LIEBHERR

Crawler crane with telescopic boom

LTR 1100

LTR 1100-005

Operating instructions

BAL No.: 17505-03-02

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Serial No.	
Date	

ORIGINAL OPERATING MANUAL

The operating manual is part of the crane!

It must always be available within reach!

The regulations for crane operation must be observed!

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Preface

General

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

This crane may only be used:
- in impeccable 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 recording device

This crane is equipped with a data recording device. Among others, the following data is recorded:
- Date and time of day
- Entered configuration of the crane
- Actual load
- Percentage of utilization of the crane
- 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 notes

Safety and warning notes are 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.

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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.

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 to utilize 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!
Personnel can be killed or seriously injured!
This could result in 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.

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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 accidents!
Personnel can be killed or seriously injured!
This could result in 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.

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 accidents!
Personnel can be killed or seriously injured!
This could result in property damage!
- ▶ Clear up open questions regarding the crane documentation with Liebherr Service before carrying out the respective task.

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

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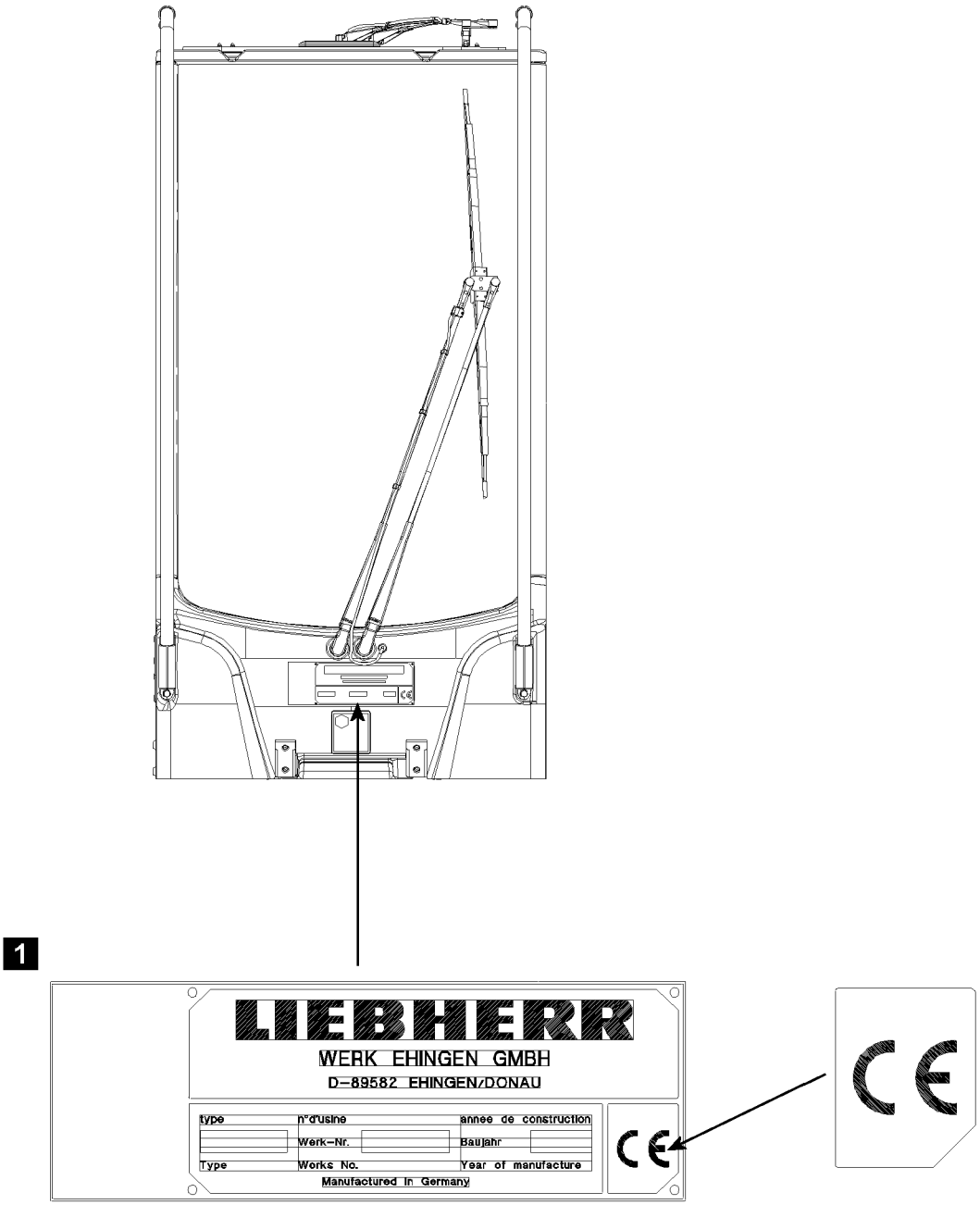

Fig.110001

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CE marking

The CE marking is a mark according to EU laws:
- Cranes with CE-marking according to the European machinery directive 2006/42/EC and the EN 13000! Data tag Crane with CE-marking, see illustration **1**.
- Cranes which are operated outside the respective area of application do not require a CE marking. Data tag Crane without CE marking, see illustration **2**.
- It is prohibited to market and operate cranes without CE marking, which do not meet the product-specific regulations valid in Europe, when a CE marking is specified for the country.
- It is prohibited to operate cranes with a tipping load utilization of 85 % which are programmed according to ASME B30.5 within the European Union or in countries which permit a lower stationary stability utilization (for example ISO 4305)! The national regulations apply. These cranes may not have a CE marking!

Destined use

The destined use of the crane consists solely in vertical lifting and lowering of free and non-adhered 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 crane configurations.

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 damages, which are 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 devices, for example bypassed load moment limitation or with bypassed hoist limit switch.
- Increasing the radius of the lifted load after a LMB shut off, for example by diagonally pulling the load.
- Using the support pressure display as a safety function against tipping over.
- Use of equipment parts which are not approved for the crane.
- Using the crane at sports and recreational events, especially for "Bungee" jumps and / or "Dinner in the sky".
- Driving on a public road in non-permissible driving condition (axle load, dimension).
- Driving with the equipment in place in a non-permissible driving condition.
- Pushing, pulling or lifting loads with the leveling regulation, 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).

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– Utilizing the crane when the weight of the load, which is suspended on the crane is changed, for example by filling a container suspended on the load hook, except:
– • The load moment 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 used load chart.

The crane may **not** be used for:
– Attaching 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.
– Transporting personnel in the crane cab while driving.
– Transporting personnel with the lifting 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 boom lattice sections and / or the crane boom.
– Two hook operation without auxiliary equipment.
– Extended material handling operation.
– Crane operation on a barge if the conditions are not determined 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.

Safety systems

Special attention must be paid to the safety systems built into the crane. The safety systems must constantly be checked for functionality. The crane may not be operated if the safety systems 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 crane operation and driving regulations and has been approved by the relevant authorities.

Equipment and spare parts

WARNING
Danger to life if original equipment parts are **not** used!
If the crane is operated with equipment parts, which are **not** original, then the crane can fail and cause fatal accidents!
Crane components can be damaged!
▶ 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!

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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.

Definition of directional data for mobile cranes

Driving forwards: 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 operator's cab** refer to the superstructure. Front is always in direction of the placed down boom.

Definition of directional data for crawler cranes

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

Driving in 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 track** from the position of the chain tension devices. The chain tension devices on the crawler track 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

Note
- ▶ If the crane is used in countries where US-units are customary, you can use the conversion factors in this chart for conversion of metric measuring units into US-units!

	Unit of Measure	Multiply by	To obtain
Length	millimeter (mm)	0.03937	inch (in)
	millimeter (mm)	0.00328084	foot (ft)
	meter (m)	39.37	inch (in)
	meter (m)	3.28084	foot (ft)
	meter (m)	1.09361	yard (yd)
	kilometer (km)	0.62137	mile (mi)
Area	square centimeter (cm^2)	0.155	square inch (in^2)

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	Unit of Measure	Multiply by	To obtain
	square meter (m^2)	10.7639	square foot (ft^2)
	square meter (m^2)	1.196	square yard (yd^2)
	square kilometer (km^2)	0.3861	square mile (mi^2)
Volume	cubic centimeter (cm^3)	0.06102	cubic inch (in^3)
	cubic meter (m^3)	35.3147	cubic foot (ft^3)
	cubic meter (m^3)	1.308	cubic yard (yd^3)
	liter (L)	61.024	cubic inch (in^3)
	liter (L)	0.035	cubic foot (ft^3)
	liter (L)	0.264	gallon (U.S.) (gal)
Weight	gram (g)	0.03527	ounce (oz)
	kilogram (kg)	2.20462	pound (lb)
	metric ton (t)	2204.62262	pound (lb)
	metric ton (t)	1.102	short tons (U.S.)
Mass divided	kilogram per meter (kg/m)	0.055998	pound per inch (lb/in)
by length	kilogram per meter (kg/m)	0.67197	pound per foot (lb/ft)
Force	newton (N)	0.2248	pound-force (lbf)
	kilonewton (kN)	224.809	pound-force (lbf)
	kilonewton (kN)	0.2248	kip (1 kip = 1000 lbf)
Torque	newton meter (N·m)	8.85075	pound-force inch (lbf·in)
	newton meter (N·m)	0.73756	pound-force foot (lbf·in)
Power	horsepower (metric)	0.73549	kilowatt (kW)
	horsepower (metric)	0.98632	horsepower (U.K.)
	kilowatt (kW)	1.34102	horsepower (U.K.)
Pressure	kilopascal (kPa)	0.01	bar (bar)
	kilopascal (kPa)	0.1450377	pound-force per square inch (psi)
	bar (bar)	14.50377	pound-force per square inch (psi)
	newton per square centimeter (N/cm^2)	1.450377	pound-force per square inch (psi)
	newton per square meter (N/m^2)	0.0001450377	pound-force per square inch (psi)
Speed	meter per second (m/s)	39.37	inch per second (in/s)
	meter per second (m/s)	3.28084	foot per second (ft/s)
	kilometer per hour (km/h)	0.62137	mile per hour (mi/h)
	liter per minute (l/min)	0.26417	gallon per minute (gal/min)
Temperature	degree Celsius (°C)	([°C] · 1.8) + 32	degree Fahrenheit (°F)
	kelvin (K)	([K] · 1.8) - 459.67	degree Fahrenheit (°F)

Conversion chart version 1

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1 Description of crane

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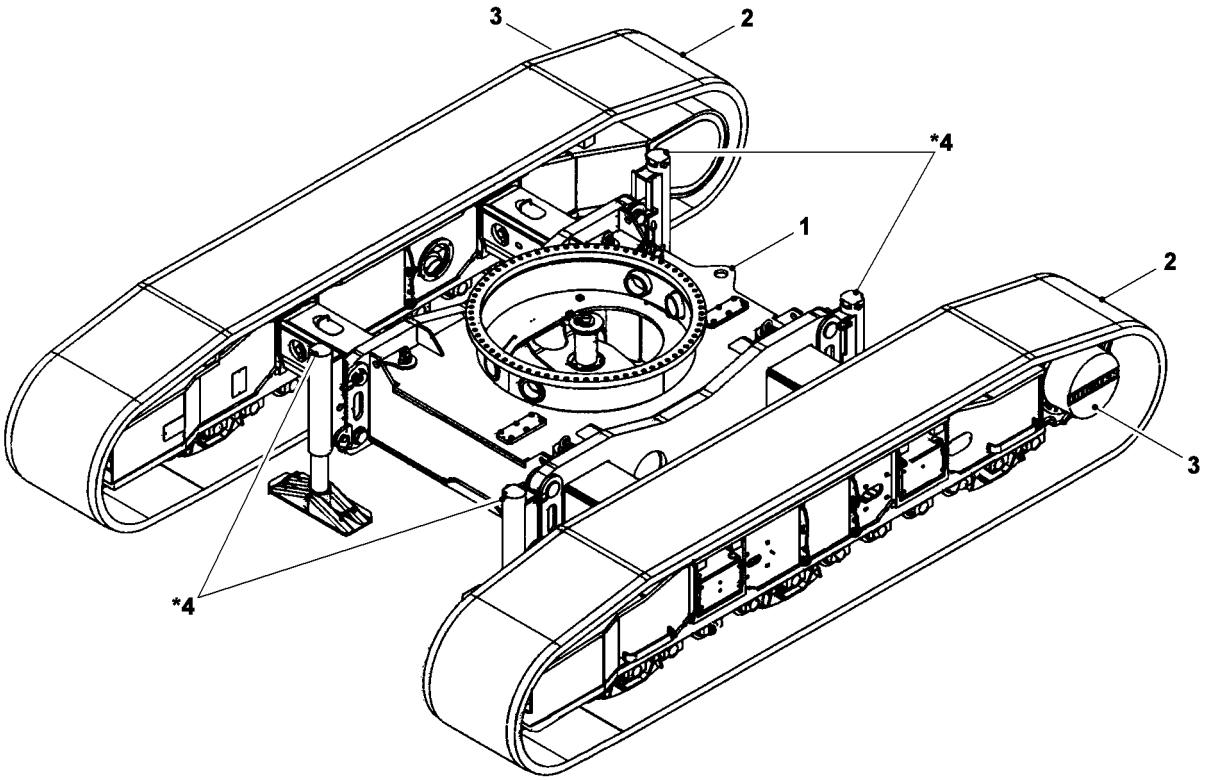

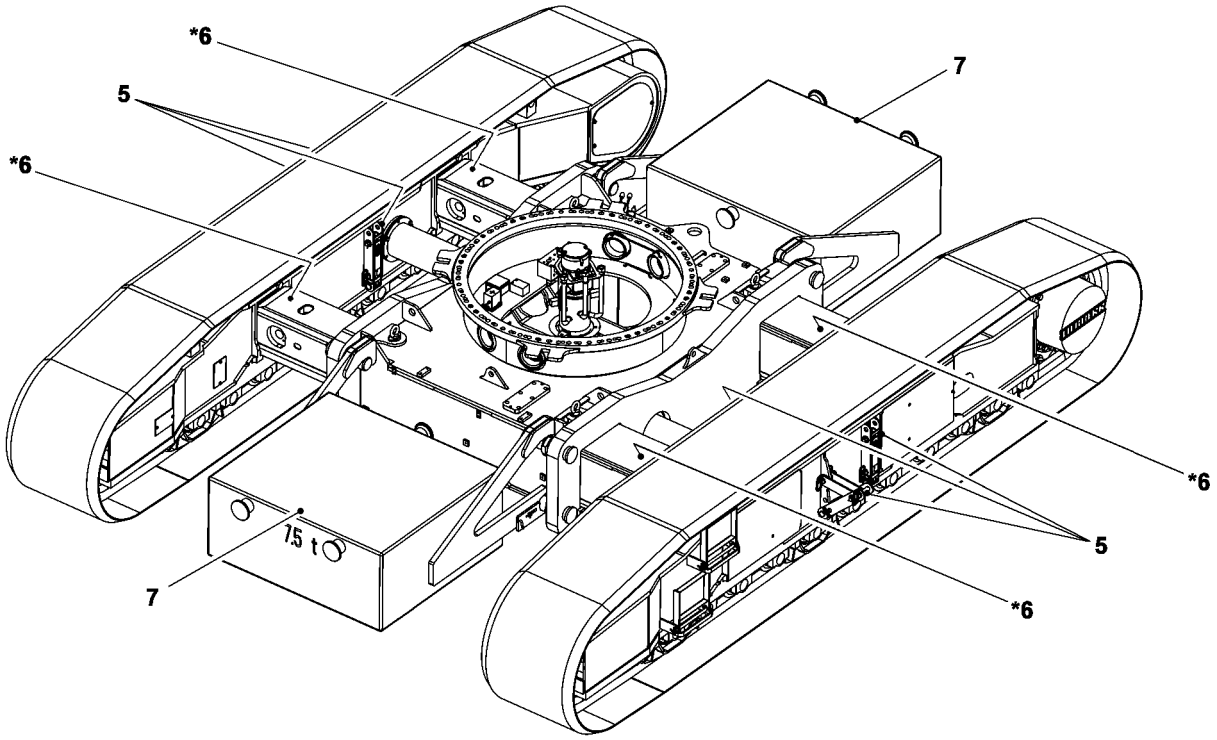

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Fig.198746

1 Crane components

1.1 Crawler travel gear

1 Crawler center section
2 Crawler carrier
3 Travelling gear transmission
4 Hydraulic assembly support*
5 Transport retainers*
6 Beams for track adjustment*
7 Central ballast

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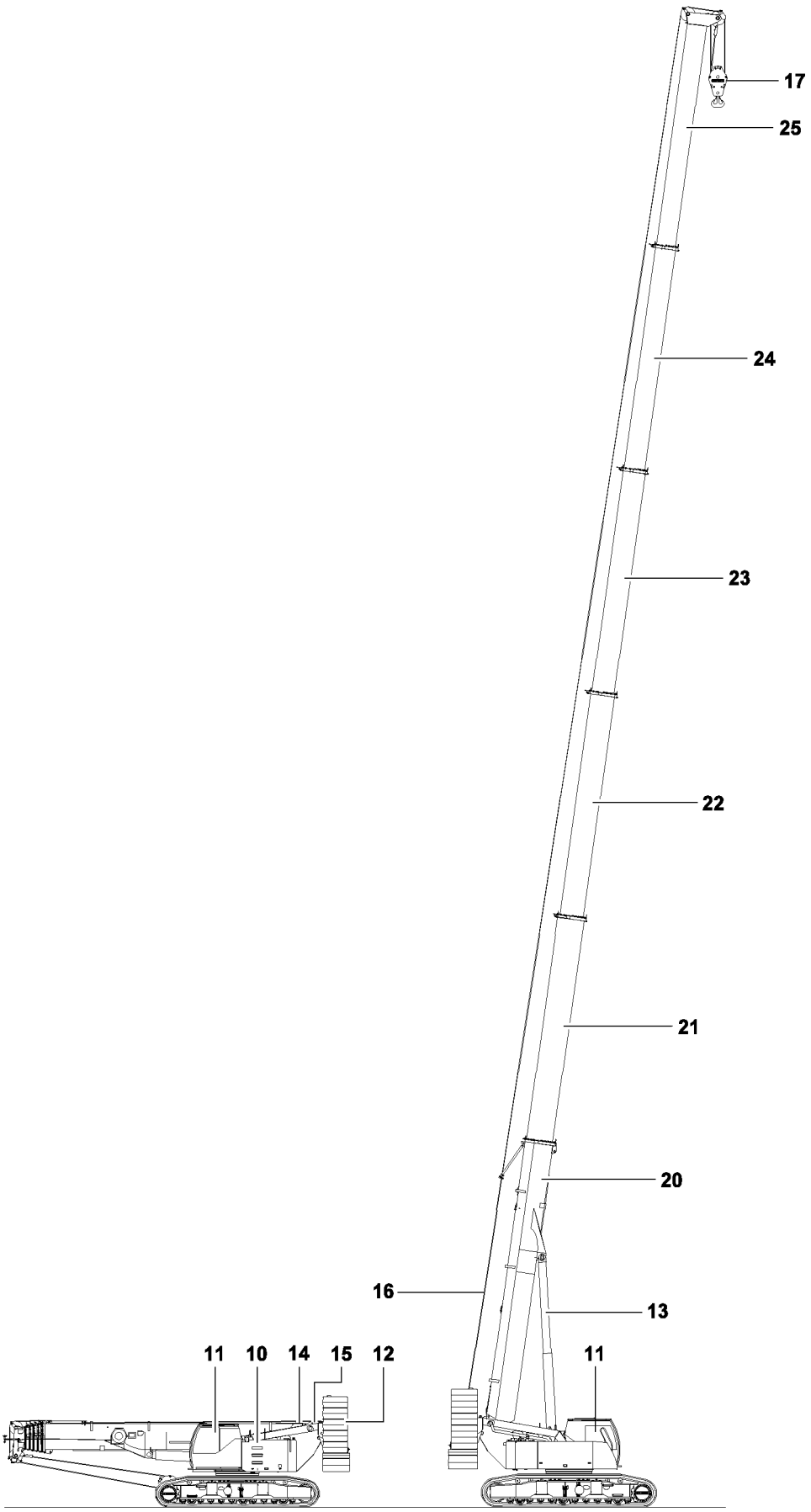

Fig.198747

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1.2 Crane superstructure

10 Crane engine
11 Crane cab
12 Counterweight
13 Luffing cylinder
- for telescopic boom adjustment

14 Winch 1
15 Winch 2*
16 Hoist rope*
17 Hook block*

1.3 Telescopic boom (T)

20 Articulated piece
21 Telescopic section 1
22 Telescopic section 2
23 Telescopic section 3
24 Telescopic section 4
25 Telescopic section 5

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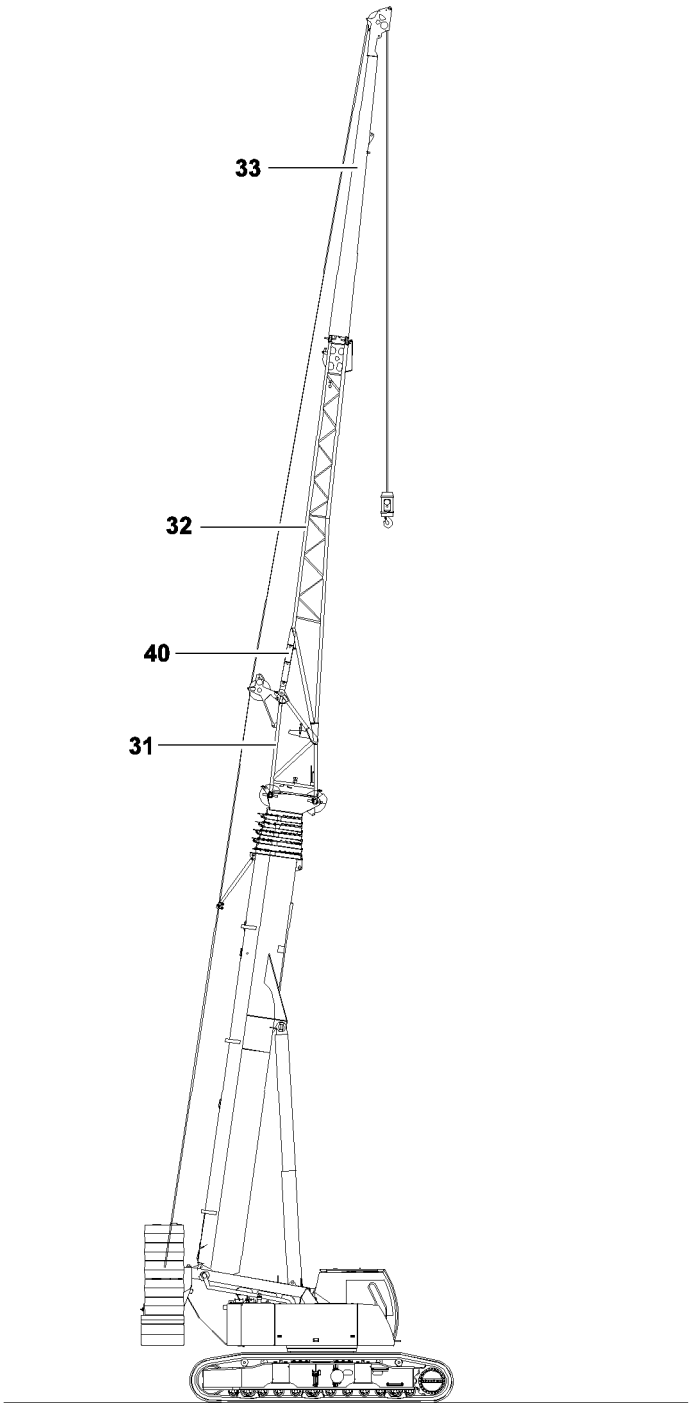

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Fig.198748

2 Auxiliary boom

2.1 Folding jib (TK)*

31 Adapter
32 Articulated piece
33 Head piece

2.2 Hydraulically adjustable folding jib (TNZK)*

31 Adapter
32 Articulated piece
33 Head piece
40 Adjusting cylinder

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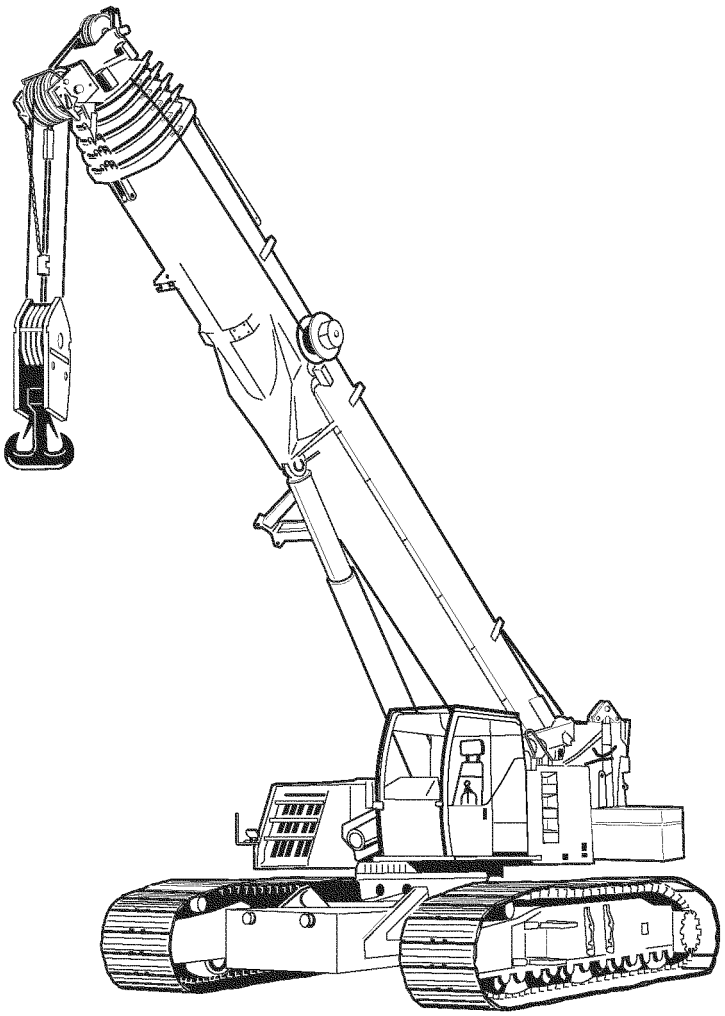

Fig.198625

1 Crawler travel gear

1.1 Frame

Torsion resistant box construction, consisting of crawler center section and two crawler carriers. The crawler carriers can be removed from the telescoping beams. Hydraulic track width adjustment.

1.2 Hydraulic track width adjustment

The track width adjustment is made via two independent, hydraulic cylinders. They are actuated via two manually actuated directional valves, which are installed on the crawler chassis.

1.3 Tracks

Maintenance free crawler travel gear with 900 mm wide triple grouser track pads.

1.4 Travel drive

Per crawler carrier, a hydraulic travel drive consisting of an axial piston motor, planetary gear with spring-loaded hydraulically-releasable travel brake. The crawler chains can be controlled synchronously as well as independently and counterrotating.

Travel speed: 0 - 2.8 km/hr

1.5 Central ballast

15.0 t , attachment blocks each 7.5 t , mounting on crawler center section.

2 Crane superstructure

2.1 Frame

In-house manufactured, weight-optimised and distortion-resistant welded structure made from high-strength, close-grained structural steel. A 3-row roller slewing ring is used as the connecting element to the crawler chassis, providing unlimited rotation.

2.2 Travel / crane engine

4-cylinder Diesel engine, manufactured by Liebherr, model D 934 S A6, water-cooled.

Performance: 129 kW at 1800 rpm
Maximum torque: 815 Nm at 1500 rpm
exhaust emissions according to guidelines per 97/68/EG Stage 3 and EPA/CARB Tier 3
Fuel tank: 727 l

2.3 Crane drive

Diesel hydraulic with 2 axial piston adjustment pumps with servo control and power control.

1 gear double pump, open, regulated oil circuits.

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Hydraulic power system in a compact design is flanged directly onto the diesel engine, complete drive assembly encased for noise reduction.

2.4 Control

Electric „Load-Sensing“ control, 4 working movements simultaneously controllable.

2 self-centring 4-way manual control levers.

The crawler travel gear is actuated via 2 two-way controllable foot pedals.

Crawler travel gear and crane superstructure can be driven at the same time.

2.5 Hoist gear

Axial piston fixed displacement motor.

Liebherr cable winch with built-in planetary gearbox and spring-loaded stop brake.

2.6 Luffing gear

1 differential cylinder with safety non-return valves.

2.7 Slewing gear

Axial piston fixed displacement motor, planetary gearbox, spring-loaded stop brake.

2.8 Crane driver's cab

Steel construction, fully galvanized, powder-coated, with safety glass, operating and control elements, luxury equipment.

Crane cab can be tilted backwards.

2.9 Safety equipment

LICCON overload system, testing system, hoist limit switch, safety valves to prevent pipe and hose breakage.

2.10 Telescopic boom

Dent and distortion-resistant design made from high-strength, close-grained structural steel with oval boom section, 1 articulated piece and 5 telescopic sections. All telescopic sections are hydraulically extendable independently of each other. Rapid-cycle telescoping system „Telematik“.

Boom length: 11.5 m to 52.0 m

2.11 Counterweight

Counterweight 26 t

2.12 Electrical system

Modern data bus technology

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3 Auxiliary equipment

3.1 Folding jib

10.8 m to 19.0 m long, can be attached below 0°, 20° or 40° in relation to telescopic boom.

Hydraulic cylinder for stepless adjustment of folding jib from 0° to 40°.

3.2 Auxiliary boom

2.9 m

3.3 Winch 2

For double hook operation or during operations with folding jib if main hoist rope is to remain reeved.

3.4 Additional counterweight

6.0 t for a total counterweight of 32 t.

3.5 Jack-up cylinder

For crawler removal

Flatbed vertical height: 1.1 m

Flatbed width: 3.0 m

3.6 Base plates

900 mm flat bottom plates

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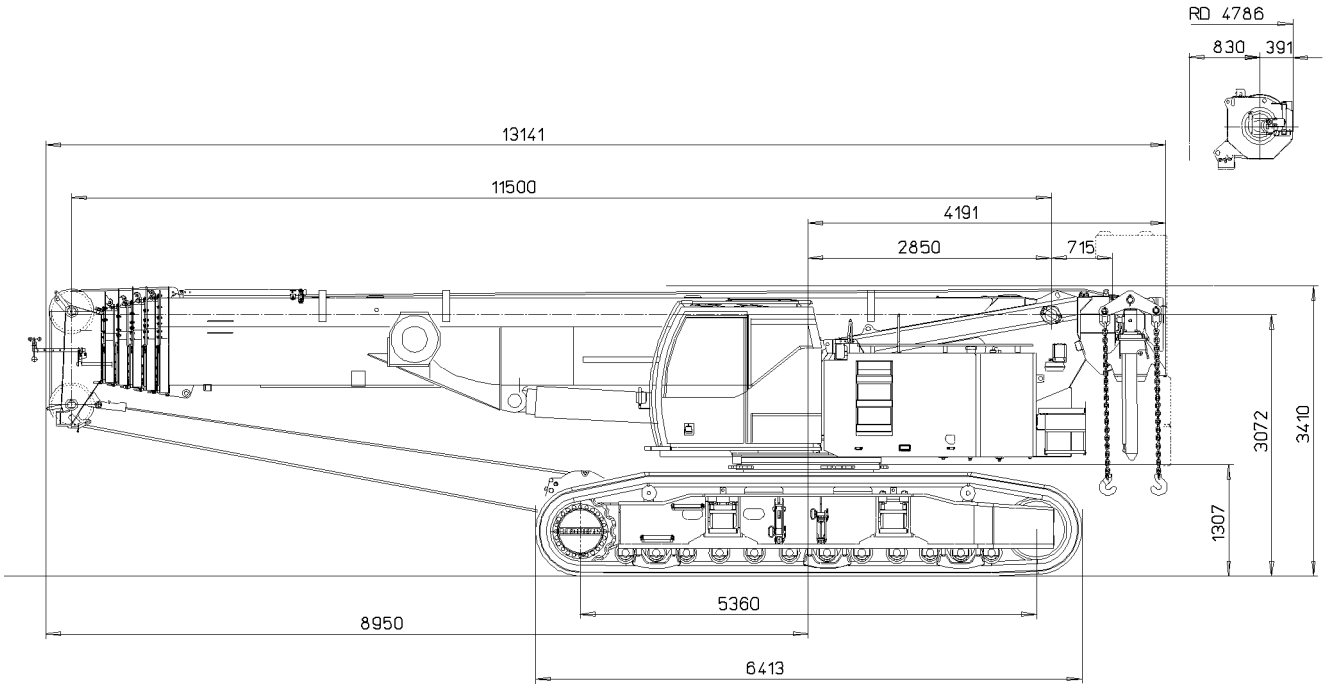

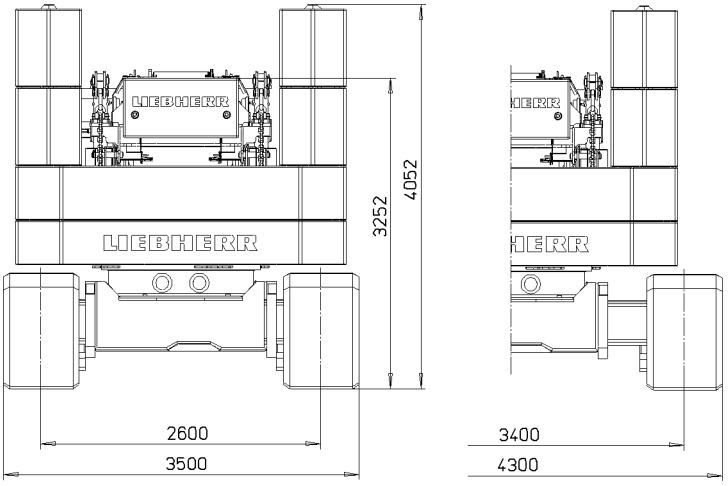

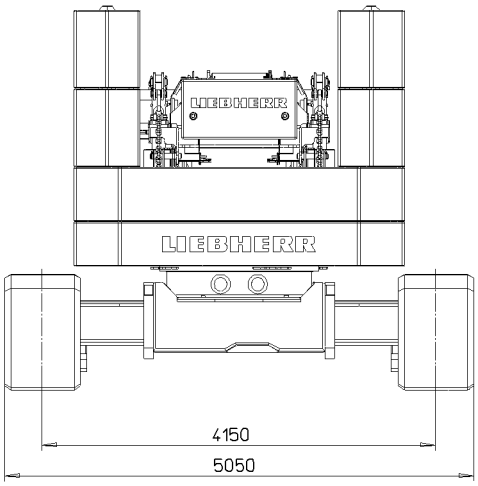

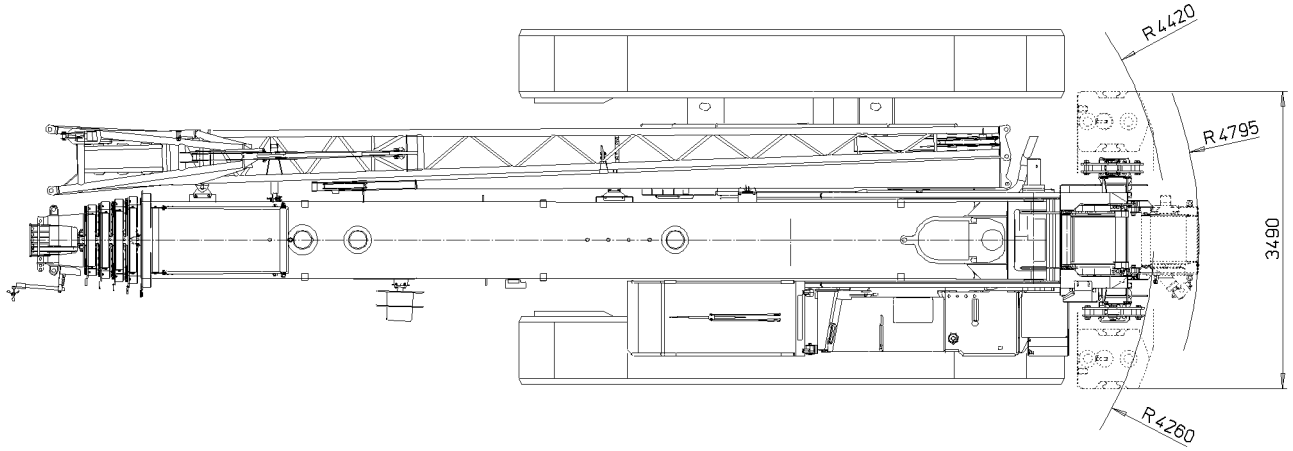

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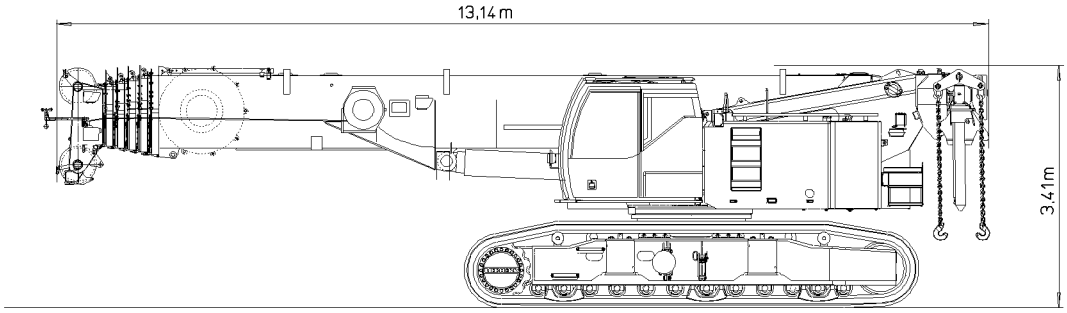
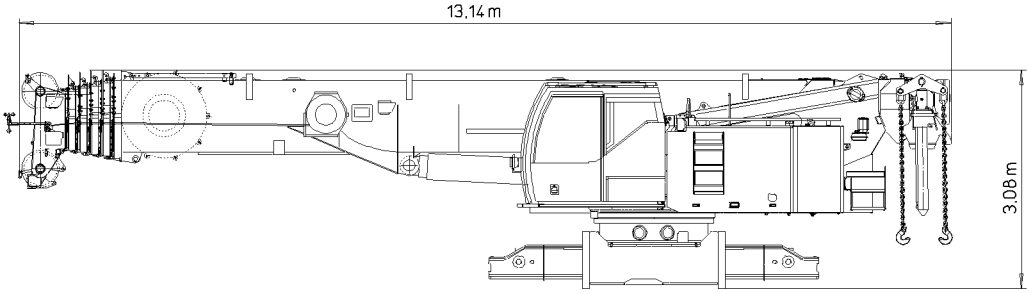
Fig.114063

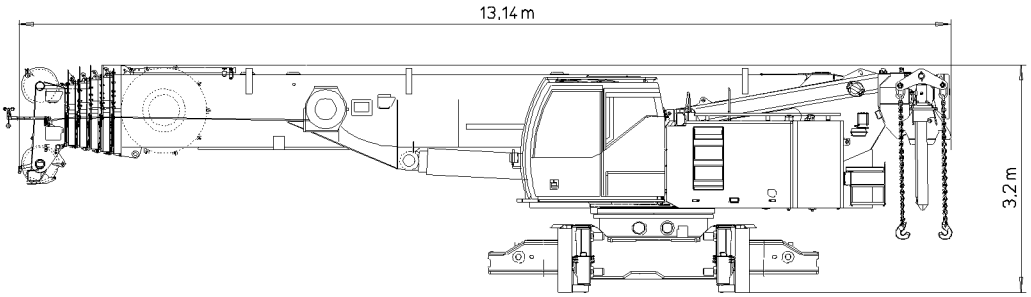
52,6 t



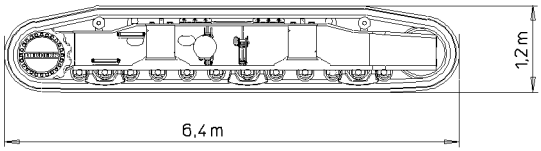
35,2 t



36,6 t



9,9 t



1,67 t (1,8 t)

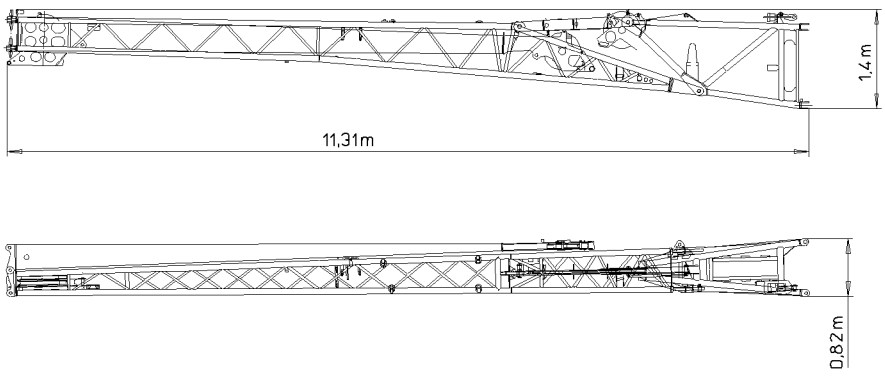


Fig.110976

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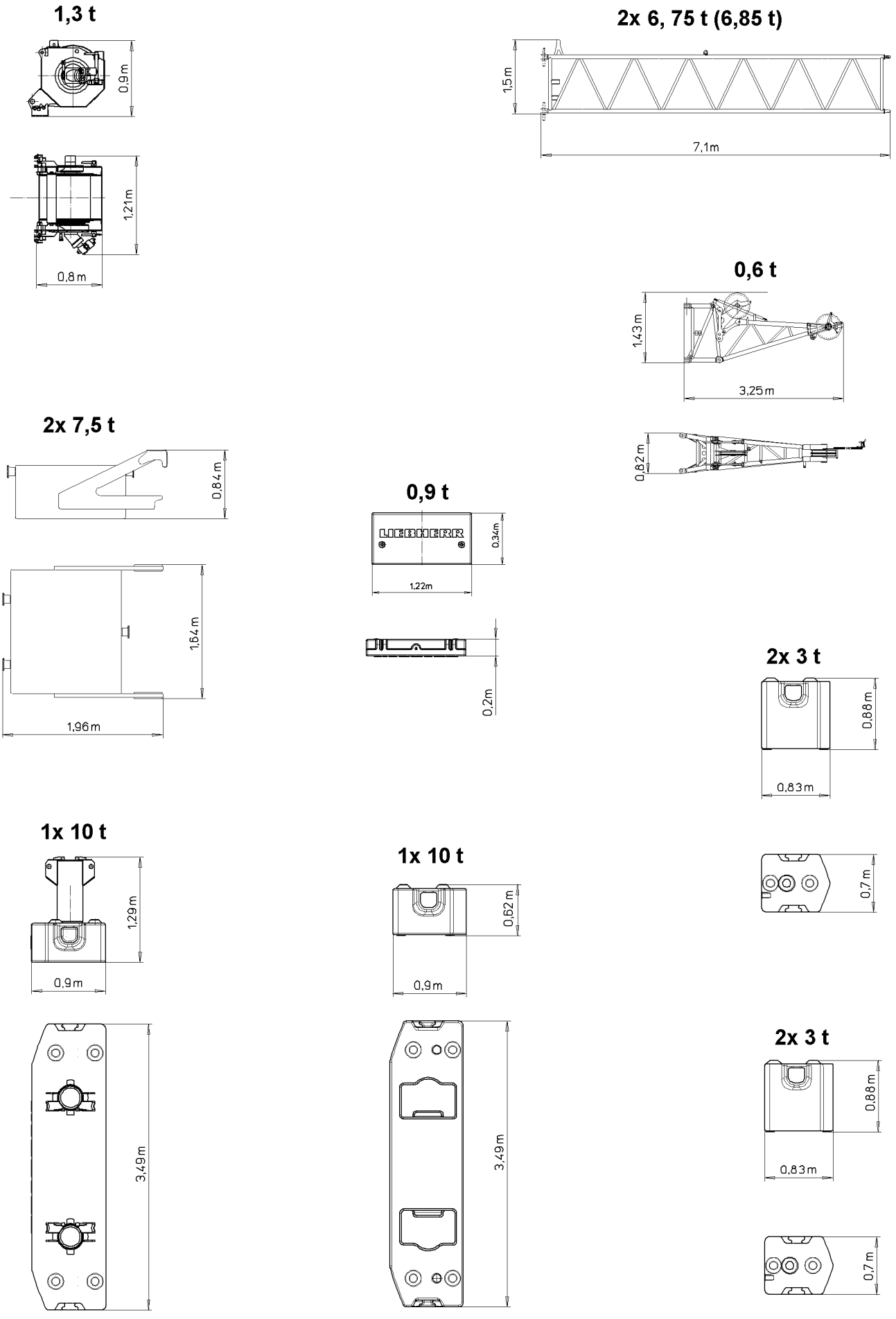

Fig.105824

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1 Dimensions

See illustrations.

2 Weights

2.1 Crane

Quantity	Component	Weight
	Turntable with telescopic boom **and** crawlers	52.6 t
	Turntable with telescopic boom **without** crawlers **without** „Jack-up System*“	35.2 t
	Turntable with telescopic boom **without** crawlers **with** „Jack-up System*“	36.6 t
2	Crawlers with track pads	9.9 t
1	Folding jib mechanical*	1.67 t
1	Folding jib hydraulic*	1.8 t
2	Telescopic boom extension mechanical*	6.75 t
2	Telescopic boom extension hydraulic*	6.85 t
1	Winch 2*	1.3 t
1	Auxiliary boom*	0.6 t
2	Central ballast	7.5 t
1	Replacement ballast for winch 2	0.9 t
1	Base plate	10 t
1	Counterweight plate	10 t
4	Counterweight plates	3 t

2.2 Load handling equipment

Load	Pulleys	Strands	Net weight
100 t	7	14	1.2 t
90 t	5	11	0.7 t
59 t	3	7	0.5 t
26 t	1	3	0.45 t
8.8 t	-	1	0.25 t

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3 Crane data

Crane data	
Total propelling force	660 kN
Maximum ground pressure with nominal load	1550 kN/m²
Total weight with 32 t counterweight, 15 t central ballast and 3-roller hook block	approx: 102 t

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/s²
Effective value of weighted acceleration to which the entire body is exposed to	Not more than 0.5 m/s²

5 Speeds

5.1 Travel speeds

Gear	Speed
Creeper gear	0 to 1 km/h
Fast mode (Rapid gear)	0 to 2.8 km/h

5.2 Crane speeds

Drives	Infinitely variable	Rope / rope length
Hoist gear 1	0 m/min – 110 m/min for single strand	21 mm / 200 m
Hoist gear 2	0 m/min – 110 m/min for single strand	21 mm / 200 m
Slewing gear	0 rpm – 1.8 rpm	
Luffing gear	Approx. 60 s -2° to 82° boom position	
Telescoping	Approx. 360s for boom length 11.5 m – 52 m	

6 Rope diameter

Components	Rope diameter	Rope category number RCN
Hoist rope 1	21 mm	See Rope certificate
Hoist rope 2	21 mm	See Rope certificate

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7 Lifting heights

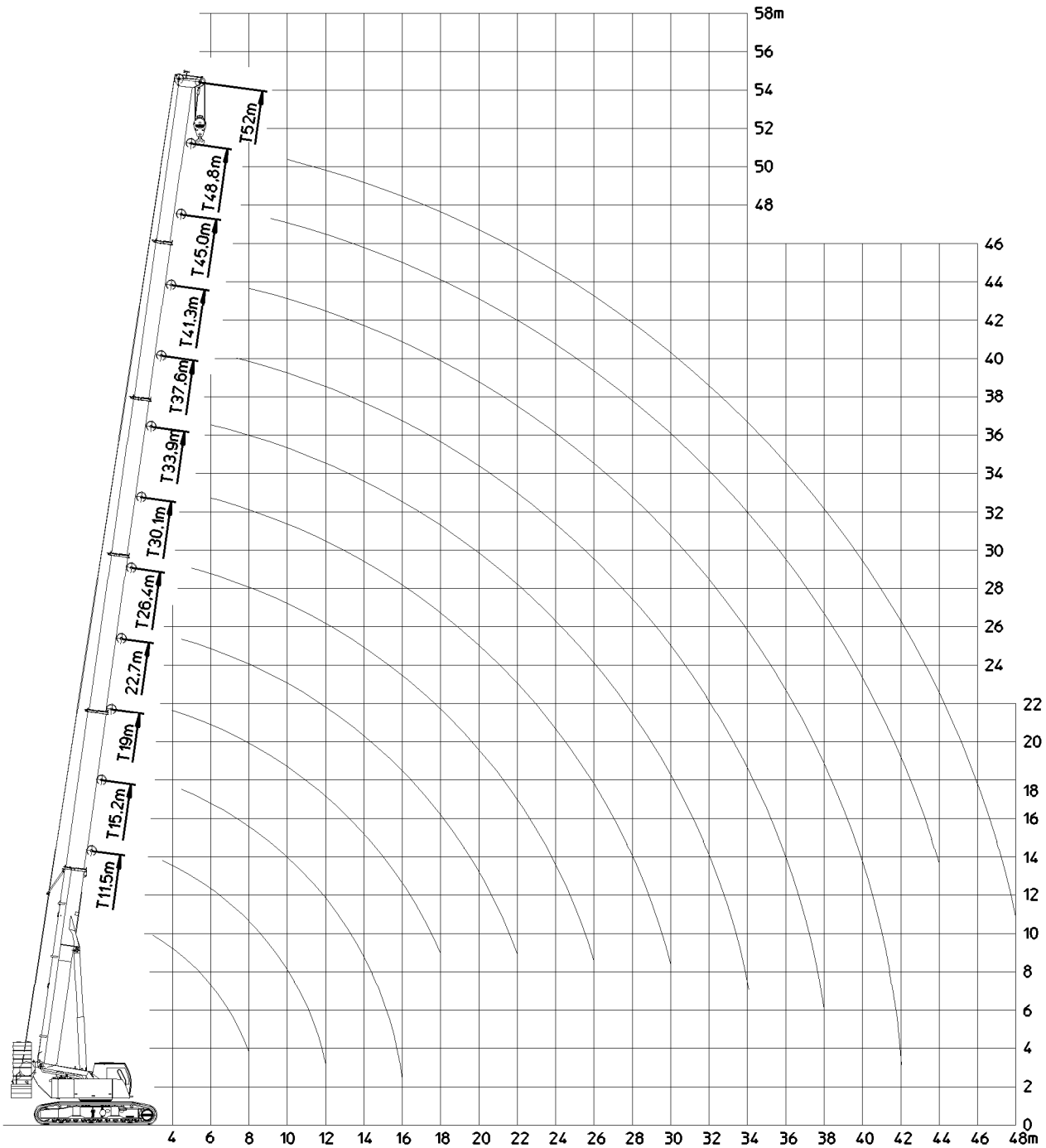

Fig.198675: Telescopic boom (T)

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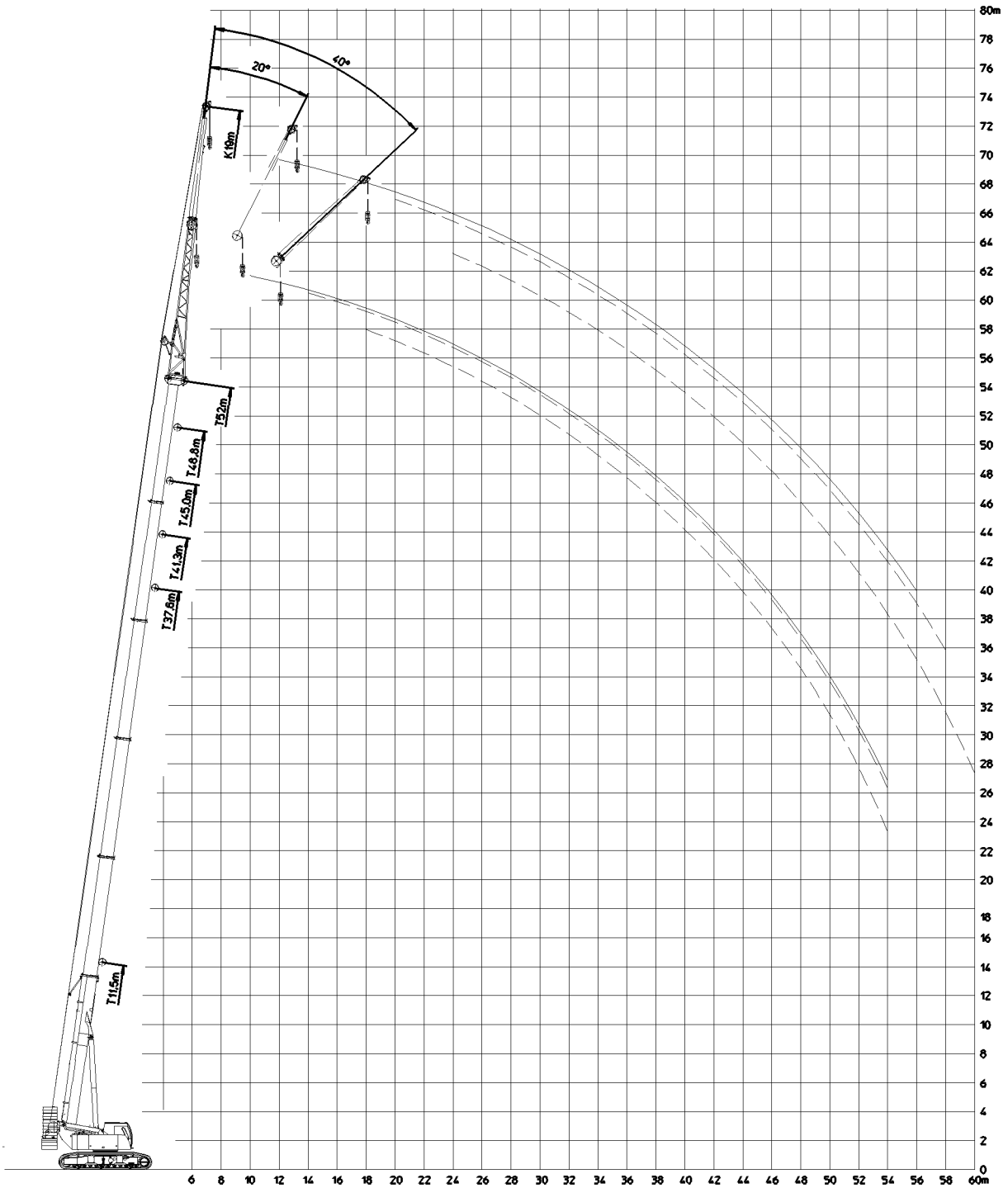

Fig.198676: Telescopic boom with folding jib (TK)

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2 Safety

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Fig.195219

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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Fig.195219

Note

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

1 Danger zone of crane

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.

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 with a safety distance.

2 Traffic endangerment and environmental damage

WARNING

Danger of slipping and skidding!
If the roadway 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.

3 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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4 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.

5 Emergency exit

5.1 Emergency exit - driver's cab

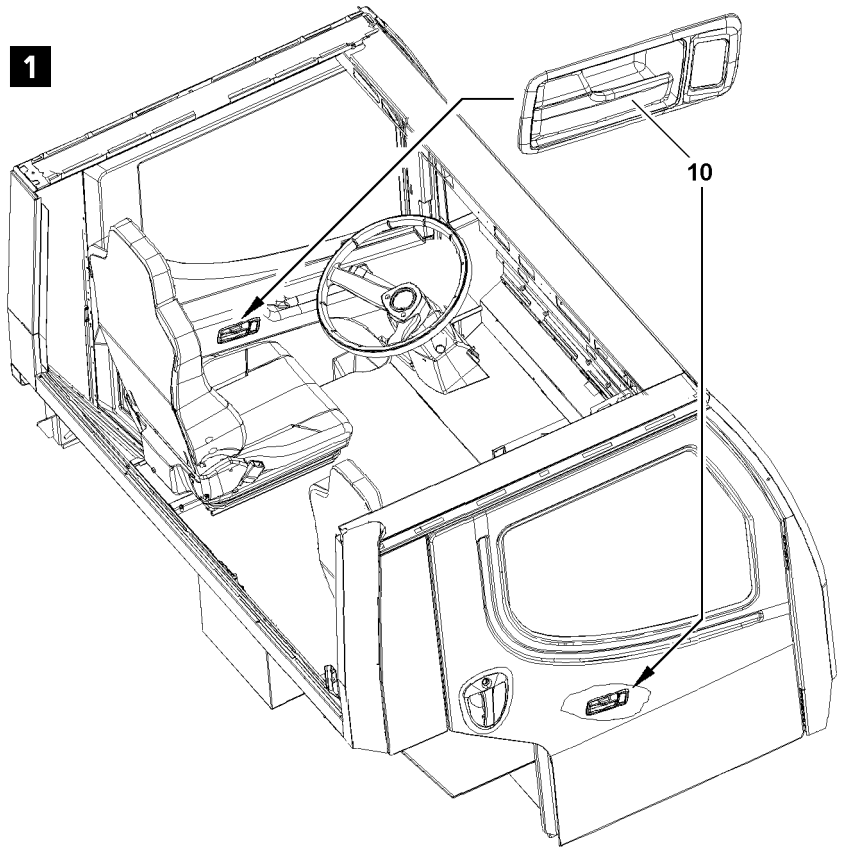

Fig.120932: Example for emergency exit - driver's cab

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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5.2 Emergency exist crane cab

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 third-party assistance.

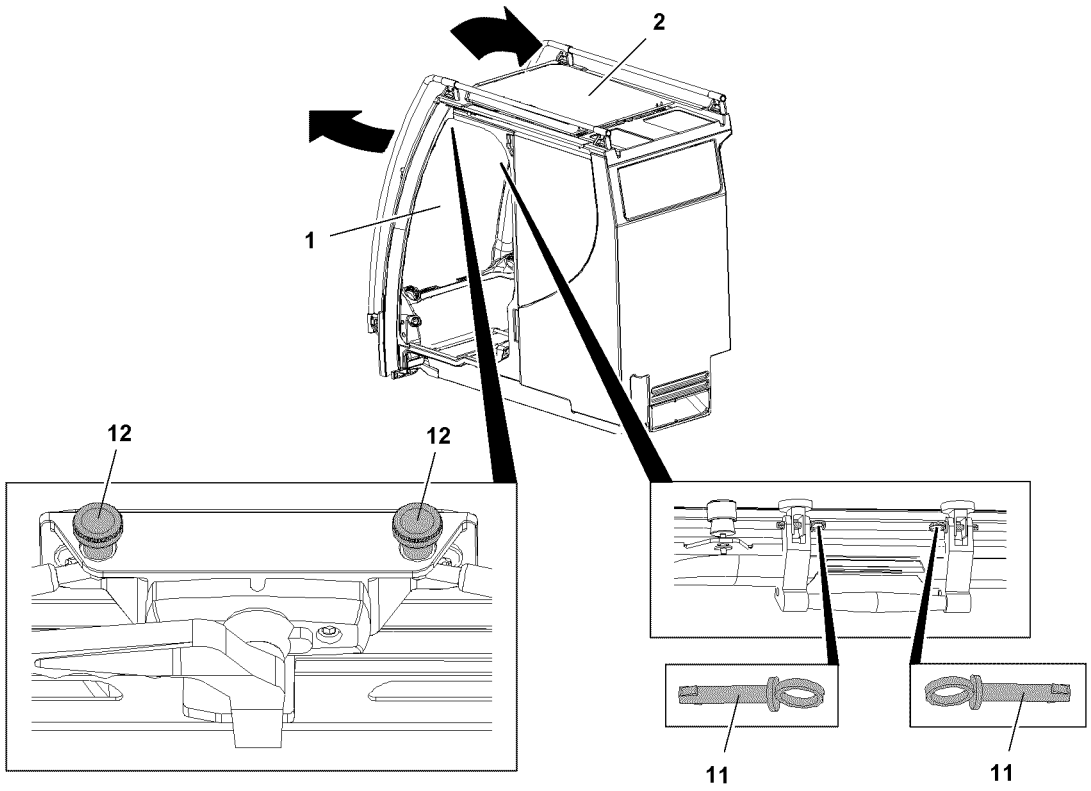

Fig.121111: Examples for emergency exit from the crane cab

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

5.2.1 Emergency exit through front window

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

5.2.2 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**.

5.2.3 Emergency exit with EMERGENCY hammer*

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

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

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6 Personal protective equipment

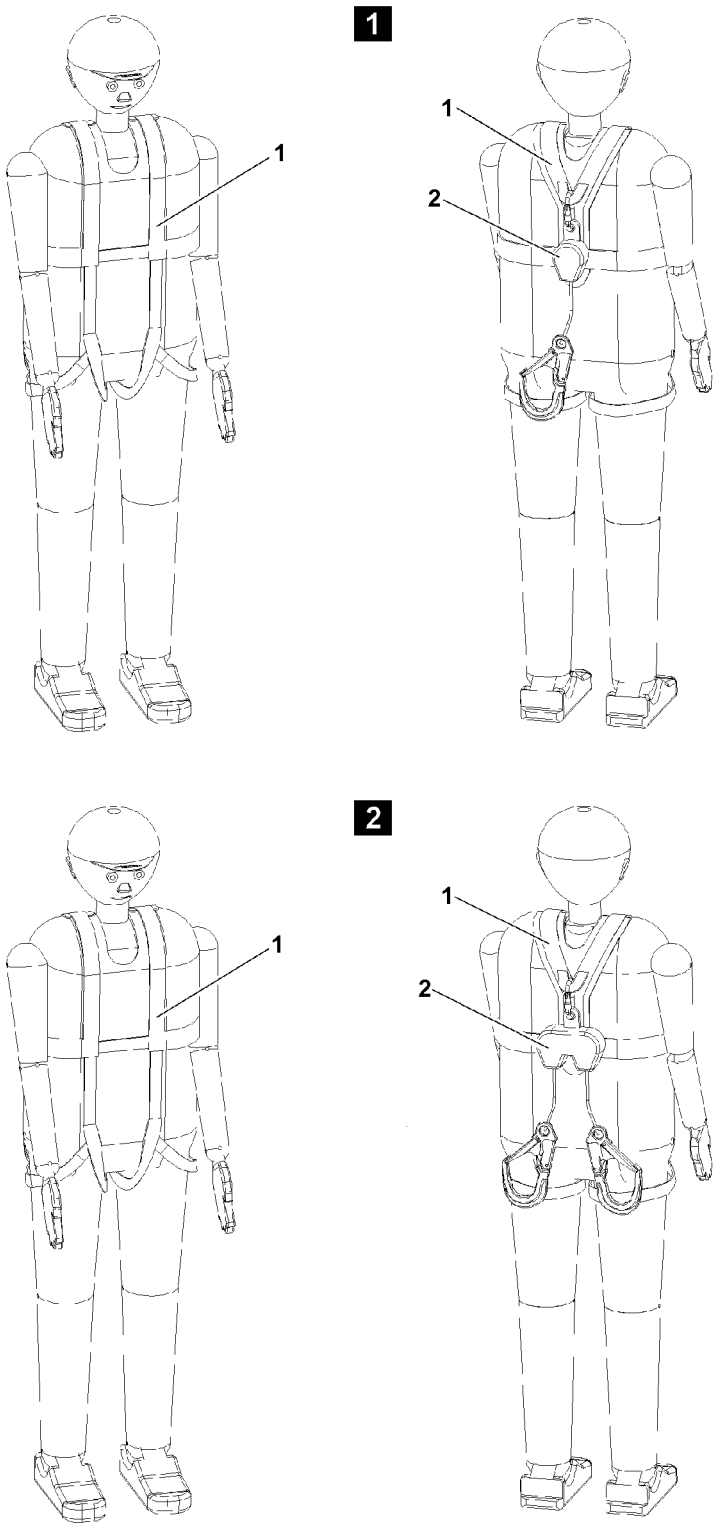

Fig.121161: Examples for safety harness and height safety equipment

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WARNING
Danger of falling!
If personal protective equipment is not worn during assembly or maintenance work, then the assembly personnel can be killed or severely injured.
- ▶ Observe and adhere the operating instructions and maintenance instructions of the manufacturer for the personal protective equipment.
- ▶ Ensure through regular inspections that the product identification is not damaged.
- ▶ The crane operator must make personal protective equipment available for the assembly personnel.
- ▶ The crane operator must ensure that the personal protective equipment is worn by the assembly personnel.
- ▶ The assembly personnel is obligated to carry the personal protective equipment and to wear it.
- ▶ Check personal protective equipment before use for damage and completeness.
- ▶ Replace defective or damaged personal protective equipment with functioning protective equipment.

WARNING
Impermissible fall arrest system!
If a fall arrest system is used, which was not obtained via Liebherr-Werk Ehingen GmbH, there is a danger of falling. Another fall arrest system is **NOT** designed for the crane structure.
Personnel can be severely injured or killed.
- ▶ Utilize exclusively fall arrest systems from Liebherr-Werk Ehingen GmbH.

The personal protective equipment includes the following equipment:
- – Supplied fall arrest systems (safety harness **1** and height rescue equipment **2**).
- – Head protection with chin strap: Protection from falling parts at assembly and disassembly. Hitting the head during assembly and disassembly work
- – Non-skid and slip resistance safety gloves
  As a rule, when working with ropes, penetration safe safety gloves must be used.
- – Safety shoes: Protection from falling parts at assembly and disassembly.
- – Warning apparel

WARNING
Danger of fatal injury!
Even personal protective equipment does not provide 100 % protection.
A helmet can protect against small falling objects, but not against falling loads.
Personnel can be killed or seriously injured.
- ▶ Always remain alert.
- ▶ Always be safety conscious.
- ▶ Standing under suspended loads is prohibited.

WARNING
Danger of accident!
If the following measures are not carried out, personnel can be killed or severely injured.
- ▶ A plan for rescue actions, taking all possible emergencies into account, must be on hand.
- ▶ The following points can endanger the safe function of the personal protective equipment: For example extreme temperatures, routing of connecting devices, routing over or around sharp edges, chemical influences, electrical effects, cuts, abrasion, climatic influences or swing movements during falls.
- ▶ For that reason, safety preparations must be made.

WARNING
Important for the safety of the user.
- ▶ If the personal protective equipment is sold to another country, then the purchaser must make the manufacturer's operating instructions as well as the inspection and maintenance documents available in the language of the user country.

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6.1 Identification of protective equipment

Every personal protective equipment or other equipment must be marked clearly and permanently in the language of the user country.

If the identification is no longer legible, then the personal protective equipment must be handed to an expert for inspection.

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6.2 Supplied fall arrest system (safety harness and height safety equipment)

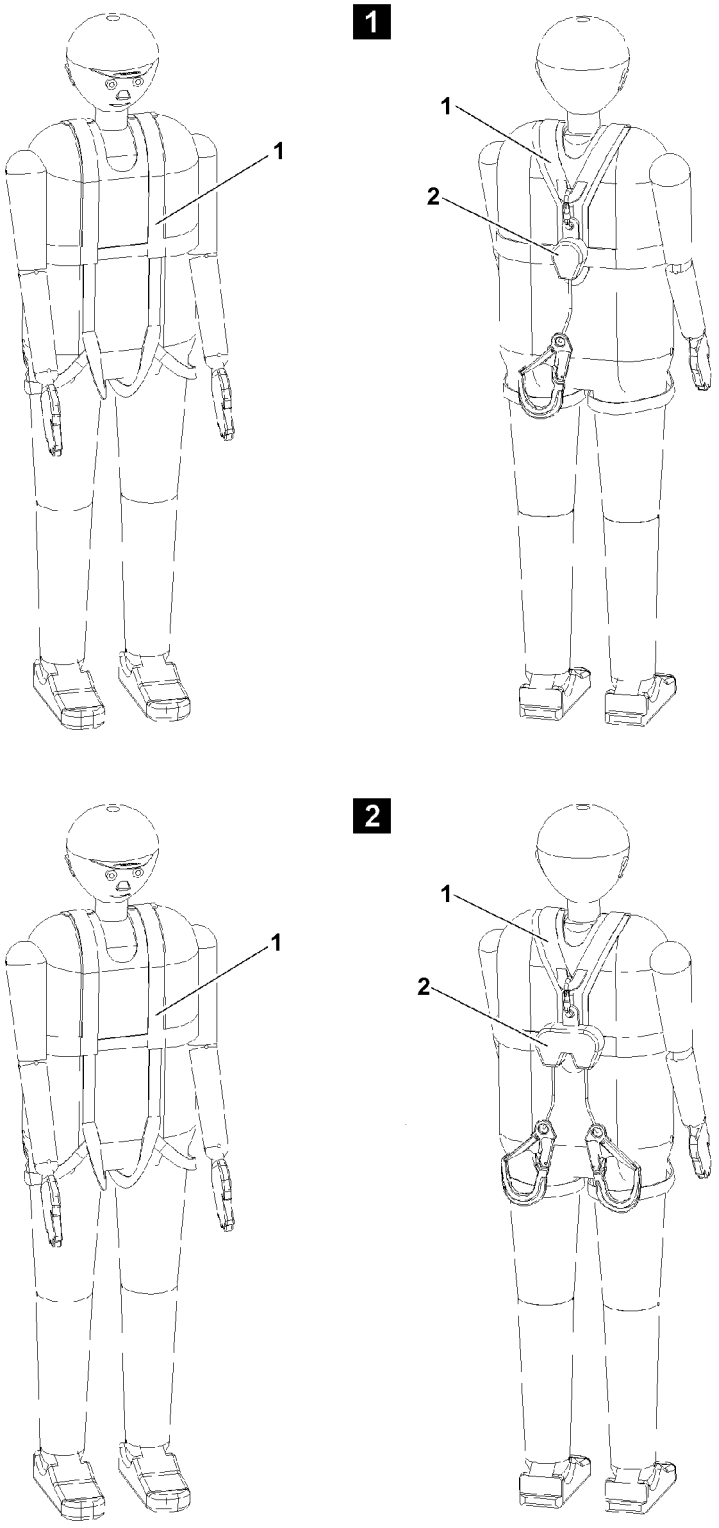

Fig.121161: Examples for safety harness and height safety equipment

The supplied fall arrest system, consisting of safety harness **1** and height safety device **2** must be worn where no other fall protection equipment, such as railings, can be installed for technical reasons.

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In these cases, marked fastening and hook points for the fall arrest systems are provided on the components.

Height rescue system, see section "Saving the assembly personnel".

Note

▶ For cranes, which do not include the fall arrest system and the height rescue system as part of the scope of delivery can purchase the fall arrest system, consisting of safety harness **1** and height rescue equipment **2** as well as the height rescue system at the Liebherr-Werk Ehingen GmbH.

Part of the category „Aids for working aloft“ are, for example:
- Lifting platforms
- Scaffolding
- Auxiliary cranes
- Ladders

WARNING

Danger of falling.
If the fall arrest system is not worn during assembly or maintenance work, then the assembly personnel can fall down and be killed or severely injured.

▶ All work aloft, where there is a danger of falling must be carried out with suitable aids.
▶ If fall protection equipment is available, then the fall protection equipment must be used, see Crane operating instructions, chapter 2.06.
▶ 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.
▶ The supplied fall arrest system must be fastened on the fastening and hook points as well as on the safety ropes. For safety points, see Crane operating instructions, chapter 2.06.
▶ The assembly personnel must be instructed in practice on how to wear the supplied fall arrest system (safety harness **1** and height safety equipment **2**). Annual practice instructions and drills must be carried out.
▶ The supplied fall arrest system must be used.
▶ The fall arrest system consists of a safety harness **1**, approved according to **EN 361** and a height safety equipment **2**, approved according to **EN 360** (for horizontal application and sharp edges).
▶ The supplied fall arrest system may not be changed in its configuration. Extending or shortening the fall arrest rope is prohibited.
▶ The fall absorber is integrated in the height safety device **2**. The utilization of an additional fall absorber is prohibited.
▶ The supplied fall arrest system is effective from a height of 2.5 m.
▶ The fall space must be free of obstacles.
▶ Solely the intended safety points designed for this purpose on the crane may be used.
▶ The operating instructions of the manufacturer for the supplied fall arrest systems (safety harnesses **1** and height safety equipment **2**) must be observed and adhered to.
▶ Only step on the aids, ladders and catwalks with clean shoes.
▶ Keep aids, ladders and catwalks free of heavy dirt.
▶ Keep aids, ladders and catwalks free of snow and ice.
▶ The safety harness **1** and the height safety equipment **2** must be inspected annually by authorized and trained expert personnel and the results must be documented in the inspection log book.
▶ After every fall, the safety harness **1** and the height safety equipment **2** must be removed and inspected by an authorized and trained expert and the results must be documented in the inspection log book.
▶ The results must be documented in the inspection log book.
▶ Only after written release by expert personnel may be fall arrest system be reused.

6.3 Use of single strand height safety equipment

Height safety equipment with a belt strap, see illustration **1**, is intended for all cranes which have no catwalks with safety ropes. Use the supplied height safety equipment with extendable belt strap and snap hook (**EN 362 Class A**) with link.

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6.4 Use of double strand height safety equipment

Height safety equipment with two belt straps, see illustration **2**, is intended for cranes with catwalks, which are equipped with two ropes as fastening device on the left and right hand side of the catwalk. 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 (**EN 362 Class A**) with links.

WARNING
Danger of falling.
- ▶ If two safety ropes are installed on the booms, lattice sections and other components, then the height safety equipment with two belt straps must always be used and one belt strap per safety rope must be hooked.

6.5 Documentation Fall arrest systems and Height rescue system

Note
- ▶ The documentation of the fall arrest systems (safety harnesses and height safety equipment) and the height rescue system must be carried out according to the operating instructions of the respective manufacturer.
- ▶ The crane operator, who employs the user, is responsible for the creation of documentation and entry of the required data.

7 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 Crane operating instructions, chapter 2.04.10.

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

Reeve the hoist rope in or out on the pulley head:
- For ladder work, use the supplied ladder. For fastening and hook points, see Crane operating instructions, chapter 2.06.
- For cranes, which carry a ladder along **with** 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.

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7.2 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 the 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.

7.3 Access to 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, the assembly personnel must hook at least one snap hook of the fall arrest system on 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.

7.4 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 one safety device.

7.5 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.

Attaching the lattice sections:
- When attaching 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.

7.6 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, the assembly personnel must hook at least one snap hook of the fall arrest system on a safety rope and secure themselves against falling.
- When stepping on the ladder, the assembly personnel must ensure a 3-point support.

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– 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.

8 Rescuing the assembly personnel

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 inspected annually by authorized and trained expert personnel and documented in the inspection log book.

8.1 First aid measures after rescue

WARNING
Mortal danger.
▶ 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.

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9 Crane cab with retractable / extendable step

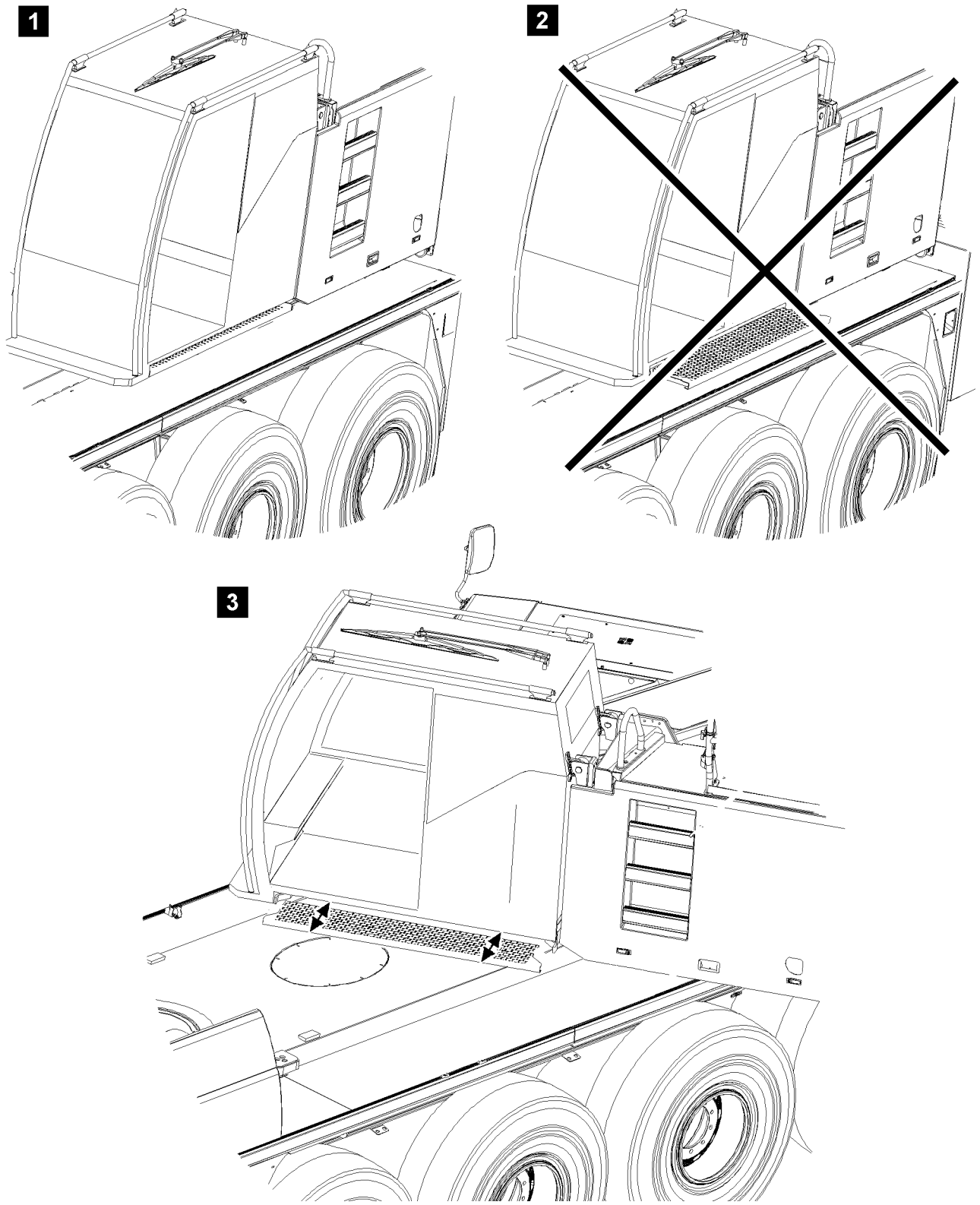

Fig.121159: Example for crane cab with retractable / extendable step

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9.1 Entering / exiting of crane superstructure alignment length axis crane chassis

See illustration **1**

Before entering the crane cab or existing from the crane cab, the following prerequisites must be met:
- The crane superstructure is aligned in length axis of the crane chassis.
- The step under the crane cab is retracted.
- The crane cab with incline adjustment is in 0° position.
- Folding ladders are folded into the ascent and descent position.

Note
- ▶ When all folding ladders are folded into the ascent and descent position, then a safe descent is possible from every position. See Crane operating instructions, chapter 2.07.

WARNING
Danger of falling.
If the crane superstructure is aligned in length axis of the crane chassis and the step can **not** be moved in, then there is a danger of falling when entering / exiting. See illustration **2**.
Personnel can be severely injured or killed.
- ▶ Set up a suitable access, such as a ladder or platform, to ensure safe entry into the crane cab.
- ▶ When exiting the crane cab in position crane superstructure in length axis crane chassis, always move the step in completely.

9.2 Entering / exiting a swung crane superstructure

See illustration **3**

Before entering the crane cab or existing from the crane cab, 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.
- For the crane cab with incline adjustment, the crane cab is in 0° position.
- All folding ladders are folded into the ascent and descent position.

Note
- ▶ Use extendable step.
- ▶ The extended step allows comfortable entry into the crane cab as well as safe exit from the crane to the crane chassis.
- ▶ When all folding ladders are folded into the ascent and descent position, then a safe descent is possible from every position. See Crane operating instructions, chapter 2.07.

10 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 0° position, for example due to a problem, then utmost caution must be used when entering / exiting the crane cab.
There is a danger of falling. Personnel can be severely injured or killed.
- ▶ For safety reasons, we recommend to take advantage 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 Safety bar

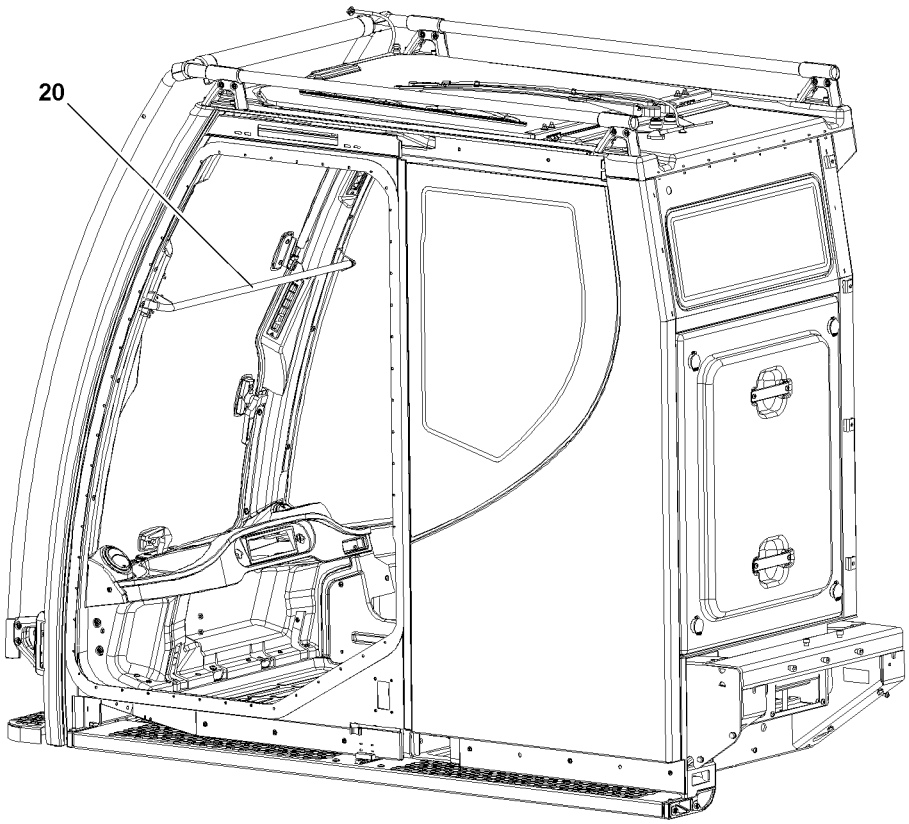

Fig.121158: Example for crane cab with safety bar

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

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12 Closing the windows

WARNING
Danger of crushing.
Never close the windows carelessly or uncontrolled. Significant crushing injuries can occur.
- ▶ During closing, watch the windows as it moves up.
- ▶ Make sure that no personnel or objects are wedged in.

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13 Rigging and fastening points

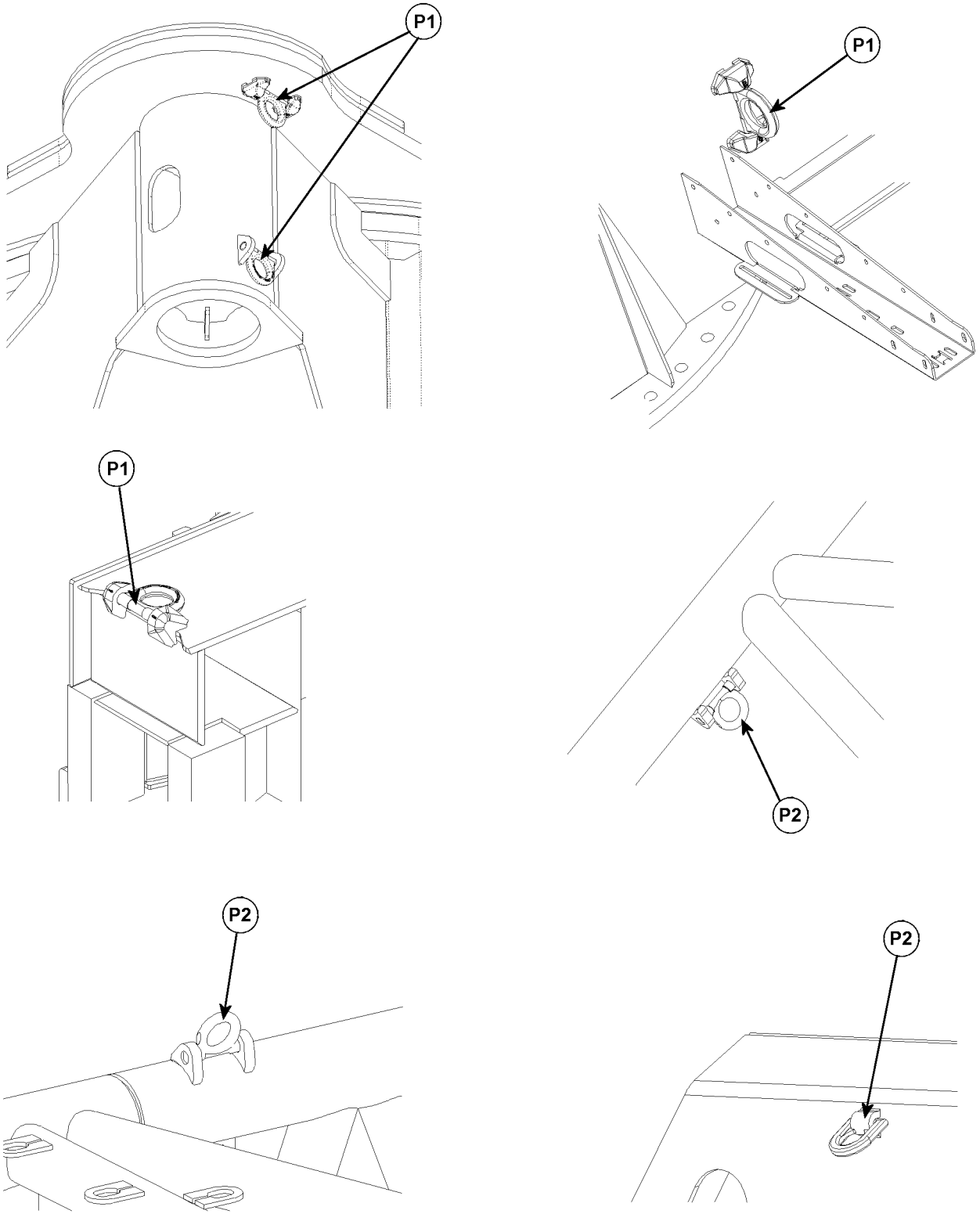

Fig.121160: Examples for rigging and fastening points

P1 Rigging points **P2** Fastening points

Before every operation and at regular intervals, check the rigging points **P1** and the fastening points **P2** for cracks of the welding seam, significant corrosion, wear and distortion.

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The inspection criteria are:
- Completeness of rigging points **P1** and fastening points **P2**.
- 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.

WARNING
Danger of accident.
When using rigging and fastening points which are not operationally safe, severe personal and property damage can occur.
- ▶ Have rigging and fastening points, which are not operationally safe replaced with new rigging and fastening points by authorized and trained expert personnel.
- ▶ When hooking and unhooking the rigging and fastening equipment, handle carefully to avoid crushing, sheering, catch and impact points.
- ▶ Eliminate damage of rigging and fastening equipment due to sharp edged stress loads.

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 off before touching them.
- ▶ Proceed with special caution near heated crane components.

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 guidelines will help you achieve this.

Many crane accidents are caused by incorrect crane operation.

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 while operating or driving a crane are especially careless while working, in particular:
- Slewing 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 roadway
- Attaching the load incorrectly
- Unsuitable operation; especially angular pulling, breaking away stuck loads

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- Wind action on suspended loads
- Mistakes when driving on a road, 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 headroom
- Inadequate support; support base, support under the support plates
- Mistakes during assembly or disassembly of booms

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

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.
- ▶ Only step on such aids with clean shoes.
- ▶ Keep aids clean and free of 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 devices are set to neutral or idle position before release of the energy supply to the drive components.
   - The control devices 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 operation.
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.

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6. The crane operator must monitor the load during all crane movements or the load handling equipment 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 devices within reach. This does not apply for towing of vehicles with towing cranes.
11. The crane operator may not run up to end positions operationally, if they are limited by the emergency limit switches.
12. After a load torque limiter was triggered, the crane operator may not take on an overload by pulling in / raising the boom.
13. The crane operator may **not** bypass the overload protection to increase the hoisting power of the crane.

16 Selecting the operating site

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.

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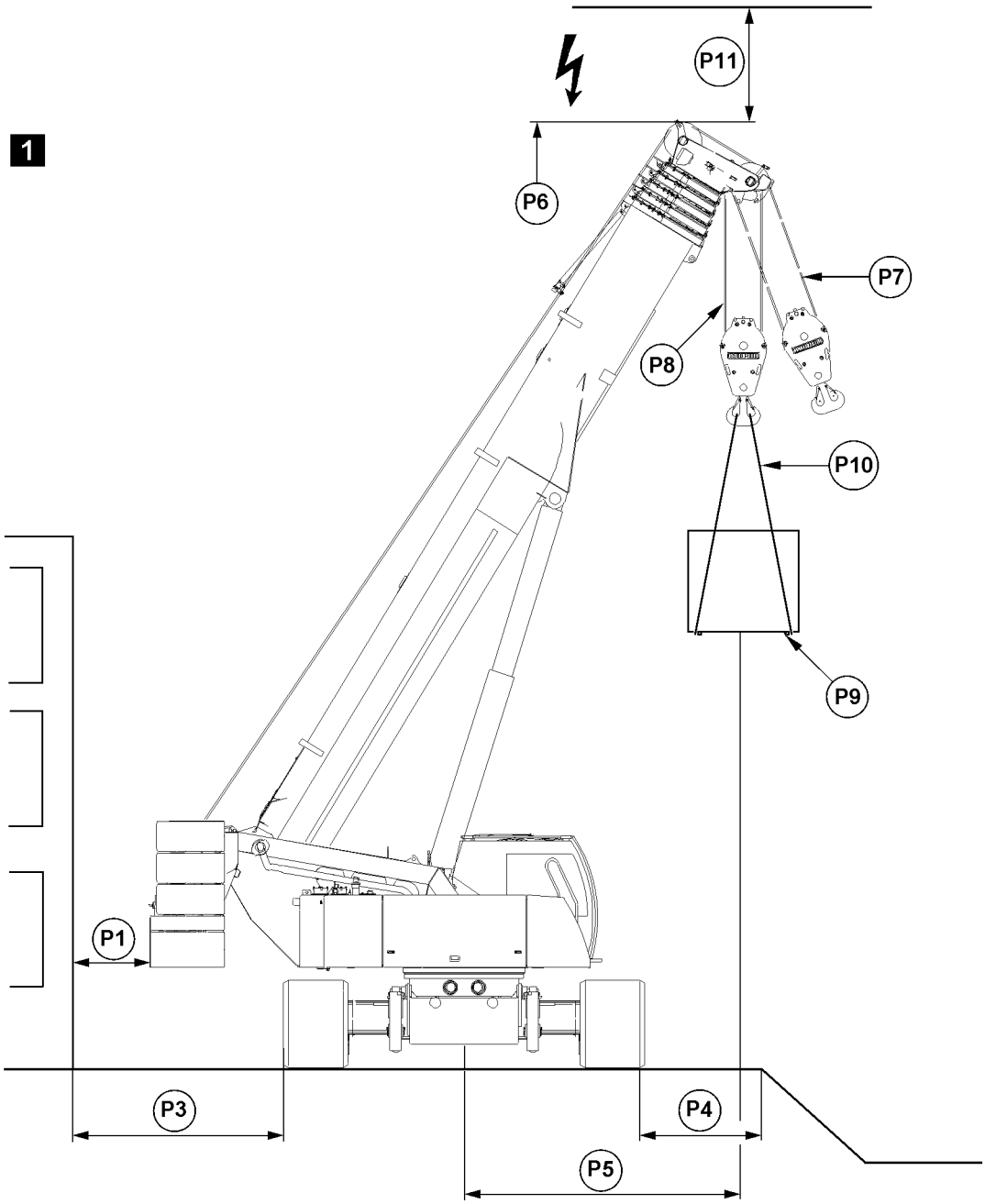

Fig.121166: Example for crawler crane with telescopic boom

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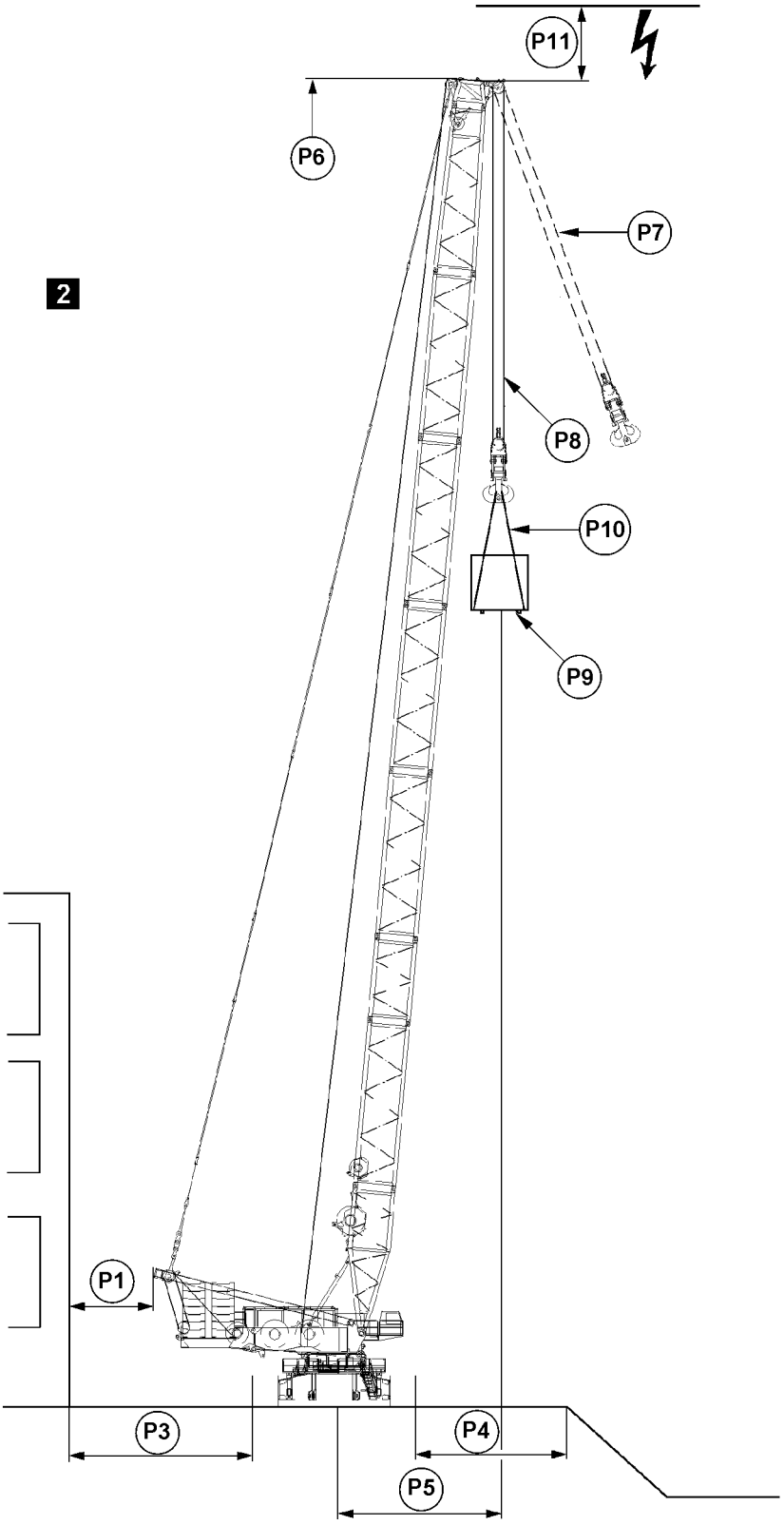

Fig.121167: Example for crawler crane with lattice mast boom

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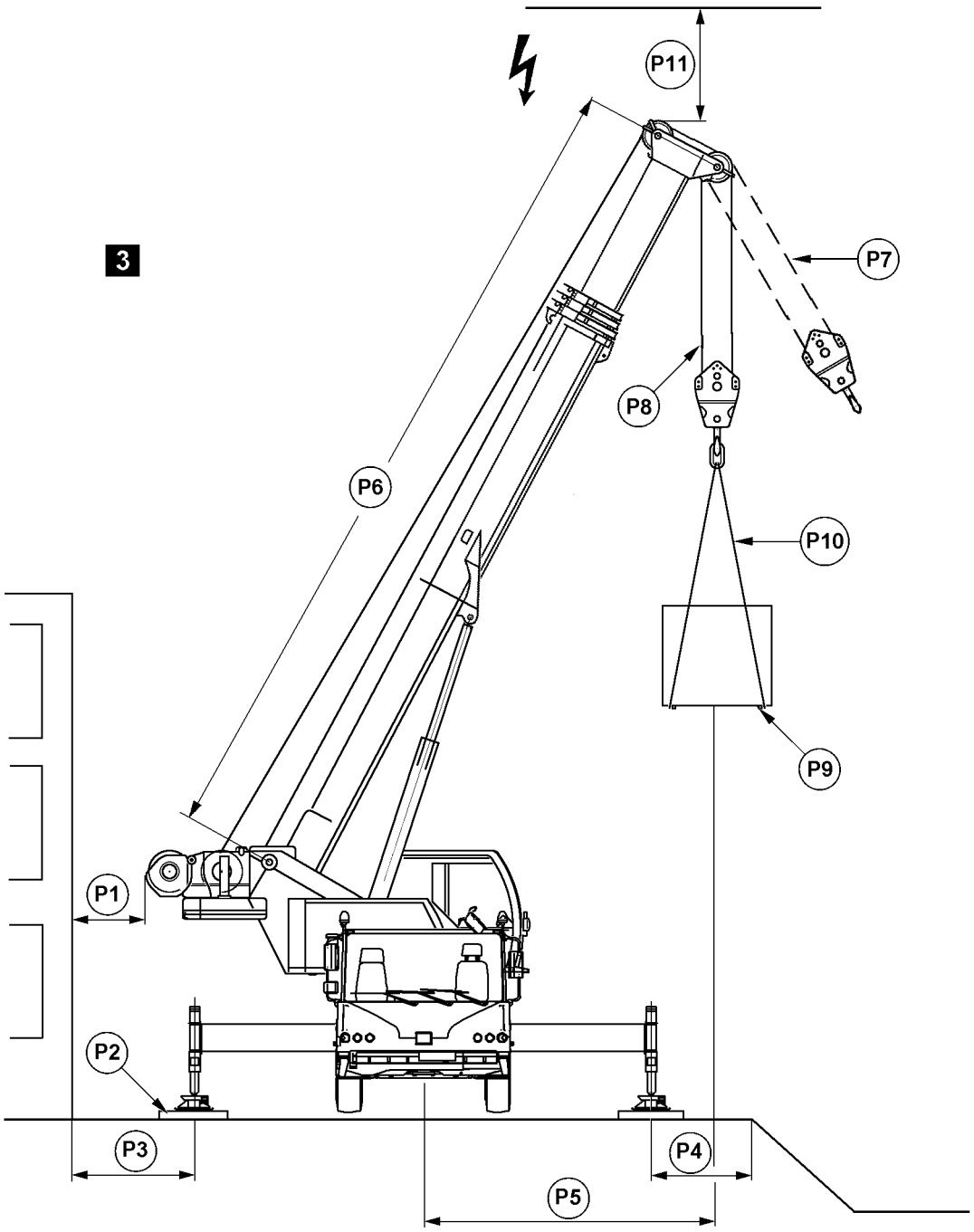

Fig.121168: Example for mobile cranes

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	Keep a safety distance to basements or similar.
P4	Keep a safety distance to slopes or similar.
P5	Keep the radius to as low as possible.
P6	Select the correct boom length to the load case.
P7	Angular pull is prohibited.
P8	Select the correct reeving of the hoist rope to the load case.
P9	Bear 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	Keep sufficient distance to electrical overhead wiring.

17 Slopes and ditches

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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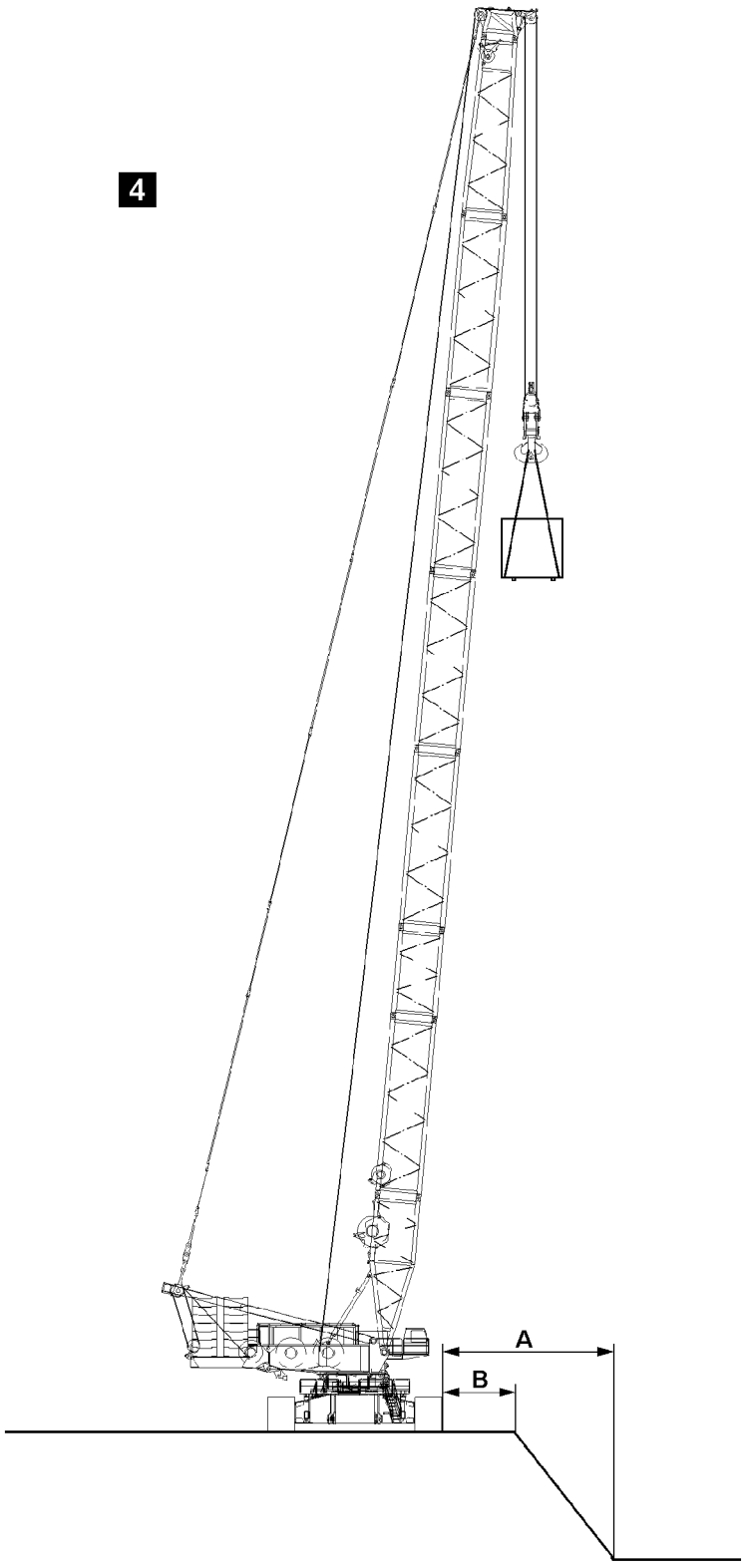

Fig.121162: Example for crawler cranes

A Distance to bottom of excavation

B Distance to excavation

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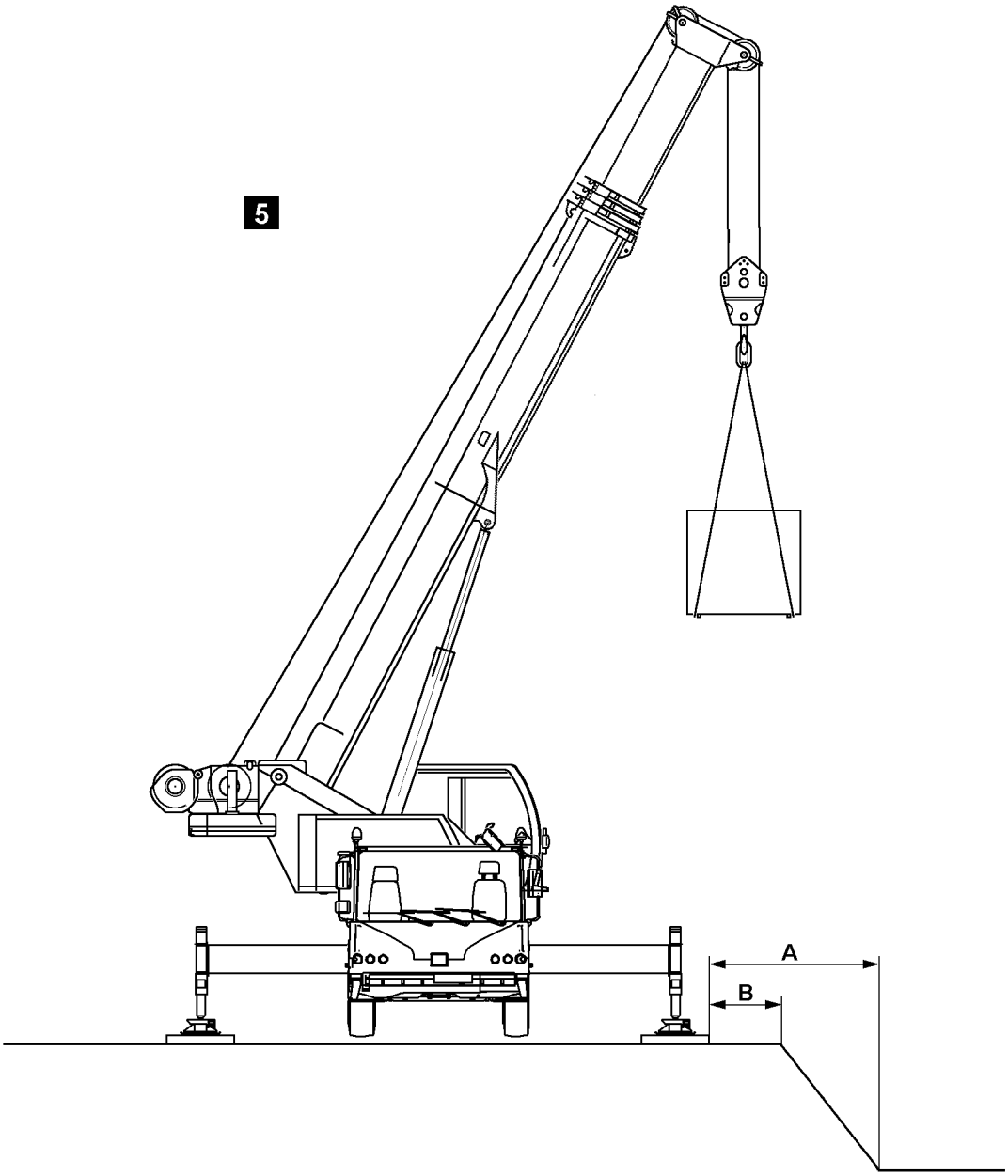

Fig.121163: Example for mobile cranes

A Distance to bottom of excavation

B Distance to excavation

WARNING
Toppling crane.
The edge of the slope or excavation can break in if safety distance **A** or safety distance **B** is too small.
If the edge of the slope or excavation break in, the crane can topple over and kill personnel.
▶ Always maintain the required safety distance **A** and safety distance **B**.

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18 Permissible ground pressures

Permissible ground pressures		
Soil type		[N/cm²]
1.	Organic ground:	
	Peat, sludge, muck	0
2.	Uncompacted fill:	
	Construction debris	0 to 10
3.	Non-cohesive ground:	
	Sand, gravel, rocks and mix	20
4.	Cohesive soil:	
	a) Clayed silt, mixed with topsoil	12
	b) Silt, consisting of poor clay and coarse clay	13
	c) Plastic clay, consisting of potter's clay and fill	
	Stiff	9
	Semi-solid	14
	Solid	20
	d) Mixed granular ground, clay to sand, gravel and rocky areas	
	Stiff	15
	Semi-solid	22
	Solid	33
5.	Rock in evenly solid condition:	
	a) Brittle, with traces of decomposition	150
	b) Not brittle	400

If there is any doubt about the load bearing capability of the ground at the site, soil tests should be carried out by specialists using, for example, a penetrometer.

Note

▶ Consider that the support force, due to the counterweight, can be higher without a load than with a load.

18.1 Permitted ground pressure for crawler cranes

In crane operation, significant forces are transferred to the ground. The ground must be able to safely withstand the pressure. If the crawler area is inadequate, then the crawlers must be supported from below according to the load bearing capacity of the ground.

WARNING

Toppling crane.

If the crane is not properly supported, the crane can topple over and fatally injure personnel.

▶ The foundation support must be large enough for the ground conditions and constructed from solid materials, such as wood or steel plates.

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18.2 Permitted ground pressure for mobile cranes

When the crane is supported, the support cylinders transmit significant forces to the ground.

In any case, the ground must be able to safely withstand this pressure. If the support pad area is inadequate, the support pads must be supported from below according to the load bearing capacity of the ground.

The required support area can be calculated from the load bearing capability of the ground and the crane support force.

WARNING
Toppling crane.
If the crane is not properly supported, the crane can topple over and fatally injure personnel.
- ▶ Only strong materials may be used for the support pad bases; for example properly dimensioned wooden timbers.
- ▶ In order to ensure that pressure is evenly distributed across the base surface, the support pads shall be positioned at the center of the base.

Note
- ▶ 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.

Example: Calculation of specific support pressure	
Maximum support force according to crane operating instructions, chapter 1.03 for example: 720 kN	720000 N
Surface of square support plate with 550 mm side length according to chapter 1.03, for example: 302500 mm^2	3025 cm^2
80 % as carrying surface of support plate: 302500 mm^2 x 0.8 = 242000 mm^2	2420 cm^2
Specific support pressure = Support force / surface support plate	720000 N / 2420 cm^2 = 297.52 N/cm^2
Specific support pressure:	**298 N/cm^2**

The value of the specific support pressure is far higher than the permissible ground pressure for all types of granular soil. If this crane is utilized on bedrock, type of ground gravel, permissible ground pressure 20 N/cm^2 , then the support surface must be increased.

Example: Calculation of required support surface	
Maximum support force according to crane operating instructions, chapter 1.03 for example: 720 kN	720000 N
Permissible ground pressure, for example: 20 N/cm^2	20 N/cm^2
Required support surface = Support force / permissible ground pressure	720000 N / 20 N/cm^2 = 36000 cm^2
Required support surface:	36000 cm^2 = **3.6 m^2**

The surface of the support for each support plate must be at least **3.6 m^2**.

The height of the support must be selected depending on the load distribution angle.

Note
- ▶ The corresponding support forces can be determined with the crane job planner.

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18.3 LICCON job planner

The calculation of support forces and ground pressures of tracks with the LICCON job planner are based on idealized assumptions.

Side deformations of the boom system due to wind, inclined position and elastic compliancy of the steel structure are not taken into account in the LICCON job planner.

These influences can lead to an increase of support forces or increase of ground pressures of the tracks.

19 Support

19.1 Supporting the crane

DANGER
Toppling crane.
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 system.
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 exactly in accordance with the load charts to ensure safe crane operation.

The match 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
Toppling crane.
If only the sliding beams on the load side are extended, then the crane can topple over and kill personnel.
- ▶ Move all 4 sliding beams and support cylinders out according to the data in the load chart and pin.
- ▶ In intermediate positions between the support bases, do **not** support.
- ▶ Pin the sliding beams to support base according to the load chart.
- ▶ Fully insert and secure the pins.

WARNING
Danger 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 is dropped 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 slewing from the longitudinal vehicle direction.
- ▶ Move all 4 sliding beams and support cylinders out according to the data in the load chart.

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19.2 Supporting the crane with *variable support*

When supporting the crane with *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

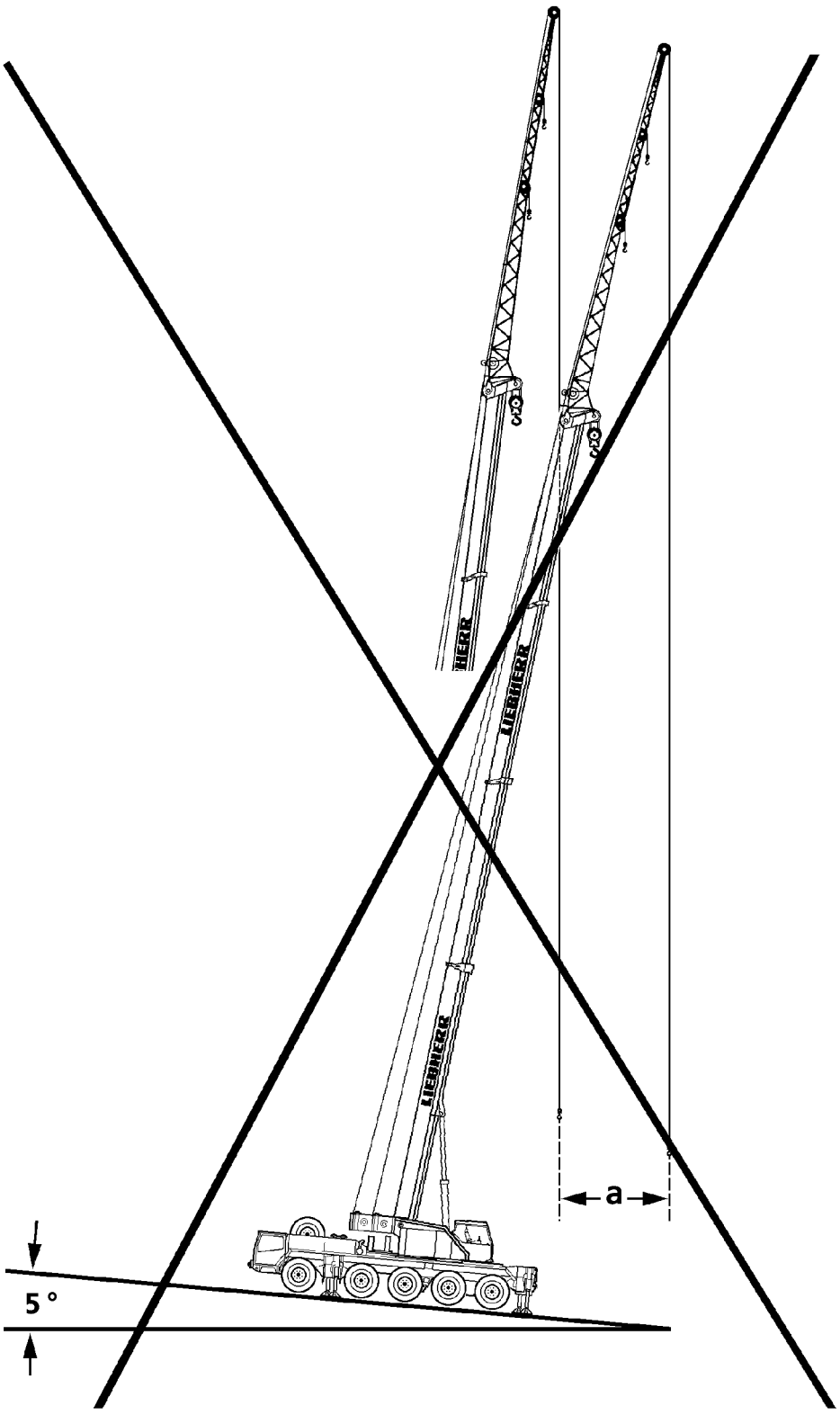

*Fig.121164: Example for **non-permissible** incline position*

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

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 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 of the crane by only 5° at a 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 the crane may be operated with minimum boom projection.
- The load bearing capacity of the ground is adequate.
- There is sufficient distance 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 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 guidelines in case of external power supply

Fig.197720

A potential hazard 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 it 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

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 operation:
– Near transmitters (radio and TV transmitters, radio stations, etc.)

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- 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 risk 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 operation:
- 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

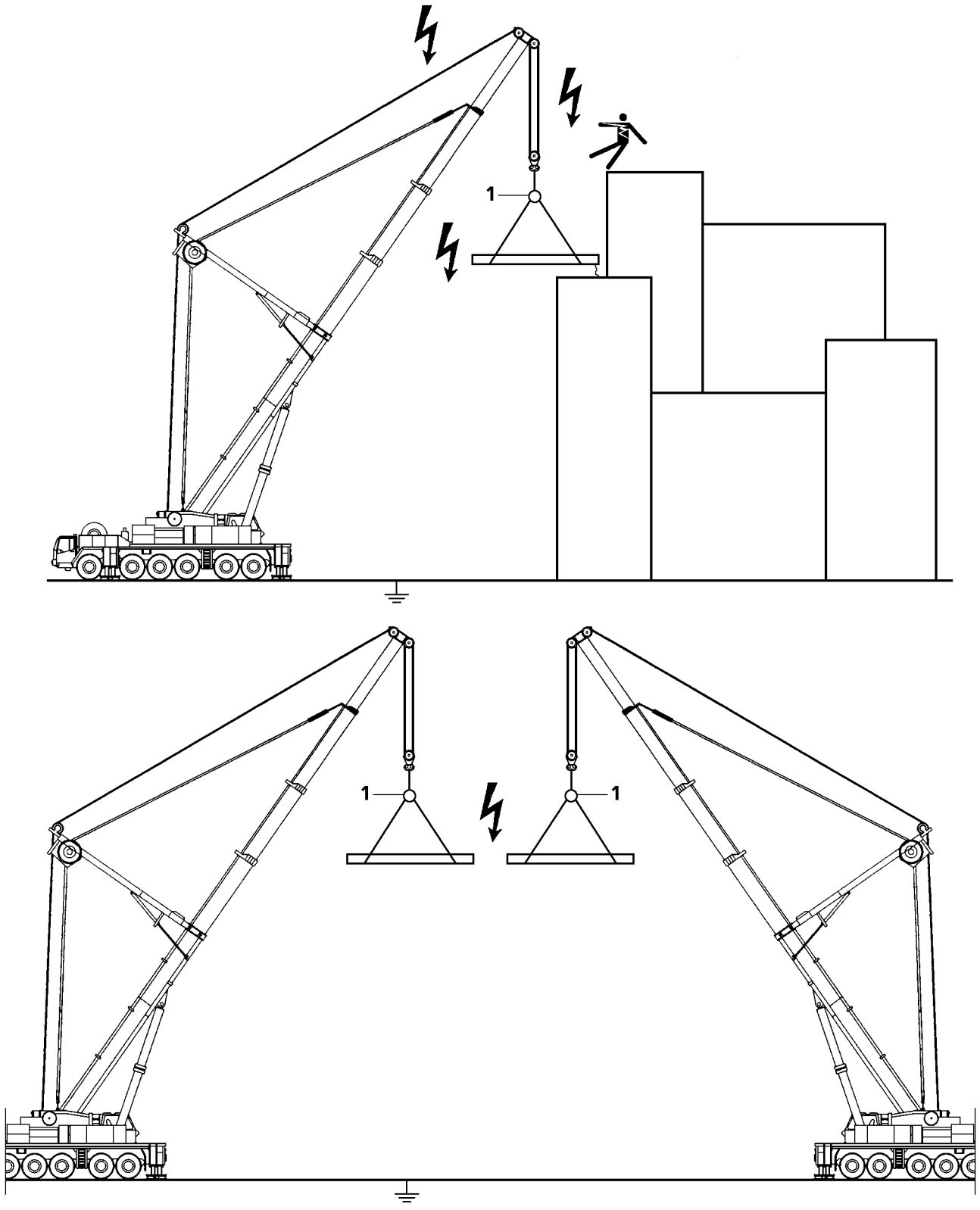

Fig.121165: Example for electrostatic charge

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 personnel:

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 carrying capacity, any such occurrences must be reported immediately to the foreman 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 is the voltage 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, place the load down.
- If possible, telescope the boom in or put it down 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.

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

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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.

WARNING

Increase of support force and exceedance of permissible ground pressure.
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 forces and the ground 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.
The ground pressure is increased.
▶ Do not exceed the permissible ground pressure.

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.

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26.1 Wind speed charts for *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.

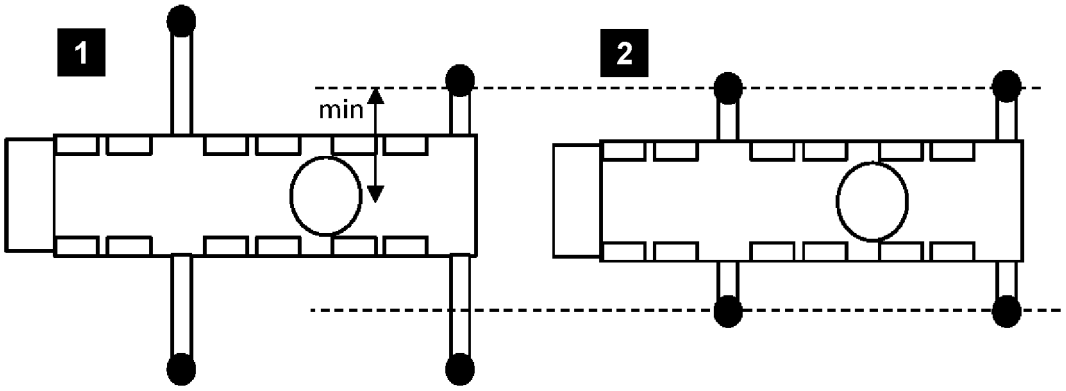

Fig.121577: Example for the selection of wind speed charts for variable support

Example for the selection of wind speed charts for *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 tip of the boom and shows the current wind speed in the crane cab.

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.

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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: 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 operator.
- ▶ 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	Description	[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
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

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Wind force		Wind speed		Effect of the wind
Beaufort number	Description	[m/s]	[km/h]	Inland
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 dependent wind speeds according to EN 13000:2010

Note

- The maximum permissible wind speed (v_{max}) and the maximum permissible wind speed according to the load chart (v_{max_TAB}) always refers to the 3 second wind gust speed, which is present in 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 medium 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 time 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
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

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Beaufort number	3	4	5[a]	5	6	7[a]	7	8	9	10
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 back pressure, determined from v(z)

Symbol

26.6 Wind influences during erection and take down

WARNING
Toppling crane.
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.
Toppling crane. Death, severe injury, property damage.
- ▶ If wind speeds are expected which 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 Erection and take down charts.
- ▶ Observe the permissible wind speeds for take down.

26.7 Wind influences in crane operation

WARNING
Toppling crane.
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 signifiant 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
Toppling crane.
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 which are larger than the maximum permissible wind speeds for the equipped crane, then the attachments and the boom must be taken down.
- ▶ If wind speeds are expected which 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
Toppling crane. 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 which 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 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 supervisory person must monitor the operation and remain in constant contact with the crane operator.

WARNING
Overload and toppling 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 guidelines.
- ▶ 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_1)** is lowered, the load on crane 2 **(F_1)** increases. Crane 1 can thereby be overloaded.

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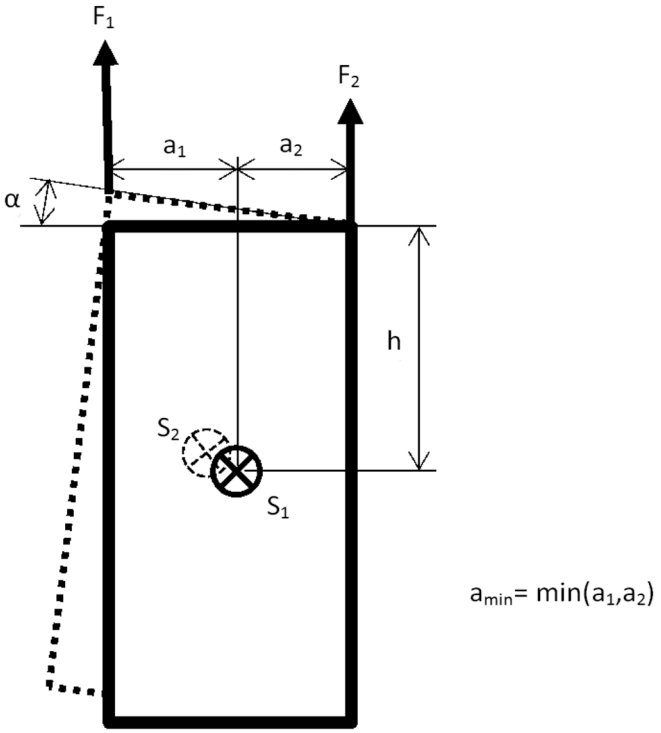

Fig.124126: Geometric conditions

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 chart 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 Working ranges overlap

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.

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

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 load.
- ▶ 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, **national regulations** must be observed.

29.1 Hand signals

29.1.1 Starting operation, follow my instructions

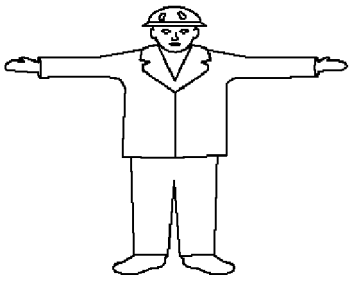

Fig.111700: Start operation, follow my instructions

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

29.1.2 Stop (normal stop)

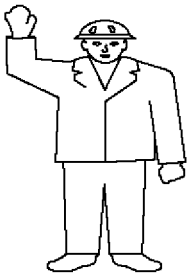

Fig.111701: Stop (normal stop)

Lift one arm overhead with open hand and palm directed to the front.

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29.1.3 Emergency stop (quick stop)

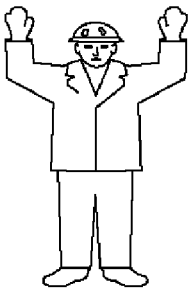

Fig.111702: Emergency stop (quick stop)

Lift both arms overhead with open hands and palms directed to the front.

29.1.4 End operation, no longer follow my instructions

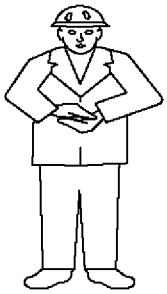

Fig.111703: End operation, no longer follow my instructions

Fold hands together at chest height in front of body.

29.1.5 Inching gear or very slow movement

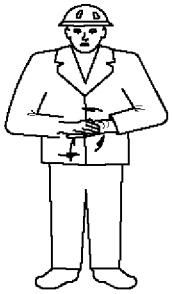

Fig.111704: Inching gear or very slow movement

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

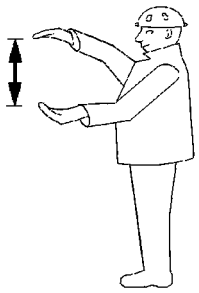

Fig.121364: Show the vertical distance

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: Lift / lower 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

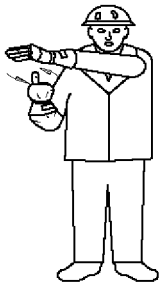

Fig.121365: Lift slowly

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

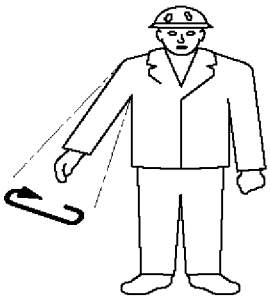

Fig.111708: Lower the load while stationary

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

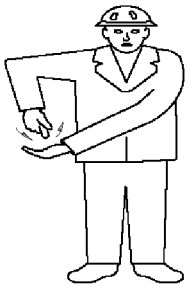

Fig.121366: Lower slowly

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 Moving / swinging in specified direction

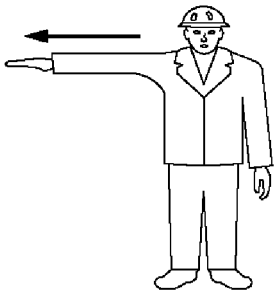

Fig.111710: Move / swing in specified direction

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: Move 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

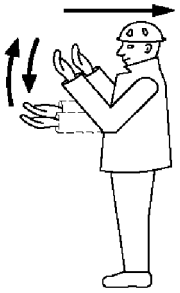

Fig.111712: Move toward me

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

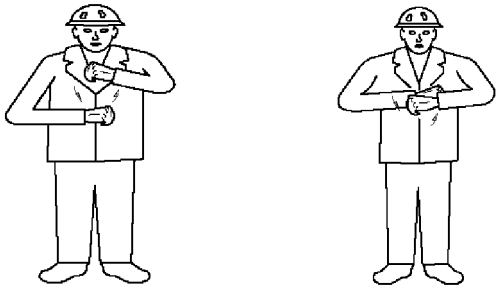

Fig.121367: Move both track chains

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 track chain

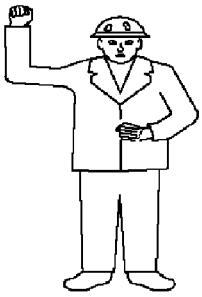

Fig.111714: Move one track chain

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

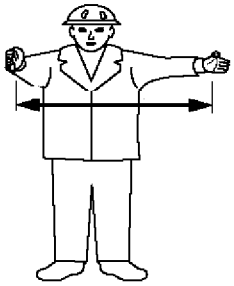

Fig.121380: Show the horizontal distance

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)

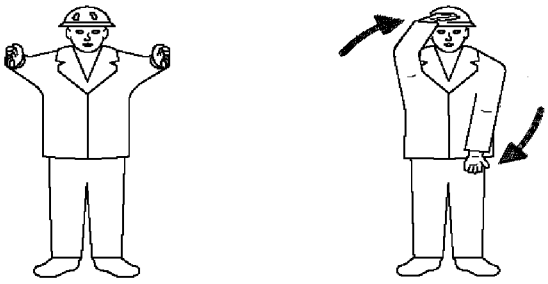

Fig.121368: Transfer (between two cranes or two hooks)

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

WARNING
Danger of toppling the crane.
▶ Make sure that the load carrying 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

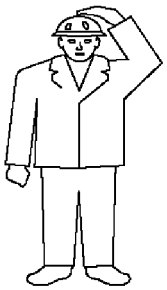

Fig.111719: Lift with main winch

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

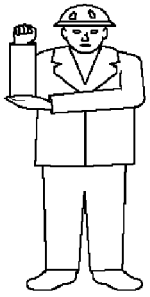

Fig.111720: Lift with auxiliary winch

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

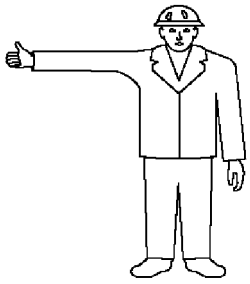

Fig.111721: Lift the boom

Hold one arm horizontally with thumb directed upward.

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29.4.4 Lowering the boom

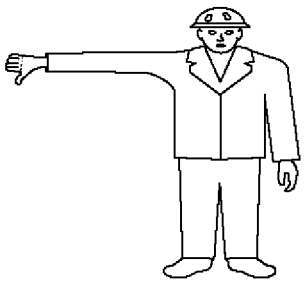

Fig.111722: Lower the boom

Hold one arm horizontally with thumb directed downward.

29.4.5 Extending the boom

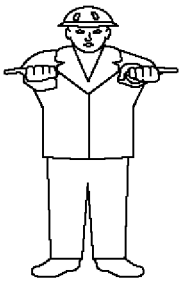

Fig.111723: Extend the boom

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

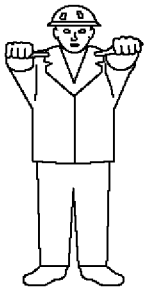

Fig.111724: Retract the boom

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

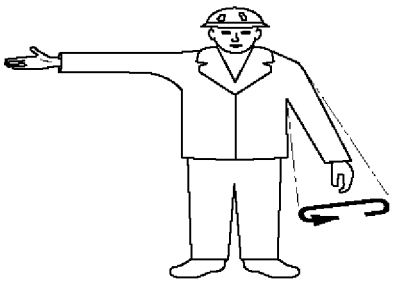

Fig.111725: Lift the boom and lower the load at the same time

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

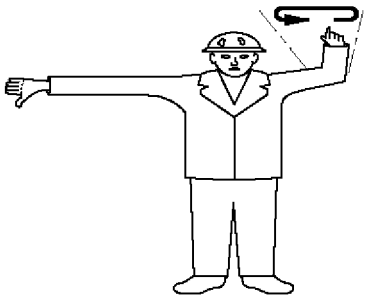

Fig.111726: Lower the boom and lift the load at the same time

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

30 Crane operation with a load

WARNING
Toppling crane.
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 devices, for example: Load moment 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 with a load which exceeds those specified in the load charts.
- The weight, center of gravity and dimensions of the load to be lifted must be known.
- Load carriers, load lifting and fastening equipment must be in accordance with specified requirements.

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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.**

30.1 Counterweight and / or ballast

The type of counterweight and / or ballast required depends on the weight of the load to be lifted and the 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

Toppling crane.

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.

30.2 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

Breaking hoist rope.

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 tensile force of the hoist gear.

30.3 Crane operation

DANGER

There is a high risk of accidents should the following points not be observed.

▶ Observe the following points.

Great danger of accidents exists if:

1. The load torque limiter is not set to the current set up configuration of the crane and is therefore not able to provide proper protection.
2. The load torque limiter is defective or taken out of operation.
3. The hoist limit switches are defective or not functioning.

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4. For crawler cranes and mobile cranes with luffing lattice jib:
   The angle sensor and the force test brackets are not functioning.
5. For mobile cranes and crawler cranes with support:
   The sliding beams of the hydraulic supports are not extended to the dimensions specified in the load chart.
6. On crawler cranes:
   The crawlers are not supported with stable base material sufficiently large for the ground conditions.
7. For mobile cranes and crawler cranes with support:
   The support plates are not supported with stable base materials sufficiently large for the ground conditions.
8. If the load is pulled at an angle.
   Angular pulling to the side is particularly dangerous, because the boom has only minimal lateral resistance momentum.
   Angular pull is prohibited.
9. Load attached during disassembly is too heavy and is freely suspended on the crane after release.
10. 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 jerk back violently.
11. When working when the wind is excessively strong.
    Comply with the load chart specifications.
12. The crane is not aligned horizontally and the load is swung toward the slope.
13. If improper crane movements cause the suspended load to swing like a pendulum.
14. The loads and radii specified in the load charts are exceeded.
15. When working in the vicinity of electricity transmission lines:
    - The electricity transmission lines were not turned off by expert electricians
    - **or** 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 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
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

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31 Lifting of personnel

31.1 Destined 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.

WARNING

Non-designated use of the crane.

Personnel can be severely injured or killed.

▶ The crane is **not** intended to lift personnel.

▶ 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).

31.2 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.

31.2.1 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 was 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.

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31.2.2 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.

31.2.3 Inspection before operation

Make sure that the following inspections are made before use of 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.

31.2.4 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 capacity of the valid load chart.

32 Securing personnel on shut off crane

32.1 Terms and abbreviations

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

32.2 Destined 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 care is present.
- A project-specific written risk assessment and work procedure for the precise case by the employer is on hand.
- Specific safety measures are strictly adhered to.
- The crane is intended by the manufacturer for personnel protection.

Limitations for movement and operation:
- Moving the secured person on the crane **from** job site and **to** job site is impermissible.

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– 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.

32.3 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.

32.3.1 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
  • 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.

32.3.2 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 body 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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32.3.3 Crane

Make sure that the following prerequisites are met:
- The maintenance intervals and recurring crane inspections of 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 capacity: For the load cases catching, pendular fall and possible diagonal pull adhere to the manufacturer's instructions.
- The crane is secured against movements and inadvertent movement (remote control is deactivated, crane control is activated).
- Only for aligning loads in the end position: Carry out a minimum of crane movements with the least possible speed.
- The overload protection is active.
- Auxiliary booms are **not** used.

32.4 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.

32.5 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.

32.6 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

33 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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34 Travel and crane operation

34.1 Before starting to work

Before driving the crane and before starting to work with the crane:

- ▶ Close all doors.
- ▶ Keep the doors closed during travel and crane operation.

34.2 During crane operation

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 completely and place it down, find the source of the problem and remedy it.

34.3 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:
- ▶ Place 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.

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 leakage, no danger for persons, crane and surrounding is created.

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

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Note

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

WARNING

Crane is unsupervised.

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:

▶ Place 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.

WARNING

Set up crane is unsupervised.

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.

▶ Before the crane is unsupervised: Establish an emergency plan.

Note

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

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WARNING
Set up crane is unsupervised.
If the set up crane is left during interruption of crane operation, situations may occur which could cause the crane to become unsafe.
Toppling crane, death, severe bodily injuries, property damage.

If possible:
▶ Place the equipment down and secure it.

If possible:
▶ Telescope the boom in and secure it.

If possible:
▶ Place the boom down and secure it.

For mobile crane:
▶ Lift the axles to the maximum position and block the hydraulic suspension.
▶ Place the suspended ballast down on the ground.
▶ Place the load fully on the ground and unhook 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.
▶ 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, which are required for restart.
▶ Establish the energy supply and functionality of safety devices.
▶ 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.
▶ 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.

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.

When the boom can **not** be placed down:
▶ Telescope the telescopic boom in as far as possible and erect the boom as far as possible.

When **no** park position is described:
▶ Bring the crane into a position, which was determined by an expert, who has knowledge about the job site, conditions, limitations, safety regulations and the expected weather conditions.
▶ Make sure that access to the crane and operation for unauthorized personnel is excluded: Close the driver's cab, crane cab and windows.
▶ Make sure that all measures were taken to keep the crane in a safe condition if something happens.

Incidents 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

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- Landslides
- Washouts
- For mobile cranes and crawler cranes with support:
  Slippage of support cylinders (leakage, temperature changes)
- For cranes with telescopic booms:
  Slippage of luffing cylinders (leakage, temperature changes)

Make sure that the following prerequisites are met:
- **No** load on hook
- The fastening ropes on the hook were removed.
- The hook block is in the highest position.
- The driver's cab and the crane cab are locked.
- The predicted wind speeds during the time frame of the interruption of crane operation are within the permissible range.
- The crane poses no traffic obstacle.

34.4 Resuming crane operation

Before resuming crane operation, the crane operator is obligated, among others, but not exclusively, to inspect the crane condition, the safety devices, 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.

▶ Check operating mode settings and reset, if necessary.

34.5 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 all the way in and place the boom down.
▶ On crane with lattice mast boom: Set down the lattice mast boom and disassemble if necessary.
▶ Bring the control lever (master switch) to 0-position.
▶ Apply the parking brake on the crane chassis.
▶ Turn the engine off and pull the ignition key.
▶ Turn the battery master switch off and remove 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.

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34.6 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 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.

34.7 Parking the mobile crane

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

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 the ignition off and pull out the ignition key.
- ▶ Turn the battery master switch off and remove the switch cam.

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

If necessary:
- ▶ Place wheel chocks.

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Fig.195219

1 Safety guidelines

The ladders have been 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.

The 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 on the structure may exclusively be made with written approval of the manufacturer.

The ladders are exclusively designated for the entry and exit of personnel.

Any other use is not as intended and therefore prohibited.

The manufacturer is **not** liable for damages, which are caused by unintended use or improper usage.

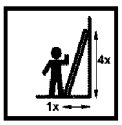
WARNING
Danger of falling!
If the following safety guidelines are not observed, personnel can fall down and be killed or severely injured.

- ▶ 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.
- ▶ 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.
- ▶ Do not use damaged ladders and replace them immediately.
- ▶ Repair the ladder exclusively through authorized service facilities.

2 Safety signs

Note

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

Sign	Explanation
	Read the operating instructions.
	Maximum number of users on one ladder.
	Correct set up angle 65° to 75°.

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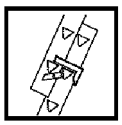
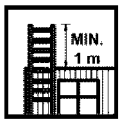
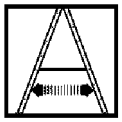
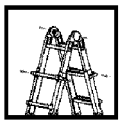
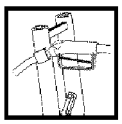
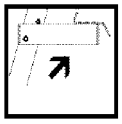
Sign	Explanation
	Before use: Engage the lift out safety.
	Ladder overhang above the exit level.
	Secure the upper / lower end of the ladder.
	Before use: Tension the safety struts on stepladders.
	Before use: Engage the locking pin joints and pull pin locks.
	To open / close the tank cover and to ascent / descent: Insert the nozzle into the retainer.
	Fold the platform out before setting up the ladder.
	Before use: Check the ladder for damage.
	Check the legs of the ladder.
	Maximum load.

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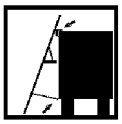
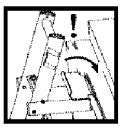
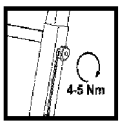
Sign	Explanation
	Do not use the three uppermost rungs of an extension ladders as rungs to stand on.
	Do not use the four uppermost rungs / steps of a stepladder without a platform to stand on.
	Do not use the two uppermost rungs of a stepladder with integrated extension ladder as rungs to stand on.
	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.
	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.

Sign	Explanation
	Only one person may climb up / down on any accessible leg of the ladder.
	Avoid leaning out to the side. The body's center of gravity should be 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 (extension) ladder.
	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.

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Sign	Explanation
	Do not carry along bulky objects or objects over 10 kg.
	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!
	Danger due to shearing point.

3 Ladder inspection

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

4 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.
- Use are able to use a ladder as far as your health is concerned.
- 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

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  - Frost
  - Wet paint
  - Lubricants
- The legs of the ladders are not worn.
- Screws and connections have been checked for tight seating.
- The base is:
  - Level
  - Horizontal
  - Slip-resistant
  - Unmoveable

Before setting the ladder up:
- 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.

When using the ladder:
- Make sure that no children are playing on the ladders.
- Set the ladder up in the correct set up angle.
- Subject the ladder with 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 excessively to 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 (extension) 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.
- For working on a ladder: Grip with one hand.
  If this is not possible: Take additional safety measures, such as: Use a WORK POSITIONING SYSTEM (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.

5 Ladder access

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

5.1 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 structure
- 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

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5.2 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.

5.3 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

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

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5.4 Types of ladders

5.4.1 Stepladder

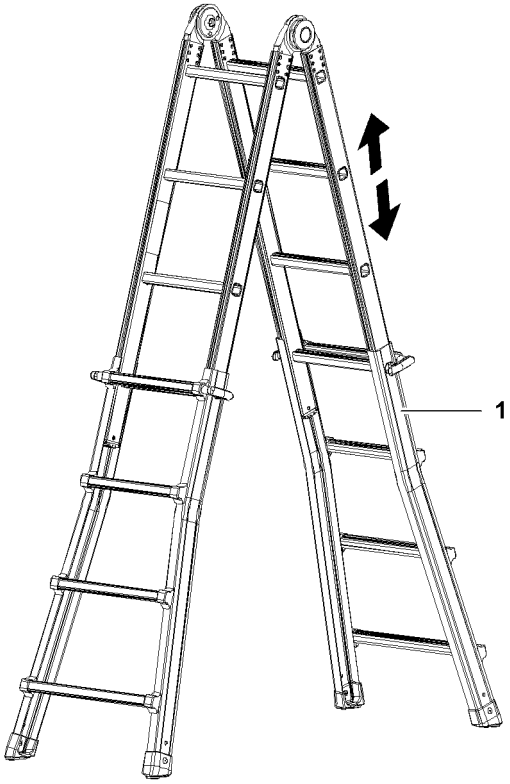

Fig.121175: Examples for stepladders

WARNING
Danger of falling when transitioning from a stepladder **1** to other components!
Personnel can fall down and be killed or severely injured.
▶ Do **not** transition from a stepladder **1** to other components.

WARNING
Danger of falling!
Personnel can fall down and be killed or severely injured.
▶ 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 is not 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***

5.4.2 Leaning (extension) ladder

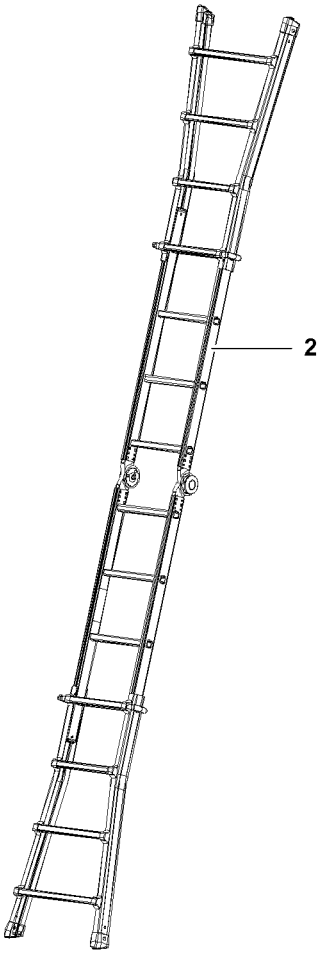

Fig.121176: Example for leaning (extension) ladders

WARNING
Danger of falling!
Personnel can fall down and be killed or severely injured.
▶ When using leaning (extension) 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 (extension) ladder **2** is positioned onto a level placement surface.

- Make sure that the leaning (extension) 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 (extension) 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 is not 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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5.4.3 Leaning (extension) ladder with transition

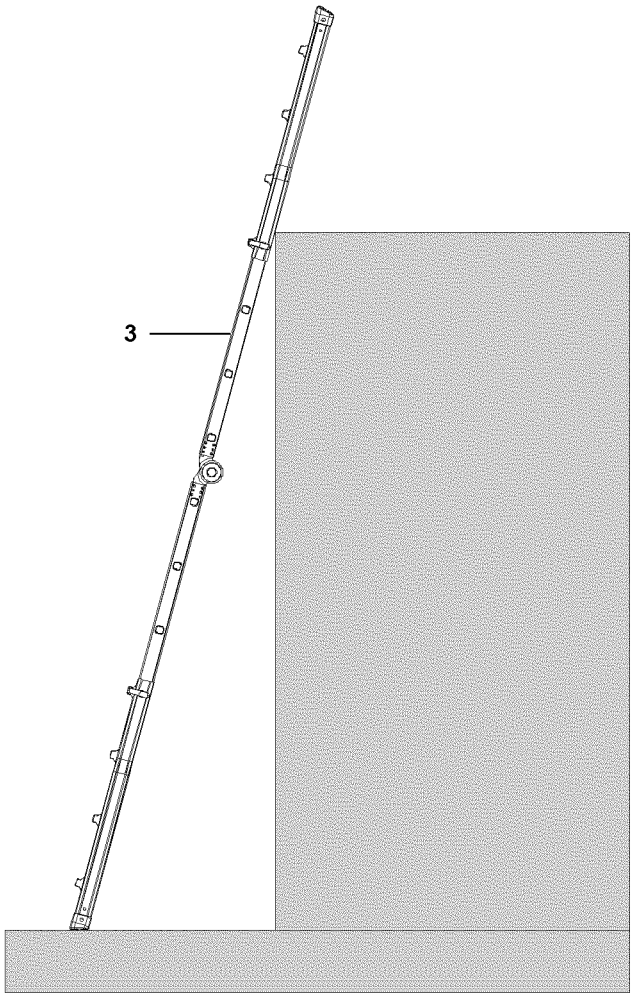

Fig.121177: Examples for leaning (extension) ladders with transition

WARNING
Danger of falling!
Personnel can fall down and be killed or severely injured.
- ▶ When transitioning, adhere to the 3-point support.
- ▶ Adhere to the prerequisites and conditions for the use of leaning (extension) ladders with transition **3**.

Prerequisites for the use of leaning (extension) ladders with transition **3**:
- – Make sure that the leaning (extension) ladder with transition **3** is positioned onto a level placement surface.
- – Make sure that the leaning (extension) ladder with transition **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 (extension) 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 ladder overhang when leaning it on components is selected in such a way that the leaning (extension) ladder is safely placed when subjected to a load / flex due to ascending persons.
- – Make sure that the weight of the tool carried along is not 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***

5.4.4 Vertical ladder with transition aid

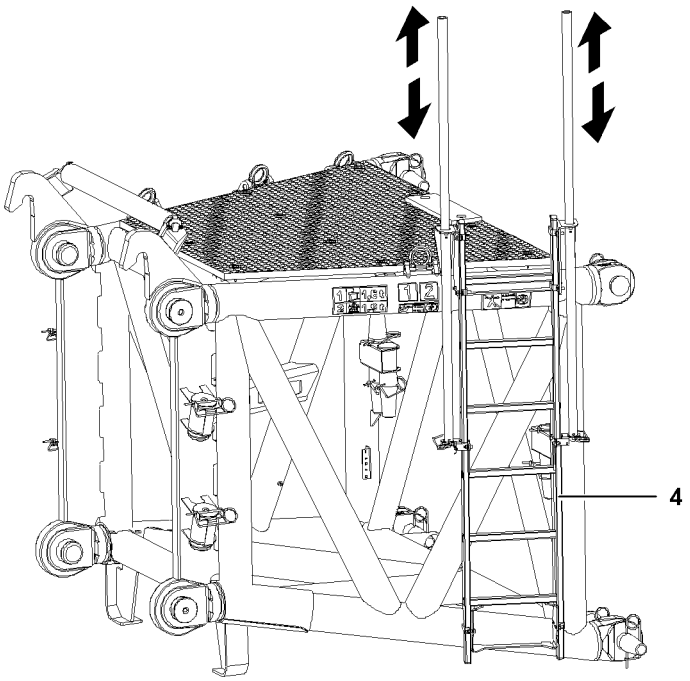

Fig.121178: Example for vertical ladder with transition aid

WARNING
Danger of falling!
Personnel can fall down and be killed or severely injured.

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 is not more than 10 kg.

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

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

Access	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 access and transition to vertical ladders with / without transition aid **4***

5.4.5 Platform ladder

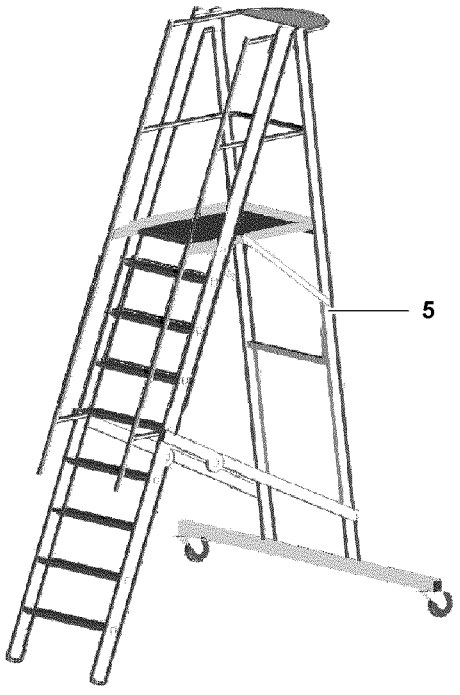

Fig.121179: Example for platform ladder

WARNING
Danger of falling when transitioning from a platform ladder **5** to other components!
Personnel can fall down and be killed or severely injured.
▶ Do **not** transition from a platform ladder **5** to other components.

WARNING
Danger of falling!
Personnel can fall down and be killed or severely injured.

For use of 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 is not 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	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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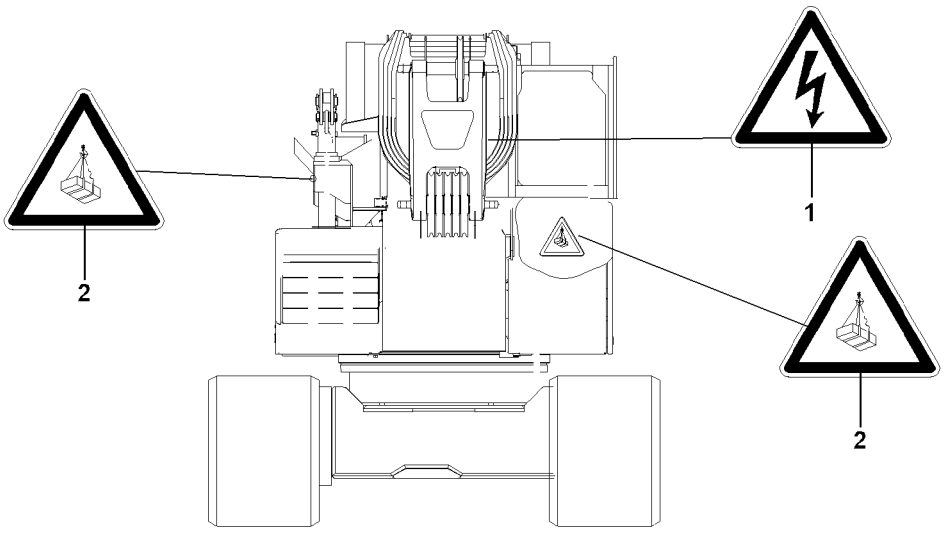

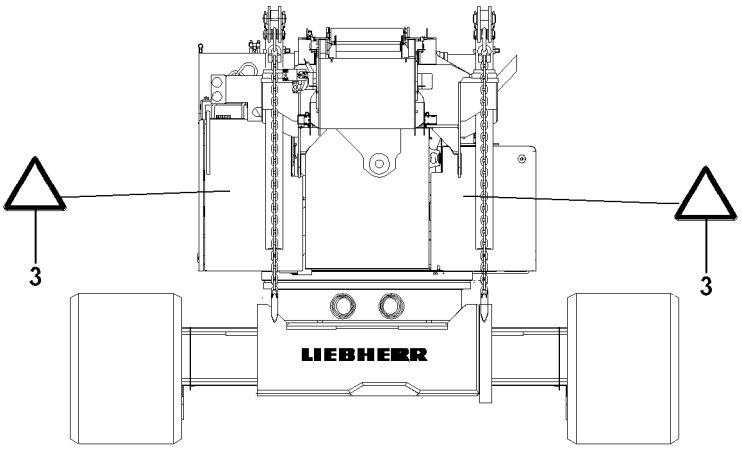

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Fig.198663

1 Warning signs

1.1 Configuration of warning signs

The shape is a triangle, the border and the sign are black. The base is yellow.

Note

- ▶ Warning signs are safety signs, which warn of a risk or danger.
- ▶ For that reason, all warning signs on the crane must be complete and always legible.

1.2 Warning signs on the crane

The following warning signs are installed on the crane:

- Warning sign **1**, „Warning of dangerous electric current“, valid only for certain countries*****
- Warning sign **2**, „Warning of suspended load“
- Warning sign **3**, „Slewing range“, valid only for certain countries*****

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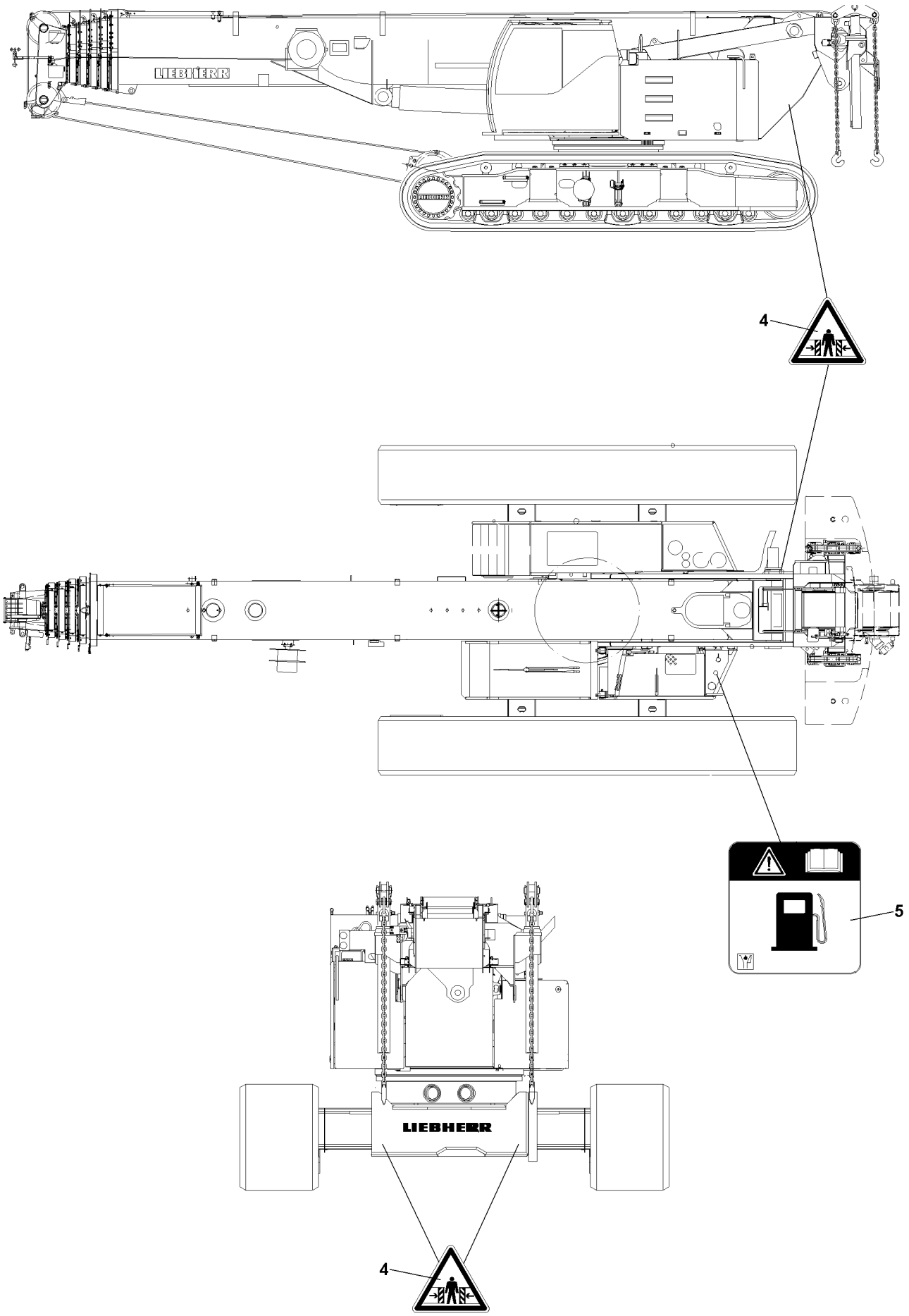

Fig.198667

- Warning sign **4**, „Danger of crushing“
- Warning sign **5**, „Only fill with diesel fuel“

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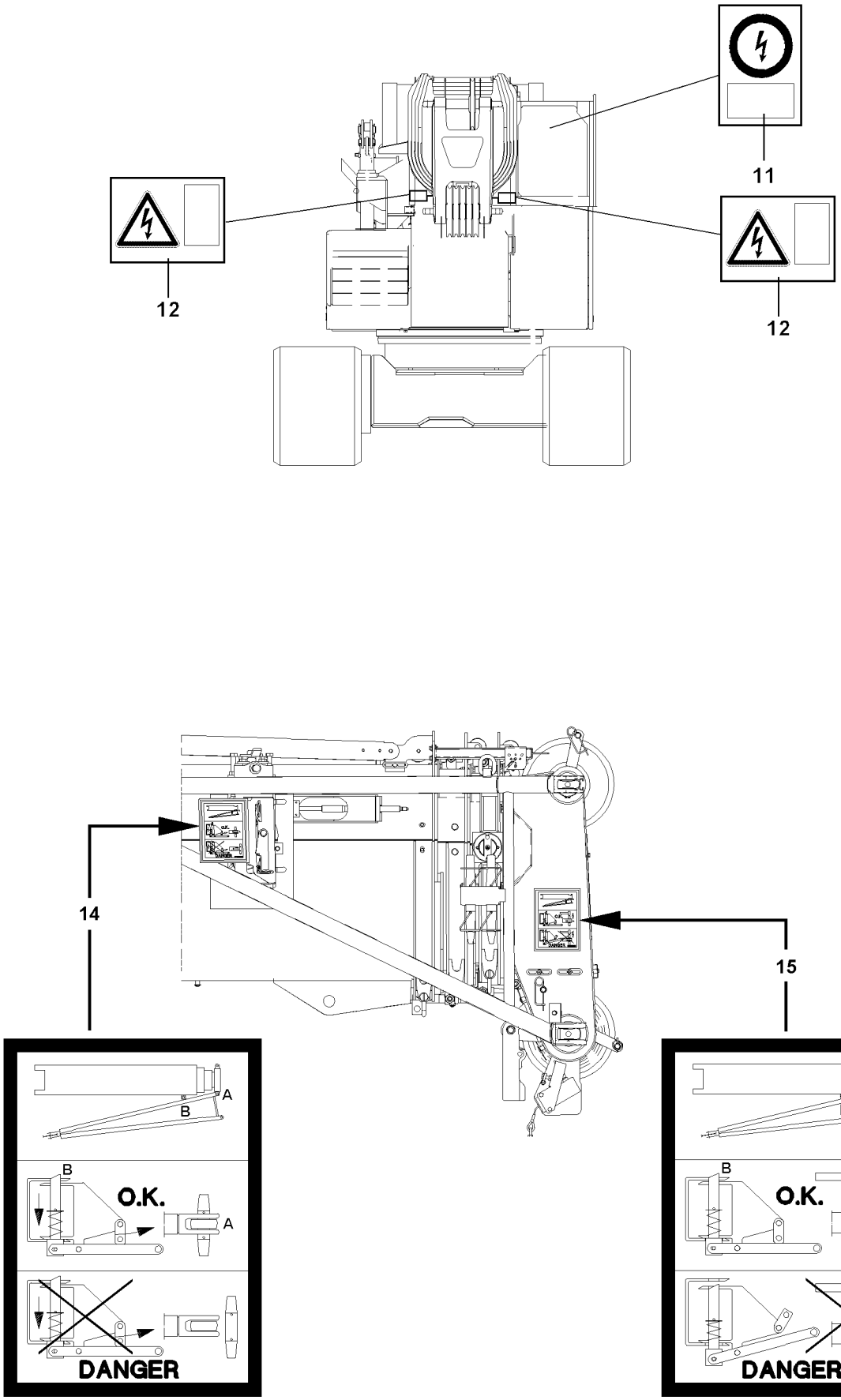

Fig.198664

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2 Warning notes

2.1 Configuration of warning notes

The shape is rectangular. The border, the lettering and the symbols are black. The base is yellow.

Note

- ▶ Warning notes are safety signs with text, which warn of a risk or danger.
- ▶ For that reason, all warning notes on the crane and the folding jib must be complete and always legible.

2.2 Warning notes on the crane

The following warning notes are installed on the crane:

- Warning note **11**, „Warning of high voltage“, valid only for certain countries*****
- Warning notes **12**, „Warning of dangerous electric current“, valid only for certain countries*****

2.3 Warning notes on the auxiliary boom

The following warning notes are installed on the auxiliary boom:

- **14** Warning note
- **15** Warning note

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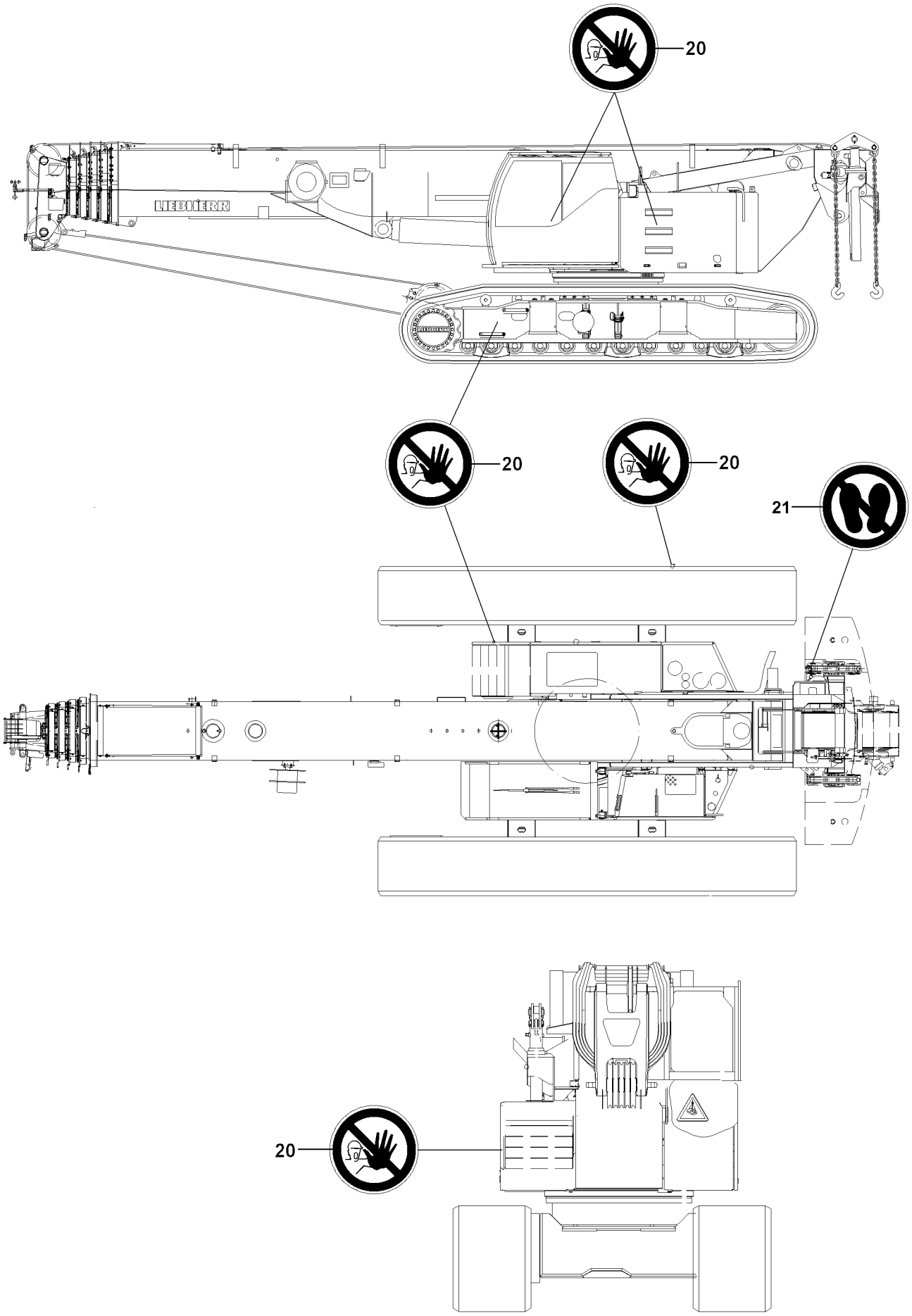

Fig.198665

LWE/LTR 1100-005/17505-03-02/en

3 Command / prohibition signs

3.1 Configuration of command signs

The shape is round and the base is blue.

The surface of the sign is bordered by a bright edge.

Note
- ▶ Command signs are safety signs, which dictate a certain behavior.
- ▶ For that reason, all command signs on the crane must be complete and always legible.

3.2 Configuration of prohibition signs

The shape is a round, the border is red, and the symbol is black. A red crossbar is drawn through the symbol. The base is white.

Note
- ▶ Prohibition signs are safety signs, which prohibit a behavior, which can result in danger.
- ▶ For that reason, all prohibition signs on the crane must be complete and always legible.

3.3 Command / prohibition signs on the crane

The following command / prohibition signs are installed on the crane:

- Prohibition sign **20**, „Access for unauthorized personnel prohibited“
- Prohibition sign **21**, „Walking on the area is forbidden“

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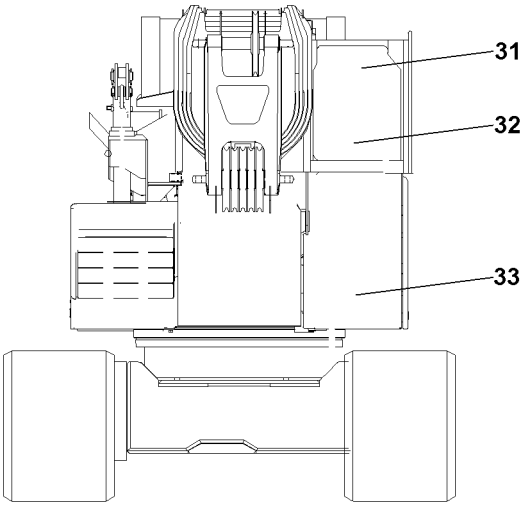

Fig.198666

4 Notice signs

4.1 Configuration of notice signs

The shape is rectangular and the lettering is black. The base is yellow.

Note

- ▶ Notice signs are signs, which provide additional notes in text form.
- ▶ For that reason, all notice signs in the crane must be complete and always legible.

4.2 Notice signs on the crane

The following notice signs are installed on the crane:

- Notice sign **31**, „Operating regulations for cranes“, valid only for certain countries*****
- Notice sign **32**, „Operating notes“
- Notice sign **33**, „Noise level“

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Fig.195219

1 Identifications on the hook block or load hooks

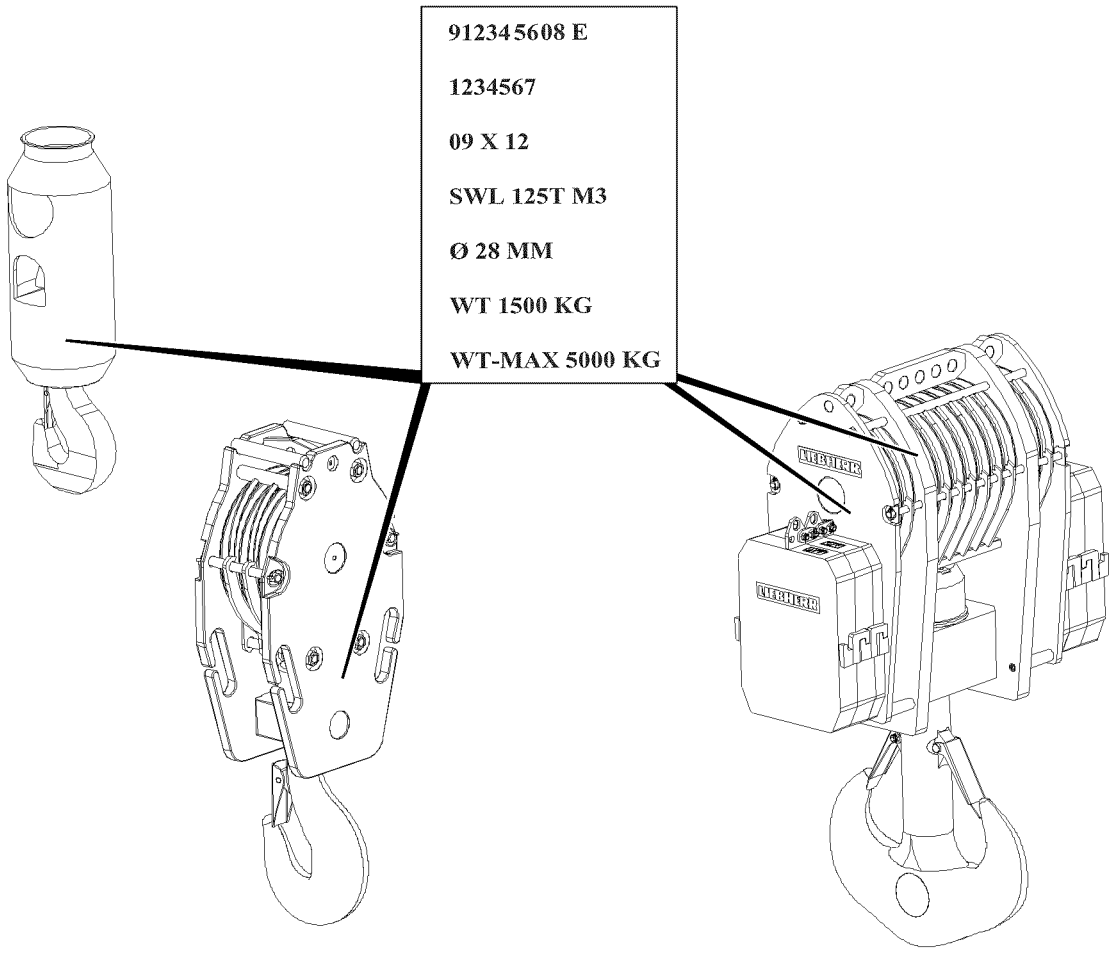

Fig.118509

Note

- For the load hooks and hook blocks approved for this crane type refer to 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 Tara) = 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 hooks

2 Identifications on single hook or double hook

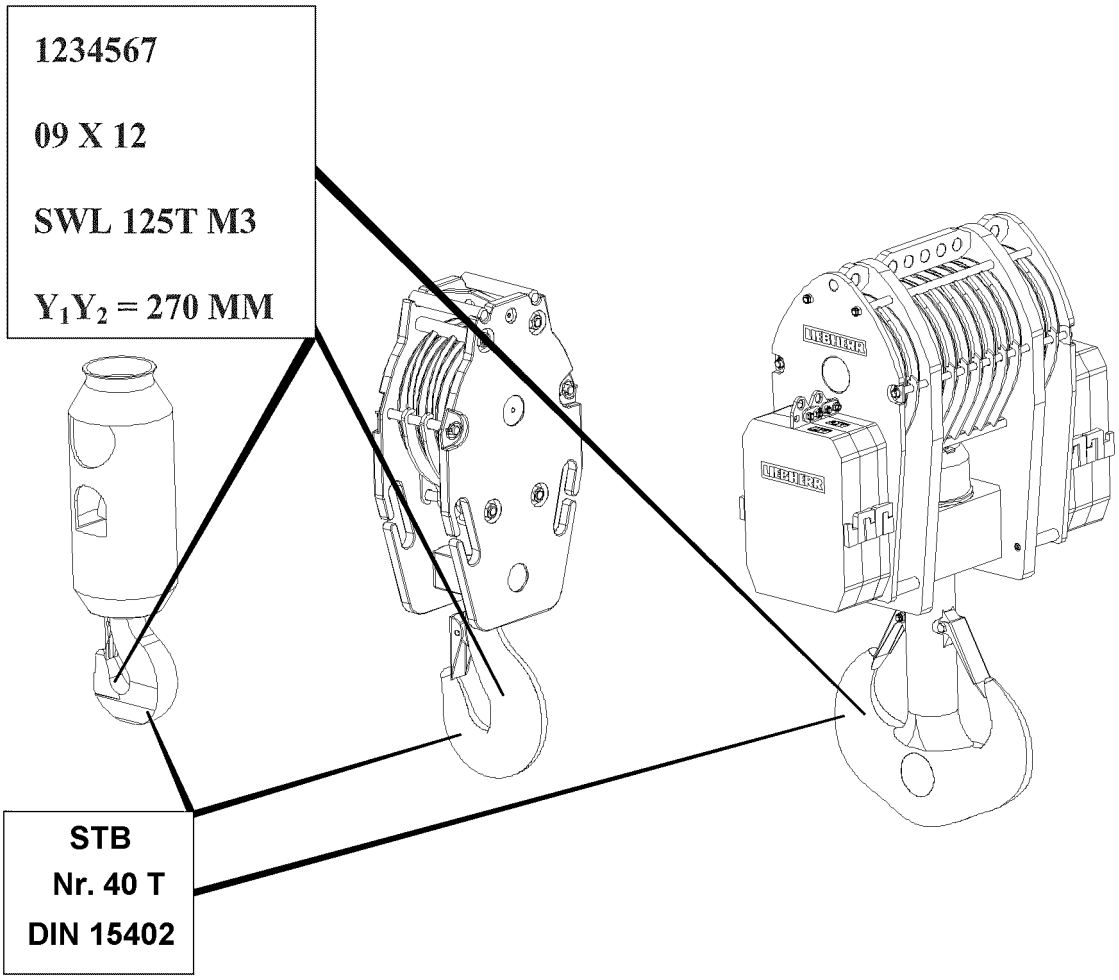

Fig.118510

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
09 X 12	Month of construction / supplier marks / year of construction

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Punch mark area	Explanation
SWL 125T M3	SWL (Safe Working Load) = Load carrying capacity for power train group M3
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

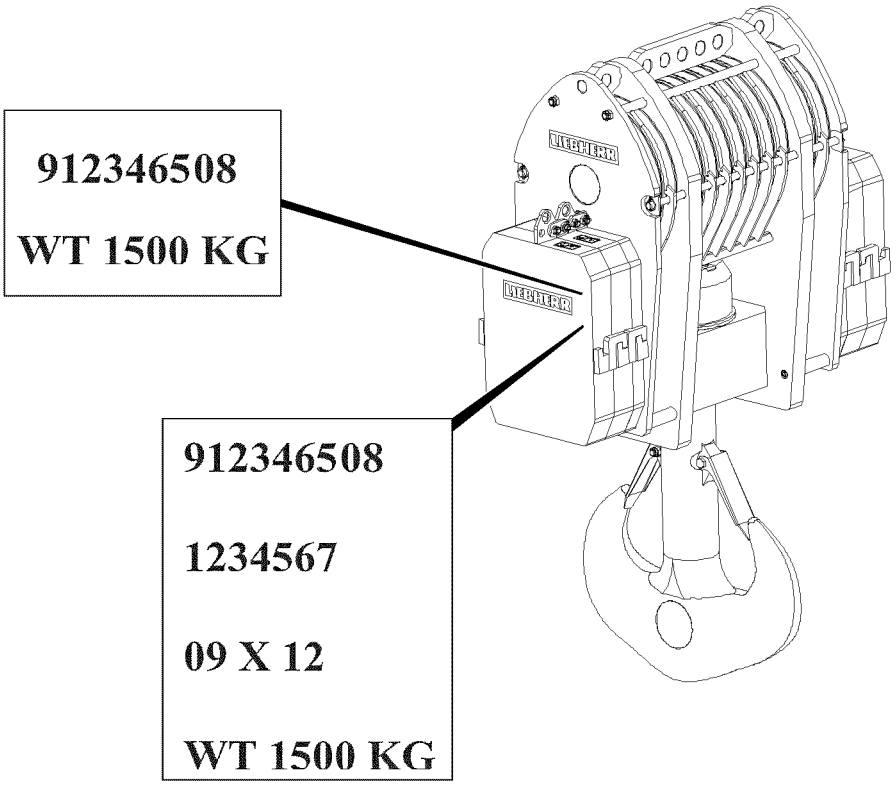

Fig.118511

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 Tara) = Own weight of individual auxiliary weight

Identifications of auxiliary weights at delivery

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 Tara) = Own weight of individual auxiliary weight

Identifications of auxiliary weights at reorder

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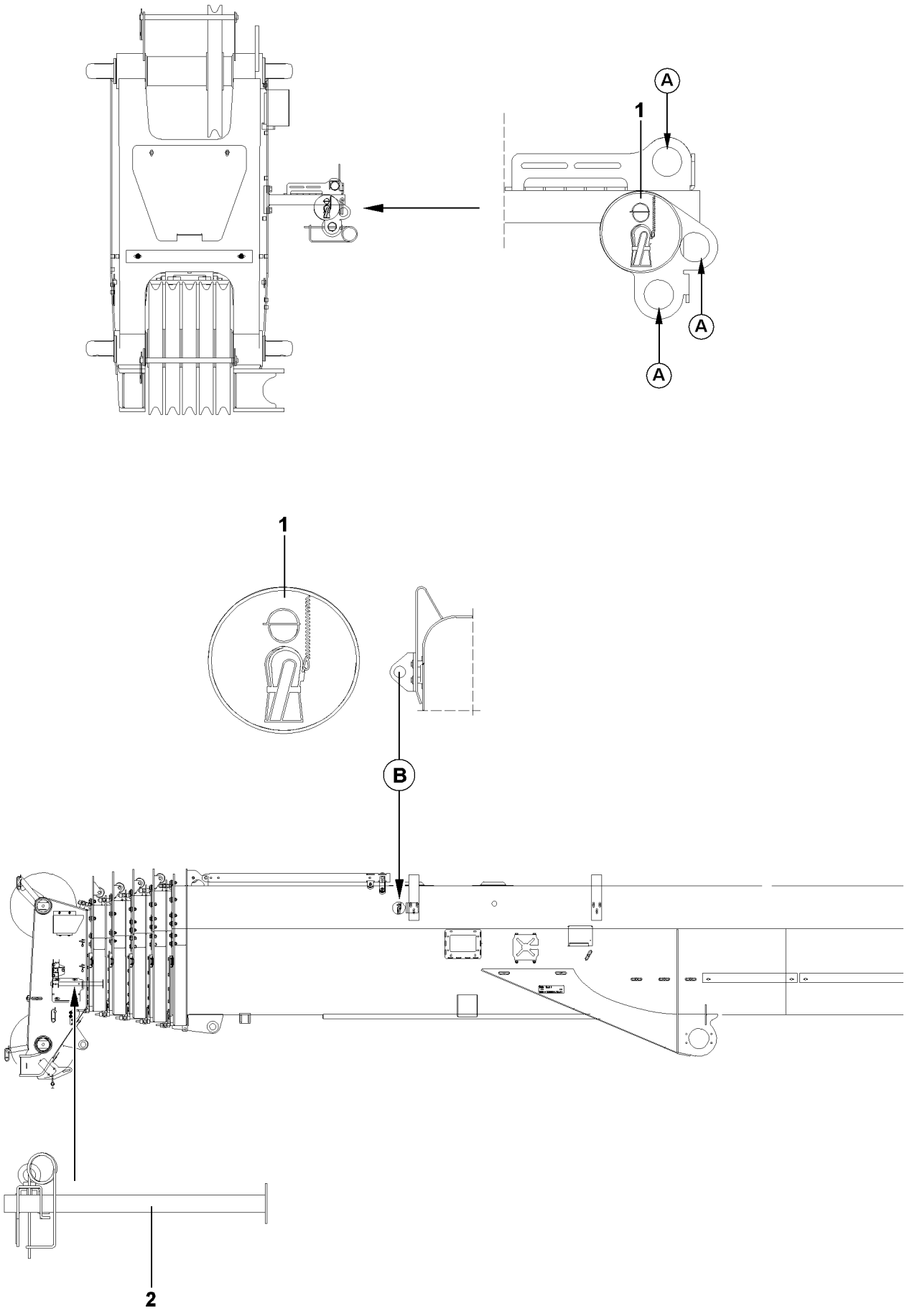

Fig.199144

1 Antifall guards on the crane

1.1 General

DANGER
Danger of falling!
During assembly and disassembly, personnel must be secured with appropriate antifall guards to prevent them from falling. If this is not observed, personnel could fall and suffer life-threatening injuries.
- ▶ All assembly work from a height of 2 m must generally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane, etc.)! The height above which assembly/disassembly work must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- ▶ If work cannot be carried out on the ground or using such aids, then assembly personnel must be secured with suitable personal protective equipment (such as safety belts) to protect against falling!

Note
- ▶ The signs **1** mark the fastening points, where assembly personnel must engage the approved safety belts to secure itself against falling.

2 Fastening points

2.1 Fastening points on the telescopic boom

Fastening points **A** and fastening point **B** are installed on the telescopic boom.

DANGER
When working aloft, there is a danger of falling!
If the following notes are not observed, the assembly personnel could fall and suffer life-threatening injuries!
- ▶ Before any assembly / disassembly work and maintenance work on the crane superstructure and the telescopic boom, the assembly personnel must attach the approved safety belts and protective devices.
- ▶ For assembly / disassembly work, the ladder **with hook device** is engaged on pipe **2**, see also section „Installing hook device on ladder“.
- ▶ The assembly personnel must secure itself with approved safety belts on fastening point **A** or fastening point **B** to prevent falling.

DANGER
Risk of damage!
- ▶ Never hang loads or objects on fastening points **A** or fastening point **B**.

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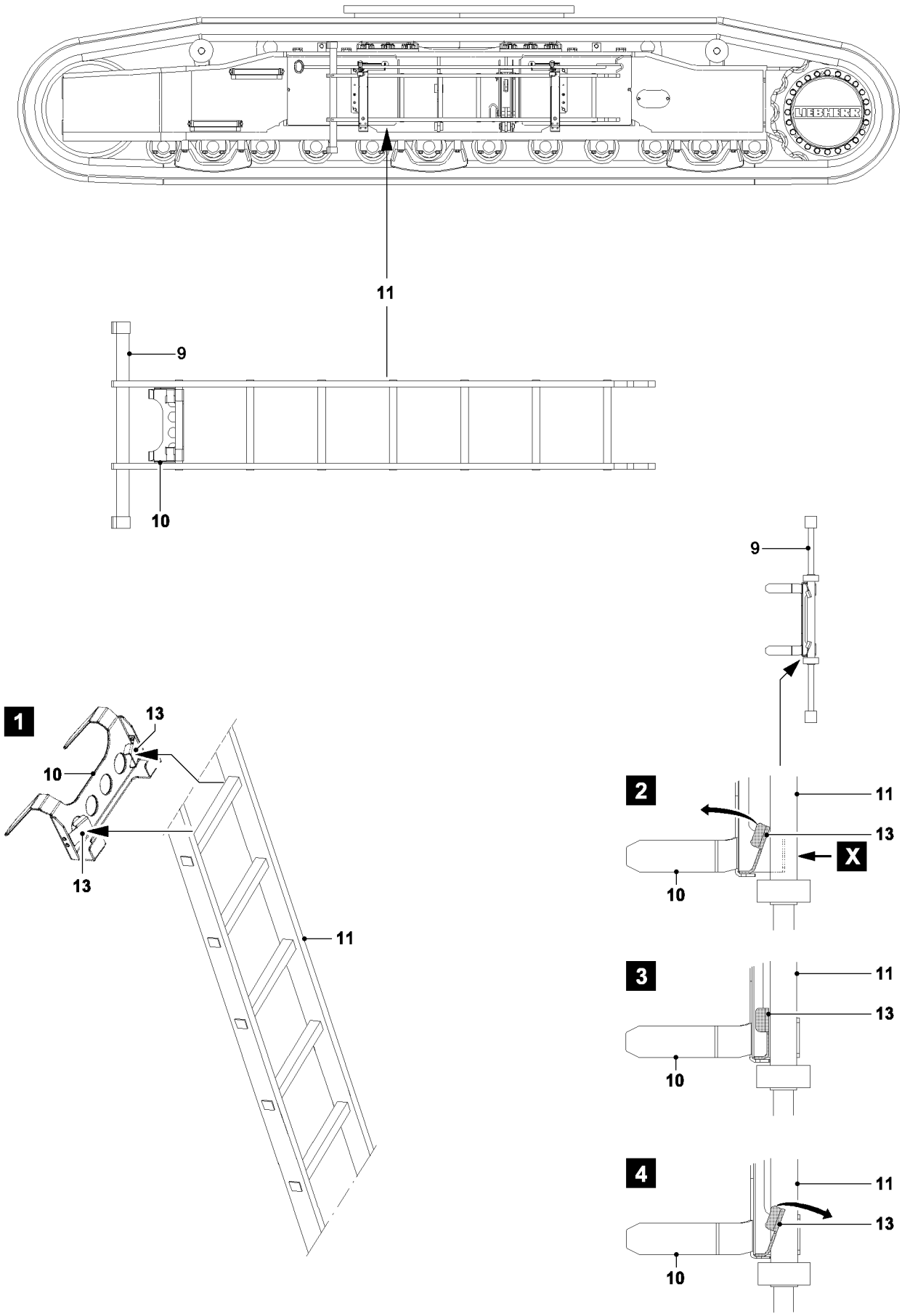

Fig.102964

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3 Attachment points on folding jib

Note

▶ For assembly / disassembly work on the folding jib and the folding jib extension, the supplied ladder must be used.

3.1 Using the ladder

DANGER

Risk of accident!

If the following notes are not observed, the ladder can tip and the assembly personnel can fall from the ladder and sustain life-threatening injuries!

▶ Damaged ladders may **not** be used!

▶ Use only the supplied ladder with cross brace **9**!

▶ The hook device **10** on the ladder serves as protection from falling over. For all assembly / disassembly work on the folding jib, folding jib extension and telescopic boom, the ladder with hook device **10** must be used!

▶ The ladder must be set up stable and safely accessible.

▶ For safe handling of ladder, observe the safety notes on the ladder!

3.2 Installing the hook device on the ladder

Before using the ladder, the hook device **10** must be installed on a rung.

▶ Push the ladder with the required rung against the locking plates **13** on the hook device **10** (point **X**), see illustration **1**, illustration **2**.

Result:

– the locking plates **13** spring in direction of the arrow and release the receptacle on the hook device **10** for the rung, see illustration **3**

▶ push the hook device **10** „upward“

Result:

– the locking plates **13** spring (arrow) „back“ into their original position by themselves and secure the rung, see illustration **4**

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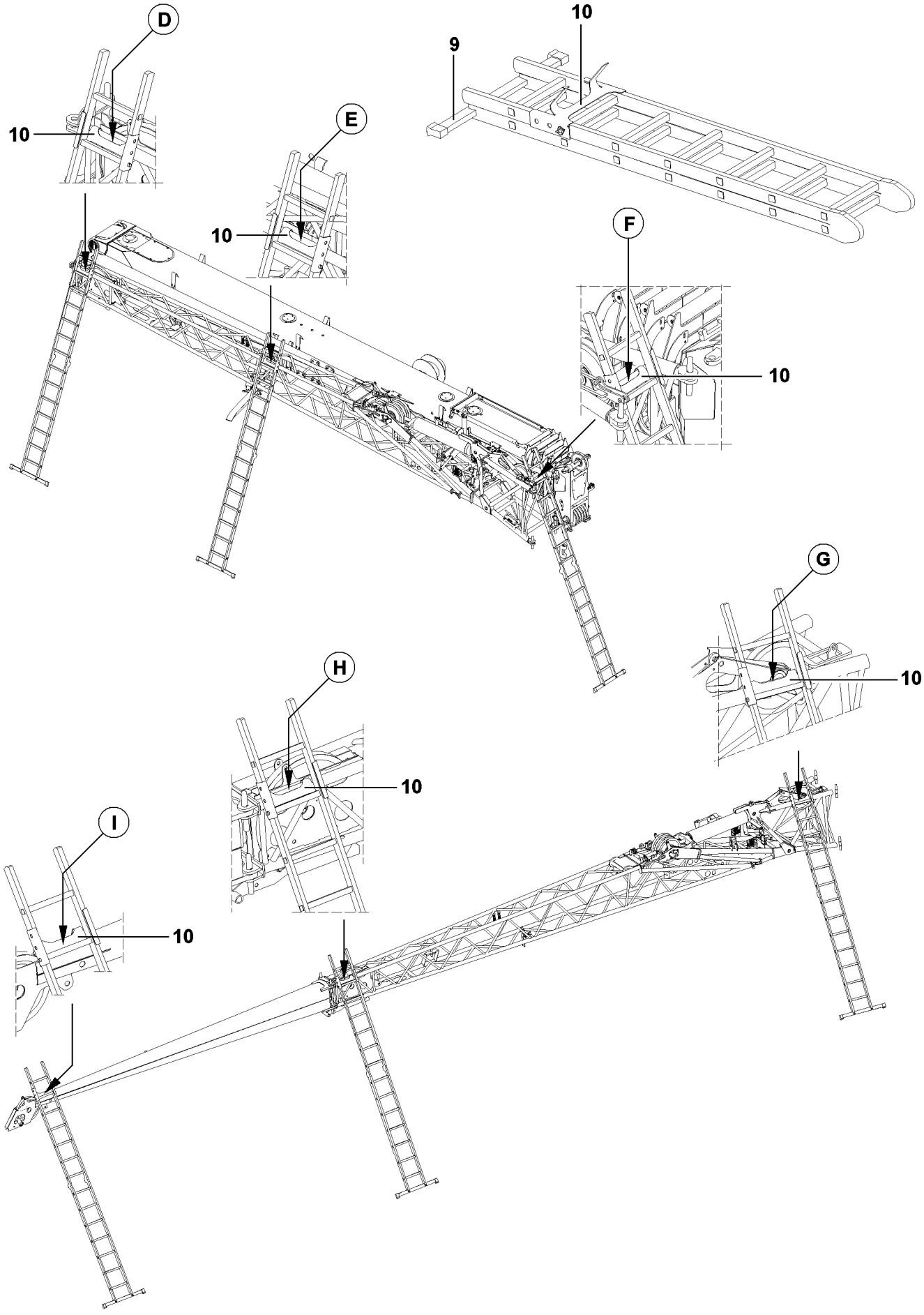

Fig.198022

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3.3 Fastening points on folding jib / folding jib extension

DANGER
When working aloft, there is a danger of falling!
If the following notes are not observed, the ladder can tip and the assembly personnel can fall from the ladder and sustain life-threatening injuries!

- ▶ For all assembly / disassembly work on the folding jib and the folding jib extension, use the ladder with cross brace **9** and hook device **10**, see section „Installing the hook device on the ladder“.
- ▶ Hang the ladder with hook device **10** on the corresponding attachment point and set it up stable.
- ▶ For safe handling of ladder, observe the safety notes on the ladder.
- ▶ Step on the ladder only with „clean shoes“.

For assembly / disassembly work on the folding jib and the folding jib extension, note the following attachment points for the ladder:

- **D** Attachment point
- **E** Attachment point
- **F** Attachment point
- **G** Attachment point
- **H** Attachment point
- **I** Attachment point

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Fig.195219

1 Working in low temperatures

1.1 Required auxiliary equipment*

Note

▶ For work in low temperatures, between -25 °C and -40 °C , or in temperatures below -40 °C , **Liebherr-Werk Ehingen GmbH** offers numerous auxiliary equipment*.

WARNING

Danger of accident when working in low temperatures!

When working in low temperatures **without** auxiliary equipment, damage can occur to crane components.

Personnel can be severely injured or killed.

▶ Make sure that the crane is equipped for application and for work in low temperatures.

▶ When working in low temperatures, always act anticipatorily, slowly and with utmost caution.

▶ Make sure that the following danger notices are observed and adhered to.

2 Working in ambient temperatures up to -40 °C

This section contains important notices for application of Liebherr cranes in ambient temperatures to -40 °C.

Valid for:

– Liebherr Lattice mast cranes
– Liebherr Telescopic cranes

WARNING

The crane can topple over!

Disregard of crane documentation can cause the crane to topple over!

Personnel can be severely injured or killed!

▶ Observe and adhere to the crane documentation.

▶ Make sure that you have read and understood the safety technical notices for crane operation, see Crane operating instructions, chapter 2.04.

▶ Make sure that you have read and understood the safety technical notices for assembly / disassembly, see Crane operating instructions, chapter 5.01.

▶ Make sure that you have read and understood the notices for maintenance, see Crane operating instructions, chapter 7.01.

2.1 Measures before crane operation

NOTICE

Danger of property damage!

Low temperatures, such as snow, frost and ice can impair crane operation and cause problems on the crane.

▶ Carry out the following measures before crane operation.

– Make sure that all winches and rope pulleys are free of snow, frost and ice.
– Make sure that all cable and hose drums are easily moveable.
– Make sure that all rope pulleys are easily moveable.
– Make sure that counterweight / ballast plates are installed smoothly.
– Make sure that the support plates are supported exclusively with suitable and sufficiently load bearing materials.
– Make sure that support plates are supported on one side of the crane with greased polyamide plates.

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– Make sure that the support cylinders for crane operation are extended only to maximum 50 %.

2.1.1 Preheating hydraulic cylinders / hydraulic system on lattice mast cranes

NOTICE
Damage to hydraulic cylinders!
▶ Always preheat hydraulic cylinders at ambient temperatures below -25 °C - before crane operation.

WARNING
Death due to hydraulically actuated crane components!
When hydraulic cylinders are „warmed up“, personnel can be severely injured or killed.
▶ Make sure that no persons or objects are within the danger zone.

Preheat the pull cylinders in the derrick ballast guying before crane operation.

WARNING
The crane can topple over!
If the following points are not observed, the crane can topple over.
Personnel can be severely injured or killed.
▶ Make sure that a valid set up configuration has been entered and confirmed in the LICCON computer system.
▶ Make sure that there is no load on the hook of the boom system.
▶ Observe and adhere to the load charts.
▶ For ballast trailer: Make sure that the ballast trailer guide is fully retracted.
▶ Make sure that the derrick radius and the derrick ballast radius are identical.
▶ Make sure that the derrick ballast is laying completely on the ground.
▶ Make sure that the derrick guy rods hang vertically.
▶ Make sure that the derrick guying is relieved.
▶ Make sure that the F1-actual force (test point 1) is in the permissible range, see Crane operating instructions, chapter 4.02.

▶ Remove the guy rods from the pull cylinders to the derrick ballast properly, see Crane operating instructions, chapter 5.35 and chapter 5.36.

When the guy rods are properly removed:
▶ Retract and extend the pull cylinders several times.

Preheat additional hydraulic cylinders:
▶ Retract and extend hydraulic cylinders several times over the entire stroke length.

2.1.2 Preheating hydraulic cylinders / hydraulic system on telescopic cranes

NOTICE
Damage to hydraulic cylinders!
▶ Always preheat hydraulic cylinders at ambient temperatures below -25 °C - before crane operation.

WARNING
Death due to hydraulically actuated crane components!
When hydraulic cylinders are „warmed up“, personnel can be severely injured or killed.
▶ Make sure that no persons or objects are within the danger zone.

Preheat the luffing cylinder before crane operation.

NOTICE
Damage to hydraulic components!
▶ Make sure that the hydraulic oil - before starting crane operation with a load - has a temperature of at least 20 °C.

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Make sure that the following prerequisites are met:
– The crane is properly supported and horizontally aligned.
– The telescopic boom is fully telescoped in.
– There is no load on the hook.

▶ Luff the telescoped in telescopic boom up and down several times.

Preheat additional hydraulic cylinders:
▶ Retract and extend hydraulic cylinders several times over the entire stroke length.

2.1.3 Reducing hoist ropes - rope / strand pull

Note
▶ When using hoist ropes in temperature ranges between -25 °C and -40 °C , **Liebherr-Werk Ehingen GmbH** recommends to reduce the rope / strand pull of the hoist ropes for crane application.

NOTICE
Rope damage due to insufficient weight of the hook block!
▶ Observe and adhere to the „minimum required hook block weight“ in the load chart.

▶ Increase the rope reeving specified in the load chart.

Result:

– The rope / strand pull of the hoist rope is reduced.

2.1.4 Increasing the hook block - hook block weight

Note
▶ The calculation of the minimum required hook block weight is described in the load chart!
▶ Depending on the temperature range in which the crane is used, increase the minimum required hook block weight, see the following chart overview.
▶ Observe the permissible hook block weights for erection and take down of the boom systems in the erection and take down charts.

Crane application in ambient temperatures	Increase of minimum required hook block weight
To -30 °C	By 10 %
To -40 °C	By 15 %

2.2 Measures for crane operation

Crane structures and crane components are subjected to special stress in low temperature application. For that reason, crane operation in low temperatures require anticipatory working procedures, adapted to the weather conditions from the crane operator.

WARNING
Breakage of crane components!
Sudden jerky initiation or slow down of crane movements can lead to breakage of crane components. Personnel can be severely injured or killed.
▶ Initiate and slow down crane movements sensitively and with utmost caution.
▶ Initiate crane movements with utmost caution and at the lowest speed.

2.2.1 Interruption of crane operation.

In areas with ambient temperatures to -40 °C , **Liebherr-Werk Ehingen GmbH** recommends to leave the engine / the engines of crane running during the entire time of the interruption.

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Possible interruptions of crane work:
– Break times
– Shut down of crane over night

WARNING
An equipped crane with running engine / engines is unattended!
If an equipped crane with running engine / engines is turned off, the crane operator is obligated to carry out special measures.
If the following measures are not observed and adhered to by the crane operator, then the crane can topple over.
Personnel can be severely injured or killed.
▶ Make sure that the measures for interruption of crane work are adhered to, see Crane operating instructions, chapter 2.04.
▶ Make sure that the following measures are additionally observed.
▶ The crane operator bears the full responsibility for observance of all measures.

– If predicted wind speeds are higher than the maximum permissible wind speeds, see wind speed chart:
  • Place the boom down according to the erection and take down charts in time.
– Make sure that no movements can be carried out on the crane:
  • Respective electrical fuses in the control cabinet may only be removed after consultation with the **Service Department of Liebherr-Werk Ehingen GmbH**.
– Make sure that access to the crane and operation for unauthorized personnel is excluded:
  • Lock the driver's cab after leaving.
  • Pull the key of the driver's cab and store it safely.
  • Lock the crane operator's cab after leaving.
  • Pull the key of the crane operator's cab and store it safely.
– Make sure that the fill levels of Diesel fuel, engine oil and urea are regularly checked by an authorized person. Top off the fill levels if necessary.
– Make sure that the crane is checked in regular intervals by an authorized person for safe crane condition.

2.2.2 Driving two-engine cranes in low temperature application

If two engine cranes are driven in areas with ambient temperatures to -40 °C , **Liebherr-Werk Ehingen GmbH** recommends to let the engine in the crane superstructure idle while driving. This requires special measures on the crane to prevent engine damage on the superstructure engine when driving on uphill or downhill gradients up to maximum 25 %.

NOTICE
Engine damage!
If the oil level on the superstructure engine is insufficient, the engine can be damaged when driving on uphill / downhill gradients up to 25 %.
▶ Make sure that the fill levels of Diesel fuel, engine oil and urea on the crane superstructure are regularly checked by an authorized person. Top off the fill levels if necessary.
▶ Make sure that the oil level is adjusted before driving the crane, with the crane in horizontal position, according the following chart.
▶ Observe and adhere to the following chart.

Engine in crane superstructure	Fill level engine oil
Four cylinder engine	To the max mark
Six cylinder engine	To the max mark + 2.5 l

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2.2.3 Crane utilization lattice mast cranes

On lattice mast cranes with pull cylinders in the derrick ballast guying, the maximum derrick ballast must be reduced in low temperature application to -40 °C.

WARNING
The crane can topple over!
Personnel can be severely injured or killed.
▶ Make sure that the crane is not overloaded with reduced derrick ballast.

▶ Reduce the maximum derrick ballast between -30 °C and -40 °C by 15 %.

2.2.4 Crane utilization telescopic cranes

For telescopic cranes, the crane utilization must be reduced in low temperature application between -30 °C and -40 °C.

▶ Reduce the crane utilization between -30 °C and -40 °C by 15 %.

2.3 Measures and notices for maintenance

2.3.1 Load bearing crane structures

Note
▶ Check load bearing crane structures for damage according to the Crane operating instructions.

2.3.2 Lubrication and service items

Note
▶ Use lubrication and service items according to the lube chart / service fill.

2.3.3 Rope pulleys and hydraulic cylinders

Note
▶ Check rope pulleys and hydraulic cylinders for damage according to the Crane operating instructions.

2.3.4 Pretension pressures of pressure accumulators

Note
▶ Check the pretension pressures of pressure accumulators according to the crane operating instructions.
▶ In low temperature application to -40 °C , reduce the maintenance intervals.

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Fig.195219

3 Working in ambient temperatures below -40 °C

The regulations and notices for the ambient temperatures up to -40 °C apply.

WARNING
The crane can topple over!
Disregard of crane documentation can cause the crane to topple over!
Personnel can be severely injured or killed!
- ▶ Observe and adhere to the crane documentation.
- ▶ Make sure that you have read and understood the safety technical notices for crane operation, see Crane operating instructions, chapter 2.04.
- ▶ Make sure that you have read and understood the safety technical notices for assembly / disassembly, see Crane operating instructions, chapter 5.01.
- ▶ Make sure that you have read and understood the notices for maintenance, see Crane operating instructions, chapter 7.01.
- ▶ Make sure that the additional measures for crane application in ambient temperatures below -40 °C are observed and adhered to.

3.1 Measures before crane operation

- ▶ Cover exposed hose drums to protect them from ice, frost and snow.

Before operation:

- ▶ Remove snow from winches, boom, hose and cable drums, including inlet and outlet.

NOTICE
Discharging batteries!
During the preheating of the Diesel engine, the batteries can discharge and be damaged as a result.
- ▶ Make sure that the batteries are fully charged before using the preheating.
- ▶ Make sure that the batteries are not discharged.
- ▶ We recommend to ensure the engine preheating via an external power supply, see Crane operating instructions, chapter 2.04.

- ▶ Preheat the Diesel engine until it can be started.
- ▶ Turn the preheater(s) off as soon as the Diesel engine has reached operating temperature.
- ▶ Preheat the hydraulic system for the crane chassis and the hydraulic system for the crane superstructure for at least 30 minutes.
- ▶ Preheat the driver's cab and the crane operator's cab at the same time with the hydraulic systems for crane chassis and crane superstructure for at least 10 minutes.

3.2 Measures for crane operation

WARNING
The crane can topple over!
The following listed property damage can cause the crane to topple over as a result.
- ▶ Make sure that the following listed property damage is prevented by appropriate measures.

NOTICE
Damage to the hydraulic system / hydraulic cylinders!
If the cold hydraulic system is actuated with high pressures, damage can occur on hydraulic cylinders, pressure accumulators and the entire hydraulic system.

Before the hydraulic system is actuated with the pressures:
- ▶ Make sure that the preheating of the hydraulic system is completed.

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NOTICE
Damage of crane components!

After ending crane operation:
▶ Protect winches, hose and cable drums from moisture and freezing.

3.3 Measures and notices for maintenance

3.3.1 Lubrication and service items

Note
▶ Use lubrication and service items according to the lube chart / service fill.

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3 Crane assembly

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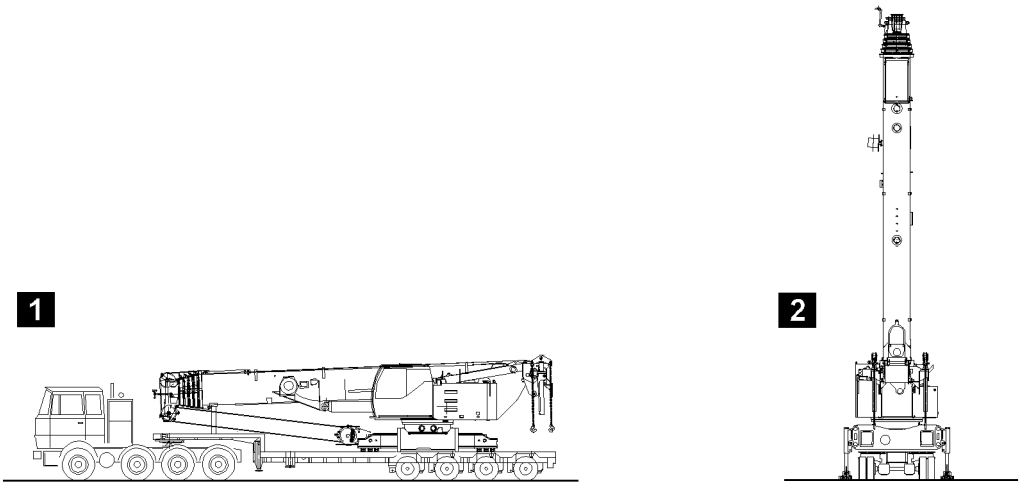

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Fig.103767

1 Assembling the crane

Make sure that the following prerequisites are met:
- The location is level, smooth and provides sufficient load-carrying capacity.
- Authorised and trained personnel are available to carry out the assembly / disassembly work.
- The telescopic boom is fully telescoped in and placed on the telescopic boom receptacle.
- The central ballast has been removed.
- The counterweight on the turntable has been removed.

DANGER
The crane can topple over!
If a counterweight is installed on the turntable when „supporting a crane with a load“, then the crane can topple over and fatally injure personnel!
- ▶ When „supporting the crane with a load“, no counterweight may be installed on the turntable!
- ▶ Do not turn the crane superstructure when the crane is resting on the transport vehicle!

Note
- ▶ For double folding jib installed on the side of the telescopic boom, the permissible load carrying capacities in T-operation at T-11,5 (0/0/0/0/0) must be reduced by approx. 1 t. This applies especially for the central ballast and crawler carrier assembly on the support cylinders.
- ▶ The additional weight of the dual folding jib is weighed by the overload protection, so that the full utilization is reached earlier.

1.1 Short description of assembly procedure

Note
- ▶ The short description of the assembly procedure is only intended as an overview. In addition, the complete assembly description must be read and understood!

Preparatory work

- ▶ Swing the hatch consoles into their operating position and pin them in place.
- ▶ Place and align the support plates under the support cylinders, illustration 2.

DANGER
Risk of tipping when the auxiliary boom is in its transport position at the side of the telescopic boom!
If the telescopic boom, with the auxiliary boom installed on the side of the telescopic boom is not luffed up to an angle range of 38° to 70° before supporting, then the crane can topple forward and fatally injure personnel!
- ▶ Luff the telescopic boom with the auxiliary boom installed on the side of the telescopic boom to an angle range of 38° to 70° before supporting the crane!

- ▶ Support the crane and remove the transport vehicle, illustration 3.
- ▶ Level out the crane and install the central ballast, see **chapter 3.03** and illustrations 4 and 5.

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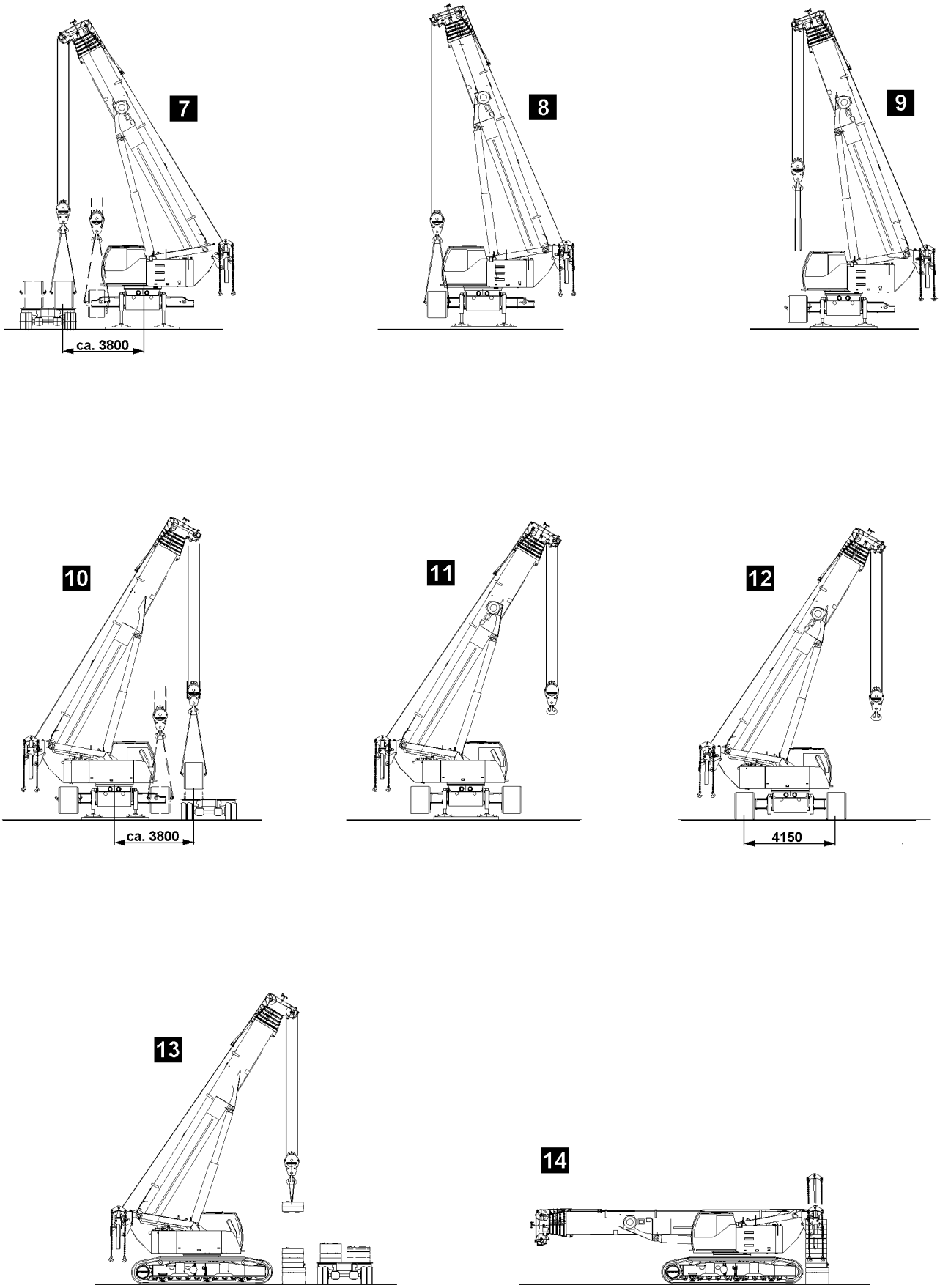

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Fig.199152

Install the first crawler carrier, illustrations 7 and 8

- ▶ Attach the supplied assembly suspension to the folded out transport retainers.
- ▶ Position the crawler carrier on the beams of the crawler center section.
- ▶ Slide the crawler carrier as far along the beam as possible.
- ▶ Clamp the crawler carrier to the beams using the clamping screws.
- ▶ Secure the clamping screws with safety strips.
- ▶ Remove the assembly suspension.
- ▶ Fold in the transport retainers and pin them in position.

Install the second crawler carrier, illustration 10

- ▶ Check and prepare the pinning points for the crawler carrier.
- ▶ Attach the supplied assembly suspension to the folded out transport retainers.
- ▶ Position the crawler carrier on the beams of the crawler center section.
- ▶ Slide the crawler carrier as far along the beam as possible.
- ▶ Clamp the crawler carrier to the beams using the clamping screws.
- ▶ Secure the clamping screws with safety strips.
- ▶ Remove the assembly suspension.
- ▶ Fold in the transport retainers and pin them in position.

Retract the support cylinders, illustrations 11 and 12

- ▶ Move the support cylinders in completely.
- ▶ Store the support plates in the holders on the crawler center section.

Start up the vehicle and install the counterweight, illustrations 13 and 14

- ▶ Establish the hydraulic connections.
- ▶ Retighten the clamping screws.
- ▶ Test the chassis.
- ▶ Install the counterweight, see chapter 4.07.

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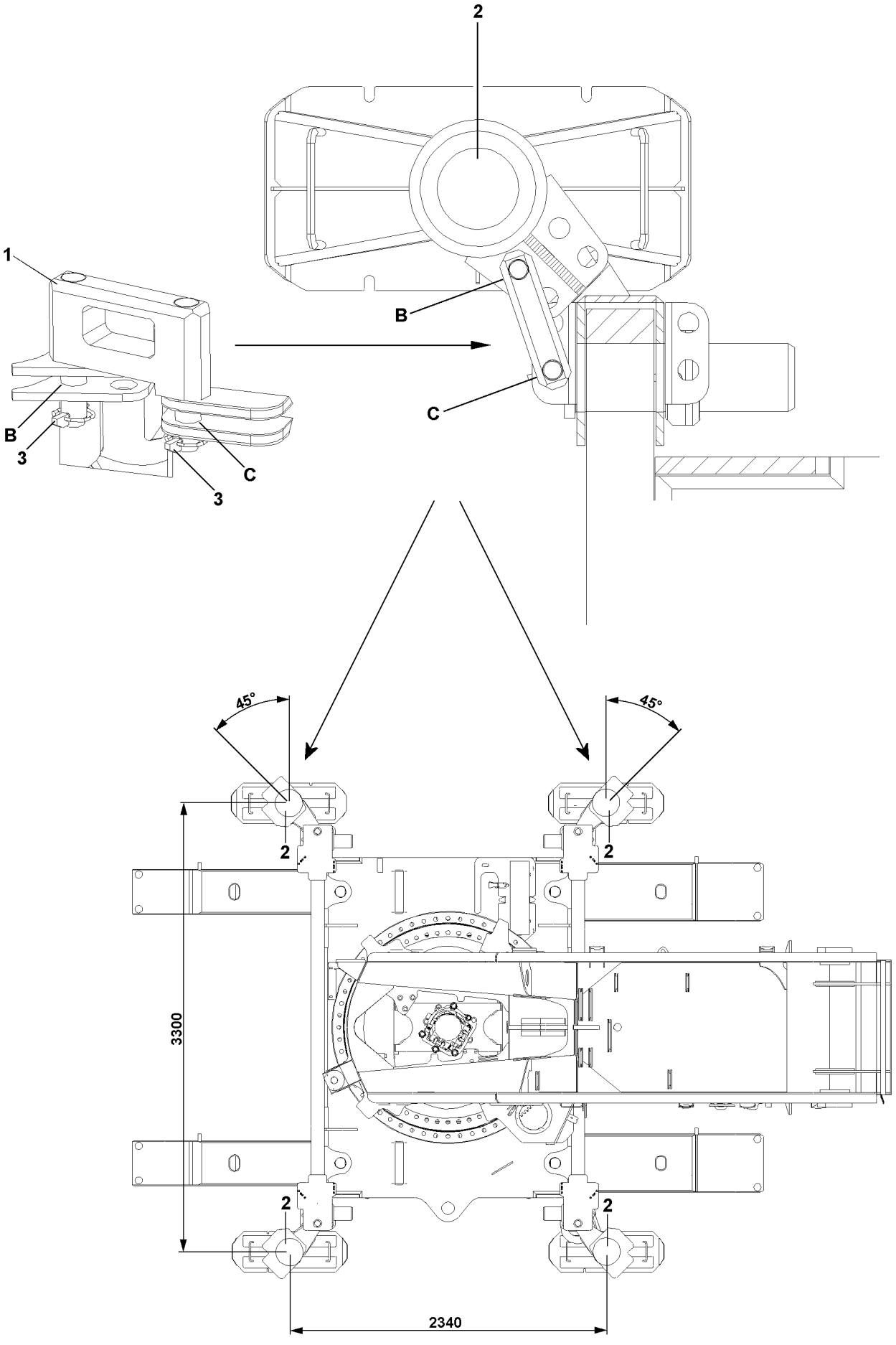

Fig.104729

LWE/LTR 1100-005/17505-03-02/en

1.2 Pinning the support cylinders in assembly position

Make sure that the following prerequisites are met:
- The crane lies on the transport vehicle.
- All straight retaining brackets **1** have been unpinned and removed

DANGER
The crane can topple over!
If the crane is supported without the support cylinders **2** being pinned in assembly position, the crane can topple over and fatally injure personnel!
- ▶ Support the crane only in assembly position (45° position of support cylinders **2**)!
- ▶ Assembly operation is only permitted at a support base of 2340 mm x 3300 mm !

- ▶ Swing the support cylinders **2** to 45°.
- ▶ Unpin the straight retaining brackets **1** at bore **B** and bore **C** and secure with linch pins **3**.

Also pin the other support cylinders **2**.

- ▶ Pin all four support cylinders **2** in assembly position support base 2340 mm x 3300 mm.

1.3 Placing and aligning the support plates

Observe the safety instructions and permissible ground pressures (see chapter 2.04).

DANGER
The crane can topple over!
The crane can topple over and cause fatal injury if the support plates are not placed under correctly.
- ▶ Only use suitable support materials!
- ▶ Place the support bases under the center of the support plates!
- ▶ Use the same material to place under the support plates!
- ▶ Observe the track width of the flatbed trailer! The underlay material may not project into the driving track.

- ▶ Use stable materials such as wood, steel plates or concrete slabs of a suitable size under the supports plates, depending on the ground conditions.
- ▶ Remove the support plates from the holders on the crawler center section and place them underneath the support cylinders.
- ▶ Align the support plates along the flatbed trailer!
- ▶ Align support plates under the support cylinders as shown in the illustration on the left!

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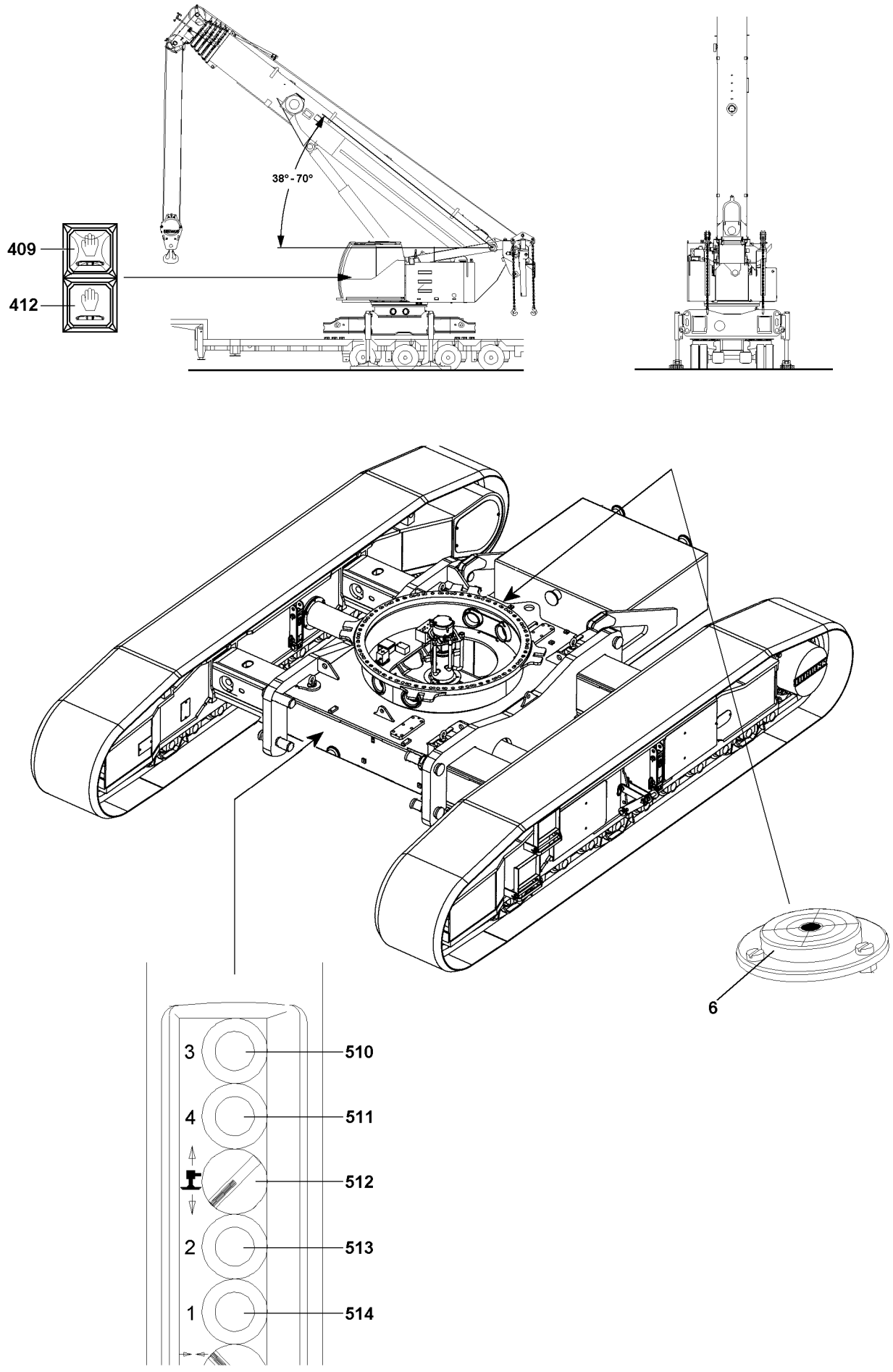

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Fig.103768

1.4 Supporting the crane

Make sure that the following prerequisites are met:
- The engine is running.
- The folding brackets with the support cylinders are pinned in the operating position.
- The LICCON overload protection has been set according to the load chart.
- The crane has been set down on the transport vehicle.
- The beams are supported on both ends with wooden planks.
- The crane superstructure is mechanically locked with the crane chassis.

1.4.1 Preparatory work

DANGER
Risk of tipping when the auxiliary boom is in its transport position at the side of the telescopic boom!
If the telescopic boom, with the auxiliary boom installed on the side of the telescopic boom is not luffed up to an angle range of 38° to 70° before supporting, then the crane can topple forward and fatally injure personnel!
▶ Luff the telescopic boom with the auxiliary boom installed on the side of the telescopic boom to an angle range of 38° to 70° before supporting the crane!

If an auxiliary boom is installed to the side of the telescopic boom:
▶ Luff the telescopic boom up to an angle range of 38° to 70°.
▶ Press the button **412**.

Result:

– The indicator light **409** lights up.
– The support pressure has been turned on.

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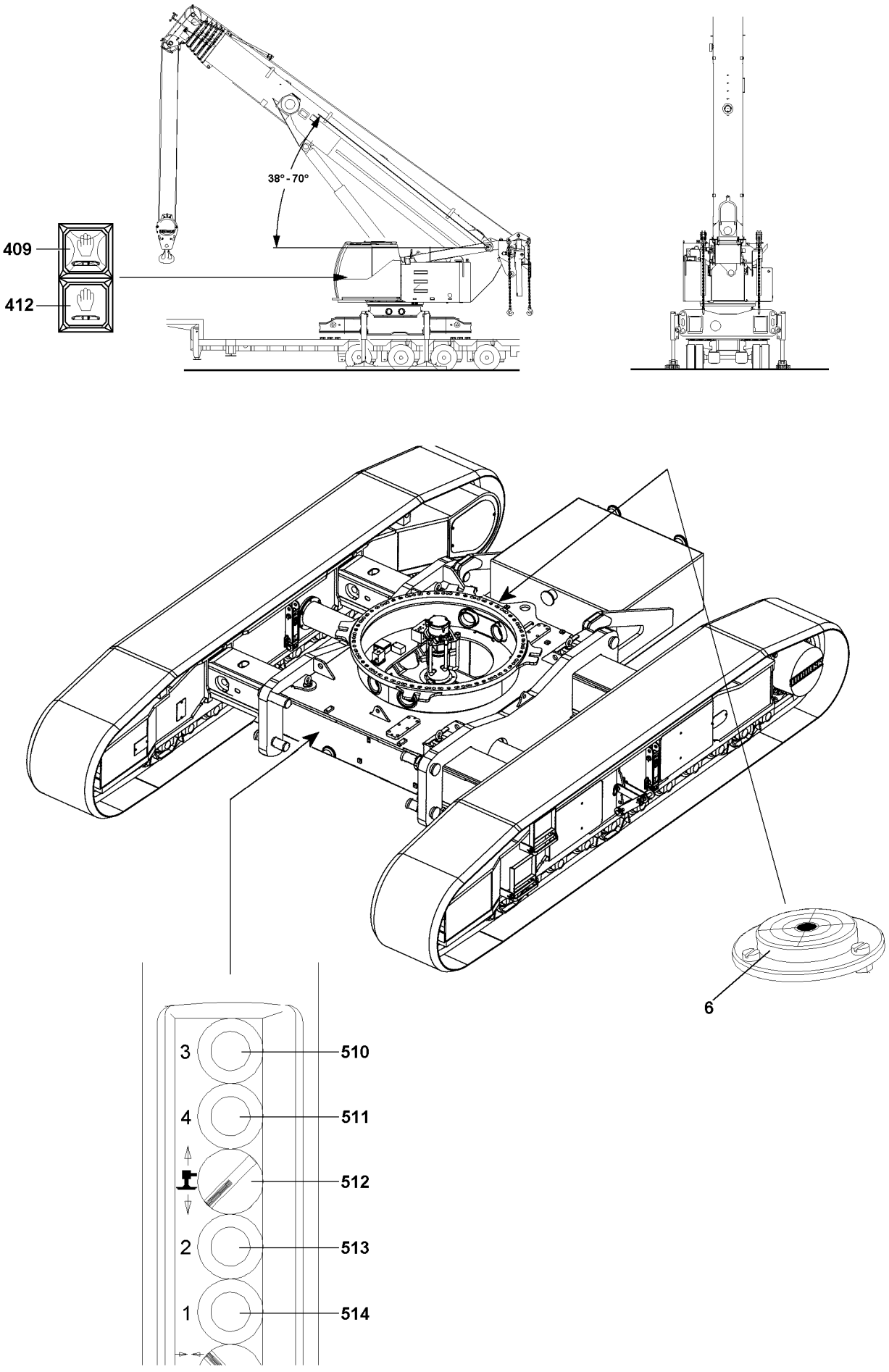

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Fig.103768

1.4.2 Supporting the crane with the control panel

Buttons **510**, **511**, **513** and **514** may be used to extend / retract the support cylinders. No more than a maximum of 2 support cylinders should be moved at the same time.

Button	Support cylinder
510	Left front
511	Left rear
513	Right front
514	Right rear

▶ Move the switch **512** downward.

Result:

– Extend support cylinder is preselected.

DANGER
The crane can topple over!
If the crane is not aligned horizontally, it may tip over and fatally injure personnel!
▶ Ensure that crane is level.
▶ The maximum permitted deviation from the horizontal position of the crane is 0.3° (0.5%).

▶ Press the corresponding button and extend all support cylinders just above the support plates.
▶ Precisely align the support plates under the support cylinders.
▶ Monitor the sight gauge **6** on the crane chassis.
▶ Lower all support cylinders into the support plates.
▶ Slowly lift and level out the crane until the desired support height is reached.
▶ Check the distance between the crawler center section and the transport vehicle (at least a hand's width).
▶ Remove the underlay timber beneath the beams.

DANGER
The crane can topple over!
When driving out the transport vehicle, the support cylinder may be caught which could cause the crane to topple over!
▶ An assistant must guide the transport vehicle!
▶ The transport vehicle should not catch any of the support cylinders!

▶ Carefully drive the transport vehicle from under the supported crane.

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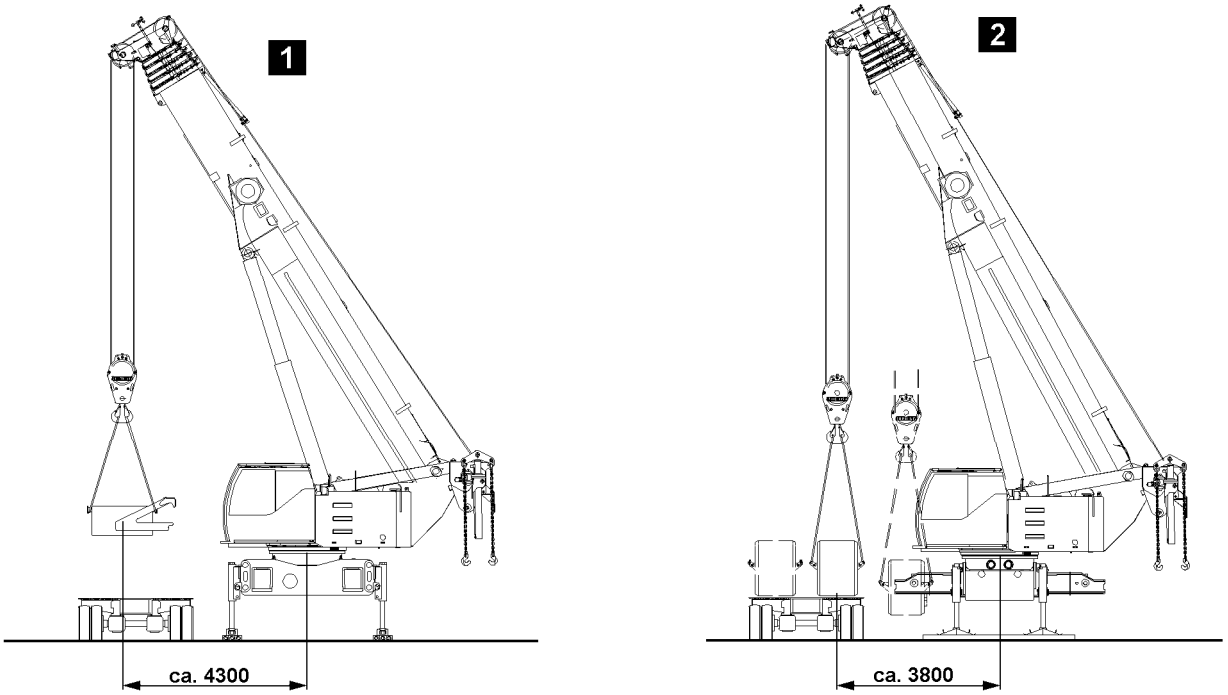

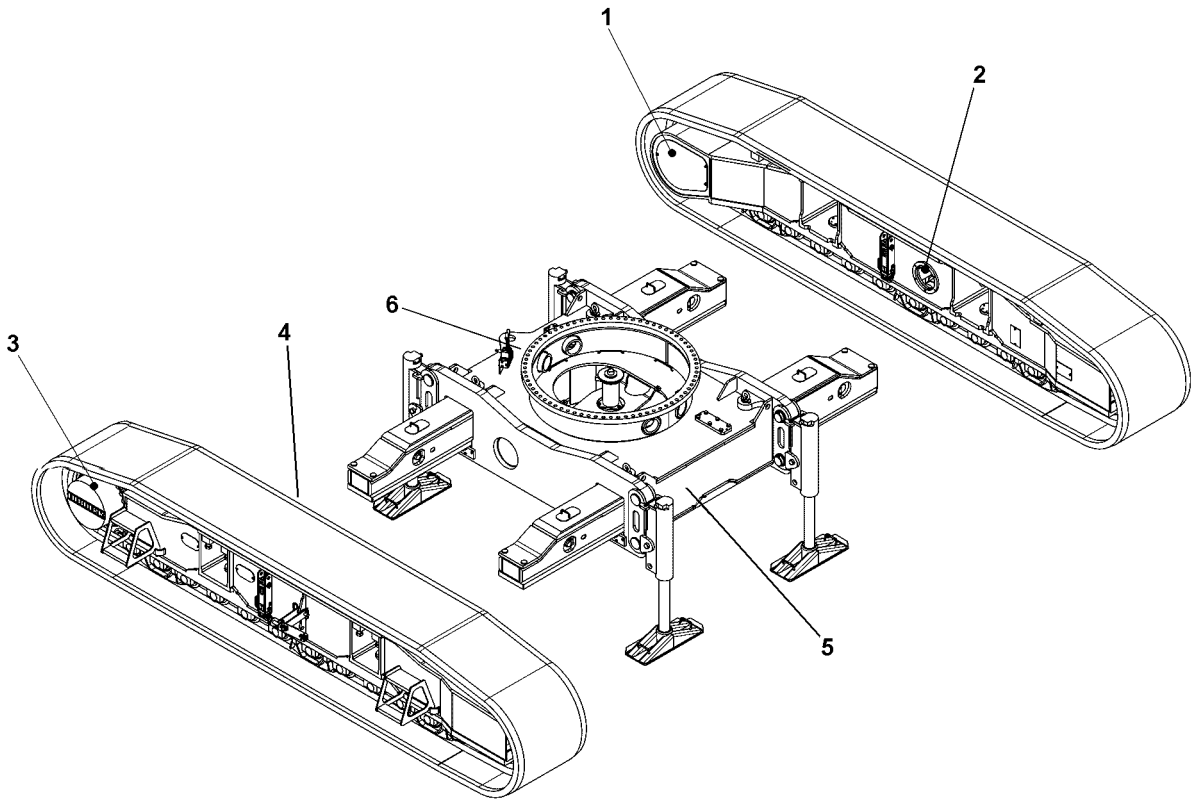

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Fig.102931

1.5 Installing the central ballast, illustration 1

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.
- The hook block weighs maximum 0.5 t.
- The maximum permitted distance between the center of the slewing ring and the central ballast on the transport vehicle is 4300 mm

▶ Install the central ballast to both sides, see detailed description in chapter 3.03.
▶ Set the LICCON overload protection according to the load chart and the installed central ballast.

1.6 Installing the crawler carrier, illustration 2

Observe the following when installing the crawler carrier:
- The LICCON overload protection has been set according to the load chart.
- The travel drives must always be on the side of the sight gauge.
- The order in which the crawler carriers are installed is arbitrary.
- Take into account the position of the crawler carriers on the transport vehicle.
- If possible, unload the crawler carriers from the transport vehicle directly in front of the beam ends, i.e. alongside the crane.
- Drive the crawler carriers as close as possible to the crane, maximum distance 3800 mm.

Position	Description
1	Travel drive left
2	Hydraulic connection left
3	Travel drive right
4	Hydraulic connection right
5	Control panel - Crane chassis
6	Sight gauge

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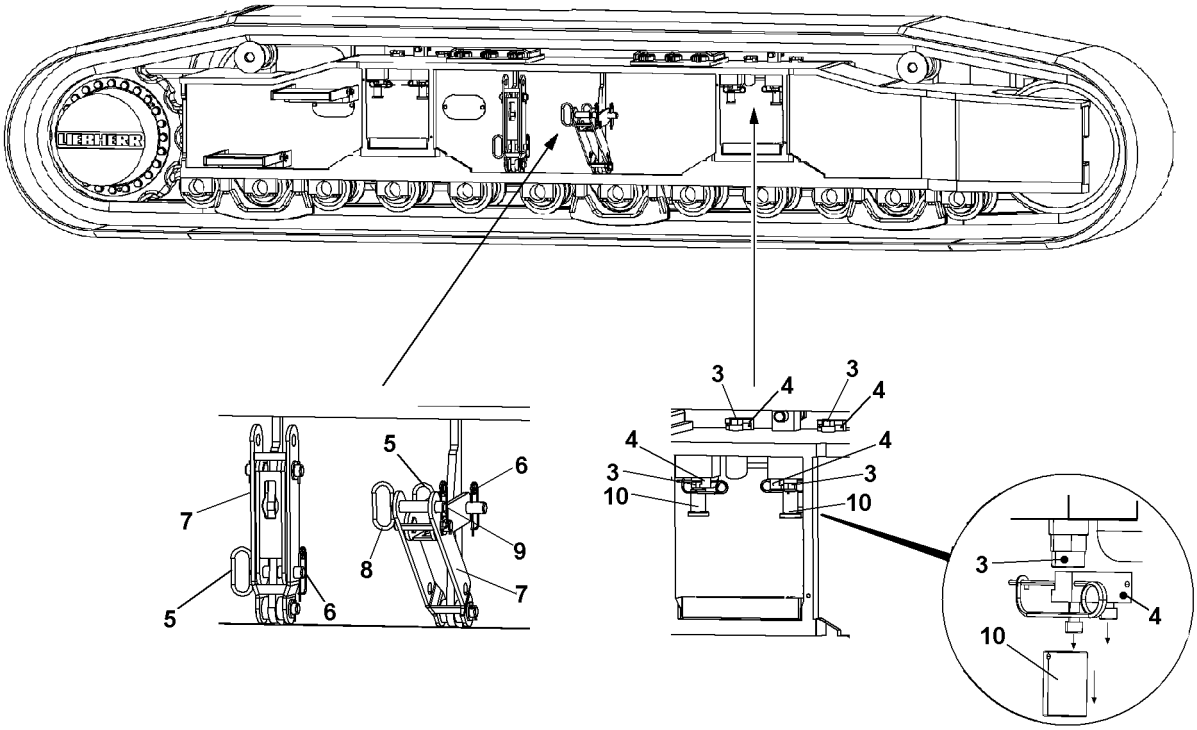

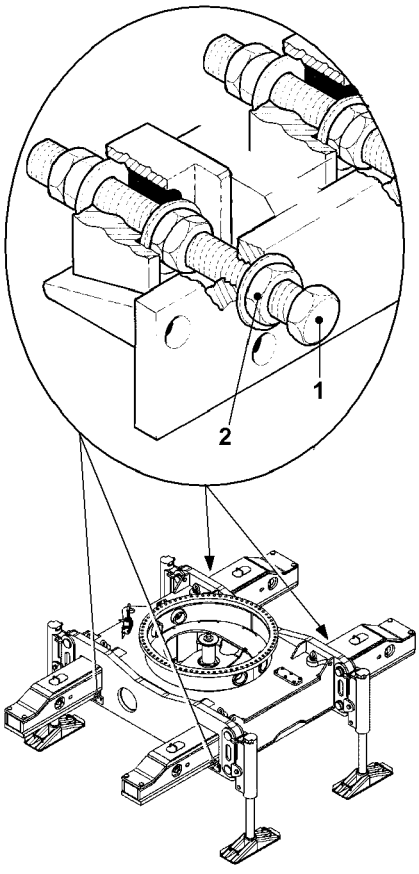

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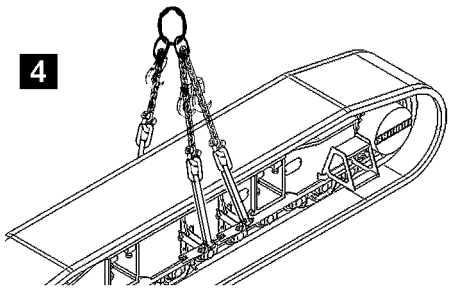

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Fig.104732

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1.6.1 Preparing the crane, illustration 3

The counter nuts **2** and clamping screws **1** must be fully tightened.

▶ Check all the beam wedges on the crane.

If a counter nut **2** or clamping screw **1** has not been fully tightened:
▶ Undo the locking nut **2** and fully tighten the clamping screw **1** and lock again with the locking nut **2**.
▶ Clean and grease all beams in contact with the sliding surfaces.

1.6.2 Preparing the first crawler carrier

Make sure that the following prerequisites are met:
– the safety strips **4** have been removed
– the front clamping screws **3** are screwed in
– the rear clamping screws **3** have been unscrewed

▶ Clean the beam receptacles.

Three transport retainers **7** are installed to the crawler carriers. The transport retainers **7** must be swung out and pinned.

▶ Release and unpin the pin **5**.
▶ Swing out the transport retainers **7** and pin in the upper bore on the crawler carrier using the pins **5**.
▶ Secure the pin **5** with spring retainer **6**.
▶ Release and unpin the pin **8**.

CAUTION
Damage to the crawler carrier!
▶ Attach the assembly suspension in such a way that the crawler carriers are not damaged, see illustration **4**.

▶ Pin the assembly suspension using pins **8**.
▶ Secure the pin **8** with spring retainer **9**.
▶ Attach the crawler carrier on all 3 transport retainers **7**, illustration 4.

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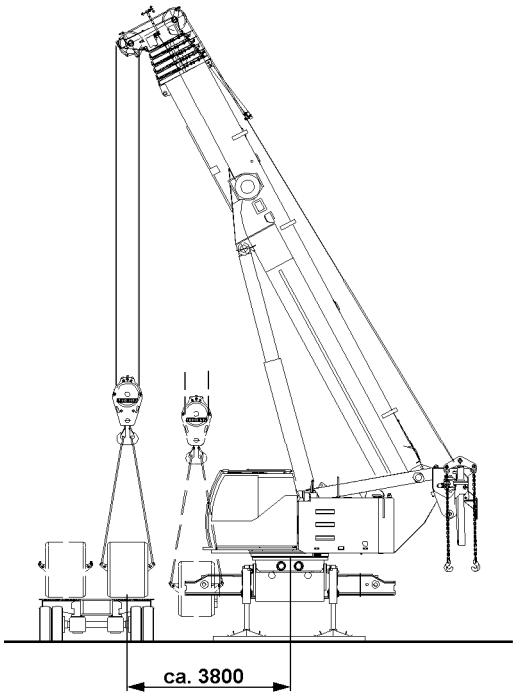

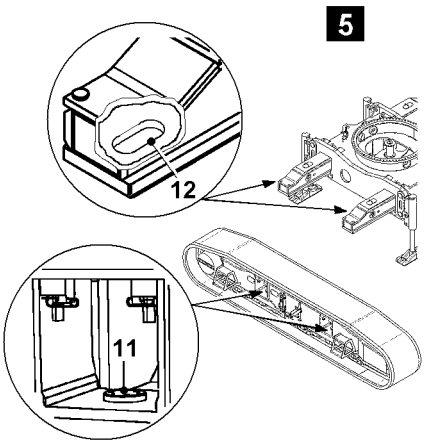

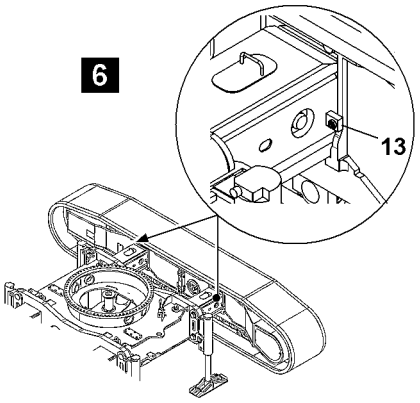

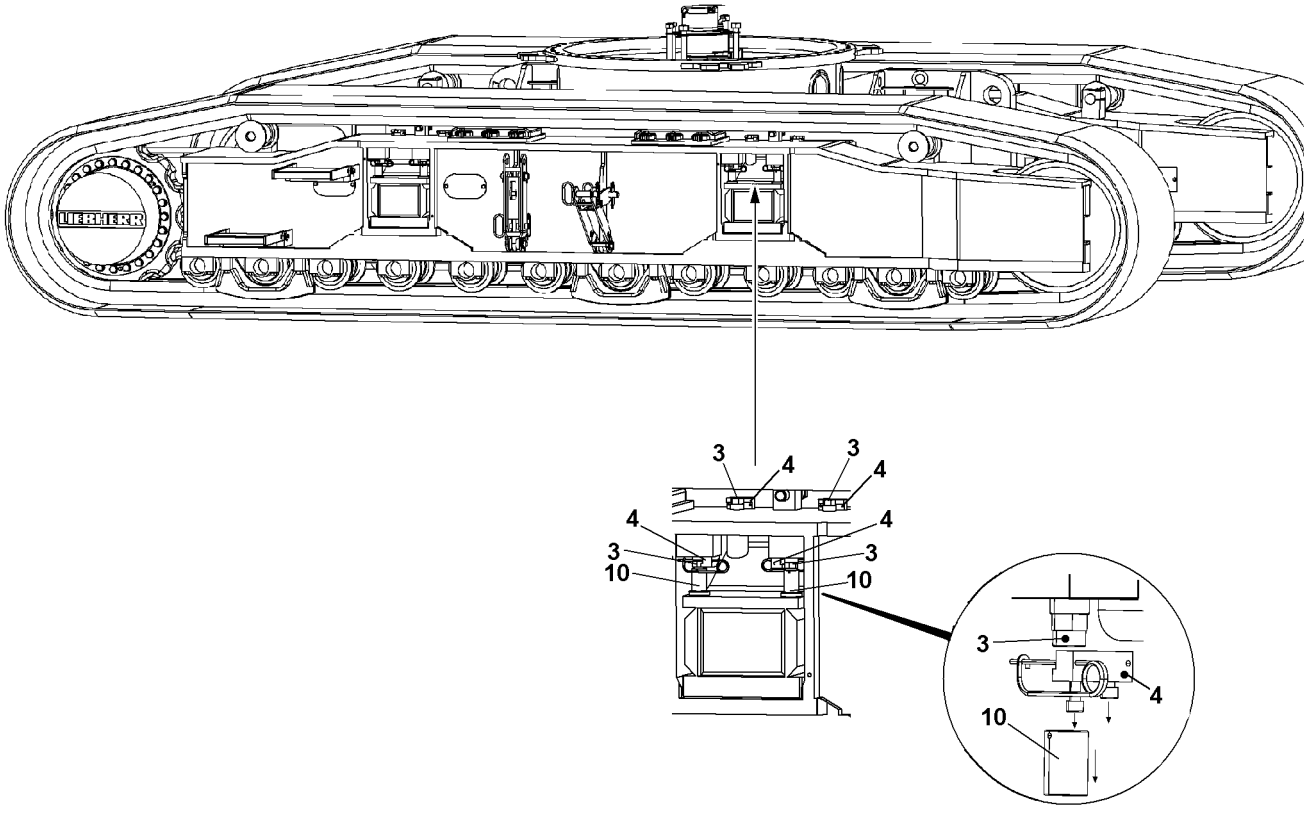

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Fig.199206

1.6.3 Assembling the first crawler carrier

Make sure that the following prerequisites are met:
- The crane is supported and horizontally aligned.
- The central ballast is installed on both sides.
- The LICCON overload protection has been set according to the load chart.
- The maximum permitted distance between the center of the slewing ring and the crawler carrier on the transport vehicle is 3800 mm

The crawler carrier may only be installed when using the **wide track**.

▶ Park the transport vehicle as close as possible to the crane.

DANGER
Persons may become crushed or trapped!
▶ Do not stand between the crawler carrier and the crawler center section while the crawler carrier is being installed!

▶ Lift the crawler carrier from the transport vehicle and drive away the transport vehicle.
▶ Precisely align the beam receptacles with the beams on the crane.

CAUTION
Risk of damage to the beams and beam receptacles!
The beams and beam receptacles may become damaged if you try to physically correct a misaligned crawler carrier!
▶ Slowly slide on the crawler carrier step-by-step!
▶ If the crawler carrier begins to twist, slide it slightly backwards and re-align!

▶ Thread the wedges **11** in the beam guides into the wedge notches **12** on the underside of the beams, illustration 5.
▶ Alternately raise and lower the crawler carrier to carefully slide it onto the beam.
▶ The assistants should aid the crane operator by holding and positioning both ends of the crawler carrier.
▶ Slide the crawler carrier along the beam to the end-position **13**, illustration 6.
▶ Clamp the crawler carrier to both beams:
▶ Unscrew the front clamping screws **3** and clamp the sliding beams with spacers **10**.
▶ Screw in the rear clamping screws **3** and clamp the beams.
▶ Secure the clamping screws **3** with safety strips **4**.
▶ Check that the beams are clamped at all four clamping points secured with safety strips **4**.

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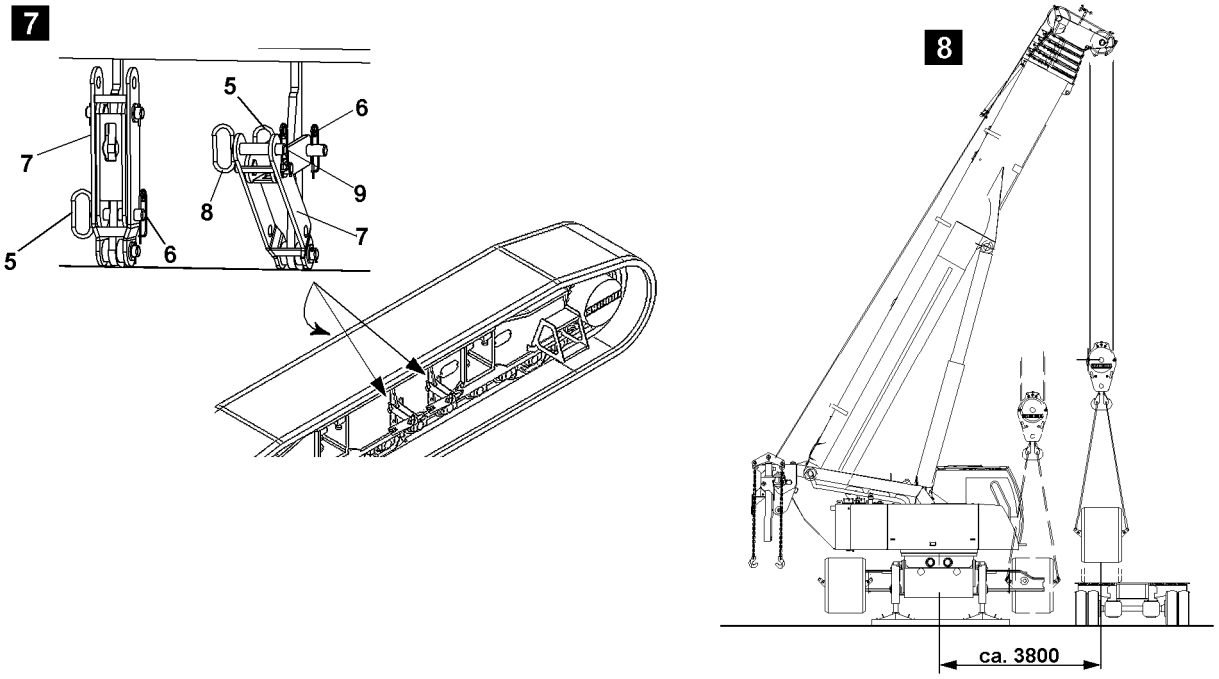

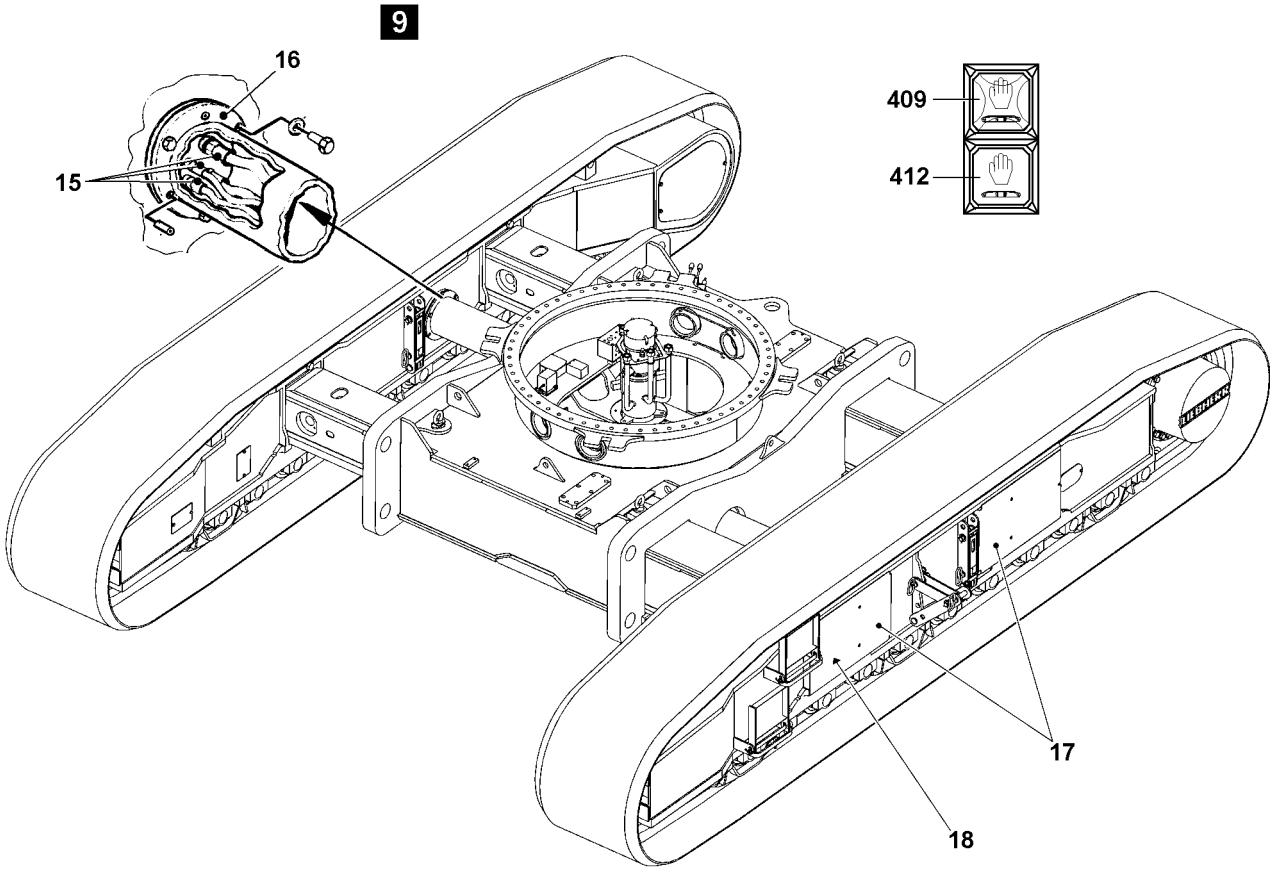

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Fig.199207

1.6.4 Folding in the transport retainers, illustration 7

Make sure that the following prerequisite is met:
– The first crawler carrier has been correctly assembled.

▶ Release and unpin the pins **8** and detach the assembly suspension.
▶ Insert the pins **8** again and secure with spring retainer **9**.
▶ Release and unpin the pins **5** and swing in the transport retainer **7**.
▶ Pin the transport retainers **7** to the crawler carrier using pins **5** and secure with spring retainers **6**.

1.6.5 Installing the second crawler carrier, illustration 8

The procedure for installing the second crawler carrier is identical to that for the first.

▶ Install the second crawler carrier.
▶ Move the support cylinders in completely.
▶ Place the support plates in the holders.

1.7 Establishing the hydraulic connections, illustration 9

Make sure that the following prerequisite is met:
– Both crawler carriers are properly assembled.

DANGER
Risk of accident when connecting the hydraulic connections!
Any movement of the crane when installing the hydraulic connections can cause fatal injury to the assembly personnel.
▶ It is prohibited to operate the pedals on the vehicle when installing the hydraulic connections!
▶ It is prohibited to turn the crane superstructure when installing the hydraulic connections!

The engine must be turned off before connecting and disconnecting any hydraulic lines.

All matching hydraulic connections are labelled.

▶ Establish the hydraulic connections **15** for the crawler drives.
▶ Screw the protective pipes **16** to the crawler carriers.
▶ Establish the hydraulic connections **18** to the track adjustment cylinder.
▶ Screw on the protective cover **17**.
▶ Press the button **412**.

Result:

– The indicator light **409** turns off.
– The support pressure has been turned off.

▶ Try and test all vehicle movements.

