and secured, see Rod plan. The numbering in the rod plan must be identical to the numbering on the guy rods.

Make sure that the following prerequisites are met:
– The boom is laying with the S-end section on the ground
– **or** the boom (from a length of 120 m) is laying on the substructure
– **or** the boom (from a length of 120 m) is held in position by an auxiliary crane.
– The D-boom is luffed down to the front.

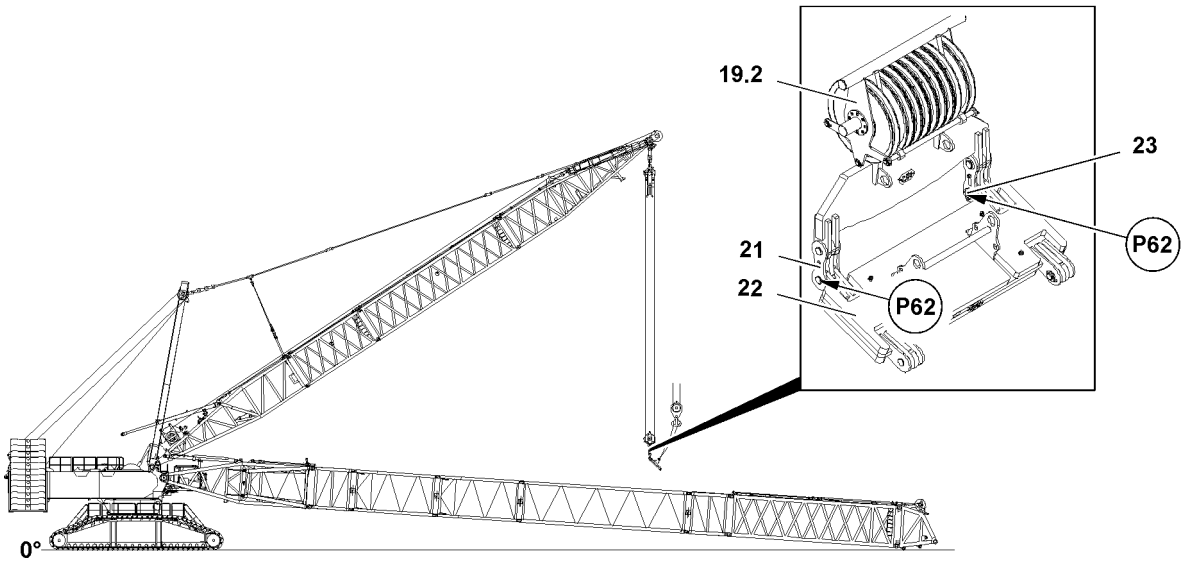

Fig.120312: Assembling the guy rods - Lowering the D-boom to the front and removing the assembly weight

▶ Luff the D-boom down carefully to the front.

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When the D-boom is in position:

- ▶ Lower the upper pulley block **19** until the brackets **21** between the upper pulley block **19** and the assembly weight **22** are easily accessible.
- ▶ Fasten the assembly weight **22** properly to the auxiliary crane.
- ▶ Lift the assembly weight **22** with the auxiliary crane to the horizontal.

When the assembly weight **22** hangs horizontally on the auxiliary crane:

- ▶ Unpin the assembly weight **22** on the upper pulley block **19**: Release the pins **23** on both sides on points **P62** and unpin.
- ▶ Swing the assembly weight **22** out with the auxiliary crane and place it on a suitable substructure.
- ▶ Continue to luff the D-boom down until the upper pulley block **19** is positioned over the boom system.

Problem remedy

The D-boom cannot be luffed down further?

You luffed the D-boom down to the mandatory system shut off.

- ▶ Move the D-boom into the opposite direction from the shut off.

- ▶ Luff the D-boom slightly up.

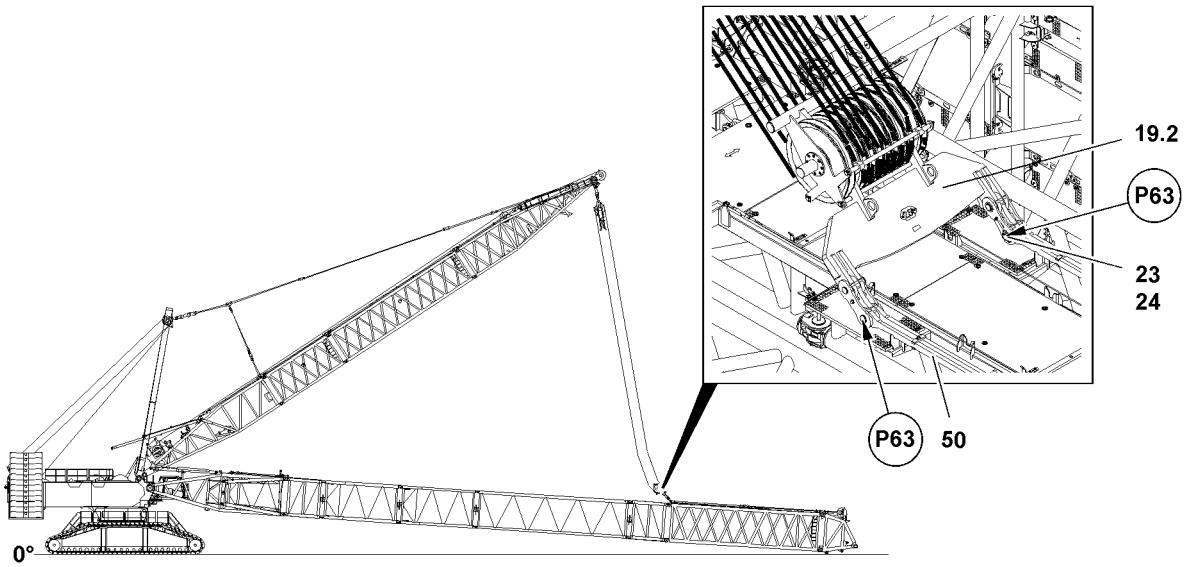

Fig.120313: Assembling the guy rods - Pinning the upper pulley block on the guy rods

Note

- ▶ Pull the upper pulley block **19** with the auxiliary crane to the pin points (points **P63**) of the guy rods **50** and position it in such a ways that the guy rods **50** can be safely pinned on the upper pulley block **19**.

When the upper pulley block **19** is positioned over the guy rods **50**:

- ▶ Pin and secure the guy rods **50** with the upper pulley block **19**: Insert the pin **23** from the inside to the outside and secure with safety locking pin **24**.

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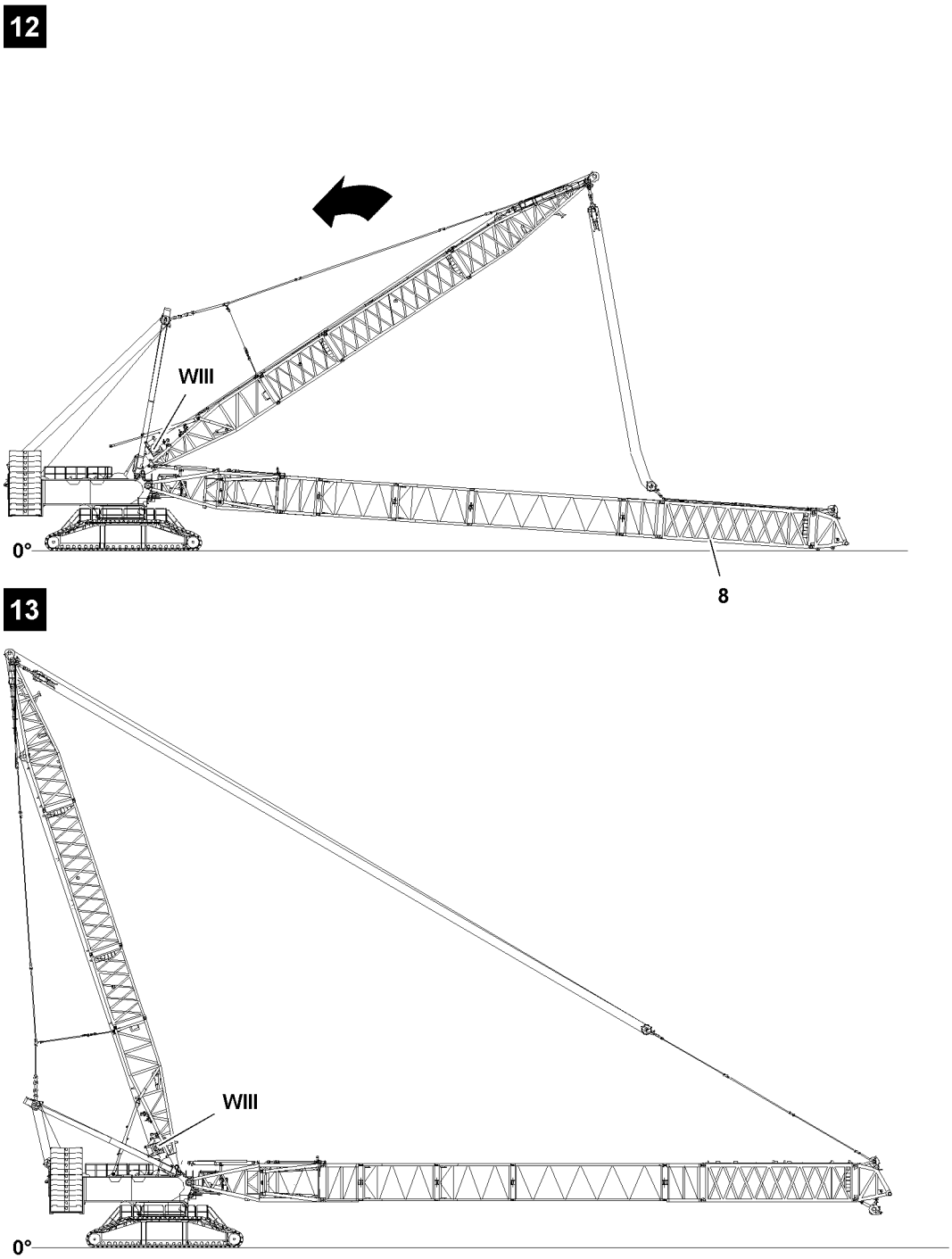

Fig.120314: Assembling the guy rods - Tensioning the guying

Note

▶ The P-boom must remain on the ground when erecting the D-boom and may **not** be pulled up along.

The guy rods **50** are placed and secured for transport on the S-intermediate sections **8**. Before assembly of the guy rods **50**, the transport retainers must be released.

When the guy rods **50** are properly pinned and secured with the upper pulley block **19**:

▶ Release and unpin transport retainers for the guy rods **50**.

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NOTICE
Property damage!
If the pins of the guy rods **50** are not pinned from the „inside“ to the „outside“, the hoist rope can scrape on the pins and be damaged.
▶ Always insert the pins of the guy rods **50** from the „inside“ to the „outside“, see Rod plan.

▶ Pin the required guy rods **50** with each other: Insert the pin from the „inside“ to the „outside“ and secure with locking pin.
▶ Assemble the guying according to the Rod plan, pin and secure it properly.
▶ Make sure that all required guy rods **50** of the boom system are pinned and secured.
▶ If it is required according to the Rod plan: Assemble the auxiliary guying, see Crane operating instructions, chapter 5.01 and 5.03.

WARNING
Unutilized guy rods on boom!
If guy rods are on the lattice sections which are not required for crane operation, then there is a danger of accidents.
Death, severe bodily injuries, property damage.
▶ Non-required guy rods must be removed from the lattice sections, see Crane operating instructions, chapter 5.01.

▶ Remove non-required guy rods from the lattice sections.

WARNING
D-boom falling to the rear!
If the relapse cylinders of the D-boom are not completely moved out before erection, then the D-boom can fall backward when erecting it into operating position.
Death, severe bodily injuries, property damage.
▶ Make sure that the relapse cylinders of the D-boom are completely moved out.

NOTICE
Danger of slack rope formation!
If winch 3 **WIII** is spooled out too quickly during the erection procedure of the D-boom, slack rope can form.
▶ Make sure that the rope of winch 3 **WIII** is tensioned during the entire erection procedure of the D-boom.

WARNING
Danger of accident due to lifting of the P-boom system!
Death, severe bodily injuries, property damage.
▶ The P-boom system may not be raised during the erection of the D-boom in the operating position and must remain in the initial position.

▶ Erect the D-boom in operating position and spool out winch 3 **WIII** at the same time, see illustration **12**.

When the D-boom is in operating position:
▶ Tension the guying between the D-end section and the boom end section, see illustration **13**.

7 Assembling the roller sets on the boom head

7.1 Assembling the roller sets

Note
▶ The assembly of the roller sets is described in the Crane operating instructions, chapter 5.14.

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When the roller set / the roller sets are properly installed on the end section:

▶ Route the hoist limit switch from the end section forward on the roller set / the roller sets, pay attention and adhere to the Electrical wiring diagram.

7.2 Establishing the electrical connections on the boom end section

Make sure that the following prerequisites are met:

- The S-intermediate sections are properly assembled and secured on the ground.
- The boom end section is properly assembled and secured.
- The electrical connections to the boom end section have been established.
- The airplane warning light, wind speed sensor and all sensors are properly installed and secured on the boom end section.
- The hoist limit switches are properly installed and secured on the pulley head / pulley heads.

NOTICE

Danger of damage to the electrical connections!

If the electrical connection from the cable drum on the S-pivot section to the terminal box on the S-pivot section is established first before the connection to the terminal box on the boom end section, the electrical connection can be damaged when spooling out the cable drum.

▶ Establish first the electrical connection from the cable drum in the S-pivot section to the terminal box on the boom end section and then the electrical connection from the terminal box in the S-pivot section to the cable drum.

Note

▶ To establish the electrical connections on the S-boom: Use the Electrical wiring diagram.

▶ Establish the electrical connections.

▶ Make sure that all electrical connections on the boom are established.

WARNING

Malfunction if dummy plugs are not installed!

If the dummy plugs on the non-required electrical connections are not installed, then malfunctions or functional limitations can occur on the crane.

▶ Make sure that all non-required electrical connections that have a dummy plug are closed off with dummy plugs.

▶ Pay attention to the Electrical wiring diagram.

▶ As a rule, close off on-required electrical connections (for example for accessories which cannot be installed) with the respective dummy plugs.

NOTICE

Property damage due to dirt and / or corrosion!

If non-required electrical connections are not closed off with the respective protective caps, then dirt and / or corrosion can damage the electrical connections.

This could result in malfunctions.

▶ Make sure that all non-required electrical connections are always closed off properly.

▶ Pay attention to the Electrical wiring diagram.

▶ Close electrical connections, which have no dummy plugs, properly off with the corresponding protective caps.

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8 Performing the function checks

WARNING
Malfunctioning safety equipment!
Death, severe bodily injuries, property damage.
- ▶ Crane operation with non-functioning safety equipment is **prohibited**.
- ▶ Start crane operation only after all safety equipment have been checked and are functioning correctly.

Note
- ▶ The function of the individual limit switches must be checked before erection of the boom system.
- ▶ The function of the limit switch initiators must be checked in the test system, see the Diagnostics manual.

Note
- ▶ If a function check on the limit switches or on the safety equipment does not lead to the desired shut-offs, then the plug connections on the connector boxes or the components themselves must be checked.
- ▶ If no visible connection errors or component defects can be found, contact Liebherr Service.

Make sure that the following prerequisites are met:
- All electrical connections have been made.
- The crane engine is running.
- The corresponding operating mode is set on the LICCON monitor.
- The actuator levers of the limit switches have been checked for easy movement and are lubricated.

8.1 Wind speed sensor

- ▶ Check the movement and the function of the wind speed sensor.

8.2 Airplane warning light

- ▶ Turn the airplane warning light on, see Crane operating instructions, chapter 4.01.
- ▶ Check the function visually.

8.3 Hoist limit switch

- ▶ Actuate the hoist limit switch manually on the pulley head.

Result:

- The hoist winch turns off in upward movement.
- The hoist top icon blinks on the LICCON monitor 0.
- The hoist limit switch is functioning.

8.4 Checking the limit switch main boom „steepest position“

Note
- ▶ The limit switch functions have to be checked individually before erection.

- ▶ Cover the limit switch initiators on the relapse cylinders of the main boom individually with a metal plate.

Result:

- The limit switch is actuated manually.
- The spool up function of winch 4 turns off.
- The „Boom limitation“ icon appears on the LICCON monitor 0.

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9 Erecting the boom

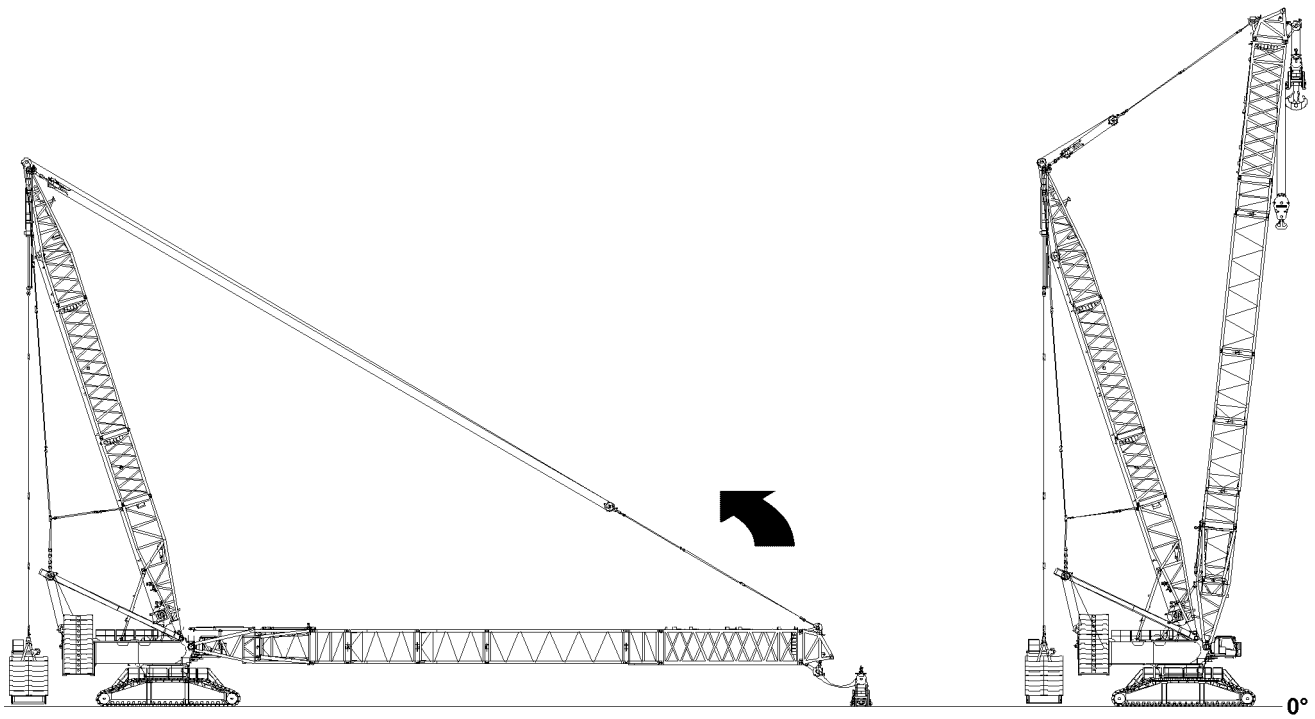

Fig.120316: Erecting the boom

WARNING
The crane can topple over!
In crane operation with deactivated LICCON overload protection, the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook.

If required in the erection and take down chart:
- ▶ Carry the hook block along with the auxiliary crane.

WARNING
The crane can topple over!
If the following conditions are not met before erecting the boom, the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ Observe the technical safety instructions, see Crane operating instructions, chapter 5.01.
- ▶ Make sure that the relapse cylinders of the main boom are completely extended before erection of the boom combination.
- ▶ Do not allow slack rope to build up on the winch 4.

WARNING
Falling hoist rope!
If the hoist rope is not reeved with the respective length on the roller set / the roller sets of the end section before the erection procedure, then it can fall down backward due to its own weight.
Death, severe bodily injuries, property damage.
- ▶ Reeve the hoist rope before the erection procedure with a sufficient length on the roller set / the roller sets of the end section.
- ▶ The hoist rope must be constantly monitored during the erection procedure.
- ▶ Make sure that there are no persons within the danger zone.

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Make sure that the following prerequisites are met:
- The crane is horizontally aligned.
- The guy rods are properly assembled.
- The guy rods which are not required have been removed from the lattice sections.
- All electrical connections have been made.
- All hydraulic connections have been made.
- The function checks were carried out properly.
- All limit switches and warning devices are functioning.
- Crane ballasting (counterweight, central ballast, derrick ballast and / or auxiliary ballast) is carried out according to the load charts and / or the erection and take-down charts
- The crane has been set up according to the load charts and / or the erection and take-down charts.
- The LICCON overload protection has been set according to the data in the load charts and / or the erection and take-down charts.
- The LICCON overload protection settings have been checked for completeness and correctness.
- Assembly operation of the crane control is activated: the assembly icon is visible on the LICCON monitor.
- All pin connections have been secured.
- The hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins.
- There are no loose parts on the boom system.
- The boom system and the safety equipment are free from snow, frost and ice.
- No personnel or obstacles are within the danger zone.

9.1 Moving the S-relapse cylinders out

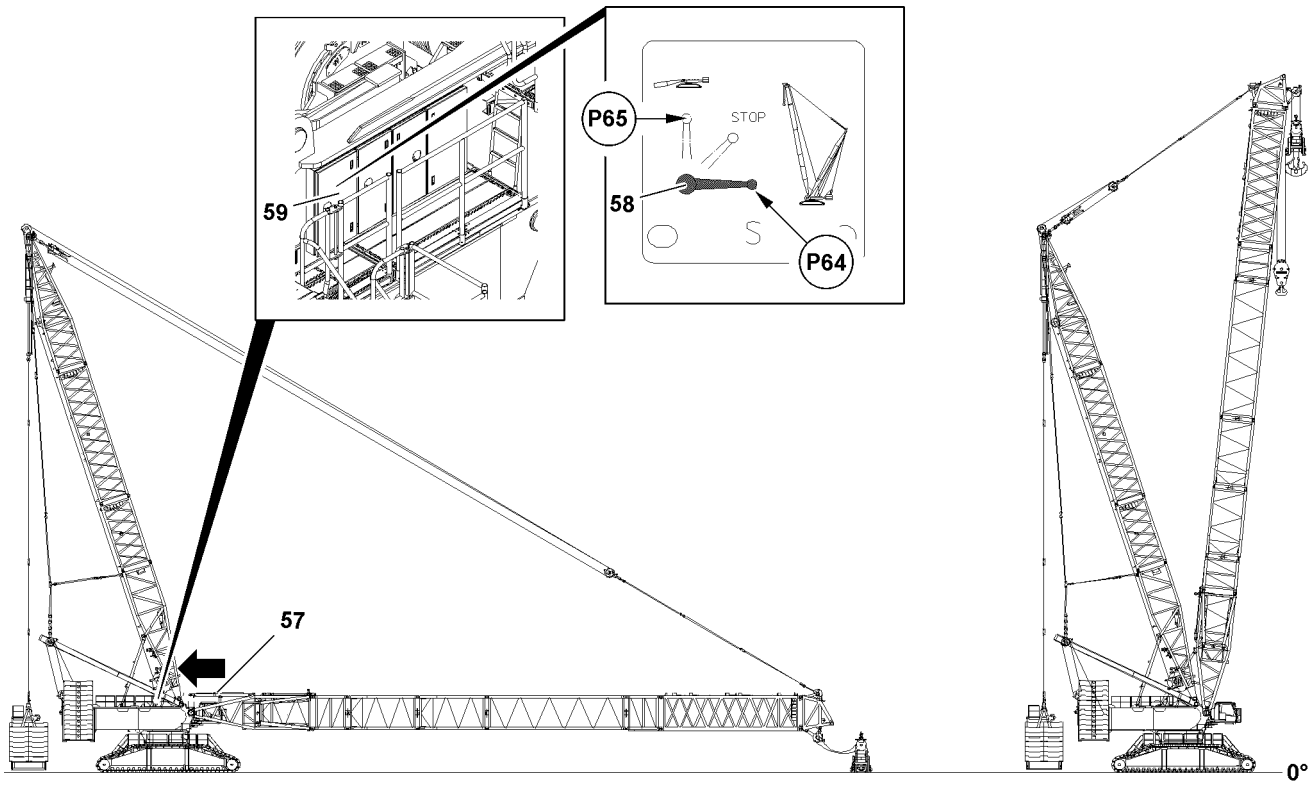

Fig.120315: Extending the relapse cylinder

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WARNING
The crane can topple over!
If the S-relapse cylinders **57** are not moved out before erecting the P-boom, then the P-boom can fall to the rear in crane operation and the crane can topple over.
Death, severe bodily injuries, property damage.
▶ Move the S-relapse cylinders **57** out completely before erecting the P-boom.
▶ Secure the ball valve **58** during crane operation to prevent inadvertent actuation.

Ball valve positions	
Position (P)	Function
64	Crane operation, extend the piston rod
65	Assembly, retract the piston rod
STOP	The piston rod cannot be retracted / extended

The piston rods on the S-relapse cylinders **57** can be moved out with the ball valve **58**.

▶ Set the ball valve **58** to position **P64**.

Result:

– The piston rods of the S-relapse cylinders **57** move out.

Note
▶ The ball valve **58** is secured by closing the cabinet door **59** and removing the key.

▶ Close the cabinet door **59** and pull out the key.
▶ Hand the key to an authorized person.

9.2 Erection procedure

DANGER
The crane can topple over!
▶ It is prohibited to turn the crane superstructure while erecting the boom.
▶ Adhere to the specifications in the erection and take down charts.

Make sure that the following prerequisite is met:
– The load weighing was carried out on the boom and the hook block weight has been entered on the LICCON monitor, see Crane operating instructions, chapter 4.02.

9.2.1 Reeving in the hook block

Make sure that the following prerequisites are met:
– The crane is horizontally aligned.
– The slewing gear brake is applied.

WARNING
Danger of accident due to side wind!
If the slewing gear brake is released after reeving in / reeving out the hook block / load hook, then the crane can turn uncontrolled if there is a strong side wind.
Death, severe bodily injuries, property damage.
The crane can collide with close-by structures or objects.
▶ Make sure that the current wind speed does not exceed the values from the wind speed chart when releasing the slewing gear brake.

▶ Erect the boom until the end section lifts off the ground.

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NOTICE
Danger of slack rope formation!
By spooling the hoist winch out too fast during the reeving procedure, slack rope can form.
▶ Make sure that the hoist rope is tensioned during the entire reeving procedure.

WARNING
Falling hoist rope!
If the hoist rope is not reeved with the respective length over the S-boom before the erection procedure, then it can fall backward due to its own weight.
Death, severe bodily injuries, property damage.
▶ Reeve in the hoist rope with sufficient length on the S-boom before the erection process.
▶ The hoist rope must be constantly monitored during erection.
▶ Do not step into the danger zone.

▶ Reeve in the hoist rope properly and secure on the rope fixed point, see Crane operating instructions, chapter 4.06.

Note
▶ Reeving, see Reeving plan.

▶ Pin and secure the rope retainers on the rope pulleys.
▶ Attach the hoist limit switch weight, see section Crane operating instructions, chapter 4.06.

9.2.2 Erecting the boom

WARNING
The crane can topple over!
In crane operation with deactivated LICCON overload protection, the crane can topple over.
There is then no additional protection against crane overload.
Death, severe bodily injuries, property damage.
▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook.
▶ Crane operation with deactivated LICCON overload protection is prohibited.

Note
▶ When the lowest operating position of the boom is reached, the LICCON overload protection is activated.
▶ In the maximum load icon appears a load number in „t“ instead of the display „???“.

▶ Luff the S-boom up to the lowest operating position.

When the S-boom has reached the lowest operating position:
▶ Make sure that the assembly icon on the LICCON monitor turns off.

Result:

– The LICCON overload protection is active.

10 Operating the crane

10.1 Preparing for crane operation

Note
▶ Observe the notes, see Crane operating instructions, chapter 4.02, chapter 4.04, chapter 4.05, chapter 4.08 and chapter 5.01.

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Make sure that the following prerequisites are met:
- The LICCON overload protection is active.
- The LICCON overload protection has been set according to the data in the load chart.

WARNING
The crane can topple over!
- ▶ Check the horizontal position of the crane before and during operation.
- ▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset if necessary before resuming crane operation.

10.1.1 Checking the settings

- ▶ Check the function of the overload protection by running against the operating positions „on top“ and „bottom“.
- ▶ Check the hoist limit switch by running against the hoist limit switch weight.
- ▶ Check the function of the limit switches „Boom steep“ on the relapse cylinders.

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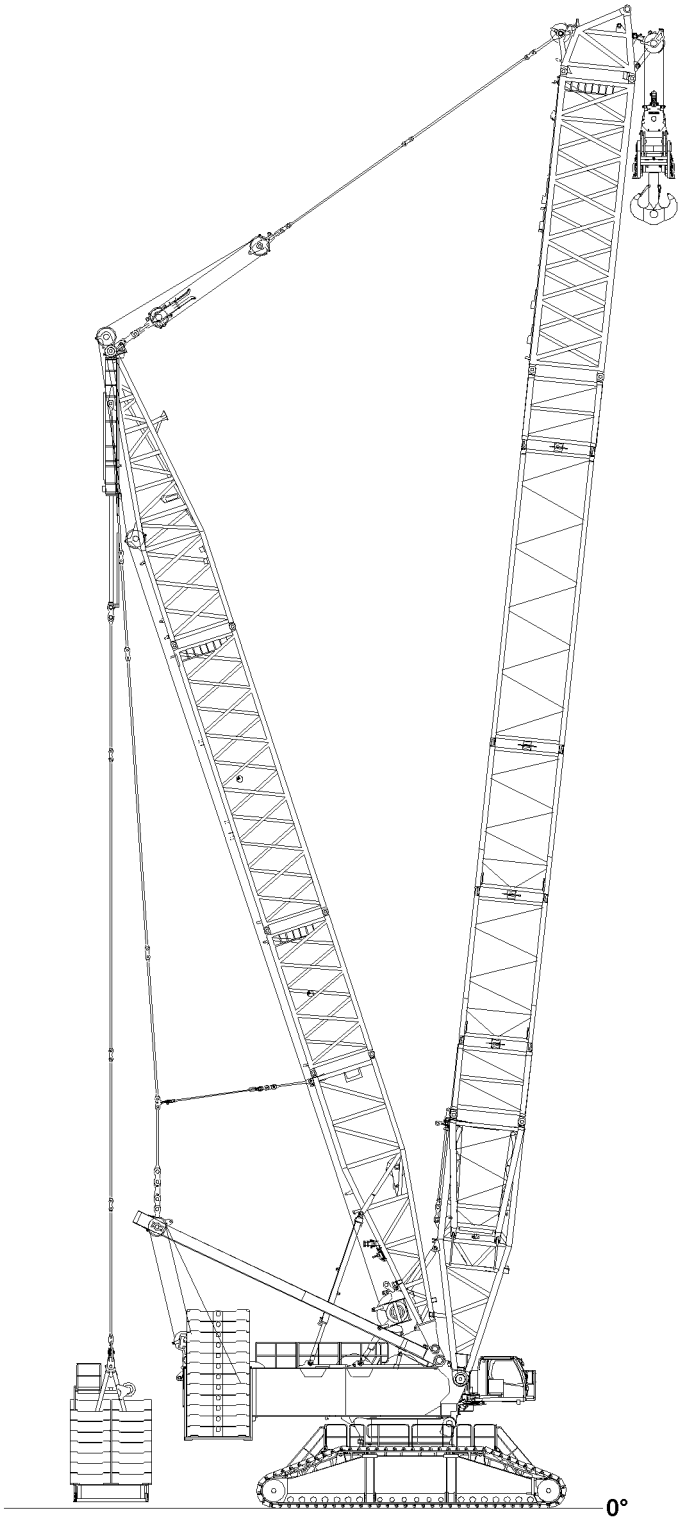

Fig.120326: Disassembly PD-boom

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11 Disassembly PD-boom

WARNING
Danger of falling!
During assembly / disassembly, inspection and maintenance work, assembly personnel must be secured with appropriate aids to prevent them from falling.
Death, severe bodily injuries, property damage.
- ▶ All work at a height, when there is a danger of falling, must be carried out with suitable aids.
- ▶ If aids are not available and work cannot be carried out from the ground, then assembly personnel must secure themselves with the supplied fall arrest system to prevent falling, see the Crane operating instructions, chapter 2.04.
- ▶ If fall protection equipment is available, then it must be used, see the Crane operating instructions, chapter 2.06.
- ▶ When lifting, lowering, swinging crane parts in and out, no persons may remain in the danger zone.
- ▶ When closing or opening boom systems during boom assembly or boom disassembly, no persons may remain on the boom system or in the danger zone.
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work.
- ▶ Only step on the aids, ladders and catwalks with clean shoes.
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice.
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited.
- ▶ Remaining on a suspended load is prohibited.
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited.
- ▶ For all assembly work, the crane driver of the main crane must be in voice contact with the crane driver / crane drivers of the auxiliary crane / auxiliary cranes.
- ▶ For assembly tasks, the crane driver may only initiate crane movements when the responsible guide has explicitly released the movement.

WARNING
The lattice sections can fall down!
If the lattice sections are not pinned and secured correctly, then they can fall down.
Death, severe bodily injuries, property damage.
- ▶ Pin or unpin both pins at the same horizontal level, i.e. **left and right**.
- ▶ Do not stand under the lattice sections or within the entire danger zone during the pinning and unpinning procedure of the boom.
- ▶ Safely secure the pins in the storage locations as well as in the receptacles.
- ▶ It is prohibited to lean the auxiliary ladder against the component being disassembled.

WARNING
Danger of impact / crushing!
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth.
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing.
Death, severe bodily injuries, property damage.
- ▶ Make sure that personnel cannot be caught by components.
- ▶ Make sure that the crane is horizontally aligned.
- ▶ When working in danger zones: Use aids to protect limbs.
- ▶ Guide components with suitable aids to minimize oscillation.

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DANGER
The components can fall down!
If the corresponding components are disengaged from the auxiliary crane before the corresponding component is pinned, the corresponding component can fall down and fatally injure personnel.
▶ Do not disengage the auxiliary crane until the respective component is pinned and secured.

Make sure that the following prerequisites are met:
- The ground is able to safely take on the total operating weight of the crane.
- The crane is horizontally aligned.
- A substructure is standing on the correct location, if needed, see Crane operating instructions, chapter 5.01.
- An auxiliary crane with sufficient load bearing capacity if available.
- An assembly scaffolding or a work platform is available.
- The counterweight has been installed on the turntable according to the load chart or the erection and take down charts.
- The LICCON overload protection has been set according to the data in the load chart.

11.1 Disassembling the derrick ballast

WARNING
The crane can topple over!
If no derrick ballast is installed on the crane, the crane can topple over.
Death, severe bodily injuries, property damage.
▶ Observe the Erection and take down charts.
▶ If a derrick ballast is required for taking down the boom system, then leave the derrick ballast on the crane.

When no derrick ballast is required for taking down the boom system:
▶ Disassemble the derrick ballast, see Crane operating instructions, chapter 5.36.

11.2 Disassembling the central ballast

WARNING
The crane can topple over!
If no central ballast is installed on the crane, the crane can topple over.
Death, severe bodily injuries, property damage.
▶ Observe the Erection and take down charts.
▶ If a central ballast is required for taking down the boom system, then leave the central ballast on the crane.

When no central ballast is required for taking down the boom system:
▶ Remove the central ballast, see Crane operating instructions, chapter 3.03.

11.3 Turning the turntable to the disassembly position

WARNING
The crane can topple over!
If the following conditions are not met before turning the turntable, then the crane can topple over.
Death, severe bodily injuries, property damage.
▶ Observe the specifications in the erection and take-down charts.
▶ Observe the data in the load charts.

▶ Turn the turntable into disassembly position according to the erection and take down charts.

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11.4 Luffing the boom system down and reeving the hoist rope out

WARNING
The crane can topple over!
If the following conditions are not met before taking down the main boom, the crane can topple over.
Death, severe bodily injuries, property damage.
- ▶ Observe the technical safety instructions, see Crane operating instructions, chapter 5.01.
- ▶ Observe the specifications in the erection and take-down charts.

NOTICE
Damage of boom components!
Taking down the boom system can lead to a collision between the hook block and the pulley head.
Boom components can be severely damaged.
- ▶ Luff the boom system down and at the same time spool the hoist winch out.
- ▶ When luffing the boom system down, the D-boom must remain in operating position until the boom is laying on the substructure or until the boom end section is laying on the ground or is safely held by an auxiliary crane.

Note
- ▶ The luff down movement is turned off as soon as the lowest operating position of the main boom is reached.
- ▶ When the lowest operating position of the main boom is reached, the load display in the maximum load icon turns off and instead of the load display appears the display „???“.
- ▶ In the crane operating screen appear alarm functions.

- ▶ Luff the boom down to the **lowest** operating position.

Result:

– The luff down movement is turned off.
– The „STOP“ icon appears on the LICCON monitor.
– The horn icon appears on the LICCON monitor.

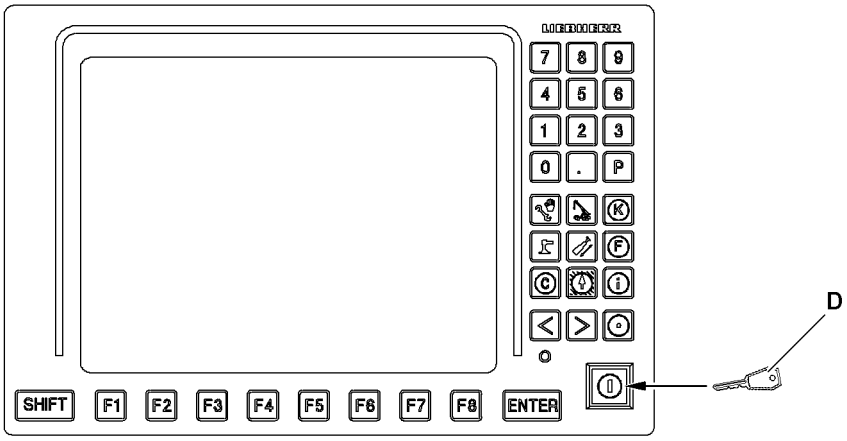

Fig.119109: Exceeding the shut off limits of the LICCON overload protection: Engage assembly operation

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WARNING
Danger of accident due to function „Exceedance of shut-off limits of the LICCON overload protection“!
If the shut off limits of the LICCON overload protection are exceeded, there is no additional protection against crane overload.
Due to erroneous operation or deliberate misuse, the crane could collapse, the boom can break off or the crane can topple over.
Death, severe bodily injuries, property damage.

- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ is only permissible in emergencies and for assembly purposes.
- ▶ The function „Exceeding the shut off limits of the LICCON overload protection“ may only be actuated by persons who know the effects of their actions regarding the function „Exceeding the shut off limits of the LICCON overload protection“.
- ▶ The function „Exceedance of shut off limits of the LICCON overload protection“ requires the presence of an authorized person and must be performed with utmost caution.
- ▶ Crane operation with activated function „Exceedance of shut off limits of the LICCON overload protection“ is prohibited.

▶ Exceeding the shut off limits of the LICCON overload protection: Engage assembly operation.

Result:

– The shut off limits of the LICCON overload protection are exceeded.
– The assembly icon appears on the LICCON monitor.

Note
▶ See the Crane operating instructions, chapter 4.02 and chapter 4.20.

▶ At the same time, spool the hoist winch out and luff the boom system down until the hook block touches the ground.

WARNING
Danger of accident due to side wind!
If the slewing gear brake is released after reeving in / reeving out the hook block / load hook, then the crane can turn uncontrolled if there is a strong side wind.
Death, severe bodily injuries, property damage.
The crane can collide with close-by structures or objects.

- ▶ Make sure that the current wind speed does not exceed the values from the wind speed chart when releasing the slewing gear brake.

▶ Remove the hoist limit switch weight and reeve out the hook block, see Crane operating instructions, chapter 4.06.
▶ Remove the hook block with the auxiliary crane.

When the hook block is removed under the boom head:
▶ Continue to luff the boom system down until the roller set / roller sets are just above the ground.

WARNING
Spooling up of hoist rope!
Death, severe bodily injuries, property damage.

- ▶ All rope retaining pins / pipes on the boom system are removed.
- ▶ Slowly spool up the hoist rope over the rope pulleys back to the winch.
- ▶ No one may be present in the danger zone.

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NOTICE
Overspooled winch!
If the hoist rope is pulled under the winch when spooling up, then the adjustment of the cam limit switch can change.
A new adjustment by **Liebherr Service** is required.
▶ Stop the winch in time, with sufficient rope reserve.
▶ Do not overspool the winch.

▶ Spool the hoist rope up.

11.5 Moving the S-relapse cylinder in

Make sure that the following prerequisite is met:
– The crane engine is running.

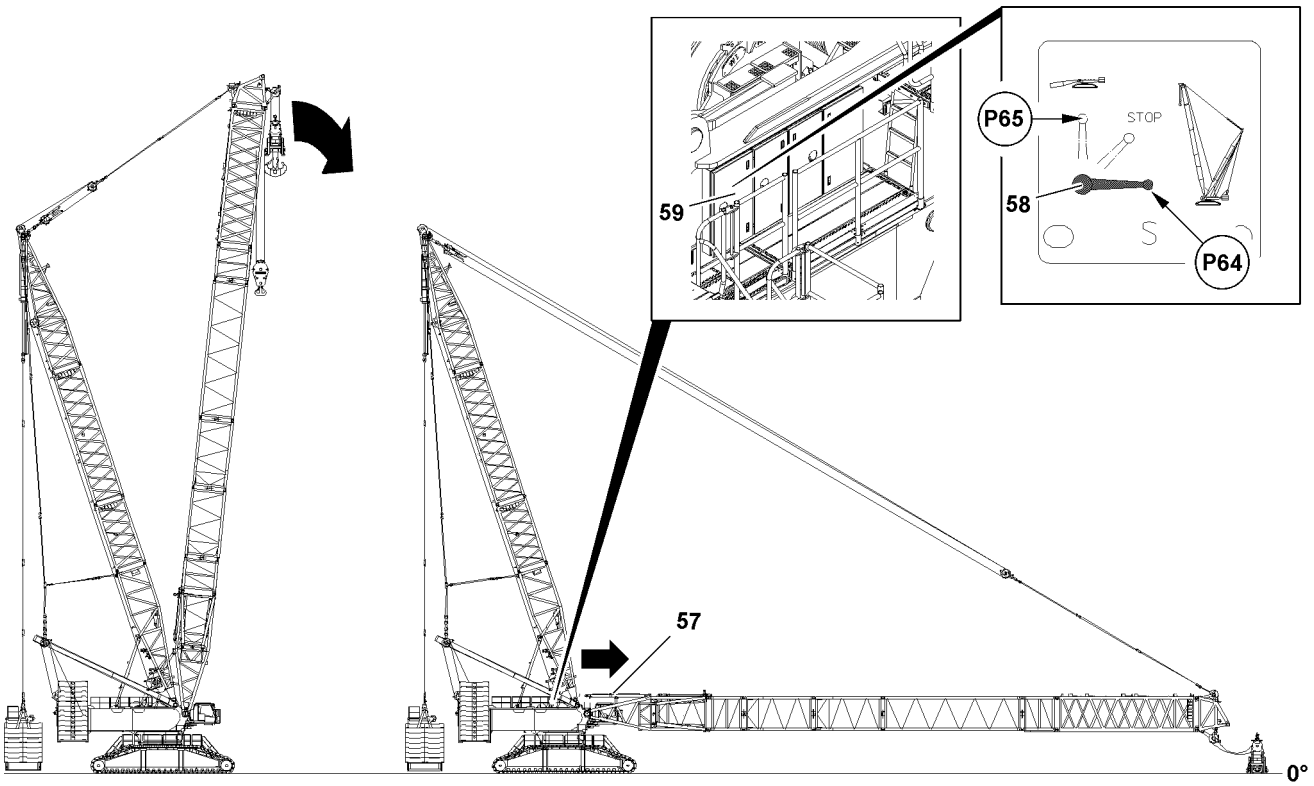

Fig.120327: Luffing the boom system down / retracting the relapse cylinder

Ball valve positions	
Position (P)	Function
64	Crane operation, extend the piston rod
65	Assembly, retract the piston rod
STOP	The piston rod cannot be retracted / extended

▶ Move the S-relapse cylinder **57** in: Actuate the ball valve **58** in position **P65**.

Result:

– The piston rods of the S-relapse cylinders **57** move in.

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Note
▶ The ball valve **58** is secured by closing the cabinet door **59** and removing the key.

▶ Close the cabinet door **59** and pull the key.
▶ Hand the key to an authorized person.

11.6 Disassembly of the roller sets on the boom head

NOTICE
Danger of property damage!
During the disassembly of the roller sets the electrical connections to the hoist limit switches can be damaged.
▶ Remove the hoist limit switches on the roller sets.

▶ Before disassembly of the roller sets, route the hoist limit switches from the roller sets back to the end section.

Note
▶ The disassembly of the roller sets is described in the Crane operating instructions, chapter 5.14.

11.7 Placing the boom on the substructure

Make sure that the following prerequisites are met:
– The hook block is properly unreeved and removed.
– The hoist limit switch in on the end section.
– The roller set / the roller sets are removed.

NOTICE
Overload of boom!
If the boom is not supported before the take down procedure, then the boom can be overloaded during the take down procedure.
The boom system will be damaged.
▶ Support the PD-boom from a length of more than 120 m.
▶ Make sure that the dimension **X** for the maximum permissible flexation of the boom system is never exceeded.
▶ Support the boom with suitable materials with sufficient load carrying capacity in the marked area, see section „Assembling the boom combinations with the substructure“.

▶ Take the boom system down on the substructure.
or
Secure the boom system with the auxiliary crane in the horizontal position.
or
Take the boom system down on the ground.

11.8 Disconnecting the electrical connections on the boom end section

Make sure that the following prerequisite is met:
– The main boom is placed on the ground or is safely held by the auxiliary crane.

NOTICE
Damage to cable drum or cable!
If the cable of the cable drum is not properly spooled up on the cable drum after unplugging the S-end section, then the cable drum or the cable can be significantly damaged.
▶ Spool the cable drum up after unplugging.

▶ Spool the cable drum up and secure it to prevent inadvertent spooling out.
▶ Disconnect the electrical connections and store the plugs and cables properly.

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11.9 Placing the guy rods down

Make sure that the following prerequisites are met:
- The boom is laying on the substructure on the ground.
- The guying is relieved.
- The auxiliary guying is removed (only if present).

NOTICE
Danger of slack rope formation!
If the D-boom is luffed down too quickly at disassembly of the guy rods, then slack rope formation can occur.
▶ Make sure that the rope of winch 3 is tensioned during the entire luff down procedure of the D-boom.

▶ Luff the D-boom down to the front and spool up winch 3 simultaneously until the guy rods are placed in the transport receptacles of the intermediate sections and in the transport receptacles of the bridge.
▶ Fasten the upper pulley block **19** to the auxiliary crane and hold it in position with the auxiliary crane.

When the upper pulley block **19** is safely held by the auxiliary crane:
▶ Unpin the guy rods on the upper pulley block **19**.
▶ Secure guy rods in the transport retainers of the S-intermediate sections: Insert and secure the pin.
▶ Guy rods, which are taken down on the rod receptacles of the bridges must be lifted off the boom system with the auxiliary crane and properly removed.

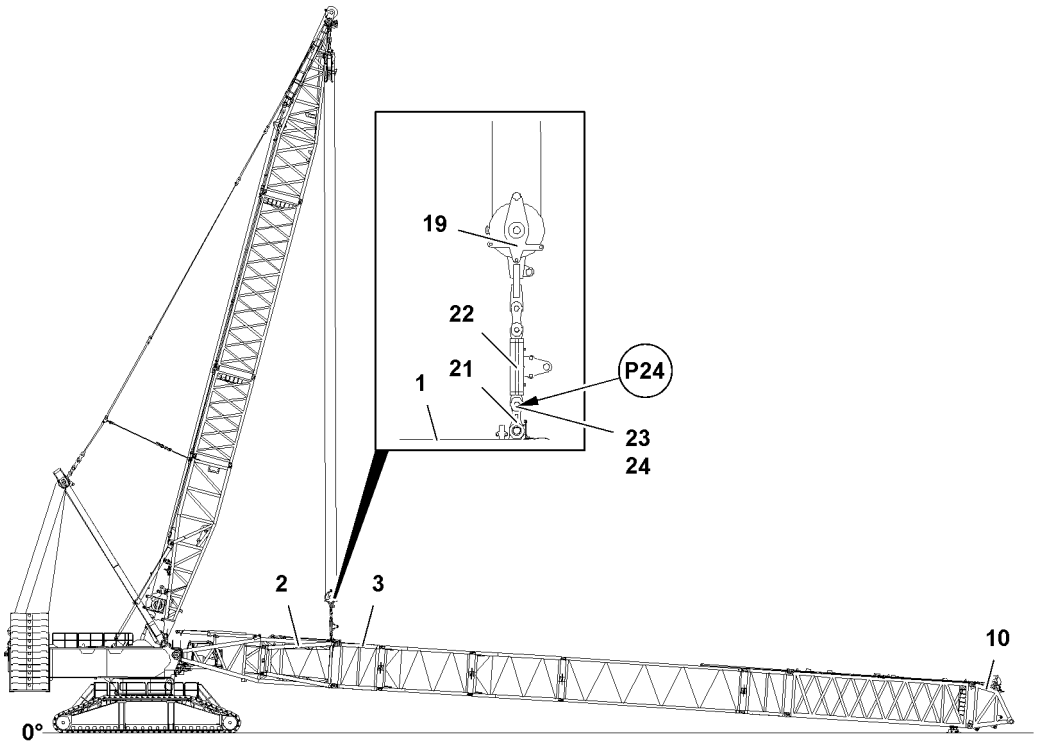

Fig.120328: Taking the guy rods down - Pinning the upper pulley block on the S-pivot section

▶ Install the assembly weight **22** on the upper pulley block **19**.
▶ Properly pin and secure the upper pulley block **19** (including assembly weight **22**) on the brackets **21** on the S-pivot section **1**.
▶ Spool winch 3 up carefully and guide the upper pulley block **19** with the auxiliary crane to the D-end section.
▶ Erect the D-boom until the D-end section stands vertically over the brackets **21** on the S-pivot section **1**.

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▶ Tension the main boom by spooling up winch 3.

WARNING
The crane can topple over!
▶ Make sure that the end section **10** of the boom system does **not** lift off the ground when opening the boom system.

When the upper pulley block **19** including the assembly weight **22** are pinned with the brackets **21** on the S-pivot section **1**:
▶ Spool winch 3 up until the boom system is held.

11.10 Opening the boom system

Make sure that the following prerequisites are met:
– The boom system is held safely by the upper pulley block.
– No personnel or obstacles are within the danger zone.

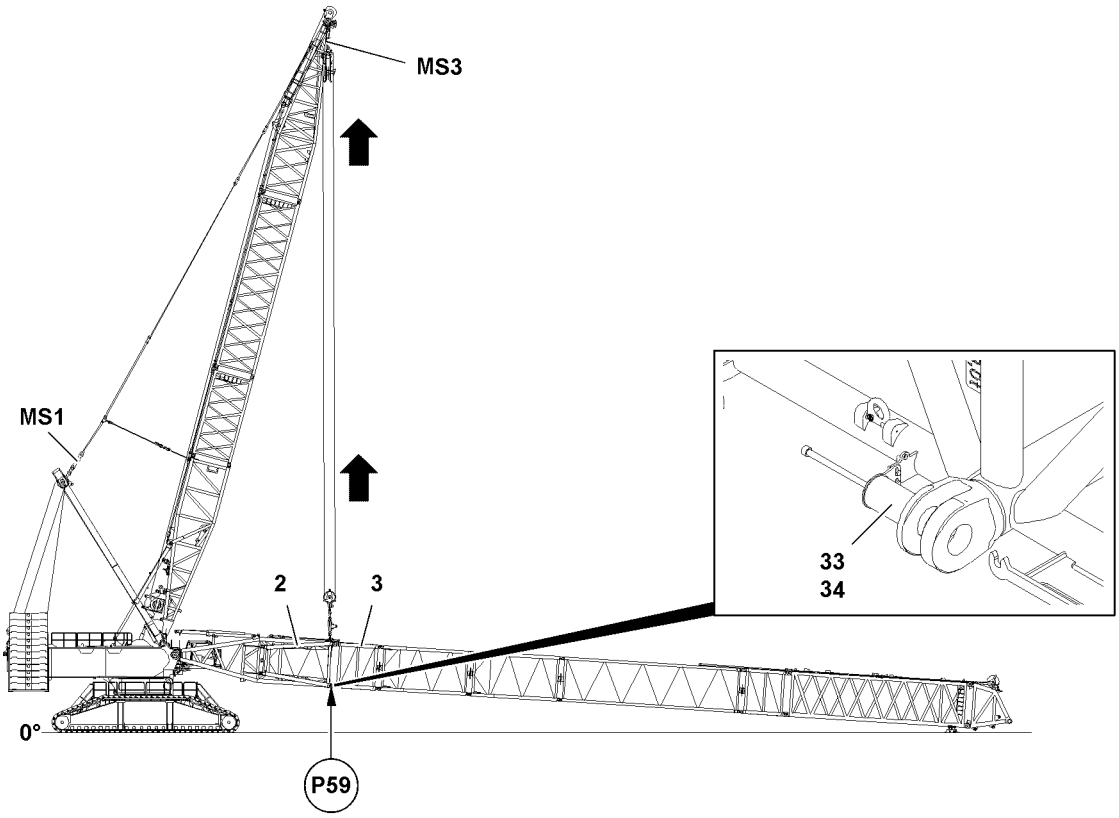

Fig.120329: Opening the boom system - tensioning the guying

WARNING
The crane can topple over!
If the following conditions are not met, the crane can topple over or be significantly damaged.
Death, severe bodily injuries, property damage.
▶ Do **not** exceed the maximum permissible total forces on test point 1 **MS1** and test point 3 **MS3**.
▶ Lifting and opening the respective boom is only permissible by observing the maximum permissible boom lengths and total forces.
▶ The end section may **not** lift off the ground during „opening procedure“ of the boom system.
▶ Make sure that there are no persons on the boom system as well as in the danger zone during the opening procedure.

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Note

- ▶ The actual forces on test point 1 **MS1** and test point 3 **MS3** - which are used during the closing procedure of the boom system - are shown on LICCON monitor 1.
- ▶ Tension the guying on the test points at disassembly with the same forces as for assembly.
- ▶ For this, use the ACTUAL forces on the test point 1 (MS1) and test point 3 (MS3) measured and recorded during the assembly.
- ▶ The pins can be pulled easier and the pins and lugs are therefore not damaged.

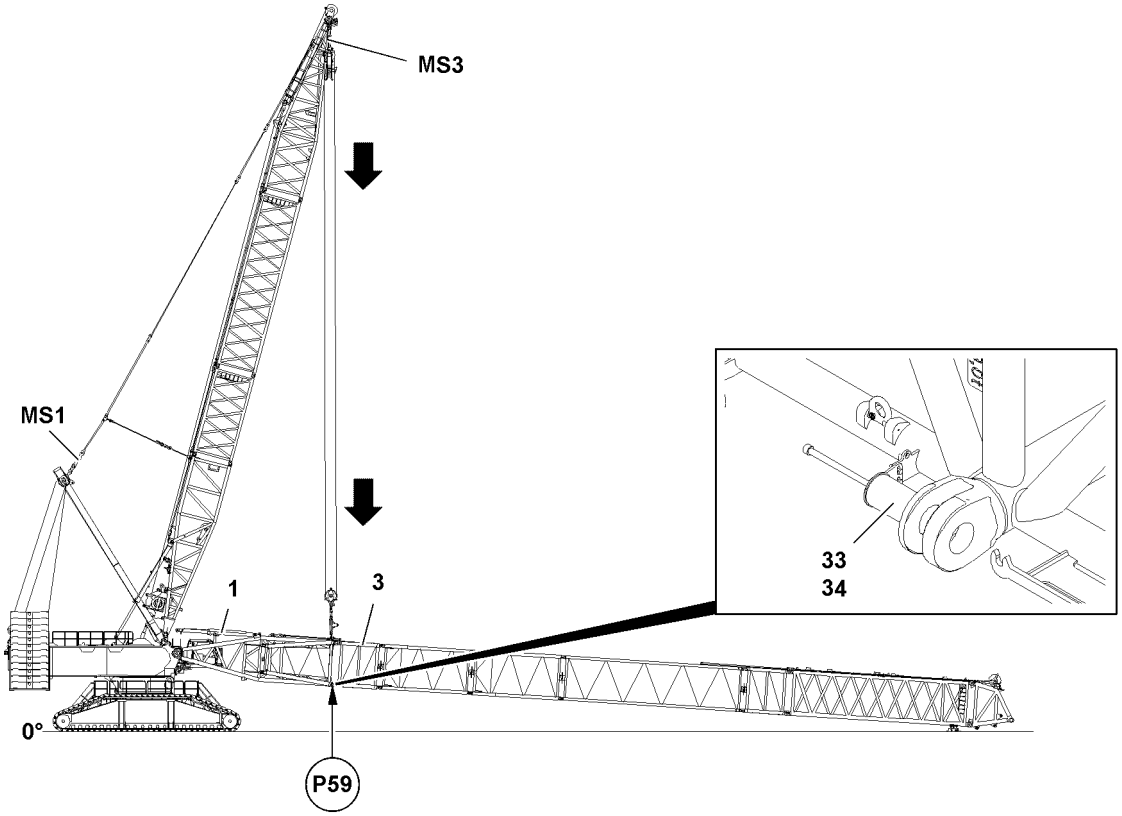

Fig.120330: Opening the boom system - unpinning the cross carrier on the bottom

- ▶ Open the boom system: Release and unpin the pins **33** on the „bottom“ on the four points **P59**.

NOTICE

Danger of property damage!

When lowering the boom system, crane components can be damaged.

- ▶ Make sure that the S-pivot section **1** is not lowered directly on the ground.
- ▶ Lower the S-pivot section **1** in the substructure when opening the boom system.

When the pins **33** are completely unpinned:

- ▶ Lower the boom system carefully on the substructure on the ground.

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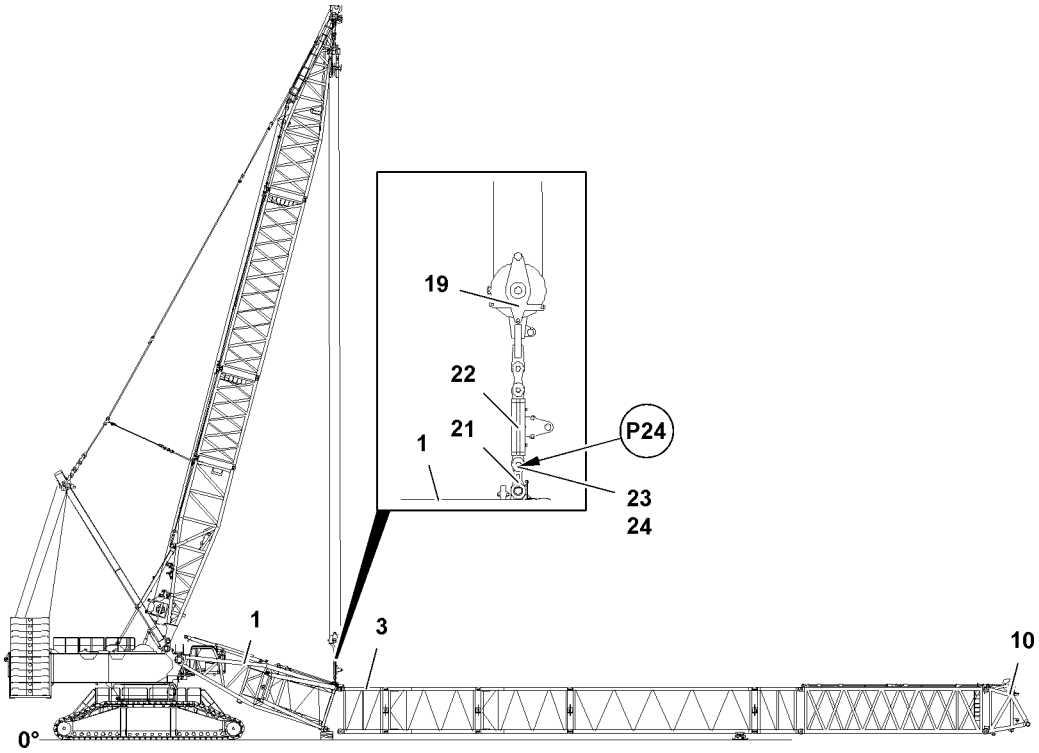

Fig.120331: Opening the boom system - Unpinning the upper pulley block on the S-pivot section

When the S-pivot section **1** is laying on the substructure on the ground:

- ▶ Unpin the assembly weight **22** on the brackets **21**: Release the pin **23** on point **P24** and unpin.
- ▶ Disconnect the electrical connections between the boom end section **10** and the S-pivot section **1** properly.
- ▶ Place the previously removed guy rods, which were not required, on the lattice sections, pin and secure.

11.11 Removing the lattice sections of the PD-boom

WARNING
The crane can topple over!
Death, severe bodily injuries, property damage.
- ▶ The turntable may not be turned during the disassembly of the boom

WARNING
Danger of accident!
Death, severe bodily injuries, property damage.
- ▶ Depending on the condition of the ground, the boom and the lattice sections must be supported from below for the assembly of the boom.
- ▶ Observe the technical safety instructions, see Crane operating instructions, chapter 5.01.

WARNING
General danger notes!
Death, severe bodily injuries, property damage.
- ▶ Support the main boom during assembly / disassembly with suitable materials.
- ▶ It is prohibited for anyone to remain under the booms or within the complete danger zone during the pinning and unpinning procedure of the lattice section.

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Note
▶ The lattice sections are unpinned with the pin pulling device, see Crane operating instructions, chapter 5.30.

Make sure that the following prerequisites are met:
- The crane is horizontally aligned.
- An auxiliary crane with an adequate load bearing capacity is available.
- An assembly scaffolding / work platform is available.
- The counterweight has been installed on the turntable according to the load chart.
- The LICCON overload protection has been set according to the data in the load chart.
- The guy rods are properly removed from the rod receptacles of the bridges **12**.

11.11.1 Bringing the rod receptacle in transport position

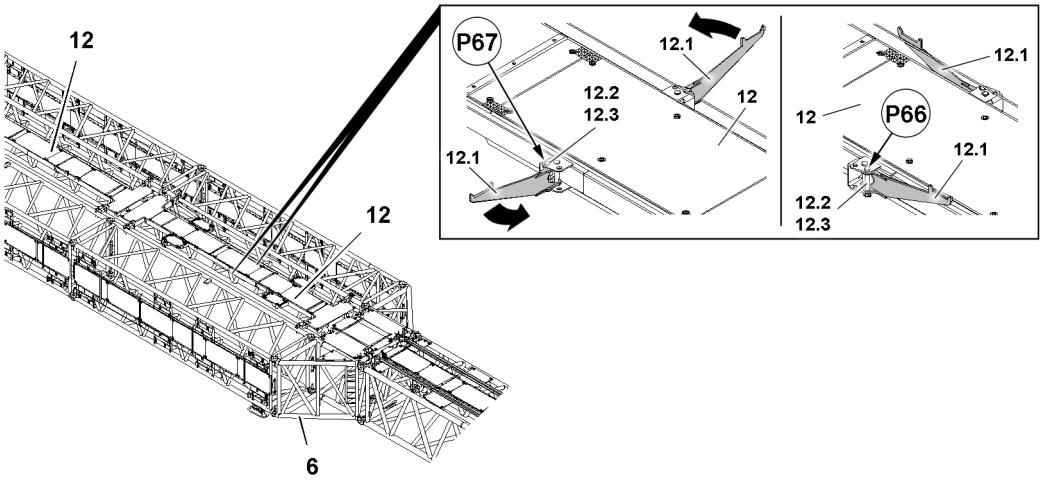

Fig.124518: Bringing the rod receptacle in transport position

Note
▶ The description of the procedure „Bringing the rod receptacle in transport position“ is an example and is described via one rod receptacle **12.1**.
▶ The procedure for the rod receptacle on the opposite side is identical.

▶ Remove the locking pin **12.1** at point **P67** and unpin the pin **12.2**.
▶ Swing the rod receptacle **12.1** all the way in.

When the rod receptacle **12.1** is in transport position:
▶ Insert the pin **12.2** at point and secure properly with the locking pin **12.1**.

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11.11.2 Removing the bridges

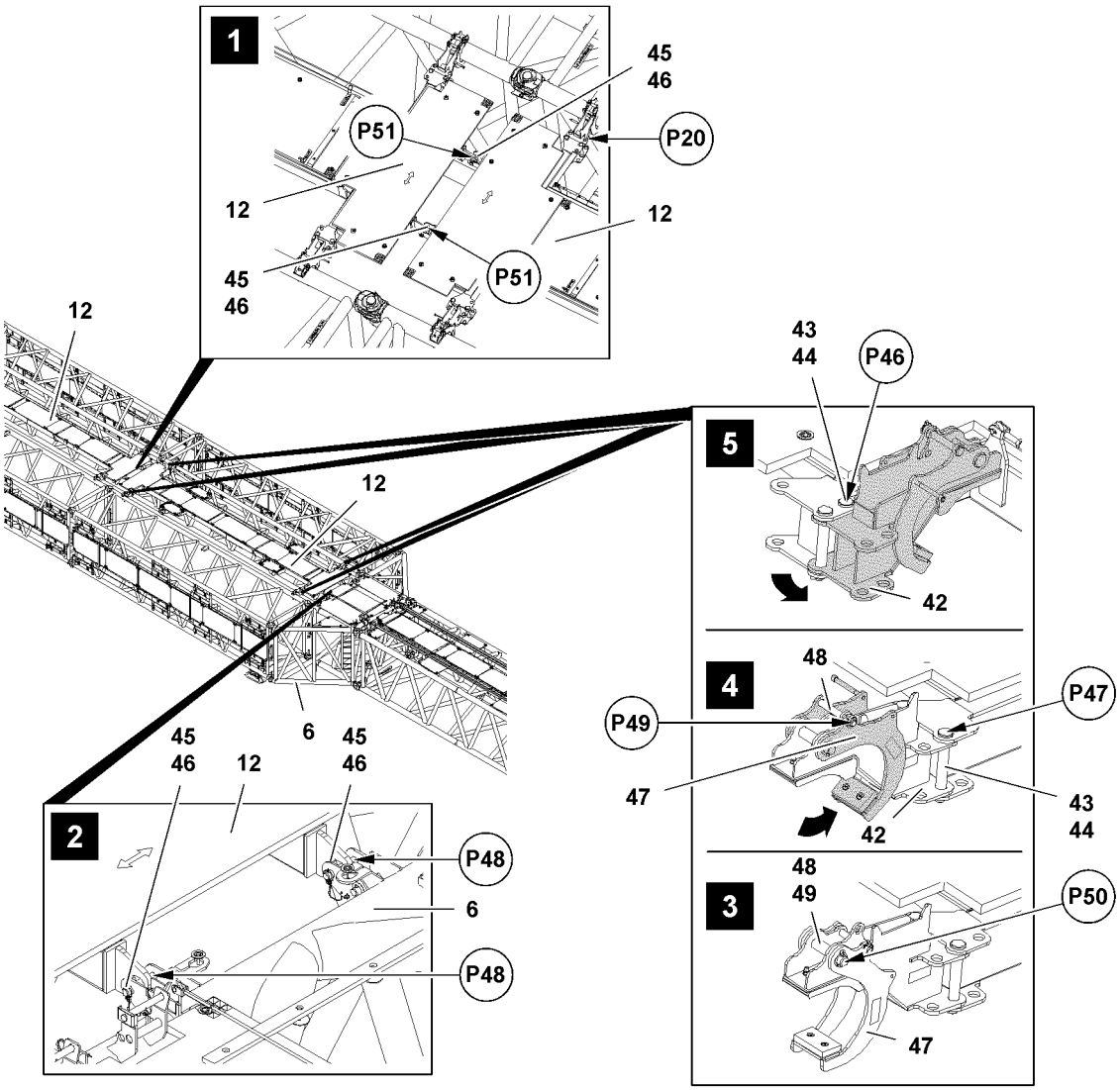

Fig.120325: Removing the bridges

NOTICE
Danger of property damage!
At disassembly, the rod receptacles **12.1** can be severely damaged.
▶ Make sure that the rod receptacles **12.1** on the bridges **12** are in transport position.

Note
▶ The following descriptions are an example for the removal of all bridges **12**.

WARNING
Danger of falling!
▶ Make sure that the assembly personnel is secured with the supplied fall arrest system to prevent them from falling when removing the bridges.

Make sure that the following prerequisites are met:
– The P-boom system is taken down on the ground.
– No guy rods are on the bridges **12**.
– The rod receptacles **12.1** on the bridges **12** are in transport position.

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▶ Fasten the bridge **12** to the auxiliary crane, see section „Fastening points“.

When one bridge **12** is removed from another bridge **12**:

▶ Unpin the bridge **12** on bridge **12**: Release the pins **45** on both sides on points **P51** and unpin, see illustration **1**.

When a bridge **12** is removed from the upper P-adapter **6**:

▶ Unpin the bridge **12** on the upper P-adapter **6**: Release the pins **45** on both sides on points **P48** and unpin, see illustration **2**.

Securing the retaining plates **47** in transport position is made for all four retaining plates **47** of the bridge **12**.

▶ Release the retaining plate **47** in operating position: Release the pin **48** on point **P50** and unpin, see illustration **3**.
▶ Fold the retaining plate **47** up and secure in transport position: Insert the pin **48** on point **P49** and secure with safety locking pin **49**, see illustration **4**.
▶ Repeat the procedure for all retaining plates **47** on the bridge **12**.
▶ Lift the bridge **12** with the auxiliary crane.
▶ Take the bridge **12** down in a suitable storage location.
▶ Remove the auxiliary crane.

Securing the folding brackets **42** in transport position is made for all four folding brackets **42** of the bridge **12**.

▶ Unpin the folding bracket **42** in operating position: Release the pin **43** on point **P47** and unpin, see illustration **4**.
▶ Swing the folding bracket **42** from operating position into transport position.
▶ Pin the folding bracket **42** in the transport position: Insert the pin **43** on point **P46** and secure with safety locking pin **44**, see illustration **5**.
▶ Repeat the procedure for all folding bracket **42** on the bridge **12**.

Note

▶ Subsequent bridges **12** are removed the same way as described before.

▶ Remove all bridges **12**.

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11.11.3 Disassembling the S-intermediate sections / S-adapter / S-end section on the upper P-adapter

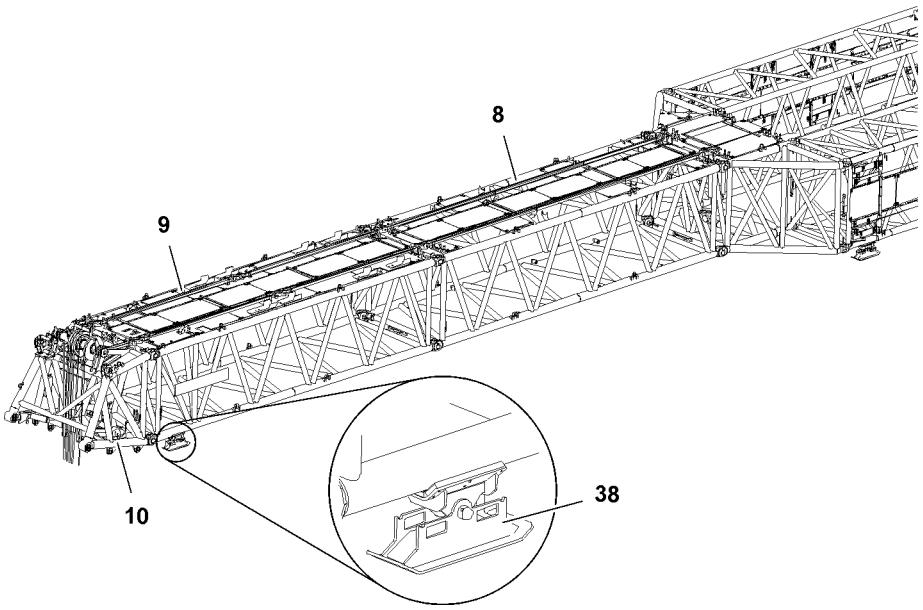

Fig.120318: Disassembling the S-intermediate sections / S-adapter / S-end section on the upper P-adapter

Make sure that the following prerequisites are met:
- The PD-boom system is open and properly taken down on the assembly shoes.
- The upper pulley block is disassembled and lifted on the lower P-adapter.
- The guy rods on the S-intermediate sections **8**, the S-adapter **9** and the S-end section **10** are unpinned from each other.
- The guy rods on the S-intermediate sections **8**, the S-adapter **9** and the S-end section **10** are secured in the transport receptacles.
- An auxiliary crane with sufficient load carrying capacity is available.

Note

▶ The technical safety instructions during assembly and disassembly must be observed, see Crane operating instructions, chapter 5.01.

WARNING

Neglected change of the assembly shoes **38**!
Death, severe bodily injuries, property damage.

▶ Place the assembly shoes **38** properly under the lattice section, which is laying in front of the one to be removed, see Crane operating instructions, chapter 5.62.

▶ Place the assembly shoes in the marked area underneath, see Crane operating instructions, chapter 5.62.

▶ Disassemble the S-boom section leg properly.

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11.11.4 Disassembling the upper P-adapter on the L-intermediate sections

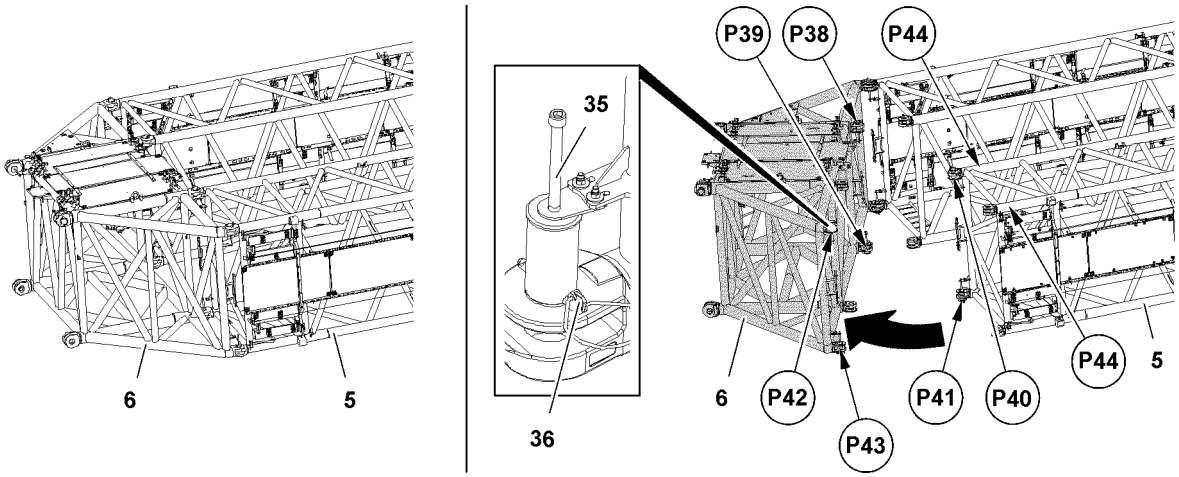

Fig.120319: Disassembling the upper P-adapter on the L-intermediate sections - Unpinning procedure

Make sure that the following prerequisites are met:
- The bridges are completely disassembled.
- The two strands between the L-intermediate sections **5** are each laying properly on the assembly shoes.

▶ Fasten the auxiliary crane on the upper P-adapter **6**, see section „Fastening points of the lattice sections“.

The pins **35** on the bottom, while they are still held by the pin pulling device, must be secured with the safety locking pins **36** to prevent them from falling down.

▶ Unpin the upper P-adapter **6** on the L-intermediate section **5**: Remove the safety locking pin **36** and unpin the pins **35** with the pin pulling device on point **P43**, point **P42**, point **P41**, point **P40**, point **P39** and point **P38**.
▶ Swing the upper P-adapter **6** up with the auxiliary crane.

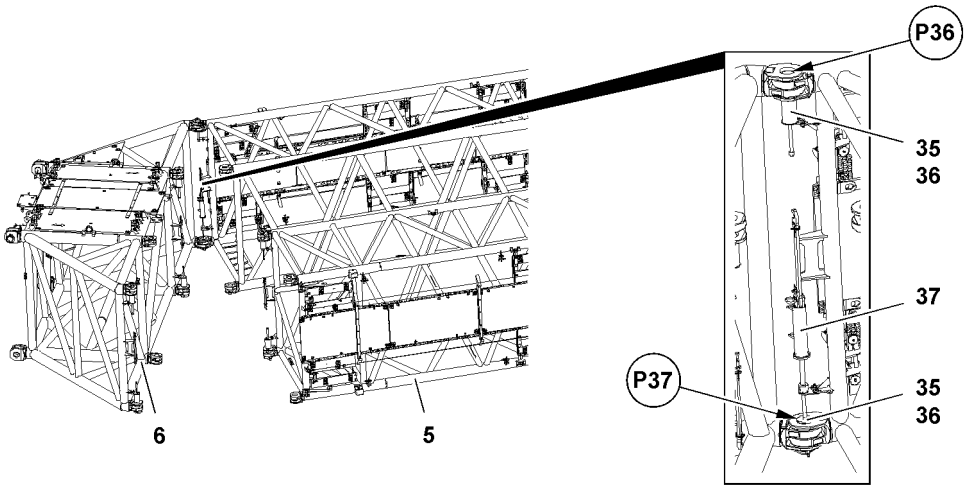

Fig.120320: Disassembling the upper P-adapter on the L-intermediate sections - Removing the upper P-adapter

The pin **35** on the bottom must be secured with the safety locking pin **36** while it is still held by the pin pulling device **37** to prevent it from falling down.

▶ Unpin the upper P-adapter **6** on the L-intermediate section **5**: Remove the safety locking pins **36** and unpin the pins **35** with the pin pulling device on point **P37** and point **P36**.

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▶ Remove the upper P-adapter **5** with the auxiliary crane and take it down in a suitable storage location.

11.11.5 Disassembling the L-intermediate sections

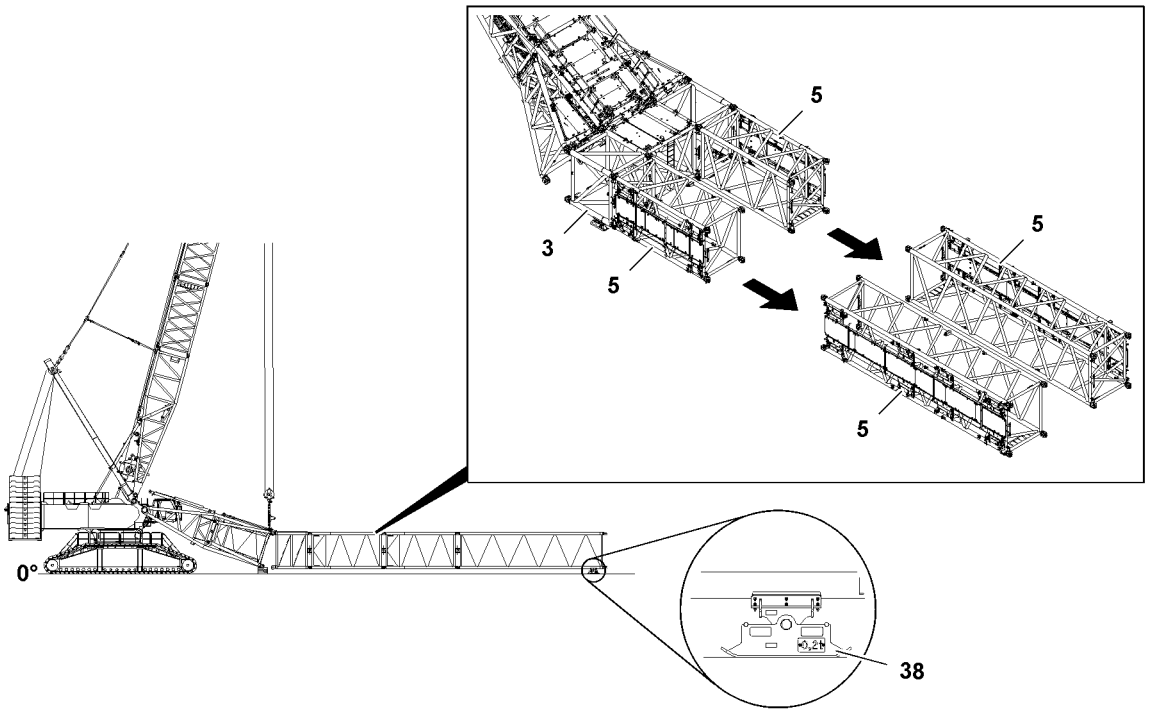

Fig.120321: Disassembling the L-intermediate sections

Make sure that the following prerequisites are met:
- The upper P-adapter is completely disassembled.
- The respective L-intermediate section **5** is placed on the assembly shoes **38**.
- An auxiliary crane is available.

Note

▶ The disassembly of the L-intermediate sections **5** is identical for each L-intermediate section **5**. The disassembly procedure is described as an example for one L-intermediate section **5**.

▶ Fasten the L-intermediate section **5** to the auxiliary crane.
▶ Move the assembly shoes **38**, see Crane operating instructions, chapter 5.62.
▶ Unpin the L-intermediate section **5** on L-intermediate section **5**, see unpinning procedure in section „Disassembling the upper P-adapter on the L-intermediate sections“.
▶ Remove the L-intermediate section **5** with the auxiliary crane.
▶ Turn the L-intermediate section **5** 90° in the transport position, see section „Changing the boom“: „ Turn the L-intermediate sections“.
▶ Take the L-intermediate section **5** down in a suitable storage location.

Note

▶ The guy rods which are not required and which have been removed at the assembly of the boom system from the lattice sections must be installed in the transport retainers of the lattice sections and properly secured.

▶ Install the guy rods belonging to the L-intermediate section **5** in the transport retainers of the lattice sections and secure properly.
▶ Repeat the procedure for all L-intermediate sections **5** the same way.

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11.11.6 Removing the cross carrier

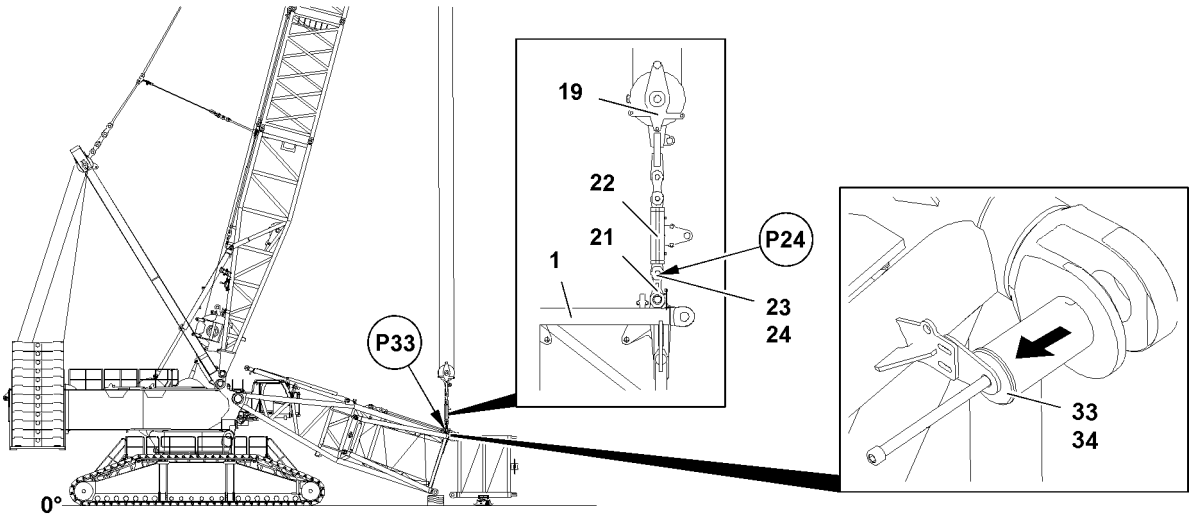

Fig.120322: Removing the cross carrier

The upper pulley block **19** must be removed for the disassembly from the working range, otherwise it is not possible to unpin the cross carrier due to space restrictions.

- ▶ Unpin the assembly weight **22** on the brackets **21**: Release the pins **23** on both sides on points **P24** and unpin.
- ▶ Lift the upper pulley block **19** including the auxiliary weight **22** from the assembly area.
- ▶ Fasten the cross carrier **3** to the auxiliary crane, see section „Fastening points of the lattice sections“.

Note

- ▶ The pinning or unpinning is carried out with the pin pulling device, see Crane operating instructions, chapter 5.30.

- ▶ Unpin the cross carrier **3** on the lower P-adapters **2**: Release and unpin all four pins **29** on points **P33** with the pin pulling device.
- ▶ Lift the cross carrier **3** with the auxiliary crane and remove.
- ▶ Pin the assembly weight **22** with the brackets **21**: Insert the pin **23** on both sides at point **P24** and secure with spring retainer **24**.

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11.11.7 Removing the lower P-adapters

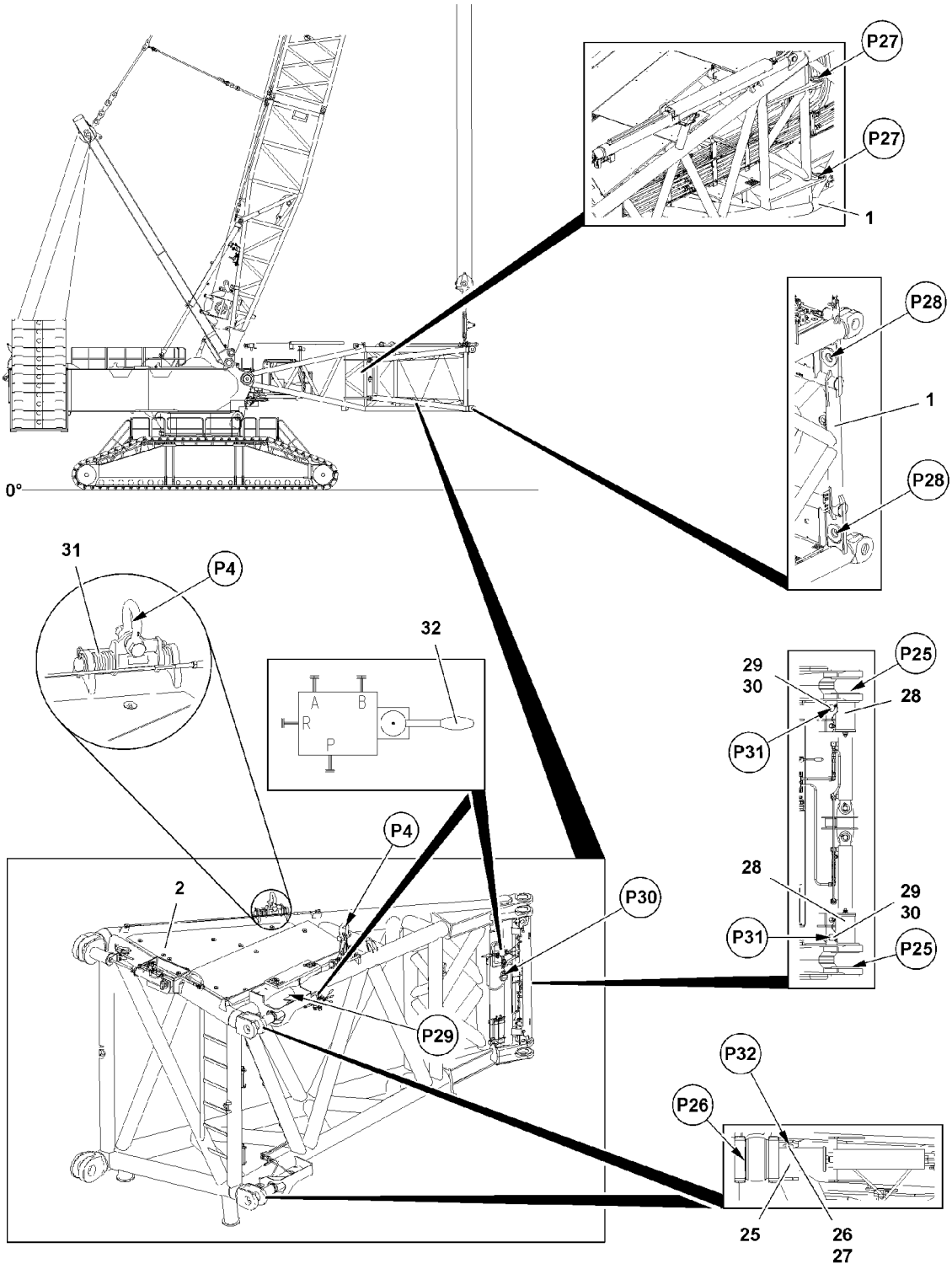

Fig.120323: Disassembling the lower P-adapters — Disassembly procedure

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Note

▶ The hydraulic supply for the disassembly of the lower P-adapters **2** is made via the external hydraulic aggregate.

WARNING

Pressure in the hydraulic lines!

If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure.

Death, severe bodily injuries, property damage.

▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time.

Make sure that the following prerequisites are met:

– The S-pivot section **1** is horizontally aligned.
– An auxiliary crane is available.
– A hydraulic aggregate is available.

The disassembly is described on the example of the right, lower P-adapter **2**.

▶ Fasten the lower P-adapter **2** on both sides to the auxiliary crane, see section „Fastening points“.
▶ Establish the hydraulic connection on point **P29**: Connect the coupling parts (sleeve and plug) and screw together by hand until the knurled nut is turned to a noticeable, fixed stop.
▶ Release retaining pins **26** on points **P32** and unpin.
▶ Insert the retaining pins **26** into the transport retainer and secure with safety locking pins **27**.
▶ Unpin the lower P-adapter **2** on the S-pivot section **1**: **32**Actuate the hand lever **32** until the pins **25** on points **P28** are completely unpinned.
▶ Disconnect the hydraulic connection on point **P29**: Install the coupling components (sleeve and connector) with the knurled nut.
▶ Install dust caps on the quick couplings.
▶ Establish the hydraulic connection on point **P30**: Connect the coupling parts (sleeve and plug) and screw together by hand until the knurled nut is turned to a noticeable, fixed stop.
▶ Release retaining pins **29** on points **P32** and unpin.
▶ Insert the retaining pins **29** into the transport retainer and secure with safety locking pins **30**.
▶ Unpin the lower P-adapter **2** on the S-pivot section **1**: **32**Actuate the hand lever **32** until the pins **28** on points **P27** are completely unpinned.
▶ Disconnect the hydraulic connection on point **P30**: Install the coupling components (sleeve and connector) with the knurled nut.
▶ Install dust caps on the quick couplings.
▶ Take the lower P-adapter down with the auxiliary crane in a suitable storage location.
▶ Remove the auxiliary crane.
▶ Remove the left, lower P-adapter **2** the same way as described before.

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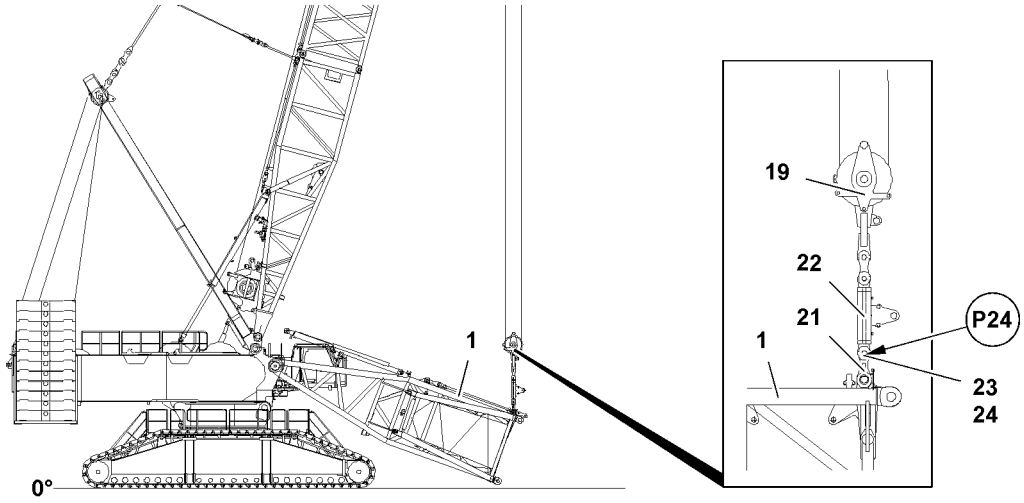

Fig.120324: Disassembling the lower P-adapter - Unpinning the upper pulley block on the S-pivot section

- ▶ Take the S-pivot section **1** down on the substructure.
- ▶ Unpin the assembly weight **22** on the brackets **21**: Release the pins **23** on both sides on points **P24** and unpin.
- ▶ Lift the upper pulley block **19** including the auxiliary weight **22** from the assembly area.

11.12 Disconnecting the electric and hydraulic connections on the S-pivot section

11.12.1 Disconnecting the electrical connections

Make sure that the following prerequisites are met:
- The boom system is opened.
- The S-pivot section is laying on the ground on the substructure.

NOTICE
Damage to cable drum or cable!
If the cable of the cable drum is not properly spooled up on the cable drum after unplugging the S-end section, then the cable drum or the cable can be significantly damaged.
- ▶ Spool the cable drum up after unplugging.

- ▶ Spool the cable drum up and secure it to prevent inadvertent spooling out.
- ▶ Disconnect the electrical connections and store the plugs and cables properly.

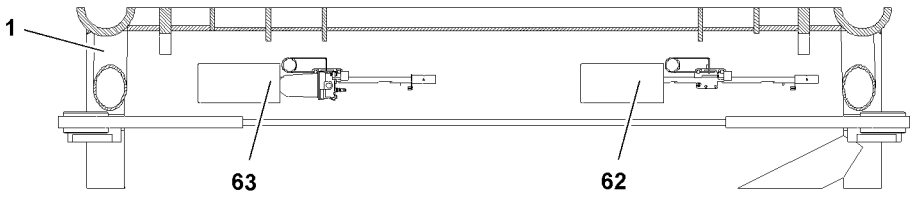

Fig.120332: Park position Wind speed sensor and airplane warning light

- ▶ Remove the wind speed sensor **62** and / or airplane warning light with wind speed sensor **63** on the boom end section and store it on the S-pivot section **1** properly in park position.

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11.12.2 Disconnecting the hydraulic connections

When connecting and releasing hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

DANGER
Danger of accident due to loss of pressure or leakage!
Incorrectly coupled or self-loosening quick couplings (particularly return lines) can result in serious accidents due to component failure.
▶ Check that the quick couplings have been properly connected before using the crane.

Note
▶ To connect or release the hydraulic lines with quick couplings, see Crane operating instructions, chapter 5.01.

▶ Release the pressure in the hydraulic system before connecting or disconnecting. Turn the engine off and wait for short time.
▶ Assembling coupling components (sleeve and connector) by using knurled nut.
▶ Connect coupling components.

11.13 Disassembling the S-pivot section on the turntable

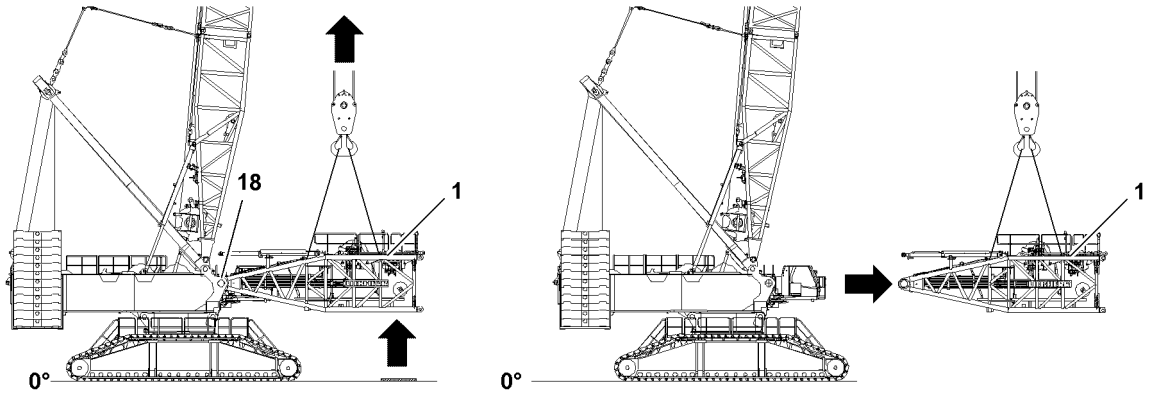

Fig.120333: Disassembling the S-pivot section on the turntable

WARNING
General danger note!
▶ Insert and secure all pins after disassembly in the intended transport receptacles.

Make sure that the following prerequisites are met:
– The hydraulic connections to the S-pivot section are properly disconnected.
– The hydraulic connections on the S-pivot sections are properly closed off with caps.
– The electrical connections to the S-pivot section are properly disconnected.
– The electrical connections are properly closed off with dummy plugs (see Electrical wiring diagram).
– The crane engine is running.
– An auxiliary crane with sufficient load bearing capacity if available.

Note
▶ Select the fastening points on the S-pivot section **1** in such a way that the S-pivot section **1** hangs horizontally on the auxiliary crane at disassembly. See section „Fastening points“.

▶ Attach the S-pivot section **1** properly on the auxiliary crane.
▶ Lift the S-pivot section **1** with the auxiliary crane to the horizontal.

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WARNING
Falling S-pivot section!
▶ Make sure that the S-pivot section **1** is safely held by the auxiliary crane before unpinning the S-connector pins **18**.

Note
▶ The unpinning of the S-pivot section **1** on the turntable is described in detail in section: „Unpinning the S-connector pins on the turntable“.

When the S-pivot section is horizontally aligned and safely held by the auxiliary crane:
▶ Unpin the S-connector pins **18** on the turntable.

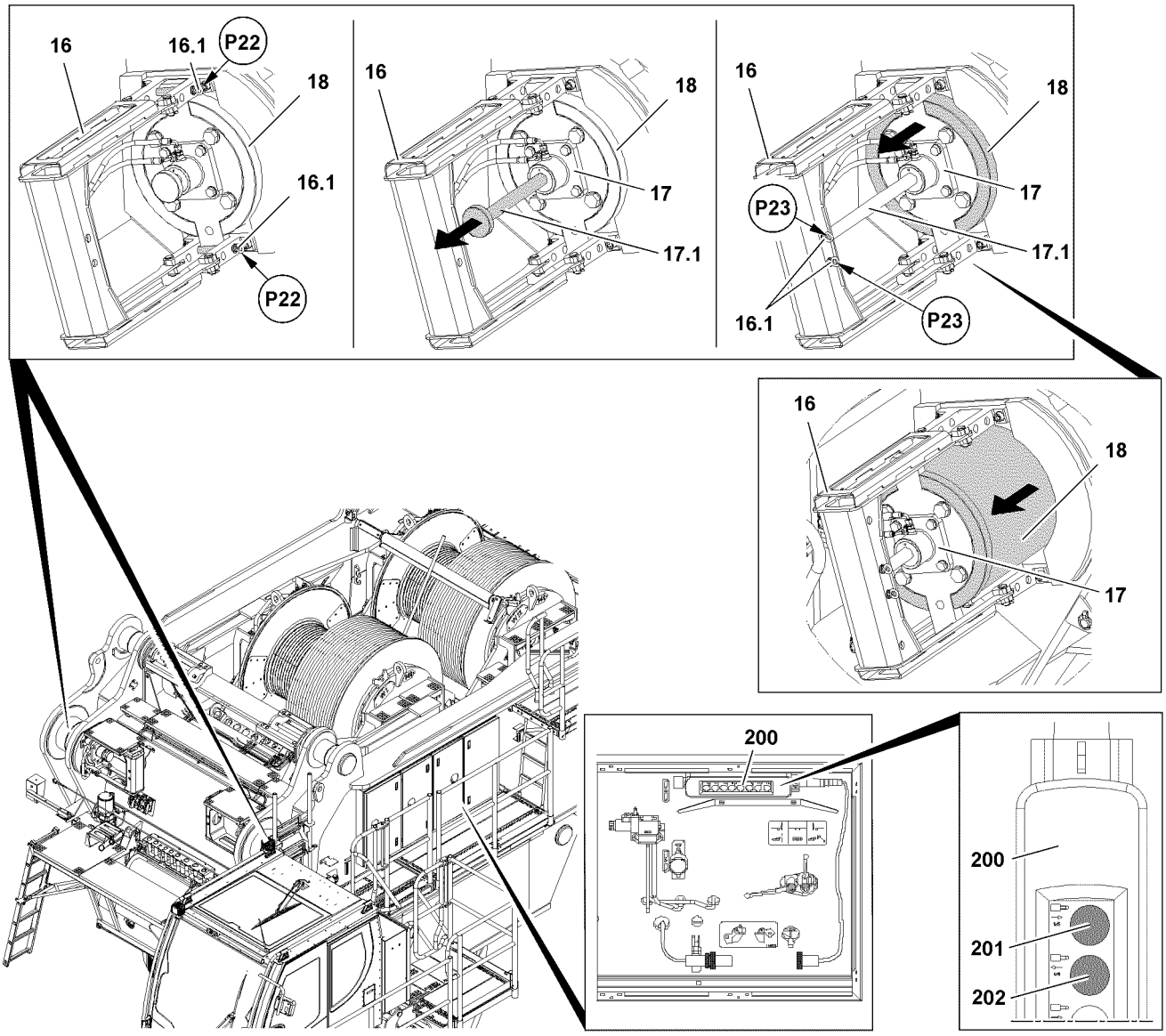

Fig.120289: Disassembling the S-pivot section on the turntable - Unpinning procedure

NOTICE
Damage of the turntable and the S-pivot section **1**!
▶ Slowly swing the S-pivot section **1** out with the auxiliary crane and at low speed on the turntable.
▶ Before placing it on the ground, support the S-pivot section **1**.

When the S-connector pins **18** on the S-pivot section **1** are fully unpinned on both sides:
▶ Swing the S-pivot section **1** out on the turntable with the auxiliary crane and place it down.

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▶ Remove the auxiliary crane.

When the S-pivot section **1** is removed on the turntable:
▶ Fully insert and secure the S-connector pins **18** again.

11.14 Disassembling winch 5 on the S-pivot section

Note
▶ The disassembly of winch 5 is described in the Crane operating instructions, chapter 3.07.50.

11.15 Disassembling winch 6 on the S-pivot section

Note
▶ The disassembly of winch 6 is described in the Crane operating instructions, chapter 3.07.60.

11.16 Swinging the railing on the S-pivot section into transport position

WARNING
Danger of falling!
Death, severe bodily injuries, property damage.
▶ Assembly personnel must secure themselves for the assembly / disassembly of the railings and protective devices with an approved fall arrest system to prevent them from falling.
▶ For assembly and disassembly work, maintenance and inspection work on the S-pivot section, all railings and protective devices must be properly assembled and secured.

Make sure that the following prerequisites are met:
– The ground is able to safely take on the weight of the S-pivot section.
– The S-pivot section is laying completely on the ground.

▶ For assembly / disassembly of railings and protective devices, see Crane operating instructions, chapter 2.06.

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5.61 Roller cart

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4	Disassembly	7

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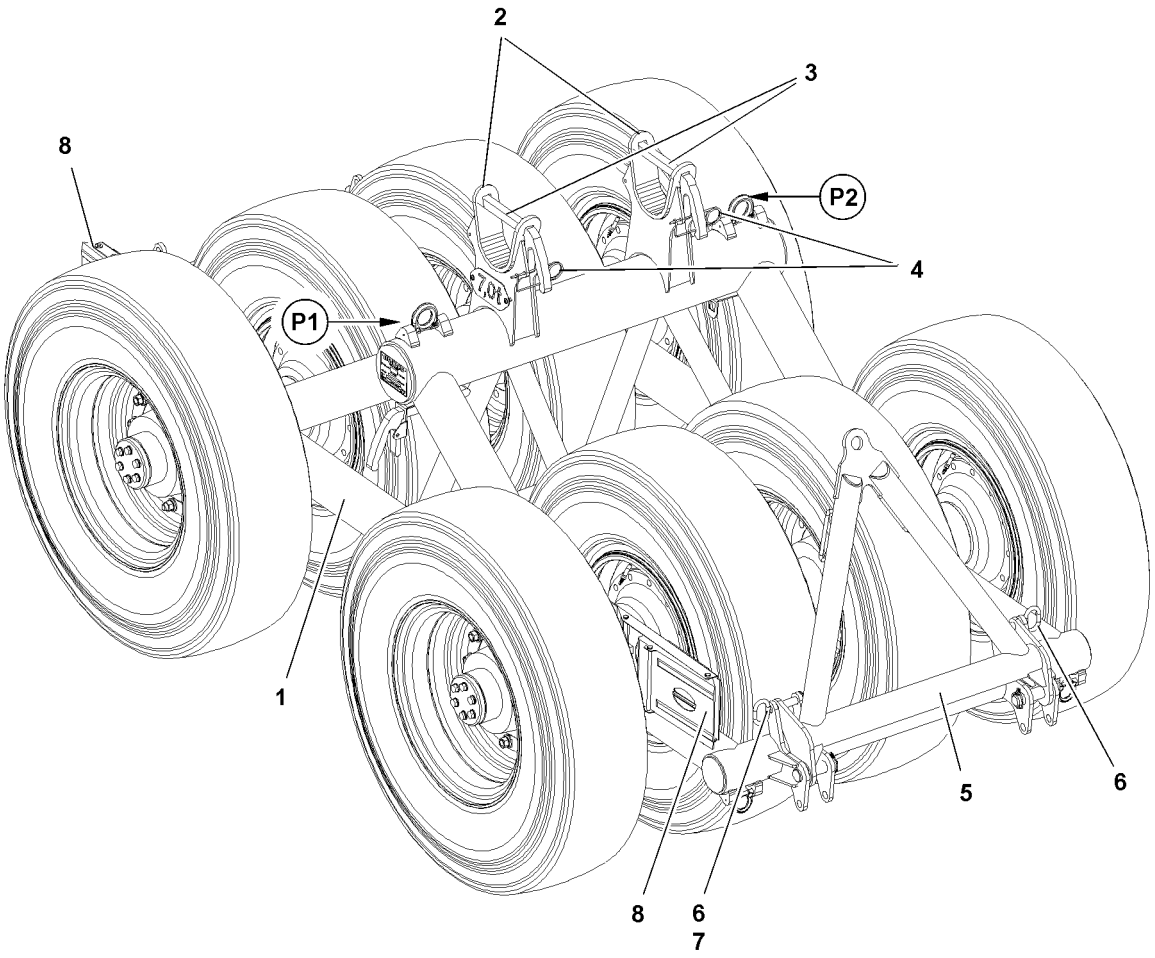

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Fig.119034

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1 Component overview

Note
▶ The pulley cart is marked with its own weight.

Position	Component
1	Pulley cart
2	Receptacle
3	Retainer
4	Spring retainer
5	Drawbar
6	Socket pin
7	Safety locking pin
8	Wedge

2 Fastening points for pulley cart

WARNING
Component incorrectly fastened!
Life-threatening situations can arise due to improper or incorrect attachment of the corresponding components.
Death, severe injury, property damage.
▶ Fasten the components only on the intended fastening points on both sides.
▶ Fastening of components and description of fastening points, see Crane operating instructions, chapter 5.01.

Fastening points	
P1 and P2	Pulley cart

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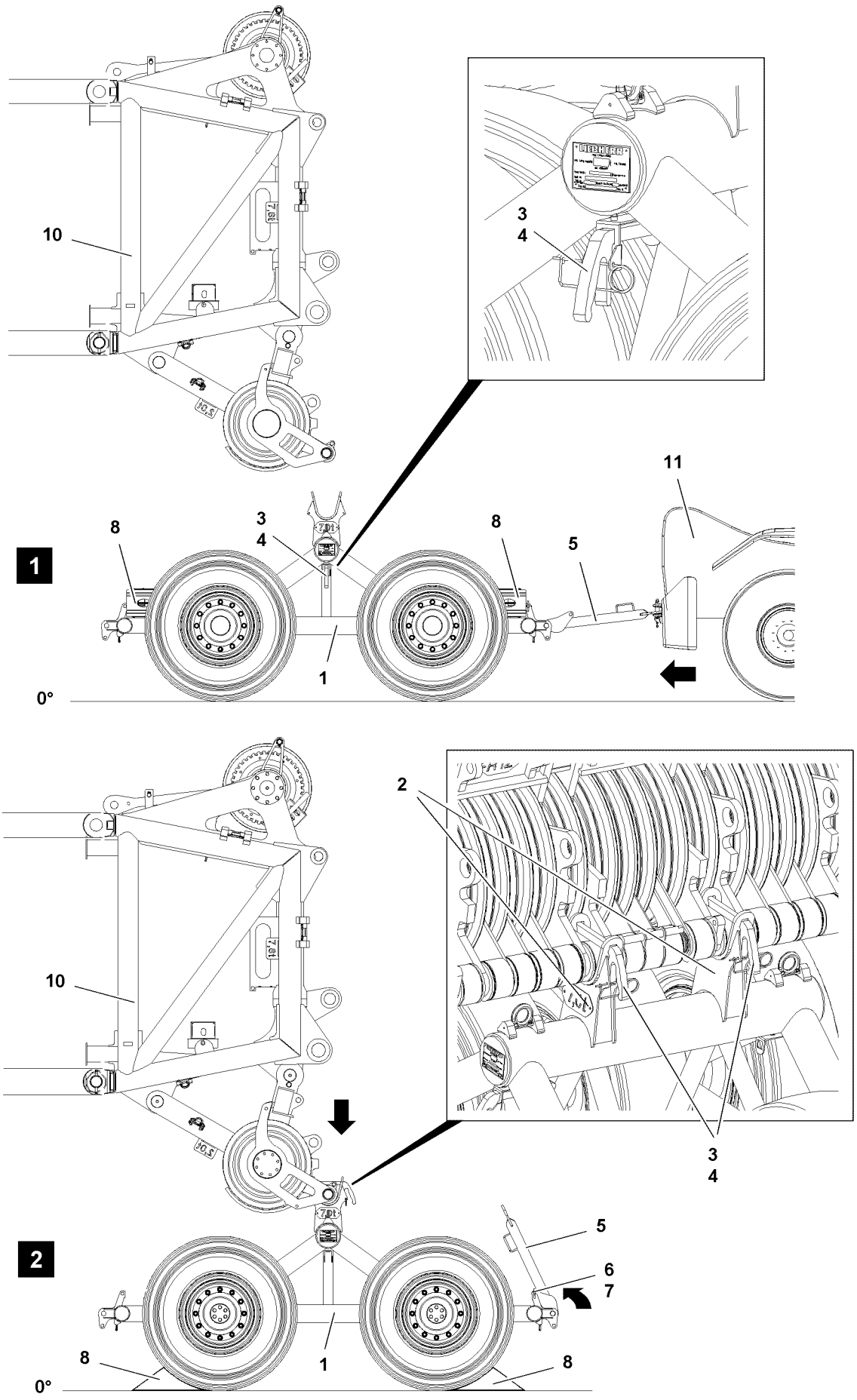

Fig.119033

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3 Assembly

3.1 Installing the pulley cart

Make sure that the following prerequisites are met:
- The retainer **3** is in park position, see illustration **1**
- An auxiliary crane with sufficient load carrying capacity is available.
- The W-boom is properly fastened on the auxiliary crane, see Crane operating instructions, chapter 5.01.
- The W-boom is lifted off the ground with the auxiliary crane.

▶ Position the pulley cart **1** below the pulley set of the boom end section **10**, see illustration **1**.
▶ Remove the wedges **8** from the transport retainer on the pulley cart **1**.
▶ Secure the pulley cart **1** with wedges **8** to prevent it from rolling off: Push the wedges **8** on the left and right hand side tightly under the wheels, see illustration **2**.
▶ Unpin the drawbar **5** from the auxiliary vehicle **11**.
▶ Remove the auxiliary vehicle.

WARNING
Danger of crushed limbs!
When swinging the drawbar **5**, fingers and hands can be crushed.
Death, severe injury, property damage.
▶ Do not reach with your hands into the danger zone.

▶ Swing the drawbar **5** in park position up, see illustration **2**.
▶ Pin the drawbar **5** in park position with socket pin **6** and secure with safety locking pin **7**, see illustration **2**.

WARNING
Danger of accident when placing the boom system in the pulley cart!
Death, severe injury, property damage.
▶ Make sure that the boom system is properly positioned under the pulley set / the pulley sets.
▶ Make sure, when placing the boom system in the pulley cart, that no personnel is within the danger zone.

▶ Slowly lower the boom **10** with the auxiliary crane until the carrier rollers of the pulley set are laying in the receptacles **2** of the pulley cart **1**, see illustration **2**.
▶ Take the retainer **3** from the park position: Remove the spring retainer **4** and pull out the retainer **3**, see illustration **1**.
▶ Secure the pulley cart **1**: Insert the retainer **3** on the receptacles **2** and secure with spring retainer **4**, see illustration **2**.
▶ Remove the wedges **8** on the wheels.
▶ Secure the wedges **8** again in the transport retainers on the pulley cart.

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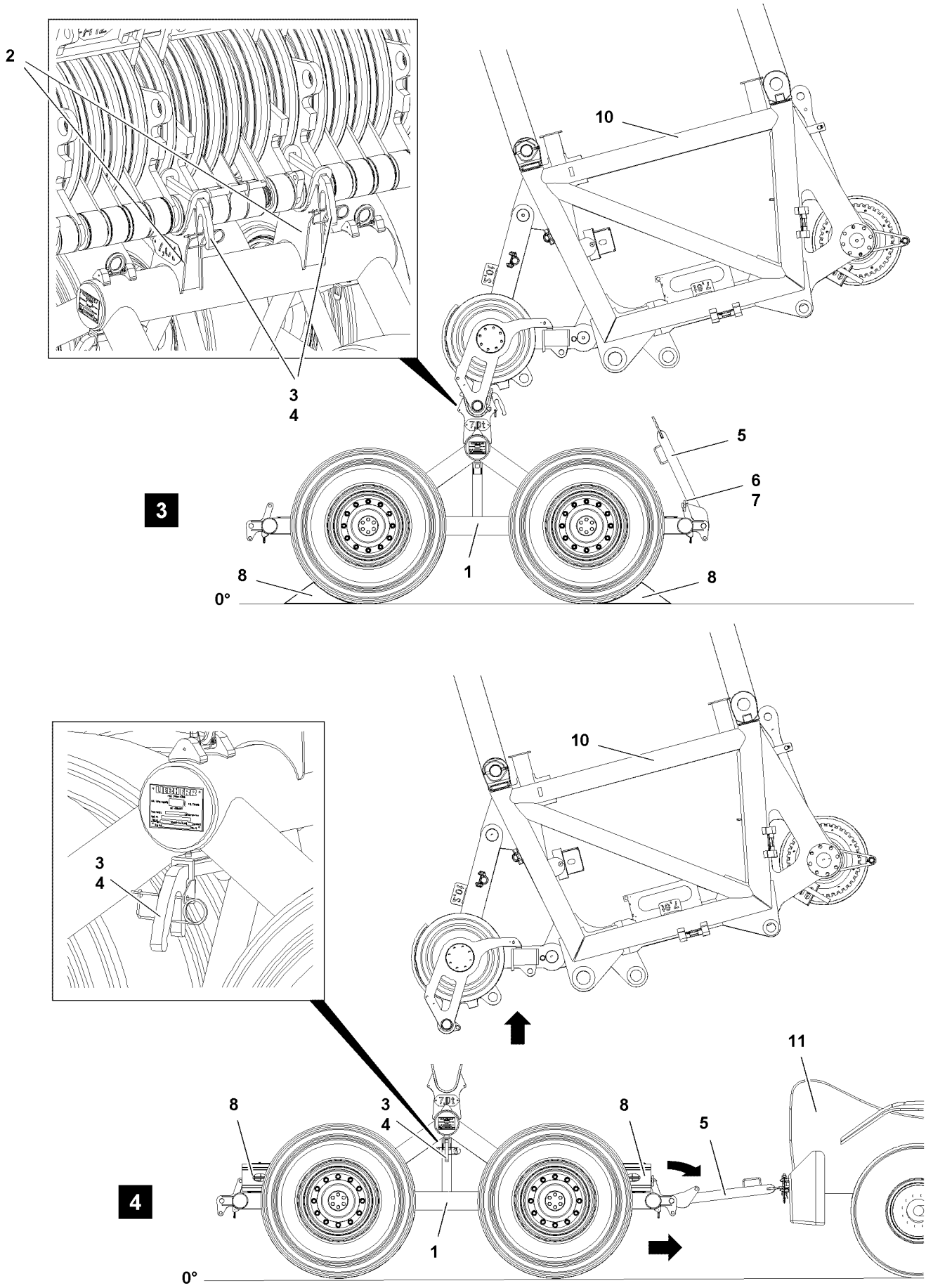

Fig.119035

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4 Disassembly

4.1 Removing the pulley cart

When the boom system has reached a certain angle, the pulley cart **1** is no longer required. Before lifting the W-boom system off, remove the pulley cart **1**.

WARNING
Overload of crane!
If the pulley cart **1** is not removed before erecting the boom system all the way, the crane can be overloaded and topple over.
Death, severe injury, property damage.
▶ Make sure that the pulley cart **1** is removed before the W-boom lifts off the ground.

Make sure that the following prerequisite is met:
– The boom system has reached a certain angle.

▶ Remove the wedges **8** from the transport retainer on the pulley cart **1**.
▶ Secure the pulley cart with wedges **8** to prevent it from rolling off: Push the wedges **8** on the left and right hand side tightly under the wheels, see illustration **3**.
▶ Remove the spring retainer **4** and pull out the retainer **3**, see illustration **3**.

Result:

– The boom system can be luffed up.

▶ Insert the retainer **3** in park position and secure with spring retainer **4**, see illustration **4**.
▶ Luff the boom system up.

WARNING
Drawbar swinging down!
The drawbar can swing down by itself due to its own weight when it is unpinned.
Death, severe injury, property damage.
▶ Make sure that the position of the drawbar is always changed by **two** persons.
▶ When unpinning the drawbar, hold the drawbar.
▶ Do not reach with your hands into the danger zone.

▶ Unpin the drawbar **5** in park position: Remove the safety locking pin **7** and unpin the socket pin **6**, see illustration **3**.
▶ Swing the drawbar **5** downward into operating position.
▶ Pin the drawbar **5** on the auxiliary vehicle **11**, see illustration **4**.

When the boom system is luffed up:
▶ Remove the wedges **8** on the pulley cart.
▶ Secure the wedges **8** on the transport receptacle on the pulley cart **1**, see illustration **4**.
▶ Remove the pulley cart **1**.

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5.62 Assembly shoes

1 Assembly shoes 3

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Fig.195219

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1 Assembly shoes

Note

- During assembly / disassembly of the S-boom system, the W-boom system and the P-boom system the assembly shoes **1** must be offset to avoid overload of the intermediate sections **3**.
- The change of the assembly shoes **1** is described on the example of the S-boom and is made the same way for boom assembly / disassembly of the P-boom system and the W-boom system.

WARNING

Incorrect position of the assembly shoes **1**!
If the assembly shoes **1** are not placed underneath in the permitted area of the intermediate sections **3**, then the intermediate sections **3** can be overloaded and damaged.
An accident can occur during crane operation due to a damaged or previously overloaded intermediate sections **3**.
Personnel can be severely injured or killed.

- Make sure that the assembly shoes **1** are placed underneath between the arrow marks **2**.
- The crane operator is responsible for the proper support of the assembly shoes **1** on the intermediate sections **3**.

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1.1 Changing the assembly shoes at assembly

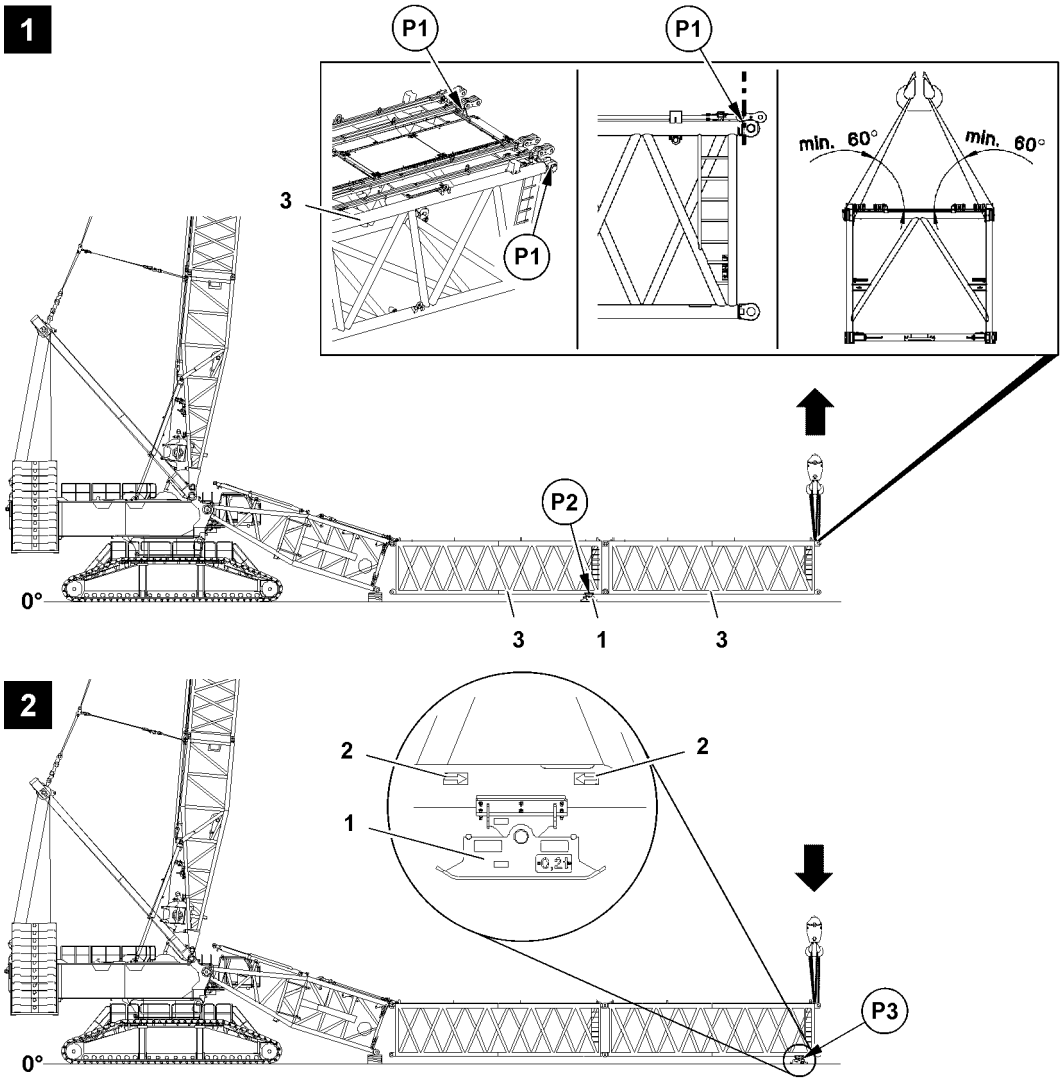

Fig.120304: Change the assembly shoes at assembly

Make sure that the following prerequisites are met:
- The respective intermediate section **3** is completely assembled.
- The fastening equipment has been removed.
- An auxiliary crane is available.

Note

▶ Changing the assembly shoes **1** is identical for each intermediate section **3**. The change procedure is described as an example for one intermediate section **3**.

▶ Fasten the intermediate section **3** on the points **P1**.

WARNING

Overload of lattice sections!
Personnel can be severely injured or killed.
Significant property damage can result.
If the lattice section leg is lifted higher than necessary, the lattice sections can be overloaded.
At a later point in time an accident can occur.

▶ Lift the lattice section leg only as high until the assembly shoes can be moved freely.

▶ Lift the lattice section leg with the auxiliary crane, see illustration **1**.

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Result:

– The assembly shoes **1** on point **P2** are not subjected to a load and can be changed over.

▶ Remove the assembly shoes **1** on point **P2**, see illustration **1**.
▶ Support the assembly shoes **1** on point **P3** so that they are between the arrow marks **2**, see illustration **2**.
▶ Lower the lattice section leg with the auxiliary crane until the intermediate section **3** is properly laying on the assembly shoes **1**, see illustration **2**.
▶ Repeat the procedure the same way for additional intermediate sections **3**.

1.2 Changing the assembly shoes at disassembly

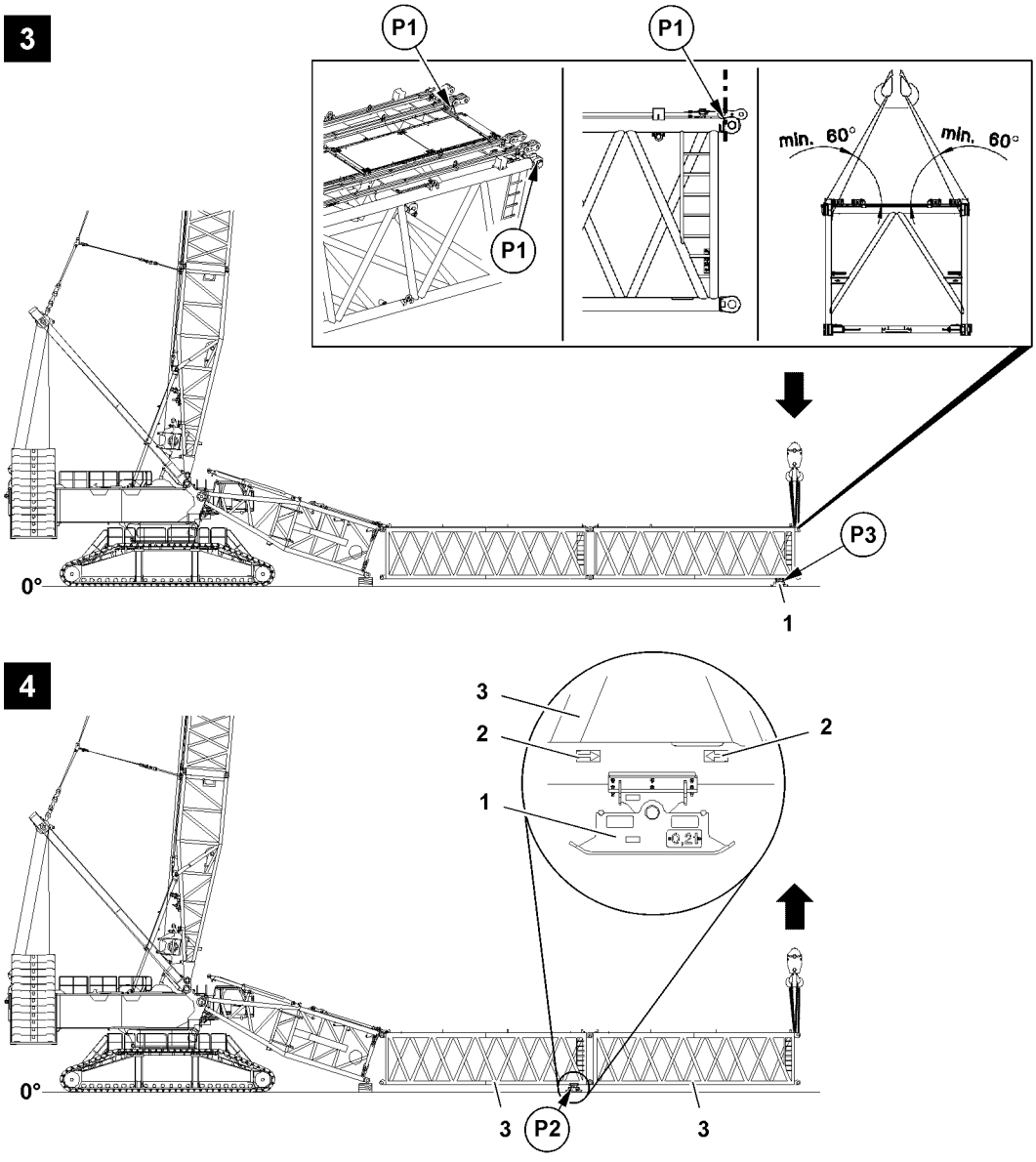

Fig.120305

Make sure that the following prerequisites are met:
– The respective intermediate section is laying on the assembly shoes.
– An auxiliary crane is available.

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Note

▶ Changing the assembly shoes **1** is identical for each intermediate section **3**. The change procedure is described as an example for one intermediate section **3**.

▶ Fasten the intermediate section **3** on the points **P1**.

WARNING

Overload of lattice sections!
Personnel can be severely injured or killed.
Significant property damage can result.
If the lattice section leg is lifted higher than necessary, the lattice sections can be overloaded.
At a later point in time an accident can occur.

▶ Lift the lattice section leg only as high until the assembly shoes can be moved freely.

▶ Lift the lattice section leg with the auxiliary crane, see illustration **3**.

Result:

– The assembly shoes **1** on point **P3** are not subjected to a load and can be changed over.

▶ Remove the assembly shoes **1** on point **P3**, see illustration **3**.
▶ Support the assembly shoes **1** on point **P2** so that they are between the arrow marks **2**, see illustration **4**.
▶ Lower the lattice section leg with the auxiliary crane.
▶ Remove the front intermediate section **3**.
▶ Repeat the procedure the same way for additional intermediate sections **3**.

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6 Auxiliary equipment

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6.02 Crane operator's cab heater / engine preheating / air conditioning system

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1 Climate control systems

Depending on the crane type, the climate control system consists of up to three components (partially optional equipment*):
- Heater, coupled with the coolant circuit of the crane engine (only for crane types with engine in crane superstructure).
- Auxiliary heater with engine preheating (optional equipment* for crane types with engine in crane superstructure).
- Climate control system*

1.1 Operating instructions

The heater and the climate control system* are only operational when the crane engine is running.

The auxiliary heater* is operational when the crane engine is turned on and off.

If the outside temperatures are very low, heating the crane cab without an auxiliary heater* can be limited.

If the outside temperatures are very high, cooling the crane cab without a climate control system* can be limited.

Keep the air intake and the air filter of the climate control system free of:
- Ice
- Snow
- Contaminants
- Objects

For efficient climate control, close the windows and door of the crane cab.

2 Safety instructions

Observe the country specific regulations for the operation of climate control systems.

WARNING
Danger of accident due to bad visibility!
A window that is fogged up, icy or dirty impedes the view of the crane operator.
▶ Only drive / operate the crane with good visibility through the windows.

Note
Fogged up or icy window
▶ Observe the section „Defrosting the window“.

NOTICE
Damage to the climate control systems!
▶ Adjust the operating fluids in time to the ambient temperatures.
▶ Comply with the maintenance intervals, see chapter 7.02.

NOTICE
Deep discharge of the battery!
When the engine is turned off, operating the auxiliary heater can discharge the batteries.
A long-term programmed turn on time for the auxiliary heater can discharge the batteries.
▶ Make sure that the battery charge is sufficient.

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NOTICE
Damage to the climate control systems!

Repair work on the climate control systems:
▶ Contact Service at Liebherr-Werk Ehingen and coordinate the procedure.

3 Climate control

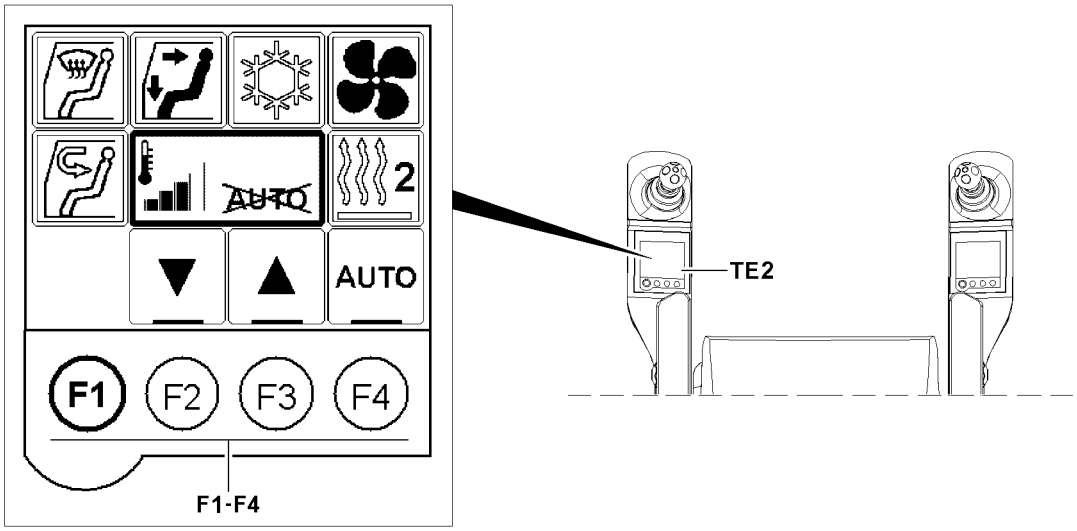

Fig.144224: Exemplary view of the Climate control menu

The *Climate control* menu is displayed on the touch display **TE2** and can be displayed / hidden by pressing the function key **F1**.

The climate control in the crane cab can:
– Be automatically regulated in automatic operation.
– Be manually regulated in manual operation.

In the *Climate control* menu, the climate control functions are selected by tapping the respective icons on the display.
– By pressing the function keys **F1-F4**, the settings can be changed.
– If nothing is selected / changed after a certain period of time, the *Climate control* menu is blanked out and the master switch assignment appears again on the touch display **TE2**.

Note
At low temperatures, the touch display can react delayed initially.
▶ Wait a few minutes when the ignition is turned on until the touch display reacts.

