

LIEBHERR

Crawler crane with lattice mast

LR11350

LR 11350-003

Operating instructions

BAL-No.: 19001-05-02

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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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Foreword

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.

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

¹⁾This could also result in property damage.

Additional notes

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

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 Ebingen 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 Ebingen 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.

**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!

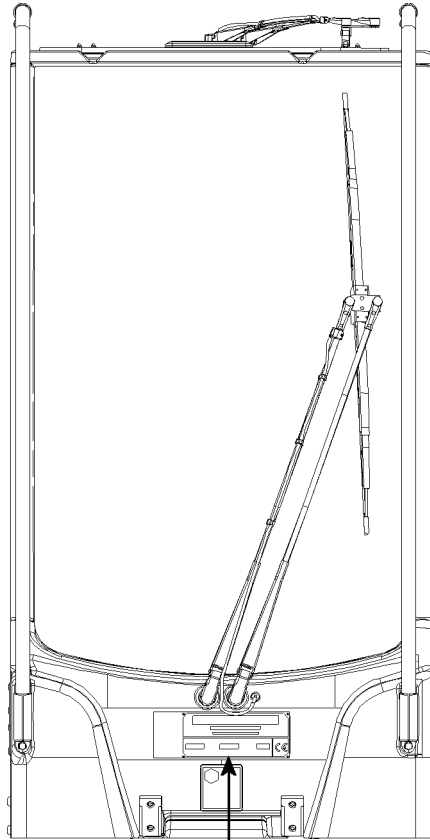
This could result in property damage!

- ▶ Clear up open questions regarding the crane documentation with Liebherr Service before carrying out the respective task.

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

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LIEBHERR		
WERK EHINGEN GMBH D-89582 EHINGEN/DONAU		
type	n° d'usine	année de construction
Werk-Nr.	Baujahr	
Type	Works No.	Year of manufacture
Manufactured in Germany		
		CE



2

LIEBHERR		
WERK EHINGEN GMBH D-89582 EHINGEN/DONAU		
type	n° d'usine	année de construction
Werk-Nr.	Baujahr	
Type	Works No.	Year of manufacture
Manufactured in Germany		

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).
- 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 on the chassis.
- 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!

**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)
	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 by length	kilogram per meter (kg/m)	0.055998	pound per inch (lb/in)
	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·ft)
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)

	Unit of Measure	Multiply by	To obtain
	liter per minute (l/min)	0.26417	gallon per minute (gal/min)
Temperature	degree Celsius (°C)	$([^{\circ}\text{C}] \cdot 1.8) + 32$	degree Fahrenheit (°F)
	kelvin (K)	$([\text{K}] \cdot 1.8) - 459.67$	degree Fahrenheit (°F)

Conversion chart version 1

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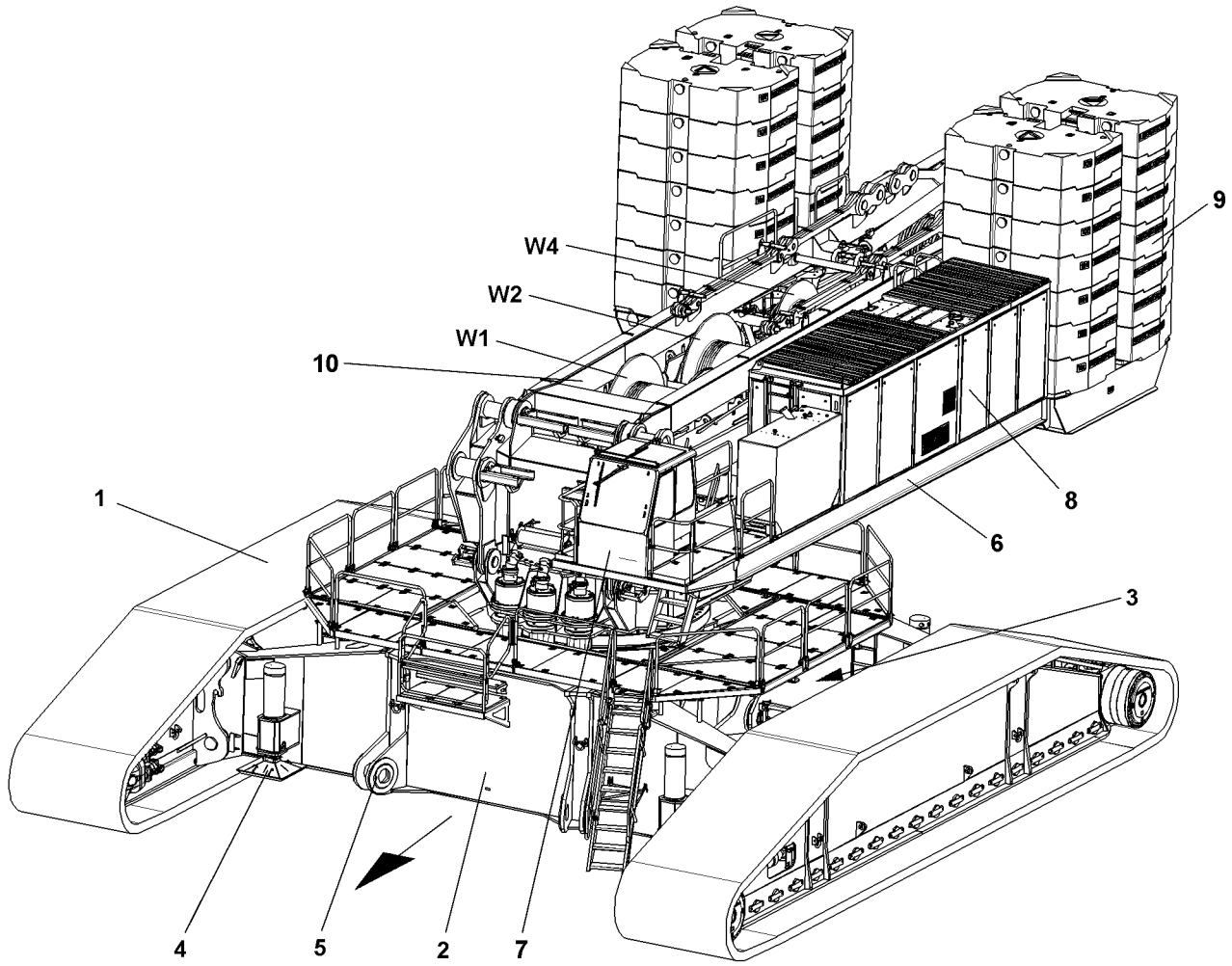
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1 Description of crane



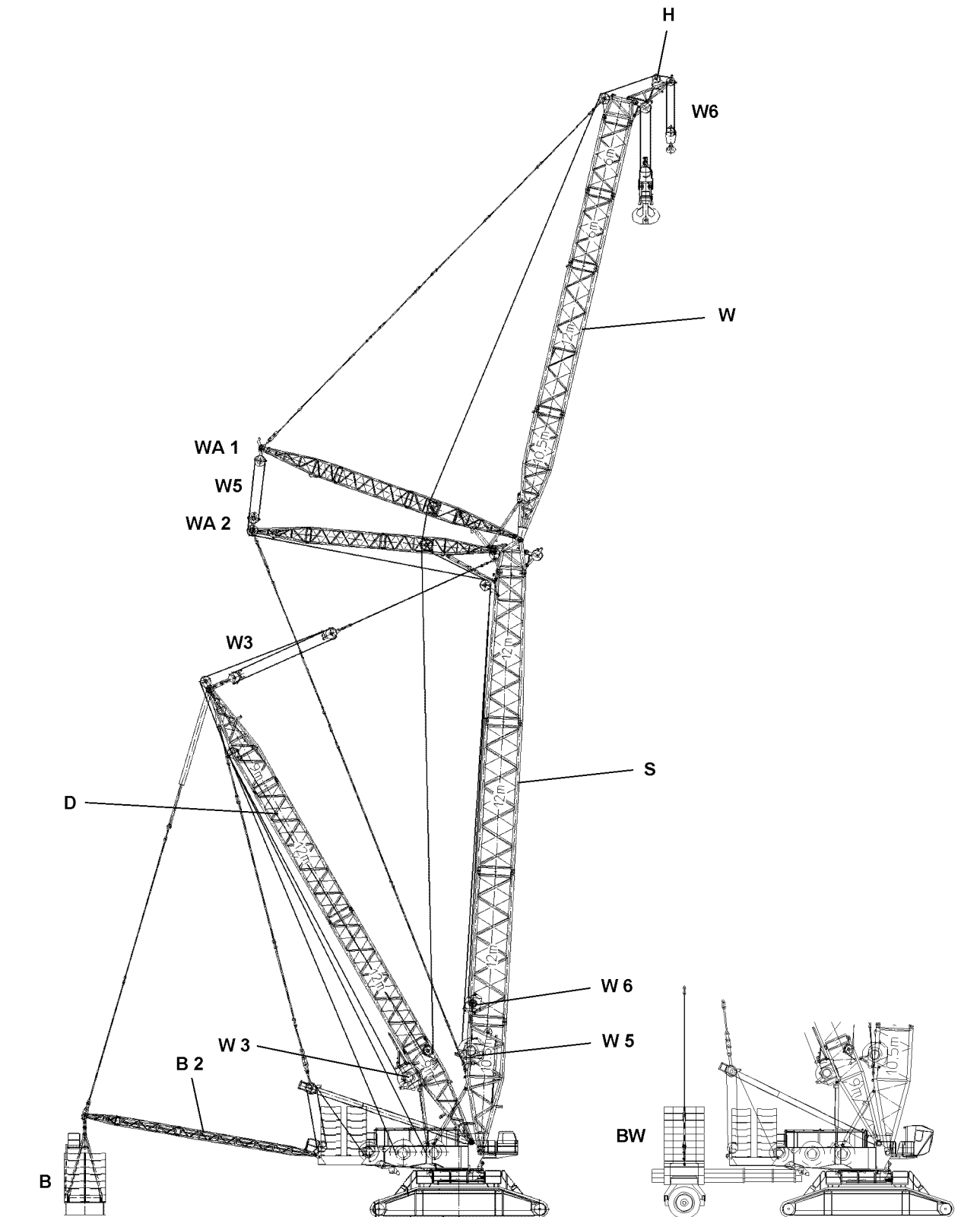
1 Component overview

1.1 Crawler travel gear

- 1 Crawler carrier
- 2 Cross carrier
- 3 Crawler center section
with turning device
- 4 Hydraulic assembly
supports
- 5 Mechanical auxiliary
supports

1.2 Turntable

- 6 Turntable
- 7 Crane operator's cab
- 8 Crane engine
- 9 Counterweight
- 10 SA-frame
- W1** Winch 1
- W2** Winch 2
- W4** Winch 4



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1.3 Boom

- WA1** WA-frame 1
- WA2** WA-frame 2
- W3** Winch 3
- W5** Winch 5
- W6** Winch 6
- H** Boom nose
- W** Luffing lattice jib
- S** Lattice mast - main boom,
heavy duty version
- D** Derrick

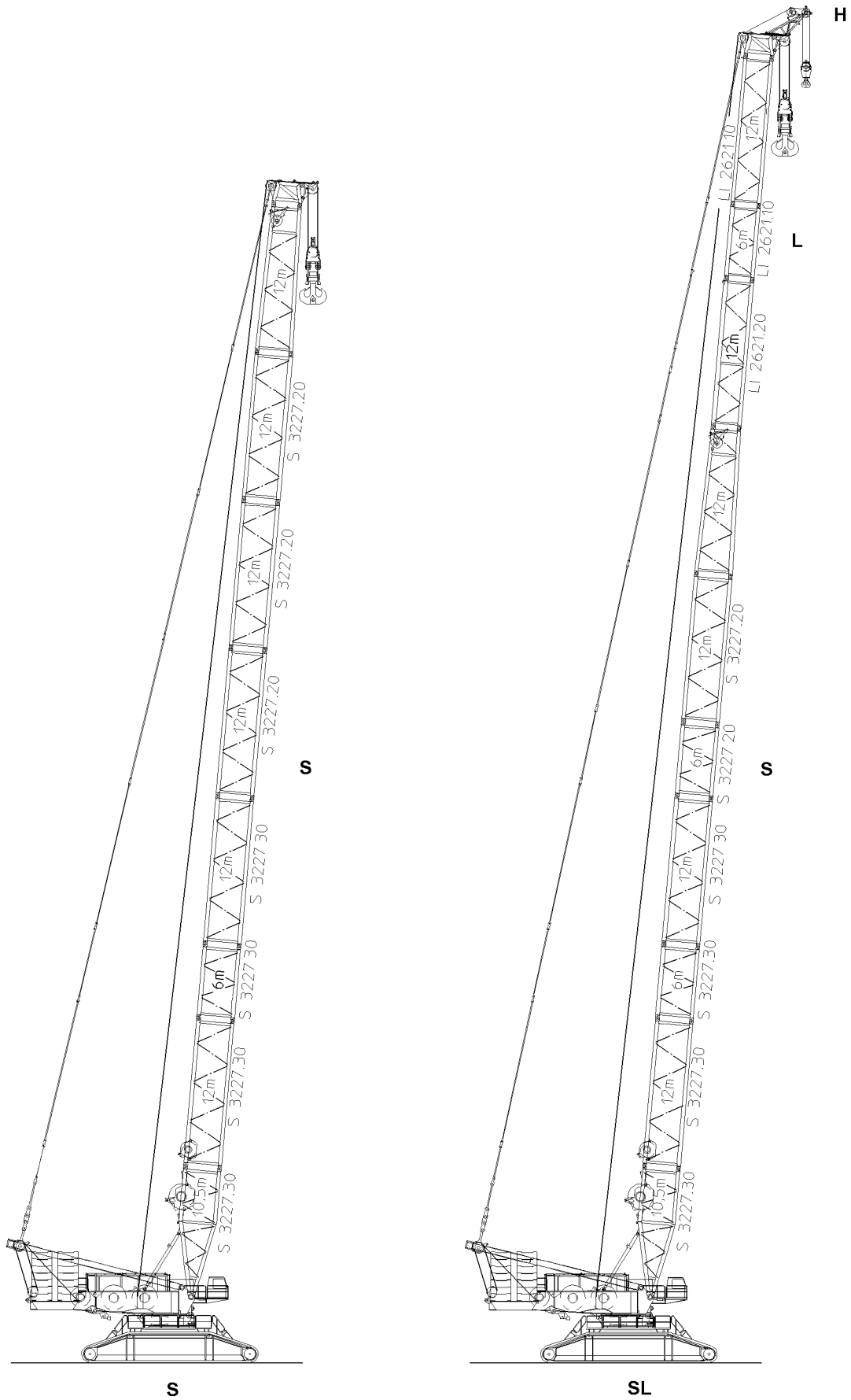
1.4 Derrick ballast



Note

- ▶ The suspended ballast and ballast trailer are generally referred to as **derrick ballast**.
-

- B** Suspended ballast
without guide
- B2** Suspended ballast
with guide
- BW** Ballast trailer



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2 Boom systems

2.1 Abbreviations

S = Lattice mast - main boom (heavy duty version)

SL = Lattice mast - main boom **S**, supplemented on top with light **L** lattice sections

W = Luffing lattice jib with **long** WA-frames, 21.5m

W2 = Luffing lattice jib with **short** WA-frames, 15.5m

H = Boom nose

2.1.1 **S - boom combination**

S = Lattice mast - main boom, heavy duty version

S = 30.00 m - 90.00 m

2.1.2 **SL - boom combination**

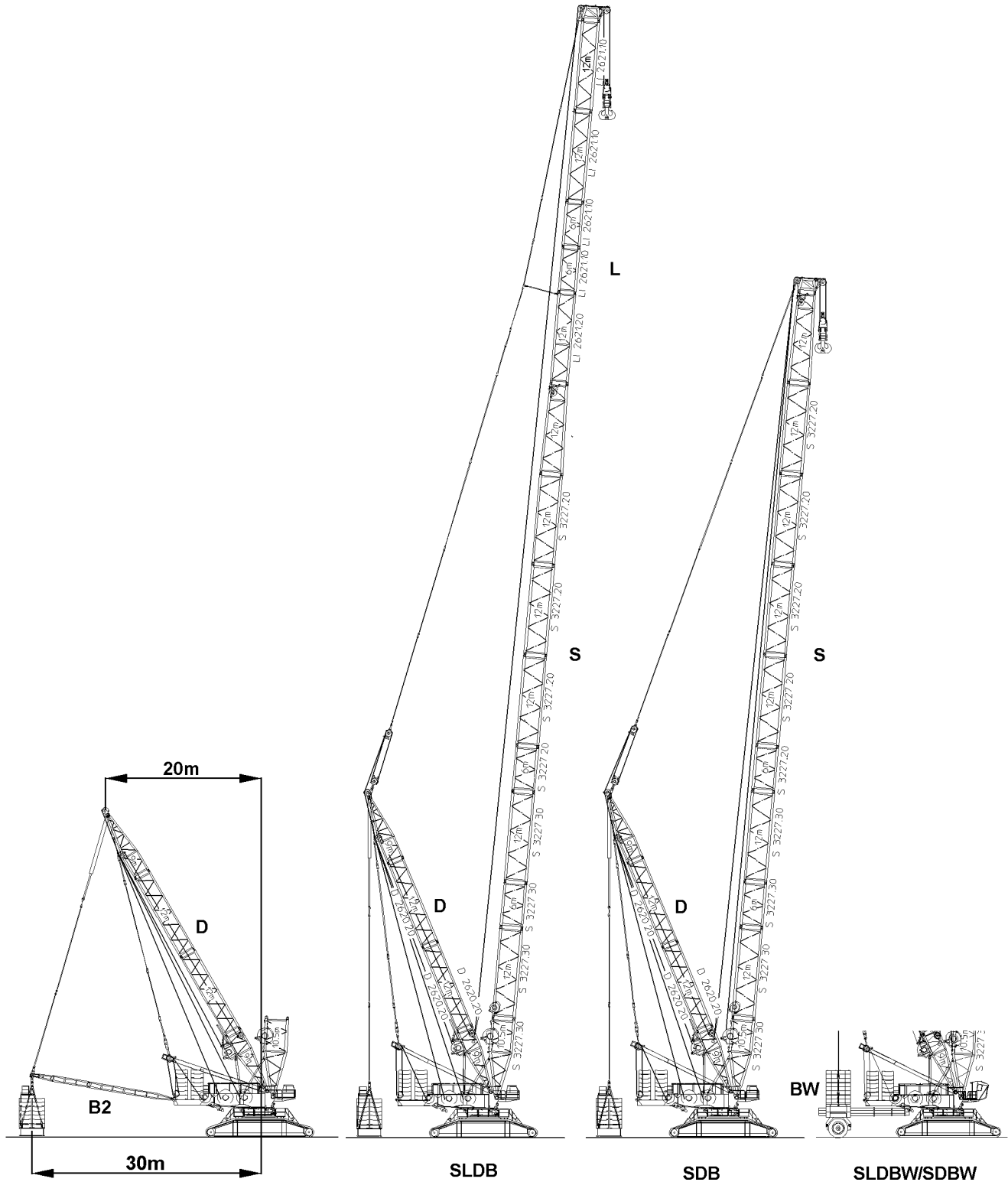
SL = Lattice mast - main boom **S**, supplemented on top with light **L** lattice sections

SL = 42.00 m - 102.00 m

2.1.3 **SL(H) - boom combination**

SL = Lattice mast - main boom **S**, supplemented on top with light **L** lattice sections

SL(H) = 42.00 m - 90.00 m



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2.1.4 SLDB/SLDB2 - boom combination

SLDB = SL-boom with derrick and suspended ballast

SL = 48.00 m - 144.00 m

D = 42.00 m

2.1.5 SDB/SDB2 - boom combination

SDB = S-boom with derrick and suspended ballast

SDB = 48.00 m - 150.00 m

D = 42.00 m

2.1.6 SLDBW - boom combination

SLDBW = SL-boom with derrick and ballast trailer

SL = 48.00 m - 144.00 m

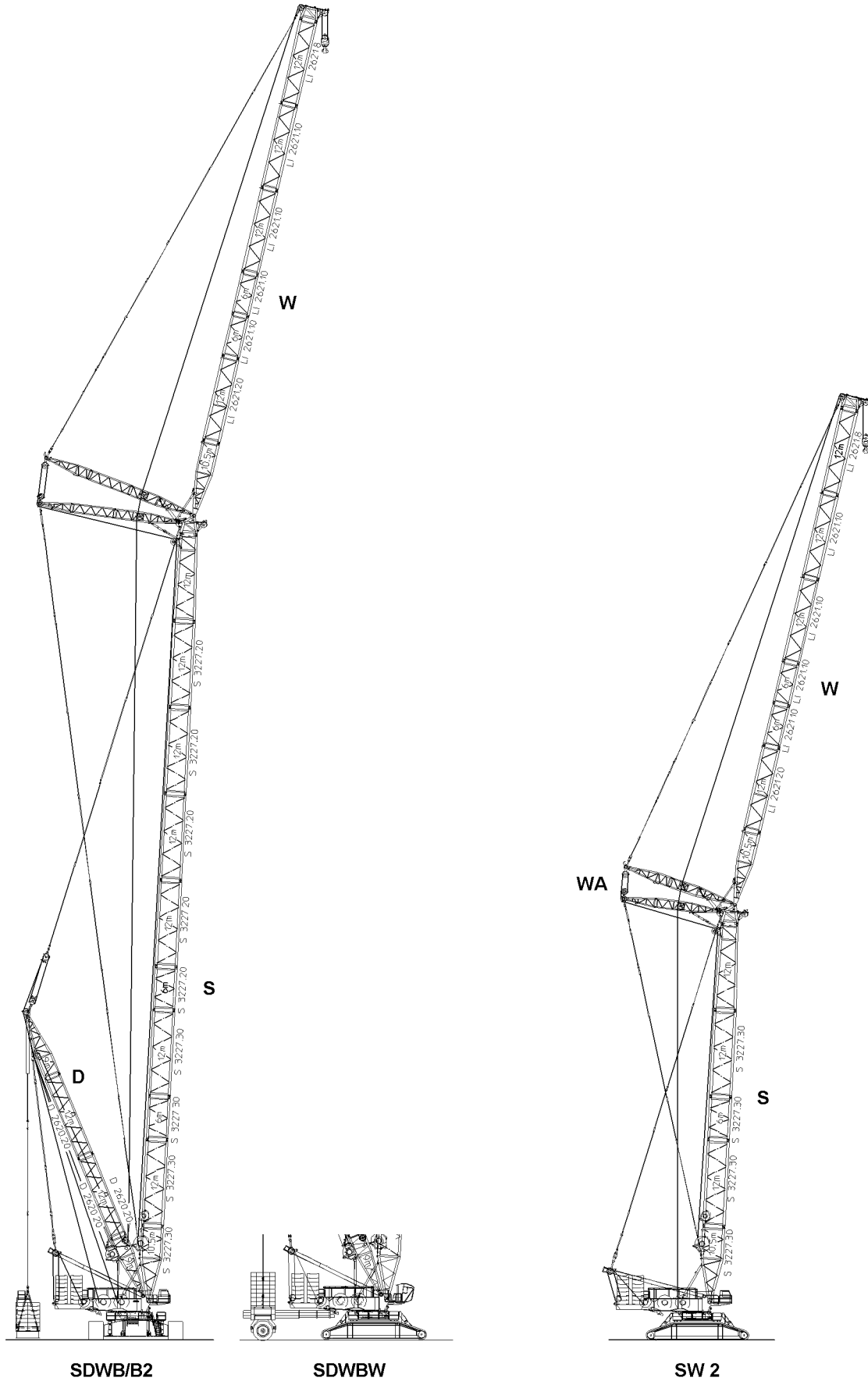
D = 42.00 m

2.1.7 SDBW - boom combination

SDBW = S-boom with derrick and ballast trailer

S = 48.00 m - 150.00 m

D = 42.00 m



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2.1.8 SDWB/SDWB2 - boom combination

SDWB = S-boom with derrick, luffing lattice jib and suspended ballast

S = 48.00 m - 114.00 m

D = 42.00 m

W = 36.00 m - 72.00 m

with **long** WA-frames 21.5 m

2.1.9 SDWBW - boom combination

SDWBW = S-boom with derrick, luffing lattice jib and ballast trailer

S = 48.00 m - 114.00 m

D = 42.00 m

W = 36.00 m - 72.00 m

with **long** WA-frames 21.5 m

2.1.10 SW2 - boom combinations

SW = S-boom with luffing lattice jib and short WA-frames

S = 54.00 m

W = 84.00 m

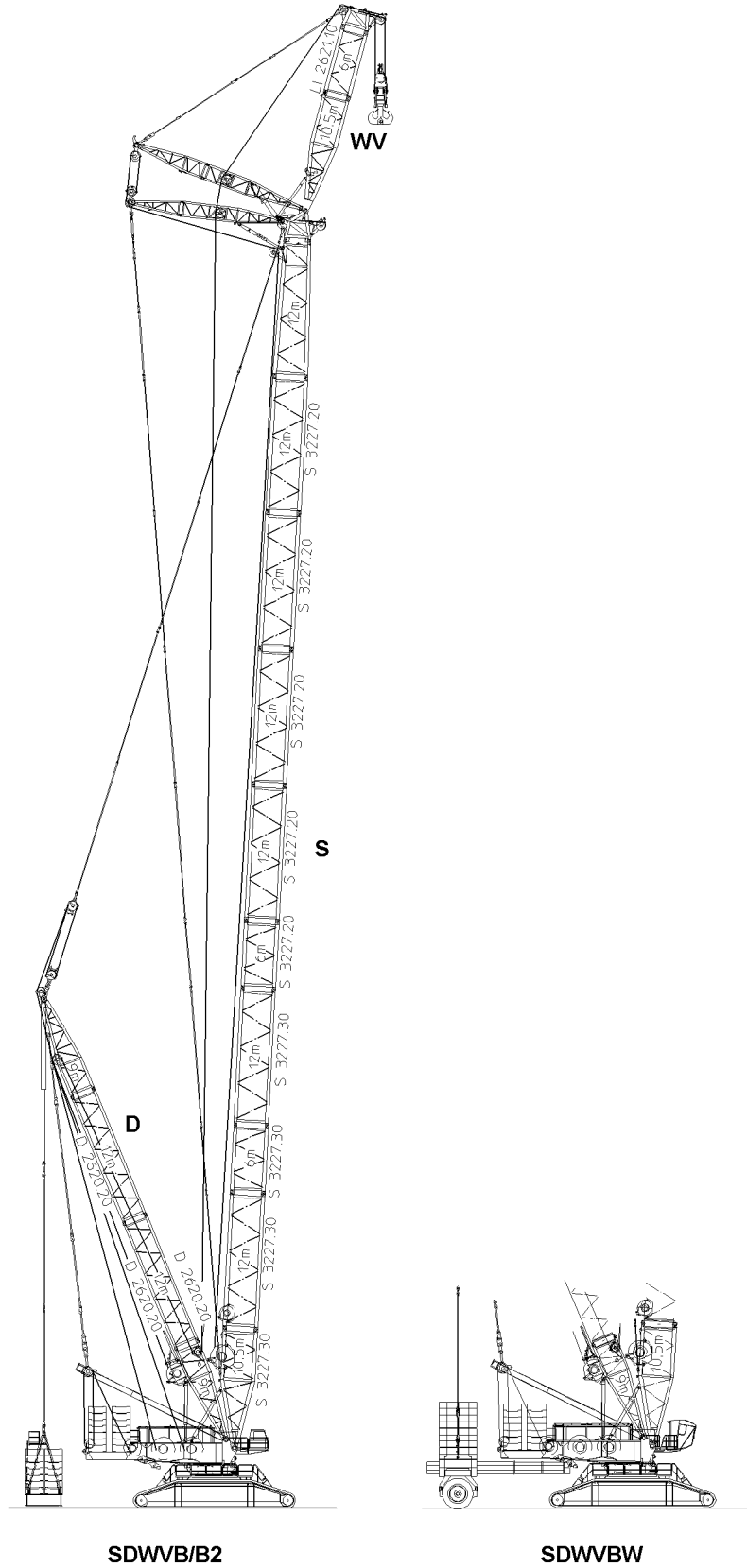
S = 66.00 m

W = 48.00 m



Note

► W2 designates short WA-frames (15.5m)



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2.1.11 SDWVB/SDWB2 - boom combination

SDWVB = S-boom with derrick, WV-lattice jib with an operating range of 12° to 20° to S-boom, suspended ballast

Length of WV-lattice jib, 12.00 m **or** 18.00 m

S = 48.00 m to 114.00 m

D = 42.00 m

with **short** WA-frames 15.5 m

2.1.12 SDWVBW - boom combination

SDWVBW = S-boom with derrick, WV-lattice jib with an operating range of 12° to 20° to S-boom, ballast trailer

Length of WV-lattice jib, 12.00 m **or** 18.00 m

S = 48.00 m to 114.00 m

D = 42.00 m

with **short** WA-frames 15.5 m

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1 Crawler travel gear

1.1 Frame

In-house manufactured, distortion-resistant welding structure made from high-strength, close-grained structural steel, consisting of a center section, two cross carriers and two crawler carriers. The crawler carriers can be removed and can be installed / removed by the crane itself.

1.2 Tracks

Maintenance free, dirt protected crawler track with flat track pads.

Pad width: 2.0 m

Pad width: 2.5 m *

Track width: 11.0 m

1.3 Central ballast

30 t consisting of four ballast plates with 7.5 t each.

1.4 Drive

Drive: 4 way

Hydraulic travel drives with planetary gears.

The crawler chains can be controlled independently and in the opposite direction.

There is no preferred travel direction.

1.5 Travel power

Stepless speed from 0 km/h to 1.05 km/h.

2 Crane superstructure

2.1 Frame

Liebherr turntable frame, consisting of turntable front section, turntable rear section with winch 4, SA-frame and machine house with catwalk and crane operator's cab.

Connection to the crawler center section via roller ring connection, with 360° rotation.

2.2 Diesel engine

– Number of cylinders: 6

– Make: CUMMINS

2.2.1 Engine type QSK23 860

Performance: 641 KW at 2100 rpm

Maximum torque: 3525 Nm at 1400 rpm

2.3 Winch 1

Standard hoist winch. Hydraulically driven via axial piston displacement pumps and integrated planetary gears.

2.4 Winch 2

Second hoist winch.

2.5 Winch 4

Intake gear.

2.6 Reeving winch

Auxiliary winch to reeve in the hoist ropes or control ropes.

2.7 Slewing gear

Two slewing gears.

Hydraulically driven via axial piston displacement pumps and integrated planetary gears.

2.8 Crane operator's cab

With safety glass, tiltable to the rear, heat deflecting glass, roof window with impact-proof glass, with operating elements and control instruments, warm water auxiliary heater*.

2.9 Crane control

All crane movements are controlled independently of each other via joysticks.

2.10 Counterweight

340.0 t, consists of: Two consoles 2 x 10.0 t and 32 counterweight plates* with 10.0 t each.

2.11 Safety systems

LICCON overload system, hoist limitation, electronic incline display, safety valves against pipe and hose bursts.

2.12 Electrical system

24 Volt direct current, 4 batteries with 225 Ah each.

3 Boom systems

3.1 Main boom S-system

With end section for maximum load capacity on the S-system.

Boom lengths from S36 m to S90 m.

Boom lengths from SDB48 m to SDB150 m with derrick system.

3.2 Main boom P-system

Only in connection with derrick system D.

With end section for maximum load capacity on the P-system.

Boom lengths of PD(B)48 m to PDB150 m.

3.3 Luffing lattice jib W-system

Can be installed on S-system.

Can be installed on P-system.

With end section for maximum load capacity on the W-system.

Lengths of luffing lattice jib from 36 m to 84 m.

For crane operation with luffing lattice jib, winch 5 is required.

3.4 Heavy duty jib WV

Use of existing lattice sections of W-system.
Can be installed on S-system.
Can be installed on P-system.
Operating range between 12° and 20° to S-boom.
Lengths: 12 m or 18 m

3.5 Derrick boom D-system

For crane operation with derrick boom, winch 3 is required.

4 Auxiliary equipment

4.1 Ballast pallet B

For maximum Derrick ballast of 600 t.
Stepless derrick ballast radius: 15 m to 25 m.
Maximum possible derrick ballast radius with guide frame: 30 m.

4.2 Ballast trailer BW

For maximum Derrick ballast of 600 t.
Stepless derrick ballast radius: 15 m to 25 m or 20 m to 30 m.
Maximum possible derrick ballast radius: 30 m.

4.3 Derrick ballast

Ballast plates with a total weight of 600 t.

4.4 Winch 3

Adjustment of main boom in derrick operation.

4.5 Winch 5

Adjustment of luffing lattice jib.

4.6 Winch 6

Auxiliary hoist gear

4.7 Boom nose 60 t

For installation on S-, SL-, W- or WV-end section.

4.8 Hydraulic assembly support

Consisting of four support cylinders including support plates, installed on cross carriers of crawler travel gear.
Lifting the basic machine for installation or removal.

4.9 Mechanical auxiliary support

To erect long boom combinations without derrick ballast.