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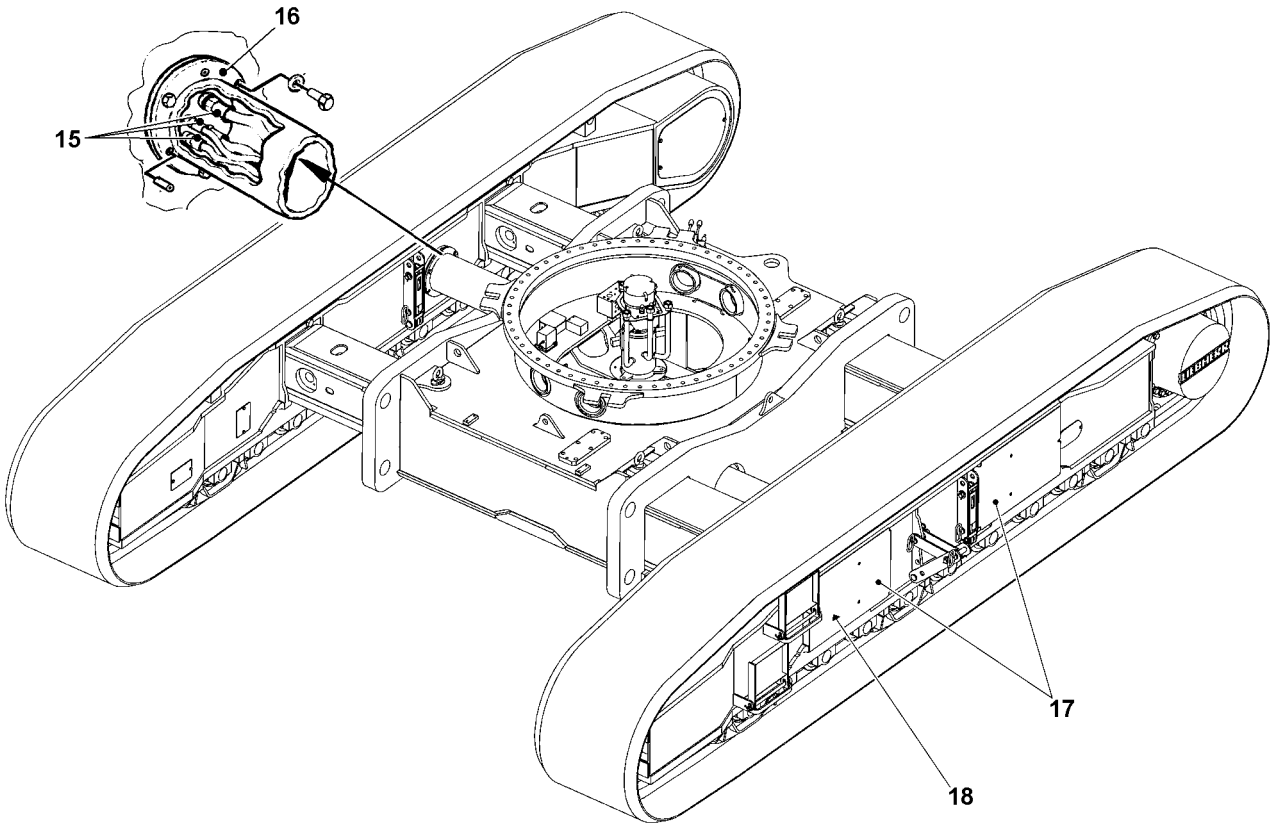

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Fig.199139

2 Disassembling the crane

Make sure that the following prerequisites are met:
- The location is level, smooth and provides sufficient load-carrying capacity.
- Authorised and trained personnel are available to carry out the assembly / disassembly work.
- The telescopic boom is fully telescoped in.
- The crawlers are assembled on wide track.
- The counterweight on the turntable has been removed.

DANGER
The crane can topple over!
If a counterweight is installed on the turntable when „supporting a crane with a load“, then the crane can topple over and fatally injure personnel!
▶ When „supporting the crane with a load“, no counterweight may be installed on the turntable!

Note
▶ The crawlers can only be assembled or disassembled on wide track.

2.1 Disconnecting the hydraulic connections

DANGER
Risk of accident when connecting the hydraulic connections!
Any movement of the crane when installing the hydraulic connections can cause fatal injury to the assembly personnel.
▶ It is prohibited to operate the pedals on the vehicle when installing the hydraulic connections!
▶ It is prohibited to turn the crane superstructure when installing the hydraulic connections!

▶ Remove the protective cover **17**.

The engine must be turned off before connecting and disconnecting any hydraulic lines.

▶ Remove the hydraulic connections **18** to the track adjustment cylinder.
▶ Protect hydraulic connections **18** with caps from contamination.
▶ Release the protective pipes **16** on the crawler carriers.
▶ Disconnect the hydraulic connections **15** for the crawler drives.
▶ Protect hydraulic connections **15** with caps from contamination.

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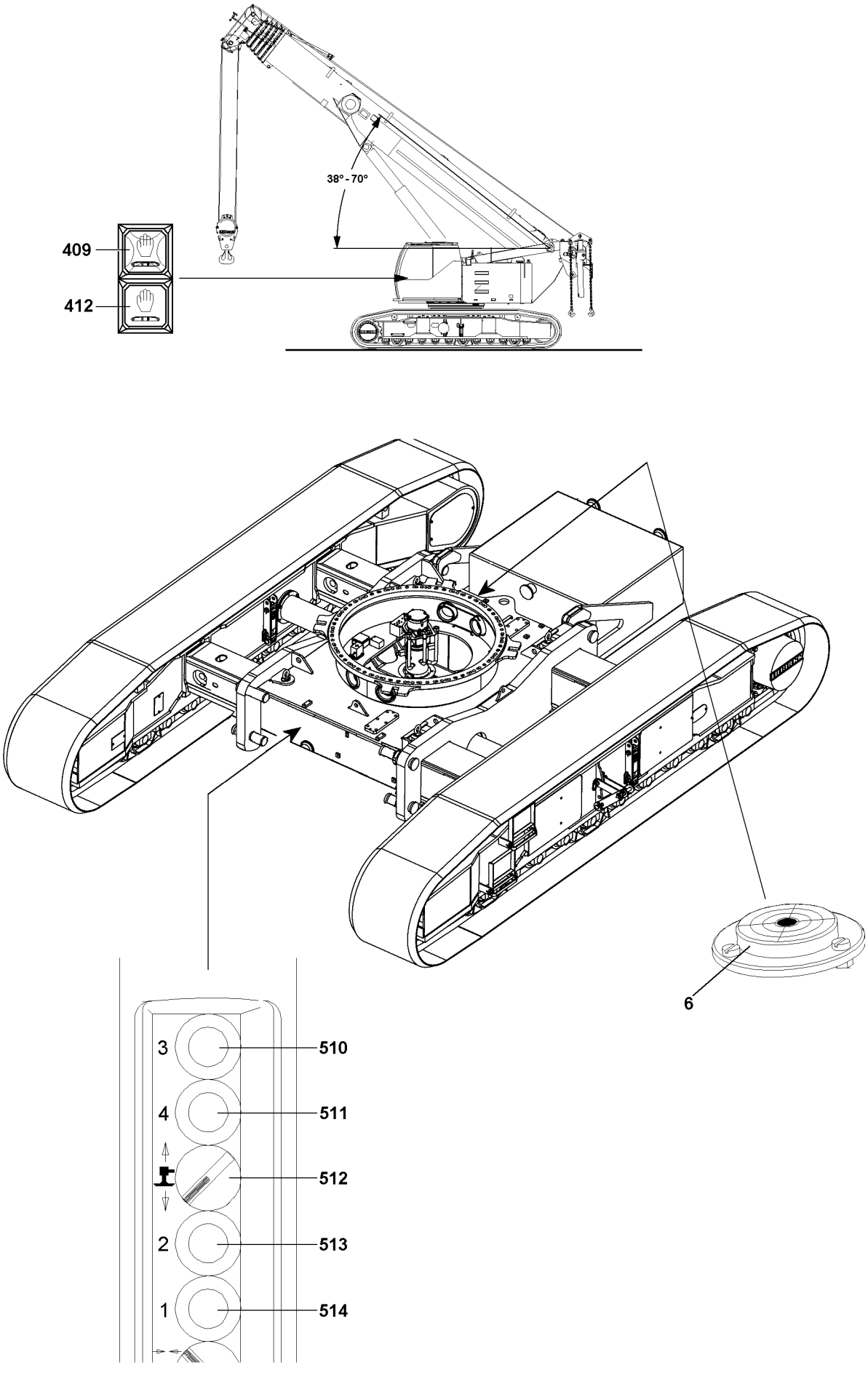

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Fig.103769

2.2 Supporting the crane

Make sure that the following prerequisites are met:
- The engine is running.
- The support cylinders are pinned in assembly position support base 2340 mm x 3300 mm.
- The LICCON overload protection has been set according to the load chart.
- The crane superstructure is mechanically locked with the crane chassis.

DANGER
Risk of tipping when the auxiliary boom is in its transport position at the side of the telescopic boom!
If the telescopic boom, with the auxiliary boom installed on the side of the telescopic boom is not luffed up to an angle range of 38° to 70° before supporting, then the crane can topple forward and fatally injure personnel!
▶ Luff the telescopic boom with the auxiliary boom installed on the side of the telescopic boom to an angle range of 38° to 70° before supporting the crane!

If an auxiliary boom is installed to the side of the telescopic boom:
▶ Luff the telescopic boom up to an angle range of 38° to 70°.
▶ Press the button **412**.

Result:

- The indicator light **409** lights up.
- The support pressure has been turned on.

Button	Support cylinder
510	Left front
511	Left rear
513	Right front
514	Right rear

▶ Move the switch **512** downward.

Result:

- Extend support cylinder is preselected.

DANGER
The crane can topple over!
If the crane is not aligned horizontally, it may tip over and fatally injure personnel!
▶ Ensure that crane is level.
▶ The maximum permitted deviation from the horizontal position of the crane is 0.3° (0.5%).

▶ Press the corresponding button and extend all support cylinders just above the support plates.
▶ Precisely align the support plates under the support cylinders.
▶ Monitor the sight gauge **6** on the crane chassis.
▶ Lower all support cylinders into the support plates.
▶ Slowly lift and level out the crane until the desired support height is reached.

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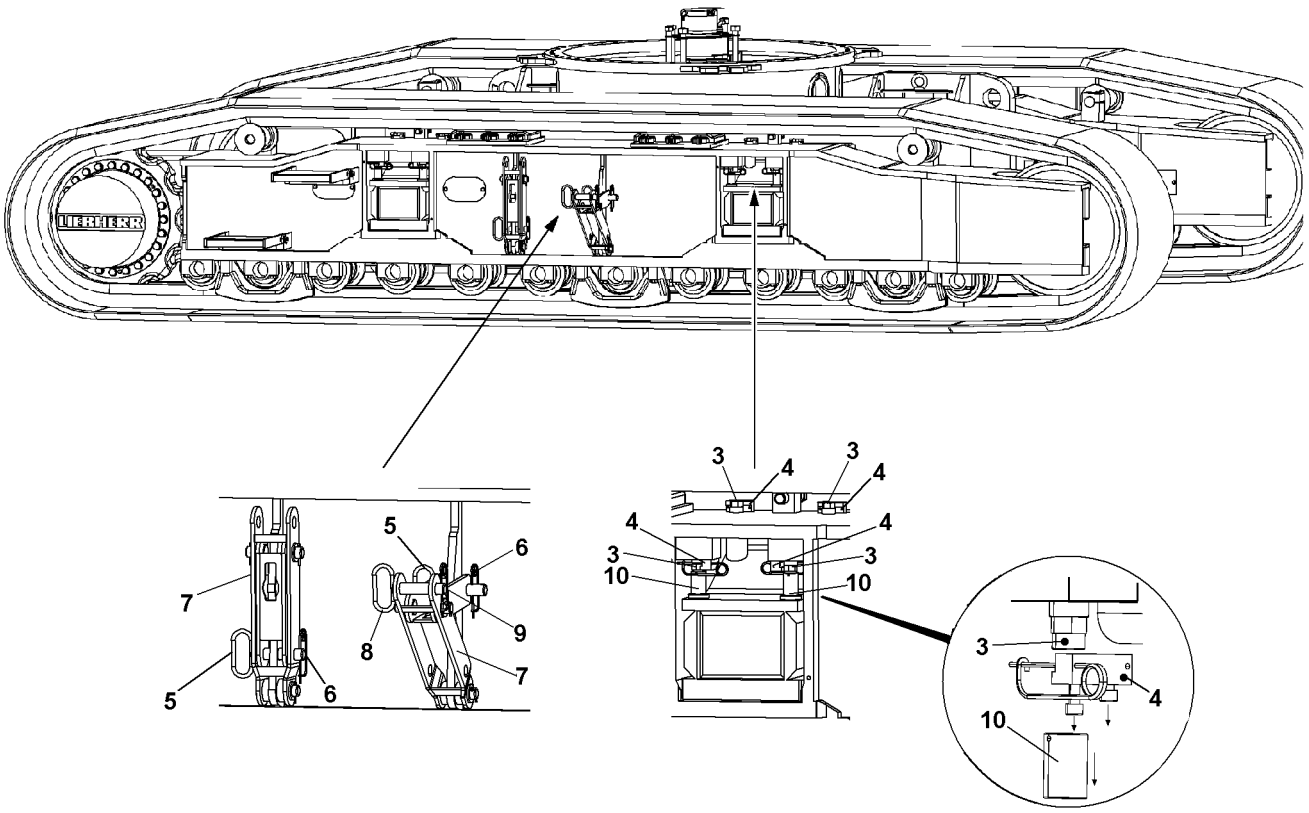

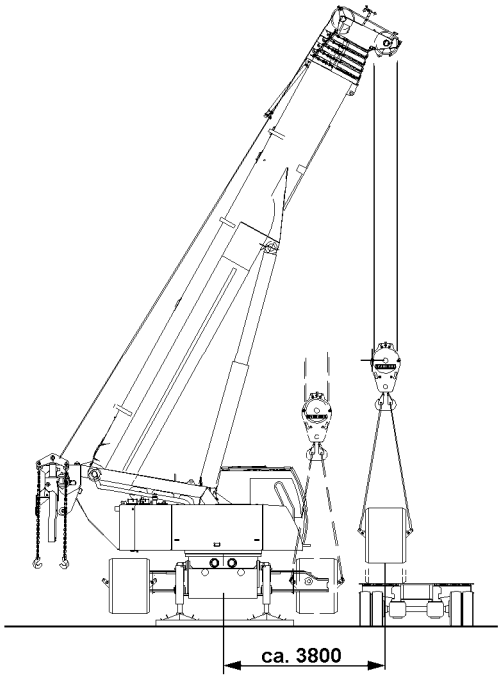

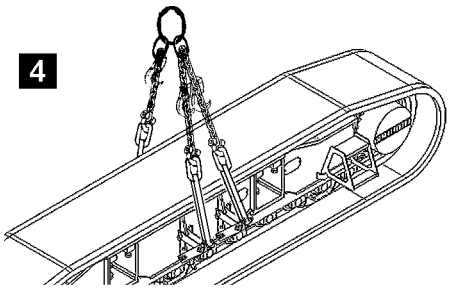

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Fig.104733

2.3 Disassembling the crawler carrier

Make sure that the following prerequisites are met:
- The crane is supported and horizontally aligned.
- The central ballast is installed on both sides.
- The LICCON overload protection has been set according to the load chart.
- The hydraulic connections are disassembled.
- The maximum permitted distance between the center of the slewing ring and the transport vehicle is 3800 mm

2.3.1 Disassembling the first crawler carrier

Three transport retainers **7** are installed to the crawler carriers. The transport retainers **7** must be swung out and pinned.

▶ Release and unpin the pin **5**.
▶ Swing out the transport retainers **7** and pin in the upper bore on the crawler carrier using the pins **5**.
▶ Secure the pin **5** with spring retainer **6**.
▶ Release and unpin the pin **8**.

CAUTION
Damage to the crawler carrier!
▶ Attach the assembly suspension in such a way that the crawler carriers are not damaged, see illustration **4**!

▶ Pin the assembly suspension using pins **8**.
▶ Attach the crawler carrier on all 3 transport retainers **7** and lightly tension the assembly suspension.
▶ Remove the safety strips **4**.
▶ Screw in the front clamping screws **3** and stow away the spacers **10**.
▶ Unscrew the rear clamping screws **3**.

CAUTION
Risk of damage to the beams and beam receptacles!
The beams and beam receptacles may become damaged if you try to physically correct a misaligned crawler carrier!
▶ Slowly remove the crawler carrier step-by-step!

▶ Lower the crawler carried approximately 50 mm.
▶ Alternately raise and lower the crawler carrier to carefully slide it off the beams.

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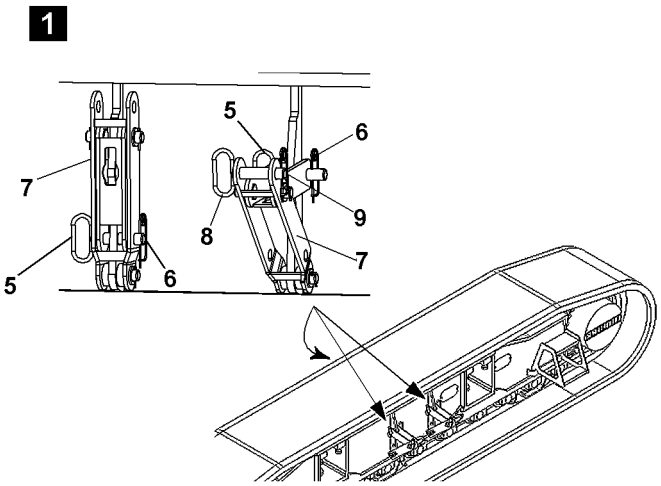

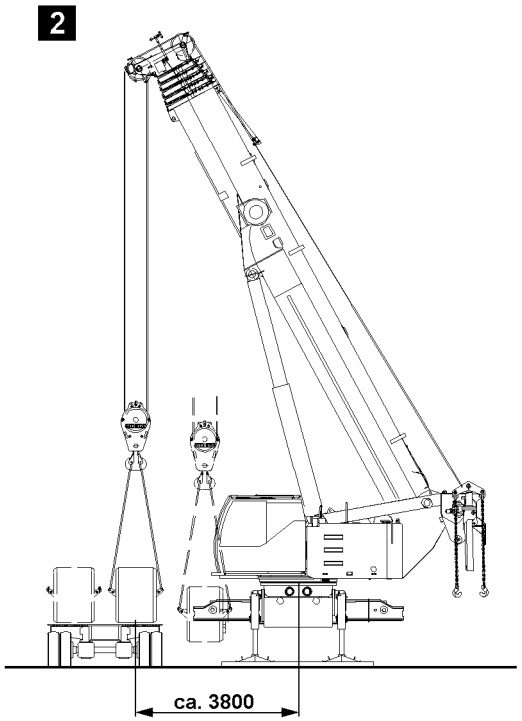

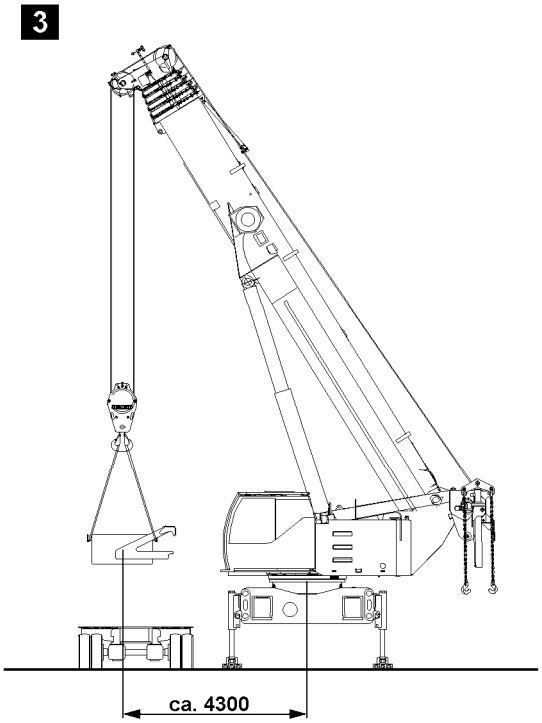

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Fig.102929

DANGER
Persons may become crushed or trapped!
▶ Do not stand between the crawler carrier and the transport vehicle when the crawler carrier is being removed!

▶ The assistants should aid the crane operator by holding and positioning both ends of the crawler carrier.
▶ Load the crawler carrier onto the transport vehicle.

2.3.2 Folding in the transport retainers, illustration 1

▶ Release and unpin the pins **8** and detach the assembly suspension.
▶ Insert the pins **8** again and secure with spring retainer **9**.
▶ Release and unpin the pins **5** and swing in the transport retainer **7**.
▶ Pin the transport retainers **7** to the crawler carrier using pins **5** and secure with spring retainers **6**.

2.3.3 Disassembling the second crawler carrier, illustration 2

The procedure for disassembling the second crawler carrier is identical to that for the first.

▶ Disassemble the second crawler carrier.

2.4 Disassembling the central ballast, illustration 3

Make sure that the following prerequisites are met:
– The crawler carriers on both sides have been disassembled.
– The LICCON overload protection has been set according to the load chart.
– The hook block weighs maximum 0.5 t.
– The maximum permitted distance between the center of the slewing ring and the central ballast on the transport vehicle is 4300 mm

▶ Remove the central ballast on both sides, see detailed description in chapter 3.03.

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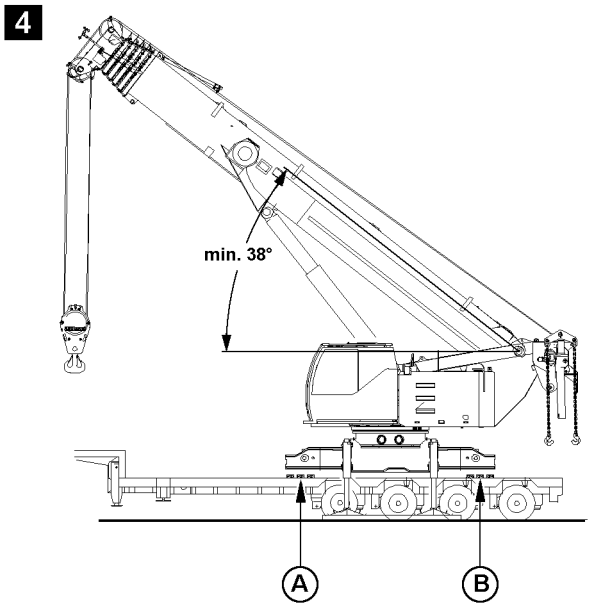

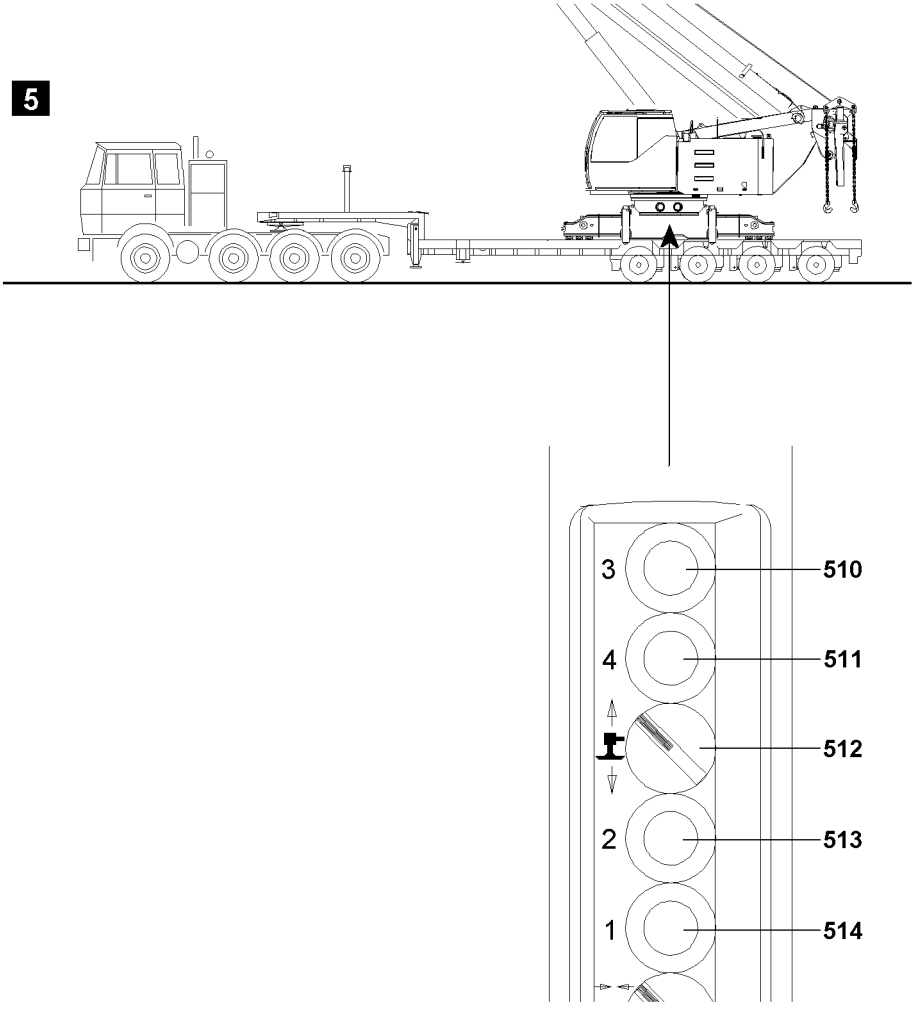

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Fig.102930

2.5 Loading the crane onto the transport vehicle, illustrations 4 and 5

Make sure that the following prerequisites are met:
- The crawler carriers and central ballast on both sides have been disassembled.
- The crane is supported at a sufficient height to enable the transport vehicle to drive under the crane.
- The LICCON overload protection has been set according to the load chart.
- The transport vehicle is equipped with underlay timbers for supporting the beams.

Note

▶ The beams must be supported at both ends to ensure the stability of the crane. See illustration 4 position **A** and **B**.

DANGER

The crane can topple over!
When driving in the transport vehicle, the support cylinder may be caught and cause the crane to topple over!

▶ An assistant must guide the transport vehicle!
▶ The transport vehicle should not catch any of the support cylinders!
▶ Do not turn the crane superstructure when the crane is resting on the transport vehicle!

▶ Carefully drive the transport vehicle under the supported crane.

Buttons **510**, **511**, **513** and **514** may be used to extend / retract the support cylinders. No more than a maximum of 2 support cylinders should be moved at the same time.

Button	Support cylinder
510	Left front
511	Left rear
513	Right front
514	Right rear

▶ Move the switch **512** upward.

Result:

– Support cylinder retraction is preselected.

▶ Press the corresponding button and retract all supports until the crane is lying on the transport vehicle.
▶ Place the support plates in the holders.

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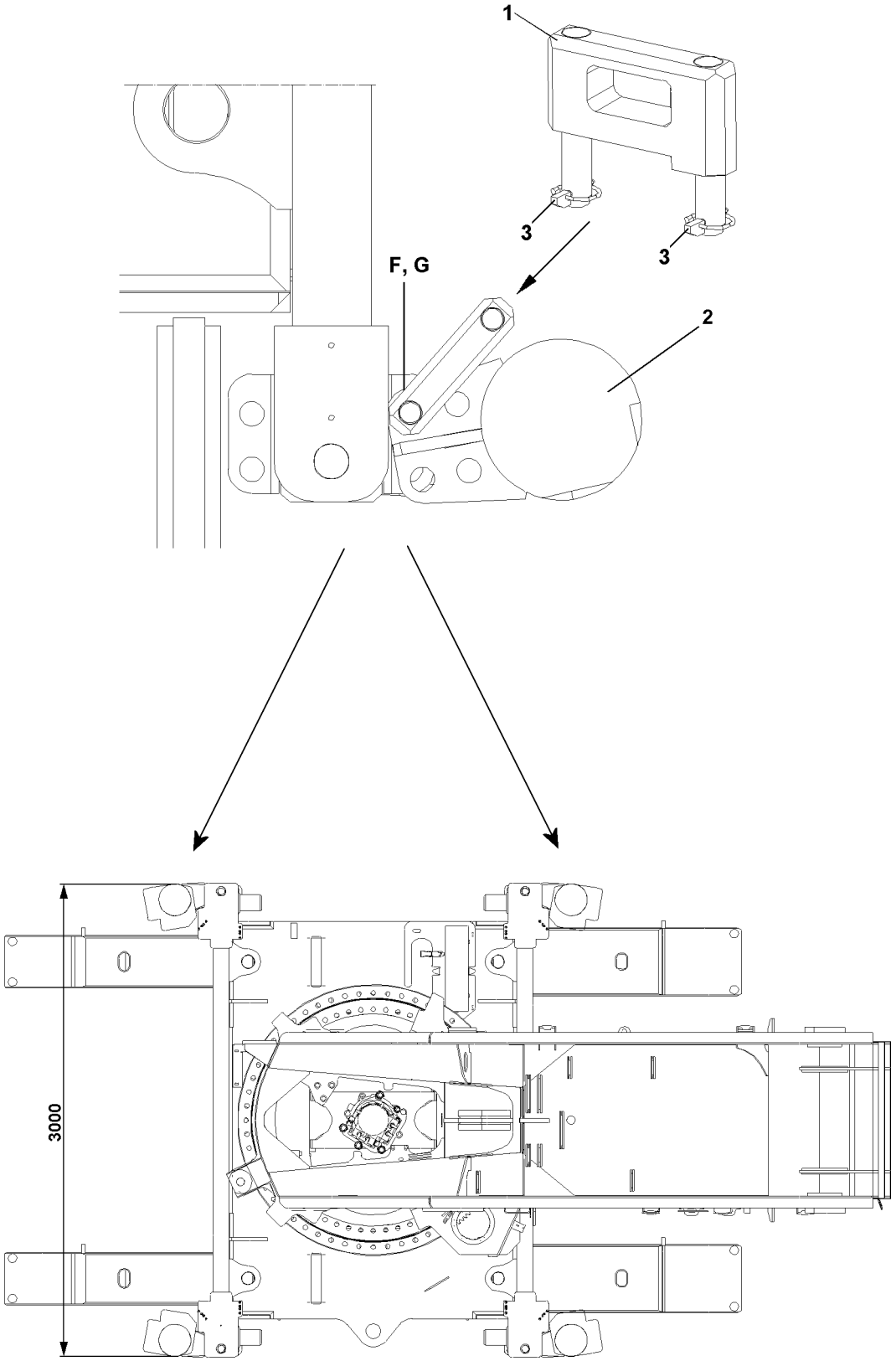

LWE/LTR 1100-005/17505-03-02/en

Fig.104730

2.6 Pinning the support cylinders in transport position

Make sure that the following prerequisites are met:
- The support cylinders have been fully retracted.
- The crane has been set down on the transport vehicle.
- The beams are supported on both ends with wooden planks.

▶ Release and unpin the straight retaining bracket **1**.
▶ Swing the support cylinders **2** in until the bore **F** and the bore **G** align.
▶ Unpin the straight retaining bracket **3** on one side at hole **F** and hole **G** and secure with linch pins **3**.

Also pin the other support cylinders **2**.

▶ Pin all four support cylinders **2** in their transport position.

Note
▶ The crane has a transport width of 3000 mm when the support cylinders **2** are swung in.

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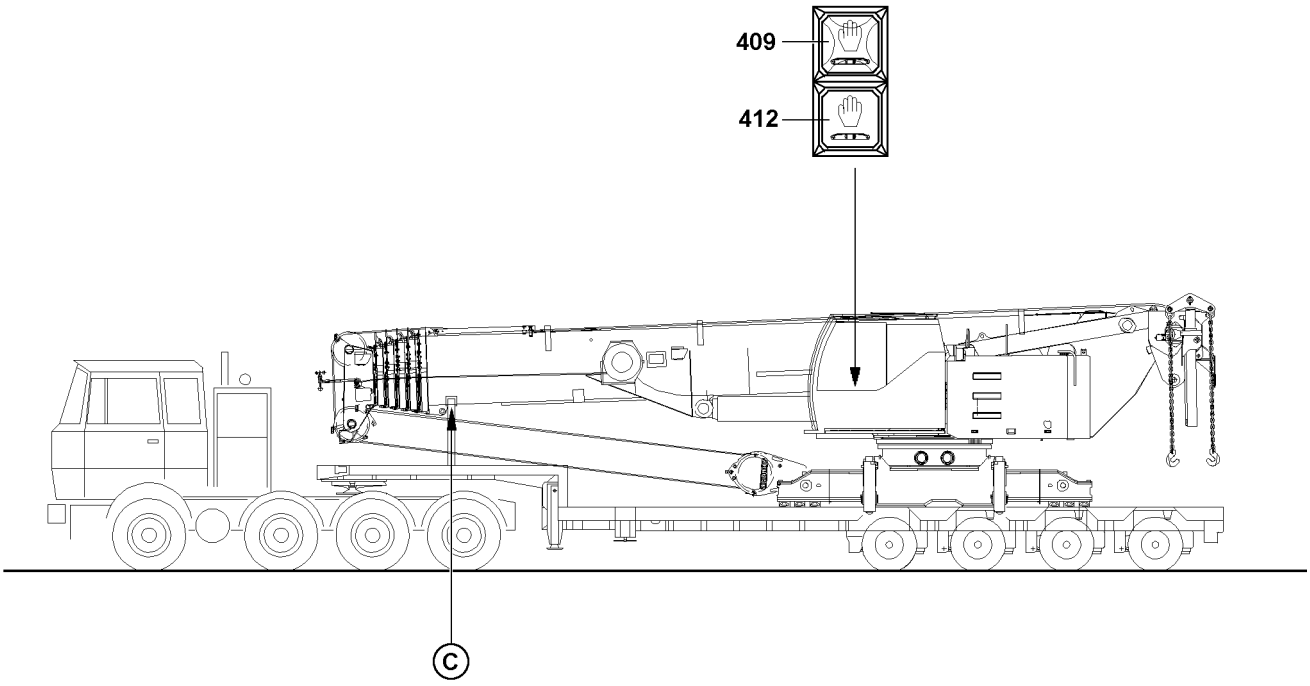

Fig.199146

2.7 Securing the crane properly on the transport vehicle

Make sure that the following prerequisites are met:
- The hatch consoles are pinned in their transport position.
- The LICCON overload protection has been set according to the load chart.
- The crane has been set down on the transport vehicle.
- The beams are supported on both ends with wooden planks.

▶ Lock the crane superstructure with the crane chassis.

Note

▶ The telescopic boom must be supported on the transport vehicle to ensure the stability of the crane. See position **C**.

▶ Luff down the telescopic boom and place it on the support base.
▶ Fasten the hook block to the crawler center section and lightly tension the hoist rope.
▶ Secure the ballast assembly chains to avoid uncontrolled swinging.
▶ Press the button **412**.

Result:

- The indicator light **409** turns off.
- The support pressure has been turned off.

WARNING

Falling crane if insufficiently secured!

▶ The crane must be rigged and secured sufficiently to survive a strong braking maneuver!

▶ Rig and secure the crane properly on the transport vehicle, see Crane operating instructions, chapter 3.80.

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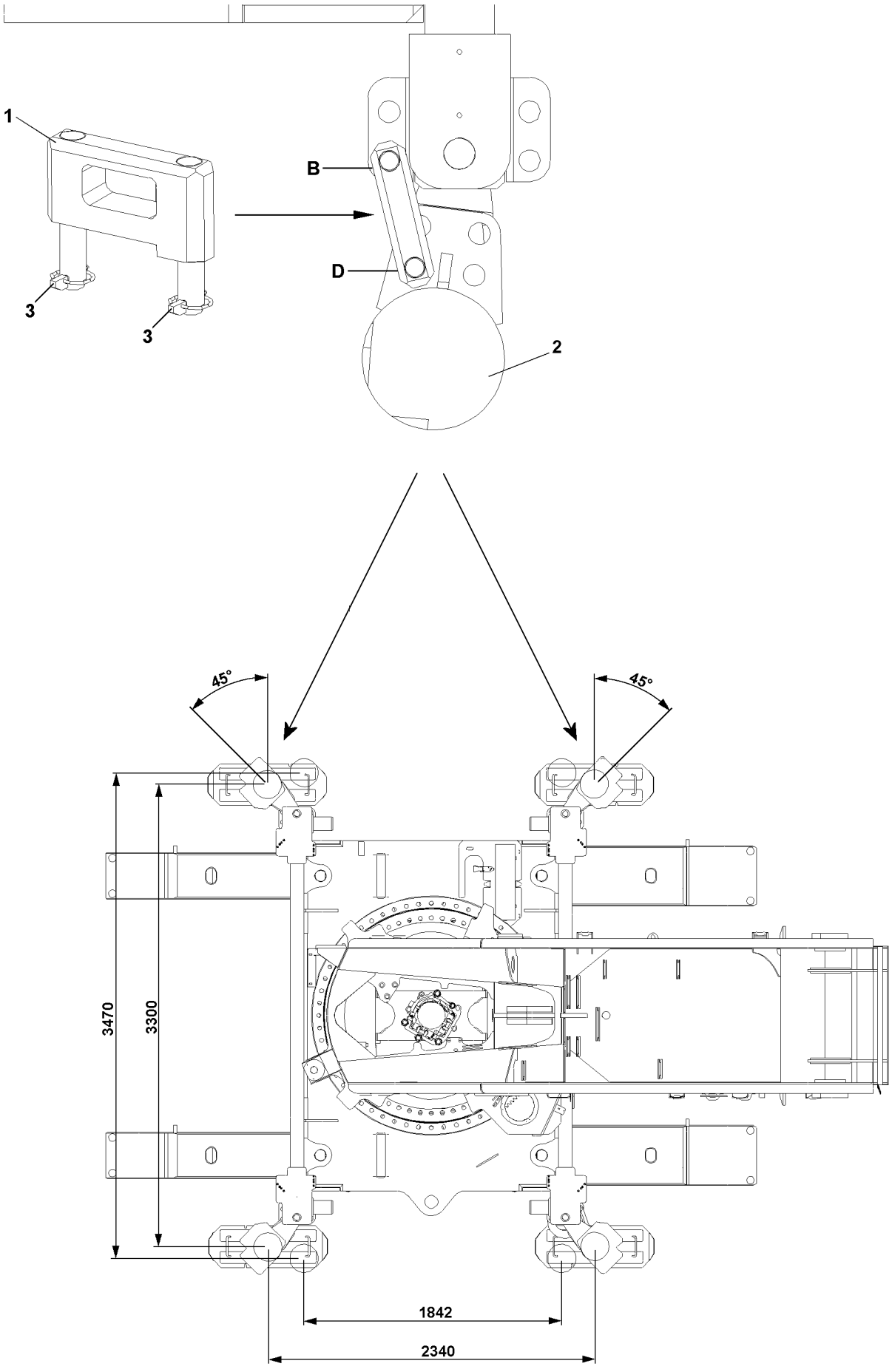

Fig.104731

3 Unloading / loading the crane with extra wide transport vehicle

3.1 Unloading the crane with extra wide transport vehicle

Make sure that the following prerequisites are met:
- The location is level, smooth and provides sufficient load-carrying capacity.
- Authorised and trained personnel are available to carry out the assembly / disassembly work.
- The telescopic boom is fully telescoped in and placed on the telescopic boom receptacle.
- The crane superstructure is locked with the crane chassis.
- The crane lies on the transport vehicle.
- The straight retaining brackets **1** are released and unpinned
- The central ballast has been removed.
- The counterweight on the turntable has been removed.

DANGER
The crane can topple over!
If a counterweight is installed on the turntable when „supporting a crane with a load“, then the crane can topple over and fatally injure personnel!
▶ When „supporting the crane with a load“, no counterweight may be installed on the turntable!

DANGER
The crane can topple over!
If the crane superstructure is turned with a support base of 1842 mm x 3470 mm , the crane can topple over and fatally injure personnel!
▶ Turning the crane superstructure at a support base of 1842 mm x 3470 mm is prohibited!
▶ The crane may only be supported at a support base of 1842 mm x 3470 mm for unloading / loading of extra wide transport vehicles!
▶ Assembly operation is only permitted at a support base of 2340 mm x 3300 mm !

▶ Swing out the support cylinder **2**.
▶ Pin the straight retaining brackets **1** at hole **B** and hole **D** and secure with linch pins **3**.

Also pin the other support cylinders **2**.

▶ Pin all four support cylinders **2** in assembly position support base 1842 mm x 3470 mm.

DANGER
Risk of tipping when the auxiliary boom is in its transport position at the side of the telescopic boom!
If the telescopic boom, with the auxiliary boom installed on the side of the telescopic boom is not luffed up to an angle range of 38° to 60° before supporting, then the crane can topple over and fatally injure personnel!
▶ Luff the telescopic boom with the auxiliary boom installed on the side of the telescopic boom to an angle range of 38° to 60° before supporting the crane!

▶ Support the crane until the extra wide transport vehicle can be driven off underneath the crane.
▶ Carefully drive the extra wide transport vehicle off underneath the supported crane.

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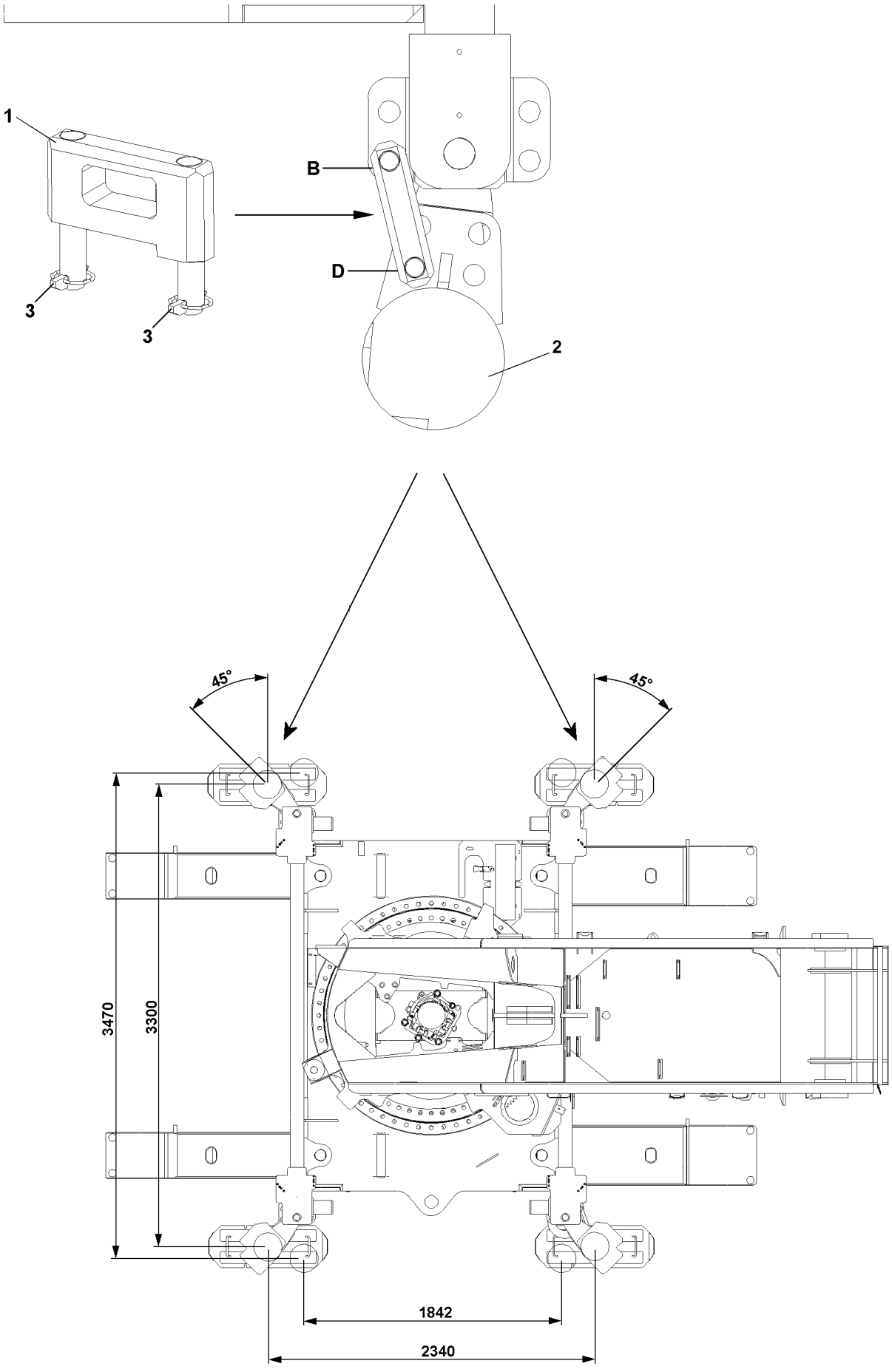

Fig.104731

DANGER
The crane can topple over!
If the crane is not properly and safely supported, the crane can topple over and fatally injure personnel!
▶ Support the crane properly and safely to prevent it from tipping over.

▶ Support the crane properly and safely to prevent it from tipping over.
▶ Retract the support cylinders and carefully lower the crane onto the support.
▶ Swing and pin all four support cylinders in assembly position, see section „Pinning the support cylinder in assembly position“.
▶ Support the crane in a assembly position support base 2340 mm x 3300 mm.
▶ Assemble the crane as described in the chapter.

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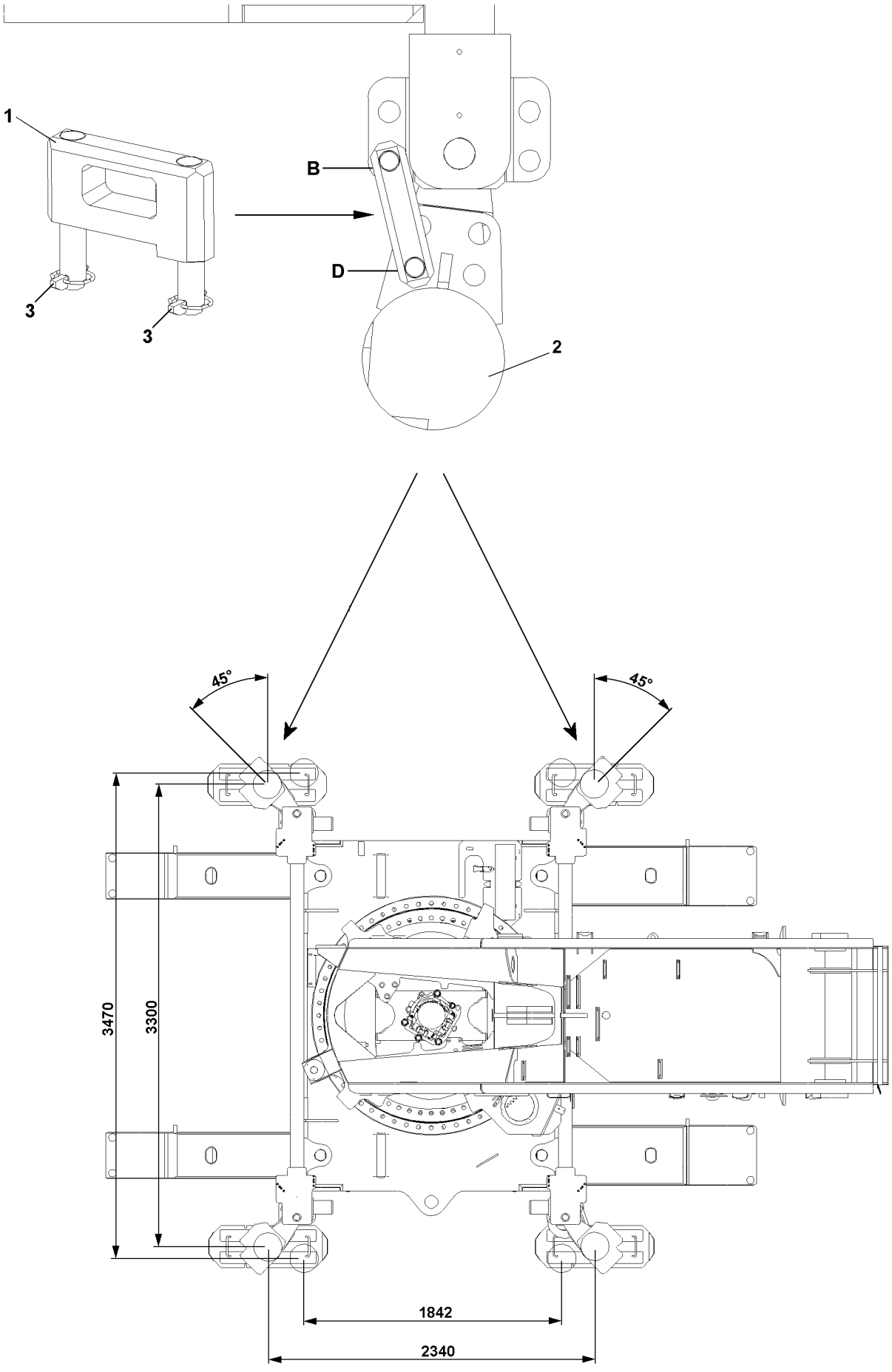

Fig.104731

3.2 Loading the crane with extra wide transport vehicle

Make sure that the following prerequisites are met:
- The location is level, smooth and provides sufficient load-carrying capacity.
- Authorised and trained personnel are available to carry out the assembly / disassembly work.
- The crane superstructure is locked with the crane chassis.
- The central ballast has been removed.
- The counterweight on the turntable has been removed.
- Both crawler carriers have been removed.
- Wooden beams for the support of the sliding beams are placed on the extra wide transport vehicle.
- The crane is supported on a support base of 2340 mm x 3300 mm.

DANGER
The crane can topple over!
If the crane superstructure is turned with a support base of 1842 mm x 3470 mm , the crane can topple over and fatally injure personnel!
- ▶ Turning the crane superstructure at a support base of 1842 mm x 3470 mm is prohibited!
- ▶ The crane may only be supported at a support base of 1842 mm x 3470 mm for unloading / loading of extra wide transport vehicles!
- ▶ Assembly operation is only permitted at a support base of 2340 mm x 3300 mm !

DANGER
The crane can topple over!
If the crane is not properly and safely supported, the crane can topple over and fatally injure personnel!
- ▶ Support the crane properly and safely to prevent it from tipping over.

- ▶ Support the crane properly and safely to prevent it from tipping over.
- ▶ Retract the support cylinders and carefully lower the crane onto the support.
- ▶ Release and unpin the straight retaining bracket **1**.
- ▶ Swing out the support cylinder **2**.
- ▶ Pin the straight retaining brackets **1** at hole **B** and hole **D** and secure with linch pins **3**.

Also pin the other support cylinders **2**.

DANGER
Risk of tipping when the auxiliary boom is in its transport position at the side of the telescopic boom!
If the telescopic boom, with the auxiliary boom installed on the side of the telescopic boom is not luffed up to an angle range of 38° to 60° before supporting, then the crane can topple over and fatally injure personnel!
- ▶ Luff the telescopic boom with the auxiliary boom installed on the side of the telescopic boom to an angle range of 38° to 60° before supporting the crane!

- ▶ Support all four support cylinders **2** on support base 1842 mm x 3470 mm.
- ▶ Carefully drive the extra wide transport vehicle under the supported crane.
- ▶ Retract the support cylinders and place the crane on the extra wide transport vehicle.
- ▶ Disassemble the crane as described in the chapter.

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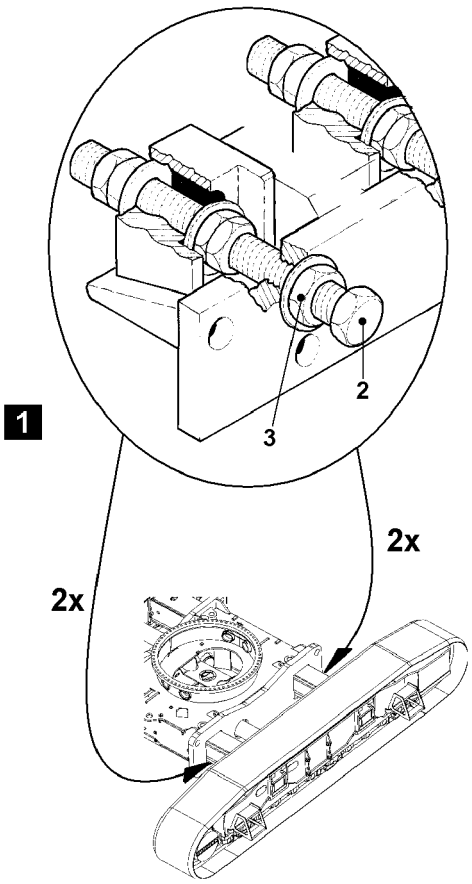

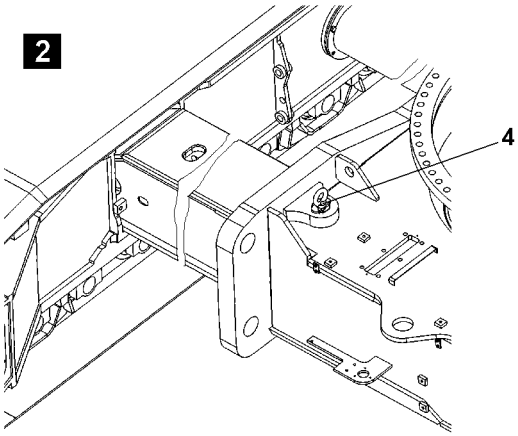

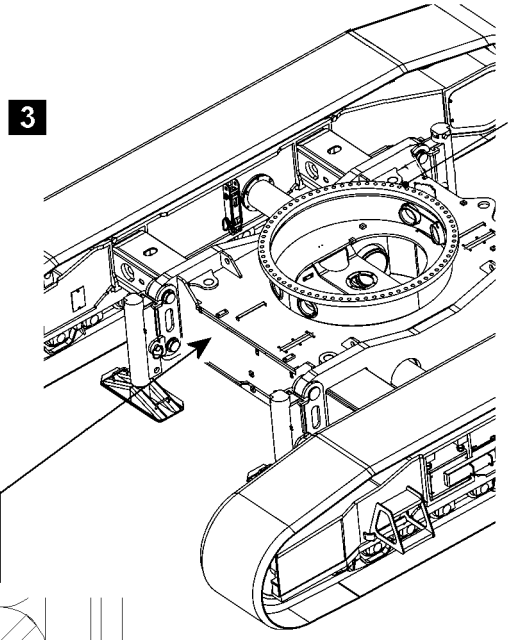

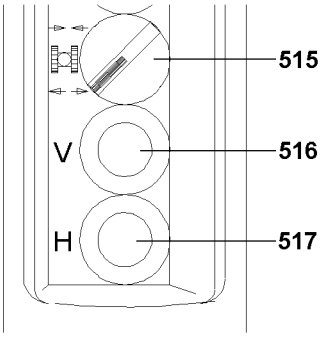

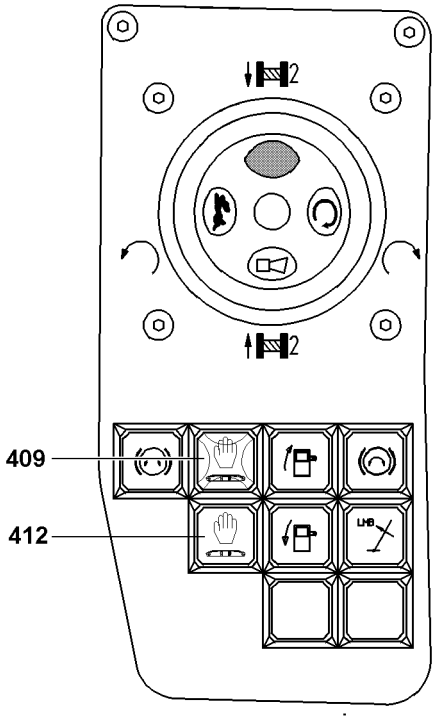

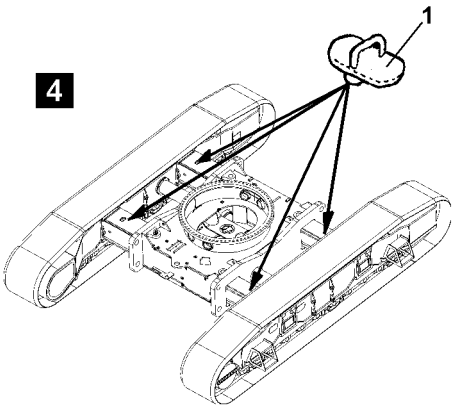

Fig.102925

4 Adjusting the track width

4.1 General

DANGER
The crane can topple over!
The reduced or retracted track reduces the stability of the crawler crane. Due to operational errors during crane operation or driving, the crawler crane can topple over and fatally injure personnel!
- ▶ Crane operation and „driving the crawler with load“ is permitted for reduced or retracted track, if **extra load charts** are programmed for this case!
- ▶ Crane operation and „driving the crawler with load“ is strictly prohibited for reduced or retracted track, if **no extra load charts** are programmed for this case!

Make sure that the following prerequisites are met:
- The crane is horizontally aligned and standing on level and smooth ground.
  The crawler carriers should not sink into the ground, or get caught by obstacles such as boulder edges when changing the track.
- All loads and lifting equipment have been set down.
- The engine is running.
- The counterweight on the turntable has been removed.
- The crane superstructure is pointing either „backwards“ or „forwards“ and is mechanically locked to the chassis
- Two assistants are ready to help.

Note
- ▶ It is not possible to remove the crawler carrier, counterweight and central ballast in narrow track operation.
- ▶ The crawler carrier should always be completely converted before starting on the other crawler carrier!

4.2 Tasks of the assistants

Assistant at the front of the chassis:

- ▶ Loosens the front pins **4** on the beams, illustration 2.
- ▶ Monitors the front track adjustment and maintains direct eye contact with the machine operator.
- ▶ Relays instructions from the machine operator to the assistant at the rear and vice-versa.
- ▶ Once the track has been adjusted, the front assistant must pin the front beam.

Assistant at the rear of the chassis:

- ▶ Loosens the rear pins **4** on the beams, illustration 2.
- ▶ Monitors the rear track adjustment and maintains direct eye contact with the front assistant.
- ▶ Gives / takes instructions from the front assistant.
- ▶ Once the track has been adjusted, the rear assistant must pin the rear beam.

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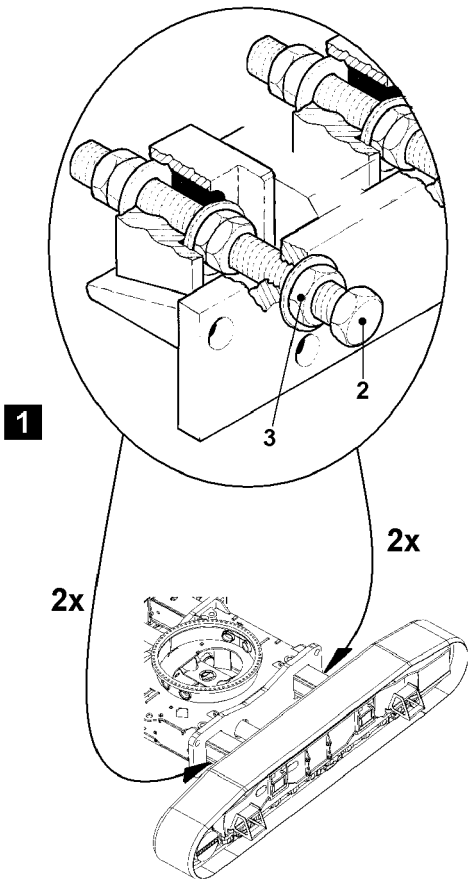

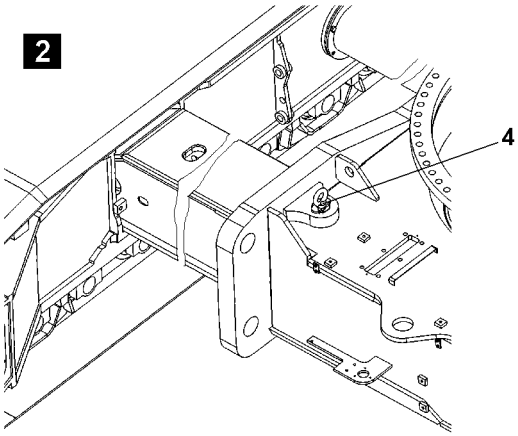

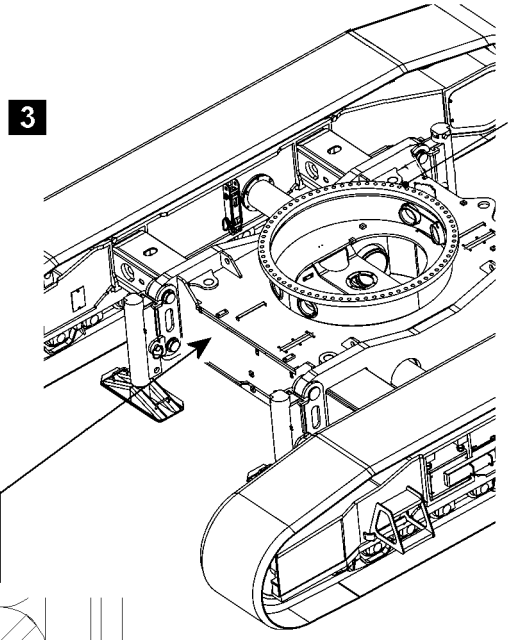

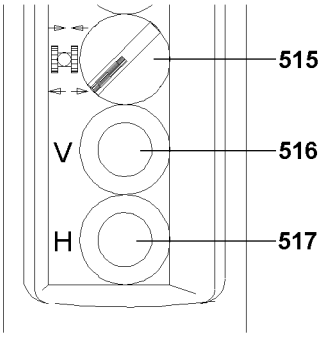

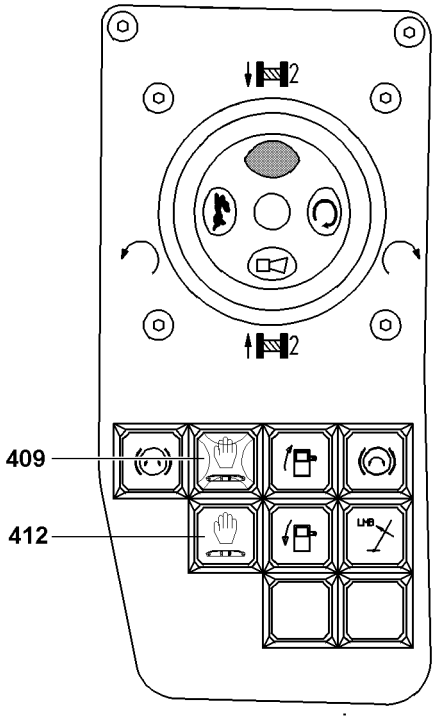

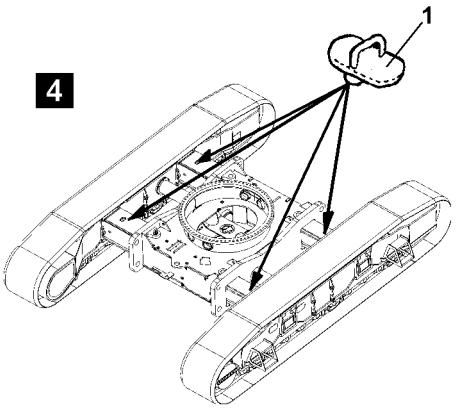

Fig.102925

4.3 Increasing the track width

DANGER
Danger of crushing!
▶ When adjusting the track, take particular care to ensure that no one is in the vicinity of the danger zone around the crawler carrier.

CAUTION
Damage to the machine!
▶ Always drive out the left crawler carrier first!

Note
▶ Left and right are defined as viewed from the rear. The crawler carrier drive is located at the rear.

▶ Remove both beam wedges at the **left front** and **left rear** of the crawler center section:

This is made easier if both wedge screws are loosened by the same amount (not too much).

▶ First loosen the nut **3** and then turn the screw **2** clockwise to remove the wedge, illustration 1.
▶ Pull the front and rear pins **4** on the left crawler center section, illustration 2.
▶ Press the button **412**.

Result:

– The indicator light **409** lights up.
– The crawler track adjustment has been turned on.

▶ Move the switch **515** downward.

Result:

– Track width enlarging is preselected.

▶ Press the button **516** for „track adjustment front“ and the button **517** for „track adjustment rear“ and push the crawler carriers out to the outer pin points of the sliding beams, illustration 3.
▶ Insert the front and rear pins **4** into the left crawler center section, illustration 2.

The right crawler carrier can be slid in identically as the left crawler carrier.

CAUTION
Hydraulic hoses may break off!
The right crawler carrier does not have a mechanical end-stop.
▶ Do not slide out the right crawler carrier beyond the specified distance (wide track)!

▶ Slide out the right crawler carrier and pin using pin **4**, illustration 2.

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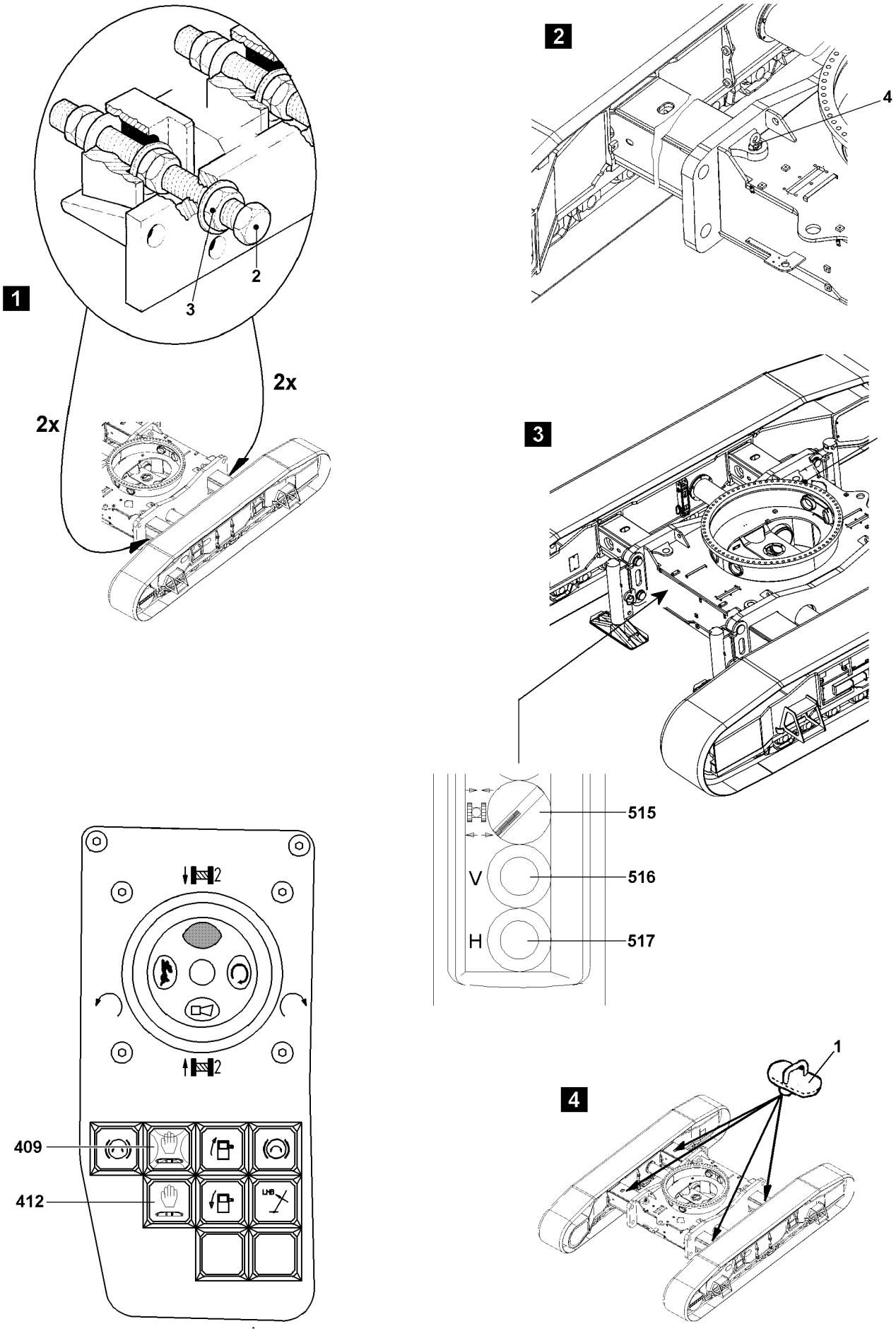

Fig.102925

▶ Wedge the beams on the left and right crawler carriers:

The maximum tightening torque of the screw **2** is 120 Nm.

When wedging each of the beams:
▶ Unscrew the screw **2** (counter clockwise) to wedge the beams.

When wedging each of the beams:
▶ Tighten the nut **3**.
▶ Attach the cover **1** to the beams, illustration 4.
▶ Check all eight screws **2** and if necessary tighten and secure.

After sliding out the crawler carrier:
▶ Grease any exposed sliding surfaces on the beams.
▶ Press the button **412** again.

Result:

– The indicator light **409** turns off.
– The crawler track adjustment has been turned off.

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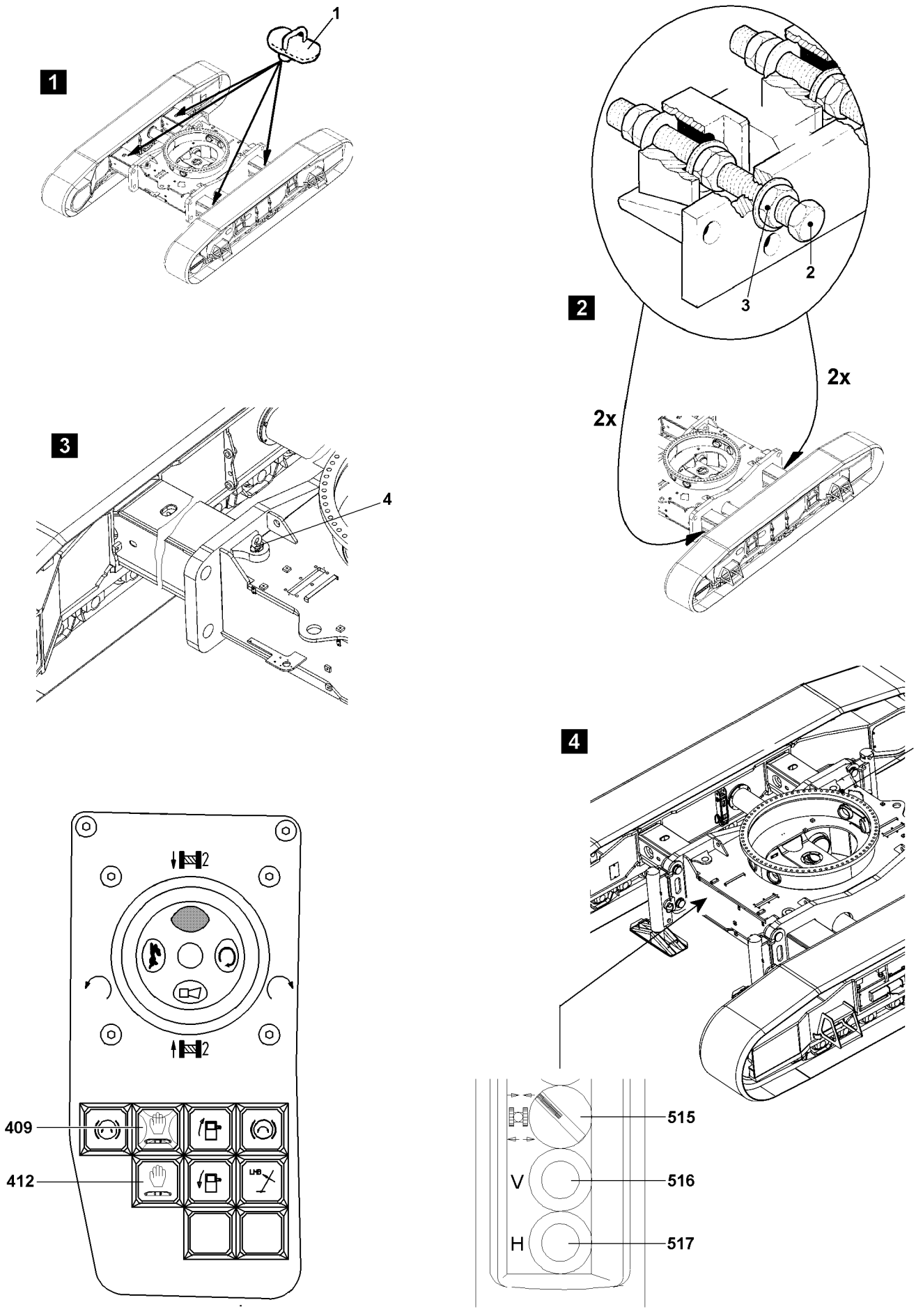

Fig.102926

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4.4 Reducing track width

DANGER
Danger of crushing!
▶ When adjusting the track, take particular care to ensure that no one is in the vicinity of the danger zone around the crawler carrier.

CAUTION
Damage to the machine!
▶ Always drive in the right crawler carrier first!

Note
▶ Left and right are defined as viewed from the rear. The crawler carrier drive is located at the rear.

▶ Remove the cover **1** from the beams, illustration 1.

If necessary:
▶ Clean any of the exposed sliding surfaces on the beams.
▶ Remove both beam wedges at the **right front** and **right rear** of the crawler center section:

This is made easier if both wedge screws are loosened by the same amount (not too much).

▶ First loosen the nut **3** and then turn the screw **2** clockwise to remove the wedge, illustration 2.
▶ Pull the front and rear pins **4** on the right crawler center section, illustration 3.
▶ Press the button **412**.

Result:

– The indicator light **409** lights up.
– The crawler track adjustment has been turned on.

▶ Move the switch **515** upward.

Result:

– Retract track width is preselected.

▶ Press the button **516** for „track adjustment front“ and the button **517** for „track adjustment rear“ and push the crawler carriers in to the inner pin points of the sliding beams, illustration 4.
▶ Insert the front and rear pins **4** into the right crawler center section, illustration 3.

The left crawler carrier can be slid in the same way as the right crawler carrier.

▶ Slide in the left crawler carrier and pin using pins **4**, illustration 3.

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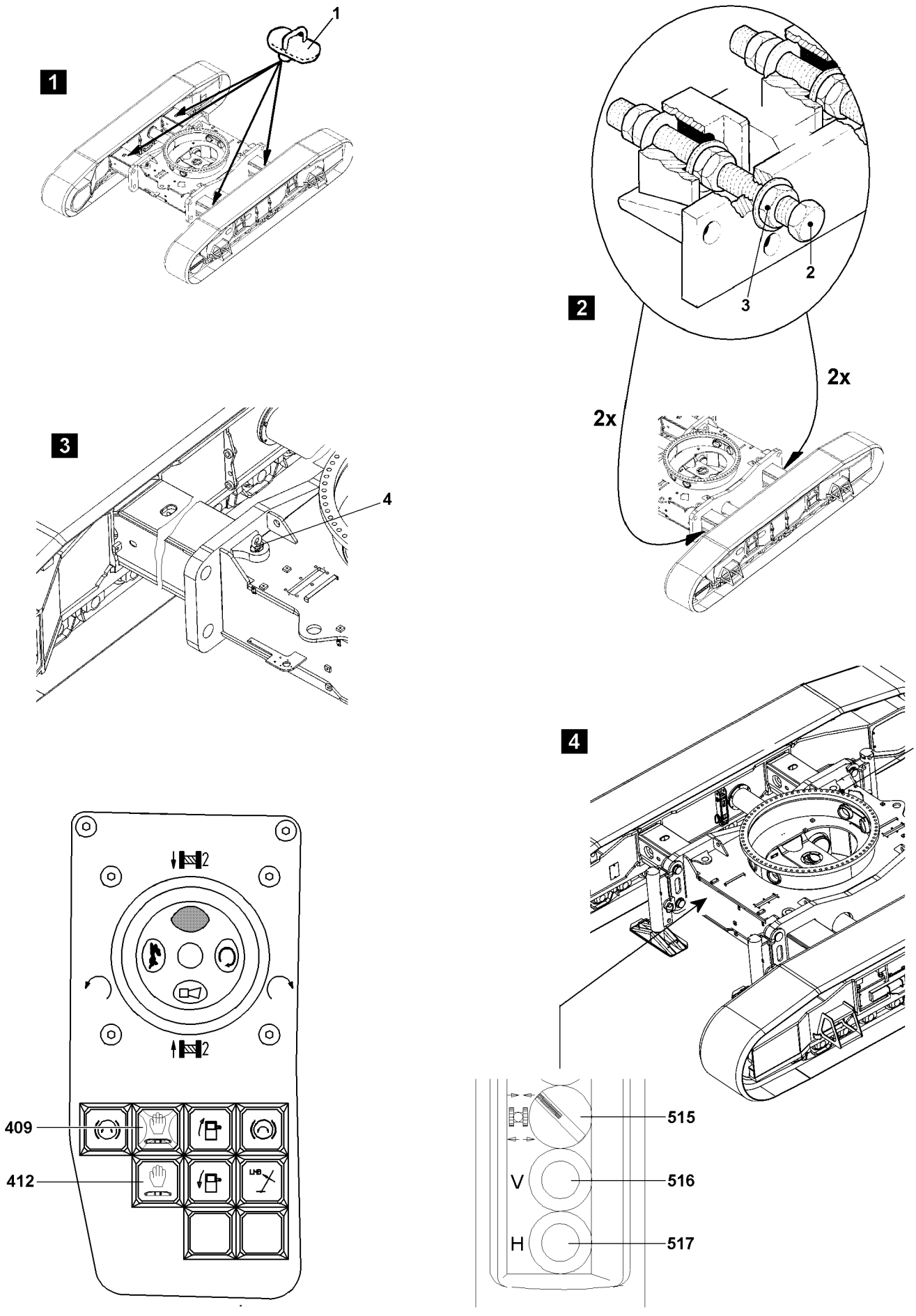

Fig.102926

LWE/LTR 1100-005/17505-03-02/en

▶ Wedge the beams on the left and right crawler carriers:

The maximum tightening torque of the screw **2** is 120 Nm.

When wedging each of the beams:
▶ Unscrew the screw **2** (counter clockwise) to wedge the beams.

When wedging each of the beams:
▶ Tighten the nut **3**.
▶ Check all eight screws **2** and if necessary tighten and secure.
▶ Press the button **412** again.

Result:

– The indicator light **409** turns off.
– The crawler track adjustment has been turned off.

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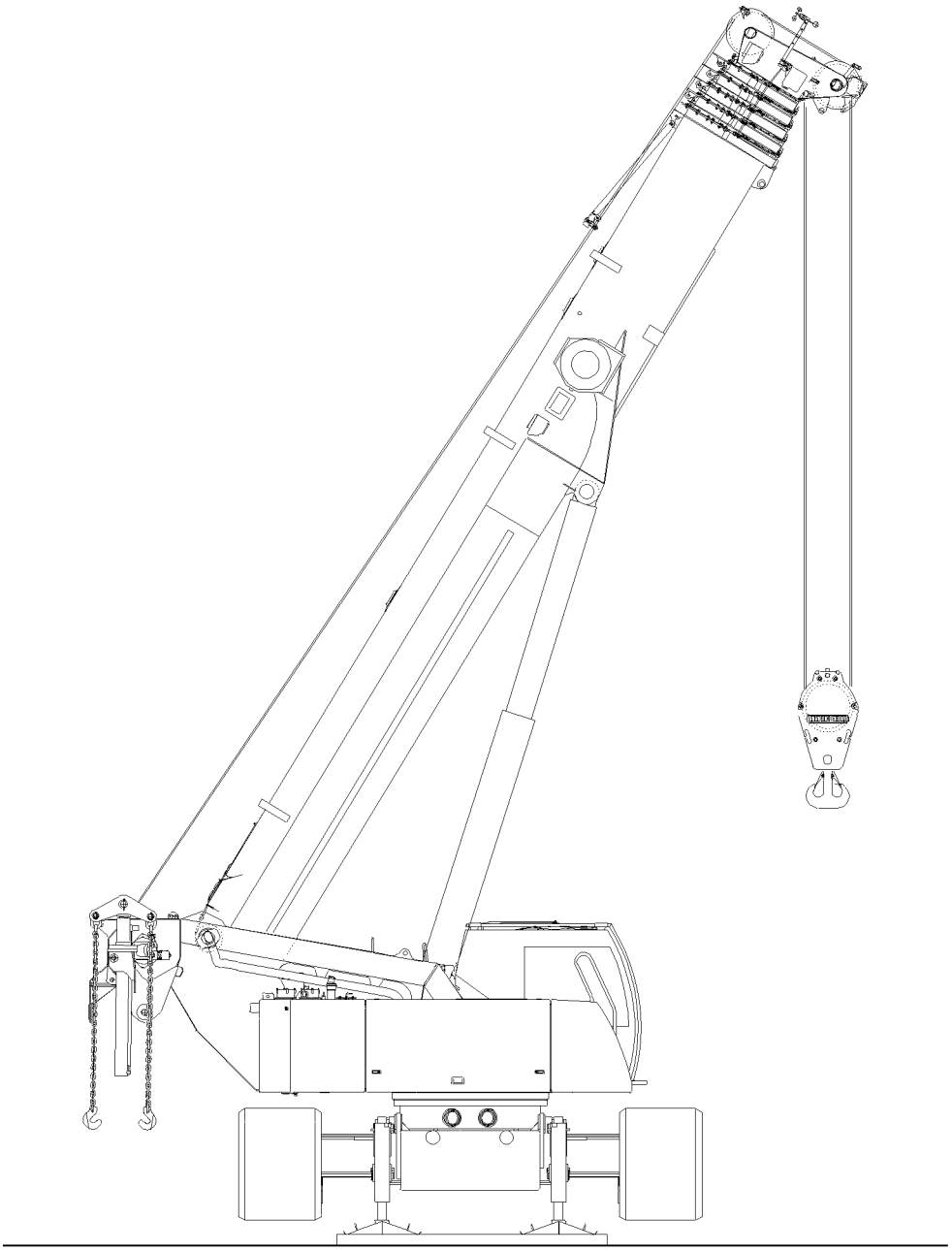

Fig.103678

4.5 Supporting the equipped crane without load

This crane can be supported on the support cylinders for simpler track adjustment in equipped condition (with crawler carriers and counterweight). To do so, the telescopic boom without load must be held within the angle ranges noted in the following chart.

Make sure that the following prerequisites are met:
- The crane is standing on wide track 4.15 m **or** reduced track 3.40 m.
- The crane superstructure is locked to the crane chassis, in travel direction to the front or rear (0° or 180°).
- The support base 2.34 m x 3.30 m (45°) **or** 1.84 m x 3.47 m (0°) is set.
- The ground is horizontal (maximum 2.5° ground incline) and of sufficient load bearing capacity.
- The folding jib may only be installed in transport position on the side of the telescopic boom.
- The auxiliary boom K- 2.9 m can be installed in transport position or in operating position.

DANGER
The crane can topple over!
If the prerequisites are not strictly observed, the crane can topple over and fatally injure personnel or the support cylinders can be overloaded!
- ▶ Adhere to the prerequisites exactly!
- ▶ Support the crane only according to the data in the chart, „permissible angle window for the telescopic boom“!

Note
- ▶ If all conditions are observed, support forces up to maximum 350 kN may occur.
- ▶ The retracted track of 2.60 m cannot be set in supported condition.

Permissible angle window for the telescopic boom					
Counterweight	**Central ballast**	**T-11.5 (0/0/0/0/0)**	**T-15.2 (0/46/0/0/0)**	**T-19.0 (46/46/0/0/0)**	**T-22.7 (92/46/0/0/0)**
32.0 t	15.0 t				36° to 34°
26.0 t	15.0 t			39° to 12°	52° to 39°
22.0 t	15.0 t		36° to 8°	52° to 22°	61° to 43°
20.0 t	15.0 t		45° to 8°	57° to 26°	65° to 44°
16.0 t	15.0 t	48° to 10°	60° to 8°	68° to 31°	73° to 47°
10.0 t	15.0 t	65° to 10°	71° to 8°	75° to 38°	78° to 51°
0.0 t	15.0 t	65° to 10°	71° to 29°	75° to 48°	78° to 57°
0.0 t	0.0 t	65° to 10°	71° to 29°	75° to 48°	78° to 57°

Lift the crane only until all track rollers are cleared.

- ▶ Support the crane and ensure it is level.
- ▶ Set the desired track, see section „Assembling the crane“.

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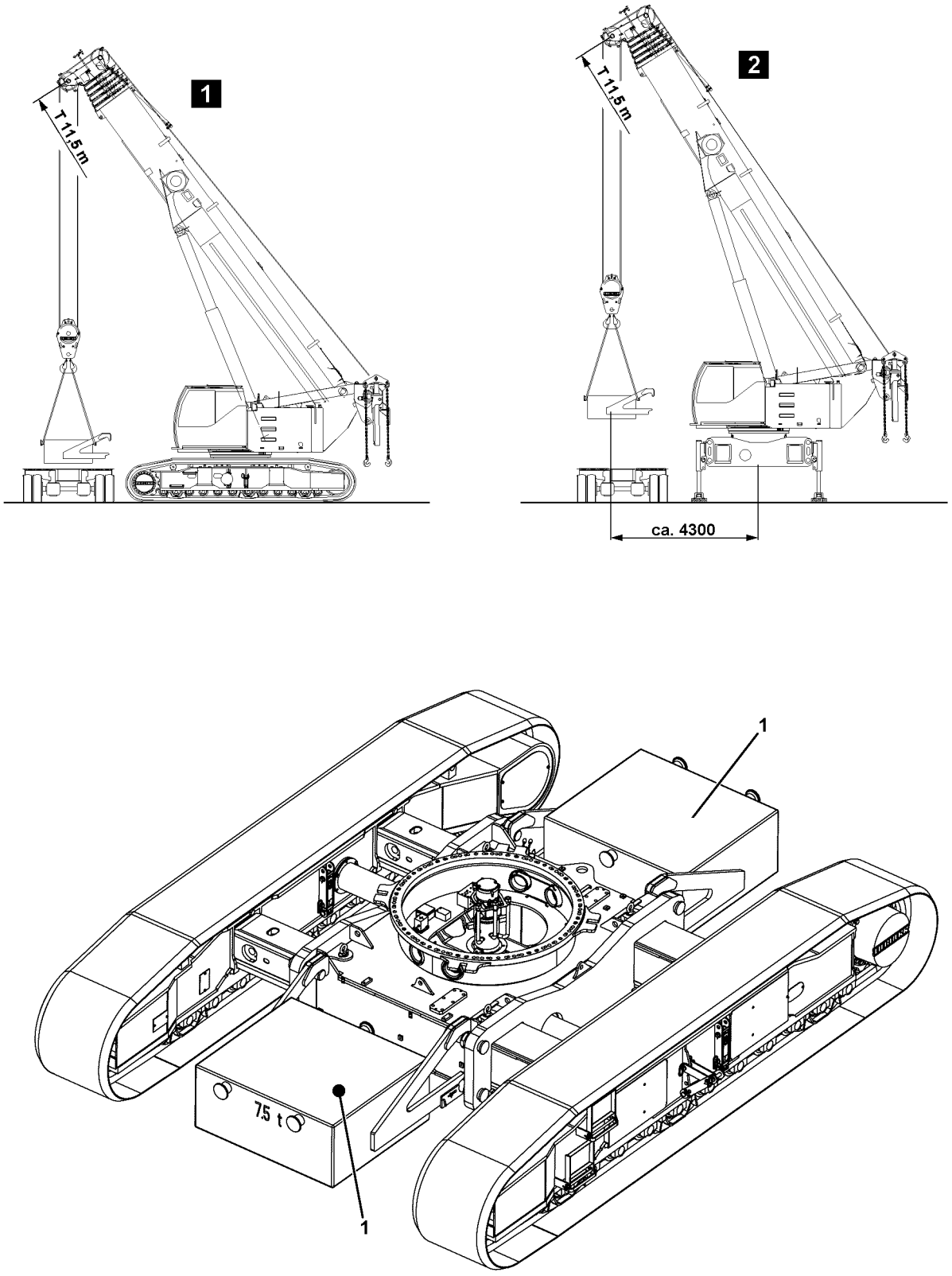

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Fig.199148

1 Fitting/removing the central ballast

Ensure that the following prerequisites are met:
- the ground is able to carry the weight of the crane, the load and the lifting equipment
- the crane is aligned in horizontal direction
- there are no persons or objects in the danger zone
- the telescopic boom is fully telescoped in
- the counterweight on the turntable has been removed
- the LICCON overload protection has been set according to the load chart
- the crawler carriers have been extended to a track width of 4.15 m (wide track), pinned and wedged, illustration 1
- **or**, the crane is supported on the support cylinders* in accordance with the load charts, illustration 2

Note

▶ The maximum permitted distance between the center of the slewing ring and the central ballast on the transportation vehicle is 4300 mm.

1.1 Possible central ballast combinations

DANGER

Crane can topple over!

If a different counterweight is used than the one specified in the load chart, the crane may topple over and cause fatal injury.

▶ Use the central ballast as specified in the load chart!

▶ The central ballast must be fitted at the front **and** rear!

The following central ballast combinations are possible:

Central ballast	Combination	Ballast block
0	no central ballast	0,0

Central ballast	Combination	Ballast block
15 t	2x ballast block **1**	7.5 t

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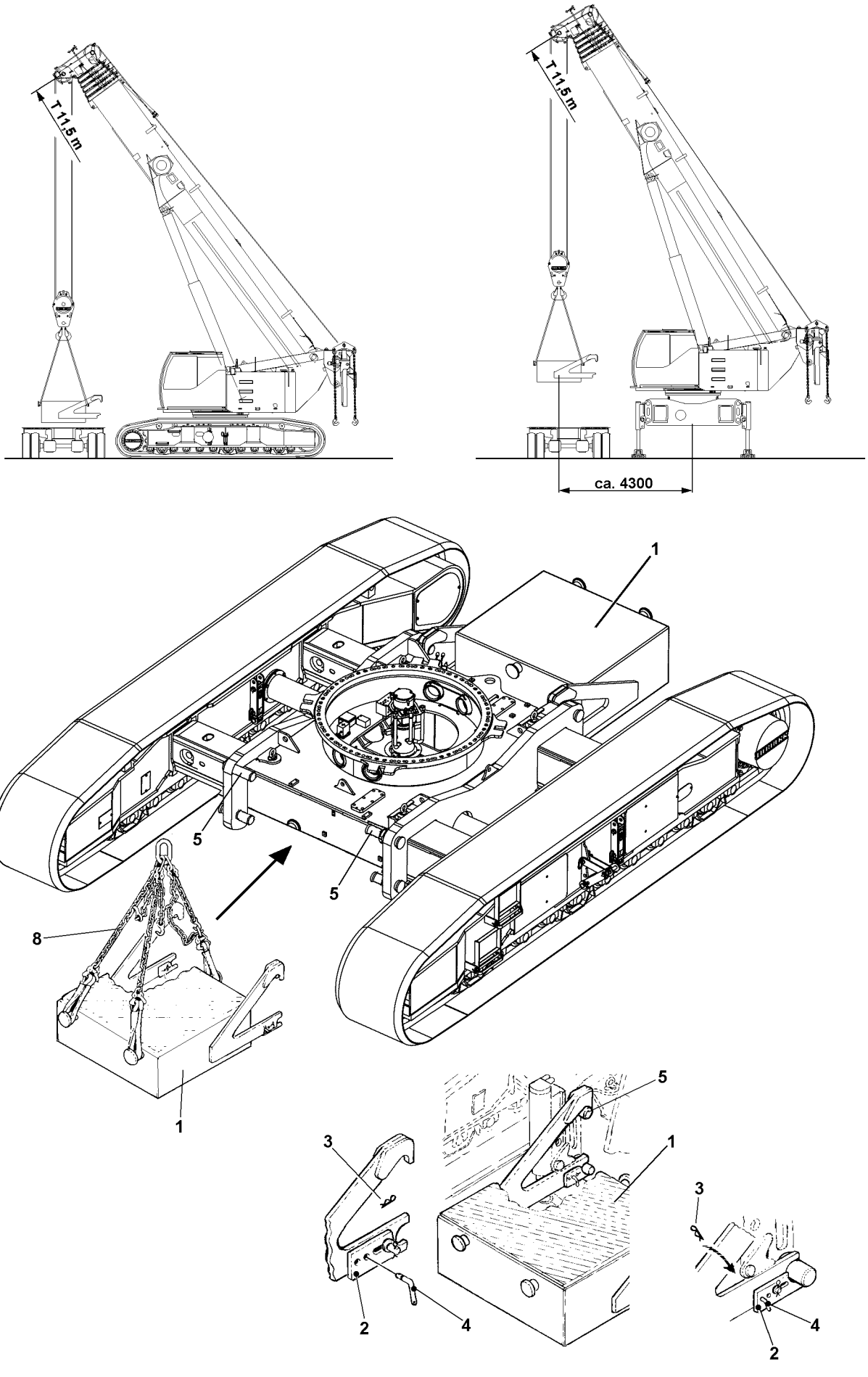

Fig.199149

LWE/LTR 1100-005/17505-03-02/en

1.2 Fitting the central ballast

- ▶ Park the transportation vehicle as close as possible to the crane.
- ▶ Attaching the ballast block **1**:
- ▶ Hang two strands of the supplied assembly equipment **8** to the front fastening points.

Note

- ▶ The front strands must be of the same length.

- ▶ Arrange the hook block at the center of gravity of the ballast block **1**.
- ▶ Attach the third strand to the rear fastening point.
- ▶ Shorten the chain so that the ballast block **1** hangs horizontally when lifted.

Note

- ▶ Ensure that the ballast block **1** is hanging horizontally.
- ▶ Ensure that the safety mechanism **2** has been reset.

- ▶ Lift the ballast block **1**.

CAUTION

Damage to the engine radiator!

The ballast blocks **1** could collide with the engine radiator during positioning!

- ▶ At installation of the ballast blocks **1**, watch out for the engine cooler!

- ▶ Hang the ballast block **1** in the upper pins **5**.
- ▶ Secure the ballast block **1** by sliding the lashes **2** to their end-positions on both sides.
- ▶ Pin the pins **4** at both sides and secure with spring-loaded safety pins **3**.

The second ballast block **1** is fitted in an identical manner to the first ballast block **1**.

- ▶ Fit the second ballast block **1** the same way as the first ballast block **1**.

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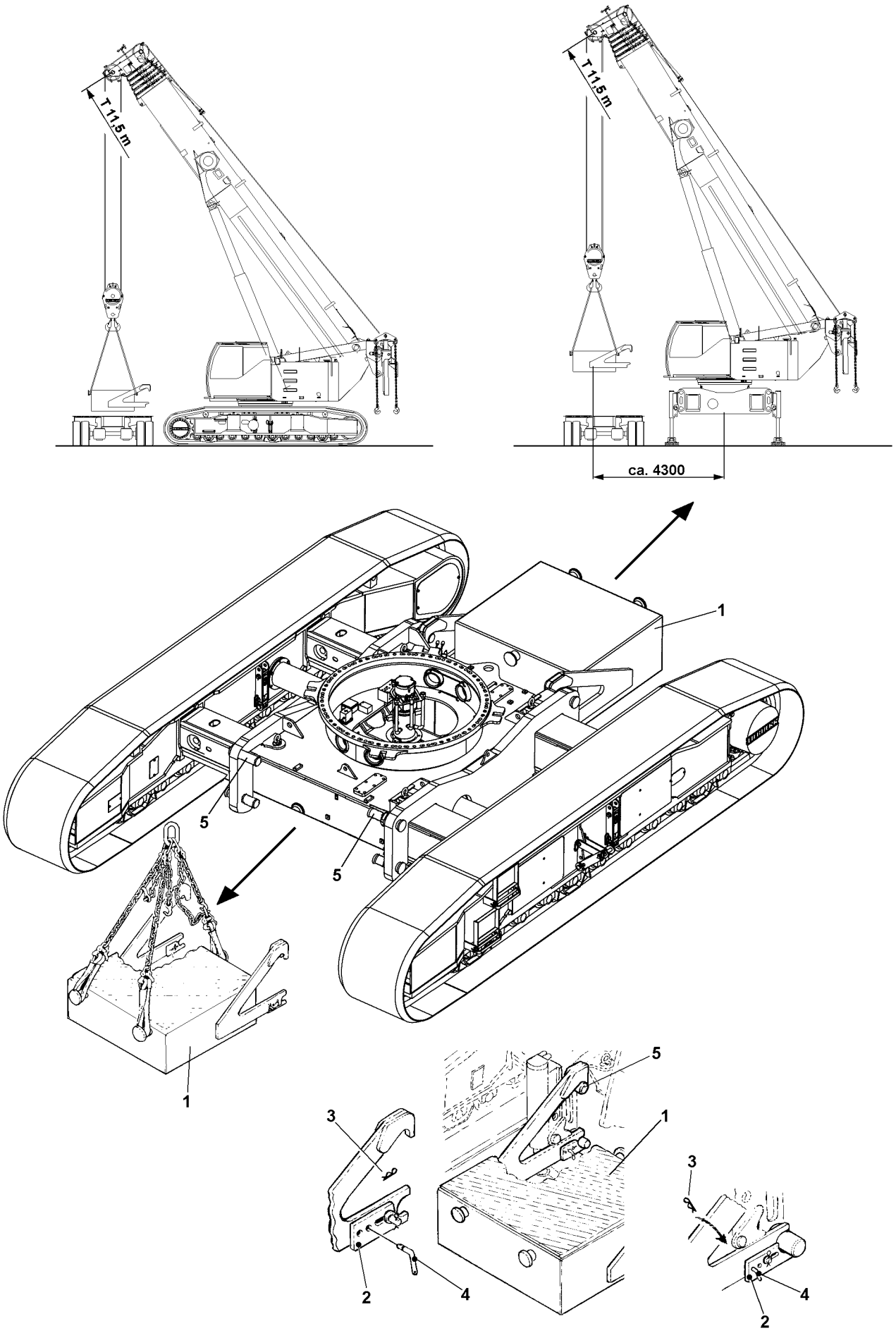

Fig.199150

LWE/LTR 1100-005/17505-03-02/en

1.3 Removing the central ballast

- ▶ Park the transportation vehicle as close as possible to the crane.
- ▶ Attaching the ballast block **1**:
- ▶ Hang two strands of the supplied assembly equipment **8** to the front fastening points.

Note

- ▶ The front strands must be of the same length.

- ▶ Arrange the hook block at the center of gravity of the ballast block **1**.
- ▶ Attach the third strand to the rear fastening point.
- ▶ Shorten the chain so that the ballast block **1** hangs horizontally when lifted.
- ▶ Release safety springs **3** and unpin pins **4** on both sides.
- ▶ Push the lashes **2** back on both sides and release the ballast block **1**.

CAUTION

Damage to the engine radiator!

Lifting the ballast blocks **1** out of their retainers could cause them to collide with the engine radiator!

- ▶ When removing the ballast blocks **1**, watch out for the engine cooler!

- ▶ Carefully lift the ballast block **1** out of the retainer and place it on the transportation vehicle.

The second ballast block **1** is removed in an identical manner to the first ballast block **1**.

- ▶ Remove the second ballast block **1** the same way as the first ballast block **1**.

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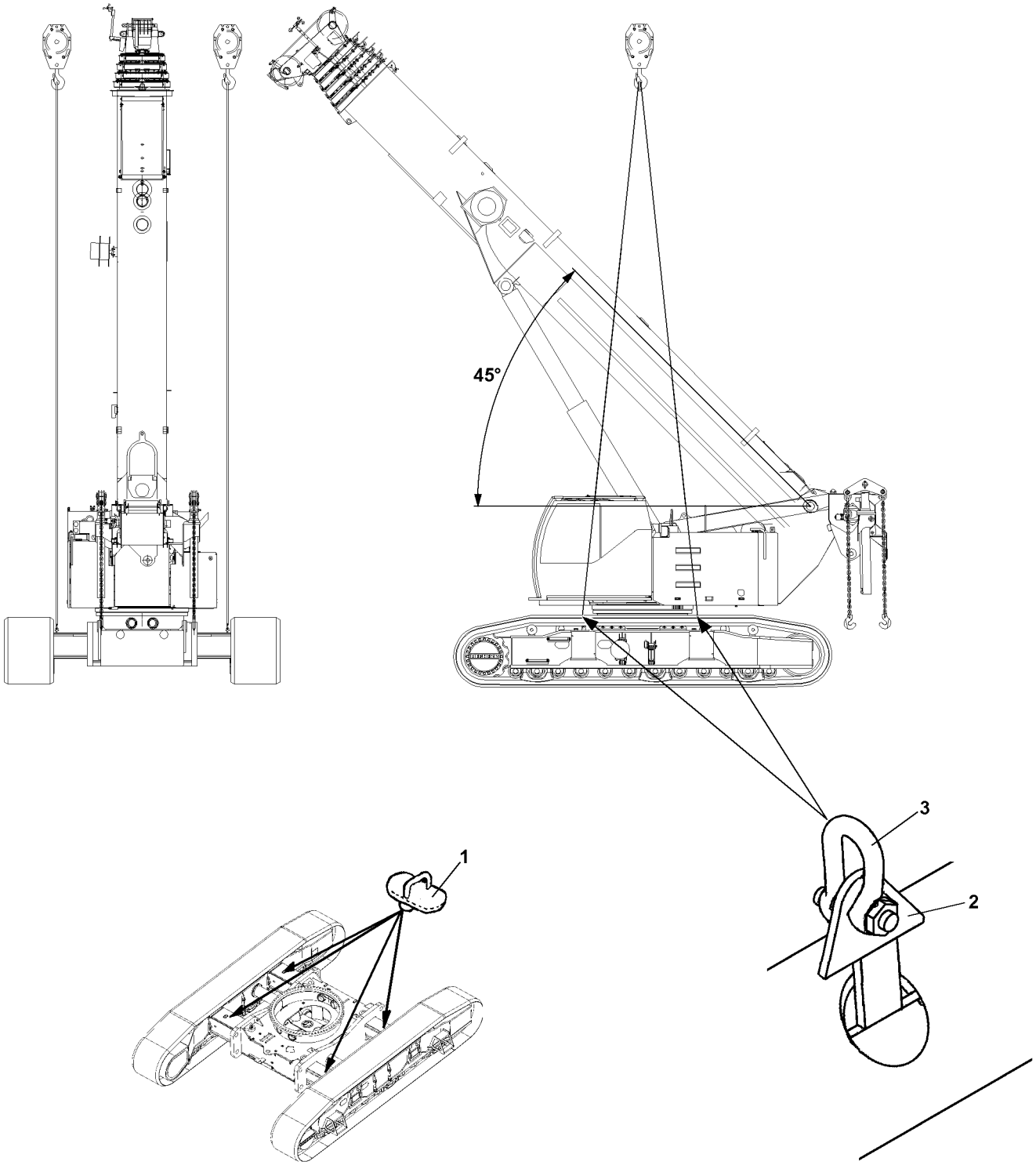

LWE/LTR 1100-005/17505-03-02/en

Fig.199223

1 Loading the crane with the auxiliary cranes

Component	Weight
Crane superstructure	12 t
Telescopic boom with folding jib	14 t
Crane chassis	32 t
Overall weight	**58 t**

1.1 Attaching the crane

Ensure that the following prerequisites are met:
- the crane is horizontally aligned and is positioned on level ground
- the counterweight on the turntable has been removed
- the central ballast on the chassis has been removed
- the telescopic boom is fully telescoped in
- the crane superstructure is mechanically locked with the chassis
- the crawlers are extended to wide track, pinned and wedged
- two auxiliary cranes are provided

DANGER
The crane can tip over!
If the prerequisites are not observed, or the telescopic boom is not luffed up to 45° before loading, the center of gravity of the crane changes, which can cause the crane to tip over.
▶ Observe the prerequisites and luff the telescopic boom up to 45° before loading!

▶ Remove cover **1** on the 4 beams.
▶ Insert the suspension plates **2** properly into the 4 beams and turn by 90° .
▶ Attach the suspension plates **2** with shackles **3** to the left tackle ropes of the first auxiliary crane.
▶ Attach the suspension plates **2** with shackles **3** to the right tackle ropes of the second auxiliary crane.
▶ Tension the tackle ropes of the auxiliary cranes lightly.

DANGER
The crane can fall off!
When tensioning the tackle ropes of the auxiliary cranes, the suspension plates **2** may not twist.
▶ Check the correct position of the suspension plates **2** after tensioning the tackle ropes of the auxiliary cranes!

▶ Luff the telescopic boom up to 45° .
▶ Load the crane using the auxiliary cranes.

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4 Operation of crane superstructure

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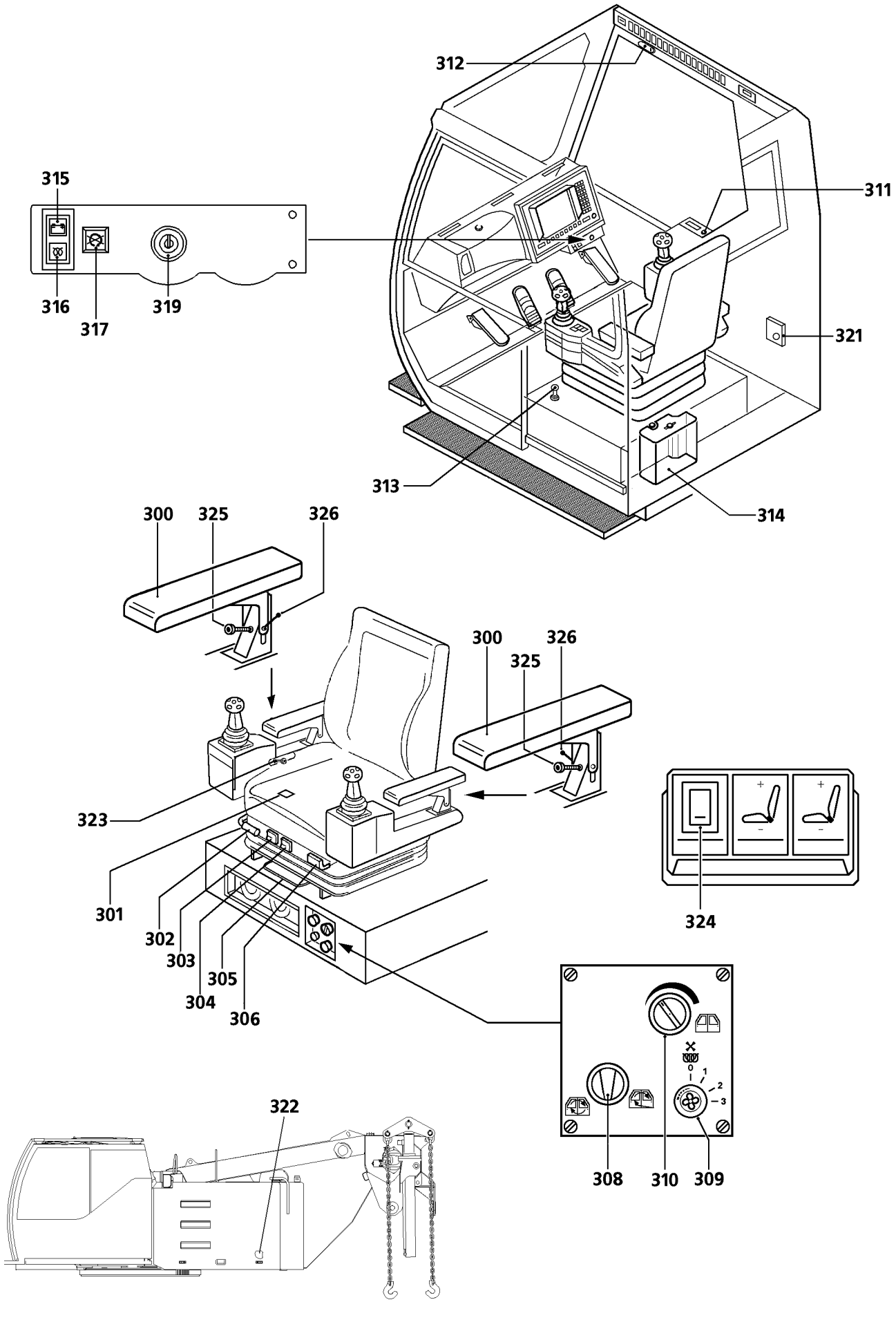

Fig.198459

LWE/LTR 1100-005/17505-03-02/en

1 Operating and control instruments

1.1 General operating elements

300 Armrest

301 Seat contact switch

302 Manual lever
- Adjustment of seat cushion angle

303 Button
- Lumbar support in lower part of backrest

304 Button
- Lumbar support in upper part of backrest

305 Manual lever
- Lock for horizontal seat adjustment

306 Manual lever
- Backrest angle adjustment

307 Rotary control*
- Air conditioning device

308 Rotary switch
- Switching between fresh air / recirculated air

309 Rotary switch
- 3-stage fan

310 Rotary control
- Cab heating temperature

311 Socket 24 V

312 Cab lighting

313 Lock
- The footboard securing
  Pull handle and hold: footboard unlocked
  Release and engage the handle: footboard locked

314 Tank
- Windshield washing fluid

315 Charge control light
- Motor

316 Control light
- Engine preheating, flame start system

317 Button
- Stand-by mode
  Note:
  Pressing the button **317** will turn off the engine, but the LICCON remains turned on.

319 Ignition starter switch
- Motor

321 Thermostat*
- Auxiliary heating

322 Battery master switch

323 Lock screw
- Adjusting the control unit lengthwise

324 Switch *
- Seat heating

325 Set screw
- Arm rest inclination adjustment

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326 Locking lever
- Am rest height adjustment

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Fig.102818

1.2 Roof console controls

341 Operating hour meter - Superstructure

342 Control light*
- Air-conditioning system is switched on

343 Control light
- Tele pinning
  Note:
  The control light **343** tele pinning is only needed when the telescopic boom has to be manually pinned.

345 Switch
- Instrument panel lighting

346 Switch
- Extend / retract footboard
  switched upwards: footboard is extended
  switched downwards: footboard is retracted

347 Switch *
- Aircraft warning lights, on the boom head and/or the single and dual folding jib

348 Button*
- Height adjustment work headlight, boom articulated section

349 Switch *
- Work headlight on the boom articulated section

350 Switch *
- Work headlight on the boom articulated section or the boom head

351 Switch *
- Work headlight, cab roof rear and front

352 Switch
- Work headlight for hoist winch and mirror heater

353 Switch
- Work headlight on cab front

354 Switch *
- Air conditioning device

355 Control light*
- Auxiliary heating switched on

356 Switch *
- Auxiliary heating

357 Plate
- Function of the 2 switch positions **358** in emergency operation

358 Button
- For emergency operation, with 2 switch positions
- Position 2 (switched up):
  - Hoist on
  - Turning left
  - Telescope in the telescopic boom
  - Luff up boom
- Position 0 (central position):
  - Off
- Position 1 (switched down):
  - Hoist off
  - Turning right
  - Telescope out the telescopic boom
  - Luffing the boom down

359 Switch
- Manual pressure increase for emergency operation

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360 Switch
- Telescoping
- Position 2 (switched up): Unpin the telescopic boom during manual operation
- Position 0 (central position): Pin the telescopic boom or lock the telescopic boom cylinder during manual operations or automatic pinning „OK“
- Position 1 (switched down): Unpin the telescopic boom cylinder during manual operation

361 Plate
- Function of the 3 switch positions **360**

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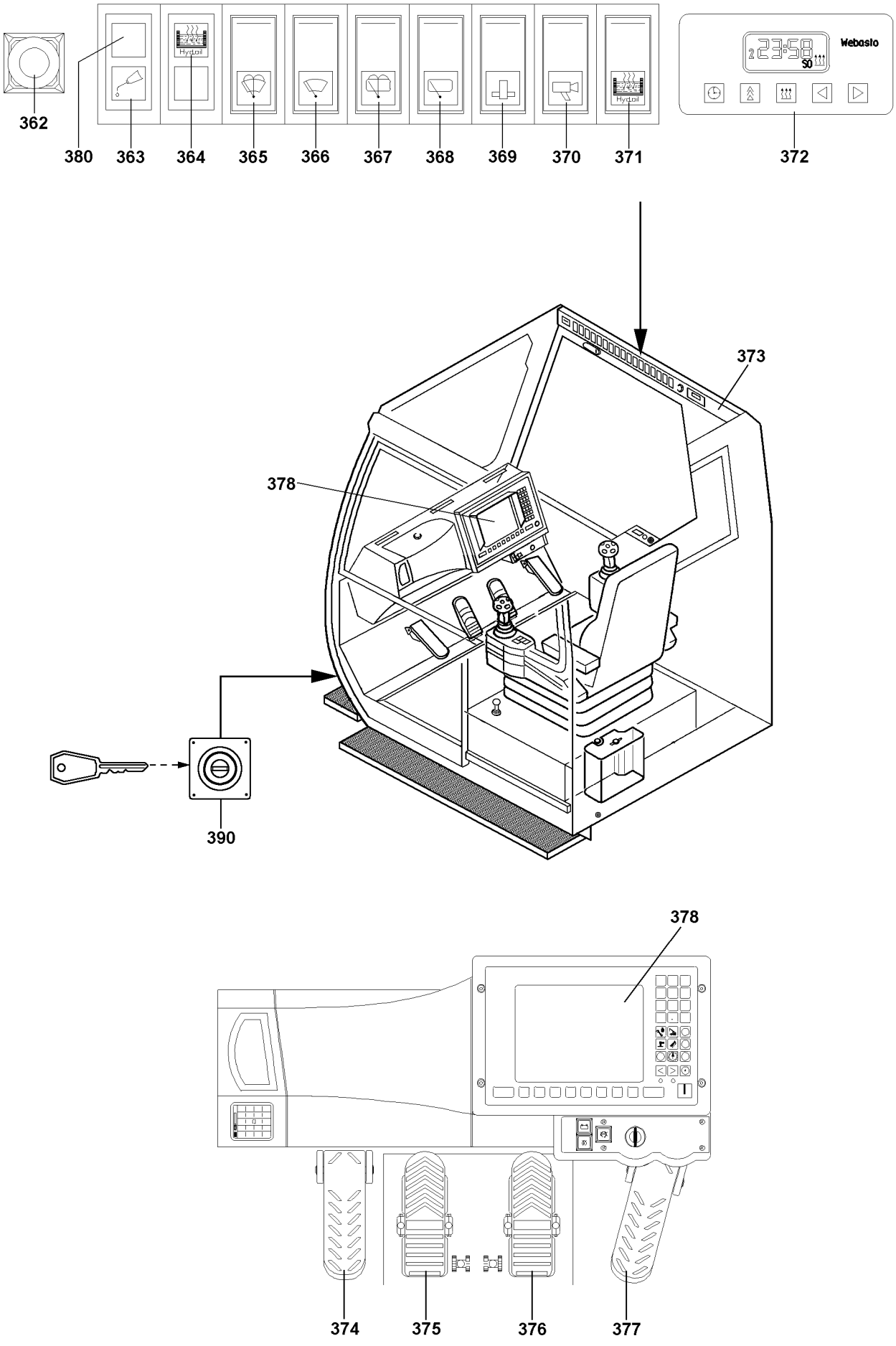

Fig.102819

362 EMERGENCY OFF switch

363 Control light
- Central greasing

364 Control light
- Hydraulic oil preheating is turned on

365 Button
- Windscreen washing system front window

366 Switch
- Window wiper front window, 2 stages: 1 intermittent, 2 wipe

367 Button
- Windscreen washing system roof window

368 Switch
- Roof window wiper with 2 stages: 1 intermittent, 2 wipe

369 Button
- Lock / unlock crane superstructure lock

370 Switch
- Turn on camera illumination

371 Switch
- Turn on hydraulic oil preheating

372 Timer for auxiliary heater*

with the following displays:
- Time and day of the week
- Fault in auxiliary heating
- Air temperature
- Pre-selected heating

373 Buzzer
- Ballast cylinder fully retracted/extended

374 Pedal
- Slewing gear brake

375 Master switch foot pedal left MS4
- Crawler travel gear left

376 Master switch foot pedal right MS5
- Crawler travel gear right

377 Pedal
- Engine control

378 LICCON monitor

379 Operating hour meter - Chassis
- **Note:**
  The operating hour meter - chassis **379** is located in the control cabinet.

380 Warning light
- Failure central lubrication system

390 EMERGENCY OFF switch*

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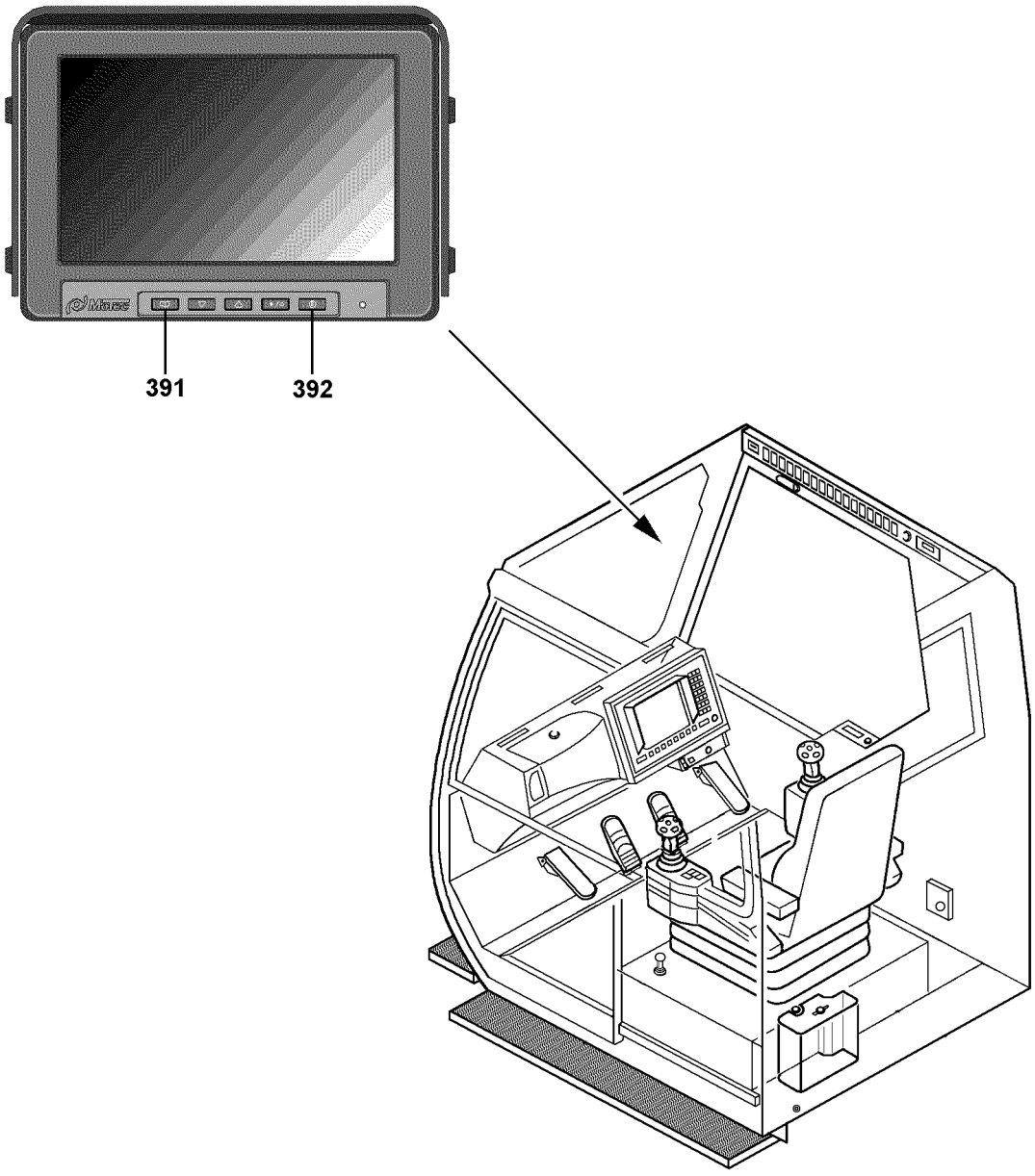

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Fig.105023

1.3 Operating elements on camera-monitor

Note

▶ The camera-monitor is used to observe the assembly or dismantling of the counterweight plates.

391 Button
- Menu

392 Button
- ON / OFF

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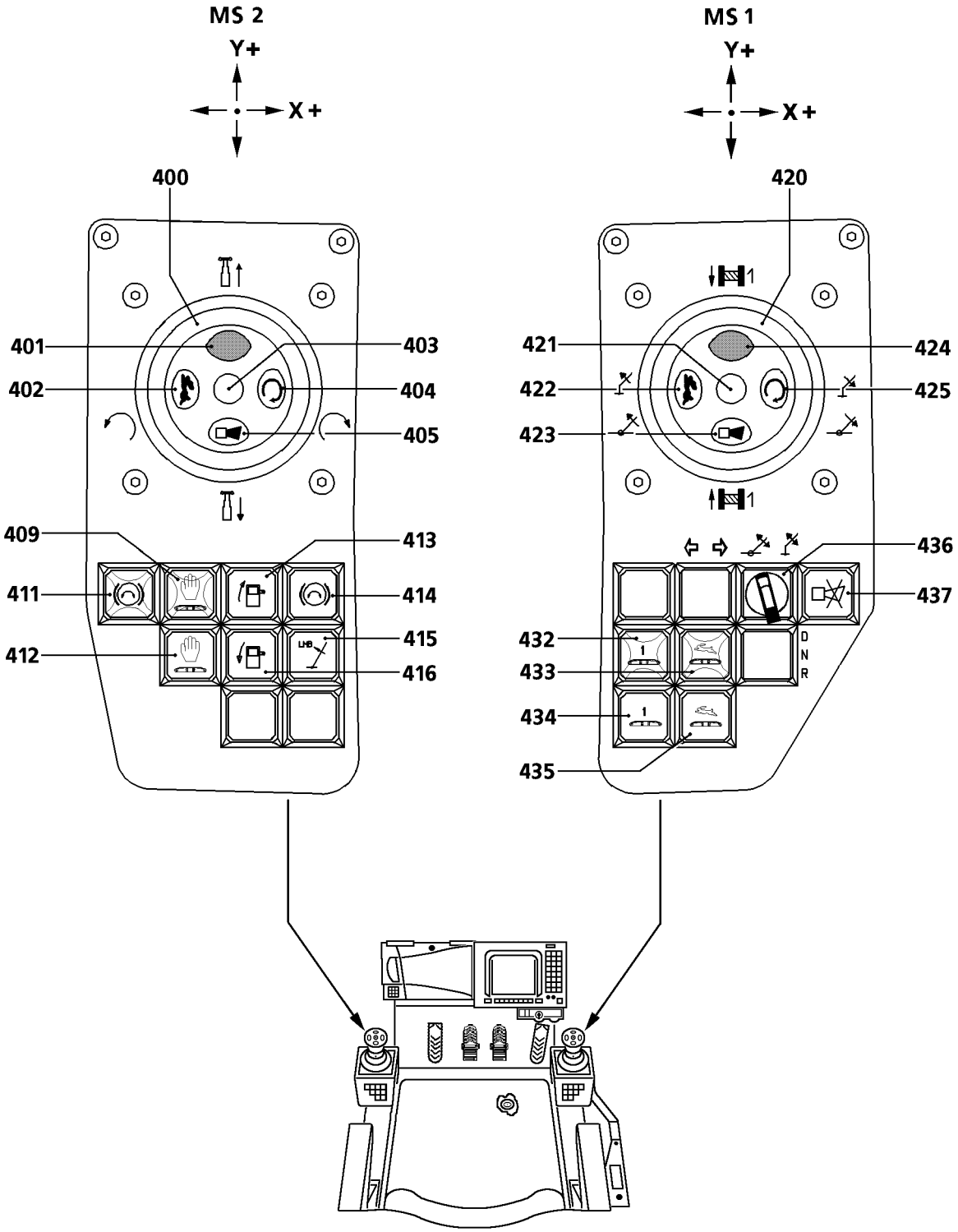

LWE/LTR 1100-005/17505-03-02/en

Fig.198461

1.4 Operating instruments on control panel (cranes with one winch)

Control panel, left:

400 Master switch left (MS 2)

Telescoping gear
- Operate master switch **400** in direction Y+ (forwards): Telescope out.
- Operate master switch **400** in direction Y- (backwards): Telescope in.

Slewing gear:
- Operate master switch **400** in direction X+ (to the right): Slewing gear turns to the right.
- Operate master switch **400** in direction X- (to the left): Slewing gear turns to the left.

401 Button
- Bypassing the seat contact switch. **Or** if the seat contact switch is actuated: Adding the vibration sensor **403**

402 Button
- Adding rapid gear crane operation (winch 1 and luffing up)
- Adding rapid gear crawler operation

403 Vibration sensor
- Winch turn counter, (Vibrator) Winch 1.

404 Button
- Latch for superstructure engine control
  Note:
  Pressing button **404** will lock the engine control in its current position.

405 Button
- Signal horn (hooter)

409 Control light
- Support **and** track adjustment of crawler is added

411 Control light
- Slewing gear brake is turned off

412 Control light
- Addition of support **and** track adjustment of crawler

413 Button
- Rotate crane cab upwards

414 Button
- „Turn slewing gear brake“ off / on

415 Button
- Bypassing of overload protection, used to raise an overload
  Danger:
  The bypass may only be carried out if the overload has been caused by luffing down at freely suspended load and the crane operator is absolutely certain that he can leave the overload range by luffing up. For the same reason, bypassing the LICCON overload protection at a boom radius smaller or equal to 3.5 m is prohibited.

416 Button
- Rotate crane cab downwards

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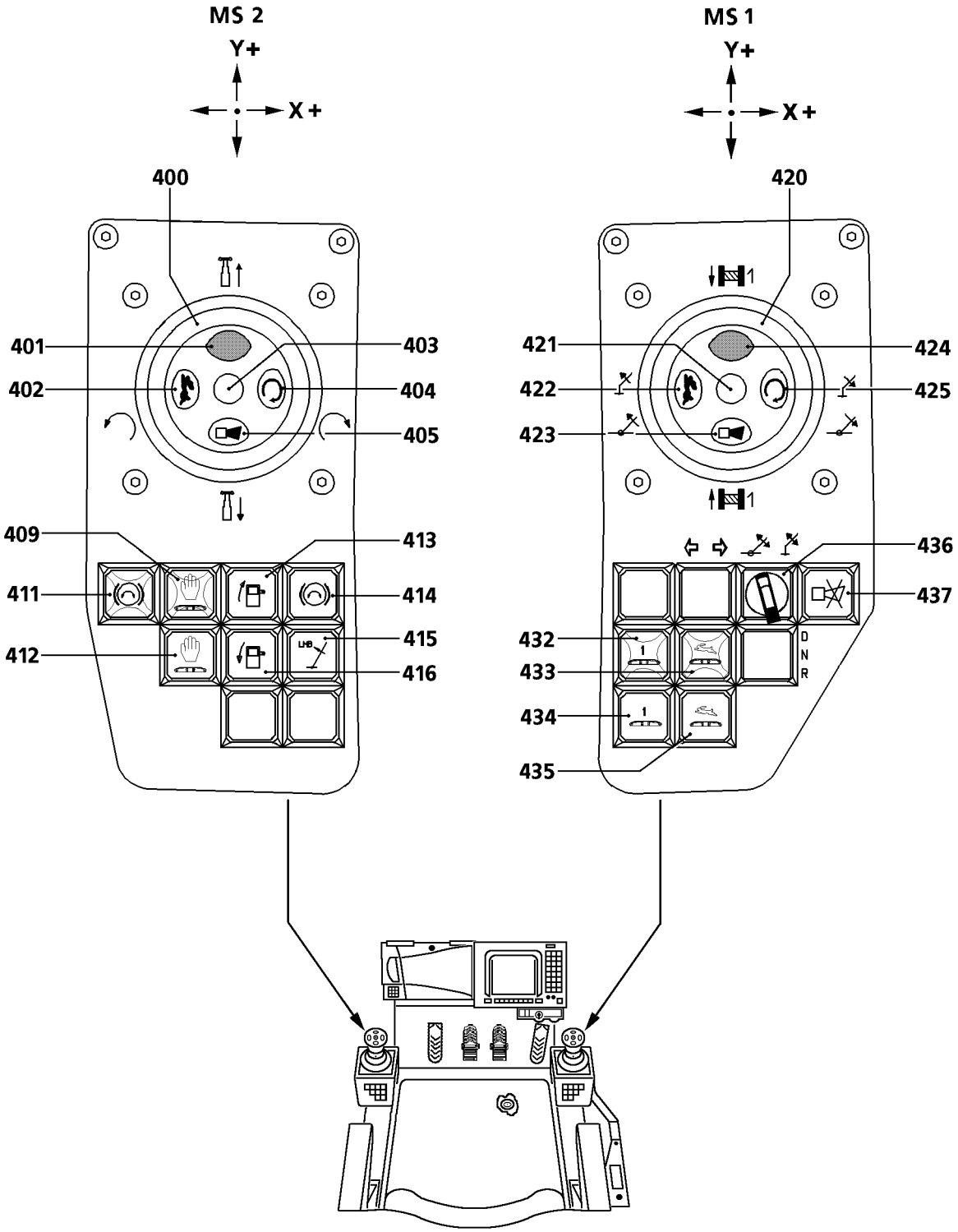

LWE/LTR 1100-005/17505-03-02/en

Fig.198461

Control panel, right:

420 Master switch - right (MS 1)

Winch 1:
- Operate master switch **420** in direction Y+ (forwards): Winch 1 reels off and the load is lowered.
- Operate master switch **420** in direction Y- (backwards): Winch 1 spools up and the load is raised.

Luffing gear - telescopic boom: Rotary switch **436** in left position:
- Operate master switch **420** in direction X+ (to the right): Telescopic boom is luffed down.
- Operate master switch **420** in direction X- (to the left): Telescopic boom is luffed up.

Luffing folding jib*: Rotary switch **436** in right position:
- Operate master switch **420** in direction X+ (to the right): Folding jib is luffed down.
- Operate master switch **420** in direction X- (to the left): Folding jib is luffed up.

421 Vibration sensor
- Winch turn counter, (vibrator) winch 1

422 Button
- Adding rapid gear crane operation (winch 1 and luffing up)
- Adding rapid gear crawler operation

423 Button
- Signal horn (hooter)

424 Button
- Bypassing the seat contact switch. **Or** if the seat contact switch is actuated: Adding the vibration sensor **421**

425 Button
- Latch for superstructure engine control
  Note:
  Pressing button **425** will lock the engine control in its current position.

432 Control light
- Control light is **illuminated**: Crawler operation is added
  Control light **does not illuminate**: Crawler operation is **not** added

433 Control light
- Control light is **illuminated**: Rapid gear crawler operation is added
  Control light **does not illuminate**: Creeper gear is added

434 Button
- Addition of crawler operation
  Note:
  Crane operation is turned on automatically.

435 Button
- Change over creeper gear / rapid gear

436 Rotary switch
- Operating mode preselection for master switch **420**
  Left position: Luffing telescopic boom
  Right position: Luffing folding jib

437 Button
- Switch off acoustic warning (bell on turntable)

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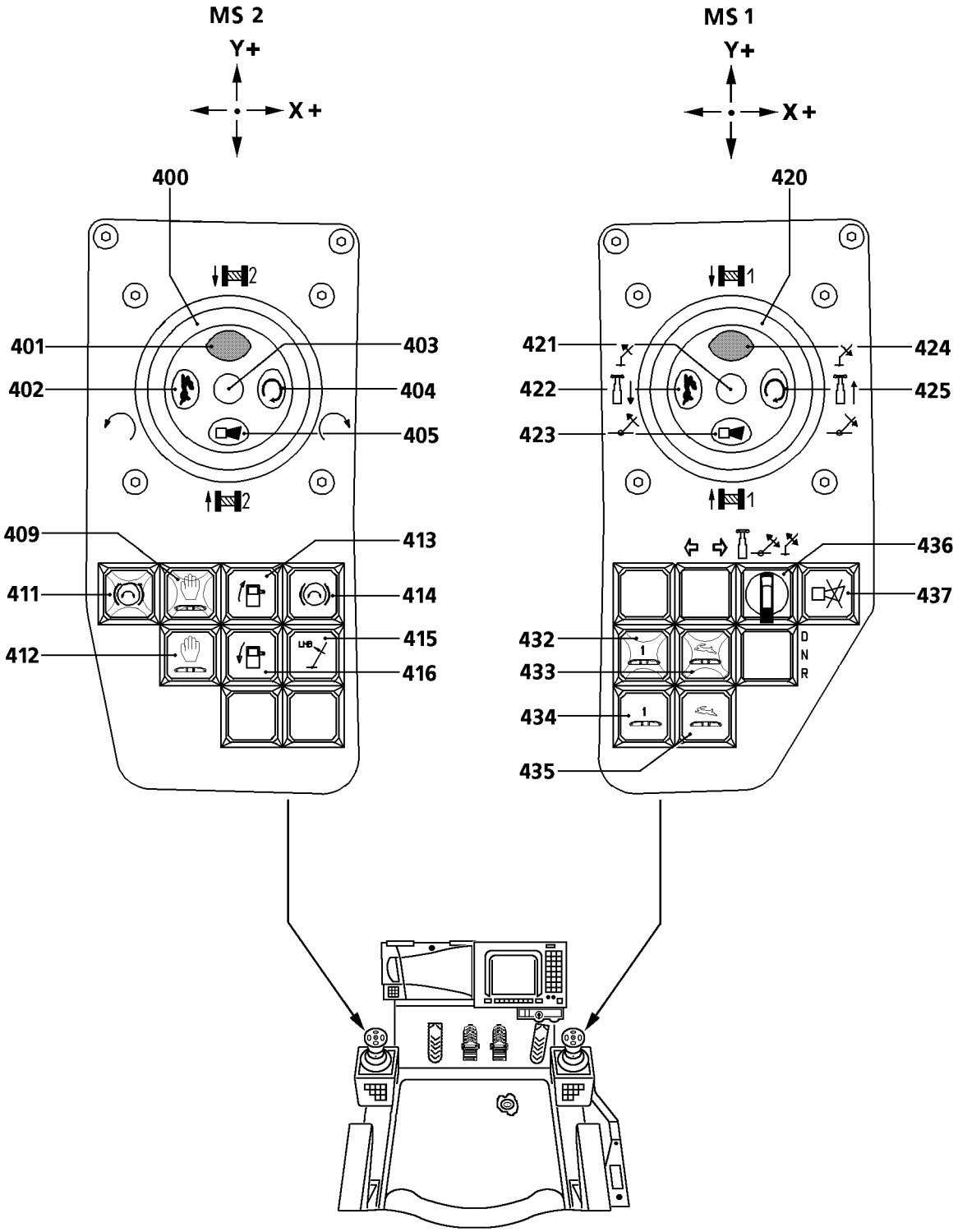

LWE/LTR 1100-005/17505-03-02/en

Fig.198462

1.5 Operating instruments on control panel (cranes with two winches)*

Control panel, left:

400 Master switch left (MS 2)

Winch 2
- Operate master switch **400** in direction Y+ (forwards): Winch 2 reels off and the load is lowered.
- Operate master switch **400** in direction Y- (backwards): Winch 2 spools up and the load is raised.

Slewing gear:
- Operate master switch **400** in direction X+ (to the right): Slewing gear turns to the right.
- Operate master switch **400** in direction X- (to the left): Slewing gear turns to the left.

401 Button
- Bypassing the seat contact switch. **Or** if the seat contact switch is actuated: Adding the vibration sensor **403**

402 Button
- Adding rapid gear crane operation (winch(es) and luffing up)
- Adding rapid gear crawler operation

403 Vibration sensor
- Winch turn sensor, (vibrator) winch 2 **or** turn sensor, (vibrator) slewing gear

404 Button
- Latch for superstructure engine control
  Note:
  Pressing button **404** will lock the engine control in its current position.

405 Button
- Signal horn (hooter)

409 Control light
- Support **and** track adjustment of crawler is added

411 Control light
- Slewing gear parking brake is off

412 Control light
- Addition of support **and** track adjustment of crawler

413 Button
- Rotate crane cab upwards

414 Button
- „Turn slewing gear brake“ off / on

415 Button
- Bypassing of overload protection, used to raise an overload
  Danger:
  The bypass may only be carried out if the overload has been caused by luffing down at freely suspended load and the crane operator is absolutely certain that he can leave the overload range by luffing up. For the same reason, bypassing the LICCON overload protection at a boom radius smaller or equal to 3.5 m is prohibited.

416 Button
- Rotate crane cab downwards

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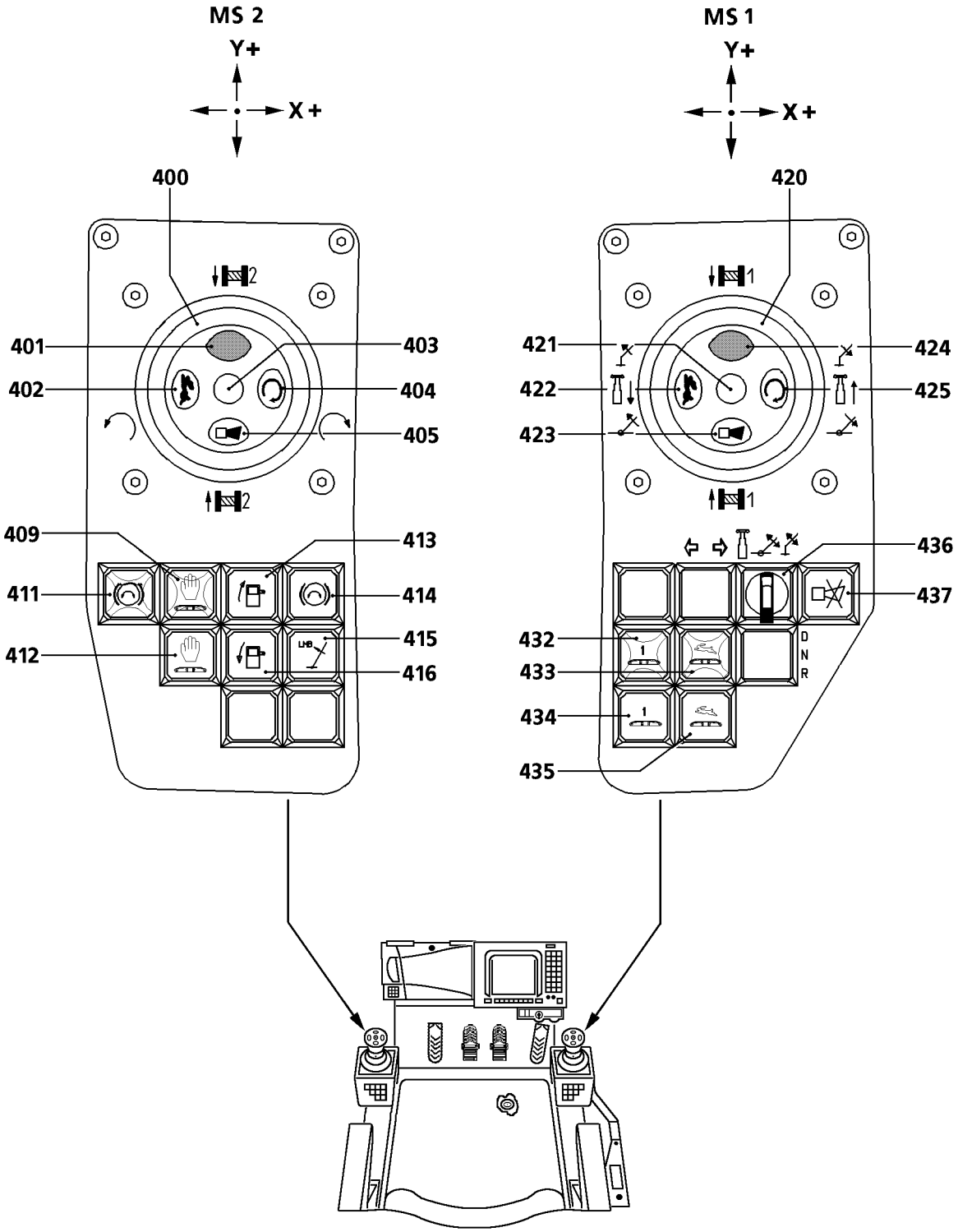

LWE/LTR 1100-005/17505-03-02/en

Fig.198462

Control panel, right:

420 Master switch - right (MS 1)

Winch 1:
- Operate master switch **420** in direction Y+ (forwards): Winch 1 reels off and the load is lowered.
- Operate master switch **420** in direction Y- (backwards): Winch 1 spools up and the load is raised.

Telescoping gear: Rotary switch **436** in left position:
- Operate master switch **420** in direction X+ (to the right): telescope out
- Operate master switch **420** in direction X- (to the left): telescope in

Luffing telescopic boom: Rotary switch **436** in center position:
- Operate master switch **420** in direction X+ (to the right): Telescopic boom is luffed down.
- Operate master switch **420** in direction X- (to the left): Telescopic boom is luffed up.

Luffing folding jib*: Rotary switch **436** in right position:
- Operate master switch **420** in direction X+ (to the right): Folding jib is luffed down.
- Operate master switch **420** in direction X- (to the left): Folding jib is luffed up.

421 Vibration sensor
- Winch turn counter, (vibrator) winch 1

422 Button
- Adding rapid gear crane operation (winch(es) and luffing up)
- Adding rapid gear crawler operation

423 Button
- Signal horn (hooter)

424 Button
- Bypassing the seat contact switch. **Or** if the seat contact switch is actuated: Adding the vibration sensor **421**

425 Button
- Latch for superstructure engine control
  Note:
  Pressing button **425** will lock the engine control in its current position.

432 Control light
- Control light is **illuminated**: Crawler operation is added
  Control light **does not illuminate**: Crawler operation is **not** added

433 Control light
- Control light is **illuminated**: Rapid gear crawler operation is added
  Control light **does not illuminate**: Creeper gear is added

434 Button
- Addition of crawler operation
  Note:
  Crane operation is turned on automatically.

435 Button
- Change over creeper gear / rapid gear

436 Rotary switch
- Operating mode preselection for master switch **420**
  Left position: Telescoping gear
  Center position: Luffing telescopic boom
  Right position: Luffing folding jib

437 Button
- Switch off acoustic warning (bell on turntable)

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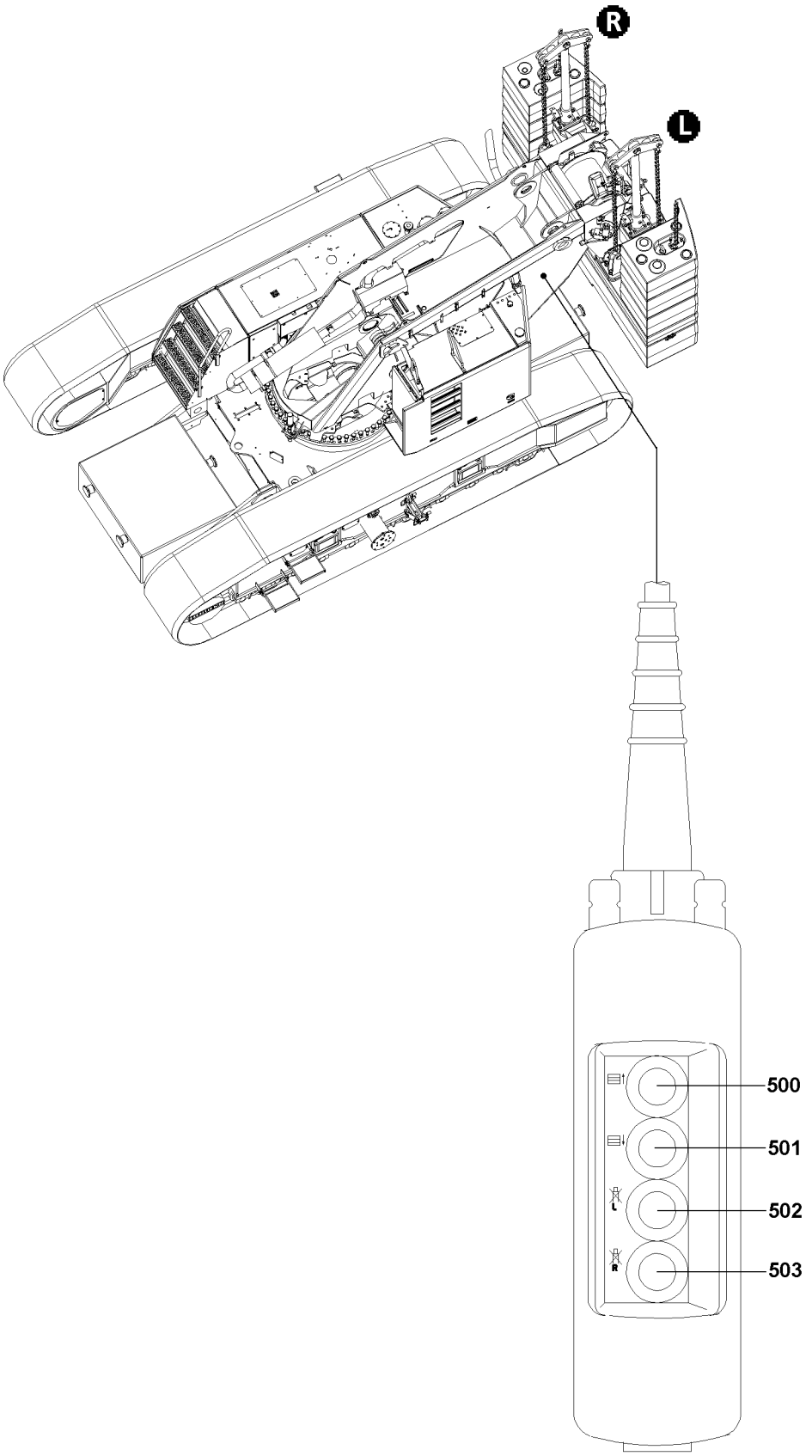

LWE/LTR 1100-005/17505-03-02/en

Fig.198611

1.6 Control panel - Ballasting

500 Button
- Retract the ballasting cylinder, lift the counterweight

501 Button
- Extend the ballasting cylinder, lower the counterweight

502 Button
- Block the ballasting cylinder on the left

503 Button
- Block the ballasting cylinder on the right

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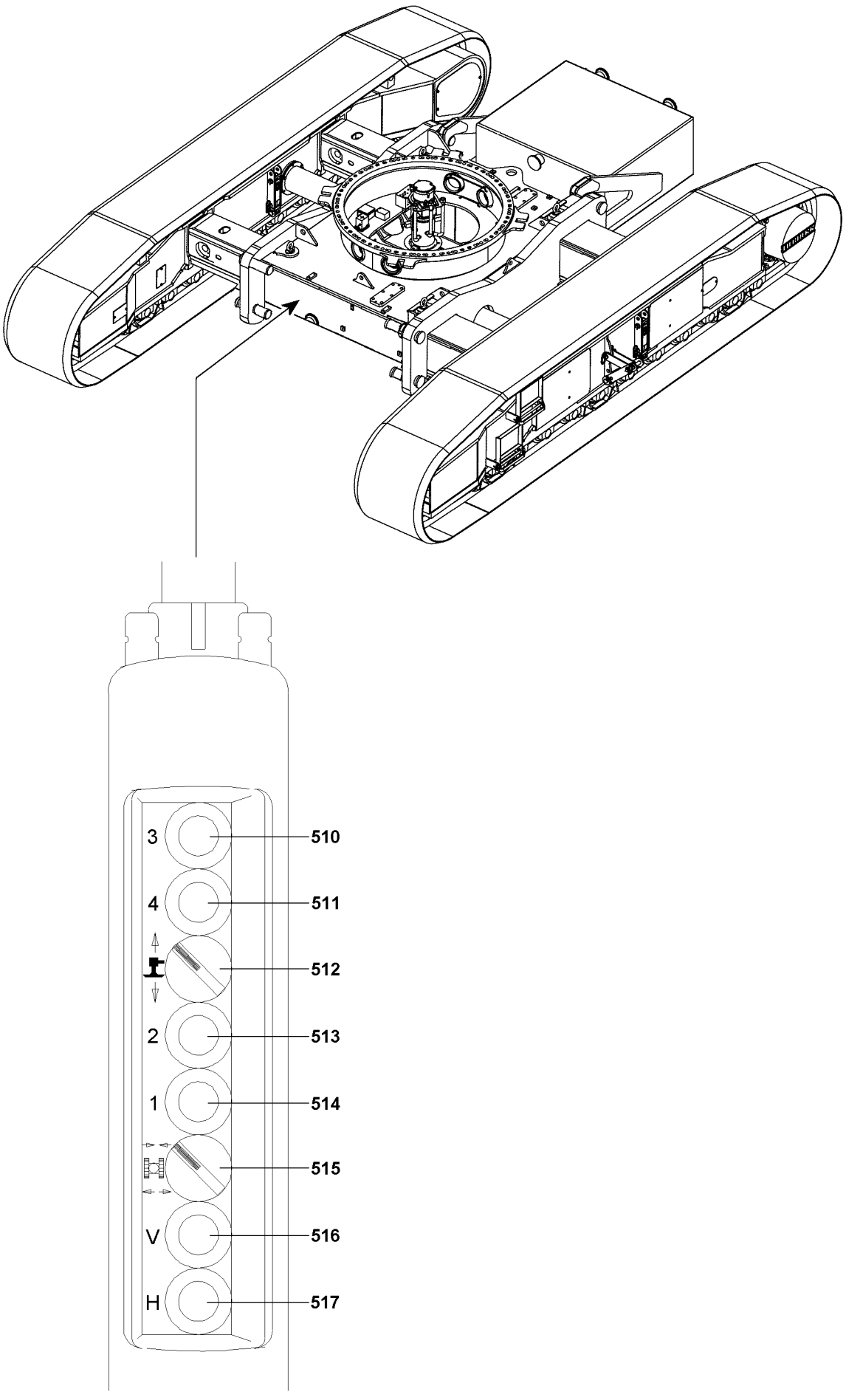

Fig.102820

LWE/LTR 1100-005/17505-03-02/en

1.7 Control panel - Crane chassis

510 Button
- Retract or extend left front support cylinder

511 Button
- Retract or extend left rear support cylinder

512 Rotary switch
- Retract or extend preselected support cylinder

513 Button
- Retract or extend right front support cylinder

514 Button
- Retract or extend right rear support cylinder

515 Rotary switch
- Increase / decrease preselected track width

516 Button
- Increase / decrease front track width

517 Button
- Increase / decrease rear track width

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LWE/LTR 1100-005/17505-03-02/en

Fig.197731

1 General

Note
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. In addition, many of the illustrations show the maximum configuration of the LICCON monitor with icons. In normal 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 cranes. In addition to the overload protection (Load moment limitation = **LMB**) there are a number of application programs that can be used for controlling and monitoring the crane movements.

Currently the LICCON computer system includes the following application programs:
- „Configuration“ program
- „Crane operation“ program
- „Telescoping“ program
- „Working range limiter*****“ program
- „Control parameter“ program
- „Engine monitoring“ program

The electrical and electronic components in the superstructure and the chassis are linked via data bus transmission technology (Liebherr System Bus = LSB).

1.1 Overload protection (LMB)

Overload protection is implemented in microprocessor CPU 0 of base assembly 0. The LICCON computer system works on the principle of comparing the current / actual load with the maximum permissible load according to the load chart and reeving.

1.1.1 Actual load

The current or actual load is recorded by acquiring variable values.

The **load on the crane** results from the load momentum and the boom momentum together. It exerts a force in the boom luffing cylinder, which is measured by pressure sensors.

The **boom momentum** is calculated with data from the angle sensors (boom angle), the length sensors (boom length) and from crane data (boom weights) for the set operating mode.

The **boom radius** is calculated with data from the angle sensors (boom angle), the length sensors (boom length) and from geometry data for the set operating mode. This also takes into account the boom flexation due to its own weight and the weight of the load.

The actual load is calculated from the total load, the boom momentum and the boom radius.

1.1.2 Maximum load according to load chart and reeving

Crane data such as load charts, boom weights and geometry data are stored in the central data memory of the LICCON computer system.

The „maximum load according to the load chart and reeving“ is constantly recorded for the set crane configuration state, for the set reeving, and for the calculated boom radius, based on the load charts.

1.1.3 Comparison

The actual load and the „maximum load according to the loading chart and reeving“ are compared. When they approach the specified limit, an advance warning is issued. If this limit is exceeded, the overload stop is triggered and any crane movements which increase the load momentum are turned off.

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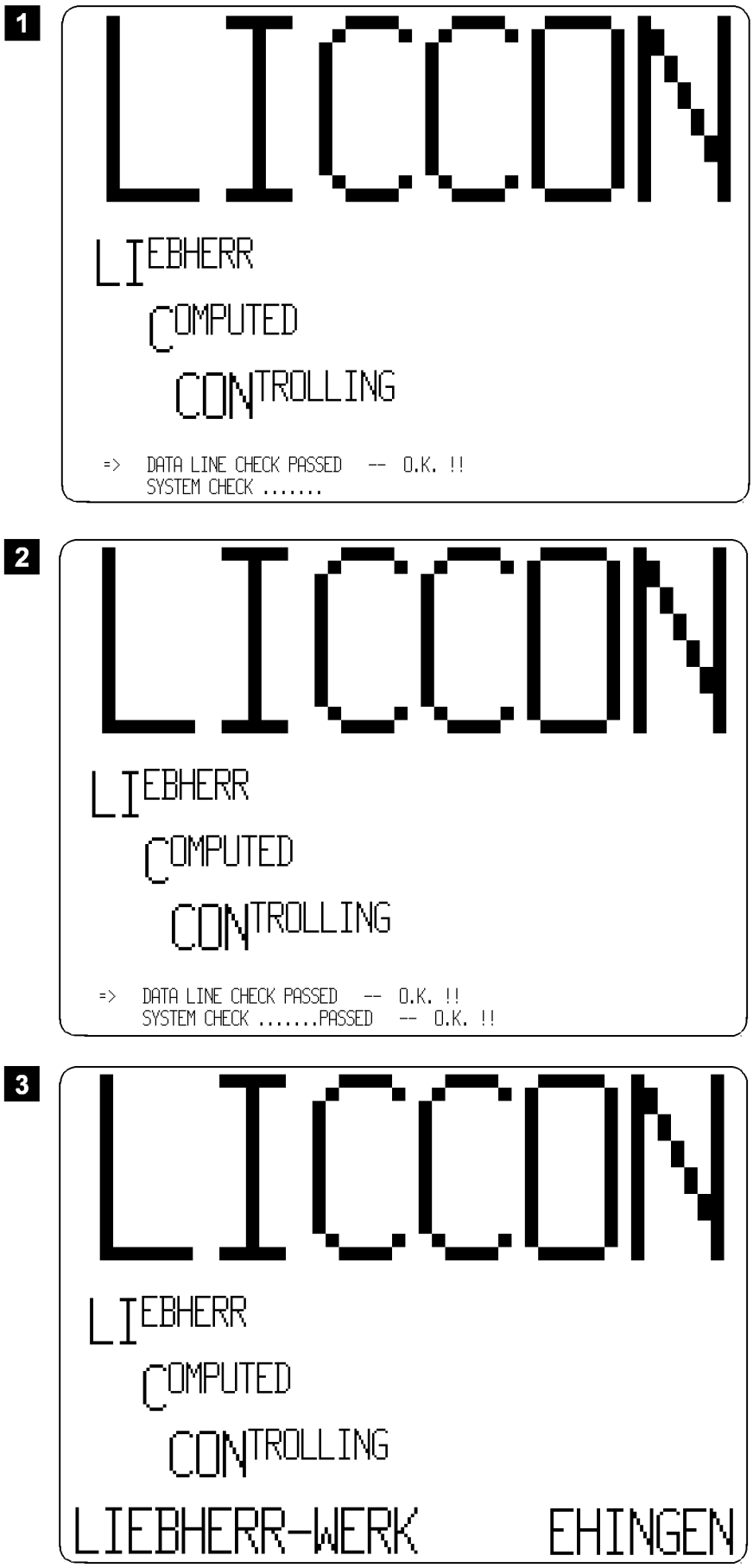

Fig.197620

LWE/LTR 1100-005/17505-03-02/en

2 LICCON computer system boot up

After it is turned on, the LICCON computer system performs a self test.

First the connections from the microprocessor CPU (ZE 0) to the monitor are checked. If no error is found during the test, the monitor shows this image:

```
=>  DATA LINE CHECK PASSED  --  O.K. !!
    SYSTEM CHECK .......
```

Fig.197734

If the test finds no connection problems, there is a system test of all the microprocessor CPUs (ZE). The incremental sequence of the self test can be monitored on the 7 segment displays of the CPUs. If no errors are found during the system test, the monitor shows this image:

```
=>  DATA LINE CHECK PASSED  --  O.K. !!
    SYSTEM CHECK .......PASSED  --  O.K. !!
```

Fig.197735

Shortly after that, this general initialisation screen appears on the monitor:

```
LIEBHERR-WERK      EHINGEN
```

Fig.197736

Note
Errors during the boot up procedure of the LICCON computer system.
If an advance warning, warning or STOP event occurs in the engine monitoring section while the LICCON computer system boots up, the system switches automatically to the „Engine monitoring“ program.
▶ Refer to section „Engine monitoring program“ for additional information.

If the start procedure has run successfully, it switches automatically to the „Configuration“ program.

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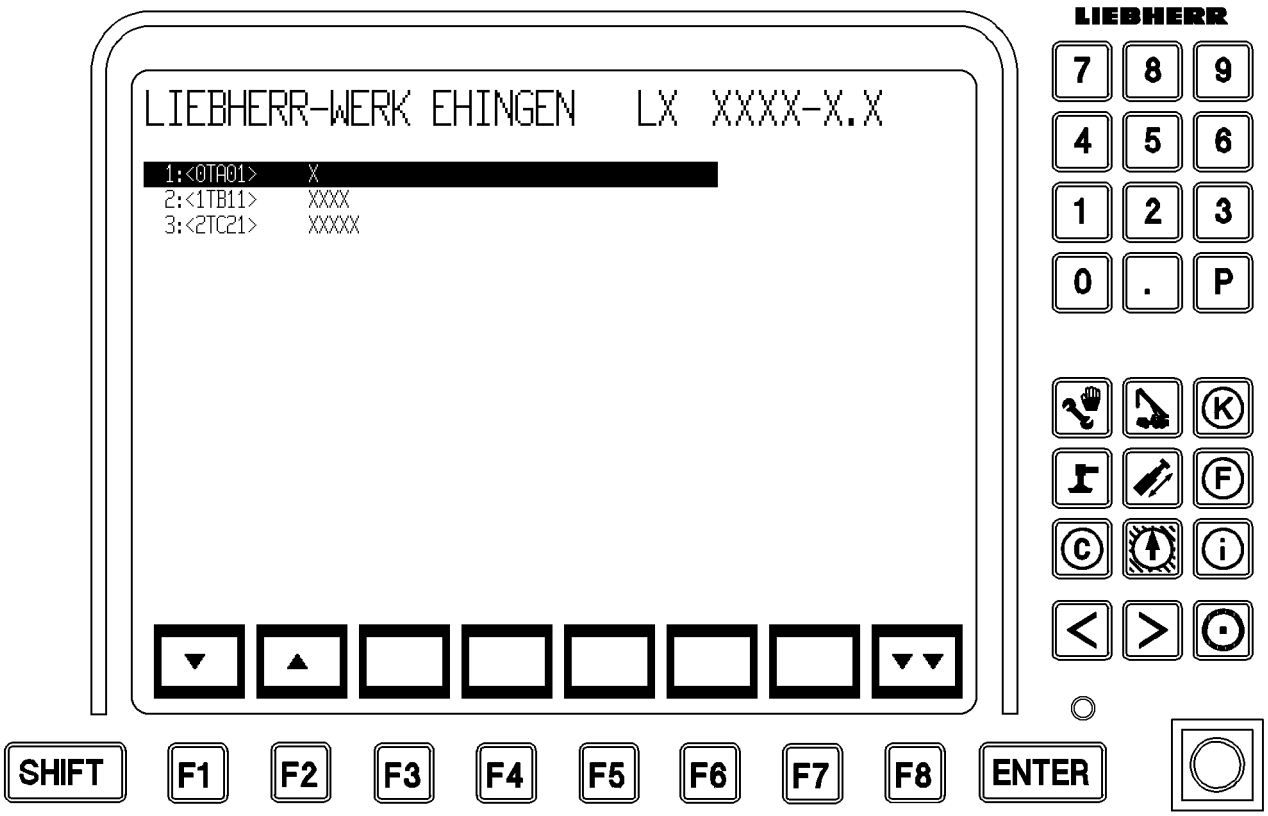

Fig.198728

3 Operating mode preselection on the LICCON computer system

DANGER
Risk of accident!
▶ Only select the operating mode corresponding to the actual crane setup condition.

The operating mode preselection screen will appear on the monitor for approximately 3 s after completion of the startup procedure and successful self-test of the LICCON computer system.

Note
Note
▶ The operating mode preselection screen is skipped if the crane only has one level (for example: only teleoperation) - without optional equipment. In this case, the system changes directly into the configuration screen for the only possible level.
▶ If the memory loses its data (for example as a result of a cold start) the previous operating mode is „rejected“ and the first operating mode in the operating mode selection menu is activated. In this case, the corresponding configuration screen appears.

When the operating mode preselection screen appears, press function key **„F1“** or **„F2“** within 3 s.

Result:
– The operating mode selection screen is retained until the settings are confirmed by pressing either **„F8“** or **„ENTER“**.

Note
Note
▶ If the crane operator does **not** press either function key **„F1“** or **„F2“** within 3 s , the system selects the operating mode which was active before the LICCON computer system was turned off and the corresponding configuration screen appears automatically.

Press function key **„F1“** (cursor down) or **„F2“** (cursor up) to select the required crane operating mode.

Note
Note
▶ The selected operating mode is highlighted in black on the operating mode selection screen.

Press **„F8“** or **„ENTER“**.

Result:
– The selected operating mode is accepted by the LICCON computer system and the corresponding configuration screen is displayed.

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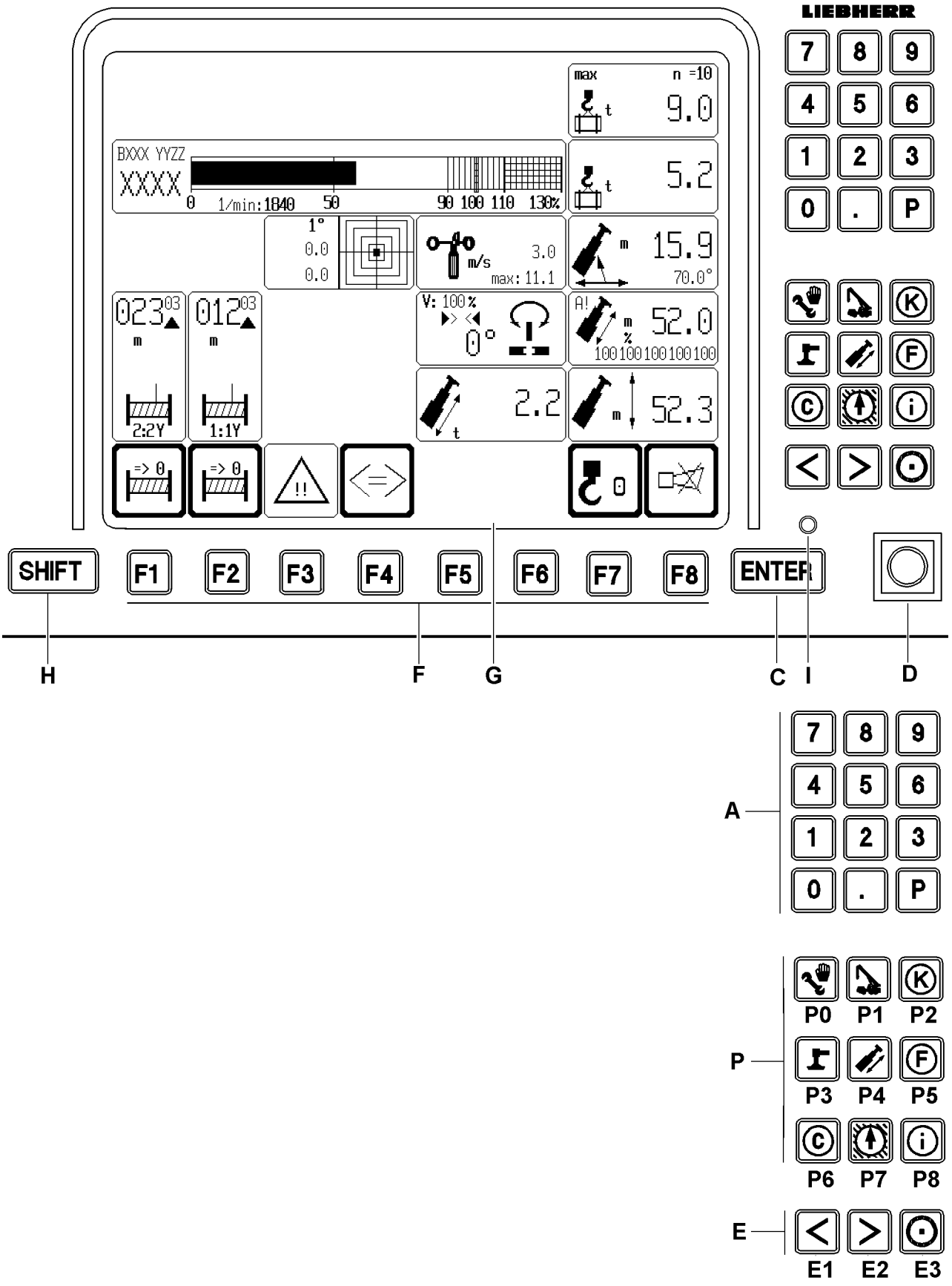

Fig.198612

4 Operating elements of the LICCON computer system

The functions of the individual monitor operating elements are program-dependent, and can differ, depending on the LICCON program which is currently running. This will be described in more detail in the description of the individual LICCON programs.

A Keypad

P Program keys
- Selection of the individual LICCON programs.

P0 Configuration
- **SHIFT** and **P0:** Engine monitoring.

P1 Crane operation

P2 Crane acceptance
- Correction coefficients (for LIEBHERR personnel only).

P4 Telescoping

P6 Control parameter

P7 Working range limitation*****

P8 Test system

C Input key „ENTER“
- Confirmation of changes.

D Bypass key button
- Operating position (self-retaining)
  = crane is in normal operation.
- Position to right (touching):
  = the hoist limit switch and the LMB shutoff are bypassed.

E Special function keys
- Monitor brightness adjustment.
- **E3** and **E1**: Turn background illumination on / off.
- **E3** and **E2**: Brightness adjustment in three stages.
- Additional functions of the special function keys are program-dependent and are further explained in the descriptions of the individual LICCON programs.

F Function keys
- The function keys should always be used in conjunction with the function key icon line displayed on the monitor.

G Monitor
- Display of the individual programs (example: „Crane operation“ program).

H SHIFT key
- Second-level key assignments, for example „Supervisory function“.

I LED displays
- Monitor supply voltage present.

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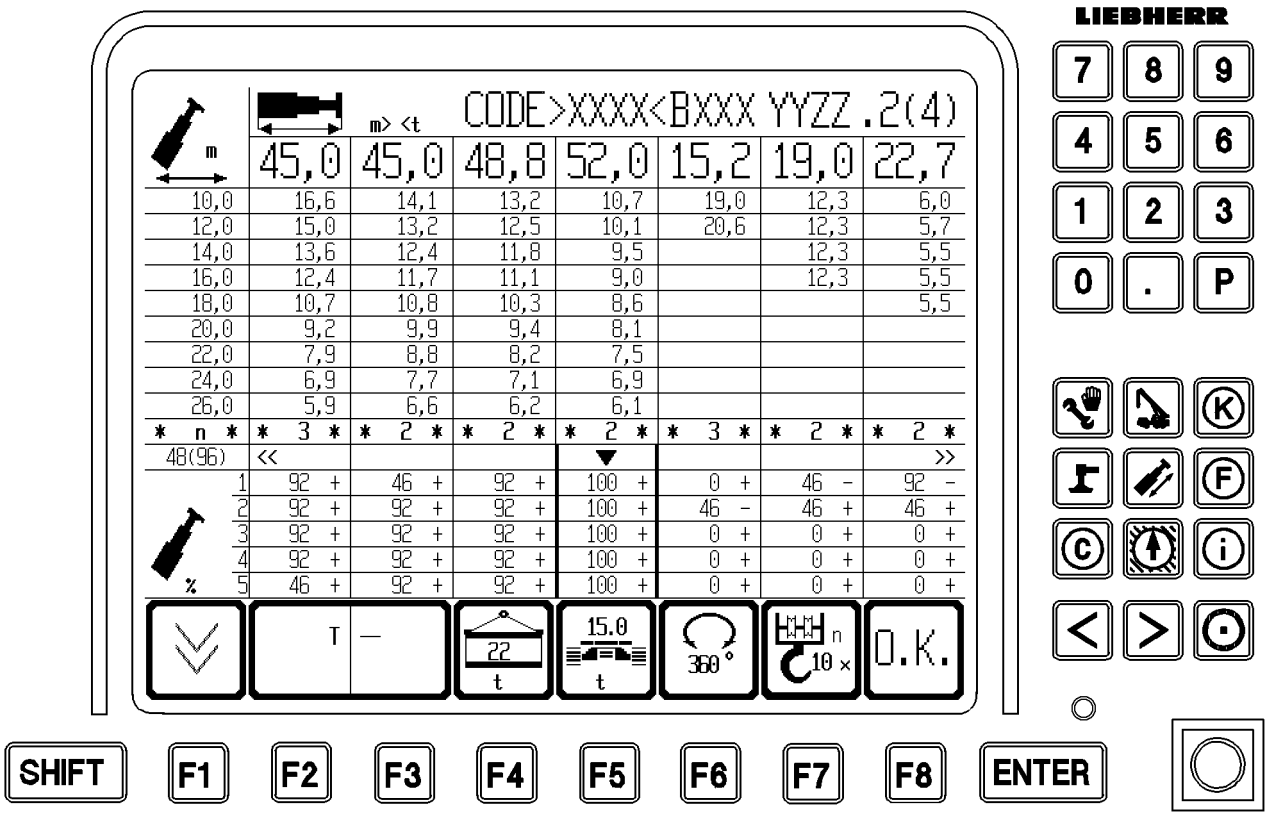

Fig.102822

5 „Configuration“ program

After turning the LICCON computer system on and after successful boot up, the „Configuration“ program appears automatically.

Note
Adjustment and display of equipment configuration and reeving.

- ▶ Normally, the most recently run equipment configuration and the reeving used at that time will be automatically set and displayed. Only when the computer system is started for the first time or after a loss of data occurred in the memory, for example due to a cold start (change of battery or CPU, etc.), will the first valid operating mode, the first valid equipment configuration and the reeving number „0“ appear on configuration screen.

Using the „Configuration“ program, the crane operator can set the current operating mode, the current configuration state of the crane and the reeving number of the hoist rope.

In addition, in the „Configuration“ program he can also see all the load chart programmed into LICCON.

5.1 Setting the operating mode and equipment configuration

The crane operator can select the operating mode and the equipment configuration using the function keys or by entering a 4-digit short code.

Using the function keys:

The function keys are explained in the section „Function key line“ in this chapter.

- ▶ Select the respective function keys.
- ▶ Press **Enter** key to confirm and accept the settings.

Result:

– The data from the selected load chart can be viewed.

Using a 4-digit short code:

- ▶ Enter a 4-digit short code using the keypad on the LICCON monitor.
- ▶ Press **Enter** key to confirm and accept the settings.

Result:

– The data from the selected load chart can be viewed.

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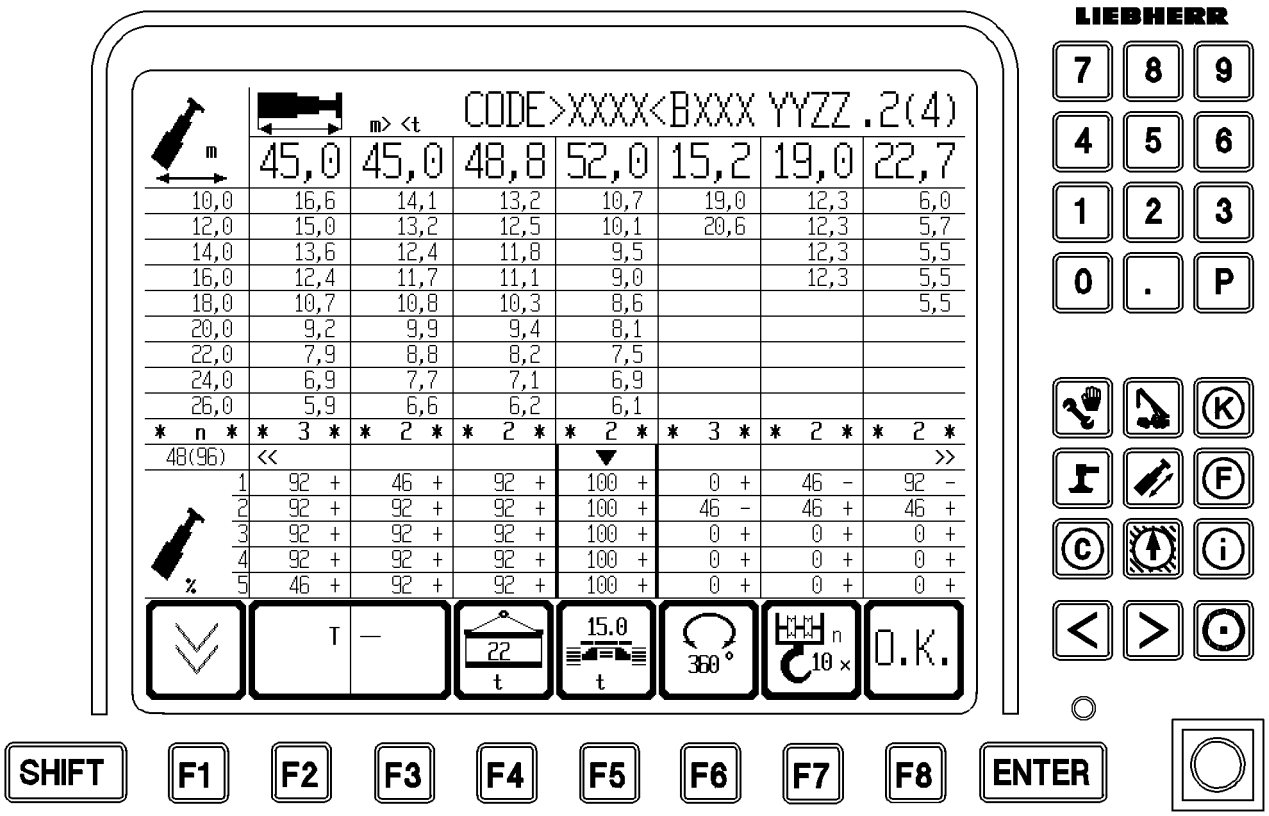

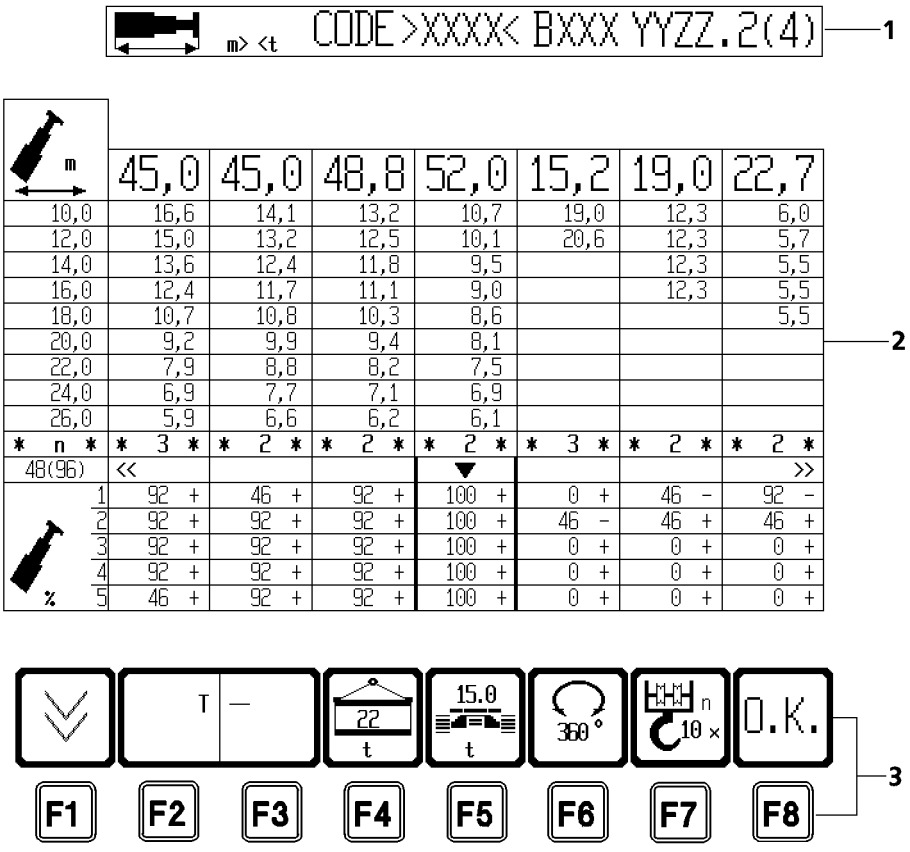

Fig.102823

5.2 „Configuration“ program areas

The monitor is divided into three areas in the „Configuration“ program:
- **1** General information line
- **2** Display area of load chart values
- **3** Function key line

Note
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 programmed load charts for the crane are binding.

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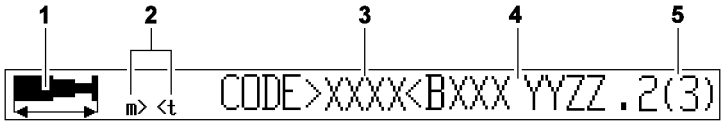

Fig.197624

5.2.1 General information line

1 „Telescopic boom length“ icon
- The icon is identical for all operating modes.

2 Abbreviations
- For the programmed length units (LE) and weight units (GE).
  Possible length units are [m] and [ft].
  Possible weight units are [t] and [lbs].

3 4-digit short code
- It is located next to the text „CODE“ inside angled brackets.
- Each short code uniquely identifies a crane configuration. The valid equipment configuration and their associated short code numbers for the crane can be found in the load chart manual of the crane.

4 8-digit organization number
- Relates to the selected load chart.
- Operating mode-dependent.
- Example: BXXX YYZZ
  - Letter in first position = calculation basis for the load chart (country or county specific). Example: „B“ = DIN, BS 75%.
  - Number combination „XXX“ = crane type.
  - 4-digit number block „YYZZ“ = respective operating mode; whereby YY = main geometry status; ZZ = accessory geometry status.

5 Page number
- Relates to the currently displayed part of the load chart.
- Separated from the organization number with „.“
- The total number of pages in this load chart is in parentheses.

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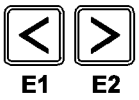

45,0	45,0	48,8	52,0	15,2	19,0	22,7

1

2

m

12,0	2,0						
14,0	1,8	2,1				2,1	
16,0	1,7	2,1	1,8	1,6		2,1	1,8
18,0	1,5	2,1	1,8	1,6	1,2	2,1	1,8
20,0	1,4	2,1	1,8	1,6	1,2	2,1	1,8
22,0	1,3	2,1	1,8	1,6	1,2	2,1	1,8
24,0	1,2	2,0	1,8	1,6	1,2	2,0	1,8
26,0	1,1	2,0	1,8	1,6	1,2	2,0	1,8

3

* n *	* 1 *	* 1 *	* 1 *	* 1 *	* 1 *	* 1 *	* 1 *

4

xx	40,0	40,0	40,0	40,0	40,0	40,0	40,0

5

1(27)	▼						>>

6

1	92 +	46 +	92 +	100 +	0 +	46 -	92 -
2	92 +	92 +	92 +	100 +	46 -	46 +	46 +
3	92 +	92 +	92 +	100 +	0 +	0 +	0 +
4	92 +	92 +	92 +	100 +	0 +	0 +	0 +
5	46 +	92 +	92 +	100 +	0 +	0 +	0 +

%

7

8

LWE/LTR 1100-005/17505-03-02/en

Fig.198615

5.2.2 Display area of load chart values

1 Telescopic boom lengths
- In [m] or [ft].
  Maximum of 7 columns per display page.
- Displayed as the horizontal axis of the load value field.

2 Icon „Boom radius“
- Operating mode-dependent.
- In [m] or [ft].
- Maximum 9 lines of boom radius values.
- Vertical axis of load value field.

3 Load value field
- Columns under the telescopic boom lengths and in the lines to the right of values for the boom radii.
- Load values depending on boom length and radii.

4 Reeving number of hoist rope
- * n *
  n = Reeving number of the hoist rope between the boom head and hook block, in order to be able to lift the maximum load in the corresponding load chart column.
  Note:
  If a load value in the column exceeds that of a load that can be lifted with the maximum possible reeving, then there is an exclamation mark beside the reeving number („!“). This exclamation mark indicates that special equipment is needed to lift this load.

5 Main boom angle or accessory angle*****
- In [°].
- In the line „xx“ the main boom and accessory angles are listed. These must be set in order to be able to lift the load values in the corresponding load chart column.
  Note:
  The line „Accessory angle“ is visible **only** in the TNZK / TVNZK operating modes. The number of lines for the boom projection values is thereby reduced by 1 line.

6 Line for special displays
- If a load chart consists of more than seven columns, it cannot be fully displayed because of the size of the monitor. In that case, marking arrows in the first or the seventh field indicate that there are additional columns to the left or right of the displayed chart. They can be shown by pressing the key **E1** or the key **E2**.
  As supporting information, the currently selected column number and the number of columns in the chart are shown. e.g. 1 (27) means the first of 27 columns.
- **Note:**
  Using the key combination **SHIFT** and **E1** or **SHIFT** and **E2**, you can, where possible, scroll left or right by seven load chart columns (corresponds to 1 page). The marking for selecting a telescope target is placed in the centre.

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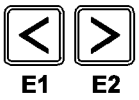

45,0	45,0	48,8	52,0	15,2	19,0	22,7

1

2

12,0	2,0						
14,0	1,8	2,1				2,1	
16,0	1,7	2,1	1,8	1,6		2,1	1,8
18,0	1,5	2,1	1,8	1,6	1,2	2,1	1,8
20,0	1,4	2,1	1,8	1,6	1,2	2,1	1,8
22,0	1,3	2,1	1,8	1,6	1,2	2,1	1,8
24,0	1,2	2,0	1,8	1,6	1,2	2,0	1,8
26,0	1,1	2,0	1,8	1,6	1,2	2,0	1,8

3

* n *	* 1 *	* 1 *	* 1 *	* 1 *	* 1 *	* 1 *	* 1 *

4

xx	40,0	40,0	40,0	40,0	40,0	40,0	40,0

5

1(27)	▼						>>

6

1	92 +	46 +	92 +	100 +	0 +	46 -	92 -
2	92 +	92 +	92 +	100 +	46 -	46 +	46 +
3	92 +	92 +	92 +	100 +	0 +	0 +	0 +
4	92 +	92 +	92 +	100 +	0 +	0 +	0 +
5	46 +	92 +	92 +	100 +	0 +	0 +	0 +

%

7

8

LWE/LTR 1100-005/17505-03-02/en

Fig.198615

7 Extension condition of telescopic sections
- In percent [%].
- The first column contains the „boom length“ icon [%].
  Next to that are 5 lines for the extension condition of the telescopic sections. The number in the symbol column describes the corresponding telescopic section (highest number = outermost telescopic section). The value in the boom length column displays the extension condition of the telescope in percentages, which must be maintained for the corresponding boom length.
  The status indicator „+“ next to the percentage boom status value means that the corresponding telescopic section must be pinned.
  The status indicator „-“ next to the percentage boom status value means that the corresponding telescopic section can be telescoped up as far as the percentage value of the boom status under load (as in the load chart).

8 Mark for selecting telescope target
- The special function key **E1** or the special function key **E2** can be used to move the mark to the left or right. (see chapter 4.05, „Crane operation - Automatic telescoping“)

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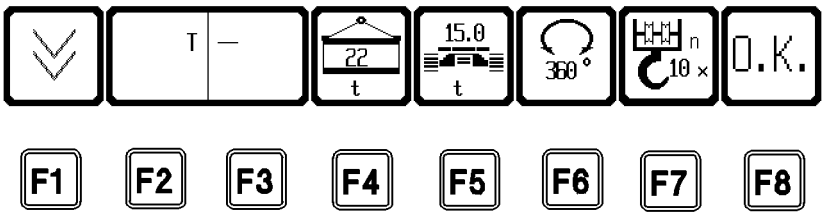

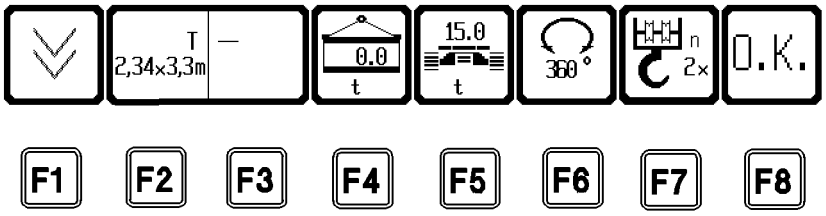

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Fig.102847

5.2.3 The function key line

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.

Various functions are indicated by the function key icons, or they may refer to the following changes:
- Operating mode
- Set up condition

Not all function keys have to be assigned icons on the LICCON monitor. This depends on the program selection.

Pressing a function key changes the appearance of the icon above, its meaning, or its textual content.

F1 Vertical paging
- Depending on the size of the monitor, up to 9 load chart lines can be displayed at once. If a chart consists of more than 9 lines, the display is spread over several pages. When pressing a key, the next page of the load chart will be displayed, and the number of the current page in the „general information line“ will be counted up by 1. When the last page is reached, page 1 will appear again after pressing the function key **F1**.

F2 Support base
- Add or turn off the support base for the assembly / disassembly of the crane (if present).
- Example:
  2.34 x 3.3m.

F2 Main geometry status
- Options for setting the different main boom operating modes of the crane (if available). The types are described by abbreviations and length data in the icon.
- Example:
  T for **Telescopic boom**.

SHIFT and **F2**
- Previous main boom (if present).

F3 Accessories
- Options for selecting the different accessory types of the crane (if present). The types are described using abbreviations, angle and length data in the icon.
- Example:
  „K 0°“ 10.8 m for the crane operation with folding jib***** assembled at an angle of 0° on the telescopic boom, length 10.8 m .
- **Note:**
  Pressing the function key **F2** and/or the function key **F3** deletes all data related to the operating mode and configuration data from the monitor and sets the short code in the general information line to „CODE >????<“.
- **Operating mode dependent data:**
  - Telescopic boom length icon for the general information line.
  - Length units and weight units.
  - Load chart organization number.
  - Boom radius icon.
  - Telescopic boom lengths.
  - Telescopic boom length icon in area „Telescopic part extension status in percent [%]“.
  - Percentage telescopic section extension with status indicator.
- **Configuration dependent data:**
  - Numbering of current page number and total number of pages in load chart.
  - Radius values in length units.
  - Load values in weight units.

SHIFT and **F3**
- Previous accessory status.

F4 Counterweight (superstructure)
- Adjustment option for the current counterweight, which must be on the superstructure in order to achieve the values in the current chart.

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- Example:
  „ 22 t “ = total counterweight of 22 t .

F5 Central ballast (chassis)
- Adjustment possibility for current central ballast, which must be on the chassis in order to obtain the values in the current chart.
- Example:
  „ 0 t “ = central ballast of 0 t .
  „ 15.0 t “ = central ballast of 15.0 t .

F6 Slewing range - Superstructure
1.360° working range: Unlimited rotation is possible.
2.0° working range: Toward the back (locked).

F7 Hoist rope reeving
- Option to set the number of hoist rope strands in order to reach a particular lifting capacity.
  The displayed number of hoist rope strands (reeving) in the icon will be increased with every keystroke by one counter, up to a fixed maximum value for the respective operating mode. After that the count restarts from a fixed minimum value.
  If the set value is still within the minimum and maximum values when switching to another operating mode, it remains valid. Otherwise it will be set to the minimum value for the new operating mode.
- After a „cold start“ (for example, loss of data in the memory), the display of the hoist rope reeving is at „0“.

SHIFT and **F7**
- Reduce the reeving number by 1

F8 Function key
- Confirmation of selected equipment configuration.
  Prerequisites:
  The configuration mode setting must be completed, i.e. a valid short code is displayed and load capacity values are in the chart field.
  The external conditions for this configuration state, if specified, must be fulfilled (e.g. locking the superstructure).
  In the configuration state so far, the crane must not be loaded to more than 20%, and the load on the hook must not be greater than 0.5 t. Switching to the „Crane operation“ program can otherwise only be done using the program key **P1**. In that case, the newly entered equipment configuration is not accepted.
  If the crane is equipped with sliding beam monitoring*****, the sliding beams must be extended to the support base specified in the selected load chart.
  If these preconditions are met, then the „O.K.“ key confirms that the chosen configuration state and the selected reeving are correct and transfers the parameters to the „Crane operation“ program.
  Note:
  Make sure that after switching to the crane operating screen, the chosen configuration state (short code) and the hoist rope reeving(s) have been accepted.
- Display of operating errors from the „Configuration“ program.
  Operating errors caused by the „Configuration“ program are displayed in the icon above the function key **F8** and in the error line for about 5 seconds. If the function key **F8** is pressed within 5 seconds, the program will switch automatically to the error determination screen in the test system and the error documentary will be displayed. The operating error will not be saved.
  Operating errors are shown at the top of the error line.

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Empty page!

LWE/LTR 1100-005/17505-03-02/en

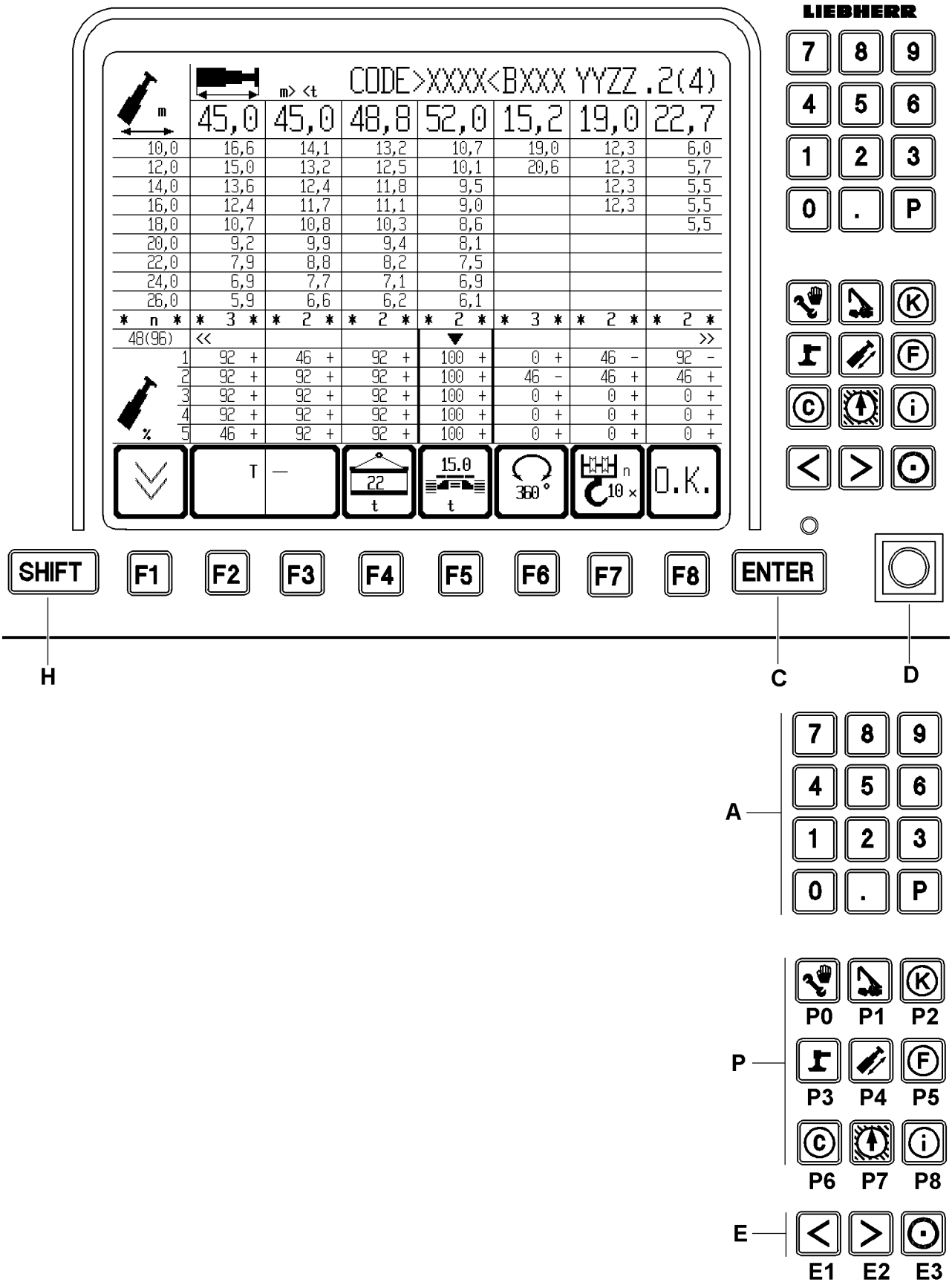

Fig.102848

5.2.4 Other operating elements

A Keypad
- Pressing the keypad deletes all operating mode and equipment configuration dependent data from the monitor.
  The keys **0** to **9** on the keypad can be used to enter the short code directly into the LICCON monitor.
  The key **P** and the key **.** have no function in the „Configuration“ program.

P Program keys
- Selecting from the individual programs. The settings in the Configuration program are discarded, and the equipment configuration and reeving most recently confirmed with the **O.K.** key will continue to be used.
  A program currently running **cannot** be called again using its program key.

C Input key „ENTER“
- Confirmation of input both for short codes and for any change in the equipment configuration using the function keys.
- Key **Enter** after entering the short code, the code is searched for in all stored load charts. If the matching load chart has been programmed, it will be displayed in full. Otherwise there is an error message in the form of „????“ in the second part of the organization number, and the acoustic signal „horn“ sounds.
- Pressing **Enter** key after a changing the operating mode using the function key **F2** and the function key **F3** searches for this operating mode. If successful, sets its first equipment configuration and displays the load chart and its short code. In case of an error, the short code display remains at „CODE ????“, the organization number is displayed as „axxx???“, and the acoustic signal „horn“ sounds.
- Pressing **Enter** key after a change in the configuration status using the function key **F4**, the function key **F5** and the function key **F6**, displays the load chart (if the chart exists) plus the short code on the LICCON monitor. In case of an error, the short code display remains at „CODE ????“ and the acoustic signal „horn“ sounds.

D Bypass key button
- Has no function in the „Configuration“ program.

E Horizontal paging
- The **E1** and **E2** keys only have a function if this is indicated in the „special displays line“.
  If a load chart consists of more than seven columns, the first display of the configuration state only shows columns 1 to 7.
  The double arrow at the right edge of the line points to additional columns in either direction. If the cursor touches an edge with arrows, the next movement in this direction will display the next three chart columns. The cursor will then be automatically returned to the middle.

H SHIFT key
- For example Supervisory function.

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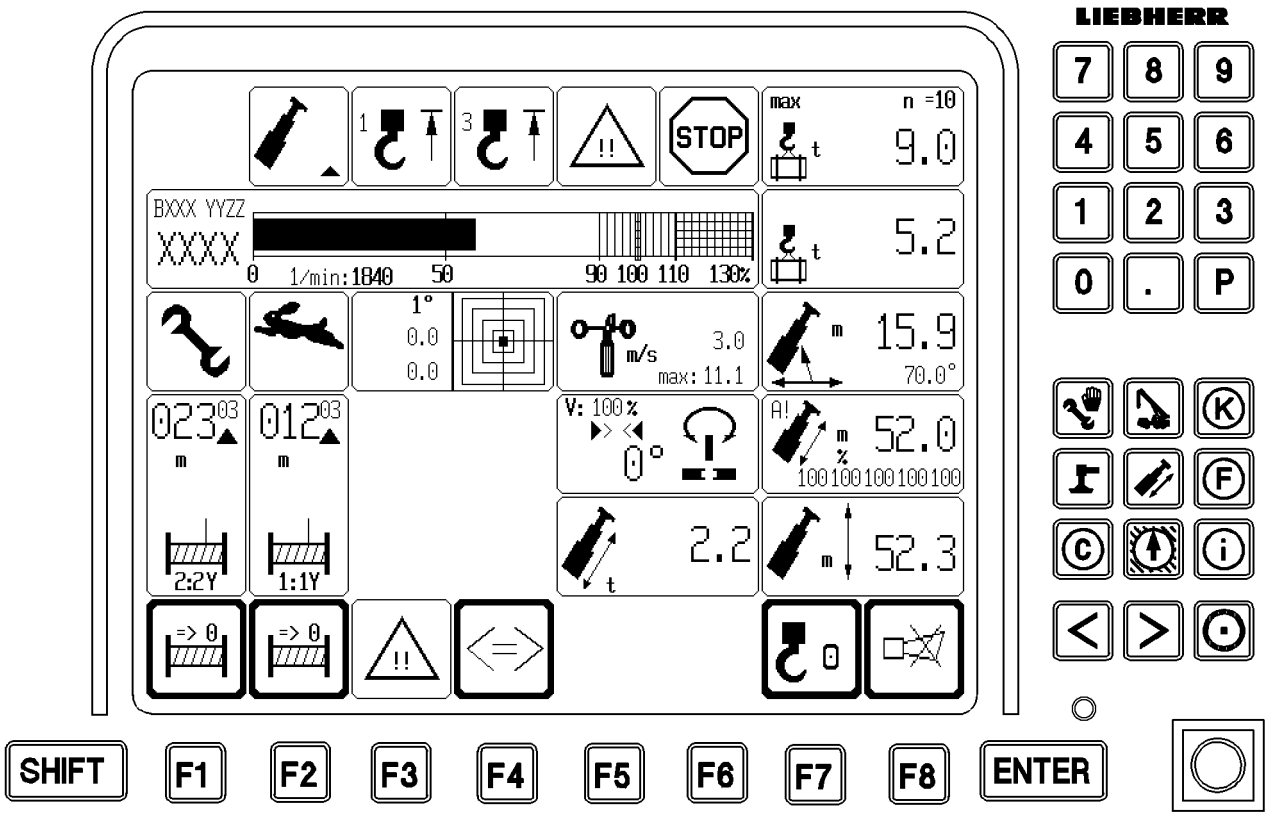

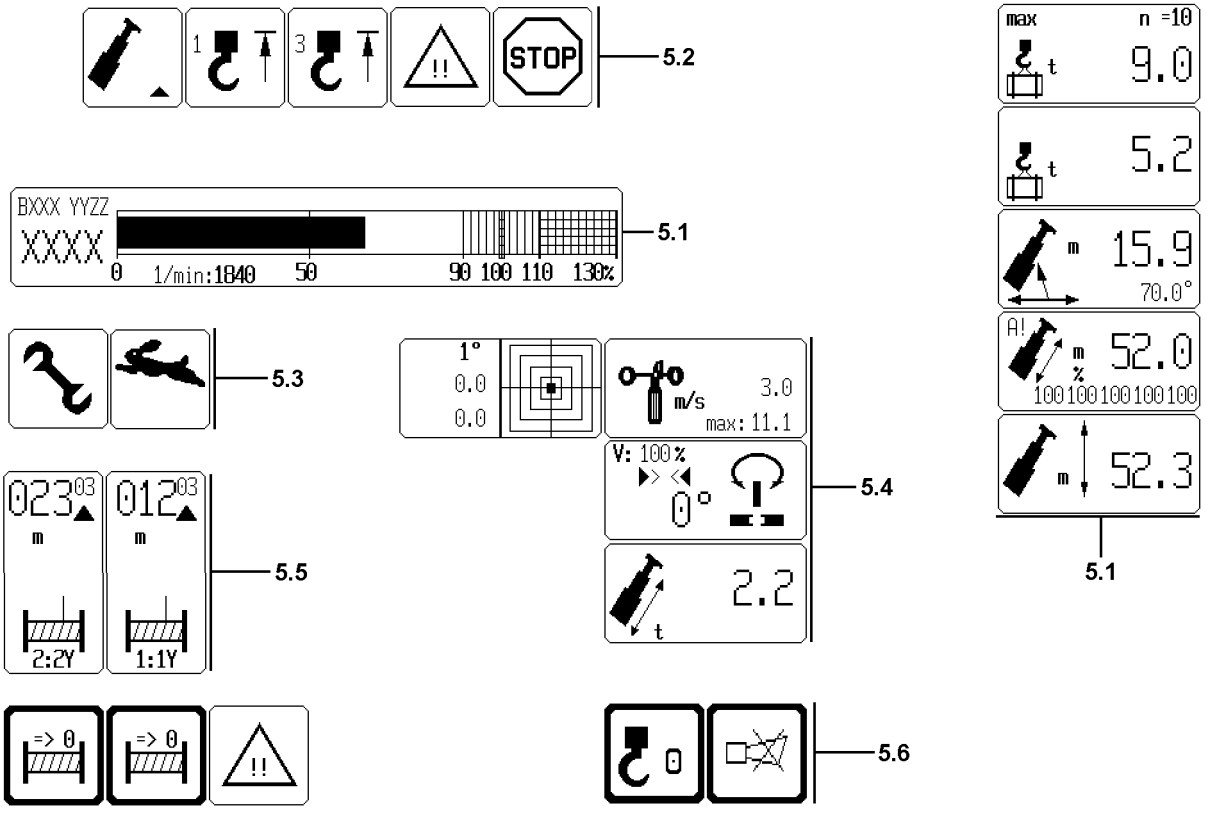

Fig.198618

6 „Crane operation“ program

The LICCON program „Crane operation“ assists the crane driver by displaying clearly on the monitor the data needed for operating the crane. An acoustical 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, the system shuts off.

The monitor is divided into six areas in the „Crane operation“ program:
- **5.1** Crane geometry and load information
- **5.2** Alarm functions
- **5.3** Special functions
- **5.4** Monitored auxiliary functions
- **5.5** Winch display
- **5.6** Function key line

Note
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.
- ▶ In actual crane operations, an identical icon display will **not** appear!

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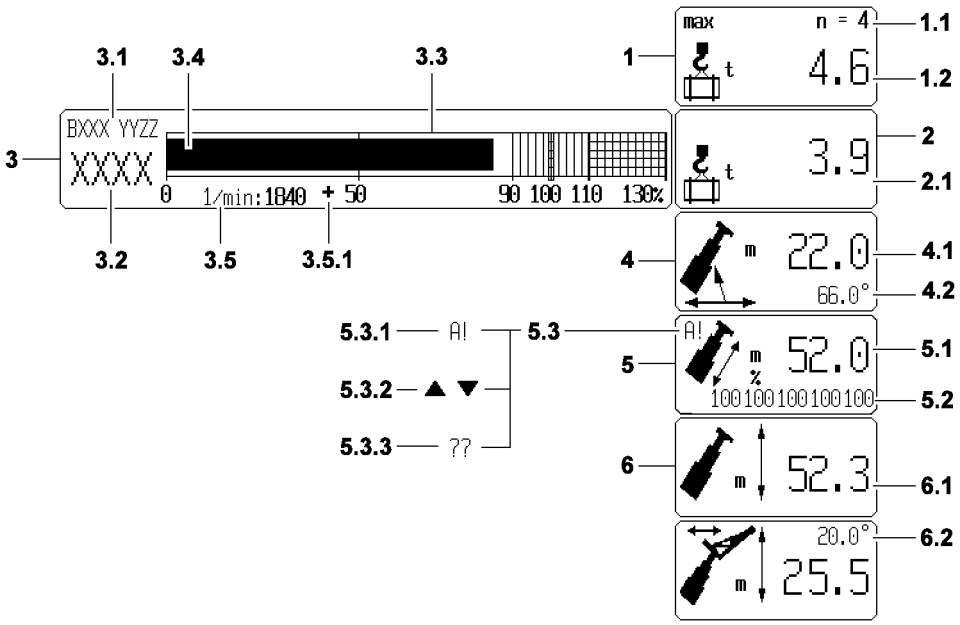

Fig.198619

6.1 Crane geometry and load information

1 Icon „Maximum load“
- In [t] or [lbs].

1.1 Reeving number of hoist rope
- n = reeving number of hoist rope that is reeved at the pulley head selected via the load chart (previously selected in the „Configuration“ program).

1.2 Maximum load according to load chart and reeving
- In [t] or [lbs].
- It depends on:
  - The selected operating mode.
  - The selected configuration (load chart).
  - The boom radius.
  - The hoist rope reeving.
  - **Note:**
    „? ? ? . ?“ if a value in the load chart cannot be accessed, for example because the crane is not within the load chart range, or one or more sensors are missing or so defective, so that the radius cannot be calculated.

2 „Current load“ icon
- In [t] or [lbs].

2.1 Current load
- Actual load display = load in [t] or [lbs] that is currently suspended from the crane hook.
- Display of the calculated total load including the weights of the support, the lifting and / or the attachment equipment.
  By using the function „tare“ (see description of function key **F7** in section „Function key icon line“) the display can be changed over to display the net load. In addition, the word „net“ appears in the icon, the unit of weight is then shown directly next to the load icon.
- **Note:**
  „? ? ? . ?“ is displayed if one or more sensors are missing or so defective that the current load cannot be calculated.

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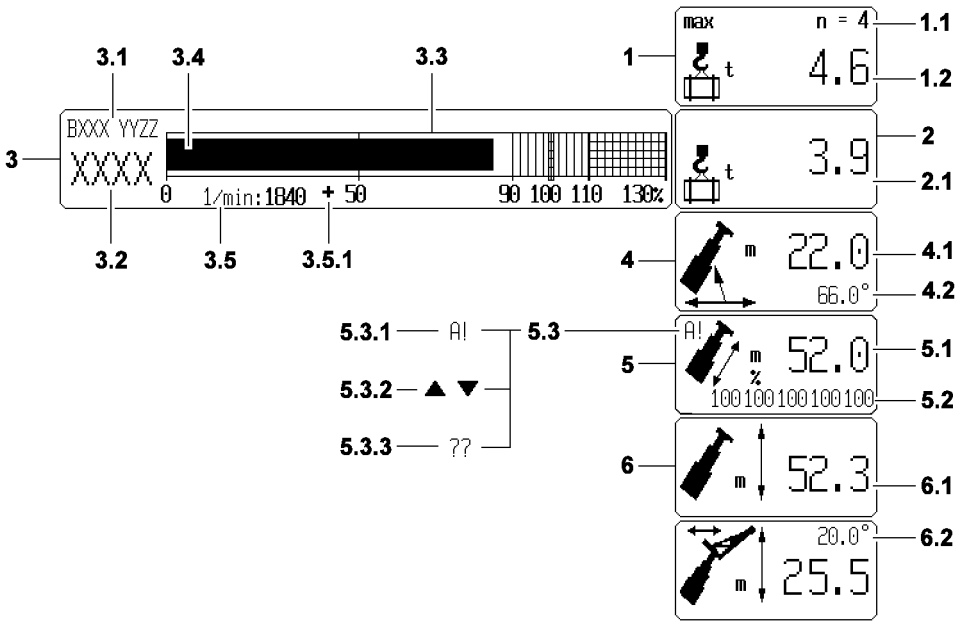

Fig.198619

3 „Dynamic utilization bar display“ icon

3.1 8-digit organization number
- Identifies the type of load chart that has been selected and the operating mode.

3.2 Short code
- Identifies the selected equipment configuration.

3.3 Utilization scale
- Marking from load of 90%: **Advance warning.**
- Marking at 100% load: **STOP shut-off.**

3.4 Utilization bar of crane
- According to load chart and reeving.

3.5 Engine RPM
- In [rpm].
- **Note:**
  „????“ is displayed for an invalid RPM value (for approximately 10 seconds). A fixed RPM is set in the event of a problem. The digital display blinks, and an error message is displayed.

3.5.1 Engine RPM lock
- The engine RPM can be locked on the master switch. If the engine RPM has been locked, the icon „+“ appears behind the RPM display.

4 Icon „Boom radius“

4.1 Radius
- In [m] or [ft].
  Identifies the horizontal center of gravity distance of the load (on the load hook selected by the operating mode) from the center of rotation of the superstructure, measured on the ground. This also takes into account the boom flexation due to its own weight and the suspended weight of the load.
- **Note:**
  „? ? ? . ?“ is displayed, if geometrical data or sensor values are missing, so that the radius cannot be calculated.

4.2 Main boom angle to the horizontal
- In [°].
- **Note:**
  „? ? ? . ?“ is displayed, when the geometrical data or the sensor values are missing, so that the main boom angle cannot be calculated.

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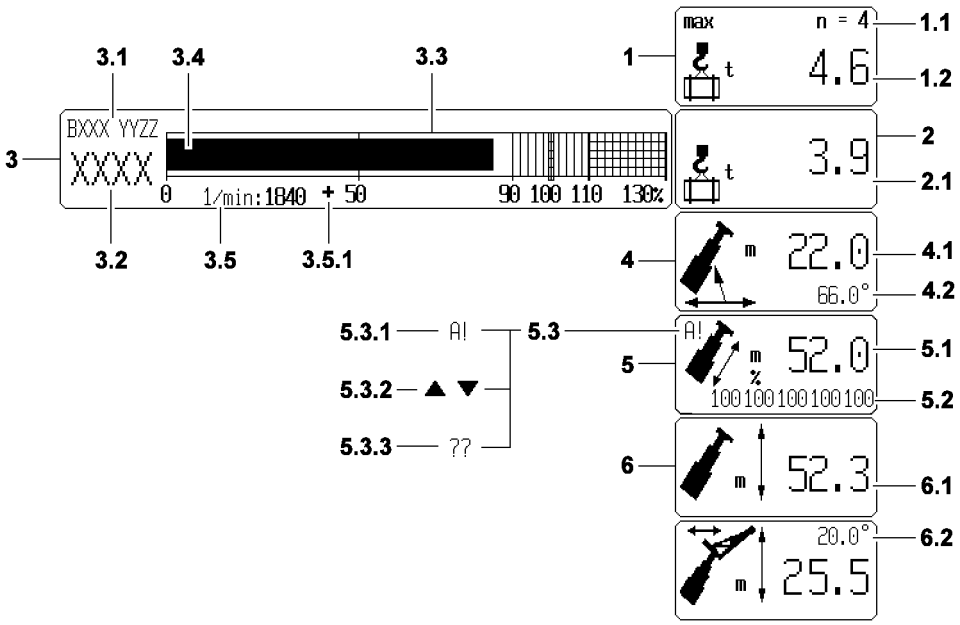

Fig.198619

5 Icon „Main boom length“

5.1 Length of main boom
- In [m] or [ft].

5.2 Extension condition of individual telescopic sections
- In [%].
  Order: Telescope 1 to telescope 5 from left to right.

5.3 TELEMATIC
- Special functions in „Crane operation“ program.
  Note:
  In the „Main boom length“ icon all the information required is displayed to enable an experienced crane operator to telescope the telescopic boom to a desired length without switching to the „Telescoping“ program.

5.3.1 Preselected telescoping target reached

5.3.2 Nominal deflection direction of master switch
- Request: Telescope in = down arrow.
- Request: Telescope out = up arrow.

5.3.3 Error in system

6 Icon „Pulley head height“

6.1 Pulley head height
- In [m] or [ft].
- Identifies the vertical distance from the crane base to the selected pulley head axle, to which the displayed maximum load applies.
- **Note:**
  „? ? ? . ?“ is displayed, when the geometric data or the sensor values are missing, so that the pulley head height cannot be calculated.

6.2 Angle of hydraulically adjustable folding jib (**TNZK**)*****
- In [°].
- The display is in the form of the relative angle between the telescopic boom head and the folding jib.
- **Note:**
  „? ? ? . ?“ is displayed, when the geometry data or the sensor values are missing, so that the angle of the hydraulically adjustable folding jib cannot be calculated.

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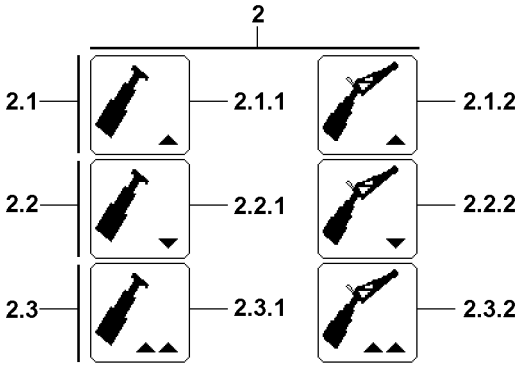

Fig.104778

6.2 Alarm functions

The limit ranges of the crane movements are monitored. The crane operator is alerted that the limits are reached by fading in of the following blinking icons.

6.2.1 Boom limitation

2 Icon „Boom limitation“
- The luffing range of the boom is limited both upwards and downwards. This symbol appears if an end-position determined by the load chart is reached when luffing the boom, or when luffing up the boom is disabled by a proximity switch.

Shut off of upper / lower limit angle

2.1 Arrow pointing up
- The arrow shows that the main boom was shut off because it triggered the upper limit. During telescoping operation the icon **2.1.1** is shown on the LICCON monitor.
  If the folding jib is attached and configured, the arrow remains unchanged however the icon **2.1.2** is shown on the LICCON monitor.
  Note:
  Luffing down the main boom is still possible.

2.2 Arrow pointing down
- The arrow shows that the shut off of the main boom was due to triggering the lower limit. During telescoping operation the icon **2.2.1** is shown on the LICCON monitor.
  If the folding jib is attached and configured, the arrow remains unchanged however the icon **2.2.2** is shown on the LICCON monitor.
  Note:
  Luffing up the main boom is still possible.

Shut-off Steep boom*

2.3 Double arrow pointing up
- The double arrow indicates that the proximity switch on the turntable has shut off the main boom and folding jib. During telescoping operation the icon **2.3.1** is shown on the LICCON monitor.
  If the folding jib is attached and configured, the arrow remains unchanged however the icon **2.3.2** is shown on the LICCON monitor.
  Note:
  Luffing down the main boom is still possible.

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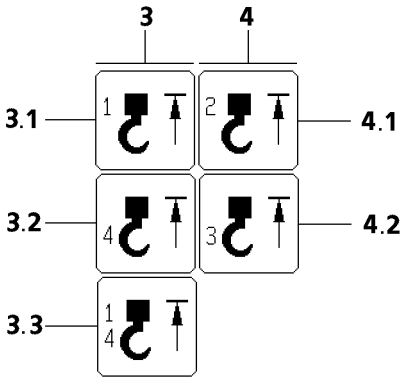

Fig.198397

6.2.2 Hoist top limit switch HES1 and HES4*

3 Icons „Hoist top on HES1 / HES4*“
- In order to prevent the crane from being operated without hoist limit switches (HES), the minimum hoist limit switch configuration is continuously monitored. Four hoist limit switches are possible.
  An „operating error“ is issued if a movement, which is shut off by the hoist limit switch, is actuated anyway.
  A „system error“ is issued if a obligatory bus sensor is missing or an active bus sensor is defective.

3.1 HES1
- Location: Telescopic boom head, right.
  Bus address: 28
  Switch: -S930.
- The icon appears if:
  - The hook block moves against the HES1 at the right telescopic boom head.
  - HES1 is not active, although it must be present on the bus.
  - HES1 has an internal error.
- **Note:**
  The crane movements spool up hoist winch, luff down telescopic boom and telescope out the telescopic boom are shut off.

3.2 HES4*
- Location: Telescopic boom head, left* or boom nose*.
  Bus address: 24
  Switch: -S931.
- The icon appears if:
  - The hook block runs against the HES4 at the left telescopic boom head* or on the boom nose*.
  - HES4 is not active, although it must be present on the bus.
  - HES4 has an internal error.
- **Note:**
  The crane movements spool up hoist winch, luff down telescopic boom and telescope out the telescopic boom are shut off.
  The HES4 must be plugged in in operation mode „Boom nose“.

3.3 HES1 and HES4*
- The icon appears when icon HES1 **3.1** and HES4 **3.2** appear simultaneously.

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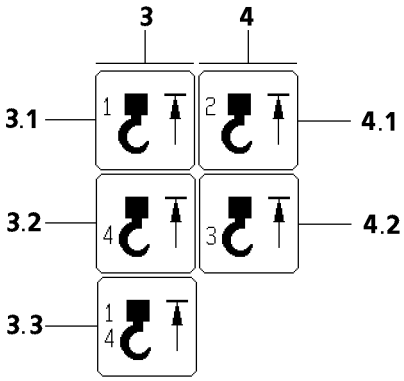

Fig.198397

6.2.3 Hoist top limit switch HES2* and HES3*

4 „Hoist top at HES2***** / HES3*****“ icons **4**.
- In order to prevent the crane from being operated without hoist limit switches (HES), the minimum hoist limit switch configuration is continuously monitored.
  An „operating error“ is issued if a movement, which is shut off by the hoist limit switch, is actuated anyway.
  A „system error“ is issued if a obligatory bus sensor is missing or an active bus sensor is defective.

4.1 HES2*****
- Location: Single folding jib***** or auxiliary boom*****.
  Bus address: 27
  Switch: -S940.
- The icon appears if:
  - The hook block moves against HES2 on the single folding jib***** or on the auxiliary boom*****.
  - HES2 is not active, although it must be present on the bus.
  - HES2 has an internal error.
- **Note:**
  The crane movements spool up hoist winch, luff down telescopic boom and telescope out the telescopic boom are shut off.
  The HES2 must be plugged in in operation mode „Single folding jib“ or „Auxiliary boom“.

4.2 HES3*****
- Location: Double folding jib*****
  Bus address: 26
  Switch: -S945
- The icon appears if:
  - The hook block moves against the HES3 on the dual folding jib*****.
  - HES3 is not active, although it must be present on the bus.
  - HES3 has an internal error.
- **Note:**
  The crane movements spool up hoist winch, luff down telescopic boom and telescope out the telescopic boom are shut off.
  The HES3 must be plugged in in operation mode „Dual folding jib“. If this is not the case, an „LMB STOP“ is triggered and an operating error message is also transmitted.

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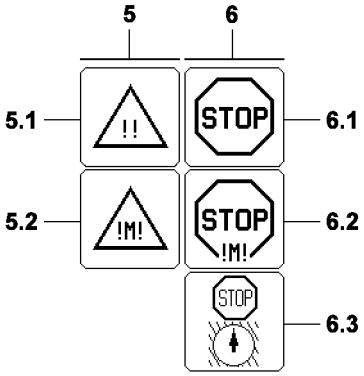

Fig.197632

6.2.4 Load chart capacity, exceeded, working range limitation*

5 „Advance warning“ **5** icon

5.1 Load chart utilization
- The current load chart utilization is calculated from the „current load“ and the „maximum load according to the load chart and the reeving“. The icon „Advance warning“ appears, if the current load chart capacity exceeds the (**90%**) limit programmed in for advance warning.

5.2 Engine monitoring
- If a warning event occurs in the engine monitoring system, the „Engine monitoring advance warning“ icon is displayed on the LICCON monitor.

6 Icon „STOP“

6.1 Load carrying capacity exceeded
- The „STOP“ icon is displayed if the load chart load („current load“ **>** „maximum load according to the load chart and the reeving“) exceeds the **100% mark**.
- **Note:**
  All crane movements that increase the load momentum are shut off.

6.2 Engine monitoring
- If a STOP event occurs in the engine monitoring system, an automatic switch-over (from the program „Operation“, „Support“ or „Telescoping“) is activated into the program „Engine monitoring“.

6.3 Working range limitation*****
- If a programmed working range limit***** is reached, this condition is indicated by the STOP icon Working range limitation*** 6.3** instead of the standard icon „LMB-STOP“ **6.1** is displayed.
  Note:
  If an LMB-STOP occurs simultaneously, the STOP Working range limitation*** 6.3** icon continues to be displayed. The LMB-STOP is identifiable if the load capacity bar exceeds 100% or if a maximum load of 0 t is permitted.

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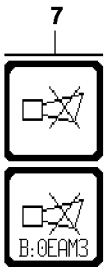

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Fig.197633

6.2.5 Horn

7 Icon „Horn“
- Acoustical signal.
- Sounds in addition to the optical display (for example, E:1TMS) of detected operational errors, leading to interruption of a movement, and application errors with error number (such as sensor errors, which occurred due to insufficient sensor signals or due to defective sensors).
  „Horn“ is a beeping sound of a duration of approximately 0.5 seconds, which is repeated in a second cycle.
- **Operational errors are:**
  - Overload.
  - Boom outside the angle range of the load chart.
  - Boom outside radius range of the load chart.
  - Extension condition of telescopic sections not in accordance with the load chart.
- **The following sensors are monitored:**
  - Hoist limit switch
  - Length sensors
  - Angle sensors
  - Pressure sensors
  - Wind sensor
  - Battery voltage
  - Inductive sensors

„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.
  „Short horn“ is a beeping sound of a duration of approximately 0.1 seconds, which is repeated in a second cycle.
- **The following errors are monitored:**
  - Maximum permissible wind speed exceeded (only for activated wind sensor*****).
  - Maximum or minimum support force exceeded (only with active support force monitoring*****).
  - Crane load value for „caution“ (90%) reached.

Priority and „Horn off“.
- The „horn“ alarm has higher priority than the „short horn“ alarm, i.e. „horn“ takes preference over „short horn“.
- The „horn“, as well as the „short horn“ of the monitor may be turned off by function key **F8**.
- If an operational error is present, press the function key **F8** again to automatically change into the error determination screen of the test system. The error is displayed there in documentary form.
- **Note:**
  The „horn“, as well as the „short horn“ immediately become active again if an error recurs.

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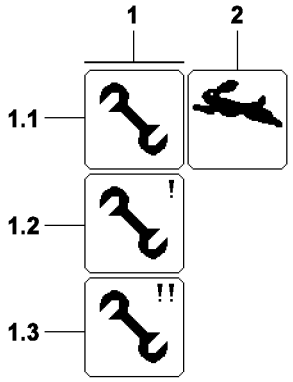

Fig.197634

6.3 Special functions

For special functions, see also chapter 4.04.

DANGER
Risk of fatal injury!
- ▶ All LMB overload protection **shut downs** and „hoist up“ are **ineffective** in the assembly operating modes!
- ▶ This can lead to life-threatening situations.
- ▶ The crane operator bears **full** responsibility for his actions and safe operation of the crane.

Note
- ▶ The various icons **1** are shown on the same position in the LICCON monitor, depending on the operating mode.

6.3.1 Assembly operation

1.1 Assembly
- The icon blinks:
  - When the crane control is bypassed via the bypass key button **D**.
    Note:
    The Operation program is locked, meaning, no other program can be turned on via the program keys.
    or
  - When the crane control is bypassed in active shut off (overload safety load moment limiter, „hoist top“) via the bypass key button **D**.

6.3.2 Emergency operation

1.2 Emergency operation without assembly
- The icon blinks during emergency operation: Key switch **-S81** or plug **-XNOT.S** is activated. If the bypass key button **D** is **not** switched to „assembly“.
  Note:
  The „Operation“ program is **not** locked in this case.

6.3.3 Bypass of load moment limiter emergency operation*

1.3 Emergency operation and assembly
- The icon blinks if:
  - „Assembly“ is switched via the bypass key button **D** and emergency operation is switched via the key switch **-S81** or plug **-XNOT.S**.
    or
  - The key button **-S82** in the control cabinet was used to turn on the „Load moment limiter bypass, emergency operation“.

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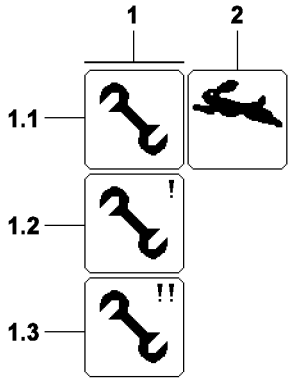

Fig.197634

6.3.4 Fast mode (rapid gear)

2 „Fast mode“ icon
- The icon appears if rapid gear is enabled during a crane movement.
- This is possible for the following crane movements:
  - Lift / lower hoist gear 1.
  - Lift / lower hoist gear 2.
  - Luff up boom.

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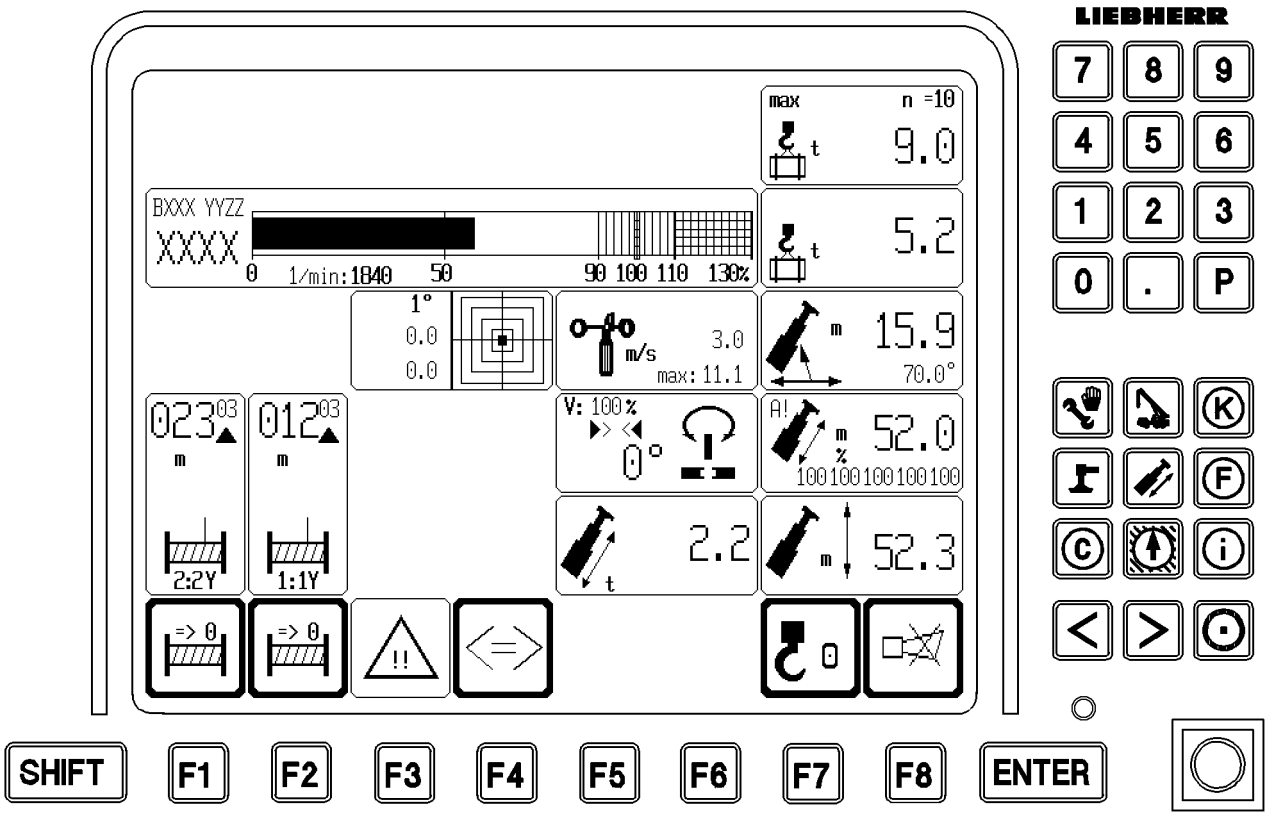

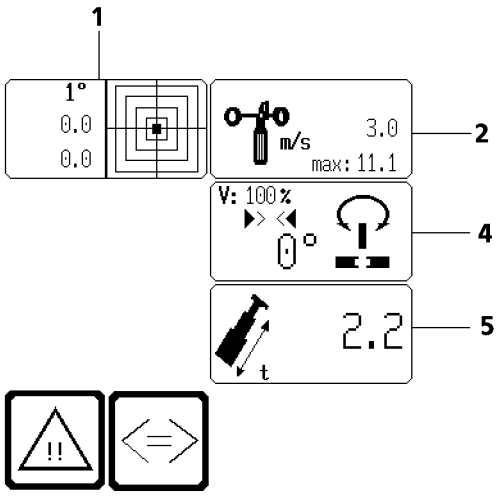

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Fig.198620

6.4 Monitored auxiliary functions

There are several monitored auxiliary functions that can be displayed when required or automatically:
– Auxiliary functions for crane operation.

The monitoring of all auxiliary functions is always active, only the icons may be hidden. The icons of the monitored auxiliary functions have their fixed place on the LICCON monitor.

6.4.1 Auxiliary functions for crane operation

Using the function key **F3**, you can show the icons for the monitored auxiliary functions. Since not all icons of the auxiliary functions fit on one page (at maximum assignment), they are split over two pages. The icons on page 2 (if available) can be shown with the function key **F4**.

Page 1:
1 Crane incline
2 Wind speed
4 Slewing range
5 Telescopable load

Page 2:
Not assigned.

If an error occurs in one or more of these monitored functions, this is displayed in the „Crane operation“ program, as follows:
1. Monitored auxiliary functions **turned off F3**:
   - Error in one function on page 1:
     Icon is displayed on page 1.
   - Error in one function on page 2:
     Icon is displayed on page 2.
   - Error in a function on page 1 and 2:
     Icon is displayed on page 1 and icon for **F4** blinks (= indicates an error in a function on page 2).
2. Monitored auxiliary functions **turned on F3**:
   - No error:
     Optional icons (optional) are displayed.
     If there are also optional icons on page 2, the icon „change page“ of the **F4** key is activated (= indication for switching option).
   - Error in one function on page 1:
     Icon has been previously displayed.
   - Error in one function on page 2:
     Icon „change page“ blinks (= indication regarding an error of a function on the other page).
   - Error in a function on page 1 and 2:
     Icon is displayed on page 1.
     Icon „change page“ blinks (= indication regarding an error of a function on the other page).

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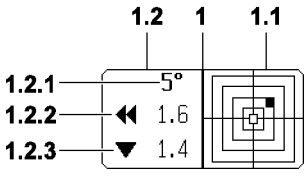

Fig.197636

1 „Incline“ **1**icon
- Display of the incline of the superstructure to the horizontal in longitudinal and lateral direction. The display is graphic as well as numeric.

1.1 Graphic part
- The graphic display is in the form of a spirit level, with a moving dot (small square) representing the air bubble. The center of the dot shows the precise incline value.

1.2 Numeric part

1.2.1 Incline range
- Value either 1° or 5°.
  This value describes the distribution of the graphic illustration and can only assume the two values „1°“ or „5°“.
- If the incline is less than 1° in lateral direction **and** in longitudinal direction, the level moves within the 1° range.
  Note:
  With the maximum deflection this corresponds to 1°.
- If at least one value exceeds the 1° limit, it switches to the 5° range.
  Note:
  With the maximum deflection this corresponds to 5°.
- The range change is automatic.

1.2.2 Crane incline
- In [°] in lateral direction.
- The double arrow shows the direction of incline:
  - Double arrow to left = crane is inclined to the left.
  - Double arrow to right = crane is inclined to the right.

1.2.3 Crane incline
- In [°] in longitudinal direction.
- The arrow shows the direction of incline:
  - Up arrow = crane is inclined to the rear.
  - Down arrow = crane is inclined to the front.

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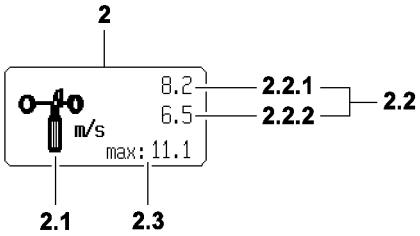

Fig.197637

2 Icon „Wind speed“
- The wind speeds are displayed in [m/sec.] or [ft/sec.] depending on the units of measurement shown in the load chart.

2.1 Icon „Wind speed“
- In [m/sec.] or [ft/sec.].

2.2 Current wind speeds

2.2.1 Current wind speed WG
- In crane operation with equipment / accessories: **TK**, **TNZK**.
- **Note:**
  If several wind sensors are attached to the LSB bus, the location of the wind sensor determines the corresponding display in the icon „wind speed“.
  The priority depends on the location of the wind sensor, from „outside“ (accessory) to „inside“ (telescopic boom). The wind speed of the „exterior“ wind sensor is displayed in **2.2.1** and the wind speed of the „interior“ wind sensor is displayed in **2.2.2**.
  Note:
  If only one wind sensor is installed and connected to the LSB bus, the wind speed is displayed in **2.2.1**.

2.2.2 Current wind speed WG
- If two wind sensors are installed and connected to the LSB bus, the wind speed of the „inner“ wind sensor is displayed in **2.2.2**.

Note
Note
▶ If no wind sensor is connected to the LSB bus, **„????“** appears in the display.

2.3 Maximum permissible wind speed
- With icon text „max:“
- The value depends on the operating mode and the equipment configuration.
  Note:
  If access to a load chart is not possible, then the maximum value starts to blink and the acoustic alarm „short horn“ sounds.
  If the current wind speed value exceeds the displayed maximum value, the maximum value starts to blink and the acoustic alarm „short horn“ sounds.
  The crane movements will not be shut off!

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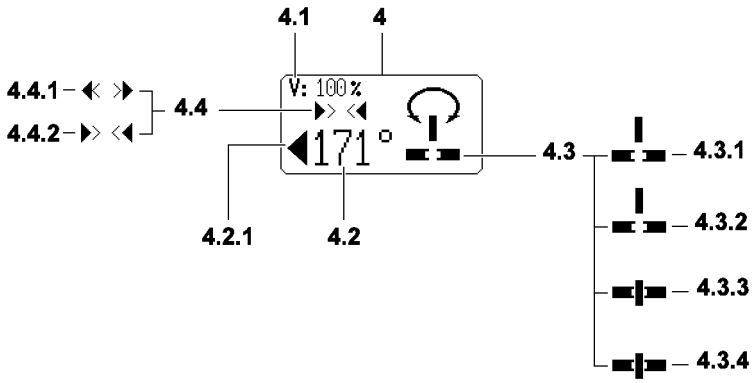

LWE/LTR 1100-005/17505-03-02/en

Fig.197639

4 Icon „Slewing range“

4.1 Maximum slewing speed
- V: [%]
- Identifies the current (selected) „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 may be selected in fixed percentage stages in the LICCON program „Control Parameter“.

DANGER
Danger of accidents in case of excessive slewing speed!
▶ Make the preselection according to the specifications in the load chart.

4.2 Current superstructure position*
- In relation to the main working direction „to the rear“ (0 [°]).
  Increases clockwise to a maximum value of 180°.

4.2.1 Deviation direction

The arrow in front of the value indicates the deviation direction.
- Arrow to the right: Turn to the right.
- Arrow to the left: Turn to the left.

4.3 Status of lock between superstructure and chassis

4.3.1 Lock is static
- Locking pin on top: Superstructure unpinned.

4.3.2 Lock is blinking
- Locking pin in intermediate position: Error.

4.3.3 Lock is static
- Locking pin bottom, ±5° in length axle: Superstructure pinned in length axle.

4.3.4 Lock is blinking
- Locking pin bottom, ±5° **not** in length axle: Superstructure pinned.

4.4 Slewing gear operating mode

4.4.1 Flexible slewing gear* „freely rotating“

4.4.2 Flexible slewing gear* „fixed“

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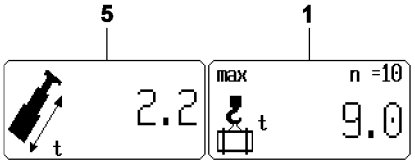

Fig.197640

5 Icon „Telescopable load“
- This icon is automatically shown if „telescoping“ crane movement has been selected and the telescopic boom is still pinned.
  The weight unit [t] or [lbs] defined in the load chart is displayed in the icon, under which the selected telescopic section can still be unpinned and then telescoped.
- The displayed value begins to flash and the acoustic alarm „short horn“ sounds, if the load on the hook is greater or if the displayed value is „0“.
- If the telescopic boom is not pinned, the icon „Maximum load“ **1** shows the same value as the icon „Telescopable load“ **5** and the icon „Telescopable load“ **5** no longer appears automatically, but only after pressing the function key **F3**.

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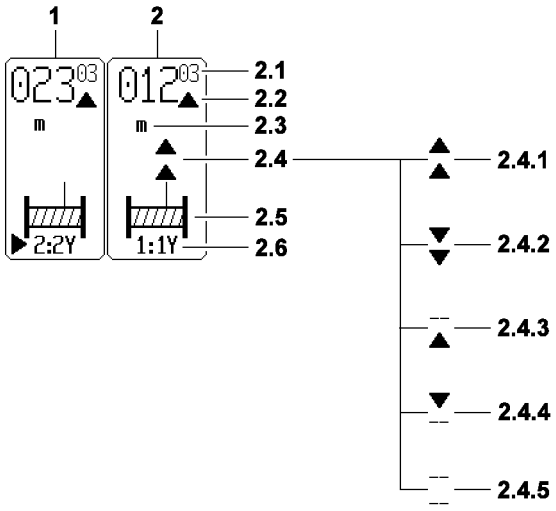

LWE/LTR 1100-005/17505-03-02/en

Fig.197641

6.5 „Winch display“ icon

1 Icon „Winch2“
- The meanings for the icons for winch1 and winch2***** are the same, and are explained at the icon „winch1“ **2**.

2 Icon „Winch 1“

2.1 Travelled distance
- In [m] or [ft].
  From a zero point which must be determined.
- For a single operation with the reeving setting made in the „Configuration“ program: Completed hook path.
  For parallel operation: Distance completed by hook block.
- The positions before the decimal point are displayed with up to 3 large digits. The digits after the decimal point are displayed with small digits. (Also refer to the description of the function key **F1** and function key **F2**).
- A precondition for a correct display is that the value entered equals the actual number of rope strands between the boom head and the hook block.
  If the set reeving does not correspond with the reeving of the appropriate winch (for example, winch on the boom nose at a set load capacity table for the main boom), the correct block travel can be calculated from the displayed hook travel as follows:

$$s_{Hk} = \frac{s_{Ha} \times n_e}{n_t}$$

Fig.197737

Legend:
- s_{Hk} = correct hook path
- s_{Ha} = displayed hook path
- n_e = selected reeving
- n_t = actual reeving

- 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.
- **Note:**
  The length display (hook travel display) is only accurate and the layer sheer is only taken into account correctly if the winch has been calibrated and no interruptions of the CPU power supply have occurred (cold start). The hook travel display is calibrated by spooling the rope up or out until the calibration switch reacts.

2.2 Direction of hook movement

The arrows on the length value show the direction of the hook movement in relation to the zero point:
- Arrow pointing up: Hook has moved upward from the zero point.
- Arrow pointing down: Hook has moved down from the zero point.

2.3 Length unit for hook path display
- In [m] or [ft].

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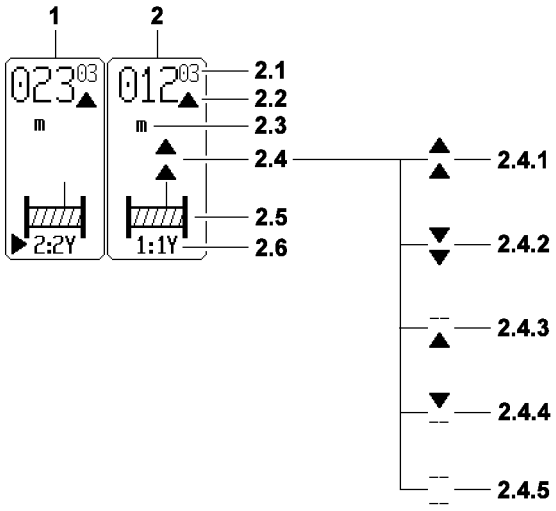

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Fig.197641

2.4 Winch status display
- There are five winch status icons (all flashing):

2.4.1 Spool out

2.4.2 Spool up

2.4.3 Spooled out.
- Spooling out is blocked.

2.4.4 Spooled up
- Spooling up is blocked.

2.4.5 Winch is deactivated or unplugged
- Spooling up and spooling out are blocked (via „Control parameter“ program).
- **Note:**
  If no winch status icon appears, the activated winch is inactive and is neither spooled up nor spooled out.

2.5 Winch icon
- (With rope end for winch status icon).

2.6 Winch number with master switch number and master switch operating direction
- Example: 1 : 1 Y
  First digit: Winch number.
  Second digit: Master switch number.
  Letter: Master switch operating direction.

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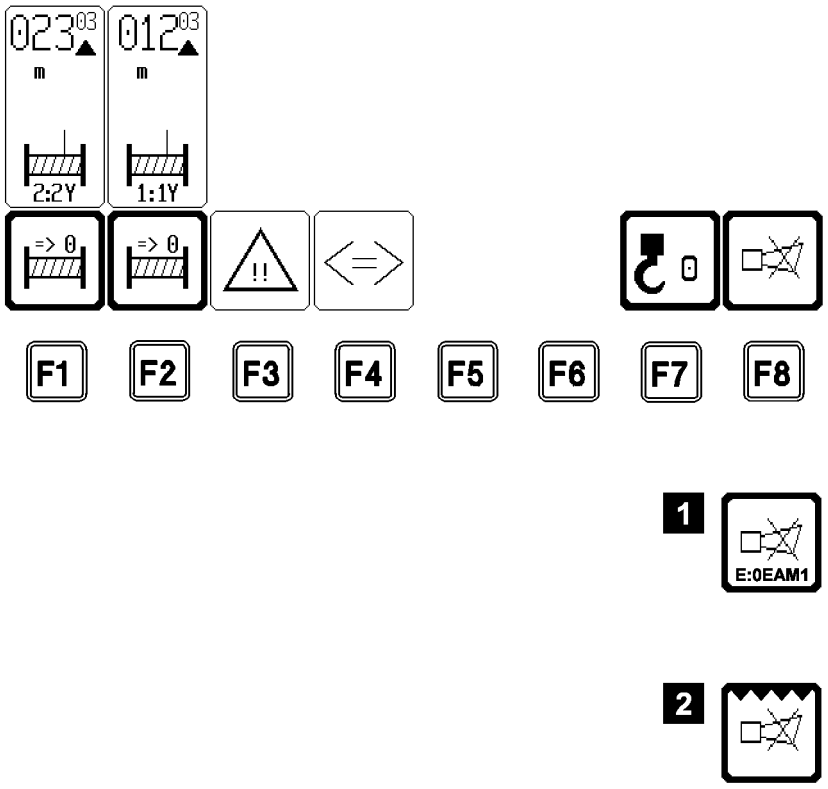

Fig.197642

6.6 The function key line

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 may trigger a function or they may change their appearance when a key is pushed (function keys) and thereby their definition.

Not all function keys must have assigned icons. This depends on the „active“ program selection.

Pressing a function key changes the appearance of the icon above, its meaning, or its textual content.

Note

▶ The function key icons **F3** to **F6** have different assignment in the programs „Crane operation“ and „Driving mode superstructure“.

6.6.1 Crane operation

F1 Function key
- Zero point for hook travel display winch2.
- Pressing the function key **F1** causes the „set winch display to zero“ icon to appear, i.e. the winch2 hook path display in the winch icon above is set to „000.00“ when the key is pressed. The path measurement begins here.

F2 Function key
- Zero point for hook travel display winch 1.
- Pressing the function key **F2** causes the „Set winch display to zero“ icon to appear, i.e. the winch1 hook path display in the winch icon above is set to „000.00“ when the key is pressed. The path measurement begins here.

F3 Function key
- Turn monitoring icons on / off.
- The function key **F3** can be used to turn all the monitored auxiliary functions in the crane on or off.
- The appearance of the icon changes according to the condition:
  „Thick border“ = auxiliary function icons turned off.
  „Thin border“ = auxiliary function icons turned on.
  See also section „Monitored auxiliary functions“.

F4 Function key
- Change monitoring page (if present).
  See also section „Monitored auxiliary functions“.

F5 Function key
- Not assigned.

F6 Function key
- Not assigned.

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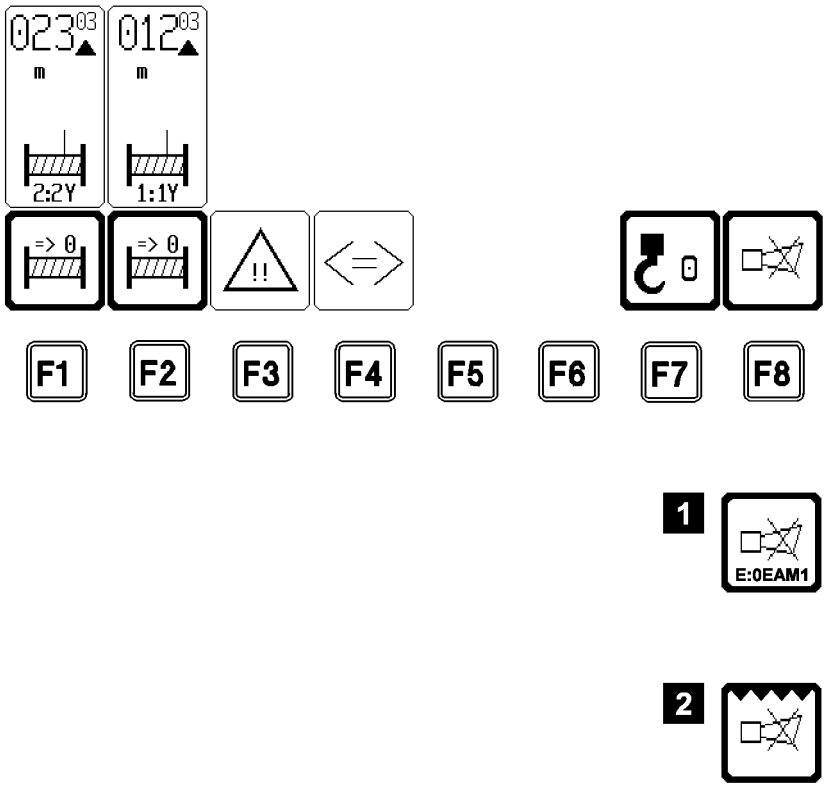

Fig.197642

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 icon of the actual load display. This function, for example, makes it possible to eliminate the weights of the hoist rope, load carriers, lifting and attachment equipment and only display the weight of the load that must be lifted (net load).
  If the taring is cancelled, the word „net“ disappears from the icon „Actual load display“ and the gross load value is displayed.
- Taring is cancelled by one of the following three actions:
  1.Pressing the function key **F7** again.
  2.Telescoping the boom by more than 3 LE (dm or 1/10 ft.).
  3.Luffing by more than ±4°.

F8 Function key
1. Turn off horn / error diagnostics.
2. Turn off the acoustic warning.
   The „horn“ and „short horn“ acoustic warnings can be turned off by pressing the function key **F8**.
   A new error turns the acoustic warning on again.
3. Error message in „Horn“ icon.
   If a system, application or operating error occurs, an error message appears in the „Horn“ icon (refer to illustration **1**).
   Example: E:0EAM1
   By pressing the function key **F8** twice, the acoustic warning is turned off and the „Test system“ program switches to the error determination screen where the error is documented.
4. Special function „Horn“ icon.
   A special program is available for crane acceptance in the LICCON computer system. This program is blocked after completion of crane acceptance. If an additional marking is displayed in the „Horn“ icon (talons along the upper margin, see illustration **2**), this means that the acceptance program is not yet blocked. 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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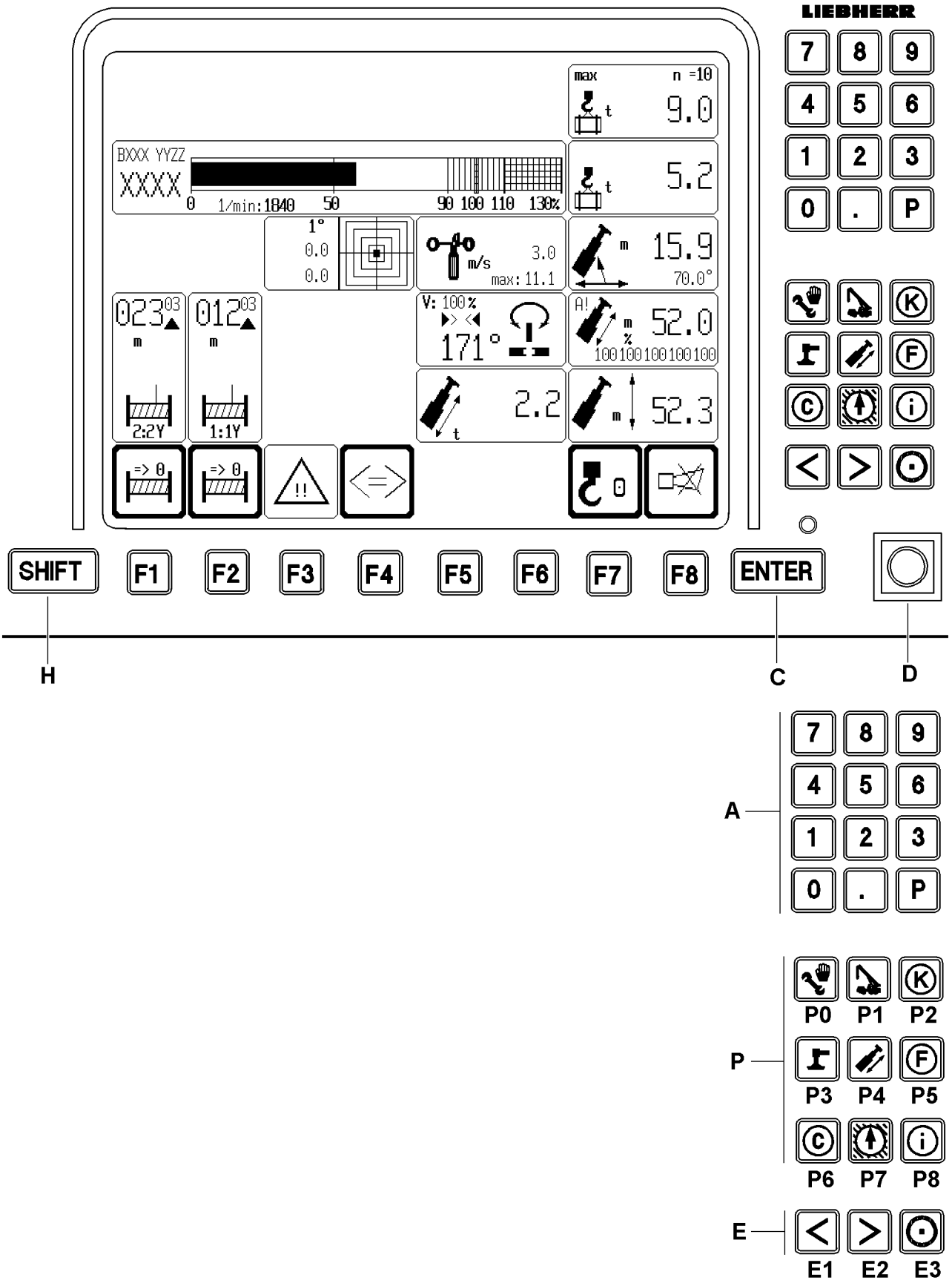

Fig.198621

6.7 Other operating elements

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“ and „P“ have no function in the „Crane operation“ program.

„**SHIFT**“ and **„.“** keys

Using key „.“, the so-called test pattern function is turned on and off, meaning that all available symbols appear on the monitor with an incorrect display value.

Note:

The monitored auxiliary functions, however, must be opened on the desired page if they are to appear in the test pattern. The test pattern display may be held by pressing the „**SHIFT**“ key and **„.“**, otherwise the normal crane operating pattern will appear after 10 seconds or after again pressing the key „.“.

P Program keys

- The program keys are used to select individual programs. However, the appropriate program-specific features (for example, switching from „configuration“ to „crane operation“ using the „O.K.“) must always be observed.

  Note:

  A program currently running **cannot** be called again using its program key.

  The programs may only be called up with their program key, if the bypass key switch „assembly“ is not in the „assembly“ position.

C Input key „**ENTER**“

- No function in „Crane operation“ program.

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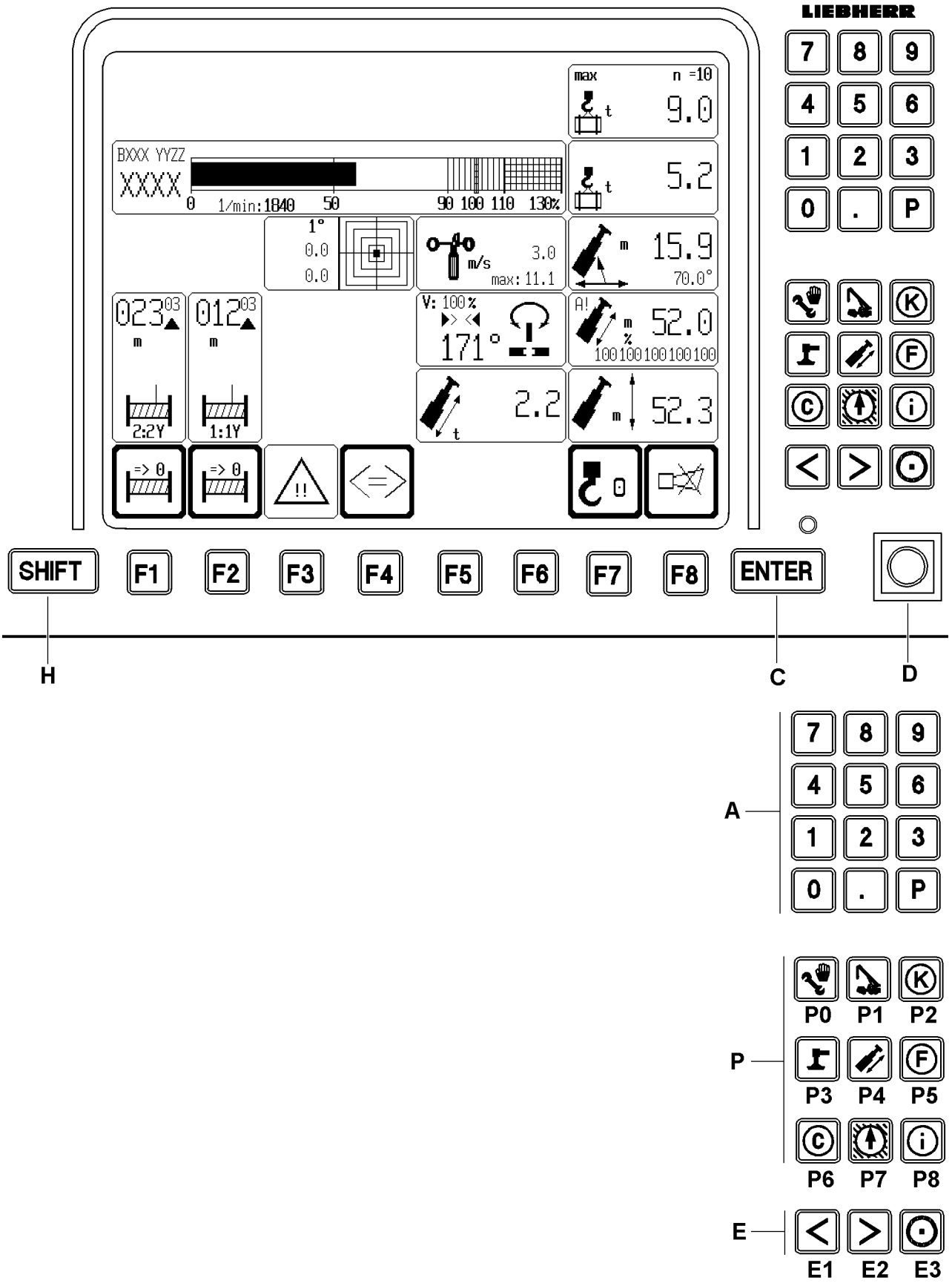

Fig.198621

D Bypass key button

The bypass key button has two positions:
- Operating position (self-retaining).
  Crane is in normal operation.
- Position to right (touching):
  The hoist limit switch and the LMB shutoff are bypassed.

- **Bypassing the overload protection:**
  If the maximum permissible load moment is exceeded, the LICCON overload protection turns off all crane movements that increase the load moment. This shut-off can be bypassed by the bypass key button **D** in the „right touching position“.

DANGER
Increased accident risk when bypassing the overload protection!
If the overload protection is bypassed, there is no further protection against crane overload!
All LICCON overload protection displays remain functional.
- ▶ It is only permitted to bypass the overload protection during assembly or in emergencies!
- ▶ The bypass key button **D** should only be operated by persons aware of the consequences of bypassing!
- ▶ Bypassing overload protection may only be done if the crane supervisor is present and with utmost caution.
- ▶ Crane operation with overload protection bypassed is prohibited!

- **Bypassing the hoist top shut off.**
  If the hook block touches the hoist limit switch weight during the upward movement, the hoist limit switch reacts. The crane movements „Spool up winches“, „Luff telescopic boom down“ and „Telescope out“ are shut off. The shut off can be bypassed by the bypass key button **D** in the „right touching“ position.

DANGER
Increased accident risk when bypassing the overload protection!
When bypassing the hoist top shut-off, there is a risk 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 hoist up shut-off must only be bypassed if the crane supervisor is present, and with the help 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 care and minimum speed.

E Special function keys
- Monitor brightness adjustment (see section „Control elements of the LICCON computer system“).

H „SHIFT“ key
- Second level key assignments.
  „SHIFT“ and „P0“: Program call up for engine monitoring.