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3.1 Switching between automatic operation and manual operation

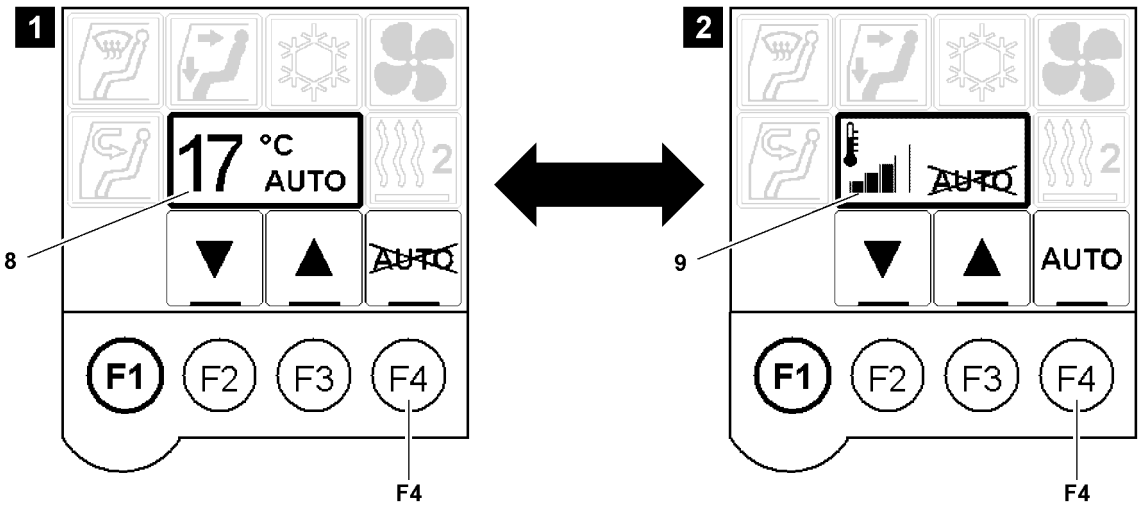

Fig.144089: Switching between automatic operation and manual operation

To switch from automatic operation (sample illustration **1**) to manual operation (sample illustration **2**):
▶ Press the function key **F4**.

Result:

– The *manual operation* icon **9** is shown.
– Manual operation is turned on.

To switch from manual operation (illustration **2**) to automatic operation (illustration **1**):
▶ Press the function key **F4**.

Result:

– The *Automatic operation* icon **8** is shown.
– Automatic operation is turned on.

Note
In automatic operation:
▶ If the fan stage is changed manually, the climate control switches to manual operation.

3.2 Automatic operation

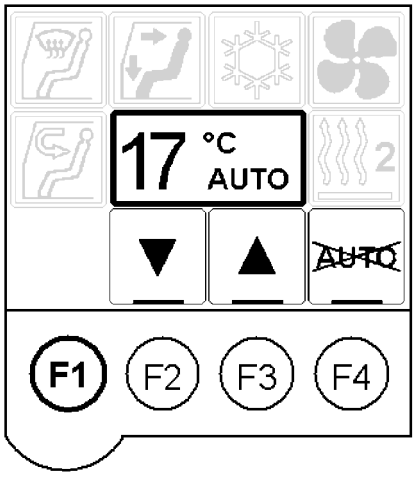

Fig.144090: Automatic operation

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Automatic operation automatically regulates the climate control to reach the set temperature and keep it constant.

The following settings are automatically adjusted:
- Warm air supply
- Fan stage
- Air supply

If the engine is running, the auxiliary heater* is automatically engaged if needed.

If the engine is running, the climate control system* is automatically engaged if needed.

3.2.1 Adjusting the temperature

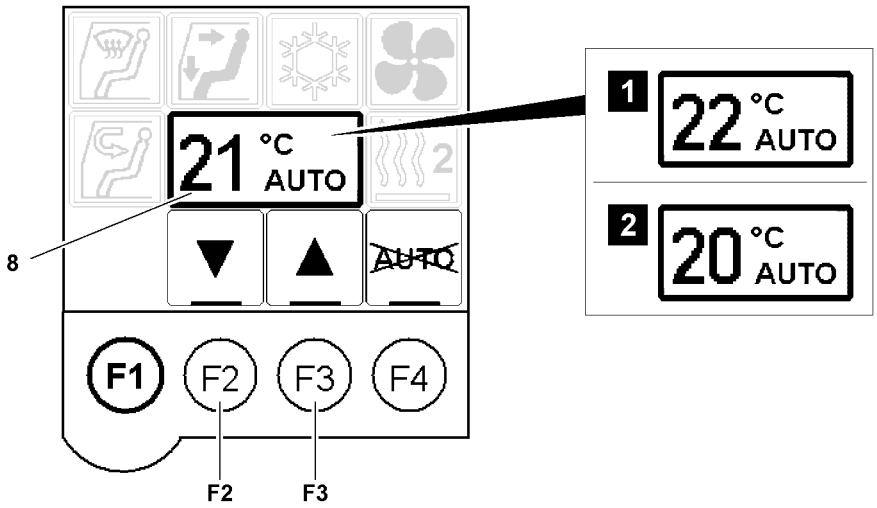

Fig.144091: Adjusting the temperature in automatic operation

The temperature setting can be changed directly in automatic operation.

To increase the temperature setting:
▶ Press the function key **F3**.

Result:

– The temperature setting is increased, see example illustration **1**.
– The warm air supply and fan stage are automatically regulated.

To decrease the temperature setting:
▶ Press the function key **F2**.

Result:

– The temperature setting is decreased, see example illustration **2**.
– The warm air supply and fan stage are automatically regulated.

Problem remedy
Does the **AUTO** text blink on the display?
The temperature setting can momentarily not be reached.
Observe the information in section „Climate control system“.

Speed up the heating of the cab:
▶ Adjust the air supply to recirculating air.

Speed up the cooling of the cab:
▶ Ventilate the crane cab for a short time.

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3.3 Manual operation

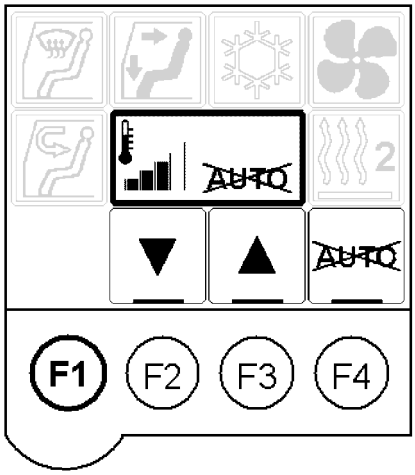

Fig.144092: Manual operation

In manual operation all settings must be carried out manually.

3.3.1 Adjusting the warm air supply

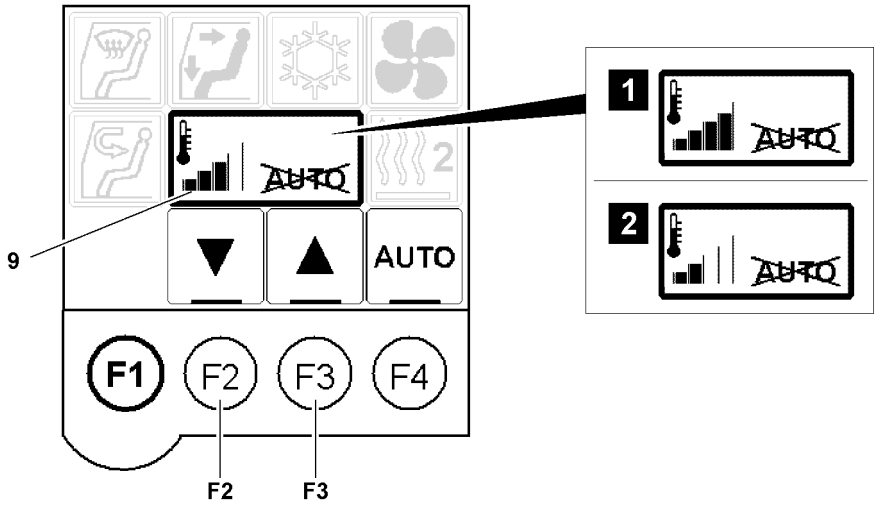

Fig.144093: Adjusting the warm air supply in manual operation

The warm air supply can be set directly in manual operation.

To increase the warm air supply:
▶ Press the function key **F3**.

Result:

– The bar display is increased, see example illustration **1**.

To decrease the warm air supply:
▶ Press the function key **F2**.

Result:

– The bar display is decreased, see example illustration **2**.

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Problem remedy
Does the temperature in the crane cab not change accordingly?
Observe the information in section „Climate control system“.

Speed up the heating of the cab:
▶ Adjust the air supply to recirculating air.

Speed up the cooling of the cab:
▶ Ventilate the crane cab for a short time.

3.3.2 Adjusting the fan stage

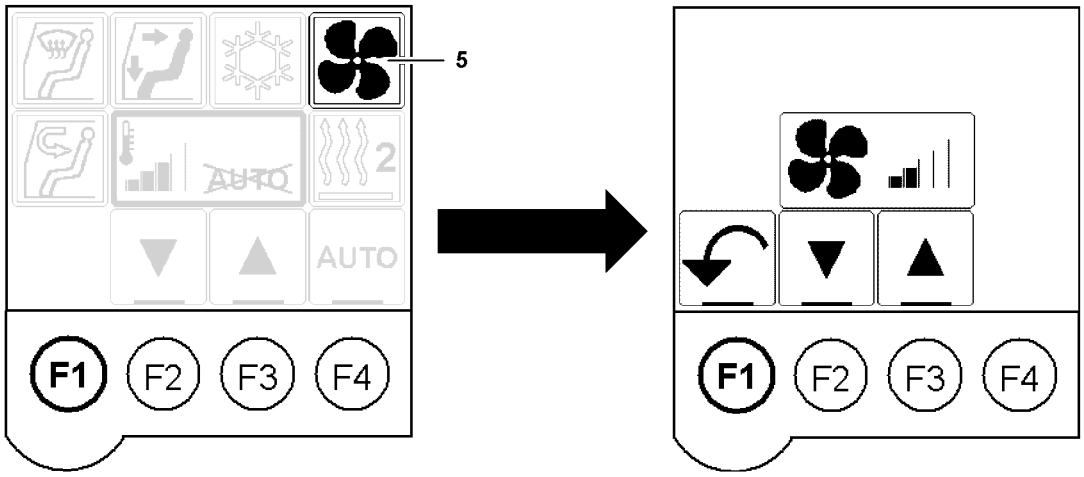

Fig.144094: Selecting the Fan stage menu

The fan stages can be set to different stages.

▶ Tap the *fan stage* icon **5**.

Result:

– The *Fan stage* menu is selected.

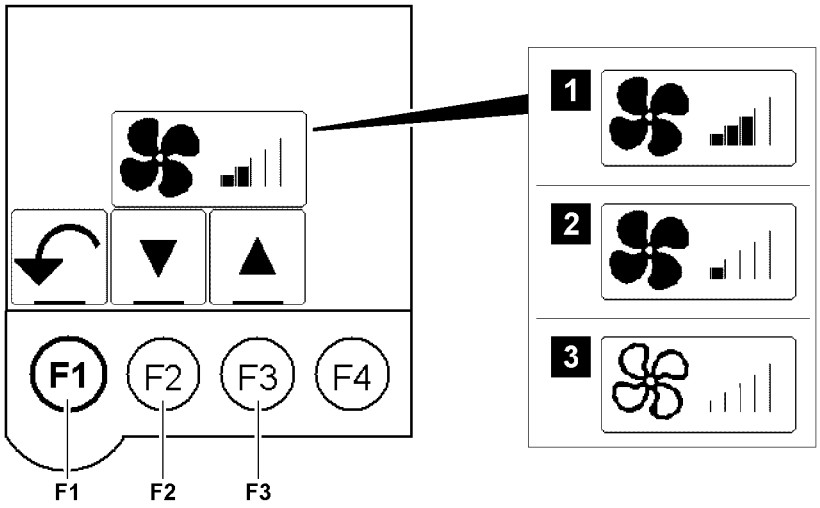

Fig.144060: Adjusting the fan stage

To increase the fan stage:
▶ Press the function key **F3**.

Result:

– The bar display is increased, see example illustration **1**.

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– The fan stage is increased.

To decrease the fan stage:
▶ Press the function key **F2**.

Result:

– The bar display is decreased, see example illustration **2**.
– Fan stage is decreased.

Note
▶ When the fan is switched off, the fan icon is displayed not filled out, see illustration **3**.

To return to the *Climate control* menu:
▶ Press the function key **F1**.

4 Adjusting the air supply

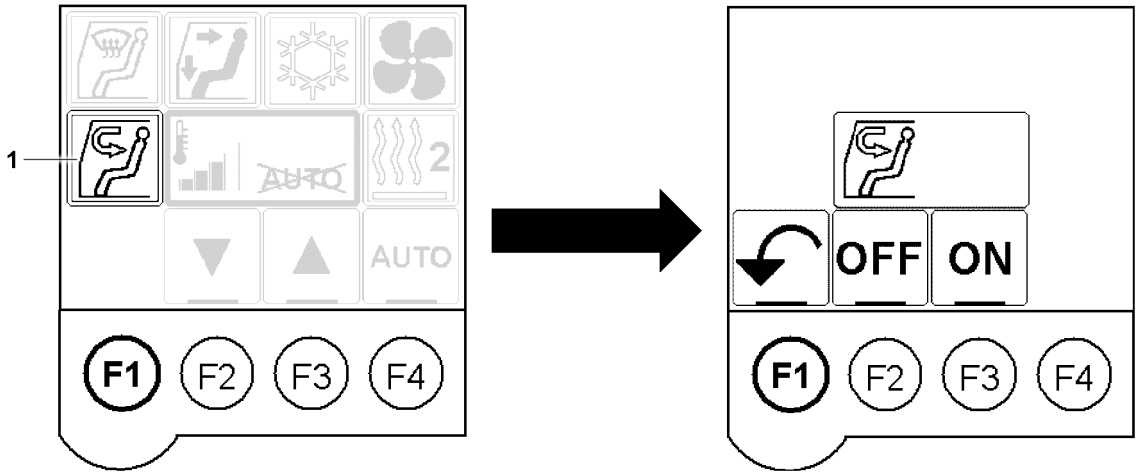

Fig.144095: Climate control menu

Use the recirculating air function to regulate the air supply between recirculating air and fresh air.

▶ Tap the *recirculating air* icon **1**.

Result:

– The *Recirculating air* menu is selected.

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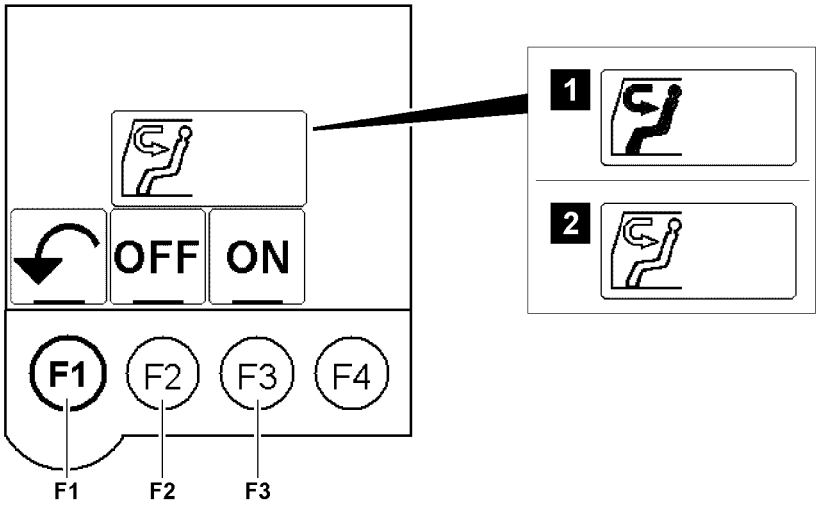

Fig.144230: Recirculating air menu

To turn the *recirculating air* function on:
▶ Press the function key **F3**.

Result:

– The *recirculating air* icon is highlighted in black, see illustration **1**.
– The air supply is switched to recirculating air.

To turn the *recirculating air* function off:
▶ Press the function key **F2**.

Result:

– The *recirculating air* icon is highlighted in white, see illustration **2**.
– The air supply is switched to fresh air.

To return to the *Climate control* menu:
▶ Press the function key **F1**.

5 Air distribution

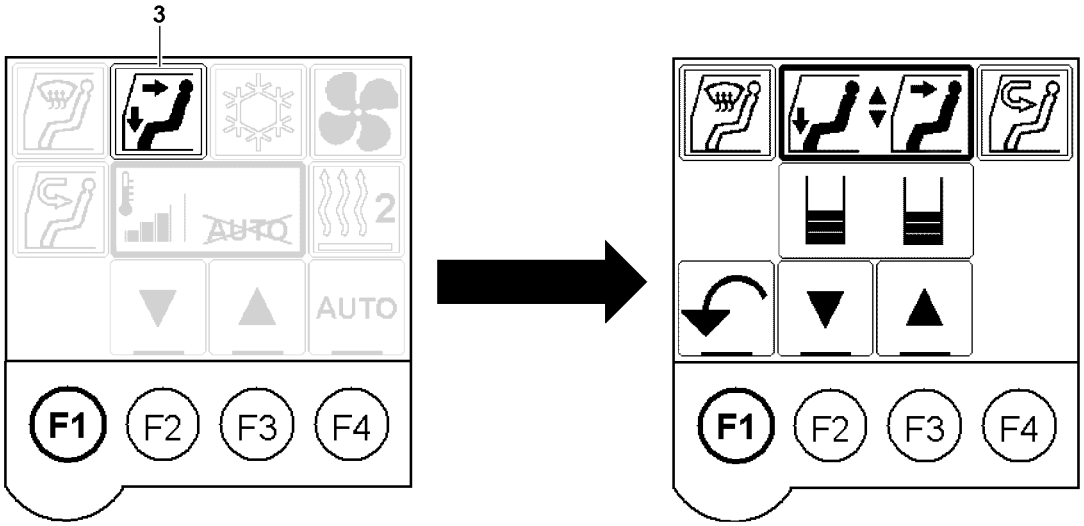

Fig.144096: Climate control menu

Use the air distribution function to regulate the air distribution between floorboard area and the head area.

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▶ Tap the *air distribution* icon **3**.

Result:

– The *air distribution* menu is selected.

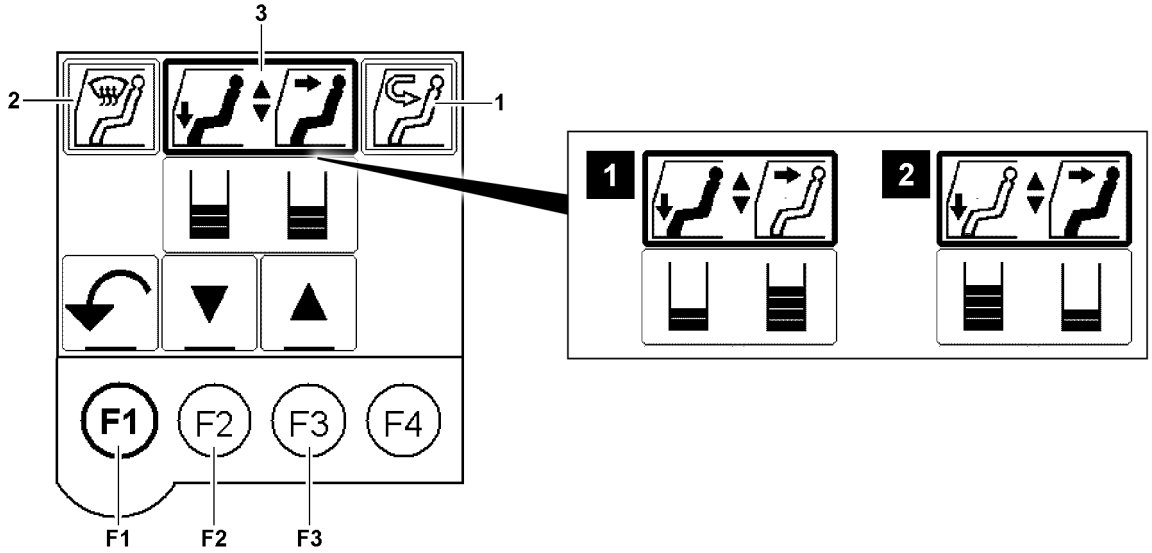

Fig.144097: Air distribution menu

By tapping the *recirculating air* icon **1**, the *air supply* function is preselected.

By tapping the *defrost window* icon **2** the *defrost window* function is preselected.

By tapping the *air distribution* icon **3**, the *air distribution* function is preselected.

Note

To regulate the air supply:
▶ Observe and adhere to the description in section Air supply.

To defrost the window:
▶ Observe and adhere to the description in section *Defrost window*.

When the *air distribution* icon is **3 not** selected:
▶ Tap the *air distribution* icon **3**.

To increase *air distribution* to the head area:
▶ Press the function key **F3**.

Result:

– The bar display on the right side is increased.
– At maximum *air distribution* to the head area, the *floorboard area* icon is highlighted in white, see illustration **1**.

To increase *air distribution* to the floorboard area:
▶ Press the function key **F2**.

Result:

– The bar display on the left side is increased.
– At maximum *air distribution* to the floorboard area, the *head area* icon is highlighted in white, see illustration **2**.

To return to the *Climate control* menu:
▶ Press the function key **F1**.

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6 Defrosting the window

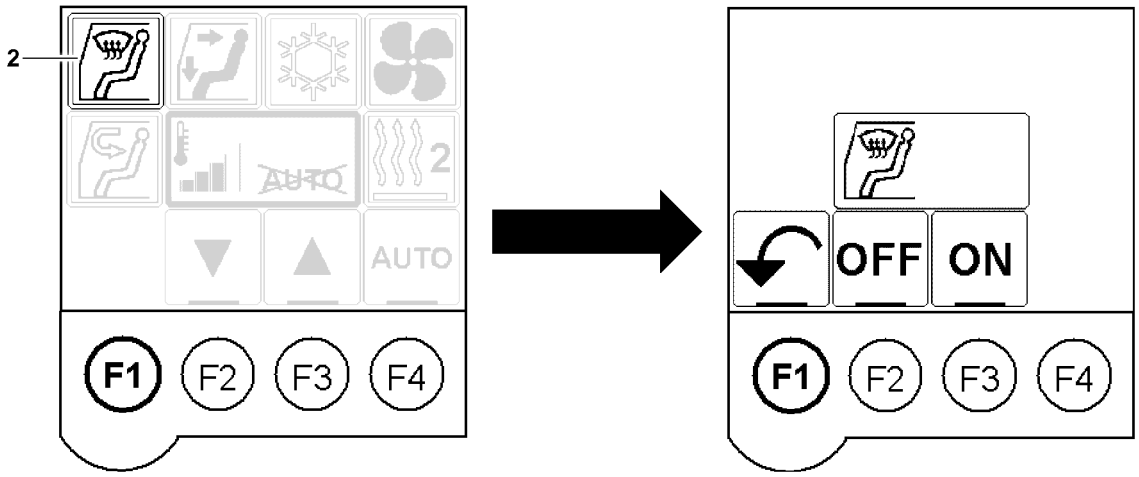

Fig.144098: Climate control menu

Use the *defrost window* function to quickly defrost the window to remove condensation on the inside of the window.

Note

When the window is defrosted:
▶ Turn the function *defrost window* off.

▶ Tap the *defrost window* icon **2**.

Result:

– The *defrost window* menu is selected.

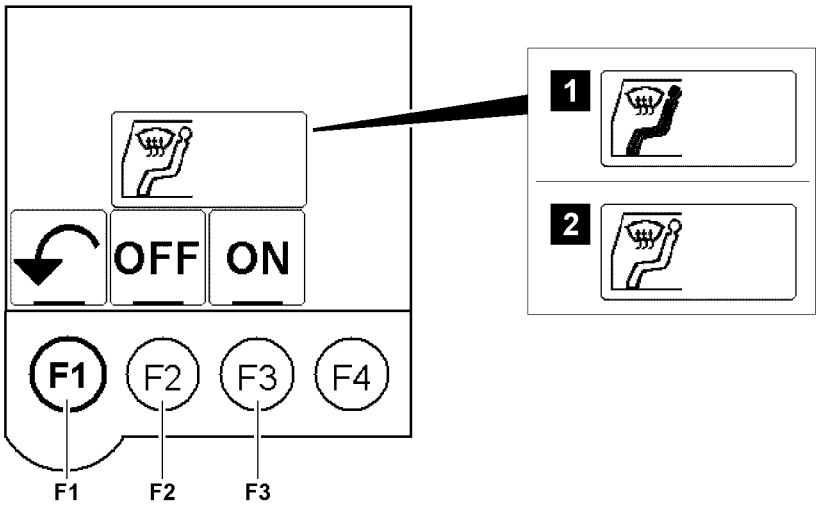

Fig.144232: Defrost window menu

To turn the function *defrost window* on:
▶ Press the function key **F3**.

Result:

– The *defrost window* icon is highlighted in black, see illustration **1**.
– The fan stage is increased.
– Air is directed to the window.
– The air supply is switched to recirculating air.

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– The Climate control system* switches on, as needed.

To turn the *defrost window* function off:
▶ Press the function key **F2**.

Result:

– The *defrost window* icon is highlighted in white, see illustration **2**.

To return to the *Climate control* menu:
▶ Press the function key **F1**.

7 Climate control system*

Note
Protection against condenser freezing
▶ The climate control system cannot be operated if the outside temperature is too low. This prevents the condenser from freezing.

7.1 Turning the climate control system* on / off

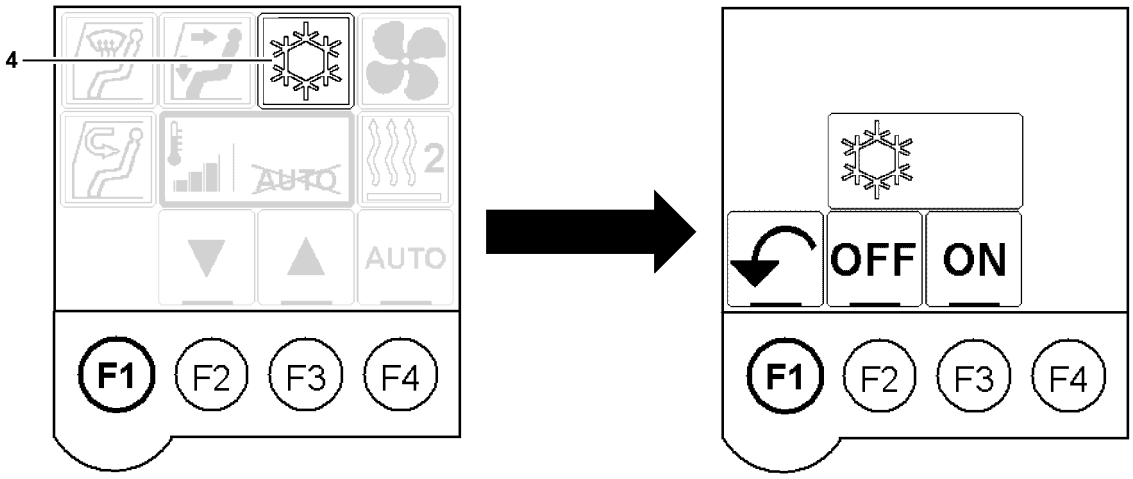

Fig.144099: Selecting the Climate control system menu

The climate control system* is responsible for cooling and the dehumidification of the air in the crane cab.

The humidity is reduced considerably when the climate control system* is switched on. This counteracts the fogging up of the windows.

The maximum cooling output is reached when:
– The air supply is switched to recirculating air.
– The fan stage is set to maximum output.
– The temperature stage is set to the lowest value.
– All air vents are open.
– The door and windows are closed.

Make sure that the following prerequisites are met:
– The engine is running.
– The *Climate control* menu is selected.

▶ Tap the *climate control system* icon **4**.

Result:

– The *Climate control system* menu is selected.

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Note

▶ In automatic operation (*climate control* menu), the climate control system* is switched on automatically if needed.

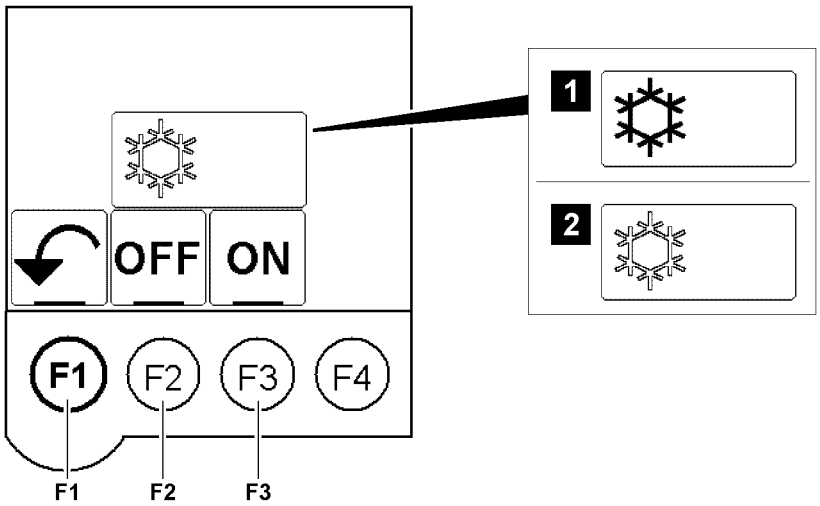

Fig.144063: Turning the climate control system on / off

Turn the climate control system on:

▶ Press the function key **F3**.

Result:

– The *climate control system* icon is highlighted in black, see illustration **1**.
– The climate control system is turned on.

Problem remedy

The temperature from the air vents is not below the ambient temperature?
The air circulation filter, fresh air filter or condenser could be dirty.

▶ Check the filter for impurities. If necessary, clean or replace.
▶ Check the evaporator for impurities and clean, if necessary.

When all these measures do not help:

▶ Contact the Service Dept. at Liebherr-Werk Ehingen.

Turn the climate control system off:

▶ Press the function key **F2**.

Result:

– The *climate control system* icon is highlighted in white, see illustration **2**.
– The climate control system is turned off.

To return to the *Climate control* menu:

▶ Press the function key **F1**.

8 Auxiliary heater

The auxiliary heater can be used as:

– Crane cab auxiliary heater
– Engine preheating
  • **Note**: Only for crane types with a crane engine in the crane superstructure.
– Auxiliary heater crane cab / engine preheating
  • **Note**: Only for crane types with a crane engine in the crane superstructure.

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WARNING
Danger of poisoning and suffocation in enclosed areas!
▶ Do **not** operate the auxiliary heater in closed rooms.

There is a danger of explosion and fires on the following locations:
– Gas stations and refueling facilities.
– Locations where vapors, gases or dust can form.
– Locations with easily flammable materials or fluids.

WARNING
Danger of explosion and fires!
▶ Do **not** operate the auxiliary heater if there is a danger of explosion or fires.

WARNING
Danger of poisoning and suffocation!
After turning it off, a shut off delay occurs.
During the shut off delay, exhaust gases are still emitted.
▶ Ensure sufficient ventilation.

Signs of a defective auxiliary heater:
– Significant smoke development
– Unusual combustion noise
– Fuel odor

NOTICE
Auxiliary heater* defective!
▶ Turn the auxiliary heater* off.
▶ Take the auxiliary heater* out of operation: Shut off the power supply to the auxiliary heater.
▶ Before turning it on again: Have the auxiliary heater* inspected by authorized and trained expert personnel.

NOTICE
Damage of auxiliary heater*!
▶ Operate the auxiliary heater* at least once a month for 15 minutes.
▶ Regularly burn-off the burner of the auxiliary heater*. See section „Auxiliary heater maintenance“.

8.1 Auxiliary heater icons

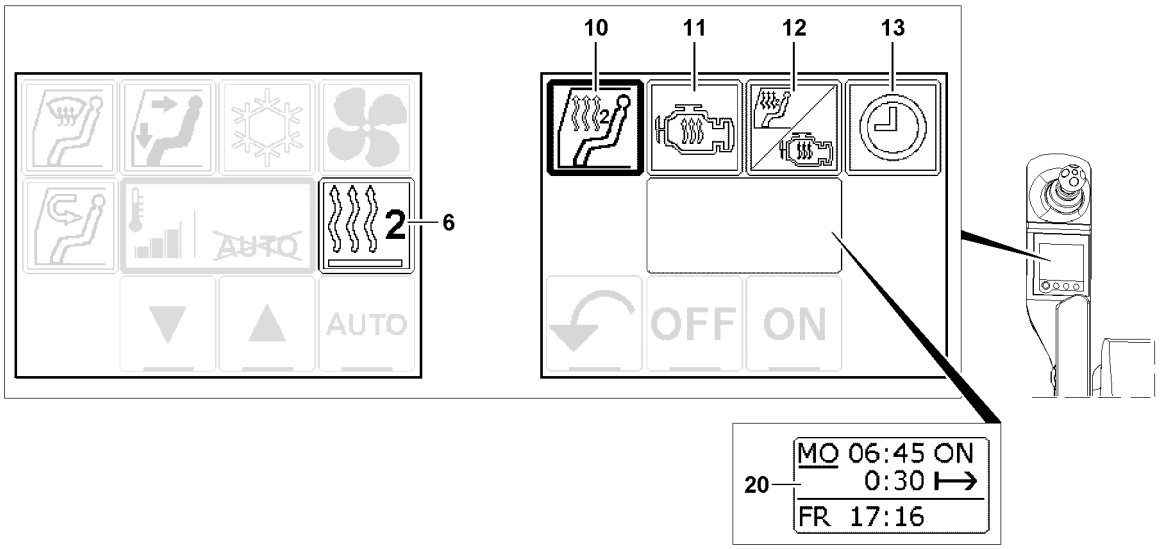

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Fig.144100: Auxiliary heater icons

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Note

▶ The field in the middle of the *Auxiliary heater* menu displays, depending on the situation, the selected icon or the timer program dialog **20**.

***Climate control* menu:** *Auxiliary heater* icon **6**	
Icon	**Function**
	Auxiliary heater crane cab turned off
	Auxiliary heater crane cab turned off, timer activated
	Auxiliary heater crane cab turned on, timer activated

***Auxiliary heater* menu:** *Crane cab auxiliary heater* icon **10**	
Icon	**Function**
	Auxiliary heater crane cab turned off
	Auxiliary heater crane cab turned on
	Auxiliary heater crane cab turned off, timer activated
	Auxiliary heater crane cab turned on, timer activated

***Auxiliary heater* menu:** *Engine preheating* icon **11**[1)]	
Icon	**Function**
	Engine preheating turned off
	Engine preheating turned on
	Engine preheating turned off, timer activated
	Engine preheating turned on, timer activated

1) Only for crane types with a crane engine in the crane superstructure

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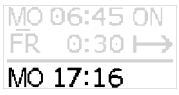
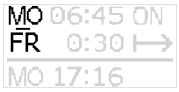
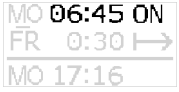
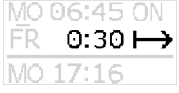
***Auxiliary heater* menu:** *Auxiliary heater crane cab / engine preheating* icon **12**[1)]	
Icon	**Function**
	Auxiliary heater crane cab / engine preheating turned off
	Auxiliary heater crane cab / engine preheating turned on
	Auxiliary heater crane cab / engine preheating turned off, timer activated
	Auxiliary heater crane cab / engine preheating turned on, timer activated

1) Only for crane types with a crane engine in the crane superstructure

***Auxiliary heater* menu:** *Timer* icon **13**	
Icon	**Function**
	Timer turned off
	Timer turned on

***Auxiliary heater* menu:** Timer program dialog **20**	
Icon	**Function**
	System time The day of the week and time of day are transferred from the system time of the LICCON computer system
	Turn on day The following can be set as the turn on day: - single day of the week - five days in a row from Monday to Friday - seven days in a row from Monday to Sunday
	Turn on time Current programmed start time / turn on time of auxiliary heater
	Turn on duration Current programmed turn on duration of the auxiliary heater from the turn on time

1) Only for crane types with a crane engine in the crane superstructure

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8.2 Operating the auxiliary heater with the ignition on

Make sure that the following prerequisites are met:
- The crane superstructure ignition is turned on.
- Sufficient fuel for the auxiliary heater has been added.
- The *Climate control* menu is selected.

8.2.1 Selecting the *Auxiliary heater* menu

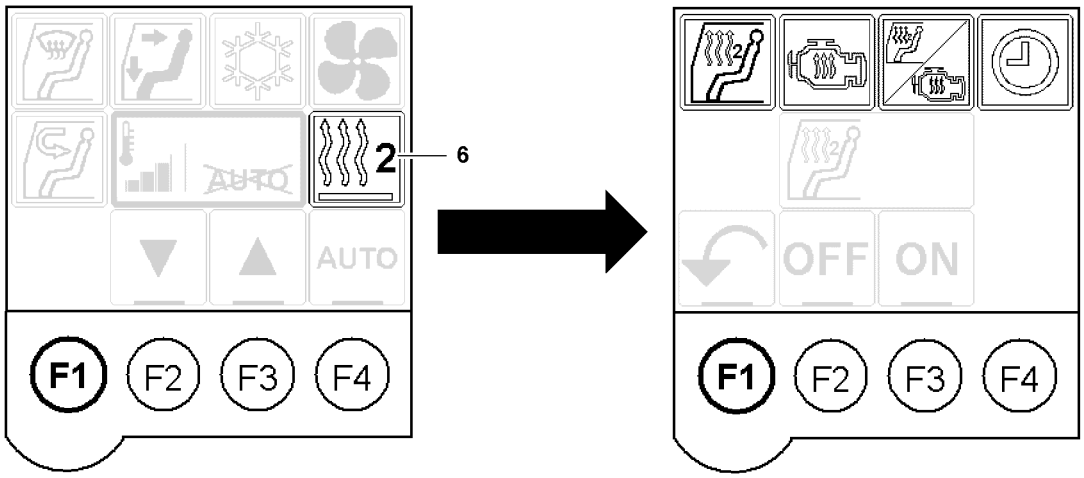

Fig.144101: Selecting the Auxiliary heater menu

▶ Tap the *auxiliary heater* icon **6**.

Result:

– The *auxiliary heater* menu is selected.

Note

▶ If a selection is made in the *auxiliary heater* menu, it is displayed again.

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8.2.2 Turning the auxiliary heater on

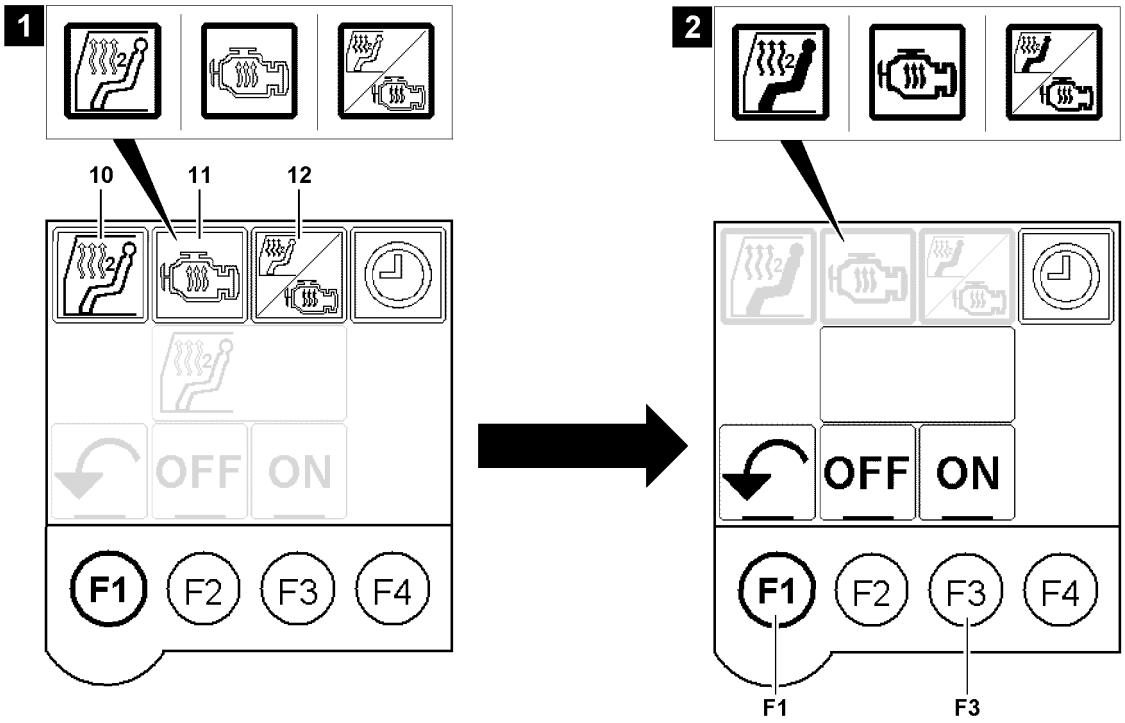

Fig.144084: Turning the auxiliary heater on

The auxiliary heater functions are selected by tapping the respective icon on the display:
- Crane cab auxiliary heater
  - Tap the *auxiliary heater crane cab* icon **10**
- Engine preheating
  - Tap the *engine preheating* icon **11**
  - **Note**: Only for crane types with a crane engine in the crane superstructure.
- Auxiliary heater crane cab / engine preheating
  - Tap the *auxiliary heater crane cab / engine preheating* icon **12**
  - **Note**: Only for crane types with a crane engine in the crane superstructure.

A selected function is bordered in black, see illustration **1**. By tapping another function, the previous selection is discarded.

▶ Tap the *auxiliary heater crane cab* icon **10**.
or
Tap the *engine preheating* icon **11**.
or
Tap the *auxiliary heater crane cab / engine preheating* icon **12**.

Result:

- The selected icon is bordered in black, see illustration **1**.
- The function is selected and is displayed in the field in the middle of the *auxiliary heater* menu.

To turn on the auxiliary heater for the selected function:
▶ Press the function key **F3**.

Result:

- The selected icon is filled out in black, see illustration **2**.
- The auxiliary heater is turned on.

To return to the *Climate control* menu:
▶ Press the function key **F1**.

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8.2.3 Turning the auxiliary heater off

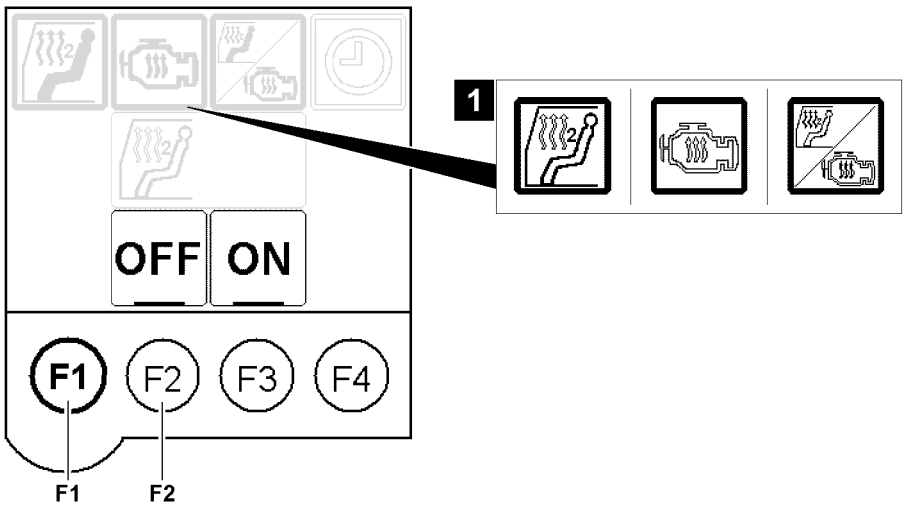

Fig.144085: Turning the auxiliary heater off

When the *auxiliary heater* menu is not displayed:
▶ Select the *Auxiliary heater* menu.

To turn the auxiliary heater off:
▶ Press the function key **F2**.

Result:

– The selected auxiliary heater function is no longer displayed filled out in black, see illustration **1**.
– The auxiliary heater is turned off.

To return to the *Climate control* menu:
▶ Press the function key **F1**.

8.2.4 Operating the timer

The auxiliary heater can be turned on at any time using the timer.

WARNING
Danger of suffocation and explosion!

Only when the auxiliary heater is turned on if sufficient ventilation is ensured and no danger of explosion exists:
▶ Activate the timer.

Note
▶ Pay attention to a sufficient fuel reserve for the auxiliary heater. See the section „Checking the fill level of the fuel container“.
▶ Add fuel, see chapter 7.05.

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Programming the timer

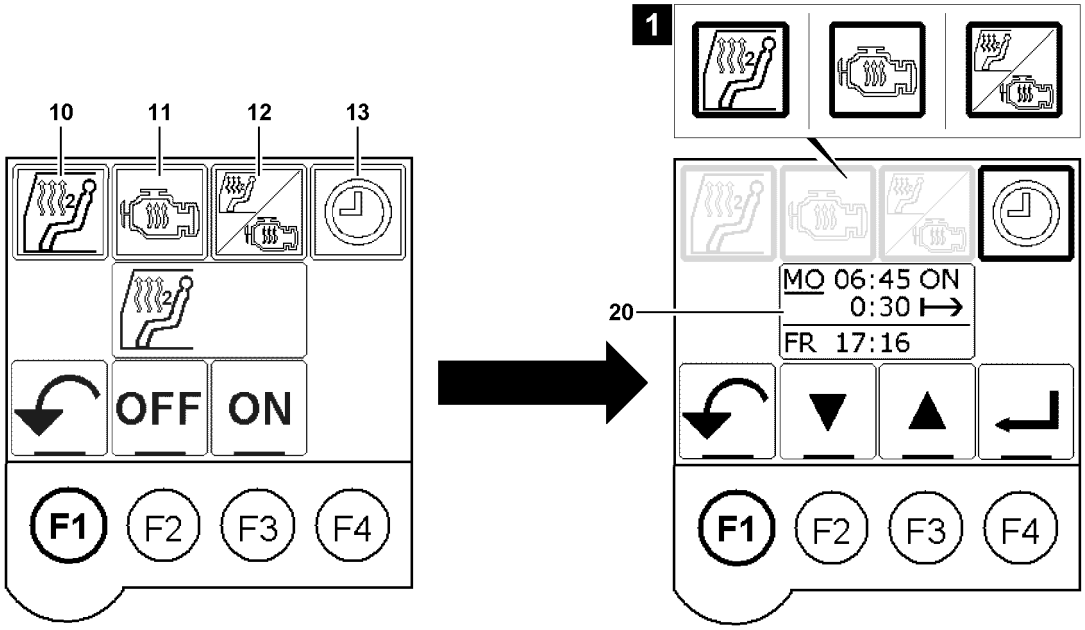

Fig.144087: Auxiliary heater menu: Programming the timer

The previously set function, air supply and air distribution is taken over.

The fan stage is set to 30 %.

The program ends after the set time and is not repeated.

The timer is only activated when all program steps are completed.

Make sure that the following prerequisites are met:
- The *auxiliary heater* menu is selected.
- At the programmed start time for the timer, the ignition is turned off.

▶ Tap the *auxiliary heater crane cab* icon **10**.
or
Tap the *engine preheating* icon **11**.
or
Tap the *auxiliary heater crane cab / engine preheating* icon **12**.

Result:

– The selected icon is bordered in black, see illustration **1**.

▶ Tap the *timer* **13** icon.

Result:

– The *timer* icon **13** is bordered in black.
– The timer program dialog **20** is shown on the display.
– The cursor is on the turn on day - the turn on day is underlined.

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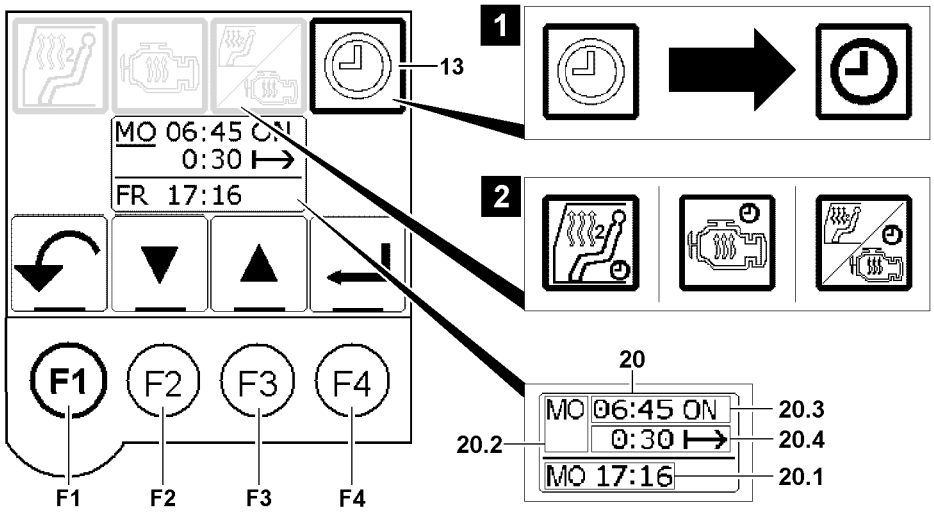

Fig.144088: Auxiliary heater menu: Programming the timer

The timer program dialog **20** displays the current system time **20.1**. The system time **20.1** is the determining factor for the timer.

The following can be set as the turn on day **20.2**:
– Single day of the week
– Daily from Monday to Friday
– Daily from Monday to Sunday

▶ Select the turn on day **20.2** with function key **F2** and function key **F3**.
▶ Confirm the turn on day **20.2** with the function key **F4**.

Result:

– The cursor is on turn on time **20.3** (hour). The turn on time **20.3** (hour) is underlined.

Set the turn on time **20.3** (hour).

▶ Select the turn on time **20.3** (hour) with function key **F2** and function key **F3**.
▶ Confirm the turn on time **20.3** (hour) with the function key **F4**.

Result:

– The cursor is on turn on time **20.3** (minute). The turn on time **20.3** (minute) is underlined.

Set the turn on time **20.3** (minute).

▶ Select the turn on time **20.3** (minute) with function key **F2** and function key **F3**.
▶ Confirm the turn on time **20.3** (minute) with the function key **F4**.

Result:

– The cursor is on the turn on duration **20.4**. The turn on duration **20.4** is underlined.

Set the turn on duration **20.4** between 5 minutes and 55 minutes.

▶ Select the turn on duration **20.4** with function key **F2** and function key **F3**.
▶ Confirm the turn on duration **20.4** with function key **F4**.

Result:

– The *timer* icon **13** is filled out, see illustration **1**.
– The selected *auxiliary heater* icon has a clock symbol, see illustration **2**.
– The timer is programmed and activated.

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Note

- ▶ As soon as the timer is activated, the current turn on time is displayed also when the ignition is turned off.
- ▶ At the programmed start time for the timer, the ignition must be turned off so that the auxiliary heater turns on.

To return to the *Climate control* menu:

▶ Press the function key **F1**.

Turning the timer off

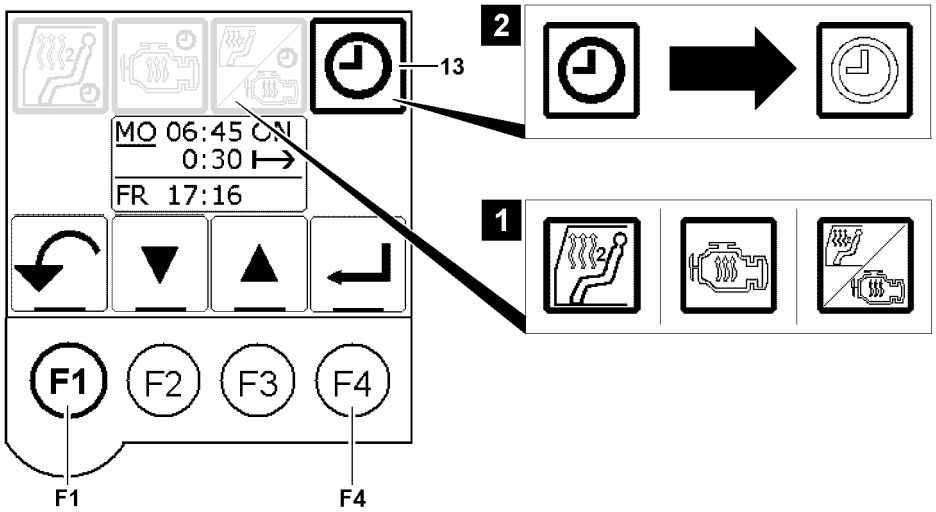

Fig.144086: Auxiliary heater menu: turning off the timer

Make sure that the following prerequisite is met:

– The *timer* icon **13** is not filled out in black.

▶ Press the function key **F4**.

Result:

– The clock on the selected *auxiliary heater* icon is deleted, see illustration **1**.
– The *timer* icon **13** is not filled out, see illustration **2**.
– The timer is turned off.

To return to the *Climate control* menu:

▶ Press the function key **F1**.

8.3 Operating the auxiliary heater with the ignition off

Make sure that the following prerequisites are met:

– The crane superstructure ignition is turned off.
– Sufficient fuel for the auxiliary heater has been added.

8.3.1 Turning the auxiliary heater on / off (ignition off)

If the ignition is turned off during operation of the auxiliary heater, the auxiliary heater continues to run for up to 30 minutes due to the shut off delay. In the *auxiliary heater* menu, the auxiliary heater can be turned off immediately, ending the shut off delay.

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Turning the auxiliary heater on

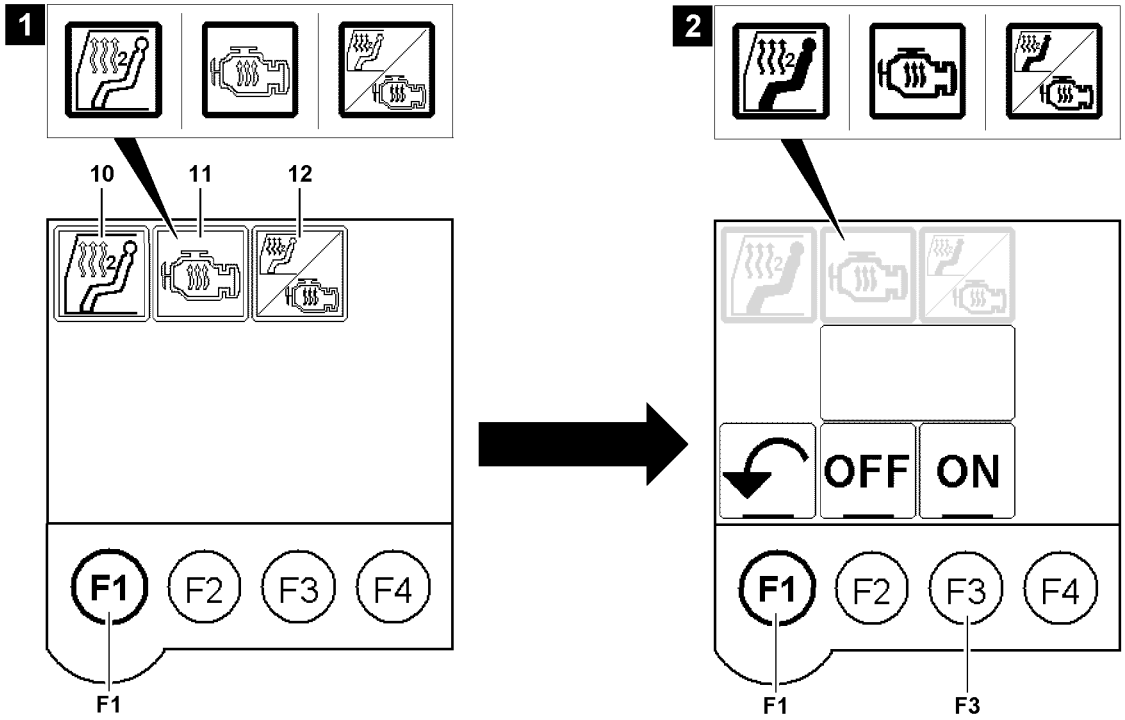

Fig.144073: Auxiliary heater menu: Turning the auxiliary heater on

When the *auxiliary heater* menu is not displayed:

▶ Hold down the function key **F1** until the *auxiliary heater* menu appears.

Note

▶ If no entry is made within a certain time, then the touch display is automatically turned off.

▶ The *engine preheating* icon **11** and *auxiliary heater crane cab / engine preheating* icon **12** are only available for crane types with a crane engine in the crane superstructure.

Select the settings:

▶ Tap the *auxiliary heater crane cab* icon **10**.
or
Tap the *engine preheating* icon **11**.
or
Tap the *auxiliary heater crane cab / engine preheating* icon **12**.

▶ Press the function key **F3**.

Result:

– The icon for the selected function is filled out in black, see illustration **1**.
– The auxiliary heater is turned on.

Note

▶ After the auxiliary heater is turned on, pressing the function key **F1** calls up the *Climate control* menu. Description of setting possibilities, see section „Climate control“.

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Turning the auxiliary heater off

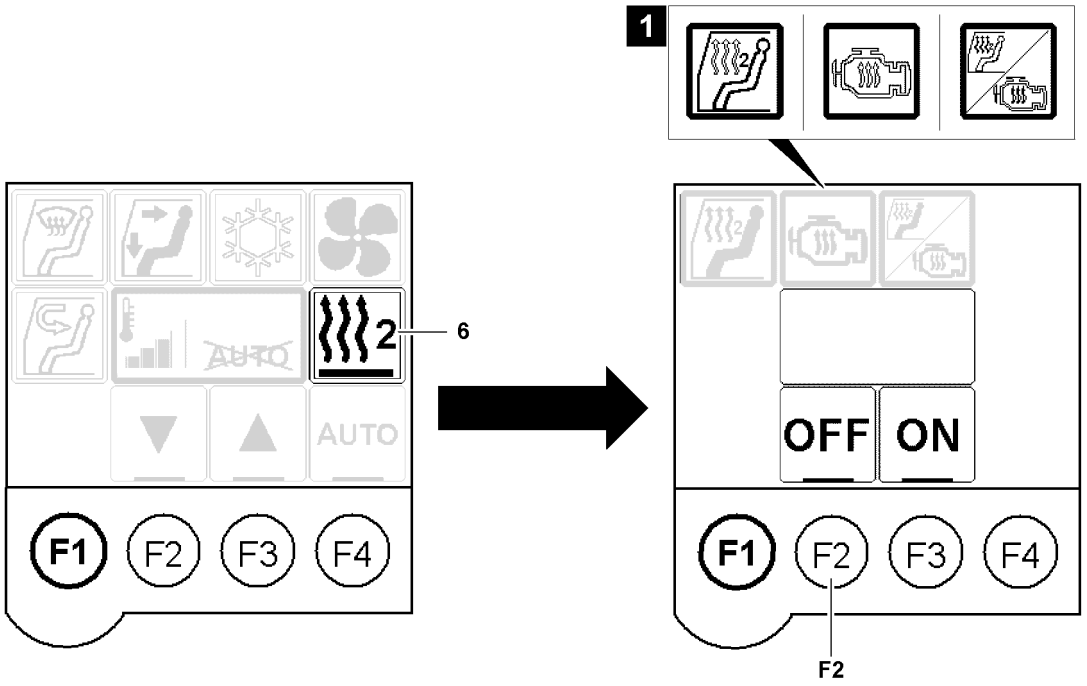

Fig.144102: Auxiliary heater menu: Turning the auxiliary heater off

When the *auxiliary heater* menu is not displayed:
▶ Tap the *auxiliary heater* icon **6**.

The programmed auxiliary heater function is displayed bordered in black

To turn the auxiliary heater off:
▶ Press the function key **F2**.

Result:

– The icon for the selected function is no longer filled out in black, see illustration **1**.
– The auxiliary heater is turned off.

8.3.2 Turning the timer off (ignition off)

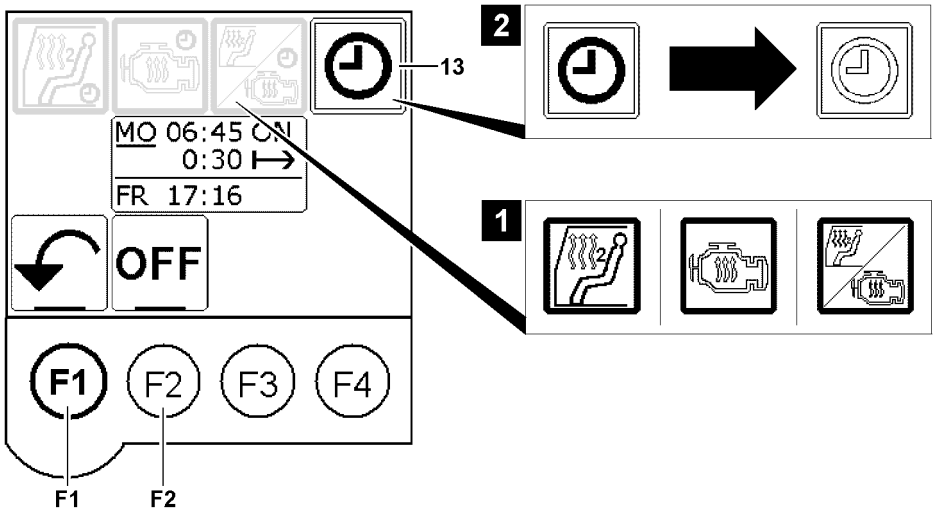

Fig.144075: Turning the timer off (ignition off)

▶ Press the function key **F2**.

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Result:

– The clock on the selected *auxiliary heater* icon is deleted, see illustration **1**.
– The *timer* icon **13** is no longer filled out, see illustration **2**.
– The timer is turned off.

9 Air heater*

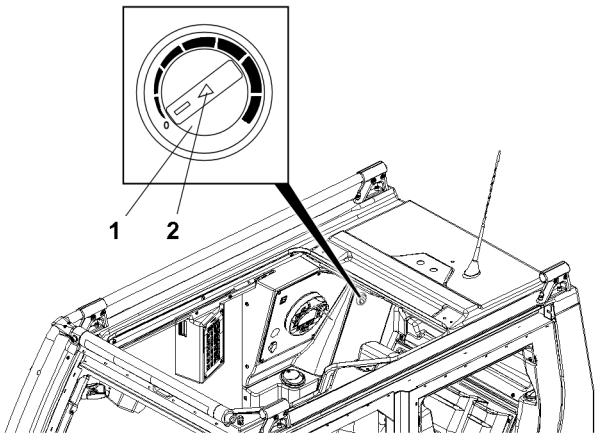

Fig.152428: Side panel, air heater rotary switch

9.1 Turning the air heater* on

For description of the air heater*, see the documentation from the manufacturer.

▶ Turn the rotary switch **1** to the desired temperature.

Result:

– The LED **2** lights up: The *heating* function is turned on.

9.2 Turning the air heater* off

▶ Set the rotary switch **1** to „0“.

Result:

– The LED **2** turns off: The *heating* function is turned off.

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10 Checking the fill level of the fuel container

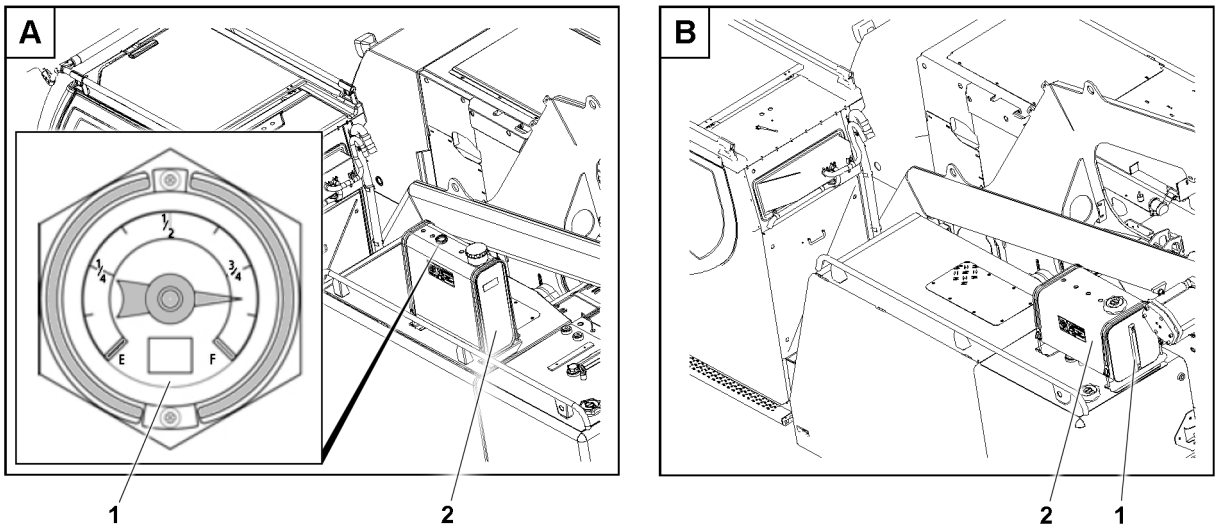

Fig.152431: Checking the fuel reserve

A Variation **B** Variation

Variation A: The fill level of the fuel container **2** is displayed by a level indicator **1**:
- Green mark: The fuel container is full.
- Red mark: The fuel container is empty.

Variation B: The fill level of the fuel container is displayed through a sight gauge **1**. When the crane is horizontal, the filling height in the sight gauge corresponds to the filling height in the fuel container.

Make sure that the following prerequisites are met:
- The crane is horizontal.

▶ Variation A: Check the fill level on the level indicator **1**.
or
Variation B: Check the filling height on the sight gauge **1**.
▶ Add fuel in time before the fuel container is empty.
▶ Add fuel, see section „Adding fuel“.

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6.05 Emergency take down

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6	Completing emergency control	31

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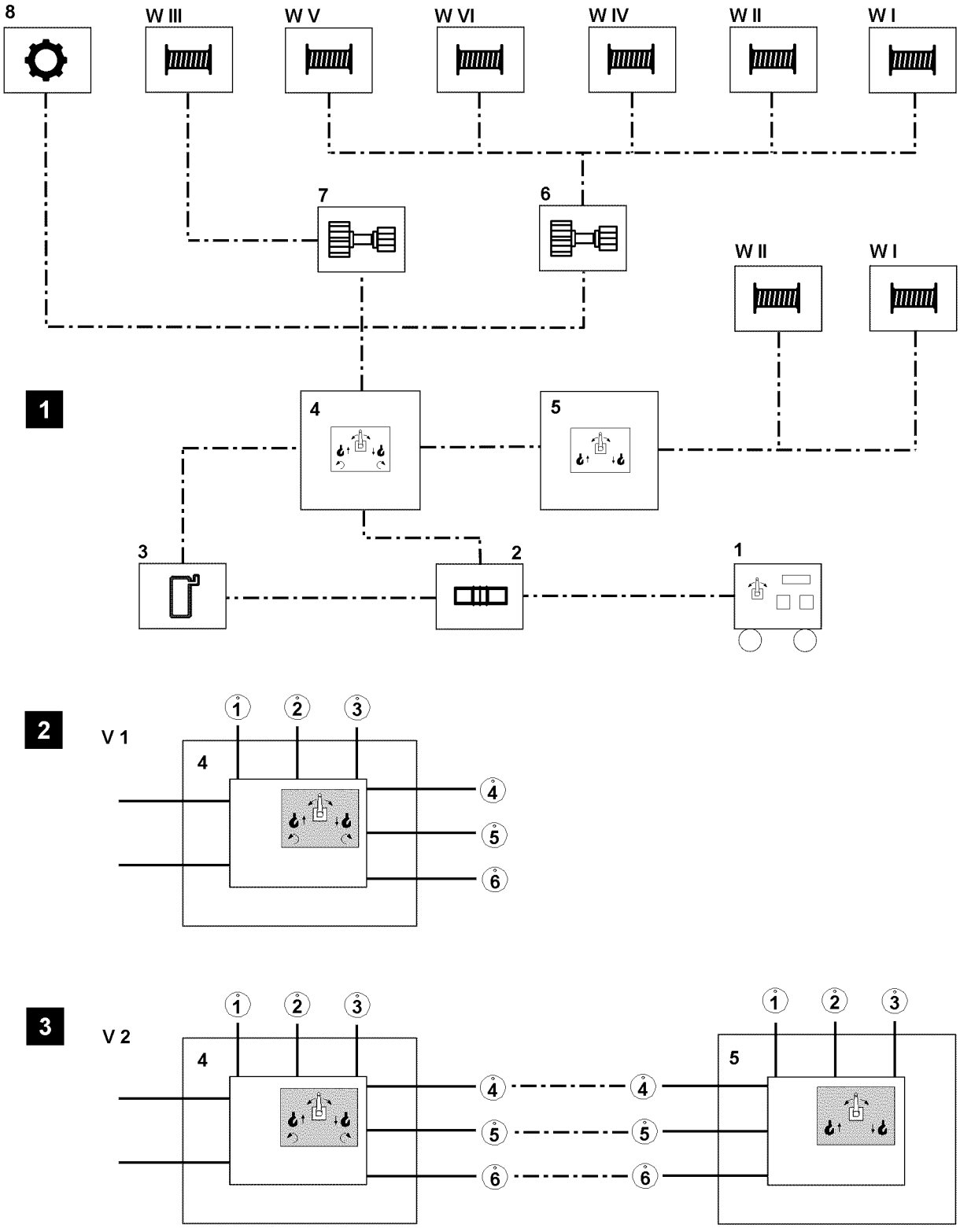

Fig.121033: Piping plan Emergency operation

1 Emergency control

Note

▶ The illustrations in this chapter are examples and may not apply exactly to your crane.

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Note

▶ Before you start with preparations for emergency operation, check which of the following assembly plates you have available to carry out the emergency operation.

There are two **different** variations of assembly plates.

With variation 1 **V1**, all winches, which are equipped with the respective auxiliary hydraulic for emergency control and the slewing gear can be actuated, each individually, see illustration **1** and illustration **2**.

With variation 2 **V2**, which consists of two assembly plates, all winches, which are equipped with the respective auxiliary hydraulic for emergency control can be actuated, each individually, **or** winch 1 **WI** and winch 2 **WII** can be actuated in parallel operation or the slewing gear can be actuated individually, see illustration **1** and illustration **3**.

Position	Component
1	Emergency operation aggregate
2	Hydraulic transformer
3	Oil container
4	Assembly plate emergency operation
5	Assembly plate parallel operation
6	Adapter 1
7	Adapter 2
8	Slewing gear
W I - W VI	Winch 1 **WI** to winch 6 **WVI**

Component overview

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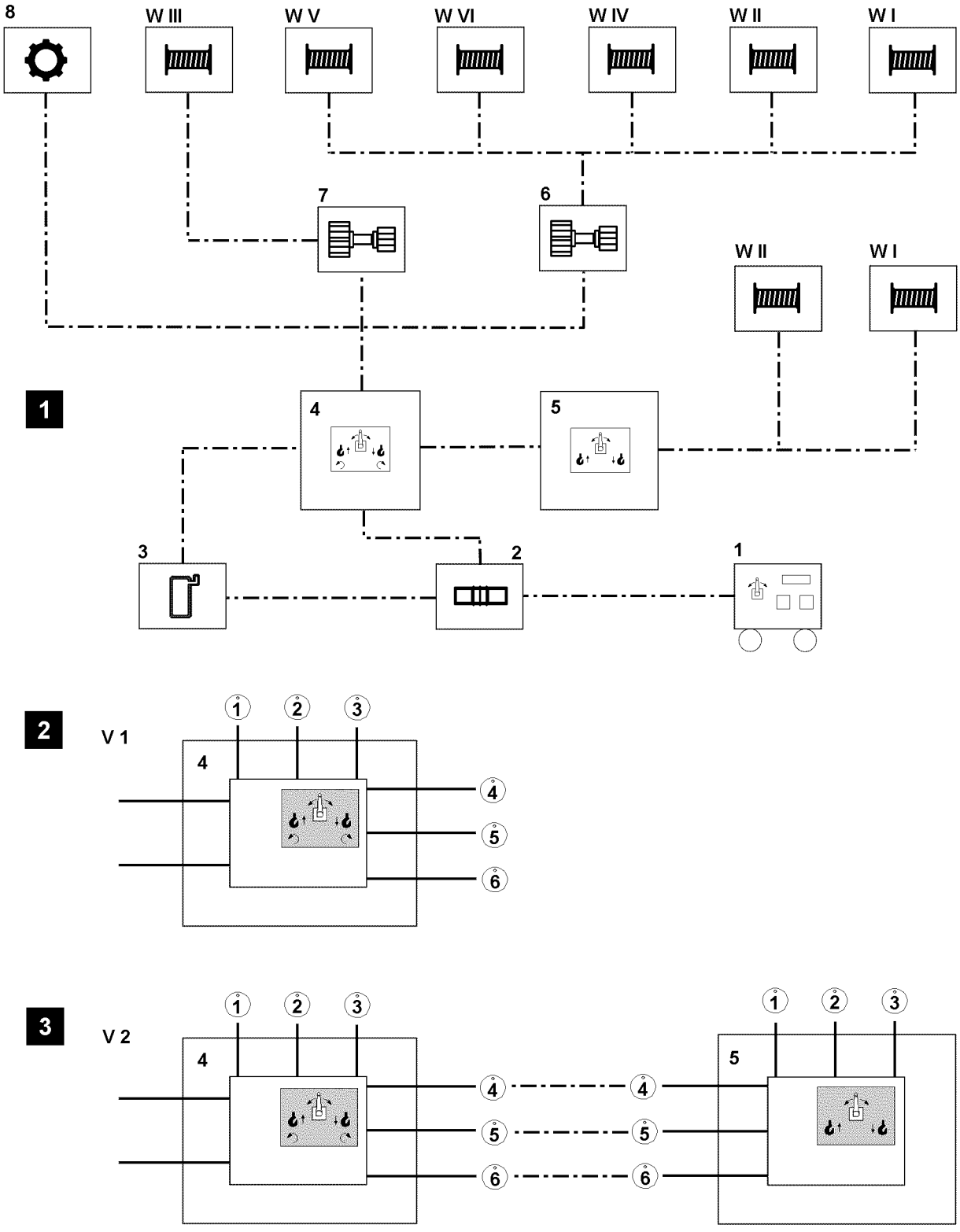

Fig.121033: Piping plan Emergency operation

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1.1 General danger notes

DANGER
Significant danger of accident during emergency control!
During an emergency control, crane movements are no longer monitored by the LICCON computer system.
In the event of improper operation or deliberate misuse, the crane can topple over.
There is an increased risk of accident if the following danger notes are not observed.
Personnel can be severely injured or killed.
This could result in high property damage.
▶ All danger notes are to be observed and maintained.

General danger notes!

1. **Emergency control of the crane superstructure may only be carried out:**
   - **To remove a dangerous situation.**
   - **After consultation with customer service at LIEBHERR-Werk Ehingen GmbH.**
   - **By authorized personnel who are knowledgeable of the hydraulic circuit diagram, the connection diagram and carrying out emergency control.**
   - **By authorized personnel who are aware of the risks of emergency control.**
   - **To carry out load reducing movements.**
2. **The danger zone must be blocked off.**
3. **No persons or objects may remain in the danger zone.**
4. **If a load is on the hook, then it must first be set down to relieve the boom.**
5. **During emergency control, all safety equipment, with the exception of „winch spooled out“ are automatically bypassed**.
6. **In the event of a problem or failure of the LICCON computer system, each step must be carried out and checked with extreme caution and care, since a visual check on the LICCON monitor is no longer possible. Visual check.**
7. **All crane movements must be carried out with extreme caution and at the lowest speed.**
8. **The crane operator must be in visual contact with auxiliary personnel or guides.**

Note
Please note!
▶ The hydraulic supply for the crane can, to the extent that the crane has been equipped, take place through an emergency unit*. If this is not the case, the crane must be taken down by using auxiliary cranes.

WARNING
The crane can topple over!
▶ The boom may only be luffed down if the stability of the crane permits this action, observe and adhere to the data in the load charts.
▶ When taking down the boom, the information in the erection and take down charts must be observed and adhered to.

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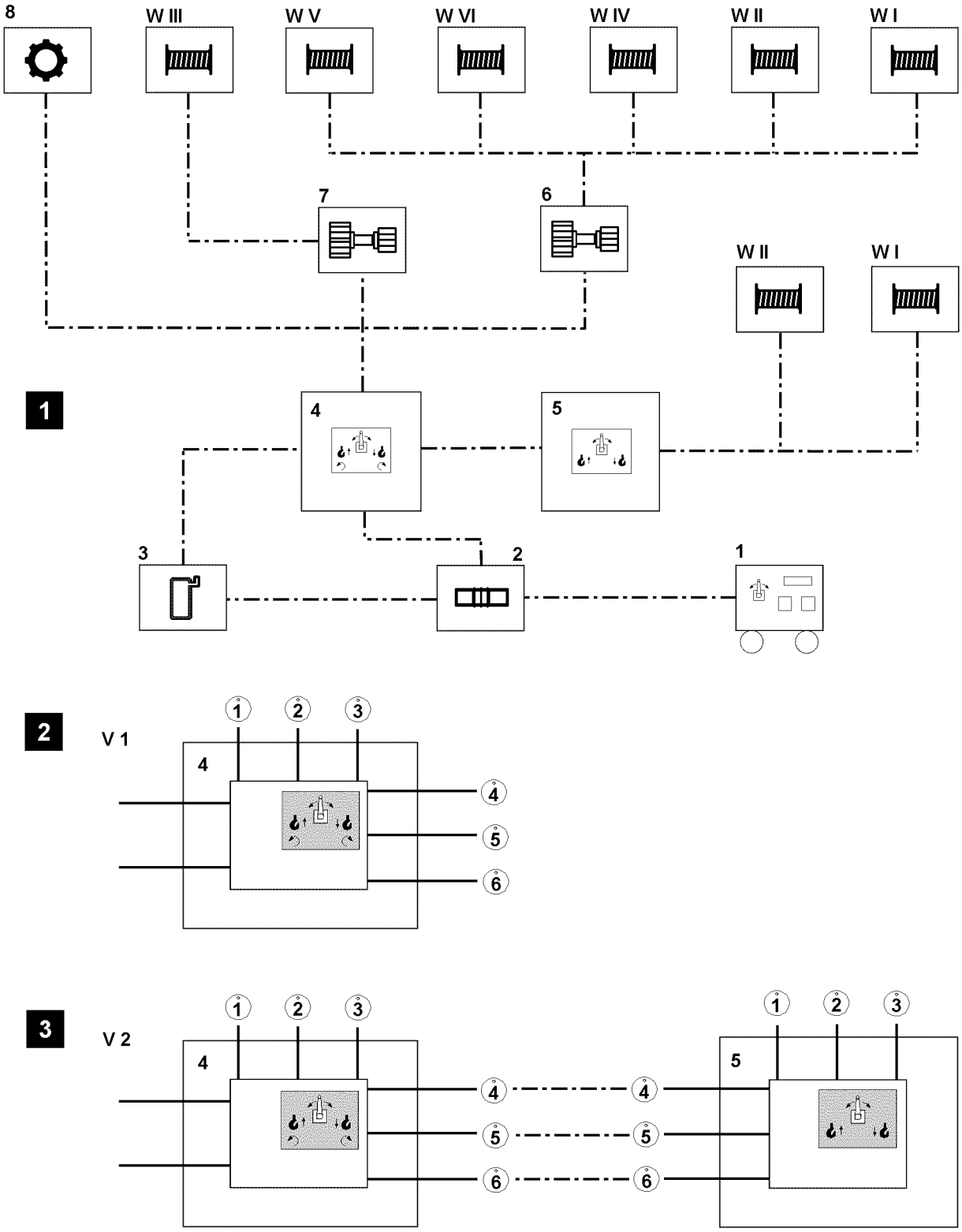

Fig.121033: Piping plan Emergency operation

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1.2 Handling of assembly plates

WARNING
Falling assembly plates!
Non-secured assembly plates can fall down when carrying out the emergency control.
Personnel can be severely injured or killed.
- ▶ For emergency control, secure the assembly plates with the chains to prevent them from falling down.
- ▶ Do not secure the assembly plates near movable crane components.

1.3 Prerequisites for emergency control

Note
- ▶ Due to different line diameters on the hydraulic lines, they cannot connected incorrectly, in addition, the hydraulic connections are identified with numbers.

Make sure that the following prerequisites are met:
- The hydraulic schematic is available.
- The hydraulic system is functional.
- An emergency operation aggregate **1** is available.
- A „hydraulic transformer **2**“ is available.
- The assembly plate(s) are available.
- Adapter **6** and adapter **7** are available.
- The dust caps for the hydraulic connections are removed.
- The pressure in the hydraulic system has been relieved.

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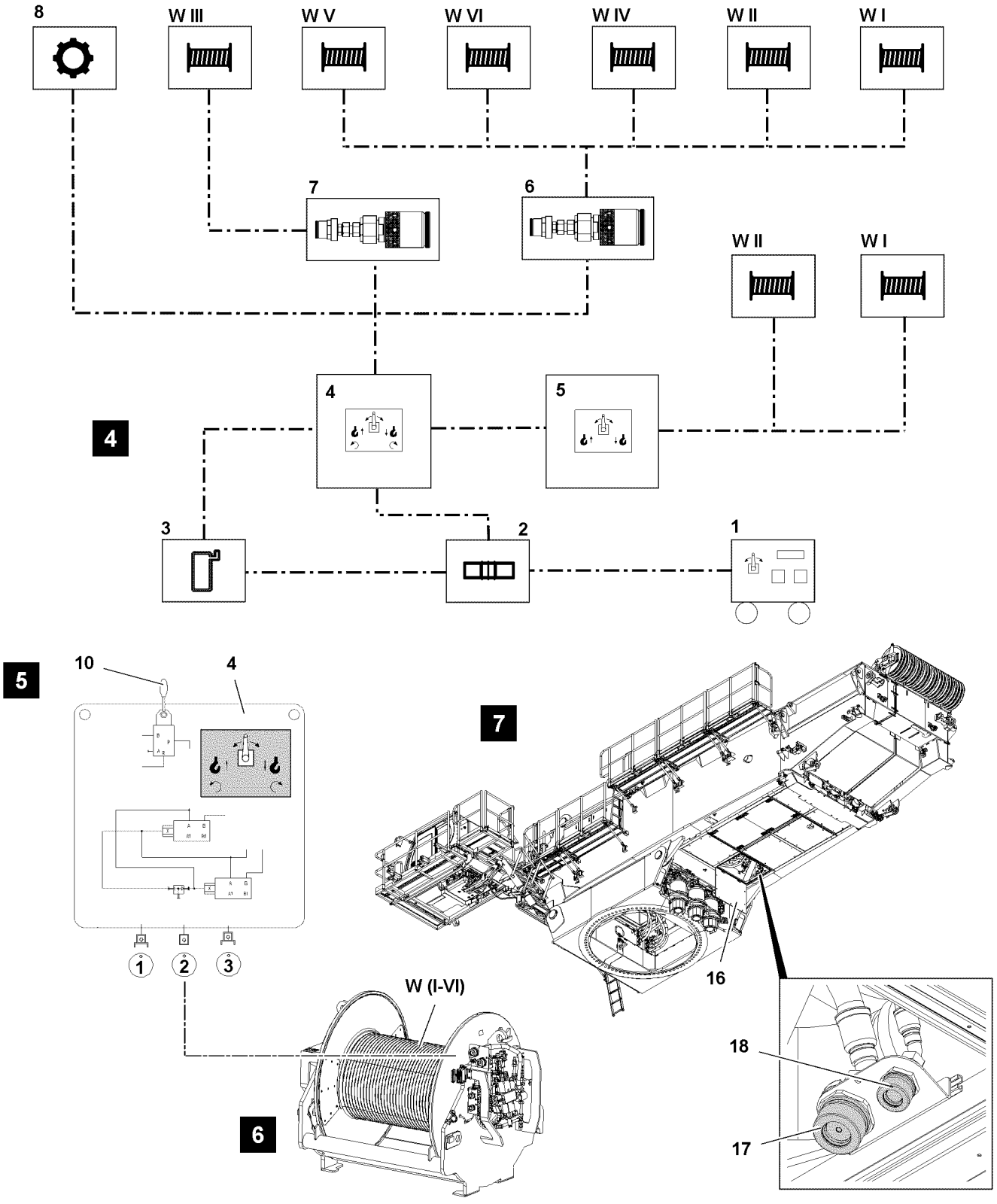

Fig.121034: Emergency control with assembly plate Variation 1 (V1)

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2 Emergency control with assembly plate Variation 1 (V1)

Note

▶ Carrying out emergency control is identical for all winches and is described on the example of one winch.

Numbering						
	Connections of assembly plate					
	Connection 1 „lift“		Connection 2 „lower“		Connection 3 „brake“	
Winch 1 **WI**	**1**[1)]	1[2)]	**2**[1)]	2[2)]	**5**[1)]	5[2)]
Winch 2 **WII**	**1**[1)]	1[2)]	**2**[1)]	2[2)]	**5**[1)]	5[2)]
Winch 3 **WIII**	**1**[1)]	5[2)]	**2**[1)]	6[2)]	**5**[1)]	W3[2)]
Winch 4 **WIV**	**1**[1)]	1[2)]	**2**[1)]	2[2)]	**5** or **6**[1)]	5/6[2)]
Winch 5 **WV**	**1**[1)]	7[2)]	**2**[1)]	6[2)]	**5**[1)]	W5[2)]
Winch 6 **WVI**	**1**[1)]	9[2)]	**2**[1)]	8[2)]	**5**[1)]	W6[2)]

Numbering of hydraulic connections

[1)] - Identification (numbering) on winches
[2)] - Identification (numbering) on piping plan

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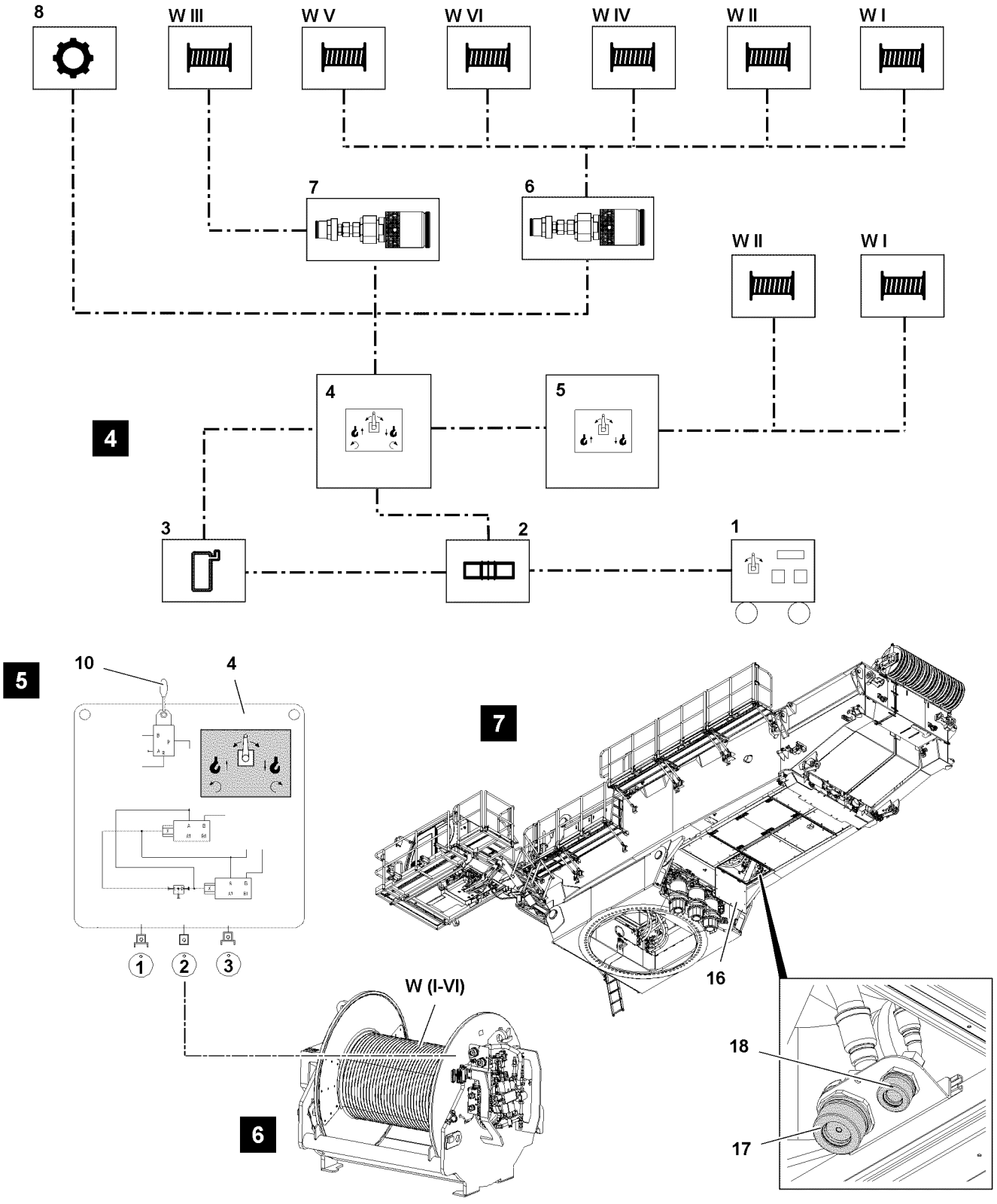

Fig.121034: Emergency control with assembly plate Variation 1 (V1)

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2.1 Establishing the hydraulic connections

WARNING
Danger due to hydraulic pressure!
If the hydraulic lines are under pressure when releasing the connections, assembly personnel can be severely injured.
- ▶ Relieve the pressure in the hydraulic lines before releasing.
- ▶ Make sure that the engine is turned off.

- ▶ Establish the hydraulic connections from the emergency operation aggregate* **1** to the transformer **2**, see illustration **4**.

WARNING
Cover swinging down!
The cover **16** can swing down by itself due to its own weight when releasing the connections, see illustration **7**.
Personnel can be injured.
- ▶ When releasing the connections, hold the cover **16**.

- ▶ Open the cover **16**, see illustration **7**.
- ▶ Establish the hydraulic connection from the hydraulic transformer **2** to the suction line **17** of the oil tank **3** on the turntable of the crane, see illustration **4** and illustration **7**.
- ▶ Establish the hydraulic connection from the turntable of the crane (oil tank **3**, return line **18**) to the Assembly plate emergency operation **4**, see illustration **4** and illustration **7**.
- ▶ Establish the hydraulic connection (pressure line) from the hydraulic transformer **2** to the assembly plate emergency operation **4**, see illustration **4**.
- ▶ Release the hydraulic connections on the corresponding winch.

Note
- ▶ Pay attention to the numbering of the hydraulic lines, see chart.

- ▶ Establish the hydraulic connection from the assembly plate emergency operation **4** to the winch through adapter **6** or adapter **7**, see illustration **4**, illustration **5** and illustration **6**.

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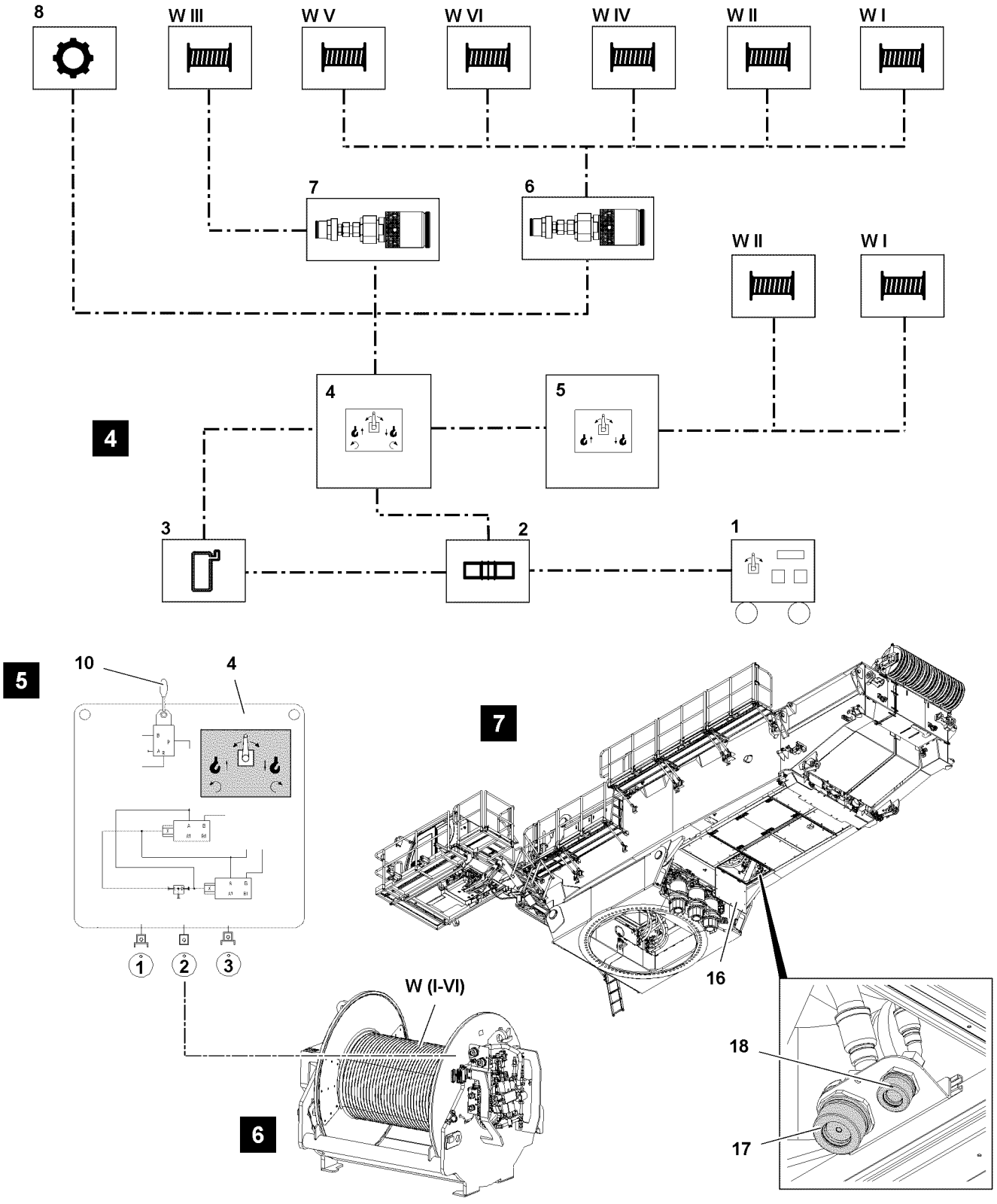

Fig.121034: Emergency control with assembly plate Variation 1 (V1)

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2.2 Starting the emergency operation aggregate

Note

- ▶ Start the emergency operation aggregate, see Operating instructions for emergency operation aggregate.
- ▶ The engine rpm on the emergency operation aggregate can be set via a separate speed regulation.

2.3 Emergency control winches

2.3.1 Function selection on the assembly plate emergency operation

Note

- ▶ The crane movements are actuated and the speed of the respective crane movement is determined via the ball valve **10**.

With the ball valve **10** on the assembly plate emergency operation **4** the following movements for the winches are preselected:

– Lift or lower

▶ Preselect crane movement: Set the ball valve **10** in the respective direction and carry out the respective crane movement carefully, see illustration **5**.

2.3.2 Spooling the winch out

▶ Spool the winch out: Set the ball valve **10** for the assembly plate emergency operation **4** in „lower“ direction.

Result:

– The winch spools out.

2.3.3 Spooling the winch up

▶ Spool the winch up: Set the ball valve **10** for the assembly plate emergency operation **4** in „lift“ direction.

Result:

– The winch spools up.

2.4 Disconnecting the hydraulic connections

Make sure that the following prerequisites are met:

- The emergency control is completed.
- The pressure in the hydraulic system has been relieved.

▶ Disconnect the hydraulic connections from the winch to the assembly plate emergency operation **4**.
▶ Disassemble adapter **6** or adapter **7**.
▶ Close off the hydraulic connections of the winch with dust caps.
or
Reconnect the winch to the hydraulic system of the crane.

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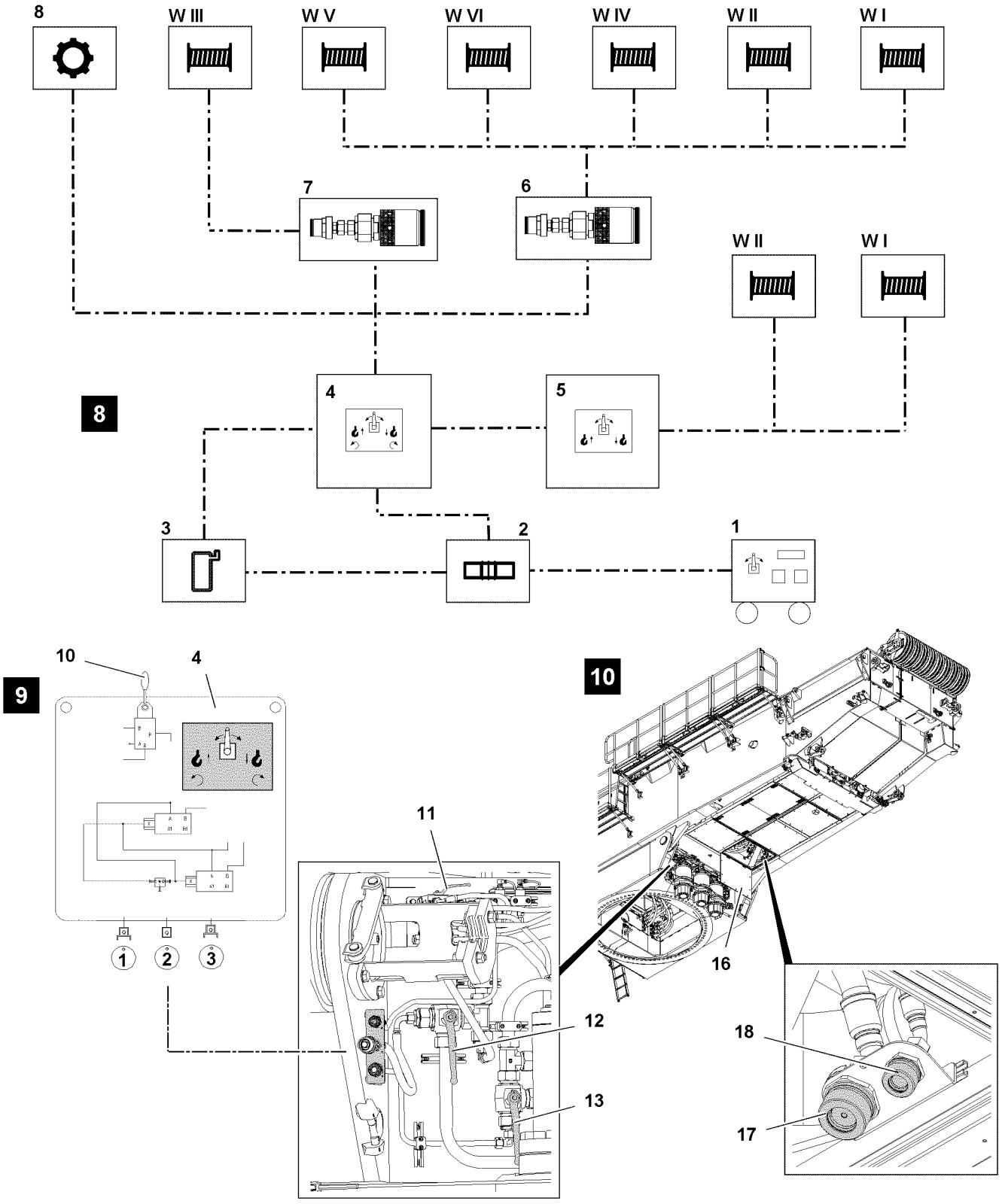

Fig.121035: Emergency control of slewing gear(s) with assembly plate Variation 1 (V1)

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3 Emergency control of slewing gear(s) with assembly plate Variation 1 (V1)

WARNING
Danger due to hydraulic pressure!
If the hydraulic lines are under pressure when releasing the connections, assembly personnel can be severely injured.
▶ Relieve the pressure in the hydraulic lines before releasing.

Note
▶ The crane movements are actuated and the speed of the respective crane movement is determined via the ball valve **10**.

With the ball valve **10** on the assembly plate emergency operation **4** the following movements are preselected:
– turn left
– turn right

3.1 Establishing the hydraulic connection to the slewing gears

WARNING
Danger due to hydraulic pressure!
If the hydraulic lines are under pressure when releasing the connections, assembly personnel can be severely injured.
▶ Relieve the pressure in the hydraulic lines before releasing.
▶ Make sure that the engine is turned off.

▶ Establish the hydraulic connections from the emergency operation aggregate* **1** to the transformer **2**, see illustration **8**.

WARNING
Cover swinging down!
The cover **16** can swing down by itself due to its own weight when releasing the connections, see illustration **10**.
Personnel can be injured.
▶ When releasing the connections, hold the cover **16**.

▶ Open the cover **16**, see illustration **10**.
▶ Establish the hydraulic connection from the hydraulic transformer **2** to the suction line **17** of the oil tank **3** on the turntable of the crane, see illustration **8** and illustration **10**.
▶ Establish the hydraulic connection from the turntable of the crane (oil tank **3**, return line **18**) to the Assembly plate emergency operation **4**, see illustration **8** and illustration **10**.
▶ Establish the hydraulic connection (pressure line) from the hydraulic transformer **2** to the assembly plate emergency operation **8**, see illustration **8**.

Note
▶ Pay attention to the numbering of the hydraulic lines.

▶ Establish the hydraulic connections for the Assembly plate emergency operation **4** to the slewing gear **8** on the turntable „ball valves for emergency control“, see illustration **8**, illustration **9** and illustration **10**.

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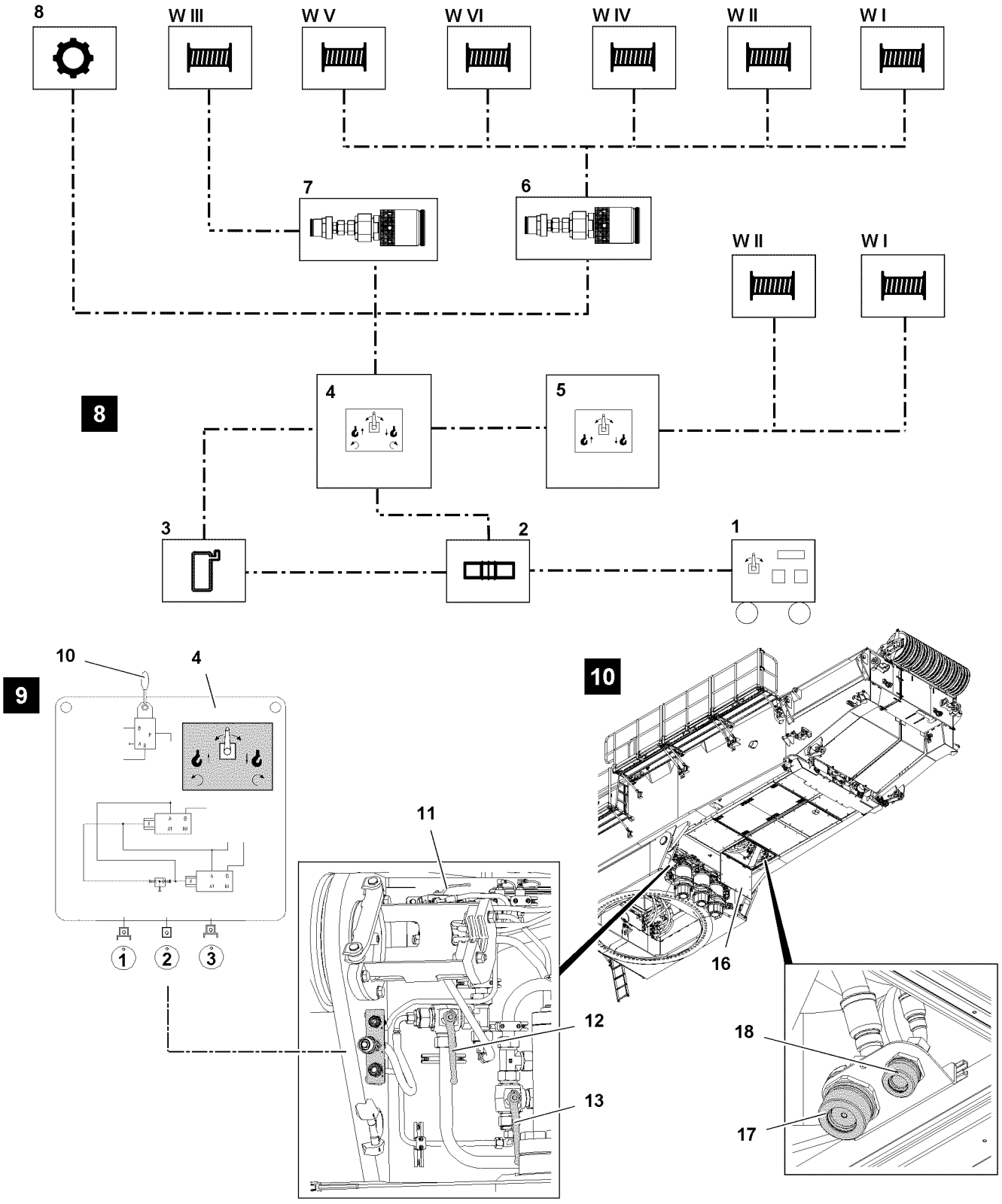

Fig.121035: Emergency control of slewing gear(s) with assembly plate Variation 1 (V1)

3.2 Turning the turntable to the left

- ▶ Set the ball valve **11** into emergency control position.
- ▶ Set the ball valve **12** into emergency control position.
- ▶ Set the ball valve **13** into emergency control position.

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▶ Turn the turntable to the left: Carefully set the ball valve **10** for the assembly plate emergency operation **4** in „turn left“ direction, see illustration **9**.

Result:

– The turntable turns to the left.

3.3 Turning the turntable to the right

▶ Set the ball valve **11** into emergency control position.
▶ Set the ball valve **12** into emergency control position.
▶ Set the ball valve **13** into emergency control position.
▶ Turn the turntable to the right: Carefully set the ball valve **10** for the assembly plate emergency operation **4** in „turn right“ direction, see illustration **9**.

Result:

– The turntable turns to the right.

3.4 Disconnecting the hydraulic connections

Make sure that the following prerequisites are met:
– The emergency control is completed.
– The pressure in the hydraulic system has been relieved.

Disconnect the hydraulic connections to the assembly plate emergency operation **4**.

▶ Change the ball valve **11** in crane operation position.
▶ Change the ball valve **12** in crane operation position.
▶ Change the ball valve **13** in crane operation position.

When the ball valve **11**, ball valve **12** and ball valve **13** are changed to crane operation position:
▶ Disconnect the hydraulic connections from the slewing gear **8** on the turntable „ball valves for emergency control“ to the assembly plate emergency operation **4**.
▶ Close off the hydraulic connections with dust caps.

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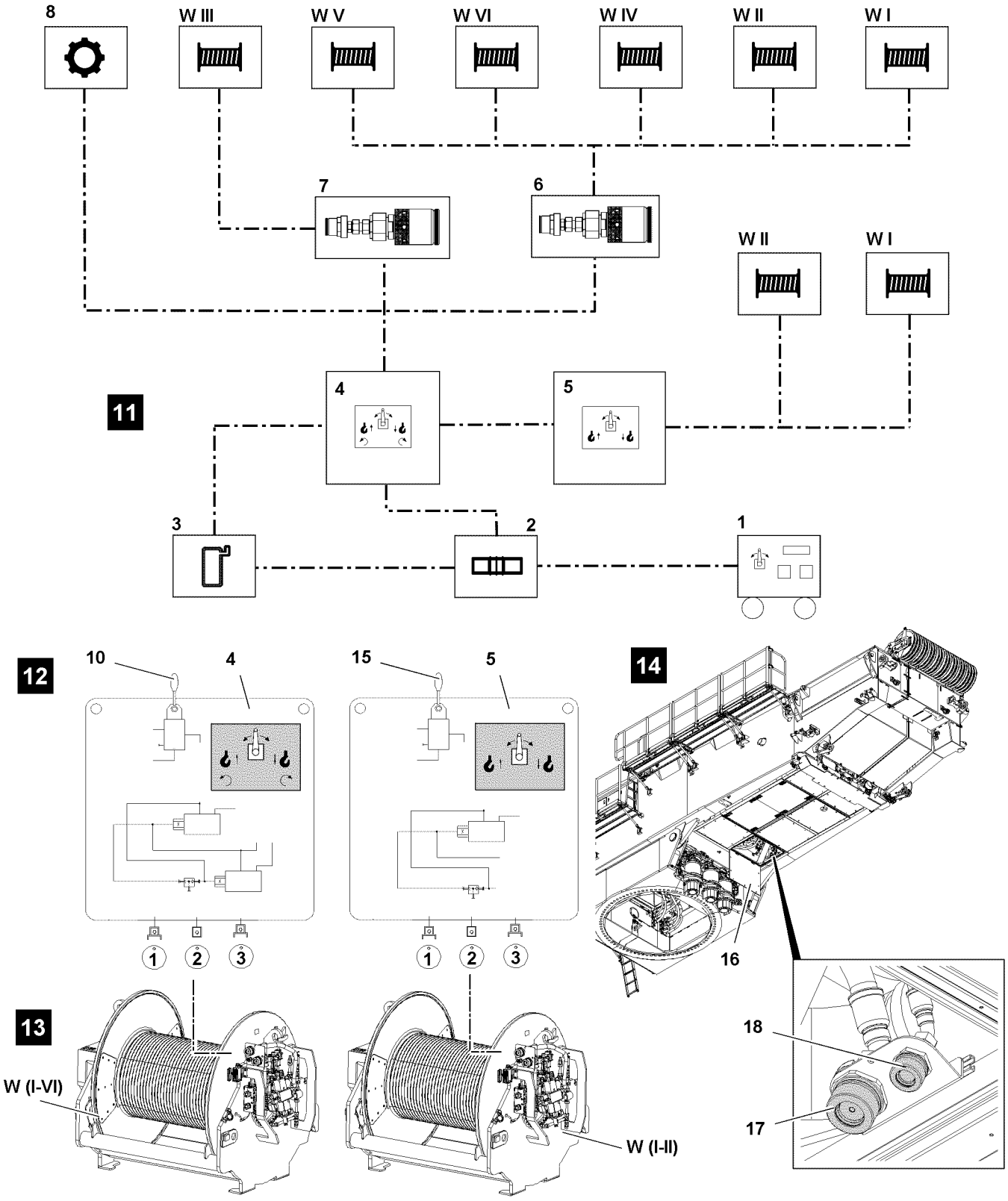

Fig.121036: Emergency control with assembly plate(s) Variation 2 (V2)

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4 Emergency control with assembly plate(s) Variation 2 (V2)

Note

▶ Carrying out emergency control is identical for all winches and is described on the example of one winch.

Numbering						
	Connections of assembly plate					
	Connection 1 „lift“		Connection 2 „lower“		Connection 3 „brake“	
Winch 1 **WI**	**1**[1)]	1[2)]	**2**[1)]	2[2)]	**5**[1)]	5[2)]
Winch 2 **WII**	**1**[1)]	1[2)]	**2**[1)]	2[2)]	**5**[1)]	5[2)]
Winch 3 **WIII**	**1**[1)]	5[2)]	**2**[1)]	6[2)]	**5**[1)]	W3[2)]
Winch 4 **WIV**	**1**[1)]	1[2)]	**2**[1)]	2[2)]	**5** or **6**[1)]	5/6[2)]
Winch 5 **WV**	**1**[1)]	7[2)]	**2**[1)]	6[2)]	**5**[1)]	W5[2)]
Winch 6 **WVI**	**1**[1)]	9[2)]	**2**[1)]	8[2)]	**5**[1)]	W6[2)]

Numbering of hydraulic connections

[1)] - Identification (numbering) on winches
[2)] - Identification (numbering) on piping plan

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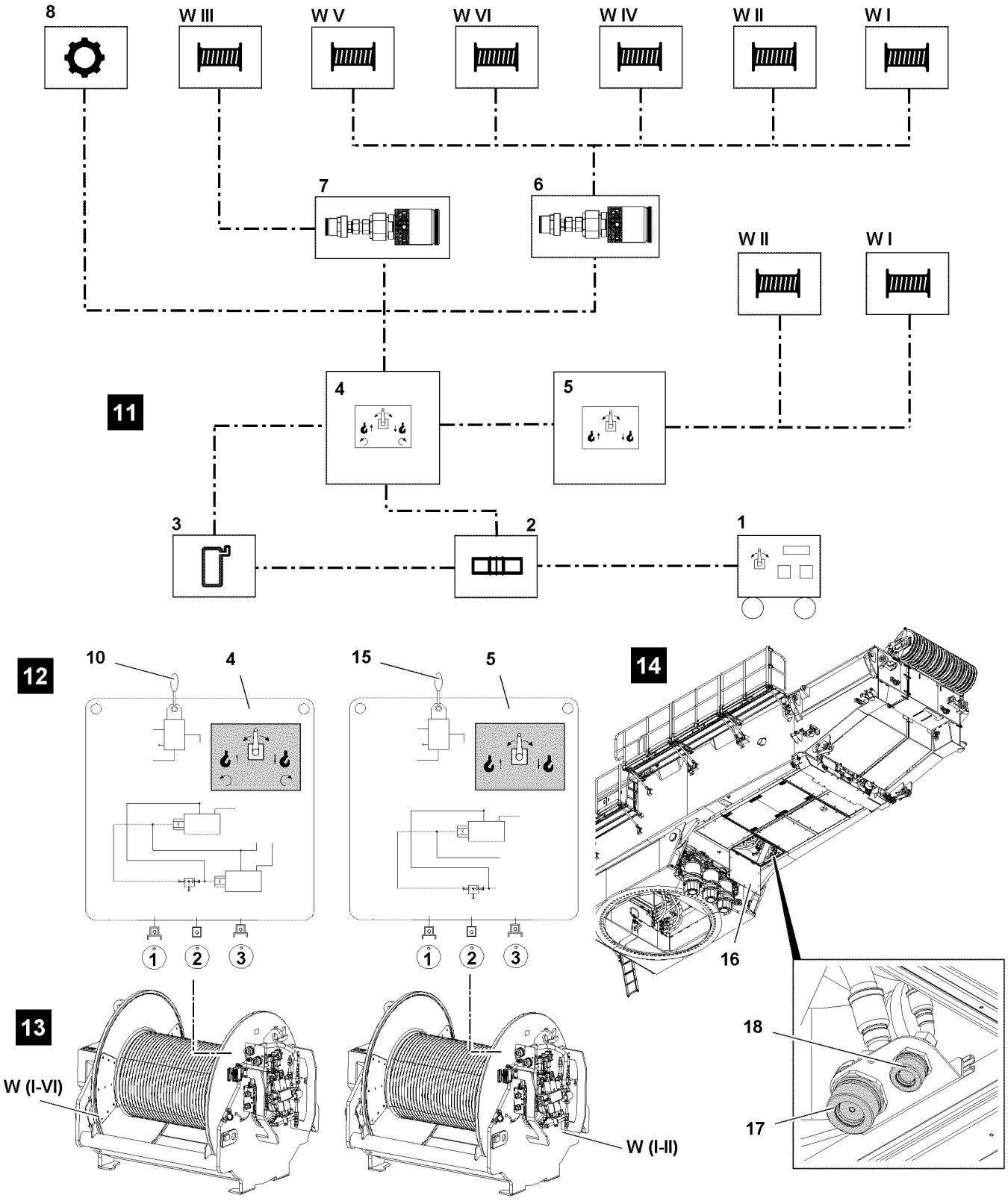

Fig.121036: Emergency control with assembly plate(s) Variation 2 (V2)

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4.1 Establishing the hydraulic connections

WARNING
Danger due to hydraulic pressure!
If the hydraulic lines are under pressure when releasing the connections, assembly personnel can be severely injured.
- ▶ Relieve the pressure in the hydraulic lines before releasing.
- ▶ Make sure that the engine is turned off.

- ▶ Establish the hydraulic connections from the emergency operation aggregate* **1** to the transformer **2**, see illustration **11**.

WARNING
Cover swinging down!
The cover **16** can swing down by itself due to its own weight when releasing the connections, see illustration **14**.
Personnel can be injured.
- ▶ When releasing the connections, hold the cover **16**.

- ▶ Open the cover **16**, see illustration **14**.
- ▶ Establish the hydraulic connection from the hydraulic transformer **2** to the suction line of the oil tank **3** on the turntable of the crane, see illustration **11** and illustration **14**.
- ▶ Establish the hydraulic connection from the turntable of the crane (oil tank **3**, return line) to the assembly plate emergency operation **4**, see illustration **11** and illustration **14**.
- ▶ Establish the hydraulic connection (pressure line) from the hydraulic transformer **2** to the assembly plate emergency operation **4**, see illustration **11**.
- ▶ Establish the hydraulic connection from the assembly plate emergency operation **4** to the assembly plate parallel operation **5**, see illustration **11** and illustration **12**.
- ▶ Release the hydraulic connections on the corresponding winch.

Note
- ▶ Pay attention to the numbering of the hydraulic lines, see chart.

- ▶ Establish the hydraulic connection from the assembly plate emergency operation **4** to the winch through adapter **6** or adapter **7**, see illustration **11** and illustration **13**.
- ▶ Establish the hydraulic connection from the assembly plate parallel operation **5** to the winch 1 **WI**, see illustration **11** and illustration **13**.
  or
  Establish the hydraulic connection from the assembly plate parallel operation **5** to the winch 2 **WII**, see illustration **11** and illustration **13**.

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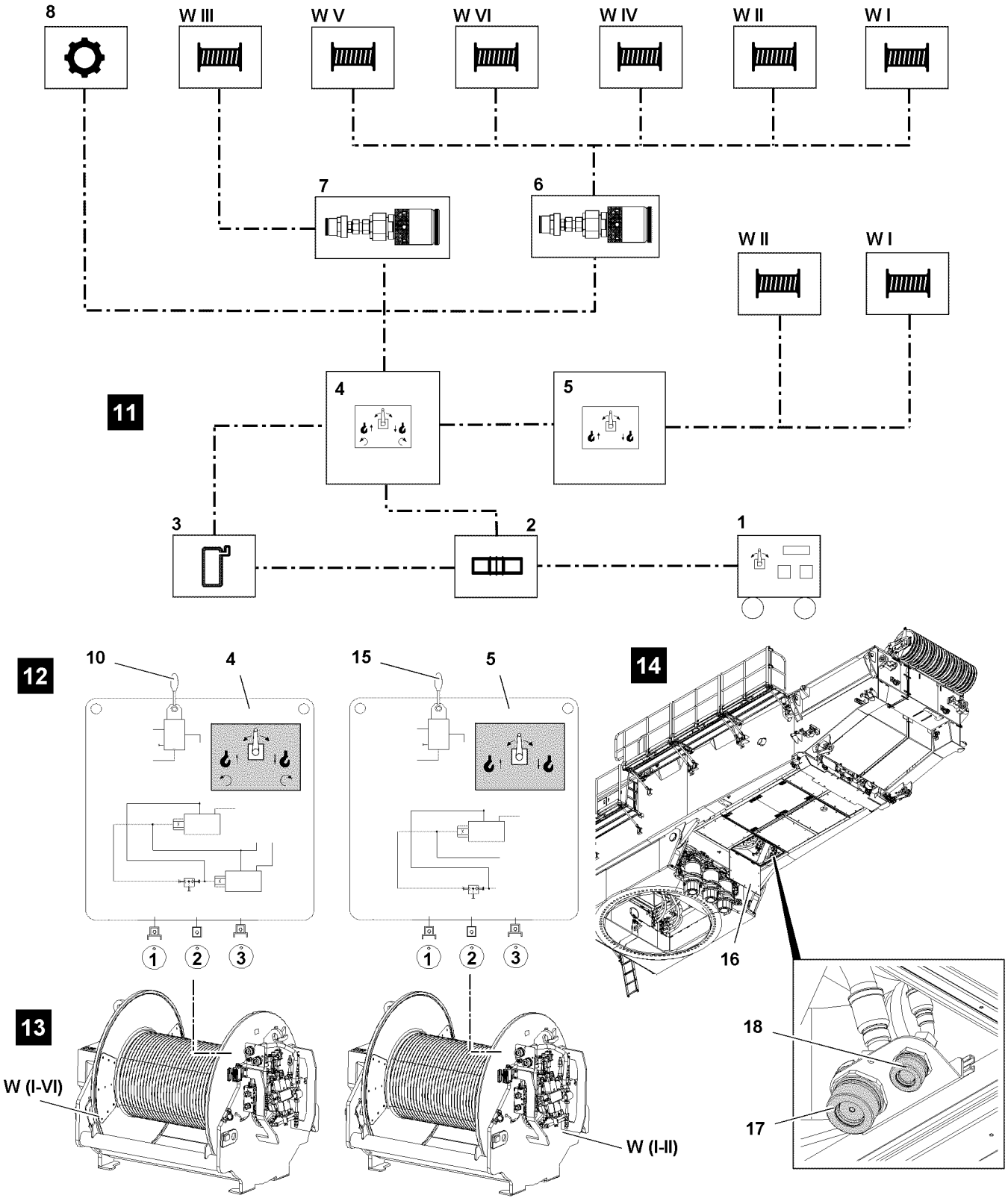

Fig.121036: Emergency control with assembly plate(s) Variation 2 (V2)

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4.2 Starting the emergency operation aggregate

Note

▶ Start the emergency operation aggregate, see Operating instructions for emergency operation aggregate.

▶ The engine rpm on the emergency operation aggregate can be set via a separate speed regulation.

4.3 Emergency control of winches, individual operation

Note

▶ The crane movements are actuated and the speed of the respective crane movement is determined via the ball valve **10** and ball valve **15**.

4.3.1 Function selection on the assembly plate emergency operation

With the ball valve **10** on the assembly plate emergency operation **4** the following movements for the winches are preselected:

– Lift or lower

▶ Preselect crane movement: Set the ball valve **10** in the respective direction and carry out the respective crane movement carefully.

4.3.2 Function selection on the assembly plate parallel operation

With the ball valve **15** on the assembly plate parallel operation **5** the following movements for winch 1 **WI** or winch 2 **WII** are preselected:

– Lift or lower

▶ Preselect crane movement: Set the ball valve **15** in the respective direction and carry out the respective crane movement carefully.

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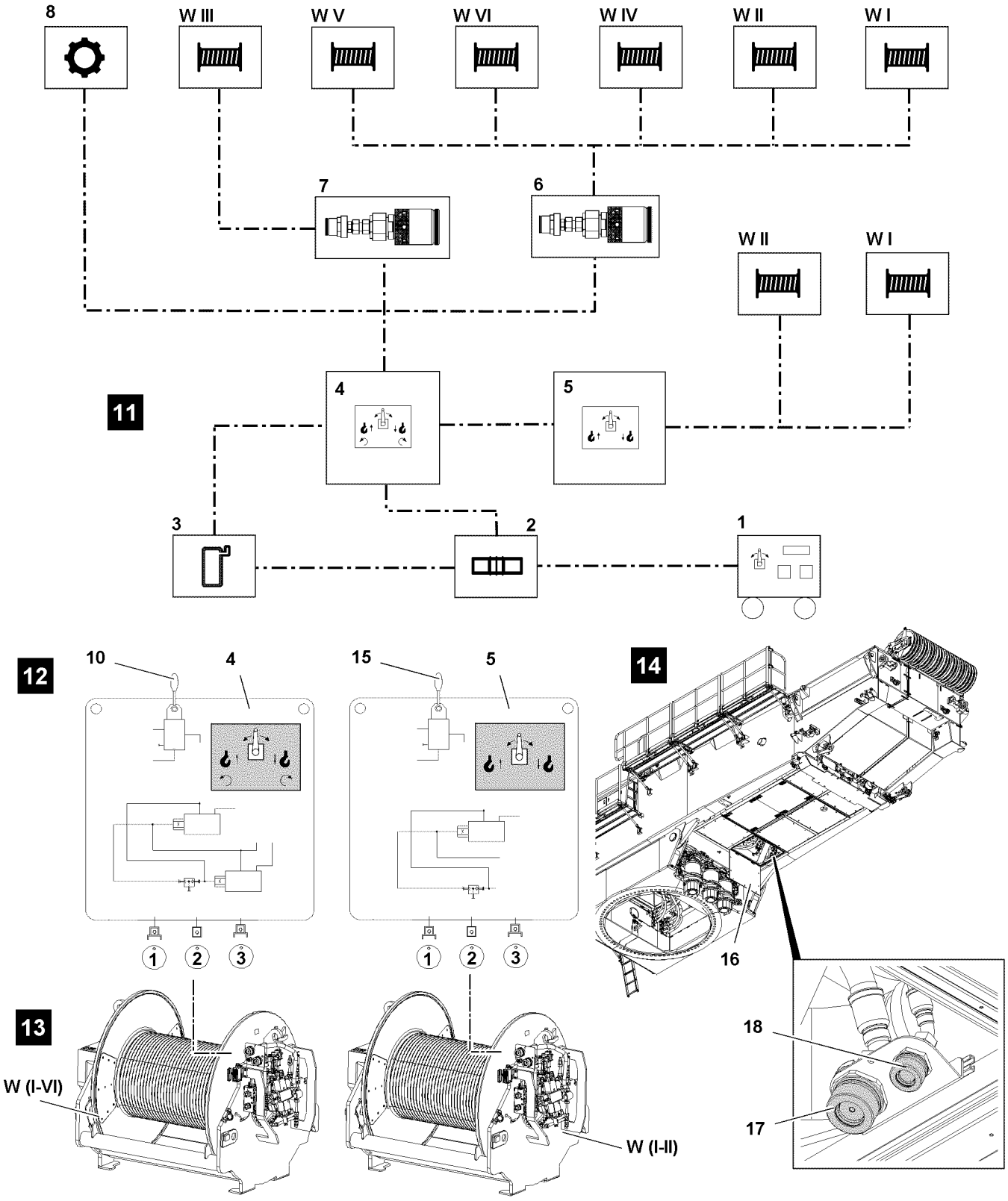

Fig.121036: Emergency control with assembly plate(s) Variation 2 (V2)

4.3.3 Spooling the winch out

▶ Spool the winch out: Set the ball valve **10** for the assembly plate emergency operation **4** in „lower“ direction.
or
Set the ball valve **15** on the assembly plate parallel operation **5** in „lower“ direction.

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Result:

– The winch spools out.

4.3.4 Spooling the winch up

▶ Spool the winch up: Set the ball valve **10** for the assembly plate emergency operation **4** in „lift“ direction.
or
Carefully set the ball valve **15** on the assembly plate parallel operation **5** in „lift“ direction.

Result:

– The winch spools up.

4.3.5 Disconnecting the hydraulic connections

Make sure that the following prerequisites are met:
– The emergency control is completed.
– The pressure in the hydraulic system has been relieved.

▶ Disconnect the hydraulic connections from the respective winch to the respective assembly plates.
▶ Close off the hydraulic connections of the winch with dust caps.
or
Reconnect the winch to the hydraulic system of the crane.

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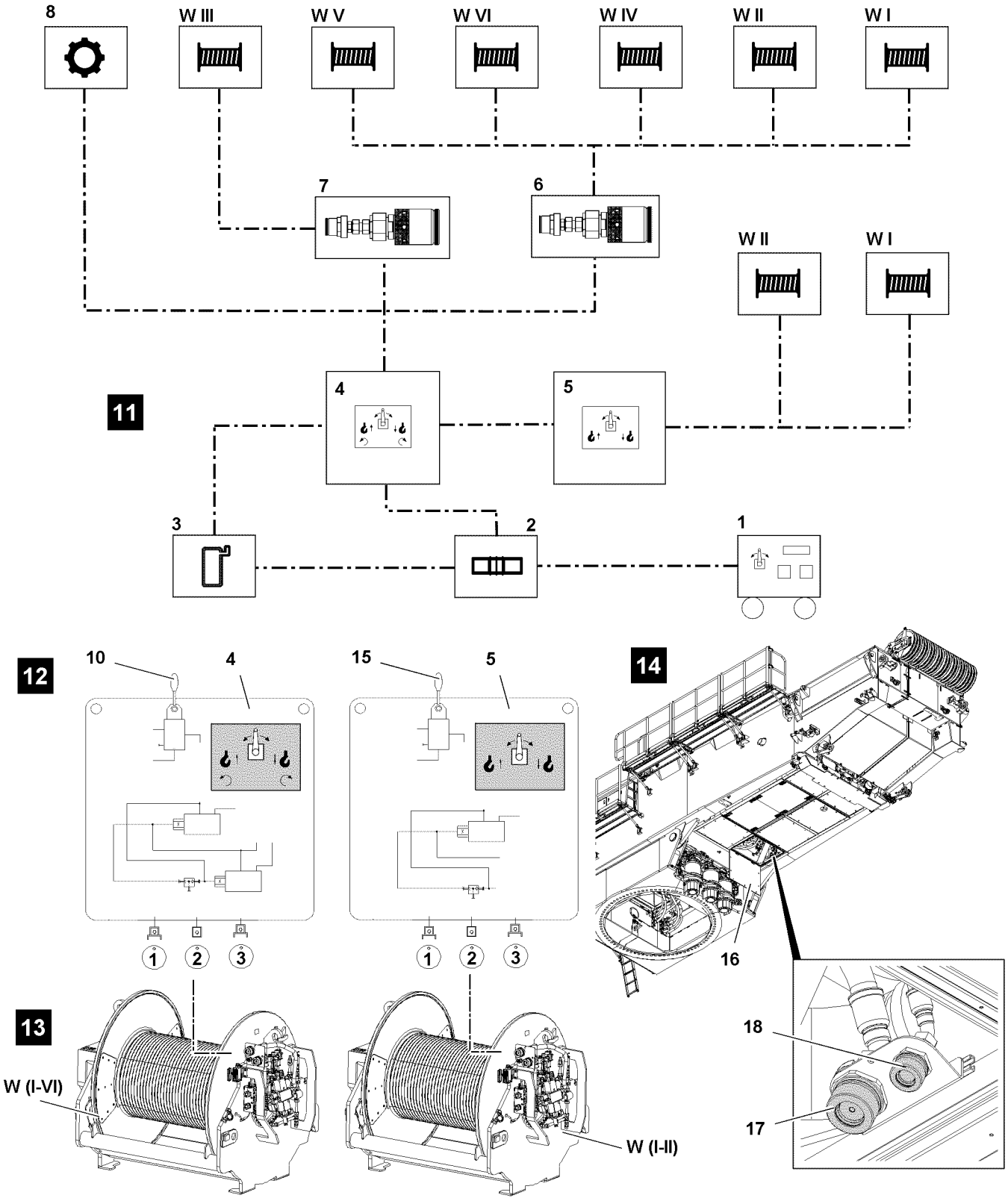

Fig.121036: Emergency control of winches, parallel operation winch 1II2

4.4 Emergency control of winches, parallel operation winch 1II2

Note

▶ The crane movements are actuated and the speed of the respective crane movement is determined via the ball valve **10** and ball valve **15**.

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WARNING
Danger of accident!
If the following notes are not observed, dangerous situations can arise.
Personnel can be severely injured or killed.
- ▶ If winch 1 **WI** and winch 2 **WII** are actuated in emergency control in parallel operation, then it must be ensured that the hook blocks are horizontally aligned.
- ▶ Always actuate winch 1 **WI** and winch 2 **WII** simultaneously.

4.4.1 Establishing the hydraulic connections to the winches

Make sure that the following prerequisite is met:
– The pressure in the hydraulic system has been relieved.

▶ Release the hydraulic connections on winch 1 **WI** and winch 2 **WII**.

Note
▶ Pay attention to the numbering of the hydraulic lines.

▶ Establish the hydraulic connection from the assembly plate emergency operation **4** to winch 1 **WI** through adapter **6**.
or
Establish the hydraulic connections of assembly plate parallel operation **5** to winch 2 **WII**.
▶ Establish the hydraulic connections of the assembly plate emergency operation **4** to winch 2 **WII** through adapter **6**.
or
Establish the hydraulic connections of assembly plate parallel operation **5** to winch 1 **WI**.

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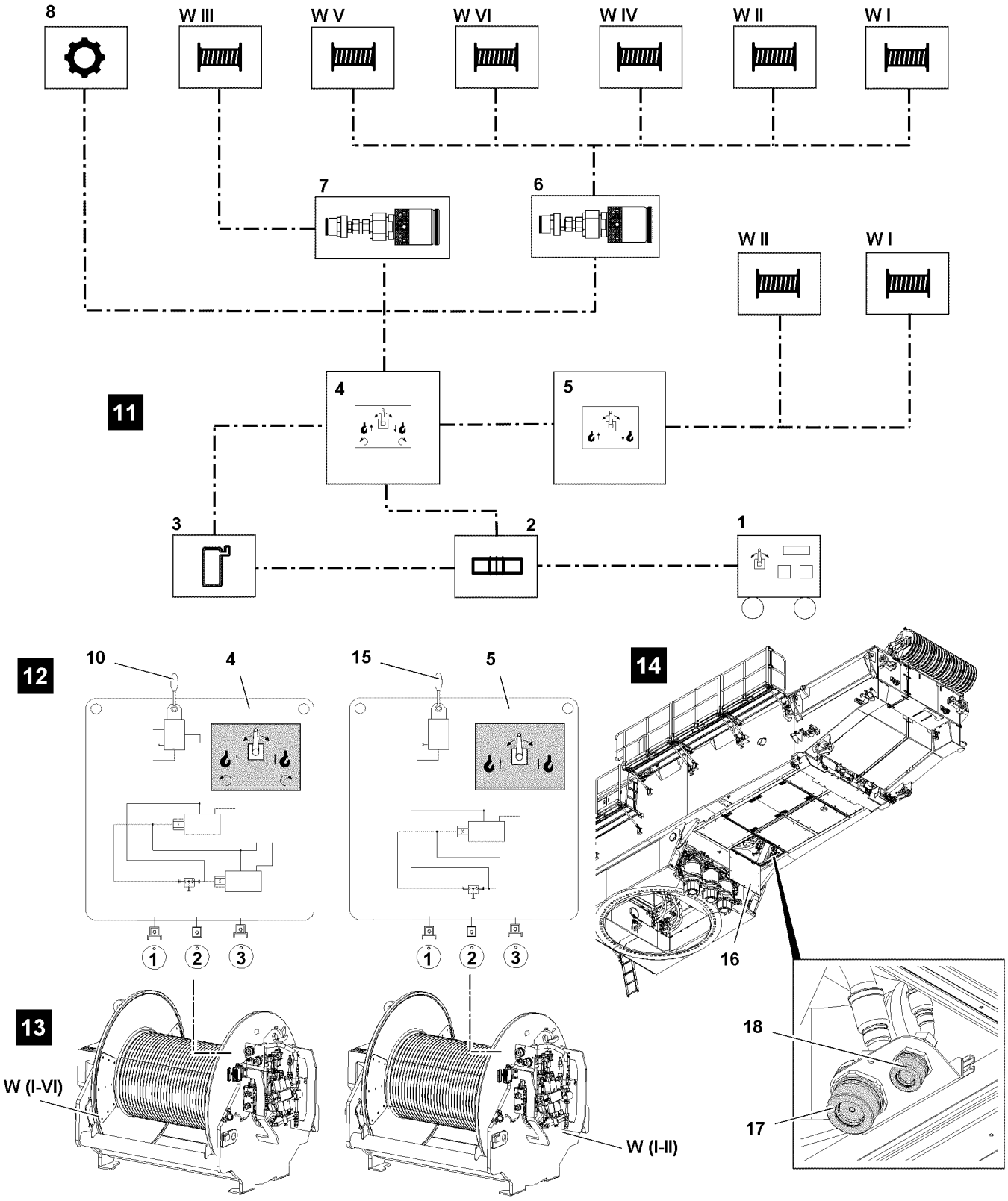

Fig.121036: Emergency control of winches, parallel operation winch 1II2

4.4.2 Spooling the winches out

Note

▶ Check which winch you have connected to which assembly plate.