4.10 Hydraulic assembly cylinder

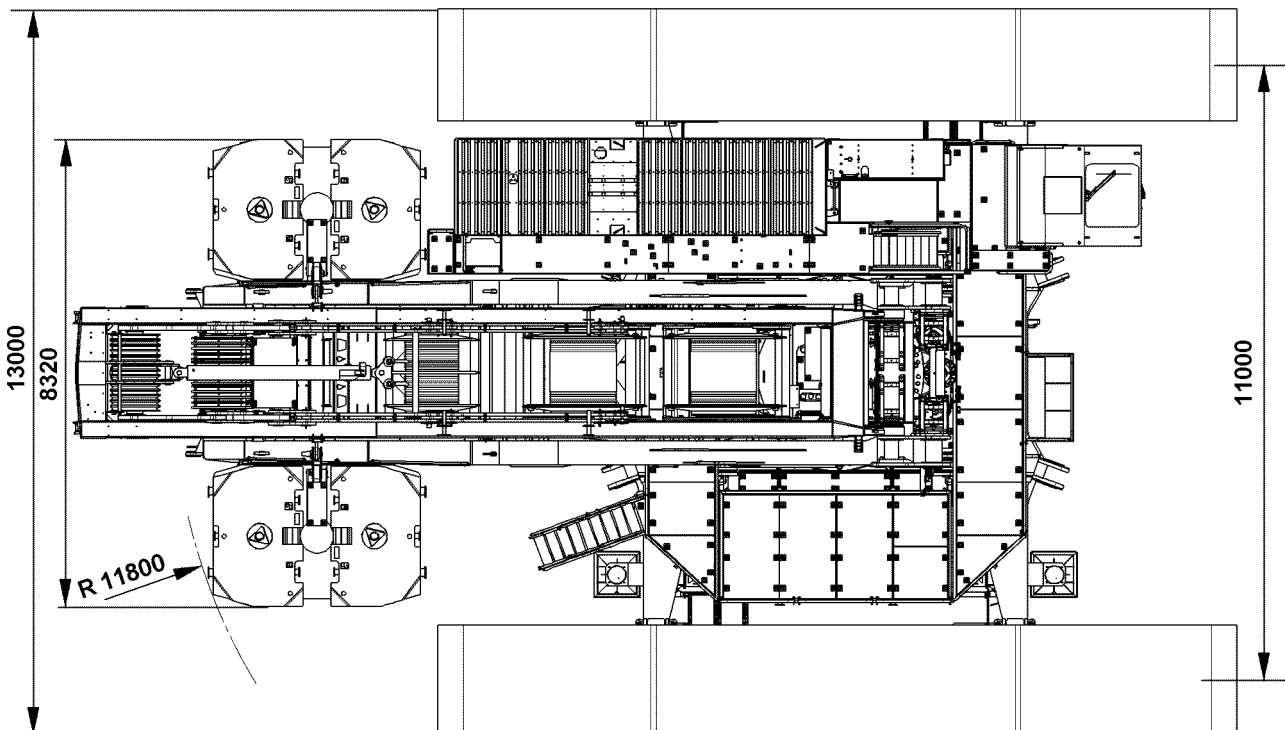
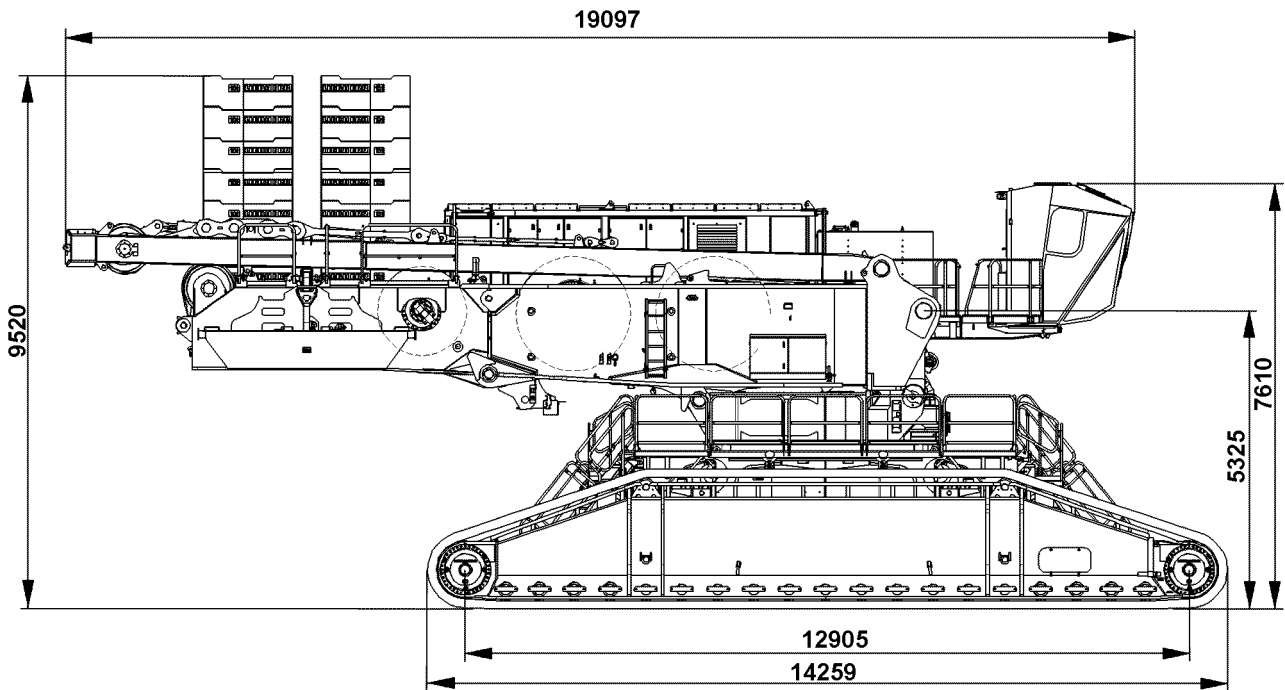
For self-assembly / self-disassembly of crawler travel gear.

4.11 Pin pulling device

Including mobile hydraulic aggregate.

For pinning and unpinning the S-, L- and W-lattice sections.

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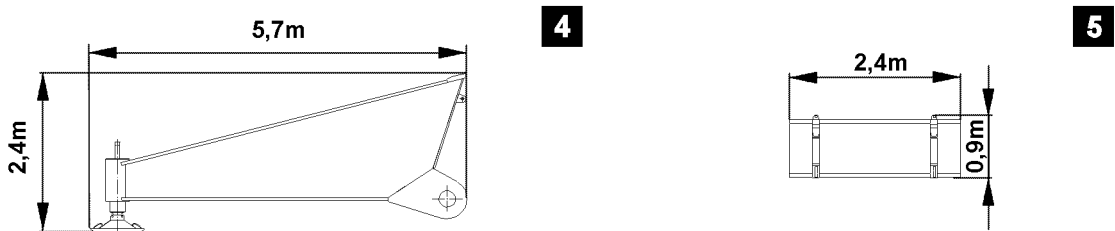
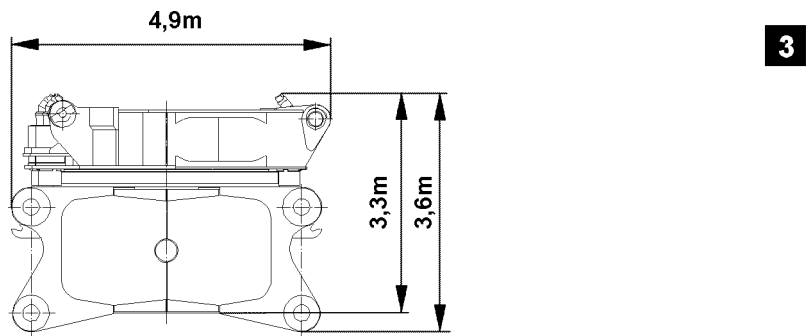
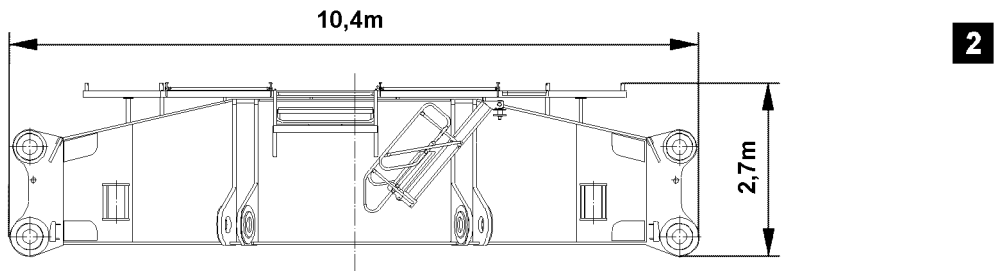
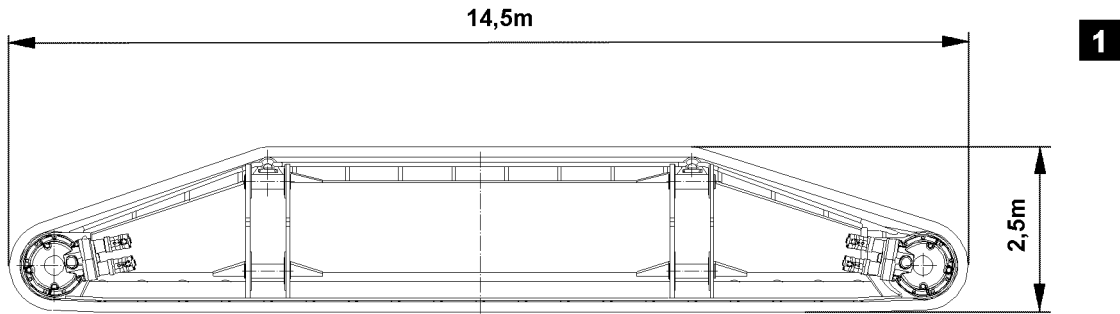
1 Dimensions and weights

1.1 Dimensions of crawler travel gear with crane superstructure



Note

► For dimensions, see opposite illustration.



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1.2 Crawler carrier

See illustration 1

Component	Weight
Crawler carrier including two travel drives and track pads ¹⁾	70.5 t
Crawler carrier including two travel drives without track pads	38.5 t

1) Track pad width: 2,0 m

1.3 Cross carrier

See illustration 2.

Weight	Width
45.0 t	2.6 m

1.4 Crawler center section with turning device

See illustration 3.

Weight	Width
43.0 t	3.5 m

1.5 Mechanical auxiliary support

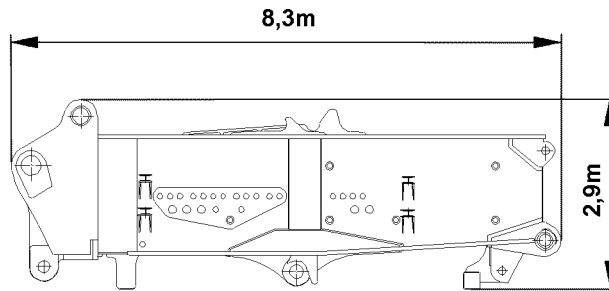
See illustration 4.

Weight	Width
5.8 t	0.9 m

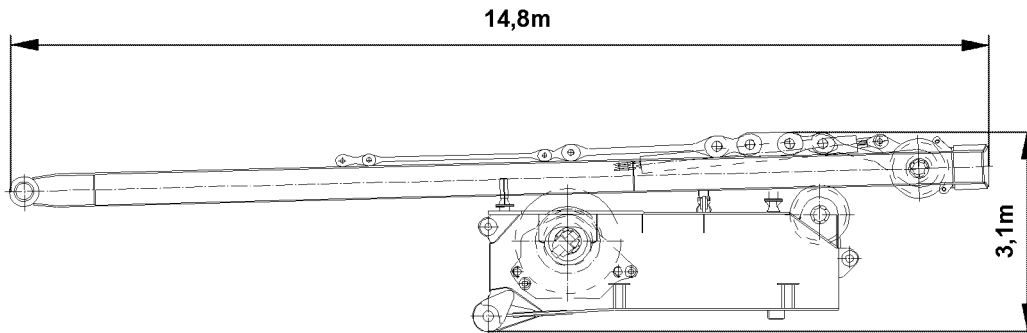
1.6 Auxiliary weight crawler travel gear

See illustration 5.

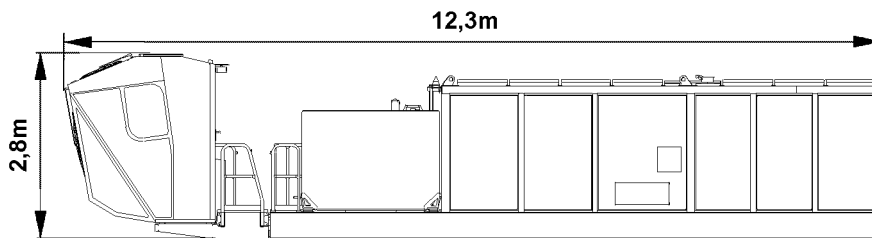
Weight	Width
7.5 t	1.2 m



6

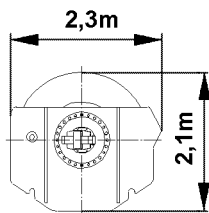


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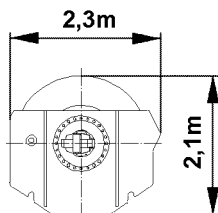


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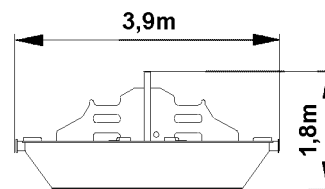
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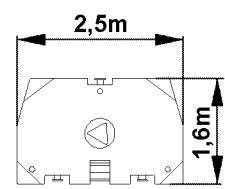
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11



12



1.7 Turntable, front section

See illustration 6.

Weight	Width
30.8 t	3.4 m

1.8 Turntable, rear section with SA-frame and winch 4

See illustration 7.

Weight	Width
44.0 t	3.3 m

1.9 Machine house with catwalk and cab

See illustration 8.

Weight	Width
17.6 t	2.5 m

1.10 Winch 1

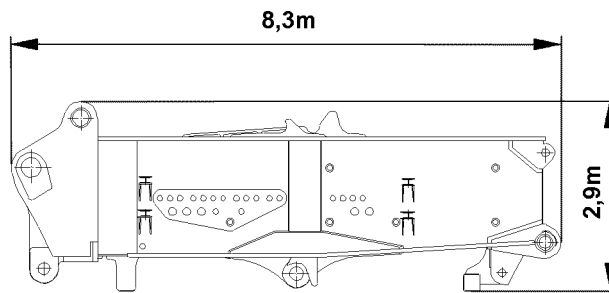
See illustration 9.

Weight	Width
22.8 t	2.3 m

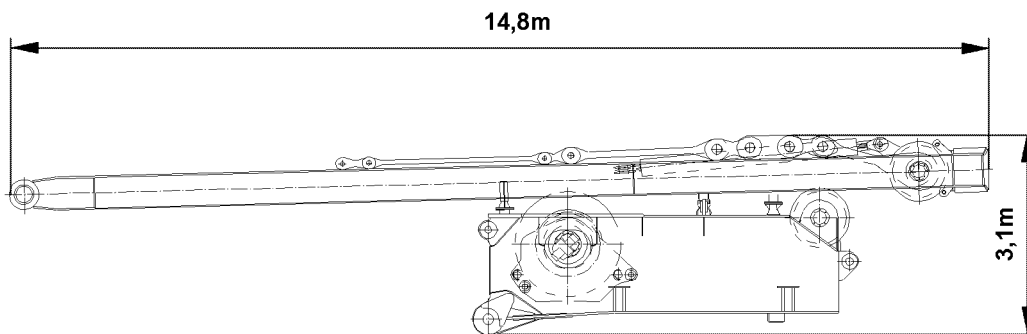
1.11 Winch 2

See illustration 10.

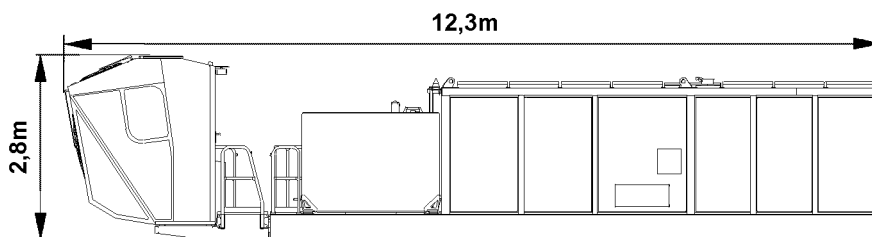
Weight	Width
22.8 t	2.3 m



6

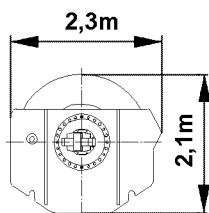


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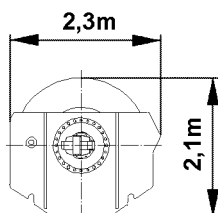


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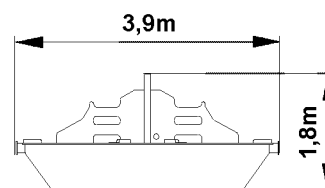
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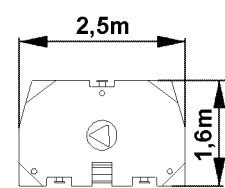
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12



1.12 Base plate counterweight

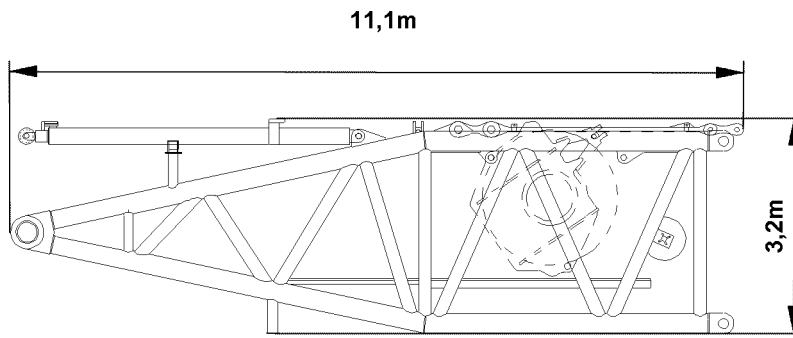
See illustration 11.

Weight	Width
10.2 t	2.5 m

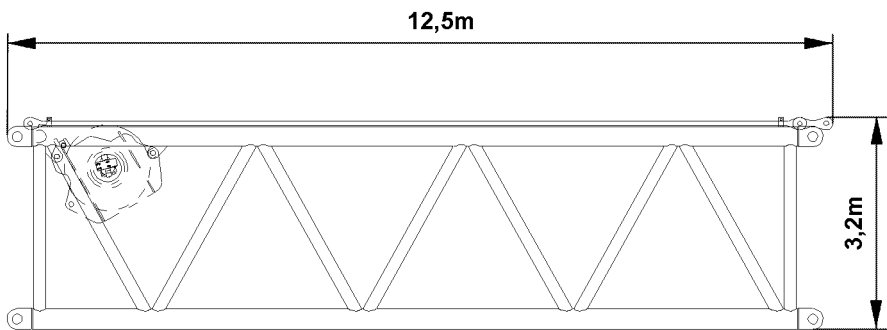
1.13 Counterweight

See illustration 12.

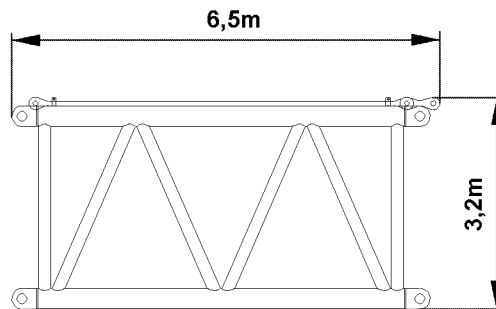
Weight	Width
10.0 t	0.6 m



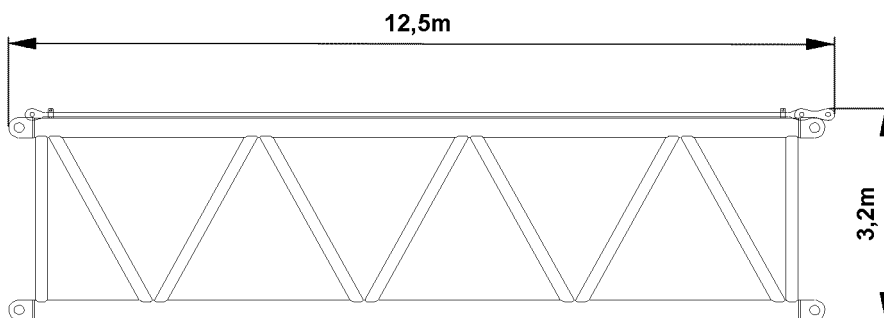
13



14



15



16

1.14 S-pivot section 10.5 m

See illustration 13.

Weight	Width
48.4 t ¹⁾	3.5 m
26.2 t ²⁾	3.5 m

1) with winch 5

2) without winch 5

1.15 S-intermediate section 12 m, 3227.30

See illustration 14.

Weight	Width
25.6 t ¹⁾	3.5 m
18.4 t ²⁾	3.5 m

1) with winch 6

2) without winch 6

1.16 S-intermediate section 6 m, 3227.30

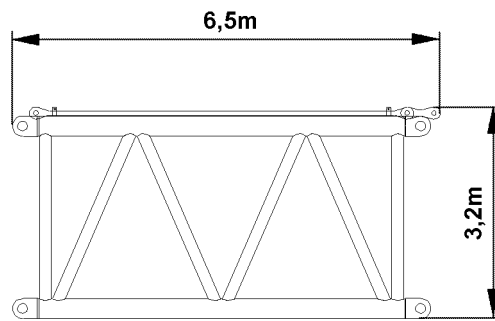
See illustration 15.

Weight	Width
9.9 t	3.5 m

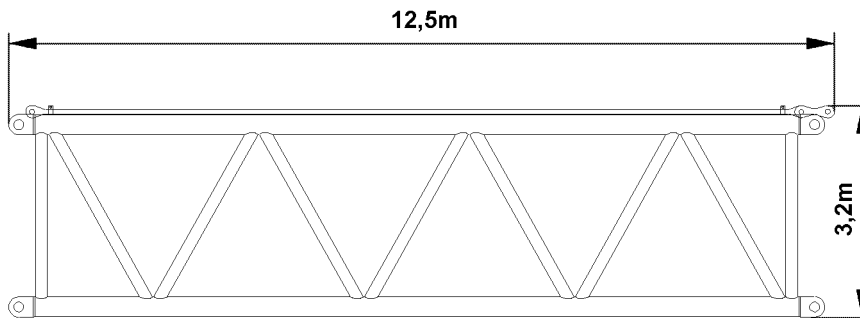
1.17 S-intermediate section 12 m, 3227.30

See illustration 16.

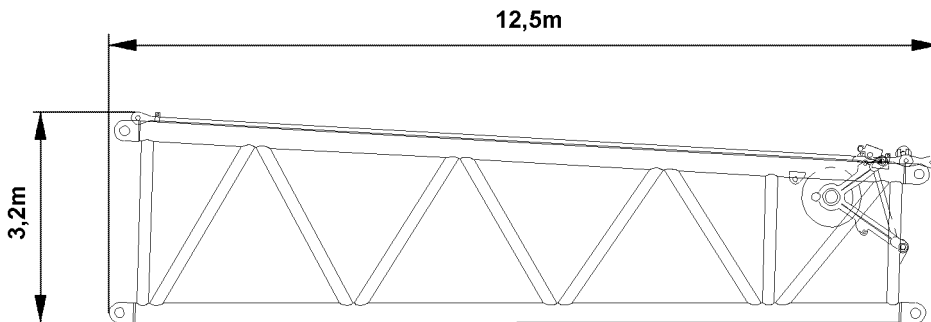
Weight	Width
18.2 t	3.5 m



17

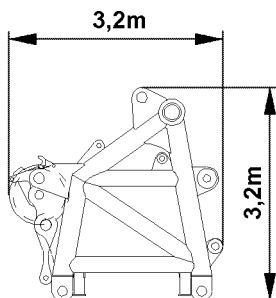


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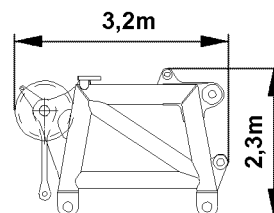


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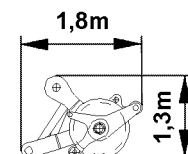
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22



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1.18 S-intermediate section 6 m, 3227.20

See illustration 17.

Weight	Width
8.8 t	3.5 m

1.19 S-intermediate section 12 m, 3227.20

See illustration 18.

Weight	Width
15.5 t	3.5 m

1.20 S-adapter 12 m

See illustration 19.

Weight	Width
17.9 t	3.5 m

1.21 W-connector head 1.5 m, 675 t

See illustration 20.

Weight	Width
10.0 t	3.5 m

1.22 S/W-end section 1.5 m, 1350 t

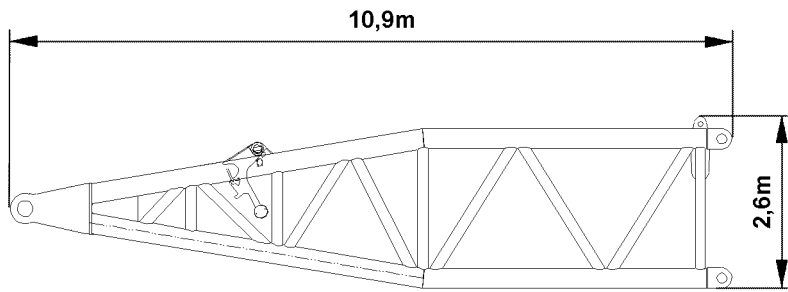
See illustration 21.

Weight	Width
8.8 t	3.5 m

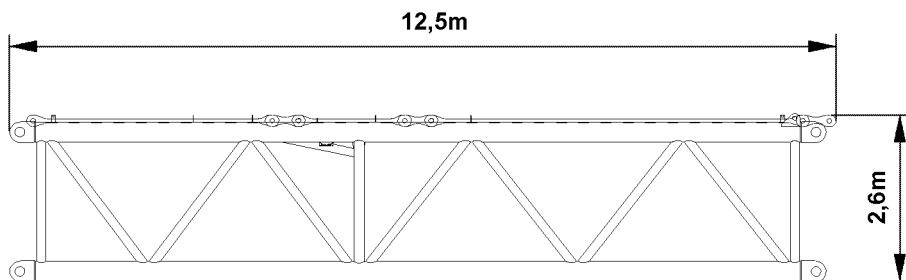
1.23 Pulley set 675 t

See illustration 22.

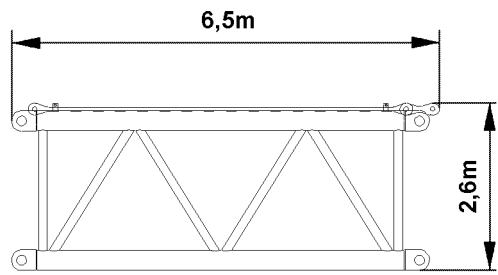
Weight	Width
2.8 t	1.9 m



23



24



25

1.24 W-pivot section 10.5 m

See illustration 23.

Weight	Width
12.6 t	3.0 m

1.25 LI-intermediate section 12 m, 2621.20

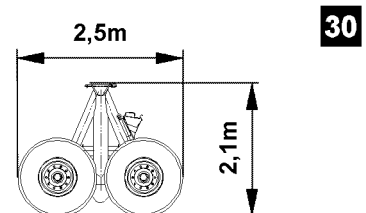
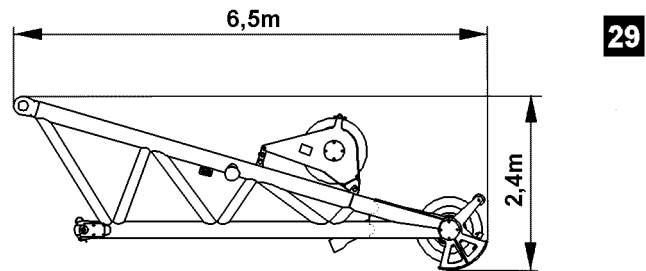
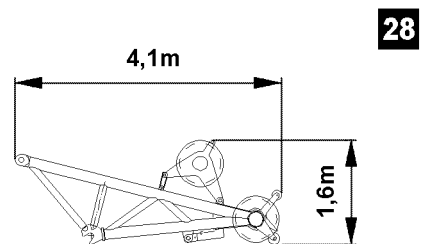
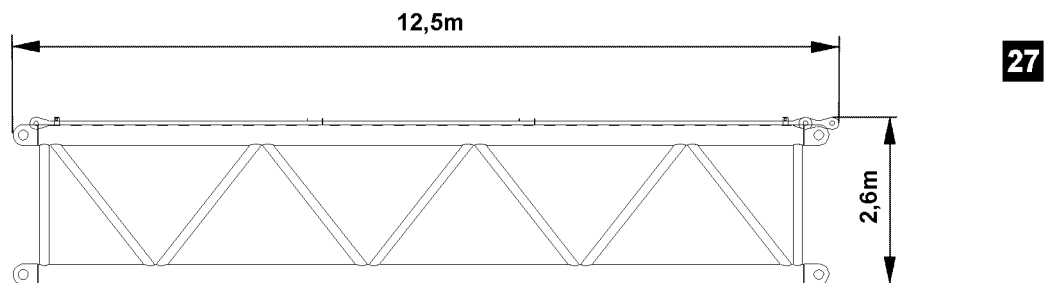
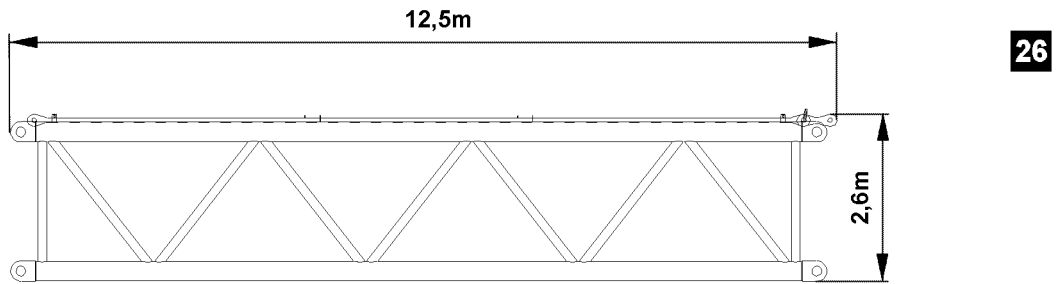
See illustration 24.

Weight	Width
11.5 t	3.0 m

1.26 LI-intermediate section 6 m, 2621.20

See illustration 25.

Weight	Width
5.9 t	3.0 m



1.27 LI-intermediate section 12 m, 2621.10

See illustration 26.

Weight	Width
9.8 t	3.0 m

1.28 LI-intermediate section 12 m, 2621.8

See illustration 27.

Weight	Width
8.2 t	3.0 m

1.29 Boom nose 62 t

See illustration 28.

Weight	Width
1.3 t	1.1 m

1.30 Boom nose 120 t

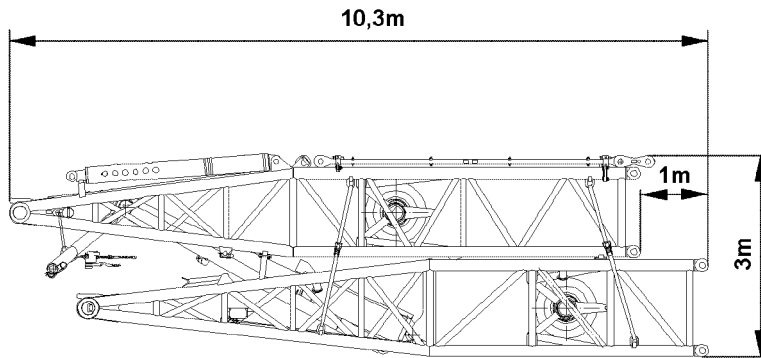
See illustration 29.

Weight	Width
3.8 t	2.3 m

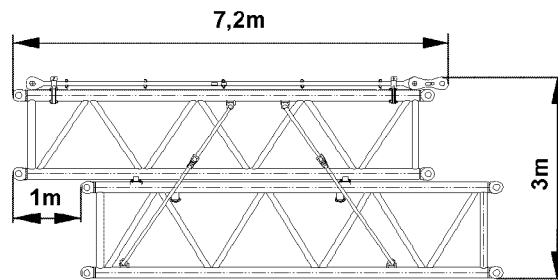
1.31 Erection cart

See illustration 30.

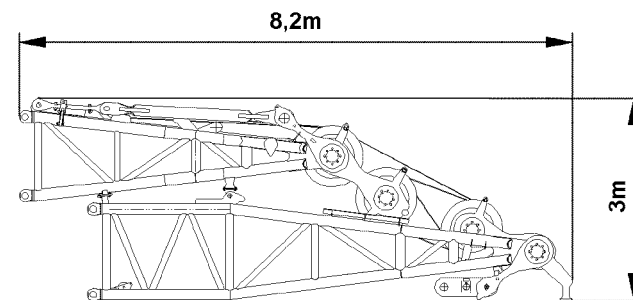
Weight	Width
3.4 t	3.1 m



31



32



33

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1.32 WA-frame 1 + WA-frame 2, pivot section 9 m

See illustration 31.