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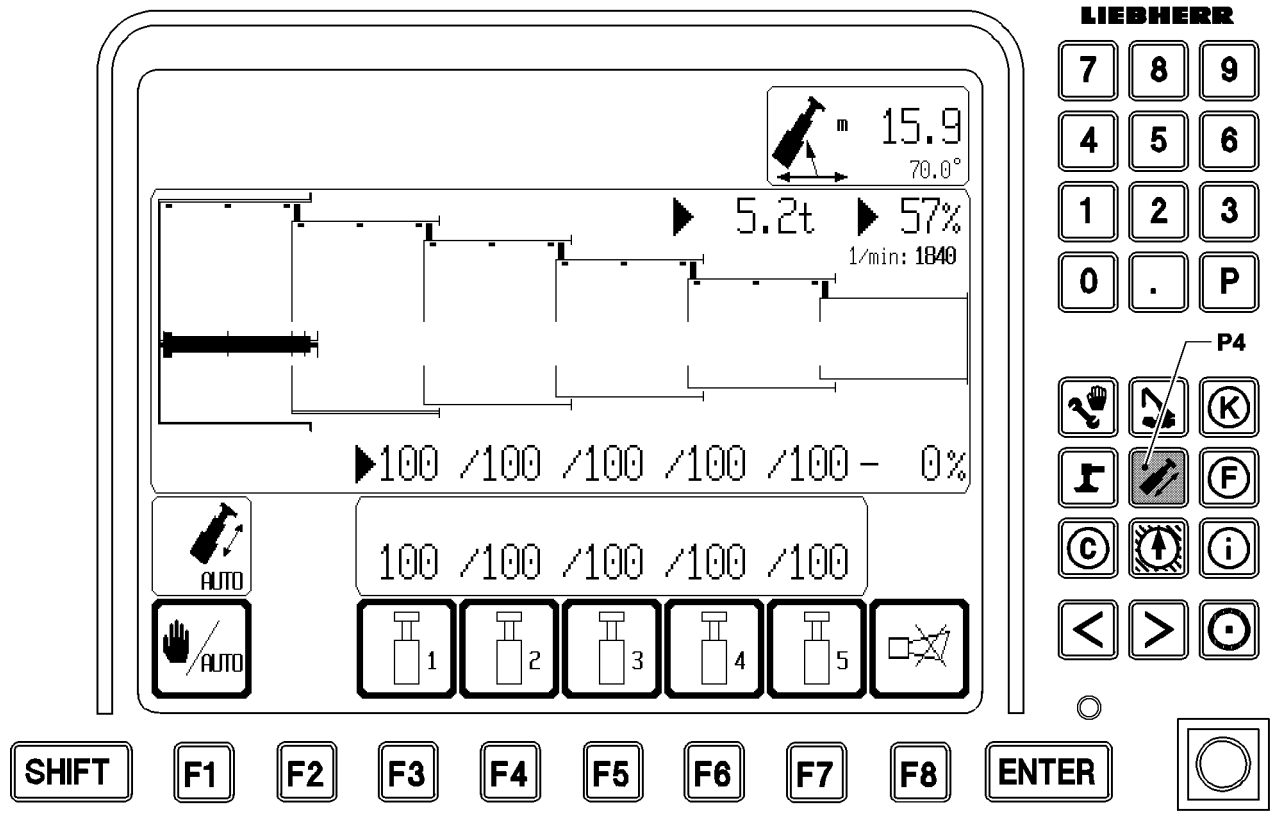

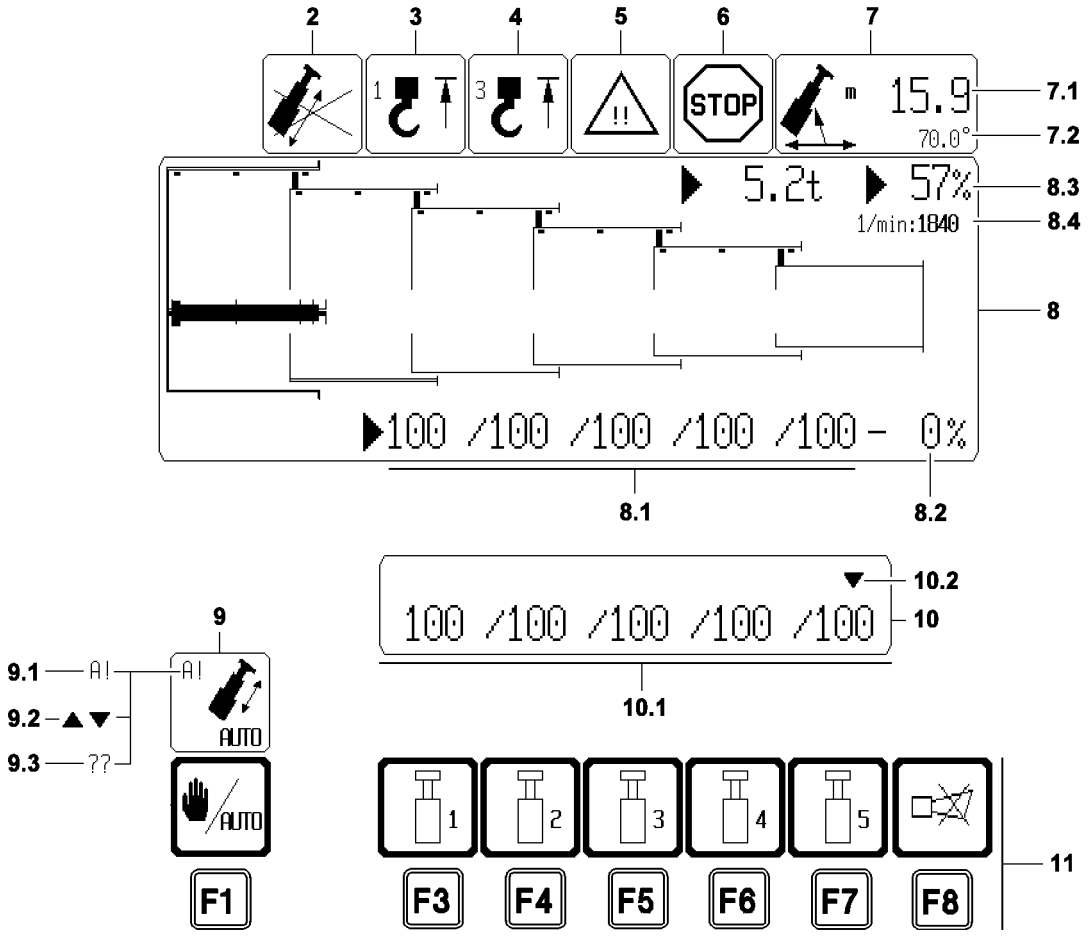

Fig.198622

7 „Telescoping“ program

The telescoping screen shows the crane operator the pinned state of the telescopic boom, the position of the individual telescopes and the extension state of the telescoping cylinder, in full dynamic graphics (refer to chapter 4.05 „Crane operation“).

7.1 Starting the program

▶ Press program key **P4**.
or
Automatic start from „Crane operation“ program when telescoping target (A!) **9.1** is reached and telescoping at master switch.

7.2 User interface

For a description of icons 2 to 7, see section „Alarm functions“ in the „Crane operation“ program.

2 Preventing further telescoping processes in relation to the telescoping cylinder
- Based on exceeding the expected load in the unpinned state.
- **Note:**
  This is the same program-specific illustration of the same topic as in section „Telescopable load“.

3 Icon „Hoist top“ on HES1 and / or HES4

4 „Hoist top“ icon at HES2 or HES4

5 Icon „Advance warning“

6 Icon „STOP“

7 Icon „Boom radius“

7.1 Radius
- In [m] or [ft].

7.2 Main boom angle to the horizontal
- In [°].

8 Icon „Stylized illustration of the telescopic boom“

8.1 Current extension condition of telescopes 1 - 5
- In [%].

8.2 Current extension condition of telescoping cylinder
- In [%].

8.3 Display of actual load and utilization of crane in percentages
- In [t] or [kips] and in [%].

8.4 Engine RPM
- In [rpm].

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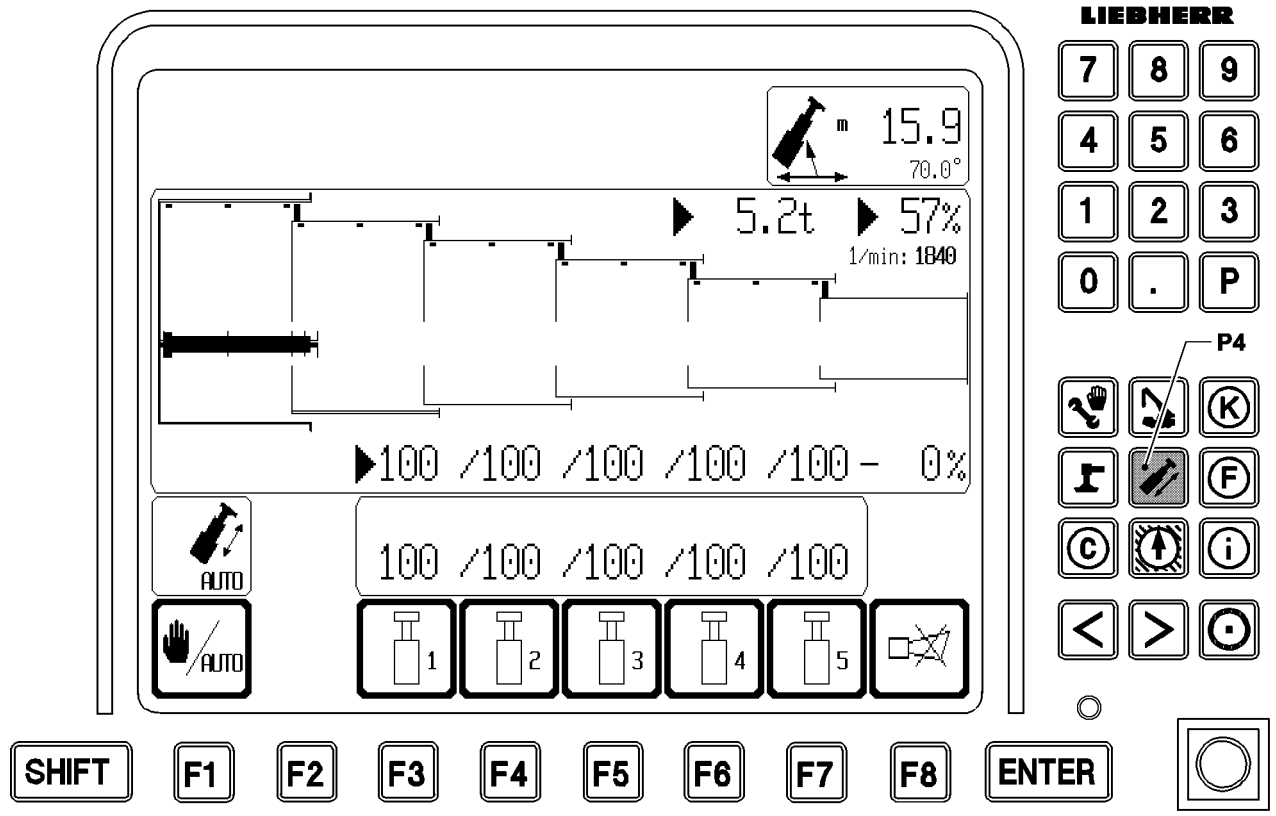

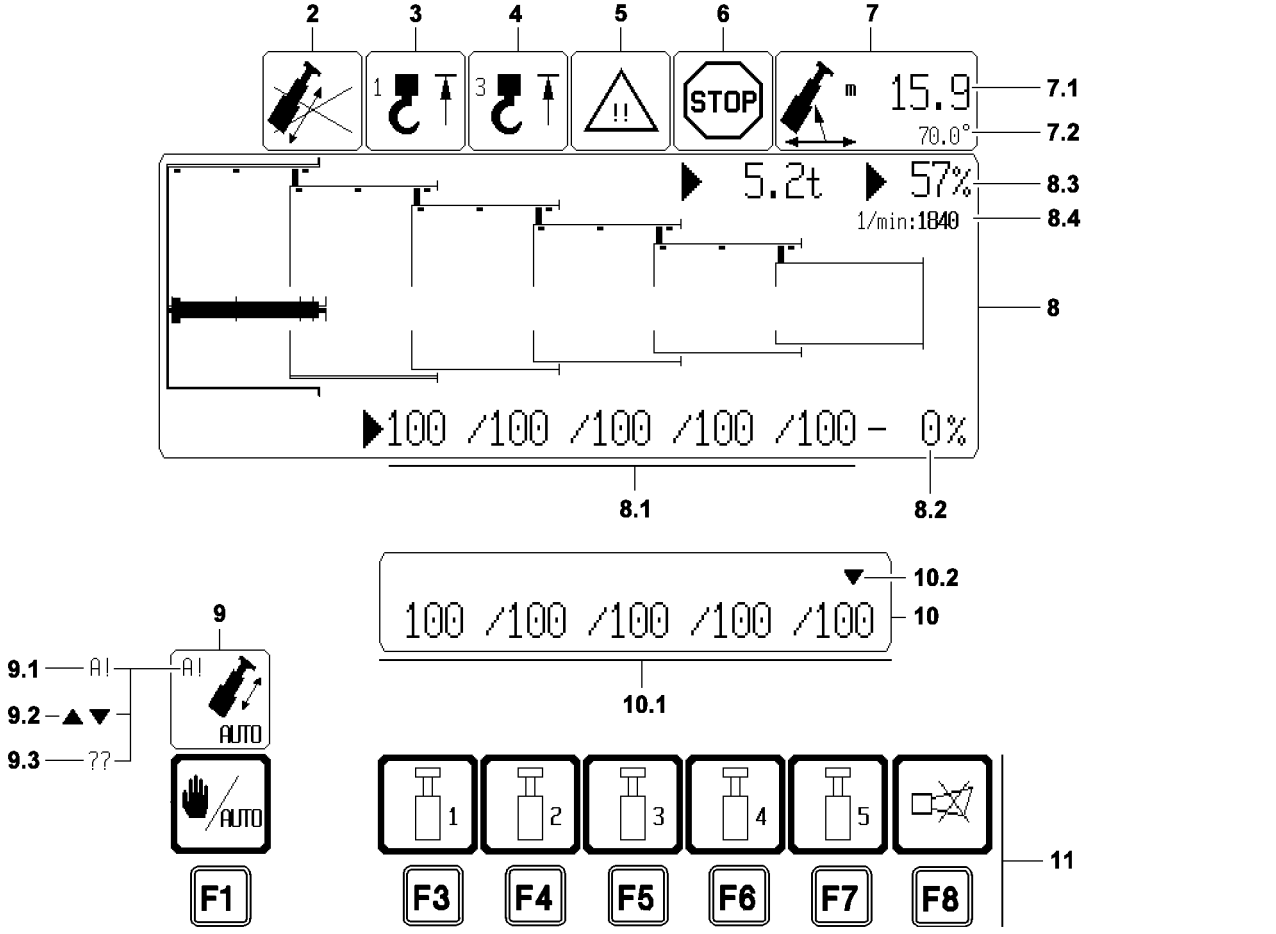

Fig.198622

9 „Automatic telescoping mode“ icon

9.1 Preselected telescoping target reached

9.2 Nominal deflection direction of master switch

Request:
Telescope in = down arrow.
Telescope out = up arrow.

9.3 Error in system

10 Icon „Selected telescoping targets of telescopes 1 -5“

10.1 Telescope 1 - 5 target selection

10.2 Blinking marker (arrow)
- To the selected telescoping target.
- As a warning in the event of incorrect operation, target already reached, or enter new target.

11 Function key line

F1 Function key
- Switch between automatic operation and manual telescoping.

F3 Function key
- Telescope 1 target selection.

F4 Function key
- Telescope 2 target selection.

F5 Function key
- Telescope 3 target selection.

F6 Function key
- Telescope 4 target selection.

F7 Function key
- Telescope 5 target selection.

F8 Function key
- Press once:
  Turn the acoustic signal off.
- Press twice:
  Fields that are displayed visually in the „Horn“ icon are automatically displayed in the error determination display.

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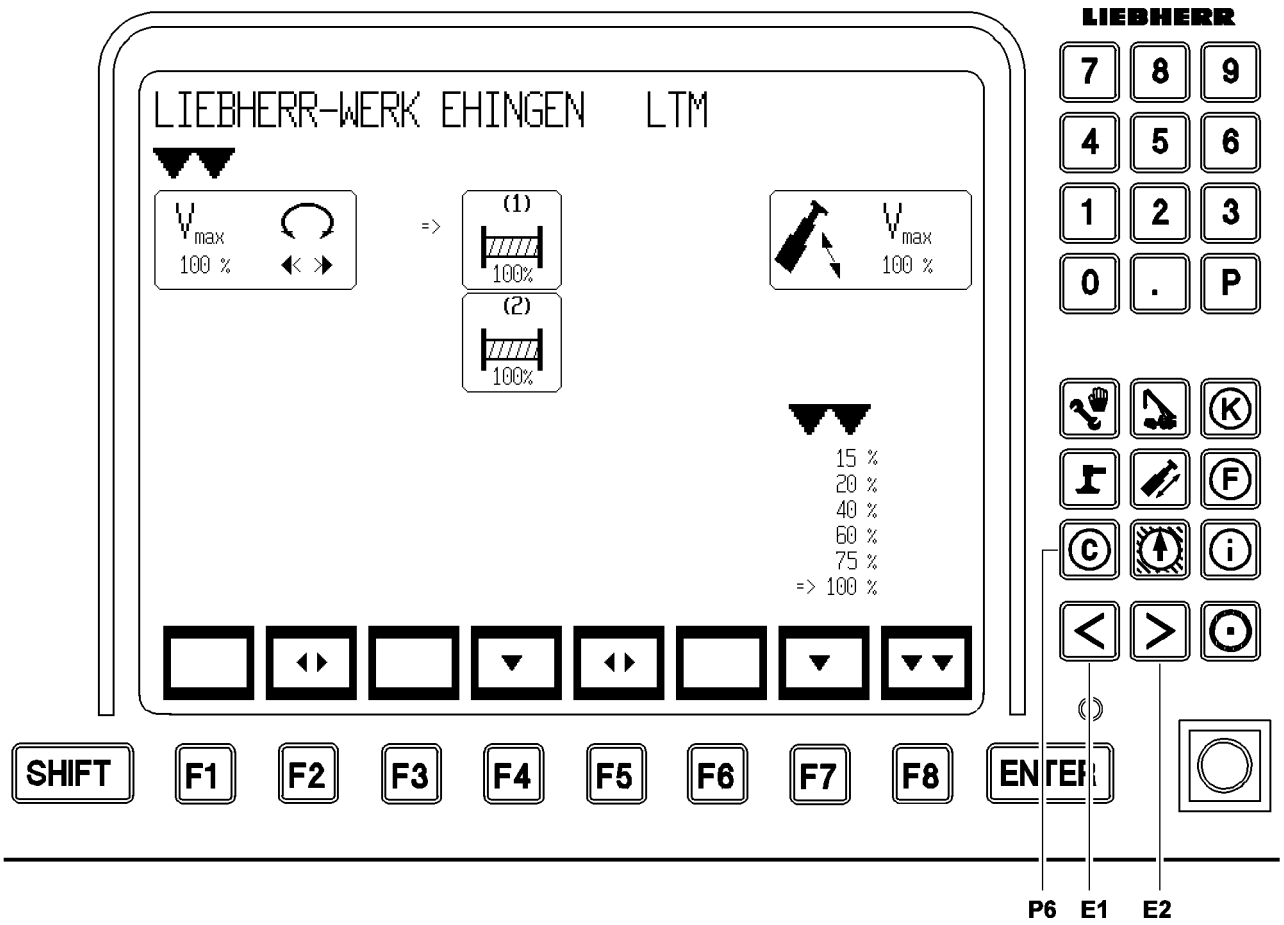

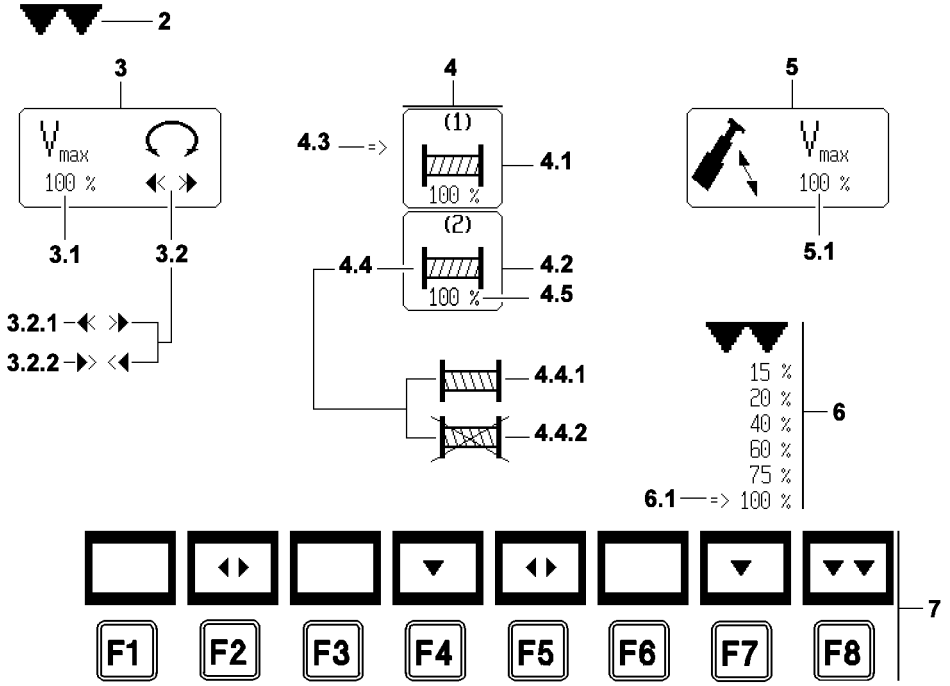

Fig.197645

8 „Control parameter“ program

The „Control parameter“ program offers the following possibilities:
- Preselection of maximum slewing gear rotation speed.
- Selection between „freely rotating slewing gear“ and „fixed slewing gear“.
- Preselection of the maximum winch rotation speed and activation / deactivation of winch 1 and winch 2*.
- Preselection of the telescopic boom maximum luffing speed.

The assembly and bypass switches are monitored during the „Control Parameter“ program. If one of these switches is activated during the program, the system immediately switches back to the „Crane operation“ program.

DANGER
Risk of accident!
▶ **Never** change the maximum speeds or the activation / de-activation of the winches during a crane movement.

8.1 Starting the program

▶ Press program key **P6**.

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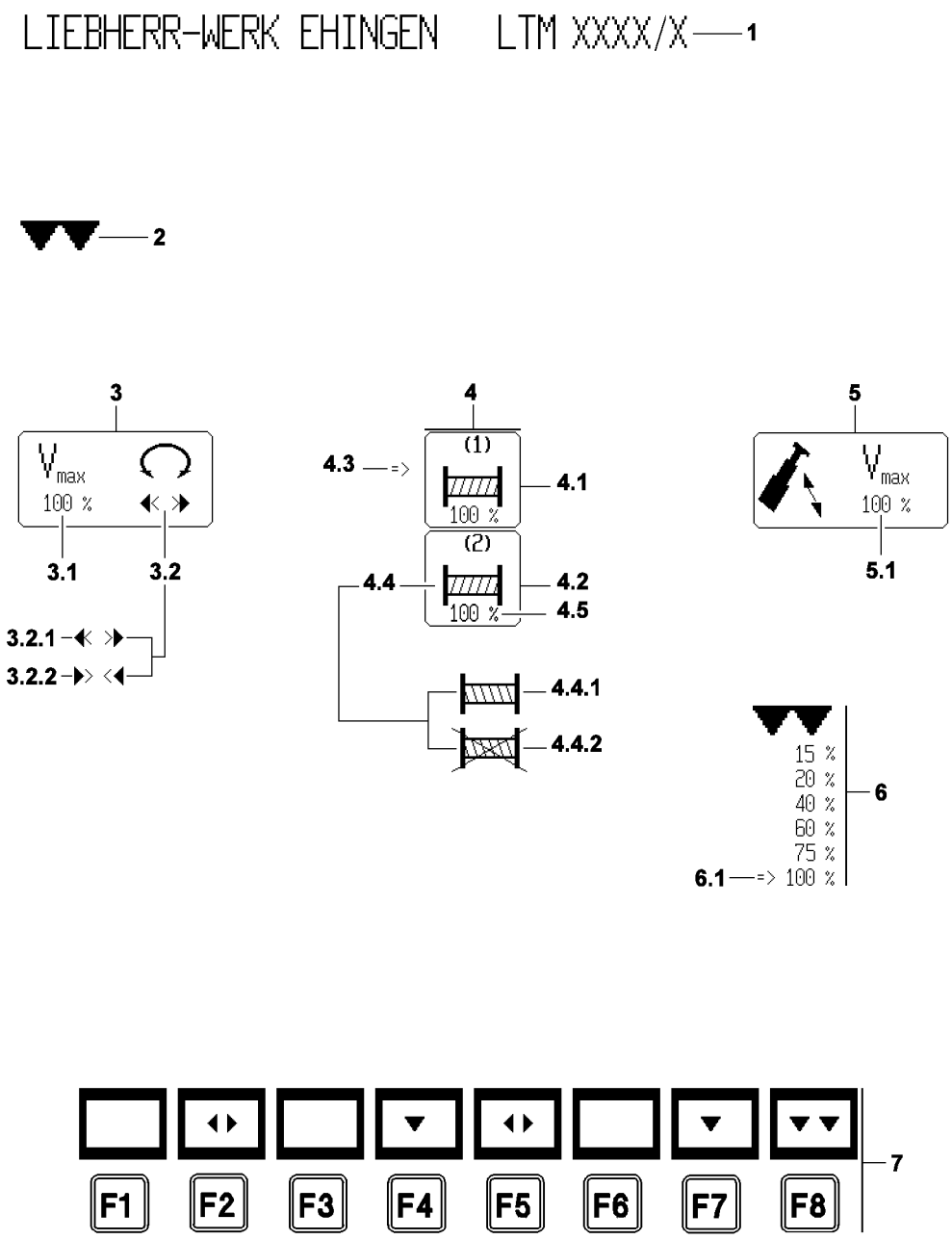

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Fig.197732

8.2 User interface

1 Crane type

2 Selector
- Double arrow pointing down.
- For selecting icons.

3 Icon „Slewing gear“

3.1 Icon „Maximum slewing speed“
- V_{max} in [%].

3.2 Slewing gear operating mode
- Changing operating mode using the function key **F2** (see chap. 4.05, „Crane operation“).

3.2.1 Flexible slewing gear „freely rotating / coasting“

3.2.2 Flexible slewing gear „fixed“

4 Icon group „Winches“

4.1 Winch 1

4.2 Winch 2

4.3 Selector
- Right arrow.
- For selecting winches.

4.4 Winch icon

4.4.1 Winch activated

4.4.2 Winch deactivated

4.5 Speed
- In [%].
- See value field with selector.

5 Icon „Maximum luffing speed“
- V_{max} in [%].

6 Value field with selector
- The percentage values relate to the speed with maximum deflection of the manual control lever, always in relation to the maximum achievable speed of the drive, with 100% preselected speed. Five stages may be preselected.

7 Function key line

F2 Function key
- Operating mode selection for slewing gear*****.

F4 Function key
- Winch selection.

F5 Function key
- Activation and deactivation of selected winches.

F7 Function key
- Selection of percentage value for respective speed in value field.

F8 Function key
- Switch back to „Crane operation“ program and transfer parameters.

8 Input key „**ENTER**“
- Transfer selected speed setting to the preselected functions.

9 Special function keys

E1 Special function key
- Moves the selector **2** for selecting icons to the left.

E2 Special function key
- Moves the selector **2** for selecting icons to the right.

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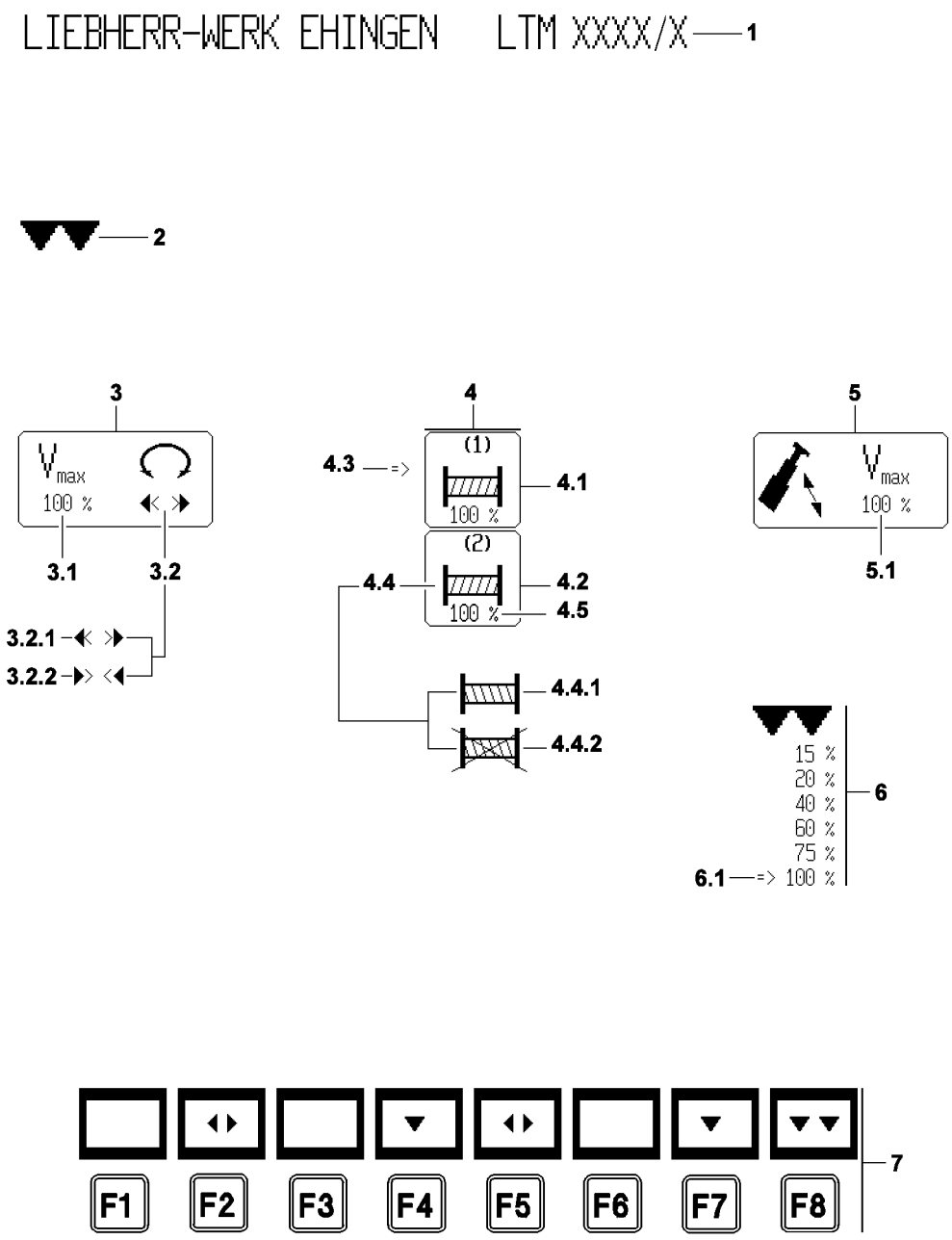

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Fig.197732

8.3 Changing the maximum rotation speed of slewing gear

DANGER
Risk of accident!

- ▶ Always adhere to the maximum speeds relative to the boom length and the operating modes during crane operations with loads (according to load charts)!
- ▶ The greater the boom length, the heavier the equipment and the greater the load, the smaller the set „maximum rotation speed“.
- ▶ **Never** deflect the master switch for the slewing gear to the stop at maximum load.

▶ Using the special function key **E1** or special function key **E2**, select the icon „Maximum slewing speed“ **3.1**.

Result:

– Selector (double arrow down) **2** appears above the icon.

▶ Select the maximum rotation speed in [%] with function key **F7**.

Result:

– Selector (arrow to right) **6.1** shows the selected percentage value.

▶ Use the „Enter“ key **8** to confirm the selected maximum rotation speed.

Result:

– The value of the maximum rotation speed will be accepted.

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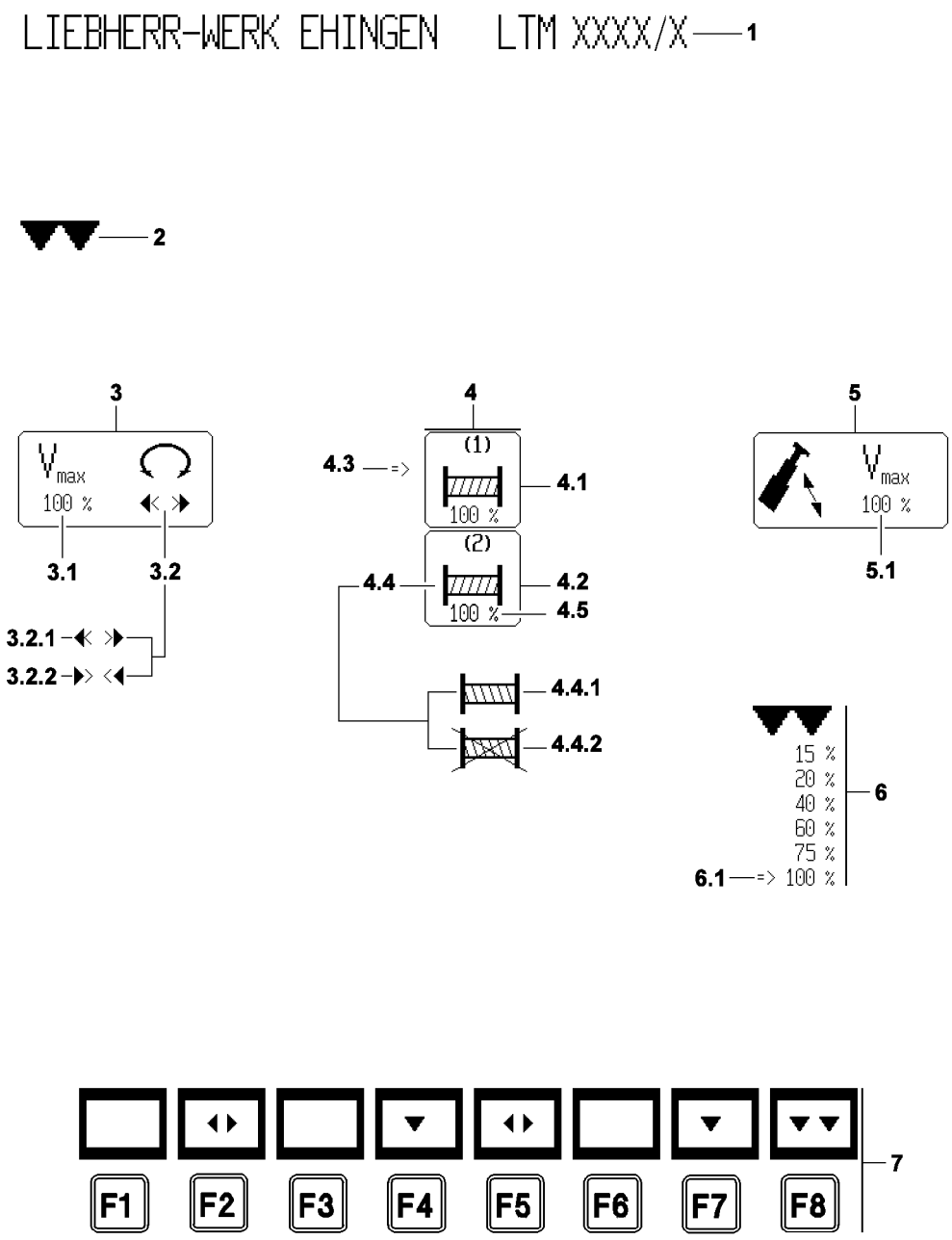

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Fig.197732

8.4 Winches

8.4.1 Changing maximum rotation speed

▶ Using the special function key **E1** or special function key **E2**, select the icon group winches **4**.

Result:

– Selector (double arrow down) **2** appears above the icon group.

▶ Using the function key **F4**, select the icon for winch 1 or winch 2.

Result:

– Selector (arrow to right) **4.3** shows the selected winch.

▶ Select the maximum rotation speed in [%] with function key **F7**.

Result:

– Selector (arrow to right) **6.1** shows the selected percentage value.

▶ Use the „ENTER“ key **8** to confirm the selected maximum rotation speed.

Result:

– The value of the maximum rotation speed will be accepted.

8.4.2 Activating / deactivating individual winches

In order to prevent unintentional activation of a winch that is currently not required, de-activate individual winches.

▶ Using the special function key **E1** or special function key **E2**, select the icon group winches **4**.

Result:

– Selector (double arrow down) **2** appears above the icon group.

▶ Using the function key **F4**, select the icon for winch 1 or winch 2*****.

Result:

– Selector (arrow to right) **4.3** shows the selected winch.

▶ Using the function key **F5**, activate or deactivate the selected winch.

Result:

The winch icon in the icon changes the appearance:
– Winch icon crossed out = winch deactivated **4.4.2**.
– Winch icon not crossed out = winch activated **4.4.1**.

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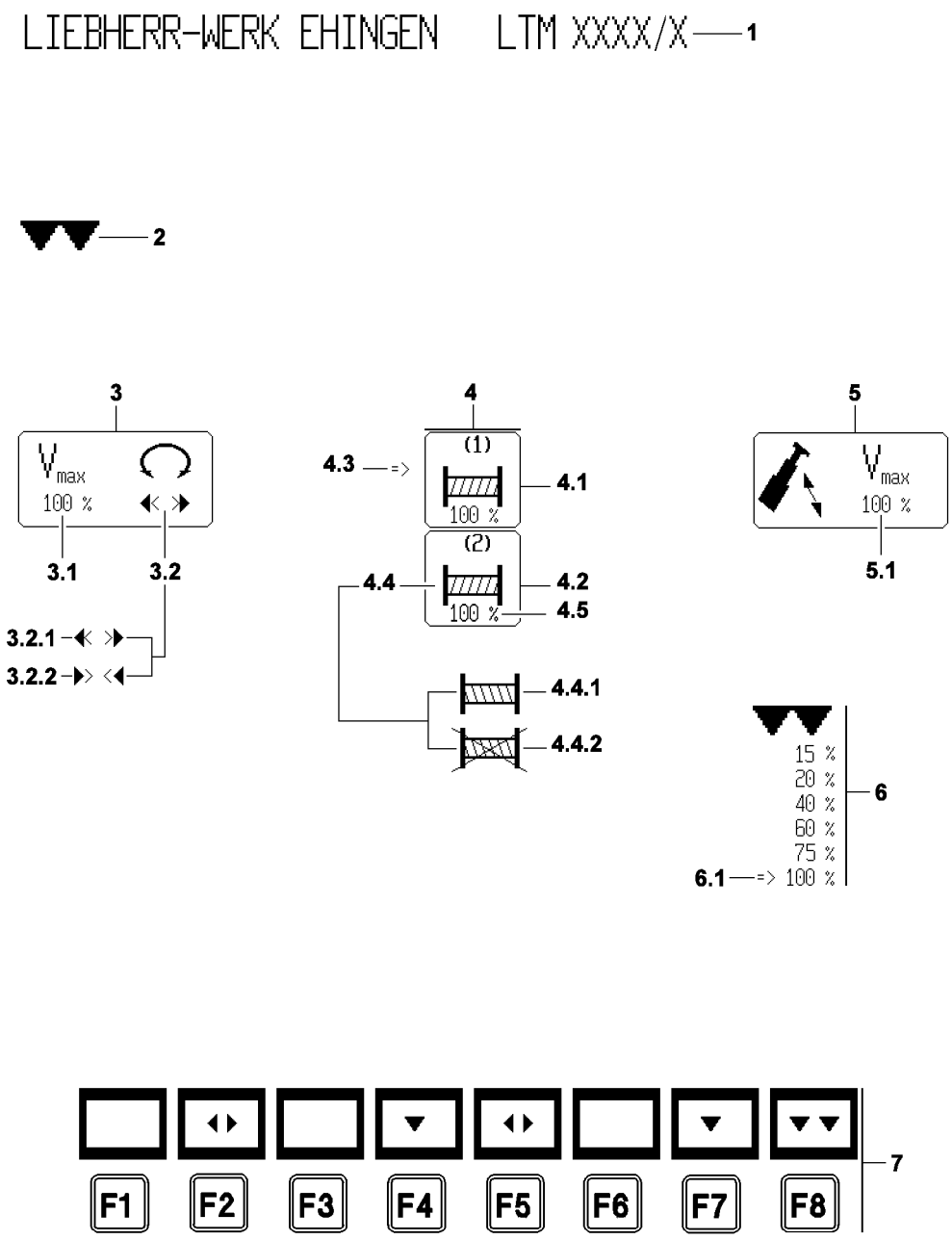

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Fig.197732

8.5 Changing maximum luffing speed

▶ Using the special function key **E1** or special function key **E2**, select the „Maximum luffing speed“ icon **5**.

Result:

– Selector (double arrow down) **2** appears above the icon.

▶ Select the maximum luffing speed in [%] with function key **F7**.

Result:

– Selector (arrow to right) **6.1** shows the selected percentage value.

▶ Use the „Enter“ key **8** to confirm the selected maximum luffing speed.

Result:

– The value of the maximum luffing speed will be accepted.

8.6 Switching back to the „Crane operation“ program

▶ Press function key **F8**.

Result:

– The parameters previously confirmed using the „Enter“ key **8** will be accepted.

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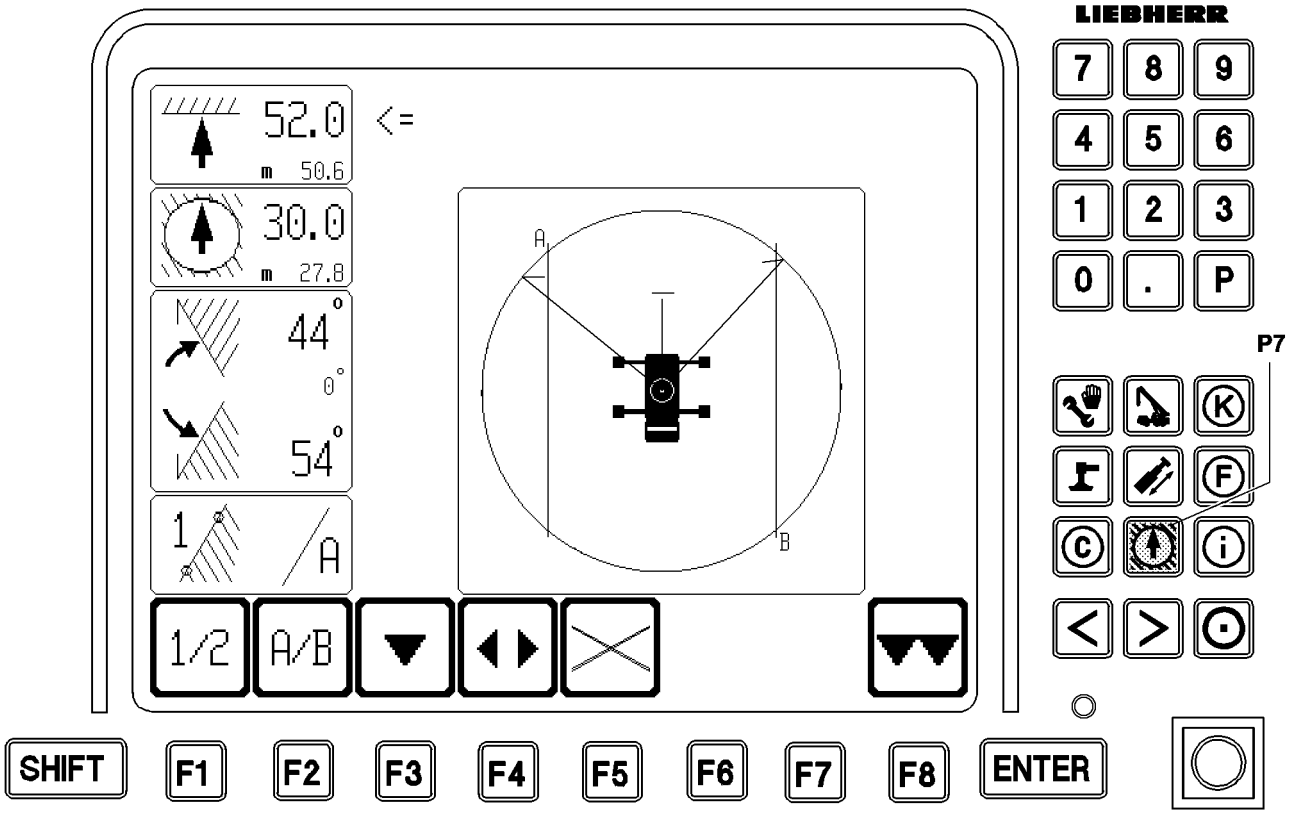

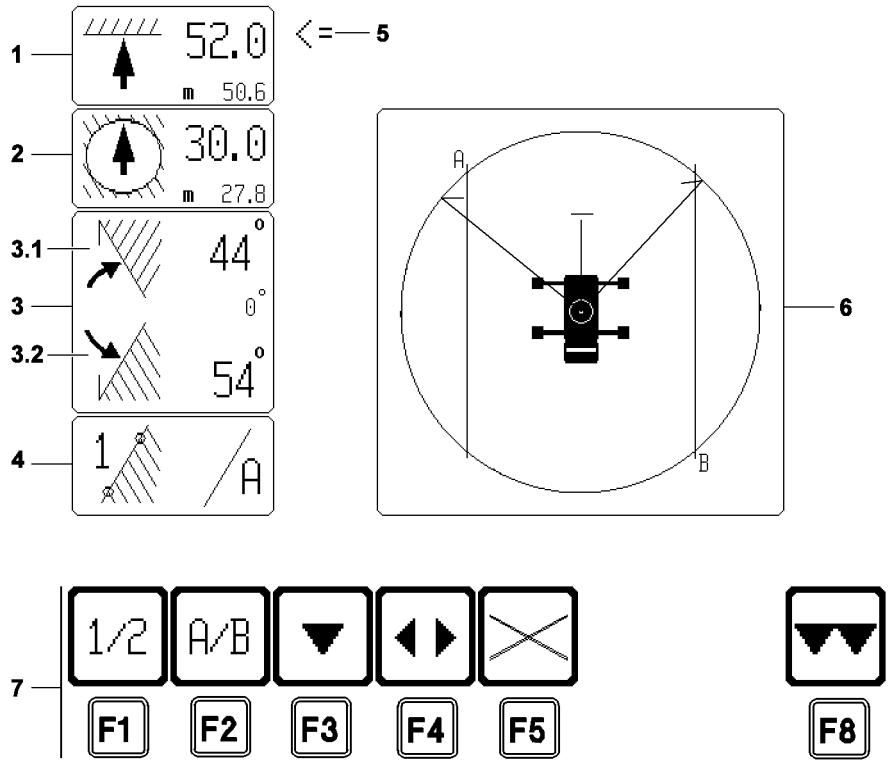

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Fig.197646

9 The „Working range limitation“* program

A detailed description of operating range limitation can be found in the separate operating instructions for „Working range limitation“.

9.1 Starting the program

▶ Press program key **P7**.

9.2 User interface

1 Icon „Limitation of pulley head height“

2 Icon „Radius limitation“

3 Icon „Slewing limit stop“

3.1 Right slewing limit stop

3.2 Left slewing limit stop

4 Icon „Edge limit with edge and point selection“
- The limit function icons are shown crossed out if they are inactive.

5 Function selector
- For selecting limiting functions.

6 Icon „Graphic display of programmed limits“

7 Function key line

F1 Function key
- Select point 1 or 2 of selected edge A or B.

F2 Function key
- Selected edge A or B that is being programmed.

F3 Function key
- The function selector is moved down by one limit function.

F4 Function key
- The limit function selected with the function selector changes its status. If previously active, it will now be inactive when the function key **F4** is pressed, and vice versa. An inactive limit function is identified by a crossed out icon. If the function selector shows a slewing limit to the left or the right, then both limits will always be switched.
  Note:
  For the edge limit, only the preselected edge will be switched. The edge that is not displayed can be active or inactive at the same time.

F5 Function key
- All limit functions become inactive.

F8 Function key
- Exit the program and return to the „Crane operation“ program.

9.3 Displays in „Crane operation“ program

If a programmed working range limiter is activated, this condition is indicated in the „Crane operation“ program by an alternative STOP icon in the position of the normal LMB STOP icon (see section „Alarm functions“ in „Crane operation“ program).

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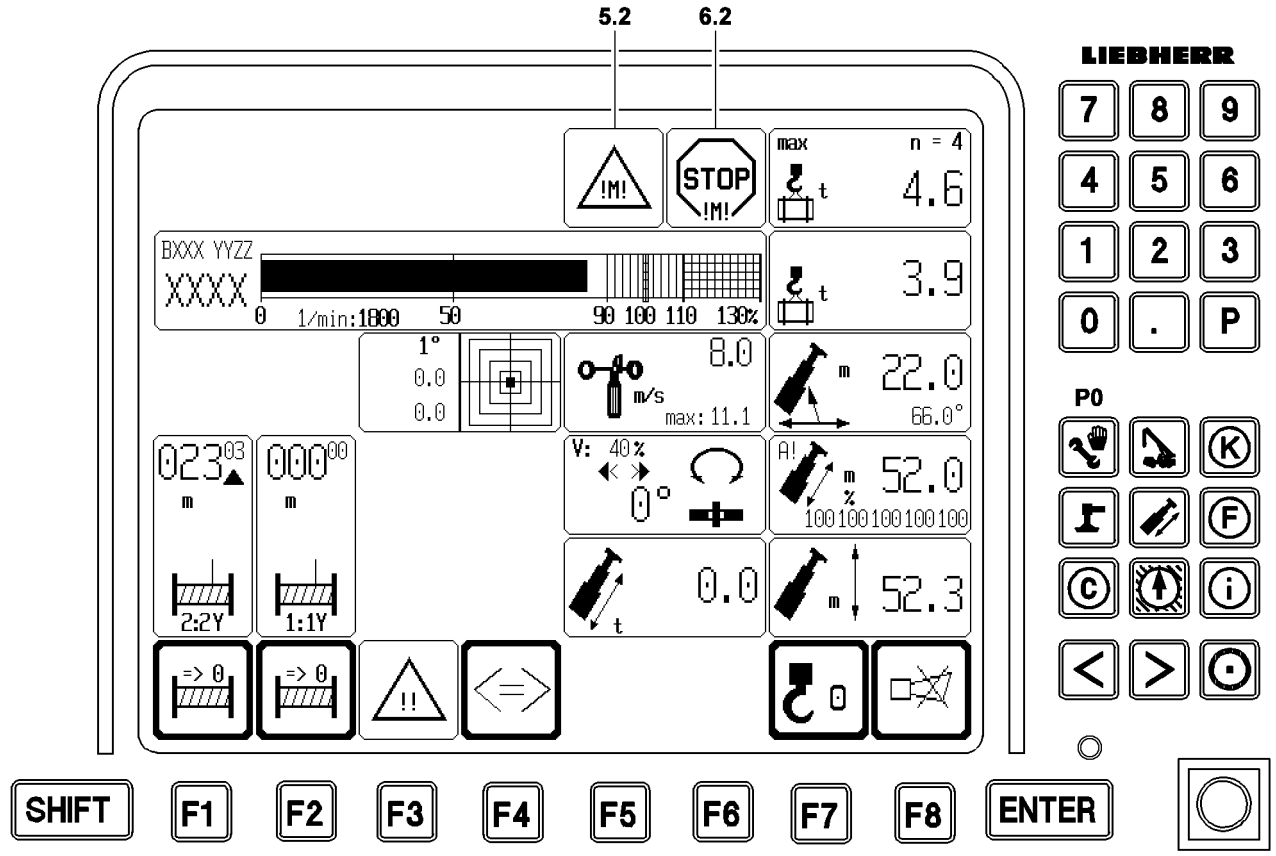

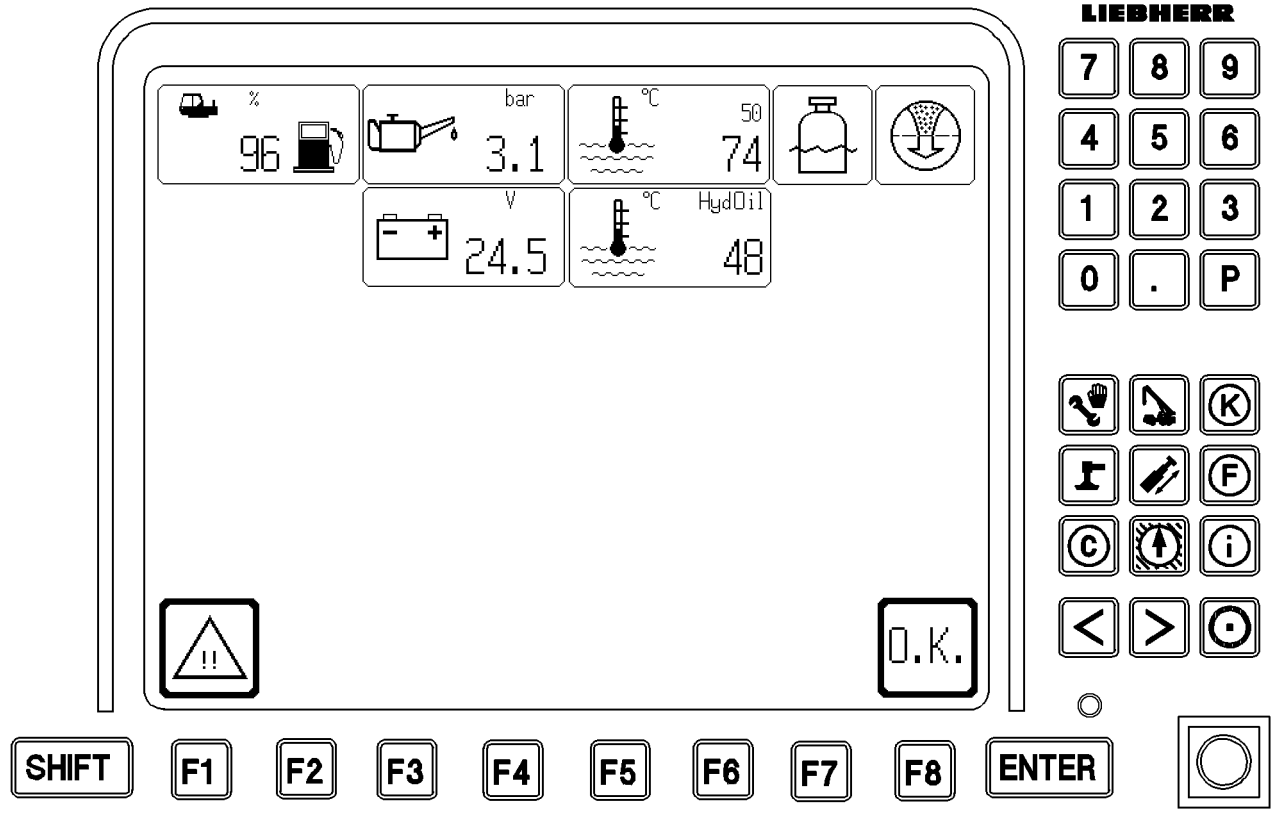

Fig.198623

10 The „Engine monitoring“ program

In the „Engine monitoring“ program, all relevant data for the engine are shown, such as engine oil pressure, coolant temperature etc. In case of a problem, the system switches back automatically from „Crane operation“ or „Telescoping“ programs.

10.1 Starting the program

The program starts automatically:

- ▶ Once if a STOP event takes place during crane operations (at least one master switch is deflected or activated). The engine monitoring screen is displayed for 3 seconds and then automatically reverts to the crane operating screen.
  or
  At an advance warning, warning or STOP event during the start-up of the LICCON computer system.

This is how you start the program on request:

In that case the engine monitoring screen is retained, and all **load torque increasing** crane movements are locked or turned off.

- ▶ Press of the key combination **SHIFT** and **P0** (Configuration).

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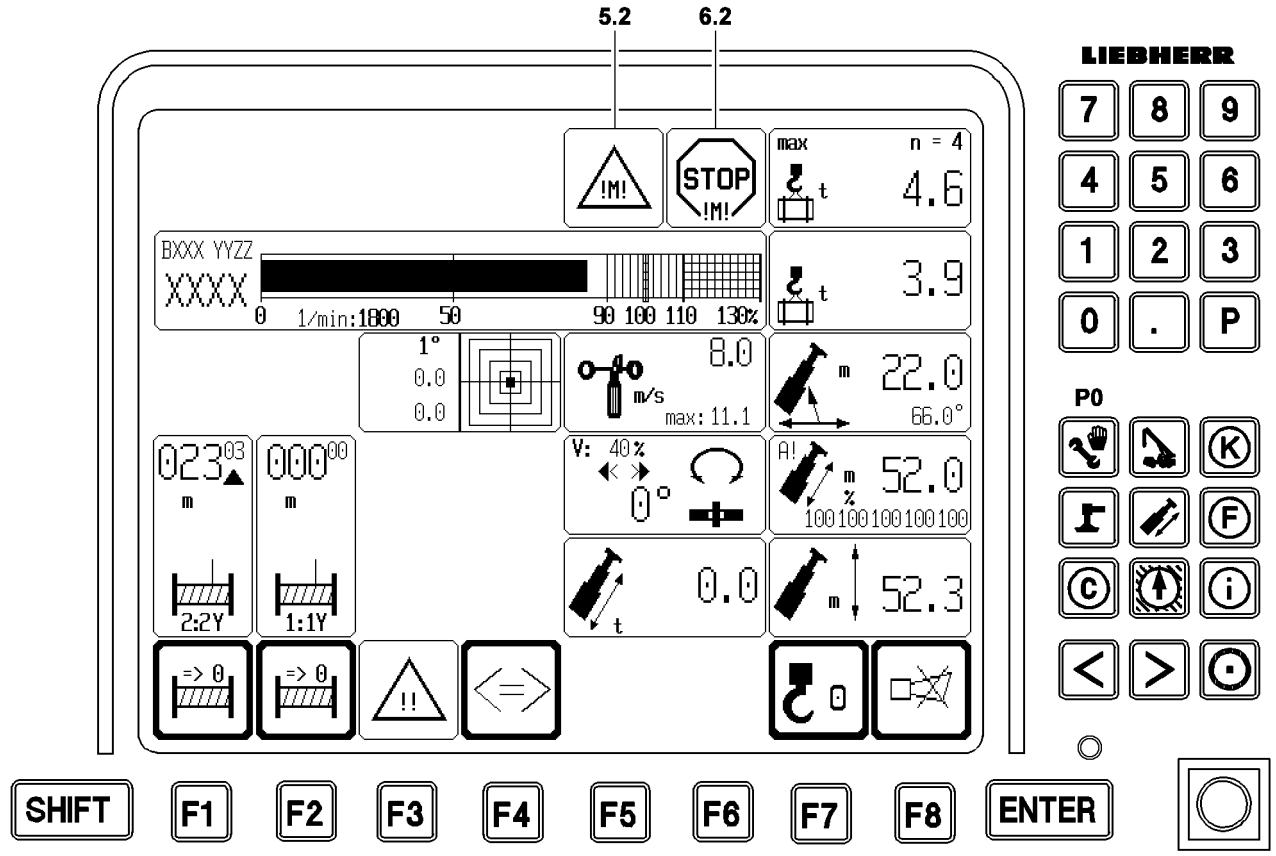

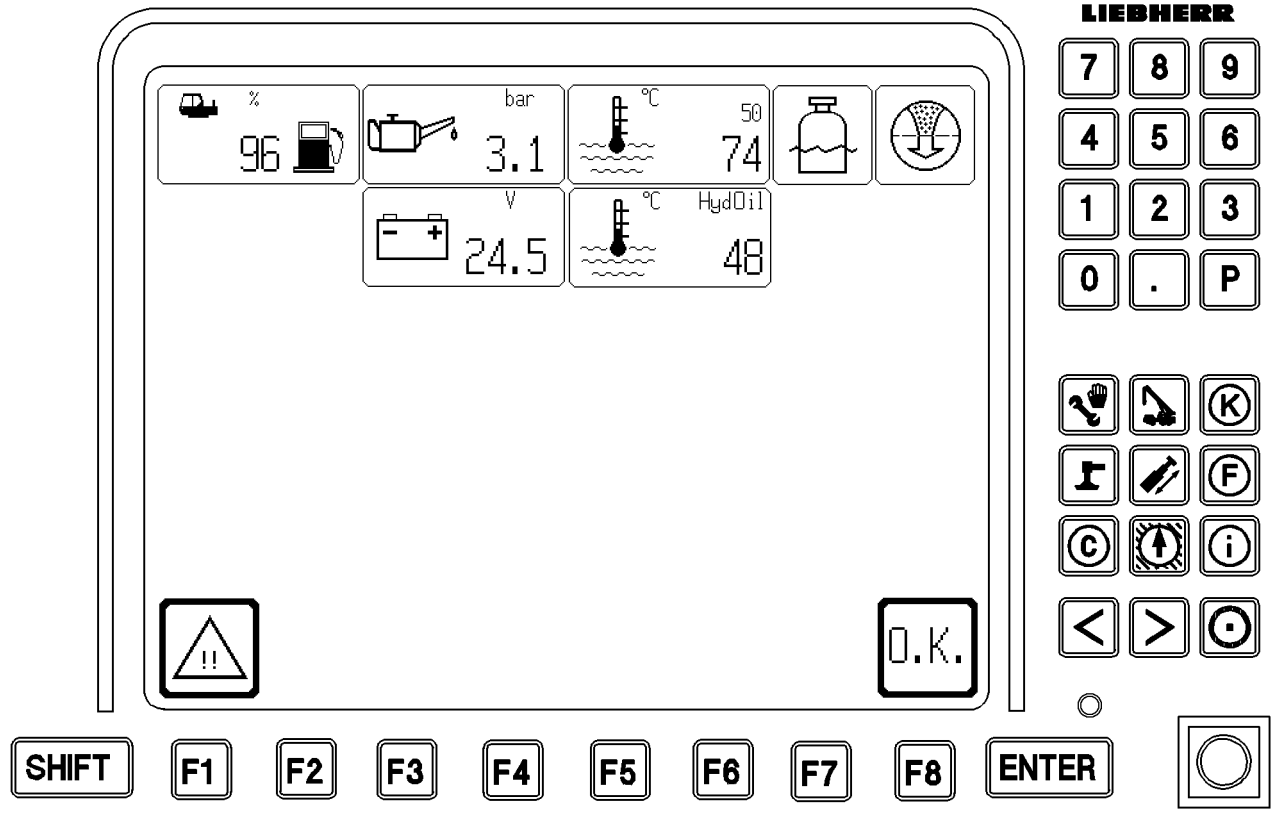

Fig.198623

10.2 Possible engine monitoring advance warning, warning and STOP events

Events	**Advance warning**	Warning **5.2**	STOP **6.2**
Engine oil pressure (display value) missing		x	
Erroneous engine oil pressure (display value)		x	
Engine oil pressure warning active			x
Coolant / charge air temperature (display value) missing		x	
Erroneous coolant / charge air temperature (display value)		x	
Coolant / charge air temperature warning active			x
Coolant level warning active			x
Hydraulic oil temperature (display value) too high		x	
Air filter monitoring		x	
Battery voltage (display value) missing	x		
Erroneous battery voltage (display value)	x		
Battery voltage not between 16 V and 36 V	x		
Fuel reserve (display value) missing	x		
Erroneous fuel reserve (display value)	x		
Fuel reserve (display value) 5% or less	x		
Fuel reserve (display value) 1% or less		x	
Fuel reserve (display value) 0%			x

If the system automatically switches to the „Engine monitoring“ program when an engine STOP event occurs, there is an option for retaining the engine monitoring screen within 3 seconds (retaining the engine monitoring screen is achieved by pressing the function key **F1**). Switch back to the crane operating screen using the function key **F8** (OK) or the program key **P1** (Crane operation). If the engine monitoring screen is **not** retained, then after 3 seconds the system switches back automatically to the „Crane operation“ program.

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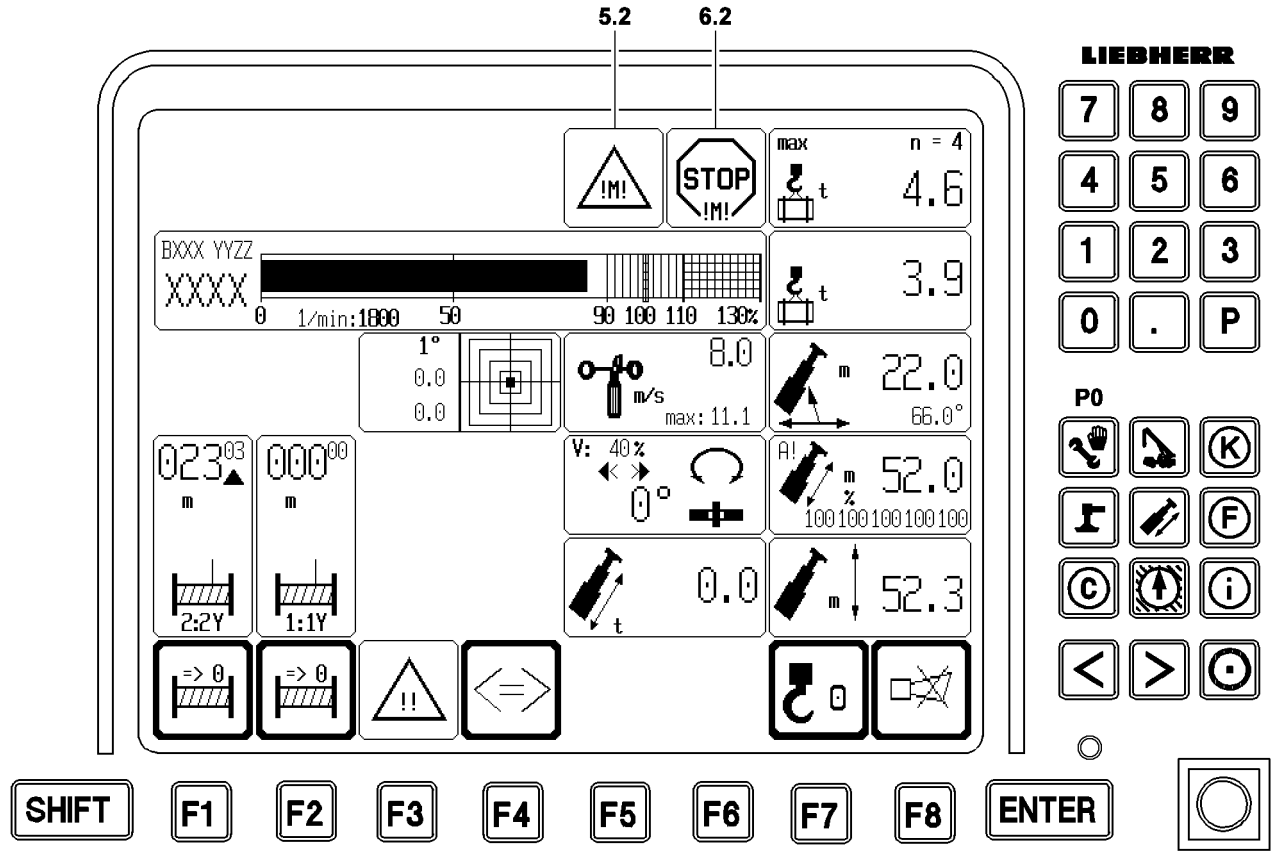

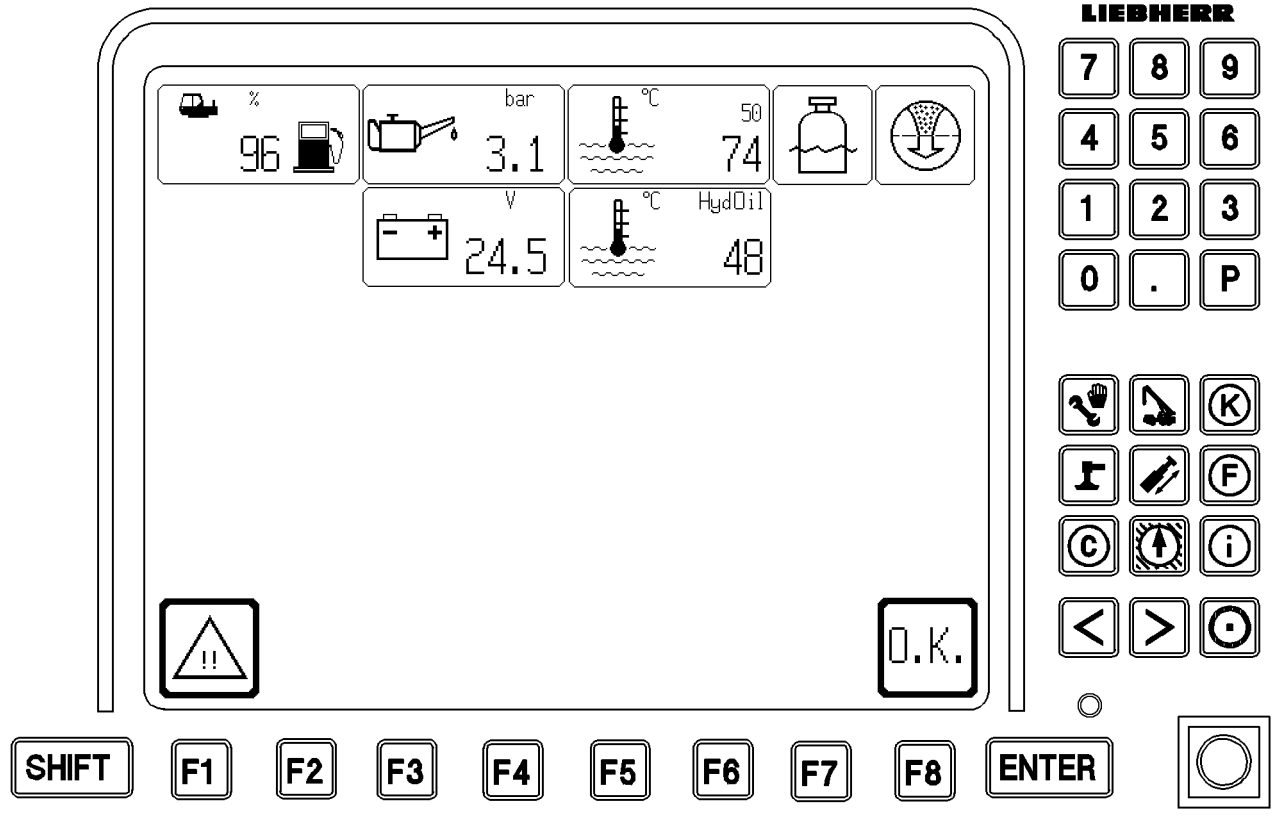

Fig.198623

10.3 Retaining the engine monitoring screen

The automatic change over to the engine monitoring screen can only take place from the „Crane operation“ or „Telescoping“ programs.

If you confirm a monitoring event in the engine monitoring screen with the function key **F8**, then there will be **no** automatic change over to the engine monitoring screen for the same event.

On switching back to the „Crane operation“ program, the STOP icon **6.2** or the Advance warning icon **5.2** appears. There is no indication about advance warnings in the „Crane operation“ or „Telescoping“ programs.

WARNING
There is a danger of severe damage to the engine if STOP events are ignored!
If other programs are used for extended periods of time, for example the „configuration“ or „test system“, it is essential to switch occasionally to the engine monitoring screen in order to ensure that no engine monitoring events have occurred, which could lead to damage or destruction of the engine.
▶ Switch over occasionally to the engine monitoring screen!

▶ Press function key **F1**.

Result:

– Icon frames are displayed with a thin border.
– All load moment increasing crane movements will be turned off or blocked.

▶ Press function key **F8**.

Result:

– System switches back to the „Crane operation“ program.
– The block of the load moment increasing crane movements will be lifted.
– The warning or STOP icon is faded into the „Crane operation“ program.

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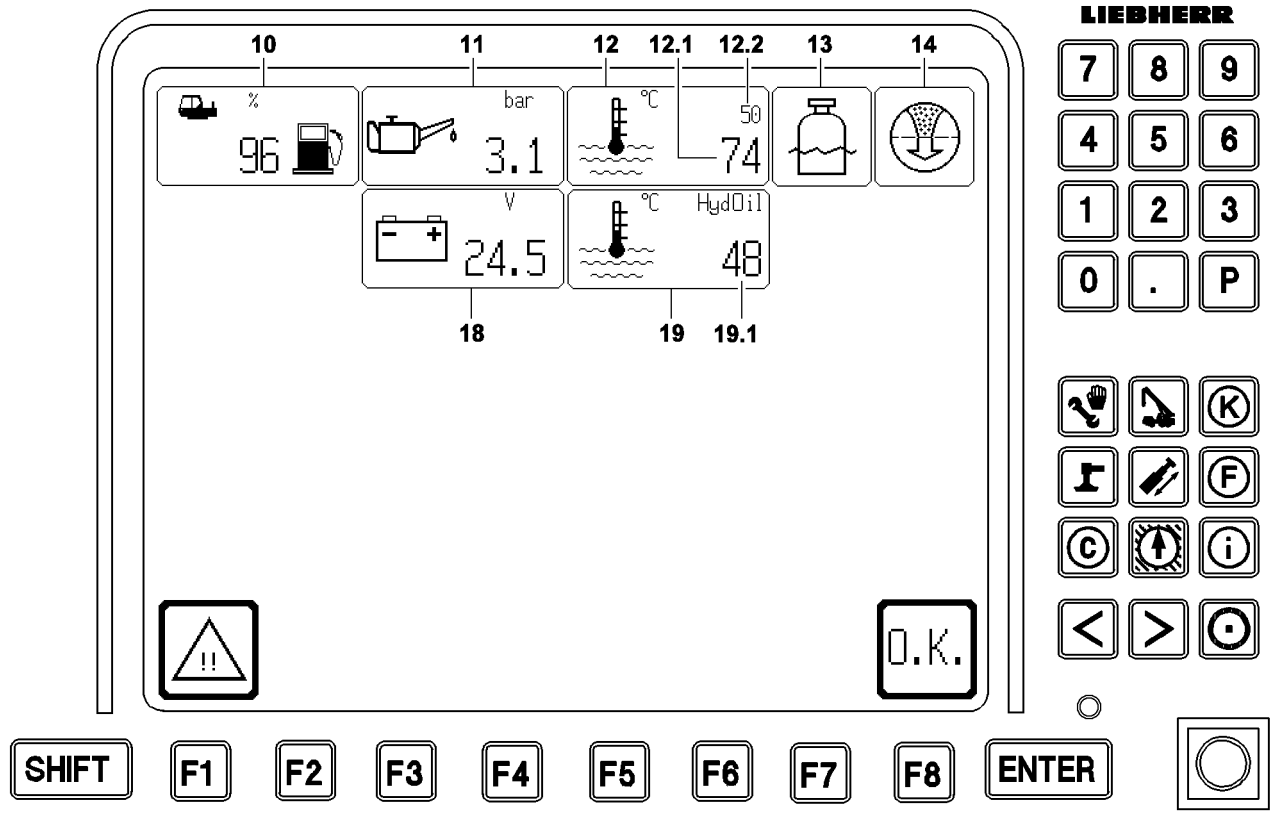

Fig.198624

10.4 Engine monitoring icons

10.4.1 Engine

10 Tank capacity
- In [%].
  Icon blinks the fuel reserve is less than 10%.

11 Oil pressure
- In [bar].
  Numeric display in icon blinks if the engine oil pressure is too low.

12 Coolant / charge air temperature
- In [°C].

12.1 Coolant temperature
- Numeric display blinks if the coolant temperature is too high.

12.2 Charge air temperature
- Numeric display blinks if the charge air temperature is too high.

13 Coolant level too low
- Icon appears if the coolant level is too low.

14 Air filter is dirty
- Icon appears if air filter is dirty.

18 Auxiliary function - Battery voltage
- In [V].
  Numeric display in icon blinks if the operating voltage is less than 16 volts or above 36 volts.

19 Hydraulic oil temperature
- In [°C].

19.1 Hydraulic oil temperature
- Numeric display blinks if the hydraulic oil temperature is too high.

10.5 Function key line

F1 Function key
- Retaining the engine monitoring screen.

F8 Function key
- Switching back to the „Crane operation“ program.

Function keys **F2** - **F7** are **not** used

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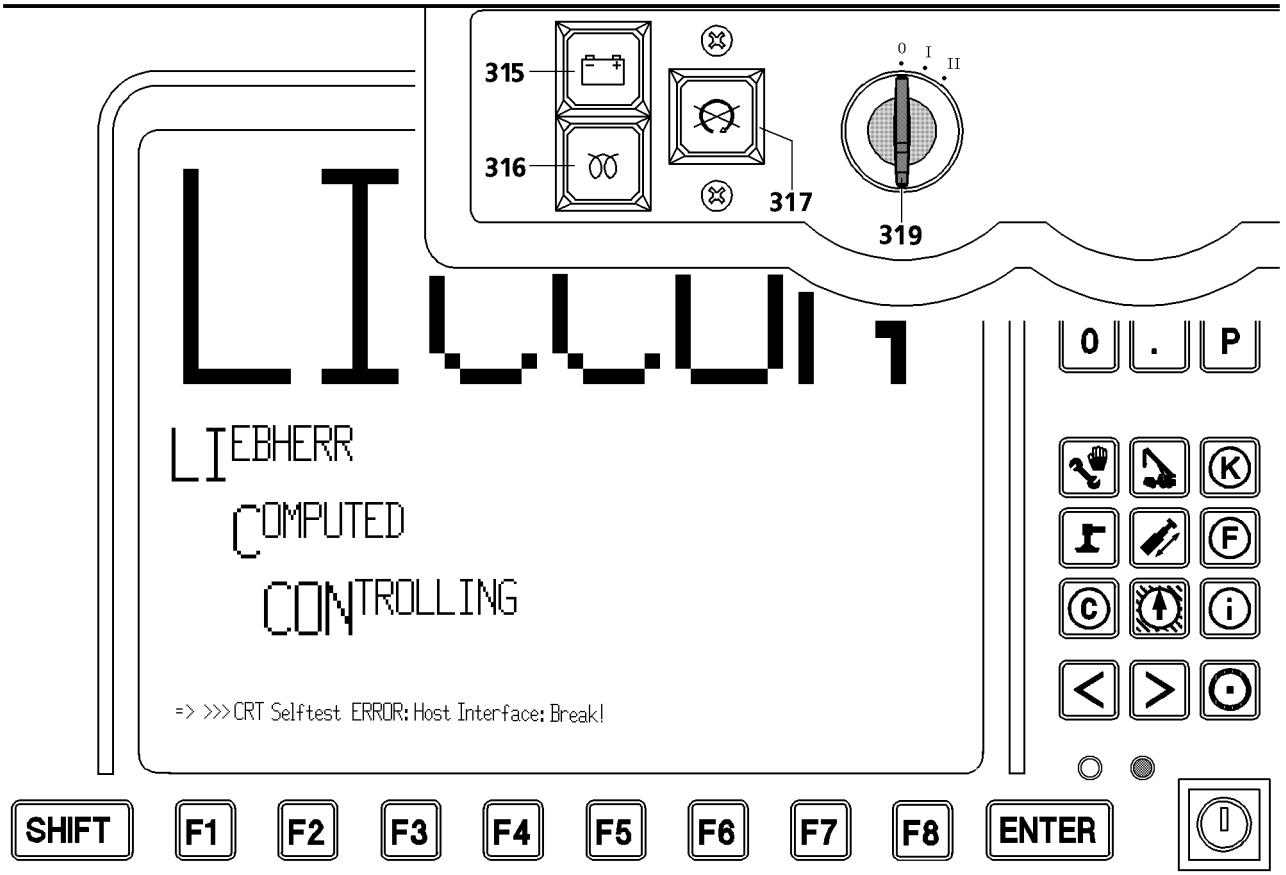

Fig.194896

11 LICCON computer system in stand-by mode

11.1 Starting LICCON computer system in stand-by mode

There are two ways of achieving stand-by mode with the LICCON computer system.

Starting the LICCON computer system without engine:

▶ Turn the ignition key **319** to position „I“ and leave it there.

Result:

– The LICCON computer system runs and the monitor shows the configuration screen, or alternatively for a stop / warning / advance warning, the engine monitoring screen.

▶ Press function key **F8** (O.K.).

Result:

– System switches to the „Crane operation“ program.

Turning off the engine with the engine stop key:

▶ Press the button **317**.
▶ Leave the ignition key **319** in position „I“.

Result:

– The engine is turned off.

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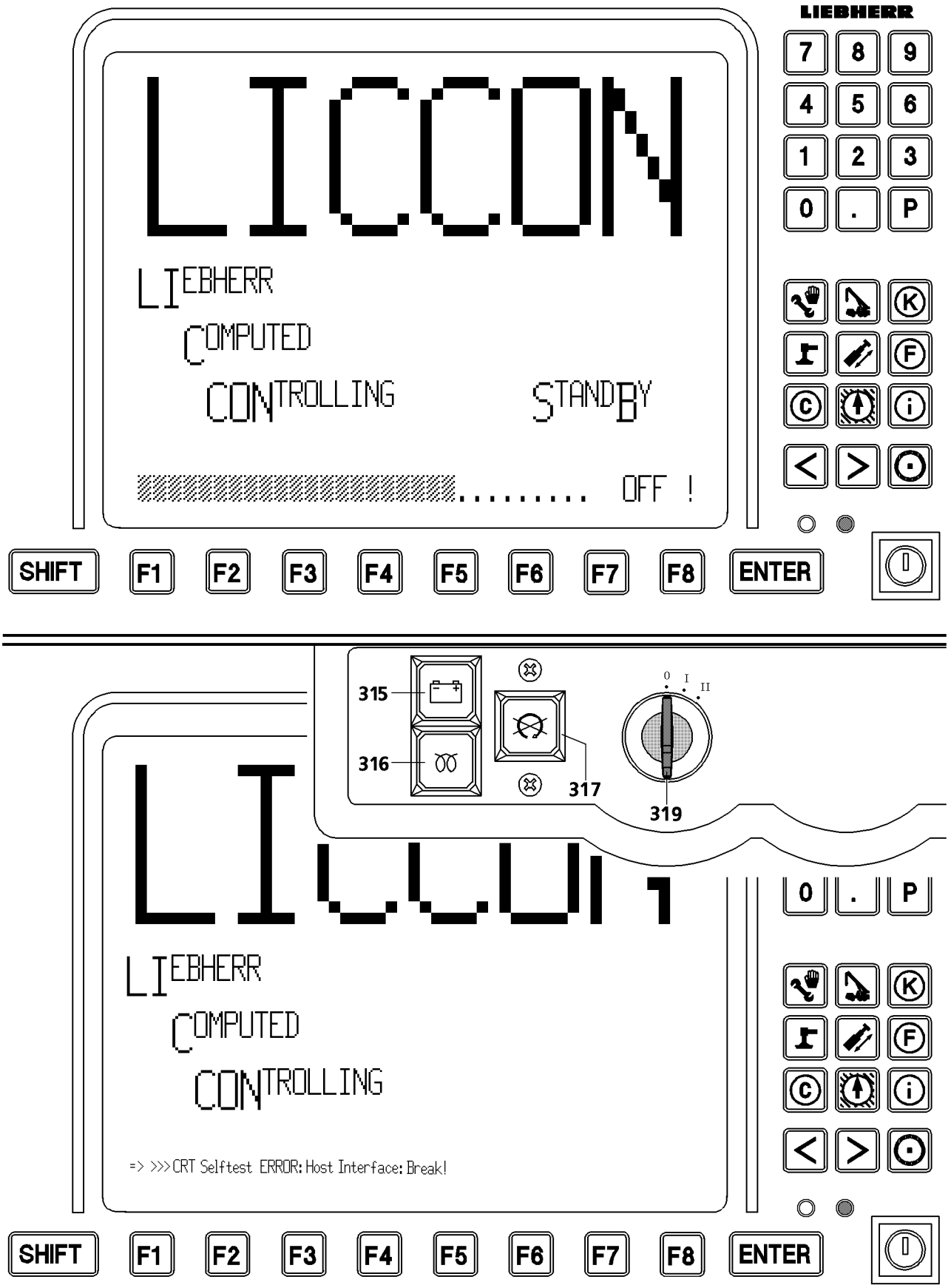

Fig.194896

11.2 Active stand-by operation / alarm

The operating programs and the monitor displays function exactly the same as in the turn-on procedure for the LICCON computer system with engine start (crane operation).

No crane movements are possible. If a crane movement is selected anyway, a message appears on the LICCON monitor.

Example: **Control turning shut off, the crane engine is not running.**

The duration of the stand-by operation is 15 minutes, of which 3 minutes are the stand-by alarm. Operating the LICCON computer system during stand-by operation automatically extends the stand-by time.

▶ In **stand-by operation no** keys are pressed on the monitor.

Result:

– The stand-by alarm (horn) is reached after 12 minutes.
– This screen appears on the monitor: **STANDBY** (see illustration).

▶ Now press any key on the LICCON monitor.

Result:

– System switches back to the interrupted program.
– The stand-by time is extended by a further 15 minutes.

▶ During the **stand-by alarm** (Duration: 3 minutes) **no** keys on the monitor are pressed.

Result:

– The LICCON computer system shuts completely off. The shut off is announced by acoustical signals 60 seconds in advance (short horn) and 30 seconds in advance (long horn). The power supply of the LICCON computer system turns off.
– This screen appears on the LICCON monitor: **CRT self test: ERROR: Host Interface: Break!** (see illustration) and the control lights **315**, **316** and **317** blink. In this case, this is not an error message from the LICCON computer system, the error message appears only on the monitor because the connection between the monitor and the CPU is broken.

11.3 Start prevention

Starting the engine again after complete shut down of the LICCON computer system:

▶ Return the ignition switch **319** first to position „0“.
▶ Turn the ignition switch **319** to position „I“ (note the preheating time).
▶ Turn the ignition switch **319** briefly to position „II“.

Result:

– The engine starts.

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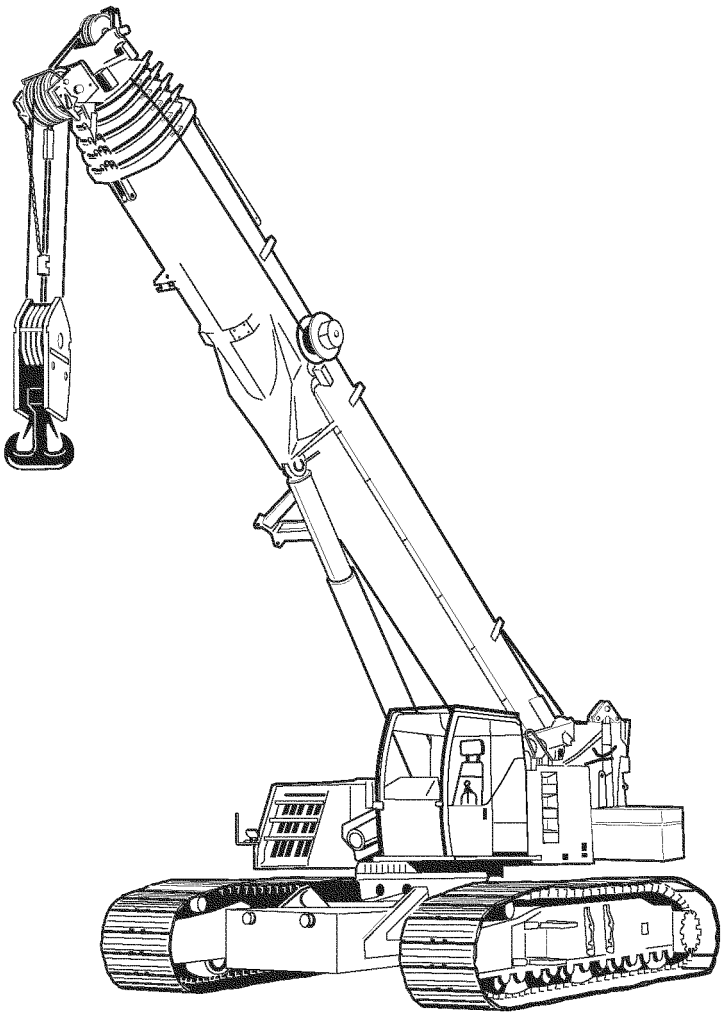

Fig.198625

LWE/LTR 1100-005/17505-03-02/en

1 Checks before start up

Various checks must be performed every time before operating the crane.

If an item is low or lacking during an inspection, then it must be refilled or brought to normal status before operating the crane.

If the inspection shows a very dirty filter, then it must be replaced before operating the crane.

Note

▶ For detailed description of fill quantities, service items and lubricants, see chapter 7.06 and chapter 7.07 in the Crane operating instructions!

WARNING

Heated crane components!

When the engine is running, crane components can heat up significantly! This applies especially to exhaust systems, the engines, the coolant circuit and the respective gears in the crane!

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!

1.1 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 can fall down during crane operation and hit personnel!

Personnel can be killed or seriously injured!

▶ Before starting crane operation, make sure that there are no loose parts on the boom and crane!

▶ Check the crane for visible damage before starting crane operation.

▶ Carry out a function test of available safety devices.

▶ Make sure that the crane is standing on level, load bearing ground.

▶ Make sure that the crane is horizontally aligned.

▶ Make sure that the gear ring of the rotary 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 drum / rope drum and the limit switches are free of snow and ice.

▶ Make sure that there are no loose parts on the boom and the crane.

1.2 Checking the coolant level

WARNING

Danger of injury due to scalding of the skin!

▶ Check the coolant level only when the engine is cold.

▶ Check the coolant level.

If the coolant level is too low:

▶ Add coolant, see Crane operating instructions, chapter 7.05.

1.3 Checking the oil level and filters

▶ Check the engine oil level.

▶ Check the oil level in the hydraulic tank.

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▶ Check the filter on the hydraulic tank.

1.4 Checking the central lubrication system

The grease container must be filled at all times with sufficient lubricant.

▶ Check the grease container.

If the lubricant level is too low:

▶ Add lubricant, see Crane operating instructions, chapter 7.05.

1.5 Checking the window cleaning fluid

NOTICE
Frozen window cleaning fluid!
If the window cleaning fluid is not frost resistant, then the window washer system can freeze during the cold time of the year!
Failure of the window washer system is the result!
The window 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.

1.6 Checking the fuel level

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!

Note
If the fuel tank has been run dry, then the fuel system must be bled.
▶ Do **not** deplete the fuel tank!

On the LICCON monitor, the amount in the tank is given in the form of a numerical display in percent [%].

▶ Check the tank content on the LICCON monitor, see Crane operating instructions, chapter 4.02.

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Empty page!

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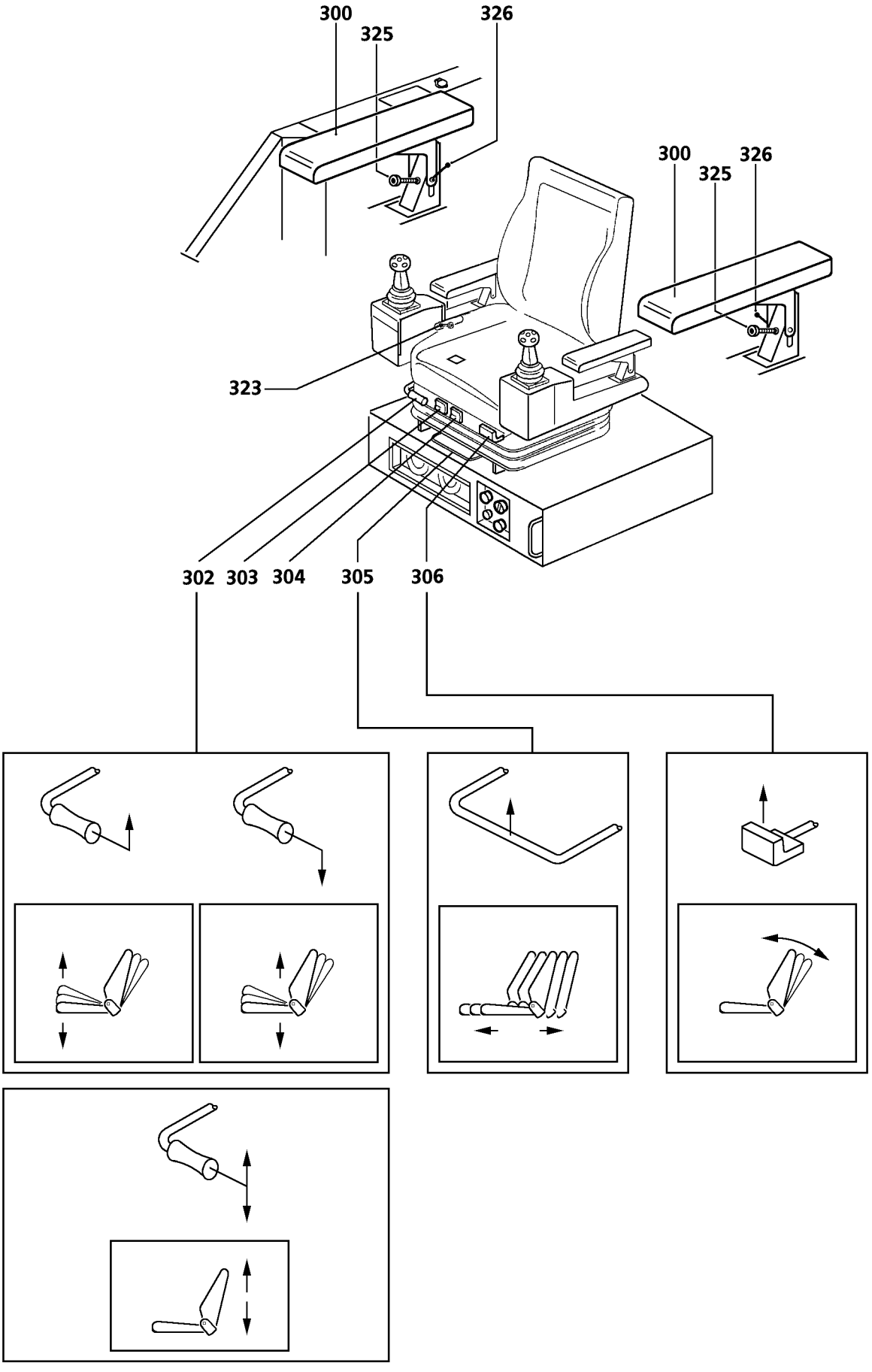

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Fig.197017

2 Work station - Crane operator's cab

2.1 Adjusting the crane operator's seat

The crane operator's seat can be adjusted to suit different body sizes.

- ▶ With the lever **302** adjust the seat incline.
- ▶ With the lever **302** adjust height of seat.
- ▶ With the button **303** adjust the pneumatic lumbar support in lower part of backrest.
- ▶ With the button **304** adjust the pneumatic lumbar support in upper part of backrest.
- ▶ Unlock the horizontal seat adjustment with the bar **305**.
- ▶ With the lever **306** adjust the angle of the backrest.
- ▶ Clamping screw **323** to adjust joystick support.
- ▶ Set with adjusting screw **325** to adjust angle of armrests.
- ▶ Set with lever **326** to adjust height of armrests.

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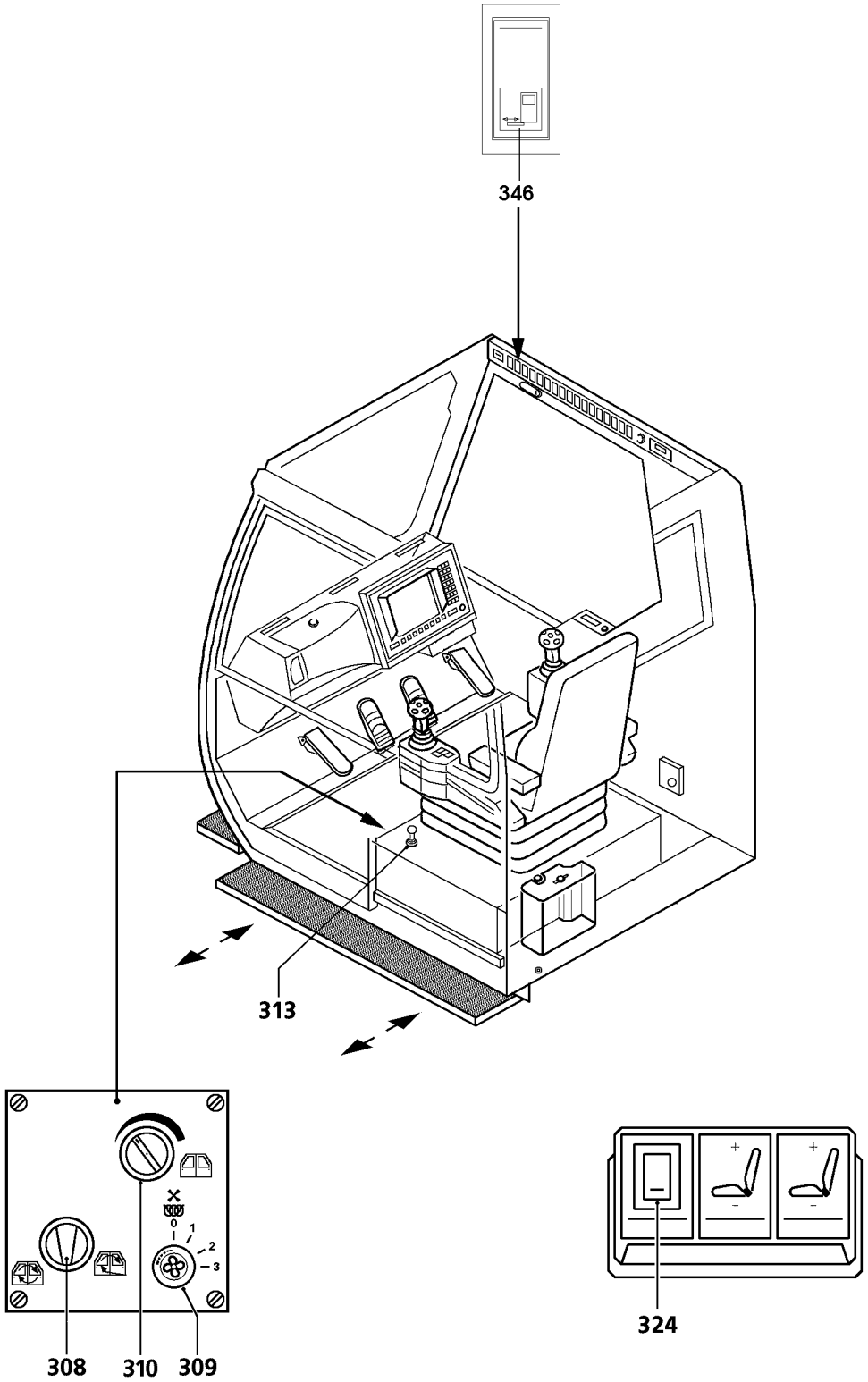

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Fig.102849

2.2 Step

In order to make it easier for the crane operator to enter and leave the crane, the step on the crane cab can be extended or retracted.

After completion of working with the crane, retract the step again and secure it in the end position.

2.2.1 Extending the step

▶ Swing the left armrest upward.
▶ Pull the latch **313** and press the button **346** on top.

Result:

– The step is extended.

▶ Release the latch **313** as soon as the step extends.
▶ Extend the step until it locks in place again.

2.2.2 Retracting the step

▶ Swing the left armrest upward.
▶ Pull the latch **313** and press the button **346**.

Result:

– The step is retracted.

▶ Release the latch **313** as soon as the step retracts.
▶ Retract the step until it locks in place again.

2.3 Turning the seat heater* on

▶ Actuate the switch **324**.

2.4 Turning the heater / ventilation on

The crane operator's cab can be heated or ventilated, depending on the desired temperature. The control elements for the heater / ventilation are underneath the crane operator's seat. For a detailed description see Chapter 6.01.

2.4.1 Heating

▶ Set the knob **308** to recirculated air.
▶ Turn on the fan with the rotary switch **309**.
▶ Regulate the temperature with the knob **310**.

2.4.2 Ventilation

▶ Move the knob **308** to fresh air operation.
▶ Turn on the fan with the rotary switch **309**.

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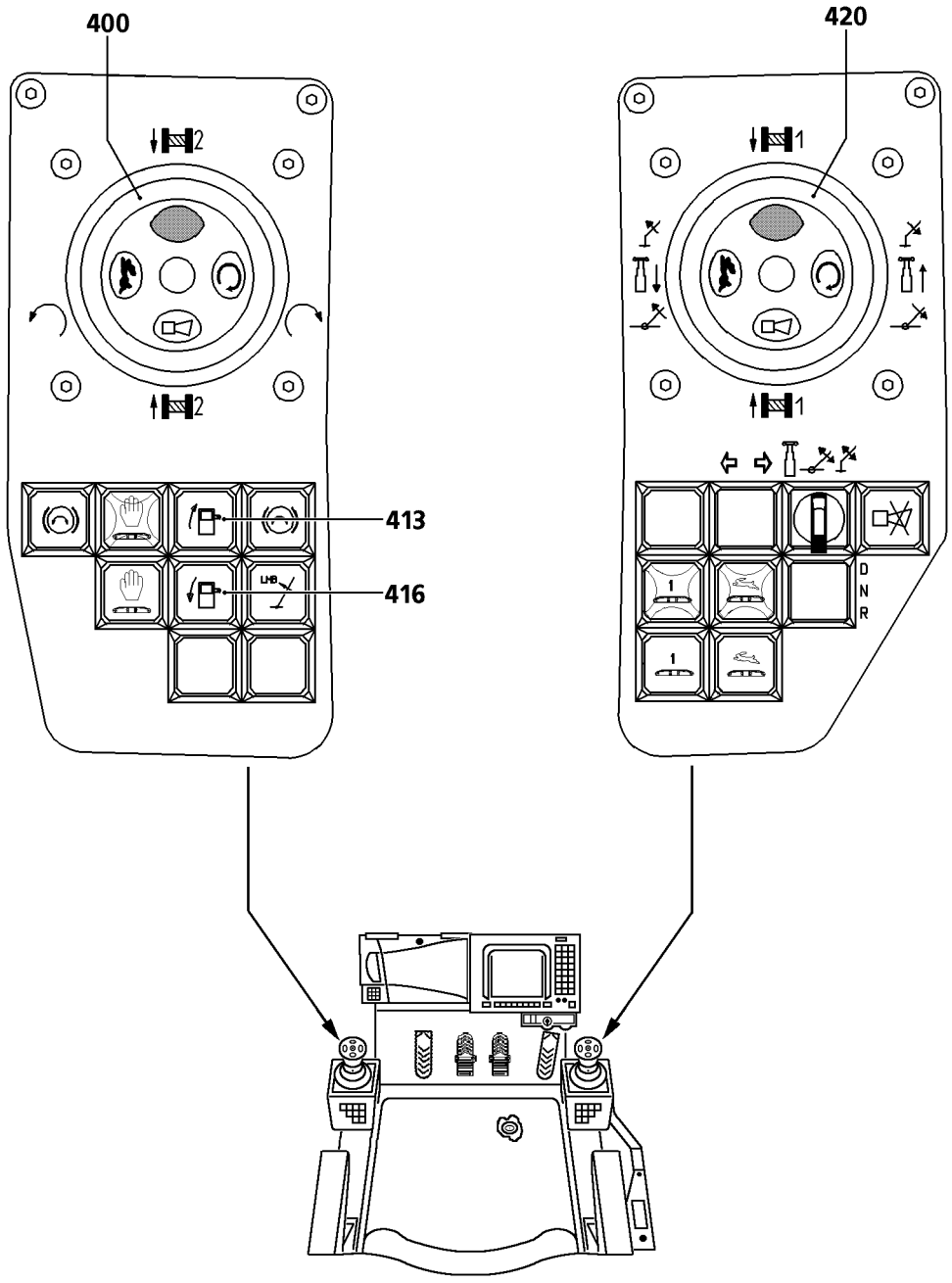

LWE/LTR 1100-005/17505-03-02/en

Fig.198627

2.5 Tilting the crane cab

To give the crane driver a better field of vision, the cab can be tilted upwards.

When opening the tilted cab the cab door accelerates to the rear to the stop. Therefore: Hold the cab door by the handle and open slowly.

When you have finished working with the crane, set the cab horizontally.

CAUTION
Danger of accident!
▶ If the cab is tilted, it is prohibited to stand on the step!

2.5.1 Tilting the cab upward

▶ Press the button **413**.

Result:

– The cab swings upward.

2.5.2 Move the cab into horizontal position

▶ Press the button **416**.

Result:

– The cab swings downward.

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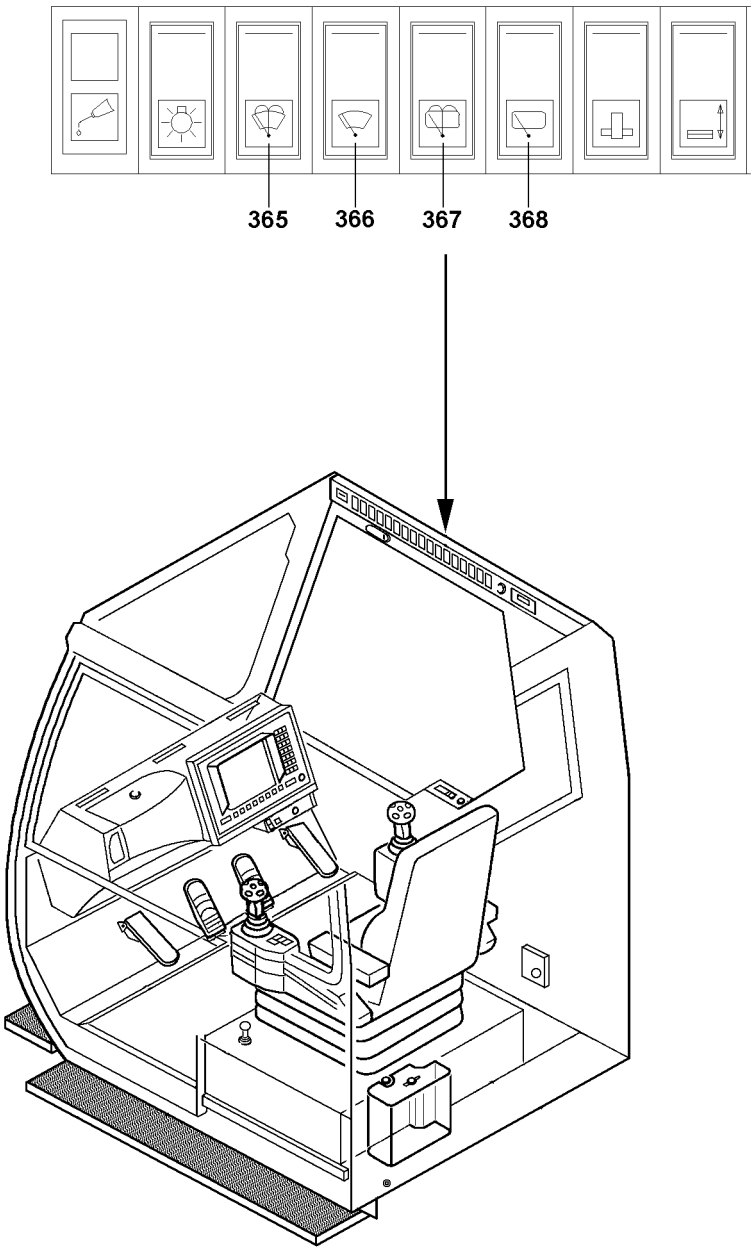

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Fig.102850

2.6 Operating the window wiper / window washer system

2.6.1 Operating the window wipers

The windshield wipers for the front and the roof window are operated with a 2-stage switch (first stage - intermittent, second stage - continuous wipe).

To activate the windshield wiper on the front window:

▶ Actuate the switch **366**.

or

To activate the windshield wiper on the roof window:

Actuate the switch **368**.

2.6.2 Operating the window washer system

The window wipers on the front and roof windows can be assisted by a window washer system.

Before the start of the cold season, fill the container for the window washer fluid with standard anti-freeze mix.

To activate the windshield washer system for the front window:

▶ Press the button **365**.

or

To activate the windshield washer system for the roof window:

Press the button **367**.

2.7 Opening the front window

WARNING
Danger of hand injury from trapping!
▶ Be careful with your hands when closing the front window.

A pair of nitrogen gas cylinders support the lifting movement of the front window.

▶ To open from inside, just push on the front window.

or

If you only want to partly open the window:

Use the attached strap to set the desired opening angle.

2.8 Checking the horn

Note
Use of horn!
▶ Only use the horn in dangerous situations to maintain its warning effect.

▶ Before starting work, check that the horn is functioning.

3 Preheating the hydraulic oil with the Hydraulic oil preheating*

Purpose of use:

- The hydraulic oil can be preheated with the Hydraulic oil preheating, if needed.
- It makes sense to use the hydraulic oil preheating at double digit temperatures below freezing.
- Hydraulic oil preheating shortens the preparation time significantly contrary to moving the crane components only.

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Note

▶ At low ambient temperatures: Run through all hydraulic crane functions without a load for 15 minutes. This will warm up cylinders, valves, oil motors and hoses.

3.1 Turning the Hydraulic oil preheating* on

Make sure that the following prerequisites are met:

– The crane 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.

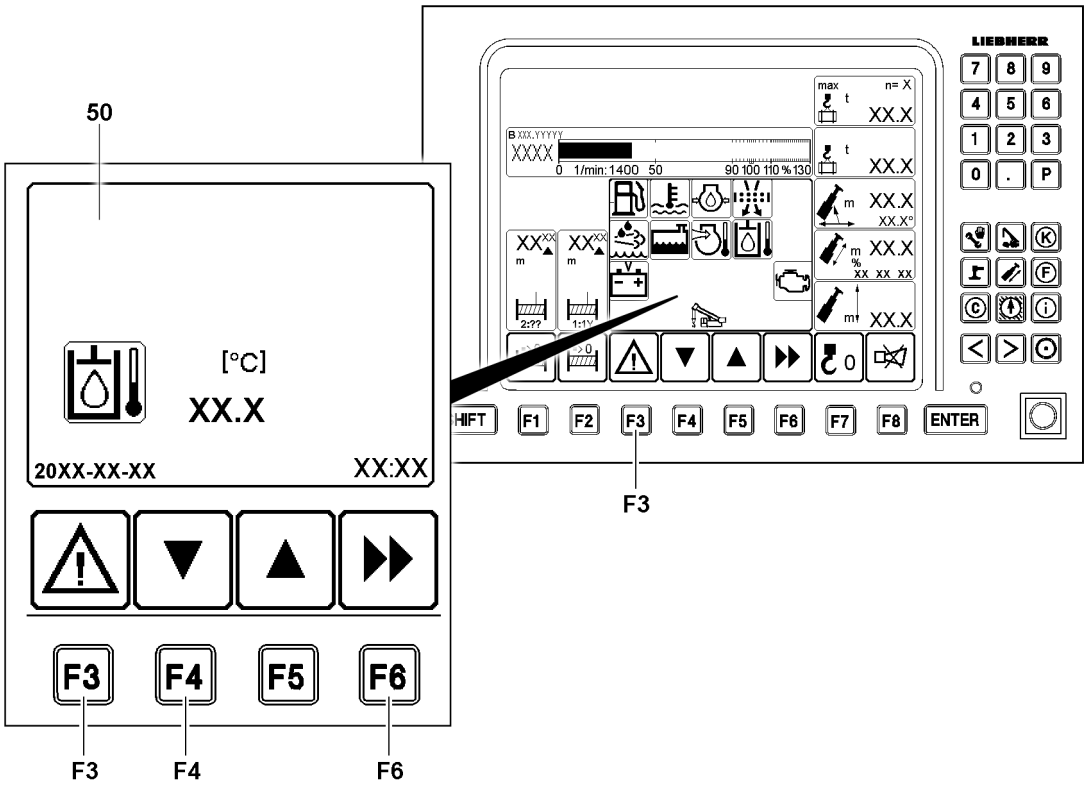

Fig.123994: Hydraulic oil temperature: Individual control display

The current hydraulic oil temperature can be called up via the individual control display hydraulic oil temperature **50** on the LICCON monitor.

▶ 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 respective individual control display hydraulic oil temperature **50** is shown on the LICCON monitor.

▶ Check the hydraulic oil temperature.

When the hydraulic oil temperature is above **25°C**:

▶ Do **not** turn the hydraulic oil preheating on

When the hydraulic oil preheating is turned on, various crane functions are turned off.

The hydraulic oil preheating does **not** turn automatically off.

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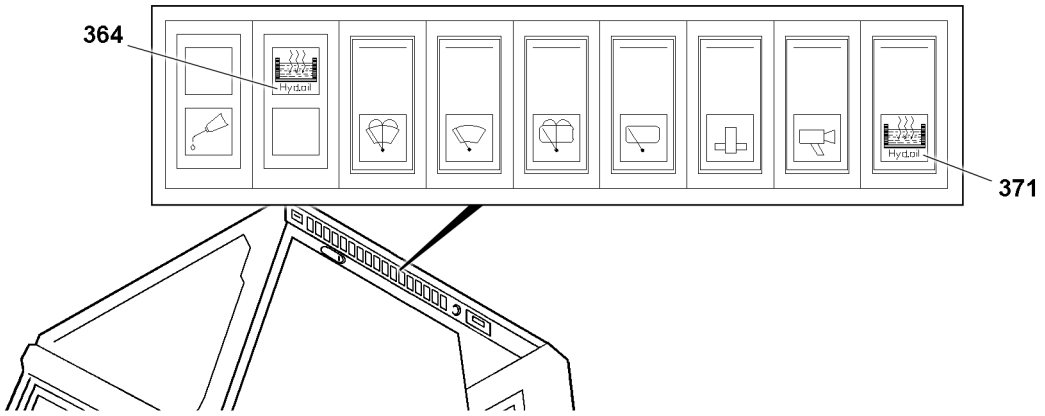

Fig.123995: Hydraulic oil preheating: Switch and indicator light

▶ Actuate the switch **371**.

Result:
– The indicator light **364** lights up.

▶ Run through all hydraulic crane functions without a load for 15 minutes.

When the hydraulic oil temperature has reached **20°C**:
▶ Turn the Hydraulic oil preheating off: Actuate the switch **371**.

Result:
– The indicator light **364** turns off.

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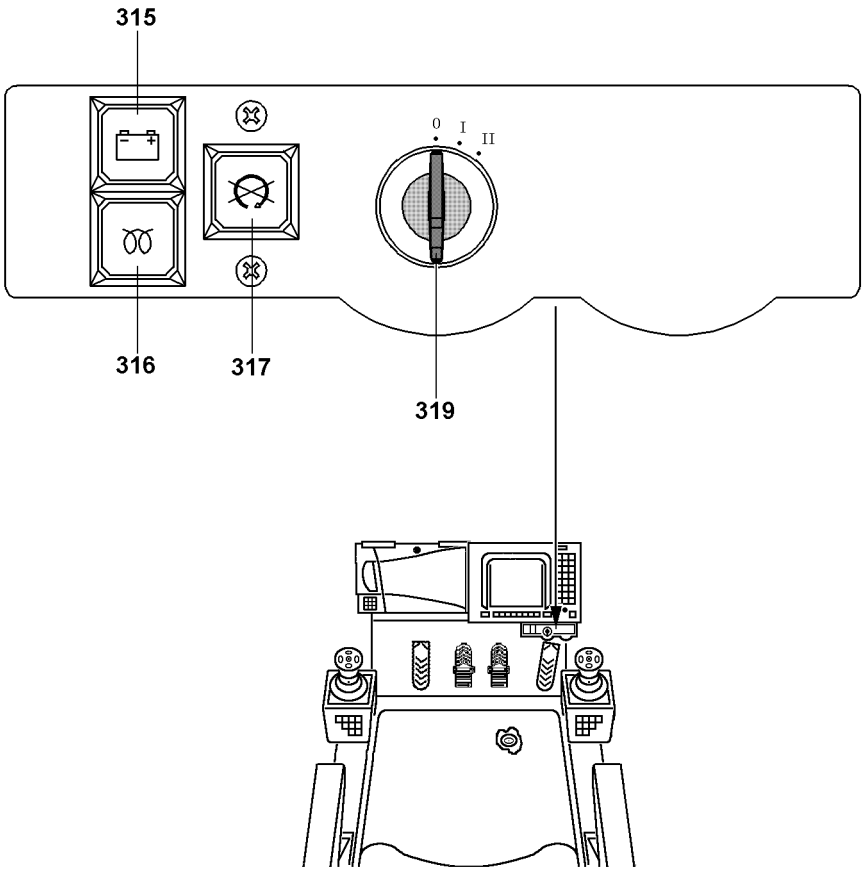

LWE/LTR 1100-005/17505-03-02/en

Fig.198629

4 Starting and stopping the engine

The engine can only be subjected to a full load after the operating temperature has been reached.

Make sure that the following prerequisite is met:
- The battery master switch is turned on.

4.1 Starting the engine

▶ Turn the ignition switch **319** to position „I“.

Result:

– The indicator light **316** blinks.
– The indicator light **315** lights up.
The engine is ready to start.

CAUTION
Danger of property damage!
▶ Only start the engine if the indicator light **315** is on and the indicator light **316** blinks.

▶ Turn the ignition switch **319** to position „II“.
▶ Start the engine.

Problem remedy
The engine does not start after a maximum of 10 seconds.
▶ Wait for 1 minute. The starter can be operated three times for 10 seconds per attempt with a pause in between of one minute each time.

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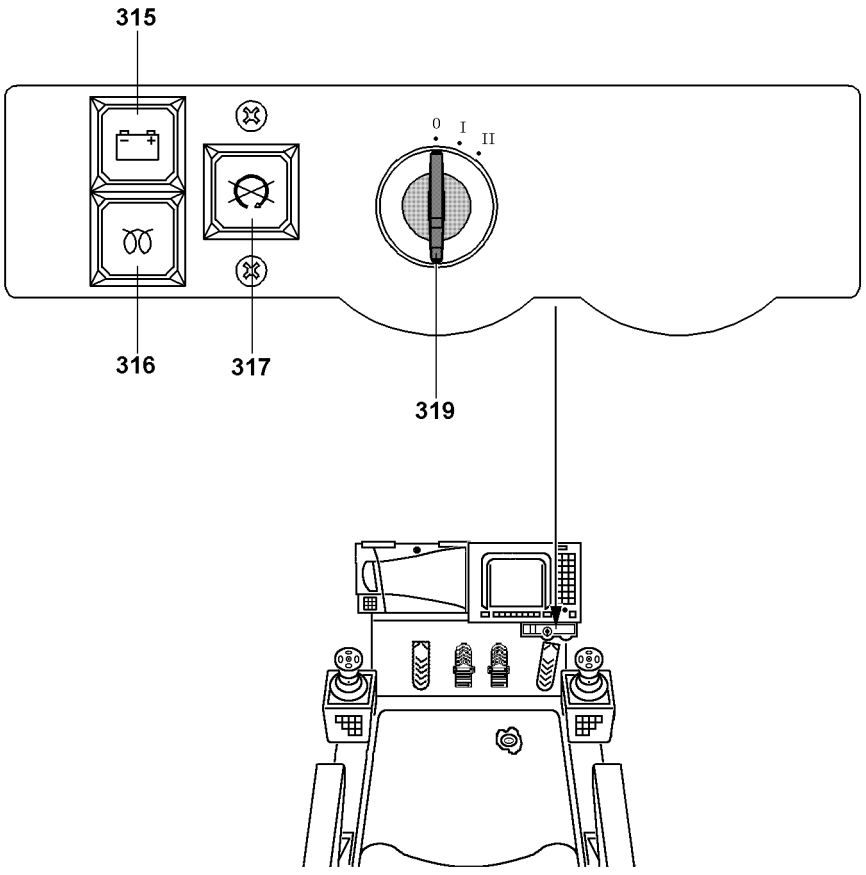

LWE/LTR 1100-005/17505-03-02/en

Fig.198629

4.2 Starting the engine with flame starting device

To improve the cold start process and the warm-up phase, the engine is equipped with a flame start system.

The flame start system turns off automatically if:
- The engine is not start when it is ready.
- The engine is started while the indicator light **316** is illuminated.
- The coolant temperature reaches 20 °C while the engine is running.

WARNING
Functionality of the battery in the cold season!
The starting capacity of the battery is considerably reduced in cold temperatures: For example, at a temperature of - 10 °C it has only 66 % of its normal capacity.
▶ After the engine has been turned off, store batteries in a heated room, if possible.

▶ Turn the ignition switch **319** to position „I“.

Result:

- The indicator light **316** lights up first and then starts to blink after a short time.
  The engine is ready to start.

▶ Turn the ignition switch **319** to position „II“.
▶ Start the engine.

Problem remedy
The control light **316** flashes?
The control unit has identified a defect with the flame starting device.
▶ Remedy the problem.

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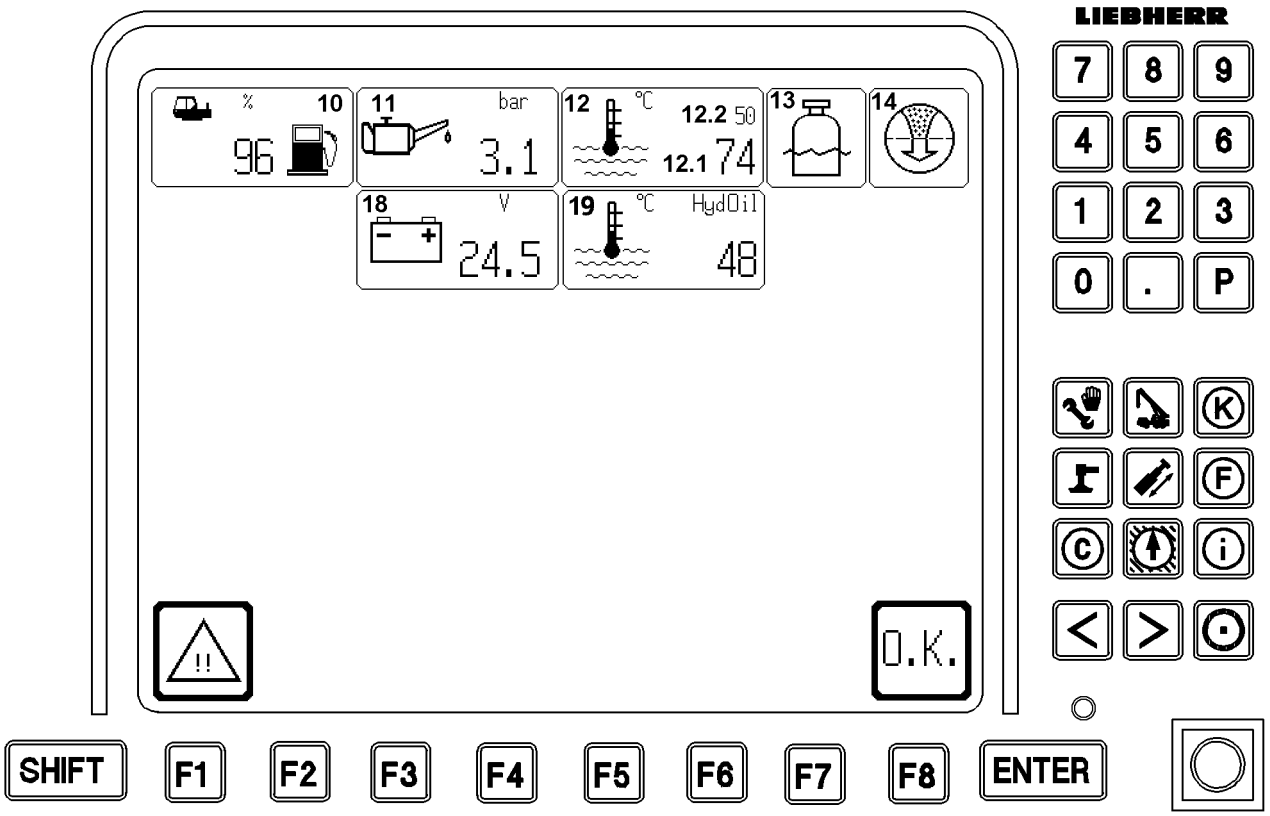

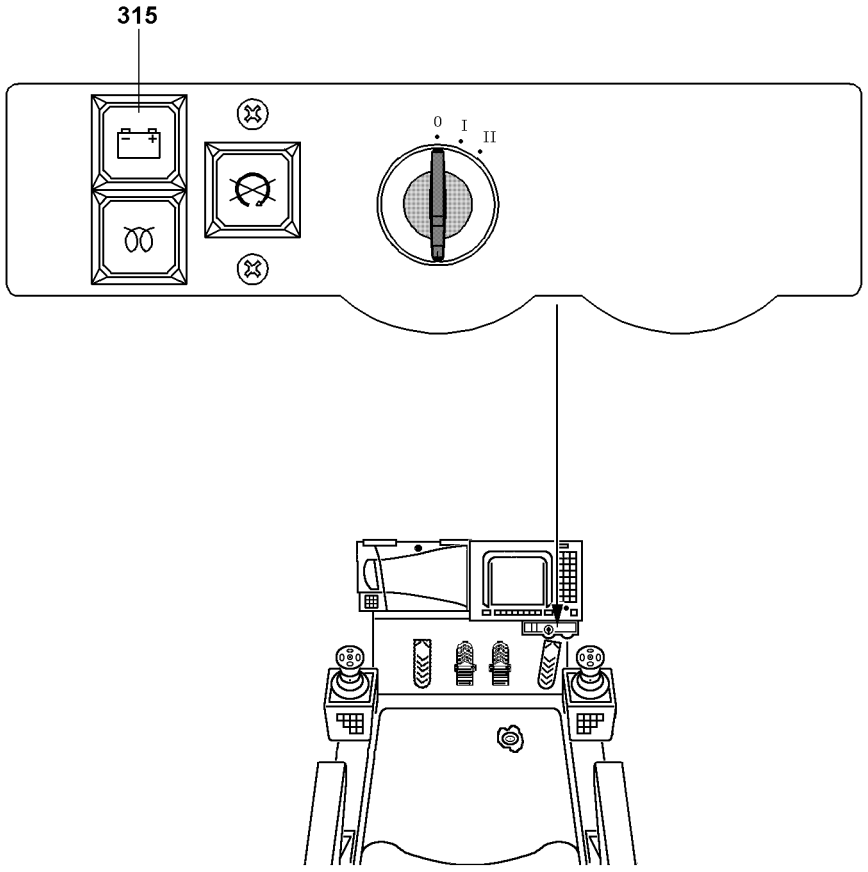

Fig.198630

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4.3 Checking the instruments after starting the engine

As soon as a stable voltage is present with the engine running, the electric crane control and the LICCON computer system are automatically turned on. A self-test of the microprocessor system follows and after a few seconds the set up screen appears on the monitor.

4.3.1 Checking the instruments on LICCON monitor

The following icons must turn off when the engine is running:

- ▶ Check the indicator light **315**.
- ▶ Check the icon **11** „Engine oil pressure“ on the LICCON monitor.

Problem remedy
Does the numerical display for the engine oil pressure in the icon **11** blink after approximately 10 seconds or does it start to blink during crane operation?
The engine oil pressure is too low. The engine can be damaged as a result of insufficient oil pressure.
▶ Turn the engine off immediately and determine the cause.

▶ Check the numerical display for the coolant temperature in the icon **12.1**.

Problem remedy
Does the numerical display for the „coolant temperature“ in the icon **12.1** blink during operation?
The coolant temperature is too high. Excessive coolant temperatures can lead to engine damage.
▶ Turn the engine off immediately.

- ▶ Check the icon **10** for „Fuel content“.
- ▶ Check the icon **19** for „Hydraulic oil temperature“.
- ▶ Check the icon **12.2** for „Charge air temperature“.
- ▶ Check the icon **13** for „Coolant level“.
- ▶ Check the icon **14** for „Air filter“.
- ▶ Check the icon **18** for „Battery voltage“.

4.4 Engine monitoring

See chapter 4.02, section Engine monitoring.

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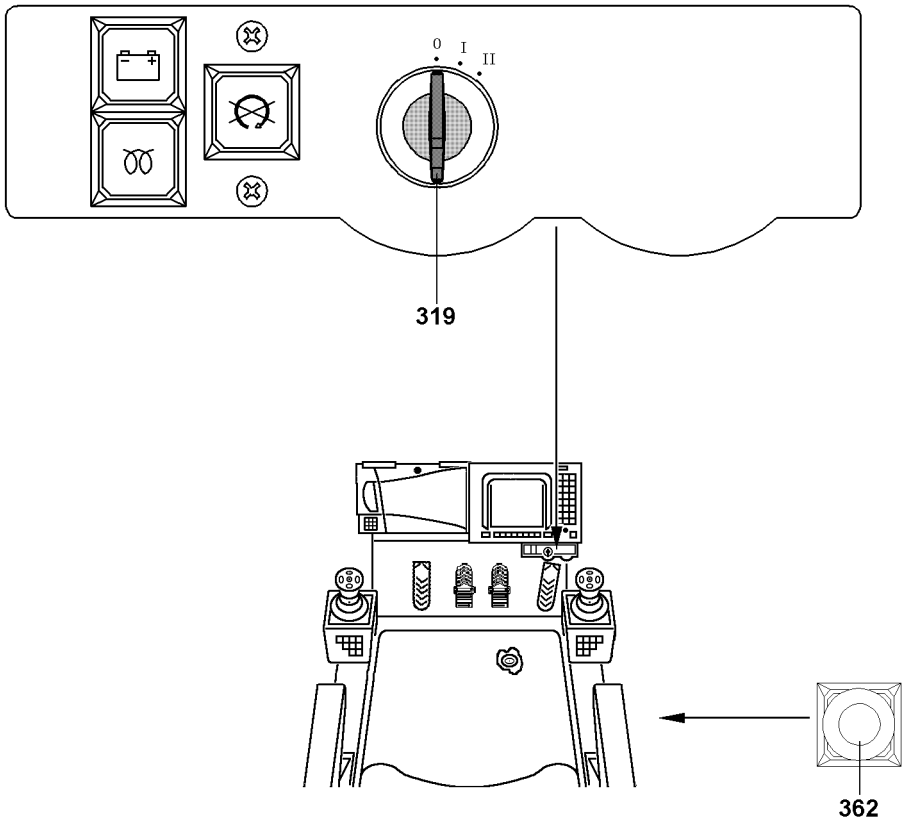

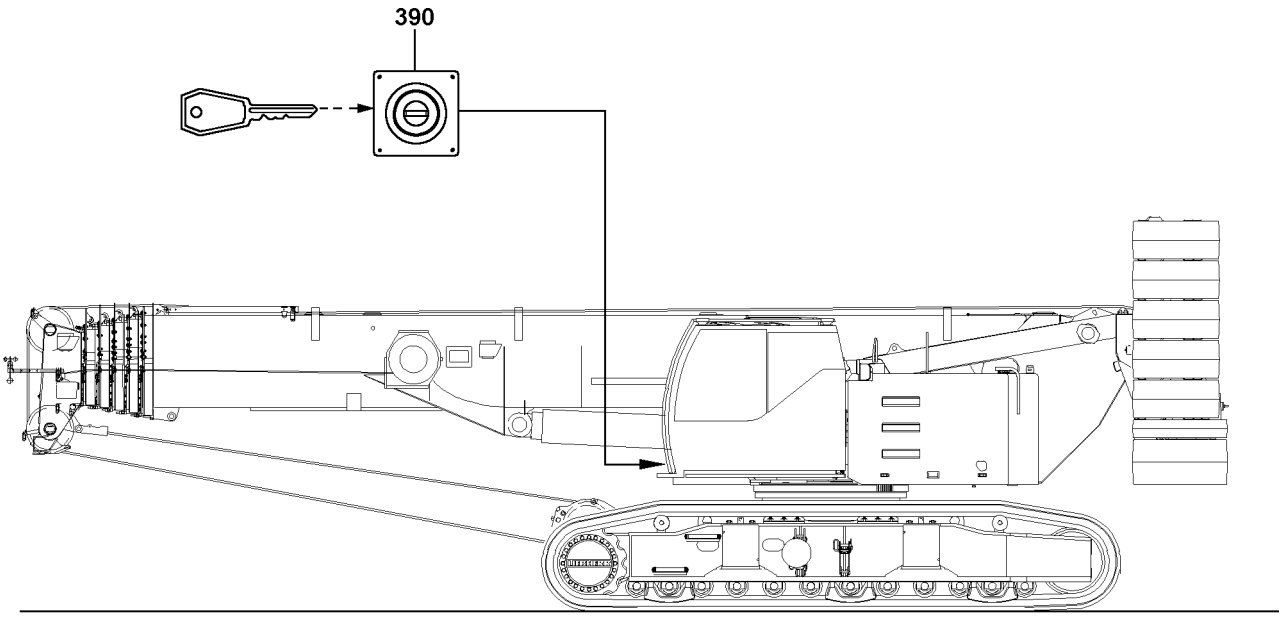

LWE/LTR 1100-005/17505-03-02/en

Fig.102851

4.5 Turning the engine off

4.5.1 Turning the engine off

If the crane has been operated at full engine output or with very high coolant temperatures (above 95 °C), let the engine run without a load for 1-2 minutes at low idle speed.

- ▶ Turn the ignition switch **319** back to the stop.
- ▶ Pull the ignition switch **319** off and store in a safe place.

4.5.2 Turning the engine off in the event of danger

CAUTION
Operate the emergency off switch

- ▶ Only use the emergency off switch **390** or the emergency off switch **362** in case of serious emergency. Use of the emergency off switch **390** or the emergency off switch **362** in normal situations is prohibited!

- ▶ Press the emergency off switch **390**.
  or
  Press the emergency off switch **362**.

Result:

– The crane will be turned off immediately.

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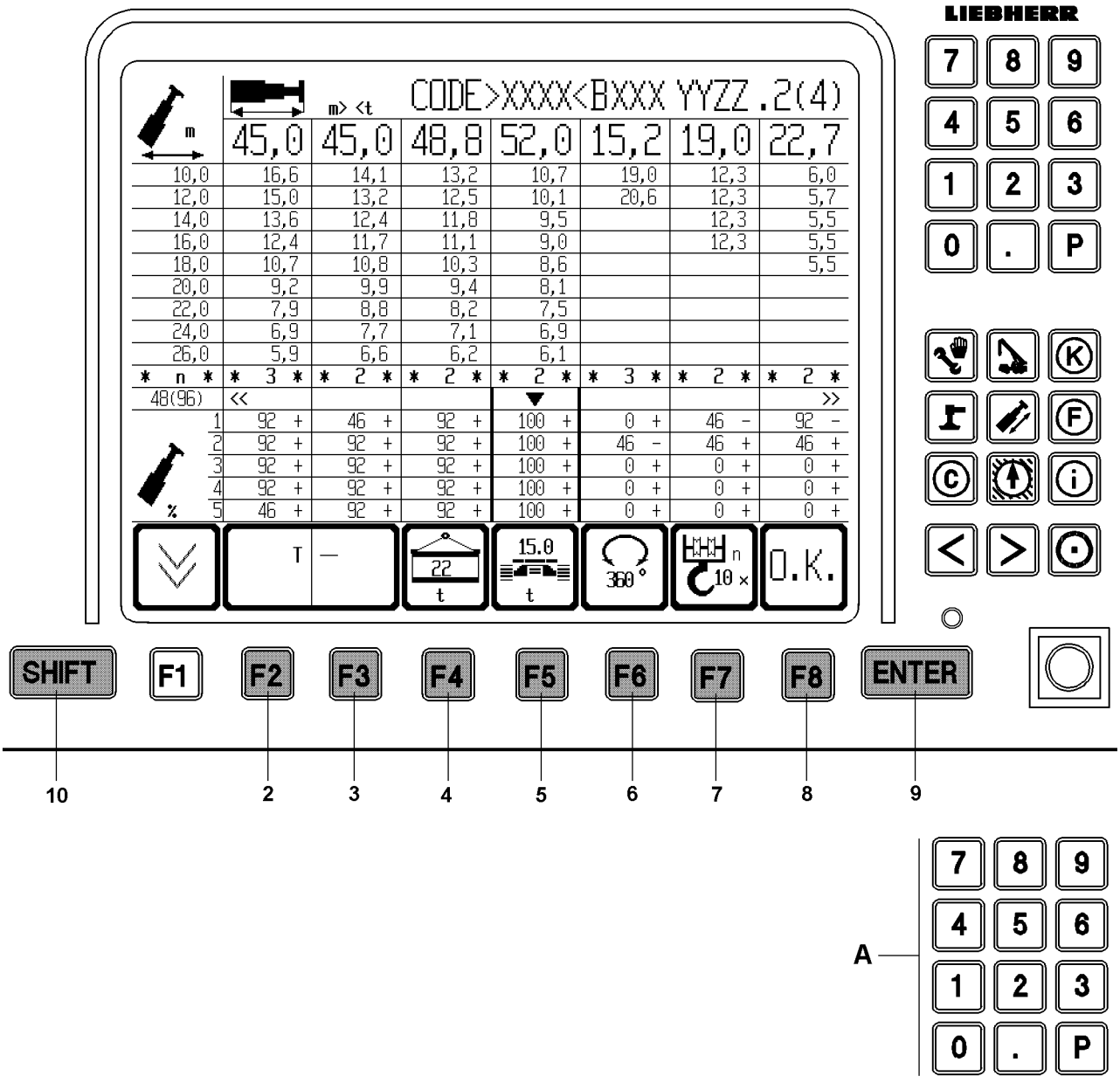

Fig.102853

5 LICCON computer system after engine start

The LICCON computer system is only operational when the engine is running.

5.1 Waiting for the boot up phase

After being turned on, the LICCON computer system boots up and carries out a self-test, see chapter 4.02.

▶ Wait for the boot up phase.

Result:

– The set up screen appears on the LICCON monitor.

– Normally, the most recently set equipment set up configuration and reeving number will be displayed.

If a master switch is moved away from the zero position during the boot up phase, then the function circuit of the electrical safety chain is interrupted.

In this case:
▶ Turn the engine and the ignition off and restart.

Problem remedy
An error message appears on the LICCON monitor?
▶ Turn the engine and the ignition off and restart.
▶ The LICCON computer system automatically displays the error determination screen.

Problem remedy
The LICCON monitor does not show the most recently set set up configuration and reeving number? If there has been a data loss in the memory (cold start), then the first valid set up configuration appears in the set up screen. The reeving number is set to „0“.
▶ Set the set up configuration and reeving number again.

5.2 Taking over the previously selected set up configuration and hoist rope reeving

Check in the operating screen if the correct short code and the correct reeving number have been set.

If the settings on the operating screen are correct:
▶ Press function key „F8“ **8**.

Result:

– The „Set up“ program is terminated and the adjusted parameters are accepted for the newly started „Operation“ program.

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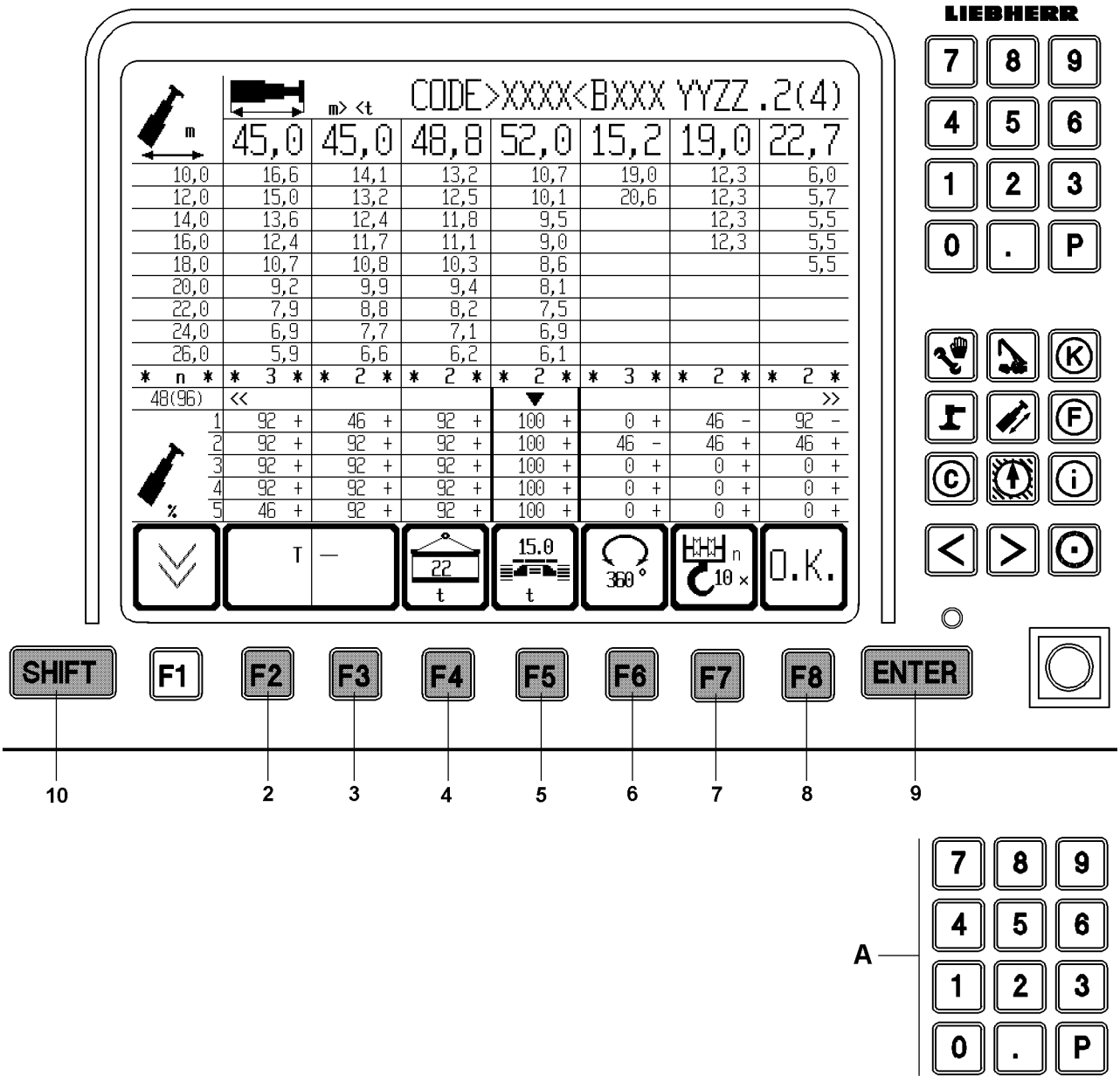

Fig.102853

5.3 Setting a new set up configuration and new hoist rope reeving

The selected and displayed set up configuration can be changed with the function keys or by entering the short code.

5.3.1 Setting a new set up configuration with the function keys

- ▶ Press function key „F2“ **2** until the desired main geometry status is selected.
- ▶ Press function key „F3“ **3** until the desired accessory status is selected.
- ▶ Press function key „F4“ **4** until the desired superstructure counterweight status is selected.
- ▶ Press function key „F5“ **5** until the desired chassis central ballast status is selected.
- ▶ Press function key „F6“ **6** until the desired slewing area of the superstructure is selected.
- ▶ Press the „Enter“ **9** key.
- ▶ Check the set load chart.

5.3.2 Setting a new set up configuration with short code

The short code can be found in the load chart.

- ▶ Entering the 4-digit short code with the keypad **A**.
- ▶ Press „ENTER“ **9**.

Result:

– The data of the selected load chart can be viewed.

For a more detailed description of the „Configuration“ program, see chapter 4.02.

- ▶ Check the set load chart.

5.3.3 Setting a new hoist rope reeving

- ▶ Press function key „F7“ **7** until the desired reeving number is selected.
  or
  Press function keys „SHIFT“ **10** and „F7“ **7** until the desired reeving number is selected.

5.3.4 Checking and accepting the new set up configuration and hoist rope reeving

If the settings on the set up screen are correct:

- ▶ Press function key „F8“ **8**.

Result:

– The „Set up“ program is terminated and the adjusted parameters are accepted for the newly started „Operation“ program.

- ▶ Check in the operating screen if the correct short code and the correct reeving number have been set.

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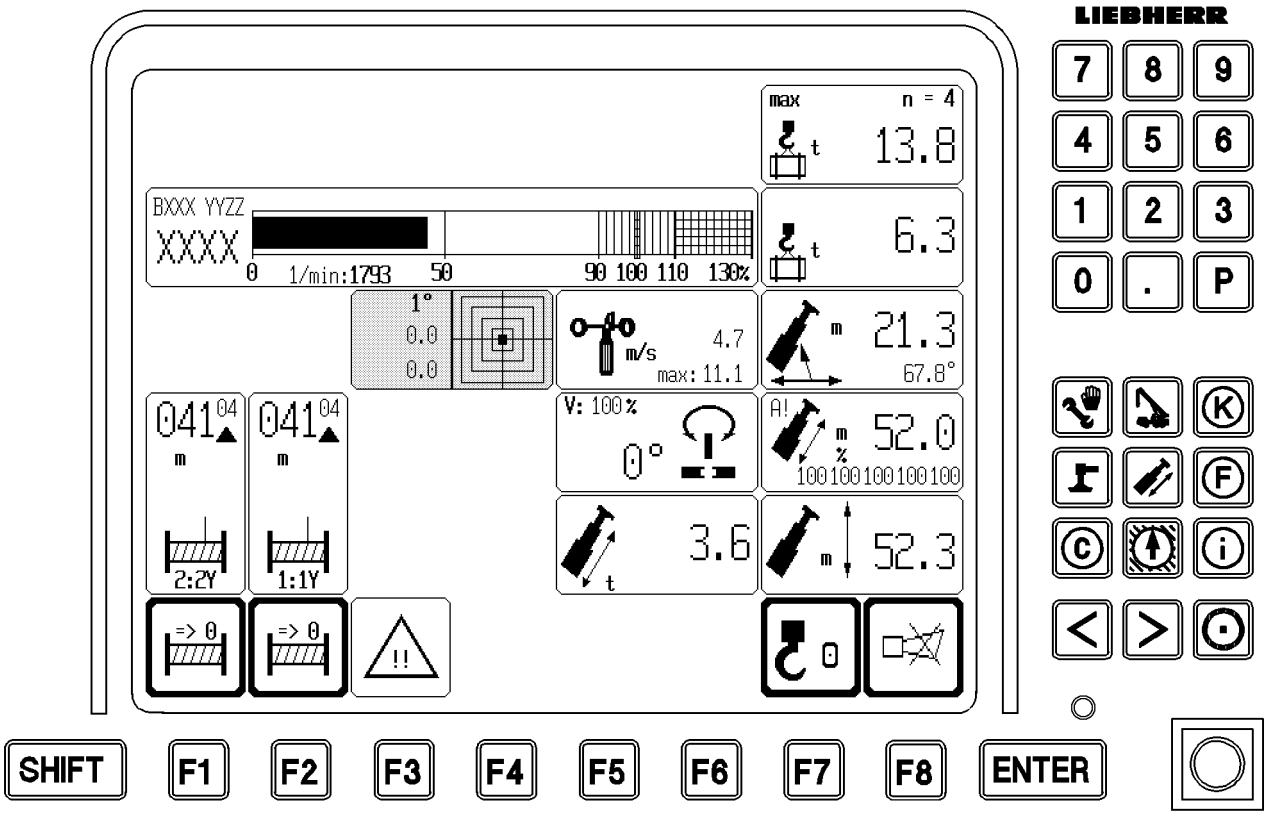

Fig.198633

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1 General

1.1 Safety systems

Every time the crane is operated, the crane operator is required to satisfy himself about the functionality of the safety systems.

DANGER
Danger of accident from defective warning and safety systems!
Operating the crane with defective warning and safety systems can lead to life-threatening accidents!
▶ Make sure that all warning and safety systems are functioning.
▶ Make sure that the overload protection is functioning.

1.1.1 Checking overload protection

If the telescopic boom without a load and lifting equipment is fully telescoped in and horizontally aligned, then the LICCON must show approximately the following:
– Load 0 t.
– Telescopic boom length 11.5 m.
– Telescopic boom angle 0°.

1.2 Levelling instruments

To ensure the working safety of the crane, the crane must be aligned horizontally on level ground with sufficient load bearing capacity.

DANGER
Danger of accidents due to toppling of the crane!
If the crane is not aligned horizontally, it may tip over. The maximum permitted deviation from the horizontal position of the crane is ± 0.5% (± 0.3°).
▶ Ensure that crane is level.

2 LICCON computer system

The LICCON computer system is a system for controlling and monitoring mobile cranes. In addition to the overload protection (Load moment limiter **LMB**) there are a number of application programs that can be used for controlling and monitoring the crane movements, see chapter 4.02.

2.1 Overload protection

The relevant sensors for the overload protection are:
– Length sensors
– Angle sensors
– Pressure sensors
– Inductive sensor - Telescopic boom pinning

The electronic overload protection **turns** all **load moment increasing** crane movements **off** if the permissible load moment is being exceeded. Only load moment decreasing movements can then be carried out.

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DANGER
Risk of accident!
The presence of the overload protection does not relieve the crane operator of his obligation for care and attention.
▶ Before lifting a load, determine its approximate weight and center of gravity, and with the help of the load chart, decide whether the crane is in a position to carry out this job.

The overload protection cannot cover all possible operational conditions.

DANGER
Danger of accident due to incorrect operation of the crane!
Due to incorrect operation of the crane, the overload protection does not become effective or the shut off does not occur quickly enough. In these cases, accidents are possible despite an installed overload protection!
▶ Be especially vigilant!

The overload protection registers, but:
– does not turn off, for example the wind speed,
– does not monitor, for example the crane incline,
– does not monitor, for example the turn angle of the turntable.

The overload protection does **not** register:
– the hooking of the load or the load tackle,
– excessive delay forces,
– loads falling onto the rope,
– angular pull,
– driving the crane on ground with large slope,
– collapsing ground.

DANGER
Danger of toppling or destroying the crane!
▶ The overload protection is a device according to EN 13000. It may not be used as an operational shut off device for crane movements of any kind.
▶ The overload protection must be adjusted to the current equipment configuration of the crane before crane operation to match the load chart. Only that way can it fulfill its protective task.
▶ After every equipment configuration change and / or boom configuration, the overload protection device must be reset to the corresponding equipment configuration and / or boom configuration.
▶ The crane operator must meet his duty of caution and attention, despite the overload protection.

2.1.1 Failure of the overload protection

It is technically possible to operate the crane without the LICCON.

DANGER
Serious risk of accidents!
If the LICCON system is no longer functioning properly because of a error in the LICCON monitor, the CPU or the power supply, then the crane can be operated in emergency mode with utmost caution, if absolutely necessary.
▶ In this case, the crane operator bears full responsibility.
▶ The crane operator may **not** use emergency mode if he is **not** fully aware of the extent of the monitoring tasks and dangers associated with that mode.

2.1.2 Procedure to follow in case of a problem

Basically, all conditions in the load charts must be strictly adhered to, even those not monitored by the LMB:
– The exact weight of the load, including load tackle, must be known.
– The condition of the boom and the boom geometry must be known and must agree with the stated values in the corresponding load chart.

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The boom length and boom projection radius must be measured manually.
– It must be ensured that the telescopic boom has been pinned.

In the event of a LICCON monitor failure:
Replace LICCON monitor with a functioning substitute monitor.

In the event of a CPU failure:
Replace CPU with a functioning substitute CPU.

In the event of power supply failure:
Replace the power supply unit with a functioning substitute power supply unit.

If one or more sensors fail, it is possible to continue work manually, if the „missing values“ are monitored manually and agree with the values in the load chart that is used.

2.1.3 Ending a load lift

If the problem cannot be remedied using these measures, we recommend:
– Before continuing the load lift, contact the nearest Liebherr Service center or the Liebherr-Werk in Ehingen.

If this is not possible, then the load lift can be completed with utmost caution, as follows:
– All values that are needed for determining the equipment configuration and the associated load chart must be measured and / or manually determined.

DANGER
Risk of accident due to overloading the crane!
▶ The exact weight of the load, including hook and attachment equipment, must be known!

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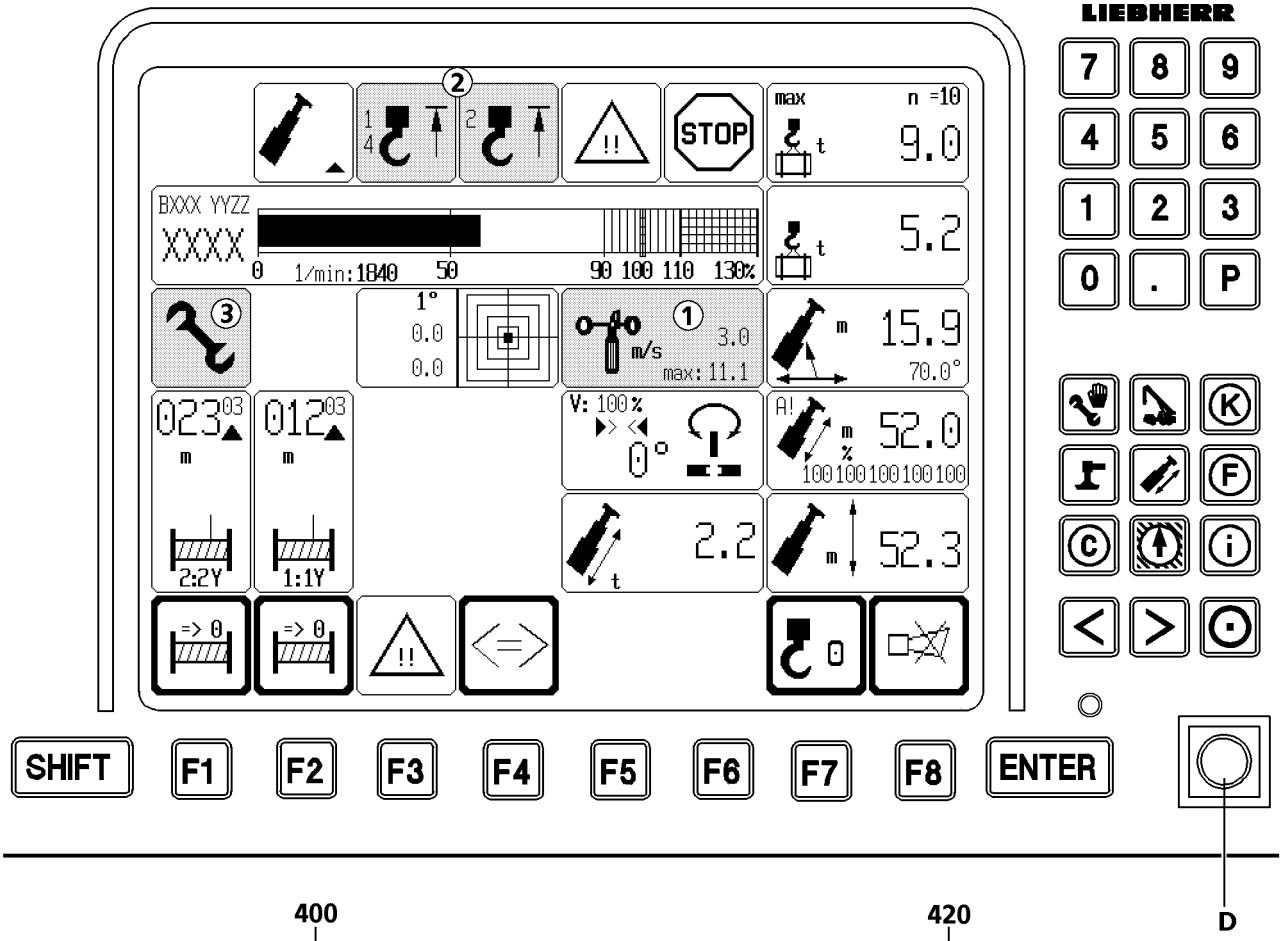

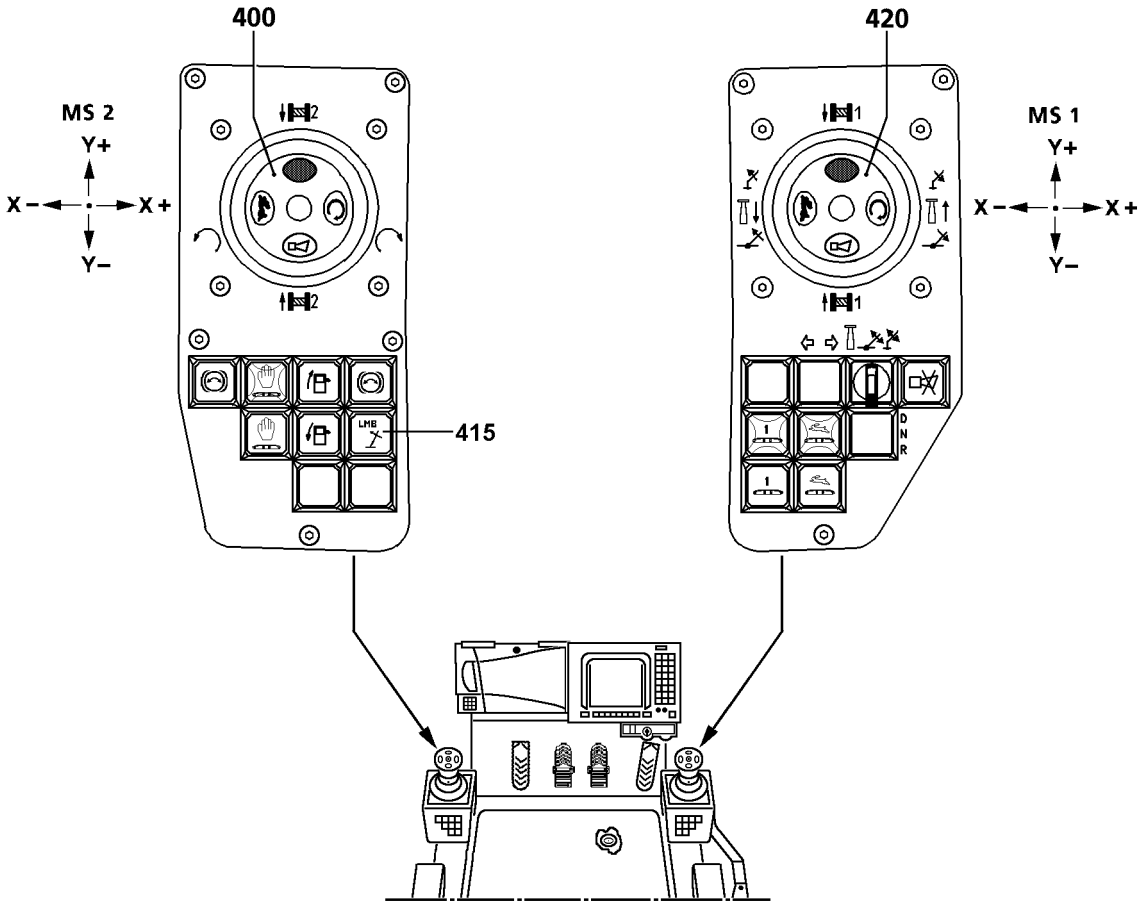

Fig.198634

3 General safety equipment

3.1 Wind warning device

The wind warning appears in the operating view of the LICCON computer system.

If the current wind speed exceeds the displayed maximum value, the „Wind warning“ icon **1** starts to blink and the acoustic alarm „short horn“ sounds. But there is **no shut off** of crane movements.

DANGER
Danger of accidents from exceeding the permitted wind speed!
There is **no** automatic shut off of crane movements.
▶ Stop crane operation and place down the boom.

3.2 Hoist limit switch „Hoist top“

The hoist limit switch is intended to prevent the hook block from colliding with 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.

When the hoist limit switch is actuated, the icon **2** appears in the operations screen. The crane movements „lift“, „luff down“ and „telescope out“ are turned off.

DANGER
Risk of accident due to crane toppling over or destruction of the crane!
▶ During crane operations, only bypass the hoist limit switch with the key switch if an observer can monitor the distance between the hook block and the boom head exactly. The guide must be in direct contact with the crane operator.
▶ Carry out hoist movements with maximum caution and minimum speed.
▶ In emergency situations, only an authorized person may bypass the hoist limit switch.
▶ Do **not** use the hoist limit switch as an operational shut off function.

3.3 Limit switch winch spooled out

The cam limit switch installed in the winch turns „winch spool out“ off if there are only 3 rope coils remaining on the winch.

DANGER
Risk of accident due to falling load!
If the following notes are not observed, the rope attachment may be torn out and the load may topple.
▶ The cam limit switch must turn off when there are 3 cable coils remaining on the winch!
▶ If the hoist rope is spooled up during assembly, please ensure that the rope end remains in front of the winch and is not pulled over the winch. If the rope end is pulled over the winch by another rotation, the cam-type limit switch must be reset!
▶ If a new rope is used, the cam limit switch must be reset!

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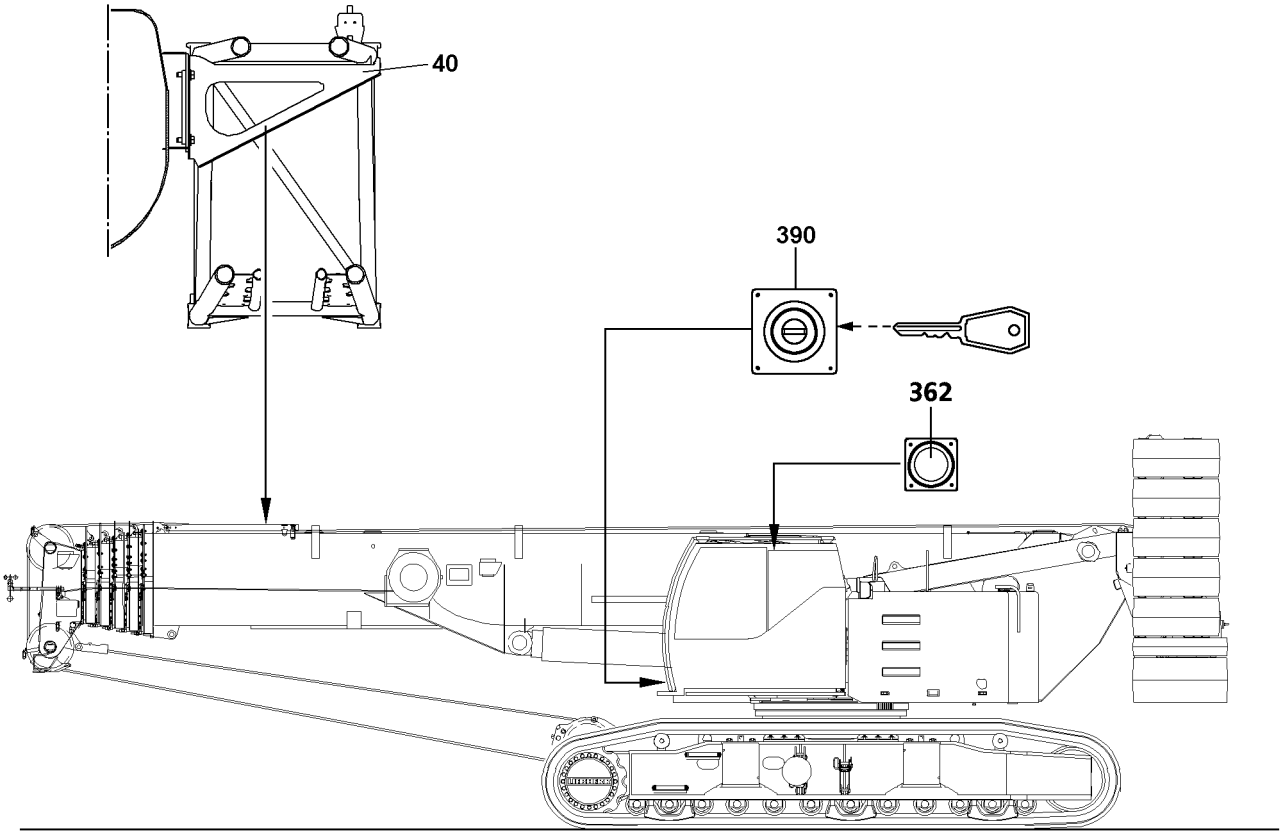

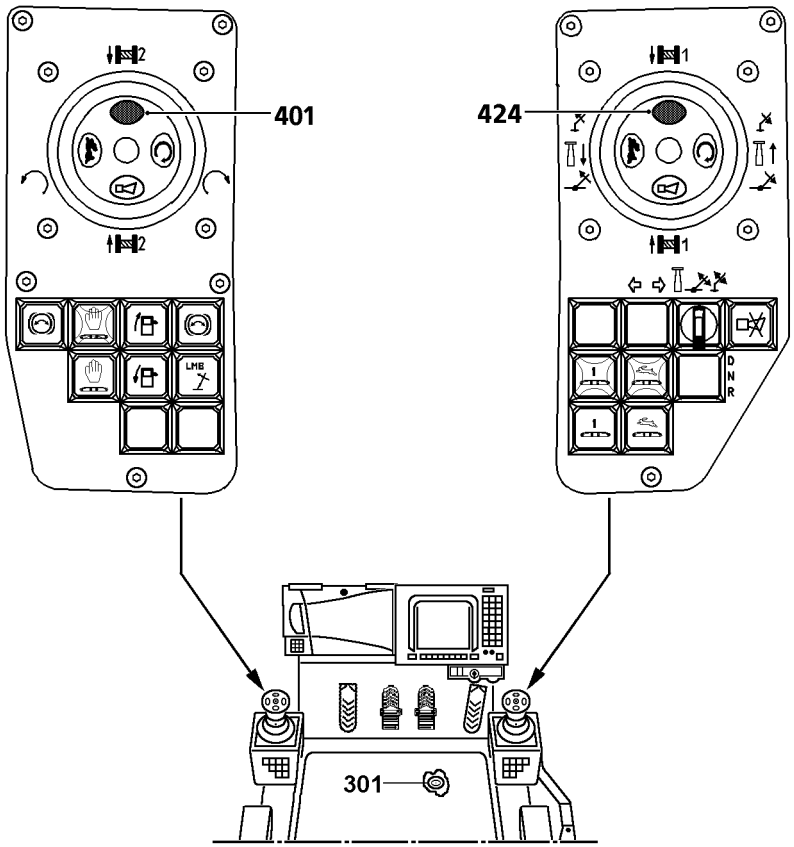

Fig.107361

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3.4 EMERGENCY OFF switch*

If the EMERGENCY OFF switch **60**, the EMERGENCY OFF switch **362** or the EMERGENCY OFF switch **390** is operated, the engine and the electrical crane control are switched off. Every carried out movement can be stopped immediately.

After the EMERGENCY OFF switch **60** or the EMERGENCY OFF switch **390** has been operated, the system can only be released by an authorized person with a key.

Note
It is imperative to comply with the following instructions!
- ▶ Only use the EMERGENCY OFF switch in the event of a clear emergency!
- ▶ Use of the EMERGENCY OFF switch for normal operation is not permitted!

3.5 Control release

The seat contact switch **301** shuts the crane control down as soon as the crane operator gets up from the seat.

This prevents unintended crane movements by accidentally touching the master switch when getting in or out of the cab.

The button **401** and the button **424** bypass the seat contact switch **301** if necessary if the operator has to work standing up.

3.6 Hydraulic safety valves

A distinction is made between two types:
- – Pressure limitation valves against pipe and hose breaks.
- – Shut off valves in the luffing cylinder, telescoping cylinder and in the support cylinders.

3.7 Catch bar

The catch bar **40** on the telescopic boom articulated piece is a mechanical safety device!

DANGER
Danger of fatal injuries due to toppling folding jib!
As a result of improperly mounted, damaged or non-existing catch bar **40** on the telescopic boom pivot section, the folding jib – due to an assembly error – can fall down and cause fatal injuries.
- ▶ Before folding jib assembly, make sure that the catch bar **40** is properly mounted on the telescopic boom pivot section and that it is not damaged.
- ▶ The catch bar **40** is a mechanical safety device. For that reason, it is prohibited to change the catch bar **40** in any way.

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4 Acoustic / visual warning overview

4.1 Crane operator

Function	Signal	Crane operator							
		Acoustic warning		Visual warning - LICCON monitor icons					
		Slow	Fast	Advance warning	Shut off				
									
Crane operation, assembly, disassembly	Utilization greater than 90%	X[2]		X					
Crane operation, assembly, disassembly	Utilization greater than 100%		X[2]		X				
Bypass key button **D**	Assembly					X		X	
Key switch **-S81 or** plug **XNOT**	Emergency operation						X	X	X
Bypass key button **D**	Bypass of load torque limiter - hoist top					X			X
 SHIFT	Bypass „without motor“						X		
Key switch **-S82**	Bypass of load moment limiter - emergency operation							X	

X = cannot be turned off

X[1] = can be turned off after 5 seconds on control platform

X[2] = can be turned off immediately at LICCON monitor

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4.2 Personnel present in danger zone

Function	Signal	Personnel present in danger zone	
		Acoustic warning	Visual warning
		Turntable signal bell	Cabin / roof flashing beacon
Crane operation, assembly, disassembly	Utilization greater than 90%		
Crane operation, assembly, disassembly	Utilization greater than 100%	X[1]	
Bypass key button **D**	Assembly	X	X
Key switch **-S81 or** plug **XNOT**	Emergency operation		X
Bypass key button **D**	Bypass of load torque limiter - hoist top	X	X
 	Bypass „without motor“		
Key switch **-S82**	Bypass of load moment limiter - emergency operation	X	X

X = cannot be turned off

X[1] = can be turned off after 5 seconds on control platform

X[2] = can be turned off immediately at LICCON monitor

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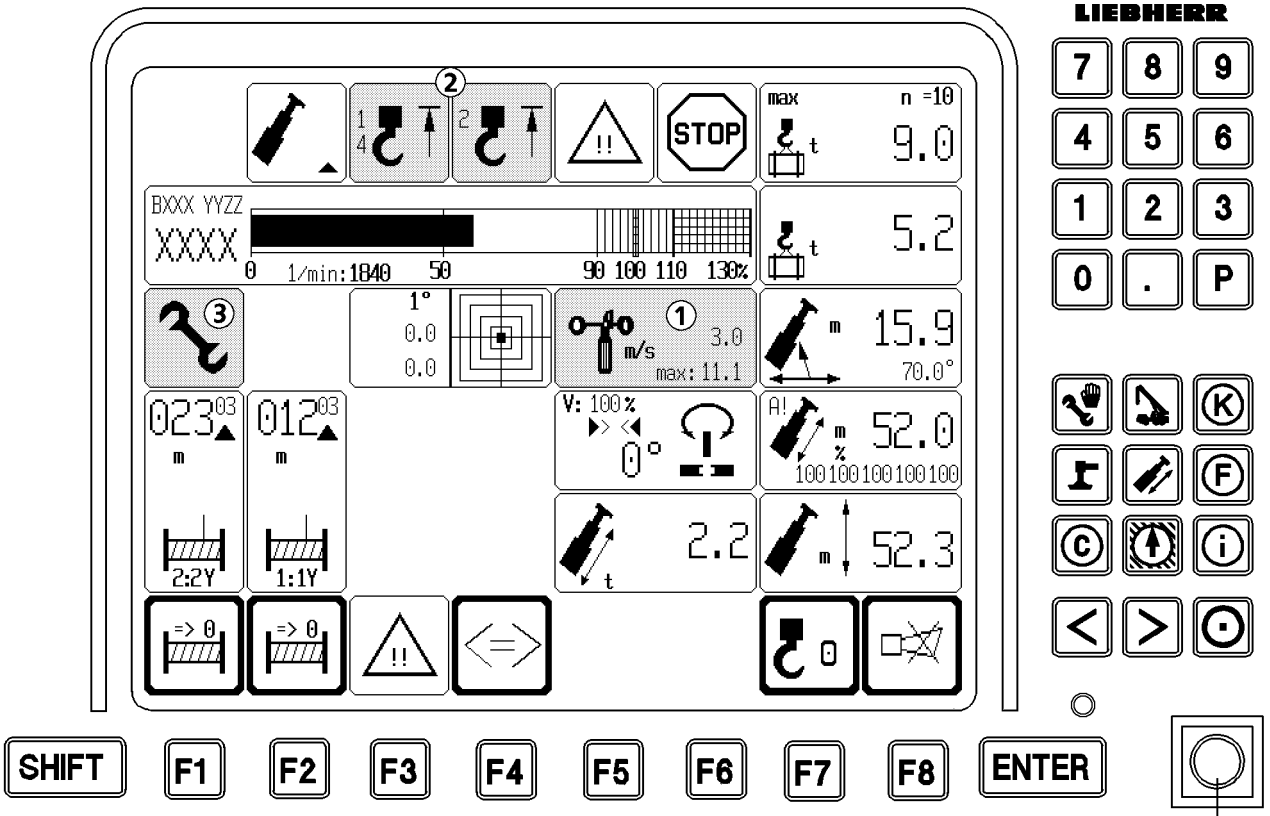


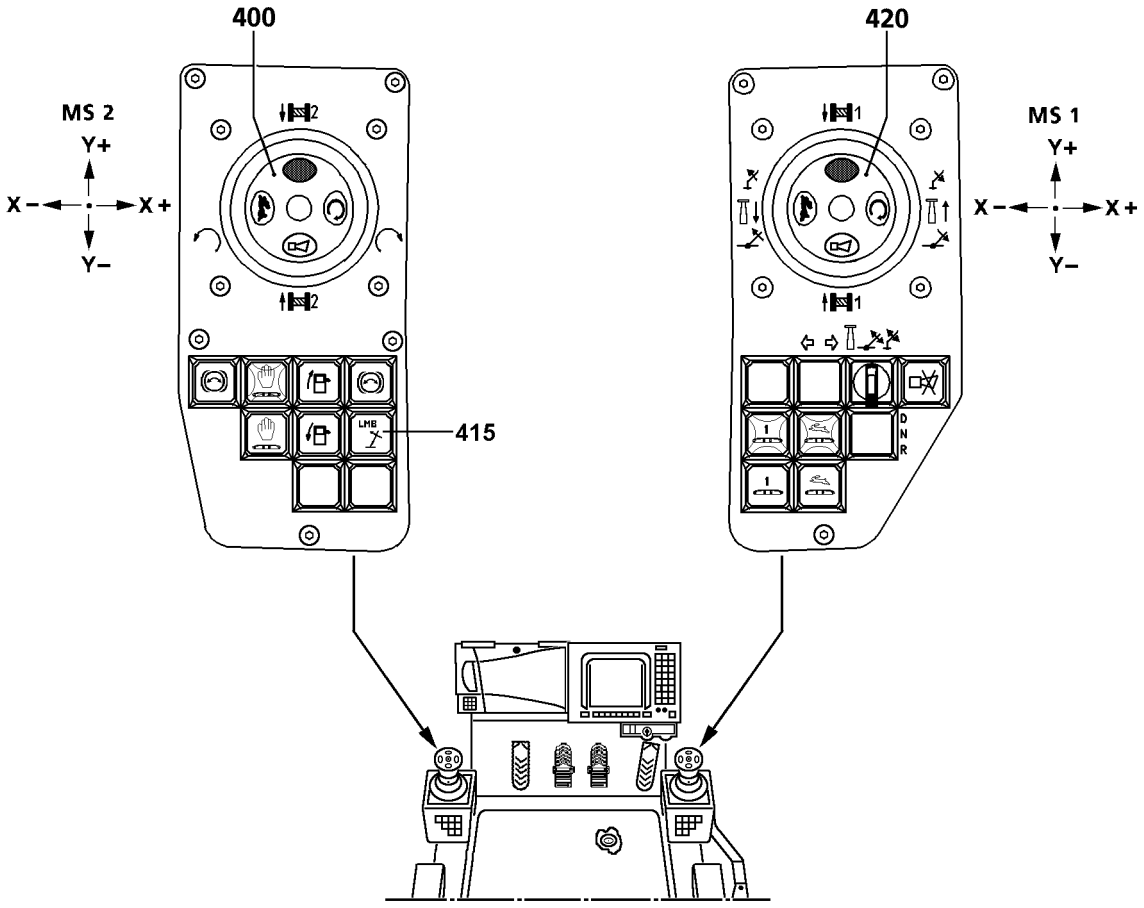


Fig.198634

5 LICCON overload safety device

There are three ways of bypassing the LICCON overload protection:
- Bypassing the load moment limiter by pressing bypass key button **D** on the LICCON monitor.
- Bypassing the load moment limiter by pressing button **415** on the control panel.
- Bypass of the boom limitation with key button*** -S82** in control cabinet.

5.1 Bypass with the bypass key button D on the LICCON monitor

The bypass key button **D** on the LICCON monitor is used to bypass the following shut off mechanisms:
- Hoist-top shut off.
- Load moment limiter.
- Shut off upper / lower limit angle.
- Proximity switch „Steep boom“.

Note

▶ If it is not possible to bypass the shut offs „upper / lower limit angle“, „steep boom“ via the bypass key button **D**, then they must be bypassed with the key button*** -S82** in the control cabinet, see section „Bypass with key button -S82***** in control cabinet“.

The bypass key button **D** on the LICCON monitor has two positions:
- Operating position (not pressed): Crane is in normal operation.
- Position to right (touching): The hoist limit switch and load moment limiter are bypassed.

5.1.1 Bypassing the hoist top shut off

If the hook block touches the hoist limit switch weight during the upward movement, the hoist limit switch reacts. The hoist-top icon **2** on the LICCON monitor flashes. The crane movements „spool up winches“, „luff telescopic boom down“, „luff hydraulic folding jib down“ and „telescope out“ are turned off. The shut off can be bypassed with the bypass key button **D** in position „right touching“, see section „Actuate bypass key button D on the LICCON monitor“.

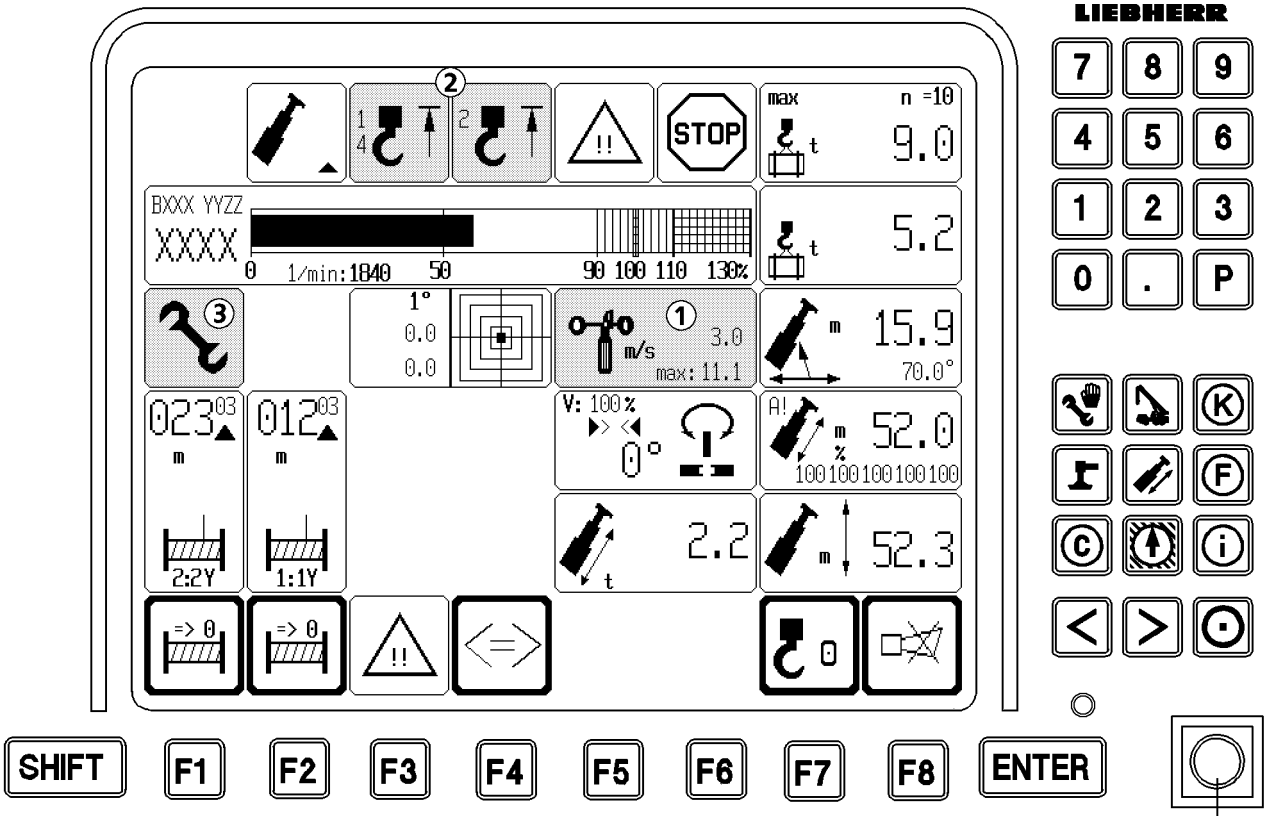
DANGER

Increased accident risk when bypassing the overload protection!
When bypassing the hoist top shut-off, there is a risk 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 hoist up shut-off must only be bypassed if the crane supervisor is present, and with the help 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 utmost caution!

LWE/LTR 1100-005/17505-03-02/en



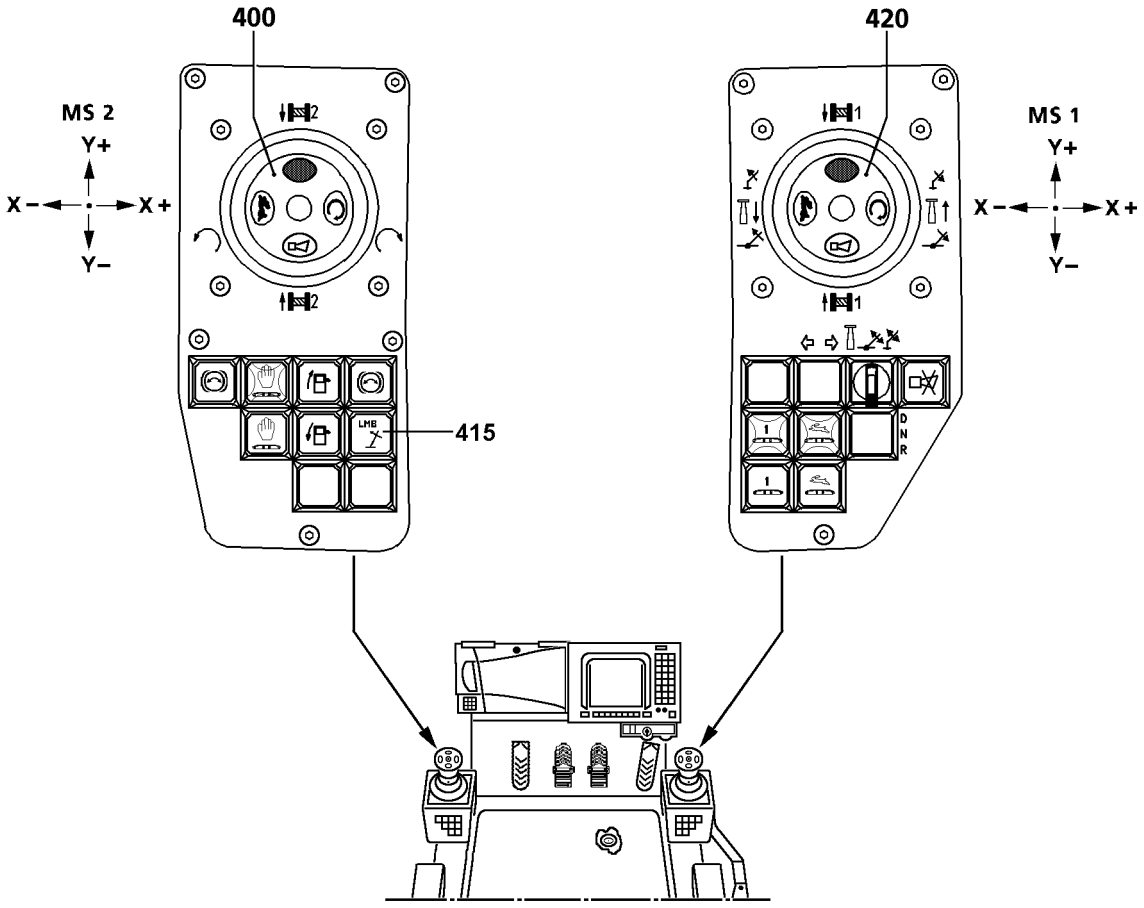


Fig.198634

5.1.2 Bypassing the load moment limiter

If the maximum permissible load moment is exceeded, the LICCON overload protection turns off all crane movements that increase the load moment. This shut off can be bypassed with the bypass key button **D** in position „right touching“, see section „Actuate bypass key button D on the LICCON monitor“.

DANGER
Increased accident risk when bypassing the overload protection!
If the overload protection is bypassed, there is no further protection against crane overload!
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!
All LICCON overload protection displays remain functional!

- ▶ It is only permitted to bypass the overload protection during assembly or in emergencies!
- ▶ The bypass key button **D** may only be actuated by persons who are aware of the effects of their acts regarding the bypass of the overload protection!
- ▶ Bypassing the overload protection requires the presence of the crane supervisor and must be performed with utmost caution!
- ▶ Crane operation with bypassed overload protection is prohibited!

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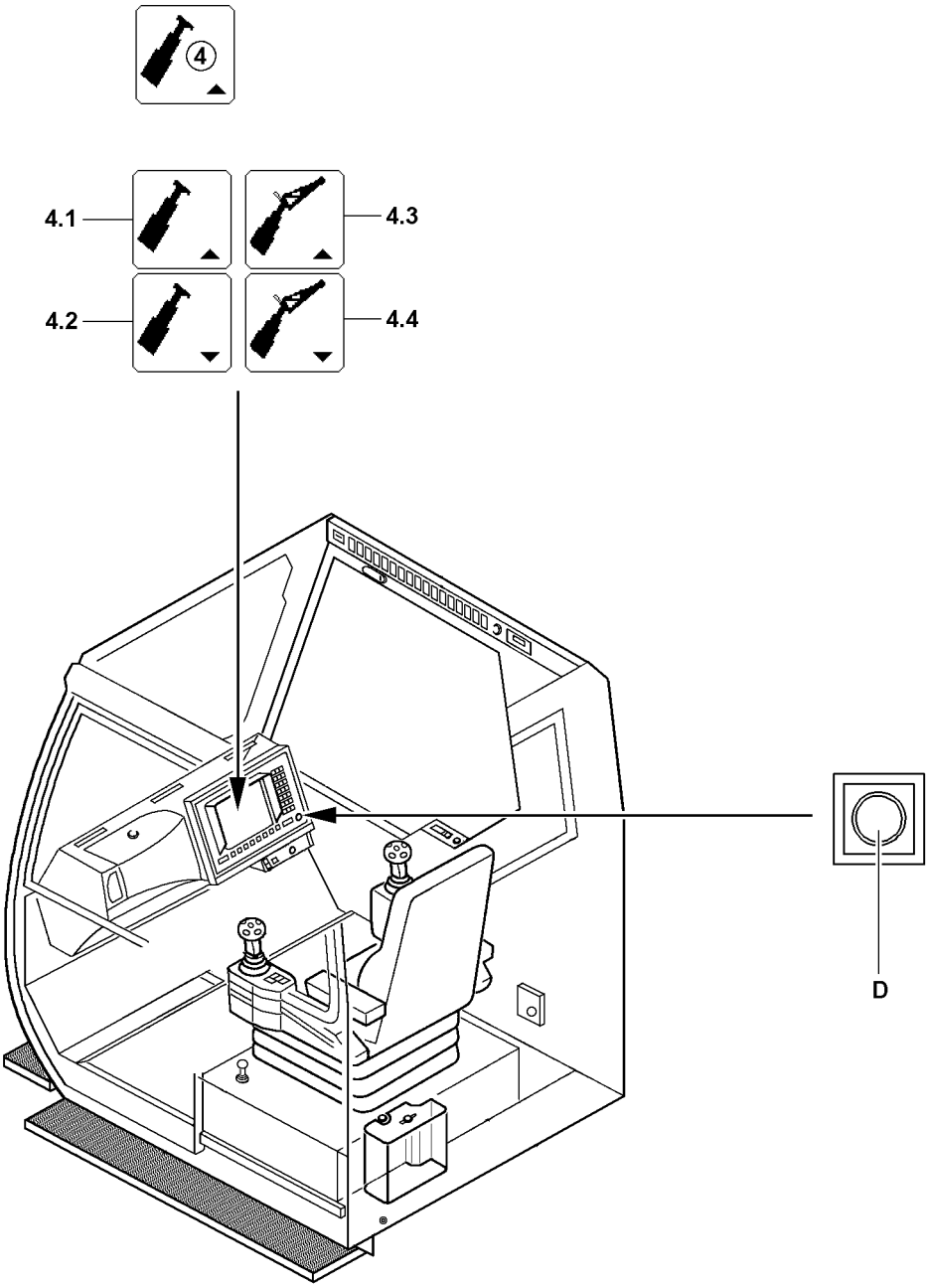

LWE/LTR 1100-005/17505-03-02/en

Fig.107323

5.1.3 Bypassing shut-off upper / lower limit angle

If the angle exceeds or falls below the programmed limit angle for a given load chart when luffing the boom up or down, the crane movements „luffing up“ or „luffing down“ are shut off by the load torque limiter. The limit angle symbol **4** appears on the LICCON monitor and the arrow for the upper **4.1** or lower limit angle **4.2** flashes.

If the folding jib is attached and configured, the shut-off function remains the same, however icon **4.3** and icon **4.4** appear for the upper and lower limit angle respectively.

The shut off can be bypassed with the bypass key button **D** on the monitor, see section „Actuate bypass key button D on the LICCON monitor “.

DANGER
Increased accident risk when bypassing the load moment limiter!
If the shut-off for the upper / lower limit angle is bypassed, there is a risk that the boom will lie outside the range of the load chart if it continues to be luffed up or down. This may lead to dangerous situations and could even cause the crane to topple over.
Personnel could be killed or seriously injured.

- ▶ The shut-off for the upper / lower limit angle should only be bypassed if the crane supervisor is present, and with the help of a „guide“. The guide must be in direct contact with the crane operator and must continually monitor the crane.
- ▶ Carry out all crane movements with utmost caution!

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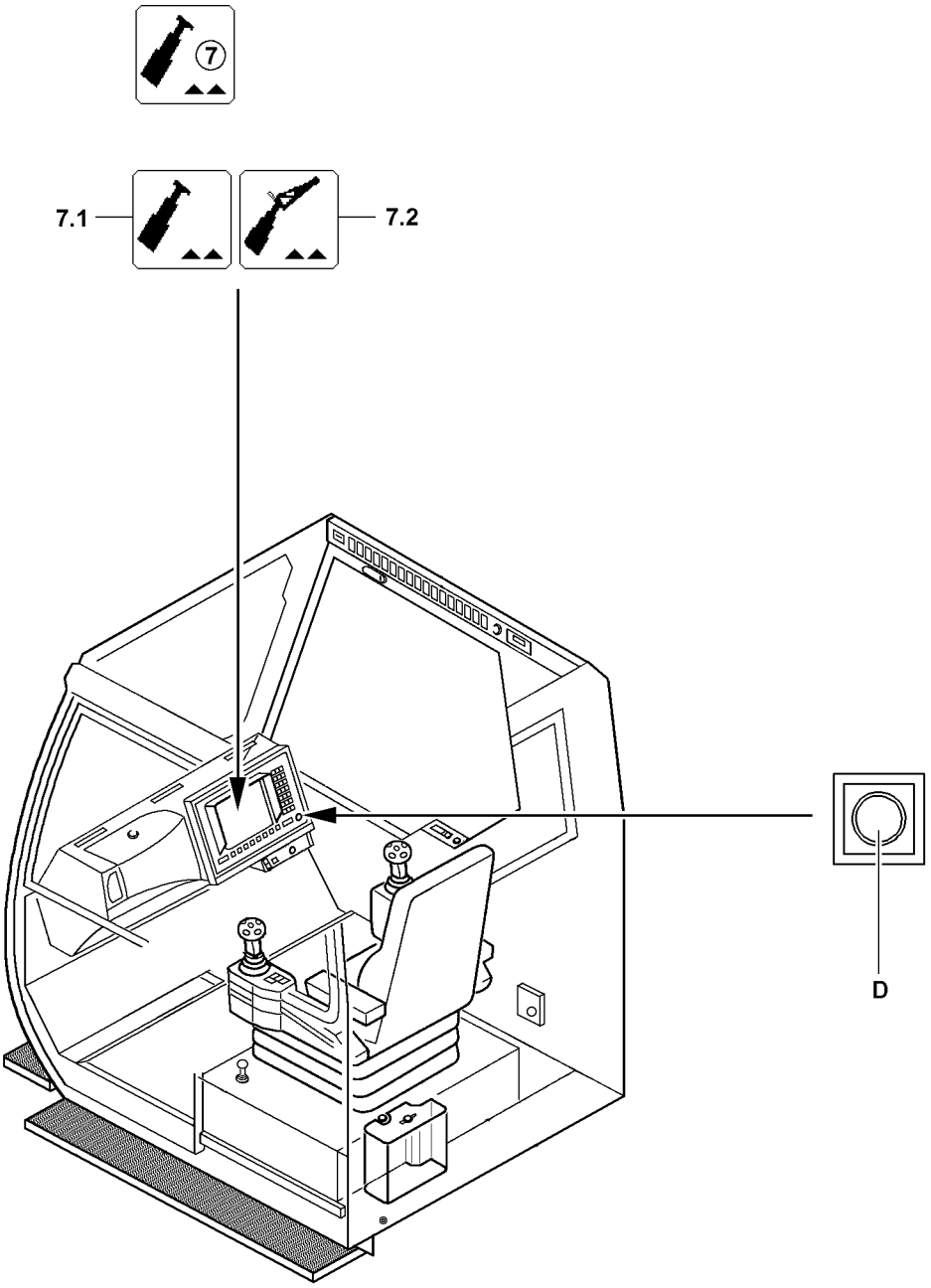

LWE/LTR 1100-005/17505-03-02/en

Fig.107324

5.1.4 Bypassing proximity switch „Steep boom“.

If the boom is luffed up to just before the block position of the luffing cylinder, a proximity switch on the turntable will shut off the „luffing up“ movement of the crane. The „Boom steep“ icon **7** appears on the LICCON monitor and the double arrow flashes.

The icon **7.1** appears on the LICCON monitor if a shut-off occurs during telescoping operation. If the folding jib is attached and configured, the icon **7.2** is displayed.

The shut off can be bypassed with the bypass key button **D** on the monitor, see section „Actuate bypass key button D on the LICCON monitor “.

DANGER
Increased accident risk when bypassing the load moment limiter!
If the boom steep shut-off is bypassed, there is a risk that further luffing will cause the block position of the luffing cylinder to be reached. This can damage the luffing cylinder and could even cause the crane to topple over.
Personnel could be killed or seriously injured.

- ▶ The boom steep shut-off should only be bypassed if a crane supervisor is present, and with the help of a „guide“. The guide must be in direct contact with the crane operator and must continually monitor the crane.
- ▶ Carry out all crane movements with utmost caution!

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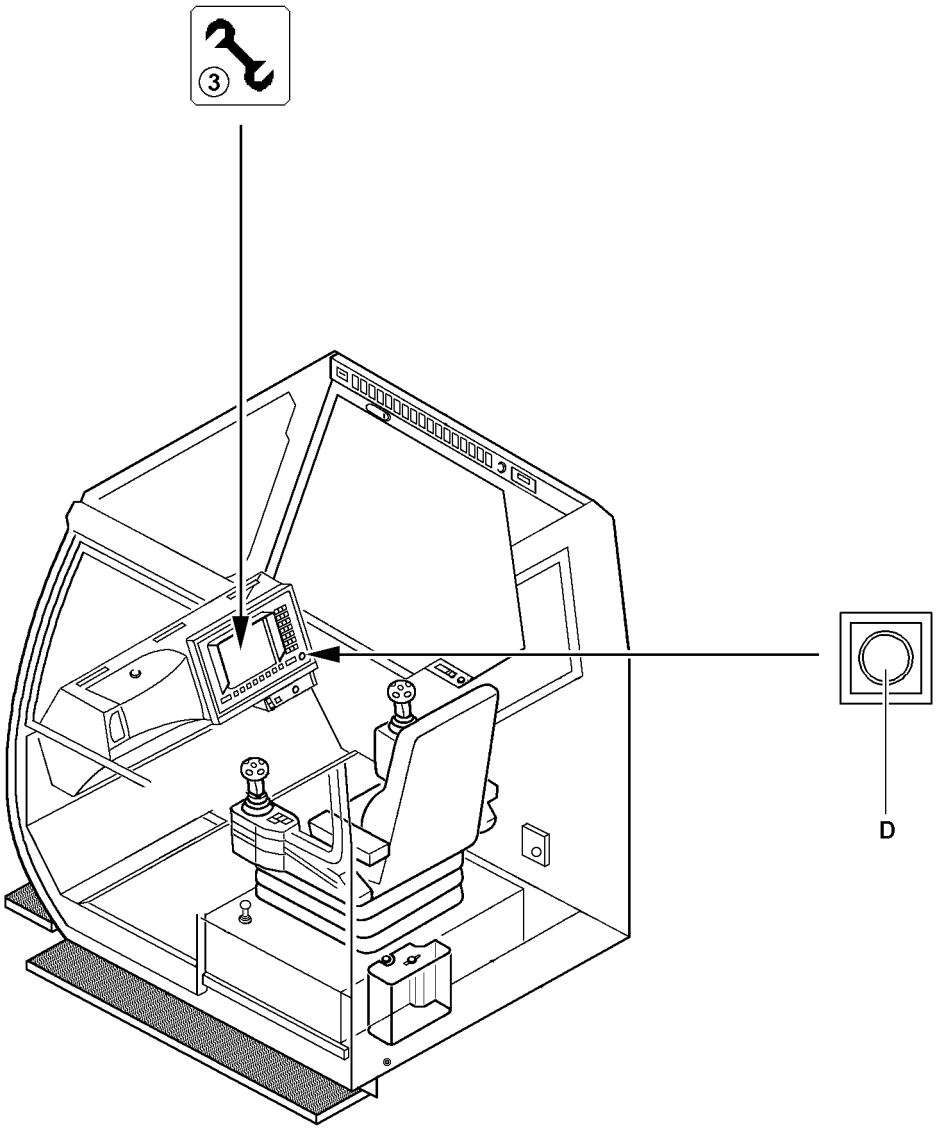

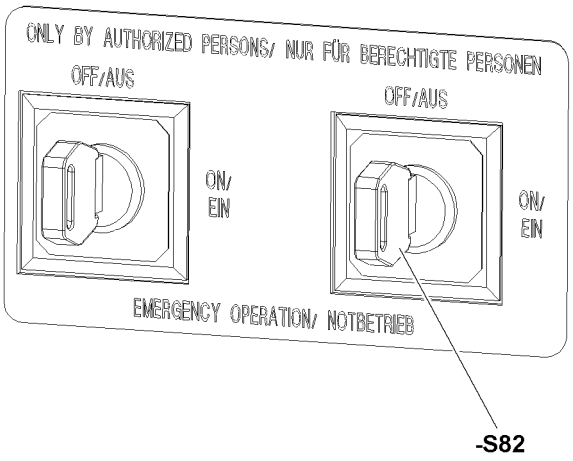

LWE/LTR 1100-005/17505-03-02/en

Fig.107326

5.1.5 Operating the bypass key button D on the LICCON monitor

Make sure that the following prerequisites are met:
- the master switches have **not** been operated,
- one of the following shut offs is active:
  - hoist-top shut off,
  - load moment limiter,
  - shut off upper / lower limit angle,
  - proximity switch „Steep boom“.

Note
▶ It is **not** possible to bypass the hoist limit switch without performing an active shut-off.

▶ Turn the bypass key button **D** to the right and hold.

Result:

- The assembly icon **3** on the LICCON monitor blinks.
- An acoustic signal sounds.
- The red flashing beacon on the crane cab blinks.
- The working speed is reduced for all functions, except for the slewing gear and the hydraulic folding jib*****.

Problem remedy
When the shut offs „upper / lower limit angle“, „steep boom“ cannot be bypassed with the bypass key button **D**?
▶ Bypass them with key button **-S82** in the control cabinet.
▶ See section „Bypass with key button -S82***** in the control cabinet“.

The bypass function turns off:
- If the bypass key button **D** is no longer pressed.
- If the bypass key button **D** is actuated but all master switches are in neutral position for 10 seconds.

▶ The bypass function turns off.

Result:

- The assembly symbol **3** on the LICCON monitor extinguishes.
- The acoustic signal is turned off.
- The red flashing beacon on the crane cab extinguishes.
- The working speed is reduced***** until the master switches are in neutral position, after releasing the bypass key button **D**.

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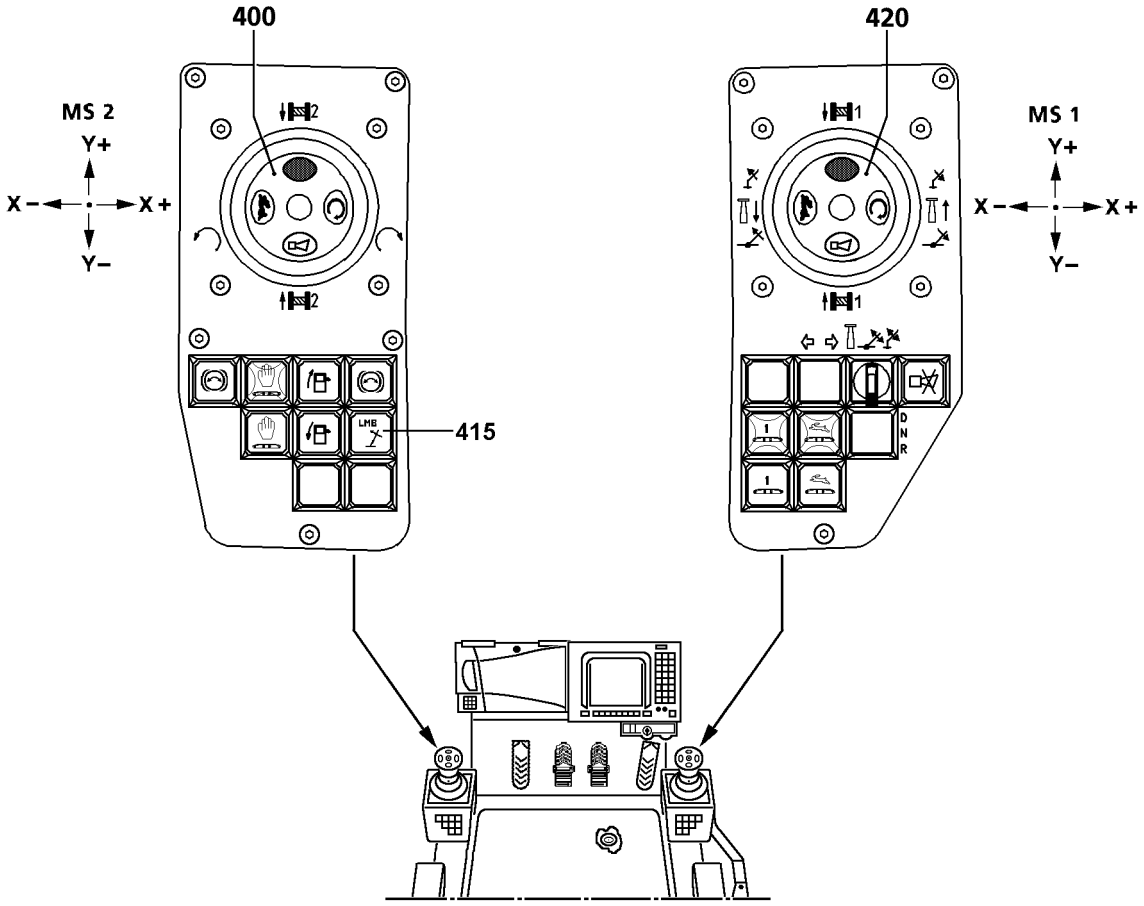

LWE/LTR 1100-005/17505-03-02/en

Fig.107362

5.2 Bypassing the load torque limiter by pressing button 415 on the control panel

5.2.1 Bypassing „Luff up at overload“

In case of an overload, the „luffing up“ crane movement is disabled, even though this is a load torque-reducing crane movement with a freely suspended load.

DANGER
Risk of accident from overloading and toppling the crane!
Never hoist a load by raising the boom if, when trying to lift the load, the hoist gear would be turned off by the load torque limiter.

▶ Bypass the limit range only if the LICCON overload protection with a freely suspended load does not report an overload and if the boom radius is not less than 3.5 m.

Ensure that the following prerequisite is met:
– the master switches have **not** been operated,
– a shut off mechanism is active.

In order to still perform this crane movement:

▶ Operate button **415** and deflect the master switch „MS1 **420**“ in X-direction.

Result:

– The LICCON overload protection is inactive.
– The boom is luffed up at a reduced* working speed.

The bypass function turns off:
– If the button **415** is no longer pressed.
– If all master switches are in neutral position for 10 seconds.

▶ The bypass function turns off.

Result:

– The LICCON overload protection is active.
– The working speed is reduced* until the master switches are in neutral position, after releasing the button **415**.

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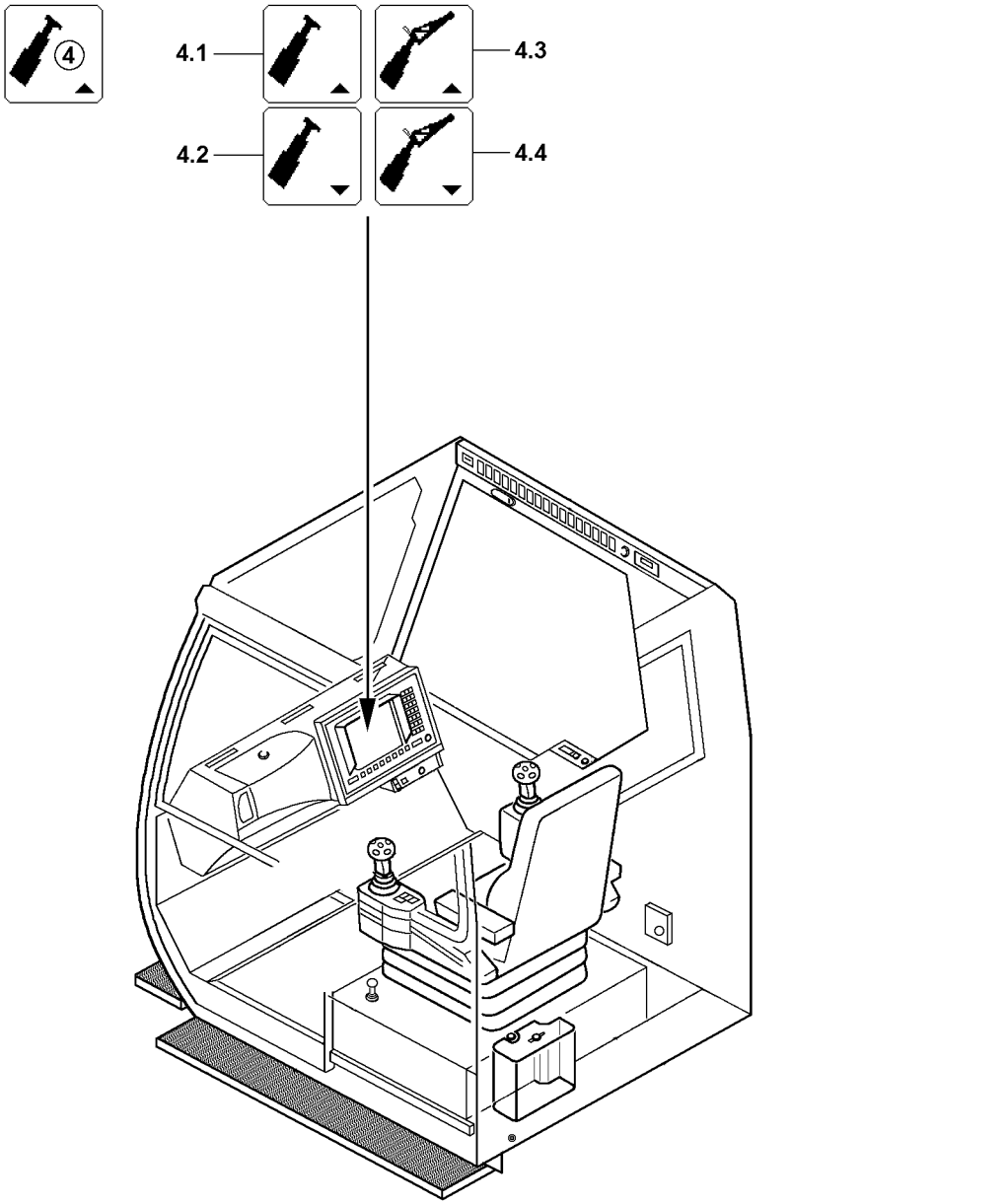

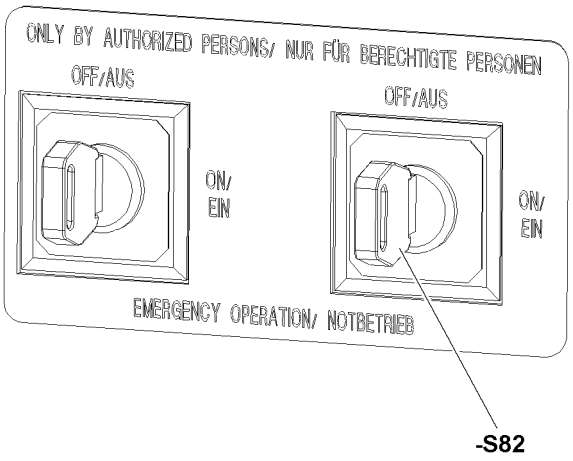

LWE/LTR 1100-005/17505-03-02/en

Fig.107328

5.3 Bypass with key button -S82* in control cabinet

With the key button **-S82** in the control cabinet, the following shut offs can be bypassed:
- Bypassing shut-off upper / lower limit angle.
- Bypassing proximity switch „Steep boom“.

The key button **-S82** in the control cabinet has two positions:
- Operating position (not pressed): Crane is in normal operation.
- Position to right (touching): Load moment limitation bypass is activated (self-retaining).

5.3.1 Bypassing shut-off upper / lower limit angle

If the angle exceeds or falls below the programmed limit angle for a given load chart when luffing the boom up or down, the crane movements „luffing up“ or „luffing down“ are shut off by the load torque limiter. The limit angle symbol **4** appears on the LICCON monitor and the arrow for the upper **4.1** or lower limit angle **4.2** flashes.

If the folding jib is attached and configured, the shut-off function remains the same, however icon **4.3** and icon **4.4** appear for the upper and lower limit angle respectively.

The shut off can be bypassed via the key button **-S82** in the control cabinet with reduced***** working speed, see section „Bypass of load moment limiter emergency operation with key button -S82*****“.

DANGER
Increased accident risk when bypassing the load moment limiter!
If the shut-off for the upper / lower limit angle is bypassed, there is a risk that the boom will lie outside the range of the load chart if it continues to be luffed up or down. This may lead to dangerous situations and could even cause the crane to topple over.
Personnel could be killed or seriously injured.
- ▶ The shut-off for the upper / lower limit angle should only be bypassed if the crane supervisor is present, and with the help of a „guide“. The guide must be in direct contact with the crane operator and must continually monitor the crane.
- ▶ Carry out all crane movements with utmost caution!

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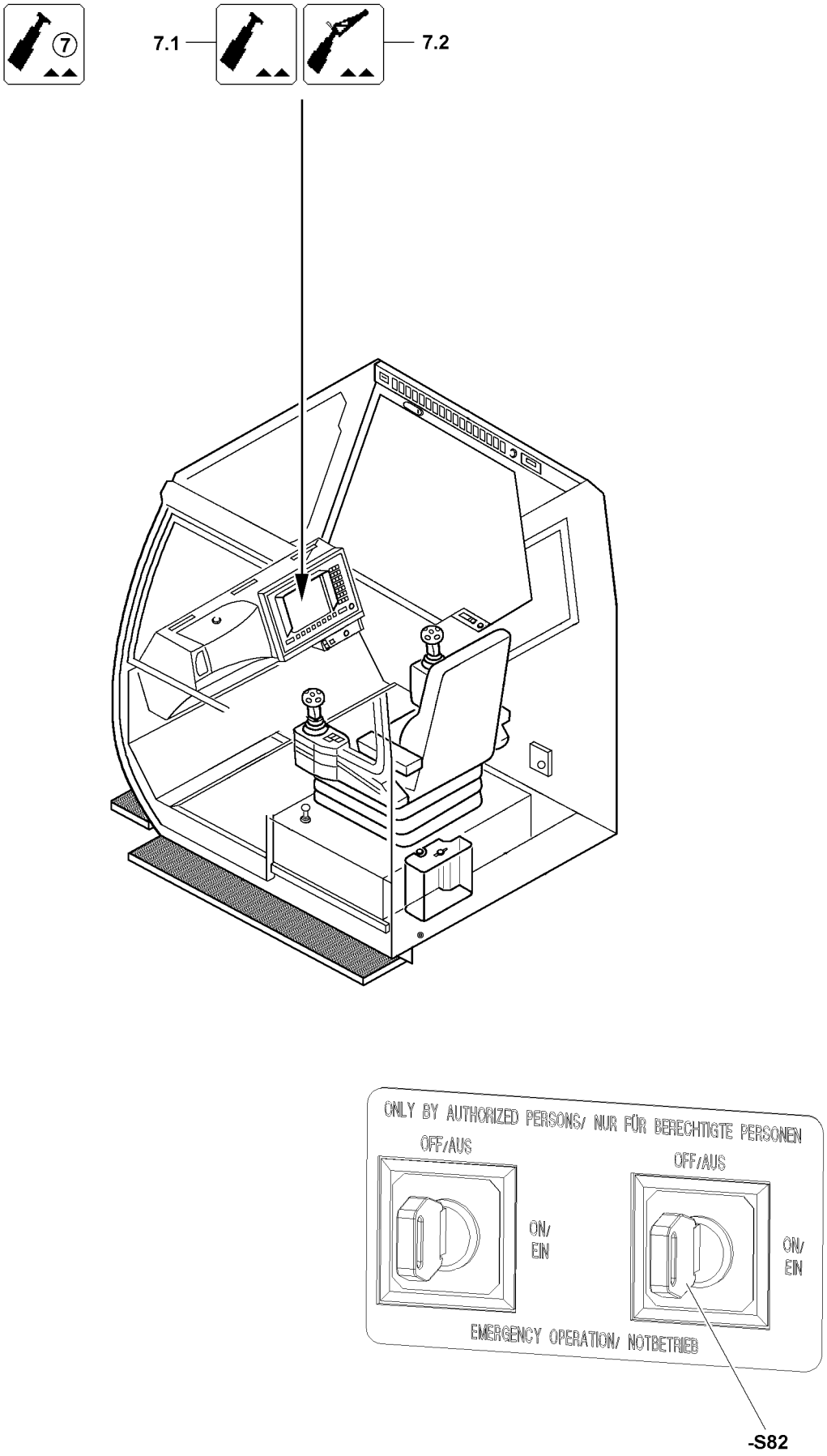

LWE/LTR 1100-005/17505-03-02/en

Fig.107329

5.3.2 Bypassing proximity switch „Steep boom“

If the boom is luffed up to just before the block position of the luffing cylinder, a proximity switch on the turntable will shut off the „luffing up“ movement of the crane. The „Boom steep“ icon **7** appears on the LICCON monitor and the double arrow flashes. In addition, the shut off is shown by an acoustical signal.

The icon **7.1** appears on the LICCON monitor if a shut-off occurs during telescoping operation. If the folding jib is attached and configured, the icon **7.2** is displayed.

The shut off can be bypassed via the key button **-S82** in the control cabinet with reduced***** working speed, see section „Bypass of load moment limiter emergency operation with key button -S82*****“.

DANGER
Increased accident risk when bypassing the load moment limiter!
If the boom steep shut-off is bypassed, there is a risk that further luffing will cause the block position of the luffing cylinder to be reached. This can damage the luffing cylinder and could even cause the crane to topple over.
Personnel could be killed or seriously injured.

- ▶ The boom steep shut-off should only be bypassed if a crane supervisor is present, and with the help of a „guide“. The guide must be in direct contact with the crane operator and must continually monitor the crane.
- ▶ Carry out all crane movements with utmost caution!

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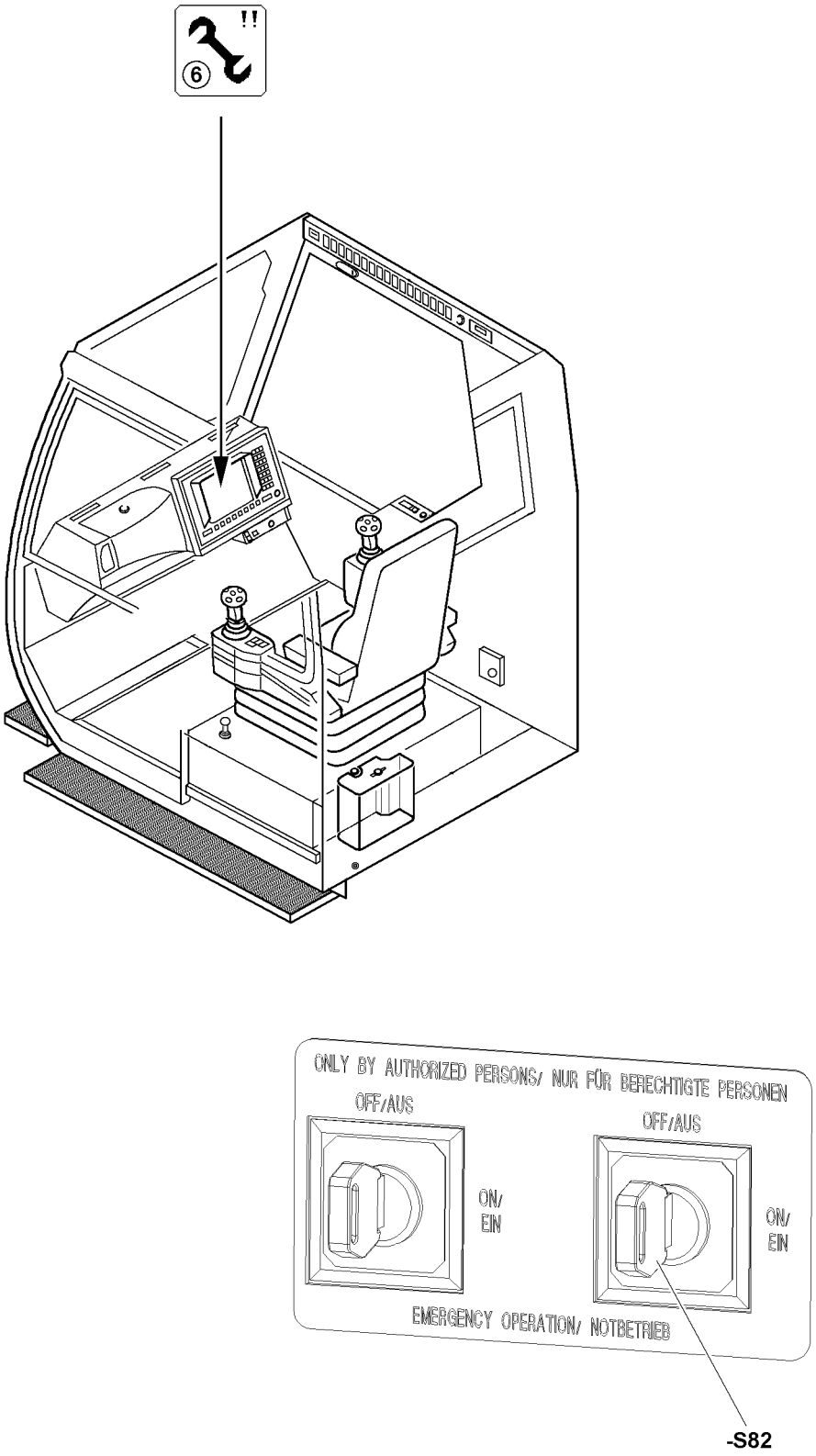

LWE/LTR 1100-005/17505-03-02/en

Fig.107334

5.3.3 Bypass of „Load moment limiter emergency operation“ with key button -S82*

Ensure that the following prerequisite is met:
- the master switches have **not** been operated,
- one of the following shut offs is active:
  - shut off upper / lower limit angle,
  - proximity switch „steep boom“.

▶ Turn the key button **-S82** to the right to the stop and release.

Result:

- The LICCON overload protection is inactive.
- The Assembly / bypass load torque limitation symbol **6** in the LICCON monitor blinks.
- An acoustic signal sounds.
- The red flashing beacon on the crane cab blinks.
- The working speed is reduced* for all functions, except for the slewing gear and the hydraulic folding jib.

The bypass is active for maximum 30 minutes. Then it turns off automatically after the last deflection of a master switch.

Note

▶ If a movement is initiated via the master switch shortly before the maximum bypass time of 30 minutes is over, then the bypass time is extended until the master switch is again in zero position.

The bypass function turns off:
- When all master switches are for 10 seconds in neutral position after the last deflection.

▶ The bypass function turns off.

Result:

- The LICCON overload protection is active.
- The Assembly / bypass load moment limitation icon **6** in the LICCON monitor turns off.
- The acoustic signal is turned off.
- The working speed is reduced* until the master switches are in neutral position, after turning the bypass off.
- The red beacon on the crane cab turns off after ignition off.

If the bypass is to be reactivated:

▶ Turn the key button **-S82** to the right to the stop and release.

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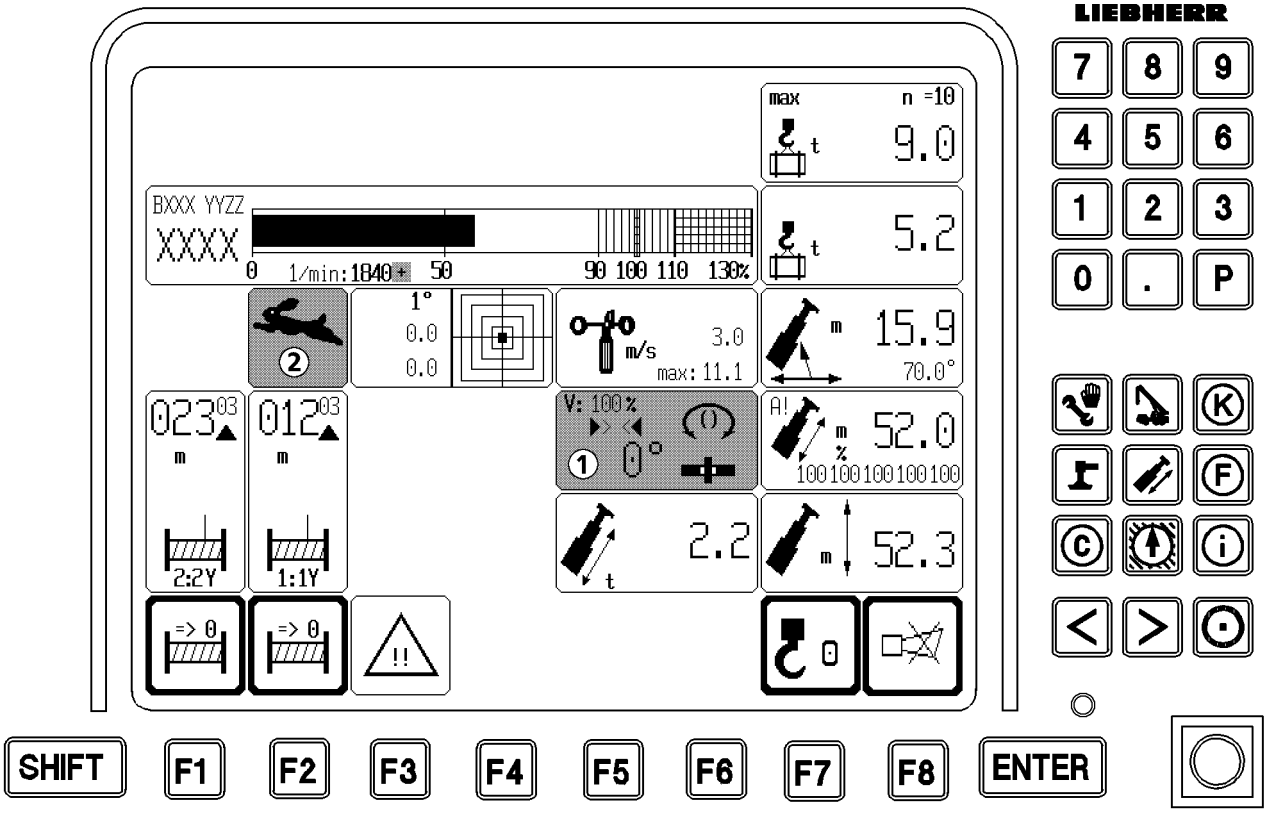

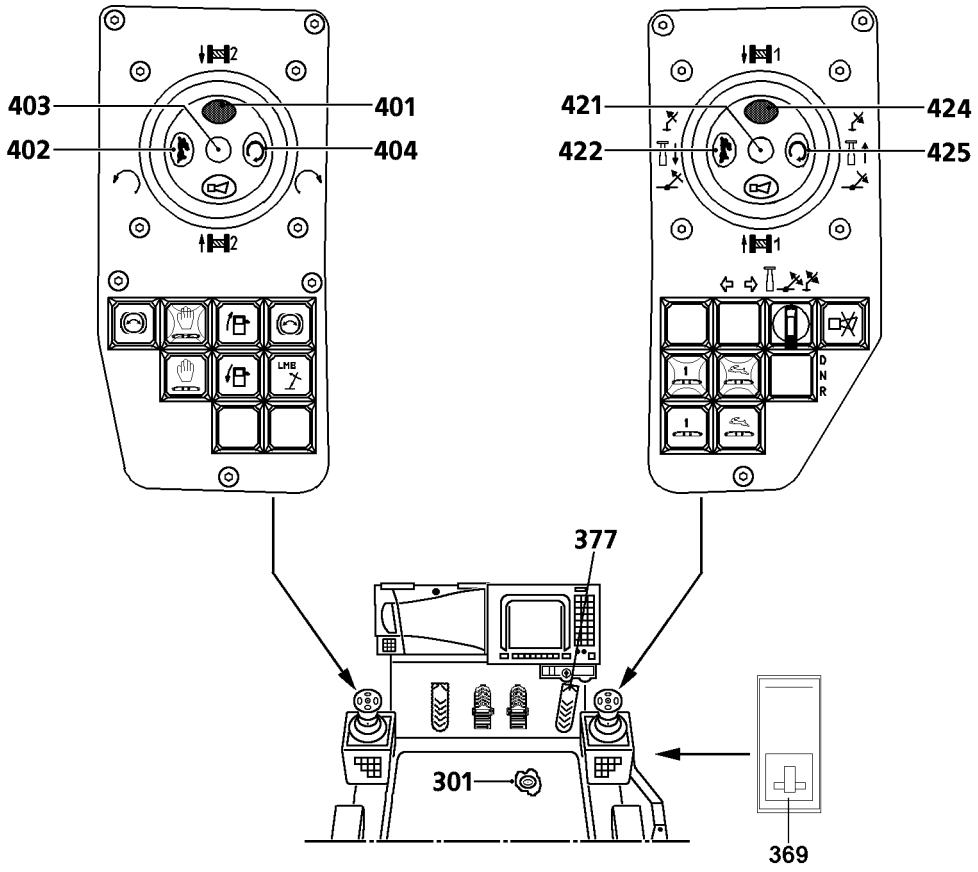

Fig.111650

1 General

Make sure that the following prerequisites are met:
- The crane is aligned in horizontal direction.
- The counterweight is attached and secured according to the data in the load chart.
- The ground is able to carry the weight of the crane, the load and the load tackle.
- The central ballast is attached and secured according to the data in the load chart.
- The hook block is correctly reeved as shown in reeving plan.
- The crane engine is running.
- All safety devices have been adjusted according to the data in the load chart.
- There are no persons or objects in the danger zone.
- The crawlers are pushed out, pinned and wedged to a track width as specified in the load chart.

DANGER
The crane can topple over!
The reduced or retracted track reduces the stability of the crawler crane. Due to operational errors during crane operation or driving, the crawler crane can topple over and fatally injure personnel!
- ▶ Crane operation and „driving the crawler with load“ is permitted for reduced or retracted track, if **extra load charts** are programmed for this case!
- ▶ Crane operation and „driving the crawler with load“ is strictly prohibited for reduced or retracted track, if **no extra load charts** are programmed for this case!

DANGER
Risk of accident!
- ▶ In order to protect the crane and reduce the danger of accidents always use the master switch slowly and sensitively.
- ▶ Ensure that there are no obstacles in the working range of the crane and that there are no persons within the danger zone.

1.1 Superstructure

1.1.1 Locking the superstructure

▶ Press the button **369**.

Result:

– The locking mechanism of the superstructure is locked.
The icon **1** appears on the LICCON monitor.

1.1.2 Releasing the superstructure locking mechanism

Once the superstructure is locked:
▶ Press the button **369** again.

Result:

– The locking mechanism of the superstructure is unlocked.

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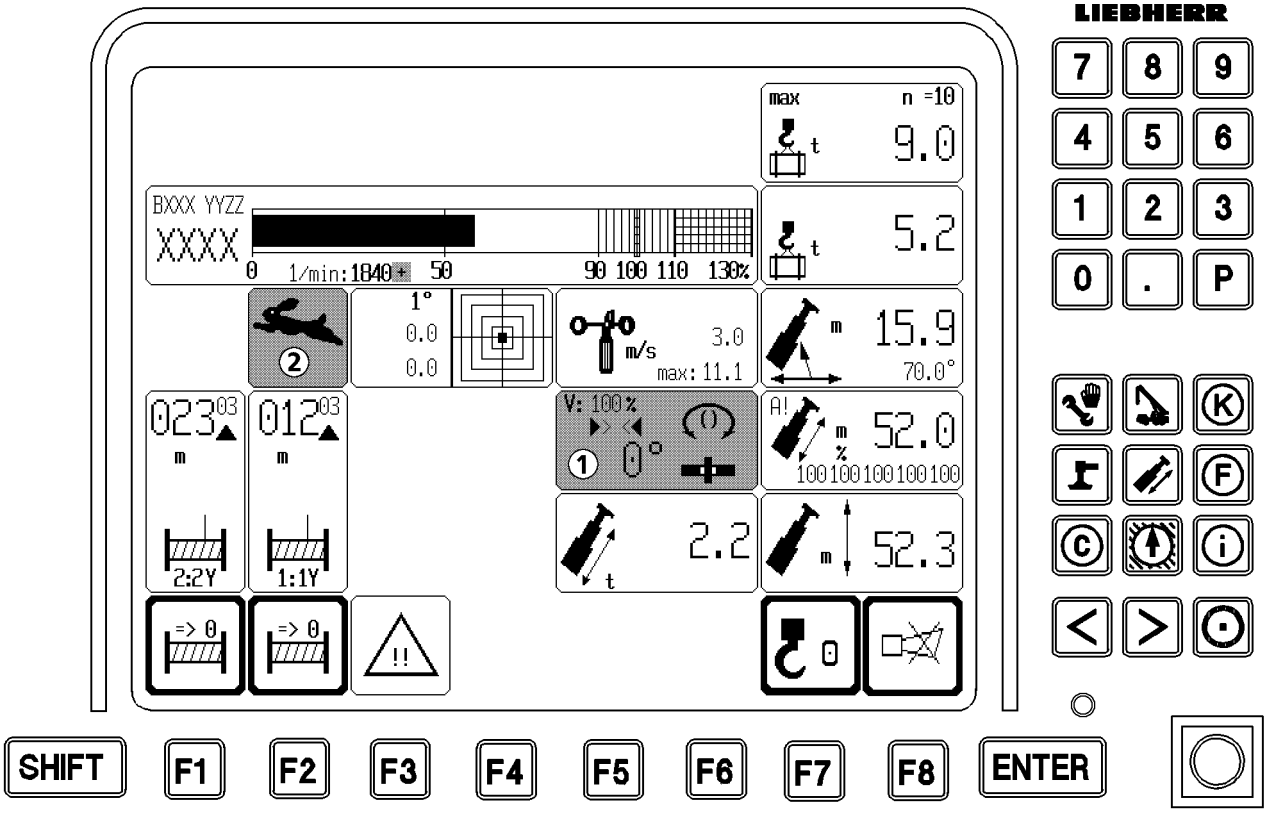

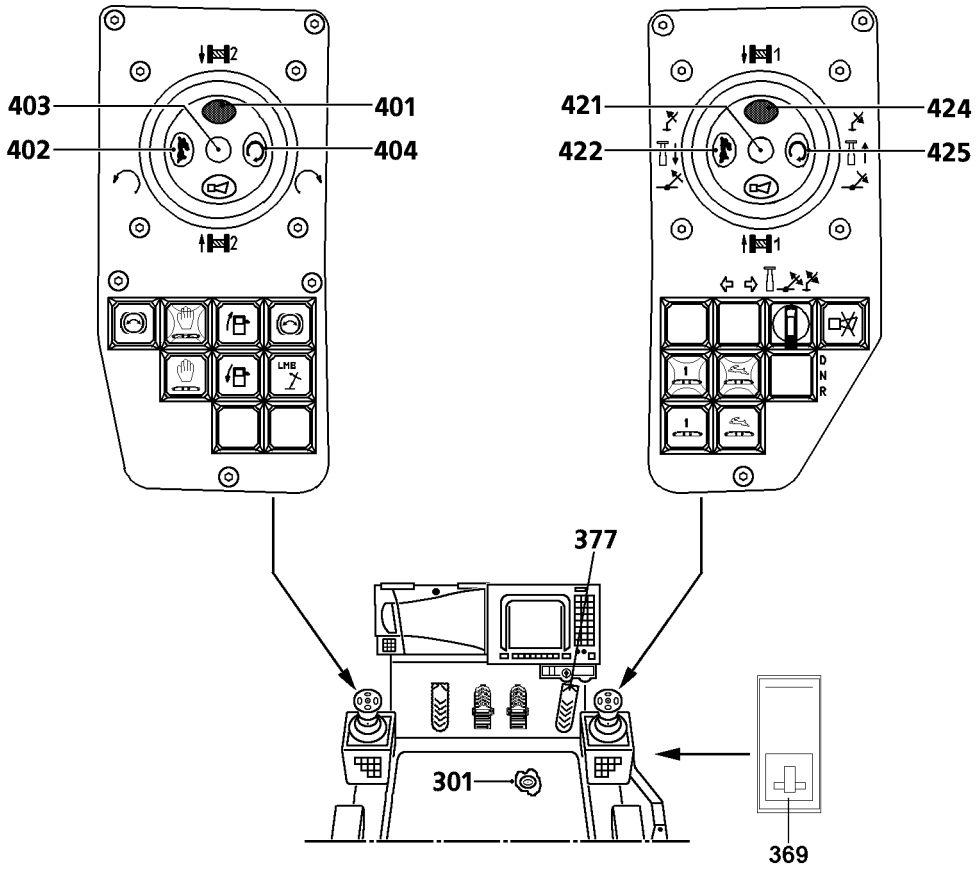

Fig.111650

1.2 Engine RPM

1.2.1 Locking the engine RPM

Locking engine RPM relieves the crane operator if he needs to work for an extended period with constant RPM. The engine control can be locked in any position.

▶ Press the pedal **377** down for the engine regulation until the desired RPM is reached.
▶ Press the button **404**.
or
Press the button **425**.

Result:

– The pedal **377** is locked.
– The „+“ symbol appears on the monitor.

1.2.2 Releasing the engine rpm lock

If the engine rpm is locked:
▶ Press the button **404** again.
or
Press the button **425** again.

Result:

– The lock is released.
– The „+“ symbol extinguishes on the monitor.

1.3 Rapid gear „crawler operation and crane operation“

1.3.1 Adding rapid gear „crawler operation and crane operation“

Using the button **402** or the button **422** will increase the speed of the crane movement for „luffing up“ and „lift / lower“.

DANGER
Accident hazard in the event of one to three strand reeving!
▶ Do **not** turn the rapid gear on if the crane is loaded to more than 50 % of its maximum permitted load carrying capacity for the respective radius.

▶ Press the button **402**.
or
Press the button **422**.

Result:

– The rapid gear „crawler operation and crane operation“ is added.
The icon **2** appears on the LICCON monitor.

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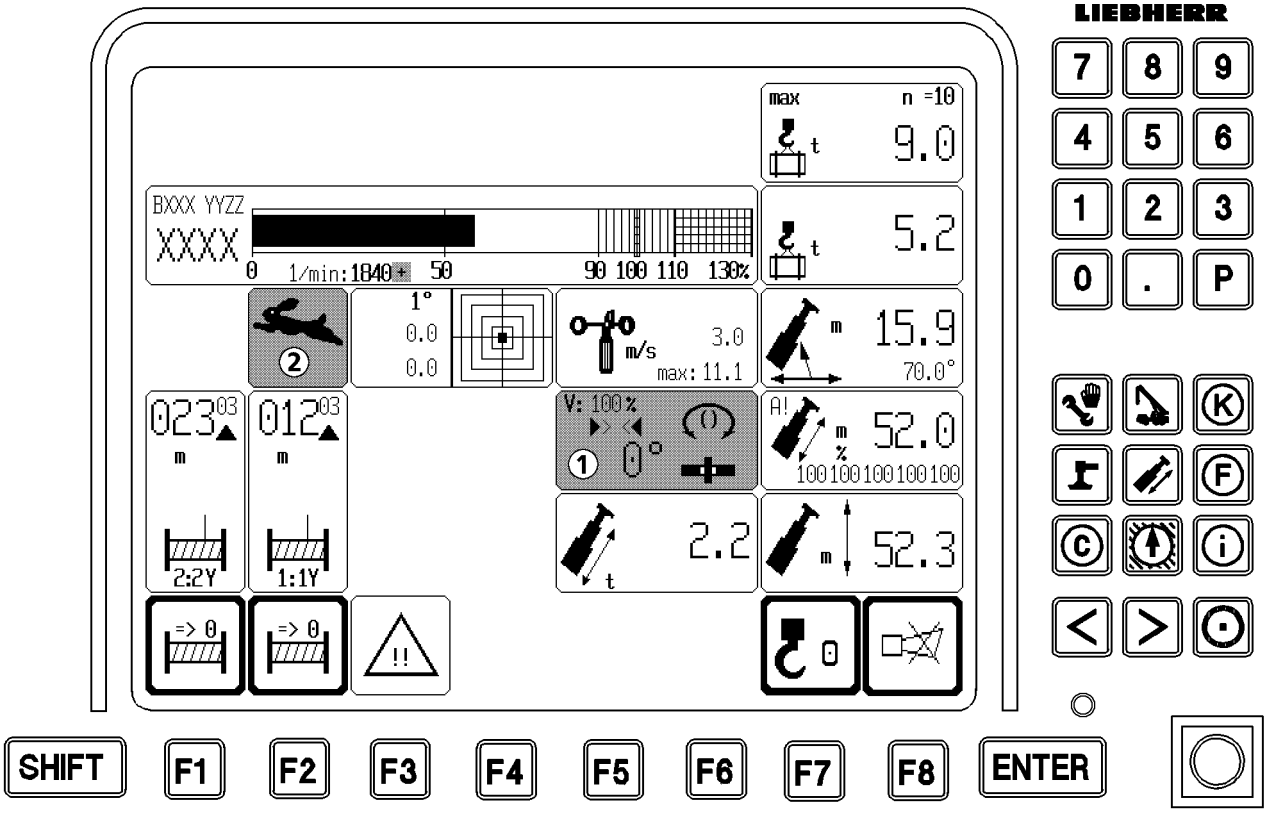

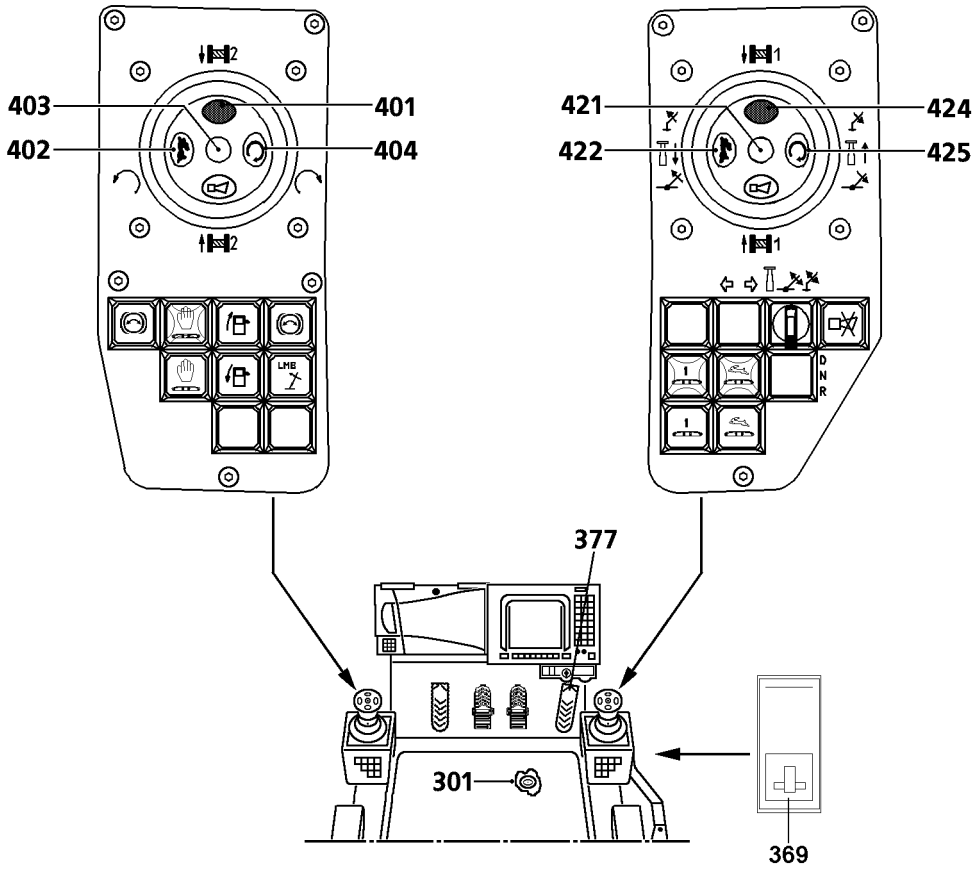

Fig.111650

1.3.2 Turning off rapid gear „crawler operation and crane operation“

When the rapid gear „crawler operation and crane operation“ is added:

▶ Press the button **402** again.
or
Press the button **422** again.

Result:

– The rapid gear „crawler operation and crane operation“ is turned off.
The icon **2** turns off on the LICCON monitor.

1.4 Vibration sensor

By adding the vibration sensor, a crane movements can be detected by vibration of the master switch.

Make sure that the following prerequisite is met:
– The seat contact switch **301** is activated.

1.4.1 Winch 1

▶ Press the button **424**.

Result:

– The vibration sensor **421** is turned on.

When the vibration sensor **421** is turned on:
▶ Press the button **424** again.

Result:

– The vibration sensor **421** is turned off.

1.4.2 Winch 2 or slewing gear

If winch 2 and the slewing gear are operated, the vibration sensor **403** will react to the first deflecting movement.

▶ Press the button **401**.

Result:

– The vibration sensor **403** is turned on.

When the vibration sensor **401** is turned on:
▶ Press the button **401** again.

Result:

– The vibration sensor **403** is turned off.

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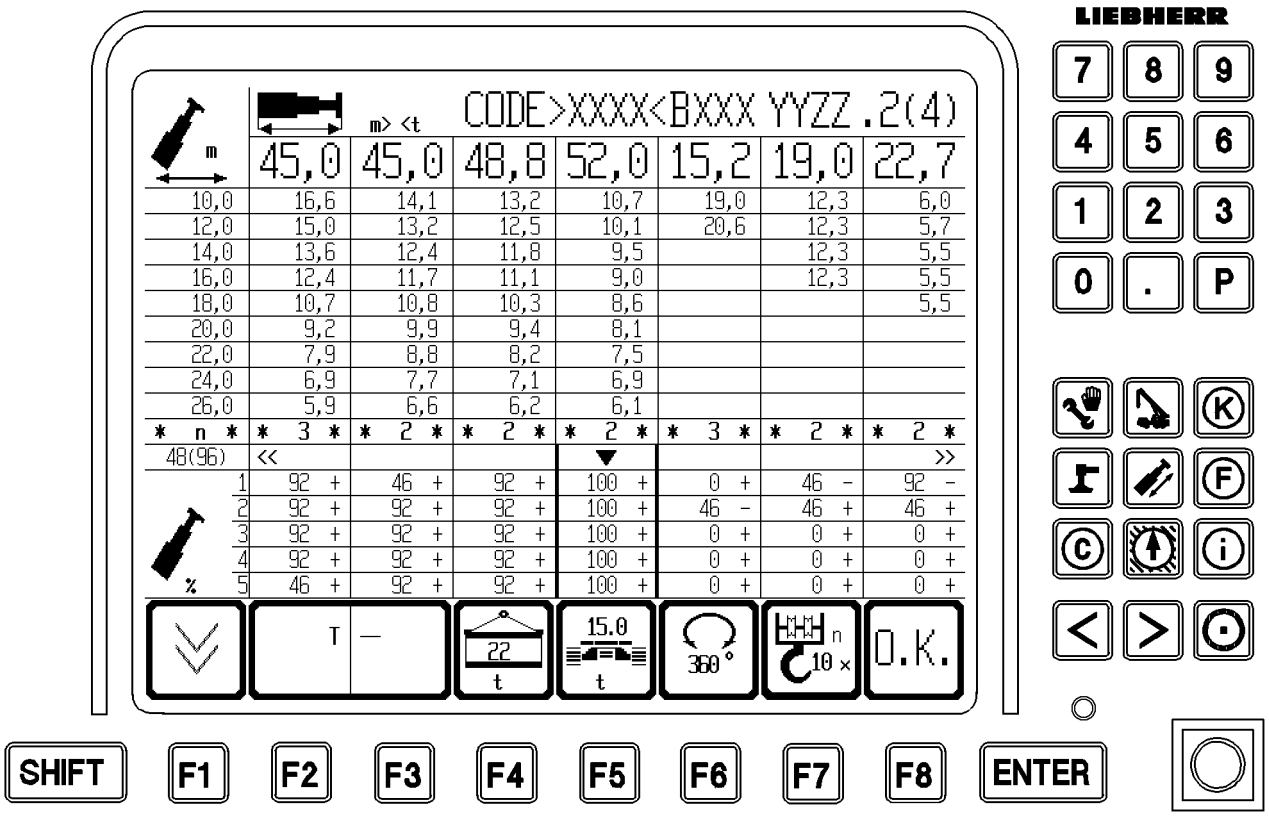

Fig.102854

2 LICCON computer system

See chapter 4.02.

2.1 The crane engine is running.

Make sure that the following prerequisites are met:
- The batteries are charged by the alternator.
- A stable voltage is present.

The electric crane control system and the LICCON computer system are turned on automatically. A self test of the LICCON computer system follows.

▶ Await the self test.

Result:

– After a few seconds the configuration screen appears on the monitor.

Problem remedy
The configuration screen does not appear on the monitor?
A fault was detected during the self test of the LICCON computer system.
▶ See chapter 4.02.

2.2 Stand-by mode

No crane movements are possible. See chapter 4.02.

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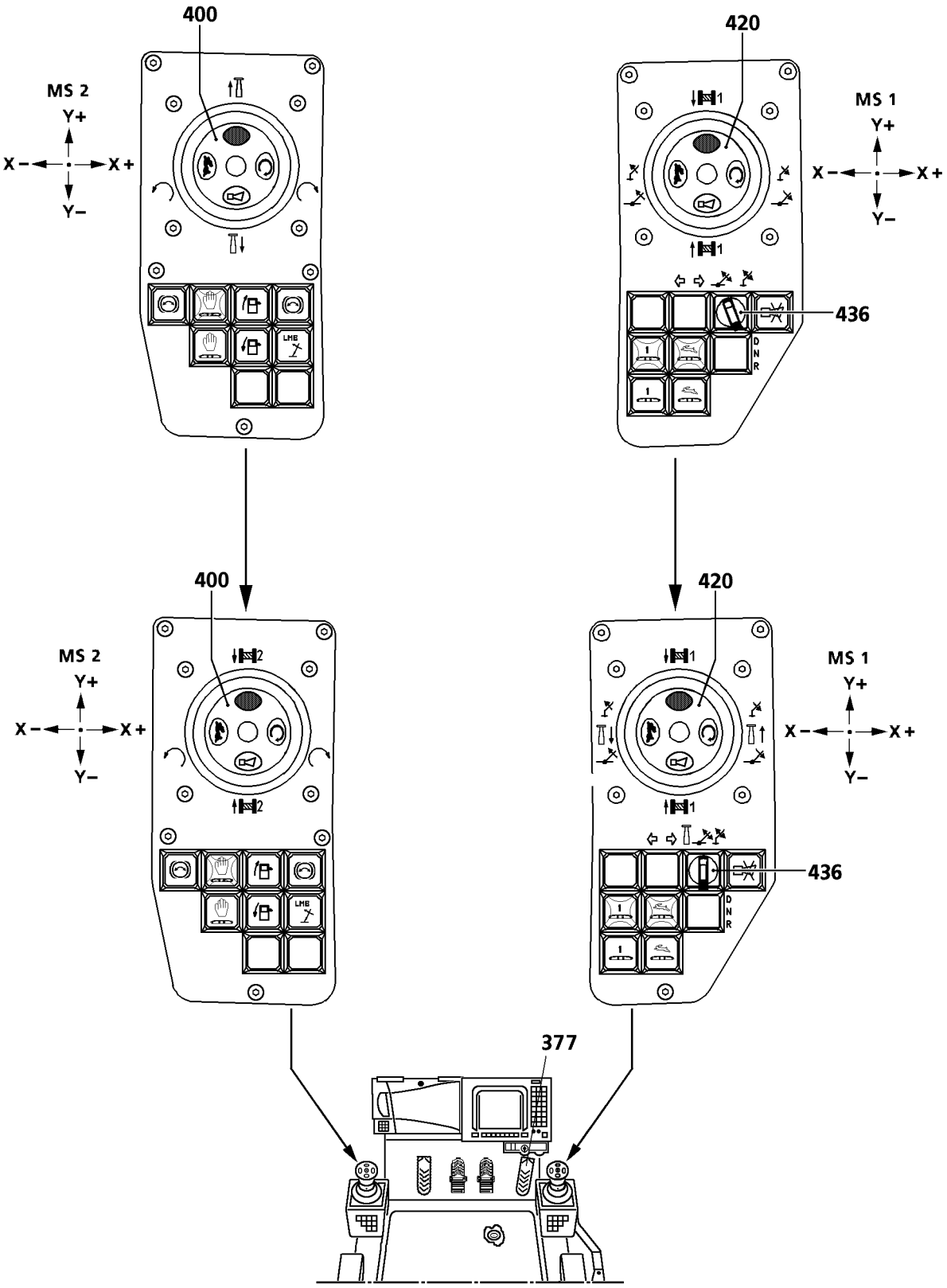

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Fig.198637

3 Luffing

Speed of crane movement „Luffing“ is controlled by the deflection of master switch 1 **420** and by the pedal **377** of the engine control.

DANGER
Crane can be damaged or topple over!
▶ If an attempt to lift a load with the hoist gear causes the LICCON overload protection to turn off, then the load may not be lifted by luffing up the boom.

3.1 Luffing the telescopic boom

In the „Control Parameter program“, it is possible to preselect the maximum luffing speed of the telescopic boom.

See chapter 4.02, section „Control Parameter“.

3.1.1 Luffing the telescopic boom on cranes with one winch

Make sure that the following prerequisite is met:
– The rotary switch **436** is at position left „luffing telescopic boom“.
– The seat contact switch is activated.

▶ Deflect the master switch 1 **420** in direction X-.

Result:

– The telescopic boom is luffed up.

▶ Deflect the master switch 1 **420** in direction X+.

Result:

– The telescopic boom is luffed down.

3.1.2 Luffing the telescopic boom on cranes with two winches

Make sure that the following prerequisite is met:
– The rotary switch **436** is at center position „luffing telescopic boom“.
– The seat contact switch is activated.

▶ Deflect the master switch 1 **420** in direction X-.

Result:

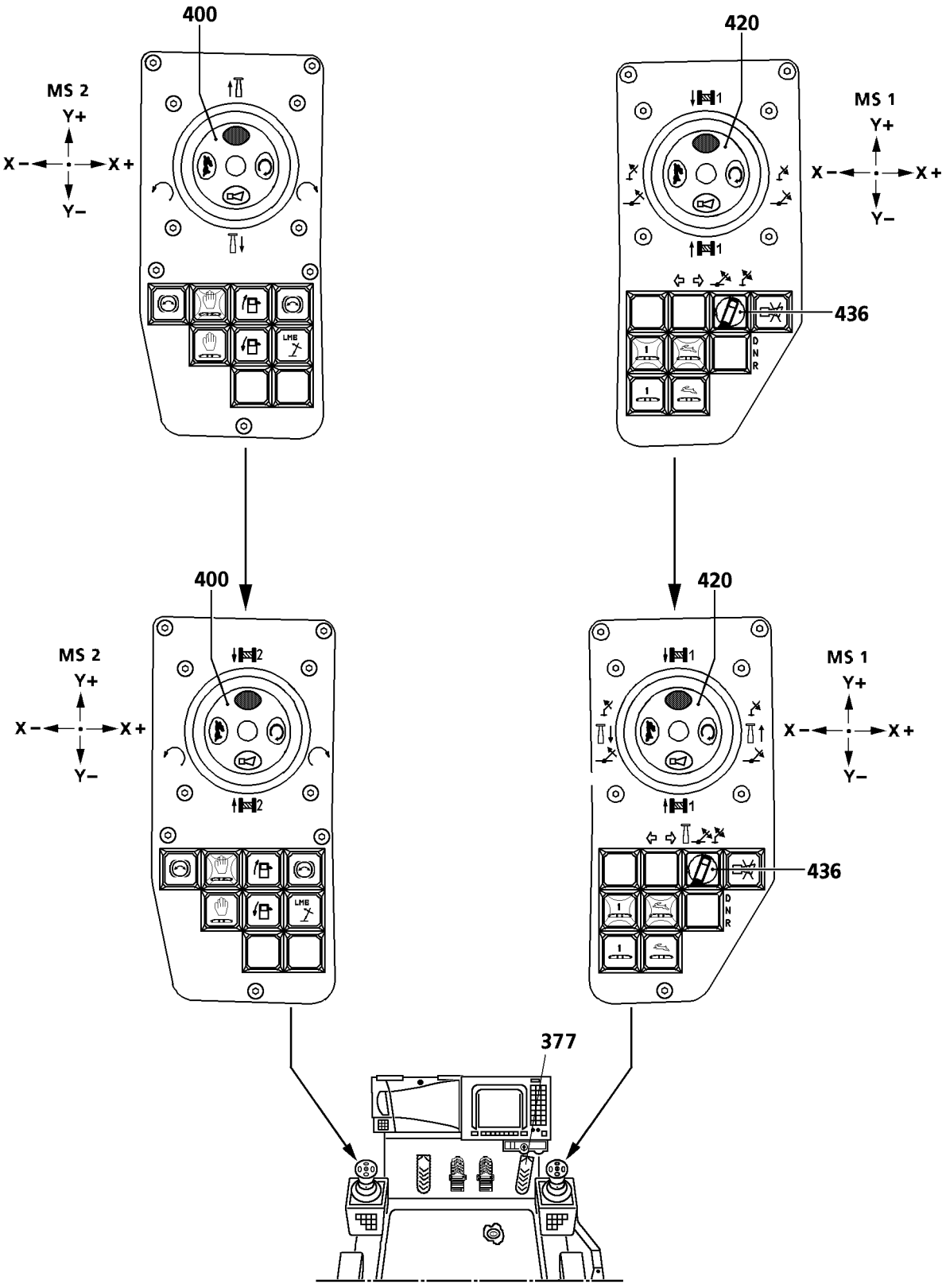
– The telescopic boom is luffed up.

▶ Deflect the master switch 1 **420** in direction X+.

Result:

– The telescopic boom is luffed down.

LWE/LTR 1100-005/17505-03-02/en



LWE/LTR 1100-005/17505-03-02/en

Fig.198638

3.2 Luffing the folding jib*

Make sure that the following prerequisite is met:
- The rotary switch **436** is set to position right „luff folding jib“.
- The seat contact switch is activated.
- Operating mode hydraulically adjustable folding jib has been selected on the LICCON.

▶ Deflect the master switch 1 **420** in direction X-.

Result:

– Folding jib is luffed up.

▶ Deflect the master switch 1 **420** in direction X+.

Result:

– Folding jib is luffed down.