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▶ Spool out winch 1 **WI or** winch 2 **WII**: Set the ball valve **10** for the assembly plate emergency operation **4** in „lower“ direction.
or
Set the ball valve **15** on the assembly plate parallel operation **5** in „lower“ direction.

Result:

– Winch 1 **WI or** winch 2 **WII** spools out.

4.4.3 Spooling the winches up

Note
▶ Check which winch you have connected to which assembly plate.

▶ Spool up winch 1 **WI or** winch 2 **WII**: Set the ball valve **10** for the assembly plate emergency operation **4** in „lift“ direction.
or
Carefully set the ball valve **15** on the assembly plate parallel operation **5** in „lift“ direction.

Result:

– Winch 1 **WI or** winch 2 **WII** spools up.

4.4.4 Disconnecting the hydraulic connections

Make sure that the following prerequisites are met:
– The emergency control is completed.
– The pressure in the hydraulic system has been relieved.

▶ Disconnect the hydraulic connections of winch 1 **WI** and winch 2 **WII** to the respective assembly plates.
▶ Close off the hydraulic connections of the winch with dust caps.
or
Reconnect the winch to the hydraulic system of the crane.

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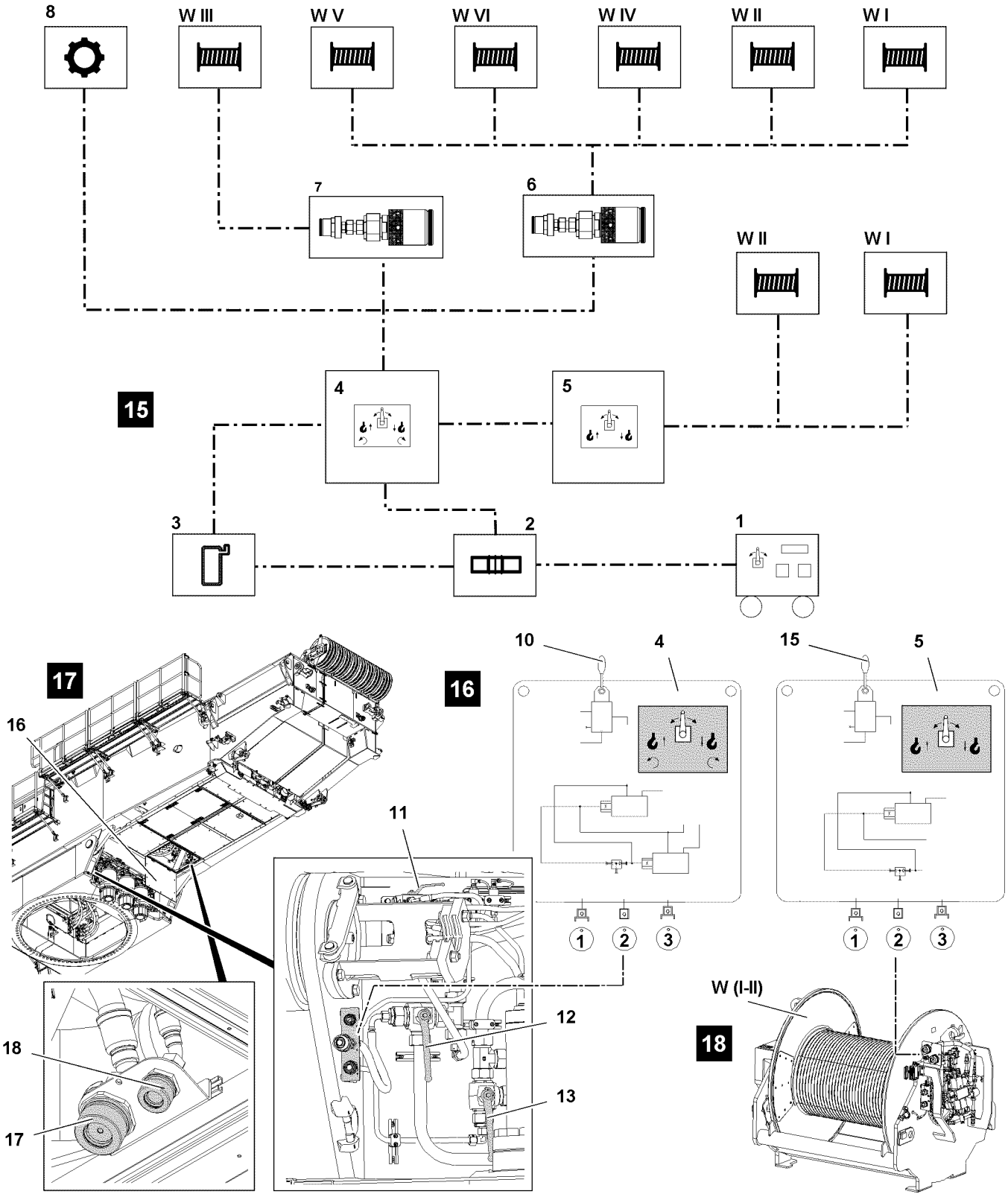

Fig.121037: Emergency control slewing gear(s) with assembly plate(s) Variation 2 (V2)

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5 Emergency control slewing gear(s) with assembly plate(s) Variation 2 (V2)

WARNING
Danger due to hydraulic pressure!
If the hydraulic lines are under pressure when releasing the connections, assembly personnel can be severely injured.
▶ Relieve the pressure in the hydraulic lines before releasing.

Note
▶ The slewing movement is actuated and the speed of the slewing movement is determined via the ball valve **10** on the assembly plate emergency operation **4**.

Note
▶ Pay attention to the numbering of the hydraulic lines.

Note
▶ „Emergency control slewing gear(s) with assembly plate(s) Variation 2 **VII**“ is identical with „Emergency control slewing gear(s) with assembly plate Variation 1 **VI**“ except that for Variation 2 **VII** the assembly plate parallel operation **5** is additionally connected.
▶ Connection of hydraulic lines and turning the turntable, see section „Emergency control slewing gear(s) with assembly plate Variation 1 **VI**“.

6 Completing emergency control

6.1 Procedure

Note
▶ Turn the emergency operation aggregate off, see Operating instructions for emergency operation aggregate.

▶ Turn the emergency operation aggregate*** 1** off.
▶ Disconnect the hydraulic connections and close them off with dust caps.

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7 Maintenance and service

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7.01 Maintenance and service - General

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3	Liebherr Service	7
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6	Storage	13
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Fig.195219

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1 Technical safety instructions

WARNING
Maintenance instructions **not** adhered to!
Death, severe injury, increased wear and failure of components.
- ▶ Observe the following listed safety instructions and the generally applicable safety rules!
- ▶ Adhere to the maintenance intervals.
- ▶ Carry out only applicable maintenance tasks.
- ▶ Repair and maintenance tasks are to be carried out carefully.
- ▶ For aggregates and components: Follow the operating instructions of the manufacturer.

1.1 Description of intervals and tasks

Note
- ▶ Fill quantities and descriptions of service items and lubricants are specified in the Service fill.

The maintenance intervals and scope of maintenance are described in several chapters.

For crane maintenance, observe the following chapters:
- Crane operating instructions, chapter 7.02: Maintenance intervals - Crane chassis [1)]
- Crane operating instructions, chapter 7.02.50: Maintenance intervals Ballast trailer*[1)]
- Crane operating instructions, chapter 7.03: Maintenance intervals - Crane superstructure [1)]
- Crane operating instructions, chapter 7.03.50: Maintenance intervals - Crane boom [1)]
- Crane operating instructions, chapter 7.04: Maintenance instructions - Crane chassis [2)]
- Crane operating instructions, chapter 7.04.50: Ballast trailer maintenance instructions [2)]
- Crane operating instructions, chapter 7.05: Maintenance instructions - Crane superstructure [2)]
- Crane operating instructions, chapter 7.05.50: Crane boom maintenance instructions [2)]
- Crane operating instructions, chapter 7.06: Fill quantities, lubrication chart
- Crane operating instructions, chapter 7.07: Operating fluids and lubricants

[1)] These chapters contain a list of maintenance intervals for all maintenance tasks.
[2)] For aggregates, observe and adhere to additionally to the instructions of the manufacturer.

1.2 Definition of „Checking“

The action of „Checking“ includes all required task in connection with the maintenance, for example:
- Determining a specified value
- Cleaning
- Adjusting
- Refilling
- Replacing

1.3 Maintenance intervals

Use the following rules for interval determination:
- Carry out maintenance and inspection tasks on the crane chassis after reaching the specified driven mileage, operating hours or calendar intervals. The interval that occurs first is the deciding factor.
- Carry out maintenance and inspection tasks on the crane superstructure after reaching the specified operating hours or calendar intervals. The interval that occurs first is the deciding factor.
- The maintenance intervals complement each other. If a higher interval is coming up, then carry out the tasks according to the lower interval also.

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1.4 Securing against start up

WARNING
Impermissible travel or crane operation during maintenance or repair tasks!
Death, severe injury, severe property damage.
- ▶ Make sure that travel and crane operation is not possible during maintenance and repair tasks.
- ▶ Show clearly with signs that maintenance or repair tasks are being carried out on the mobile crane.
- ▶ Use signs which show without a doubt that it travel operation and crane operation are prohibited.
- ▶ Adhere to the national regulations regarding tagging on mobile crane and signs.
- ▶ Turn the engine on the crane superstructure and the crane chassis off!
- ▶ Apply the „parking brake crane chassis“.

If possible:
- ▶ Lock the driver’s cab and the crane cab.
- ▶ Hand the ignition key from the crane superstructure and the crane chassis to an authorized person.

1.5 Personnel

WARNING
Unauthorized and **untrained** expert personnel!
Improper maintenance, personal injury, property damage.
- ▶ Observe and follow the personnel requirements for the respective maintenance task.

If there are no personnel requirements:
- ▶ The crane operator can perform the maintenance task.
- ▶ Have the repair tasks performed exclusively by authorized and trained expert personnel.
- ▶ Make sure that only authorized persons are in the danger zone.

Maintenance tasks may only be carried out by expert, authorized and trained employees.

An expert is someone who possesses the required expert knowledge for performing a certain task. Requirements regarding the technical qualification depends on the type of task.

Requirements regarding the technical qualification of a person:
- – Corresponding professional training.
- – Professional experience or a currently performed corresponding professional activity.
- – Participation in training to keep the expert knowledge up to date.

1.6 Securing against falls

WARNING
Personnel is **not** secured against falls!
During maintenance tasks on the crane superstructure or boom, personnel must be secured with appropriate safety measures to prevent them from falling. If this is **not** observed, working personnel can fall and be killed or severely injured.
- ▶ For all tasks on the crane where there is a danger of falling, take suitable safety measures.
- ▶ The crane superstructure or the boom may **not** be accessed without suitable aids.
- ▶ Suitable aids are, for example: Lifting platforms, scaffoldings, ladders, assembly platforms, auxiliary crane.
- ▶ If railings are present on the crane superstructure, then they must be swung into operating position and secured for all tasks. See the Crane operating instructions, chapter 2.06.
- ▶ Only step on such aids with clean shoes.
- ▶ Keep aids clean, free of snow and ice.
- ▶ If tasks cannot be carried out using these aids or from the ground, then the maintenance personnel must be protected from falling using approved fall arrest systems. See the Crane operating instructions, chapter 2.04.
- ▶ It is prohibited to step on the driver’s cab or cab roof and specially marked surfaces. See the Crane operating instructions, chapter 2.05.

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WARNING
Dirty slip-resistant mats!
Fall
- ▶ Keep slip-resistant mats clean and free of snow and ice!
- ▶ Only step on slip-resistant mats with clean shoes!
- ▶ Replace or renew missing or damaged slip-resistant mats!

1.7 Preventing fires

WARNING
Excess fuel, excess oil in engine compartment during operation!
Death, severe injury, fire damage.
- ▶ Check the diesel engine after repairs and Service tasks but also in regular intervals for leaking oil and fuel.
- ▶ Fix the leaks. Replace damaged components.
- ▶ Do **not** spill service fluids.

WARNING
Disregard of general safety regulations during tasks on the fuel system or on the electrical system!
Severe burns, fire damage.
- ▶ Disconnect the battery from the power supply.
- ▶ Do **not** smoke.
- ▶ Do **not** work near open flames.
- ▶ Keep a functioning fire extinguisher ready.

WARNING
Sound insulation mats are contaminated with fuel, engine oil, gear oil, hydraulic oil or solvents!
The sound insulation mats can ignite. Severe burns, fire damage.
- ▶ Remove any polluted sound insulation mats **immediately** and **replace immediately** with **Original Liebherr spare parts**.

If there are sound insulation mats in the chassis near the starter:
- ▶ **Immediately remove** any sound insulation mats located in an area of 0.5 m around the starter and **do not replace them**

If there are sound insulation mats in the superstructure in the engine compartment flap:
- ▶ **Immediately remove** the sound insulation mats and **do not replace them**.
- ▶ Also observe and adhere to the section „Sound insulation mats“.

1.8 Protecting against burns

WARNING
Hot surfaces!
Severe burns.
- ▶ Let any components to be maintained or inspected cool off.
- ▶ Let hot components cool off.
- ▶ Avoid contact with hands and skin.
- ▶ Wear personal protective equipment and suitable protective gloves.

WARNING
Hot service fluids!
Severe burns.
- ▶ Let hot service fluids cool off.
- ▶ Avoid contact with hands, skin and eyes.
- ▶ Wear safety glasses.
- ▶ Wear personal protective equipment and suitable protective gloves.

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WARNING
Electric short circuit!
Severe burns.
- ▶ Prevent short circuits in the electrical system, especially on the battery.
- ▶ Replace or change missing or defective protective insulation.

1.9 Protecting from scalding

WARNING
Cooling system is pressurized!
When the coolant reservoir is opened, hot coolant can escape explosively.
Severe scalding.

When the engine is warm:
- ▶ Do **not** open the cover of the coolant reservoir.
- ▶ To protect face, hands and arms from hot steam of hot coolant, cover the cap with a large rag when opening.

1.10 Rotating parts

WARNING
Rotating parts, ignition system on running engine!
The cooler fan can turn on suddenly.
Death, severe injury.
- ▶ Proceed especially careful.
- ▶ Do **not** reach into rotating parts.
- ▶ Never reach into the cooler fan when the engine is warm.

1.11 Using suitable operating fluids

NOTICE
Diesel filled in the urea tank or vice versa!
Destruction of the diesel engine or the exhaust aftertreatment system.
- ▶ Keep the urea solution absolutely pure.
- ▶ Do not reuse pumped out urea solution.

WARNING
Operating fluids **not** suitable for ambient temperature!
Death, severe injuries, property damage.
- ▶ Adjust the operating fluids in time to the ambient temperatures.
- ▶ Only use service fluids approved by Liebherr-Werk Ehingen GmbH. See chapter 7.07.

1.12 Replacing damaged crane components

WARNING
Damaged crane components **not** replaced!
Death, severe injury, failure of components.
- ▶ Maintain crane components according to the data in the maintenance intervals, the maintenance guidelines and the chart for service items and lubricants.
- ▶ Replace damaged crane components immediately.

1.13 After replacement of components

Type of oil, see data tag and supplied „Service fill“.

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The following instructions must be observed when replacing components such as the engine, transmission or axle:

WARNING
Maintenance of a replaced component **not** carried out!
- ▶ Before start up, be sure to refill with the correct type of oil to the center of the minimum / maximum mark.
- ▶ Carry out first maintenance. See chapter „Maintenance intervals“.
- ▶ Adhere to regular maintenance intervals.
- ▶ Follow the break-in instructions. See the Crane operating instructions, chapter 2.02.

1.14 Tire size

When changing certain tire sizes, the mobile crane must be modified.

Contact Liebherr customer service to change the following tire sizes:
- From 385/95 R 25 to 445/95 R 25
- From 385/95 R 25 to 525/80 R 25
- From 445/95 R 25 to 385/95 R 25
- From 525/80 R 25 to 385/95 R 25

2 Warranty and coverage

NOTICE
Maintenance intervals and maintenance guidelines **not** adhered to, impermissible lubricants used!
Damage, failure of crane components.
The warranty for the respective crane component is voided.
- ▶ Maintain crane components according to the data in the maintenance intervals, the maintenance guidelines and the chart for service items and lubricants.

NOTICE
Not using Original Liebherr spare parts and **not** using Original Liebherr Service items!
In the event that replacement parts are used that are **not** Original Liebherr replacement parts and **not** Original Liebherr service items and lubricants, Liebherr-Werk Ehingen GmbH disclaims all liability for system functionality as well as for the parts.
- ▶ Use exclusively Original Liebherr spare parts.

Note
- ▶ Original Liebherr replacement parts have been tested for crane operation and may be used without risking safety.

The buyer in entitled to warranty or coverage only:
- when exclusively Original Liebherr spare parts are used.
- when Liebherr Service items and Liebherr lubricants are used for the Liebherr crane.

3 Liebherr Service

Liebherr mobile cranes, whether truck-mounted, mobile or crawler cranes - are technically advanced products, which prove their worth daily even under tough conditions.

The high technical standards of these cranes provide functional security, resistance to failure and ease of maintenance.

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Liebherr is continuously developing the drive and control components. The combination of well proven units and modern manufacturing methods produces cranes that are safe to operate and easy to maintain.

Several hundred cranes are built every year for the international market, supported by international service.

Liebherr's „After Sales Service" plays an important role at Liebherr in ensuring operational readiness and high crane availability.

With Liebherr, Service begins when the crane is handed over. Your crane operators will be professionally trained in line with their level of knowledge and we devote much time to this.

We also train your workshop staff in all crane-specific matters, because we know that they can deal with more than just minor repairs themselves. Often there are specialists who can quickly and reliably carry out crane repairs.

We have special service advisers available who will solve any problems you may have. This phone contact saves time and money. You should take advantage of it as soon as possible.

Our service technicians are specialists with years of experience, who can be deployed from local support points. Naturally these experts have specialized knowledge and special tools.

But before you call these specialists, it is worth making use of the facilities for getting advice mentioned above.

4 Taking an oil sample

Note

- ▶ Liebherr recommends taking oil samples for the gears, engines and hydraulic system in regular intervals.
- ▶ Based on the trend analysis of the oil analysis results, changes can be determined in the lubricity of the oil and increased component wear.

WARNING

Tasks on components and operating fluids at operating temperature!
Burns.

- ▶ Carry out all tasks with utmost caution.
- ▶ Wear protective clothing.

Make sure that the following prerequisites are met:

– Oil has a normal operating temperature.

- ▶ Always take oil in the same location.
- ▶ Take oil always according to the same method.
- ▶ Do **not** take oil right after an oil change.
- ▶ Do **not** take oil immediately after larger amounts of oil have been added.

Note

Recommendation:

- ▶ Fill oil into original laboratory sample containers.

- ▶ Fill oil exclusively in a clean and dry sample container.

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5 Taking care of the crane

5.1 Washing the crane

In order to ensure a consistent surface quality, the crane must be washed regularly. See the maintenance intervals, chapter 7.02, chapter 7.03,chapter 7.03.50. Clean the crane in particular after contact with highly corrosive materials or highly adherent contaminants.

Highly adherent contaminants are:
- Residual road salt
- Oils, grease and fuel
- Insect remains
- Rust film
- Tar splashes, concrete splatter

Check the crane for corrosion and paint damage. See the maintenance intervals, chapter 7.02, chapter 7.03,chapter 7.03.50. If detected, have corrosion and paint damage removed by authorized and trained service personnel.

NOTICE
Impermissible cleaning agent!
Damage to the surface.
- ▶ Do not use aggressive cleaning agents.
- ▶ Do not use scouring cleaning agents.
- ▶ Do not use a phosphate based cleaner.
- ▶ Do not solvents or cleaning agents that contain solvents.
- ▶ Only use cleaning agents with a pH value that is less than / equal to 12.
- ▶ Make sure that the cleaning agent and water ratio of 3% is not exceeded.
- ▶ Rinse with clear water (not salt water).

Make sure that the following prerequisites are met:
- The crane is switched off and secured against unauthorized start up.
- The crane has cooled down.
- The battery master switch is turned off.

5.1.1 High pressure cleaner

The water jet of a circular jet nozzle can cause damage to the tyres or parts of the travel gear that cannot be seen exteriorly.

NOTICE
High pressure cleaner with circular jet nozzle used!
Damaged components could fail unexpectedly.
- ▶ Do not use a high pressure cleaner with a circular jet nozzle.
- ▶ Replace damaged components.

CAUTION
Hot steam and compressed air!
Burns.
- ▶ Wear personal protective equipment.

Do **not** expose the following components to a water jet:
- Inside of the driver's cab and cab
- Electric motor
- Electrical plug connections, line drums and power distributor
- Control units
- Transmitter
- Relay circuit boards and fuse circuit boards
- Hydraulic block

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- Intake manifolds for combustion air
- Seals
- Bellows
- Gear shafts
- Retracted sliding beams
- Sealing lips on slewing ring connections
- Radial shaft sealing rings on winches
- Slewing gears
- Hoist rope, control rope, assembly rope
- Piston rods
- Slip-resistant mats
- Signs
- Overflow container on the equipment
- Generator
- Lighting
- Wind speed sensor / airplane warning light
- Bearing on the rope pulleys
- Carrier rollers
- Swivel joints
- Pin points
- Head camera inclusive of the transmitter and receiver unit
- Hand pump on the folding jib

The crane can be cleaned with the high pressure cleaner. The water pressure, minimum distance and water temperature are specified in the following chart:

Washing painted surfaces		
Water pressure	**Minimum distance**	**Water temperature**
maximum 150 bar	30 cm to 40 cm	60 °C

Adjusting the high pressure cleaner

Washing surfaces covered with film		
Water pressure	**Minimum distance**	**Water temperature**
maximum 150 bar	80 cm	60 °C

Adjusting the high pressure cleaner

Washing surfaces protected against corrosion with Carlofon 81		
Water pressure	**Minimum distance**	**Water temperature**
maximum 30 bar	30 cm to 40 cm	40 °C

Adjusting the high pressure cleaner

Clean electrical systems, cables, cable harnesses and sound insulation mats with low pressure.

- ▶ Before cleaning, cover all openings.
- ▶ Wash the crane and equipment with a high pressure cleaner.
- ▶ Lubricate the crane and equipment.

Note
Environmental pollution!
- ▶ Dispose of auxiliary and cleaning materials contaminated with oil according to national and international regulations and directives.
- ▶ Only direct cleaning water through the oil separator of the drainage system.

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5.1.2 Exhaust system

NOTICE
Ingress of water, steam or cleaning substances into the AGN-module!
Sensors and electrics for the exhaust aftertreatment can be destroyed, the coating of the catalytic converter can be washed off.
- ▶ Before cleaning, let the AGN system cool down (surface temperature 50 °C).
- ▶ Before cleaning, cover all openings.
- ▶ Make sure that **no** fluids and **no** dirt gets into the tailpipe opening of the AGN module.
- ▶ During cleaning, maintain a sufficient distance from the tailpipe opening.

5.1.3 Sound insulation mats

NOTICE
Improper cleaning (tools or cleaning methods)!
Sound insulation mats can be destroyed or damaged.
- ▶ Remove severe contamination with suitable tools, for example with soft plastic scrapers.
- ▶ Do **not** use tools with sharp edges.
- ▶ Use high pressure cleaners **exclusively** with extreme caution and with a sufficient distance to the sound insulation mats and with low water pressure.
- ▶ Do **not** use solvents for cleaning.

If sound insulation mats are contaminated with fuel, engine oil, gear oil, hydraulic oil or solvents:
- ▶ Observe and adhere to the section „Preventing fires“.

5.1.4 Slip-resistant mats

WARNING
Heavily worn slip-resistant mats!
People can slip and fall down from the crane.
- ▶ Replace heavily worn slip-resistant mats.
- ▶ Do **not** wax slip-resistant mats.

- ▶ Before every access: Check the slip-resistant mats for slip resistance and cleanliness.
- ▶ If dirty: Clean the slip-resistant mats with a brush with hard plastic bristles.
- ▶ For cleaning the surfaces, use commercially available cleaners.
- ▶ Flush with water.

5.1.5 Driver’s cab and crane cab

Note
- ▶ The steering wheel, center console, instrument panel cover, floor covering and dirty upholstery in the driver’s cab and the crane cab should only be cleaned with warm water mixed with dishwashing detergent.
- ▶ Keep the driver’s cab and crane cab free from trash.

5.1.6 Ladders

- ▶ Remove any dirt on the ladders.
- ▶ Make sure that the grooves on the rungs are free of dirt.

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5.2 Protecting the crane against corrosion

NOTICE
Aggressive environmental conditions!
Crane components can corrode and be damaged.
▶ Protecting the crane against corrosion

The corrosion protection agent **Carlofon 81** must be reapplied regularly according to wear. See the maintenance intervals, chapter 7.02, chapter 7.03,chapter 7.03.50.

The corrosion protection agent **Metacorin 822** must be reapplied regularly according to wear on the mechanically machined, blank surfaces. See the maintenance intervals, chapter 7.02, chapter 7.03,chapter 7.03.50.

WARNING
Improper corrosion protection!
Injury to the respiratory system, suffocation.
▶ Wear a respirator mask.

NOTICE
Improper corrosion protection!
Damage to the crane.
▶ Make sure that crane corrosion protection is carried out only by authorized and trained service personnel.
▶ Make sure that the inspection and reconditioning intervals are not exceeded.

Make sure that the following prerequisites are met:
– A sufficient quantity of corrosion protection agent is available.
– Appropriate tools and aids are available.
– The crane is switched off and secured against unauthorized start up.
– The crane has cooled down.
– The battery master switch is turned off.
– Protective equipment is worn.

5.2.1 Crane

▶ Wash the crane thoroughly with a high pressure cleaner.
▶ Let the crane dry.

If corrosion or paint damage is found:
▶ Remove the corrosion and paint damage.

The following surfaces must be masked prior to corrosion protection:
– Walking surfaces and stepping surfaces
– Vents on brake valves and control valves
– Vents and drains on electrical equipment
– Mechanically machined, blank surfaces
– Piston rods

WARNING
Walking surfaces and stepping surfaces **not** masked!
Personnel can slip and fall down.
▶ Mask walking surfaces and stepping surfaces prior to corrosion protection.

▶ All surfaces that should **not** be corrosion protected should be masked.
▶ Protect the crane against corrosion with **Carlofon 81**.
▶ Remove the masking.
▶ Protect mechanically machined, blank surfaces against corrosion with **Metacorin 822**.
▶ Lubricate the crane.

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5.2.2 Cylinders

To prevent corrosion on the hydraulic cylinders. Coat chrome-plated areas of the piston rods that have not been retracted for a long period of time with a thin layer of oil.

5.3 Protecting the crane against corrosion for storage

Note
▶ When storing the crane, contact the Service department at Liebherr-Werk Ehingen GmbH.

5.4 Protecting the crane against corrosion for shutdown

Note
▶ Before shutting down the crane, contact the Service department at Liebherr-Werk Ehingen GmbH.

6 Storage

If the conditions in this section are observed, the crane can be stored as long as necessary.

6.1 Storage conditions

▶ Store the crane in a dry hall.

6.2 Decommissioning

Make sure that the following prerequisites are met:
- The crane is carefully washed.
- Corrosion and paint damage on the crane have been removed.
- Worn or damaged components have been replaced.

In the case of cranes with the battery master switch in the chassis and superstructure, both battery master switches must be turned off.

▶ Turn the battery master switch off.

In the case of cranes with a superstructure engine and a chassis engine, the batteries in the chassis and superstructure must be removed.

▶ Remove the batteries properly.

6.3 Maintenance

In the case of cranes with a fuel tank in the chassis and superstructure, both fuel tanks must be filled.

▶ Fill up the fuel tank completely.
▶ Apply approved lubricants in all lube points.
▶ Replace all service fluids.
▶ Check the crane for leaking fluids.

If fluids are leaking from the crane:
▶ fix the leak.

In the case of cranes with a superstructure engine and a chassis engine, both engines must be started once a month.

▶ Start the engine once a month.

The specified maintenance interval must be observed even if the crane is in storage.

▶ Service the crane according to the maintenance interval.

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6.4 Returning to service

NOTICE
Impermissible start up!
Damage to the crane.
- ▶ Make sure that the crane is supplied with approved lubricants.
- ▶ Make sure that the oil levels are correct.
- ▶ Only operate the crane in a perfect condition.

In the case of cranes with a superstructure engine and a chassis engine, the batteries must be installed in the chassis and superstructure.

- ▶ Install the batteries properly.
- ▶ Turn on the battery master switch.
- ▶ Put the crane in operation.

7 Disposal

7.1 Operating fluids and lubricants

WARNING
Operating items and lubricants are dangerous waste products!
- ▶ Dispose of operating fluids and lubricants separately.
- ▶ Service items and lubricants may **not** be disposed of in the ground, bodies of waters, wastewater systems, sewers or in the groundwater.
- ▶ Dispose of operating items and lubricants in an environmentally safe manner.
- ▶ When disposing operating items and lubricants observe and follow the valid regulations of the relevant authorities.

Service items and lubricants are:
- – Fuels
- – Coolant
- – Urea
- – Engine oils, gear oils
- – Hydraulic fluids
- – Brake fluids
- – Window washer concentrate
- – Greases

7.2 Batteries

WARNING
Batteries contain harmful substances!
- ▶ Do **not** dispose of batteries in regular household trash.
- ▶ Collect batteries separately and send them for environmentally safe disposal.
- ▶ Leave batteries at a qualified workshop or at a collection points for used batteries.

7.3 Disposing of the machine

After the end of its service life, the crane must be made unusable by cutting the load bearing crane structures, and in particular the steel structures. This can be done by means of flame cutting.

After the machine's service life has ended:
- ▶ Make the machine unusable.
- ▶ Separate the metals and send them for recycling.

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If the counterweights are made of concrete:

▶ Brake the steel parts out of the counterweight. Dispose of the concrete or recycle it.

Rope pulleys and bearing shoes in the boom are made out of PA6.

Due to the markings on the plastic parts, it is possible to dispose of them properly.

▶ Separate the plastic parts and send them for recycling.

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7.02 Maintenance intervals - Crawler chassis

1 Maintenance and inspection schedule 3

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Fig.195219

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1 Maintenance and inspection schedule

Note

- ▶ Carry out maintenance work after reaching the specified operating hours or calendar intervals. The interval which occurs first is the deciding factor.
- ▶ The maintenance intervals complement each other. If a higher interval is coming up, then carry out the work according to the lower interval also.
- ▶ The operating hour meter of the crawler travel gear is the determining factor for the operator hour intervals.
- ▶ The „crawler travel gear“ operating hour meter* is located in the control cabinet.

First maintenance after	Operating hour intervals 10 h	100 h	1000 h	Calendar intervals Daily	Weekly	Annually	Work to be carried out	O.K.
Safety systems								□
						X	Personal protective equipment Follow the instructions of the manufacturer	
						X	Height rescue system Follow the instructions of the manufacturer	
Fall protection equipment								□
						X	Check protection points	
						X	Check safety ropes	
						X	Check the ladders for technically immaculate condition	
						X	Check railings, steps and pedestals for safe function	
						X	Check catwalks and open mesh flooring for safe function	
Crane surface								□
					X		Check accessible surfaces for cleanliness	
						X	Check accessible surfaces for completeness and slip resistance	
						X	Check labels for completeness and legibility	
Rigging and fastening points								□
				X [2)]			Check condition and mounting	
						X	Check for continued suitability by expert	

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First maintenance	Operating hour intervals			Calendar intervals			Work to be carried out	O.K.
after	10 h	100 h	1000 h	Daily	Weekly	Annually		
Travel gear								□
		X					Check for leaks	
	X						Grease the sprocket bearing if it is not lubricated via the central lubrication system	
		X					Check the tightness of the mounting screws	
		500 h					Check the gear oil via oil analysis	
200 h			1000 h			Every 4 years	Change the gear oil	
Crawler carrier								□
		X					Check track rollers, carrier rollers with oil lubrication for leaks	
	X						Grease the track rollers, carrier rollers if it is not lubricated via the central lubrication system	
	X				Every 4 weeks		Check the wear on the roll off surfaces of the track rollers / carrier rollers, replace the track rollers / carrier rollers if necessary	
	X				Every 4 weeks		Check for wear on the glide rails	
						X	Grease guide rails on sliding section	
						X	Lubricate the consoles	
					Every 4 weeks		Lubricate the connector pins between crawler carrier and crawler center section or crawler carrier and cross carriers	

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First maintenance after	Operating hour intervals 10 h	100 h	1000 h	Calendar intervals Daily	Weekly	Annually	Work to be carried out	O.K.
Crawler chain								□
		X					Check the connector pin retainer	
		X					Check for damage	
	X				Every 4 weeks		Check the chain tension, retension the track chain if necessary	
	X						Check the wear on the bores of the track pads, replace track pads if necessary	
	X						Check the wear on the connector pins of the track pads, replace pins if necessary	
	X				Every 4 weeks		Check the wear on the roll off surfaces of the track pads / track rollers, replace track pads if necessary	
					Every 4 weeks		Check the wear on the sprocket wheels and the transport cams of the track pads	
Assembly support								□
					X		Check the hydraulic cylinder for leaks	
						X	Check support beam for ease of movement, grease	
						X	Lubricate the bearing points of the support beams	
						X	Check sight gauge, adjust if necessary	
Crane support								□
					X		Check the hydraulic cylinder for leaks	
						X	Check support beams for ease of movement, grease	
						X	Lubricate the struts	
						X	Lubricate the mounting pins on the struts	
						X	Lubricate the support pad bearing	
Concrete ballast plates / concrete catwalks (central ballast) (only LR1500)								
				X			Check for damage	
						X[4)]	Have an authorized inspector check that the fastening points are fit tightly and for continued suitability	

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First maintenance	Operating hour intervals			Calendar intervals			Work to be carried out	O.K.
after	10 h	100 h	1000 h	Daily	Weekly	Annually		
Pin connections								□
					Every 2 months [3]		Check the retainer of the pin connections	
					Every 2 months [3]		Check the pins and / or connector elements for damage, visual inspection	
					Every 2 months [3]		Check the retaining elements for damage, visual inspection	
Rotary connection								□
			X				Lubricate (grease lubrication)	
Hydraulic cylinder								□
					X		Check for leaks	
Hydraulic hose lines								□
				X			Check for leaks and damage	
						X	Have safe working condition checked by expert	
Central lubrication system								□
					Every 6 months [1]		Carry out intermediate lubrication (with central lubrication system with control unit)	
		X					Check for correct function	
	8 h			X			Check the lubricant level	

[1] if the crane is not moved: every 3 months
[2] before every start up: perform a visual inspection
[3] also for cranes used for a long period of time
[4] and at each assembly / disassembly

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7.02.50 Maintenance intervals - Ballast trailer

1 Maintenance and inspection schedule 3

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1 Maintenance and inspection schedule

Note

- Carry out maintenance work after reaching the specified operating hours or calendar intervals. The interval which occurs first is the deciding factor!
- The maintenance intervals complement each other. If a higher interval is coming up, then carry out the work according to the lower interval also!

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out	O.K.
	10 h	100 h	1000 h	Daily	Weekly	Annually		
Fall protection equipment								
						X	Check protection points	
						X	Check safety ropes	
						X	Check the ladders for technically immaculate condition	
						X	Check railings, steps and pedestals for safe function	
						X	Check catwalks and open mesh flooring for safe function	
Ballast trailer surface								
					X		Check accessible surfaces for cleanliness	
						X	Check accessible surfaces for completeness and slip resistance	
						X	Check labels for completeness and legibility	
Rigging and fastening points								
				X [2)]			Check condition and mounting	
						X	Check for continued suitability by an authorized inspector, inspection expert	
Tires								
					X		Check for external damage and distortion	
					X		Check the tire pressure	
	X						Check lug nuts for tight seating, retighten if necessary	
						Every 5 years	Replace tires; have further service life confirmed by a tire manufacturer expert	
Axle link								
						X	Lubricate	
Hydraulic cylinder								
					X		Check for leaks	

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First maintenance after	Operating hour intervals 10 h	100 h	1000 h	Calendar intervals Daily	Weekly	Annually	Work to be carried out	O.K.
Hydraulic hose lines								
				X			Check for leaks and damage	
						X	Check for a safe condition by an authorized inspector, inspection expert	
Travel drive								
						X	Check the mounting screws for tight seating	
					X		Check for leaks	
						X	Check the oil level	
						Every 5 years	Change the gear oil if necessary	
Slewing gear								
						X	Check the mounting screws for tight seating	
					X		Check for leaks	
						X	Check the oil level	
						Every 5 years	Change the gear oil if necessary	
Central lubrication system								
				X			Check grease supply of central lubrication system. Fill the reservoir if the grease supply has dropped below 1/4 of the reservoir content.	
						X	Check for correct function	
Pin connections								
					Every 2 months [3]		Check the retainer of the pin connections	
					Every 2 months [3]		Check the pins and / or connector elements for damage, visual inspection	
					Every 2 months [3]		Check the retaining elements for damage, visual inspection	
Emergency control								
						X	Check for correct function	

[2] before every start up: checking visually
[3] also for cranes used for a long period of time

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7.03 Maintenance intervals - Crane superstructure

1 Maintenance and inspection schedule 2

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1 Maintenance and inspection schedule

Note

- ▶ Carry out maintenance work after reaching the specified operating hours or calendar intervals. The interval which occurs first is the deciding factor!
- ▶ The maintenance intervals complement each other. If a higher interval is coming up, then carry out the work according to the lower interval also!

First maintenance	Operating hour intervals			Calendar intervals			Work to be carried out	O.K.
after	250 h	500 h	1000 h	Daily	Weekly	Annually		
Safety systems								□
						X	Personal protective equipment Follow the instructions of the manufacturer	
						X	Height rescue system Follow the instructions of the manufacturer	
Fall protection equipment								□
						X	Check protection points	
						X	Check safety ropes	
						X	Check the ladders for technically immaculate condition	
						X	Check railings, steps and pedestals for safe function	
						X	Check catwalks and open mesh flooring for safe function	
Crane surface								□
					X		Check accessible surfaces for cleanliness	
						X	Check accessible surfaces for completeness and slip resistance	
						X	Check labels for completeness and legibility	
Rigging and fastening points								□
				X [2)]			Check condition and mounting	
						X	Check for continued suitability by an authorized inspector, inspection expert	
Load handling equipment and assembly aids								□
				X [2)]			Check for cracks, damage, wear and distortion	
						X	Check for continued suitability by an authorized inspector, inspection expert	

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First maintenance after	Operating hour intervals 250 h	500 h	1000 h	Calendar intervals Daily	Weekly	Annually	Work to be carried out	O.K.
Fastening equipment and load securing devices								□
				X [2)]			Observe and adhere to the manufacturer's instructions	
				X [2)]			Check the grommets and cable laid fastening rope for damage, operational safety, proper identification. Take-down criteria, see chapter 8.01	
						X	Have the fastening equipment checked by an authorized person, authorized inspector	
Fire extinguishing system								□
						X	Carry out a visual inspection of the system For all other maintenance tasks, observe the instructions of the fire extinguisher manufacturer.	
						Every 5 years	Replace trigger elements and extinguisher tank.	
Diesel engine								□
				X			Check the oil level For all other maintenance tasks, observe the instructions of the engine manufacturer	
Cooling system								□
				X			Check the coolant level in the expansion tank	
			6000 h			Every 4 years	Replace the coolant if filled with **Liebherr Antifreeze OS Mix**	
			3000 h			Every 2 years	Replacing the coolant	
SCR Exhaust aftertreatment								□
			4500 h			Every 2 years	Replace foam and filter element of urea pump	
Heating-air conditioning device								□
					Every 4 weeks		Operate the climate control system for 15 min and check the function	
						X	Replacing the filter insert	

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First maintenance after	Operating hour intervals 250 h	500 h	1000 h	Calendar intervals Daily	Weekly	Annually	Work to be carried out	O.K.
Cab auxiliary heater*, Engine preheating auxiliary heater*								□
				X			Check the fill level of the fuel container	
				X			Check the fill level in the expansion tank	
					Every 4 weeks [8]		Operate the auxiliary heater for 15 min and check the function	
					X [9]		Operate the auxiliary heater for 15 min and burn-off the burner	
						X [12]	Have the water heater checked by an authorized and trained service technician	
						X [12]	Have the air heater checked by an authorized and trained service technician	
						Every 2 years	Have the fluid in the heating system replaced by an authorized and trained service technician	
			3000 h				Have the burner of the heating system replaced by an authorized and trained service technician	
						Every 10 years	Have the heat exchanger of the heater replaced by an authorized and trained service technician	
Air filter								□
					X		Check monitoring device	
						X	Clean, change the filter insert Observe the instructions of the engine manufacturer	
Slewing ring connection								□
	X						Lubricate the gears	
						X [1]	Lubricating the slewing ring connection	
					Every 6 months [1]		Drain water on the water drain bores of the slewing ring connection (only LTM 11200-9.1, LTR 11200)	
250 h			1500 h			X	Check the tightness of the mounting screws	
						X	Checking the tilt play	

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First maintenance after	Operating hour intervals 250 h	500 h	1000 h	Calendar intervals Daily	Weekly	Annually	Work to be carried out	O.K.
Winches								□
250 h			X			X	Check the tightness of the mounting screws	
				X			Check for leaks	
					X [6]		Check the oil level	
250 h			3000 h			Every 4 years	Change the gear oil	
			1500 h [4]			X [4]	Lubricate the space between V-ring / winch bearing (only for winches with a winch bearing that is lubricated with a grease fitting)	
			200 h			X	Check the condition of the tooth flanks; determining factor are the operating hours of the winch (only for winches with gear ring drive)	
						X	Check the remaining theoretical service life by an authorized inspector	
						Every 4 years	Check the remaining theoretical utilization life by an inspection expert	
Winch brakes								□
				X			Check for leaks	
						X	Check for correct function	
Relapse supports								□
					Every 3 months [5], [6]		Lubricating the bearings	
X [2], [6]							Check the oscillation guard for easy movement	
Relapse cylinder								□
X [2], [6]					X		Check for leaks	
					Every 3 months [5], [6]		Lubricating the bearings	
X [2], [6]		X				X	Check pretension pressure (nitrogen)	
X [2], [6]		X				X	Check the oil quantity	
Pneumatic springs								□
X [2], [5], [6]		X				X	Check for correct function	

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First maintenance after	Operating hour intervals 250 h	500 h	1000 h	Calendar intervals Daily	Weekly	Annually	Work to be carried out	O.K.
A-frame								□
		X					Lubricate the bearing	
X [2), 6)]						X	Check the lever for the limit switch on the A-frame 3 for easy movement and reset of spring	
X [2), 6)]						X	Check the rods with guide rail on the A-frame 2 and A-frame 3 for easy movement and distortion	
Counterweight frame								□
						X	Check the cylinder stroke of the locking pin on the swinging arms (only LTM 1450-8.1)	
Counterweight								□
1000 km		or 10,000 km				X	Check tightening torque of mounting screws	
Concrete ballast plates (ballast container) (only LR 13000)								□
				X			Check for damage	
						Every 5 years	Check by licensing agency	
Ballasting								□
	X					X	Lubricating the bearings	
						X	Check the swing play (only LTM 11200-9.1)	
						X	Check the braid ropes (only LTM 11200-9.1)	
Press on pulleys of rope winches								□
	X					X	Grease guides	
Rope pulleys								□
					X [5), 6)]		Check groove base for cleanliness	
			X			X	Check for wear, damage, cracks and easy movement	
			3000 h			Every 3 years	Lubricate the bearings	
Carrier rollers								□
				X [2)]			Check for damage and distortion	
			X			X	Check for wear, damage and easy movement	
			X			X	Check the tightness of the mounting screws	

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First maintenance after	Operating hour intervals 250 h	500 h	1000 h	Calendar intervals Daily	Weekly	Annually	Work to be carried out	O.K.
Crane cab								□
				X			Check instruments for function	
				X			Check indicator lights for function	
						X	Replace the filter insert for switch cabinet ventilation	
				X			Check fluid level in expansion tank of engine regulation	
		X				X	Check the sliding or incline device for function	
		X				X	Lubricate the bearings of the sliding or incline device	
		X				X [7)]	Check the lift device (telescope arm) for function	
		X				X [7)]	Lubricate the bearings of the lift device and telescope arm	
Window washing bays, camera washing bays								□
				X			Check the fluid level in the reservoir for the washing bays	
Overload protection								□
				X			Check for correct function	
		X				X	Check length sensor for function	
		X				X	Check length sensor rope for damage	
Remote diagnostics device								□
						X	Check for correct function	
						X	Check the validity of the SIM card	
Electrical system								□
						X	Cable connections	
					Every 6 months [3)]		Service the batteries	
					Every 6 months [3)]		Empty the acid collection container	
						X [5)]	Replace the interior compartment filter of the switch cabinet ventilation	

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First maintenance after	Operating hour intervals 250 h	500 h	1000 h	Calendar intervals Daily	Weekly	Annually	Work to be carried out	O.K.
Fuel system								□
				X			Check for leaks	
						X	Check condition and mounting	
						X	Drain off water and sediments	
						X	Clean preliminary filter for auxiliary fuel pump	
	Every 50 h						Check fuel preliminary filter, drain off water if necessary	
		Every 1000 h					Replace the fuel preliminary filter	
Slewing gear								□
250 h			X			X	Check the tightness of the mounting screws	
				X			Check for leaks	
					X		Check the oil level	
250 h			3000 h			Every 4 years	Change the gear oil	
Slewing gear brakes								□
				X			Check for leaks	
						X	Check for correct function	
Turntable lock								□
		X				X	Grease	
		X				X	Check for correct function	
Bearings								□
						X	Checking the retaining elements	
Pin connections								□
					Every 2 months [10]		Check the retainer of the pin connections	
					Every 2 months [10]		Check the pins and / or connector elements for damage, visual inspection	
					Every 2 months [10]		Check the retaining elements for damage, visual inspection	
Pump distributor gear								□
				X			Check for leaks	
					X		Check the oil level	
500 h			1500 h			X	Change the gear oil	

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First maintenance after	Operating hour intervals 250 h	500 h	1000 h	Calendar intervals Daily	Weekly	Annually	Work to be carried out	O.K.
Miter gear crane drive								□
					X		Check for leaks	
	X						Check mounting	
100 h			1500 h			X	Oil change	
Hydraulic hose lines								□
				X			Check for leaks and damage	
						X	Check for a safe condition by an authorized inspector, inspection expert	
Hydraulic system								□
				X			Check the oil level	
					X		Check for leaks	
250 h		X				X	Replace the servo pressure and replenishing pressure filter inserts	
250 h		X				X	Replace return filter inserts (only for cranes with open hydraulic circuit)	
250 h		X				X	Replace bleeder filter of hydraulic tank	
500 h			X			X	Check hydraulic oil, required degree of purity: 20/18/15 Take an oil sample and have it checked by the oil supplier	
Hydraulic cylinder								□
					X		Check for leaks	
					Every 3 months [5), 6)]		Lubricating the bearings	
Hydraulic pressure accumulator (nitrogen)								□
		X [4)]				X [4)]	Check pretension pressures	
Hydraulic coupling system LIKUFIX								□
				X [2) 6)]			Check for leaks, dirt and lubricate the guides	
Compressed air system								□
					X		Check for leaks	
					X		Check operating pressure	
					X		Check shut off pressure	
					X		Check operation of automatic drain valve	
						X	Replace air dryer granular cartridges	
						X	Clean air dryer preliminary filter	

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First maintenance after	Operating hour intervals 250 h	500 h	1000 h	Calendar intervals Daily	Weekly	Annually	Work to be carried out	O.K.
Central lubrication system								□
					Every 6 months [1]		Carrying out an intermediate lubrication	
		X					Check for correct function	
					X		Check the grease container fill level	
Emergency control								□
						X	Check for correct function	
Suspended ballast								□
						X	Check the fall protection equipment	
						X	Check frame, suspension and guide section for distortion and cracks	
Crane superstructure								□
					X[11]		Wash the crane superstructure	
						Every 6 months [11]	Check the crane superstructure for corrosion and paint damage	
Crane superstructure, protected against corrosion								□
						Every 6 months	Check the corrosion protection for wear, and if necessary reapply protection	
						Every 2 months	Check the corrosion protection on mechanically machined, blank surfaces for wear and reapply the corrosion protection if necessary	
						Every 3 months	Check the corrosion protection on the chrome-plated piston rods for wear, and if necessary reapply the corrosion protection	

[1] if the crane is not moved: every 3 months
[2] before every start up: Perform a visual inspection
[3] in hot climate zones: every 3 months
[4] observe maintenance instructions - crane superstructure, chapter 7.05
[5] and as necessary
[6] and during assembly
[7] in Great Britain: every 6 months
[8] outside of the heating period
[9] during the heating period
[10] also for cranes used for a long period of time
[11] each time after the crane is used if possible
[12] before and after every heating period

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7.03.50 Maintenance intervals - Crane boom

1 Maintenance and inspection schedule 3

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Fig.195219

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1 Maintenance and inspection schedule

Note

- Carry out maintenance work after reaching the specified operating hours or calendar intervals. The interval which occurs first is the deciding factor!
- The maintenance intervals complement each other. If a higher interval is coming up, then carry out the work according to the lower interval also!

First maintenance after	Operating hour intervals 250 h	500 h	1000 h	Calendar intervals Daily	Weekly	Annually	Work to be carried out	O.K.
Safety systems								□
						X	Personal protective equipment Follow the instructions of the manufacturer	
						X	Height rescue system Follow the instructions of the manufacturer	
Fall protection equipment								□
						X	Check protection points	
						X	Check safety ropes	
						X	Check the ladders for technically immaculate condition	
						X	Check railings, steps and pedestals for safe function	
						X	Check catwalks and open mesh flooring for safe function	
Surface of crane boom								□
					X		Check accessible surfaces for cleanliness	
						X	Check accessible surfaces for completeness and slip resistance	
						X	Check labels for completeness and legibility	
Rigging and fastening points								□
				X [2)]			Check condition and mounting	
						X	Check for continued suitability by an authorized inspector, inspection expert	
Load handling equipment and assembly aids								□
				X [2)]			Check for cracks, damage, wear and distortion	
						X	Check for continued suitability by an authorized inspector, inspection expert	

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First maintenance after	Operating hour intervals 250 h	500 h	1000 h	Calendar intervals Daily	Weekly	Annually	Work to be carried out	O.K.
Fastening equipment and load securing devices								□
				X [2]			Observe and adhere to the manufacturer's instructions	
Lattice sections								□
						X	Check cracks, damage and distortion	
						X	Check protection points	
						X	Check safety ropes	
						X	Check railings and pedestals for safe function	
						X	Check catwalks and open mesh flooring for safe function	
X [6]						X	Grease the lube points of lattice sections	
Guy rods								□
						X	Check for cracks, damage and distortion by an authorized person	
						Every 4 years	Check cracks, damage and distortion by an authorized inspector	
						X	Checking the retaining elements	
						X	Check labels for completeness and legibility	
X [6]						X	Lubricate the lube points of guy rods	
Fiber guy ropes								□
					Every 3 months [7]		Check braid and intermediate layers for damage and distortion	
					Every 3 months [7]		Check rope end connections for cracks, damage and distortion	
					Every 3 months [7]		Check rope grommet transitions for damage and distortion	
Relapse supports								□
					Every 3 months [5], [6]		Lubricating the bearings	
X [2], [6]							Check the oscillation guard for easy movement	

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First maintenance after	Operating hour intervals 250 h	500 h	1000 h	Calendar intervals Daily	Weekly	Annually	Work to be carried out	O.K.
Relapse cylinder								□
X [2), 6)]					X		Check for leaks	
					Every 3 months [5), 6)]		Lubricating the bearings	
X [2), 6)]		X				X	Check pretension pressure (nitrogen)	
X [2), 6)]		X				X	Check the oil quantity	
Hydraulic hose lines								□
				X			Check for leaks and damage	
						X	Check for a safe condition by an authorized inspector, inspection expert	
Hydraulic cylinder								□
					X		Check for leaks	
					Every 3 months [5), 6)]		Lubricating the bearings	
Hydraulic pressure accumulator (nitrogen)								□
		X [4)]				X [4)]	Check pretension pressures	
Rope pulleys								□
					X [5), 6)]		Check groove base for cleanliness	
			X			X	Check for wear, damage, cracks and easy movement	
			3000 h			Every 3 years	Lubricate the bearings	
Carrier rollers								□
				X [2)]			Check for damage and distortion	
			X			X	Check for wear, damage and easy movement	
			X			X	Check the mounting screws for tight seating	
Auxiliary guying								□
						X [6)]	Check the rope connection between the guy point and the lattice section	
						X [6)]	Check cracks, damage and distortion	

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First maintenance after	Operating hour intervals 250 h	500 h	1000 h	Calendar intervals Daily	Weekly	Annually	Work to be carried out	O.K.
Pin connections								□
					Every 2 months 8)		Check the retainer of the pin connections	
					Every 2 months 8)		Check the pins and / or connector elements for damage, visual inspection	
					Every 2 months 8)		Check the retaining elements for damage, visual inspection	
Crane ropes								□
				X			Check for damage and distortion	
					Monthly 5)		Check, grease by expert personnel	
						X	Check by an authorized inspector	
						Every 4 years	Check by an inspection expert	

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First maintenance after	Operating hour intervals 250 h	500 h	1000 h	Calendar intervals Daily	Weekly	Annually	Work to be carried out	O.K.
Hook blocks								□
				X [3]			Check of the load hook for distortion, wear, damage and cracks by the crane operator	
			X			X	Check rope pulleys for distortion, wear, damage and cracks	
			3000 h			Every 3 years	Lubricate rope pulley bearings	
	100 h				Every 3 months [5]		Lubricate pressure bearings	
	100 h				Every 3 months [5]		Lubricate radial bushing	
	100 h				Every 3 months [5]		Lubricate suspension of hook beam	
					Every 6 months [5]		Replace batteries on incline sensor	
						X	Load hook: Check distance dimension (y)	
						X	Check of the load hook for distortion, wear, damage and cracks by an authorized person	
						Every 4 years	Check of the load hook for distortion, wear, damage and cracks by an inspection expert	

[2] before every start up: checking visually
[3] before starting crane operation: checking visually
[4] observe maintenance instructions - crane superstructure, chapter 7.05
[5] and as necessary
[6] and during assembly
[7] by authorized and trained expert personnel with boom taken down and before every erection procedure
[8] also for cranes used for a long period of time

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7.04 Maintenance instructions - Crane chassis

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2	Central lubrication system	7
3	Servicing the track chain	16
4	Ladders	27

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Fig.195219

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1 Travel gear

NOTICE
Dirt inside the gear!
Transmission damage.
- ▶ Maintain extreme cleanliness during all tasks.
- ▶ Make sure that **no** dirt gets into the inside of the gear.

Note
- ▶ The planetary gear and the miter gear have separate, different sized oil chambers: Check the oil levels of the gear independent of each other.
- ▶ Control bores for checking the oil level on the planetary gear and on the miter gear can differ in design.
- ▶ On the planetary gear is **no** separate fill bore. Fill gear oil on the control bore.

The travel gear consists of the following components:
- Planetary gear
- Miter gear with brake

1.1 Checking for leaks

NOTICE
Gear damage due to leaky gear!
- ▶ Check the travel gear for leaks according to the maintenance schedule.

- ▶ Check the travel gear for leaks: Perform a visual inspection.

When the travel gear leaks:
- ▶ Have the travel gear sealed by authorized and trained expert personnel.

1.2 Planetary gear

1.2.1 Checking the oil level

NOTICE
Transmission damage due to lack of oil!
- ▶ Check the oil level and add gear oil if necessary.

Make sure that the following prerequisite is met:
- Authorized and trained expert personnel checks the oil level.
- The crane is in horizontal position.
- The travel gear has been at a standstill for two minutes before checking the oil: The gear oil has drained back completely.

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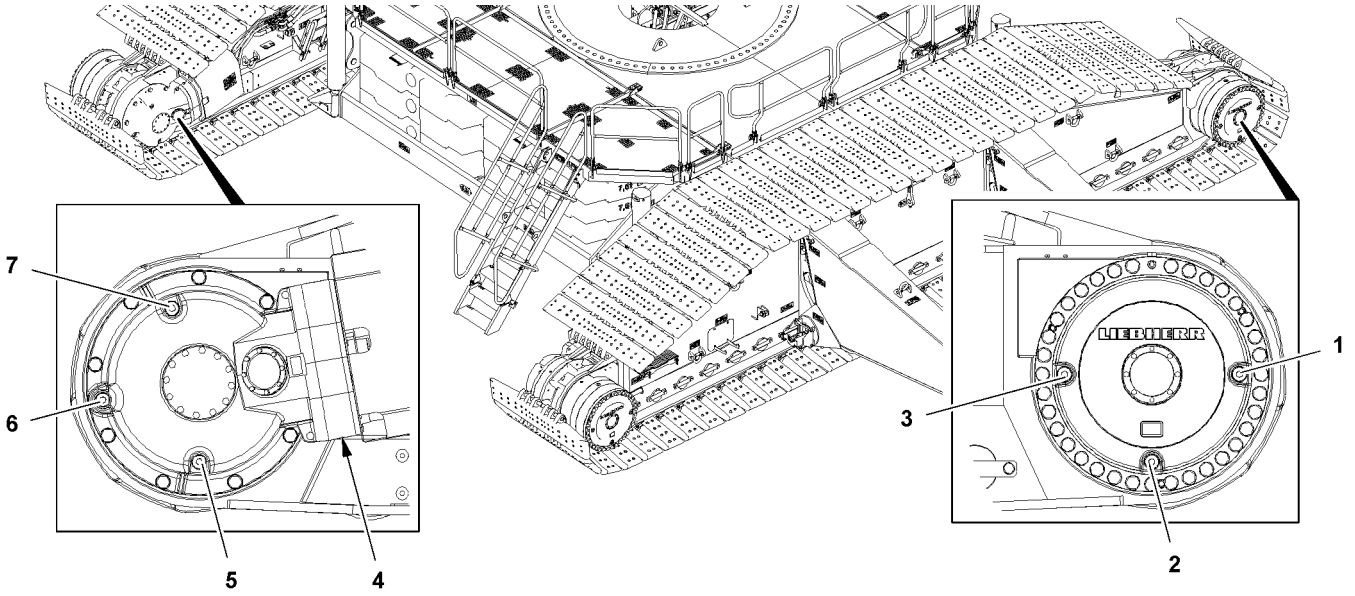

Fig.120158

▶ Unscrew the control plug **1** or control plug **3**.

The oil level must be on the lower edge of the control bore.

▶ Perform a visual inspection.
▶ Screw in the control plug with new seal and tighten.

Problem remedy
When opening the control plug, oil emerges?
Depending on the position of the gears in the planetary gear, the oil level can be higher than the control bore.
▶ Replace any emerged gear oil in the same amount.

Problem remedy
The oil level is **not** on the lower edge of the control bore?
▶ Unscrew the second control plug.
▶ Add gear oil on one control bore until gear oil starts to run over on the second control bore.
▶ Install the control plugs with a new seal and tighten.

Problem remedy
Oil consumption or loss of oil too high?
▶ Find the cause and remedy it.

If the cause cannot be remedied:
▶ Contact Liebherr Service.

1.2.2 Replacing the gear oil

Make sure that the following prerequisite is met:
- Authorized and trained expert personnel checks the oil level.
- The crane is in horizontal position.
- The travel gear is at operating temperature.
- Container for the used oil is on hand.

To be able to hold the entire old oil, the container must be sufficiently sized.

For fill quantity of miter gear, see Service fill.

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WARNING
Components and gear oil at operating temperature!
Burns.
▶ Avoid direct body contact with travel gears and gear oil.

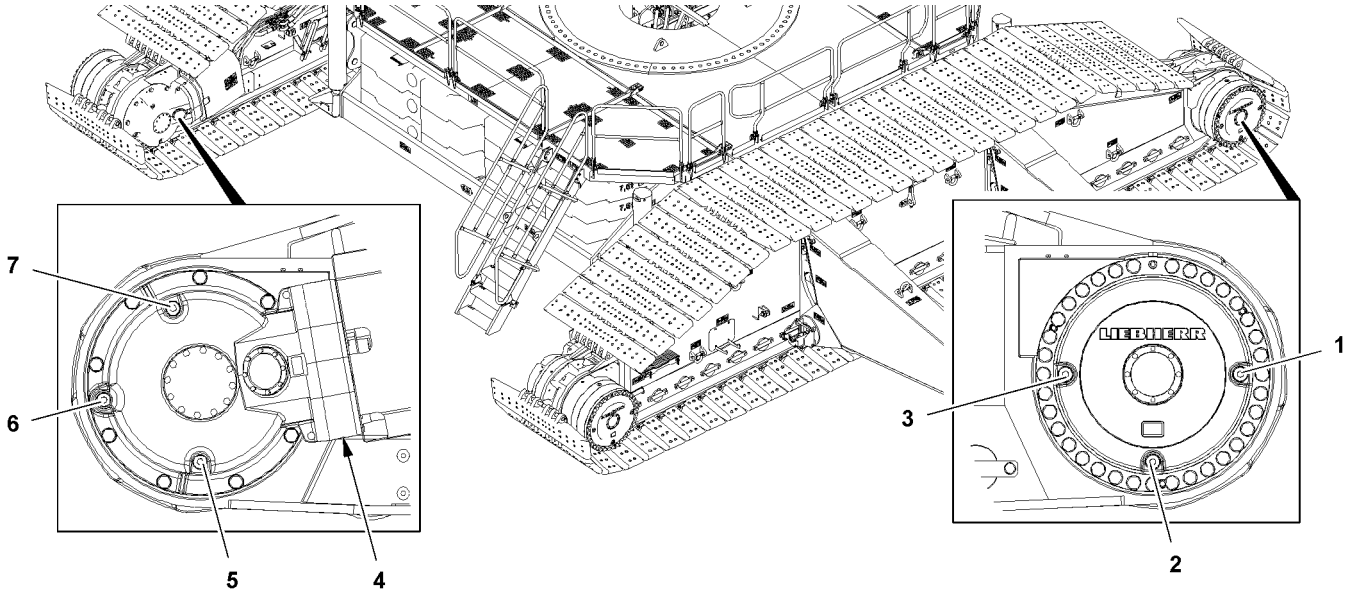

Fig.120158

▶ Unscrew the control plug **1** and control plug **3**.
▶ Catch the gear oil: Position a container under the drain plug **2**.
▶ Drain the gear oil: Unscrew the drain plug **2**.

When gear oil is completely drained:
▶ Install the drain plug **2** with new seal and tighten.
▶ Add gear oil on one control bore until gear oil starts to run over on the second control bore.
▶ Install the control plugs with a new seal and tighten.

1.3 Miter gear

1.3.1 Checking the oil level

NOTICE
Transmission damage due to lack of oil!
▶ Check the oil level and add gear oil if necessary.

Make sure that the following prerequisite is met:
– Authorized and trained expert personnel checks the oil level.
– The crane is in horizontal position.
– The travel gear has been at a standstill for two minutes before checking the oil: The gear oil has drained back completely.

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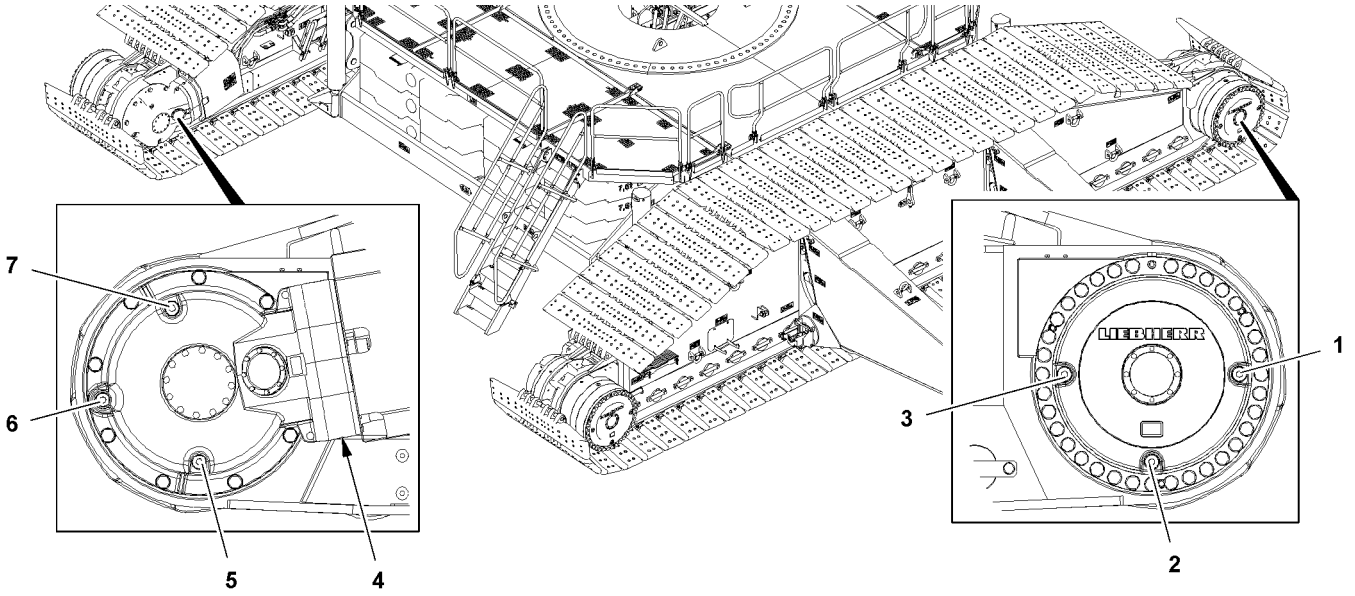

Fig.120158

▶ Unscrew the control plug **6**.

The oil level must be on the lower edge of the control bore.

▶ Perform a visual inspection.
▶ Screw in the control plug **6** with new seal and tighten.

Problem remedy
The oil level is **not** on the lower edge of the control bore?
▶ Unscrew the filler plug **7**.
▶ Add gear oil on the filler bore until gear oil starts to run over on the control bore.
▶ Install the filler plug **7** with a new seal and tighten.

Problem remedy
Oil consumption or loss of oil too high?
▶ Find the cause and remedy it.

If the cause cannot be remedied:
▶ Contact Liebherr Service.

1.3.2 Replacing the gear oil

Make sure that the following prerequisite is met:
– Authorized and trained expert personnel checks the oil level.
– The crane is in horizontal position.
– The travel gear is at operating temperature.
– Container for the used oil is on hand.

To be able to hold the entire old oil, the container must be sufficiently sized.

For fill quantity of miter gear, see Service fill.

WARNING
Components and gear oil at operating temperature!
Burns.
▶ Avoid direct body contact with travel gears and gear oil.
▶ Wear suitable protective gloves.

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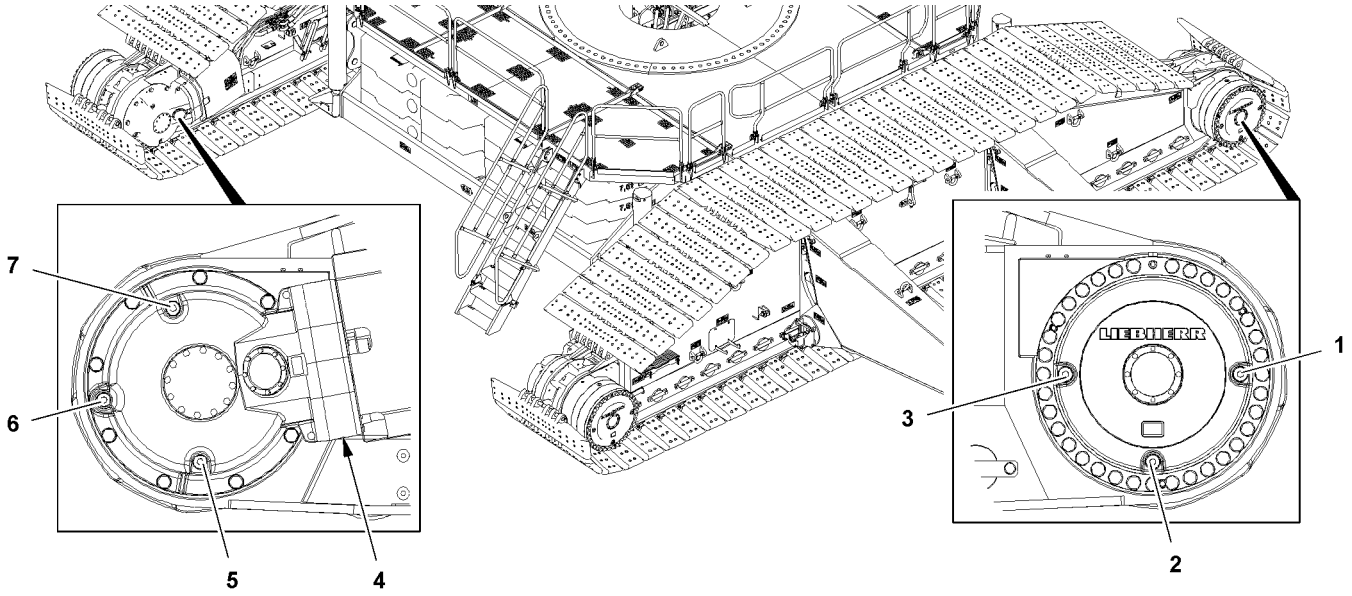

Fig.120158

- ▶ Unscrew the filler plug **7**.
- ▶ Catch the gear oil: Place a container under the drain plug **5** and under the drain plug **4**.
- ▶ Drain the gear oil: Unscrew the drain plug **5** and drain plug **4**.

When gear oil is completely drained:

- ▶ Install the drain plug **5** with new seal and tighten.
- ▶ Install the drain plug **4** with new seal and tighten.
- ▶ Add gear oil on the filler bore until gear oil starts to run over on the control bore.
- ▶ Screw in the control plug **6** with new seal and tighten.
- ▶ Screw in the filler plug **7** and tighten.

2 Central lubrication system

Differentiation between central lubrication systems:

- Central lubrication system **with** integrated control unit
- Central lubrication system **without** integrated control unit

2.1 Technical safety instructions

WARNING
Non-observance of safety instructions!
Personnel can be harmed due to electrical, mechanical and chemical exposure.
Dangerous substances can be discharged and endanger the environment.
Death, severe injury, property damage.

- ▶ Have maintenance and repair work carried out exclusively by authorized and trained expert personnel.
- ▶ Use exclusively Original Liebherr spare parts.

If defects affect the safety:

- ▶ Remedy the defect immediately.

NOTICE
Dirt in lubrication system!
Failure of lubrication, property damage. Damage to central lubrication system.

- ▶ Maintain extreme cleanliness during all work.

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NOTICE
Crane is not being moved for longer than three months!
Insufficient lubrication, property damage.
- ▶ Check central lubrication system for correct function.
- ▶ Carry out intermediate lubrication until lubricant emerges on all lube points.
- ▶ Repeat the respective crane movement several times.
- ▶ Carry out intermediate lubrications again.

NOTICE
Property damage due to crane cleaning procedure!
- ▶ Carry out the cleaning procedure with a steam cleaner or high pressure cleaner at a minimum distance of 0.4 m.

When the crane is cleaned:
- ▶ Carry out intermediate lubrication until lubricant emerges on all lube points.

Note
- ▶ Cleaning is only permitted in washing bays.

2.2 Central lubrication system with control unit

Types of central lubrication systems with integrated control unit, see illustration.

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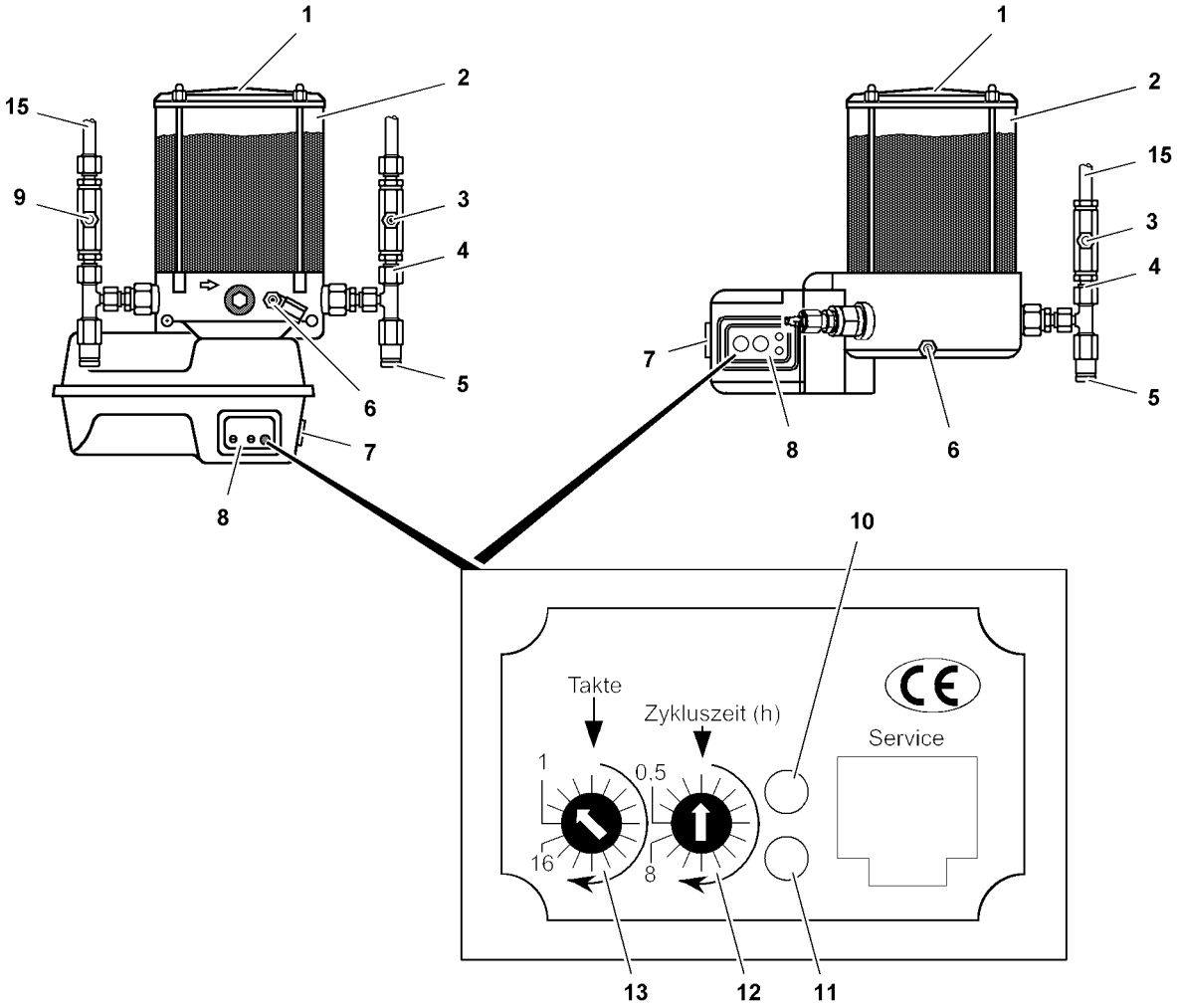

Fig.120487: Central lubrication system with control unit

1	Cover Grease container	**6**	Grease fitting Grease container	**11**	LED green
2	Grease container	**7**	Button	**12**	Latched switch cycle time
3	Grease fitting Lube line	**8**	Control element	**13**	Latched switch lube cycles
4	Pump outlet	**9**	Grease fitting Lube line	**15**	Main line
5	Pressure relief valve	**10**	LED red		

2.2.1 Description of function

Displays on control element

Note

- ▶ In the crane operator's cab, operating conditions and problems of the central lubrication system are shown on indicator lights.
- ▶ Indicator lights on operating and control unit, see Crane operating instructions, chapter 4.01.

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LED red 11	LED green 10	Operating condition
Lights up for 1.5 seconds	Lights up for 1.5 seconds	Operational readiness after ignition on
Off	Lights up	Lubrication is active (during lube cycles)

*Status of LEDs on control element **8***

Lube cycle

Note
The lubrication time and the cycle time are set in the factory!
▶ Do **not** change the settings.

Cycle time: Time from start of one lubrication to the start of another lubrication.

The cycle time is set with the latched switch **12**.

Lube cycles: Number of strokes, during which lubricant is supplied by the pump cylinder.

The number of lube pulses for a lube cycle is set with the latched switch **13**.

2.2.2 Carrying out an intermediate lubrication

Manual intermediate lubrication is carried out, for example:
– If the crane has not been moved for longer than three months.
– After washing the crane.

Note
▶ When an intermediate lubrication is carried out, the pump starts the lube cycle again. The lube cycle is reset.

Several lube pulses may be required until lubricant emerges on all lube points.

▶ Press the button **7** until lubricant emerges on all lube points.
or

Fig.124495

In the crane operator's cab: Press the button **381** until lubricant emerges on all lube points.

2.2.3 Checking the function

Make sure that the following prerequisite is met:
– The ignition is turned on.

Note
▶ Problems, see section „Diagnostics and troubleshooting“

When lubricant emerges on all lube points, then the central lubrication system functions error-free.

▶ Check the function: Trigger several lube pulses.
▶ Carry out intermediate lubrication until lubricant emerges on all lube points.

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2.2.4 Filling the grease container

NOTICE
Insufficient lubrication!
Lube points run dry, property damage.
- ▶ Make sure that the grease container **2** is filled.
- ▶ Fill the grease container **2** before it is completely empty.
- ▶ Make sure that all grease fittings are clean.

When the grease container is completely empty:
- ▶ Bleed the central lubrication system.
- ▶ Fill the grease container **2** with a grease pump on the grease fitting **6**.

2.2.5 Bleeding the central lubrication system

NOTICE
Insufficient lubrication!
Air in the grease pump, lube points running dry.
- ▶ Bleed the central lubrication system carefully.

When the grease container **2** is completely empty, the central lubrication system must be bled.

Note
- ▶ Carry out the bleeding procedure individually for each main line **15**.
- ▶ Every crawler carrier has a separate grease pump.

- ▶ Fill the grease container **2** with a grease pump via the grease fitting **6**.
- ▶ Fill the main lines **15** with an external grease pump via the grease fittings **3** until grease free of air bubbles emerges on all grease points.
- ▶ Unscrew main line **15** on the pump outlet **4**.
- ▶ Carry out intermediate lubrication until lubricant emerges without air bubbles on the pump outlet **4**.
- ▶ Install the main line **15**.
- ▶ Carry out intermediate lubrication until lubricant emerges on all lube points.

2.2.6 Filling repaired lube lines

NOTICE
Components running dry due to insufficient lubrication!
- ▶ After every repair on lubricated components fill the lube lines completely with lubricant.
- ▶ Make sure that all grease fittings are clean.

- ▶ Fill lube lines completely with lubricant before installation.
  or
  Carry out intermediate lubrication until lubricant emerges on all lube points.
- ▶ Check repaired lube lines for function and leaks.

2.2.7 Diagnostics and problem remedy

Problem signals on control element

Note
- ▶ In the crane operator's cab, operating conditions and problems of the central lubrication system are shown on indicator lights.
- ▶ Indicator lights on operating and control unit, see Crane operating instructions, chapter 4.01.

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Status LEDs		Cause	Remedy
LED red 10	**LED green 11**		
Blinks once in two seconds	Blinks once in two seconds	Cycle error	Fix the system; contact Liebherr Service.
Blinks once a second	Off	CPU error, memory error	Fix the system; contact Liebherr Service.
Lights up	Off	Lubricant level too low (depending on system type)	Fill the grease container.

*Problem signals on the control element **8** with diagnostics*

Problems on central lubrication system

Status lubrication system	Cause	Remedy
The grease pump does not work.	Electrical line interrupted, grease pump defective	Fix the system **or** contact Liebherr Service.
Grease pump words but lubricant is not supplied.	Air cushion in delivery piston, minimum fill level fallen below, grease pump element defective.	Bleed the central lubrication system, fill the grease container, fix the system **or** contact Liebherr Service.
No lubricant emerges on all lube points.	Grease pump is defective, system is blocked or grease container is empty.	See „Grease pump does not work“ **or** „Lubricant emerges on the pressure relief valve **5**“.
No lubricant emerges on several lube points or on one lube point.	Supply lines to auxiliary distributor broken or leaky, associated lube line broken or leaky, fittings leak.	Retighten fittings, fix the system **or** contact Liebherr Service.
Grease pump speed reduced	High system pressure, low ambient temperature	Check system / bearing points, if no damage can be found: Carry out one or two intermediate lubrications.
Lubricant emerges via pressure relief valve **5**	System pressure too high, distributor blocked, system blocked, defective valve spring on pressure relief valve	Check the system, fix the system **or** contact Liebherr Service.

Problems and diagnostics on the central lubrication system

Resetting a problem

▶ Press the button **7**.

Result:

– Problem signal on control element turns off.

When a problem signal occurs again:
▶ Contact Liebherr Service.

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2.3 Central lubrication system without control unit

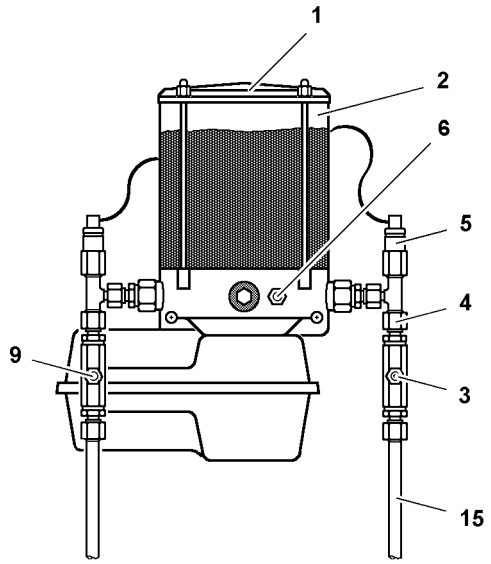

Fig.120489: Central lubrication system without control unit

1 Cover Grease container
2 Grease container
3 Grease fitting Lube line
4 Pump outlet
5 Pressure relief valve
6 Grease fitting Grease container
9 Grease fitting Lube line
15 Main line

2.3.1 Description of function

If the crawler crane is driven via the crawler travel gear, then the central lubrication systems turn on automatically. The central lubrication systems supply all connected lube points with the correct amount of lubricant.

2.3.2 Carrying out an intermediate lubrication

Manual intermediate lubrication is carried out, for example:
– If the crane has not been moved for longer than three months.
– After washing the crane.

Several lube pulses may be required until lubricant emerges on all lube points.

▶ Fill the main line **15** with an external grease pump via the grease fitting **3** until lubricant free of air bubbles emerges on all lube points.

WARNING
Crane can start to drive unintentionally!
If the foot rocker in the crane operator's cab or the manual control lever on the radio remote control panel* is moved too far while bleeding the grease pump, then the track chain can start to move.
Death, severe injury, property damage.
▶ Actuate the foot rocker carefully to bleed the grease pump.
▶ Watch the emergence of lubricant from the grease pump from a safe distance.

Note
▶ For assignment of foot rockers to the crawler carriers, see Crane operating instructions, chapter 4.01.

▶ Make sure that the track chain does **not** start to move when actuating the foot rocker.
▶ Move the foot rocker or the manual control lever to the point where the grease pump supplies.
▶ Actuate the foot rocker or the manual control lever until lubricant emerges on all lube points.

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2.3.3 Checking the function

Make sure that the following prerequisite is met:
– The ignition is turned on.

Note
▶ Problems, see section „Diagnostics and troubleshooting“

When lubricant emerges on all lube points, then the central lubrication system functions error-free.

WARNING
Crane can start to drive unintentionally!
If the foot rocker in the crane operator’s cab or the manual control lever on the radio remote control panel* is moved too far while bleeding the grease pump, then the track chain can start to move.
Death, severe injury, property damage.
▶ Actuate the foot rocker carefully while bleeding the grease pump.
▶ Watch the emergence of lubricant from the grease pump from a safe distance.

▶ Carry out intermediate lubrication until lubricant emerges on all lube points.

2.3.4 Filling the grease container

NOTICE
Insufficient lubrication!
Lube points run dry, property damage.
▶ Make sure that the grease container **2** is filled.
▶ Fill the grease container **2** before it is completely empty.
▶ Make sure that all grease fittings are clean.

When the grease container is completely empty:
▶ Bleed the central lubrication system.
▶ Fill the grease container **2** with a grease pump on the grease fitting **6**.

2.3.5 Bleeding the central lubrication system

NOTICE
Insufficient lubrication!
Air in the grease pump, lube points running dry.
▶ Bleed the central lubrication system carefully.

The central lubrication system of the crawler travel gear can be bled two ways:
– By actuation of the grease pump by simulating the crawler operation.
– By separate actuation of the grease pump with the aid of the electric wiring diagram.

Bleeding by simulating crawler operation

▶ Fill the grease container **2** with an external grease pump via the grease fitting **6**.
▶ Fill the main lines **15** with an external grease pump via the grease fittings **3** until grease free of air bubbles emerges on all grease points.

Note
▶ Carry out the bleeding procedure individually for each pump outlet **4**.
▶ Every crawler carrier has a separate grease pump.

▶ Unscrew main line **15** on the pump outlet **4**.
▶ Start the crane engine.
▶ Select crawler operation.

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WARNING
Crane can start to drive unintentionally!
If the foot rocker in the crane operator's cab or the manual control lever on the radio remote control panel* is moved too far while bleeding the grease pump, then the track chain can start to move.
Death, severe injury, property damage.
- ▶ Actuate the foot rocker carefully to bleed the grease pump.
- ▶ Watch the emergence of lubricant from the grease pump from a safe distance.

Note
- ▶ For assignment of foot rockers to the crawler carriers, see Crane operating instructions, chapter 4.01.

- ▶ Make sure that the track chain does **not** start to move when actuating the foot rocker.
- ▶ Move the foot rocker or the manual control lever to the point where the grease pump supplies.

Result:

– The acoustic signal crawler operation sounds.

- ▶ Actuate the foot rocker or the manual control lever until lubricant free of air bubbles emerges on the pump outlet **4**.
- ▶ Install the main line **15**.
- ▶ Actuate the foot rocker / manual control lever until lubricant emerges on at least one of the lube points in the bled lubrication circuit.

Bleeding by separate actuation of the grease pump

Make sure that the following prerequisites are met:
- Authorized and trained expert personnel works on the electrical system.
- The separate electric wiring diagram of the crane is available.

- ▶ Fill the grease container **2** with an external grease pump via the grease fitting **6**.
- ▶ Fill the main lines **15** with an external grease pump via the grease fittings **3** until grease free of air bubbles emerges on all grease points.

Note
- ▶ Carry out the bleeding procedure individually for each main line **15**.
- ▶ Every crawler carrier has a separate grease pump.

- ▶ Unscrew main line **15** on the pump outlet **4**.
- ▶ Actuate the grease pump separately, see crane electric wiring plan.

Result:

– The grease pump starts to supply.

- ▶ Actuate the lube pump until lubricant emerges without air bubbles on the pump outlet **4**.
- ▶ Install the main line **15**.
- ▶ Actuate the grease pump again until lubricant emerges again on at least one of the lube points in the bled lubrication circuit.

2.3.6 Filling repaired lube lines

NOTICE
Components running dry due to insufficient lubrication!
- ▶ After every repair on lubricated components fill the lube lines completely with lubricant.
- ▶ Make sure that all grease fittings are clean.

- ▶ Fill lube lines completely with lubricant before installation.
  or
  Carry out intermediate lubrication until lubricant emerges on all lube points.
- ▶ Check repaired lube lines for function and leaks.

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2.3.7 Diagnostics and problem remedy

Status lubrication system	Cause	Remedy
The grease pump does not work.	Electrical line interrupted, grease pump defective	Fix the system **or** contact Liebherr Service.
Grease pump words but lubricant is not supplied.	Air cushion in delivery piston, minimum fill level fallen below, grease pump element defective.	Bleed the central lubrication system, fill the grease container, fix the system **or** contact Liebherr Service.
No lubricant emerges on all lube points.	Grease pump is defective, system is blocked or grease container is empty.	See „Grease pump does not work“ **or** „Lubricant emerges on the pressure relief valve **5**“.
No lubricant emerges on several lube points or on one lube point.	Supply lines to auxiliary distributor broken or leaky, associated lube line broken or leaky, fittings leak.	Retighten fittings, fix the system **or** contact Liebherr Service.
Grease pump speed reduced	High system pressure, low ambient temperature	Check system / bearing points, if no damage can be found: Carry out one or two intermediate lubrications.
Lubricant emerges via pressure relief valve **5**	System pressure too high, distributor blocked, system blocked, defective valve spring on pressure relief valve	Check the system, fix the system **or** contact Liebherr Service.

Problems and diagnostics on the central lubrication system

3 Servicing the track chain

Note
▶ The illustrations in this chapter are examples and may not apply exactly to your crane.

In crawler operation, the components of the crawler travel gear are subject to wear caused by operation.

In order to continuously guarantee safe and effective crane operation, components must be checked at the specified maintenance intervals and replaced if necessary, see the Crane operating instructions, chapter 7.02.

WARNING
Maintenance interval exceeded!
Failure to observe the specified maintenance intervals can lead to increased crane failure time as well as to damage on the crawler travel gear.
Death, severe bodily injuries, property damage.
▶ Make sure that the maintenance intervals in the Crane operating instructions chapter 7.02 are observed.
▶ The crane operator is responsible for complying with the maintenance intervals, properly performing the specified maintenance tasks as well as initiating the corresponding measures as a result of the inspection results.

3.1 Tensioning the track chain

The track chain must be retensioned at the latest when three track pads **2** at point **P2** are laying flat on the glide rails **1.1** on the crawler carrier **1**.

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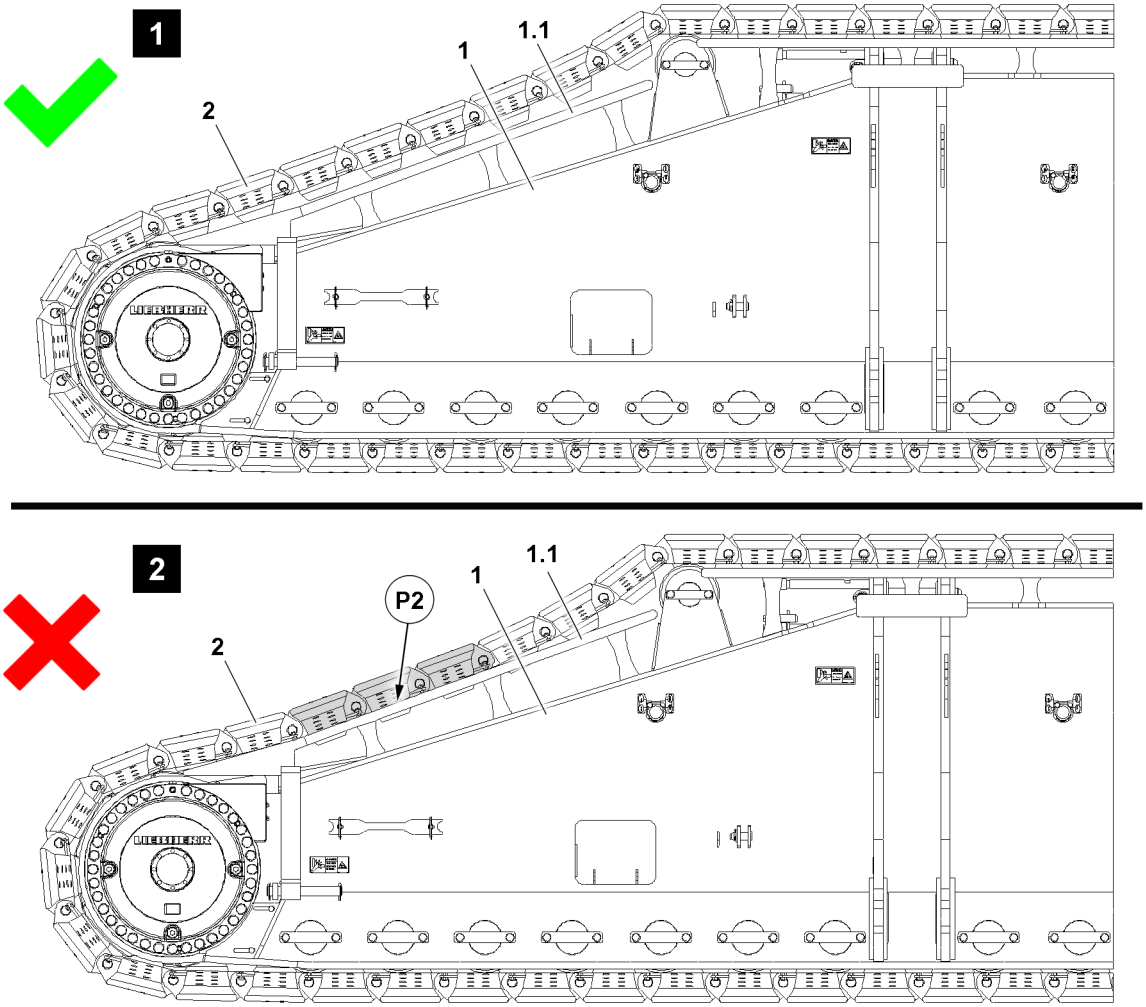

*Fig.128241: Chain tension OK, illustration **1** // Track chain too slack, illustration **2***

NOTICE
Damage to the track chain!
If the chain tension is not checked within the specified maintenance intervals, the track chain or the steel structure of the crawler carrier can be damaged.
- ▶ Observe and adhere to the maintenance intervals, see the Crane operating instructions, chapter 7.02.
- ▶ If **three** of the track pads **2** of the track chain lie flat on the glide rails **1.1** on the crawler carrier **1** (see point **P2**), then the track chain must be retensioned **immediately**.

The following applies in the case of crawler carriers **1** without glide rails **1.1** or with worn glide rails **1.1**:
- ▶ Make sure that the track pad cams never come into contact with the base steel structure of the crawler carrier. Always retension the track chain early on.

The following applies:
- ▶ The crane driver bears full responsibility for damage resulting from a non-tensioned track chain.

NOTICE
Glide rails worn!
If the glide rails on the crawler carriers are worn to the extent that the remaining material can be deformed or could break under the weight of the track chain, this could result in capital property damage to the crawler travel gear.
- ▶ Retension the track chain early on.
- ▶ Make sure that worn glide rails are replaced early on, please contact Customer Service at LIEBHERR-Werk Ehingen GmbH.

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Note
▶ The chain tension is held by spacer plates **16**.

NOTICE
Foreign matter in track chains!
Foreign matter in the track chains and on the travel drive can cause damage.
▶ Before tensioning the track chains, check the track chains and the travel drives for foreign particles, such as rocks, and clean them, if necessary.

Make sure that the following prerequisite is met:

– The crane is horizontal.

3.1.1 Placing the tension cylinder in crawler carrier opening

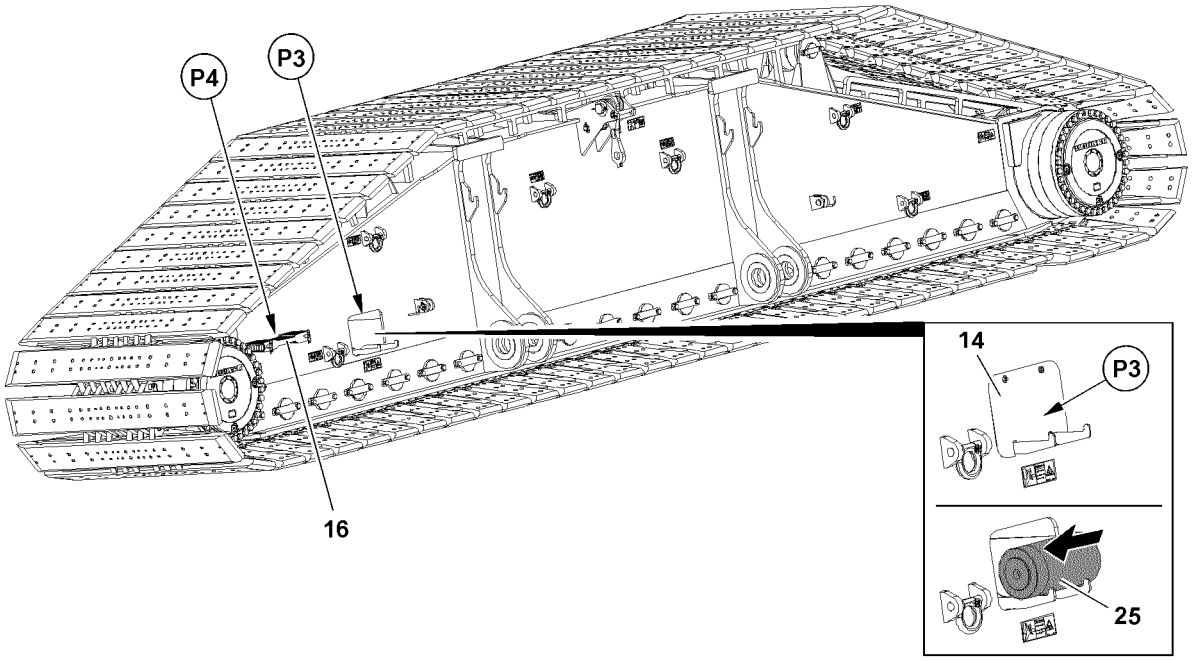

Fig.123567: Placing the tension cylinder in crawler carrier opening

▶ Remove maintenance flap **14** at point **P3**.

NOTICE
Damage to hydraulic connections!
When sliding the tension cylinder **25** in the crawler carrier opening, the hydraulic connections can be damaged.
▶ Make sure that the hydraulic connections of the tension cylinder point forward to the crawler carrier opening when sliding it in.

▶ Place the tension cylinder **25** on the cylinder receptacle.
▶ Slide the tension cylinder in the crawler carrier opening until it is centered in „working position“.

3.1.2 Carrying out the tension procedure

Make sure that the following prerequisites are met:
– The tension cylinder **25** is properly placed in the crawler carrier opening.
– The hydraulic lines **15.1** between the tension cylinder **25** and hand lever pump **15** are properly installed.

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Note

▶ By extending the tension cylinder **25**, the sliding section of the crawler carrier is moved in direction of the arrow.

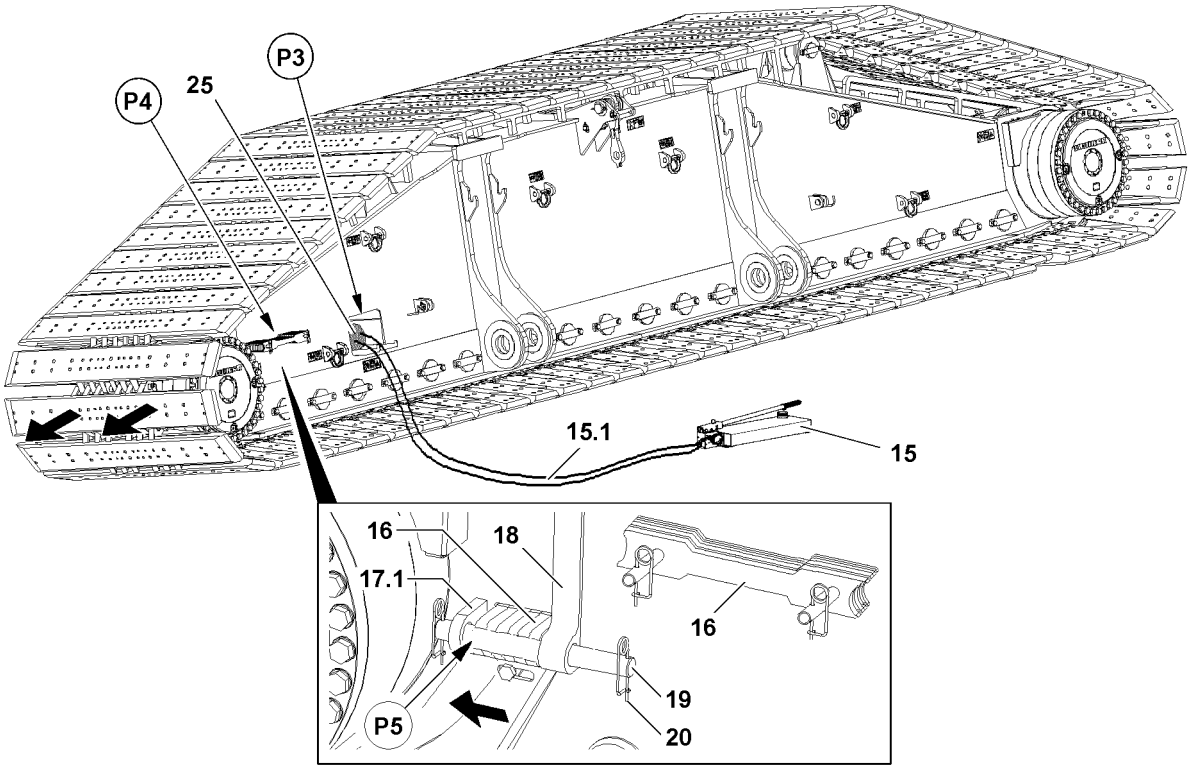

Fig.123568: Tension the track chain with the tension cylinder and the hand lever pump

▶ Actuate the hand lever pump **15**.

Result:

– The tension cylinder **25** extends.
– The crawler chain is tensioned.

▶ Remove the spacer plates **16** from the transport receptacle at point **P4**.
▶ At point **P5**, insert as many spacer plates **16** as fit into the gap between the stop sliding section **17.1** and the stop crawler carrier **18**.
▶ Secure the spacer plates **16** with pin **19** and spring retainer **20**.

WARNING
Moving in tension cylinder!
Crushing and shearing off body parts, such as: fingers, hands and arms.
Death, severe injury, property damage.

When the tension cylinder is moved in:
▶ Make sure that personnel keeps away from the crawler carrier.
▶ Stop work on the crawler carrier.

▶ Move the tension cylinder **25** in with the hand lever pump **15**.
▶ After the tension procedure, drive the crawler back and forth by one crawler length in operating mode „Straight forward travel“.

Result:

– The tension of the track chain is reduced.

▶ Check the distance of the crawler chain to the steel structure of the crawler carrier at point **P2**.

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If necessary:

▶ Repeat the tension procedure of the track chain and insert additional spacer plates **16**.

Problem remedy

Crawler chain can **not** be tensioned?

The stroke on the tension cylinder is **not** sufficient.

▶ Have one track pad removed by authorized and trained expert personnel.

3.1.3 Removing the tension cylinder on the crawler carrier

Make sure that the following prerequisites are met:

- The track chain is tensioned.
- The spacer plates are properly placed in the gap between the stop sliding section **17.1** and stop crawler carrier **18**.
- The spacer plates **16** are properly secured with pins.
- The tension cylinder **25** is retracted in all the way.

NOTICE

Damage to hydraulic connections!

When removing the tension cylinder **25** on the crawler carrier, the hydraulic connections can be damaged.

▶ Pull the tension cylinder carefully from the crawler carrier opening on the cylinder receptacle.

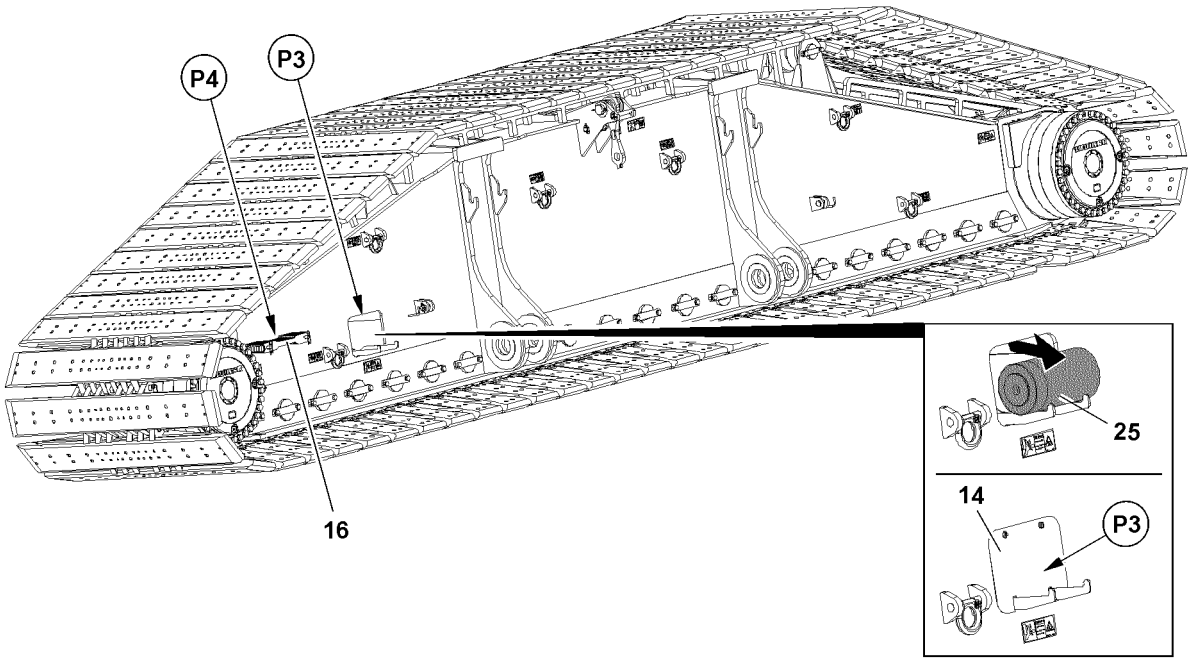

Fig.123570: Removing the tension cylinder on the crawler carrier

▶ Slide the tension cylinder **25** from the crawler carrier opening at point **P3** on the cylinder receptacle.

▶ Lift the tension cylinder **25** from the cylinder receptacle.

▶ Install the maintenance flap **14** properly at point **P3**.

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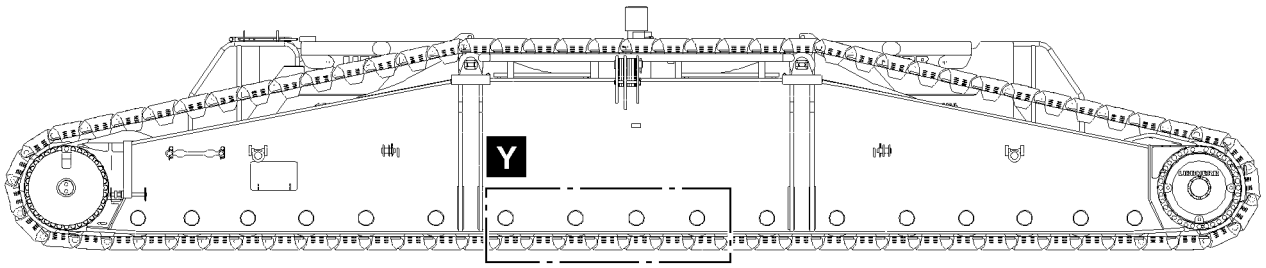

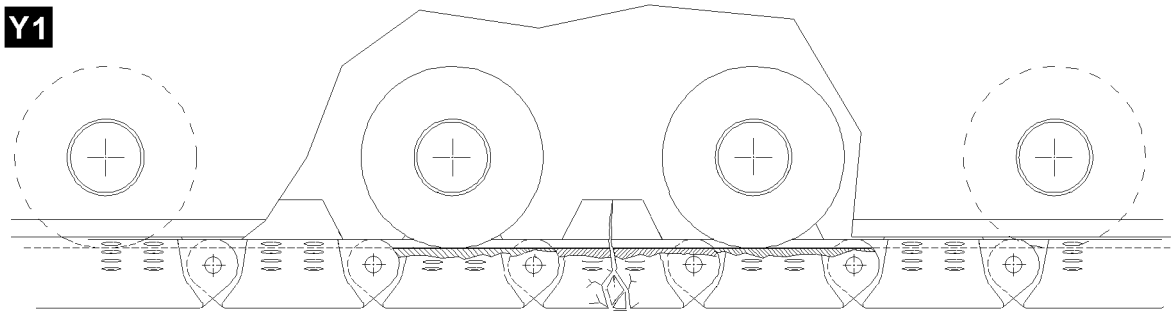

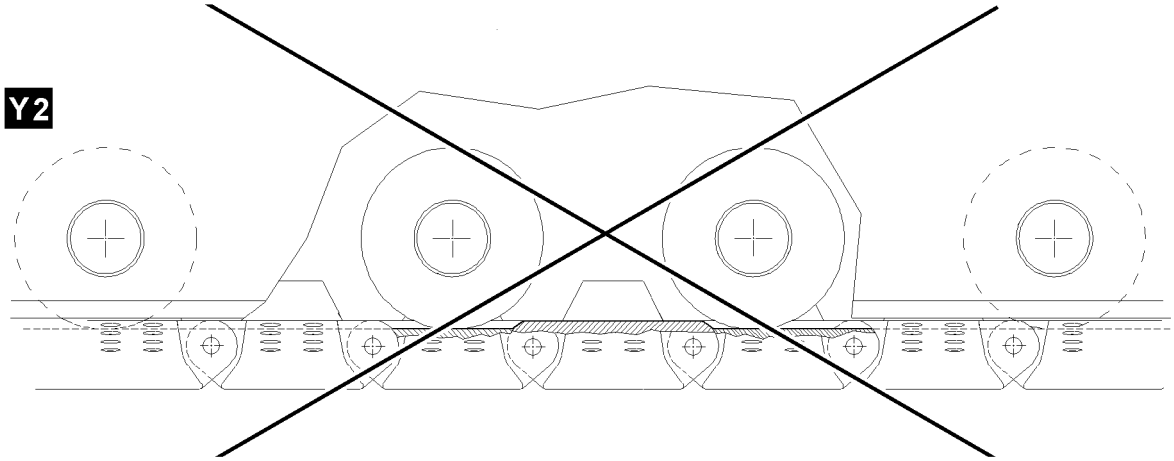

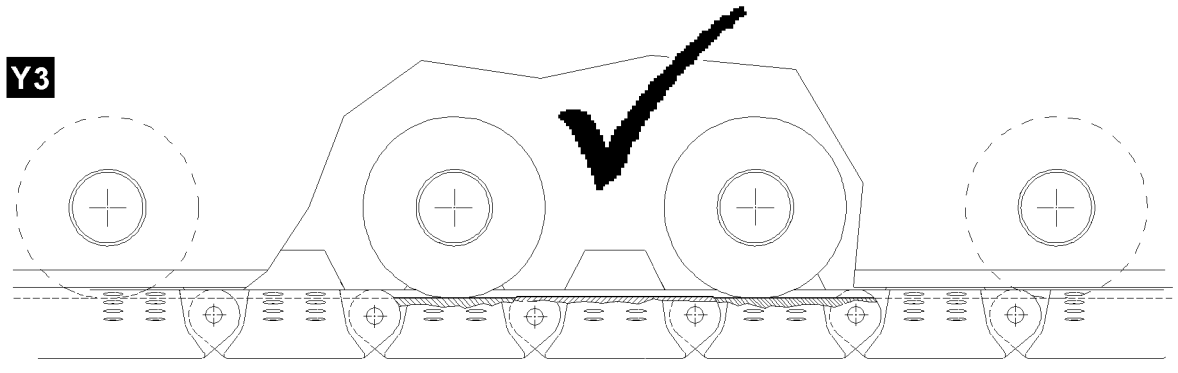

Fig.109917

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3.2 Checking wear on the track chain

WARNING
Exceeding the wear limits on track pads **21**, pins **22** or track rollers **23**!
Track chain can be ripped off. Toppling crane. Death, severe injuries.
- ▶ Make sure that random checks of the track pads **21**, pins **22** and track rollers **23** are carried out within the specified intervals.
- ▶ During the random inspection of the track rollers, always check the first and the last track roller on the crawler carrier.

When a wear limit on the component is reached:
- ▶ Replace the component or have it reworked by authorized and trained expert personnel.

NOTICE
Significant height differences between the individual track pads, see illustration **Y2**!
Increased mechanical stress on the track pads **21** and the track rollers **23**. Property damage.

If one individual track pad **21** must be replaced:
- ▶ Make sure that the track pad is **not** replaced by a track pad **21** with a much lower degree of wear.
- ▶ Replace a defective track pad **21** with a track pad **21** which shows a similar degree of wear, see illustration **Y3**.

Note
- ▶ New crawler track: As the components break in toward each other, the track chain lengthens initially more.

If necessary:
- ▶ To be able to tension the track chain correctly, remove a track pad **21** early on.

The wear of the track pad **21**, pin **22** and track rollers **23** depends a various factors:
- Length of travel route
- Frequency of driving in curves
- Friction ratios between track pad **21** and ground
- Evenness of the ground
- Type of ground
- Load bearing capacity of the ground / base
- Position of the total center of gravity
- Load on the hook
- Placed ballast on the crane

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3.2.1 Checking the wear on the connections of the track pads

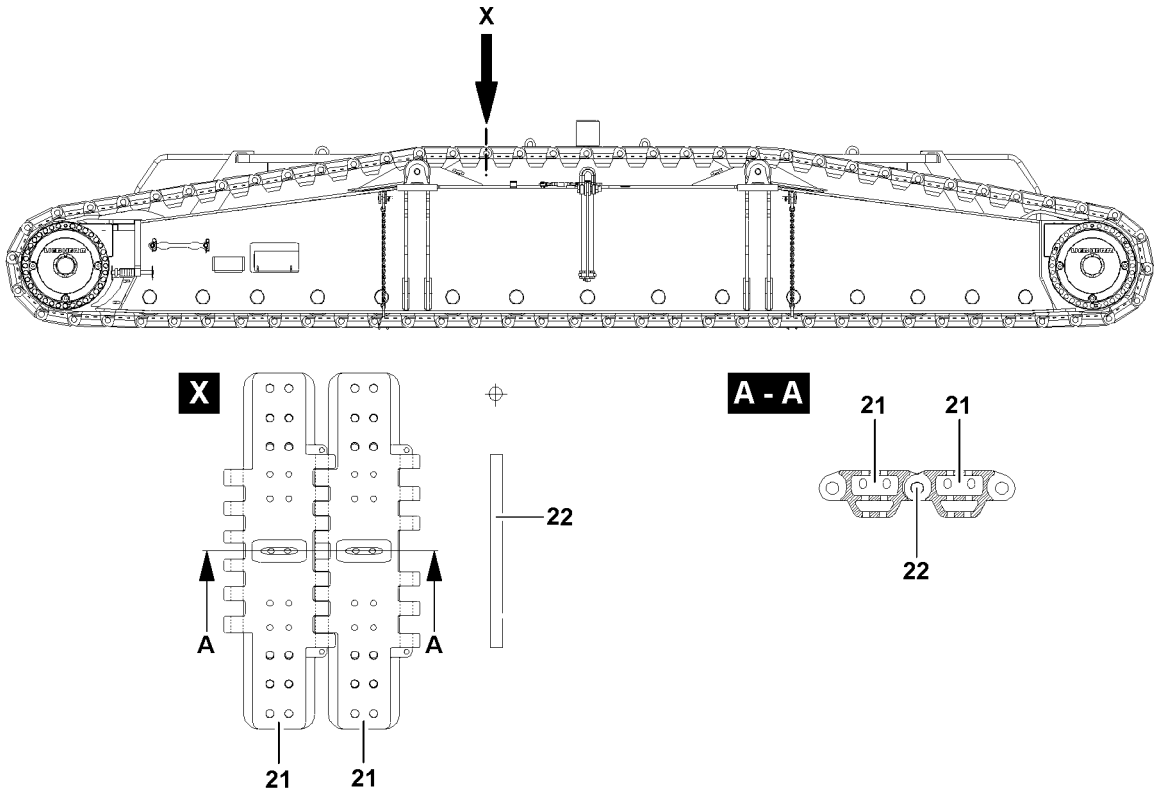

Fig.108536: Checking the wear on the connections of the track pads

NOTICE
Wear limits at the connections to the track pads is reached!
Damage of sprocket, chain lengthening too much, increased wear on sprocket and on transport cams of track pads.
Expensive and extensive repairs.
▶ Make sure, that the random inspection of the bolt diameter is made within the specified intervals.

When one pin **22** falls below the minimum dimension:
▶ Replace the pin **22**.
▶ Make sure, that the random inspection of the bore diameter is made within the specified intervals.

If a bore diameter exceeds the maximum permissible highest dimension:
▶ Replace the track pad **21**.

NOTICE
Dimension and association of wear on pins, bore and run in depth on track pads!
On the sprocket and on the transport cams increased wear can occur, before wear limits of pins, bore and run in depth of the track pad are reached.
Expensive and extensive repairs.
▶ Check the sprocket and transport cams of the track pads for wear.
▶ Check the run in depth of the track pads.

If increased wear is found:
▶ Stop crawler operation and contact Liebherr Service.

The track pads **21** of the crawler track are connected by pins **22**.

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Wear limit bore for the track pad	
Initial diameter	53 mm
Maximum permissible upper limit	56 mm

Pin wear limit	
Initial diameter	50 mm
Maximum permissible minimum dimension	47 mm

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3.2.2 Checking the wear on the roll off surfaces of the track pads / track rollers

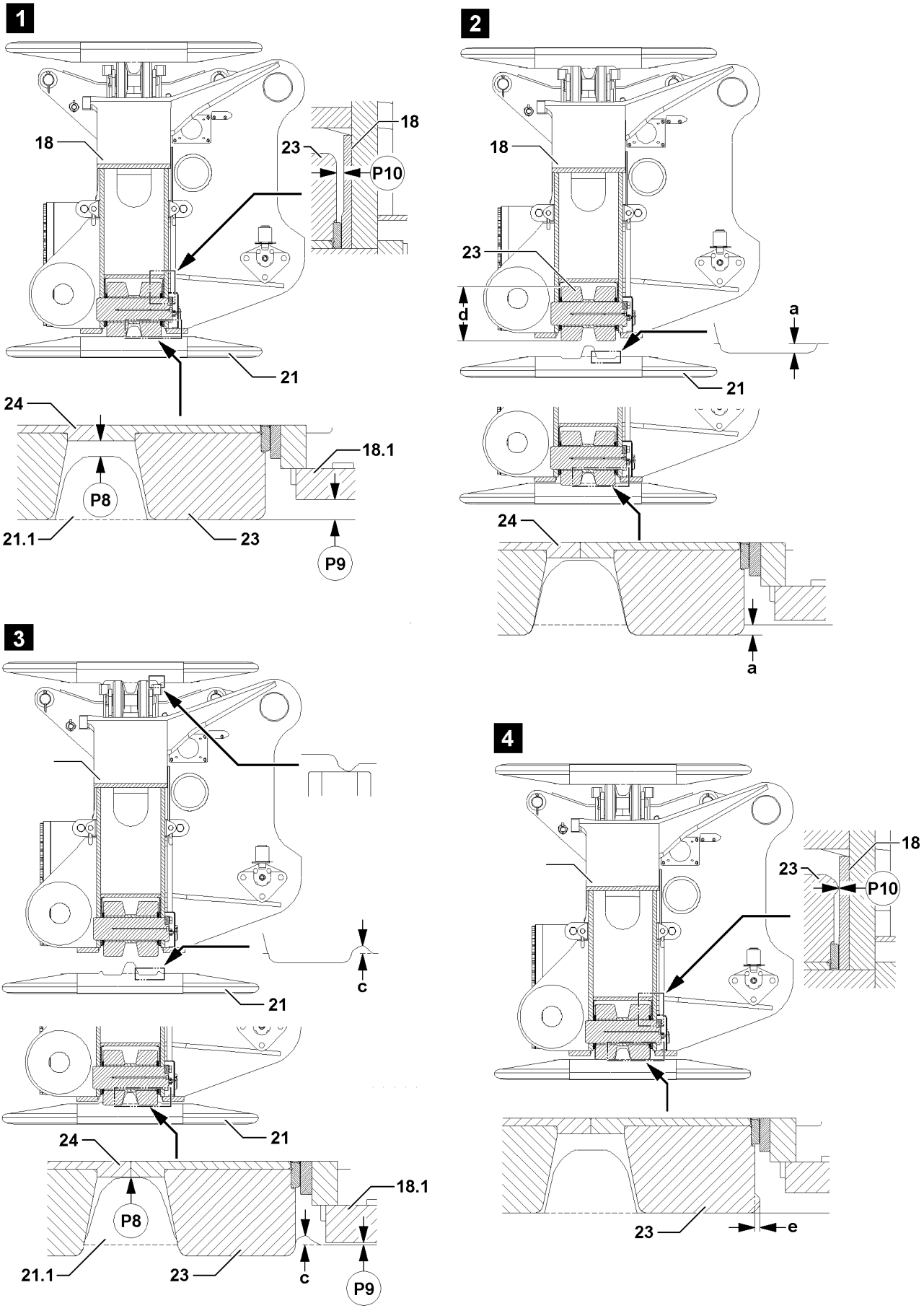

Fig.109882

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NOTICE
Destruction of track pad!
If a track pad **21** is not fixed or replaced after reaching the wear limit, then the track pad **21** will be destroyed and can cause damage to the crawler carrier **18**.
This could result in high property damage.
▶ Fix or replace the track pad **21** after reaching the wear limit.

NOTICE
Failure of track rollers!
If the track rollers **23** are not replaced after reaching the wear limit, then they can fail and cause damage to the crawler carrier **18** and track pad **21**.
This could result in high property damage.
▶ Replace track rollers **23** after reaching the wear limit.

NOTICE
Bulges on track pads **21** and track rollers **23** are too large, see illustration **3** and illustration **4**!
Increased wear on the crawler travel gear!
This could result in high property damage.
▶ Grind off or remove bulges in time.

When the wear limits are exceeded, the minimum distances are fallen below on the following points:
– On point **P8** between the transport cams **21.1** and track roller body **24**
– On point **P9** between the track pad **21** and base belt **18.1**
– On point **P10** between the track rollers **23** and crawler carrier **18**

Wear limit track pad	
Maximum permissible run in depth **a**	8 mm
Maximum permissible bulge **c**	[1]

Wear limit track roller	
Initial diameter	370 mm
Permissible minimum diameter **d** (measured in the center of the running surface)	366 mm
Maximum permissible bulge **e**	3 mm [2]

1) As soon as the bulge scrapes on the base belt of the crawler carrier, **grind the bulge off**.
2) Valid for all track systems: If the bulge is larger than 3 mm , **grind the bulge off**.

WARNING
Danger of injury due to improper procedure!
▶ Have all work on the track chains carried out by authorized and trained expert personnel.

Note

When the maximum run in depth is reached or the running surfaces are significantly worn:
▶ Track pads can be repaired by repair welds according to welding guidelines or repair instructions from Liebherr-Werk Ehingen GmbH.

When sprocket and track pad are worn or damaged due to operation:
▶ Damage can be repaired by repair welds according to welding guidelines or repair instructions from Liebherr-Werk Ehingen GmbH.
▶ Contact Liebherr Service.

▶ Replace worn track rollers **23**.

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▶ Grind off excessive bulges, see illustration **3** and illustration **4**.

4 Ladders

Note
▶ The following listed ladders are examples and may not match your crane exactly.

WARNING
Danger of falling!
If the following safety notes are **not** observed, personnel can fall down.
Death, severe bodily injuries, property damage.
▶ Observe and adhere to the installation and safety guidelines for ladders.
▶ Observe and adhere to the safety signs on the ladders.
▶ Install and secure the ladders properly.
▶ Do **not** use damaged ladders and replace them immediately.
▶ Repair the ladder exclusively through authorized service facilities.

4.1 Lubricating ladders

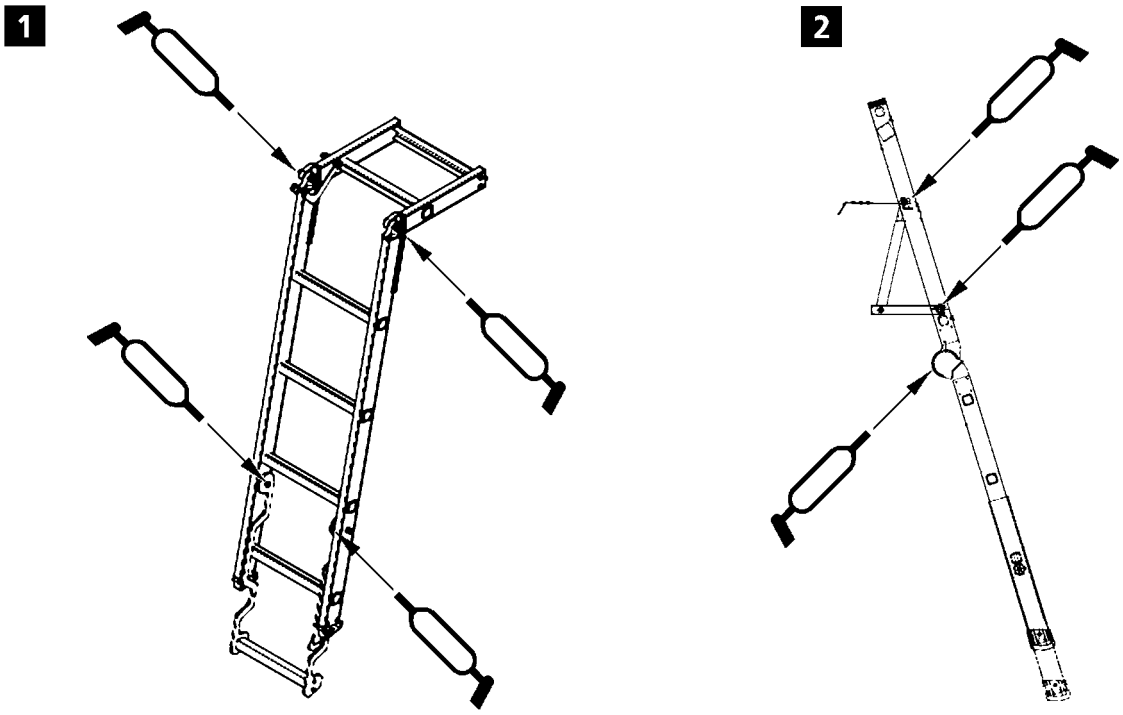

Fig.109766

▶ Grease joints and pivot points on the ladders regularly and check them for easy movement, see illustration **1** and illustration **2**.
▶ Repairs and maintenance work on the ladder must be made by expert personnel.

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7.04.50 Maintenance instructions - Ballast trailer

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Fig.195219

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1 Maintenance

Note
- ▶ For all maintenance work, use service items and lubricants according to the service fill list.
- ▶ Observe the ballast trailer maintenance intervals, see the chapter 7.02.50.

2 Ballast trailer tires

2.1 Ballast trailer tires

Note
- ▶ See chapter 2.15.

2.2 Ballast trailer tires and disk wheels

Note
- ▶ See chapter 8.01.

3 Hydraulic hose lines

Note
- ▶ See chapter 7.05.

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4 Slewing gear

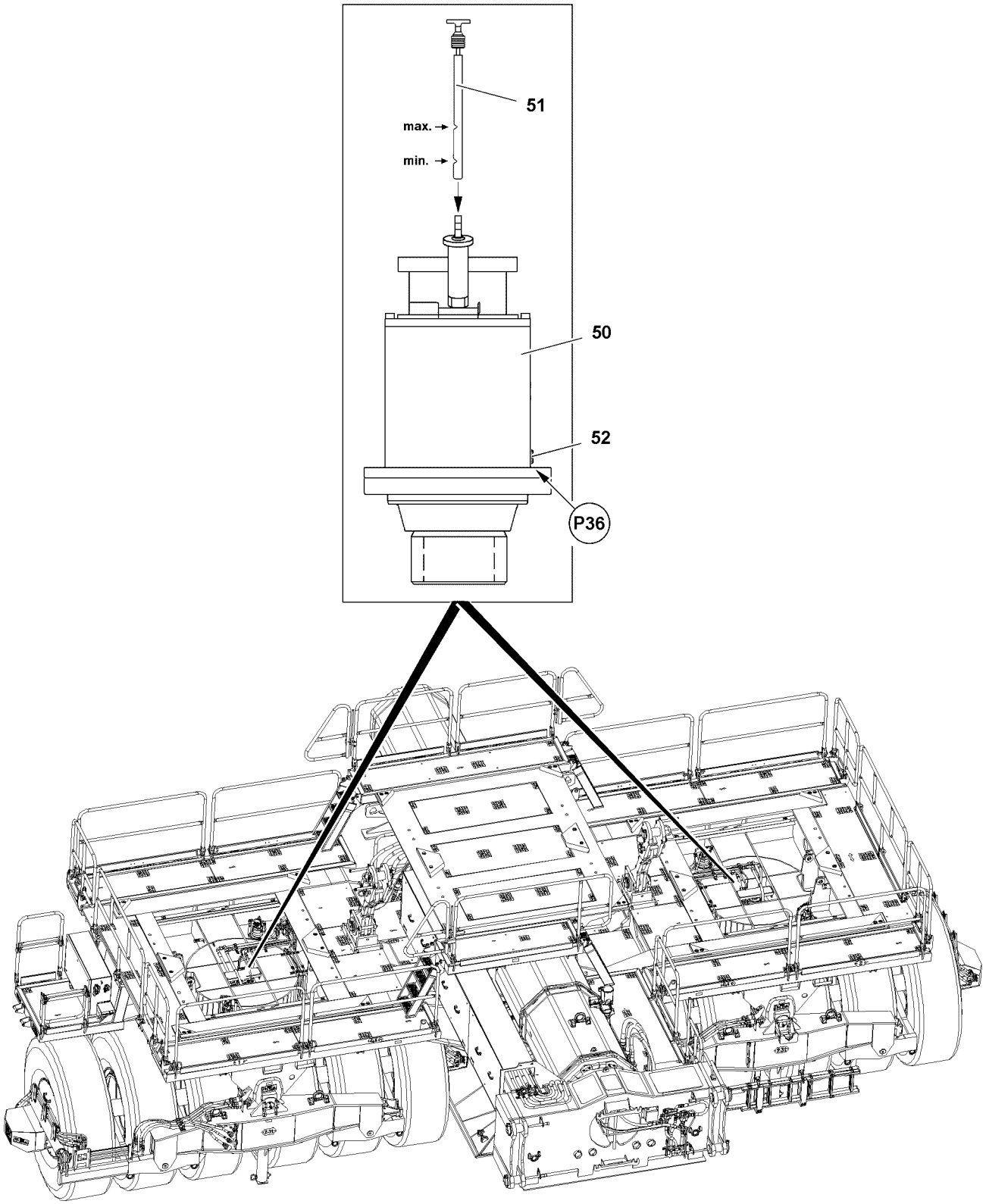

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Fig.120246: Slewing gear

Maintain utmost cleanliness during all work to prevent dirt from entering the interior of the slewing gear.

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WARNING
Danger of burns during maintenance and inspection work!
Severe burns can results due to the crane components and service fluids at operating temperatures.
▶ Avoid direct body contact to heated crane components and service fluids.

NOTICE
Dirt in the slewing gear!
If any dirt gets inside the slewing gear it can be damaged.
▶ Make sure that no dirt gets inside the slewing gear during maintenance work.

NOTICE
Danger of property damage.
▶ Do not mix synthetic oils with mineral oils.

The specified fill quantities (change quantities) are orientation values. The markings on the dipsticks, inspection ports or sight gauges are decisive for filling.

Position	Components	Fill quantity
50	Slewing gear	4.4 l

4.1 Checking for leaks

NOTICE
Leaky slewing gear!
If a leak is found during the visual inspection of the slewing gear, it can result in failure of the slewing gear.
The slewing gears can be damaged, resulting in high property damage.
▶ Repair the leaky slewing gear and replace the slewing gear, if in doubt.

▶ Check visually to ensure that the slewing gears do not leak.

4.2 Checking the oil level

Note
▶ To ensure a reliable oil level check, it must be ensured that the slewing gears have been at a standstill for at least two minutes. This ensures that the gear oil has returned to the oil chamber completely.

Make sure that the following prerequisite is met:
– Ballast trailer is in horizontal position.

▶ Remove and wipe off the dipstick **51**.
▶ Insert and pull out the dipstick **51**.

The gear oil must be visible between both marks on the dipstick **51**.

▶ Check the oil level.

NOTICE
Transmission damage due to impermissible oil level!
Too little gear oil causes lubricating problems and reduces the service life of the gear.
Too much gear oil causes more displacement work and overheats the gear.
▶ Check the oil level.

If necessary:
▶ Add or drain gear oil.

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▶ Add or drain gear oil.
▶ Reinsert the dipstick **51**.

4.3 Changing the oil

NOTICE
Damage to the slewing gear!
If seal rings are used repeatedly, it can result in loss of oil.
Due to loss of oil, the slewing gears can wear significantly and / or be damaged.
▶ Use the seal rings on the maintenance ports only once.

Make sure that the following prerequisites are met:
– Ballast trailer is in horizontal position.
– The slewing gear is warm.

▶ Open the oil filler port by unscrewing the dipstick **51**.
▶ Catch the gear oil: Position a container under the oil drain plug **52** at point **P36**.
▶ Drain the gear oil: Unscrew the oil drain plug **52** with seal ring at point **P36**.
▶ Clean the oil drain plug **52** and sealing surface on the housing.

When gear oil is drained:
▶ Install the oil drain plug **52** with new a seal ring and tighten.
▶ Add oil as specified in the Service schedule on the oil filler port until the oil level is visible between the two marks on the dipstick **51**.
▶ Close the oil filler port by screwing in the dipstick **51**.
▶ Check the oil level, see section „Checking the oil level“.