Weight	Width
15.0 t	3.0 m

1.33 WA-frame 1 + WA-frame 2, intermediate section 6 m

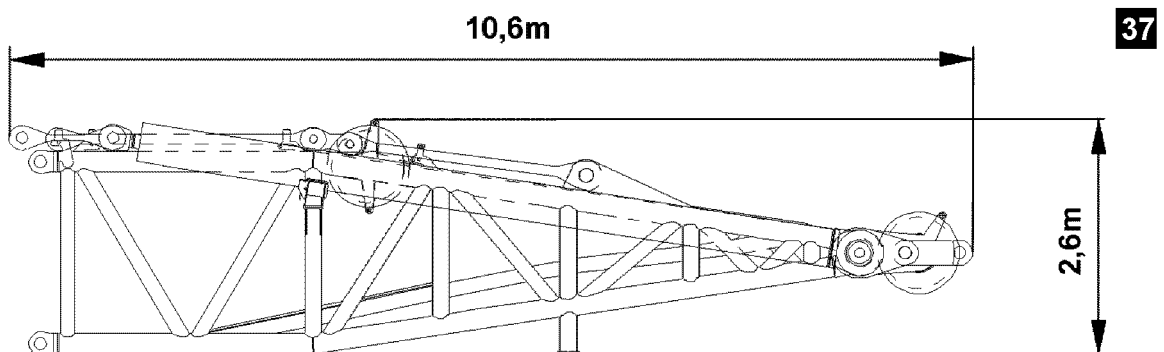
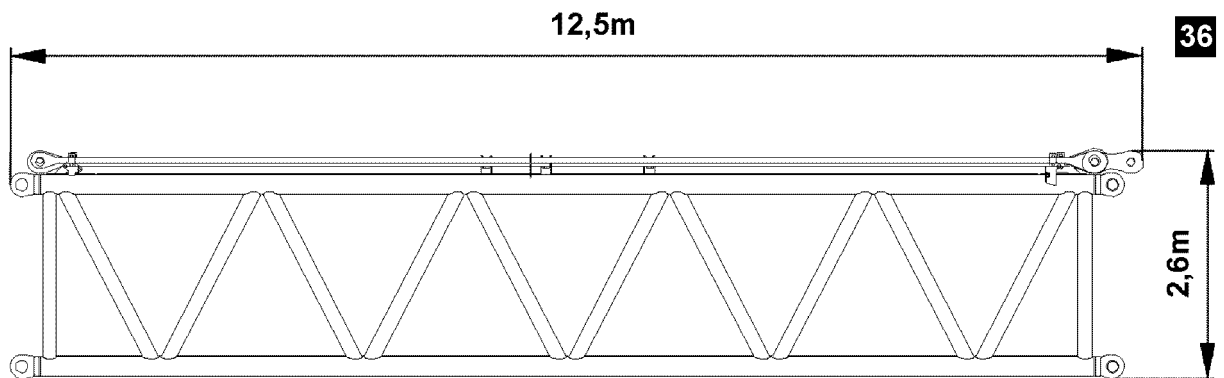
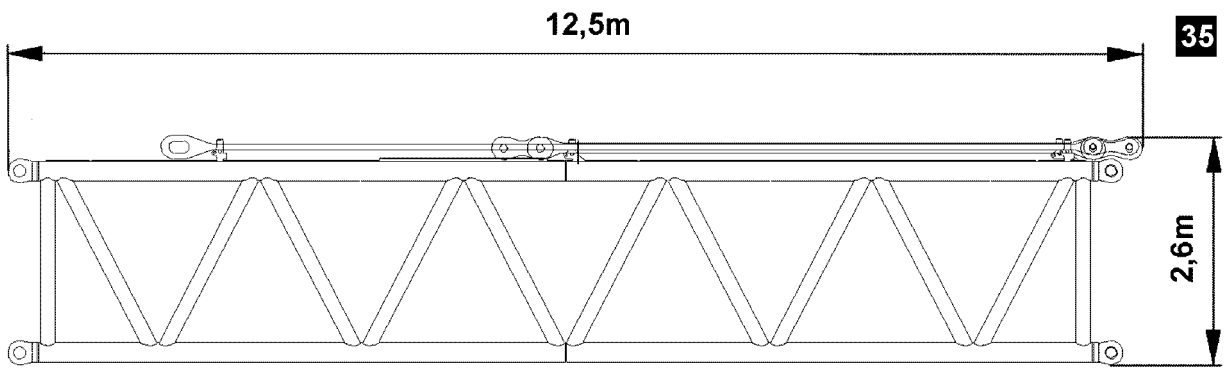
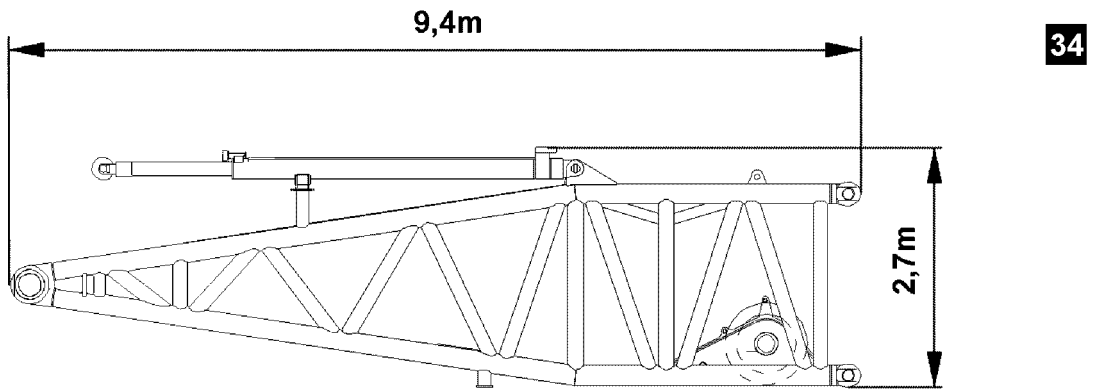
See illustration 32.

Weight	Width
4.9 t	2.9 m

1.34 WA-frame 1, end section 8 m + WA-frame 2, end section 4.5 m

See illustration 33.

Weight	Width
13.0 t	2.9 m



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1.35 D-pivot section 9 m

See illustration 34.

Weight	Width
12.4 t	3.0 m

1.36 D-intermediate section 12 m

See illustration 35.

Weight	Width
12.5 t	3.0 m

1.37 D-reducer section 12 m

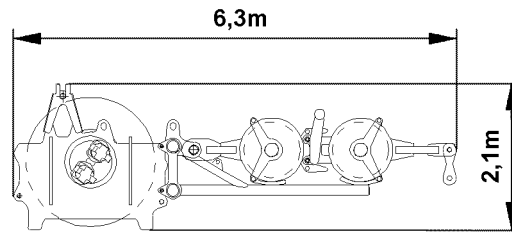
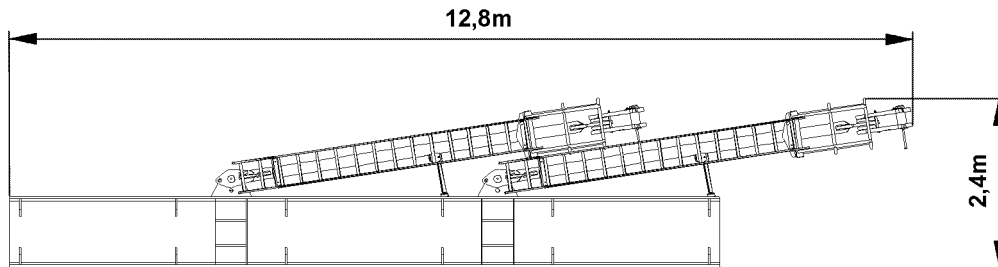
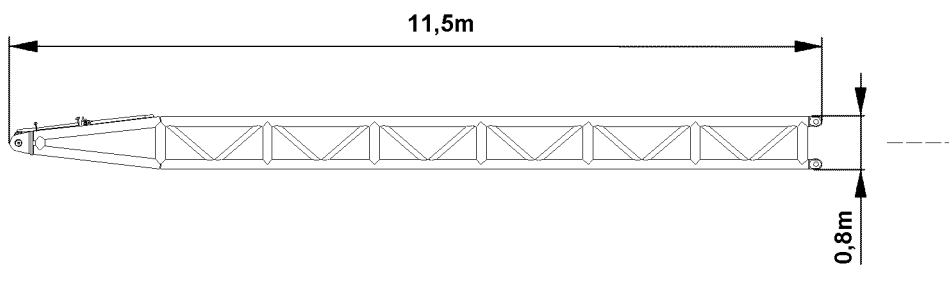
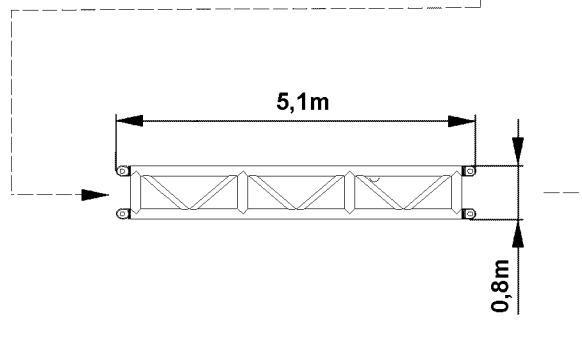
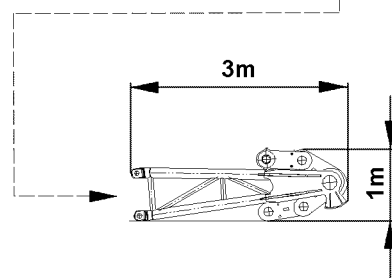
See illustration 36.

Weight	Width
12.2 t	3.0 m

1.38 D-end section 9 m

See illustration 37.

Weight	Width
35.6 t	3.5 m

**38****39****40****41****42**

1.39 Winch 3 with pulley blocks

See illustration 38.

Weight	Width
29.5 t	2.9 m

1.40 Ballast pallet

See illustration 39.

Weight	Width
21.1 t	3.0 m

1.41 Suspended ballast guide pivot section

See illustration 40.

Weight	Width
2.8 t	3.0 m

1.42 Suspended ballast guide intermediate section

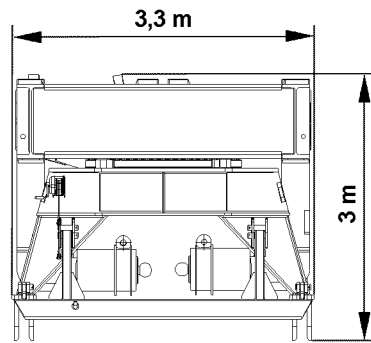
See illustration 41.

Weight	Width
1.2 t	3.0 m

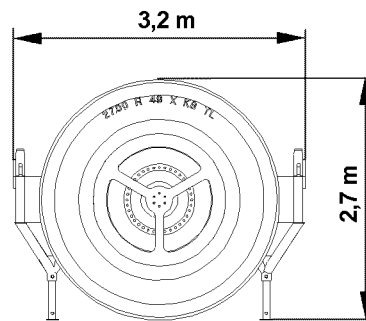
1.43 Suspended ballast guide end section

See illustration 42.

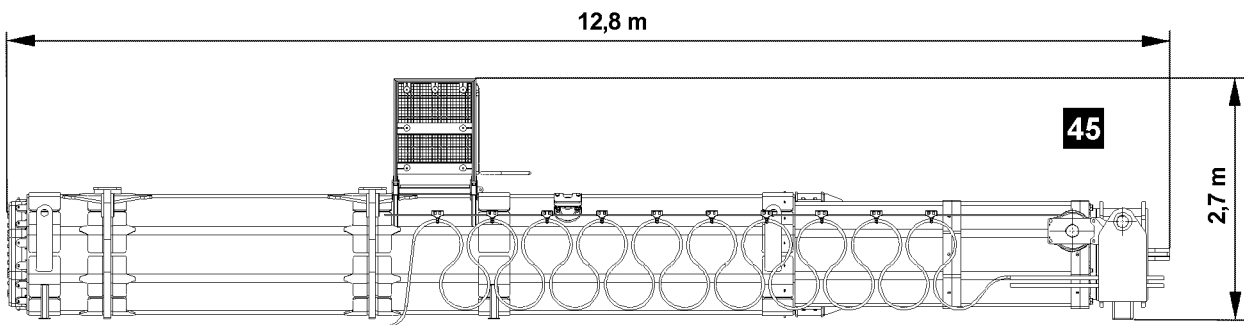
Weight	Width
3.1 t	4.3 m



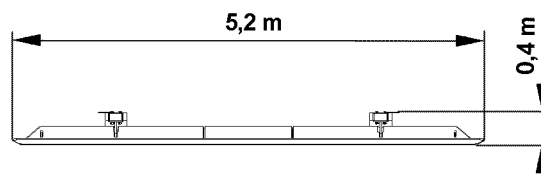
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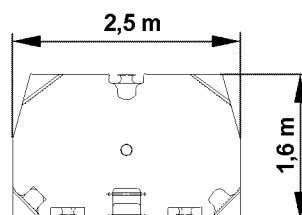
44



45



46



47

1.44 Ballast trailer frame

See illustration 43.

Weight	Width
35.1 t	10.0 m

1.45 Wheel set

See illustration 44.

Weight	Width
24.0 t	4.8 m

1.46 Ballast trailer guide

See illustration 45.

Weight	Width
35.5 t	2.5 m

1.47 Support pad

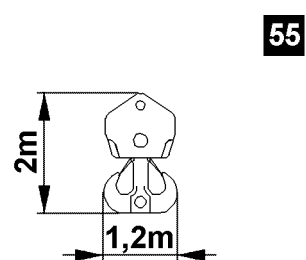
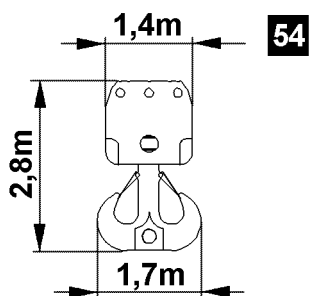
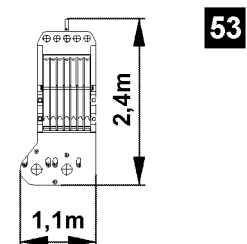
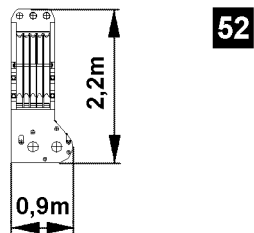
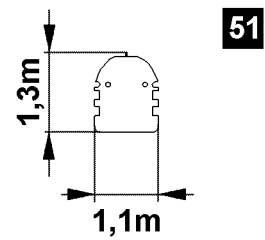
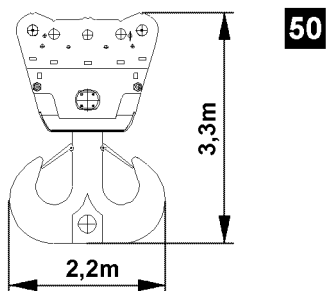
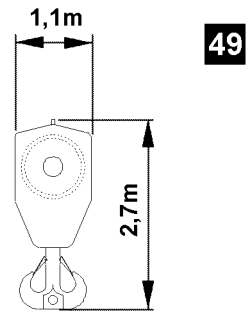
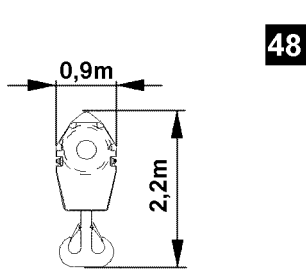
See illustration 46.

Weight	Width
2.4 t	1.2 m

1.48 Ballast plate

See illustration 47.

Weight	Width
10.0 t	0.6 m



1.49 Hook block 125DM

See illustration 48.

Weight	Width
5.5 t	1.0 m

1.50 Hook block 200DM

See illustration 49.

Weight	Width
11.9 t	1.4 m

1.51 Hook block 1350DMZ

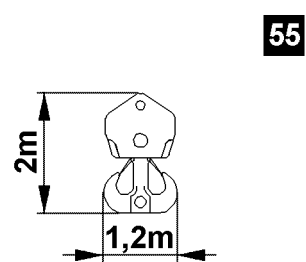
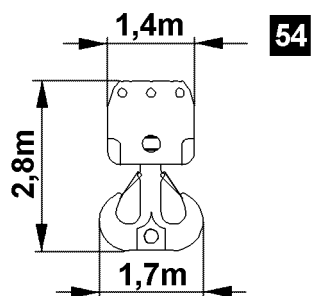
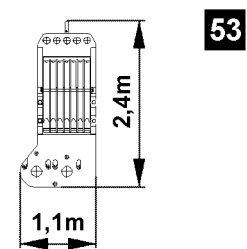
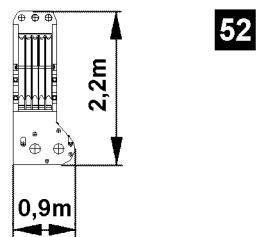
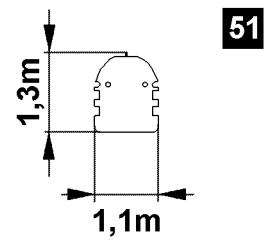
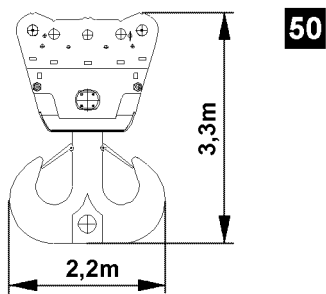
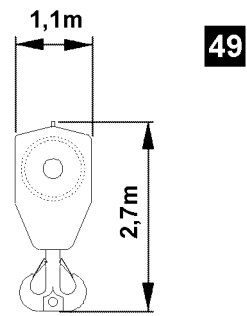
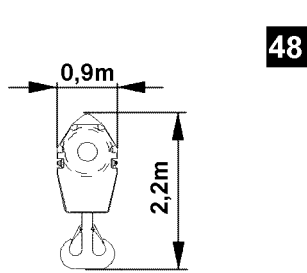
See illustration 50.

Weight	Width
12.8 t	1.2 m

1.52 Auxiliary weight

See illustration 51.

Weight	Width
1.0 t	0.2 m



1.53 Pulley block

See illustration 52.

Weight	Width
3.7 t	1.1 m

1.54 Pulley block

See illustration 53.

Weight	Width
4.7 t	1.1 m

1.55 Hook with traverse 630DZ

See illustration 54.

Weight	Width
6.0 t	1.0 m

1.56 Hook with traverse 320DZ

See illustration 55.

Weight	Width
3.7 t	1.0 m

2 Lifting equipment



Note

► For lifting equipment, see load chart manual.

3 Ground pressure

Maximum ground pressure at nominal load	1850 kN/m ²
---	------------------------

4 Workplace-related emission value

Sound pressure level at nominal engine rpm	Stationary noise L_{pAeq}	
	Left ear	Right ear
Crane operator's cab	72 db(A)	

5 Vibrations

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

6 Crane speeds

Crane speeds at an engine rpm of 1800 rpm .

Drives	
Winch 1, 2	0 m/min to 112 m/min for single strand
Winch 3	0 m/min to 119 m/min for single strand
Winch 5	0 m/min to 119 m/min for single strand
Winch 6	0 m/min to 123 m/min for single strand
Winch 4	2 x 62 m/min for single strand
Slewing gear	0 rpm to 0.82 rpm

7 Ropes

7.1 Hoist ropes

	Rope diameter
Winch 1	38 mm
Winch 2	38 mm
Winch 6	38 mm
Winch 6	28 mm

7.2 Control ropes

	Rope diameter
Winch 3	38 mm
Winch 4	38 mm
Winch 5	38 mm

7.3 Guy ropes

	Rope diameter
Auxiliary guying	54 mm
Auxiliary guying	36 mm

7.4 Assembly rope

	Rope diameter
Assembly winch	8 mm

2 Safety

1 Crane operation planning

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



DANGER

Missing information increases the risk of accidents!

Crane operation may not be possible or improvisation can result if a crane operator does not have all the required data.

► A crane operator must have exact data before starting any work!

The crane operator must obtain or receive the necessary information in a timely fashion before driving to the work site. In particular:

- type of crane operation
- height and width clearance measurements
- electrical transmission lines (including voltages)
- space restrictions at the work site
- movement restrictions caused by buildings
- weight and dimensions of the load(s) to be hoisted
- required hoisting height and boom projection
- ground bearing capacity at the work site

Based on the above information, the crane operator must assemble the equipment required to operate the crane:

- hook block / load hook
- auxiliary boom
- fastening equipment
- counterweight

1 General

**Note**

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

1.1 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!

1.2 Danger of crushing when 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!

1.3 Exhaust systems and other crane components with high temperatures

**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!

1.4 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!
-

1.5 Traffic endangerment and environmental damage



WARNING

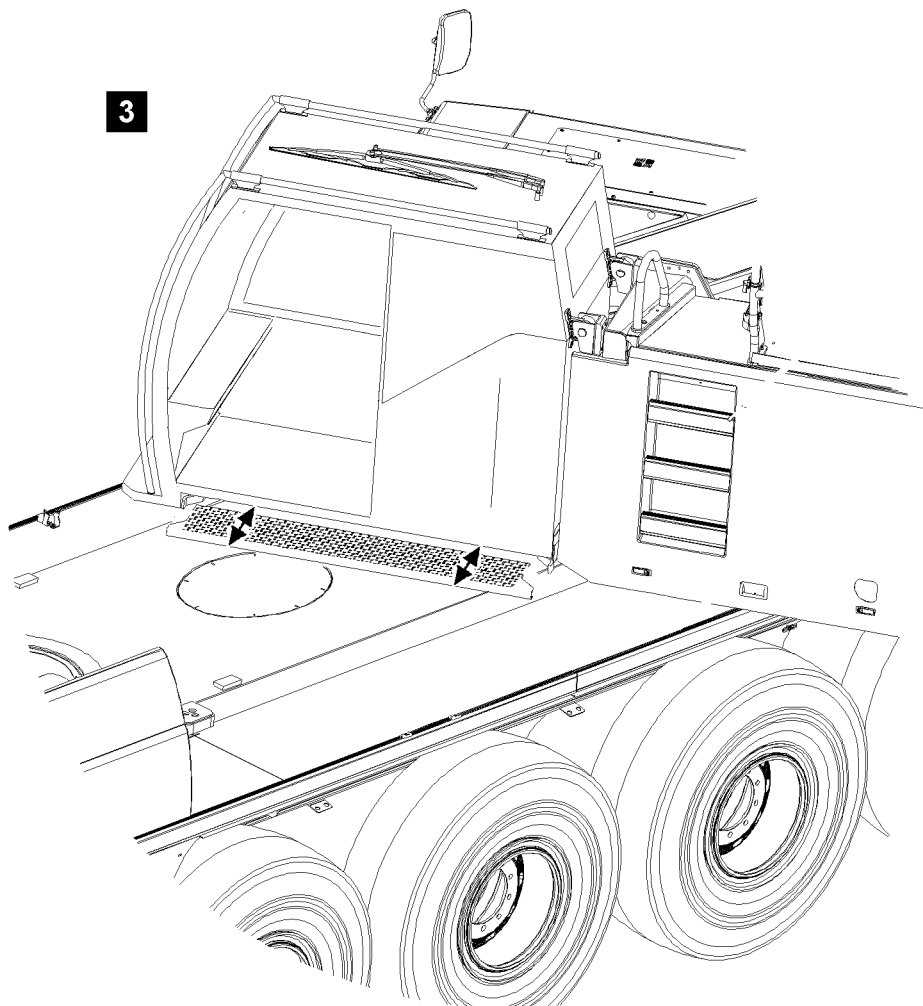
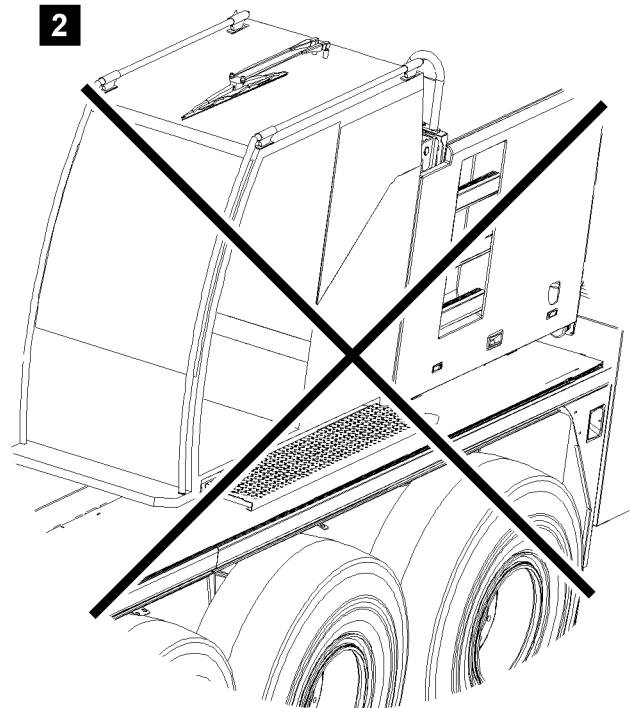
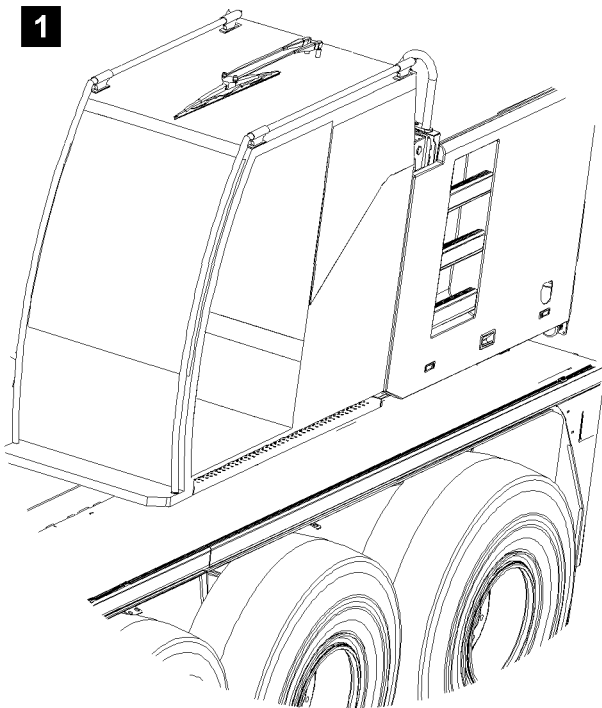
Danger of slipping and skidding!

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!
-

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1.6 Crane cab with retracted / extended step

1.6.1 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.
- All 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 pedestal, 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!

1.6.2 Entering / exiting a swung crane superstructure

See illustration 3

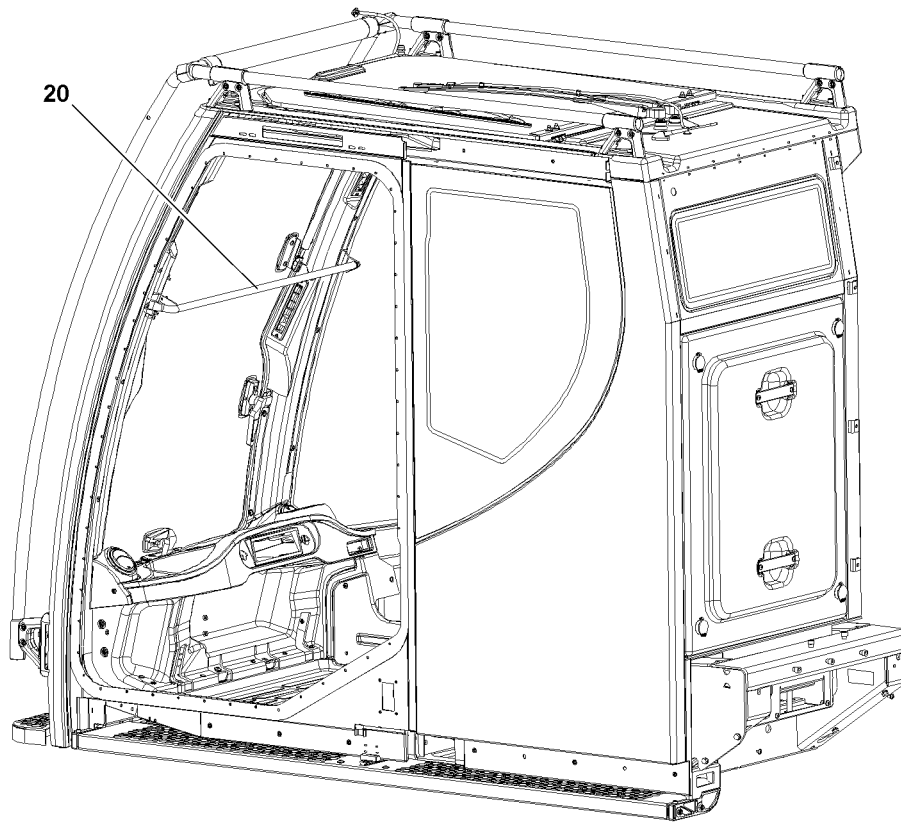
Before entering the crane cab or existing from the crane cab, the following prerequisites must be met:

- 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 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.



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1.7 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 pedestals or other suitable entry aids set up to ensure safe exit from the crane cab!
-



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!