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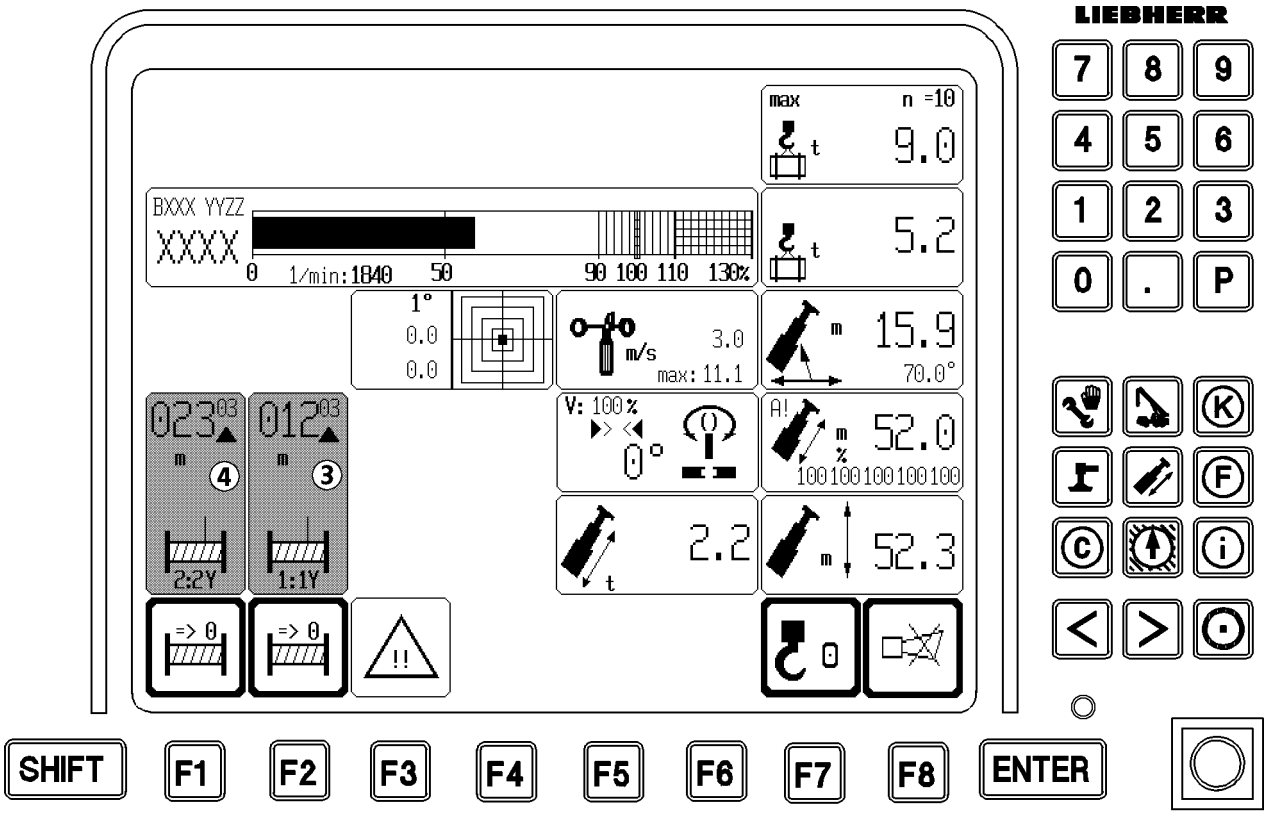

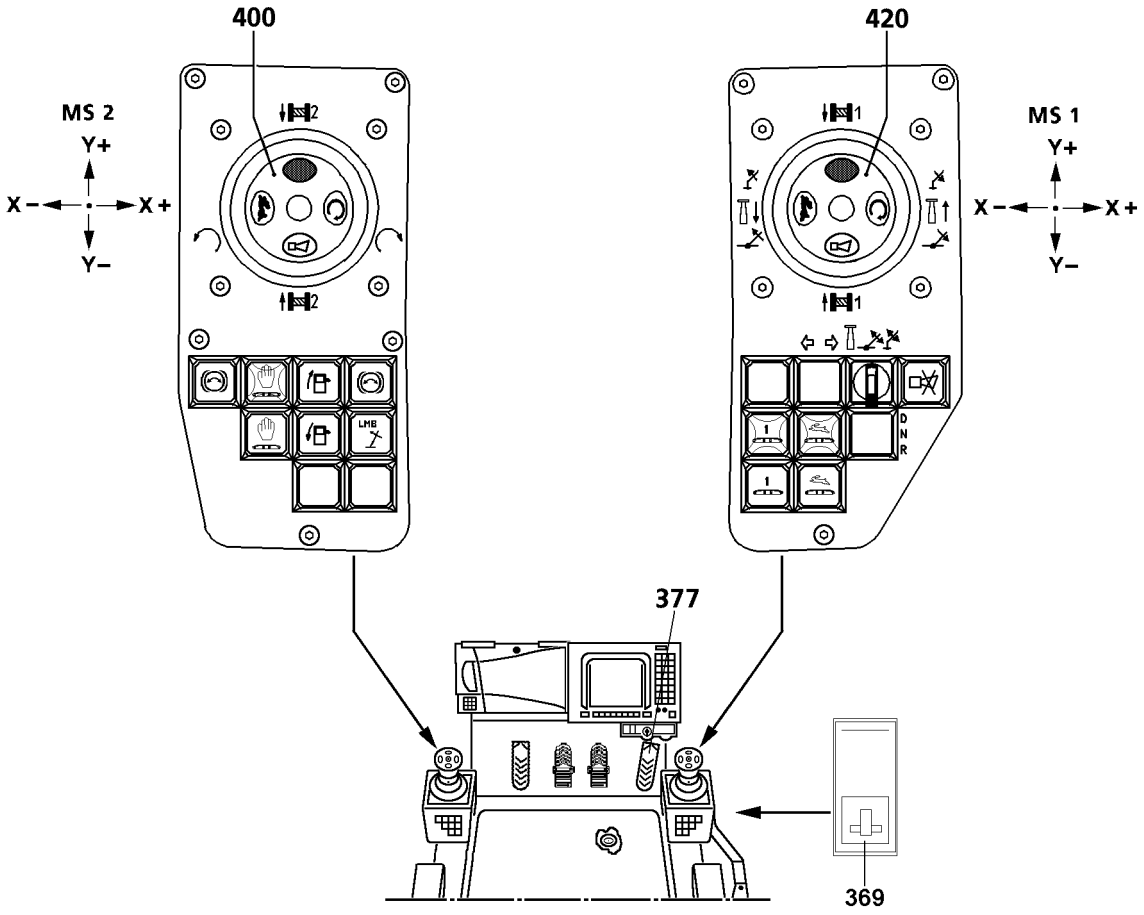

Fig.111651

4 Lifting / lowering

CAUTION
Danger of damaging the hoist rope when spooling up and/or spooling out!
▶ Do not allow slack cable to build up.

Speed of crane movement „Lifting“ is controlled by the deflection of the respective master switch and by the pedal **377** of the engine control.

In the „Control Parameter“ program, it is possible to preselect the maximum winch speed. It is also possible to deactivate or activate the individual winches.

See chapter 4.02, section „Control Parameter“.

4.1 Lifting / lowering winch 1

The winch icon **3** shows that winch 1 is turning, even when because of multiple reeving and low speed, no hook movement is visible.

Make sure that the following prerequisite is met:
– The seat contact switch is activated.

▶ Deflect master switch 1 **420** in direction Y+.

Result:

– Winch 1 spools out and the load is lowered.

▶ Deflect master switch 1 **420** in direction Y-.

Result:

– Winch 1 spools up and the load is lifted.

4.2 Lifting / lowering winch 2

The winch icon **4** shows that winch 2 is turning, even when because of multiple reeving and low speed, no hook movement is visible.

Make sure that the following prerequisite is met:
– The seat contact switch is activated.

▶ Deflect master switch 2 **400** in direction Y+.

Result:

– Winch 2 spools out and the load is lowered.

▶ Deflect master switch 2 **400** in direction Y-.

Result:

– Winch 2 spools up and the load is lifted.

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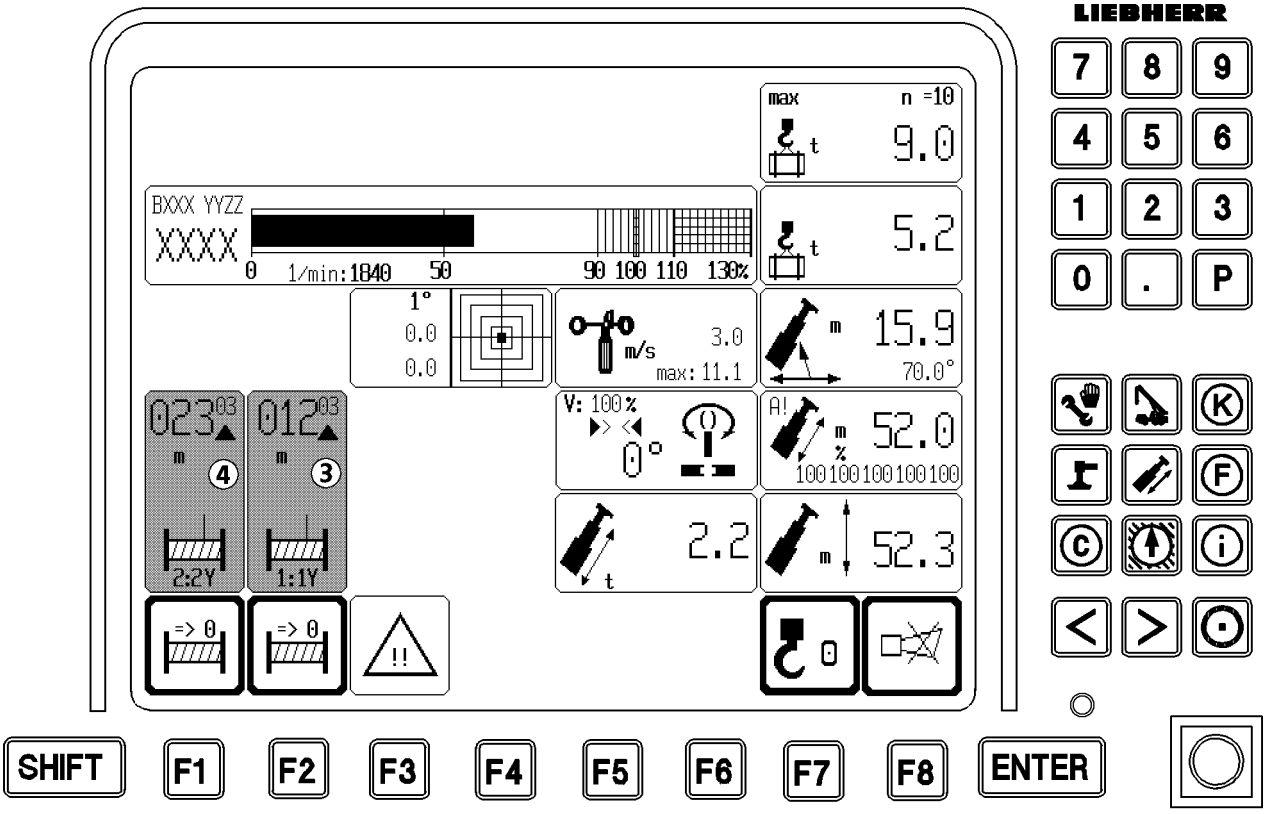

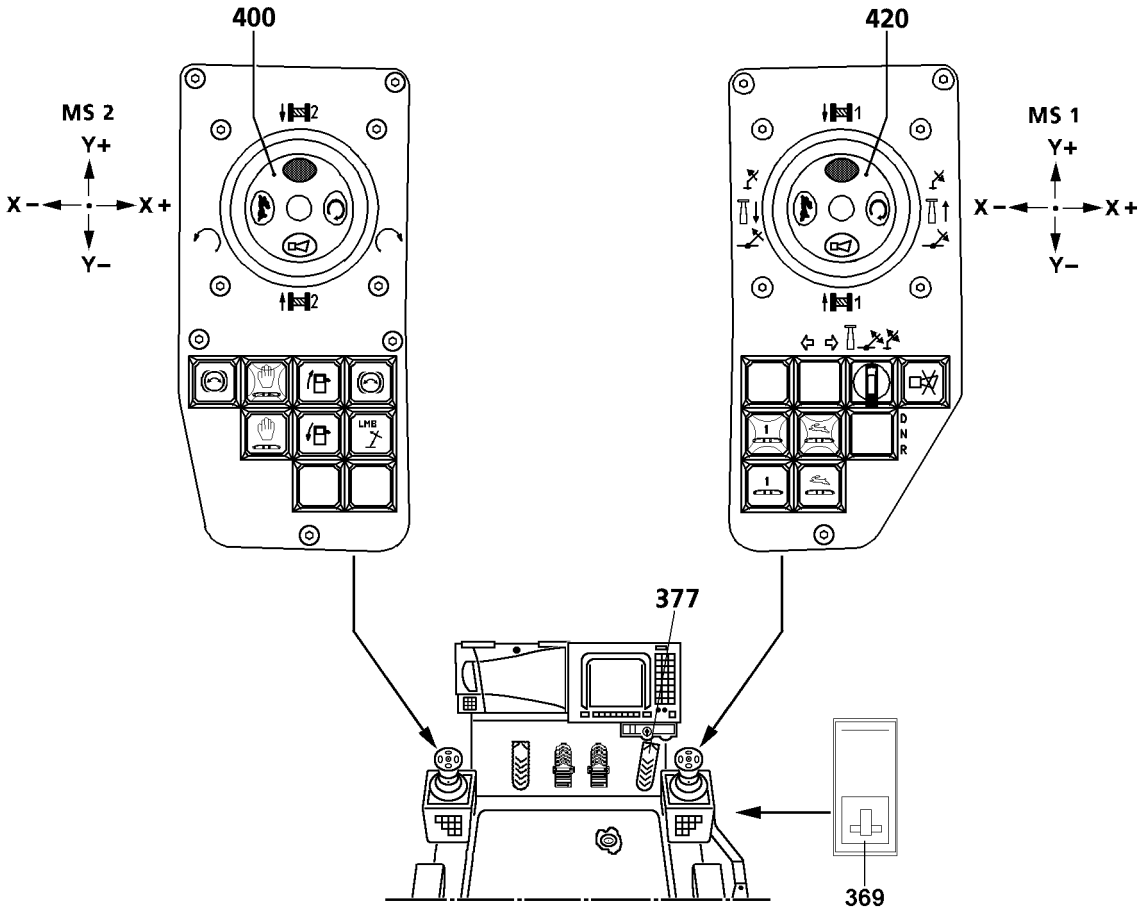

Fig.111651

5 Turning

The speed of the „turning“ crane movement is controlled via the deflection of master switch 2 **400** and via the pedal **377** of the engine regulation.

NOTICE
Damage to crane!
If the crawler travel gear is added while turning the crane, the crane can be damaged!
▶ Adding the crane travel gear while turning the crane is prohibited!

5.1 Turning the crane superstructure

Make sure that the following prerequisite is met:
– The crane superstructure must be unpinned before initiating the turning movement.

WARNING
Risk of fatal injury!
If there are any persons on the crawler travel gear during turning or in any other danger zone of the crane, then these persons can be killed or severely injured!
▶ It is prohibited for personnel to remain in the danger zone!
▶ Make sure that there are no obstacles within the working range of the crane!
▶ Give a short warning signal (horn) before initiating a crane movement!
▶ When turning with a load, initiate and slow down the turning maneuver extremely sensitively!

▶ Deflect the master switch 2 **400** in direction X+.

Result:

– The crane superstructure turns to the right.

▶ Deflect the master switch 2 **400** in direction X-.

Result:

– The crane superstructure turns to the left.

5.2 Preselection of slewing speed

The load chart manual gives the maximum slewing speeds in percentages. The maximum permissible slewing speeds can be set on the LICCON monitor in adjustment window „Speed reduction master switch“, see Crane operating instructions, chapter 4.02. Always move at slower speed with a longer boom and a heavier load.

WARNING
The crane can topple over!
If the following instructions are not observed, life threatening situations could arise even causing the crane to topple over.
▶ The boom length values and the operating mode that are specified in the load chart must **never** be exceeded during crane operation!
▶ The maximum slewing speed may not be modified when executing a crane movement.

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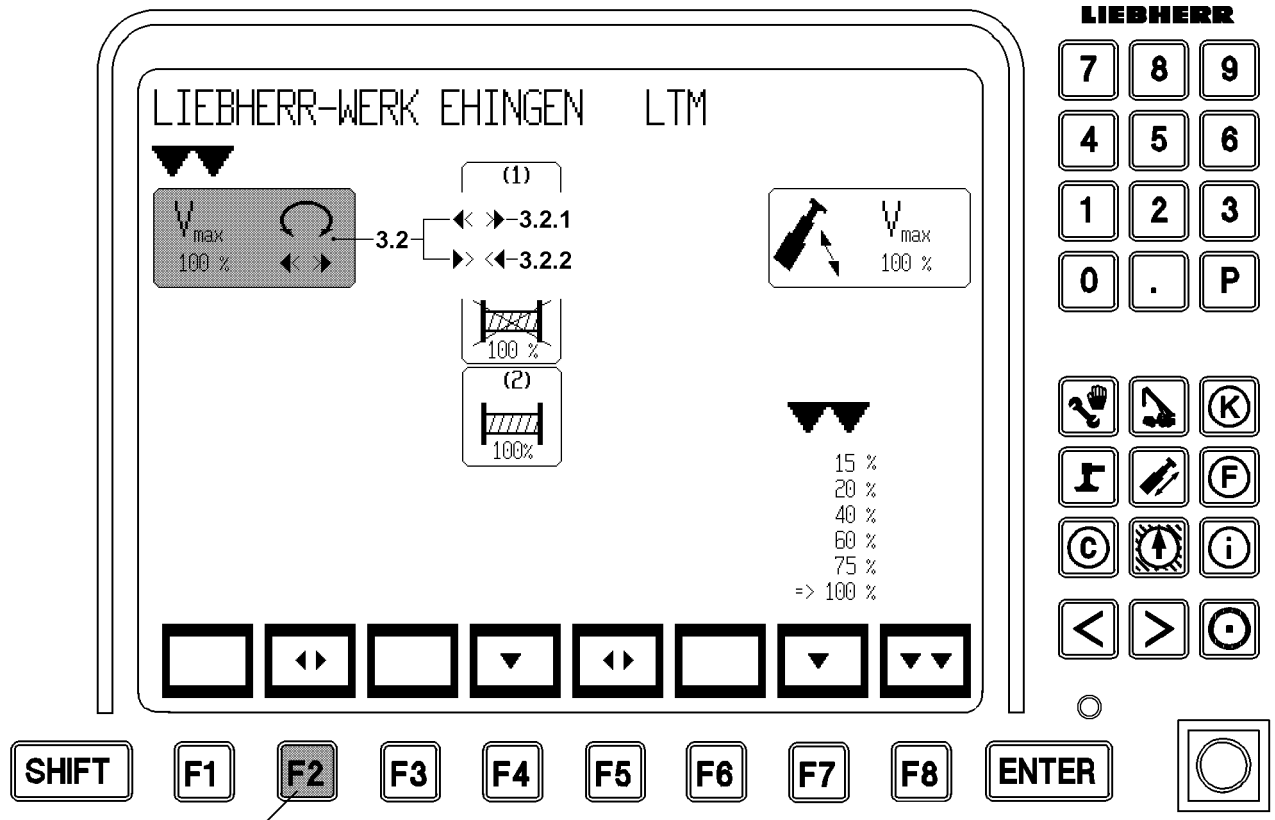

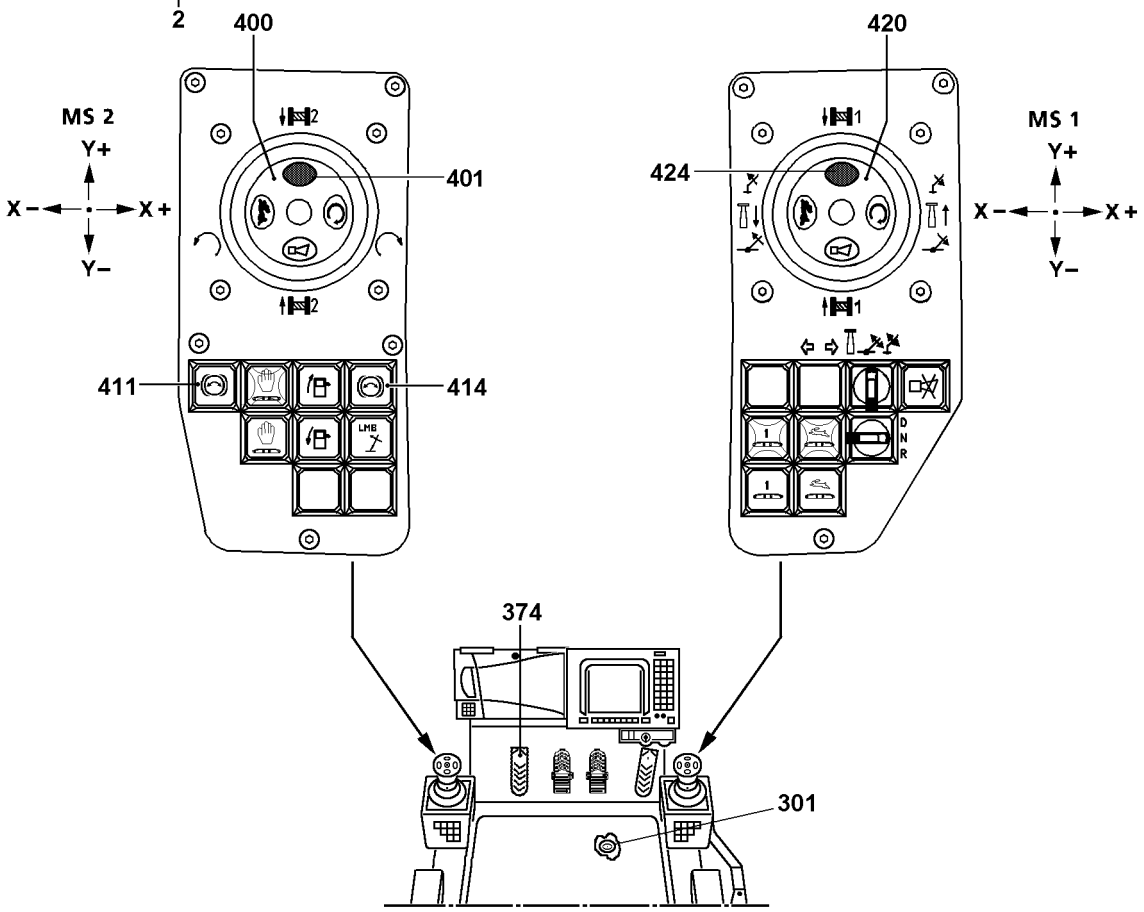

Fig.104736

5.3 Slewing gear, General

With this slewing gear it is possible to select between „freely rotating / coasting“ and „fixed“ slewing gear. Switching over takes place in the „Control Parameter program“ using function key „F2“ **2** and can only be carried out while the crane is stationary. If the „slewing gear is freely rotating“ icon **3.2.1** is displayed, and if the „slewing gear is fixed“ icon **3.2.2** is displayed. See chapter 4.02, section „Control Parameter program“.

The slewing gear cannot be switched to „freely rotating / coasting slewing gear“ if:
- The crawler travel gear is added.
- The radio remote control is being used.
- The working range limiter is active.
- Charts that have not been approved are selected.

Note
▶ In the above cases the „freely rotating / coasting slewing gear“ can be pre-selected in the adjustment window „Speed reduction master switch“, but the function is not applied to the „Crane operation“ program.

5.3.1 Freely rotating slewing gear (open)

DANGER
Danger of accident in inclined position!
If the „freely rotating slewing ear“ is turned on in inclined position, then the crane superstructure turns uncontrolled to the side and can topple over!
Personnel can be severely injured or killed!
▶ In inclined position, crane operation with „freely rotating slewing gear“ is prohibited!
▶ Never release the parking brake in inclined position!
▶ In inclined position, „only crane operation with fixed slewing gear“ is permissible!

To be able to operate the „freely rotating slewing gear“:
- The „parking brake for the slewing gear“ must be **released**.
- The indicator light **411** lights up.

NOTICE
Uncontrolled turning of the slewing gear!
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 diagonal pull!
▶ In this case, apply the „parking brake of the slewing gear“ with button **414**. For more information, see section „Parking brake - Slewing gear“.

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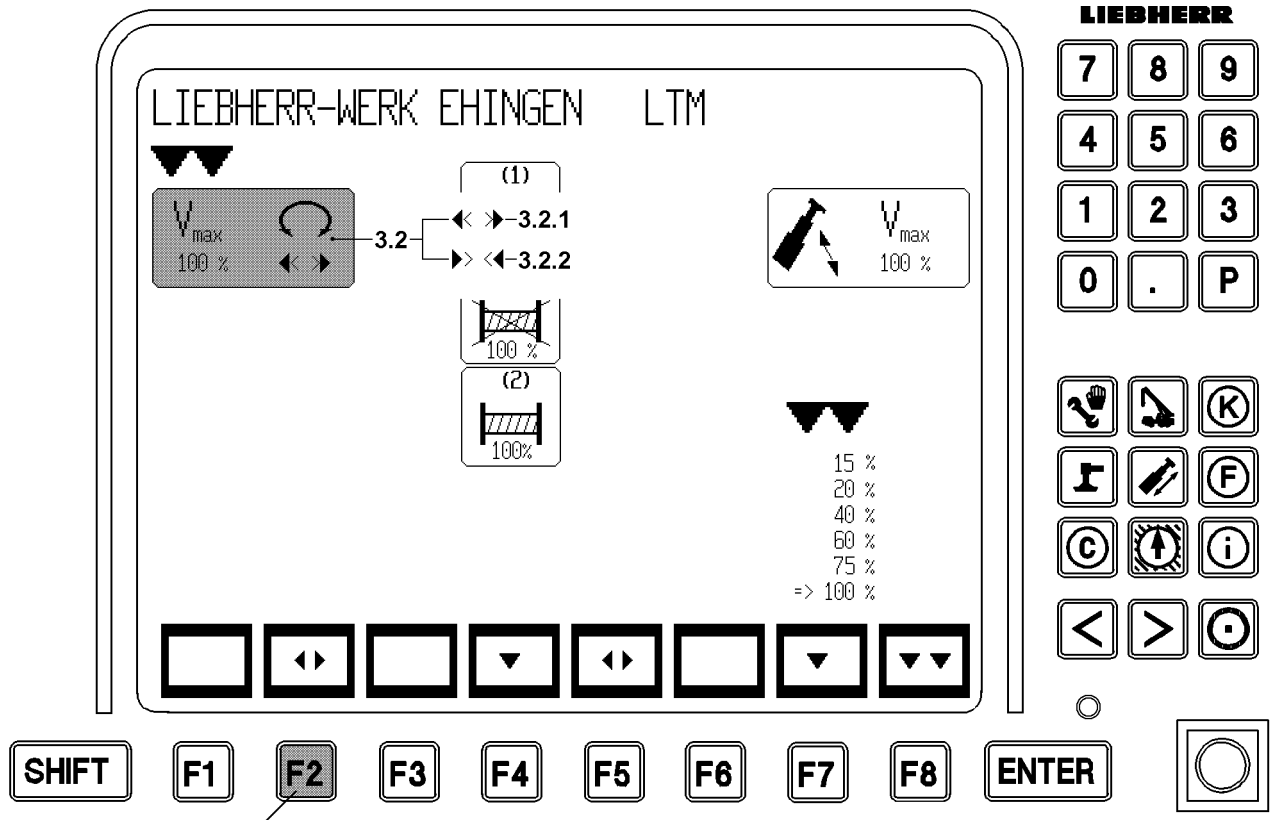

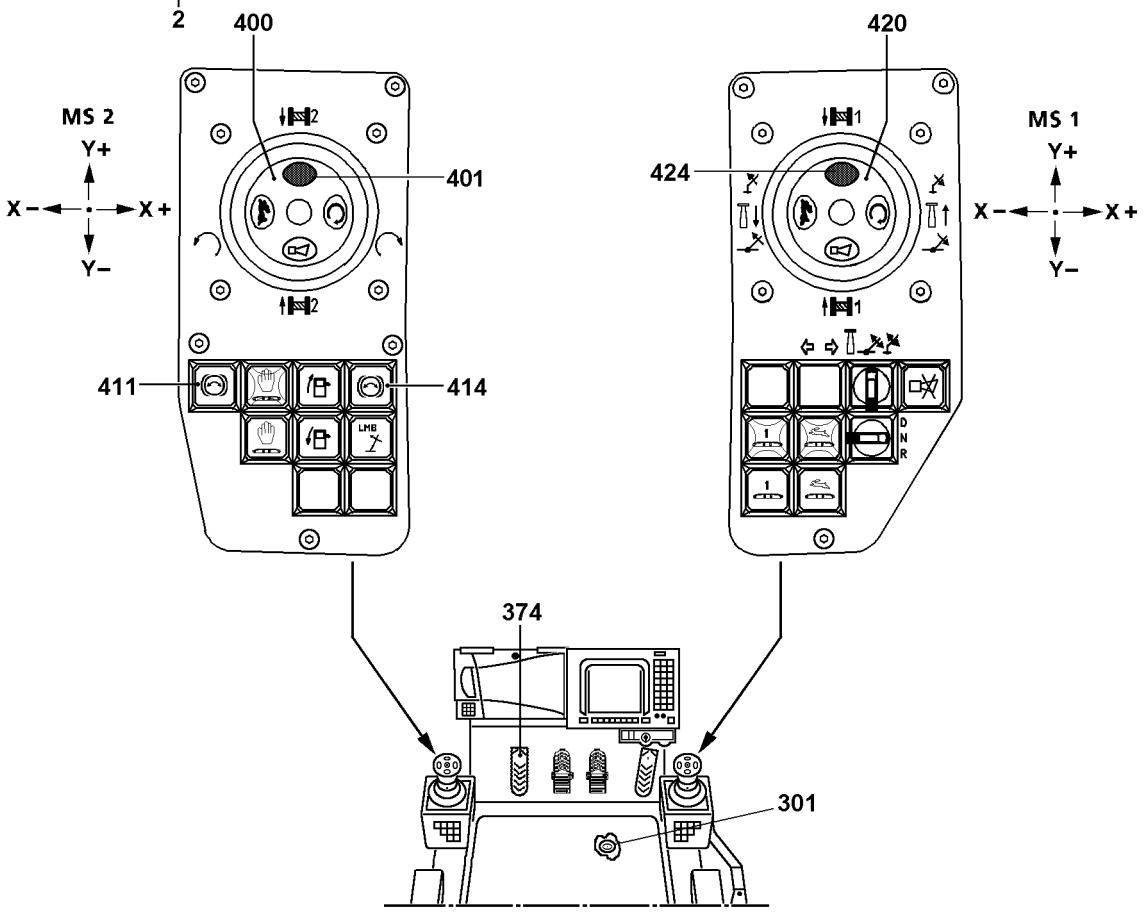

Fig.104736

5.3.2 Fixed slewing gear

The „fixed slewing gear“ can be operated with the parking brake **released** or **engaged**.

For more information see section „Switching parking brake on/off“.

Note

- ▶ Once the parking brake is **released**, it **remains released**, regardless of whether the slewing gear is actuated using the master switch **400** or if it is not actuated. This is to prevent a sudden stop.
- ▶ If the parking brake is **engaged**, it is released as soon as the master switch **400** is deflected. The parking brake **engages** again as soon as the master switch **400** is moved to the neutral position and the slewing gear is **no longer** actuated.

NOTICE

Uncontrolled turning of the slewing gear!

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 diagonal pull!

- ▶ In this case, apply the „parking brake of the slewing gear“ with button **414**.

5.3.3 Foot brake - Slewing gear

The „freely rotating“ and the „fixed slewing gear“ can also be slowed down with the pedal **374**.

Note

- ▶ The slewing gear brake must be carefully actuated with pedal **320**!
- ▶ The harder the pedal **320** is actuated, the greater the braking force!

- ▶ Carefully actuate the foot brake with the pedal **374**.

NOTICE

Increased brake lining wear!

- ▶ The pedal **374** must not be operated for long periods with simultaneous actuation of a turning movement.

- ▶ Do not actuate the pedal **374** for an extended period of time.

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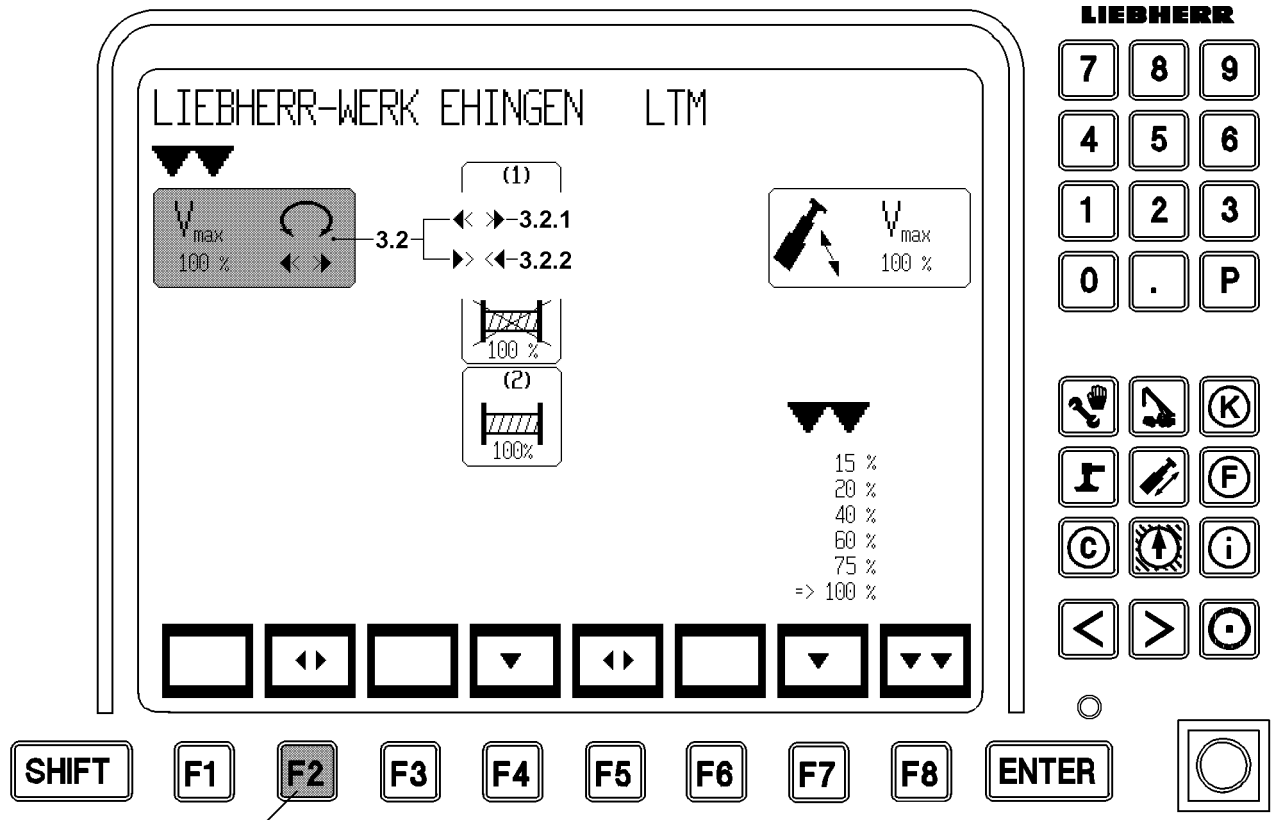

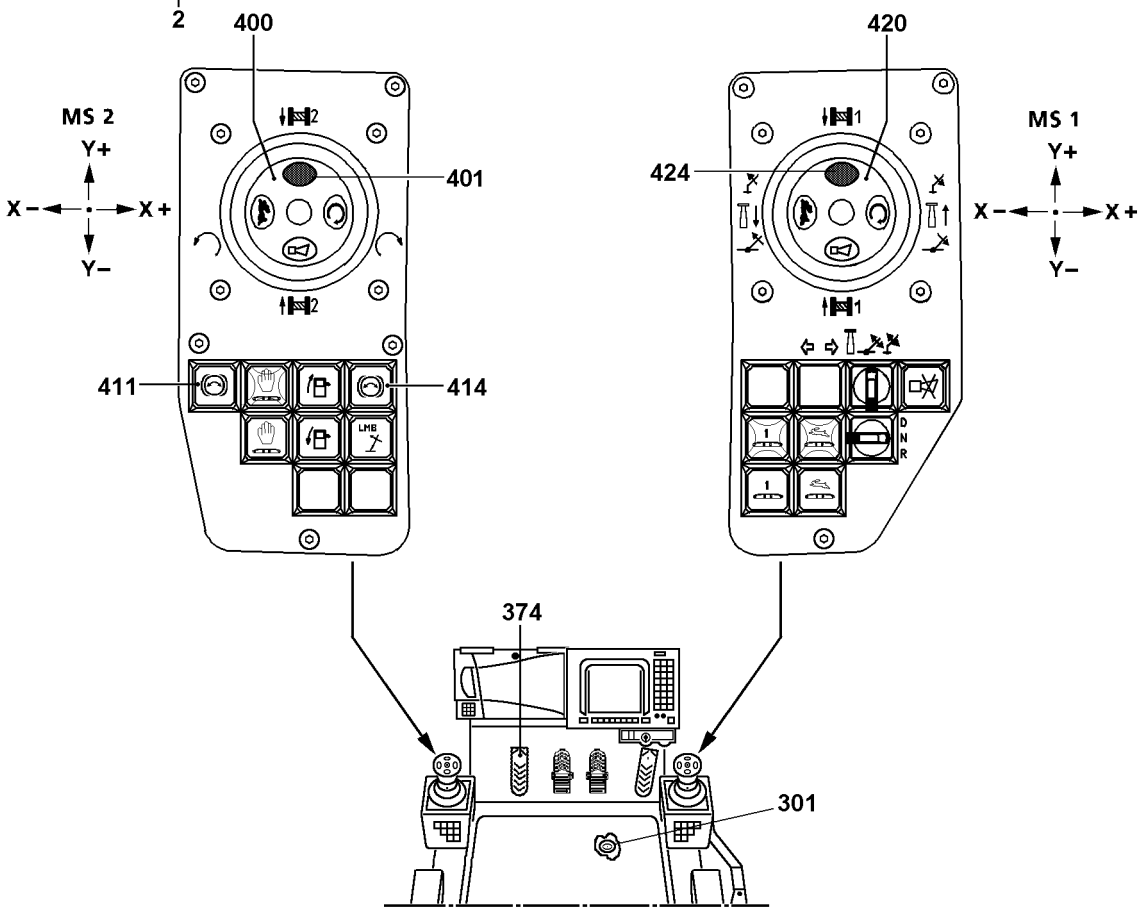

Fig.104736

5.4 Parking brake - Slewing gear

The „parking brake of the slewing gear“ can be **applied or released** with „freely rotating“ and „fixed“ slewing gear using the button **414**.

The indicator light **411** shows if the „parking brake slewing gear“ is released or applied.

5.4.1 Releasing the parking brake

Make sure that the following prerequisites are met:
- The „parking brake slewing gear“ is **applied**.
- The indicator light **411 does not** light up.
- The seat contact button **301** or bypass seat contact switch **401** or seat contact switch **424** are actuated.
- The engine is running.
- The crawler travel gear is not added.

▶ Press the button **414**.

Result:

– The parking brake is **released**.
– The indicator light **411** lights up.

5.4.2 Applying the parking brake

Make sure that the following prerequisites are met:
- The parking brake is **released**.
- The indicator light **411** lights up.

▶ Press the button **414**.
or
Turn the engine off.
or
Do no longer actuate seat contact button **301** or bypass seat contact switch **401** or seat contact switch **424**.
or
Adding the crawler travel gear

Result:

– The parking brake is **applied**.
– The indicator light **411** turns off.

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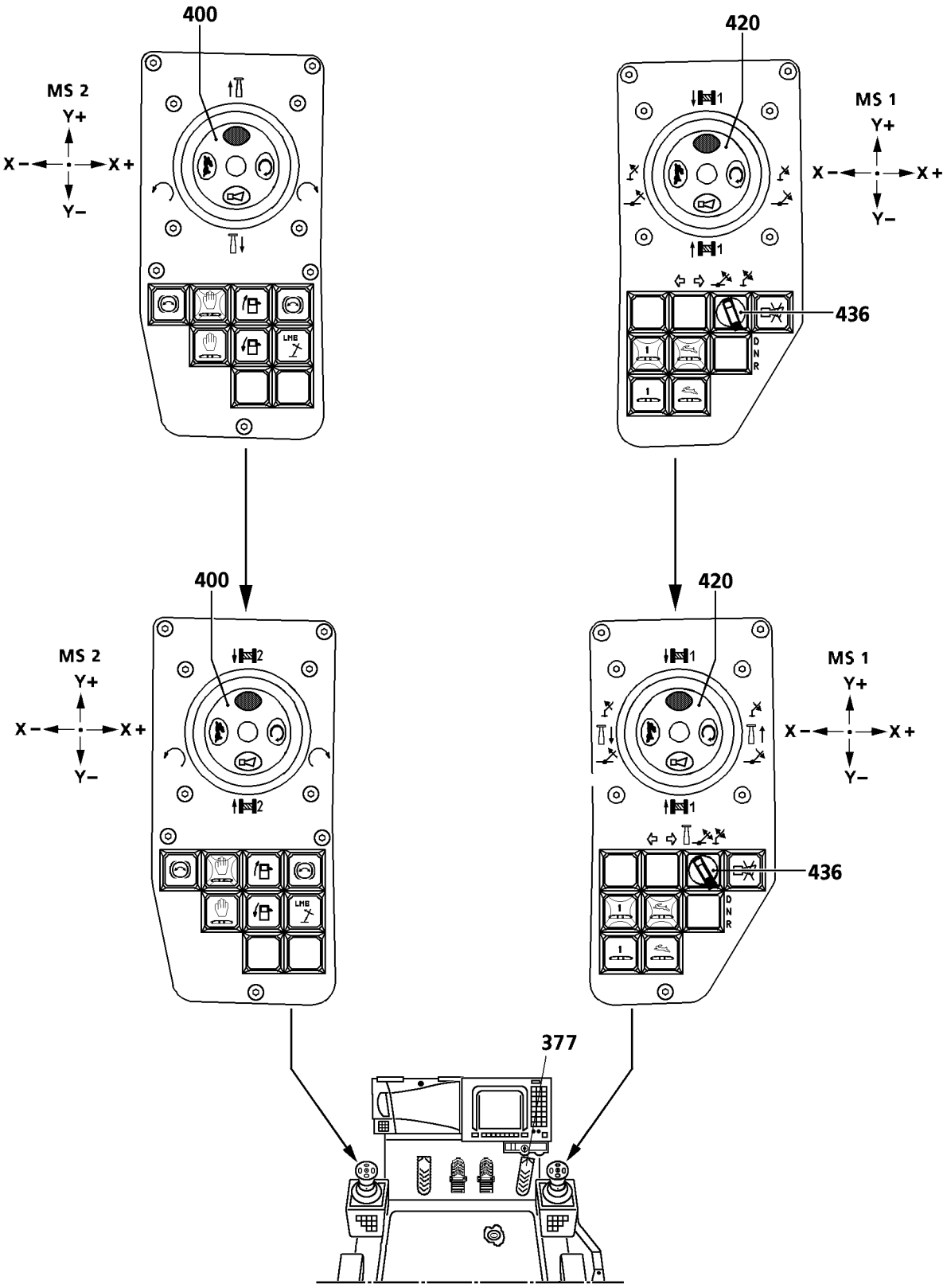

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Fig.198641

6 Telescoping

6.1 Control of crane movement „Telescoping“

6.1.1 Cranes with one winch

Speed of crane movement is controlled by the deflection of the master switch **400** and by the pedal of the engine control **377**.

▶ Move the master switch **400** in direction Y+ (forward).

Result:

– The telescopic boom is telescoped out.

▶ Move the master switch **400** in direction Y- (backward).

Result:

– The telescopic boom is telescoped in.

6.1.2 Cranes with two winches*

Speed of crane movement is controlled by the deflection of the master switch **420** and by the pedal **377** of the engine control.

Make sure that the following prerequisite is met:
– the rotary switch **436** is at position left „telescoping“

▶ Move the master switch **420** in direction X+ (toward the right).

Result:

– The telescopic boom is telescoped out.

▶ Move the master switch **420** in direction X- (toward the left).

Result:

– The telescopic boom is telescoped in.

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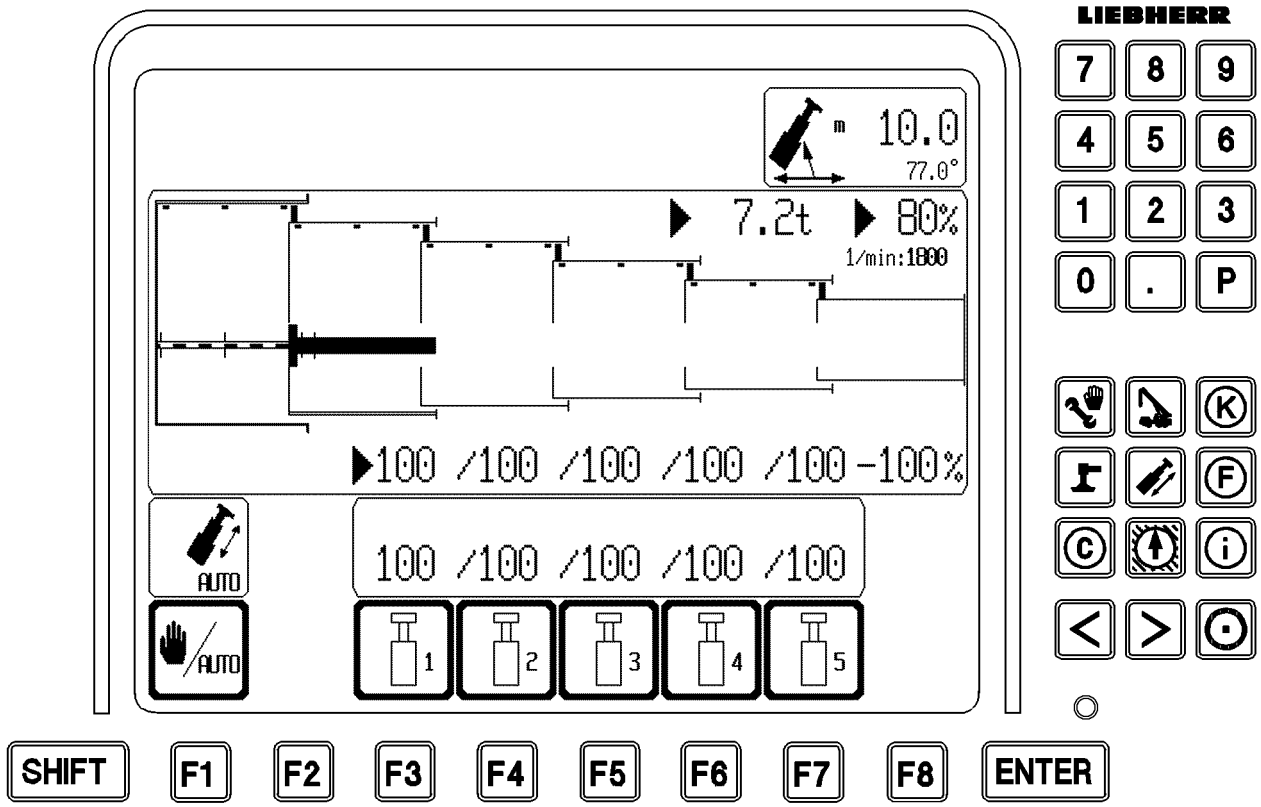

Fig.196273

6.2 General

The „Telematik“ automatic telescopic boom control system consists of:
- The dual action telescoping cylinder
- The hydraulically operated gripper pinning
- The hydraulically operated boom pinning

The gripper and boom pins are mechanically interlinked, in other words the telescope section can only be unpinned when at the same time the gripper is locked with this telescope section.

In the LICCON telescoping screen the crane operator can see, in dynamic graphics, the pinning state of the telescopic boom, the position of the individual telescopes in relation to each other, and the extension status of the telescoping cylinder.

Thanks to the automatic telescoping procedure, the crane operator can easily telescope the telescoping boom, as he does not have to concern himself with the pinning or unpinning of the telescoping cylinder or the telescope. The LICCON telescoping control system therefore makes possible very straightforward telescoping, only the desired telescoping targets need to be entered into the system.

The LICCON telescoping control system decides the sequence in which the individual telescopes will be moved in order to achieve the desired end state. After setting the desired telescoping targets, all telescoping movements, as well as locking and unlocking, are carried out fully automatically.

The following procedures are carried out by the system:
- Locking and unlocking of the telescoping cylinder
- Pinning and unpinning of the telescopes
- Sequence for the telescopes to be telescoped in order to achieve the desired end state

This automatic process will however only be carried out as long as the master switch is operated.

The master switch determines the direction and the speed of the telescoping movement. In this way the crane operator has continuous control over the crane.

The direction of the cylinder movement is set by the LICCON computer system.

If the telescopic boom is lengthened, with the result that currently unreachable telescopes must be moved, then they must first be retracted until the last telescope to be moved is reached. In this case, in order to lengthen the telescopic boom (telescope out), telescoping in must first take place.

The LICCON computer system displays the direction in which the next telescoping must be done. The master switch must also be pressed to correspond to this direction setting. In this way the connection between the direction of movement of the appropriate master switch and the telescope continues.

In this way it is possible to move to a telescoping target automatically without an operating screen. It is therefore also not essential to keep watching the LICCON monitor all the time.

If the direction needs to be changed by the master switch, the telescopic boom remains stationary if the current direction is to be maintained. This also means that the master switch must be moved in the other direction. If there is no further movement in the other direction, this means that the telescoping target has been reached. This state is displayed visually on the operating screen. If the master switch is still being pressed, then after 3 to 5 seconds, the system switches to the telescoping screen.

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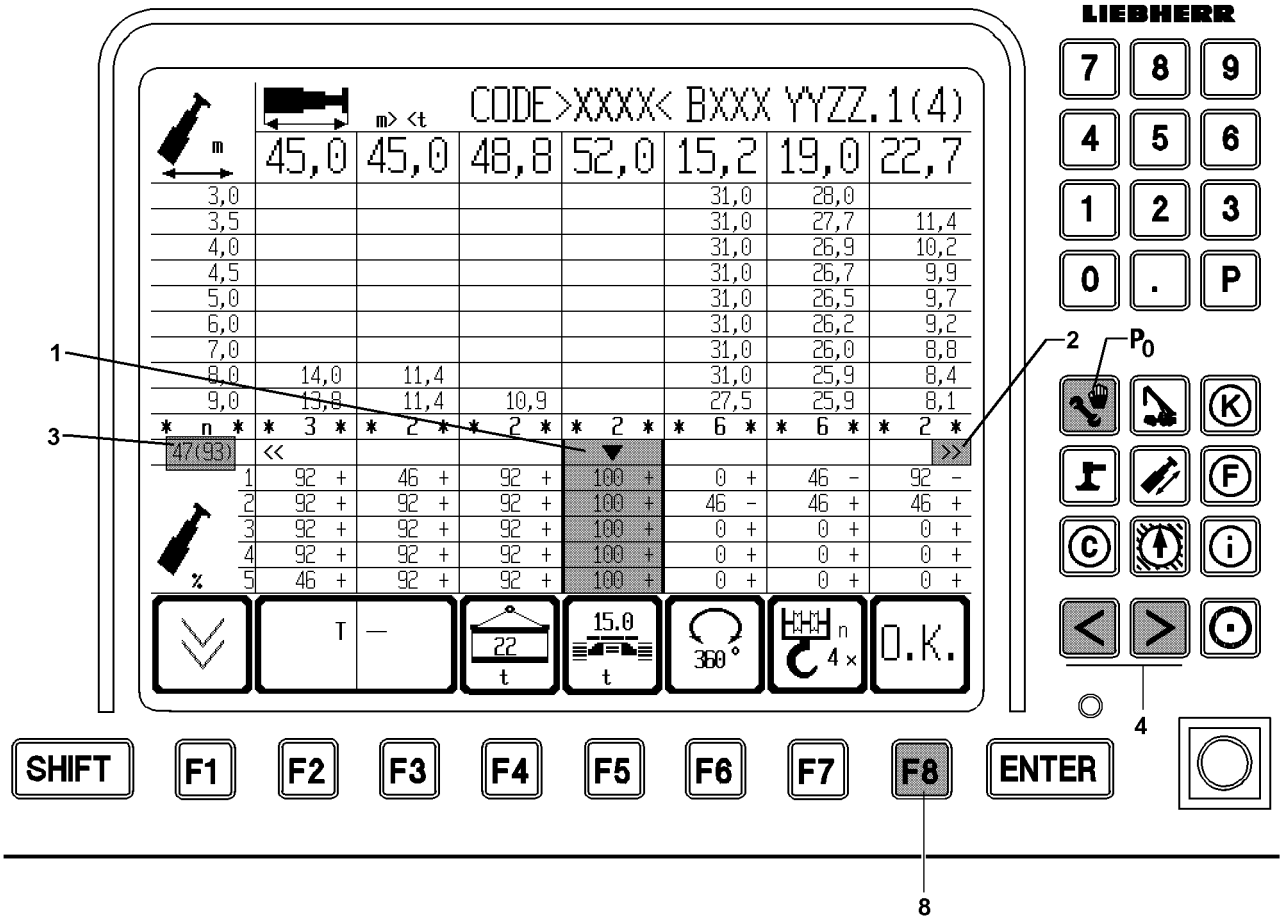

Fig.102855

6.3 Selecting the telescoping target

There are two options for selecting the telescoping target:
1. Target selection through the configuration screen
2. Target selection through the telescoping screen

6.3.1 Target selection through the configuration screen

▶ Press the program key **P0**.

Result:

– The configuration screen appears on the LICCON monitor.

▶ Using the arrow keys **4**, move the cursor **1** to the left or the right into the column corresponding to the desired telescopic boom length.

As supporting information, the currently selected column number **3** and the number of columns in the table are shown. For example, 47(93) means 47 of 93 columns.

The status indicator (±) on the left next to the percentage extension condition value means:
– „+“ the corresponding telescopic section must be pinned.
– „-“ the corresponding telescopic section can be telescoped up to the percentage value of the extension status value under load (according to the load chart).

The double arrow **2** at the left and/or right edge of this line points to additional columns in either direction.

If the cursor **1** touches an edge marked with arrows, the next movement in this direction will display the next load chart column(s).

The cursor **1** itself will be set on the next column, if possible in the middle.

A change in the telescoping target is only possible if the master switch is at neutral.

If no cursor appears in the configuration screen, this means that on the telescoping screen a boom configuration that is not supported in the tables was selected and perhaps even started!

▶ Press function key „F8“ **8**.

Result:

– The selected telescoping target will be activated.
– The selected column for the telescoping target concerned will be marked in bold along the side.

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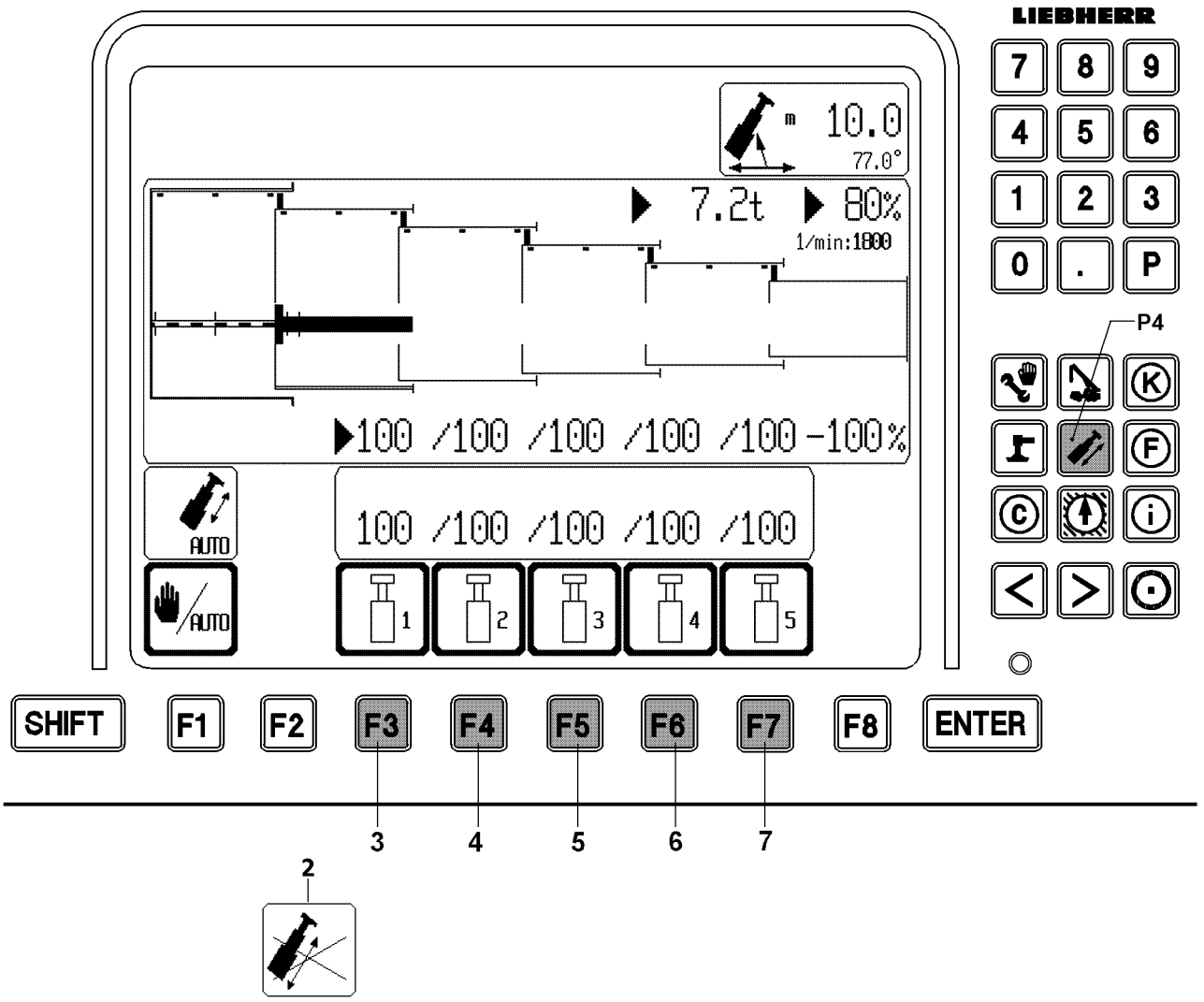

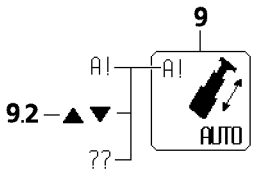

LWE/LTR 1100-005/17505-03-02/en

Fig.196275

6.3.2 Target selection through the telescoping screen

▶ Press the program key **P4**.

Result:

– The telescoping screen appears on the LICCON monitor.

The selection of the telescoping target is achieved by pressing the function key assigned to the telescope concerned several times. After every key press, the intended extension status of the associated telescope changes to the next percentage value where there is a hole for pins.

In contrast to the configuration screen, the telescoping length is displayed immediately as a target, without further confirmation, as soon as the function key is pressed. No confirmation is required, as the assigned function keys do not have any other functions.

The appearance of a direction arrow in the automatic icon **9.2** immediately after a change in the telescoping target can be interpreted as feedback.

If the blinking icon **2** appears on the LICCON monitor, then:
– The telescoping sections cannot be unpinned.
– The unpinned load is exceeded.
– No load chart present.

▶ Press function key „F3“ **3**.

Result:

– The following appears on telescope 1: 0%, 46%, 92% or 100%.

▶ Press function key „F4“ **4**.

Result:

– The following appears on telescope 2: 0%, 46%, 92% or 100%.

▶ Press function key „F5“ **5**.

Result:

– The following appears on telescope 3: 0%, 46%, 92% or 100%.

▶ Press function key „F6“ **6**.

Result:

– The following appears on telescope 4: 0%, 46%, 92% or 100%.

▶ Press function key „F7“ **7**.

Result:

– The following appears on telescope 5: 0%, 46%, 92% or 100%.

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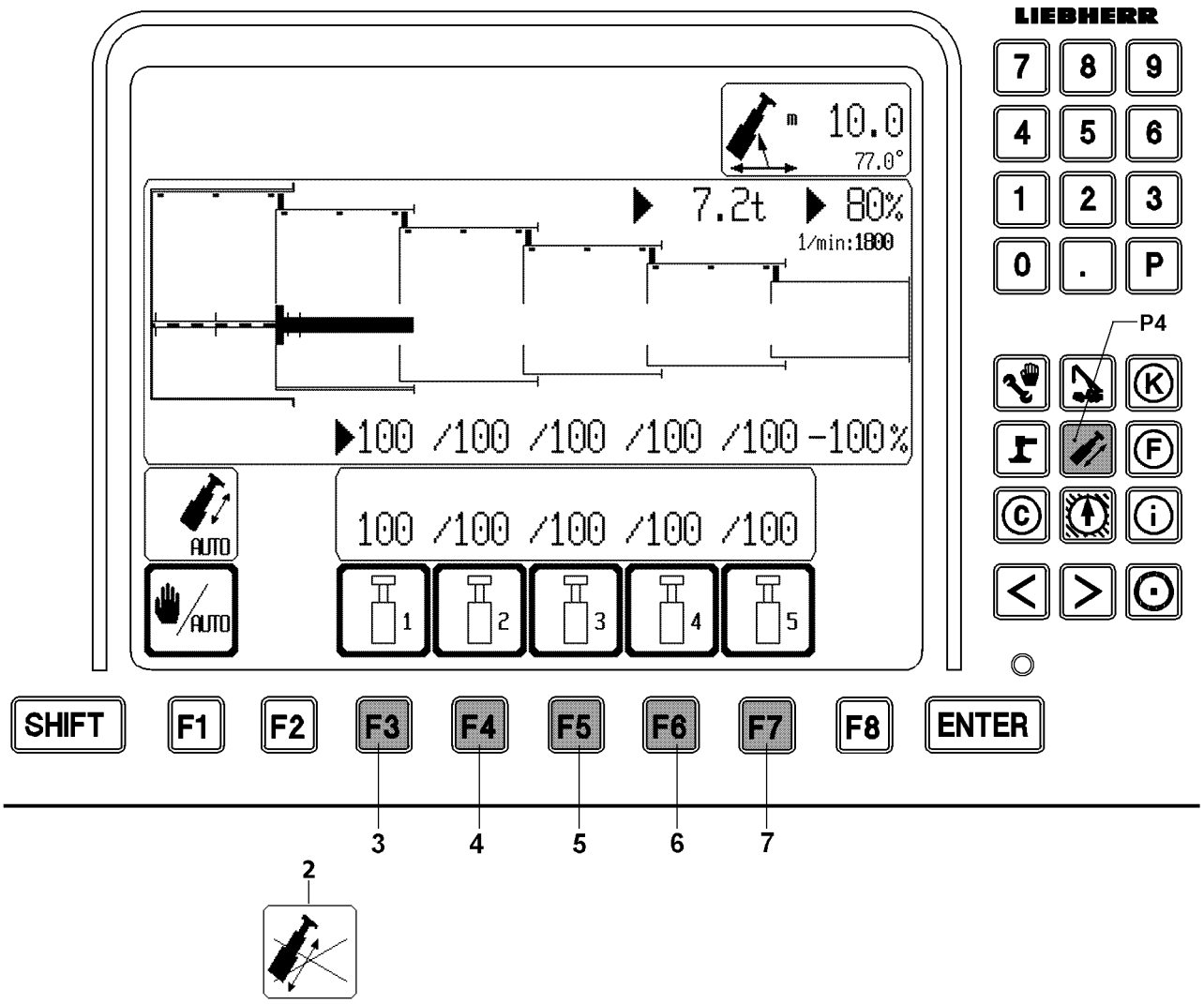

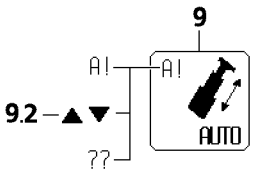

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Fig.196275

6.4 Telescoping to the selected target

If the desired telescoping target is set, then the direction in which the master switch must be deflected is displayed on the operating screen and on the telescoping screen.

If the master switch is moved against the specified direction, the telescope remains stationary. The specified direction remains visible as a an error criteria.

If the set telescoping target has been reached, then the telescopic boom remains stationary, regardless of any movements of the master switch, and the markings on the set telescoping target begin to blink. The target has thus been reached.

If the arrow **9.2** up appears in the automatic icon **9**:
▶ Telescope the telescopic boom out.

If the arrow **9.2** down appears in the automatic icon **9**:
▶ Telescope the telescopic boom in.

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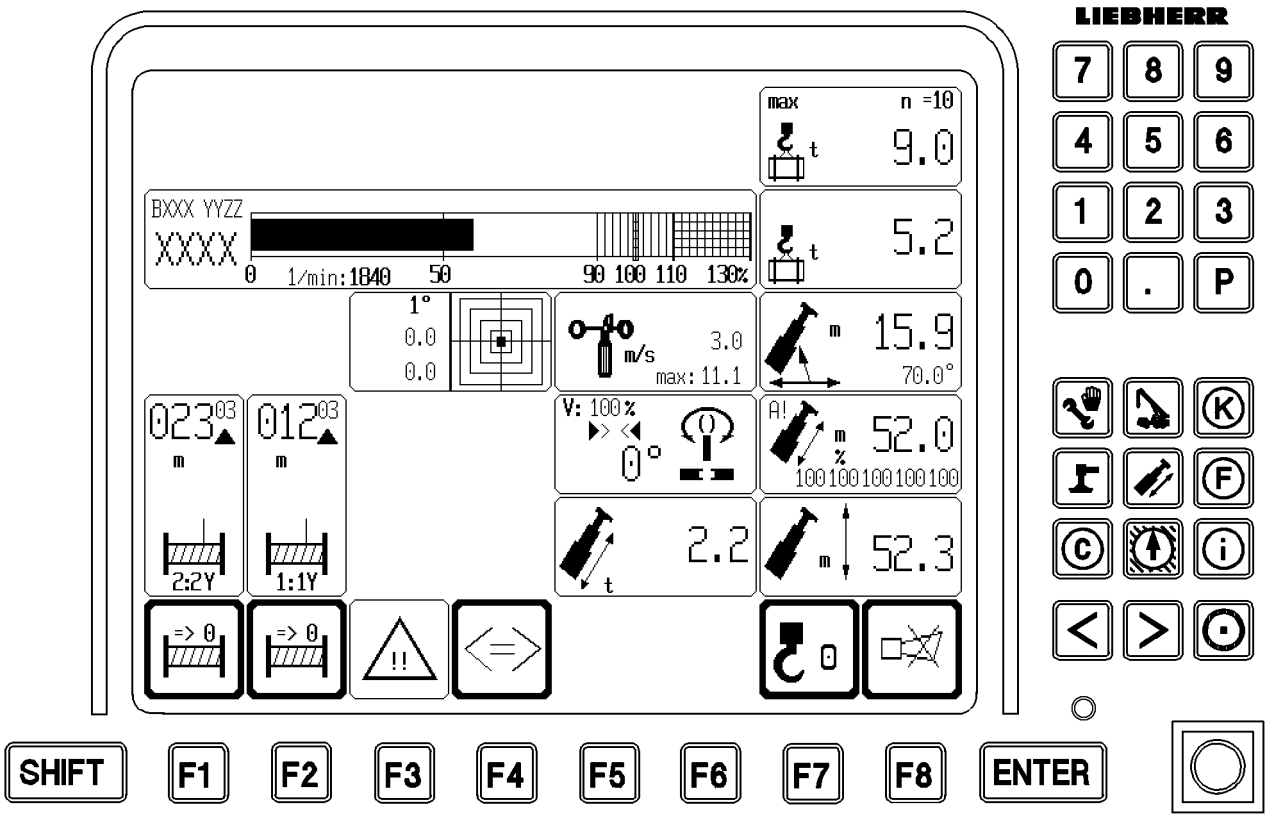

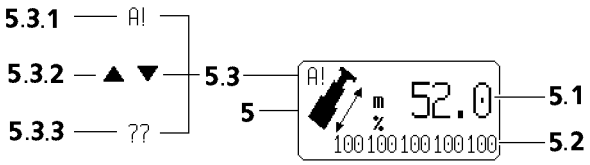

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Fig.111652

6.5 Telescoping with the operating screen

The telescoping system is designed so that an experienced crane driver can telescope without the telescoping screen, in other words using just the operating screen.

The crane driver receives information about the direction in which the master switch must be moved from the arrow **5.3.2** in the icon **5**.

If the crane operator attempts further telescoping once the telescoping target has been reached, then there is an automatic changeover from the operating screen to the telescoping screen. If the master switch is still being deflected, then the markings on the set telescoping target blink. This means that the telescoping target has been reached.

If the arrow **5.3.2** up appears in the icon **5**:
▶ Telescope the telescopic boom out.

If the arrow **5.3.2** down appears in the automatic icon **5**:
▶ Telescope the telescopic boom in.

Once the telescoping target is reached, icon A! **5.3.1** appears.

▶ Press the master switch for another 3 seconds or so until the telescope is resting on the pin.

6.6 Aborting telescoping

Telescoping can be aborted at any time.

The pins, the telescoping cylinder and the telescopes remain where they were, in the last state they were in when the master switch was still being pressed.

If desired, a new telescoping target can be set and telescoped to automatically.

It is also possible to proceed manually by switching over to manual operation.

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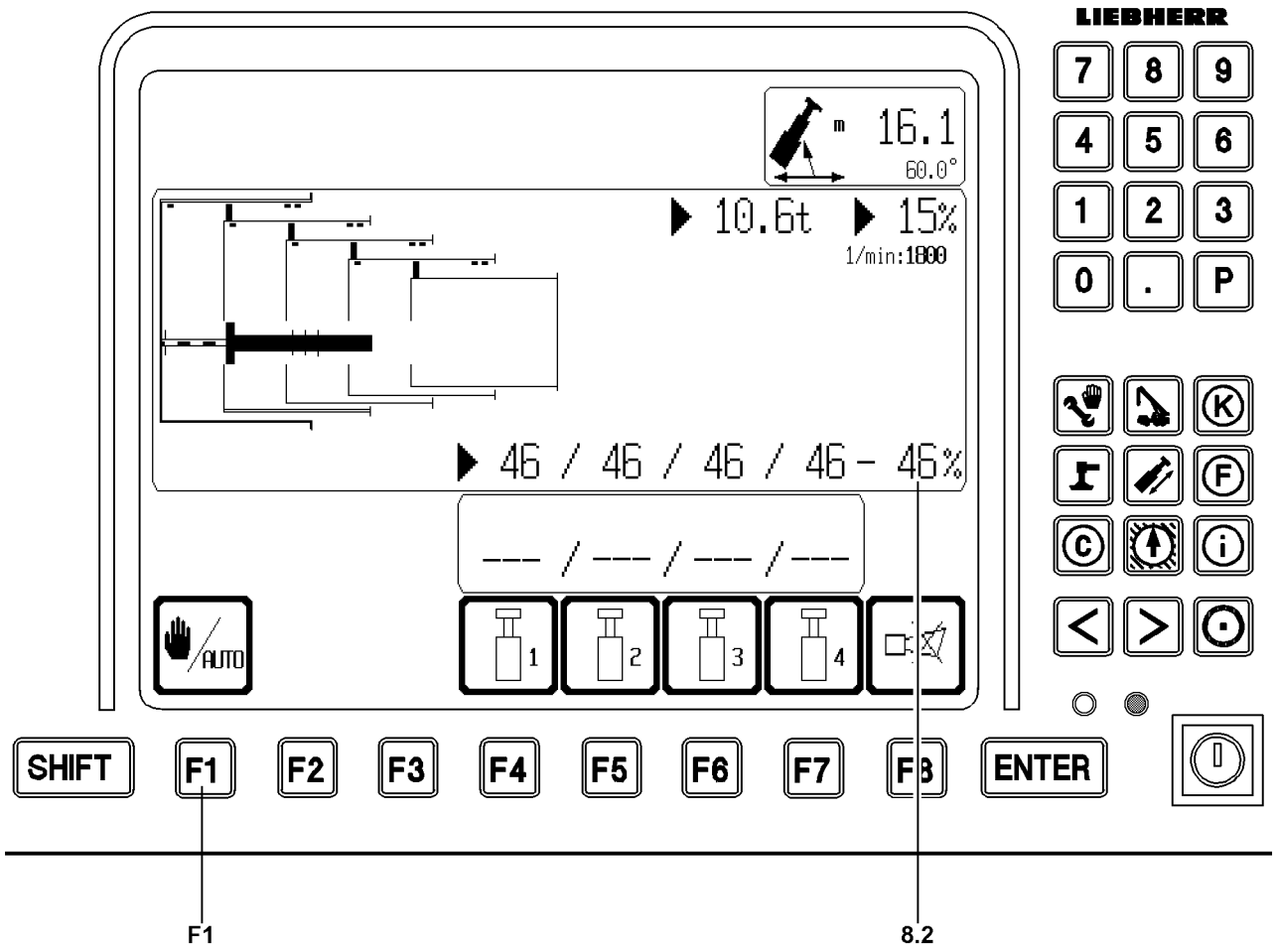

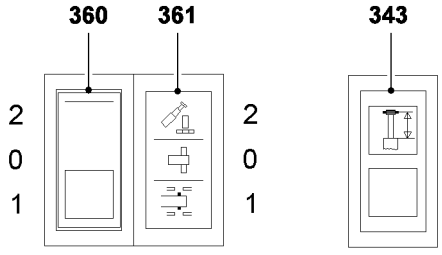

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Fig.104761

6.7 Manually telescoping the telescopic boom

Manual telescoping is regarded as an exception mode, as automatic mode makes it possible to reach any chosen extension state.

In manual telescoping, pinning and unpinning of the telescoping cylinder, and telescoping, must be carried out manually.

The marking on the telescoping screen will indicate in which telescope the pinning equipment of the telescoping cylinder is currently located.

The proximity to a telescope pin bore can be determined on the telescoping screen to an accuracy of 1%.

6.7.1 Activating manual telescoping operation

▶ Press the function key **F1**.

Result:

– Manual telescoping operation is now activated.

6.7.2 Unpinning the telescoping section

▶ Change over switch **360** from position **0** to position **2**.

Result:

– Unpinning the telescoping section will be preselected.

▶ Move the master switch for the telescopic boom forwards until the telescopic section is unpinned.

Result:

– The unpinned telescoping section is displayed on the telescoping screen.

6.7.3 Telescoping and pinning the telescoping section

▶ Operate the master switch. Telescope the telescopic section.
▶ Change over switch **360** from position **2** to position **0**.

Result:

– Pinning the telescoping section will be preselected.

▶ Continue to move the master switch in the same direction until the locking pin latches in audibly.

Result:

– The telescoping section is pinned.

6.7.4 Unpinning the telescoping cylinder

Before carrying out any other steps, please ensure that the locking pin has latched in audibly.

▶ Move the master switch for the telescopic boom forwards until the locking pins of the telescoping cylinder are released.
▶ Do not operate the master switch again.
▶ Change over switch **360** from position **0** to position **1**.

Result:

– The telescoping cylinder will be unpinned.
– The telescoping screen displays the unpinned telescoping cylinder.

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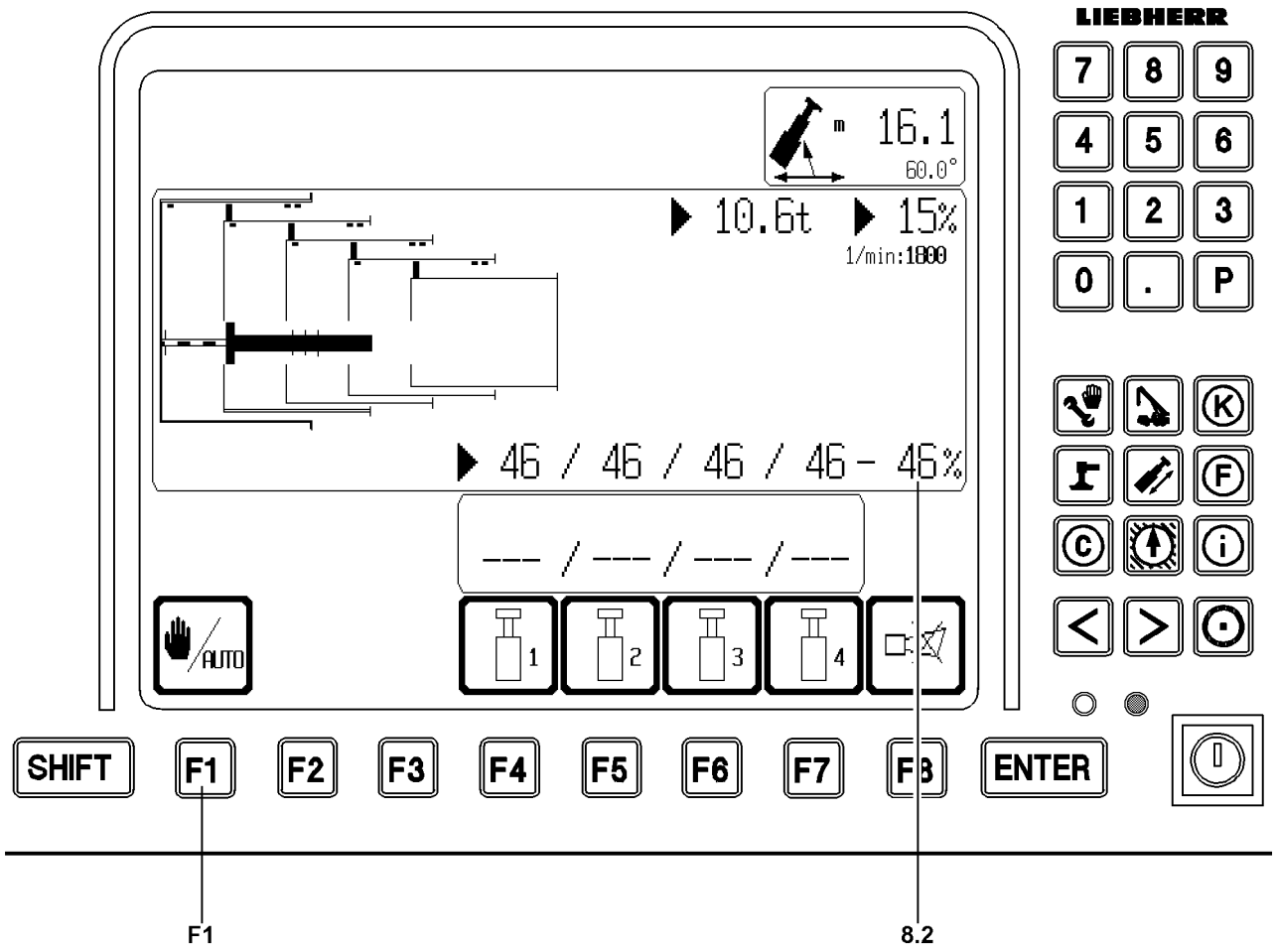

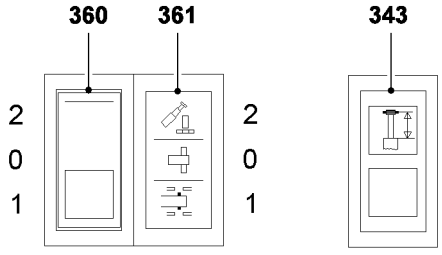

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Fig.104761

6.7.5 Telescoping and pinning the telescoping cylinder

The position of the telescoping cylinder is indicated by the image shown on the monitor and in icon **8.2**.

▶ Telescope the telescoping cylinder until it reaches the pinning position.

CAUTION
Risk of damage to the tele locking!
▶ Only pin the telescoping cylinder when it is in the pinning position!
▶ Pin the telescoping cylinder only when the indicator light **343** lights up!
▶ The locking pins must latch in audibly!

▶ Change over switch **360** from position **1** to position **0**.

Result:

– Pinning the telescoping cylinder will be preselected.

▶ Continue telescoping the telescoping cylinder in the same direction and pin the telescoping cylinder.

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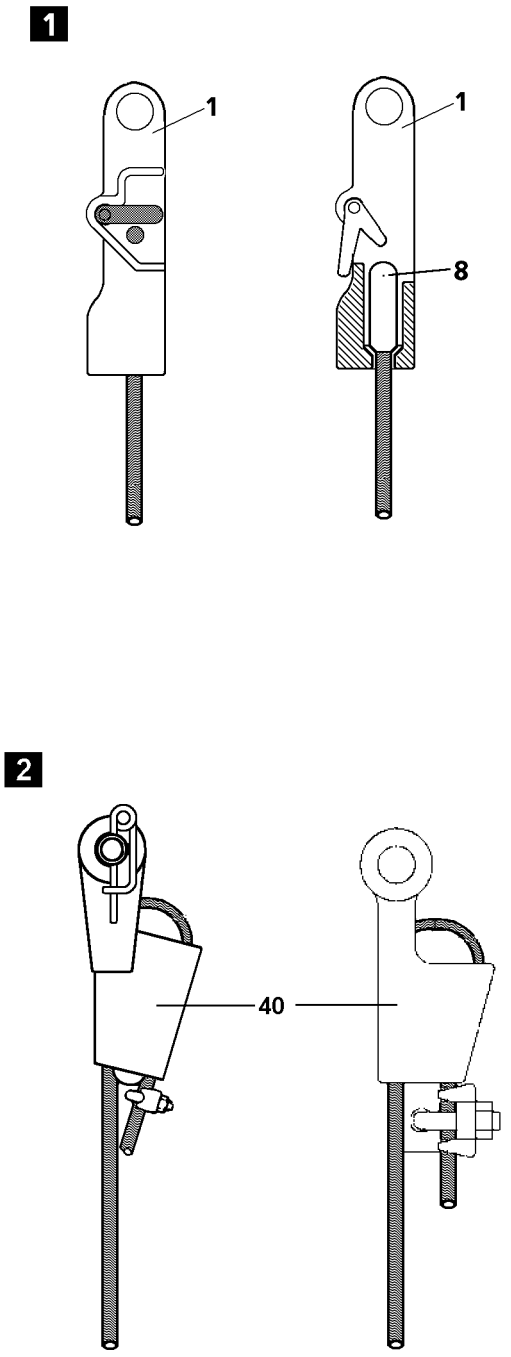

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Fig.108118

1 Wire ropes and rope end connections

1.1 Wire ropes

Please check if a **rotating resistant** or a **non-rotating** rope is required for the application. The type of rope that is selected then determines the required type of rope end connections, see Crane operating instructions, chapter 8.04.

Note

▶ The correct choice and use of wire rope and rope end connections are decisive preconditions for proper and accident-free crane operation!

DANGER

Danger of serious personnel injury and equipment 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 rope clamp **8**
  For that, use a rope lock **1**, see illustration **1**.
– Rope end connections without rope clamp
  For that, use a wedge lock **40**, see illustration **2**.

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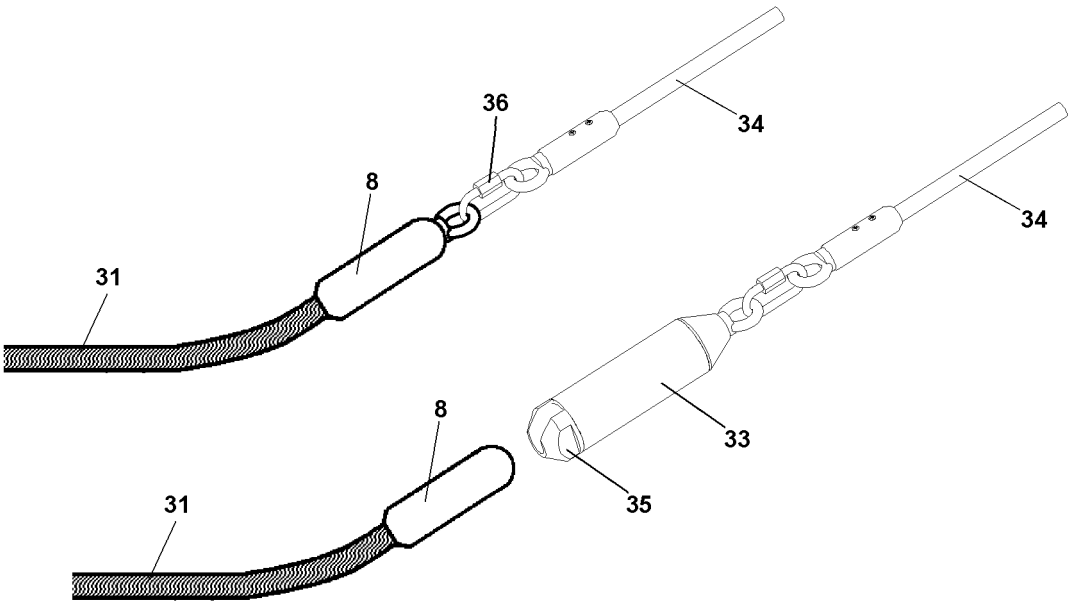

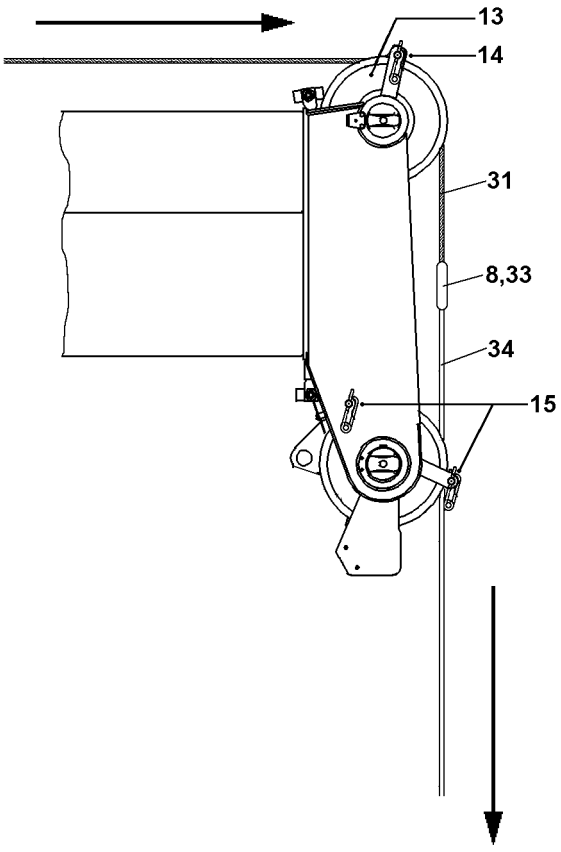

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Fig.110411

2 Reeving the hoist rope with the auxiliary reeving rope

WARNING
Risk of falling!
The assembly personnel, due to an erroneous operation of the crane function or slip on the telescopic boom, can fall and be killed!
- ▶ The telescopic boom 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 telescopic boom, then the assembly personnel must hang an approved fall arrest system to the retaining ropes of the telescopic boom on the left and right with both snap hooks and secure themselves in case of falls. See crane operating instructions, chapter 2.04 and chapter 2.06!
- ▶ Without appropriate safety measures, it is **strictly** prohibited to step on the telescopic boom!
- ▶ 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 place!

2.1 Reeving procedure

Make sure that the following prerequisites are met:
- The crane is properly supported and horizontally aligned.
- The crane is ballasted according to the load chart.
- The LICCON overload protection has been set according to the load chart.
- The telescopic boom is fully telescoped in.
- The telescopic boom has been luffed to the rear or the side.
- The telescopic boom is luffed down in 0° position.

- ▶ Wear approved fall arrest system and protective equipment, see Crane operating instructions, chapter 2.04.
- ▶ Install the hook device on the ladder, see Crane operating instructions, Chapter 2.06.

WARNING
Risk of falling!
- ▶ Hang the ladder in such a way onto the hoist gear and on the telescopic boom that it cannot fall over! See Crane operating instructions, chapter 2.06.

If no railing is installed on the crane superstructure:
- ▶ Hang the ladder on the hoist gear and set it up safely, see Crane Operating instructions, Chapter 2.06.

If a railing is installed on the crane superstructure:
- ▶ Set the railing on the crane superstructure into assembly / disassembly position, see Crane operating instructions, chapter 2.06.
- ▶ Secure the assembly personnel from falling: Hook assembly personnel with fall arrest system on the respective fastening points, see Crane operating instructions, chapter 2.06.

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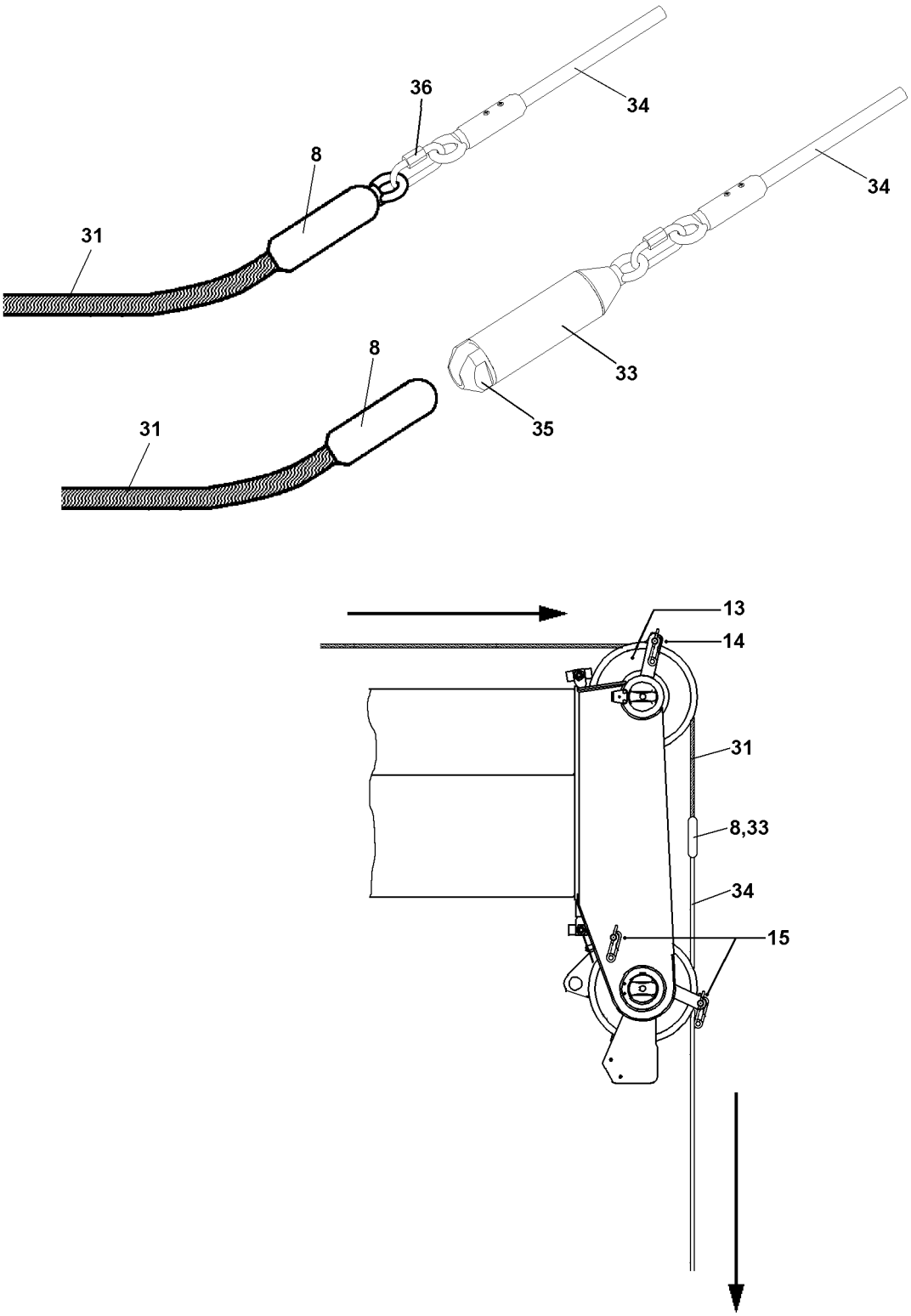

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Fig.110411

With the auxiliary reeving rope **34**, the hoist rope **31**can be reeved safely.

When **a** intake sleeve **33** is installed on the auxiliary reeving rope **34**:

- ▶ Connect the auxiliary reeving rope **34** with the hoist rope **31**: Slide the intake sleeve **33** onto the locking clamp **8** and close off with the sleeve plug **35**.

When **no** intake sleeve **33** is installed on the auxiliary reeving rope **34**:

- ▶ Connect the auxiliary reeving rope **34** with the hoist rope **31**: Open the chain lock **36**, connect it with the eyehook of the lock clamp **8** and close the chain lock **36**.
- ▶ Place the auxiliary reeving rope **34** forward over the pulley head.
- ▶ Hang the ladder on the telescopic boom and set it up safely, see Crane Operating instructions, Chapter 2.06.
- ▶ Secure the assembly personnel from falling: Hook assembly personnel with fall arrest system on the respective fastening points, see Crane operating instructions, chapter 2.06.
- ▶ Remove the rope retaining pipe **14** and rope retaining pipe **15** on the pulley head.
- ▶ Place the auxiliary reeving rope **34** over the upper rope pulley **13**.

NOTICE

Danger of slack rope formation!

If the auxiliary reeving rope **34** is not held tight when spooling the winch out, slack rope can form on the hoist rope **31**!

- ▶ Hold the auxiliary reeving rope **34** tight!

- ▶ Slowly spool out the winch by deflecting the master switch and pull the auxiliary reeving rope **34** with the hoist rope **31** over the upper rope pulley **13**.
- ▶ Detach the auxiliary reeving rope **34** on the hoist rope **31** and reeve the hoist rope **31** into the hook block.
- ▶ Insert and secure the rope retaining pipe **14** and the rope retaining pipe **15** on the pulley head.

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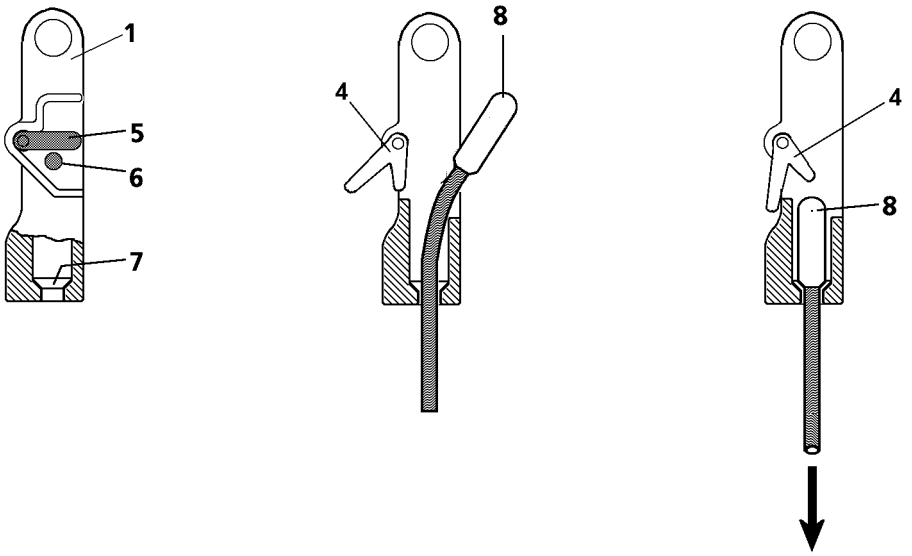

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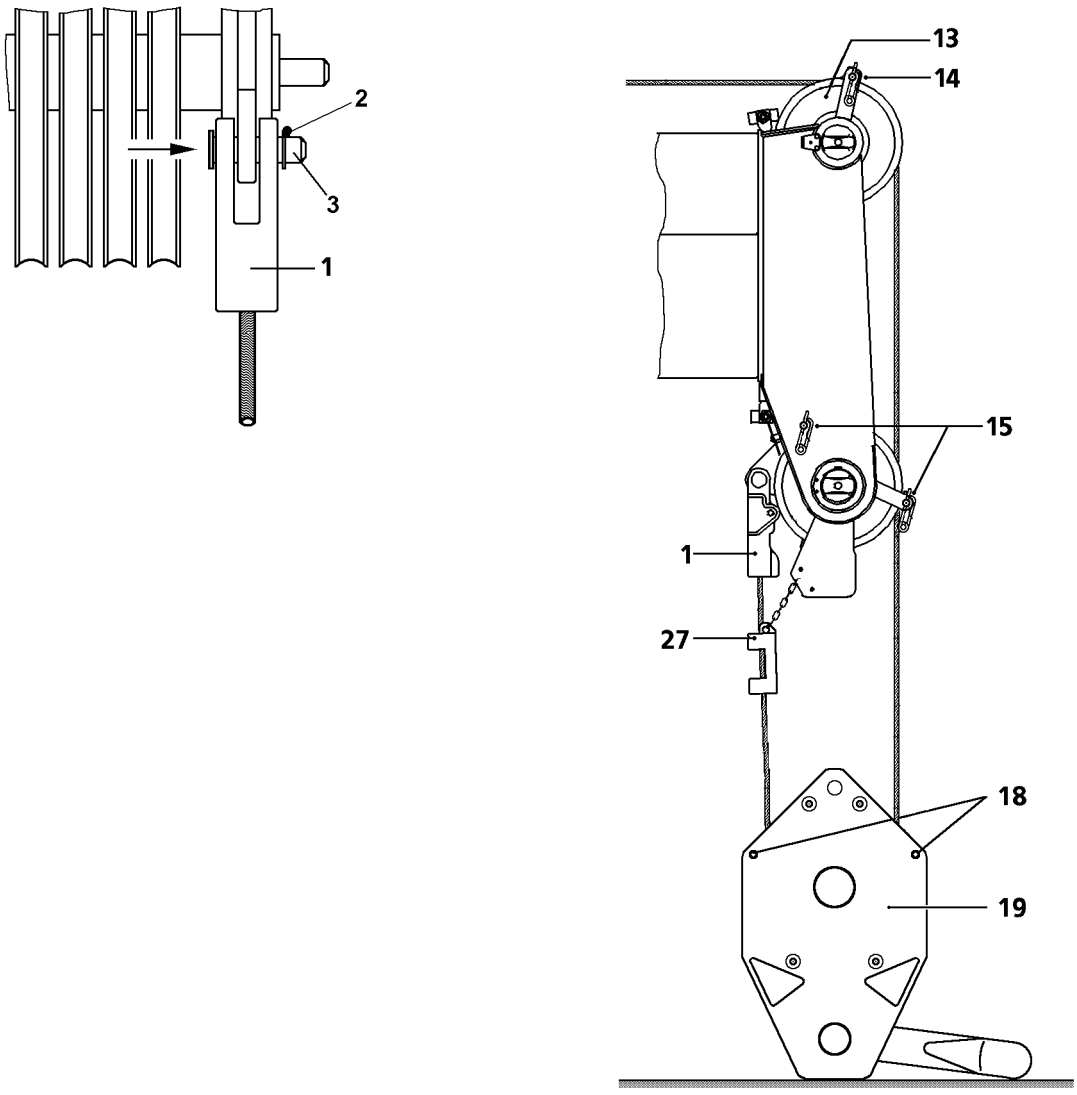

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Fig.108124

3 Reeving the hook block in and out

3.1 Reeving in the hook block

3.1.1 Preparing the hook block

NOTICE
Damage to the hoist rope!
An incorrectly reeved hoist rope or the incorrect selection of the rope fixed point can cause the hook block not to hang vertically and thus cause damage to the hoist rope!
- ▶ Always carry out the reeving of the hoist rope according to the reeving plan!
- ▶ The rope fixed point on the hook block is to be selected in such a way that the last strand runs parallel to the remaining rope strands, as much as possible!

- ▶ Place the required hook block under the pulley head of the telescopic boom.
- ▶ At the hook block **19**, remove the spring retainers **18** for both rope retaining pins and pull them both out.

WARNING
Risk of falling!
The assembly personnel, due to an erroneous operation of the crane function or slip on the telescopic boom, can fall and be killed!
- ▶ The telescopic boom 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 telescopic boom, then the assembly personnel must hang an approved fall arrest system to the retaining ropes of the telescopic boom on the left and right with both snap hooks and secure themselves in case of falls. See crane operating instructions, chapter 2.04 and chapter 2.06!
- ▶ Without appropriate safety measures, it is **strictly** prohibited to step on the telescopic boom!
- ▶ 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 place!

- ▶ Reeve in the hoist rope, see section „Reeving the hoist rope with the auxiliary reeving rope“.
- ▶ Insert the rope retaining pipes again and secure with spring retainers.

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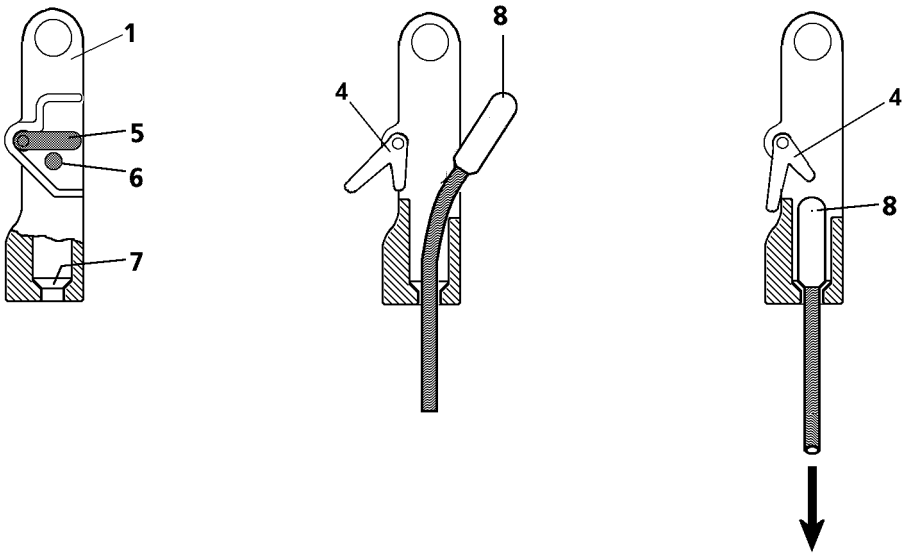

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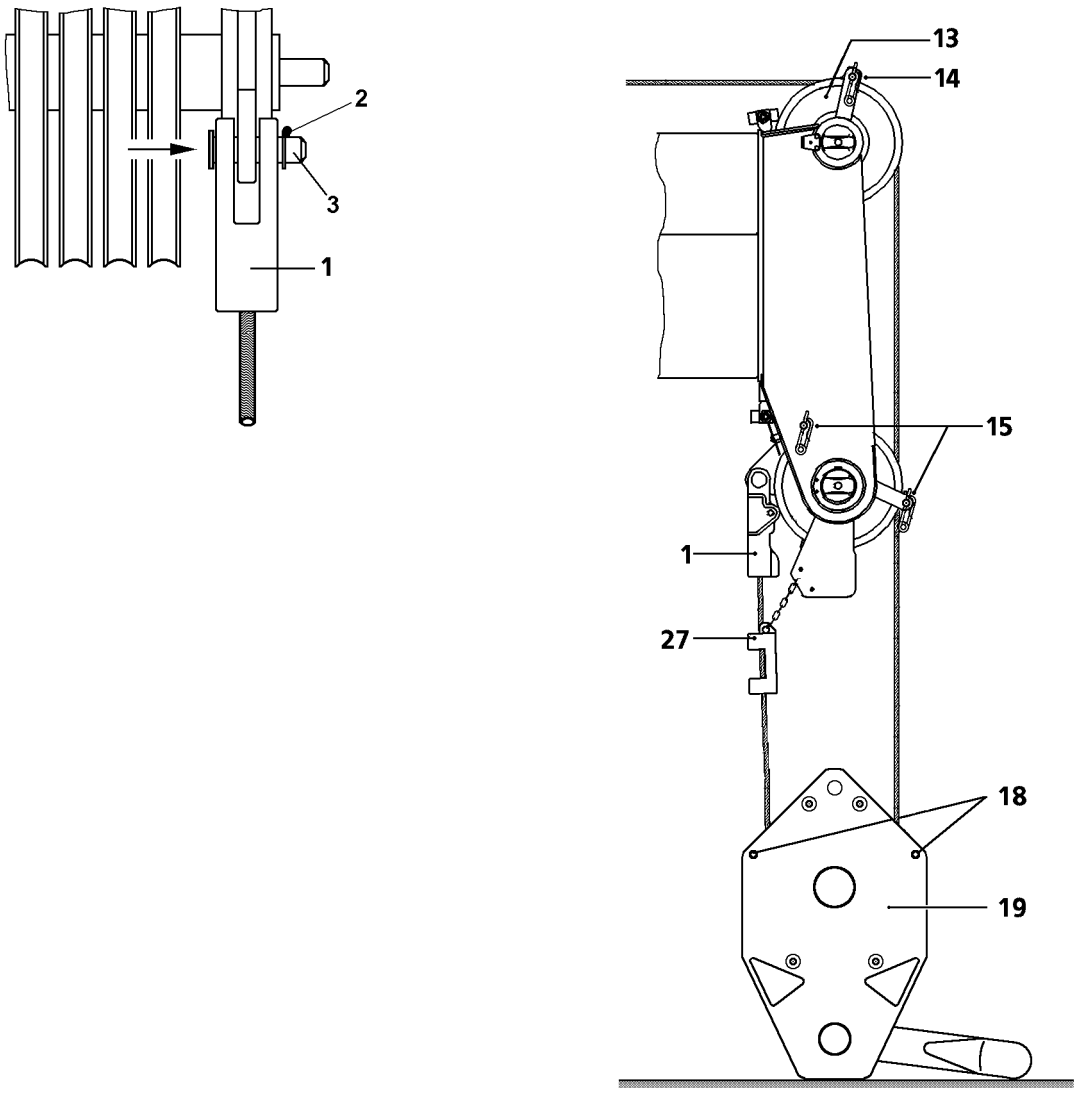

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Fig.108124

3.1.2 Fastening the hoist 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, see fig. **1**.

▶ The rope lock **1** must be pinned in either at the pulley head or on the hook block and secured with linch pins **2**, depending on reeving.
▶ Push the retaining pin **6** on the rope lock **1** in, move the lever **5** „downward“ and hold it in this position.

Result:

– The latch **4** will be swivelled downward.

▶ Attach the rope end with the locking clamp **8** in the rope lock and pull the rope firmly „downward“ (in direction of arrow), until the locking clamp **8**is placed in the cone **7**.

WARNING
Danger of accident due to incorrect mounting of locking clamp!
▶ 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 retaining pin **6**.

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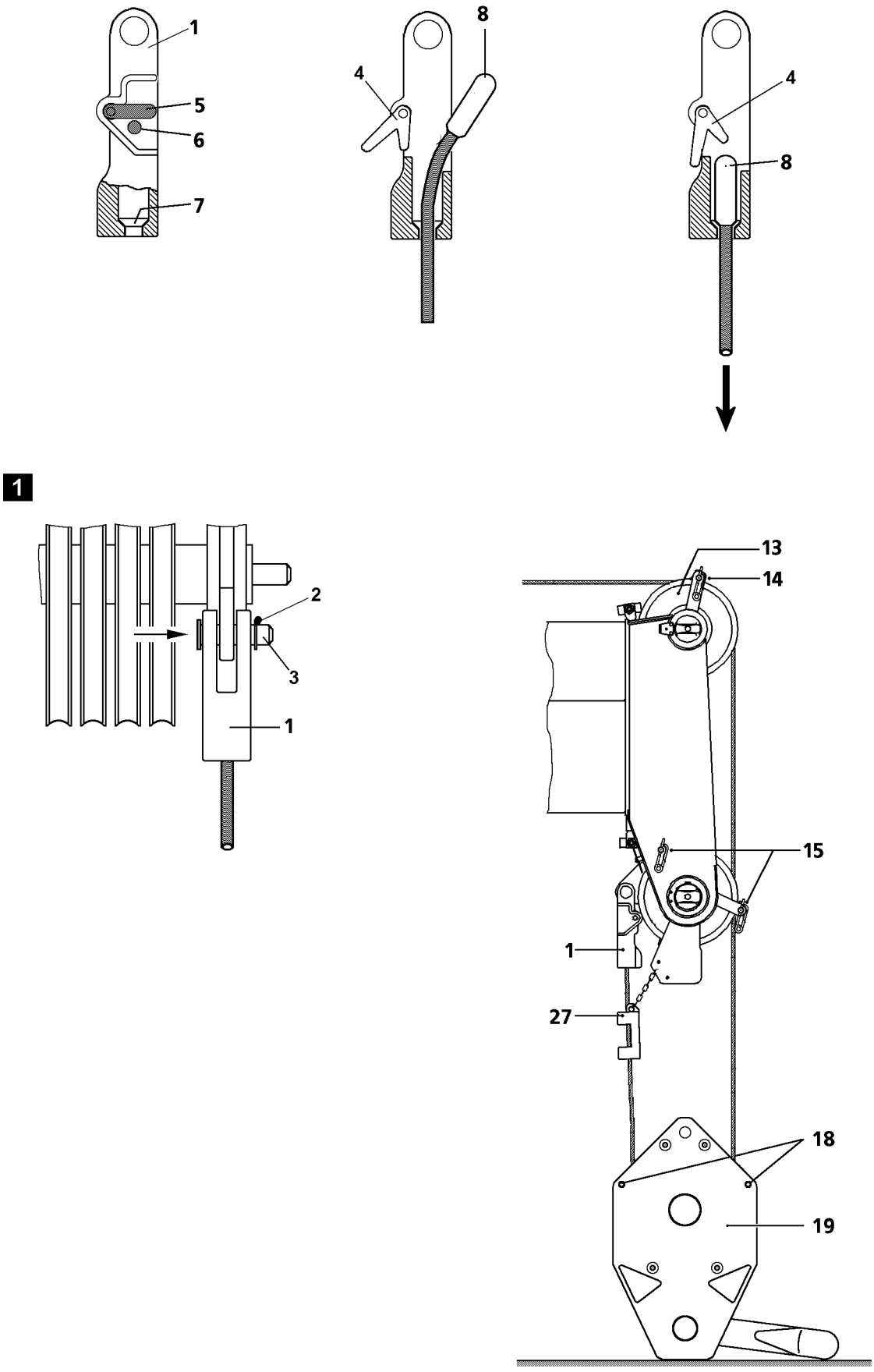

Fig.108124

3.2 Unreeving the hook block

Make sure that the following prerequisites are met:
- The crane is properly supported and horizontally aligned.
- The crane is ballasted according to the load chart.
- The LICCON overload protection has been set according to the load chart.
- The telescopic boom is fully telescoped in.
- The telescopic boom has been luffed to the rear or the side.
- The telescopic boom is luffed down in 0° position.
- The ground is level and of sufficient load carrying capacity.

3.2.1 Lowering the hook block

WARNING
Crushing of hands!
When guiding the hook block by hand, hands or fingers can be crushed!
When unreeving the hook block, it can topple over!
- ▶ 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, see section „Removing the hoist limit switch weight“.

3.2.2 Detaching the hoist rope

- ▶ Push in retaining pin **6** on the rope lock **1** move the lever **5** downward and hold it in this position.

Result:

- The latch **4** is moved to the side and the locking clamp **8** is released.

- ▶ Push the hoist rope up and detach the locking clamp **8**.
- ▶ At the hook block **19**, remove the spring retainers **18** for both rope retaining pins and pull both rope retaining pins out, see section „Reeving the hoist rope with the assembly winch“
- ▶ On the pulley head remove the spring retainers on the rope retaining pipe **14** and on the rope retaining pipe **15** and pull the rope retaining pipes out, see section „Reeving the hoist rope with the auxiliary reeving rope“
- ▶ Unreeve the hoist rope from the hook block and the pulley head.
- ▶ Insert the rope retaining pipes again and secure with spring retainers.

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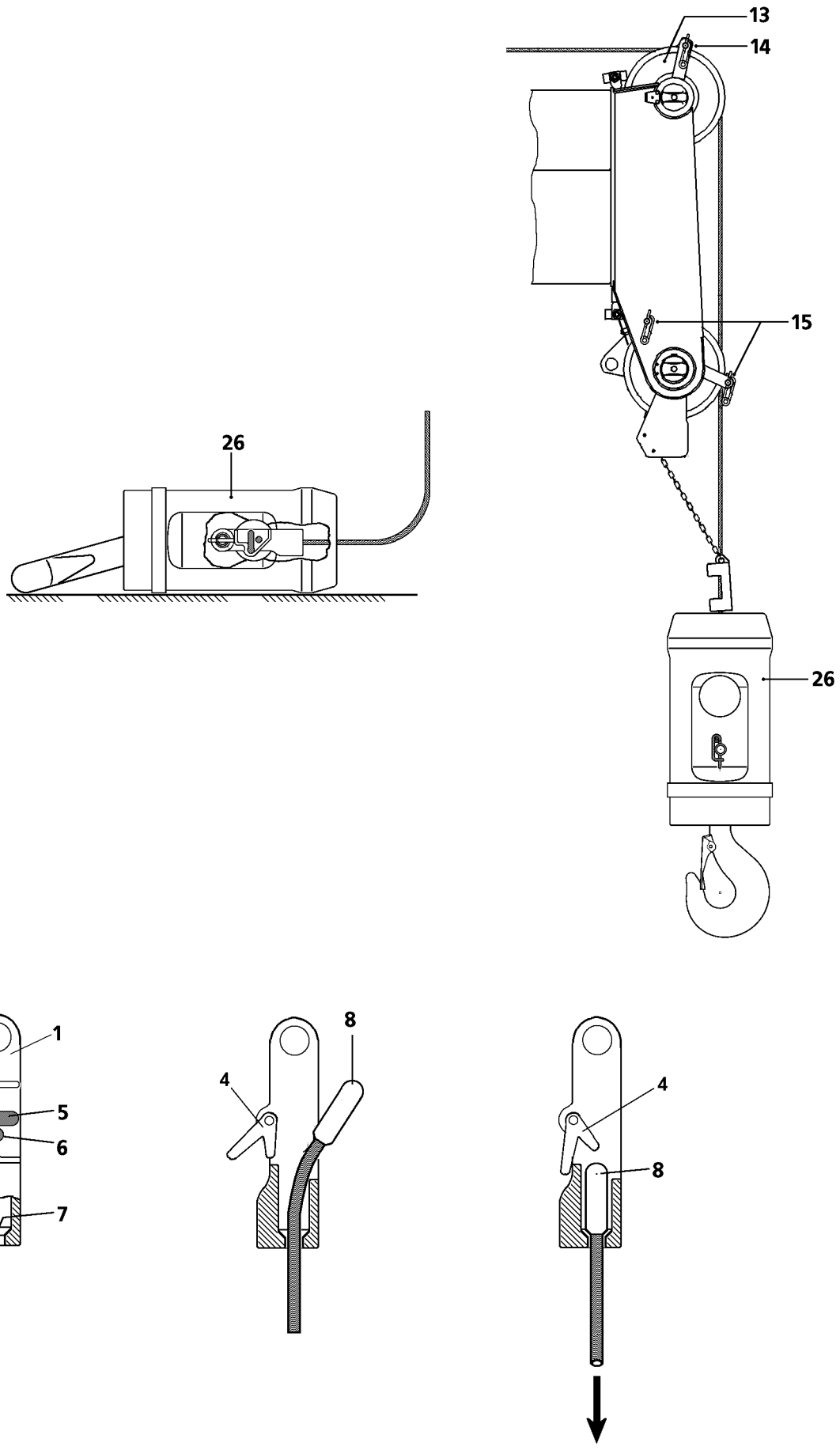

Fig.108125

4 Securing and removing the load hook*

4.1 Securing the load hook*

4.1.1 Assembling the load hook*

- ▶ Place the load hook under the pulley head of the telescopic boom.
- ▶ At the pulley head remove the spring retainers on the rope retaining pipe **14** and on the rope retaining pipe **15** and pull the rope retaining pipe out.

WARNING
Risk of falling!
The assembly personnel, due to an erroneous operation of the crane function or slip on the telescopic boom, can fall and be killed!

- ▶ The telescopic boom 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 telescopic boom, then the assembly personnel must hang an approved fall arrest system to the retaining ropes of the telescopic boom on the left and right with both snap hooks and secure themselves in case of falls. See crane operating instructions, chapter 2.04 and chapter 2.06!
- ▶ Without appropriate safety measures, it is **strictly** prohibited to step on the telescopic boom!
- ▶ 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 place!

- ▶ Place the hoist rope over the upper rope pulley **13**, see section „Reeving the hoist rope with the auxiliary reeving rope“.
- ▶ Insert the rope retaining pipe **14** and the rope retaining pipe **15** and secure with spring retainers.
- ▶ Pin the rope lock **1** in the load hook **26** and secure with spring retainers.

4.1.2 Fastening the hoist rope

- ▶ Push the retaining pin **6** into the rope lock **1**, move the lever **5** sideways and hold it in this position.

Result:

– The latch **4** is moved to the side.

- ▶ Hang in the rope end with the locking clamp **8** in the rope lock and pull the rope firmly in the direction of the arrow, until the locking clamp **8** contacts the cone **7**.

WARNING
Danger of accident due to incorrect mounting of locking clamp!

- ▶ 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 retaining pin **6**.

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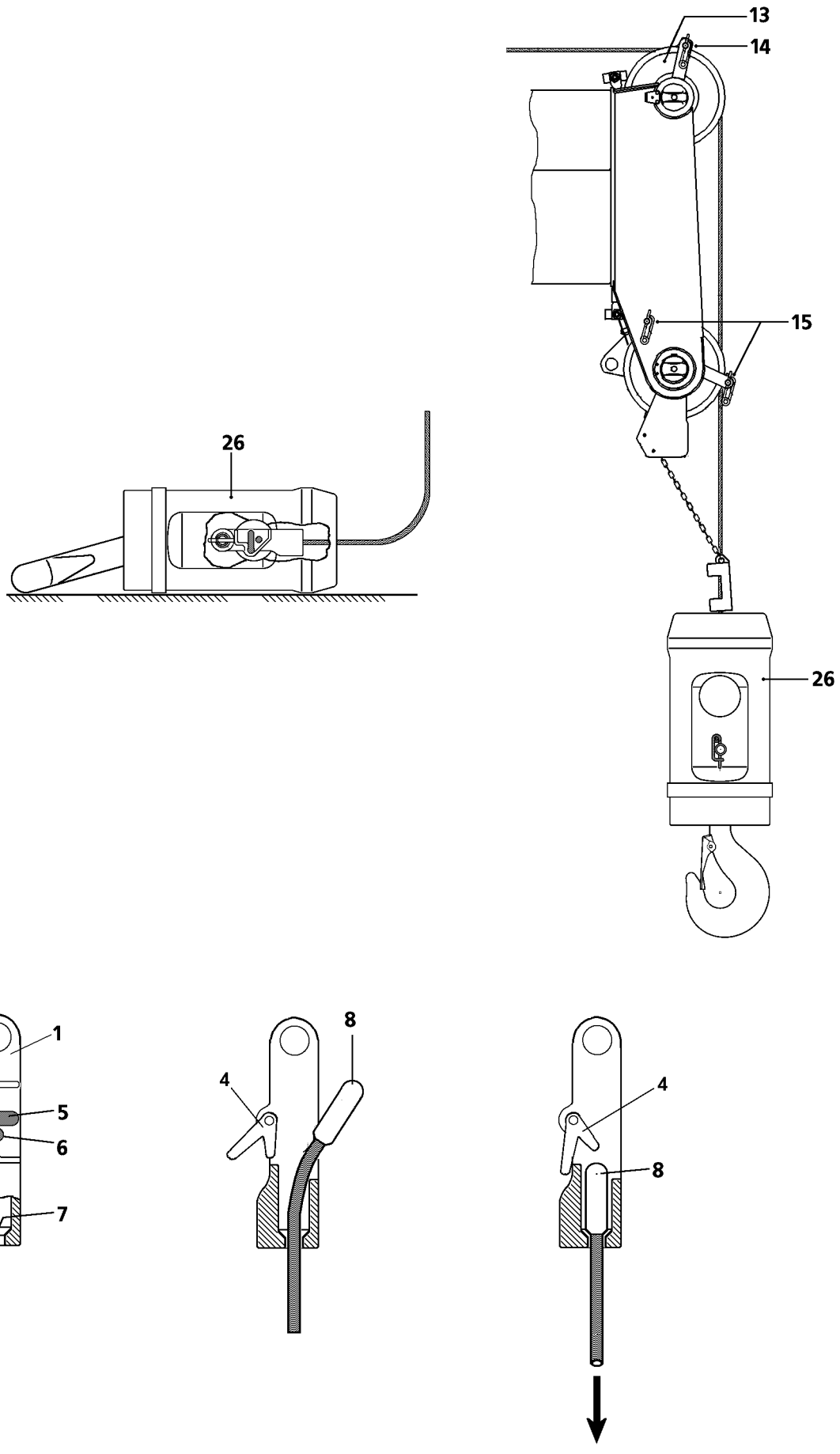

Fig.108125

4.2 Removing the load hook*

Make sure that the following prerequisites are met:
- The crane is properly supported and horizontally aligned.
- The crane is ballasted according to the load chart.
- The LICCON overload protection has been set according to the load chart.
- The telescopic boom is fully telescoped in.
- The telescopic boom has been luffed to the rear or the side.
- The telescopic boom is luffed down in 0° position.
- The ground is level and of sufficient load carrying capacity.

4.2.1 Lowering the load hook

WARNING
Crushing of hands!
When guiding the load hook by hand, hands or fingers can be crushed!
The load hook could roll away!
▶ Make sure the load hook is safely positioned!

▶ Place the load hook **26** on the ground.
▶ Remove the hoist limit switch weight, see section „Removing the hoist limit switch weight“.

4.2.2 Detaching the hoist rope

▶ Push the retaining pin **6** into the rope lock **1**, move the lever **5** sideways and hold it in this position.

Result:

– The latch **4** is moved to the side and the locking clamp **8** is released.

▶ Push the hoist rope in the direction of the load hook and detach the locking clamp **8**.
▶ At the pulley head remove the spring retainers on the rope retaining pipe **14** and on the rope retaining pipe **15** and pull the rope retaining pipe out, see section „Reeving the hoist rope with the assembly winch“.
▶ Unreeve the hoist rope from the pulley head.
▶ Insert the rope retaining pipes again and secure with spring retainers.

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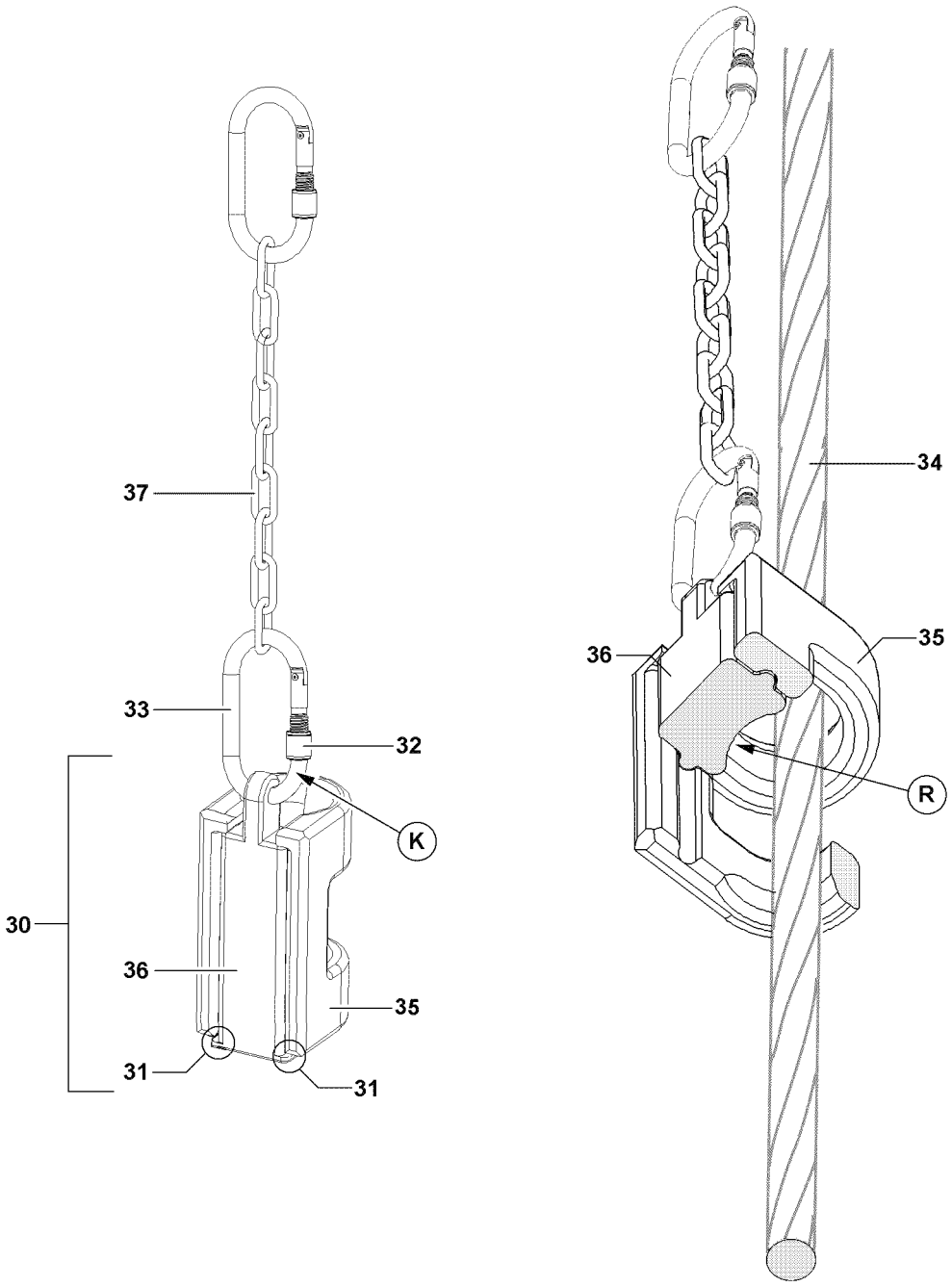

Fig.106127

5 Attaching / removing the hoist limit switch weight

5.1 Attaching the hoist limit switch weight

The hoist limit switch weight **30** consists of 2 parts, which are pushed into each other:
- The weight **35**.
- The carrier section **36**.

▶ Loosen and open the screw retainer **32**.

WARNING
The hoist limit switch can fall down!
If the hoist limit switch weight is incorrectly assembled, components can fall down!
Personnel can be severely injured or killed!
▶ 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 stubs **31** of the carrier section **36** touch 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 diagonal 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**.

▶ Close the screw retainer **32** on the snap hook **33**.

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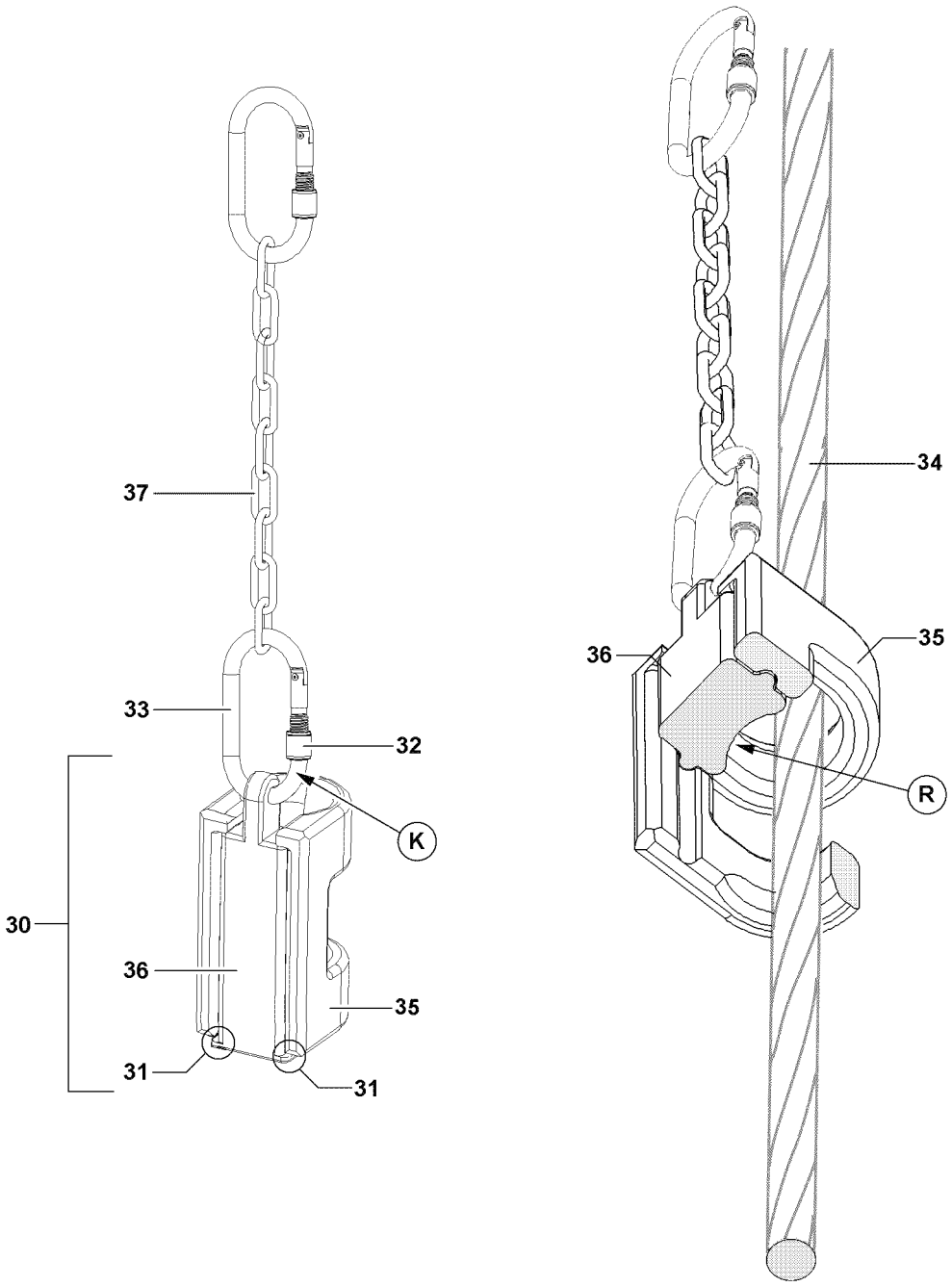

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Fig.106127

5.2 Removing the hoist limit switch weight

WARNING
The hoist limit switch can fall down!
If the hoist limit switch weight is incorrectly removed, components can fall down!
Personnel can be severely injured!
- ▶ 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 for anyone to remain in 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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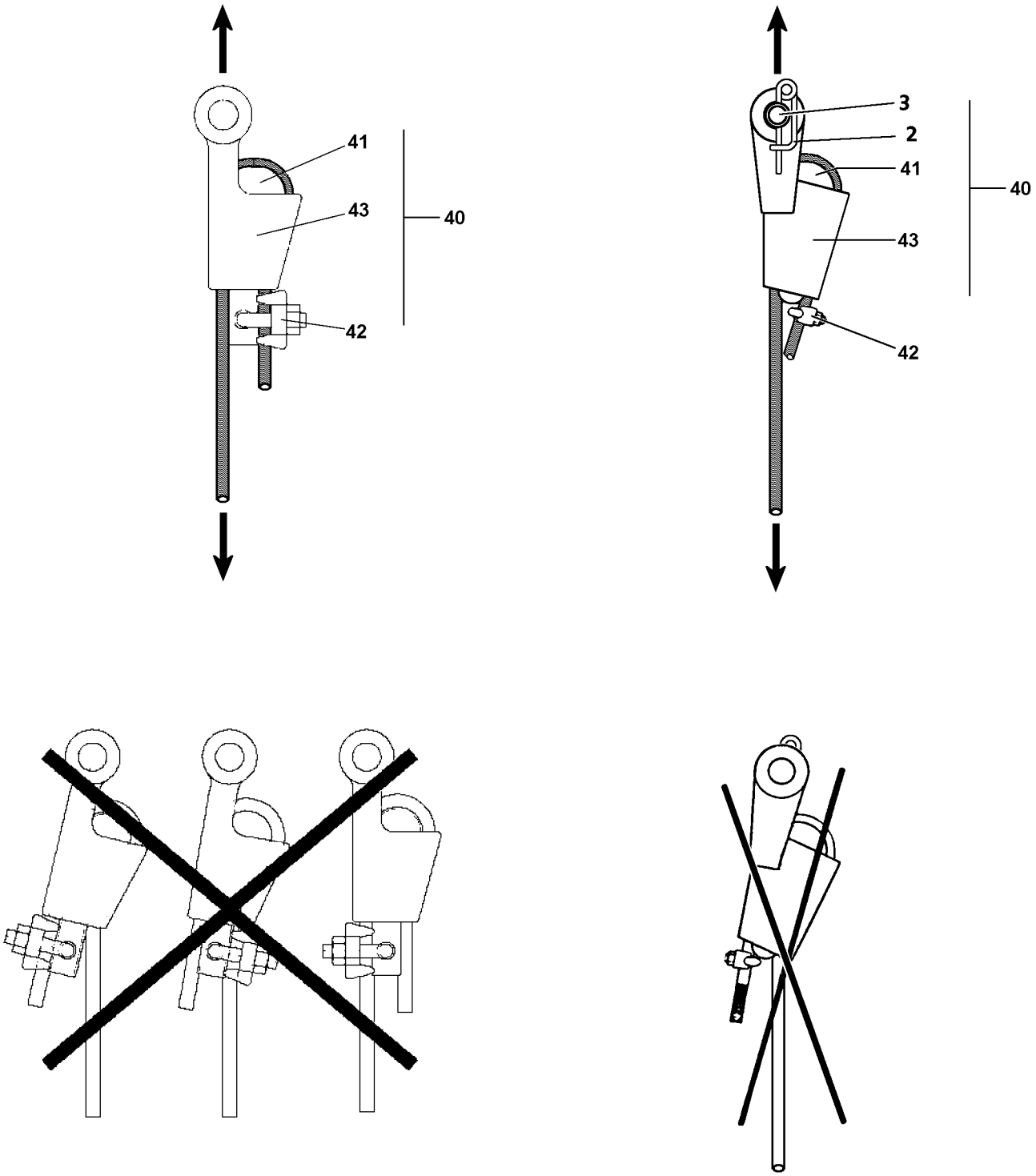

Fig.108119

6 Assembling / disassembling the 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 are ready for assembly.

6.1 Installing the wedge lock

WARNING
Danger of fatal accidents due to falling load!
If an incorrect wedge lock **40** is used or if the wedge lock **40** is incorrectly assembled, the hoist rope can rip off or the hoist rope can be pulled through the wedge lock **40**!
The hook block and the load can fall down and kill personnel!
- ▶ Use only a wedge lock **40** approved by Liebherrwerk Ehingen!
- ▶ Assembling 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 that of the hook block or on the load hook, depending on the reeving plan.

6.2 Disassembling 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**.

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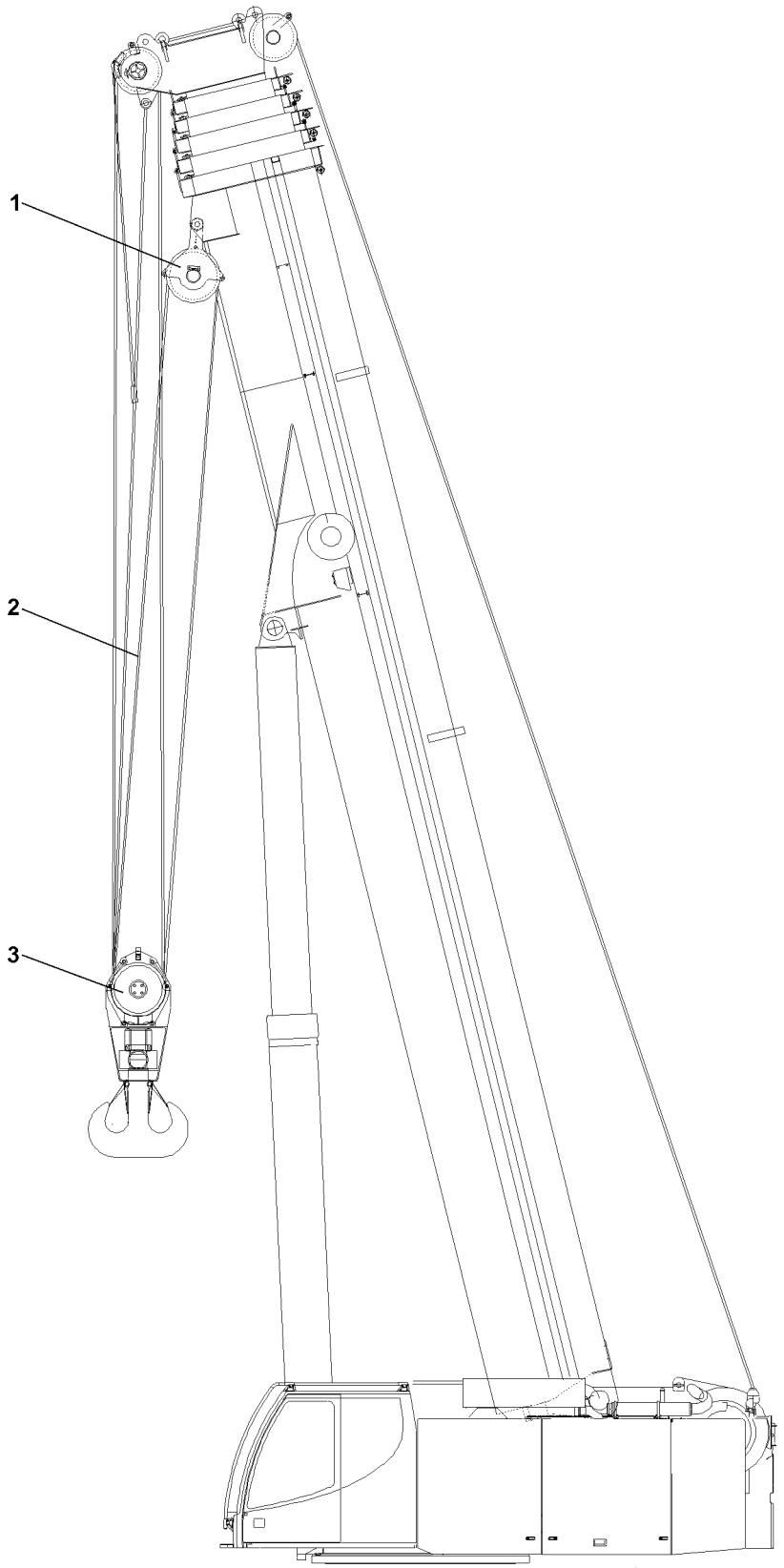

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Fig.108222

7 Crane operation with auxiliary block* on the telescopic boom

7.1 Crane operation with auxiliary block*

For crane operation with auxiliary block **1**, the following prerequisites are required:
- The TY guying has been disassembled (if present).
- The working floodlights on the telescopic boom have been disassembled.

Note
▶ For crane operation with auxiliary block **1** on the telescopic boom, move only to the radius ranges, which are present in the load chart!

NOTICE
Damage of hook block, auxiliary block or hoist rope!
If the following notes are not observed, the hook block **3**, the hoist rope **2** or the auxiliary block **1** can be damaged!
If the hoist limit switch chain on the hoist limit switch weight is too short, the hook block **3** can run on the auxiliary block **1** when spooling up the hoist rope **2** and damage it severely.
▶ Before crane operation with auxiliary block **1**, assemble the longer hoist limit switch chain!
▶ Before crane operation with auxiliary block **1**, remove the rope protection pipes on the hook block **3**!
▶ When the hook block **3** is on the ground, ensure that the hoist rope **2** remains in the pulleys!
▶ For operation with auxiliary block **1**, do **not** telescope the telescopic boom out and run only the radii ranges, which are specified in the load chart!

▶ Carry out crane operation with auxiliary block **1** carefully.

8 Rope reeving

Note
▶ For reeving plans, see Crane operating instructions, chapter 4.15!

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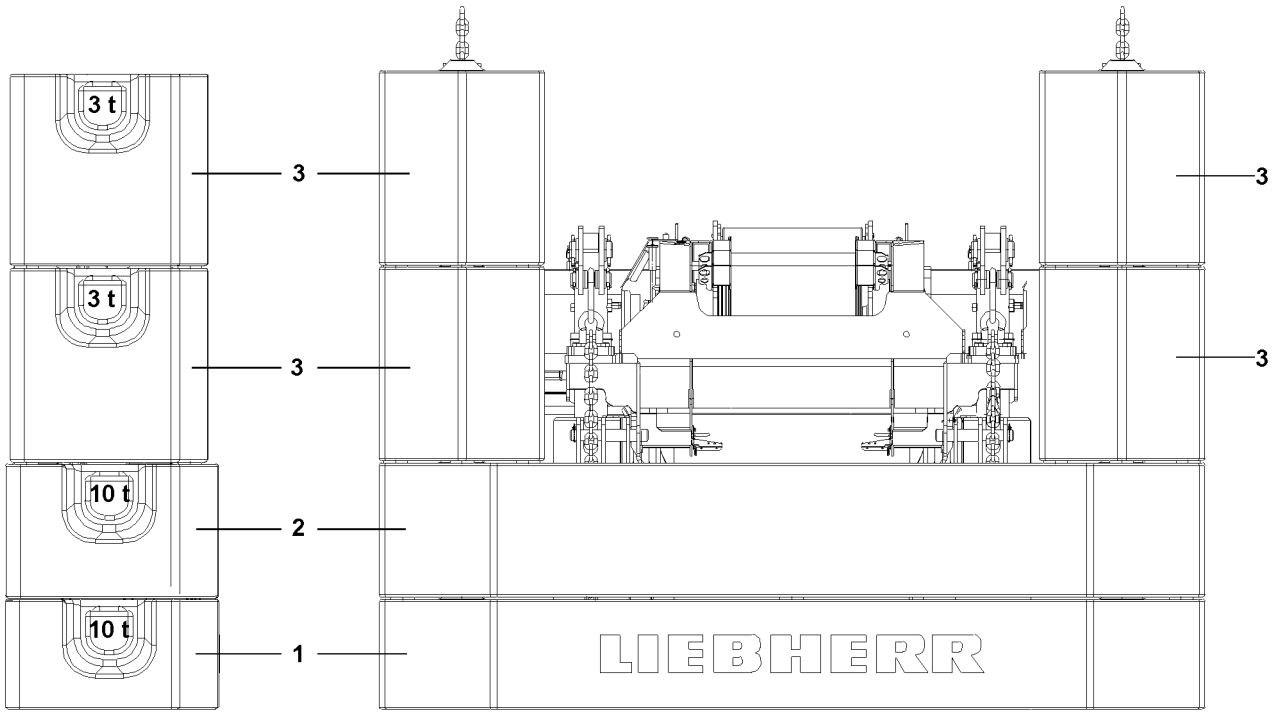

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Fig.102814

1 General

1.1 Counterweight combinations

The counterweight plates are marked with their own weights.

DANGER
Crane can topple over!
If a different counterweight than the one listed in the load chart is used, the crane may be damaged or topple over.
▶ Counterweight must be attached according to the data in the load chart!

The following counterweight combinations are possible:

Counterweight	Combination	Individual weight
0	no counterweight	0

Counterweight	Combination	Individual weight
10	Base plate **1**	10

Counterweight	Combination	Individual weight
16 t	Base plate **1**	10 t
	2x counterweight plate **3**	3 t

Counterweight	Combination	Individual weight
20 t	Base plate **1**	10 t
	Counterweight plate **2**	10 t

Counterweight	Combination	Individual weight
22 t	Base plate **1**	10 t
	4x counterweight plate **3**	3 t

Counterweight	Combination	Individual weight
26 t	Base plate **1**	10 t
	Counterweight plate **2**	10 t
	2x counterweight plate **3**	3 t

Counterweight	Combination	Individual weight
32 t	Base plate **1**	10 t
	Counterweight plate **2**	10 t
	4x counterweight plate **3**	3 t

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1.2 Checking the counterweight plates

DANGER
Risk of accident from damaged counterweights!
If damaged counterweights are ballasted, the stable seating of the counterweights can no longer be ensured.
▶ Replace damaged counterweights immediately!

Before assembly or disassembly of the counterweight plates, perform a visual check for damage and foreign matter.

1.3 Taking on permissible telescopic boom angle at counterweight

Make sure that the following prerequisites for the stability to the ballast side on the crawlers are met:
– the telescopic boom is fully telescoped in, T-11.5
– there is no load on the hook

DANGER
Crane can topple over!
If the permissible telescopic boom angles are not abided by, the crane can tip to the rear and cause fatal injury to personnel!
▶ Observe the permissible telescopic boom angle when taking on counterweight!

1.3.1 Permissible telescopic boom angle at wide track 4.15 m

At 0°, 90°, 180° and 270°.

Counterweight on superstructure	Central ballast	Permissible telescopic boom angles
32 t	15 t	-2° to 70.4°
26 t	15 t	-2° to 81°
22 t	15 t	-2° to 82°
20 t	15 t	-2° to 82°
16 t	15 t	-2° to 82°
10 t	15 t	-2° to 82°
0 t	15 t	-2° to 82°
0 t	0 t	-2° to 82°

1.3.2 Permissible telescopic boom angle at reduced track 3.40 m

At 90° and 270°.

Counterweight on superstructure	Central ballast	Permissible telescopic boom angles
32 t	15 t	-2° to 45.2°
26 t	15 t	-2° to 61.9°
22 t	15 t	-2° to 70.4°
20 t	15 t	-2° to 73.1°
16 t	15 t	-2° to 81°

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Counterweight on super-structure	Central ballast	Permissible telescopic boom angles
10 t	15 t	-2° to 82°
0 t	15 t	-2° to 82°
0 t	0 t	-2° to 82°

1.3.3 Permissible telescopic boom angle at retracted track 2.60 m

At 90° and 270°.

Counterweight on super-structure	Central ballast	Permissible telescopic boom angles
–	–	–
–	–	–
22 t	15 t	-2° to 45.2°
20 t	15 t	-2° to 52.4°
16 t	15 t	-2° to 61.9°
10 t	15 t	-2° to 75.8°
0 t	15 t	-2° to 82°
0 t	0 t	-2° to 82°

1.4 Permissible incline for ballasting

DANGER
Crane can topple over!
If the incline for ballasting is larger than +/- 1°, the crane can topple over and fatally injure personnel!
▶ Do not exceed nor fall below an incline of +/- 1° for ballasting!

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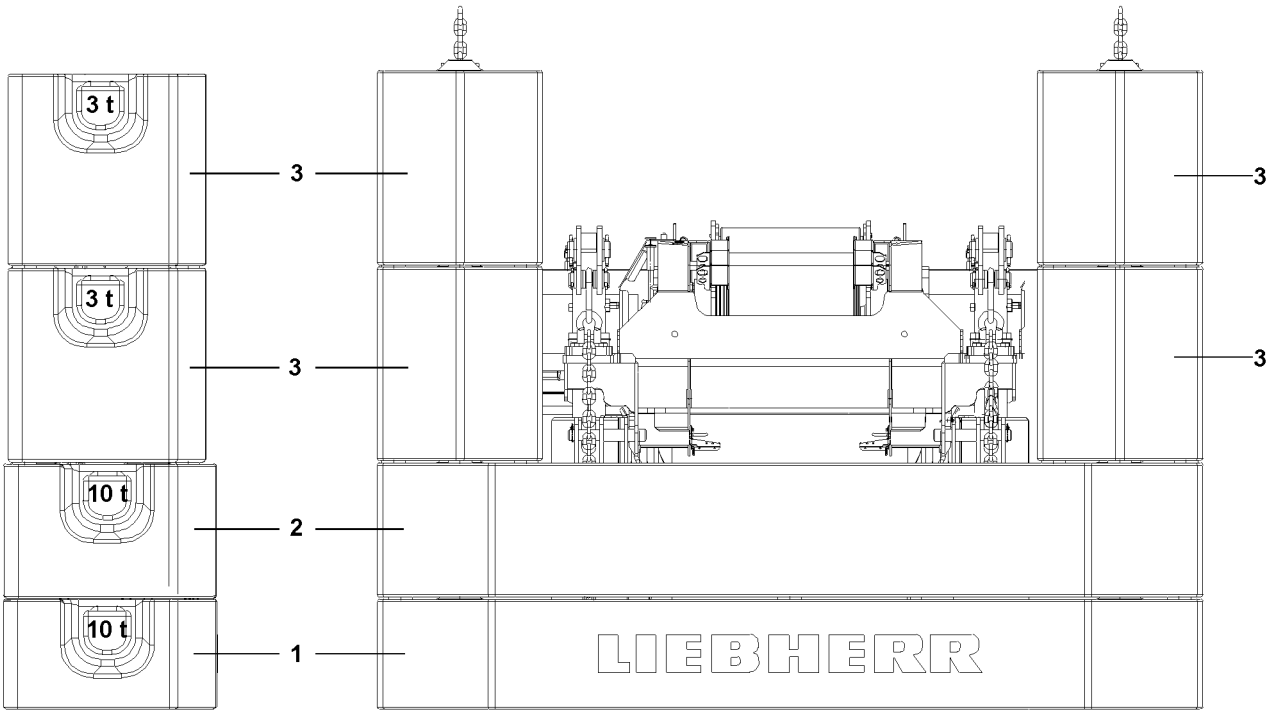

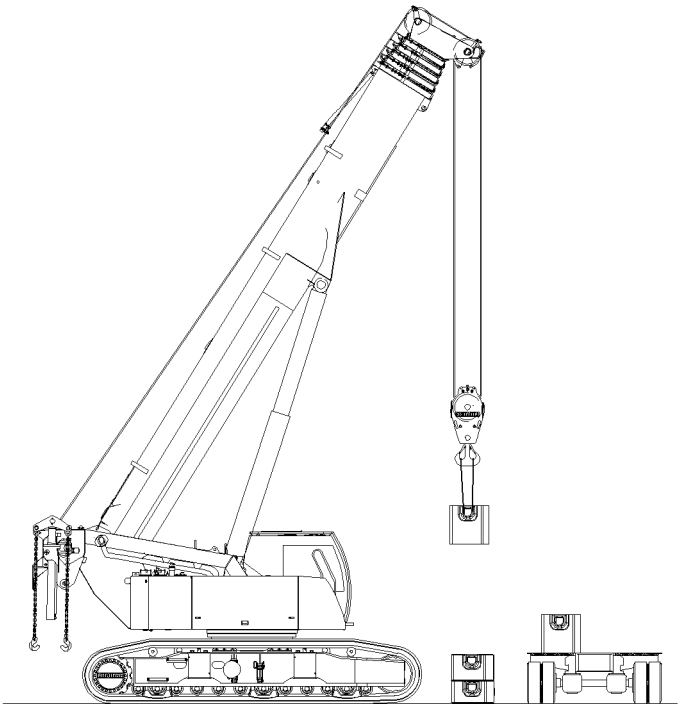

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Fig.102815

2 Assembly

2.1 General

Ensure that the following preconditions are met:
- the crane is aligned in horizontal direction
- the central ballast is installed
- the crane with installed crawler carriers is operational as assembly crane
- the transport vehicle with the counterweight plates is in the immediate vicinity of the crane
- the ground is level and of sufficient load carrying capacity

DANGER
Collapsing substrate!
For assembly or disassembly of the counterweight, make sure that the ground is of sufficient load carrying capacity, otherwise the counterweight can sink in and topple over.
▶ If ground gives way, select assembly location with sufficient load bearing capacity!

2.2 Unloading the base plate and the counterweight

DANGER
Crane can topple over!
Before the boom is raised, the LICCON overload protection must be set according to the valid load chart! The boom lengths and boom radii specified in the load chart may not be exceeded during ballasting!
▶ The data in the load charts must be strictly observed!

▶ Set the LICCON overload protection according to the load chart.
▶ Hang the base plate **1** on the suspension bitts.
▶ Lift the base plate **1** with the own crane and set in down on the assembly location.
▶ Unload the remaining counterweight plates, align and stack them on top of each other.

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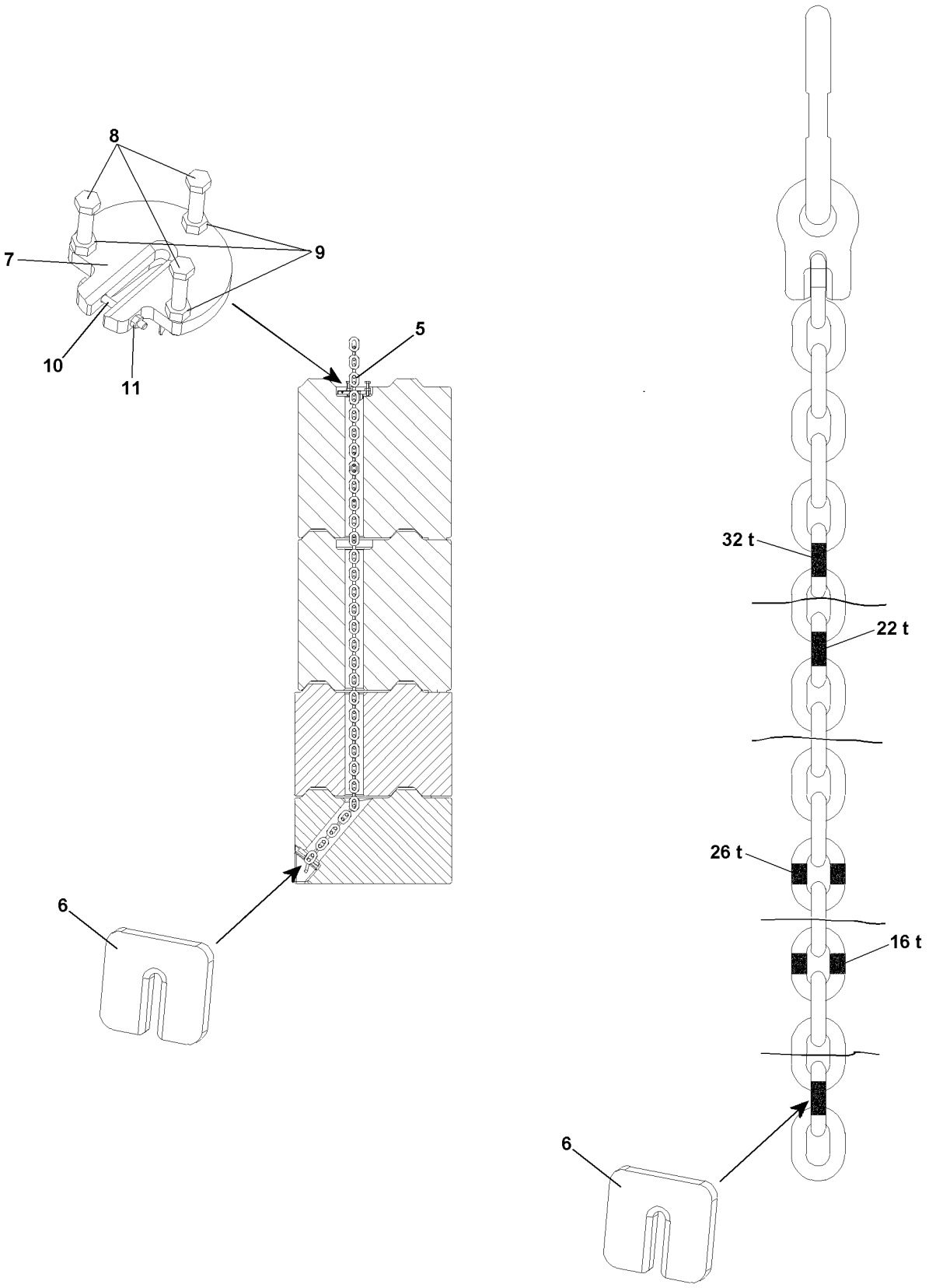

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Fig.103203

2.3 Securing the counterweight

DANGER
Danger of accident when tensioning the counterweight plates!
An increased accident hazard exists, if the following notes are not observed!
- ▶ To pretension, use only supplies safety chains **5**, chain receptacles **6** and retaining plates **7**!
- ▶ For larger ballasting, use a non-skid ladder to thread the safety chains **5**!
- ▶ Secure the counterweights before starting to use the crane!

Red and blue marks are applied to the safety chains **5**. The chain receptacles **6** and retaining plates **7** must be attached on these marks. For various counterweight combinations, chain links with different marks must be used to attach the retaining plates **7**.

Chain links with the following marks must be used:
- To attach the chain receptacles **6**, the lowest chain links with a red mark.
- To attach the retaining plates **7** for the 16 t counterweight, the lower chain links with a blue mark.
- To attach the retaining plates **7** for the 26 t counterweight, the lower chain links with a red mark.
- To attach the retaining plates **7** for the 22 t counterweight, the upper chain links with a blue mark.
- To attach the retaining plates **7** for the 32 t counterweight, the upper chain links with a red mark.

- ▶ Push the retaining plates **7** on both sides on the marked chain links onto the safety chains **5**.
- ▶ Secure the retaining plates **7** on both sides with screws **10**.
- ▶ Secure the screws **10** with nuts **11**.

The crane can be used to lift and link the safety chains **5**.

- ▶ Link the safety chains **5** on both sides from the top to the bottom through the counterweight assembly.
- ▶ Push the chain receptacles **6** on both sides on the lowest red mark onto the safety chains **5**.

Note
- ▶ The tensioning screws **8** of the retaining plates **7** must be tightened with a tightening torque of 63 Nm.

- ▶ Tension the safety chains **5** with tensioning screws **8** and then counter with nuts **9**.

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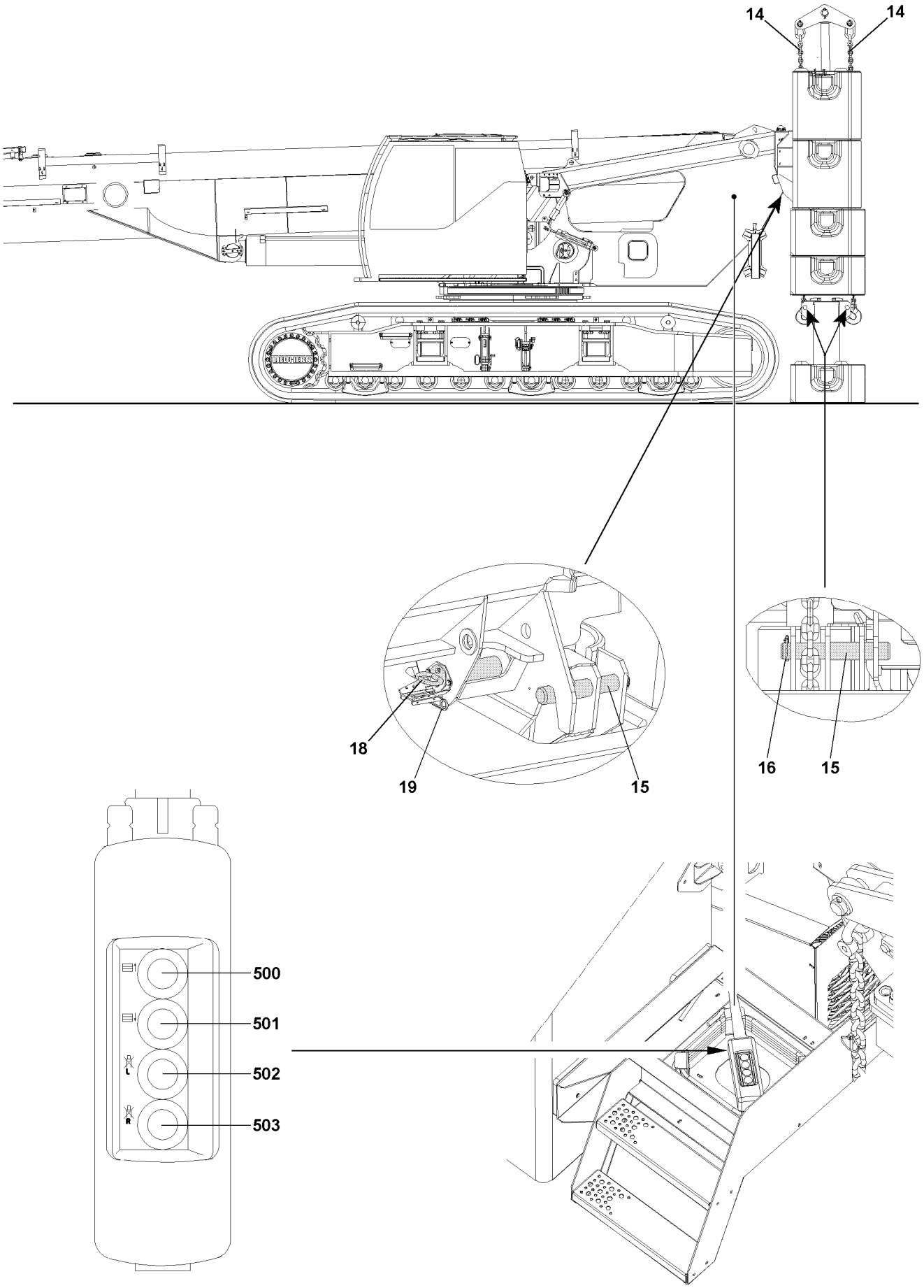

Fig.104734

2.4 Taking up the counterweight

Ensure that the following preconditions are met:
- the crane is aligned in horizontal direction
- the central ballast is installed
- the respective counterweight has been placed and secured on the base plate
- the pins **15** to engage the ballast assembly chains **14** are pinned and secured with linch pins **16**
- the crane superstructure is mechanically locked with the crane chassis
- the telescopic boom is fully telescoped in
- the telescopic boom is luffed to a permissible telescopic boom angle, see paragraph „Taking on permissible telescopic boom angle at counterweight“
- a guide for reverse travel is available

CAUTION
The counterweight may oscillate when pulled up!
If the crane is not aligned in lengthwise or crosswise direction exactly over the counterweight, then oscillating movements can occur when the counterweight is lifted, which in turn can cause damage to the ballasting cylinders or the crane.
▶ Align the crane exactly over the counterweight!

The crane is aligned exactly if the ballast assembly chains **14** are above the corresponding pins **15** on the base plate.

▶ Move the crane backwards with the turntable between the ballasting stacks until the ballast assembly chains **14** are above the corresponding pins **15**.
▶ Press button **501** and fully retract the ballasting cylinders.
▶ Engage the ballast assembly chains **14** on the pins **15**.
▶ Release safety springs **19** and unpin pins **18** on both sides.

DANGER
Counterweight can fall down!
Due to an assembly error, the counterweight could fall down and fatally injure personnel!
▶ As long as the counterweight is not properly pinned and secured on the turntable, it is prohibited for anyone to remain under the counterweight as well as within the complete danger zone!

▶ Press the button **500** and evenly tension the ballast assembly chains **14**.
▶ Press the button **500** and lift the counterweight a little off the ground and let it stop swinging.
▶ Press the button **500** and slowly extend the ballasting cylinders all the way.

Problem remedy
The counterweight is hanging unevenly on the turntable!
If the counterweight is hanging unevenly on the turntable, then the uneven position can be equalized by blocking the corresponding ballasting cylinder.
▶ Press the button **502** and block the ballasting cylinder on the left.
▶ **or**, press the button **503** and block the ballasting cylinder on the right.
▶ Equalize the uneven position by extending or retracting the corresponding ballasting cylinder.

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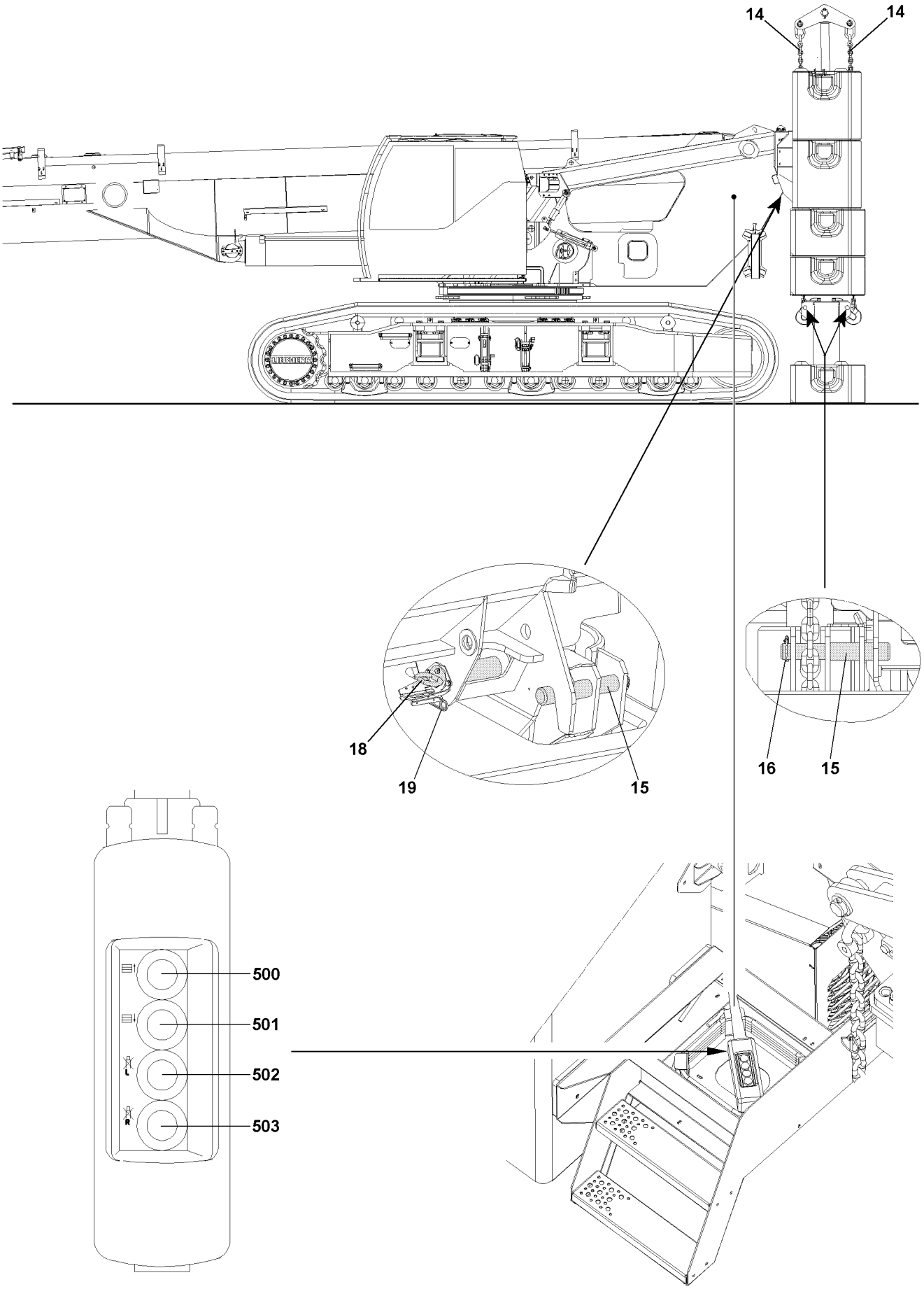

Fig.104734

2.5 Pinning the counterweight to the turntable

Ensure that the following preconditions are met:
- the counterweight is horizontally aligned
- the pin points on the turntable and the counterweight align

DANGER
Counterweight can fall down!
Due to an assembly error, the counterweight could fall down and fatally injure personnel!
▶ As long as the counterweight is not properly pinned and secured on the turntable, it is prohibited for anyone to remain under the counterweight as well as within the complete danger zone!

▶ Pin the pins **18** on both sides and secure with safety springs **19**.
▶ Check if the pins **18** are fully inserted and secured with safety springs **19**.
▶ Press the button **501** and fully retract the ballasting cylinders.

Problem remedy
The pin **18** cannot be inserted.
The pin points on the turntable and the counterweight are not aligned.
▶ Unpin the other pin **18**.
▶ Lower the counterweight a little and raise it again.
▶ Align the pin points on the turntable and the counterweight exactly until they align.

Note
▶ After assembly, the ballast assembly chains **14** remain engaged on the pins **15** and rest on the base plate.

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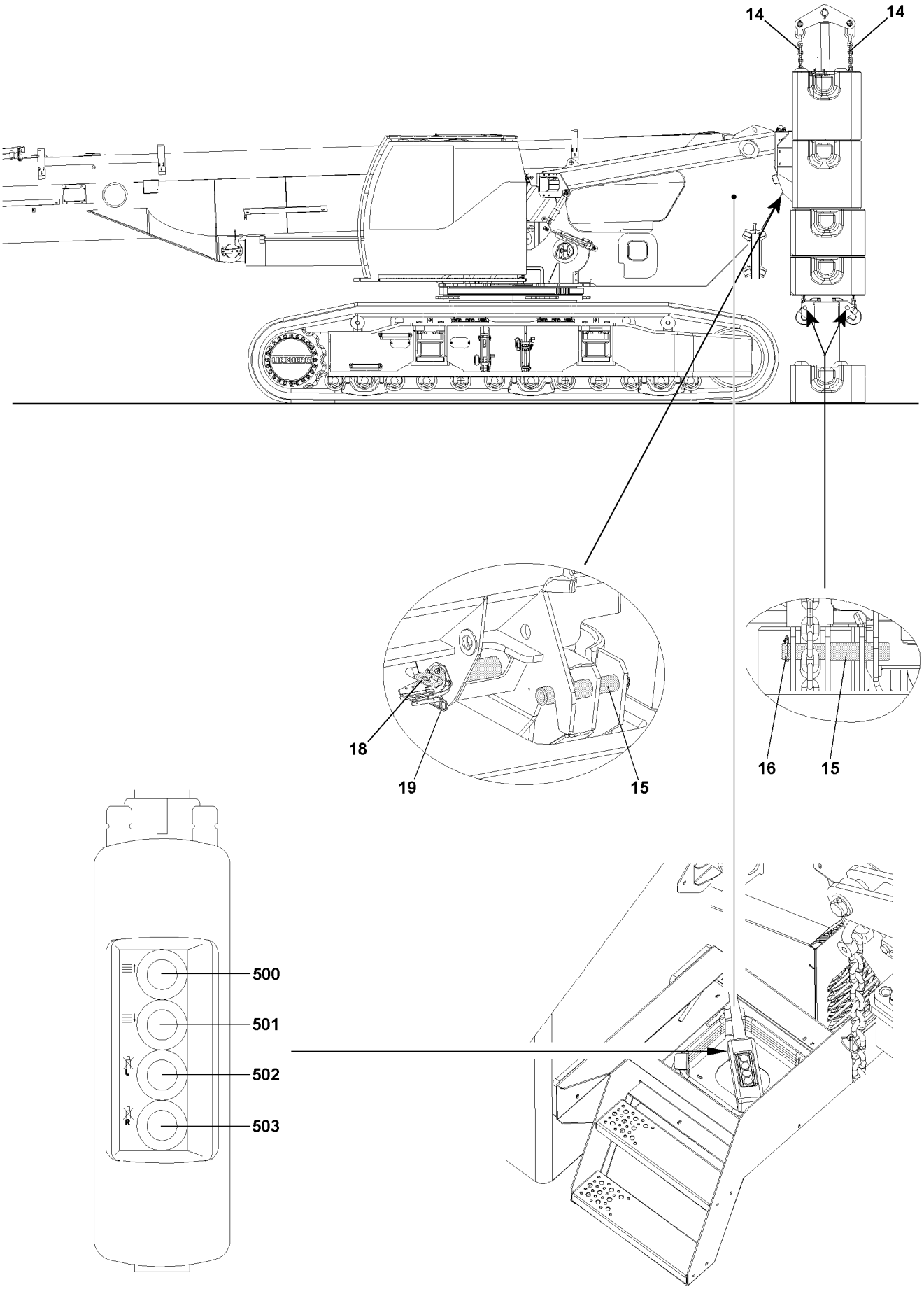

Fig.104734

3 Disassembly

3.1 General

Ensure that the following preconditions are met:
- the crane is aligned in horizontal direction
- the crane superstructure is aligned in lengthwise direction to the crawler carriers
- the central ballast is installed
- the ballast assembly chains **14** are engaged on all four pins **15**
- the telescopic boom is fully telescoped in
- the telescopic boom is luffed to a permissible telescopic boom angle, see paragraph „Permissible telescopic boom angles“
- the ground is level and of sufficient load carrying capacity

DANGER
Collapsing substrate!
For assembly or disassembly of the counterweight, make sure that the ground is of sufficient load carrying capacity, otherwise the counterweight can sink in and topple over.
▶ If ground gives way, select assembly location with sufficient load bearing capacity!

3.2 Placing the counterweight down

For the lift of the ballasting cylinder to be sufficient, the counterweight must be properly supported from below by 100 mm to 200 mm.

▶ Establish proper support for the counterweight.
▶ Press the button **500** and slowly extend the ballasting cylinder.
▶ Tension the ballast assembly chains **14** evenly until the pin points of the counterweight and the turntable align.

DANGER
Counterweight can fall down!
Due to a disassembly error, the counterweight could fall down and fatally injure personnel!
▶ The ballast assembly chains **14** must be engaged on all four pins **15** and must be tensioned!
▶ During and after loosening the counterweight, it is prohibited for anyone to remain under the counterweight as well as within the complete danger zone!

▶ Release safety springs **19** and remove pins **18** all the way on both sides.
▶ Press the button **501** and slowly and evenly retract the ballasting cylinders and carefully lower the counterweight.

When the counterweight has been lowered to the ground:
▶ Press button **501** and fully retract the ballasting cylinders.
▶ Disengage the ballast assembly chains **14** from the pins **15**.
▶ Drive the crawler crane away from the counterweight.

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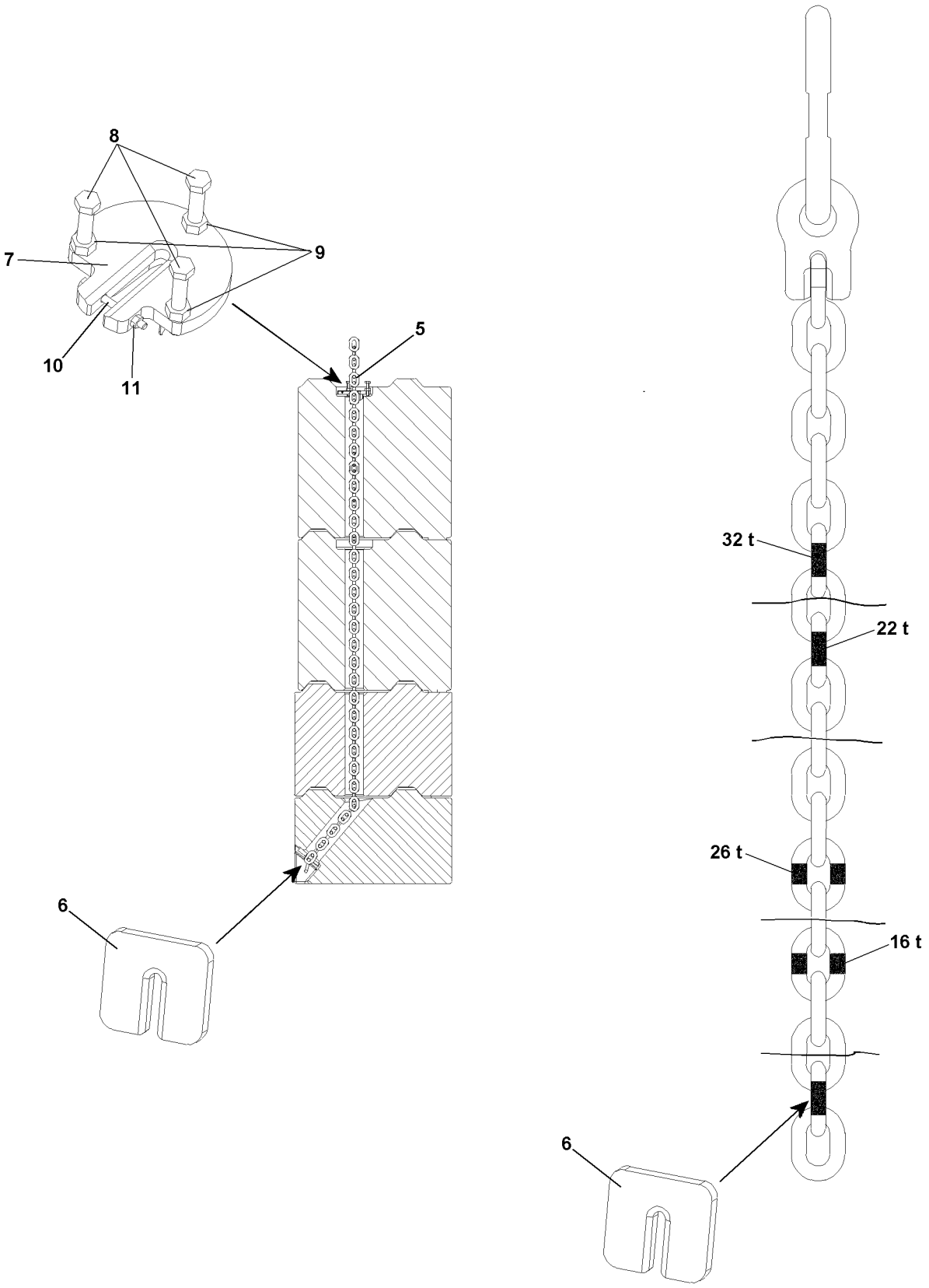

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Fig.103203

3.3 Releasing and loading the counterweight

DANGER
Danger of accidents when releasing the safety chains!
▶ For larger ballasting, use a non-skid ladder to disengage the safety chains **5**!

▶ Loosen the nuts **9** and unscrew the tensioning screws **8** a little.
▶ Release the chain receptacles **6** on both sides.
▶ Pull out the retaining chains **5** through the top.
▶ Loosen the nuts **11** and unscrew the screws **10** on the retaining plates **7**.
▶ Remove the retaining plates **7** on the safety chains **5**.
▶ Store the safety chains **5**, chain receptacles **6** and retaining plates **7**.
▶ Adjust LICCON overload retainer as per load chart.

DANGER
Crane can topple over!
The boom lengths and radii specified in the load chart may not be exceeded. If this is not observed, the crane can topple over fatally injure personnel!
▶ The boom lengths and radii noted in the load chart must be strictly observed!

▶ Place counterweight plates onto the transport vehicle.

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Fig.195219

1 Safety technical instructions for working with a load

Note

▶ In addition to this chapter, observe Chapter 2.04 in the Crane operating instructions.

WARNING

The crane can topple over!

For steep boom positions, for which no loads are specified in the load charts there is a risk of the crane superstructure toppling when turning „backward“, i.e. towards the counterweight side.

There is a particular danger if the support basis has been reduced and supported with the sliding beams retracted.

Personnel can be severely injured or killed.

▶ The radii specified in the load chart must be observed.

WARNING

Danger of accident due to faulty operation!

If the reeving number on the pulley head is less than the reeving number set on the LICCON computer system and if the load is lifted with the luffing gear, it can result in an overload of the hoist rope, as a result, the hoist rope can rip, causing the load to drop.

Personnel can be severely injured or killed.

▶ Always comply with the reeving numbers specified in the load chart for maximum loads.

▶ The reeving on the pulley head and the reeving set on the LICCON computer system must match, otherwise crane operation is prohibited.

DANGER

Danger of fatal accidents due falling load!

If the number of three coils is fallen below (for example due to a technical defect), the hoist rope is ripped from the winch drum and the load falls down.

Personnel can be severely injured or killed.

▶ The crane operator must ensure that there are always at least three rope coils on the winch drum.

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.

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 slow down the crane movements carefully. That way you can avoid a swinging or pendulum motion in the suspended load.

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 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 in the crane danger zone.

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WARNING
Danger of accidents when turning the crane superstructure!
By turning the crane superstructure in restricted space conditions on the job site, especially in the rear area of the counterweight and towards the chassis, personnel can be crushed and severely injured or killed.
▶ Give a short warning signal (horn) before starting a crane movement.
▶ Ensure before starting any slewing movement that there are no people or objects in the danger zone.

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 operations 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
– Functional defects in the safety devices
– Leakages 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 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 carrying capacity is being utilized when a telescopic boom extension such as a fixed lattice jib, luffing lattice jib or folding jib is being used, then in 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 auxiliary 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.

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– There is no strong side wind.

WARNING
Damage of 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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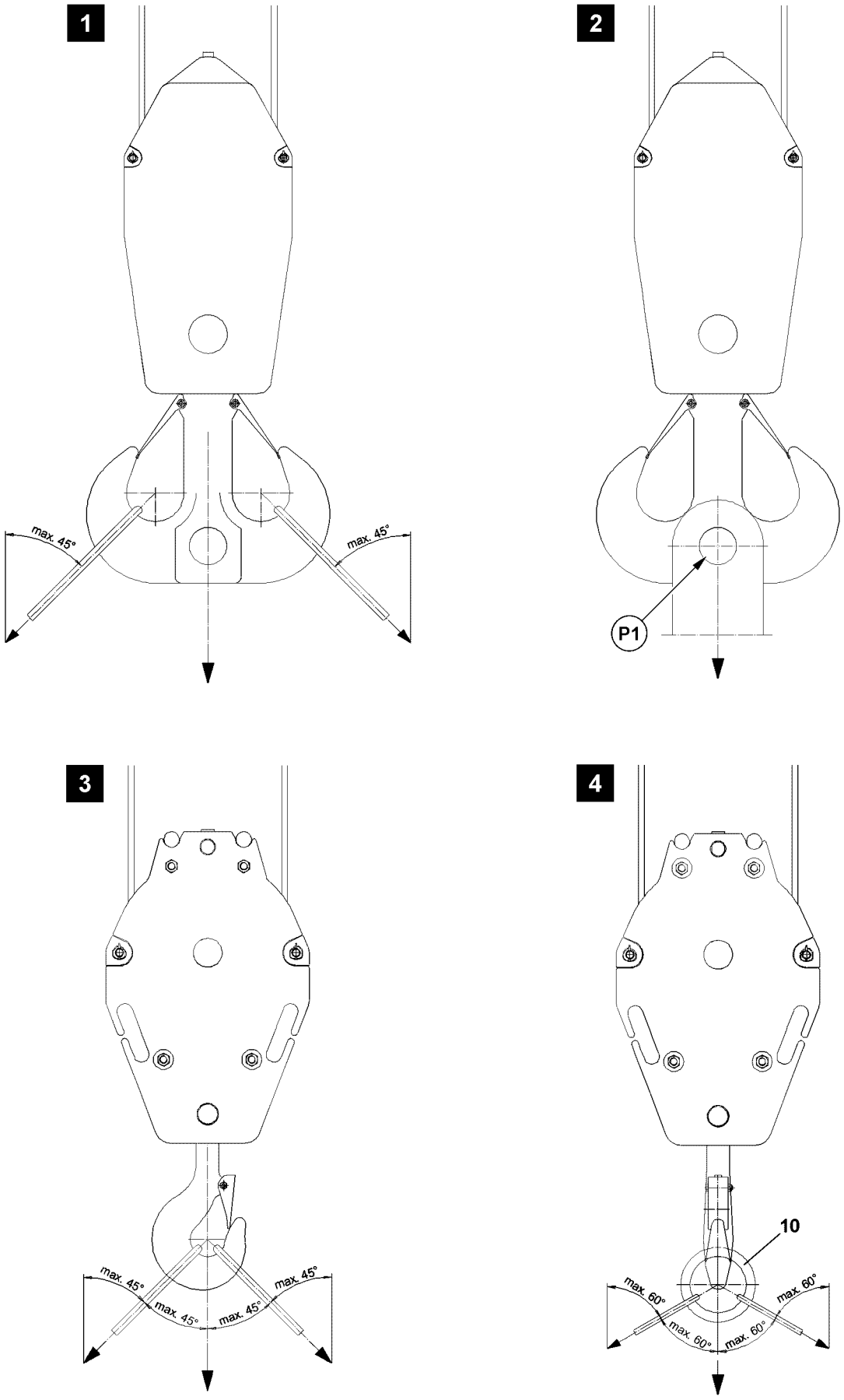

Fig.121650

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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.
- The LICCON overload protection is active.
- The central ballast has been attached according to the load chart.
- The counterweight is installed according to the load chart.
- The derrick ballast has been 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 up 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 high property damage.
▶ Pay attention to the own weight of the load handling equipment.
▶ Pay attention to the load 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 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 crossbars or two cranes for taking up the load.

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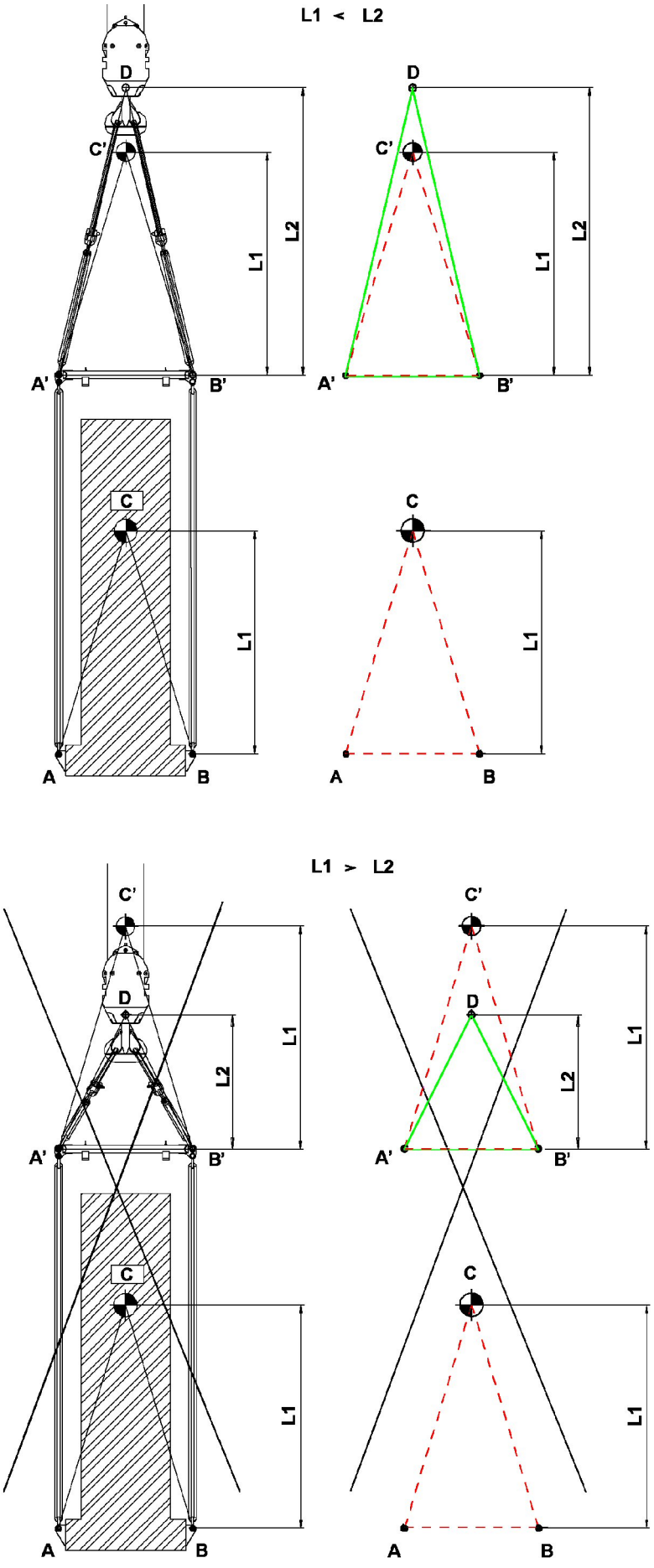

Fig.116274

4.2 Load take up with cross bar

Cross bars 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 bar 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 bar 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.

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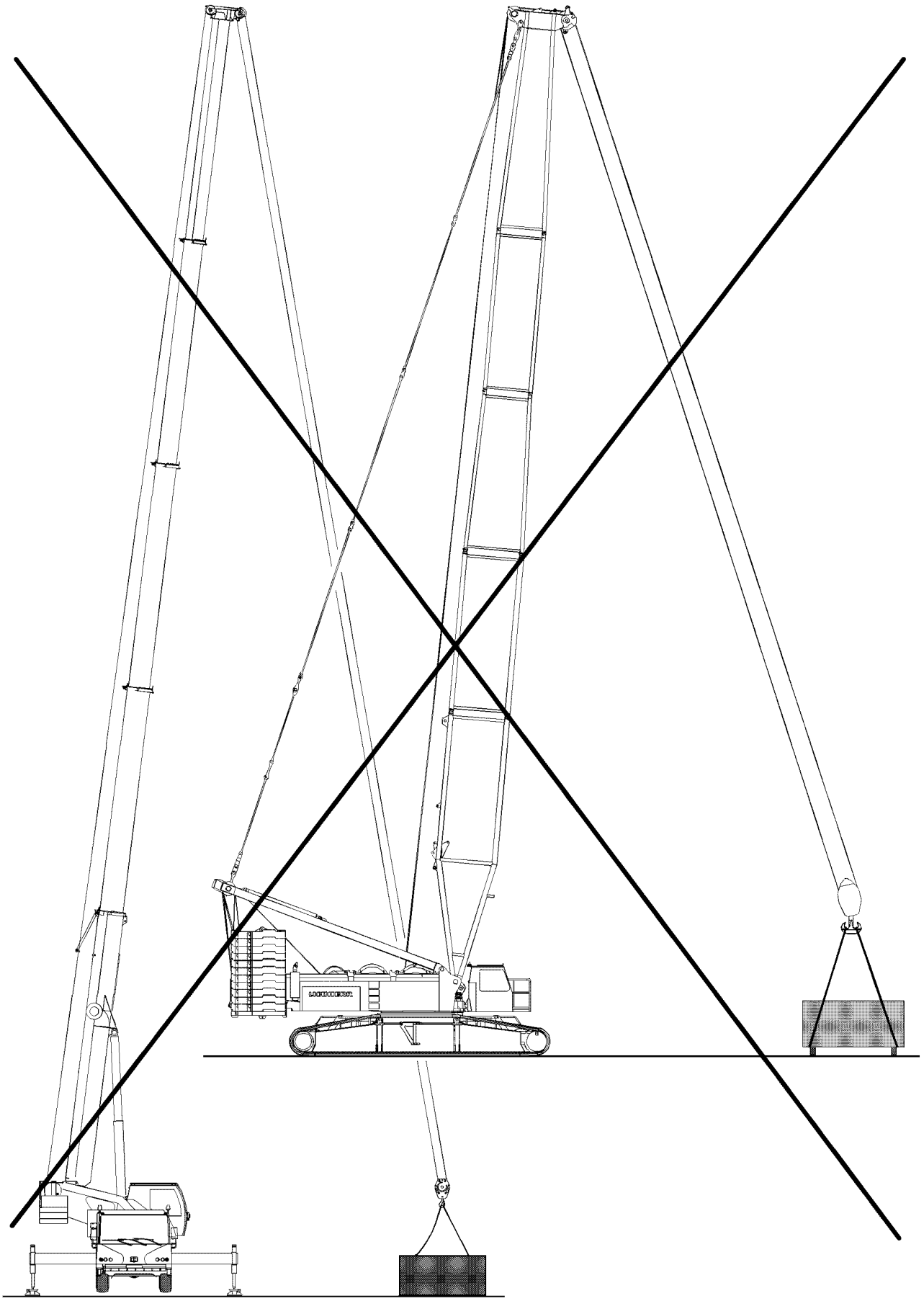

Fig.102716

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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 within the danger zone.
- ▶ It is prohibited for anyone to be under the load. Keep a safety 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 pulling

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.
- ▶ Attach (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.
- ▶ 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 in addition to the vertical forces, for which the boom is not designed.

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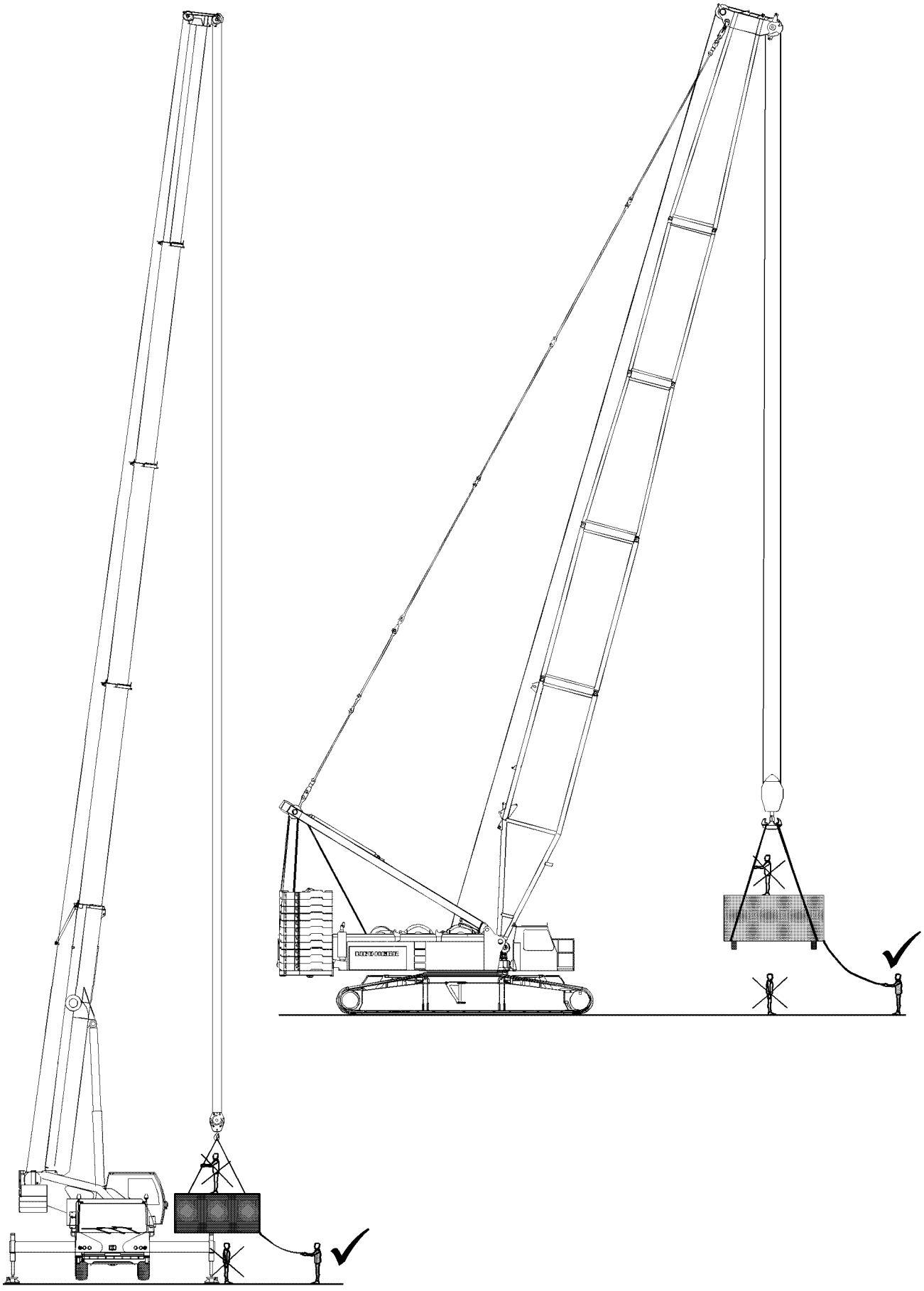

Fig.102717

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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
Risk 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, auxiliary 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.

5.3 Danger of crushing

WARNING
Danger of fatal injury!
Extreme care is needed when lowering a load. Mortal danger 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.

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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 due to current transfer.
- ▶ For rated voltages 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.

5.6 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.

DANGER
Important instructions for „ram work“ or „pulling sheet piles“.
If the crane is used for ram work or pulling sheet piles, then the following instructions must be followed. Failure to follow the instructions can result in damage to the crane.
- ▶ The ramming equipment may not pass on vibrations into the boom.
- ▶ When pulling sheet piles, the maximum pull force of the crane is limited according to the load chart. Restricting the maximum pull force via the crane overload protection **only** is prohibited. The pull force must be additionally checked by measuring.

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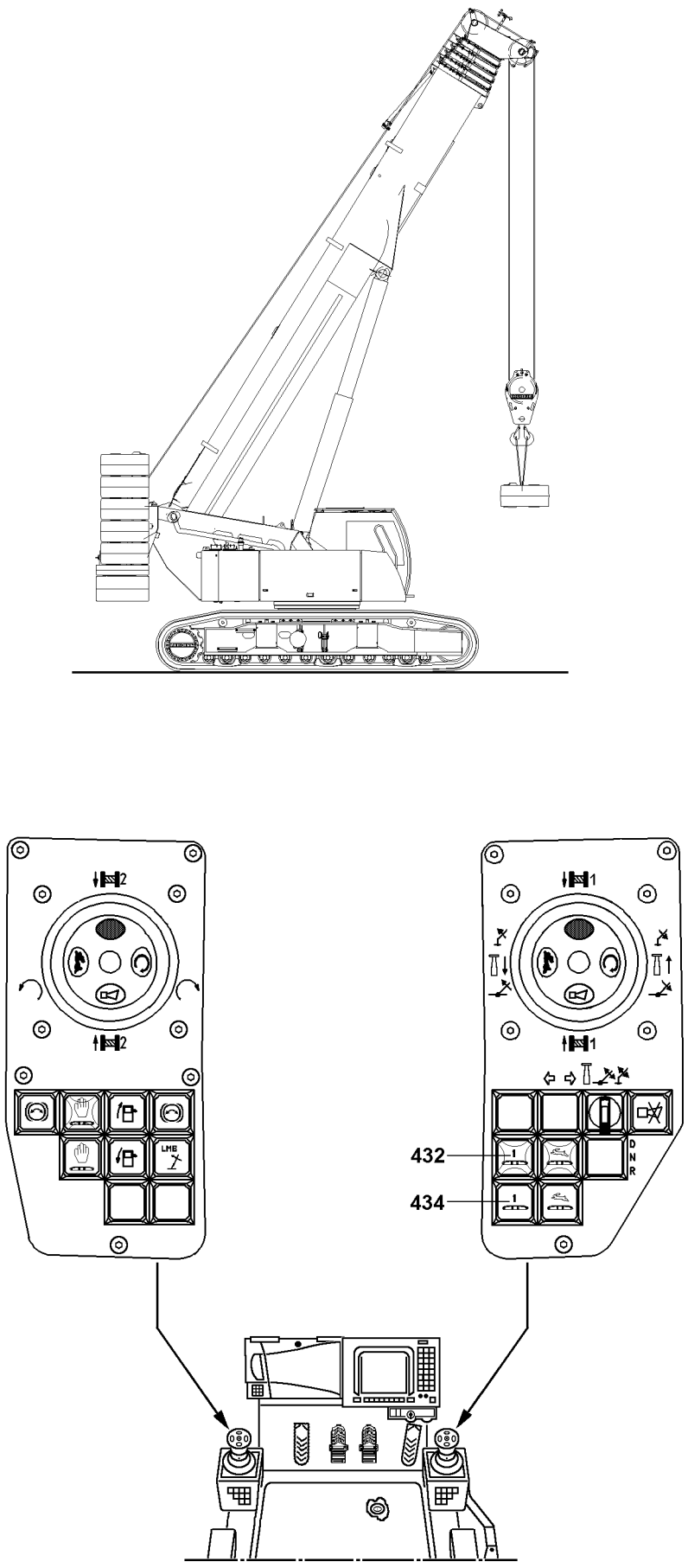

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Fig.198657

1 Crawler operation

Make sure that the following prerequisites are met:
- The ground is able to carry the weight of the crane, the load and the load tackle.
- The engine is running.
- There are no persons or objects in the danger zone.
- The crawlers are pushed out, pinned and wedged to a track width as specified in the load chart.

DANGER
The crane can topple over!
The reduced or retracted track reduces the stability of the crawler crane. Due to operational errors during crane operation or driving, the crawler crane can topple over and fatally injure personnel!
- ▶ Crane operation and „driving the crawler with load“ is permitted for reduced or retracted track, if **extra load charts** are programmed for this case!
- ▶ Crane operation and „driving the crawler with load“ is strictly prohibited for reduced or retracted track, if **no extra load charts** are programmed for this case!

Note
- ▶ The danger zone should be monitored by cameras or a guide when driving or turning the crane!

1.1 Activating crawler operation

Crane operation is turned on automatically. Use the button **434** to turn the crawler operation on or off.

▶ Press the button **434**.

Result:

– The indicator light **432 lights up**.
Crawler operation **and** crane operation are activated.

If the crawler operation is to be turned off:
▶ Press the button **434** again.

Result:

– The indicator light **432** does **not light up**.
The crawler operation is turned off, crane operation remains on.

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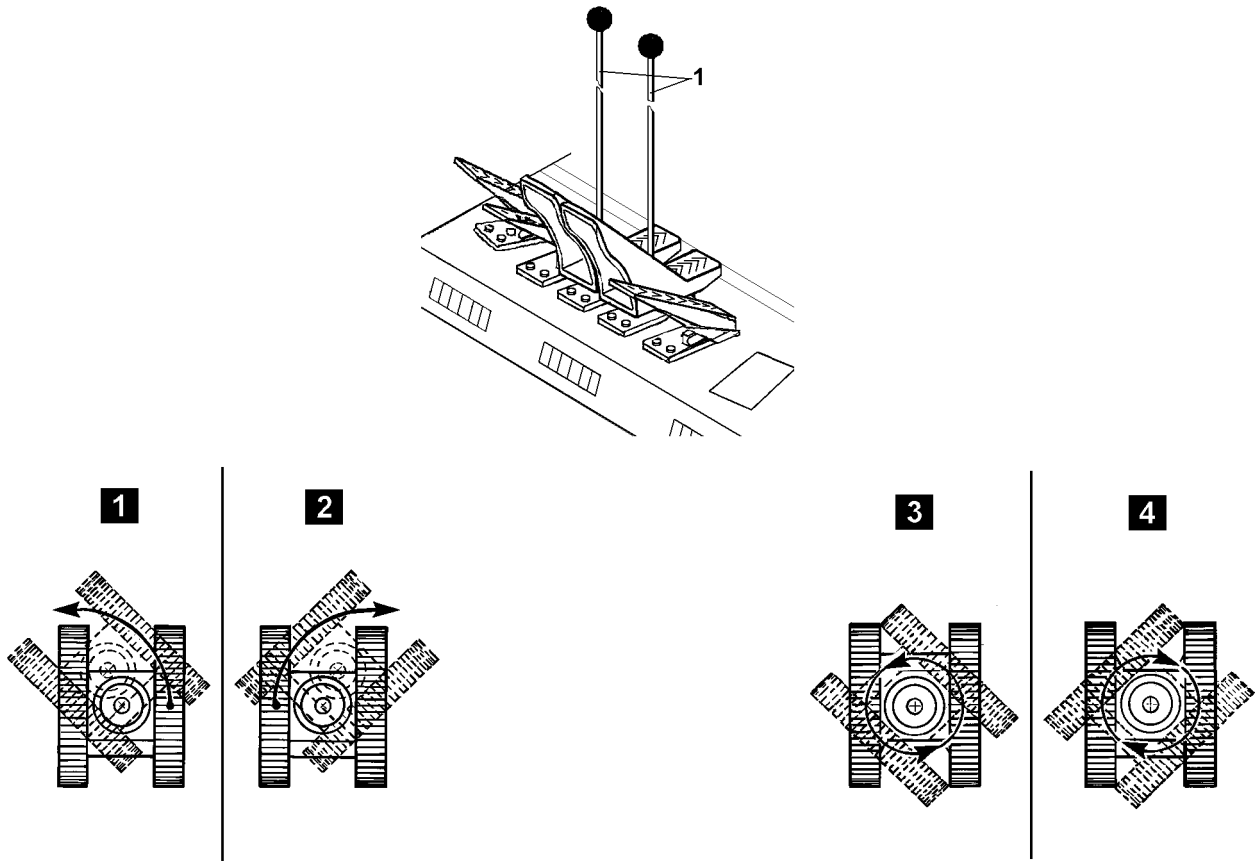

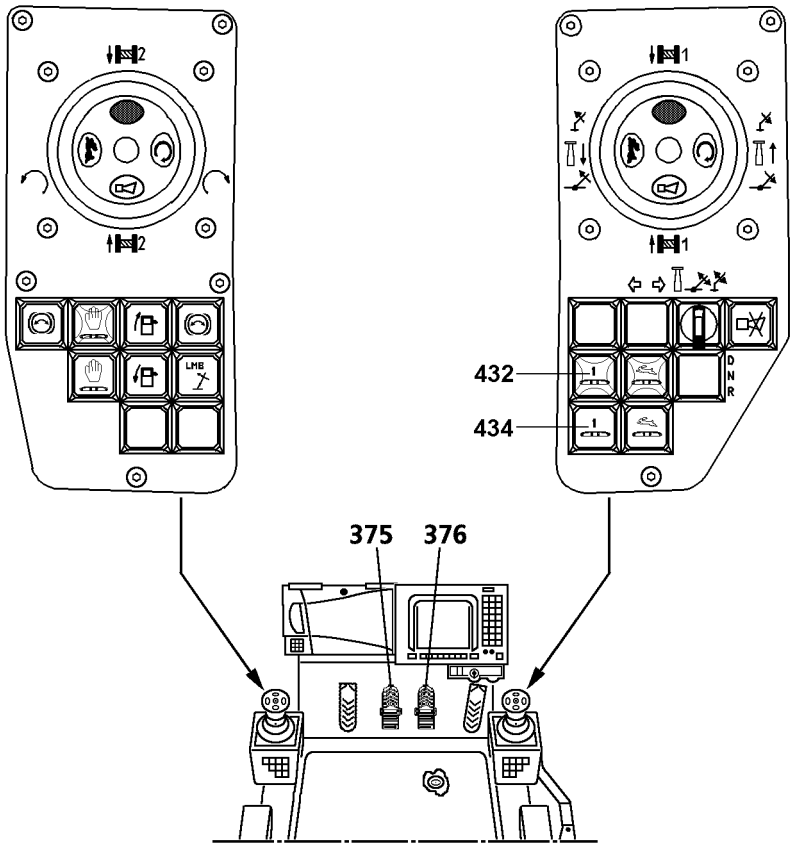

Fig.198644

1.2 Driving the crawler

Make sure that the following prerequisites are met:
- The crane is switched to crawler operation.
- The indicator light **432** lights up.

Special hand levers **1** can be screwed to the foot rockers. These hand levers **1** are used for delicate driving maneuvers. The operation is identical to that for the foot rockers.

The driving direction is relative to the position of the crane superstructure. If the crane superstructure is turned by 90°, the forward / reverse travel direction changes. When pedal **375** or **376** is operated, and the crane slews beyond 90°, the driving direction will be maintained until the relevant pedal is set to zero. This means that the new driving direction will only become active once the pedal is no longer pressed.

▶ Move the left foot rocker MS4 **375** forward

Result:

– The left track moves forward.

▶ Move the left foot rocker MS4 **375** backward

Result:

– The left track moves backward.

▶ Move the right foot rocker MS5 **376** forward

Result:

– The right track moves forward.

▶ Move the right foot rocker MS5 **376** backward

Result:

– The right track moves backward.

To drive the crawler crane forward:
▶ Move the left foot rocker MS4 **375** and the right foot rocker MS5 **376** forward.

To drive the crawler crane backward:
▶ Move the left foot rocker MS4 **375** and the right foot rocker MS5 **376** backward.

Note
▶ Protect the travel gear by always using the maximum possible turning radius and avoid turning backward!
▶ Protect the travel gear by avoiding counterrotation turns!

To drive the crawler crane toward the left:
▶ Move the right foot rocker MS5 **376** forward, illustration 1.

To drive the crawler crane toward the right:
▶ Move the left foot rocker MS4 **375** forward, illustration 2.

To counterrotate the crawler crane to the left:
▶ Move the right foot rocker MS5 **376** forward and the left foot rocker MS4 **375** backward, illustration 3.

To counterrotate the crawler crane to the right:
▶ Move the left foot rocker MS4 **375** forward and the right foot rocker MS5 **376** backward, illustration 4.

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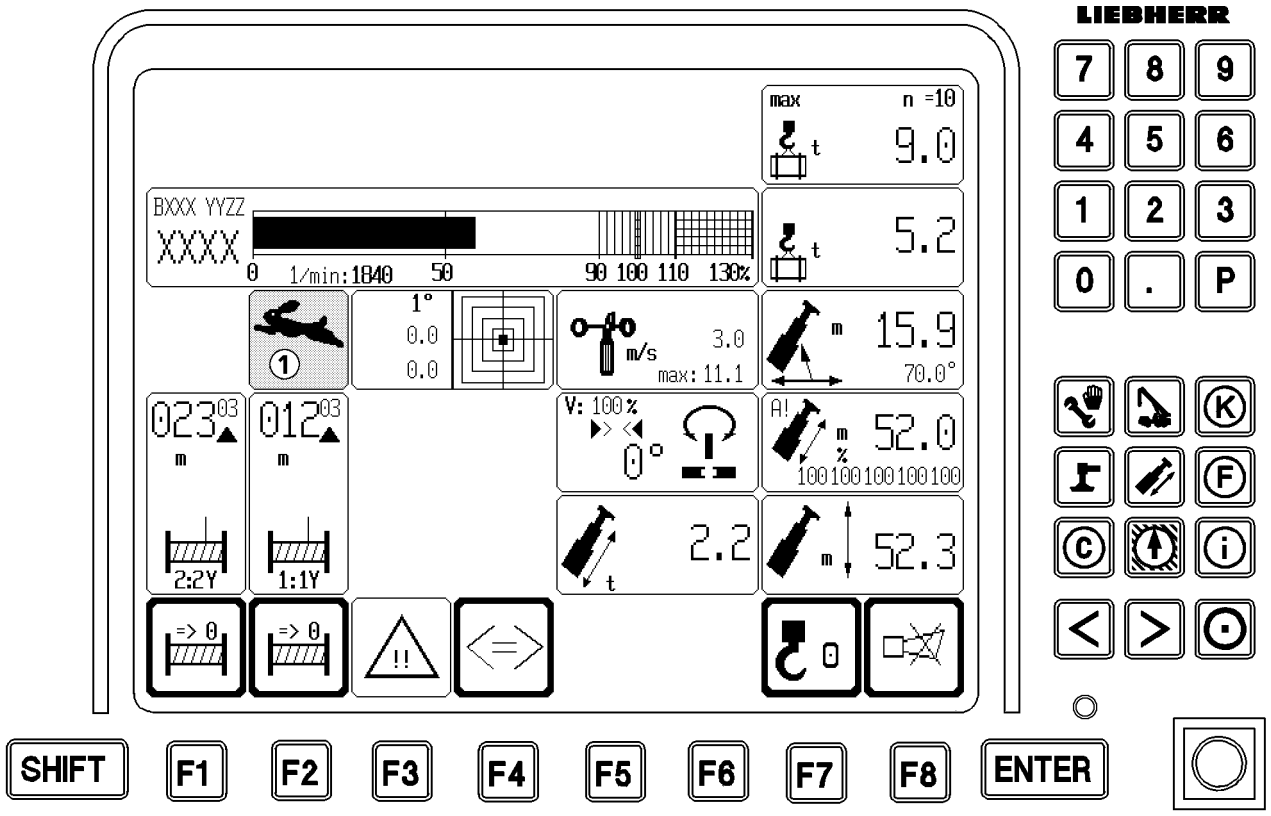

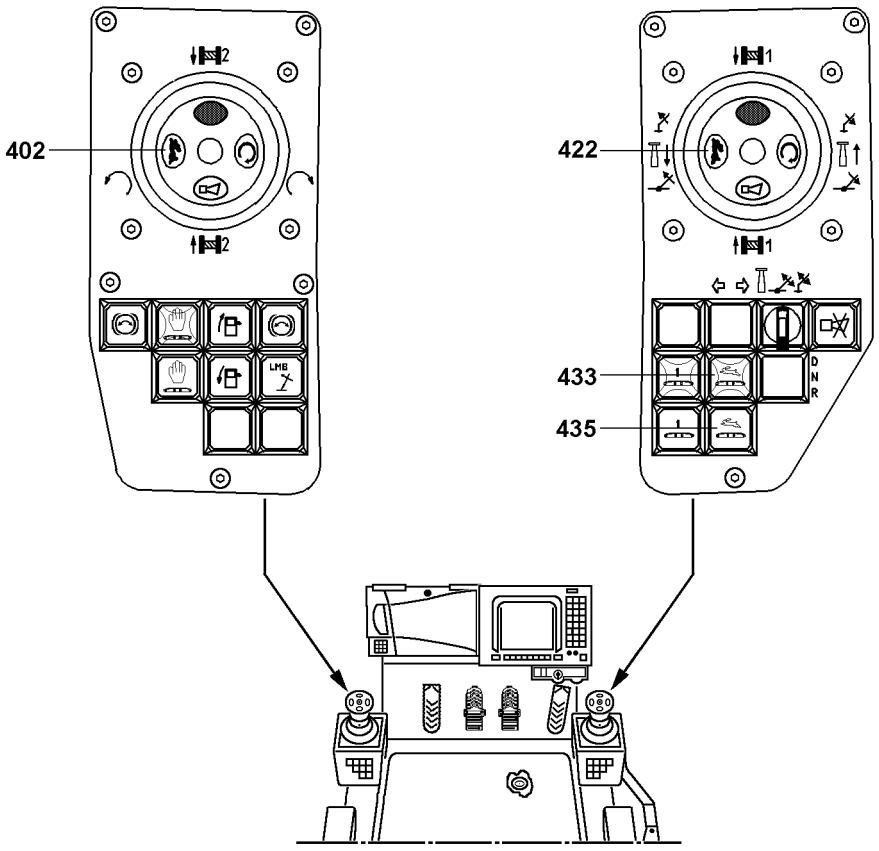

Fig.198656

1.3 Selecting the travel speed

This crawler crane has 4 possible speeds:

1. Speed stage 1
   Creeper gear is activated.
2. Speed stage 2
   Rapid gear „for crane and crawler operation“ is activated.
3. Speed stage 3
   Rapid gear for „Crawler operation“ is activated.
4. Speed stage 4
   Rapid gear „for crane and crawler operation“ **and** „crawler operation“ is activated.

To select speed stage 1:

▶ Do **not** press the button **435** and the button **402** and the button **422**.

Result:

– The creeper gear has been turned on.
– The icon **1** does **not** appear on the monitor.
– The indicator light **433** does **not** light up.

To select speed stage 2:

▶ Press button **402** or button **422**.

Result:

– The rapid gear „for crane and crawler operation“ is activated.
– The icon **1** appears on the monitor.

To select speed stage 3:

▶ Press the button **435**.

Result:

– The rapid gear for „Crawler operation“ is activated.
– The indicator light **433** lights up.

To select speed stage 4:

▶ Press button **435** and button **402** or button **422**.

Result:

– The rapid gear „for crane and crawler operation“ **and** „crawler operation“ is activated.
– The icon **1** appears on the monitor.
– The indicator light **433** lights up.

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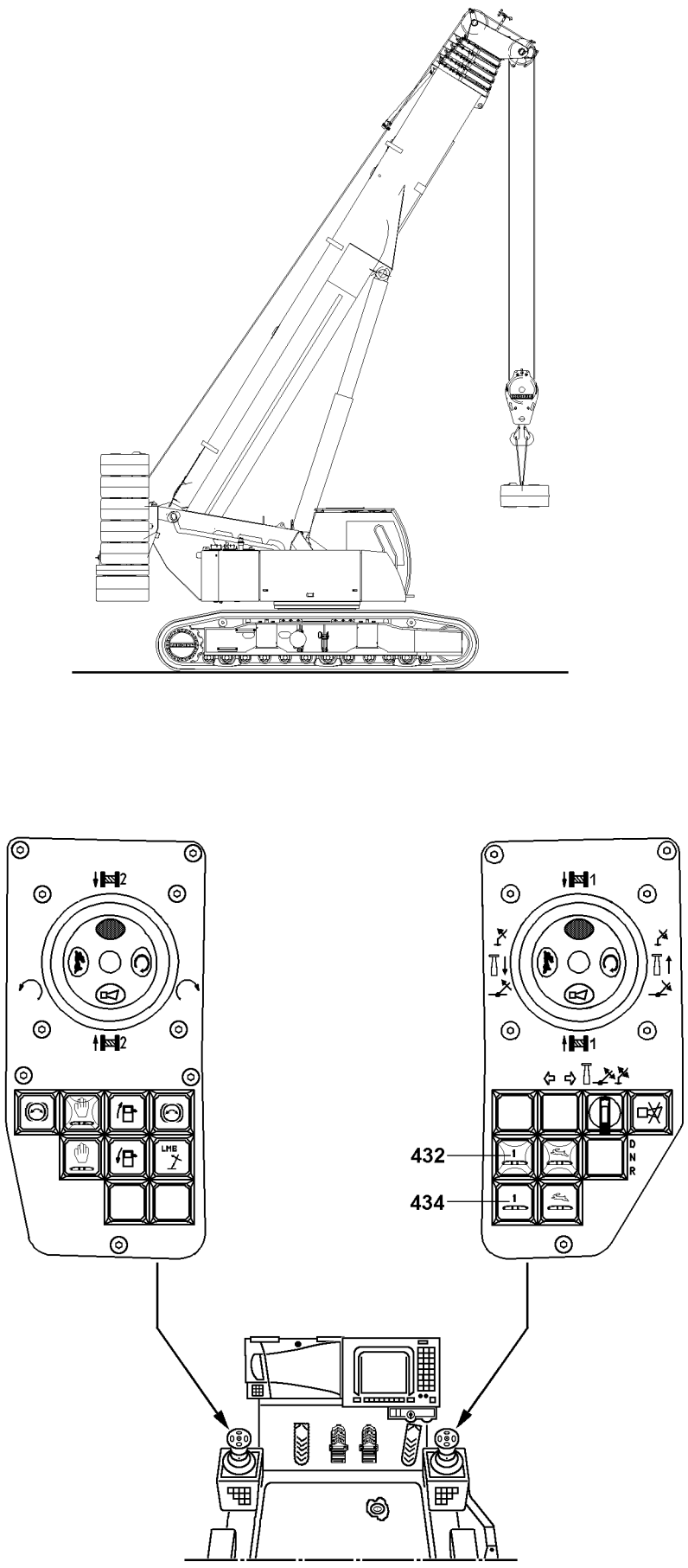

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Fig.198657

1.4 Steerability of the crawler

The steerability of the crawler depends on the following conditions:

- The friction conditions under the chains.
  Panels underneath, sand or gravel improve the steerability of the crane.
- The levelness of the ground.
  Steering is not possible if the crawler track is only making contact with the ground on the front and rear!
- The load-bearing capability of the ground.
  Steerability is significantly restricted if the crawler track sinks into the ground!
- The position of the overall center of gravity.
  If the overall center of gravity of the crane and load is in the center of the crane, then steering is hard or not possible at all!

1.5 Driving with an attached load

DANGER
The crane can topple over!
The crane can be driven with the loads given in the load charts, providing the following conditions are met.

- ▶ The ground may not exceed the maximum incline according to the load chart!
- ▶ The ground must be able to safely take on the ground pressures, which were calculated with the job planner!
- ▶ Only drive at the lowest possible speed!
- ▶ Avoid jerky driving movements!
- ▶ The attached load must be secured to prevent it from swinging!
- ▶ Carry out any steering movements with utmost caution!

Note
For all driving conditions, the ratio between the front and rear or the rear and the front ground pressures must be greater than 0.3.

- ▶ A : B must be greater than 0.3.

A = maximum ground pressure of the track which has the lower load of the two tracks

B = maximum ground pressure of the track which has the higher load of the two tracks

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1.6 Driving the crawler crane without a load with the equipment in place on an uphill / downhill slope

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 roadway and track pads
- The transit between the horizontal and the incline
- The maximum incline / slope of 25°
- The maximum side incline 1°

Make sure that the following prerequisites are met:
- The ground has sufficient load carrying capacity and has sufficient traction to prevent the crane from slipping.
- The counterweight is secured on the turntable with a round steel chain.
  See chapter 4.07.
- The telescopic boom is set with the aid of the job planner in such a way that the center of gravity is in the center of the crawler travel gear.
- The telescopic boom is set with the aid of the job planner even when extending and retracting into the uphill / downhill slope and telescoped out in as flat a position as possible that the center of gravity is in the center of the crawler travel gear.
- The medium oil level in the engine is available.

WARNING
The crane can topple over!
If the following conditions for driving the crawler crane on an incline are not met, then the crane can topple over and fatally or severely injure personnel!
- ▶ The turntable must be aligned parallel to the crawler carriers and must be mechanically locked with the crane chassis!
- ▶ The side slope may be no more than max. 1° !
- ▶ Avoid jerky driving movements!
- ▶ Slow driving speed, all movements and delay maneuvers must be initiated with extreme caution and at the least possible speed!
- ▶ The transfer from the horizontal into an uphill slope and from the uphill slope into the horizontal must be made evenly, i.e. there may be no edges which can cause the crane to topple over. The incline change must be made continuously!
- ▶ The ground pressures which will occur must be determined with the job planner before driving!
- ▶ The ground must be sufficiently load bearing and have sufficient traction to prevent the track pads or the crane from slipping!
- ▶ The ground must be able to safely take on the ground pressures, which were calculated with the job planner!
- ▶ The friction coefficient between the roadway and the ground must be large enough to take on the occurring drive forces. Slippery ground can cause the crane to slip off to the side and therefore lead to an impermissible side slope position!

Note
- ▶ The telescopic boom must be telescoped in before driving and luffed down until the tracks are evenly subjected to the load.
- ▶ If there is a large counterweight on the superstructure, it might be necessary to first telescope the telescopic boom out below a flat angle to obtain a suitable distribution of ground pressure for driving the crane.

Note
For all driving conditions, the ratio between the front and rear or the rear and the front ground pressures must be greater than 0.3.
- ▶ A : B must be greater than 0.3.

A = maximum ground pressure of the track which has the lower load of the two tracks

B = maximum ground pressure of the track which has the higher load of the two tracks

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1.6.1 Calculation of required length for transfers

The required length **L** for transfers results from the existing uphill angle **α** and the length of the crawlers **LC**.

- L = Required length of transfers
- α = Angle of uphill slope in degrees
- LC = Length of tracks between drive wheels and change over wheels

Calculation example

Given:

α = 10°

LC = 5.36 m

Wanted:

L = ?

Formula:

L = 0.5 * α * LC

Result:

L = 0.5 * 10 * 5.36 m = 26.8 m

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Fig.195219

1 Auxiliary boom

A distinction is made between the following auxiliary booms:
- Boom nose on telescopic boom
- Boom nose on lattice jib
- Auxiliary jib
- Folding jib
- Fixed lattice jib
- Luffing lattice jib

1.1 Boom nose on telescopic boom

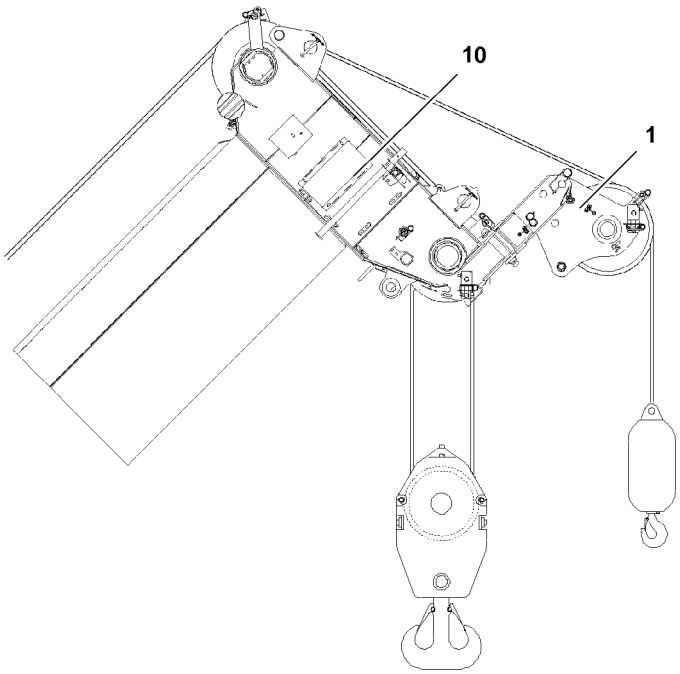

*Fig.120451: Boom nose **1** on telescopic boom*

- Short auxiliary boom as bracket
- Is installed on the telescopic boom head **10**
- No proprietary load charts available
- Abbreviation: **M**

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1.2 Boom nose on lattice jib

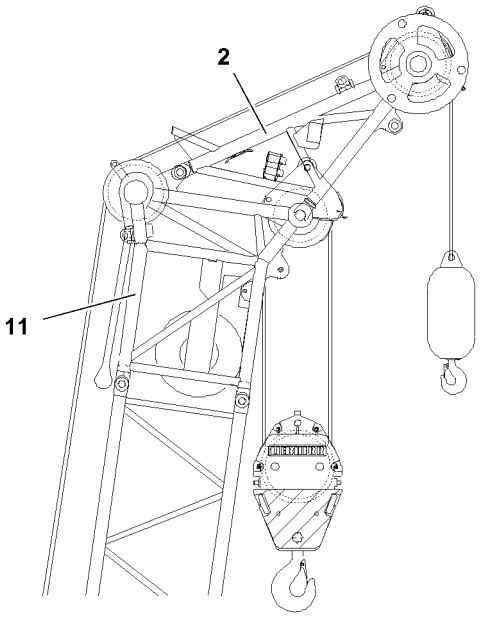

*Fig.120452: Boom nose **2** on lattice jib*

- Auxiliary boom as lattice structure
- Is installed on the N-head **11**
- No proprietary load charts available
- Abbreviation: **M**

1.3 Auxiliary jib

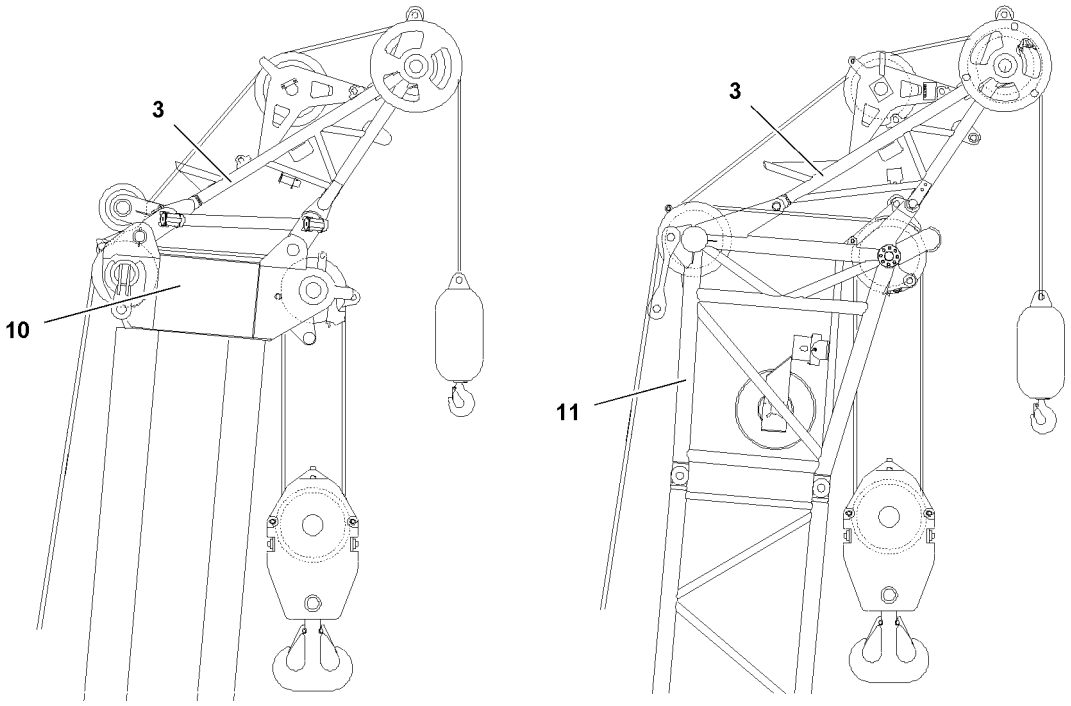

*Fig.120453: Auxiliary jib **3***

- Short auxiliary boom as lattice structure
- Is installed on the telescopic boom head **10** or N-head **11**
- Proprietary load charts available

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– Abbreviation: **H**

1.4 Folding jib

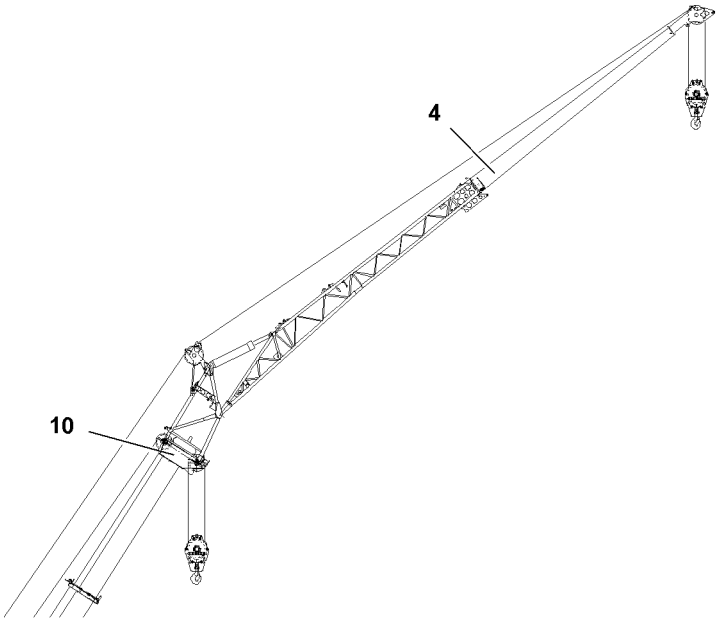

*Fig.120454: Folding jib **4***

– Auxiliary boom as lattice or metal sheeting structure
– Is installed on the telescopic boom head **10**
– Proprietary load charts available
– Abbreviation: **K**

The following folding jib variations are possible:
– Special folding jib
– Single folding jib
– Double folding jib
– 3-part single folding jib
– 3-part double folding jib
– 4-part single folding jib
– 4-part double folding jib

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1.5 Fixed lattice jib

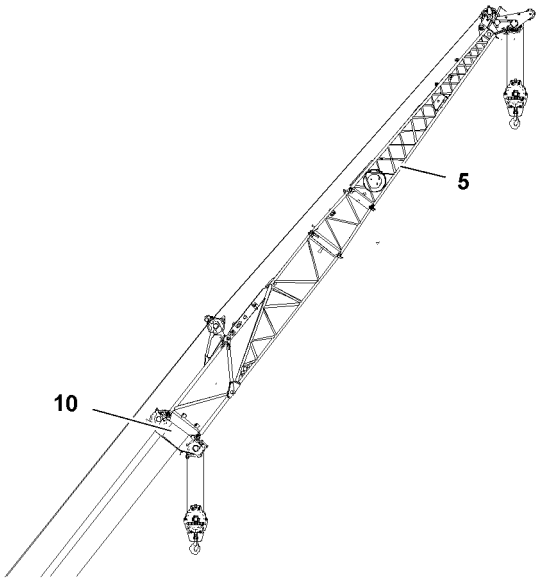

*Fig.120455: Fixed lattice jib **5***

- Auxiliary boom in lattice structure
- Is installed on the telescopic boom head **10**
- Proprietary load charts available
- Abbreviation: **F**

1.6 Luffing lattice jib

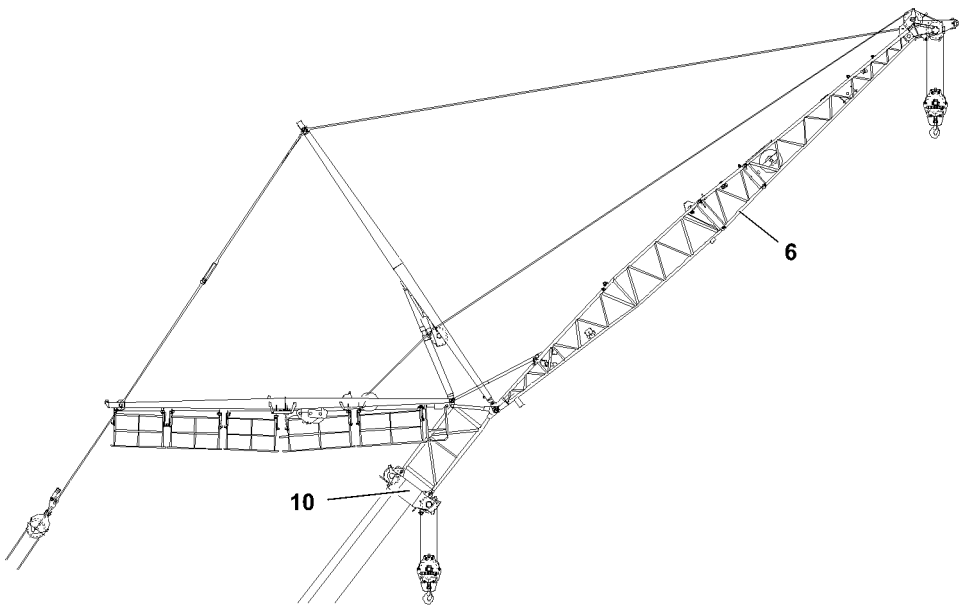

*Fig.120456: Luffing lattice jib **6***

- Auxiliary boom as lattice structure with guying
- Is installed on the telescopic boom head **10**
- Proprietary load charts available
- Abbreviation: **N**

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2 Hook operation

A distinction is made between the following hook operating modes:
- One hook operation
- Two hook operation
- Three hook operation
- Hook operation depending on the load

2.1 One hook operation

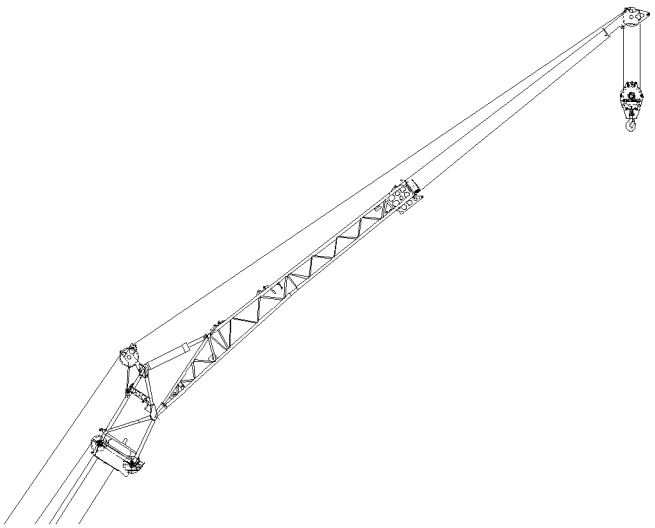

Fig.120458: One hook operation

One hook is reeved on the boom.

2.2 Two hook operation

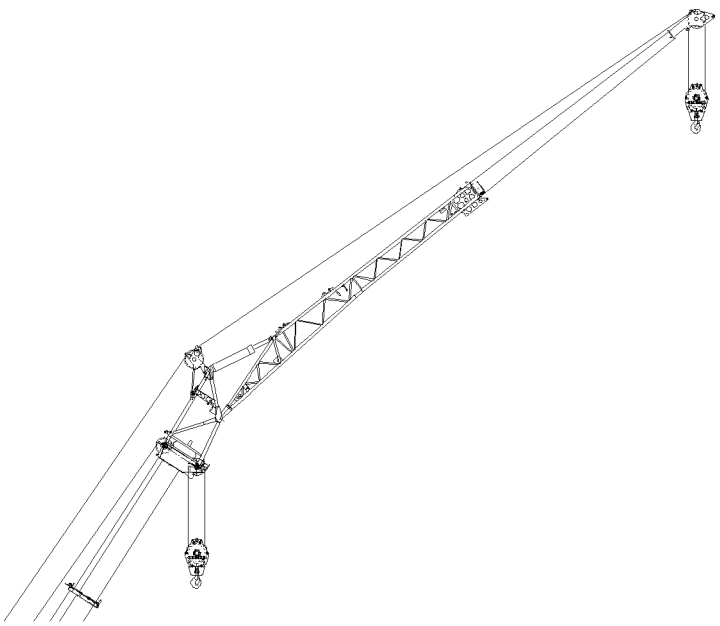

Fig.120459: Two hook operation

Two hooks are reeved on the booms. Number of loads and type of crane operation are not taken into account.

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2.3 Three hook operation

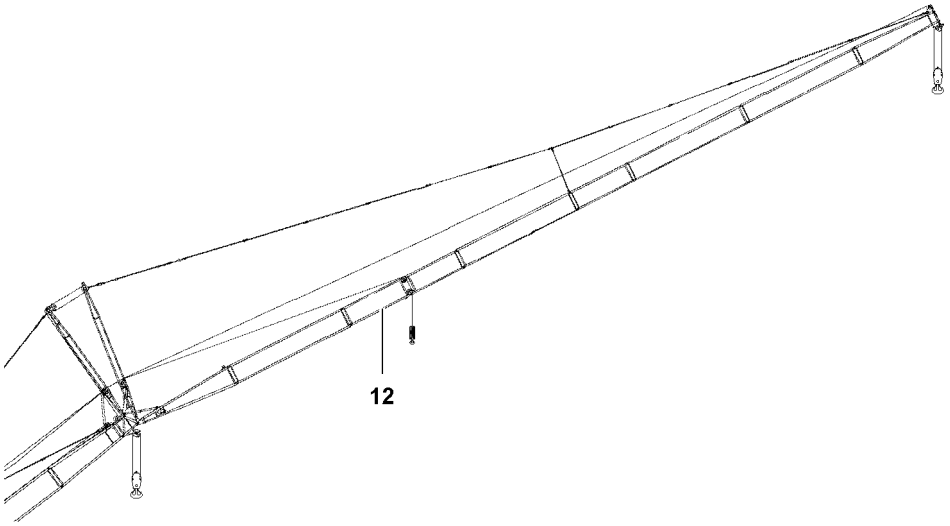

Fig.120457: Three hook operation

Three hooks are reeved on the booms. Number of loads and type of crane operation are not taken into account.

Note

▶ Three hook operation is **not** possible on telescopic cranes.

2.4 Hook operation depending on the load

The following hook operating modes are differentiated depending on the load:
- Two hook operation on joint load
- Two hook operation on individual loads

2.4.1 Two hook operation on joint load

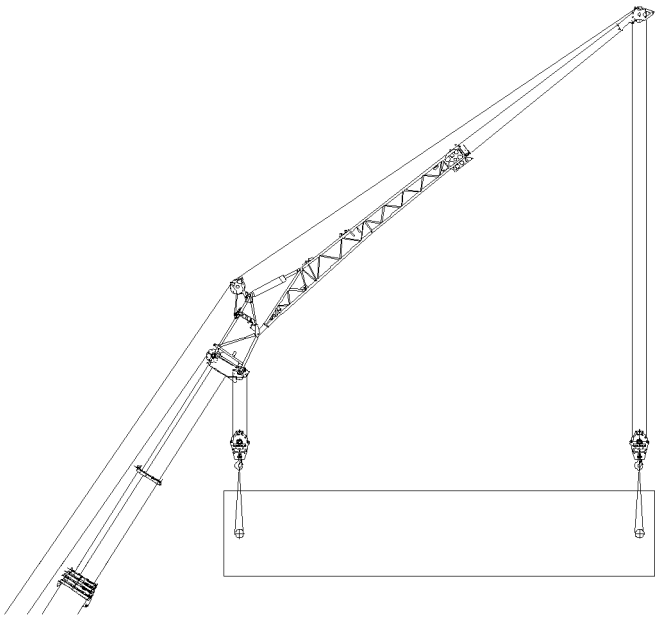

Fig.120460: Two hook operation on joint load

A joint load hangs on two hooks.

2.4.2 Two hook operation on individual loads

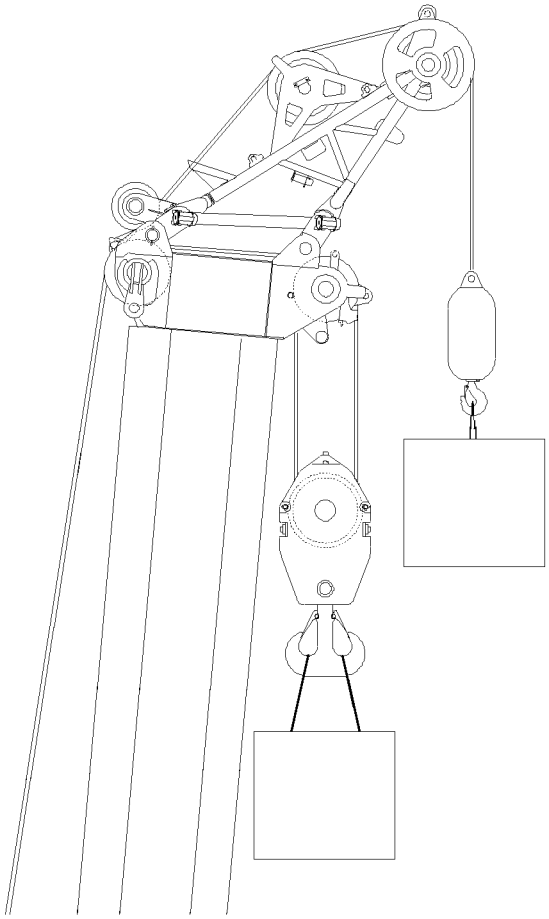

Fig.121508: Two hook operation for individual loads

Individual loads hang on individual hooks.

3 Two hook operation monitored / Two hook operation not monitored

For two hook operation the following is differentiated:

- Two hook operation monitored
  Two hook operation on joint load and on individual loads is monitored by the LICCON overload protection
- Two hook operation **not** monitored
  Two hook operation on joint load and on individual loads is **not** monitored by the LICCON overload protection

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3.1 Two hook operation monitored

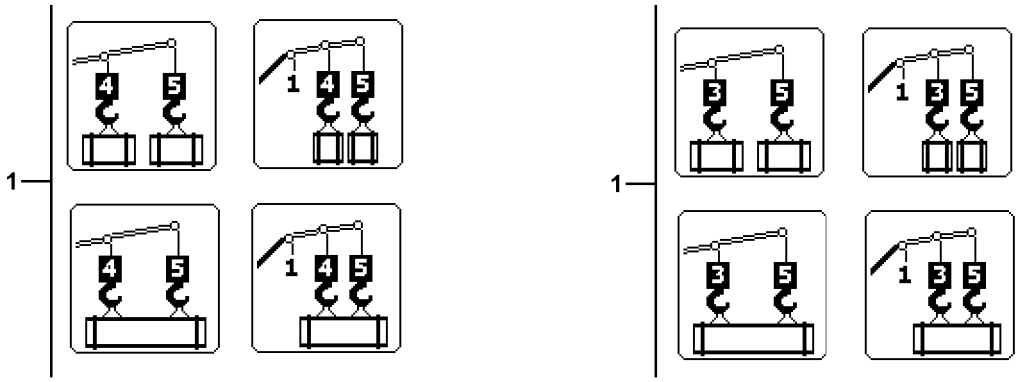

*Fig.121109: Icons **1** Two hook operation monitored*

For crane types, which are equipped with monitored two hook operation, the two hook operation can be selected in the Set up program. The monitored two hook operation is displayed by the two selectable icons **1**.

3.2 Two hook operation not monitored

If the two hook operation can **not** be selected in the Set up program, then the two hook operation is **not** monitored.

4 Safety guidelines

WARNING
Danger of accident if „two hook operation is **not** monitored“!
If „two hook operation is **not** monitored“ and both hooks are subjected to a load, then the boom can be overloaded when luffing down.

When both hooks are subjected to a load and are **not** monitored:
▶ Do not luff the boom down.

WARNING
Overload of crane!
Death, severe injuries, property damage.
▶ Set up solely permissible hook operations.
▶ Lift and lower the load vertically.

When a hook is reeved on the telescopic boom:
▶ Do **not** carry out two hook operation with TY-guying and eccentric or spacer.

WARNING
Overload of crane!
Death, severe injuries, property damage.

If no load chart is available:
▶ **Make sure that the total weight of the load(s) is smaller than / equal to the maximum permissible load of the auxiliary boom.**
▶ Two hook operation with load(s) heavier than the maximum permissible load of the auxiliary boom is prohibited.

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WARNING
Overload of crane due to imprecise radius and load display!
When no load charts is available, then the radius and load display is not exact.
Toppling crane, death, property damage.
▶ Move the crane within the permissible utilization range.

WARNING
Incorrect reeving for two hook operation!
Overload of crane, death, property damage.
▶ Reeve in an auxiliary boom head smaller than / equal to the main boom head.
▶ Set the LICCON overload protection to the reeving on the auxiliary boom head.

WARNING
Incorrect distance of fastening points!
Overload of crane, death, property damage.

For two hook operation on joint load:
▶ Place the fastening points according to the horizontal distance of both hooks.

WARNING
Danger of collision for two hook operation on joint load!
Falling load, death, property damage.
▶ Lift the load no higher than to the height of the main boom head.

Add the following weights to the load:
– Hook block on main boom head
– Hook block (load hook) on auxiliary boom head
– Fastening equipment

5 Boom nose on telescopic boom

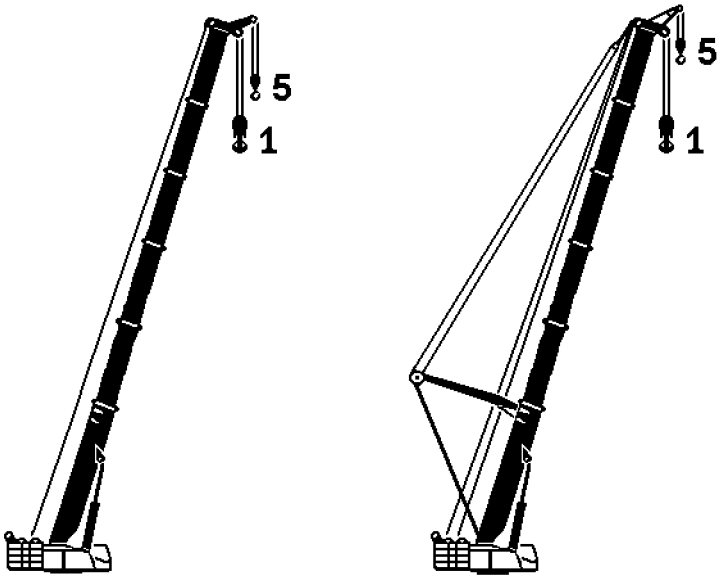

Fig.120462: Boom nose on telescopic boom

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WARNING
Impermissible operating conditions for two hook operation!
Overload of crane, death, property damage.
▶ Set up solely permissible hook operations.
▶ Set up of **non-permissible** hook operations is prohibited.

Hook	Illustration	Permissible hook operations for boom nose on telescopic boom
[5]		**One hook operation:** Hook 5 is reeved on **boom nose**. Load is fastened on hook 5. **WARNING!** Radius and load display is not exact.
[1]		**One hook operation:** Hook 1 is reeved on **telescopic boom**. Load is fastened on hook 1. **WARNING!** Radius and load display is not exact.
1 [5]		**Two hook operation:** Hook 1 is reeved on **telescopic boom**. Hook 5 is reeved on **boom nose**. Load is fastened on hook 5. **WARNING!** Radius and load display is not exact.
[1] 5		**Two hook operation:** Hook 1 is reeved on **telescopic boom**. Hook 5 is reeved on **boom nose**. Load is fastened on hook 1. **WARNING!** Radius and load display is not exact.

5.1 Set up for boom nose on telescopic boom

▶ Reeve in a boom nose smaller than / equal to the telescopic boom head.

When a load is fastened on hook 5 (boom nose):
▶ Set the LICCON overload protection to the reeving on the boom nose.

For the two hook operation boom nose on telescopic boom no special load charts are available.

▶ Set operating mode **telescopic boom** on the LICCON overload protection.

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6 Auxiliary jib on telescopic boom

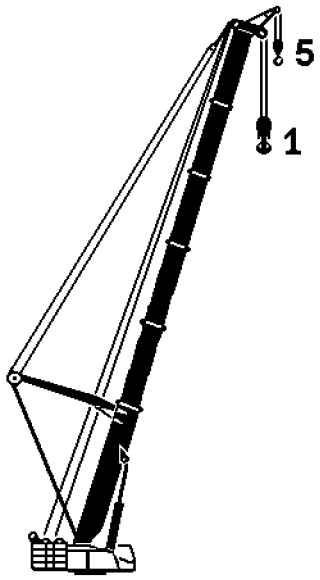

Fig.120467: Auxiliary jib on telescopic boom

WARNING
Impermissible operating conditions for two hook operation!
Overload of crane, death, property damage.
▶ Set up solely permissible hook operations.
▶ Set up of **non-permissible** hook operations is prohibited.

Hook	Illustration	Permissible hook operations for auxiliary jib on telescopic boom
[5]		**One hook operation:** Hook 5 is reeved on **auxiliary jib**. Load is fastened on hook 5.
[1]		**One hook operation:** Hook 1 is reeved on **telescopic boom**. Load is fastened on hook 1. **WARNING!** For **non-monitored** two hook operation: Radius and load display is not exact.
1 [5]		**Two hook operation:** Hook 1 is reeved on **telescopic boom**. Hook 5 is reeved on **auxiliary jib**. Load is fastened on hook 5. **WARNING!** For **non-monitored** two hook operation: Radius and load display is not exact.
[1] 5		**Two hook operation:** Hook 1 is reeved on **telescopic boom**. Hook 5 is reeved on **auxiliary jib**. Load is fastened on hook 1. **WARNING!** For **non-monitored** two hook operation: Radius and load display is not exact.
[1] [5]		**Two hook operation:** Hook 1 is reeved on **telescopic boom**. Hook 5 is reeved on **auxiliary jib**. First load is fastened on hook 1. Second load is fastened on hook 5. **WARNING!** Permissible solely for monitored two hook operation.

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Hook	Illustration	Permissible hook operations for auxiliary jib on telescopic boom
[1 5]		**Two hook operation:** Hook 1 is reeved on **telescopic boom**. Hook 5 is reeved on **auxiliary jib**. A joint load is fastened on hook 1 and hook 5. **WARNING!** Permissible solely for monitored two hook operation. **WARNING!** Make sure that the weight of the load is smaller than / equal to the maximum permissible load of the auxiliary jib.

6.1 Set up for auxiliary jib on telescopic boom

WARNING
Impermissible hook operation!
Overload of crane, death, property damage.

Solely if the required load charts is available:
▶ Set up hook operation.

▶ Reeve in a auxiliary jib smaller than / equal to the telescopic boom head.
▶ Set the LICCON overload protection to the reeving on the auxiliary jib.
▶ Set operating mode **auxiliary jib** on the LICCON overload protection.

7 Folding jib

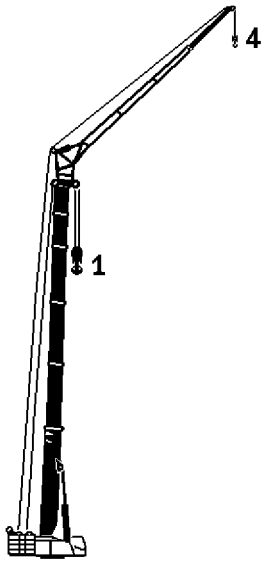

Fig.120468: Folding jib

WARNING
Impermissible hook operations!
Overload of crane, death, property damage.
▶ Set up solely permissible hook operations.
▶ Set up of **non-permissible** hook operations is prohibited.

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Hook	Illustration	Permissible hook operations for folding jib
[4]		**One hook operation:** Hook 4 is reeved on **folding jib**. Load is fastened on hook 4.
[1] 4		**Two hook operation:** Hook 1 is reeved on **telescopic boom**. Hook 4 is reeved on **folding jib**. Load is fastened on hook 1. **WARNING!** Radius and load display is not exact.
1 [4]		**Two hook operation:** Hook 1 is reeved on **telescopic boom**. Hook 4 is reeved on **folding jib**. Load is fastened on hook 4. **WARNING!** Radius and load display is not exact.
[1 4]		**Two hook operation:** Hook 1 is reeved on **telescopic boom**. Hook 4 is reeved on **folding jib**. A joint load is fastened on hook 1 and hook 4. **WARNING!** Radius and load display is not exact. **WARNING!** Make sure that the weight of the load is smaller than / equal to the maximum permissible load of the folding jib.

7.1 Set up for operation with folding jib

WARNING
Impermissible hook operation!
Overload of crane, death, property damage.

Solely if the required load charts is available:
▶ Set up hook operation.

▶ Reeve in a folding jib smaller than / equal to the telescopic boom head.
▶ Set the LICCON overload protection to the reeving on the folding jib.
▶ Set operating mode **folding jib** on the LICCON overload protection.

8 Fixed lattice jib

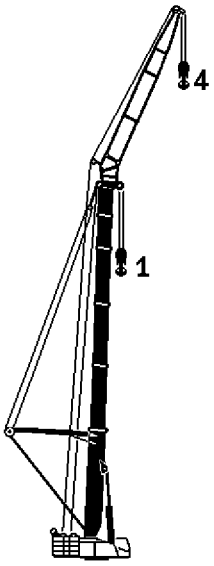

Fig.120473: Fixed lattice jib

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WARNING
Impermissible hook operations!
Overload of crane, death, property damage.
- ▶ Set up solely permissible hook operations.
- ▶ Set up of **non-permissible** hook operations is prohibited.

Hook	Illustration	Permissible hook operations for fixed lattice jib
[4]		**One hook operation:** Hook 4 is reeved on **fixed lattice jib**. Load is fastened on hook 4.
[1] 4		**Two hook operation:** Hook 1 is reeved on **telescopic boom**. Hook 4 is reeved on **fixed lattice jib**. Load is fastened on hook 1. **WARNING!** Radius and load display is not exact.
1 [4]		**Two hook operation:** Hook 1 is reeved on **telescopic boom**. Hook 4 is reeved on **fixed lattice jib**. Load is fastened on hook 4. **WARNING!** Radius and load display is not exact.
[1 4]		**Two hook operation:** Hook 1 is reeved on **telescopic boom**. Hook 4 is reeved on **fixed lattice jib**. A joint load is fastened on hook 1 and hook 4. **WARNING!** Radius and load display is not exact. **WARNING!** Make sure that the weight of the load is smaller than / equal to the maximum permissible load of the fixed lattice jib.

8.1 Set up for operation with fixed lattice jib

WARNING
Impermissible hook operation!
Overload of crane, death, property damage.

Solely if the required load charts is available:
- ▶ Set up hook operation.

- ▶ Reeve in a fixed lattice jib smaller than / equal to the telescopic boom head.
- ▶ Set the LICCON overload protection to the reeving on the fixed lattice jib.
- ▶ Set operating mode **fixed lattice jib** on the LICCON overload protection.

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9 Boom nose on fixed lattice jib

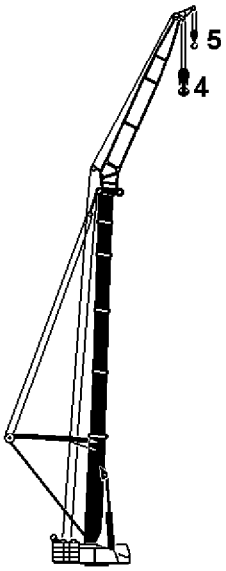

Fig.120474: Boom nose on fixed lattice jib

WARNING
Impermissible hook operations!
Overload of crane, death, property damage.
- ▶ Set up solely permissible hook operations.
- ▶ Set up of **non-permissible** hook operations is prohibited.

Hook	Illustration	Permissible hook operations for boom nose on fixed lattice jib
[5]		**One hook operation:** Hook 5 is reeved on **boom nose**. Load is fastened on hook 5. **WARNING!** Radius and load display is not exact.
[4]		**One hook operation:** Hook 4 is reeved on **fixed lattice jib**. Load is fastened on hook 4. **WARNING!** Radius and load display is not exact.
4 [5]		**Two hook operation:** Hook 4 is reeved on **fixed lattice jib**. Hook 5 is reeved on **boom nose**. Load is fastened on hook 5. **WARNING!** Radius and load display is not exact.
[4] 5		**Two hook operation:** Hook 4 is reeved on **fixed lattice jib**. Hook 5 is reeved on **boom nose**. Load is fastened on hook 4. **WARNING!** Radius and load display is not exact.
[4 5]		**Two hook operation:** Hook 4 is reeved on **fixed lattice jib**. Hook 5 is reeved on **boom nose**. A joint load is fastened on hook 4 and hook 5. **WARNING!** Radius and load display is not exact. **WARNING!** Make sure that the weight of the load is smaller than / equal to the maximum permissible load of the boom nose.

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9.1 Set up for operation with boom nose on fixed lattice jib

▶ Reeve in a boom nose smaller than / equal to the N-head.

When a load is fastened on hook 5 (boom nose):
▶ Set the LICCON overload protection to the reeving on the boom nose.
▶ Set operating mode **fixed lattice jib** on the LICCON overload protection.

10 Auxiliary jib on fixed lattice jib

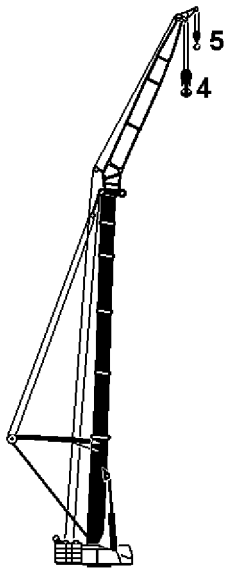
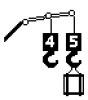


Fig.120474: Auxiliary jib on fixed lattice jib

WARNING
Impermissible hook operations!
Overload of crane, death, property damage.
▶ Set up solely permissible hook operations.
▶ Set up of **non-permissible** hook operations is prohibited.

Hook	Illustration	Permissible hook operations for auxiliary jib on fixed lattice jib
[5]		**One hook operation:** Hook 5 is reeved on **auxiliary jib**. Load is fastened on hook 5.
[4]		**One hook operation:** Hook 4 is reeved on **fixed lattice jib**. Load is fastened on hook 4. **WARNING!** For **non-monitored** two hook operation: Radius and load display is not exact.
4 [5]		**Two hook operation:** Hook 4 is reeved on **fixed lattice jib**. Hook 5 is reeved on **auxiliary jib**. Load is fastened on hook 5. **WARNING!** For **non-monitored** two hook operation: Radius and load display is not exact.

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Hook	Illustration	Permissible hook operations for auxiliary jib on fixed lattice jib
[4] 5		**Two hook operation:** Hook 4 is reeved on **fixed lattice jib**. Hook 5 is reeved on **auxiliary jib**. Load is fastened on hook 4. **WARNING!** For **non-monitored** two hook operation: Radius and load display is not exact.
[4] [5]		**Two hook operation:** Hook 4 is reeved on **fixed lattice jib**. Hook 5 is reeved on **auxiliary jib**. First load is fastened on hook 4. Second load is fastened on hook 5. **WARNING!** Permissible solely for monitored two hook operation.
[4 5]		**Two hook operation:** Hook 4 is reeved on **fixed lattice jib**. Hook 5 is reeved on **auxiliary jib**. A joint load is fastened on hook 4 and hook 5. **WARNING!** For **non-monitored** two hook operation: Radius and load display is not exact. **WARNING!** Make sure that the weight of the load is smaller than / equal to the maximum permissible load of the auxiliary jib.

10.1 Set up for operation with auxiliary jib on fixed lattice jib

WARNING
Impermissible hook operation!
Overload of crane, death, property damage.

Solely if the required load charts is available:
▶ Set up hook operation.

▶ Reeve in an auxiliary jib smaller than / equal to the N-head.
▶ Set the LICCON overload protection to the reeving on the auxiliary jib.
▶ Set operating mode **auxiliary jib** on the LICCON overload protection.

11 Luffing lattice jib

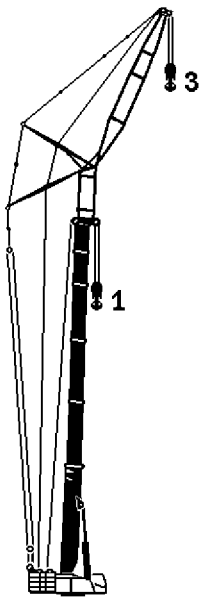

Fig.120700: Luffing lattice jib

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WARNING
Impermissible hook operations!
Overload of crane, death, property damage.
▶ Set up solely permissible hook operations.
▶ Set up of **non-permissible** hook operations is prohibited.