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5 Wheel set drive

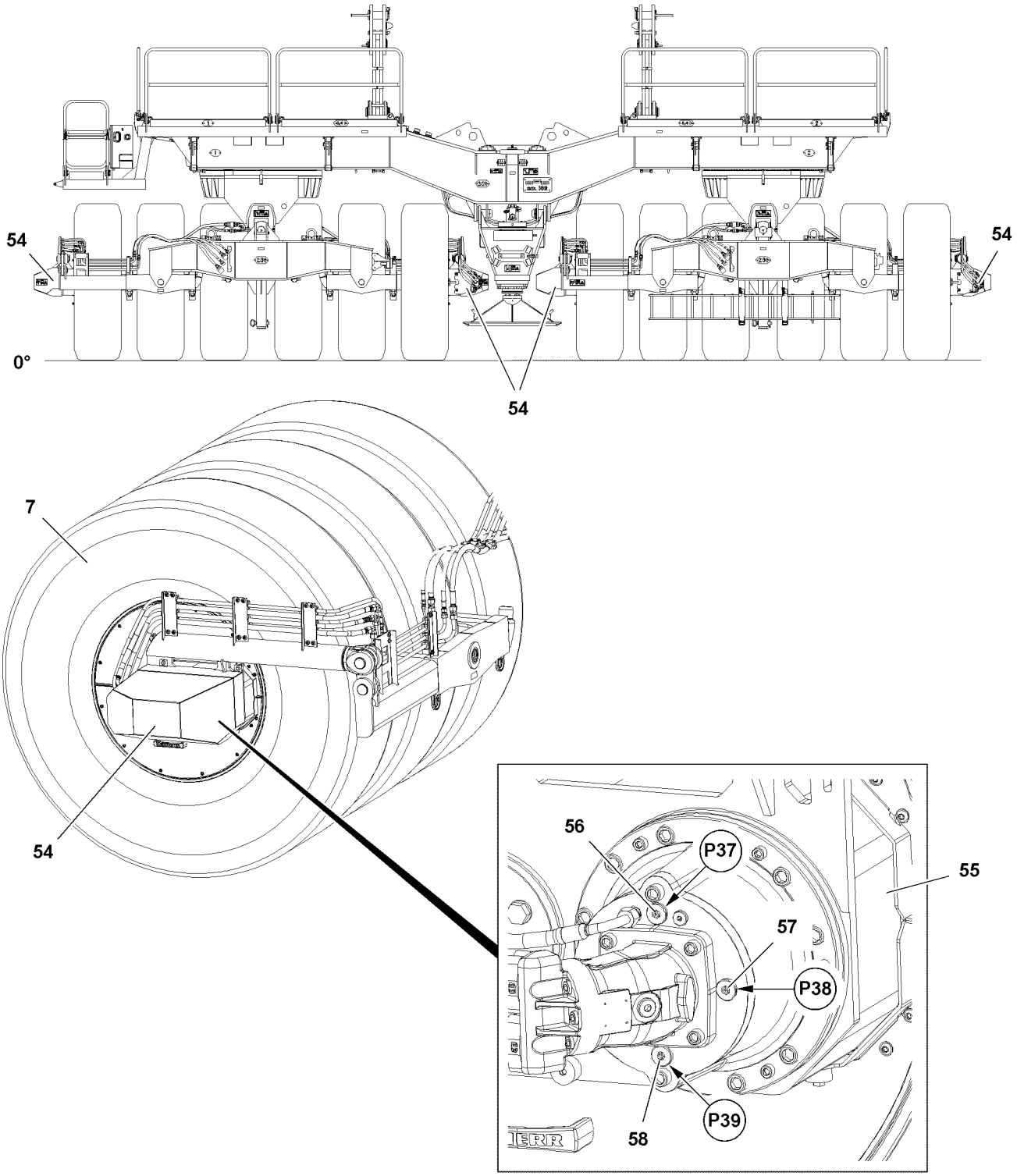

Fig.120248: Wheel set drive

Maintain utmost cleanliness during all work to prevent dirt from entering the interior of the slewing gear.

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WARNING
Danger of burns during maintenance and inspection work!
Severe burns can results due to the crane components and service fluids at operating temperatures.
▶ Avoid direct body contact to heated crane components and service fluids.

NOTICE
Dirt in the wheel set drive!
If any dirt gets inside the wheel set drive it can be damaged.
▶ Make sure that no dirt gets inside the wheel set drive during maintenance work.

NOTICE
Danger of property damage.
▶ Do not mix synthetic oils with mineral oils.

The specified fill quantities (change quantities) are orientation values. The markings on the dipsticks, inspection ports or sight gauges are decisive for filling.

Position	Components	Fill quantity
55	Wheel set drive	0.33 l

5.1 Checking for leaks

NOTICE
Leaky wheel set drive!
If a leak is found during the visual inspection of the wheel set drives, it can result in failure of the wheel set drive.
The wheel set drives can be damaged, resulting in considerable property damage.
▶ Repair the leaky wheel set drive and replace the wheel set drive, if in doubt.

▶ Check visually to ensure that the wheel set drives do not leak.

5.2 Checking the oil level

NOTICE
Damage to wheel set drives!
If seal rings are used repeatedly, it can result in loss of oil.
Due to loss of oil, the wheel set drives can wear significantly and / or be damaged.
▶ Use the seal rings on the maintenance ports only once.

Note
▶ To ensure a reliable oil level check, it must be ensured that the wheel set drives have been at a standstill for at least two minutes. This ensures that the gear oil has returned to the oil chamber completely.

Make sure that the following prerequisite is met:
– Ballast trailer is in horizontal position.

▶ Remove the hoods **54** on the wheel set drives **7**.
▶ Unscrew the oil level plug **57** with seal ring at point **P38**.

The gear oil must be visible at the fill height on the oil level plug **57**.

▶ Check the oil level.

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NOTICE
Transmission damage due to impermissible oil level!
Too little gear oil causes lubricating problems and reduces the service life of the gear.
Too much gear oil causes more displacement work and overheats the gear.
▶ Check the oil level.

If necessary:
▶ Add or drain gear oil.

▶ Add or drain gear oil.

If gear oil must be added:
▶ Open the oil filler port by unscrewing the oil filler plug **56** at point **P37**.
▶ Add gear oil to the fill height on the oil level plug **57**.
▶ Close the maintenance ports tightly.
▶ Reinstall the hoods **54** on the wheel set drives **7** again properly.

5.3 Changing the gear oil

Make sure that the following prerequisites are met:
– Ballast trailer is in horizontal position.
– The wheel set drive is warm.

▶ Remove the hoods **54** on the wheel set drives **7**.

If gear oil must be replaced:
▶ Open the oil filler port by unscrewing the oil filler plug **56** at point **P37**.
▶ Catch the gear oil: Position a container under the oil drain plug **58** at point **P39**.
▶ Drain the gear oil: Unscrew the oil drain plug **58** with seal ring at point **P39**.
▶ Clean the oil drain plug **58** and sealing surface on the housing.

When gear oil is drained:
▶ Install the oil drain plug **58** with new a seal ring and tighten.
▶ Add gear oil to the fill height on the oil level plug **57**.
▶ Install the oil level plug **57** with new a seal and tighten.
▶ Install the oil filler plug **56** with new a seal and tighten.
▶ Install the hoods **54** on the wheel set drives **7**.

6 Central lubrication system

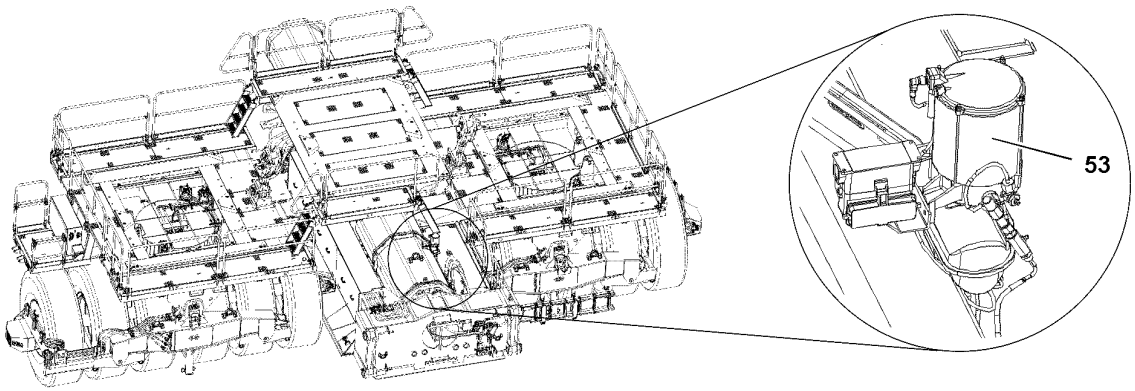

Fig.120249: Position of central lubrication system

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Note
▶ See chapter 7.05.

The specified fill quantities (change quantities) are orientation values. The markings on the dipsticks, inspection ports or sight gauges are decisive for filling.

Position	Components	Fill quantity
53	Central lubrication system	2.5 kg

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7.05 Maintenance instructions - Crane superstructure

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Fig.195219

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1 Safety guidelines

Observe and adhere to the Crane operating instructions, chapter 2.04 and chapter 2.06.

Observe and adhere to the Crane operating instructions, chapter 7.01.

2 Engine

Note
Recommendation!
▶ Check the oil level before starting to travel or before starting to work.

2.1 Checking the oil level on the LICCON monitor

Make sure that the following prerequisites are met:
– The crane is in a horizontal position.
– The engine has been turned off for at least 30 minutes.
– The ignition is turned on.

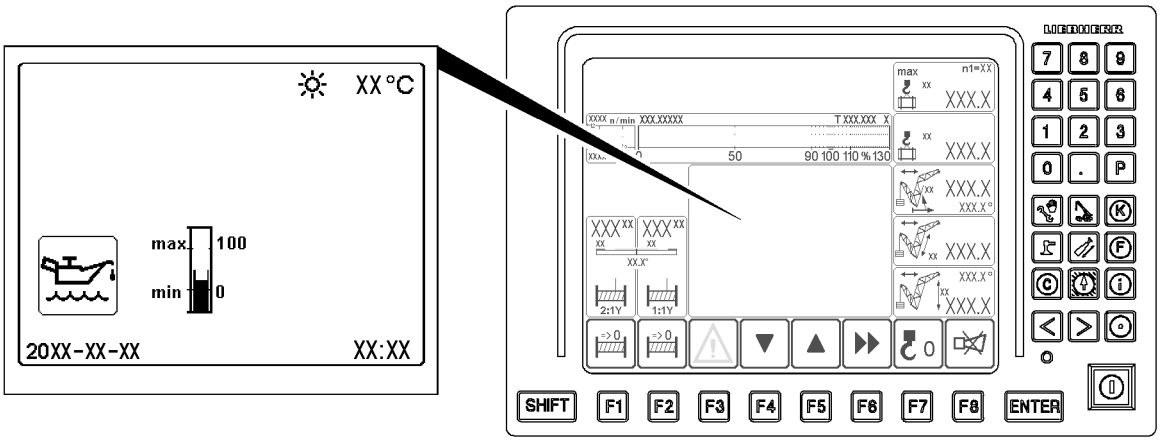

Fig.126500: Individual control display for Engine oil level

In the LICCON monitor the oil level is shown in the form of a bargraph in percentages [%].

Explanation of bargraph:
– Under *min*: Oil level too low.
– Between *min* and *max*: Oil level OK.
– Over *max*: Oil level overfilled.

The selection of the individual control display is described in the Crane operating instructions, chapter 4.02.

▶ Select Individual control display *Engine oil level*

NOTICE
Engine damage due to insufficient engine oil!

If too little engine oil is shown:
▶ Add engine oil.

▶ Check the oil level.

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Problem remedy
Oil consumption or loss of oil too high?
▶ Find the cause and remedy it.

If the cause cannot be remedied:
▶ Contact Liebherr Service.

2.2 Checking the oil level with the dipstick

Note
Recommendation!
▶ Check the oil level before starting to travel or before starting to work.

NOTICE
Engine damage due to lack of oil!
▶ Check the oil level and establish the permissible oil level, if necessary.

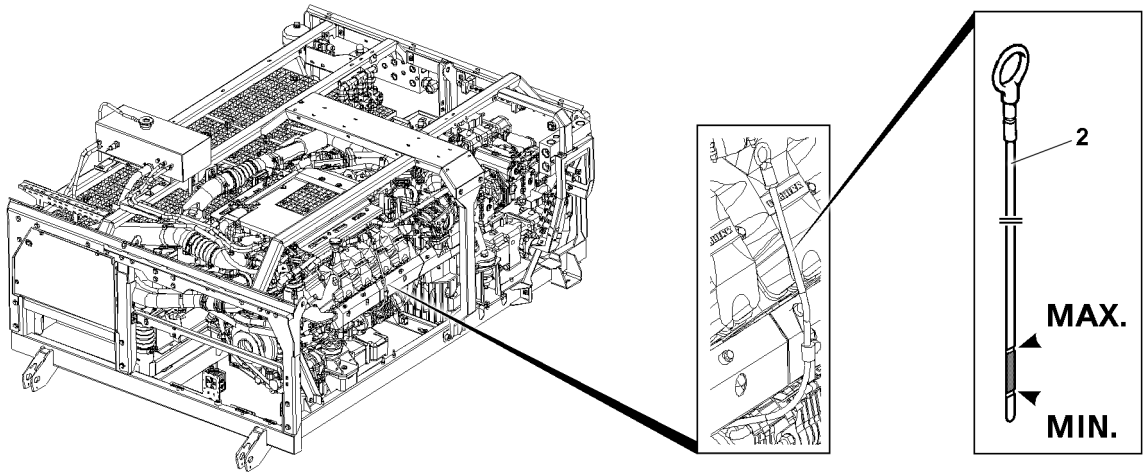

Fig.126501: Engine dipstick

Make sure that the following prerequisites are met:
– The crane is in a horizontal position.
– The engine has been turned off for at least 30 minutes.

▶ Pull out the dipstick **2** and wipe it off.
▶ Insert the dipstick **2** and pull it out.

The engine oil must be visible between both marks on the dipstick **2**.

▶ Check the oil level.

Problem remedy
The oil level is too low?
▶ Add engine oil until the oil level is visible between both marks on the dipstick **2**. See Engine operating instructions.

▶ Insert the dipstick **2**.

Problem remedy
Oil consumption or loss of oil too high?
▶ Find the cause and remedy it.

If the cause cannot be remedied:
▶ Contact Liebherr Service.

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2.3 Servicing the engine according to the information from the manufacturer

Service the engine according to the information from the manufacturer.

3 Cooling system

WARNING
Swallowing coolant, contact with coolant!
Poisoning when ingesting, eye damage and skin irritation at contact.
▶ Make sure that eyes, skin and clothing do **not** come in contact with coolant.

If coolant was swallowed:
▶ Contact a physician immediately.

When eyes came in contact with coolant:
▶ Flush the eyes out with a lot of clear water and go to a physician, if necessary.

When skin and clothing came in contact with coolant:
▶ Clean the skin and clothing immediately with water and soap.

NOTICE
Property damage due to impermissible coolant!
▶ Do **not** mix different coolant products.
▶ Do **not** thin Liebherr-Fertig-Mix (Liebherr Ready Made Mix).

When adding coolant:
▶ Use only the same coolant with the same color.

Different coolants are differentiated by different colors.

Coolants contain corrosion inhibitor - antifreeze fluid.

3.1 Checking the coolant level

Make sure that the following prerequisites are met:
– The crane is in a horizontal position.
– The engine is cold.

The coolant level is monitored by the LICCON computer system.

▶ Call up the monitoring functions. See the Crane operating instructions, chapter 4.02.

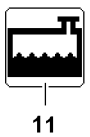

Fig.122792

When the *coolant level* icon **11** is yellow, then the coolant level is too low.

▶ Call up the individual control display.

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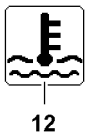

Fig.122795

When the *coolant temperature* icon **12** is red:
▶ Wait until the coolant is cooled off.

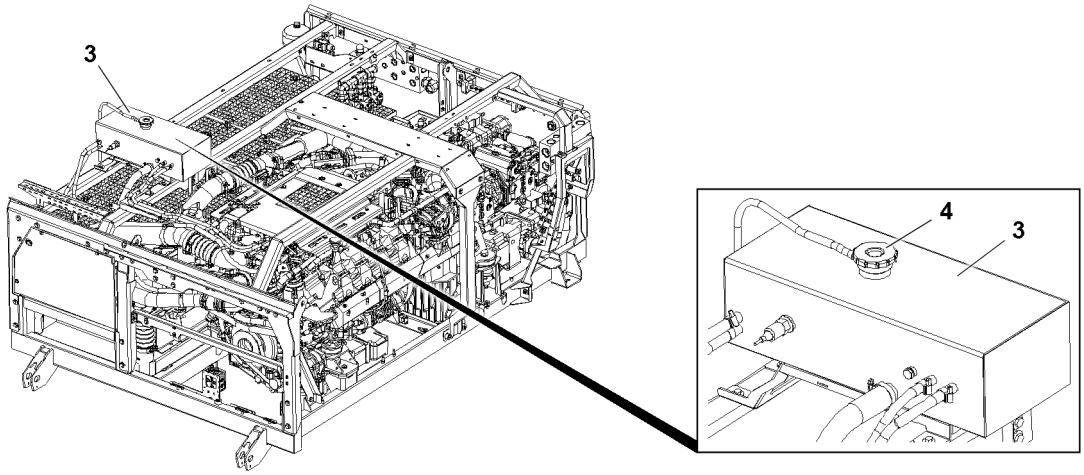

Fig.126502: Water cooler expansion tank

DANGER
Scalding due to hot coolant vapor!
▶ Check the coolant level only when the engine is cold.
▶ Wear protective gloves and safety glasses.

▶ Release excess pressure: Turn the cap **4** on the filler neck of water cooler expansion tank to the first notch.
▶ Remove the cap **4**.
▶ Check the coolant level.

Problem remedy
Coolant level is too low?

When the coolant level is too low:
▶ Add coolant until the lower edge of the riser tube.
▶ Add coolant only at the filler neck.

3.2 Replacing the coolant

Note

When the coolant is changed:
▶ Empty the cooling system completely and flush it.

Make sure that the following prerequisites are met:
– Coolant is replaced by authorized and trained expert personnel.

When the cooling system is completely emptied:
▶ Add coolant until the lower edge of the riser tube.

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3.3 Servicing the cooling system according to the information from the manufacturer

Service the cooling system according to the information from the manufacturer.

4 Air filter system

4.1 Replacing the air filter

The air filters are monitored by the LICCON computer system.

▶ Call up the monitoring functions. See the Crane operating instructions, chapter 4.02.

Depending on the crane, different icons appear for the air filter.

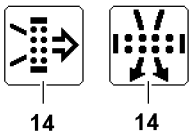

Fig.122794

When the *air filter* icon **14** is yellow, then the air filter is dirty.

▶ Call up the individual control display.

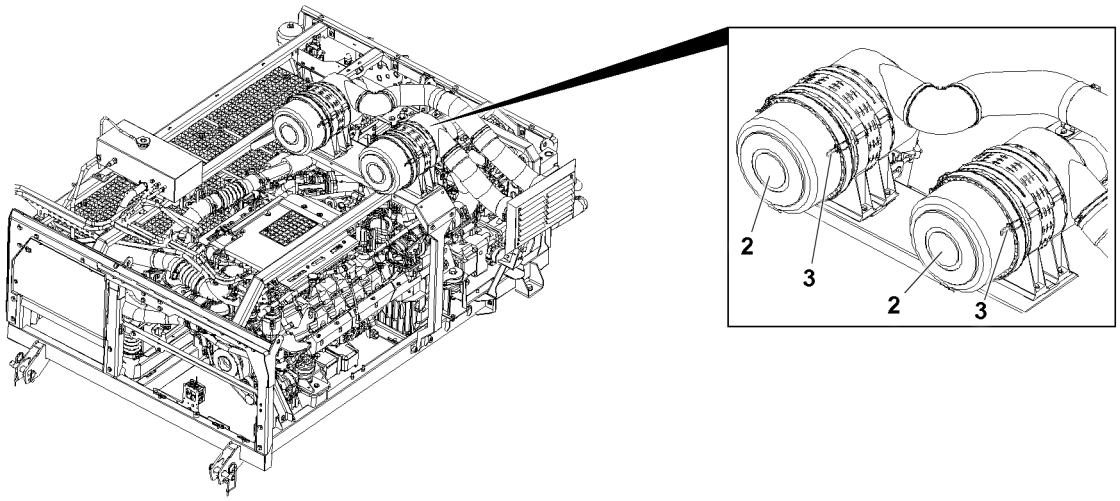

Fig.126503: Air filter system

When the *air filter* icon **14** is yellow:

▶ Remove the cover **2**.
▶ Open the locks **3** and open the cover **2**.
▶ Replace the filter insert.
▶ Close the cover **2** and fasten with locks **3**.

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5 Fuel system

DANGER
Danger of fire and explosion!
- ▶ Do **not** smoke.
- ▶ Avoid open flames and light.
- ▶ Work only when the engine is turned off.
- ▶ Maintain extreme cleanliness during all work.

Note
Recommendation!
- ▶ Before releasing the fuel filter, place cleaning rags underneath.

5.1 Bleeding the fuel preliminary filter

Bleeding the preliminary fuel filter and the fuel low pressure system becomes necessary after:
- – Draining the fuel preliminary filter.
- – Changing the fuel preliminary filter.
- – Emptying the fuel tank.
- – Operating the engine for the first time.

WARNING
Manual opening of the fuel system!
Death, severe injuries, destruction of the Common Rail System.
- ▶ Do **not** release or open the fuel lines and injection lines.
- ▶ Bleed only through actuation of the hand pump.
- ▶ Maintain extreme cleanliness during all work.

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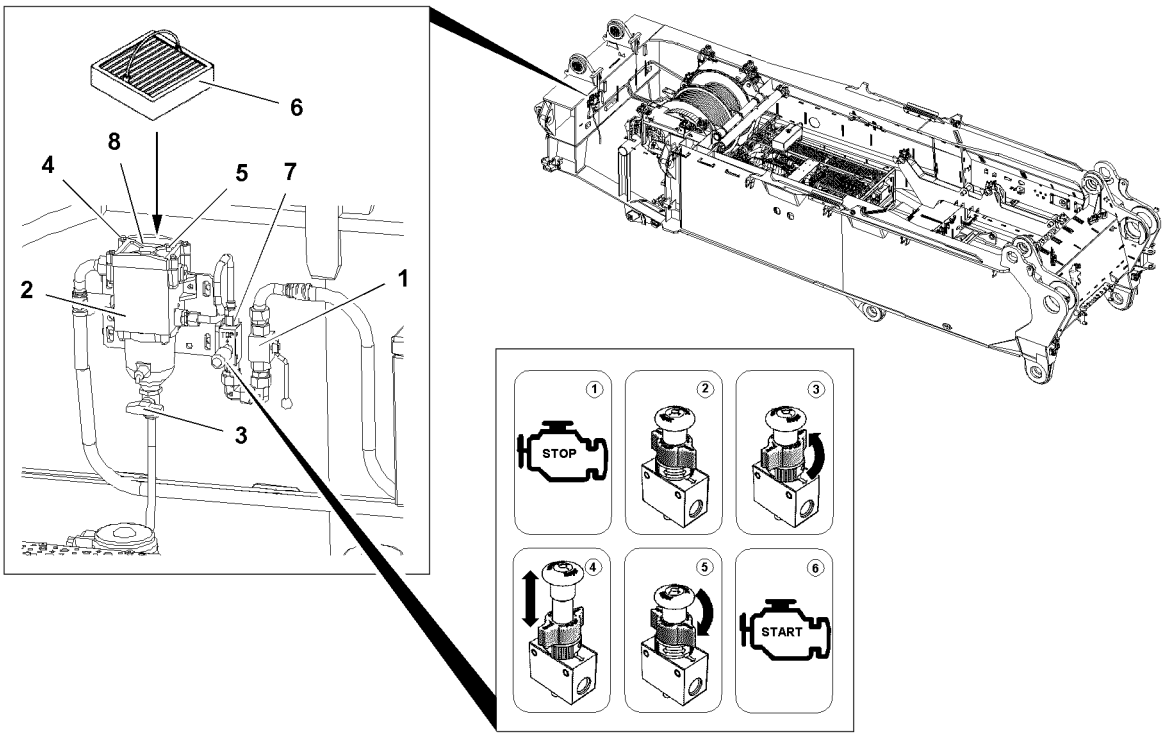

Fig.126504: Fuel preliminary filter

NOTICE
Breather screw is open!
Emerging fuel.
▶ Screw in the breather screw **5** on the fuel preliminary filter and tighten.

Make sure that the following prerequisites are met:
– The breather screw **5** on the fuel preliminary filter is screwed in and tightened.
– The ball valve is open.

▶ Turn the flow indicator on the manual supply pump to the pump position (PUMP).

The hand pump **7** is actuated by pulling.

▶ Actuate the hand pump **7** until a stronger resistance can be felt.
▶ Turn the mark of the flow indicator into operating position (RUN).

Result:

– The red arrow of the flow indicator points in the same direction as the connections of the fuel lines on the pump housing.

▶ Start the engine.

Problem remedy
Starting procedure remains unsuccessful after approx. 20 seconds?
Mark of flow indicator is in incorrect position.
▶ Wait for 1 minute.
▶ Check if the red arrow of the flow indicator points in the same direction as the connections of the fuel lines on the pump housing.

When the procedure has been repeated three times:
▶ Repeat the bleeding procedure.

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5.2 Replacing the fuel preliminary filter insert

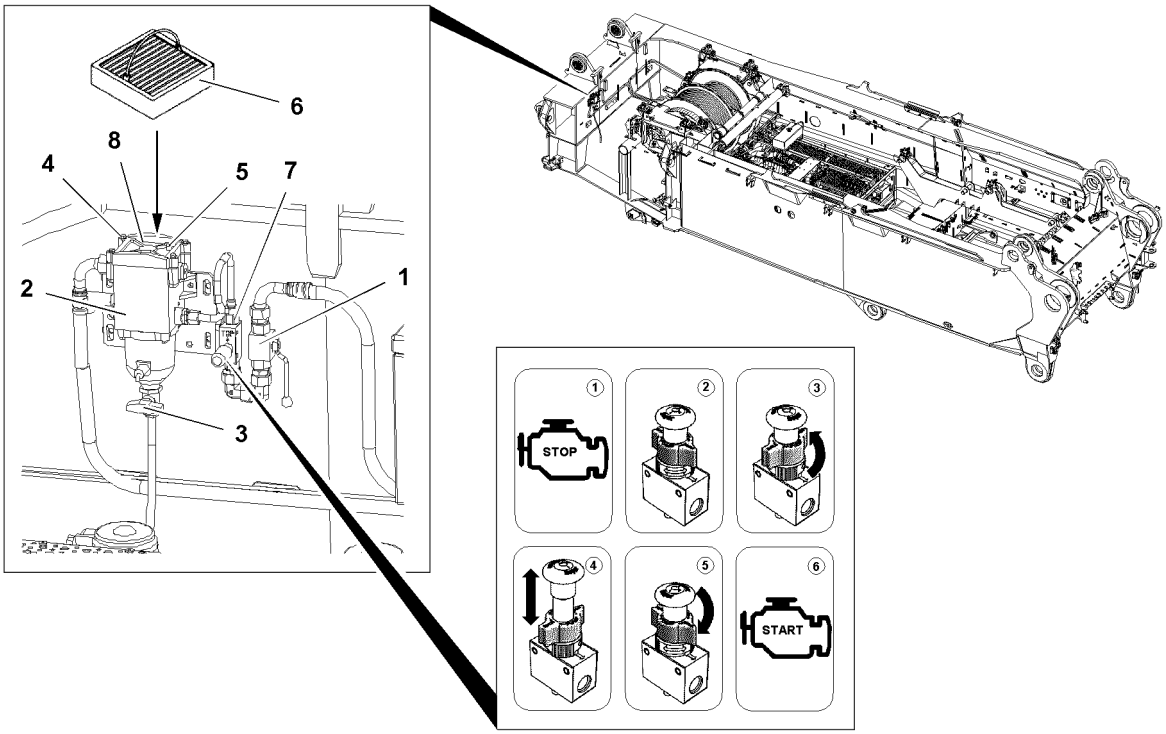

Fig.126504: Fuel preliminary filter

The filter strainer **6** on the fuel preliminary filter is changed:
- According to the maintenance intervals,
- **or** when an error message is shown.

Make sure that the following prerequisites are met:
- A container with the required capacity is on hand.
- New fuel preliminary filter insert is available.

▶ Turn the engine off.
▶ Catch the diesel fuel: Position a container under the fuel preliminary filter.
▶ Close the ball valve **1**.
▶ Turn the flow indicator on the hand pump to the pump position (PUMP).
▶ Release the breather screw **5**.
▶ Drain diesel fuel: Open the drain valve **3** until diesel fuel is visible on the water separator **2**.
▶ Close the drain valve **3**.
▶ Screw in the breather screw **5** on the fuel preliminary filter and tighten.

NOTICE
Dirt!
Destruction of Common Rail System.
▶ Make sure that **no** dirt gets into the inside of the filter.
▶ Do not reuse a used filter.

▶ Back out the screws **4** and remove the cover **8**.
▶ Take out the filter strainer **6**.
▶ Insert a new filter strainer **6** properly.
▶ Check the seal for damage.

When the seal is damaged:
▶ Replace the seal.
▶ Install the cover **8** with seals properly.
▶ Properly install and tighten the screws **4**.
▶ Open the ball valve **1**.

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The hand pump **7** is actuated by pulling.

▶ Actuate the hand pump **7** until a stronger resistance can be felt.
▶ Turn the mark of the flow indicator into operating position (RUN).

Result:

– The red arrow of the flow indicator points in the same direction as the connections of the fuel lines on the pump housing.

▶ Remove the container and dispose of the fluid.
▶ Start the engine.

Problem remedy
Starting procedure remains unsuccessful after approx. 20 seconds?
Mark of flow indicator is in incorrect position.
▶ Wait for 1 minute.
▶ Check if the red arrow of the flow indicator points in the same direction as the connections of the fuel lines on the pump housing.

When the procedure has been repeated three times:
▶ Repeat the bleeding procedure.

5.3 Draining the fuel preliminary filter

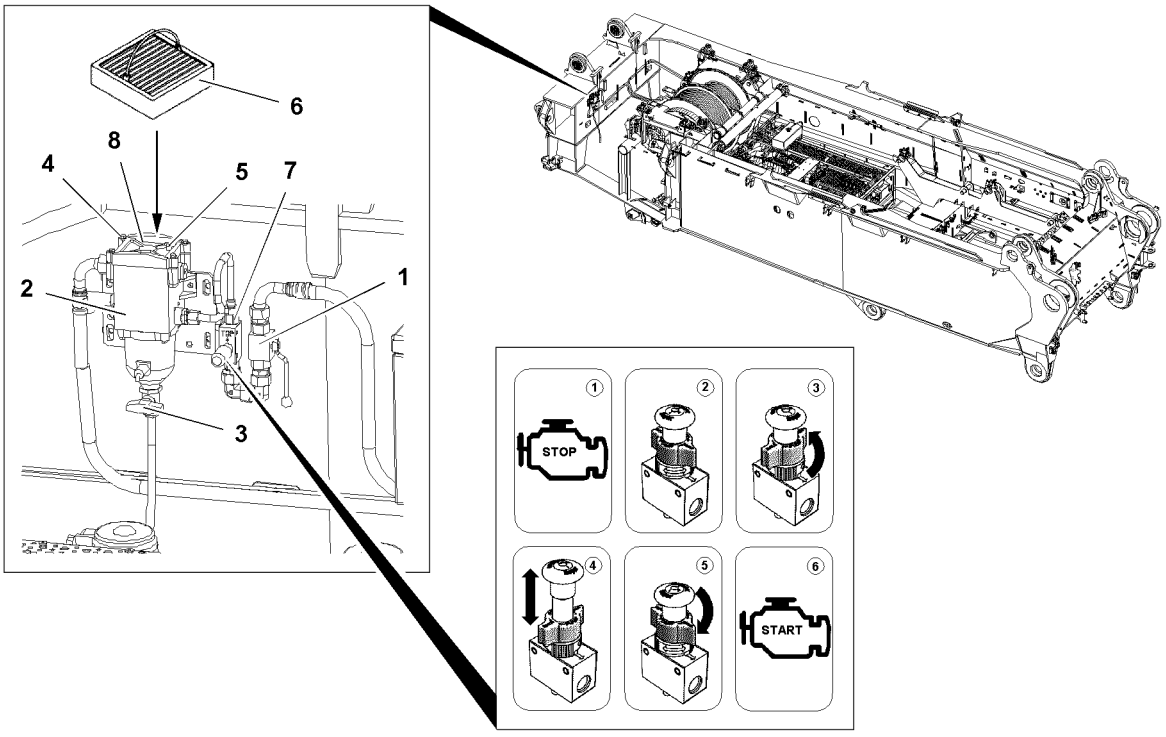

Fig.126504: Fuel preliminary filter

The water separator **2** on the fuel preliminary filter is drained:
– When an error message is shown.
– When a diesel - water mix is found in the water separator.

Make sure that the following prerequisites are met:
– The engine is turned off, the ignition is turned off.
– A container with the required capacity is on hand.
– New fuel preliminary filter insert is available.

▶ Catch the diesel fuel: Position a container under the fuel preliminary filter.
▶ Close the ball valve **1**.

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- ▶ Turn the flow indicator on the hand pump to the pump position (PUMP).
- ▶ Release the breather screw **5**.
- ▶ Drain the diesel - water mix: Open the drain valve **3** until diesel fuel is visible on the water separator **2**.
- ▶ Close the drain valve **3**.
- ▶ Screw in the breather screw **5** on the fuel preliminary filter and tighten.
- ▶ Open the ball valve **1**.

The hand pump **7** is actuated by pulling.

- ▶ Actuate the hand pump **7** until a stronger resistance can be felt.
- ▶ Turn the mark of the flow indicator into operating position (RUN).

Result:

– The red arrow of the flow indicator points in the same direction as the connections of the fuel lines on the pump housing.

- ▶ Remove the container and dispose of the fluid.
- ▶ Start the engine.

Problem remedy
Starting procedure remains unsuccessful after approx. 20 seconds?
Mark of flow indicator is in incorrect position.
- ▶ Wait for 1 minute.
- ▶ Check if the red arrow of the flow indicator points in the same direction as the connections of the fuel lines on the pump housing.

When the procedure has been repeated three times:
- ▶ Repeat the bleeding procedure.

5.4 Servicing the fuel system according to the information from the manufacturer

- ▶ Service the fuel system according to the information from the manufacturer.

5.5 Adding diesel fuel

WARNING
Danger of fire!
Diesel fuel is easily flammable and can cause fatal accidents in case of fire or open flames.
High property damage.
- ▶ Before the refueling procedure, turn the heating systems off, for example the auxiliary heater, flame start system.
- ▶ During refueling, preclude fire, open light and smoking.

DANGER
Danger of fires due to spilled fuel!
- ▶ Keep the engine area free of fuel.
- ▶ Absorb fuel with rags.
- ▶ Dry up spilled fuel.

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WARNING
Poisoning due to fuel!
Fuel is poisonous and hazardous to health.
- ▶ Do **not** allow for fuel to come in contact with skin, eyes or clothing.
- ▶ Do **not** breathe in fuel vapors.
- ▶ Keep children away from fuel.

If persons did come in contact with fuel:
- ▶ In case of eye contact, flush out the eyes immediately and consult a physician if necessary.
- ▶ Clean affected skin areas with clear water.

If fuel was swallowed:
- ▶ Contact a physician immediately.

NOTICE
Engine damage due to impermissible fuel!
When using incorrect fuel, the engine and the fuel system can be severely damaged.
- ▶ Do **not** add gasoline.
- ▶ Do **not** mix diesel fuel with gasoline.

When impermissible fuel was added:
- ▶ Do **not** turn the ignition on.
- ▶ Have the fuel tank and fuel lines completely drained by authorized and trained expert personnel.

Make sure that the following prerequisites are met:
- The crane vehicle is horizontal.
- The parking brake is applied.
- The engine is turned off.
- The ignition is turned off.
- The heating systems are turned off, for example auxiliary heater, flame start system.

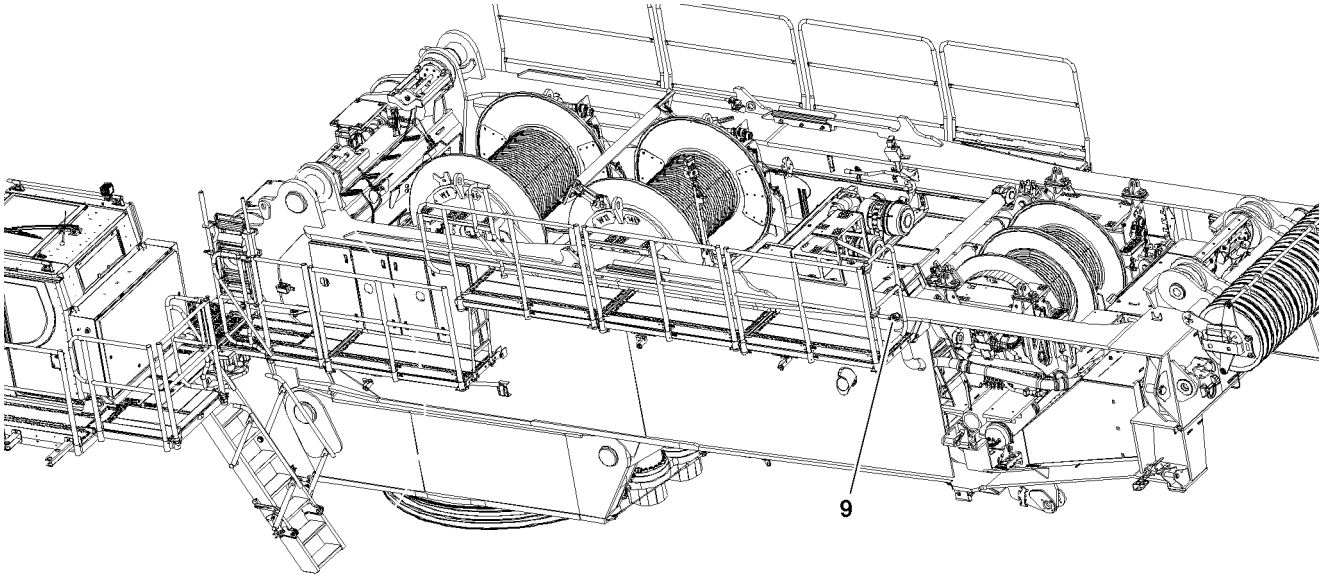

Fig.119065: Fuel tank

- ▶ Hang the fuel nozzle in the retainer.

Climb up and down on the crane vehicle.

- ▶ Open the tank cover **9**.
- ▶ Insert the fuel nozzle in the filler neck.
- ▶ Add diesel fuel.

When the refueling procedure is done:
- ▶ Remove the fuel nozzle from the filler neck.

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▶ Close the tank cover **9**.

6 Urea system*

Note
▶ Applies only if an engine with exhaust aftertreatment, system SCR is installed.

WARNING
Skin irritation and eye injuries due to contact with urea!
Urea can cause skin irritation and eye injuries at contact.
▶ Do **not** allow for urea to come in contact with skin, eyes or clothing.

If persons did come in contact with urea:
▶ In case of eye contact, flush out the eyes immediately and consult a physician if necessary.
▶ Clean affected skin areas with clear water.

If urea was swallowed:
▶ Flush the mouth immediately with a lot of water. Then drink a lot of water and consult a physician, if necessary.

WARNING
Irritation of eyes and mucous membranes due to ammonia vapors!
If the urea tank cover is opened at high temperatures, ammonia vapors can emerge.
Burning eyes, nose, throat. Urge to cough.
▶ Keep the urea tank **1** closed at high temperatures.
▶ Do **not** breathe in ammonia vapors.

6.1 Adding urea solution

Make sure that the following prerequisites are met:
– The crane vehicle is horizontal.
– The engine is turned off, the ignition is turned off.
– The heating systems are turned off, for example auxiliary heater, flame start system.

NOTICE
Corrosion due to spilled urea!
If urea is spilled during refueling, affected surfaces can corrode.
▶ Flush affected surfaces immediately with lots of water.
▶ Do **not** overfill the urea tank.

If present:
▶ Refuel on a fuel pump with nozzle.

In this section, the refueling procedure with a fuel nozzle is described.

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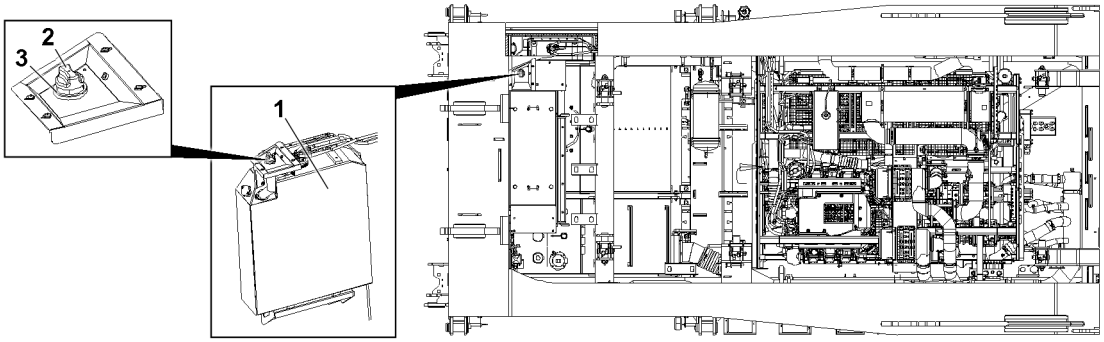

Fig.126505: Urea system

- ▶ Remove the cover **2**.
- ▶ Insert the fuel nozzle in the filler neck **3**.

NOTICE
Urea tank overfilled!
Urea solution expands at temperature fluctuations: Crack formation in the urea tank.

When the fuel nozzle turns off:
- ▶ End the refueling procedure.
- ▶ Do **not** overfill the urea tank.

- ▶ Refill Urea.

When the refueling procedure is done:
- ▶ Remove the fuel nozzle and close urea tank **1** with the cover **2**.

7 Exhaust system

7.1 Diesel particle filter*

DANGER
Danger of igniting the diesel particle filter*!
- ▶ Regenerate the diesel particle filter* only under supervision of the operating personnel.

Note
- ▶ Diesel particle filter **not** possible on Diesel engines with exhaust aftertreatment system SCR (Selective Catalytic Reduction).
- ▶ Maintain and operate the diesel particle filter*, see Operating instructions of the manufacturer.

8 Pump distributor gear

NOTICE
Transmission damage due to lack of oil!

When the oil level has dropped below the minimum mark:
- ▶ Add gear oil on the filler bore until the oil level is visible between the minimum and maximum mark on the dipstick **1**.

Maintain utmost cleanliness during all work to prevent any dirt from entering the inside of the gear.

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Make sure that the following prerequisites are met:
- The crane is in a horizontal position.
- The gear has warmed up.

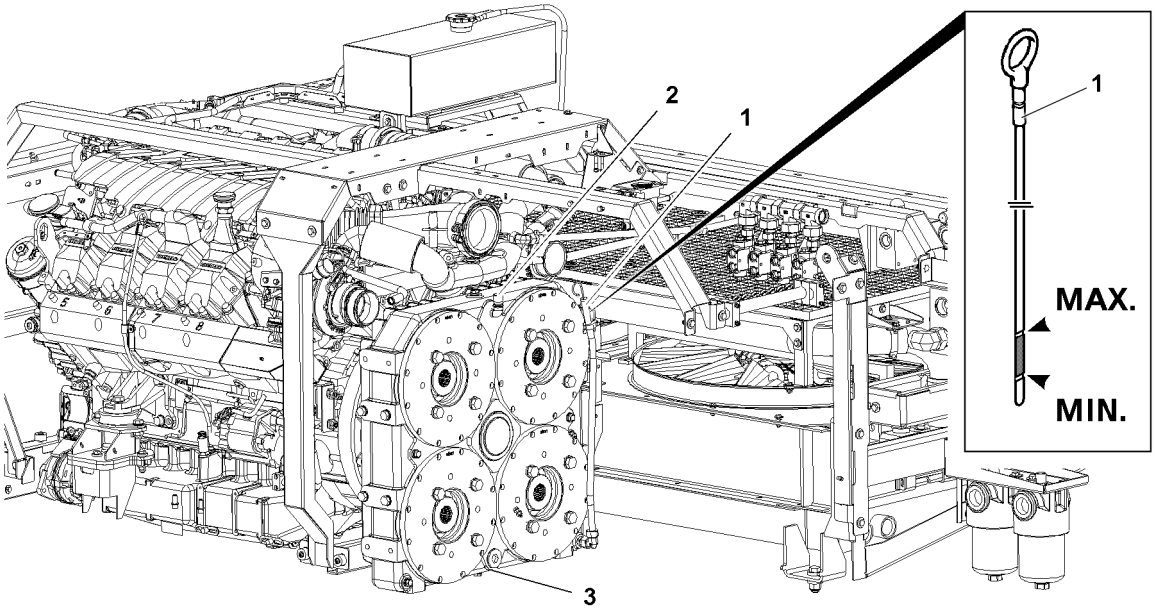

Fig.126506: Pump distributor gear

8.1 Checking the oil level

▶ Pull out the dipstick **1** and wipe it off.
▶ Insert the dipstick **1** and pull it out.

The oil level must be visible between the minimum and maximum mark on the dipstick **1**.

▶ Check the oil level.
▶ Insert the dipstick **1**.

Problem remedy
Oil consumption or loss of oil too high?
▶ Find the cause and remedy it.

If the cause cannot be remedied:
▶ Contact Liebherr Service.

8.2 Changing the gear oil

Make sure that the following prerequisites are met:
- The gear oil is changed by authorized and trained expert personnel.

▶ Unscrew the filler plug **2**.
▶ Catch the gear oil: Position a container under the drain plug.
▶ Drain the gear oil: Unscrew the drain plug **3**.

When gear oil is drained:
▶ Clean the drain plug **3** and sealing surface on the housing.
▶ Install the drain plug **3** with a new seal and tighten.
▶ Add gear oil on the filler bore until gear oil is visible between the minimum and maximum mark on the dipstick **1**.
▶ Install the filler plug **2** with new seal.
▶ Check the oil level.

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9 Central lubrication system

9.1 Technical safety instructions

WARNING
Non-observance of safety instructions!
Personnel can be harmed due to electrical, mechanical and chemical exposure.
Dangerous substances can be discharged and endanger the environment.
Property damage on the system can occur.
- ▶ Have maintenance and repair work carried out exclusively by authorized and trained expert personnel.
- ▶ Use exclusively original Liebherr spare parts.
- ▶ Remedy any problems, which affect safety immediately.
- ▶ Avoid direct body contact to heated components.
- ▶ Maintain cleanliness during all work.

NOTICE
Property damage if the crane has not been moved for longer than three months!
- ▶ Actuate the central lubrication system until lubricant emerges on all lube points.
- ▶ Repeat the respective crane movement several times.
- ▶ Carry out intermediate lubrications again.

NOTICE
Property damage due to crane cleaning procedure!
- ▶ Cleaning is only permitted in washing bays.
- ▶ Carry out the cleaning procedure with a steam cleaner or high pressure cleaner at a minimum distance of 0.4 m.

When the crane is cleaned:
- ▶ Carry out intermediate lubrication processes manually, see section „Carrying out intermediate lubrication“.

9.2 Description of function

The crane superstructure is equipped with three central lubrication systems.

The lube points in the bearings of the components are automatically supplied with lubricant.

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9.2.1 Central lubrication system Superstructure

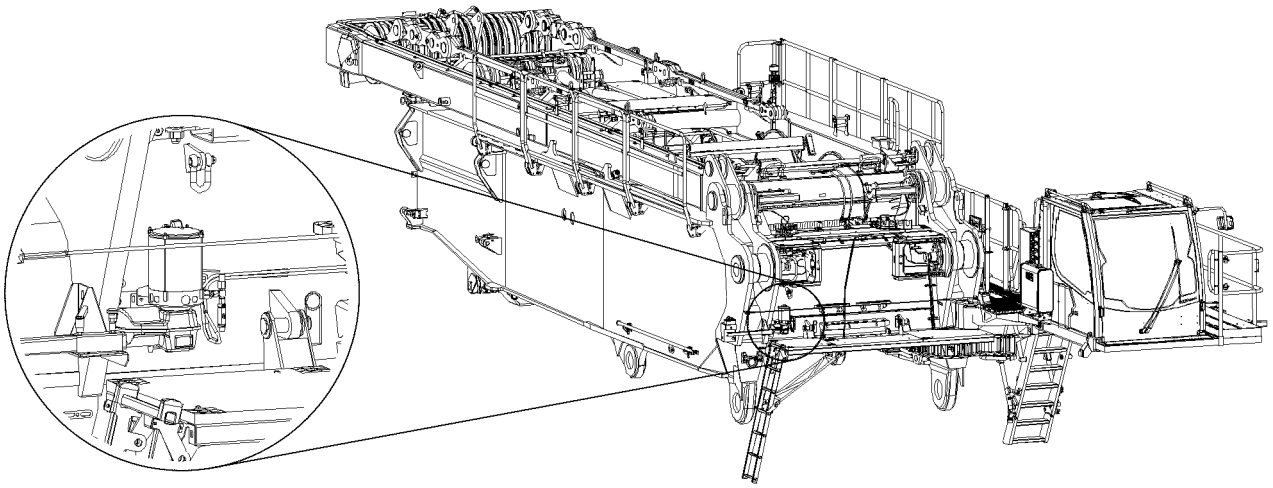

Fig.119078: Position of central lubrication system

The lube points in the bearings of the following components are supplied with lubricant:
- Pin SA-frame
- Pin S-pivot section
- Pin D-pivot section
- Winch 1
- Winch 2
- Cab
- Assembly winch
- Pin roller set

9.2.2 Central lubrication system Roller ring connection

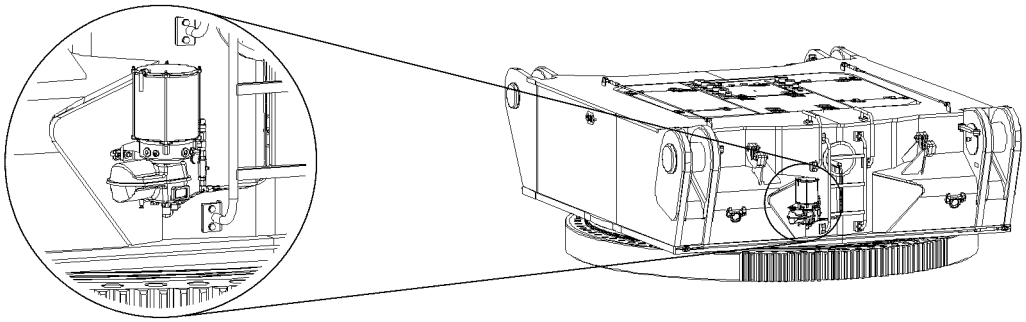

Fig.119079: Position of central lubrication system

The lube points in the bearing of the following component are supplied with lubricant:
- Roller ring connection

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9.2.3 Central lubrication system Ballast trailer*

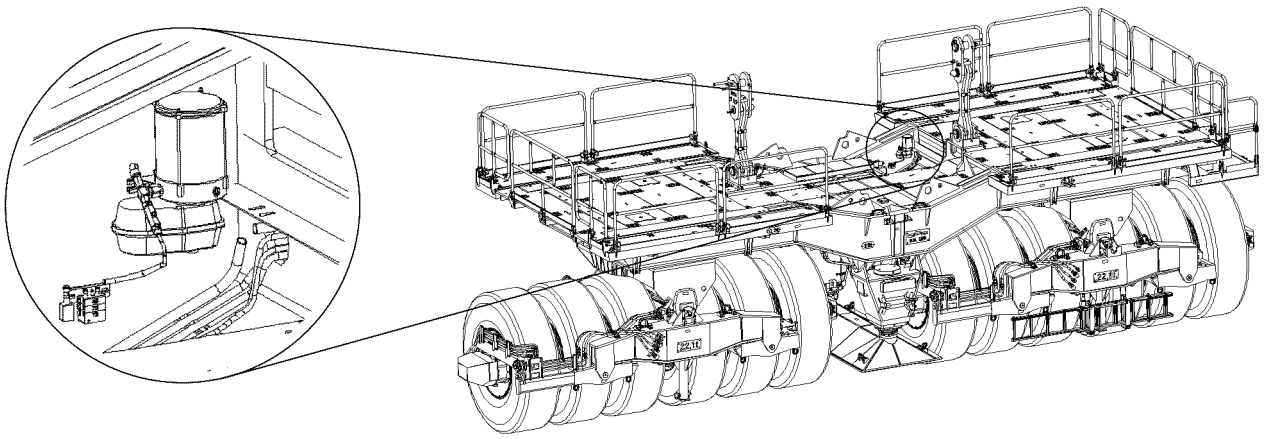

Fig.119080: Position of central lubrication system

The lube points in the bearings of the following components are supplied with lubricant:
- Drive shaft
- Roller ring connection
- Rotary connection

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9.3 Operating and maintaining the central lubrication system

9.3.1 Displays on the control element

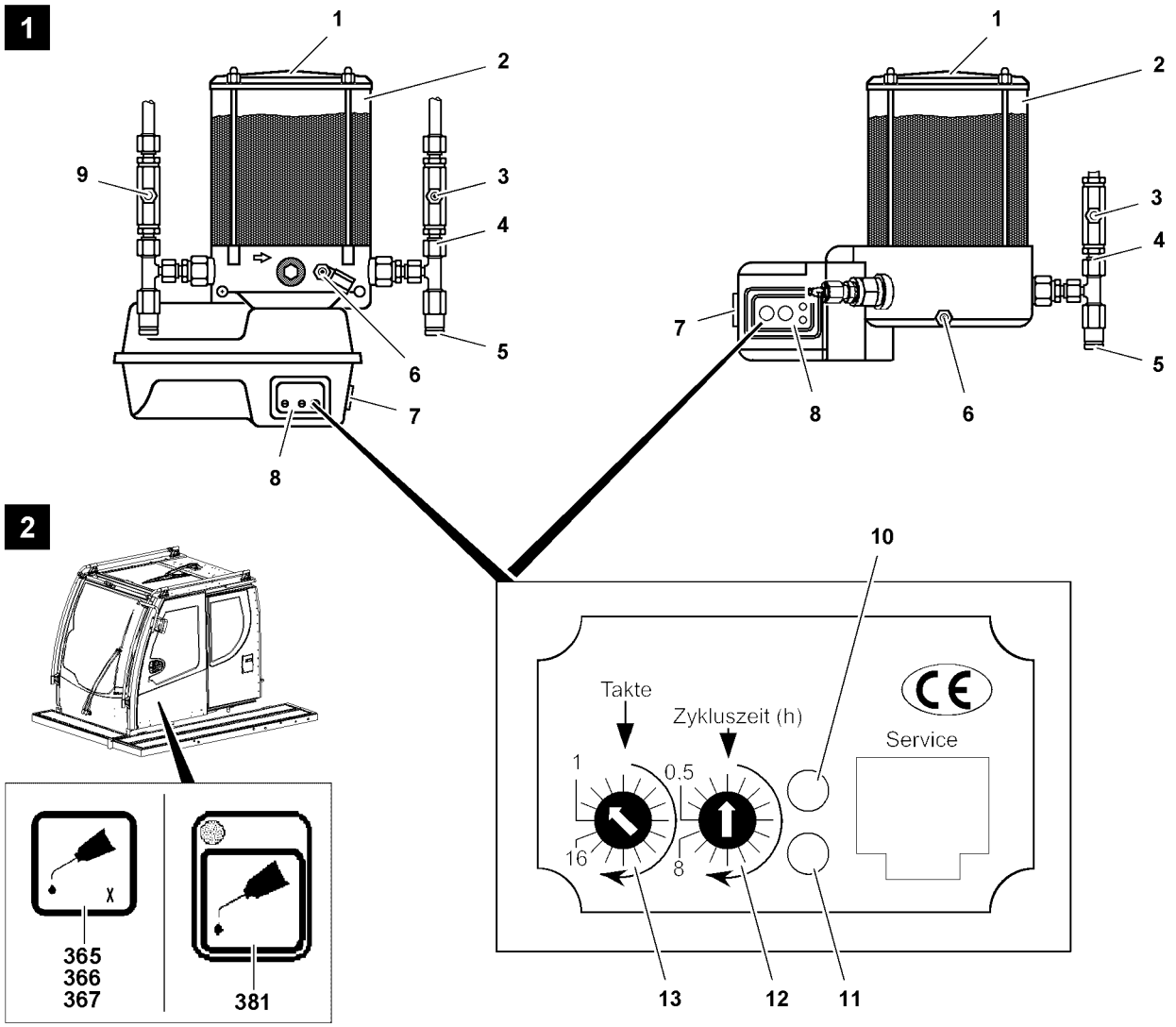

Fig.145952: Operation - Central lubrication system

1 Cover Grease container

2 Grease container

3 Grease fitting Lube line

4 Pump outlet

5 Pressure relief valve

6 Grease fitting Grease container

7 Intermediate lubrication button

8 Control element

9 Grease fitting Lube line

10 LED red

11 LED green

12 Latched switch cycle time

13 Latched switch lube cycles

365 Indicator light lubrication circuit 1

366 Indicator light lubrication circuit 2

367 Indicator light lubrication circuit 3

381 Intermediate lubrication button

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Note
- ▶ In the crane operator's cab, operating conditions and problems of the central lubrication system are shown on indicator light **365**, indicator light **366** and indicator light **365**, see illustration **2**.
- ▶ For an overview of the indicator lights on the crane operator's cab, see the Crane operating instructions, chapter 4.01.
- ▶ Warning messages red LED **10** and green LED **11**, see section „Diagnostics and troubleshooting"

LED red 11	LED green 10	Operating condition
Lights up for 1.5 seconds	Lights up for 1.5 seconds	Operational readiness after ignition on
Off	Lights up	Lubrication is active (during lube cycles)
Lights up / blinks continuously	See section „Diagnostics and troubleshooting"	

*Status of LEDs on the control element **8***

9.3.2 Lube cycle

Note
The lubrication time and the cycle time are set in the factory.
- ▶ Do **not** change the settings.

Cycle time: Time from start of one lubrication to the start of another lubrication.

The cycle time is set with the latched switch **12**.

Lube cycles: Number of strokes, during which lubricant is supplied by the pump cylinder.

The number of lube pulses for a lube cycle is set with the latched switch **13**.

9.3.3 Checking the function

Make sure that the following prerequisites are met:
- The ignition is turned on.

Note
- ▶ When lubricant emerges on all lube points, then the central lubrication system functions error-free.
- ▶ Problems, see section „Diagnostics".

- ▶ To check the function, trigger several lube pulses.
- ▶ Trigger a lube pulse: Press the button **7** until lubricant emerges on all lube points.

9.3.4 Carrying out an intermediate lubrication

Manual intermediate lubrication is carried out, for example:
- If the crane has not been moved for longer than three months.
- After washing the crane.

Note
- ▶ When intermediate lubrication is carried out, the pump starts the lube cycle again. The lube cycle is reset.

Several lube pulses may be required until lubricant emerges on all lube points.

- ▶ Press the button **7** until lubricant emerges on all lube points.
  or
  Press the button **381** (in the crane operator's cab) until lubricant emerges on all lube points.

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9.3.5 Filling the grease container

NOTICE
Property damage due to insufficient lubrication!
- ▶ Make sure that the grease container **2** is filled.
- ▶ Make sure that all grease fittings are clean.

- ▶ Fill the grease container **2** with a grease pump on the grease fitting **6**.

9.3.6 Bleeding the central lubrication system

If the grease container **2** is emptied, it may be necessary to bleed the central lubrication system.

- ▶ Fill the grease container **2** with a grease pump via the grease fitting **6**.
- ▶ Unscrew the main line from the pump outlet **4**.
- ▶ Trigger additional lubricating pulses until there are no more air bubbles in the emerging grease at the pump outlet **4**.
- ▶ Reconnect the main line.
- ▶ Carry out intermediate lubrication until lubricant emerges on all lube points.

9.3.7 Filling the lubrication lines

NOTICE
Components running dry due to insufficient lubrication!
- ▶ After every repair on greased components, fill the lube lines with grease.
- ▶ Make sure that all grease fittings are clean.

- ▶ Fill lube lines with a grease pump on grease fitting **3** (and grease fitting **9**).
  or
  Carry out intermediate lubrication until lubricant emerges on all lube points.

9.4 Diagnostics and problem remedy

9.4.1 Problem signals on control element

Note
- ▶ In the crane operator's cab, operating conditions and problems of the central lubrication system are shown on button **662**, see illustration **2**.
- ▶ For an overview of the indicator lights on the crane operator's cab, see the Crane operating instructions, chapter 4.01.

Status LEDs		Cause	Remedy
LED red 10	**LED green 11**		
Blinks once in two seconds	Blinks once in two seconds	Cycle error	Fix the system; contact Liebherr Service
Blinks once a second	Off	CPU error, memory error	Fix the system; contact Liebherr Service
Lights up	Off	Grease level too low (depending on system type)	Filling the grease container

*Diagnostics for problem signals on control element **8***

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9.4.2 Problems on central lubrication system

Lubrication system status	Cause	Remedy
Lubricant emerges via pressure relief valve **5**	The lubrication system is blocked	Fix the system; contact Liebherr Service
No lubricant emerges from the system	Grease container is empty **or** electric pump is defective	Fill grease container **or** fix system; contact Liebherr Service

Diagnostics for problems on the central lubrication system

9.4.3 Resetting a problem

▶ Press the button **7**.

Result:

– Problem signal on control element turns off.

When a problem signal occurs again:
▶ Contact Liebherr Service.

10 Slewing ring connection

WARNING
Impermissible set up configuration when turning the crane superstructure!
Toppling crane. Death, severe bodily injuries, property damage.
▶ Enter and activate the load chart for crane operation *Turning 360°* in the LICCON overload protection.
▶ Set up the crane according to the set up configuration for load chart *Turning 360°*.

WARNING
Danger of crushing due to turning of crane superstructure!
▶ Work only when the crane superstructure is at a standstill.
▶ Do not crush your fingers during lubrication.

Make sure that the following prerequisites are met:
– The crane is supported and horizontally aligned.
– The load chart for crane operation *Turning 360°* is entered in the LICCON overload protection and active.
– The crane is equipped according to the set up configuration for load chart *Turning 360°*.

10.1 Lubricating the slewing ring connection

WARNING
Persons in the slewing range!
Crushing danger, death, severe bodily injuries.
▶ Monitor the slewing range.
▶ Make sure that there are **no** persons within the slewing range.
▶ Before initiating the turning movement, give a warning signal (horn).

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WARNING
Obstacle in the slewing range!
Danger of collision, property damage.
▶ Make sure that there is **no** obstacle within the slewing range of the crane and the crane components.

▶ Trigger and intermediate lubrication manually on the central lubrication system.
or
Lubricate with external grease pump.
▶ Turn the crane superstructure slowly.
▶ Carry out lubrication until lubricant emerges on the sealing lips.
▶ Stop the slewing movement of the crane superstructure.

10.2 Lubricating the gear ring and the slewing gear pinion

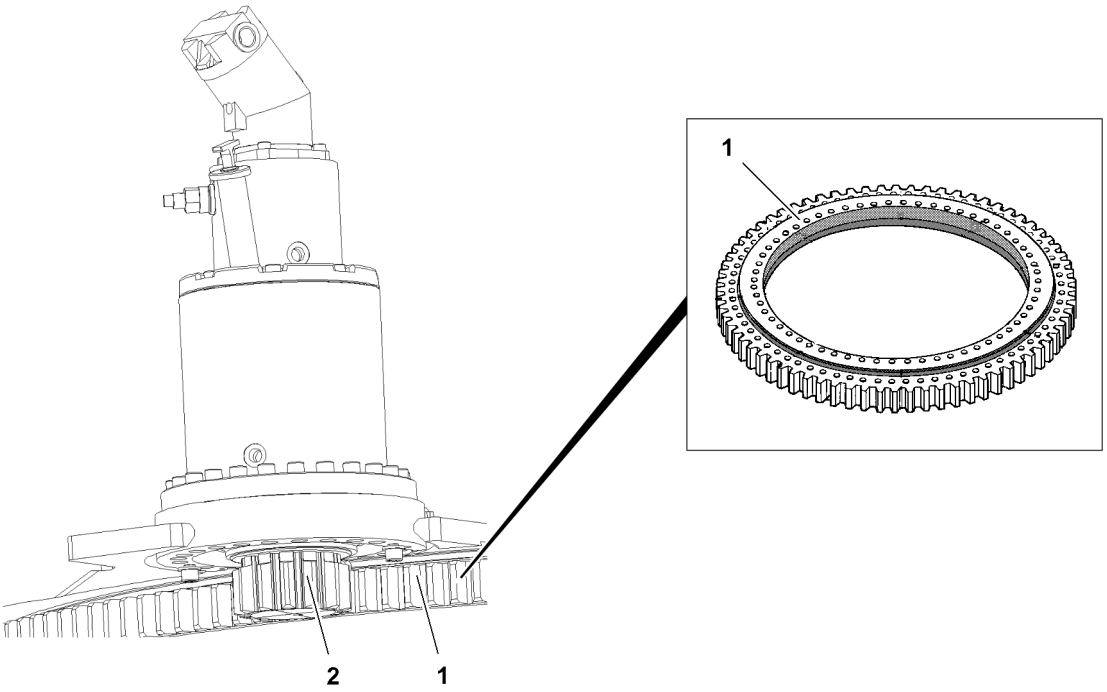

Fig.126815: Slewing gear

Before and after extended breaks in service, grease the gear ring **1** and the slewing gear pinion **2** to ensure the best possible protection from corrosion.

▶ Grease the gear ring **1** and the slewing gear pinion **2** externally.

11 Slewing gear

Maintain utmost cleanliness during all work to prevent any dirt from entering the inside of the gear.

Make sure that the following prerequisites are met:
– The crane is in a horizontal position.
– The gear has warmed up.

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11.1 Checking the oil level with the dipstick

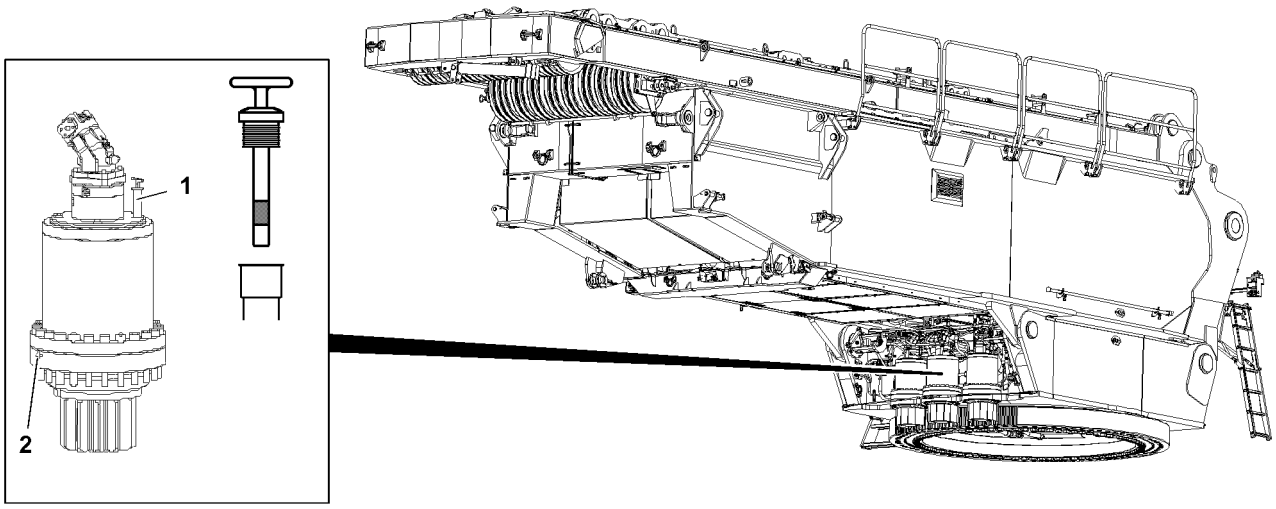

Fig.119070: Slewing gear

- ▶ Pull out the dipstick **1** and wipe it off.
- ▶ Insert the dipstick **1** and pull it out.

NOTICE
Danger of gear damage!
If the oil level has dropped below the minimum mark, add gear oil until the oil level is between the minimum and maximum mark on the dipstick **1**.
- ▶ Add gear oil and check again.

The oil level must be visible between the minimum and maximum mark on the dipstick **1**.

- ▶ Check the oil level.
- ▶ Insert the dipstick **1**.

Problem remedy
Oil consumption or loss of oil too high?
- ▶ Find the cause and remedy it.

If the cause cannot be remedied:
- ▶ Contact Liebherr Service.

11.2 Changing the gear oil

Make sure that the following prerequisites are met:
– The gear oil is changed by authorized and trained expert personnel.

- ▶ Pull out the dipstick **1**.
- ▶ Catch the gear oil: Position a container under the drain plug.
- ▶ Drain the gear oil: **2**Unscrew the drain plug **2**.

When gear oil is drained:
- ▶ Clean the drain plug **2** and sealing surface on the housing.
- ▶ Install the drain plug **2** with a new seal and tighten.
- ▶ Add gear oil on the filler bore until gear oil is visible between the minimum and maximum mark on the dipstick **1**.
- ▶ Insert the dipstick **1**.
- ▶ Check the oil level.

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12 Hoist gears

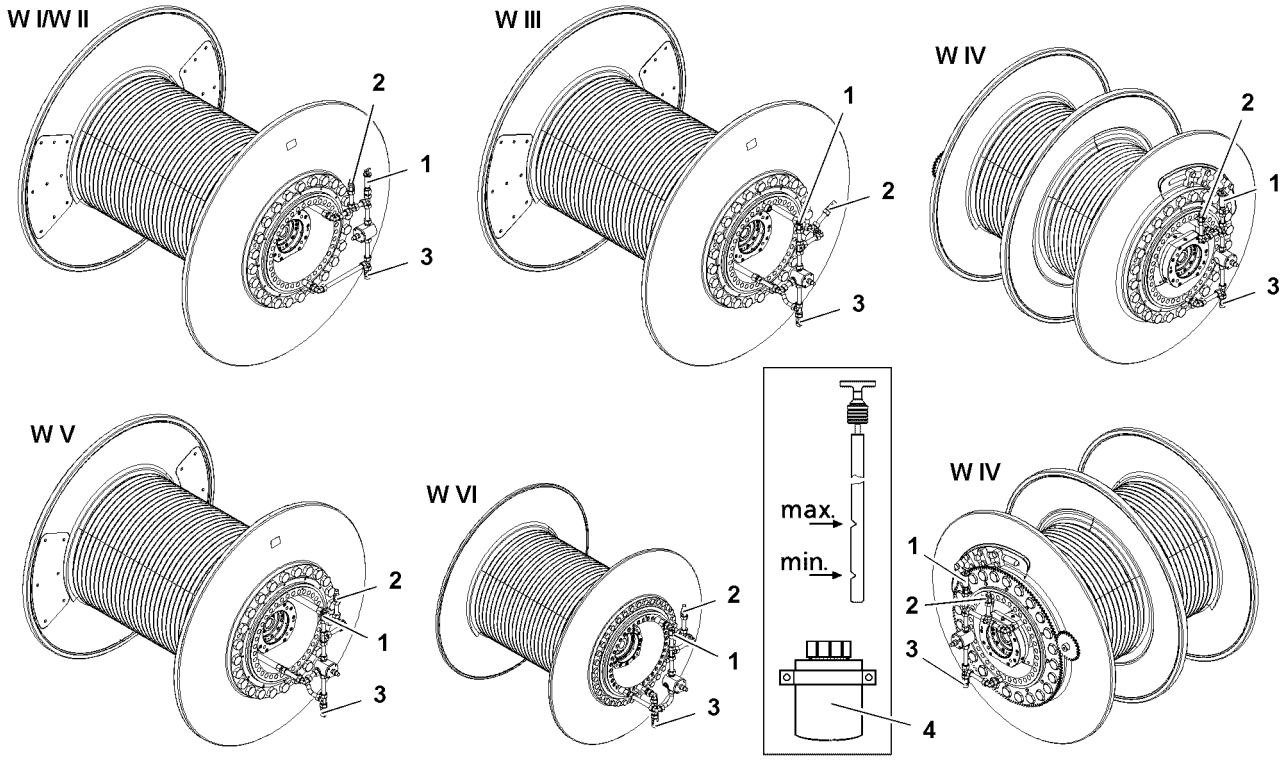

Fig.119077: Winches 1 to 6

Maintain utmost cleanliness during all work to prevent any dirt from entering the inside of the gear.

Make sure that the following prerequisites are met:
- The hoist gears are at a standstill.
- The crane is in a horizontal position.

12.1 Checking the oil level

▶ Remove and wipe off the dipstick **1**.
▶ Reinsert the dipstick **1** and pull it out again.

NOTICE
Transmission damage due to lack of oil!

When the oil level has dropped below the minimum mark:
▶ Add gear oil at the oil filler port until the oil level is between the minimum and maximum mark on the dipstick **1**.

The oil level must be between the min. and max. marks on the dipstick **1**.

▶ Check the oil level.
▶ Insert the dipstick **1**.

Problem remedy
Unusual oil consumption or loss of oil!
▶ Find the cause and remedy it.

If the cause cannot be remedied:
▶ Contact Liebherr Service.

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12.2 Changing the gear oil

- ▶ Unscrew the breather screw **2**.
- ▶ Drain the gear oil into a suitable container: Remove the oil drain plug **3**.
- ▶ Clean the oil drain plug **3** and sealing surface on the housing.
- ▶ Install the oil drain plug **3** with a new seal and tighten.
- ▶ Pull out the dipstick **1**.
- ▶ Add gear oil on the oil filler port until the gear oil is between the minimum and maximum mark on the dipstick **1**.
- ▶ Screw in the breather screw **2** and tighten.
- ▶ Insert the dipstick **1**.
- ▶ Check the oil level.

12.3 Overflow container

When the oil heats up in the winch hydraulic motor, the oil can enter the overflow container **4** via a check valve, but cannot flow back into the hydraulic system after cooling off.

- ▶ Dispose of the oil in the overflow container **4** properly.

12.4 Lubricating the bearing at winch 1 and winch 2

Note

- ▶ Winch 1 and winch 2 are identical, for that reason the lubrication of the bearing is described on the example of one winch.

NOTICE

Insufficient lubrication!
In case of insufficient lubrication, the lubrication points can run dry.
This could result in high property damage.

- ▶ Adhere to the maintenance intervals: Lubricate the bearing at winch 1 and winch 2.

Note

- ▶ The amount of grease for the entire lubrication procedure is 200 g.
- ▶ Lubricate the winch bearing in 45° steps with 25 g each of grease.

Make sure that the following prerequisites are met:

- The hoist gears are at a standstill.
- The crane engine is running.

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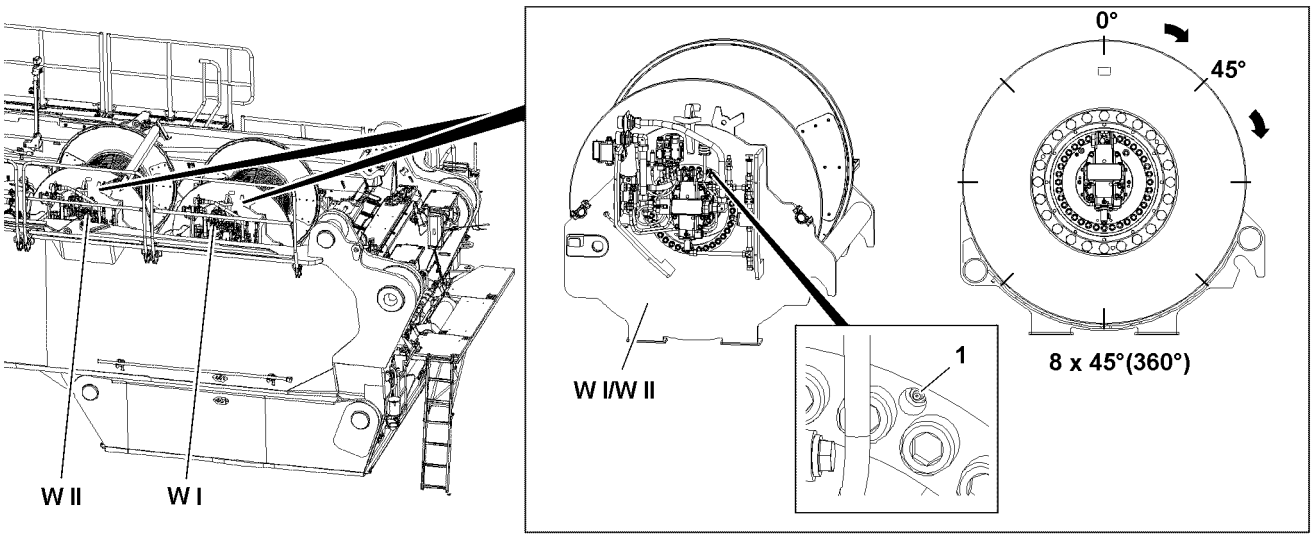

Fig.119083: Position of the grease fitting

▶ Lubricate the bearing of winch 1 with an external grease gun via the grease fitting **1**, amount of grease approx. 25 g.

WARNING
Danger of accident due to running winch!
If the following instructions are not observed, dangerous situations can arise.
Death, severe bodily injuries, property damage.
▶ Make sure that winch 1 is at a standstill during the lubrication procedure.
▶ Make sure that there are no persons within the danger zone.

When no persons are present in the danger zone:
▶ Turn winch 1 by 45° (spool up / out).
▶ Lubricate the bearing of winch 1 again with an external grease gun via the grease fitting **1**, amount of grease approx. 25 g.

When no persons are present in the danger zone:
▶ Turn winch 1 again by 45° in the same direction.
▶ Lubricate the bearing of winch 1 again with an external grease gun via the grease fitting **1**, amount of grease approx. 25 g.
▶ Carry out the lubrication procedure until winch 1 has completed a full turn (8 x 45°).

Note
▶ The lubrication of the bearing of winch 2 is identical with the lubrication procedure of the bearing of winch 1.

▶ Lubricate the bearing of winch 2.

13 Assembly winch

13.1 Changing the gear oil

Make sure that the following prerequisites are met:
– The assembly winch is spooled out.
– The winch mark is on top.

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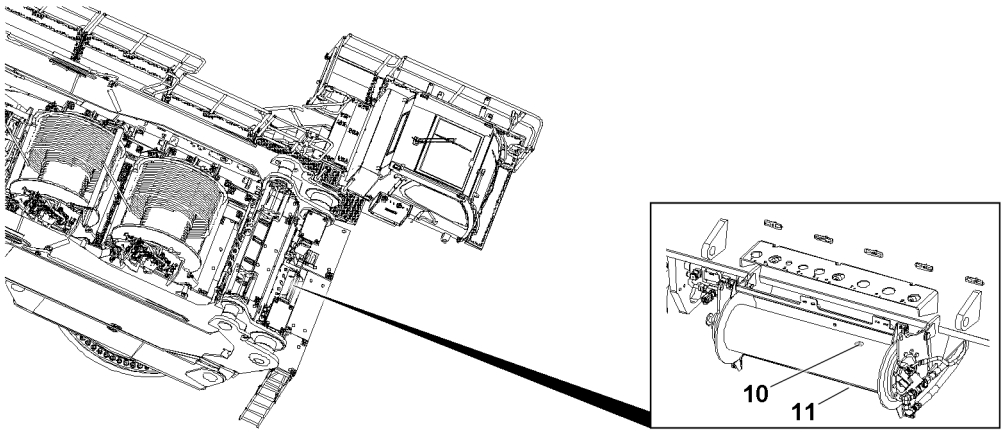

Fig.126507: Assembly winch

- ▶ Unscrew the filler plug **10**.
- ▶ Catch the gear oil: Position a container under the drain plug.
- ▶ Drain the gear oil: Unscrew the drain plug **11**.

When gear oil is drained:

- ▶ Install the drain plug **11** with a new seal and tighten.
- ▶ Add gear oil on the filler bore.
- ▶ Install the filler plug **10** with a new a seal and tighten.

14 Auxiliary heater*

14.1 Replacing the filter insert

The crane operator's cab can be tilted upward for maintenance work.

WARNING
Danger of accident!
Death, severe bodily injuries, property damage.

- ▶ While the crane operator's cab is tilted, it is prohibited for any persons or objects to remain within the danger zone of the crane operator's cab.
- ▶ Make sure that the crane operator's cab is horizontally aligned.

14.1.1 Replacing the filter insert

Note

- ▶ Maintenance interval, see the Crane operating instructions, chapter 7.03.
- ▶ The maintenance interval can change depending on the area of operation.

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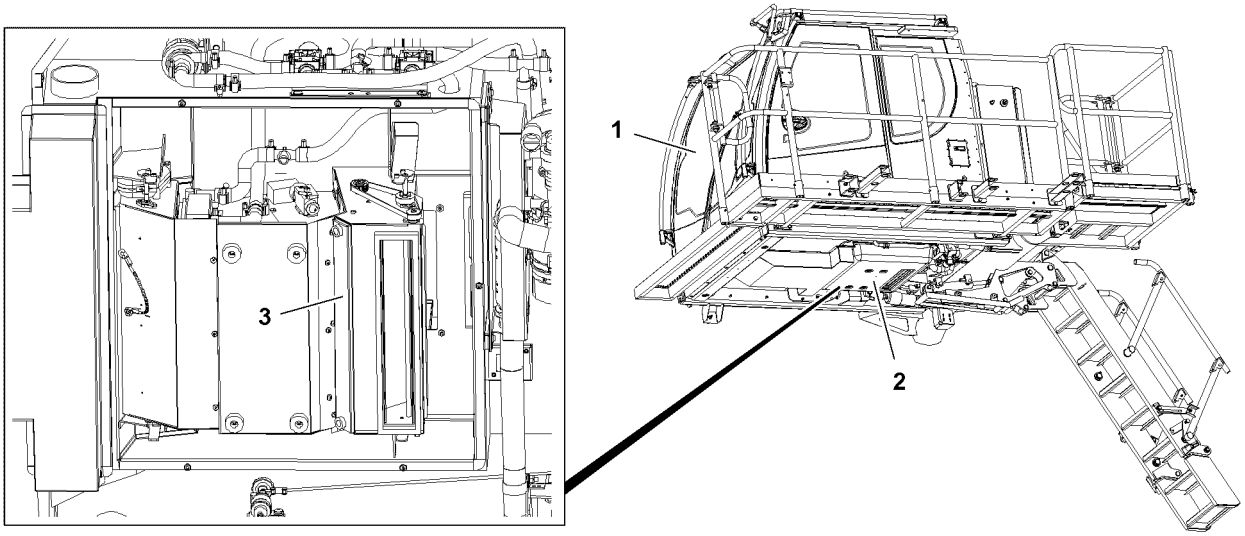

Fig.119075: Filter insert, auxiliary heater

- ▶ Remove the housing and cover **2**.
- ▶ Remove the filter insert **4** and replace it.
- ▶ Install the cover **2** and housing.

14.2 Refueling fuel

Make sure that the following prerequisites are met:
- The crane is in a horizontal position.
- The auxiliary heater is turned off.
- The engine and the ignition are turned off.
- All railings and steps are swung into assembly position, see Crane operating instructions, chapter 2.06.

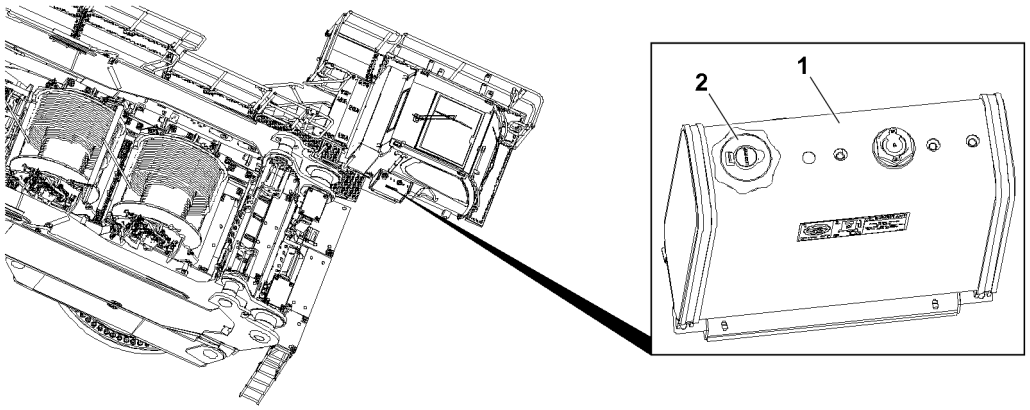

Fig.126508: Fuel container, auxiliary heater

- ▶ Open the cover **2**.
- ▶ Insert the fuel nozzle in the filler neck.
- ▶ Refuel fuel.

After the refueling procedure:
- ▶ Remove the fuel nozzle from the filler neck.
- ▶ Close the fuel container **1** with the cover **2**.

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15 Hydraulic system

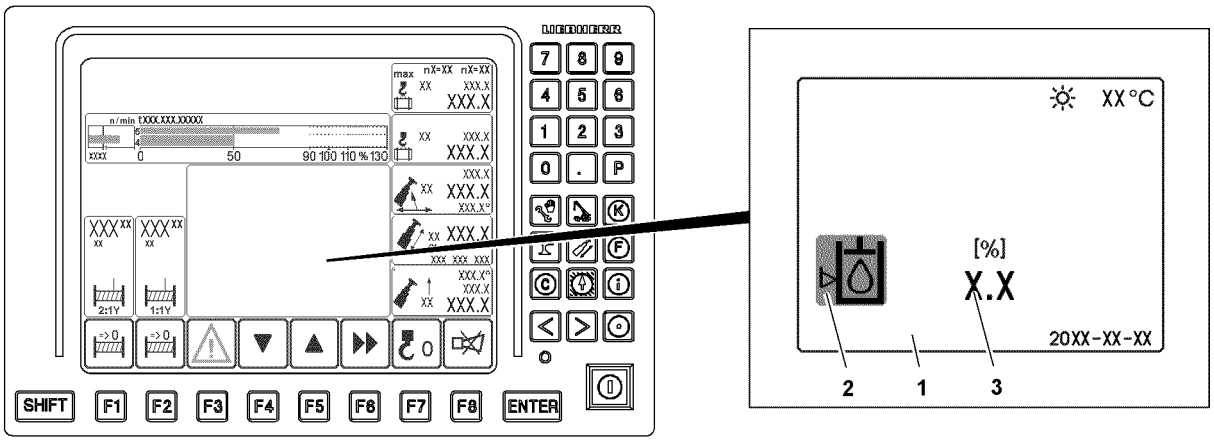

Fig.119071: Hydraulic oil level display

Extreme cleanliness must be maintained when adding hydraulic oil.

15.1 Checking the hydraulic oil level

Make sure that the following prerequisites are met:
- The crane is in a horizontal position.
- The luffing cylinder and the telescoping cylinder are fully retracted.
- The engine is turned off.
- The ignition is turned on.

Note
Recommendation!
▶ Check the oil level before starting to work.

Note
▶ The current oil level is shown in percentages.

All hydraulic cylinders are retracted:
– Display **2** is „green“ and display **3** shows a value between 95 % and 100 %, the oil level is ok.

Crane operation relevant hydraulic cylinders are extended or are in intermediate position:
– Display **2** is „green“, the oil level is ok.
– Display **2** is „yellow“ and display **3** shows a value under 10 %. Hydraulic oil must be added.
– Display **2** is „red“ and display **3** shows a value under 5 %. Hydraulic oil must be added.

When the hydraulic temperature is lower than 20 °C:
▶ Warm up the hydraulic oil.

When the hydraulic temperature is higher than 20 °C:
▶ Let the hydraulic oil cool off.
▶ Select display **1** of oil level. See the Crane operating instructions, chapter 4.02.
▶ Check the oil level on the display **3**.

Problem remedy
Display **3** shows low oil level:
▶ Add hydraulic oil.
▶ Filter hydraulic oil when adding it through a fine mesh strainer.

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Problem remedy
Unusual high hydraulic oil usage or loss of hydraulic oil!
▶ Find the cause and remedy it.

If the cause cannot be remedied:
▶ Contact Liebherr Service.

15.2 Checking the vent filter / breather filter

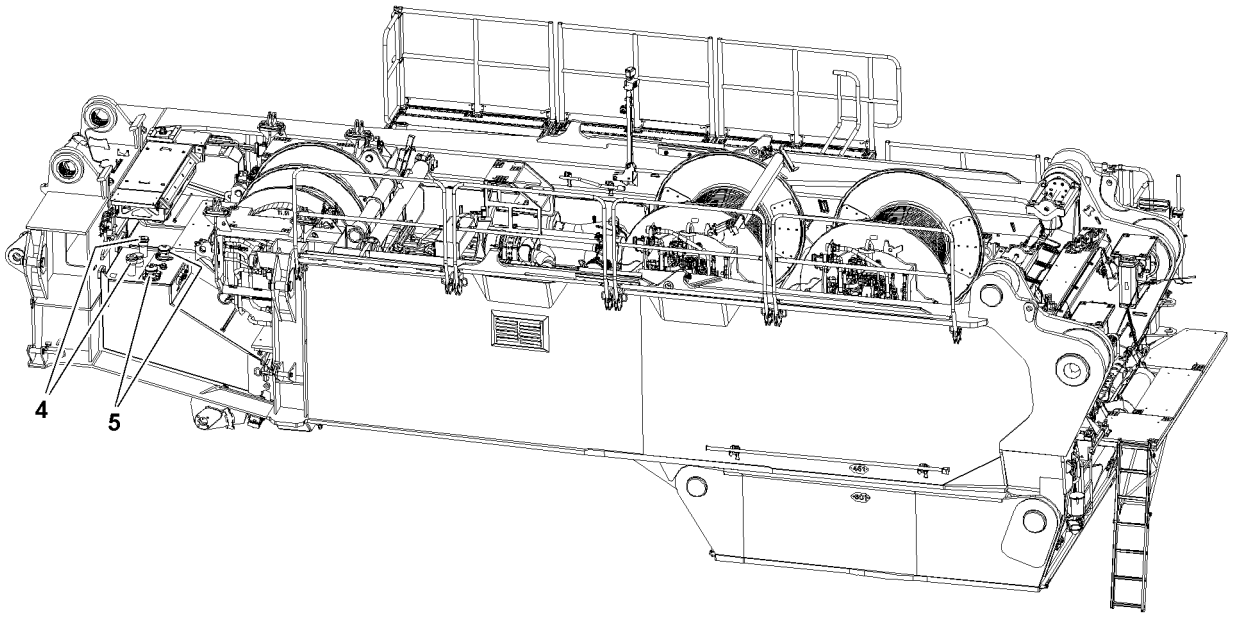

Fig.119072: Position of hydraulic system

▶ Turn the diesel engine off.
▶ Open the cover with the turn lock.
▶ Check the filter **4** for impurities (visual inspection).

In the event of heavy contamination:
▶ Replace the filter.
▶ Close the cover with the turn lock again.
▶ Start the diesel engine.
▶ Slowly go through all crane movements, this will bleed the hydraulic system.

Result:

– This bleeds the hydraulic system.

▶ Check the oil level again and add oil if necessary.

15.3 Checking the return filter

The return filter **5** is equipped with a maintenance indicator.

If the indicator moves into the red zone when the oil is warmed up ready for operation, then the filter must be changed.

▶ Turn the diesel engine off.
▶ Open the cover with the turn lock.
▶ Remove the filter insert.
▶ Rinse out the filter housing.
▶ Clean sealing surface on the cover and filter bracket.
▶ Insert a new filter insert.
▶ Lubricate the rubber seal ring on the new oil filter cartridge with oil.

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▶ Close the cover with the turn lock again.
▶ Start the diesel engine.
▶ Slowly go through all crane movements, this will bleed the hydraulic system.

Result:

– This bleeds the hydraulic system.

▶ Check the oil level again and add oil if necessary.

15.4 Replacing the pressure filter

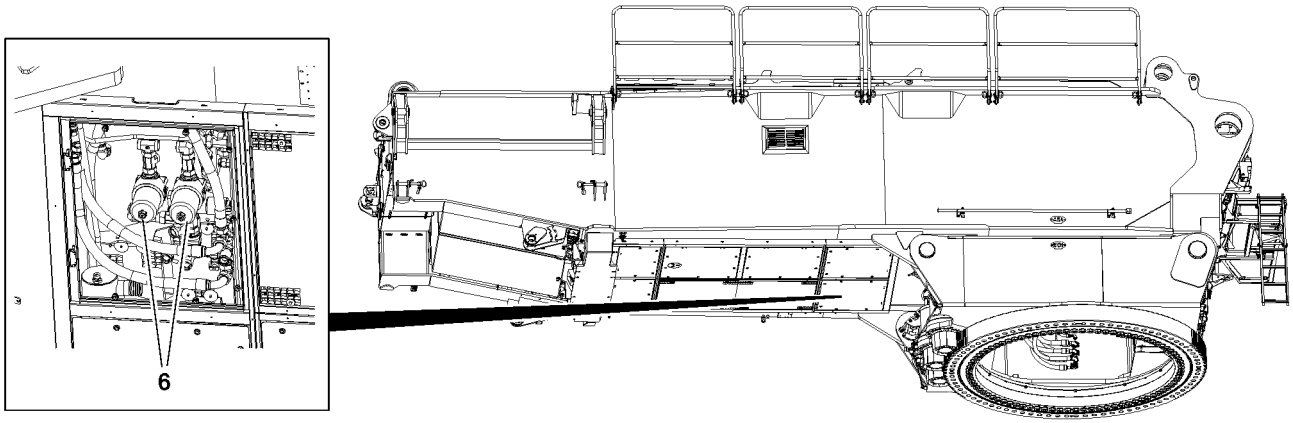

Fig.119074: Position of the pressure filter

The pressure filters **6** are equipped with a maintenance indicator. If the red bar is visible when the hydraulic oil is at the operating temperature, then the filter cartridge must be replaced.

▶ Turn the diesel engine off.
▶ Release the filter cartridge and collect escaping oil in a container.
▶ Remove and dispose of the filter cartridge.
▶ Clean the sealing surface on the filter bracket.
▶ Lubricate the rubber seal ring on the new oil filter cartridge with oil.
▶ Install a new filter cartridge and tighten.
▶ Start the diesel engine and check for leaks.
▶ Slowly run through all crane movements.

Result:

– The hydraulic system is bled.

▶ Check the oil level again and add oil if necessary.

15.5 Checking pretension pressure for the diaphragm reservoir

Various diaphragm reservoirs are installed in the hydraulic system. The pretension pressures are specified in the hydraulic circuit diagram as well as on the individual diaphragm reservoirs. The pretension pressure must be measured separately in each diaphragm reservoir.

CAUTION
Damage to the hydraulic system due to significantly fluctuating ambient temperatures!
If the outside temperature fluctuates considerably, e.g. after transport to extremely hot or cold countries or in countries with considerable differences between the summer and winter temperatures, the gas accumulator pressures may change.
▶ Check the gas accumulator pressures and correct if necessary.

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Make sure that the following prerequisites are met:
– The diesel engine is turned off (diaphragm reservoir is relieved on the fluid side).

DANGER
Explosion due to exceedance of the maximum permissible operating pressure!
The pressure in the nitrogen cylinder must be less than the maximum permissible operating pressure of the accumulator or the pressure gauge. Otherwise install a pressure reducer between the cylinder and the filling device.
▶ Make sure that the pressure in the nitrogen cylinder is below the maximum permissible operating pressure of the reservoir or the pressure gauge.

When
▶ Switch the pressure reducing device between the bottle and the fill device.
▶ Do not use air or oxygen to fill the diaphragm reservoir.
▶ Make sure that the pretension pressure in the hydraulic reservoirs is only checked by expert personnel with appropriate training and equipment.
▶ Adhere to the national regulations regarding the inspection of pressurized containers.

▶ Check the pretension pressure with a testing and filling device and correct, if necessary.

16 Hydraulic hose lines

WARNING
Damaged and leaky hydraulic hose lines!
Fire. Accident. Death, severe injury, property damage.

If leaky areas are found during the visual inspection:
▶ Have these leaky areas inspected immediately by authorized and trained expert personnel and remedied.

If damage is found during the visual inspection:
▶ Have the hydraulic hose lines checked by an **expert person for hydraulic hose lines**.

Note
▶ For annual inspection of hydraulic hose lines and for definition of **expert person for hydraulic hose lines**, see the Crane operating instructions, chapter 8.06.

Hydraulic hose lines must be inspected **once a year** by an **expert person for hydraulic hose lines**.

The system must be visually inspected **before starting to work**.

16.1 Inspecting the hydraulic hose lines for damage

Hydraulic hose lines must be inspected by an **expert person for hydraulic hose lines** when one of the following defects is found:
– Damage on outer surface, such as chafe marks, cuts and cracks.
– Brittleness due to aging of outer layer (cracks).
– Distortion, such as splitting of hose layers, bubbles, crushed areas, kinks, twists.
– Damage or distortion of hose fixtures or hose fitting (seal is endangered).

▶ Inspect the hydraulic hose lines for damage.

If one of the listed defects is found:
▶ Have the hydraulic hose lines checked by an **expert person for hydraulic hose lines**.
▶ Document conspicuous findings, decisions and replacements comprehensibly, see the Crane operating instructions, chapter 8.06.

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16.2 Checking the hydraulic hose lines for leaks

- ▶ Check the crane for escaped hydraulic oil.
- ▶ Check the ground under the crane for leaks.

When the hydraulic system leaks:

- ▶ Have these leaky areas inspected by authorized and trained expert personnel and remedied.

If one of the listed defects is found:

- ▶ Have the hydraulic hose lines checked by an **expert person for hydraulic hose lines**.
  or
  Contact Liebherr Service.
- ▶ Document conspicuous findings, decisions and replacements comprehensibly, see the Crane operating instructions, chapter 8.06.

17 Air dryer

17.1 Replacing the granular cartridge of the air dryer

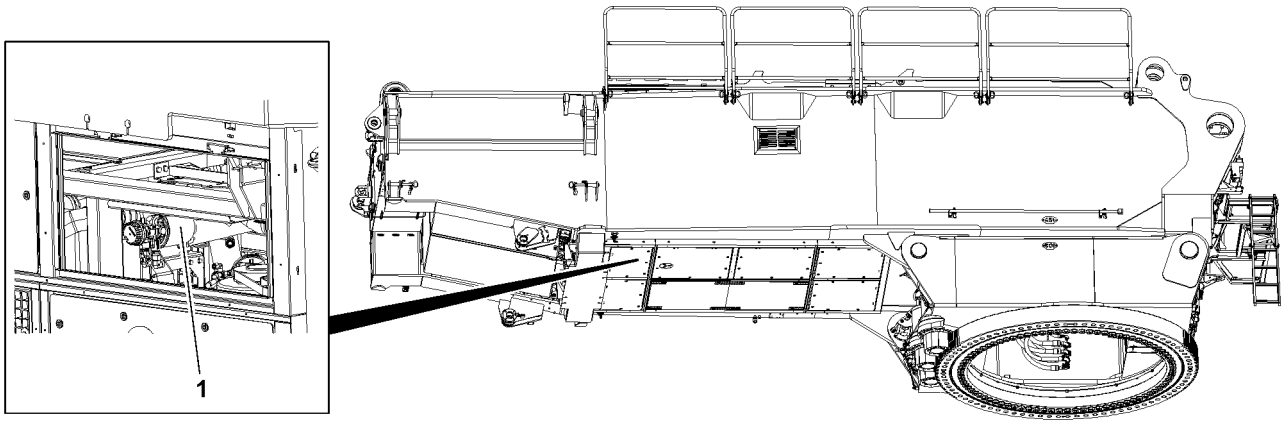

Fig.119076: Air dryer granular cartridge

NOTICE
Erroneous function of compressed air system and exhaust aftertreatment!
If the maintenance interval is exceeded, the drying and filter performance of the granular cartridge is reduced.
Condensation and dirt can accumulate in the compressed air system, which can cause erroneous functions of the compressed air system and the exhaust aftertreatment.

- ▶ Replace the granular cartridge **1** according to maintenance intervals.

The granular cartridge **1** of the air dryer is under spring tension.

WARNING
Uncontrolled release of the granular cartridge!
Severe injury, property damage.

- ▶ Release the granular cartridge carefully.

- ▶ Replace the granular cartridge **1** according to maintenance intervals.

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18 Electrical system

18.1 Bulbs and fuses

NOTICE
Property damage on the electrical system!
- ▶ Defective fuses may **not** be bypassed with wire or the like.
- ▶ Always replace defective fuses with fuses for the same current strength.
- ▶ Always replace defective bulbs with bulbs that have the same output.

When the same fuse or bulb becomes defective repeatedly:
- ▶ Check the electrical system.

18.2 Lines

- ▶ Make sure that all electrical lines are properly routed and fastened in their retainers.
- ▶ Fix any chafes or brittle areas in the insulation and coverings immediately.
- ▶ Any installation lines that are **not** in perfect condition must be immediately and professionally replaced.

18.3 Batteries

18.3.1 Safety guidelines

WARNING
Danger of accidents due to discharged batteries!
- ▶ Plug in the cable of the external power supply on the Liebherr charger.
- ▶ Make sure that the batteries are charged while the crane is not in operation.

Note
- ▶ All safety signs on the batteries must be complete and always legible.
- ▶ Observe and adhere to the manufacturer's operating instructions.

Sign	Explanation
	Follow the guidelines on the battery, in the instruction manual and in the Crane operating instructions.
	Wear eye protection.
	Keep children away from acid and batteries.

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Sign	Explanation
	Danger of explosion! A highly explosive acoustic mixture is created when charging batteries.
	Warning! Fire, sparks, open light and smoking is prohibited. Avoid spark formation when handling cables and electrical devices. Avoid short circuits.
	Danger of chemical burns! Battery acid is very caustic, for that reason: Wear protective gloves and eye protection. Do **not** tilt the battery, acid can emerge from the vent openings.
	First aid: Flush splashed acid in the eye immediately for several minutes with clear water and consult a physician immediately. Neutralize splashed acid on skin or clothing immediately with an antacid or soap and flush with lots of water. When acid was ingested, contact a physician immediately.
	Warning! Do **not** expose batteries unprotected to direct daylight. Discharged batteries can freeze. Store batteries frost free.
	Disposal! Dispose old batteries at a collection point. During transport, observe the guidelines of the manufacturer. Never dispose of old batteries in general trash.
	Back to the manufacturer! Used batteries with this sign are reusable assets. Send batteries for recycling. Old batteries, which are **not** recycled must be disposed of as hazardous waste under observation of all regulations.

18.3.2 Checking the batteries

DANGER
Mortal danger due to electric shock!
- ▶ When working on the electrical system of the crane, disconnect batteries from the electric circuits.
- ▶ Avoid spark formation caused by electrostatic charge.

When working on batteries:
- ▶ Wear a ground strap.
- ▶ Do **not** bring oil, grease, fuel or solvents into contact with the battery casting compound.

- ▶ Keep batteries dry and clean.
- ▶ Release dirty terminals, clean and grease them with an acid-free and acid-resistant grease.
- ▶ Charge batteries in time.
- ▶ Make sure that batteries are charged in the cold season.

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18.3.3 Charging batteries with the Liebherr charger*

The Liebherr charger is integrated in the crane electrical system.

Make sure that the following prerequisites are met:
– The ignition is turned off.

▶ Turn the battery master switch off.

A socket for external power supply for the Liebherr charger is located on the crane.

▶ Plug in the cable of the external power supply on the socket.

18.3.4 Charging the battery with an external charger

WARNING
Danger of injuries!
▶ Do **not** place tools on batteries and keep out of open light.
▶ Eliminate spark formation caused by electrostatic charge.
▶ Work only in well ventilated rooms.
▶ Before working on batteries, wear a ground strap.
▶ Do **not** tilt or shake the batteries.

NOTICE
Property damage if charge voltage is more than 14.4 V !
▶ Make sure that the external charger delivers a charge voltage of maximum 14.4 V.

NOTICE
Loss of data due to disconnected battery!

When the battery is disconnected:
▶ Make sure that the temporary data memory is **not** needed.

Make sure that the following prerequisites are met:
– The ignition is turned off.

Charging the battery while installed

▶ Turn the battery master switch off.
▶ Use an external charger with a charge voltage of maximum 14.4 V.
▶ Charge the battery professionally with an external charger.

Charging the battery while removed

NOTICE
Damage to alternator!
▶ Do not disconnect batteries unless the diesel engine has been turned off.

Removing the batteries

▶ Turn the battery master switch off.
▶ Use an external charger with a charge voltage of maximum 14.4 V.
▶ Disconnect the negative terminal first (ground cable), then the positive terminal.
▶ Disconnect the vent hose from the vent channels of the batteries.
▶ Remove the batteries.

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Charging the batteries externally

NOTICE
Damage to batteries!
▶ Charge only with direct current: Maximum current: 1/10 of the battery capacity.

Example for charging: To charge a battery with 70 Ah , the maximum charge current is 7 A.

▶ Thaw frozen batteries before charging.
▶ Make sure that the battery is ventilated during the charging procedure (danger of oxyhydrogen explosion).
▶ Connect the battery to a charger (positive to positive and negative to negative).
▶ Turn on the battery charger after connecting the battery.

Stop charging immediately if:
– The acid temperature exceeds 55 °C (casing more than warm to the touch).
– The battery starts to give off gas.
– The charging voltage has **not** changed for 2 hours.

▶ Turn the battery charger off after charging, then remove the connector cables individually from the battery and battery charger.

Installing the batteries

▶ Reinstall the batteries tightly in the vehicle.
▶ Connect the vent hose on the vent channels of the batteries.
▶ First connect positive terminal to battery, then negative terminal (ground lead).
▶ Check that the terminals are tightly seated (low transfer resistance).
▶ Grease the terminals and terminal posts with acid-free and acid-resistant grease (use corrosion protection even for modern maintenance-free batteries).

19 Ballast trailer*

19.1 Ballast trailer tires

19.1.1 Ballast trailer tires

Note
▶ See the Crane operating instructions, chapter 2.15.

19.1.2 Ballast trailer tires and disk wheels

Note
▶ See Crane operating instructions, chapter 8.01!

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19.2 Slewing gear

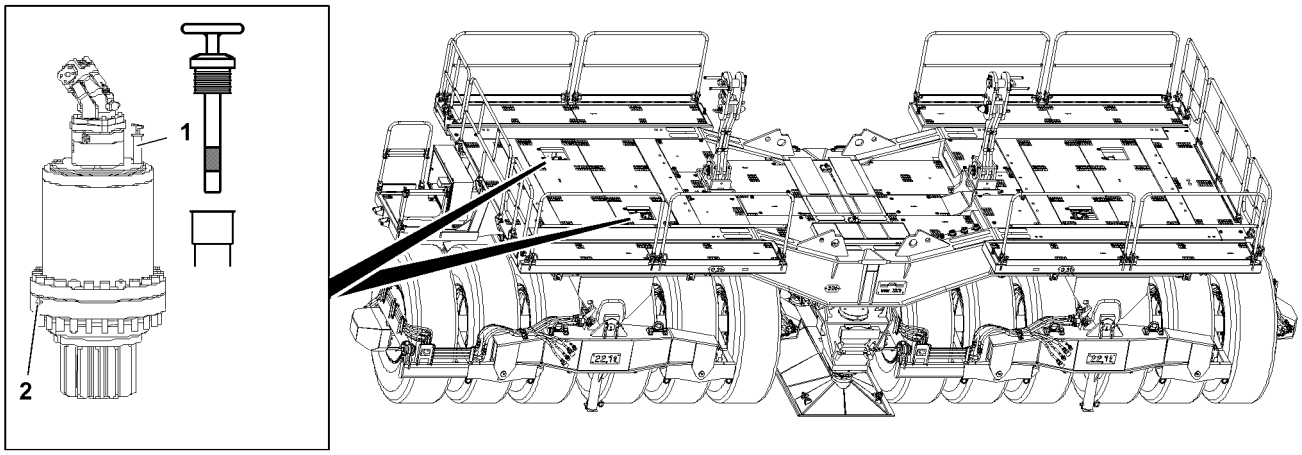

Fig.119081: Position of the slewing gear

NOTICE
Transmission damage due to lack of oil!

When the oil level has dropped below the minimum mark:
▶ Add gear oil at the oil filler port until the oil level is between the minimum and maximum mark on the dipstick **1**.

Maintain utmost cleanliness during all work to prevent any dirt from entering the inside of the gear.

Make sure that the following prerequisites are met:
– Ballast trailer is in horizontal position.
– The gear has warmed up.

19.2.1 Checking for leaks

NOTICE
Leaky slewing gear!
If a leak was found on one or several slewing gears during the visual inspection, it can result in a failure of the affected slewing gear / slewing gears.
The slewing gears can be damaged, resulting in high property damage.
▶ Take the crane out of serve, repair the leaky slewing gear / slewing gears and replace the slewing gear(s) if in doubt.

▶ Check visually to ensure that the slewing gears do not leak.

19.2.2 Checking the gear oil level

▶ Remove and wipe off the dipstick **1**.
▶ Reinsert the dipstick **1** and pull it out again.

The oil level must be between the min. and max. marks on the dipstick **1**.

▶ Check the oil level.
▶ Insert the dipstick **1**.

Problem remedy
Unusual oil consumption or loss of oil!
▶ Find the cause and remedy it.

If the cause cannot be remedied:
▶ Contact Liebherr Service.

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19.2.3 Changing the gear oil

- ▶ Pull out the dipstick **1**.
- ▶ Drain the gear oil into a suitable container: Remove the oil drain plug **2**.
- ▶ Clean the oil drain plug **2** and sealing surface on the housing.
- ▶ Install the oil drain plug **2** with a new seal and tighten.
- ▶ Add gear oil on the oil filler port until the gear oil is between the minimum and maximum mark on the dipstick **1**.
- ▶ Insert the dipstick **1**.
- ▶ Check the oil level.

19.3 Wheel drive

WARNING
Danger of burns during maintenance and inspection work!
Severe burns can results due to the crane components and service fluids at operating temperatures.
▶ Avoid direct body contact to heated crane components and service fluids.

Maintain utmost cleanliness during all work to prevent any dirt from entering the inside of the gear.

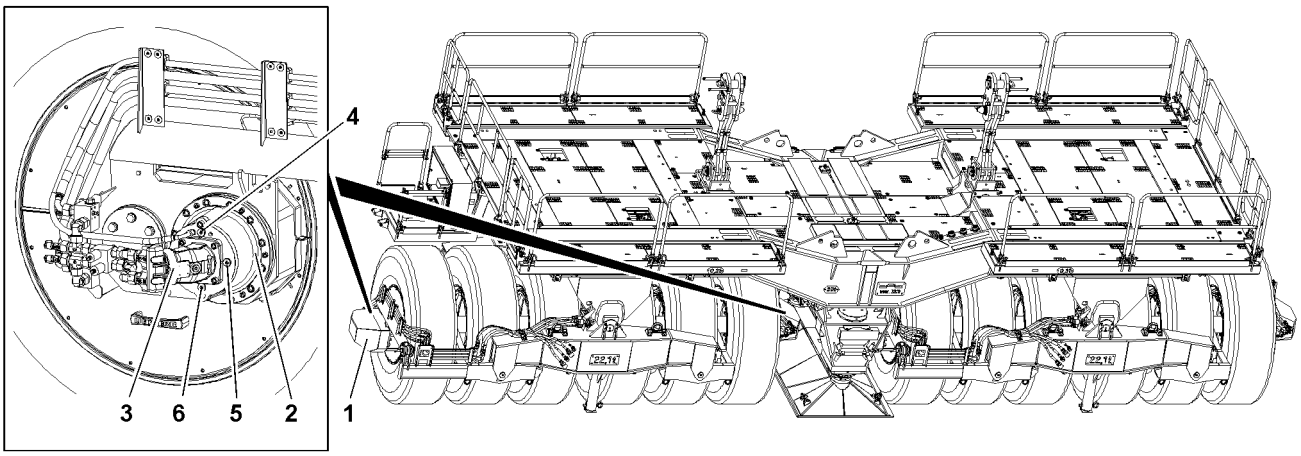

Fig.119082: Position of the wheel drive

The following maintenance ports are on the wheel drive **2**:
4 Oil filler plug, oil filler port
5 Oil level plug, oil level port
6 Oil drain plug, oil drain port

Make sure that the following prerequisites are met:
– Ballast trailer is in horizontal position.
– The gear has warmed up.

19.3.1 Checking for leaks

NOTICE
Leaky swing drive!
If a leakage is found during the visual inspection of the swing drive, it can result in failure of the swing drive!
The swing drive can be damaged, resulting in high property damage.
▶ Repair the leaky swing drive and replace the swing drive, if in doubt.

▶ Check visually to ensure that the swing drives do not leak.

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19.3.2 Checking the oil level

NOTICE
Damage to swing drives!
If seals are used repeatedly, it can result in loss of oil!
Due to loss of oil, the swing drives can wear significantly and / or be damaged.
▶ Use the seals on the maintenance ports only once.

Note
▶ To ensure a reliable oil level check, it must be ensured that the swing drives have been at a standstill for at least two minutes. This ensures that the oil has returned to the oil chamber completely.

▶ Remove the hoods **1** on the swing drives **2**.
▶ Carefully unscrew the oil level plug **5**.

NOTICE
Insufficient oil fill quantity!
If the oil level drops below the fill level on the oil level plug **5**, the swing drives can be damaged.
▶ Add gear oil until the oil level is again on the fill level on the oil level plug **5**.

If oil must be added:
▶ Add oil in the oil filler port **4**.
▶ If the oil level is on the fill level on the oil level plug **5**, then the oil level on the swing drive is OK.
▶ Close the maintenance ports tightly.
▶ Reinstall the hoods **1** on the swing drives **2** again properly.

19.3.3 Changing the oil

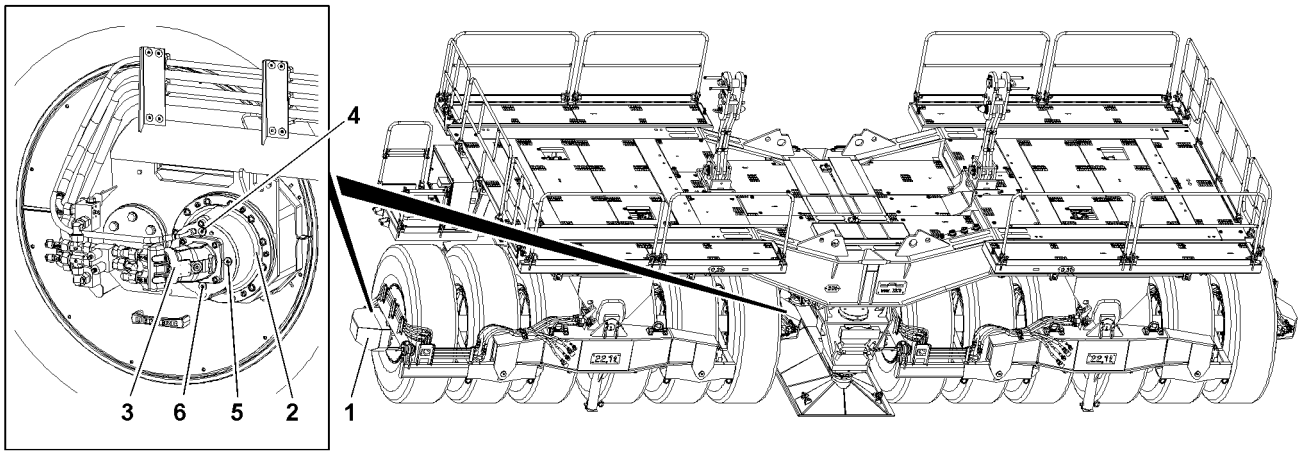

Fig.119082: Position of the wheel drive

Note
▶ Drain the gear oil on the oil drain plug **6**.

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Make sure that the following prerequisites are met:
- The ballast trailer is in a horizontal position.
- The swing drive **2** must be at a standstill.
- The swing drive is warm.
- A suitable container to catch the used oil is available.

Note
- ▶ When selecting the container to catch the used oil, make sure that the container is sufficiently sized to be able to catch all the used oil.
- ▶ Pay attention to the fill quantity of the swing drive.

WARNING
Risk of burns during maintenance or inspection work!
While carrying out maintenance or inspection work, maintenance personnel can get severe burns on hot crane components.
When opening the oil drain plug, hot oil can cause burns on arms, hands, face or eyes.
Death, severe bodily injuries, property damage.
- ▶ Let any crane components to be maintained or inspected cool off until „hand warm“.
- ▶ Wear protective equipment.

- ▶ Remove the hoods **1** on the swing drives **2**.
- ▶ Remove the oil filler plug **4**.
- ▶ Unscrew the oil drain plug **6** with seal ring and drain oil into a suitable container.

Note
- ▶ Allow the swing drive **2** to empty completely.

- ▶ Clean the oil drain plug **6** and sealing surface on the housing.
- ▶ Screw in the oil drain plug **6** with a new seal ring and tighten.
- ▶ Open the oil level port **5**.
- ▶ Add oil on the oil filler port **4** until it is at the fill level on the oil level port **5** or until it starts to run over.
- ▶ Clean the sealing surface on the oil level port **5**.
- ▶ Close off the oil level port **5** tightly.
- ▶ Close off the oil fill port **4** tightly.
- ▶ Reinstall the hoods **1** on the swing drives **2** again properly.

20 Ladders

WARNING
Danger of falling!
If the following safety notes are **not** observed, personnel can fall down.
Death, severe bodily injuries, property damage.
- ▶ Observe and adhere to the assembly and safety guidelines for ladders.
- ▶ Observe and adhere to the safety signs on the ladders.
- ▶ Install and secure the ladders properly.
- ▶ Do **not** use damaged ladders and replace them immediately.
- ▶ Have ladders repaired only at authorized expert repair shops.

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20.1 Lubricating ladders

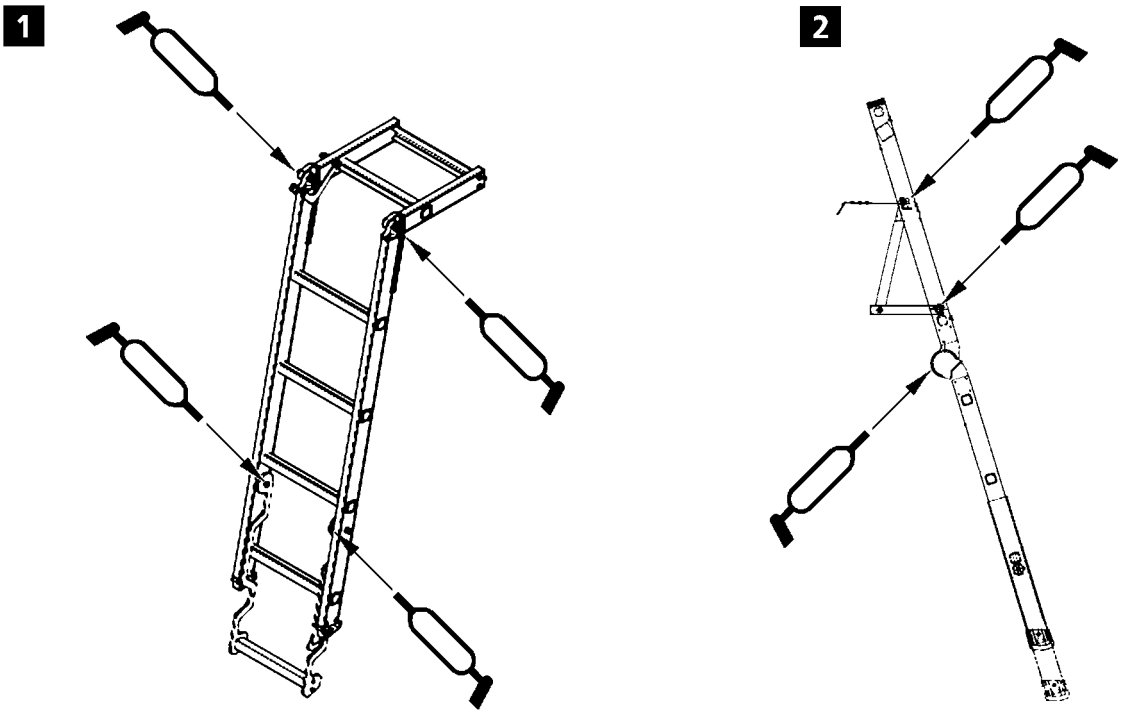

Fig.109766

Make sure that the following prerequisites are met:
- Repairs and maintenance work are carried out by expert personnel.

▶ Grease joints and pivot points on the ladders according to maintenance interval and check them for easy movement, see illustration **1** and illustration **2**.

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21 Window cleaning system

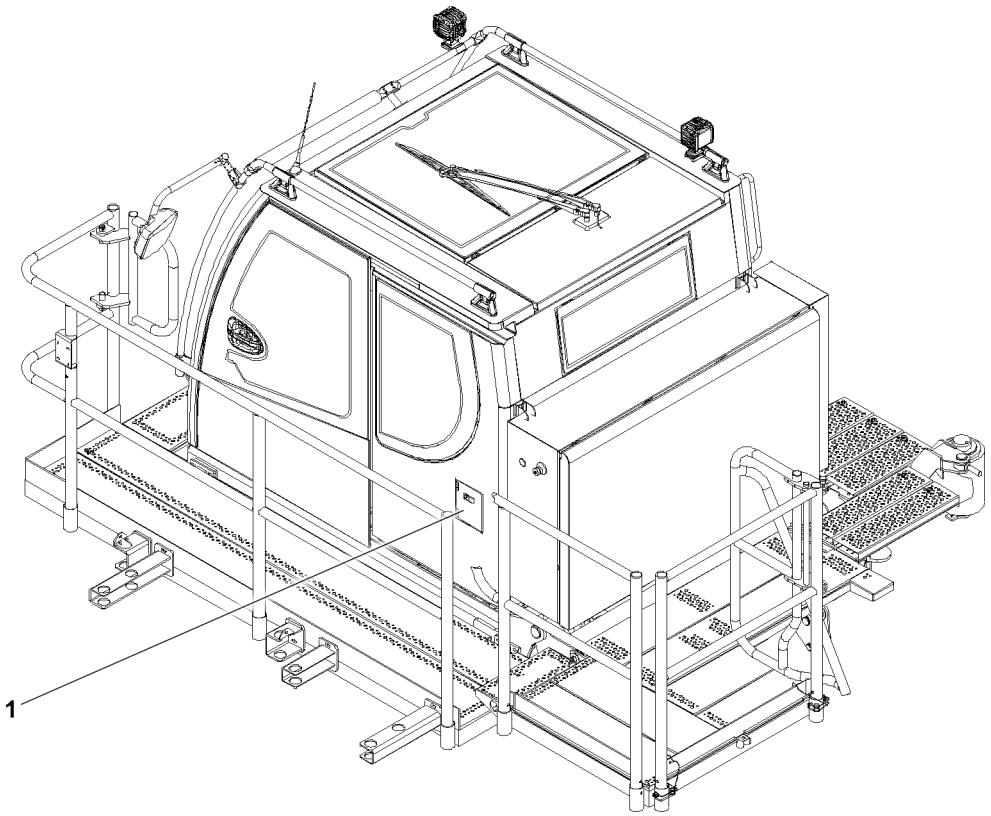

Fig.126509: Container Window cleaning system

21.1 Checking the cleaning fluid level

- ▶ Open the container **1**.
- ▶ Check the cleaning fluid level.

When the cleaning fluid level is low:

- ▶ Add cleaning fluid.
- ▶ Close the container **1**.

21.2 Replacing the cleaning fluid

The cleaning fluid must be replaced before the cold season.

- ▶ Open the container **1**.
- ▶ Empty the container **1**.
- ▶ Fill the container with a commercially available, frost resistant window cleaning fluid.
- ▶ Close the container **1**.

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7.05.50 Maintenance instructions - Crane boom

1	Lattice mast boom	3
2	Rope pulleys and guide pulleys	4
3	Crane ropes	4

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Fig.195219

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1 Lattice mast boom

WARNING
Danger of falling!
Death, severe injuries.
▶ For all work on the crane where there is a danger of falling, suitable safety measures must be taken, see Crane operating instructions, chapter 2.06.

Note
▶ The following illustration is an example and may not exactly match to your crane.

1.1 Lubricating the pin bores on the lattice sections and guy rods

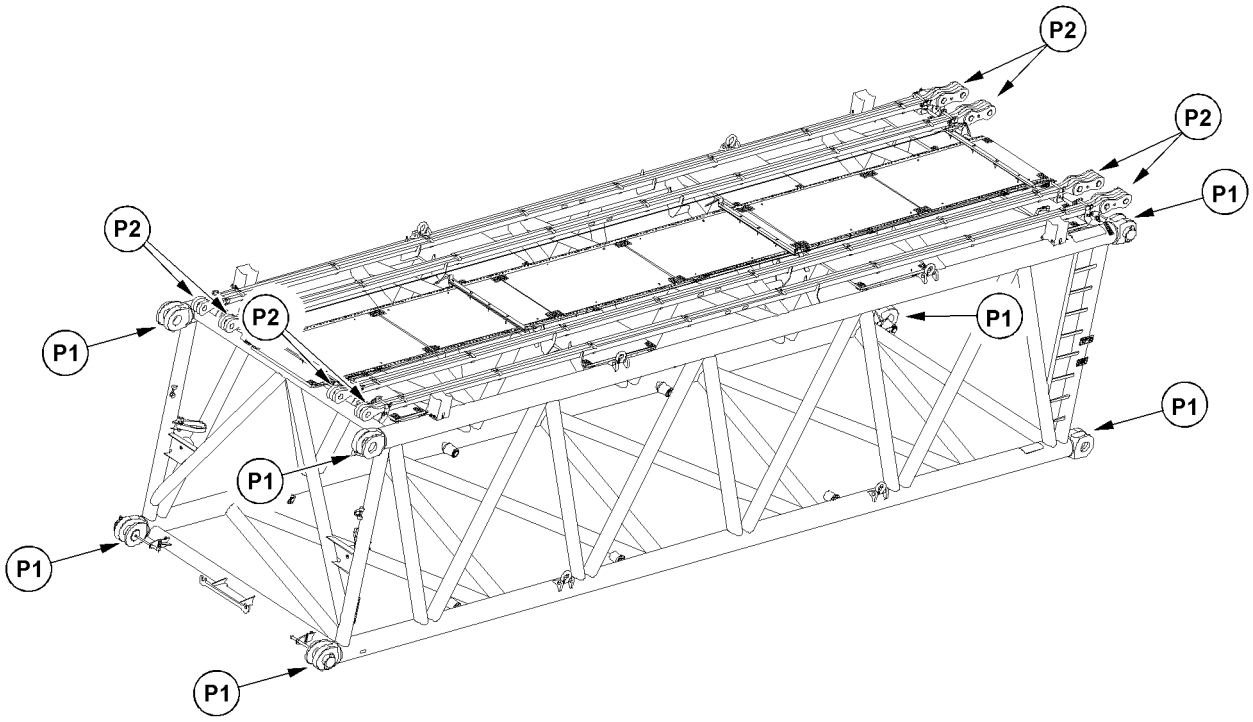

Fig.123861: Lube points on boom lattice sections and guy rods

Note
▶ For the pin bores on the lattice sections (points **P1**) and the guy rods (points **P2**), use special grease as lubricant. See Service fill and Crane operating instructions, chapter 7.07.
▶ Apply the grease on the pin bores over the entire circumference.
▶ The lubrication of the pin bores on the boom lattice sections and the guy rods is made before assembly or after disassembly.

Make sure that the following prerequisites are met:
– The lattice sections are not installed on the crane.
– The lattice sections are playing on a load bearing support on the ground.

▶ Grease the pin bores on the boom lattice sections and the guy rods.

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2 Rope pulleys and guide pulleys

2.1 Check bearings for easy movement

Stiff or blocked rope pulleys or compensation pulleys wear rapidly and unevenly and cause serious rope abrasion.

Ineffective compensation pulleys can lead to irregular rope tension.

▶ Check the rope pulleys for proper movement in their bearings.

When rope pulleys are **not** easily moveable in their bearings:
▶ Fix the bearings.

2.2 Checking for mechanical damage

Ropes can cause mechanical damage, such as stress marks.

▶ Check guide pulleys and rope pulleys for mechanical damage.

3 Crane ropes

3.1 Personal protective equipment

WARNING
Injury due to wires and skin irritation due to lubricant!
▶ When working with ropes, always wear work gloves.

WARNING
Injuries if protective equipment is **not** worn!
▶ Wear hard hat, safety shoes and safety glasses.

3.2 Safe and problem-free operation

WARNING
Wear, overload, incorrect use, damage, improper maintenance!
Failure of ropes. Death, severe injuries, property damage.
▶ Prevent failure of ropes: Observe and adhere to the following notes.

Carry out the following measures to ensure safe and problem-free rope operation.
- Service ropes and rope end connections regularly according to the maintenance intervals.
- Check ropes and rope end connections regularly according to the inspection intervals.
- When it is determined that the ropes should be withdrawn from service, do **not** continue to use them further.
- Exclude contact of rope with components except rope drive elements.
- Exclude contact of rope with structural parts, power lines or other objects within the surrounding area.
- Avoid corrosive and chemical surroundings.
- Avoid excessive soiling.
- Avoid excessive heat influence.
- Ensure proper condition of all elements of rope drive.
- Ensure proper spooling formation on the rope drum.
- Use the entire rope length of hoist ropes.
- Avoid slack rope formation on the drum.
- Do **not** bring outer twists into the rope.
- Avoid shock relief of the rope, such as sudden set down of the load.

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– Avoid **non-permissible** angular pull, for example by pulling the load at an angle.

3.3 Temperature operating limits

Adhere the temperature operating limits for steel ropes. The determining factors are wire material, lubricant, rope end connections. See Manufacturer's specifications.

3.4 Qualification Maintenance personnel

Make sure that the following prerequisites are met:
– The maintenance personnel is trained and instructed in maintenance tasks.
– The maintenance personnel is assigned (authorized) for the maintenance by the crane operator.

3.5 Damage on rope

Rope removal criteria: If severe damage reduces the operational safety, then the rope can reached the removal criteria.

This section provides an overview for possible damage on the rope. For clearer illustration, the distortions on the illustrations are exaggerated.

The displayed ropes show a condition, which is far above the removal criteria.

Damage on the rope causes uneven load distribution in the affected areas.

Damage on the rope is most often localized.

Typical examples for damage, which can be recognized during maintenance work:
– Broken strands
– Wire breaks
– Reduction of rope diameter
– Localized increase of rope diameter
– Corrosion
– Flattenings
– Corkscrew-like distortion
– Basket formation
– Protruding, distorted inlay or braiding
– Loop formation
– Kinking, rope loops (grommets) pulled closed
– Buckles
– Influence of heat or electrical voltage, such as arcing

3.5.1 Broken strands

A strand consists of several individual wires.

When a complete braid is broken, then the rope must be taken down.

3.5.2 Broken wire

Externally visible broken wires are the result of wear caused by operation.

Additional types of broken wires:
– Broken wire in the inside of the rope
– Broken wire in the strand valleys
– Broken wire on a rope connection

A broken wire does not endanger the safety of the rope.

3.5.3 Reduction of rope diameter

The rope diameter changes due to abrasion, settling and external influences.

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Abrasion of cover wires of outer strands of rope due to frictional contact. Especially in those areas where ropes are in contact with the rope pulleys during start up or slow down of the load.

Wear is increased by lack of or incorrect lubrication and the effect of dust.

Abrasion reduces the tensile strength of steel ropes because the cross section of the steel is reduced.

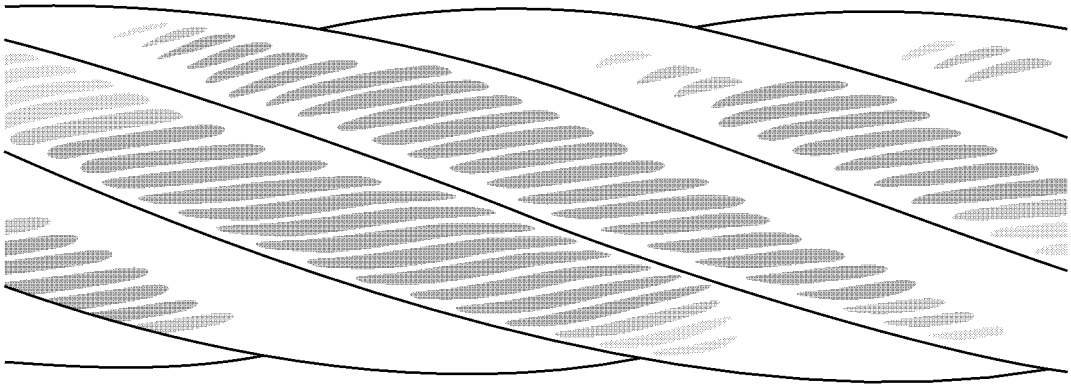

Fig.121001: External abrasion on the rope

When the rope diameter is reduced, the rope must be checked by **expert personnel for crane rope inspection**.

3.5.4 Localized increase of rope diameter

An increase, which occurs over a longer area of the rope can be caused by absorption of moisture in the fiber insert or due to corrosion in the inside of the rope.

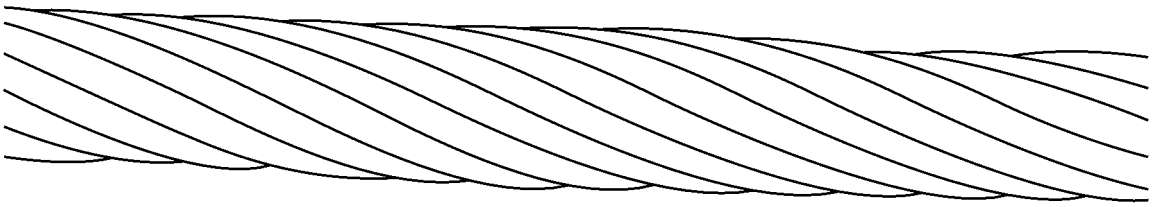

Fig.120992: Increase of rope diameter

When a localized increase of the rope diameter is present, then the rope must be checked by **expert personnel for crane rope inspection**.