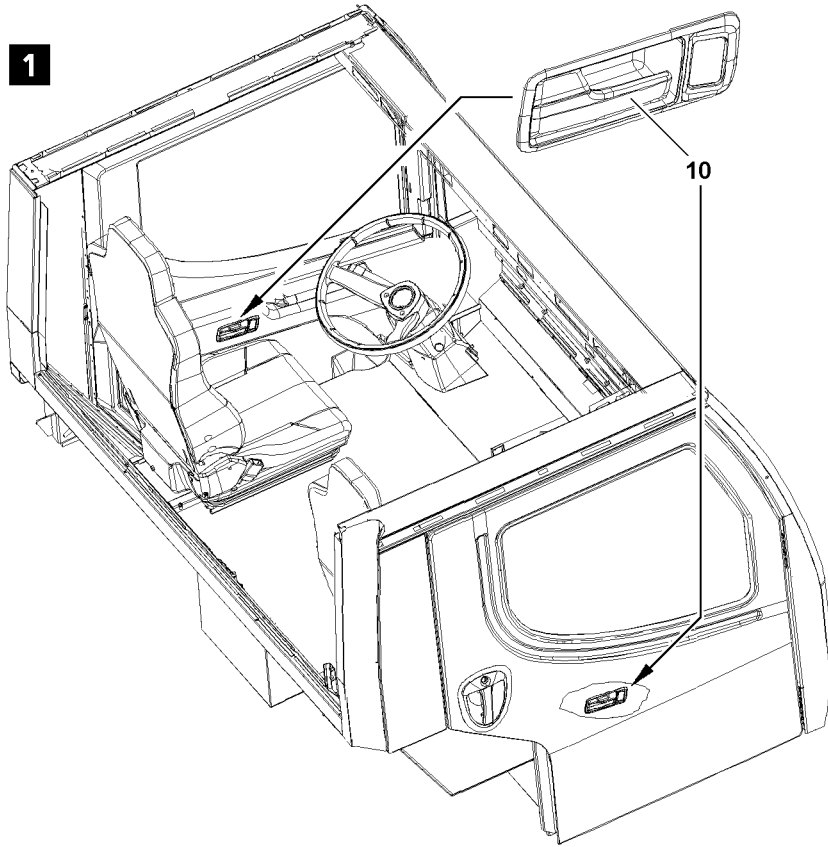
- ▶ When the crane cab is in inclined position, open the door carefully!
-

1.8 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.
-



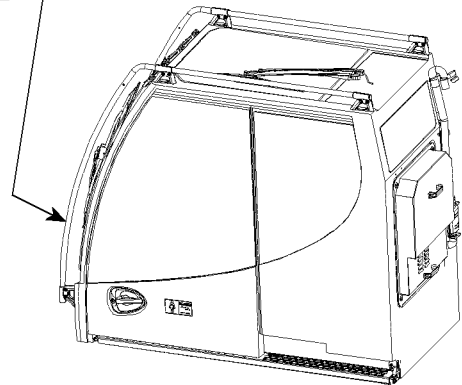
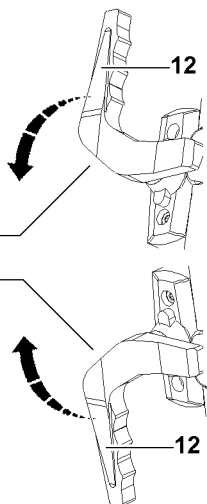
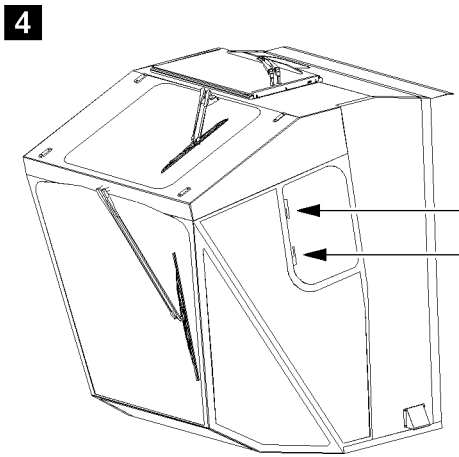
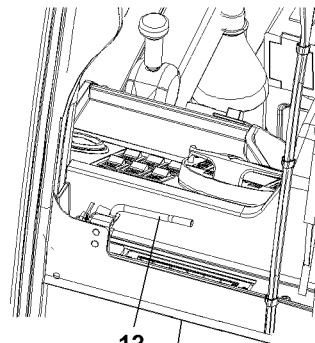
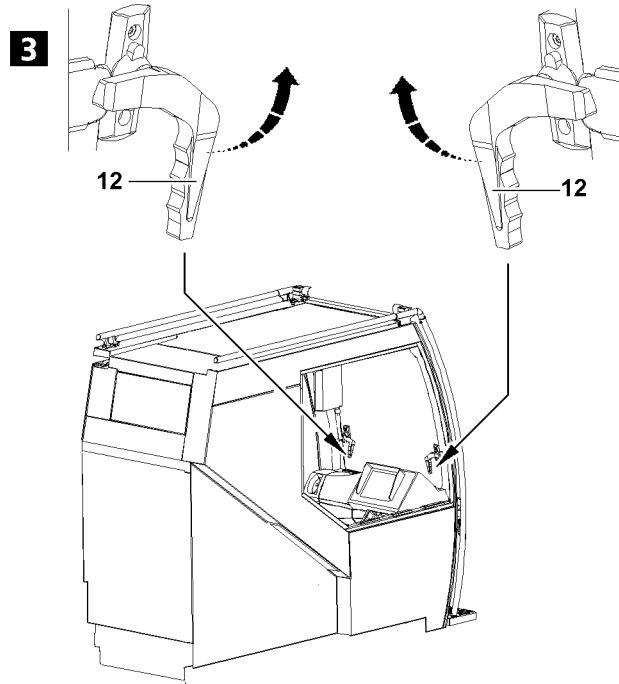
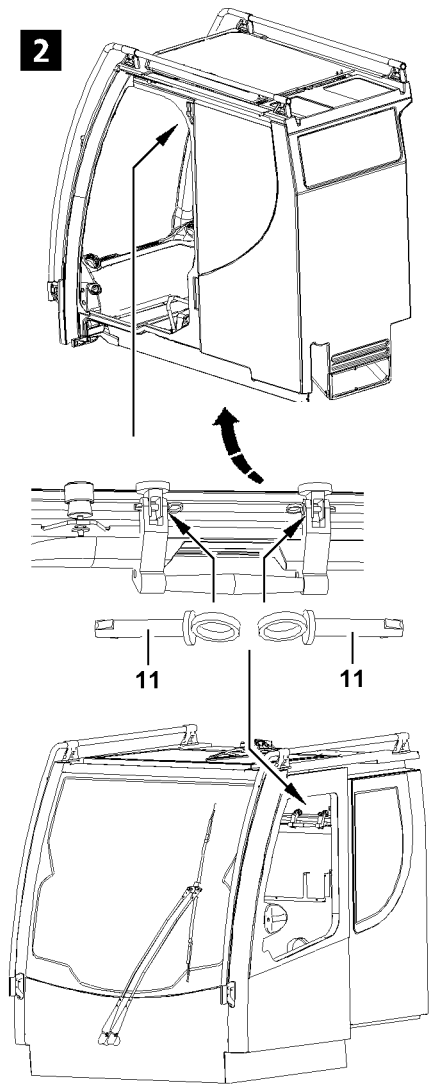
2 Emergency exit

2.1 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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2.2 Emergency exit crane cab



WARNING

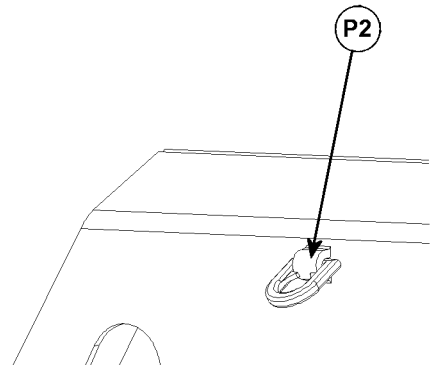
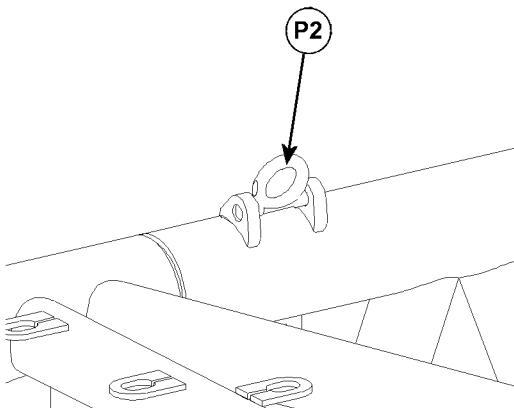
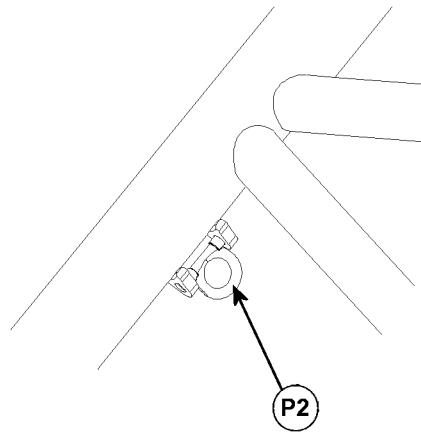
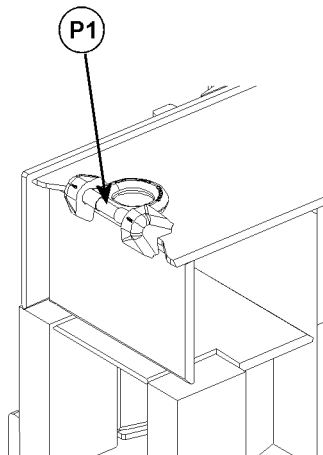
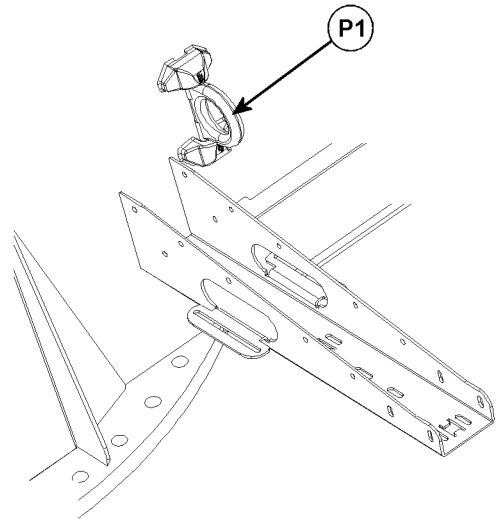
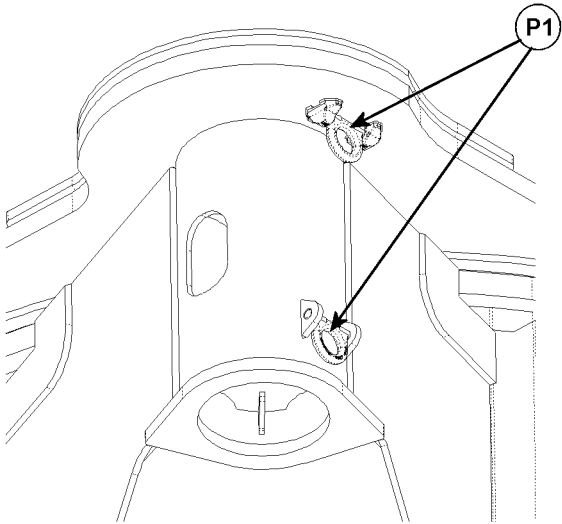
Danger of falling!

If it is not possible to safely leave the crane cab through the door or to reset the crane cab from inclined position to horizontal position, then the crane operator can fall from the crane cab during the emergency exit and be severely injured!

- ▶ Be especially careful when exiting at emergency exit!
 - ▶ If the crane cab cannot be exited safely, use outside aid!
-

In case of an emergency, if it is not possible to leave the crane cab through the door, the crane cab can be exited through one of the following openings, depending on the model:

- **Roof window**, see illustration 2: Pull the pins **11** on the left and right and open the roof window upward.
- **Rear window**, see illustration 2: Pull the pins **11** on the left and right and open the rear window upward.
- **Front window**, see illustration 3: Unlock the left and right handles **12** and open the front window.
- **Side window**, see illustration 4: Unlock the top and bottom handles **12** and open the side window.



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3 Checking the rigging and fastening points

The rigging and fastening points are marked as follows:

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.

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.

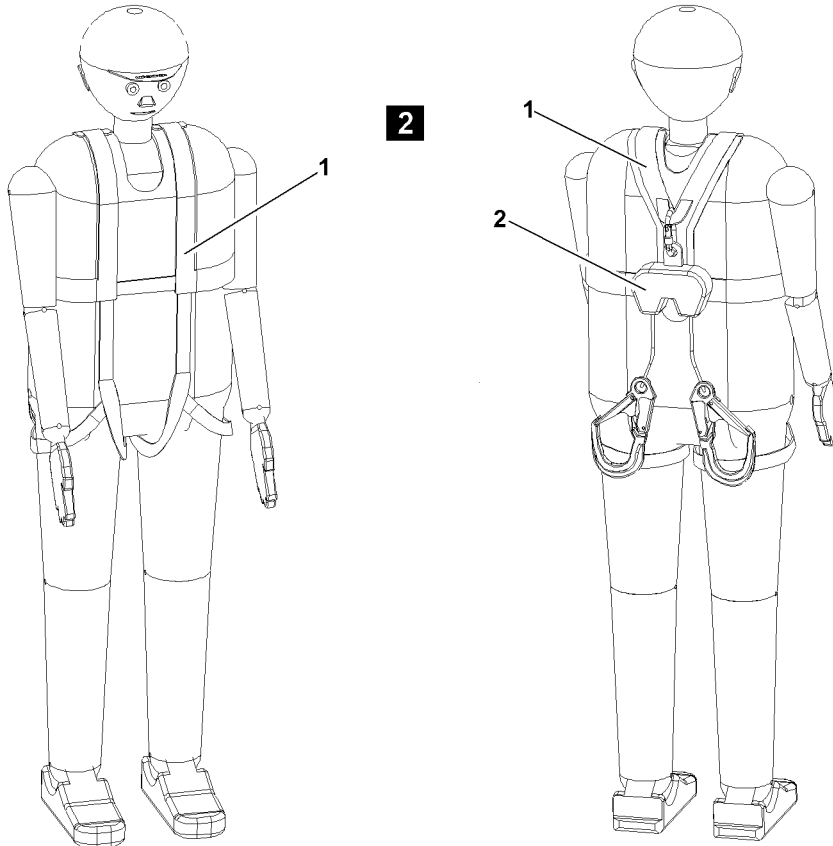
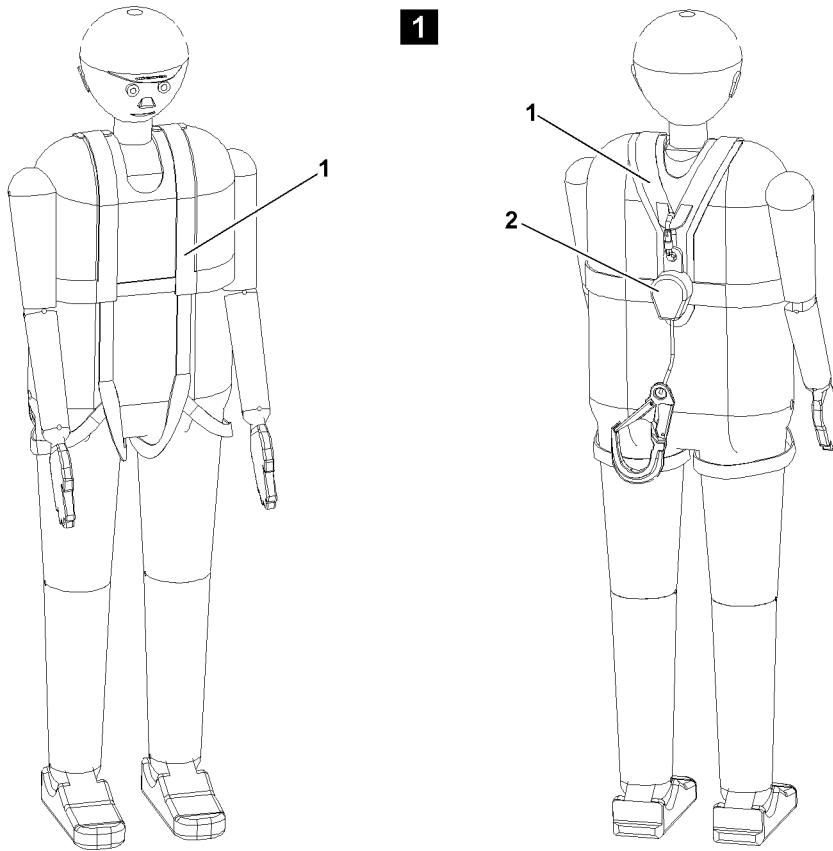


WARNING

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!
-



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4 Personal protective equipment



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 safety equipment **2**).
- Head protection with chin strap: Protection from falling parts at assembly and disassembly. Hitting the head at assembly and disassembly of lattice mast equipment.
- Non-slid 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!

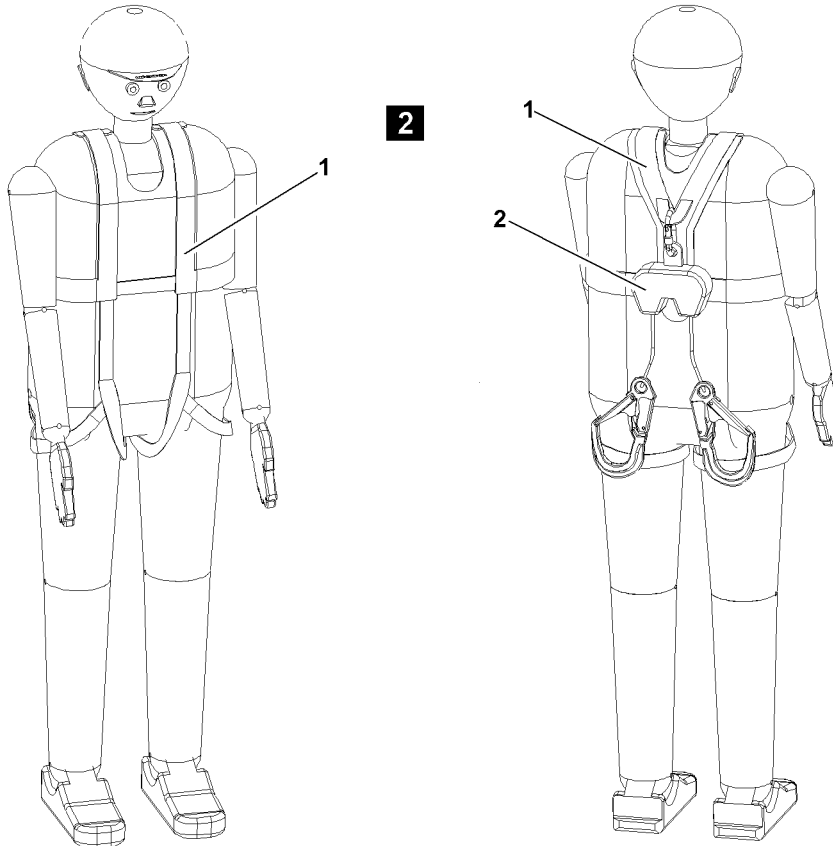
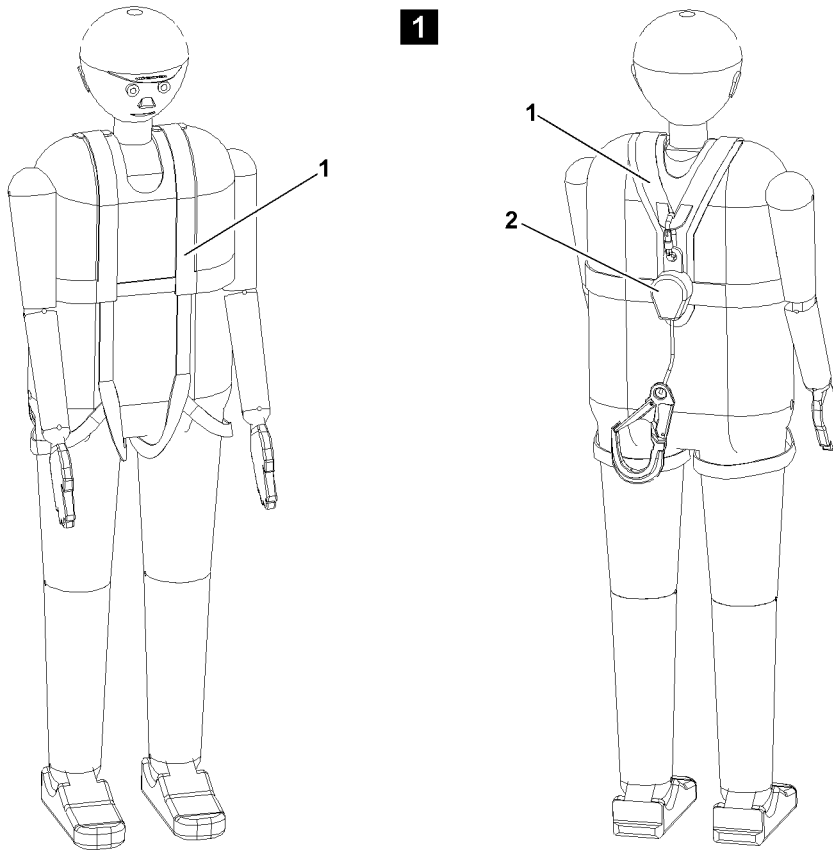
- ▶ A plan for rescue actions, taking all possible emergencies into account, must be on hand!
- ▶ The following points can endanger the safe function of the personal protective equipment: For example extreme temperatures, routing of connecting devices, routing over or around sharp edges, chemical influences, 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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B111691

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

The supplied fall arrest system, consisting of safety harness **1** and height safety equipment **2** must be worn where no other fall protection equipment, such as railings, can be installed for technical reasons. In these cases, marked fastening and hook points for the fall arrest systems are provided on the components.



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 safety 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



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!
- ▶ The intended safety points designed for this purpose on the crane must 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, 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!

5 Use of single-stranded height safety equipment, illustration 1

Height safety equipment with a belt strap 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.

6 Use of double-stranded height safety equipment, illustration 2

Height safety equipment with two belt straps are 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!

7 Securing the assembly personnel against falling

Make sure that the assembly personnel is wearing the supplied fall arrest systems (safety harnesses and height safety equipment) correctly.

A 3-point support is ensured when:

- Two legs are standing safely and one hand has a safe hold.
- Two hands have a safe hold and one leg is standing safely.



WARNING

Danger of falling in case of missing 3-point support!

- ▶ When accessing a ladder, do not hold any objects in your hands!

7.1 Working on the telescopic boom head

Reeve the hoist rope in or out on the pulley head:

- When working on a ladder, always use the supplied ladder with hook device. For fastening and hook points, see Crane operating instructions, chapter 2.06.
- When ascending, the assembly personnel must ensure a 3-point support.
- When working on the ladder, the assembly personnel must hook themselves with the snap hooks of the fall arrest system on the fastening points and secure themselves against falling.

7.2 Working on the auxiliary boom

Assembling or disassembling the auxiliary boom:

- When working on a ladder, always use the supplied ladder with hook device. For fastening and hook points, see Crane operating instructions, chapter 2.06.
- When ascending, the assembly personnel must ensure a 3-point support.
- When working on the ladder, the assembly personnel must hook themselves with the snap hooks of the fall arrest system on the fastening points and secure themselves against falling.

7.3 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.

7.4 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:

- Before changing over, the assembly personnel must hook at least one snap hook of the fall arrest system on a safety rope and secure themselves against falling.

7.5 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.

7.6 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.

7.7 Descending from lattice sections or booms

Stepping on the ladder:

- 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.
- The snap hook of the fall arrest system may only be unhooked after standing safely on the ladder (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. With the height rescue system, one or more persons can rappel down in an oscillating procedure from a higher to a lower location with limited speed. In addition, one person can be pulled up by a helper from a lower to a higher location.



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

Danger of fatal injury!

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

9 Documentation



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.

10 Identification

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.

11 Crane operator responsibilities

11.1 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.

The main **operating errors**, which are made again and again while operating or driving a crane, are as follows:

- Not paying careful attention while working, for example:
 - Slewing too quickly
 - Stopping the load too quickly
 - Angular pulling
 - Slack rope formation
- Overloading
- 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
- 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

11.2 Working on the crane superstructure or boom

**WARNING**

Danger of falling!

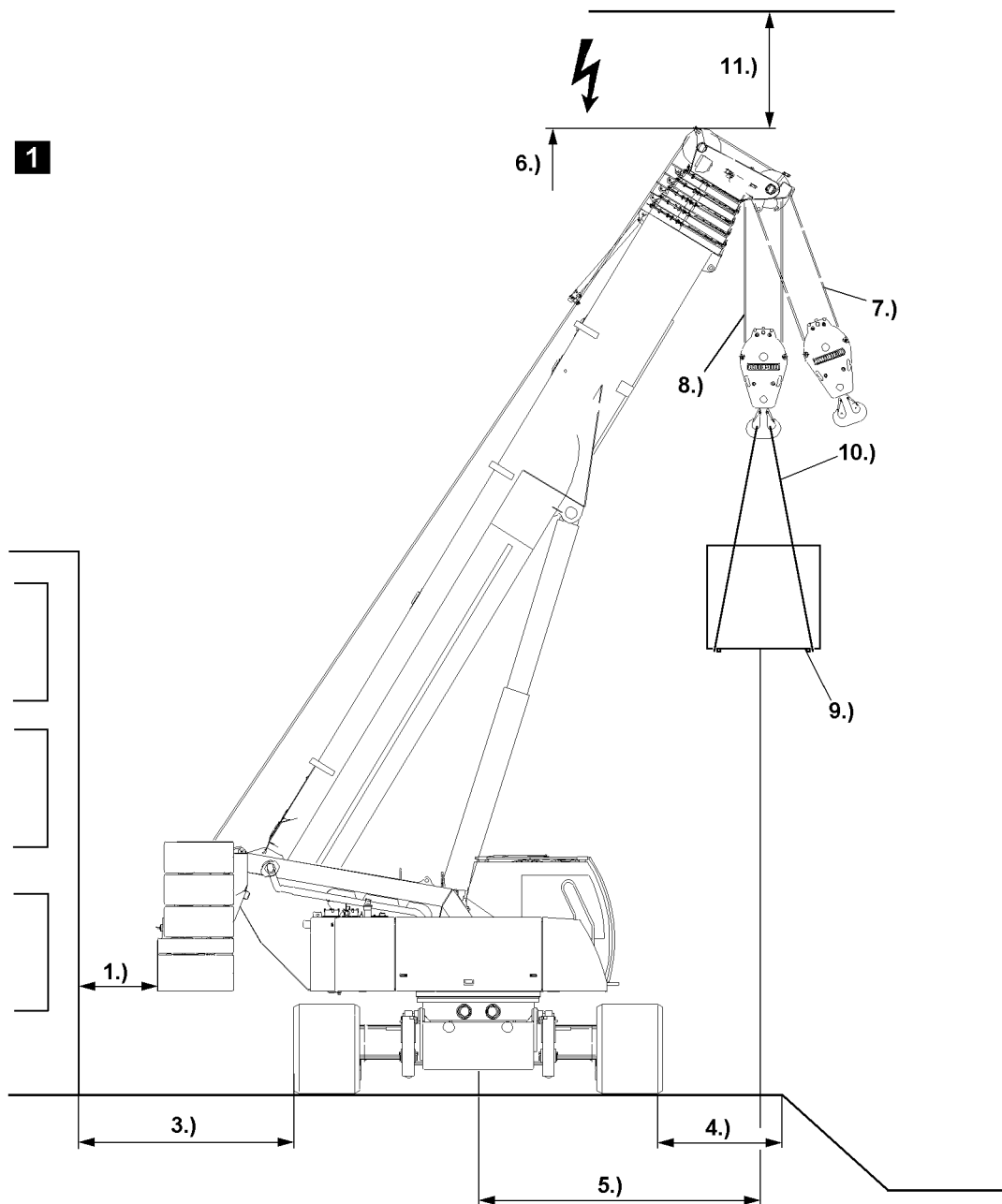
When working on the crane superstructure or boom, personnel must be secured with appropriate safety measures to prevent them from falling! If this is not observed, working personnel can fall and be killed or severely injured!

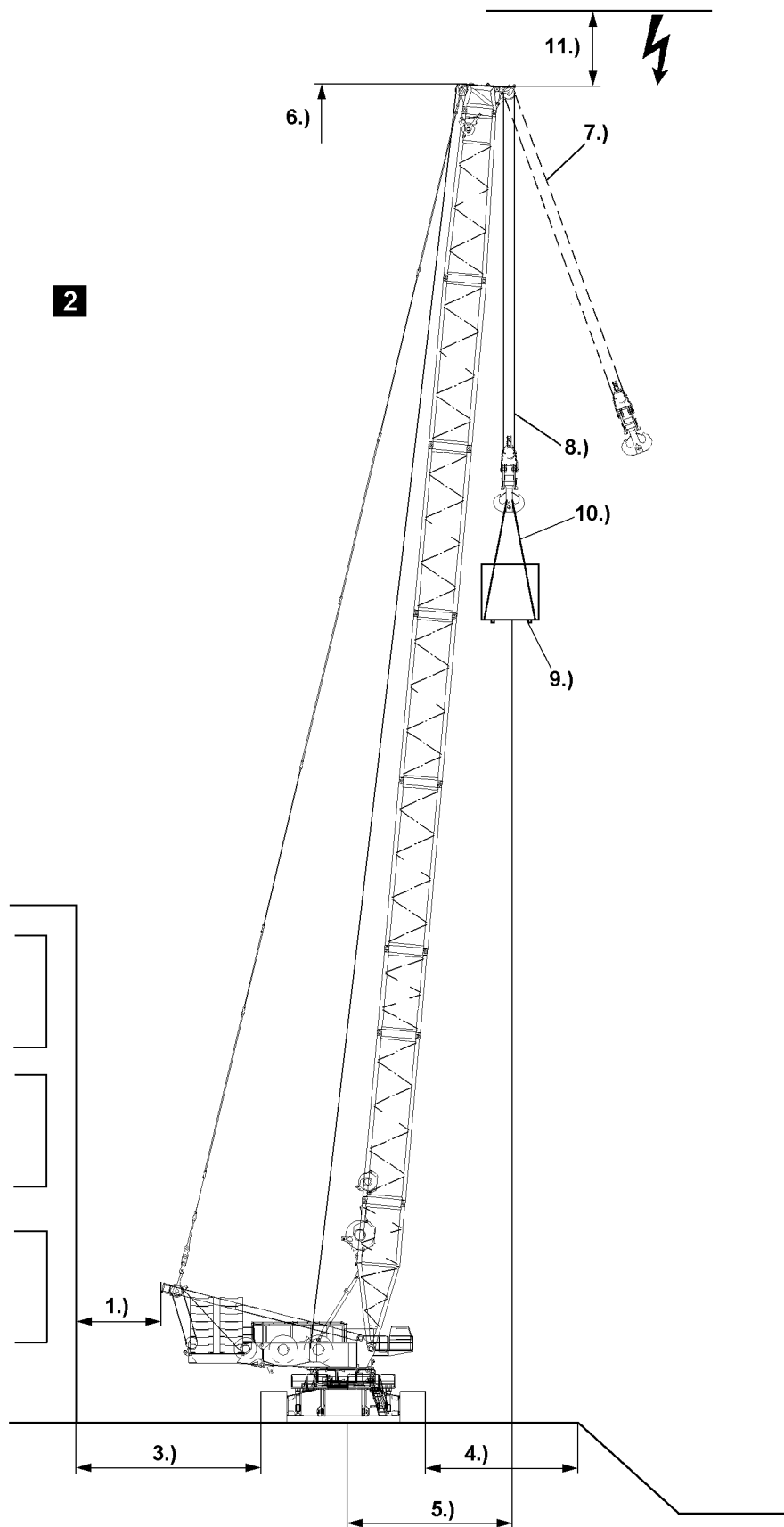
- ▶ For all work on the crane where there is a danger of falling, suitable safety measures must be taken!
- ▶ The crane superstructure or the boom may not be accessed without suitable aids!
- ▶ Suitable aids are, for example: Lifting platforms, scaffoldings, ladders, assembly platforms, auxiliary crane.
- ▶ If railings 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!

11.3 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.
- 6.) The crane operator must monitor the load at all crane movements or the load tackle devices when moving the crane without a load, if they could cause a dangerous situation. If observation is not possible, then the crane operator may move the crane only with the aid of a guide.
- 7.) The crane operator must give warning signs when necessary.
- 8.) The crane operator may not move loads over personnel.
- 9.) Any loads attached by hand may only be moved by the crane operator after he received a clear sign from the person who attached the load, the guide or any other responsible party which was assigned to that task by the contractor. If signals must be used to communicate with the crane operator, then these signals must be agreed upon before use between the responsible party and the crane operator. If the crane operator determines that the loads are not properly attached, then he may not move these loads.
- 10.) As long as a load is suspended on the crane, the crane operator must keep the control 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 moment 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.

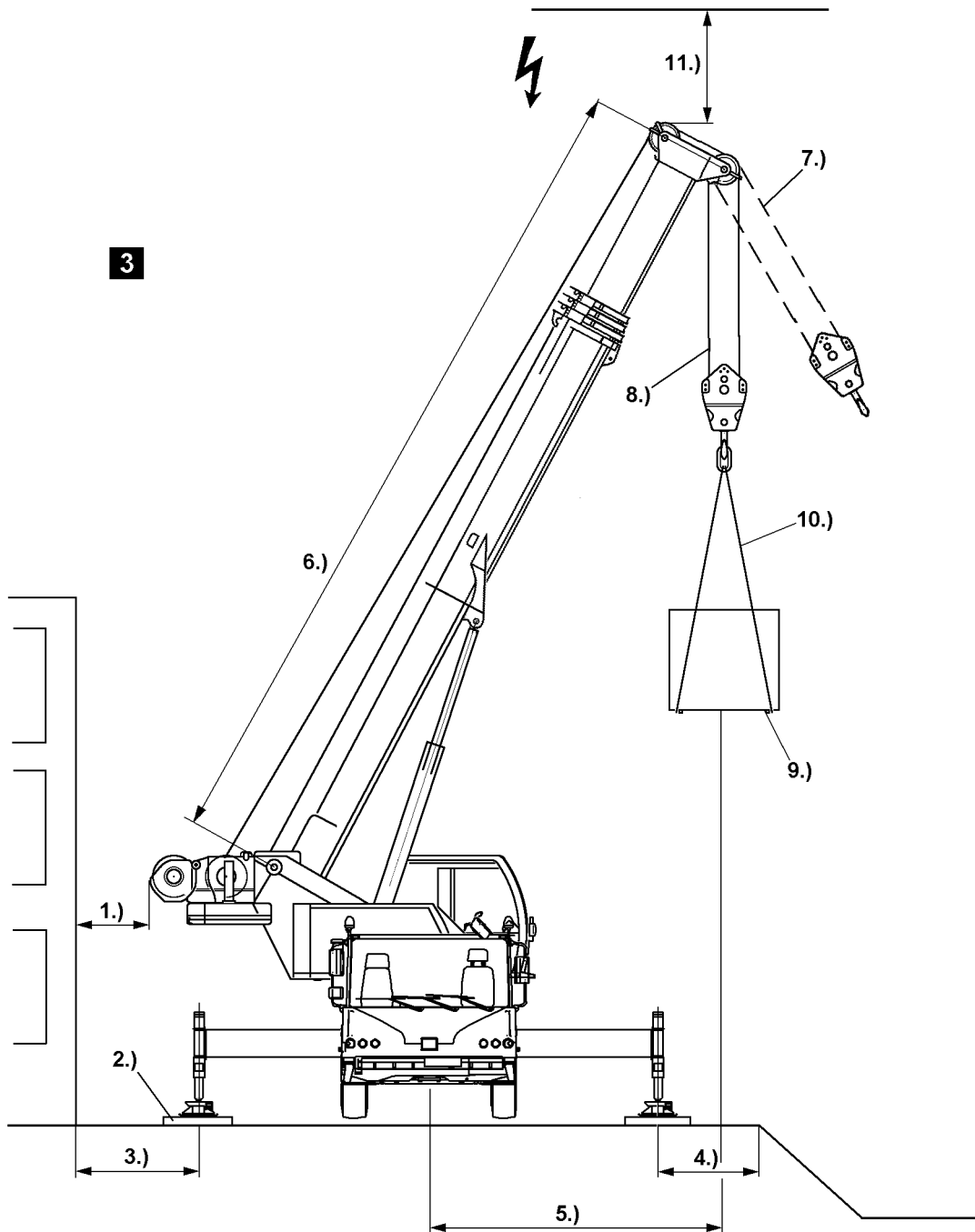
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B104102

Example for crawler crane with lattice mast boom



B104103

Example for mobile cranes

12 Selecting the location, illustrations 1 to 3

It is very important to choose an appropriate location for crane operation in order to minimize accident risks.