Hook	Illustration	Permissible hook operations for luffing lattice jib
[3]		**One hook operation:** Hook 3 is reeved on **luffing lattice jib**. Load is fastened on hook 3.

11.1 Set up for operation with luffing lattice jib

WARNING
Impermissible hook operation!
Overload of crane, death, property damage.

Solely if the required load charts is available:
▶ Set up hook operation.

▶ Set the LICCON overload protection to the reeving on the luffing lattice jib.
▶ Set operating mode **luffing lattice jib** on the LICCON overload protection.

12 Boom nose on luffing lattice jib

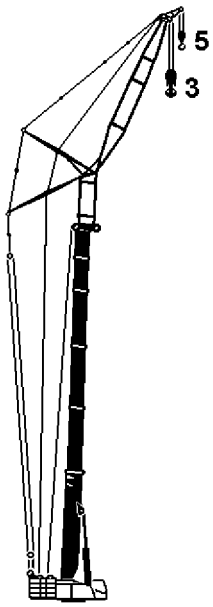

Fig.120702: Boom nose on luffing lattice jib

WARNING
Impermissible hook operations!
Overload of crane, death, property damage.
▶ Set up solely permissible hook operations.
▶ Set up of **non-permissible** hook operations is prohibited.

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Hook	Illustration	Permissible hook operations for boom nose on luffing lattice jib
[5]		**One hook operation:** Hook 5 is reeved on **boom nose**. Load is fastened on hook 5. **WARNING!** Radius and load display is not exact.
[3]		**One hook operation:** Hook 3 is reeved on **luffing lattice jib**. Load is fastened on hook 3. **WARNING!** Radius and load display is not exact.
3 [5]		**Two hook operation:** Hook 3 is reeved on **luffing lattice jib**. Hook 5 is reeved on **boom nose**. Load is fastened on hook 5. **WARNING!** Radius and load display is not exact.
[3] 5		**Two hook operation:** Hook 3 is reeved on **luffing lattice jib**. Hook 5 is reeved on **boom nose**. Load is fastened on hook 3. **WARNING!** Radius and load display is not exact.
[3 5]		**Two hook operation:** Hook 3 is reeved on **luffing lattice jib**. Hook 5 is reeved on **boom nose**. A joint load is fastened on hook 3 and hook 5. **WARNING!** Radius and load display is not exact. **WARNING!** Make sure that the weight of the load is smaller than / equal to the maximum permissible load of the boom nose.

12.1 Set up for operation with boom nose on luffing lattice jib

▶ Reeve in a boom nose smaller than / equal to the N-head.

When a load is fastened on hook 5 (boom nose):
▶ Set the LICCON overload protection to the reeving on the boom nose.
▶ Set operating mode **luffing lattice jib** on the LICCON overload protection.

13 Auxiliary jib on luffing lattice jib

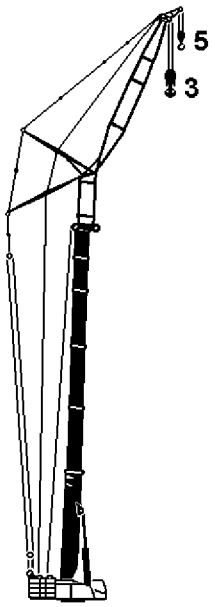

Fig.120702: Auxiliary jib on luffing lattice jib

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WARNING
Impermissible hook operations!
Overload of crane, death, property damage.
▶ Set up solely permissible hook operations.
▶ Set up of **non-permissible** hook operations is prohibited.

Hook	Illustration	Permissible hook operations for auxiliary jib on luffing lattice jib
[5]		**One hook operation:** Hook 5 is reeved on **auxiliary jib**. Load is fastened on hook 5.
[3]		**One hook operation:** Hook 3 is reeved on **luffing lattice jib**. Load is fastened on hook 3. **WARNING!** For **non-monitored** two hook operation: Radius and load display is not exact.
3 [5]		**Two hook operation:** Hook 3 is reeved on **luffing lattice jib**. Hook 5 is reeved on **auxiliary jib**. Load is fastened on hook 5. **WARNING!** For **non-monitored** two hook operation: Radius and load display is not exact.
[3] 5		**Two hook operation:** Hook 3 is reeved on **luffing lattice jib**. Hook 5 is reeved on **auxiliary jib**. Load is fastened on hook 3. **WARNING!** For **non-monitored** two hook operation: Radius and load display is not exact.
[3] [5]		**Two hook operation:** Hook 3 is reeved on **luffing lattice jib**. Hook 5 is reeved on **auxiliary jib**. First load is fastened on hook 3. Second load is fastened on hook 5. **WARNING!** Permissible solely for monitored two hook operation.
[3 5]		**Two hook operation:** Hook 3 is reeved on **luffing lattice jib**. Hook 5 is reeved on **auxiliary jib**. A joint load is fastened on hook 3 and hook 5. **WARNING!** For **non-monitored** two hook operation: Radius and load display is not exact. **WARNING!** Make sure that the weight of the load is smaller than / equal to the maximum permissible load of the auxiliary jib.

13.1 Set up for operation with auxiliary jib on luffing lattice jib

WARNING
Impermissible hook operation!
Overload of crane, death, property damage.

Solely if the required load charts is available:
▶ Set up hook operation.

▶ Reeve in an auxiliary jib smaller than / equal to the N-head.
▶ Set the LICCON overload protection to the reeving on the auxiliary jib.
▶ Set operating mode **auxiliary jib** on the LICCON overload protection.

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14 Lifting a joint load

14.1 Lifting a joint load solely with auxiliary boom

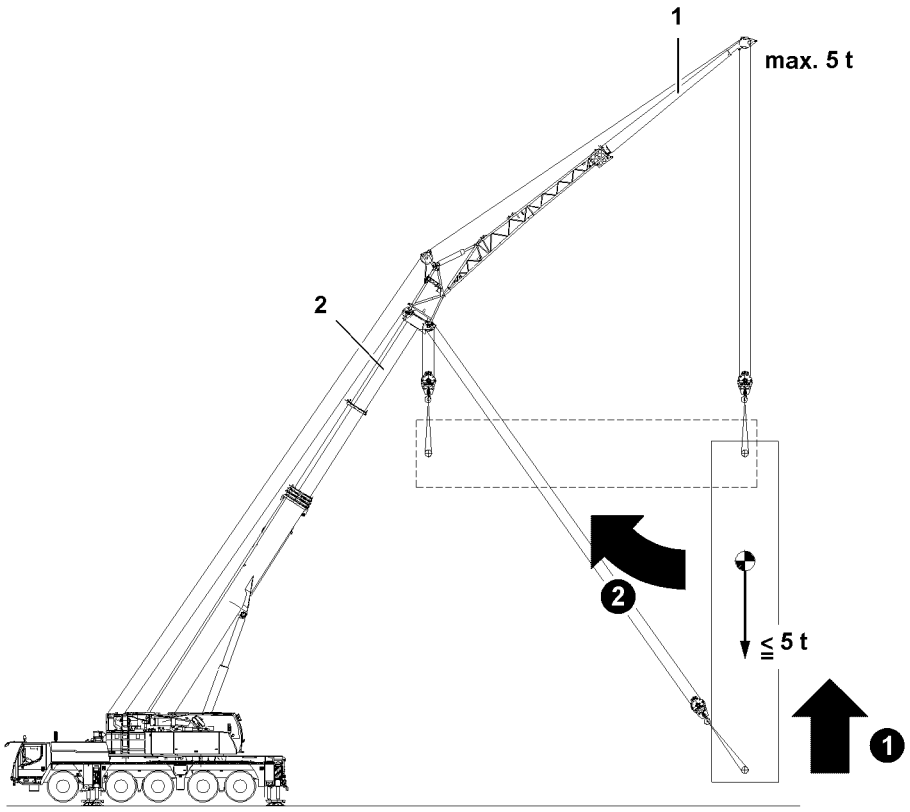

*Fig.120710: Lift the load with auxiliary boom **1** to 100 %.*

If the weight or the center of gravity of the load is not exactly known, then the load must first be lifted with the auxiliary boom **1** to 100 %.

Make sure that the following prerequisite is met:
– The weight of the load is smaller / equal to the maximum permissible load of the auxiliary boom **1**.

WARNING
Incorrect lifting the load!
Toppling crane, death, property damage.
▶ Lift the load with auxiliary boom **1** to 100 %.

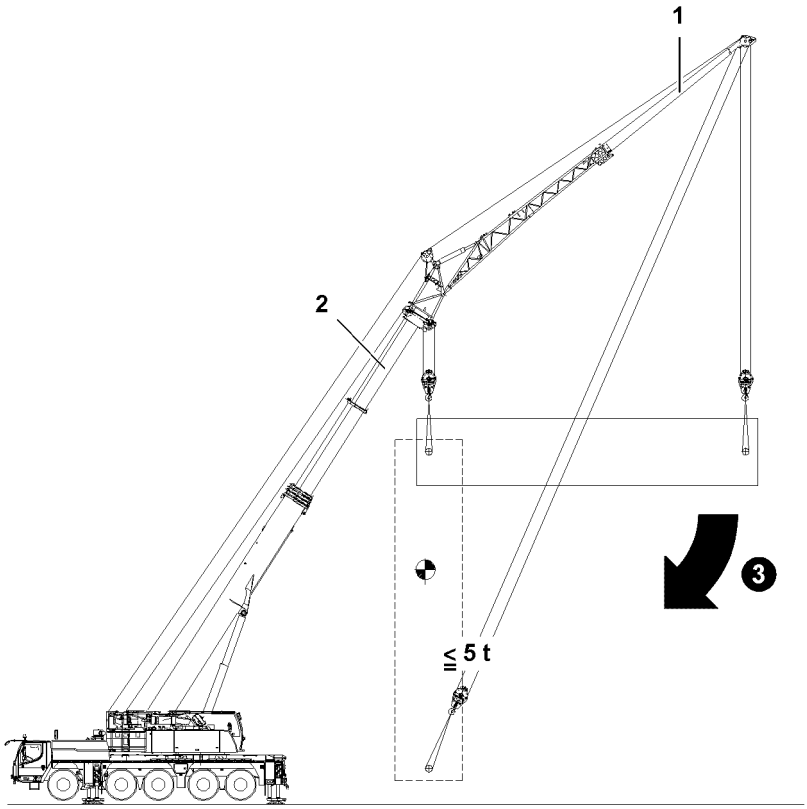

*Fig.120711: Take over the load with the main boom **2**.*

In „two hook operation“ angular pull is only permissible in boom direction with raised load.

NOTICE
Rubbing hoist ropes!
- ▶ Make sure that the hoist ropes do not rub on the rope retaining pipes of the rope pulleys during angular pull.

- ▶ Take over the load with the main boom **2**.

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14.2 Lifting joint load with two booms

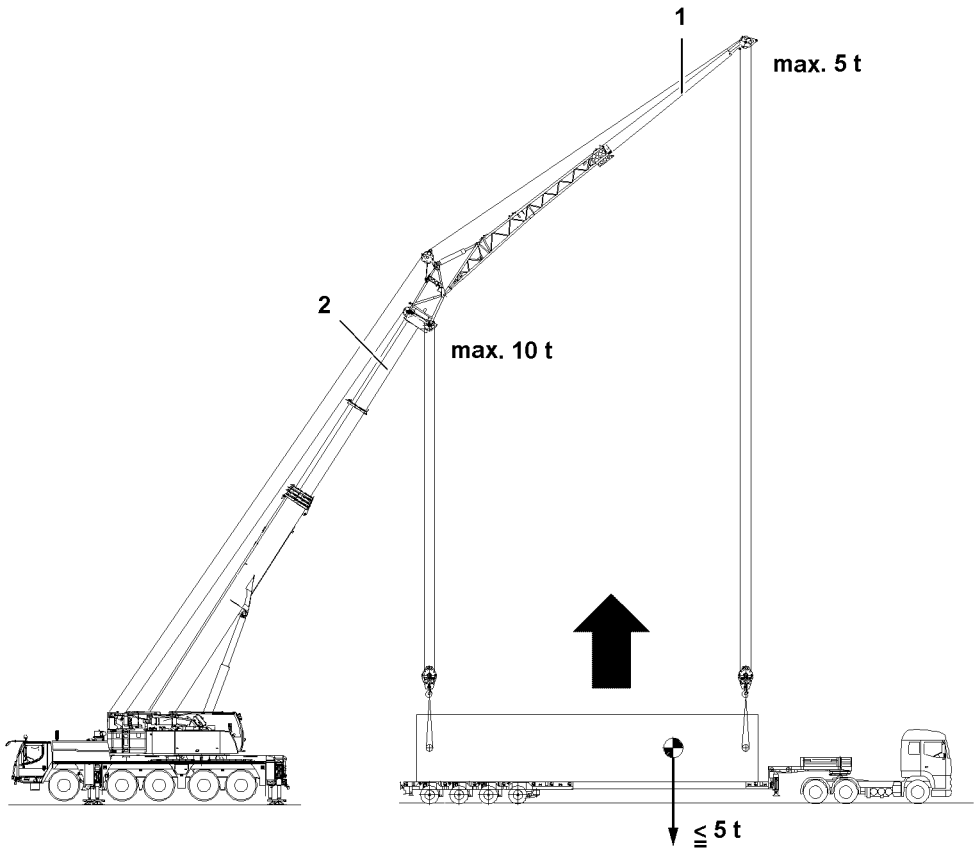

*Fig.120712: Lift the load with the main boom **2** and auxiliary boom **1**.*

Make sure that the following prerequisite is met:
– The weight of the load is smaller / equal to the maximum permissible load of the auxiliary boom **1**.

WARNING
Overload of crane!
Death, severe injuries, property damage.
▶ Make sure that the weight and the center of gravity of the load is known exactly.

In „two hook operation“ angular pull is only permissible in boom direction with raised load.

NOTICE
Rubbing hoist ropes!
▶ Make sure that the hoist ropes do not rub on the rope retaining pipes of the rope pulleys during angular pull.

▶ Lift the load with the main boom **2** and auxiliary boom **1**.

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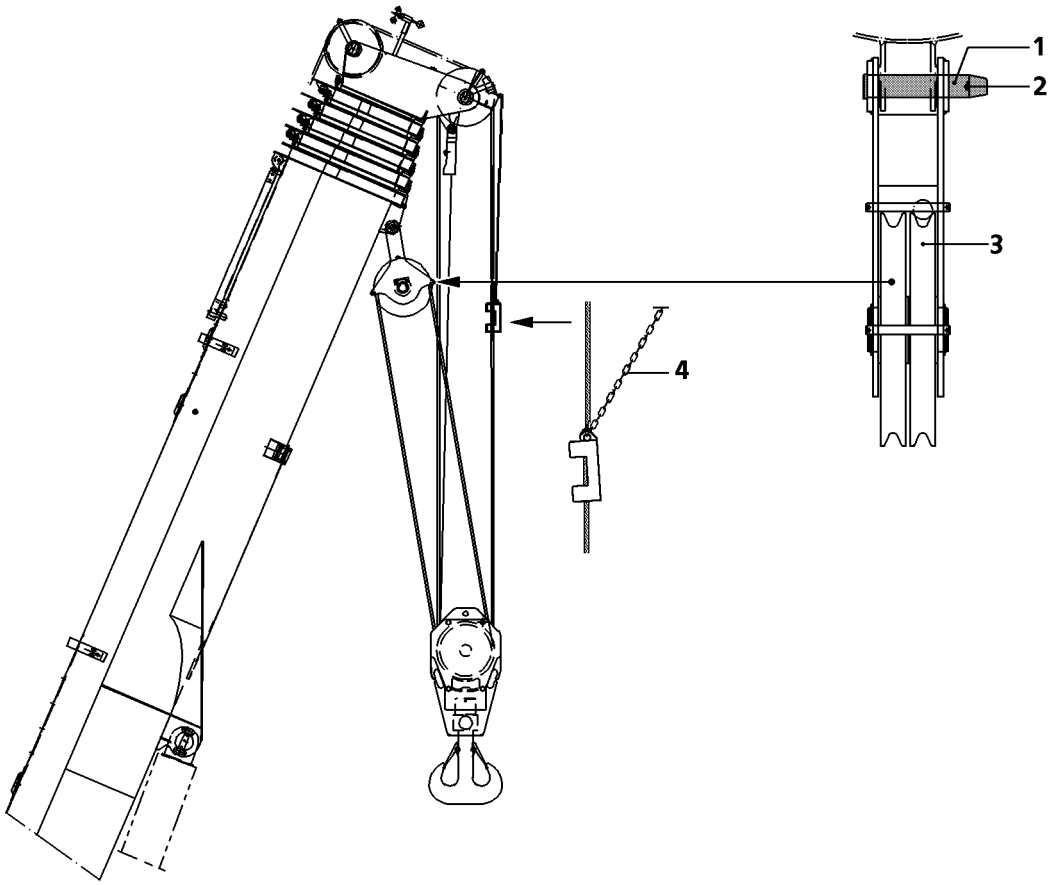

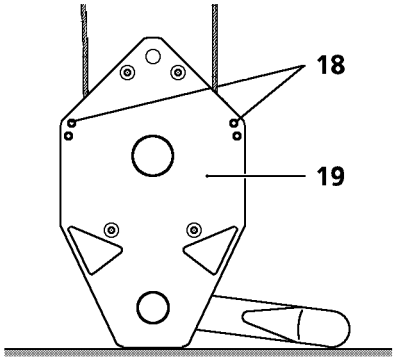

LWE/LTR 1100-005/17505-03-02/en

Fig.110783

1 Reeving plans

1.1 Assembling the auxiliary equipment*

- ▶ Affix the auxiliary pulleys **3** on the intended bores.
- ▶ Insert the pins **1**.
- ▶ Secure pins **1** with spring retainers **2**.

1.2 Operation with auxiliary block on the telescopic boom*

NOTICE
Damage to auxiliary device!
If the following notes are not observed, the hook block, the hoist rope or the auxiliary block can be damaged!
For operation with auxiliary pulley block on the telescopic boom, do **not** telescope out and run only the radii ranges, which are specified in the load chart.
Before operation with the auxiliary pulley block, the rope guard pins on the hook block must be removed!
When the hook block is on the ground, it must be ensured that the ropes remain in the pulleys!
If the limit switch chain **4** on the hoist limit switch weight is set too short, then the hook block can run onto the auxiliary device when the hoist rope is spooled up and damage it severely.

- ▶ Do not telescope out!
- ▶ On the hook block **19**, remove the spring retainers **18** and pull out the rope guard pin!
- ▶ Check if all ropes are in the pulleys.
- ▶ Before operation with the auxiliary device, set the limit switch chain **4** on the hoist limit switch weight to maximum length.

- ▶ Check if all prerequisites have been met.

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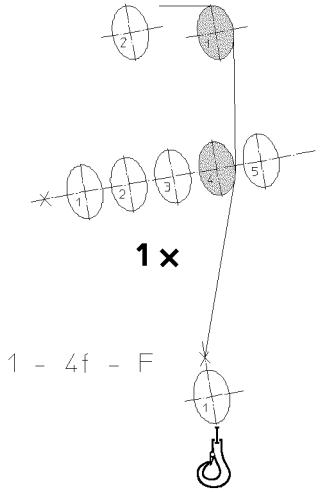

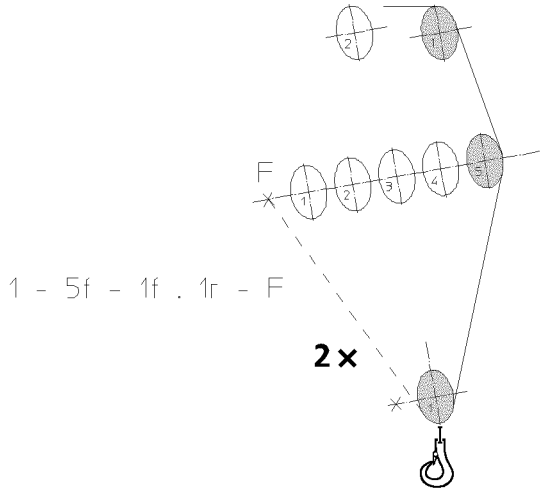

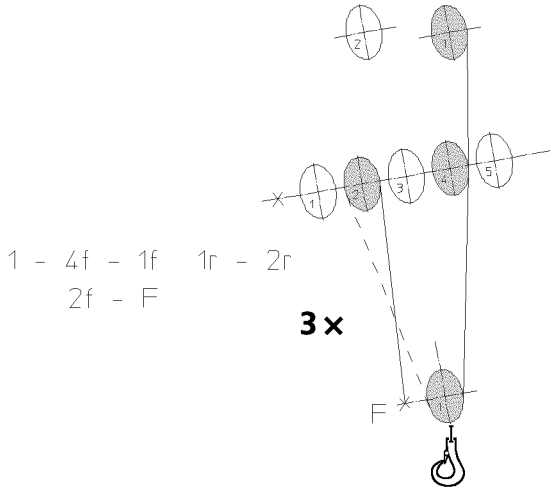

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Fig.120410

2 Reeving in, T-operation

Explanation of symbols on the reeving plans:
- The number denotes the number of the respective rope pulley on the pulley head.
- The letter **f** means reeve on the **front** over the rope pulley on the pulley head.
- The letter **r** means reeve on the **rear** over the rope pulley on the pulley head.
- The letter **F** means **rope fixed point**.

2.1 1-pulley hook block / load hook

Reeving	Rope fixed point
1x	On the hook block or on the load hook fixed point
2x	On the pulley head
3x	On the hook block

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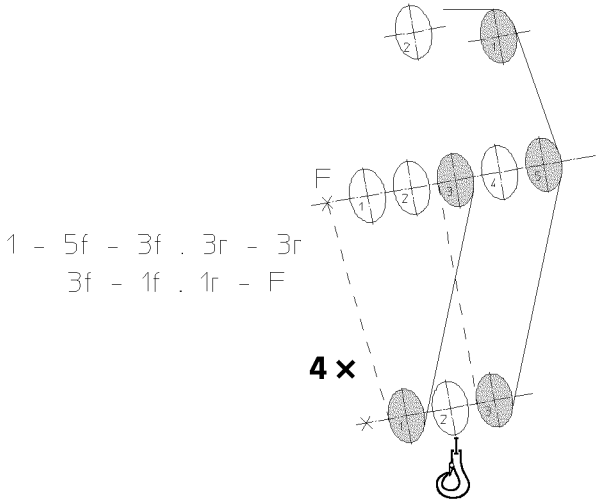

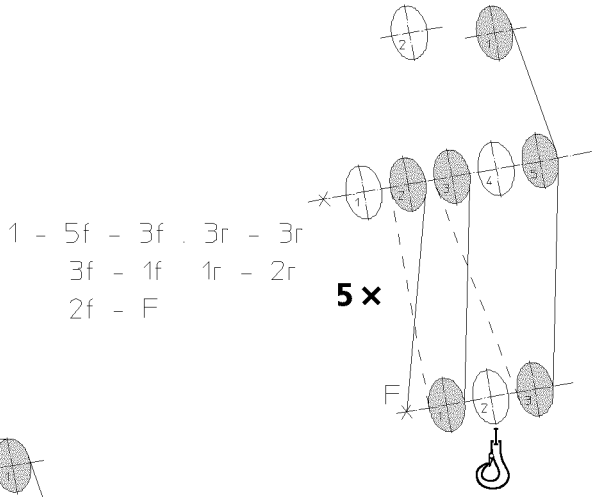

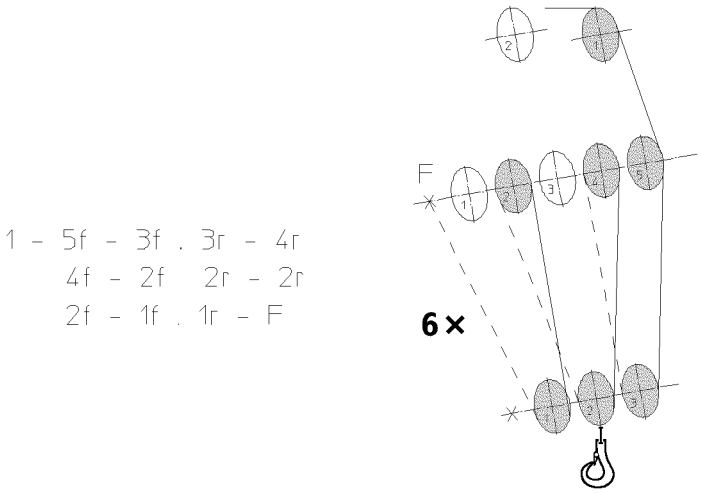

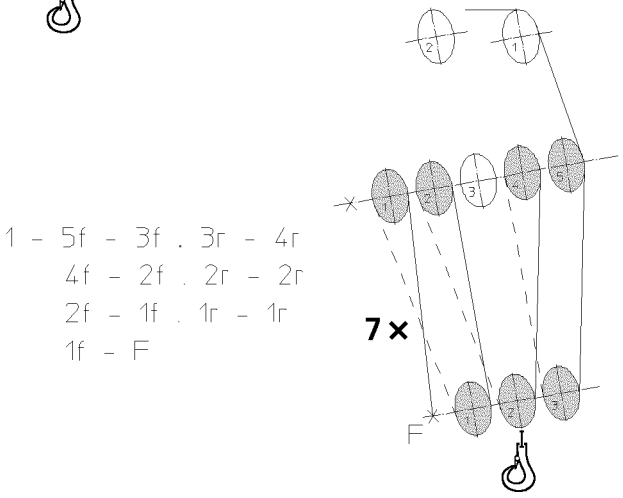

Fig.120411

2.2 3-pulley hook block

Reeving	Rope fixed point
4x	On the pulley head
5x	On the hook block
6x	On the pulley head
7x	On the hook block

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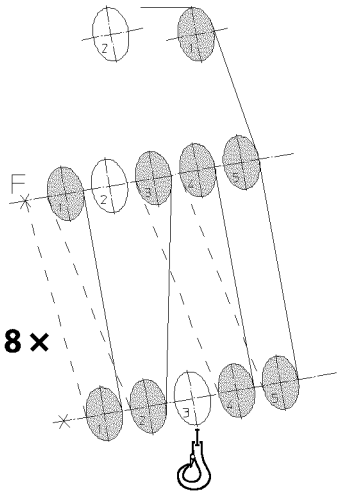
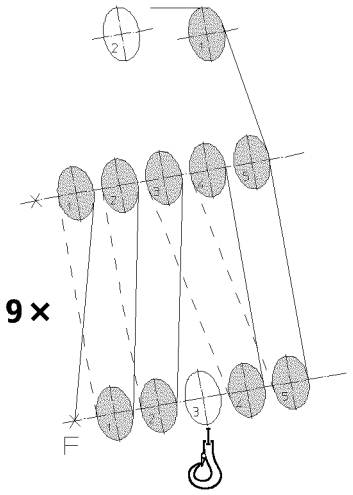
1 - 5f - 5f 5r - 4r
4f - 4f . 4r - 3r
3f - 2f . 2r - 1r
1f - 1f . 1r - F



1 - 5f - 5f . 5r - 4r
4f - 4f 4r - 3r
3f - 2f . 2r - 2r
2f - 1f . 1r - 1r
1f - F



1 - 5f - 5f 5r - 4r
4f - 4f . 4r - 3r
3f - 3f . 3r - 2r
2f - 2f . 2r - 1r
1f - 1f . 1r - F

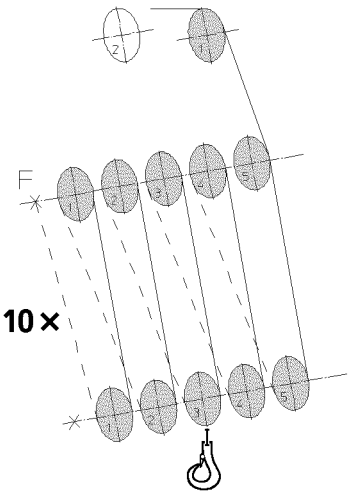


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Fig.120412

2.3 5-pulley hook block

Reeving	Rope fixed point
8x	On the pulley head
9x	On the hook block
10x	On side of pulley head

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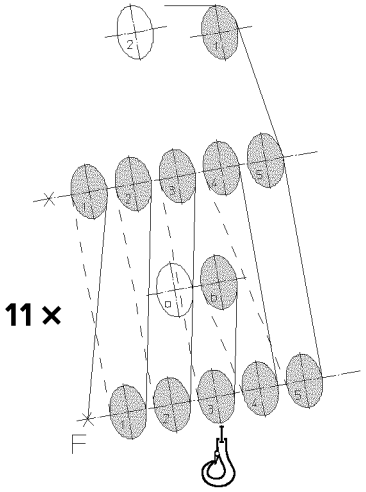
1 - 5f - 5f . 5r - 4r
4f - 4f 4r - br
bf - 3f . 3r - 3r
3f - 2f . 2r - 2r
2f - 1f 1r - 1r
1f - F



1 - 5f - 7f . 7r - 4r
4f - 6f . 6r - 3r
3f - 5f . 5r - br
bf - 3f . 3r - 2r
2f - 2f . 2r - 1r
1f - 1f . 1r - F

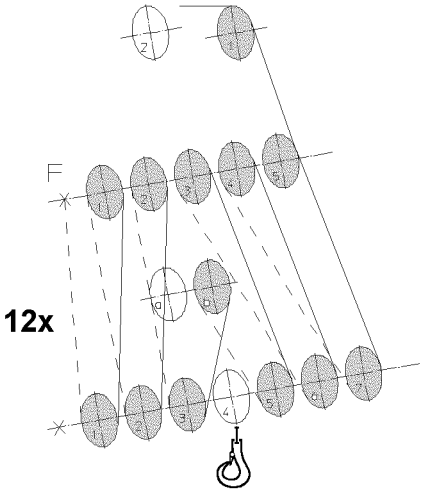


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Fig.120413

2.4 Reeving with auxiliary device*

2.4.1 5-pulley hook block

Note
▶ 11-way reeving is only possible with an auxiliary device!

Reeving	Rope fixed point
11x	On the hook block

2.4.2 7-pulley hook block

Note
▶ 12-way reeving is only possible with an auxiliary device!

Reeving	Rope fixed point
12x	On the pulley head

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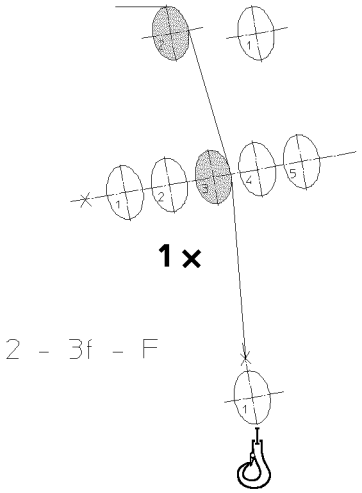

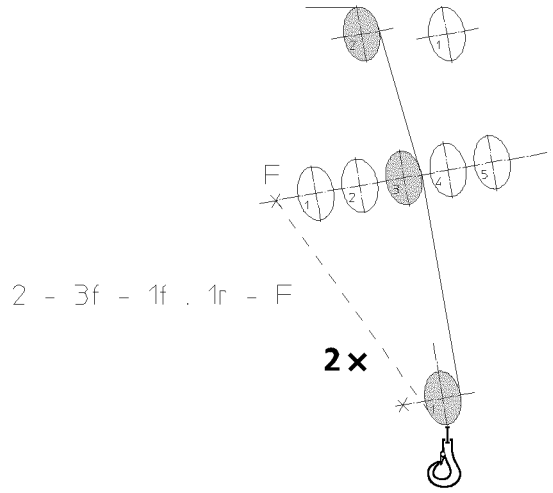

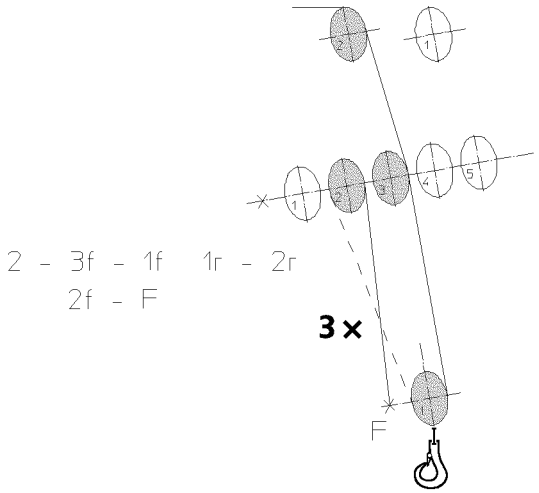

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Fig.120414

2.5 Special reeving 1-pulley hook block / load hook

Note

▶ The special reeving are exclusively for T-operation. For the special reevings the rope friction is reduced and the life expectancy of the rope is increased.

Reeving	Rope fixed point
1x	On the hook block or on the load hook fixed point
2x	On the pulley head
3x	On the hook block

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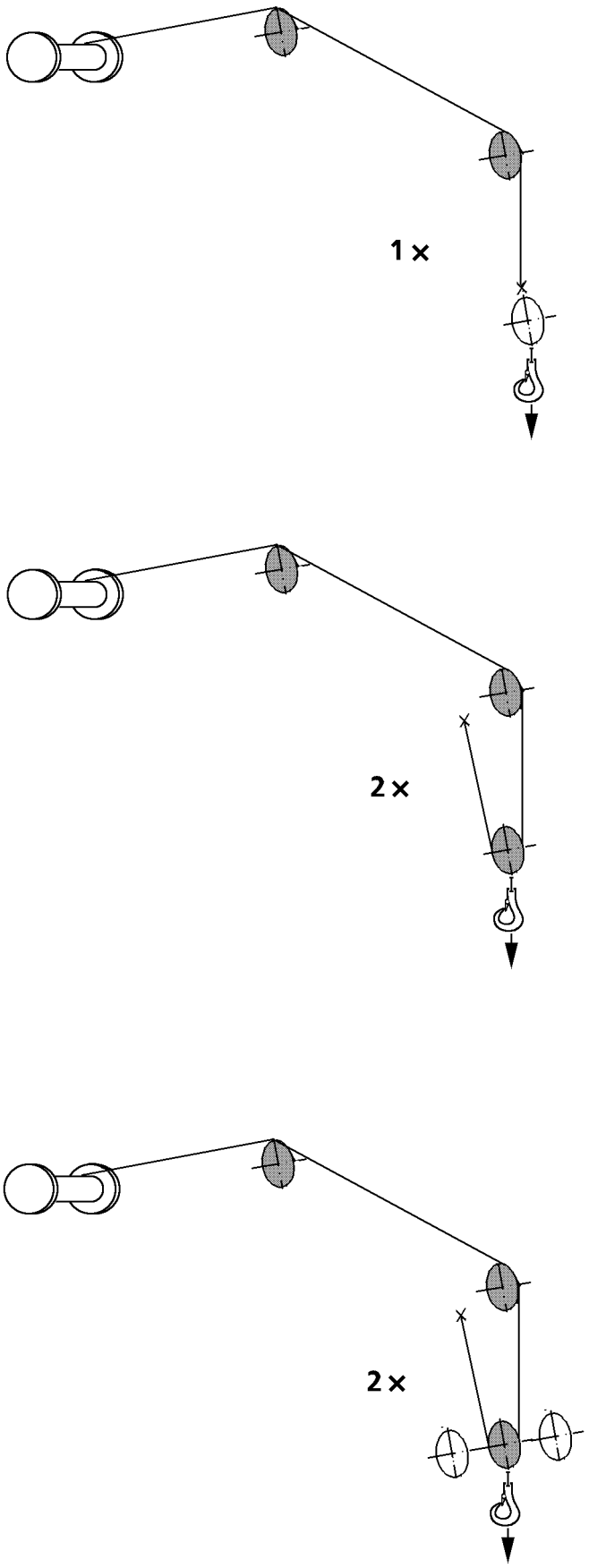

Fig.118490

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3 Reeving in TK / TNZK operation

3.1 1-pulley hook block / load hook

Reeving	Rope fixed point
1x	On the hook block or on the load hook fixed point
2x	On the pulley head

3.2 3-pulley hook block

Reeving	Rope fixed point
2x	On the pulley head

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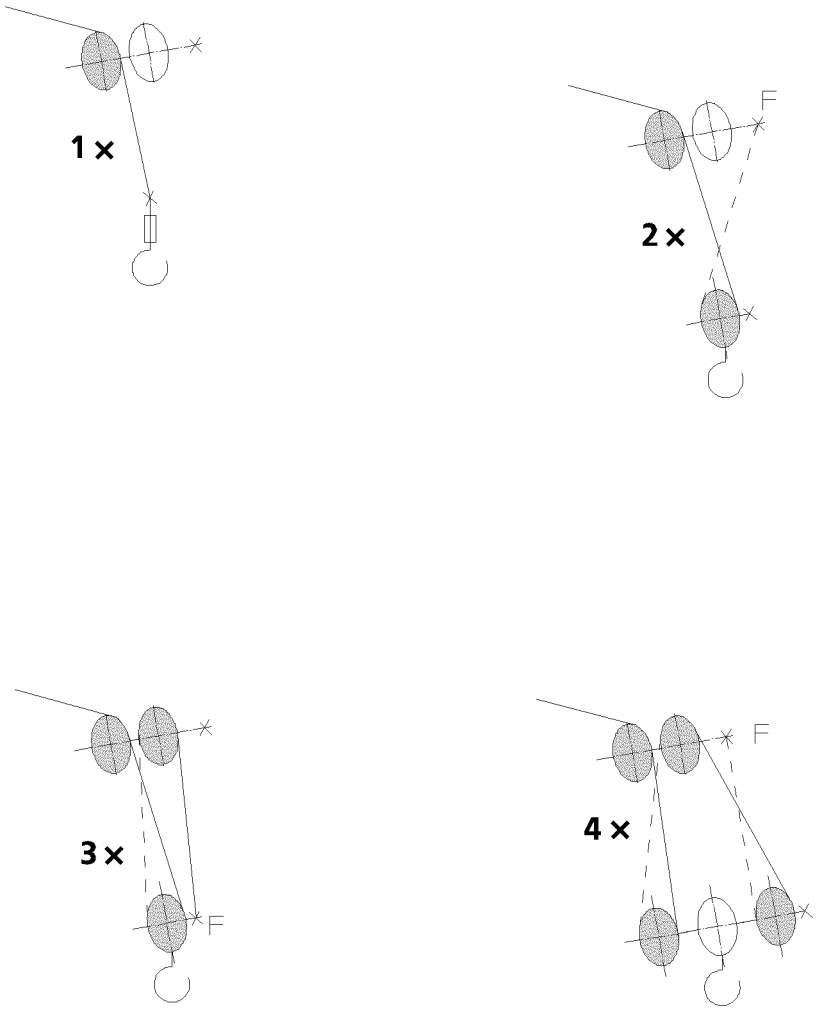

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Fig.120415

4 Reeving THK-operation*

Explanation of symbols on the reeving plans:
- The number denotes the number of the respective rope pulley on the pulley head.
- The letter **F** means **rope fixed point**.

4.1 1-pulley hook block / load hook

Reeving	Rope fixed point
1x	On fixed point load hook
2x	On the pulley head
3x	On the hook block

4.2 3-pulley hook block

Reeving	Rope fixed point
4x	On the pulley head

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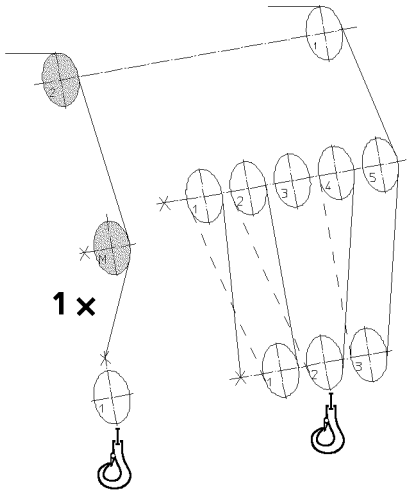
1 - 5f - 3f . 3r - 4r
4f - 2f . 2r - 2r
2f - 1f . 1r - 1r
1f - F
2 - Mf - F



1 - 5f - 3f . 3r - 4r
4f - 2f . 2r - 2r
2f - 1f . 1r - 1r
1f - F
2 - Mf - 1f . 1r - F

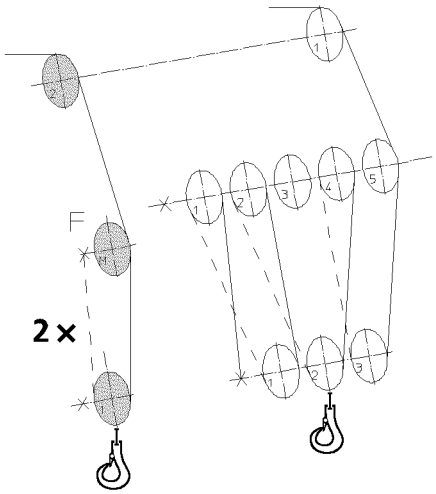


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Fig.120416

5 Reeving Boom nose*

Note

▶ The quoted implementations are examples for reeving the telescopic boom. Only the reevings for the telescopic boom may be used, see section Reevings T-operation.

WARNING

The crane can topple over!

Death, severe injuries, property damage.

▶ For operation with boom nose* on the telescopic boom reeve exclusively the reevings for T-operation.

▶ The special reevings for the telescopic boom are **prohibited** for operation with boom nose.

Explanation of symbols on the reeving plans:

– The number denotes the number of the respective rope pulley on the pulley head.
– The letter **f** means reeve on the **front** over the rope pulley on the pulley head.
– The letter **r** means reeve on the **rear** over the rope pulley on the pulley head.
– The letter **F** means **rope fixed point**.

5.1 Boom nose with load hook

Reeving Boom nose	Rope fixed point
1x	On the hook block or on the load hook fixed point

5.2 Boom nose with 1-pulley hook block

Reeving Boom nose	Rope fixed point
2x	On boom nose

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5 Equipment

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Fig.195219

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
Failure of retaining element!
If the spring force of the retaining element is not sufficient or in case of mechanical damage / distortion, the retaining element can fail.
If the correct retention of the pin is no longer ensured, then the pin can unpin by itself.
Accidents with bodily injuries / property damage can result.
▶ Use exclusively **functioning** retaining elements in proper condition.

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 Checking the 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 Crane operating instructions, chapter 8.04.

The ropes must be removed 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 / control ropes

In order to guarantee safety and operating characteristics, only original Liebherr replacement parts or parts approved by Liebherr may be used.

NOTICE
Damage of hoist / control rope!
If a hoist / control rope is placed with worn rope pulleys, damage can occur.
▶ Before placing a rope, check the rope pulleys. See Crane operating instructions, chapter 8.01.
▶ Replace worn or damaged rope pulleys.

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NOTICE
If the following notes are not observed, the cam limit switch / winch turn 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 turn sensor must also be readjusted, if it is determined during operation or when changing the hoist rope that the winch does not turn off when the minimum rope coils are reached.

3.1.1 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.

3.1.2 Cranes with winch turn sensor

The winch turn 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 turn sensor must be checked.
- ▶ The winch turn sensor must be set to turn off when only 4 hoist rope coils remain on the winch.

4 Control measures

WARNING
The crane can topple over!
If the control measures are not carried out before crane operation, then accidents can occur. The crane can topple over, be overloaded or damaged.
Personnel can be killed or injured.
- ▶ Crane operation with safety devices which are **not** functioning correctly is strictly prohibited.
- ▶ Start crane operation only after all safety devices 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.

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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.

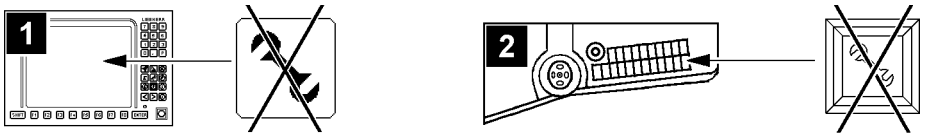

Fig.113437

Make sure that the following prerequisites are met:
- The overload protection is not bypassed.
- No assembly operation is activated.
- Crane operation can be carried out with minimum boom radius.

4.1 General control measures 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 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 gear ring of the rotary 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.
- Make sure that there is sufficient 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 devices are 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.

4.2 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).

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- Make sure that the track chains are secured to prevent them from sagging (crawler crane).

4.3 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.

4.4 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.

4.5 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.
- Make sure that the ground is sufficiently level for crane operation on tires.

4.6 Additional controls for cranes with derrick boom

- Make sure that the shut off via the limit switch - derrick is functioning.
- Make sure that the entire swing range of the suspended ballast / ballast trailer is free of personnel and obstacles.

4.7 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 swing range and is functioning.

4.8 Additional controls for certain crawler cranes

For existing crawler assembly key button:

- Make sure that the crawler assembly key button is turned off.

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5 Dangerous conditions without shut off

5.1 Block position of relapse cylinders when setting down the load

NOTICE
Damage to boom or relapse cylinder!
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, which causes the boom system to move to the rear.
There is no shut-off of the hoist gear down function.
- ▶ Actuate the opposite direction of movement which caused the block position and eliminate the block position.

6 Transporting components

WARNING
Danger of accident!
- ▶ If any components are transported on an auxiliary vehicle, then they must be properly secured. If necessary, transport these components on supports or using a special transport device.

6.1 Transporting lattice sections

WARNING
Danger of accident!
- ▶ If the lattice sections are pushed into each other for transport, the lattice sections must be safely rigged on the transport vehicle and secured on at least two independent points.

7 Pneumatic springs for assembly support of components

Pneumatic springs are installed on various crane components to simplify the installation of these components.

WARNING
Danger of crushing!
Defective pneumatic springs no longer provide the supporting properties on the movable components.
Due to falling components, personnel can be killed or severely injured.
High risk of accident.
- ▶ 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.

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8 Manual rope winches for assembly support of components

Manual rope winches are installed on various components to simplify the installation or removal of these components.

WARNING
Danger of crushing!
Defective manual rope winches no longer provide the supporting action on the movable components.
Due to falling components, personnel can be killed or severely injured.
High risk of accident.
- ▶ 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 moveable 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 intermediate pieces) 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.

10 Guy rods

WARNING
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.
Personnel can be severely injured or killed.
- ▶ 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.

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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.
Unused guy rods can loosen up and fall down.
Personnel can be severely injured or killed.
The load chart is invalid.
The load display of the LICCON computer system shows an incorrect value.
The weight of the boom is too large for erection.
▶ Disassemble and remove the guy rods which are not needed on the transport retainers before erecting the boom.

Note
▶ Inspection and maintenance of guy rods, see Crane operating instructions, chapter 8.15.
▶ In reference to the guy rods, observe section „Erection / take down“.

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

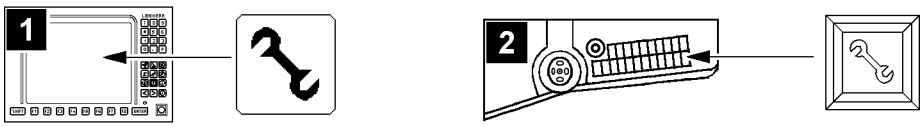

Fig.113438

– 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 capacity of the crane above the rated value in the load chart or to extend the designated working range of the crane – does not constitute a **sensibly foreseeable erroneous operation**, rather **a deliberate improper use with high risk of accident**.
The possible risks and consequences of such deliberate 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 by: 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 overload protection is bypassed, there is no further protection against overloading the crane.
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.

- ▶ 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.
- ▶ It is strictly prohibited to operate the crane 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 console.
- Key button on the LICCON monitor.
- Key button in the instrument panel.
- Key button in the switch cabinet.
- Sensor for transponder on the crane cab.

- ▶ 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 contacts the hoist limit switch weight during its upward movement, the hoist limit switch is triggered. The crane movements „Spool up winches“, „Luff boom down“ and „Telescope telescopic boom out“ are turned off. The shut off can be bypassed.

WARNING
Danger of accidents due to bypass of Hoist top shut off!
When bypassing the hoist top shut off, there is a risk 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 care and minimum speed.

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14 Assembly / disassembly

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.
- ▶ The winch use is regulated in the master switch assignment in the Electric wiring diagram. The winches may only be operated according to this master switch assignment specified in the Electric wiring diagram.
- ▶ 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.

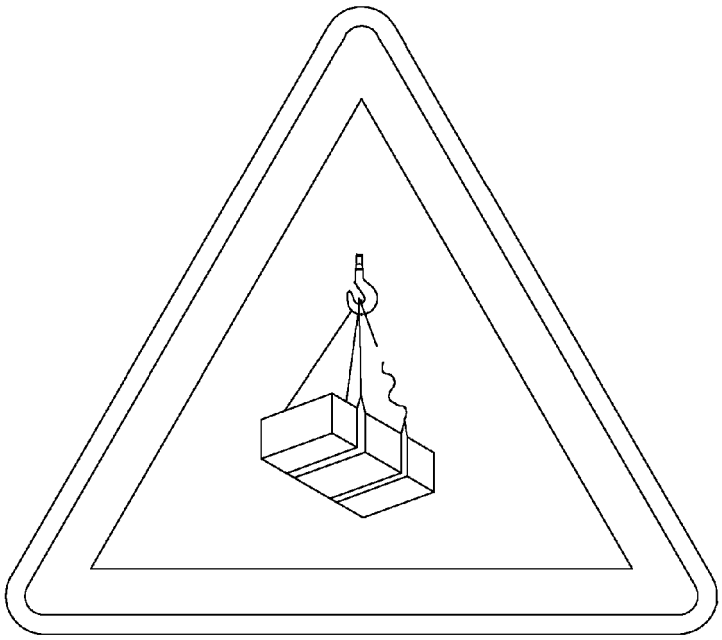

Fig.121169

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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.
- ▶ 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 load before the load has been secured.

Part of the category „Aids for working aloft“ are, for example:
- Lifting platforms
- Scaffolding
- Auxiliary cranes
- Ladders

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 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.
- ▶ 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 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, 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 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 until the corresponding component is pinned and secured.

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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 aloft, 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.

14.1 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.

14.2 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.

14.3 Pin connections

WARNING
Danger due to pin connections!
If pins / pin connections are not properly greased or lubricated before installation, then they can corrode.
The pins can be stuck in the pin bores and / or 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.
▶ Make sure that all pins are secured with the intended retaining elements to prevent them from loosening up by themselves.
▶ Never pin or unpin pins by force.

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14.4 Assembly / disassembly of electrical lines

WARNING
The crane can topple over!
If mechanical crane components, which have electrical connections are not immediately electrically connected after installation, 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 of 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 Service at Liebherr-Werk Ehingen.

WARNING
Faulty function if dummy plugs are not installed!
If the dummy plugs on the non-required electrical connections are not installed, then faulty functions 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 faulty functions.
- ▶ 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 with dust caps.

- ▶ Establish the electrical connections to the installed crane components properly.
- ▶ As a rule, close off on-required electrical connections (for example for 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.

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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.

14.5 Assembling / disassembly 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 after fastened after assembly with the hand nut.

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 and disconnecting: Turn the engine off and wait for short time.
- ▶ 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.

14.6 Bypass at assembly / disassembly Crawler

Note

- ▶ Applies only for cranes with crawler assembly key button.

WARNING
High risk of injury 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 deliberate 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.
- ▶ Operating the crane with the crawler assembly key button enabled is strictly prohibited.

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14.6.1 Activating the bypass at crawler assembly and crawler disassembly

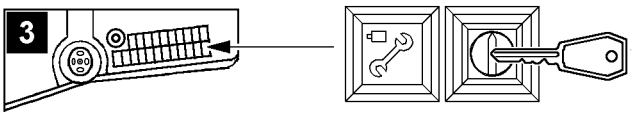

Fig.113441

– 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.

14.6.2 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 indicator light *Crawler assembly* lights up.

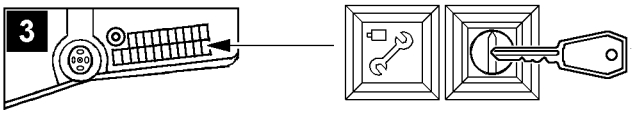

Fig.113441

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.

14.7 Bypass 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.

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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 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.

- ▶ 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).

14.7.1 Activating the bypass at assembly and disassembly

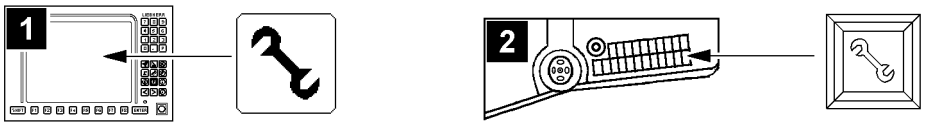

Fig.113438

– 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.
– 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.

14.7.2 Bypass at assembly and disassembly

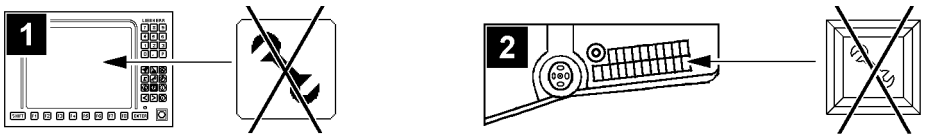

Fig.113437

▶ 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.

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– The acoustic and / or optical warning signals which were triggered by the bypass are turned off again.

14.8 Assembly / disassembly of 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.

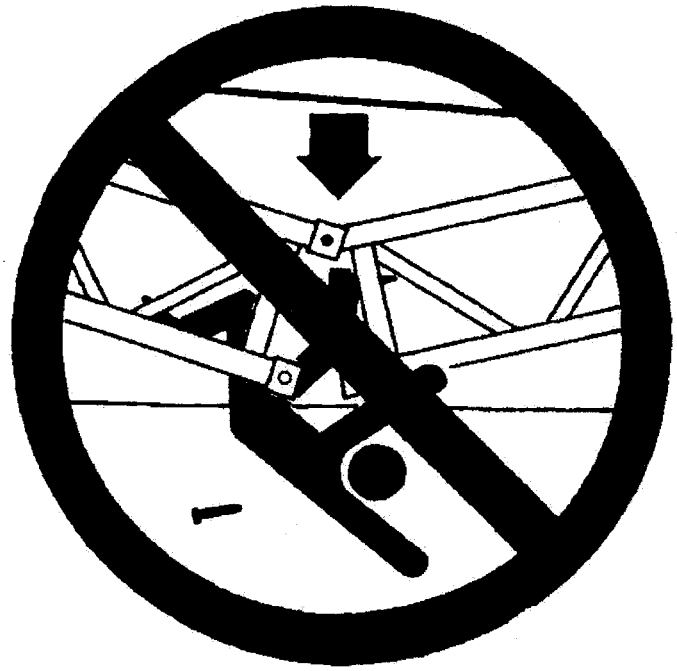

Fig.113444

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 connecting 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 storage locations and in the receptacles.
- ▶ The railing at assembly and disassembly of booms must be horizontal.
- ▶ Do not lean the ladder against the component being disassembled.

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WARNING
Danger of accident due to distorted pins!
Angular pulling or excessive / 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 crane must be adapted to the „weight“ of the parts being lifted.
- ▶ Do **not** remove difficult to remove pins by force.
- ▶ Remedy the cause of the distortion.

WARNING
If the following specifications are not observed, accidents can result:
- ▶ Pin or unpin both pins at the same horizontal level, i.e. **left and right**.
- ▶ Pin the lower collar pins **from the inside to the outside** and unpin from the **outside to inside**.
- ▶ Insert and unpin horizontally installable double cone pins from the **outside to inside**.
- ▶ Insert and unpin vertically installable double cone pins from **top to bottom**.

Make sure that the following prerequisites are met:
- – 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.
- – Select the height of the support so that the parts of the equipment are not in contact with the ground.
- – Place the parts of the equipment with rope pulleys down 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 carrying capacity available to be able to hold the load at a respective radius.

14.9 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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14.9.1 Closing the end section

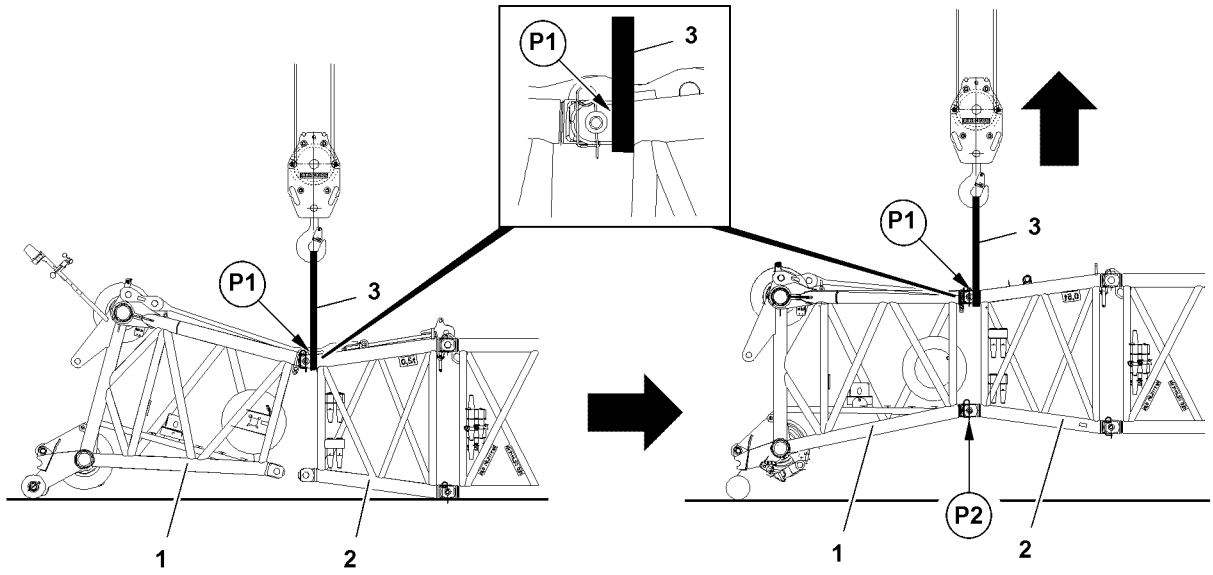

Fig.117840: Closing the end section

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**.

14.9.2 Placing the lattice jib into the pulley cart

Note
- ▶ The following illustrations are examples and may not match your crane exactly.

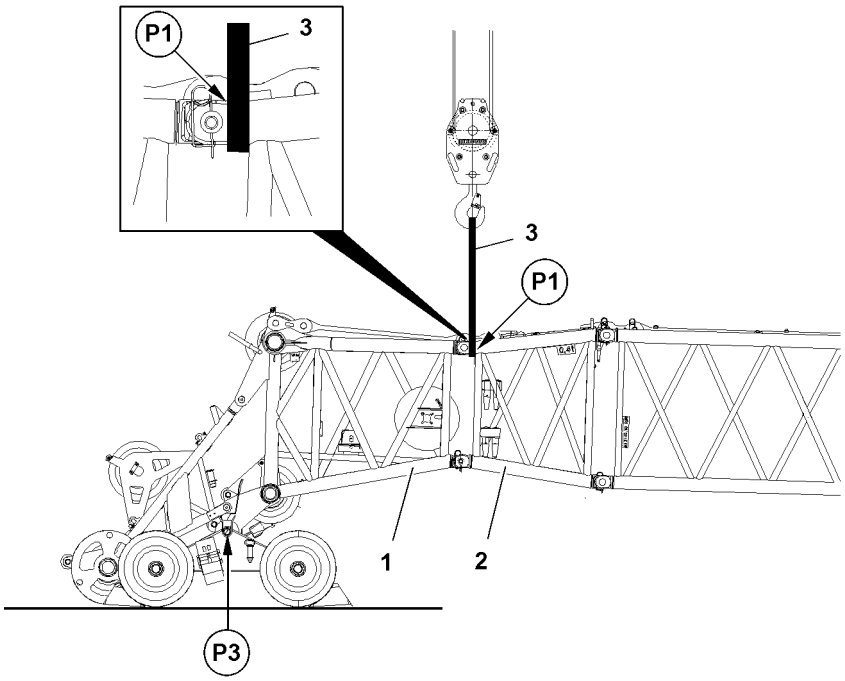

Fig.117842: Place the lattice jib into the pulley cart (telescopic crane with lattice jib)

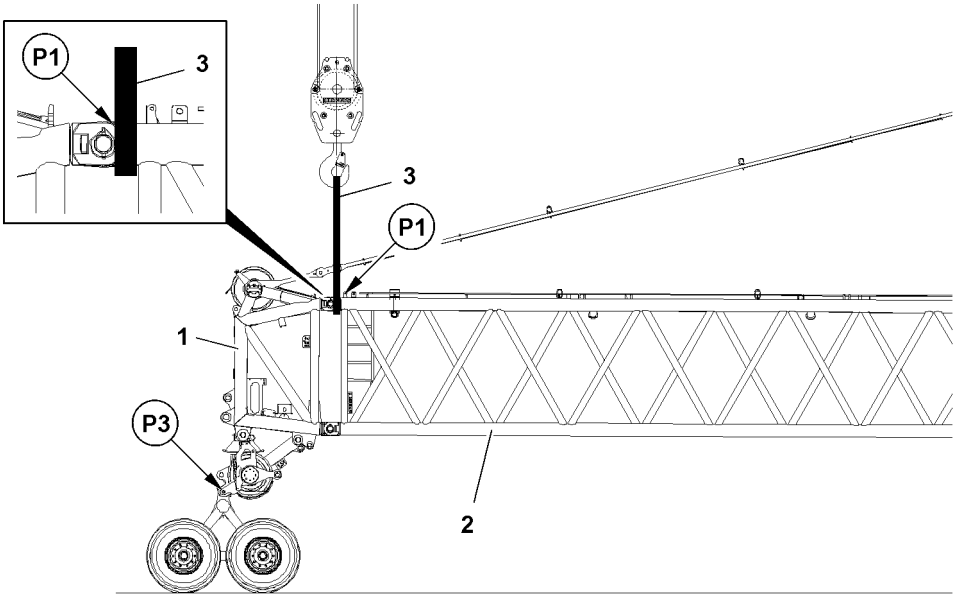

Fig.121550: Place the lattice jib into the pulley cart (lattice mast crane)

When placing it into the pulley cart, observe the following:
- The end section **1** is completely installed.
- 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 place it in the pulley cart **4**.
- ▶ Pin the end section **1** with the pulley 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.

14.9.3 Opening the end section

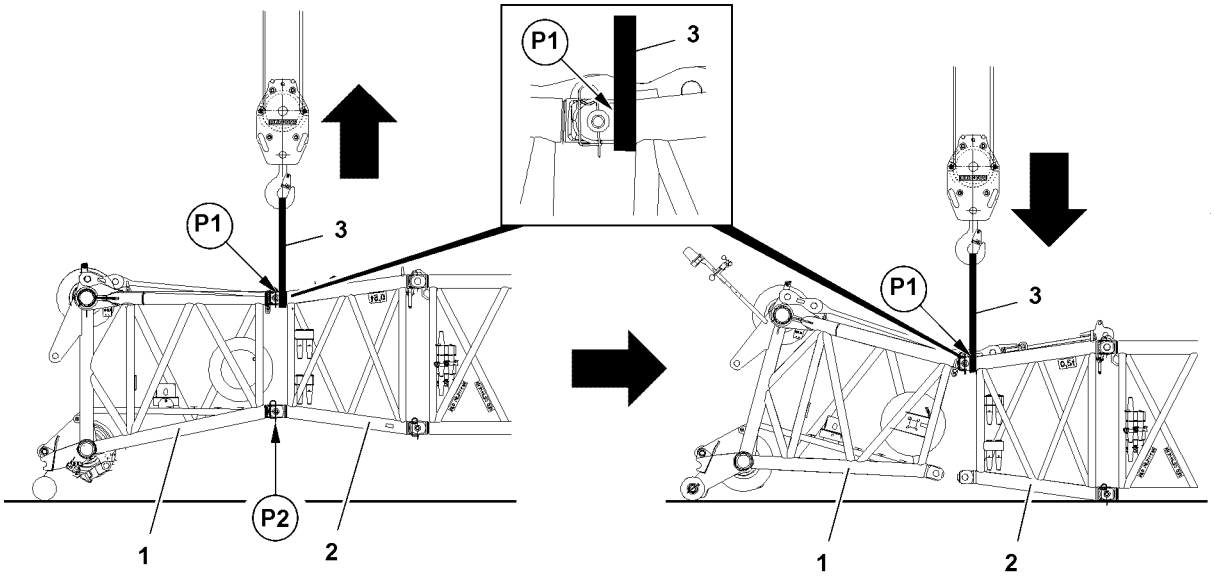

Fig.117841: Opening the end section

For opening the end section, observe the following:
- The pulley 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.
▶ Place the lattice jib on the ground.
▶ Remove the textile type fastening equipment **3**.

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14.9.4 Holding the luffing lattice jib

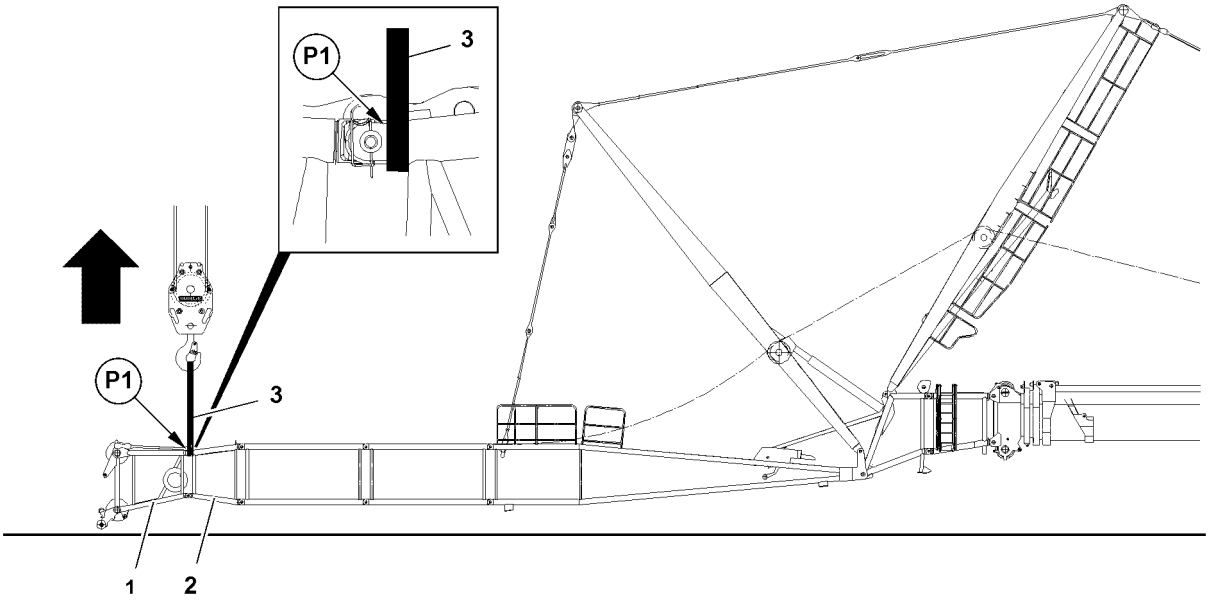

Fig.117843: Holding the luffing lattice jib

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.

14.9.5 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 the Crane operating instructions, chapter 5.01.10.

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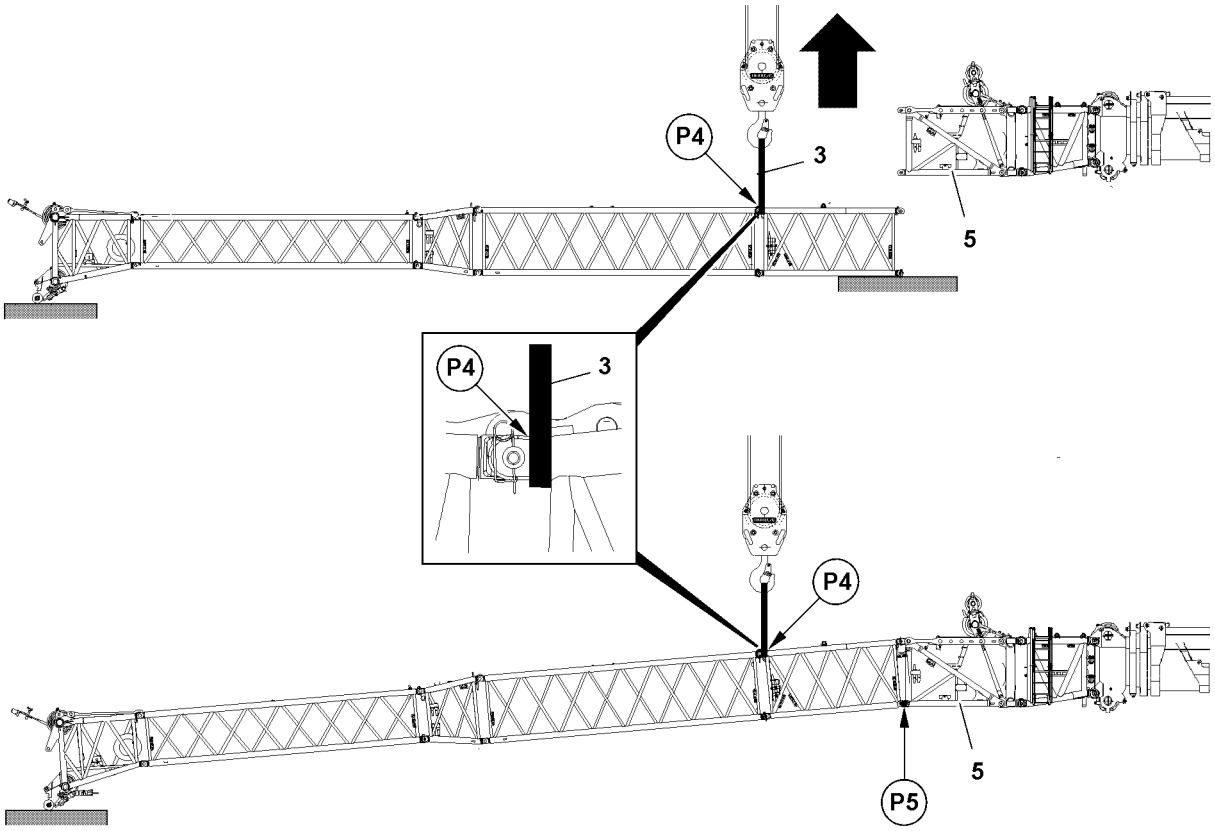

Fig.117844: Assembling the lattice jib on the TF-adapter

For installation on the TF-adapter, observe the following:
- The lattice jib has been assembled.
- The TF-adapter **5** is installed.
- 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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14.9.6 Closing the fixed lattice jib

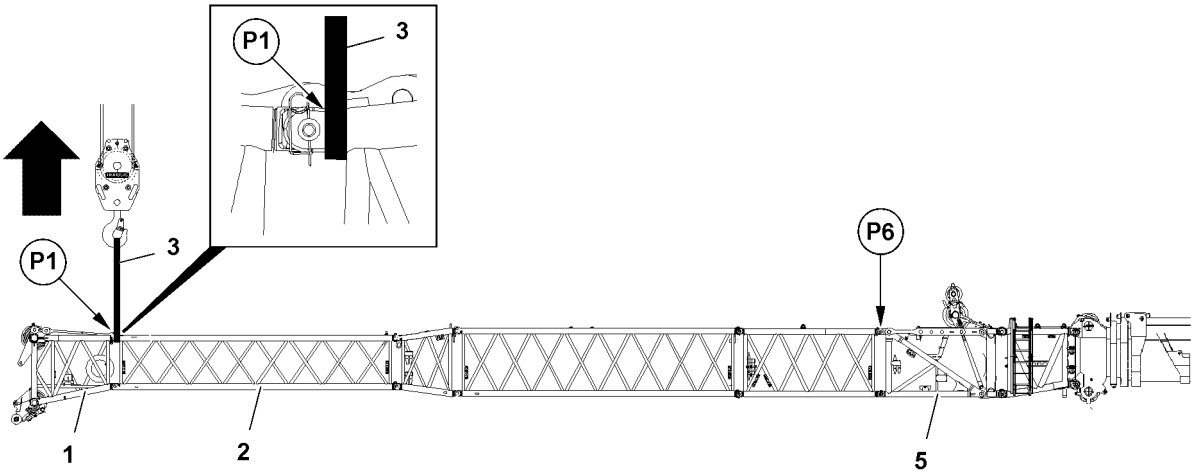

Fig.117850: Closing the lattice jib

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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14.9.7 Angle adjustment on the fixed lattice jib

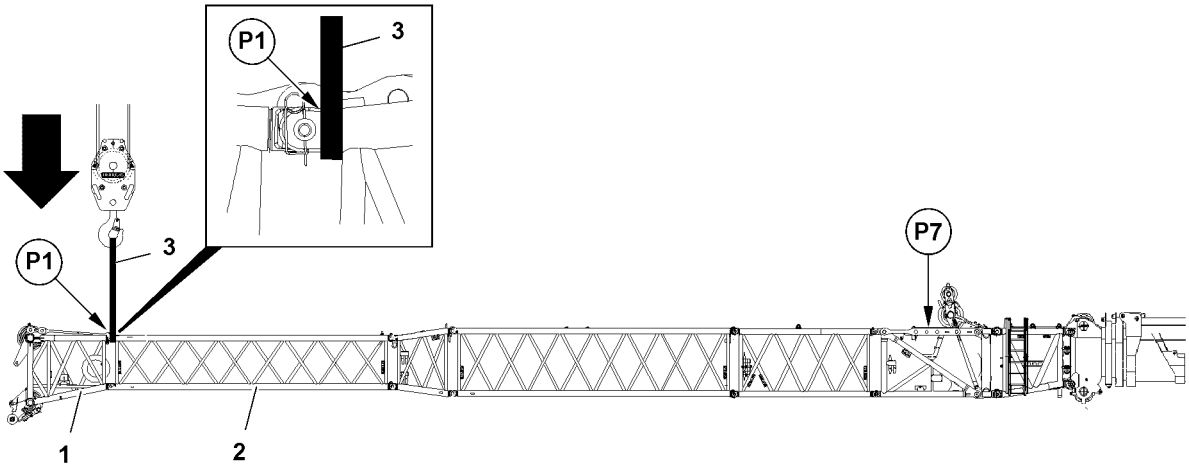

Fig.117851: Angle adjustment on the fixed lattice jib

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 Crane operating instructions, chapter 5.03.
- ▶ Set and pin a New angle on the angle adjustment **P7**, see Crane operating instructions, chapter 5.03.
- ▶ Lower the lattice jib.

After lowering:
- ▶ Remove the textile type fastening equipment **3**.

14.9.8 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 in the Crane operating instructions, chapter 5.03.

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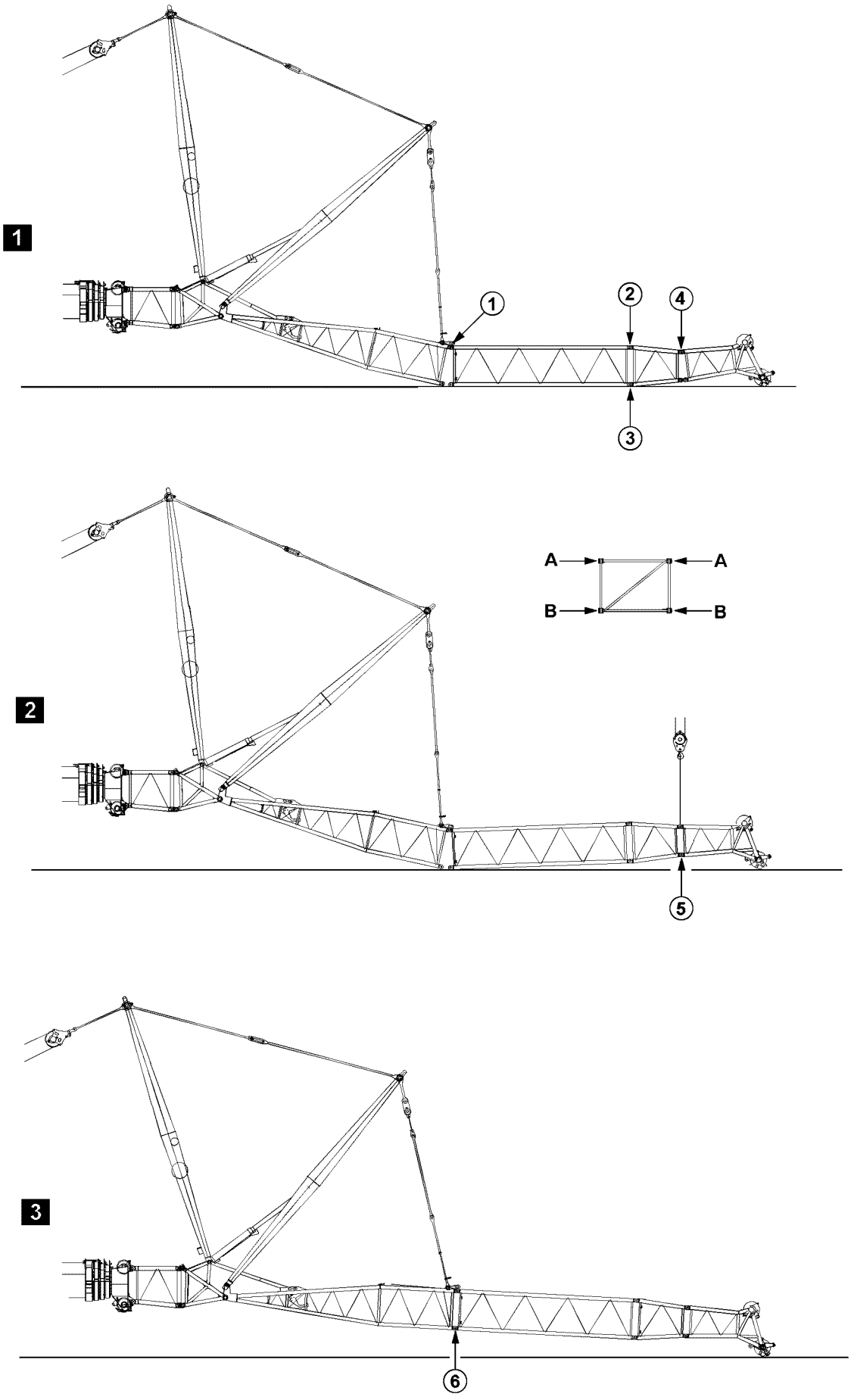

Fig.197718: Example for cranes with telescopic boom

14.10 Assembly / disassembly of lattice sections on telescopic cranes with guyed auxiliary boom with an auxiliary crane

14.10.1 Assembly of lattice sections for guyed 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 **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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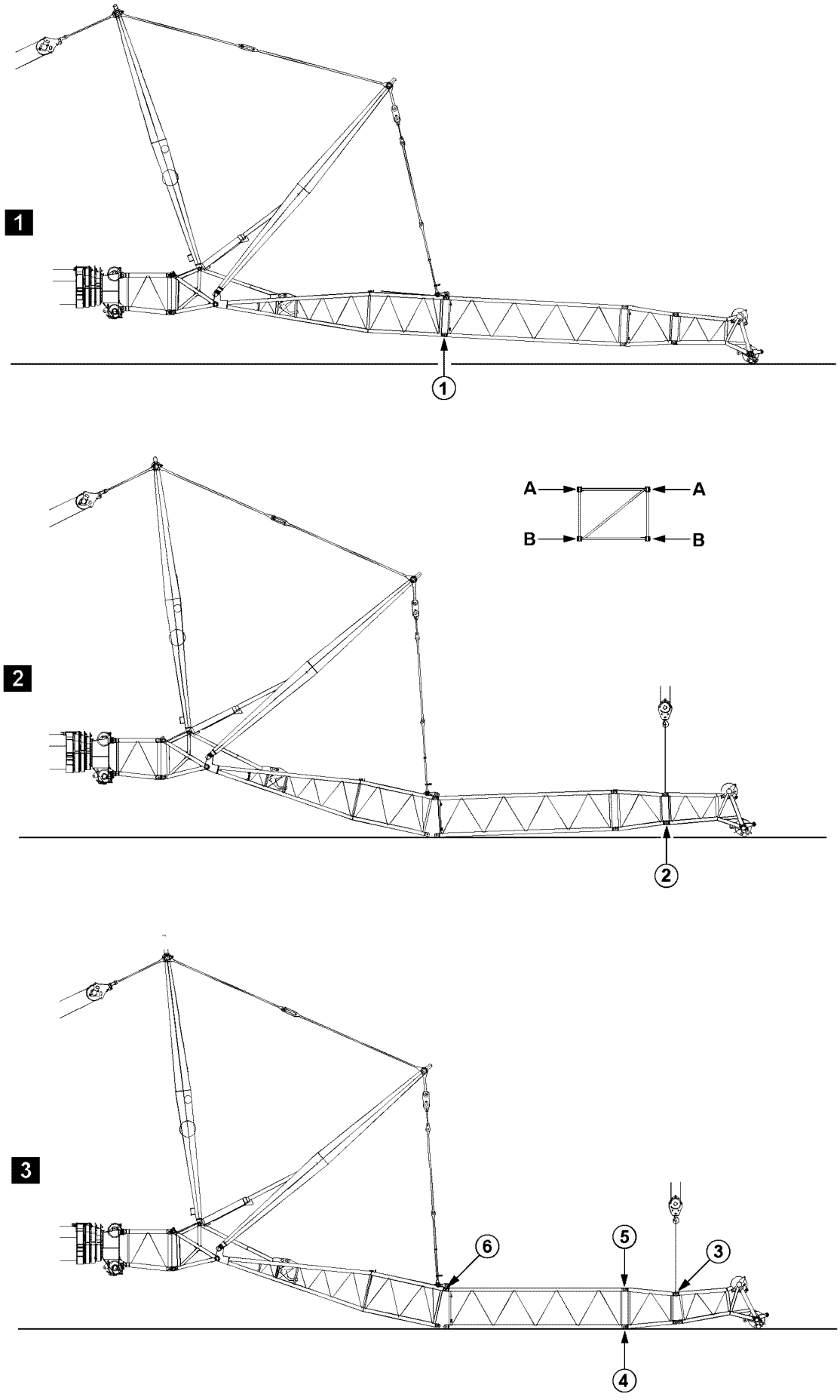

Fig.197719: Example for cranes with telescopic boom

14.10.2 Disassembly of lattice sections for guyed 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 order specified.

- ▶ Luff the auxiliary boom down until the end section touches the ground slightly, illustration **1**.
- ▶ Release and unpin the pins at both sides (level **B**) at point **1**, illustration **1**.
- ▶ Completely remove the lattice sections, illustration **2**.
- ▶ Lift the end section with the auxiliary crane, illustration **2**.
- ▶ Release and unpin the pins at both sides (level **B**) at point **2**, illustration **2**.
- ▶ Release and unpin the pins at both sides (level **A**) at point **3**, illustration **3**.
- ▶ Release and unpin the pins at both sides (level **B**) at point **4**, illustration **3**.
- ▶ Release and unpin the pins at both sides (level **A**) at point **5**, illustration **3**.
- ▶ Release and unpin the pins at both sides (level **A**) at point **6**, illustration **3**.

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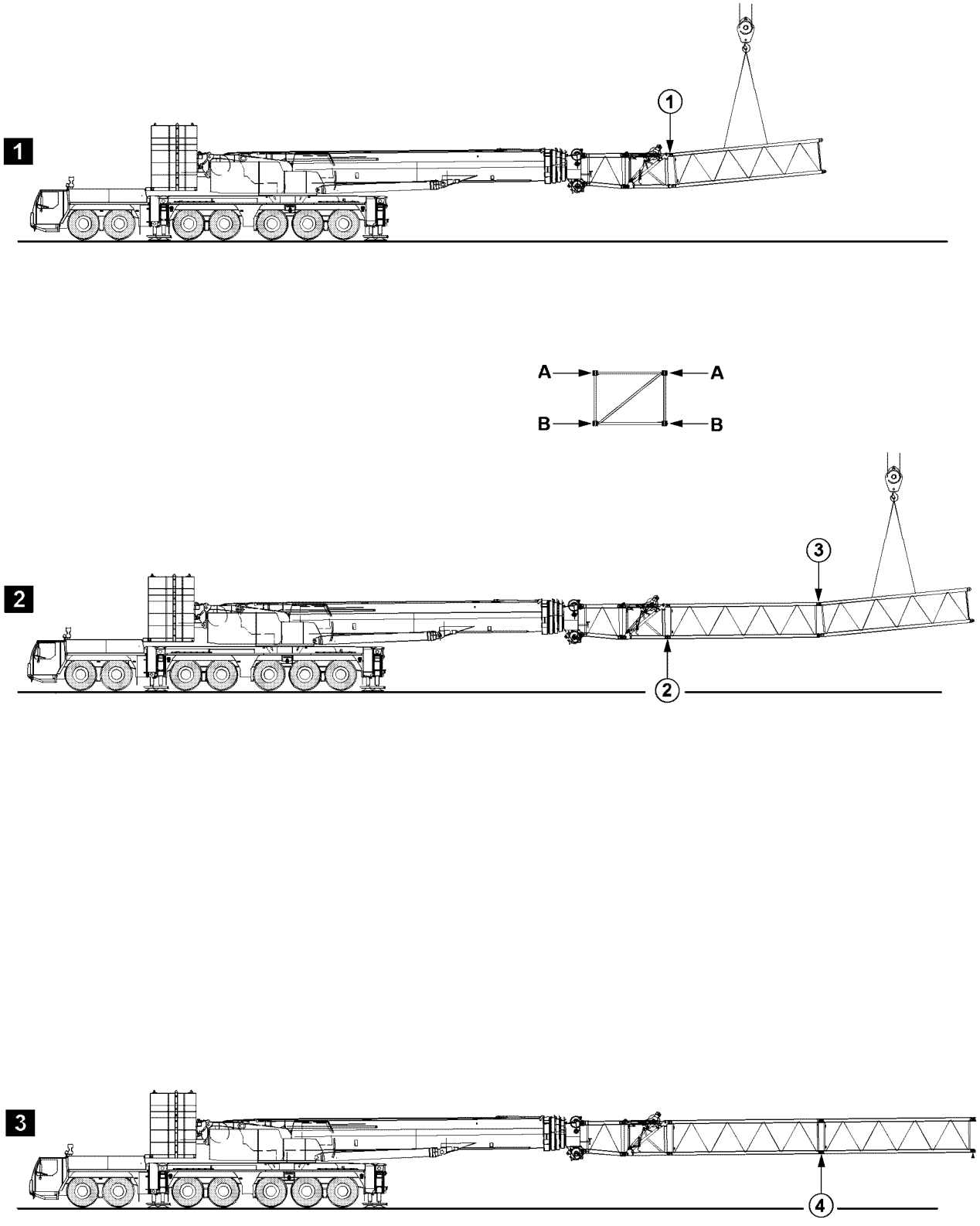

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Fig.197705: Example for cranes with telescopic boom

14.11 Assembly / disassembly of lattice sections on telescopic cranes with self-supporting auxiliary boom with an auxiliary crane

14.11.1 Assembly of lattice sections on self-supporting 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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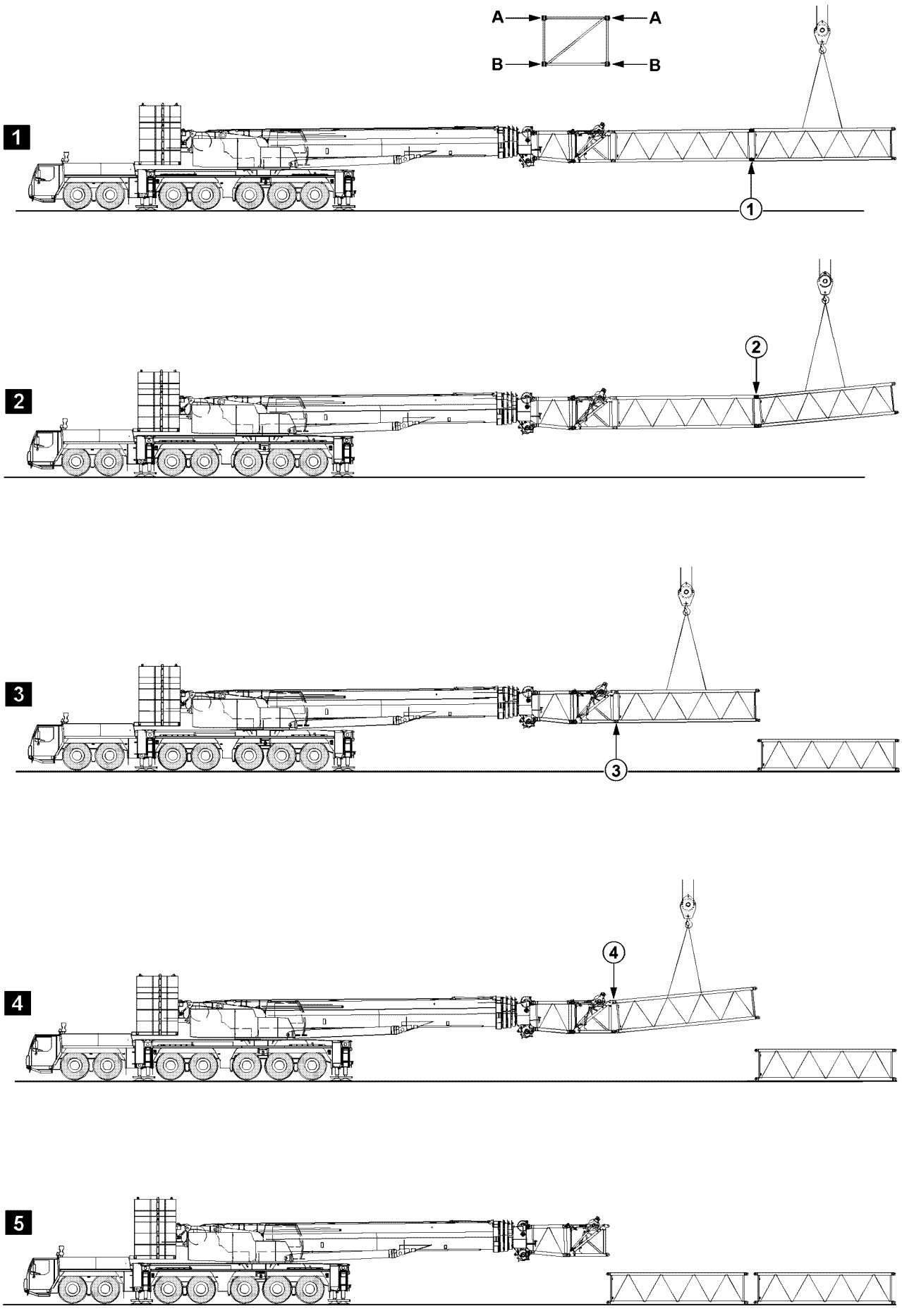

Fig.105510: Example for cranes with telescopic boom

14.11.2 Disassembly of lattice sections on self-supporting 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 order specified.

▶ Release and unpin the pins at both sides (level **B**) at point **1**, illustration **1**.
▶ Release and unpin the pins at both sides (level **A**) at point **2**, illustration **2**.
▶ Release and unpin the pins at both sides (level **B**) at point **3**, illustration **3**.
▶ Release and unpin the pins at both sides (level **A**) at point **4**, illustration **4**.

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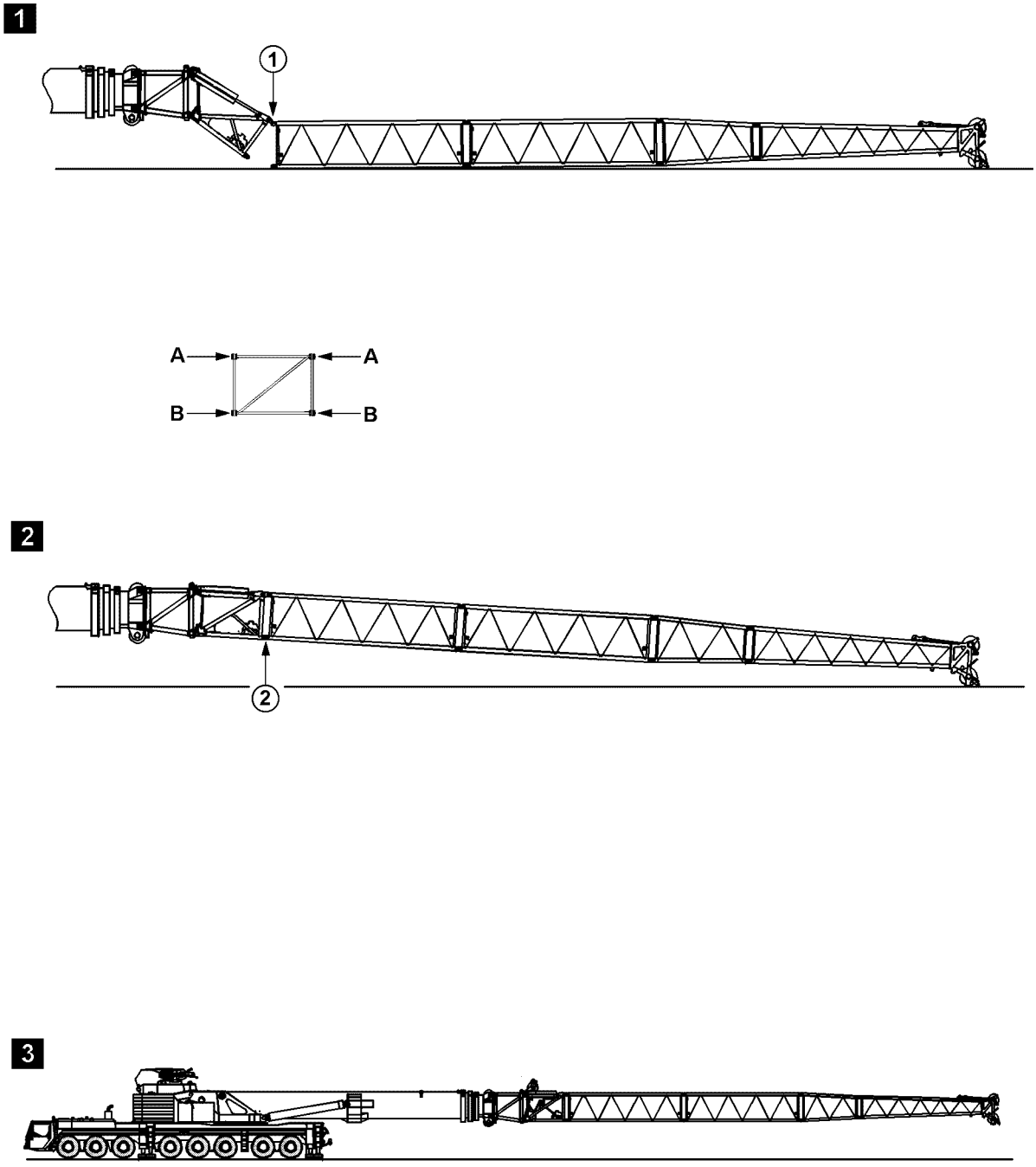

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Fig.197712: Example for cranes with telescopic boom

14.12 Assembly / disassembly of lattice sections on telescopic cranes with self-supporting auxiliary boom, without an auxiliary crane

14.12.1 Assembly of lattice sections on self-supporting auxiliary booms, without 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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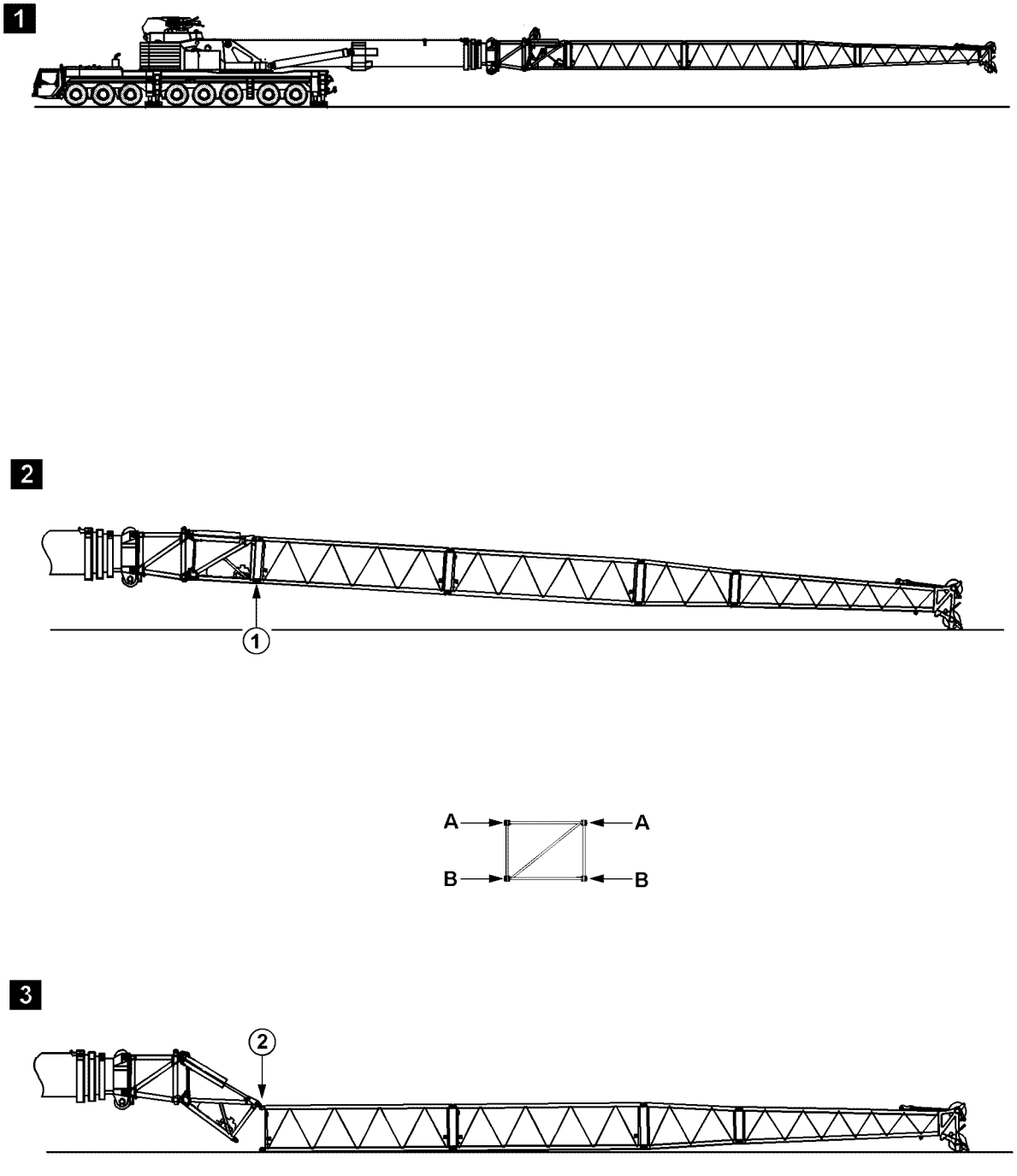

Fig.197713: Example for cranes with telescopic boom

14.12.2 Disassembly of lattice sections on self-supporting auxiliary booms, without 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 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.

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 at 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 at both sides (level **A**) at point **2**, illustration **3**.
▶ Completely remove the auxiliary boom.

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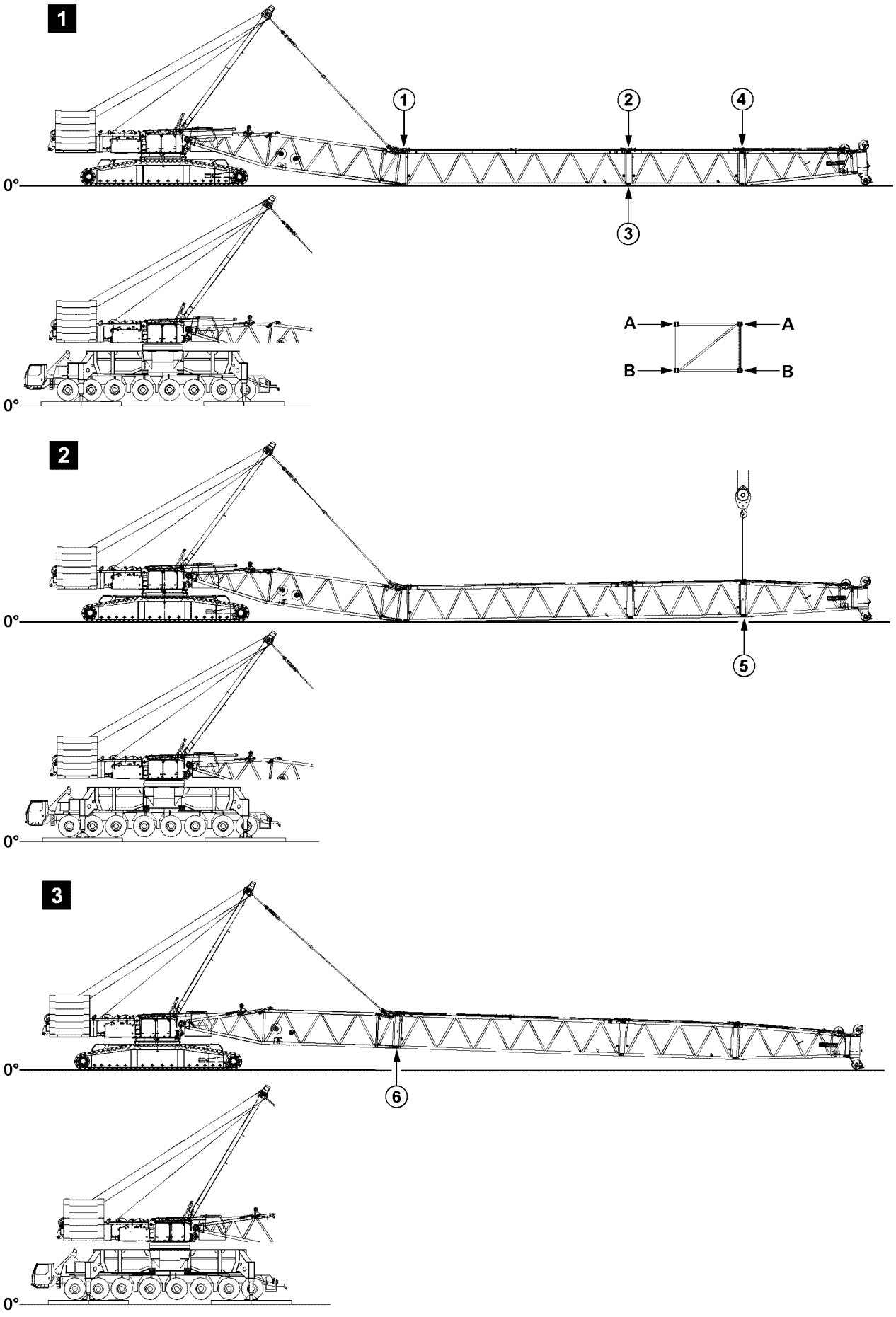

Fig.121633: Example for cranes with lattice mast booms

14.13 Assembly / disassembly of lattice sections for lattice mast cranes

14.13.1 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.
Personnel can be killed or seriously injured.
▶ 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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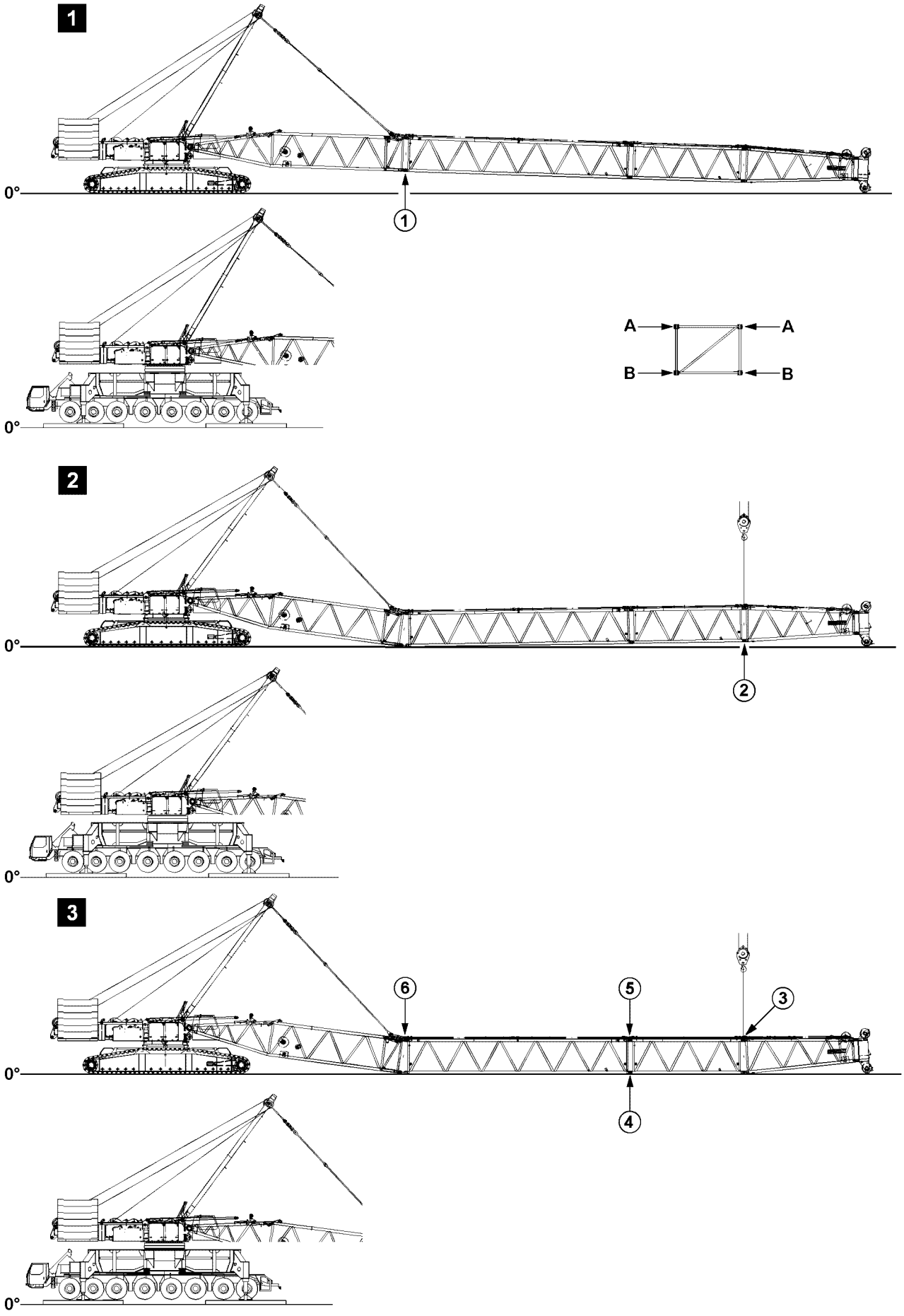

Fig.121634: Example for cranes with lattice mast booms

14.13.2 Disassembly of 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.
Personnel can be killed or seriously injured.
- ▶ Make sure that the SA-frame guying is tensioned before the pins are unpinned at point **1**, see illustration **1**.
- ▶ Pins must be unpinned in the order specified.

- ▶ 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 at both sides (level **B**) at point **1**, illustration **1**.
- ▶ Open the boom system with the SA-frame, illustration **2**.
- ▶ Completely remove the lattice sections, illustration **2**.
- ▶ Lift the end section with the auxiliary crane, illustration **2**.
- ▶ Release and unpin the pins at both sides (level **B**) at point **2**, illustration **2**.
- ▶ Release and unpin the pins at both sides (level **A**) at point **3**, illustration **3**.
- ▶ Release and unpin the pins at both sides (level **B**) at point **4**, illustration **3**.
- ▶ Release and unpin the pins at both sides (level **A**) at point **5**, illustration **3**.
- ▶ Release and unpin the pins at both sides (level **A**) at point **6**, illustration **3**.

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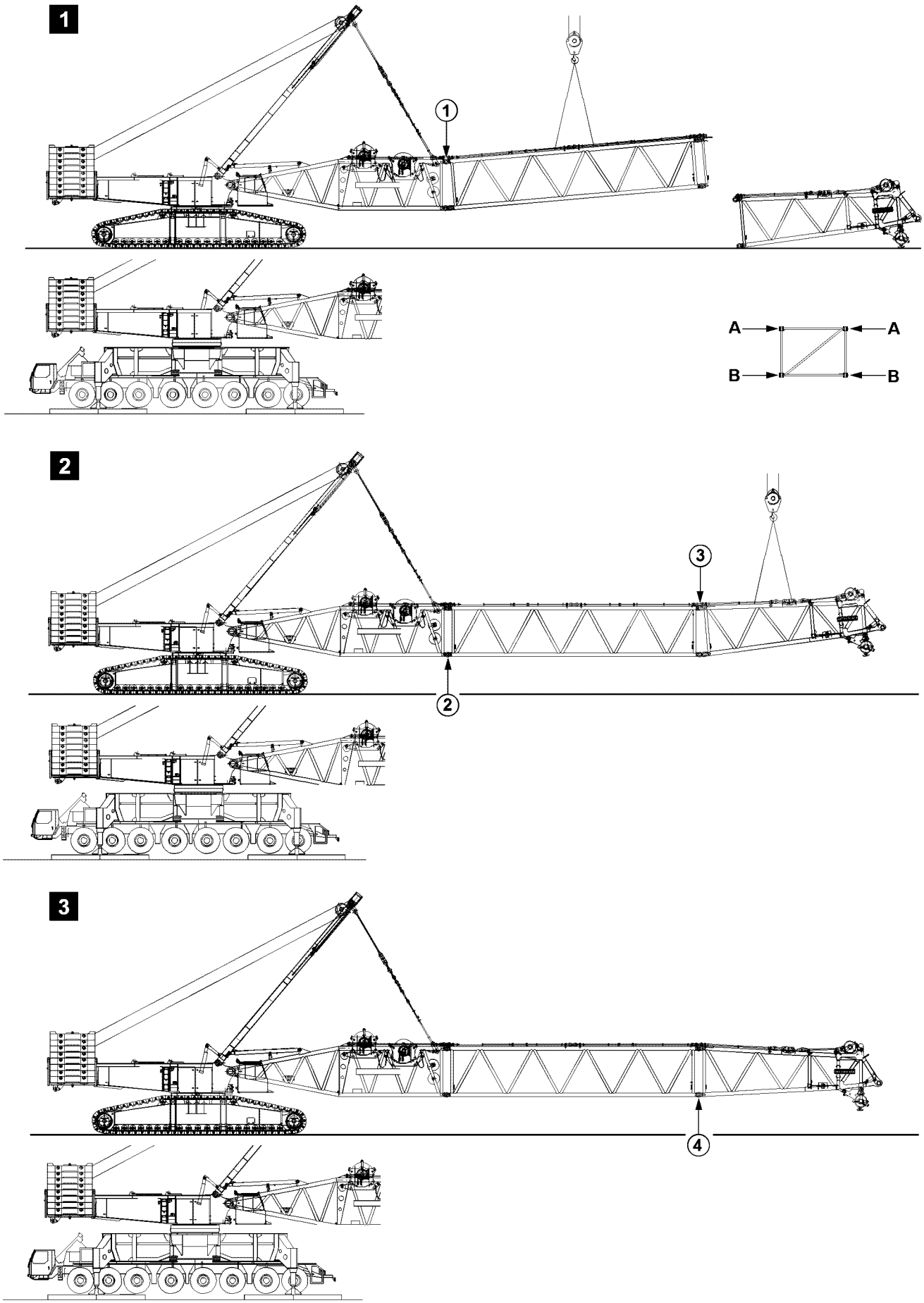

Fig.198182: Example for cranes with lattice mast booms

14.14 Flying assembly / disassembly of lattice sections

14.14.1 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.
Personnel can be killed or seriously injured.
▶ 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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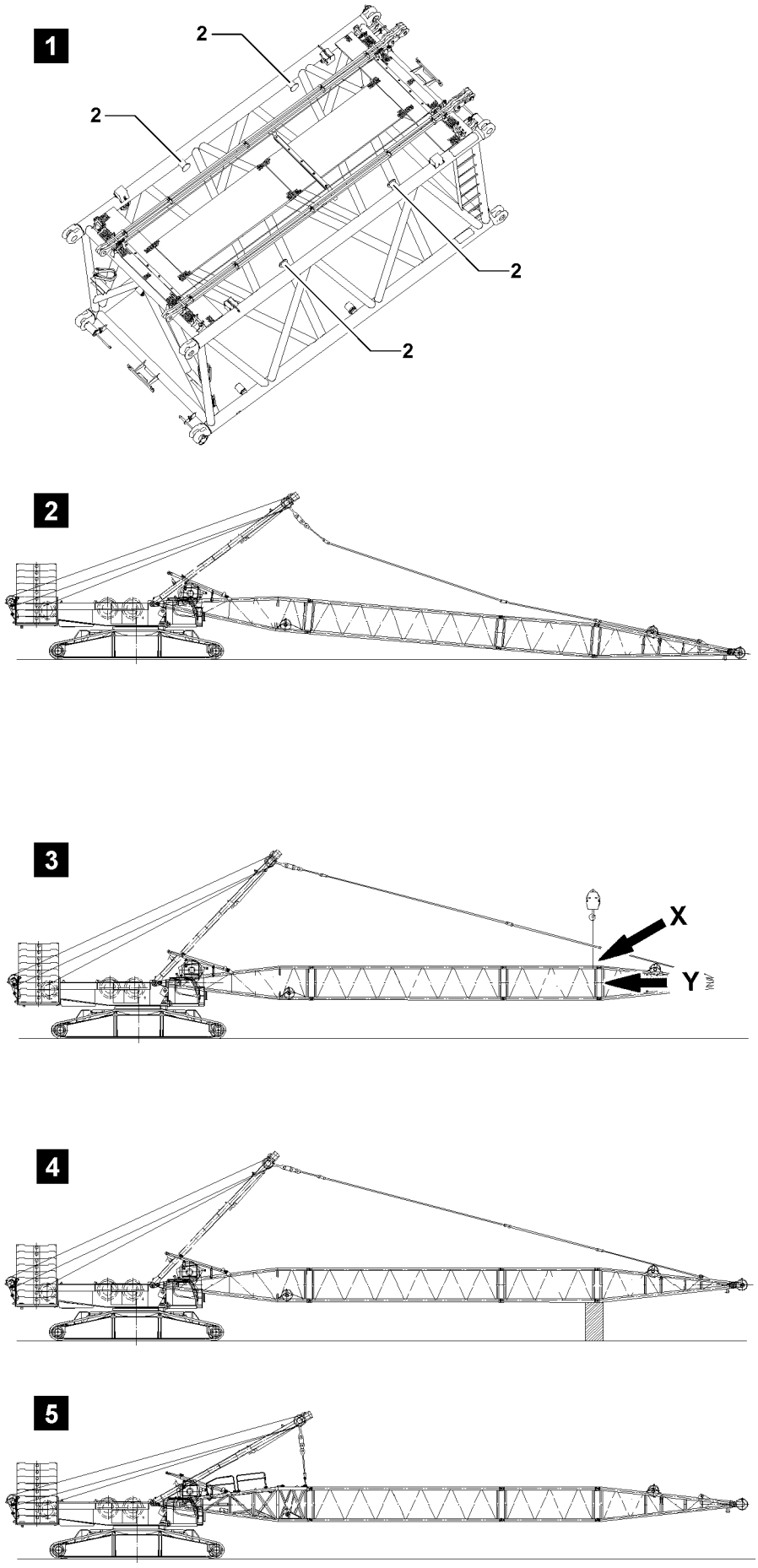

Fig.111448: Guying the pivot section with the SA-frame

14.14.2 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

▶ Place 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.
Personnel can be severely injured or killed.

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 **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 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.

▶ Place 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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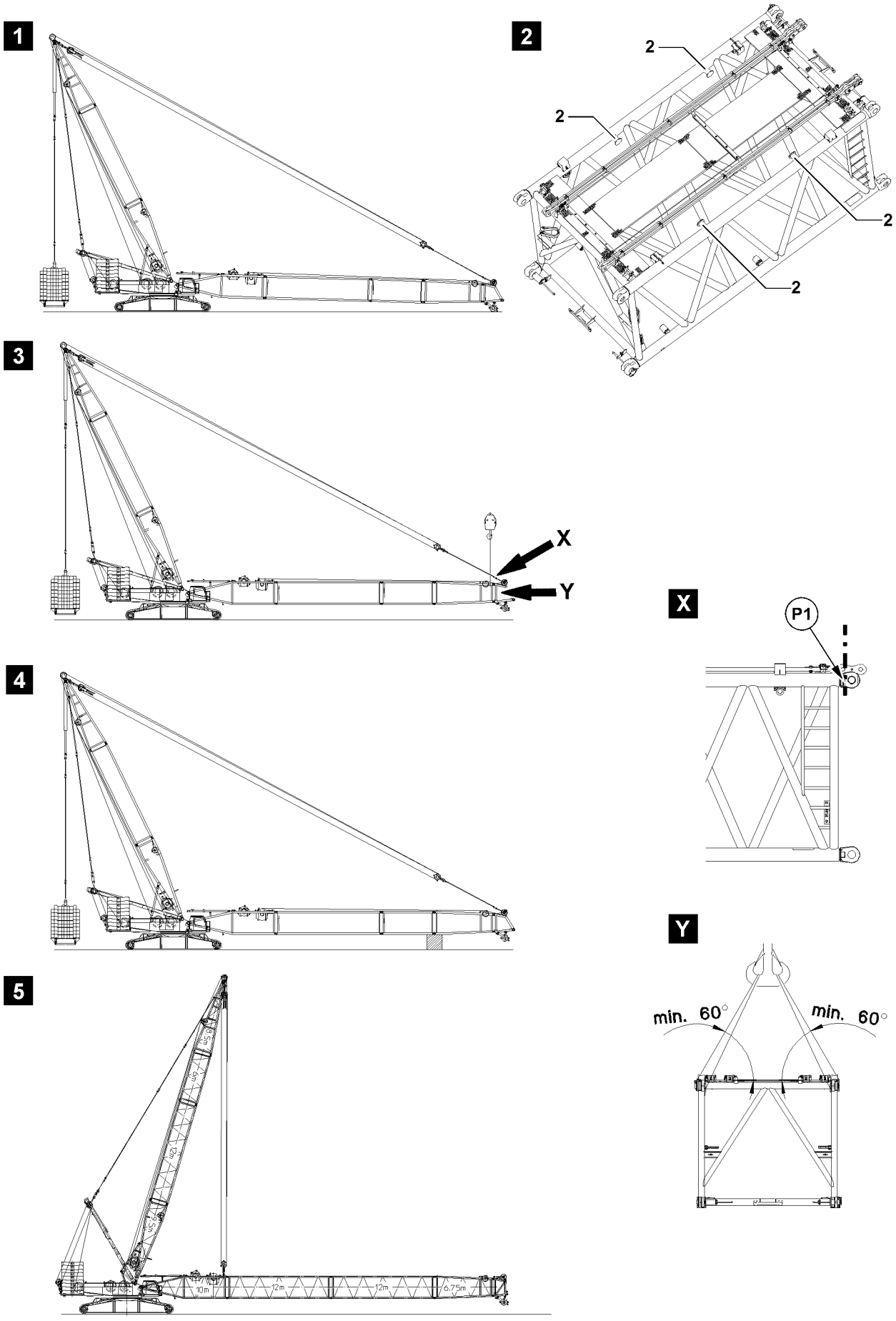

Fig.111449: Guying the pivot section with the derrick boom

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Guying the pivot section in flying mode with the derrick boom

▶ Place 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.
Personnel can be severely injured or killed.

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 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.

▶ Place down, secure and disassemble the guy rods.
▶ Pin and secure the 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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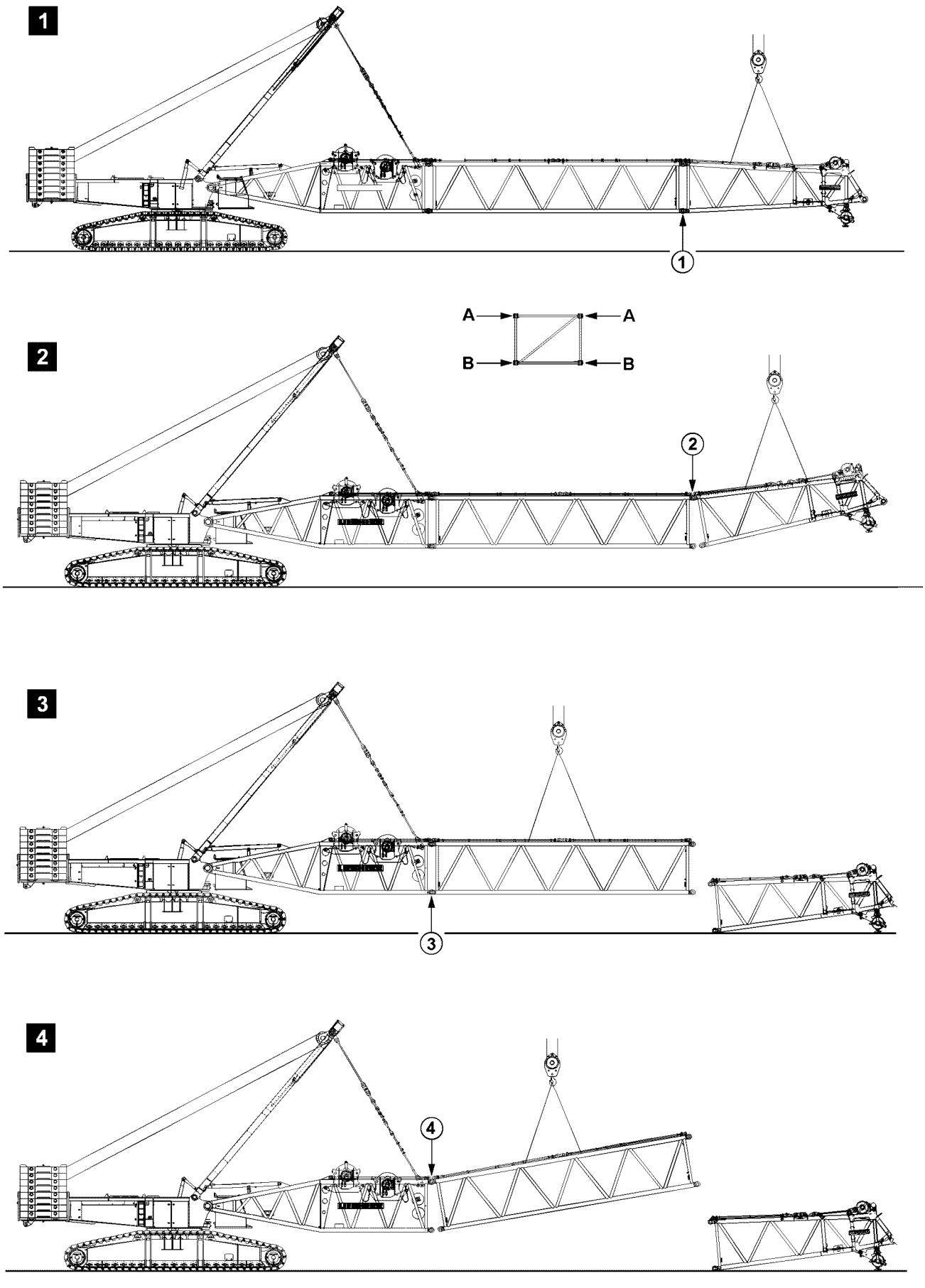

Fig.105511: Example for cranes with lattice mast booms

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.
Personnel can be killed or seriously injured.
▶ Pins must be unpinned in the order specified.

▶ Release and unpin the pins at both sides (level **B**) at point **1**, illustration **1**.
▶ Release and unpin the pins at both sides (level **A**) at point **2**, illustration **2**.
▶ Release and unpin the pins at both sides (level **B**) at point **3**, illustration **3**.
▶ Release and unpin the pins at both sides (level **A**) at point **4**, illustration **4**.

14.15 Assembly / disassembly 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
Mortal danger at assembly / disassembly of booms!
If the pins are not pinned / unpinned in the specified sequence, then lattice sections may suddenly fold down or fall down.
Personnel can be killed or seriously injured.
▶ 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 are no persons within the danger zone.

14.15.1 Assembly of boom systems on ascending terrain

Make sure that the following prerequisites are met:
– The lattice sections are properly assembled.
– An auxiliary crane with sufficient load carrying capacity if available.

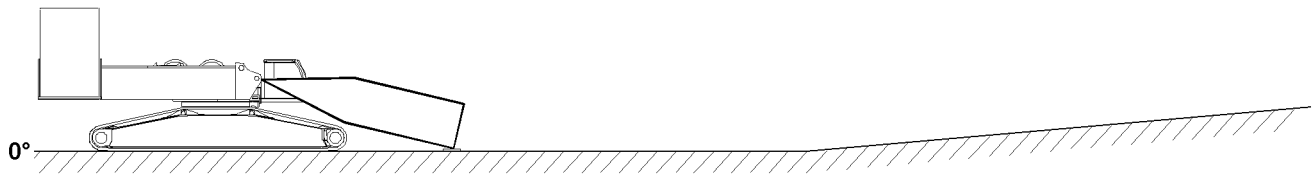

Fig.121635: Boom - pivot section installed on turntable and placed on the ground

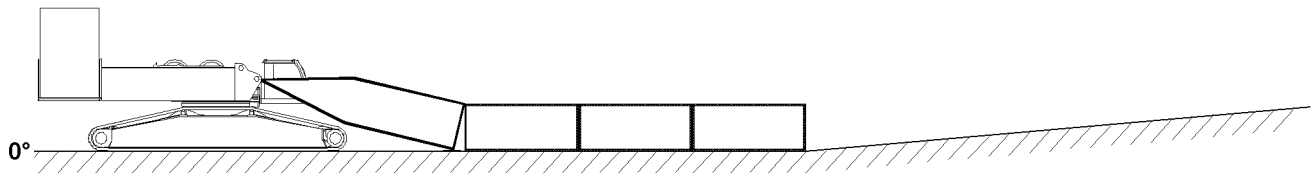

Fig.121636: Boom - intermediate sections installed on boom - pivot section and placed on the ground

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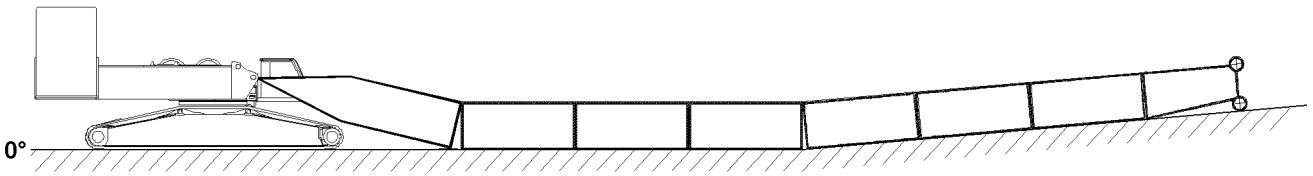

Fig.121637: Boom - intermediate sections installed and placed in ascending terrain

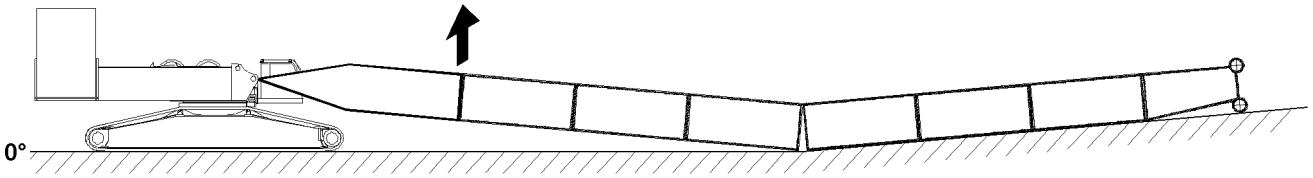

Fig.121638: Lift and close the boom system in the area of the boom - pivot section

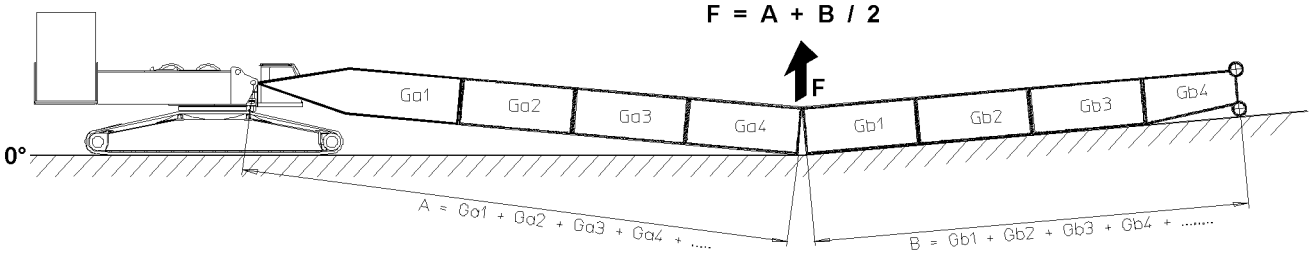

Fig.121645: Calculate the force for the closing procedure of the boom system

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.

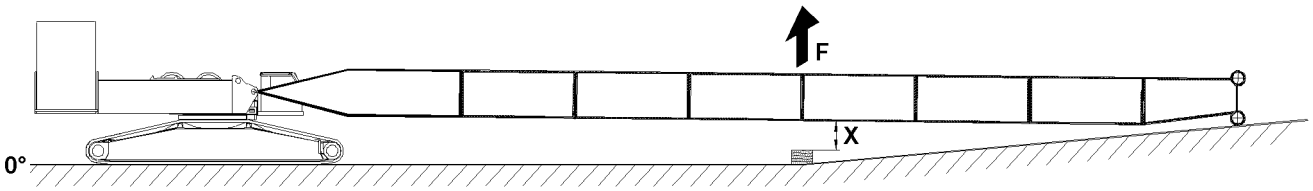

Fig.121639: Lift and close the boom system // Support the boom system

Note

- ▶ The height of the support or dimension **X** is noted on the respective boom assembly chapter, see Crane operating instructions, chapter 5.38 or chapter 5.39.

- ▶ Support the boom system properly after the closing procedure.

14.15.2 Disassembly of boom systems on ascending terrain

Make sure that the following prerequisites are met:

– An auxiliary crane with sufficient load carrying capacity if available.

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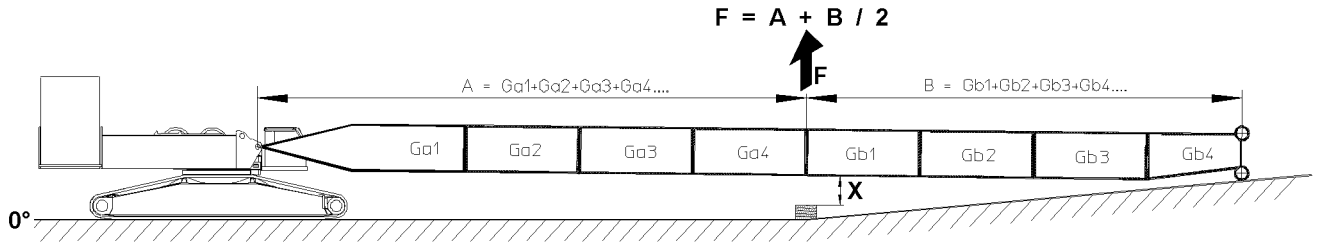

Fig.121651: Calculation of force for opening the boom system // Lift the boom system // Remove the support // Open the boom system

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.

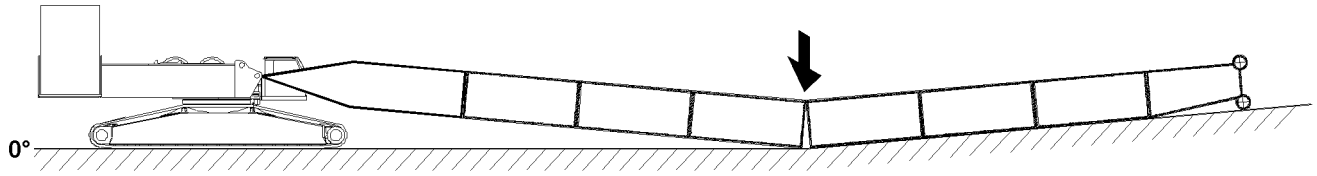

Fig.121657: Place the boom system down

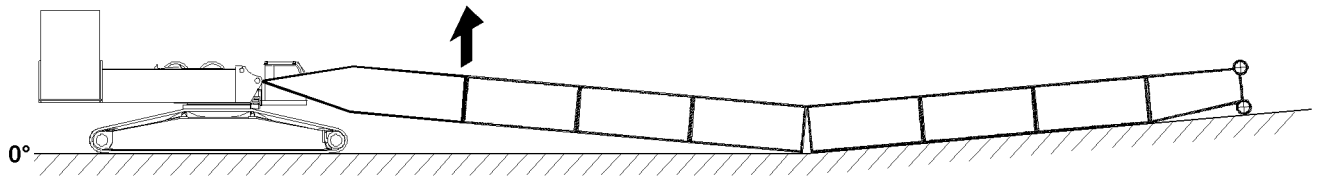

Fig.121652: Lift and open the boom system

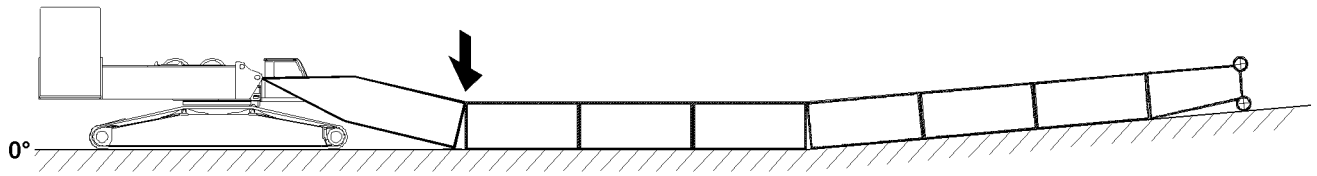

Fig.121653: Place the boom system down

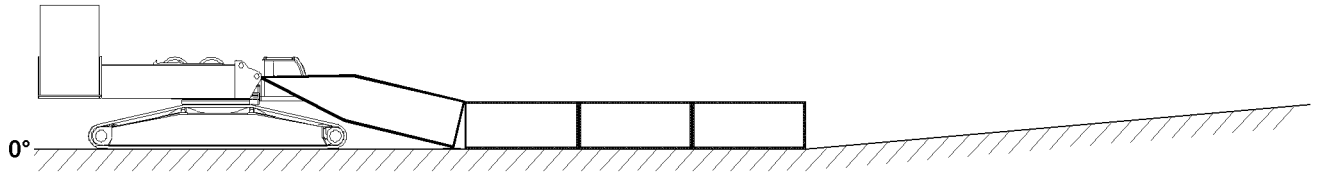

Fig.121636: Disassemble and remove the boom - intermediate sections with the end section

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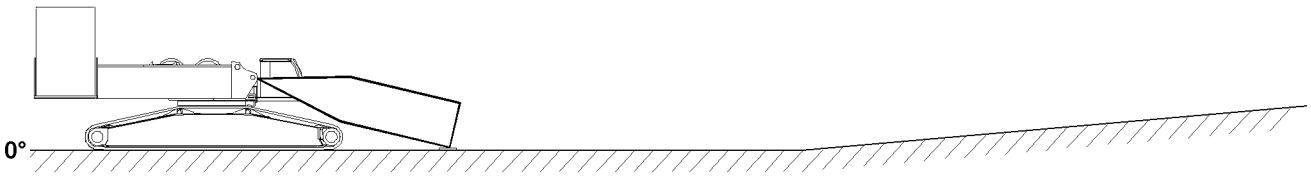

Fig.121635: Disassemble and remove the boom - intermediate sections to the boom - pivot section

▶ Disassemble and remove the boom - pivot section.

14.16 Assembly / disassembly 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

Mortal danger at assembly / disassembly of booms!
If the pins are not pinned / unpinned in the specified sequence, then lattice sections may suddenly fold down or fall down.
Personnel can be killed or seriously injured.

▶ 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 are no persons within the danger zone.

14.16.1 Assembly of 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 carrying capacity if available.

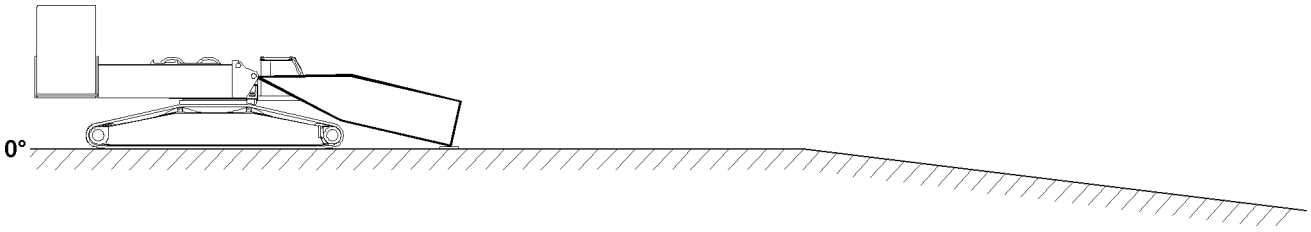

Fig.121640: Boom - pivot section installed on turntable and placed on the ground

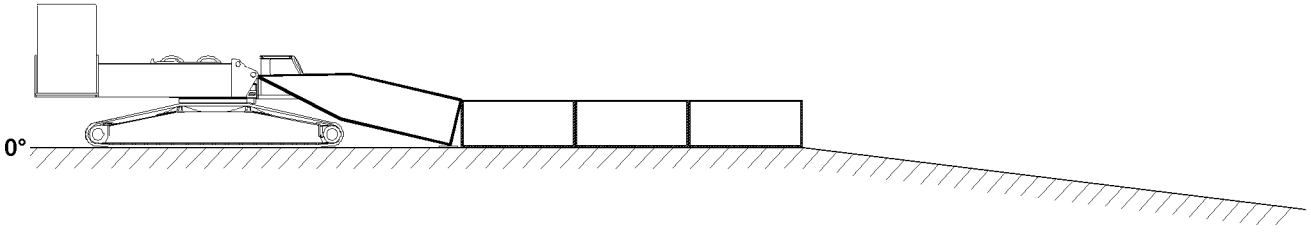

Fig.121641: Boom - intermediate sections installed on boom - pivot section and placed on the ground

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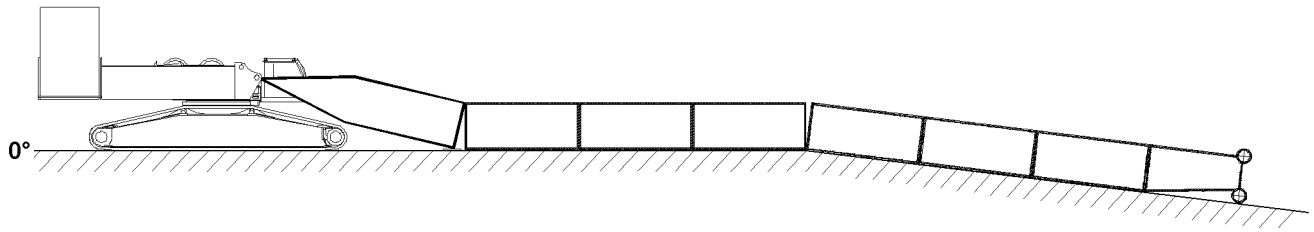

Fig.121642: Boom - intermediate sections installed and placed in descending terrain

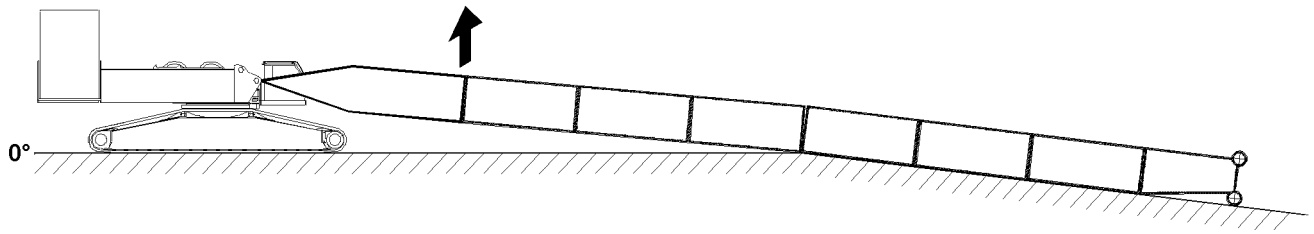

Fig.121643: Lift and close the boom system in the area of the boom - pivot section

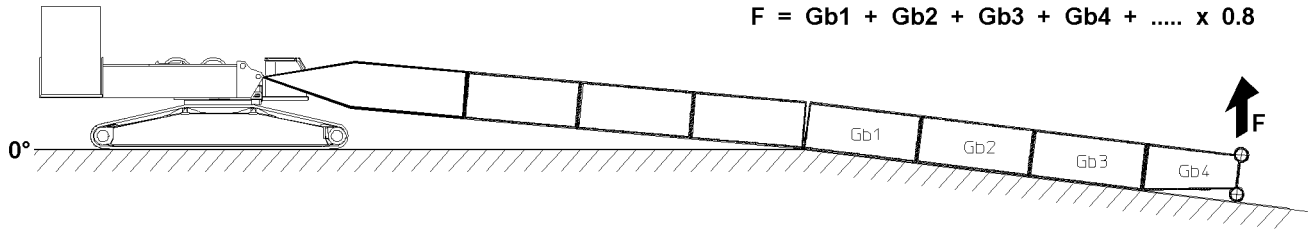

Fig.121646: Calculate the force for the closing procedure of the boom system

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.

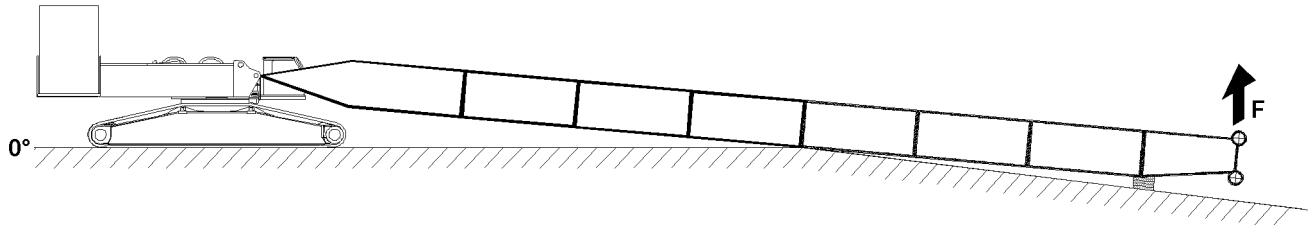

Fig.121644: Lift and close the boom system // Support the boom system

Note
- ▶ The height of the support depends on the lay of the terrain and the resulting incline of the boom system.

- ▶ Support the boom system properly after the closing procedure.

14.16.2 Disassembly of boom systems on descending terrain

Make sure that the following prerequisite is met:
- An auxiliary crane with sufficient load carrying capacity if available.

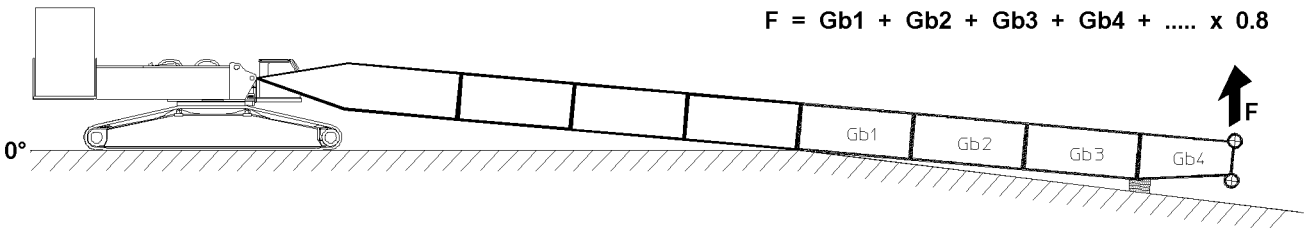

Fig.121654: Calculation of force for opening the boom system // Lift the boom system // Remove the support // Open the boom system

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.

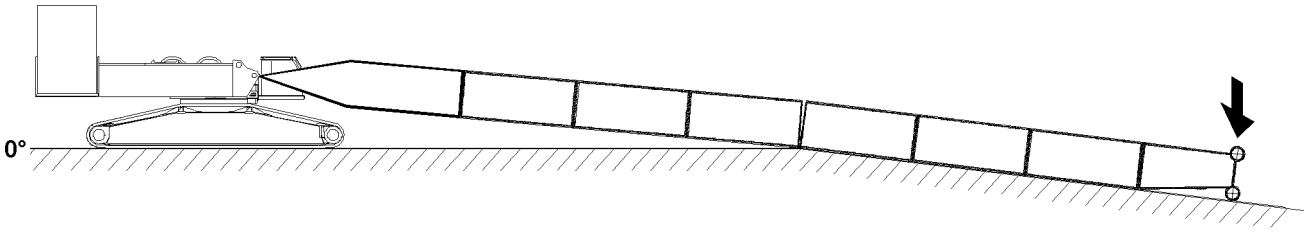

Fig.121658: Place the boom system down

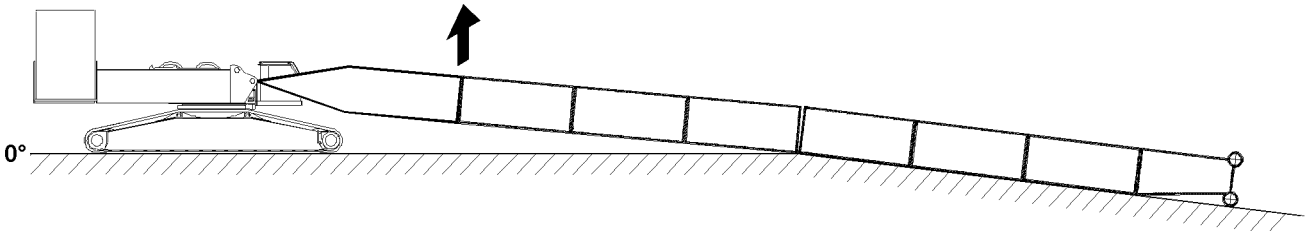

Fig.121655: Lift and open the boom system

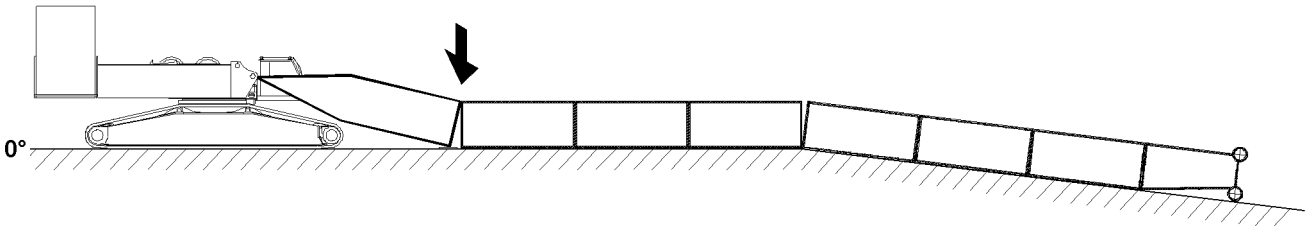

Fig.121656: Place the boom system down

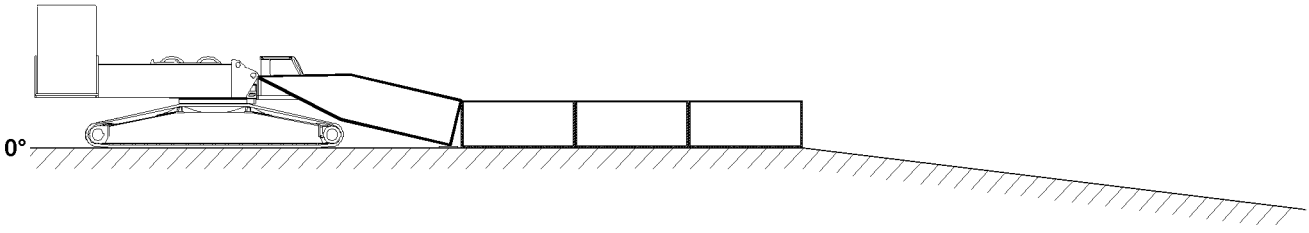

Fig.121641: Disassemble and remove the boom - intermediate sections with the end section

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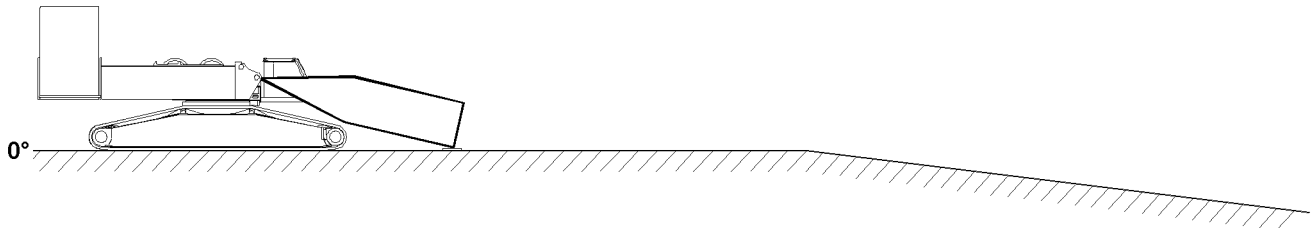

Fig.121640: Disassemble and remove the boom - intermediate sections to the boom - pivot section

▶ Disassemble and remove the boom - pivot section.

15 Erection / take 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.
Personnel can be severely injured or killed.
▶ The boom must be able to be placed down at any time with its current equipment, observe the erection and take down charts.
▶ The required counterweight must always be in direct vicinity of the crane.
▶ The crane operator must ensure that the required counterweight is carried along when driving the crane with the equipment in place and that the boom can be placed down at any time.

WARNING
Mortal danger.
▶ Incorrectly installed or non-functioning limit switches as well as falling parts (pins, spring retainers, ice etc.) can cause accidents.

15.1 Erection / take down for 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.
– The derrick ballast (suspended ballast or ballast trailer ballast) is installed according to the load chart or the erection / take down charts.
– The telescopic boom is fully telescoped in.
– 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 installed and are fully functional.
– All pin connections have been secured.
– No personnel is within the danger zone.
– There are no loose parts on the boom or the auxiliary boom.
– In winter, the exposed rope pulleys must be kept free of snow, frost and ice.
– In winter, the telescopic boom, the auxiliary boom and their associated components (limit switches, cable drum, flashing beacon, wind speed sensor etc.) must be kept free of ice and snow.

▶ Check if all prerequisites have been met.

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15.2 Erection / take down for crawler cranes

Make sure that the following prerequisites are met:
- The crane is horizontally aligned.
- The crane is properly supported (cranes with support).
- The counterweight has been installed on the turntable according to the load chart.
- The central ballast has been installed according to the load chart.
- The counterweight is installed according to the load chart or the erection / take down charts.
- The derrick ballast (suspended ballast or ballast trailer ballast) is installed according to the load chart or the erection / take down charts.
- 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 installed and are fully functional.
- All pin connections have been secured.
- No personnel is within the danger zone.
- There are no loose parts on the boom or the auxiliary boom.
- In winter, the exposed rope pulleys must be kept free of snow, frost and ice.
- In winter, the boom, the auxiliary boom and their associated components (limit switches, cable drum, flashing beacon, wind speed sensor etc.) must be kept free of ice and snow.

▶ Check if all prerequisites have been met.

15.3 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 support 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. Personnel can be severely injured or killed.
- ▶ Make sure that the guy rods are placed completely on the lattice sections and relieved when the boom systems are placed 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 support.
- ▶ 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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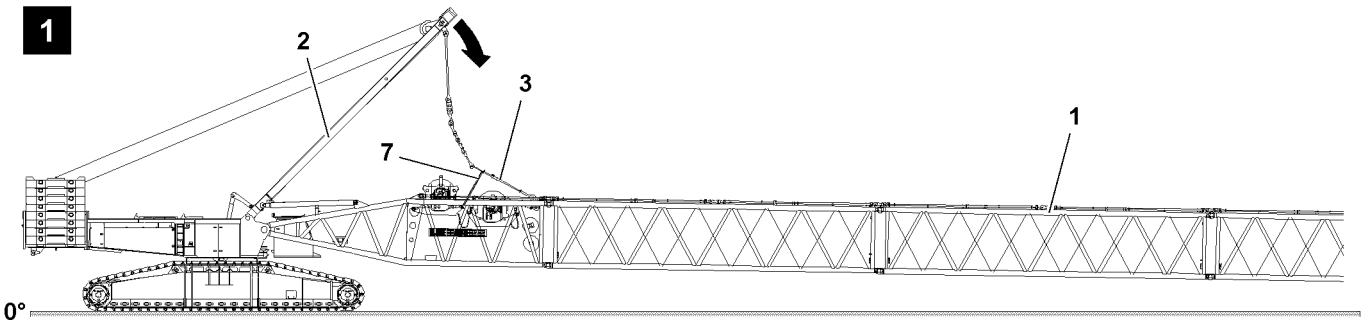

Fig.120722: Guying placed in transport receptacle and SA-frame guying relieved

- ▶ Place the guy rods on the lattice sections **1**: Luff the SA-frame **2** 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**.

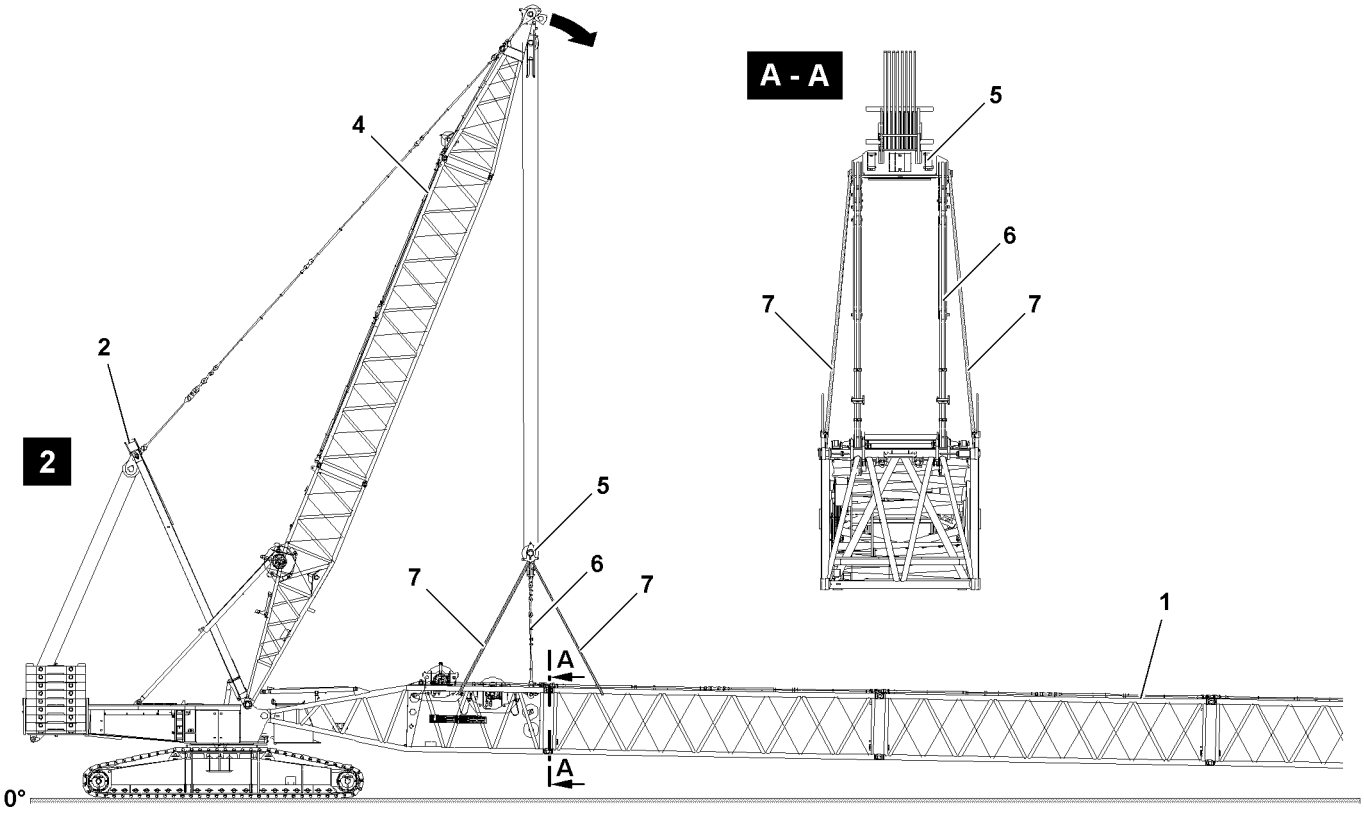

Fig.120771: Guying placed in transport receptacle and upper pulley block rigged against the boom

- ▶ Place the boom system down and - if present - release the derrick guying to the derrick ballast.
- ▶ Place the guy rods 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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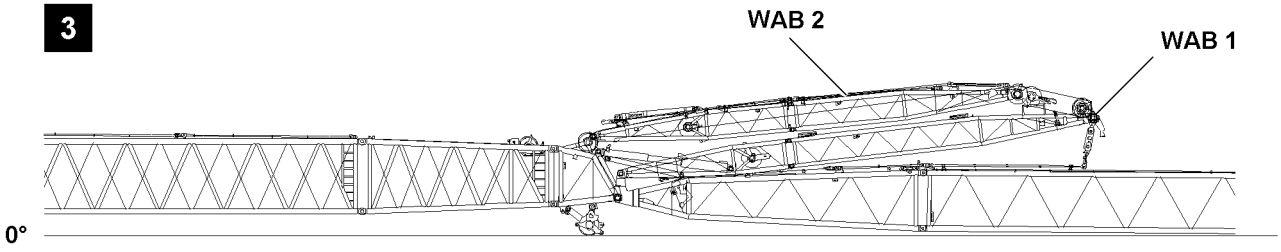

Fig.120821: Guying in transport receptacle(s) and WA-frames placed down to the front (example lattice mast crane)

WARNING
Danger of accident when removing the W-guying!
When placing 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 place them into the transport receptacles.
▶ Place 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:

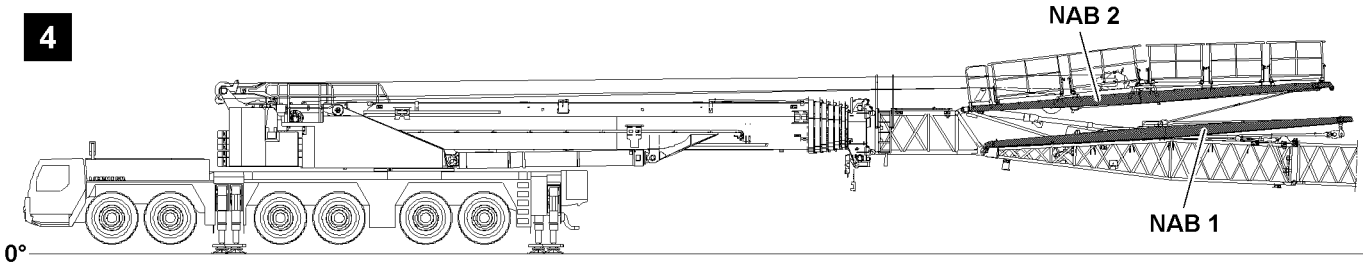

Fig.121261: Guying in transport receptacle(s) and NA-frames placed down to the front (example telescopic crane)

WARNING
Danger of accident when placing the NA-frames down!
When placing 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 place the NA-frames down to the front so that the guy rods are relieved.

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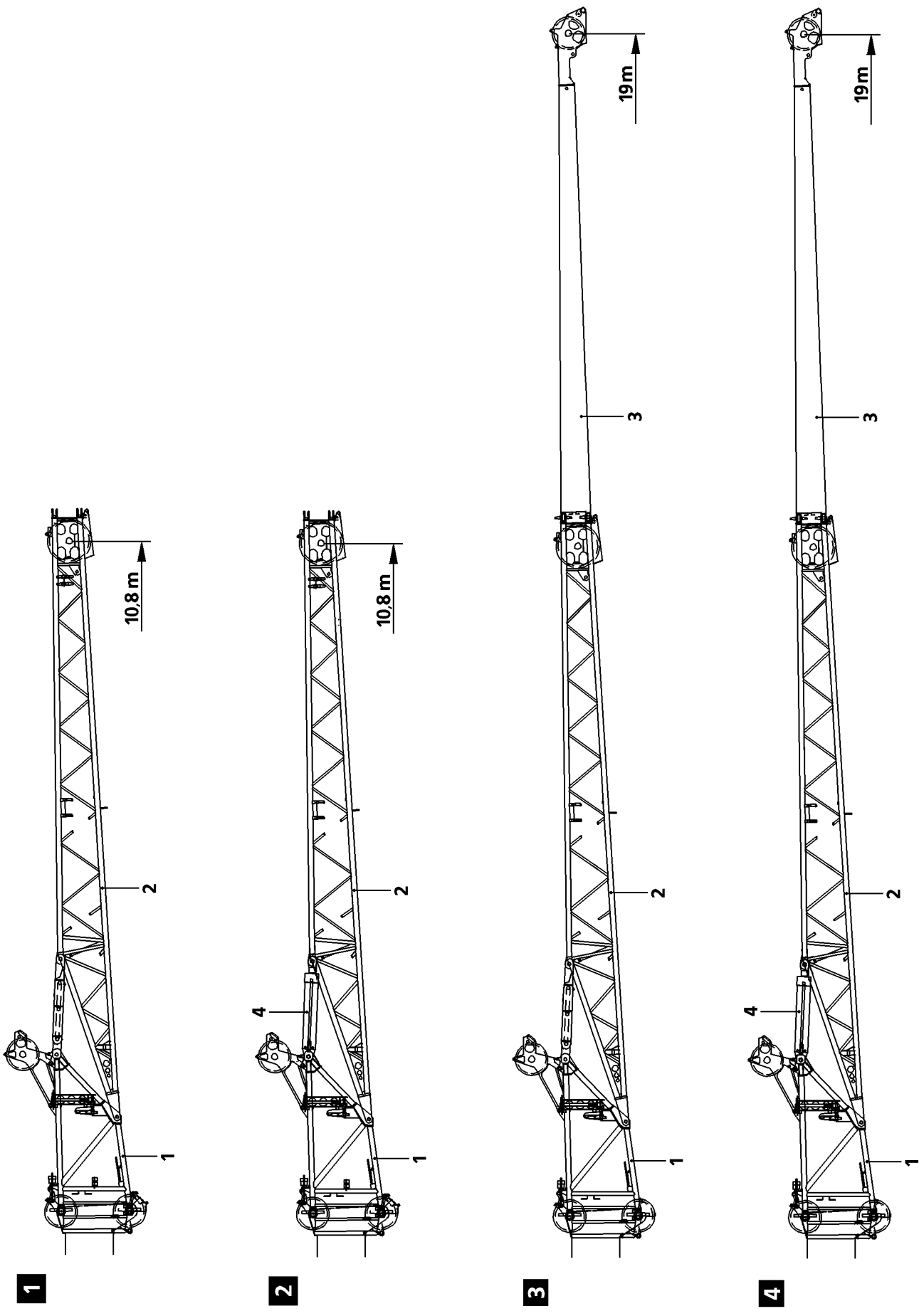

Fig.198646

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1 General

The folding jib versions for TK operation (mechanical angle adjustment) and TNZK operation (hydraulic angle adjustment) can be self-assembled on the telescopic boom.

The folding jib can be operated as a single folding jib with a height of 10.8 m or as a dual folding jib with a height of 19 m.

The folding jib with „mechanical angle adjustment“ can be mounted on the telescopic boom from 0° to 20° or 40°.

The folding jib with „hydraulic angle adjustment“ can be luffed under load from 0° to 40°.

1.1 Folding jib variations

1.1.1 Single folding jib, see illustrations 1 and 2

Position	Description	Length
1	Adapter	
2	Articulated piece	
4	Pulley block	
Length of single folding jib		10.8 m

1.1.2 Dual folding jib, see illustrations 3 and 4

Position	Description	Length
1	Adapter	
2	Articulated piece	
3	Head piece	
4	Pulley block	
Length of dual folding jib		19 m

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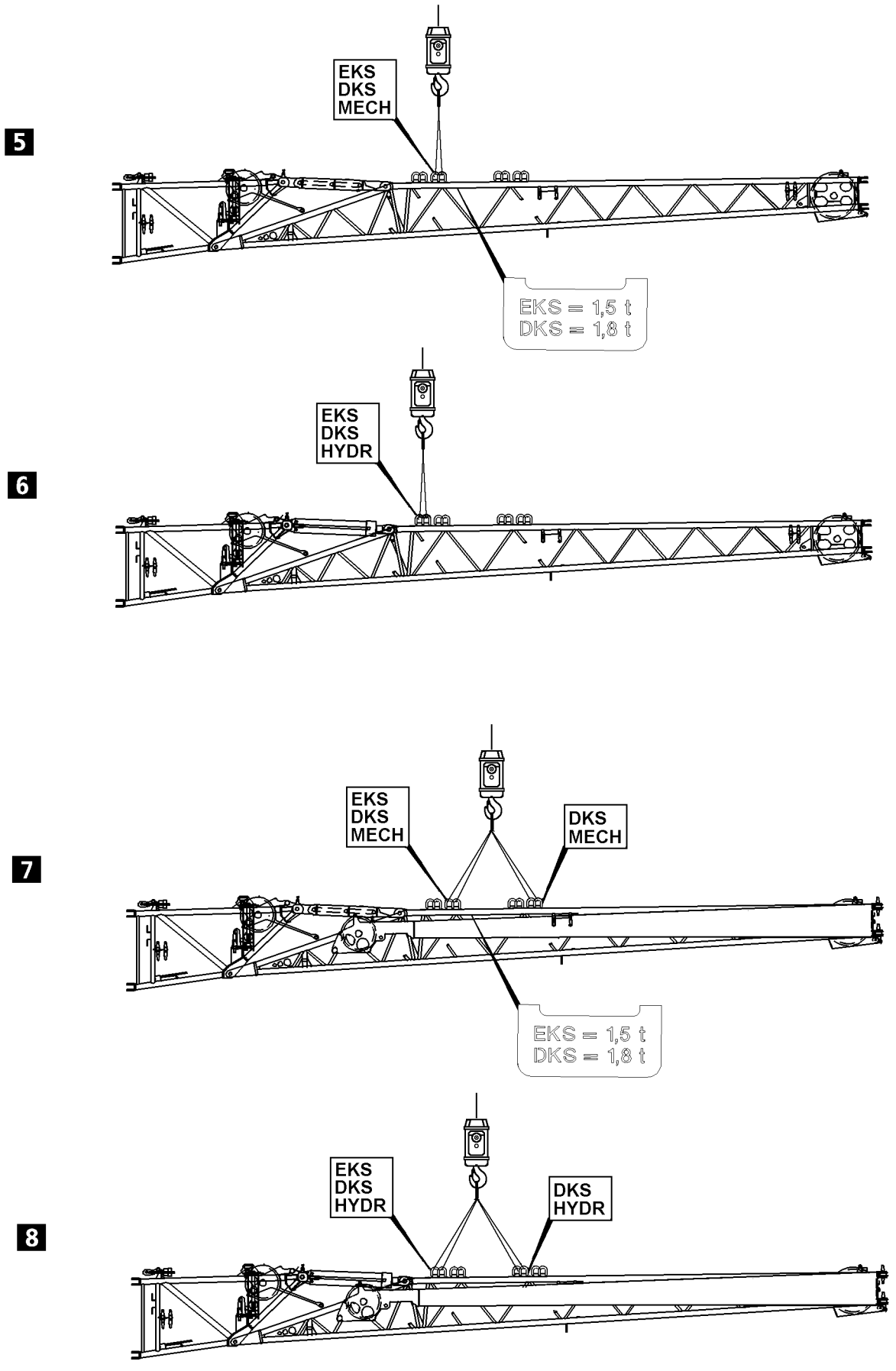

Fig.198647

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1.2 Fastening points

With fastening points the head piece, if also transported, must be folded in and locked.

Various fastening eyes are installed on the folding jib for the different methods of transporting it. The transportation methods are separated into single or dual folding jib and/or „mechanical angle adjustment“ or „hydraulic angle adjustment“.

The appropriate fastening eyes and points are marked with tags.

DANGER
Accident risk if incorrectly attached!
Life-threatening situations can arise if the folding jib is improperly or incorrectly fastened.
▶ Please ensure that the folding jib is attached in accordance with the fastening points as shown on the signs!

1.2.1 Single folding jib, see illustrations 5 and 6

Description	Abbreviation	Weight
Single folding jib	EKS	1.5 t
mechanical	MECH	
hydraulic	HYDR	

1.2.2 Dual folding jib, see illustrations 7 and 8

Description	Abbreviation	Weight
Dual folding jib	DKS	1.8 t
mechanical	MECH	
hydraulic	HYDR	

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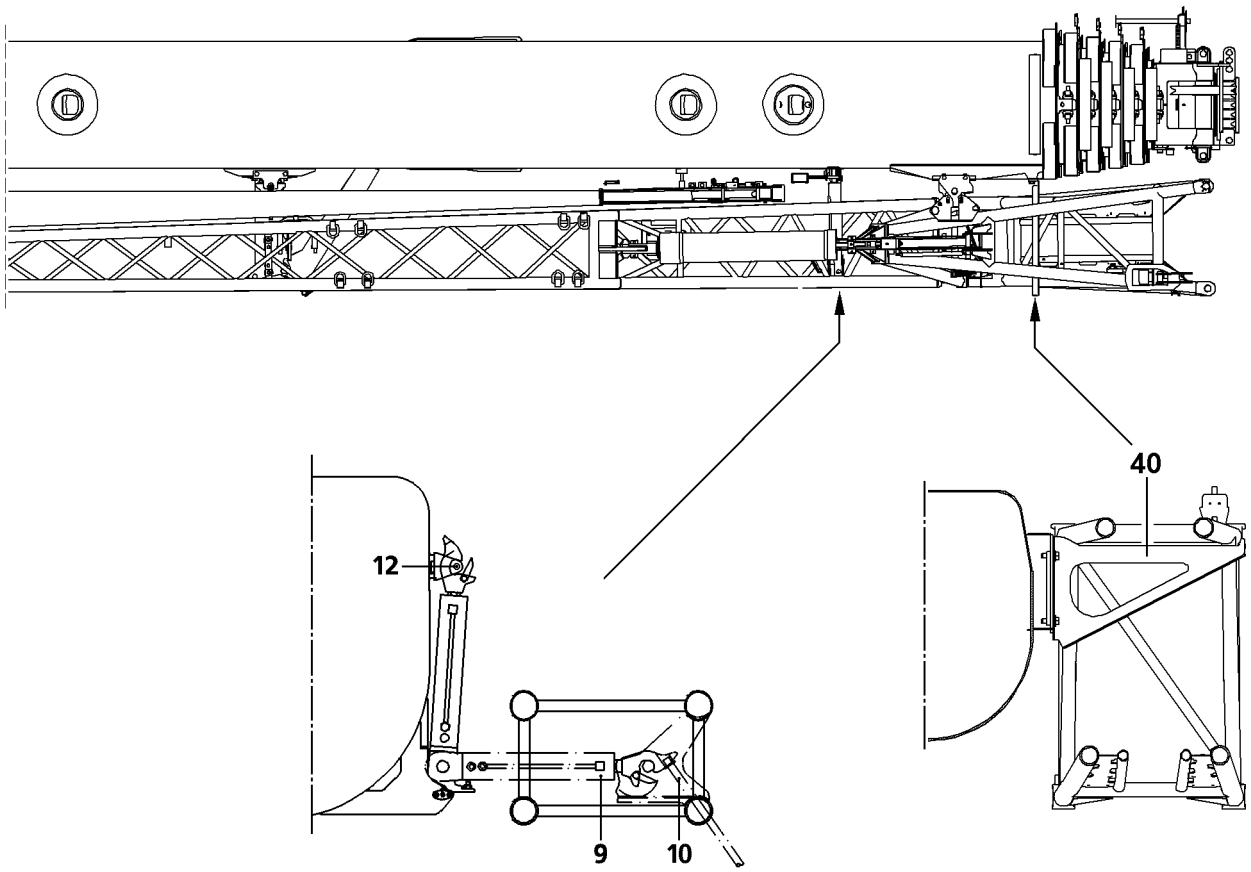

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Fig.103740

2 Assembly of the folding jib

In tele operation, the swing cylinder **9** can be folded up if necessary and pinned with a pin **12**.

2.1 General

DANGER
Danger of fatal injuries due to falling folding jib!
As a result of improperly mounted, damaged or non-existing catch bar **40** on the telescopic boom articulated piece, the folding jib – due to an assembly error – can fall down and cause fatal injuries.

- ▶ Before folding jib assembly, make sure that the catch bar **40** is properly mounted on the telescopic boom articulated piece and that it is not damaged.
- ▶ The catch bar **40** is a mechanical safety device. For that reason, it is prohibited to change the catch bar **40** in any way.
- ▶ Standing under the folding jib during the swing operation is prohibited!
- ▶ It is prohibited for anyone to remain in the swing range as well as the folding range of the folding jib!
- ▶ The folding jib must be secured with an auxiliary rope during the swing process!

DANGER
Danger of falling!
During assembly and disassembly, personnel must be secured with appropriate antifall guards to prevent them from falling. If this is not observed, personnel could fall and suffer life-threatening injuries.

- ▶ All assembly work from a height of 2 m must generally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane, etc.)! The height above which assembly/disassembly work must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- ▶ If work cannot be carried out using these aids or from the ground, the assembly personnel must be protected from falling using suitable means (such as safety belts)!
- ▶ Do not walk on the telescopic boom or folding jib!

Ensure that the following prerequisites are met:

- the crane is aligned in horizontal direction
- the counterweight has been attached to the turntable according to the load chart
- the central ballast is attached to the crane chassis in accordance with the load chart specifications
- the telescopic boom is fully telescoped in
- the folding jib has been secured on the telescopic boom articulated piece for transport
- the telescopic boom has been luffed down to the rear or the side in the 0° position

DANGER
Danger of accident if the folding jib swings out by itself when it is unpinned!
If the telescopic boom is not in the 0° position, there is a danger of accidents if the folding jib swings out by itself when it is unpinned.

- ▶ Move the telescopic boom to 0° position.

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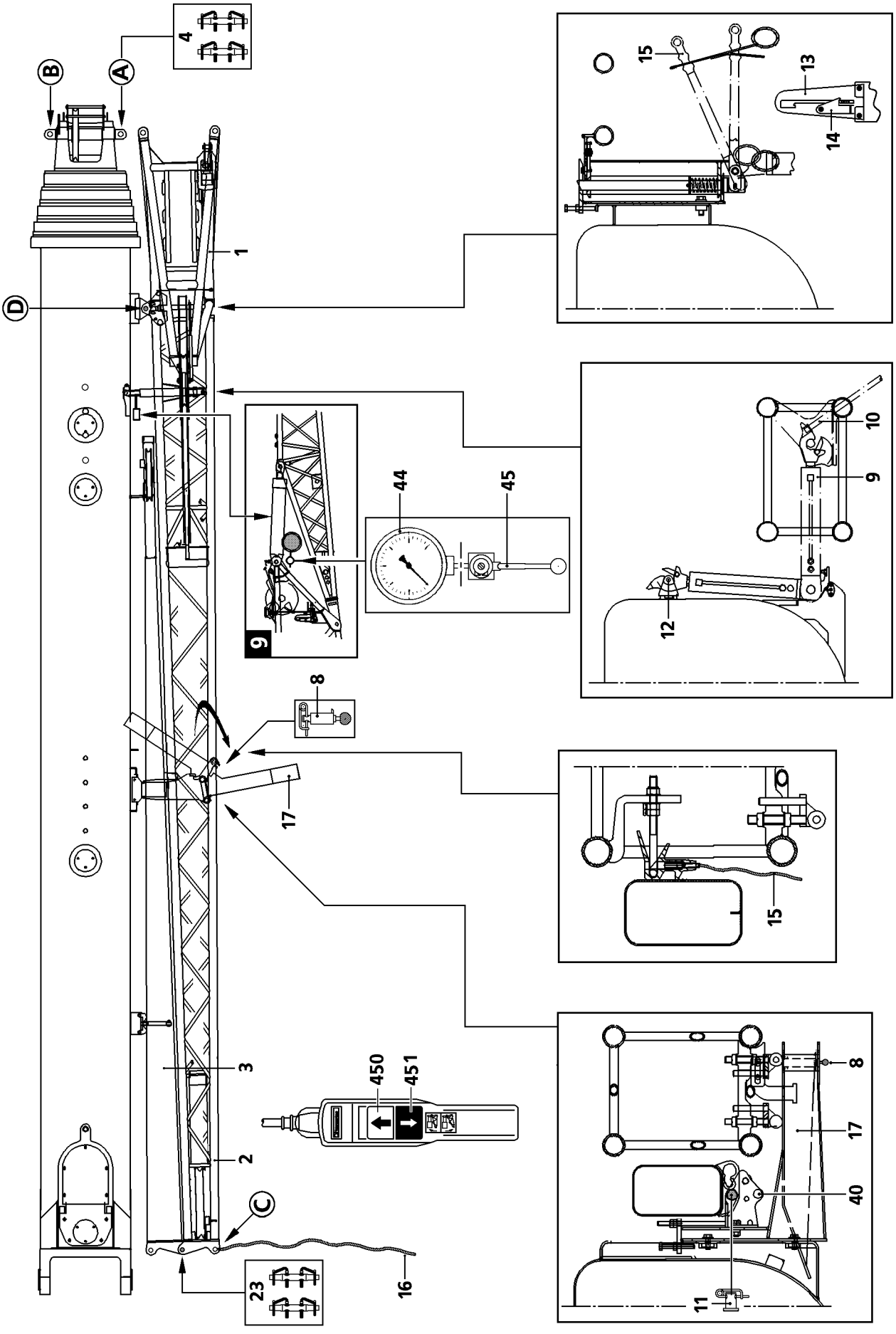

Fig.195367

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2.2 Reeving out the hoist rope on the telescopic boom head

In order to speed up the subsequent reeving in of the hoist rope after assembly of the folding jib, set down the hook block at a distance from the crane, approximating to the subsequent distance of the telescoped in telescopic boom **with** assembled folding jib.

- ▶ Telescope the telescopic boom out to the corresponding length.
- ▶ Place the hook block on the ground.
- ▶ Detach the hoist rope at the rope fixed point.
- ▶ For safety reasons, remove the hoist limit switch weight and the chain.

Note

- ▶ When operating the folding jib, the hoist limit switch must be pulled mechanically and the control rope must be attached to the telescopic boom head with a snap hook.
- ▶ The telescopic boom may remain reeved if the hoist rope of winch 2 is used for folding jib operation.

- ▶ Remove the rope retaining tube at the pulley head and the end pulley.
- ▶ Fully telescope the telescopic boom in again.

2.3 Important check before swinging out the hydraulic folding jibs (TNZK operation)

DANGER

Danger of fatal injury if the folding jib folds down by itself!

When using hydraulic folding jibs (TNZK operation), prior to swinging out the folding jib, check whether a pressure of 60 bar is shown on the pressure gauge **44**. If the pressure on the pressure gauge **44** is too low, fatal accidents can occur if the folding jib folds down by itself!

- ▶ It is **expressly prohibited** to swing the folding jib out with less than 60 bar on the pressure gauge **44**.

The ball valve **45** may only be operated during maintenance operations.

If the pressure shown on the pressure gauge **44** is too low:

- ▶ Connect hydraulic lines.
- ▶ Actuate luff up the folding jib until a pressure of at least 60 bar is shown on the pressure gauge **44**.

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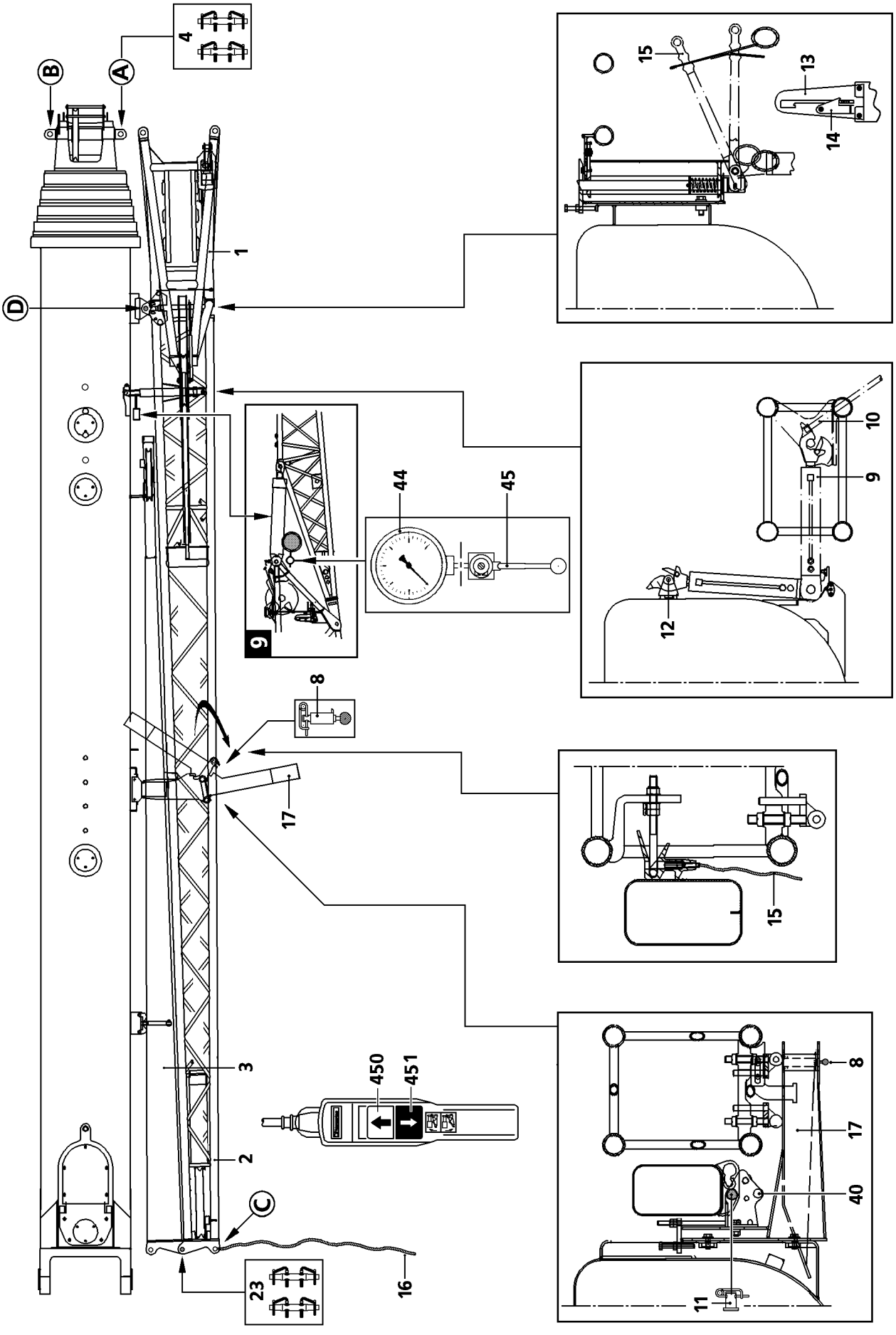

Fig.195367

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2.4 Assembly of the single folding jib carried on the crane

The head piece **3**, which is not required, remains pinned to the telescopic boom during single folding jib operation.

DANGER
Danger of fatal injury due to toppling head piece!
During operation with the single folding jib, the head piece **3** may not be unpinned from the telescopic boom. Otherwise there is a danger of injury from the toppling head piece **3**.
▶ Do not unpin the head piece from the telescopic boom!

When swinging the folding jib support **17** in and out, make sure that the spring-loaded pin **8** is unlocked using one hand and that the folding jib support **17** is moved overhead with the other hand.

▶ Release and unpin the spring-loaded pin **8**.
▶ Swing the folding jib support **17** out until the spring-loaded pin **8** reengages.

With „hydraulic folding jibs“ (TNZK operation) the hydraulic line must be disconnected before swinging out the folding jib.

If a hydraulic folding jib is carried along:
▶ Disconnect hydraulic line to hydraulic cylinder (illustration 9).
▶ Attach the auxiliary rope **16** at point **C**.

If a dual folding jib is carried along:
▶ Release and unpin the pins **23**.

If a dual folding jib is carried along:
▶ Pull the nylon rope **15** and loosen the lock between the head piece **3** and the articulated piece **2**.
▶ Start the crane engine.
▶ Press button **451** and swing out the folding jib with swing cylinder until it can be pinned at point **A**.
▶ Insert the pins **4** at the top and at the bottom at point **A** and secure.

DANGER
Danger of fatal injury due to toppling folding jib!
Special retaining clips must be used to secure the pins **4**. The use of spring-loaded pins or safety springs on the pins **4** is not permitted. The folding jib may only be unlocked at point **D**, when the pins **4** are pinned and secured at the top and bottom at point **A**.
▶ Pin and secure pins **4** at point **A** at top and bottom.

▶ Swing the safety bracket **14** with assembly rod **10** to the side.
▶ Push lever **15** with assembly rod **10** upwards and latch into the platform.
▶ Press button **451** and swing the folding jib with swing cylinder all the way out.
▶ Unlock the swing cylinder **9** with assembly rod **10**.

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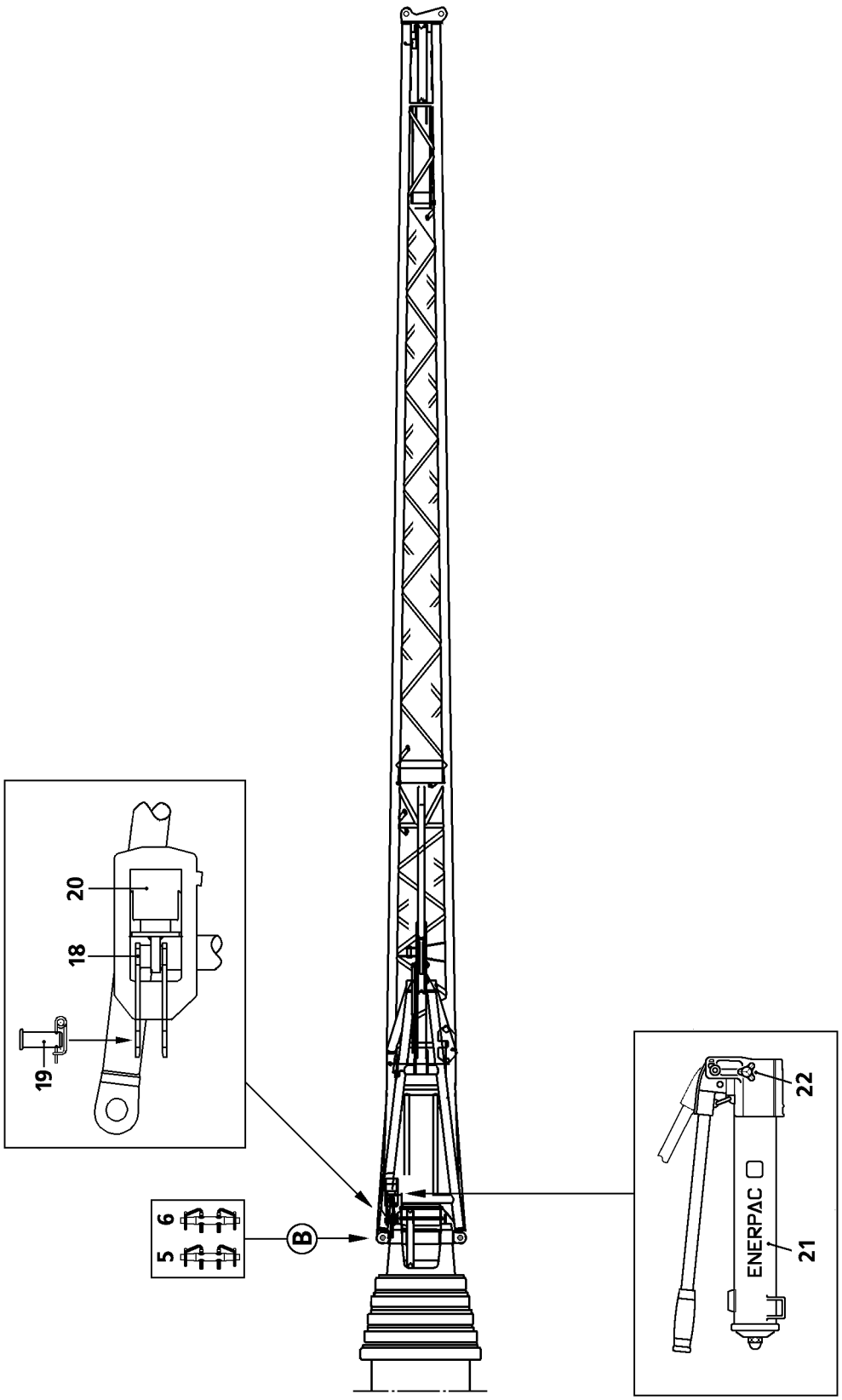

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Fig.190754

DANGER
Danger of fatal injuries due to falling folding jib!
The folding jib could fall down due to an assembly error.
- ▶ Standing under the folding jib during the swing operation is prohibited!
- ▶ It is prohibited for anyone to remain in the swing range as well as the folding range of the folding jib!

▶ Swing articulated piece **2** with auxiliary rope by 180° until it can be pinned at top and bottom at point **B**.

DANGER
Risk of accident!
- ▶ The use of spring-loaded pins or safety springs is prohibited on pin **5** and pin **6**!
- ▶ To secure the pin **5** and the pin **6**, use the special retaining clips.

▶ Pin and secure pin **5** at bottom at point **B**.

In order to pin at the top of the point **B**, the hydraulic/mechanical assembly aid **20** must be used.

- ▶ Release pin **19** and unpin from bore **18**.
- ▶ Pin and secure the assembly aid **20** to the towing bracket with pin **19**.
- ▶ Close the knob **22** on the manual pump **21**.
- ▶ Extend the hydraulic cylinder of the assembly aid **20** by operating the manual pump **21** until the bore on the eye of the folding jib is aligned with that on the telescopic boom.
- ▶ Pin and secure the pin **6** on top on point **B**.
- ▶ Open the knob **22**.

Result:

– The hydraulic cylinder of the assembly aid **20** returns to the starting position and the pin is released.

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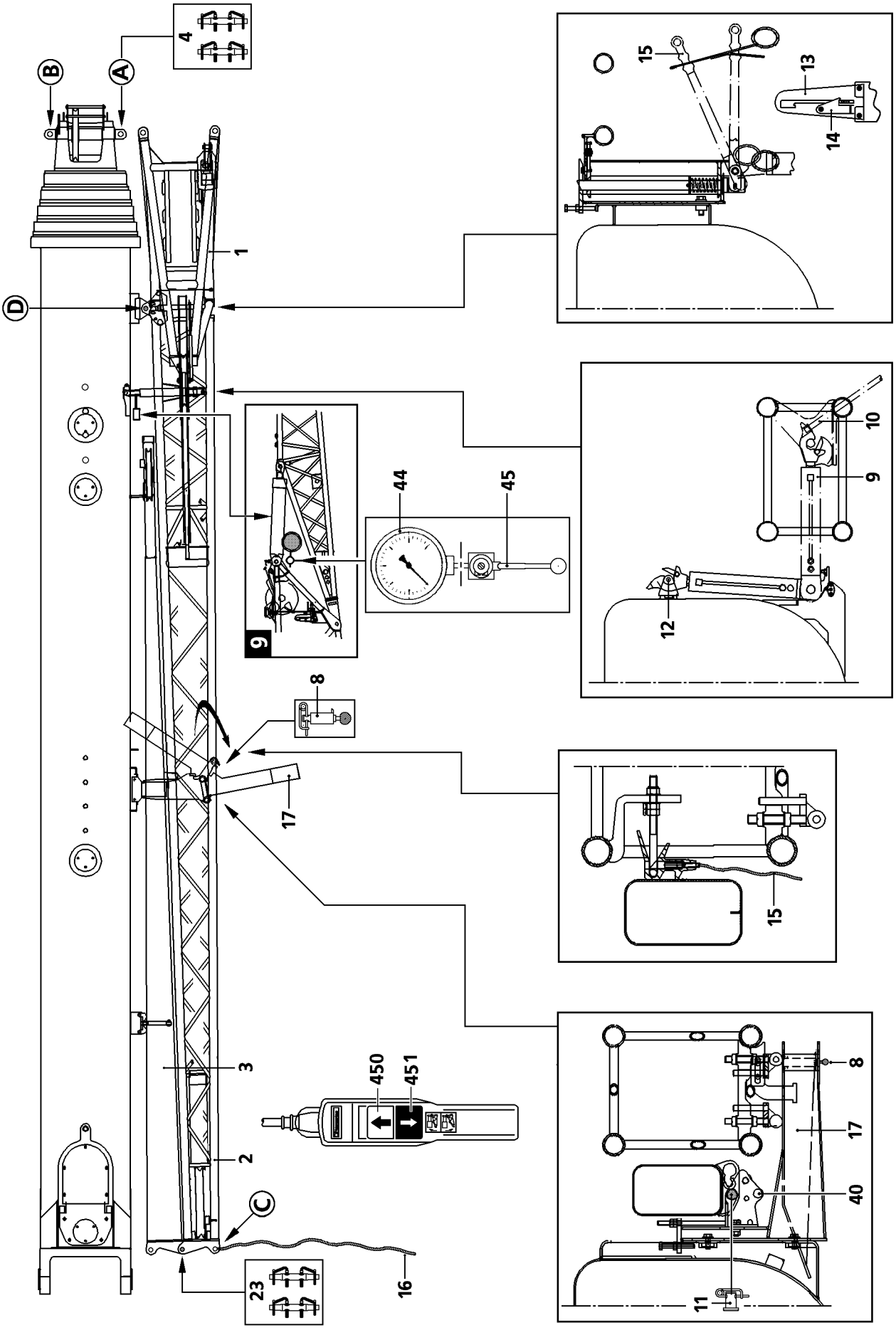

Fig.195367

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2.5 Assembly of the dual folding jib carried on the crane

2.5.1 Articulated piece assembly

When swinging the folding jib support **17** in and out, ensure that the spring-loaded pin **8** is unlocked using the first hand and that the folding jib support **17** is moved overhead by using the second hand.

- ▶ Release and unpin the spring-loaded pin **8**.
- ▶ Swing the folding jib support **17** out until the spring-loaded pin **8** locks again.

With „hydraulic folding jibs“ (TNZK operation) the hydraulic line must be disconnected before swinging out the folding jib.

If a hydraulic folding jib is carried along:

- ▶ Disconnect hydraulic line to hydraulic cylinder (illustration 9).
- ▶ Attach the auxiliary rope **16** at point **C**.
- ▶ Release and unpin pins **11** and pin into hole **40**.
- ▶ Press button **451** and swing out the folding jib with swing cylinder until it can be pinned at point **A**.
- ▶ Pin upper and lower pins **4** at point **A** and secure.

DANGER
Danger of fatal injury due to toppling folding jib!
Special retaining clips must be used to secure the pins **4**. The use of spring-loaded pins or safety springs on the pins **4** is not permitted. The folding jib may only be unlocked at point **D**, when the pins **4** are pinned and secured at the top and bottom at point **A**.

- ▶ Pin and secure pins **4** at point **A** at top and bottom.

- ▶ Swing the safety bracket **14** with assembly rod **10** to the side.
- ▶ Push lever **15** with assembly rod **10** upwards and latch into the platform.
- ▶ Press button **451** and swing the folding jib with swing cylinder all the way out.
- ▶ Unlock the swing cylinder **9** with assembly rod **10**.

DANGER
Danger of fatal injury due to toppling folding jib!
It is forbidden to stand beneath the folding jib during the swing operation, since the folding jib could topple if it was incorrectly fitted!

- ▶ No persons or objects must be present in the swinging or folding area of the telescopic boom or folding jib.

- ▶ Swing folding jib with auxiliary rope **16** by 180° until it can be pinned at top and bottom at point **B**.

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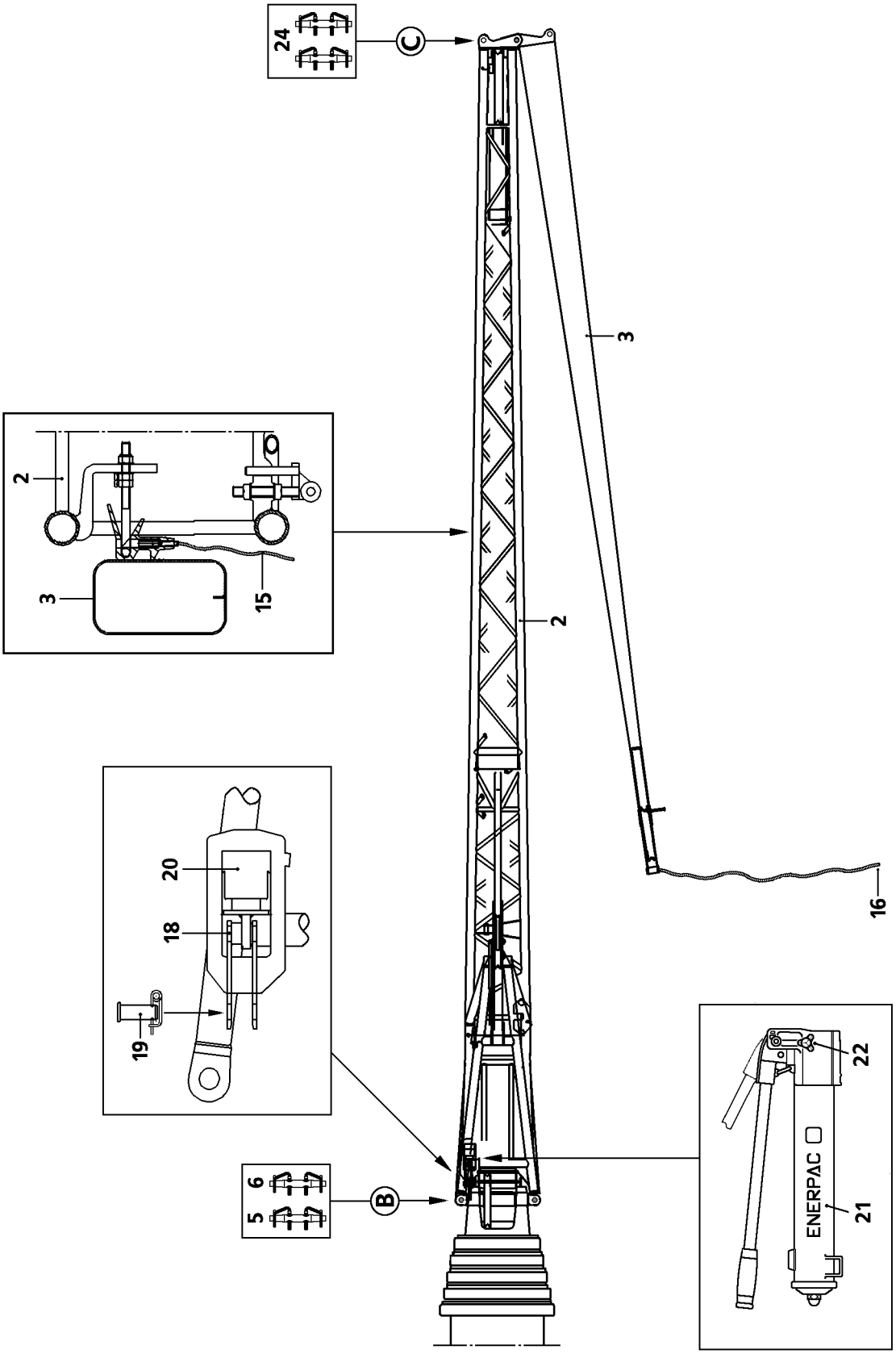

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Fig.194013

2.5.2 Articulated piece assembly, continued

DANGER
Risk of accident!
- ▶ The use of spring-loaded safety pins or safety springs is prohibited on pins **5** and pins **6**!
- ▶ Special retaining clips must be used to secure pins **5** and pins **6**.

▶ Pin and secure pin **5** at bottom at point **B**.

In order to pin at the top of the point **B**, the hydraulic/mechanical assembly aid **20** must be used.

- ▶ Release pin **19** and unpin from bore **18**.
- ▶ Pin and secure the assembly aid **20** to the towing bracket with pin **19**.
- ▶ Close the knob **22** on the manual pump **21**.
- ▶ Extend the hydraulic cylinder of the assembly aid **20** by operating the manual pump **21** until the bore on the eye of the folding jib is aligned with that on the telescopic boom.
- ▶ Pin and secure the pin **6** on top on point **B**.
- ▶ Open the knob **22**.

Result:

– The hydraulic cylinder of the assembly aid **20** returns to the starting position and the pin is released.

2.5.3 Assembly of head piece

- ▶ Remove auxiliary rope **16** at point **C** and attach on head piece **3**.
- ▶ Pull nylon rope **15** and release locking mechanism between head piece **3** and articulated piece **2**.

CAUTION
Headpiece can swing out involuntarily!
- ▶ Hold head piece with auxiliary rope during unlocking procedure to prevent the head piece from swinging out involuntarily.

▶ Swing the head piece **3** forward by 180° until it can be pinned at point **C**.

DANGER
Danger of fatal injury due to toppling folding jib!
It is forbidden to stand beneath the folding jib during the swing operation, since the folding jib could topple if it was incorrectly fitted!
- ▶ No persons or objects must be present in the swinging or folding area of the telescopic boom or folding jib.

- ▶ Pin and secure pins **24** at top and bottom using safety clips.
- ▶ Remove auxiliary rope.

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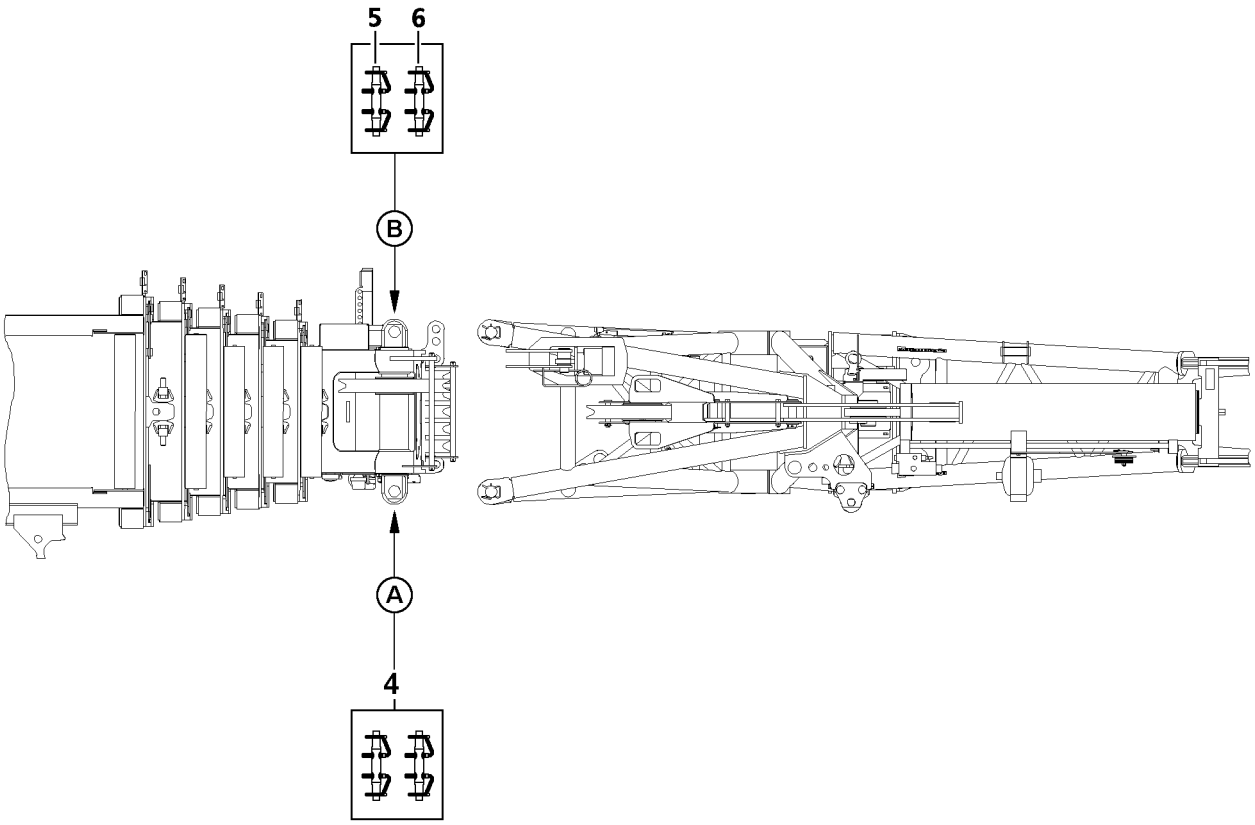

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Fig.197651

2.6 Assembly of the separately transported folding jib

For description of fastening points, see section „Fastening points“.

- ▶ Attach the auxiliary crane to corresponding fastening points on folding jib.
- ▶ Lift the folding jib with the auxiliary crane and guide it into pin points on the telescopic boom.

DANGER
Risk of accident!
- ▶ The use of spring-loaded pins or safety springs is prohibited on pins **4**, **5** and **6**!
- ▶ Use the special retaining clips to secure pins **4**, **5** and **6**.

- ▶ Pin the folding jib to telescopic boom:
- ▶ Pin and secure pin **4** on top and on the bottom at point **A**.
- ▶ Pin and secure pins **5** and **6** on the top and bottom at point **B**.
- ▶ For further assembly of dual folding jib, see section „Assembly of head piece“.

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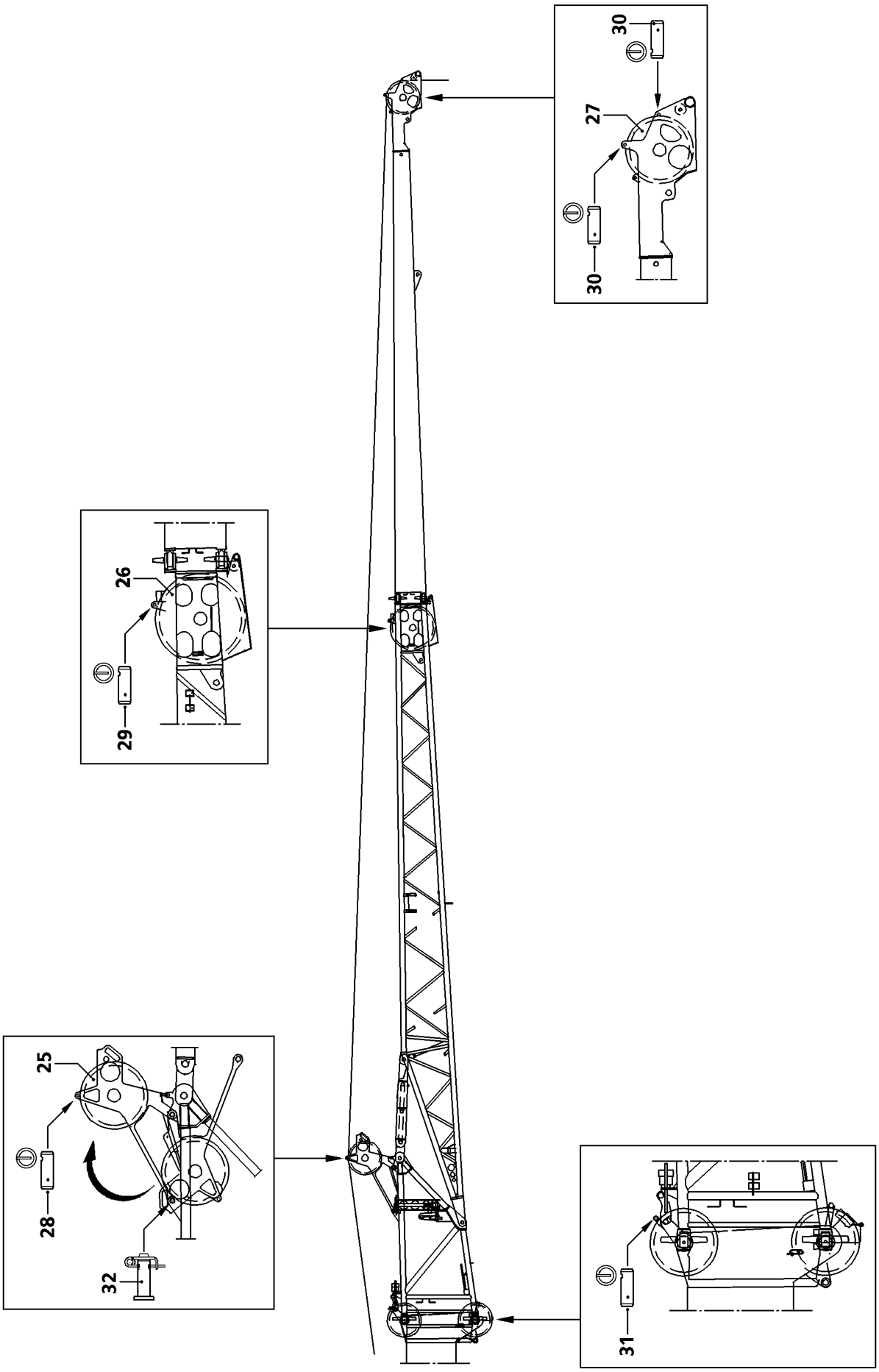

Fig.190759

LWE/LTR 1100-005/17505-03-02/en

3 Reeving in the hoist rope

DANGER
Risk of falling from folding jib!
When stepping on the folding jib, for example to reeve the hoist rope in or out, there is a risk of slipping and falling from the folding jib.
▶ Do not step on the folding jib!

3.1 Swinging the rope guide pulley into operating position

▶ Release and unpin the pins **32**.
▶ Swing rope guide pulley **25** into operating position.
▶ Pinning rope guide pulley **25** into operating position: Pin and secure pin **32**.

3.2 Reeving in the hoist rope

▶ Release and unpin the rope retaining pin **28** and rope retaining pin **29**.

For operations with dual folding jib:
▶ Release and unpin the rope retaining pins **30**.
▶ Place hoist rope over the rope guide pulley **25** and over the main pulley **26** at 10.8 m or over the main pulley **27** at 19 m.
▶ Pin the rope retaining pin in again and secure with linch pins.

CAUTION
Damage to hoist rope!
If the rope retaining pin **29** is pinned in during operation with the dual folding jib, the slack hoist rope may scrape against the rope retaining pin **29** and become damaged.
▶ **Do not** pin in the rope retaining pin **29** during dual folding jib operation!

▶ Reeve in the load hook or hoist rope.
▶ Attach hoist limit switch weight.

Note
▶ During folding jib operation with the hook block reeved to the telescopic boom, the load is reduced by the weight of the reeved-in hook block.

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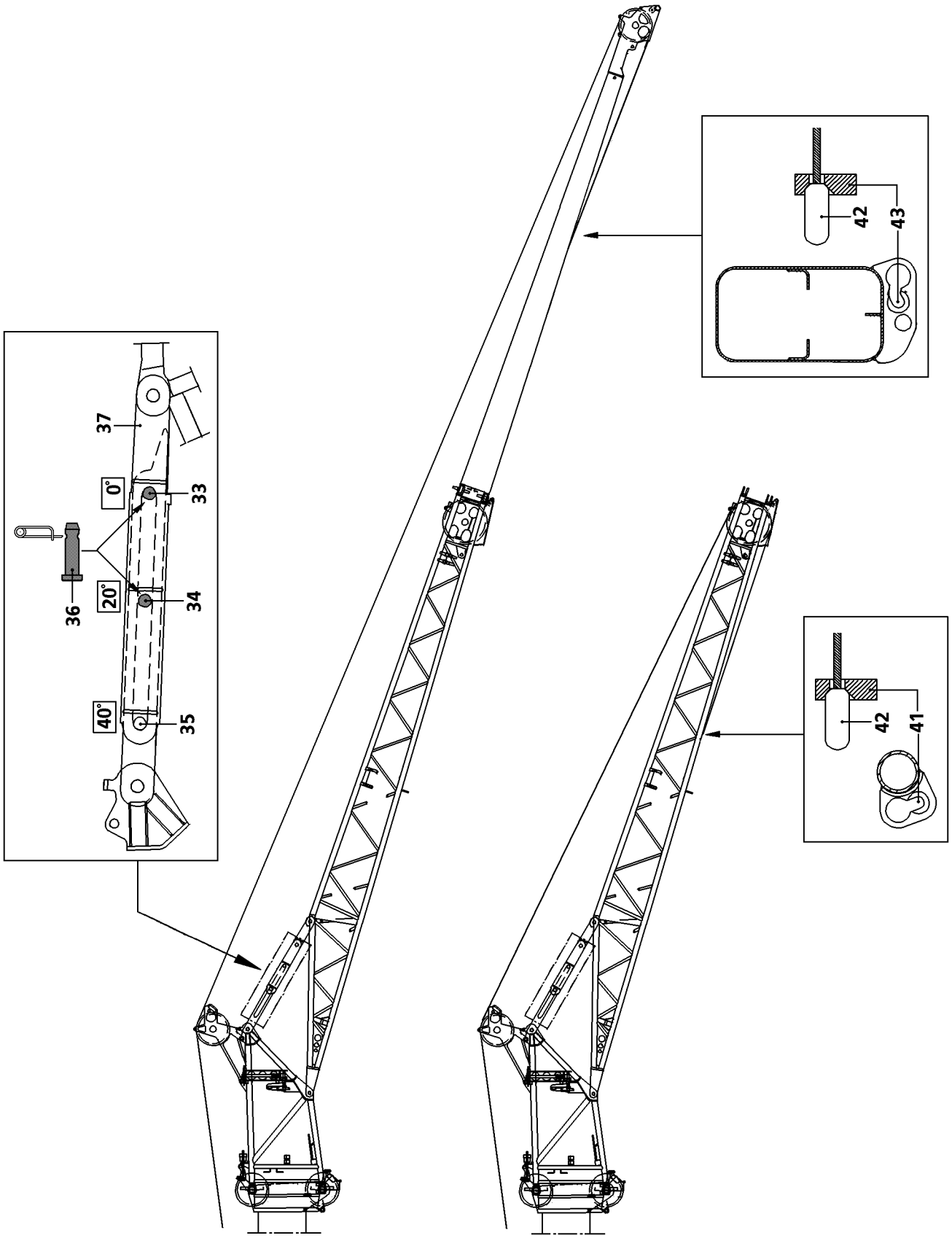

Fig.194017

4 Changing the mechanical folding jib from 0° to 20° or 40°

There are 3 ways of changing the mechanical folding jib to 20° or 40°:
1. Changing the folding jib with the hoist rope
2. Changing the folding jib by supporting
3. Changing the folding jib with hook block or load hook

Ensure that the following prerequisites are met:
- the crane is aligned in horizontal direction
- the telescopic boom is fully telescoped in
- the folding jib is attached as a straight extension in 0° position
- the telescopic boom has been swung to the rear or the side

4.1 Changing the folding jib with the hoist rope

CAUTION
Danger of damage to folding jib and hoist rope!
If the telescopic boom is telescoped out or luffed down as long as the hoist rope is tightened on the fixed assembly point, the hoist rope and the folding jib can be damaged.
▶ Do not telescope out or luff down the telescopic boom with the hoist rope attached on the fixed assembly point!

4.1.1 Preparatory work

▶ Unreeve the hoist rope on the lock.
▶ Remove the hoist limit switch weight.

For operations with dual folding jib:
▶ Insert the press fitting **42** into the fixed assembly point **43**.
or

During operation with single folding jib:
Insert the press fitting **42** into the fixed assembly point **41**.
▶ Tighten the hoist rope by **carefully moving** the appropriate master switch.

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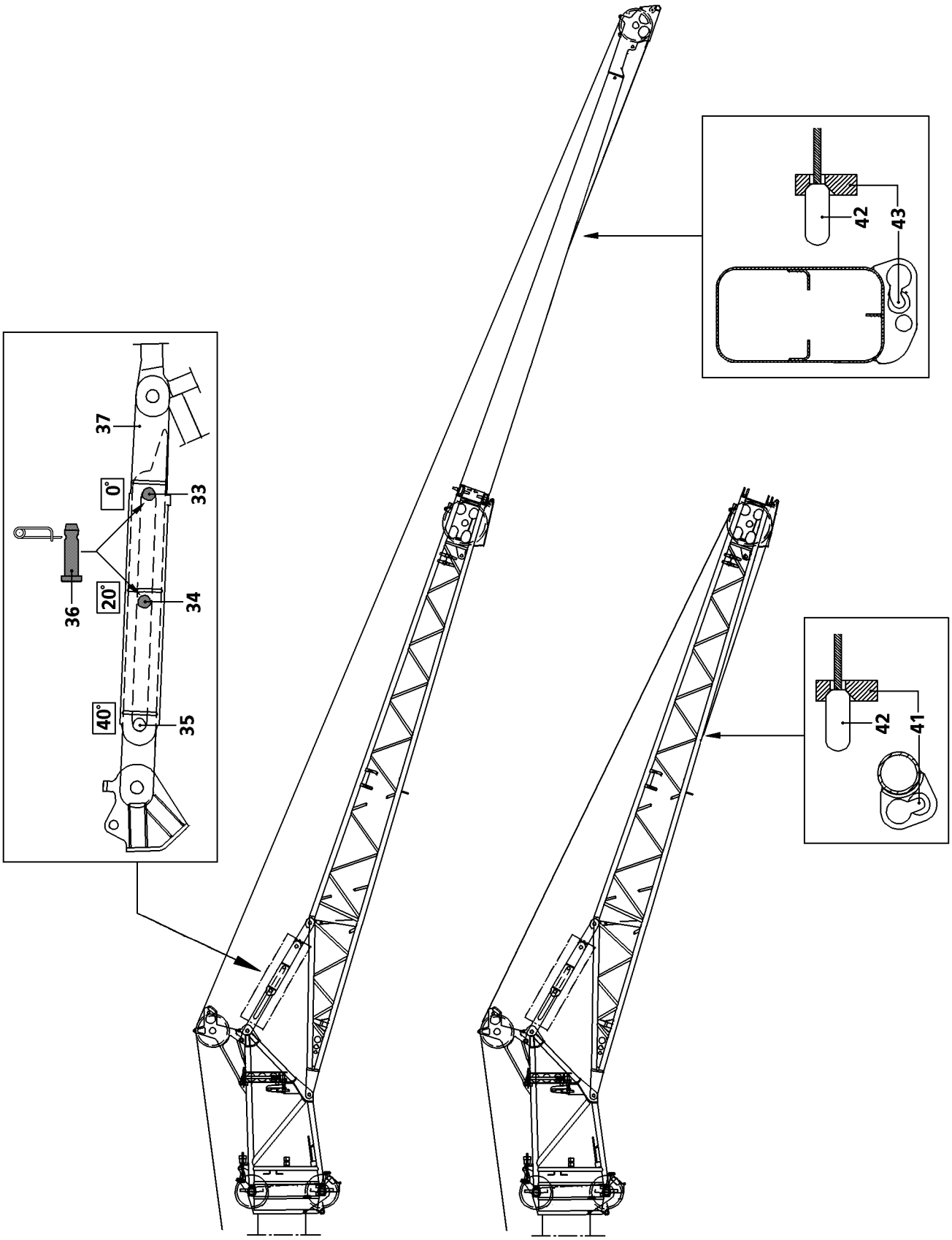

Fig.194017

4.1.2 Changing the angle with hoist rope

You can operate the folding jib at three different angles. The required angle is set using the pin **36**. In the „base setting“, immediately after assembling the folding jib, the folding jib is in the 0° position.

DANGER
Danger of fatal injury!
Danger of accident if folding jib is allowed to tilt suddenly „downwards“!
- ▶ Ensure that **before unpinning** the pin **36**, the hoist rope is taut and that the folding jib is actually held in position by the hoist rope.
- ▶ **It is prohibited** to unpin the retaining pins **35** at the 40° pin holes.

Angle setting 20°

- ▶ Release pin **36** and unpin from 0° hole **33**.
- ▶ Pin the pin **36** into 20° hole **34** and secure.

Angle setting 40°

- ▶ Release pin **36** and unpin from 0° hole **33**.
- ▶ Pin the pin **36** into pin store and secure.

Positioning the folding jib

Make sure that the pin **36** is properly pinned in and secured for the required angle setting.

- ▶ Spool out the hoist rope by carefully moving with the corresponding master switch and simultaneously luffing up the telescopic boom.

Result:

– The lug **37** lies against the respective pin in the selected angular setting.
– The folding jib is held by the respective pins.

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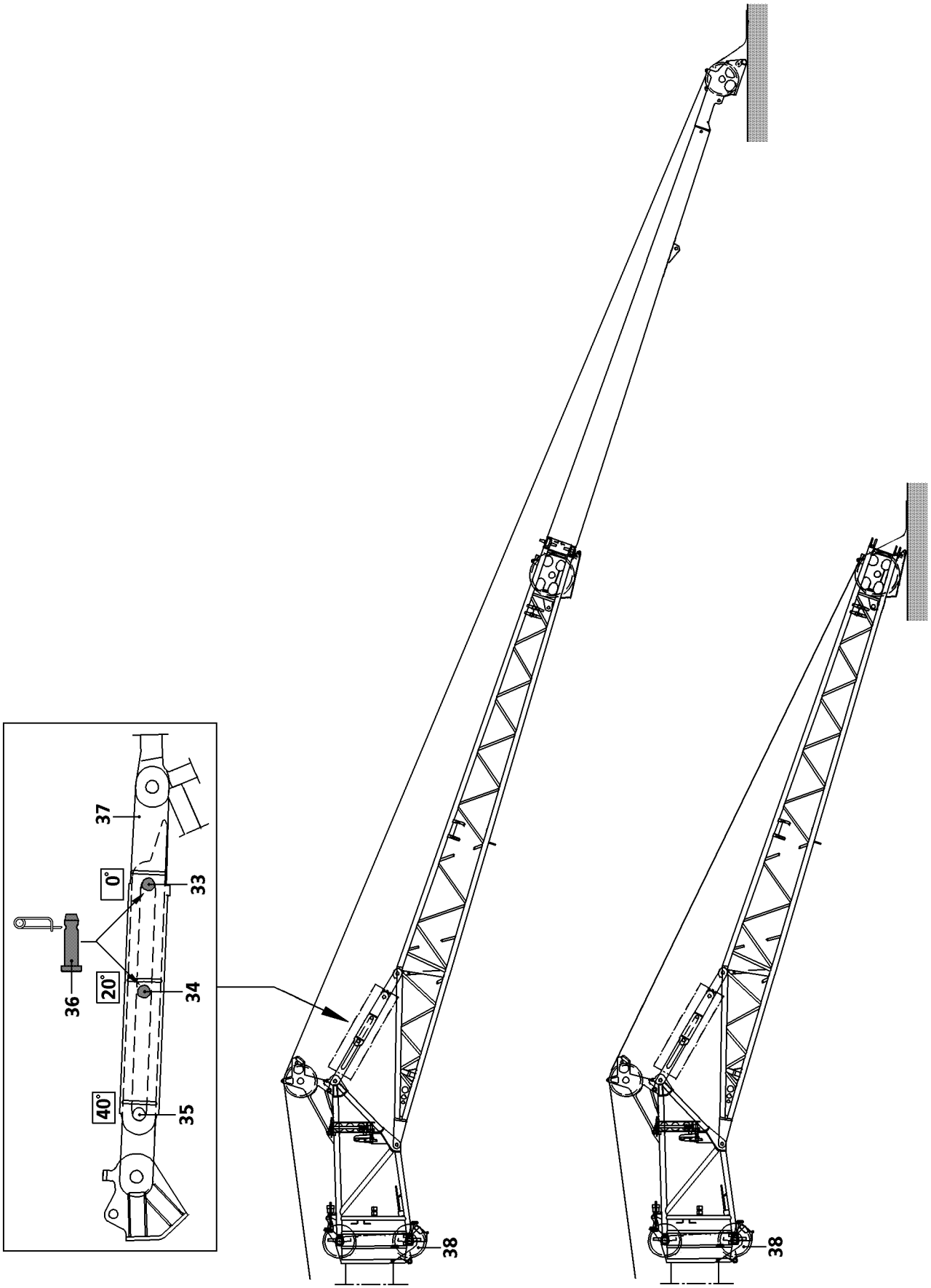

Fig.190763

4.2 Changing the folding jib by supporting

4.2.1 Preparatory work

Note

▶ The folding jib may lie on the ground or must be properly supported, if necessary.

CAUTION

Danger of equipment damage!

▶ When laying down the folding jib, make sure that the folding jib is **not** laid on the rope pulley. Otherwise it will be damaged. Also make sure that the hoist rope is **not** damaged.

▶ Completely luff down the telescopic boom until the folding jib lies the ground.

4.2.2 Changing angle with folding jib supported

You can operate the folding jib at three different angles. The required angle is set using the pin **36**. In the „base setting“ - immediately after assembling the folding jib - the folding jib is in the 0° position.

DANGER

Danger of fatal injury!

Danger of accident if folding jib is allowed to tilt suddenly „downwards“!

▶ Make sure that **before unpinning** the pin **36**, the folding jib is lying on the ground or on a proper and secure support.

▶ **It is prohibited** to unpin the retaining pins **35** at the 40° pin holes.

Angle setting 20°

▶ Release pin **36** and unpin from 0° hole **33**.

▶ Pin the pin **36** into 20° hole **34** and secure.

Angle setting 40°

▶ Release pin **36** and unpin from 0° hole **33**.

▶ Pin the pin **36** into pin store and secure.

Positioning the folding jib

Make sure that the pin **36** is properly pinned in and secured for the required angle setting.

▶ Luff up the telescopic boom slowly and carefully.

Result:

– The lug **37** lies against the respective pin in the selected angular setting.

– The folding jib is held by the respective pins.

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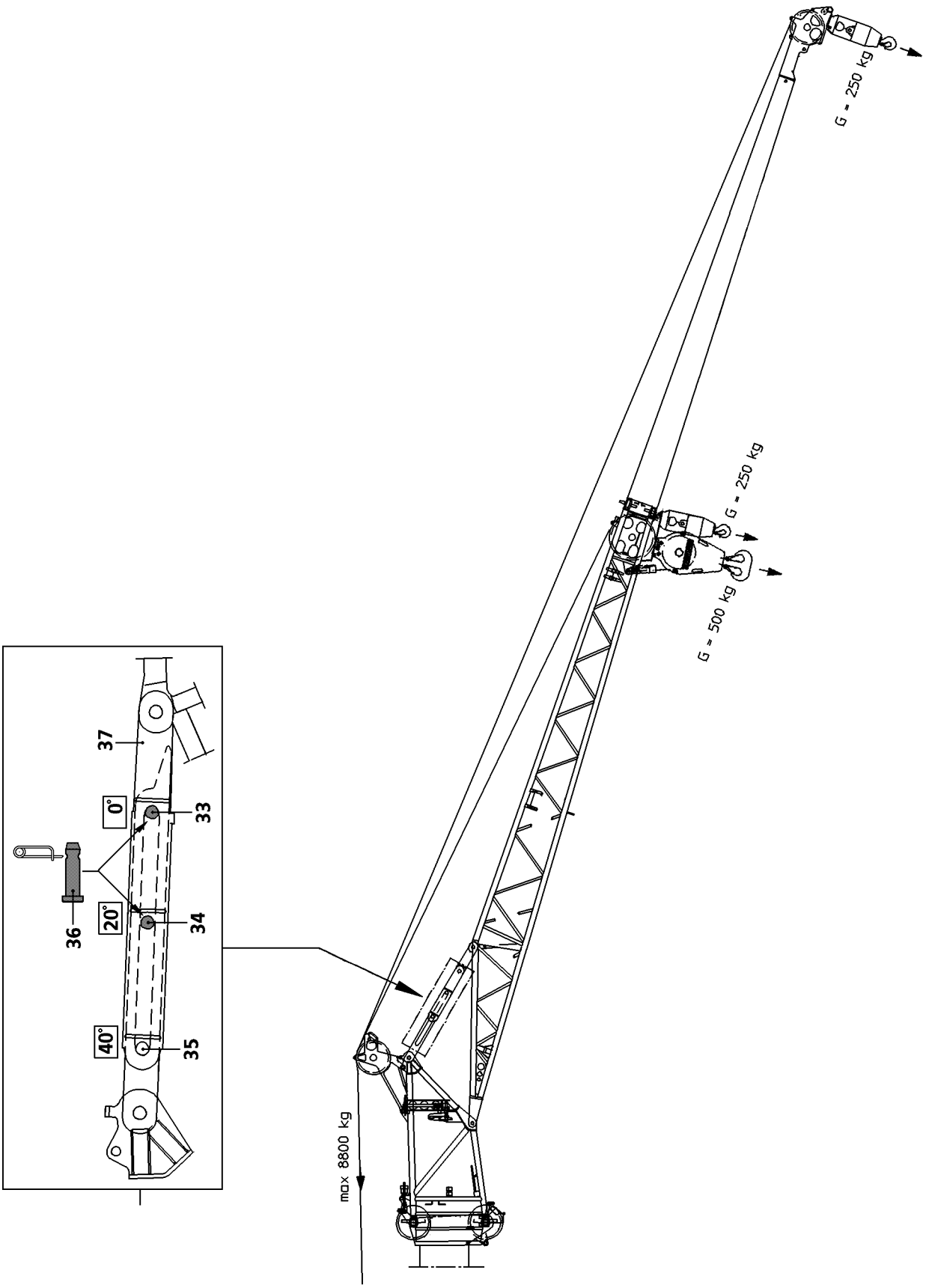

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Fig.194442

4.3 Changing the folding jib with hook block or load hook

For a single folding jib the changing can be done with a 1–pulley (G= 450 kg) or a 3–pulley hook block (G= 500 kg) or with a load hook (G= 450 kg).

For a dual folding jib, the changing may only be done with a load hook (G= 450 kg).

CAUTION
Damage to load hook!
Changing with a load hook is **not** possible for a rope wedge socket „with a pulley“!
▶ Use a rope wedge socket „without a pulley“!

4.3.1 Preparatory work

▶ Disassemble the hoist limit switch weight with chain.
▶ Bypass „the hoist top shut-off“ on the LICCON.

CAUTION
Danger of damage to folding jib and hoist rope!
If the telescopic boom is telescoped out or luffed down while the hook block/load hook is at the end position of the folding jib, the hoist rope and the folding jib can be damaged.
▶ Do not telescope out or luff down the telescopic boom with the hook block/load hook at the end position of the folding jib!

▶ By **delicately moving** the corresponding master switch, move the hook block or the load hook carefully to the stop position and tension the hoist gear (maximum permissible rope tension 8800 kg).
▶ End the bypassing „the hoist up shut-off“.

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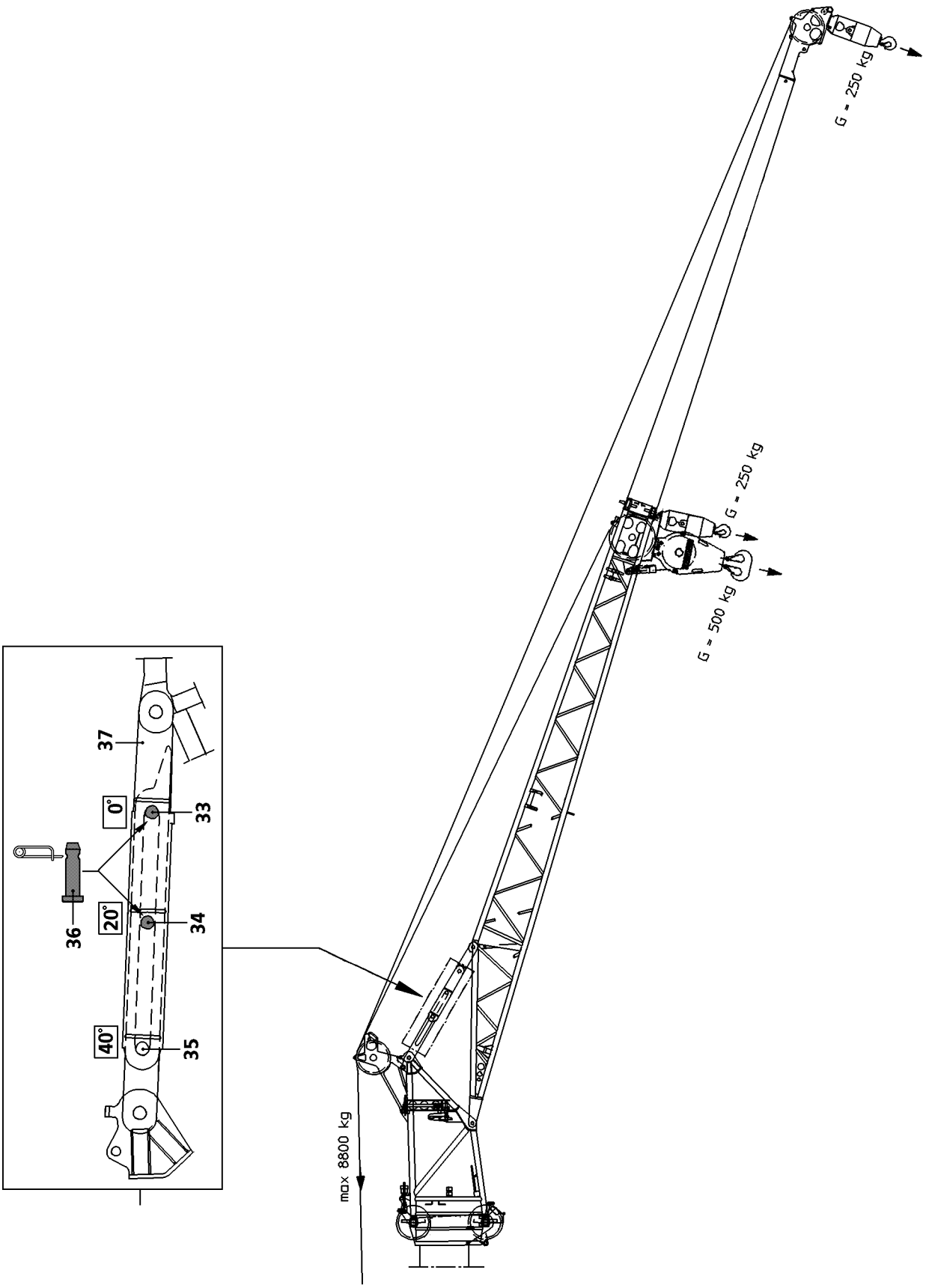

LWE/LTR 1100-005/17505-03-02/en

Fig.194442

4.3.2 Changing angle with hook block or load hook

You can operate the folding jib at three different angles. The required angle is set using the pin **36**. In the „base setting“, immediately after assembling the folding jib, the folding jib is in the 0° position.

DANGER
Danger of fatal injury!
Danger of accident if folding jib is allowed to tilt suddenly „downwards“!
- ▶ Make sure that **before unpinning** the pin **36**, the folding jib is secured against falling down by the hook block or the load hook.
- ▶ Unpinning the retaining pins **35** at the 40° pinning holes is **forbidden**!

Angle setting 20°

- ▶ Release pin **36** and unpin from 0° hole **33**.
- ▶ Pin the pin **36** into 20° hole **34** and secure.

Angle setting 40°

- ▶ Release pin **36** and unpin from 0° hole **33**.
- ▶ Pin the pin **36** into pin store and secure.

Positioning the folding jib

Make sure that the pin **36** is properly pinned in and secured for the required angle setting.

- ▶ Spool out the hoist rope by carefully moving with the corresponding master switch and simultaneously luffing up the telescopic boom.

Result:

– The lug **37** lies against the respective pin in the selected angular setting.
– The folding jib is held by the respective pins.

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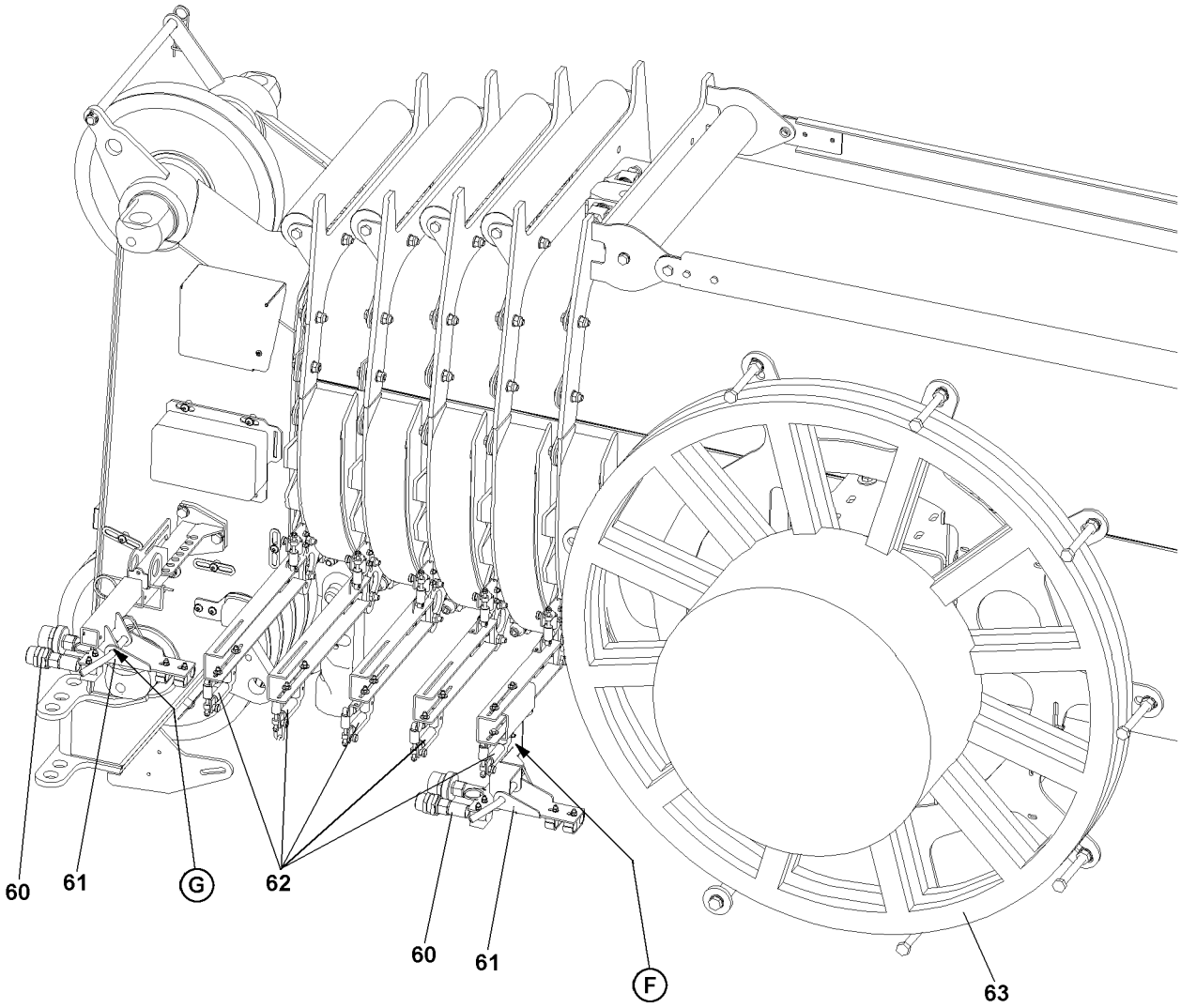

LWE/LTR 1100-005/17505-03-02/en

Fig.197047

5 Hydraulic connections

5.1 Establishing the hydraulic connections

A hydraulic connection to the folding jib only needs to be made if the folding jib is hydraulic (TNZK operation). Hydraulic lines cannot be incorrectly connected due to the different diameters of the hydraulic connections.

For operation with hydraulic folding jib:

▶ Make hydraulic connections to the hose couplings **60** at point **G**.

After operation with hydraulic folding jib:

▶ Protect connections from contamination.

5.2 Installing hose couplings in operating or neutral position

The hydraulic supply to the folding jib comes from the hose reel **63** on the telescopic boom. During longer periods of telescopic boom operation the console **61** should be installed with the hose couplings **60** in neutral position point **F**. This prevents unnecessary hydraulic hose winding and unwinding.

CAUTION
Danger of accident if hydraulic hoses snap back!
The hydraulic hoses are under spring tension. If the removed console **61** is released, it snaps back against the hose drum **63** due to the spring force. This can cause injury to assembly personnel or damage the hose drum **63**.

▶ Do not allow the removed console **61** to snap back!
▶ Hold the removed console **61** and then reinstall!

5.2.1 Installing hose couplings in operating position

▶ Remove console **61** with hose couplings **60** at point **F**.
▶ Place hydraulic hoses in the guides **62**.
▶ Properly install the console **61** with hose couplings **60** at point **G**.
▶ Secure hydraulic hoses in the guides **62**.

5.2.2 Installing hose couplings in neutral position

▶ Release hydraulic hoses from the guides **62**.
▶ Remove console **61** with hose couplings **60** at point **G**.
▶ Remove hydraulic hoses from the guides **62**.
▶ Properly install the console **61** with hose couplings **60** at point **F**.

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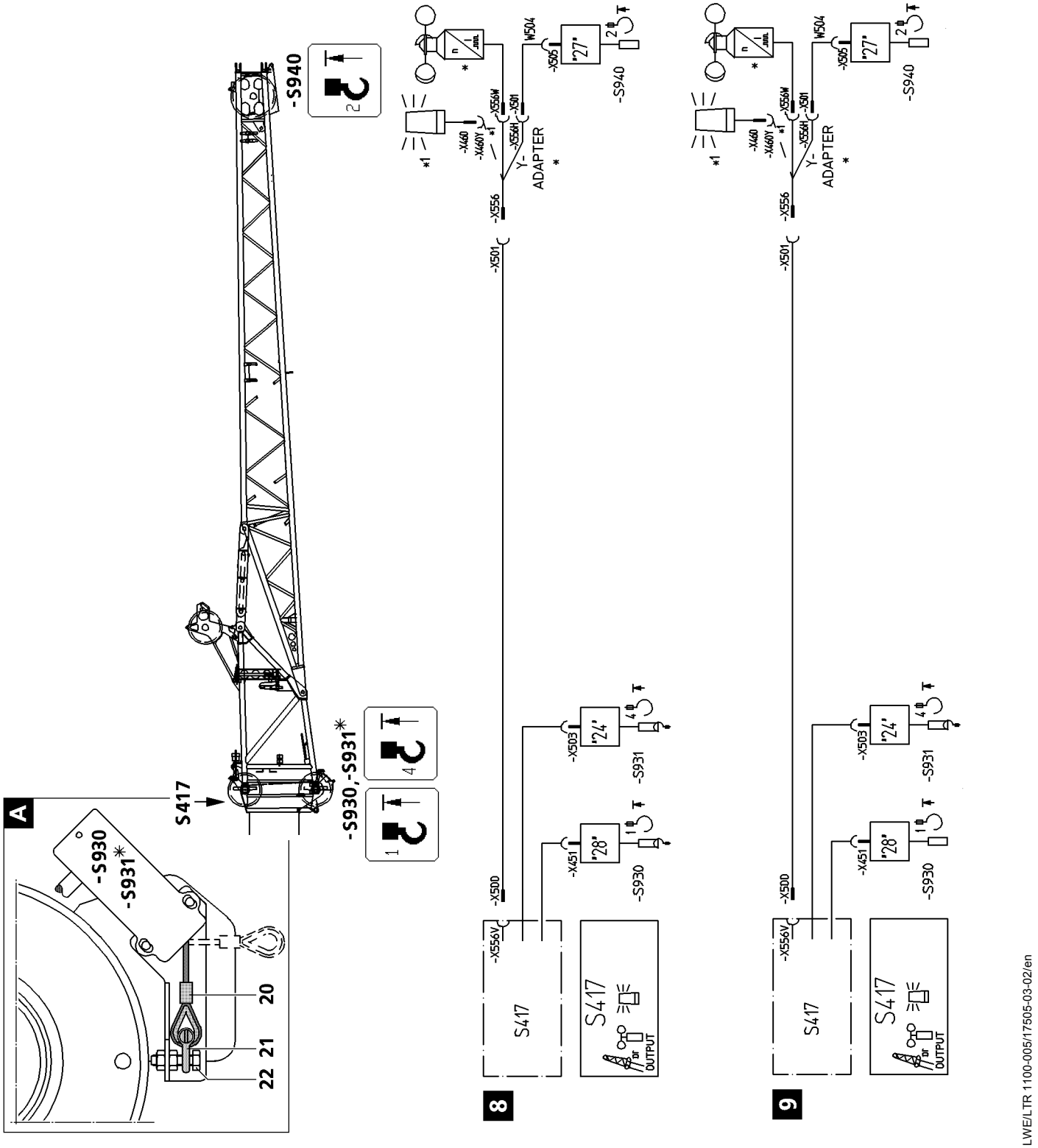

Fig.194018

6 Electrical connections

6.1 Mechanically operating hoist limit switch, see illustration A

If „dual hook mode“ is not being used during folding jib operation, the hoist limit switch **-S930/-S931** that is not required must be operated mechanically.

- ▶ Remove the hoist limit switch weight and chain.
- ▶ Pull the hoist limit switch rope **20** and attach to the fixed point **22** with the shackle **21**.

6.2 Electrical connections on the single folding jib

6.2.1 Single hook operation, see illustration 8

CAUTION
Danger of equipment damage!
- ▶ Only the hoist limit switch **S940** at the single folding jib is active.

- ▶ Actuate the hoist limit switch **-S930** mechanically.
- ▶ Actuate the hoist limit switch***** **-S931** mechanically.
- ▶ Insert the cable plug **-X500** into the socket **-X556V**.
- ▶ Insert the adapter **-X556** into the socket **-X501**.
- ▶ Insert the hoist limit switch **-S940** with the cable plug **-X501** into the socket **-X556H**.
- ▶ Insert the wind speed sensor***** with the cable plug **-X556W** into the socket **-X556**.
- ▶ Insert the flashing beacon***** with the cable plug **-X460** into the socket **-X460Y**.

6.2.2 Dual hook operation, see illustration 9

CAUTION
Danger of equipment damage!
- ▶ The hoist limit switch **S930** at the telescopic boom and the hoist limit switch **S940** at the single folding jib are active!

- ▶ Actuate the hoist limit switch***** **-S931** mechanically.
- ▶ Insert the cable plug **-X500** into the socket **-X556V**.
- ▶ Insert the adapter **-X556** into the socket **-X501**.
- ▶ Insert the hoist limit switch **-S940** with the cable plug **-X501** into the socket **-X556H**.
- ▶ Insert the wind speed sensor***** with the cable plug **-X556W** into the socket **-X556**.
- ▶ Insert the flashing beacon***** with the cable plug **-X460** into the socket **-X460Y**.

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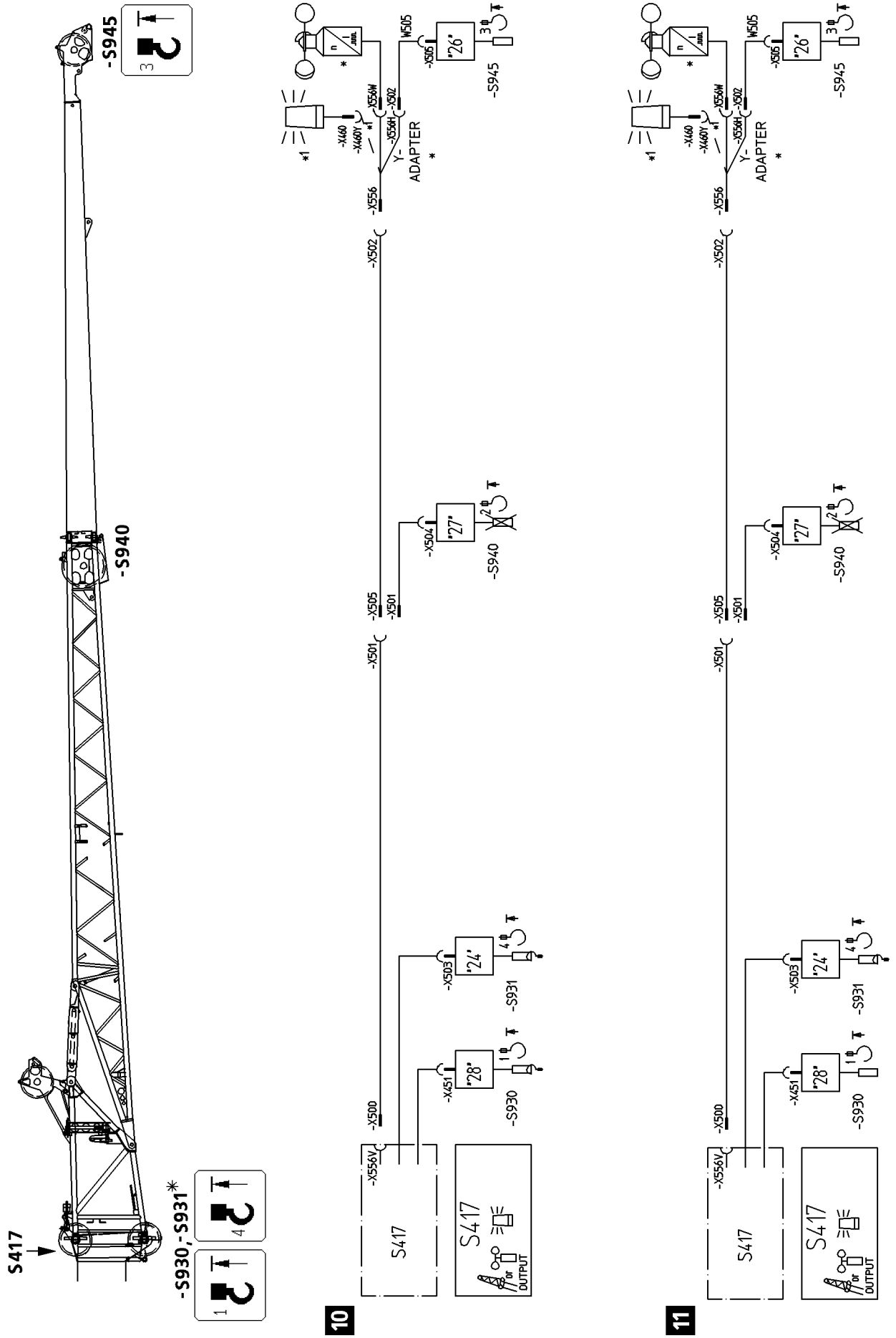

Fig.194019

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6.3 Electrical connections on the dual folding jib

6.3.1 Single hook operation, see illustration 10

CAUTION
Danger of equipment damage!
- ▶ Only the hoist limit switch **S945** at the dual folding jib is active. The hoist limit switch **S940** on the single folding jib is unplugged.

- ▶ Actuate the hoist limit switch **-S930** mechanically.
- ▶ Actuate the hoist limit switch***** **-S931** mechanically.
- ▶ Insert the cable plug **-X500** into the socket **-X556V**.
- ▶ Insert the cable plug **-X505** into the socket **-X501**.
- ▶ Insert the adapter **-X556** into the socket **-X502**.
- ▶ Insert the hoist limit switch **-S945** with the cable plug **-X502** into the socket **-X556H**.
- ▶ Insert the wind speed sensor***** with the cable plug **-X556W** into the socket **-X556**.
- ▶ Insert the flashing beacon***** with the cable plug **-X460** into the socket **-X460Y**.

6.3.2 Dual hook operation, see illustration 11

CAUTION
Danger of equipment damage!
- ▶ The hoist limit switch **S930** at the telescopic boom and the hoist limit switch **S945** at the dual folding jib are active! The hoist limit switch **S940** on the single folding jib is unplugged.

- ▶ Actuate the hoist limit switch***** **-S931** mechanically.
- ▶ Insert the cable plug **-X500** into the socket **-X556V**.
- ▶ Insert the cable plug **-X505** into the socket **-X501**.
- ▶ Insert the adapter **-X556** into the socket **-X502**.
- ▶ Insert the hoist limit switch **-S945** with the cable plug **-X502** into the socket **-X556H**.
- ▶ Insert the wind speed sensor***** with the cable plug **-X556W** into the socket **-X556**.
- ▶ Insert the flashing beacon***** with the cable plug **-X460** into the socket **-X460Y**.

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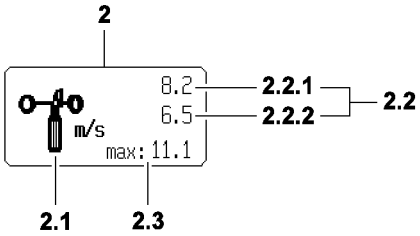

Fig.197637

6.4 Function check

Ensure that the following prerequisites are met:
- all electrical connections have been made
- the LICCON computer system is running

6.4.1 Wind speed sensors

Check movement and operation by manually operating the wind sensor at the „Wind speed“ **2.2** symbol element.

CAUTION
Danger of equipment damage!
▶ Re-check the operation of the wind sensor after every attachment.

6.4.2 Hoist limit switches

Manually operate all active hoist limit switches - the relevant „Hoist top“ symbol element must appear on the LICCON monitor. The hoist winch must switch off.

Note
▶ When replacing or changing the hoist limit switch (HES), the relevant HES must have the correct bus address and the correct software version in order to be detected again by the bus system (LSB).

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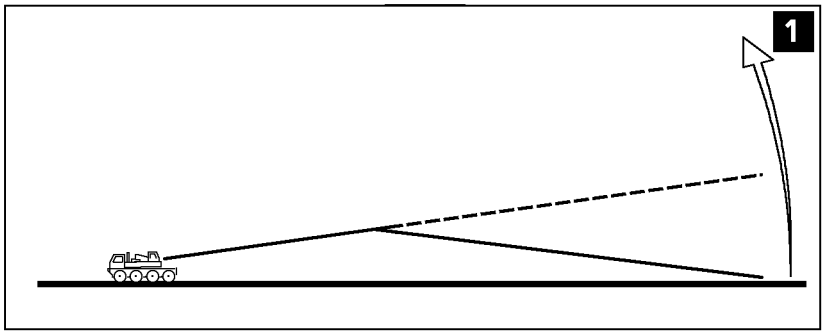

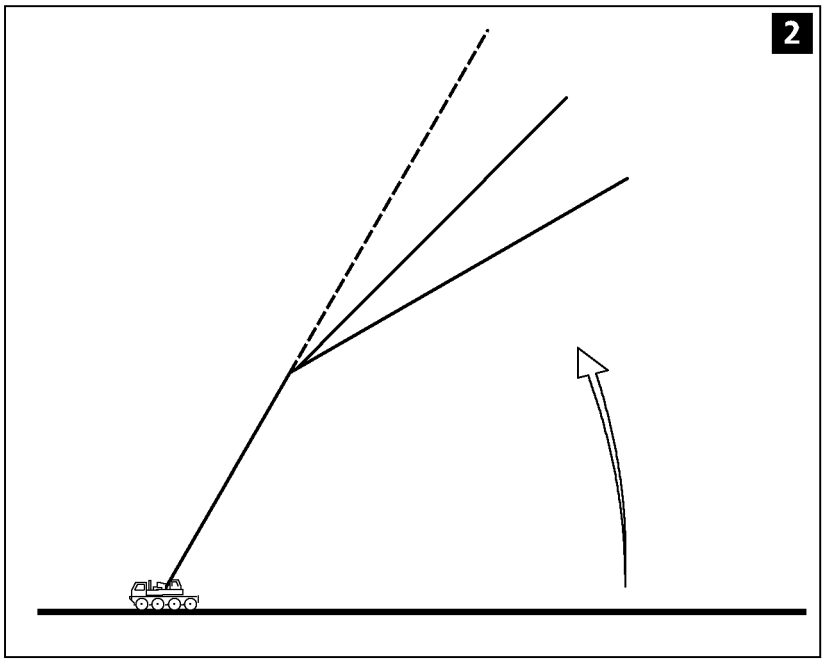

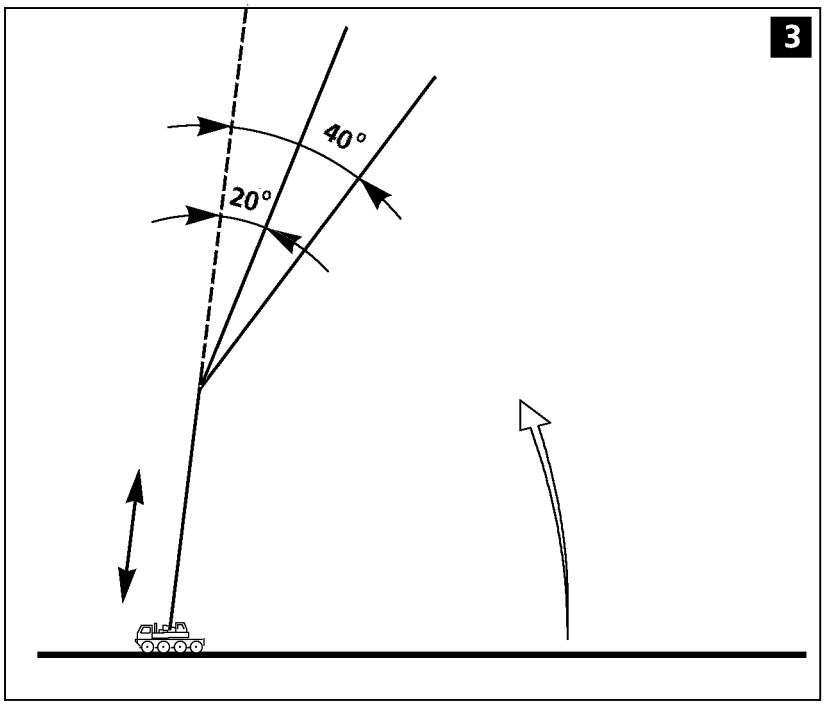

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Fig.185908

7 Erection

7.1 Preparatory work

Ensure that the following prerequisites are met:
- the crane is aligned in horizontal direction
- the counterweight has been attached to the turntable according to the load chart
- the central ballast is attached to the crane chassis in accordance with the load chart specifications
- the telescopic boom is fully telescoped in
- the folding jib has been installed according to the load chart and the operating manual
- all limit switches are correctly installed and fully functioning
- all pin connections have been secured
- the hoist rope has been correctly placed in the rope pulleys and prevented from jumping out with the rope retaining pins
- there are no loose parts on the telescopic boom and the folding jib
- the telescopic boom, the folding jib and its components (limit switches, airplane warning light, wind speed sensor, etc.) must be free of snow and ice in the winter

DANGER
Risk of accident!
Incorrectly fitted or non-operational limit switches and falling parts (pins, spring-loaded safety pins, ice etc.) can cause injuries!
▶ Install all limit switches, pins and spring-loaded pins properly.