3.5.5 Corrosion

Corrosion occurs due to insufficient lubrication, in maritime climates and in an atmosphere polluted by industrial fumes.

External corrosion is indicated by a rough wire surface. A superficial rust film can be wiped off.

Significant corrosion reduces the strength and elasticity of the rope due to the reduction of the rope diameter.

Inner corrosion is hard to detect.

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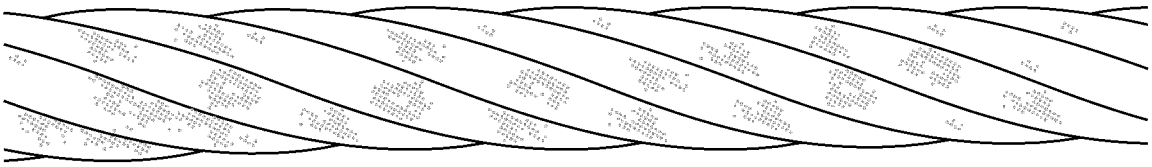

Fig.120994: External corrosion

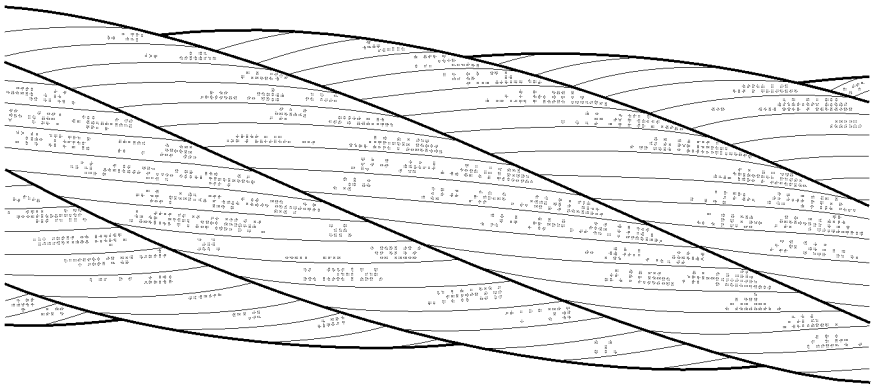

Fig.120995: Magnification of external corrosion for better depiction

When significant corrosion is present, the rope must be checked by **expert personnel for crane rope inspection**.

3.5.6 Flattening

Flattening occurs when the rope runs through the rope pulleys. In this area the rope wears quicker.

Corrosion occurs faster on retaining ropes and guy ropes.

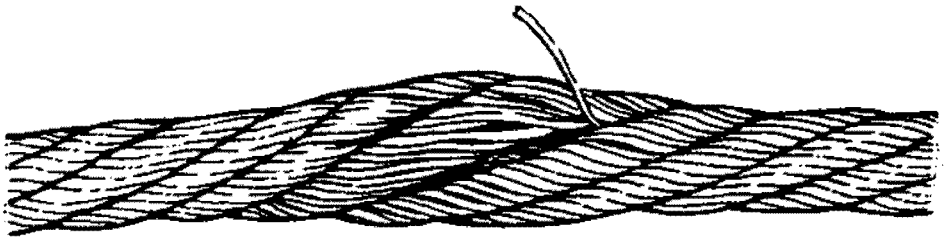

Fig.120997: Localized limited flattening, which leads to broken wires (single layer rope)

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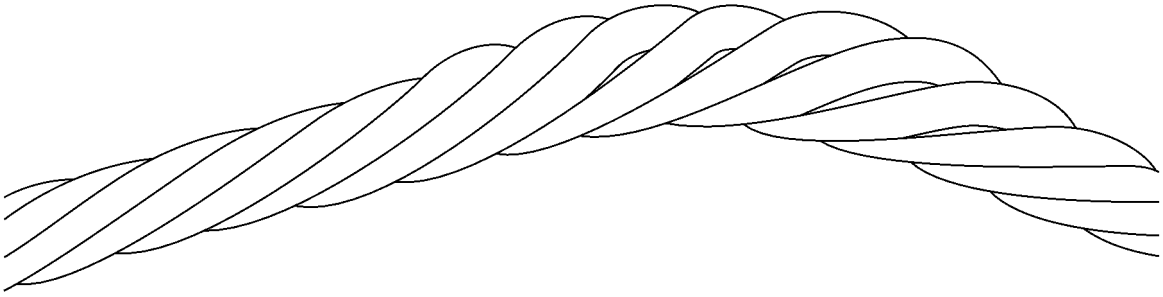

Fig.120996: Flattenings on multi layer spoolings

When flattening is present, the rope must be checked by **expert personnel for crane rope inspection**.

3.5.7 Corkscrew-like distortion

Distortion where the rope is in the form of a corkscrew along its longitudinal axis.

Corkscrew-like distortion causes rope wear, broken wires and bearing damage on rope pulleys.

Fig.120988: Corkscrew-like distortion

When corkscrew-like distortion is present, the rope must be checked by **expert personnel for crane rope inspection**.

3.5.8 Basket formation

This distortion occurs due to different layers between the outer strand layers and the inside of the rope.

Causes for basket formation are high angular pull angles during the run over the rope pulleys and run-in rope pulleys. Even load distribution over the entire cross section is not possible.

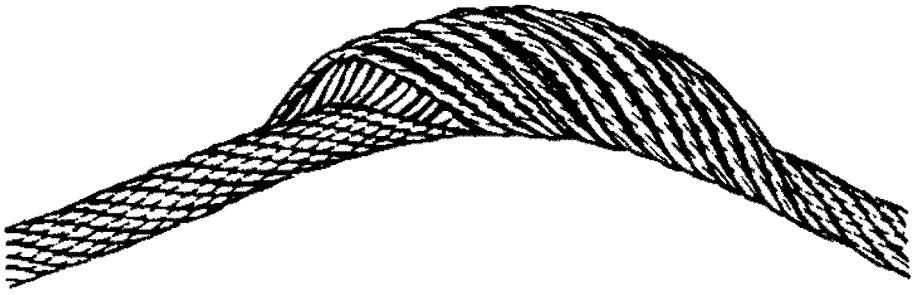

Fig.120989: Basket formation

When basket formation is present, then the rope must be taken down.

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3.5.9 Protruding, distorted inlay, braiding

This distortion is a special form of basket formation: The insert or the core of the rope protrudes between the external braids or an external braid protrudes from the rope banding.

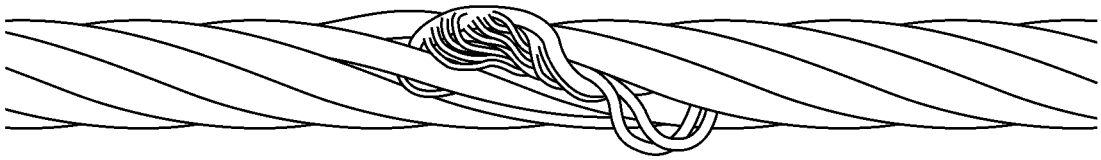

Fig.120990: Protrusion of an insert (rope single layer)

Fig.120991: Distorted or protruding strand

When the insert or a strand protrudes or is distorted, place the rope down. Have **expert personnel for crane rope inspection** check if the rope area with the distortion can be removed.

3.5.10 Loop formation

At loop formation individual wires protrude from the rope banding, when no broken wire ends can be seen.

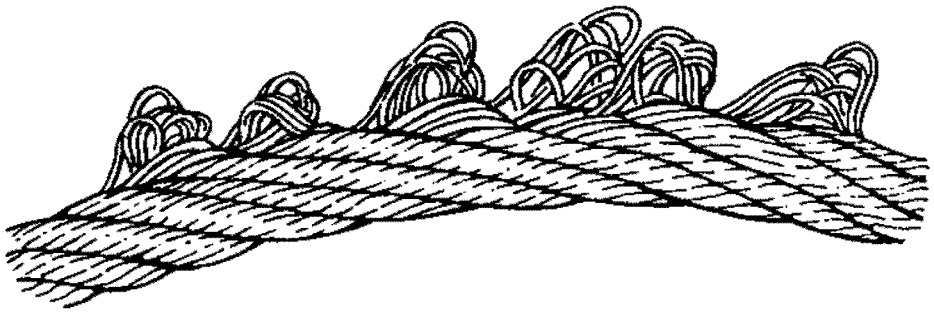

Fig.120993: Emergence of individual wires

When loop formation is present, take the rope down.

3.5.11 Kinking, rope loops (grommets) pulled closed

Deformation, where a loop has formed in the rope, without the possibility to rotate around its own axis during a load. The rope is subjected to more wear.

The rope is deformed. The strength remains only in part.

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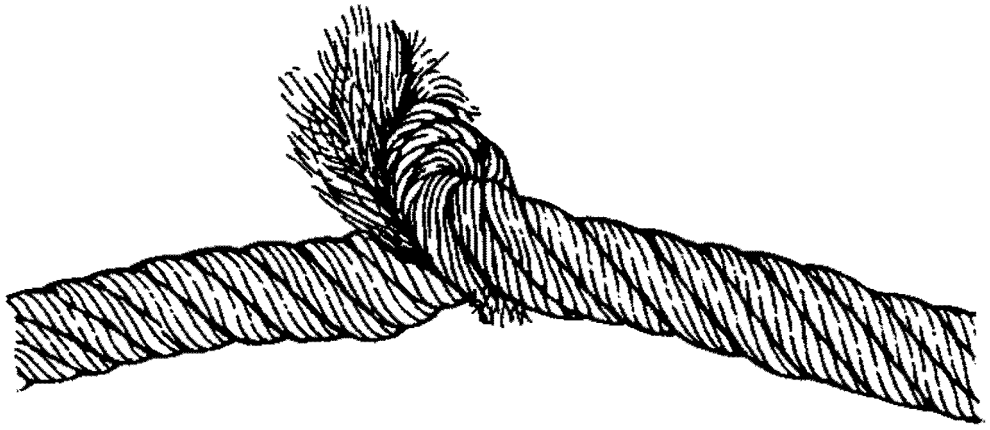

Fig.120998: Severe kinking or knots

When kinking or rope loops are present, place the rope down.

3.5.12 Buckles

Buckles are angular deformations. The rope was damaged due to external influences. Strong deformations of the rope cause stronger wear.

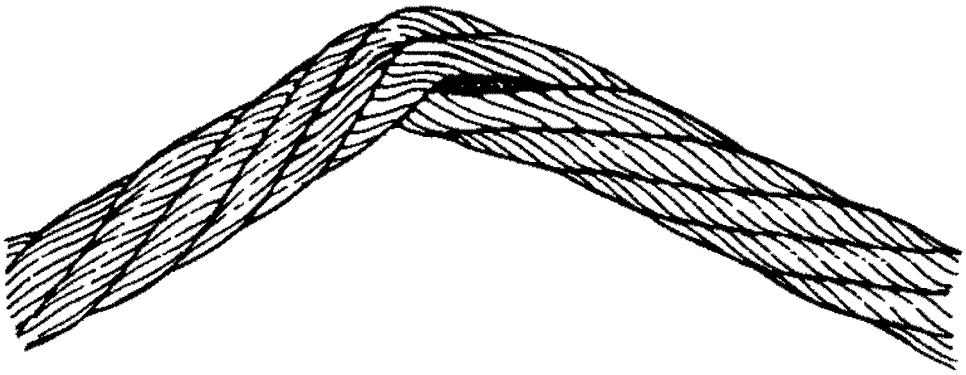

Fig.120999: Severe buckle

When buckles are present, take the rope down.

3.5.13 Effects of heat, arcs

Damage caused to the rope by welding work, for example.

Unusual heat impact is visible by tempering colors and loss of lubricant.

When heat impact has occurred on the rope, then the rope must be taken down.

3.6 Checking the ropes

WARNING
Operation with damaged rope!
Failure of rope. Death, severe injury, property damage.

When damage, wear and deformations are present:
▶ Have **expert personnel for crane rope inspection** determine if the rope has to be taken down.

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The following sections describe the tasks for **daily visual inspection**.

The crane operator can carry out a daily visual inspection if he is sufficiently trained in the tasks and considered to be able to do so.

3.6.1 Intervals

Intervals and situations where the daily visual inspection must be made:
- Daily, before starting to work
- In case of change of the reeving of the crane rope due to
  - Transport
  - New reeving
  - Removal and installation

3.6.2 Areas

The rope must be checked over the entire length.

The following areas must be checked with special diligence:
- Rope end connections
- Safety coils and fixed point on the winch
- Areas of the rope which run through the hook block
- Areas of the rope which run over the rope pulleys or laying on the rope pulleys
- Areas of the rope which are spooled on the winch, especially cross over areas
- Areas of the rope which are laying above the compensation pulleys
- Areas of the rope which are subjected to abrasion due to external components
- All areas of the rope which are subjected to temperatures above 60°C

3.6.3 Documentation of rope condition

Every visible change of the wire rope must be documented in the crane records.

3.6.4 Checking the lubrication

WARNING
Missing lubrication!
Functional problems. Inner and outer corrosion.
- ▶ Lubricate the rope regularly.
- ▶ Make sure that the rope is lubricated all around.
- ▶ Select manual or automatic lubrication procedures.

The lubrication must be checked at least once a **month**.

When the rope shows signs of drying out:
- ▶ Lubricate the rope, see section „Lubricating the rope“.

3.6.5 Check for wear and distortion

- ▶ Check all visible parts of the rope for wear and distortion.
- ▶ Check the rope end connections and fixed points especially carefully for wear, damage, cracks and distortion.
- ▶ Check pressed together rope end connection for slipping and traces on the rope.

Note
- ▶ The maximum permissible number for broken wires over a certain rope length may not be exceeded.
- ▶ Determine the maximum permissible number of broken wires, see Crane operating instructions, chapter 8.04.

- ▶ Check the rope end connection and rope area near the rope end connection for broken wires.

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When broken wires are present on the rope:
▶ Remove the broken wire, see section „Removing broken wires“.

When broken wires or damage is present on the rope end connection:
▶ Document visible changes of the rope condition.
▶ Have the rope checked by **expert personnel for crane rope inspection**.

When the rope can be shortened without reducing the operational safety:
▶ Shorten the rope, see section „Shortening the rope“.

3.6.6 Checking the rope drive for spooling problems

Lacking pretension of the rope on the winch can cause spooling problems in multi layer spooling.

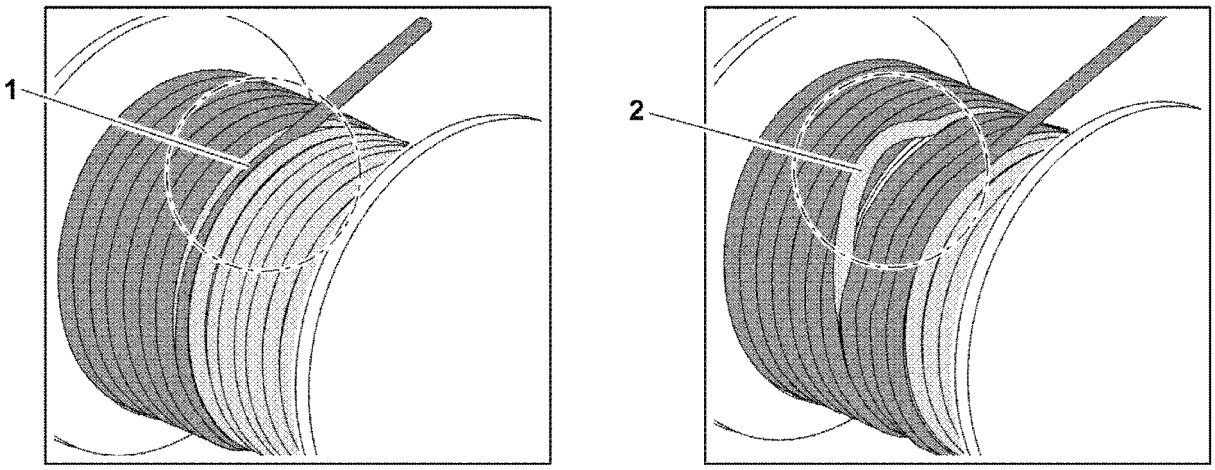

Fig.120967: Possible spooling problems on the rope winch

1 Cutting into the lower rope layers **2** Loop formation in the lower rope layers

▶ Check the spooling behavior of rope on the rope winch for cutting into the lower rope layers **1**.
▶ Check the spooling behavior of rope on the rope winch for loop formation in the lower rope layers **2**.

When spooling defects are found:
▶ Renew the pretension, see section „Renewing the pretension of hoist ropes“.
▶ Document visible changes of the rope condition.
▶ Have the rope checked by **expert personnel for crane rope inspection**.

3.6.7 Checking the position

▶ Check the correct position of the rope on the rope pulleys.

When the rope is **not** correctly laying on the rope pulley:
▶ Have the rope and rope pulley checked by **expert personnel for crane rope inspection**.

3.6.8 Checking for corrosion

A superficial „rust film“ can be wiped off.

▶ Do **not** clean the rope with solvents or cleaners.
▶ Clean the rope solely with a wire hand brush.
▶ Check rope for corrosion.

When the rope shows a rough surface:
▶ Document visible changes of the rope condition and have the rope checked by **expert personnel for crane rope inspection**.

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If there is any uncertainly regarding the condition of the rope:
▶ Place the rope down or contact Liebherr Service.

3.6.9 Checking for flattenings

In the cross over area of the spooled up rope layers on the winch the rope is stressed more. The rope can be flattened as a result.

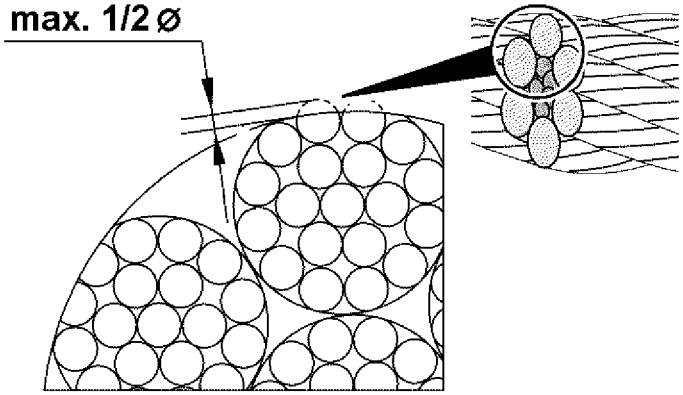

Fig.120966: Maximum flattening of wires on the outer strands

▶ Check the rope in the ascent zones of the rope spooling on the winch for flattenings.

When the outer braids are flattened more than half of the wire diameter:
▶ Document visible changes of the rope condition.
▶ Have the rope inspected by **expert personnel for crane rope inspection** or place the rope down.

When the rope can be shortened without reducing the operational safety:
▶ Shorten the rope on the rope drum fixed point, see section „Shortening the rope“.

3.7 Checking the control rope for distortions

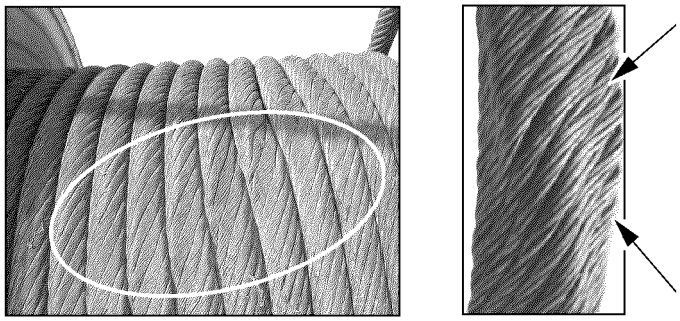

Fig.114002: Distortion on control ropes

▶ Check the first rope layer of the control rope for crushed areas and distortions.

When distortions are present:
▶ Have the rope checked by **expert personnel for crane rope inspection**.

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3.8 Lubricating the rope

WARNING
Missing lubrication!
Functional problems. Inner and outer corrosion.
▶ Lubricate the rope regularly.
▶ Make sure that the rope is lubricated all around.
▶ Select manual or automatic lubrication procedures.

NOTICE
Too much or incorrect lubricant!
Excessive soiling. Wear on rope, on rope pulley and on winch. Recognition of take down criteria is impeded.
▶ Use lubricant, which is compatible with the rope and the original lubricant.

▶ Do **not** clean the rope with solvents or cleaners.
▶ Clean the rope solely with a wire hand brush.

Areas, which must be lubricated especially well are bending zones on winch and rope pulleys.

▶ Lubricate the rope.

3.9 Removing broken wires

NOTICE
Broken wires!
Damage of other components in crane operation, for example rope pulleys and compensation pulleys.
▶ Remove broken wires.

Make sure that the following prerequisite is met:
– Suitable pliers are on hand.

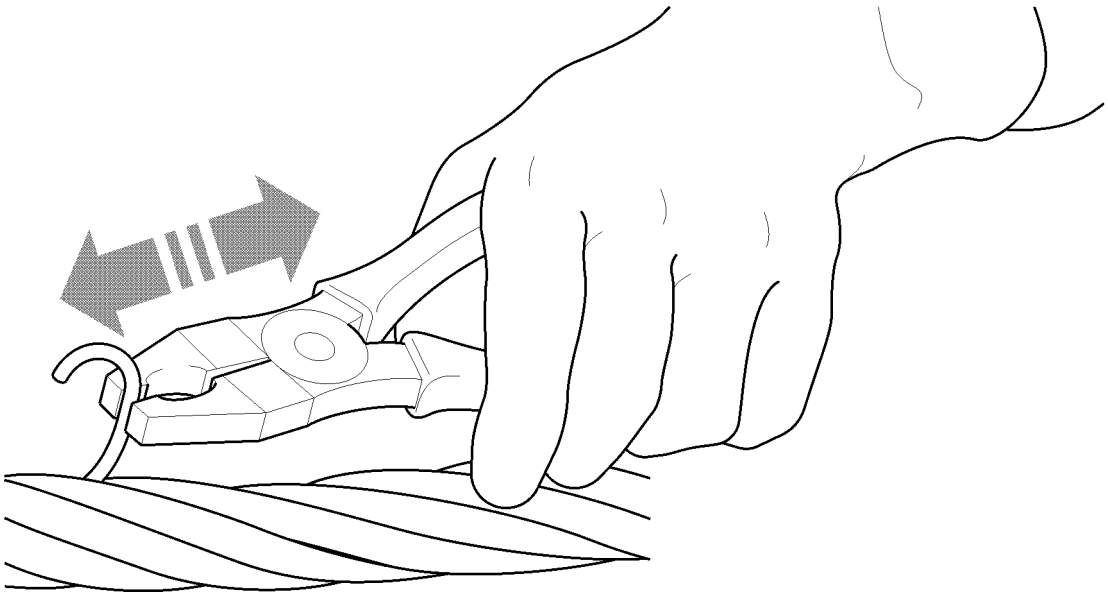

Fig.120979: Remove broken wire

▶ Grasp the wire on the upper end with pliers. Bend the wire back and forth until the wire breaks off in the braid valley.

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The position of a broken wire is important for subsequent inspection. Individual broken wires are counted and are recorded later in the evaluation for withdrawal from service.

▶ Document the position of the broken wires in the crane record. Inspection checklist, see chapter 8.04.

3.10 Turning an extremely rotation-resistant hoist rope out

WARNING
Damage of rope due to incorrect procedure!
▶ Use extreme caution for the following procedures.
▶ Observe the following instructions exactly.

The cause for the turn-in of the hook block can have various reasons.

Check the crane for the following peculiarities:
– Scrub marks: Are hoist rope scrub marks present on the crane components? If scrub marks are present, check the hoist rope run and correct it.
– Rope pulleys: Did the groove diameter become too small?
  • Groove diameter dimensional stability must be present.
  • If this is not the case, the rope pulley must be replaced.
– Rope lubrication: Has the hoist rope been sufficiently lubricated? If the rope surface is dry, the hoist rope must be re-lubricated.

If the crane does not display other peculiarities, the hoist rope must be spun out.

The following sections describe two methods of how to spin out the hoist rope. The methods must be applied in the described sequence.

3.10.1 Spinning out with single strand reeving

▶ Reeve in the single strand hoist rope.
▶ Extend the boom to the maximal boom length and hook height.
▶ Lower hooks to approximately 1 m above the ground and allow the hoist rope to spin out.
▶ With an empty hook block, carry out one complete hoist cycle.
▶ Lower the hook again to approximately 1 m above the ground and allow the hoist rope to spin out again.
▶ Reeve the number of strands of hoist rope carefully and spin free where the twisting of the hook block is largest.
▶ Distribute the spin out to the entire rope length: Run at least two entire hoist cycles at maximum boom length and hook height.

Note

When the hook block continues to turn in:
▶ Spin the rope out, see section „Spinning out by turning the hook block out“.

3.10.2 Spinning out by turning out the hook block

Make sure that the following prerequisite is met:
– The hook block is reeved with the number of strands where the twisting is the largest.

▶ Extend the boom completely and lower the hook block.
▶ Attach a load of approximately 10 % of the nominal rope pull on the hook block.

Before lifting the load, a helper must rotate the twisted hook block to a straight position by hand until the rope strands no longer touch each other.

▶ Continue to turn the hook block by one entire turn.

Result:

– The rope strands touch again.

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NOTICE
The hook block turns back under load in a straight position!

When the hook block turns back in a straight position:
▶ Release the hook block.

▶ Hold the hook block in the prescribed position until the load lifts off the ground.
▶ Move the load until approximately 15 m before the uppermost hook position of the completely extended boom.
▶ Lower load and set it down.

3.11 Renewing the pretension of hoist ropes

WARNING
Lacking pretension of the rope on the winch!
Excessive rope wear in the lower spooling layers, gap formation, rope cutting in.

When the lower rope layers on the winch are hardly used or **not**:
▶ Renew the pretension in the entire rope regularly.

Make sure that the following prerequisites are met:
– A reeving is selected where the entire rope length can be spooled.
– Clean spooling pattern on the drum at spooling.

Note
Recommendation!
▶ The rope application is the most economical when the entire rope length is utilized.

When only a part of the rope length is used for a longer period of time:
▶ Use a proportionally shorter rope.

▶ Spool the rope out until three safety coils.
▶ Spool the rope up with a rope tensile force of 10 % of the maximum rope tensile force.

3.12 Shortening the rope

WARNING
Distortions and mechanical damage!
Operational safety significantly disturbed, uneven load distribution within the rope.
▶ Have the manufacturer check if the distorted and damaged area can be severed.

Visible form changes often occur localized or in short rope sections.

When a safe operation of the rope is ensured, a distorted and damaged area can be severed.

To shorten the rope there are different prerequisites:
– Rope shows flattenings
– Broken wires occur solely within the area of the rope end connection, the remaining rope is undamaged

DANGER
Minimum number of remaining coils on the winch fallen below!
Rope releases or rips off, falling load. Death, severe injury, property damage.
▶ Make sure, after shortening the rope that **at least three remaining coils** remain on the winch in all working positions of the crane.

Make sure that the following prerequisite is met:
– The rope was shortened by authorized and trained expert personnel.

Multi layer spooling: When the rope on the fixed point on the winch is shortened by half the winch diameter, then the service life of the rope increases significantly.

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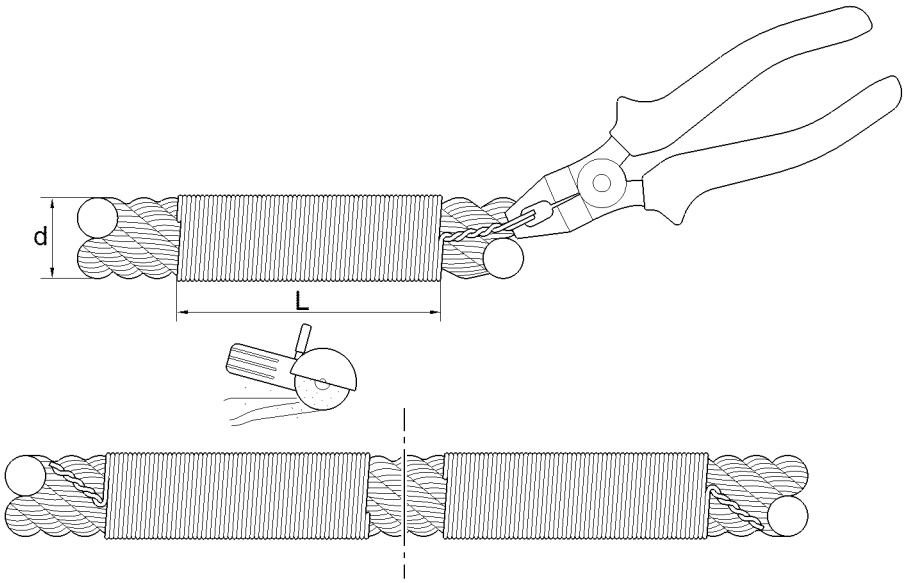

Fig.120972: Tie the rope before shortening it

d Rope nominal diameter **L** Length of tie, at least 2d

The length of the tie **L** must be at least 2 times the rope nominal diameter (2d).

The shortening of the rope in this section applies to a single layer rope. On rotation-resistance, parallel roped ropes it may be necessary to tie several times to prevent the rope from jumping open when it is cut.

- ▶ Tie the rope on both sides with wire.
- ▶ Twist the end of the wire with the pliers to prevent them from releasing.

WARNING
Danger of injury due to flying sparks!
- ▶ Wear safety glasses and safety gloves.

- ▶ Separate the rope vertically to the rope axis.
- ▶ Fasten the end connections on the rope according to the manufacturer's instructions.
- ▶ Remove the tie on both ends of the separation from the rope.

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7.06 Fill quantities, lubrication chart

1	Fill quantities	3
2	Lubrication schedule	4

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Fig.195219

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1 Fill quantities

WARNING
Handling poisonous operating fluids and lubricants!
Poisoning, severe health damage.

When operating fluids are to be used, stored and disposed of:
- ▶ Observe and follow the printed instructions on the original containers.
- ▶ Store operating fluids exclusively in the closed original container.
- ▶ Keep children away from operating fluids. Keep operating fluids away from children.
- ▶ Dispose of operating items and lubricants in an environmentally safe manner.

NOTICE
Damage on aggregates due to impermissible additives!
- ▶ Make sure that **no** impermissible additives are added to the operating fluids.

Note
- ▶ Fill quantities and descriptions of service items and lubricants are specified in the Service fill.
- ▶ Fill the crane chassis, crane superstructure and equipment with the respective operating fluids.
- ▶ The specified fill quantities (change quantities) are orientation values. The marks on the dipsticks, inspection ports and sight gauges are decisive for filling.
- ▶ The equipment depends on the purchased scope of delivery.

On mobile cranes with truck chassis:
- ▶ Observe the maintenance intervals and maintenance notes of the truck chassis manufacturer.

NOTICE
Danger of property damage!
- ▶ Do **not** mix different oil products!
- ▶ Do **not** mix synthetic oils with mineral oils!
- ▶ Adhere to the data in the Service fill!

1.1 Diesel engine

- ▶ Check the engine oil. See Maintenance intervals and maintenance instructions.
- ▶ Adhere to the operating instructions of the engine manufacturer.

1.2 Coolant system

NOTICE
Property damage due to impermissible coolant!
- ▶ Do **not** mix different coolant products.
- ▶ Do **not** thin Liebherr-Fertig-Mix (Liebherr Ready Made Mix).

When adding coolant:
- ▶ Use exclusively the same coolant.

Coolants contain corrosion inhibitor - antifreeze fluid.

Add coolant only on the filler neck. See Service fill.

Note
If the coolant is changed:
- ▶ Contact the Service Dept. at Liebherr-Werk Ehingen GmbH for procedure.
- ▶ Empty the cooling system completely and flush.

In exceptional cases, the coolant can be supplemented with different coolants.

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Note
Supplementing the coolant with different coolants:
▶ Contact the Service Dept. at Liebherr-Werk Ehingen GmbH for procedure.

▶ Check the coolant level. See Maintenance intervals and maintenance instructions.

1.3 Transmission

▶ Check the gear oil. See Maintenance intervals and maintenance instructions.

1.4 Hydraulic system

Note
▶ The oil level must be in the center of the hydraulic oil level sight gauge at 20 °C oil temperature.

At lower hydraulic oil temperature:
▶ Warm up the hydraulic oil.

At higher hydraulic oil temperature:
▶ Cool off the hydraulic oil.
▶ Retract all hydraulic cylinders completely, for example luffing cylinder, telescoping cylinder.

On vehicles with level regulation:
▶ Lower the vehicle completely with the level regulation.

▶ Check the hydraulic oil. See Maintenance intervals and maintenance instructions.

2 Lubrication schedule

Note
▶ Grease the crane chassis, crane superstructure and equipment with the respective lubricants. See Service fill.
▶ The equipment depends on the purchased scope of delivery.

On mobile cranes with truck chassis:
▶ Observe the maintenance intervals and maintenance notes of the truck chassis manufacturer.

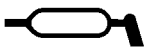

Fig.107729

Note
▶ Lube points are marked with a symbol.

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7.07 Operating fluids and lubricants

1 Specified service fluids and lubricants for Liebherr cranes 3

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Fig.195219

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1 Specified service fluids and lubricants for Liebherr cranes

No.	Crane components	Ambient temperature for driving and crane operation	
		-20 °C to +50 °C	**-40 °C to +30 °C**
1.1	Diesel engine **with**	**LWE Id. No.: 11100934**	**LWE Id. No.: 11100934**
	Exhaust aftertreatment	**Liebherr Motoroil 5W-30 low ash**	**Liebherr Motoroil 5W-30 low ash**
		or:	**or:**
		LWE Id. No.: 10663796	**LWE Id. No.: 10663796**
		Liebherr Motoroil 10W-40 low ash	**Liebherr Motoroil 10W-40 low ash**
		LH-00–ENG$_{LA}$	LH-00–ENG$_{LA}$
		Observe the instructions of the engine manufacturer	Observe the instructions of the engine manufacturer
			Below -20 °C with pre-heating
	Note: To improve the cold start ability of the diesel engine at an ambient temperature below -10 °C we recommend the use of Liebherr Motoroil 5W-30 low ash, **LWE Id. no.: 11100934**		
	Note: For alternative oil specifications, see the separate engine manufacturer's operating instructions		
1.2	Diesel engine **without**	**LWE Id. No.: 10871536**	**LWE Id. No.: 10871536**
	Exhaust aftertreatment	**Liebherr Motoroil 5W-30**	**Liebherr Motoroil 5W-30**
		or:	**or:**
		LWE Id. No.: 861005308	**LWE Id. No.: 861005308**
		Liebherr Motoroil 10W-40	**Liebherr Motoroil 10W-40**
		LH-00–ENG	LH-00–ENG
		Observe the instructions of the engine manufacturer	Observe the instructions of the engine manufacturer
			Below -20 °C with pre-heating
	Note: To improve the cold start ability of the diesel engine at an ambient temperature below -10 °C , we recommend the use of Liebherr Motoroil 5W-30, **LWE-Id no.: 10871536**		
	Note: For alternative oil specifications, see the separate engine manufacturer's operating instructions		
2	Drive axle	**LWE Id. No.: 861901008**	**LWE Id. No.: 10425142**
	with differentials,	**Liebherr Gear Hypoid 90 EP**	**Liebherr Syntogear Plus 75W-90**
	planetary gear and	SAE 90 and API GL 5	SAE 75W-90 and API GL 5
	installed distributor gear		
3	Axle drive ZF DK-7	**LWE Id. No.: 861901008**	**LWE Id. No.: 10425142**
		Liebherr Gear Hypoid 90 EP	**Liebherr Syntogear Plus 75W-90**
		ZF TE-ML 05	ZF TE-ML 05

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No.	Crane components	Ambient temperature for driving and crane operation	
		-20 °C to +50 °C	-40 °C to +30 °C
4.1	Vehicle distributor gear KESSLER VG 1800, VG 2400, VG 2550, VG 2600, VG 2700, VG 3750, VG 3751 W 3750, W 3751	**LWE Id. No.: 861901008** **Liebherr Gear Hypoid 90 EP** SAE 90 and API GL 5	**LWE Id. No.: 10425142** **Liebherr Syntogear Plus 75W-90** SAE 75W-90 and API GL 5
4.2	Vehicle distributor gear with PTO for crane drive KESSLER VG 2700 with PTO VG 3751 with PTO	**LWE Id. No.: 10425142** **Liebherr Syntogear Plus 75W-90** SAE 75W-90 and API GL 5	**LWE Id. No.: 10425142** **Liebherr Syntogear Plus 75W-90** SAE 75W-90 and API GL 5
4.3	Vehicle distributor gear ZF Passau, STEYR PUCH VG 1200, VG 1600, VG 2000, VG 3800	**LWE Id. No.: 861901008** **Liebherr Gear Hypoid 90 EP** ZF TE-ML 19	**LWE Id. No.: 10425142** **Liebherr Syntogear Plus 75W-90** ZF TE-ML 19
5	Miter gear for crane drive	**LWE Id. No.: 10425142** **Liebherr Syntogear Plus 75W-90** SAE 75W-90 and API GL 5	**LWE Id. No.: 10425142** **Liebherr Syntogear Plus 75W-90** SAE 75W-90 and API GL 5
6	Offset gear (drop box) ZF Passau, STEYR PUCH	**LWE Id. No.: 861901008** **Liebherr Gear Hypoid 90 EP** ZF TE-ML 19	**LWE Id. No.: 10425142** **Liebherr Syntogear Plus 75W-90** ZF TE-ML 19
7.1	Pump distributor gear filled with **mineral** gear oil	**LWE Id. No.: 861901008** **Liebherr Gear Hypoid 90 EP** SAE 90 and API GL 5	**LWE Id. No.: 10425142** **Liebherr Syntogear Plus 75W-90** SAE 75W-90 and API GL 5
7.2	Pump distributor gear filled with **synthetic** gear oil	**LWE Id. No.: 861901208** **Liebherr Gear PG 220** CLP PG 220, DIN 51517-3 **WARNING: May not be mixed with other oils!**	**LWE Id. No.: 10664125** **Liebherr Gear PG 150** CLP PG 150, DIN 51517-3 **WARNING: May not be mixed with other oils!**
7.3	Pump distributor gear LTC 1055-3.1	**LWE Id. No.: 10425142** **Liebherr Syntogear Plus 75W-90** SAE 75W-90 and API GL 5	**LWE Id. No.: 10425142** **Liebherr Syntogear Plus 75W-90** SAE 75W-90 and API GL 5

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No.	Crane components	Ambient temperature for driving and crane operation	
		-20 °C to +50 °C	-40 °C to +30 °C
8.1	Powershift transmission ZF torque converter WG 120, WG 150, WG 180, WG 181, WG 200, WG 201	**LWE Id. No.: 861005308** **Liebherr Motoroil 10W-40** ZF TE-ML 03	**LWE Id. No.: 861900608** **Liebherr Hydraulic-Gear ATF** ZF TE-ML 03 **Below -20 °C** run until warm according to the operating instructions
8.2	Powershift transmission ZF torque converter WG 251* ZF ERGOPOWER WG 210, WG 260, WG 310 * also for ambient temperatures above -10 °C	**LWE Id. No.: 861900608** **Liebherr Hydraulic-Gear ATF** ZF TE-ML 03	**LWE Id. No.: 861900608** **Liebherr Hydraulic-Gear ATF** ZF TE-ML 03 **Below -20 °C** run until warm according to the operating instructions
9	Powershift transmission CLARK	**LWE Id. No.: 861005308** **Liebherr Motoroil 10W-40** SAE 10W-40 and ACEA E4	**LWE Id. No.: 861900608** **Liebherr Hydraulic-Gear ATF** ATF Dexron II D and ALLISON C4 **Below -20 °C** run until warm according to the operating instructions
10	Offset gear (drop box) ALLISON	**LWE Id. No.: 861005308** **Liebherr Motoroil 10W-40** SAE 10W-40 and API CF, ACEA E4	**LWE Id. No.: 861900608** **Liebherr Hydraulic-Gear ATF** ALLISON C4 **Below -20 °C** run until warm according to the operating instructions
11.1	Automatic transmission ALLISON CLBT 740, CLBT 750, CLBT 754, CLBT 755 HT 755, HD 4560	**LWE Id. No.: 861900608** **Liebherr Hydraulic-Gear ATF** ALLISON C4	**LWE Id. No.: 861903708** **CASTROL Transynd** ALLISON C4 **Below -20 °C** run until warm according to the operating instructions
11.2	Automatic transmission ZF	**LWE Id. No.: 861900608** **Liebherr Hydraulic-Gear ATF** ZF TE-ML 14	**LWE Id. No.: 861900608** **Liebherr Hydraulic-Gear ATF** ZF TE-ML 14 **Below -20 °C** run until warm according to the operating instructions

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No.	Crane components	Ambient temperature for driving and crane operation	
		-20 °C to +50 °C	-40 °C to +30 °C
12.1	Automatic transmission ZF AS-Tronic ZF TC-Tronic (basic gear) ZF TC-Tronic HD (basic gear)	**LWE Id. No.: 10218305** **ZF-Ecofluid M** ZF TE-ML 02	**LWE Id. No.: 10218305** **ZF-Ecofluid M** ZF TE-ML 02 **below -20 °C** preheat the gear according to the operating instructions
12.2	Automatic transmission ZF TraXon ZF TraXon Torque (basic gear)	**LWE Id. No.: 10218305** **ZF-Ecofluid M** ZF TE-ML 02	**LWE Id. No.: 10218305** **ZF-Ecofluid M** ZF TE-ML 02 **below -20 °C** preheat the gear according to the operating instructions
13.1	Torque converter coupling ZF TC HD	**LWE Id. No.: 10218305** **ZF-Ecofluid M** ZF TE-ML 02	**LWE Id. No.: 10218305** **ZF-Ecofluid M** ZF TE-ML 02 **below -20 °C** preheat the gear according to the operating instructions
13.2	Torque converter coupling ZF TC 2	**LWE Id. No.: 861900608** **Liebherr Hydraulic-Gear ATF** ZF TE-ML 14	**LWE Id. No.: 861900608** **Liebherr Hydraulic-Gear ATF** ZF TE-ML 14
14	Transmission ZF ECO-Split	**LWE Id. No.: 10218305** **ZF-Ecofluid M** ZF TE-ML 02	**LWE Id. No.: 10218305** **ZF-Ecofluid M** ZF TE-ML 02
15	Slewing gear	**LWE Id. No.: 861901208** **Liebherr Gear PG 220** CLP PG 220, DIN 51517-3 **WARNING: May not be mixed with other oils!**	**LWE Id. No.: 861901208** **Liebherr Gear PG 220** CLP PG 220, DIN 51517-3 **WARNING: May not be mixed with other oils!**
16.1	Rope winch	**LWE Id. No.: 861901208** **Liebherr Gear PG 220** CLP PG 220, DIN 51517-3 **WARNING: May not be mixed with other oils!**	**LWE Id. No.: 861901208** **Liebherr Gear PG 220** CLP PG 220, DIN 51517-3 **WARNING: May not be mixed with other oils!**
16.2	Rope winch (tooth flanks) LR 13000	**LWE Id. No.: 11000948** **Liebherr Universal grease 9900** KPF2N-25, DIN 51502	**LWE Id. No.: 11000948** **Liebherr Universal grease 9900** KPF2N-25, DIN 51502

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No.	Crane components	Ambient temperature for driving and crane operation	
		-20 °C to +50 °C	-40 °C to +30 °C
17	Winch of Telescopic boom guying	**LWE Id. No.: 861901208** **Liebherr Gear PG 220** CLP PG 220, DIN 51517-3 **WARNING: May not be mixed with other oils!**	**LWE Id. No.: 861901208** **Liebherr Gear PG 220** CLP PG 220, DIN 51517-3 **WARNING: May not be mixed with other oils!**
18.1	Crane hydraulics Crane chassis and crane superstructure Observe exceptions, see 18.2	**LWE Id. No.: 861903508** **Liebherr Hydraulic 37**	**LWE Id. No.: 10293807** **Liebherr Hydraulic Plus Arctic**
18.2	Crane hydraulics Crane chassis and crane superstructure LTM 11200-9.1 LTR 11200 LR 13000, LR 11000, LR 1600/2, LR 1600/2-W LTC 1055-3.1	**LWE Id. No.: 10293807** **Liebherr Hydraulic Plus Arctic**	**LWE Id. No.: 10293807** **Liebherr Hydraulic Plus Arctic**
19	Brake system if hydraulically actuated	**LWE Id. No.: 861000108** **DOT 4** SAE J 1703e	**LWE Id. No.: 861000108** **DOT 4** SAE J 1703e
20	Clutch actuator	**LWE Id. No.: 861000108** **DOT 4** SAE J 1703e	**LWE Id. No.: 861000108** **DOT 4** SAE J 1703e
21	King pin bearing Gear shaft if **not** maintenance-free	**LWE Id. No.: 861301308** **Liebherr Special grease 9610 Plus** KP2K-20, DIN 51502	**LWE Id. No.: 10296825** **Liebherr Universal grease Arctic** KPFHC1N-60, DIN 51502
22.1	Glide and roller bearing roller bearing joint	**LWE Id. No.: 861301308** **Liebherr Special grease 9610 Plus** KP2K-20, DIN 51502	**LWE Id. No.: 10296825** **Liebherr Universal grease Arctic** KPFHC1N-60, DIN 51502
22.2	Rope pulley bearing	**LWE Id. No.: 10296825** **Liebherr Universal grease Arctic** KPFHC1N-60, DIN 51502	**LWE Id. No.: 10296825** **Liebherr Universal grease Arctic** KPFHC1N-60, DIN 51502
23	Central lubrication system	**LWE Id. No.: 861301308** **Liebherr Special grease 9610 Plus** KP2K-20, DIN 51502	**LWE Id. No.: 10296825** **Liebherr Universal grease Arctic** KPFHC1N-60, DIN 51502

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No.	Crane components	Ambient temperature for driving and crane operation	
		-20 °C to +50 °C	-40 °C to +30 °C
24.1	Slewing ring connection Roller bearing	**LWE Id. No.: 861301308** **Liebherr Special grease 9610 Plus** KP2K-20, DIN 51502	**LWE Id. No.: 10296825** **Liebherr Universal grease Arctic** KPFHC1N-60, DIN 51502
24.2	Slewing ring connection LR 13000	**LWE Id. No.: 11000948** **Liebherr Universal grease 9900** KPF2N-25, DIN 51502	**LWE Id. No.: 10296825** **Liebherr Universal grease Arctic** KPFHC1N-60, DIN 51502
25.1	Support plate with equalization	**LWE Id. No.: 10877698** **Loctite LB 8104** Silicone oil base **WARNING: Do not use oils with another base!**	**LWE Id. No.: 10877698** **Loctite LB 8104** Silicone oil base **WARNING: Do not use oils with another base!**
25.2	Glide shoes for cab guidance on vehicle frame LTC 1045-3.1 LTC 1050-3.1	**LWE Id. No.: 861303608** **Liebherr Telescope grease 9613 Plus** KP2K-30, DIN 51502	**LWE Id. No.: 861303608** **Liebherr Telescope grease 9613 Plus** KP2K-30, DIN 51502
26	Sliding beam Plastic glide bearing Beam for track adjustment	**LWE Id. No.: 861303608** **Liebherr Telescope grease 9613 Plus** KP2K-30, DIN 51502	**LWE Id. No.: 861303608** **Liebherr Telescope grease 9613 Plus** KP2K-30, DIN 51502
27.1	Telescopic boom Plastic glide bearing Corner guide top	**LWE Id. No.: 861303608** **Liebherr Telescope grease 9613 Plus** KP2K-30, DIN 51502	**LWE Id. No.: 861303608** **Liebherr Telescope grease 9613 Plus** KP2K-30, DIN 51502
27.2	Telescopic boom Outer glide bearing Lower shell Inner glide bearing (only during assembly)	**LWE Id. No.: 861303308** **Liebherr Special grease 1336** KP2K-30, DIN 51502 Spray grease	**LWE Id. No.: 861303308** **Liebherr Special grease 1336** KP2K-30, DIN 51502 Spray grease
27.3	Telescopic boom LTC 1045-3.1 LTC 1050-3.1	**LWE Id. No.: 11651459** **Bechem Berulub TCG 1 V**	**LWE Id. No.: 11651459** **Bechem Berulub TCG 1 V**
27.4	Telescopic boom LTM 1050-3.1	**LWE Id. No.: 10878154** **Liebherr Sliding Paste TB 1**	**LWE Id. No.: 10878154** **Liebherr Sliding Paste TB 1**

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No.	Crane components	Ambient temperature for driving and crane operation	
		-20 °C to +50 °C	-40 °C to +30 °C
28	Boom lock	**LWE Id. No.: 861301308** **Liebherr Special grease 9610 Plus** KP2K-20, DIN 51502	**LWE Id. No.: 10296825** **Liebherr Universal grease Arctic** KPFHC1N-60, DIN 51502
29	Guide rail on Telescoping cylinder	**LWE Id. No.: 861303308** **Liebherr Special grease 1336** KP2K-30, DIN 51502 Spray grease	**LWE Id. No.: 861303308** **Liebherr Special grease 1336** KP2K-30, DIN 51502 Spray grease
30	Gear ring rotary connection Slewing gear drive pinion	**LWE Id. No.: 861007708** **Liebherr RHS-Fluid** OGPF 0 S-20, DIN 51502	**LWE Id. No.: 861007708** **Liebherr RHS-Fluid** OGPF 0 S-20, DIN 51502
		or **LWE Id. No.: 861301508** **Liebherr gear protection RHY** OGPF 2 S-30, DIN 51502	**or** **LWE Id. No.: 861301508** **Liebherr gear protection RHY** OGPF 2 S-30, DIN 51502
31	Running rope	**LWE Id. No.: 10173371** **Liebherr WR-Lube SC** Adhesive grease	**LWE Id. No.: 10173371** **Liebherr WR-Lube SC** Adhesive grease
		or **LWE Id. No.: 10174262** **Liebherr WR-Lube SC** Adhesive grease	**or** **LWE Id. No.: 10174262** **Liebherr WR-Lube SC** Adhesive grease
32	Radiator fluid Diesel engine and heating system	**LWE Id. No.: 10871121** **Liebherr Antifreeze OS Mix** Pre-mixed corrosion inhibitor / antifreeze **WARNING: May not be diluted and / or mixed with other corrosion inhibitors / antifreeze!**	**LWE Id. No.: 10871121** **Liebherr Antifreeze OS Mix** Pre-mixed corrosion inhibitor / antifreeze **WARNING: May not be diluted and / or mixed with other corrosion inhibitors / antifreeze!**
33.1	Travel gears Crawler crane	see data tag	see data tag
33.2	Travel gears telescope crawler crane	see data tag	see data tag
34	Recovery winch	See the data tag and manufacturer's specifications	See the data tag and manufacturer's specifications
35	Recovery winch rope	See the manufacturer's specifications	See the manufacturer's specifications
36	Steering uncoupling LTC 1045-3.1 LTC 1050-3.1	**LWE Id. No.: 10800345** **Teflon Spray**	**LWE Id. No.: 10800345** **Teflon Spray**

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No.	Crane components	Ambient temperature for driving and crane operation	
		-20 °C to +50 °C	-40 °C to +30 °C
37	Pin connections	**LWE Id. No.: 11000948** **Liebherr Universal grease 9900** KPF2N-25, DIN 51502	**LWE Id. No.: 11000948** **Liebherr Universal grease 9900** KPF2N-25, DIN 51502

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8 Inspections of cranes

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8.01 Periodic crane inspections

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1 General information

This crane was tested at the manufacturer's facilities prior to shipment in accordance with the valid ISO, FEM and DIN Standards and DGUV 52 (DGUV 309-001).

The safety level achieved during initial start up may not be attainable during operation.

Examples of the root cause of such deviations include; e.g., wear and tear, corrosion, effects of external forces, changes in the environment and changes to the mode of operation.

The operator is responsible for taking the necessary steps to ensure that the level of safety is maintained.

Periodic inspections are regulated nationally in the BetrSichV.

The crane operator is therefore obligated to have the crane inspected by an **authorized inspector**, at intervals depending on the operational conditions but at least once per year, from the first day of vehicle registration.

The operator specifies an authorized inspector and assigns him to perform the tests and maintenance required nationally and by Liebherr-Werk Ehingen GmbH to ensure further, safe and reliable crane operation:
- Carry out the inspection tasks required by Liebherr-Werk Ehingen GmbH.
- Additional national inspection intervals must be monitored by the crane operator.

Every 4 operating years, in the 13th operating year and thereafter at least annually, from the first day of vehicle registration, the crane must be inspected by an **inspection expert**.

Periodic inspection are principally a visual inspection, where the inspector (either type) appraises the condition of the crane and its components.

WARNING
There is danger of weakening the supporting components when major changes or repairs are made to the crane!
▶ In this case, the operator must have the crane reinspected by an inspection expert before putting it back in service!

In addition, all respective local and national regulations also apply.

Authorized inspector
Authorized inspectors are those persons who through their professional training, their professional experience and their recent professional activity have the necessary knowledge for the inspection of work equipment.

Authorized inspector for pressure tanks
Authorized inspector for pressure tanks are authorized inspectors who additionally:
- Have relevant technical professional training.
- Have at least one year of experience with the manufacture, assembly, operation or maintenance of the equipment or components to be inspected in accordance with BetrSichV.
- Keep their knowledge about pressure-related hazards up to date by participating in training or instruction, in particular with regard to the following topics:
  - Design and manufacturing processes
  - Equipment and safeguarding concepts
  - Assembly, installation and operation / use
  - Intended use
  - Risk assessment
  - Inspections, inspection periods, inspection procedures including assessment of the results
  - Relevant influences and damage symptoms found in practice

Inspection expert
Inspection experts are authorized inspectors who also:
- Have completed training as an engineer or have equivalent knowledge and experience in the subject area with which their activities are involved.

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- Have at least three years of experience in the design, construction, maintenance or inspection of cranes, of which at least half a year were involved in the inspection activities of an inspection expert.
- Possess sufficient knowledge of the relevant regulations and rules.
- Have the necessary facilities for inspection and documentation.
- Keep their professional knowledge up to date.

To ensure the high safety standard of the crane, it is recommended, no later than the 12th year, in the 20th year, in the 26th year and then every 4 years, to have the crane undergo a **general inspection** by an **inspection expert**. At that time, in addition to the usual scope of inspection, all load carrying parts of the crane - the complete steel structure with all welding seams as well as all components and connecting devices - are to be subjected to a complete visual inspection. The following procedural notes for repeat inspections are to be observed for that.

The purpose of the inspections is to avoid accidents by detecting deficiencies early on. Any deficiencies found by the inspector must be documented, corrected and subsequently reinspected.

A number of important examples of items that are particularly important during the periodic crane inspections are listed in the following. We wish to advise that the **authorized inspectors** or **inspection experts** take sole responsibility for the crane inspections that they carry out.

Note

▶ The inspection may not be solely limited to the following positions shown in the sample component illustrations. Rather the **entire** crane structure must be subjected to a careful inspection!

In the Crane operating instructions, chapter 8.90 is a checklist to assist the inspector during the periodic inspections of Liebherr mobile and crawler cranes.

If the inspector has any questions they should be directed through the Service Department of Liebherr-Werk Ehingen GmbH to the technical departments.

WARNING

Danger of accident!

▶ Adhere to the following inspection guidelines and intervals.

2 Inspecting load bearing crane structures, especially steel structures

2.1 Basic principles and procedure

DANGER

Danger of fatal injury!

The crane structures, particularly steel constructions, have to be checked by an **authorized inspector** or **inspection expert** at least once a year. If this is not the case, they could fail and cause fatal injury or seriously damage the crane!

▶ Crane structures, particularly steel constructions must be checked by an **authorized inspector** or an **inspection expert** at least once a year!

▶ Shorten the inspection intervals when the crane is subjected to above-average load spectrums, for example when handling large material quantities or frequently erecting long boom systems.

▶ When the crane was subjected to excessive operating loads; e.g., due to an unusual impact, the crane structure, especially the steel structures must be inspected immediately!

Crane structures, especially steel structures, such as booms, turntables, chassis, support equipment (e.g., sliding beams or folding outriggers) must be carefully inspected, at the very least during the annual recommended crane inspections. Inspect welding seams especially through an intensive visual inspection.

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If paint damage with corrosion (rust) is found on load carrying parts of the crane structure, especially on telescopic booms, lattice booms, lattice jibs, pull rods etc., then the rust must be removed, primed and painted.

In the case of an electrolyte process, such as corrosion in combination with water, atomic hydrogen is created, which leads to hydrogen induced corrosion with resulting cracks on high tensile fine grain construction steel.

If disassembly and assembly work on the crane is required to carry out the inspections, then they must be carried out by taking the manufacturer's data into account or in coordination with the crane manufacturer.

We would like to point out that the framework of mobile cranes is designed for a limited number of stress work cycles. This also determines the utilization or service life of the framework. The service life is not determined solely by the number of stress cycles. It also depends on the loads (load spectrum) applied during the time in operation.

Liebherr mobile and crawler cranes are designed for specific characteristics and movements, such as constant deployment of drive forces, only occasional operation and load conditions according to EN 13000.

Liebherr mobile and crawler cranes are designed for assembly operation and, according to grouping in class A1 according to ISO 4301-1, they can only take on a limited number of work cycles (N = 63000) with a collective class Q1 = light (kp = 0.125).

Example of a load collective according to grouping in collective class Q_1 = light (k_p = 0.125).

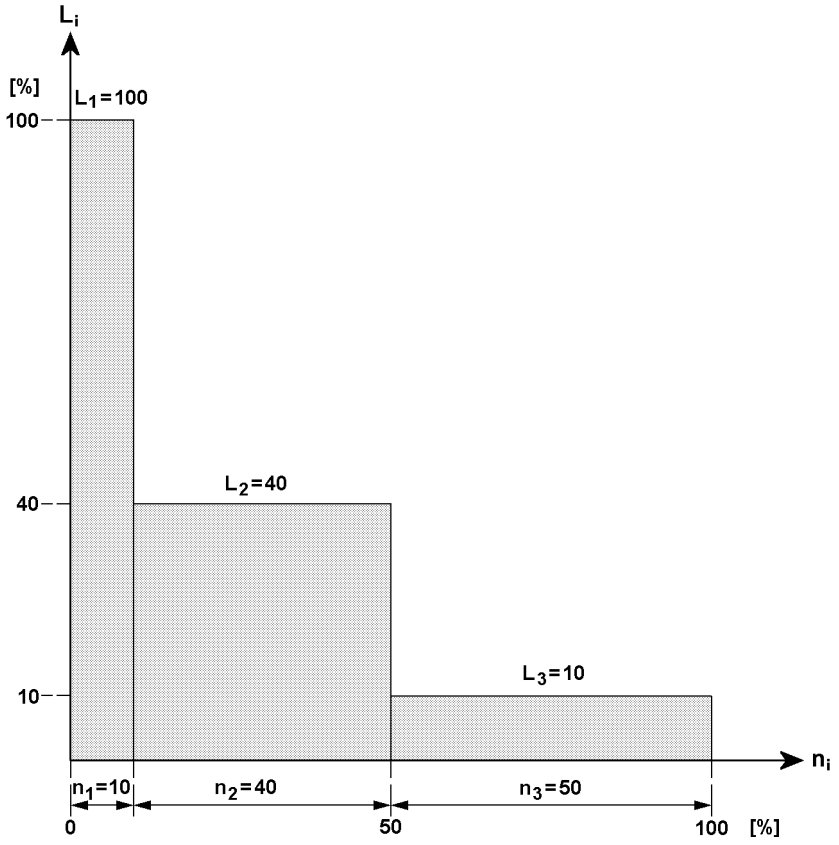

Fig.104716

L_i: Load proportion in relation to maximum load [%]

n_i: Load cycles in relation to maximum number [%]

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Note

- The service life of Liebherr mobile and crawler cranes can be drastically reduced, for example when used in magnet, grapple or material handling applications!
- Repeated inspection of crane structure, especially the steel structure and the welding seams must then be carried out in shorter intervals than specified.

For that reason, the steel structures and the welding joints must be subjected to a visual intensive inspection by the **authorized inspector** or **inspection expert** during the specified periodic inspections.

If any damage (such as cracks or suspicion of cracks) are apparent on any part of the steel structure, the total extent of the damage must be determined by qualified specialists using appropriate material testing methods, such as magnetic crack detection, ultrasound or x-rays. Thereafter, the qualified personnel must determine whether or not the damaged area can be repaired by welding or by other means.

The following diagrams are samples of the load-bearing welding structures. The welding joints or seams or steel structural zones that require inspection may be present more than once and in various forms. The joints or zones must be inspected all around at the locations identified by arrows.

Note

- The scope and extent of all inspections remain the sole responsibility of the inspectors!
- The scope and results of tests should be documented to permit reproducibility. This documentation forms part of the crane records and should be safely stored during the entire service life of the crane!
- The following diagrams are provided to assist the inspector. The illustrations are only examples and are not necessarily 100 % complete!

2.2 Repair welding

Defects such as cracks or permanent deformation on load-bearing steel components must be immediately reported to the Service Department at **Liebherr-Werk Ehingen GmbH**.

The defect must immediately be appraised by an inspection expert according to standard welding technology rules. The inspection expert must immediately ascertain if the crane can continue to be safely operated due to danger of accident until a repair welding is performed.

Repair welding may solely be made in consultation and under the instructions of the Customer Service at **Liebherr-Werk Ehingen GmbH** by authorized and trained expert personnel.

WARNING

Repair welding **not** according to regulations!
Death, severe bodily injuries, property damage.

- Contact Customer Service at **Liebherr-Werk Ehingen GmbH**.
- Coordinate the procedure for repair welding with **Liebherr-Werk Ehingen GmbH**.

Note

Exclusion of liability!
For repair welding, which were not carried out by personnel from **Liebherr-Werk Ehingen GmbH** or by authorized personnel from **Liebherr-Werk Ehingen GmbH**, **Liebherr-Werk Ehingen GmbH** excludes any liability, for system functionality as well as for the parts.

- Have repair welding made solely by personnel of **Liebherr-Werk Ehingen GmbH** or by personnel authorized by **Liebherr-Werk Ehingen GmbH**.

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2.3 Examples of test points

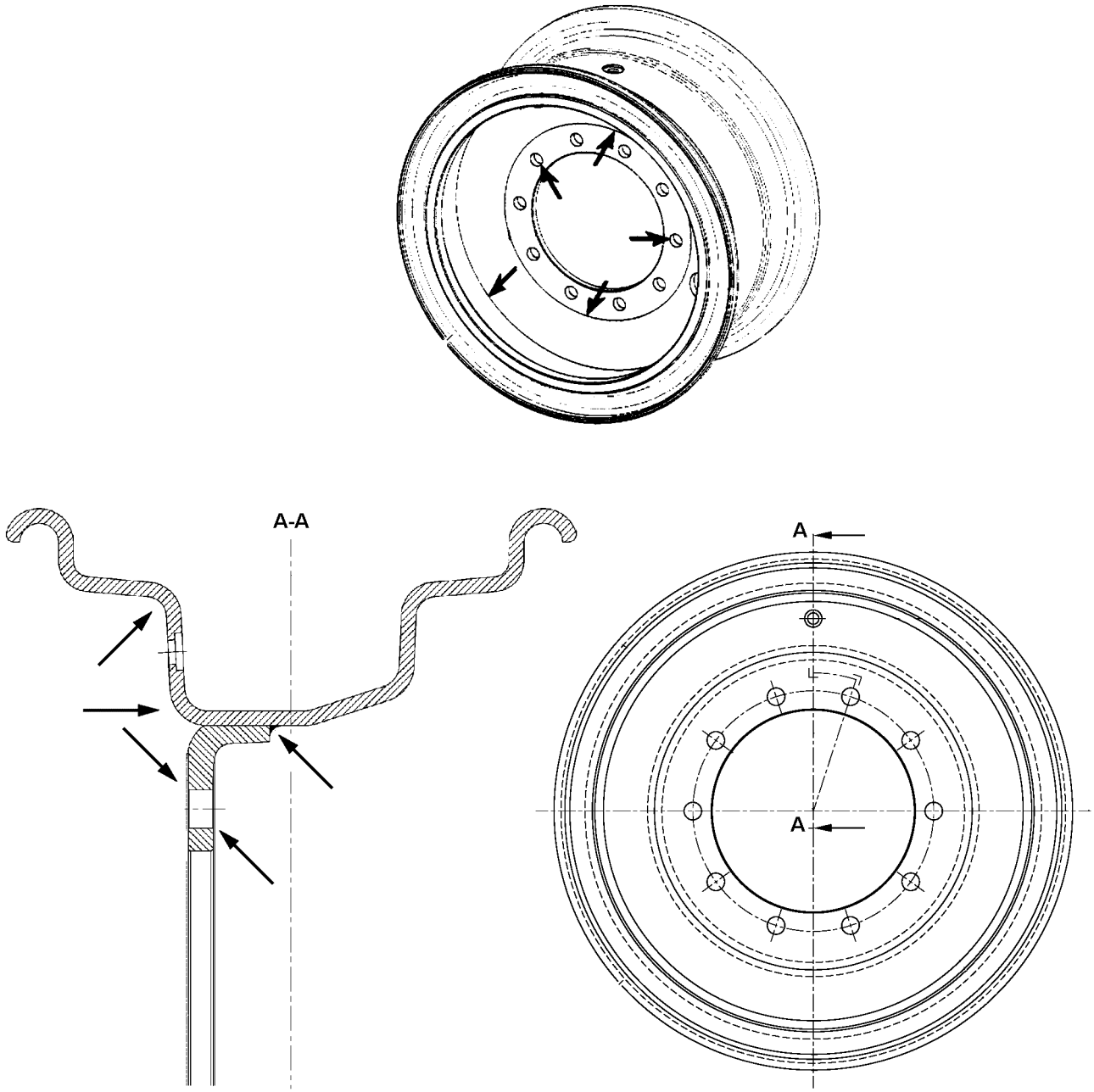

Fig.118052: Example of a 1-part disk wheel

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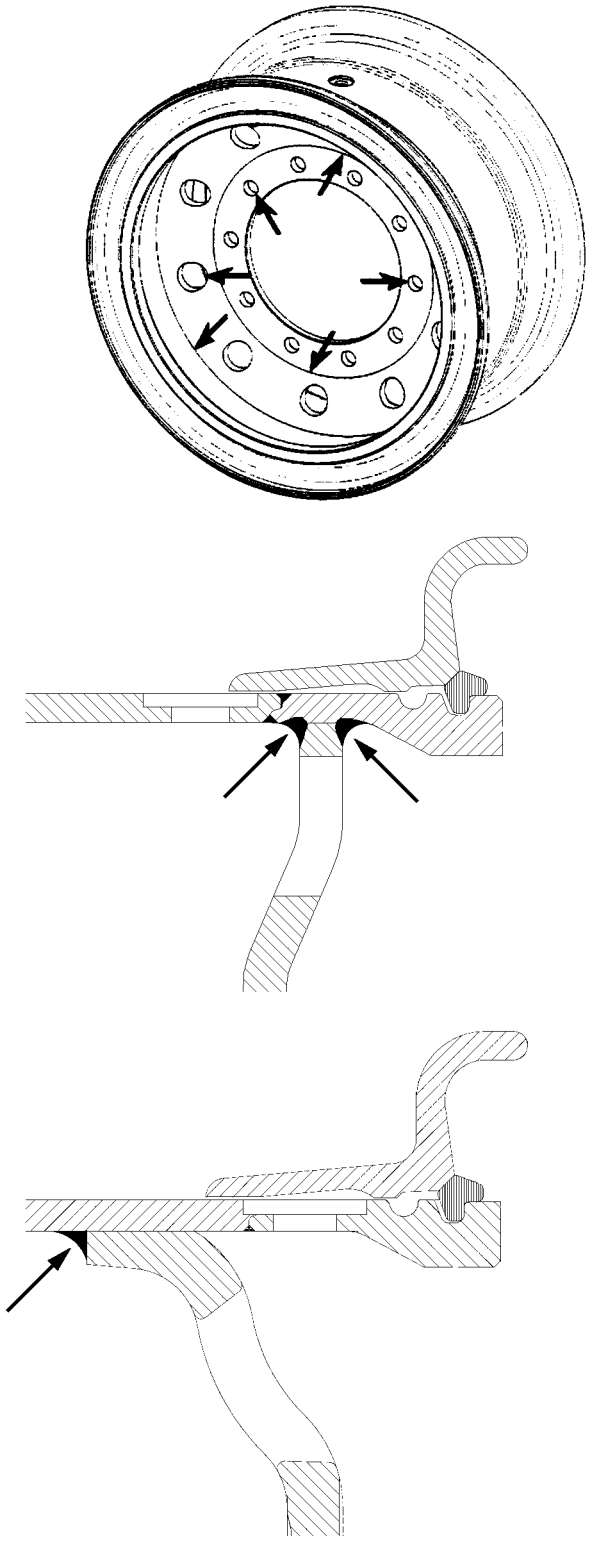

Fig.118053: Example of a 3-part disk wheel

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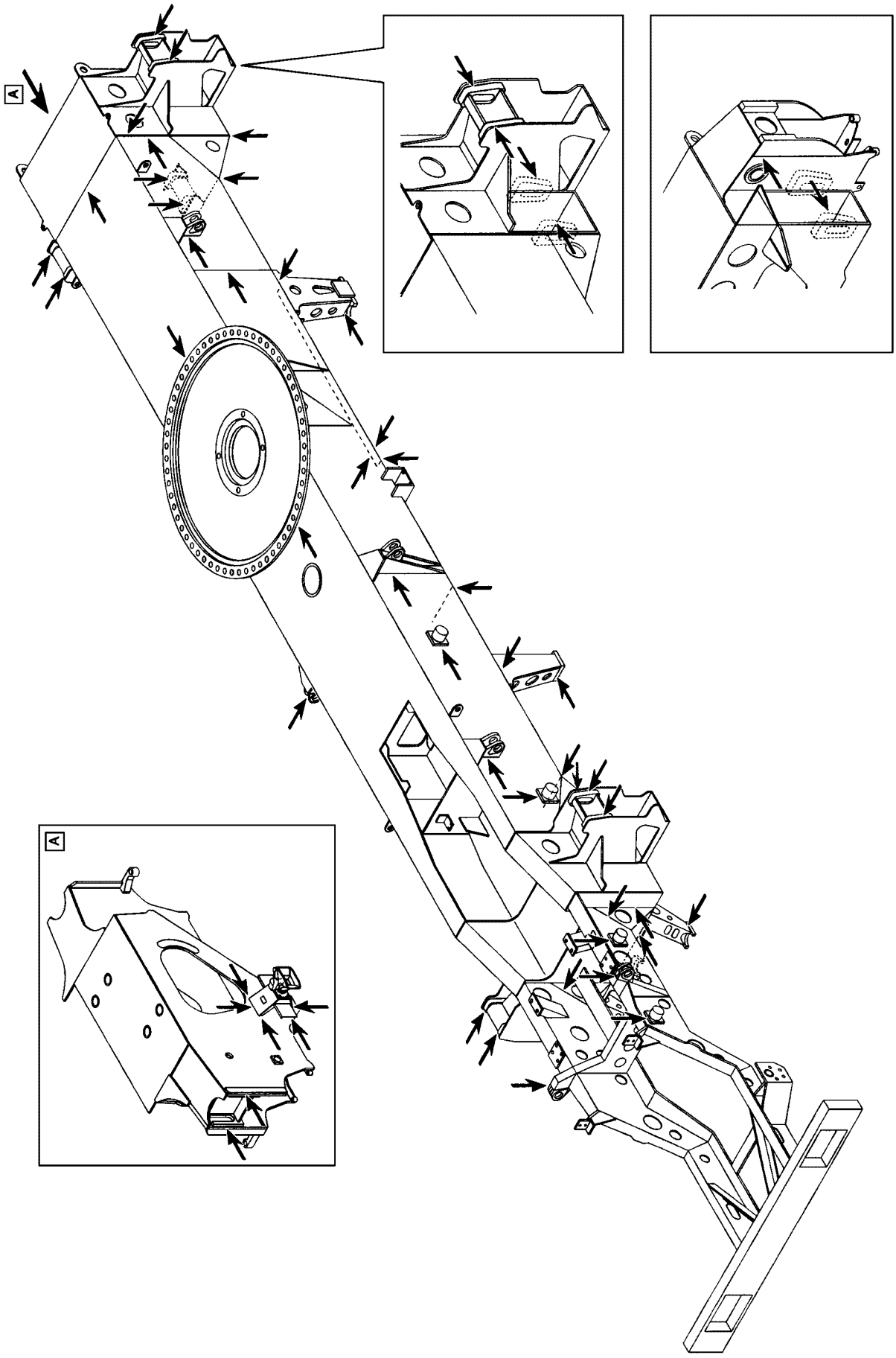

Fig.185046: Example of a vehicle frame

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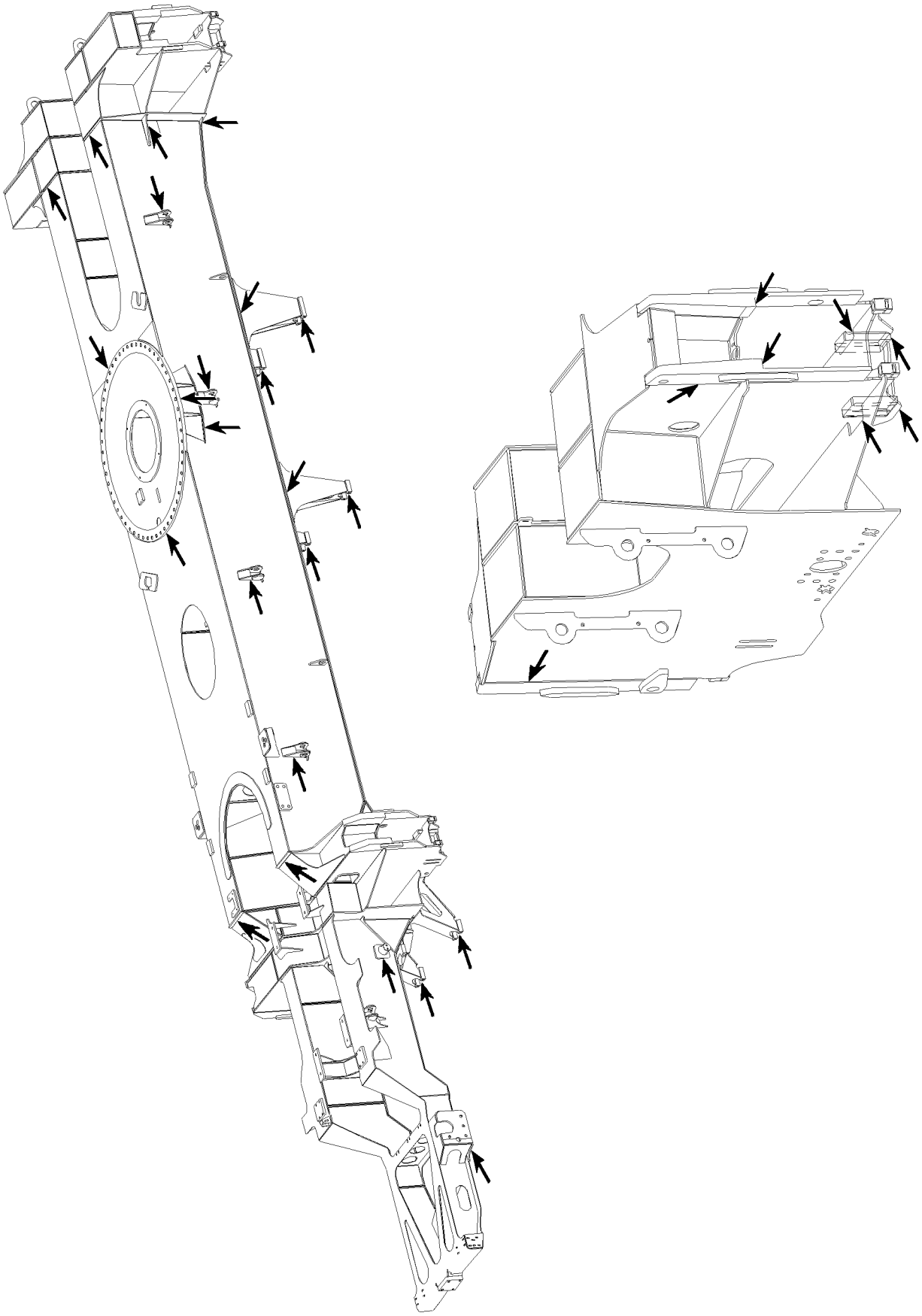

Fig.105702: Example of a vehicle frame

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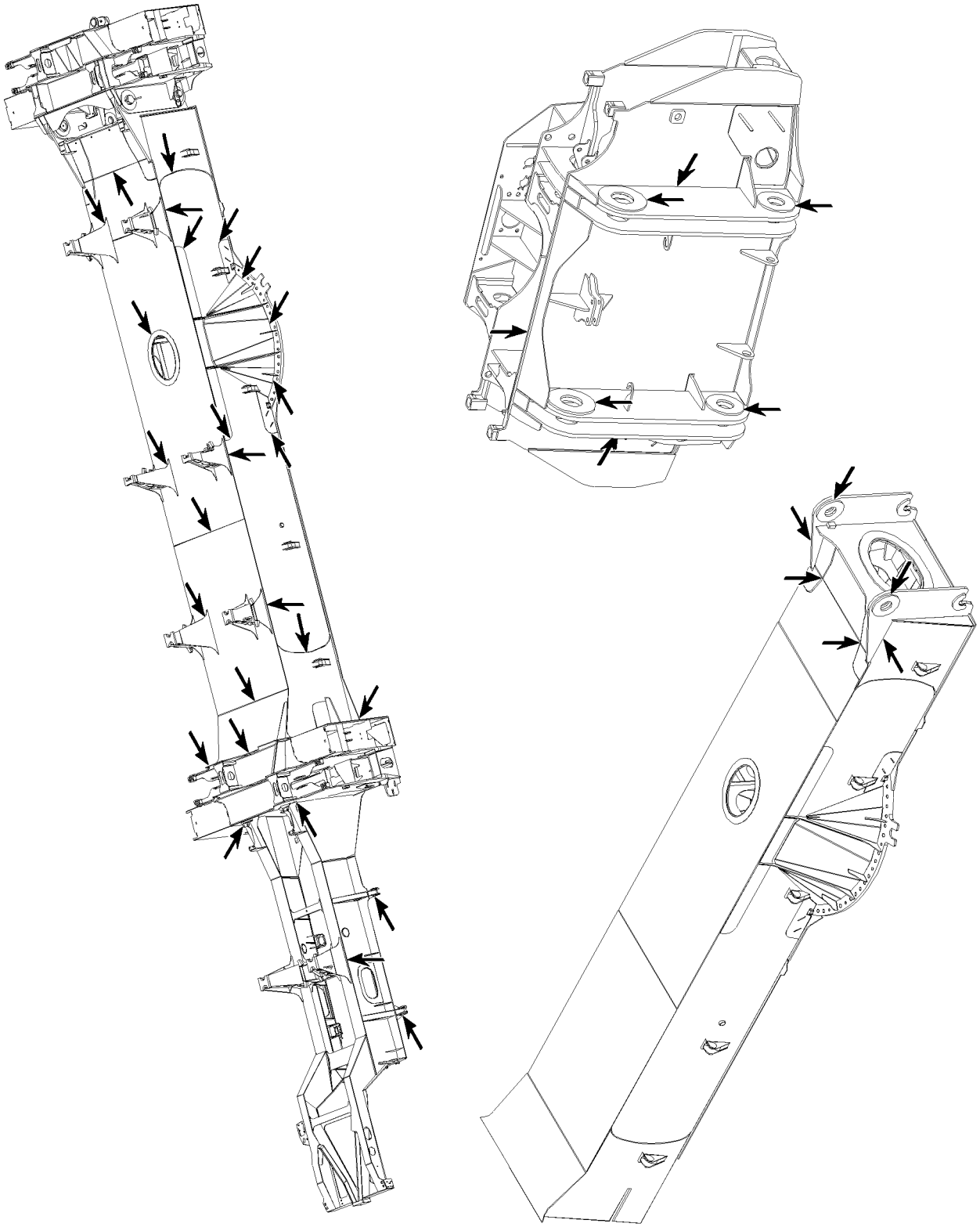

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Fig.105719: Example of a vehicle frame

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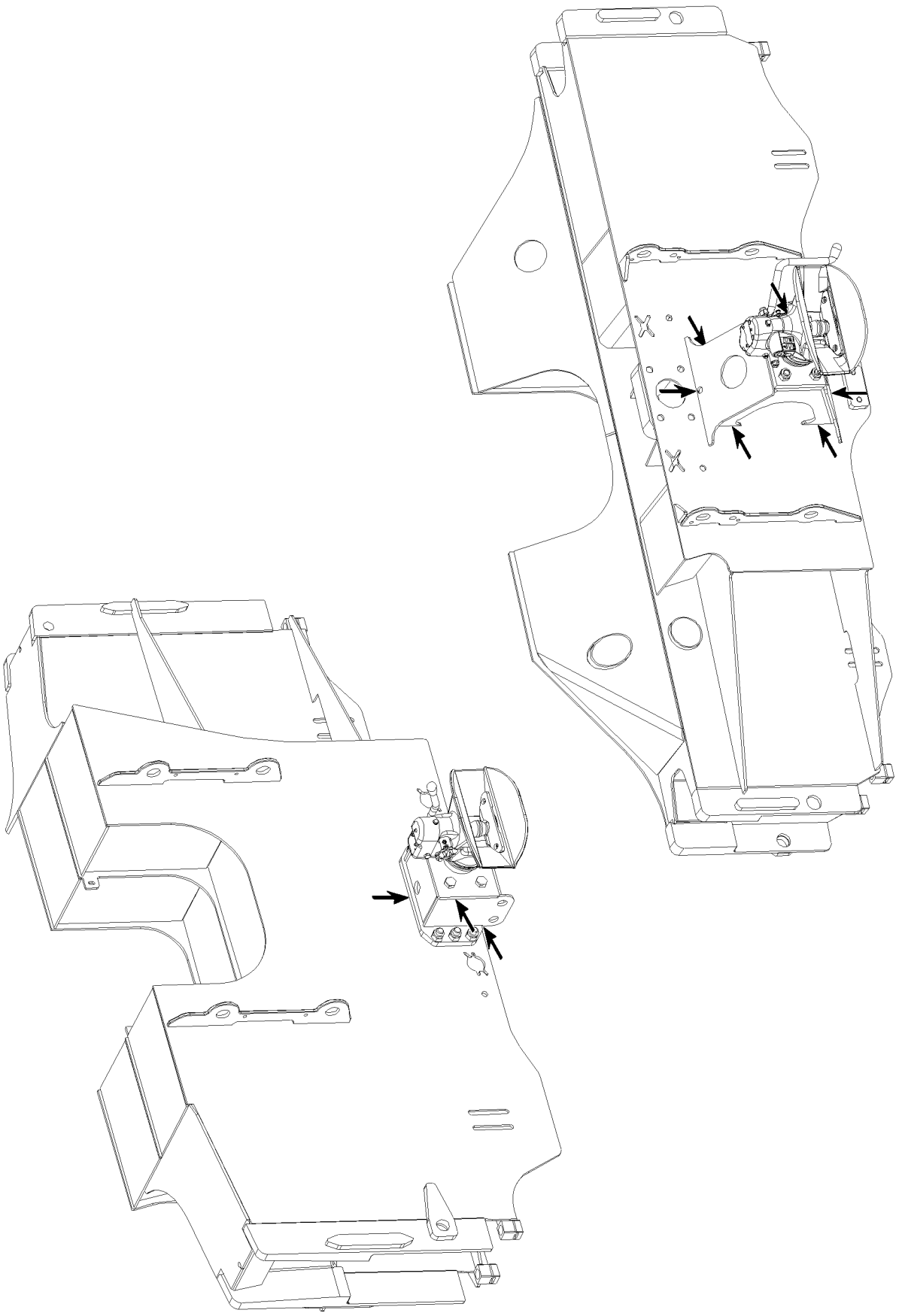

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Fig.105687: Example of tow coupling

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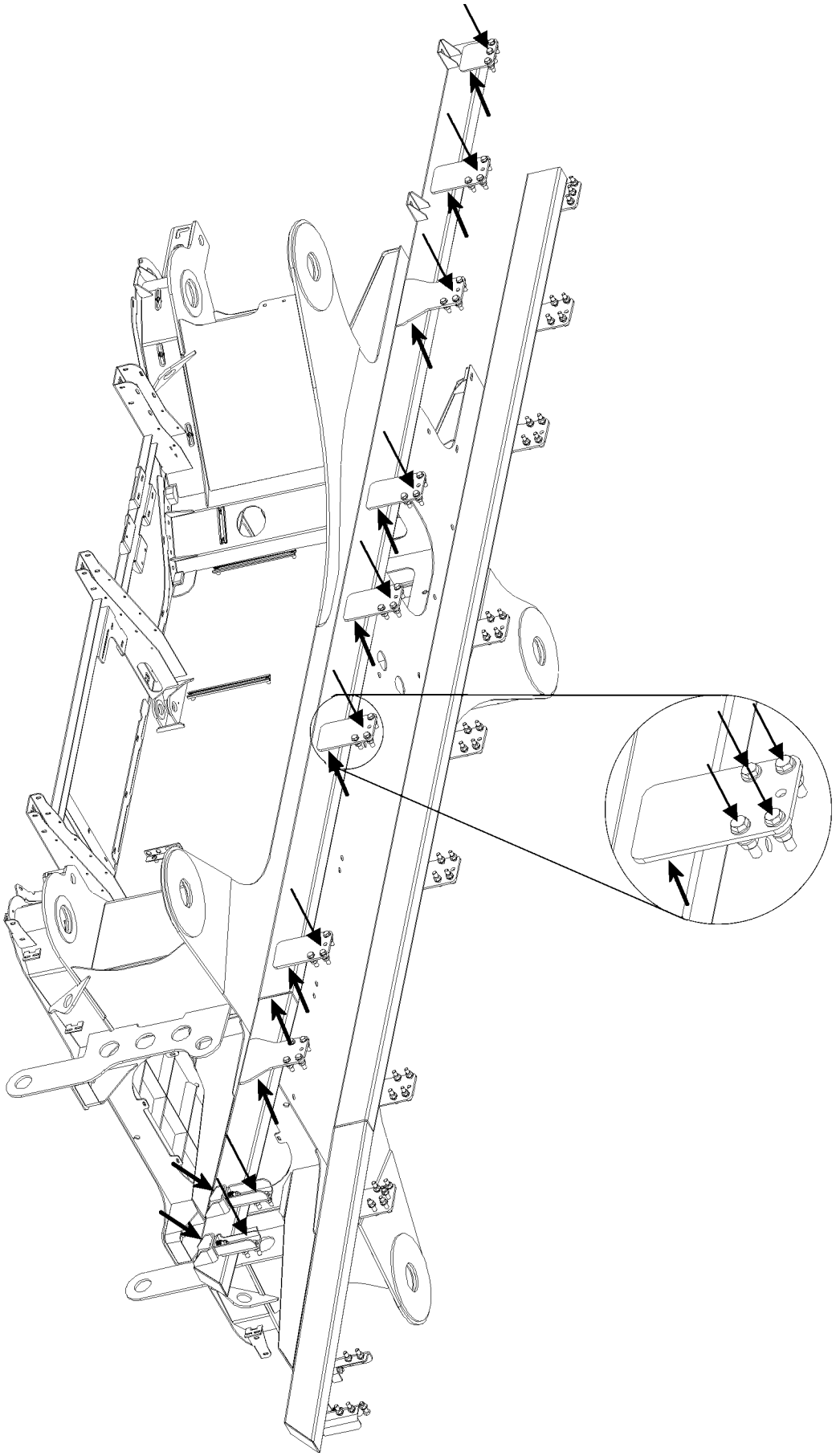

Fig.113940: Example of an intermediate frame

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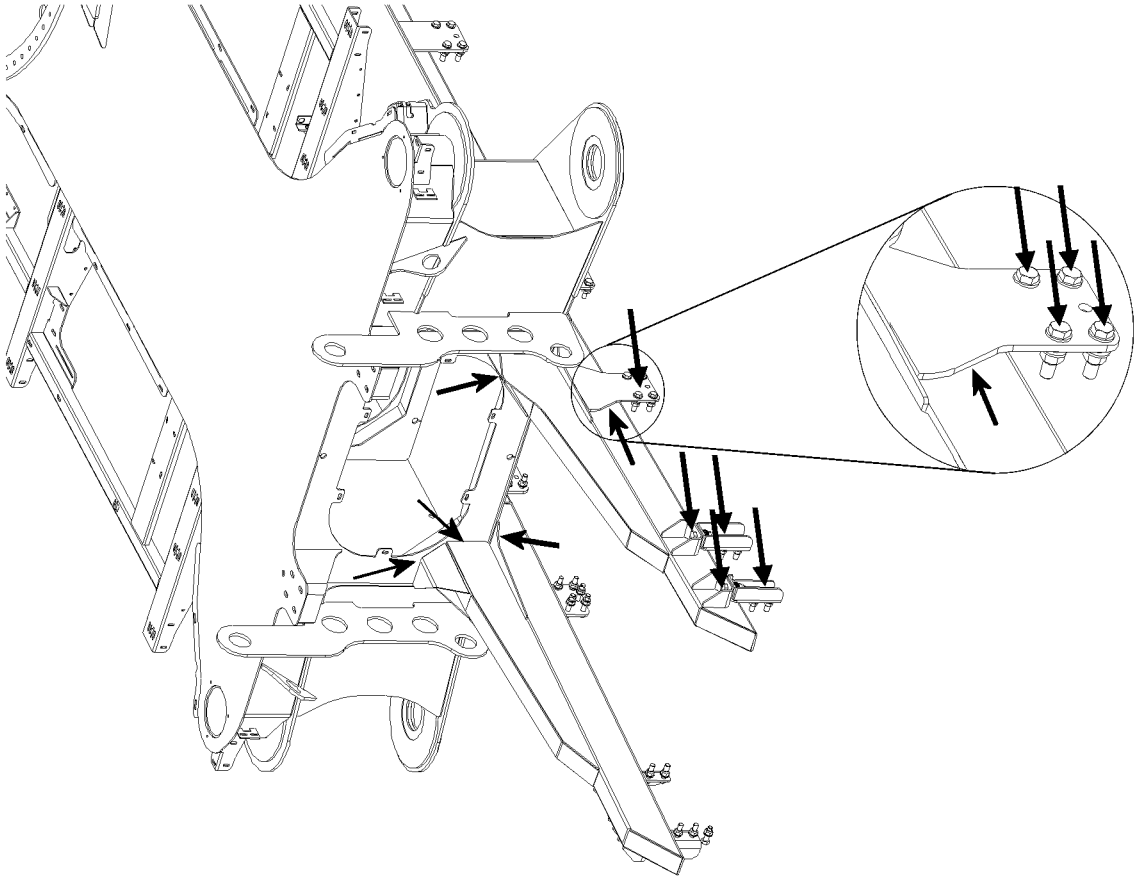

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Fig.114000: Example of an intermediate frame

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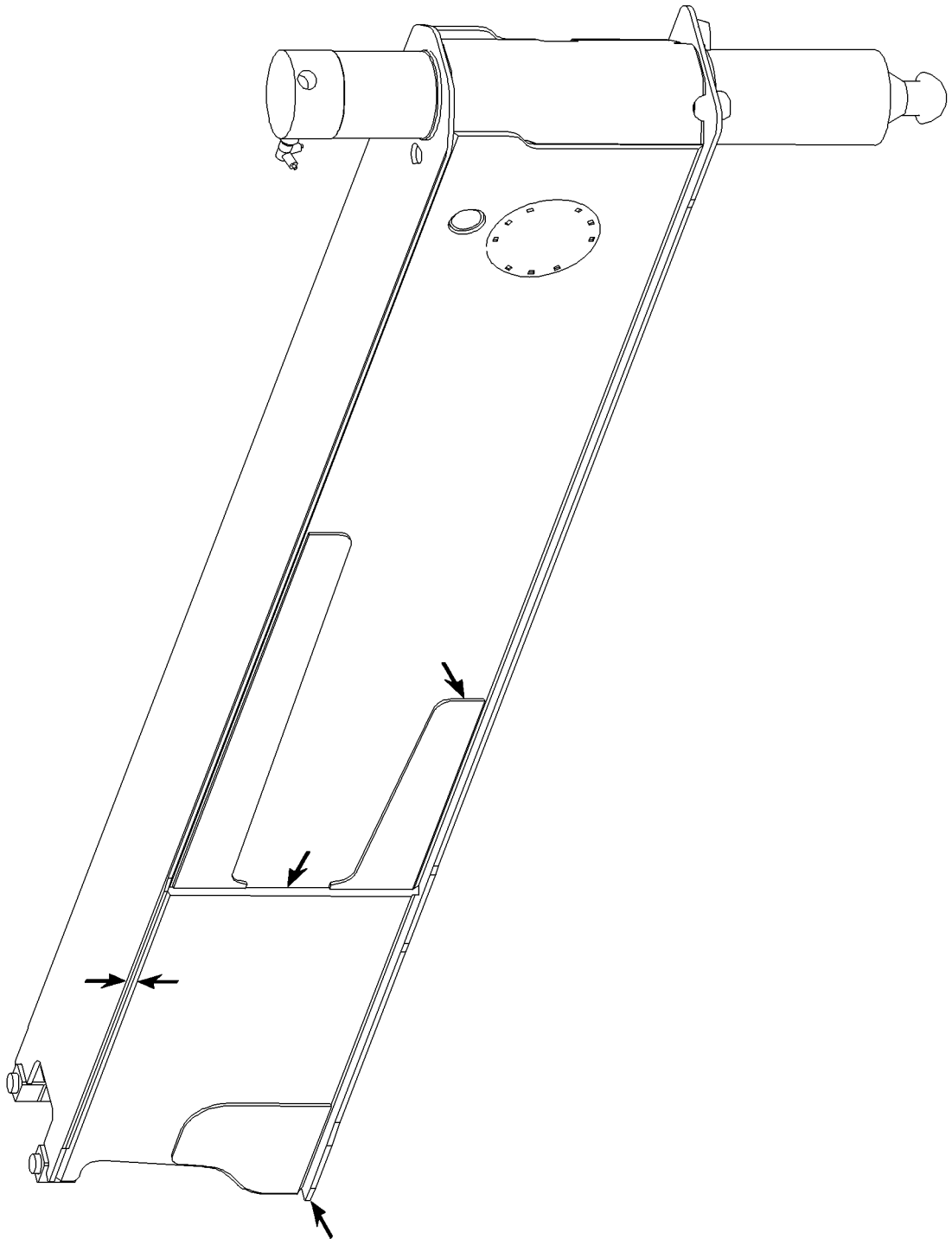

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Fig.105698: Example of a sliding beam

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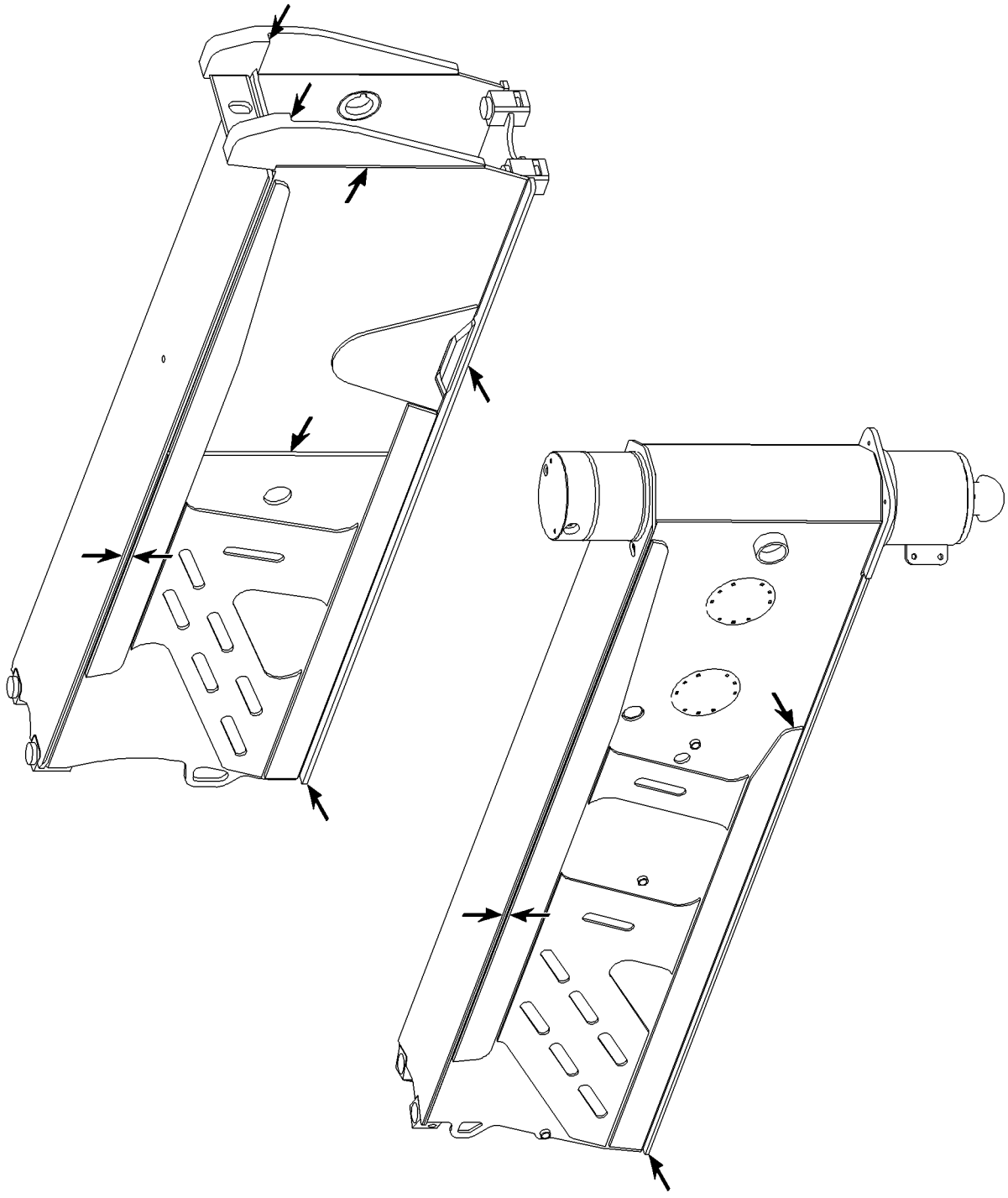

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Fig.105717: Example of a sliding beam

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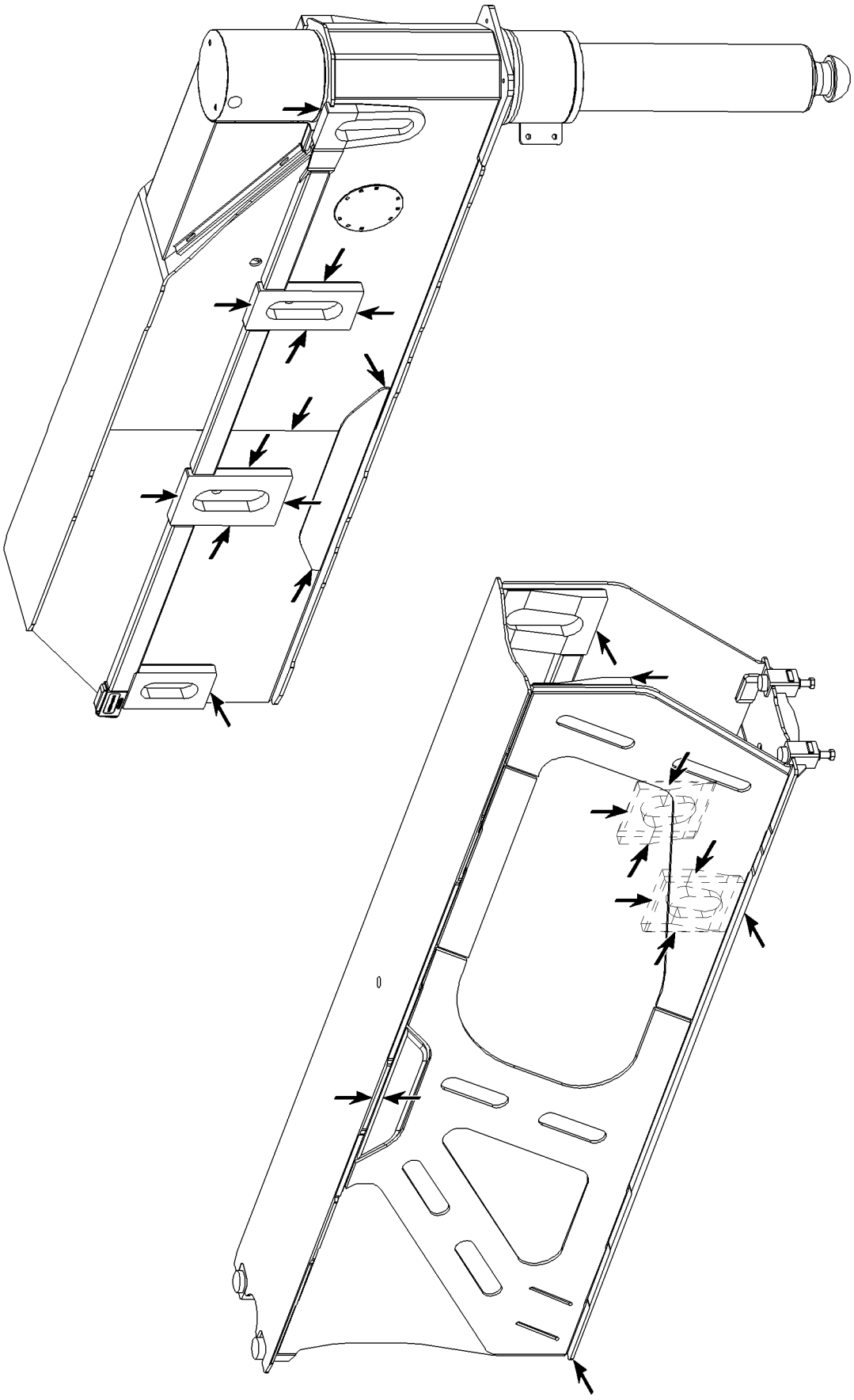

Fig.105718: Example of a sliding beam

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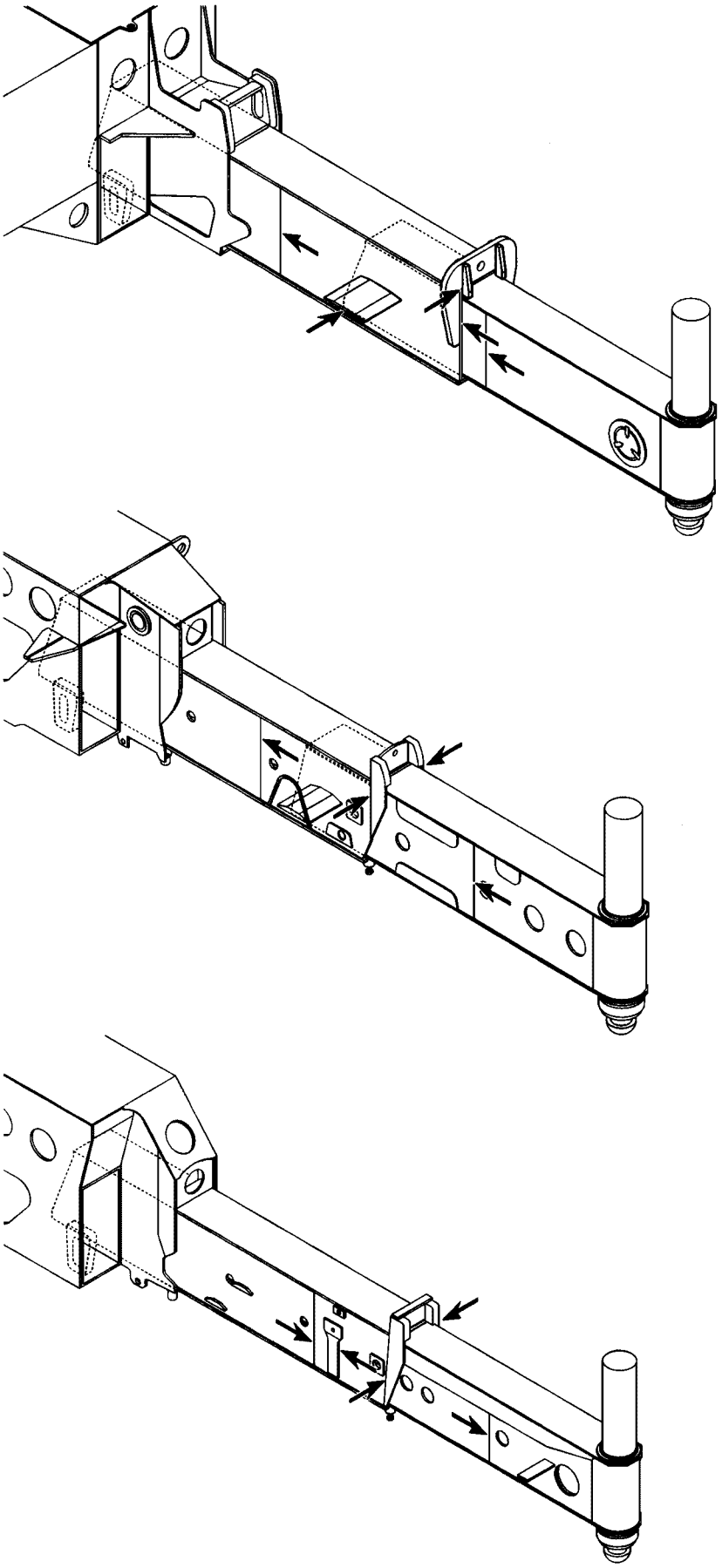

Fig.185047: Example of a sliding beam

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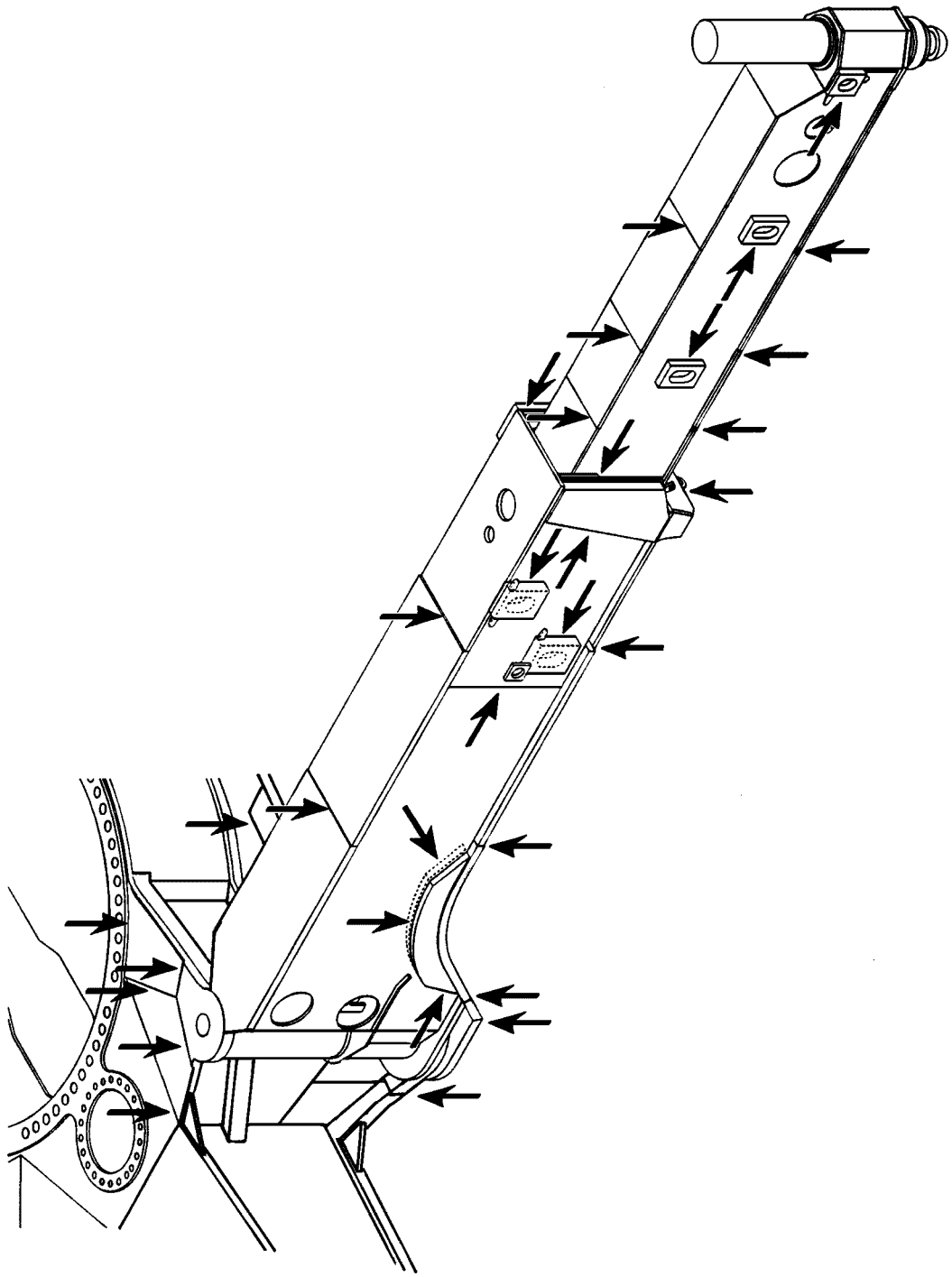

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Fig.185060: Example of a swinging sliding beam

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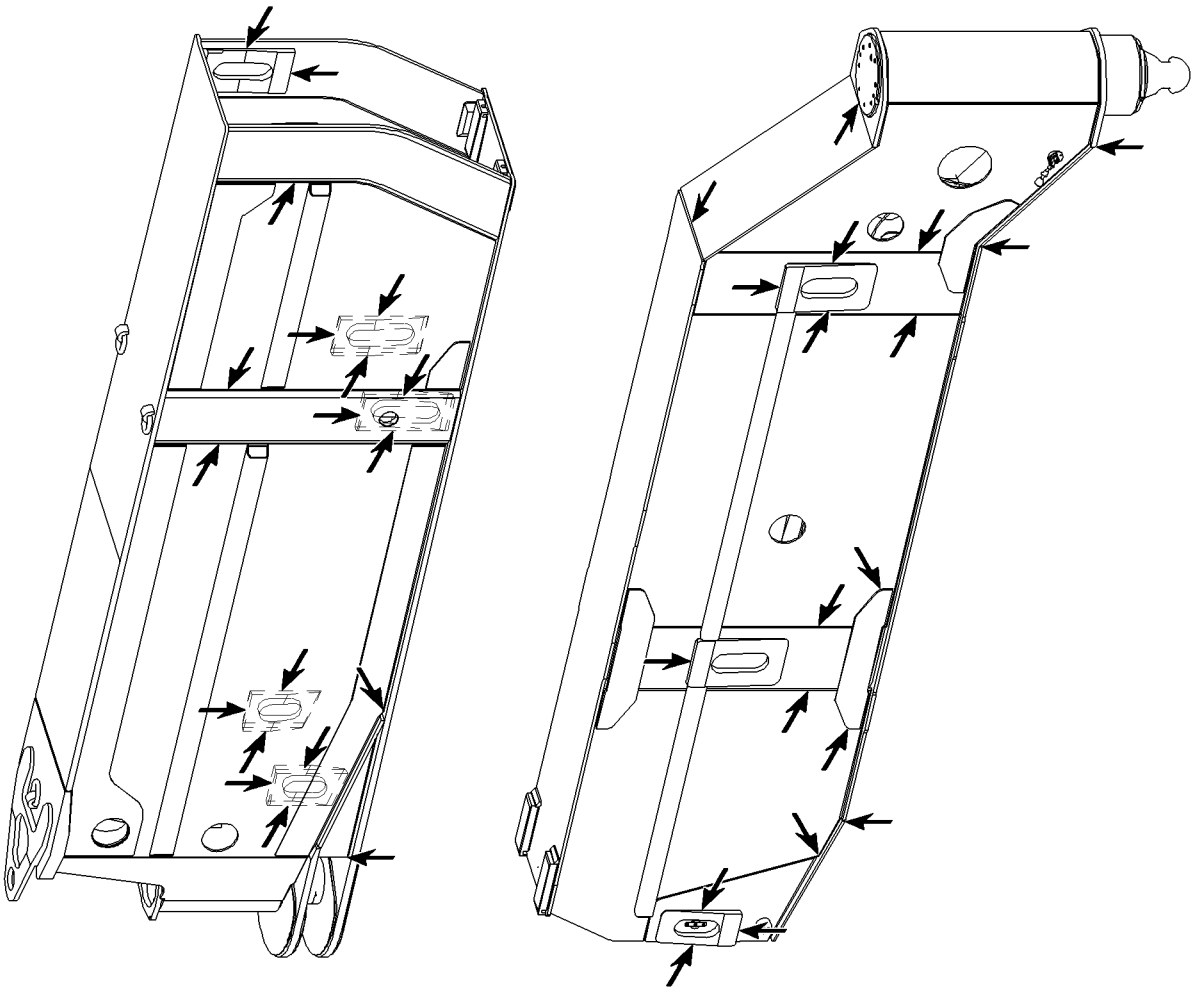

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Fig.105690: Example of a swinging sliding beam

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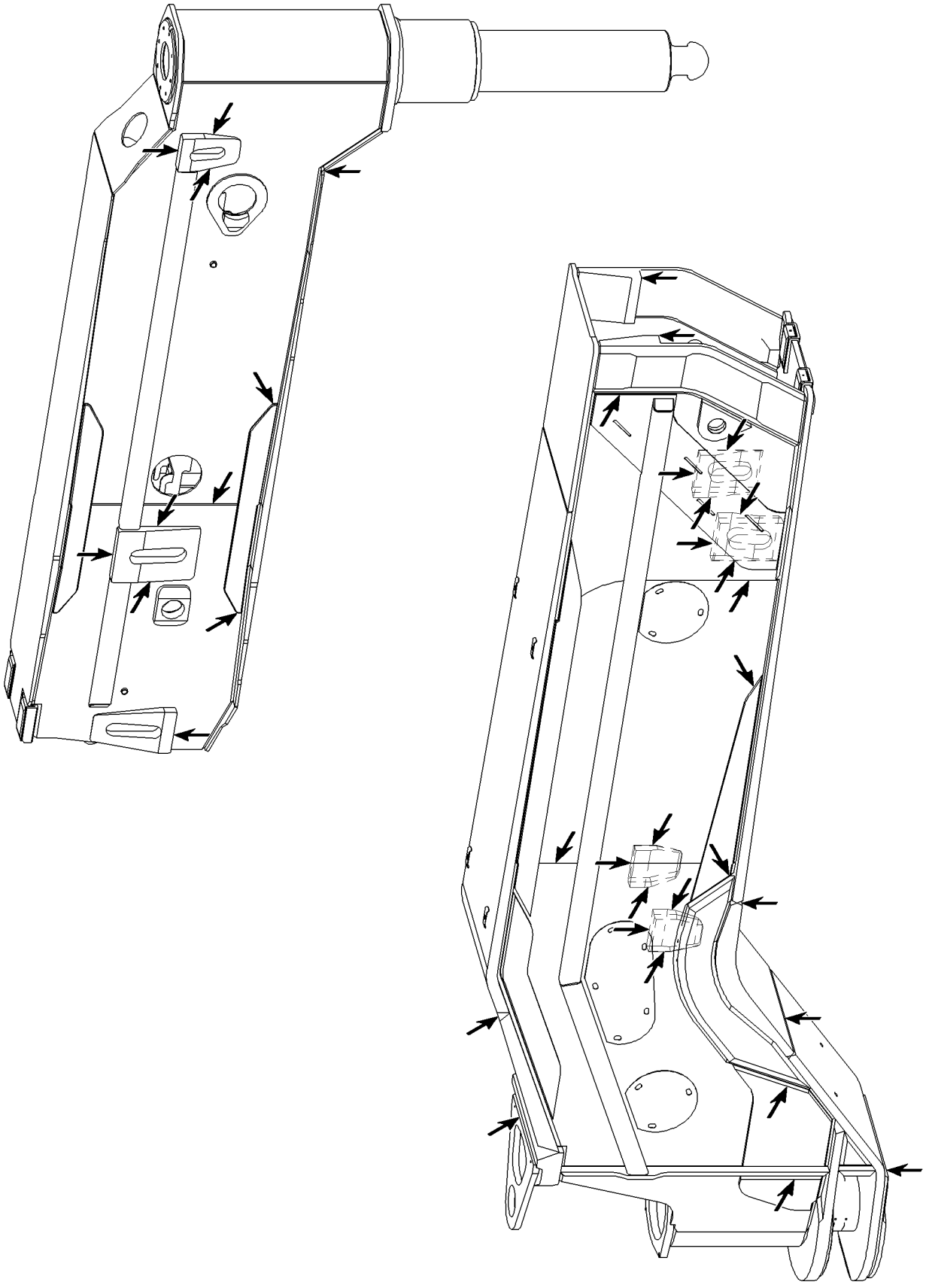

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Fig.105704: Example of a swinging sliding beam

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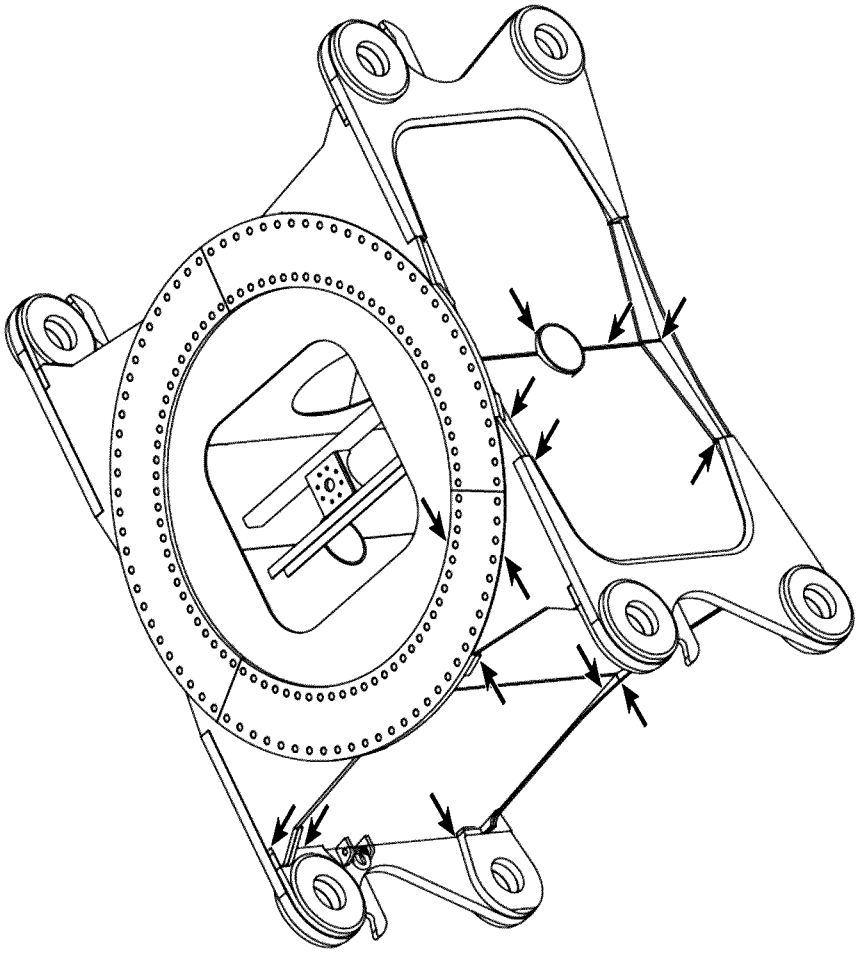

Fig.105725: Example of a crawler center section

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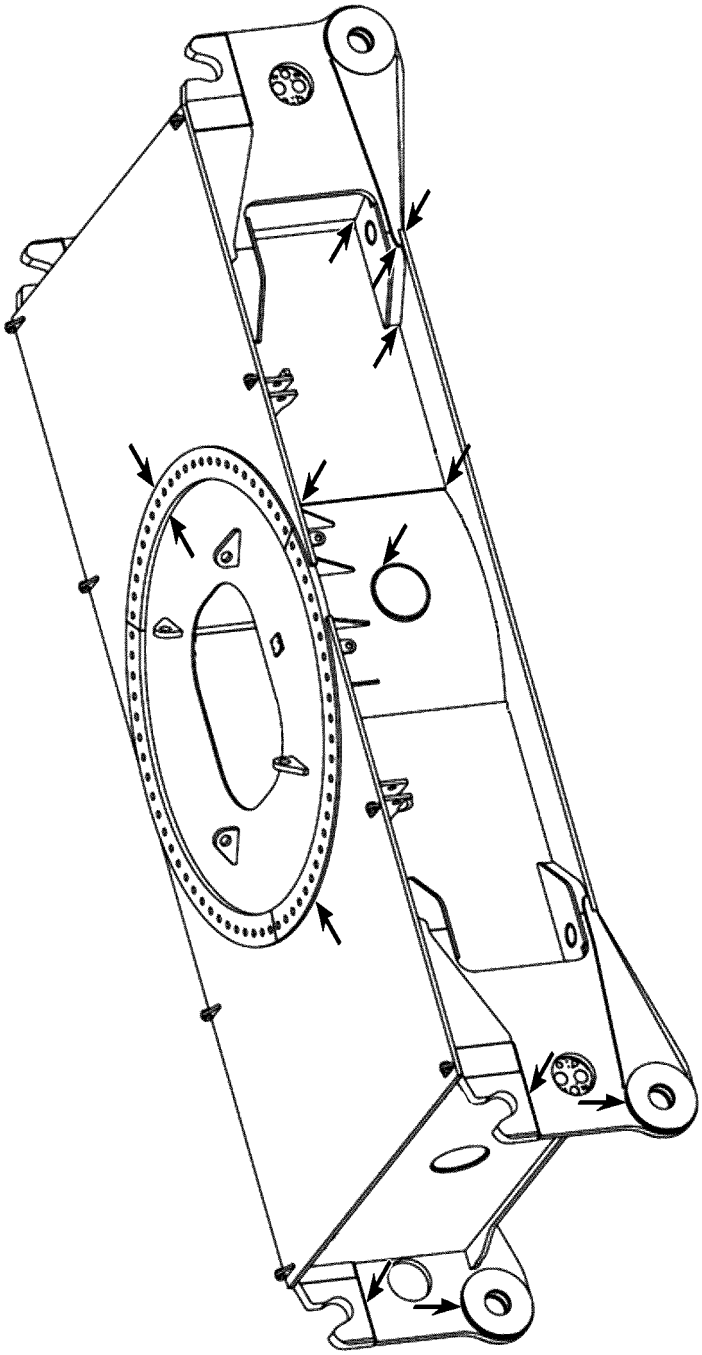

Fig.105726: Example of a crawler center section

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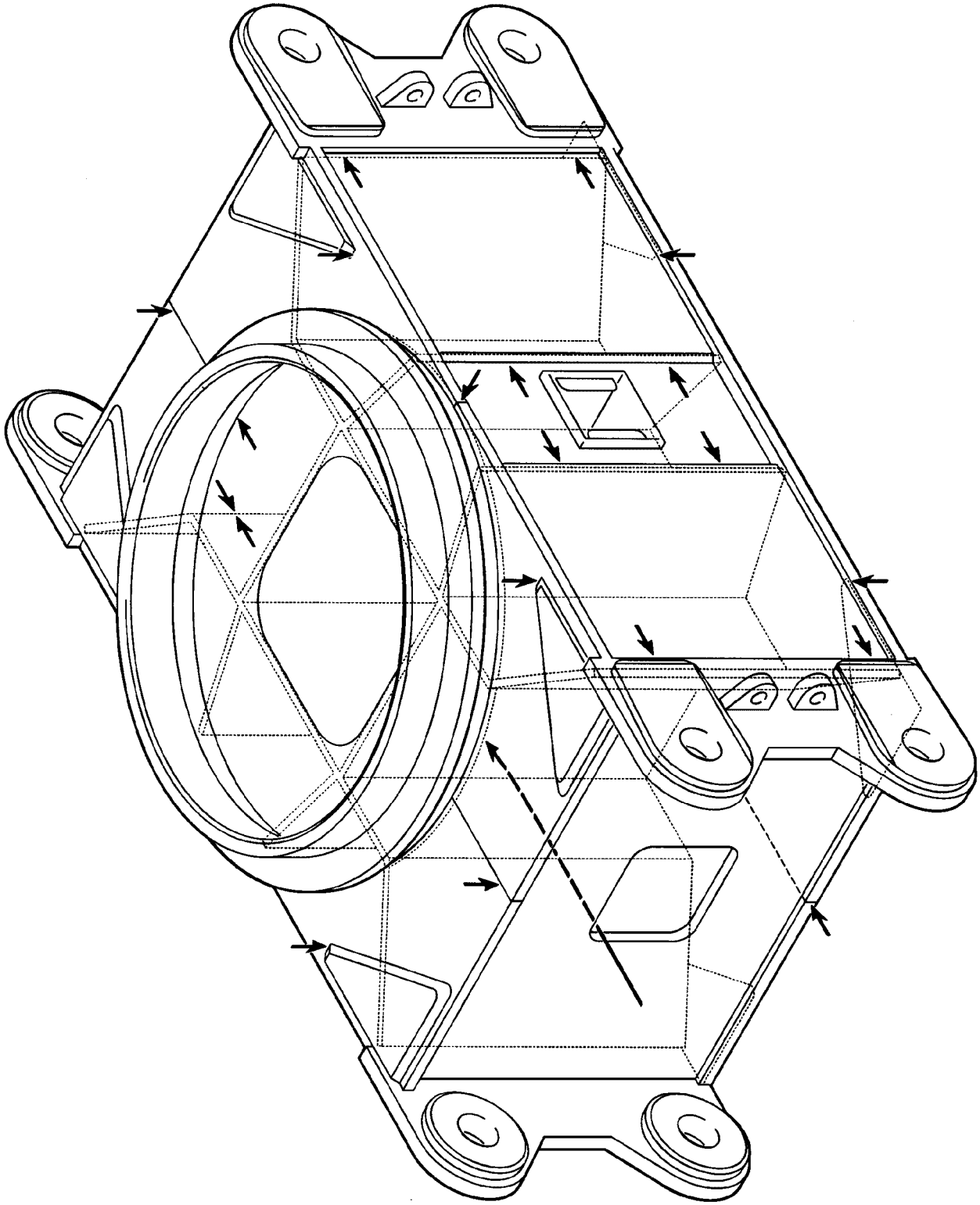

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Fig.187347: Example of a crawler center section

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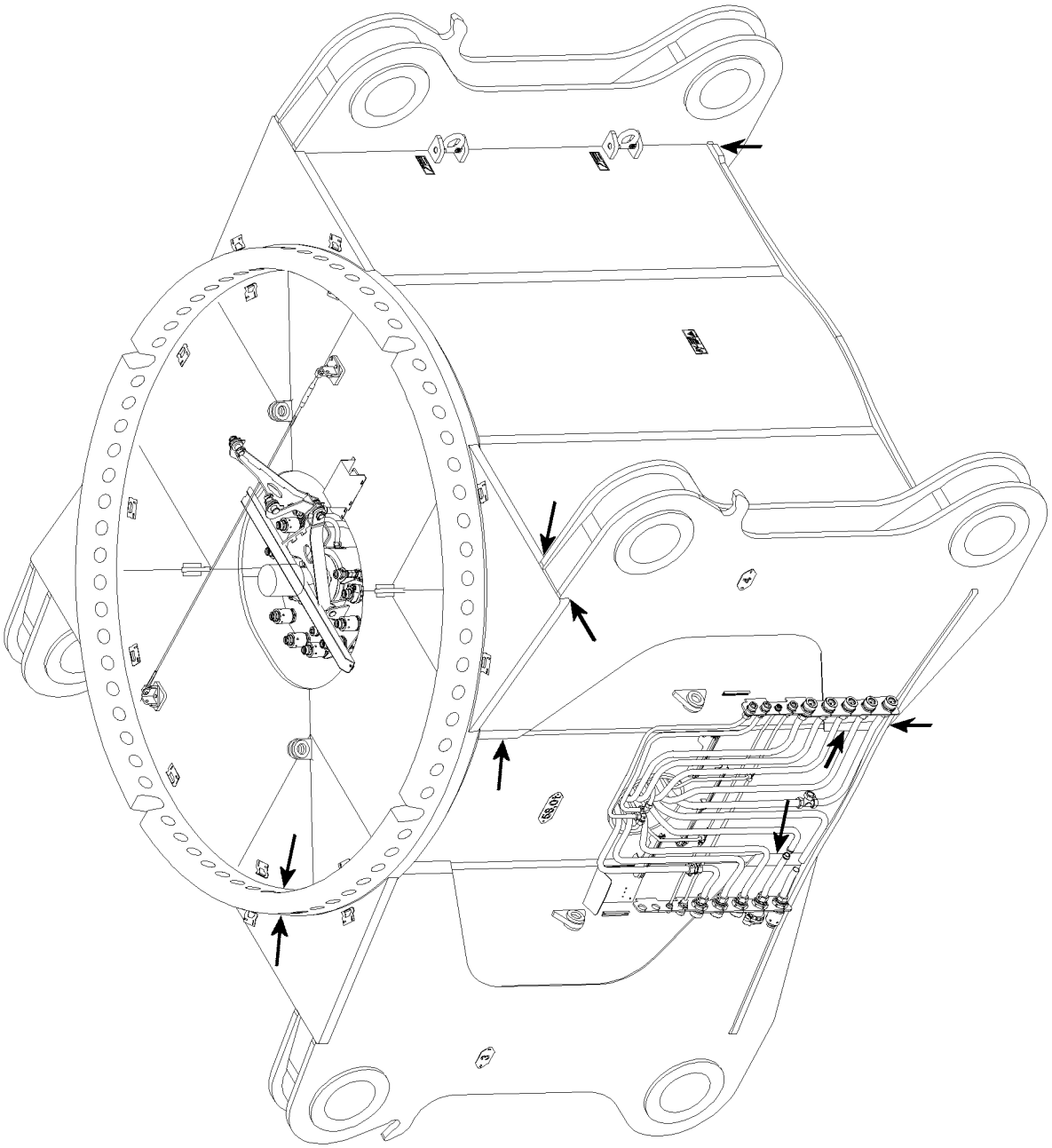

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Fig.115920: Example of a crawler center section

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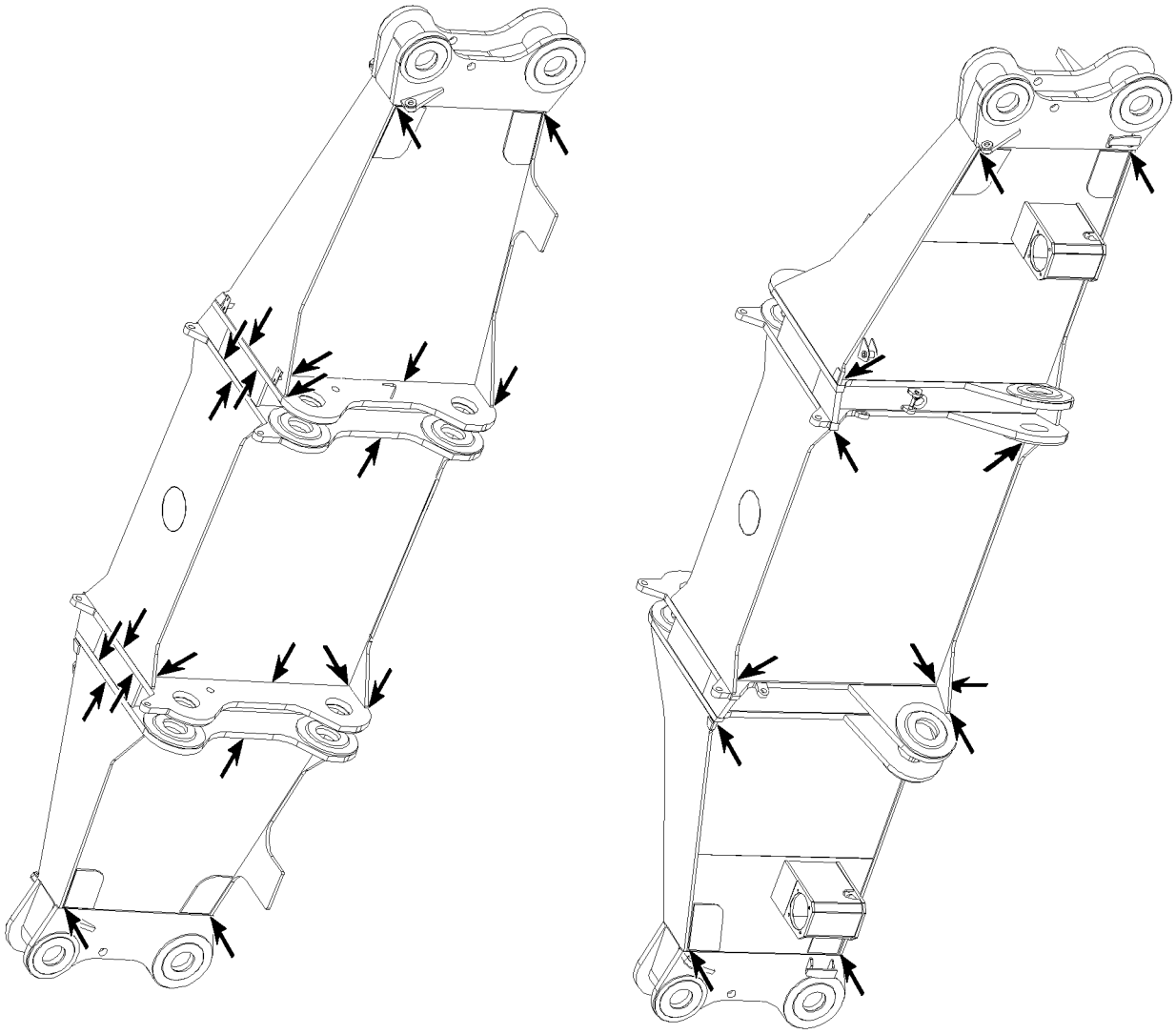

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Fig.105727: Example of a cross carrier