DANGER

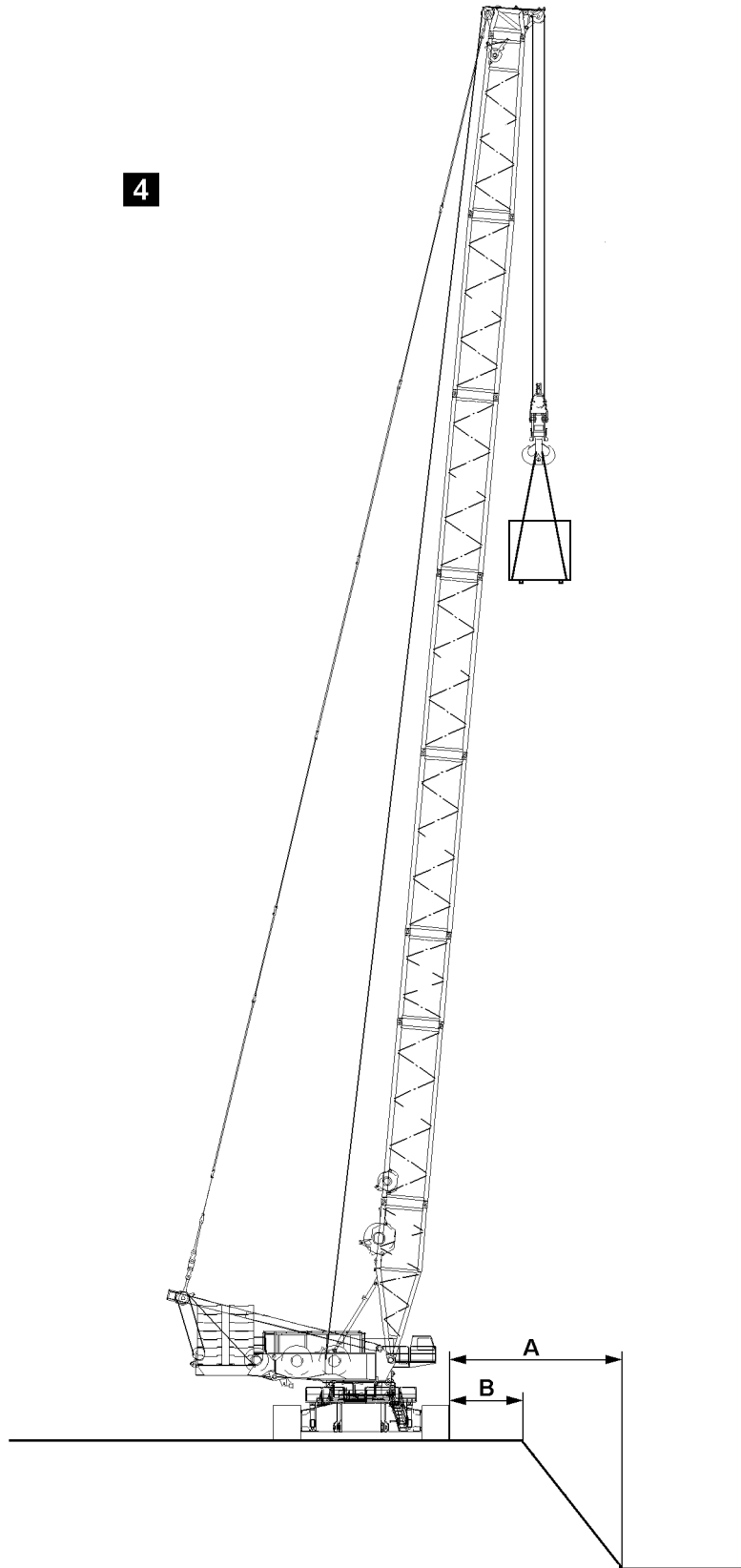
Risk of accidents due to ground with **insufficient** load bearing capacity!

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 the required load-bearing capacity!
 - ▶ Act responsibly when planning and selecting the crane location and route.
 - ▶ Note the following points!
-

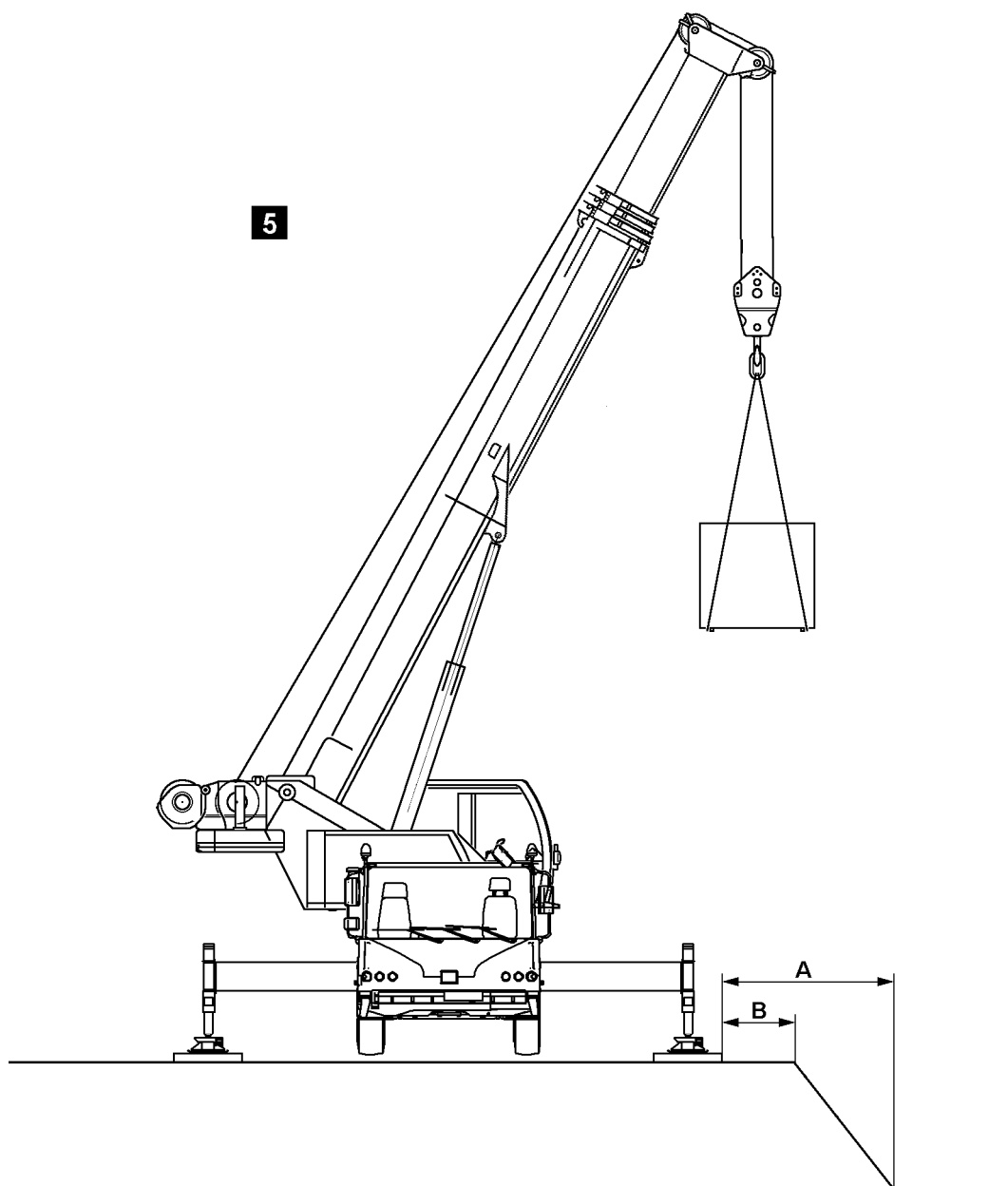
When selecting the location for the crane, observe the following:

- 1.) 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.
- 2.) On mobile cranes:
Support the crane correctly and support the support plates according to the load bearing capacity of the ground on the placement location.
- 3.) Keep a safety distance to basements or similar.
- 4.) Keep a safety distance to slopes or similar.
- 5.) Keep the radius to as low as possible.
- 6.) Select the correct boom length to the load case.
- 7.) Angular pull is prohibited!
- 8.) Select the correct reeving of the hoist rope to the load case.
- 9.) Bear in mind the weight and the wind exposure surface of the load.
- 10.) Select tackle according to the weight of the load, the type of attachment and the incline angle.
- 11.) Keep sufficient distance to electrical overhead wiring.



B108387

Example for crawler cranes



B108388

Example for mobile cranes

13 Slopes and excavations, illustrations 4 and 5

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.



WARNING

The crane can topple over!

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 breaks in, the crane can topple over and kill personnel!

► Always maintain the required safety distance **A** and safety distance **B**!

Abbreviation	Term
A	Distance to bottom of excavation
B	Distance to excavation

14 Permissible ground pressures

Permissible ground pressures		
Soil type		[N/cm ²]
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 b) Silt, consisting of poor clay and coarse clay c) Plastic clay, consisting of potter's clay and fill Stiff Semi-solid Solid d) Mixed granular ground, clay to sand, gravel and rocky areas Stiff Semi-solid Solid	12 13 9 14 20 15 22 33
5.	Rock in evenly solid condition:	

Permissible ground pressures		
Soil type		[N/cm ²]
	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.

14.1 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

The crane can topple over!

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!

14.2 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.



Note

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



WARNING

The crane can topple over!

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 over the base surface, the support plates must be positioned in the center of the support 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/cm²

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/cm², 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 m²

The surface of the support for each support plate must be at least **3.6 m²** .



Note

► The corresponding support forces can be determined with the crane job planer.

14.3 LICCON job planer

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.

15 Support

15.1 Supporting the crane



DANGER

The crane can topple over!

When actuating the supports with attached load and / or at loaded derrick ballast guying, the incline and the force conditions of the entire boom system change!

There is **no** shut off by the LICCON overload 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

Danger of tipping over!

If only the load side sliding beams are extended, the crane can tip over when turning or setting down the load!

- ▶ Move all 4 sliding beams and support cylinders out according to the data in the load chart!
- ▶ In intermediate positions between the support bases supporting is prohibited!
- ▶ Pin the sliding beams to support base according to the load chart!
- ▶ Fully insert and secure the pins!



WARNING

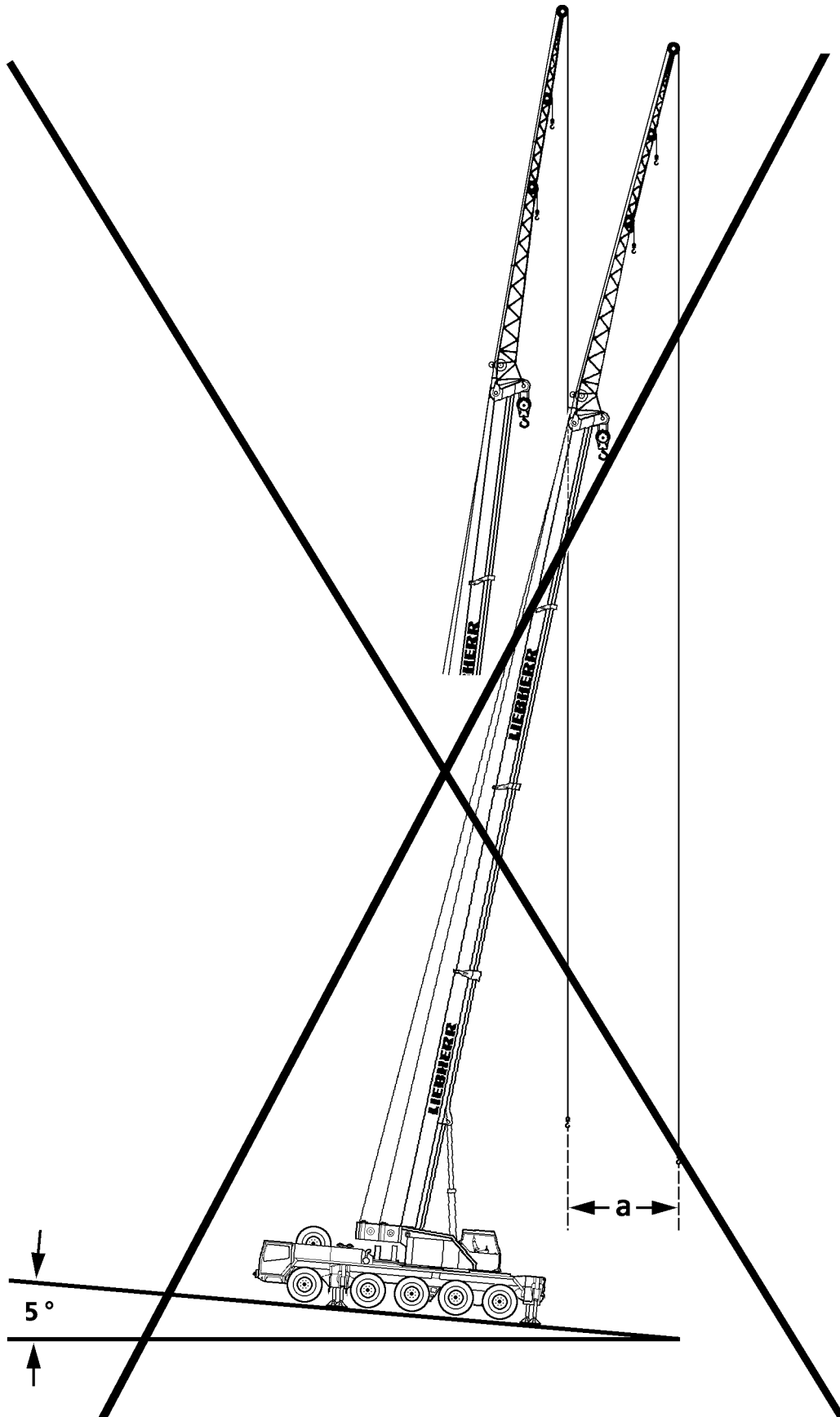
Risk of toppling the crane due to incorrect extension of the sliding beams!

The load suspended on the hook causes tension and deformation of the hoist rope and telescopic boom. The same applies for operation with lattice jib and guy ropes. If the load 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!



B180001

General example

15.2 Aligning the crane

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 boom radius is increased as a result!

It is possible that the slewing gear can no longer hold the crane superstructure and, in extreme cases, the crane can topple over!

Personnel can be severely injured or killed!

► Align the crane horizontally before starting crane operation!

If the horizontal alignment of the crane has to be readjusted:

► Set the load down on the ground before readjusting the crane!

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

16 Checking the safety measures

- The placement location has been selected in such a way that the crane can be operated with the least possible boom radius.
- 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.
- On mobile cranes:
 - The axle suspension is blocked.
 - All four sliding beams and support cylinders have been extended according to the support base given in the load chart.
 - The sliding beams have been secured with pins to prevent them from moving.
 - The support plates are pinned and secured in the operating position.
 - The axles are relieved, which means the tires do not touch the ground.

17 Endangering air traffic

When working with cranes, 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!

► Assemble 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!

18 Grounding

18.1 Grounding the crane



WARNING

Danger of fatal injury due to electrical shock!

There is a risk 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.).
- 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).

18.2 Grounding the load



WARNING

Danger of fatal injury due to electrical 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.

19 Consideration of wind conditions



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
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



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 m²/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!

19.1 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.

19.2 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.



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 m², 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“!

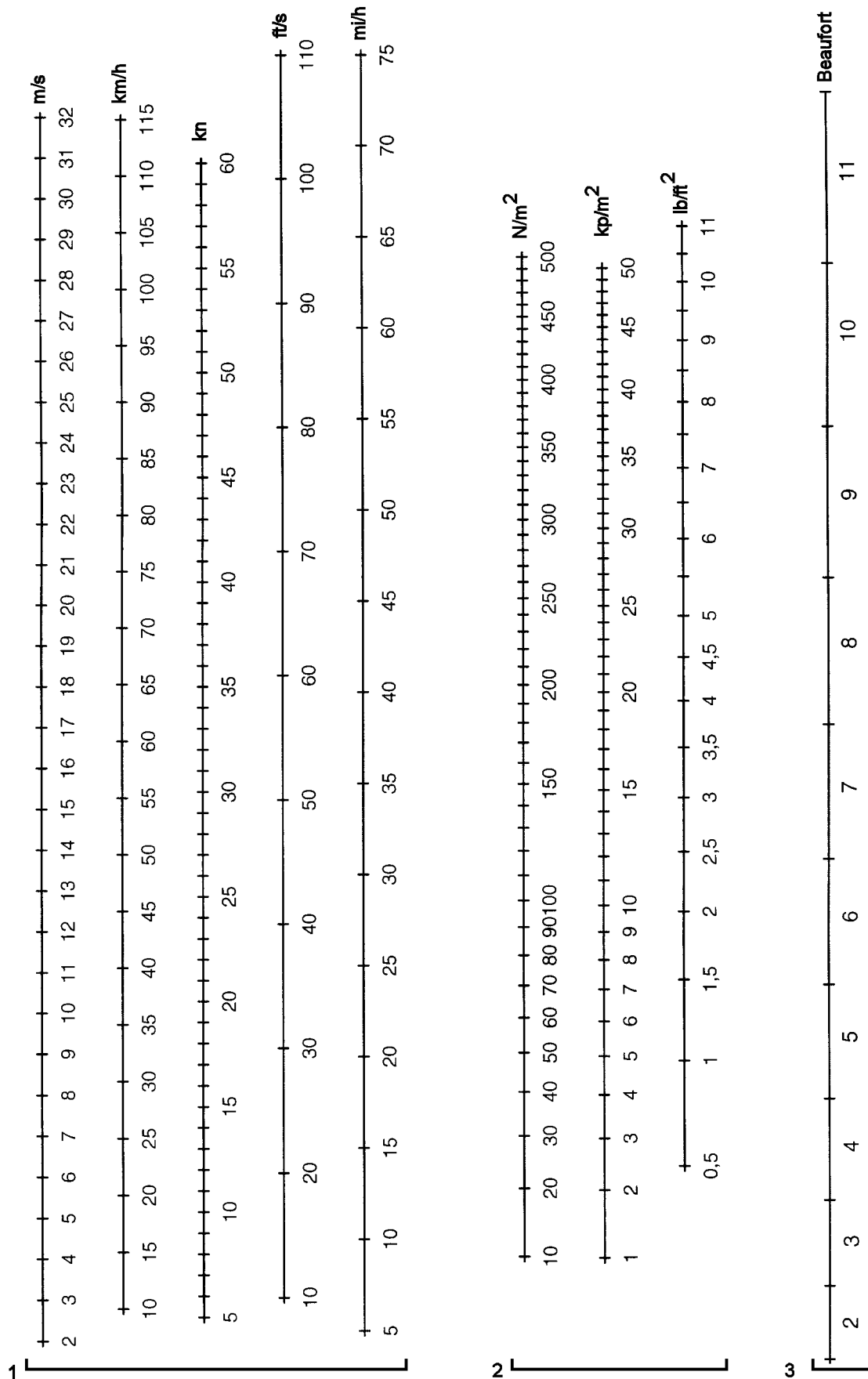
For safe determination of wind speed, the crane must be turned before application by 360°. The highest measured value while doing so must be compared with the "maximum permissible wind speed" for the load according to the load chart. Thus the possibility that the result of the measurement is distorted 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" please contact the Customer Service at Liebherr-Werk Ehingen GmbH!



B106876

1 Wind speeds

2 Dynamic pressure

3 Wind velocity

19.3 Conversion chart for wind speed and dynamic pressure



Note

► The wind scales for the following conversion charts are in the adjacent graphic!

Wind speed					Dynamic pressure		
[m/s]	[km/h]	[kn]	[ft/s]	[mi/h]	[N/m ²]	[kp/m ²]	[lb/ft ²]
2	7.2	3.9	6.6	4.5	2.5	0.25	0.05
4	14.4	7.8	13.1	8.9	9.8	1.00	0.20
6	21.6	11.7	19.7	13.4	22.1	2.25	0.46
8	28.8	15.6	26.2	17.9	39.2	4.00	0.82
10	36.0	19.4	32.8	22.4	61.3	6.25	1.28
12	43.2	23.3	39.4	26.8	88.3	9.00	1.84
14	50.4	27.2	45.9	31.3	120.2	12.25	2.51
16	57.6	31.1	52.5	35.8	157.0	16.00	3.28
18	64.8	35.0	59.1	40.3	198.7	20.25	4.15
20	72.0	38.9	65.6	44.7	245.3	25.00	5.12
22	79.2	42.8	72.2	49.2	296.8	30.25	6.20
24	86.4	46.7	78.7	53.7	353.2	36.00	7.37
26	93.6	50.5	85.3	58.2	414.5	42.25	8.65
28	100.8	54.4	91.9	62.6	480.7	49.00	10.04
30	108.0	58.3	98.4	67.1	551.8	56.25	11.52
32	115.2	62.2	105.0	71.6	627.8	64.00	13.11

19.4 Conversion chart for wind force



Note

► The influence of the wind onto the surrounding is described clearly in the Beaufort wind chart below to provide an orientation for the crane operator!

Wind force		Wind speed		Effect of the wind Inland
Beaufort	Description	[m/s]	[km/h]	
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

Wind force		Wind speed		Effect of the wind Inland
Beaufort	Description	[m/s]	[km/h]	
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
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

19.5 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 hoist height.
- ▶ 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 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!
- ▶ The following chart shows the 3 second wind gust speed depending on the medium wind speed according to the Beaufort Scale and the height!

3 second wind gust speed depending on the medium wind speed according to the Beaufort Scale and the height

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

Beaufort number	3	4	5 ^a	5	6	7 ^a	7	8	9	10
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
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 $v_m = 10.1 \text{ m/s}$ at $z = 10 \text{ m}$ $v(z) = 14.1 \text{ m/s}$ $q(z) = 125 \text{ N/m}^2$ 2 normal $v_m = 14.3 \text{ m/s}$ at $z = 10 \text{ m}$ $v(z) = 20.0 \text{ m/s}$ $q(z) = 250 \text{ N/m}^2$										
^b Upper limit of Beaufort scale										

Sign [Unit]	Definition
v_m [m/s]	Wind speed determined over 10 minutes at a height of 10 m (Upper limit of Beaufort Scale)
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/m ²]	At a height z effective quasi-static back pressure, determined from $v(z)$

19.6 Wind influences during erection and take down



WARNING

The crane can topple over!

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

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

19.7 Wind influences in crane operation



WARNING

The crane can topple over!

Unforeseeable factors, such as sudden gusts of wind onto the crane and the load cannot be considered exactly in advance!

- ▶ Carry out a professional job planning with authorized and trained expert personnel!
- ▶ The authorized and trained expert personnel must have sufficient knowledge in the area of "Wind influences in crane operation"!



Note

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

Depending on crane application, for example:

- 1.) Lifting of large surfaced loads.
- 2.) Working with long boom combinations.
- 3.) Erection and take down of boom combinations.

The crane operator must check with appropriate information sources about the expected wind speeds, at:

- 1.) The start of crane operation.
- 2.) Interruption of crane operation.
- 3.) Resumption of crane operation



WARNING

The crane can topple over!

If the crane is operated at wind speeds which are larger than the maximum permissible wind speeds according to the load chart, then the crane can topple over and kill personnel!

- ▶ If wind speeds are expected 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!

19.8 Wind influences when the “Crane is not in service”



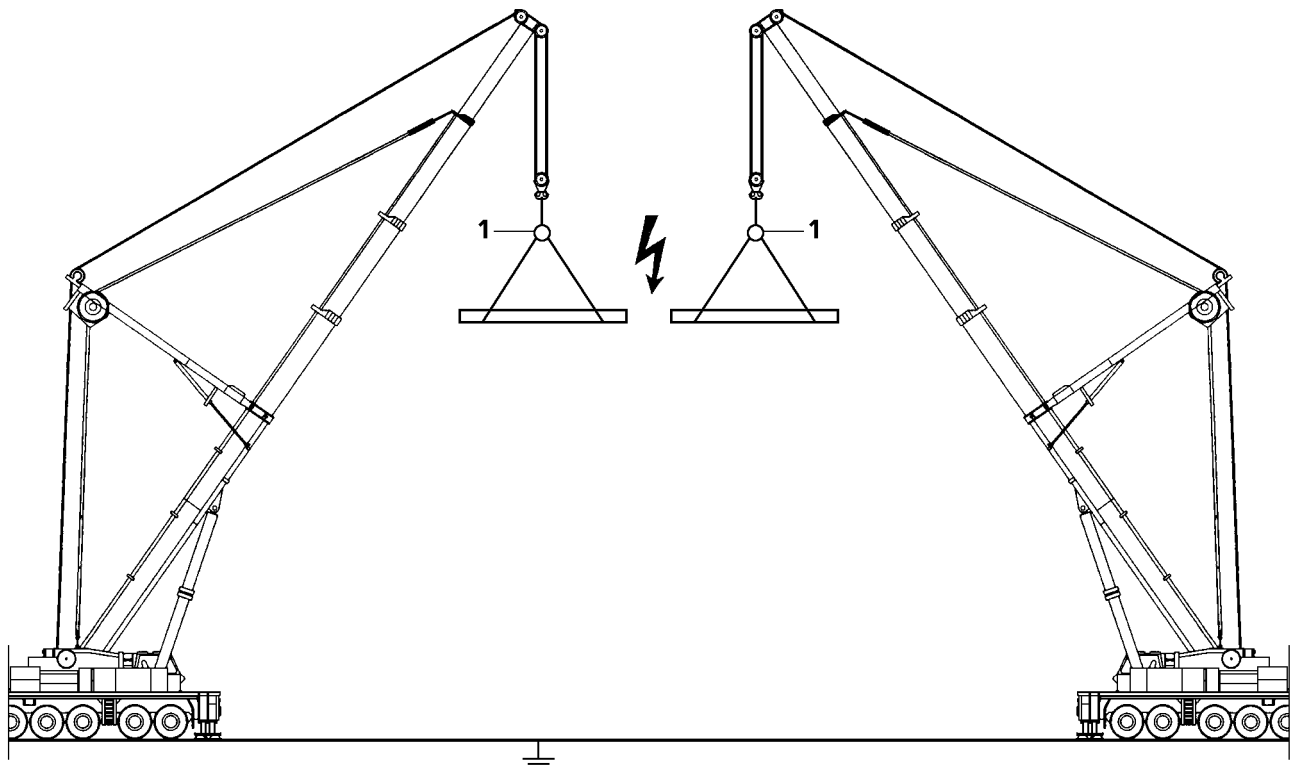
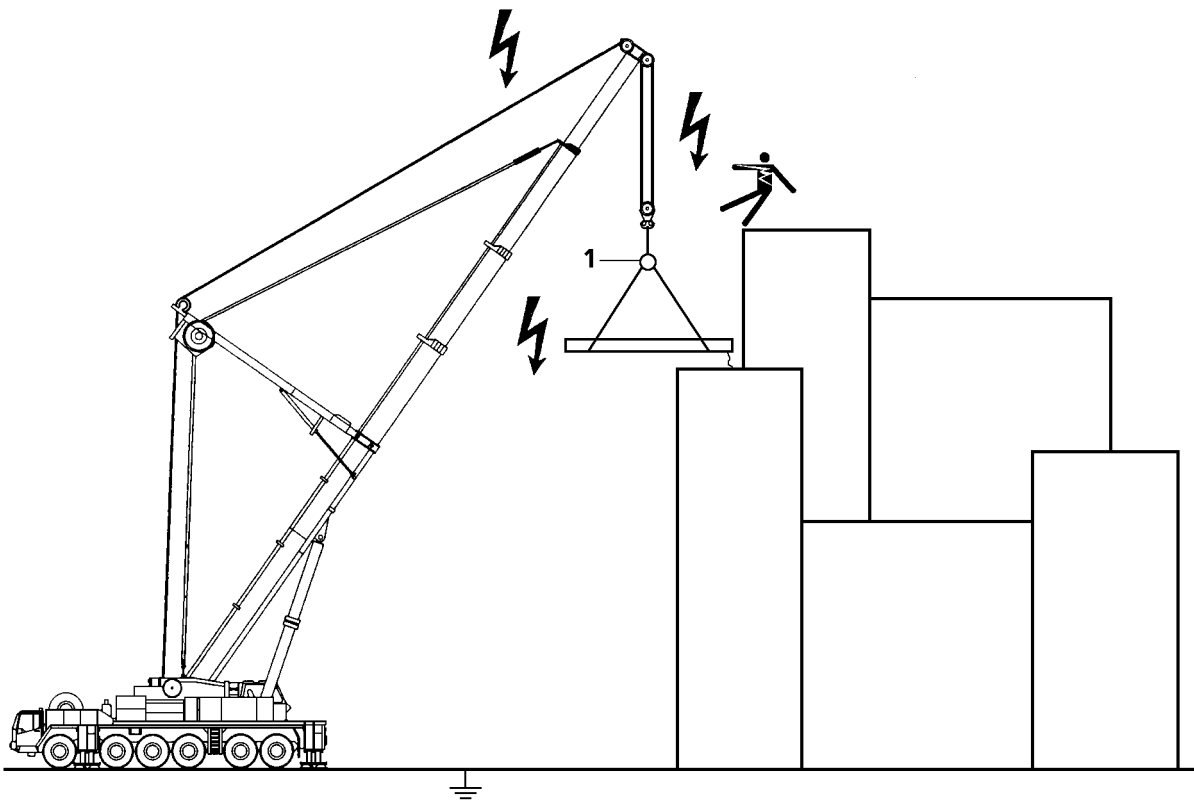
WARNING

The crane can topple over!

If the crane is taken out of service in configured condition and the expected wind speeds are larger 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 larger than the maximum permissible wind speeds for “Taking the crane out of service”, then the attachments and the boom must be taken down!
 - ▶ Always take the boom down for safety reasons if weather conditions are unclear, see Erection and take down charts!
-

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B189640

General example

20 Working in the vicinity of transmitters

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.
- Combustion and ignition caused by temperature increases.
- Sparks or arcing.



DANGER

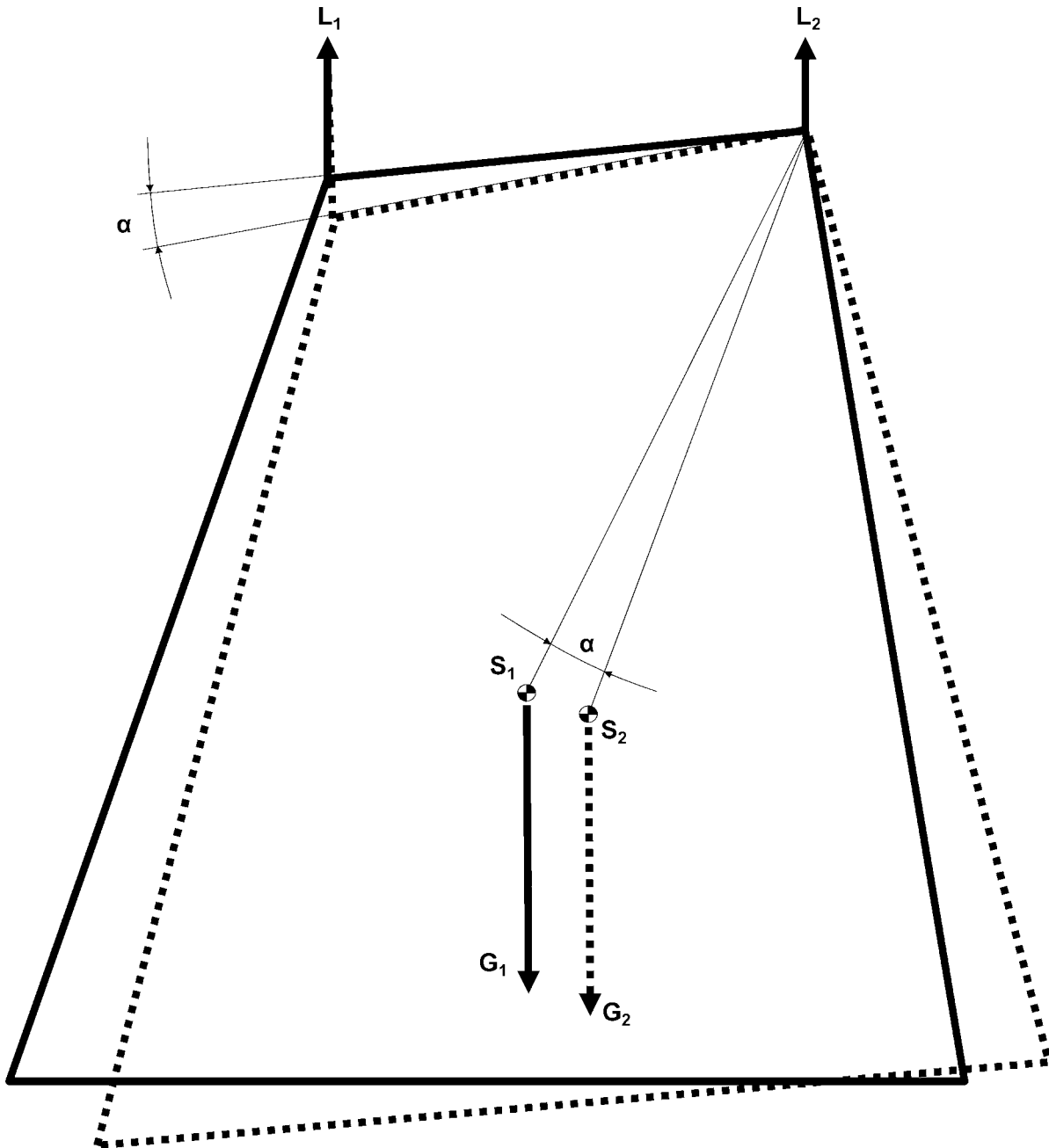
Risk due to electromagnetic fields!

- ▶ 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.

20.1 Joint lifting of a load with two cranes



B111731

L_1 = Load on crane 1
 L_2 = Load on crane 2

α = Angle of incline position
 S_1 = Center of gravity of load

S_2 = Center of gravity of load at
 incline position

Before lifting a load jointly with two cranes, the operator of the cranes 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.



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!

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

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

**WARNING**

Danger of tipping and overload of load carrying components!

If the load is not lifted or lowered exactly evenly by both cranes, then the center of gravity changes. One of the two 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!
- ▶ Utilize the load values given in the load chart manual for the used crane configuration to no more than the utilization degree of maximum 80 %!

In 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 1 (L_1) is lowered, the load on crane 2 (L_2) increases. As a result, crane 2 can be overloaded as a result of the load reduction of crane 1, without any action of its own!

20.2 Working ranges of several cranes 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"!

21 Hand signals for guidance

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

**WARNING**

Danger of accident if standing under suspended loads!