▶ Check if all prerequisites are met.

7.2 Erection procedure

DANGER
Danger of fatal injury!
The loads listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook! If this regulation is not observed, the crane can topple over.
▶ Compare and check the settings on the LICCON computer system with the actual set up condition!

For adjustment of the LICCON overload protection, refer to chapter 4.02.

▶ Set the LICCON overload protection according to the required set up condition and confirm.
▶ Luff the telescopic boom with installed folding jib up until the release is issued by the LICCON.
▶ Telescope the telescopic boom out to values specified in the load chart.

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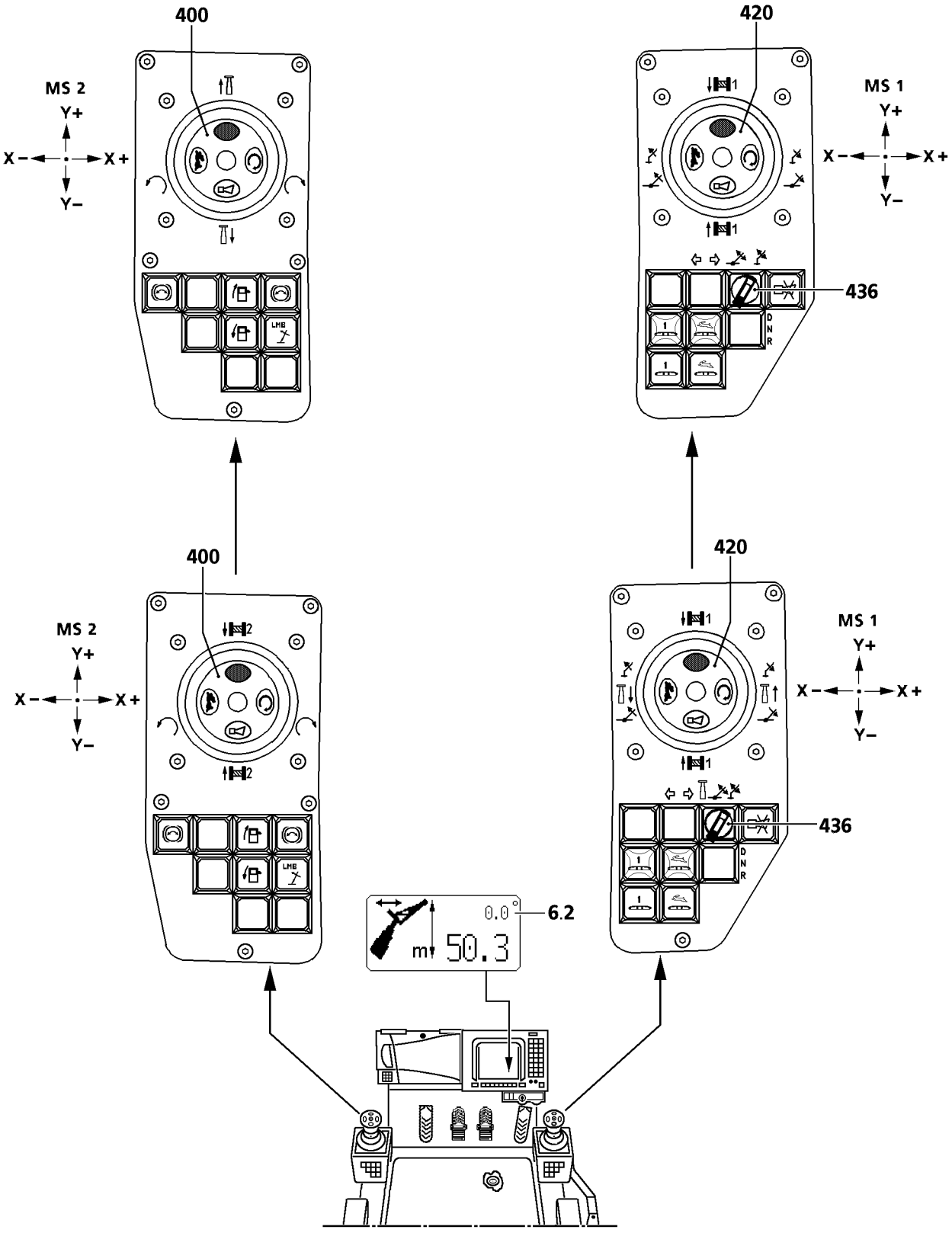

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Fig.198648

8 Adjusting the folding jib angle with a hydraulic folding jib

The adjustment range of the folding jib lies between 0° and 40° to the telescopic boom. It is possible to luff the hydraulically adjustable folding jib under load.

DANGER
Crane can topple over!
The crane can topple over if the maximum load carrying capacity of the crane is exceeded.
- ▶ The data in the load charts must be strictly adhered to!
- ▶ The load charts for the hydraulically adjustable folding jib are only valid for angles of 0°, 20° and 40°!
- ▶ For the adjustment angles between the nominal angles of 0°, 20° and 40°, the maximum load carrying capacity will be determined by the LICCON computer system shown on the LICCON monitor.

Ensure that the following prerequisites are met:
- the hydraulic connections have been established
- the electrical connections have been established
- the engine is running
- operating mode **TNZK** has been set and confirmed on the LICCON computer system

8.1 Angle display for folding jib

The folding jib angle **6.2** is shown on the LICCON monitor as the relative angle between the telescopic boom pulley head and the folding jib.

8.2 Luffing with hydraulic folding jib

Ensure that the following preconditions are met:
- the rotary switch **436** is set to position right „luff folding jib“

If the folding jib is to be luffed down:
- ▶ Move master switch 1 **420** to the right in direction X+.

Result:

- The hydraulic folding jib is luffed down.

If the folding jib is to be luffed up:
- ▶ Move master switch 1 **420** to the left in direction X-.

Result:

- The hydraulic folding jib is luffed up.

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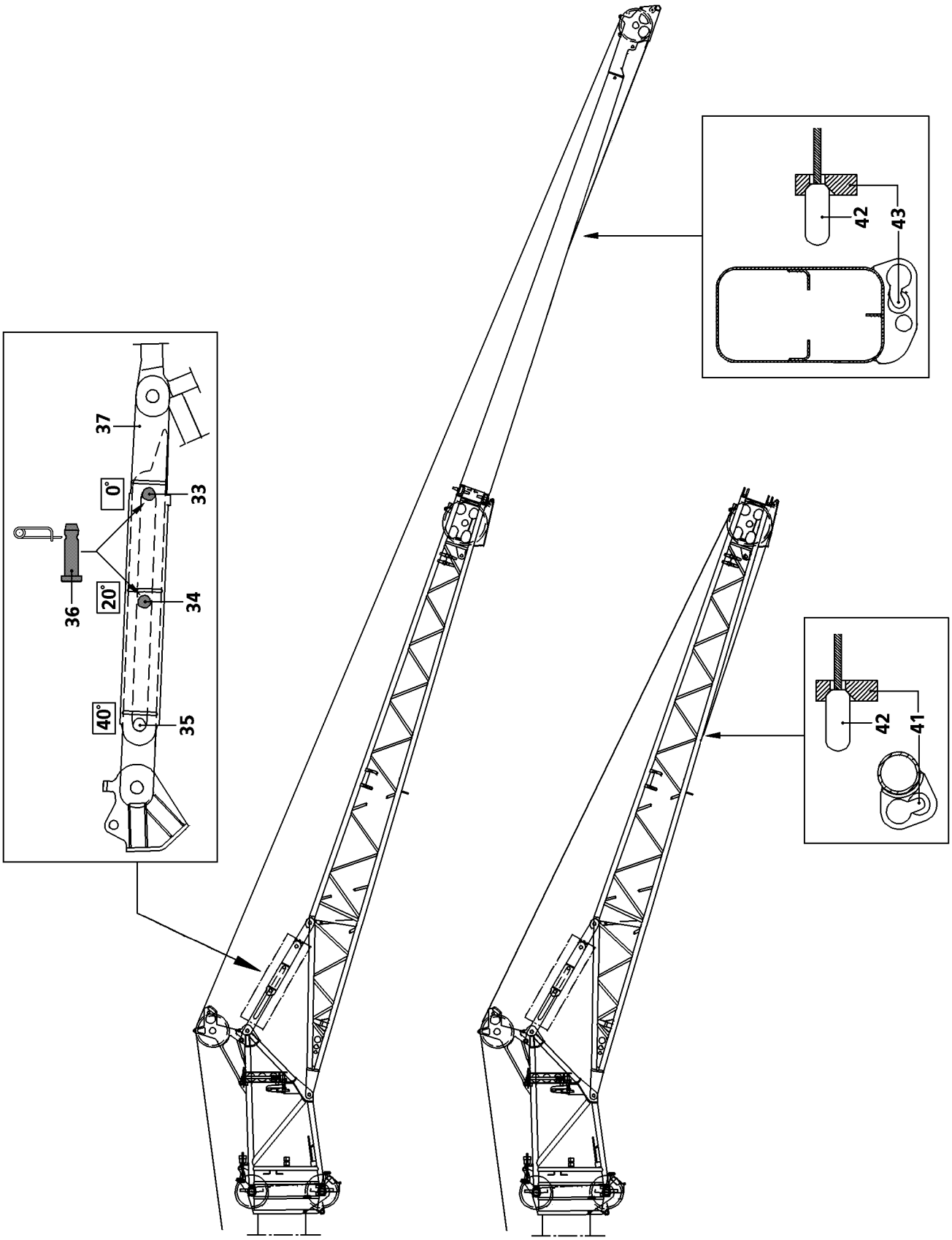

Fig.194017

9 Changing the mechanical folding jib from 20° or 40° to 0°

There are 3 ways of changing the mechanical folding jib to 0°:
1. Changing the folding jib with the hoist rope
2. Changing the folding jib by supporting
3. Changing the folding jib with hook block or load hook

Ensure that the following prerequisites are met:
- the crane is aligned in horizontal direction
- the telescopic boom is fully telescoped in
- the folding jib is attached at an angle of 20° or 40°
- the telescopic boom has been swung to the rear or the side

9.1 Changing the folding jib with the hoist rope

9.1.1 Preparatory work

- ▶ Luff down the telescopic boom until the hook block can be unreeved on the head piece of the folding jib.
- ▶ Unreeve the hoist rope onto the hook block.
- ▶ Remove the hoist limit switch weight.

CAUTION
Danger of damage to folding jib and hoist rope!
If the telescopic boom is telescoped out or luffed down as long as the hoist rope is tightened on the fixed assembly point, the hoist rope and the folding jib can be damaged.
- ▶ Do not telescope out or luff down the telescopic boom with the hoist rope attached on the fixed assembly point!

For operations with dual folding jib:
- ▶ Insert the press fitting **42** into the fixed assembly point **43**.

or

During operation with single folding jib:
Insert the press fitting **42** into the fixed assembly point **41**.
- ▶ Tighten the hoist rope by **carefully moving** the appropriate manual control lever.

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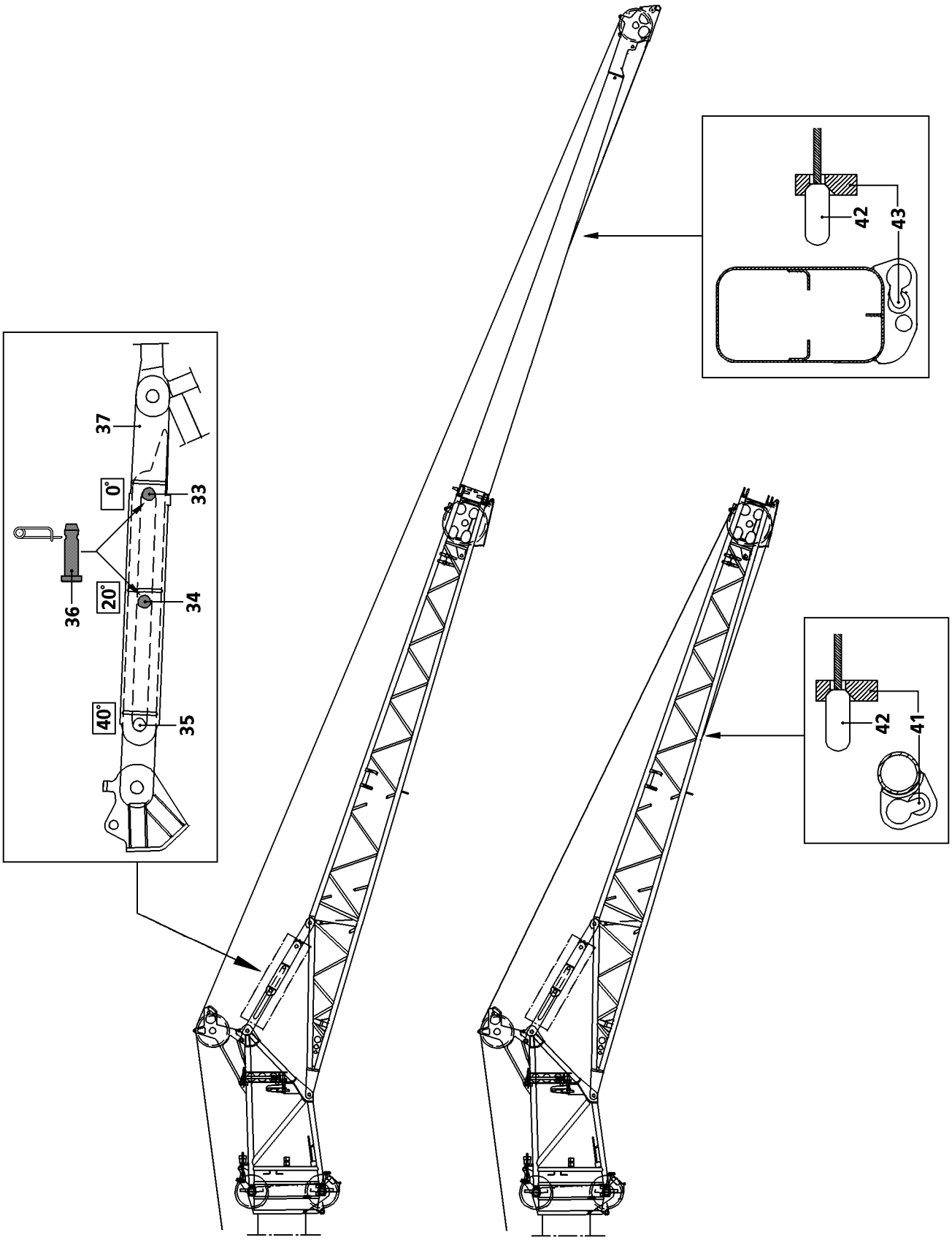

Fig.194017

9.1.2 Changing the angle with hoist rope

CAUTION
Danger of damage to the folding jib and the hoist rope!
- ▶ As soon as the folding jib has reached the 0° position (stop at lug), the „lifting“ and „luffing“ movement must be stopped immediately.

- ▶ Luff down telescopic boom and simultaneously spool up the hoist rope so that the articulated piece of the folding jib is always kept at the same height, approx. 1.0 m - 1.5 m , above the ground until the 0° position (stop on pull bracket) has been reached.

DANGER
Danger of fatal injury!
Danger of accident if folding jib is allowed to tilt suddenly „downwards“!
- ▶ Ensure that **before unpinning** the pin **36**, the hoist rope is taut and that the folding jib is actually held in position by the hoist rope.
- ▶ **It is prohibited** to unpin the retaining pins **35** at the 40° pin holes.

- ▶ Release pins **36** and unpin from 20° hole **34 or** remove from the transport retainer.
- ▶ Pin the pin **36** into 0° hole **33** and secure.
- ▶ Disengage the hoist rope at the fixed assembly point.

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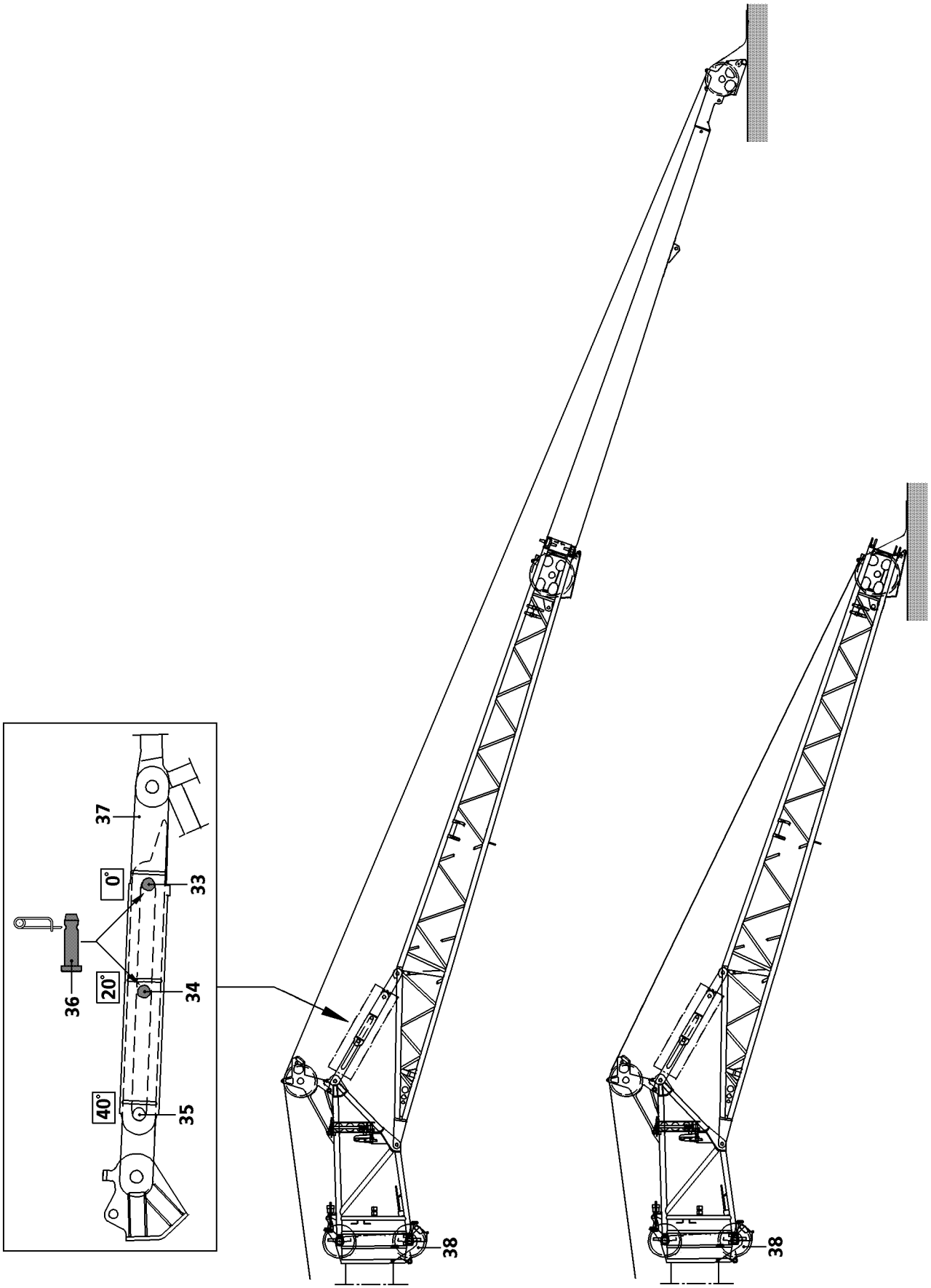

Fig.190763

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9.2 Changing the folding jib by supporting

- ▶ Luff the telescopic boom down until the hook block can be unreeved.
- ▶ Remove the lock and the hoist limit switch weight.

CAUTION
Danger of equipment damage!
- ▶ When laying down the folding jib, make sure that the folding jib is **not** laid on the rope pulley. Otherwise it will be damaged. Also make sure that the hoist rope is **not** damaged.
- ▶ Make sure that the ground is firm and even, so that the folding jib does not sink into the ground when it is lowered.

- ▶ Completely luff down the telescopic boom until the folding jib lies on the ground.
- ▶ Continue to luff down the telescopic boom carefully until the 0° position (stop at lug) is reached.

DANGER
Danger of fatal injury!
Danger of accident if folding jib is allowed to tilt suddenly „downwards“!
- ▶ Make sure that **before unpinning** the pin **36**, the folding jib is lying on the ground or on a proper and secure support.
- ▶ **It is prohibited** to unpin the retaining pins **35** at the 40° pin holes.

- ▶ Release pins **36** and unpin from 20° hole **34 or** remove from the transportation retainer.
- ▶ Pin the pin **36** into 0° hole **33** and secure.

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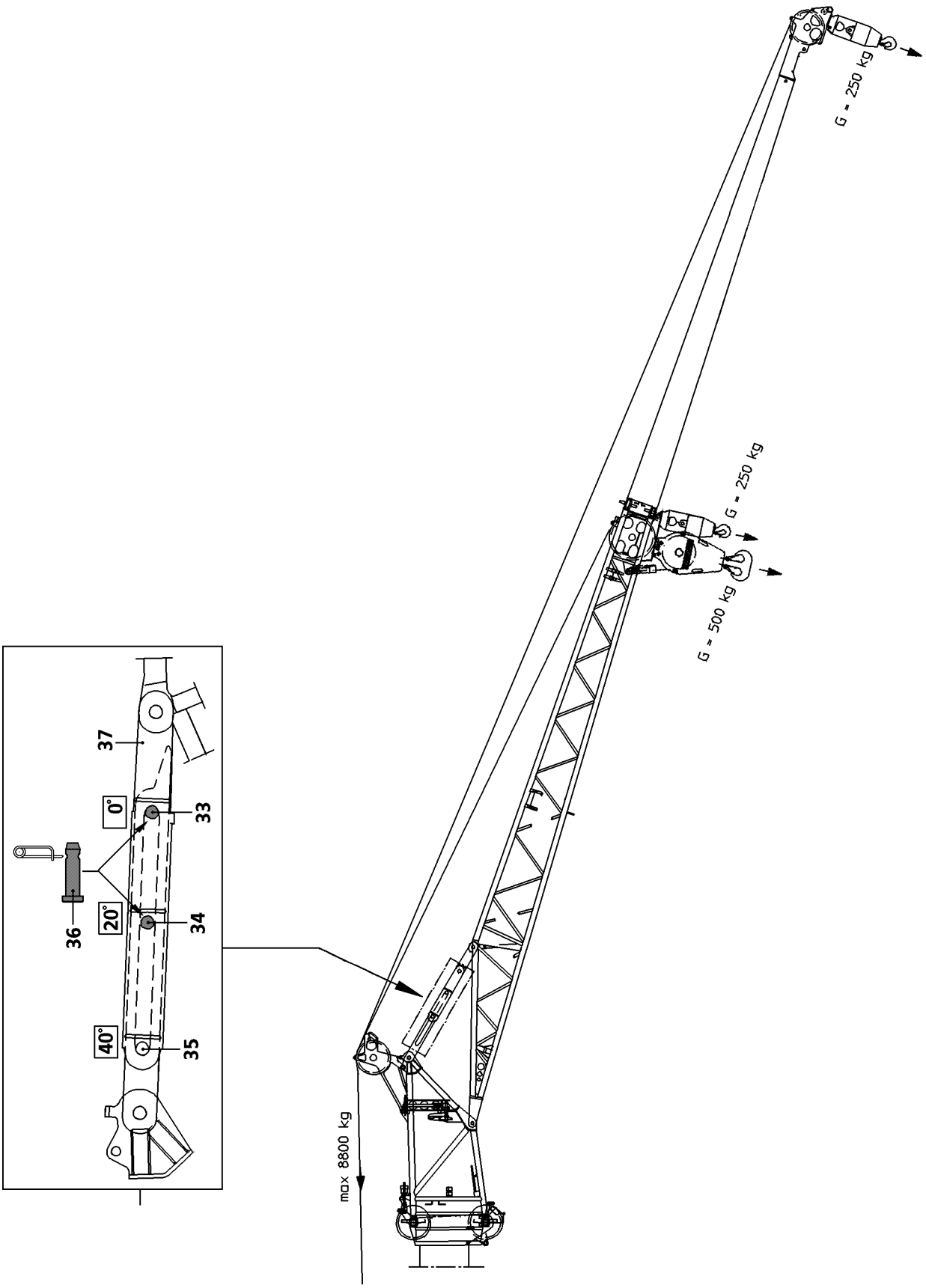

Fig.194442

9.3 Changing the folding jib with hook block or load hook

For a single folding jib the changing can be done with a 1–pulley (G= 450 kg) or a 3–pulley hook block (G= 500 kg) or with a load hook (G= 450 kg).

For a dual folding jib, the changing may only be done with a load hook (G= 450 kg).

CAUTION
Damage to load hook!
Changing with a load hook is **not** possible for a rope wedge socket „with a pulley“!
▶ Use a rope wedge socket „without a pulley“!

▶ Disassemble the hoist limit switch weight with chain.
▶ Bypass „the hoist top shut-off“ on the LICCON.

CAUTION
Danger of damage to folding jib and hoist rope!
If the telescopic boom is telescoped out or luffed down while the hook block/load hook is at the end position of the folding jib, the hoist rope and the folding jib can be damaged.
▶ Do not telescope out or luff down the telescopic boom with the hook block/load hook at the end position of the folding jib!

▶ By **delicately moving** the corresponding master switch, move the hook block or the load hook carefully to the stop position and tension the hoist gear (maximum permissible rope tension 8800 kg).
▶ End the bypassing „the hoist up shut-off“.

CAUTION
Danger of damage to the folding jib and the hoist rope!
▶ As soon as the folding jib has reached the 0° position (stop at lug), the „lifting“ and „luffing“ movement must be stopped immediately.

▶ Luff down telescopic boom and simultaneously spool up the hoist rope so that the articulated piece of the folding jib is always kept at the same height, approx. 1.0 m - 1.5 m , above the ground until the 0° position (stop on pull bracket) has been reached.

DANGER
Danger of fatal injury!
Danger of accident if folding jib is allowed to tilt suddenly „downwards“!
▶ Make sure that **before unpinning** the pin **36**, the folding jib is secured against falling down by the hook block or the load hook.
▶ Unpinning the retaining pins **35** at the 40° pinning holes is **forbidden**!

▶ Release pins **36** and unpin from 20° hole **34 or** remove from the transport retainer.
▶ Pin the pin **36** into 0° hole **33** and secure.

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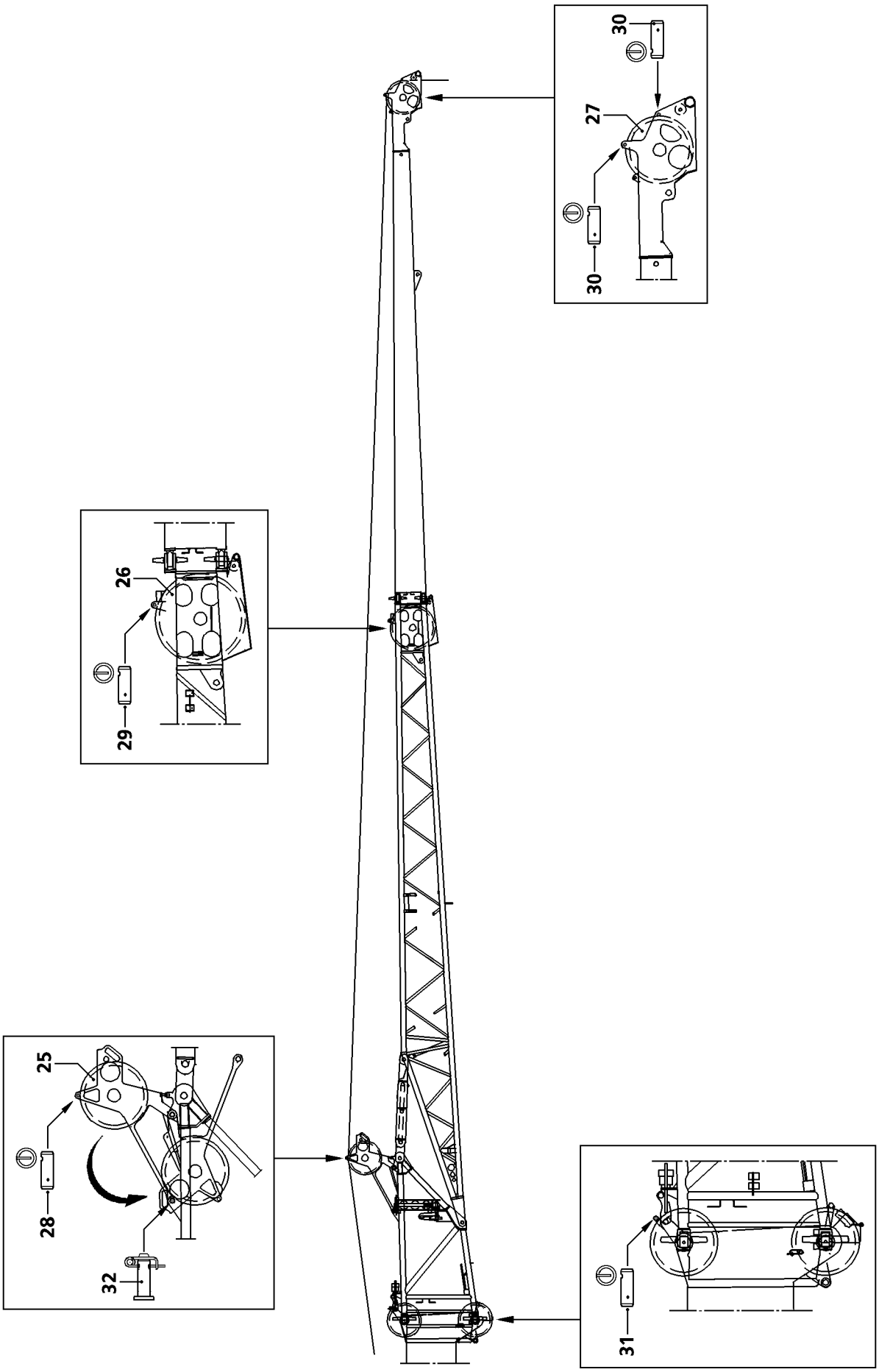

Fig.190766

10 Reeving out the hoist rope

DANGER
Risk of falling from folding jib!
When stepping on the folding jib, for example to reeve the hoist rope in or out, there is a risk of slipping and falling from the folding jib.
▶ Do not step on the folding jib!

Ensure that the following prerequisites are met:

– the telescopic boom is fully telescoped in
– the hook block / load hook has been placed on the ground
– the hoist rope is detached to the rope fixed point
– the hoist limit switch weight and the chain have been removed

10.1 Pinning/unpinning the rope retaining pins

▶ Release and unpin the rope retaining pin **28** and rope retaining pin **29**.

For operations with dual folding jib:
▶ Release and unpin rope retaining pin **30**.
▶ Spool up the hoist rope.
▶ Repin the rope retaining pin **28**, rope retaining pin **29** and rope retaining pin **30** and secure with linch pins.

10.2 Swinging the rope guide pulley into transport position

▶ Release and unpin the pins **32**.
▶ Swing the rope guide pulley **25** into transport position.
▶ Pin rope guide pulley **25** with pin **32** and secure.

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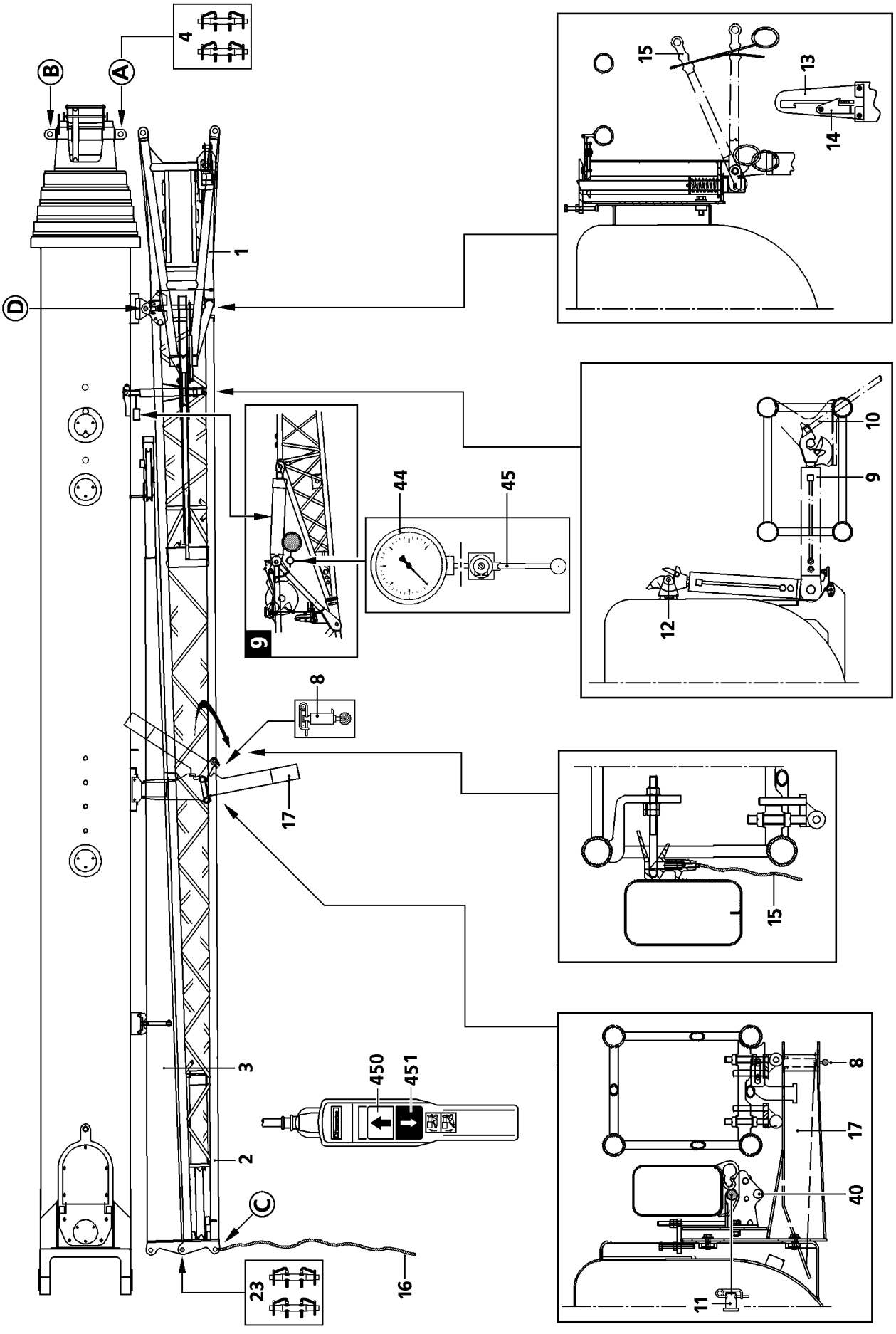

Fig.195367

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11 Removing the folding jib

11.1 General

DANGER
Danger of fatal injuries due to falling folding jib!
The folding jib can fall down due to a disassembly error.
- ▶ Standing under the folding jib during the swing operation is prohibited!
- ▶ It is prohibited for anyone to remain in the swing range as well as the folding range of the folding jib!
- ▶ The folding jib must be secured by an auxiliary rope during the swing procedure!

DANGER
Danger of falling!
During assembly and disassembly, personnel must be secured with appropriate antifall guards to prevent them from falling. If this is not observed, personnel could fall and suffer life-threatening injuries.
- ▶ All assembly work from a height of 2 m must generally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane, etc.)! The height above which assembly/disassembly work must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- ▶ If work cannot be carried out using these aids or from the ground, the assembly personnel must be protected from falling using suitable means (such as safety belts)!
- ▶ Do not walk on the telescopic boom or folding jib!

Ensure that the following prerequisites are met:
- – the crane is aligned in horizontal direction
- – the counterweight has been attached to the turntable according to the load chart
- – the central ballast is attached to the crane chassis in accordance with the load chart specifications
- – the telescopic boom is fully telescoped in
- – the folding jib is in 0° position
- – the electrical/hydraulic connections on the folding jib have been released
- – the rope guide pulley has been folded from the operating position to the transport position
- – the telescopic boom has been luffed down to the rear or the side in the 0° position

DANGER
Danger of accident if the folding jib swings out by itself when it is unpinned!
The telescopic boom must be in 0° position, otherwise there is a risk of accidents if the folding jib swings out by itself when it is unpinned.
- ▶ Move the telescopic boom to 0° position.

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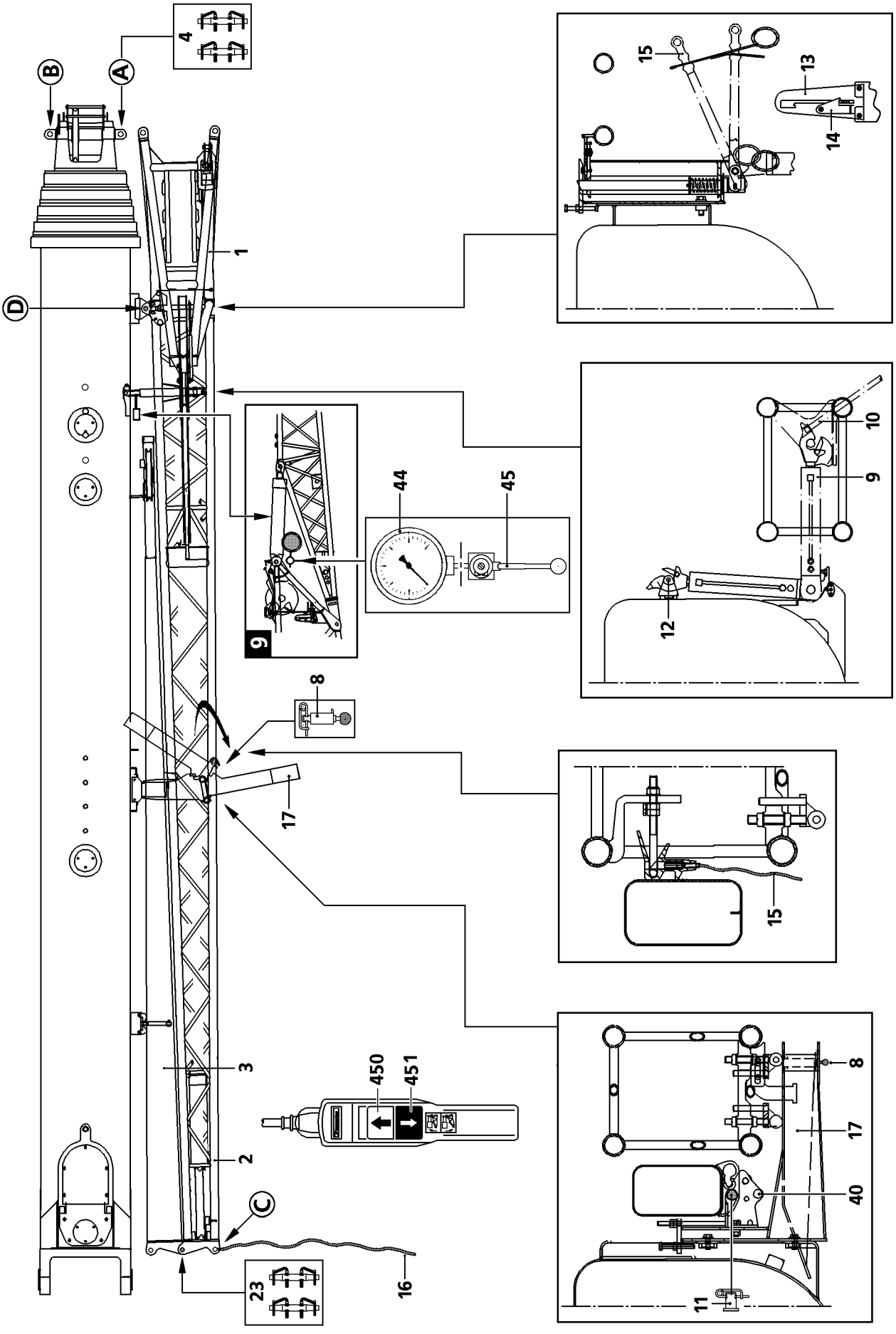

Fig.195367

LWE/LTR 1100-005/17505-03-02/en

11.2 Preparatory work before swinging in the hydraulic folding jibs

Before swinging the hydraulic folding jib* in, the folding jib must be fully luffed up and held on block for approximately 15 seconds. This causes the hydraulic reservoir to fill.

For operation with hydraulic folding jib:

▶ Luff up folding jib and move on block.

Result:

– The pressure gauge **44** must then show 200 to 250 bar.

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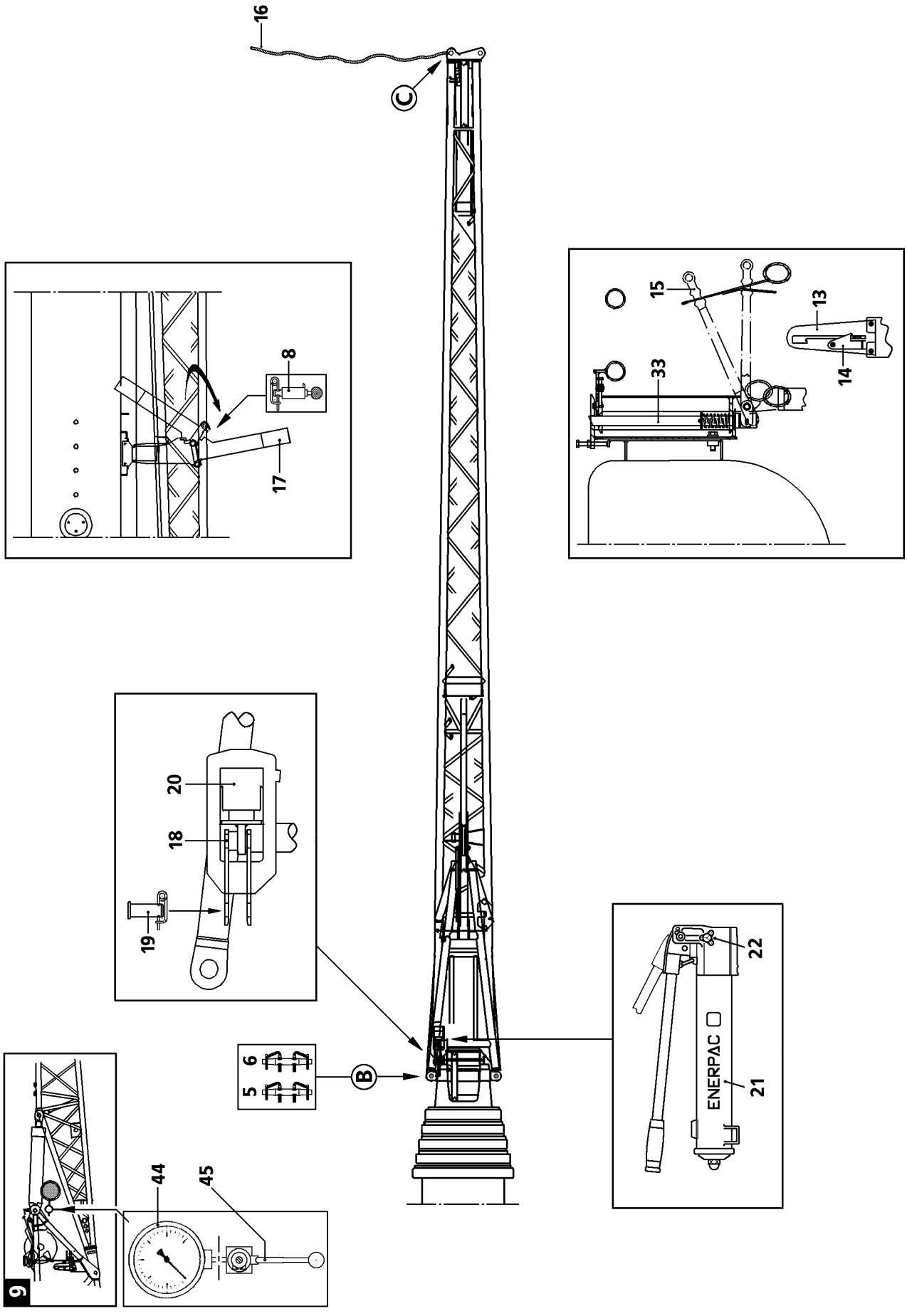

Fig.195373

11.3 Removing the single folding jib carried on the crane

▶ Disengage the lever **15** with the assembly rod from the link **13** and pull downward.
▶ Attach the auxiliary rope **16** at point **C**.

When swinging the folding jib support **17** in and out, ensure that the spring-loaded pin **8** is unlocked using one hand and that the folding jib support **17** is moved overhead with the other hand.

▶ Release and unpin the spring-loaded pin **8**.
▶ Swing out the folding jib support **17** until the spring-loaded pin **8** engages again.

In order to remove the pin at the top of the point **B**, the hydraulic/mechanical assembly aid **20** must be used.

▶ Close the knob **22** on the manual pump **21**.
▶ Extend the hydraulic cylinder of the assembly aid **20** by actuating the manual pump **21** until the pin **6** can be unpinned.
▶ Release and unpin the pin **6** on top.
▶ Open the rotary knob **22** at the manual pump **21**

Result:

– The hydraulic cylinder of the assembly aid **20** returns to the starting position.

▶ Unpin the pins **19** and insert into bore **18** and secure.

DANGER
The folding jib can swing out inadvertently!
When removing the pin **5**, the folding jib may swing out unintentionally.

In order to prevent the folding jib from swinging out by itself:
▶ Hold the folding jib with the auxiliary rope!
▶ Do not lean the ladder against the folding jib!

▶ Release the pin **5** on the bottom and unpin.

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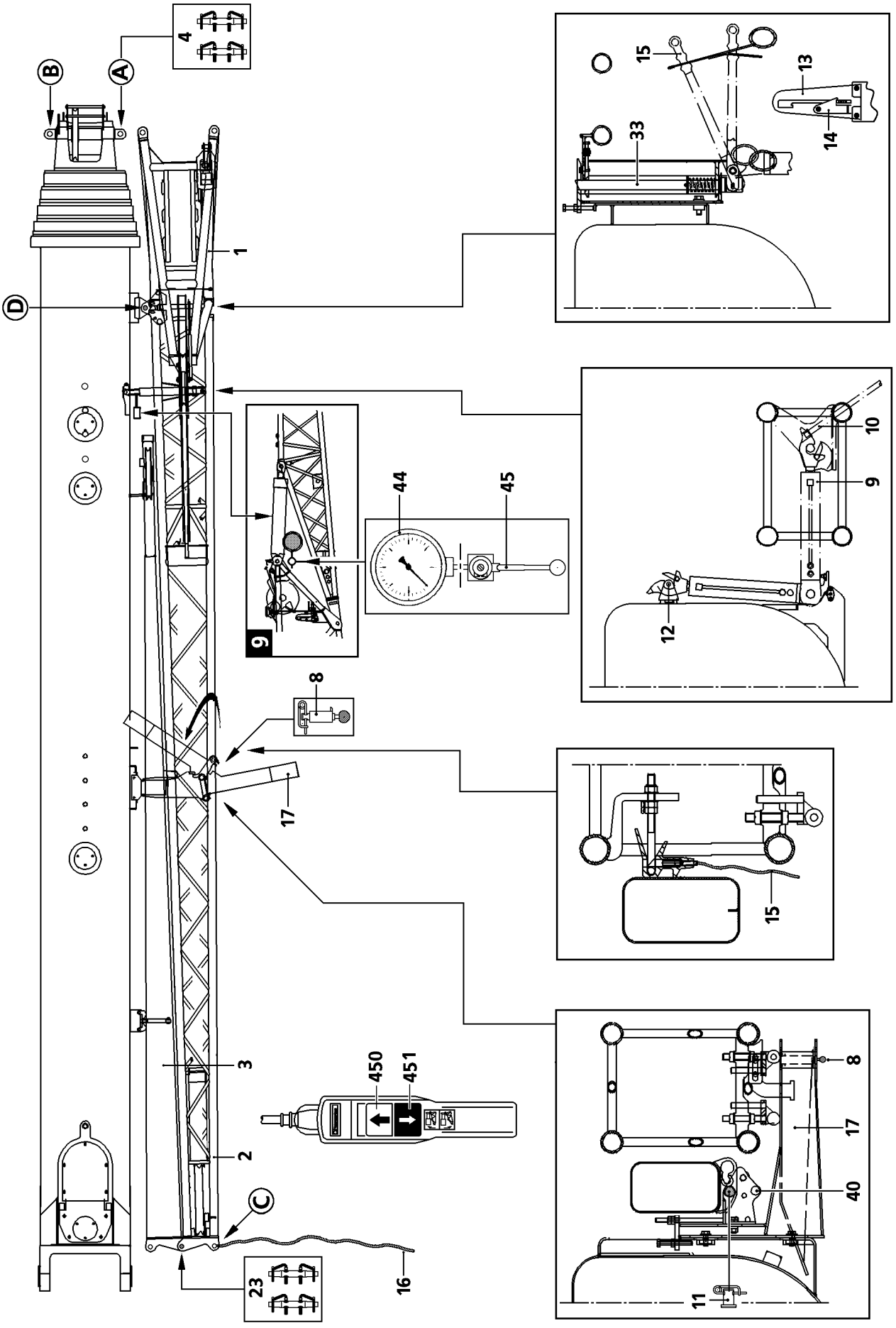

Fig.195368

LWE/LTR 1100-005/17505-03-02/en

DANGER
Danger of fatal injuries due to falling folding jib!
The folding jib can fall down due to a disassembly error.
- ▶ Standing under the folding jib during the swing operation is prohibited!
- ▶ It is prohibited for anyone to remain in the swing range as well as the folding range of the folding jib!

- ▶ Swing the folding jib back until the swing cylinder **9** is locked to the folding jib.
- ▶ Start the crane engine.
- ▶ Press button **450** and swing in the folding jib with the swing cylinder until the lock **33** engages audibly.
- ▶ Check whether the lock **33** has engaged properly.

DANGER
Danger of fatal injury when unpinning the pins **4**!
If the pins **4** are unpinned before the lock **33** has engaged, then the folding jib will fall down and possibly cause fatal injury to the installation personnel.
- ▶ The pins **4** may not be unpinned until the lock **33** has engaged and the manual lever **16** has been secured with the safety bracket **15**.

- ▶ Secure the manual lever **15** with the safety bracket **14**.
- ▶ Release the pin **4** at point **A**, unpin and insert into transport retainer.
- ▶ Press button **450** and swing the folding jib with swing cylinder in all the way.

Result:

– When the dual folding jib is being transported the articulated piece **2** is locked to the head piece **3**.

If a dual folding jib is carried along:
- ▶ Pin and secure pin **23**.

When swinging the folding jib support **17** in and out, make sure that the spring-loaded pin **8** is unlocked using one hand and that the folding jib support **17** is moved overhead with the other hand.

- ▶ Unpin the spring-loaded pin **8** and swing in the folding jib support **17** until the spring-loaded pin **8** engages.
- ▶ Secure the spring-loaded pin **8**.

If a hydraulic folding jib is carried along:
- ▶ Connect hydraulic line to hydraulic cylinder (illustration 9).
- ▶ Remove the auxiliary rope **16**.

Hydraulic folding jibs have an overflow tank attached to the hydraulic cylinder. The overflow tank must be emptied when it is full. Even if the folding jib is not transported on the crane.

For operation with hydraulic folding jib:
- ▶ Empty the overflow tank on the hydraulic cylinder.

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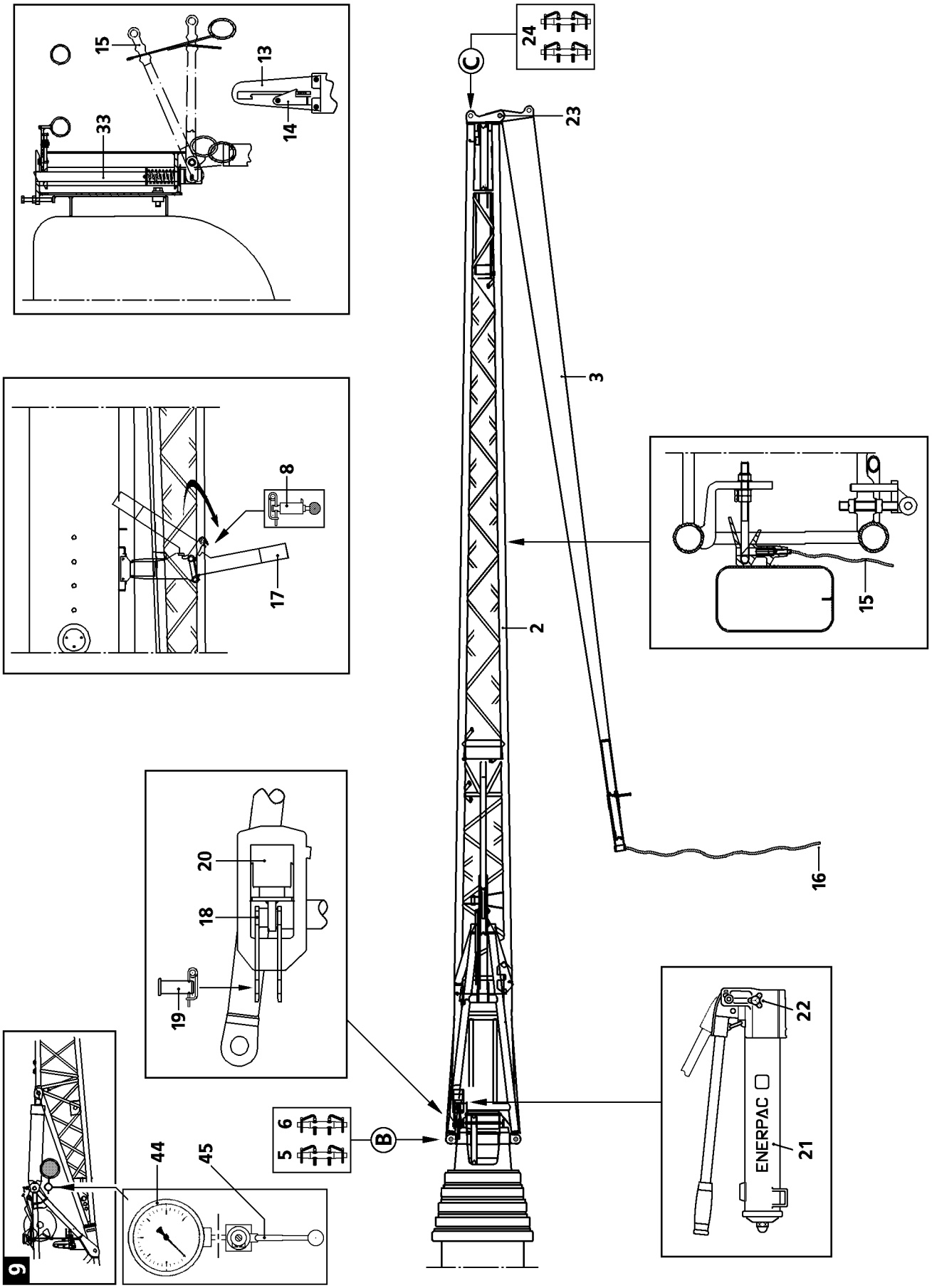

Fig.195369

11.4 Removing the dual folding jib carried on the crane

11.4.1 Disassembly of the head piece

▶ Attach the auxiliary rope **16** on the head piece.

DANGER
The folding jib can swing out inadvertently!
While unpinning the pins **24**, the folding jib may swing out involuntarily.

In order to prevent the folding jib from swinging out by itself:
▶ Hold the folding jib with the auxiliary rope!
▶ Do not lean the ladder against the head piece **3**!

▶ Release and unpin the pin **24**.

DANGER
Danger of fatal injuries due to falling folding jib!
The folding jib can fall down due to a disassembly error.
▶ Standing under the folding jib during the swing operation is prohibited!
▶ It is prohibited for anyone to remain in the swing range as well as the folding range of the folding jib!
▶ The pins **23** must remain pinned.

▶ Swing in the head piece **3** until the head piece **3** is locked to the articulated piece **2**.
▶ Check whether the head piece **3** and the articulated piece **2** are properly locked together.
▶ Remove the auxiliary rope **16** from the head piece **3** and attach on point **C**.
▶ Disengage the lever **15** with the assembly rod from the link **13** and pull downward.

When swinging the folding jib support **17** in and out, make sure that the spring-loaded pin **8** is unlocked using one hand and that the folding jib support **17** is moved overhead with the other hand.

▶ Release and unpin the spring-loaded pin **8**.
▶ Swing out the folding jib support **17** until the spring-loaded pin **8** engages again.

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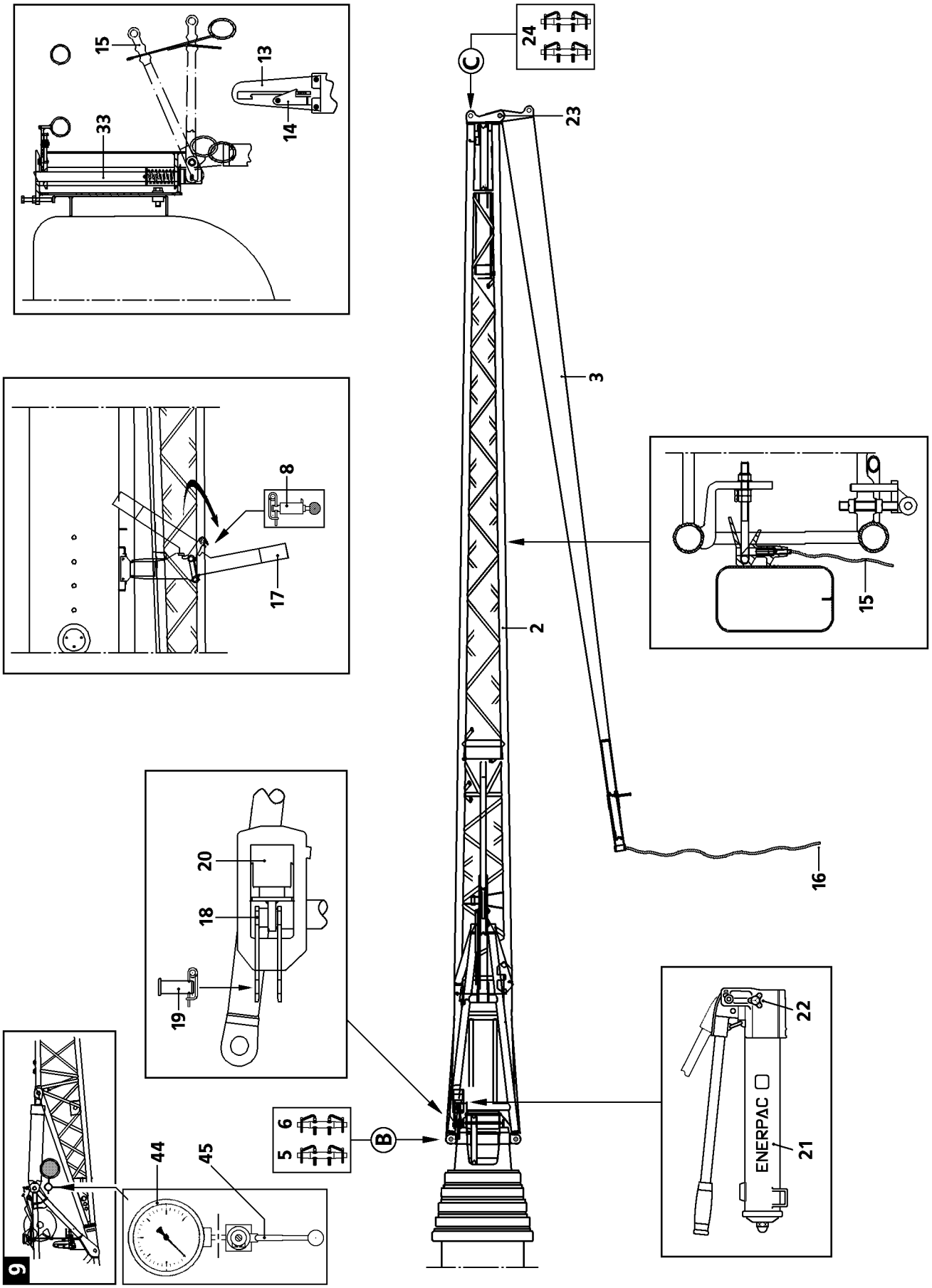

Fig.195369

11.4.2 Dismantling articulated piece

In order to remove the pin at the top of the point **B**, the hydraulic/mechanical assembly aid **20** must be used.

- ▶ Close the knob **22** on the manual pump **21**.
- ▶ Extend the hydraulic cylinder of the assembly aid **20** by actuating the manual pump **21** until the pin **6** can be unpinned.
- ▶ Release and unpin the pin **6** on top.
- ▶ Open the knob **22** on the manual pump **21**.

Result:

– The hydraulic cylinder of the assembly aid **20** returns to the starting position.

- ▶ Unpin the pins **19** and insert into bore **18** and secure.

DANGER
The folding jib can swing out inadvertently!
When removing the pin **5**, the folding jib may swing out unintentionally.

In order to prevent the folding jib from swinging out by itself:
- ▶ Hold the folding jib with the auxiliary rope!
- ▶ Do not lean the ladder against the folding jib!

- ▶ Release the pin **5** on the bottom and unpin.

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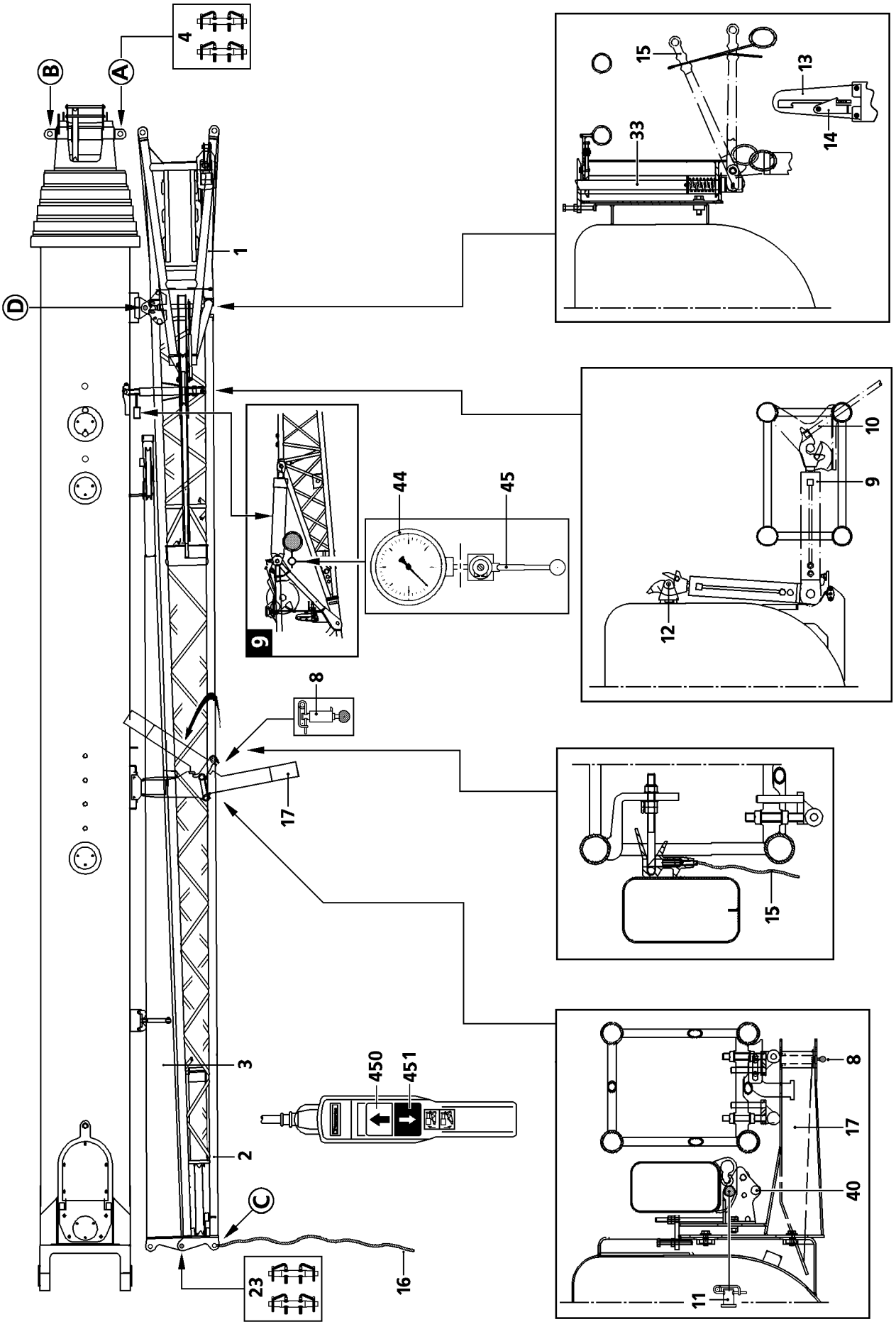

Fig.195368

DANGER
Danger of fatal injuries due to falling folding jib!
The folding jib can fall down due to a disassembly error.
- ▶ Standing under the folding jib during the swing operation is prohibited!
- ▶ It is prohibited for anyone to remain in the swing range as well as the folding range of the folding jib!

- ▶ Swing the folding jib back until the swing cylinder **9** is locked to the folding jib.
- ▶ Start the crane engine.
- ▶ Press button **450** and swing in the folding jib with the swing cylinder until the lock **33** engages audibly.
- ▶ Check whether the lock **33** has engaged properly.

DANGER
Danger of fatal injury when unpinning the pins **4**!
If the pins **4** are unpinned before the lock **33** has engaged, then the folding jib will fall down and possibly cause fatal injury to the installation personnel.
- ▶ The pins **4** may not be unpinned until the lock **33** has engaged and the manual lever **16** has been secured with the safety bracket **15**.

- ▶ Secure the manual lever **15** with the safety bracket **14**.
- ▶ Release the pin **4** at point **A**, unpin and insert into transport retainer.
- ▶ Press button **450** and swing the folding jib with swing cylinder in all the way.
- ▶ Unpin the pin **11** from hole **40**, pin folding jib with pin **11** and secure.

When swinging the folding jib support **17** in and out, make sure that the spring-loaded pin **8** is unlocked using one hand and that the folding jib support **17** is moved overhead with the other hand.

- ▶ Unpin the spring-loaded pin **8** and swing in the folding jib support **17** until the spring-loaded pin **8** engages.
- ▶ Secure the spring-loaded pin **8**.

If a hydraulic folding jib is carried along:
- ▶ Connect hydraulic line to hydraulic cylinder (illustration 9).
- ▶ Remove the auxiliary rope **16**.

Hydraulic folding jibs have an overflow tank attached to the hydraulic cylinder. The overflow tank must be emptied when it is full. Even if the folding jib is not transported on the crane.

For operation with hydraulic folding jib:
- ▶ Empty the overflow tank on the hydraulic cylinder.

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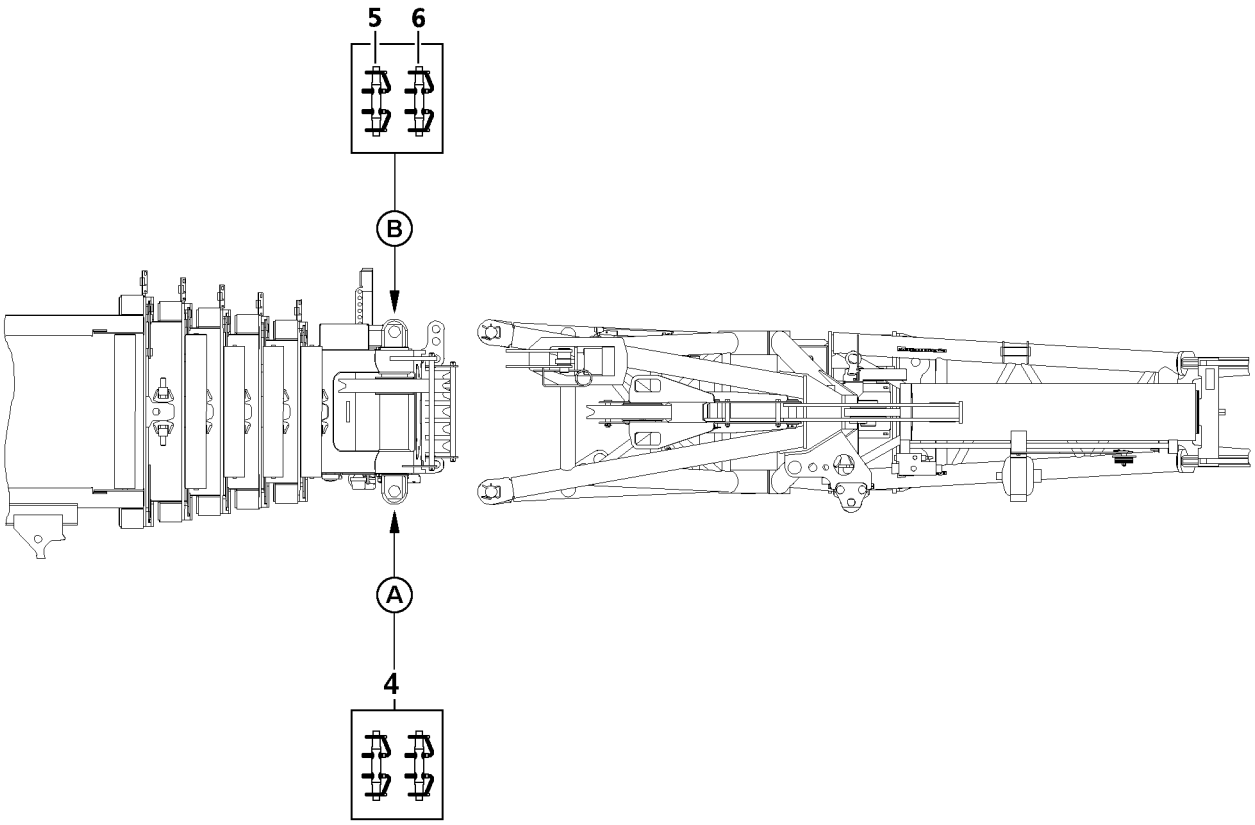

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Fig.197651

11.5 Disassembly of the separately transported folding jib

Ensure that the following prerequisites are met:
- the head piece is locked to the articulated piece
  See also section „Disassembly of the head piece“

For description of fastening points, see section „Fastening points“.

▶ Attach the auxiliary crane to corresponding fastening points on folding jib.

DANGER
Danger of accident when removing the folding jib!
If the following conditions are not met, personnel can be fatally injured during the disassembly.
▶ When knocking out the pins, no one may remain under the folding jib!
▶ Attach ropes so that no sloping occurs!
▶ Only lift a weight with the auxiliary crane that corresponds to the weight of the folding jib that is being removed!
▶ The folding jib may suddenly release due to distortion!
▶ Do not remove the folding jib until it has been secured with the auxiliary crane to prevent it from falling!
▶ Do not lean the ladder against the folding jib!

▶ Tighten the ropes until the folding jib is secured to prevent it from falling.
▶ Unpin the folding jib from the telescopic boom:
▶ Release and unpin pins **4** at the top and at the bottom at point **A**.
▶ Release and unpin pins **5** and **6** at the top and the bottom at point **B**.
▶ Place the folding jib onto the transport vehicle.

Hydraulic folding jibs have an overflow tank attached to the hydraulic cylinder. The overflow tank must be emptied when it is full. Even if the folding jib is not transported on the crane.

For operation with hydraulic folding jib:
▶ Empty the overflow tank on the hydraulic cylinder.

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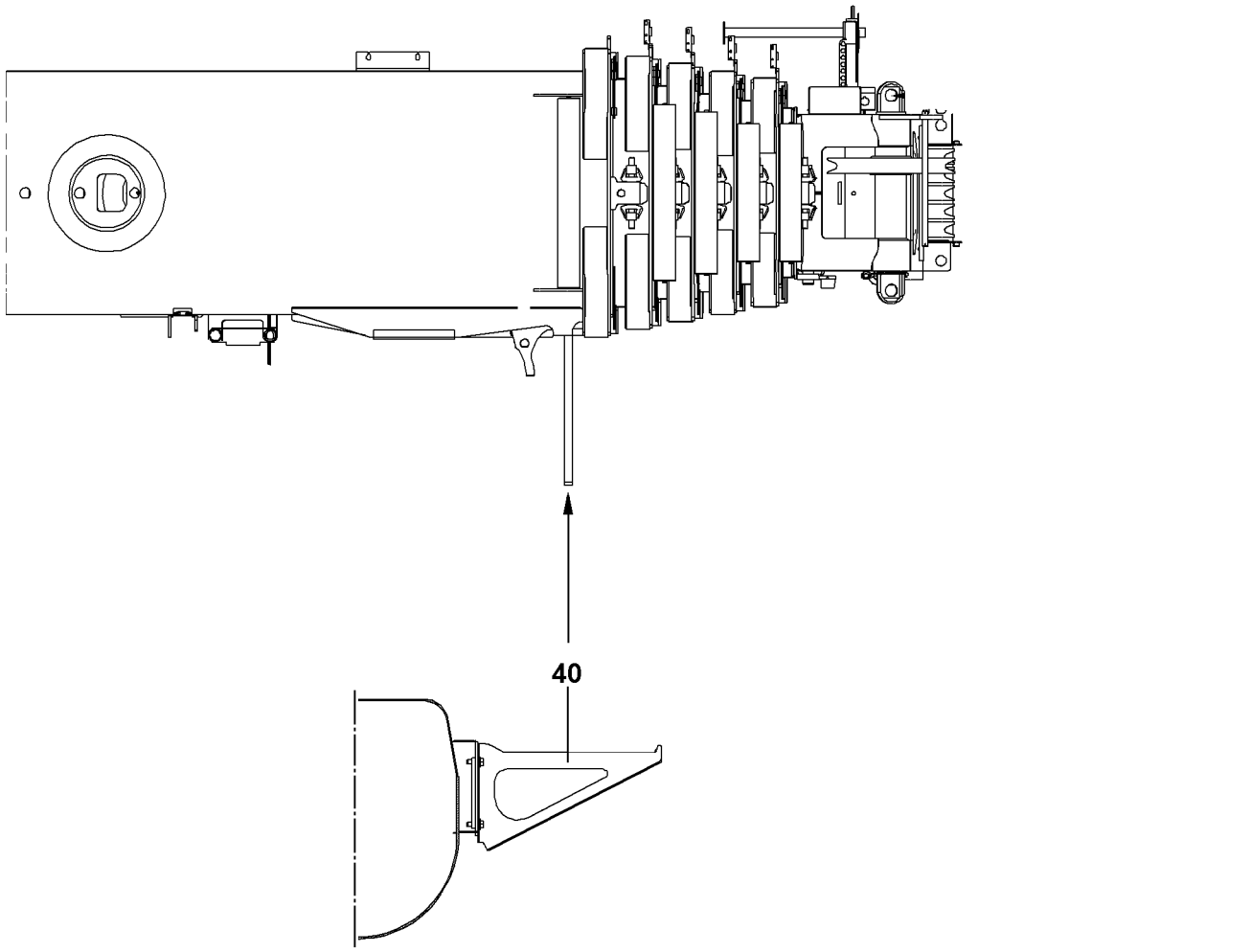

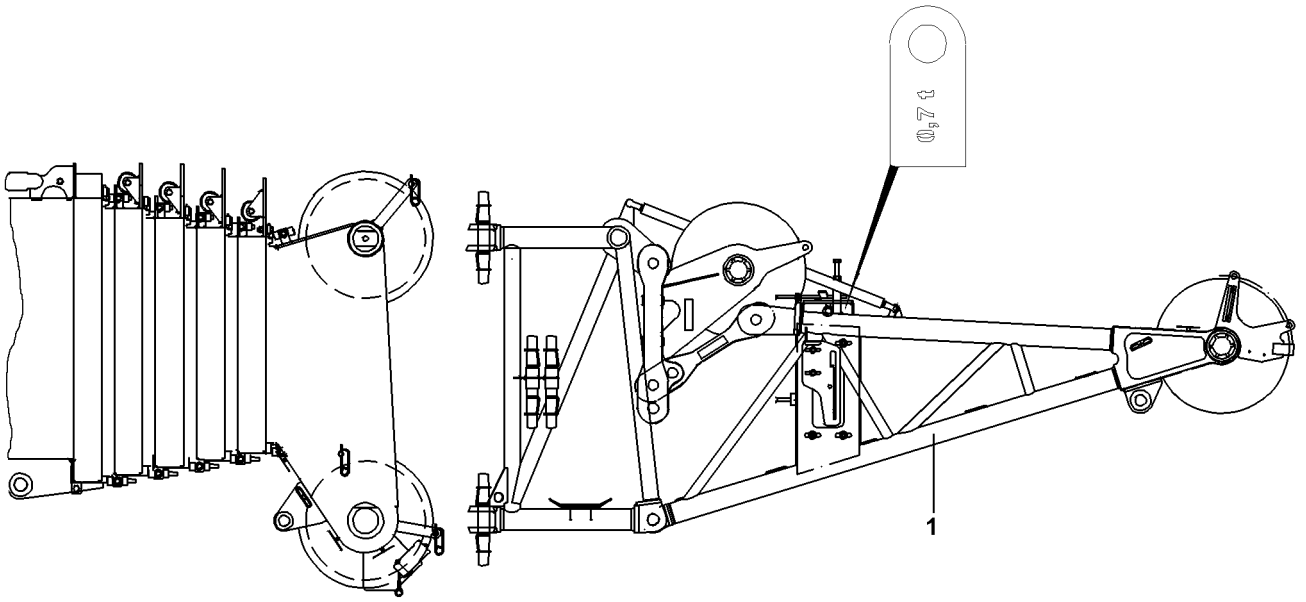

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Fig.103741

1 General

CAUTION
The auxiliary boom can collide with the catch bar **40** for the single / dual folding jib!
▶ Remove the catch bar **40** before assembling the auxiliary boom.

DANGER
Danger of fatal injuries due to toppling folding jib!
As a result of improperly assembled, damaged or non-existing catch bar **40** on the telescopic boom pivot section, „the folding jib“ – due to an assembly error – can fall down and cause fatal injuries.
▶ Make sure that the catch bar **40** is property assembled again and not damaged „before assembling the single or the dual folding jib“, see also „chapter 5.02“.

The auxiliary boom can be self-assembled on the telescopic boom.

DANGER
Danger of accident when driving with the auxiliary boom!
▶ Before being driven on roads, the auxiliary boom must always be brought to the transportation position and mechanically secured.
▶ Make sure that the auxiliary boom is properly secured before driving the crane on public roads.

1.1 Components overview

Position	Description	Length	Weight
1	Auxiliary boom	2.9 m	0.7 t

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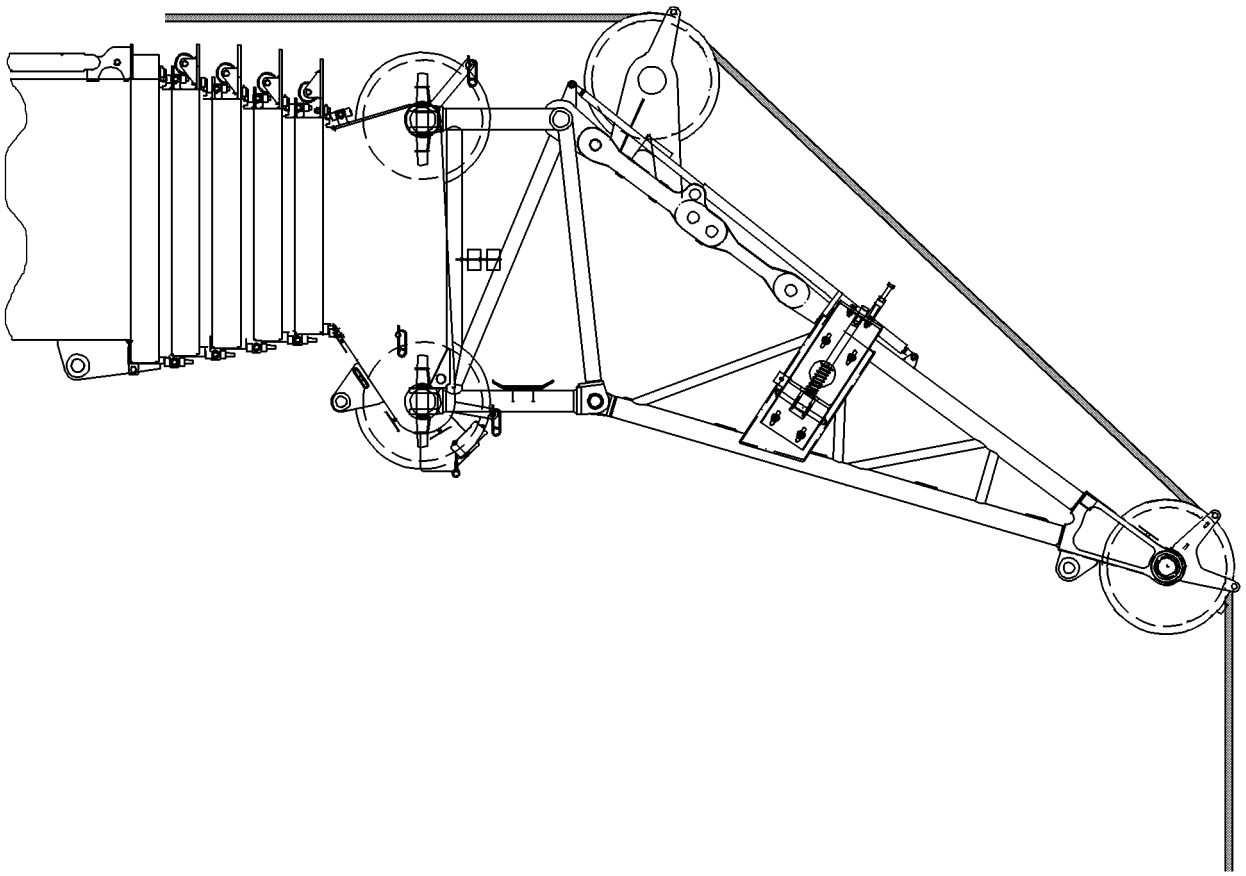

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Fig.192467

2 Assembly of the auxiliary boom

2.1 General

DANGER
Danger of fatal injury due to toppling auxiliary boom!
Due to an assembly error, the auxiliary boom could fall down.
- ▶ Standing under the auxiliary boom during the swing operation is prohibited!
- ▶ It is prohibited for anyone to remain within the swinging area or the folding area of the auxiliary boom!
- ▶ The auxiliary boom must be secured by an auxiliary rope during the swing process!

DANGER
Danger of falling!
During assembly and disassembly, personnel must be secured with appropriate antifall guards to prevent them from falling. If this is not observed, personnel could fall and suffer life-threatening injuries.
- ▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which assembly / disassembly work must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- ▶ If work cannot be carried out using these aids or from the ground, the installers must be protected from falling using suitable means (such as safety belts)!
- ▶ Do not walk on the telescopic boom or auxiliary boom!

Make sure that the following prerequisites are met:
- the crane is properly supported and horizontally aligned,
- the counterweight has been attached to the turntable according to the load chart,
- the telescopic boom is fully telescoped in,
- the auxiliary boom is attached on the telescopic boom pivot section for transport,
- the telescopic boom has been luffed to the rear or the side in the 0° position.

DANGER
Danger of accident from involuntary swinging out of the auxiliary boom when it is unpinned!
If the telescopic boom is not in the 0° position, a risk of accident exists due to involuntary swinging out of the auxiliary boom when it is unpinned.
- ▶ Move the telescopic boom to 0° position.

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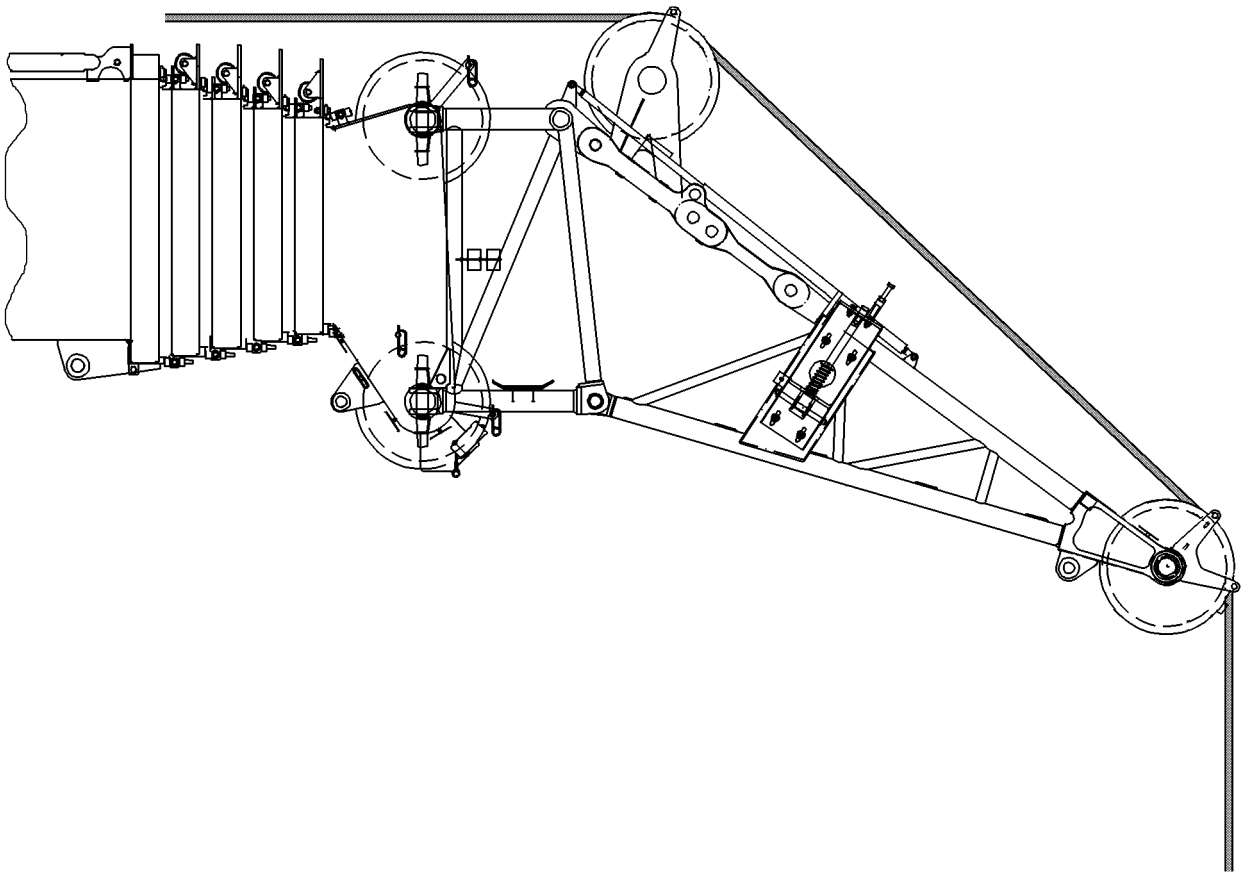

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Fig.192467

2.2 Reeving out the hoist rope on the telescopic boom head

In order to speed up the subsequent reeving in of the hoist rope after assembling the auxiliary boom, the hook block can be put down at a distance from the crane approximating to the subsequent distance of the telescoped in telescopic boom **with** assembled auxiliary boom.

- ▶ Telescope out the telescopic boom to the corresponding length.
- ▶ Place the hook block on the ground.
- ▶ Disengage the hoist rope at the rope fixed point.
- ▶ Disassemble the hoist limit switch weight and the chain for safety reasons.

Note

- ▶ The hoist limit switch must be pulled mechanically and the operating cable must be attached to the telescopic boom head with the snap hook when operating the auxiliary boom.
- ▶ The telescopic boom may remain reeved in, if the hoist rope of winch 2 is used for auxiliary boom operation.

- ▶ Remove the rope retaining pipes on the pulley head and on the back pulley.
- ▶ Telescope the telescopic boom in again completely.

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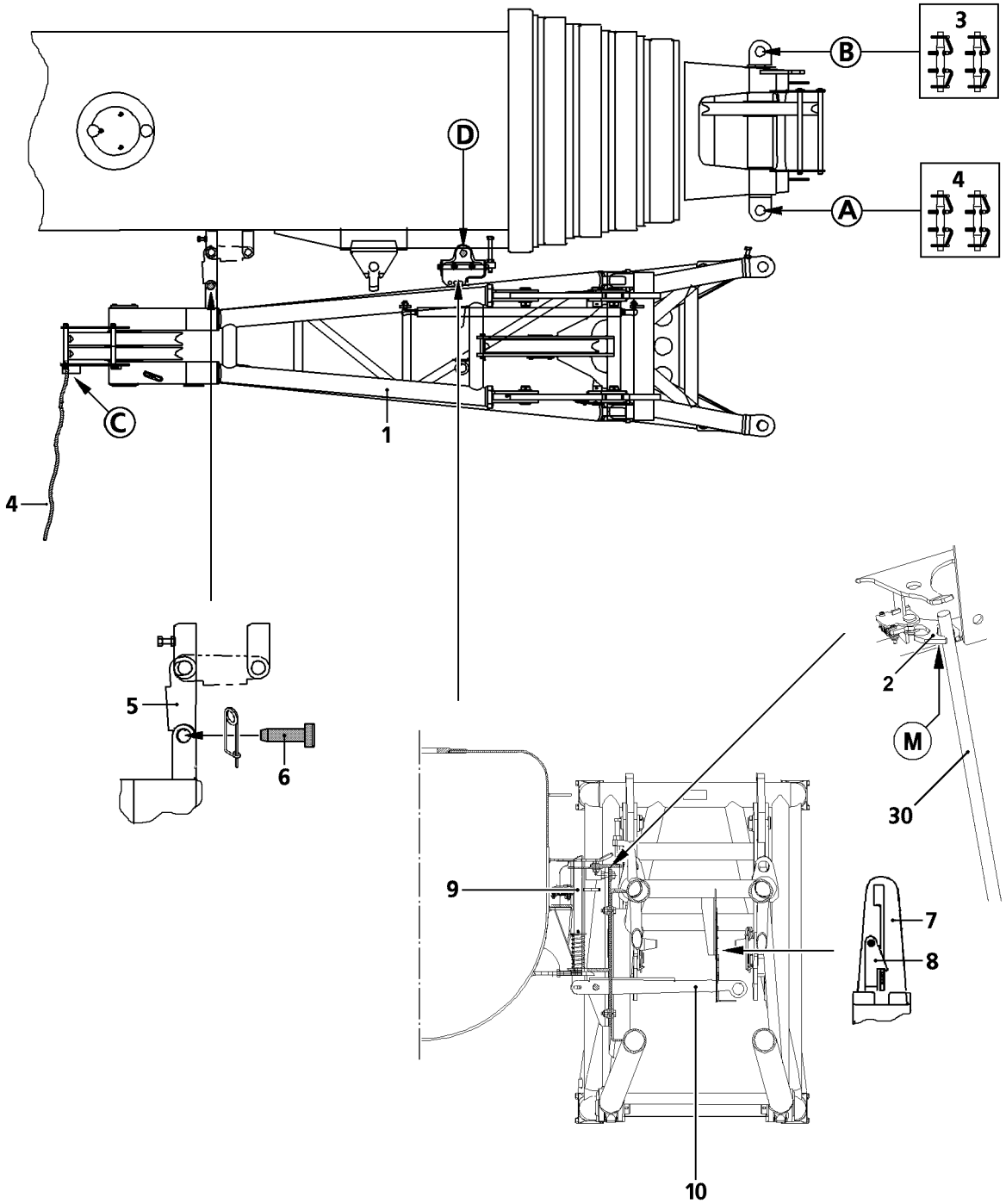

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Fig.107338

2.3 Swivelling auxiliary boom into operating position

- ▶ Attach the auxiliary rope **4** at point **C**.
- ▶ Release and unpin the pin **6**.
- ▶ Swivel auxiliary boom **1** out until it can be pinned at point **A**.
- ▶ Insert the pins **4** at the top and at the bottom at point **A** and secure.

DANGER
Danger of fatal injury due to toppling auxiliary boom!
Special retaining clips must be used to secure the pins **4**. The use of spring pins or spring retainers on the pins **4** is not permitted. The auxiliary boom may only be released at point **D** if the pins **4** are pinned and secured at the top and bottom at point **A**.

- ▶ Pin and secure pins **4** at point **A** at top and bottom.

- ▶ Swing the safety bracket **8** with the assembly rod to the side.
- ▶ Push the lever **10** with the assembly rod up and latch into the bracket **7**.

Note

- ▶ Open the catch claw **2** with the special assembly rod **30** from the ground.

- ▶ Guide the assembly rod **30** from below in point **M** and leverage the catch claw **2** on the side in direction of the boom head.

Result:

– The catch claw **2** opens and the auxiliary boom **1** is leveraged from the console of the transport retainer.

- ▶ Swing the auxiliary boom **1** out from the catch claw **2**.
- ▶ Swivel the auxiliary boom **1** with the auxiliary rope **4** by 180 ° until it can be pinned at point **B** at the top and bottom.

DANGER
Risk of accident!

- ▶ The use of spring cotters or spring retainers is prohibited on the pins **3**!
- ▶ Special retaining clips must be used to secure the pins **3**.

- ▶ Insert the pins **3** at the top and at the bottom at point **B** and secure.
- ▶ Remove the auxiliary rope **4**.

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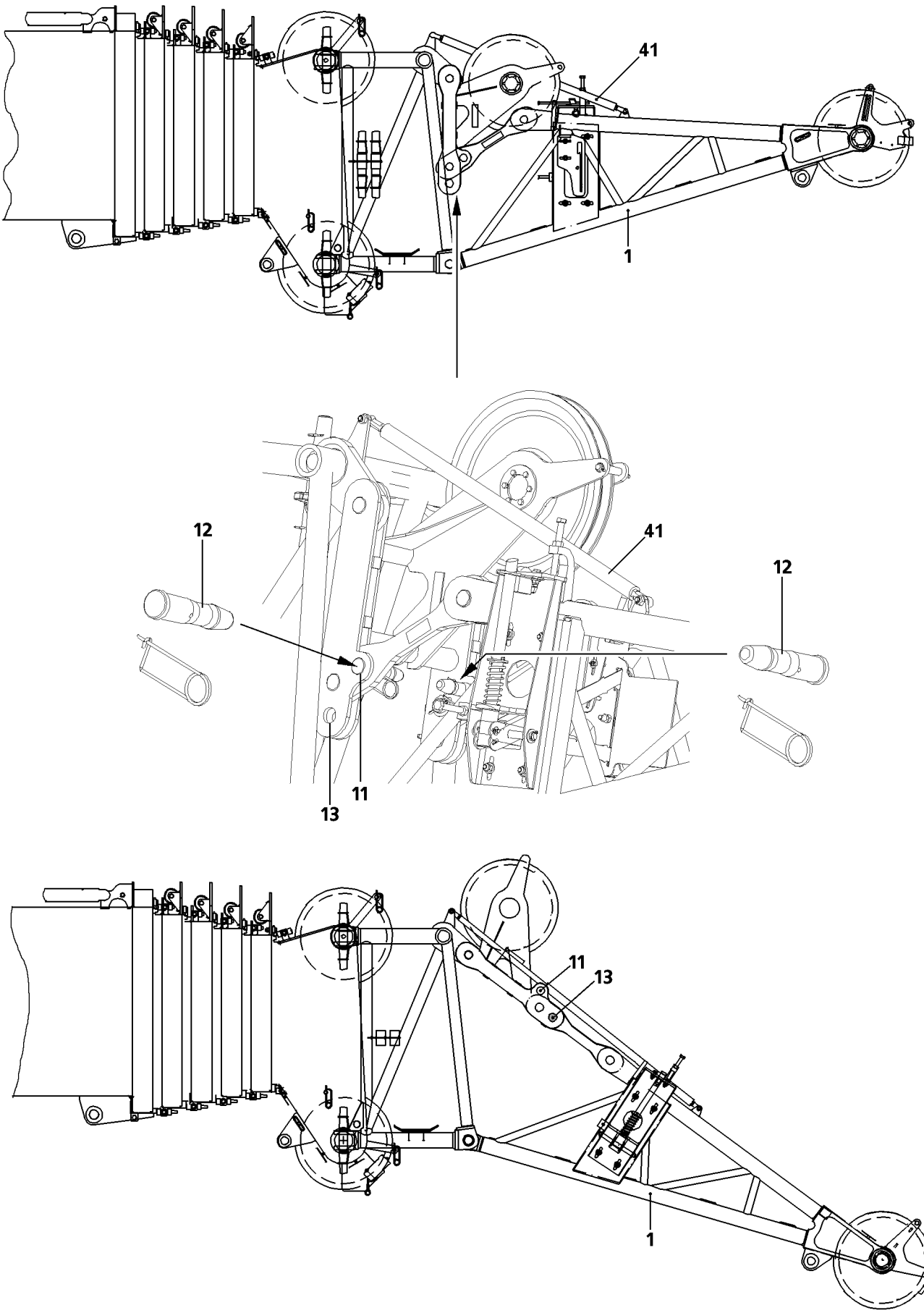

Fig.104953

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2.4 Folding the auxiliary boom into operating position

DANGER
Danger of fatal injury in case of defective pneumatic spring!
The pins **12** are easy to remove when the pneumatic spring **41** is working correctly.
If the pneumatic spring **41 is defective**, it is **not** possible to remove the pins **12**!
Defective pneumatic springs **41** no longer provide the supporting properties on the movable components on the auxiliary boom **1**!
If the pneumatic spring **41** is defective, the auxiliary boom **1** can fall down and fatally or seriously injure personnel!
There is an increased danger of accidents!

- ▶ Before unpinning the pin **12** and before actuation, check the pneumatic spring **41** for external damage!
- ▶ Do not use auxiliary boom **1** with defective pneumatic spring **41**! Replace defective pneumatic springs **41**!
- ▶ If the pneumatic spring **41** is defective, support the auxiliary boom **1** from below or hang it on an auxiliary crane.
- ▶ It is strictly prohibited for personnel or objects to remain within the movement range of the auxiliary boom **1**!
- ▶ It is prohibited for personnel or objects to remain within the danger zone of the moveable components!

DANGER
Danger of fatal injury due to toppling auxiliary boom!
Before unpinning the pins **12** it must be ensured that no persons or objects are in the danger zone, particularly beneath the auxiliary boom.

- ▶ Do not unpin pins **12** until all persons and objects have been removed from the danger zone!

- ▶ Unpin the pins **12** on both sides from the bores **11**.
- ▶ Fold the auxiliary boom **1** down until the bores align.

Note

- ▶ The folding procedure is simplified if a hook block is reeved in.
- ▶ The rope retaining pins must be unpinned before the folding procedure, see paragraph „Reeving the hoist rope“.
- ▶ Lift the hook block to the point where the bores align.

- ▶ Fit the pins **12** on both sides in bores **13** from „outside to inside“ and secure with spring retainers.

Before starting to use the auxiliary boom **1**, the auxiliary boom **1** must be folded down and pinned.

- ▶ Check if the auxiliary boom **1** has been pinned as described in the operating instructions.

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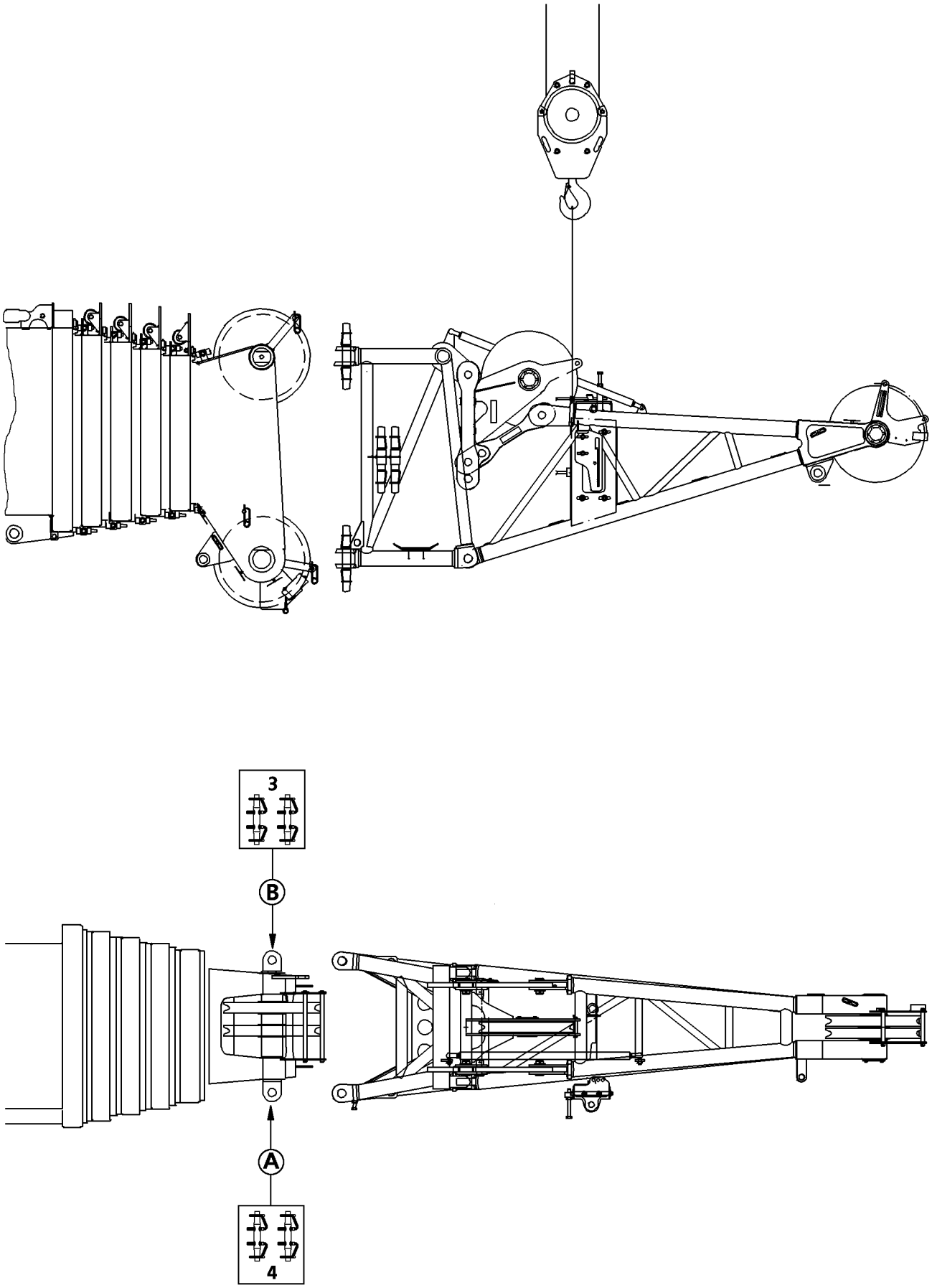

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Fig.192473

2.5 On-the-fly assembly of the auxiliary boom

▶ Hang the auxiliary boom on the auxiliary crane and guide in the fork heads on the telescopic boom.

DANGER
Risk of accident!
▶ The use of spring cotters or spring retainers is prohibited on pins **3** and pins **4**!
▶ To secure the pin **3** and the pin **4**, use the special retaining clips.

▶ Pin auxiliary boom to telescopic boom:
▶ Pin and secure pins **4** on top and on the bottom at point **A**.
▶ Pin and secure pins **3** on top and on the bottom at point **B**.
▶ For rest of assembly see section „Folding end section to operating position“.

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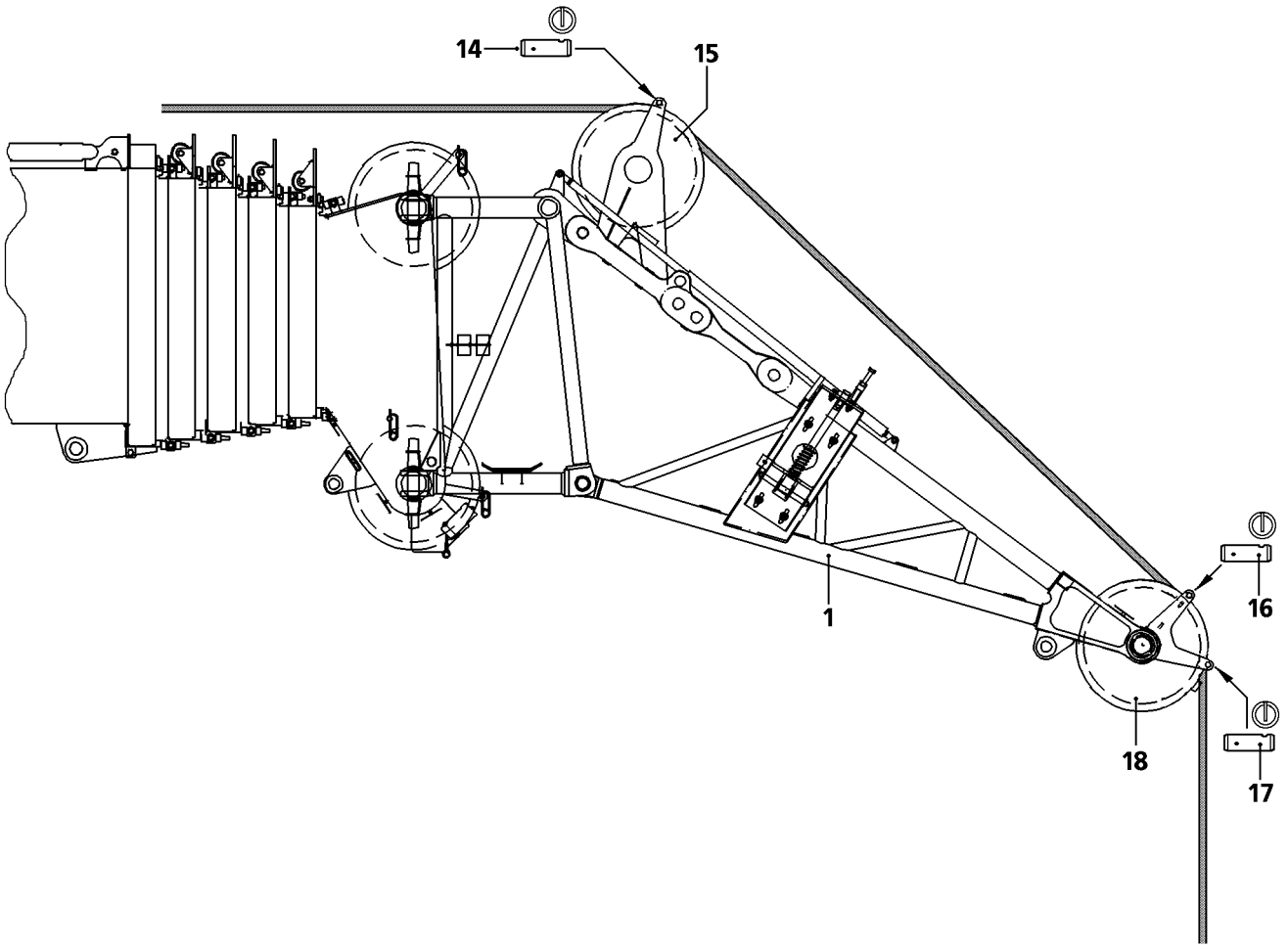

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Fig.192470

2.6 Reeving in the hoist rope

- ▶ Release and unpin rope retaining pin **14**, rope retaining pin **16** and rope retaining pin **17**.
- ▶ Run hoist rope over rope guide pulley **15** and main pulley **18**.
- ▶ Pin rope retaining pin in again and secure with linch pins.
- ▶ Reeve in the load hook or hook block.
- ▶ Attach the hoist limit switch weight.

Note

- ▶ The weight of the hook block that is reeved into the telescope boom must be deducted from the load during auxiliary boom operations with the hook block reeved into the telescope boom.

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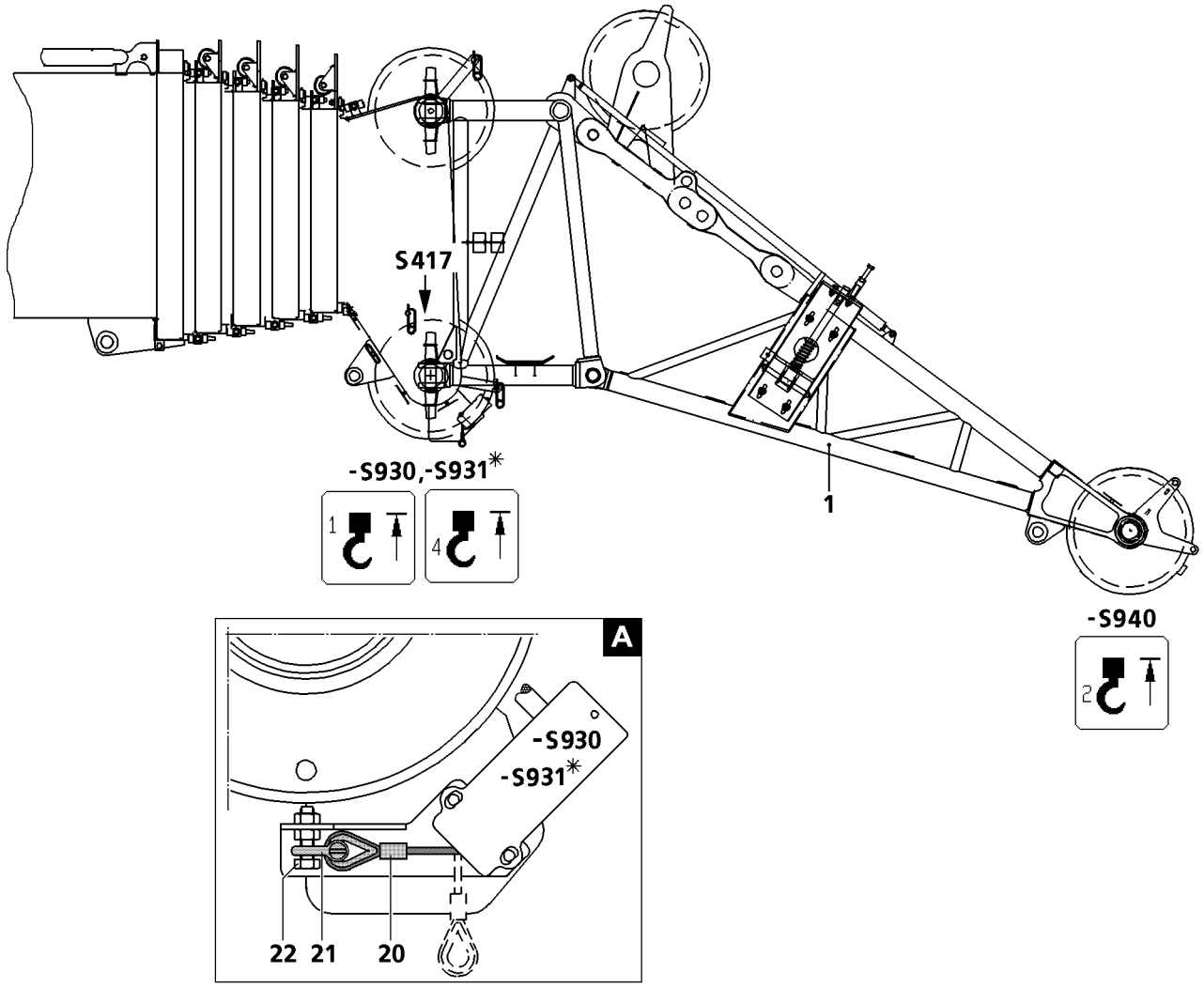

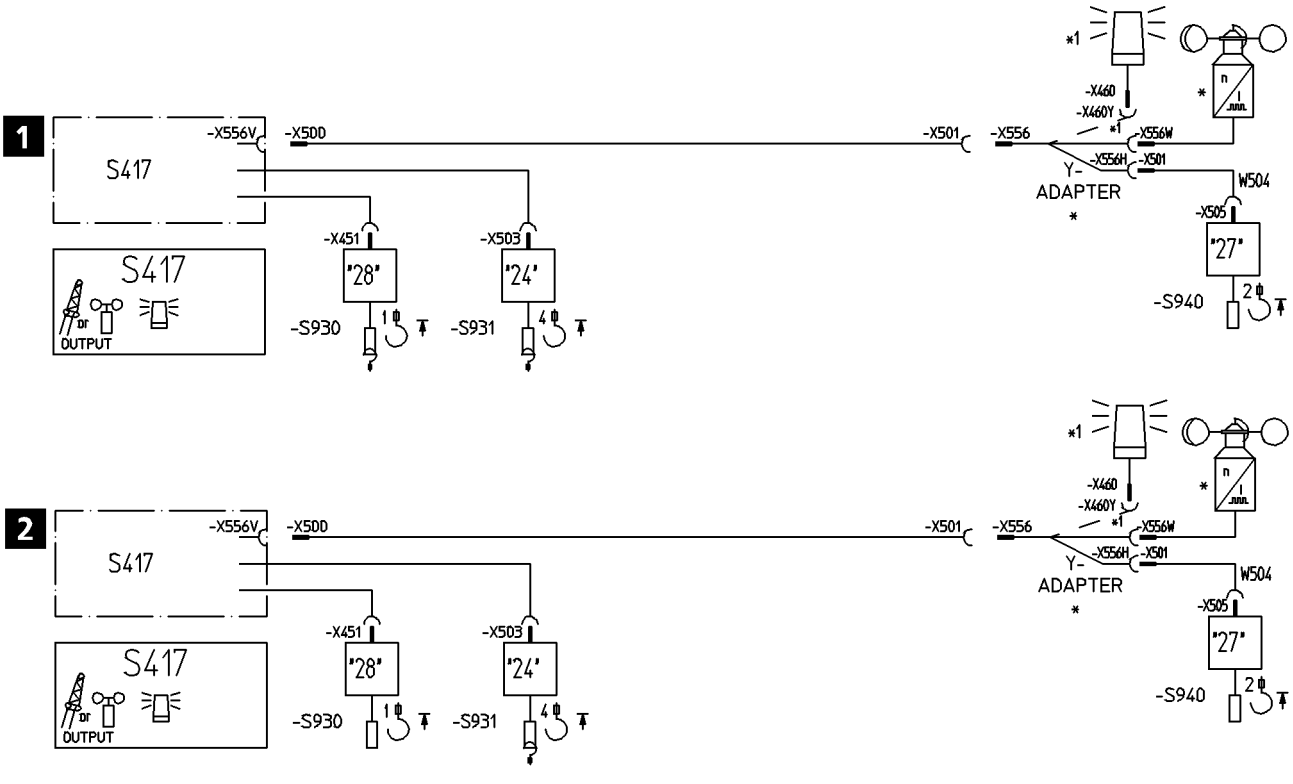

Fig.194428

LWE/LTR 1100-005/17505-03-02/en

2.7 Electrical connections on auxiliary boom

2.7.1 Mechanically actuating the hoist limit switch, illustration A

If you are working in „single hook mode“ when using the auxiliary boom, the hoist limit switch **-S930/-S931** that is not required must be operated manually.

- ▶ Disassemble the hoist limit switch weight and chain.
- ▶ Pull the hoist limit switch rope **20** and attach to the fixed point **22** with the shackle **21**.

2.7.2 Electrical connections

Single hook operation, illustration 1

Only the hoist limit switch **S940** at the auxiliary boom is active during single hook operation.

- ▶ Actuate the hoist limit switch **-S930** mechanically.

If installed on the telescopic boom:
- ▶ Actuate the hoist limit switch***** **-S931** mechanically.
- ▶ Insert the cable plug **-X500** into the socket **-X556V**.
- ▶ Insert the adapter **-X556** into the socket **-X501**.
- ▶ Insert the hoist limit switch **-S940** with the cable plug **-X501** into the socket **-X556H**.
- ▶ Insert the wind speed sensor***** with the cable plug **-X556W** into the socket **-X556**.
- ▶ Insert the flashing beacon***** with the cable plug **-X460** into the socket **-X460Y**.

Two hook operation, illustration 2

During two hook operation the hoist limit switch **S930** on the telescopic boom and the hoist limit switch **S940** on the auxiliary boom are active!

If assembled on the telescopic boom:
- ▶ Actuate the hoist limit switch***** **-S931** mechanically.
- ▶ Insert the cable plug **-X500** into the socket **-X556V**.
- ▶ Insert the adapter **-X556** into the socket **-X501**.
- ▶ Insert the hoist limit switch **-S940** with the cable plug **-X501** into the socket **-X556H**.
- ▶ Insert the wind speed sensor***** with the cable plug **-X556W** into the socket **-X556**.
- ▶ Insert the flashing beacon***** with the cable plug **-X460** into the socket **-X460Y**.

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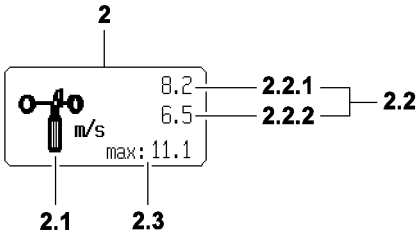

Fig.197637

2.7.3 Function check

Ensure that the following preconditions are met:
- all electrical connections have been made,
- the LICCON computer system is running.

Wind sensor

CAUTION
Danger of accidents due to toppling of the crane!
The wind speed can no longer be determined if a defective wind sensor is installed.
▶ Check the function of the wind sensor every time it is installed.

▶ Manually actuate the wind sensor.

Result:

– The symbol element „Wind velocity“ **2.2** appears on the monitor.

Hoist limit switch

▶ Actuate all active hoist limit switches manually.

Result:

– The appropriate symbol element „Hoist top“ appears on the monitor.
– The winch switches off.

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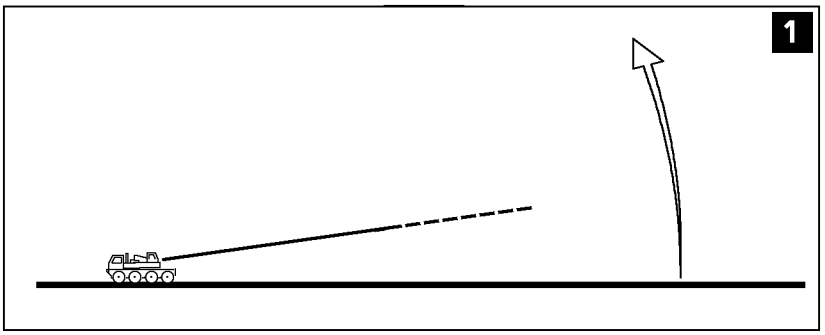

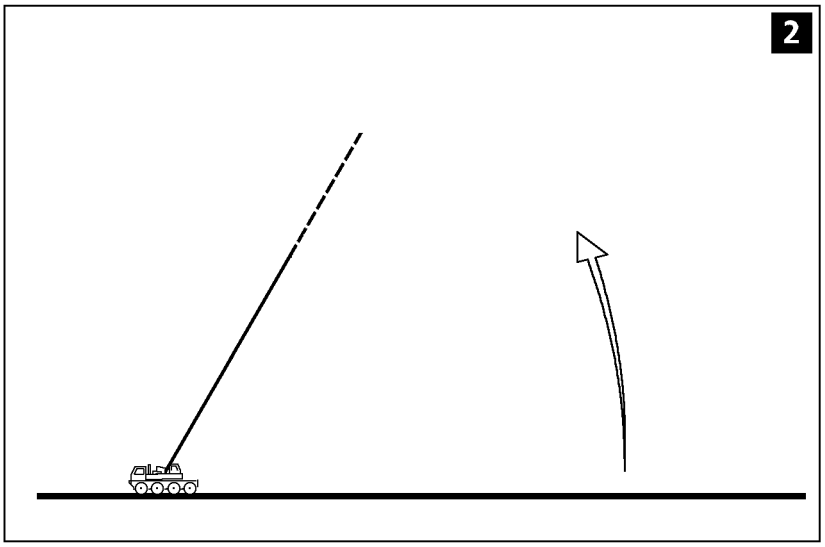

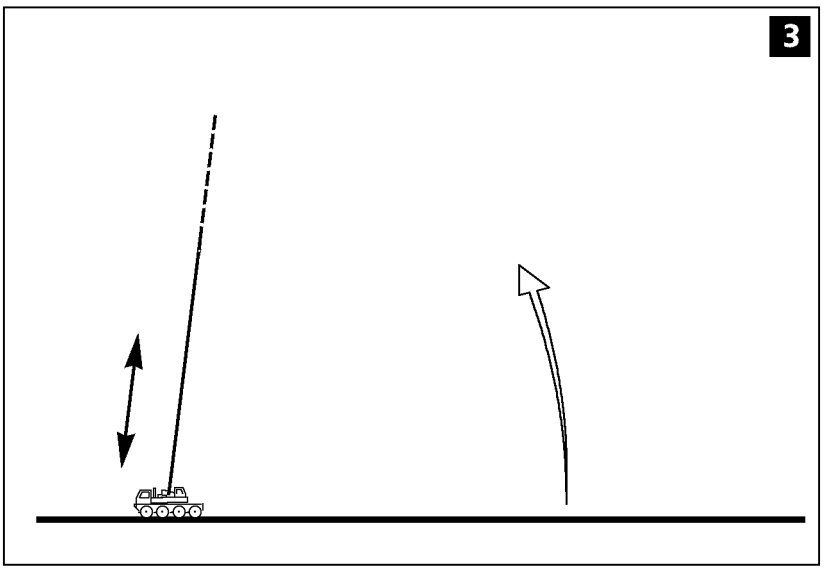

Fig.192389

3 Erection

3.1 Preparatory work

Make sure that the following prerequisites are met:
- the crane is properly supported and horizontally aligned,
- the counterweight has been attached to the turntable according to the load chart,
- the telescopic boom is fully telescoped in,
- the auxiliary boom has been assembled in accordance with the load chart specifications and the operating manual,
- all limit switches have been correctly assembled and are fully functional,
- all pin connections have been secured,
- the hoist rope has been correctly placed in the cable pulleys and is secured with the rope retaining pins to prevent it from jumping out,
- there are no loose parts on the telescopic boom or the auxiliary boom,
- the telescopic boom, the auxiliary boom and their components (limit switches, flight warning lamp, anemometer etc.) must be free of snow and ice in the winter.

DANGER
Risk of accident!
Incorrectly assembled or non-operational limit switches and falling parts (pins, spring pins, ice etc.) can cause injuries!
▶ Assemble all limit switches, pins and cotter pins properly.

▶ Check if all preconditions have been met.

3.2 Erection procedure

DANGER
Danger of accidents due to toppling of the crane!
The radii specified in the load chart may not be exceeded or fallen below, even if there is no load on the hook! If this regulation is not observed, the crane can topple over.
▶ Compare and check the settings on the LICCON computer system with the actual configuration status!

Adjustment of the LICCON overload protection, refer to chapter 4.02.

▶ Set and confirm the LICCON overload protection according to the required set up configuration.
▶ Luff the telescopic boom up with assembled auxiliary boom until the LICCON issues the release.
▶ Telescope the telescopic boom out to values specified in load chart.

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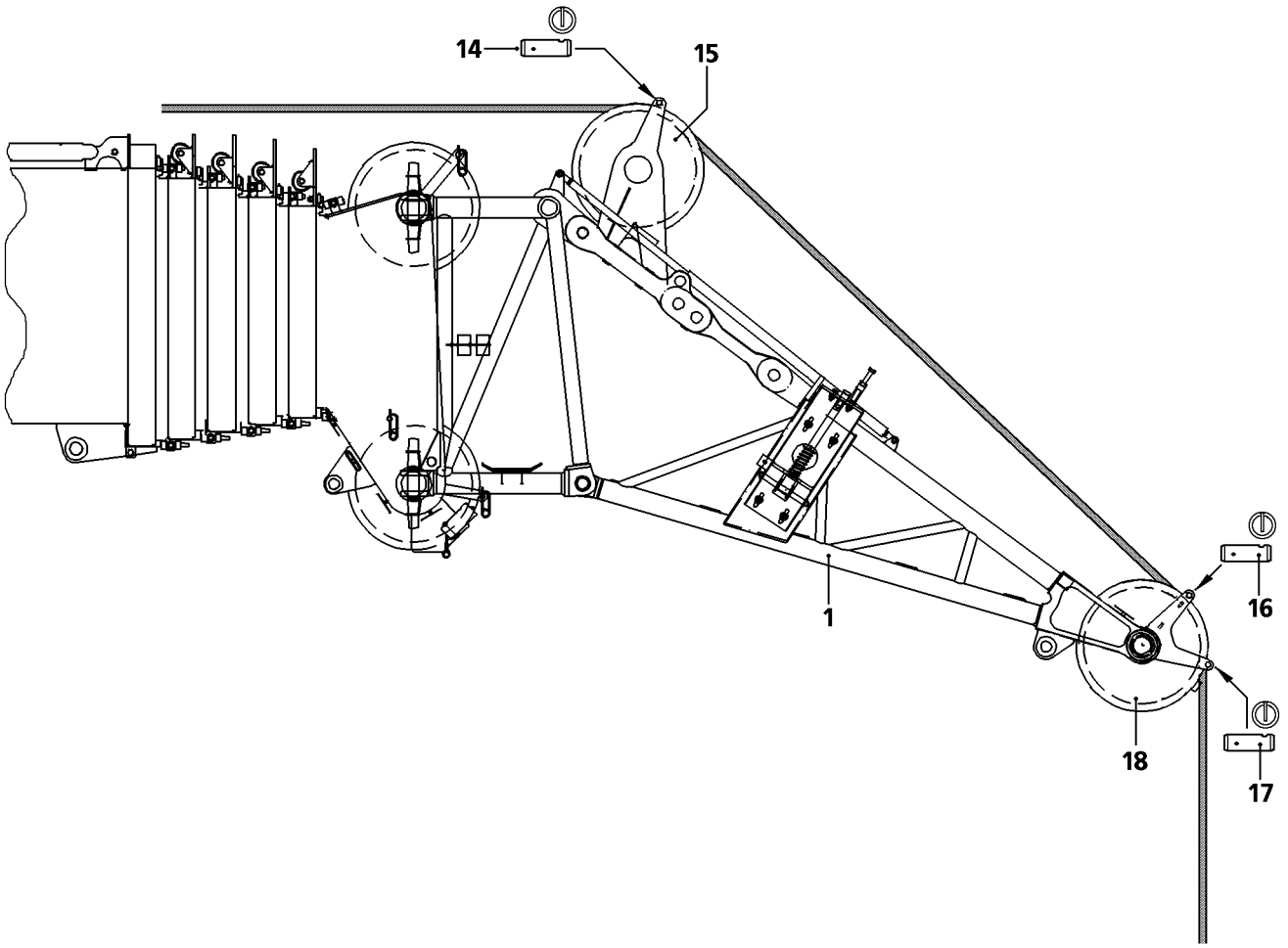

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Fig.192470

4 Disassembling the auxiliary boom

4.1 General

DANGER
Danger of fatal injury due to toppling auxiliary boom!
The auxiliary boom may topple if it is incorrectly disassembled.
- ▶ Standing under the auxiliary boom during the swing operation is prohibited!
- ▶ The auxiliary boom must be secured by an auxiliary rope during the slewing process!
- ▶ Never stand beneath the auxiliary boom during disassembling!

DANGER
Danger of falling!
During assembly and disassembly, personnel must be secured with appropriate antifall guards to prevent them from falling. If this is not observed, personnel could fall and suffer life-threatening injuries.
- ▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (lifting platforms, scaffolding, ladders, auxiliary crane etc.)! The height above which assembly / disassembly work must be carried out with aids depends on national regulations. The national regulations must be adhered to!
- ▶ If work cannot be carried out using these aids or from the ground, the assembly personnel must be protected from falling using suitable means (such as safety belts)!
- ▶ Do not walk on the telescopic boom or auxiliary boom!

Make sure that the following prerequisites are met:
- – the crane is properly supported and horizontally aligned,
- – the counterweight has been attached to the turntable according to the load chart,
- – the telescopic boom is fully telescoped in,
- – the electrical connections at the auxiliary boom have been released,
- – the telescopic boom has been luffed to the rear or the side in the 0° position.

DANGER
Danger of accident from involuntary swinging out of the auxiliary boom!
The telescopic boom must be in the 0° position, otherwise there is a risk of accident from involuntary auxiliary boom movements when the pins are undone on the telescopic boom.
- ▶ Move the telescopic boom to 0° position.

4.2 Reeving out the hoist rope

- ▶ Release and unpin rope retaining pin **14**, rope retaining pin **16** and rope retaining pin **17**.
- ▶ Spool up the hoist rope.
- ▶ Repin the rope retaining pin **14**, rope retaining pin **16** and rope retaining pin **17** and secure with linch pins.

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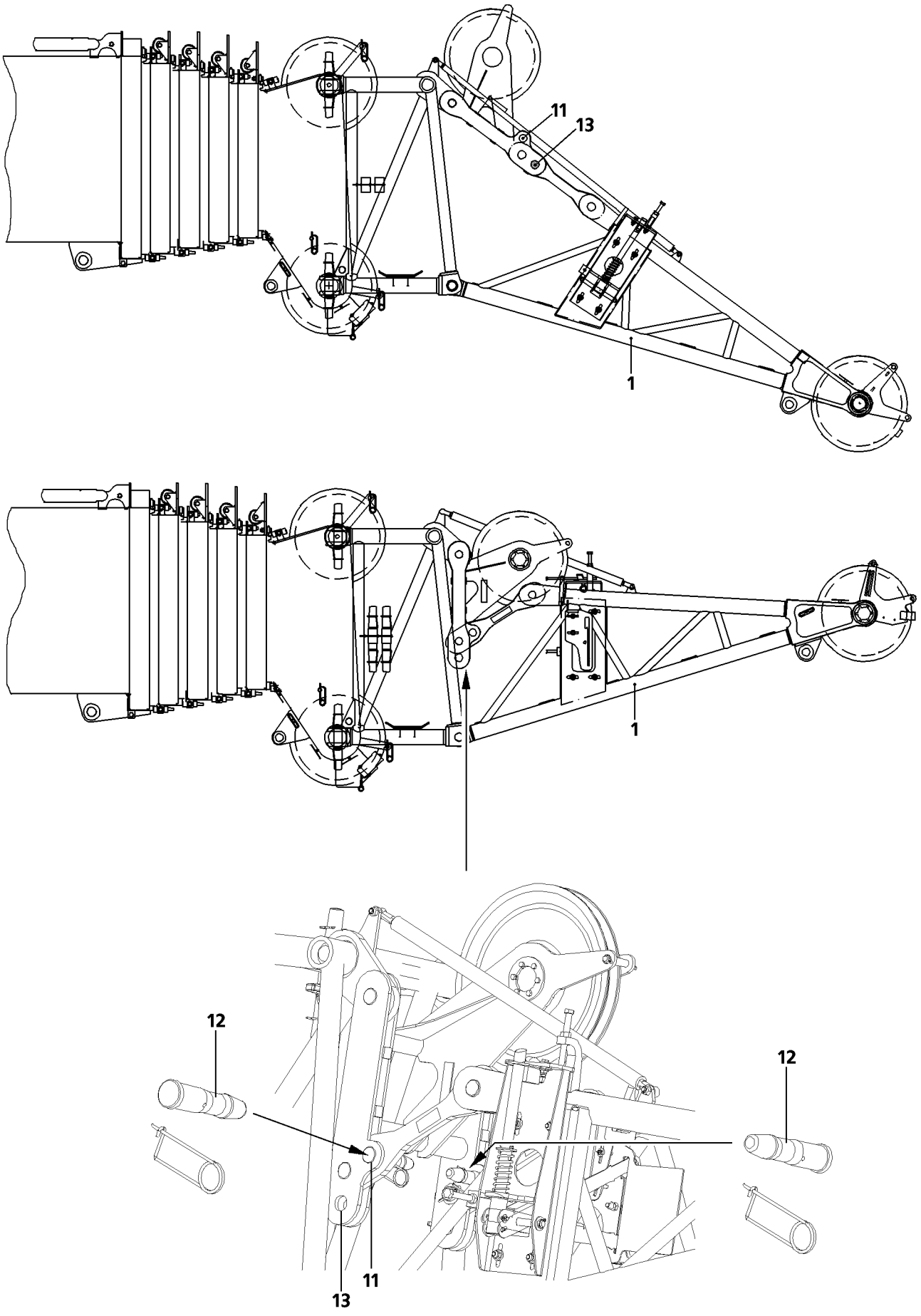

Fig.104954

4.3 Folding the auxiliary boom into transport position

DANGER
Risk of accident!
Before the auxiliary boom **1** may be swung into transport position, the auxiliary boom **1** must be folded up into transport position and pinned.
Before unpinning the pins **12** it must be ensured that no persons or objects are in the danger zone, particularly beneath the auxiliary boom.

- ▶ Do not unpin pins **12** until all persons and objects have been removed from the danger zone!
- ▶ Insert pins **12** from the „outside to the inside“.

- ▶ Release the pins **12** on both sides and unpin them from the bores **13**.
- ▶ Fold the auxiliary boom **1** up in transport position until the bores align.
- ▶ Fit the pins **12** on both sides in bores **11** from „outside to inside“ and secure with spring retainers.

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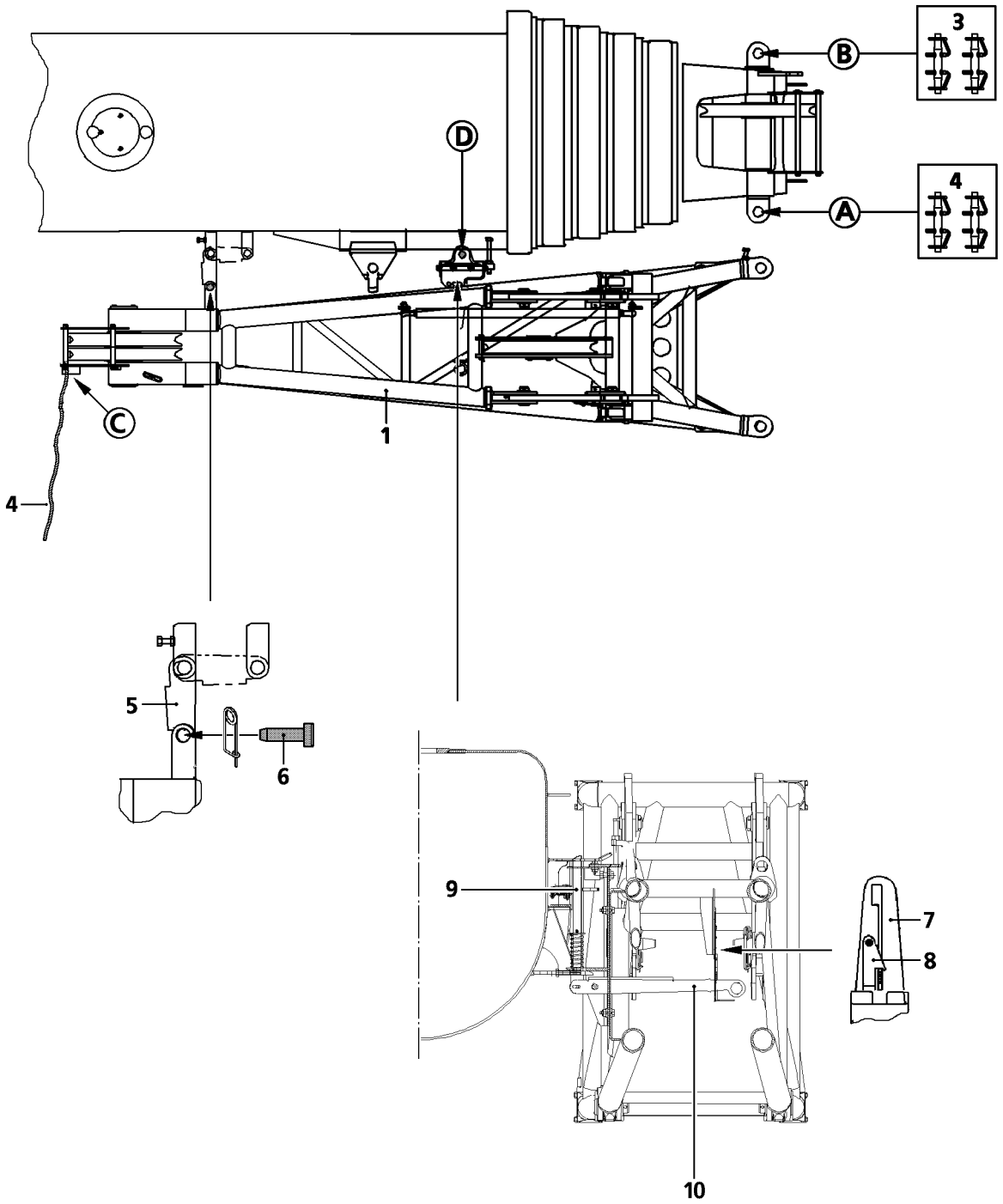

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Fig.107339

4.4 Swivelling the auxiliary boom into the transport position

▶ Attach the auxiliary rope **4** at point **C**.

DANGER
The auxiliary boom may swing out involuntarily!
While unpinning the pin **3**, the auxiliary boom may swing out unintentionally.

In order to prevent the auxiliary boom from involuntarily swinging out:
▶ Hold down auxiliary boom using the auxiliary rope **16**!
▶ Do not lean the ladder against the auxiliary boom!

▶ Release and unpin the pin **3**.
▶ Disengage the lever **10** with the assembly rod from the bracket **7** and pull downward.
▶ Swing in auxiliary boom **1** with auxiliary rope **16** until locking **9** audibly engages.
▶ Perform a visual inspection.
▶ Secure the lever **10** with safety bracket **8**.

DANGER
Danger of accident from auxiliary boom falling down!
If the pins **4** are unpinned before the locking **9** is engaged and secured with the safety bracket **8**, the auxiliary boom will fall down!
▶ Unpin the pins **4** only if the locking **9** is engaged and secured with the safety bracket **8**.

▶ Release and unpin the pin **4**.
▶ Swing the auxiliary boom **1** in until the pin **6** can be pinned.
▶ Pin the auxiliary boom **1** with the telescopic boom: Pin and secure pin **6**.
▶ Remove the auxiliary rope **4**.

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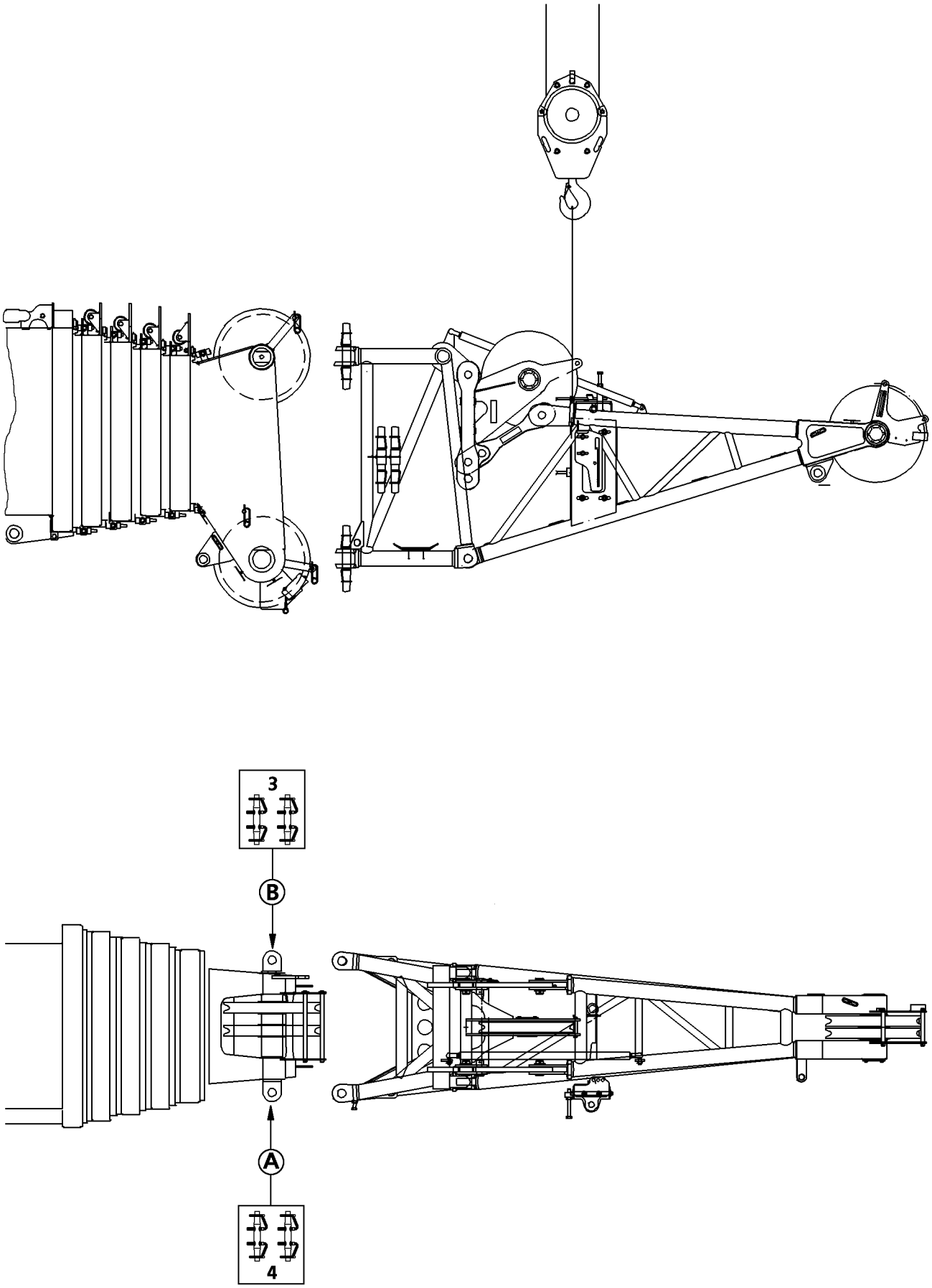

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Fig.192473

4.5 Removing the separately transported auxiliary boom

Make sure that the following prerequisites are met:
– the auxiliary boom is folded in operating position.

▶ Attach auxiliary crane to attachment point of auxiliary boom.

DANGER
Danger of accident when removing the auxiliary boom!
Failing to comply with the following conditions may result in fatal injury to the assembly personnel during disassembly.
▶ When knocking out the pins, no personnel may remain under the auxiliary boom!
▶ Attach the auxiliary crane so that no diagonal pull occurs!
▶ Match the „hoisting power“ of the auxiliary crane to the „weight“ of the auxiliary boom!
▶ The auxiliary boom may detach suddenly because of distortion!
▶ Do not remove auxiliary boom until it has been secured with the auxiliary crane to prevent it from falling!
▶ Do not lean the ladder against the auxiliary boom!

▶ Tighten the ropes so that auxiliary boom is prevented from falling.
▶ Unpinning the auxiliary boom from the telescopic boom:
▶ Release and unpin pins **4** at the top and at the bottom at point **A**.
▶ Release and unpin pins **3** at the top and at the bottom at point **B**.
▶ Place the auxiliary boom onto the transport vehicle.

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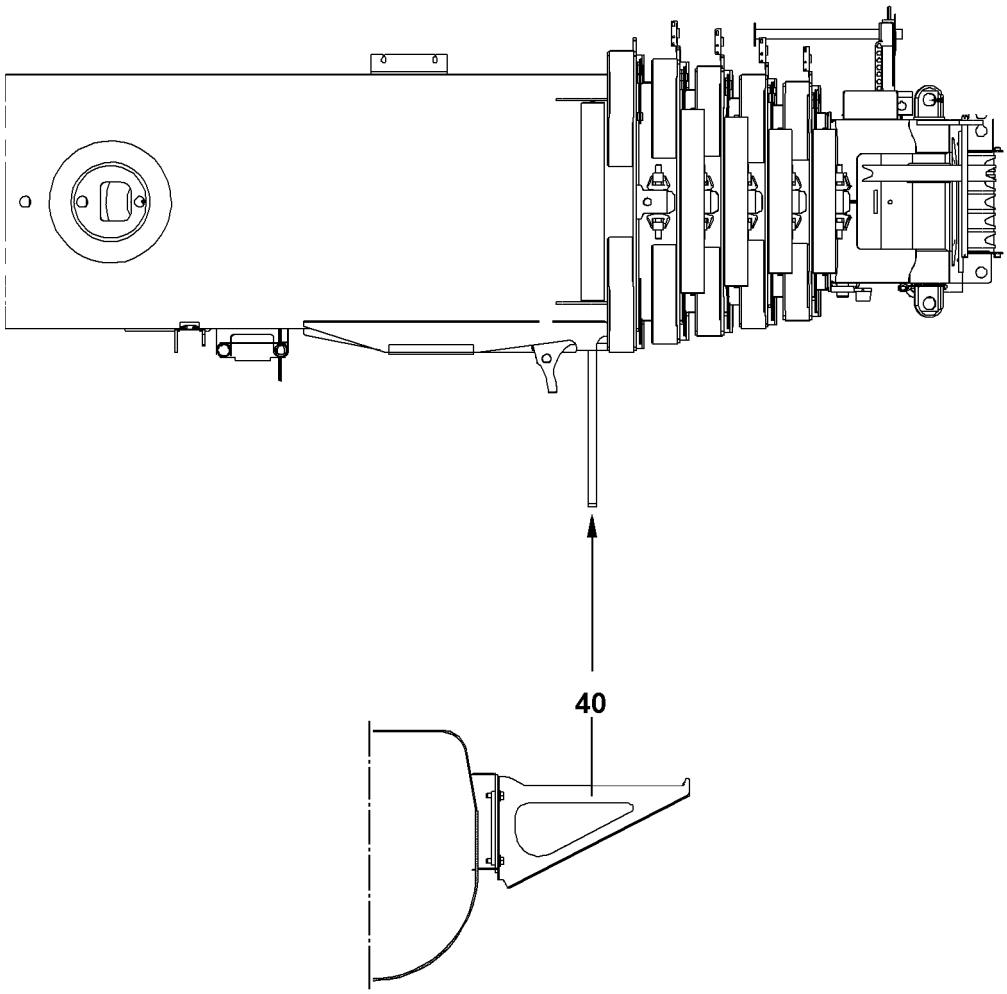

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Fig.103264

4.6 Assembling the catch bar on the telescopic boom pivot section

DANGER
Danger of fatal injuries due to toppling folding jib!
As a result of improperly assembled, damaged or non-existing catch bar **40** on the telescopic boom pivot section, the folding jib – due to an assembly error – can fall down and cause fatal injuries.

- ▶ After the auxiliary boom is removed from the telescopic boom, the catch bar **40** must be reinstalled properly.
- ▶ Make sure that the catch bar **40** property is properly assembled again and not damaged „before assembling the single or the dual folding jib“, see also „chapter 5.02“.

- ▶ Properly assemble the catch bar **40** on the telescopic boom pivot section.

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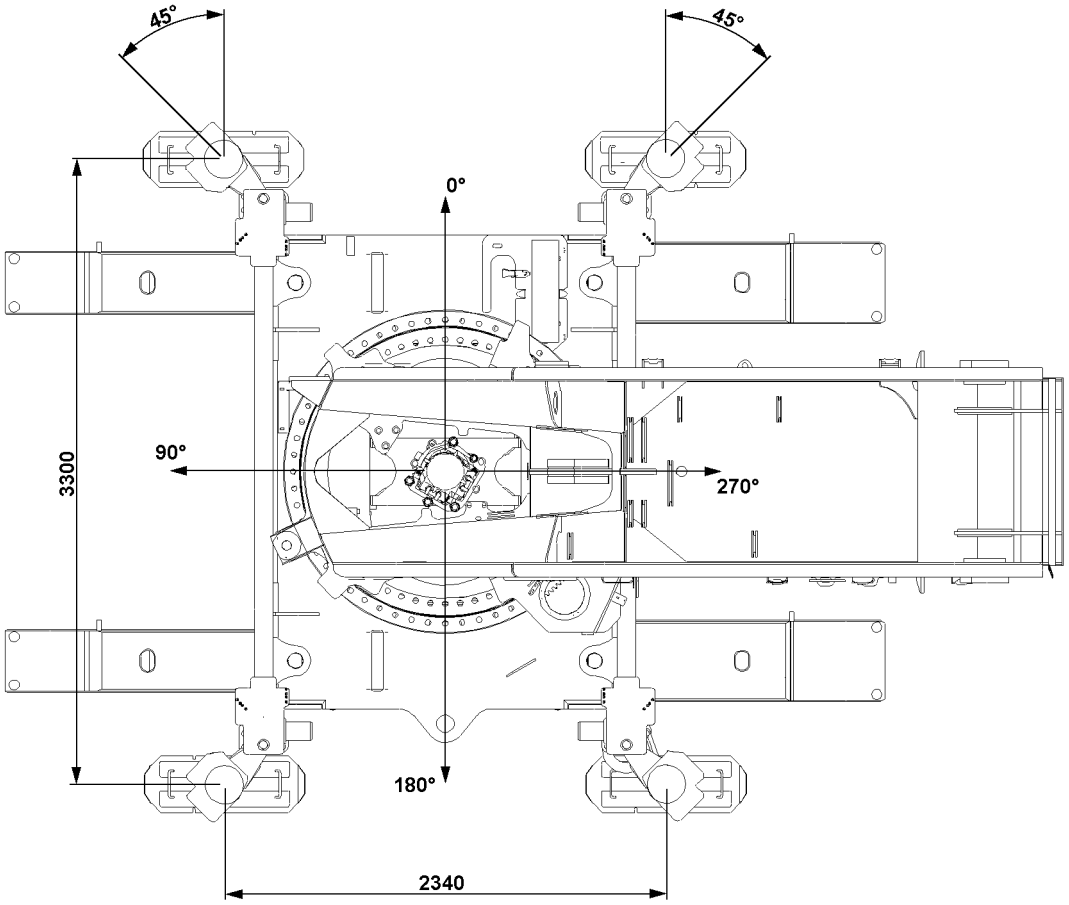

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Fig.105024

1 General

DANGER
Overload or toppling the crane!
- ▶ Do not reeve a larger hook block than the one that is required to lift the maximum load specified in the load chart!
- ▶ Observe the data in the erection and take-down charts!

2 Erection and take-down chart for T operation

2.1 For support base 2.34 m x 3.30 m

DANGER
Overload or toppling the crane!
- ▶ Erection / taking down is only permitted with support base **2.34 m x 3.30 m** !
- ▶ Fit winch 2 or the replacement ballast to the turntable prior to erection / taking down!
- ▶ Depending on the state, either the folding jib or auxiliary boom are folded in the „transportation position“ at the side of the articulated piece, see erection and take-down chart!

The telescopic boom T-11.5 (0/0/0/0/0) can be fully luffed down to reeve in the hook block onto support **2.34 m x 3.30 m** (hatch consoles 45 °) without crawlers, without central ballast and without turntable ballast, however, when using winch 2 or replacement ballast, observe the data given on the erection and take-down chart.

Boom position, T operation		
	Maximum hook block weight	
Folding jib or auxiliary boom at side of articulated piece in „transportation position“	Boom in driving direction of crawler 0 ° or 180 °	Boom vertical to the crawler direction 90 ° or 270 °
no	1.24 t	0.70 t
Auxiliary boom	1.24 t	0.45 t
Single folding jib	1.24 t	0 t
Dual folding jib	1.24 t	0 t

2.2 For wider track 4.15 m

The telescopic boom can be fully luffed down as far as the specified distances (LICCON-monitoring).

Additional assembly parts (auxiliary boom without the like) may not be mounted in the process.

Counterweight	Boom position 360° for wider track 4.15 m
32 t / 15 t	T-52.0
26 t / 15 t	T-52.0
22 t / 15 t	T-48.8
20 t / 15 t	T-41.3
16 t / 15 t	T-37.6

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Counterweight	Boom position 360° for wider track 4.15 m
10 t / 15 t	T-33.9
0 t / 15 t	T-19.0
0 t / 0 t	T-15.2

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6 Additional equipment

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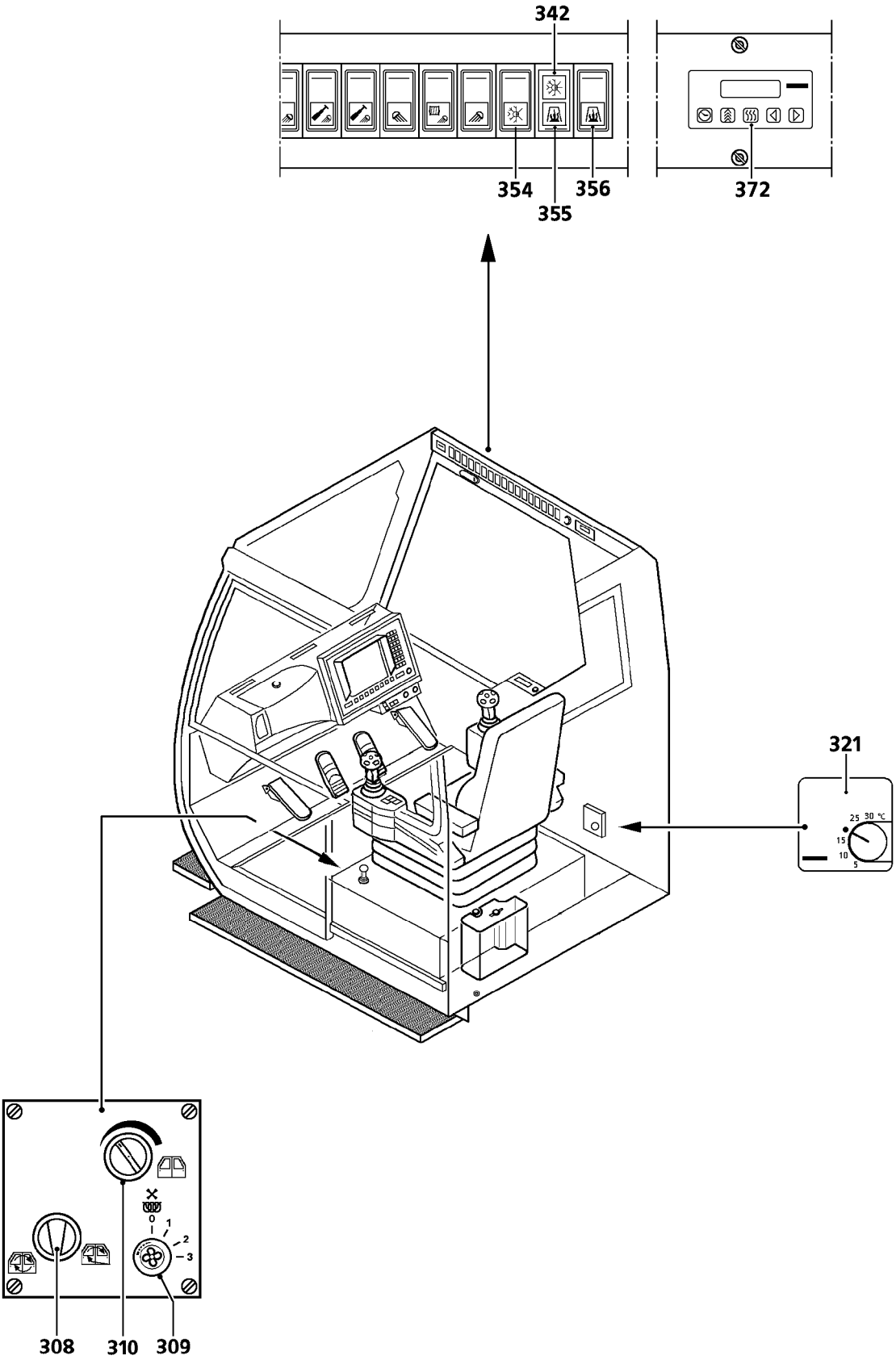

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Fig.198741

1 Heating the crane operator's cab

The cab can be heated with three independent types of heat:
- Engine-dependent heater
- Engine-independent auxiliary heater with engine preheating, at ambient temperatures of up to -40 °C, WEBASTO; Thermo 90 S*
- Engine-independent auxiliary heater with engine preheating, at ambient temperatures of less than -40 °C, WEBASTO; DBW 2020*, Air Top 5000*

The individual adjustment of the heater (for both engine-dependent and engine-independent auxiliary heaters*) is carried out with the control elements under the crane operator's seat as well as via switches and indicator lights on the instrument panel.

CAUTION
Risk of damage to the heater control units* when carrying out electrical welding work on the crane!
▶ Remove the negative and positive cables from the vehicle and crane superstructure batteries and apply the positive cable respectively to the vehicle ground.

1.1 Heater operation

1.1.1 Adjusting the temperature

The cab is heated with the engine coolant.

▶ Adjust the regulating valve **310**.

1.1.2 Adjusting the ventilation

▶ Set 3-level fan switch **309**.

Result:

– The air volume will be regulated.

1.1.3 Adjusting the recirculating air / fresh air

▶ Actuate the changeover switch **308**.

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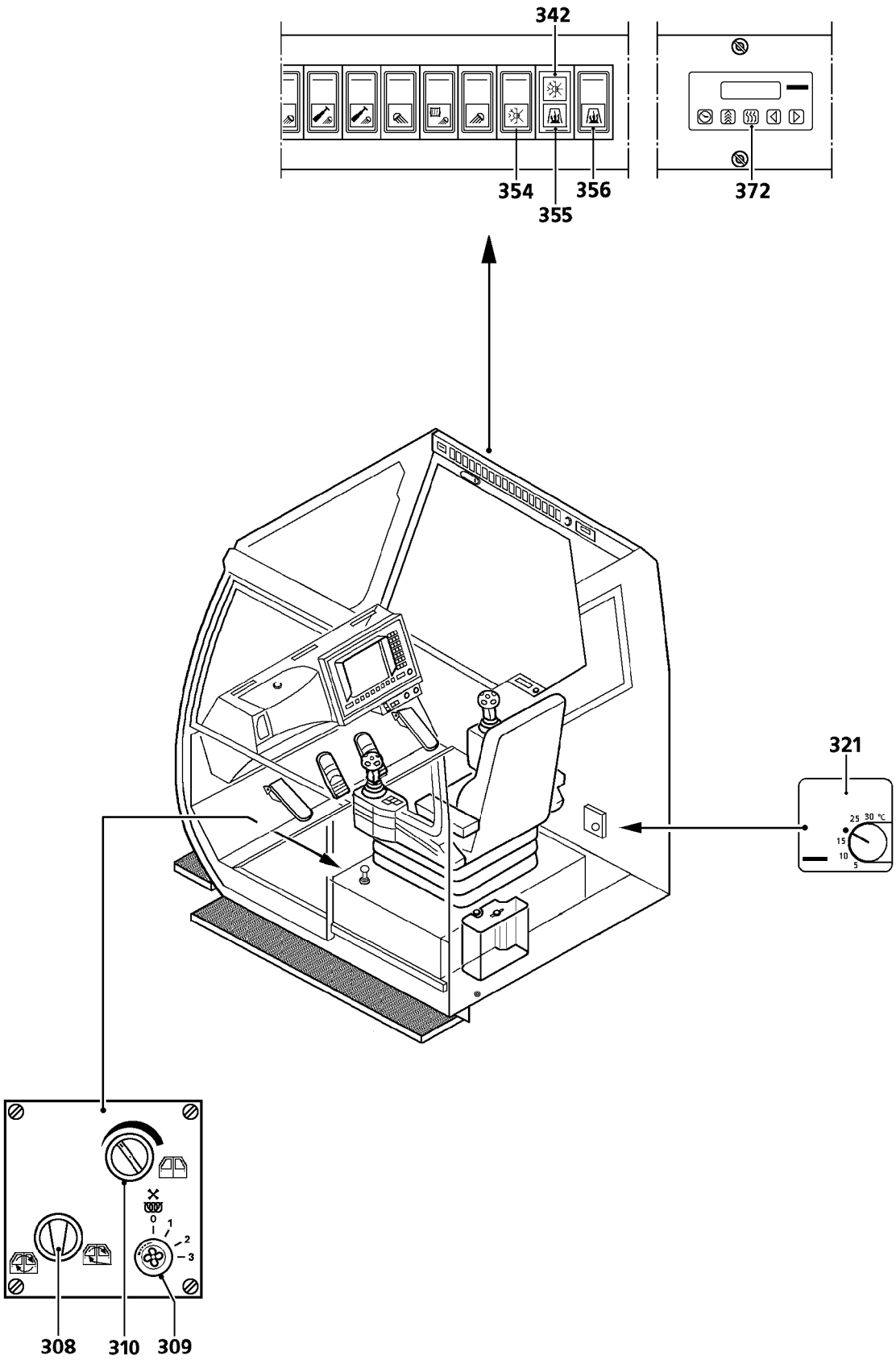

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Fig.198741

1.2 Operating the engine-independent auxiliary heater*

The engine-independent auxiliary heater is used to heat the cab when the engine is turned off and as auxiliary heater* at low ambient temperatures, if the engine-dependent heating is insufficient.

In summer run the auxiliary heater* once a month for approx. 15 to 20 minutes.

1.2.1 Start up

WARNING
Risk of explosion!
In areas where combustible fumes or dust could form, such as in the vicinity of storage areas for fuel, coal, wood dust or grain storage or similar and in the vicinity of filling stations or tank depots, there is a risk of explosion.
- ▶ Turn the auxiliary heater off on locations where combustible vapors or dust can form.
- ▶ Turn the auxiliary heater* off approx. 3 min before refueling the fuel tank!
- ▶ Before refueling the fuel tank, turn the engine off!

WARNING
Risk of poisoning and suffocation in enclosed areas!
If the auxiliary heater is operated in closed rooms, there is a danger of poisoning and suffocation!
Personnel can be killed or seriously injured!
- ▶ Do not operate the auxiliary heater in closed rooms.
- ▶ If the auxiliary heater must be operated in closed rooms, the exhaust gases must be suctioned off via an exhaust suction system.

NOTICE
Risk of damage to auxiliary heater!
- ▶ Fill the auxiliary heater in time with operating fluids for winter operation!

- ▶ Set the regulating valve **310** to „warm“.
- ▶ Actuate the switch **356**.

Result:

- – The function control on the switch **356** lights up.
- – The indicator light **355** lights up.

1.2.2 Turning off

- ▶ Actuate the switch **356**.

Result:

- – The function control on the switch **356** turns off.
- – Each time the auxiliary heater is turned off, it continues to run up to 150 seconds longer.

CAUTION
Danger of property damage!
- ▶ Turn the battery master switch off only when the heater shut off delay is over.

- – Once the shut off delay is ended:
  The indicator light **355** turns off.

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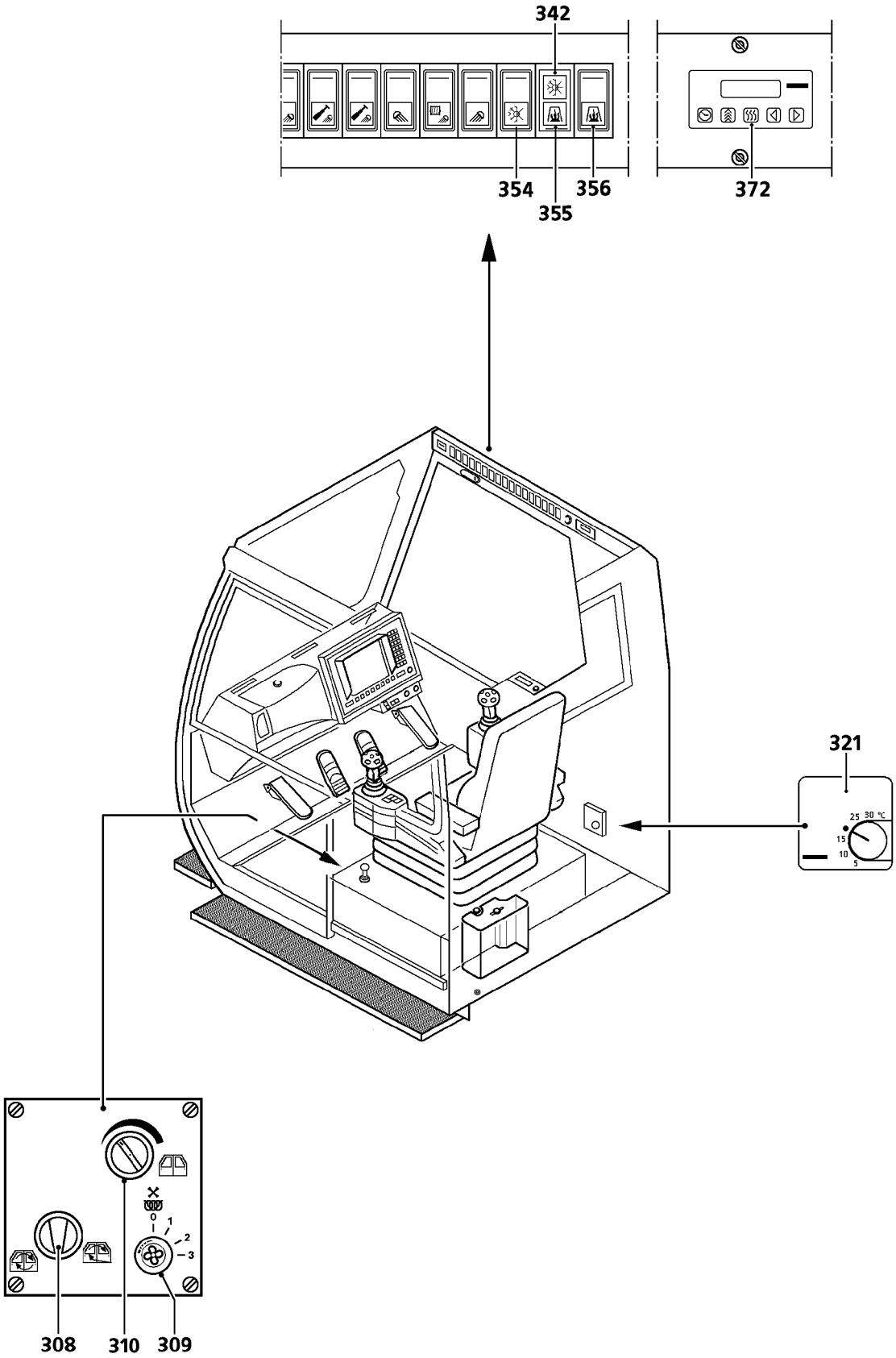

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Fig.198741

1.2.3 Operation with timer*

For a detailed description of the timer*** 372** refer to the enclosed manufacturer's operating instructions.

▶ Set the required turn-on time, temperature and duration of heater operation on the timer*** 372**.
▶ Open or close the air vents, as desired.

Result:

– Upwards or downwards air distribution will be selected.

▶ Set the regulating valve **310** to „warm“.

1.2.4 Operating the thermostat*

Make sure that the following prerequisite is met:
– The regulating valve **310** is set to „warm“.

▶ Turn the thermostat **321** to the desired temperature.

1.2.5 Venting the system

When draining off the engine coolant, the contents of the heating system will also be drained because the engine and heater operate as one circuit. When refilling the system, it must be carefully bled.

▶ Fill the coolant via the equalizing reservoir of the engine cooling circuit as specified in the lubricant chart.
▶ Start the engine, see Crane operating instructions, chapter 4.03.
▶ Set the regulating valve **310** to „warm“.
▶ Check the expansion tank for air bubbles.

Result:

– The engine is bled as soon as no more air bubbles rise up.

Once no more air bubbles appear in the expansion tank:
▶ Set the regulating valve **310** to „cold“.

Result:

– The heater circuit will be bled.

▶ Check the expansion tank for air bubbles.

Result:

– The heater circuit is bled as soon as no more air bubbles rise up.

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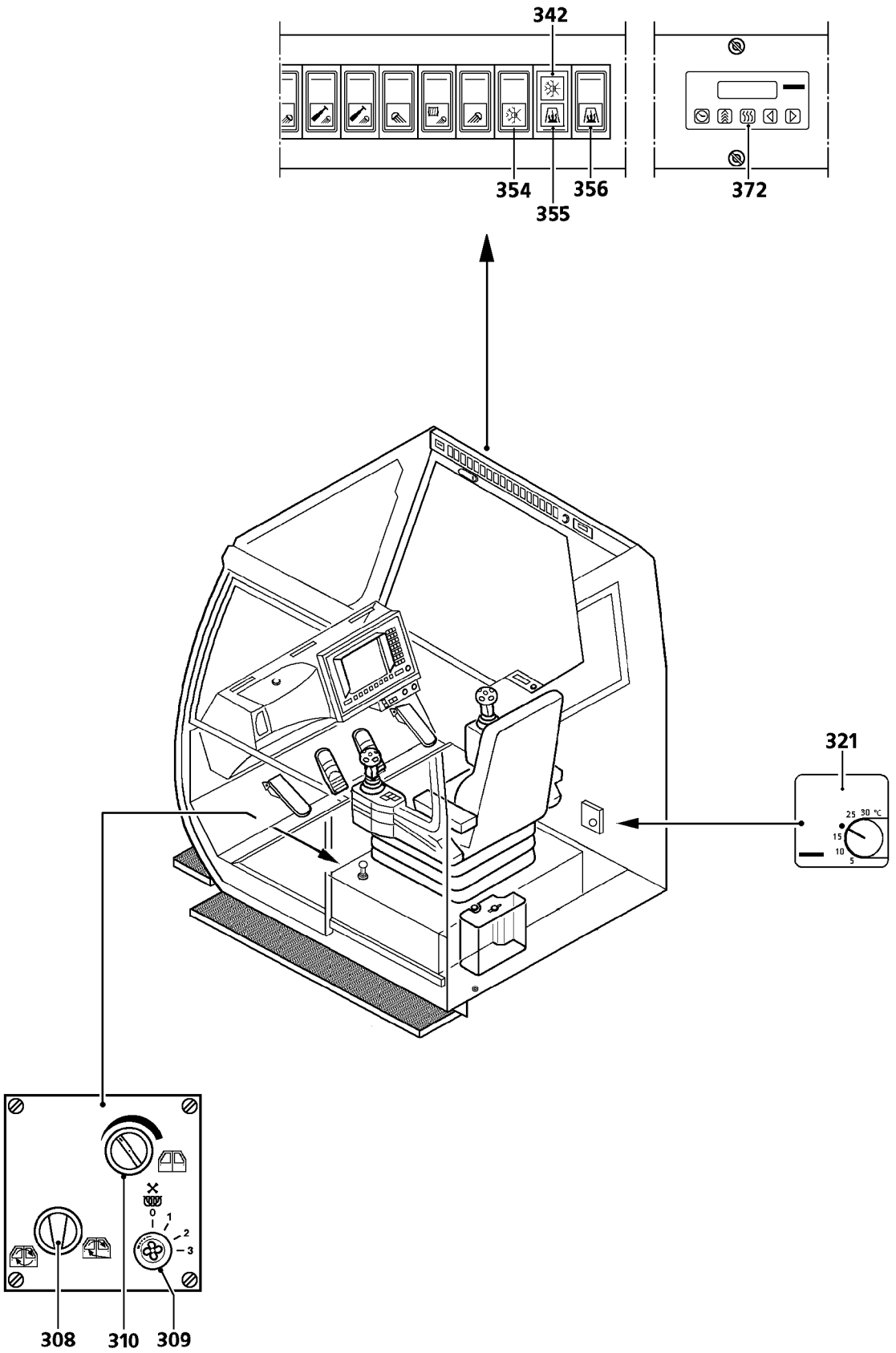

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Fig.198741

1.3 Operating the engine-independent auxiliary heater for engine pre-heating*

At ambient temperatures of under -20 °C, the crane engine must be preheated using engine preheating which is operated with diesel fuel.

1.3.1 Start up

WARNING
Risk of explosion!
In areas where combustible fumes or dust could form, such as in the vicinity of storage areas for fuel, coal, wood dust or grain storage or similar and in the vicinity of filling stations or tank depots, there is a risk of explosion.
- ▶ Turn the auxiliary heater off on locations where combustible vapors or dust can form.
- ▶ Turn the auxiliary heater* off approx. 3 min before refueling the fuel tank!
- ▶ Before refueling the fuel tank, turn the engine off!

WARNING
Risk of poisoning and suffocation in enclosed areas!
If the auxiliary heater is operated in closed rooms, there is a danger of poisoning and suffocation!
Personnel can be killed or seriously injured!
- ▶ Do not operate the auxiliary heater in closed rooms.
- ▶ If the auxiliary heater must be operated in closed rooms, the exhaust gases must be suctioned off via an exhaust suction system.

NOTICE
Risk of damage to auxiliary heater!
- ▶ Fill the auxiliary heater in time with operating fluids for winter operation!

- ▶ Set the regulating valve **310** to „cold“.
- ▶ Actuate the switch **356**.

Result:

- – The indicator light **355** lights up.
- – Engine preheating is turned on.

1.3.2 Turning off

- ▶ Actuate the switch **356**.

Result:

- – The indicator light **355** turns off.
- – Engine preheating is completed.

CAUTION
Danger of property damage!
- ▶ Turn the battery master switch off only when the heater shut off delay is over.

- – A shut off delay of the engine preheating will run up to 150 seconds.

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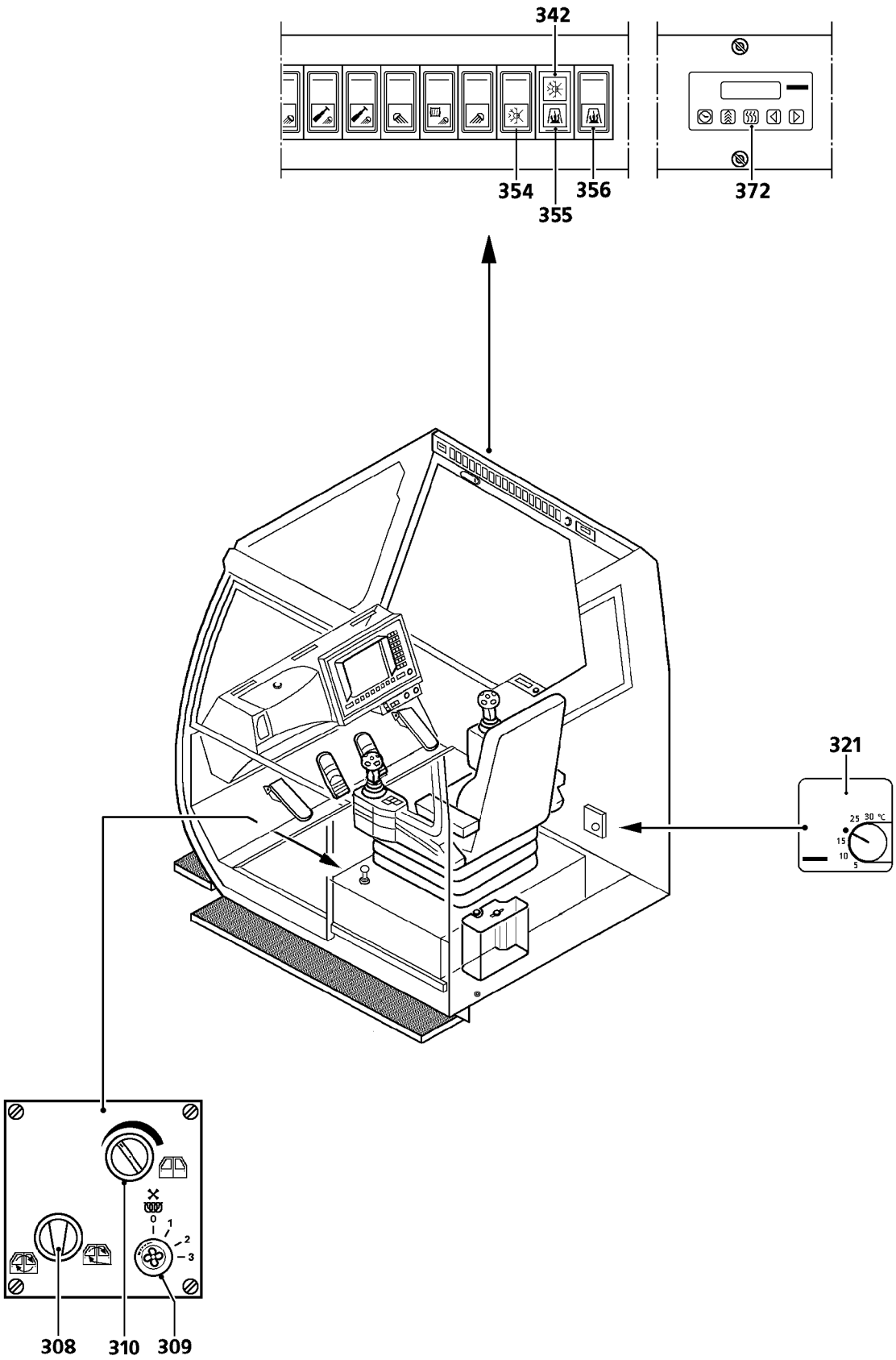

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Fig.198741

1.3.3 Starting up with timer*

For a detailed description of the timer*** 372** refer to the enclosed manufacturer's operating instructions.

- ▶ Turn the battery master switch **15** on.
- ▶ Set the regulating valve **310** to „cold“.
- ▶ Use the timer*** 372** to turn the engine preheating on.

Result:

- – The prerun of the engine preheating system turns on and runs for approx. 10 to 25 seconds.
- – The engine preheating starts after 10 to 25 seconds.
- – The engine preheating runs in automatic regulating mode.

1.3.4 Turning off with timer*

When the preheating period is over:

- ▶ Turn the timer off*** 372**.

Result:

- – Engine preheating is completed.

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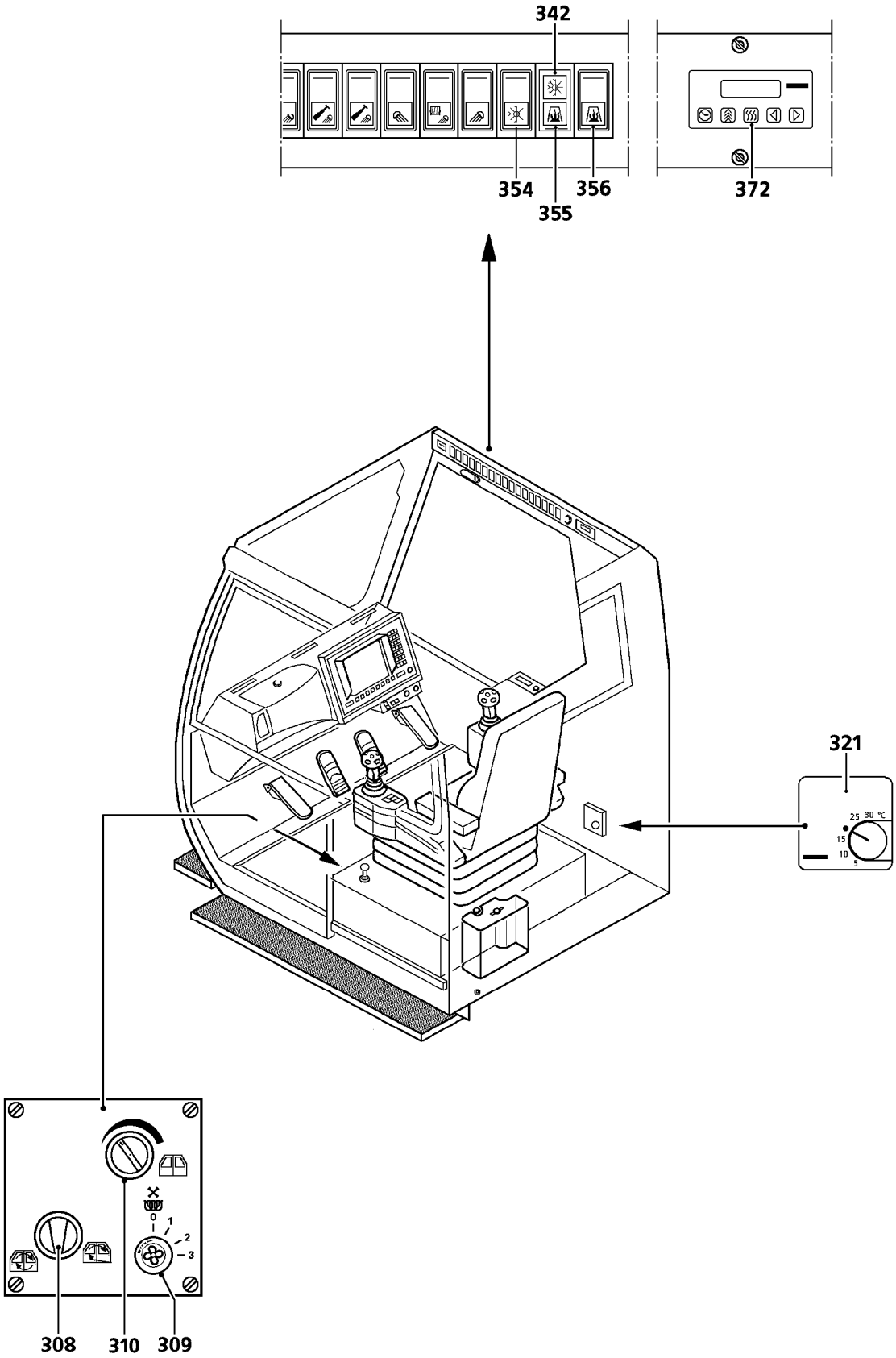

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Fig.198741

1.4 Climate control system operation*

The climate control system is a combination of heater and ventilation system as well as an air conditioning system, which is used to dehumidify and cool the air in the crane cab.

Please note:
- In air conditioning operation, the humidity in the crane cab is decreased. This prevents the windows from fogging up.
- In case of high outside humidity and high outside temperatures, condensation can drip from the evaporator of the air conditioning system and form a puddle under the mobile crane. This is normal and no sign of leaks.

WARNING
Injuries to persons and property damage!
- ▶ If the climate control system is turned off and in air circulation operation, the windows can fog up!
- ▶ Do not expose personnel to very low temperatures!
- ▶ Repair work on the climate control system and maintenance work on the cooling circuit must be carried out solely by a Service technician from Liebherr-Werk Ehingen!

Note
- ▶ In order not to compromise the heater or cooling output and to prevent the windows from fogging up, the air intake must be clear of ice, snow and contaminants.
- ▶ The climate control system works best if the windows and doors are closed. However, if the crane operator's cab is heated up too much due to sun rays when the mobile crane is at a standstill, then the cool off procedure can be accelerated by opening the windows or doors for a short time.
- ▶ Do not cover up the air circulation intake with clothing or other objects!

The maximum cooling output is reached when:
- Windows and cab door are closed.
- All air vents are open.
- The change over switch **308** is set to air circulation.
- The blower switch **309** is set to maximum power.
- The regulating valve **310** is set to low temperature.

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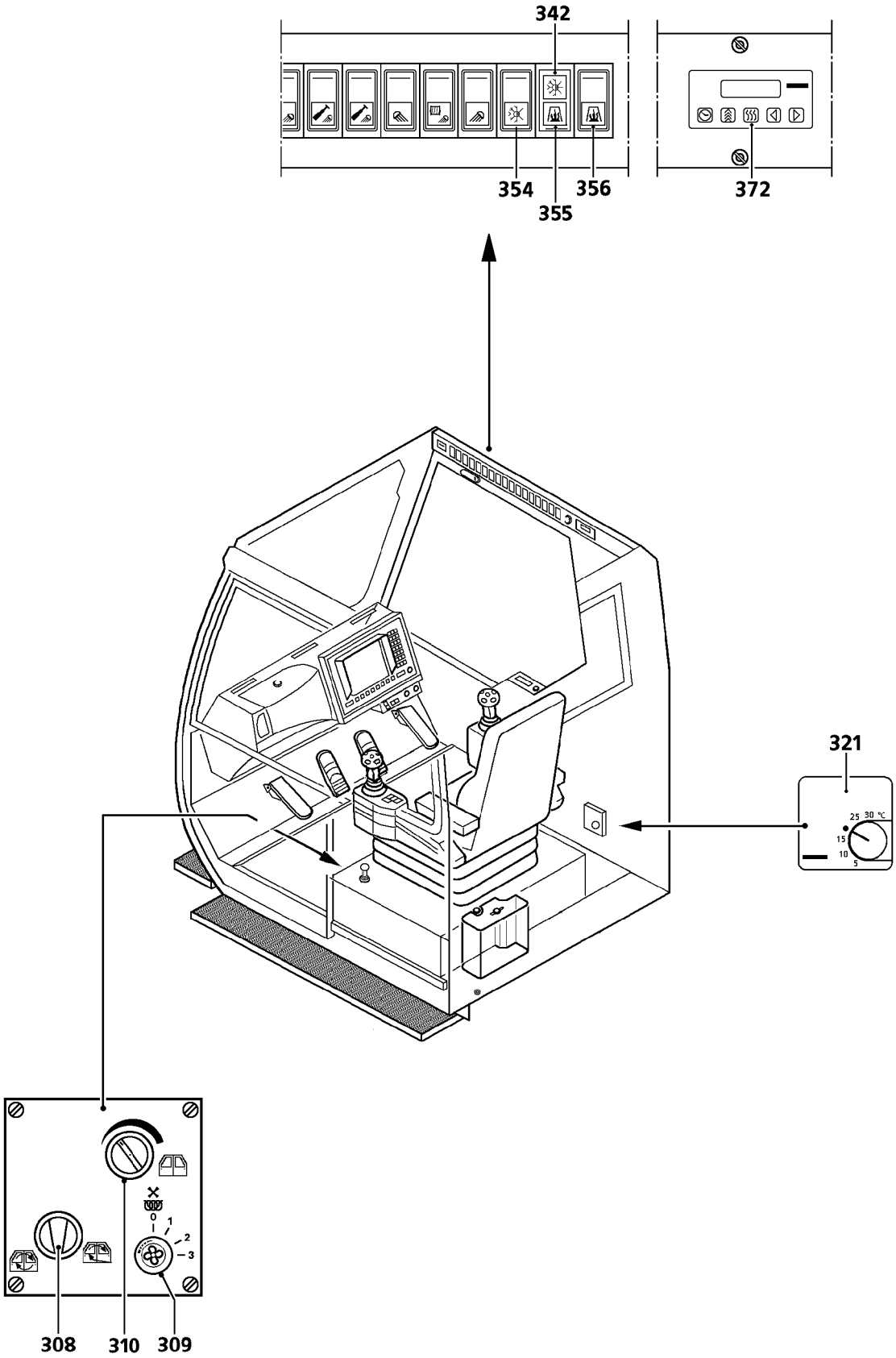

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Fig.198741

1.4.1 Operating the climate control system

Make sure that the following prerequisites are met:
- The battery master switch is turned on.
- The engine is running.

▶ Actuate the switch **354**.

Result:

- The indicator light **342** lights up.
- The air conditioning system* is turned on and ready to operate.

▶ Turn on the fan with the rotary switch **309**.
▶ Adjust temperature with the regulating valve **310**.
▶ Open or close the air vents, as desired.

Problem remedy
The temperature from the air vents is not noticeably below the ambient temperature?
The air circulation or the fresh air filter or evaporator are dirty.
▶ Check the air circulation and fresh air filter for contaminants and clean or replace, as necessary.
▶ Check the evaporator for contaminants and clean, if necessary.

▶ If none of these measures are helpful, contact Liebherr-Werk Ehingen customer service!

1.4.2 Turning the climate control system off

▶ Turn the switch **354** off.

Result:

- The indicator light **342** turns off.
- The climate control system* is turned off.

2 Bleeding the heating system

When draining off the engine coolant, the contents of the heating system will also be drained because the engine and heater operate as one circuit. When refilling the system, it must be carefully bled.

2.1 Bleeding the heating system without engine independent auxiliary heater

▶ Fill the coolant via the expansion tank of the engine cooling system for the superstructure as specified in the lubrication chart.
▶ Start the crane engine.
▶ Set the heater for the crane cab to „warm“.
▶ Check the expansion tank for air bubbles.

Result:

- The engine is bled as soon as no more air bubbles rise up.

Once no more air bubbles appear in the expansion tank:
▶ Set the crane cab heater to „cold“.

Result:

- The heating circuit will be bled.

▶ Check the expansion tank for air bubbles.

Result:

- The heating circuit is bled as soon as no more air bubbles rise up.

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2.2 Bleeding the heating system with engine independent auxiliary heater

The procedure is as in section „Bleeding the heating system without engine independent auxiliary heater“.

3 Maintaining the engine independent heater

Note
▶ The maintenance guidelines of the heater manufacturer remain valid and binding!

If an engine independent heater (auxiliary heater) is installed on the crane, maintenance must be carried out in regular intervals.

WARNING
Danger of accident!
On locations, where flammable vapors or dust can form (for example on gas stations), there is a danger of explosion when operating the engine independent heater!
▶ Do not operated the engine independent heater in case of a danger of explosion!
▶ Do not breathe in the exhaust of the engine independent heater!

The maintenance of the engine independent heater includes:
– Monthly: Function test.
– Before every heating period: Checks.
– According to the specification of the heater manufacturer: Replacing components of the heater.
– After fuel tank was empty: Bleed the fuel line.

3.1 Perform function tests

Operate the engine independent heater once a month for at least 10 minutes.

Make sure that the following prerequisites are met:
– The crane is outside or a sufficient exhaust suction is ensured.
– The location has been selected in such a way that there is no danger of explosion when operating the engine independent heater.
– Combustion air infiltration and exhaust emission of the heater are free of foreign particles.
– Pollen filter / dust filter of the heater are continuous (if present).
– Heating circuit is bled.
– Fuel line is bled.
– Heating circuit is completely cold.
– The crane engine is turned off.

▶ Turn the engine independent heater and heater blower on.

Result:

– The circulation pump starts.
– The combustion air blower starts.
– After maximum four minutes an exhaust emission on the exhaust pipe is noticeable.
– The engine independent heater runs: The heating circuit starts to warm up.

▶ Check the heat effect on the air vents of the vehicle.
▶ Engine preheating* (Engine must be off!): Check if the engine temperature increases.

3.2 Checks to be performed

Before every heating period, carry out the following checks.

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Make sure that the following prerequisites are met:
- The heater and the heating circuit are completely cold.
- A function check was completed successfully.
- In the error stack of the heater **and** in the error stack of the LICCON computer system are no error messages listed for the heater.

Note
The error stack of the heater can only be read by expert personnel.
▶ Contact Customer Service at Liebherr-Werk Ehingen.

▶ Clean the heater externally (avoid water infiltration).
▶ Check the electrical connections for contact corrosion and tight seating.
▶ Check the exhaust and combustion air line for damage and free passage.
▶ Check the fuel line and fuel filter (if installed separately) for leaks and cracks.
▶ Replace the fuel filter (if installed separately).
▶ Check the circulation pump for leaks.
▶ Check the heating circuit for leaks and cracks.
▶ Check the anti-corrosion / antifreeze in the heating circuit (specification: 50 % anti-corrosion fluid / antifreeze).

3.3 Replacing components of the heater.

The heater manufacturer specifies time frames, after which the components of the heater must be replaced.

- No later than after 3000 operating hours, the burner of the heater must be replaced.
- No later than after 10 years, the heat exchanger of the heater must be replaced.

3.4 Bleed the fuel line.

If the fuel tank of the engine independent heater was run dry, then it is possible that the fuel line must be bled.

In addition, it may be possible that a new start must be carried out on the control unit of the engine independent heater.

Note
New start of the control unit of the engine independent heater.
▶ Contact Customer Service at Liebherr-Werk Ehingen and coordinate the procedure.

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Fig.195219

1 General

WARNING
Increased risk of accident during emergency operation!
If the following general danger notes are not observed, there is an increased danger of accidents since an optical check is no longer possible on the LICCON monitor.

- ▶ In case of a problem or failure of the LICCON computer system, every step must be carried out and checked with utmost caution and care.
- ▶ All crane movements must be carried out with extreme caution!
- ▶ Telescoping must be constantly monitored by a second person!
- ▶ The crane operator must be in visual contact with the second person!
- ▶ Observe general danger notes!

General danger notes

1. **All safety devices are automatically bypassed during emergency operation.**
2. **Emergency operation of the crane superstructure may only be carried out:**
   - **To remove a dangerous situation.**
   - **After consultation with LIEBHERR Service.**
   - **By authorized persons who are aware of the risks of emergency operation.**
   - **To carry out load reducing movements.**
3. **The danger zone must be blocked off.**
4. **No persons or objects may remain in the danger zone**.

Note
In order to carry out emergency operations, it is necessary to have the engine running and the hydraulic system of the superstructure functioning. If this is not the case, the crane must be taken down by using auxiliary cranes. The boom may only be luffed down if the stability of the crane permits this.

- ▶ The information provided in the operating instructions and the erection and take down charts for taking down the telescopic boom or the equipment must be observed.

1.1 First measures in emergency operation

Note

- ▶ In emergency operation, the crane superstructure must always be taken down first.

The following work must be carried out first in emergency operation:

1. Set down the load to relieve the boom.
2. Retract the telescopic boom.
3. Place down the equipment.

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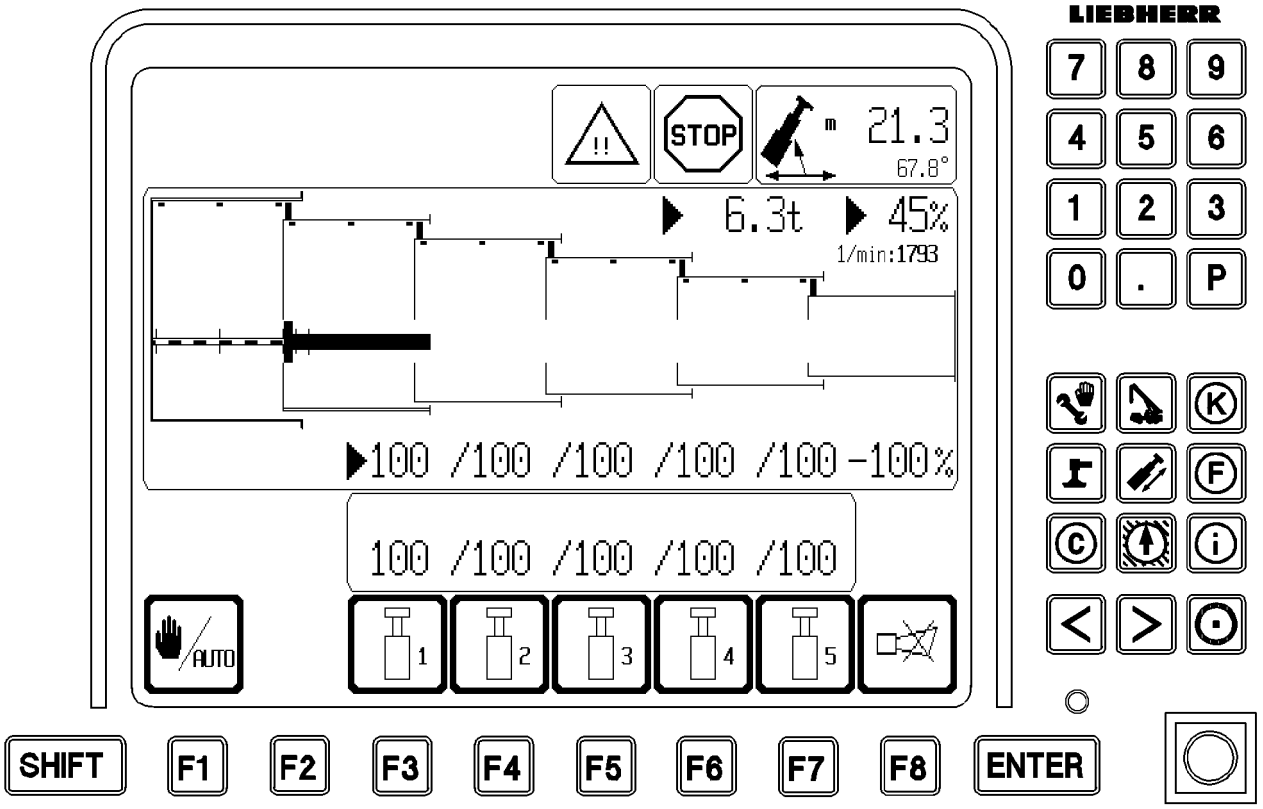

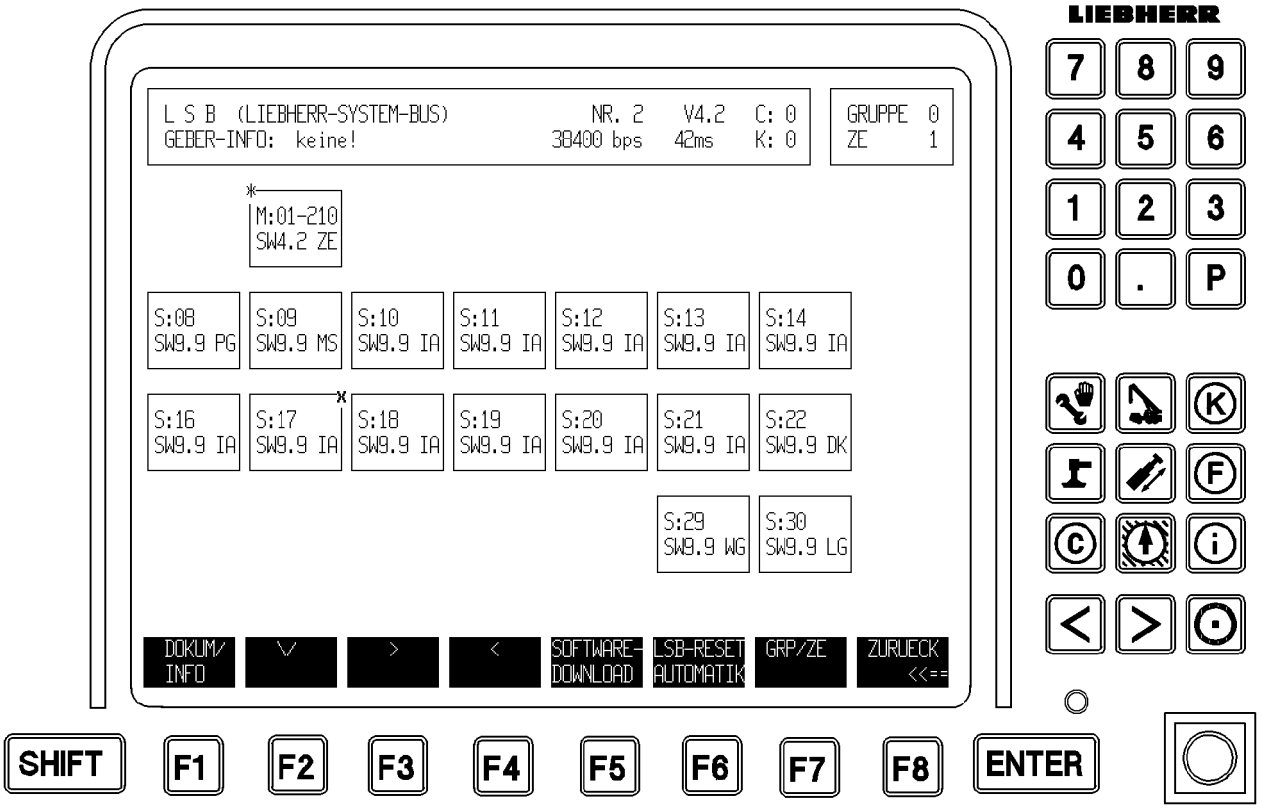

Fig.197769

2 Failure of an inductive sensor

WARNING
Danger of accidents in case of failure of one or more inductive sensors!
▶ It is imperative that the next **Liebherr Service location** or **Liebherr-Werk Ehingen** is contacted!

In case of failure of one or several inductive sensors, the LICCON computer system can no longer determine the exact position of the telescoping cylinder, the telescoping lock or the telescopic pinning.

Result:

– Telescoping is no longer or only partially possible.

3 LICCON-System-Bus 2 (LSB 2) defective

WARNING
Risk of accident!
▶ It is imperative that the next **Liebherr Service location** or **Liebherr-Werk Ehingen** is contacted!

3.1 Possible cause

– Input pcb not connected to central processing unit (CPU 1).
– Supply bus circuit board defective.
– LSB power source or CPU interface interrupted.
– Electrical connection interrupted.

Result:

– Neither automatic nor manual telescoping is possible.

3.2 How will the error be recognized on the operating screen?

– Number value in icon „Maximum load carrying capacity“ is 0.0.
– Number value in icon „Current load carrying capacity“ is incorrect.

3.3 How will the error be recognized on the telescoping screen?

– Telescopic sections are not pinned.
– Telescoping cylinder not locked.

3.4 Error recognition in LSB overview

– Transmitter, inductive sensors for telescoping are not assembled on the bus, even though they are required.**„O“**.
– Transmitter is available, but an error in its configuration was recognized.**„X“**.

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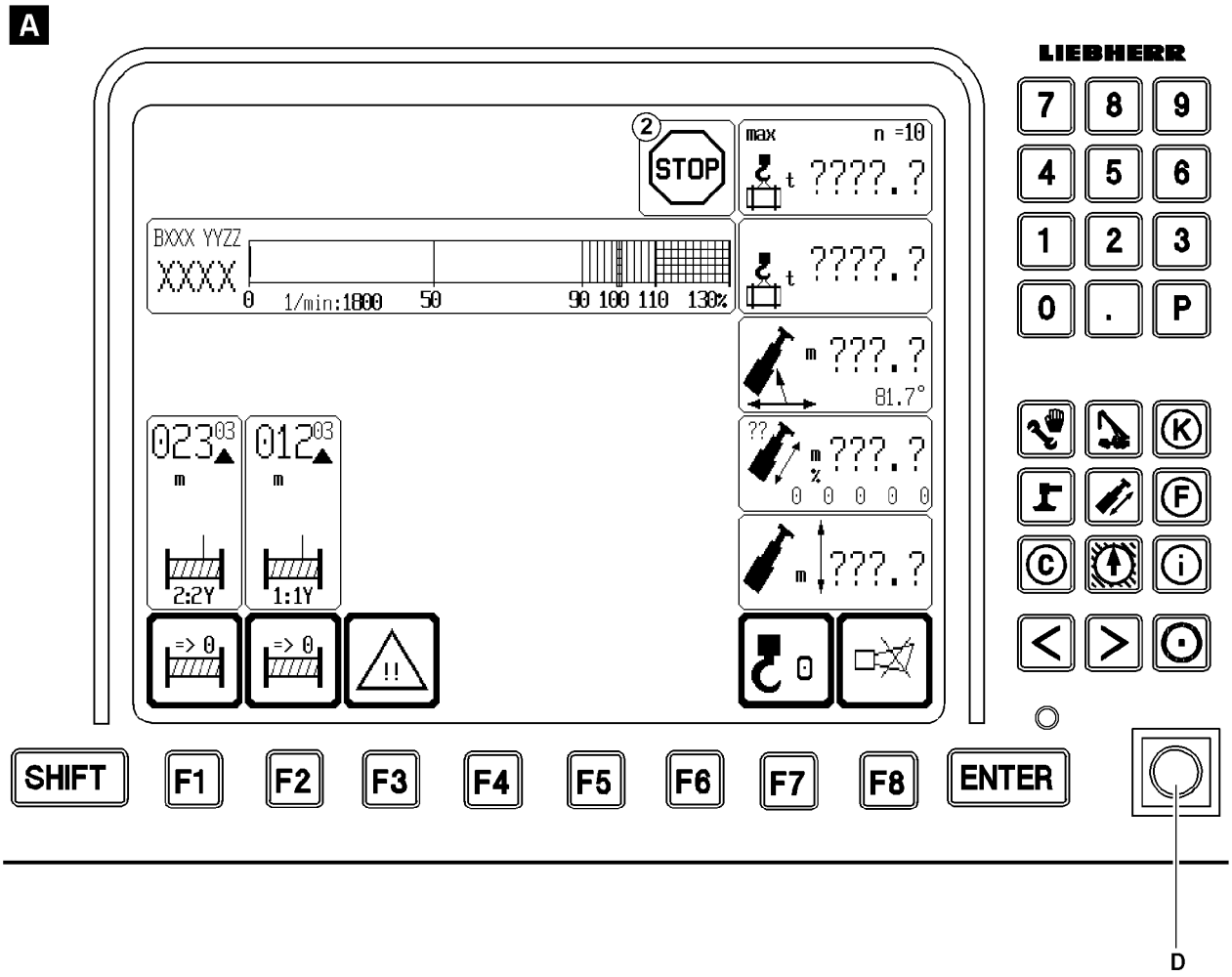

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Fig.105674

4 Defective sensor

4.1 Length sensor defective

If the length sensor on the telescoping cylinder fails, the boom length can no longer be calculated when the telescopic boom is unpinned. If the telescopic boom is pinned, the telescopic boom length value will continue to be displayed on the LICCON monitor. If the telescopic boom length is missing, it is not possible to calculate the radius, pulley head height and „current load“. Without the telescopic boom length, it is not possible to access the load chart. The consequence is that there is no „maximum load“ and no „maximum permitted wind speed“. Flashing question marks are shown for all values where no value is to be calculated, see illustration **A**. The shut-off is also indicated by an acoustic signal and a flashing STOP symbol **2** on the LICCON monitor.

The following crane movements are shut off by this sensor defect:
- Raise hoist gear 1 and 2.
- Telescope the telescopic boom out.
- Telescope the telescopic boom in.
- Luffing the telescopic boom up.
- Luffing the telescopic boom down.
- Hydraulic folding jib up.
- Hydraulic folding jib down.

The following crane movements are still possible:
- Lower hoist gear 1 and 2.
- Turning the crane superstructure.

The shut off can be bypassed, see section „Bypass sensor defect“.

DANGER
Increased accident risk when bypassing the overload protection!
If the overload protection is bypassed, there is no further protection against crane overload!
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!
- ▶ It is only permitted to bypass the overload protection during assembly or in emergencies!
- ▶ The bypass may only be made by persons who are aware of the consequences of their actions!
- ▶ Bypassing the overload protection requires the presence of the crane supervisor and must be performed with utmost caution!
- ▶ Crane operation with bypassed overload protection is prohibited!

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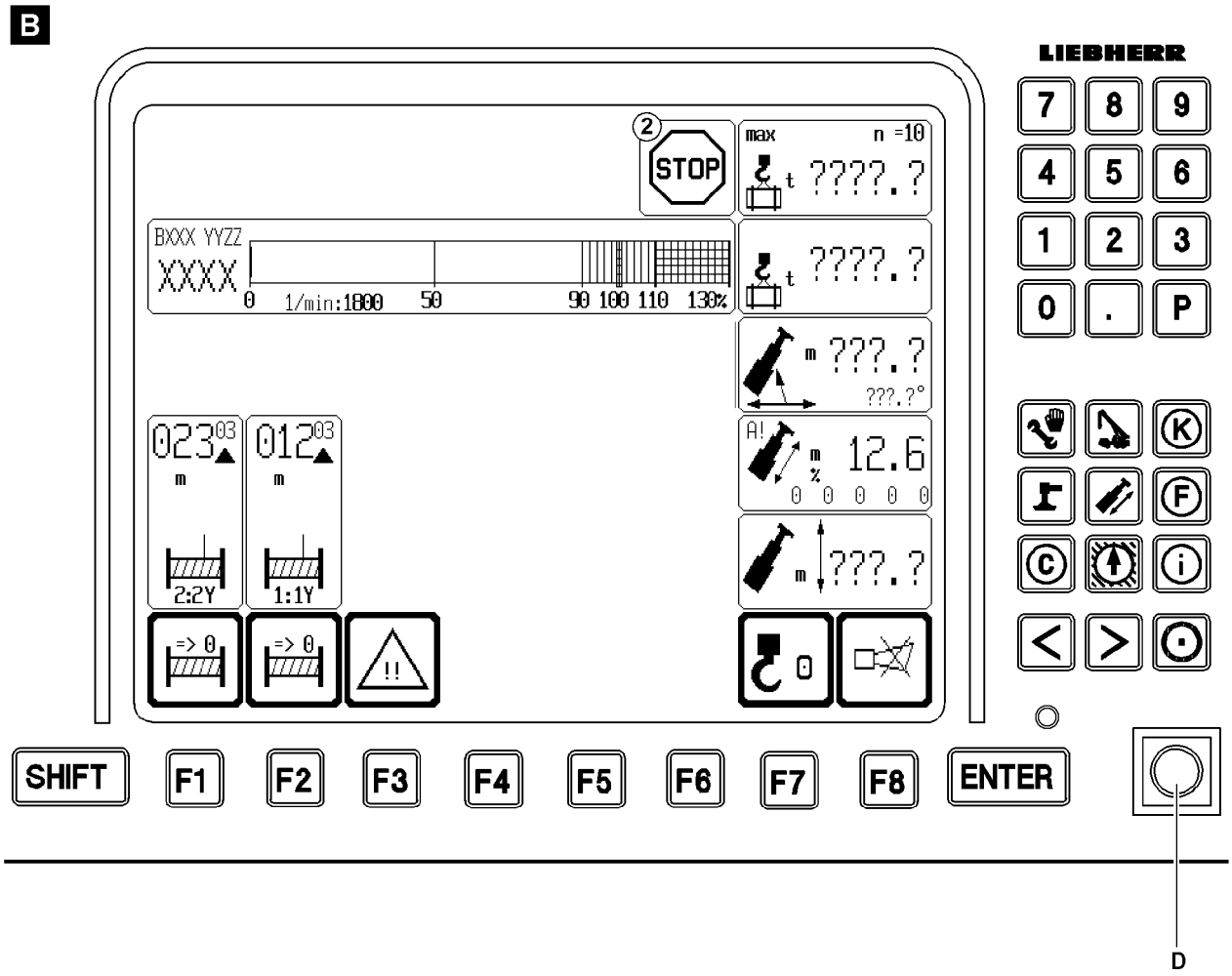

LWE/LTR 1100-005/17505-03-02/en

Fig.105675

4.2 Angle sensor defective

If both angle sensors fail, it is not possible to calculate the radius, pulley head height and „current load“. It is therefore not possible to calculate the „maximum load“ and „maximum permissible wind speed“. The boom length will still be displayed. Flashing question marks are shown for all values where no value is to be calculated, see illustration **B**. The shut-off is also indicated by an acoustic signal and a flashing STOP symbol **2** on the LICCON monitor.

The following crane movements are considered defective and shut off by this sensor:
- Raise hoist gear 1 and 2.
- Telescope the telescopic boom out.
- Telescope the telescopic boom in.
- Luffing the telescopic boom up.
- Luffing the telescopic boom down.
- Hydraulic folding jib up.
- Hydraulic folding jib down.

The following crane movements are still possible:
- Lower hoist gear 1 and 2.
- Turning the crane superstructure.

The shut off can be bypassed, see section „Bypass sensor defect“.

DANGER
Increased accident risk when bypassing the overload protection!
If the overload protection is bypassed, there is no further protection against crane overload!
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!
- ▶ It is only permitted to bypass the overload protection during assembly or in emergencies!
- ▶ The bypass may only be made by persons who are aware of the consequences of their actions!
- ▶ Bypassing the overload protection requires the presence of the crane supervisor and must be performed with utmost caution!
- ▶ Crane operation with bypassed overload protection is prohibited!

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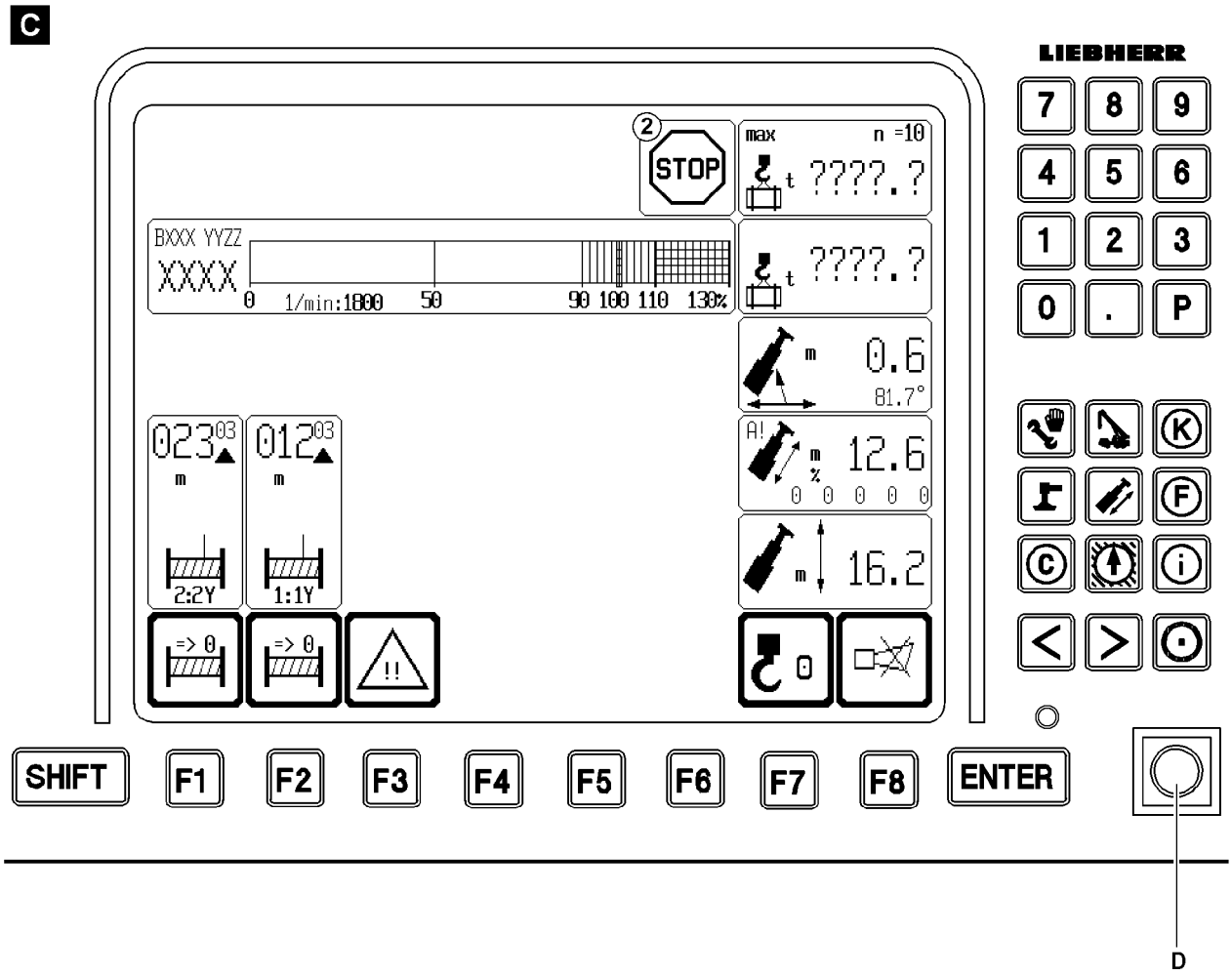

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Fig.105676

4.3 Faulty pressure sensor on luffing cylinder

If the pressure sensor on the luffing cylinder fails, it is not possible to calculate the „current load“. It is therefore not possible to calculate the „maximum load“ and „maximum permissible wind speed“. The boom length, radius and pulley head height will still be displayed. Flashing question marks are shown for all values where no value is to be calculated, see illustration **C**. The shut-off is also indicated by an acoustic signal and a flashing STOP symbol **2** on the LICCON monitor.

The following crane movements are considered defective and shut off by this sensor:
- Raise hoist gear 1 and 2.
- Telescope the telescopic boom out.
- Telescope the telescopic boom in.
- Luffing the telescopic boom up.
- Luffing the telescopic boom down.
- Hydraulic folding jib up.
- Hydraulic folding jib down.

The following crane movements are still possible:
- Lower hoist gear 1 and 2.
- Turning the crane superstructure.

The shut off can be bypassed, see section „Bypass sensor defect“.

DANGER
Increased accident risk when bypassing the overload protection!
If the overload protection is bypassed, there is no further protection against crane overload!
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!
- ▶ It is only permitted to bypass the overload protection during assembly or in emergencies!
- ▶ The bypass may only be made by persons who are aware of the consequences of their actions!
- ▶ Bypassing the overload protection requires the presence of the crane supervisor and must be performed with utmost caution!
- ▶ Crane operation with bypassed overload protection is prohibited!

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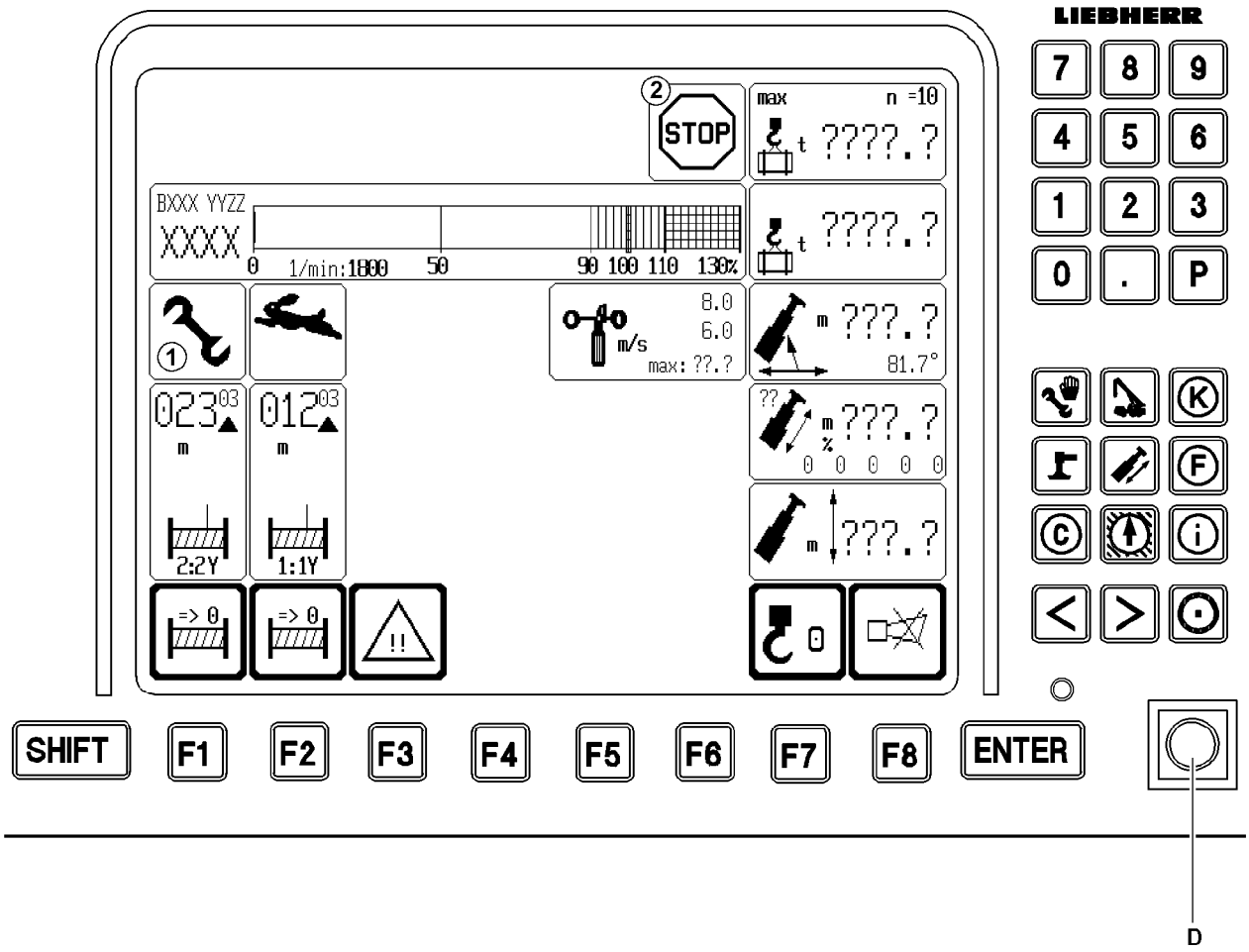

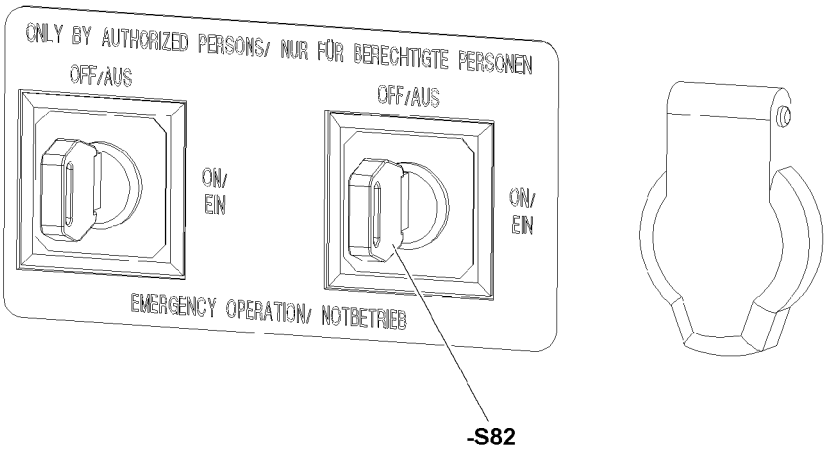

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Fig.107332

4.4 Bypass sensor defect

4.4.1 Operating the bypass key button D on the LICCON monitor

Ensure that the following prerequisite is met:
- the master switches have **not** been operated,
- one of the shut offs is active:
  - length sensor defective,
  - angle sensor defective,
  - faulty pressure sensor on luffing cylinder.

▶ Turn the bypass key button **D** to the right and hold.

Result:

- The assembly icon **1** on the LICCON monitor blinks.
- An acoustic signal sounds.
- The red flashing beacon on the crane cab blinks.
- The working speed is reduced for all functions, except for the slewing gear and the hydraulic folding jib*****.

Problem remedy
When the shut off „length sensor defective“, „angle sensor defective“ and „pressure sensor on luffing cylinder defective“ cannot be bypassed with the bypass key button **D**?
▶ Bypass them with key button **-S82** in the control cabinet.
▶ See section „Bypass of load moment limiter emergency operation with key button-S82*****“.

The bypass function turns off:
- If the bypass key button **D** is no longer pressed.
- If the bypass key button **D** is actuated but all master switches are in neutral position for 10 seconds.

▶ Do no longer press the bypass key button **D**.

Result:

- The assembly symbol **1** on the LICCON monitor extinguishes.
- The acoustic signal is turned off.
- The red flashing beacon on the crane cab extinguishes.
- The working speed is no longer reduced*****.

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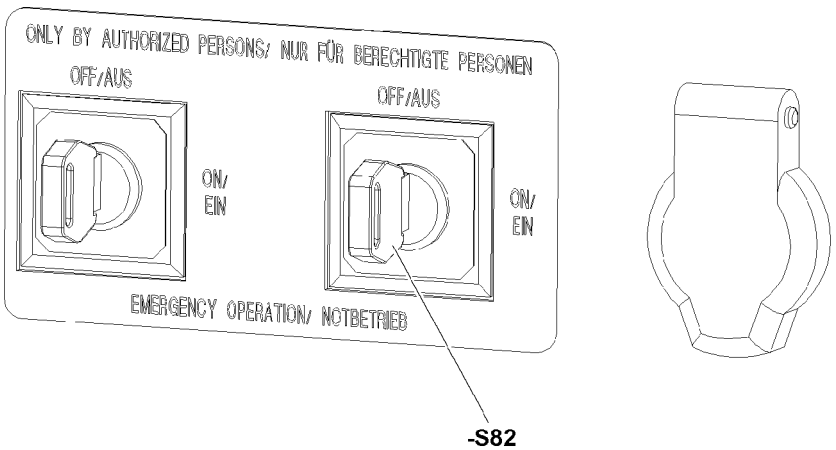

LWE/LTR 1100-005/17505-03-02/en

Fig.107333

4.4.2 Bypass of „Load moment limiter emergency operation“ with key button -S82*

Ensure that the following prerequisite is met:
– the master switches have **not** been operated,
– one of the shut offs is active:

  • length sensor defective,
  • angle sensor defective,
  • faulty pressure sensor on luffing cylinder.

▶ Turn the key button **-S82** to the right to the stop and release.

Result:

– The LICCON overload protection is inactive.
– The Assembly / bypass load torque limitation symbol **3** in the LICCON monitor blinks.
– An acoustic signal sounds.
– The red flashing beacon on the crane cab blinks.
– The working speed is reduced for all functions, apart from the slewing gear and the hydraulic folding jib.

The bypass is active for maximum 30 minutes. Then it turns off automatically after the last deflection of a master switch.

Note
▶ If a movement is initiated via the master switch shortly before the maximum bypass time of 30 minutes is over, then the bypass time is extended until the master switch is again in zero position.

The bypass function turns off:
– When all master switches are for 10 seconds in neutral position after the last deflection.

▶ The bypass function turns off.

Result:

– The LICCON overload protection is active.
– The Assembly / bypass load moment limitation icon **3** in the LICCON monitor turns off.
– The acoustic signal is turned off.
– The working speed is reduced until the master switches are in neutral position, after turning the bypass off.
– The red beacon on the crane cab turns off after ignition off.

If the bypass is to be reactivated:
▶ Turn the key button **-S82** to the right to the stop and release.

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Fig.195219

5 Telescoping lock defective

If telescoping is not possible, then the telescoping lock may be defective.

WARNING
Increased danger of accidents in case of defective telescoping lock!
There is an increased risk of accident if the following danger notes are not observed!
- ▶ „Emergency control telescoping“ may only be carried out by authorized expert personnel trained on **Liebherr-Werk Ehingen mobile cranes**, who know the dangers of emergency operation!
- ▶ It is imperative that the next **Liebherr Service location** or **Liebherr-Werk Ehingen** is contacted!
- ▶ All crane movements must be carried out with extreme caution!
- ▶ Telescoping must be constantly monitored by a second person!

5.1 How is the error recognized?

– Telescoping is not functioning.

Possible causes:
– The valves are mechanically defective.
– The electrical connection is interrupted.
– The valves can no longer be supplied with power.

6 The electrical connection of a cable drum is interrupted

WARNING
Danger of accidents if electrical connection is interrupted!
Manual telescoping is **no** longer possible if electrical connection is interrupted!
No report is shown regarding the position of the telescoping lock!
- ▶ It is imperative that the next **Liebherr Service location** or **Liebherr-Werk Ehingen** is contacted!

6.1 How is the error recognized?

– Manual telescoping is **not** possible.
– System error message in the screen for determining errors.
– LICCON test system, LSB overview (CPU1). No sensors for telescoping are available on the bus, although required.

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7 Service and maintenance

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Fig.195219

1 Technical safety instructions

WARNING
Maintenance instructions **not** adhered to!
Death, severe injury, increased wear and failure of components.
- ▶ Observe the following listed safety notes 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 guidelines - Crane chassis [2)]
- Crane operating instructions, chapter 7.05: Maintenance guidelines - Crane superstructure [2)]
- Crane operating instructions, chapter 7.05.50 Maintenance guidelines - Crane boom [2)]
- Crane operating instructions, chapter 7.06: Fill quantities, lubrication chart
- Crane operating instructions, chapter 7.07: Service items 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 which 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 which 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 operation

WARNING
Impermissible driving or crane operation during maintenance or repair tasks!
Death, severe injury, severe property damage.
- ▶ Make sure that driving 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 is prohibited to drive and operate the crane.
- ▶ 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.
- ▶ Carry out maintenance or repair tasks exclusively with authorized and trained expert personnel.
- ▶ Make sure that **exclusively** authorized persons are within the danger zone.

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 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 Crane operating instructions, chapter 2.04.
- ▶ It is prohibited to step on the driver's cab or cab roof and specially marked surfaces. See Crane operating instructions, chapter 2.05.

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!

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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.
- ▶ Make sure that the V-area of the Diesel engine is free of oil and fuel.
- ▶ Do **not** spill any service fluids over the hot components.

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
Insulation (sound insulation) are contaminated with solvents or foreign matter!
Solvents, engine oils, gear oils, hydraulic oils or fuels can ignite the insulation.
Severe burns, fire damage.
- ▶ Remove any polluted insulation **immediately** and **replace immediately** with **Original Liebherr spare parts**.

1.8 Protecting from 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 personal protective equipment and suitable protective gloves.

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.

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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 Protecting from aggressive environmental conditions

NOTICE
Aggressive environmental conditions!
When using cranes under aggressive environmental conditions, for example at places with maritime climates and particularly salty air, hydraulic cylinders can corrode and thereby be destroyed or severely damaged.
Elaborate and expensive repairs.

If the crane is taken out of operation for an extended period of time:
- ▶ Take down the crane.
- ▶ Fully retract all crane hydraulic cylinders.

When hydraulic cylinders can **not** be retracted completely:
- ▶ Protect exposed areas of the piston rod from corrosion, for example with grease.
- ▶ Grease any exposed areas on the piston rods, for example on luffing cylinders and ballasting cylinders, especially carefully.

1.12 Use suitable operating fluids

WARNING
Operating fluids **not** suitable for ambient temperature!
Death, severe injuries, property damage.
- ▶ Match the operating fluids in time to the ambient temperatures.

1.13 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.

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1.14 After replacement of components

Type of oil, see data tag and supplied „Service fill“.

The following instructions must be observed when replacing components such as engine, gear 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 guidelines. See Crane operating instructions, chapter 2.02.

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 operational use 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.

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.

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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 Oil and lubricant analysis

NOTICE
Oil analysis intervals and oil change intervals **not** adhered to!
Gear damage.
- ▶ Strictly adhere to the oil analysis and oil change intervals.
- ▶ If an earlier oil change is required due to oil analysis results: Change the oil.
- ▶ Carry out regular lubricant analysis for gear oils in travel gear, slewing gear and winch gears.
- ▶ Adhere to the maintenance intervals. See Crane operating instructions, chapter 7.02, 7.03 and chapter 7.03.50.

The following properties of the oil can be determined through oil analysis:
- – Degree of wear of gear components
- – Composition of mechanical abrasion in the oil
- – Viscosity of the oil
- – Degree of oil contamination
- – Other relevant properties of the oil

Advantages of oil or lubricant analysis:
- – Technical evaluation regarding further use of the gear or the oil
- – The gear oil change intervals can be matched according to the operating conditions and the results of the oil analysis, without risk, effectively and economically.
- – A just starting gear damage can be recognized in time and as a result, the correct time of gear replacement can be determined.
- – Operating times or repairs can be planned more effectively.
- – Am earlier repair of gear components protects from larger and unforeseen damage.
- – Subsequent damage can therefore be avoided to the greatest possible extent.

4.1 Taking an oil sample

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:
- – Gear was shut down immediately
- – Oil has normal operating temperature

- ▶ Always take oil on the same location of the gear.
- ▶ Take oil always according to the same method.
- ▶ For gears with double slipring seal: Take oil additionally from the slipring sealing chamber.

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- ▶ 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 sample containers.

- ▶ Fill oil exclusively in a clean and dry sample container.

5 Cleaning

5.1 Exhaust system

NOTICE
Ingress of water, steam or cleaning substances into the SCR-module!
Sensors for exhaust aftertreatment can be destroyed, the coating of the SCR catalytic converter can be washed off.
- ▶ Before cleaning, let the SCR system cool off (surface temperature 50 °C).
- ▶ Before cleaning, cover all openings.
- ▶ Make sure that **no** fluids and **no** dirt gets into the tailpipe opening of the SCR module.
- ▶ During cleaning, keep sufficient distance to the tailpipe opening.

5.2 Insulation (sound insulation)

NOTICE
Improper cleaning (tools or cleaning methods)!
Insulation 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 steam cleaners **exclusively** with extreme caution and with a sufficient distance to the insulation and with low water pressure.
- ▶ Do **not** use solvents for cleaning.

Note
- ▶ Sound insulation may **not** be removed!

Sound insulation in the area of engines and other noise sources is an integral part of the total construction. Sound insulation limits the noise generation of vehicles and the sound level in the workplace to the legally specified values in connection with sound insulation and the design of the equipment. Sound insulation is therefore an integral part for the construction permits for the machines.

From a construction point of view, sound insulation has been designed to be maintenance-free. Sound insulation has been equipped with surfaces that repel dirt, oil and water. Sound insulation is very flame-resistant and in part, depending on application, is fireproof.

For these reasons, sound insulation requires no care. Any small dirt deposits can be disregarded, as the acoustic effectiveness of the parts is not reduced.

5.3 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.

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5.4 Driver's cab and crane cab

Note

- ▶ The steering wheel, centre 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!
- ▶ Do not use any scouring agents!

5.5 Ladders

- ▶ Remove any dirt on the ladders.
- ▶ Make sure that the grooves on the rungs are free of dirt.

6 Disposal

6.1 Service items 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

6.2 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.

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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 or calendar intervals			Calendar intervals			Work to be carried out	O.K.
	500 h 3 months	1000 h 6 months	2000 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 [4)]			Check condition and mounting	
						X	Check for continued suitability by expert	

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First maintenance after	Operating hour intervals or calendar intervals			Calendar intervals			Work to be carried out	O.K.
	500 h 3 months	1000 h 6 months	2000 h	Daily	Weekly	Annually		
Crawler travel gear								□
	X				X		Check the track components (chain links, chain pitch, chain bushings, track pads, track rollers, carrier rollers) for wear	
	X				X		Check that carrier rollers, track rollers, idlers for leaks	
	X				X		Check idlers	
	X				X		Check the idler guides for signs of wear	
	X					X	Clean, grease sliding surfaces on sliding section	
					X		Clean crawler track	
	X				X		Check screws, nuts and mounting pins for tight seating	
	X				X		Check hydraulic cylinders (support cylinder, track adjustment cylinder) for leaks and tight seating	
Travel gear								□
	X						Checking the oil level	
		X				X	Carry out an oil analysis	
500 h		X [2)]					Oil change	
	X				X		Check the mounting screws for tight seating	
	X				X		Sprocket and travel gear motor: Check the mounting screws for tight seating	
	X				X		Check the gear and hydraulic connections for leaks	
						X	Have the hydraulic hoses checked for safe working condition by expert	
Track chain								□
	10 h			X			Check for damage and correct mounting	
	10 h			X			Check the chain tension, retension if necessary [1), 3)]	
Nitrogen clamp								□
						X	Check pre-tension pressure for the nitrogen tensioner	

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First maintenance after	Operating hour intervals or calendar intervals			Calendar intervals			Work to be carried out	O.K.
	500 h 3 months	1000 h 6 months	2000 h	Daily	Weekly	Annually		
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	
Hydraulic hose lines								□
				X			Check for leaks and damage	
						X	Have safe working condition checked by expert	

[1] Earlier if necessary
[2] Carry out an oil analysis and change the oil, depending on the results of the analysis
[3] Tension the track chain, see chapter 7.04
[4] Before every start up: Check visually

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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	
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	
Load handling equipment and assembly aids								□
				X [2)]			Check for cracks, damage, wear and distortion	
						X	Check for continued suitability by 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	
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	Replace the coolant	
SCR Exhaust aftertreatment								□
			4500 h			Every 2 years	Replace foam and filter element of urea pump	
Engine independent heater								□
				X			Check the fluid level in the expansion tank	
					Monthly		Operate for 10 minutes with cold engine and lowest fan setting	
						X	Carry out service work before and after every heating period	
						Every 2 years	Replace the fluid for the heating system	
Air filter								□
					X		Check monitoring device	
						X	Clean, change the filter insert Observe the instructions of the engine manufacturer	

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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.
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 (only LTM 11200-9.1, LTR 11200)	
250 h			1500 h			X	Check the mounting screws for tight seating	
						X	Check the tilt play	
Winches								□
250 h			X			X	Check the mounting screws for tight seating	
				X			Check for leaks	
					X		Check the oil level	
			1500 h			X	Check the gear oil via oil analysis	
250 h			3000 h			Every 4 years	Replace the gear oil	
			1500 h			X	Lubricate the space between V-ring / winch bearing (only LR 11000)	
			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 utilization life by a technical expert	
						Every 4 years	Check the remaining theoretical utilization life by authorized specialist	
Winch brakes								□
				X			Check for leaks	
						X	Check for correct function	
Relapse supports								□
					Every 3 months [5), 6)]		Lubricate 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)]		Lubricate 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	
A-bracket								□
		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								□
1,000 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	Lubricate 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	

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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.
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	
Crane cab								□
				X			Check instruments for function	
				X			Check indicator lights for function	
						X	Replace the filter insert for switch cabinet ventilation	
						X	Replace filter insert in water heater	
				X			Check fluid level in expansion tank of engine control	
		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 washer system, camera washer system								□
				X			Check the fluid level in the reservoir for the washer system	
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	

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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.
Electrical system								□
						X	Cable connections	
					Every 6 months 3)		Service the batteries	
					Every 6 months 3)		Empty the acid container	
						X 5)	Replace the interior compartment filter of the switch cabinet ventilation	
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 preliminary fuel filter	
Slewing gear								□
250 h			X			X	Check the mounting screws for tight seating	
				X			Check for leaks	
					X		Check the oil level	
			1500 h			X	Check the gear oil via oil analysis	
250 h			3000 h			Every 4 years	Replace 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	

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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.
Pump distributor gear								□
				X			Check for leaks	
					X		Check the oil level	
500 h			1500 h			X	Replace the gear oil	
Hydraulic hose lines								□
				X			Check for leaks and damage	
						X	Check for safe condition by 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 oil sample and have it tested by oil supplier	
Hydraulic cylinder								□
					X		Check for leaks	
					Every 3 months [5), 6)]		Lubricate the bearings	
Hydraulic pressure accumulator (nitrogen)								□
		X [4)]				X [4)]	Check pretension pressures	
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 drier granular cartridges	
						X	Clean air drier 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	

[1] if the crane is not moved: Every 3 months
[2] before every start up: Check visually
[3] in hot climate zones: Every 3 months
[4] observe maintenance instructions for Crane superstructure, chapter 7.05
[5] and as necessary
[6] and during assembly
[7] in Great Britain: Every 6 months

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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 expert	
Load handling equipment and assembly aids								□
				X [2)]			Check for cracks, damage, wear and distortion	
						X	Check for continued suitability by 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	
Guy rods								□
						X	Check for cracks, damage and distortion by a technical expert	
						Every 4 years	Check for cracks, damage and distortion by an authorized inspector	
						X	Checking the retaining elements	
						X	Check labels for completeness and legibility	
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]		Lubricate 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)]		Lubricate 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 safe condition by expert	
Hydraulic cylinder								□
					X		Check for leaks	
					Every 3 months [5), 6)]		Lubricate 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	

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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.
Telescopic boom with rope mechanism								□
						X	Check telescopic boom for distortions and cracks	
	X					X [5)]	Grease the sliding surfaces of the telescopic boom bearing	
			X			X	Check change over pulleys of push out mechanics for damage and cracks	
	X					X [5)]	Grease the change over pulleys of push out mechanism	
	X					X	Check mounting screws on change over pulleys for tight seating	
250 h		X					Check, adjust rope mechanism	
			20000 h			Every 10 years	Disassemble and check the boom	

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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.
Telematik telescopic boom system								□
						X	Check telescopic boom system for distortion, damage and cracks	
						X	Check hydraulic components for leaks and damage	
		X				X	Check telescoping cylinder for proper condition	
						X	Check pull knob retainer and mounting screws for tight seating	
						X	Check mounting screws of push out cylinder for tight seating	
						X	Check twist guard of cylinder pinning and telescopic boom pinning	
		X				X	Check push out gripper for proper condition	
		X				X	Check the locking bores for proper condition	
		X				X	Check locking pins for easy movement and proper condition	
		X				X [5)]	Lubricate the locking pins	
		X				X	Check inner and outer sliding surfaces for proper condition	
						X [5)]	Lubricating the gliding surfaces	
						X [5)]	Grease the guide rails on the telescoping cylinder	
			20000 h			Every 10 years	Disassemble and check the boom	

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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.
Telescopic boom guying								□
						X	Check cracks, damage and distortion	
					Every 3 months 5), 6)		Lubricate guy points on telescopic boom head on the grease nipples	
					Every 3 months 5), 6)		Lubricate the TA/TY-guying on the grease fittings	
250 h		X				X	Check mounting screws of guy winch for tight seating	
				X			Check guy winch for leaks	
					Every 6 months		Check the oil level on the guy winch	
			3000 h			Every 4 years	Replace gear oil of guy winch	
						X 4)	Check the rope connection between the guy rope and the auxiliary rope (only LTM 1400-7.1)	
						X	Check braid ropes of TY-guying (only LTM 11200-9.1, LTR 11200)	
Crane ropes								□
				X			Check for damage and distortion	
					Monthly 5)		Check, grease by expert personnel	
						X	Check by technical expert	
						Every 4 years	Check by authorized inspector	

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			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	Check distance dimension (y)	
						X	Check for distortion, wear, damage and cracks by expert	
						Every 4 years	Check for distortion, wear, damage and cracks by authorized inspector	

[2] before every start up: Check visually
[4] observe maintenance instructions for Crane superstructure, chapter 7.05
[5] and as necessary
[6] and during assembly
[7] by authorized and trained expert personnel with boom placed down and before every erection procedure

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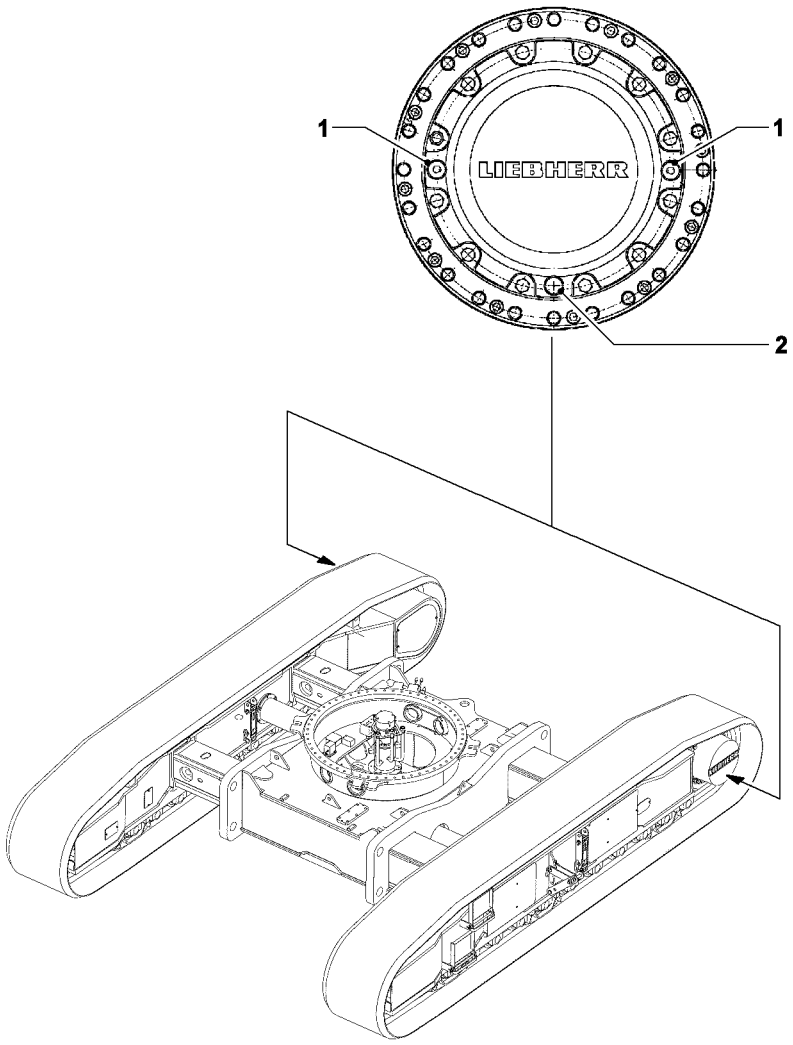

LWE/LTR 1100-005/17505-03-02/en

Fig.198739

1 Travel gear transmission

CAUTION
Danger of transmission damage!
▶ Maintain extreme cleanliness during all work on the travel gear transmission, to prevent dirt from entering the transmission.

1.1 Gear oil

1.1.1 Checking the oil level

Ensure that the following prerequisites are met:
– the crane is horizontal
– the travel gear transmission must be stationary
– the **LIEBHERR** text on the travel gear transmission is horizontal

Note
▶ In order to get a reliable oil level check, make sure that the travel gear transmission is stationary for at least two minutes before you start to check the oil level. This ensures that the oil has returned to the oil chamber completely.

▶ Carefully unscrew the oil level screw **1**.
▶ If oil runs out of the inspection opening **1**, or the oil level is up to the lower edge of the inspection opening **1**, then the oil level in the travel gear transmission is correct.

CAUTION
Danger of gear damage!
▶ If the fluid level has dropped below the inspection opening **1**, it is essential to top up the transmission fluid as shown in the lubrication chart until the fluid level is again up to the lower edge of the inspection opening.

▶ Screw in the oil level screw **1** and tighten.

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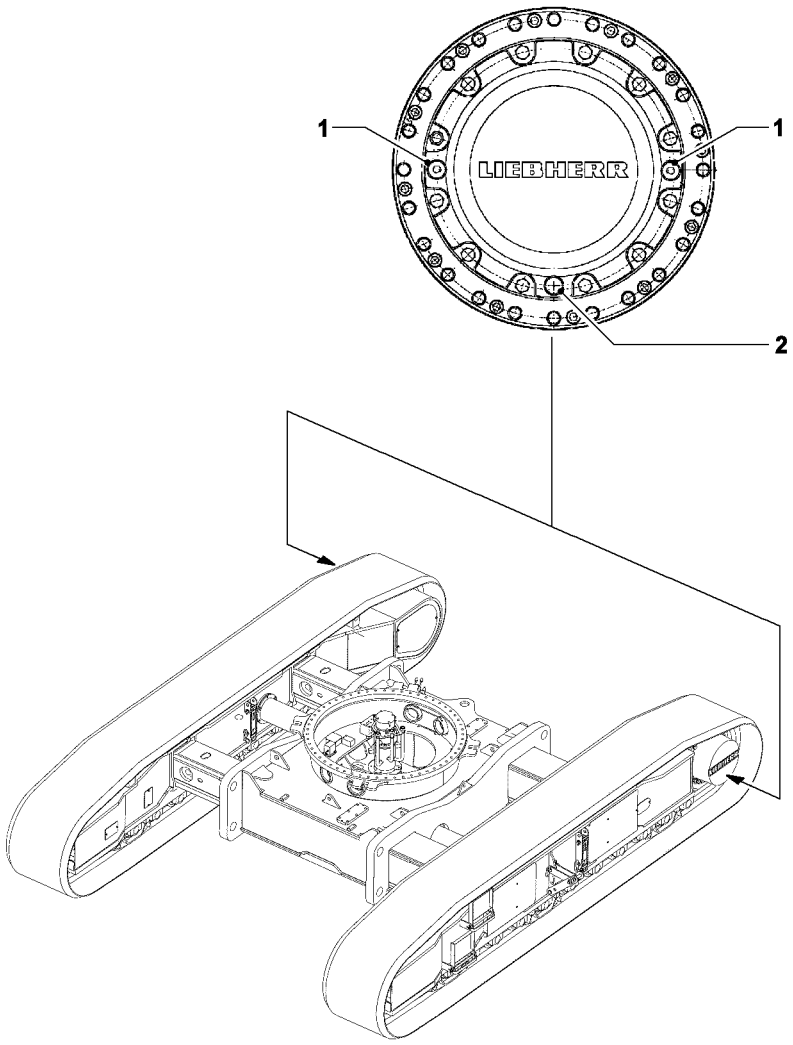

LWE/LTR 1100-005/17505-03-02/en

Fig.198739

1.1.2 Changing the oil

Ensure that the following prerequisites are met:
- the crane is horizontal
- the travel gear transmission must be stationary
- the **LIEBHERR** text on the travel gear transmission is horizontal
- travel gear transmission at operating temperature
- an oil collecting container is ready to hold „used oil“

Note
- ▶ When selecting the oil collecting container, make sure that the oil collecting container is of sufficient size to hold all the used oil.
- ▶ Filling quantity of the travel gear transmission, see chapter 7.06.

- ▶ Unscrew the oil level screw(s) **1** for bleeding.
- ▶ Remove the oil drain plug **2** and drain oil into a suitable container.

Note
- ▶ Let the travel gear transmission run completely at idling speed.

- ▶ Clean the oil drain plug **2** and the sealing surfaces.
- ▶ Install the oil drain plug **2** with new seal and tighten.
- ▶ Top up with oil as shown in the lubrication chart using the oil level screw **1** until the oil level „is up to the edge“ of the hole or starts to overflow.
- ▶ Screw in oil level screw(s) **1** with new gasket and tighten.

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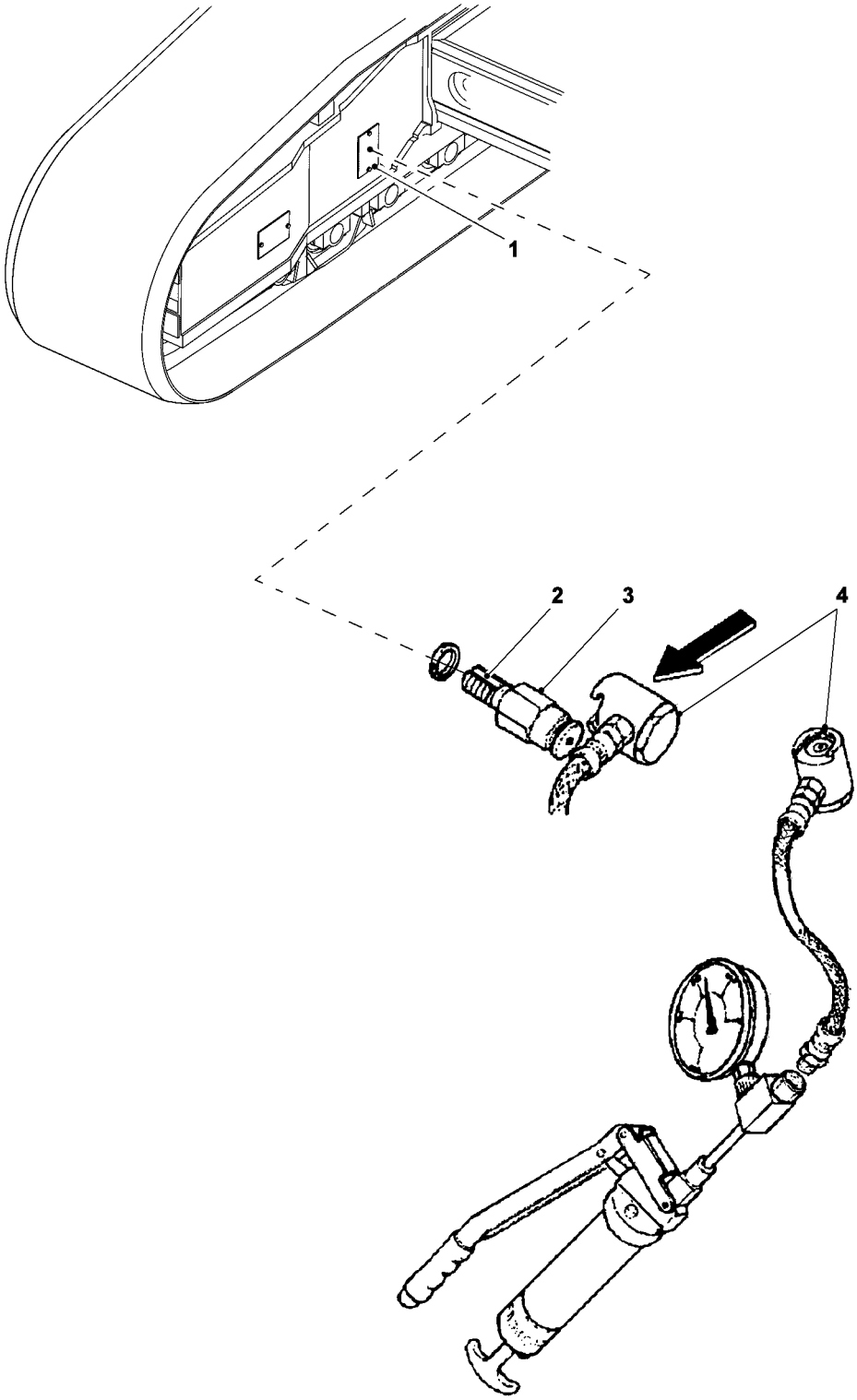

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Fig.198740

2 Crawler travel gear

The caterpillar tracks must be tensioned by means of clamping cylinders that are extended with a lever grease gun.

To slacken the caterpillar tracks, reduce the pressure in the clamping cylinder.

2.1 Tensioning the caterpillar track

Ensure that the following prerequisites are met:

- the crane is horizontal
- the lever grease gun with pressure gauge is to hand

2.1.1 Tensioning procedure

▶ Unscrew the cover **1** on the inside of the crawler carrier.
▶ Attach the hose **4** of the lever grease gun to the lubricating nipple **3** of the clamping cylinder up to the stop position (push).
▶ Activate the lever grease gun until the pressure gauge shows a pressure of about **160 bar** to **180 bar**.

Result:

– The caterpillar track will be tensioned.

▶ Remove the pressure hose **4** from the lubricating nipple

Problem remedy
The pressure hose **4** does not detach from the lubricating nipple **3**?
The pressure in the pressure hose **4** is too high.
▶ Carefully loosen the pressure hose **4** on the lever grease gun, so that the pressure in the pressure hose is reduced.

▶ Remove the pressure hose **4** from the lubricating nipple **3**.
▶ Screw back the cover **1** on the inside of the crawler carrier.
▶ After the tensioning procedure, drive the caterpillar track by about one track length straight ahead forwards and backwards.

Result:

– The tension in the lower track area evens out.

Note
▶ If necessary, repeat the tensioning procedure on the caterpillar track.

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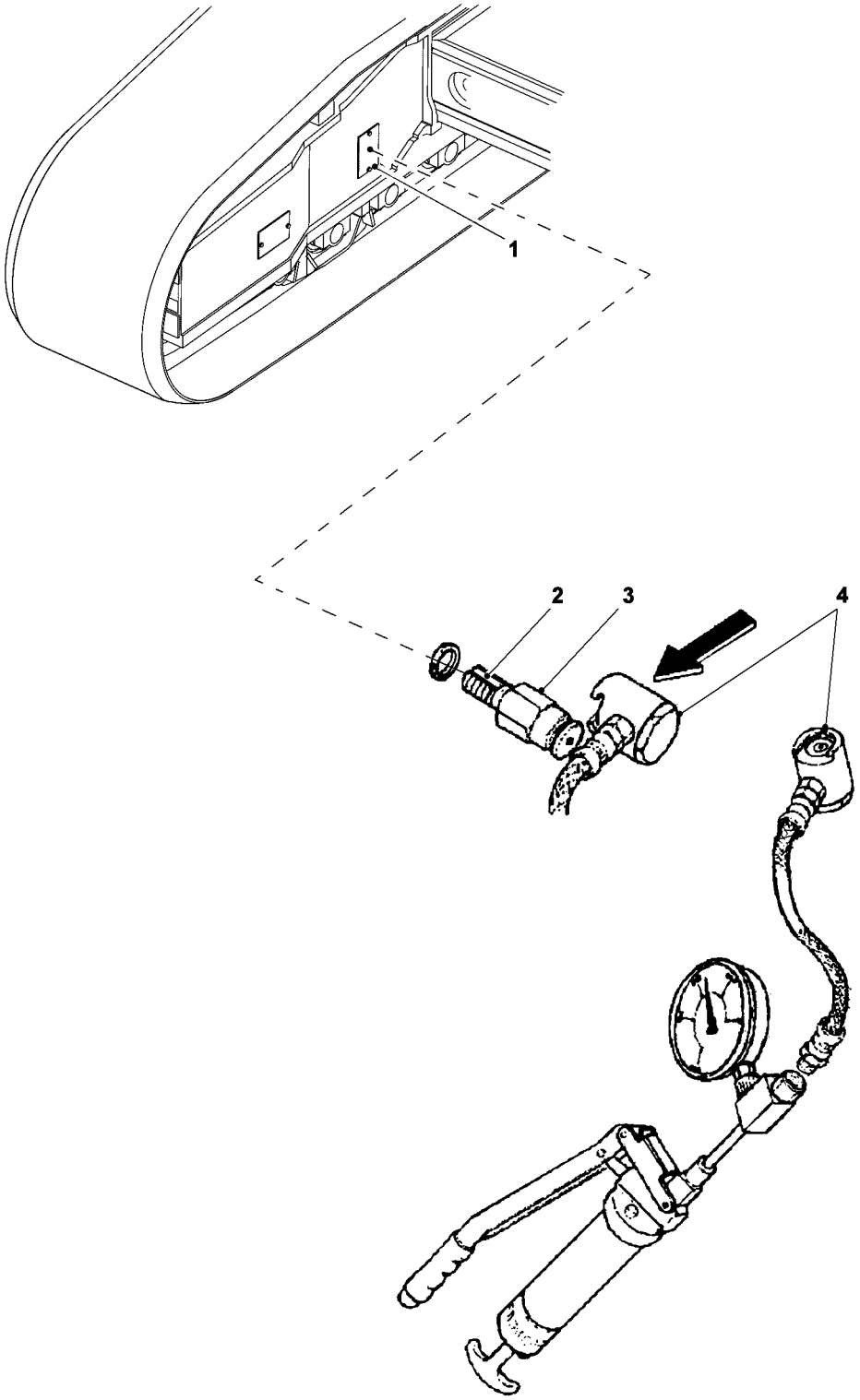

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Fig.198740

2.2 Slackening the caterpillar track

WARNING
Risk of injury due to excess pressure!
Incorrect procedures when slackening the caterpillar track can lead to severe injuries to the face and especially the eyes from grease shooting out.
- ▶ When loosening the lubricating nipple, do not look straight into the opening.
- ▶ The steps for the slackening procedure described below must be adhered to.