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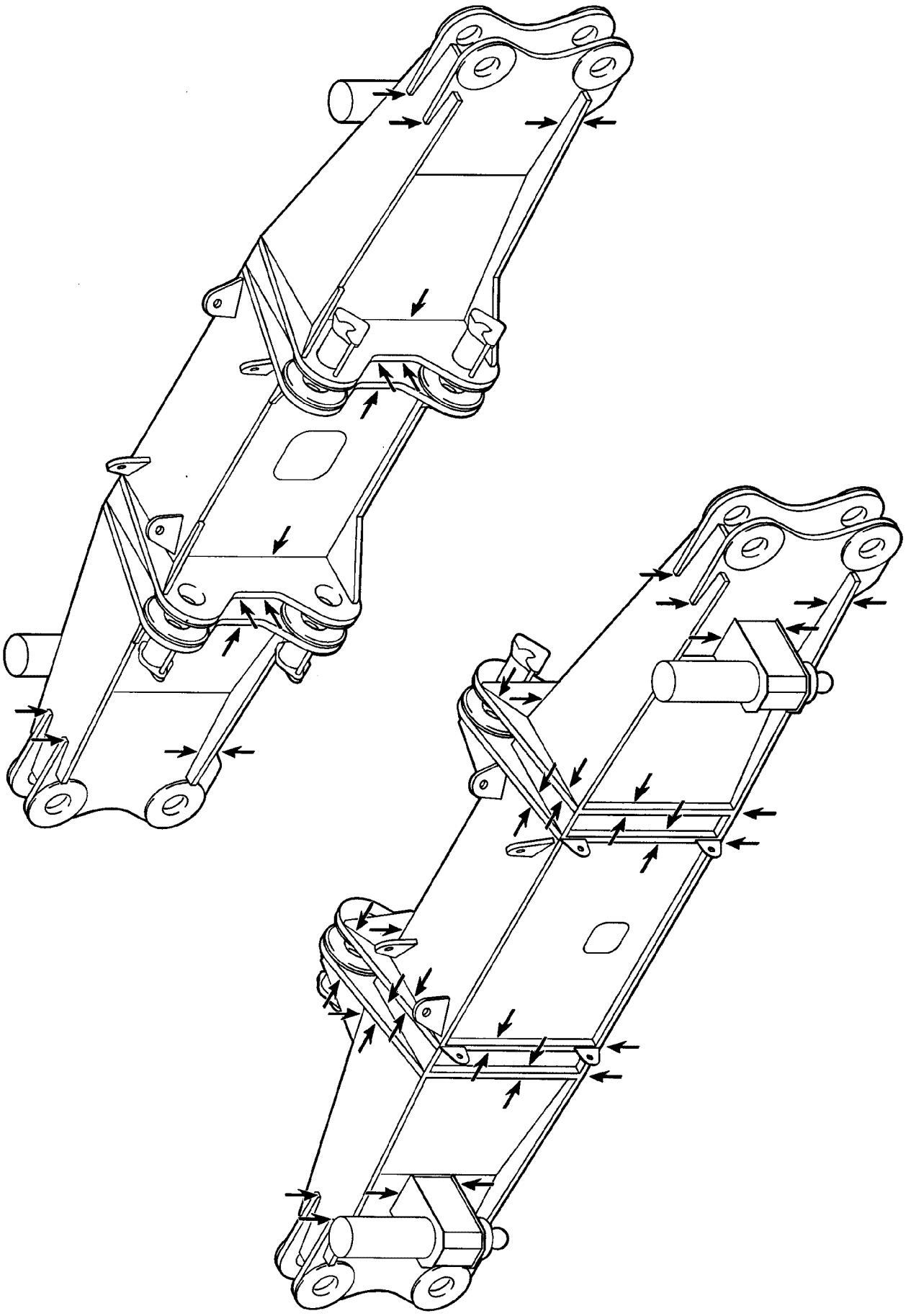

Fig.187348: Example of a cross carrier

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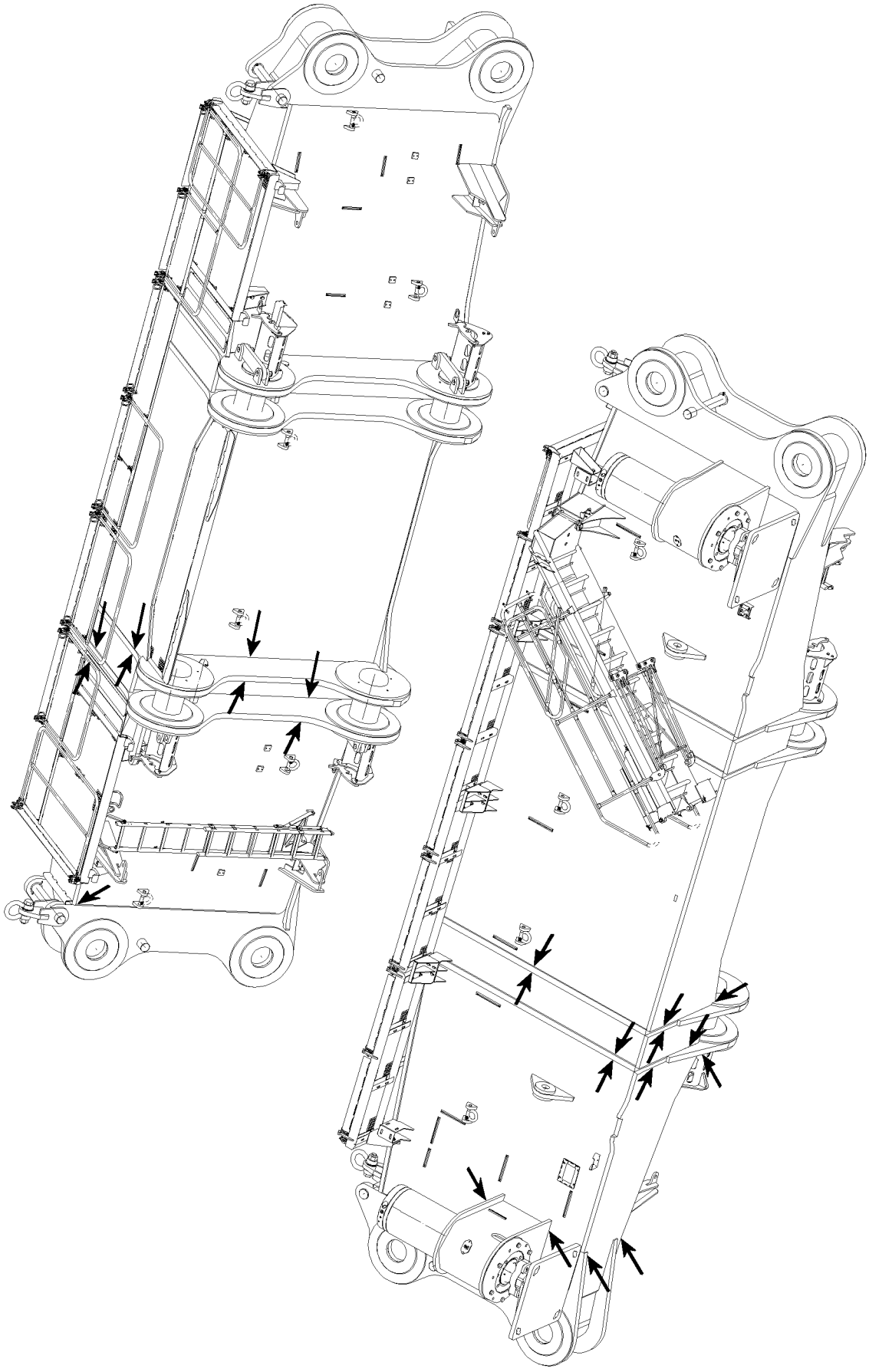

Fig.115921: Example of a cross carrier

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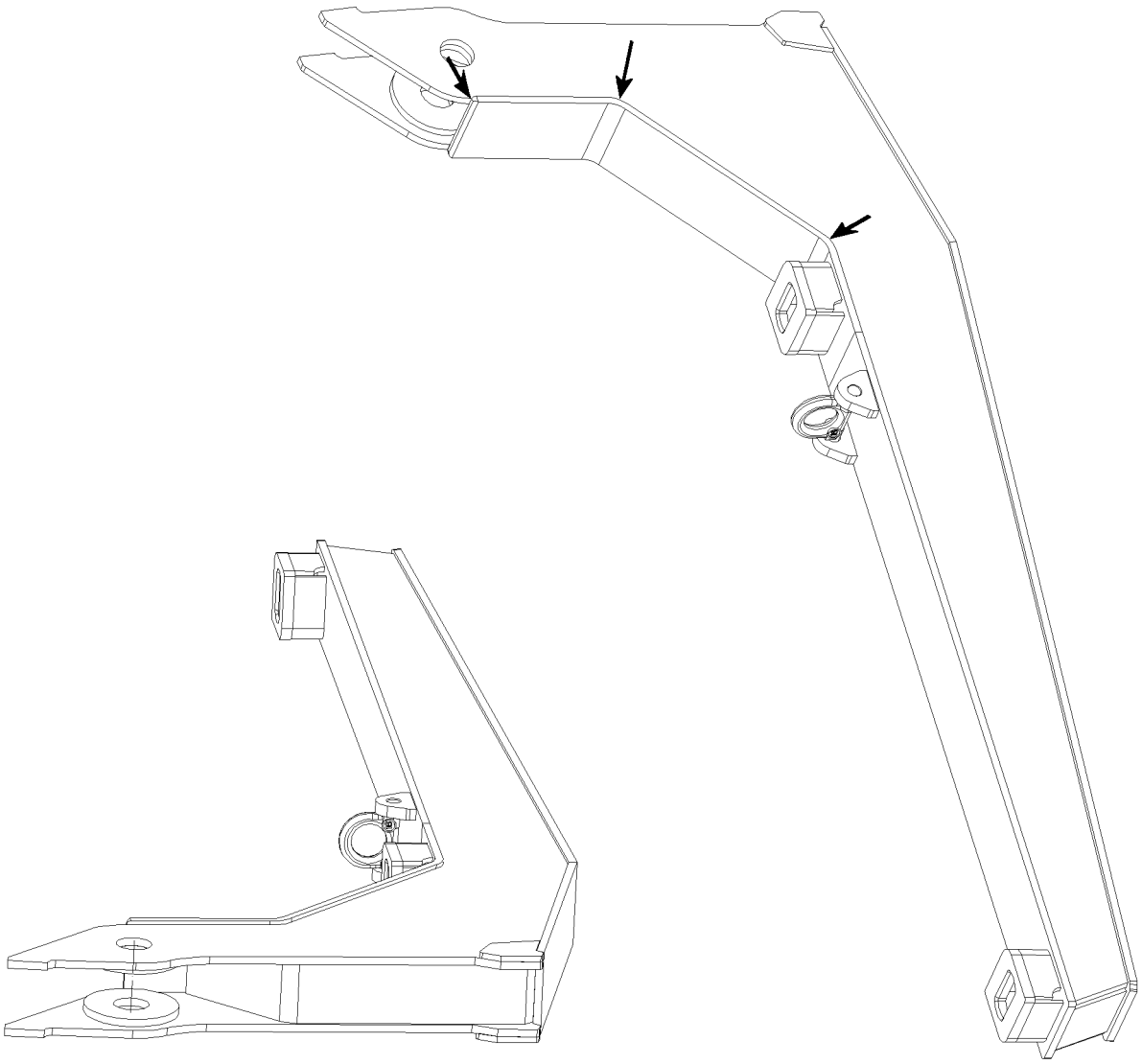

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Fig.115919: Example of carrier for central ballast

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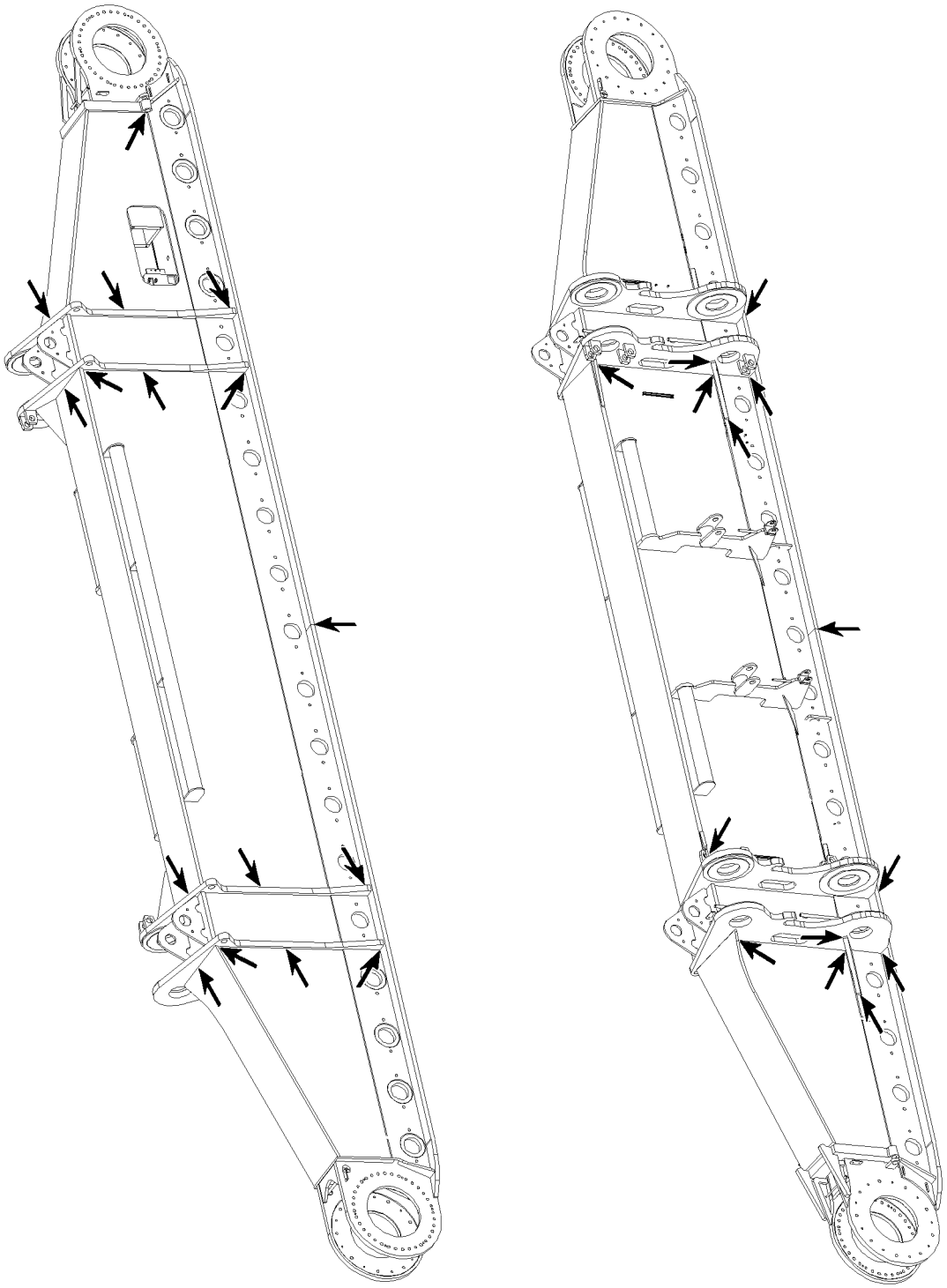

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Fig.105728: Example of a crawler carrier

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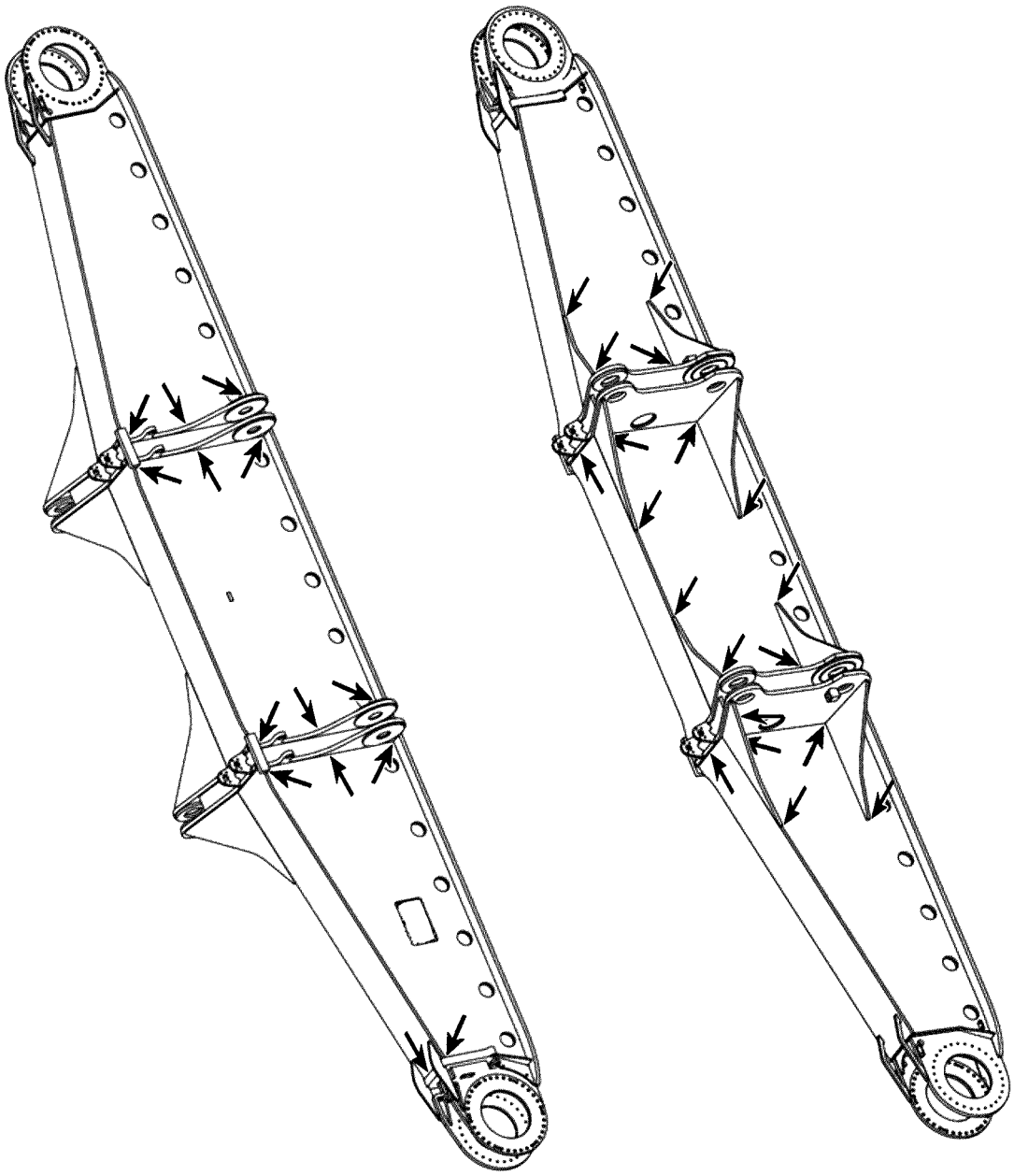

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Fig.105729: Example of a crawler carrier

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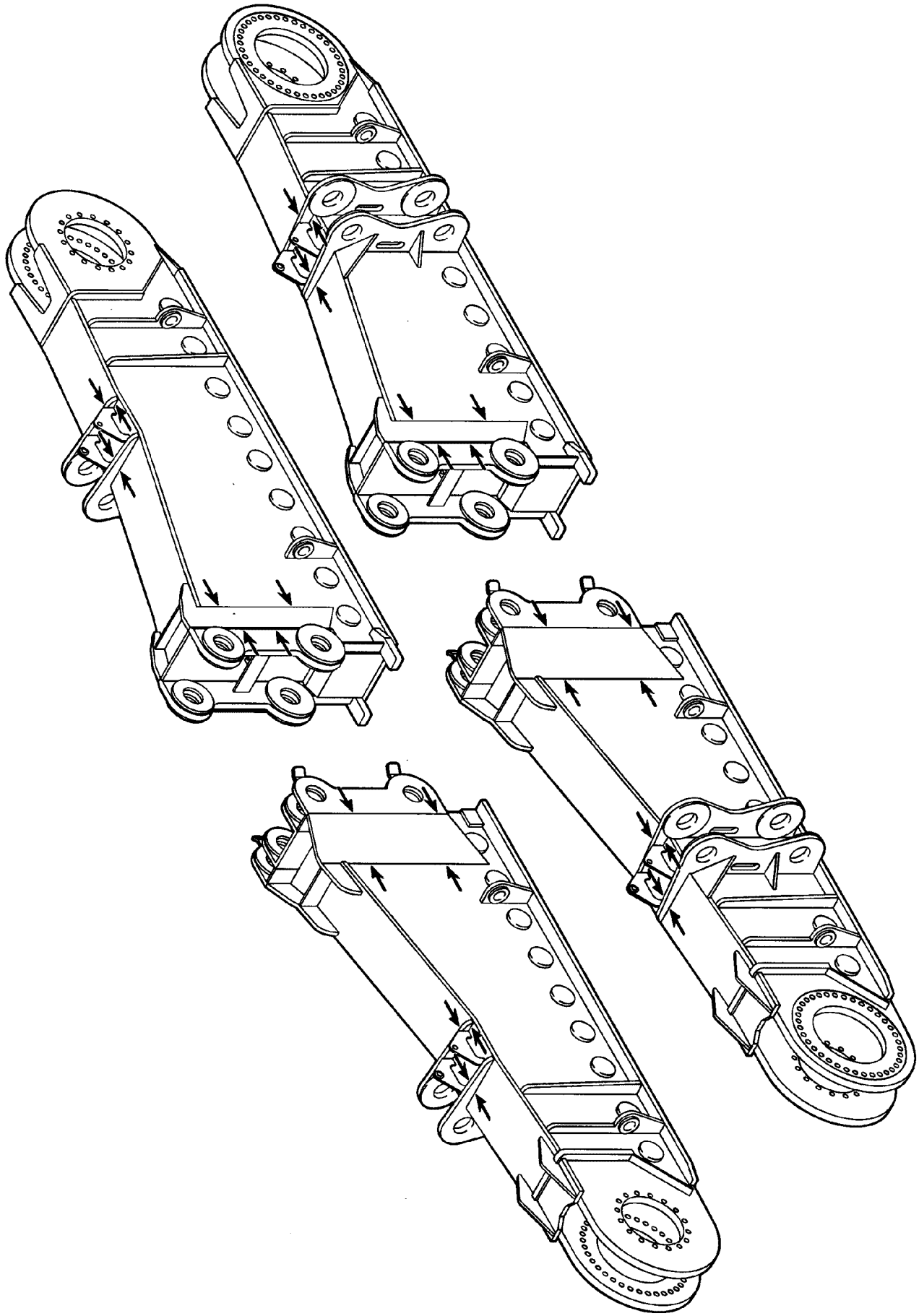

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Fig.187349: Example of a crawler carrier

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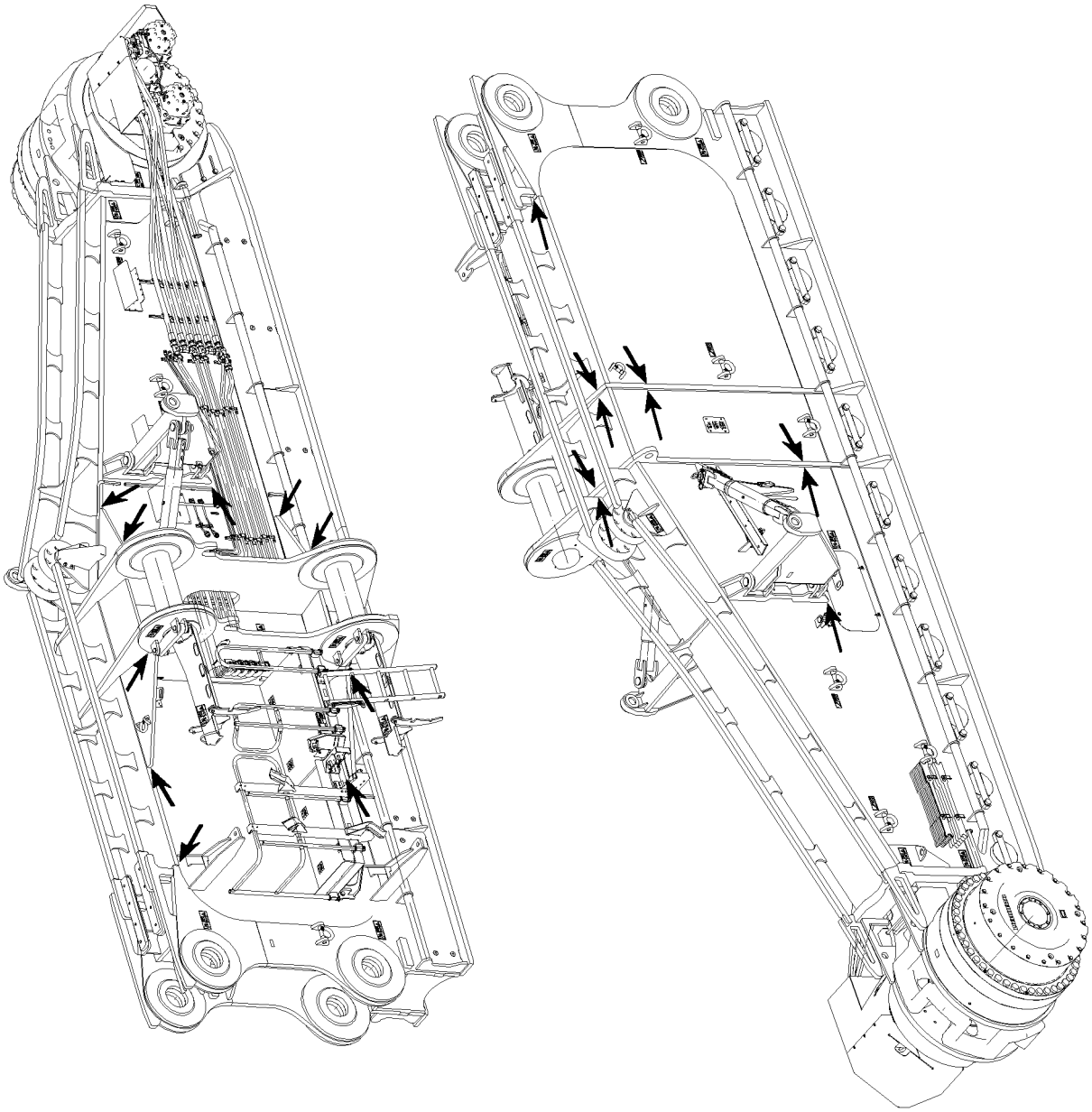

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Fig.115917: Example of a crawler carrier

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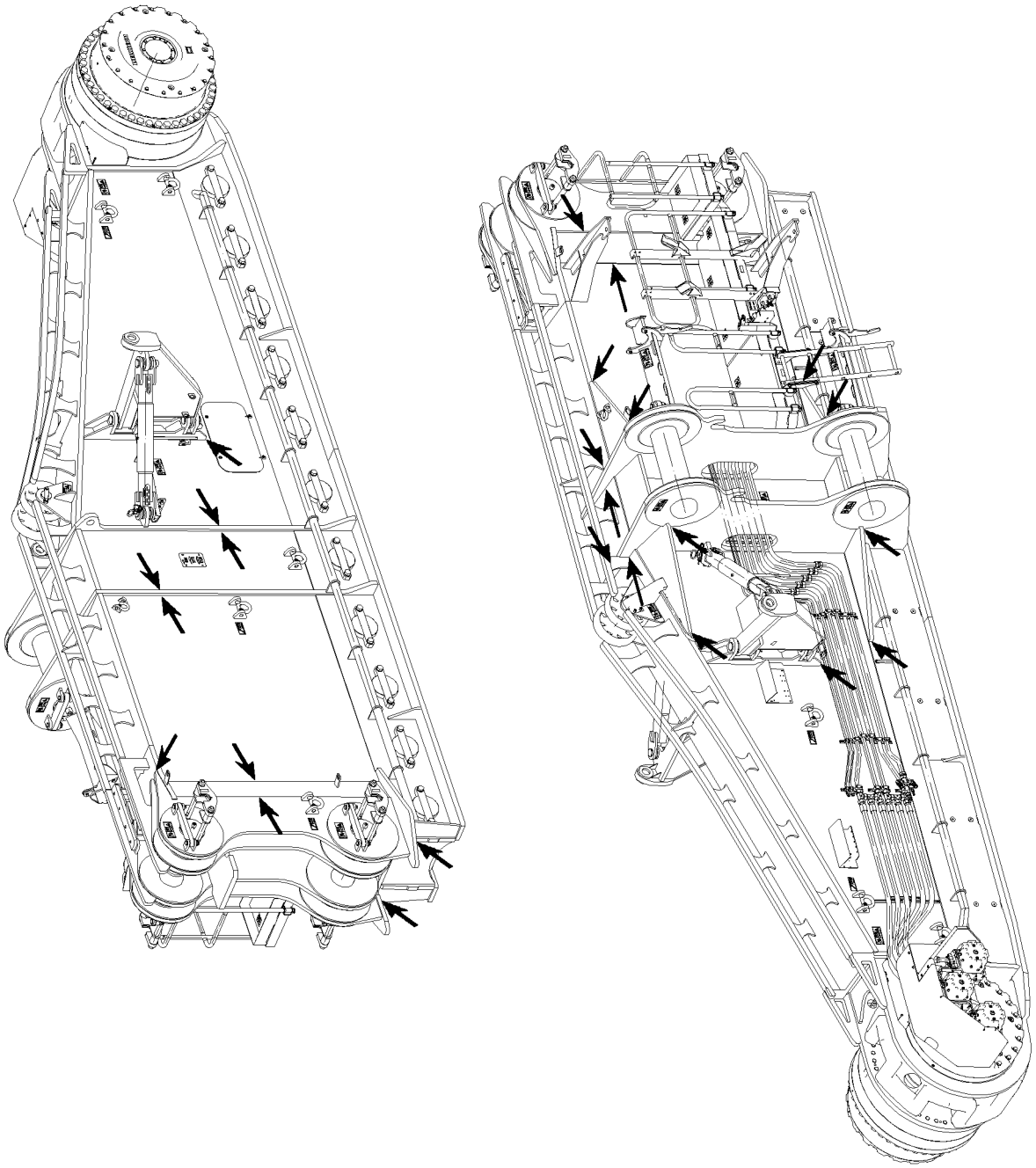

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Fig.115918: Example of a crawler carrier

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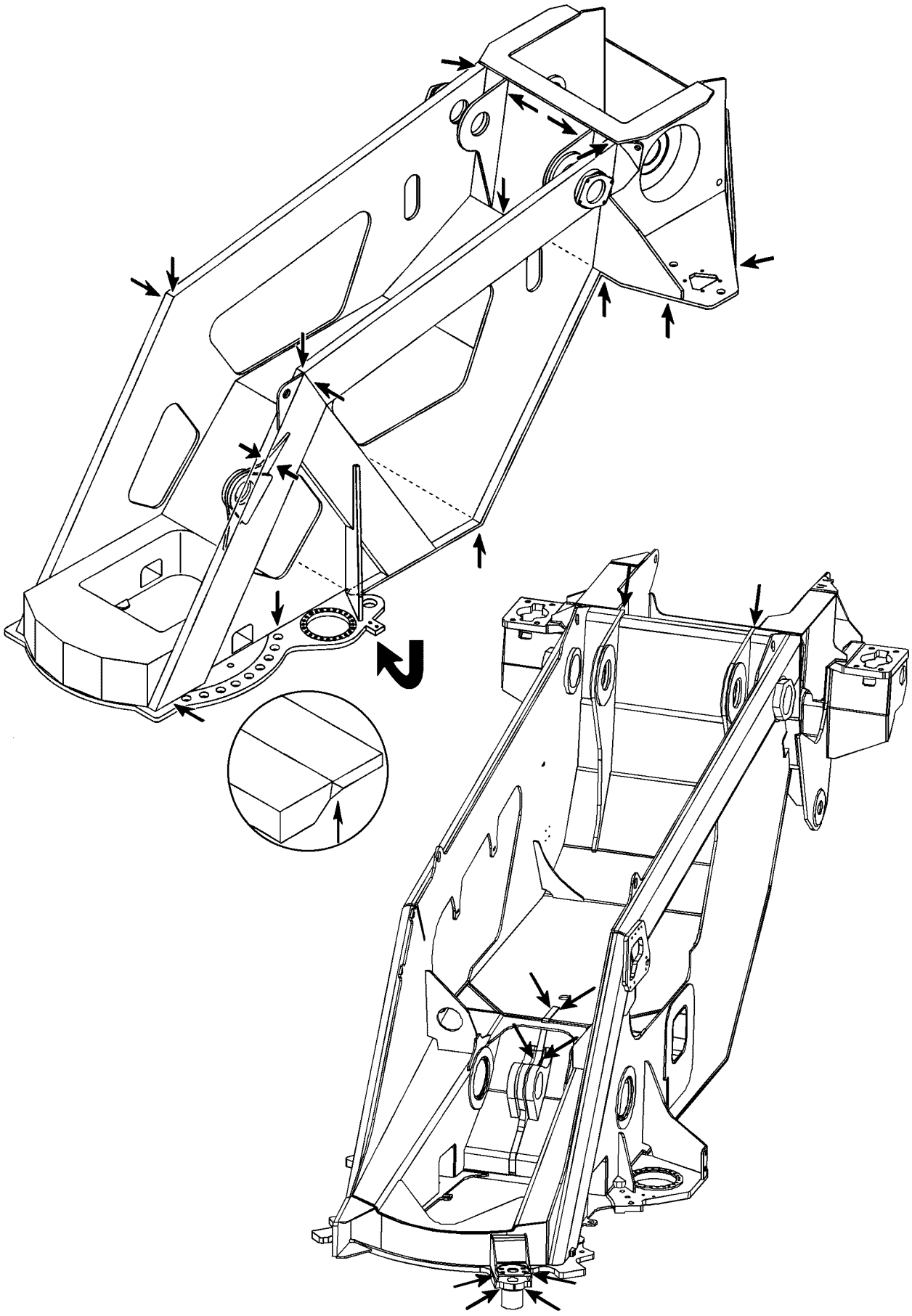

Fig.185048: Example of a turntable frame

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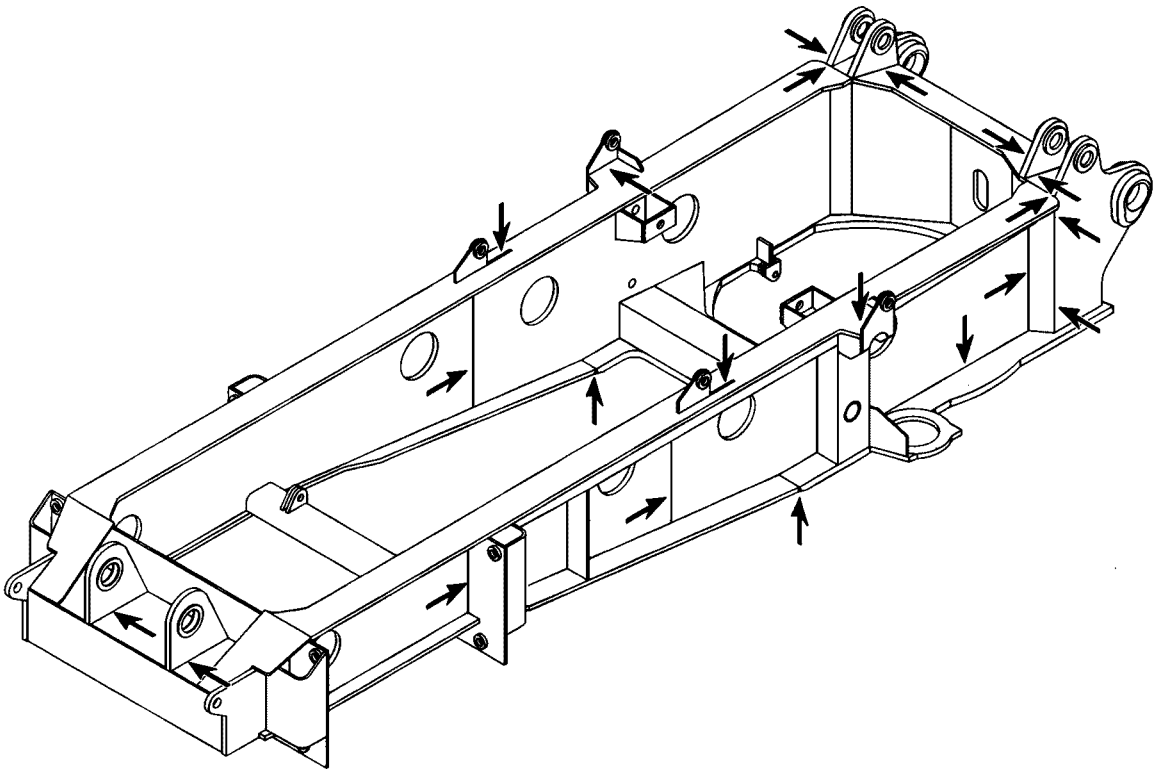

Fig.185049: Example of a turntable frame

LWE/LR 11000-001/23501-05-02/en

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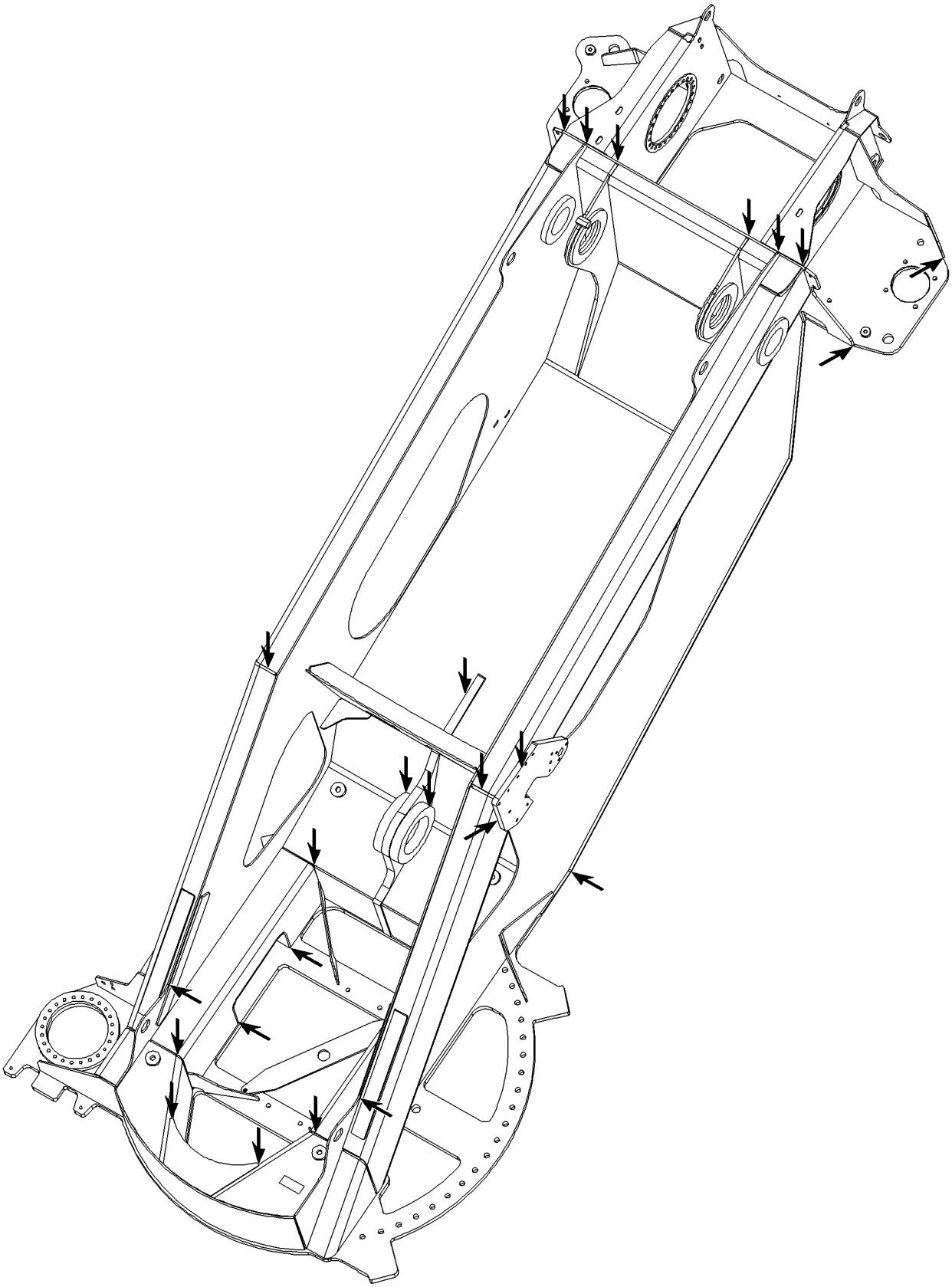

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Fig.105700: Example of a turntable frame

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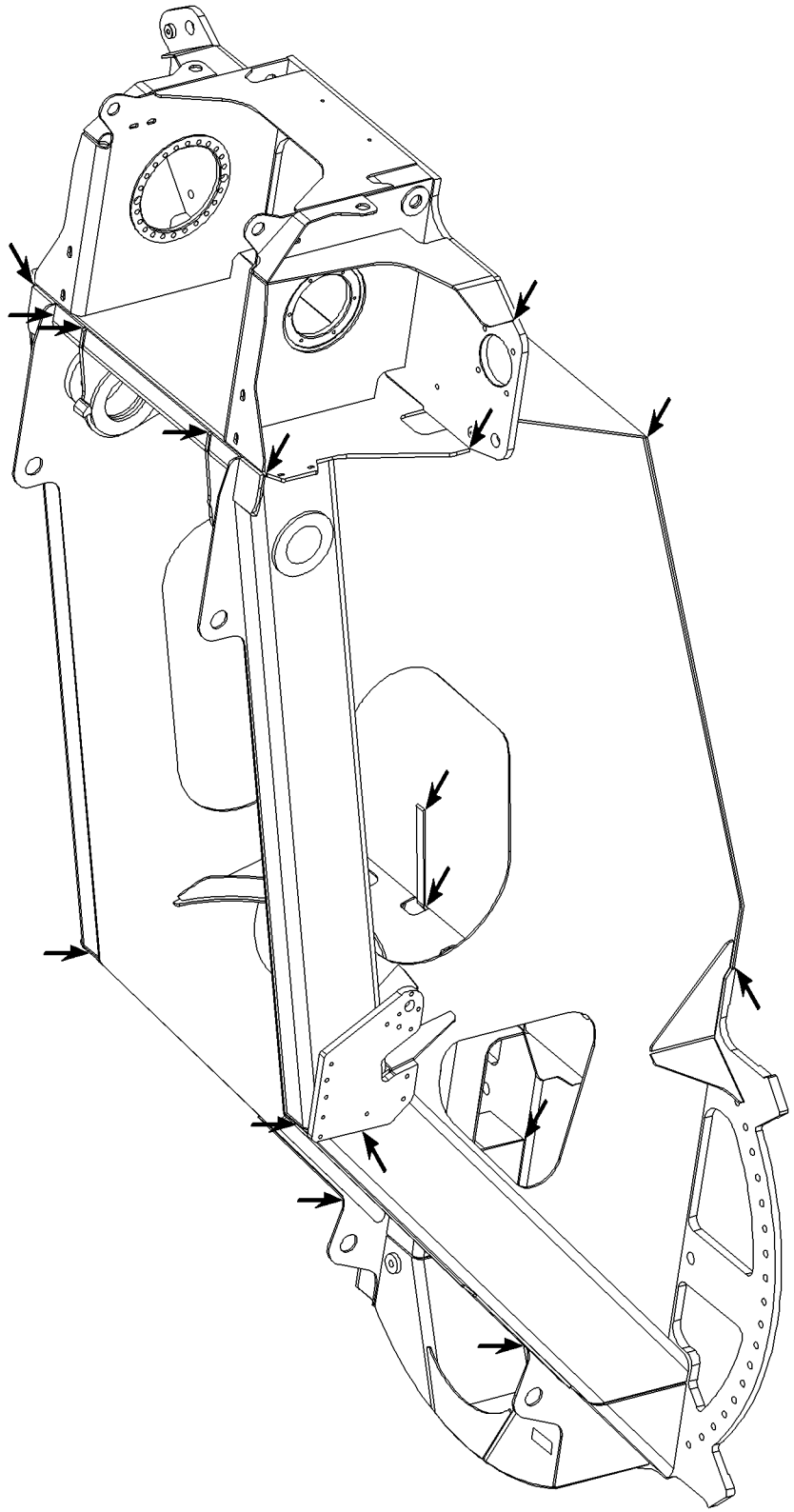

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Fig.105701: Example of a turntable frame

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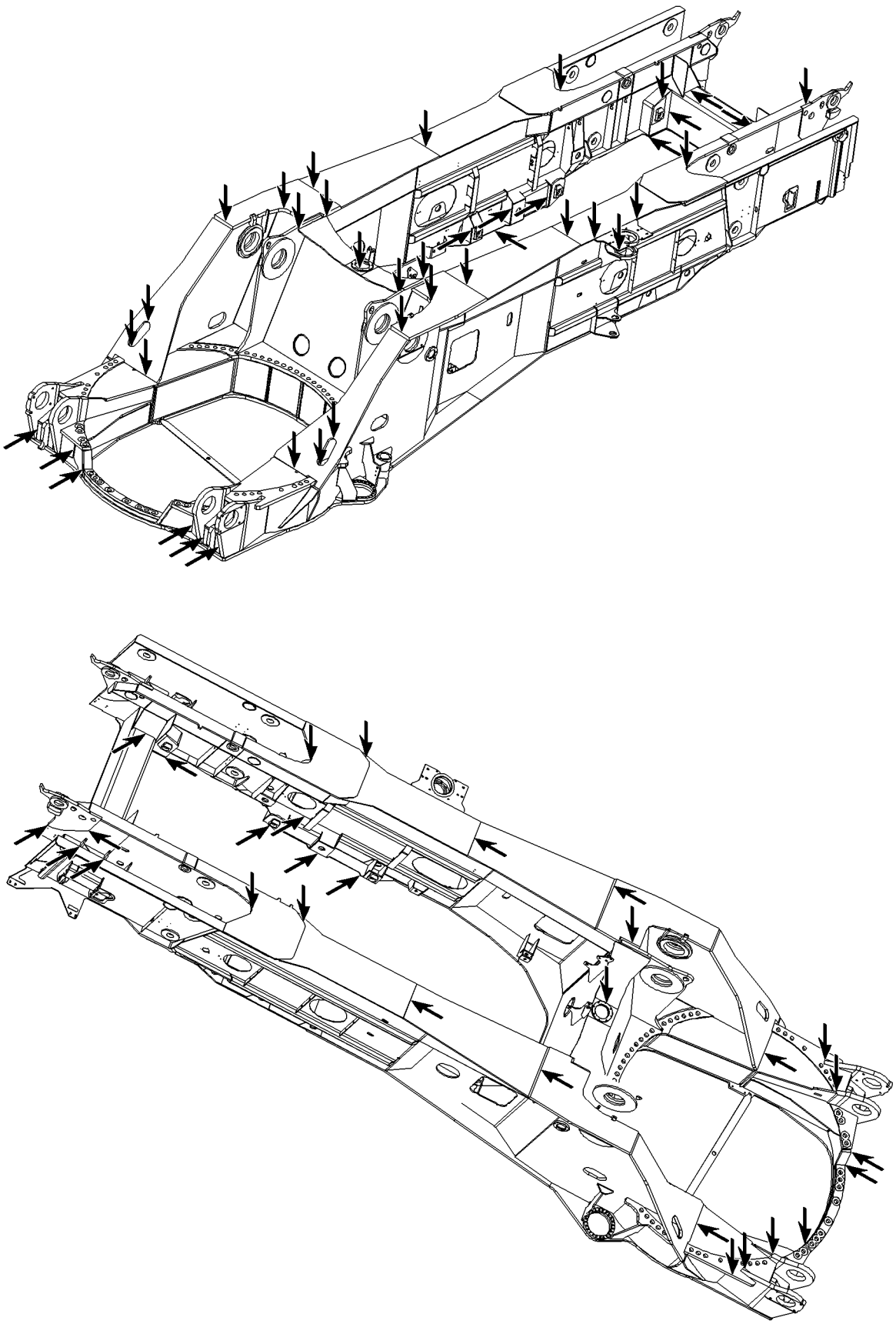

Fig.105706: Example of a turntable frame

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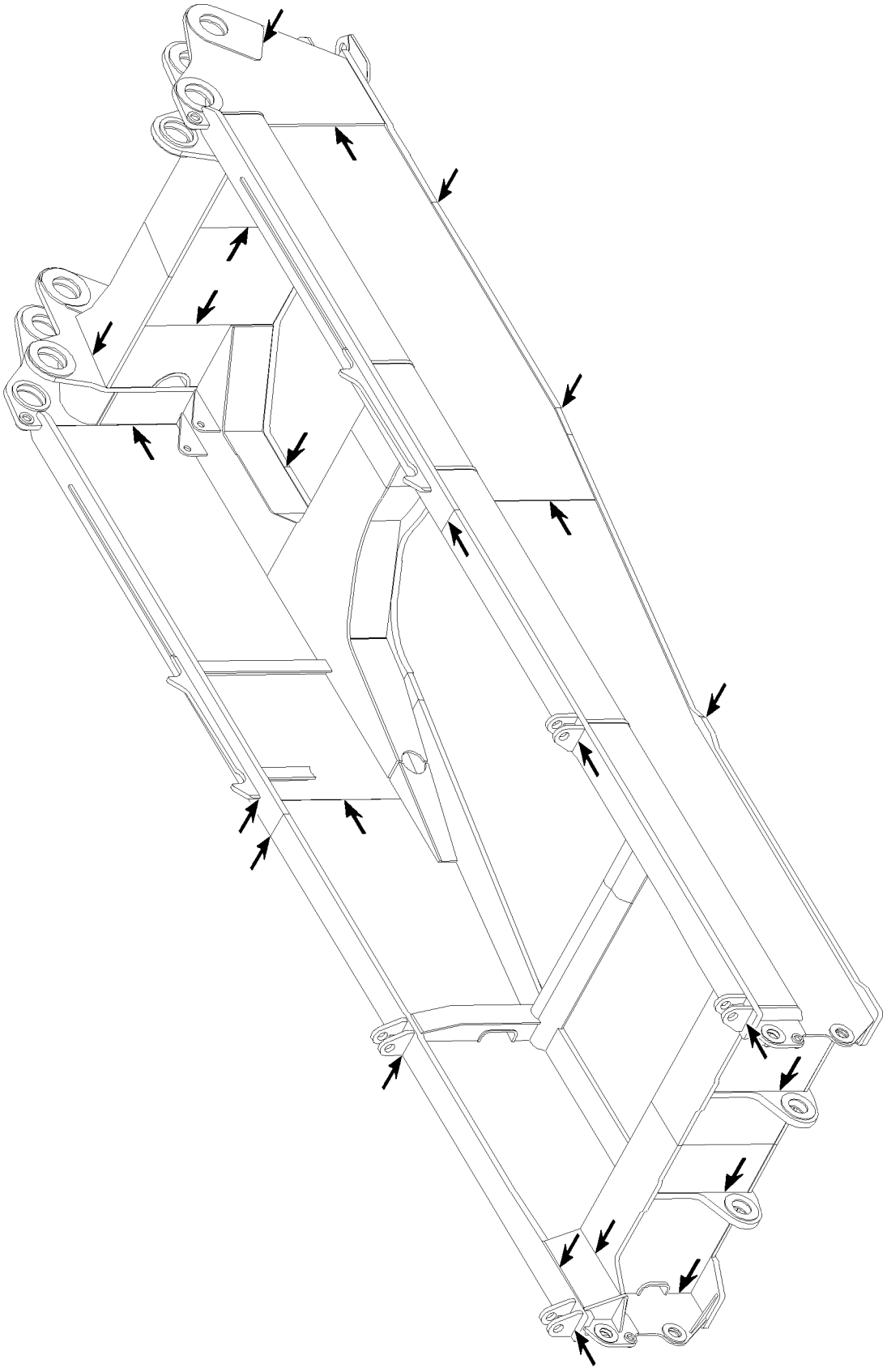

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Fig.105694: Example of a turntable frame

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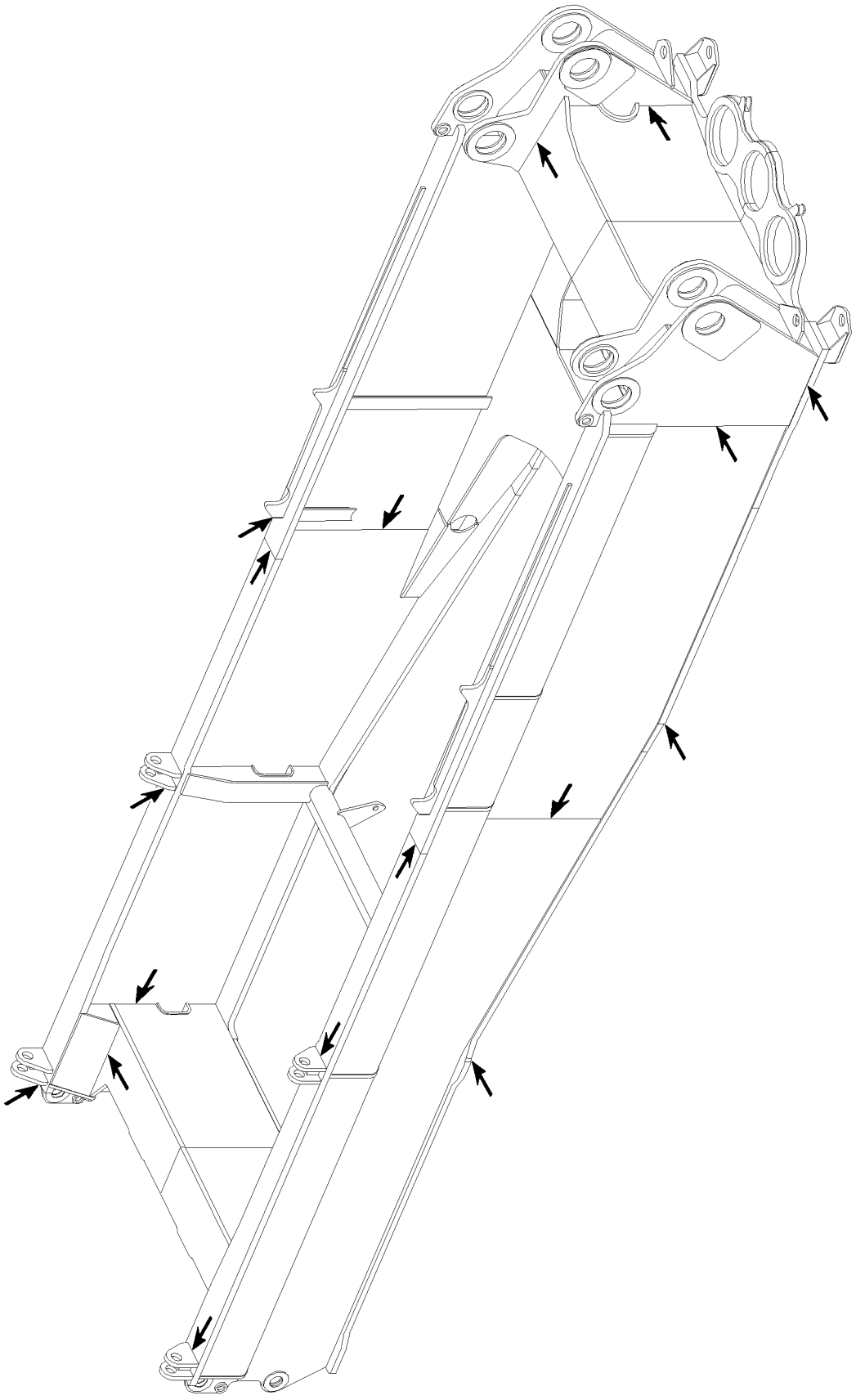

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Fig.105695: Example of a turntable frame

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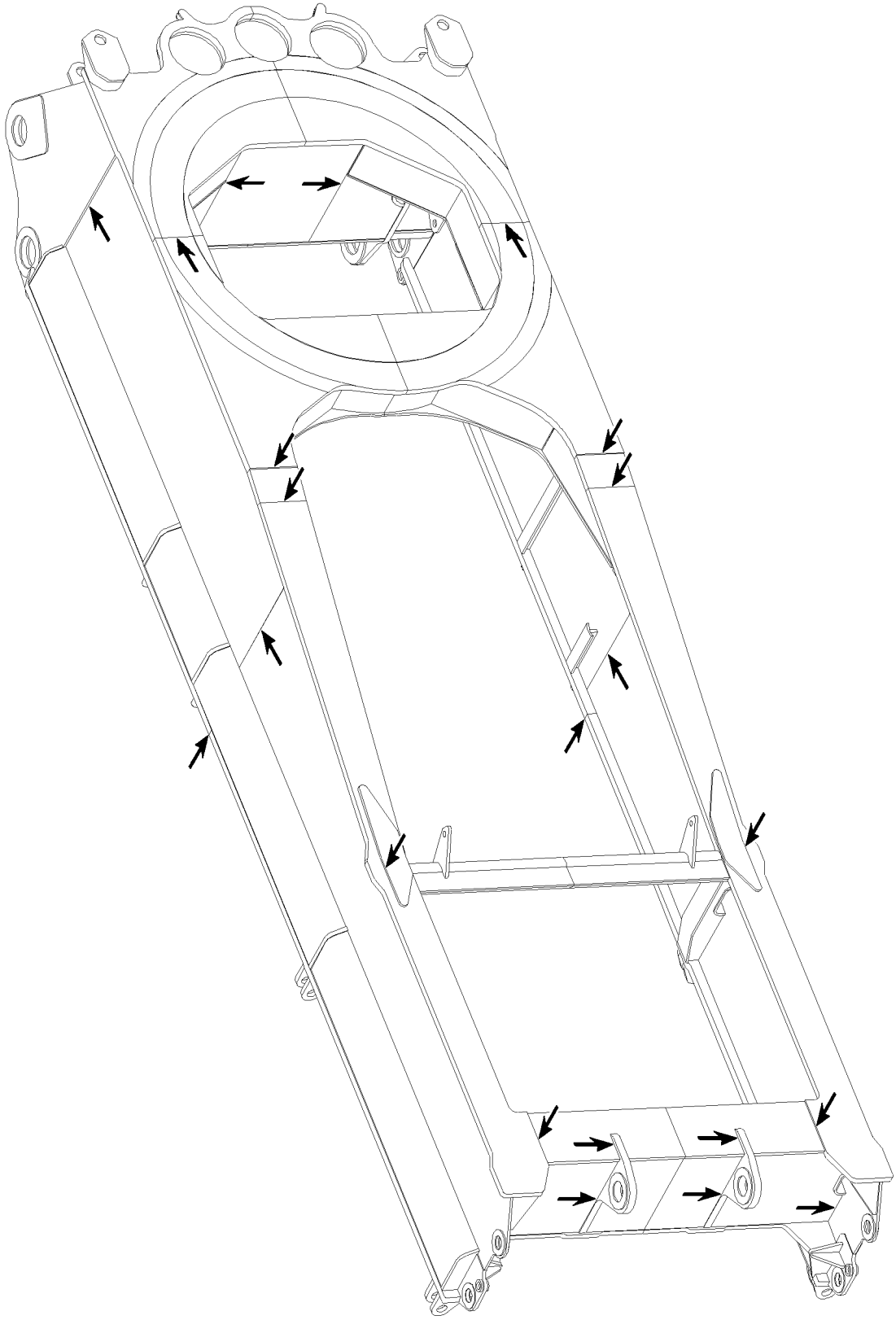

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Fig.105696: Example of a turntable frame

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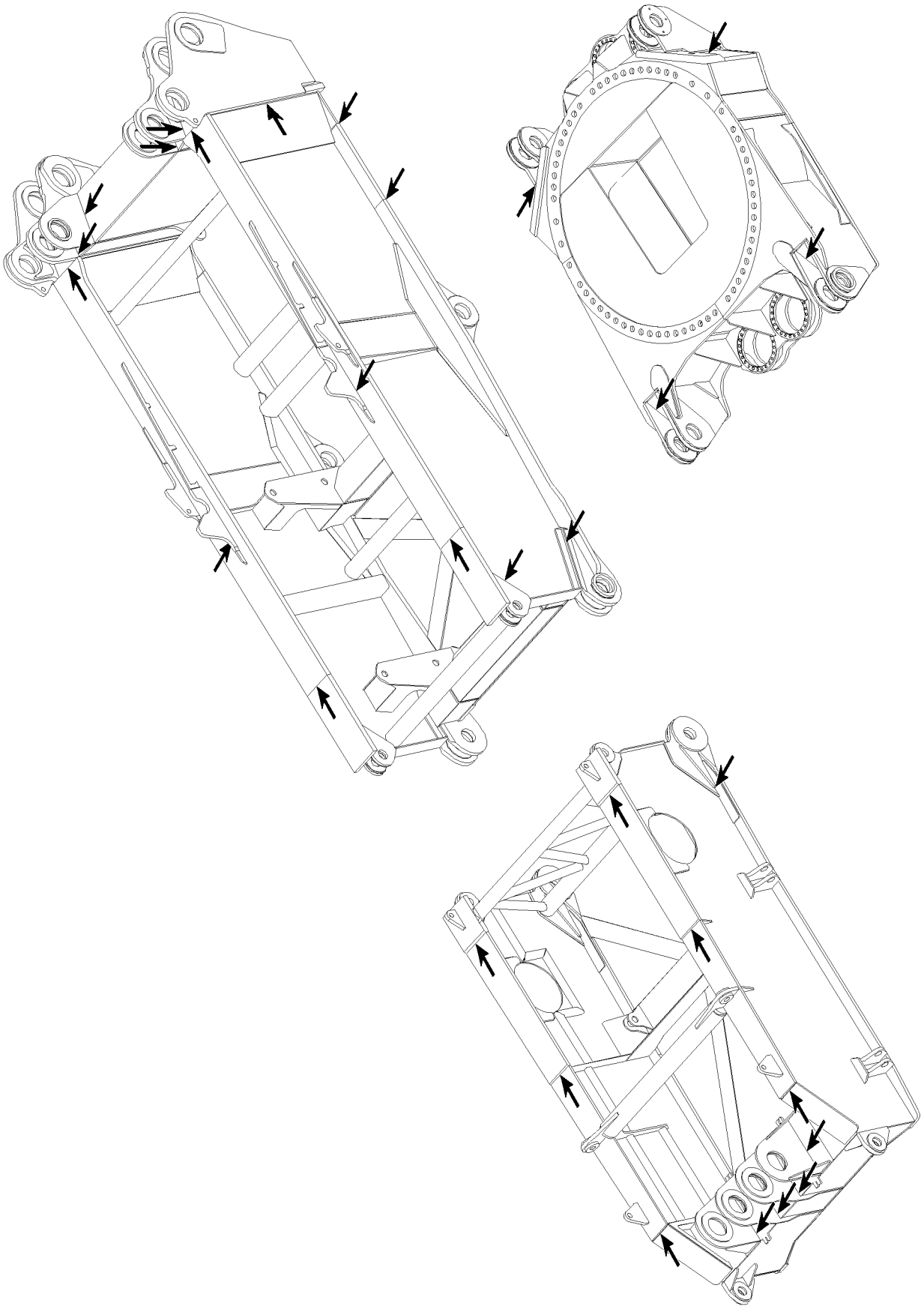

Fig.105691: Example of a turntable frame

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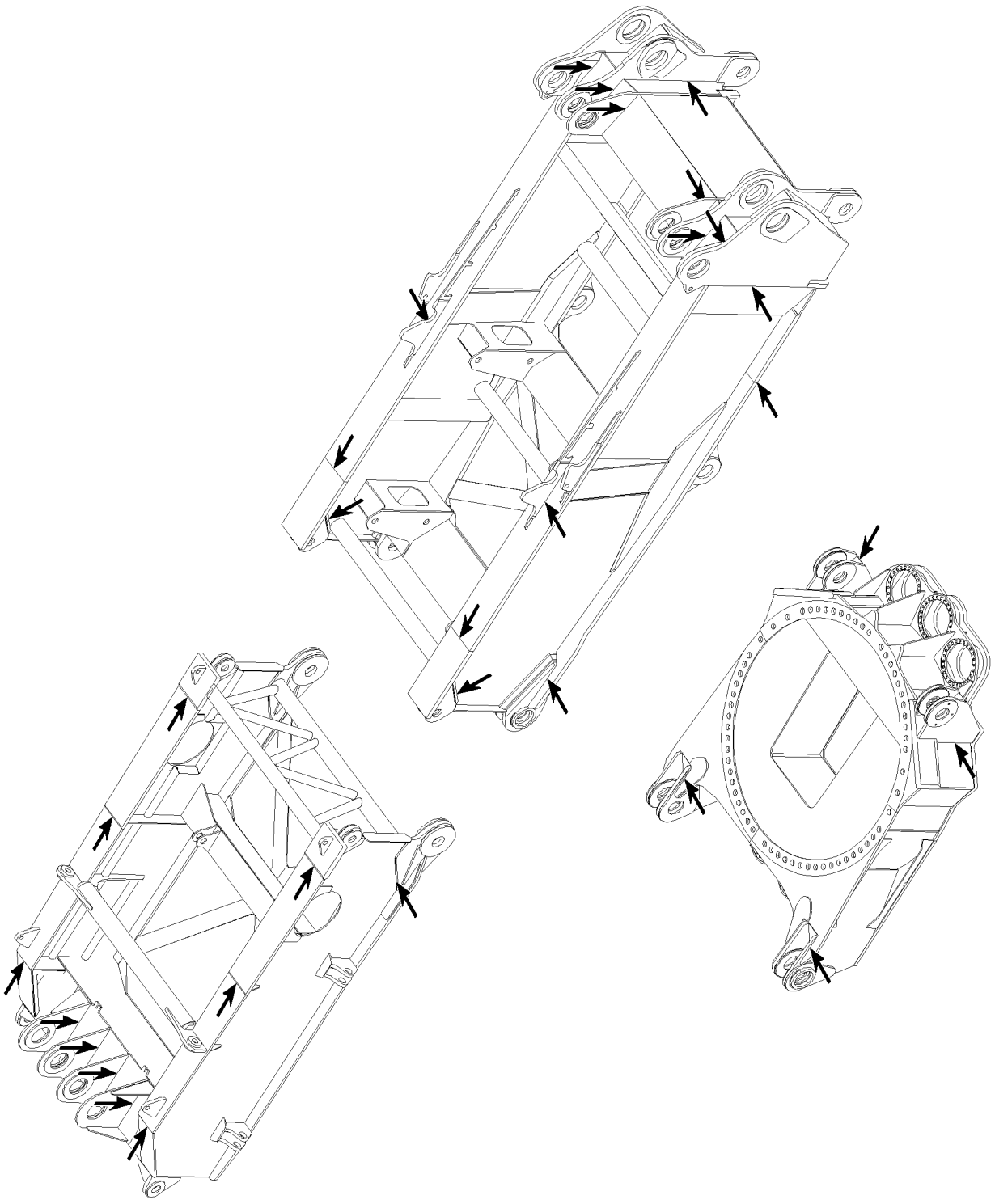

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Fig.105692: Example of a turntable frame

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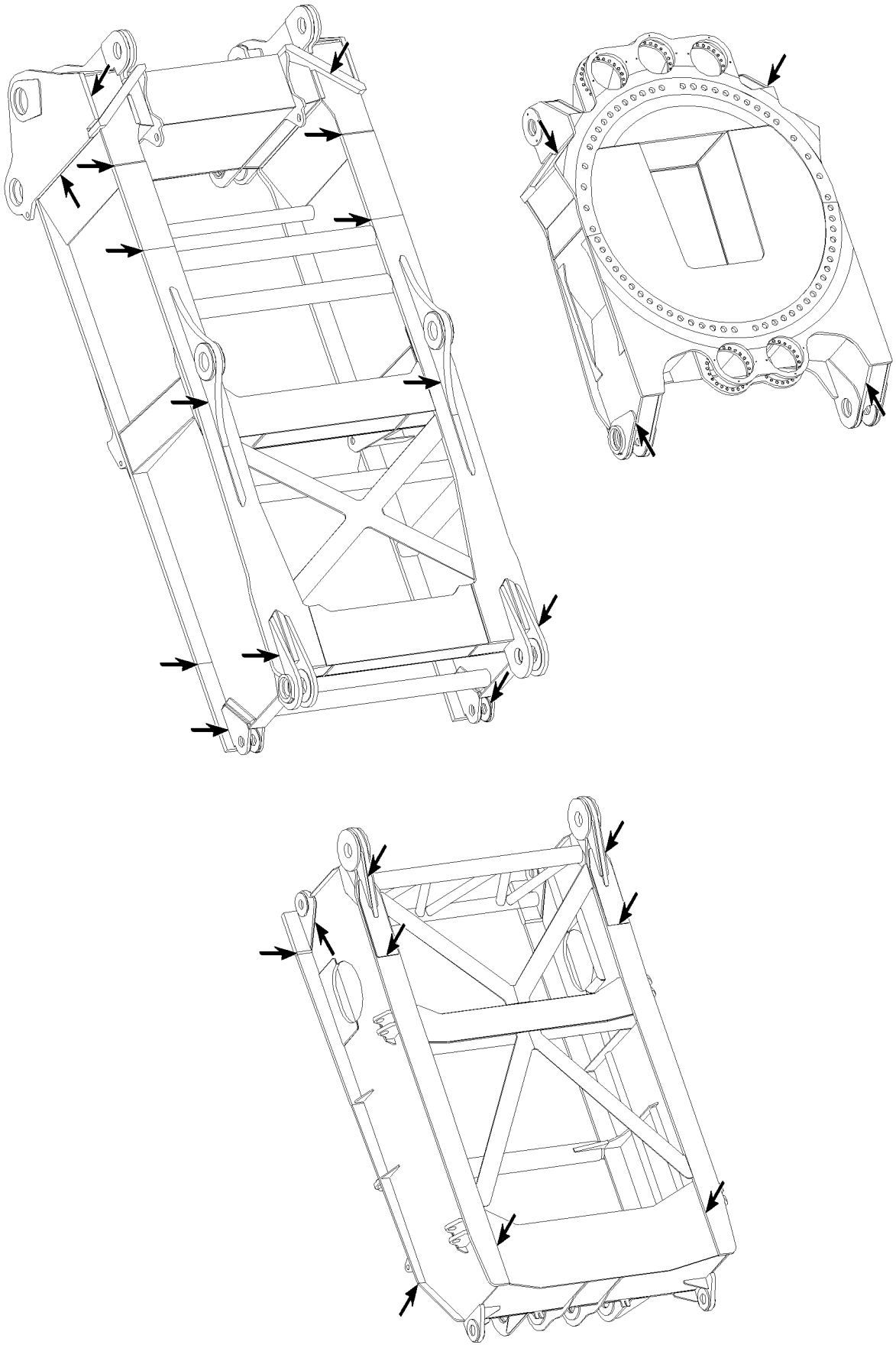

Fig.105693: Example of a turntable frame

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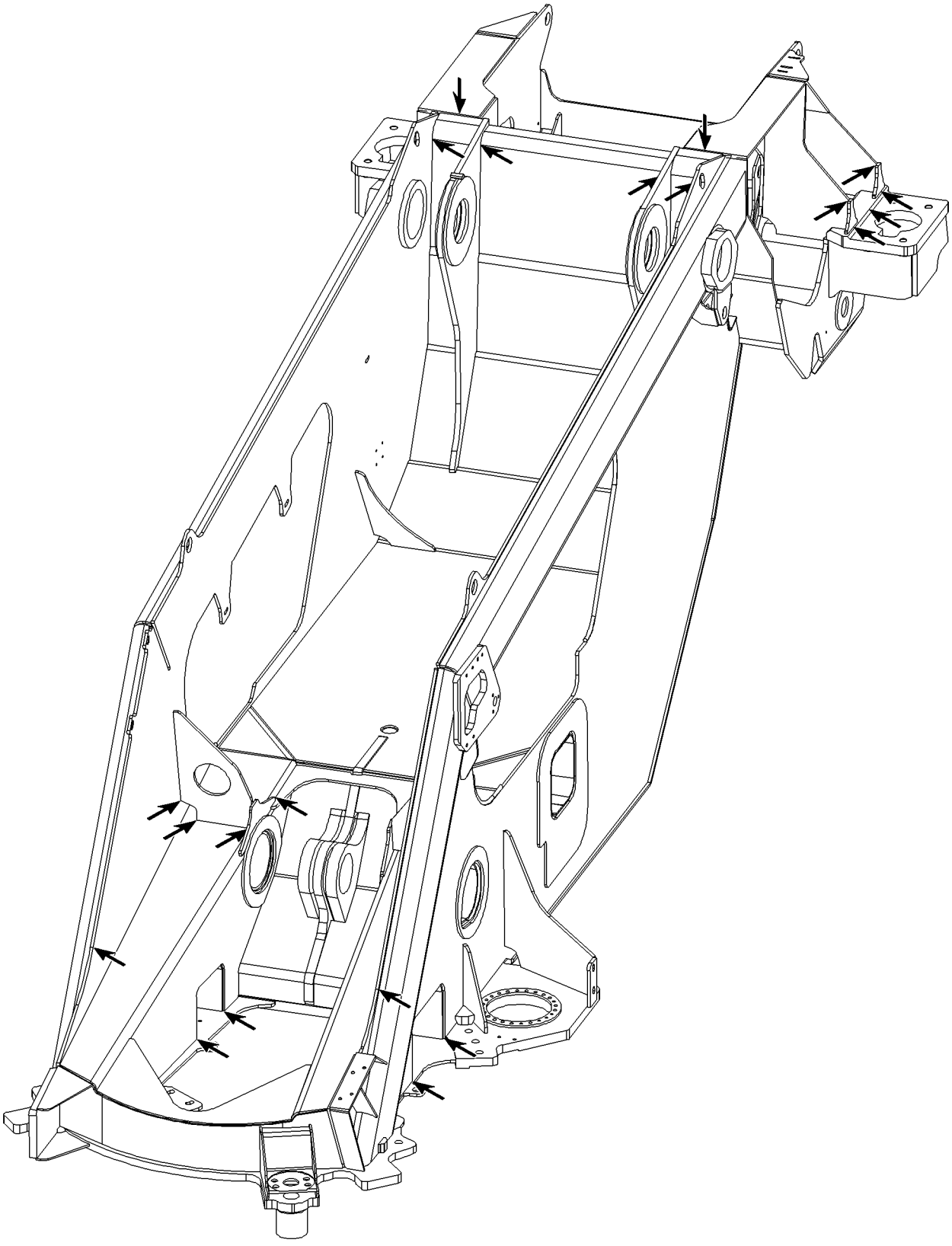

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Fig.105722: Example of a turntable frame

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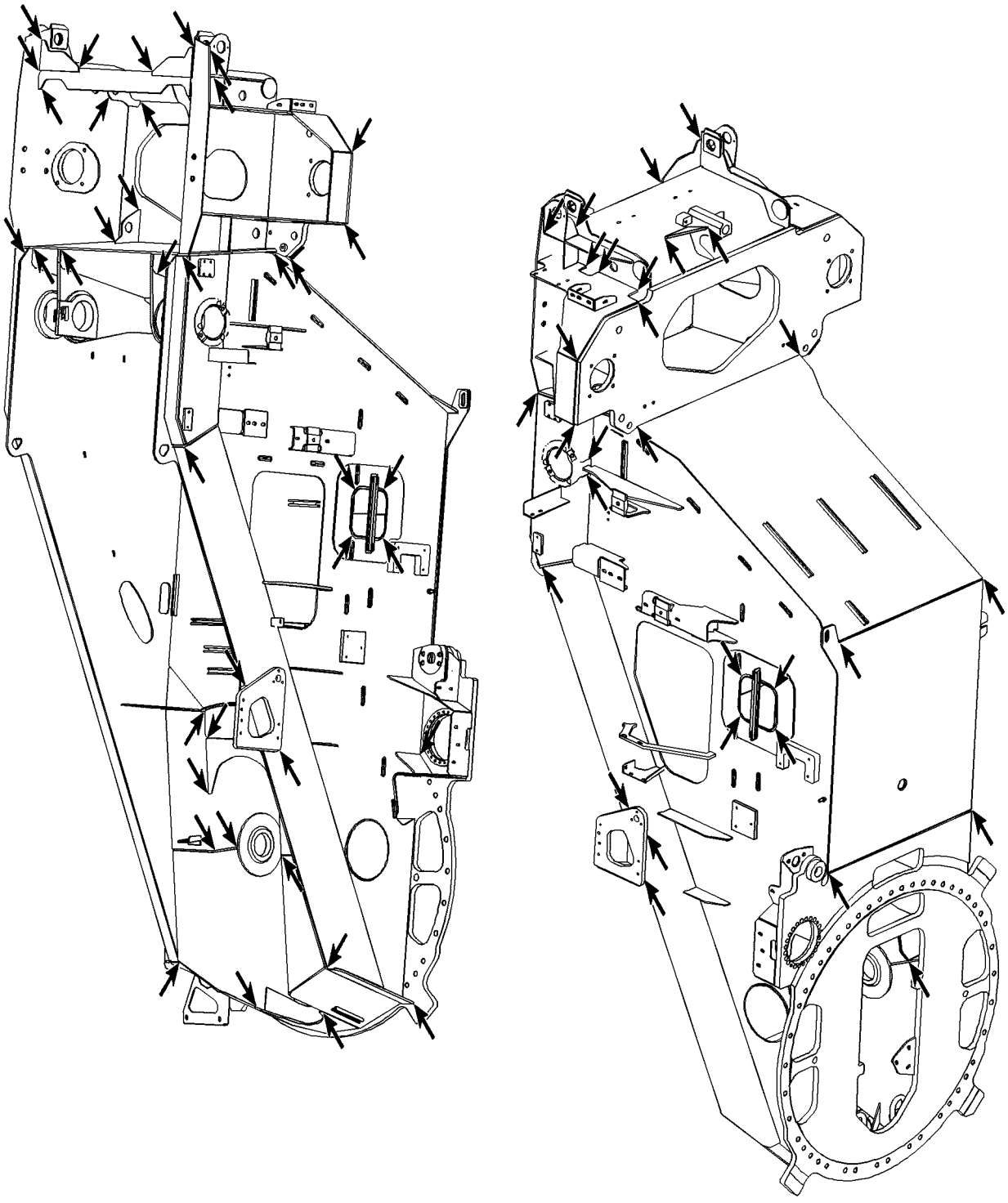

LWE/LR 11000-001/23501-05-02/en

Fig.105932: Example of a turntable frame

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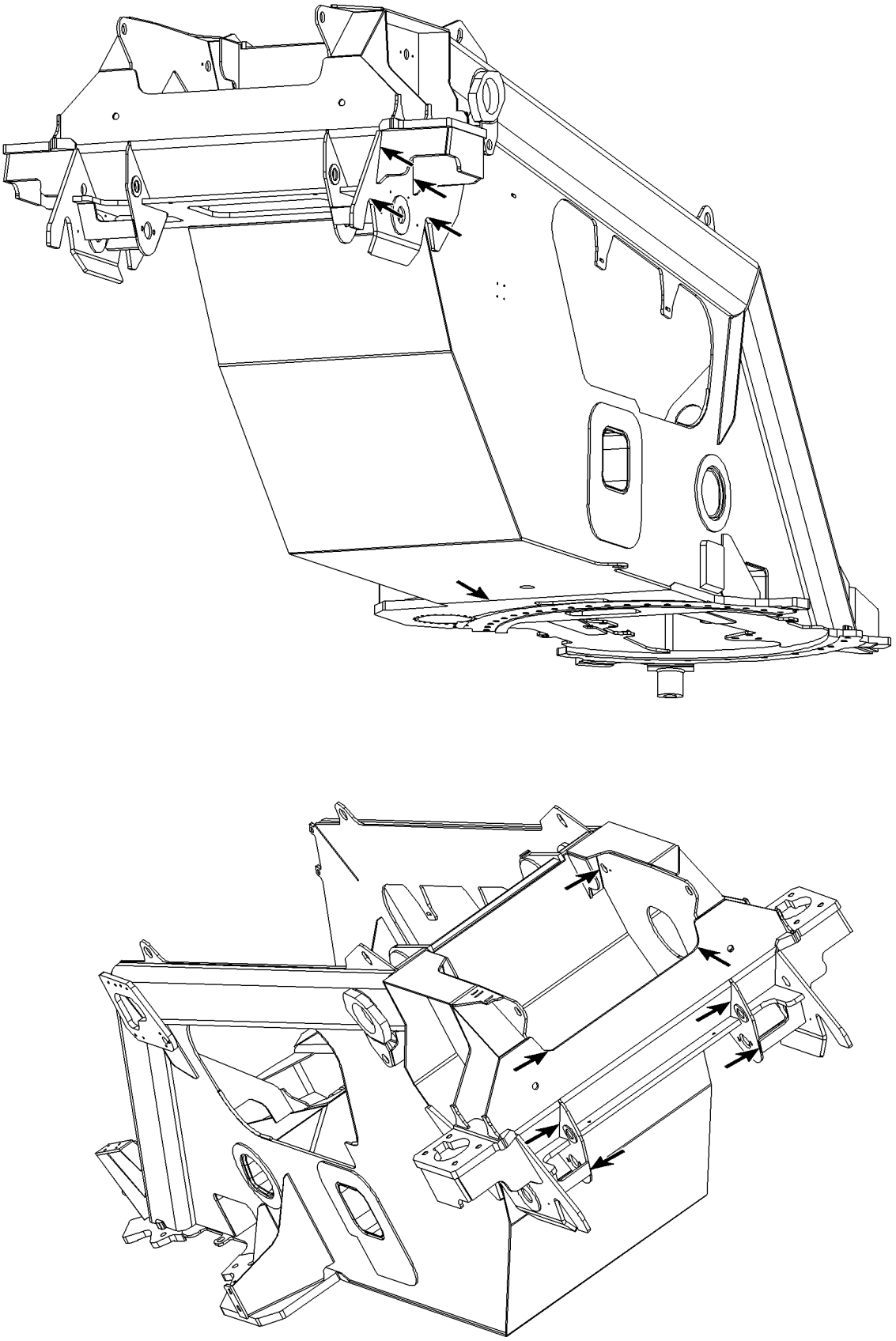

Fig.105723: Example of a turntable frame

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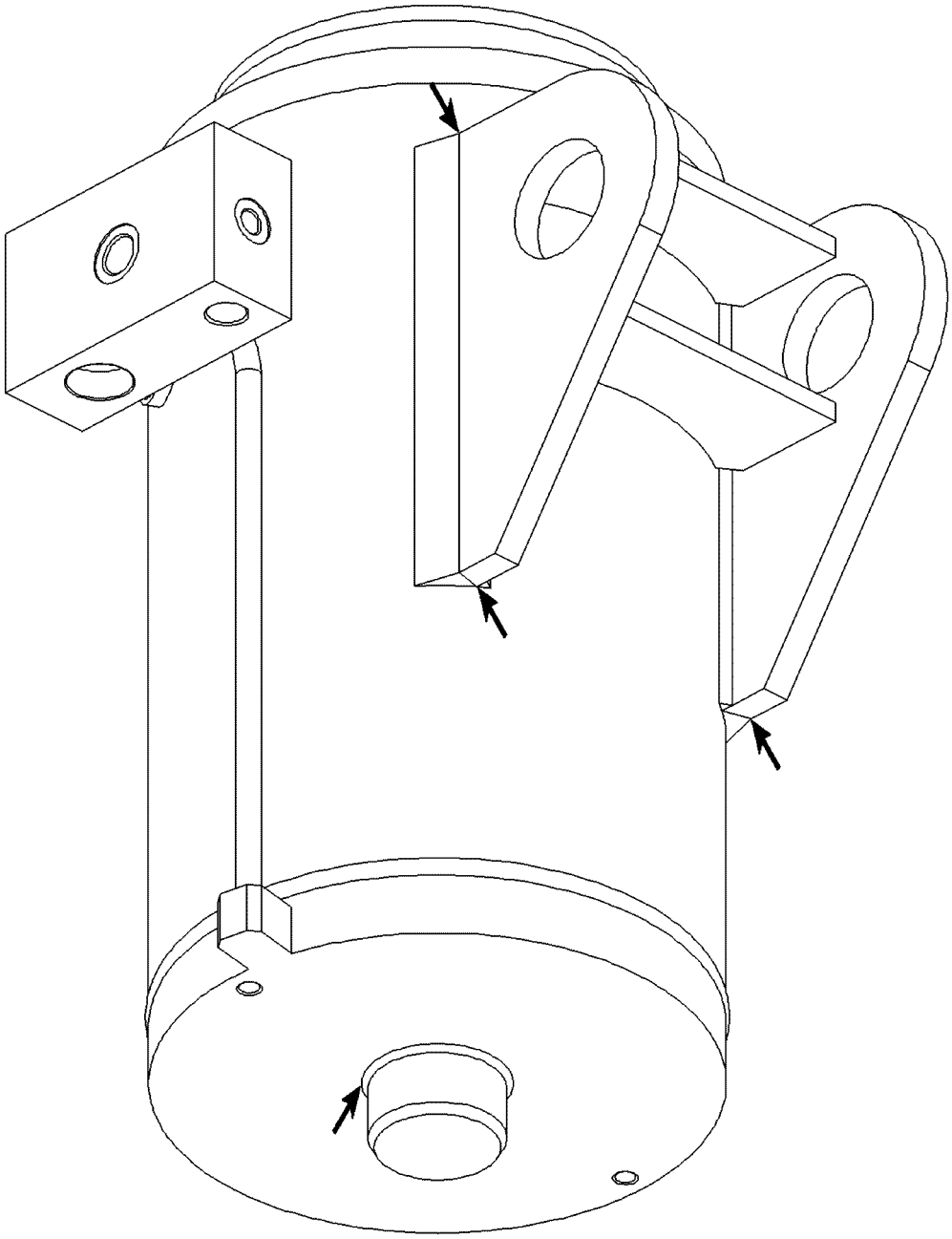

Fig.105801: Example of a ballast cylinder

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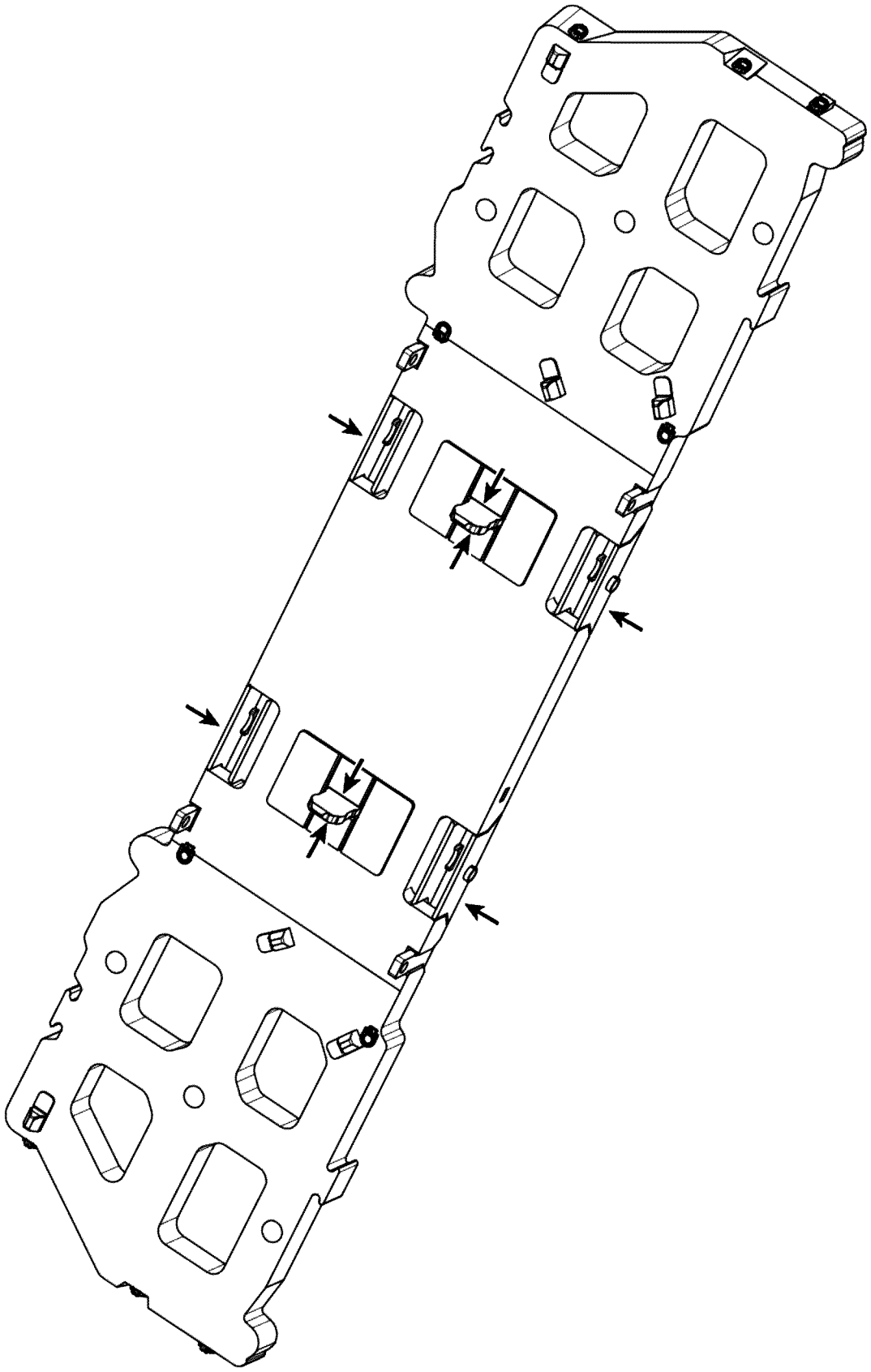

Fig.105705: Example of mounting plate

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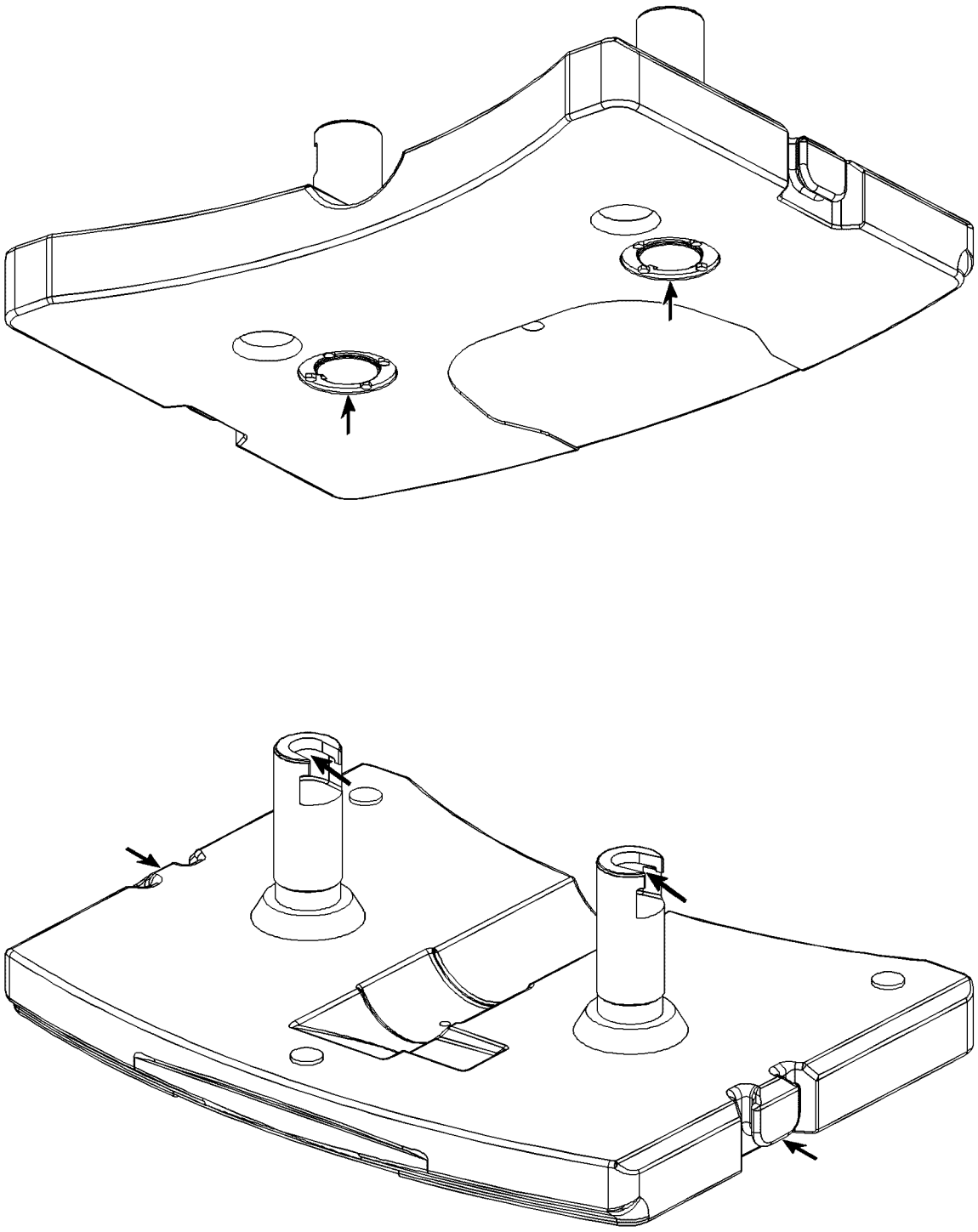

Fig.105807: Example of base plate

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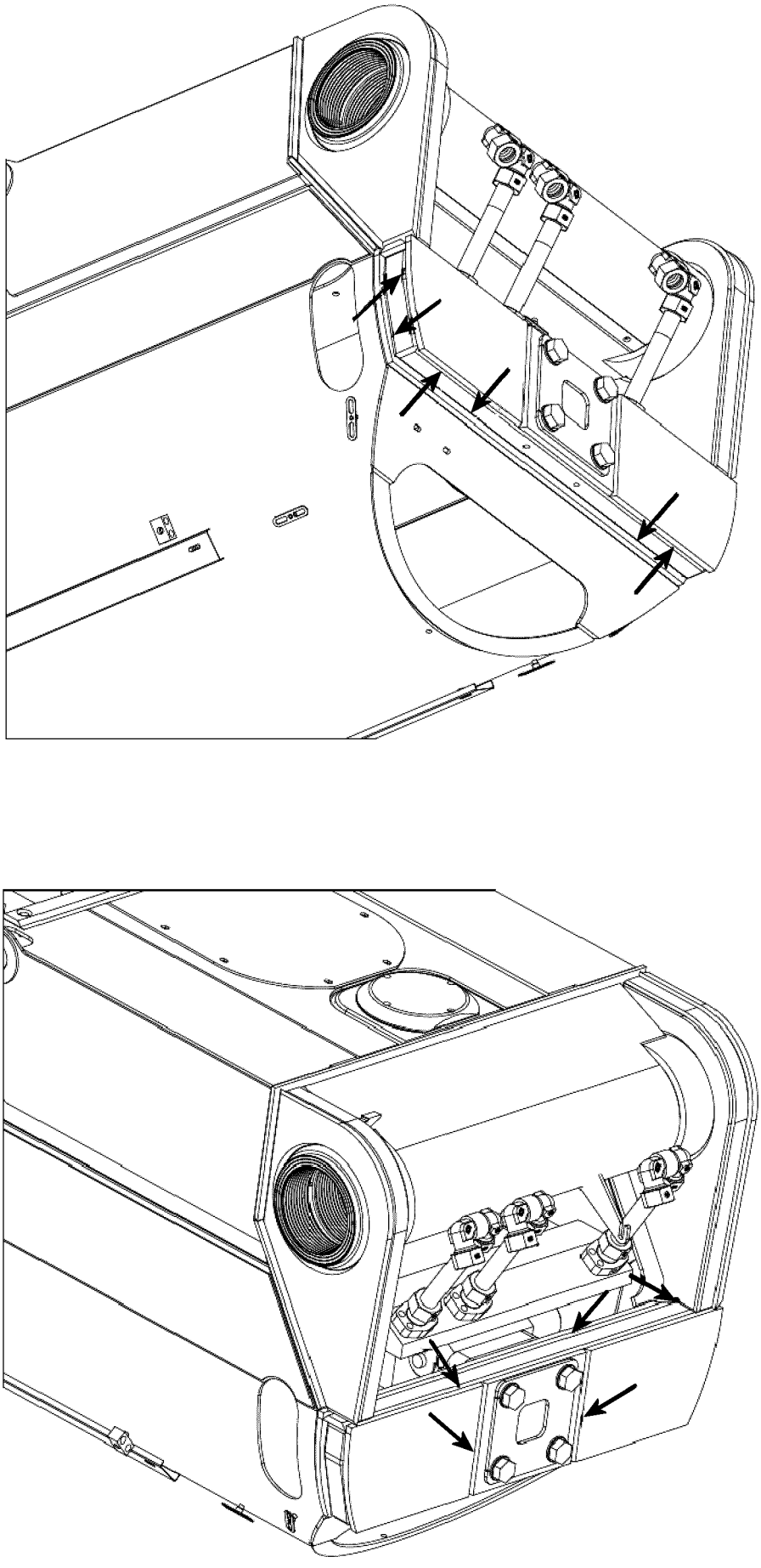

Fig.120273: Example of pivot section

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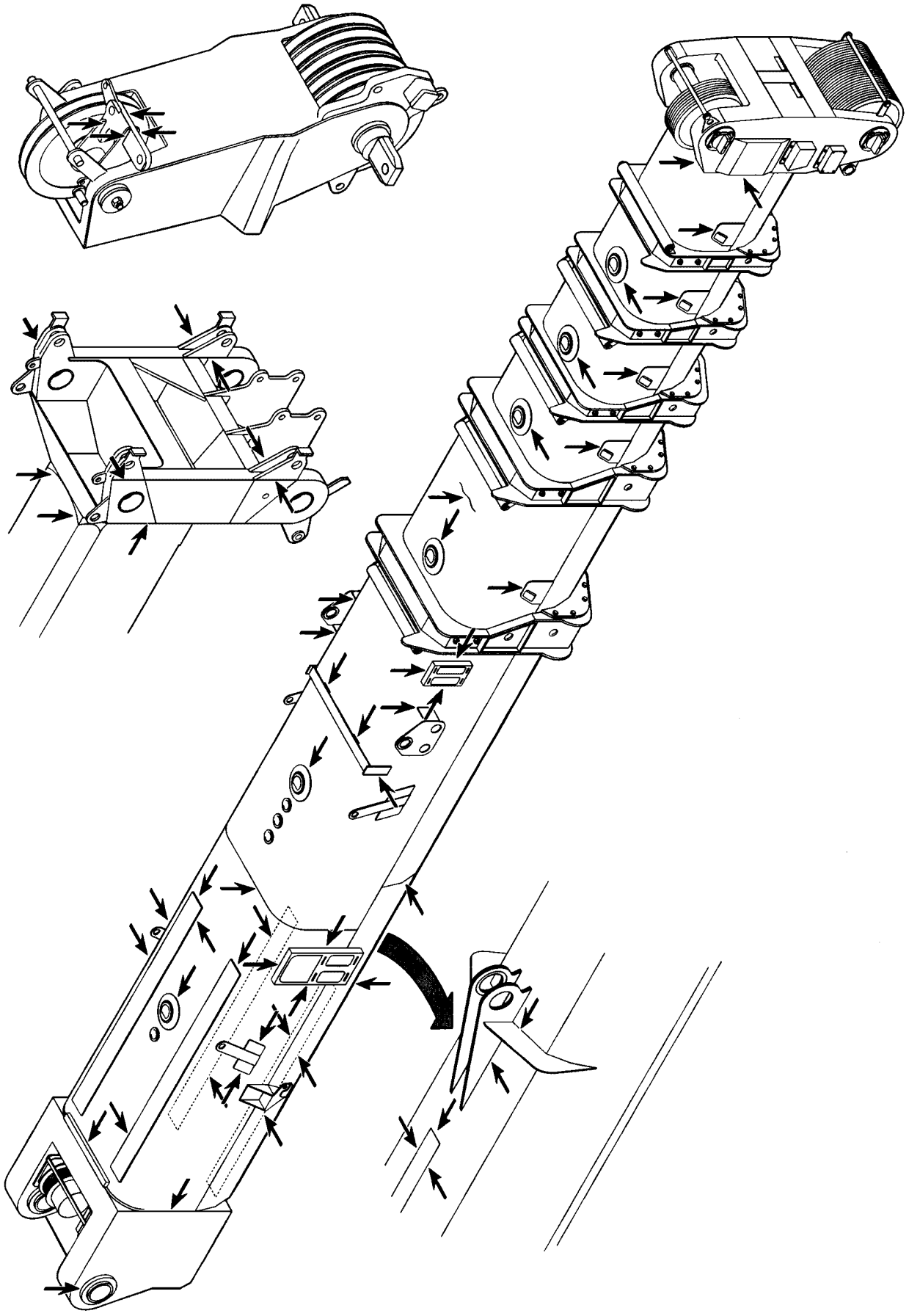

Fig.185050: Example of a telescopic boom

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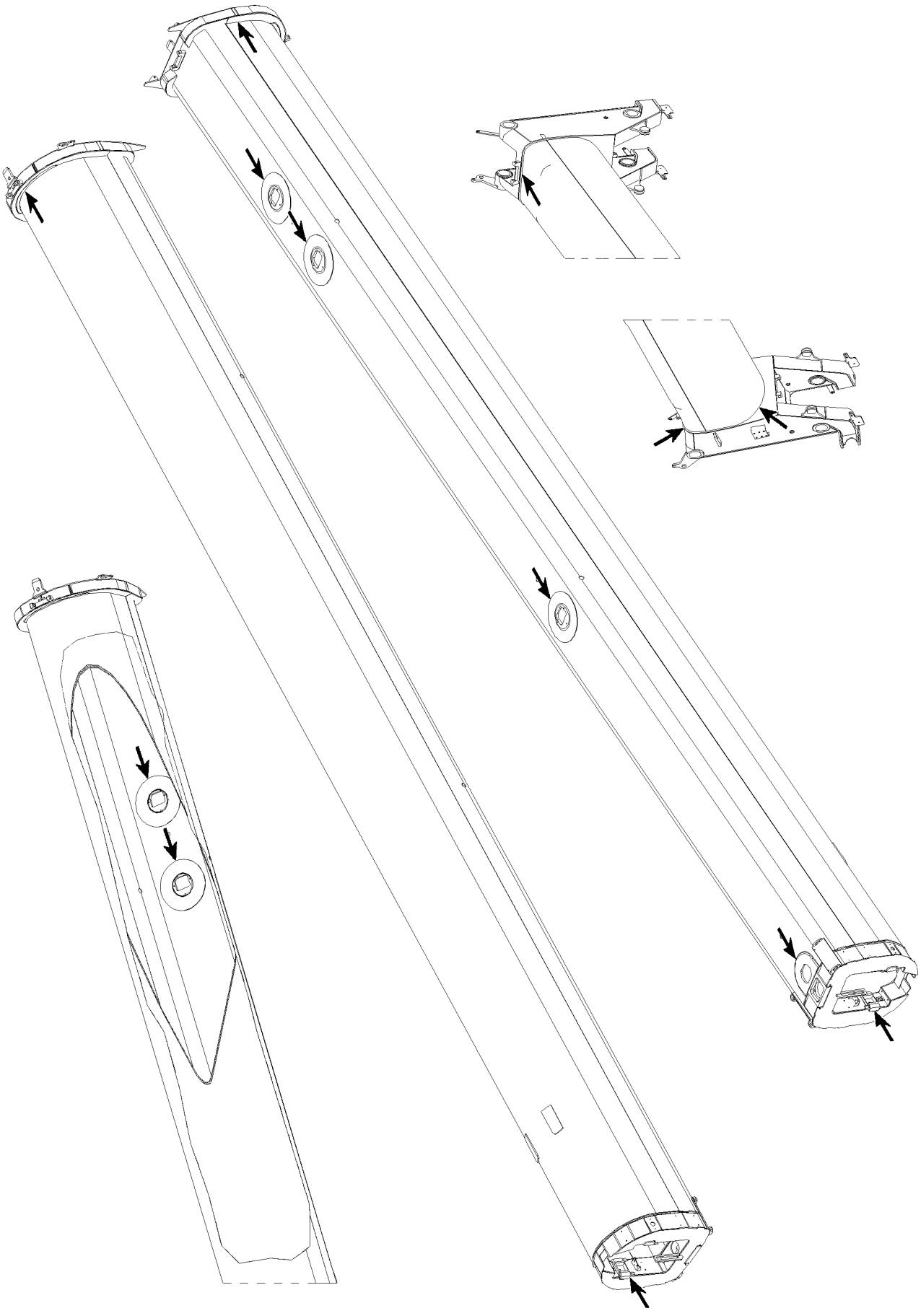

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Fig.105710: Example of a telescopic boom

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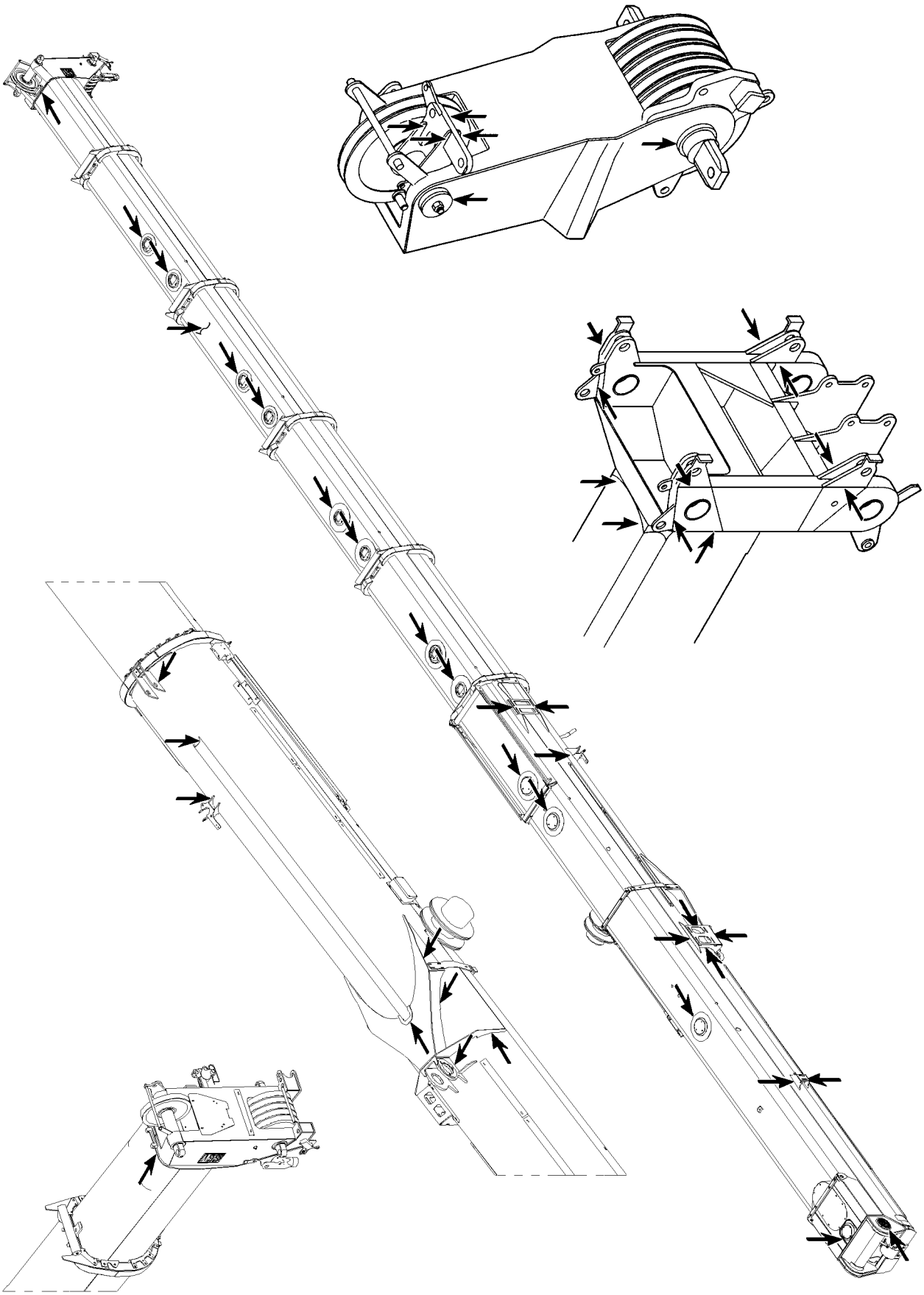

Fig.105711: Example of a telescopic boom

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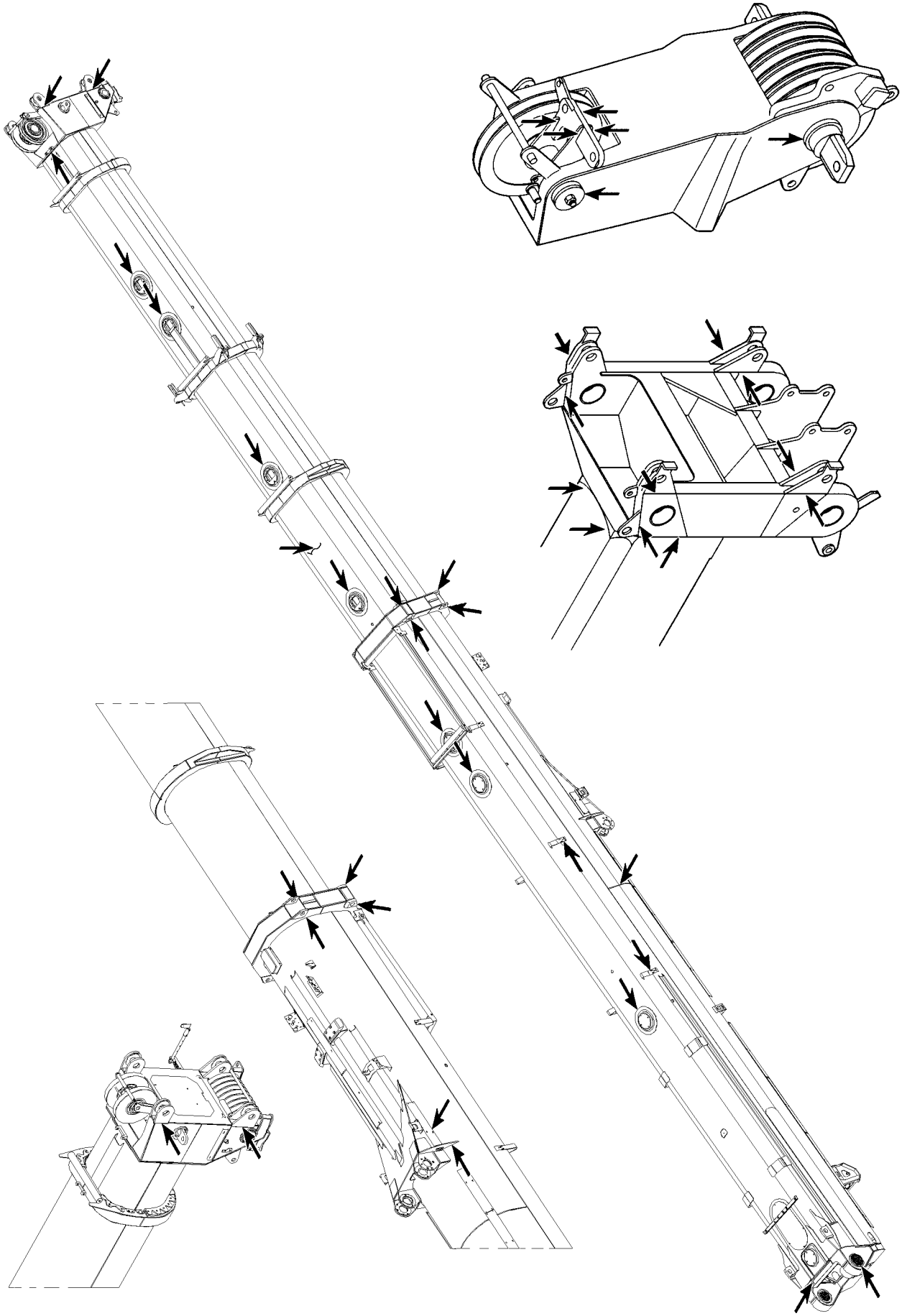

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Fig.105720: Example of a telescopic boom

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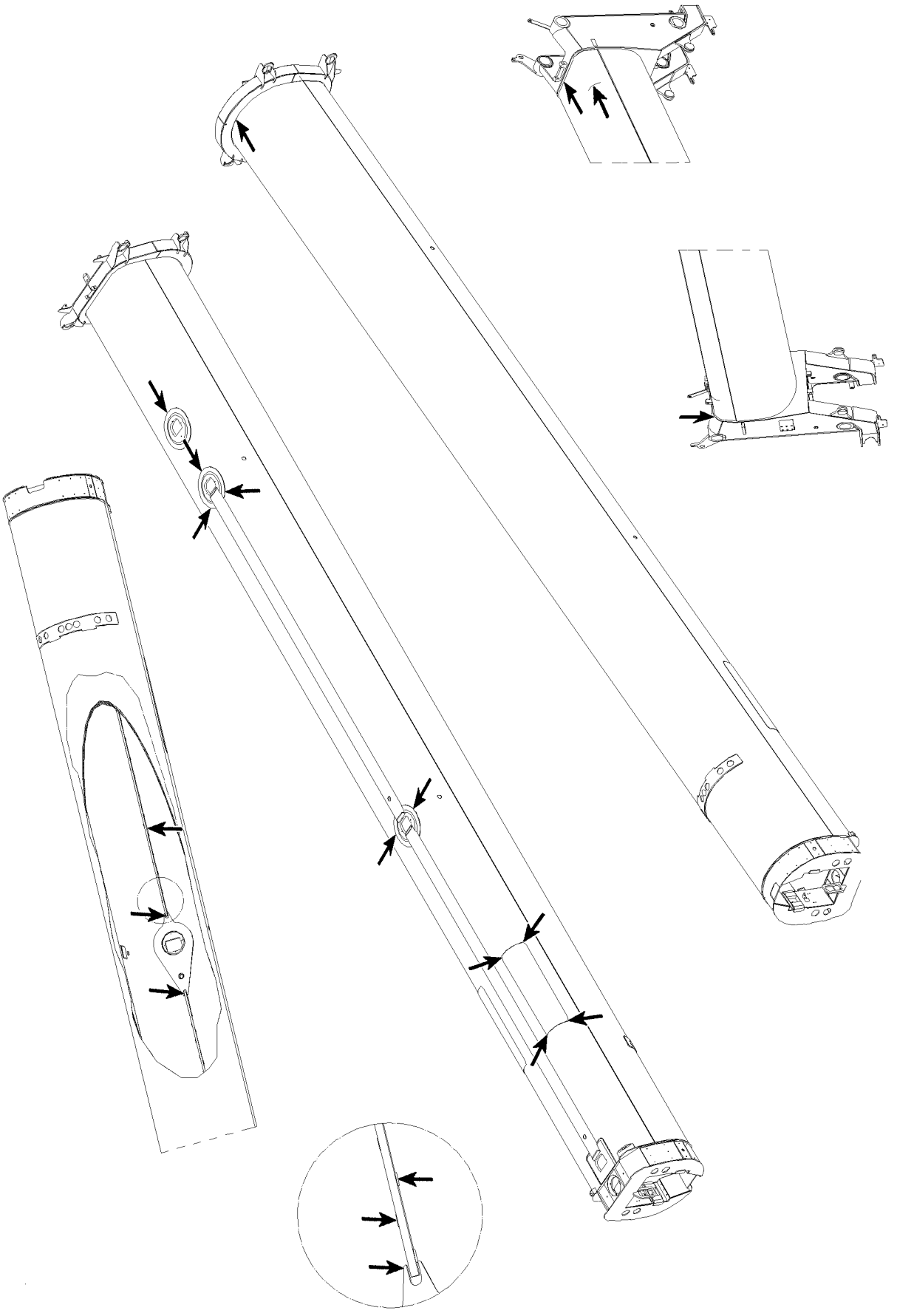

Fig.105721: Example of a telescopic boom

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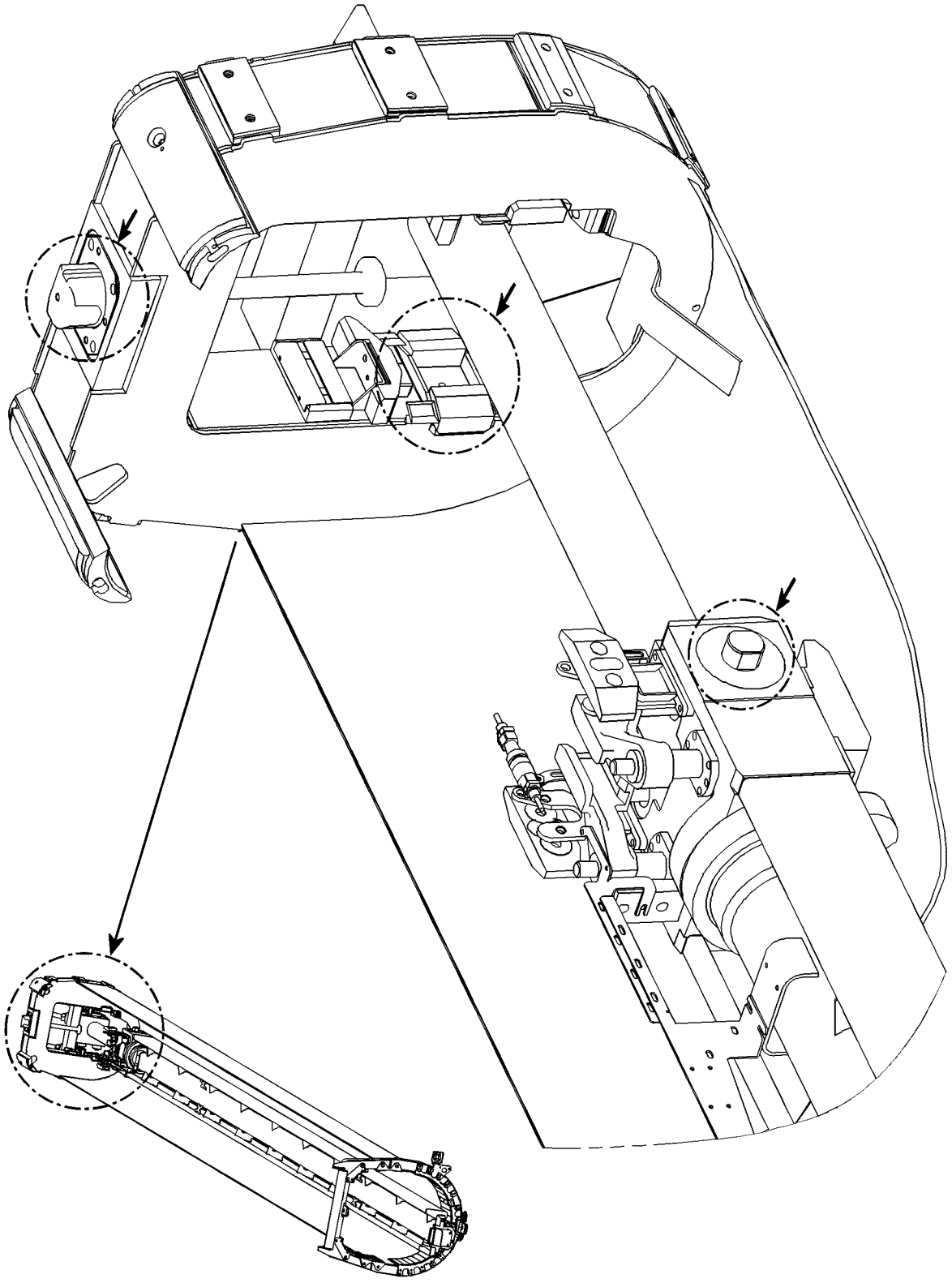

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Fig.105891: Example of push out mechanics telescopic boom

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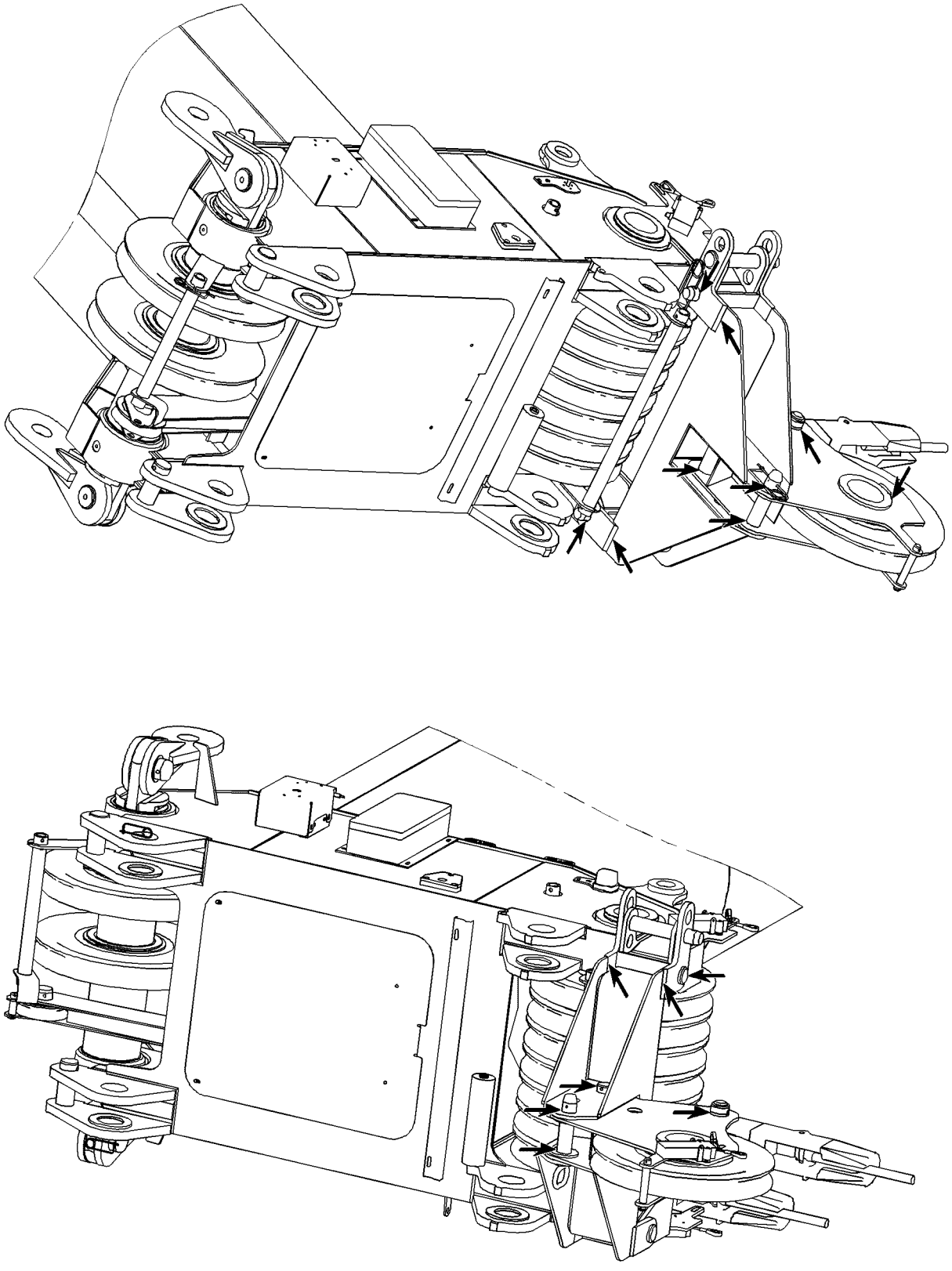

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Fig.105892: Example of boom nose

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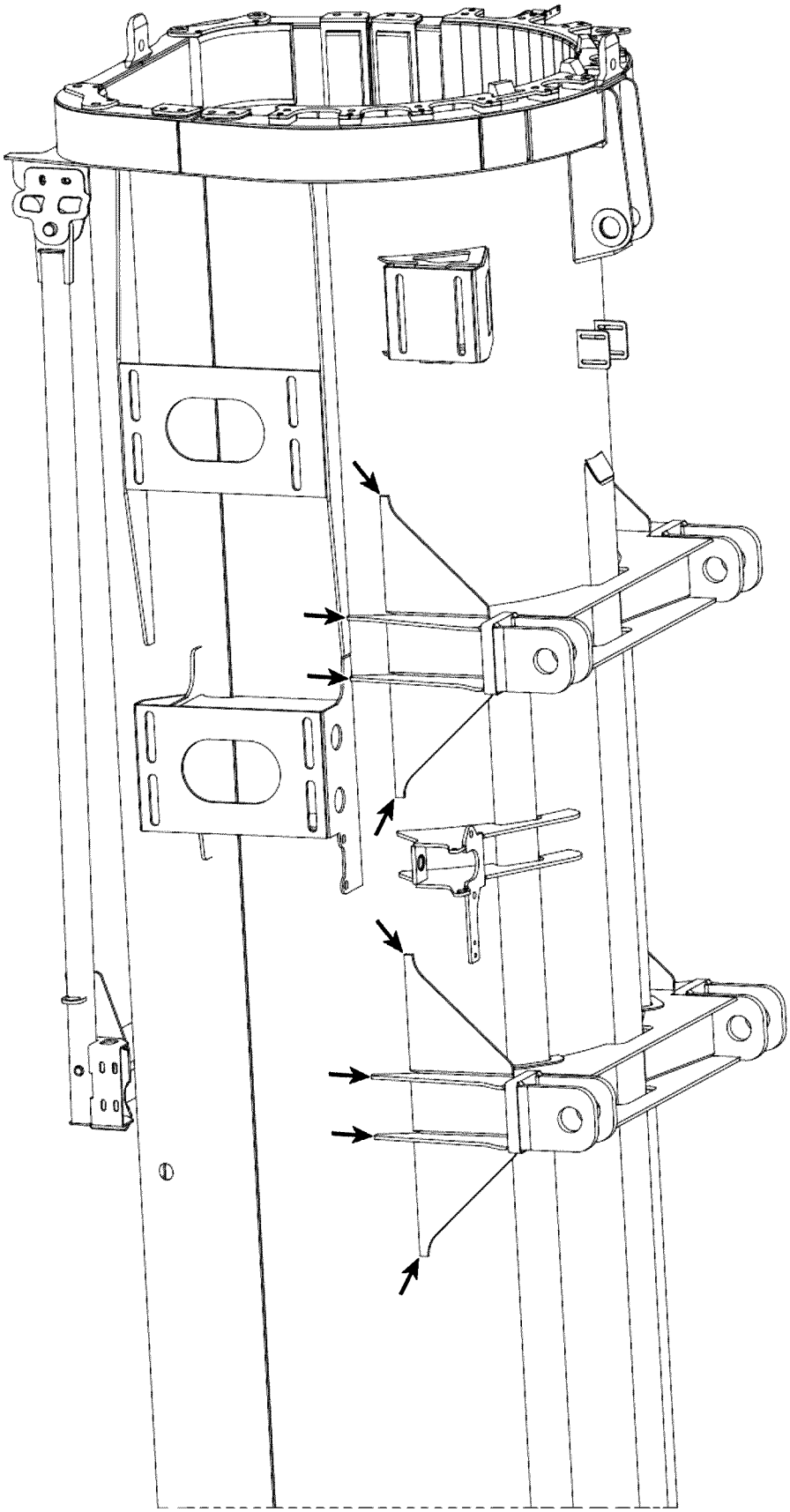

Fig.105689: Example of dolly console

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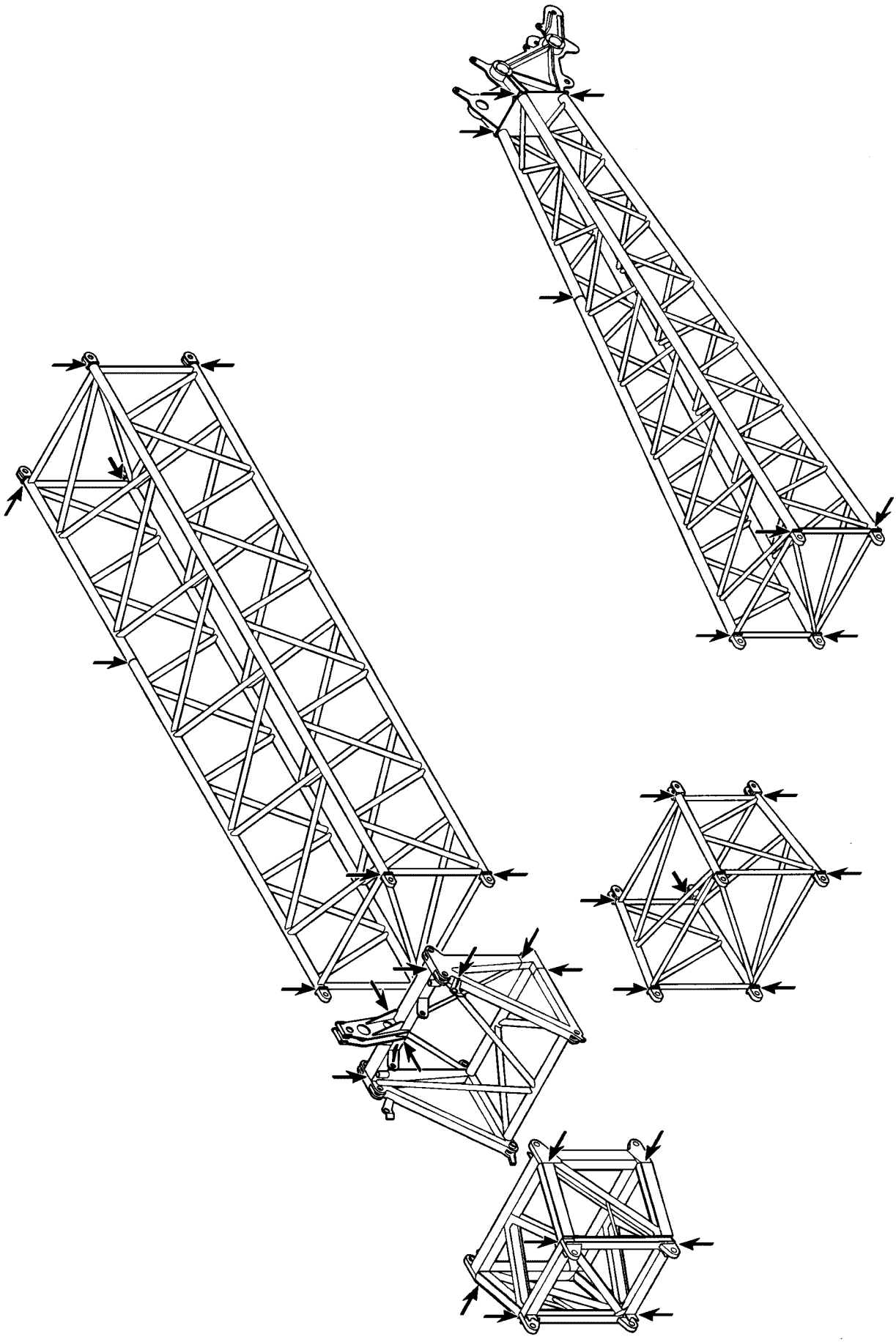

Fig.185051: Example of lattice jib

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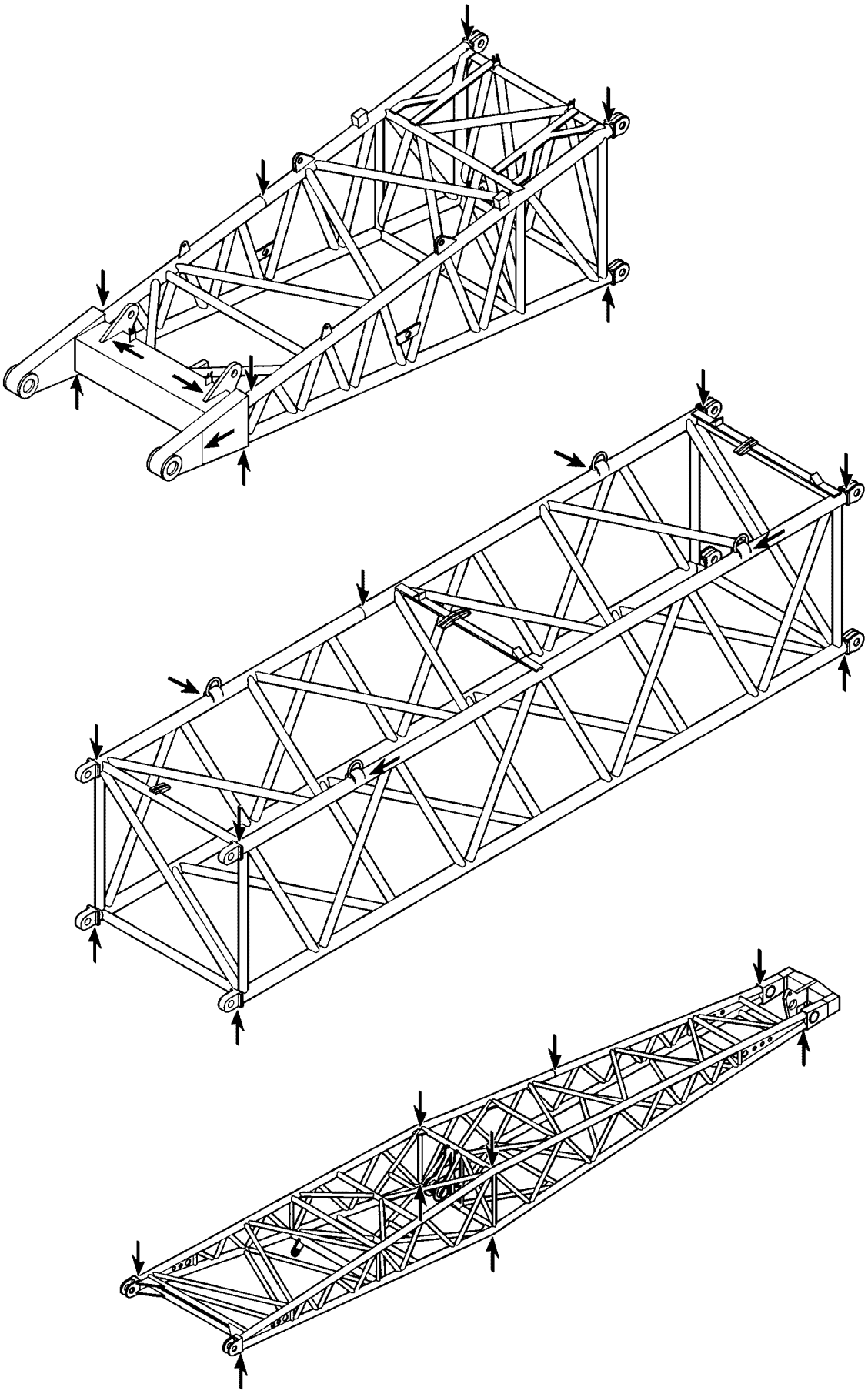