- ▶ Always keep loads in sight!
- ▶ Standing under suspended loads is prohibited!

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

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

**WARNING**

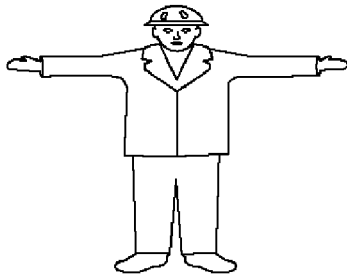
Danger of accident caused by misunderstood hand signals!

- ▶ Hand signals must be mutually agreed upon and clearly executed!
- ▶ In any case, **national regulations** must be observed!

21.1 General hand signals

21.1.1 Start operation

(follow my instructions)

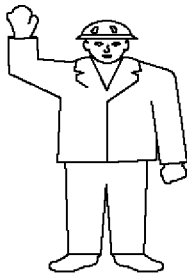


B111700

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

21.1.2 Stop

(normal stop)

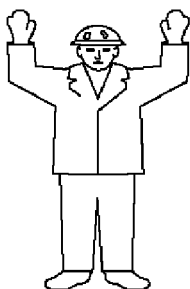


B111701

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

21.1.3 Emergency stop

(quick stop)

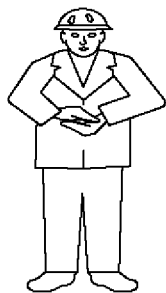


B111702

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

21.1.4 End operation

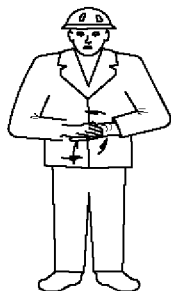
(no longer follow my instructions)



B111703

Fold hands together at chest height in front of body.

21.1.5 Inching gear or very slow movement

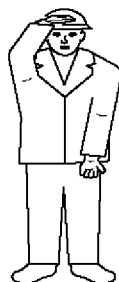


B111704

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

21.2 Vertical movements

21.2.1 Show the vertical distance



B111705

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

21.2.2 Lift / lower a load with even speed



B111706

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

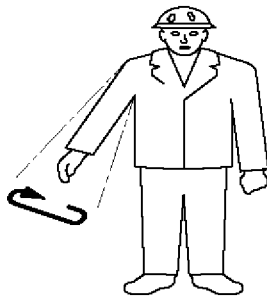
21.2.3 Lift slowly



B111707

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

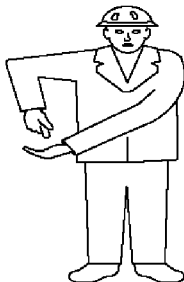
21.2.4 Lower the load while stationary



B111708

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

21.2.5 Lower slowly

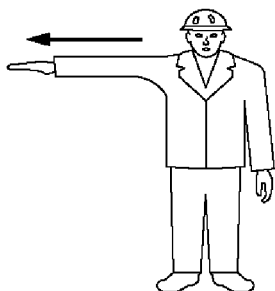


B111709

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.

21.3 Horizontal movements

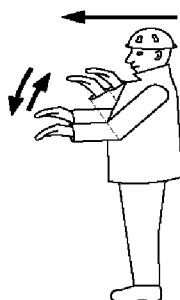
21.3.1 Move / swing in given direction



B111710

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

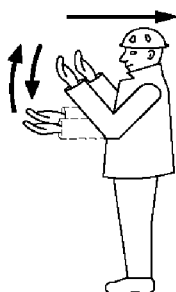
21.3.2 Move away from me



B111711

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.

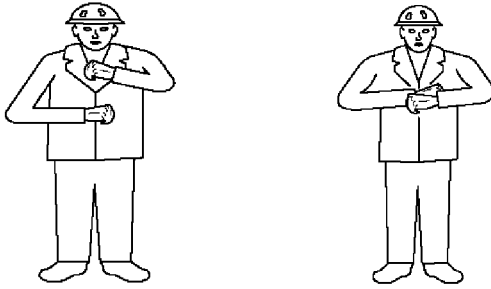
21.3.3 Move toward me



B111712

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.

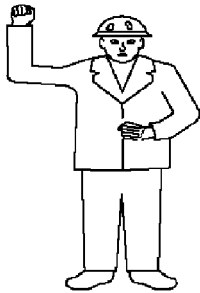
21.3.4 Move both track chains



B1117113

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

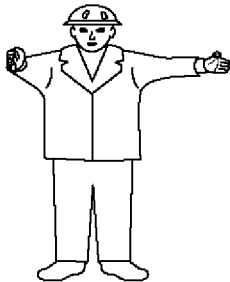
21.3.5 Move one track chain



B1117114

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.

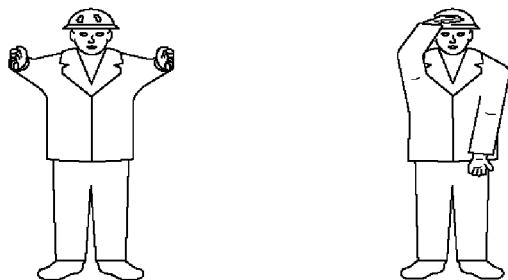
21.3.6 Show the horizontal distance



B1117115

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

21.3.7 Transfer (between two cranes or two hooks)



B1117117

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



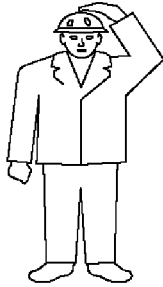
WARNING

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!

21.4 Machine related movements

21.4.1 Lift with main winch



B1117119

Place one 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.

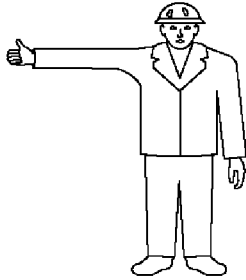
21.4.2 Lift with auxiliary winch



B111720

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.

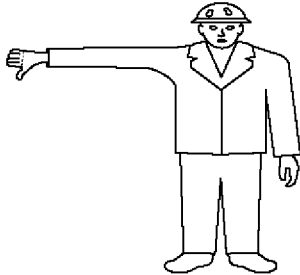
21.4.3 Lift the boom



B111721

Hold one arm horizontally with thumb directed upward.

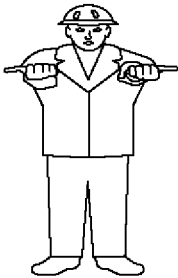
21.4.4 Lower the boom



B111722

Hold one arm horizontally with thumb directed downward.

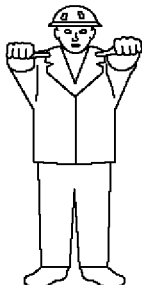
21.4.5 Extend the boom



B111723

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

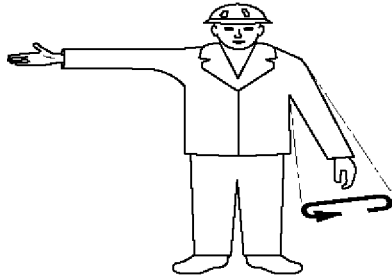
21.4.6 Retract the boom



B111724

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

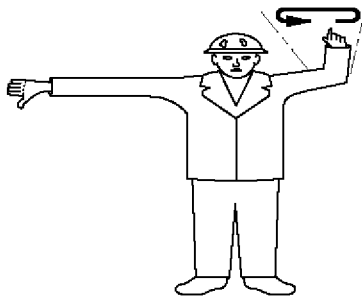
21.4.7 Lift the boom and lower the load at the same time



B111725

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.

21.4.8 Lower the boom and lift the load at the same time



B111726

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

22 Crane operation with a load



WARNING

The crane can topple over!

If the crane is in condition which is **not** operationally safe, the crane can topple over or crane components can fall down!

Personnel can be severely injured or killed!

- ▶ Before starting to work, the crane operator must ensure that the crane is in operationally safe condition!
- ▶ If safe crane operation cannot be ensured by the crane operator, then crane operation is prohibited until an operationally safe condition for the crane is established!
- ▶ Safety 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 moment limiter must be set according to the current crane configuration.
- 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, lifting equipment and tackle must be in accordance with specified requirements.



Note

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

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

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

22.1 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

The crane can topple over!

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

- ▶ Install the counterweight and / or ballast as specified on the respective load chart!

22.2 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 of the hoist gear, then the hoist rope must be reeved as needed according to the principle of a pulley between the pulley head on the boom and the hook block.

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



WARNING

Hoist rope failure!

If the maximum pull force of the hoist gear is exceeded, the hoist rope can break or the hoist gear can be damaged!

The load can fall and kill personnel!

- ▶ Observe the maximum tensile force of the hoist gear!

22.3 Crane operation



DANGER

Not-observation of the following guidelines increases the risk of accident!

- ▶ Observe the following points.

High accident risk exists if:

- 1.) The load torque limiter is not set in accordance with the current crane configuration 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.
- 4.) On crawler cranes:
The angle sensor and the force test brackets are not functioning.
- 5.) On mobile cranes:
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.) On mobile cranes:
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 a current transfer occurs, 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 out from the danger zone!

Nominal voltage	Safety clearance	
	Up to 50 kV	4 m
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

23 Lifting of personnel

23.1 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 lift cages (cherry pickers)!

23.2 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!

23.2.1 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!

23.2.2 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!

23.2.3 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!

23.2.4 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 with 50 % of its maximum load capacity of the valid load chart!

24 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.

25 Safety notes for external power feed (100 V AC to 400 V AC)



B197720

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

**WARNING**

Danger of fatal injury if the body conducts current!

Water and / or defective devices can cause hazardous stray voltages when touched. The person touching the crane is subject to lethal currents.

- ▶ The external supply cable must be in good working order!

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

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

26 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.

27 Travel and crane operation

27.1 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!

27.2 Interrupting crane operation

**WARNING**

Crane is not supervised!

Situations during interruption of crane operation may occur which could cause the crane to become unsafe if left unsupervised!

The crane can topple over, personnel can be severely injured or killed!

- ▶ Always keep the crane under control!
- If the crane can **not** be constantly kept under control:

- ▶ Take the equipment and the boom down!

If the crane is in equipped status:

- ▶ Do not leave the crane!

If wind conditions are present, which are above the permissible values of the wind speed chart:

- ▶ Do not leave the crane!

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!

If an erroneous function of a crane movement is recognized during crane operation (change of cylinder stroke):

- ▶ The boom must be placed down completely, check the cylinder for internal and external leaks!

**WARNING**

Set up crane is not supervised!

If the set up crane is left during interruption of crane operation, situations may occur which could cause the crane to become unsafe!

The crane can topple over, personnel can be severely injured or killed!

If the construction site has limited space:

- ▶ The decision not to take the boom down while the crane is unsupervised can only be made by an authorized and qualified crane operator, who is familiar with the construction site!

- ▶ Make sure that no danger can occur for the crane and its surroundings should something unforeseen happen!
- ▶ Make sure for the duration of the interruption of crane operation, that the predicted wind speeds do not exceed the permissible values for the respective set up configuration, see wind speed chart!

If the predicted wind speeds are above the permissible values:

- ▶ Place the boom and the equipment completely down on the ground in time before the permissible wind speeds occur, telescope the telescopic boom in and luff down to 0°!
- ▶ To telescope the telescopic boom in / position the boom and the auxiliary boom, see Crane operating instructions and the wind speed chart!
- ▶ 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!
- ▶ Place the load completely on the ground and unhook from the crane hook!
- ▶ Lift the hook block into the highest position!
- ▶ Remove the fastening ropes from the hook!
- ▶ Make sure that all measures were taken to keep the crane in a safe condition if something happens!
- ▶ Make sure that access to the crane and operation for unauthorized personnel is excluded: Lock the driver's cab and the crane!

Incidents which could occur (for example):

- The ground giving way due to severe rain.
- Melting ice under the supports.
- Bad weather and thunderstorms, wind.
- Storm and wind.
- Lightning.
- Flooding.
- Landslides.
- Washouts.
- On mobile cranes:
Slippage of support cylinders (leakage, temperature changes).
- On cranes with telescopic booms:
Slippage of luffing cylinders (leakage, temperature changes).
- Vandalism.

Make sure that the following prerequisites are met:

- There is no load on the 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.

27.3 Resuming crane operation

When resuming crane operation, the crane operator is required to check the condition of the crane and the safety devices.



WARNING

Danger of accident!

- ▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset, if necessary, before resuming crane operation.
- ▶ Check operating mode settings and reset, if necessary.

27.4 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 cranes with telescopic booms:
Telescope the telescopic boom all the way in and place the boom down.
- ▶ On cranes with lattice mast booms:
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.
- ▶ Lock the crane cab.
- ▶ Secure the crane to prevent unauthorized use.
- ▶ On mobile cranes:
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".

27.5 Turning / driving in reverse



WARNING

Danger of accidents when turning or driving in reverse!

When turning or driving in reverse, personnel can be overlooked or 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 drive only in reverse or move back when it is ensured that persons or equipment are not endangered! If this cannot 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!

27.6 Parking the vehicle



Note

- ▶ The "Parking the vehicle" section is only to be observed for mobile cranes!



WARNING

Danger of accidents if the vehicle rolls off!

If the following points are disregarded by the crane driver, then personnel can be fatally injured.

- ▶ It is prohibited to park the vehicle at a slope or an incline of more than 18 %.
- ▶ The parking brake must always be applied when parking the vehicle.
- ▶ The ground on which the vehicle is parked must be level and have adequate load-bearing capacity.

Make sure that the following prerequisites are met:

- The vehicle is standing on level ground with sufficient load bearing capacity.
- The parking brake is applied.

**WARNING**

The vehicle can roll off uncontrollably!

Under the following conditions, the vehicle must be secured against rolling away by using the specified number of wheel chocks or wedges, in addition to the parking brake:

- ▶ The vehicle is parked on a slope or an incline!
- ▶ The vehicle is defective, particularly if the brake system is defective!
- ▶ If all the specified wheel chocks are not placed directly behind the corresponding wheel, the vehicle may roll off uncontrollably and personnel can be fatally injured.
- ▶ All specified wheel chocks must be placed in such a way that they act against the downdrift force!
- ▶ Place all specified wheel chocks tightly directly under the wheel!
- ▶ Place all specified wheel chocks tightly so that they have an immediate braking action and keep the vehicle in parking position!

28 Safety guidelines for ladders

28.1 General

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 only 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 only 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.

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!
- ▶ Do not use damaged ladders and replace them immediately!
- ▶ Repairs on ladders may only be carried out by authorized expert workshops!

Before using the ladders, make sure that the following prerequisites are met:

- The ladders are hung and secured in the intended locations.
- The ladders are complete and not damaged (visual inspection).
- The legs of the ladders are not worn.
- Check the screws for tight seating and connection.
- The ladder may be subjected to a load of no more than one person or a maximum of 150 kg.



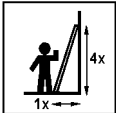






Before starting to drive / before transport, ensure that the following prerequisite is met:


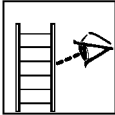




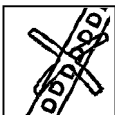

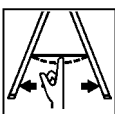
- The ladders are tightly locked and secured in the intended transport retainers.




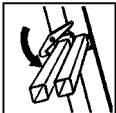


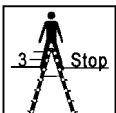
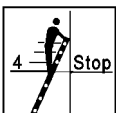
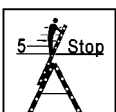
28.2 Safety signs on the ladders


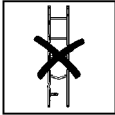



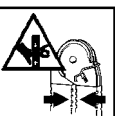
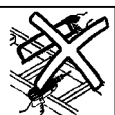

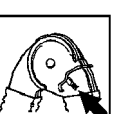
**Note**


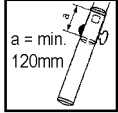
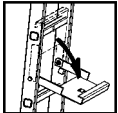

- ▶ All safety signs on the ladders must be complete and always legible!
- ▶ The operating instructions of the manufacturer must be observed and adhered to.

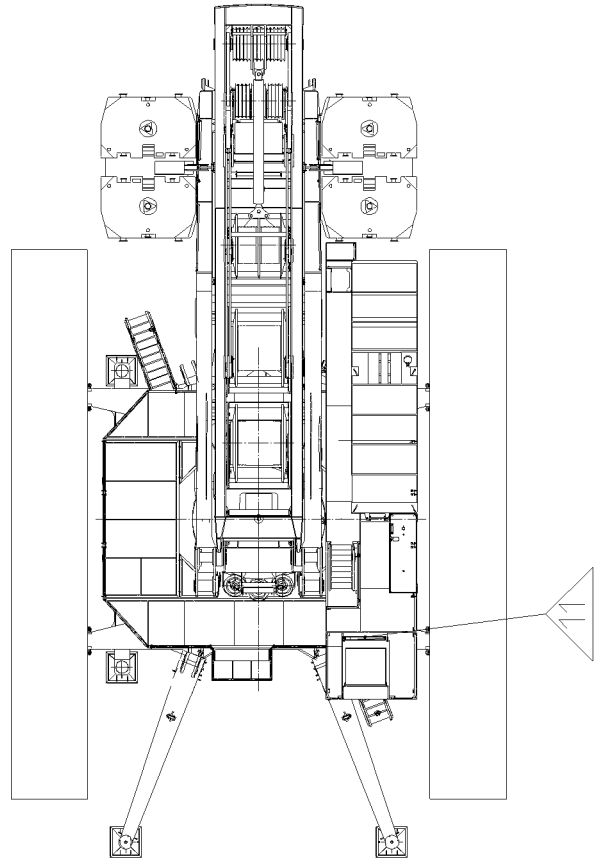
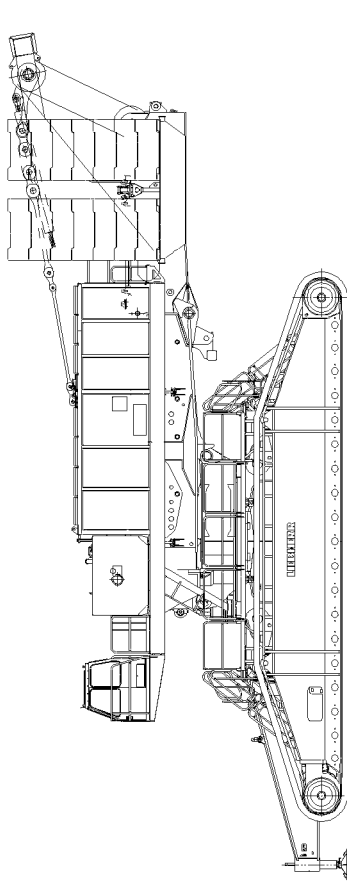
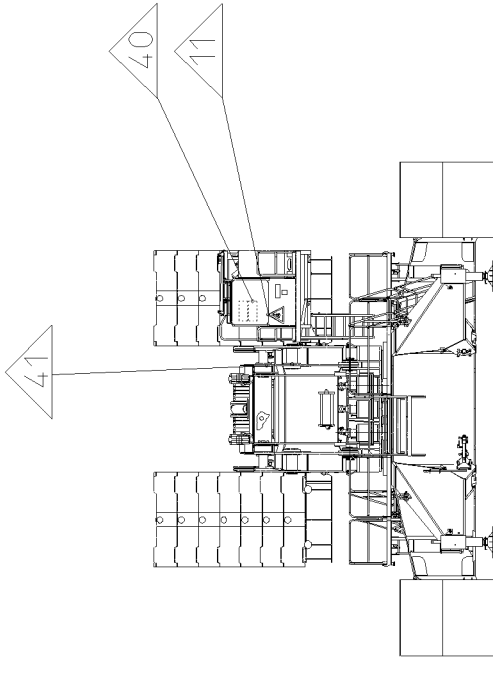
Sign	Explanation
	Read the operating instructions.
	Maximum load.
	Correct set up angle.
	Set up on level ground.
	Avoid leaning out to the side.
	Eliminate any contaminants on the ground.
	Set up on solid ground.
	Ladder overhang over the set up point.
	It is not permitted to step off to the side from the ladder.

Sign	Explanation
	Only one person on every accessible bracket.
	Visual inspection of the ladder before use.
	Do not use the ladder as a bypass.
	Do not stand on the top step.
	Check the legs of the ladder.
	When transporting the ladder, be aware of any danger due to overhead wires.
	Pay attention to correct set up direction.
	Face the ladder when climbing up or down the ladder.
	Before use, pay attention that the stepladder opens completely.

Sign	Explanation
	Make sure the upper end of the ladder is placed correctly.
	Make sure that the safety strut engages.
	Maximum number of users on the ladder.
	Before use, make sure it is safely engaged.
	Correct access.
	When climbing the ladder, wear suitable shoes.
	Stepladders: Access the ladder, without railing, to no more than the third step from the top.
	Leaning ladders: Access to no more than the fourth step from the top.
	Universal ladders: Access to no more than the fifth step from the top.

Sign	Explanation
	Access the ladder only when sober.
	Eliminate damaged ladders immediately.
	Total weight of the ladder.
	Illustration of ladder type with maximum length.
	Secure the upper / lower end of the ladder.
	When folding together, make sure that fingers are not pinched.
	Any modifications on the ladder are impermissible.
	Objects, which are to be transported when accessing a ladder should not be heavy and easy to handle.
	Make sure that the linkages engage safely.

Sign	Explanation
	Tighten the base extension (4 Nm to 5 Nm).
	Adhere to a minimum overlap of the base extension of 120 mm .
	Fold the safety bridge open.
	The ladder must be hung on the vehicle.



B108934

1 Warning signs



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!
- ▶ Replace damaged warning signs immediately!

1.1 Warning of suspended load (position 11)



B108093

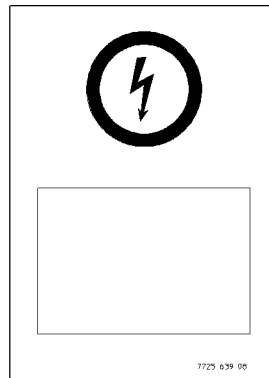


DANGER

Risk of fatal injury under suspended load!

- ▶ Standing under suspended loads is prohibited!
- ▶ Keep away from the working range of the machine!

1.2 Warning of high voltage (position 40)



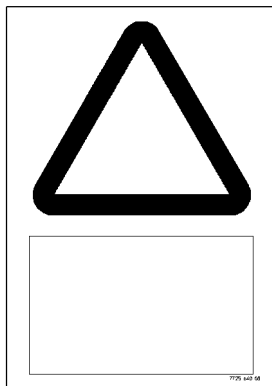
B106031



Note

- ▶ Only for certain countries!

1.3 Slewing range (position 41)

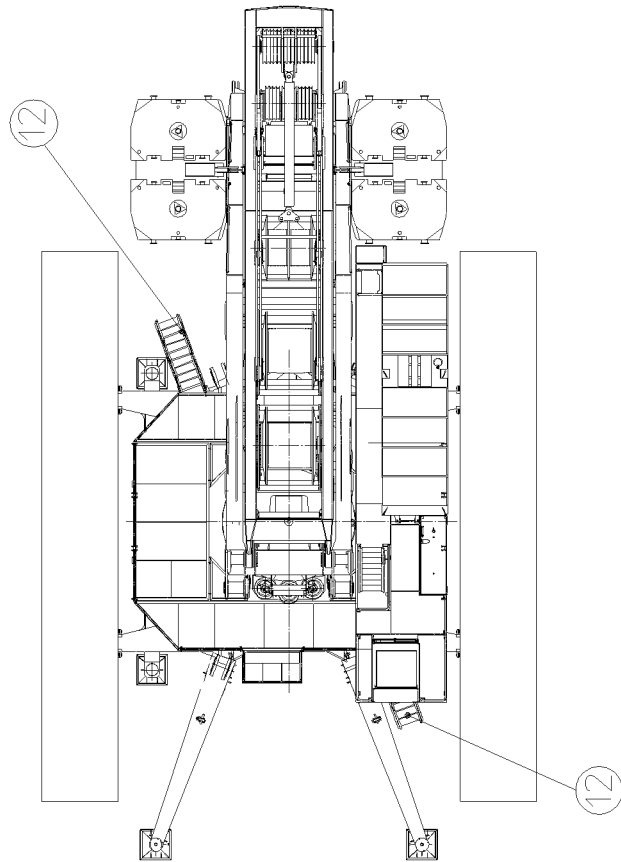
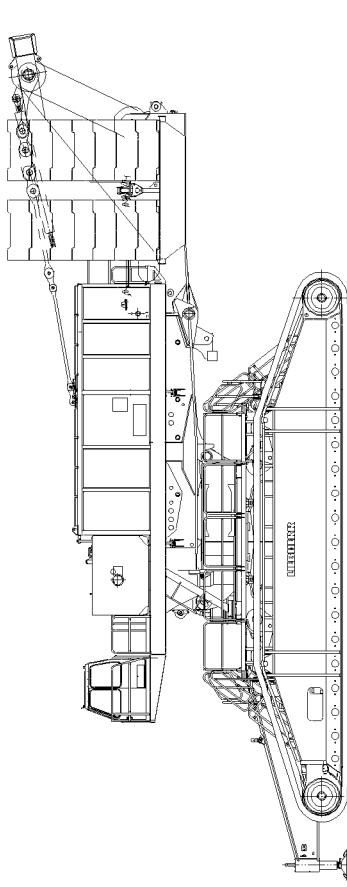
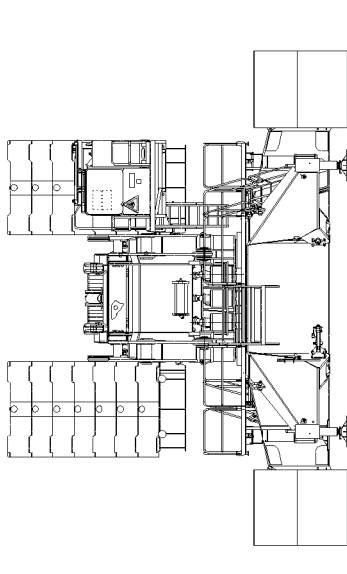


B106032

**Note**

► Only for certain countries!

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B108935

2 Command and prohibition signs

2.1 Prohibition signs

**Note**

- ▶ Prohibition signs are safety signs, which prohibit a behavior, which could result in danger!
- ▶ For that reason, all prohibition signs on the crane must be complete and always legible!
- ▶ Replace damaged prohibition signs immediately!

2.1.1 Access for unauthorized personnel prohibited (position 12)



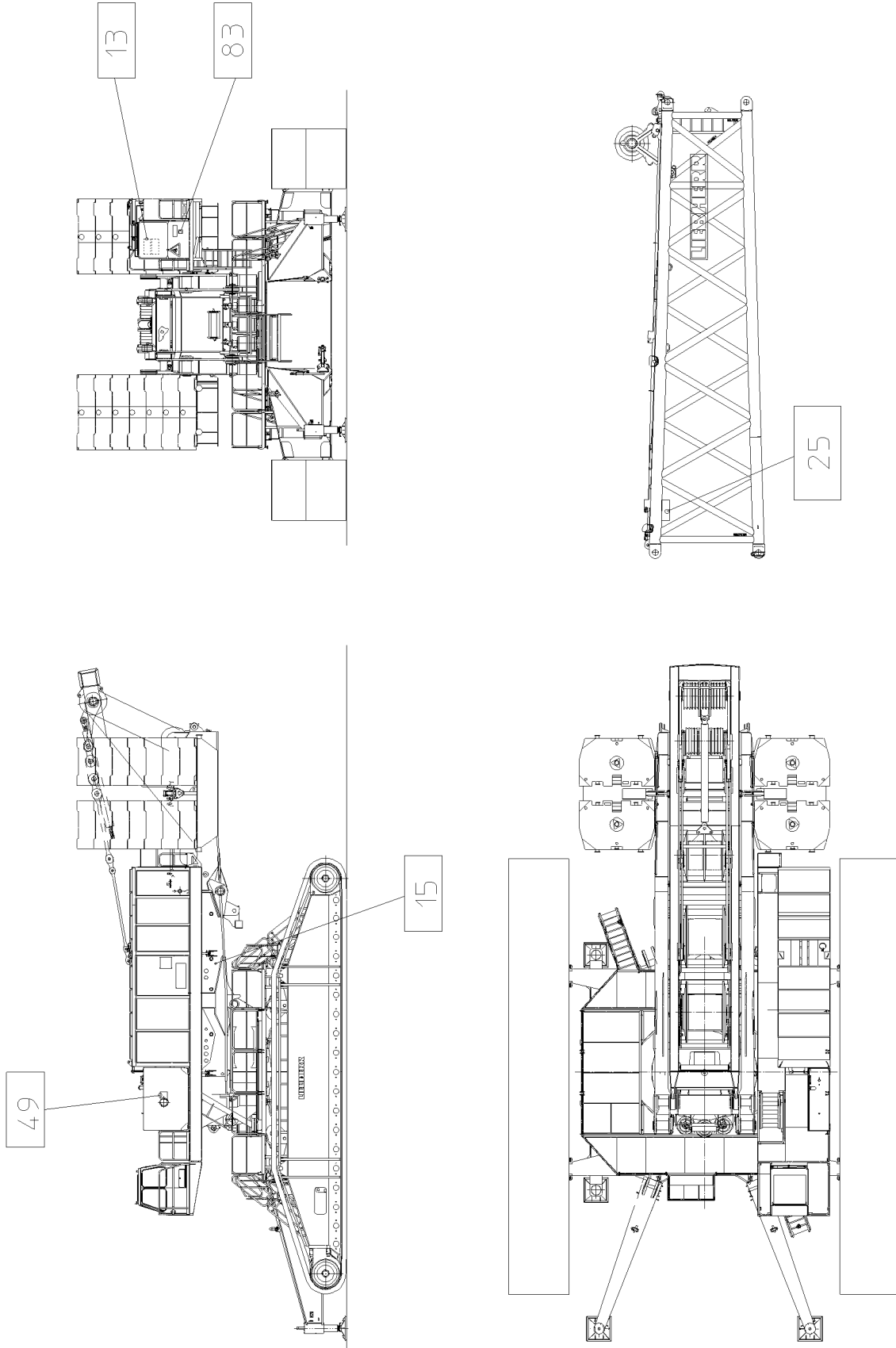
B108098

**DANGER**

Risk of fatal injury!

If the crane is accessed by unauthorized personnel, life threatening injuries can occur!

- ▶ Access is strictly prohibited during crane operation!



B108936

3 Notice signs



Note

- ▶ Notice signs are signs, which provide additional notes in text form and a pictogram!
- ▶ For that reason, all notice signs on the crane must be complete and always legible!
- ▶ Replace damaged notice signs immediately!

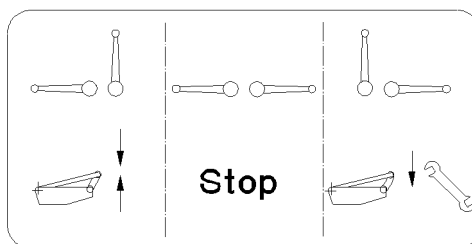
3.1 Operating instructions for cranes (position 13)



Note

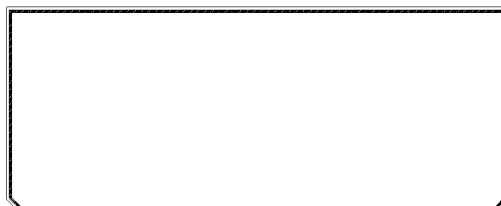
- ▶ Only for certain countries!
- ▶ Read and observe the operating instructions before operating the crane!

3.2 Notice sign Ball valve positions SA-frame (Position 15)



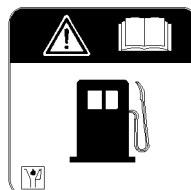
B108938

3.3 Notice sign WA-frame-II-guy rods (Position 25)



B108939

3.4 Notice sign for refueling (position 49)



B108096

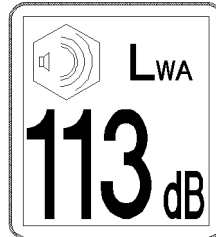
**CAUTION**

Property damage to the engine!

If the crane is refueled with fuel not specified in the operating instructions, then engine damage can occur!

► Observe the operating instructions!

3.5 Warranted maximum sound output level (position 81)



B108937

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1 Fall protection equipment on the crane



WARNING

Danger of falling!