2.2.1 Slackening procedure

- ▶ Unscrew the cover **1** on the inside of the crawler carrier.
- ▶ Loosen the lubricating nipple **3** with extreme caution.
- ▶ Unscrew the lubricating nipple **3** carefully 2 or 3 thread turns, until grease can extrude from the groove **2**.
- ▶ Tighten the lubricating nipple **3** again.
- ▶ Screw back the cover **1** on the inside of the crawler carrier.

2.3 Wear and tear data about the crawler track travel gear

CAUTION
Damage to the crawler chassis!
If components are not replaced when reaching the wear limit, the crawler chassis can be badly damaged!
- ▶ Components that have reached the wear limit must be replaced by new components!

2.3.1 Chain link

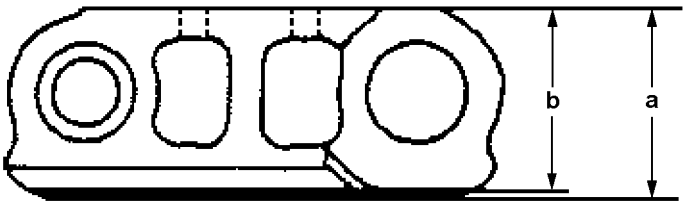

Fig.198806

Component	Dimensions	
	new	Wear limit
	a	b
Chain link	126 mm	110 mm

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2.3.2 Chain separator

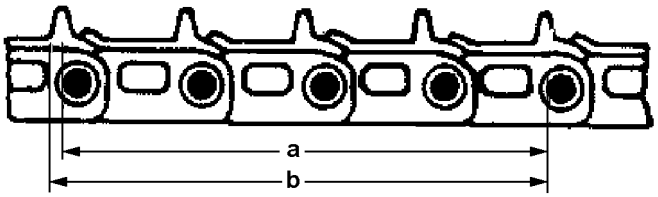

Fig.198807

Component	Dimensions	
	new	Wear limit
	a	b
Chain separator	866 mm	883 mm

2.3.3 Chain bush

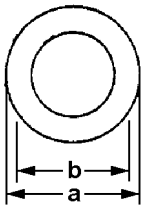

Fig.198808

Component	Dimensions	
	new	Wear limit
	a	b
Chain bush	Ø 71,42 mm	Ø 64.5 mm

2.3.4 Support plate

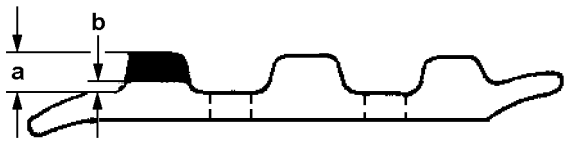

Fig.198809

Component	Dimensions	
	new	Wear limit
	a	b
Base plate	26.5 mm	12 mm

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2.3.5 Roller

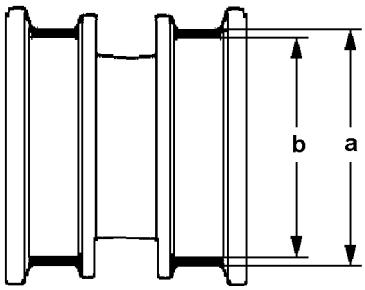

Fig.198810

Component	Dimensions	
	new	Wear limit
	a	b
Roller	Ø 200 mm	Ø 184 mm

2.3.6 Support roller

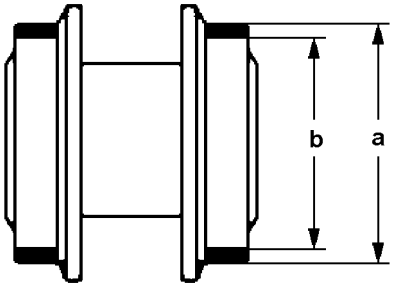

Fig.198811

Component	Dimensions	
	new	Wear limit
	a	b
Support roller	Ø 140 mm	Ø 125 mm

2.3.7 Leading wheel

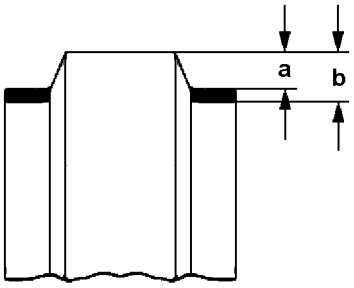

Fig.198812

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Component	Dimensions	
	new	Wear limit
	a	b
Leading wheel	24.5 mm	30 mm

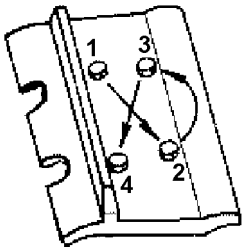

Fig.199143

2.4 Fitting the base plates

The screws used to attach the base plates must be retightened 50 operating hours after the base plates were fitted.

The regular maintenance intervals for the screws are given in chapter 7.02.

The tightening torque is 1000 Nm.

▶ Tighten the screws in the order given on the diagram.

2.5 Checking pre-tension pressure in nitrogen clamp

The crawler carriers are equipped with nitrogen clamps. Although the nitrogen clamps do not require any maintenance, check the pre-tension pressures once a year.

The pre-tension pressure in the nitrogen reservoirs must be 180 bar.

DANGER
Danger of explosion!
▶ The pressure in the nitrogen cylinder must be less than the maximum permitted operating pressure of the reservoir or the pressure gauge. Otherwise fit a pressure reducer between the cylinder and the filling device.
▶ Do not use air or oxygen to fill the nitrogen clamp!
▶ The pre-loading pressure in the nitrogen clamps must always be checked by authorized and trained personnel using appropriate equipment! The national pressurized container regulations most also be complied with!

▶ Check the pre-tension pressure in the nitrogen reservoirs using a testing and filling device and correct if necessary.

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Empty page!

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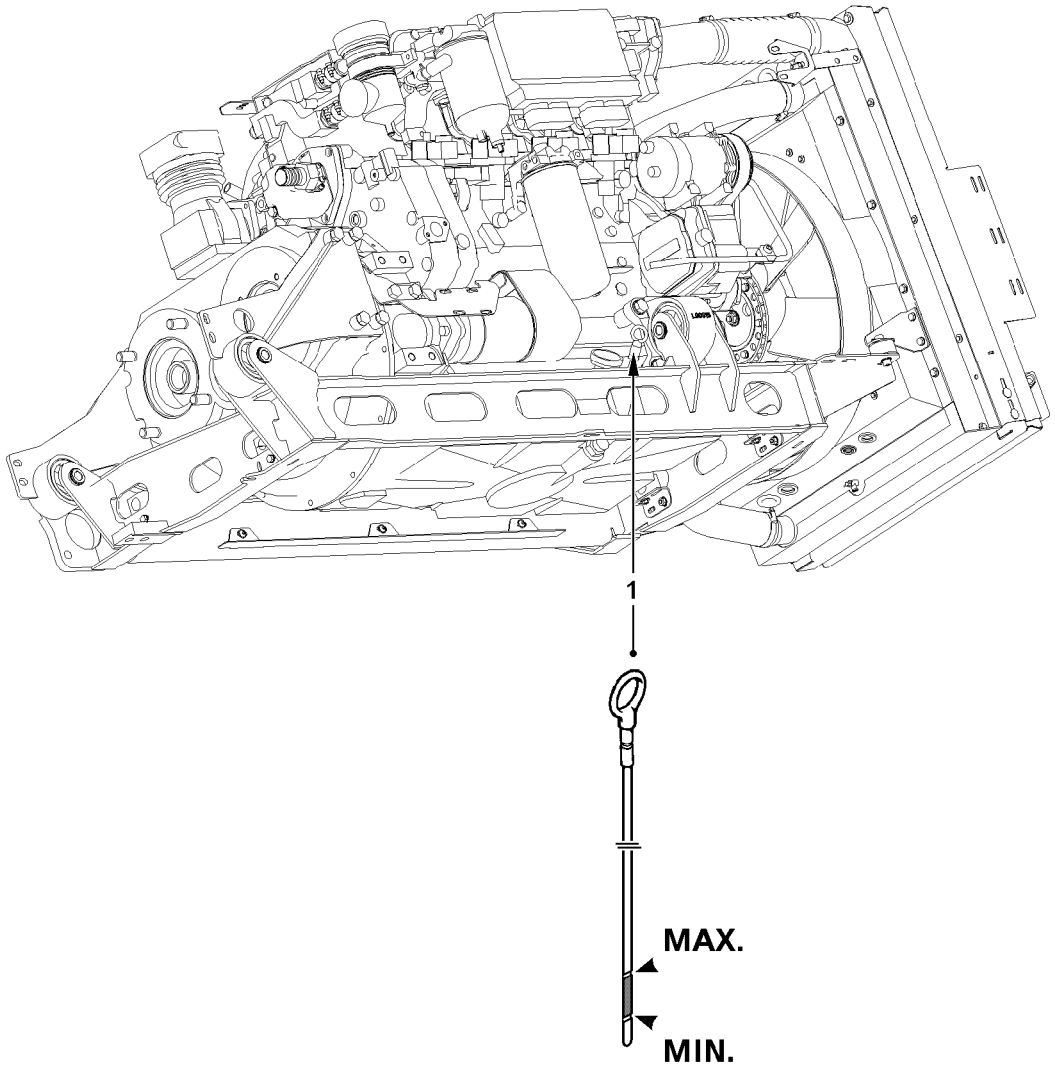

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Fig.198426

1 Crane engine

Never step on fuel lines during maintenance or repair work in the engine area!

DANGER
Danger of fire!
- ▶ Make sure that the engine area is kept free of diesel fuel.
- ▶ Extreme cleanliness is vital, particularly during filter changes and bleeding. Wipe up any spilled fuel!
- ▶ When replacing the filter, it is recommended to put down cleaning rags before removing the filter in order to absorb fuel.

1.1 Engine oil

1.1.1 Checking the oil level

Make sure that the following prerequisites are met:
- The crane is in horizontal position.
- The engine is turned off and the oil has collected in the oil pan.

- ▶ Remove the dipstick **1** and wipe it off.
- ▶ 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.

CAUTION
Danger of damaging the engine!
If the oil level has dropped below the minimum mark, add engine oil according to the lubrication chart until the oil level is between the minimum and maximum marks.
- ▶ Add engine oil and check again.

- ▶ Reinsert the dipstick **1**.

1.1.2 Changing the oil

Refer to the separate operating instructions for „LIEBHERR Diesel engines“.

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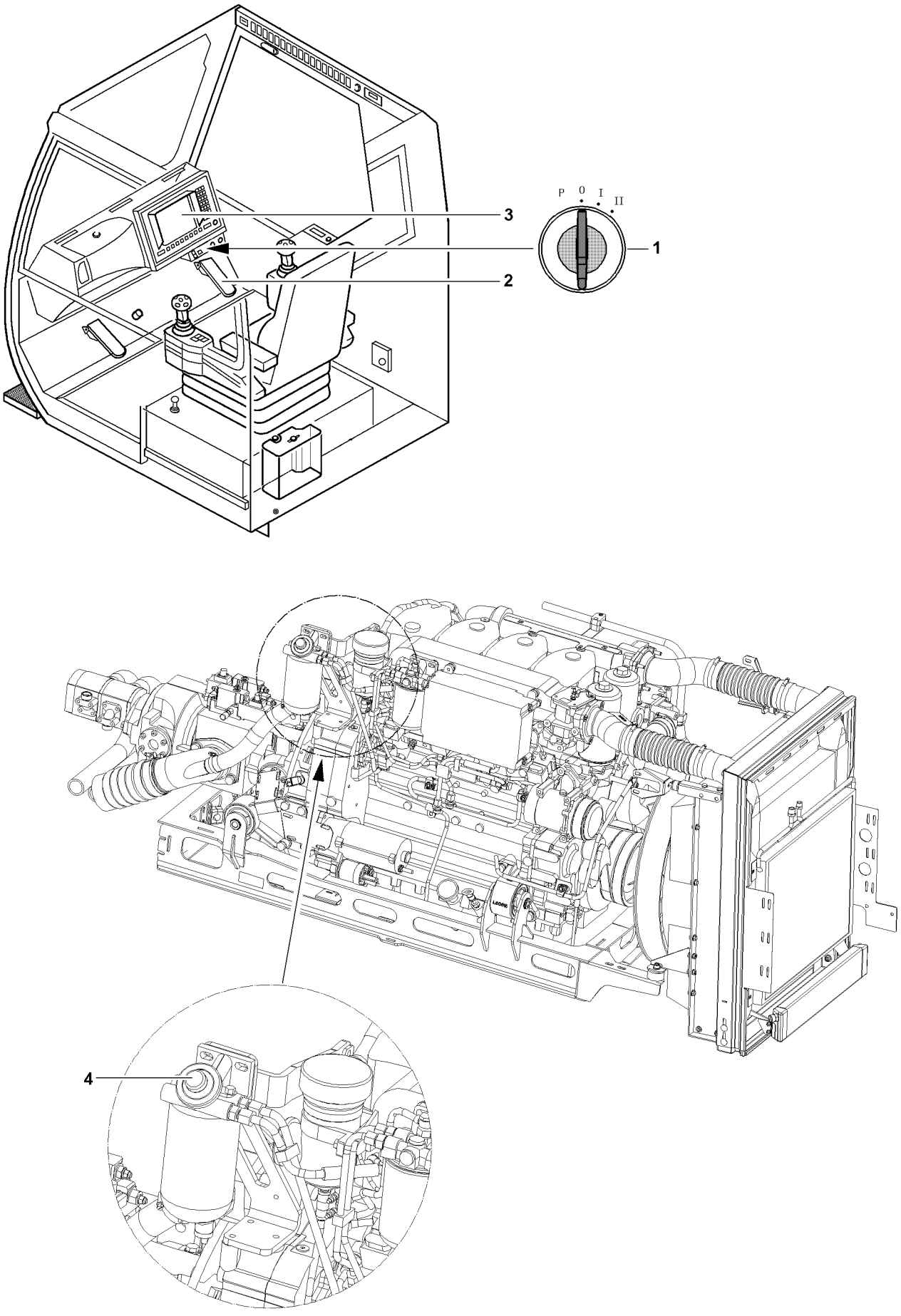

Fig.110284

1.2 Bleeding the injection lines

Note

▶ Two persons are required to bleed the injection lines!

Make sure that the following prerequisites are met:
- The diesel engine in the chassis is turned off.
- The diesel engine in the superstructure is turned off.
- The ignition switch in the crane operator's cab is in the „0 position“ (OFF).
- The diesel engine in the superstructure is easily accessible.

DANGER

Danger of falling!

During the bleeding process of the injection lines, the assembly personnel must be protected from falling with suitable aids, depending on the turntable position. If this is not observed, assembly personnel could fall and suffer life-threatening injuries.

▶ All assembly work from a height of 2 m must normally be carried out using suitable aids (scaffolding, ladders, etc.)! The height above which assembly / maintenance work must be carried out with aids depends on national regulations. The national regulations must be adhered to!

1.2.1 Activating the bleeding function

The bleeding function is activated from the crane operator's cab.

A high injection rate is required to bleed the injection lines on the diesel engine. It is therefore necessary to operate the manual feed pump **4** on the diesel engine during the bleeding process.

▶ Turn the ignition on in the crane operator's cab: Turn the ignition switch **1** to „position I“.

When the ignition is turned on:

▶ Floor the engine regulation **2** within 10 s.

▶ Repeat this step within the next 10 s: Release the engine regulation **2** and floor it again.

▶ To activate the bleeding function: Repeat this procedure five times.

Result:

- The bleeding function is now activated.
- The LICCON monitor **3** displays an operating error message with the text: „Bleeding function activated“.

Problem remedy

The LICCON monitor **3** does not display an operating error message with the text: „Bleeding function activated“?

The bleeding function has not been correctly carried out or the specified time has been exceeded.

▶ Turn the ignition off: Turn the ignition switch **1** to „position 0“.

▶ Repeat the procedure according to the description.

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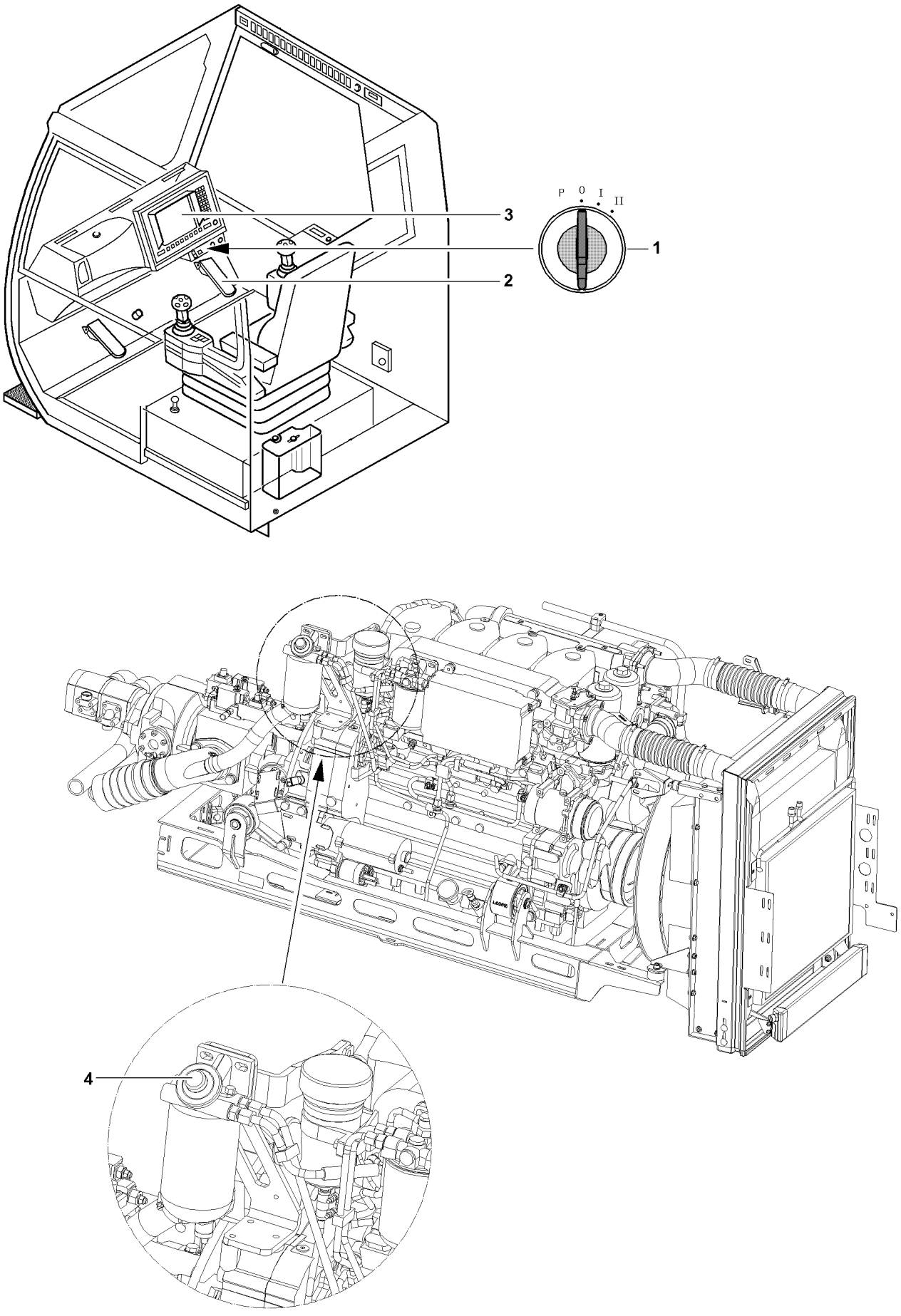

Fig.110284

1.2.2 Carrying out the bleeding procedure

Note

▶ Do **not** operate the engine regulation during the bleeding procedure!

Make sure that the following prerequisites are met:
- The bleeding function is activated.
- The operating error message is displayed on the LICCON monitor.

Pump the manual feed pump **4** during the entire engine start procedure (approx. 20 s).

▶ Turn the ignition switch **1** in the crane operator's cab to „position II“ and hold it for approx. 20 s in „position II“.

When the ignition switch **1** is actuated:

▶ Immediately pump the manual feed pump **4** for approx. 20 s , but at least as long as the ignition switch is being turned.

Result:

- The injection lines are bled.
- The diesel engine starts up and runs at low idle speed after a successful bleeding procedure.
- The bleeding function will be deactivated.
- The system switches over to normal operation.

Problem remedy

The injection lines are not bled and the diesel engine does not run at low idle speed?
The ignition switch **1** was not operated long enough or the manual feed pump **4** was used incorrectly.

▶ Hold the ignition switch **1** for 20 s in „position II“.

▶ Continuously pump the manual feed pump **4**.

Note

▶ The starter block is deactivated if the bleeding function has been activated. Several starting attempts can be made without turning the „ignition OFF“.

1.2.3 Deactivating the bleeding function

Note

▶ The bleeding function is automatically deactivated after successfully bleeding the injection lines or when the ignition is turned off.

Once the injection lines have been successfully bled, the diesel engine is regulated by the engine electronic to low idle speed after a short period and the bleeding function is automatically deactivated.

▶ Turn the ignition off: Turn the ignition switch to „position 0“.

Result:

- The diesel engine is turned off.
- The bleeding function is deactivated.

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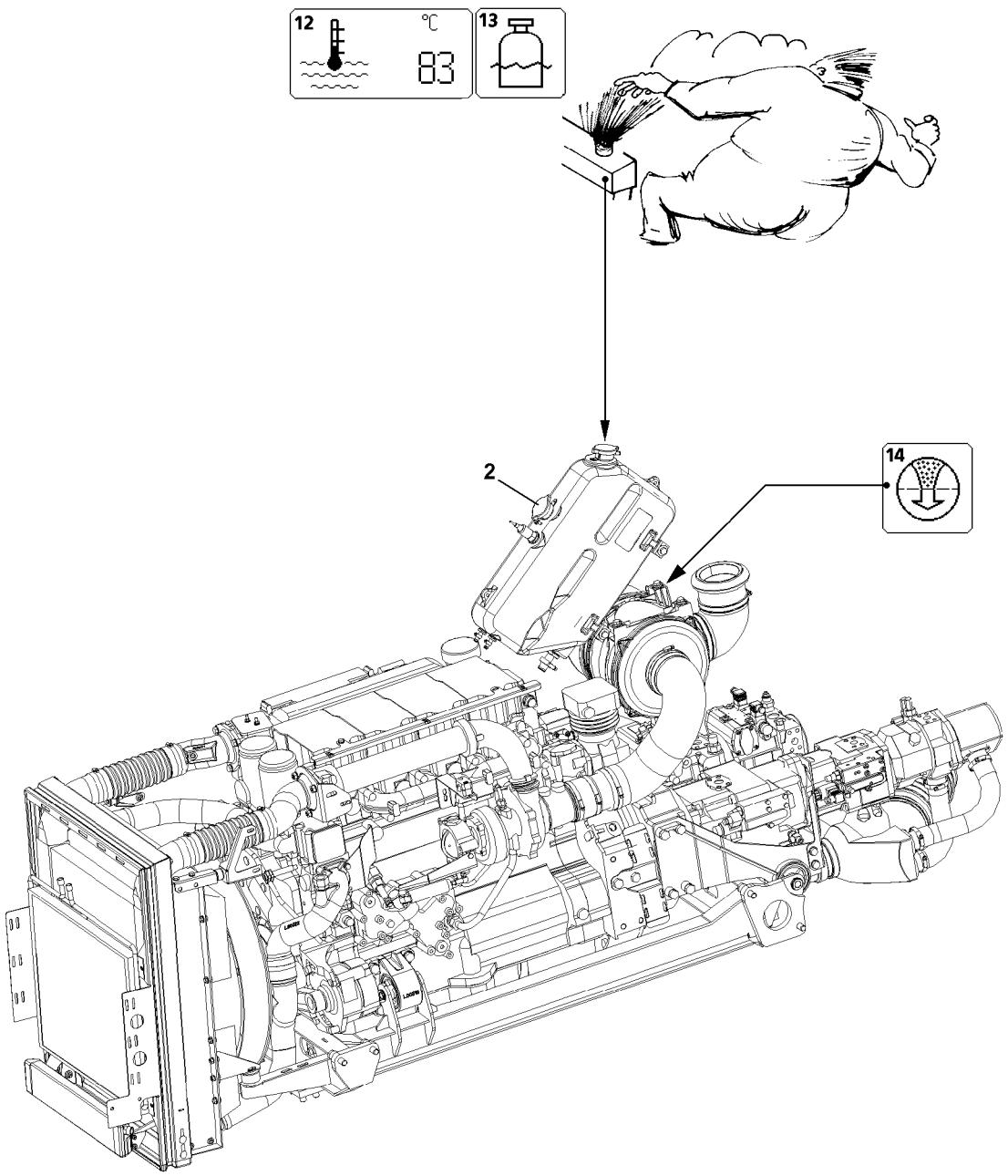

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Fig.198427

1.3 Coolant Engine cooling

The coolant level is monitored by the LICCON computer system. If the coolant level is too low the „Low coolant level“ **13** icon appears on the LICCON monitor.

The crane's engine coolant temperature can be read on the LICCON monitor in [°] on the „Engine coolant temperature“ icon.

DANGER
Danger of skin burns!
▶ The engine must be cold when checking the coolant.

▶ Turn the cap **2** on the filler neck of the water cooler expansion tank to the 1st notch.
▶ Release excess pressure.
▶ Remove the cap **2**.
▶ Check the coolant level.

Add coolant as specified in the lubrication chart only on the filler neck of the water cooler expansion tank.

▶ Add coolant to overflow level if necessary.

1.4 Air filter

The air filters are monitored by the LICCON computer system. If the vacuum increases in the intake line due to dirty filter units, the „Air filter contaminated“ **14** icon is displayed on the LICCON monitor.

If the „Air filter contaminated“ **14** icon appears:
▶ Clean or replace the filter insert.

1.5 Diesel particle filter*

DANGER
Danger of igniting the diesel particle filter*!
▶ The diesel particle filter* may only be regenerated under the supervision of operating personnel!

Carry out the operation and maintenance of the diesel particle filter* according to the separate operating instructions of the diesel particle filter* manufacturer.

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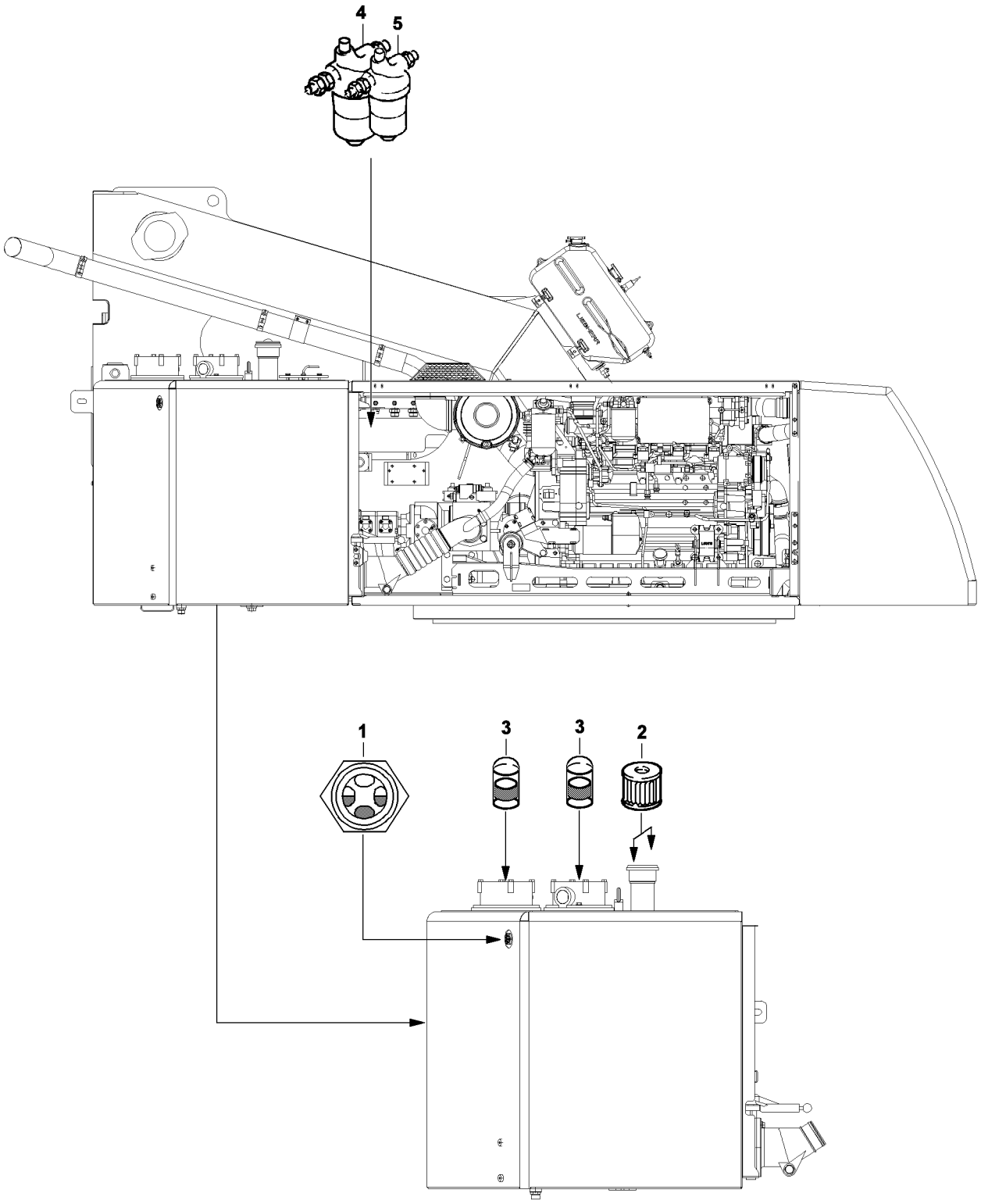

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Fig.199439

2 Hydraulic system

CAUTION
Damage to the hydraulic system!
If the hydraulic system is contaminated when working on the hydraulic system, then the hydraulic system can be damaged and fail.
- ▶ Always keep up most cleanliness when working on the hydraulic system!
- ▶ This applies especially for filter changes, refilling of hydraulic oil or changing of components!

2.1 Hydraulic tank

2.1.1 Checking the oil level

Make sure that the following prerequisites are met:
- The crane is in horizontal position.
- The luffing cylinder and the telescoping cylinder are fully retracted.

The oil level must be in the center of the oil level sight gauge **1**.

- ▶ Check the oil level on the oil level sight gauge **1** of the hydraulic oil tank.

Problem remedy
No oil is visible in the oil level sight gauge **1**?
- ▶ Add oil as specified in the lubrication chart with a fine-mesh strainer until the oil level is visible in the center of the oil level sight gauge **1**.

2.1.2 Checking the vent / breather filter

- ▶ Open the cover with the turn lock.
- ▶ Check filters **2** for impurities (visual inspection).

In the event of heavy contamination:
- ▶ Replace the filters **2**.
- ▶ Close the cover with the turn lock again.
- ▶ Start the engine.
- ▶ Slowly run through all crane movements.
- ▶ Check the oil level again and add oil if necessary.

2.1.3 Return filter

The return filters **3** are equipped with a maintenance indicator. If the red mark is visible when the oil is at operating temperature, then the filter insert must be replaced.

- ▶ Unscrew both filter covers.
- ▶ Remove the filter units.
- ▶ Rinse out the filter housing.
- ▶ Clean the sealing surfaces on the covers and filter housings.
- ▶ Insert new filter units.
- ▶ Lubricate the rubber seal rings in the covers with oil.
- ▶ Place both filter covers and tighten.
- ▶ Start the engine and check the filter for leaks.
- ▶ Check the oil level and add oil if necessary.

2.2 Pressure filters in the crane hydraulic

The pressure filter **4** and pressure filter **5** are equipped with a maintenance indicator. If the red bar indicator is visible when the oil is at operating temperature, then the filter cartridge must be replaced.

- ▶ Turn the engine off.
- ▶ Release the filter cartridge and collect any escaping oil in a suitable container.

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▶ 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 engine and check for leaks.
▶ Slowly run through all crane movements.

Result:

– This bleeds the hydraulic system.

▶ Check the oil level again and add oil if necessary.

2.3 Diaphragm reservoirs

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
Danger of damaging the hydraulic system!
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.

Make sure that the following prerequisite is met:
– The crane engine is turned off.
This relieves the diaphragm reservoir at the fluid side.

DANGER
Danger of explosion!
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.
▶ Do not use air or oxygen to fill the diaphragm reservoir.

The pretension pressure in the hydraulic reservoirs may only be checked by an expert with appropriate training and equipment. In addition, the national regulations for pressurized container inspections must also be observed.

▶ Check the pretension pressure with a testing and filling device and correct, if necessary.

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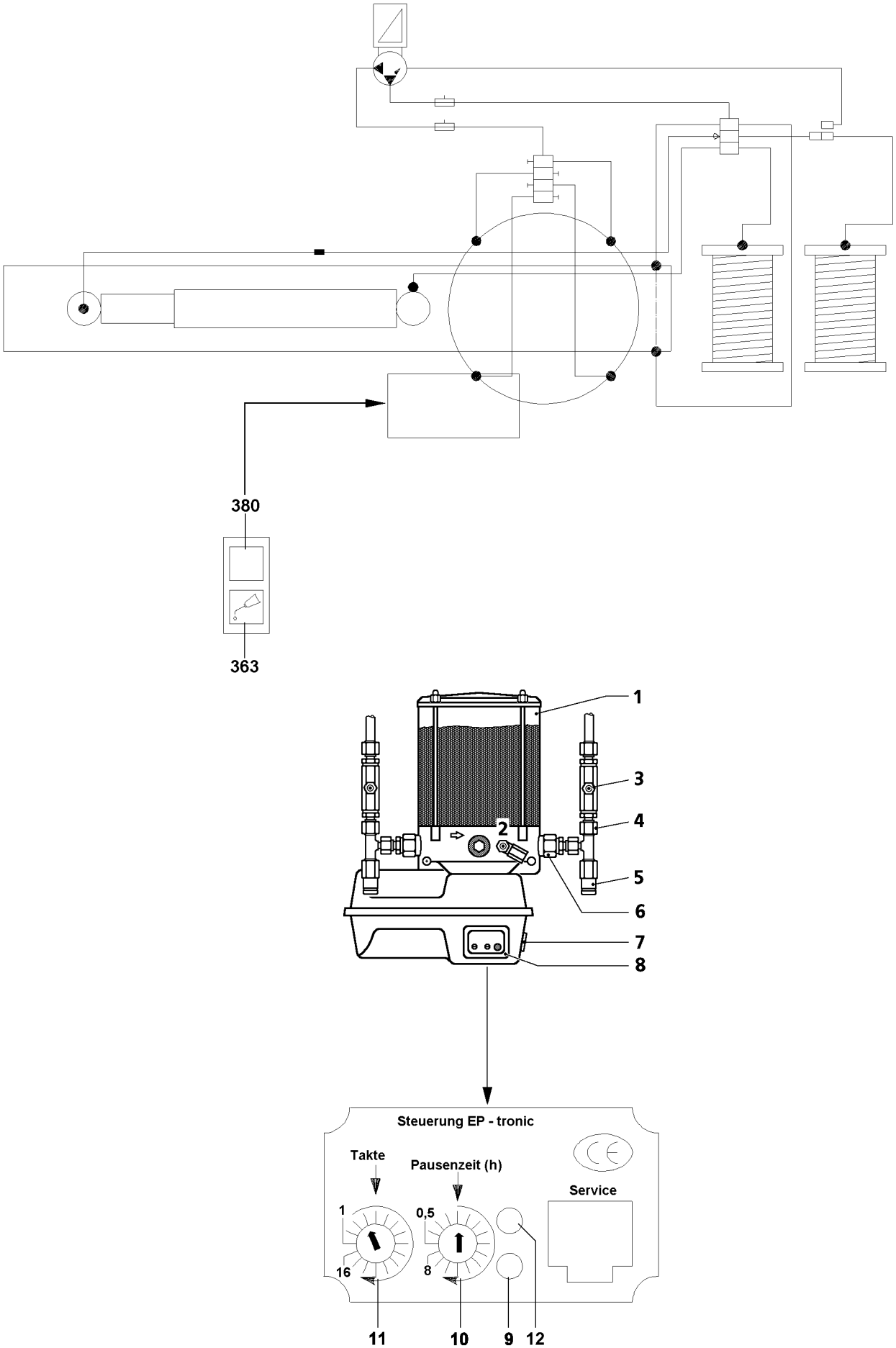

Fig.102859

3 Central lubrication system

The crane superstructure is equipped with a central lubrication system. All grease points (refer to the guide on the left), the roller slewing ring, the bearing of the telescopic boom pivot section, the bearings of the luffing cylinder and the hoist winches are automatically supplied with the correct amount of grease.

If the crane has not been moved for more than 3 months, then it must be lubricated every 3 months with an external grease pump until grease emerges from all grease points. Then the relevant crane movement must be repeated several times and the lubrication procedure must be carried out again.

- Cycle number: 4 cycles
- Idle time: 2.5 h

Note

▶ Cleaning is permitted in washing bays or with steam cleaners!

3.1 Components of the system

- **1** Grease container
- Grease fitting **2**: Fill the central lubrication pump
- Grease fitting **3**: Fill the lube lines
- **4** Pump outlet
- **5** Pressure relief valve
- **6** Pump element
- **7** Push button
- **8** Control
- LED **9** (green)
- Latched switch **10**: Idle time (h)
- Latched switch **11**: Cycles
- LED **12** (red)

3.2 Adjusting the lubrication and pause time

The LED **9** on the engine protection housing blinks in a 0.5 second cycle during the lubrication process. The lubrication and pause time is set at the factory. The times can possibly be changed by using the latched switch **10** and latched switch **11**.

▶ Turn on the engine ignition.

Result:

- When turning the ignition on, the LED **9** lights up for approximately 2 seconds and displays the operational readiness of the control **8**.

3.3 Function check

Trigger 2 to 3 additional lubricating pulses with the ignition turned on, in order to determine if grease escapes from all grease points.

If the system is blocked but the electric pump is properly functioning, the grease emerges through the pressure relief valve **5**. This serves to secure the system and to monitor the system.

3.4 Cycle control

The central lubrication system is progressively monitored. This means that a proximity switch converts the piston strokes of the central lubricating system distributor into electrical control signals and relays them to the control unit. If the control signals are not present or incomplete, the indicator light **363** displays a malfunction or a problem by blinking.

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3.4.1 Blinker code - cycle control

During operation

- Ignition on, ready for operation:
  The indicator light **363** lights up for 1.5 s and turns off.
  The warning light **380** lights up for 1.5 s and turns off.
- Lubrication active:
  The indicator light **363** lights up as long as the lubrication is active.
  The warning light **380** does not light up.

In case of a problem

- Error of monitoring period of cycle input, lubrication time larger monitoring period cycle input.
  The indicator light **363** lights up for 1 s and is off for 1 s etc.
  The warning light **380** lights up for 1 s and is off for 1 s etc.
- Error CPU, Error memory
  The indicator light **363** does not light up
  The warning light **380** lights up for 0.5 s and is off for 0.5 s etc.

3.5 Access to the automatic lubrication (intermediate lubrication)

Intermediate lubrication processes can be carried out after washing the crane or after the lube lines are refilled with grease after a repair.

▶ With the ignition turned on, press the red button **7** on the engine protection housing of the pump.

3.6 Filling the grease container

CAUTION
Risk of damage due to insufficient lubrication!
▶ There must be sufficient grease in the grease container **1** at all times.
▶ Observe utmost cleanliness when filling the grease container **1**!

▶ Fill the grease container **1** with a grease pump via the grease fitting **2** on the central lubrication pump.

3.7 Bleeding the system

If the grease container **1** has been emptied it may be necessary to bleed the system.

▶ Fill the grease container **1**.
▶ 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.
▶ Trigger an additional lubricating process.

3.8 Filling the lubricant lines

CAUTION
Risk of damage due to insufficient lubrication!
The lubrication lines must be refilled after any repair on components, which are lubricated with grease. If this is not observed, the component may run dry.
▶ Sufficient grease must be available in the grease lines after every repair on greased assembly units.
▶ Observe utmost cleanliness when filling the grease lines!

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▶ Add grease with an external grease pump via the grease fitting **3**.
or
With the ignition turned on, press the red button **7** on the engine protection housing of the pump.

3.9 Troubleshooting on the central lubrication system

Problem	Cause	Remedy
Pump is not working	Integrated electronic control defective, electrical line interrupted, pump defective	Replace lower part of motor protection housing, replace electrical line, replace pump
Pump operates, but does not deliver	Air cushion in delivery piston has dropped below minimum fill level, pump element defective	Bleed pump, fill reservoir, replace pump element
No grease collar on all lube points	Pump not operating, interval time too high or cycle time too short, system blocked	See „Pump not operating“, reduce pause time or increase number of cycles, refer to „Grease emerges on pressure relief valve“
No grease collar on several lube points	Supply lines to secondary distributors broken or leaking, screw connections leaking	Replace lines, tighten or replace screw connections
No grease collar on one lube point	Associated lube line broken or leaking, screw connection leaking	Replace line, tighten or replace screw fitting
Pump speed reduced	High system pressure, low ambient temperature	Check system / bearing points, no damage: Lubricate 1 or 2 times in between, if necessary
Grease escapes on the pressure relief valve	System pressure too high, progressive distributor blocked, system blocked, defective valve spring	Check system, replace distributor, repair blocked / seized bearing point, replace pressure relief valve
Red LED lights up in 0.5 second interval	Error CPU / memory	Consult Liebherr Service
The green LED and the red warning light blink in 1 second interval	Error in the monitoring period from cycle start	Proximity switch is defective, possibly consult Liebherr Service

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Fig.195219

4 Slewing ring connection

4.1 Greasing the slewing ring

Before and after long breaks in operation, especially before and after a possible winter break, carry out the lubrication procedure with special care to ensure the best possible corrosion protection.

If the crane has not been moved for more than 3 months, then it must be lubricated every 3 months with an external grease pump until grease emerges from all grease points. Then the relevant crane movement must be repeated several times and the lubrication procedure must be carried out again.

▶ Grease exterior of slewing ring.

4.2 Tilt play of roller ring connection

The wear of the roller ring connection is determined by measuring the „tilt play“ with the ring installed.

Note

▶ The determination of the „tilt play“ must be carried out according to the **test instructions** of **Liebherr-Werk Ehingen GmbH**.

▶ Contact the Service Dept. at **Liebherr-Werk Ehingen GmbH** for **test instructions**.

DANGER

Danger of accident if tilt play of roller ring connection is too large!

If the permissible tilt play of 2.0 mm is exceeded, then safe crane operation is no longer possible.

▶ Replace the roller ring connection if the tilt play is larger than 2.0 mm !

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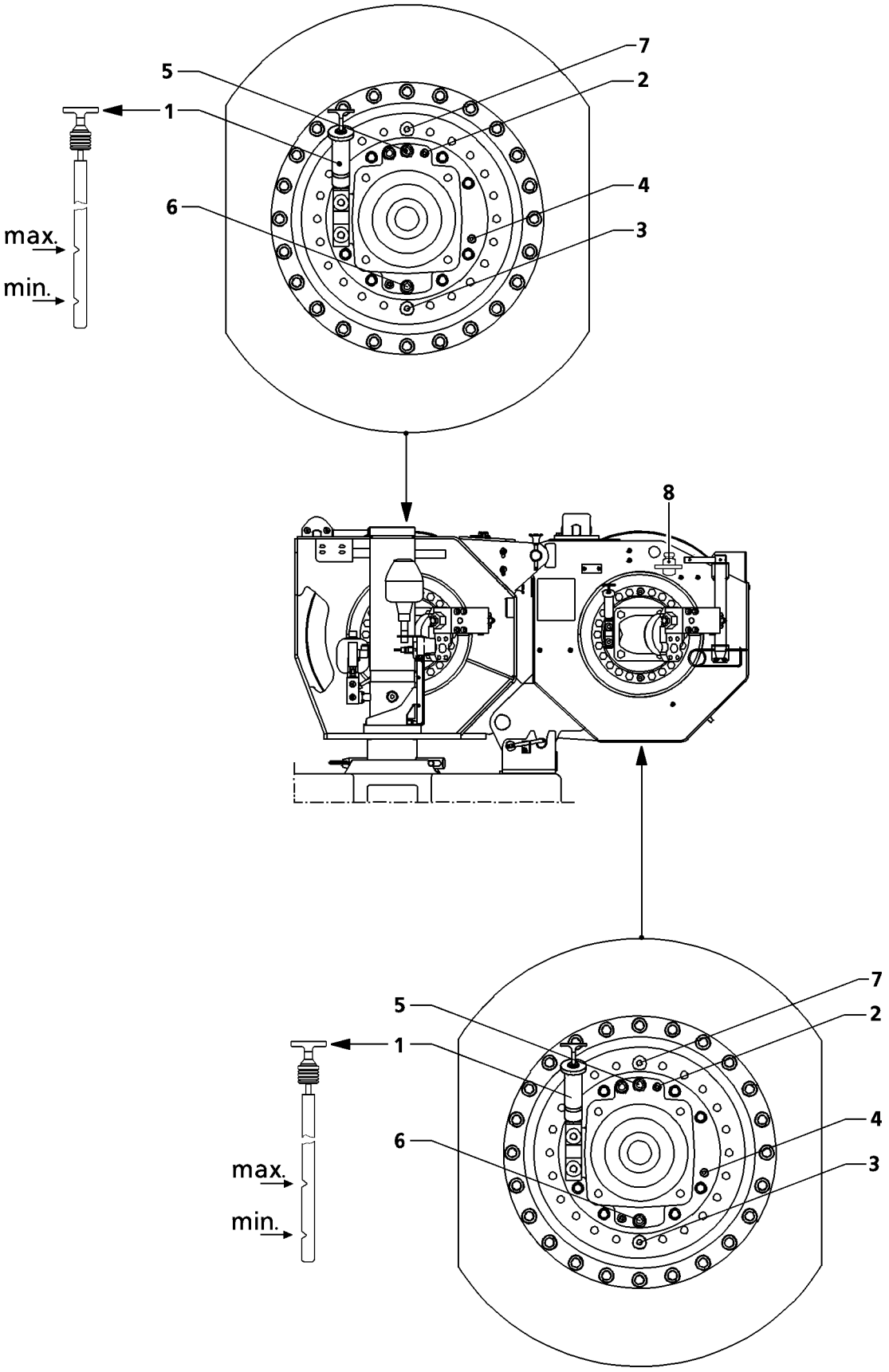

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Fig.198736

5 Winches

Maintain utmost cleanliness during all work to prevent any dirt from entering the inside of the gear.

5.1 Winch 1 / winch 2

5.1.1 Overflow container 8

When the oil heats up in the hydraulic motor of winch 2, the oil can enter the overflow container **8** via a non-return valve, but cannot flow back into the hydraulic system after cooling. For this reason the oil that has collected in the overflow container **8** must be disposed of at regular intervals.

5.2 Hoist gear

Make sure that the following prerequisites are met:
- The hoist gear is inactive.
- The crane is in horizontal position.

5.2.1 Checking the oil level

▶ Remove the dipstick **1** and wipe it off.
▶ 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.

CAUTION
Danger of gear damage!
If the oil level has dropped below the minimum mark, add oil according to the lubrication chart until the oil level is between the minimum and maximum mark.
▶ Add oil and check again.

▶ Reinsert the dipstick **1**.

5.2.2 Changing the oil

▶ Unscrew the breather screw **2**.
▶ Unscrew the oil drain plug **3** with seal ring and drain oil into a suitable container.
▶ Install the oil drain plug **3** with new seal ring and tighten.
▶ Remove the oil filler plug **7**.
▶ Replenish with oil at oil filler plug **7** in accordance with lubrication chart.
▶ Screw in and tighten the vent screw **2** and the oil filler plug **7**.
▶ Check the oil level as described above.

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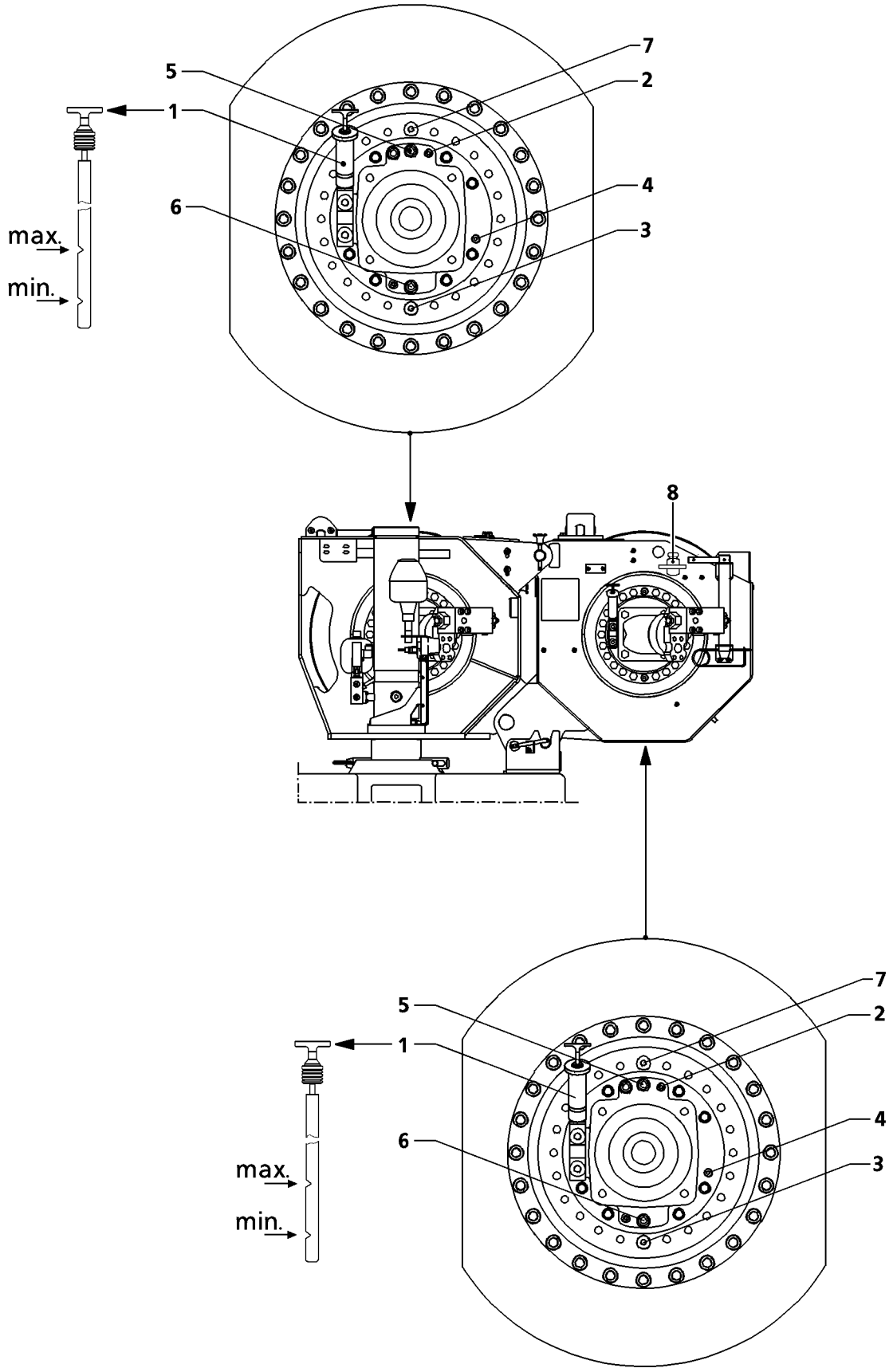

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Fig.198736

5.3 Hoist gear brake

Make sure that the following prerequisites are met:
- The hoist gear is inactive.
- The crane is in horizontal position.

5.3.1 Checking the oil level

▶ Remove the plug **4**.

The oil level must reach the edge of the bore.

▶ Perform a visual inspection.

CAUTION
Danger of gear damage!
▶ If the oil level has dropped, add oil as specified in the lubrication chart until it overflows on the filler port.

▶ Clean the sealing surfaces on the housing and on the plug.
▶ Reinstall the plug **4** and tighten.

5.3.2 Changing the oil

▶ Remove the oil filler plug **5** and clean the sealing surface.
▶ Unscrew the oil drain plug **6** with seal ring and drain oil into a suitable container.
▶ Clean the oil drain plug **6** and sealing surface on the housing.
▶ Install the oil drain plug **6** with new seal ring and tighten.
▶ Add oil according to the lubrication chart on the filler port until the oil starts to overflow at the opening **4**.
▶ Clean the oil filler plug **5** and reinstall it with a new seal ring and tighten.
▶ Check the oil level as described above.

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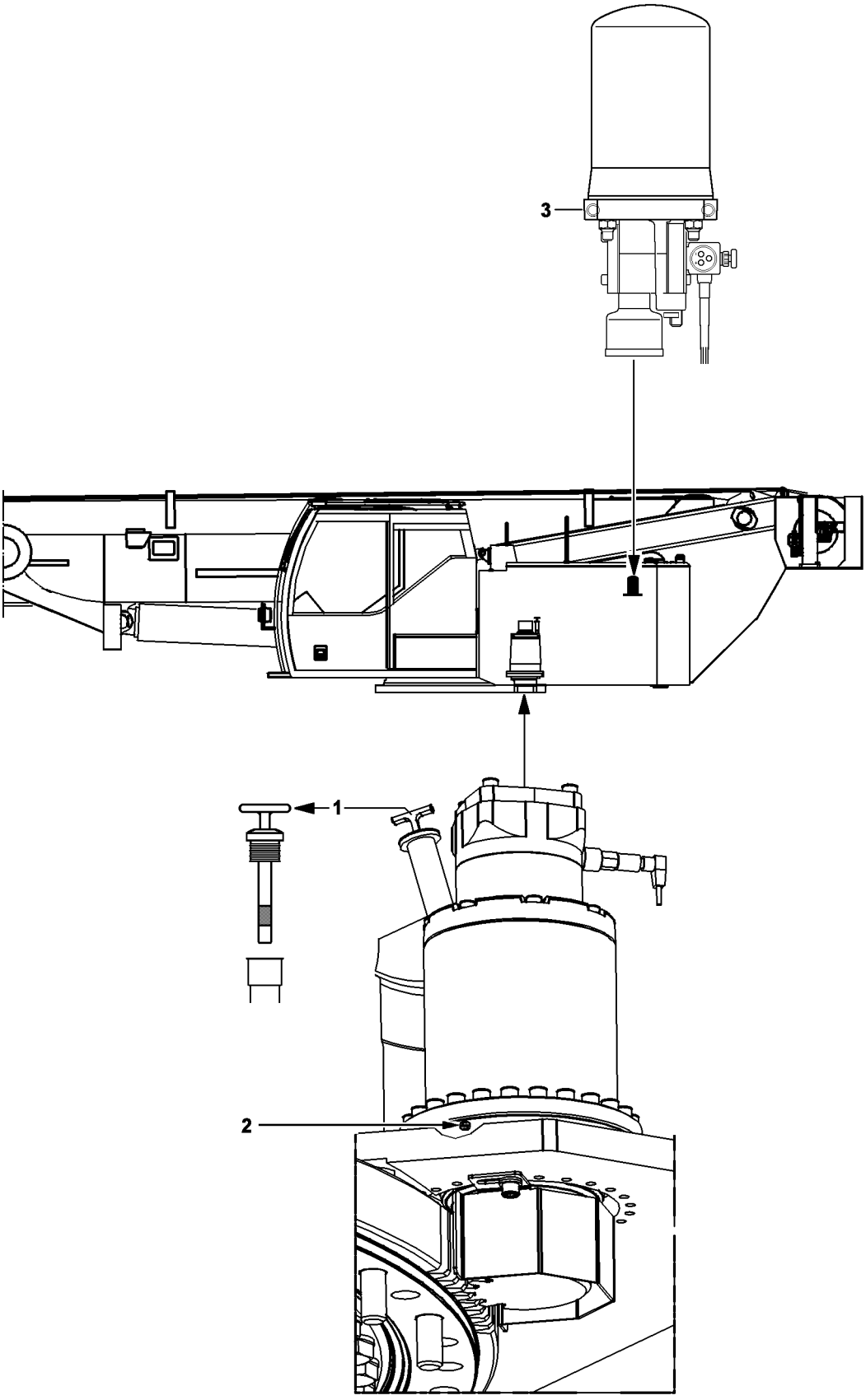

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Fig.198737

6 Air dryer of the compressed air system of the crane superstructure

The air dryer **3** of the compressed air system of the crane's superstructure is maintenance-free.

6.1 Replacing the granular cartridge

CAUTION
Danger!
The granular cartridge is under spring tension.
▶ Caution when replacing the granular cartridge.

▶ Replace the granular cartridge once a year.

7 Slewing gear

Maintain utmost cleanliness during all work to prevent any dirt from entering the inside of the gear.

7.1 Checking the oil level

Make sure that the following prerequisites are met:
– The crane is in horizontal position.

▶ Remove the dipstick **1** and wipe it off.
▶ Reinsert the dipstick **1** and pull it out again.

The oil level must be between the two notches on the dipstick **1**.

▶ Check the oil level.

CAUTION
Danger of gear damage!
If the oil level has dropped below the lower notch, add oil as specified in the lubrication chart until the oil level is between the two notches.
▶ Add oil and check again.

▶ Reinsert the dipstick **1**.

7.2 Changing the oil

Make sure that the following prerequisites are met:
– The crane is in horizontal position.
– The gear is warm.

▶ Open the oil filler port by unscrewing the dipstick **1**.
▶ Remove the oil drain plug **2** with the seal ring and drain the oil.
▶ Clean the oil drain plug **2** and sealing surface on the housing.
▶ Install the oil drain plug **2** with new seal ring and tighten.
▶ Add oil as specified in the lubrication chart on the oil filler port until the oil level is between the two notches on the dipstick **1**.
▶ Close the oil filler port by screwing in the dipstick **1**.
▶ Check the oil level as described above.

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8 Hydraulic hose lines

WARNING
Damaged and leaky hydraulic hose lines!
Fire, accidents, 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 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 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**.

8.1 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 hydraulic hose lines checked by an **expert person for hydraulic hose lines**.
▶ Document conspicuous findings, decisions and replacements comprehensibly, see Crane operating instructions, chapter 8.06.

8.2 Inspecting 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 hydraulic hose lines checked by an **expert person for hydraulic hose lines**.
or
Contact Liebherr Service.
▶ Document conspicuous findings, decisions and replacements comprehensibly, see Crane operating instructions, chapter 8.06.

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9 Electrical system

9.1 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 for the same output.

When the same fuse of bulb becomes defective repeatedly:
- ▶ Check the electrical system.

9.2 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.

9.3 Batteries

9.3.1 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.

WARNING
Chemical burns due to battery acid!
Eye damage and skin irritation on contact.
- ▶ Make sure that eyes and skin do **not** come in contact with battery acid.
- ▶ Wear eye protection.
- ▶ Wear protective gloves.

When eyes came in contact with battery acid:
- ▶ Flush the eyes out immediately with clear water and consult a physician.

When skin came in contact with battery acid:
- ▶ Flush the skin immediately with water and consult a physician.

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

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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.
	**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.

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9.3.2 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.

NOTICE
Property damage due to excessively high or low acid level!
- ▶ Check the acid level in the battery only with a wooden stick or cardboard strip.
- ▶ Never check the acid level in the battery with metallic material.
- ▶ Adhere to the „minimum“ or „maximum“ acid level over the lead plates in the batteries according to the specifications of the battery manufacturer.

- ▶ Check the acid level in the batteries.
- ▶ If necessary, add distilled water to the specified „max mark“.

An acid container is located in the battery box.

- ▶ Check the acid container.
- ▶ Fill the acid in the acid container into the battery.

The charge condition of a battery is determined by measuring the acid density.

Measure the acid density: The optimal acid temperature is + 20 °C.

When distilled water was added:
- ▶ Measure the acid density after 30 minutes.
- ▶ For the charge condition test, adhere to the specifications, see the following chart.

Acid density	Charge condition	Measure
in kg/l at +25 °C		
1.28/1.23*	charged	—
1.20/1.16*	semi-charged	charge
1.12/1.08*	discharged	charge immediately

Specifications for the charge condition test

* in tropical countries

Reduced battery performance requires greater power requirements.

- ▶ Charge batteries in time.
- ▶ Make sure that batteries are charged in the cold season.

9.3.3 Charging batteries with the Liebherr charger*

The Liebherr charger is integrated in the crane electric.

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.

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▶ Plug in the cable of the external power supply on the socket.

9.3.4 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 33 V !
▶ Make sure that the external charger delivers a charge voltage of maximum 33 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 33 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 33 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.

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 170 Ah , the maximum charge current is 17.0 A.

▶ Thaw frozen batteries before charging.

When a plug is present:
▶ Before charging, remove all plugs.
▶ Check the acid level in the battery, see section „Maintaining the batteries“.

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- ▶ Make sure that the battery is ventilated during the charging procedure (danger of oxyhydrogen explosion).
- ▶ Connect the battery to a battery 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 electrolyte concentration or the charging voltage has **not** changed for 2 hours.

- ▶ Turn the battery charger off after charging, then remove the connector cables individually from battery and battery charger.

Installing the batteries

- ▶ Check the acid level in the battery, see section „Checking the batteries“.
- ▶ Reinstall the batteries tightly in the vehicle.
- ▶ Connect the vent hose on the vent channels of the batteries.
- ▶ Connect the positive terminal to the battery first, then the negative terminal (ground cable).
- ▶ 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).

10 Ladders

WARNING
Danger of falling!
If the following safety guidelines are **not** observed, personnel can fall down and be killed or severely injured.
- ▶ 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.
- ▶ Have ladders repaired only at authorized expert repair shops.

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10.1 Lubricating ladders

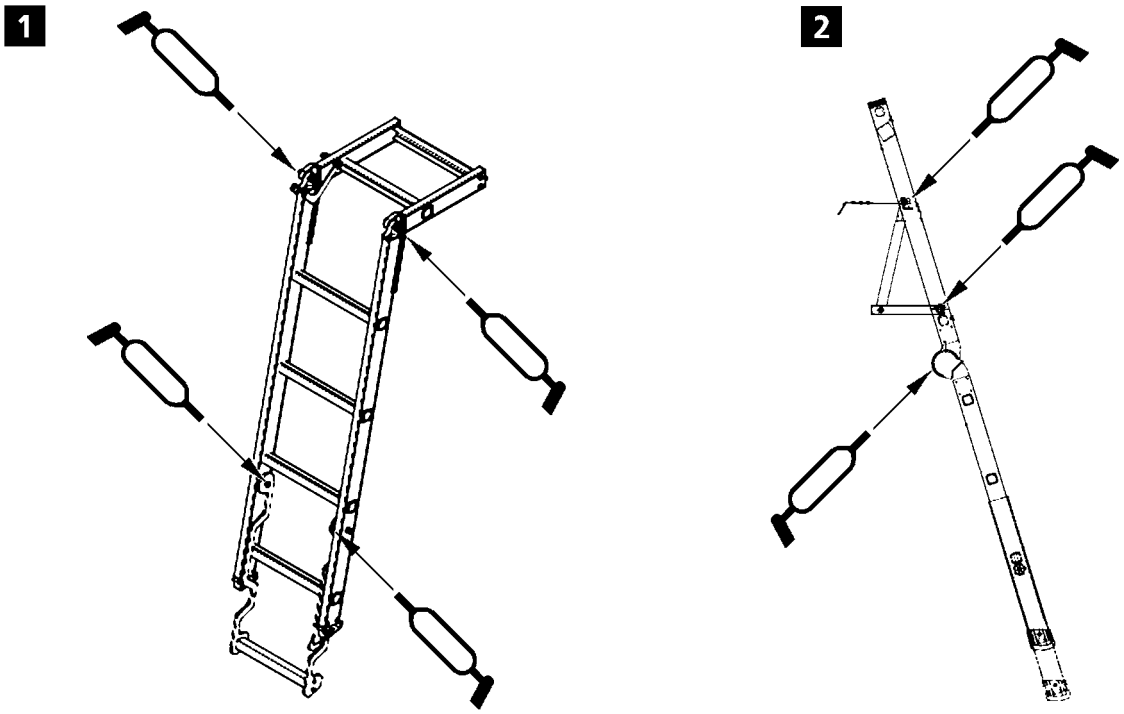

Fig.109766

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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Fig.195219

1 Telescopic boom

WARNING
Impermissible extension conditions!
Toppling crane. Death, severe bodily injuries, property damage.
- ▶ For lubrication, adhere to the specified extension conditions of the telescope boom.
- ▶ Do **not** telescope out more telescopes than specified.

WARNING
Personnel in danger zone!
Death, severe bodily injuries.
- ▶ Make sure that during telescoping **no** personnel remains within the danger zone of the telescopic boom.
- ▶ Lubricate the telescopic boom only in resting status.

WARNING
Telescoping the telescopic boom!
Shearing off of fingers.
- ▶ During telescoping, do **not** place your fingers in the inspection port.

Note
- ▶ For the gliding surfaces of the telescopic boom use special grease as lubricant. See Service fill and Crane operating instructions, chapter 7.07.

Make sure that the following prerequisites are met:
- Safety measures against falling have been made.
- Extend the crawler carriers to **wide** track width.
- The central ballast of 15 t is installed.
- At least one counterweight of 10 t is installed on the turntable.
- **No** hook block is reeved (reeved n=1).
- **No** auxiliary boom / accessory is installed.
- The folding jib is **not** on the telescopic boom.
- The hoist rope is spooled up and secured on the winch.
- The LICCON overload protection has been set according to the set up configuration.
- The telescopic boom is aligned in horizontal position to the rear (0°- main boom angle).
- The telescopic boom is fully telescoped in.
- The *Telescoping* program is selected on the LICCON computer system, see Crane operating instructions, chapter 4.05.

1.1 Lubricating the outer gliding surfaces

Note
Optimum lubrication result:
- ▶ To obtain an optimum lubrication result, let the sprayed on special grease cure four to eight hours before telescoping in.

To grease the outer gliding surfaces, every telescope can be telescoped out individually to 100 %.

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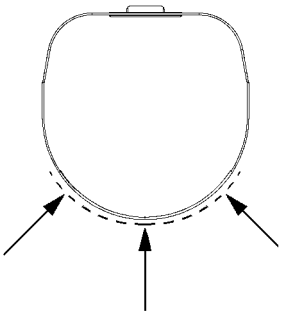

Fig.124866

- ▶ Telescope every telescope out individually to 100 % and spray special grease on the outer gliding surfaces.

1.2 Lubricating the inner gliding surfaces

Make sure that the following prerequisites are met:
- – The telescopic boom is completely telescoped in **0/0/0/0/0/0**.

Note
- ▶ The inner gliding surfaces of the telescopes (plastic glide bearing plates) are lubricated via grease fittings.
- ▶ The grease fittings can be accessed from the outside via inspection ports on both sides of the pivot section and the telescopes.

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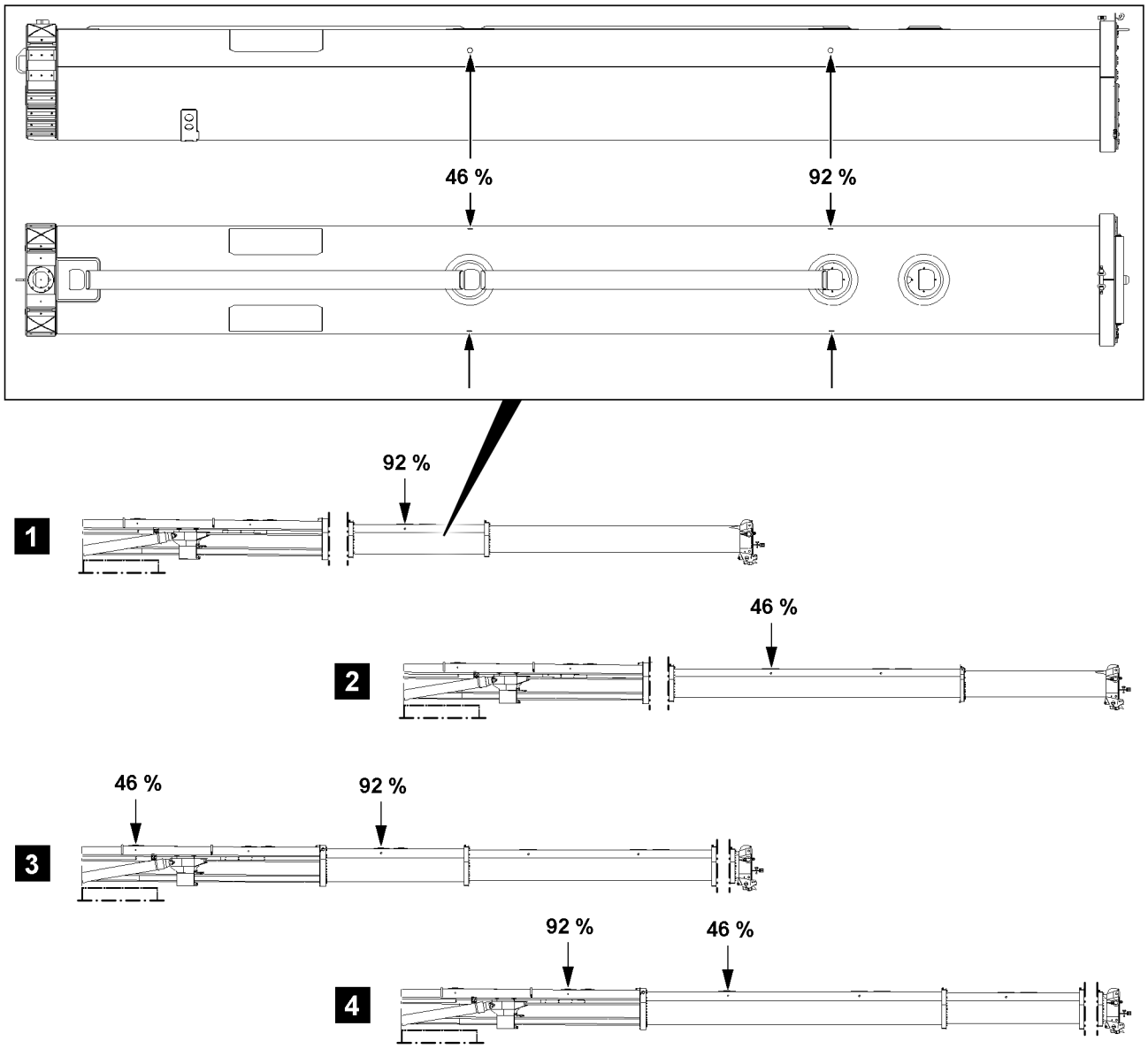

Fig.124863: Extension conditions and inspection ports

Extension condition	Telescope	Inspection port
0/0/0/46/92	4	92 %, see illustration **1**
0/0/0/92/46	4	46 %, see illustration **2**
0/0/46/92/0	3	92 %
0/0/92/46/0	3	46 %
0/46/92/0/0	2	92 %
0/92/46/0/0	2	46 %
46/92/0/0/0	1	46 % on pivot section, 92 % on telescope 1, see illustration **3**
92/46/0/0/0	1	92 % on pivot section, 46 % on telescope 1, see illustration **4**

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▶ Telescope the telescopic boom one after the other to all extension conditions and lubricate the telescopes on the grease fittings.

1.3 Lubricate the locking pins

Make sure that the following prerequisites are met:
- The telescopic boom is telescoped to extension condition **92/46/0/0/0**.
- An aerial platform is on hand.

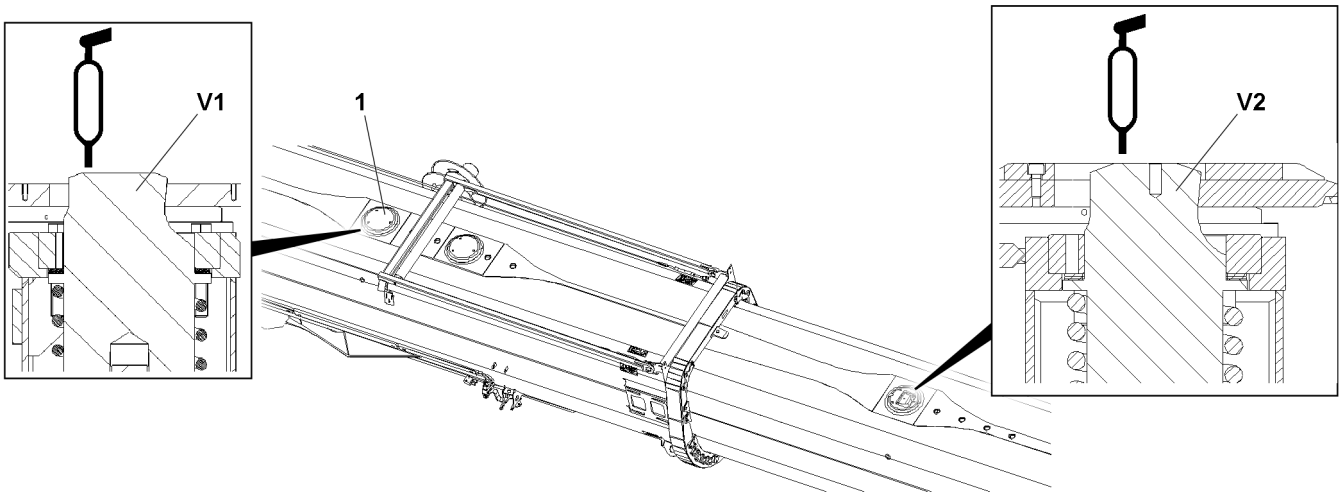

Fig.124867

▶ Remove the cover **1** on the pivot section.
▶ Lubricate the locking pins **V1**.
▶ Install the cover **1**.

Extension condition	Locking pin
92/46/0/0/0	V2
0/92/46/0/0	V3
0/0/92/46/0	V4
0/0/0/92/46	V5

▶ Lubricate the locking pins **V2**.

The following steps must be carried out for every additional locking pin.

▶ Telescope the telescopic boom to the next extension condition.
▶ Lubricate the locking pin.

When all locking pins are lubricated:
▶ Telescope the telescopic boom all the way in and lock.

2 Rope pulleys and guide pulleys

2.1 Checking for mechanical damage

Ropes can cause mechanical damage, such as stress marks.

▶ Check guide pulleys and rope pulleys for mechanical damage.
▶ Check the surface of the guide pulley and the groove of the rope pulley for smoothness.

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The actual grove diameter must be larger than the actual rope diameter.

▶ Check the actual groove diameter of the rope pulley.

2.2 Checking the 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.

When the crane is at a standstill for a longer period of time:
▶ Turn the rope pulleys regularly.

2.3 Lubricate the bearings

Rope pulleys with a diameter of more than 25 mm can be lubricated.

NOTICE
Lube pressure is too high!
When too much lubricant is introduced, then the lube pressure increases: Seal rings are pressed out.
▶ Meter the lube amount carefully.

▶ Turn the rope pulley and lubricate.

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.

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- 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.
- 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

Occurrence of removal criteria for individual criteria, see Crane operating instructions, chapter 8.04.

3.5.1 Broken strands

A strand consists of several individual wires.

When a complete strand 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.

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Additional types of broken wires:
- Broken wires in the inside of the rope
- Broken wires in the strand valleys
- Broken wires 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.

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.

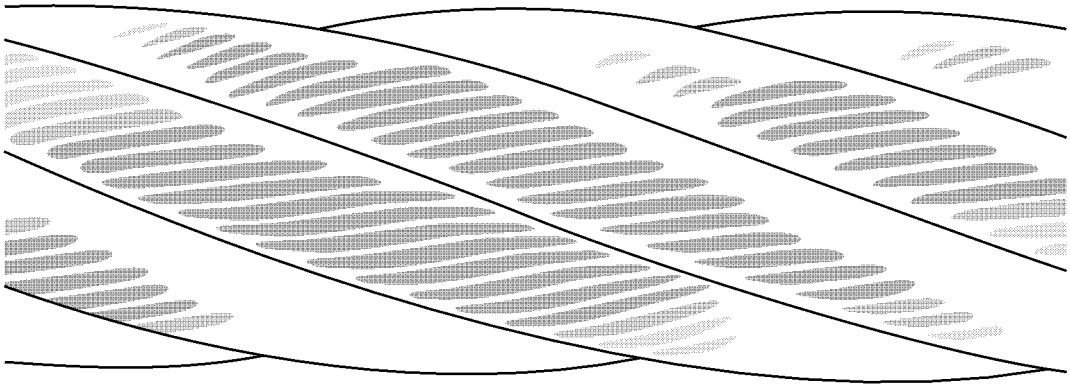

Fig.121001: External abrasion on the rope

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.

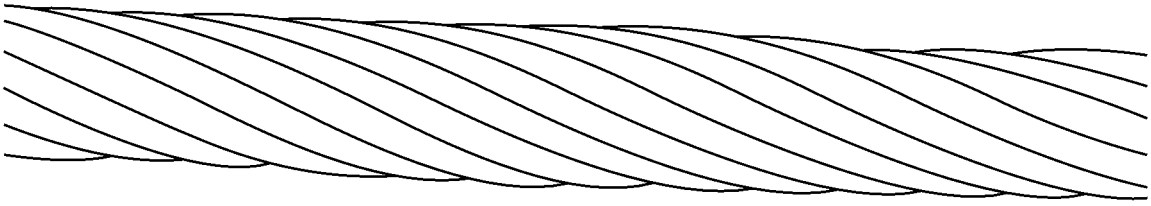

Fig.120992: Increase of rope diameter

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.

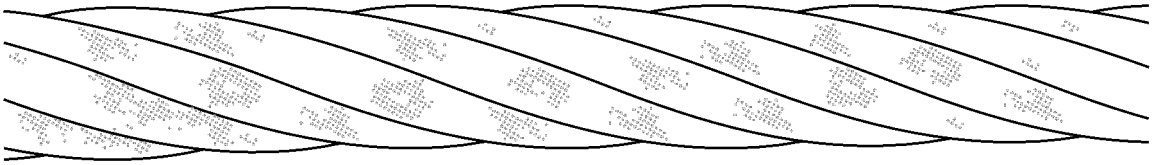

Fig.120994: External corrosion

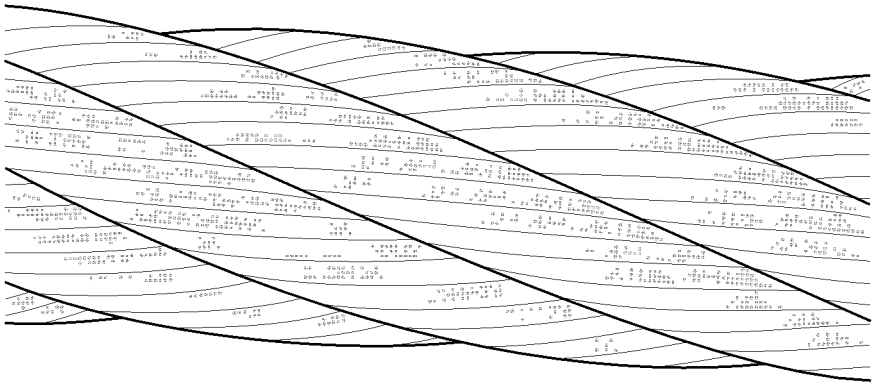

Fig.120995: Magnification of external corrosion for better depiction

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.

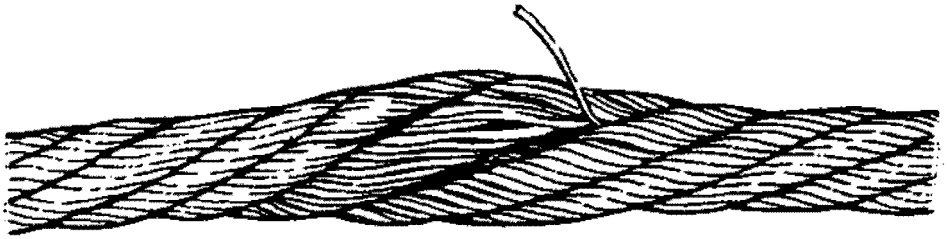

Fig.120997: Localized limited flattening, which leads to broken wires (single layer rope)

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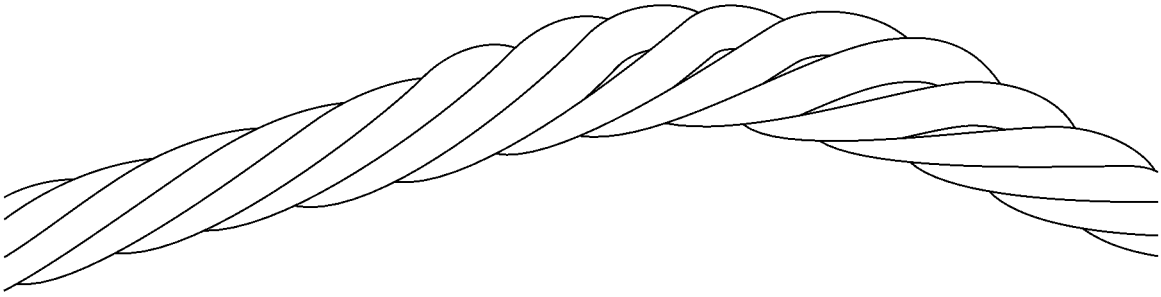

Fig.120996: Flattenings on multi layer spoolings

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.

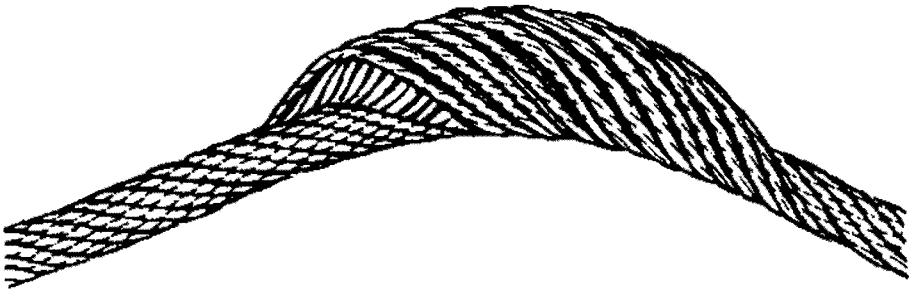

Fig.120989: Basket formation

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.

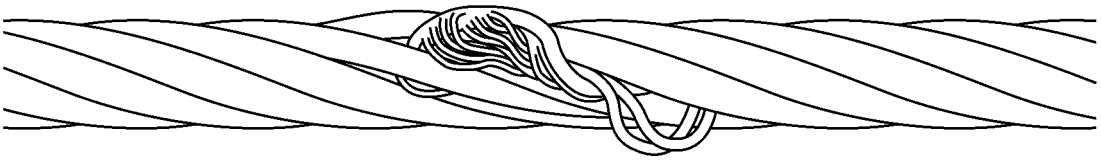

Fig.120990: Protrusion of an insert (rope single layer)

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.

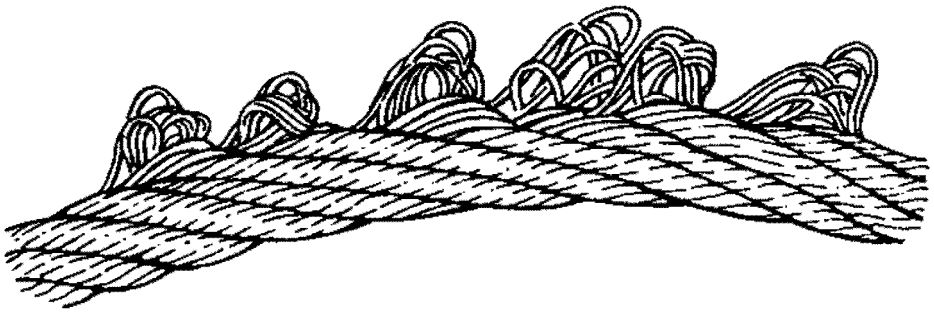

Fig.120993: Emergence of individual wires

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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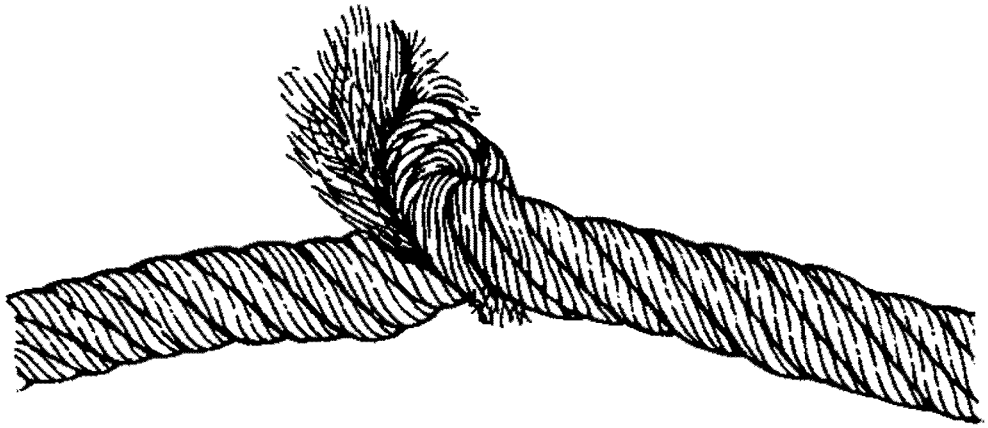

Fig.120998: Severe kinking or knots

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.

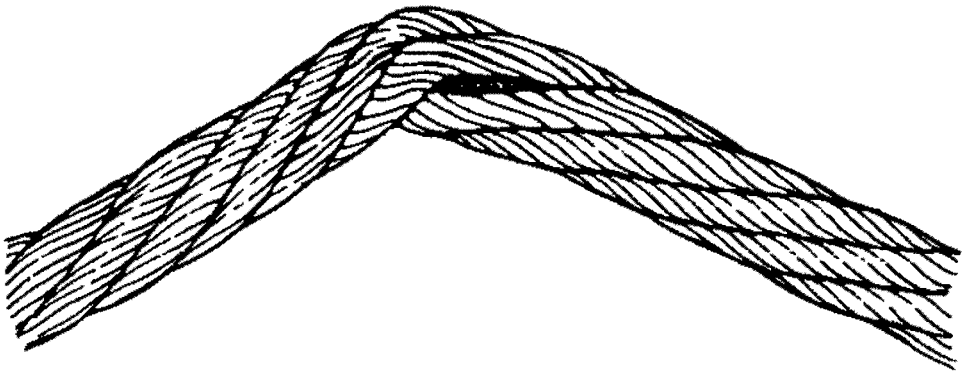

Fig.120999: Severe buckle

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.

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.

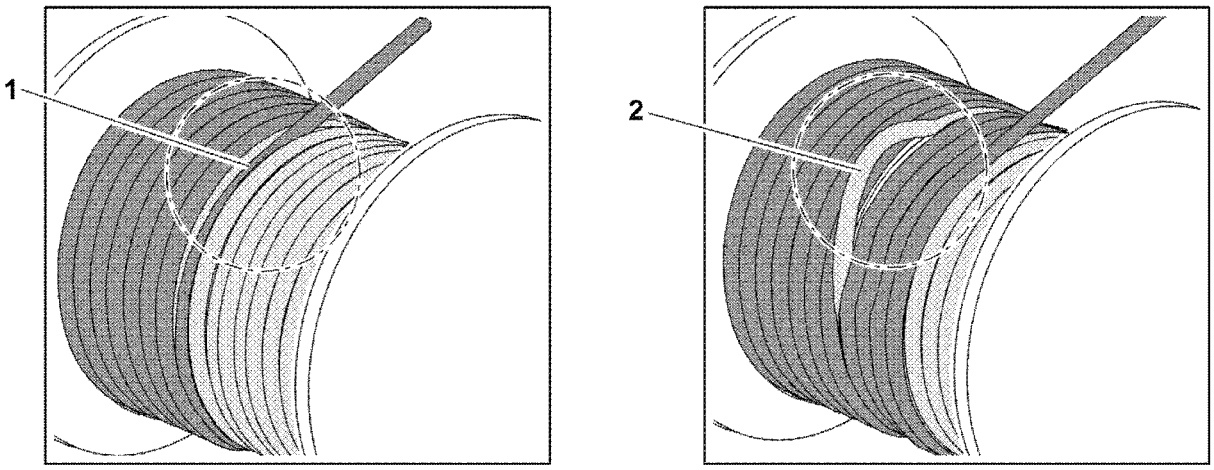

Fig.120967: Possible spooling problems on the rope winch

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**.

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.

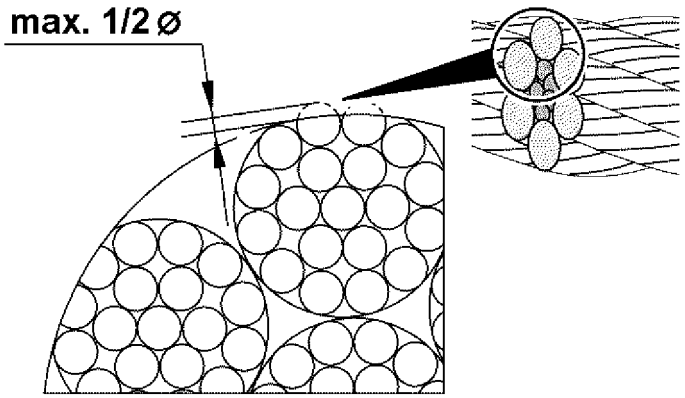

Fig.120966: Maximum flattening of wires on the outer strands

▶ 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

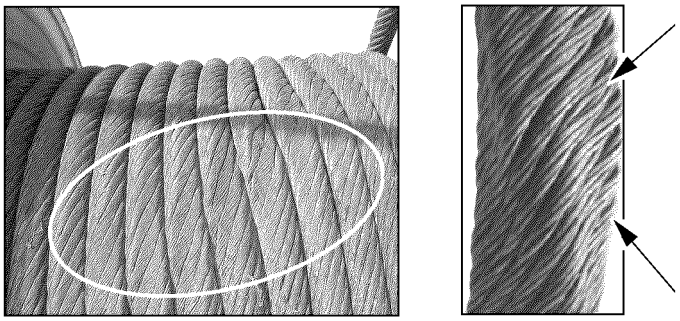

Fig.114002: Distortion on control ropes

▶ 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 prerequisites are met:
- – Suitable pliers are on hand.

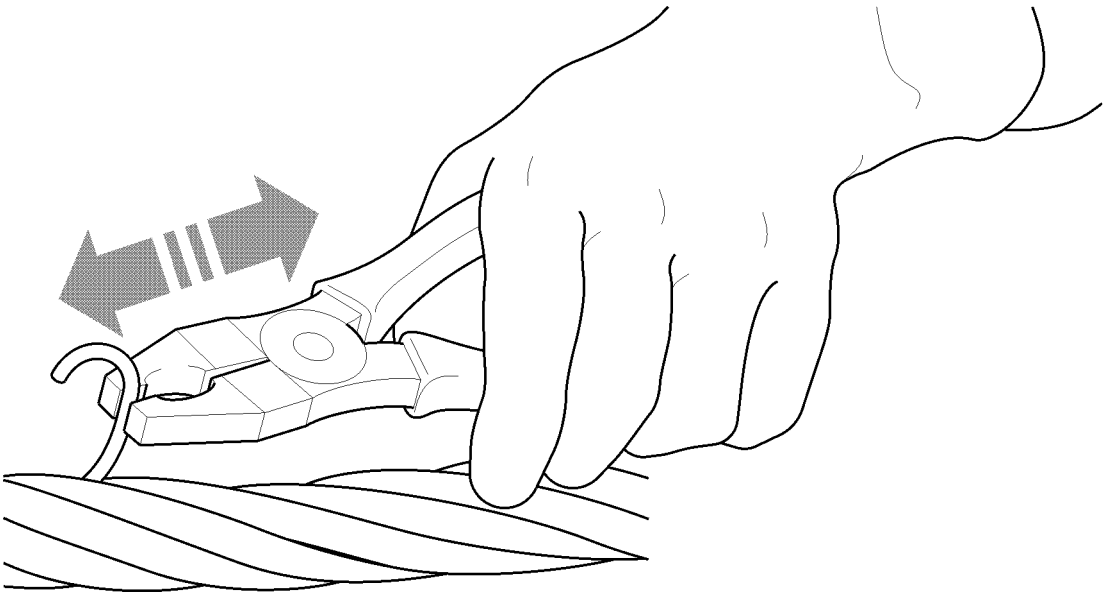

Fig.120979: Remove broken wire

- ▶ Grasp the wire on the upper end with pliers. Bend the wire back and forth until the wire breaks off in the braid valley.

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 prerequisites are 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.
– A clean spooling picture is visible when spooling on the drum.

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 prerequisites are 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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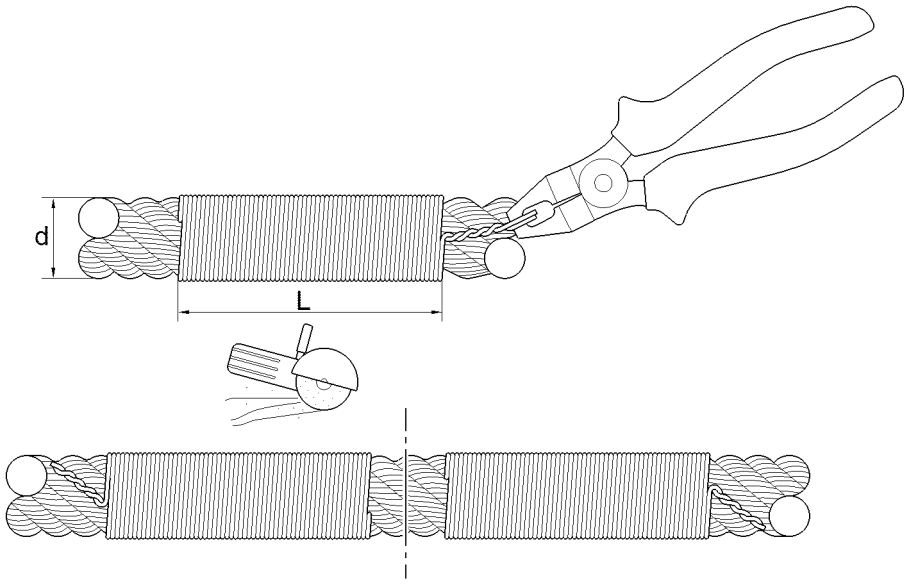

Fig.120972: Tie the rope before shortening it

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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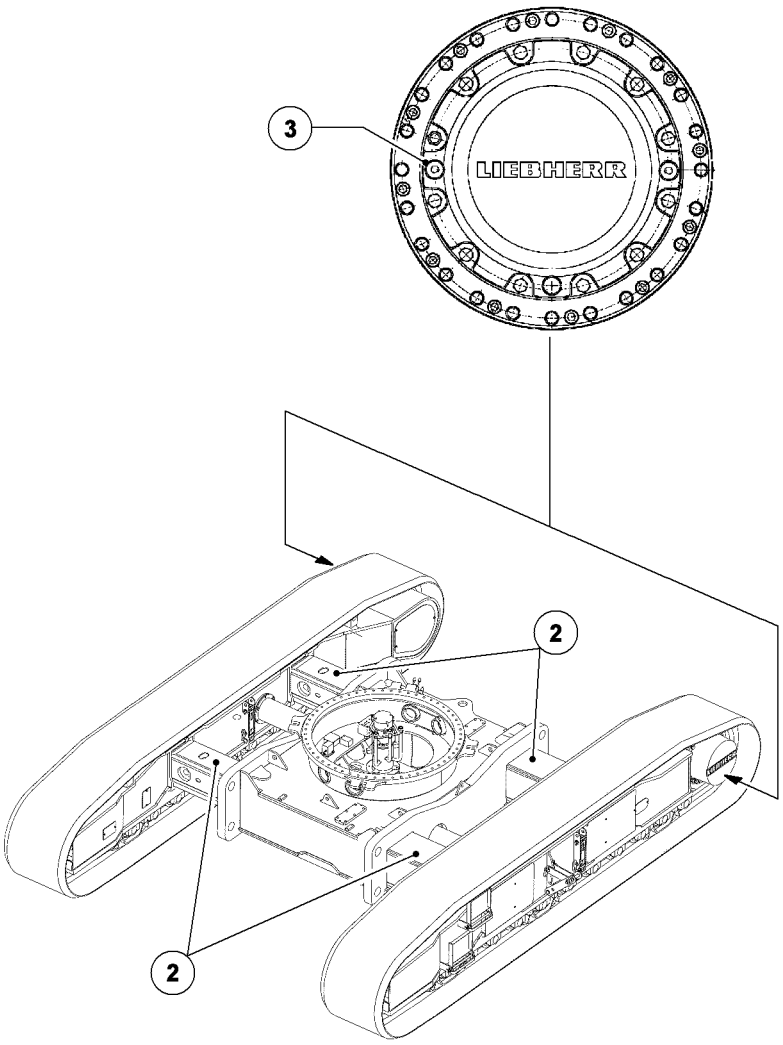

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Fig.198732

1 Crane chassis

Lubrication chart legend:

2 Lubricating grease

3 Gear oil

Fill quantities - chart

The specified filling quantities are orientation values. The markings on the dipsticks, inspection openings and viewing glasses are decisive for filling.

CAUTION
Danger of damage!
▶ Do not mix synthetic oils with mineral oils.

Description	Media	Fill quantity
Travel gear	Gear oil	12.0 l
Beams (travel track adjustment)[1]	Lubricating grease	

[1] Before conversion from wide track to reduced or retracted track, the beams must be thoroughly cleaned, followed by **careful** lubrication with grease of the sliding surfaces.

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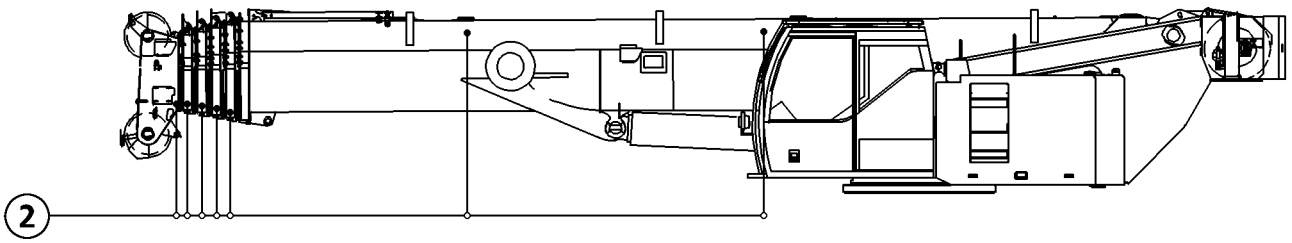

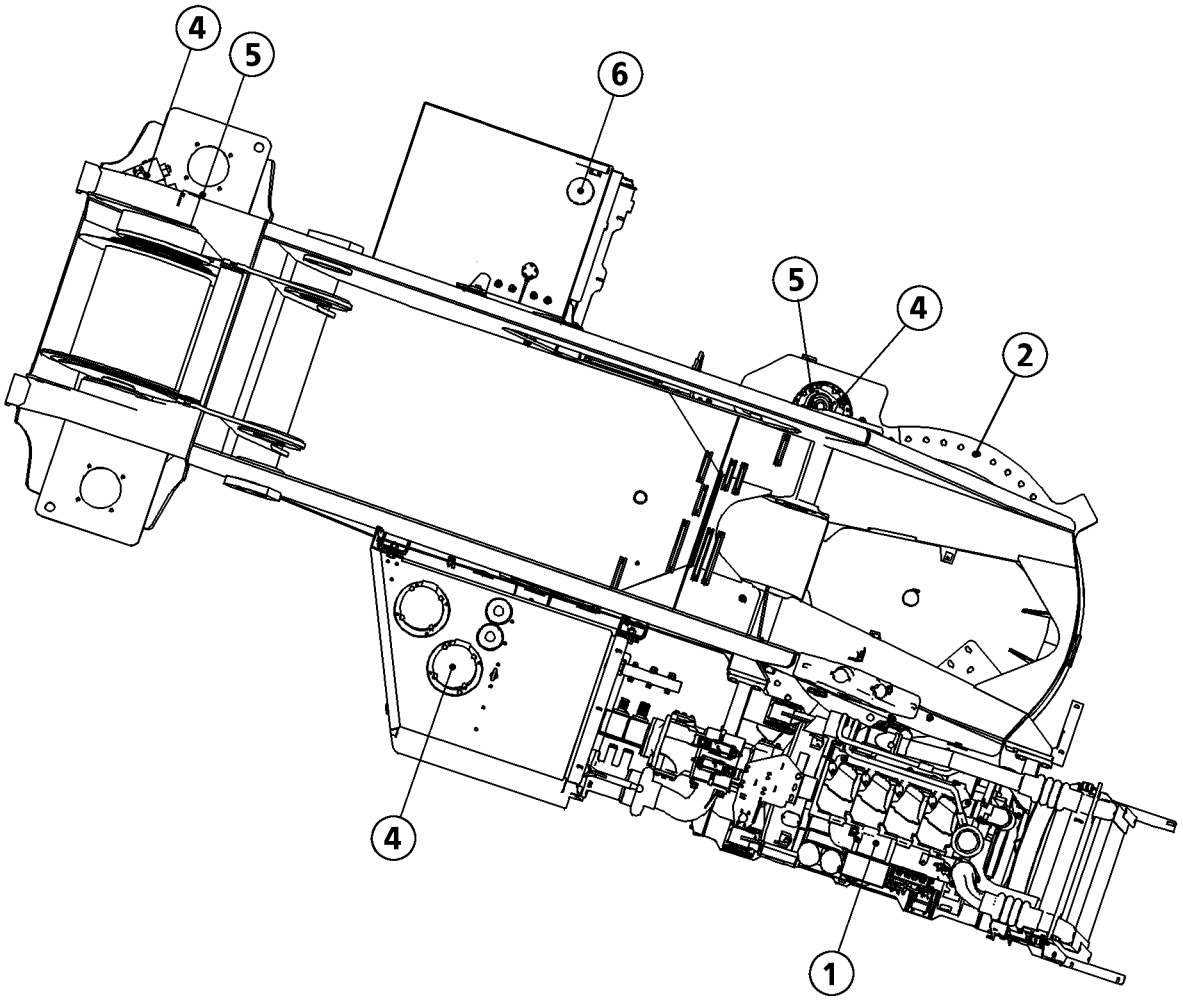

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Fig.102858

2 Crane superstructure

Lubrication chart legend:

1 Engine oil
2 Lubricating grease
3 Gear oil
4 ATF
5 Synthetic gear oil
6 Diesel fuel

Fill quantities - chart

The specified filling quantities are orientation values. The markings on the dipsticks, inspection openings and viewing glasses are decisive for filling.

CAUTION
Danger of damage!
▶ Do not mix synthetic oils with mineral oils.

Description	Media	Fill quantity
Crane engine	Engine oil	25.0 l
Crane engine	Coolant	35.0 l
Fuel tank	Diesel fuel	727.0 l
Winch 1	Synthetic gear oil	5.0 l
Winch brake, winch 1	ATF	0.2 l
Winch 2	Synthetic gear oil	5.0 l
Winch brake, winch 2	ATF	0.2 l
Slewing gear transmission	Synthetic gear oil	3.7 l
Slewing gear brake	ATF	0.2 l
Hydraulic fluid reservoir of the crane hydraulic system [1]	ATF	653.0 l
Central lubricating system	Special grease	2.0 kg
Friction bearing of boom	Special oil spray	3.0 kg
Slewing ring	Adhesive grease	0.5 kg

[1] When the oil level is checked, all hydraulic cylinders must be retracted. The oil level must be in the middle of the inspection glass.

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Fig.195219

1 Specified service fluids and lubricants for Liebherr cranes

No.	Crane components	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	**-40 °C to +30 °C**
1.1	Diesel engine **with**	**LWE Id. No.: 10871536**	**LWE Id. No.: 10871536**
	Exhaust aftertreatment	**Liebherr Motoroil 5W-30**	**Liebherr Motoroil 5W-30**
	US Tier 4	SAE 5W-30 and ACEA E4	SAE 5W-30 and ACEA E4
	EU-Stage IV	Observe the instructions of the engine manufacturer	Observe the instructions of the engine manufacturer
	EU-Stage III A Derivat	**Below -20 °C** with pre-heating	**Below -20 °C** with pre-heating
1.2	Diesel engine **with**	**LWE Id. No.: 10663796**	**LWE Id. No.: 11100934**
	Exhaust aftertreatment	**Liebherr Motoroil 10W-40 low ash**	**Liebherr Motoroil 5W-30 low ash**
	US Tier 4 interim	SAE 10W-40 low ash and ACEA E6	SAE 5W-30 low ash and ACEA E6
	EU-Stage III B	Observe the instructions of the engine manufacturer	Observe the instructions of the engine manufacturer
		Below -20 °C with pre-heating	**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**		
1.3	Diesel engine **without**	**LWE Id. No.: 861005308**	**LWE Id. No.: 10871536**
	Exhaust aftertreatment	**Liebherr Motoroil 10W-40**	**Liebherr Motoroil 5W-30**
	as 1.2 or	SAE 10W-40 and ACEA E4	SAE 5W-30 and ACEA E4
	optionally also	Observe the instructions of the engine manufacturer	Observe the instructions of the engine manufacturer
		Below -20 °C with pre-heating	**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**		
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	
		-25 °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 operation 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 operation	**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	
		-25 °C to +50 °C	**-40 °C to +30 °C**
8.1	Powershift transmission ZF Torque converter transmission WG 120, WG 150, WG 180, WG 181, WG 200, WG 201	**LWE Id. No.: 861005308** **Liebherr Motoroil 10W-40** ZF TE-ML 03 **Below -20 °C** run until warm according to operating instructions	**LWE Id. No.: 861900608** **Liebherr Hydraulic-Gear ATF** ZF TE-ML 03 **Below -20 °C** run until warm according to 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 **Below -20 °C** run until warm according to operating instructions	**LWE Id. No.: 861900608** **Liebherr Hydraulic-Gear ATF** ZF TE-ML 03 **Below -20 °C** run until warm according to operating instructions
9	Powershift transmission CLARK	**LWE Id. No.: 861005308** **Liebherr Motoroil 10W-40** SAE 10W-40 and ACEA E4 **Below -20 °C** run until warm according to operating instructions	**LWE Id. No.: 861900608** **Liebherr Hydraulic-Gear ATF** ATF Dexron II D and ALLISON C4 **Below -20 °C** run until warm according to operating instructions
10	Offset gear (drop box) ALLISON	**LWE Id. No.: 861005308** **Liebherr Motoroil 10W-40** SAE 10W-40 and API CF, ACEA E4 **Below -20 °C** run until warm according to operating instructions	**LWE Id. No.: 861900608** **Liebherr Hydraulic-Gear ATF** ATF Dexron II D or ALLISON C4 **Below -20 °C** run until warm according to 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** ATF Dexron III or ALLISON C4 **Below -20 °C** run until warm according to operating instructions	**LWE Id. No.: 861903708** **CASTROL Transynd** ATF Dexron III or ALLISON C4 **Below -20 °C** run until warm according to operating instructions
11.2	Automatic transmission ZF	**LWE Id. No.: 861900608** **Liebherr Hydraulic-Gear ATF** ZF TE-ML 14 **Below -20 °C** run until warm according to operating instructions	**LWE Id. No.: 861900608** **Liebherr Hydraulic-Gear ATF** ZF TE-ML 14 **Below -20 °C** run until warm according to operating instructions

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No.	Crane components	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
12	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 gear according to 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 gear according to 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	Gearbox 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 LR 13000	**LWE Id. No.: 11000948** **Liebherr Universalfett 9900** KPF2N-25, DIN 51502	**LWE Id. No.: 11000948** **Liebherr Universalfett 9900** KPF2N-25, DIN 51502
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	**LWE Id. No.: 861903508** **Liebherr Hydraulic 37** HVLP, DIN 51524-3	**LWE Id. No.: 10293807** **Liebherr Hydraulic Plus Arctic** HVLPD HC, DIN 51524-3

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No.	Crane components	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
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** HVLPD HC, DIN 51524-3	**LWE Id. No.: 10293807** **Liebherr Hydraulic Plus Arctic** HVLPD HC, DIN 51524-3
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 Drive shaft if **not** maintenance-free	**LWE Id. No.: 861301308** **Liebherr Spezialfett 9610 Plus** KP2K-20, DIN 51502	**LWE Id. No.: 10296825** **Liebherr Universalfett Arctic** KPFHC1N-60, DIN 51502
22.1	Glide and roller bearing roller bearing joint	**LWE Id. No.: 861301308** **Liebherr Spezialfett 9610 Plus** KP2K-20, DIN 51502	**LWE Id. No.: 10296825** **Liebherr Universalfett Arctic** KPFHC1N-60, DIN 51502
22.2	Rope pulley bearing	**LWE Id. No.: 10296825** **Liebherr Universalfett Arctic** KPFHC1N-60, DIN 51502	**LWE Id. No.: 10296825** **Liebherr Universalfett Arctic** KPFHC1N-60, DIN 51502
23	Central lubrication system	**LWE Id. No.: 861301308** **Liebherr Spezialfett 9610 Plus** KP2K-20, DIN 51502	**LWE Id. No.: 10296825** **Liebherr Universalfett Arctic** KPFHC1N-60, DIN 51502
24.1	Slewing ring connection Roller bearing	**LWE Id. No.: 861301308** **Liebherr Spezialfett 9610 Plus** KP2K-20, DIN 51502	**LWE Id. No.: 10296825** **Liebherr Universalfett Arctic** KPFHC1N-60, DIN 51502
24.2	Slewing ring connection LR 13000	**LWE Id. No.: 11000948** **Liebherr Universalfett 9900** KPF2N-25, DIN 51502	**LWE Id. No.: 10296825** **Liebherr Universalfett Arctic** KPFHC1N-60, DIN 51502
25.1	Support plate with equalization	**LWE Id. No.: 861303608** **Liebherr Teleskopfett 9613 Plus** KP2K-30, DIN 51502	**LWE Id. No.: 861303608** **Liebherr Teleskopfett 9613 Plus** KP2K-30, DIN 51502

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No.	Crane components	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
25.2	Glide shoes for cab guidance on vehicle frame LTC 1045-3.1	**LWE Id. No.: 861303608** **Liebherr Teleskopfett 9613 Plus** KP2K-30, DIN 51502	**LWE Id. No.: 861303608** **Liebherr Teleskopfett 9613 Plus** KP2K-30, DIN 51502
26	Sliding beam Plastic glide bearing Beam for track adjustment	**LWE Id. No.: 861303608** **Liebherr Teleskopfett 9613 Plus** KP2K-30, DIN 51502	**LWE Id. No.: 861303608** **Liebherr Teleskopfett 9613 Plus** KP2K-30, DIN 51502
27.1	Telescopic boom Plastic glide bearing Corner guide top	**LWE Id. No.: 861303608** **Liebherr Teleskopfett 9613 Plus** KP2K-30, DIN 51502	**LWE Id. No.: 861303608** **Liebherr Teleskopfett 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 Spezialfett 1336** KP2K-30, DIN 51502 Spray grease	**LWE Id. No.: 861303308** **Liebherr Spezialfett 1336** KP2K-30, DIN 51502 Spray grease
27.3	Telescopic boom LTC 1045-3.1 LTM 1050-3.1	**LWE Id. No.: 11651459** **Bechem Berulub TCG 1 V**	**LWE Id. No.: 11651459** **Bechem Berulub TCG 1 V**
28	Boom lock	**LWE Id. No.: 861301308** **Liebherr Spezialfett 9610 Plus** KP2K-20, DIN 51502	**LWE Id. No.: 10296825** **Liebherr Universalfett Arctic** KPFHC1N-60, DIN 51502
29	Guide rail on Telescoping cylinder	**LWE Id. No.: 861303308** **Liebherr Spezialfett 1336** KP2K-30, DIN 51502 Spray grease	**LWE Id. No.: 861303308** **Liebherr Spezialfett 1336** KP2K-30, DIN 51502 Spray grease
30	Gear ring rotary connection Slewing gear drive pinion	**LWE Id. No.: 861007708** **RHS-Fluid** OGPFOS-20, DIN 51502	**LWE Id. No.: 861007708** **RHS-Fluid** OGPFOS-20, 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

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No.	Crane components	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	**-40 °C to +30 °C**
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 gear LTR 1060 LTR 1100	**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
33.3	Travel gear LTR 11200	**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!**
34	Recovery winch	See data tag and manufacturer's instructions	See data tag and manufacturer's instructions
35	Recovery winch rope	See manufacturer's instructions	See manufacturer's instructions
36	Steering uncoupling LTC 1045-3.1	**LWE Id. No.: 10800345** **Teflon-Spray**	**LWE Id. No.: 10800345** **Teflon-Spray**

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Fig.197077

1 Procedure to follow in case of a problem

This chapter is supportive for the following questions:
- What to do in case of a problem?
- Which displays and component groups are relevant for error diagnostics?
- How can an error diagnostics be carried out?
- How to proceed in case of error messages of the LICCON computer system?
- Which measures are to be taken for defective components?
- Which measures are to be taken in clear problem cases?
- Which data is important for communication with Liebherr Service?

WARNING
Erroneous or insufficient repair!
If a crane is not properly or insufficiently repaired, then his can result in accidents!
Personnel can be killed or seriously injured!
This could result in property damage!
▶ The crane may only be repaired by authorized and trained expert personnel!

WARNING
Measures without the help of Liebherr Service!
Measures in case of a problem, which are carried out without consulting Liebherr Service can cause damage to the crane!
Personnel can be killed or seriously injured!
This could result in property damage!
▶ If problems remain or in case of error messages, consult Liebherr Service to determine the cause of the problem and further procedure.

WARNING
Problems with raised load!
If a crane is checked, diagnosed or repaired with a raised load, then there is a danger of accidents!
During accidents, personnel could be killed or seriously injured!
This could result in property damage!
▶ If possible, set the load down!
▶ If possible, telescope in / place down the boom system!
▶ If the load cannot be set down and / or the boom system cannot be telescoped in / placed down, secure a wide-ranging danger zone!

Note
▶ The display illustrations in this chapter are only examples. The display values may differ depending on the crane. In addition, some illustrations show a display with multiple icons. In normal crane operation, an identical display may **not** appear on the LICCON monitor.

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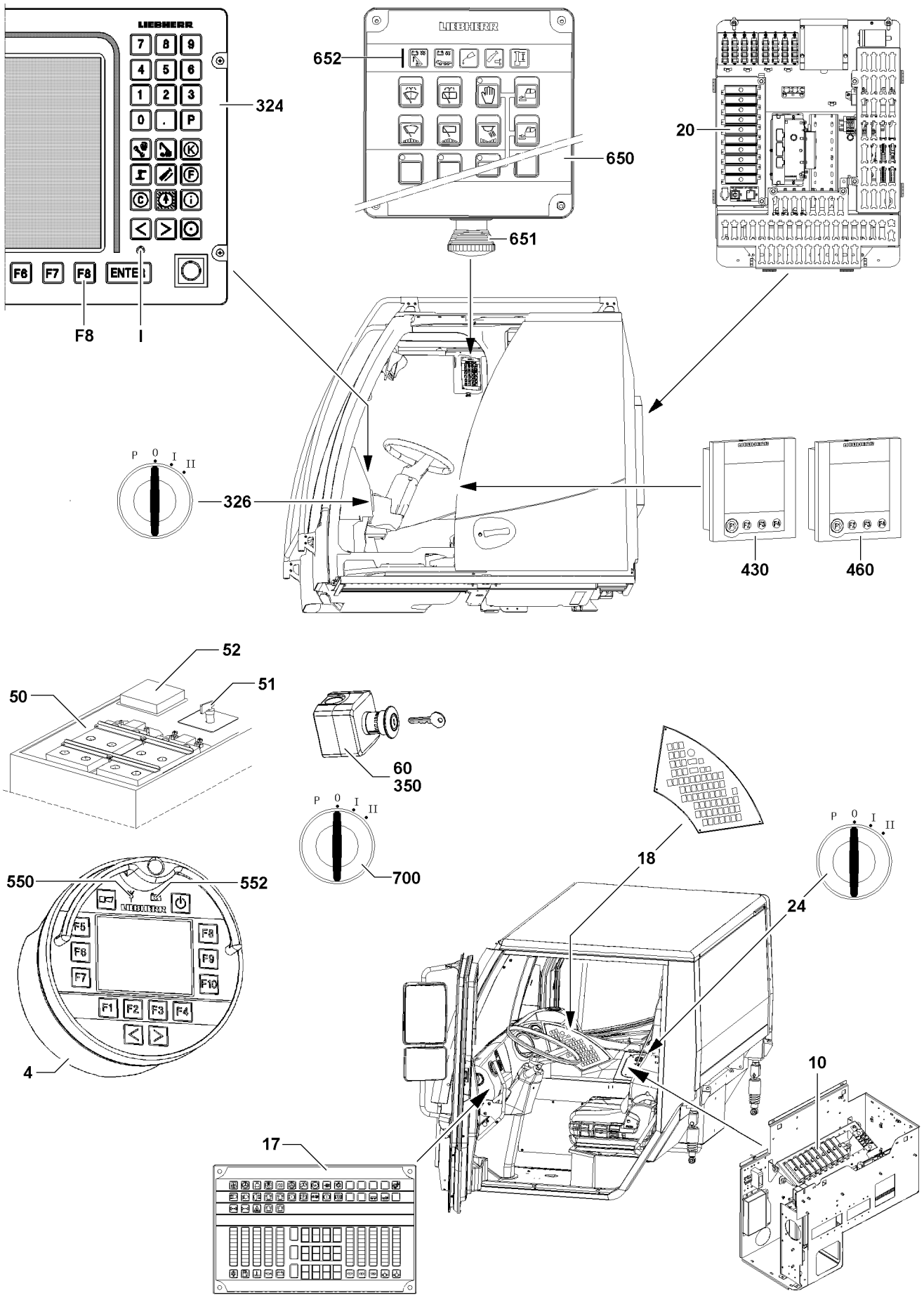

Fig.112958

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1.1 Overview of displays and component groups for error diagnostics

Various displays and component groups allow the crane driver:

- To localize error messages.
- To prepare quicker and more precise communication with Liebherr Service.
- To diagnose and remedy errors with the help of the „Diagnostics operating instructions“.

Note

- ▶ Displays and components in the driver's cab are only relevant for cranes with Liebherr crane chassis!
- ▶ If separate Operating instructions have been provided by the supplier as part of the scope of delivery for the crane, then it must be observed!

Position	Driver's cab (only Liebherr LTM chassis)
10	Fuses in driver's cab
17	Display unit
18	Operating unit
24	Ignition switch Driver's cab

Position	EMERGENCY STOP switch (location and number depending on crane type)
60	EMERGENCY STOP switch in chassis*****
350	EMERGENCY STOP switch in crane superstructure*****
651	EMERGENCY STOP switch in BKE

Position	Crane operator's cab
20	Fuses in crane operator's cab
324	LICCON monitor
F8	Function key
I	LED supply voltage
326	Ignition switch
430	Touch display left (only certain crane types)
460	Touch display right (only certain crane types)
650	Operating and control unit BKE (only certain crane types)
652	Indicator lights BKE (only certain crane types)

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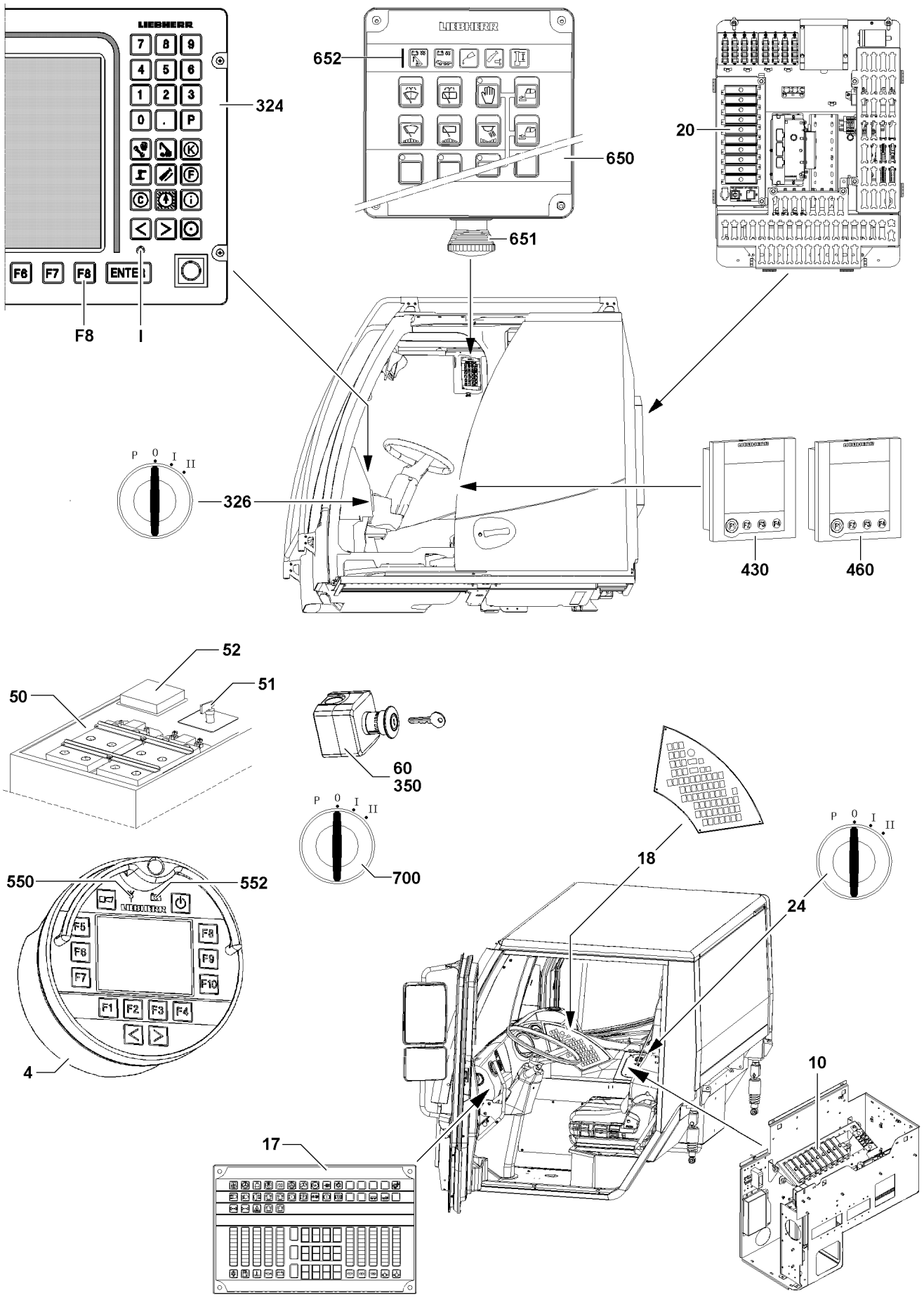

Fig.112958

Position	Bluetooth™ Terminal BTT (abbreviated BTT, only certain crane types)
4	BTT
550	Indicator light transmission signal
552	Indicator light charge condition

Position	Battery box (sample illustration - location and number depending on crane type)
50	Battery box
51	Battery master switch
52	Main fuses

Position	Ignition switch on frame
700	Ignition switch (only certain crane types)

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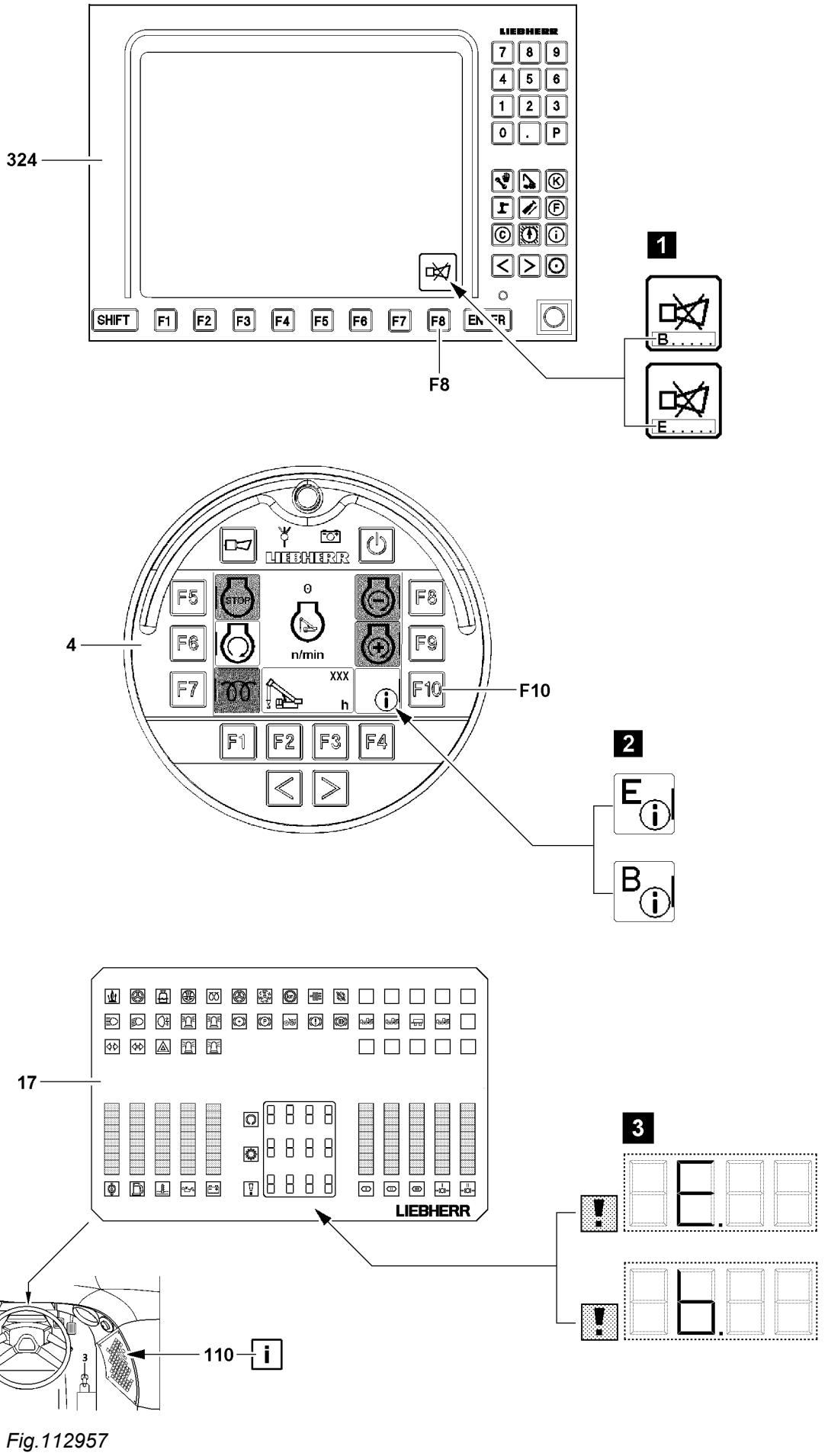

Fig.112957

1.2 Type of problem

Problems can be assigned to various error sources:
- Operating errors
  - Displayed by error number / LEC: B.....
  - To be remedied by crane operator.
- System errors in LICCON computer system
  - Displayed by error number / LEC: E.....
  - To be remedied by crane operator / Liebherr Service.
- Errors on mechanics / components
  - To be remedied by crane operator / Liebherr Service.
- Combination of error sources
  - To be remedied by crane operator / Liebherr Service.

Note
LICCON Error Code Manual (LICCON Error code list)
▶ All error numbers / LEC are listed in the „LICCON Error Code Manual“ (LICCON error code list).

2 Carry out error diagnostics

The crane is monitored:
- By the LICCON computer system for operating / system errors.
- By indicator lights.

If errors occur, error messages are issued and / or indicator lights light up.

Error messages appear in:
- Horn icon of LICCON monitor, see illustration **1**
- Window of test system in BTT, see illustration **2**
- Window and warning light in display unit, see illustration **3**

Indicator lights are located within view:
- In the driver’s cab.
- In the Crane operator's cab.
- On Components.

WARNING
Risk of accident!
When carrying out the error diagnostics, there is a danger of accidents!
During accidents, personnel could be killed or seriously injured!
This could result in property damage!
▶ Take the crane out of service!
▶ In case of safety defects, secure the crane to prevent continued operation!
▶ The crane may only be inspected, diagnosed and repairs at a standstill and in shut down condition!
▶ Inspections, error diagnostics and repairs, for which the crane must be in operation are only permissible with extreme caution and constant visual and voice contact between all associated personnel!
▶ Inspections, error diagnostics and repairs may only be carried out by expert or trained personnel!
▶ For inspections, error diagnostics and repairs of electrical devices on the crane, power must be turned off and ensured to remain so for the duration of the work!
▶ Test operation after a repair must be made by the crane operator or in his presence!

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Note
- ▶ Always observe error messages and illuminated indicator lights!
- ▶ For detailed procedure in case of error messages, see Diagnostics operating instructions, chapter 20.05.
- ▶ For overview of indicator lights on the crane chassis, see Crane operating instructions, chapter 3.01.
- ▶ For overview of indicator lights on the crane superstructure, see Crane operating instructions, chapter 4.01.

Several possibilities exist for an error diagnostics:
- Without the help of Liebherr Service.
- With the help of Liebherr Service: Error diagnostics by phone.
- With the help of Liebherr Service: Remote diagnostics.

2.1 Error diagnostics without the help of Liebherr Service

WARNING
Acting on your own authority!
If measures are carried out on your own authority in case of a problem, then this can result in damage to the crane!
Damage on the crane can cause erroneous functions and accidents!
Personnel can be severely injured or killed!
This could result in property damage!
- ▶ Observe and adhere to the notes and instructions in this chapter.
- ▶ Observe the Diagnostics operating instructions.
- ▶ In case of lack of clarity, contact Liebherr Service.
- ▶ If problems remain or in case of error messages, consult Liebherr Service to determine the cause of the problem and further procedure.

2.1.1 Error message in BTT

Note
- ▶ Only for crane types with BTT.

After display of an error message in the BTT:
- ▶ Press the function key **F10**.

Result:

- The error code is displayed on the BTT display (error determination display in the „test system“).
- In addition, all errors are listed in a separate error list (error text, cause, remedy).

In the error code, two different error types are differentiated:
- Operating errors - Error code starts with a „B“.
- System errors / application errors - Error code starts with an „E“.

If an error code starts with a „B“:
- ▶ Correct the operating error.

If an error code starts with an „E“:
- ▶ Call up the test system, see Diagnostics operating instructions.
  or

In case of lack of clarity:
Consult Liebherr Service.

2.1.2 Error message in the display unit

After display of an error message in the display unit:
- ▶ Press the i-key **110**.

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Result:

– The error code is shown alternately as long as the i-key **110** is pressed.

In the error code, two different error types are differentiated:
– Operating errors - Error code starts with a „b“.
– System errors / application errors - Error code starts with an „E“.

Note
LICCON Error Code Manual (LICCON Error code list)
▶ All error numbers / LEC are listed in the „LICCON Error Code Manual“ (LICCON error code list).

If an error code starts with a „b“:
▶ Correct the operating error.

If an error code starts with an „E“:
▶ Call up the test system, see Diagnostics operating instructions.
or

In case of lack of clarity:
Consult Liebherr Service.

2.1.3 Error message in the LICCON monitor

After display of an error message in the LICCON monitor:
▶ Press the function key **F8**.

Result:

– Acoustic warning is turned off.

▶ Press function key **F8** again.

Result:

– The error code is displayed on the LICCON monitor (error determination display in the „test system“).
– In addition, all errors are listed in a separate error list (error text, cause, remedy).

In the error code, two different error types are differentiated:
– Operating errors - Error code starts with a „B“.
– System errors / application errors - Error code starts with an „E“.

If an error code starts with a „B“:
▶ Correct the operating error.

If an error code starts with an „E“:
▶ Call up the test system, see Diagnostics operating instructions.
or

In case of lack of clarity:
Consult Liebherr Service.

2.1.4 Calling up the test system

Note
▶ For calling up the test system, see Diagnostics operating instructions!

2.1.5 Problems on the mechanics / components of the crane

▶ Determine the damage and remedy it properly by using **original spare parts**.

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2.1.6 Problems on pipes / hoses

Supply lines, return lines and control lines handle various media:
- Pneumatic pipes / hoses.
- Hydraulic pipes / hoses.
- Pipes / hoses for fluids and gases.

▶ Determine the damage and remedy it properly by using **original spare parts**.

2.1.7 Problems in electrical connections of the crane

- If a component / component group does no longer react, then the electrical connections may be interrupted.

▶ Check the error messages.
▶ Check the plug connections.
▶ Check the electrical connections visually.

Problem remedy
The erection of the crane, for example after assembly on a new job site or with another equipment configuration, is not possible due to an error message?
▶ As the first step, make sure that all electrical connections have been made.
▶ Check if all sensors or dummy plugs with integrated electronic have been connected properly.

▶ Determine the damage and remedy it properly by using **original spare parts**.
or

In case of lack of clarity:
Observe the Diagnostics operating instructions.
or
Consult Liebherr Service.

2.2 Error diagnostics with the help of Liebherr Service

2.2.1 Which data is required by Liebherr Service?

If the assistance of Liebherr Service is required, always provide the following information:
- Crane type
- Crane number
- Complete error number and any error message displayed on the LICCON monitor **324**
- Complete error code and any error message from the BTT **4**
- Application conditions of crane.
- Action during which the error occurs.
- Possibly frequency of error.

2.2.2 Error diagnostics by phone

If there is any lack of clarity, contact Liebherr Service to determine the cause of the problem and further procedure.

▶ Contact Liebherr Service.
▶ Observe and adhere to the notes and instructions given by Liebherr Service.

2.2.3 Remote diagnostics*

The remote diagnostics makes it possible for Liebherr Service to check Liebherr cranes from a remote location in case of problems.

Make sure that the following prerequisite is met:
- The crane is equipped with the optional Remote diagnostics*.

▶ Contact Liebherr service by phone.
▶ Follow the instructions given by Liebherr Service to set up the Remote diagnostics*.

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▶ Keep the phone connection to Liebherr Service up during the Remote diagnostics*.

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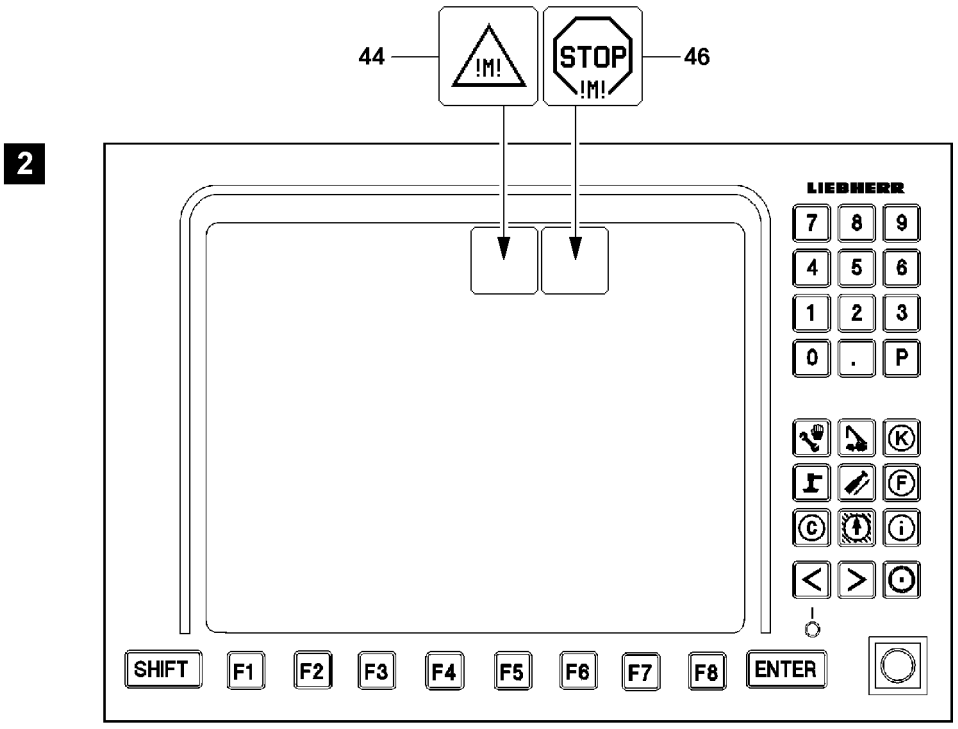

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Fig.112959

3 Measures in clear problem cases

Note

If a problem occurs, which is not described in this chapter:
▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

3.1 Remedying temporary errors during system start

Note
▶ While the LICCON computer system starts, temporary error messages **1** can occur, see illustration **1**.

Errors, which occur temporarily, can have various causes, for example:
– Fluctuations in the power supply.
– Error message can be a subsequent error.

▶ Turn the LICCON computer system off and restart it after waiting for at least 5 s.
▶ Repeat this procedure up to three times (wait 2 min after 3 start attempts).

If the same error image appears several times:
▶ Call up the test system, see Diagnostics operating instructions.
▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

3.2 Monitoring function reports a problem

Note
▶ For a detailed description of monitoring functions, see Crane operating instructions, chapter 4.02.

NOTICE
Danger of severe engine damage!
If the monitoring functions report 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!

The following alarm functions are indicated by blinking icons on the LICCON monitor (illustration **2**):
– **44** Advance warning - engine
– **46** Engine stop

▶ If an „Advance warning - engine“ **44** or an „Engine stop“ **46** is triggered, react immediately.
▶ In case of an Engine stop **46**, stop crane operation and turn the engine off.
▶ Find the cause and remedy it.

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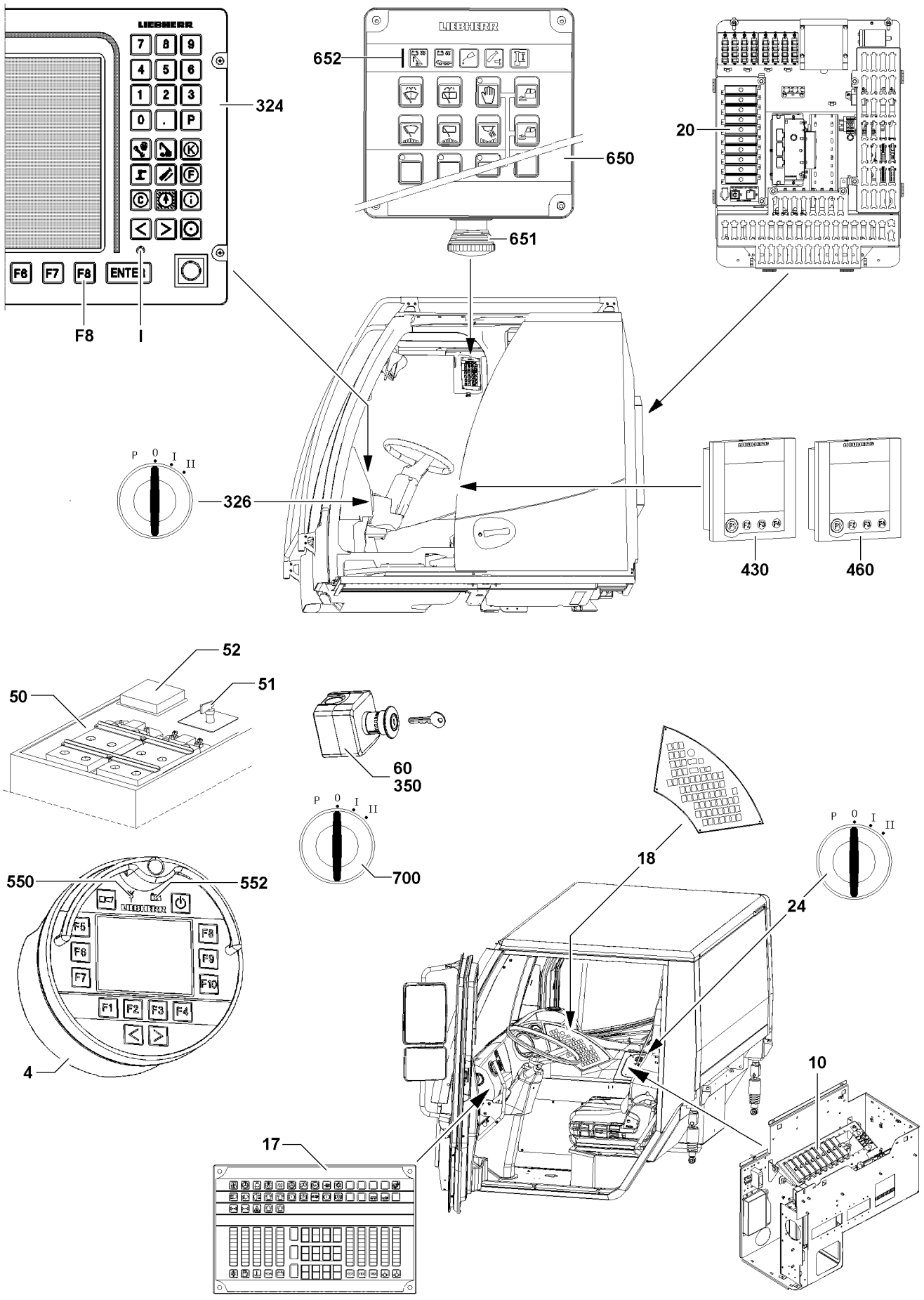

Fig.112958

3.3 Engine does not start

Make sure that:
- There is sufficient fuel in the fuel tanks.
- There is sufficient voltage in the batteries.

3.3.1 Cranes with one engine

Make sure that no EMERGENCY STOP switch is actuated:
- **60** EMERGENCY STOP switch Chassis*****
- **350** EMERGENCY STOP switch Crane superstructure*****
- EMERGENCY STOP switch **651** on the BKE***** **650**

The engine does not start from the driver's cab?

No EMERGENCY STOP switch is actuated:
▶ Turn the ignition off.
▶ Start the engine again.

If the engine still cannot be started:
▶ Check the indicator lights on the display unit **17**.

Note
▶ Problem remedy, see Crane operating instructions, chapter 3.04.

If the error cannot be remedied:
▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

The engine does not start from the crane operator's cab?

No EMERGENCY STOP switch is actuated:
▶ Turn the ignition off.
▶ Start the engine again.

If the engine still cannot be started:
▶ Watch the indicator lights **652** on the BKE **650**.

Note
▶ Problem remedy, see Crane operating instructions, chapter 4.03.

If the error cannot be remedied:
▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

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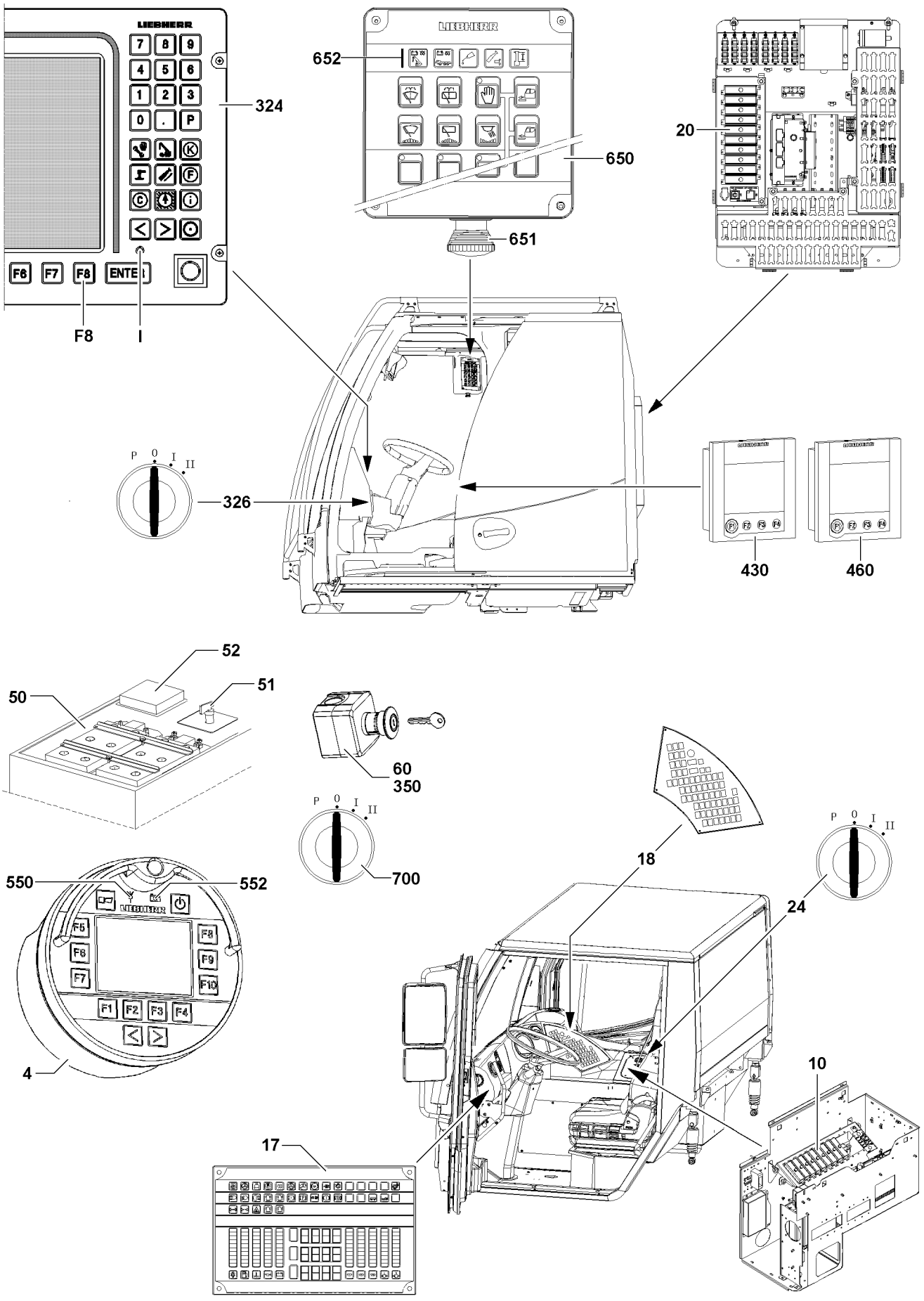

Fig.112958

3.3.2 Cranes with two engines

Make sure that no EMERGENCY STOP switch is actuated:
- **60** EMERGENCY STOP switch Chassis*****
- **350** EMERGENCY STOP switch Crane superstructure*****
- EMERGENCY STOP switch **651** on the BKE***** **650**

The engine in the crane chassis does not start?

No EMERGENCY STOP switch is actuated:
▶ Turn the ignition off.
▶ Start the engine again.

If the engine still cannot be started:
▶ Check the indicator lights on the display unit **17**.

Note
▶ Problem remedy, see Crane operating instructions, chapter 3.04.

If the error cannot be remedied:
▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

The engine in the crane superstructure does not start?

No EMERGENCY STOP switch is actuated:
▶ Turn the ignition off.
▶ Start the engine again.

If the engine still cannot be started:
▶ Watch the indicator lights **652** on the BKE **650**.

Note
▶ Problem remedy, see Crane operating instructions, chapter 4.03.

If the error cannot be remedied:
▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

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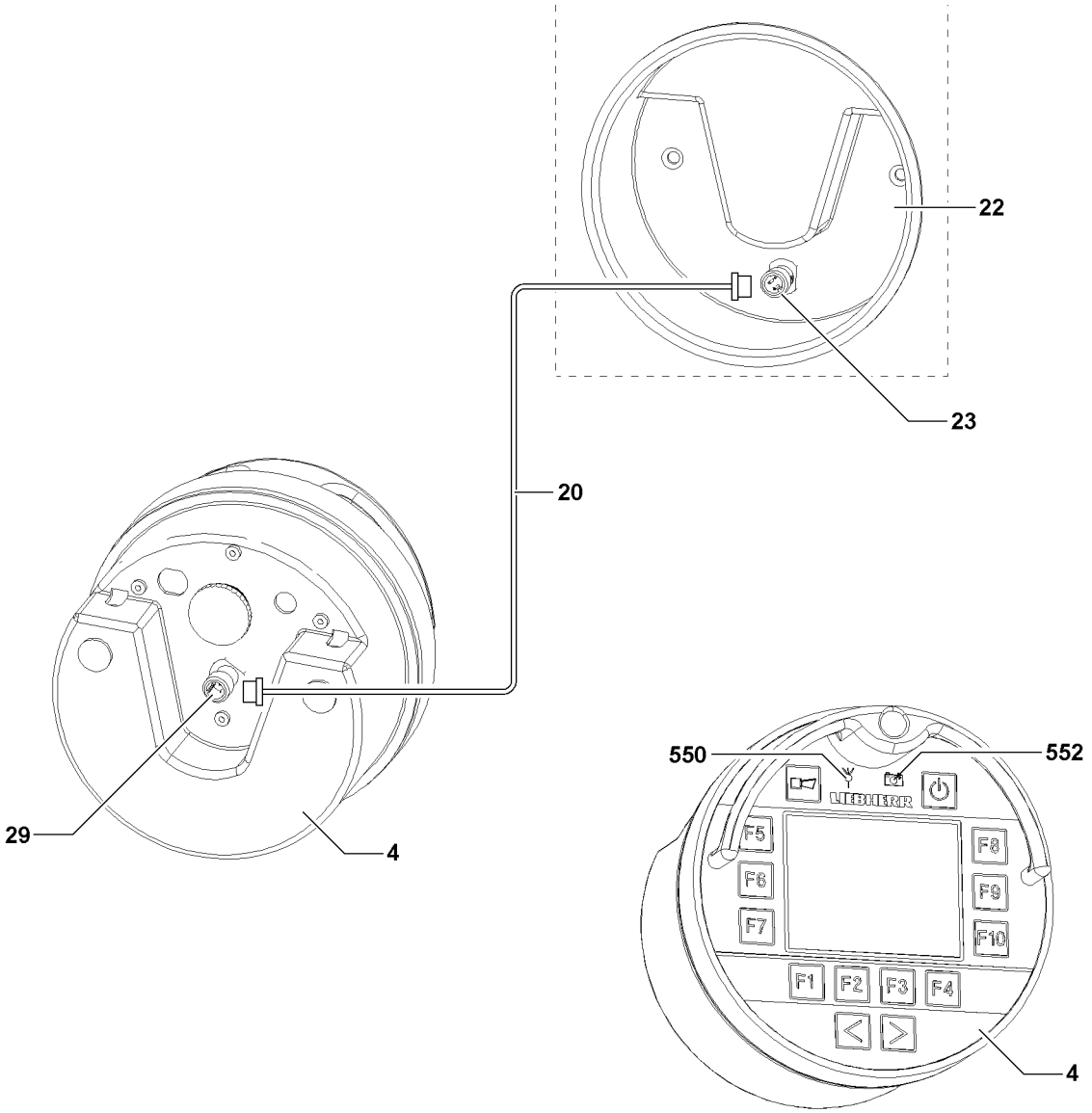

Fig.112952

3.4 Bluetooth™ Terminal

Note
▶ Required only for cranes with Bluetooth™ Terminal (BTT).

3.4.1 The display of the BTT remains dark?

Note
▶ Indicator light Charge condition **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.

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3.4.2 Is the radio contact 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 contact connection to the BTT **4** can become faulty or interrupted by the following occurrences:
- By interference signals from a nearby radio tower.
- 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 location by the operator.

Bypassing the radio contact connection

Make sure that the following prerequisites are met:
- The line **20** to bypass the radio contact connection has been removed from the switch 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 contact connection 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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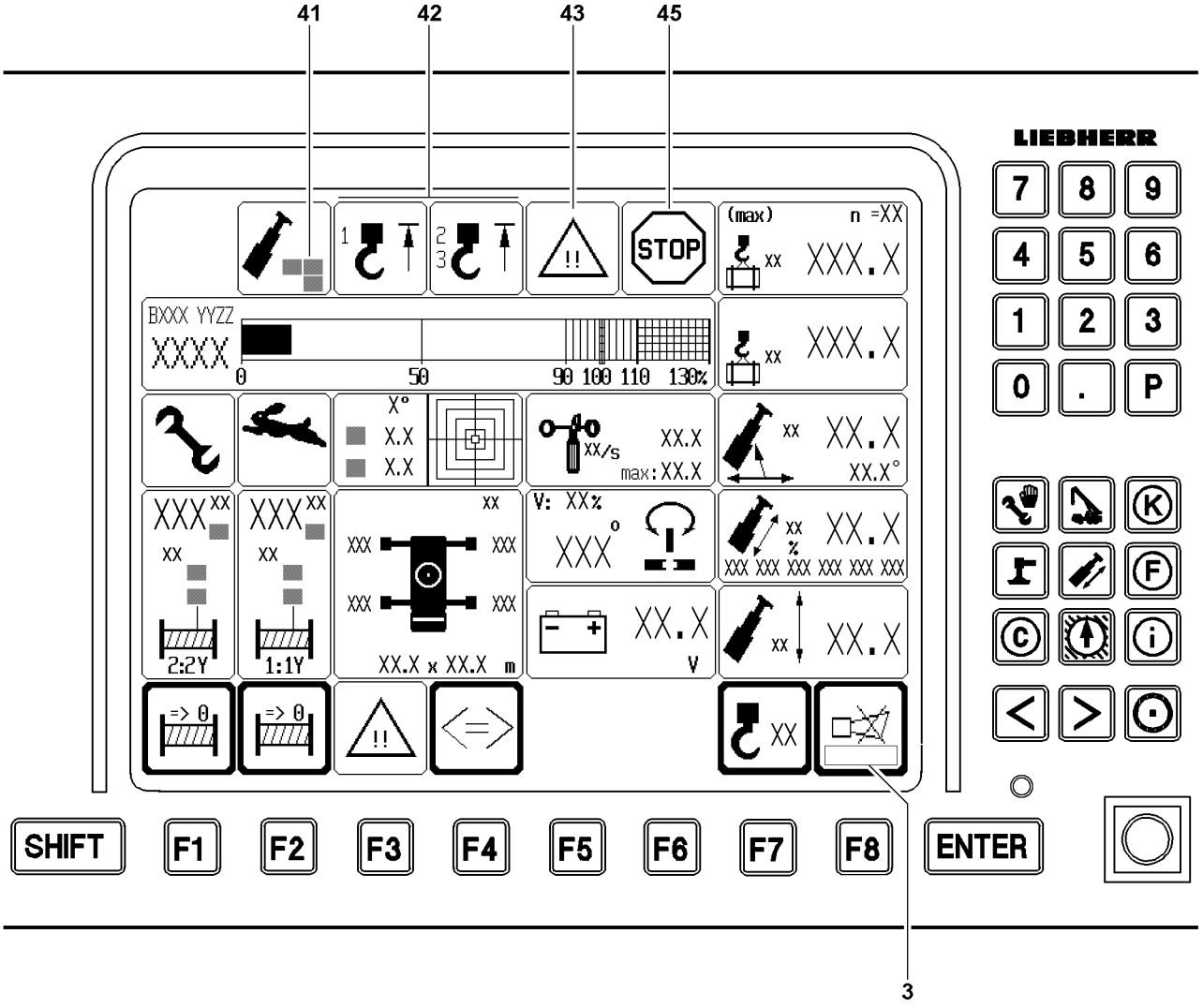

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Fig.112960

3.5 LICCON monitor

3.5.1 Operating errors: Did an alarm function occur?

Note
- ▶ For procedure of shut off of crane movement, see Crane operating instructions, chapter 4.20.
- ▶ For a detailed description of alarm functions, see Crane operating instructions, chapter 4.02.
- ▶ In case of an alarm function, an error message **3** with LICCON error code appears at the same time.

The following alarm functions are indicated by blinking icons on the LICCON monitor:
- **41** Boom limitation
- **42** Hoist top limit switch
- **43** Advance warning
- **45** LMB Stop

The limit ranges of the crane movements are monitored by:
- Hoist limit switch
- Angle sensors
- Pressure sensors
- Length sensors
- Wind sensor
- Inductive sensors

If the limit ranges for these sensors are exceeded, the crane movements are turned off (LMB-STOP).

▶ Correct the operating error.

3.6 Is telescoping not possible?

- Telescoping is not functioning.

Possible causes:
- An operating error has occurred.
- A system error has occurred.
- The valves are mechanically defective.
- The electrical connection is interrupted.

Note
If the crane is equipped with the optional „Hydraulic emergency control*“, then the crane can be taken down in case of failure of the crane hydraulic, crane electric and crane engine.
▶ For hydraulic emergency control, see Crane operating instructions, chapter 6.05.

3.6.1 Telescopic boom system Telematic

If an operating error is present:

▶ Correct the operating error.

If no operating error is present:

WARNING
Increased danger of accidents in case of defective telescoping lock!
There is an increased risk of accident if the following danger notes are not observed!
- ▶ „Emergency control telescoping“ may only be carried out by authorized expert personnel trained on **Liebherr-Werk Ehingen mobile cranes**, who know the dangers of emergency operation!
- ▶ It is imperative that the next **Liebherr Service location** or **Liebherr-Werk Ehingen** is contacted!
- ▶ All crane movements must be carried out with extreme caution!
- ▶ Telescoping must be constantly monitored by a second person!

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If the cause of the problem is unclear:
▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

3.6.2 Telescopic boom with rope mechanism

If an operating error is present:

▶ Correct the operating error.

If no operating error is present:

If the cause of the problem is unclear:
▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

4 Measures for defective components

WARNING
Impairment of crane safety!
When using non-original spare parts, crane safety can be impaired!
Changed or manipulated components can fail!
Safety relevant components can malfunction!
The crane license as well as the manufacturer's warranty will become void!
Risk of accident!
Personnel can be severely injured or killed!
This could result in property damage!
▶ Use only original spare parts or spare parts approved by Liebherr Werk Ehingen!
▶ Leave installed original parts unchanged!

Make sure that the following prerequisites are met:
– Error diagnostics has been carried out.
– Defective component has been determined.

4.1 Failure of hydraulic, electric or engine

Note
If the crane is equipped with the optional „Hydraulic emergency control*“, then the crane can be taken down in case of failure of the crane hydraulic, crane electric or crane engine.
▶ For hydraulic emergency control, see Crane operating instructions, chapter 6.05.

▶ Take the crane down with the hydraulic emergency control* and repair it, contact Liebherr Service if necessary.
or

If the crane has no „Hydraulic emergency control*“:
Secure the crane and danger zone wide-ranging.

4.2 Defective power supply (NT)

▶ Replace the power supply with a functioning power supply.

Note
▶ For instruction of replacement of a defective power supply, see Diagnostics operating instructions.

4.3 Central processing unit (CPU)

▶ Replace the CPU with a functioning CPU.

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Note

▶ For instruction of replacement of a defective CPU, see Diagnostics operating instructions.

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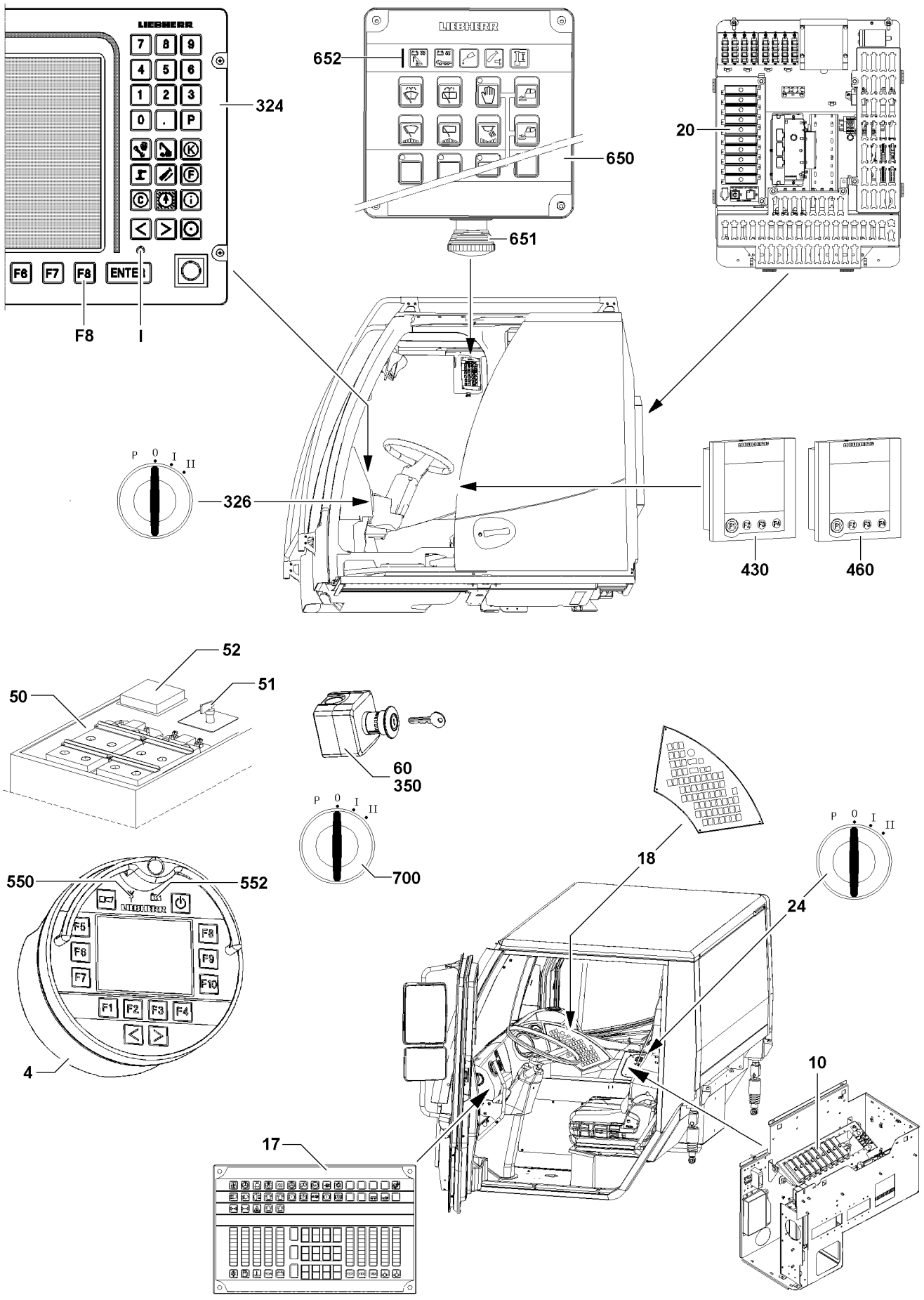

Fig.112958

4.4 Replacing a defective fuse

If a fuse is defective, then it must be replaced.

Make sure that the following prerequisites are met:
- All battery master switches **51** are in position **0**.
- All ignition switches **24/328/700** are in position **0**.
- A spare fuse of the same size and strength is available.

Fuses are located:
- **10** In the fuse box in the driver's cab.
- **20** In the fuse box in the crane operator's cab.
- In the battery box **50** (main fuses **52**)
- Directly on the individual components.

▶ Replace a defective fuse.
▶ Check the function.

Problem remedy
The same fuse fails again?
▶ Continue troubleshooting, contact Liebherr Service if necessary.
▶ Never bypass a defective fuse or replace it with a stronger fuse.

4.5 The LICCON monitor remains dark

If the LICCON monitor **324** does not turn on after turn on:
▶ See section Monitor errors in the Diagnostics operating instructions.

If the problem cannot be remedied:
▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

4.6 The touch display remains dark

If the Touch display **430** or the touch display **460** does not turn on after turning the ignition on:
▶ Check the error messages.

If the problem cannot be remedied:
▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

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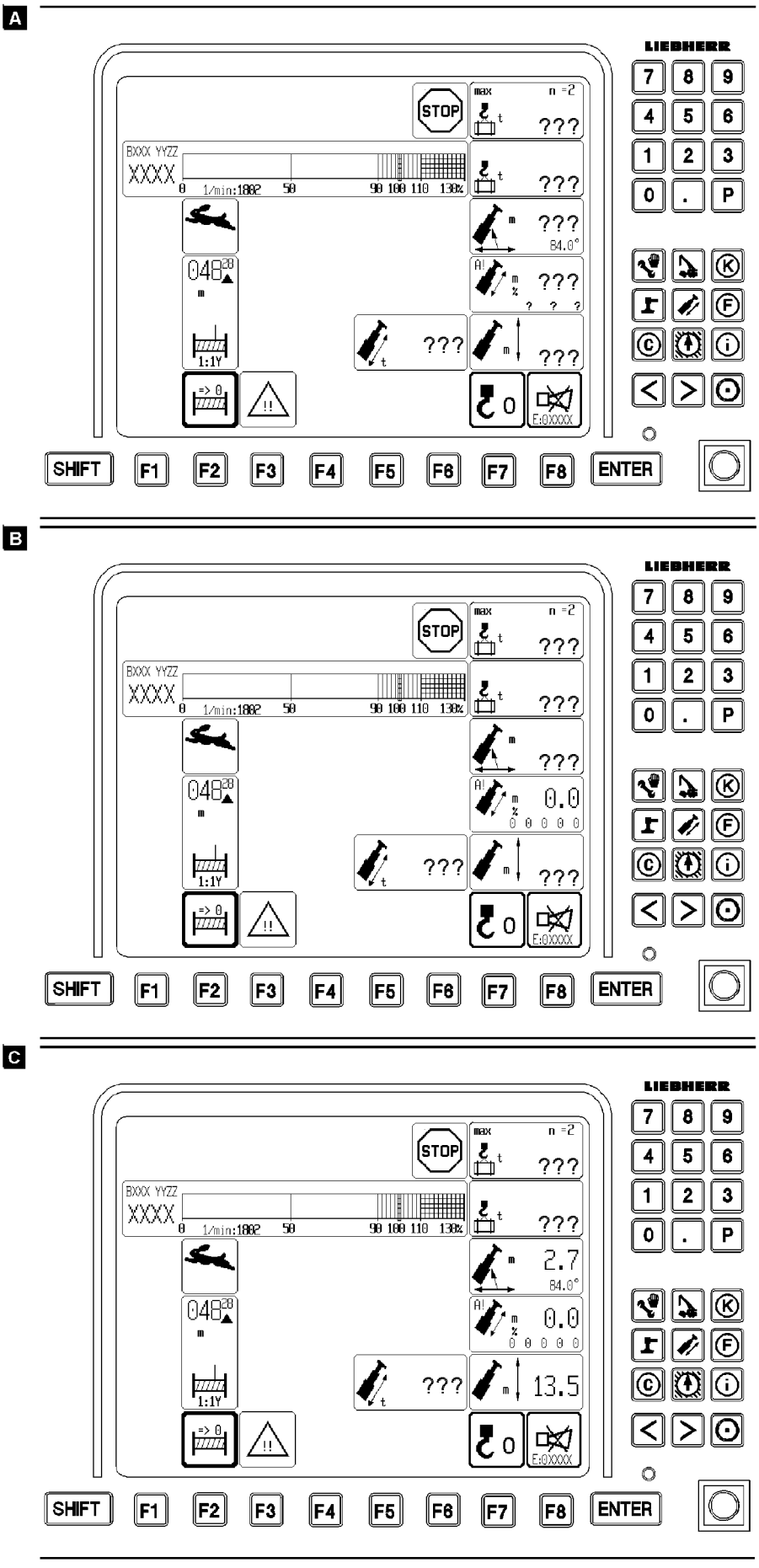

Fig.110964

4.7 Defective sensors

4.7.1 General

Depending on the classification of the sensor, crane operation with defective sensor:
- Can be continued without restriction.
- Can be continued with restriction.
- Can be continued only in LMB emergency operation.

WARNING
Limited warning functions!
If there is a defect on a participating sensor (LMB) and the crane is continued to be operated by by-passing the sensor other otherwise, then the warning functions and the shut offs of the LICCON overload protection are deactivated / limited!
- ▶ If there is a defect on a participating sensor (LMB), then the crane may be operated further only in emergency cases!
- ▶ Fix / replace the sensor before starting crane operation again!

Certain crane functions are also monitored with two sets of sensors.

Defective sensors can occur in the LICCON monitor as follows:
- Length sensor defective, see illustration **A**.
- Angle sensor defective, see illustration **B**.
- Pressure sensor defective, see illustration **C**.

If a defective sensor is shown:

- ▶ Replace / repair the defective sensor.

4.7.2 Defective length sensor

If the length sensor is defective, the crane operating screen is shown in the LICCON monitor as in illustration **A**:
- ▶ Carry out error diagnostics via the test system, see Diagnostics operating instructions.
- ▶ Contact Liebherr Service to determine further procedure.

4.7.3 Defective angle sensor

If the angle sensor is defective, the crane operating screen is shown in the LICCON monitor as in illustration **B**:
- ▶ Carry out error diagnostics via the test system, see Diagnostics operating instructions.
- ▶ Contact Liebherr Service to determine further procedure.

4.7.4 Defective pressure sensor

If the pressure sensor is defective, the crane operating screen is shown in the LICCON monitor as in illustration **C**:
- ▶ Carry out error diagnostics via the test system, see Diagnostics operating instructions.
- ▶ Contact Liebherr Service to determine further procedure.

4.8 Defective limit switch

Depending on the classification of the limit switch, crane operation with defective limit switch:
- Can be continued without restriction.
- Can be continued with restriction.
- Can be continued only in LMB emergency operation.

Certain crane functions are monitored with two sets of limit switches.

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WARNING
Limited warning functions!
If one of the double version limit switches 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!

If a defective limit switch is shown:

▶ Replace / repair the defective limit switch.

4.9 Bypass of overload protection

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.

DANGER
Bypassing the overload protection!
If the overload protection is bypassed, there is no further protection against crane overload!
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 or seriously injured!
This could result in property damage!
▶ The bypass of the overload protection is only permitted in emergency cases!
▶ The bypass may only be carried out by persons who are aware of the effects of their acts regarding the bypass of the overload protection!
▶ Bypassing the overload protection requires the presence of an authorized person and must be performed with utmost caution!
▶ Missing values must be monitored manually and must match the load chart.
▶ Crane operation with bypassed overload protection is prohibited!

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!
▶ Only carry out crane movements within the range of the load chart as well as the erection / take down charts!

As a rule, all specifications in the load chart must be adhered to strictly:
– The exact weight of the load, including load suspension equipment, must be known.
– The boom status and the boom geometry must be known.
– The boom length and boom radius must be measured manually.
– It must be ensured that the telescopic boom has been pinned accordingly (telescopic boom system Telematic).
– All values must match the values in the respective load chart.

4.9.1 Bypass of overload protection: Failure of the overload protection

Note
▶ Does **not** apply for cranes with CE-mark and configuration according to EN 13000:2010!
▶ For description of set up button **D**, see Crane operating instructions, chapter 4.02!

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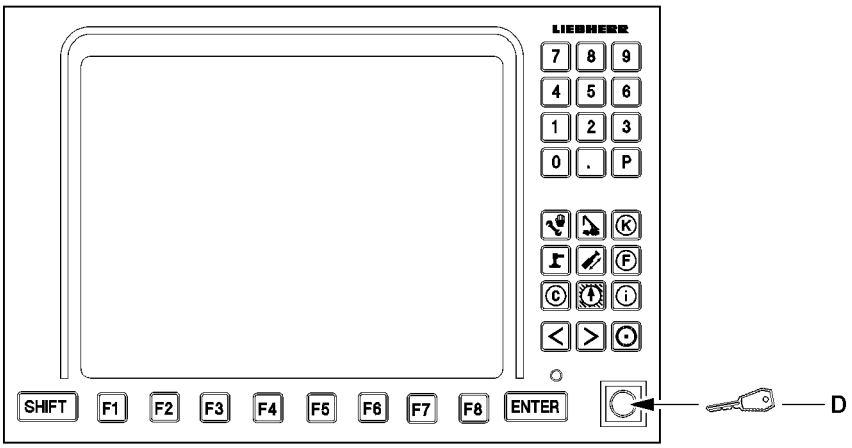

Fig.112955

▶ Press the set up button **D**:

Result:

– The overload protection is bypassed.
– The crane is emergency operation.

To turn the bypass of overload protection off:

▶ Press the set up button **D** again.

Result:

– The bypass of the overload protection is turned off.

4.9.2 Bypass of overload protection: Failure of overload protection (according to EN 13000:2010)

Note

▶ Applies **only** apply for cranes configuration according to EN 13000:2010!
▶ For location and detailed description of the bypass device outside the crane operator's cab, see Crane operating instructions, chapter 4.01 and chapter 4.02.

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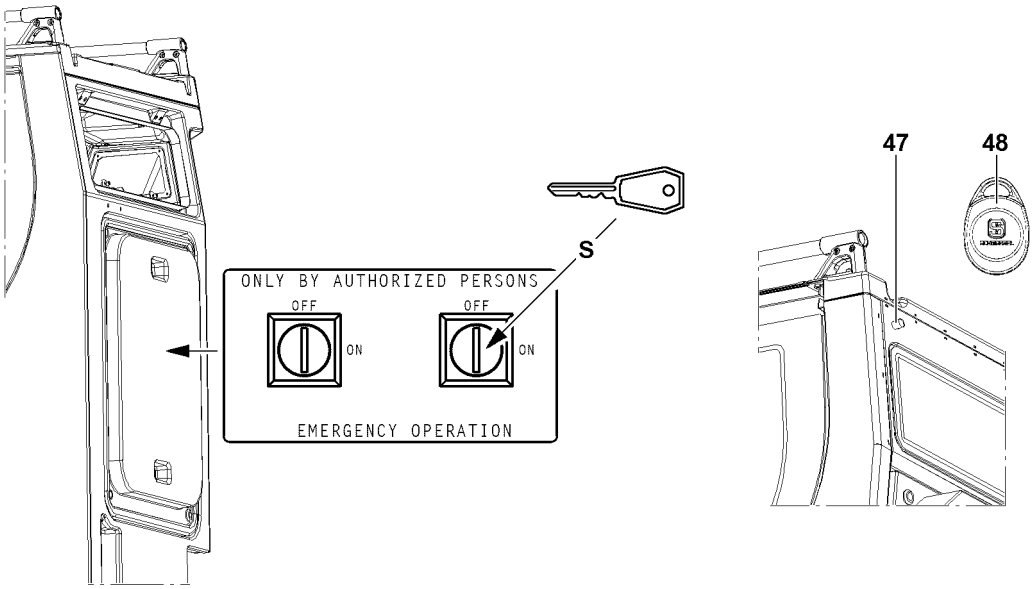

Fig.112961

The bypass of the overload protection can be carried out with the restriction, that:
- The bypass is automatically reset when the engine is turned off.
- 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 %.

The bypass is made, depending on crane type, either:
- With the respective key switch **S**
  or
- via the sensor **47** through the transponder **48**.

Note
Actuation of sensor **47**.
- ▶ To actuate the sensor **47**, the transponder **48** must be placed momentarily and then removed again.
- ▶ If the transponder **48** remains too long or permanently on the sensor **47**, then the **bypass is not active** and an error message is issued.

▶ Actuate the key switch **S**.
or
Actuate the sensor **47** through the transponder **48**.

Result:

- The overload protection is bypassed.
- The crane is emergency operation.

To turn the bypass of overload protection off:

▶ Actuate the key switch **S** again.
or
Actuate the sensor **47** through the transponder **48** again.

Result:

- The bypass of the overload protection is turned off.

4.10 Ending the load lift to avert emergency situations

When the crane movements must be carried out manually (for example with the optional „Hydraulic emergency control*****“.

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WARNING
Crane operation without overload protection!
If the LICCON overload protection 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 protection, 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 only permissible in emergency cases!
- ▶ Crane operation without overload protection may only be carried out by persons who know the effects of their actions regarding crane operation without overload protection!
- ▶ Crane operation without overload protection requires the presence of an authorized person and must be performed with utmost caution!
- ▶ Missing values must be monitored manually and must match the load chart.
- ▶ Do not take up regular crane operation again until the overload protection is functioning again!

Ending the load lift to avert emergency situations:

- Before continuing the load lift, contact the nearest Liebherr Service center or the Liebherr-Werk in Ehingen.

If this is not possible, then the load lift can be completed with utmost caution, as follows:

- All values that are needed for the exact determination of the equipment configuration and the associated load chart must be measured or manually determined.

As a rule, all specifications in the load chart must be adhered to strictly:

- The exact weight of the load, including load suspension equipment, must be known.
- The boom status and the boom geometry must be known.
- The boom length and boom radius must be measured manually.
- It must be ensured that the telescopic boom has been pinned accordingly (Telescopic boom system Telematic).
- All values must match the values in the respective load chart.

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8 Inspections of cranes

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Fig.195219

1 General

This crane was tested at the manufacturer's facilities prior to shipment in accordance with the valid ISO, FEM and DIN Standards and BGV D6 (BGG 905).

The safety level achieved during initial commissioning 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.

The crane operator is therefore obligated to have the crane inspected by an **expert**, at intervals depending on the operational conditions but at least once per year, from the first day of vehicle registration.

The crane must be inspected by an **authorized inspector** every four years after it has been licensed.

The crane must be annually inspected by an **authorized inspector** after its twelfth year of operation.

To ensure the high safety standard of the crane, we recommend - 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 **authorized inspector**. 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.

WARNING
There is a risk 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 authorized inspector before placing it back into service!

In addition, all respective local and national regulations also apply.

Expert: Is a person whose technical training and experience means that he has adequate knowledge in the field of inspecting technical equipment. They must be familiar with regulations on safety at work, as well as guidelines and standards that allow them to assess the safe condition of technical equipment (e.g. cranes). Potential experts are workshop staff and customer service engineers.

Note
▶ Experts are not authorized inspectors!

Authorized inspector: Is a person whose technical training and experience means that he has explicit knowledge in the field of inspecting technical equipment. They must be familiar with regulations on safety at work, as well as guidelines and standards that allow them to assess the safe condition of technical equipment (e.g. cranes). They are responsible for testing technical equipment and giving an expert opinion. Authorized inspectors can be active engineers.

Note
▶ Authorized inspectors are recognized experts who have received special training!

Periodic inspection are principally a visual inspection, where the inspector (either type) appraises the condition of the crane and its components.

The purpose of the inspections is to avoid accidents by detecting deficiencies early on. Any deficiencies determined by the expert / authorized 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 / experts take sole responsibility for the crane inspections that they carry out.

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Note

▶ The inspection may not be solely limited to the following positions shown in the sample construction 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 Inspection of carrying 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 expert or authorized inspector 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 expert or an authorized inspector 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.

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.

During an electrolyte process, such as corrosion in combination with water, an atomic hydrogen is created, which causes 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 13000:2010.

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Liebherr mobile and crawler cranes are designed for assembly operation and - according to EN 13000:2010, chapter 4.1.2.1 - they can only take on a limited number of work cycles (N = 32000) when grouping them into collective class Q_1 = light (k_p = 0.125).

Example of a load collective according to grouping in collective class Q_1 = light (k_p = 0.125).

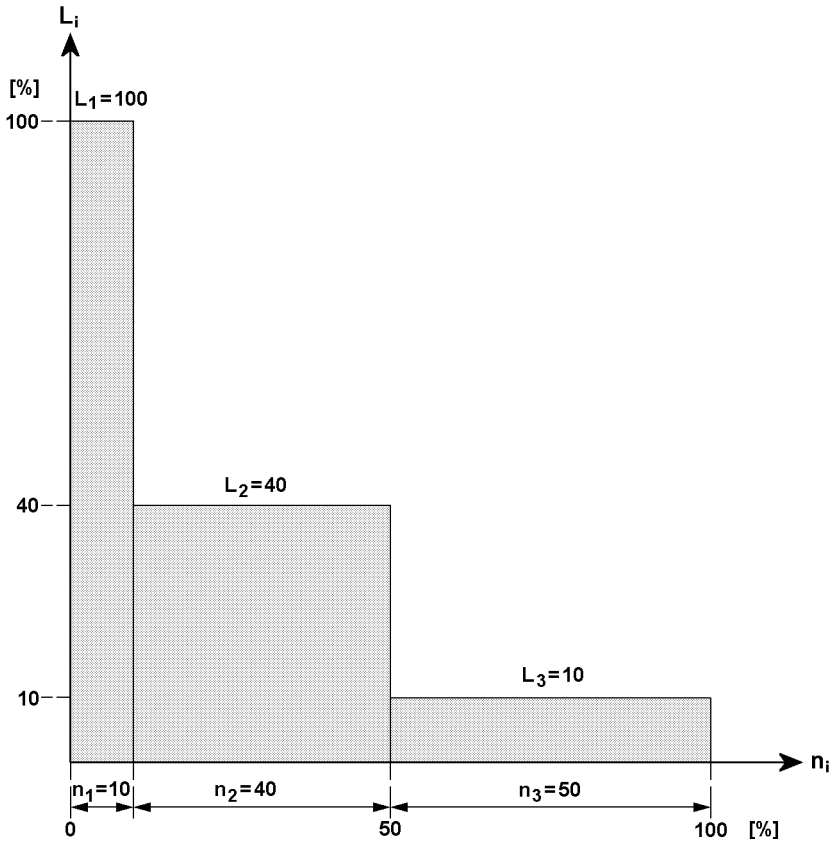

Fig.104716

L_i: Load proportion in relation to maximum load [%]

n_i: Load cycles in relation to maximum number [%]

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 an visual intensive inspection by the 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.

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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 authorized inspector according to standard welding technology rules. The authorized inspector must immediately ascertain if the crane can continue to be safely operated until a repair welding.

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 Example for test points

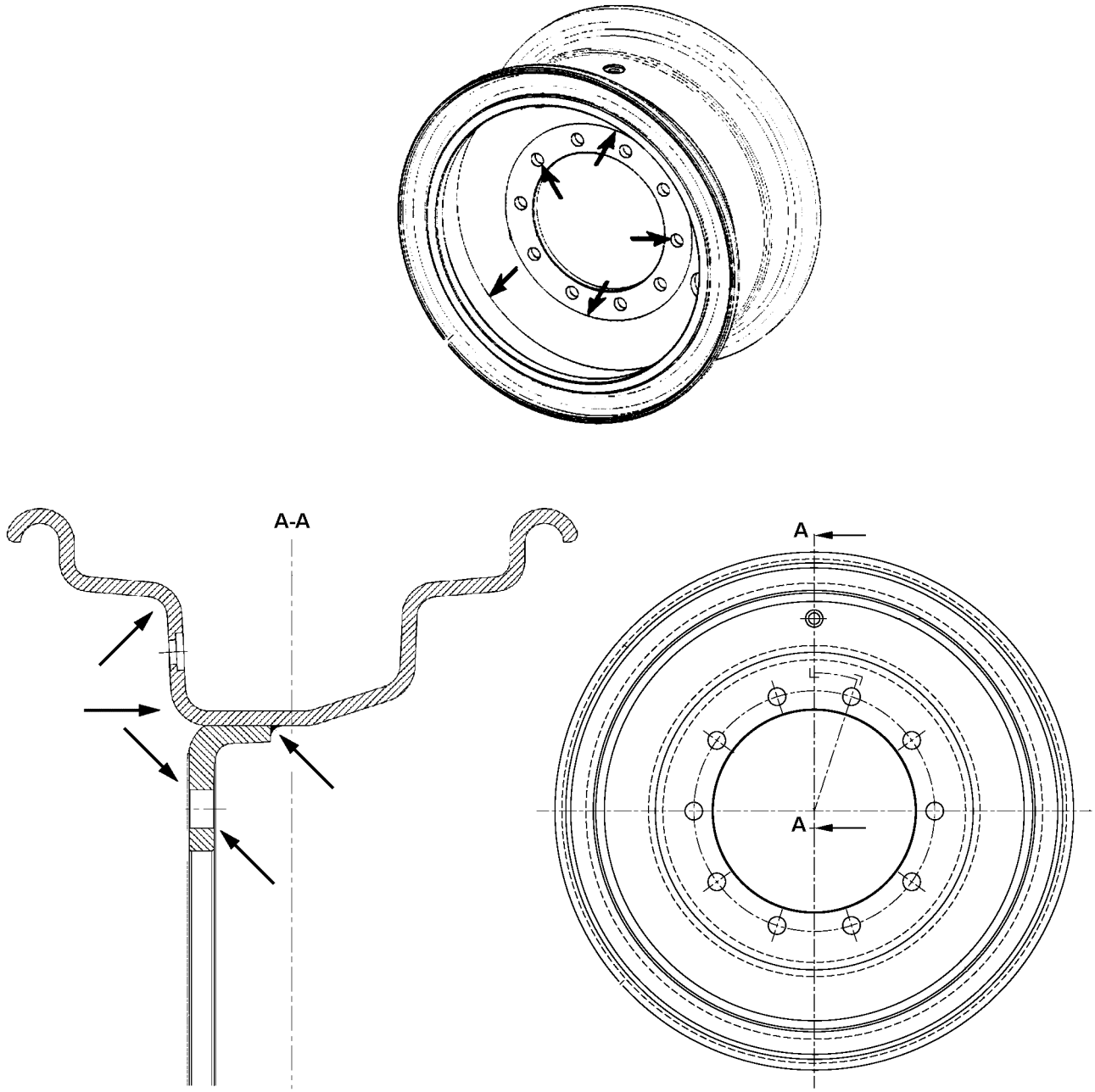

Fig.118052: Example for 1-part disk wheel

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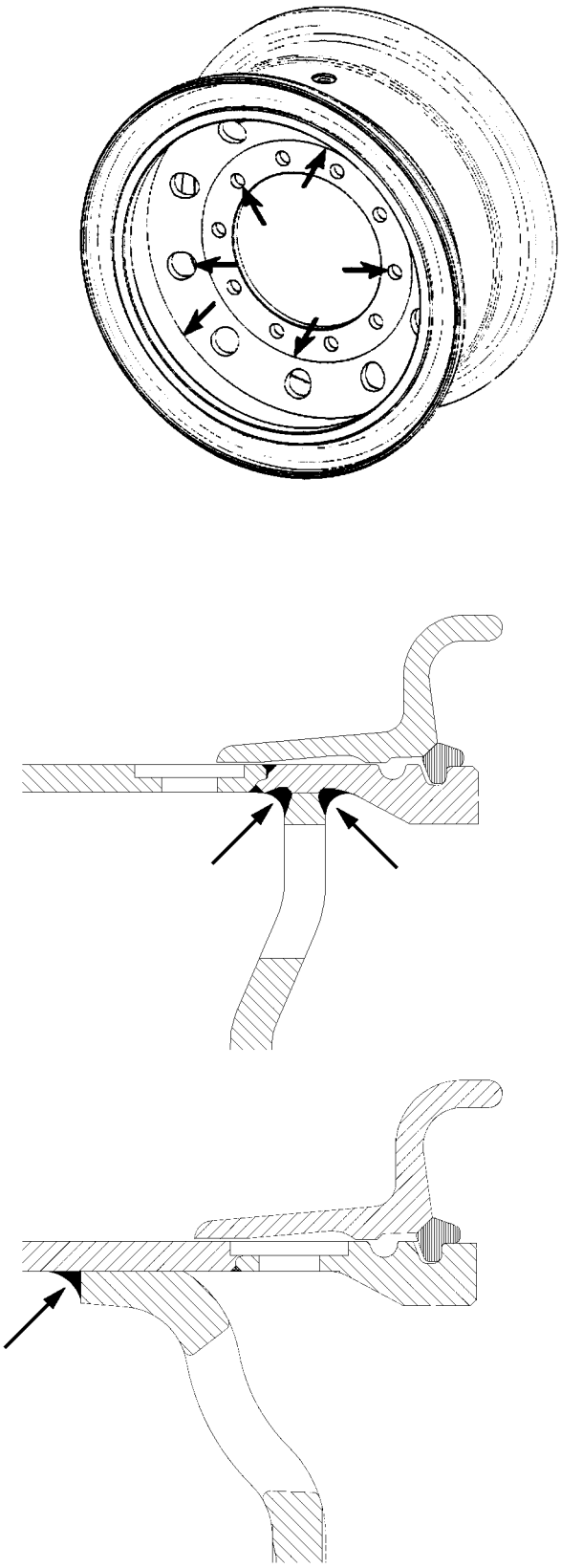

Fig.118053: Example for 3-part disk wheel

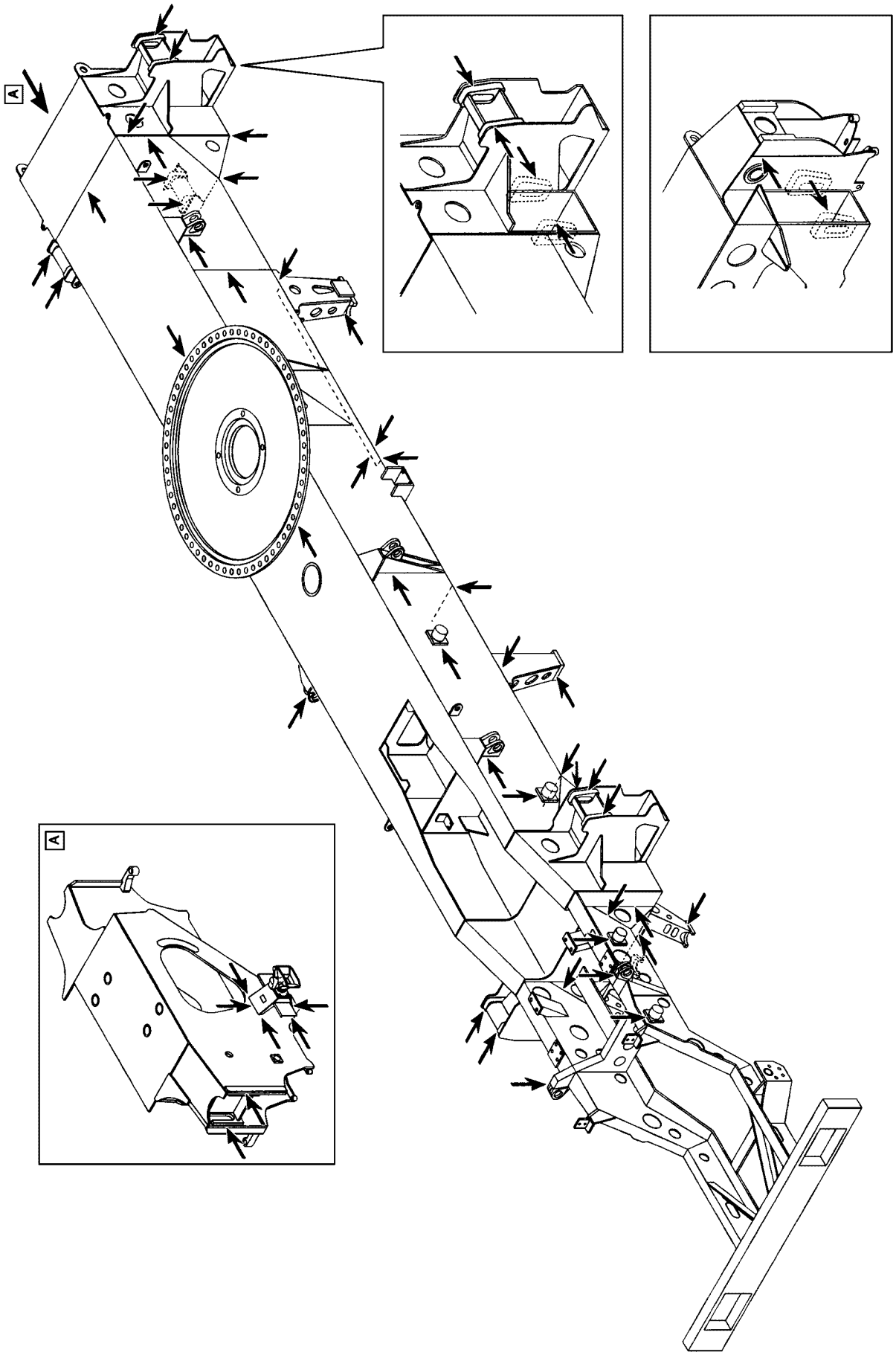

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Fig.185046: Example for vehicle frames

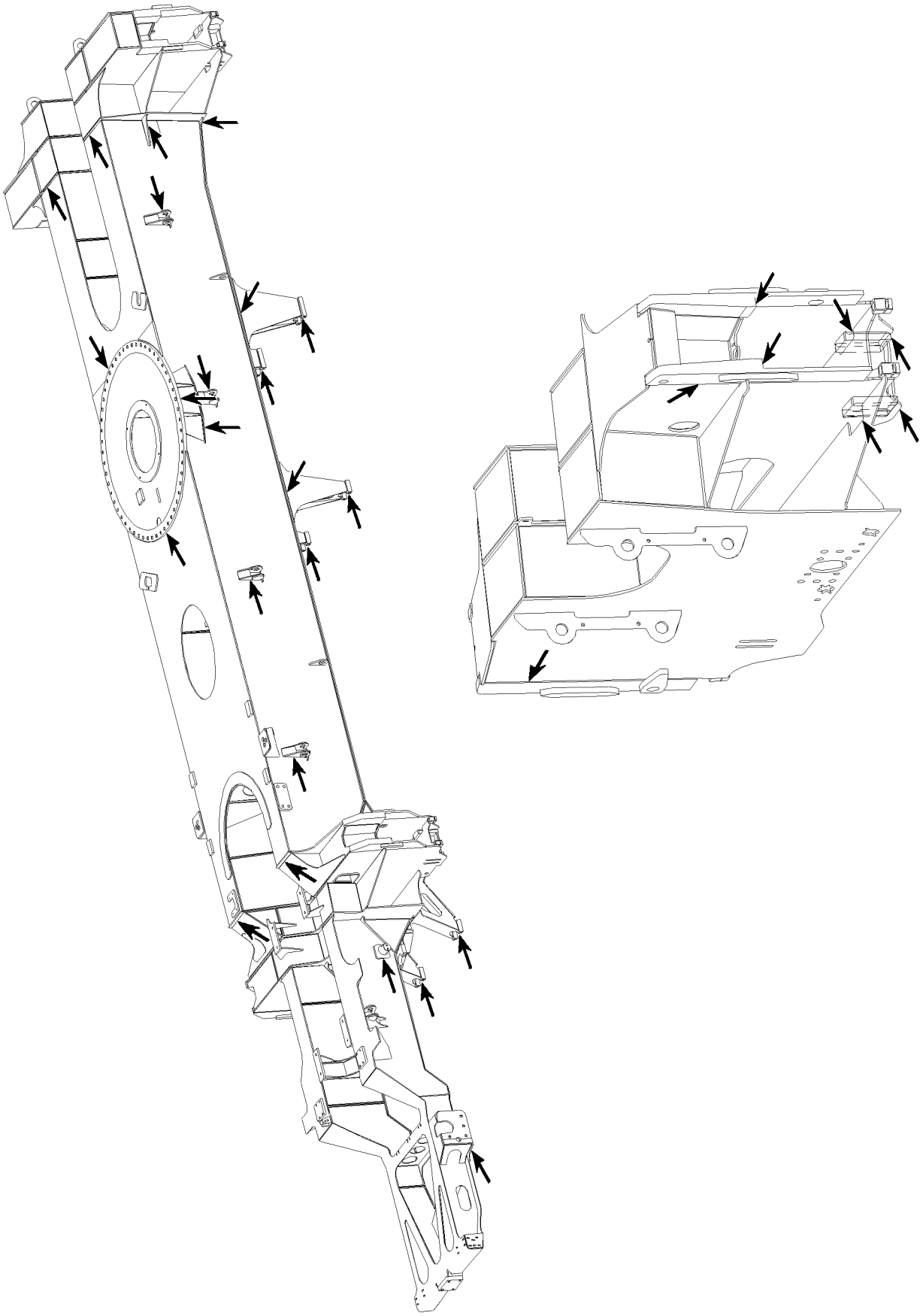

Fig.105702: Example for vehicle frames

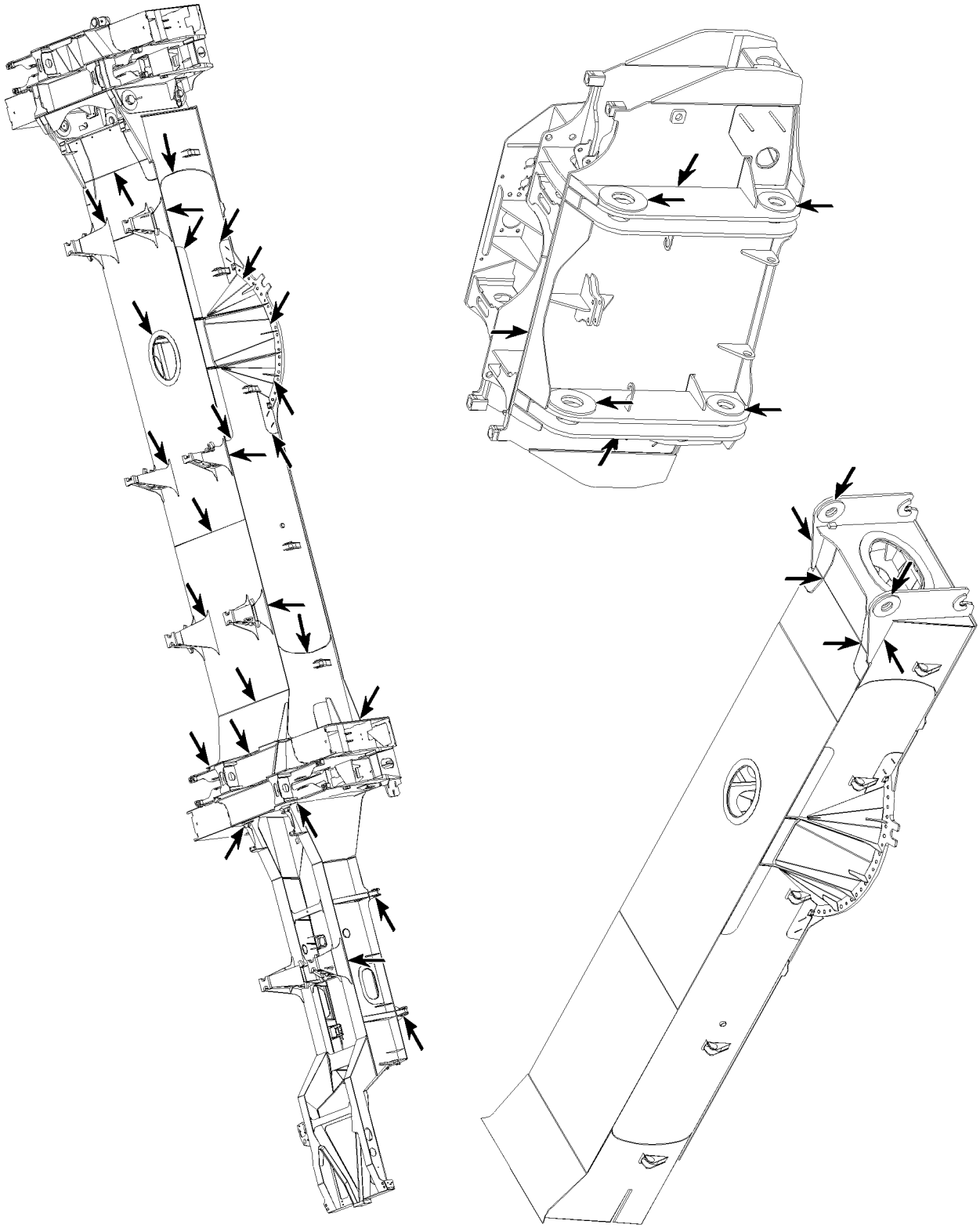

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Fig.105719: Example for vehicle frames

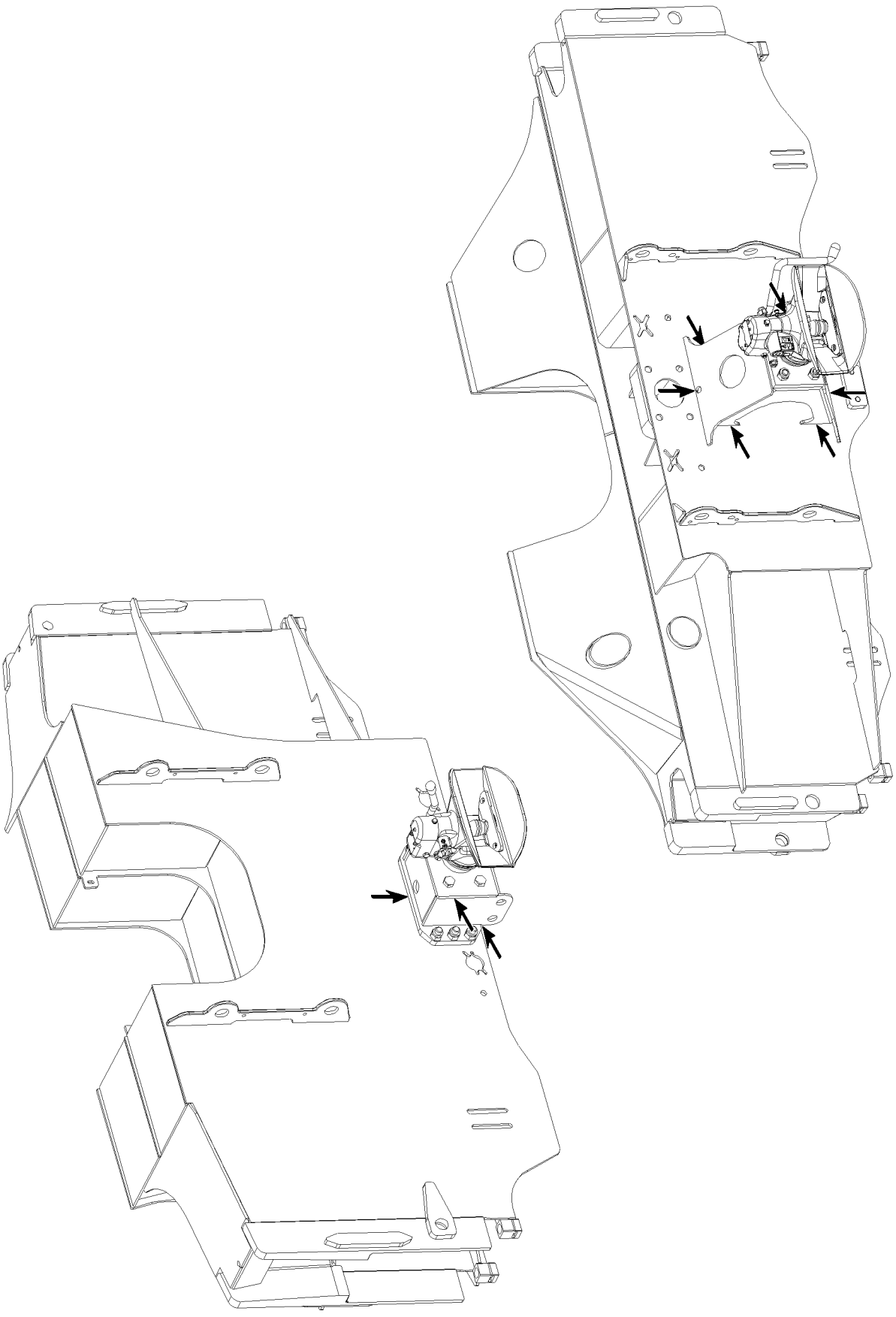

Fig.105687: Example for tow coupling

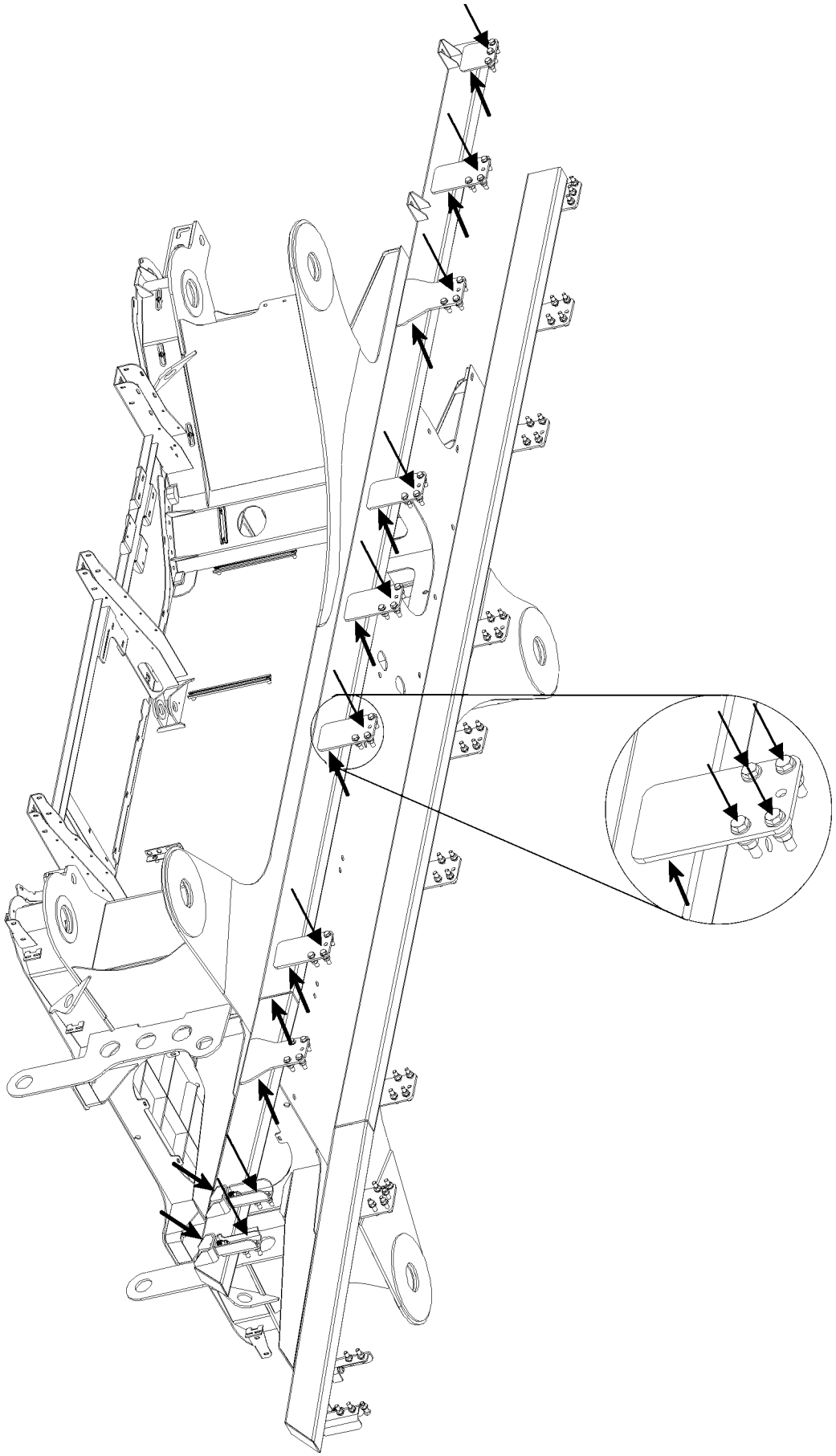

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Fig.113940: Example for intermediate frame

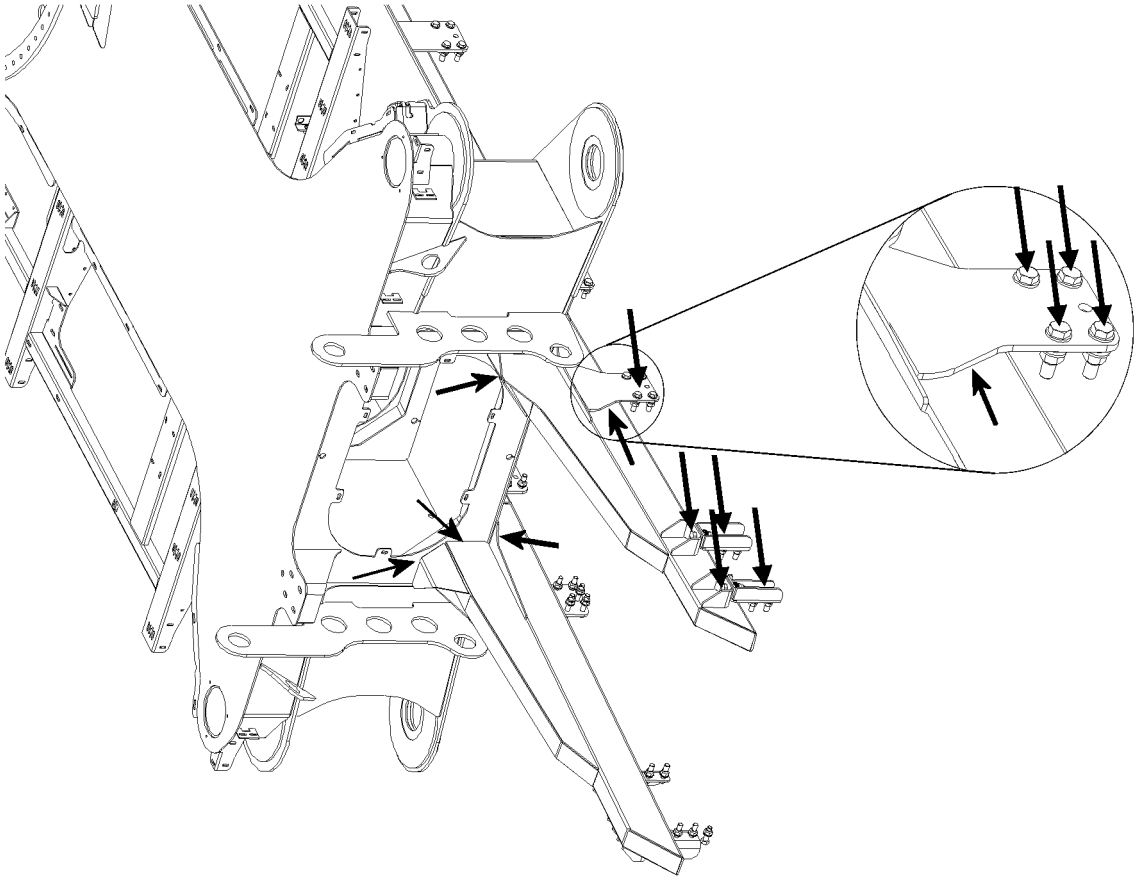

Fig.114000: Example for intermediate frame

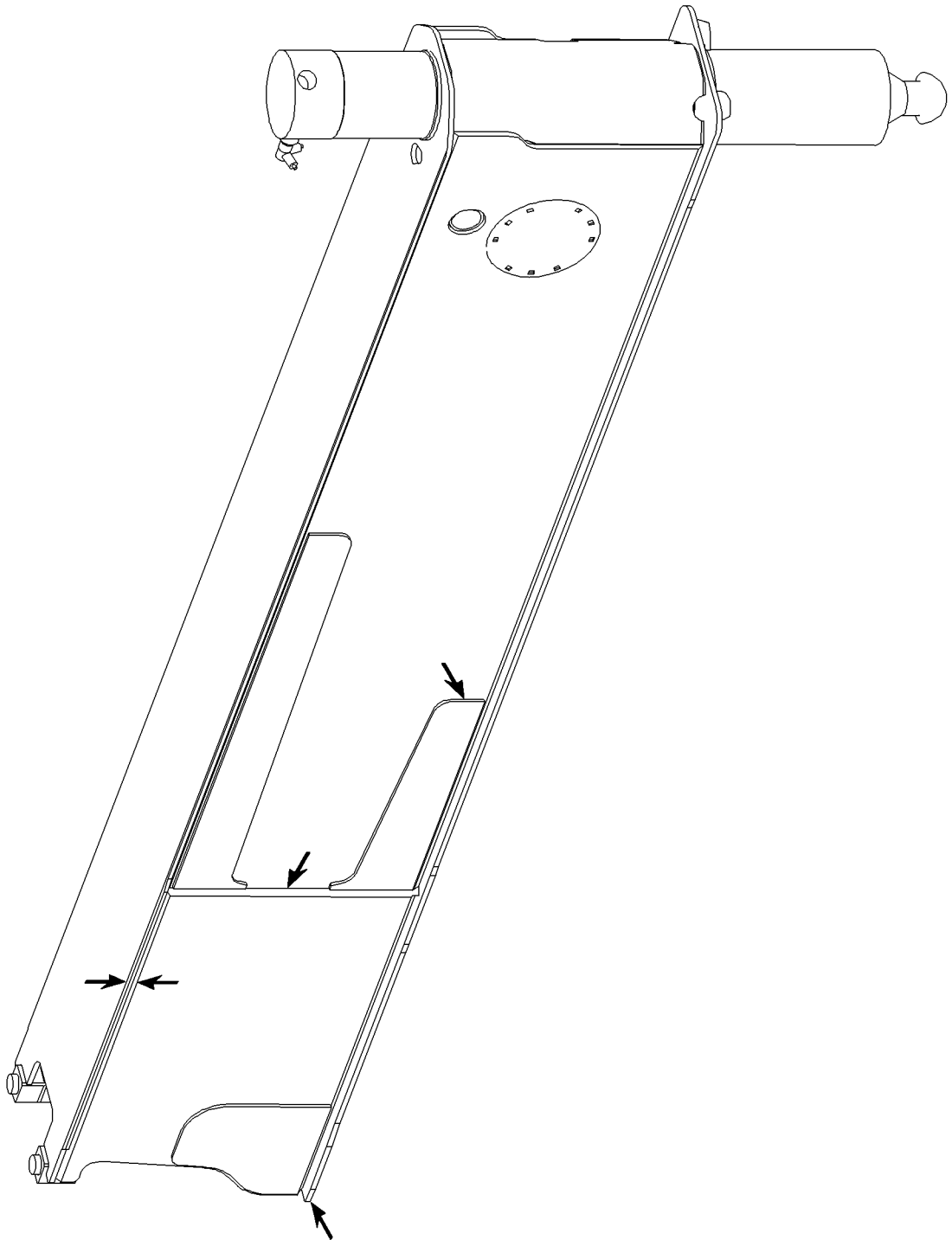

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Fig.105698: Example for sliding beam

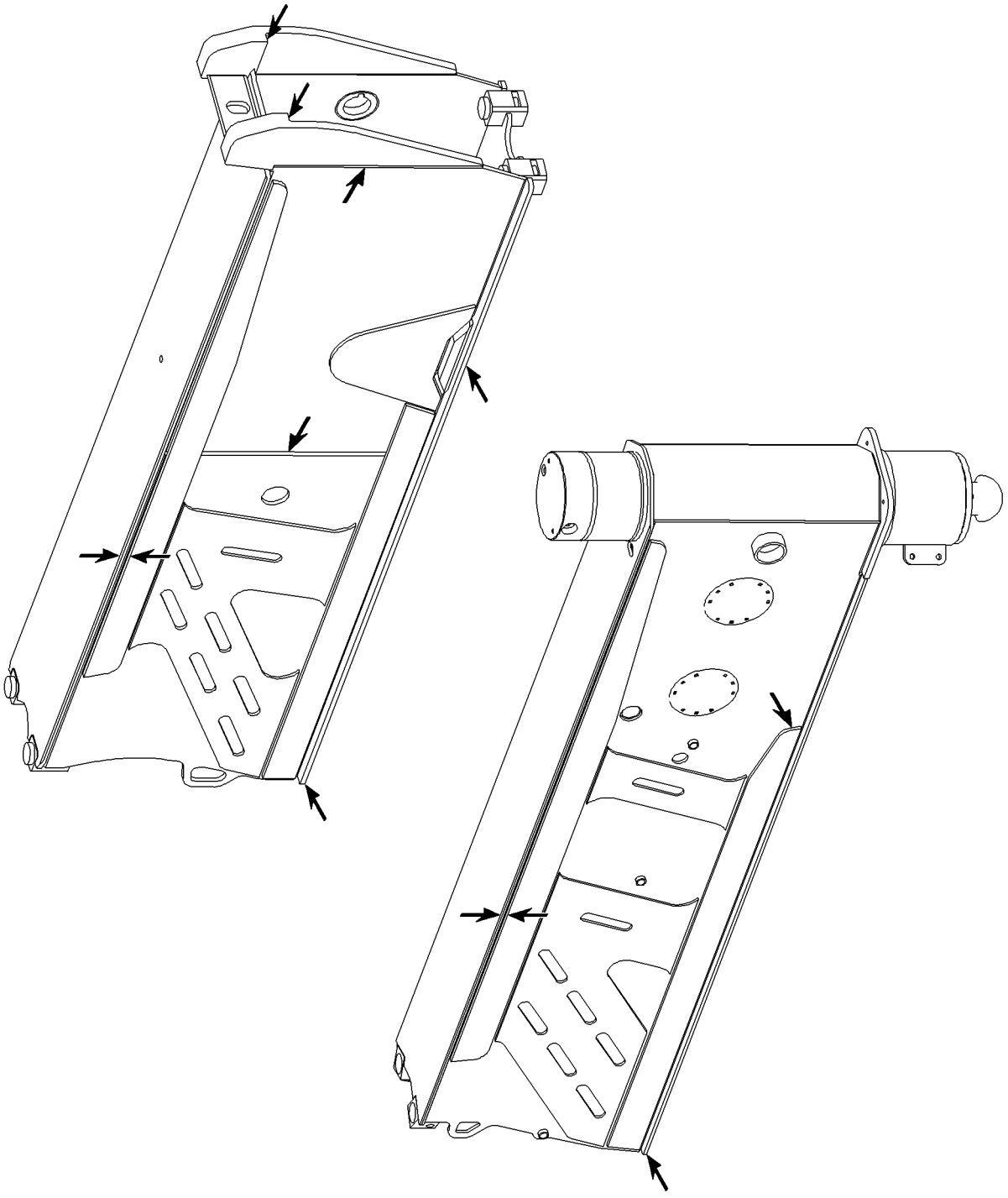

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Fig.105717: Example for sliding beam

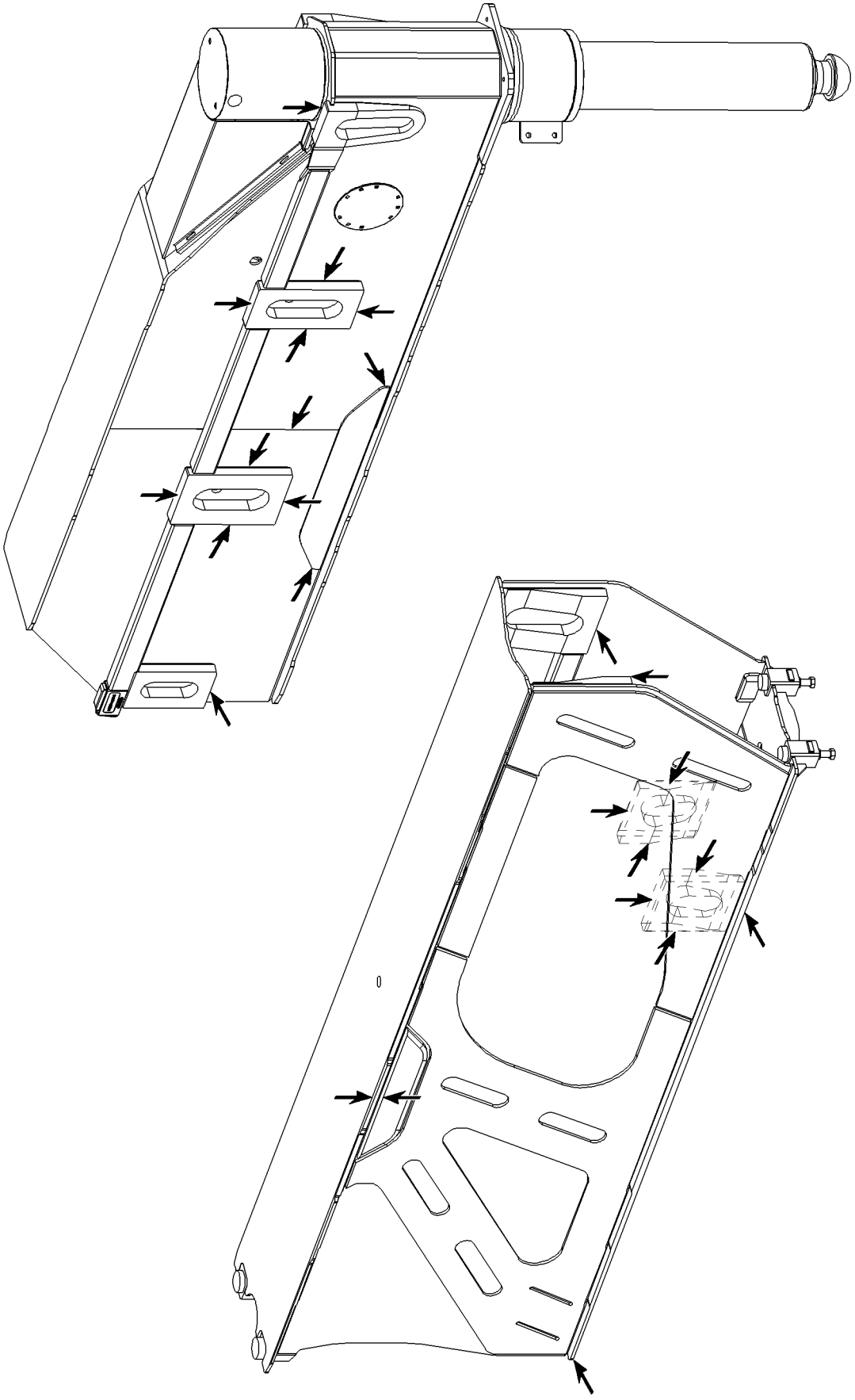

Fig.105718: Example for sliding beam

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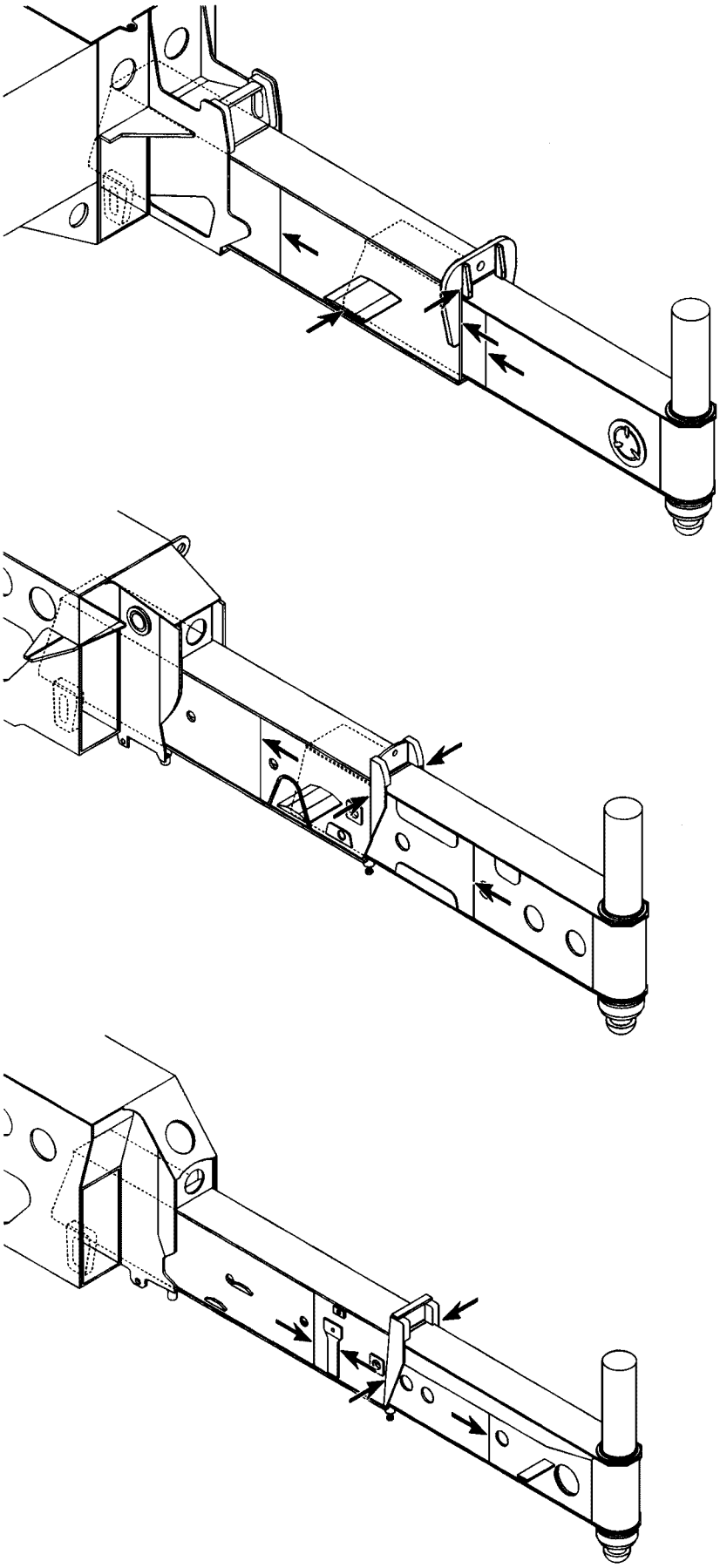

Fig.185047: Example for sliding beam

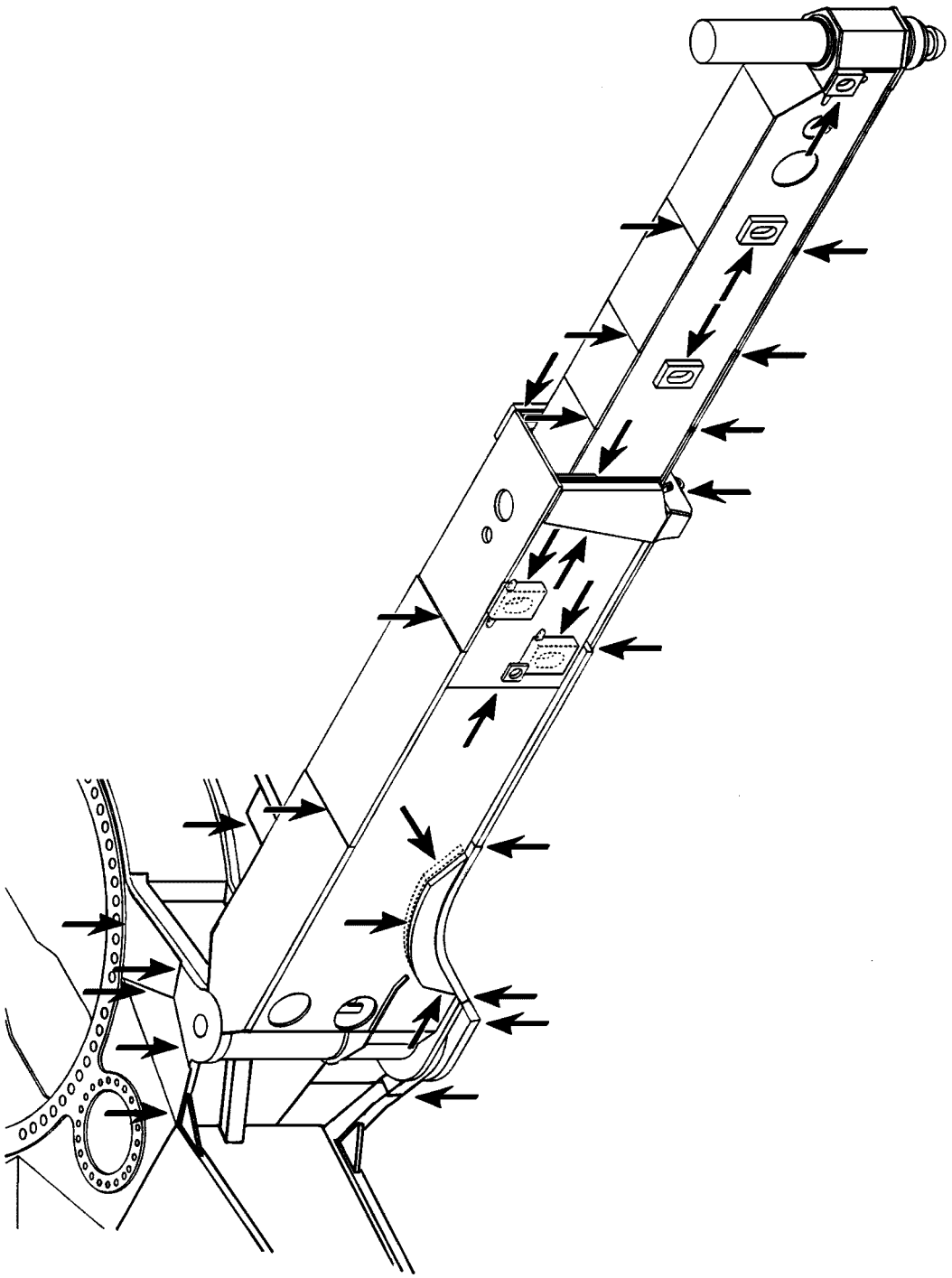

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Fig.185060: Example for swingable sliding beam

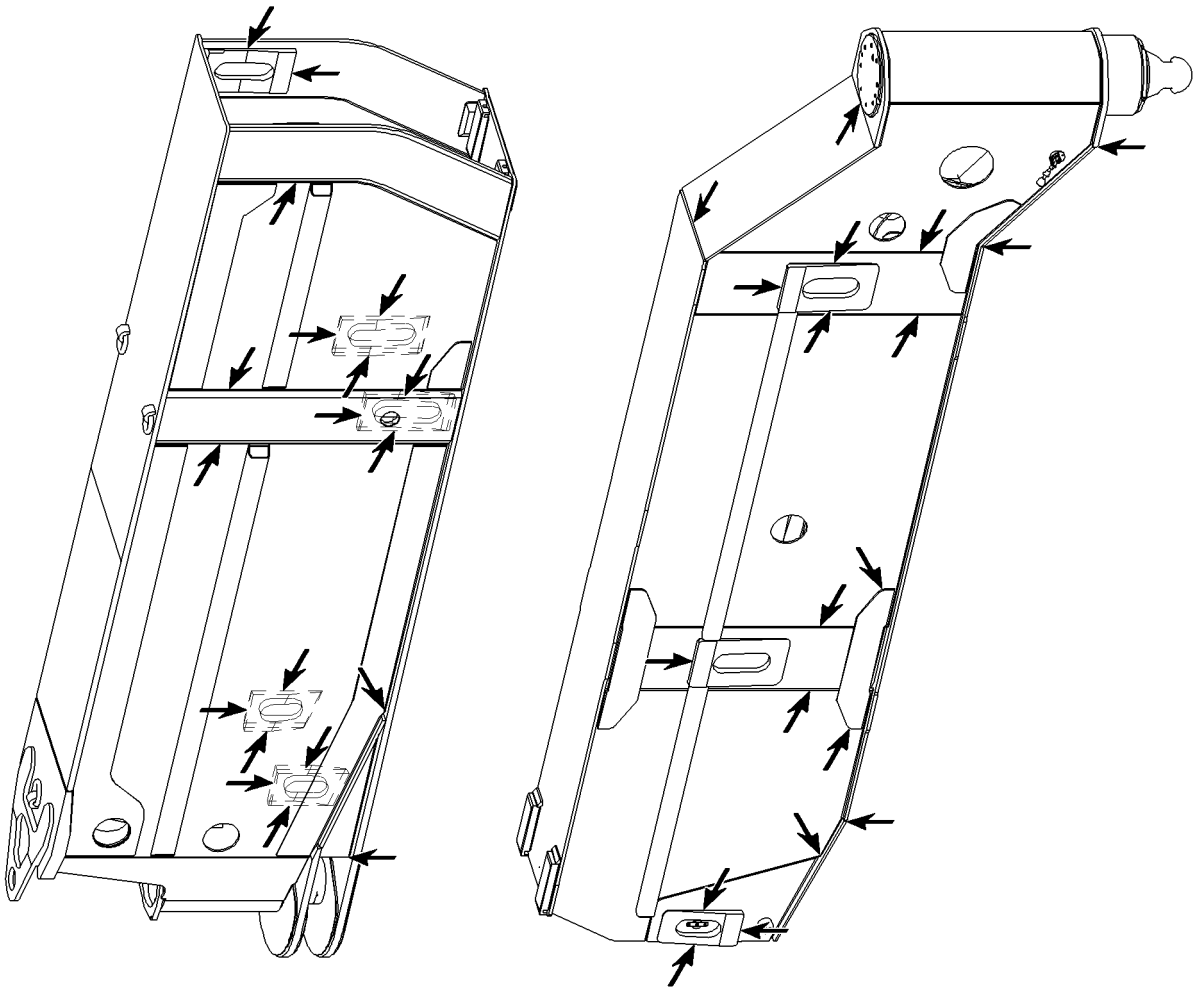

Fig.105690: Example for swingable sliding beam

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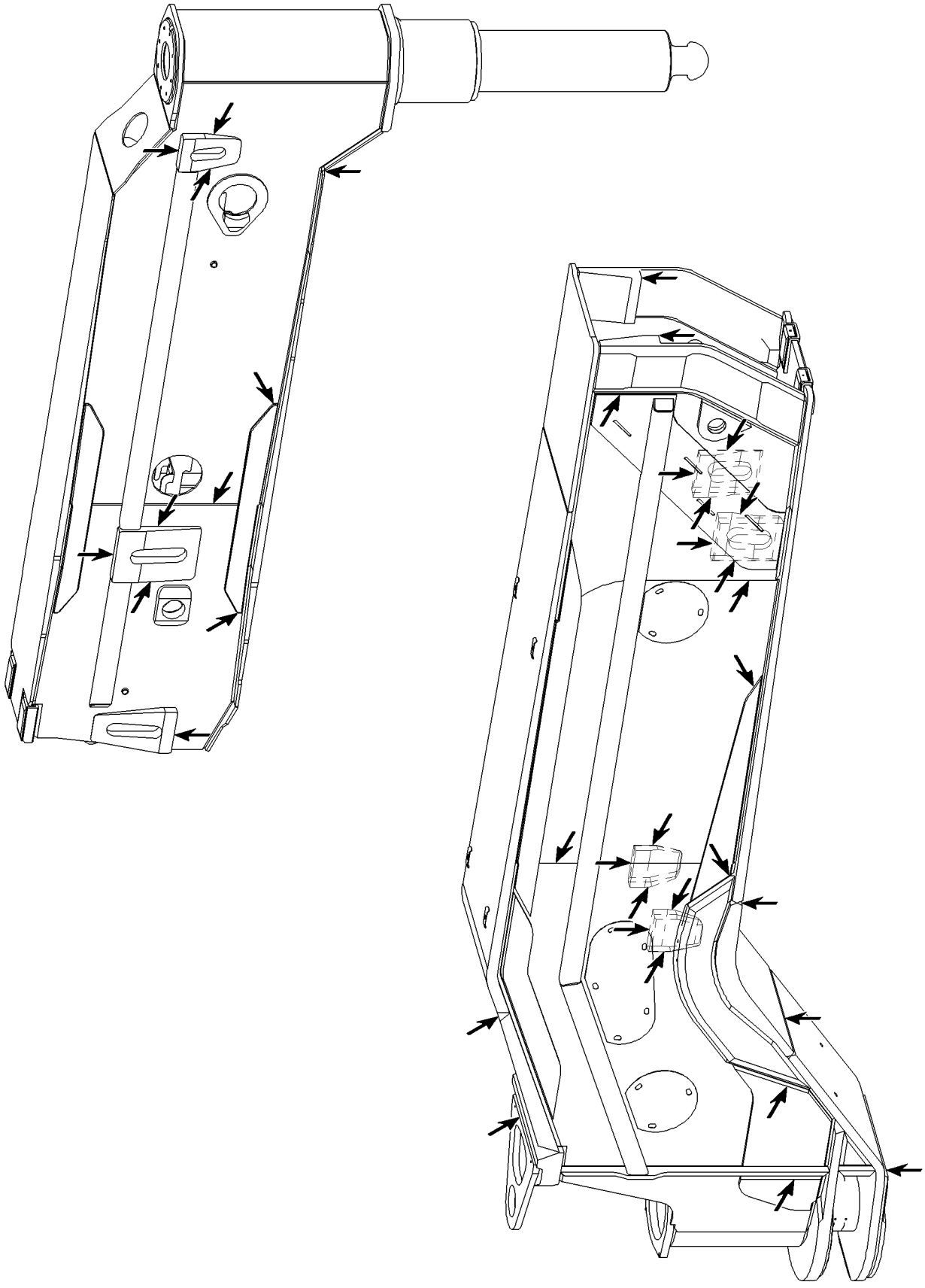

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Fig.105704: Example for swingable sliding beam

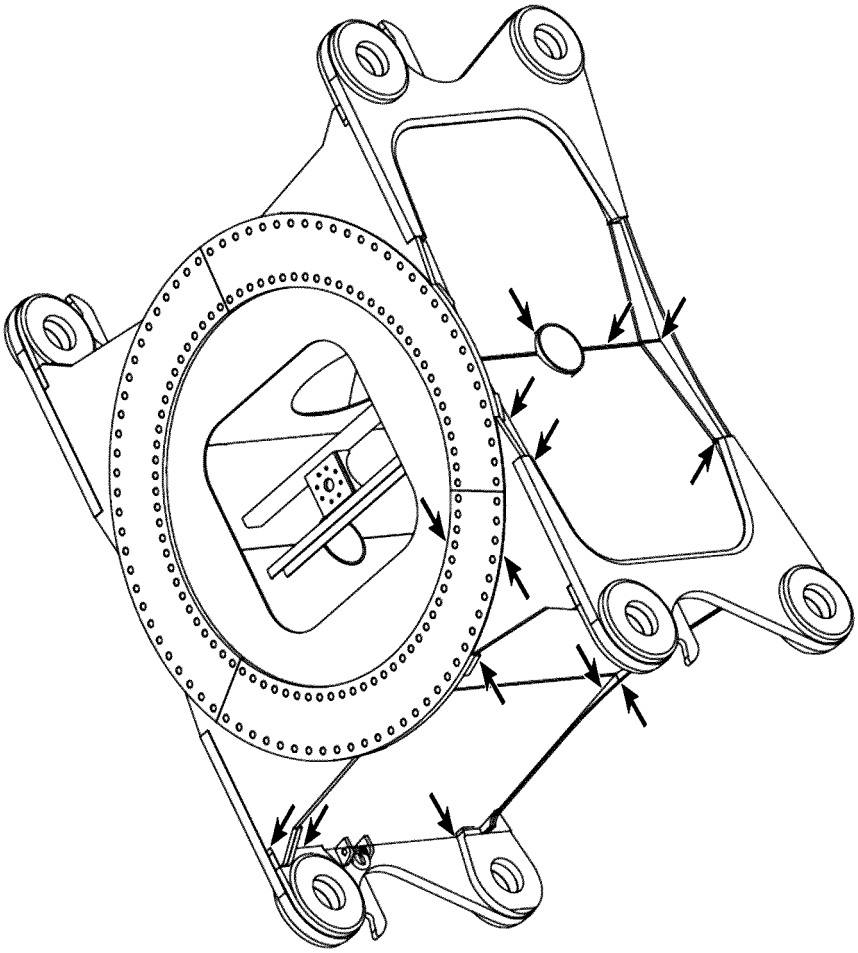

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Fig.105725: Example for crawler center section

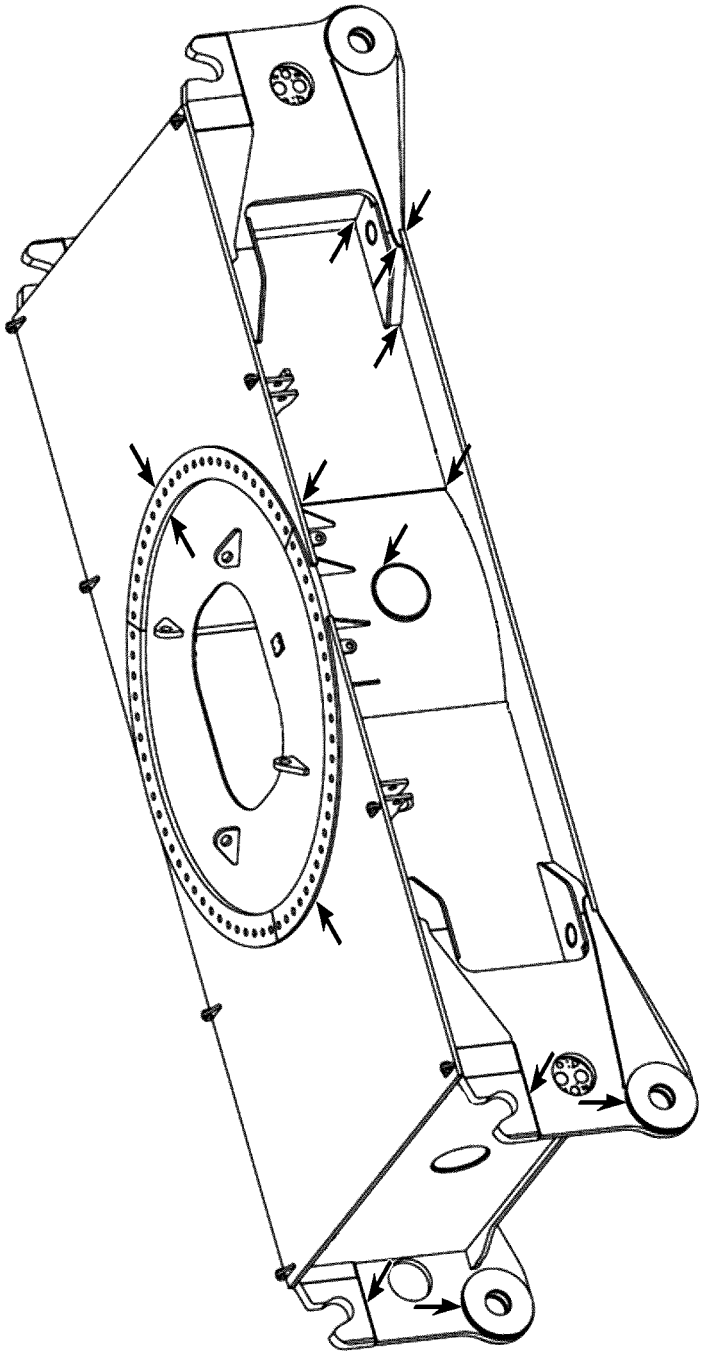

Fig.105726: Example for crawler center section

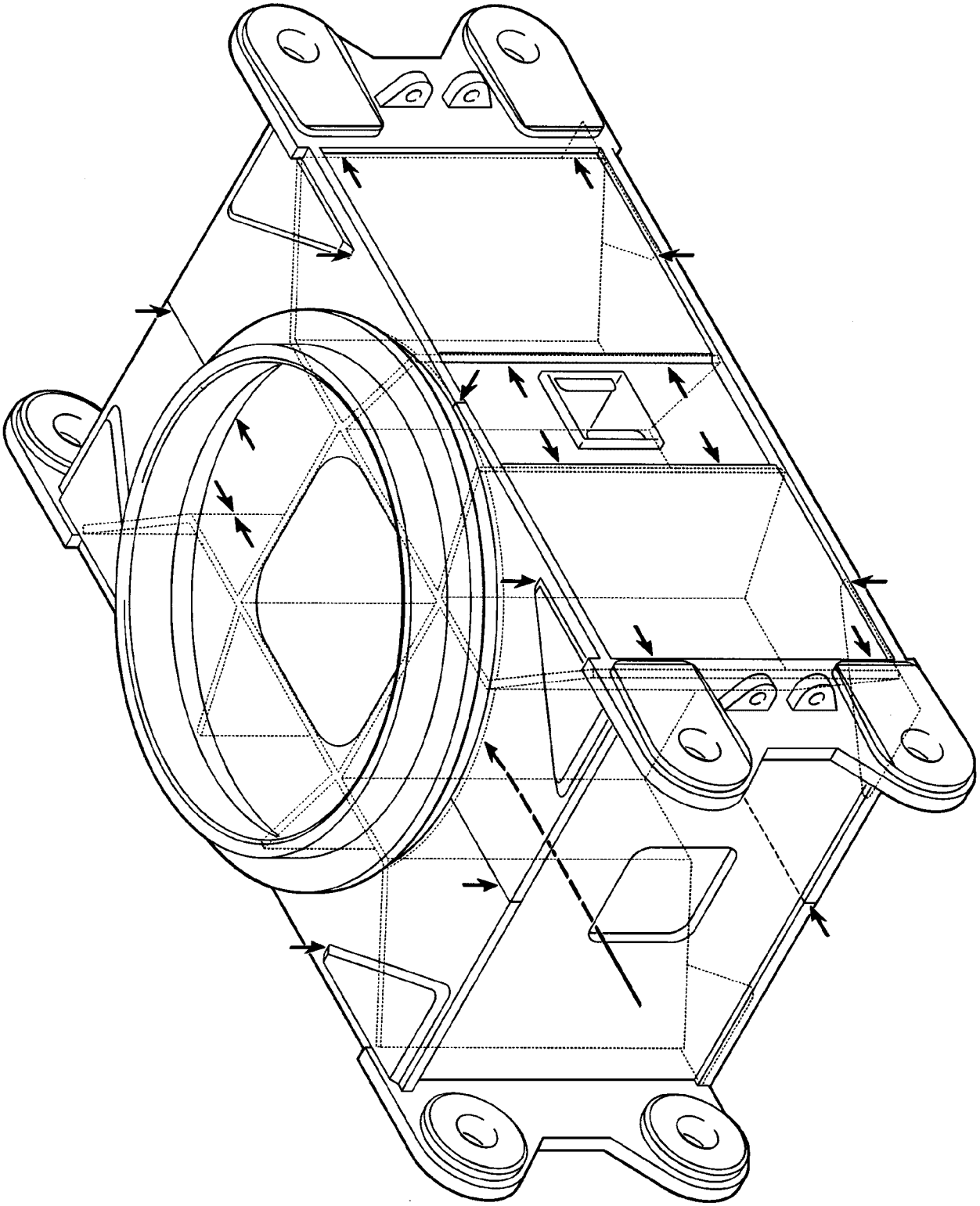

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Fig.187347: Example for crawler center section

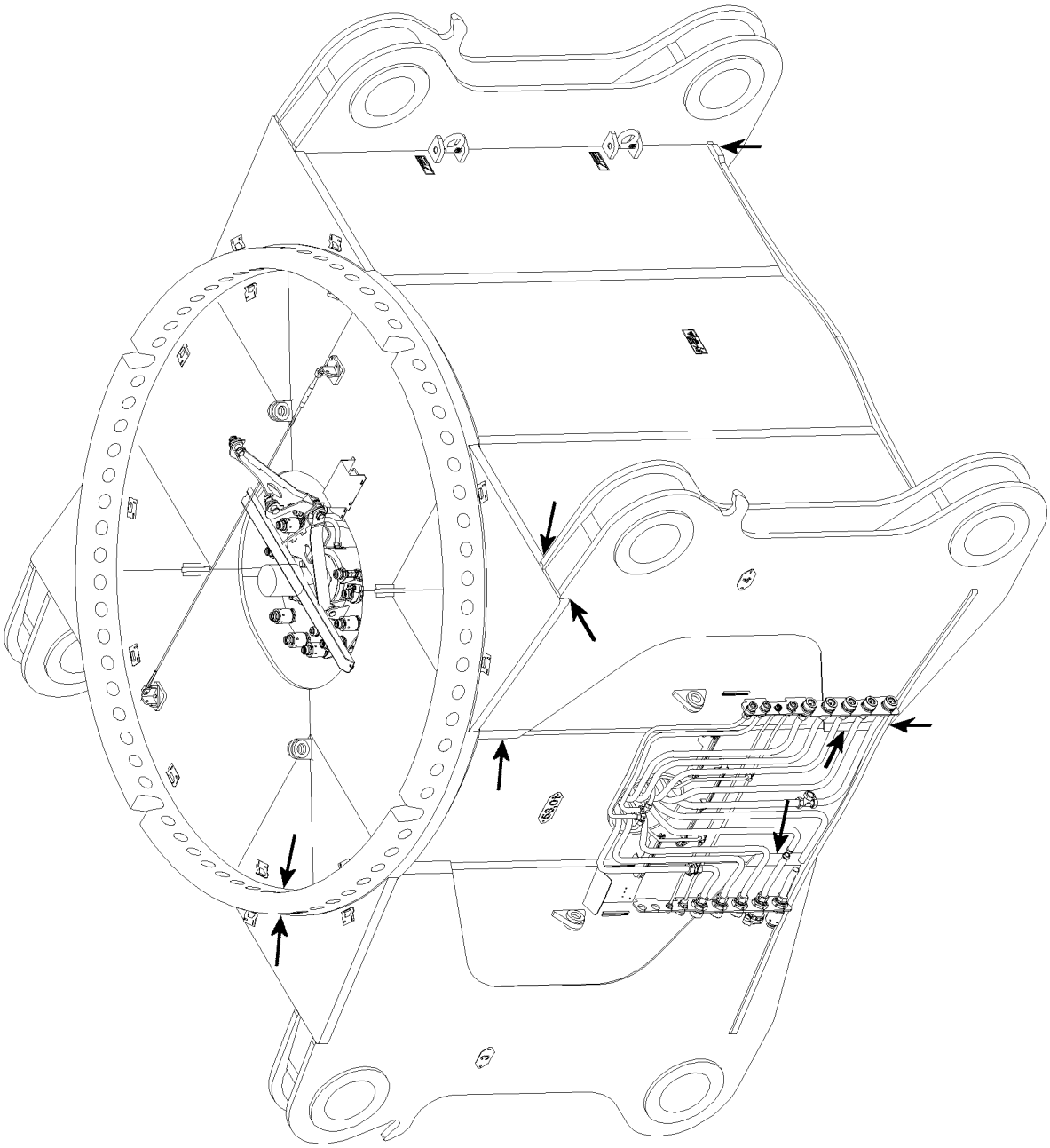

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Fig.115920: Example for crawler center section

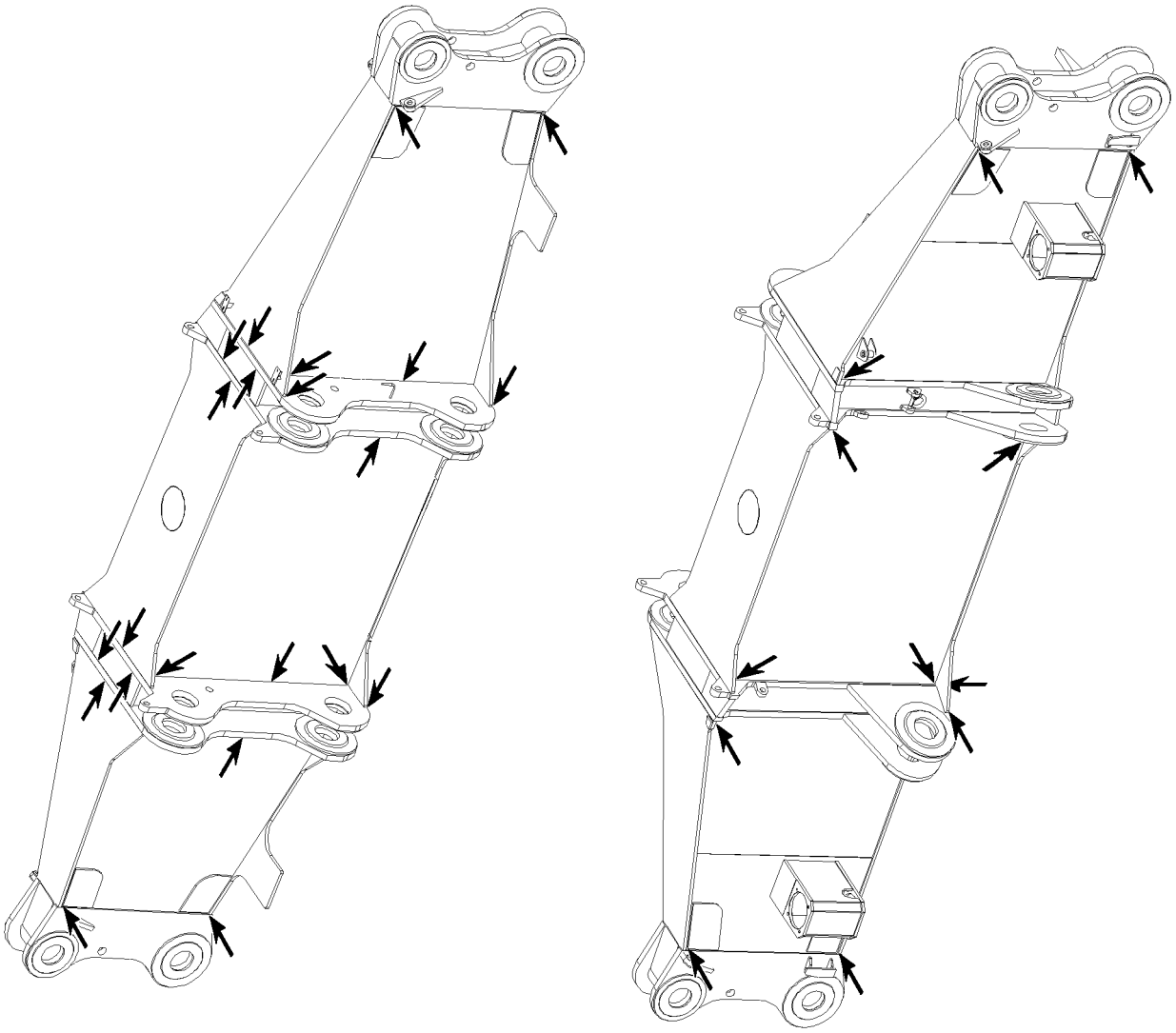

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Fig.105727: Example for cross carrier

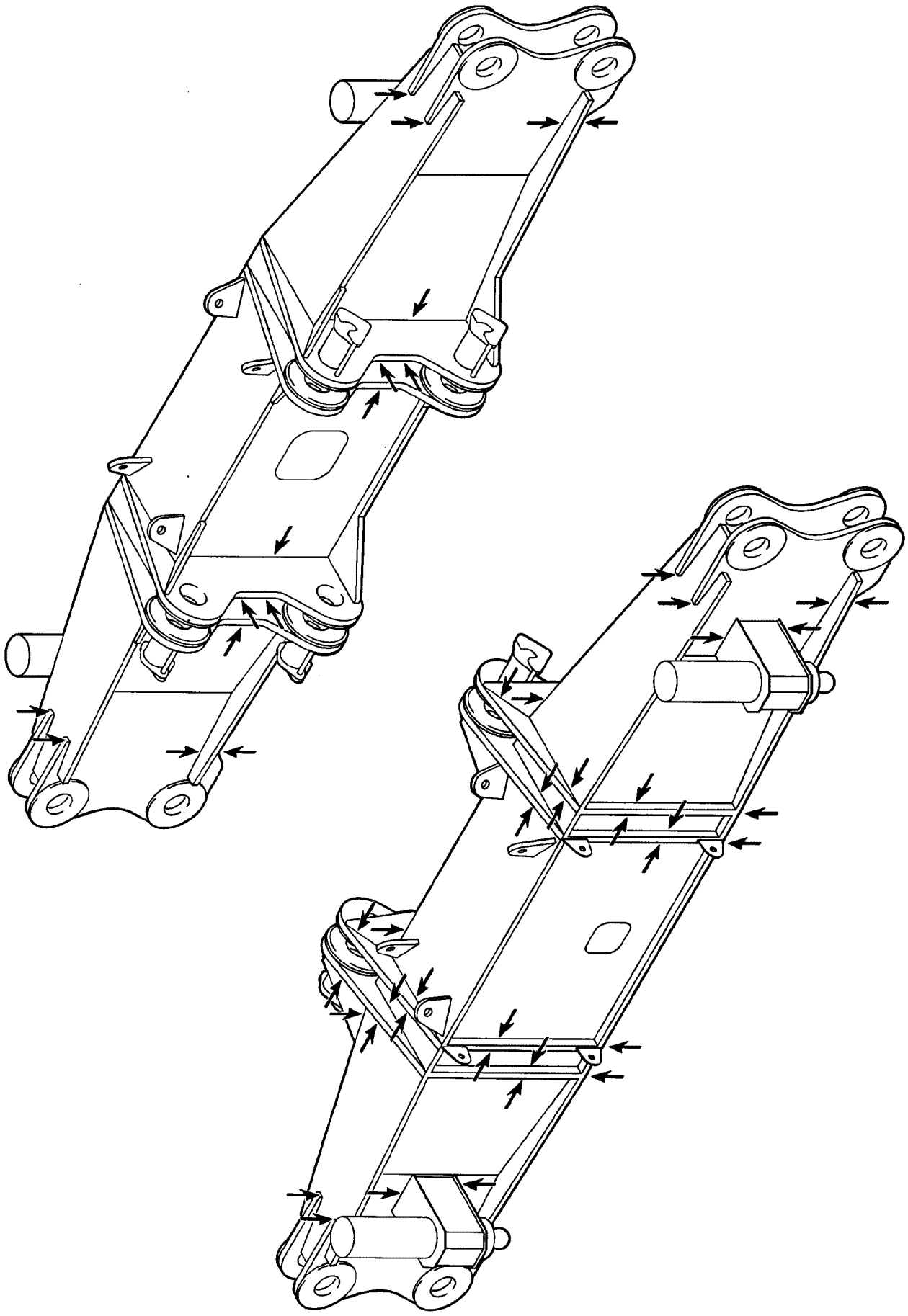

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Fig.187348: Example for cross carrier