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Fig.185052: Example of NA / WA-frame

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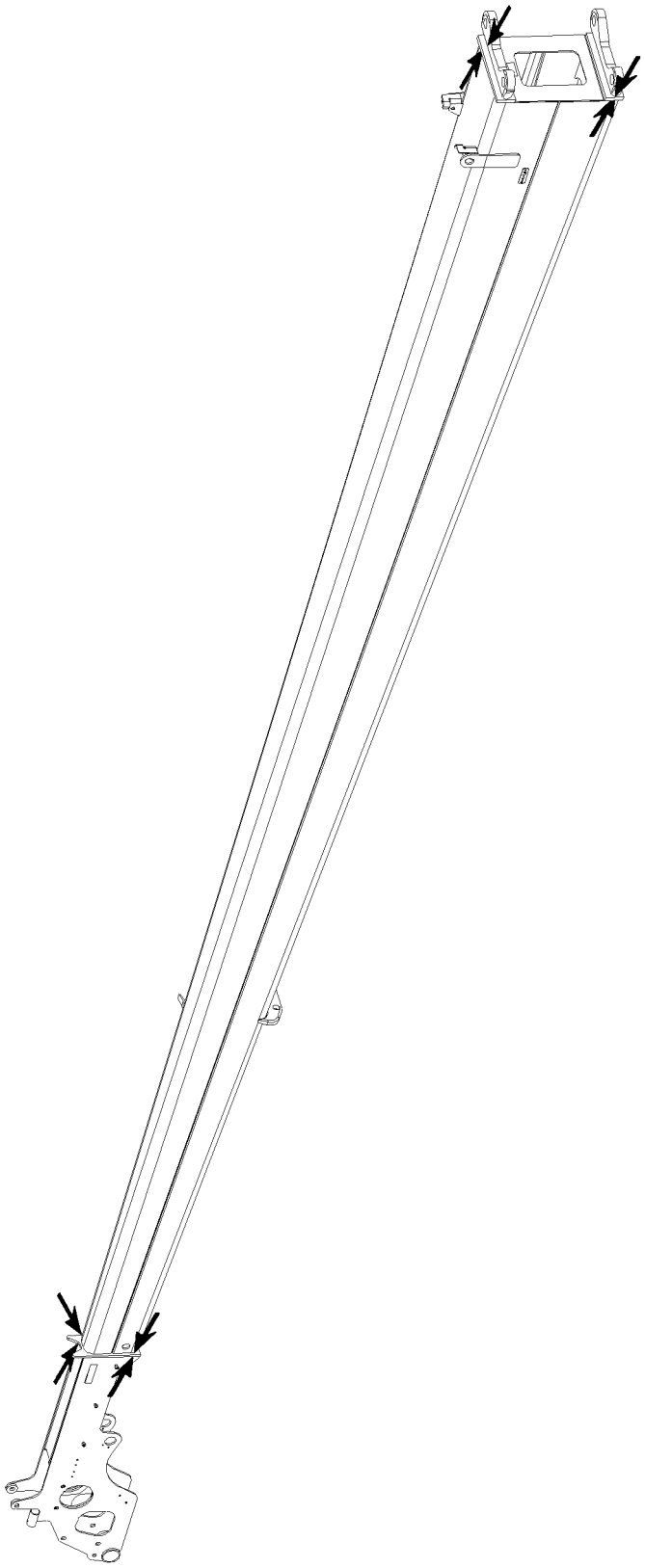

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Fig.105713: Example of end section

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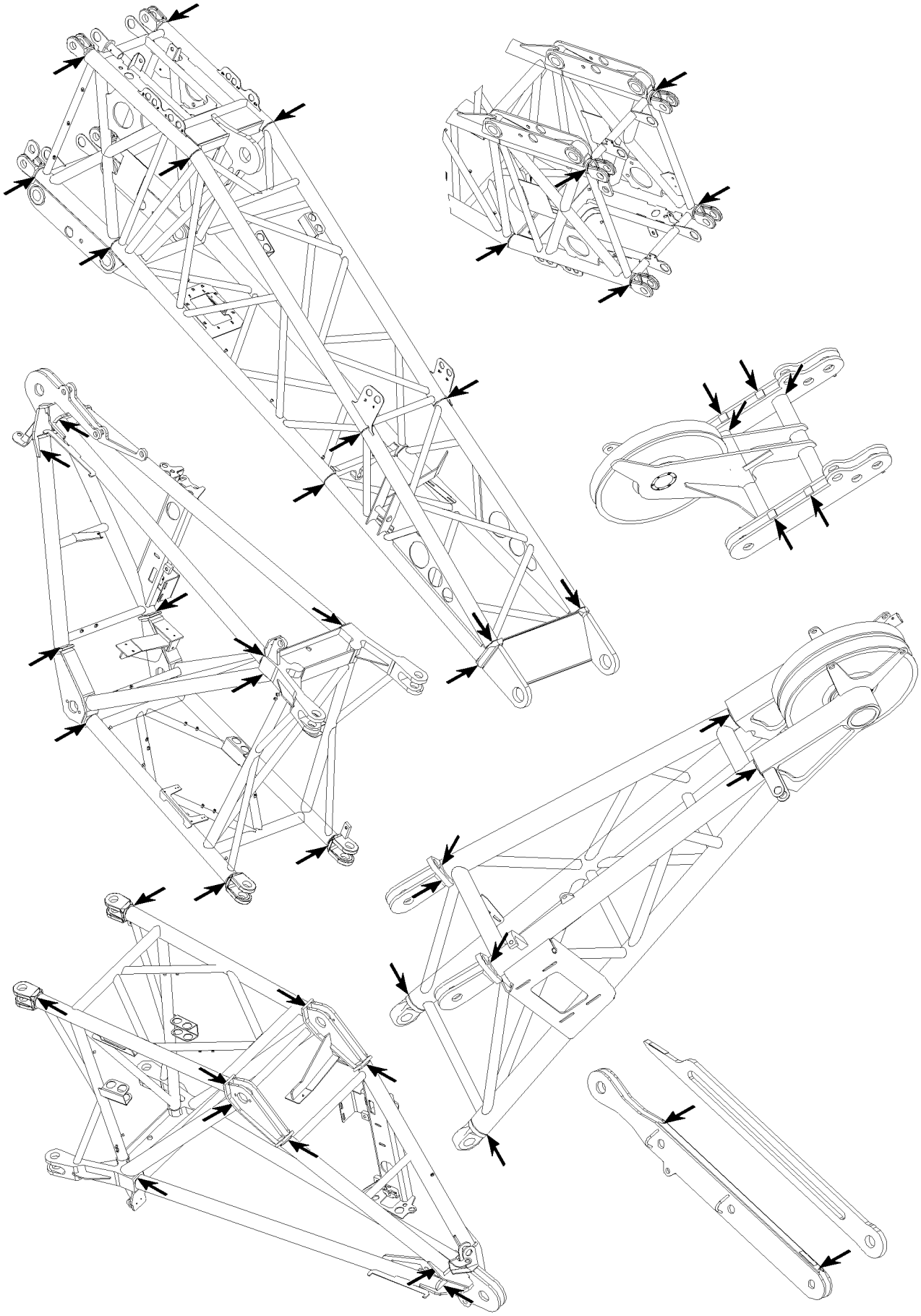

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Fig.105836: Example of pivot section, adapter and boom nose

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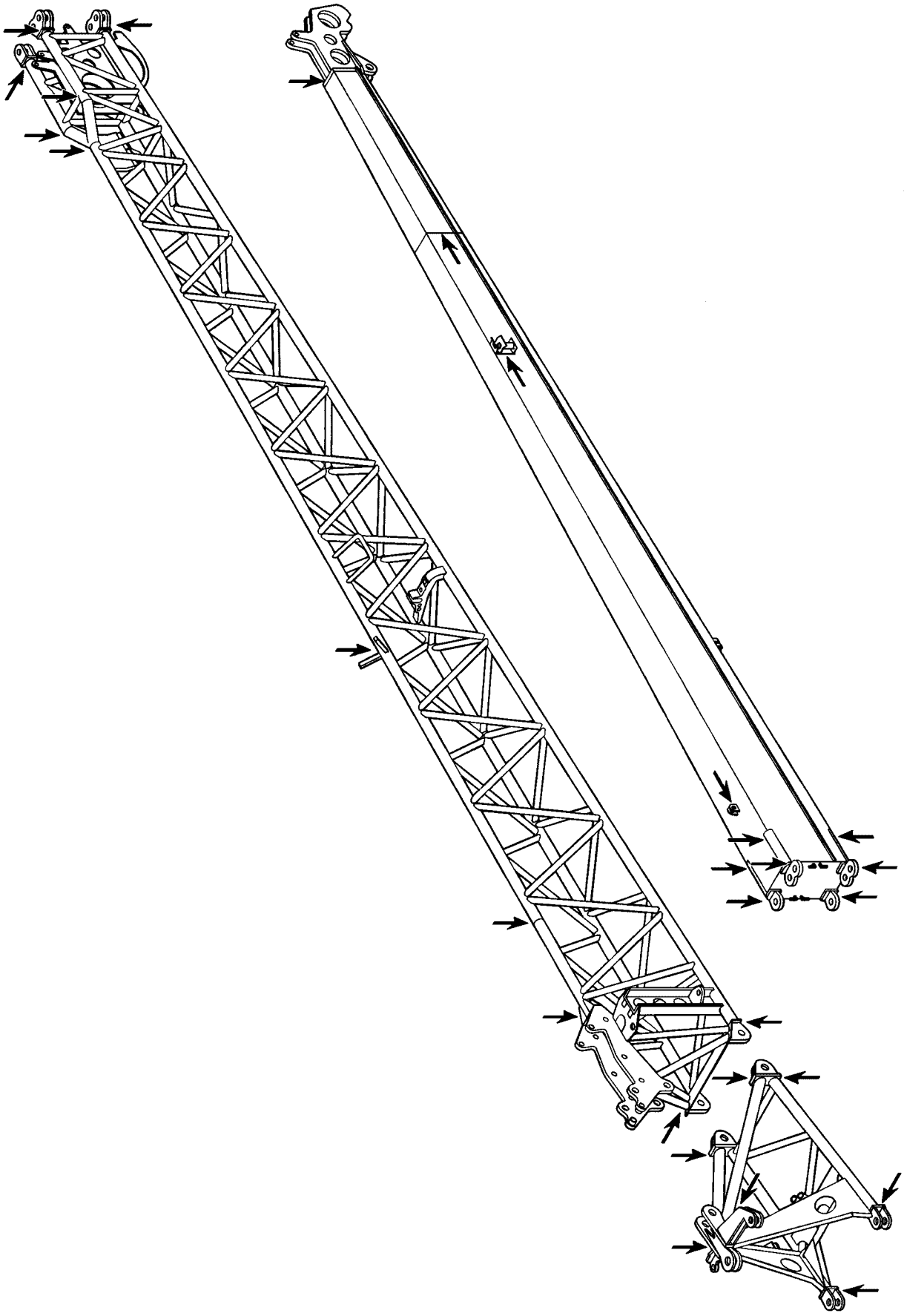

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Fig.185058: Example of a folding jib

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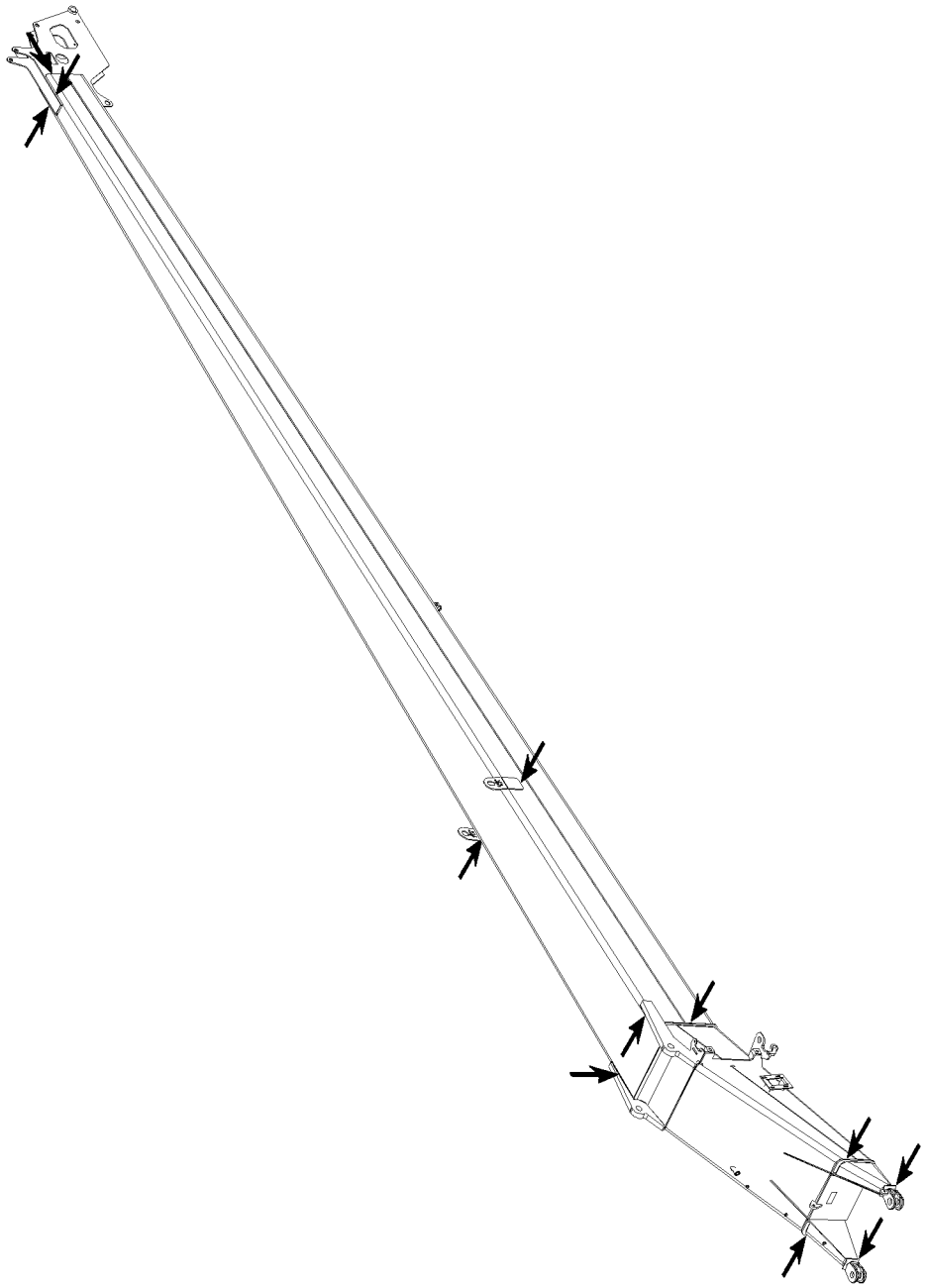

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Fig.105697: Example of a folding jib

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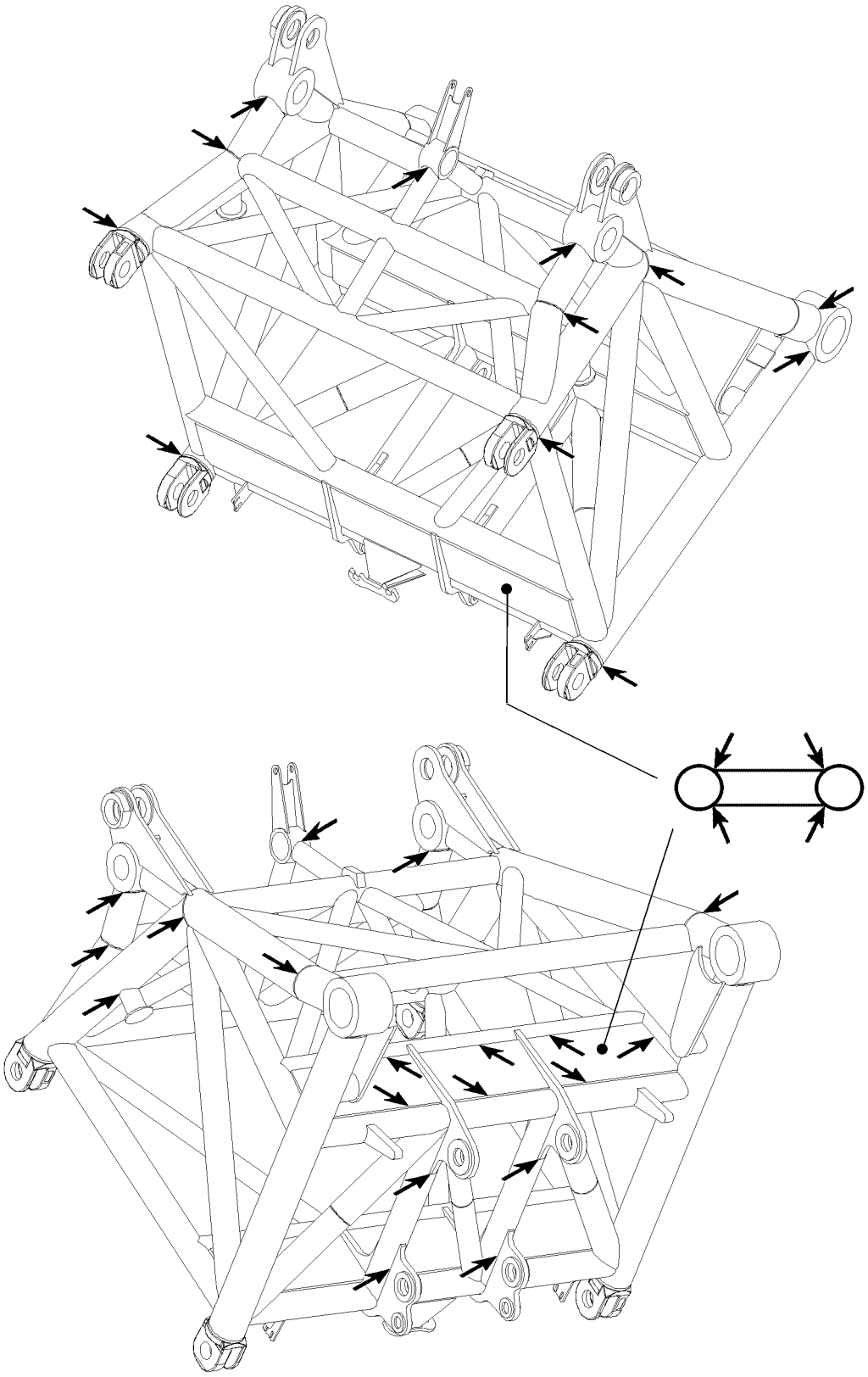

Fig.105732: Example of W-connector head

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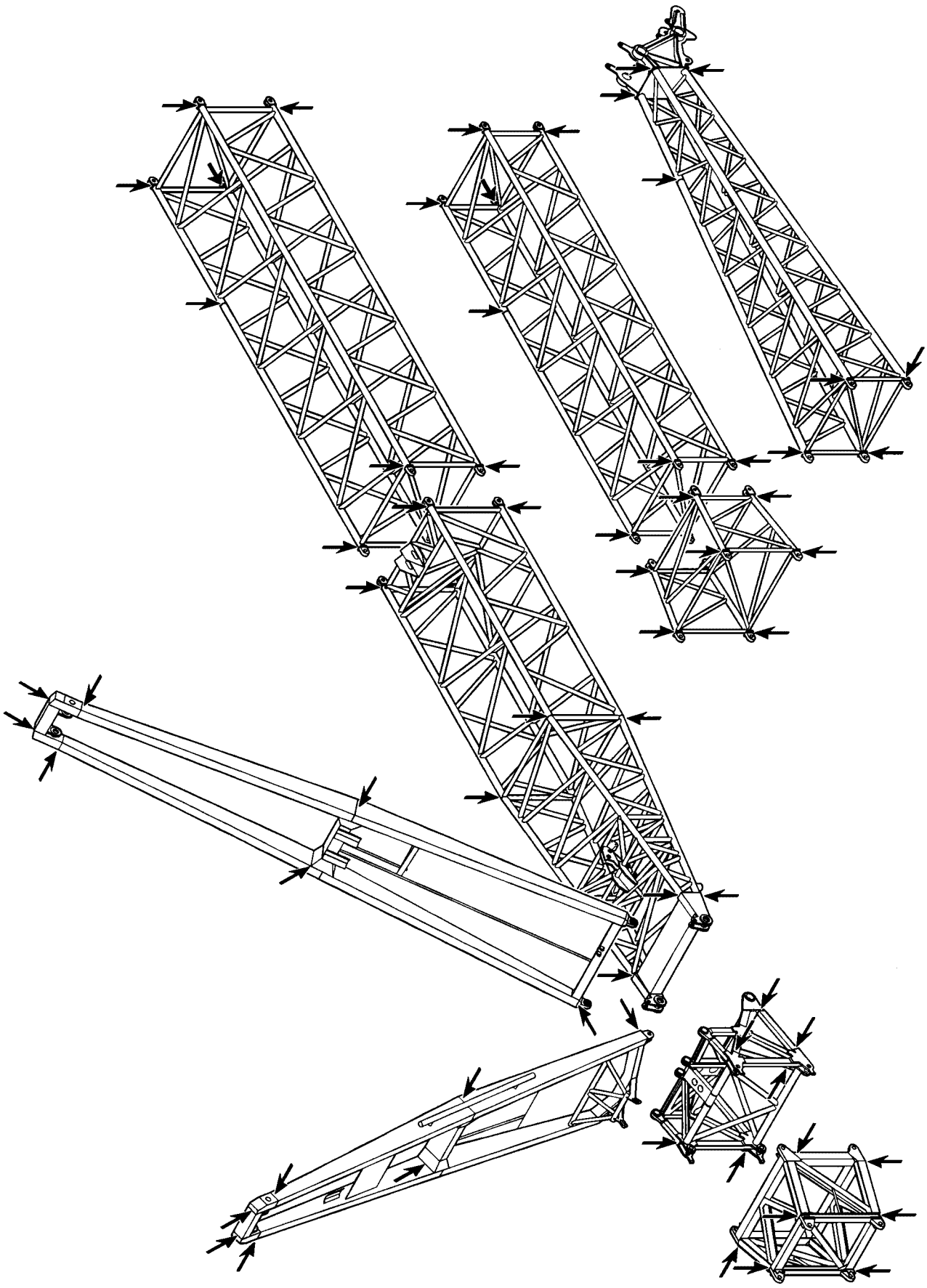

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Fig.185053: Example of assembly unit with lattice jib

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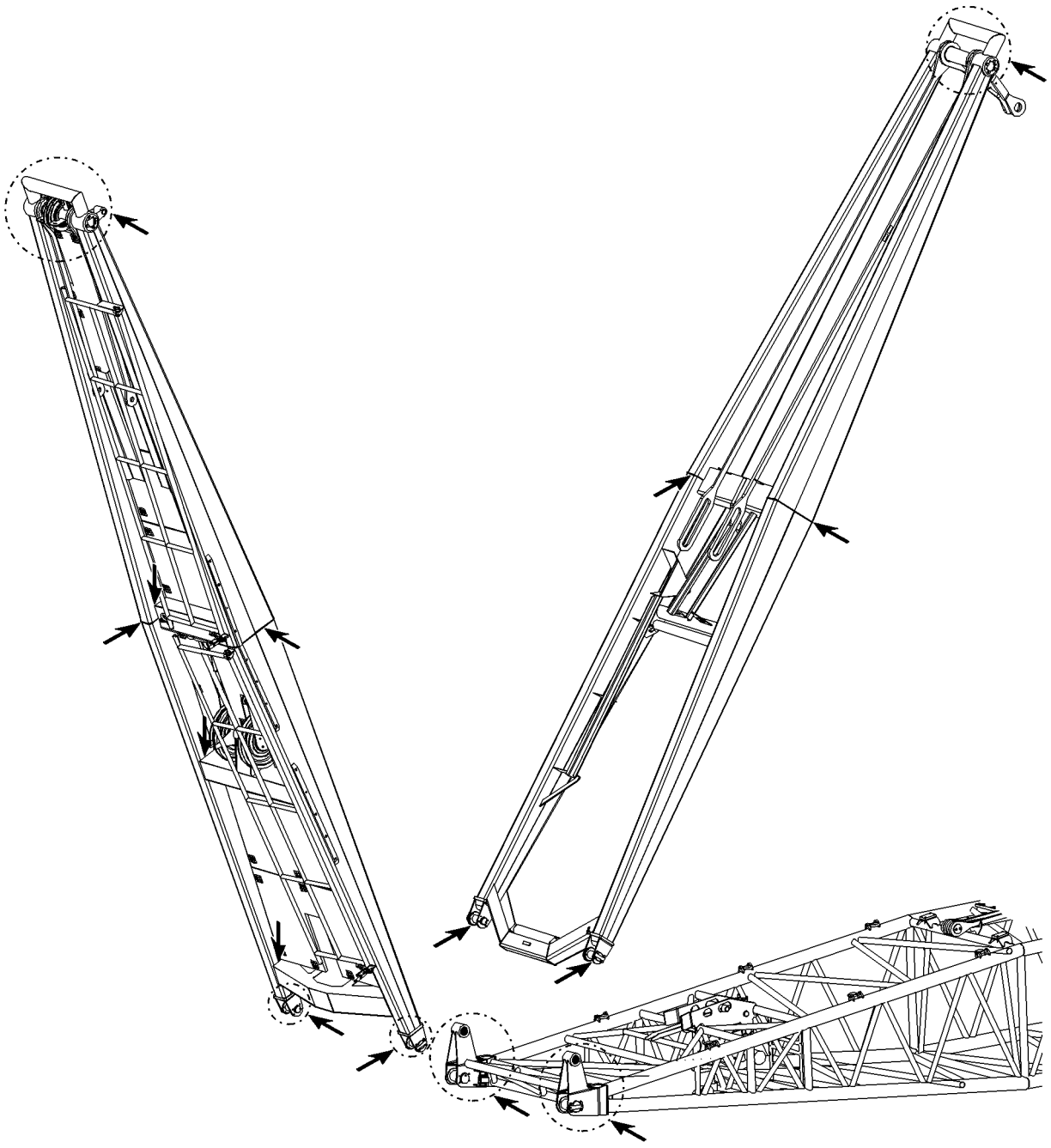

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Fig.105838: Example of NA frames

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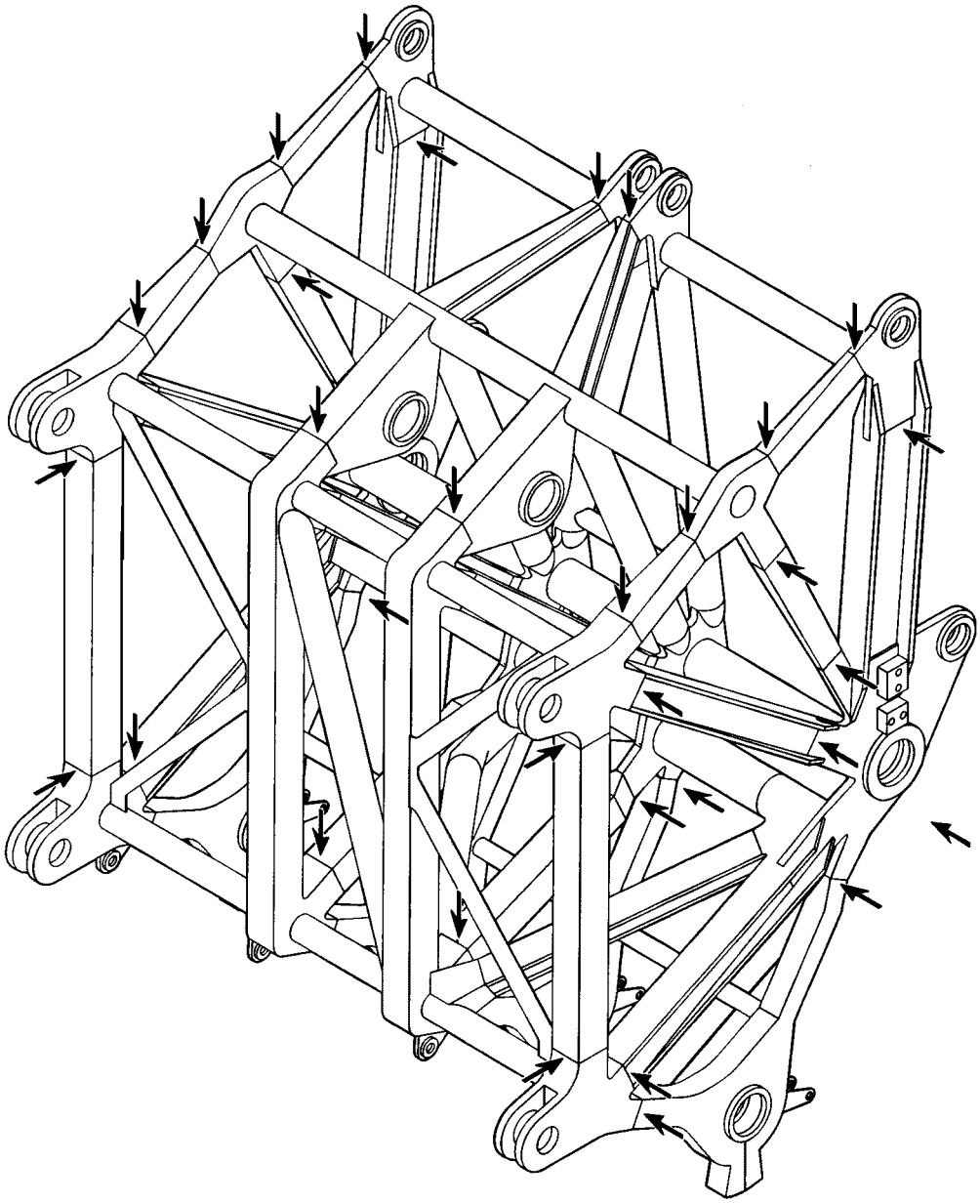

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Fig.185054: Example of pulley head

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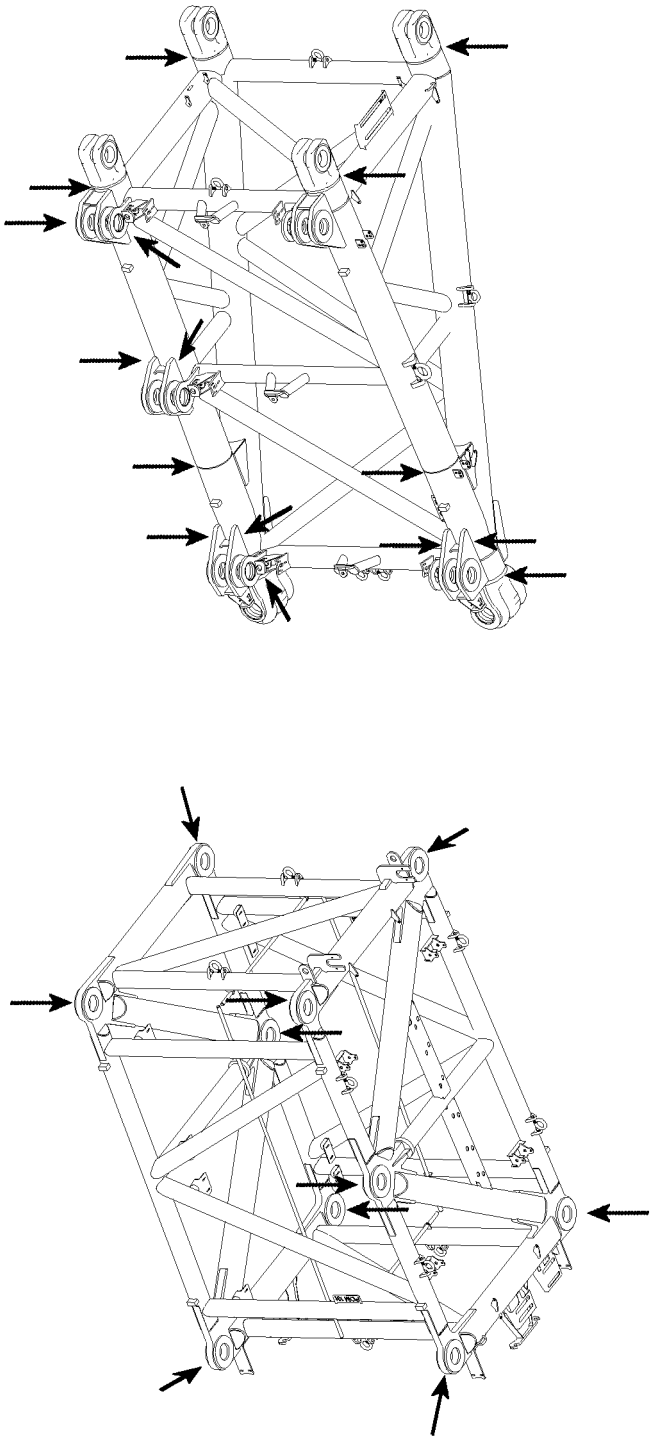

Fig.116609: Example of P-adapter

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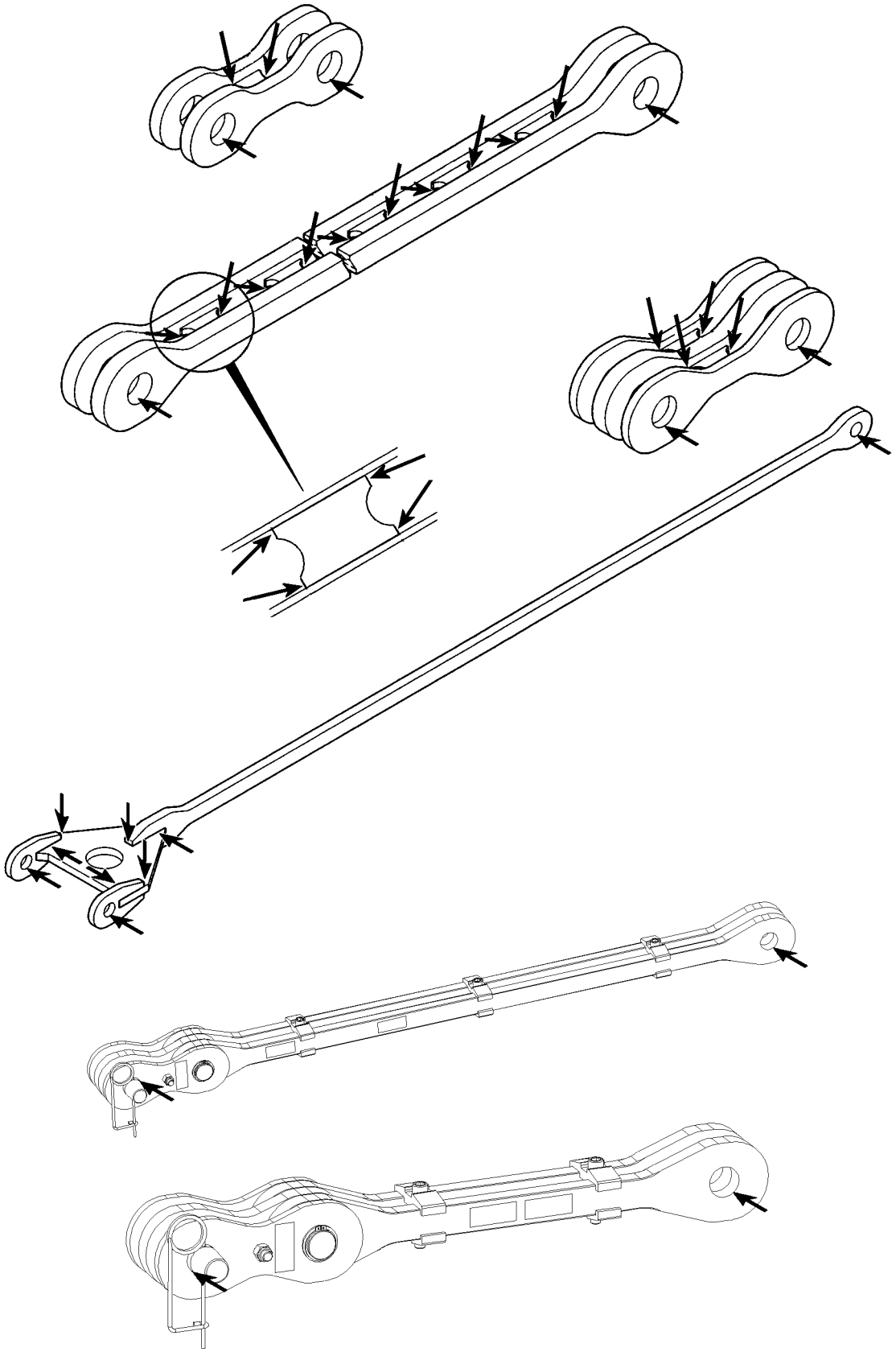

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Fig.154111: Example of guy rods

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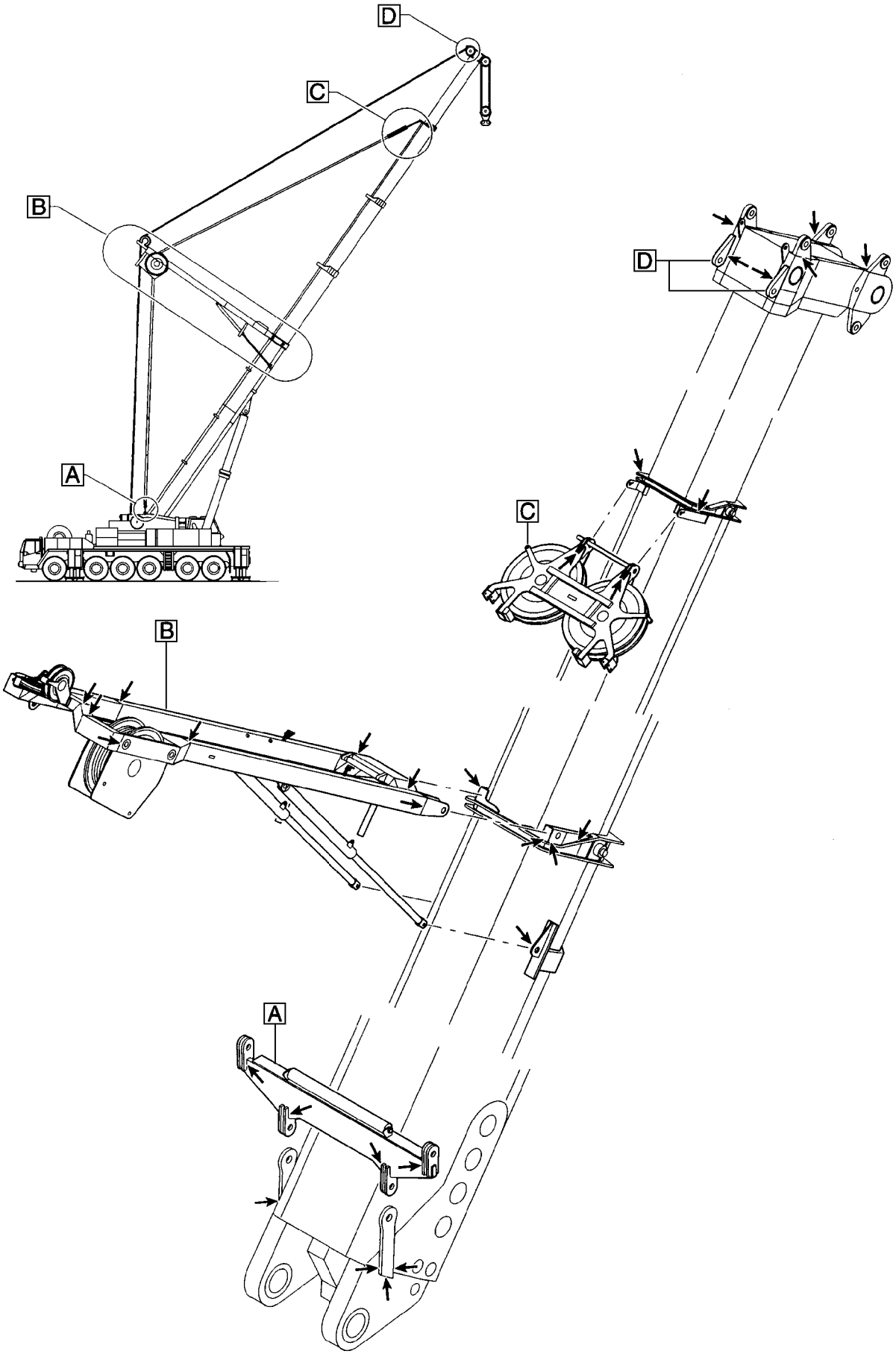

Fig.185059: Example of TA-guying

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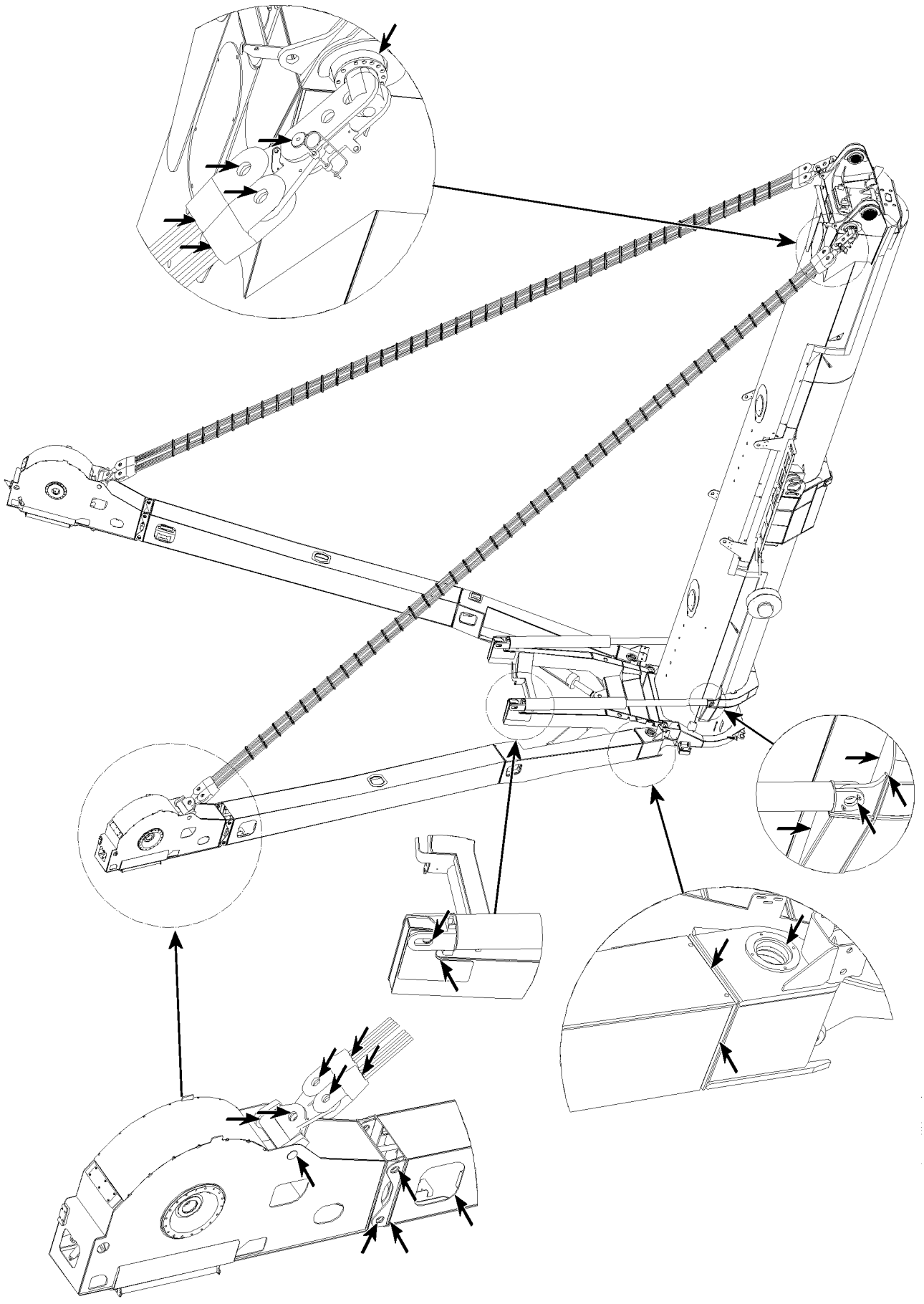

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Fig.105707: Example of TY-guying

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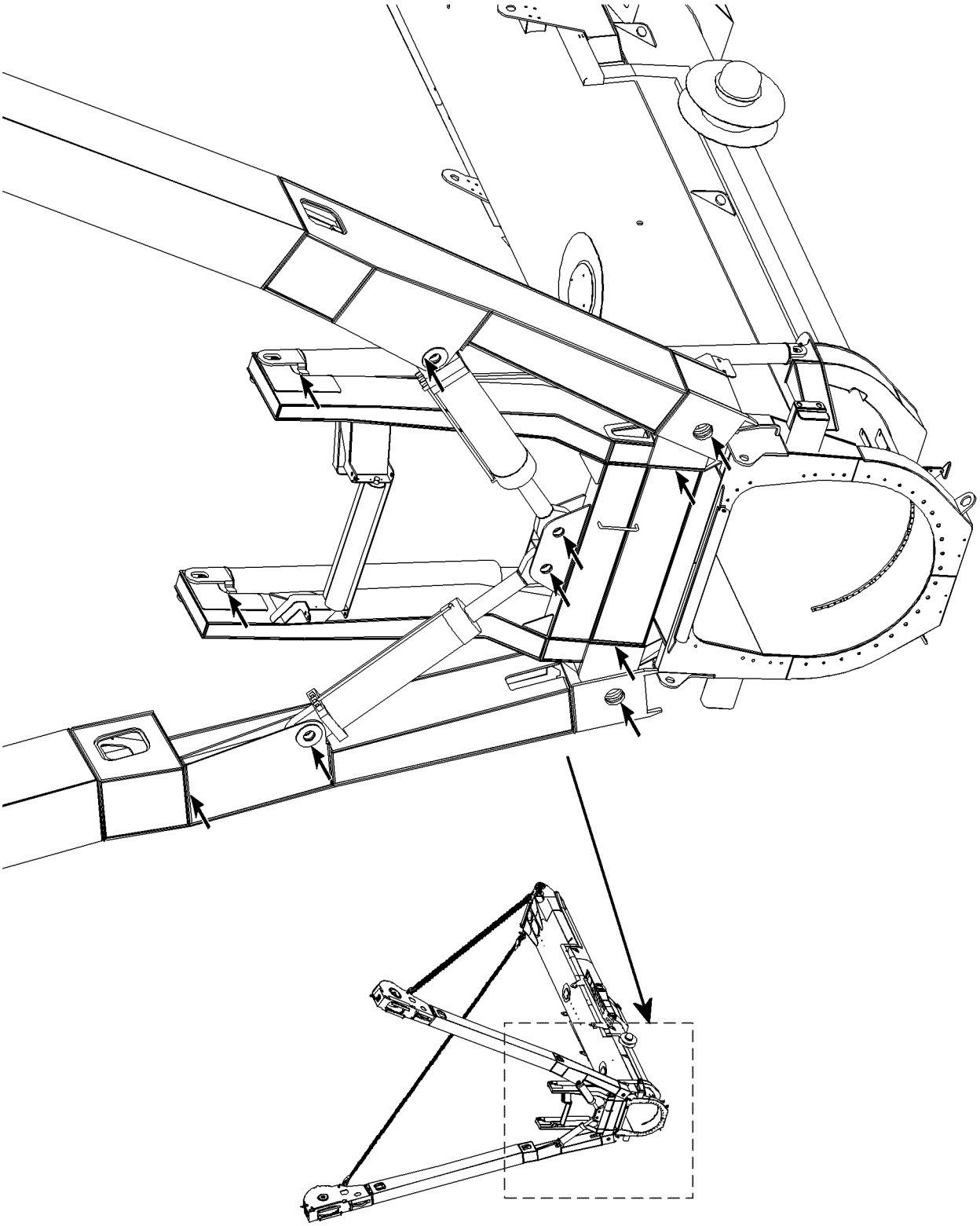

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Fig.105708: Example of TY-guying

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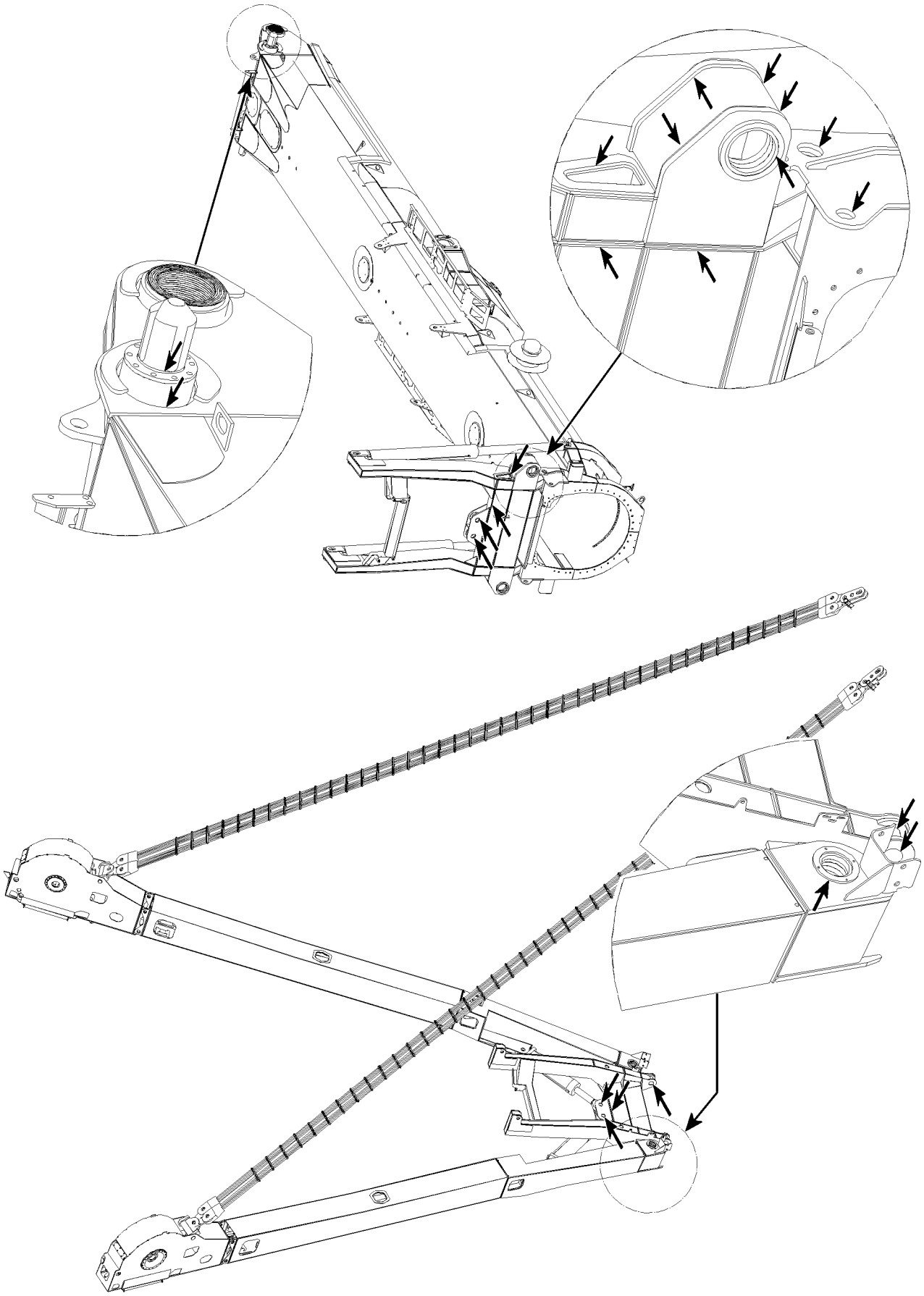

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Fig.105709: Example of TY-guying

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2.4 Rigging and fastening points

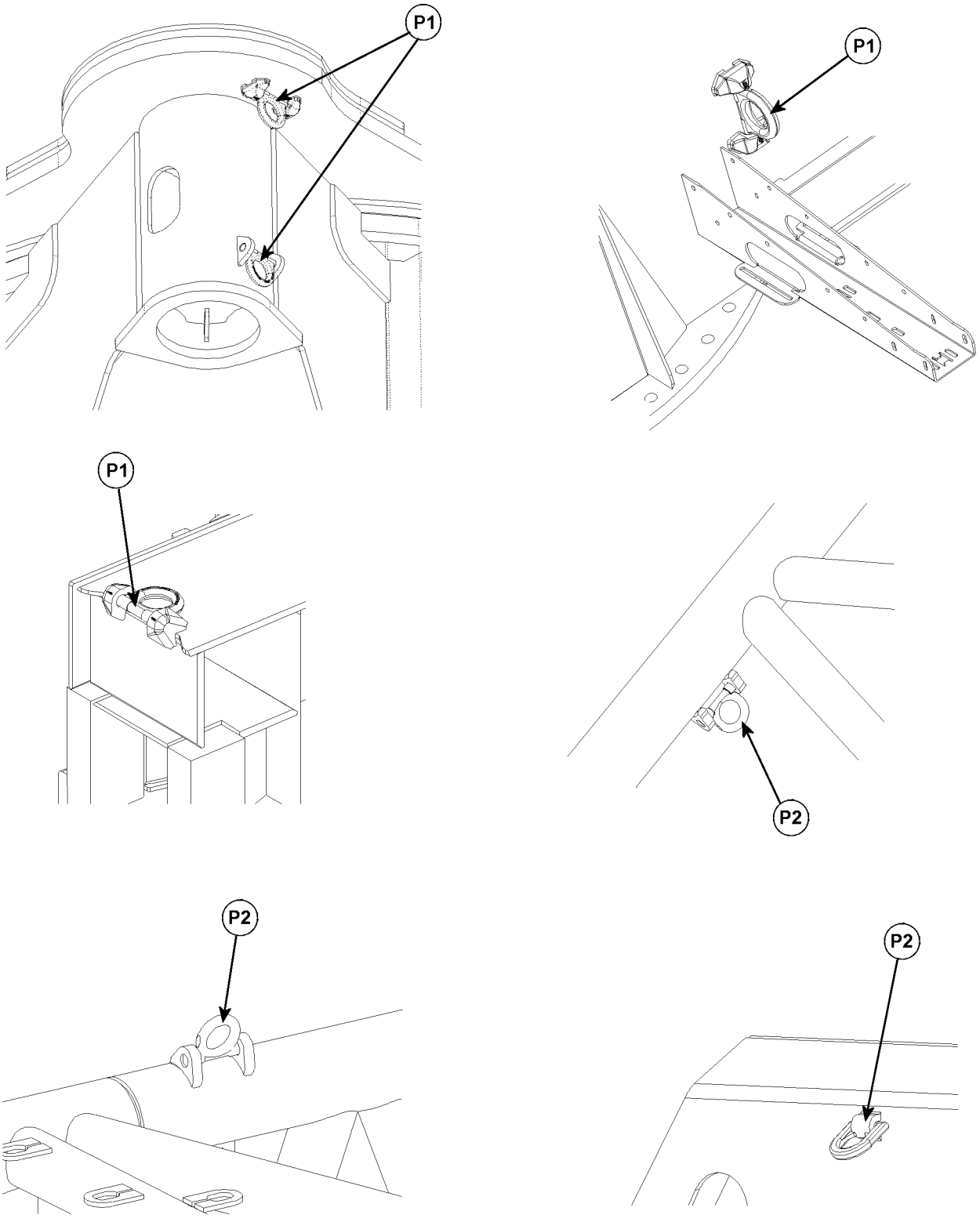

Fig.121160: Examples of rigging points and fastening points

P1 Rigging points **P2** Fastening points

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WARNING
Unsafe rigging point or fastening point!
The mobile crane or component can rip free and fall down.

When a rigging point or fastening point is not safe for operation:
- ▶ Have the rigging point or fastening point replaced by authorized and trained expert personnel.
- ▶ Avoid damage on the rigging device due to sharp-edged exposure.

Make sure that the following damage does **not** occur:
- Crushing points
- Shearing points
- Catch points
- Impact points

Inspection criteria:
- Completeness of the rigging point.
- Distortion of carrying parts.
- Mechanical damage such as severe nicks.
- Changes in diameter due to wear.
- Significant corrosion (pitting).
- Cracks on carrying parts.
- Cracks or other damage on the welding seam.

Check the rigging points **P1** and fastening points **P2** before every start up and at regular intervals.

2.5 Inspecting the lattice sections

Note
- ▶ The illustration is only an example and is valid for all lattice sections!
- ▶ Check all diagonal and frame pipe connections!
- ▶ Check all bores of the fork - finger connections!

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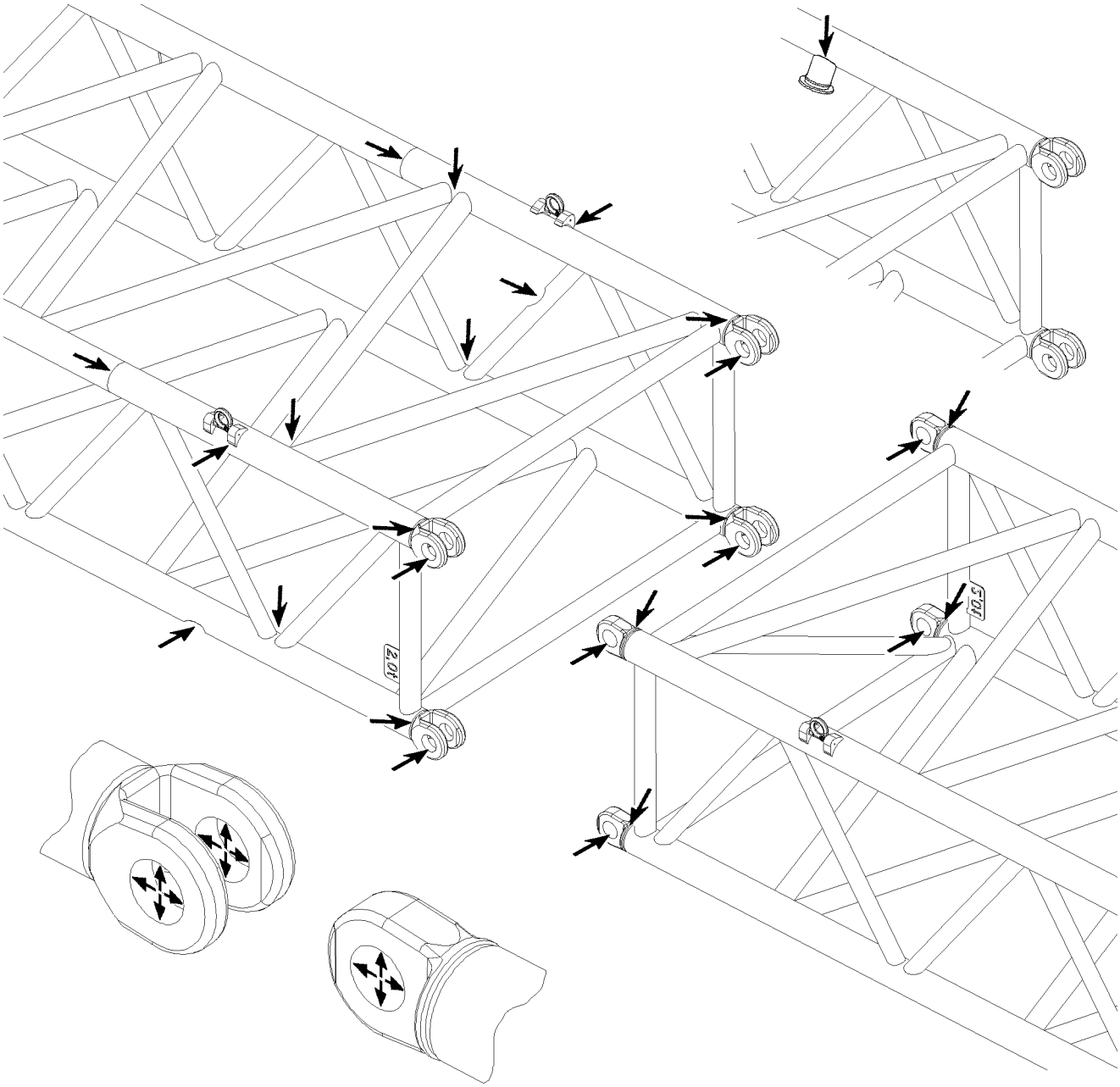

Fig.121023: Example of lattice sections

3 Inspecting the locking system of the telescopic boom

3.1 For cranes with pneumatic boom locking system

- For inspection of function, see chapter 8.11.
- For inspection of pin wear pattern, see chapter 8.11.
- For inspection of wear, see chapter 8.11.
- For inspection of safety control, see chapter 8.11.

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3.2 For cranes with the Telematik telescopic boom system

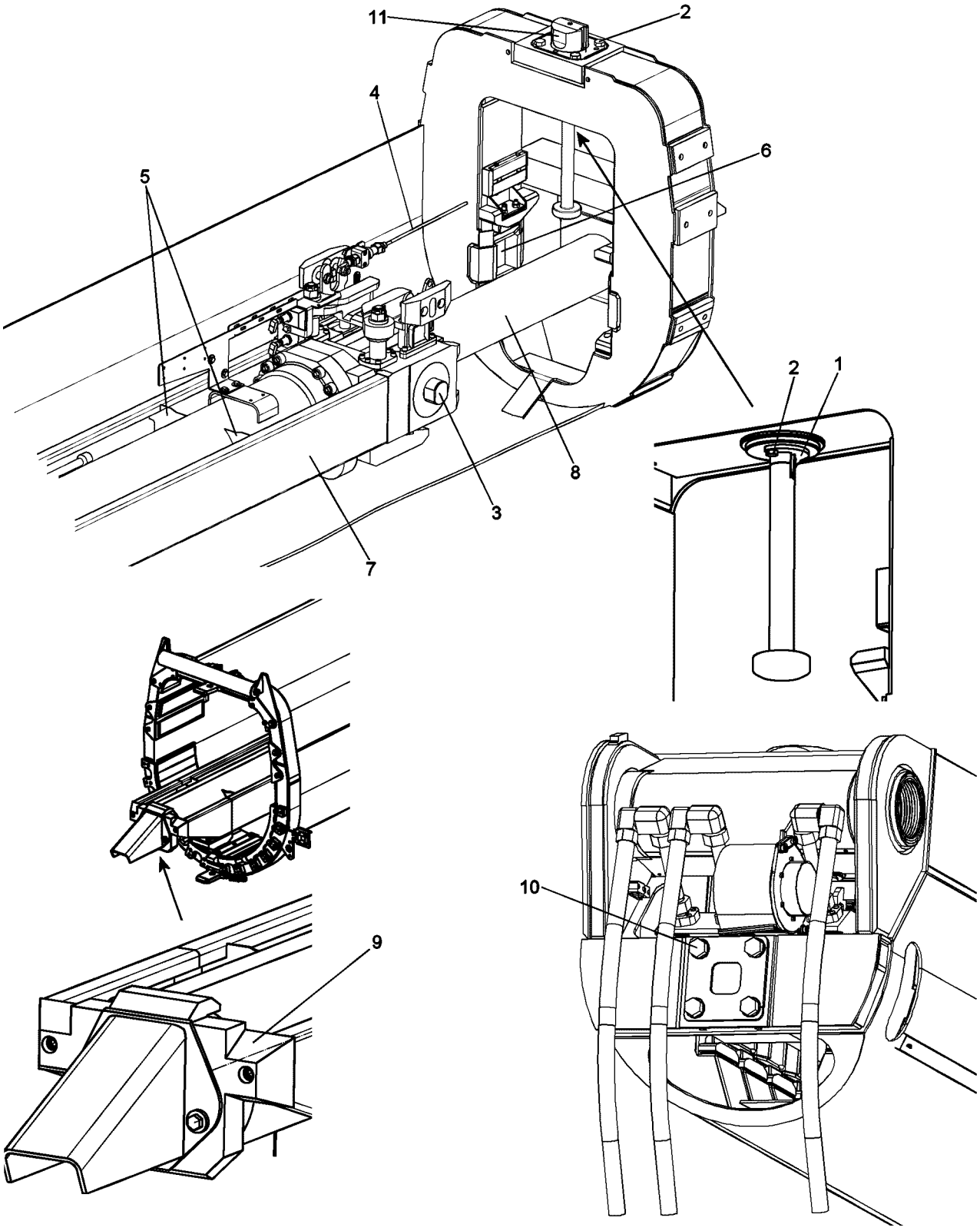

Fig.109286

- Inspection of the pull knob safety **1** and all mounting screws **2** for tight seating
- Inspection of twist guards of cylinder pinning **3** and the telescopic boom pinning **11**
- Inspection of the length sensor rope **4** for damage
- Inspection of the cylinder barrel in the area of all welding seams **5** for crack formation
- Inspection of the locking pockets **6** for damage

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- Grease the guide rail **7**
- In case of leakage: Inspection of the piston rod **8** for grooves
- Inspection of the wear pattern on the cylinder pinning **3** and the telescopic boom pinning **11**
- Inspection of guide rail **7** for distortion of contour
- Inspection of plastic guide **9** on cylinder bottom for damage
- Inspection of all mounting screws **10** on the push out cylinder for tight seating

4 Checking the safety ropes and anchor points

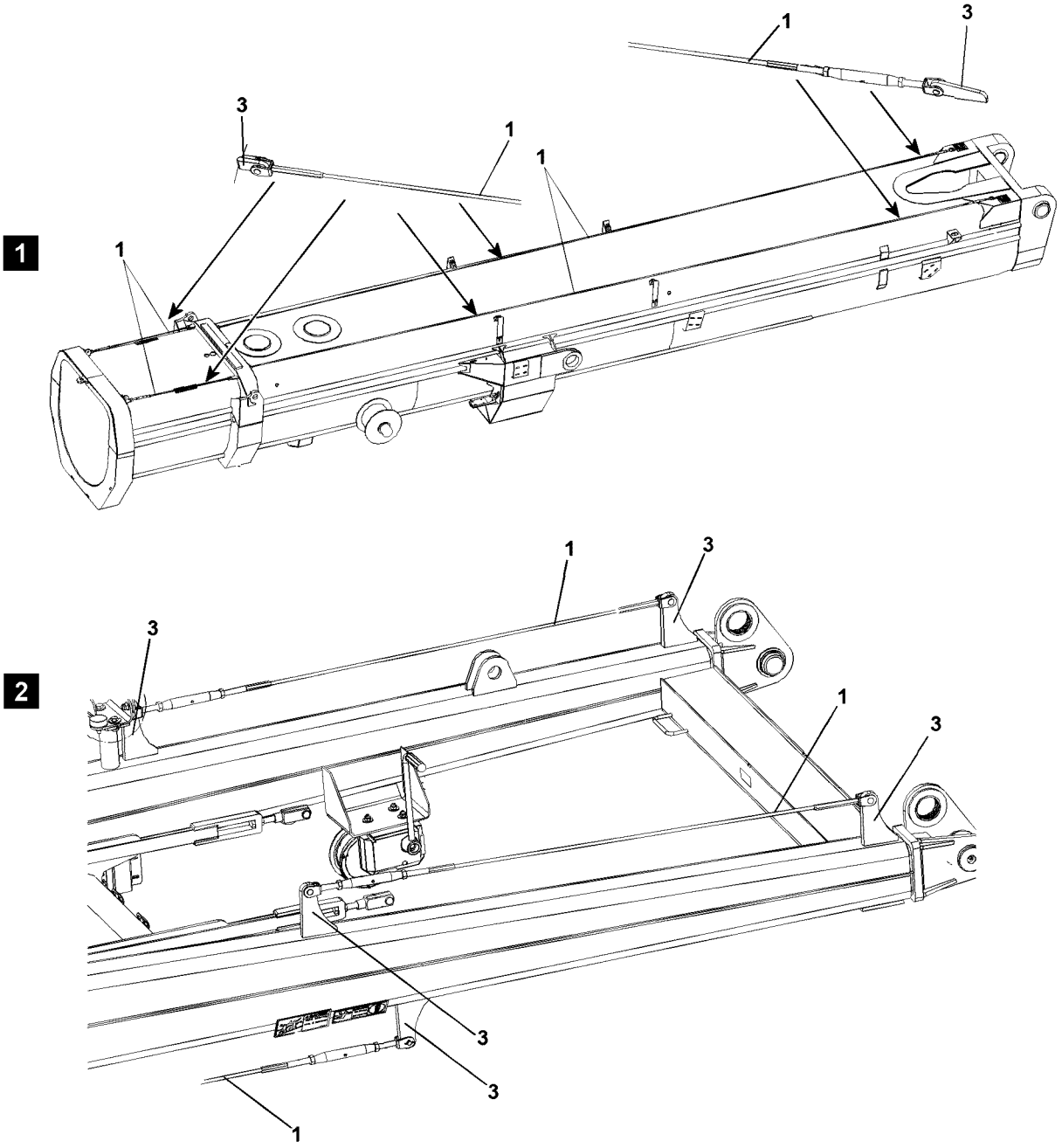

Fig.127130

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WARNING
Danger of falls due to damaged safety ropes or anchor points!
The safety ropes **1** and anchor points **3** must be checked **at least once a year** by **authorized inspectors** for safety and damage!
If any defects are found on the safety ropes **1** or anchor points **3** during the inspections, then the safety ropes **1** or anchor points **3** must be replaced immediately by authorized and trained specialists! If this is not observed, assembly personnel could be killed or fatally injured during a fall!
- ▶ The rope pretension on the safety ropes must be 800 N !
- ▶ Have damaged safety ropes **1** or anchor points **3** replaced immediately by trained expert personnel!

Note
Document the inspections in writing!
- ▶ The scope and results of tests should be documented to permit reproducibility. This documentation forms part of the crane records and should be safely stored during the entire service life of the crane.

4.1 Checking of rope pretension on telescopic booms, illustration 1

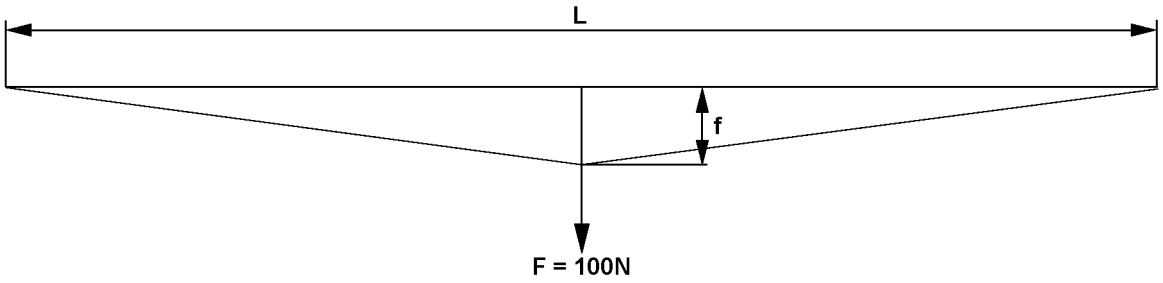

Fig.112738

The rope pretension must be 800 N. This can be checked with the aid of a spring balance, which is pulled centered on the safety rope. If the specified deflection (f) depending on the rope length (L) according to the following charts results for the raised load F = 100 N then the rope pretension of 800 N is set correctly.

Rope pretension is 800 N if:					
Rope length (L)	1.0 m	1.5 m	2.0 m	2.5 m	3.5 m
Deflection (f)	15 mm	25 mm	30 mm	40 mm	55 mm

Rope pretension is 800 N if:					
Rope length (L)	5.5 m	7.5 m	9.5 m	11.5 m	13.5 m
Deflection (f)	85 mm	115 mm	145 mm	180 mm	215 mm

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4.2 Inspecting the rope pretension on lattice sections, illustration 2

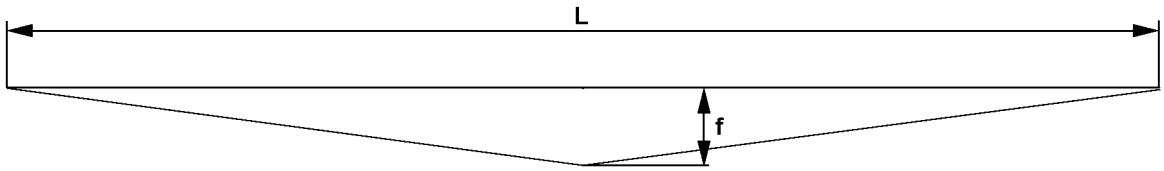

Fig.117747

The rope pretension is 800 N , if a sag (f) according to the chart is present on the safety rope according to the rope length (L).

Rope pretension is 800 N if:					
Rope length (L)	1.0 m	1.5 m	2.0 m	2.5 m	3.5 m
Deflection (f)	0	1 mm	2 mm	3 mm	6 mm

Rope pretension is 800 N if:					
Rope length (L)	5.5 m	7.5 m	9.5 m	11.5 m	13.5 m
Deflection (f)	15 mm	28 mm	45 mm	66 mm	90 mm

5 Inspecting the load handling equipment and assembly aids

WARNING
Load handling equipment and / or assembly aids **not** inspected!
Death, severe bodily injuries, property damage.
▶ Inspect load handling equipment and / or assembly aids at least once a year.

The recurring inspection of the load handling equipment and / or assembly aids must be carried out once a year.

The inspections of load handling equipment and / or assembly aids must be recorded.

The welding seams must be subjected to a visual inspection.

Check load handling equipment and assembly aids for:
- Damage
- Wear
- Cracks

Replace damaged, worn or ripped load handling equipment and assembly aids immediately.

Repairs on load handling equipment and assembly aids may solely be made in consultation and under the instructions of the Customer Service at **Liebherr-Werk Ehingen GmbH** by authorized and trained expert personnel.

Note
▶ Document the scope of the inspection and the results in writing and comprehensibly.
▶ Save the documentation as a part of the crane records for the entire service life of the crane.

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6 Inspecting of fastening equipment

WARNING
Fastening equipment **not** inspected!
Death, severe bodily injuries, property damage.
▶ Check the fastening equipment at least once a year.

The inspections of the fastening equipment must be recorded.

The welding seams must be subjected to a visual inspection.

Inspect the fastening equipment according to the specifications of the corresponding regulations and standards.

Replace damaged, worn or ripped fastening equipment immediately.

Note
▶ Document the scope of the inspection and the results in writing and comprehensibly.
▶ Save the documentation as a part of the crane records for the entire service life of the crane.

6.1 Grommets and cable laid fastening rope

Observe and comply with the operating instructions of the manufacturer.

WARNING
Damaged grommets and cable laid fastening rope used!
The fastening ropes can fail. The load call fall down.
▶ Do **not** use grommets and cable laid fastening rope with a corresponding number of wire breaks.
▶ Do **not** use grommets and cable laid fastening rope with a corresponding amount of damage.

Do **not** use grommets and cable laid fastening rope if there is one of the following numbers of wire breaks:
– Wire breaks of more than 10 wires along a length of 3D
– Wire breaks of more than 15 wires along a length of 6D
– Wire breaks of more than 40 wires along a length of 30D

Do **not** use grommets and cable laid fastening rope in the case of the following damage:
– Strong rope distortion
– Rotary distortion
– Kinks, bends, basket formation
– Corrosion
– Corrosion of the zinc coating
– Opening of the splice
– Loosening or opening of the rope bond
– Displacement of the rope bond from its original position
– Lack of identification

7 Inspecting the diaphragm reservoir

Note
▶ The national regulations for pressurized container inspection must be observed!

The inspection of the diaphragm reservoir for specified gas pressure must be carried out by an **authorized inspector**, see chapter 7.04 and chapter 7.05.

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8 Inspecting the relapse cylinders

WARNING
Fatal accidents due to defective relapse cylinders!
Loss of oil or corrosion can damage the relapse cylinders!
Safe crane operation is no longer ensured!
▶ Crane operation with defective relapse cylinders is prohibited!

8.1 Pressure testing the relapse cylinders

The relapse cylinders must be inspected annually by an **authorized inspector**. The purpose of the inspections is to avoid accidents by detecting deficiencies early on.

8.2 Checking the gas pressure and oil fill before start up

WARNING
Fatal accidents due to defective relapse cylinders!
Loss of oil or corrosion can damage the relapse cylinders!
Safe crane operation is no longer ensured!
▶ Before every start up: Carry out a visual inspection for leaks, damage and corrosion on the relapse cylinders.
▶ If any defects are found, the relapse cylinders must be inspected by the cylinder manufacturer!

The gas pressure and the oil fill must be checked by an **authorized inspector** for pressure tanks.

8.3 Inspecting the safety controls on the relapse cylinders

Inspecting the interlocking system or limit switches on the relapse cylinders and the boom A-frames, see chapter 8.12.

9 Inspecting the rope pulleys

9.1 Checking for damage and cracks

DANGER
Danger of accident in case of damage or cracks!
▶ Replace rope pulley immediately!

Check the entire rope pulley assemblies for damage and cracks once a year.

If rope pulleys are subjected to any impacts (e.g., with buildings) or are otherwise overloaded, they must be visually inspected for damage or cracks immediately.

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9.2 Checking the groove diameter

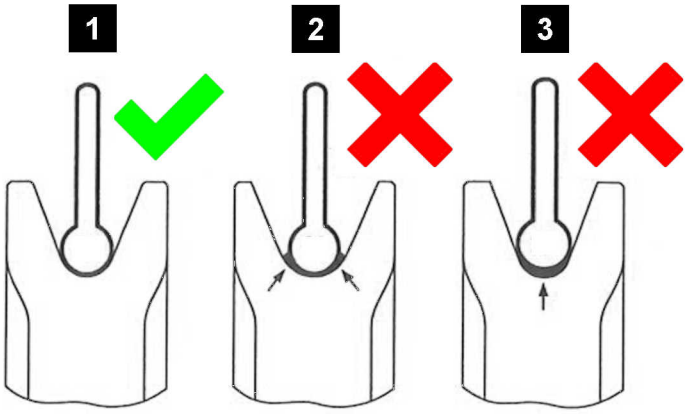

Fig.154258: Checking the groove diameter

1 Groove diameter ok
2 Groove diameter too wide
3 Groove diameter too narrow

NOTICE
Worn rope pulleys!
The functionality and service life of the rope is reduced. Damage on rope.
▶ Before placing the rope, check the groove diameter of rope pulleys.

Visible wear on rope pulleys:
– Reduced groove diameter
– Negative impressions of the rope profile in the groove

Make sure that the following tools are available:
– Groove caliber

Make sure that the following prerequisites are met:
– All components to be inspected are cleaned
– The rope does **not** obstruct the inspection of the components

Note
▶ The actual groove diameter **must** be larger than the actual diameter of the rope!

The groove diameter of rope pulleys and winches must be at least 6 % larger than the nominal rope diameter.

Check the rope pulleys with a groove caliber for wear. When wear exists on the rope grooves: Fix the rope pulleys or replace.

10 Inspecting the carrier rollers

10.1 Performing a visual inspection

DANGER
Damaged carrier rollers!
Breakage and falling components. Death, severe bodily injuries, property damage.
▶ Carry out a visual inspection according to the maintenance intervals.
▶ Replace the carrier roller immediately.

The visual inspection must be carried out according to the following criteria:
– Wear

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– Damage
– Cracks

Visible wear on carrier rollers:
– Negative imprints of the rope profile on the circumference of the carrier rollers
– Lead-in tracks

10.2 Checking the depth of the lead-in tracks

DANGER
Worn carrier rollers!
Breakage and falling components. Damage to ropes. Death, severe bodily injuries, property damage.
▶ Check the depth of the lead-in tracks.
▶ Replace worn carrier rollers immediately.

Make sure that the following prerequisites are met:
– All components to be inspected are cleaned
– The rope does **not** obstruct the inspection of the components

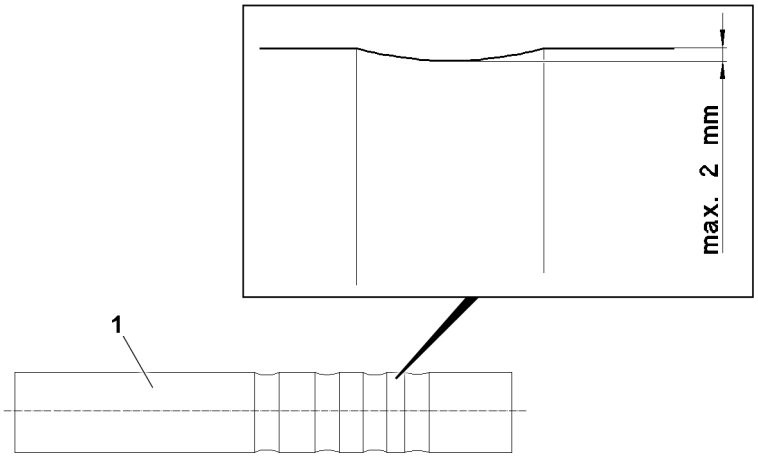

Fig.124864: Permissible depth of the lead-in tracks

1 Carrier roller

The depth of the lead-in tracks may be maximum 2 mm.

10.3 Checking bearings for easy movement

Stiff or blocked carrier rollers wear unevenly and cause serious rope abrasion.

Ineffective carrier rollers can lead to irregular rope tension.

Tasks to check the carrier rollers:
– Check the carrier rollers for proper movement in their bearings.
– When carrier rollers are **not** easily moveable in their bearings: Fix the bearings.

10.4 Checking the tightening torque

The tightening torque of screws must be checked according to maintenance interval.

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11 Inspecting the extension conditions of sliding beams

The extension conditions of the sliding beams must be inspected annually by an **authorized inspector**.

Check the extension conditions on every sliding beam:
- Check if the position 0 % of the LICCON display matches the actual condition of the sliding beam.
- Check if the position 100 % of the LICCON display matches the actual condition of the sliding beam.

12 Inspecting the function of the overload protection

Position the longest boom at minimum and maximum radius: Check the load indicator, using the hook block as a test load.

The display reading may not deviate by more than 10 % off the true load value at these two extreme positions.

Measure the indicated radius for the longest boom at its minimum radius and at a boom angle of 45°.

The display readings may not deviate more than 10 % from the measured boom radius.

13 Inspecting the pin connections

WARNING
Pin connections **not** inspected!
Death, severe bodily injuries, property damage.
▶ Check the pin connections at least once a year.

The periodic inspection of all pin connections must be carried out once a year.

The inspections of the pin connection must be recorded.

Check the pin connections for:
- Properly secured pin connections
- Damage to the pins and / or connector elements
- Damage to the retaining elements

Replace damaged pins immediately.

Immediately replace damaged, bent or broken retaining elements.

Only replace damaged pins with identical pins.

Only replace damaged retaining elements with identical retaining elements.

Note
▶ Document the scope of the inspection and the results in writing and comprehensibly.
▶ Save the documentation as a part of the crane records for the entire service life of the crane.

14 Inspecting the slewing ring connection

14.1 Checking the tilt play

The wear of the slewing ring connection is determined by measuring the tilt play with the ring installed.

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The permissible tilt play depends on the type of slewing ring connection.

WARNING
The tilt play of the slewing ring connection is too large!
If the permissible tilt play is exceeded, then safe crane operation is **no** longer possible.
Death, severe bodily injuries, property damage.

When the permissible tilt play is exceeded:
▶ Replace the slewing ring connection.

The determination of the tilt play must be carried out according to the **test instructions** of **Liebherr-Werk Ehingen GmbH**.

Request the test instructions and permissible tilt play: Contact Liebherr Service.

15 Inspecting the mounting of the load bearing equipment

15.1 Checking the tightness of the mounting screws

The mounting screws must be checked for a tight fit during the annual crane inspection.

The mounting screws are pre-stressed at the factory, so that no loosening of the screw connections will occur during normal crane operation.

The screw connection may become overloaded and the mounting screws may be permanently stretched if the crane is overloaded or if the load is pulled free. The mounting screws must be checked immediately for a tight fit after an overload.

Check the tightening torque of the mounting screws of load bearing equipment for a tight fit:
- Slewing ring connection
- Winches
- Slewing gears
- Transmission
- Trailer coupling

If a mounting screw can be tightened, then the mounting screw is loose. Follow the instructions in section „Checking the mounting screws for damage“.

15.2 Checking the mounting screws for damage

Completely unscrew the loose mounting screws and check in detail for damage.

Completely unscrew the adjacent mounting screws and check in detail for damage.

Replace the mounting screw if any of the following damage is present:
- The mounting screw is stretched by more than 2 % (in relation to its original length).
- Cracks, permanent deformation or other damage is visible on the mounting screw.
- The mounting screw is uneven.
- There is pitting.
- The thread is hard to move.

If there is **no** damage, reuse the checked mounting screws (expansion screws) a maximum of two times.

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16 Inspecting the tele extension with eccentric, illustration 1

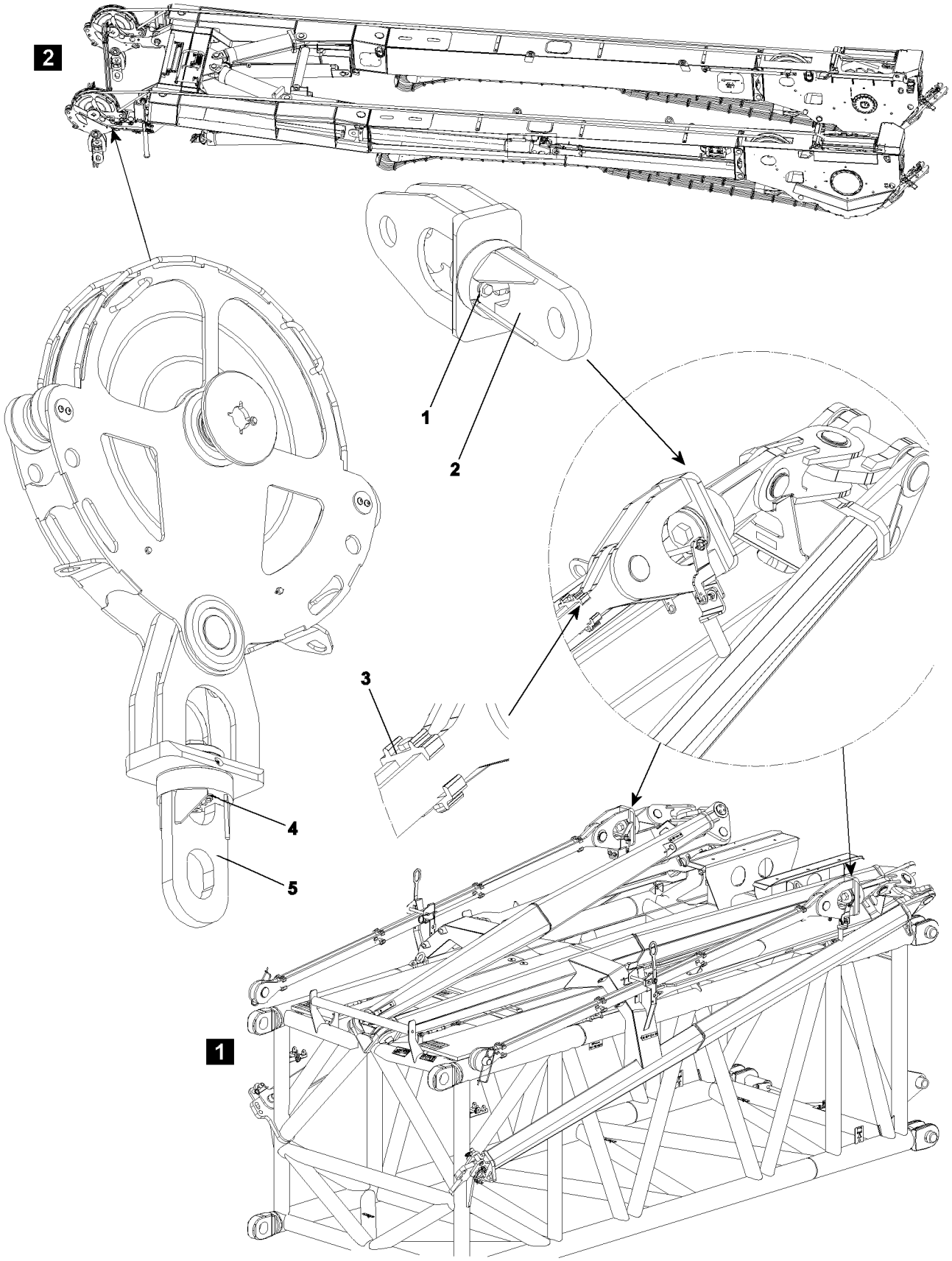

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Fig.109096

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- Inspection of twist guard **1** for damage and loose screw connection.
- Inspection of swivel **2** for easy turnability.
- Inspection of all clamps **3** for damage and function.

17 Inspecting the change over pulleys, illustration 2

- Inspection of twist guard **4** for damage and loose screw connection.
- Inspection of swivel **5** for easy turnability.

18 Inspecting the oil and fuel tanks

Visually check the oil and fuel tanks at least once a year for leaks and safe mounting.

Repairs may only be carried out by authorized and trained specialists.

Improper repairs; e.g., welding, hard or soft soldering is not permitted, particularly if the Service department at Liebherr-Werk Ehingen GmbH has not been consulted!

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8.03 Inspecting of winches

1	Inspecting the hoist and retracting winches	3
2	Inspection of the auxiliary reeving winch, recovery winch and spare wheel winch	4
3	Monitoring the winches	5

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Fig.195219

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1 Inspecting the hoist and retracting winches

The hoist and retracting winches are designed in sealed planetary gear version. These gears are sized for long service life and the drive shafts and gears are rated for endurance.

Even though the hoist and retracting winches are designed for long life, an external visual inspection is not adequate, since their life can be significantly affected by bad maintenance (insufficient oil), using oil that does not meet specification requirements, defective seals, improper operation or overloading.

The annual inspection must therefore be carried out by an **expert** in accordance with the following specification.

The winches must be inspected by an **authorized inspector** every four years after the initial license.

Within the territorial validity of the BGV D6, after the 10th year in operation, counted from the first day of initial license, when the theoretical utilization time is not over, the winches must be checked annually by an **authorized inspector**.

1.1 Checking the groove diameter

WARNING
Worn winches!
Damage of flanged disks, high rope wear, operational problems. Broken rope, falling load.
▶ Before placing the rope, check the groove diameter of winches.

Visible wear on winches:
- Reduced groove diameter
- Mechanical damage, for example scrub marks or scouring on flanged disks

Make sure that the following tools are available:
- Groove caliber

Make sure that the following prerequisites are met:
- All components to be inspected are cleaned
- The rope does **not** obstruct the inspection of the components

Note
▶ The groove radius may **not** be smaller than the actual diameter of the rope.

The groove diameter of rope pulleys and winches must be at least 6 % larger than the nominal rope diameter.

Check winches with a groove caliber for wear. When wear is present: Fix the winch or replace.

1.2 Inspection intervals

At least once a year, see Crane operating instructions, chapter 7.03.

1.3 Checking the oil level

Check the oil level with the dipstick.

For hoist and retracting winches **without** a dipstick, we recommend that the oil is drained and the amount compared to the specified oil quantity.

1.4 Evaluating oil color

Assume that the oil has been overheated if it is black and / or a burnt oil smell is detected. Change the oil.

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1.5 Checking for solid foreign substances

In general, the oil must be analyzed by a qualified laboratory.

For simple testing, the following procedure can be used:
- Drip the used oil on a specified filter fleece.
- Visual inspection with a magnifying glass may reveal coarse particles.
- If coarse particles are found: Have the components of the oil analyzed by a qualified laboratory.

NOTICE
Danger of property damage!
- ▶ Repairs may only be carried out by authorized and especially trained personnel.
- ▶ Replace damaged parts and change the gear oil.

1.6 Visual inspection for leaks

The gears must be checked for leaks, since oil losses - in addition to polluting the environment - can lead to gear failure.

1.7 Inspecting the gear brakes

Check the brakes each time the gears are inspected.

In order to do so, proceed as follows:
- Attach a load, which creates the maximum rope pull in the uppermost layer of the coil and raise it just off the ground.
- Remove the plug on the brake lifting magnet.
  This means the brake remains applied when activated.
- Activate the winch in the lowering direction.

Note
- ▶ The brake may not slip, in other words, the winch may not turn. If the brake slips, contact the Service department at Liebherr-Werk Ehingen GmbH!
- ▶ Only operate the crane after it has been checked and approved for use by the Service department at Liebherr Werk Ehingen GmbH!

NOTICE
Danger of property damage!
- ▶ Only qualified personnel with specialized knowledge may be used to evaluate gears and brakes!

1.8 Documenting the completed inspection

The results of the annual inspections and maintenance work, including the steps taken, must be documented by the competent or authorized inspector, including attachments from the inspection labs and qualified service companies if applicable.

This documentation must be filed in the crane inspection log under the heading "Periodic inspections".

2 Inspection of the auxiliary reeving winch, recovery winch and spare wheel winch

The inspection of the auxiliary reeving winch, recovery winch and spare wheel winch regarding scope and content is made according to the manufacturer's instructions.
- Inspect the auxiliary reeving winch, recovery winch and spare wheel winch according to the manufacturer's instructions.

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– Request data about the service life of the auxiliary reeving winch, recovery winch and spare wheel winch from the respective manufacturer.

3 Monitoring the winches

3.1 Theoretical service life

The designer of your crane used a theoretical total operating time when designing and sizing the winches. This resulted in the theoretical service life of the equipment.

The winches of your crane are classified according to ISO 4301/1 as follows:

Winches	Classification
Power train group:	M3
Load spectrum:	L1
Load spectrum factor Km:	0.125
Theoretical service life D:	3200 h

Note

▶ The „theoretic service life“ is not equal to the real (true) service life of a winch!

The actual life of the winch is affected by many additional outside factors; for example:

– Overloads caused by unapproved use of the crane.
– Inadequate maintenance: Oil is not changed in a timely manner
– Improper operation:
  • Extreme acceleration or deceleration of the load
  • Load falling into the ropes
– Maintenance errors:
  • Using the wrong type of oil
  • Too much or too little oil
  • Contamination during oil change
– Assembly errors during repair and maintenance
– Undetected leaks
– Incorrectly set safety equipment
– Hidden damage from accidents
– Extreme environmental conditions:
  • Extreme low or high temperatures
  • Corrosive atmosphere
  • Dust and dirt

3.2 Used proportion of the theoretical service life

The crane operator is obligated to carry out an inspection of the crane at least once a year.

At this time, the actually used part of the theoretical service life must also be calculated. If necessary, the crane operator must contract an authorized inspector.

For the determination of the used part of the theoretical service life, the actual operating conditions (load spectrum) and the hoist gear operating hours for each inspection interval are to be determined. The operator is responsible for the documentation in the crane inspection log.

3.2.1 Determining the operating conditions (load spectrum)

The load spectrum of the crane is divided into groups, please refer to ISO 4301/1.

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Select one of the following load spectrums and record it in the crane inspection log for the respective inspection interval based on the actual operating conditions. A more precise determination of the load spectrum is permissible.

Load spectrum class: Light L1

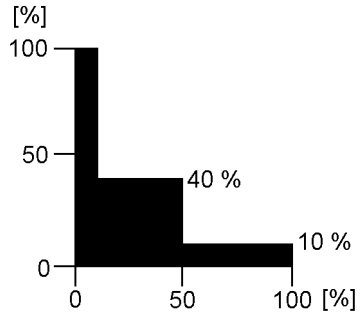

Fig.195234: Graphic illustration Load spectrum L1

Definition:

Power train or parts thereof are subjected to maximum stress only in exceptional cases, but normally only operate at very light loads.

Operating time rates:

10 % of the time at maximum load (dead load and 1/1 working load)
40 % of the time with dead load and 1/3 working load
50 % of the time only with dead load

Factor of load spectrum:

Km = 0.125

Note

▶ Load spectrum L1 with load spectrum factor Km = 0.125 is normally applied to cranes used for assembly operations!

Load spectrum class: Medium L2

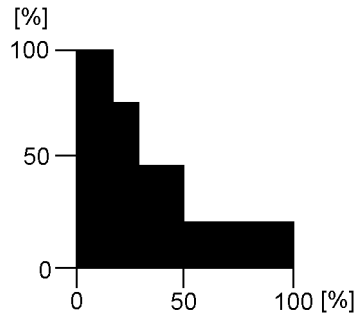

Fig.195235: Graphic illustration Load spectrum L2

Definition:

Power train or parts thereof are subjected to maximum load relatively often, but normally only operate at light load.

Operating time rates:

1/6 of the time at maximum load (dead load and 1/1 working load)
1/6 of the time with dead load and 2/3 working load

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1/6 of the time with dead load and 1/3 working load
50 % of the time only with dead load

Factor of load spectrum:
Km = 0.25

Load spectrum class: Heavy L3

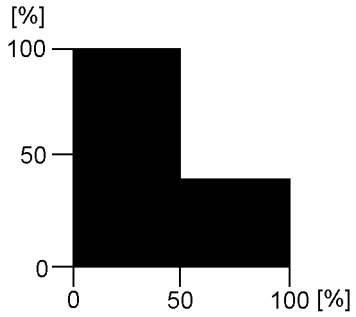

Fig.195236: Graphic illustration Load spectrum L3

Definition:
Power train or parts thereof are frequently subjected to maximum load and normally operate at medium load.

Operating time rates:
50 % of the time at maximum load (dead load and 1/1 working load)
50 % of the time only with dead load

Factor of load spectrum:
Km = 0.5

Load spectrum class: Very heavy L4

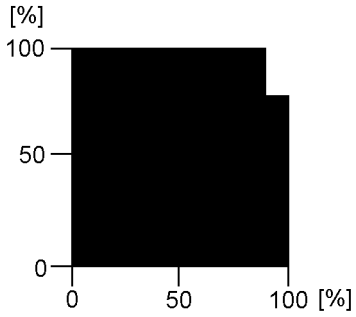

Fig.195237: Graphic illustration Load spectrum L4

Definition:
Power train or parts thereof are regularly subjected to near maximum loads.

Operating time rates:
90 % of the time at maximum load (dead load and 1/1 working load)
10 % of the time only with dead load

Factor of load spectrum:
Km = 1

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3.2.2 Determining the effective operating hours T_i

The effective operating hours calculated as follows must be entered into the crane inspection log for the respective inspection interval.

There are four different scenarios:

1. Operating hour meter installed on every winch.
   If an operating hour meter is installed on every winch in your crane, the effective operating hours T_i can be read directly during each inspection.
2. Operating hour meter installed for the overall crane drive.
   The winch proportion of the total superstructure operating hours must be estimated.
   For cranes used in assembly operations, the operating time for the hoist winches can be estimated generally at 20 % of the total operating hours of the superstructure.
3. One operating hour meter is used for both the crane engine and the crane drive
   The winch proportion of the total crane operating hours must be estimated.
   For cranes used in assembly operations, the operating time for the superstructure can be estimated at 60 % of the total operating hours of the crane. If the hoist winch proportion is estimated at 20 % of the superstructure operating hours (see previous item), then the result in relation to the **total** operating hours of the crane is: 12 %.
4. No operating hour meter is available.
   In this case, the operator must estimate and document the actual operating hours of the winch.
   The approximate percentages stated above normally apply to main hoist winches. For auxiliary hoist winches or boom control winches, the proportion of the total operating hours can be significantly less and should therefore be estimated by the operator.

3.2.3 Determining the used proportion of the theoretical service life

For an inspection interval i (max. 1 year), the actually used proportion S_i of the theoretical Service life is derived from the formula:

$$S_i = \frac{Km_i}{Km} \times T_i$$

Fig.195230

Abbreviation	Explanation
S_i	Used proportion of the theoretical service life.
Km	Load spectrum factor that was used to calculate the winch rates. This factor is provided in the Operating instructions.
Km_i	Load spectrum factor for inspection interval i according to section „Determining the operating conditions“.
T_i	Effective operating hours for inspection interval i according to section „Determining the effective operating hours T_i“.

The actually used proportion is subtracted from the remaining theoretical service life D_i after each inspection interval (see example).

If the remaining theoretical service life is not long enough to cover the next projected operating period, a general overhaul of the winch is required.

If the theoretical service life D has been reached (see chapter on „Theoretical service life“), then the winch may only be operated after conducting a general overhaul.

A general overhaul of the winch is required not later than 10 years after start up.

The general overhaul must be arranged by the operator and carried out by the manufacturer or the manufacturer's authorized representatives and must be documented in the inspection log. After the

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general overhaul, the manufacturer or the manufacturer's authorized representative will define a new theoretical service life D.

When the design life has not been reached after 10 years, continued operation of the winch without a general overhaul is acceptable, when the crane's authorized inspector has confirmed the accuracy of the actual usage calculation by signing the crane inspection log at each authorized inspection interval.

In such a case, the authorized crane inspector must thoroughly inspect the winch. This comprises at least:
- External visual inspection (leaks damage, deformation, etc.).
- Oil check, especially for metal residues.
- Load test at minimum and maximum rope tension and at maximum possible speed in both cases. At least one layer must be spooled up. Pay particular attention to any unusual noises during this load test.

The authorized crane inspector must confirm this inspection in the crane inspection log and must make a statement regarding suitability of the winch for continued operation. The next inspection must take place at the end of the 12th operating year and annually thereafter.

3.3 Example

According to the manufacturer's operating instructions, a crane with a separate operating hour meter for the travel drive and the crane drive is classified as follows:
- Power train group: M3
- Load spectrum: Light L1
- Factor of load spectrum: Km = 0.125
- Theoretical service life: D = 3200 h

Actual usage proportion S of the theoretical service life is calculated using the individual inspection intervals as follows:

3.3.1 First inspection (first year)

The crane was used for assembly work during the past year:

Load spectrum L1, in other words $Km_1 = 0.125$.

The superstructure operating hour meter indicates 800 h. The winch was operated about 20 % of the time; i.e. $T_1 = 160$ h.

The actual usage proportion S of the theoretical service life at the time of the first inspection is therefore:

$$S_1 = \frac{0{,}125}{0{,}125} \text{ x } 160 \text{ h} = 160 \text{ h}$$

Fig.195231

Remaining theoretical service life:

$D_1 = 3200 \text{ h} - 160 \text{ h} = 3040 \text{ h}$

The above values are recorded in the crane inspection log.

3.3.2 Second inspection (second year)

The crane was used at a harbor for unloading work:

Load spectrum L3, in other words $Km_2 = 0.5$.

The superstructure operating hour meter indicates 2000 h ; i.e., during this period:

2000 h – 800 h = 1200 h (800 h were used during the first year of operation)

The winch was operated about 40 % of the time; i.e. $T_2 = 480$ h.

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The actual usage proportion S_2 of the theoretical service life at the time of the second inspection is therefore:

$$S_2 = \frac{0,5}{0,125} \times 480\ h = 1920\ h$$

Fig.195232

Remaining theoretical service life:

D_2 = 3040 h – 1920 h = 1120 h

3.3.3 Third inspection (third year)

The crane was used for assembly work and occasionally at a harbor for unloading work:

Load spectrum L2, in other words Km_3 = 0.25.

The superstructure operating hour meter indicates 3000 h ; i.e., during this period:

3000 h – 2000 h = 1000 h (2000 h were used during the first two years of operation)

The winch was operated about 30 % of the time; i.e. T_3 = 300 h.

The actual usage proportion S_3 of the theoretical service life at the time of the third inspection is therefore:

$$S_3 = \frac{0,25}{0,125} \times 300\ h = 600\ h$$

Fig.195233

Remaining theoretical service life:

D_3 = 1120 h – 600 h = 520 h

3.4 Chart for determining the theoretically remaining service life

Chart 1 includes an example.

The remaining theoretical service life is to be documented in chart 2.

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Fig.121551-en: Chart 1

Chart to determine the remaining theoretical service life of winch No. 1 (Main hoist winch)

Crane type: LTM 1050
Fabrication No.: 0010 540 08
Put in service : 12345
Serial number of winch according to data tag: 0815
Last general overhaul performed on: .....
Configuration data of winch (see Operating Manual):
Drive gear group: M 3
Load collective: L 1
Factor of load collective Km: 0.125
Theoretical service life D: 3200 hrs.

S_i = Used part of theoretical service life since last inspection
D_i = Remaining theoretical service life
D_{i-1} = Remaining theoretical service life after previous inspection
Km = Factor of load collective, which was taken for calculation of winch. This factor is to be taken from the Operating Manual
Km_i = Factor of load collective in inspection interval i
T_i = Effective operating hours in inspection interval i

(*) In the following pages, carry over the last line from the previous page.

Inspection interval No. (max. annually) i	Date of initial service / data of inspection	Operating conditions since last inspection (load collective)	Factor of load connective Km_i	Total crane operating hours [h]	Operating hours of super-structure [h]	Operating hours of super-structure since last inspection [h]	Operating hours of winch [h]	Operating hours of winch since last inspection T_i [h]	Used part of theoretical service life D: $S_i = \frac{Km_i}{Km} \times T_i$ [h]	Remaining theoretical service life $D_i = D_{i-1} - S_i$ [h]	Name of inspector	Signature	Remarks	Name of expert	Signature
(*) 0	10.06.90	-	-	-	0				0	3200					
1	05.06.91	L1	0,125	-	800	800	-	160 (20 % of 800)	160	3040	Müller				
2	20.05.92	L3	0,5	-	2000	1200	-	480 (40 % of 1200)	1920	1120	Huber				
3	18.05.93	L2	0,25	-	3000	1000	-	300 (30 % of 1000)	600	520	Maier				
4															

C A U T I O N : Perform general overhaul at least once every 10 years! In case of deviation, see guidelines in this chapter.

General overhaul last performed on : .....

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Chart to determine the remaining theoretical service life of winch No. ....

Crane type: .....
Fabrication No.: .....
Put in service: .....
Serial number of winch according to data tag: .....
Last general overhaul performed on: .....
Configuration data of winch (see Operating Manual): .....
Drive gear group: M.....
Load collective: L.....
Factor of load collective Km: .....
Theoretical service life D: .....

S_i = Used part of theoretical service life since last inspection
D_i = Remaining theoretical service life
D_{i-1} = Remaining theoretical service life after previous inspection
Km = Factor of load collective, which was taken for calculation of winch. This factor is to be taken from the Operating Manual
Km_i = Factor of load collective in inspection interval i
T_i = Effective operating hours in inspection interval i

*) In the following pages, carry over the last line from the previous page.

Inspection interval No. (max. annually) i	Date of initial service / data of inspection	Operating conditions since last inspection (load collective)	Factor of load connective Km_i	Total crane operating hours [h]	Operating hours of super-structure [h]	Operating hours of super-structure since last inspection [h]	Operating hours of winch [h]	Operating hours of winch since last inspection T_i [h]	Used part of theoretical service life D: $S_i = \frac{Km_i}{Km} \times T_i$ [h]	Remaining theoretical service life $D_i = D_{i-1} - S_i$ [h]	Name of inspector	Signature	Remarks	Name of expert	Signature
(*)															

C A U T I O N : Perform general overhaul at least once every 10 years! In case of deviation, see guidelines in this chapter.

General overhaul last performed on : .....

Fig. 121552-en: Chart 2

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8.04 Inspection of crane wire ropes

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Fig.195219

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1 Crane ropes

This chapter applies, for example, for the following crane ropes:
- Hoist ropes
- Control ropes for the boom system
- Control ropes of the telescopic boom with rope mechanism: Pull-out ropes and return ropes
- Guy ropes for boom system

2 Importance of inspection

Rope removal criteria: If severe damage reduces the operational safety, then the rope has reached the removal criteria.

The importance of regular inspections is demonstrated by:
- Evaluation of operational safety of ropes
- Determination of rope removal criteria
- Determination of next inspection

3 Personal protective equipment

WARNING
Wires and lubricant!
Severe injury and skin irritation.
▶ When working with ropes, always wear work gloves.

WARNING
Protective equipment **not** worn!
Severe injuries.
▶ Wear hard hat, safety shoes and safety glasses.

4 Qualification Inspection personnel

Make sure that the following prerequisites are met:
- Inspection personnel are **expert personnel for crane rope inspection**.
- **Expert personnel for crane rope inspection:**
  - Are trained in the inspection of crane ropes according to **DIN ISO 4309** and have practical experience in the evaluation of rope removal criteria.
  - Have practical experience in the evaluation of rope removal criteria according to **DIN ISO 4309**.
- The inspection personnel is assigned (authorized) for the maintenance by the crane operator.

5 Unscheduled inspection

In the following situations the rope must be inspected:
- After unusual strain
- If non visible damage is suspected
- When a rope or the rope end connection is damaged
- When the rope has been placed again after disassembly
- When the rope has been out of service for longer than three months

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6 Intervals

Intervals for crane inspection:
- according to determination by **expert personnel for crane rope inspection**
- or **at least once a year**

Note
▶ Shortening the inspection interval: The older a rope is the more frequently will wire breaks occur.

Determining factors for determination of inspection intervals are:
- Legal regulations in the country where the crane is operated
- Climate conditions under which the rope drive is utilized
- Power train group
- Results of previous inspections on current or comparable machine and under comparable operating conditions
- Frequency and type of use of a rope
- Service life of rope

7 Areas

WARNING
Broken wires and distortions on ropes in cross over areas!
Rope performance can be greatly reduced. Rope breakage. Death, severe injuries, property damage.
▶ Check rope cross over areas especially diligently.

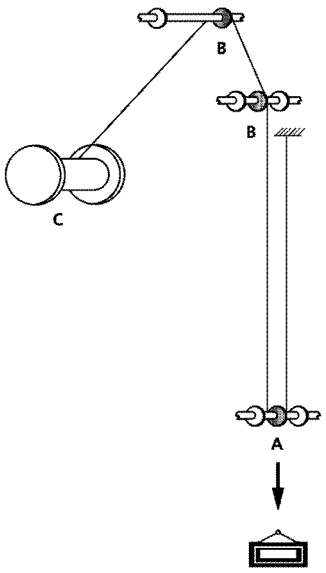

Fig.120969: Important inspection areas for multi layer spooled up ropes

A Rope sections, which run in the area of the load rise into the lower rope pulleys (the load is raised here).

B Rope intake on the first rope pulley in the area of the load rise

C Rope sections, which are subjected in the cross over areas to the strongest effects (maximum deflection angle).

The rope must be checked over the entire length.

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The following areas must be checked with special care:
- Rope end connections
- Safety coils and fixed point on the winch
- Areas of the rope which run through the hook block.
- Areas of the rope that run over the rope pulleys or lay on the rope pulleys.
- Areas of the rope that are spooled on the winch, especially cross over areas.
- Areas of the rope which are laying above the compensation pulleys.
- Areas of the rope which are subjected to abrasion due to external components.
- All areas of the rope that are subjected to temperatures above 60 °C.

8 Documenting inspection results

Note
- ▶ Document the results of the inspections in an inspection checklist.
- ▶ Form for an inspection checklist, see section „Current checklist“.

9 Wire ropes and rope end connections

WARNING
Wire rope with impermissible rope end connection!
The wire rope can fail. The load call fall down.
Death, severe bodily injuries, property damage.
- ▶ Select the permissible rope type for the respective application.
- ▶ Select the permissible rope end connection for the respective rope type.
- ▶ Observe and adhere to the warning display on the lock.

Wire rope application	Rope type
Hoist rope	Rotation-resistant rope
Guy rope or control rope	Non-rotation resistant rope
Auxiliary rope or assembly rope	Non-rotation resistant rope

Rope type depending on the application

The type of rope that is selected determines the corresponding rope end connections.

9.1 Rotation-resistant ropes with rope end connections

Use rotation-resistant ropes as **hoist ropes**.

Rotation-resistant ropes are special ropes that produce extremely little torque and twisting at the rope end connection when they are under strain.

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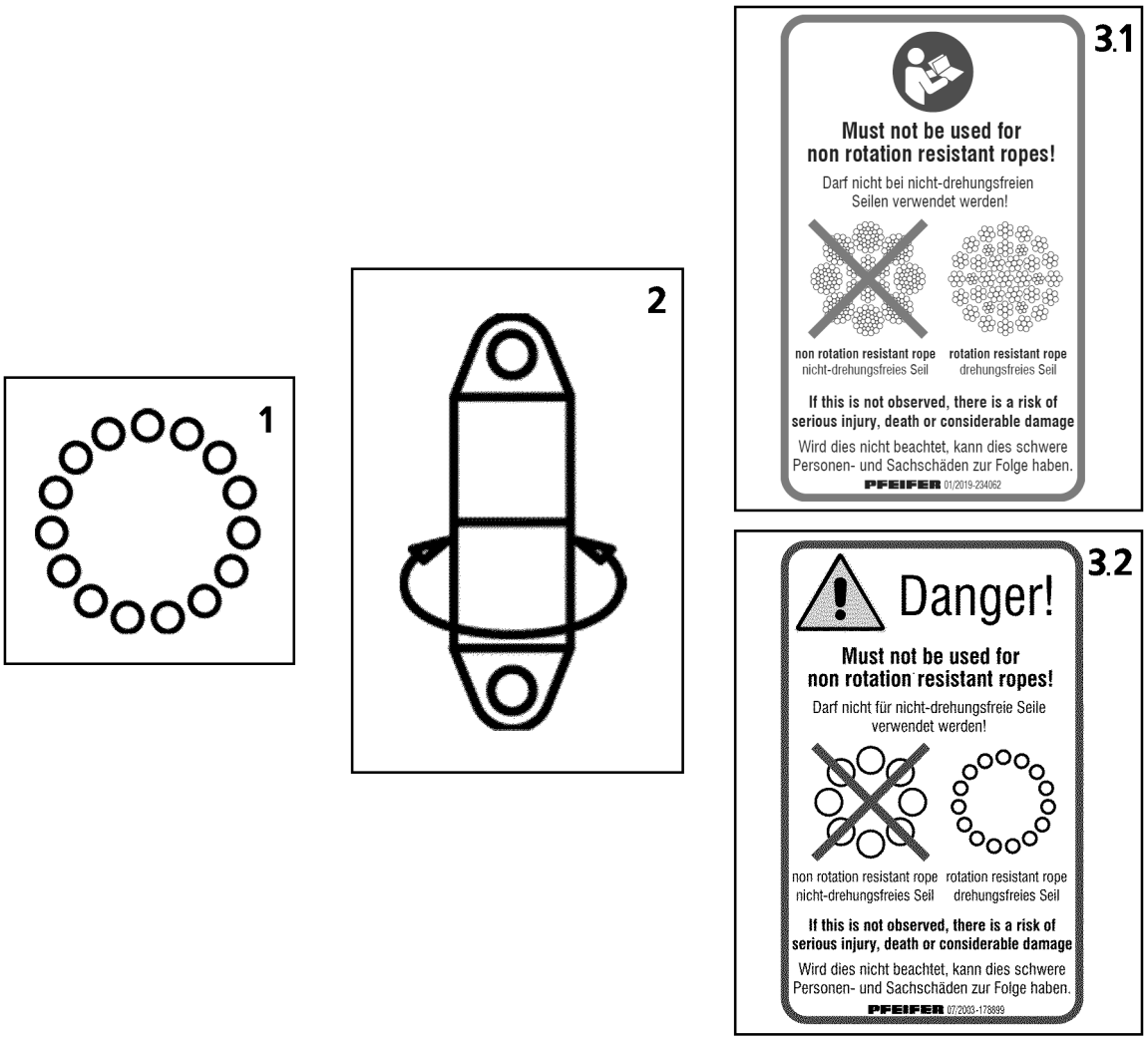

Fig.154083: Symbols for rotation-resistant ropes with rope end connections

1 Rotation-resistant rope symbol

2 Rotating rope end connection symbol

3.1 Variation 1: Warning display on the PFEIFER lock

3.2 Variation 2: Warning display on the PFEIFER lock

Typical rotation-resistant rope structures are wire ropes with 15 to 18 outer strands. Rotation-resistant ropes are symbolically depicted with 15 outer strands (circles), see illustration **1**.

9.1.1 Non-rotating rope end connection

Note

▶ In the case of a rotation-resistant ropes, Liebherr recommends the use of a lock **without** a swivel or a wedge lock. This can reduce the stress on the hoist ropes.

9.1.2 Rotating rope end connection

Note

▶ In the case of rotation-resistant ropes, Liebherr recommends **not** using a lock **with** a swivel and **not** to use a twist compensator / swivel.

To reduce a problematic turning behavior, the following rope end connections can be used in an individual case and after consultation with Liebherr customer service:

– Lock **with** swivel

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– Twist compensator / swivel

9.2 Non-twisting ropes with rope end connections

WARNING
Wire rope with impermissible rope end connection!
The wire rope can fail. The load call fall down.
Death, severe bodily injuries, property damage.
▶ Use a lock **without** a swivel or a wedge lock.
▶ **Never** use a lock **with** a swivel with non-twisting rope.
▶ **Never** use a twist compensator / swivel with a non-twisting rope.

Use non-twisting ropes as **guy ropes** or **control ropes**, **auxiliary ropes** or **assembly ropes**.

Non-twisting ropes generate high torque levels on the rope end connection under strain. For this reason, the rope ends must be protected from twisting using an appropriate rope end connection to prevent the wire rope from unscrewing under strain.

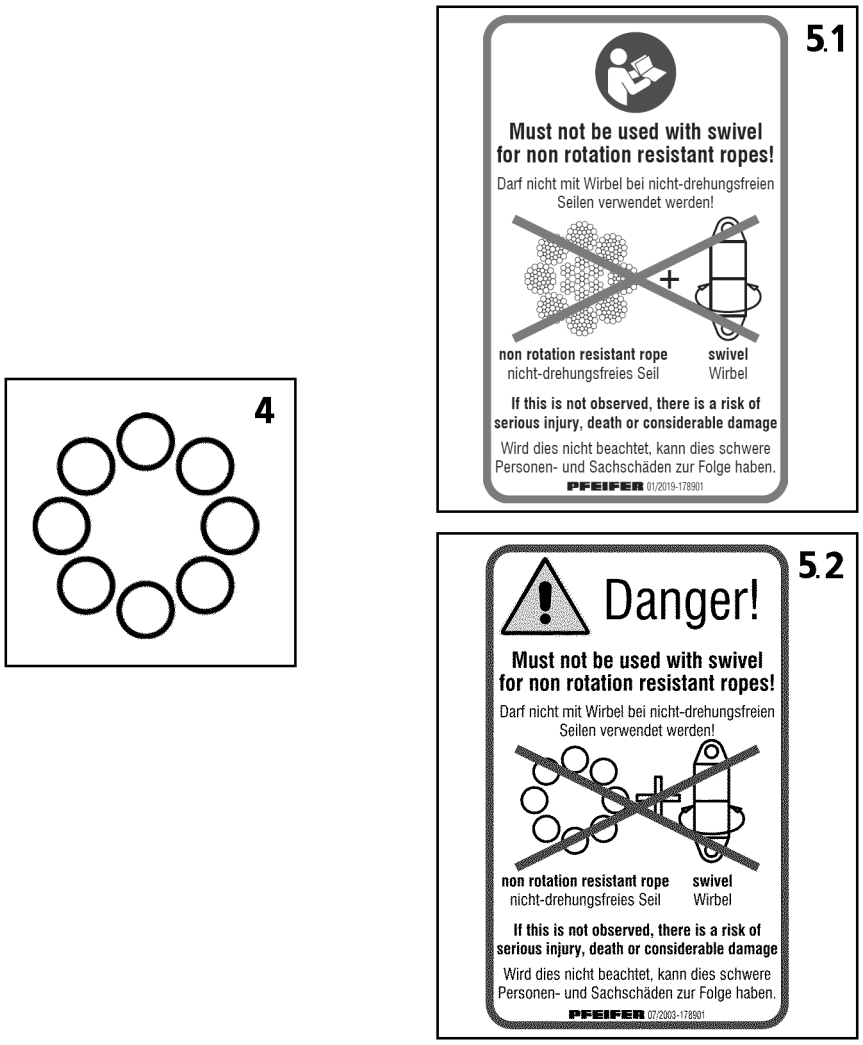

Fig.154084: Symbols for non-twisting ropes with rope end connections

4 Non-twisting rope symbol

5.1 Variation 1: Warning display on the PFEIFER lock / wedge lock

5.2 Variation 2: Warning display on the PFEIFER lock / wedge lock

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Typical non-twisting rope structures are wire ropes with eight or ten outer strands. Non-twisting ropes are symbolically depicted with eight outer strands (circles), see illustration **4**.

Only use non-twisting ropes with the following **non-twisting** rope end connections:
- Lock **without** swivel
- Wedge lock

A non-rotating rope end connection is also the mounting of the rope on the fixed point of the winch drum.

10 Degree of severity

The deciding factor for the removal criteria is which removal criteria are resent and to which degree they occur.

When various removal criteria are **not** present to a full degree, then the removal criteria must be evaluated as a total entity. For every individual removal criteria a degree of severity must be determined (percentage value).

For a certain rope section the sum of individual degrees of severity results in a **combined degree of severity**, see section „Combined degree of severity“.

When the combined degree of severity is more than 100 %, then the rope must be taken down.

11 Abbreviations Rope diameter

Abbreviations	Description
Rope nominal diameter **d**	Rope diameter, identification of rope
Reference diameter $\mathbf{d}_{ref}$	Measured rope diameter of a straight rope section, directly after placing the rope
6d	Length of 6-fold rope nominal diameter
30d	Length of 30-fold rope nominal diameter

Abbreviations Rope diameter

12 Distortions and mechanical damage

WARNING
Distortions and mechanical damage!
Operational safety significantly disturbed, uneven load distribution within the rope.
▶ Have the manufacturer check if the distorted and damaged area can be severed.

Visible form changes often occur localized or in short rope sections.

When a safe operation of the rope is ensured, a distorted and damaged area can be severed.

13 Removal criteria Overview

The following chart provides an overview between removal criteria and the respective method for inspection. The degree is described, when the removal criteria is reached.

The removal criteria is described in detail in the subsequent sections.

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Note

When the rope for parallel operation has reached the removal criteria:

▶ Often, both ropes must be replaced. The new rope has a larger diameter and other elongation characteristics.

Removal criteria	Degree for removal criteria	Inspection method
Broken strands	One strand is broken	Visual check
Broken wires on ropes, which run over rope pulleys and are spooled in multiple layers	Maximum number of broken wires reached, see Section Determining the number of broken wires	Count
Broken wire in the strand valleys	Two or more broken wires in strand valleys, on the contact points of two neighboring strands within an angular length (corresponds approx. to 6d)	Count
Broken wires in the area of the rope end connection	Two or more broken wires, according to decision of **expert personnel for crane rope inspection**	Visual inspection, test with marlin spike
Broken wire nests	On occurrence	Visual check
Reduction rope diameter at even diameter reduction	Maximum reduction of rope diameter reached	Measurement, calculation
Localized increase of rope diameter	Maximum increase of rope diameter reached	Measurement
Significant corrosion	Surface of rope is significantly affected or rust film emerges, according to decision of **expert personnel for crane rope inspection**	Visual check
Corkscrew-like distortion	Maximum permissible distortion reached	Measurement, calculation
Basket formation	On occurrence	Visual check
Wires or bunches of wires protruding from the rope	On occurrence, if more than one wire protrudes from the rope	Visual check
Flattenings	Larger than half of the diameter of the outer strand, according to decision of **expert personnel for crane rope inspection**	Visual check
Loop formation	Loops on several wires	Visual check
Kinking or remaining distortion	On occurrence	Visual check
Buckles or contusions	On occurrence, according to decision of **expert personnel for crane rope inspection**	Visual check

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Removal criteria	Degree for removal criteria	Inspection method
Heat influence, electric voltage	Bluish discoloration, broken or melted wires	Visual check
Damage on rope end connections: Material cracks, deformation, wear, corrosion, traces of slipping between the locking clamp and rope	According to decision of **expert personnel for crane rope inspection**	Visual inspection
Combined degree of severity	Degree of severity 100 % or above, according to decision of **expert personnel for crane rope inspection**	Calculation of individual degrees of severity

Removal criteria Overview

14 Checking for broken strands

A strand consists of several individual wires.

If a complete strand is broken:

▶ Take the rope down.

15 Determining the number of broken wires

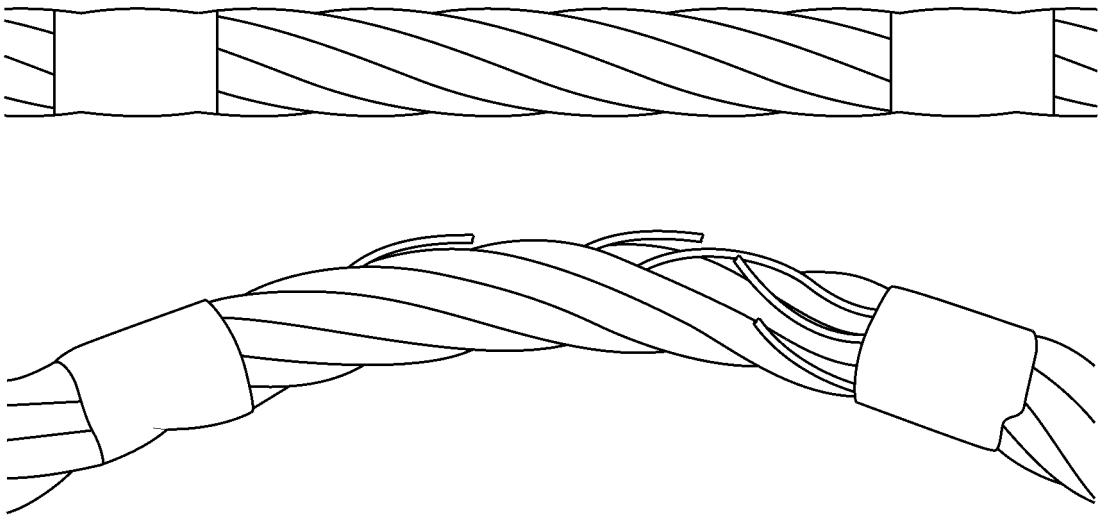

Fig.120980: Determine broken wires by bending

By bending the rope, broken wires can be recognized better.

Make sure that the following prerequisites are met:

- The rope is clean.
- Inspection checklist is on hand.

15.1 Scattered occurring broken wires

The following different rope types each have their own chart for the permissible number of broken wires:

- Single layer and parallel roped ropes

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– Rotation resistant ropes

The charts in this section are valid exclusively for **scattered occurring broken wires**.

15.1.1 Wire break increase rate

The wire break increase rate is an increase of broken wires, which can skyrocket with increasing use of the rope.

▶ Include the inspection checklists for the previous inspection and use it to draw a conclusion for the wire break rate increase.

15.1.2 Single layer and parallel roped ropes

Rope category number RCN	Total number of load carrying wires in the outer strand layer of rope[1] n	Number of visible outer wire breaks[2]					
		Rope sections, which run over steel pulleys and / or wind up on a single layer spooling drum (coincidental distribution of broken wires)				Rope sections, which wind up on a multi layer drum[3]	
		Class M1 to M4, or class unknown[4]				All classes	
		Lang lay		Even lay		Lang lay and even lay	
		Over a length of 6d[5]	Over a length of 30d[5]	Over a length of 6d[5]	Over a length of 30d[5]	Over a length of 6d[5]	Over a length of 30d[5]
01	n ≤ 50	2	4	1	2	4	8
02	51 ≤ n ≤ 75	3	6	2	3	6	12
03	76 ≤ n ≤ 100	4	8	2	4	8	16
04	101 ≤ n ≤ 120	5	10	2	5	10	20
05	121 ≤ n ≤ 140	6	11	3	6	12	22
06	141 ≤ n ≤ 160	6	13	3	6	12	26
07	161 ≤ n ≤ 180	7	14	4	7	14	28
08	181 ≤ n ≤ 200	8	16	4	8	16	32
09	201 ≤ n ≤ 220	9	18	4	9	18	36
10	221 ≤ n ≤ 240	10	19	5	10	20	38
11	241 ≤ n ≤ 260	10	21	5	10	20	42
12	261 ≤ n ≤ 280	11	22	6	11	22	44

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Rope category number RCN	Total number of load carrying wires in the outer strand layer of rope[1] n	Number of visible outer wire breaks[2]					
		Rope sections, which run over steel pulleys and / or wind up on a single layer spooling drum (coincidental distribution of broken wires)				Rope sections, which wind up on a multi layer drum[3]	
		Class M1 to M4, or class unknown[4]				All classes	
		Lang lay		Even lay		Lang lay and even lay	
		Over a length of 6d[5]	Over a length of 30d[5]	Over a length of 6d[5]	Over a length of 30d[5]	Over a length of 6d[5]	Over a length of 30d[5]
13	281 ≤ n ≤ 300	12	24	6	12	24	48
	n > 300	0.04 x n	0.08 x n	0.02 x n	0.04 x n	0.08 x n	0.16 x n
Note: Ropes with outer strands in the Seale type, number of wires per strand 19 or less (for example 6 × 19 Seale), are classified in this chart as two lines over the line, which would be defined due to the number of load carrying wires in the outer strands.							

*Number of visible broken wires (reached or exceeded) for removal criteria is reached, for **single-layer** and **parallel** roped ropes according to **DIN ISO 4309***

1) For the purpose of this international standard, fill wires are not considered to be load carrying wires and are not included in the value for n.
2) A broken wire has two ends (counted as one wire).
3) The values apply for damage in the cross over areas and the layers of coils due to deflection angles (not for rope sections, which run only over rope pulleys and do not spool up on the winch).
4) For ropes on drive gears of groups M5 to M8 twice the number of broken wires listed can be used.
5) d = Rope nominal diameter

▶ Check the rope over the entire length for visible broken wires.

When visible broken wires are scattered present:
▶ On the point of a broken wire, mark the rope sections on a length of 30d in both directions.
▶ Count visible broken wires in the marked rope sections and record them.
▶ Take the RCN (Rope category number) from the manufacturer's documentation of the rope.

When the make for single layer and parallel roped ropes is **not** listed in the chart:
▶ Determine the total number of load carrying wires in the rope: Add all wires in the strands of the outer layer, do **not** count fill wires.
▶ Compare the number of broken wires of each marked rope section 30d with the number of broken wires in the chart.

When the number of visible broken wires is smaller than listed in the chart:
▶ Within the rope section with the most broken wires: Mark the rope section with the most broken wires on a length of 6d.
▶ Count visible broken wires in the marked rope sections 6d and record them.
▶ Compare the number of broken wires of the marked rope section with the number of broken wires in the chart.

When the number of visible broken wires is equal to or larger than that listed in the chart:
▶ Take the rope down.
▶ Enter the results in the inspection checklist.

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15.1.3 Rotation resistant ropes

Rope category number RCN	Total number of load carrying wires in the outer strands of rope[1] n	Number of visible outer wire breaks[2]			
		Rope sections, which run over steel pulleys and / or wind up on a single layer spooling drum (coincidental distribution of broken wires)		Rope sections, which wind up on a multi layer drum[3]	
		Over a length of 6d[4]	Over a length of 30d[4]	Over a length of 6d[4]	Over a length of 30d[4]
21	4 strands n ≤ 100	2	4	2	4
22	3 or 4 strands n ≥ 100	2	4	4	8
	At least 11 strands in the outer layer				
23-1	71 ≤ n ≤ 100	2	4	4	8
23-2	101 ≤ n ≤ 120	3	5	5	10
23-3	121 ≤ n ≤ 140	3	5	6	11
24	141 ≤ n ≤ 160	3	6	6	13
25	161 ≤ n ≤ 180	4	7	7	14
26	181 ≤ n ≤ 200	4	8	8	16
27	201 ≤ n ≤ 220	4	9	9	18
28	221 ≤ n ≤ 240	5	10	10	19
29	241 ≤ n ≤ 260	5	10	10	21
30	261 ≤ n ≤ 280	6	11	11	22
31	281 ≤ n ≤ 300	6	12	12	24
	n > 300	6	12	12	24
Note: Ropes with outer strands in Seale type, number of wires in each strand 19 or less (for example 18 × 19 Seale - WSC), are classified in this chart as two lines over the line, which would be defined due to the number of load carrying wires in the outer strands.					

*Number of visible broken wires (reached or exceeded) is achieved in the rope removal criteria, for **rotation-resistant** ropes according to **DIN ISO 4309***

1) For the purpose of this international standard, fill wires are not considered to be load carrying wires and are not included in the value for n.
2) A broken wire has two ends (counted as one wire).
3) The values apply for damage in the cross over areas and the layers of coils due to deflection angles (not for rope sections, which run only over rope pulleys and do not spool up on the drum).
4) d = Rope nominal diameter

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▶ Check the rope over the entire length for visible broken wires.

When visible broken wires are scattered present:
▶ On the point of a broken wire, mark the rope sections on a length of 30d in both directions.
▶ Count visible broken wires in the marked rope sections and record them.
▶ Take the RCN (Rope category number) from the manufacturer's documentation of the rope.

When the make for rotation-resistant ropes is **not** listed in the chart:
▶ Determine the total number of load carrying wires in the rope: Add all wires in the strands of the outer layer, do **not** count fill wires.

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▶ Compare the number of broken wires of each marked rope section 30d with the number of broken wires in the chart.

When the number of visible broken wires is smaller than listed in the chart:
▶ Within the rope section with the most broken wires: Mark the rope section with the most broken wires on a length of 6d.
▶ Count visible broken wires in the marked rope sections 6d and record them.
▶ Compare the number of broken wires of the marked rope section with the number of broken wires in the chart.

When the number of visible broken wires is equal to or larger than that listed in the chart:
▶ Take the rope down.
▶ Enter the results in the inspection checklist.