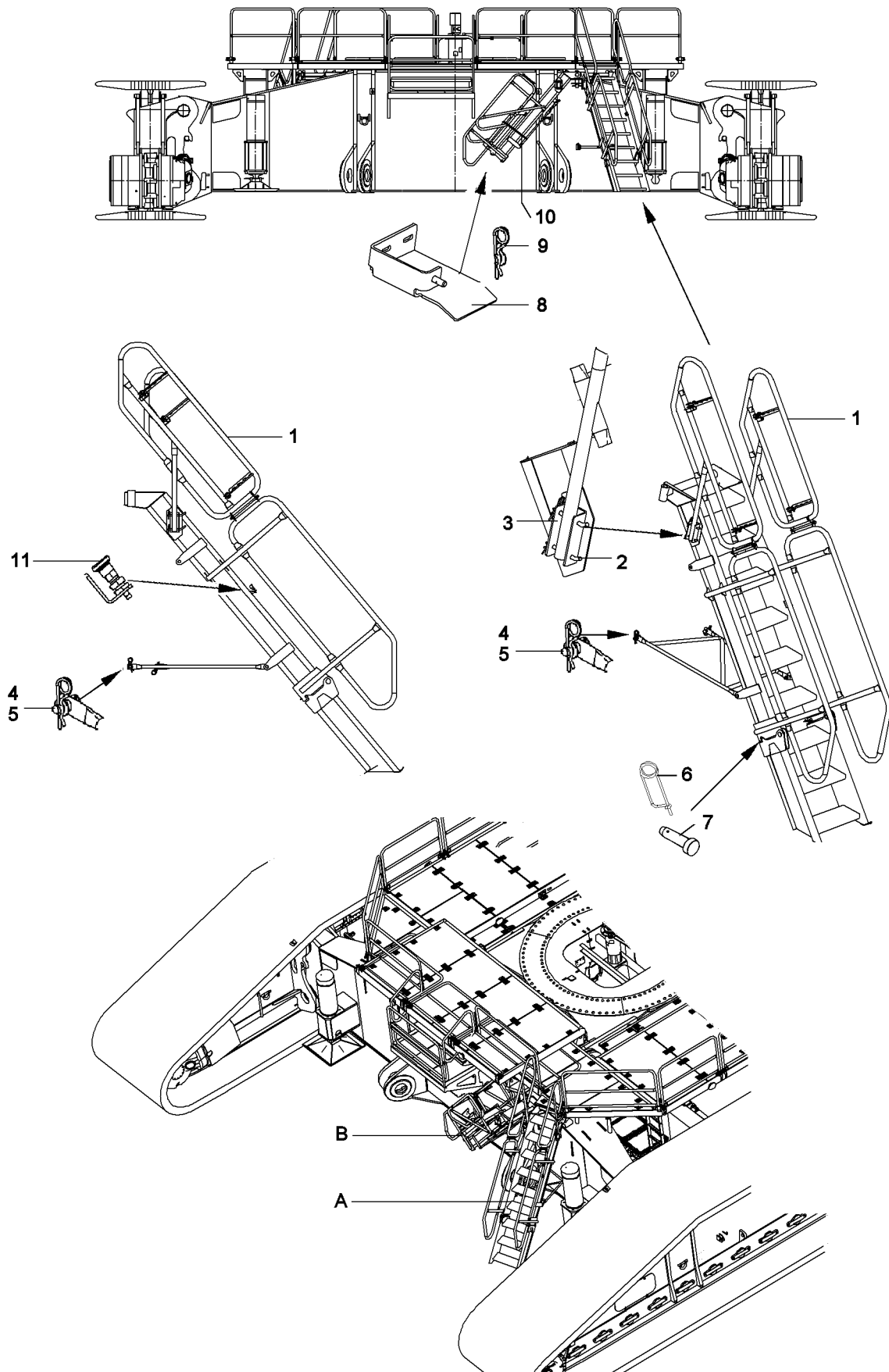
During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling! If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!

- ▶ The assembly personnel must always move carefully and anticipatory on the crane, the crane components or lattice sections!
 - ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids!
 - ▶ If fall protection equipment is available, then it must be used!
 - ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the permissible fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04!
 - ▶ The fall arrest system must be attached on the fastening and hook points as well as on the safety ropes!
 - ▶ Only step on the aids, ladders and catwalks with clean shoes!
 - ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice!
-



Note

- ▶ The sign 3 marks the fastening points, where assembly personnel must hook in the fall arrest system to secure themselves against falling!
-



B106914

2 Fall protection equipment on the crawler track



WARNING

Danger of falling!

During assembly and disassembly, assembly personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!

- ▶ For assembly / disassembly work, maintenance work and inspections, assembly all railings, ladders and platforms properly, swing in position and secure!
- ▶ Only step on the ladder and platform with "clean shoes".
- ▶ Keep ladders and platforms clean and free of snow and ice!
- ▶ Replace damaged ladders and platforms immediately!
- ▶ Assemble all ladders and platforms stable and safe to access.

2.1 Assembling the ladders

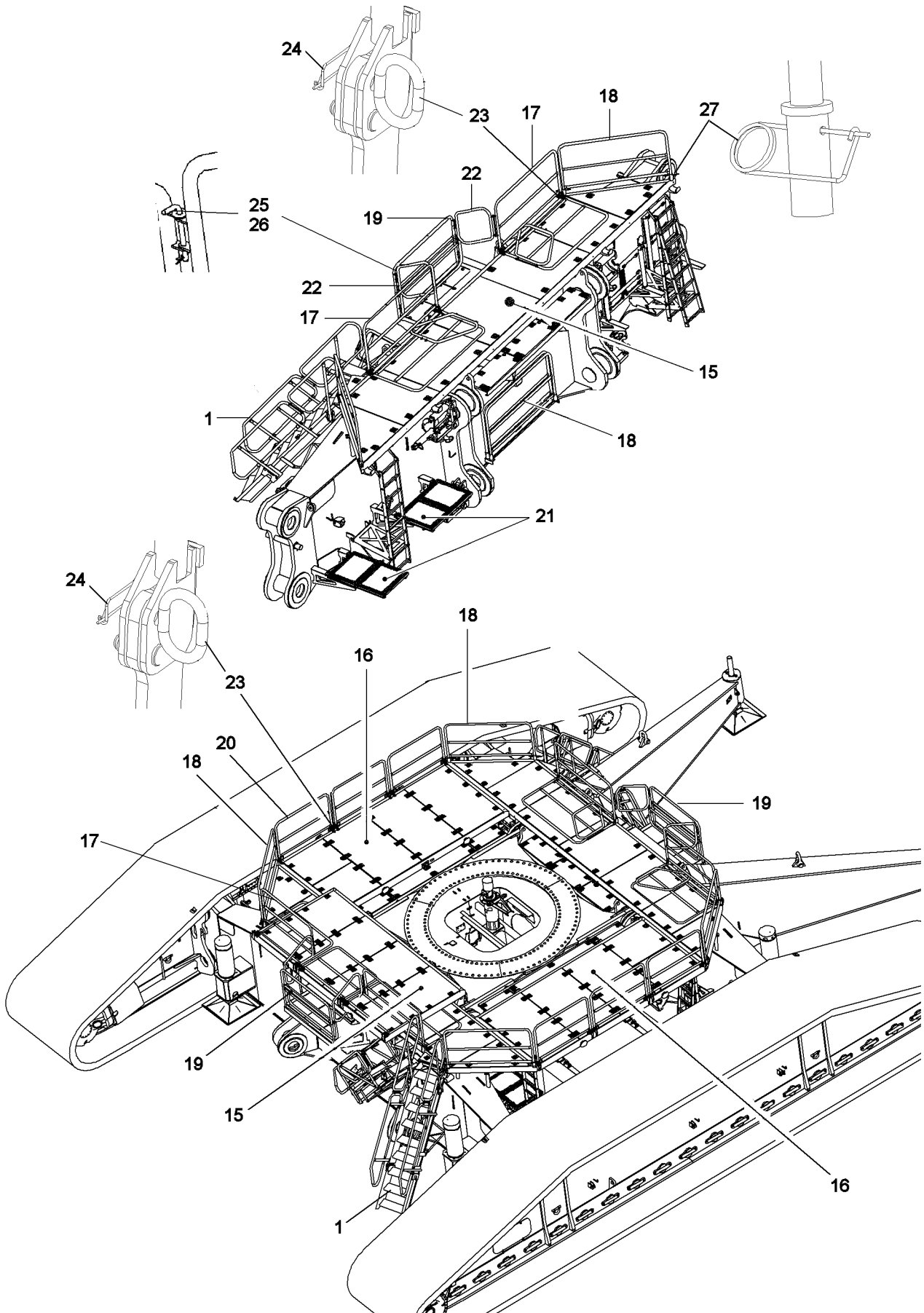


Note

- ▶ A= operating position
- ▶ B= transport position

Swing ladder from transport position **B** into operating position **A**.

- ▶ Loosen retaining pin **9** on the mounting **8**.
- ▶ Swing ladder **1** into operating position and lock.
- ▶ Pin ladder **1** securely on the cross carrier. Insert the pin **4** and secure with spring retainer **5**.
- ▶ Loosen tension belt **10**.
- ▶ Pull pin **11** and unlock ladder lower section.
- ▶ Fold down ladder lower section. Insert the pin **7** and secure with spring retainer **6**.
- ▶ Fold and secure railings upward, left and right. Insert socket pin **2** and secure with spring retainer **3**.



B106915

2.2 Assembling platforms and railings

Make sure that the following prerequisites are met:

- The railings **17** are placed down.
- The railings **18** are hung laterally on cross carrier.
- The ladder **21** has been folded in.



WARNING

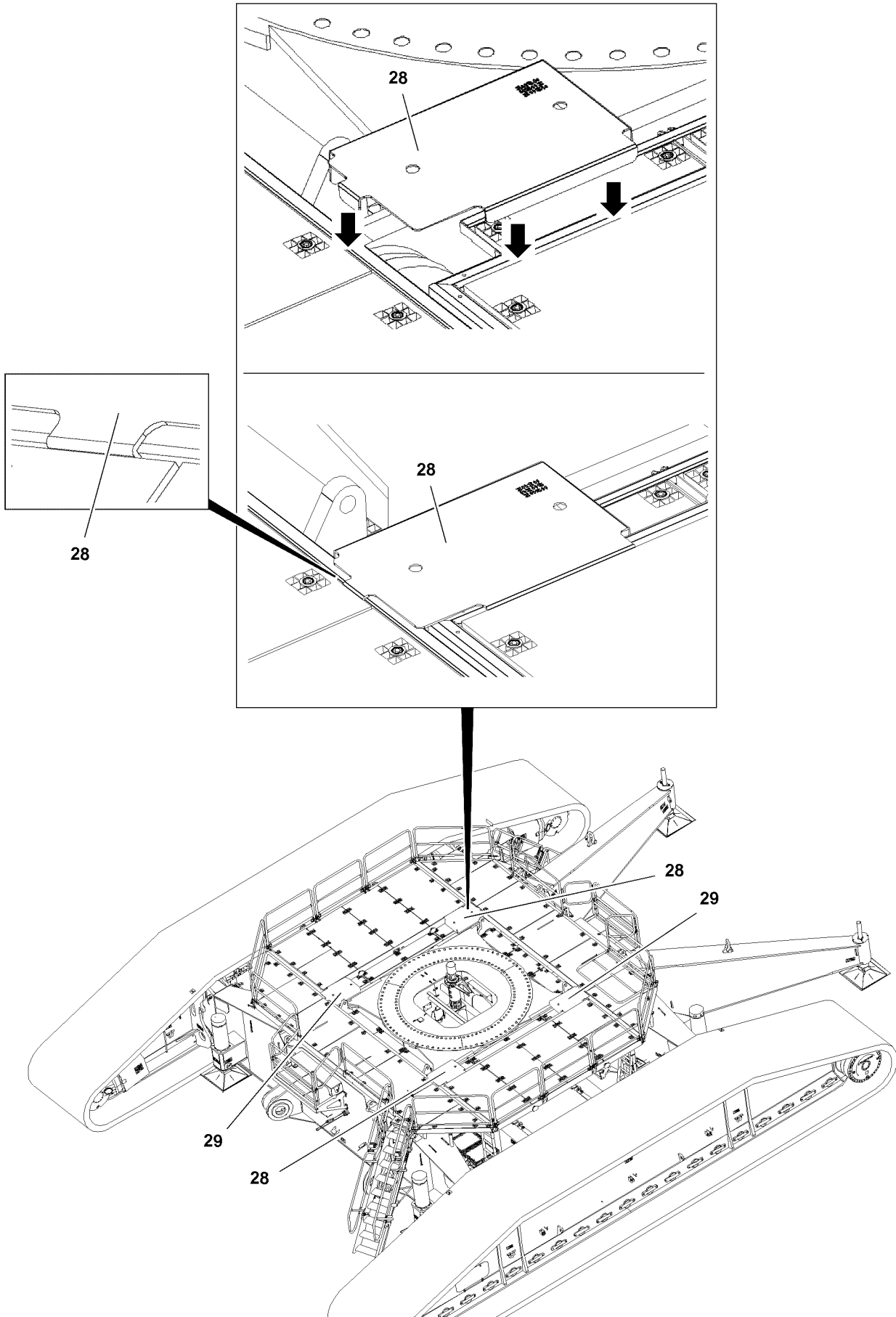
When working aloft, there is a danger of falling!

- ▶ Assemble and secure all fall protection equipment, for example, platforms, ladders and railings properly.
-



Note

- ▶ The platforms **15** and the railings are assembled onto the cross carriers for transport.
- ▶ Hang platform **16** on both sides between the cross carriers into the brackets **a** on the platforms **15**.
- ▶ Erect, pin and secure railings **20**. Insert the pin **23** and secure with spring retainer **24**.
- ▶ Erect, pin and secure railings **17**. Insert the pin **23** and secure with spring retainer **24**.
- ▶ Fold up railings **19** and simultaneously swing railings **22** both sides with locking pins **25** and secure cotter pin **26**.
- ▶ Assemble railings **18** and secure with spring retainers **27**.
- ▶ Fold down platforms **21** or fold up and lock.



B116866

2.3 Installing the steps

Make sure that the following prerequisites are met:

- The platforms are installed.
- The railings are installed.



WARNING

When working aloft, there is a danger of falling!

- ▶ Assemble and secure all anti-fall guards, for example platforms, ladders and railings properly.
-



Note

- ▶ The installation of the step **28** is identical to the installation of the step **29**!
 - ▶ The installation of the step **28** is reversed to the installation of step **29**!
-



WARNING

Danger of injury!

If the steps are not installed before installation of the turntable, then the assembly personnel can fall when installing the turntable and later when using the step on the turntable!

Personnel can be severely injured!

- ▶ Make sure that steps **28** and steps **29** are hooked on the platform!
-

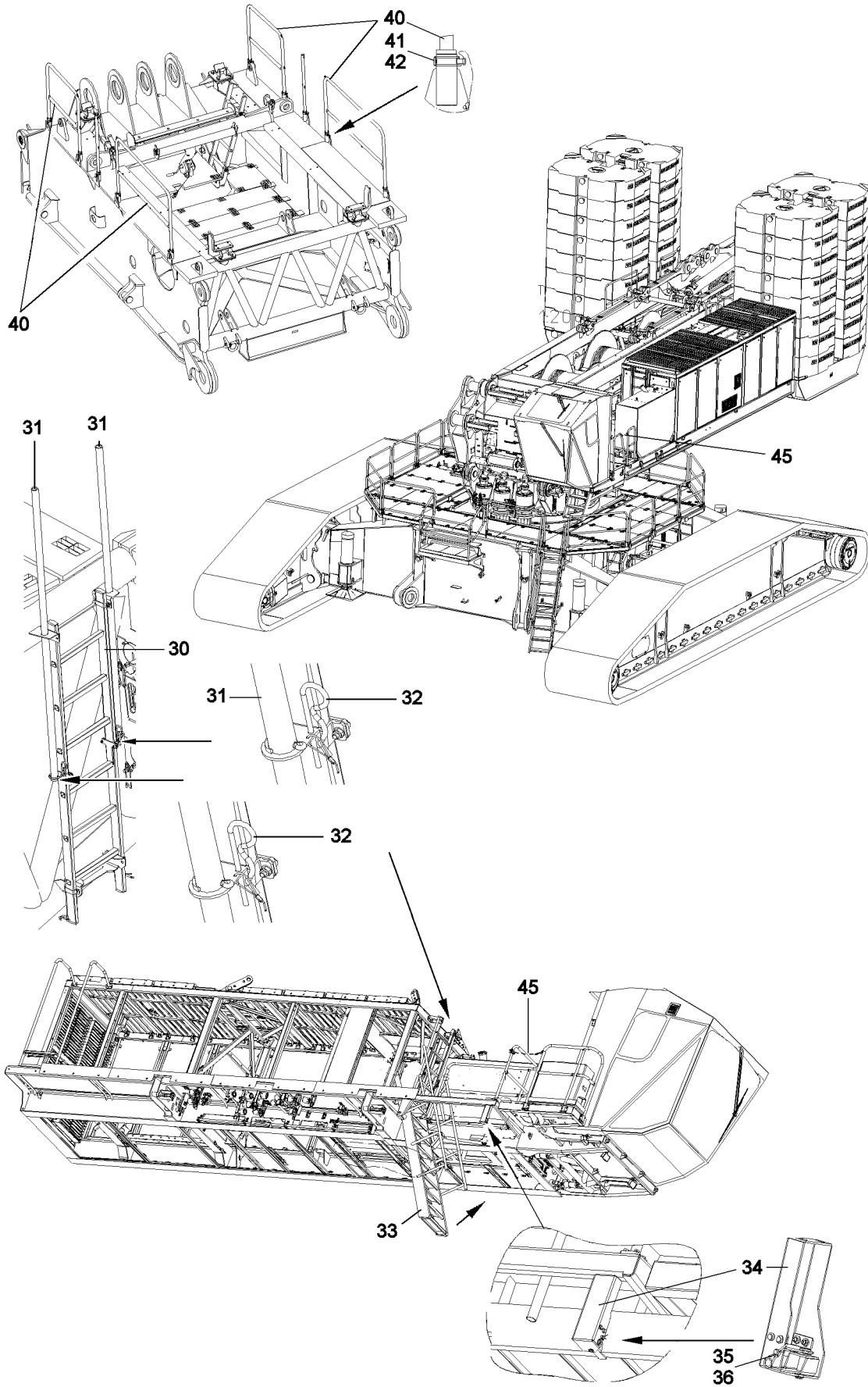


WARNING

Danger of crushing!

When hooking the step, fingers and hands can be crushed!

- ▶ Do not reach with your hands into the danger zone!
 - ▶ Hook the step **28** on the platform as shown the illustration.
 - ▶ Hook all steps on the platform as shown the illustration.
-



B106916

3 Fall protection equipment on the turntable



WARNING

Danger of falling!

During assembly and disassembly, assembly personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!

- ▶ For assembly / disassembly work, maintenance work and inspections, assembly all railings, ladders and platforms properly, swing in position and secure!
- ▶ Only step on the ladder and platform with "clean shoes".
- ▶ Keep ladders and platforms clean and free of snow and ice!
- ▶ Replace damaged ladders and platforms immediately!
- ▶ Assemble all ladders and platforms stable and safe to access.

3.1 Assembling the ladders



WARNING

When working aloft, there is a danger of falling!

- ▶ Pull and secure pipes **31** upward on both sides.

3.1.1 Installing the pipes in position for assembly / disassembly

- ▶ Pull the pipes **31** upward on both sides in position for installation / removal.
- ▶ Secure pipes **31** in position for installation / removal with cotter pin **32** on both sides.

3.1.2 Installing the pipes in transport position

- ▶ Remove the cotter pins **32**.
- ▶ Set both pipes **31** downward into transport position.
- ▶ Insert the cotter pin **32** into transport position.

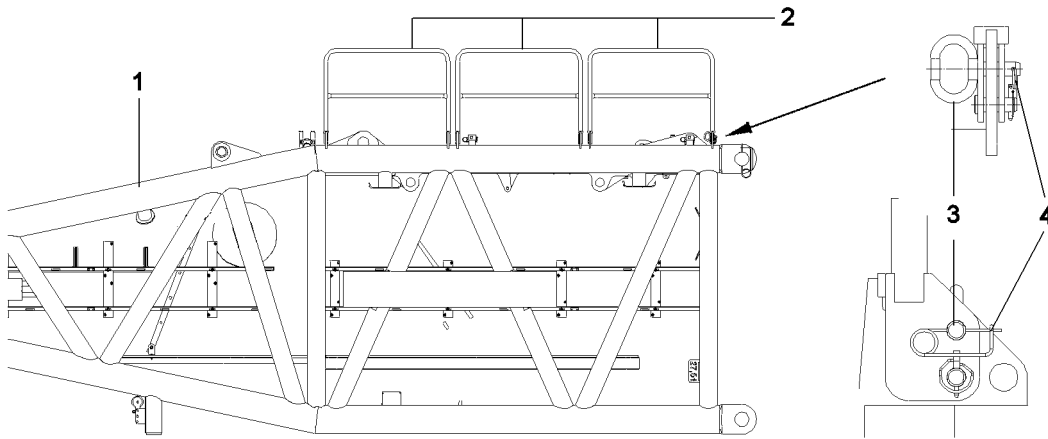
3.1.3 Fold up ladder into transport position

- ▶ Push the ladder **33** upward and fasten on the bracket **34**.
- ▶ Remove cotter pin **35**, unpin pin **36**, swing bearing **37** and pin again. Insert the pin **36** and secure it with a cotter pin **35**.

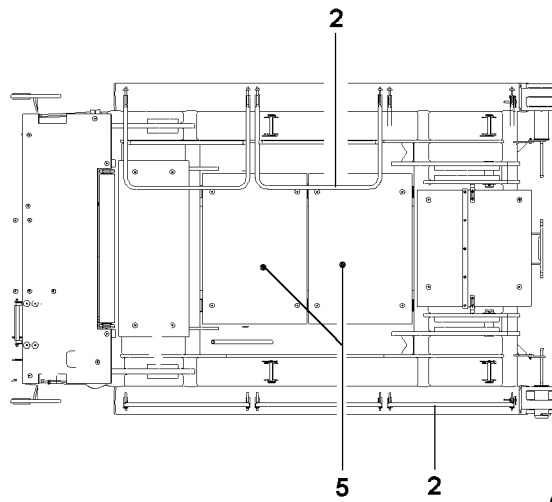
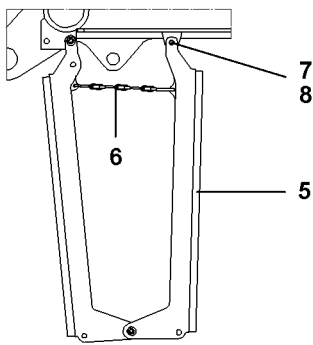
3.2 Assembling the railings

3.2.1 Assembling railings into position for assembly / disassembly

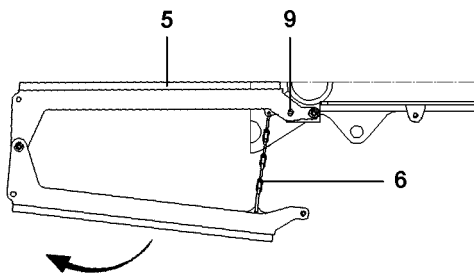
- ▶ Insert, pin and secure the railings **40** for assembly / disassembly into the holders.
- ▶ Insert the pin **41** and secure with locking pin **42**.
- ▶ Install the retaining chains **45**.



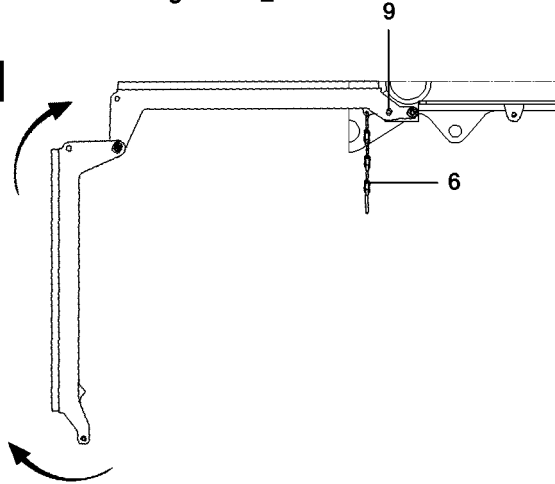
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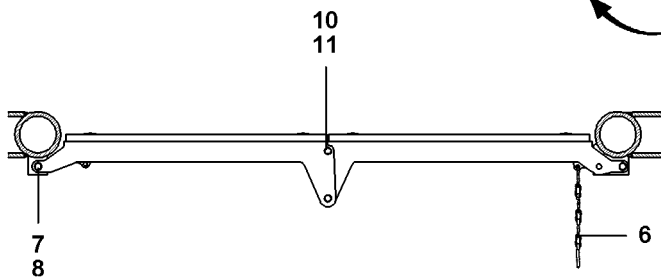
2



3



4



B107348

4 Installing the assembly platform on the S-pivot section



WARNING

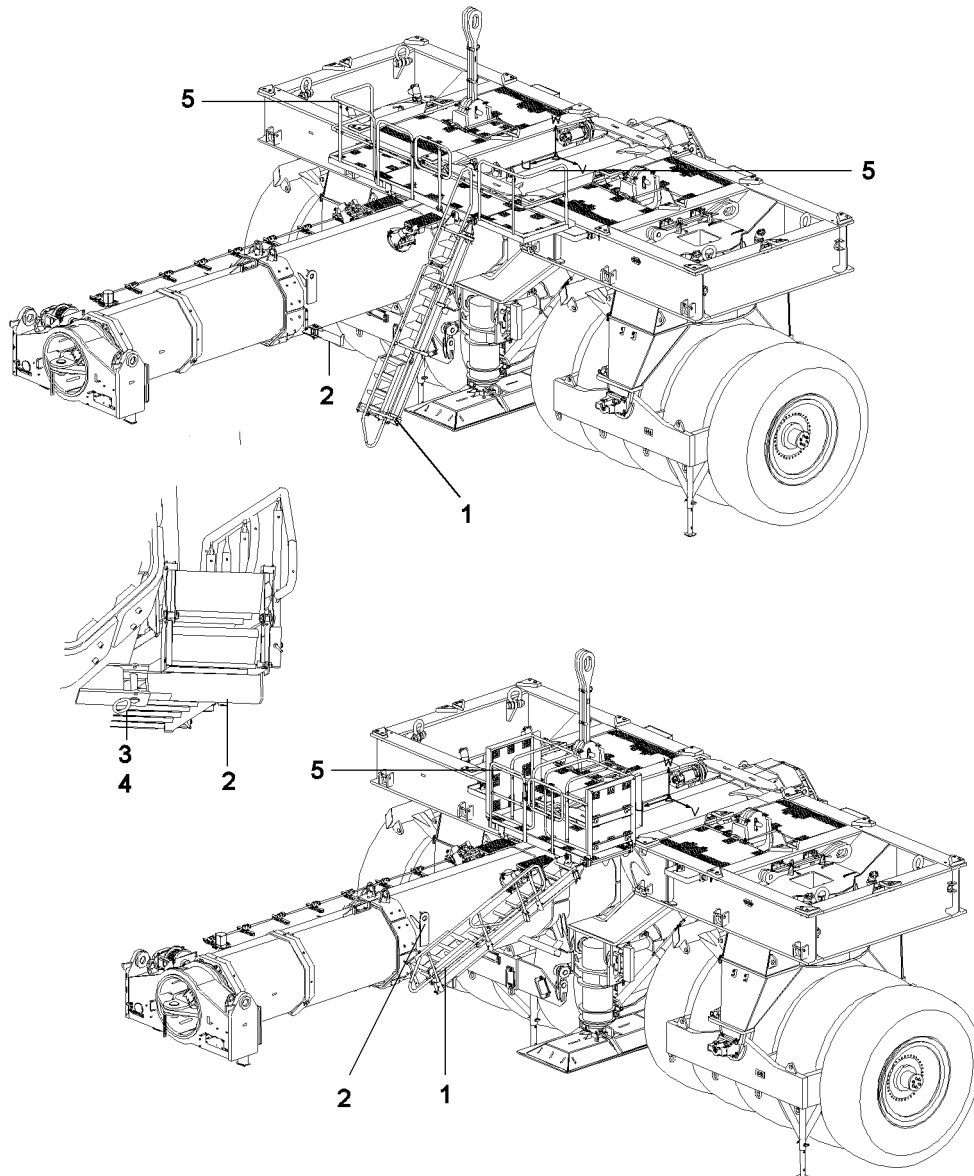
Danger of falling!

If the assembly platform **5** is not completely folded open and not pinned, there is a danger of falling!

- ▶ The assembly platform **5** may only be accessed when it is completely folded open, pinned and secured!

4.1 Installing the assembly platform

- ▶ Hang the folded assembly platform **5** on the auxiliary crane.
- ▶ Release the spring retainers **7** and unpin the pins **8**.
- ▶ Pull the assembly platform **5** upward to horizontal position and insert and secure the retaining pins **9**.
- ▶ Hang the auxiliary crane on the folded down section of the platform.
- ▶ Remove the chain **6** and lower the lower section and then pull up to the horizontal position and pin.
- ▶ Lock the platform in the center and pin.
- ▶ Insert the locking pin **10** and secure with spring retainer **11**.
- ▶ Insert the pin **8** and secure with spring retainer **7**.



B107351

5 Fall protection equipment on the ballast trailer



WARNING

Danger of falling!

During assembly and disassembly, assembly personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!

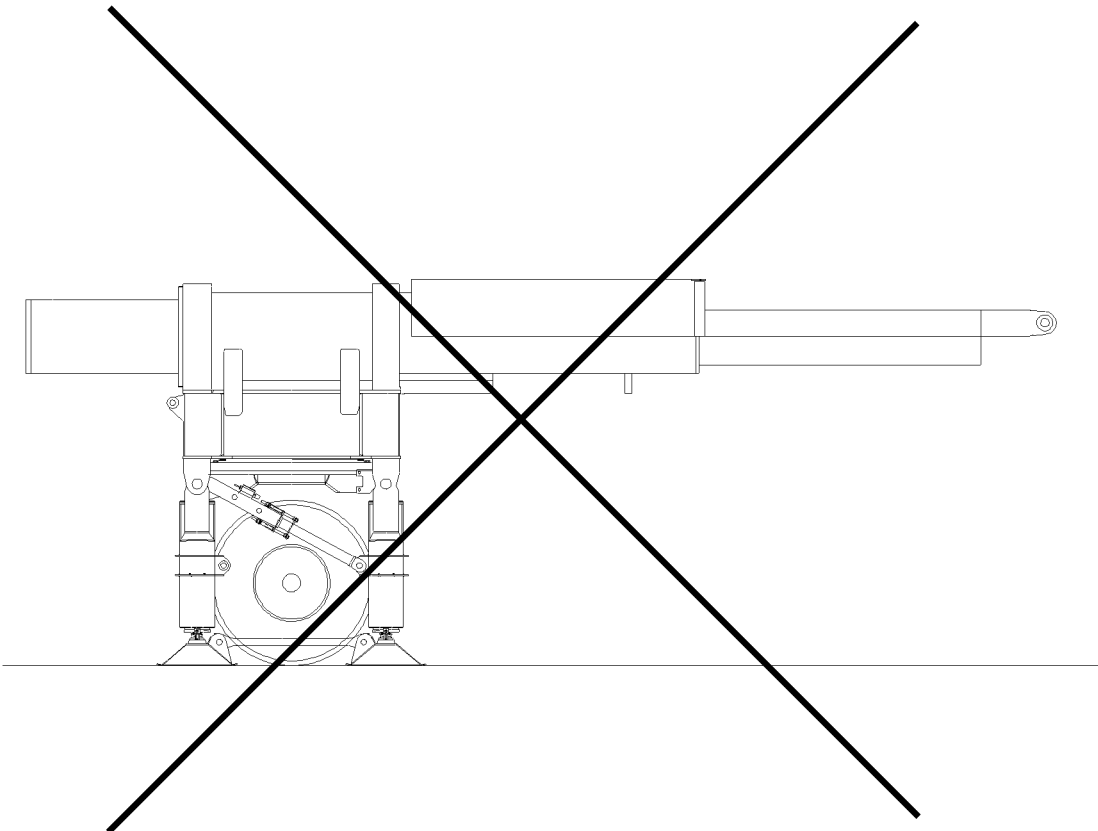
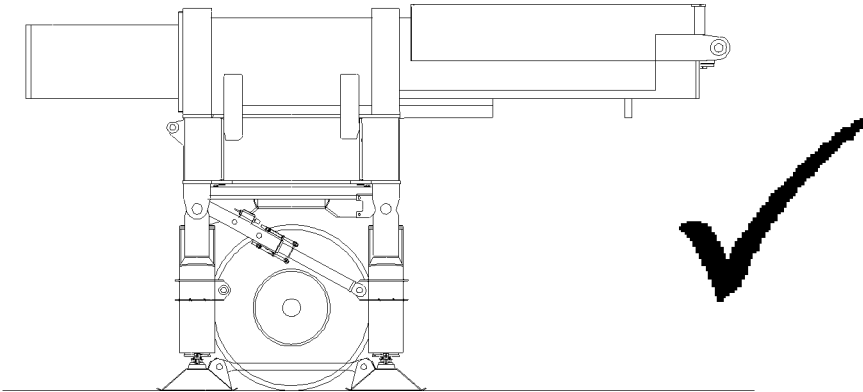
- ▶ For assembly / disassembly work, maintenance work and inspections, assemble all railings, ladders and platforms properly, swing in position and secure!
- ▶ Only step on the ladder and platform with "clean shoes".
- ▶ Keep ladders, railings and platforms clean and free of snow and ice!
- ▶ Replace damaged ladders and platforms immediately!
- ▶ Assemble all ladders and platforms stable and safe to access.
- ▶ Assemble the railings properly.

5.1 Bring ladders and railings into assembly position

- ▶ Hang ladder **1** onto the auxiliary crane and lift up lightly. Unpin bracket **2** and swing to the guide. Remove the locking pin **4** and unpin the pin **3**.
- ▶ Place ladder **1** downward.
- ▶ Fold down and lock down latter lower section.
- ▶ Swing railings **7** upward, pin and secure.
- ▶ Fold platform **6** and railings **5** to the side on both sides, pin and securely.

5.2 Bring ladders and railings into transport position

- ▶ Fold ladder lower section upward, pin and secure.
- ▶ Swing railings **7** downward, pin and secure.
- ▶ Hang ladder **1** onto the auxiliary crane and raise.
- ▶ Remove locking pin **4**, unpin pin **3**, and swing bracket **2** outward, pin and secure.
- ▶ Place down ladder **1** on the bracket **2**.
- ▶ Unpin platforms **6** and railings **5** and fold together on both sides, pin and secure.