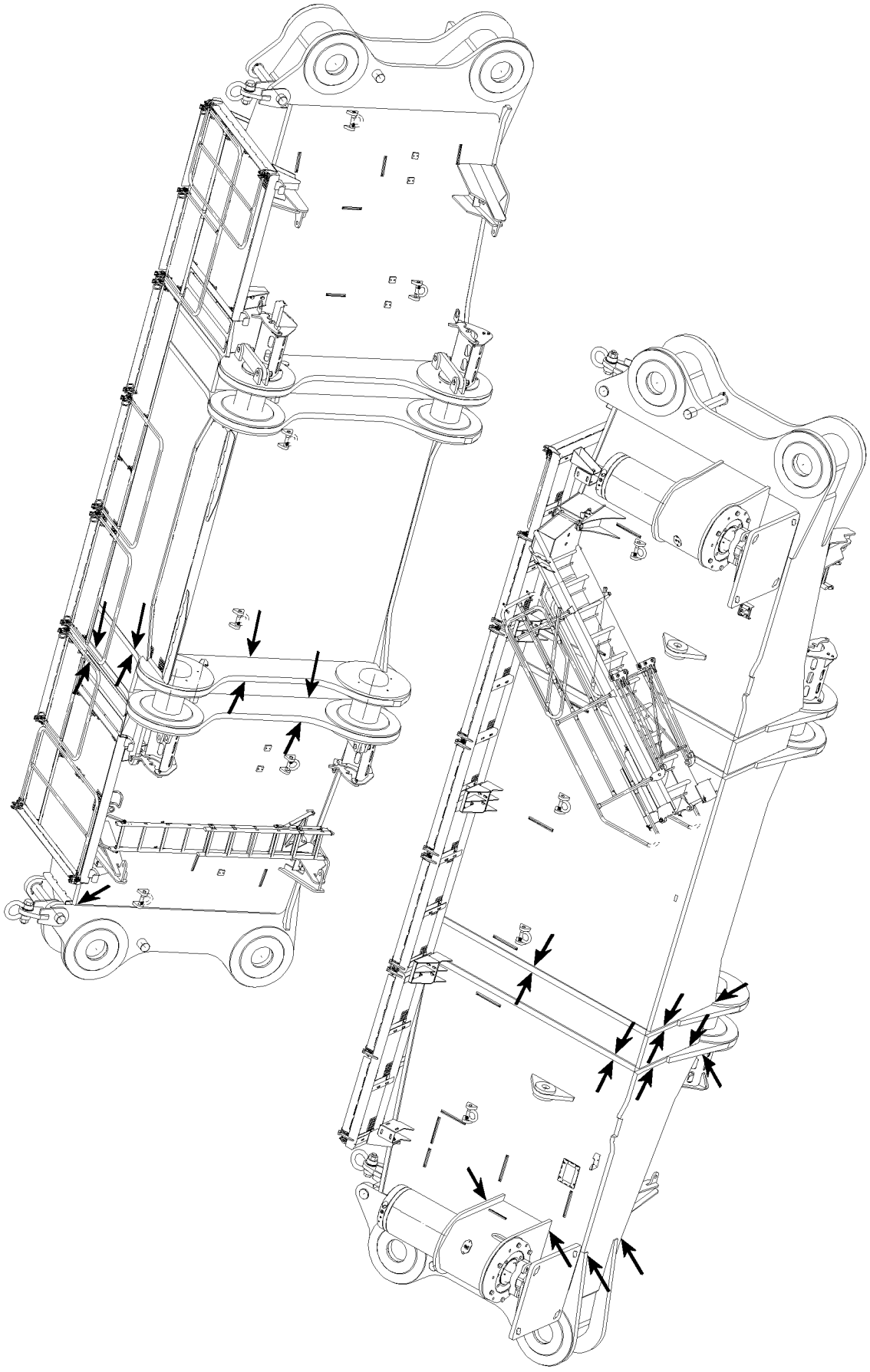

Fig.115921: Example for cross carrier

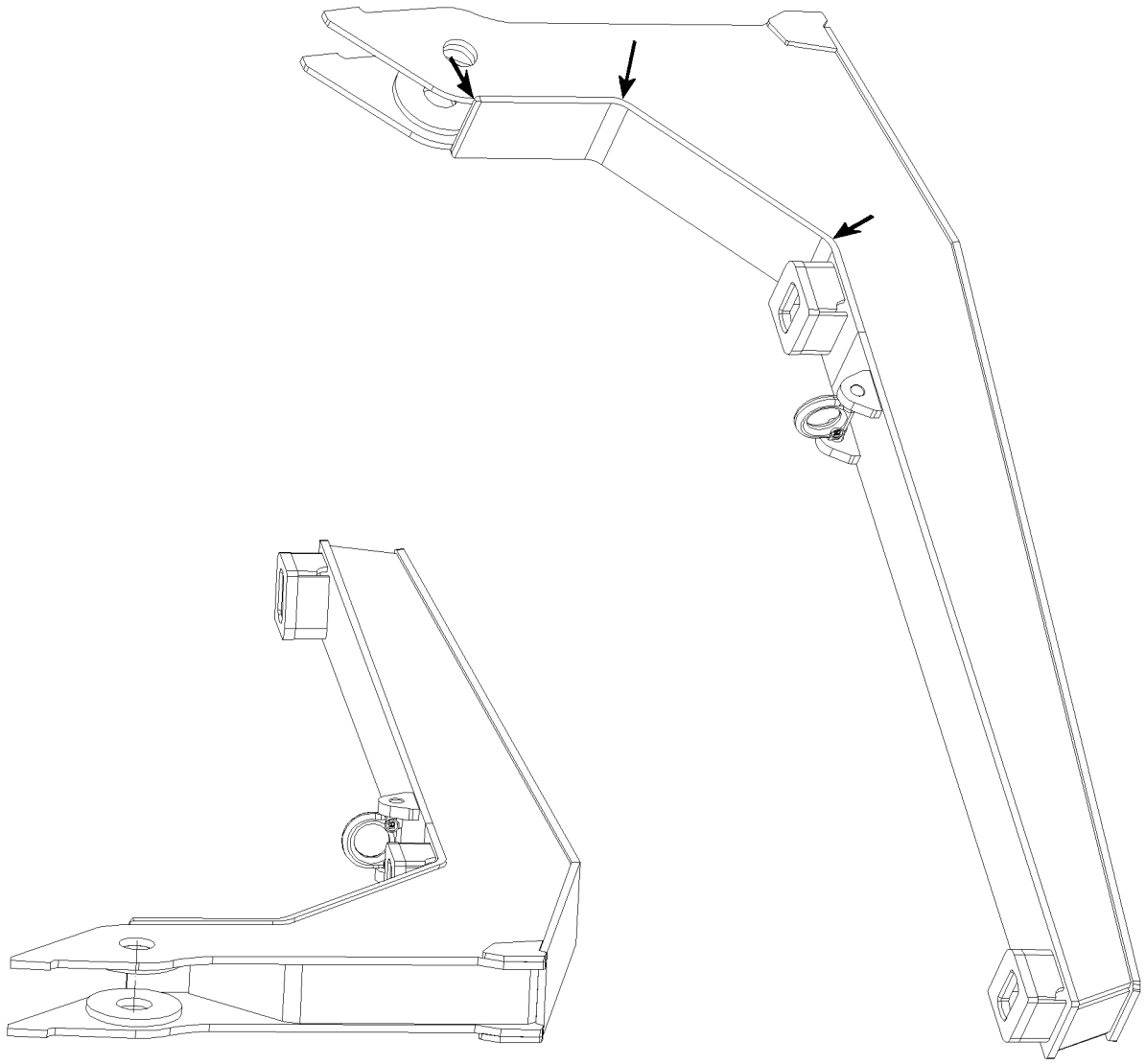

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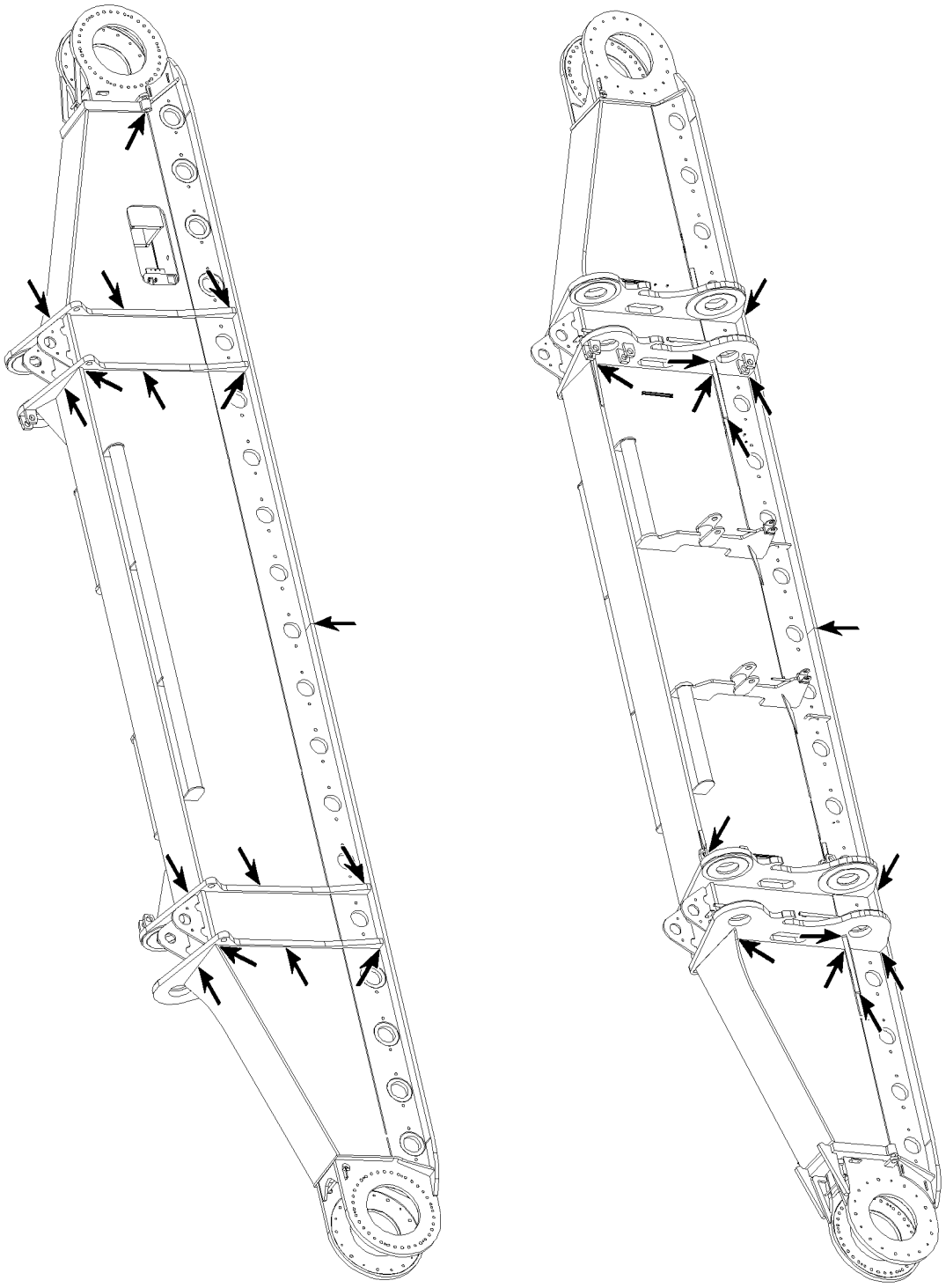
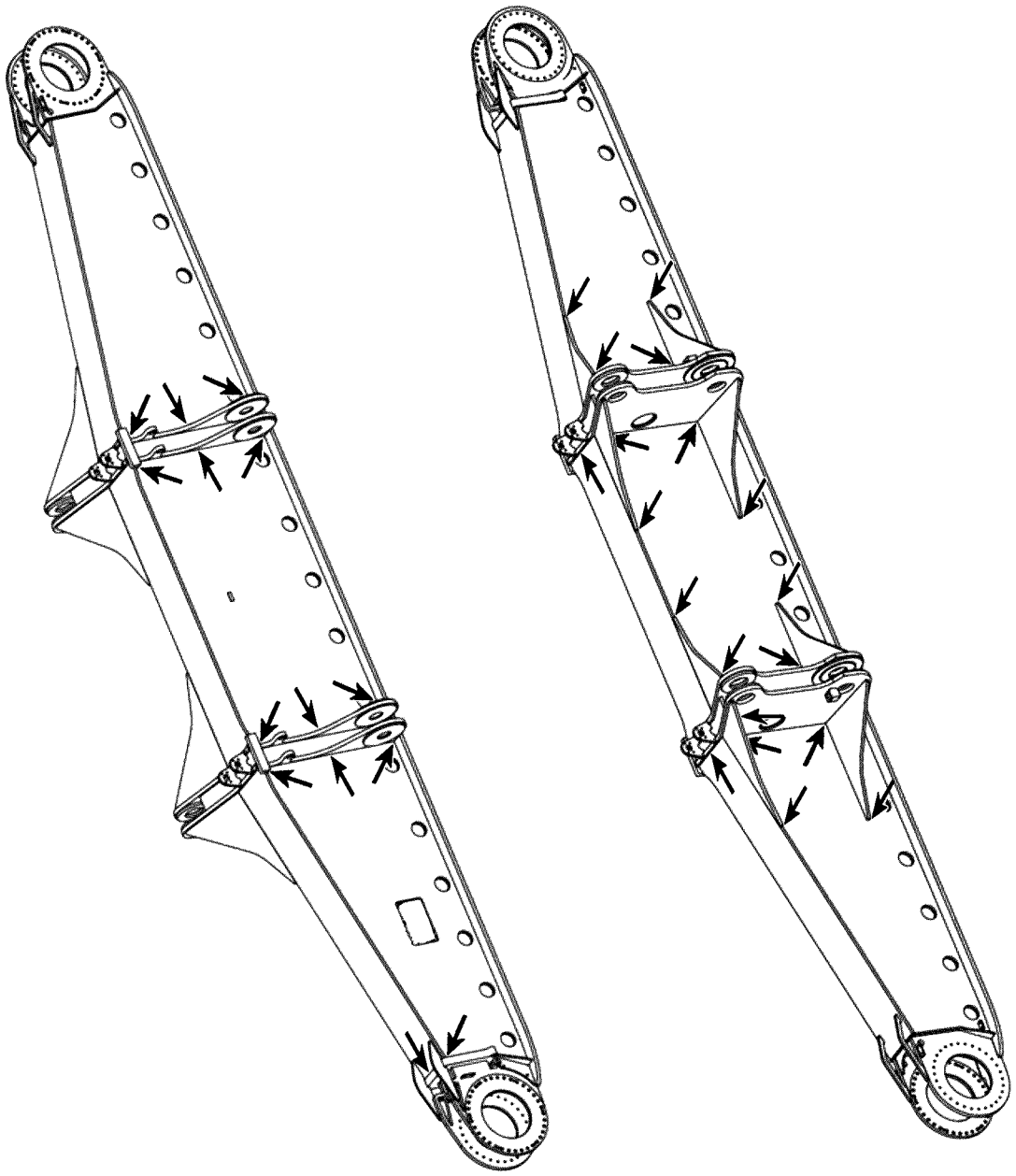
Fig.115919: Example for carrier for central ballast



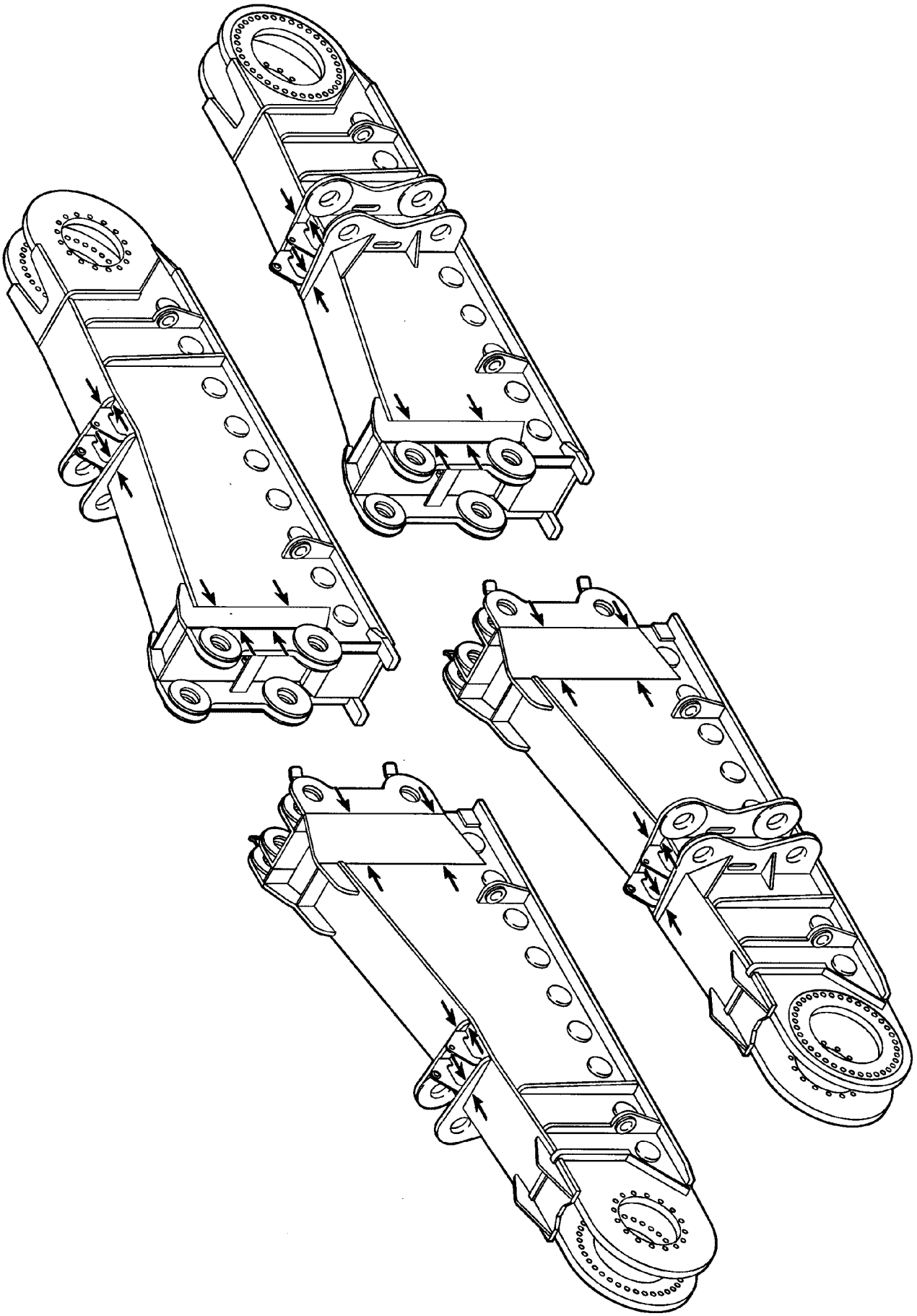
LWE/LTR 1100-005/17505-03-02/en

Fig.105728: Example for crawler carrier



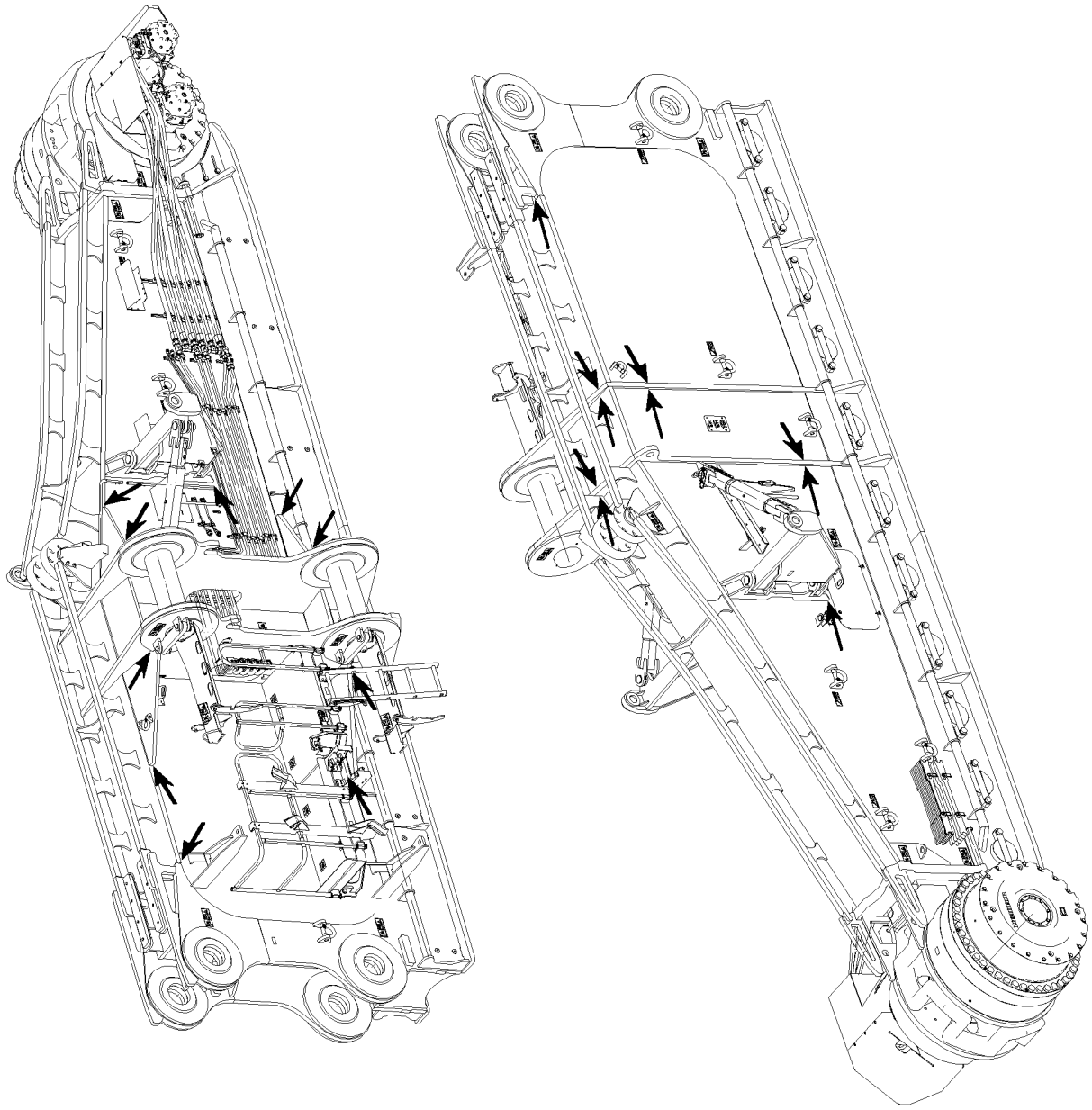
LWE/LTR 1100-005/17505-03-02/en

Fig.105729: Example for crawler carrier



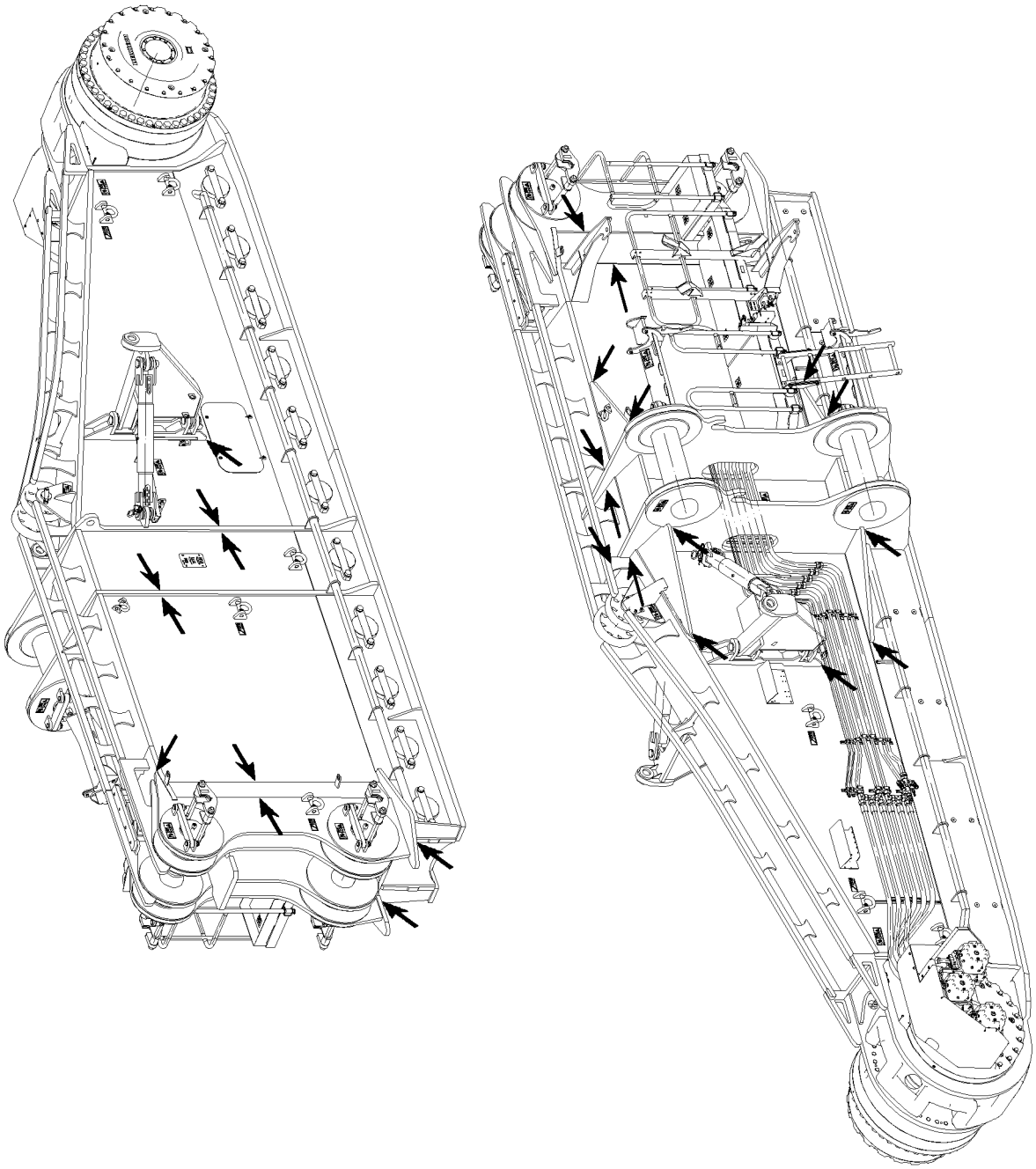
LWE/LTR 1100-005/17505-03-02/en

Fig.187349: Example for crawler carrier



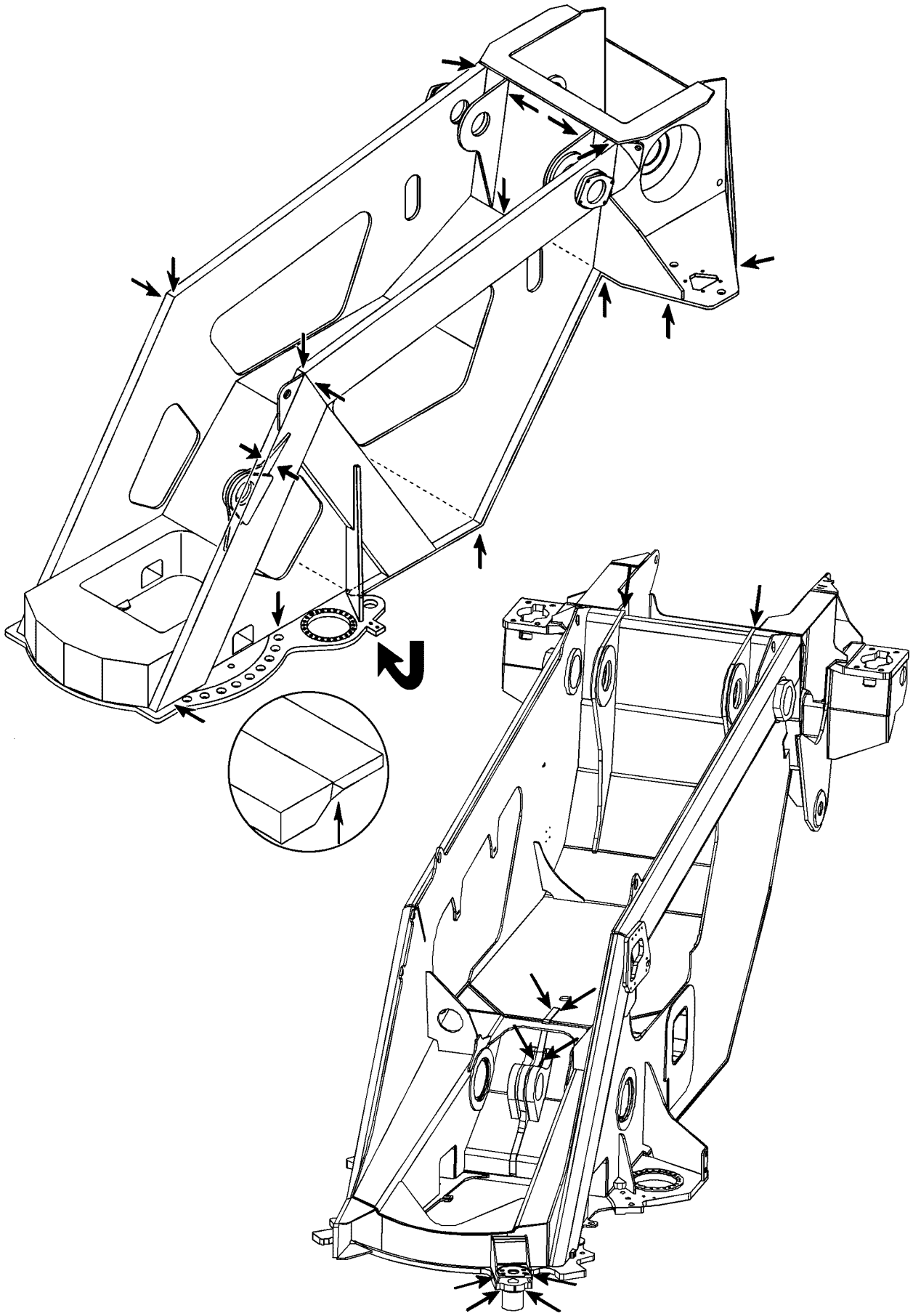
LWE/LTR 1100-005/17505-03-02/en

Fig.115917: Example for crawler carrier



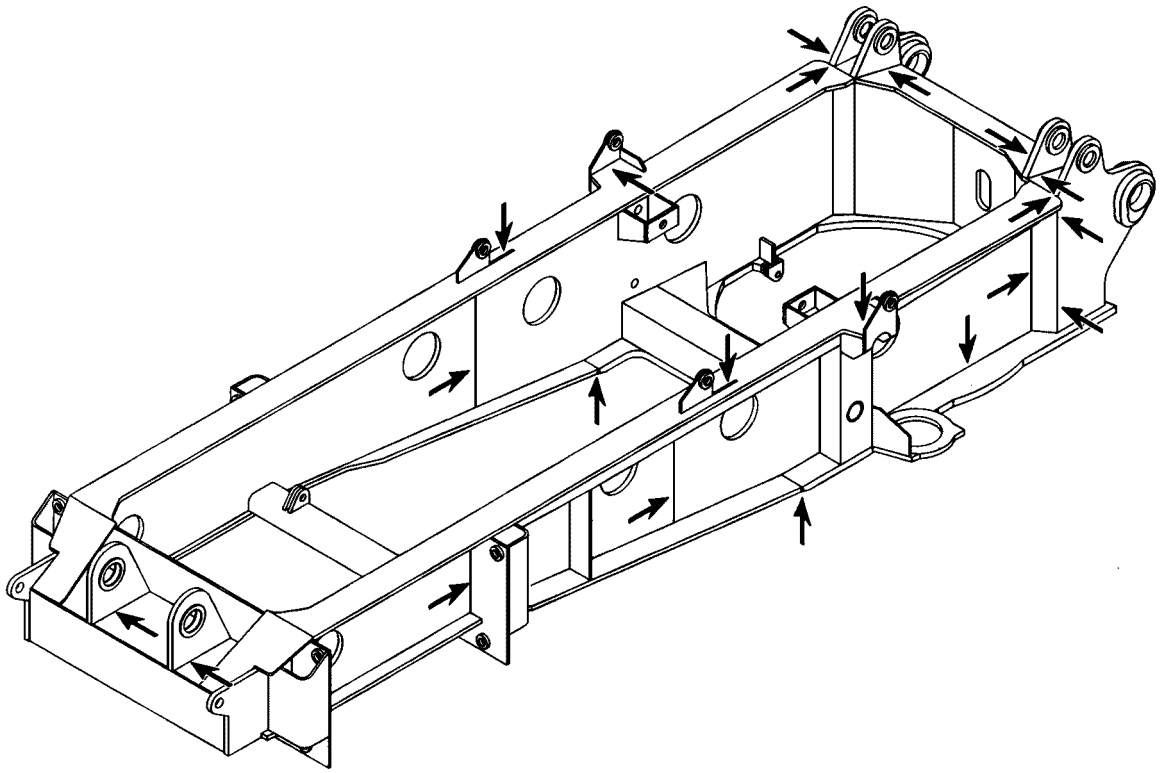
LWE/LTR 1100-005/17505-03-02/en

Fig.115918: Example for crawler carrier



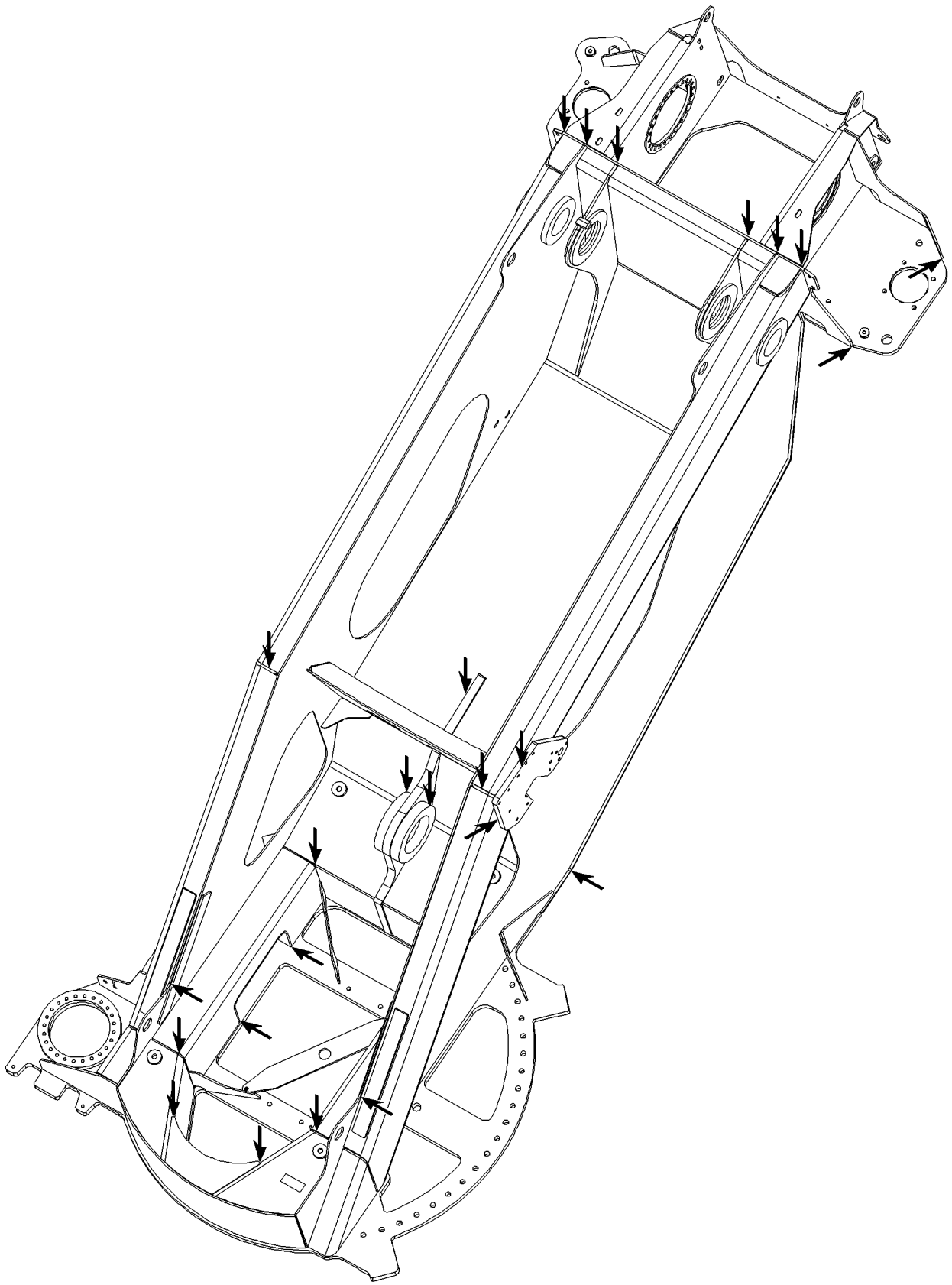
LWE/LTR 1100-005/17505-03-02/en

Fig.185048: Example for turntable frame



LWE/LTR 1100-005/17505-03-02/en

Fig.185049: Example for turntable frame



LWE/LTR 1100-005/17505-03-02/en

Fig.105700: Example for turntable frame

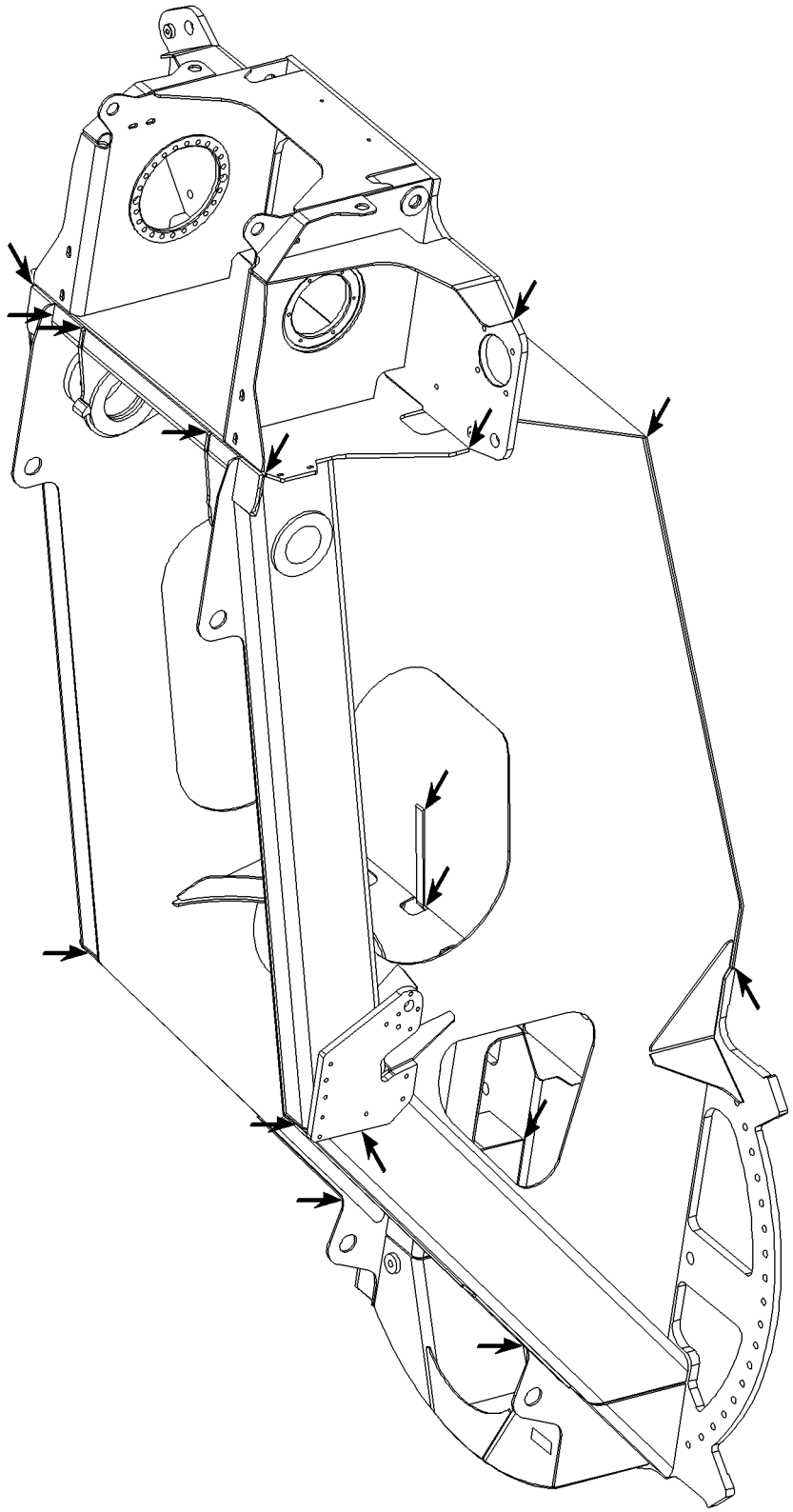
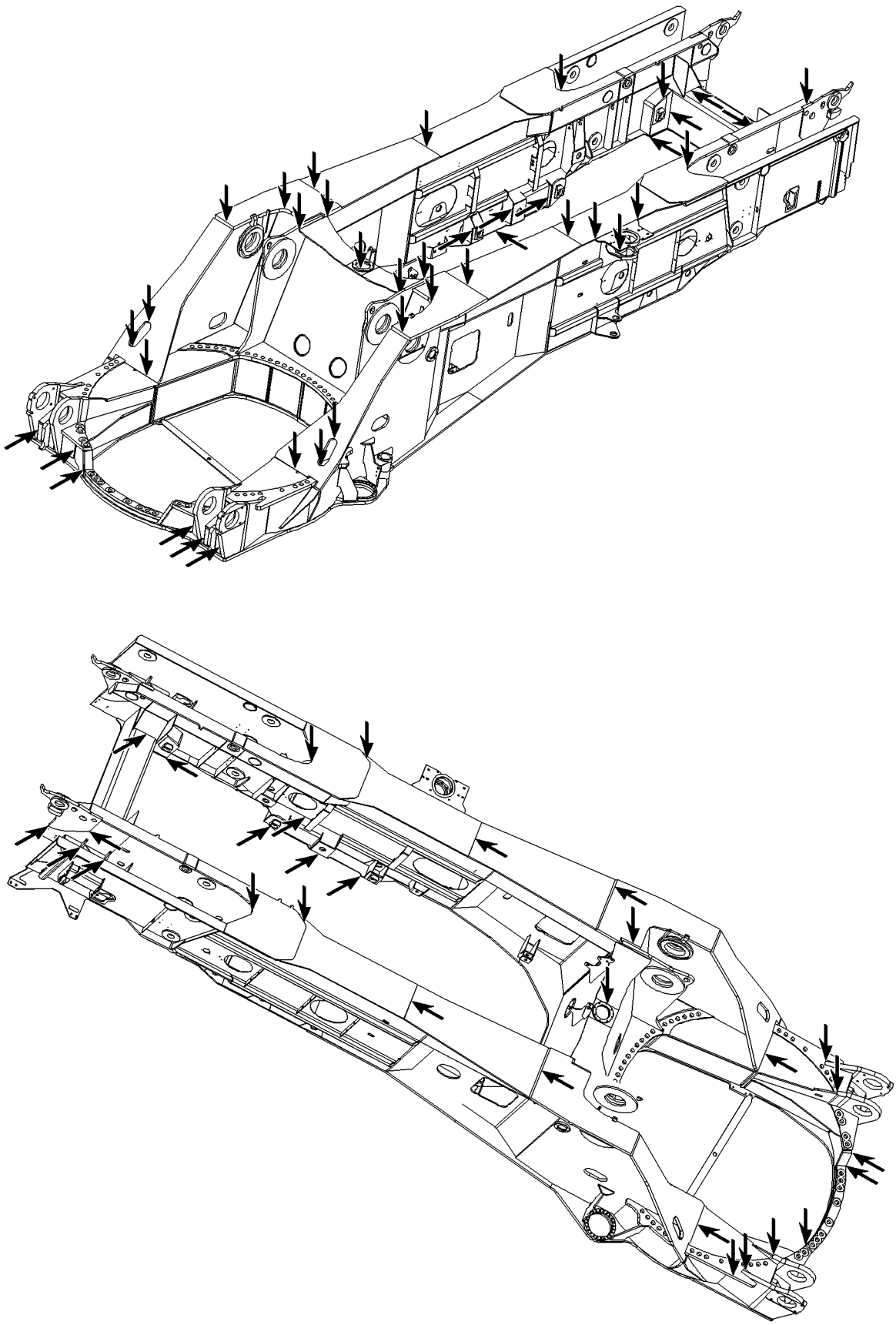
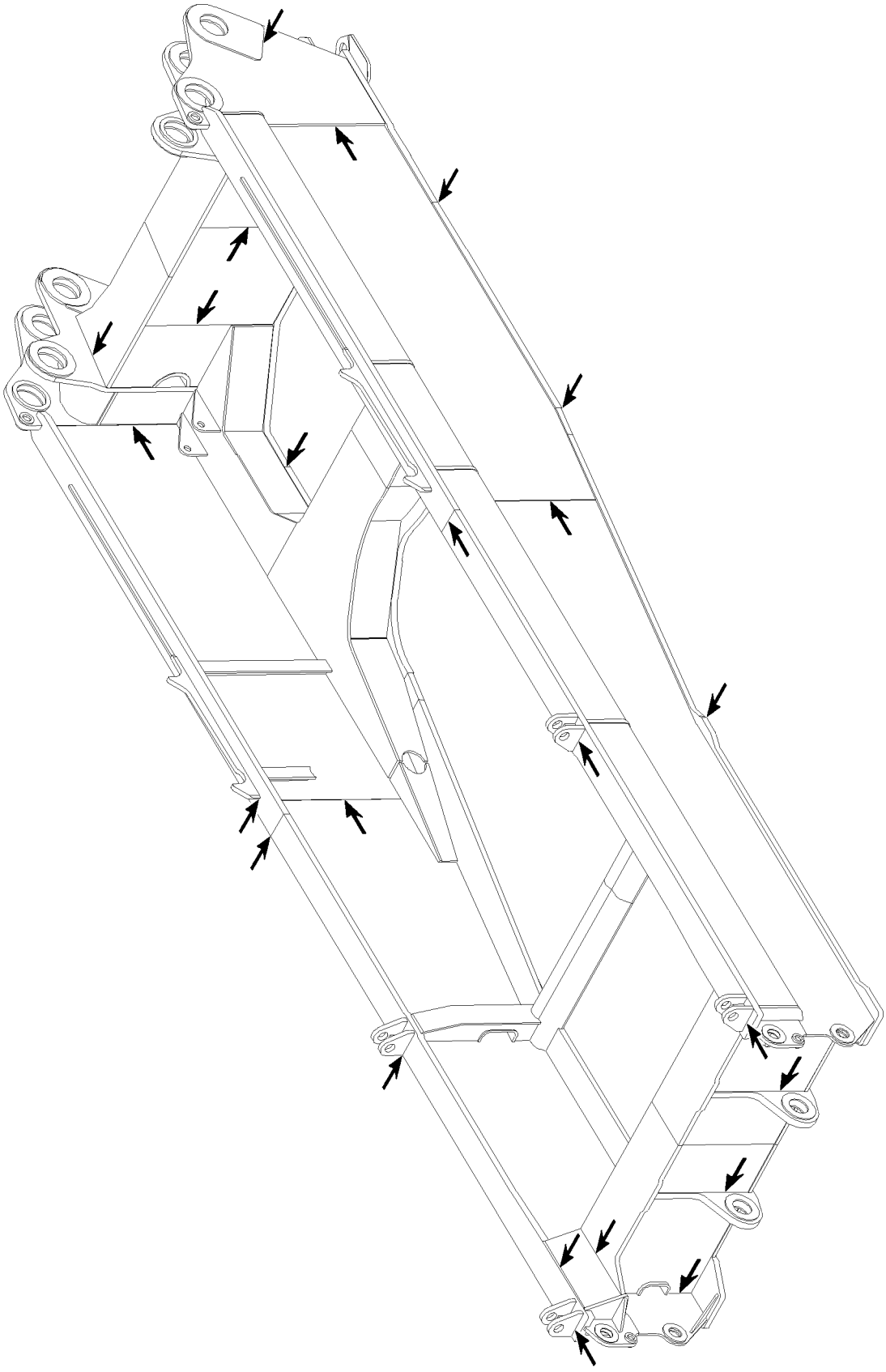


Fig.105701: Example for turntable frame



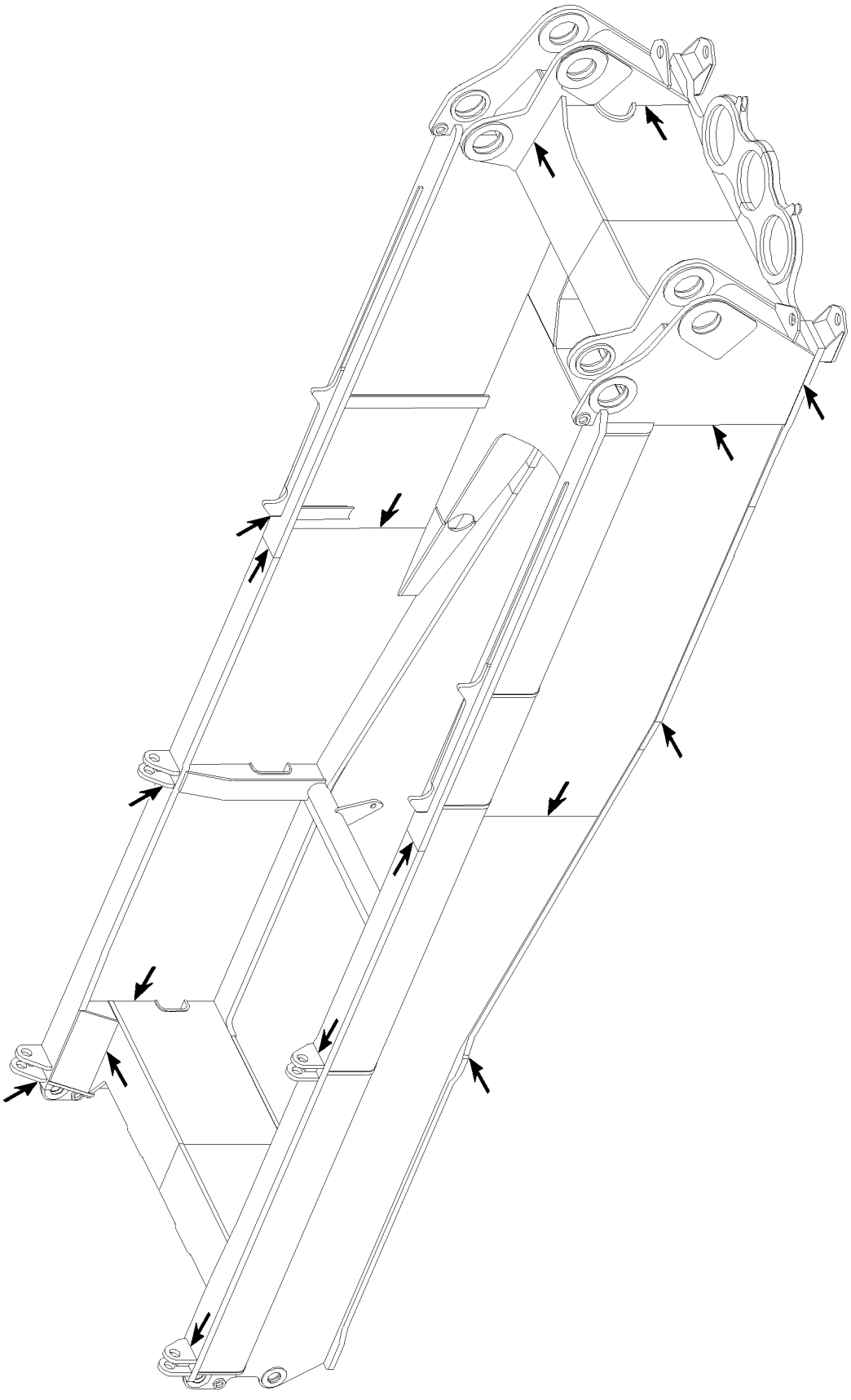
LWE/LTR 1100-005/17505-03-02/en

Fig.105706: Example for turntable frame



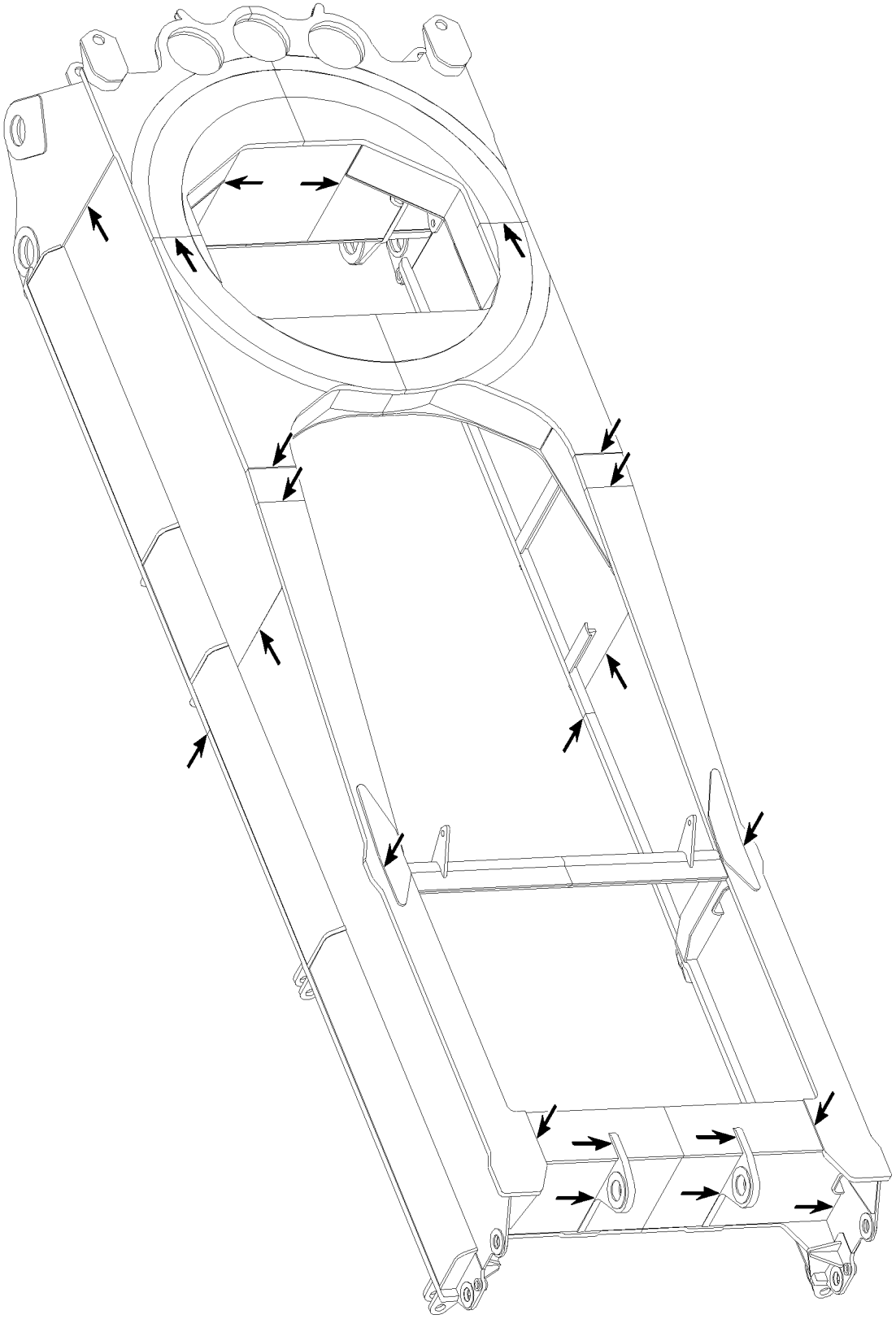
LWE/LTR 1100-005/17505-03-02/en

Fig.105694: Example for turntable frame



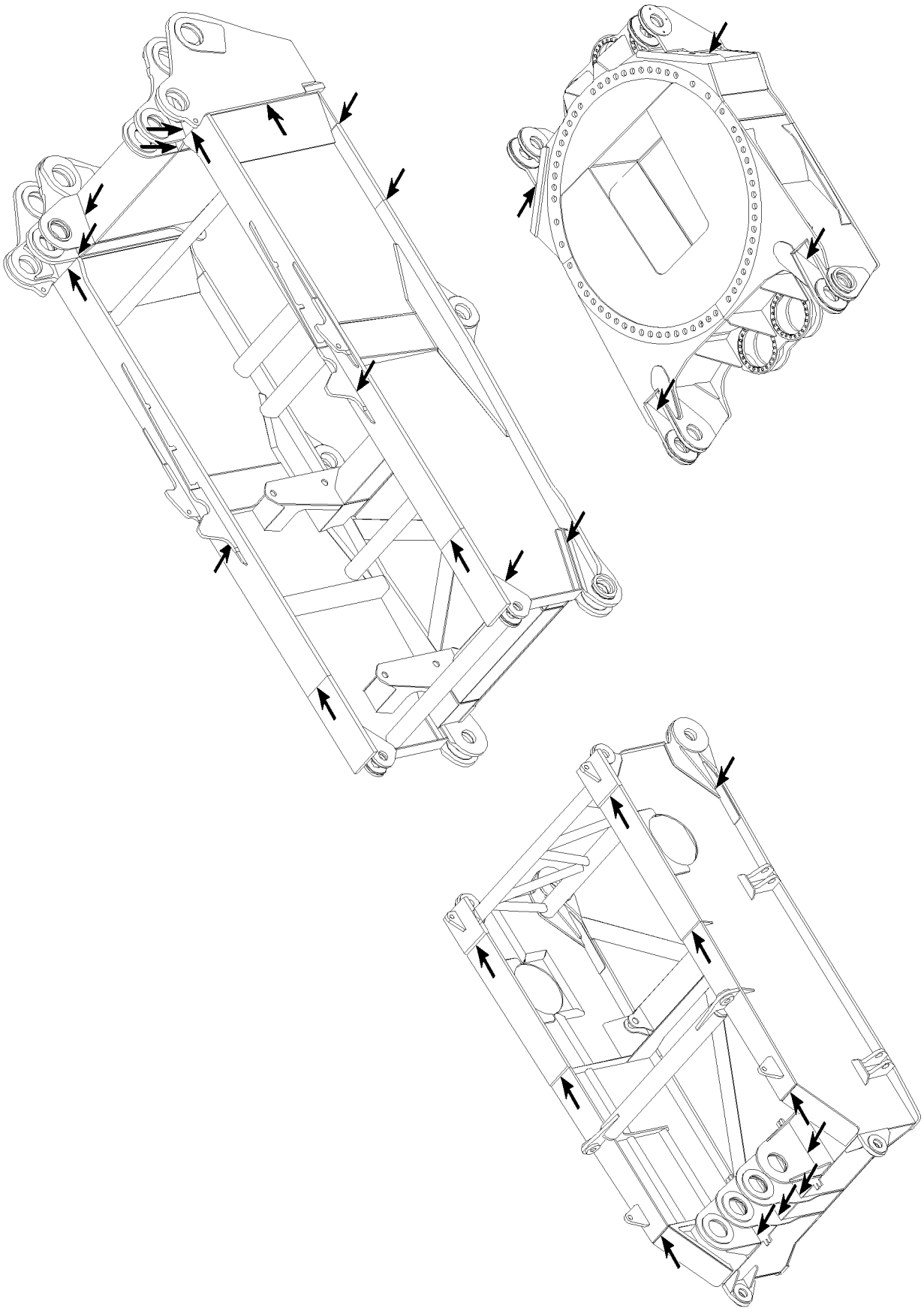
LWE/LTR 1100-005/17505-03-02/en

Fig.105695: Example for turntable frame



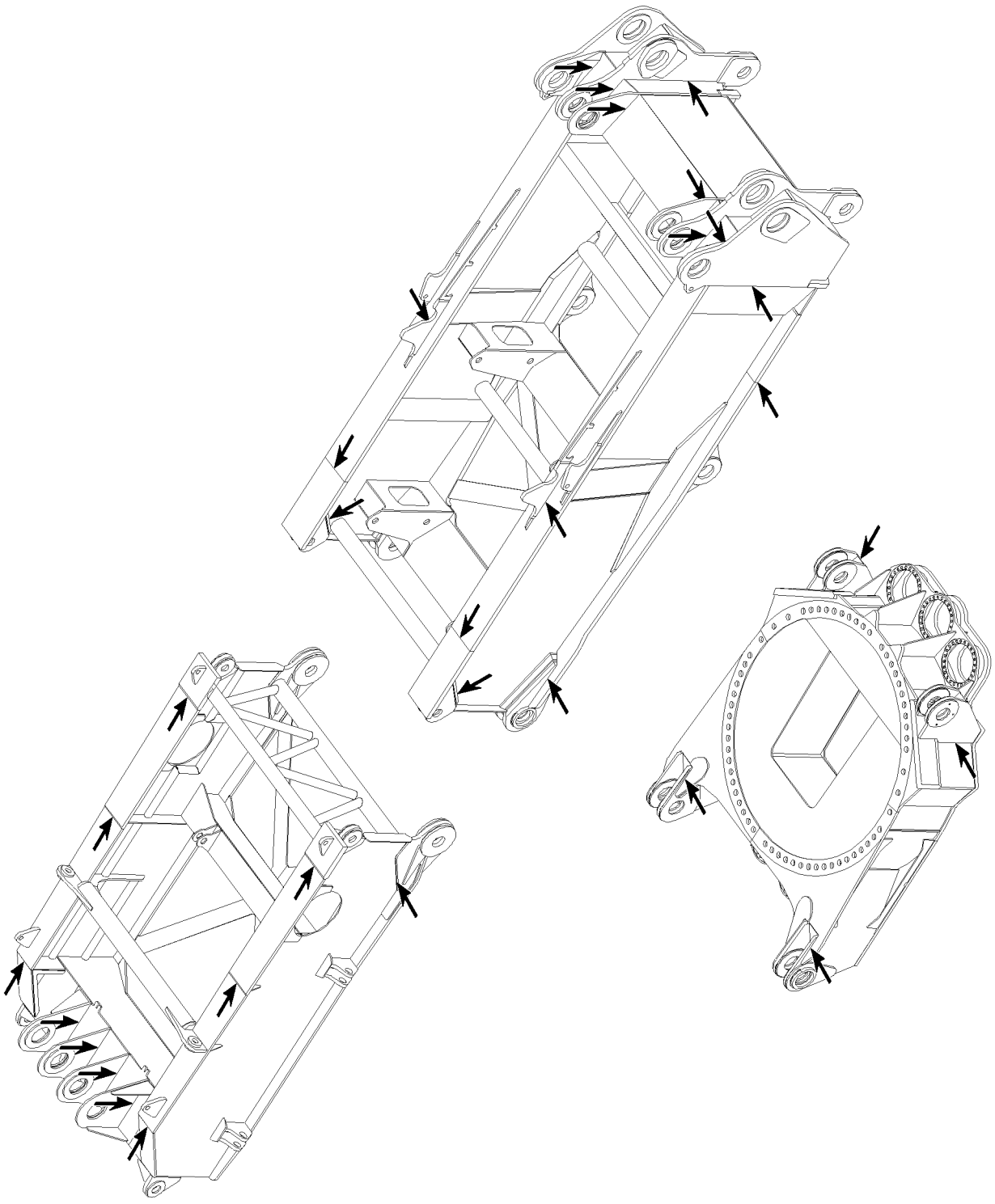
LWE/LTR 1100-005/17505-03-02/en

Fig.105696: Example for turntable frame



LWE/LTR 1100-005/17505-03-02/en

Fig.105691: Example for turntable frame



LWE/LTR 1100-005/17505-03-02/en

Fig.105692: Example for turntable frame

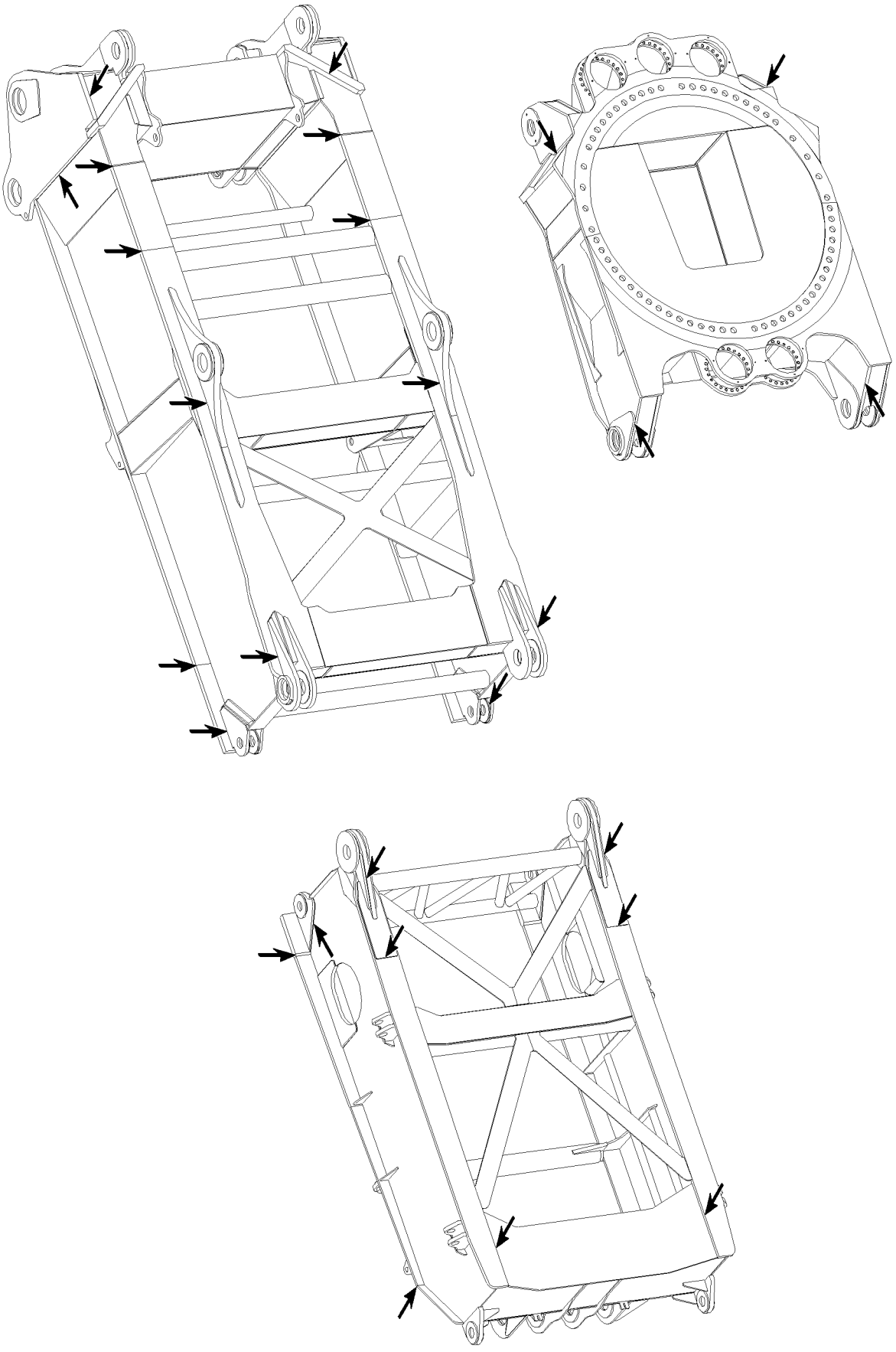
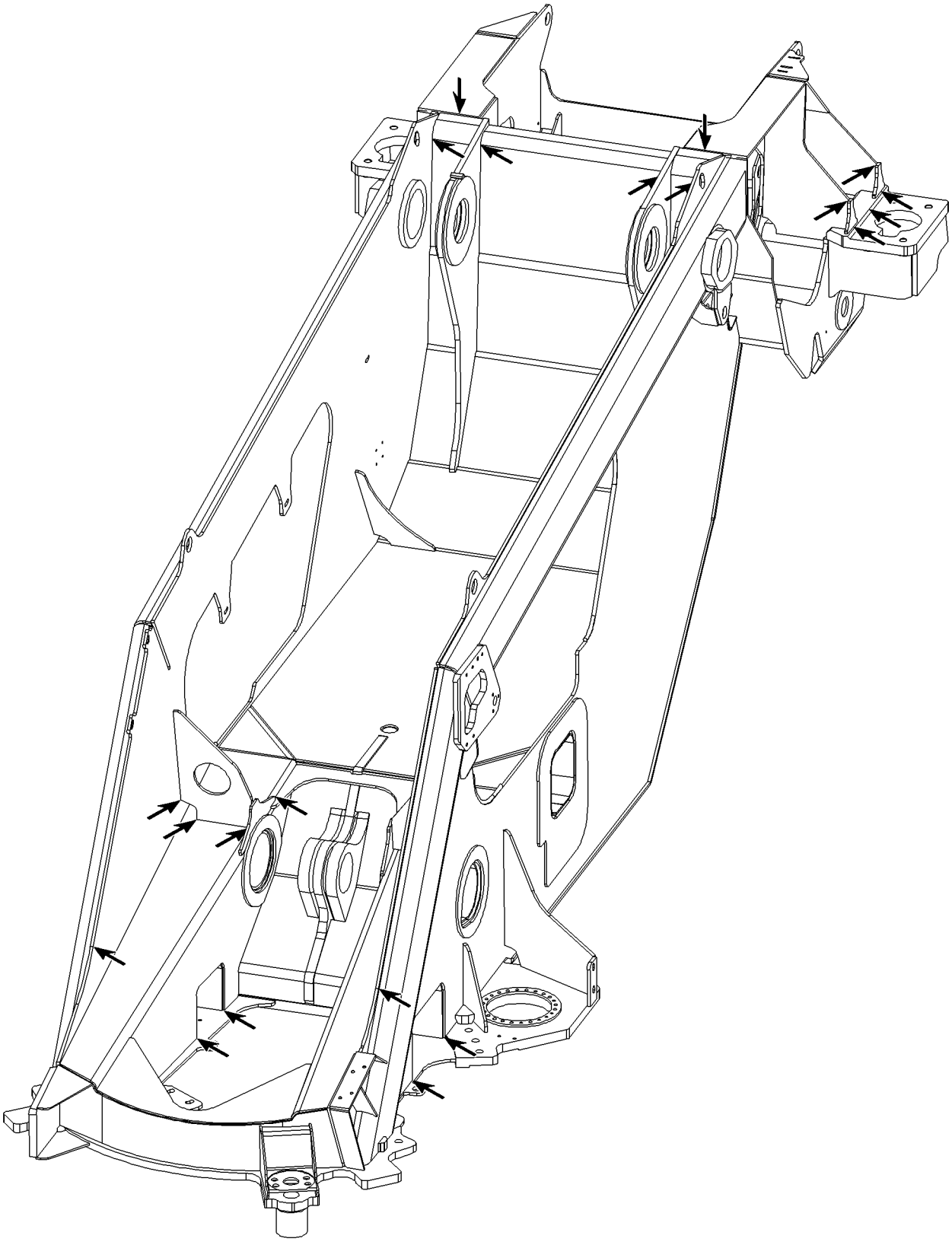


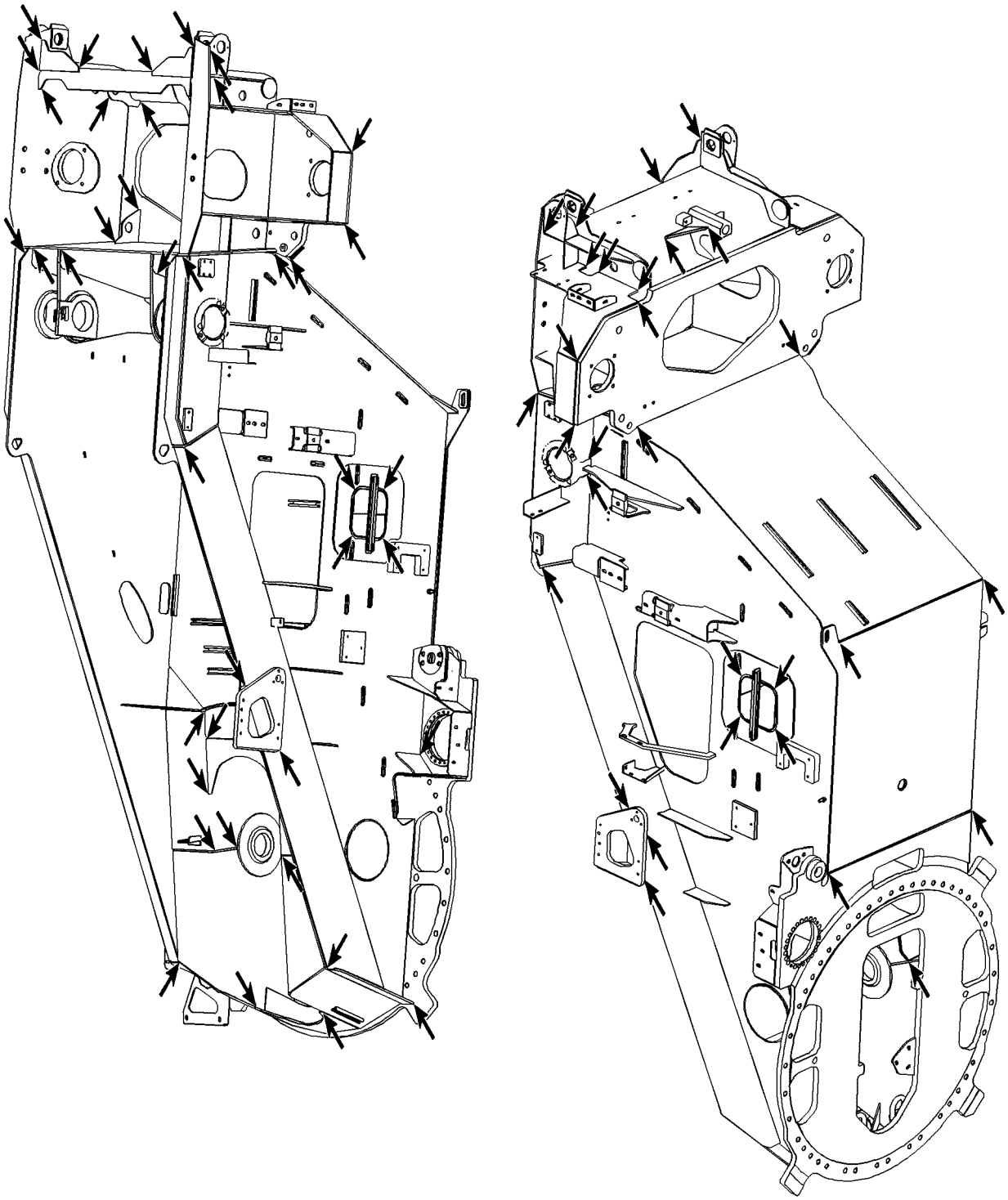
Fig.105693: Example for turntable frame

LWE/LTR 1100-005/17505-03-02/en



LWE/LTR 1100-005/17505-03-02/en

Fig.105722: Example for turntable frame



LWE/LTR 1100-005/17505-03-02/en

Fig.105932: Example for turntable frame

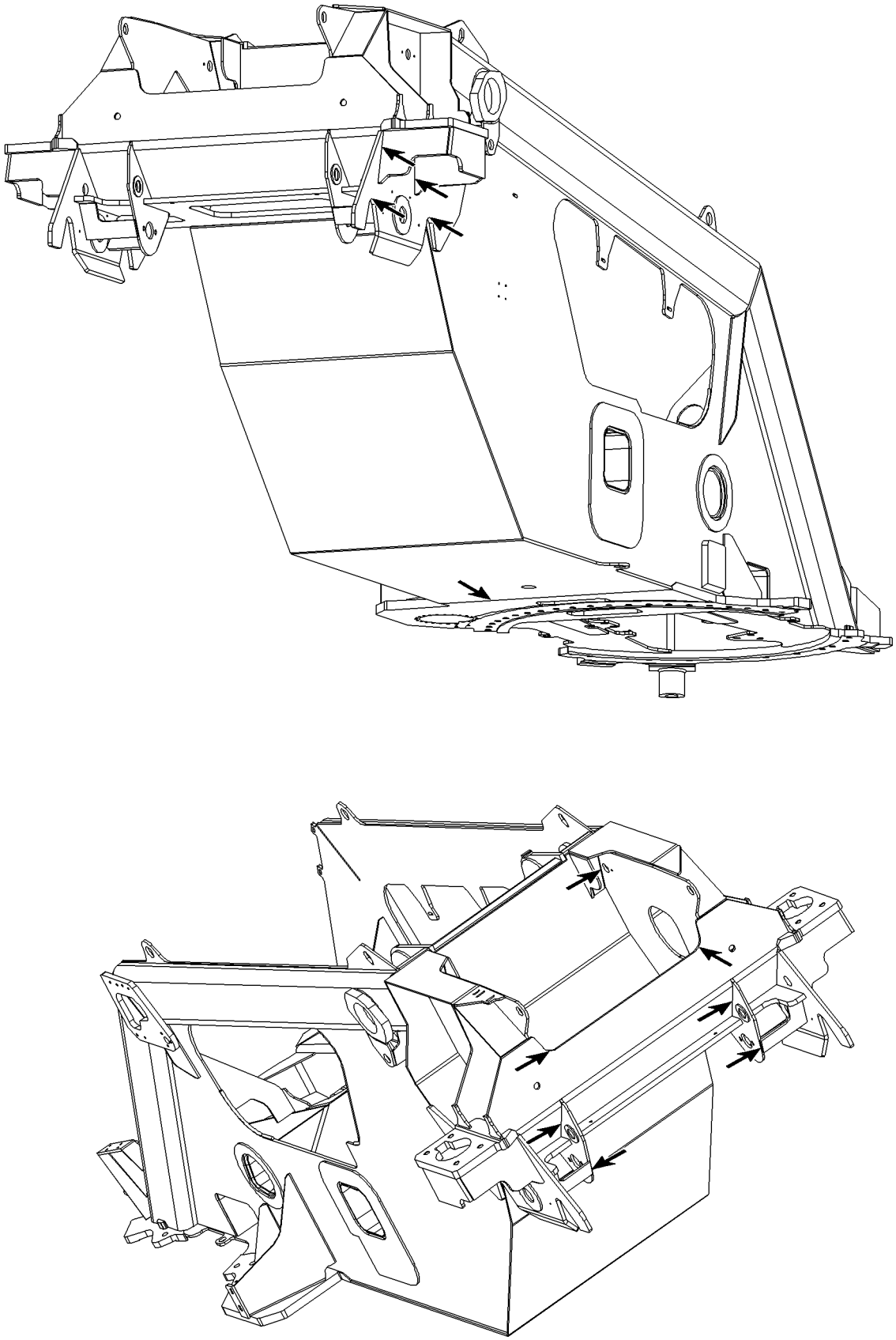
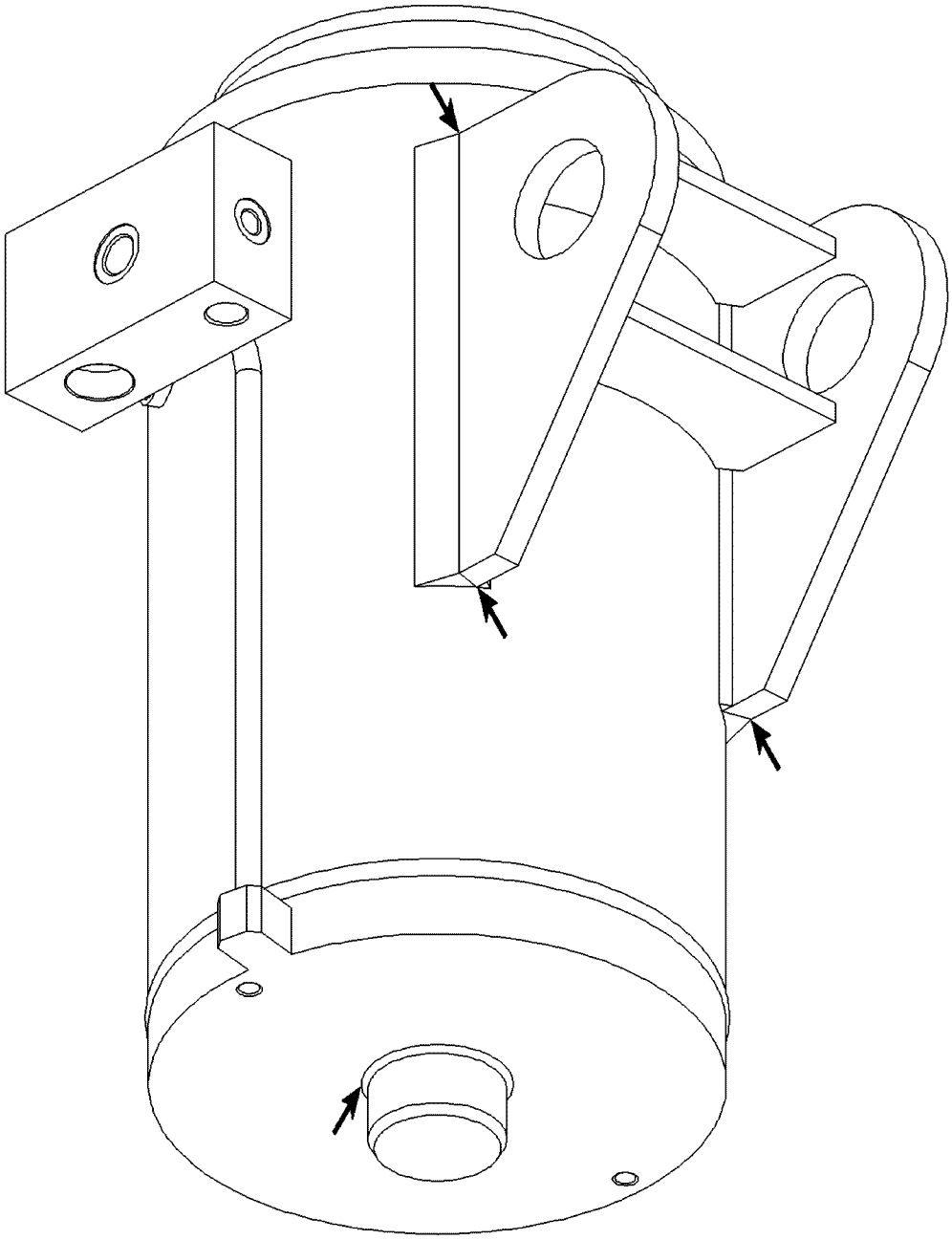


Fig.105723: Example for turntable frame



LWE/LTR 1100-005/17505-03-02/en

Fig.105801: Example for ballasting cylinder

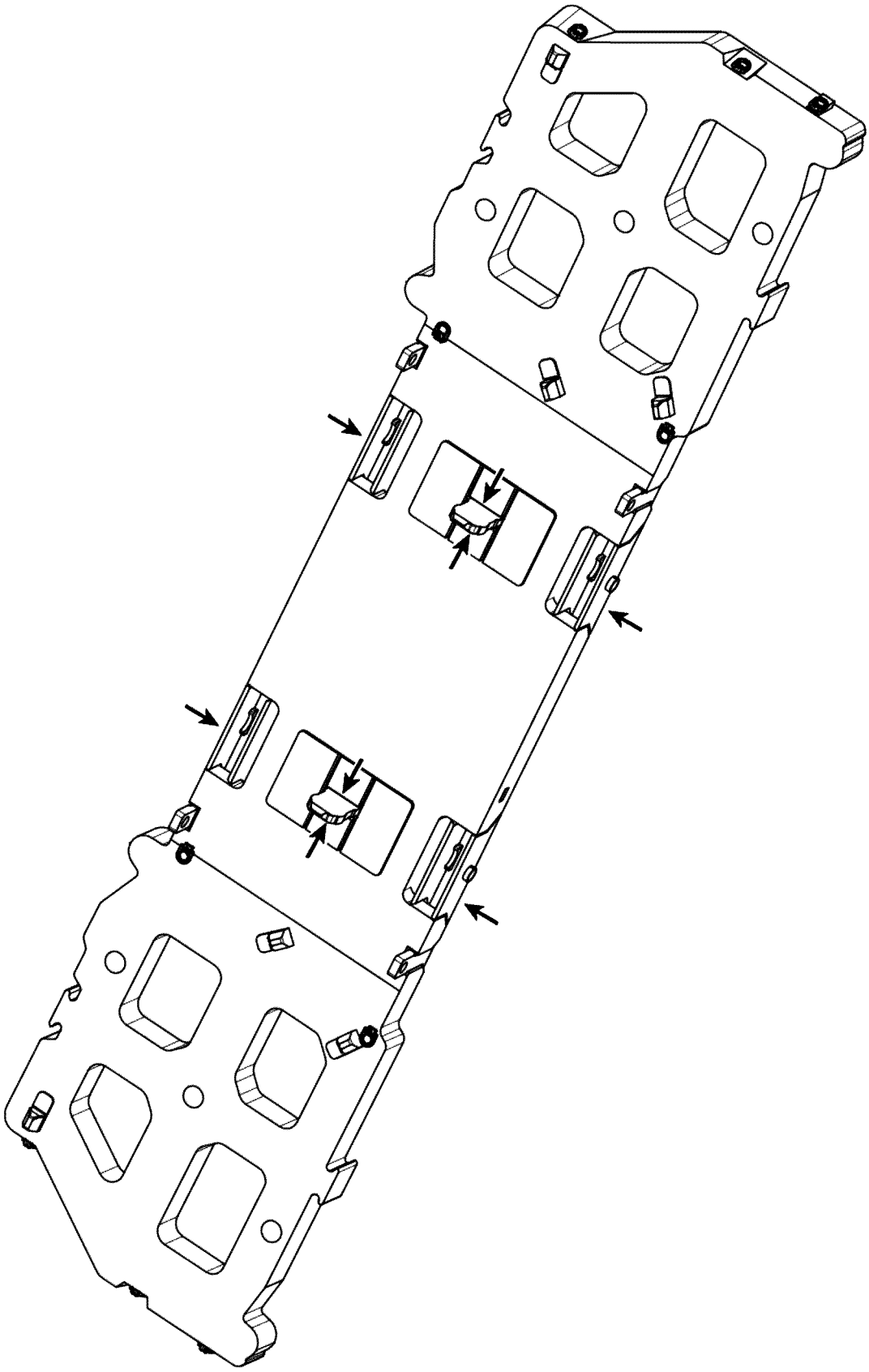
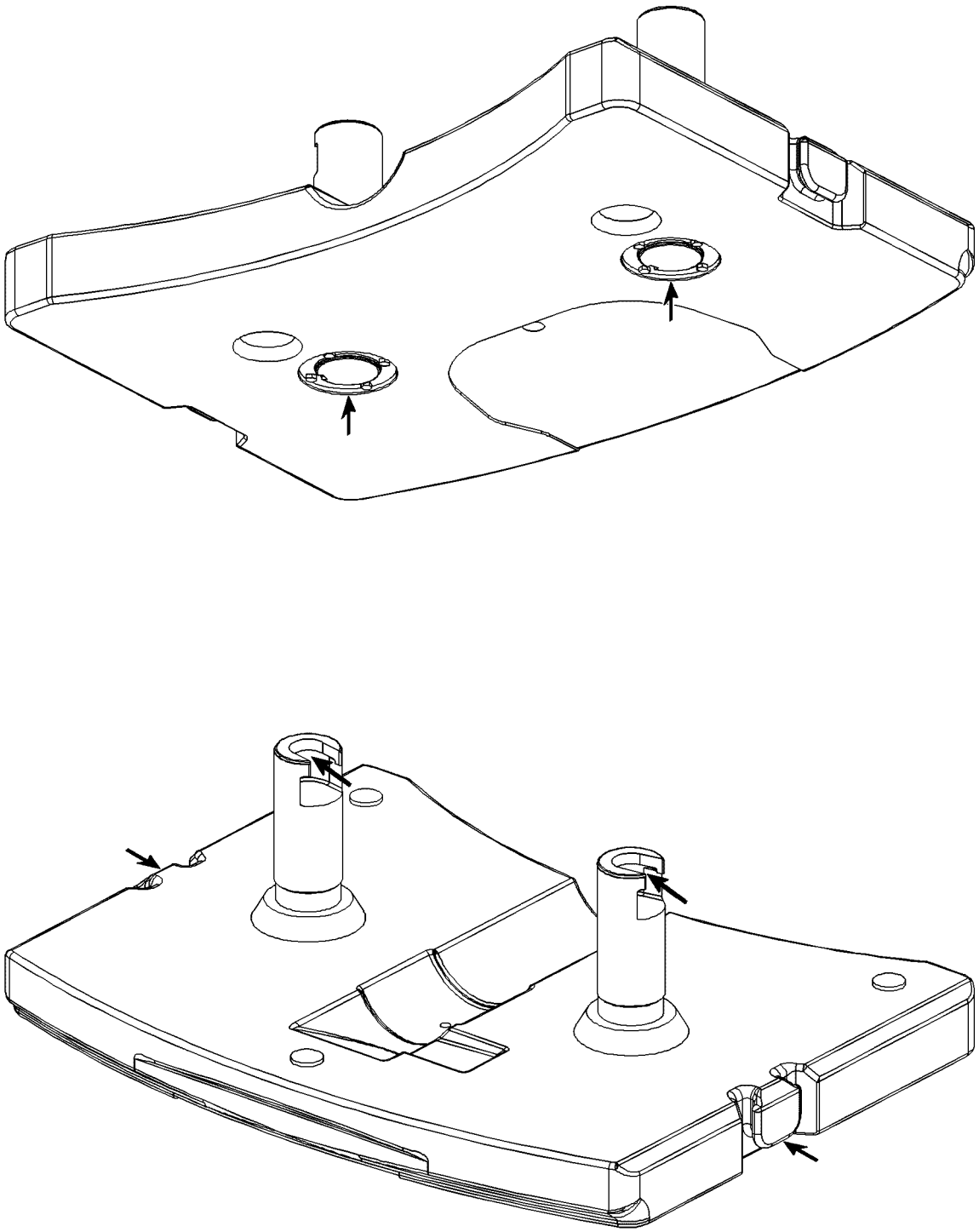
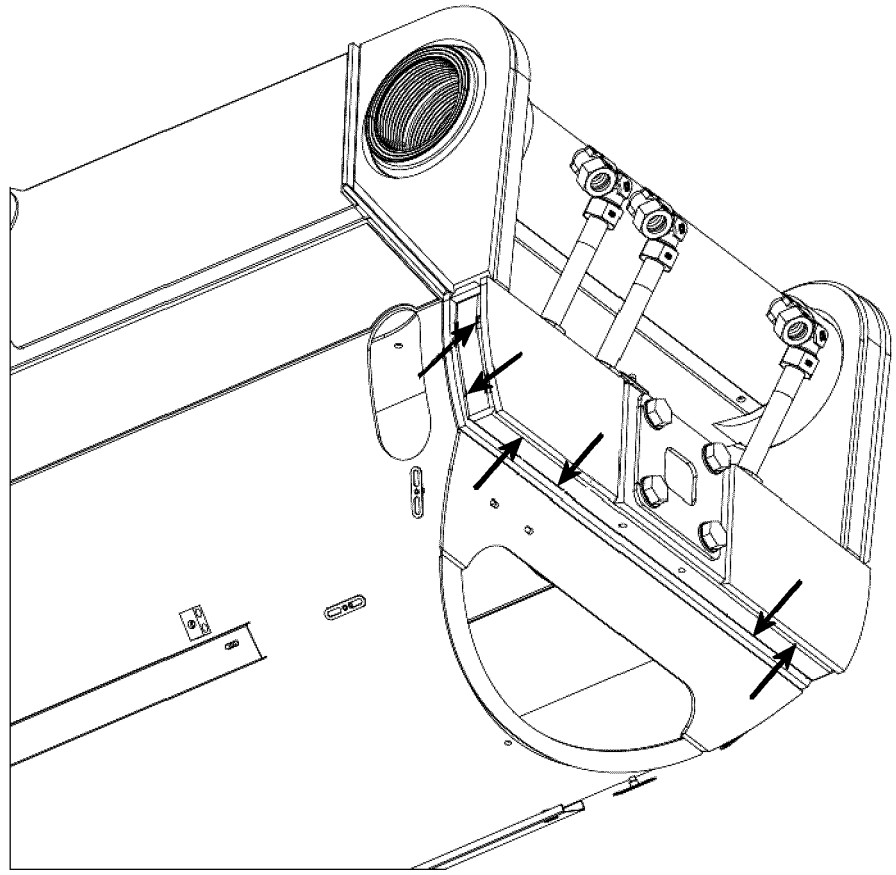


Fig.105705: Example for mounting plate



LWE/LTR 1100-005/17505-03-02/en

Fig.105807: Example for base plate



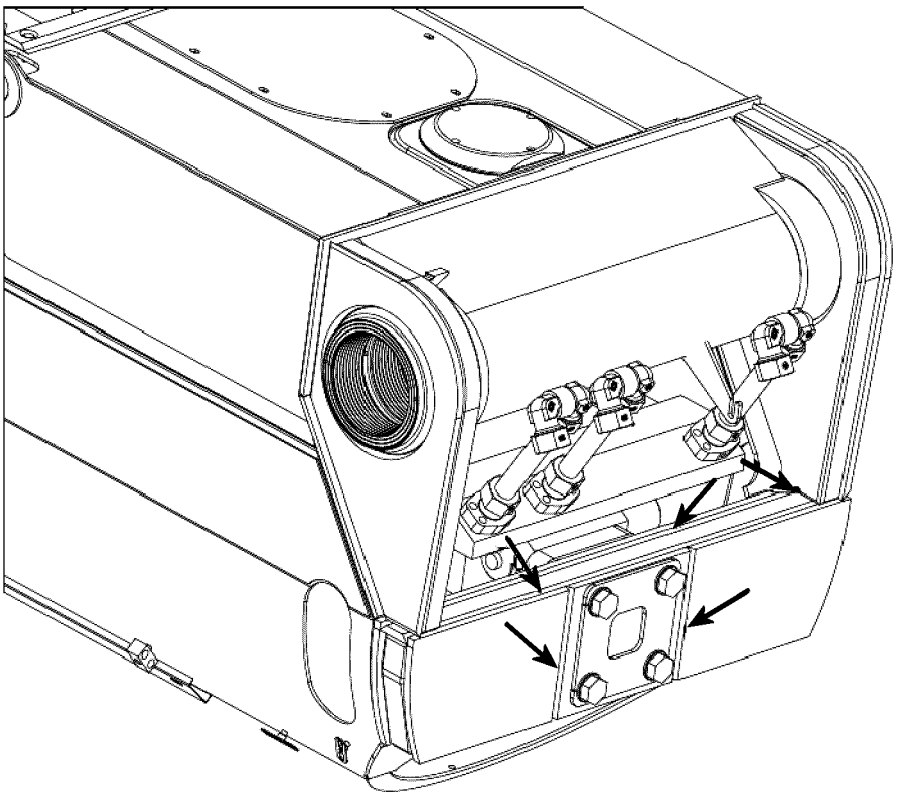


Fig.120273: Example for pivot section

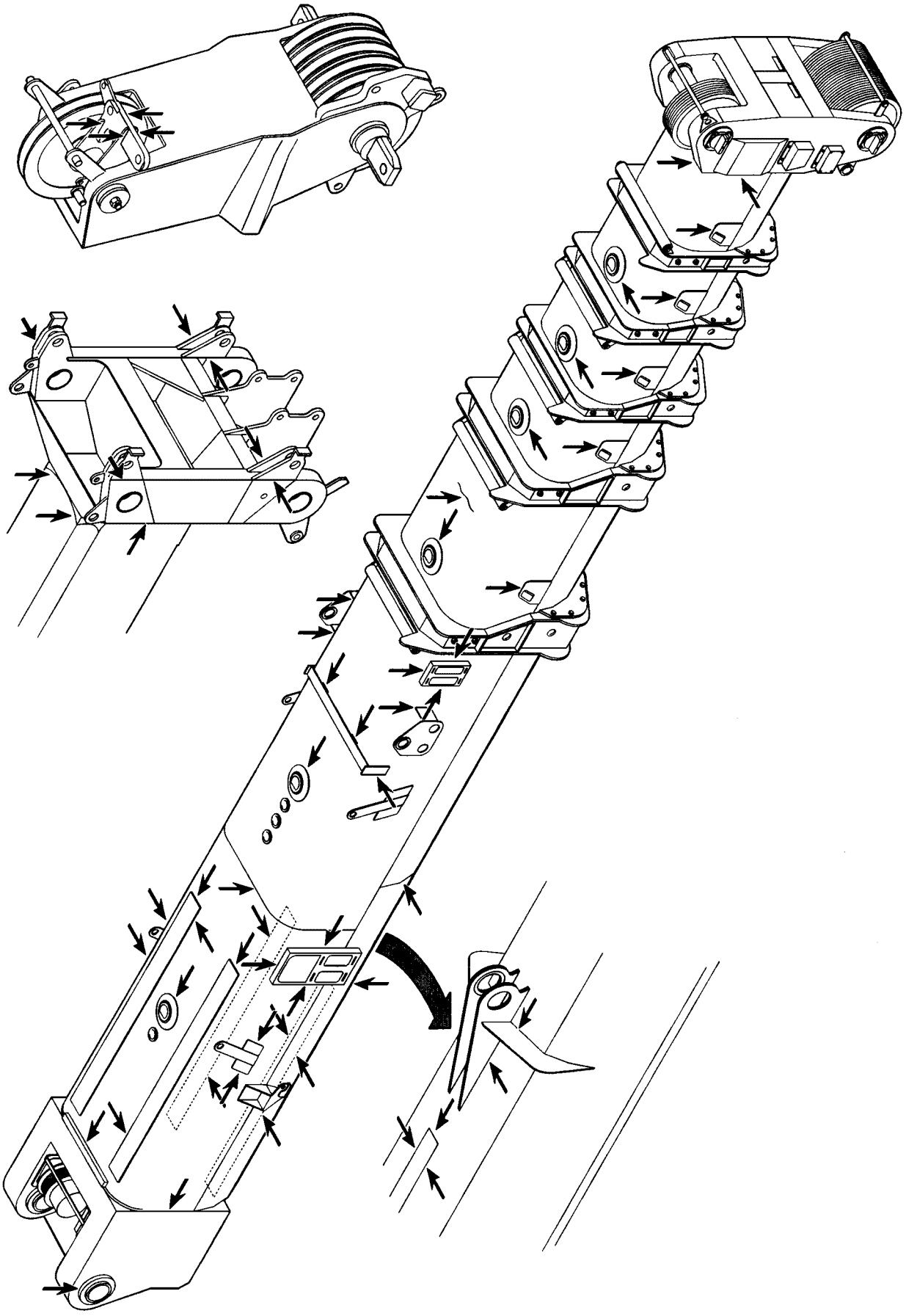


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Fig.185050: Example for telescopic boom

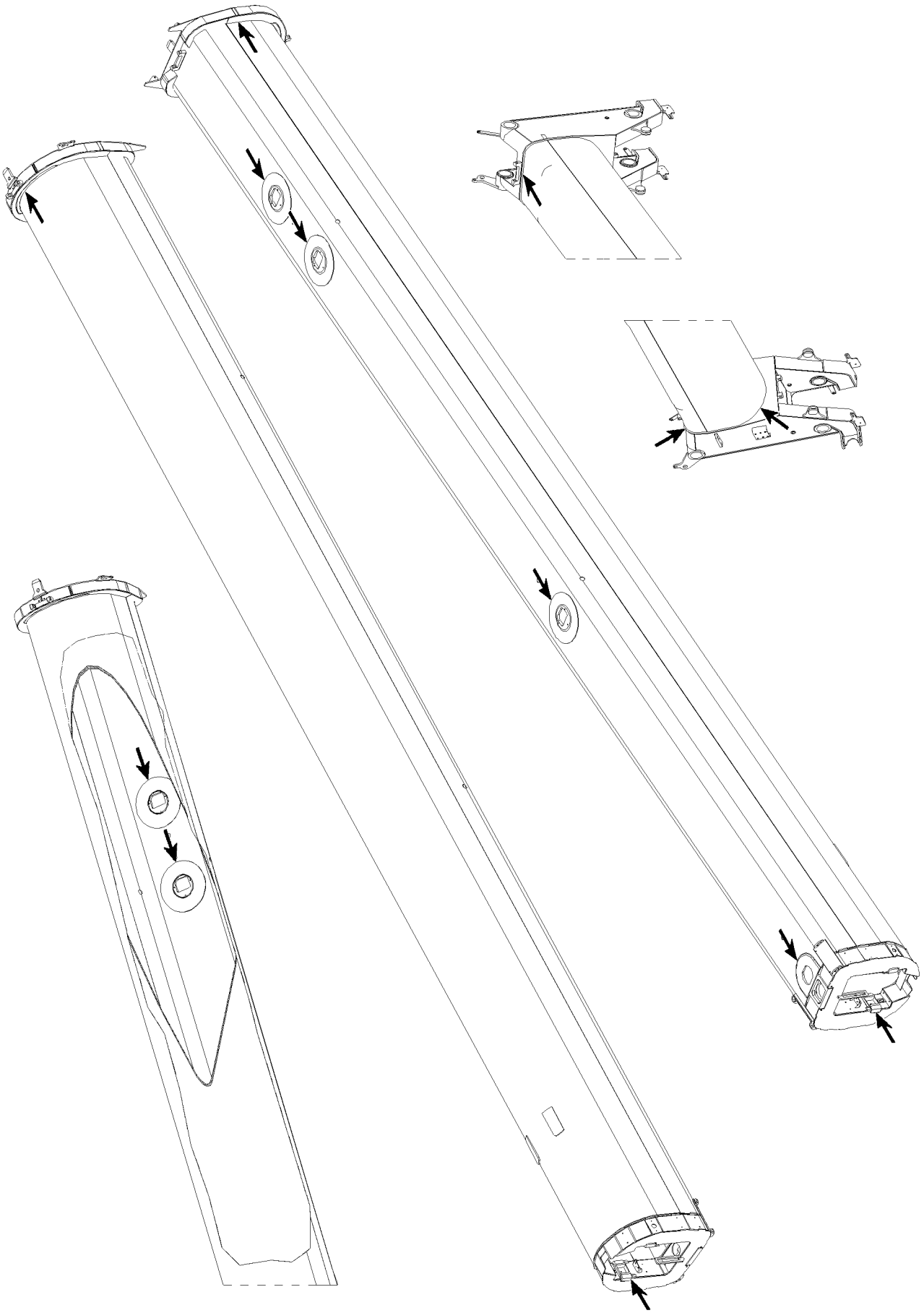
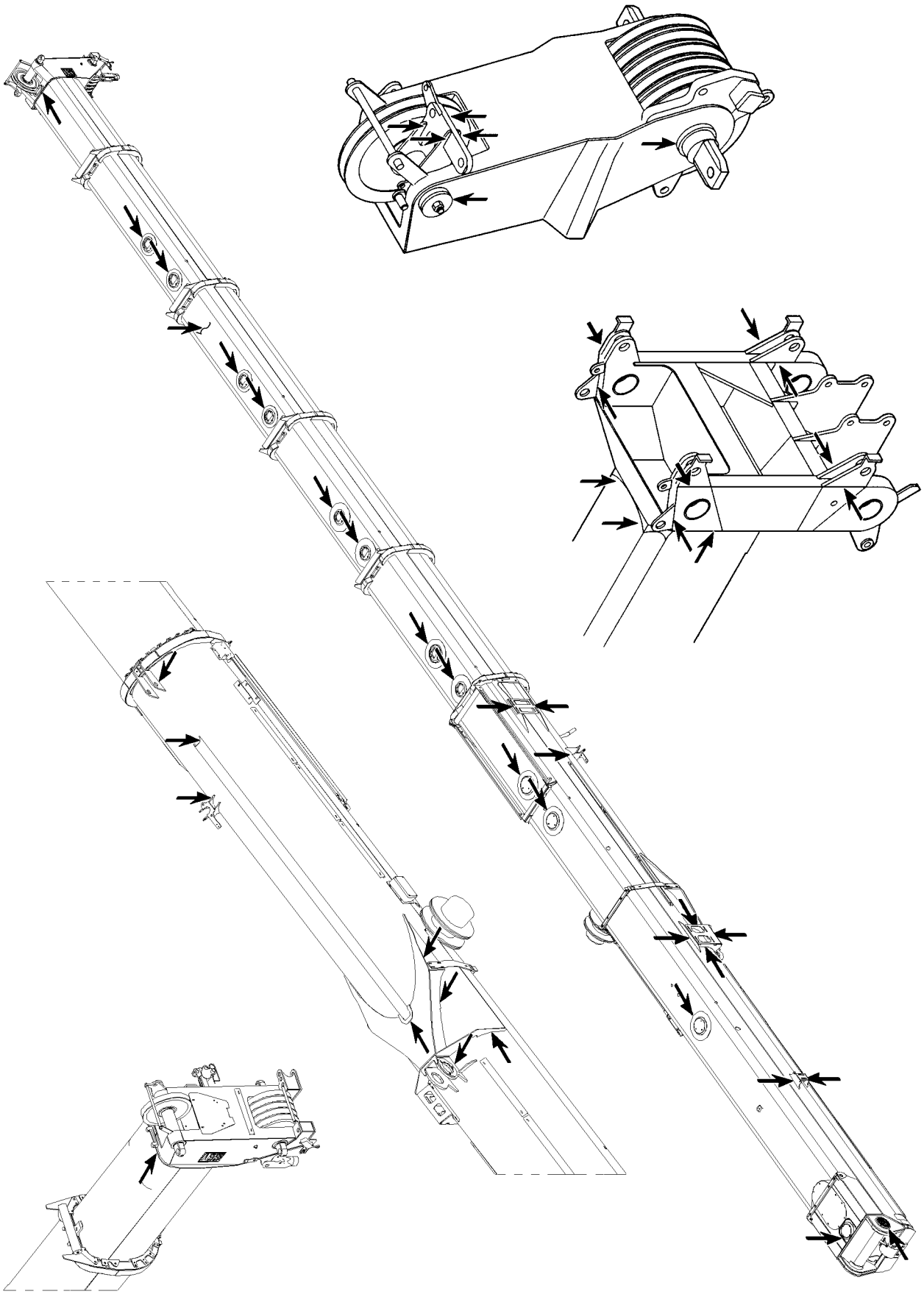


Fig.105710: Example for telescopic boom



LWE/LTR 1100-005/17505-03-02/en

Fig.105711: Example for telescopic boom

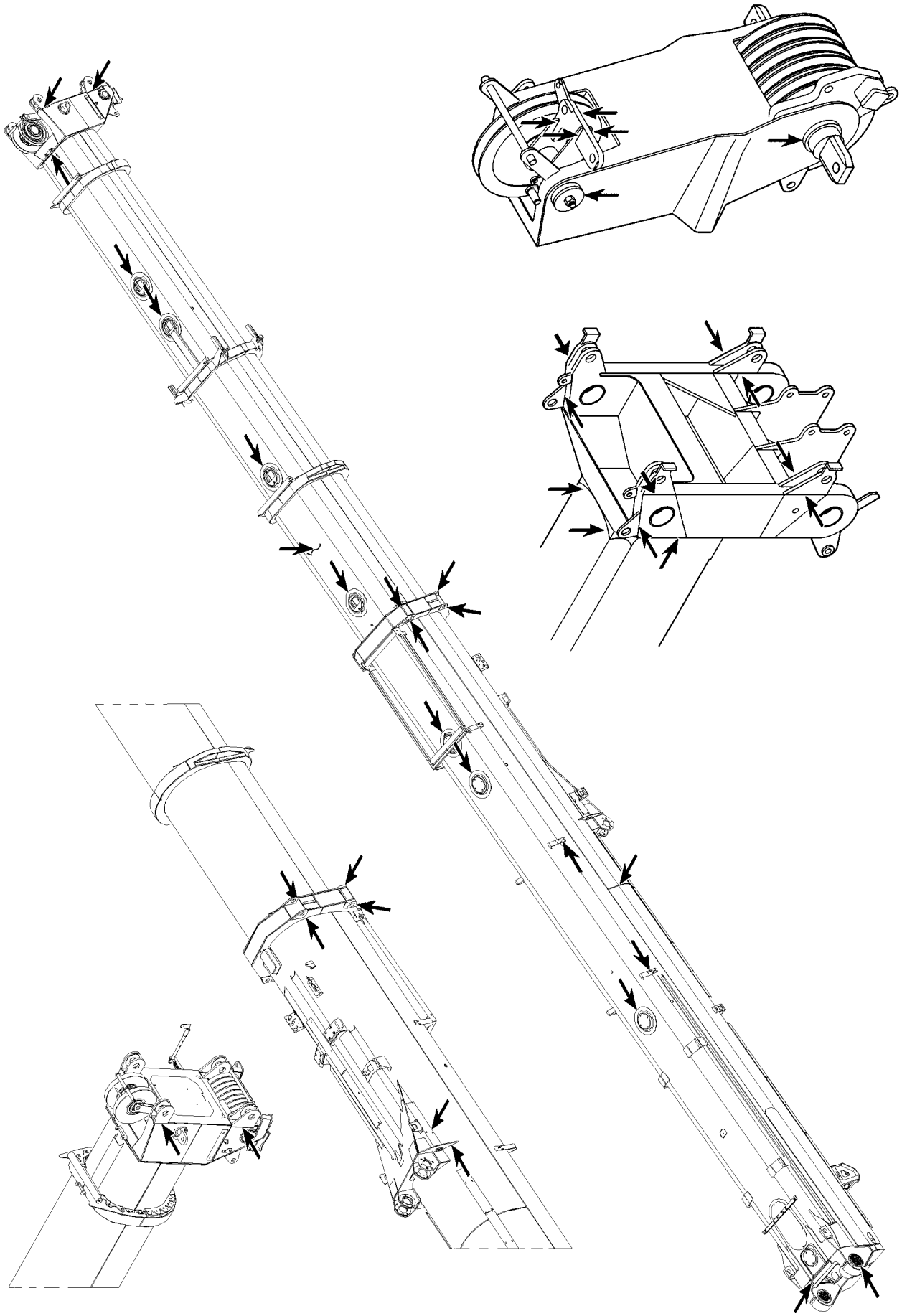


Fig.105720: Example for telescopic boom

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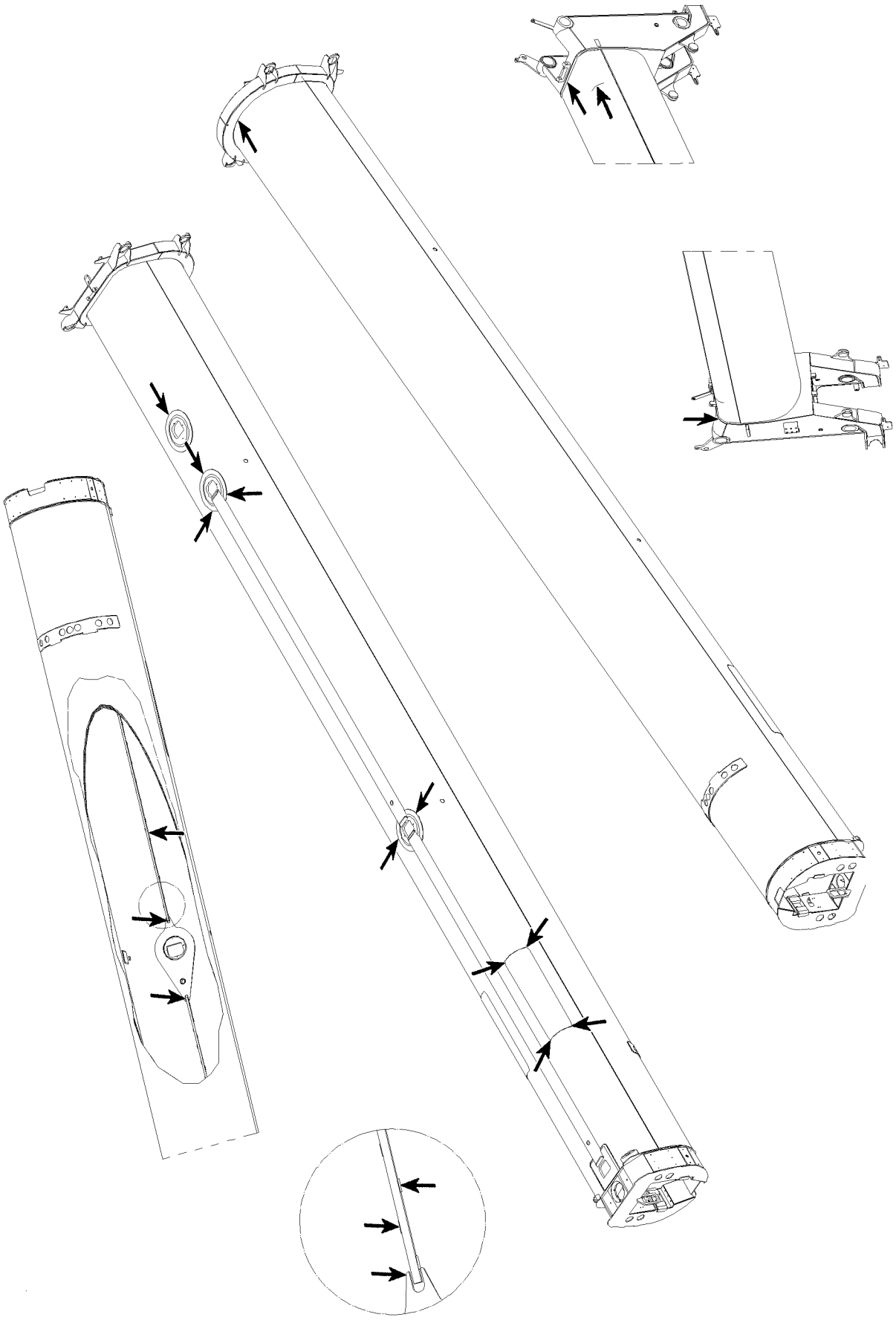
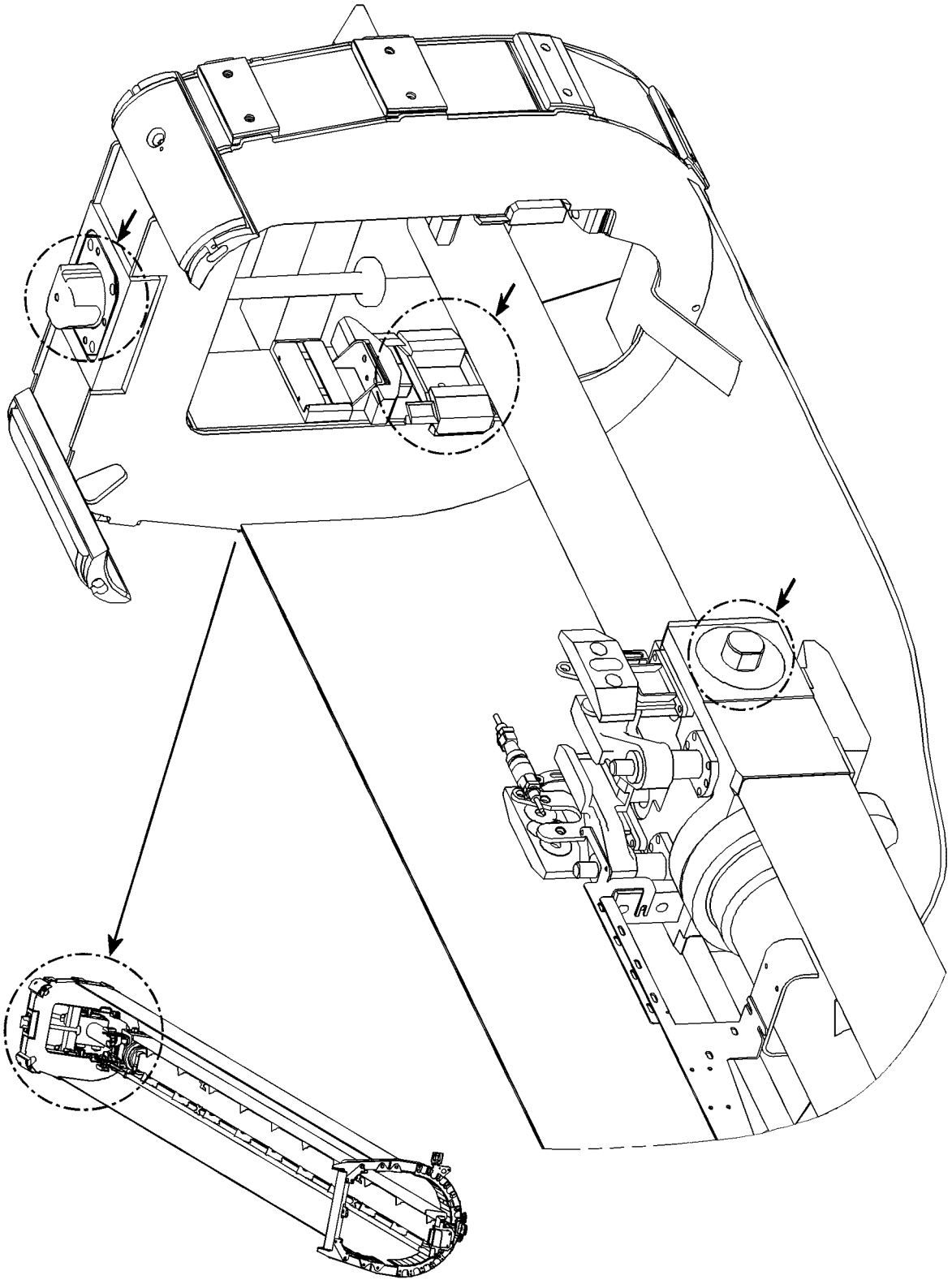


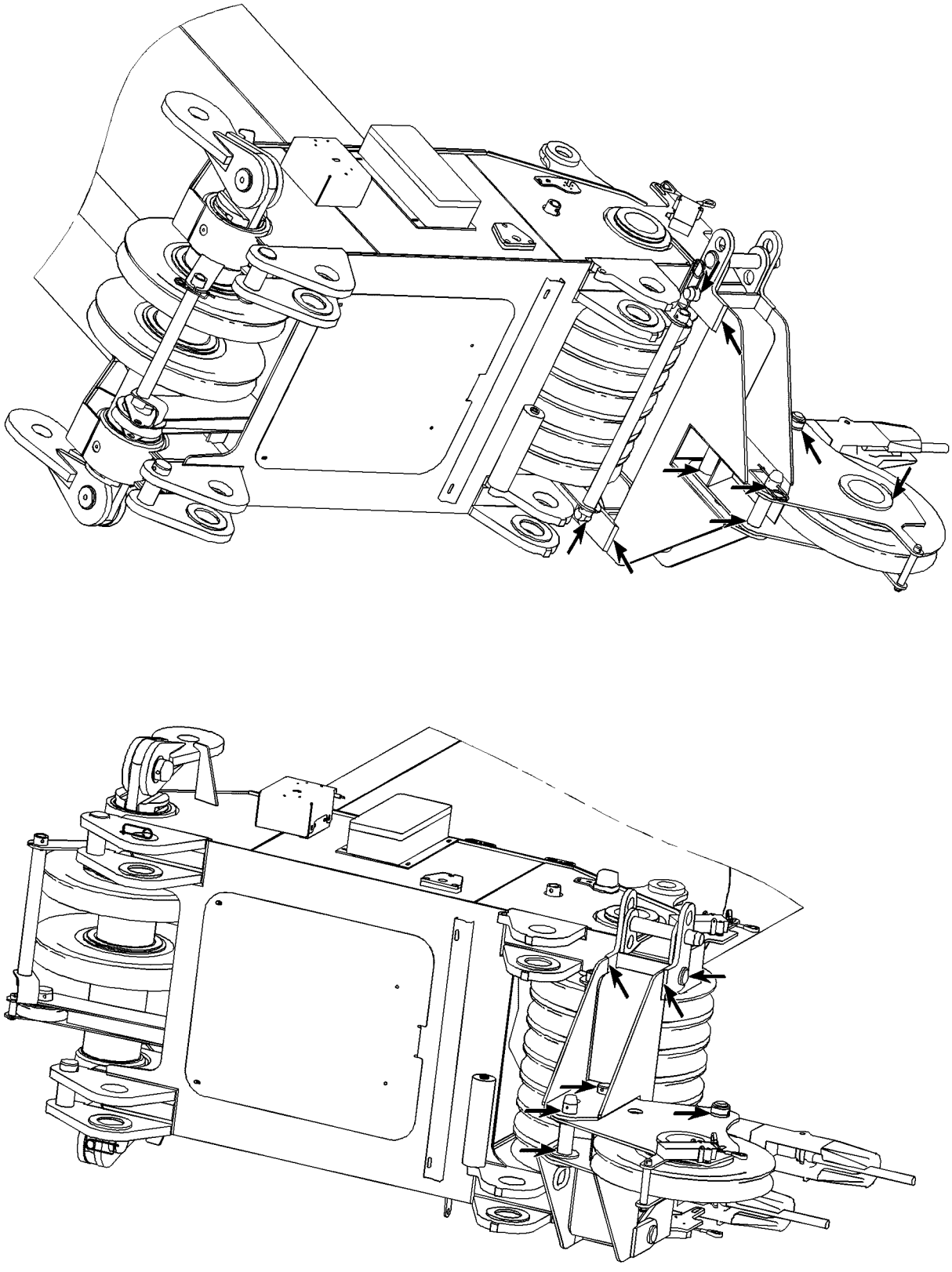
LWE/LTR 1100-005/17505-03-02/en

Fig.105721: Example for telescopic boom



LWE/LTR 1100-005/17505-03-02/en

Fig.105891: Example for push out mechanics telescopic boom



LWE/LTR 1100-005/17505-03-02/en

Fig.105892: Example for boom nose

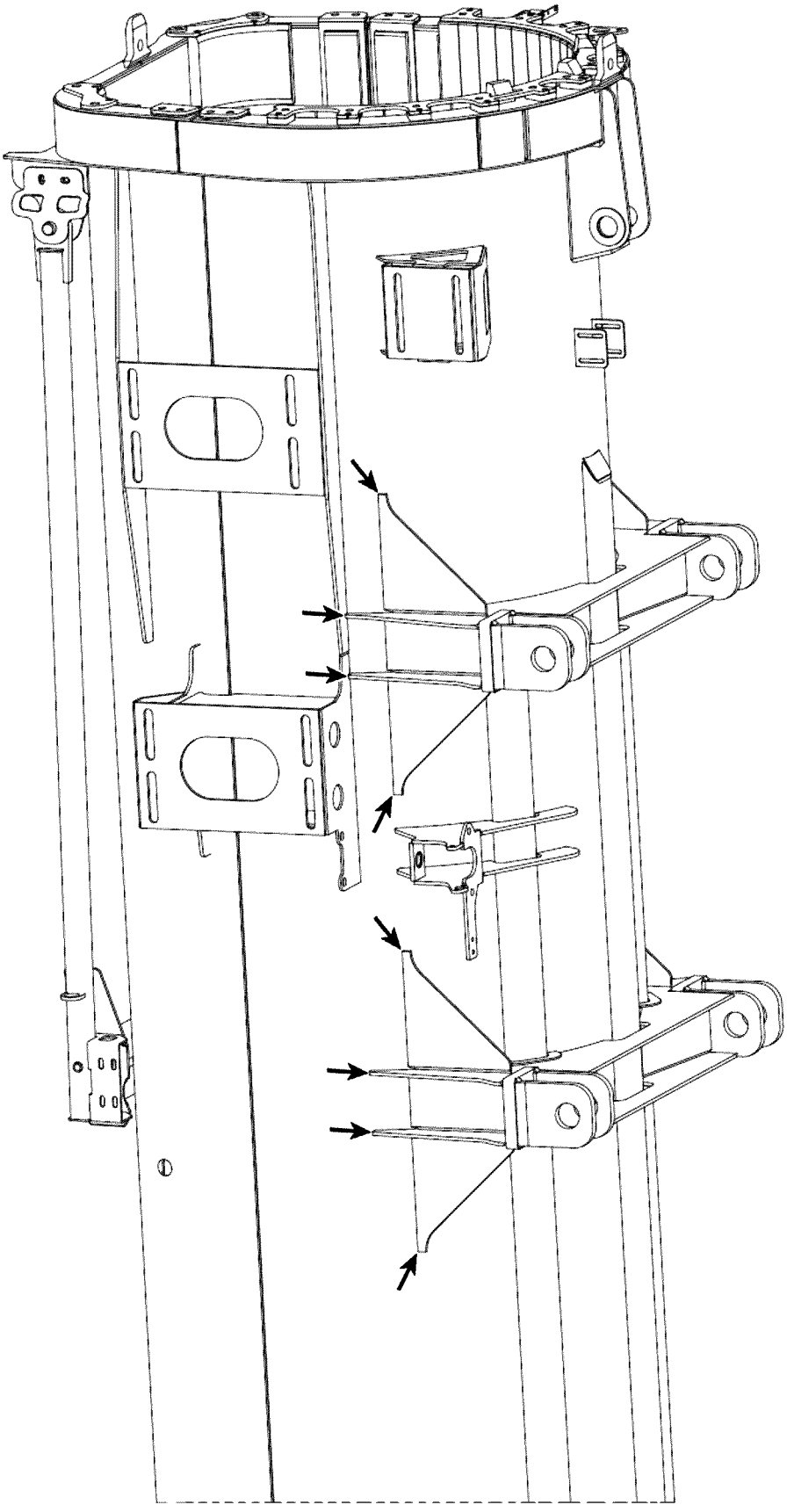


Fig.105689: Example for dolly console

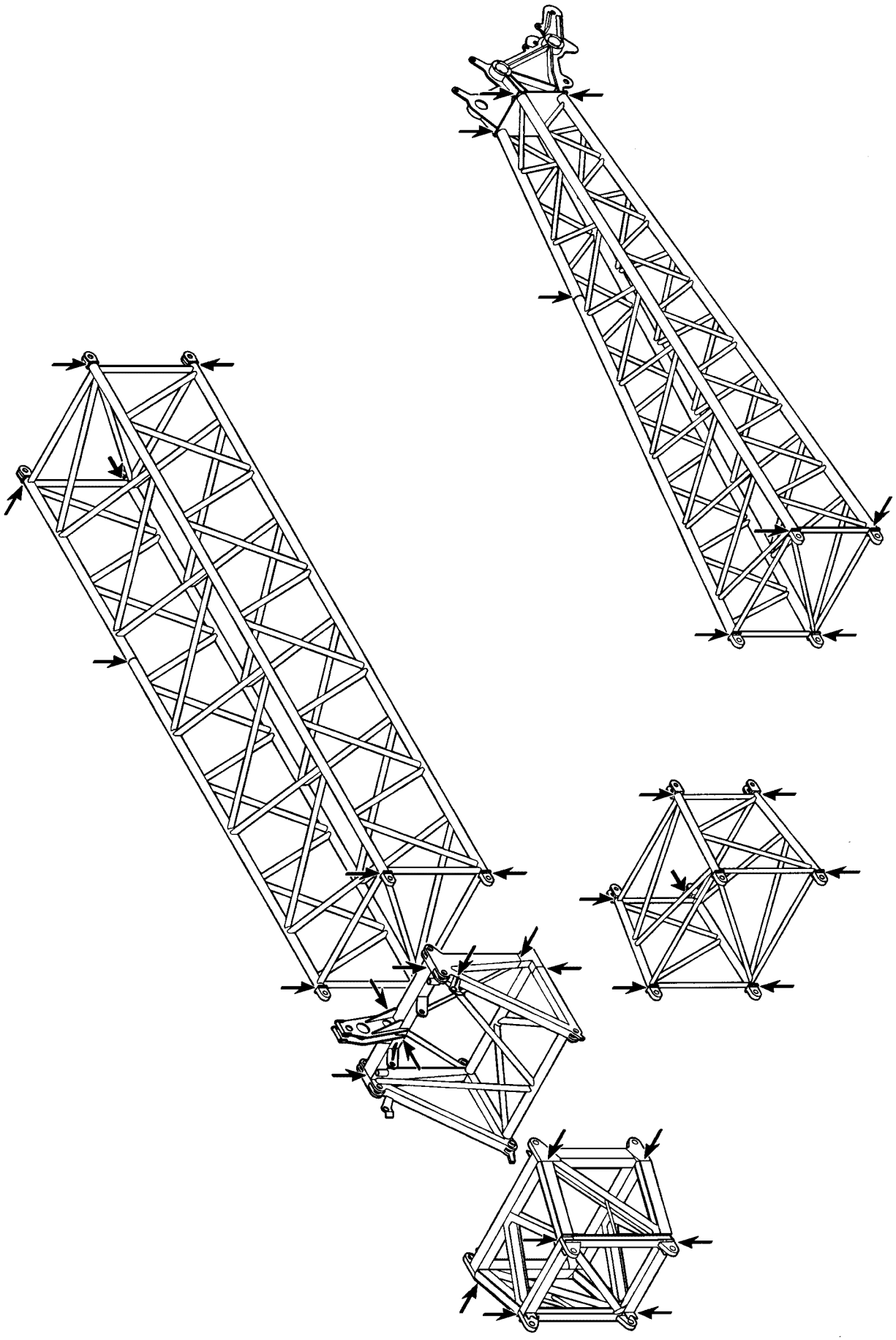


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Fig.185051: Example for lattice jib

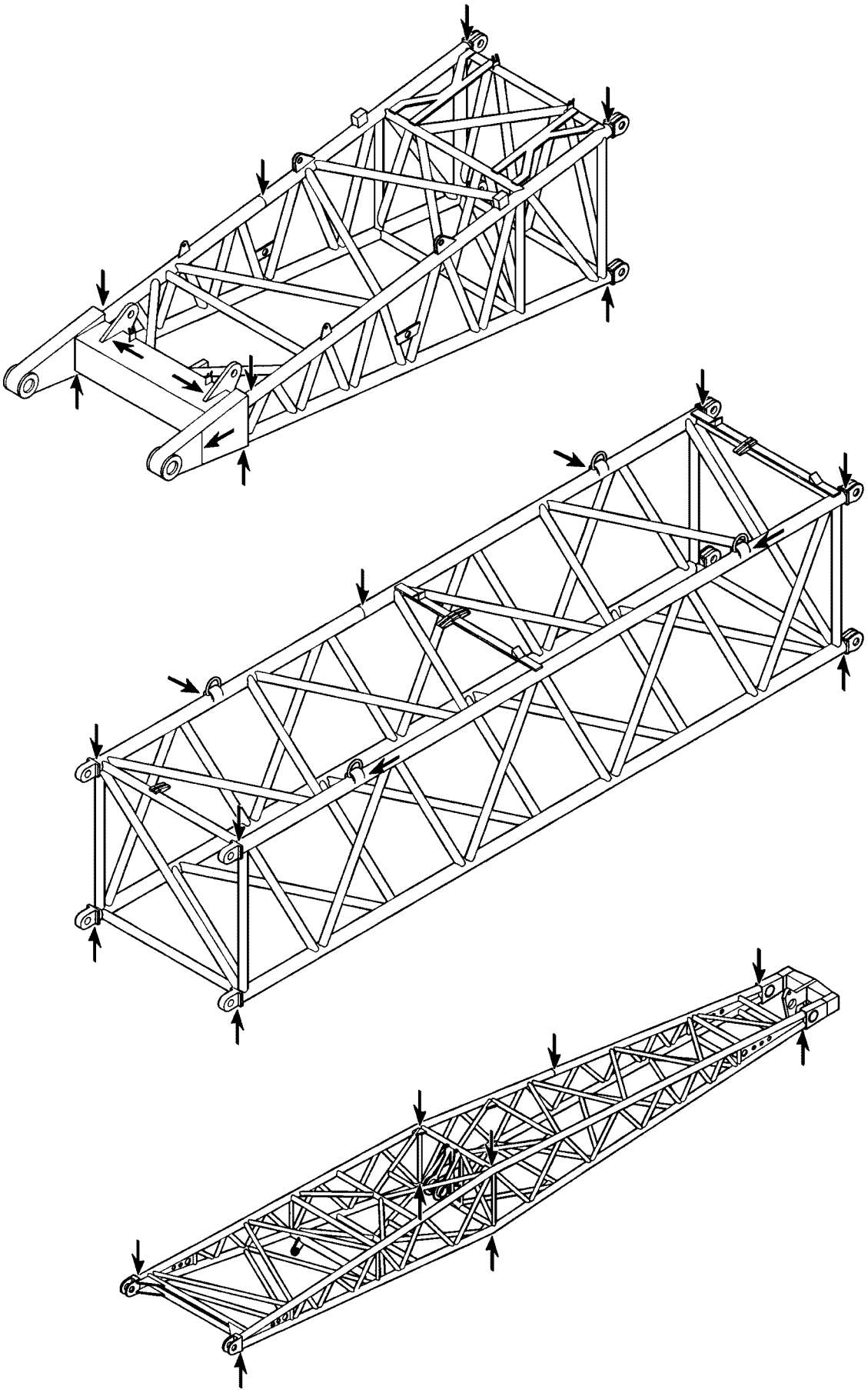
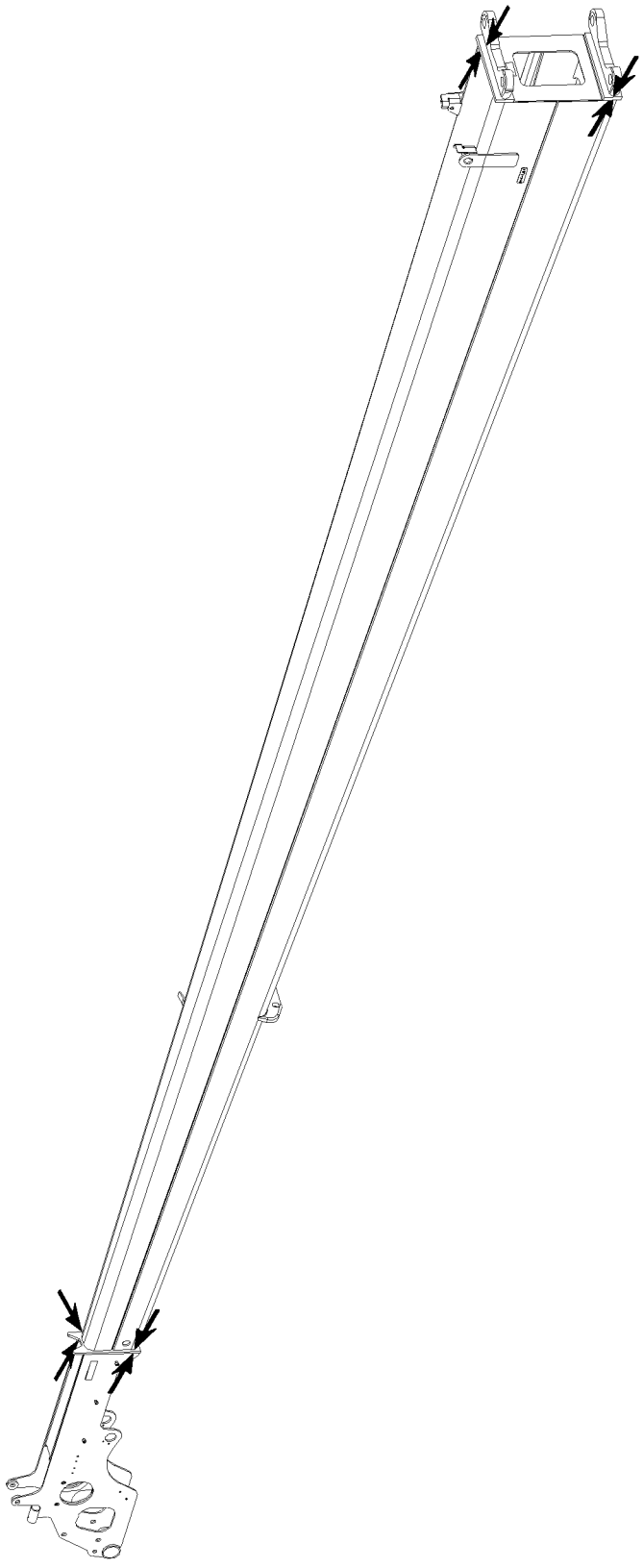


Fig.185052: Example for NA / WA-frame



LWE/LTR 1100-005/17505-03-02/en

Fig.105713: Example for end section

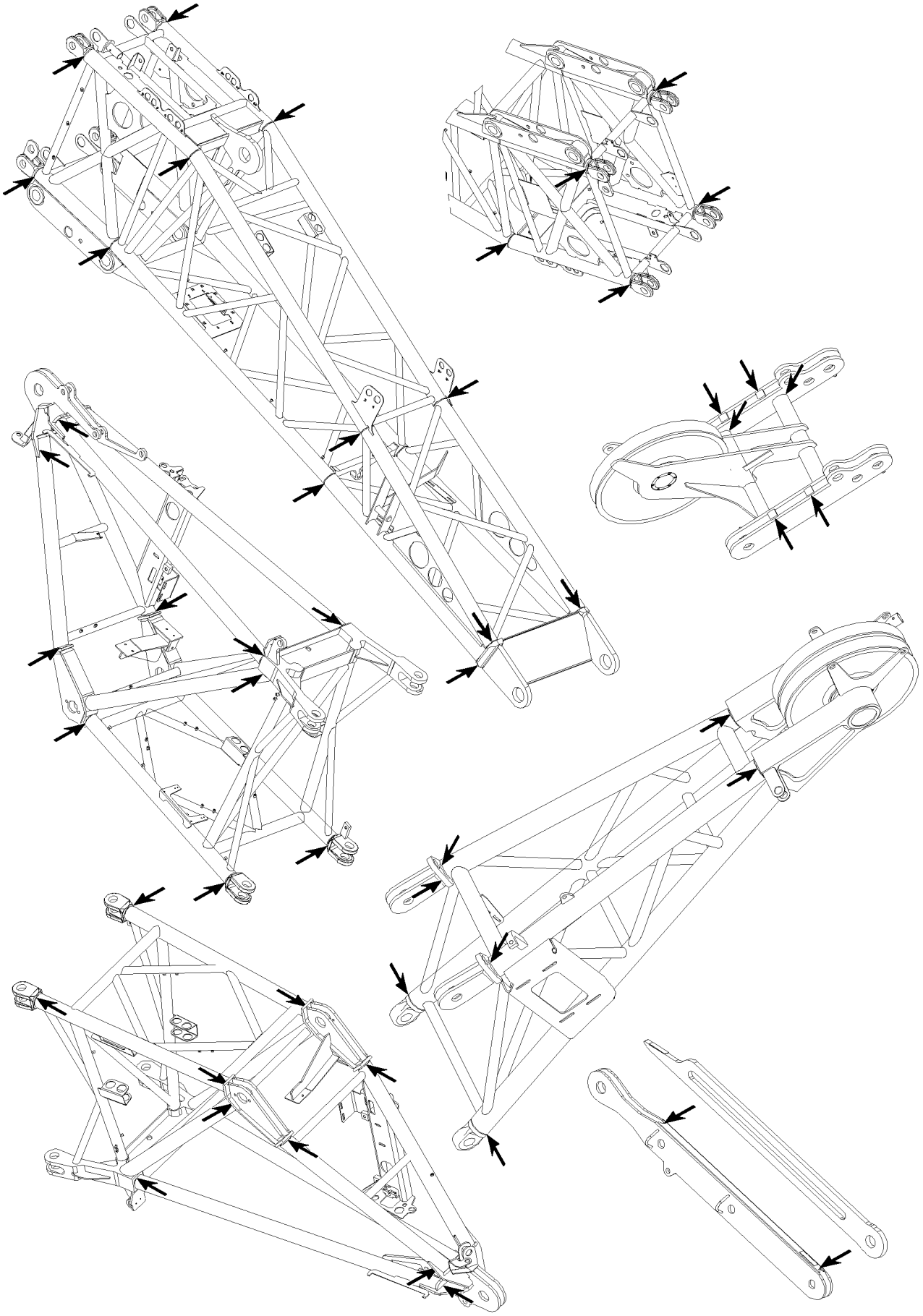


Fig.105836: Example for pivot section, adapter and boom nose

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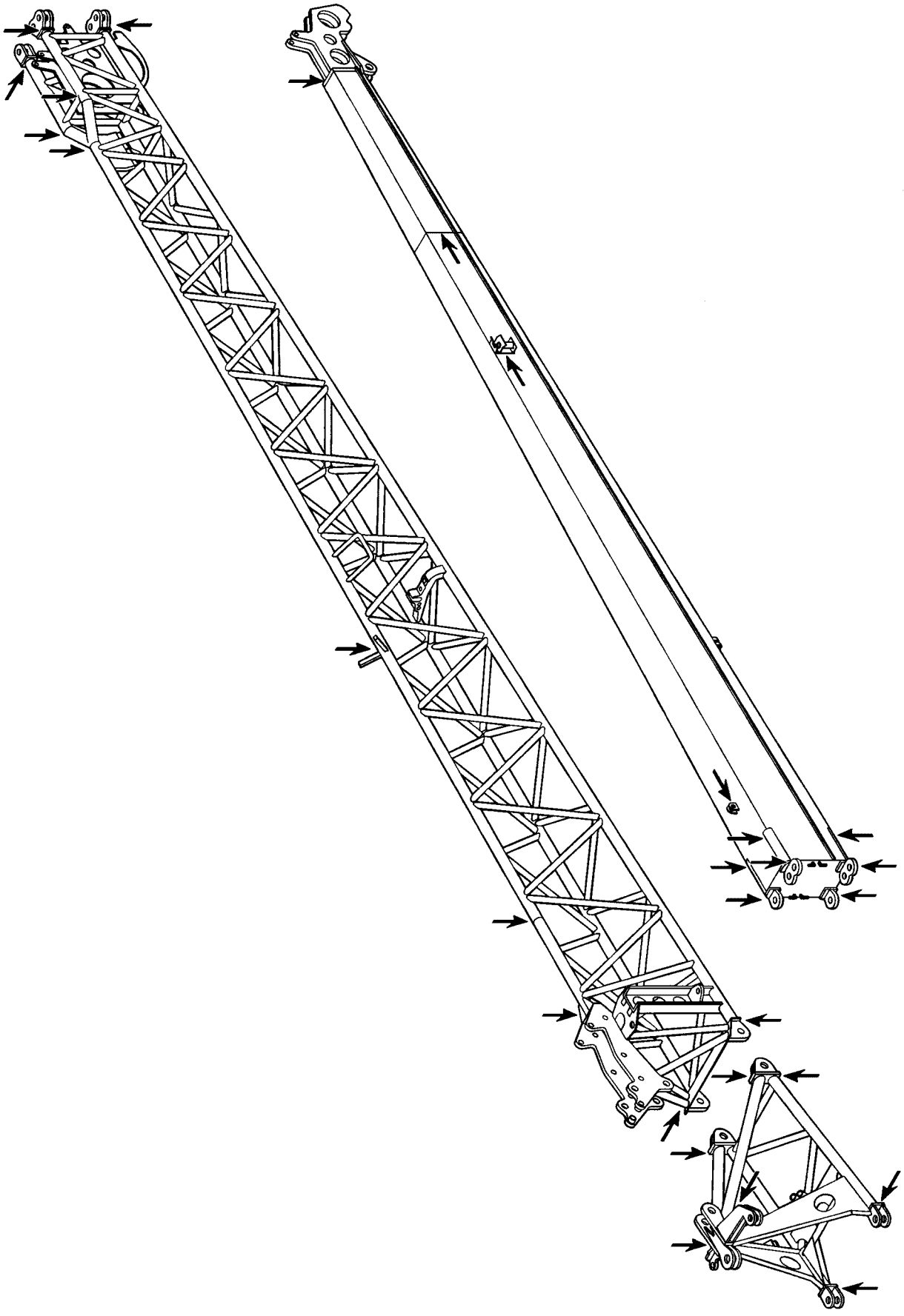
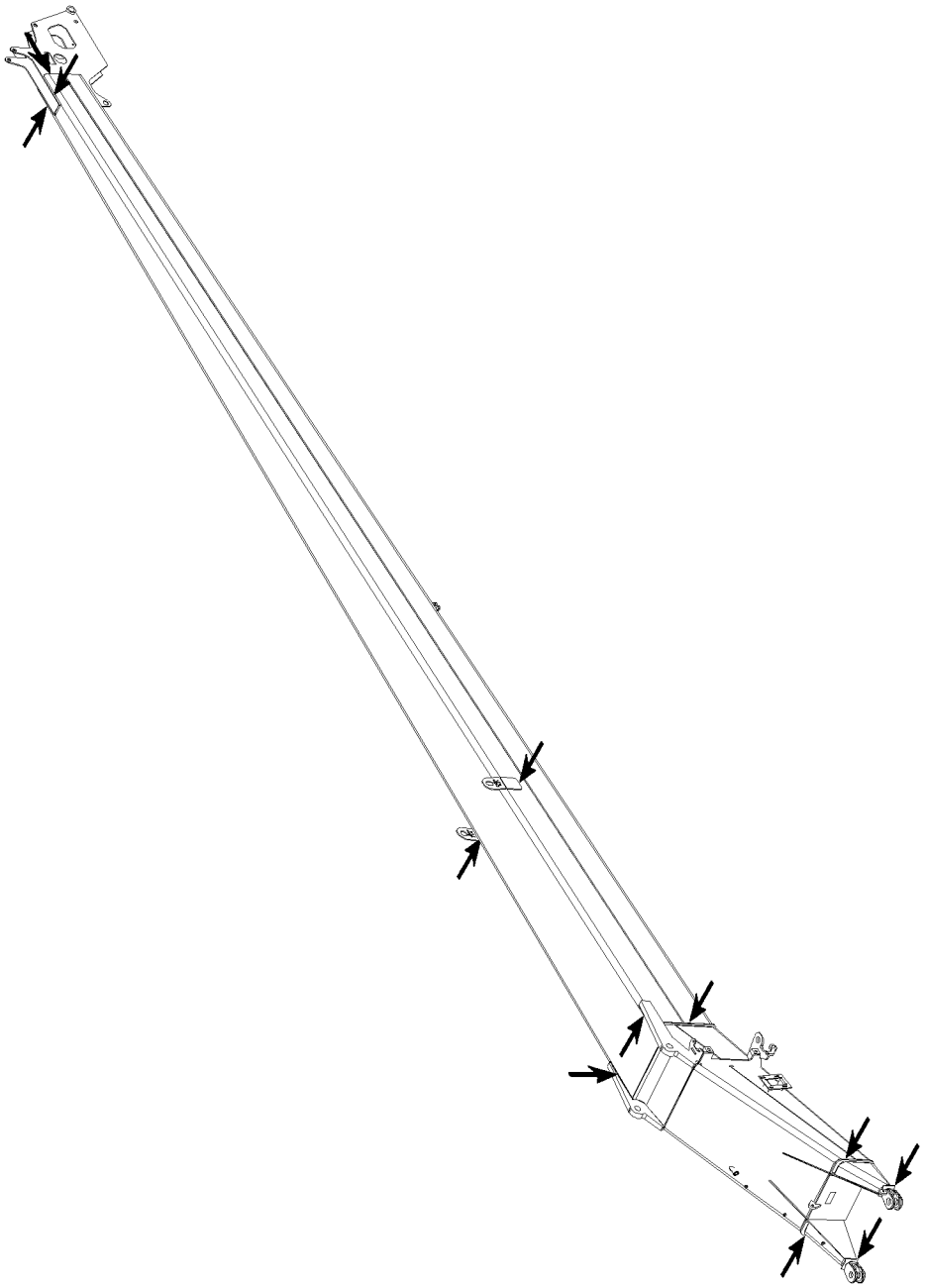


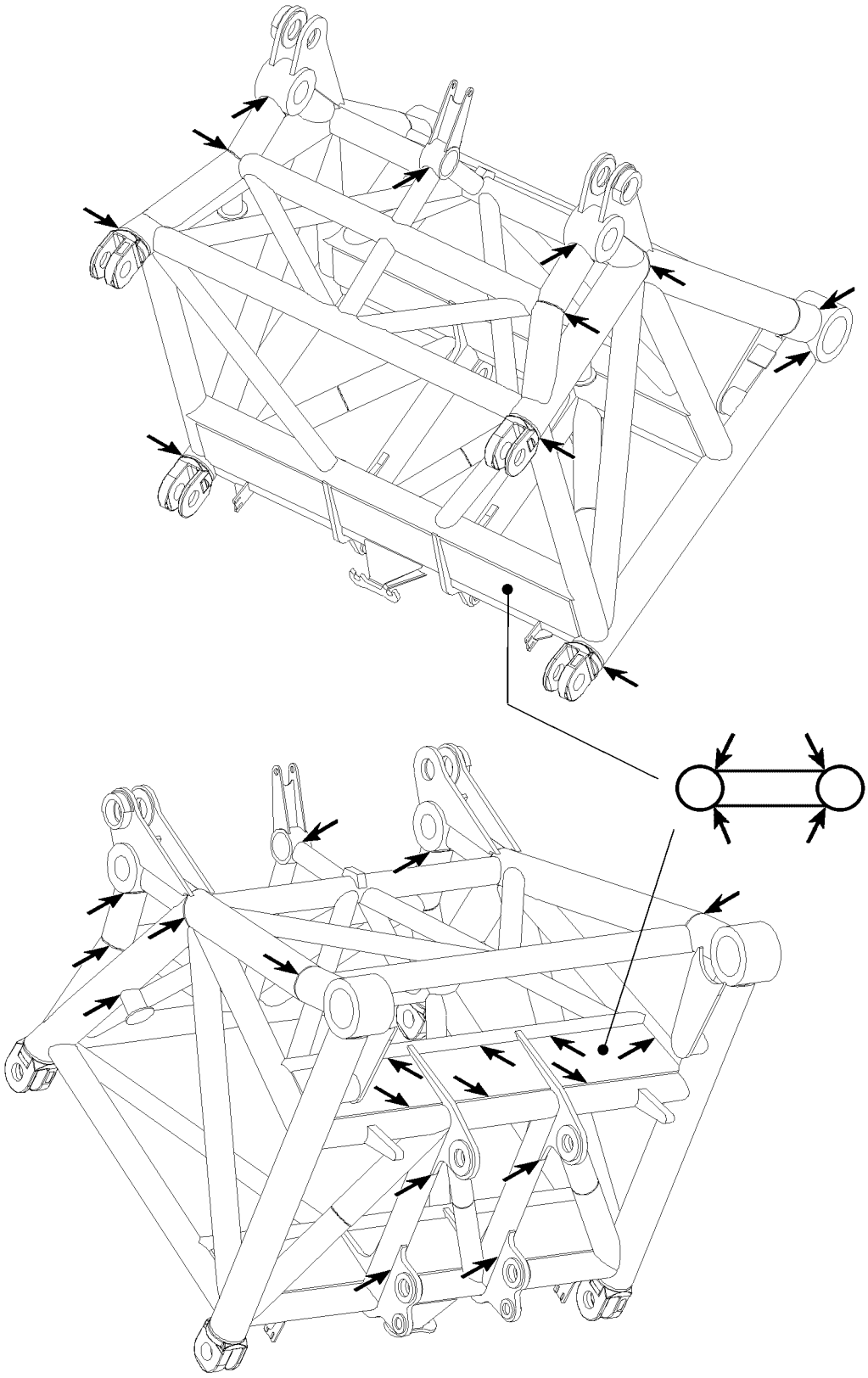
LWE/LTR 1100-005/17505-03-02/en

Fig.185058: Example for folding jib



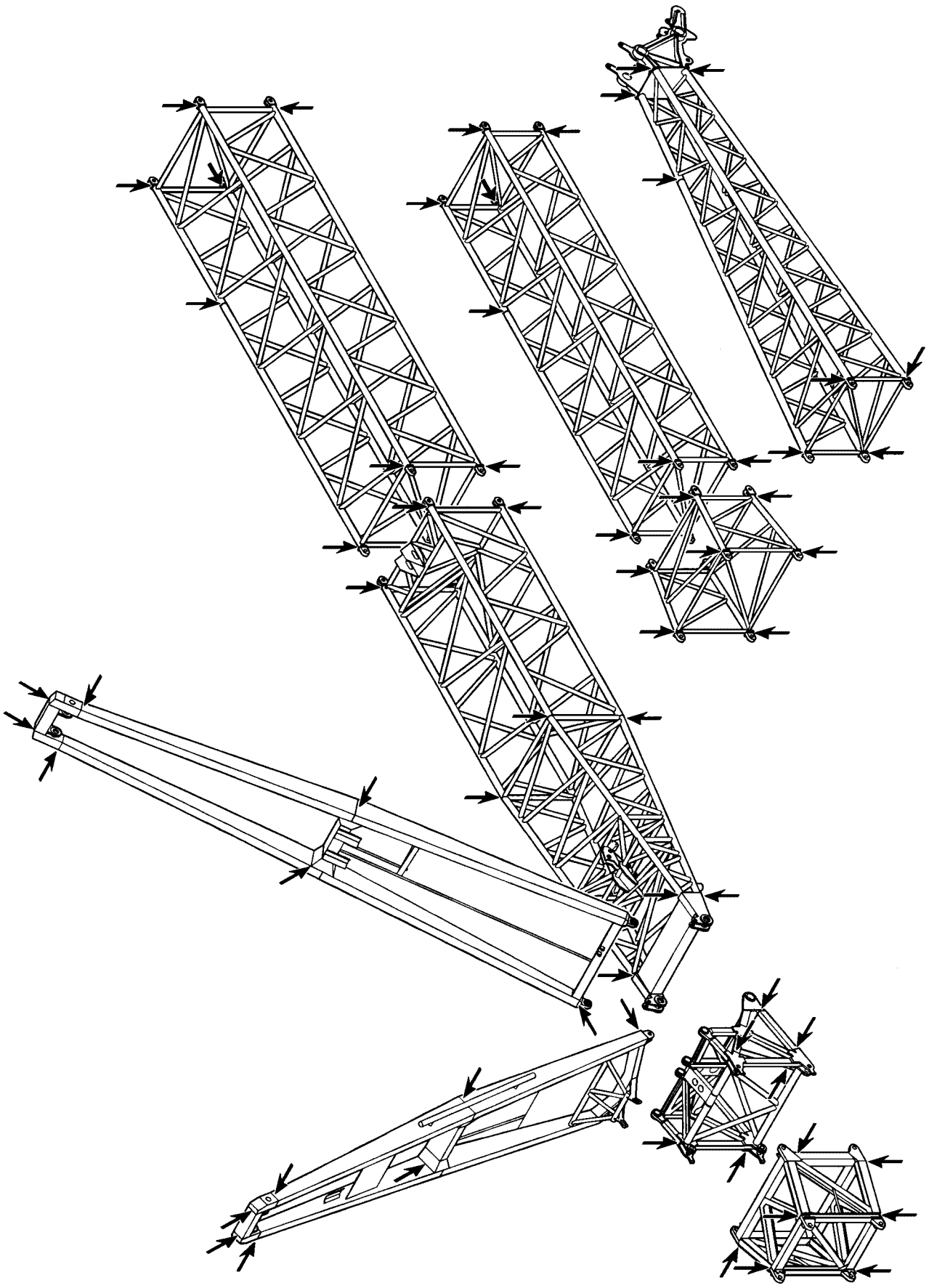
LWE/LTR 1100-005/17505-03-02/en

Fig.105697: Example for folding jib



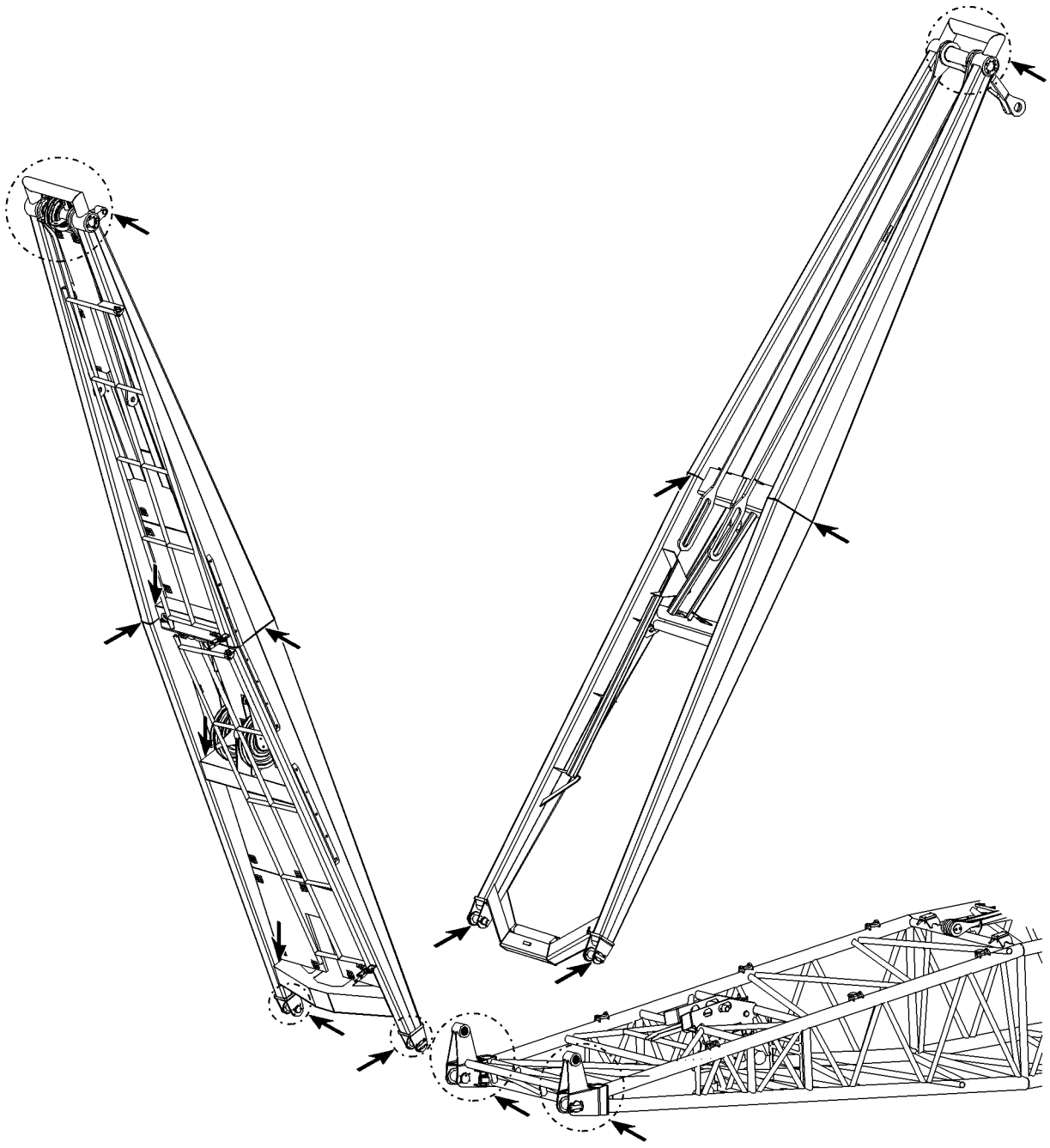
LWE/LTR 1100-005/17505-03-02/en

Fig.105732: Example for W-connector head



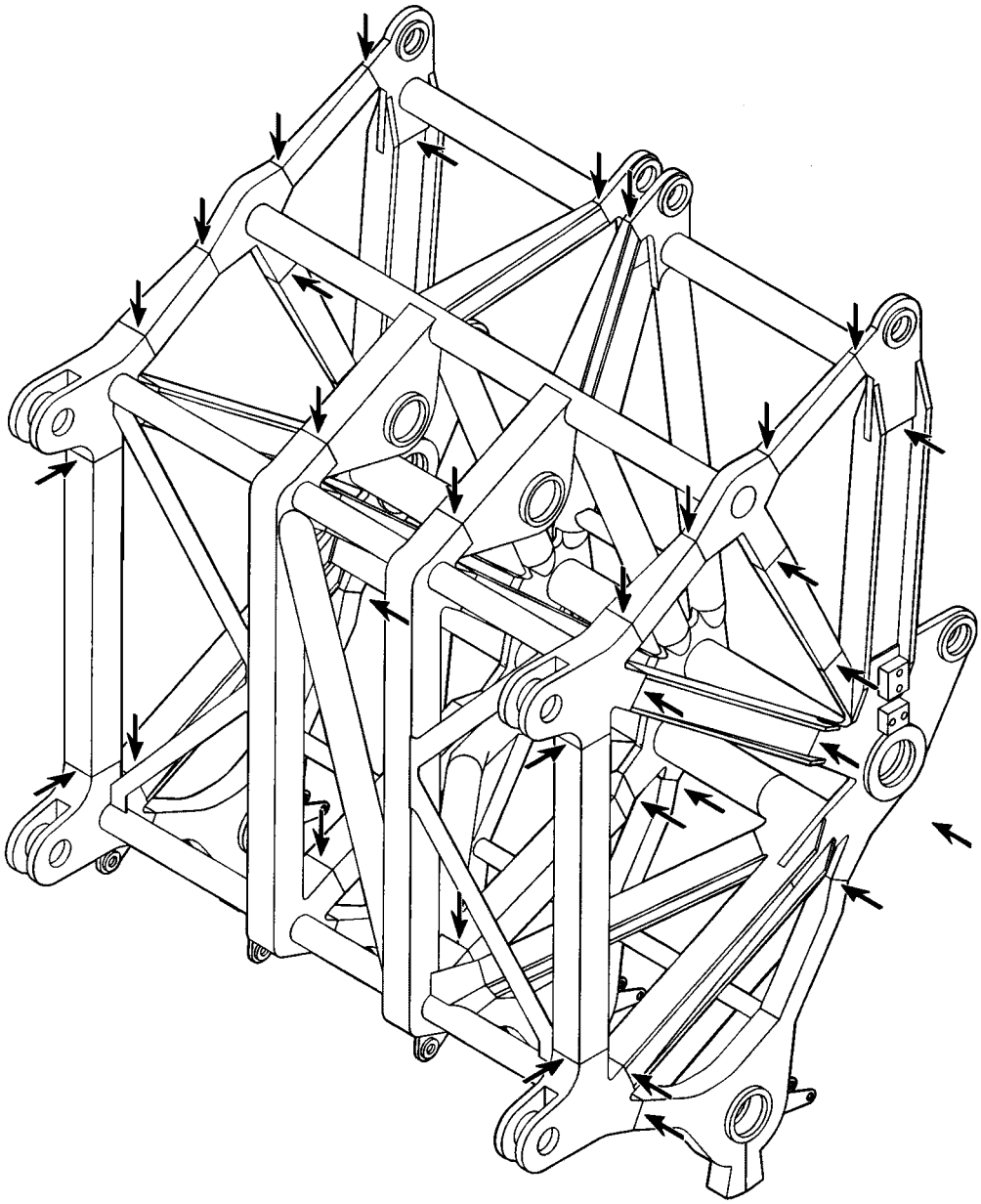
LWE/LTR 1100-005/17505-03-02/en

Fig.185053: Example for assembly unit with lattice jib



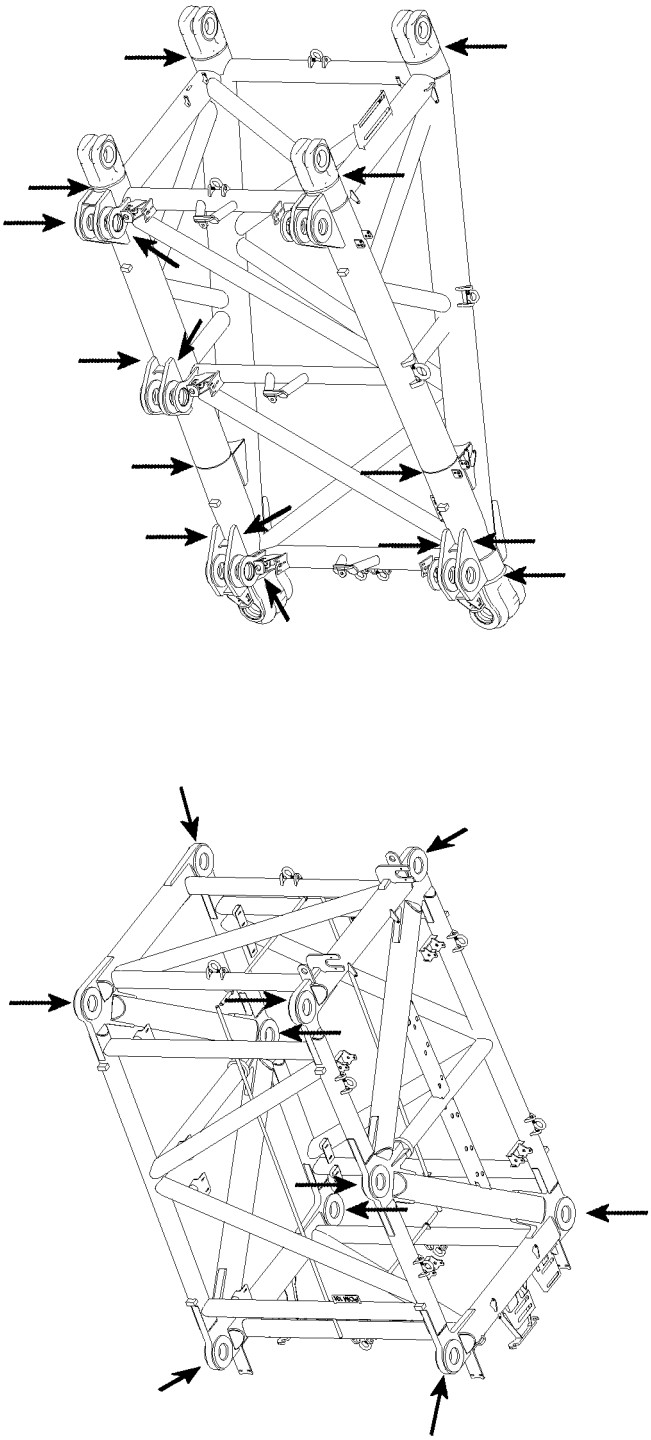
LWE/LTR 1100-005/17505-03-02/en

Fig.105838: Example for NA frames



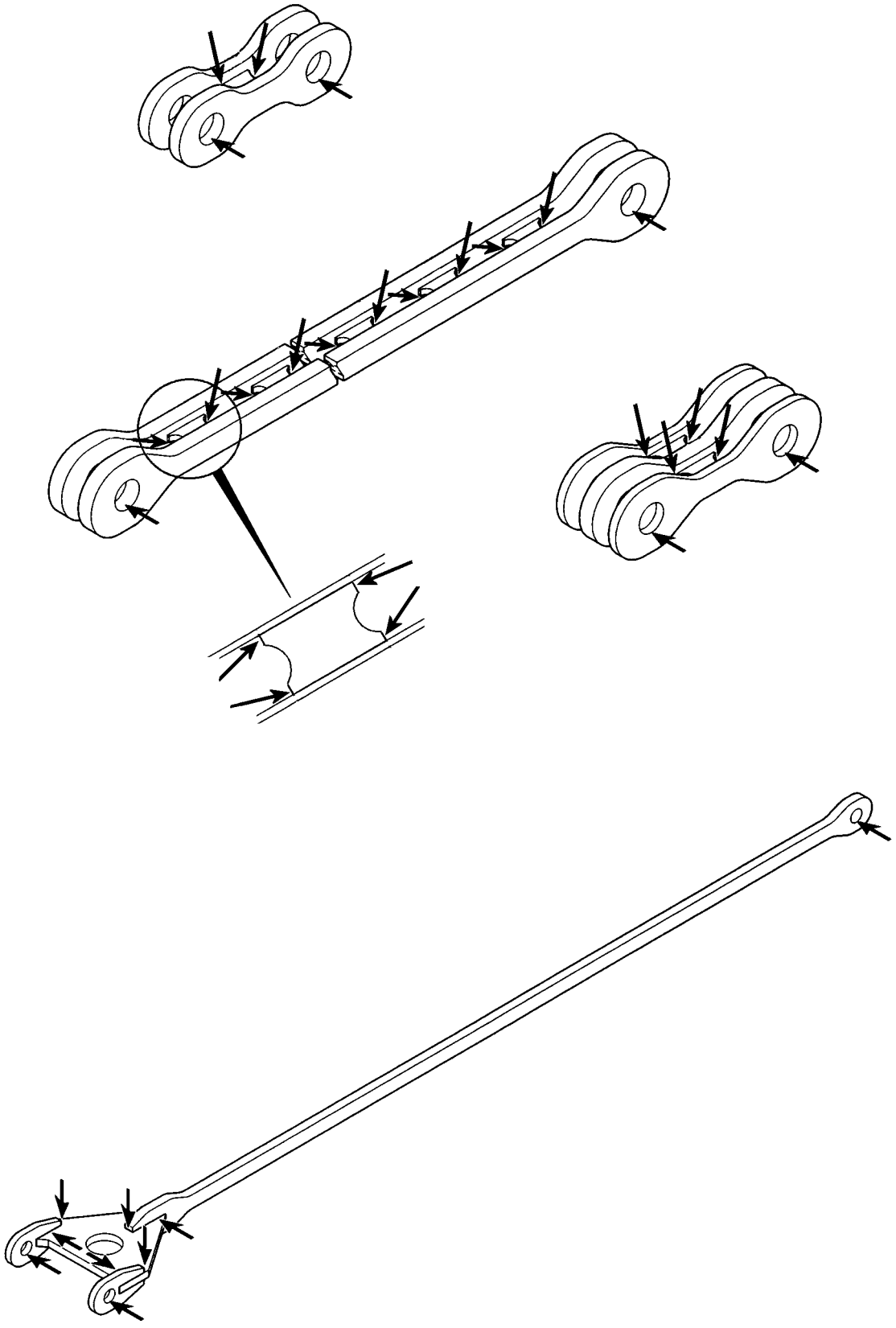
LWE/LTR 1100-005/17505-03-02/en

Fig.185054: Example for pulley head



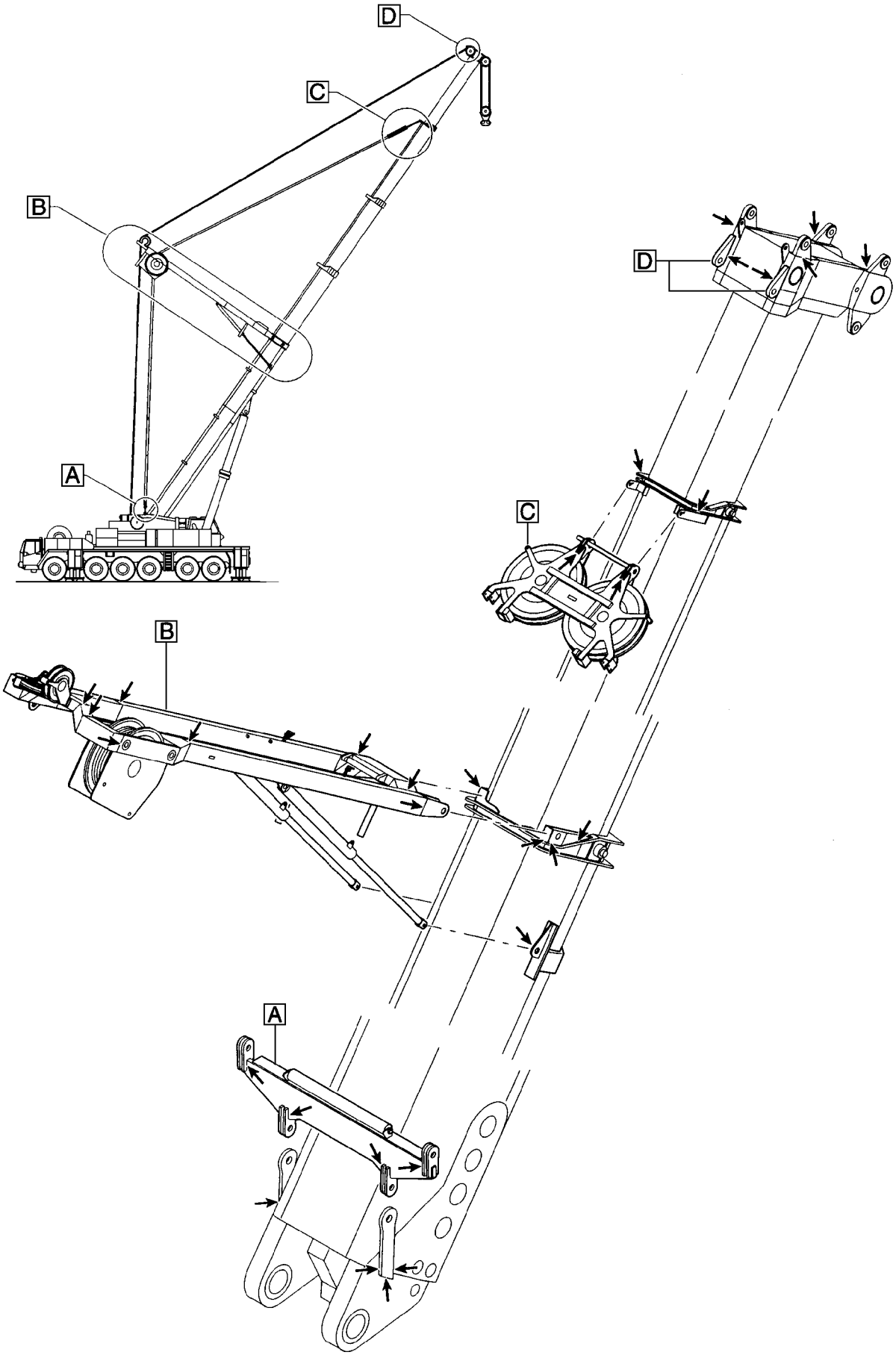
LWE/LTR 1100-005/17505-03-02/en

Fig.116609: Example for P-adapter



LWE/LTR 1100-005/17505-03-02/en

Fig.185055: Example for guy rod



LWE/LTR 1100-005/17505-03-02/en

Fig.185059: Example for TA-guying

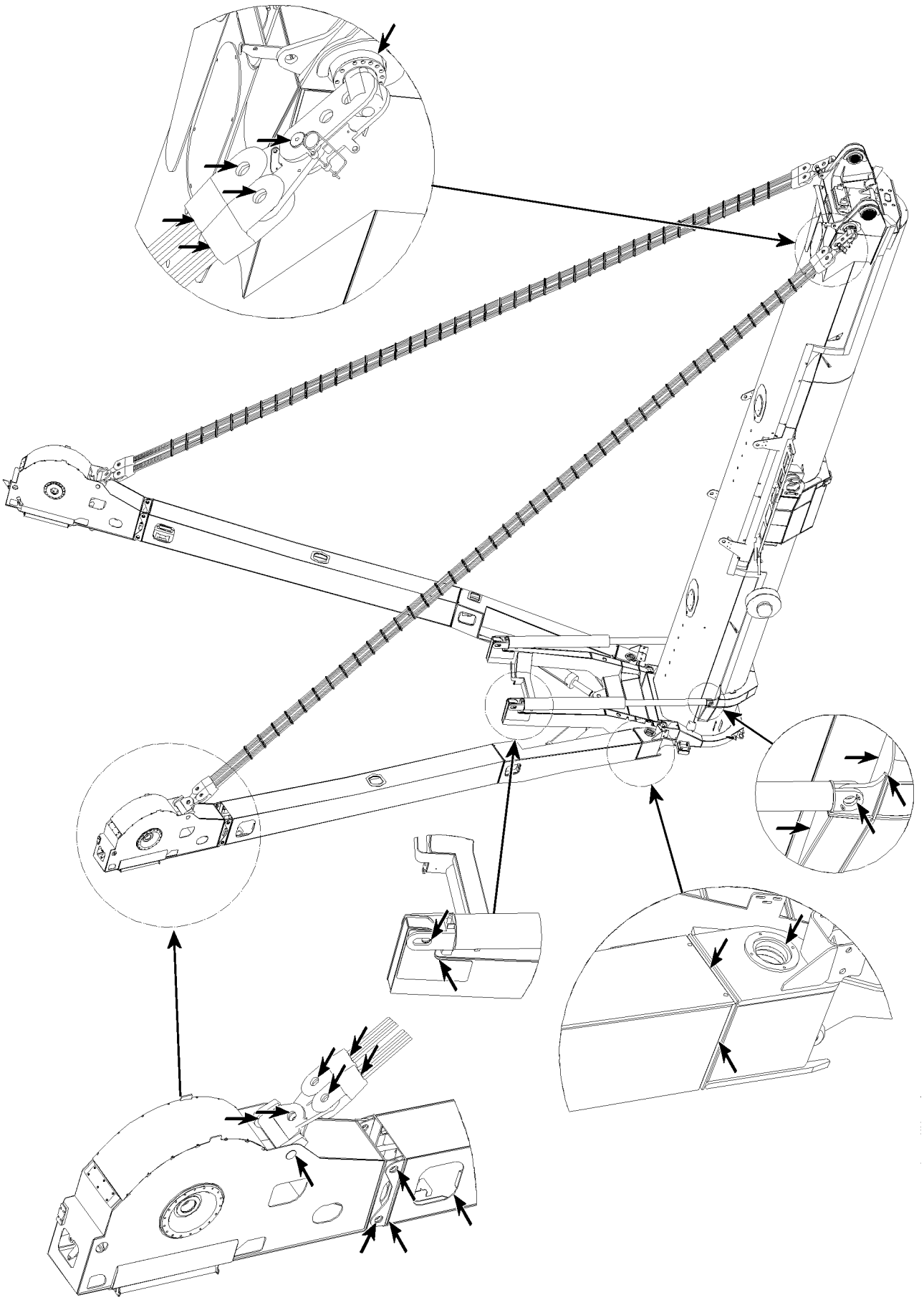
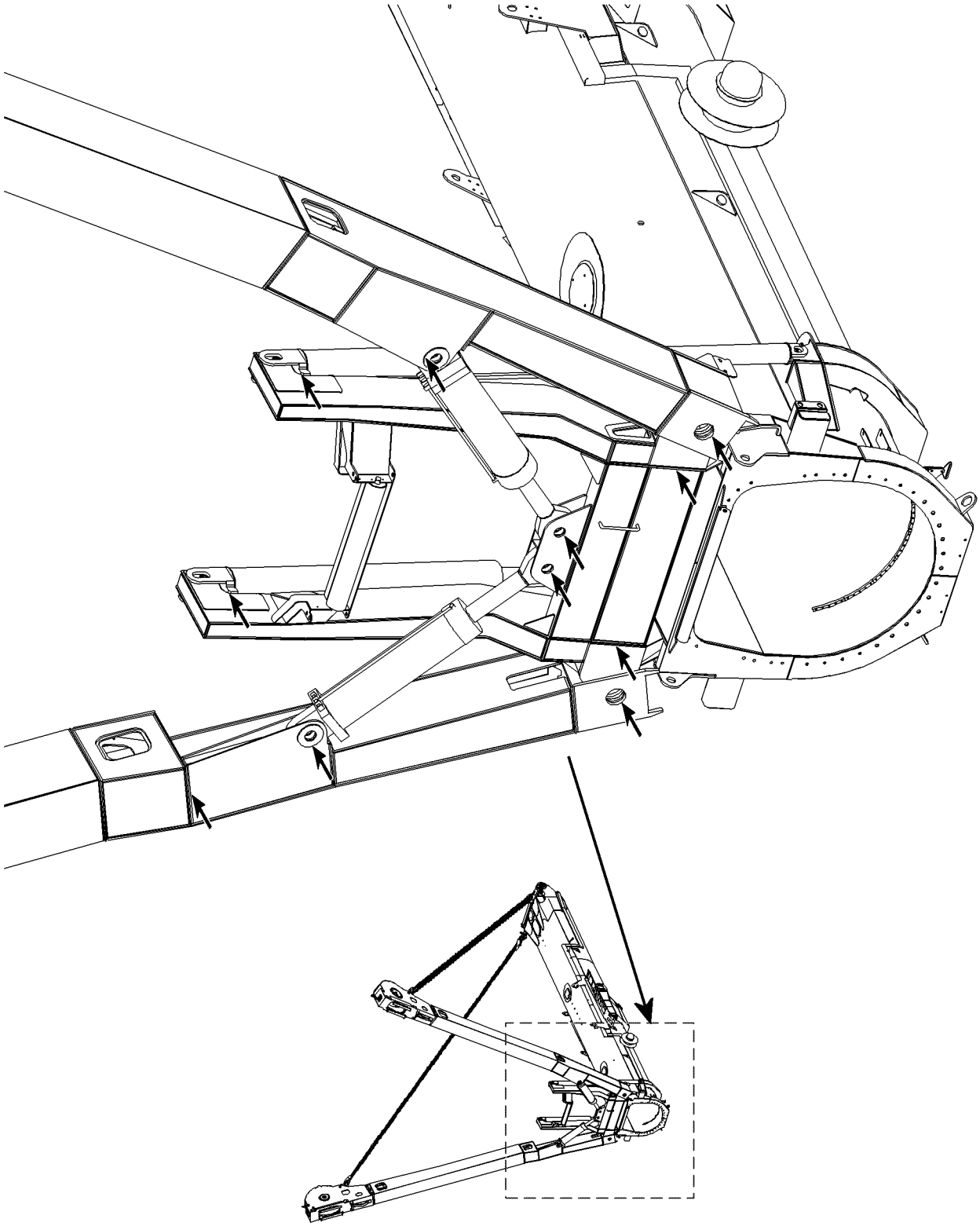


Fig.105707: Example for TY-guying

LWE/LTR 1100-005/17505-03-02/en



LWE/LTR 1100-005/17505-03-02/en

Fig.105708: Example for TY-guying

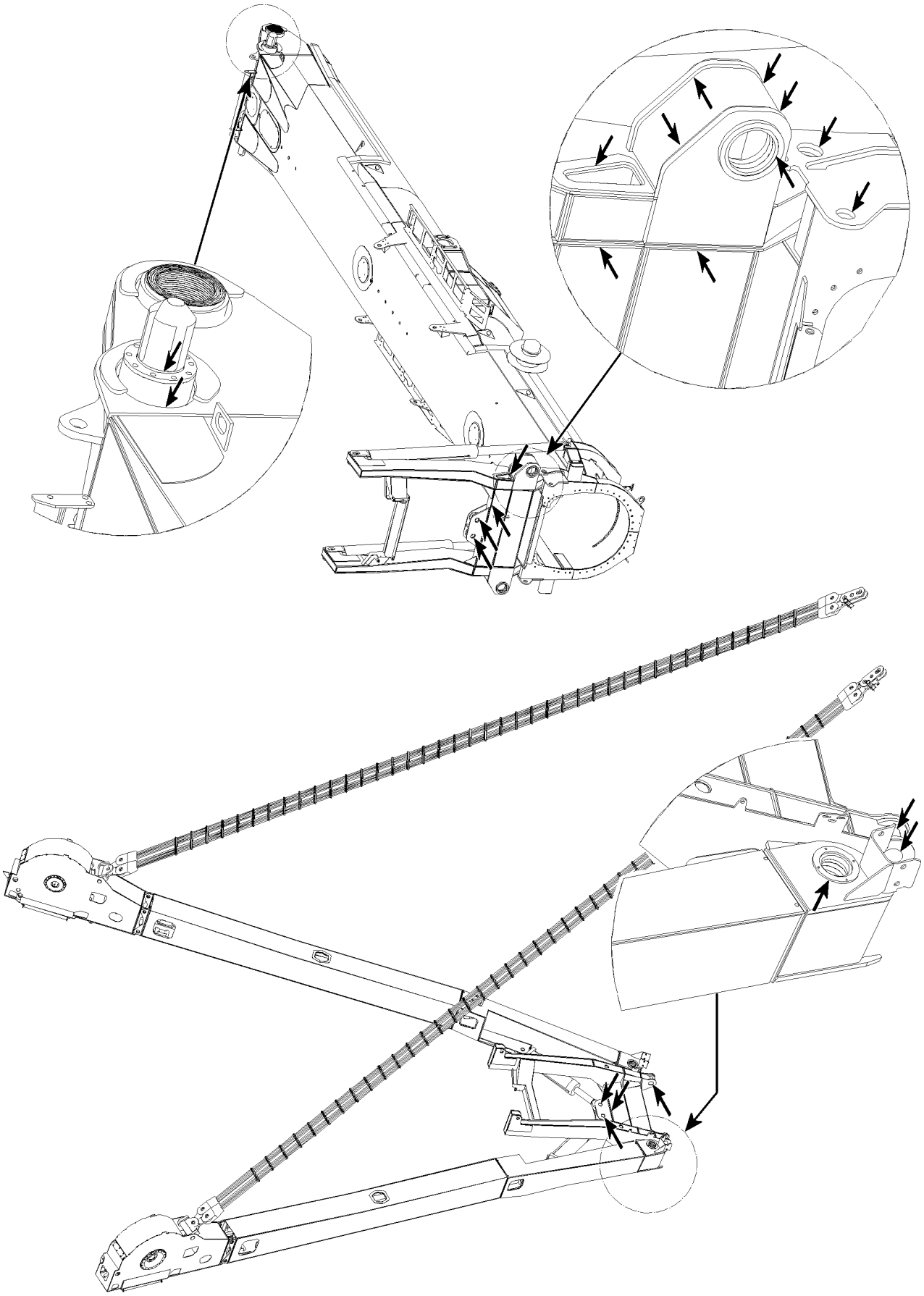


Fig.105709: Example for TY-guying

2.4 Inspection of 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!

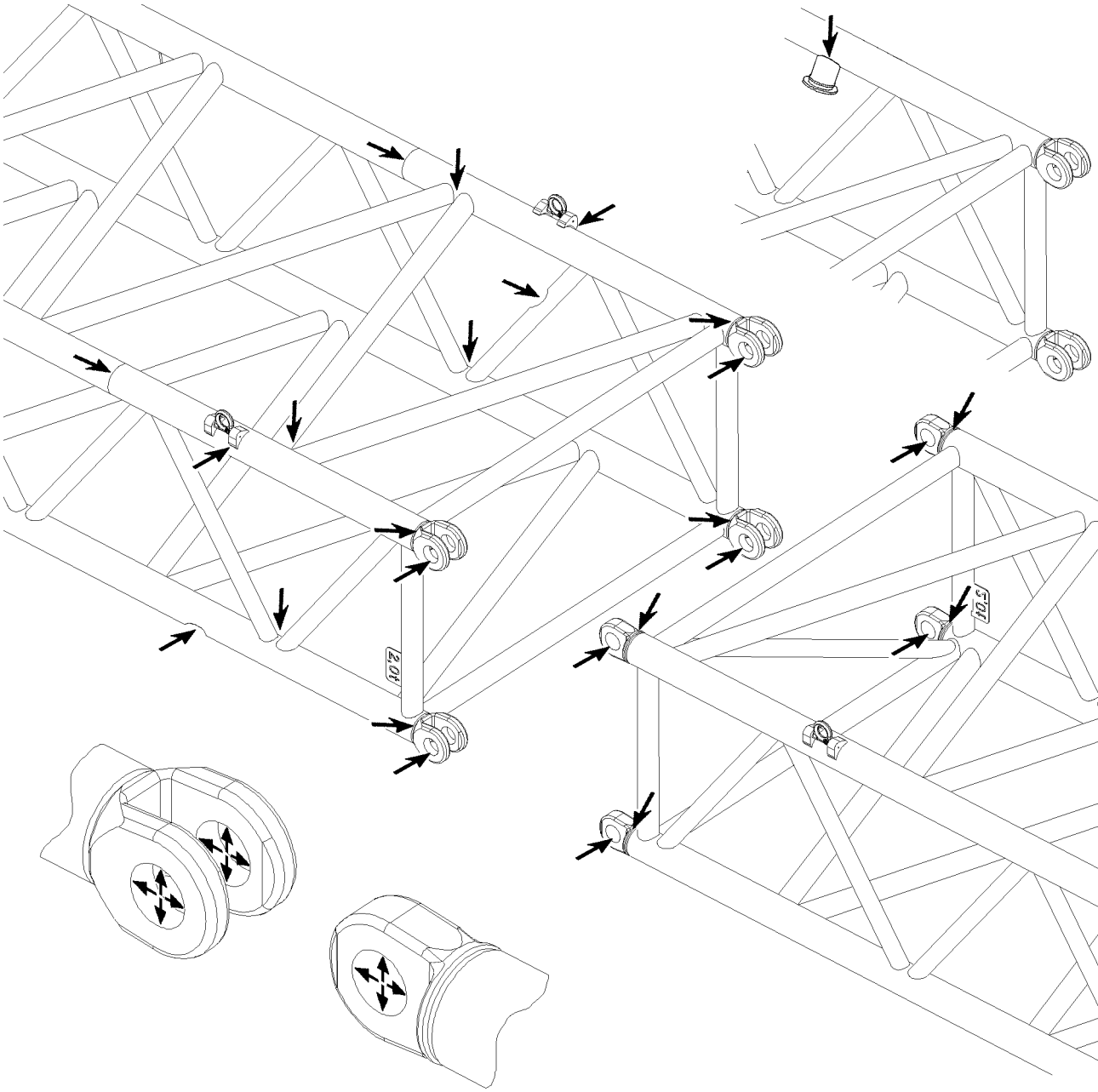


Fig.121023: Example for lattice sections

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3 Inspection of the rope feed mechanism in the telescopic boom

3.1 Checking the ropes of the rope feed mechanism

- For inspection of rope end mounts, see Crane operating instructions, chapter 7.05.
- For inspection of the pretension on the retraction ropes, see Crane operating instructions, chapter 7.05.
- Inspection of ropes for damage according to ISO 4309, see Crane operating instructions, chapter 8.04.

3.2 Checking the change over pulleys of the rope feed mechanism

DANGER
Danger of accident in case of damage or cracks!
▶ Replace the change over pulley immediately!

Check the entire change over pulley assemblies for damage and cracks once a year.

Also check for wear in the rope groove. Replace the change over pulley if the bottom of the rope groove has been run down up to 1/4 of the rope diameter.

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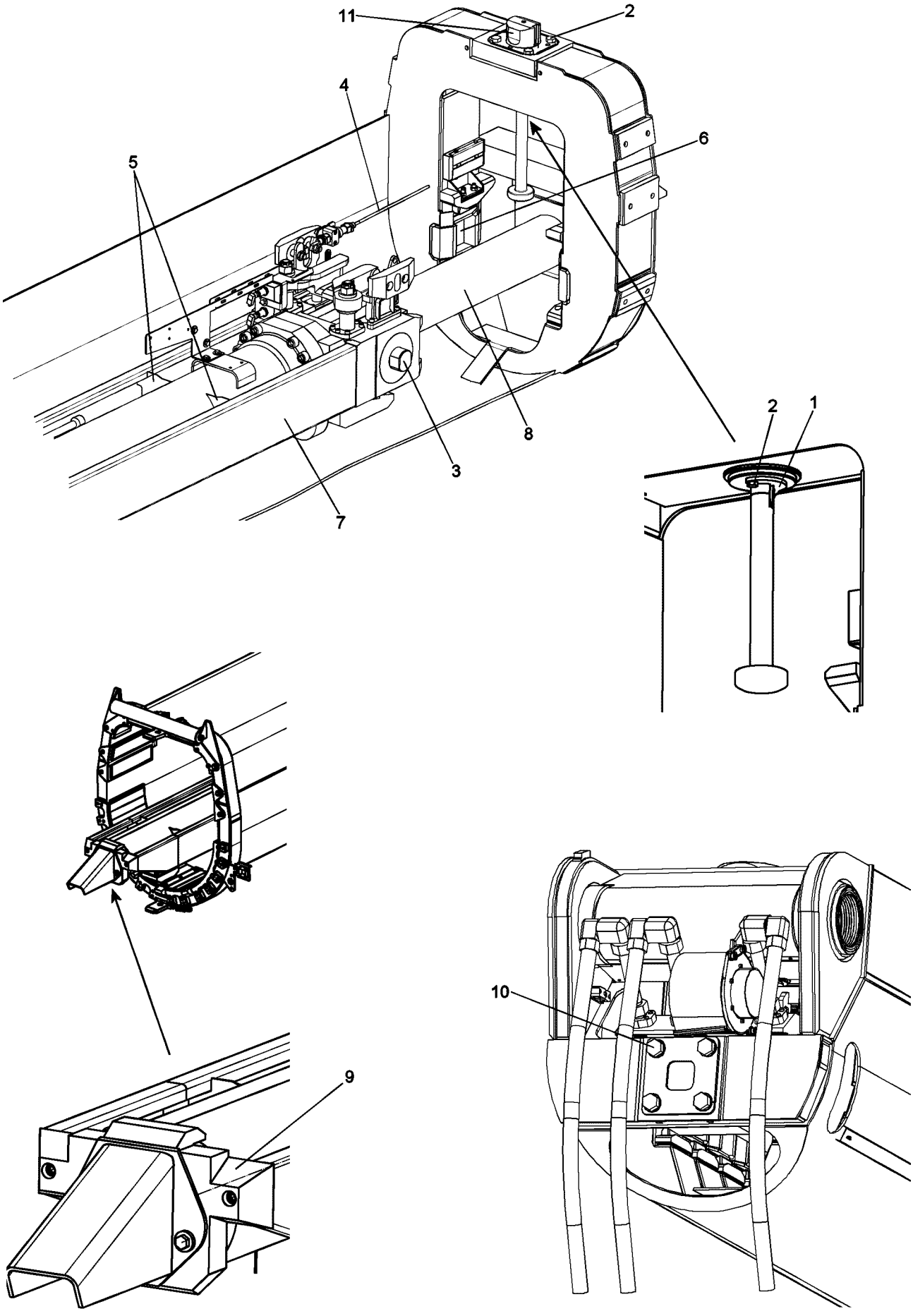

Fig.109286

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4 Inspection of locking system of telescopic boom

4.1 For cranes with pneumatic boom locking system

- To check the function, see Crane operating instructions, chapter 8.11.
- To check the pin wear pattern, see Crane operating instructions, chapter 8.11.
- To check the wear, see Crane operating instructions, chapter 8.11.
- To check the safety control, see Crane operating instructions, chapter 8.11.

4.2 For cranes with telescopic boom system Telematik

- 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
- 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

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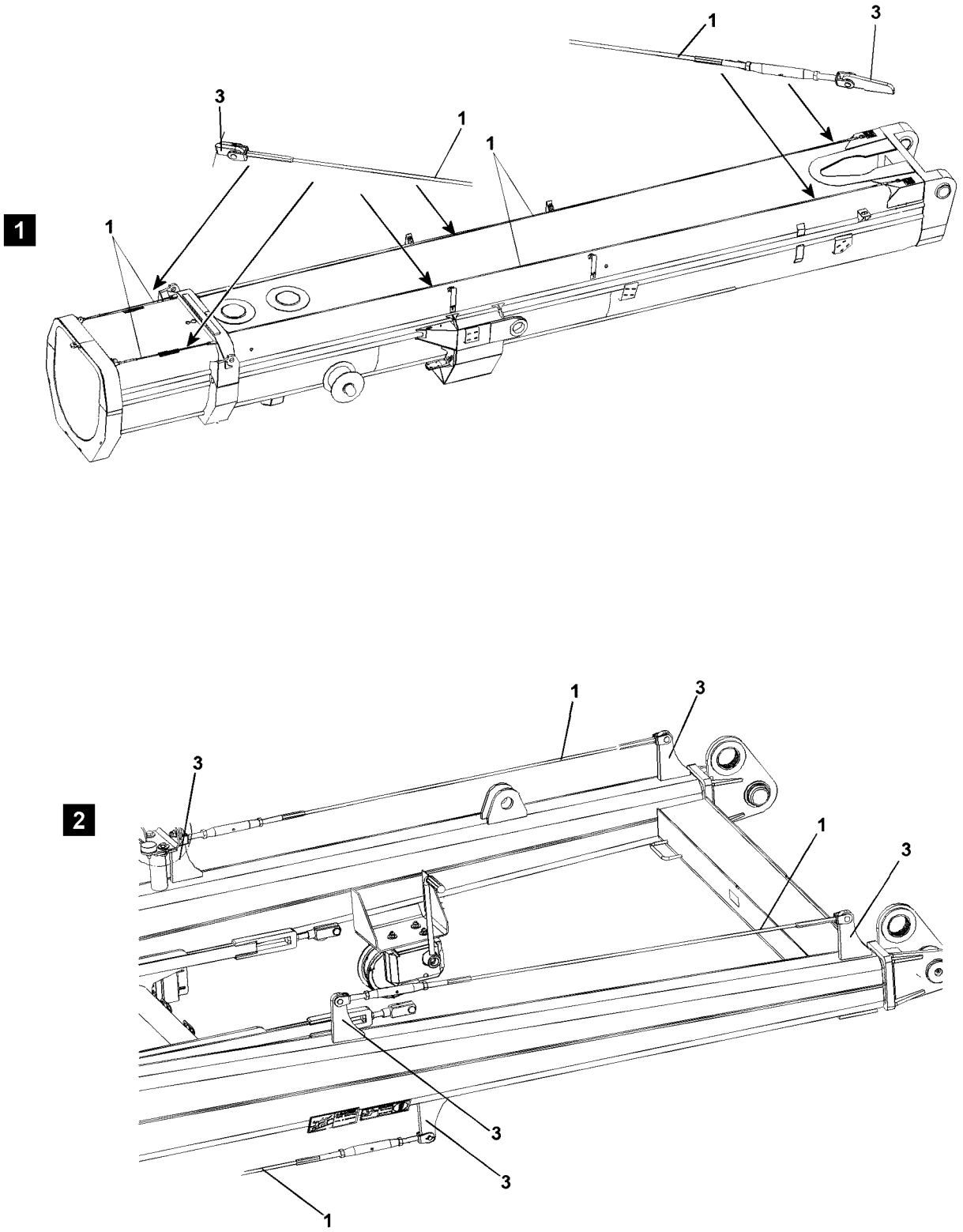

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Fig.112739

5 Inspection of safety ropes and anchor points

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 **expert personnel** 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 **expert personnel**! If this is not observed, assembly personnel could be killed or fatally injured in 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 **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.

5.1 Check of rope pretension on telescopic booms, illustration 1

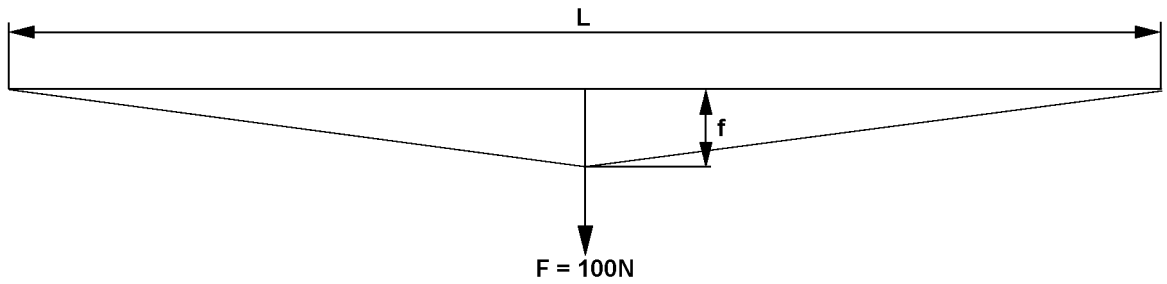

Fig.112738

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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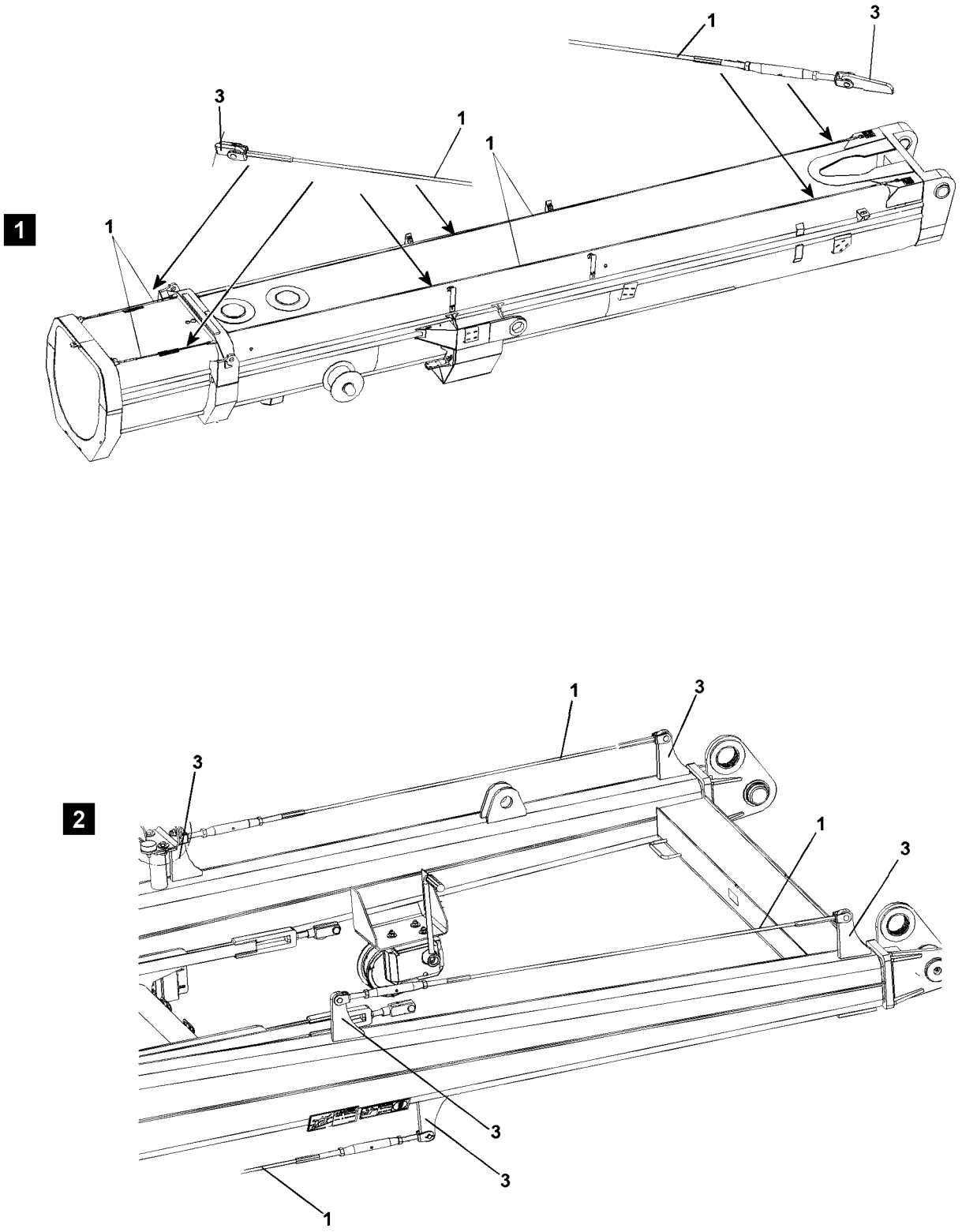

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Fig.112739

5.2 Inspection of rope pretension on lattice sections, illustration 2

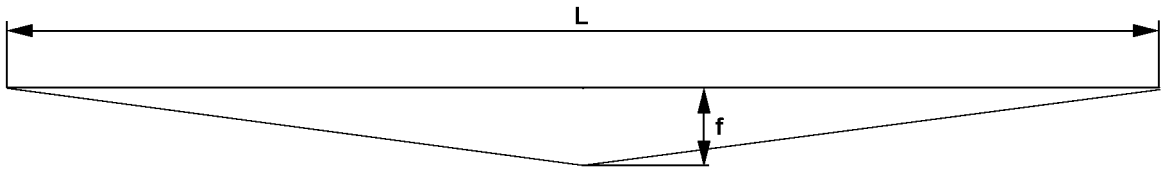

Fig.117747

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

6 Inspection of 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.

Inspect 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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7 Inspection of fastening equipment

WARNING
Fastening equipment **not** inspected!
Death, severe bodily injuries, property damage.
▶ Inspect the fastening equipment at least once a year.

The recurring inspection of the fastening equipment must be carried out 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.

8 Inspection of membrane accumulator

Note
▶ The national regulations for pressurized container inspection must be observed!

The inspection of the membrane accumulators for specified gas pressure must be carried out by authorized and trained expert personnel, see Crane operating instructions, chapter 7.04, 7.05.

9 Inspection of 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!

9.1 Pressure test of relapse cylinders

The relapse cylinders must be inspected annually by an authorized expert. The purpose of the inspections is to avoid accidents by detecting deficiencies early on.

9.2 Checking the gas pressure and oil fill before operation

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 operation: 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!

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The gas pressure and the oil fill must be checked by authorized and trained expert personnel for pressure tanks.

9.3 Inspection of the safety controls on the relapse cylinders

For inspection of the safety control or limit switches on the relapse cylinders and the boom A-frames, see Crane operating instructions, chapter 8.12.

10 Inspection of rope pulleys

10.1 Check 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.

10.2 Checking the groove diameter

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.

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11 Inspection of carrier rollers

11.1 Check visually

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
– Damage
– Cracks

Visible wear on carrier rollers:
– Negative imprints of the rope profile on the circumference of the carrier rollers
– Lead-in tracks

11.2 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.

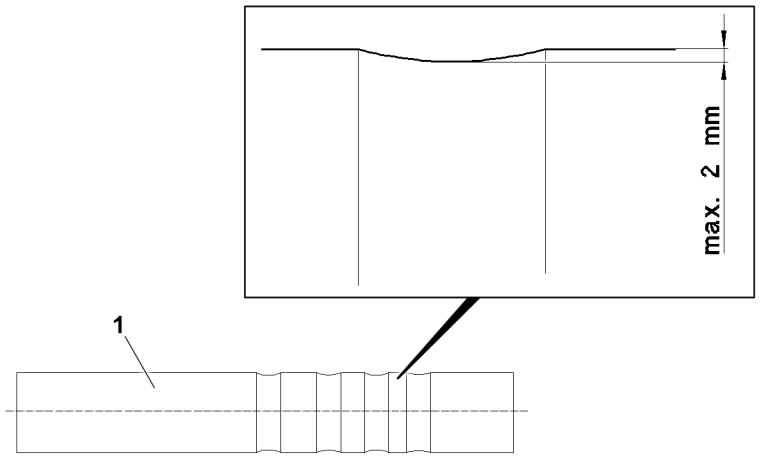

Fig.124864: Permissible depth of the lead-in tracks

1 Carrier roller

The depth of the lead-in tracks may be maximum 2 mm.

11.3 Checking the 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.

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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.

11.4 Checking the tightening torque

The tightening torque of screws must be checked according to maintenance interval.

12 Inspection of extension conditions of sliding beams

The extension conditions of the sliding beams must be checked annually by an expert.

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.

13 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 indicator 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 indicator readings may not deviate more than 10 % off the measured radius.

14 Inspecting the roller slewing ring connection

For tilt play measurement, see Crane operating instructions, chapter 7.05

15 Inspection of the mounting of the load bearing equipment

Check that the mounting bolts for the roller slewing ring, winches, slewing gears and hitch are properly seated.

The slewing ring connection mounting bolts are pre-stressed at the factory, so that no loosening of the screw connections will occur during normal crane operation.

However, the screw connection may become overloaded and the bolts may be permanently stretched if the crane is overloaded or if the load is pulled free. It is therefore important to check these screws for tight seating during the annual crane inspection or after an overload.

Remove loose screws completely as well as the two adjacent screws on the right and left and check them for damage closely. Inspect the screws especially for cracks or permanent distortion. If a screw has been stretched by more than 0.2 % (in relation to its original length) or if cracks or other damage are detected, then the damaged screws must be replaced. If the screws have been stretched or there is other damage, then the adjacent screws must also be replaced.

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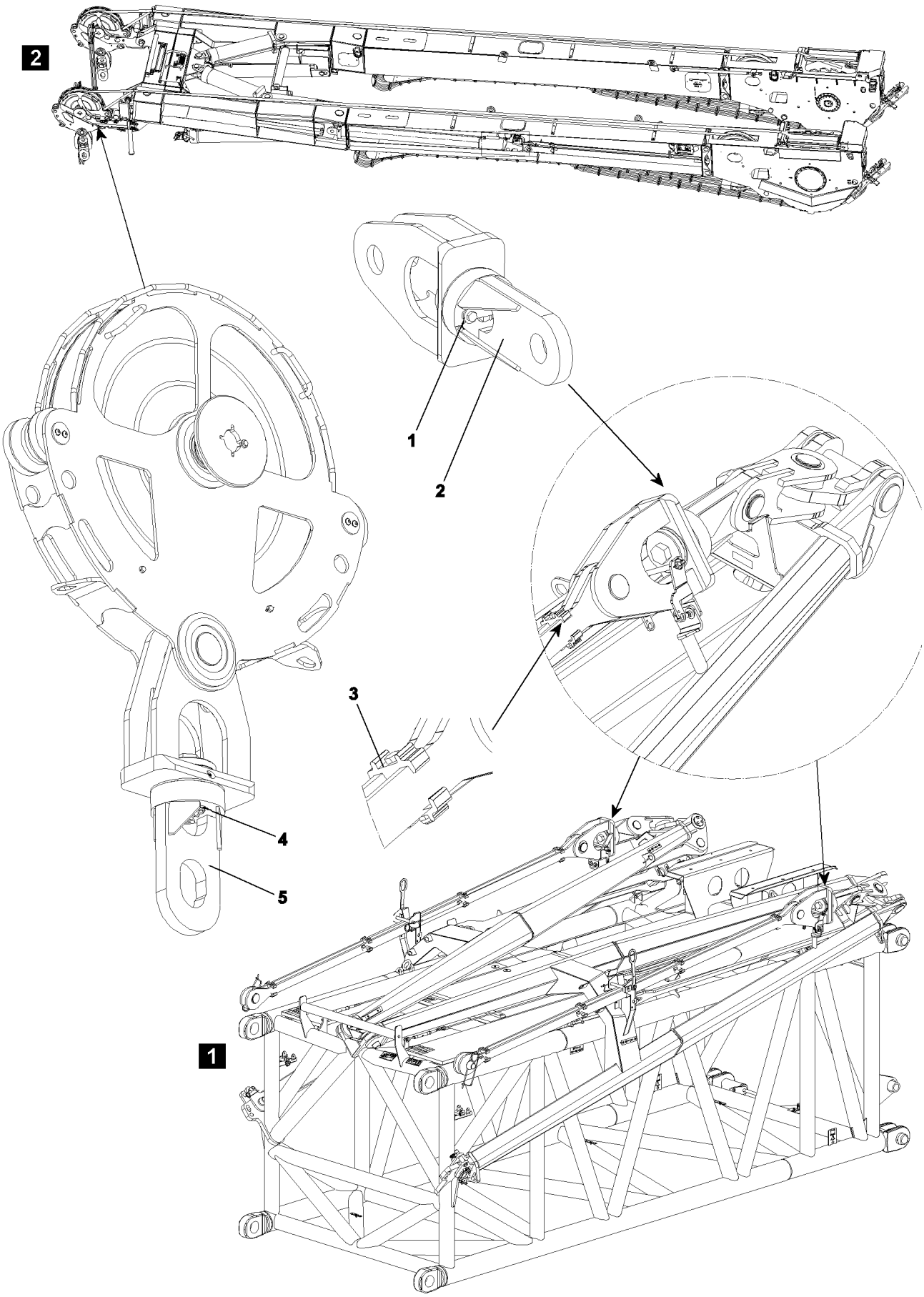

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Fig.109096

16 Inspection of the tele extension with eccentric, illustration 1

- Inspection of twist guard **1** for damage and loose screw connection.
- Inspection of rotator **2** for easy turnability.
- Inspection of all clamps **3** for damage and function.

17 Inspection of change over pulleys, illustration 2

- Inspection of twist guard **4** for damage and loose screw connection.
- Inspection of rotator **5** for easy turnability.

18 Inspection of the oil and fuel reservoirs

Visually check the oil and fuel tanks at least once a year for leaks and safe mounting.

Repairs may only be carried out by trained and knowledgeable 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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Fig.195219

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 requirements.

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

As a rule, a qualified laboratory should carry out an oil analysis.

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 particles are detected, all the oil's properties must be examined by a qualified laboratory.

Note

- ▶ The evaluation of the foreign particles found in the oil must be made by a qualified laboratory!
- ▶ The maximum permissible quantity of foreign material measured by weight is 0.15 % of total oil weight!
- ▶ Maximum permissible foreign particle size from fine abrasion is 0.25 microns!
- ▶ If the above value have been exceeded, remove the gear and search for the cause of the increased abrasion!
- ▶ Damaged components must be replaced and the gear refilled with fresh oil!

NOTICE

Danger of property damage!

- ▶ Repairs may only be carried out by specialists with appropriate technical knowledge!

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 40 % of the maximum rope pull in the uppermost layer of the coil and raise it just off the ground.
- Remove the plug on the brake vent 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".

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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.
- Request data about the service life of the auxiliary reeving winch, recovery 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 leakage
- Incorrectly set safety devices
- 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.

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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.

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

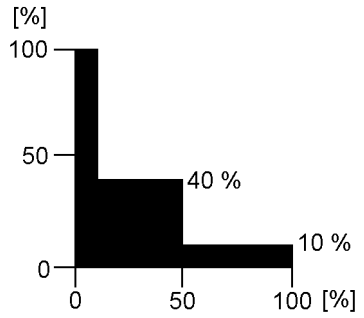

Fig.195234: Graphic illustration Load spectrum L1

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

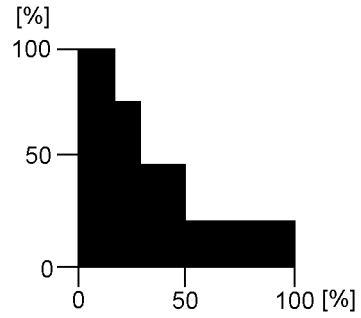

Fig.195235: Graphic illustration Load spectrum L2

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
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

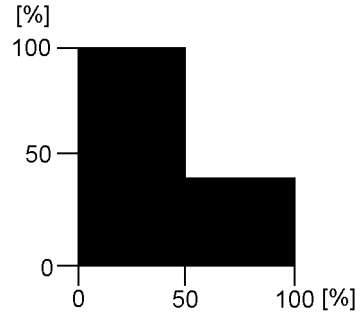

Fig.195236: Graphic illustration Load spectrum L3

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

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Load spectrum class: Very heavy L4

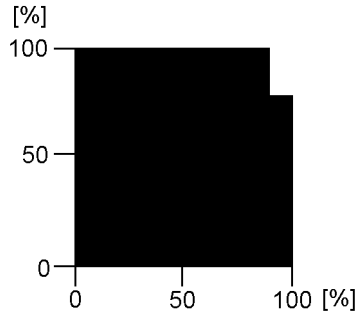

Fig.195237: Graphic illustration Load spectrum L4

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

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, 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 hours 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 installed.
   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:

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$$S_i = \frac{Km_i}{Km} \times T_i$$

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 commissioning.

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 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 (leakage, 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 manual, a mobile crane with a separate operating hour meter for the crane engine and the crane drives 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:

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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 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:

$$S_1 = \frac{0{,}125}{0{,}125} \times 160\ h = 160\ h$$

Fig.195231

Remaining theoretical service life:

$D_1 = 3200\ h - 160\ h = 3040\ h$

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 hour meter indicates 2000 h ; i.e., during this period:

2000 h – 800 h = 1200 h (800 h were used in the first year of operation)

The winch was operated about 40 % of the time; i.e. $T_2 = 480$ h.

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 hour meter indicates 3000 h ; i.e., during this period:

3000 h – 2000 h = 1000 h (2000 h were used in 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:

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$$S_3 = \frac{0{,}25}{0{,}125} \times 300\ h = 600\ h$$

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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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 : .....

Fig. 121551-en: Chart 1

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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Fig.195219

1 Importance of inspection

Rope removal criteria: If severe damage reduces the operational safety, then the rope can 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

2 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.

3 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.

4 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 end connection is damaged
- when the rope has been placed again after removal
- when the rope has been out of service for longer than three months

5 Intervals

Intervals for crane inspection:
- according to determination by **expert personnel for crane rope inspection**
- or **at least once a year**

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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

6 Areas

WARNING
Broken wires and distortions on ropes in cross over areas!
Rope performance can decrease significantly. Rope rupture. Death, severe injuries, property damage.
▶ Inspection rope cross over areas especially diligently.

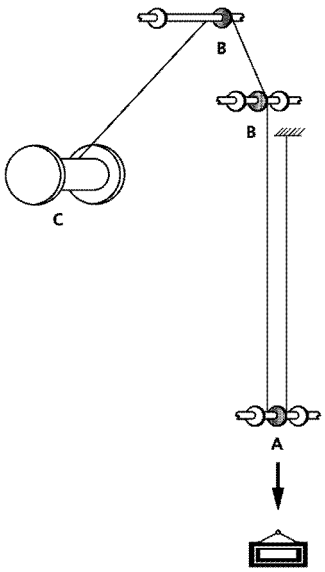

Fig.120969: Important inspection areas for multi layer spooled up ropes

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 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

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7 Documentation of inspection results

Note
- ▶ Document the results of the inspections in an inspection checklist.
- ▶ Form for an inspection checklist, see section „Current checklist“.

8 Wire ropes and rope end connections

DANGER
Danger of accident!
- ▶ Correct choice and use of the wire rope and the rope end connections are a decisive precondition for proper and accident-free crane operation.

The wire ropes and rope end connections are selected according to their application. It must be determined if a rotation-resistant or non-rotation resistant rope is required for the application. The type of rope that is selected then determines the corresponding rope end connections.

8.1 Rotation-resistant ropes and their rope end connections

Rotation-resistant ropes are special ropes that produce extremely little torque and twisting at the rope end connection when they are under strain.

Note
- ▶ Use rotation-resistant ropes as **hoist ropes**.

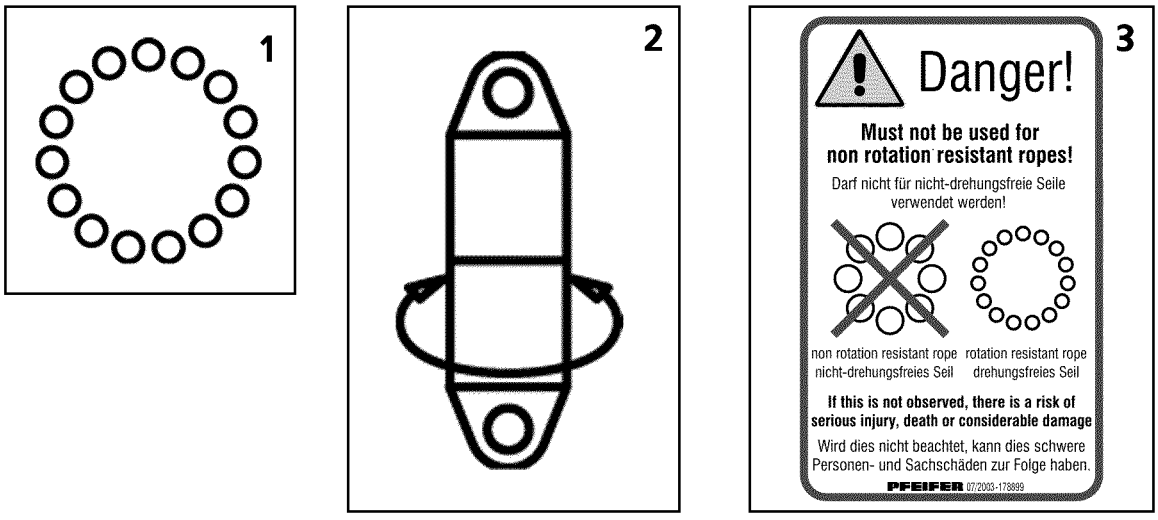

Fig.195653

Typical rotation-resistant wire rope structures are ropes with 15 to 18 outer strands. Rotation-resistant ropes are symbolically depicted with 15 outer strands (circles) (see table **1**).

Rotation-resistant ropes can be optionally used with the following rope end connections:
- **Rotating** rope end connection in the form of a PFEIFER pouch socket **with** swivel or twist compensator / swivel.
- **Non-rotation resistant** rope end connection in the form of a PFEIFER pouch socket **without** swivel or gib and cotter.

On non-rotation resistant ropes, on a one to one basis and after consultation with Liebherr Service, a rotating rope end connection can be utilized to reduce problematic turning behavior of the hoist rope (see table **2**).

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DANGER
Danger of severe injuries to personnel and property damage!
▶ **Never** use rotating rope end connections with non-rotation resistant ropes.

Note
Application warning notes
▶ The application warning note on the rotating PFEIFER pouch socket with swivel indicates that this rope end connection is impermissible for non-rotation resistant ropes (see table **3**).

8.2 Non-rotation resistant ropes and their rope end connections

Non-rotation resistant 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 rope from unscrewing under strain.

Note
▶ Use non-rotation resistant ropes as **guy ropes** or **control ropes**, **auxiliary ropes** or **assembly ropes**.

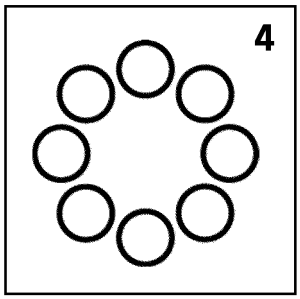

Fig.195654

Typical non-rotation resistant wire rope structures are ropes with 8 or ten outer strands. Non-rotation resistant ropes are symbolically depicted with 8 outer strands (circles) (see table **4**).

Non-rotation resistant ropes can only be used with the following rope end connections:
– **Non-rotation resistant** rope end connection in the form of a PFEIFER pouch socket **without** swivel or gib and cotter.
A non-rotation resistant rope end connection is also the mounting of the rope on the fixed point of the winch drum.

DANGER
Danger of severe injuries to personnel and property damage!
▶ **Never** use rotating rope end connections with non-rotation resistant ropes.
▶ Never install a twist compensator / swivel.

Note
Usage warning:
▶ The application warning note on PFEIFER pouch sockets without swivel and cotter indicates that this rope end connection is impermissible for non-rotation resistant ropes **in combination** with a twist compensator / swivel (see table **5**).

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9 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.

10 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

11 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.

12 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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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 wires 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 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
Heat influence, electric voltage	Bluish discoloration, broken or melted wires	Visual check
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

13 Checking for broken strands

A strand consists of several individual wires.

If a complete strand is broken:

▶ Take the rope down.

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14 Determining the number of broken wires

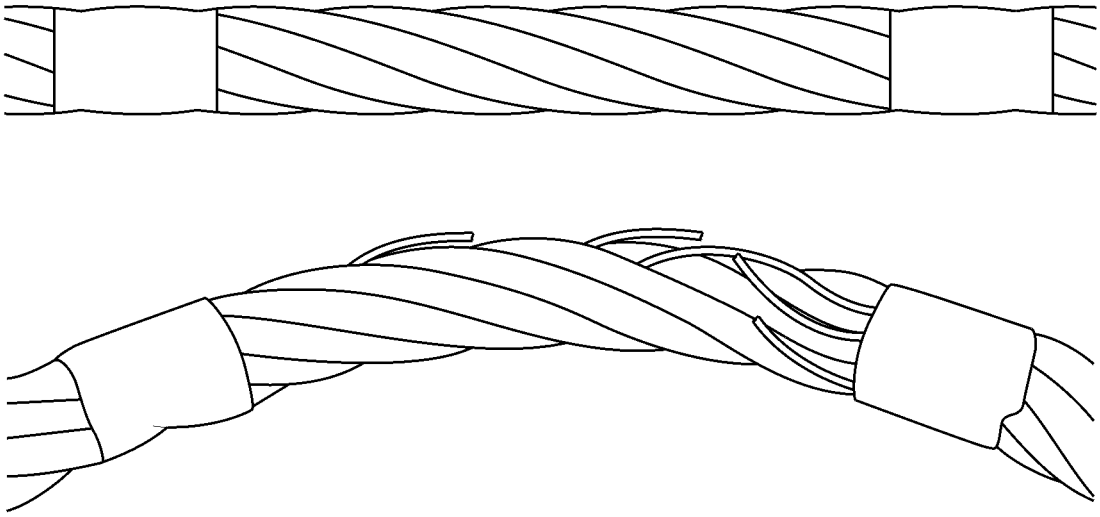

Fig.120980: Determine broken wires by bending

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.

14.1 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
- Rotation resistant ropes

The charts in this section are valid exclusively for **scattered occurring broken wires**.

14.1.1 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.

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14.1.2 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 spool up on a single layer spooling drum (coincidental distribution of broken wires)				Rope sections, which spool up on a multi layer drum Spool up[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	12
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
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 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.							

*Maximum number of broken wires 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 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 larger than listed in the chart:
▶ Take the rope down.
▶ Enter the results in the inspection checklist.

14.1.3 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 spool up on a single layer spooling drum (coincidental distribution of broken wires)		Rope sections, which spool up on a multi layer drum Spool up[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.					

*Maximum number of broken wires 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).

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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

▶ 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.
▶ 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 larger than listed in the chart:
▶ Take the rope down.
▶ Enter the results in the inspection checklist.

14.2 Broken wires 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.

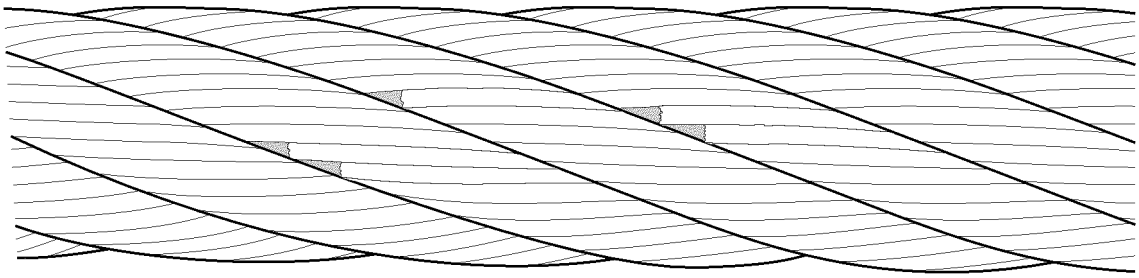

Fig.121005: Broken wires in the strand valleys

When two or more broken wires occur within a 6d long rope section:
▶ Take the rope down.

14.3 Broken wires on rope end connections

When broken wires are near an end connection and two or more wires are affected:
▶ Take the rope down.

14.4 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 length of 6d).

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▶ Have the rope removal criteria determined by **expert personnel for crane rope inspection**.

14.5 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**.

15 Checking of rope diameter

15.1 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.

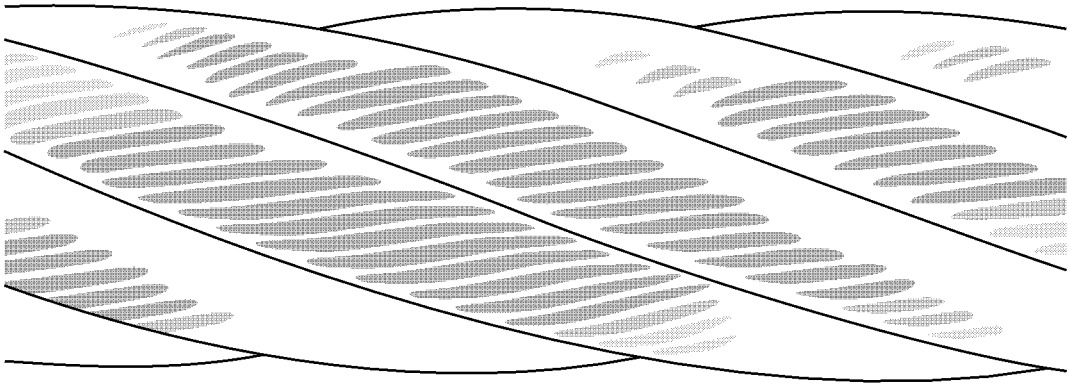

Fig.121001: External abrasion on the rope

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 spool up on single layer winches
– Ropes, which run through a steel rope pulley

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$$d_V = \frac{d_{ref} - d_m}{d} \times 100\ \%$$

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 spool 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**
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.

15.2 Localized reduction of rope diameter

Localized reductions of rope diameter point to the fact that a rope insert may have failed, for example.

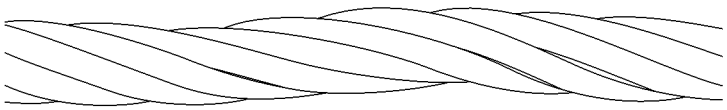

Fig.120983: Localized reduction of rope diameter

▶ Check the rope for localized reduction of rope diameter.

When a localized reduction of the rope diameter is found:
▶ Take the rope down.

15.3 Localized increases of rope diameter

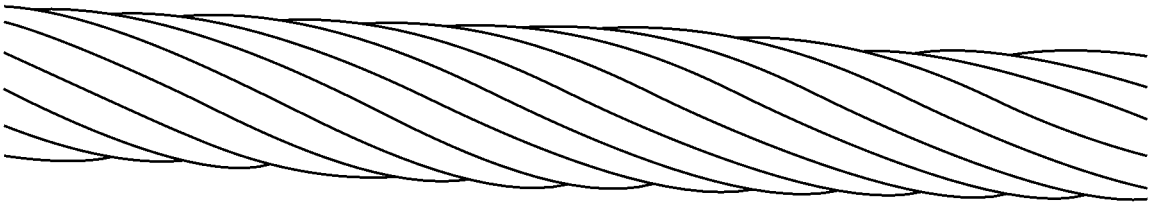

Fig.120992: Localized increase of rope diameter

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 localized increases of rope diameter.

When the increases exceed the maximum values:
▶ Take the rope down.

16 Checking for 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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Do **not** use solvents to clean the rope.

Make sure that the following prerequisite is met:
– Rope is cleaned (wiped and brushed).

16.1 External corrosion

The various types of corrosion are classified and noted with the classification for removal criteria in percentages:

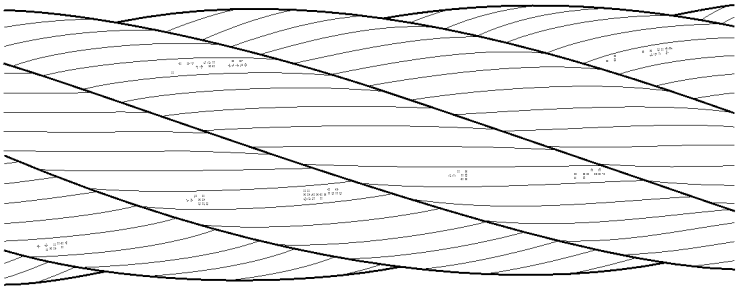

Fig.120984: Surface light corrosion: Classification 0 % of removal criteria

Superficial light corrosion (rust film) can be wiped off.

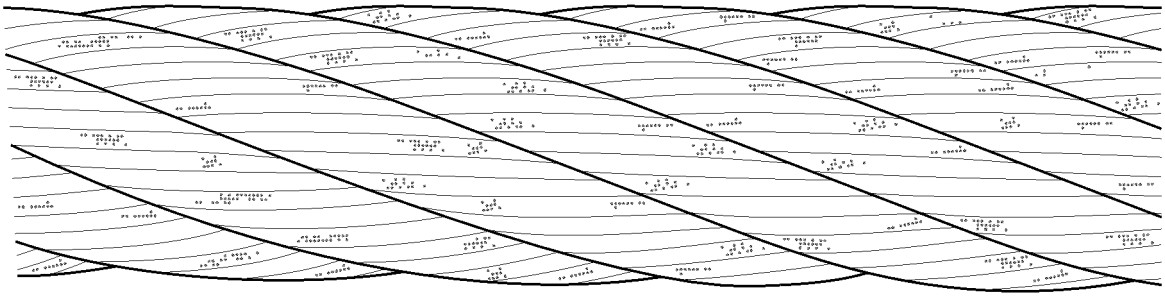

Fig.120985: Surface feels rough: Classification 20 % of removal criteria

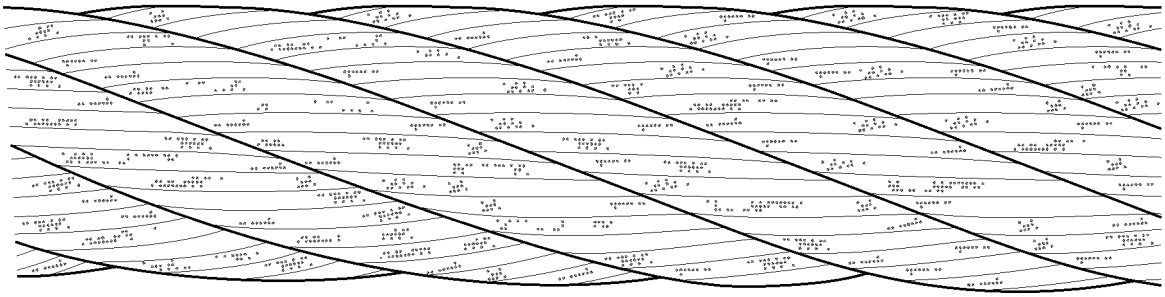

Fig.120986: Surface feels very rough: Classification 60 % of removal criteria

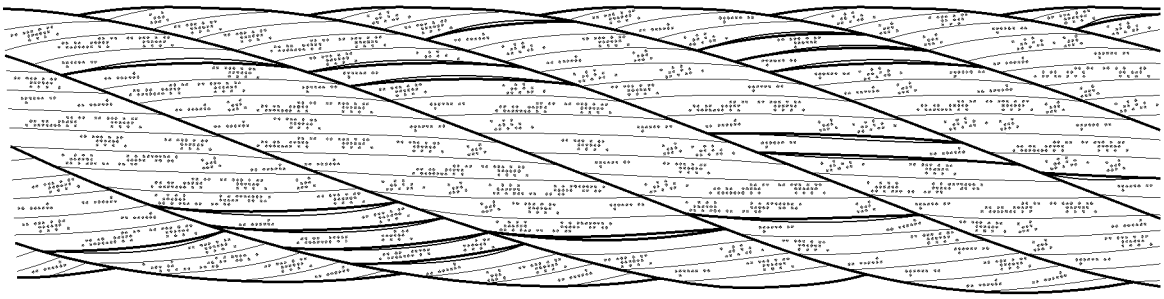

Fig.120987: Surface very decayed, spaces between individual wires can be easily recognized: Classification 100 % of removal criteria

When 100 % of removal criteria is reached:

▶ Take the rope down.

16.2 Internal corrosion

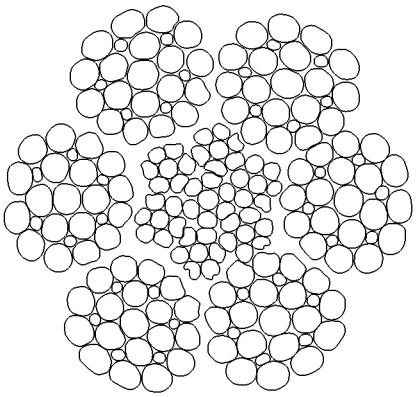

Fig.120982: Corrosion in the inside of the rope

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 place the rope down.

16.3 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 place the rope down.

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17 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

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.

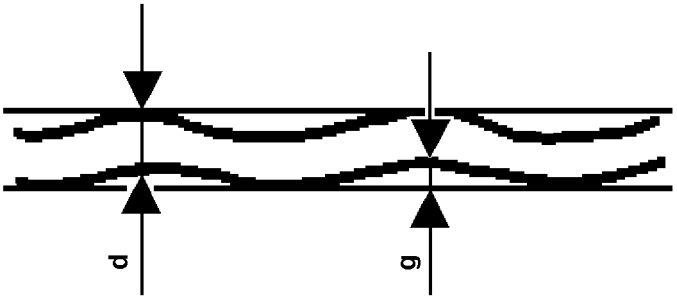

Fig.123988: Example for corkscrew-type distortion

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 spools 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.

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18 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.

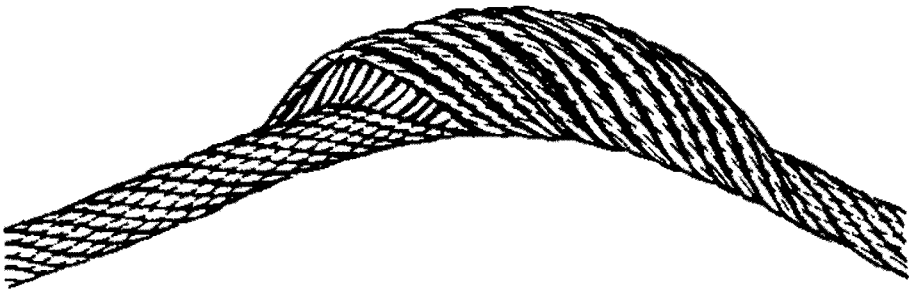

Fig.120989: Basket formation

▶ Check the entire rope for basket formation.

When basket formation is present:
▶ Take the rope down.

19 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.

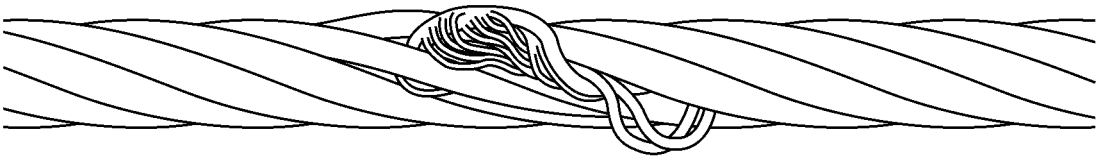

Fig.120990: Protrusion of an insert (rope single layer)

Fig.120991: Distorted or protruding strand

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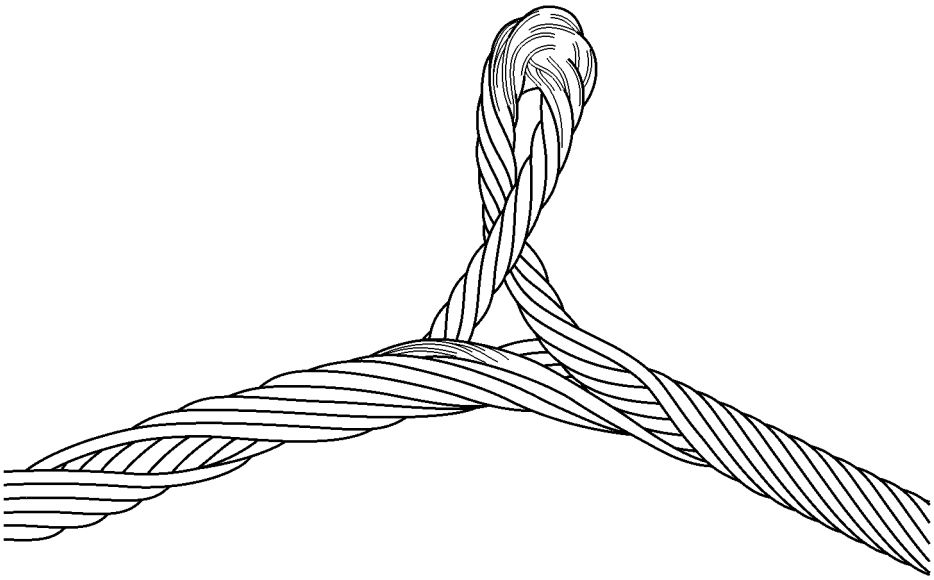

Fig.121373: Protrusion of rope insert on rotation-resistant rope

When the insert or a strand protrudes or is distorted, place 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.

20 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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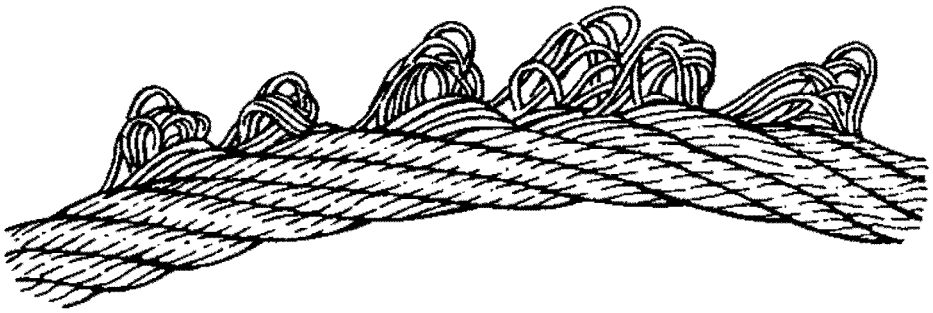

Fig.120993: Emergence of individual wires

▶ 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.

21 Kinking or rope loops pulled closed

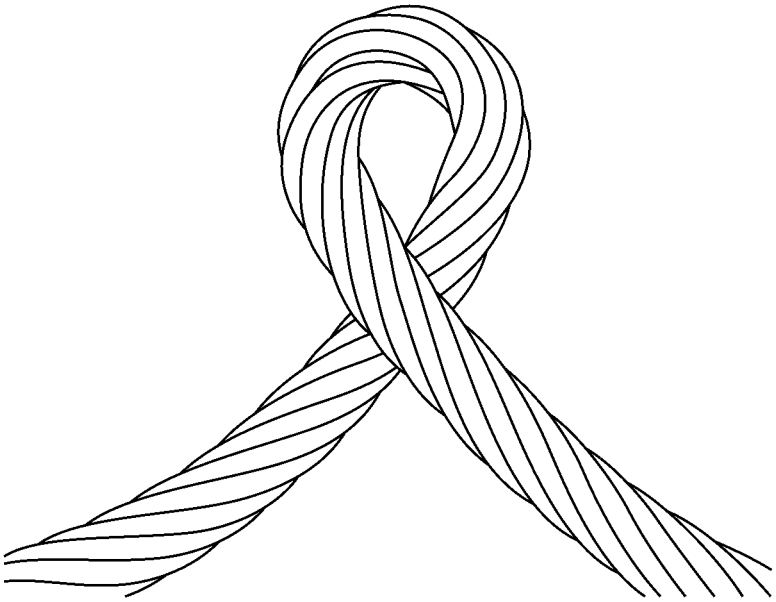

Fig.121007: Kinking or rope loop pulled closed

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 more wear.

The rope is significantly distorted. The strength remains only in part.

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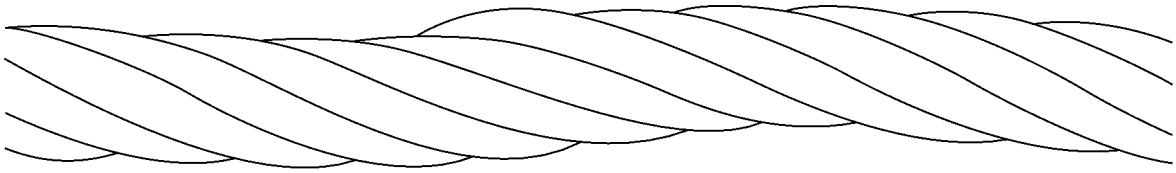

Fig.121002: Positive Kinking

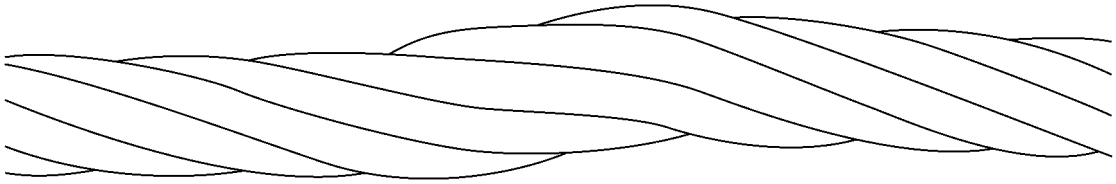

Fig.121003: Negative Kinking

▶ Check the rope for kinking or rope loops pulled closed.

When kinking or rope loops pulled closed occur:
▶ Take the rope down.

22 Buckles

Buckles are angular deformations. The rope was damaged due to external influences. Strong deformations of the rope cause stronger wear.

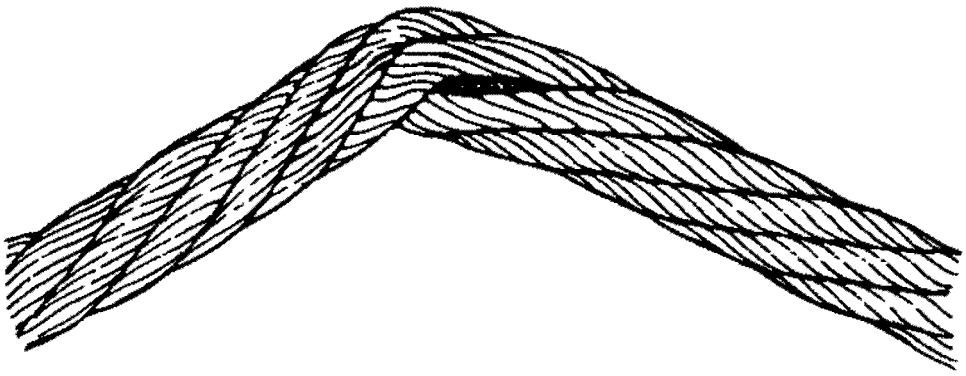

Fig.120999: Severe buckle

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.

23 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.

24 Combined degree of severity

Note
▶ For a method to determine the effect of a combined degree of severity and damage on 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.

25 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.

25.1 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.

25.2 Improper mechanical damage

An improper mechanical damage occurs, for example, when the rope is pinched.

▶ Take the rope down immediately or shorten it, see Crane operating instructions, chapter 7.05.50.

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25.3 Operational transverse pressure

Operational transverse pressure causes flattenings, for example in the incline range of multi layer spooling.

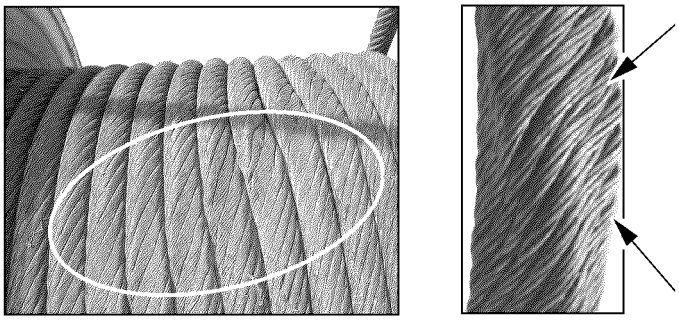

Fig.114002: Flattenings, for example on control ropes

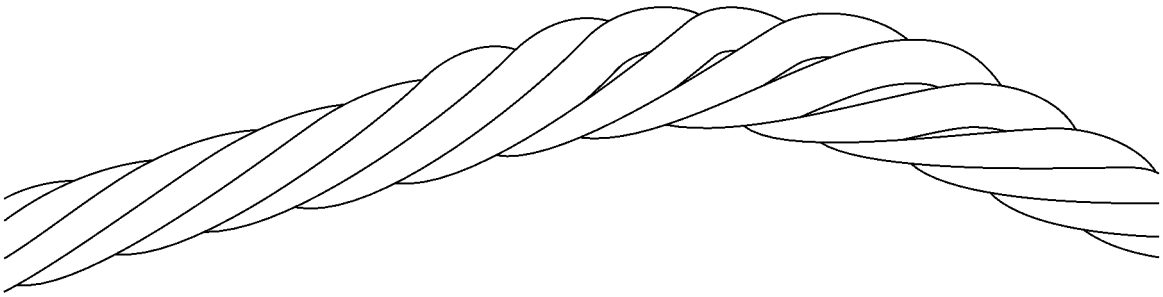

Fig.120996: Flattenings on multi layer spoolings

▶ Check the first rope layer of the winches for crushed areas and distortions.

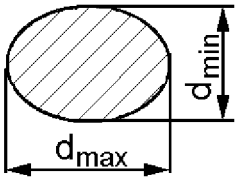

Fig.121006: Largest and smallest diameter on the distortion area

$$V = \frac{d_{max} - d_{min}}{d} \times 100\ \%$$

Fig.121374: Formula to calculate the distortion

V	Rope distortion in percentages	**dmax**	Largest diameter of distortion area
d	Control 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 control rope down.

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26 Current checklist

Crane and use:			
Rope application:		RCN[3]:	Installation date:
Brand name:		Nominal diameter:	Take-down date:
Make[1]:	○ Right hand	○ Left hand	Minimum tensile strength
Direction of lay[1]:	○ Lang's lay	○ Ordinary lay	Permissible number of visible external broken wires
Intermediate layer[1]:	○ IWRC	○ FC ○ WSC	Datum diameter
Wire surface[1]:	○ Bare	○ Galvanized	Permissible diameter reduction: 6d: 30d:

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

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Fig.121369-en: Form for current checklist

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Fig.195219

1 Safety guidelines

DANGER
Death, severe injury, property damage due to welding on load hooks!
- ▶ Do **not** weld load hooks to repair wear.
- ▶ Replace the load hook in case of impermissible wear.
- ▶ Contact Liebherr Service.

Make sure that the following regulation is followed:
- – Do **not** carry out any welding work on load hooks, for example to repair wear.

2 Inspection intervals

By recognizing defects in time, accidents are prevented.

An inspection must be made before operation.

Load hooks must be inspected as needed, but at least once a year by an expert.

The load hook must be inspected very 4 years by an expert.

3 Inspecting and monitoring the load hook

Any defects found must be remedied and documented.

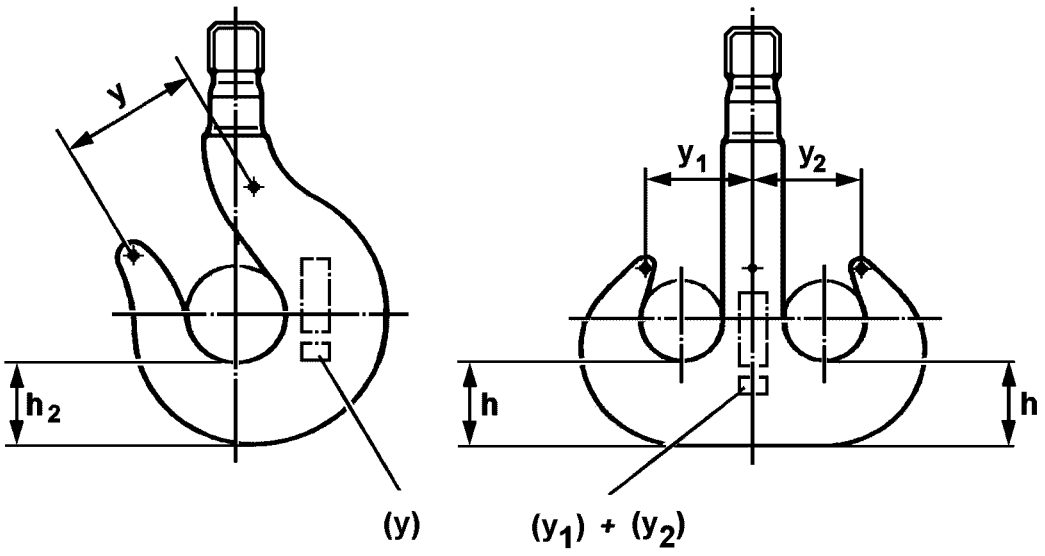

Fig.121531: Description of measured distances of load hooks

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3.1 Checking the load hook for distortion

DANGER
Death, severe injury, property damage due to expansion of hook jaw!
- ▶ Replace the load hook in case of impermissible expansion.
- ▶ Contact Liebherr Service.

The initial dimension **(y)** for the single hook is marked on the load hook.

The initial dimension **(y_1)** and the initial dimension **(y_2)** for the double hook is marked on the load hook.

The expansion of the hook jaw may not exceed more than 10 % in reference to the initial dimension **(y)** or the initial dimension **(y_1)** and the initial dimension **(y_2)**.

- ▶ Measure dimension **y** or dimension **y_1** and dimension **y_2** from center punch to center punch.
- ▶ Check for dimensional accuracy within the permissible tolerance.

3.2 Checking the load hook for surface cracks

DANGER
Death, severe injury, property damage due to surface cracks and damage on the load hook!
- ▶ Replace the load hook in case of surface cracks and damage.
- ▶ Contact Liebherr Service.

When distortions are found on the hook jaw:
- ▶ Check the load hook for surface cracks with a suitable procedure.
- ▶ Check the load hook for damage

3.3 Checking the load hook for wear

DANGER
Death, severe injury, property damage due to wear on the hook base!
- ▶ Replace the load hook in case of impermissible wear.
- ▶ Contact Liebherr Service.

The wear on the hook base may be no more than 5 % of the initial nominal dimension **h_2** for single hooks or initial nominal dimension **h** for double hooks.

The initial nominal dimensions **h_2** for single hooks and **h** for double hooks are listed in the 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

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Hook Number	Single hook h_2 [mm]	Double hook h [mm]
40	—	190
50	—	212
63	—	236
80	—	265
100	—	300
125	—	335
160	—	375
200	—	425
250	—	475
320	—	545

Initial nominal dimensions $\mathbf{h_2}$ for single hooks and **h** for double hooks

- ▶ Measure dimension $\mathbf{h_2}$ for single hooks or dimension **h** for double hooks.
- ▶ Check for dimensional accuracy within the permissible tolerance.

3.4 Checking load hooks for corrosion and wear

DANGER
Death, severe injury, property damage due to corrosion and wear on the thread!
- ▶ Replace load hooks which are **not** dimensionally accurate.

When wear or impermissible axial play on the hook nut is present:
- ▶ Replace the hook nut.
- ▶ Contact Liebherr Service.

To check the threads regarding corrosion and wear, the hook nut must be unscrewed from the hook shaft.

- ▶ Check the load hook thread and hook nut for corrosion and wear.

When reconditioning work is required to remove corrosion notches:
- ▶ Carry out a test for dimensional accuracy.

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Fig.195219

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

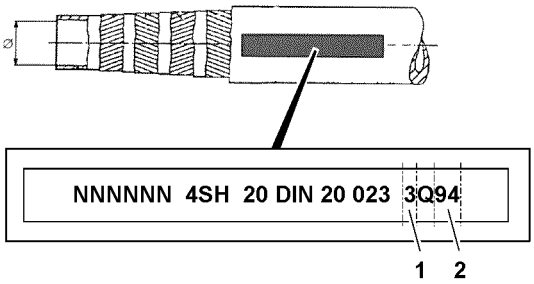

Fig.120159: Example for identification of hydraulic hose lines

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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Fig.195219

1 Safety guidelines

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** checks 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 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 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

The following is shown, as an example: Inspection form and check list for the inspection of ladders and steps.

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4.1 Inspection form for the inspection of ladders and steps

Ladder control sheet		
Stock no. of the ladder/steps		
Location/installation location		
Ladder type		Stepladder
		Leaning ladder
		Leaning ladder with overshoot
		Vertical ladder
		Vertical ladder with overshoot aid
		Platform ladder
		Steps
		Other
Material of the ladder		Aluminium
		Plastic
		Steel
		Stainless steel
Number of rungs/stairs		
Ladder length/ladder shortened to		
Manufacturer/dealer		
Article/type number		
Date of purchase		
Date of discard		
Name of representative		
Next inspection		

Control sheet for inspecting ladders and steps

Fig.121361-en

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4.2 Check list for the inspection of ladders and steps

Inspection criteria	1st Inspection	2nd Inspection	3rd Inspection	4th Inspection	5th Inspection
1. Beams					
Deformation					
Damage (for example cracks)					
Sharp edges, splinters, burrs					
Wear					
Protective treatment					
2. Rungs/stairs/platform					
Deformation					
Damage					
Sharp edges, splinters, burrs					
Connection to the beam (for example, flanging, screw/rivet connections, welding seam)					
Wear (for example, stepping surfaces, platform overlay)					
3. Spreader safety					
Completeness/fastening					
Functionality					
Damage					
4. Fitting parts					
Damage/corrosion					
Completeness/fastening					
Functionality					
Wear					
Lubrication (mechanical parts)					

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Fig.121362-en

Inspection criteria	1st Inspection	2nd Inspection	3rd Inspection	4th Inspection	5th Inspection
5. Ladder/stands/pulleys					
Completeness/fastening					
Wear/damage					
Functionality					
6. Accessories (for example, beam extension, base expansion, wall support)					
Completeness/fastening					
7. Identification					
Operating instructions (for example, pictogram)					
8. Inspection result					
Ladder OK and usable					
Repair necessary					
Discard ladder immediately					
Comments					
Next inspection (month/year)					
Ladder inspected					
Date					
Signature					

Check list for inspecting ladders and steps

Fig.121363-en

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Fig.195219

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						
Windshield 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 - pressurized air system[1]						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Compressor						
Filters						
Air tanks						
Valves						
Lines						
Hoses						
Cylinder						

9. Inspection category: Chassis - electrical system[1]						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Motors						
Generators						
Battery						

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9. 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]						

10. Inspection category: Chassis - control devices[1]						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Engine regulation						
Transmission						
Couplings						
Circuits						
Brakes						
Steering						
Indicator displays						
Engine shut off line						
Control of supports[2]						
Axle suspension						
Crane leveling						
Rear axle steering						

11. Inspection category: Superstructure						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Frame						
Coverings						
Treads						
Bearings						

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11. 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						

12. Inspection category: Superstructure - crane operator's cab						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Doors						
Windows / windshields						
Windshield wipers						
Mirrors						
Seat						
Heater						
Ventilation						
Sound absorbers						
Joystick for working functions						
Gear shifts						
Safety: Crushing / shear locations						

13. Inspection category: Superstructure - Retaining and protection devices						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Accesses, ladders						
Handles						
Coverings						
Covers						
Hatches						
Treads						

14. 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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14. 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						

16. 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						
Indicator 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						

19. 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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20. 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 moment 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						

21. 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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21. Inspection category: Boom						
Component to be inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Control ropes						
Guide ropes						
Safety ropes						
Relapse cylinders						

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						

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 regarding the used portion of the theoretical service life.

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Fig.195219

1 Preface

This crane may only be used in 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 Changes and updates for Operating instructions

Changes and updates for Operating instructions, which you receive in the circular as Customer information, must be filed in the Operating instructions for the respective crane under chapter 90.05.

Note

Procedure after receiving customer information!

▶ Attach the decals **1**, which are enclosed in the customer information to the footer of the respective chapter. See following example.

▶ Fill out the update confirmation form in chapter 90.05 of the operating instructions,

▶ Insert changes and updates under chapter 90.05 of the operating instructions.

Fig.113870

Example:

A change or update affects the Crane operating instructions, chapter 2.04.

▶ Attach the decal **1** in the footer of chapter 2.04.

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1 Update confirmation

Chapter	Change / update	Completed	
		on	by

2 Customer information

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