15.2 Broken wire in the strand valleys

The broken wires in these areas point to the fact that the condition in the inside of the rope is deteriorating.

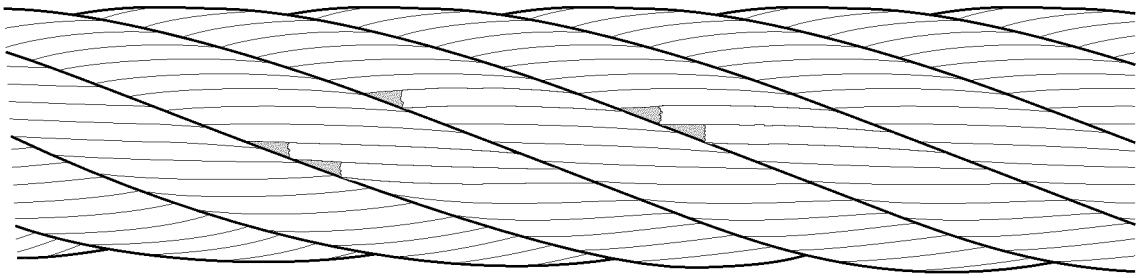

Fig.121005: Broken wire in the strand valleys

When two or more broken wires occur within a 6d long rope section:
▶ Take the rope down.

15.3 Broken wires on rope end connections

▶ Check the area near the rope end connections and carefully check for broken wires.

Loose wires are a sign of broken wires in the rope end connection.

▶ Use a marlin spike to check for loose wires.

When broken wires are near a rope end connection and two or more wires are affected:
▶ Take the rope down.
or

When the remaining rope lengths fulfil the minimum number of remaining coils in all operating positions:
Shorten the rope, see chapter 7.05.50.
▶ Attach the rope end connection.

15.4 Broken wires in rope sections, which are not spooled up on the winch

When the broken wires are concentrated on one or two strands, the removal criteria can be present at fewer broken wires as noted in the chart (rope section in the length of 6d).

▶ Have the rope removal criteria determined by **expert personnel for crane rope inspection**.

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15.5 Broken wire nests

When broken wires are very close to each other or when the broken wires are concentrated on one strand, then the rope must be taken down, even at fewer broken wires than noted in the chart (rope section 6d).

▶ Have the rope removal criteria determined by **expert personnel for crane rope inspection**.

16 Checking the rope end connection

The removal criteria are evaluated by the **expert personnel for crane rope inspection**.

Check for broken wires, see section „Broken wires on rope end connections“.

16.1 Pressed rope end connection

Example of a pressed rope end connection: Locking clamp.

▶ Check the rope end connections for signs of possible slipping between the locking clamp and the wire rope.
▶ Check the rope end connections for material cracks.
▶ Check rope end connections for corrosion, deformation and wear.

16.2 Enlarged rope end connection

Example of an enlarged rope end connection: Locking cast sleeve.

▶ If present: Remove the beam.
▶ Check rope end connections for corrosion, deformation and wear.

If the rope connection is on a flat rope:
▶ Check the cone setting, see chapter 8.04.10.

16.3 Detachable rope end connection

Example of a detachable rope end connection: Wedge lock.

▶ Check that the rope end connections are fit tightly and correctly installed.
▶ Check the wire rope inside and at the outlet of the rope end connection. Check the rope according to the removal criteria in this chapter.

17 Checking of rope diameter

17.1 Even reduction of rope diameter

WARNING
Spooling problems due to reduced rope diameter!
▶ Take the rope down even when the removal criteria according to **DIN ISO 4309** has not yet been reached.

The values in this section do **not** apply for rope sections, which were damaged in cross over areas due to multi layer spooling on a winch.

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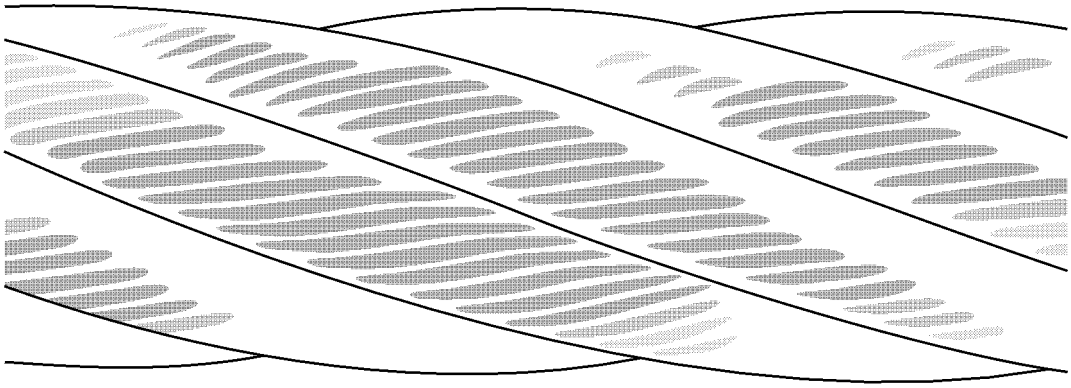

Fig.121001: External abrasion on the rope

The rope diameter changes due to abrasion, settling and external influences.

Abrasion of cover wires of outer strands of rope due to frictional contact. Especially in those areas where ropes are in contact with the rope pulleys during start up or slow down of the load.

Wear is increased by lack of or incorrect lubrication and the effect of dust.

Abrasion reduces the tensile strength of steel ropes because the cross section of the steel is reduced.

Additional possible causes for reduction of rope diameter:
- Wear in the inside of the rope
- Wear of fiber insert
- Breakage of a steel insert
- Broken inner strands

This section is valid solely for the following ropes:
- Ropes, which wind up on single layer winches
- Ropes, which run through a steel rope pulley

$$d_V = \frac{d_{ref} - d_m}{d} \times 100\ \%$$

Fig.121372: Formula Reduction of rope diameter

d_V = even reduction of rope diameter
d_{ref} = rope diameter, which was determined before placement
d_m = measured rope diameter
d = rope nominal diameter: Take value from inspection checklist

The following chart applies exclusively for ropes, which wind up on single layer winches and / or run through a steel rope pulley.

Rope type	Even reduction of diameter d_V (in percentages of rope nominal diameter d)	Classification of degree of severity	
		Description	%
	Less than 6 %	—	0
Single layer rope with fiber insert	6 % and above, but less than 7 %	Light	20
	7 % and above, but less than 8 %	Medium	40
	8 % and above, but less than 9 %	High	60
	9 % and above, but less than 10 %	Very high	80
	10 % and above	**Rope removal criteria**	**100**

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Rope type	Even reduction of diameter d_v (in percentages of rope nominal diameter d)	Classification of degree of severity	
		Description	%
Single layer rope with steel insert or parallel roped rope	Less than 3.5 %	—	0
	3.5 % and above, but less than 4.5 %	Light	20
	4.5 % and above, but less than 5.5 %	Medium	40
	5.5 % and above, but less than 6.5 %	High	60
	6.5 % and above, but less than 7.5 %	Very high	80
	7.5 % and above	**Rope removal criteria**	**100**
Rotation-resistant rope	Less than 1 %	—	0
	1 % and above, but less than 2 %	Light	20
	2 % and above, but less than 3 %	Medium	40
	3 % and above, but less than 4 %	High	60
	4 % and above, but less than 5 %	Very high	80
	5 % and above	**Rope removal criteria**	**100**

Degree of severity and removal criteria depending on rope type and even diameter reduction according to ***DIN ISO 4309***

The medium value from the smallest and the largest measured diameter results in the value for $\mathbf{d}_m$.

- ▶ Measure rope diameter on several locations and calculate measured diameter $\mathbf{d}_m$.
- ▶ Calculate even reduction $\mathbf{d}_v$ of rope diameter with formula.
- ▶ Read the degree of severity in the chart, depending on the rope type.
- ▶ Document the degree of severity in the inspection checklist.

When the degree of severity has reached 100 %:

- ▶ Take the rope down.

17.2 Localized reduction of rope diameter

Localized reductions of rope diameter point to the fact that a rope insert may have failed, for example.

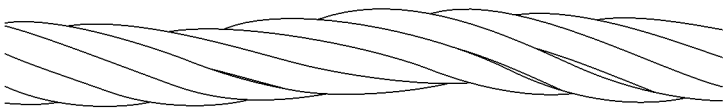

Fig.120983: Localized reduction of rope diameter

- ▶ Check the rope for localized reduction of rope diameter.

When a localized reduction of the rope diameter is found:

- ▶ Take the rope down.

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17.3 Localized increases of rope diameter

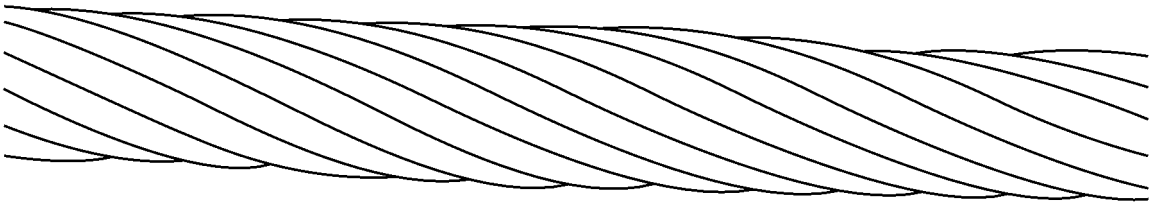

Fig.120992: Localized increase of rope diameter

An increase over a longer area of the rope can be caused by absorption of moisture in the fiber insert or due to corrosion in the inside of the rope.

Rope insert	Maximum increase of rope diameter during operation
Steel	5 %
Fiber	10 %

▶ Check the rope for increases in rope diameter.

When the increases exceed the maximum values:
▶ Take the rope down.

18 Corrosion

Corrosion occurs due to insufficient lubrication, in maritime climates and in an atmosphere polluted by industrial fumes.

External corrosion is indicated by a rough wire surface. A superficial rust film can be wiped off.

Significant corrosion reduces the strength and elasticity of the rope due to the reduction of the rope diameter.

Inner corrosion is hard to detect.

Do **not** use solvents to clean the rope.

Make sure that the following prerequisite is met:
– Rope is cleaned (wiped and brushed).

18.1 External corrosion

The various types of corrosion are classified and noted with the classification for removal criteria in percentages:

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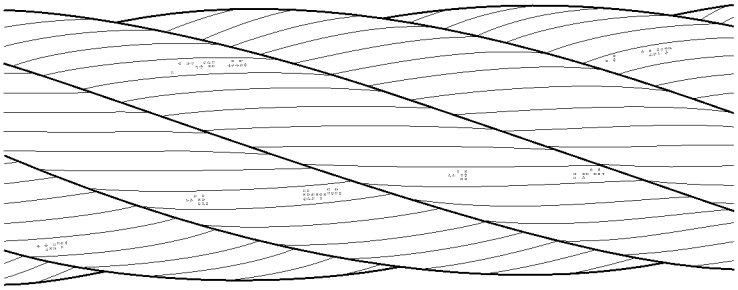

Fig.120984: Surface light corrosion: Classification 0 % of removal criteria

Superficial light corrosion (rust film) can be wiped off.

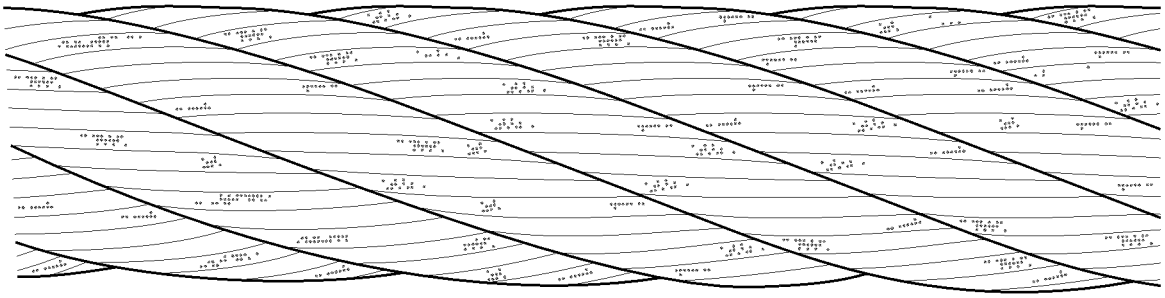

Fig.120985: Surface feels rough: Classification 20 % of removal criteria

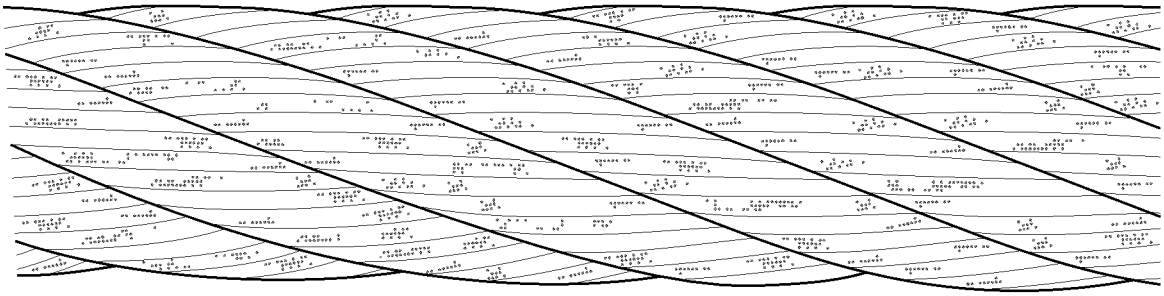

Fig.120986: Surface feels very rough: Classification 60 % of removal criteria

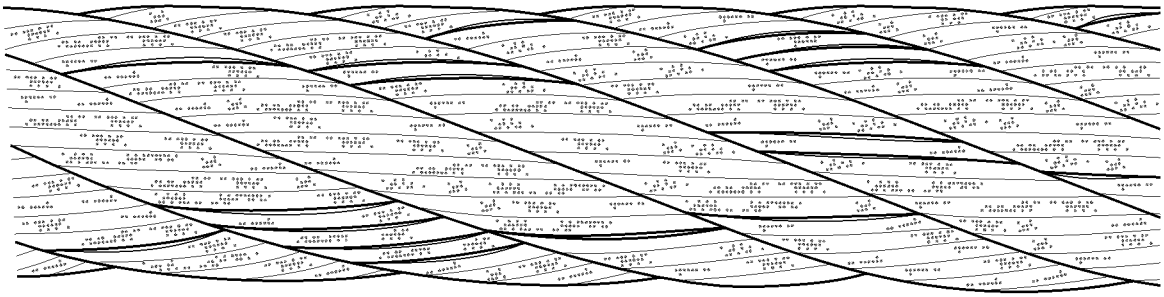

Fig.120987: Surface very decayed, spaces between individual wires can be easily recognized: Classification 100 % of removal criteria

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When 100 % of removal criteria is reached:
▶ Take the rope down.

18.2 Internal corrosion

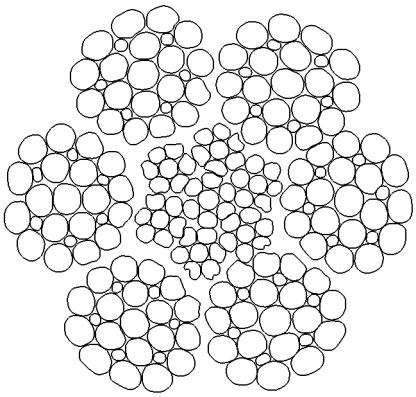

Fig.120982: Corrosion in the inside of the rope

Internal corrosion is present when clearly visible corrosion particles migrate between the valleys of the outer strands: Classification 100 % removal criteria.

When internal corrosion is found:
▶ Have the rope removal criteria evaluated by **expert personnel for crane rope inspection** or take the rope down.

18.3 Friction corrosion

Friction corrosion occurs as a type of brown powder, which migrates from the inside of the rope to the outside: Classification 100 % of removal criteria.

▶ Check the rope diligently for friction corrosion.

If friction corrosion is found:
▶ Have the rope removal criteria evaluated by **expert personnel for crane rope inspection** or take the rope down.

19 Corkscrew-like distortion

Fig.120988: Corkscrew-like distortion

Distortion where the rope is in the form of a corkscrew along its longitudinal axis.

Effects of corkscrew-like distortion:
- Irregular rope drive
- Rope wear
- Broken wire
- Bearing damage on rope pulleys

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If the distortion is very pronounced, then other components can be affected in their function when the affected rope section runs through in crane operation.

▶ Check the entire rope for corkscrew-like distortion.

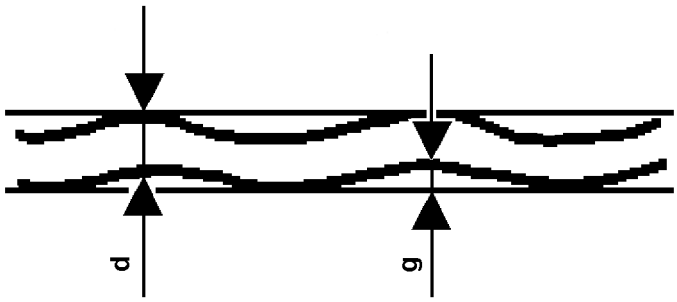

Fig.123988: Example for corkscrew-type distortion

d Rope nominal diameter **g** Distance

Rope section	Conditions for removal criteria, formula
Straight rope section, which does **not** run through or around a rope pulley or spool up on a winch	$g \geq \frac{1}{3} \times d$
Straight rope section, which runs through or around a rope pulley or spools up on a winch	$g \geq \frac{1}{10} \times d$

When corkscrew-like distortion is present:
▶ Determine the rope nominal diameter **d** and distance **g** on the rope.
▶ Check the removal criteria with the formula.

When the removal criteria is reached:
▶ Take the rope down.

20 Basket formation

This distortion occurs due to different layers between the outer strand layers and the inside of the rope.

Causes for basket formation are high angular pull angles during the run over the rope pulleys and run-in rope pulleys. Even load distribution over the entire cross section is not possible.

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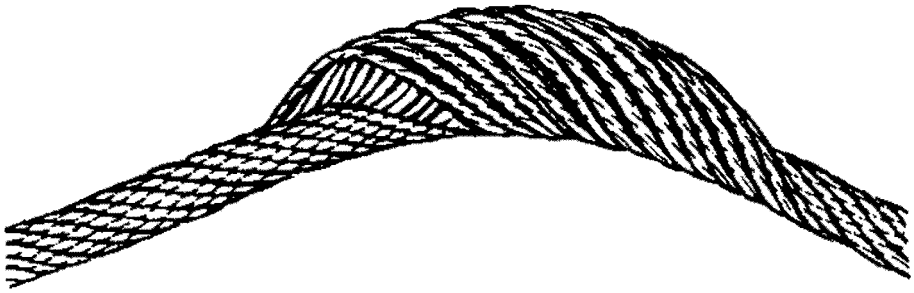

Fig.120989: Basket formation

▶ Check the entire rope for basket formation.

When basket formation is present:
▶ Take the rope down.

21 Protruding, distorted insert or strand

This distortion is a special form of basket formation. The insert or the core of the rope protrudes between the outer strands or an outer strand protrudes from the rope banding.

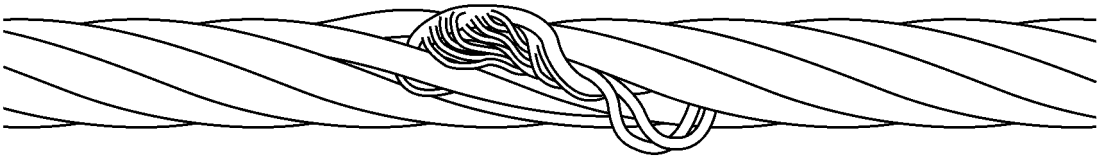

Fig.120990: Protrusion of an insert (rope single layer)

Fig.120991: Distorted or protruding strand

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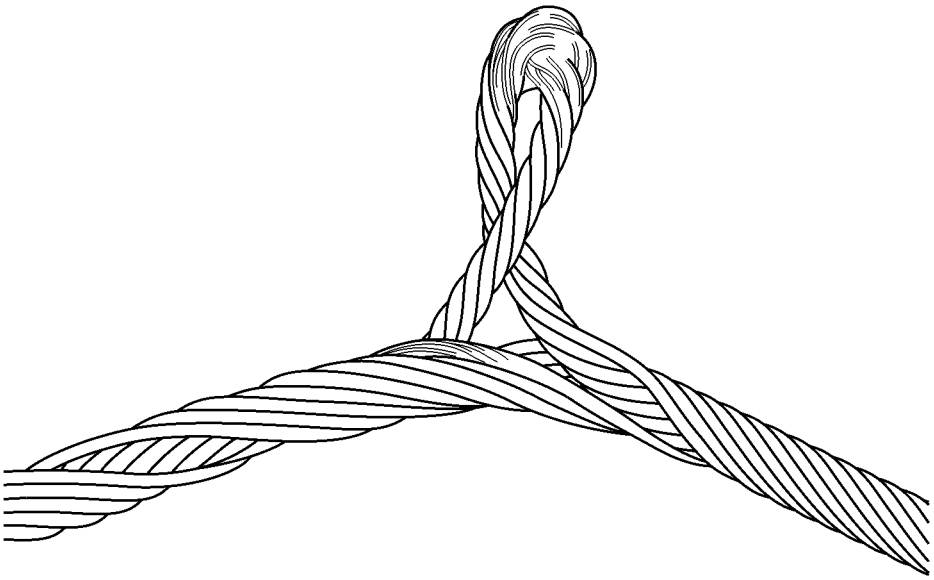

Fig.121373: Protrusion of rope insert on rotation-resistant rope

When the insert or a strand protrudes or is distorted, take the rope down. Have authorized inspector for crane rope inspection check if the rope area with the distortion can be removed.

▶ Check the entire rope for protruding, distorted insert or strand.

When protruding, distorted insert or braid is present:
▶ Take the rope down.
▶ Have **expert personnel for crane rope inspection** check if the rope area with the distortion can be removed.

22 Loop formation

At loop formation individual or several wires protrude from the rope and bulge upward (bird-caging).

These areas are most often on the opposite side of the rope pulley groove.

Make sure that the following prerequisite is met:
– There are **no** broken wire ends present.

If only a core wire of the rope insert protrudes through the outer strands, then the rope does not have to be taken down when:
– The wire can be removed.
– The wire does not disturb other elements of the rope drive.

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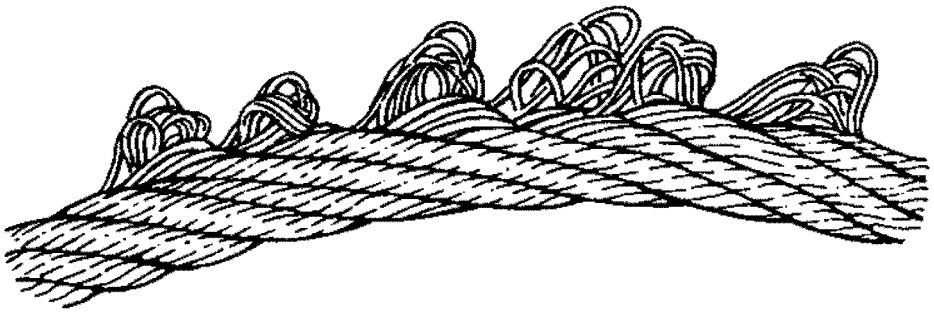

Fig.120993: Emergence of individual wires

▶ Check rope for loop formation.

When solely a core wire protrudes:
▶ Remove the core wire.

When several wires are affected from the loop formation:
▶ Take the rope down.

23 Kinking or rope loops pulled closed

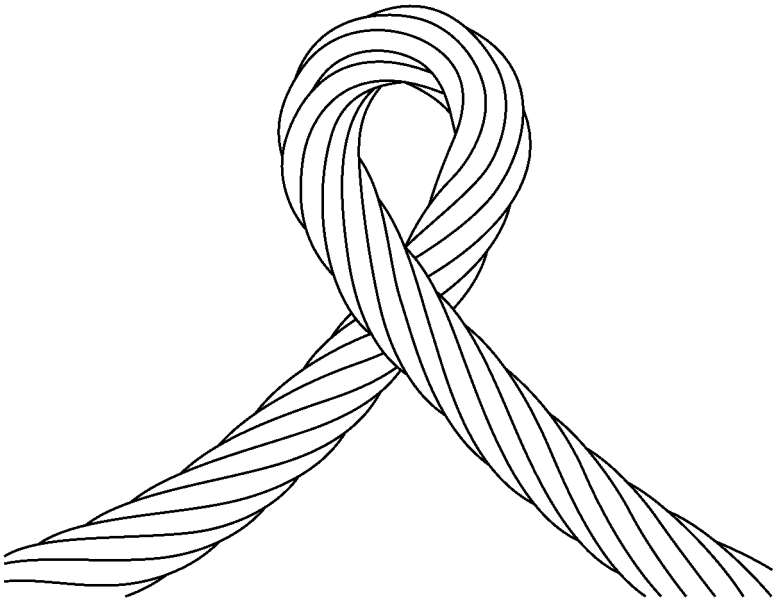

Fig.121007: Kinking or rope loop pulled closed

At this deformation a loop has formed in the rope, without the possibility to rotate around its own axis during a load. The rope is subjected to significant wear.

The rope is significantly distorted. The strength remains only in part.

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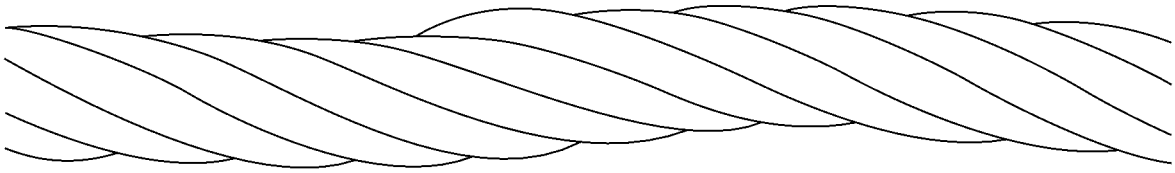

Fig.121002: Positive Kinking

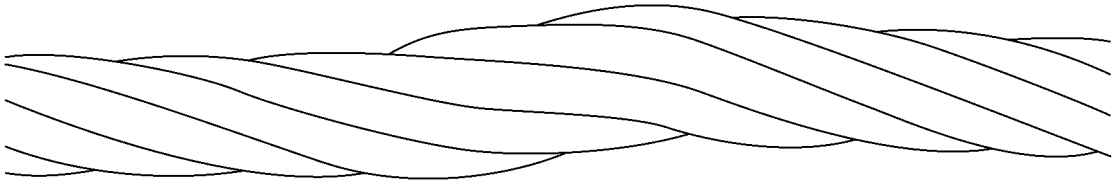

Fig.121003: Negative Kinking

▶ Check the rope for kinking or rope loops pulled closed.

When kinking or rope loops pulled closed occur:
▶ Take the rope down.

24 Buckles

Buckles are angular deformations. The rope was damaged due to external influences. Strong deformations of the rope cause stronger wear.

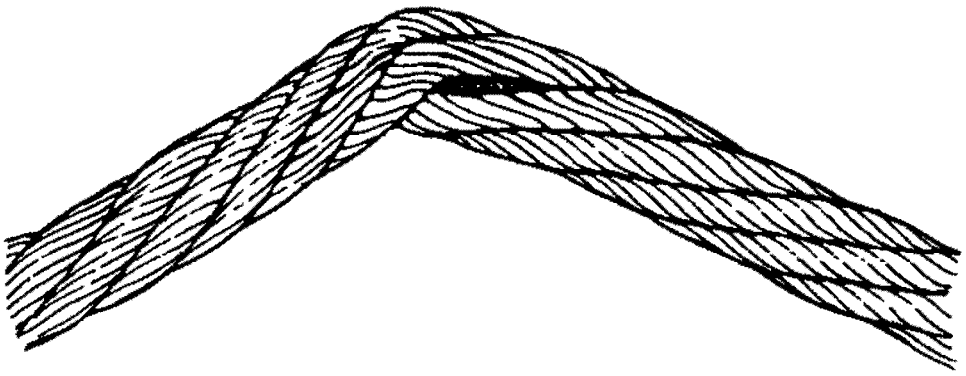

Fig.120999: Severe buckle

A buckle is a serious matter if a fold is visible on the underside of the rope.

When buckles are present:
▶ Have the rope inspected by **expert personnel for crane rope inspection**.

When a distortion and degree of severity permits further operation:
▶ Shorten the inspection interval.

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When the removal criteria is reached:
▶ Take the rope down.

25 Effects of heat, arcs

Damage caused to the rope by welding work, for example.

Exceptional thermal effect is visible through tempering colors, the loss of lubricant and by localized melting of wires.

When thermal effect has occurred on the rope:
▶ Take the rope down.

26 Combined degree of severity

Note
▶ For a method to determine the effect of a combined degree of severity and damage to the rope, see **DIN ISO 4309**.

When the condition of the rope deteriorates, then often a combination of various causes occurs.

To determine the degree of severity, the **expert personnel for crane rope inspection** must:
- take different damage within a rope section into account
- evaluate the entire effect of the damage and the distortions
- decide about the operational safety of the rope
- evaluate if inspection intervals must be adjusted
- decide if the rope must be taken down

When the combined degree of severity is more than 100 %, then the rope must be taken down.

27 Flattenings

Effects of flattenings on the rope:
- Rope sections with flattenings, which move **over the rope pulleys** tend to higher wear and a higher number of broken wires.
- Rope pulleys can be damaged.
- Flattenings on **stationary ropes** (guy ropes boom) promote quicker corrosion, especially in the areas where the outer strands have opened.

Flattened rope sections must be checked in shorter intervals for broken wires and corrosion.

27.1 Shorting the intervals

▶ Check the entire rope for flattenings.

When flattenings are present on stationary ropes:
▶ Shorten the intervals for rope inspection.

When it is **not** possible to shorten the intervals for the rope inspection:
▶ Take the rope down.

27.2 Improper mechanical damage

An improper mechanical damage occurs, for example, when the rope is trapped.

▶ Take the rope down immediately or shorten it, see chapter 7.05.50.

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27.3 Operational transverse pressure

Operational transverse pressure causes flattenings, for example in the incline range of multi layer spooling.

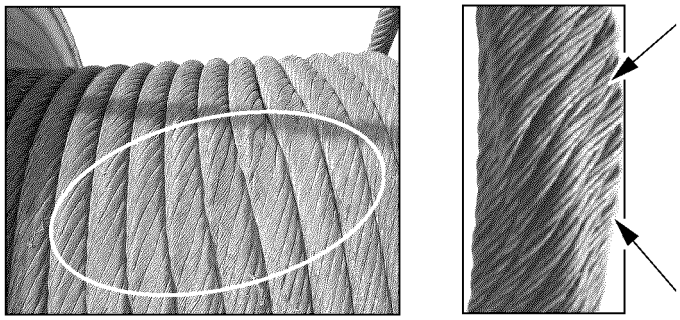

Fig.114002: Flattenings

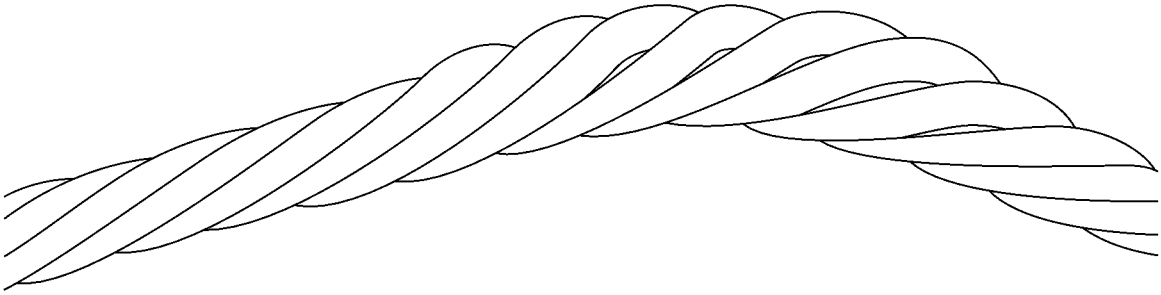

Fig.120996: Flattenings on multi layer windings

▶ Check the first rope layer of the winches for crushed areas and distortions.

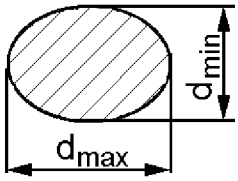

Fig.121006: Largest and smallest diameter on the distortion area

$$V = \frac{d_{max} - d_{min}}{d} \times 100\ \%$$

Fig.121374: Formula to calculate the distortion

V	Rope distortion in percentages	**dmax**	Largest diameter of distortion area
d	Rope nominal diameter	**dmin**	Smallest diameter of distortion area

When distortions are present:

▶ Determine the number of broken wires See section „Determining the number of broken wires“.

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When the number of permissible broken wires is exceeded:
- ▶ Take the rope down.
- ▶ Calculate the distortion **V** with the formula and document it in the inspection checklist.

When distortion **V** is larger than 5 %:
- ▶ Check the rope before every assembly and erection procedure.

When distortion **V** is larger than 10 %:
- ▶ Document the degree of severity of 50 % in the inspection checklist.

When distortion **V** is larger than 20 %:
- ▶ The degree of severity of 100 % is reached: Take the rope down.

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28 Current checklist

Crane and use:

Rope application:		RCN[3]:	Installation date:
Brand name:		Nominal diameter:	Take-down date:
Make[1]:	O Right hand	O Left hand	Minimum tensile strength
Direction of lay[1]:	O Lang's lay	O Ordinary lay	Permissible number of visible external broken wires
Intermediate layer[1]:	O IWRC	O FC O WSC	Datum diameter
Wire surface[1]:	O Bare	O Galvanized	Permissible diameter reduction: 6d: 30d:
Rope end connections:			

Date	Visible external broken wires						Diameter			Corrosion		Damage, deformation		Combined severity level[2]	Name of expert for the wire rope inspection	Signature
	Number in length of		Position in the rope		Severity level[2]		Measured	Actual reduction to datum diameter	Position in the rope	Severity level[2]	Position in the rope	Severity level[2]	Position in the rope			
JJ/MM/TT	6d	30d	6d	30d	6d	30d										

[1] Check where applicable.
[2] State extent of damage; slight or 20%; medium or 40%; high or 60%; very high or 80%; take-down or 100%
[3] RCN = Rope Category Number

Fig.121370-en: Form for current checklist

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8.05 Inspection of load hooks

1	Safety instructions	3
2	Inspection intervals	3
3	Checking the load hook	3

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Fig.195219

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1 Safety instructions

WARNING
The load hook did **not** pass the inspection!
The load hook can rip. The fastened load can fall down.
Death, severe bodily injuries, property damage.

If the load hook did **not** pass the inspection:
- ▶ Replace the load hook with the hook nut.
- ▶ Contact Customer Service at Liebherr-Werk Ehingen GmbH.

WARNING
Incorrect remedy of defects!
The load hook can rip. The fastened load can fall down.
Death, severe bodily injuries, property damage.
- ▶ Have defects remedied by authorized, trained expert personnel.

WARNING
Welds on the load hook!
The load hook can rip. The fastened load can fall down.
Death, severe bodily injuries, property damage.
- ▶ Do **not** weld the load hook, to repair defects, for example.

2 Inspection intervals

To detect defects in time and avoid accidents, observe the following instructions:
- – Have the load hook checked as required, however **at least once a year** by an authorized inspector.
- – Observe the national regulations concerning the inspection of load hooks.

3 Checking the load hook

The following points must be documented in the crane inspection log:
- – Performance of the inspections
- – Defects and damage
- – Measures for remedying the defects and damage

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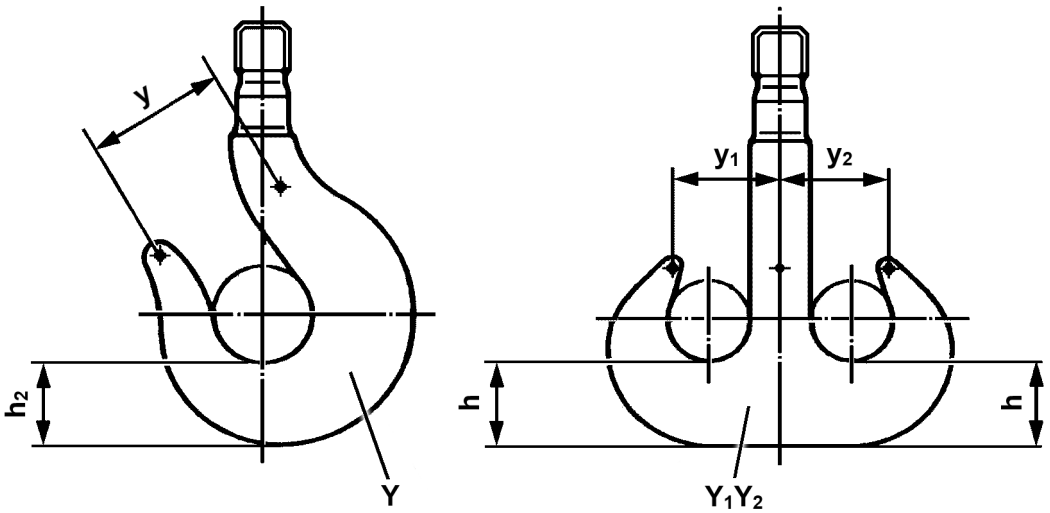

Fig.149076: Description of measured distances on the load hook

3.1 Checking the load hook for distortion

3.1.1 Hook shaft

If a distortion is visible on the hook shaft:

▶ Replace the load hook with the hook nut.

3.1.2 Hook mouth

The expansion of the hook jaw may be maximum 10 % in reference to the respective initial dimension. The initial dimensions are indicated on the load hook, see chapter 2.05.10:

– Single hook: Initial dimension **Y**
– Double hook: Initial dimension **Y_1Y_2**

▶ Single hook: Distance **y** between the punch marks.
▶ Double hook: Measure the distance **y_1** and distance **y_2** between the punch marks.

When the expansion of the hook jaw is 10 % greater than the initial dimensions:

▶ Replace the load hook with the hook nut.

When the expansion of the hook jaw less than or equal to 10% of the initial dimensions:

▶ Follow the instructions in section „Checking the load hook for surface cracks“.

3.2 Checking the load hook for surface cracks

Make sure that the following prerequisites are met:

– Distortion is present.

Inspection is required in all points where distortion is present, mainly on the hook jaw.

If it is **not** possible to check the installed load hook:

▶ Remove the load hook: Contact Customer Service at Liebherr-Werk Ehingen GmbH.
▶ Prior to the inspection: Put the surfaces into a state in which surface cracks can be detected correctly.
▶ Check the load hook for surface cracks using a suitable procedure.

An authorized inspector must decide if the surface cracks can be repaired.

When the surface cracks have been repaired:

▶ Check if the load hook dimensions lie within the permissible tolerances. Contact Customer Service at Liebherr-Werk Ehingen GmbH.

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When the surface cracks are **not** permissible:
▶ Replace the load hook with the hook nut.

3.3 Checking the hook body for wear

3.3.1 Hook base

The wear on the hook base may be maximum 5 % in reference to the respective initial dimension:
– Single hook: Initial dimension **h_2**
– Double hook: Initial dimensions **h**

The respective initial dimensions are provided in the following chart:

Hook number	Single hook h_2 [mm]	Double hook h [mm]
4	67	—
5	75	—
6	85	75
8	95	85
10	106	95
12	118	106
16	132	118
20	150	132
25	170	150
32	—	170
40	—	190
50	—	212
63	—	236
80	—	265
100	—	300
125	—	335
160	—	375
200	—	425
250	—	475
320	—	530
400	—	600

Initial dimensions for wear on the hook base, single hooks and double hooks

▶ Single hook: Measure the initial dimension **h_2**.
▶ Double hook: Measure the initial dimensions **h**.

When the wear on the hook base is 5 % greater than the initial dimension:
▶ Replace the load hook with the hook nut.

3.3.2 Surfaces

Surfaces with wear must be connected smoothly with the adjacent surfaces.

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▶ Check surfaces with wear for sharp edges, grooves or other surface errors.

An authorized inspector must decide if the surface errors can be repaired.

When the surface errors have been repaired:
▶ Check if the load hook dimensions lie within the permissible tolerances. Contact Customer Service at Liebherr-Werk Ehingen GmbH.

When the wear is **not** permissible:
▶ Replace the load hook with the hook nut.

3.4 Checking the double hook for damage

Visible damage indicate **improper** fastening of the load.

Relevant areas for the inspection:
– Lower area on the hook shaft
– On every hook: Transition area from the hook shaft to the hook jaw

▶ Check the load hook for visual damage.

An authorized inspector must decide if the damage can be repaired.

When the damage has been repaired:
▶ Check if the load hook dimensions lie within the permissible tolerances. Contact Customer Service at Liebherr-Werk Ehingen GmbH.

When the damage is **not** permissible:
▶ Replace the load hook with the hook nut.

3.5 Checking the load hook for corrosion

Depending on the overall condition of the load hook, an inspection expert must decide if the hook thread must be checked for corrosion nicks.

If the hook thread must be checked:
▶ Determine the Liebherr ID no. and manufacturer of the load hook, see chapter 2.05.10.
▶ Request the assembly instructions for the load hook: Contact Customer Service at Liebherr-Werk Ehingen GmbH.
▶ Remove the load hook: Contact Customer Service at Liebherr-Werk Ehingen GmbH.
▶ Disassemble the hook nut according to the manufacturer's assembly instructions.
▶ Check the hook thread, hook nut and machines surfaces on the hook shaft for corrosion.

An inspection expert must decide if the corrosion nicks can be repaired.

When the corrosion nicks have been repaired:
▶ Check if the dimensions of the hook thread and the hook shaft lie within the permissible tolerances. Contact Customer Service at Liebherr-Werk Ehingen GmbH.

If an **impermissible** axial play is suspected on the hook nut:
▶ Contact Customer Service at Liebherr-Werk Ehingen GmbH.

When the corrosion is **not** permissible:
▶ Replace the load hook with the hook nut.

If the load hook passed the inspection:
▶ Follow the instructions in the section „Assembling the hook nut“.

3.6 Assembling the hook nut

Make sure that the following prerequisites are met:
– The hook shaft, hook thread and hook nut fulfill all test criteria.
– The axial bearing is free of damage and turns easily.

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If the axial bearing does **not** turn easily:

- ▶ Clean the axial bearing and replace the lubricant.
  or
  Replace the axial bearing.

If the axial bearing is damaged:

- ▶ Replace the axial bearing.

Before the assembly of the hook nut: Corrosion protection must be applied between the thread sides.

- ▶ Grease the threads of the hook nut.
- ▶ Assemble the hook nut according to the manufacturer's assembly instructions.

The type of sealing after assembly must correspond to equivalent to the sealing before the inspection.

- ▶ Seal the transition between the hook thread and the hook nut thread.
- ▶ Install the load hook.

3.7 Checking the retaining elements

- ▶ Check if the twist guard of the hook nut (axle retainer) is tightened.
- ▶ Check if the twist guard of the hook nut functions.
- ▶ Check the function of the hook guard.

If the retaining element did **not** pass the inspection:

- ▶ Contact Customer Service at Liebherr-Werk Ehingen GmbH.

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8.06 Inspection of hydraulic hose lines

1	Safety guidelines	3
2	Inspection intervals	3
3	Checking the end of the service life	3
4	Inspecting the hydraulic hose lines for damage	4
5	Inspecting the hydraulic hose lines for leaks	5
6	Documenting the inspection	5
7	Replacing hydraulic hose lines	5

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Fig.195219

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1 Safety guidelines

WARNING
Damaged and leaky hydraulic hose lines!
Fire, accidents, death, severe injury, property damage.

If leaky areas are found:
▶ Have these leaky areas inspected immediately by authorized and trained expert personnel and remedied.

If damage is found:
▶ Have the hydraulic hose lines replaced exclusively by authorized and trained expert personnel.

If it is determined that the service life is over:
▶ Have the hydraulic hose lines replaced exclusively by authorized and trained expert personnel.

Make sure that the following prerequisite is met:
– A **competent person for hydraulic hose lines** inspects the hydraulic hose lines.

A **competent person for hydraulic hose lines** has the following knowledge:
– Knowledge and experience in hydraulic and mechanics
– Knowledge of all requirements regarding valid standards:
  • ISO 8331
  • ISO 2230
  • ISO 1402
  • ISO/TR
  • EN 853 to EN 857
  • National regulations
– **or:** Knowledge of all requirements regarding the valid German standards, for example:
  • DIN 20066:202-10
  • BGR 237 Feb 2008, BG-Regulation

2 Inspection intervals

The inspection of hydraulic hose lines must be carried out in the following intervals:
– when the crane is **up to 10 years** old, at least one inspection every twelve months
– when the crane is **older than 10 years**, at least one inspection every six months

3 Checking the end of the service life

Hydraulic hose lines have a limited service life.

When hydraulic hose lines are properly stored, installed and used, then the manufacturer guarantees a service life of at least 10 years.

The life expectancy of hydraulic hose lines can deviate significantly from the noted service life of hydraulic hose lines.

Note
Special case: Active rear axle steering!
▶ The life expectancy of hydraulic hose lines is six years, including a storage period of maximum two years.

The life expectancy of a hydraulic hose line depends on various factors:
– Environmental influences, for example: Temperature, humidity, corrosive air
– Use

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- Working cycles
- Number of bending cycles
- Friction
- Fluid

The following factors reduce the life expectancy significantly:
- Heat
- Repeated bending under pressure

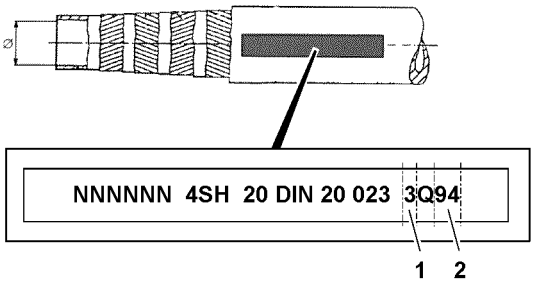

Fig.120159: Example for identification of hydraulic hose lines

The manufacturing date is marked on the fixtures or fittings.

▶ Read the quarter **1** of manufacture.
▶ Read the year **2** of manufacture.

When the life expectancy of a hydraulic hose line has been exceeded, then a **competent person** can decide **not** to replace the hydraulic hose line. Document the decisions, see section „Documenting the inspection“.

When the end of the service life is determined:
▶ Have the hydraulic hose lines replaced exclusively by authorized and trained expert personnel.

4 Inspecting the hydraulic hose lines for damage

Hydraulic hose lines must be replaced when one of the following damage is present:
– Damage on outer surface, such as chafe marks, cuts and cracks
– Brittleness due to aging of outer layer (cracks)
– Distortion, such as splitting of hose layers, bubbles, crushed areas, kinks, rotational stress
– Leakages
– Damage or distortion of hose fixtures or hose fitting (seal is endangered)
– Movement between hose and hose line, hose working itself loose from the fixture or the fitting
– Requirements for installation **not** observed
– Corrosion of fixture or fitting (solidness or function of fitting is endangered)

When the hydraulic hose line is **not** completely accessible:
▶ Remove the hydraulic hose line.

When the hydraulic hose line is protected with a protective hose:
▶ Check the hose protection for abrasion Abrasion on a hose protective hose can indicate abrasion on the hydraulic hose line.
▶ Check hydraulic hose lines for distortion in pressureless and pressurized status and during bending.

When the hydraulic hose line is slightly damaged, then a **competent person** can decide **not** to replace the hydraulic hose line. Document the decisions, see section „Documenting the inspection“.

If damage is found:
▶ Have the hydraulic hose lines replaced exclusively by authorized and trained expert personnel.

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5 Inspecting the hydraulic hose lines for leaks

▶ Check the crane for escaped hydraulic oil.
▶ Check the crane for leaks by visually checking the ground under the crane.

When the hydraulic system leaks:
▶ Have these leaks inspected immediately by authorized and trained expert personnel and remedied.
or
Contact Liebherr Service.

6 Documenting the inspection

Make sure that the following prerequisite is met:
– A **competent person for hydraulic hose lines** documents noticeable observations.

The following data about hydraulic hose lines is documented:
– Installation location
– Condition
– Date
– Time

▶ Document noticeable observations comprehensibly.

When the life expectancy of a hydraulic hose line has been exceeded of if the hydraulic hose line is slightly damaged, then a **competent person** can decide **not** to replace the hydraulic hose line.

When the hydraulic hose line is **not** replaced:
▶ Document decisions and replacements comprehensibly.
▶ Document the date for the next inspection comprehensibly.

7 Replacing hydraulic hose lines

To ensure maximum safety, sealing and service life, the following guidelines apply for replacement of hydraulic hose lines.

WARNING
Impermissible spare parts!
Death, severe injury, property damage.
▶ Do **not** use repaired or used hydraulic hose lines.
▶ Use exclusively Original Liebherr spare parts.
▶ Use exclusively hydraulic hose lines according to manufacturer's specification (including fixtures, rubber piece goods and manufacturing process).

NOTICE
Routing of hydraulic hose lines changed!
Abrasion. Incorrect bending radius. Stress. Shortened service life.
▶ Keep the routing of hydraulic hose lines.
▶ Inspect the hydraulic hose lines according to intervals.

▶ Adhere to the hose bending radii according to the manufacturer's specifications.
▶ Ensure the routing of hydraulic hose lines according to manufacturer's specifications (pressureless and pressurized condition).
▶ Ensure the distance between lines and structures.

If necessary:
▶ Check moving parts in the area of hydraulic hose lines.

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When the hydraulic hose line is installed in straight direction:

- ▶ Ensure a sag of the hose.
- ▶ Avoid mechanical tension and twisting of the hose during installation.
- ▶ Fasten the hydraulic hose line according to manufacturer's specification.
- ▶ Do not cross hydraulic hose lines for high pressure and low pressure.
- ▶ Keep hydraulic hose lines away from hot components.

When hydraulic hose lines are in a surrounding with high temperatures:

- ▶ Install protective insulation according to manufacturer's specifications.

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8.12 Inspection of safety controls on the relapse supports

1	S-boom relapse retainer	3
4	F-lattice jib relapse retainer	17

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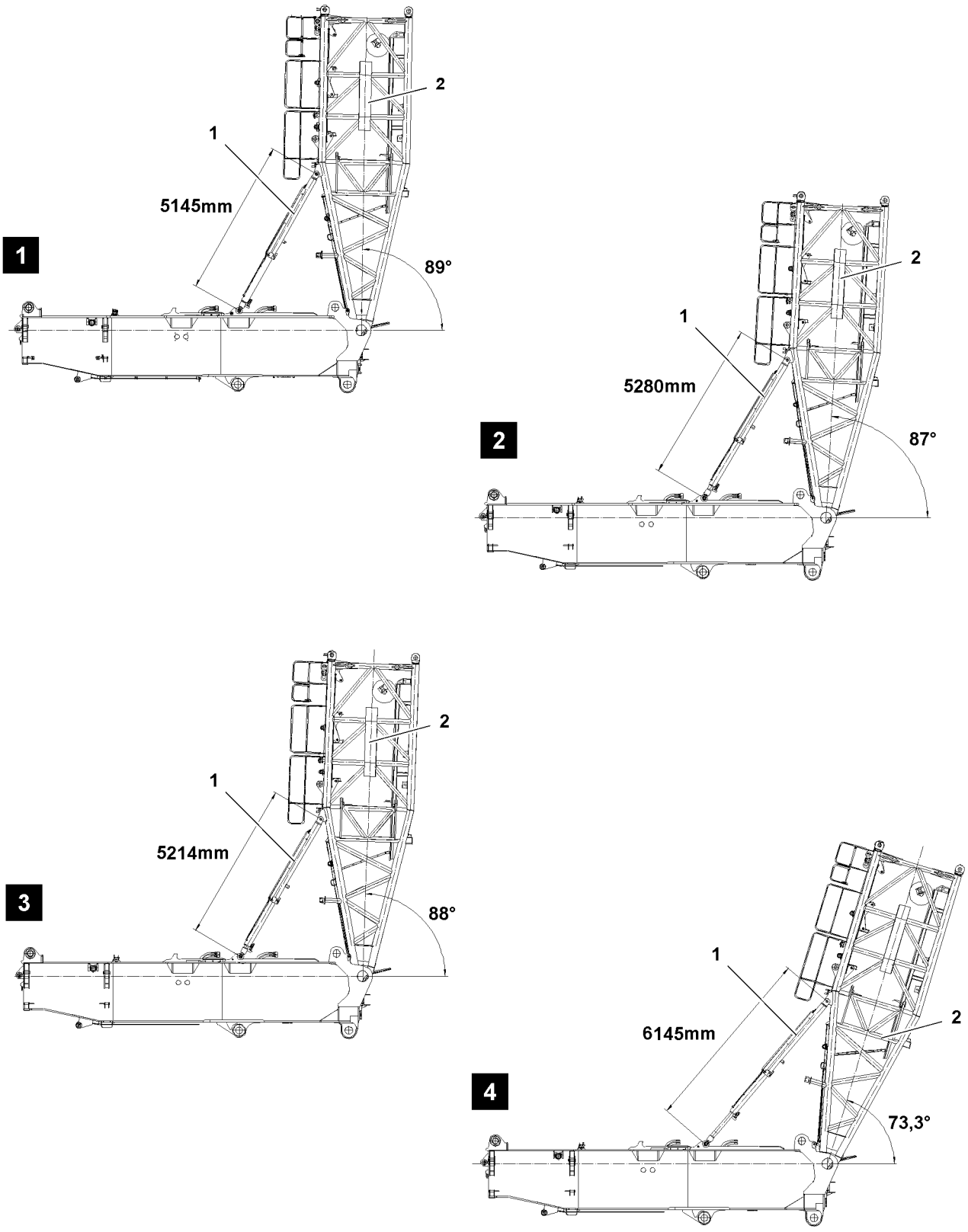

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Fig.119048

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1 S-boom relapse retainer

Two S-relapse cylinders **1** prevent the S-boom **2** from falling backward.

1.1 Checking the limit switch actuators for function before erection

Before erecting the S-boom **2**, check the function of the limit switch actuators.

Cover limit switch actuators on the S-relapse cylinder **1** individually with a metal plate.
- The „luffing up“ movement of the S-boom **2** is turned off.
- Icon appears on the LICCON monitor.

1.2 Checking the limit switch actuators for function

In the steepest boom position, the luffing up movement is turned off by the activated limit switch actuators on the cylinder.
- When the limit switches are actuated on the two S-relapse cylinders **1** the „luffing up“ movement of the S-boom **2** is turned off.
- Icon appears on the LICCON monitor.

	Angle	S-relapse cylinder length	Illustration
Block position	89°	5145 mm	1
Steepest position	87°	5280 mm	2
Electric switch position	88°	5214 mm	3
S-relapse cylinders moved out	73.3°	6145 mm	4

Switch positions of the S-relapse cylinders

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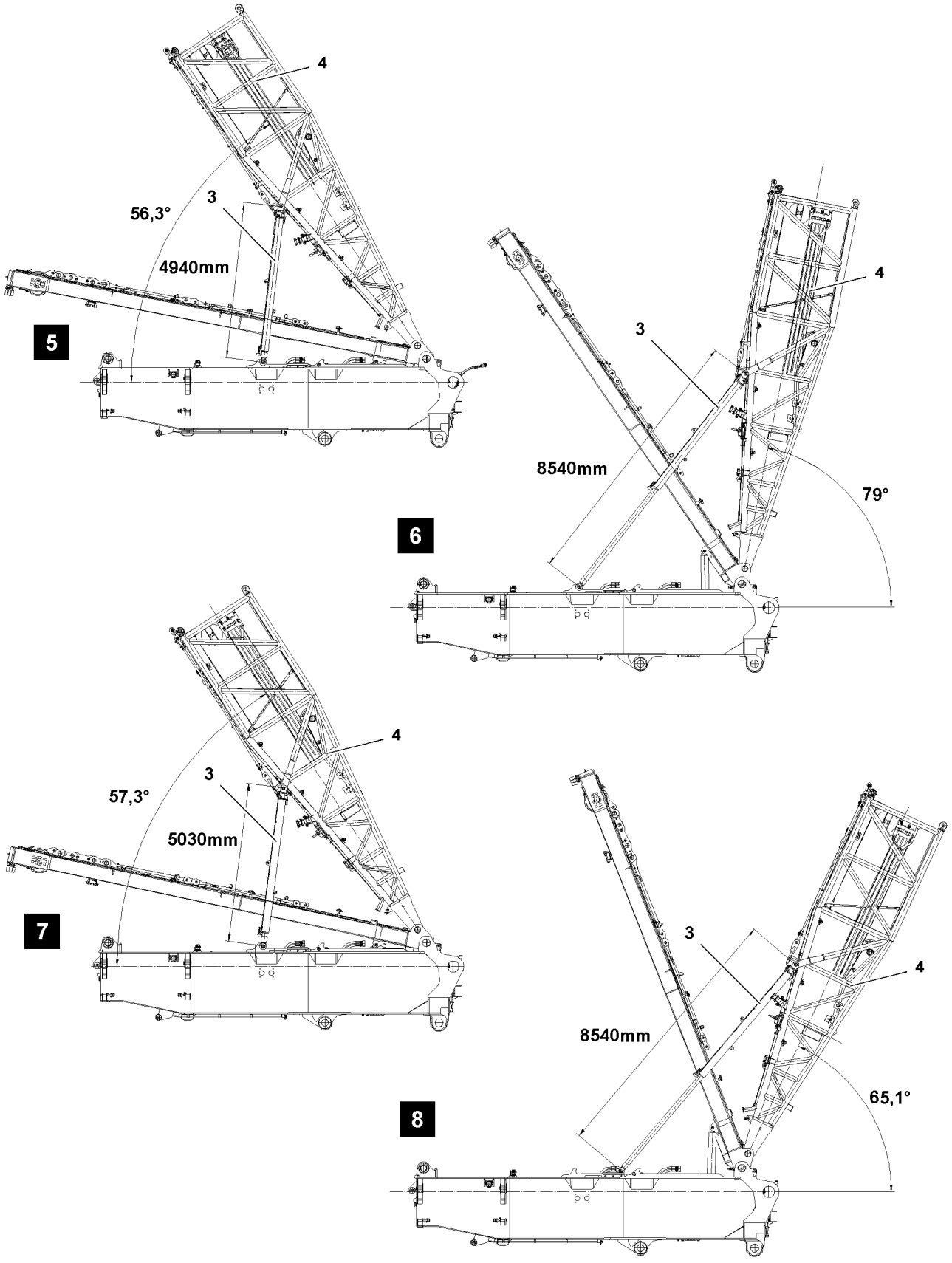

Fig.119049

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2 D-boom relapse retainer

Two D-relapse cylinders **3** prevent the D-boom **4** from falling backward.

2.1 Checking the limit switch actuators for function before erection

Before erecting the D-boom **4**, check the function of the limit switch actuators.

Cover limit switch actuators individually on the D-relapse cylinder **3** with a metal plate.
- „Spooling up“ winch 4 is blocked.
- Icon appears on the LICCON monitor.

2.2 Checking the limit switch actuators for function

When the limit switches are actuated on the two S-relapse cylinders **3** the movement of the D-boom **4** is turned off.
- „Spooling up“ winch 4 is blocked.
- Icon appears on the LICCON monitor.

	Angle	D-relapse cylinder length	Illustration
Block position	56.3°	4940 mm	5
D-relapse cylinders moved out	79°	8540 mm	6
Electric switch position	57.3°	5030 mm	7
Contact D-relapse cylinder turntable	65.1°	8540 mm	8

Switch positions of the D-relapse cylinders

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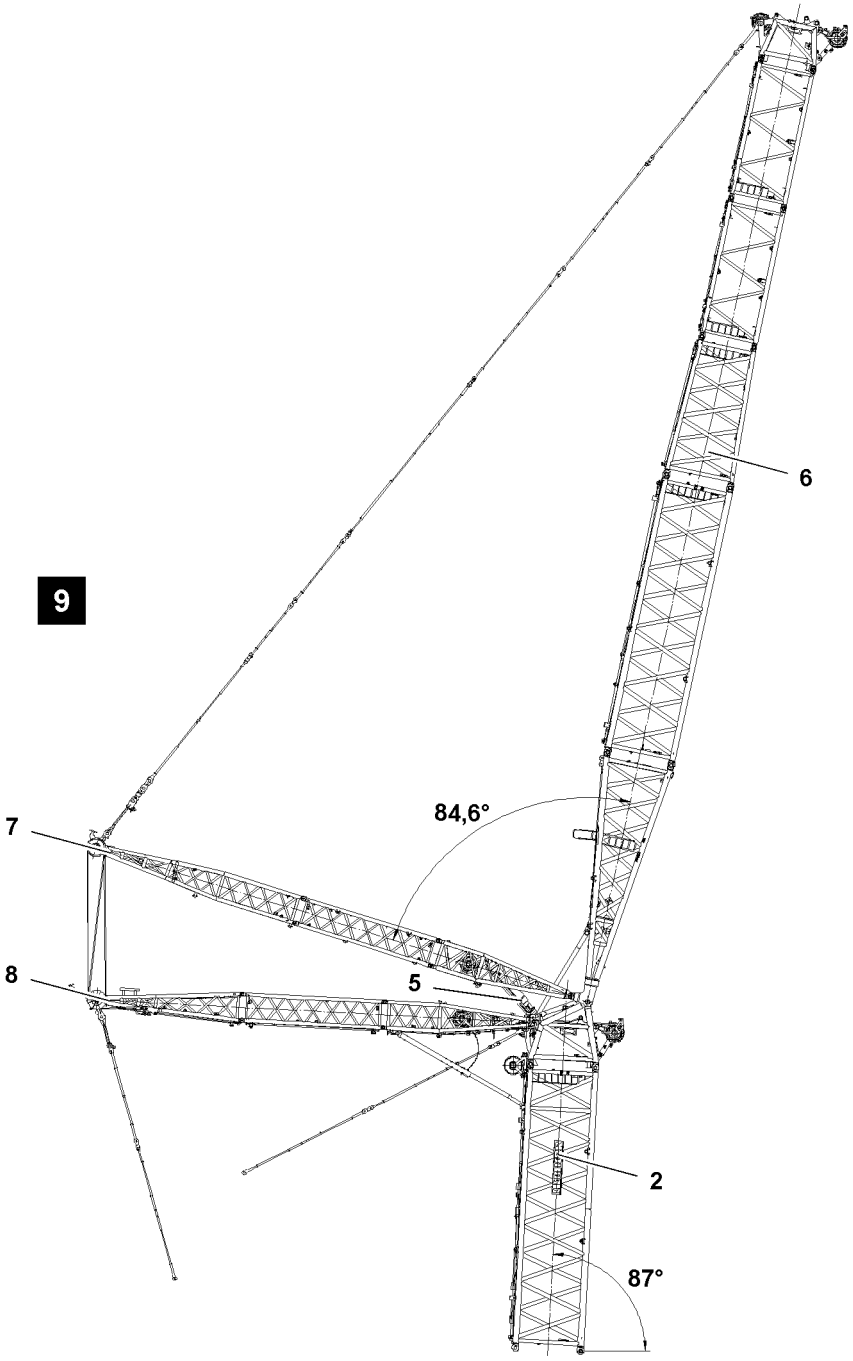

Fig.119050

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3 W-lattice jib relapse retainer

3.1 Checking the limit switch actuators for function before erection

Before erecting the W-lattice jib **6**, check the function of the limit switch actuators.

Cover the limit switch actuators on the W-relapse cylinder **5** individually with a metal plate.
- The W-control winch „spooling up“ movement is turned off.
- Icon appears on the LICCON monitor.

3.2 Checking the limit switch actuators on switch point „steepest position“

In steepest boom position the luffing up movement is turned off by the actuators.

Pull the WA-frame **7** and WA-frame **8** together to the specified angle dimension, see illustration **9**, until the limit switch actuators are activated.
- The W-control winch „spooling up“ movement is turned off.
- Icon appears on the LICCON monitor.

Note

▶ Angle 84.6° is independent of the W-boom length and the guy length.

After successful test, reset the WA-frames to set up configuration, see Crane operating instructions, chapter 5.07.

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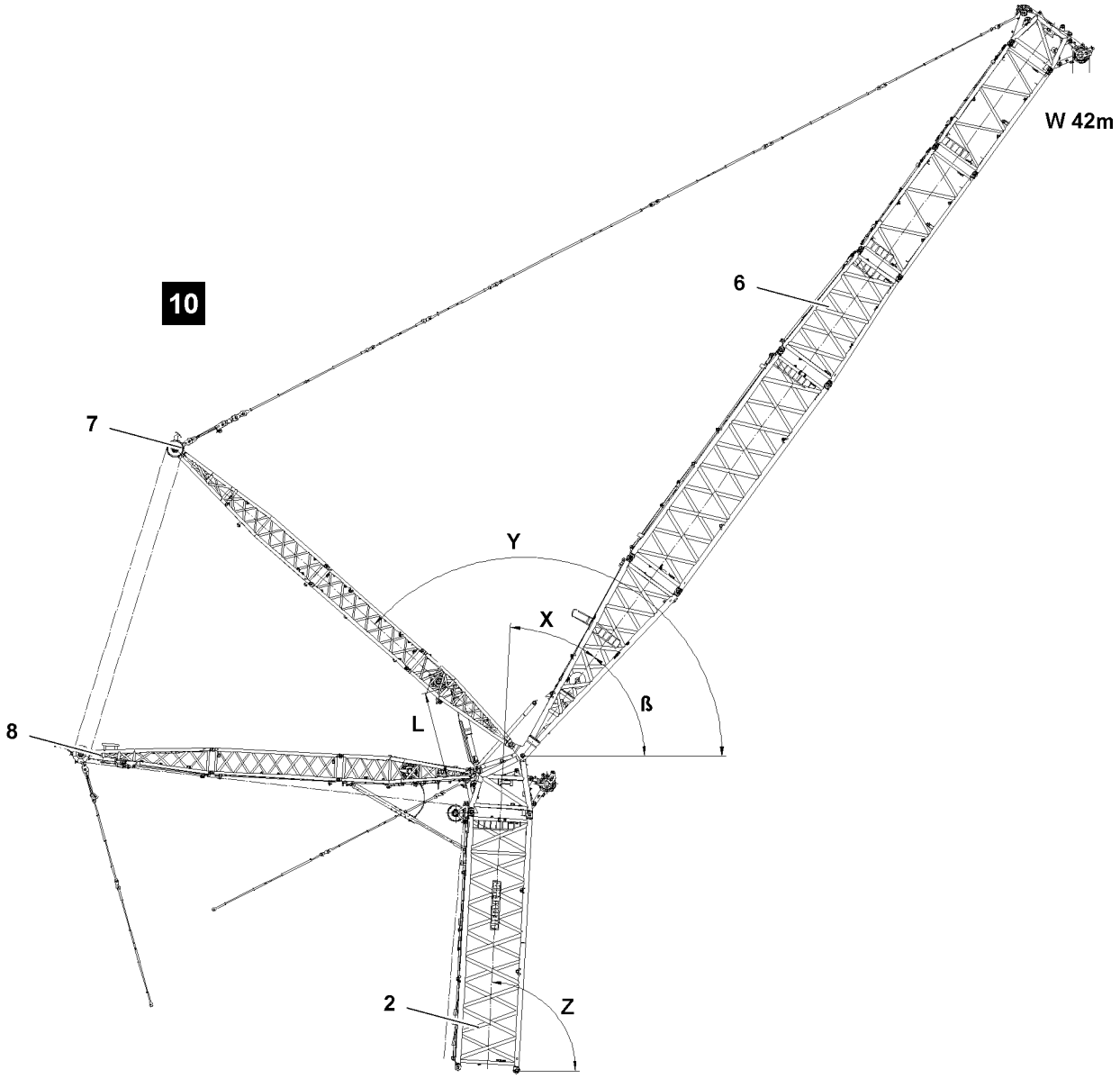

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Fig.119054

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3.3 W-lattice jib Test position

In test position, the W-control winch movement is turned off by the activated limit switch actuators on the cylinders.

- The W-control winch movement is turned off.
- Icon appears on the LICCON monitor.

Note

▶ Specified angles are valid for W-lattice jib 42 m.

	Angle				
	X[1]	**Y**[2]	**Z**[3]	**ß**[4]	**Cylinder length L**
End position specified by the control	10°	161.6°[5]	87°	77°	3158.1 mm
Switch position „Relapse support in flap“	9°	162.6°	87°	78°	3123 mm
Block position „Relapse support in flap on block“	7.7°	163.9°[5]	87°	79,3°	3078.2 mm
W-relapse cylinder moved out all the way to stop on S-end section	45.2°[5]	126.4°	87°	41.8°[5]	4500 mm

*W-lattice jib test positions, see also illustration **10***

[1] X-angle between S-boom and W-lattice jib
[2] Y- angle between horizontal and WA-frame **7**
[3] Z- angle between horizontal and S-boom
[4] ß- angle between horizontal and W-lattice jib
[5] Angle dependent on the length of the W-lattice jib

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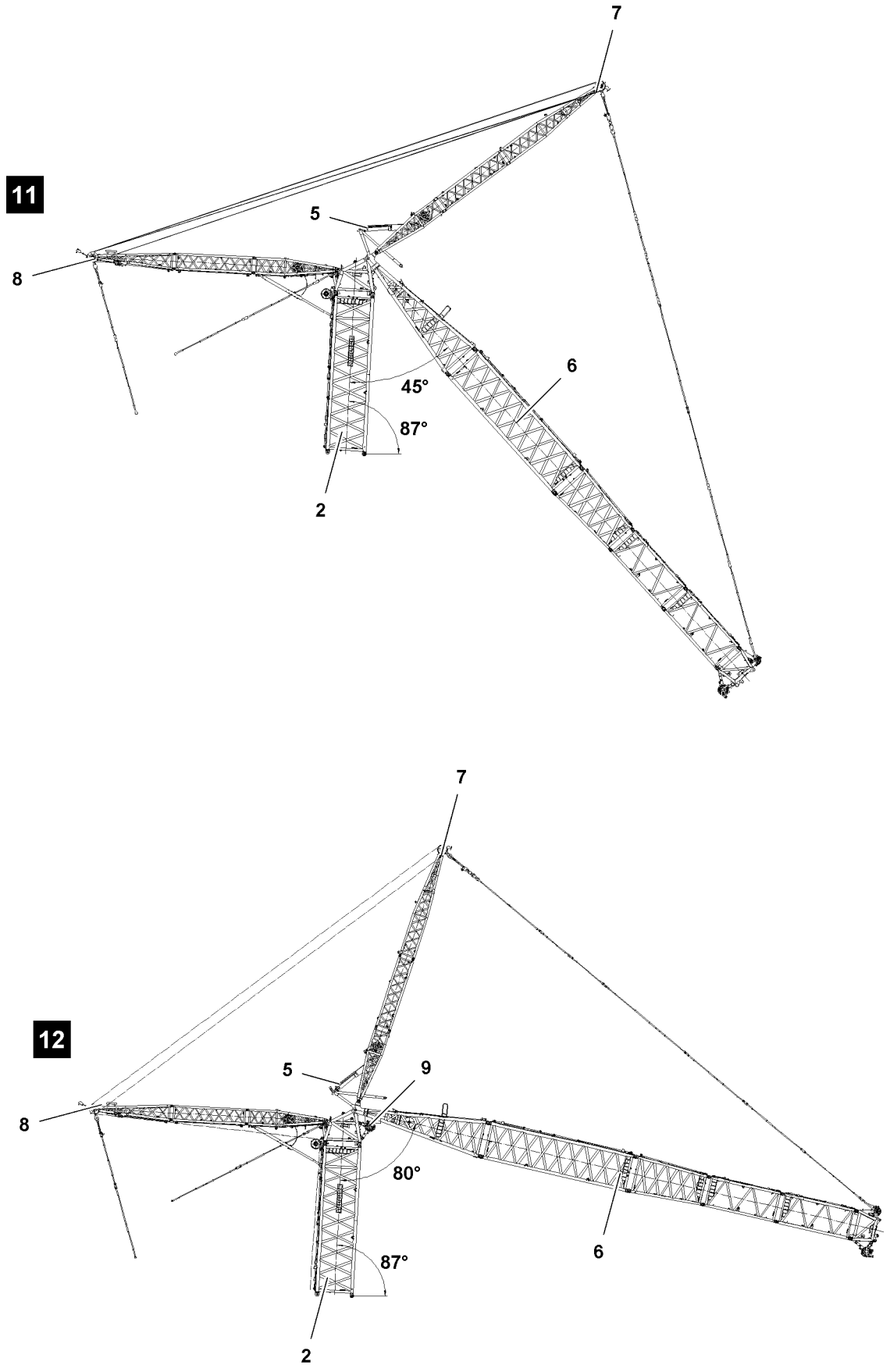

Fig.119051

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3.4 W-lattice jib „bottom“

Two switch positions W-lattice jib „bottom“: S-end section without pulley set and S-end section with pulley set **9**.

3.4.1 Checking the limit switch actuators for function (S-end section without pulley set)

Swing the WA-frame **7** to the specified angle dimension, see illustration **11**, until the limit switch actuators are activated.

- The W-control winch „spooling out“ movement is turned off.
- Icon appears on the LICCON monitor.

3.4.2 Checking the limit switch actuators for function (S-end section with pulley set)

Swing the WA-frame **7** to the specified angle dimension, see illustration **12**, until the limit switch actuators are activated.

- The W-control winch „spooling out“ movement is turned off.
- Icon appears on the LICCON monitor.

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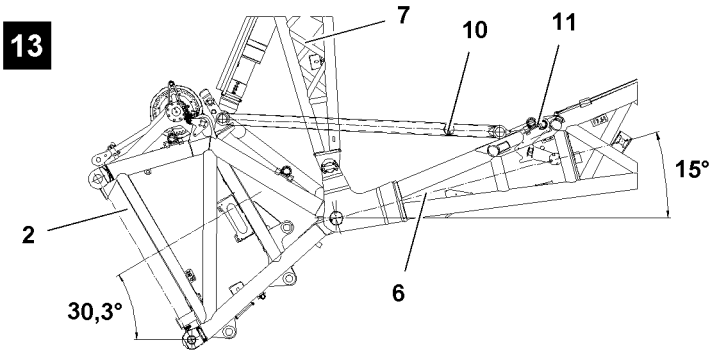

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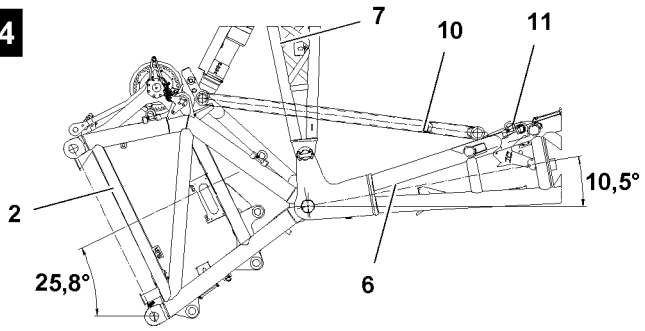

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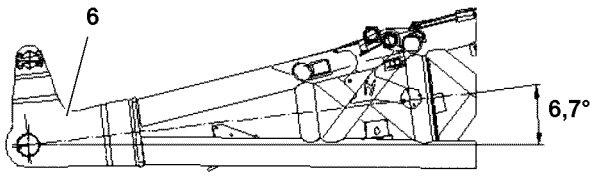

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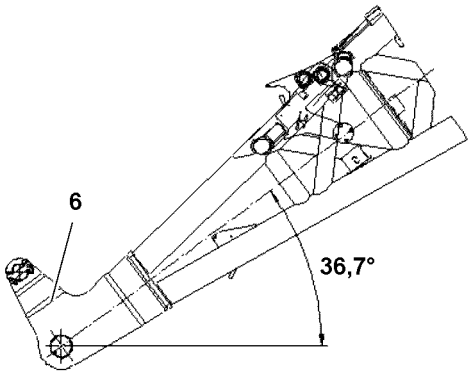

Fig.119052

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3.5 Function check of limit switch actuators on the mechanical relapse support - flap

- **10** Mechanical relapse support
- Flap **11** (oscillation guard for mechanical relapse support)

In addition to the W-relapse cylinders, the W-lattice jib is also secured by a mechanical relapse support **10**, which engages in steepest lattice jib position into the flap **11** of the oscillation guard. The luffing up movement of the W-lattice jib is turned off by the actuated limit switches on the oscillation guard.

DANGER
Danger of tipping over if the oscillation guard is hard to move!
If the flap **11** is hard to move, the mechanical relapse retainer will no longer function!
The W-lattice jib can tip backwards uncontrolled and cause the crane to topple over!
Personnel can be severely injured or killed!

- ▶ Before erecting the boom system, the flap **11** must be checked for easy movement over the entire swing range.
- ▶ Make sure that the easy movement of the flap **11** is ensured before every crane application.
- ▶ Crane operation with hard to move flap **11** is prohibited.

Note

- ▶ Depending on the angle of the W-lattice jib, the position of the flap changes due to the pendulum weight.

3.5.1 Flap can by pushed open

Flap can be pushed open, see illustration **13**.

3.5.2 Flap can be pushed closed

Flap can be pushed closed, see illustration **14**.

3.5.3 Flap swings in at stop

Flap swung in at stop, see illustration **15**.

3.5.4 Flap swings out to stop

Flap swung in to stop, see illustration **16**.

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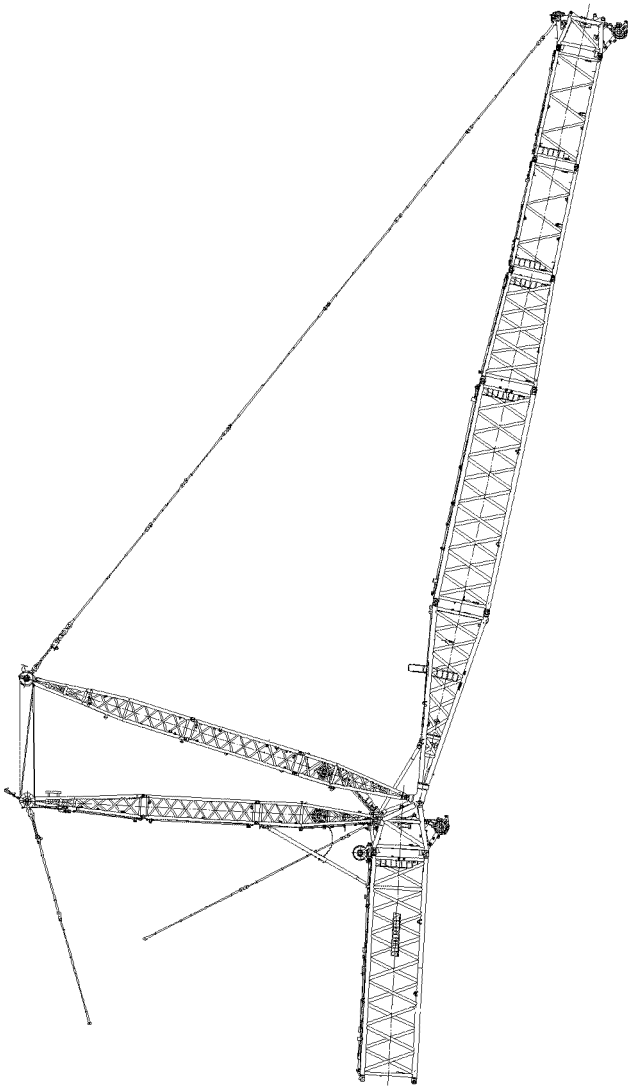

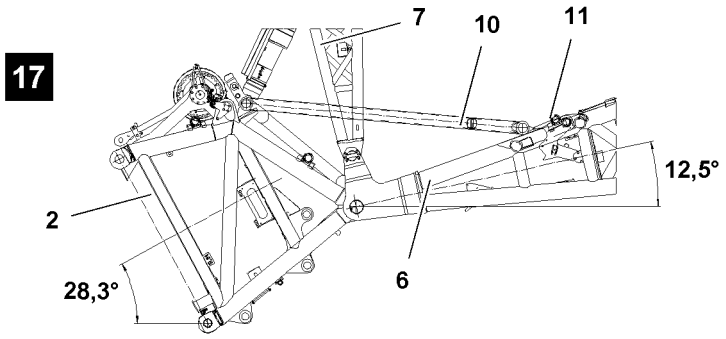

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Fig.119053

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3.6 Collision of mechanical relapse support with flap

DANGER
Danger of collision!
At an angle between the main boom and the W-lattice jib of 20.7° , the mechanical relapse support collides with the flap **11**.
The W-lattice jib can tip backwards uncontrolled and cause the crane to topple over!
Personnel can be severely injured or killed!

- ▶ Make sure that no collision will occur between the relapse support and the flap.
- ▶ Perform a visual inspection.

Collision of mechanical relapse support with flap, see illustration **17**.

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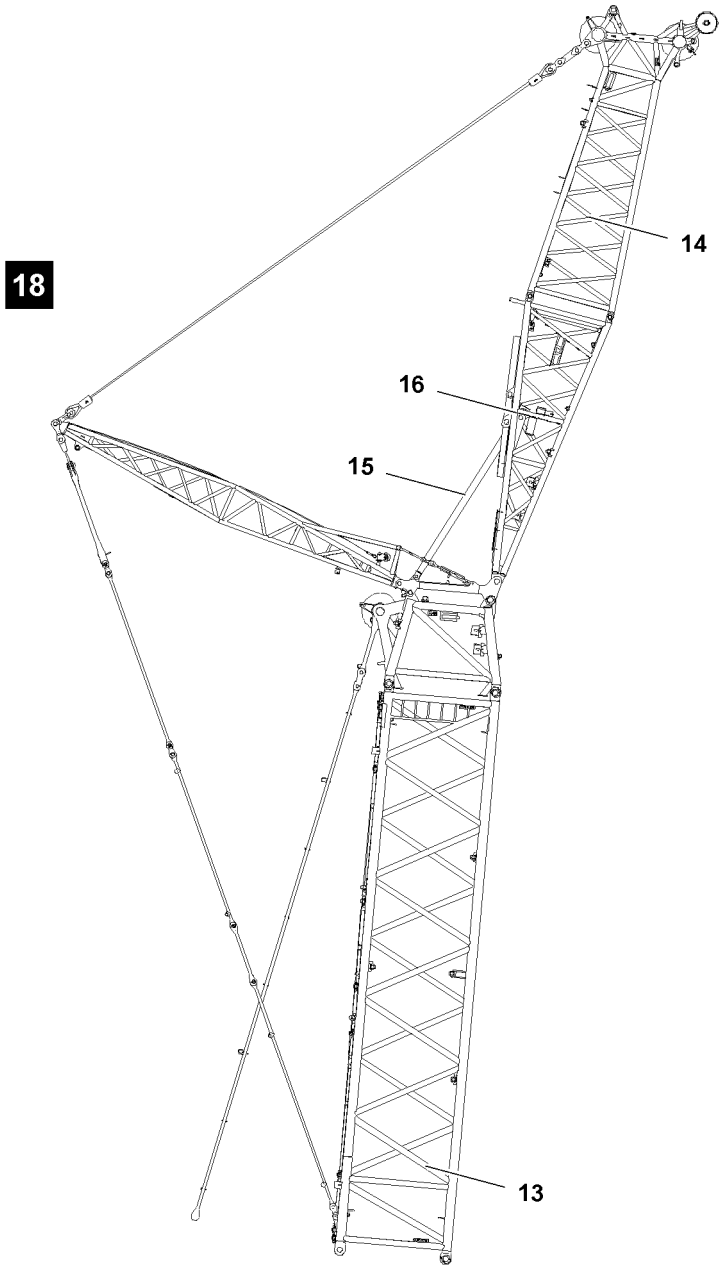

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Fig.119055

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4 F-lattice jib relapse retainer

4.1 Checking the limit switch actuators for function before erection

Before erecting the F-lattice jib **14**, check the function of the limit switch actuators.

Cover the limit switch actuators individually with a metal plate.
- The movement is turned off.
- Icon appears on the LICCON monitor.

4.2 Relapse support flap

F-lattice jib **14** secured by a mechanical relapse support **15**, which engages in the steepest lattice jib position in the flap **16** of the oscillation guard, see illustration **18**.

The movement of the F-lattice jib **14** is turned off by the actuated limit switches on the oscillation guard.

DANGER
Danger of tipping over if the oscillation guard is hard to move!
If the flap **16** is hard to move, the mechanical relapse retainer will no longer function!
The F-lattice jib can tip backwards uncontrolled and cause the crane to topple over!
Personnel can be severely injured or killed!
- ▶ Before erecting the boom system, the flap **16** must be checked for easy movement over the entire swing range.
- ▶ Make sure that the easy movement of the flap **16** is ensured before every crane application.
- ▶ Crane operation with hard to move flap **16** is prohibited.

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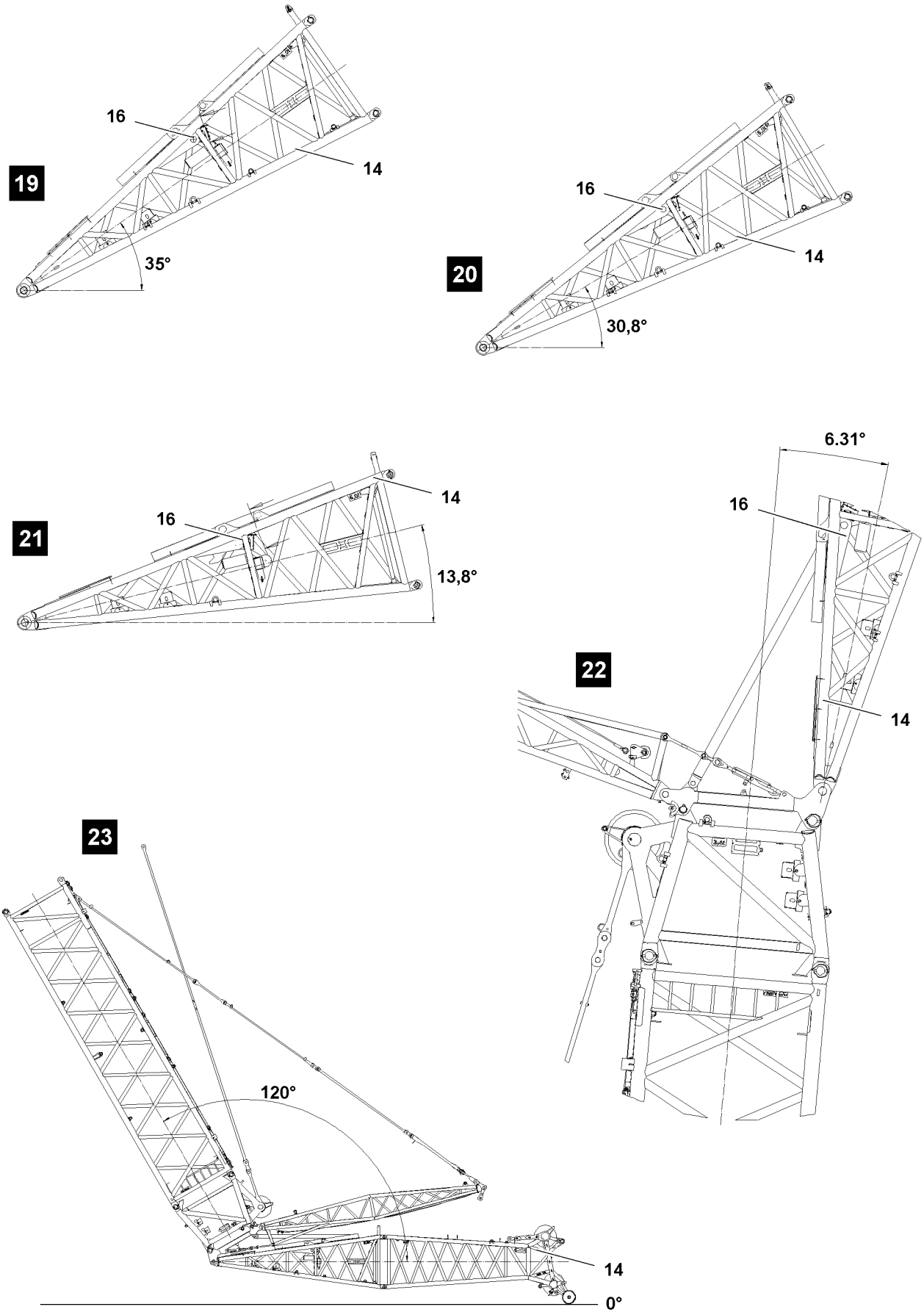

Fig.119056

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4.3 Function check of limit switch actuators on the mechanical relapse support - flap

4.3.1 Flap in operating position

Flap **16** in operating position (flap touches on the stop) from approx. 35° between the F-lattice jib and the horizontal.

Flap in operating position, see illustration **19**.

4.3.2 Switch position „Flap top“

Switch position „Flap **16** top“ at approx. 30.8° between F-lattice jib and horizontal.

Switch position „Flap top“, see illustration **20**.

4.3.3 Switch position „Flap bottom“

Switch position „Flap **16** bottom“ at approx. 13.8° between F-lattice jib and horizontal.

Switch position „Flap bottom“, see illustration **21**.

4.3.4 Block position „Relapse support in flap on block“

Flap **16** on block, see illustration **22**.

4.4 Monitoring at SWF-erection procedure

With the aid of the angle sensor the angle between the luffing boom and the F-lattice jib **14** is monitored during the erection procedure.

NOTICE
Danger of property damage!
During the SWF-erection procedure the angle between the luffing boom and the F-lattice jib may not fall below the value of 120°!
▶ Make sure that the angle between the luffing boom and the F-lattice jib does not fall below 120°.

Erection procedure, see illustration **23**.

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8.14 Inspection of accumulator pressure in relapse cylinder

1 Checking the accumulator pressure in the W-relapse cylinder 3

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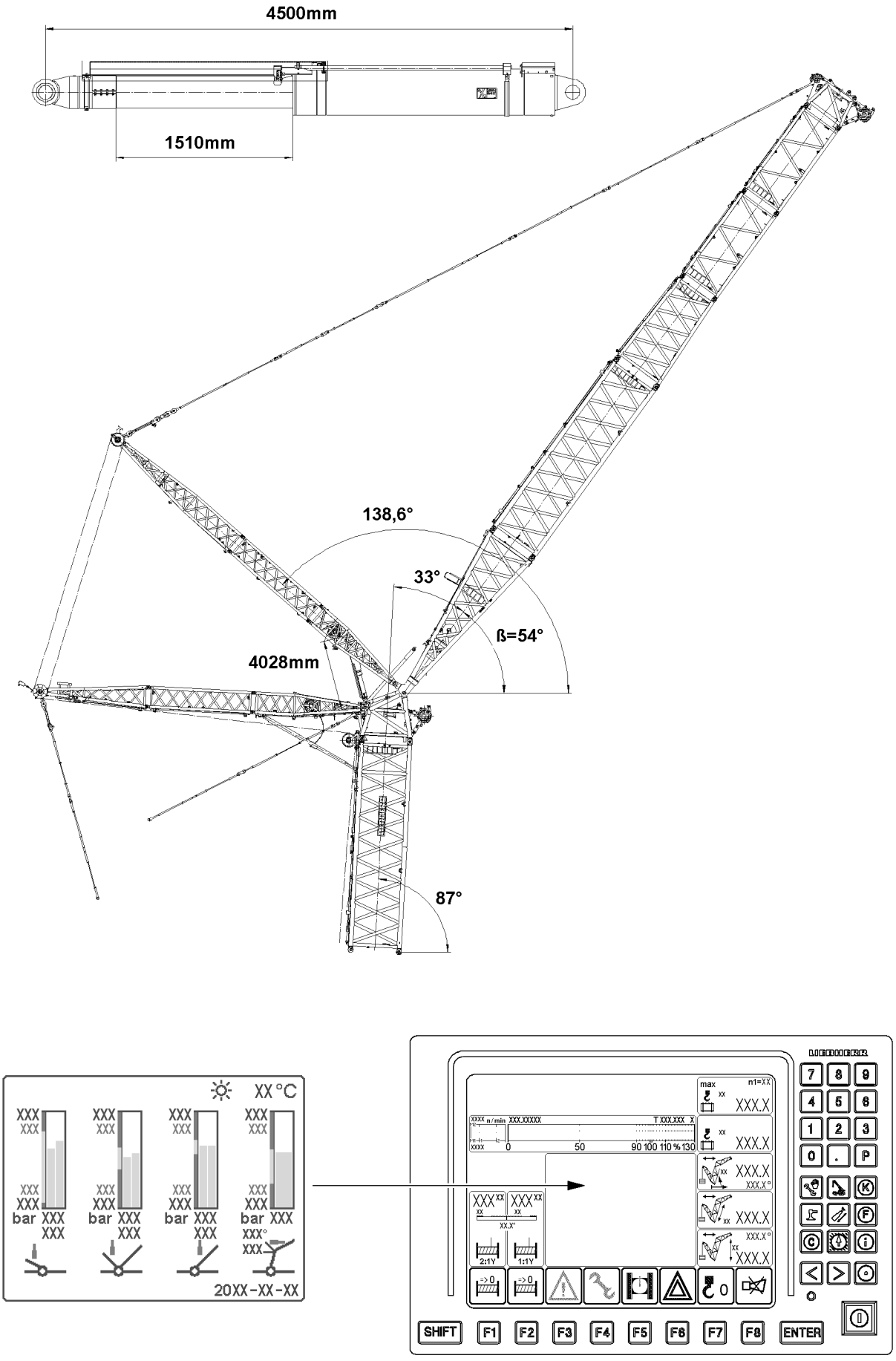

Fig.124294

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1 Checking the accumulator pressure in the W-relapse cylinder

Before and during crane operation, the accumulator pressure in the W-relapse cylinder must be checked in the crane operating screen of the LICCON monitor, see Crane operating instructions, chapter 4.02.

The actual pressure shown must match the nominal pressure in the chart.

Note

- The specified nominal pressure depends on the ambient temperature.
- The maximum permissible difference between the actual and the nominal pressure is maximum ± 10 bar.

1.1 Checking the accumulator pressure with the „W-relapse cylinder in test position“

– Set the main boom and the lattice jib to the angle specified in the chart, see illustration.
– Compare the actual pressure on the LICCON monitor with the nominal pressure in the chart.

				Pressure / bar				
	ß[3]	**Cylinder length**	**Stroke**	**- 40 °C**	**- 20 °C**	**0 °C**	**+ 20 °C**	**+ 40 °C**
I[1]	54°+2°	4028 mm	1028 mm	136,0	147,8	159,5	172,2	184,2
II[2]	41,7°	4500 mm	1500 mm	106,6	115,7	124,9	134,0	143,1

Relapse cylinder in test position

[1] I- test position W-relapse cylinder
[2] II- W-relapse cylinder moved out all the way
[3] At a main boom position of 87°

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8.15 Inspection of guy rods

1	Safety guidelines	3
2	Inspection intervals	3
3	Checking the guy rods	3

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Fig.195219

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1 Safety guidelines

WARNING
Damaged guy rods!
Accident. Death, severe injury, property damage.
▶ Crane operation with damaged guy rods **1** is prohibited.
▶ Replace damaged guy rods **1**.

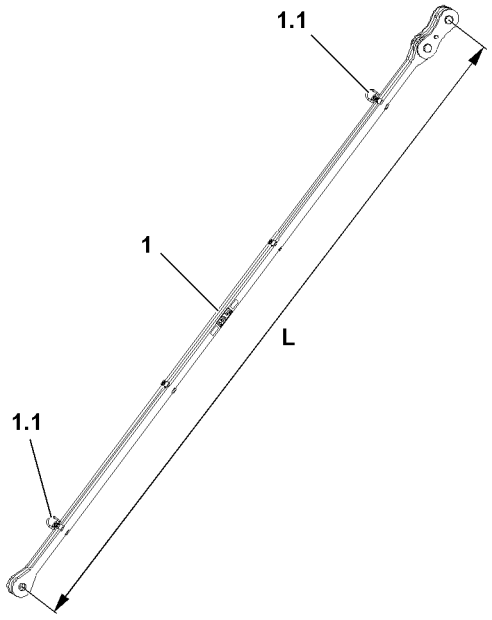

Fig.123845: Guy rod

Make sure that the following prerequisites are met:
– **Authorized and trained expert personnel** checks the guy rods **1**.
– A checklist for documentation of the inspection is on hand

2 Inspection intervals

The inspection of the guy rods **1** must be carried out in the following intervals:
– One inspection of the guy rods every 12 months by an expert.
– One inspection of the guy rods every four years by an authorized inspector.

After a load rip-off or overload of the crane:
– immediate inspection of guy rods by an expert

3 Checking the guy rods

3.1 Inspection

Note
▶ All inspections of the guy rods **1** must be documented.

The guy rods must be inspected in removed condition.

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WARNING
The guy rods **1** can be ripped off!
If a damaged guy rod **1** is used further, it can rip off in crane operation.
Death, severe injury, property damage.
- ▶ Crane operation with damaged guy rods is prohibited.
- ▶ Repairs on guy rods **1** (for example: through welding) are prohibited.
- ▶ Replace damaged guy rods immediately.
- ▶ If one of the following stated damage is found, then the guy rods **1** may no longer be used.

3.2 Cracks and dents

- ▶ Check the guy rods **1** thoroughly through a visual inspection for cracks and dents.

Problem remedy
Damage to guy rods is not clearly evidenced through a visual inspection?
- ▶ Check the respective areas of the guy rods thoroughly, for example with a magnetic particle test.

- ▶ If damage is found: Replace the guy rods **1** immediately.

3.3 Elongation

Note
- ▶ The initial dimension **L** of the guy rods **1** refers to the bore spacing of the pin bores.
- ▶ The initial dimension **L** of the guy rods **1** is listed in the separate rod plan.

- ▶ Check the elongation of the guy rods **1** by measuring the guy rods.

WARNING
The guy rods can be ripped off!
The permissible elongation of the guy rods **1** may be a maximum of 0.2 %, for example 14 mm , at an initial dimension **L** of 7000 mm.
Death, severe injury, property damage.
- ▶ If the maximum permissible elongation is reached or exceeded: Replace the guy rods **1** immediately.

- ▶ If an elongation of the guy rods of more / equal to 0.2 % of the initial dimension **L** is proven: Replace the guy rods **1** immediately.

3.4 Wear

- ▶ Check the bores, pins and pin retainers for signs of wear.
- ▶ If respective wear is present in the stated areas: Replace the guy rods **1** immediately.

3.5 Ductile deformation

- ▶ If a guy rod **1** shows any ductile deformation: Replace the guy rod **1** immediately.

3.6 Paint / coating

- ▶ The guy rods **1** must be checked for paint damage or corrosion.
- ▶ If damage is present on the paint finish / coating: Repair the paint / coating of the guy rods **1** expertly.

NOTICE
Danger of property damage!
- ▶ Never store guy rods **1** in or near aggressive media, for example: Seawater.

- ▶ Always store the guy rods **1** properly and outside of aggressive media.

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3.7 Fastening points

- ▶ Check the fastening points **1.1** of the guy rods **1** for damage.
- ▶ Replace damaged fastening points **1.1**.

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8.16 Inspection of fiber guy ropes

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2	Inspection intervals	4
3	Inspecting the fiber guy ropes	4

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Fig.195219

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1 Safety guidelines

WARNING
Damaged fiber guy rope!
Accident. Death, severe injury, property damage.

If damage is found:
▶ Have fiber guy rope **1** inspected by authorized and trained expert personnel.

When no final evaluation of the damage can be made:
▶ Send the fiber guy rope **1** to the rope manufacturer for inspection and damage evaluation.

If it is found that a fiber guy rope **1** cannot be used any longer or cannot be repaired:
▶ Replace the fiber guy rope **1**.

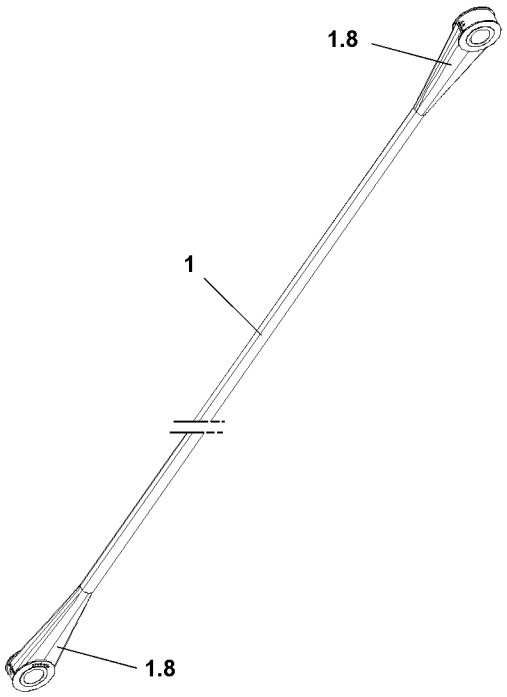

Fig.123614: Fiber guy rope

Make sure that the following prerequisites are met:
– **Authorized and trained expert personnel** inspects the fiber guy rope **1**.
– **In case of doubt:** Rope manufacturer inspects the fiber guy rope **1**

The authorized and trained expert personnel has the following expertise:
– Knowledge about technical design and the condition of fiber guy ropes **1**
– Knowledge about relevant inspection criteria for fiber guy ropes **1**
– Knowledge and experience in the use of various test procedures to determine the scope of the damage
– Knowledge and experience in the evaluation of rope damage on fiber guy ropes **1**
– Has the knowledge about inspection intervals for the required inspections, as specified by the manufacturer
– Knowledge and experience in the evaluation of further use of the fiber guy ropes **1** is permissible
– Knowledge about the required prerequisites for the inspection of fiber guy ropes **1**, as specified by the manufacturer

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2 Inspection intervals

Inspection intervals for fiber guy ropes, see Crane operating instructions, chapter 7.03.50.

After a load rip-off or overload of the crane:
- Immediate inspection of fiber guy ropes by an expert

3 Inspecting the fiber guy ropes

3.1 Composition

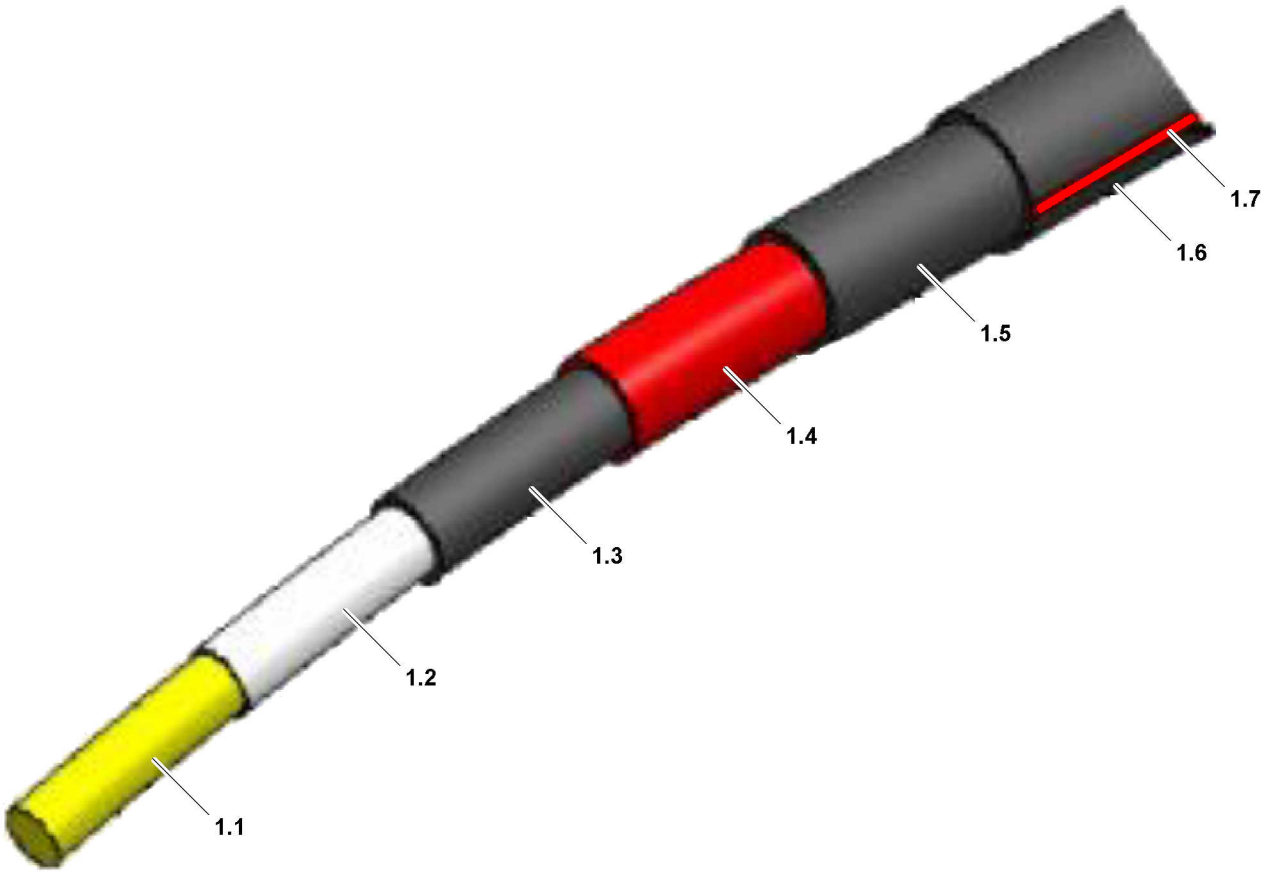

Fig.123619: Composition of a fiber guy rope

1.1 Aramid suspension rope (yellow)
1.2 Compression band
1.3 Sealing band
1.4 Inner braiding (red)
1.5 Intermediate layer
1.6 Outer braiding
1.7 Twist display

3.2 Inspection

Note
▶ All inspections of the fiber guy ropes **1** must be documented.

The inspection of the fiber guy ropes can be made via a visual inspection.

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The fiber guy ropes must be inspected in removed condition.

The degree of severity of possible damage and further use of the fiber guy ropes depends mainly on which layers of the rope structure were damaged where and how.

In case of obvious severe rope damage, a safe crane operation should always be the priority and the respective fiber guy rope should be replaced.

If there is any doubt regarding the rope damage, only a detailed inspection of the fiber guy rope by the rope manufacturer can provide information if further use is possible or permissible.

WARNING
The fiber guy ropes can rip off!
Depending on the degree of severity, a damaged fiber guy rope can rip off in crane operation.
▶ To ensure a safe crane operation: Continue to use damaged fiber guy ropes only after and extensive inspection and release by the rope manufacturer.

Note
▶ If one or several fiber guy rope(s) must be replaced, inform Liebherr Service.

To determine the degree of severity of a damaged fiber guy rope, have the fiber guy rope inspected by the rope manufacturer.

The rope manufacturer decides after intensive inspection of the damage:
– if a repair of the fiber guy rope is possible
– if further use of the fiber guy rope is possible or useful

Only use the fiber guy rope again if the rope manufacturer declares that the damage is harmless and releases the fiber guy rope for further use.

Note
▶ The following listed fiber guy rope damage is an example.

3.3 Grommets and rope end connections

The grommets **1.8** and the rope end connections must be thoroughly inspected visually for cracks and dents.

Note
▶ If there is any doubt, have the respective areas of the grommet **1.8** thoroughly tested, for example with a magnetic particle test.

Check the pin bores for expansion, elongation and diameter changes.

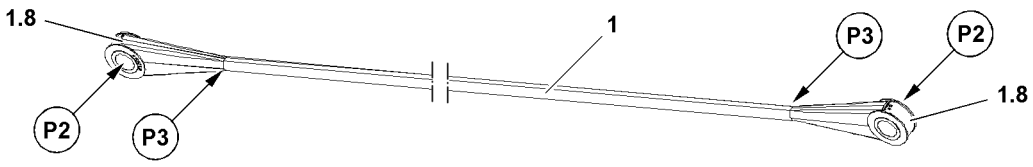

Fig.123700: Grommets and rope end connections on fiber guy rope

▶ Remove the fiber guy rope **1**.
▶ Inspect the fiber guy rope.

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DANGER
Damaged fiber guy ropes can rip off!
If a fiber guy rope **1** is damaged in the area of the grommet **1.8** or the rope end connection, then the load capacity is significantly reduced.
The grommet **1.8** or the rope end connection can rip off if used further under load in crane operation.
Death, severe injury, property damage.
- ▶ Crane operation with damaged rope end connection is prohibited.
- ▶ Replace fiber guy ropes **1** with damaged grommet **1.8** or rope end connection.

- ▶ Check grommets **1.8** on the pin bores **P2** and the rope - grommet transitions **P3**.

When cracks or other severe damage are present:
- ▶ Replace the fiber guy rope **1**.

3.4 Damage symptoms of fiber guy rope

3.4.1 Damaged outer braiding

The fiber guy rope is damaged on the outer braiding **1.6**.

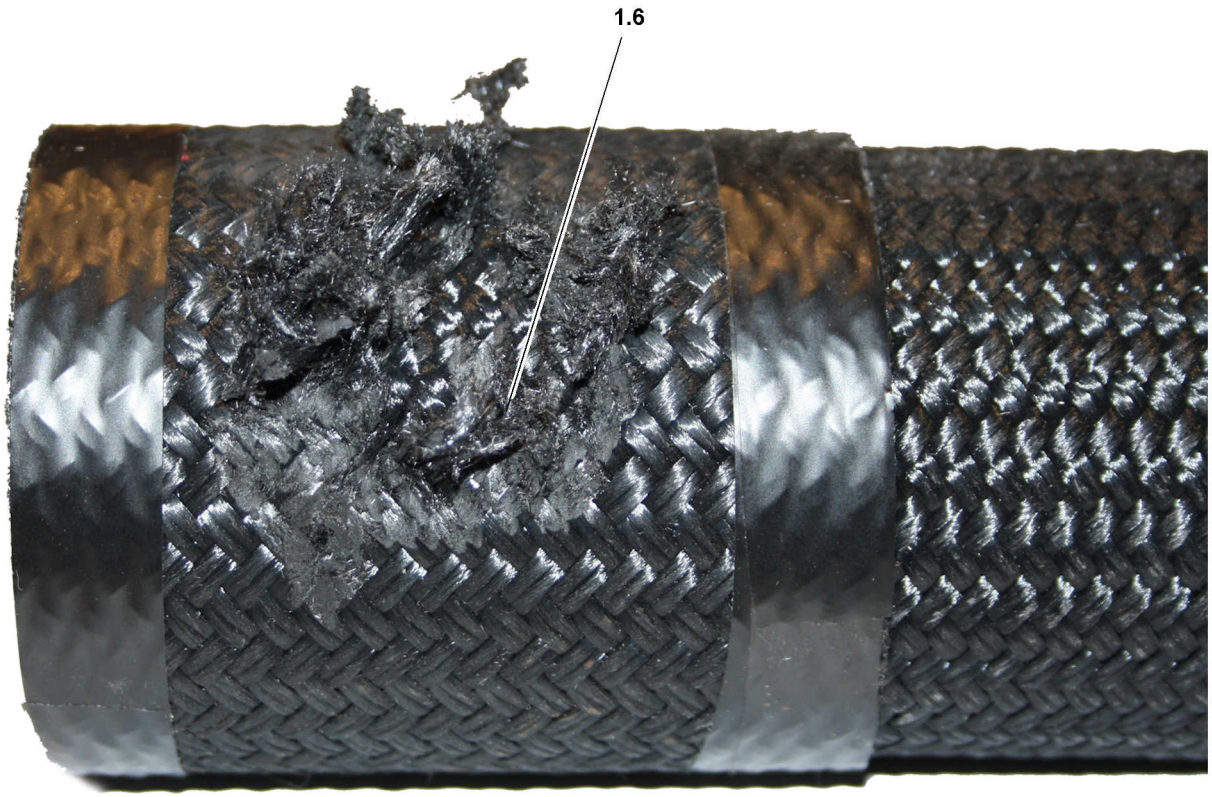

*Fig.123615: Damage on outer braiding **1.6***

- ▶ Remove the fiber guy rope.
- ▶ Inspect the fiber guy rope.

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WARNING
Fiber guy rope ripping off!
If the outer braiding **1.6** is not properly repaired, then the outer braiding **1.6** can unravel widely if further used and the braiding underneath can be damaged.
Death, severe injury, property damage.
▶ Seal fibers of the outer braiding **1.6** with approved repair agents to prevent further unraveling of the outer braiding **1.6**.

If solely the outer braiding **1.6** is damaged:
▶ Carefully remove protruding fibers with a sharp knife or scissors.
▶ Repair the outer braiding **1.6** properly with approved repair agents to prevent it from unraveling further.

Result:

– The fiber guy rope can be further used for crane operation.

3.4.2 Damaged rope braiding

The fiber guy rope is damaged on the outer braiding **1.6** and the intermediate layer **1.5**.

The inner braiding (red) **1.4** is visible.

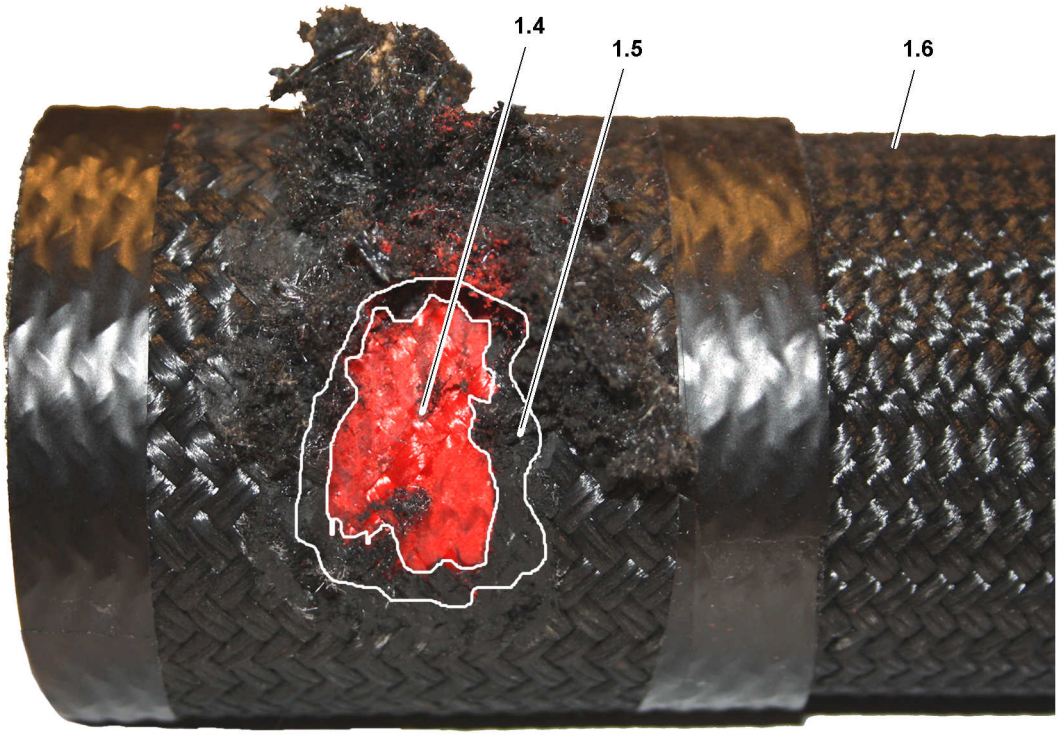

Fig.123616: Damage of outer two rope braidings, inner braiding (red) is undamaged

▶ Remove the fiber guy rope.
▶ Inspect the fiber guy rope.

WARNING
Damaged fiber guy ropes can rip off!
If a fiber guy rope is damaged, then it can rip off if used further under load in crane operation.
Death, severe injury, property damage.
▶ Crane operation with damaged fiber guy rope is prohibited.
▶ Replace the damaged fiber guy rope.

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When the outer braiding **1.6** and the intermediate layer **1.5** are damaged:
▶ Replace the fiber guy rope.

3.4.3 Damaged intermediate layers

The fiber guy rope shows grave damage.

The Aramid suspension rope **1.1** is visible and / or damaged.

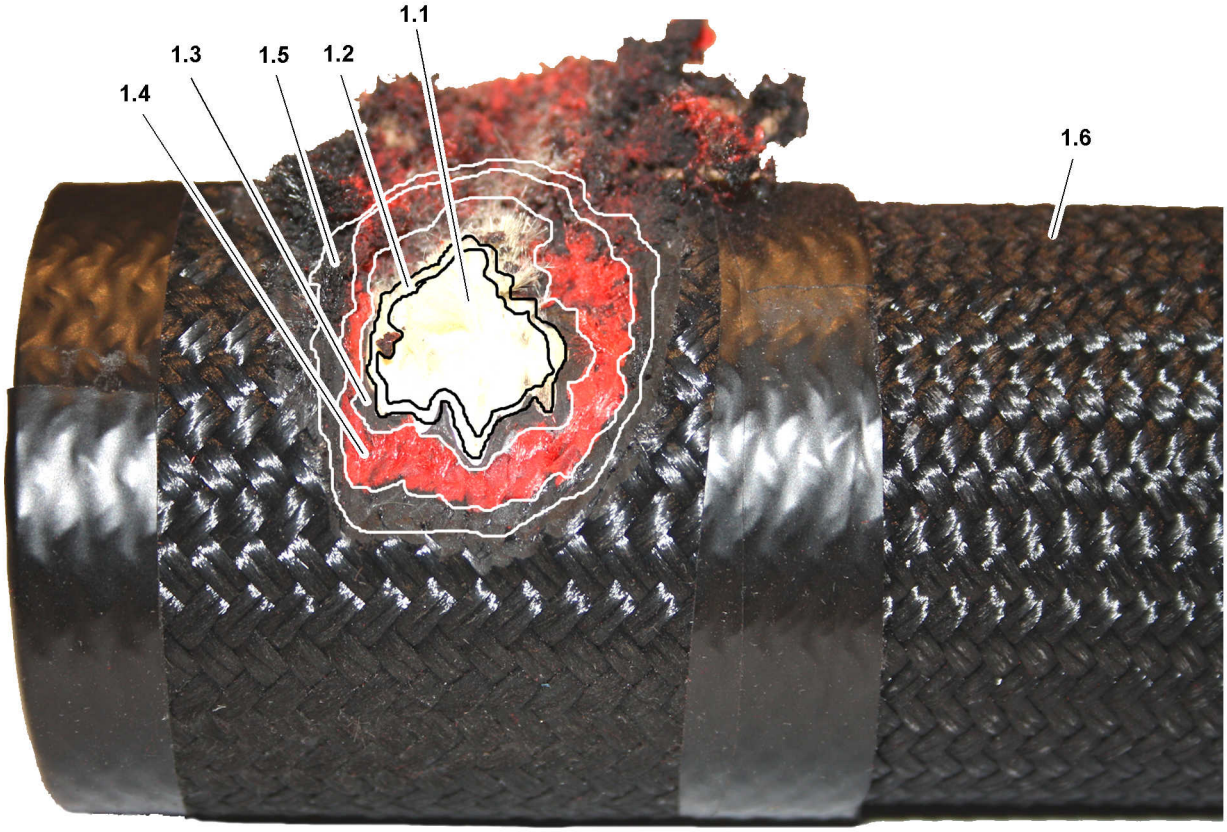

Fig.123617: Damage of outer braiding and all intermediate layers

▶ Remove the fiber guy rope.
▶ Inspect the fiber guy rope.

DANGER
Damaged fiber guy ropes can rip off!
If a fiber guy rope is damaged into the carrying structure of the Aramid suspension rope (yellow) **1.1** then the fiber guy rope will rip off if used further under load in crane operation.
Death, severe injury, property damage.
▶ Crane operation with damaged fiber guy rope is prohibited.
▶ Replace the damaged fiber guy rope.

When the outer braiding **1.6** and all intermediate layers are damaged up to the Aramid suspension rope (yellow) **1.1**:
▶ Replace the fiber guy rope.

3.4.4 Buckles

Buckles are angular deformations.

The rope was damaged due to external influences.

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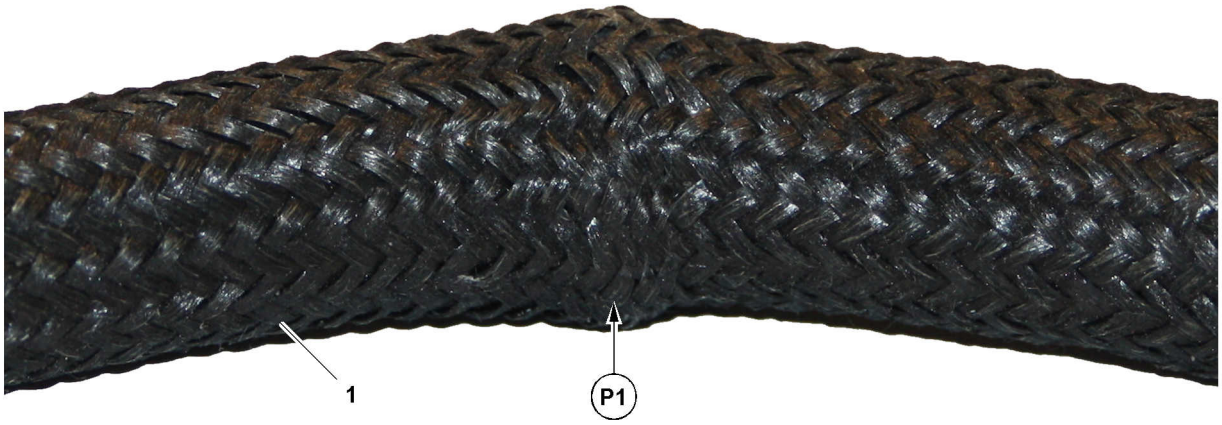

*Fig.123618: Fiber guy rope buckled at point **P1***

- ▶ Remove the fiber guy rope.
- ▶ Inspect the fiber guy rope.

DANGER
Damaged fiber guy ropes can rip off!
If a fiber guy rope is buckled, then the load capacity is significantly reduced.
The fiber guy rope can rip off if further used under load in crane operation.
Death, severe injury, property damage.

- ▶ Crane operation with buckled fiber guy rope is prohibited.
- ▶ Replace the damaged fiber guy rope.

A buckle is severe if a fold / compression well as a clear buckle is visible on one side of the fiber guy rope (for example at point **P1**).

When a buckle is present:

- ▶ Replace the fiber guy rope.
- ▶ Have the fiber guy rope inspected by the rope manufacturer.

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8.17 Inspection of ladders

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4	Inspection sheet and check list	3

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Fig.195219

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1 Safety instructions

WARNING
Damaged ladders!
Accident. Death, severe injury, property damage.

If damage is found:
▶ Have ladders repaired by authorized and trained expert personnel.

If it is determined that the ladder cannot be repaired:
▶ Scrap the ladder immediately.

Make sure that the following prerequisite is met:
– **Authorized and trained expert personnel** inspects the ladders.

The authorized and trained expert personnel has the following expertise:
– Knowledge, experience and abilities in repairing ladders
– Is familiar with the necessary prerequisites as determined by the contractor for the inspection of ladders
– Has the knowledge about the type, scope and intervals for the required inspections as determined by the contractor

2 Inspection intervals

The inspection of ladders must be carried out in the following intervals:
– The contractor determines the **required** intervals
– But there must be at least one inspection every **12 months**

Intervals depend on:
– Operating conditions
– Frequency of use
– Operational demands during use
– Frequency and severity of defects found during previous inspections

3 Inspecting the ladders

Make sure that the following prerequisites are met:
– Ladder inspection sheets are on hand. For blank form, see section „Inspection form for the inspection of ladders and steps“.
– Check lists are on hand. For a blank form, see section „Check list for the inspection of ladders and steps“.

▶ For every ladder and every step: Enter the data in the ladder inspection form.
or
Get the ladder inspection form for ladders or steps.
▶ Check the ladders and steps according to the check list and document the results.
▶ Collect the ladder inspection forms and check lists in the crane documentation.

4 Inspection sheet and check list

A sample inspection form and check list for the inspection of ladders and steps are shown below.

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4.1 Inspection form for the inspection of ladders and steps

Ladder inspection form		
Inventory no. of the ladder / step		
Location / installation location		
Ladder type		Multi-purpose ladder
		Stepladder
		Leaning ladder
		Leaning ladder with transition
		Vertical ladder
		Vertical ladder with transition aid
		Platform ladder
		Step
		Other
Ladder material		Aluminum
		Plastic
		Steel
		Stainless steel
Number of rungs / steps		
Ladder length / ladder shortened to		
Manufacturer / dealer		
Article / type number		
Date of purchase		
Date of selection		
Name of authorized inspector		
Next inspection		

Inspection form for the inspection of ladders and steps

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Fig.151627-en

4.2 Check list for the inspection of ladders and steps

Ensure the recording of the systematic inspection of ladders and steps:
- Summarize the following checklist for an inspection book.

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Inspection criteria	1. Inspection		2. Inspection		3. Inspection		4. Inspection		5. Inspection	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
1. Operating instructions (decal on the ladder) Present and legible	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2. Beams and rungs / stringers and steps										
Loose connections	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Damage, cracks, breaks, wear	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Dents, kinks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Exposed fibers of glass-fiber reinforced plastic	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Paint / glaze significantly damaged (if applicable)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Tie rod loose or damaged (if applicable)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Platform loose or damaged (if applicable)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3. Ladder locks (if applicable)										
Belts, chains, bracing damaged	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hinge spreader damaged	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4. Fixtures										
Hinges, articulations, locks damaged or loose	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Sliding parts are well lubricated	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Locking elements do not engage	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
5. Feet and accessories										
Feet, tips, caps missing or damaged	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Cross beam, feet extension defective	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
6. Other defects	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Result of the inspection										
The ladder is OK and can be used	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
The ladder may only be used after it is repaired	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
The ladder must be replaced	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
DATE, SIGNATURE										
Sent for repair to: DATE, SIGNATURE										
Repair / ladder replaced: DATE, SIGNATURE										

Fig. 149994-en

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8.90 Inspection chart for cranes

1 Inspection chart for recurring inspections of Liebherr cranes 3

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Fig.195219

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1 Inspection chart for recurring inspections of Liebherr cranes

The following is a checklist to assist the inspector during the periodic inspections of Liebherr mobile and crawler cranes.

Company:	**Inspector:**
Crane manufacturer: Liebherr	**Crane type:**
Serial number:	**Stock number:**
Year of construction:	**Date:**
Inspector's signature for No. 1 to 22:	

1. inspection category: Crane document						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Crane inspection log						
Operating and installation instructions						
Crane control log						
Load chart manual						
Job planner						

2. inspection category: Signs / identification						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Factory tag						
Load data						
Operating instruction label						
Prohibition and command signs						
Other safety signs						

3. inspection category: Travel gear[1]						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Frame[2]						
Supports[3]						
Axles						
Wheels						
Tires						
Bearings						
Transmission						
Universal drive shaft						
Leaf springs / springs						
Shock absorbers						

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3. inspection category: Travel gear[1]						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Steering						
Brakes						
Hydraulic axle suspension						

4. inspection category: Chassis[1]						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Coverings						
Accessible surfaces						
Counterweight holders[2]						
Towing devices						
Accesses, ladders						
Holding devices, handles						
Platforms, railings						
Retainer for hook block[2]						
Boom support[2]						

5. inspection category: Chassis - driver's cab[1]						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Doors						
Windows / windshields						
Window wipers						
Mirrors						
Seat						
Heater						
Ventilation						
Sound absorber						
Trip recorder						
First aid kit						
Spare bulbs						
Hazard warning triangle						
Safety vest						

6. inspection category: Chassis - drive[1]						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Combustion engine						
Exhaust system						
Fuel tank						

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6. inspection category: Chassis - drive[1]						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Urea container						
Fuel container						
Filters						
Sound absorber						
Engine mount						
Oil levels						
Fuel lines						
Urea lines						
Fuel lines						

7. inspection category: Chassis - hydraulics[1]						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Oil container						
Filter with maintenance indicator						
Pumps						
Motors						
Valves						
Lines						
Hoses						
Cylinder						
Pressure limiting valves						

8. inspection category: Chassis - compressed air system[1]						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Compressor						
Filters						
Air tanks						
Valves						
Lines						
Hoses						
Cylinder						

9th inspection category: Chassis - electrical system[1]						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Motors						
Generators						
Battery						

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9th inspection category: Chassis - electrical system[1]						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Switches / buttons						
Lines						
Fuses						
Resistors						
Lighting						
Brake lights						
Blinkers						
Tail lights						
Working lights						
Signaling systems						
Indicator lights						
Battery switch						
Limit switches: Transmission, steering, drive train						
Support pressure indicator[2]						

10th inspection category: Chassis - control systems[1]						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Engine regulation						
Transmission						
Couplings						
Circuits						
Brakes						
Steering						
Control displays						
Engine shut off line						
Control of supports[2]						
Axle suspension						
Crane leveling						
Rear axle steering						

11th inspection category: Superstructure						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Frame						
Coverings						
Treads						
Bearings						

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11th inspection category: Superstructure						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Counterweights						
Relapse retainer						
Slewing ring connection: Tilt play						
Slewing ring connection: Mounting screws						
Slewing ring connection: Gears						
Slewing gear: Mounting screws						
Slewing gear: Gears						

12th inspection category: Superstructure - crane operator's cab						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Doors						
Windows / windshields						
Window wipers						
Mirrors						
Seat						
Heater						
Ventilation						
Muffler						
Joystick for working functions						
Gear shifts						
Safety: Crushing / shear locations						

13th inspection category: Superstructure - Retaining and protection devices						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Accesses, ladders						
Handles						
Coverings						
Covers						
Hatches						
Treads						

14th inspection category: Superstructure - drive train						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Combustion engine						
Exhaust system						
Fuel tank						
Urea container						

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14th inspection category: Superstructure - drive train						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Fuel container						
Filters						
Sound absorber						
Engine mount						
Fuel lines						
Urea lines						
Fuel lines						

15. inspection category: Superstructure - hydraulic system						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Oil container						
Filters						
Pumps						
Motors						
Valves						
Lines						
Hoses						
Cylinder						
Pressure limiting valves						
Lowering brake valves						
Brake control: Hoist gear						
Brake control: Slewing gear						

16th inspection category: Superstructure - electrical system						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Motors						
Generators						
Batteries						
Switches / buttons						
Lines						
Fuses						
Resistors						
Lighting						
Signal lights						

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17. inspection category: Superstructure - control systems						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Engine regulation						
Transmission						
Flexible couplings						
Circuits						
Engine shut off line						
Control displays						

18. inspection category: Superstructure - rope drives						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Winch 1[3]						
Winch 2[3]						
Winch 3[3]						
Winch 4[3]						
Winch 5[3]						
Winch 6[3]						
Assembly winches [3]						
Rope pulleys						
Rope end connection						
Rope for winch 1						
Rope for winch 2						
Rope for winch 3						
Rope for winch 4						
Rope for winch 5						
Rope for winch 6						
Rope for assembly winches						
Guy ropes						

19th inspection category: Superstructure - hook						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Pulleys						
Rope guards on pulleys						
Axle support						
Load hook						
Load hook mounting						
Hook retention						

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20th inspection category: Superstructure - safety and switch systems						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Hoist emergency limit switch I						
Hoist emergency limit switch II						
Lowering emergency limit switch I						
Lowering emergency limit switch II						
Boom emergency limit switch I						
Boom emergency limit switch II						
Luffing jib: Boom limit switch I						
Luffing jib: Boom limit switch II						
Load torque limiter						
Angle display: Boom						
Angle display: Luffing jib						
Angle display: Slewing gear						
Safety devices: Control						
Working range limitation						
Pressure sensors						
Speed sensor						
Wind sensor						
Sliding beam monitoring						
Support pressure indicator						
Incline display						
Length indicator: Radius, boom length						
Emergency off system						
Engine stop						

21th inspection category: Boom						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Weld structure						
Rope pulleys						
Change over pulleys feed mechanism						
Luffing cylinder						
Telescoping cylinder						
Boom extension ropes						
Boom retraction ropes						
Boom bearings						
Boom pinning						
Guy rods						
Guy ropes						

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21th inspection category: Boom						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Control ropes						
Guide ropes						
Safety ropes						
Relapse cylinders						
Pin connections						

22. inspection category: Equipment						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Weld structure						
Rope pulleys						
Relapse cylinder						
Relapse support						
Oscillation guard						
A-frame bearings						
Pinning of components						
Guy rods with pinning						
Rods with guide rail on A-frame 2 and A-frame 3						
All limit switches with switch mechanism						
Pin connections						

Inspection chart for periodic inspections of Liebherr mobile and crawler cranes

Inspection criteria:

A = Present / complete
B = Condition / maintenance
C = Function
D = Repair / replace
E = Re-inspection required

Evaluation:

Satisfactory = x
Unsatisfactory = -
Not required = 0

Comments:

[1] Inspection of the crane carrier vehicle road worthiness is also fulfilled if it has already been certified by the road traffic department certification authority. For cranes that are not certified for use on public roads, an expert or authorized inspector must conduct the required tests to validate the vehicle's road worthiness.

[2] These inspections must be carried out by an authorized inspector even if it has passed the road traffic department test and is certified.

[3] Inspection of the winches with respect to the actually used proportion of their design life.

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90 Appendix

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90.01 Preface to the appendix

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1 Foreword

This crane may only be used in a flawless technical condition and according to its mission as well as with constant awareness of safety and dangers. Any problems, which could affect safety, must be fixed immediately.

Note

▶ Modifications on the crane may only be made with written approval by Liebherr-Werk Ehingen GmbH.

1.1 Change to the operating instructions

Changes to the operating instructions are received in the form of chapters. The chapter to be replaced must be removed from the operating instructions and replaced with the new chapter in the same location.

When you receive a change to the operating instructions:

▶ Remove the chapter to be replaced from the operating instructions.
▶ File the new chapter in the same location in the operating instructions.
▶ Destroy the replaced chapter.
▶ Fill out the change confirmation form in chapter 90.05 of the operating instructions.

1.2 Update to the operating instructions

Updates to the operating instructions, which you receive in the circular as Customer information, must be filed in the operating instructions in chapter 90.05.

Fig.113870: Customer information decal

When you receive an update to the operating instructions:

▶ Attach the decals **1**, which are enclosed in the customer information to the footer of the respective chapter. See the following example.

Note

Example: Update to the operating instructions!

If there is an update that concerns the operating instructions, chapter 2.04:

▶ Attach the decal **1** in the footer of chapter 2.04.

▶ File the update in chapter 90.05 of the operating instructions.
▶ Fill out the update confirmation form in chapter 90.05 of the operating instructions.

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90.05 Update confirmation

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3	Customer information	4

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1 Change confirmation form

Chapter	Change	Completed	
		on	by

2 Update confirmation

Chapter	Update	Completed	
		on	by

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3 Customer information

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