B107353

1 Safety guidelines



WARNING

Risk of falling!

- ▶ During assembly or disassembly work on the ballast trailer, assembly personnel must be secured with appropriate aids! If this is not observed, assembly personnel can fall and suffer life-threatening or fatal injuries!



WARNING

Danger of tipping the ballast trailer!

If the following notes are not observed, the freestanding ballast trailer or the ballast trailer which needs to be disassembled can tip over!

Personnel can be severely injured or killed!

- ▶ The ballast trailer may only be parked on level ground of sufficient load bearing capacity!
- ▶ The ballast trailer may only be unpinned from the crane and parked if the ballast trailer guide is fully retracted!
- ▶ The ballast trailer may only be unpinned from the crane and parked if the support cylinders are extended and the tires are relieved!
- ▶ The ballast trailer may only be unpinned from the crane and parked if the strut on the support cylinders is pinned and secured!



WARNING

Mortal danger if the permissible travel speed is exceeded!

If the permissible travel speed is exceeded, the tires can be damaged!

Personnel can be severely injured or killed!

As a result, significant property damage can occur on the crane and on the ballast trailer!

- ▶ The travel speed of the ballast trailer when turning or driving with maximum ballast on the tires may be not more than maximum 1 km/h (0.28 m/s)!



WARNING

The crane can topple over if the level of the travel path differs!

Due to impermissible level differences between the ballast trailer route and the crane placement level, the entire crane system can be pulled back suddenly!

The relapse cylinders can run to block position. The relapse cylinders and the boom system can be damaged!

Personnel can be severely injured or killed!

- ▶ Do not exceed or fall below the permissible level difference between the ballast trailer travel path and the crane placement level!
- ▶ The travel path of the crane or the circular path of the ballast trailer must be level and of sufficient load bearing capacity!
- ▶ The permissible level difference of the ballast trailer travel path and crane travel path for "towing" and "parallel driving" may be no more than maximum 250 mm!
- ▶ The permissible level difference of the ballast trailer path and the crane travel path in relation to the crane travel path for circular driving may be no more than maximum 250 mm - based on a constant uphill incline or constant downhill incline on a 90° turning range!

**WARNING**

The crane can topple over!

If the following notes are not observed, the crane can topple over!

Personnel can be severely injured or killed!

- ▶ When lifting or lowering the ballast trailer, pay attention to the horizontal alignment of the ballast trailer!
- ▶ The assembly or disassembly work must be carried out according to the Crane operating instructions, chapter 5.35 or chapter 5.11!

NOTICE

Danger of damage to the crane and the ballast trailer!

Due to steering movements on the crawler tracks while driving parallel, the crane and the ballast trailer can be significantly damaged!

- ▶ When driving parallel, steering the crawler tracks is prohibited!
- ▶ For parallel driving, the side tire distortion on the wheel sets must be observed by an instructed person over the entire travel route of the crane. If the tires distort by more than 100 mm, then the position of the wheel sets must be corrected!

**Note**

General safety technical guidelines!

- ▶ The ballast trailer guy rods must be assembled and secured according to the Rod plan. The numbering on the rod plan must be identical to the numbering on the guy rods!

2 Inspection of tires and disk wheels

**Note**

- ▶ See Crane operating instructions, chapter 8.01!

**WARNING**

Mortal danger when using non-approved tires!

Due to the use of tires, which are not explicitly approved by **LIEBHERR-Werk Ehingen GmbH**, uncontrollable operation conditions on the ballast trailer can occur due to the heavy load!

The tires can be destroyed and the ballast trailer as well as the crane can be significantly damaged!

Personnel can be severely injured or killed!

- ▶ Use only spare tires which have been approved in writing by **LIEBHERR-Werk Ehingen GmbH**!
- ▶ Using spare tires which have been not explicitly approved in writing by **LIEBHERR-Werk Ehingen GmbH** is prohibited!

NOTICE

Damage to tires!

Due to external environmental influences (for example: rain, wind, snow, frost, sun exposure) and the great weight load on the tires by the ballast trailer, the tires can become porous and the body can lose its original strength!

- ▶ The tires must be replaced according to the data of the tire manufacturer at least after 5 years, or if an expert representative of the tire manufacturer states in writing, after extensive inspection of the tires, that the tires can be utilized for an additional operation period stated by the expert representative!

**Note**

Tightening torque of ballast trailer tires!

- ▶ The tightening torque for the wheel lugs is 600 Nm!
- ▶ Check the wheel lugs according to the specified maintenance intervals for tight seating, see Crane operating instructions, chapter 7.02!

2.1 Tires with air inflation

It is imperative to comply with the following instructions:

- After extended downtime, the inflation pressure must be checked before using the ballast trailer.
- The tires must be protected against UV rays during extended downtimes with tarps or wooden boards.

**Note**

Inflation pressure of ballast trailer tires!

- ▶ The inflation pressure in all tires, which were approved in writing by **LIEBHERR-Werk Ehingen GmbH** is **10 bar** !
- ▶ Check the inflation pressure according to the specified maintenance intervals for tight seating, see Crane operating instructions, chapter 7.02!

**WARNING**

Risk of accident due to damaged ballast trailer tires!

Due to extended downtime of the crane, when the ballast trailer tires are not relieved with supports, the tires can get out of round!

As a result, the tires can be destroyed and the ballast trailer as well as the crane can be significantly damaged!

Personnel can be severely injured or killed!

- ▶ During extended downtimes, the ballast trailer tires must always be relieved by the outrigger supports!

**WARNING**

Risk of accident due to damaged ballast trailer tires!

When driving the crane on insufficiently prepared ground, the tires can become damaged or punctured by large rocks or other foreign matter!

As a result, the ballast trailer as well as the crane can be significantly damaged!

Personnel can be severely injured or killed!

- ▶ The travel route of the crane or the ballast trailer must be level, of sufficient load bearing capacity and free of rocks or other foreign matter!
- ▶ The travel route of the crane must be walked off personally in advance by the crane operator!
- ▶ Rocks and other foreign matter on the travel route must be removed before starting to travel!
- ▶ If the crane operator cannot ensure that the ballast trailer tires may not be damaged when moving the crane, then the ballast trailer tires must be foamed with a special foam approved by **LIEBHERR-Werk Ehingen GmbH**. Contact **LIEBHERR-Werk Ehingen GmbH** in this regard!
- ▶ If you decide to foam the ballast trailer tires, then ballast trailer operation is only permissible if all tires of the ballast trailer have been foamed according to the specifications of **LIEBHERR-Werk Ehingen GmbH**!

2.2 Tires foamed with special foam

The tires of the ballast trailer are foamed with a special, high quality foam.

Due to extended downtime of the crane, when the ballast trailer tires are not relieved with supports, the tires can get out of round.

It is imperative to comply with the following instructions:

- Relieve the tires on the ballast trailer if it is at a standstill for more than 2 h via the support cylinders.
- The tires must be protected against UV rays during extended downtimes with tarps or wooden boards.



WARNING

Mortal danger when using non-approved tire foams!

Due to the use of tire foams, which are not explicitly approved by **LIEBHERR-Werk Ehingen GmbH**, uncontrollable operation conditions on the ballast trailer can occur due to the heavy load!

The tires can be destroyed and the ballast trailer as well as the crane can be significantly damaged!

Personnel can be severely injured or killed!

- ▶ Use of spare tires filled with water, air or special foam of lower quality is prohibited!
 - ▶ Using spare tires which have been not explicitly approved in writing by **LIEBHERR-Werk Ehingen GmbH** is prohibited!
-



WARNING

Danger of accidents due to retreaded tires!

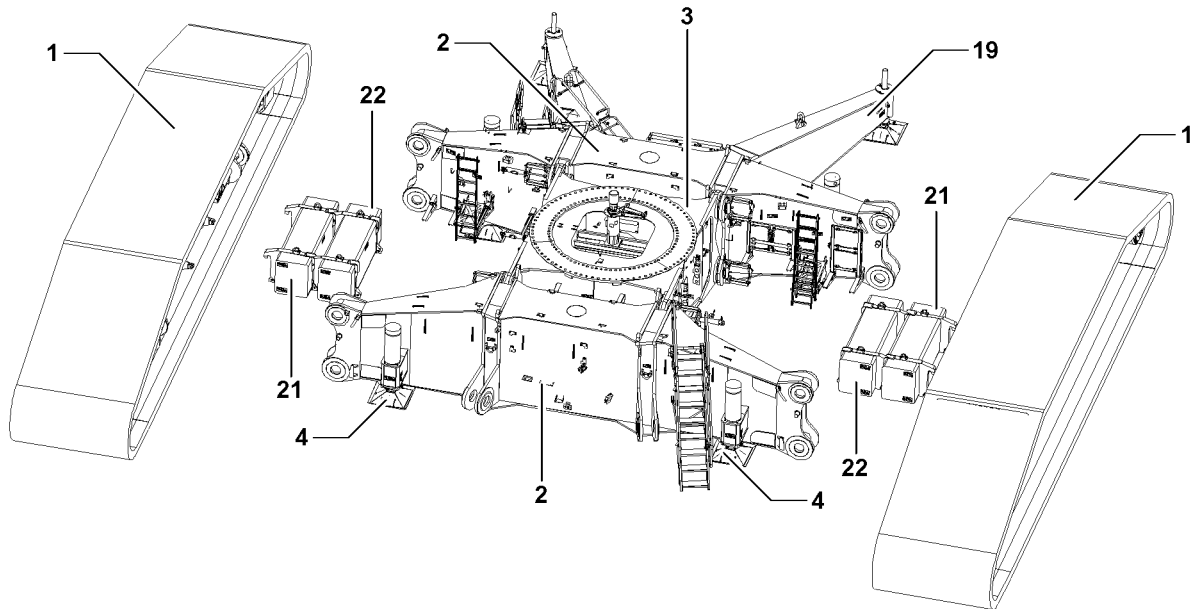
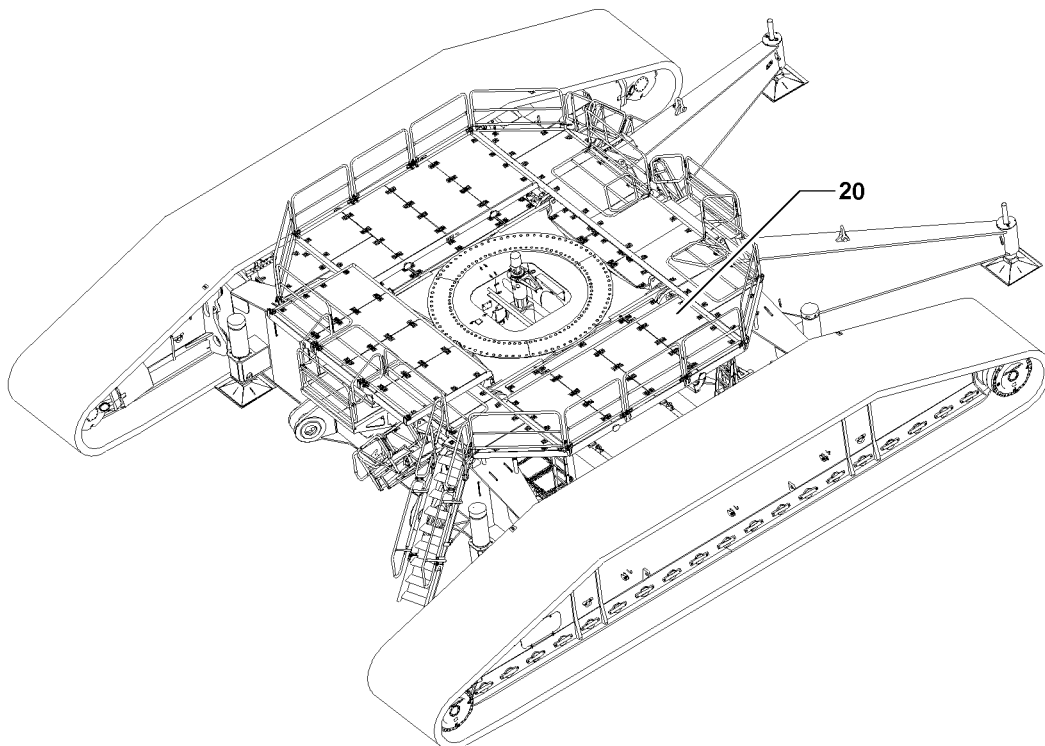
If tires foamed with the special foam are retreaded, the usage properties can be significantly changed negatively!

The tires can be destroyed and the ballast trailer as well as the crane can be significantly damaged!

Personnel can be severely injured or killed!

- ▶ Tires which are filled with special foam may not be retreaded, except if a written approval has been issued by the tire manufacturer!
-

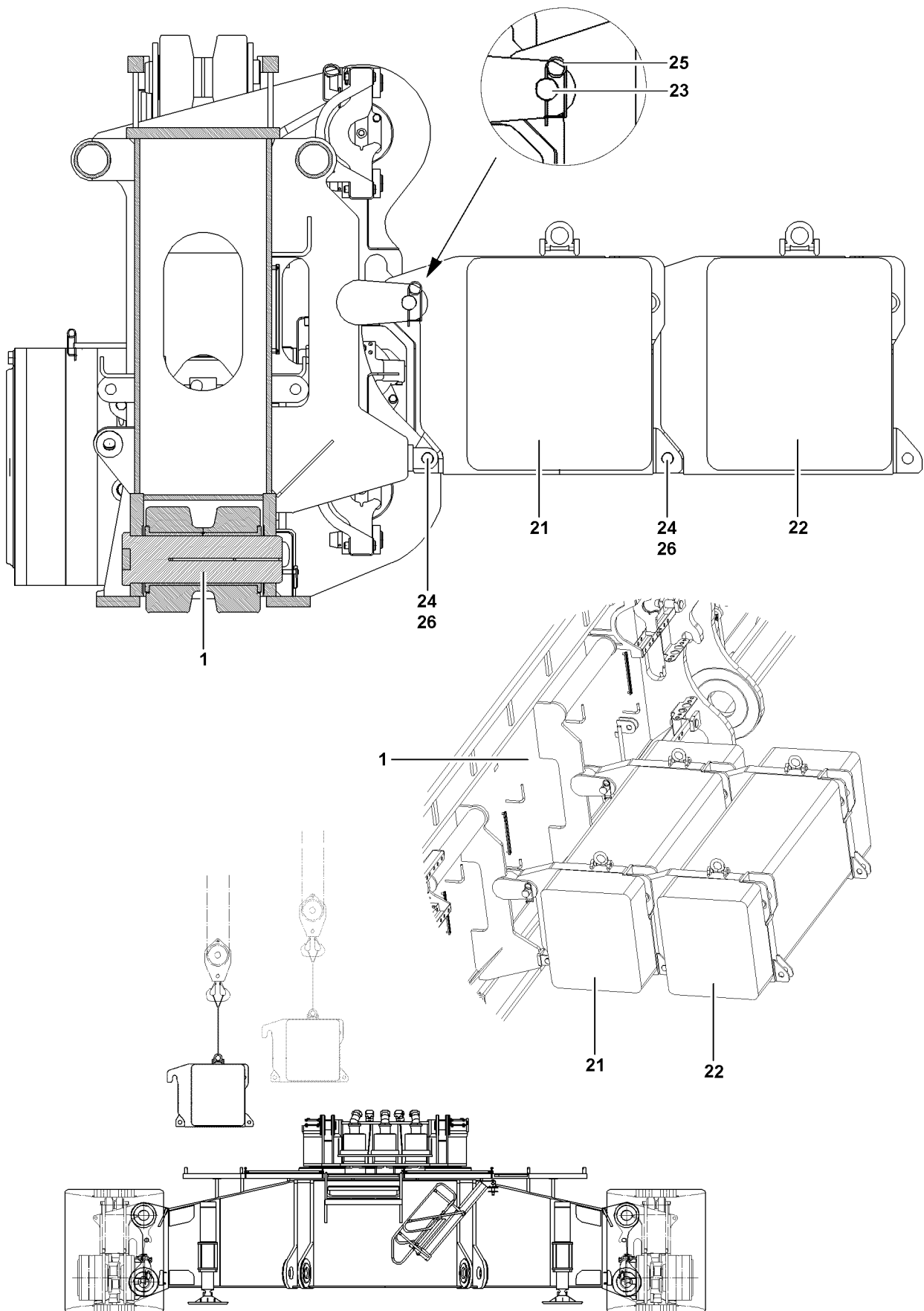
3 Crane assembly

1**2**

B112751

1 Component overview Crawler travel gear

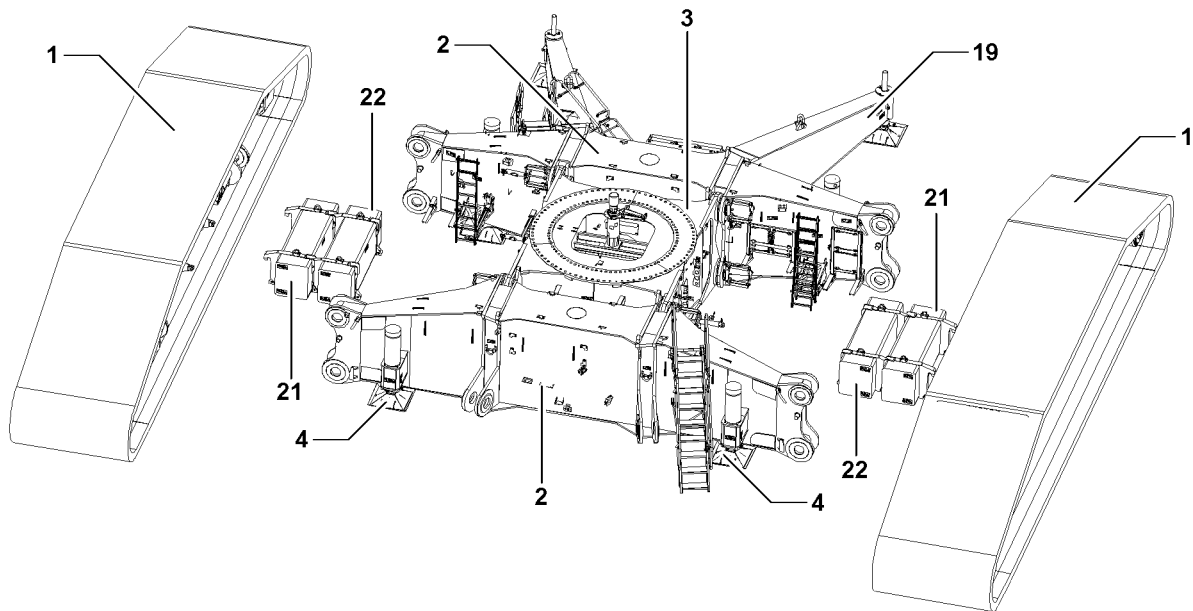
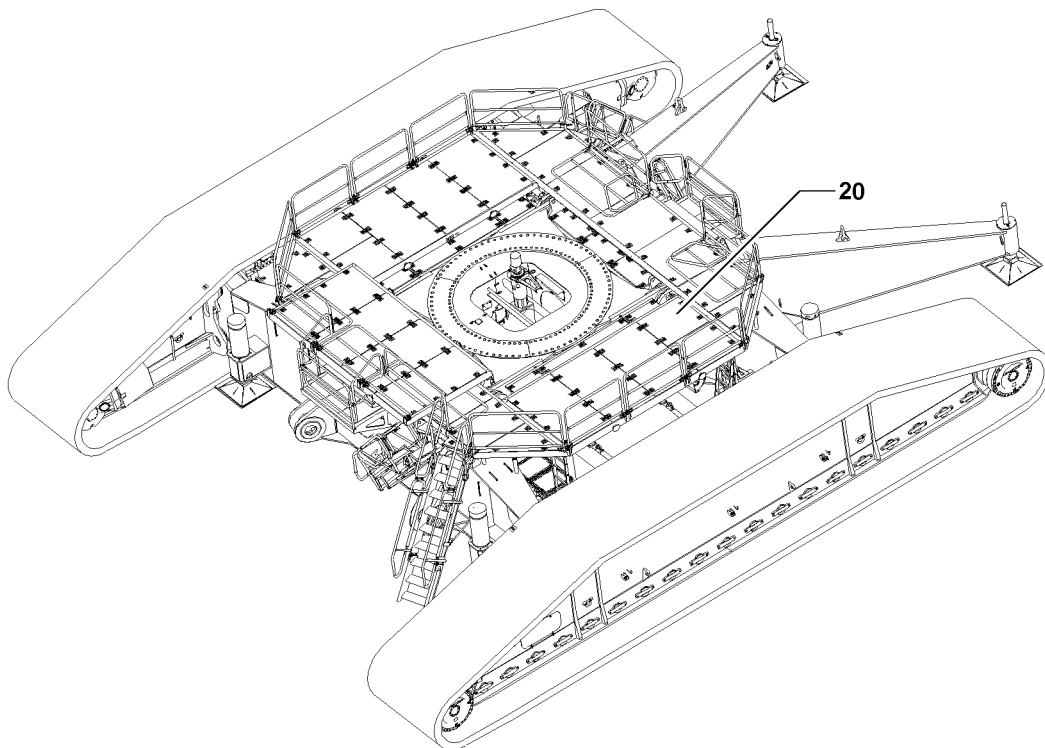
- 1 Crawler carrier
- 2 Cross carrier
- 3 Crawler center section
with turning device
- 4 Hydraulic assembly
supports
- 19 Mechanical auxiliary
support
- 20 Platform
- 21 Auxiliary weights
- 22 Auxiliary weights



B112752

2 Component overview of auxiliary weights

- 21 Auxiliary weight
- 22 Auxiliary weight
- 23 Pin , 55 mm
- 24 Pin , 45 mm
- 25 Spring retainer
- 26 Linch pin

1**2**

B112751

3 Installing the crawler travel gear

**WARNING**

Risk of falling!

During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling! If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!

- ▶ The assembly personnel must always move carefully and anticipatory on the crane, the crane components or lattice sections!
- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids!
- ▶ If fall arrest equipment is available, then it must be used!
- ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the permissible fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04!
- ▶ The fall arrest system must be attached on the fastening and hook points as well as on the retaining ropes!
- ▶ Only step on the aids, ladders and catwalks with clean shoes!
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice!

**WARNING**

Danger of impact / crushing!

When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth!

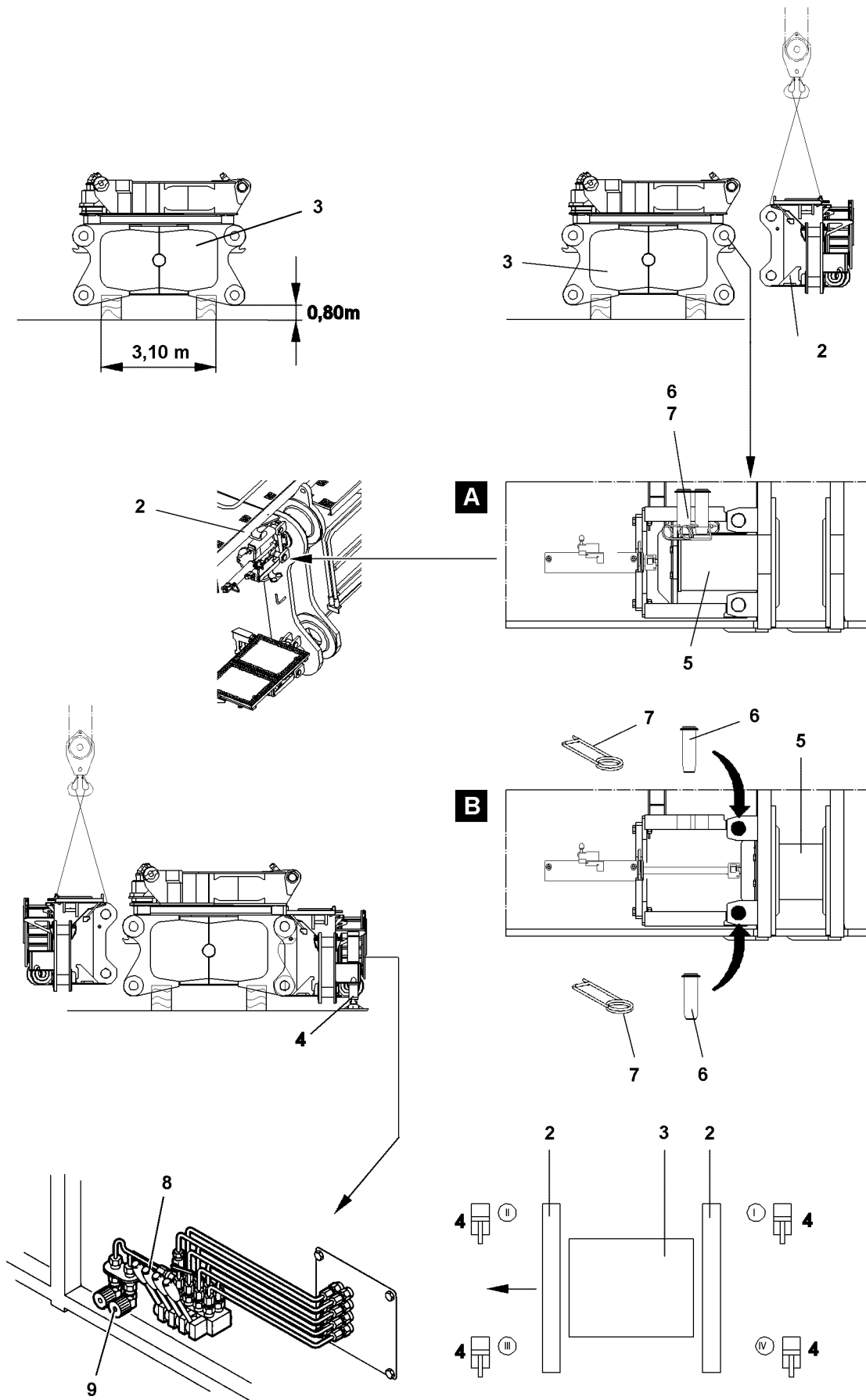
When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing!

Personnel can be caught and severely injured or killed!

- ▶ Make sure that personnel cannot be caught by components!
- ▶ When working in danger zones: Use aids to protect limbs!
- ▶ Guide components with suitable aids to minimize oscillation!

Make sure that the following prerequisites are met:

- The placement location must be level and have adequate load bearing capacity.
- An auxiliary crane is available.
- Suitable material must be available for the supporting base of the crawler center section.



B104442

3.1 Supporting the crawler center section

**WARNING**

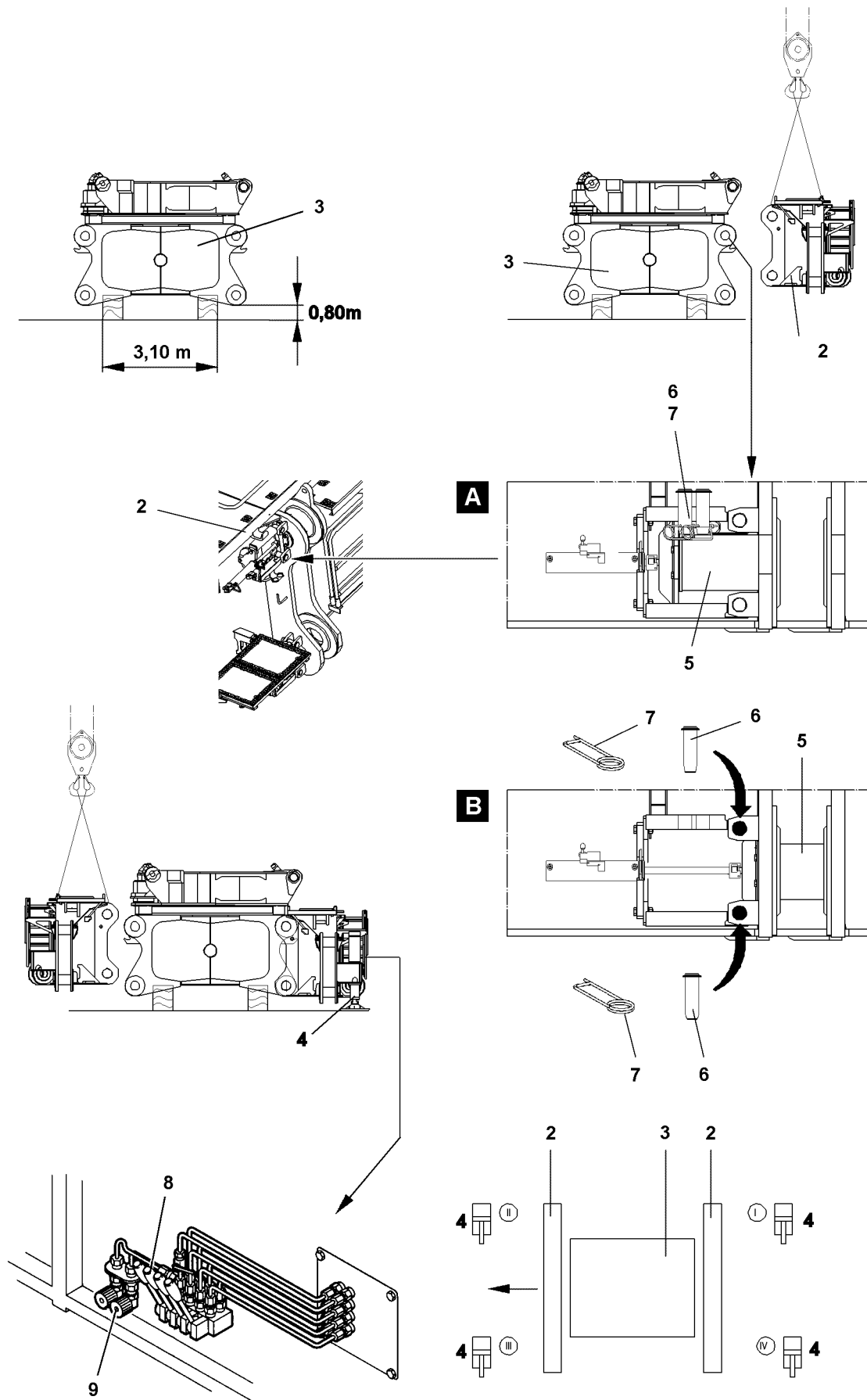
Improper support!

If the crawler center section is not properly supported from below, it can sink into the ground and severely injure personnel!

- ▶ The support must be able to safely take on the weight of the crawler center section, the turntable and the crawler carrier!
 - ▶ The support must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see Crane operating instructions, chapter 2.04!
-

**Note**

- ▶ It must be constructed in such a way that the cross carriers can be installed on the left and right without interference.
 - ▶ The support for the crawler center section must be built up to at least 0.80 m!
 - ▶ The distance between the support must be at least 3.10 m!
-
- ▶ Support the crawler center section **3** with hardwood timbers (or other suitable materials) from below.
 - ▶ Lift the crawler center section **3** with the auxiliary crane and set it onto the support.



B104442

3.2 Installing the cross carrier

- ▶ **Hang the first** cross carrier **2** onto the auxiliary crane and swing it in to the pin points on the crawler center section **3** and attach.



Note

- ▶ Note the identification on the crawler center section and the cross carrier!
 - ▶ First install the cross carrier with the installed hydraulic connections. After assembly, the support cylinders must be moved out!
-
- ▶ Pin the cross carrier **2** on the crawler center section **3** “on top”: Insert the pins **5** with the hydraulic pin pulling device and secure with retaining pins **6**.
 - ▶ Secure the retaining pins **6** with spring retainers **7**.
 - ▶ Pin the cross carrier **2** on the crawler center section **3** “on the bottom”: Insert the pins **5** with the hydraulic pin pulling device and secure with retaining pins **6**.
 - ▶ Secure the retaining pins **6** with spring retainers **7**.

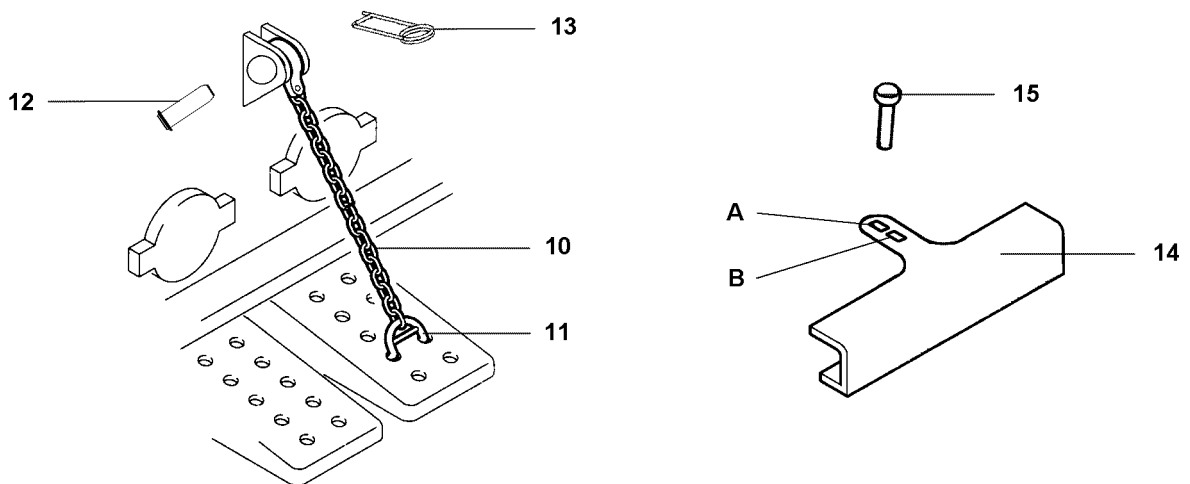
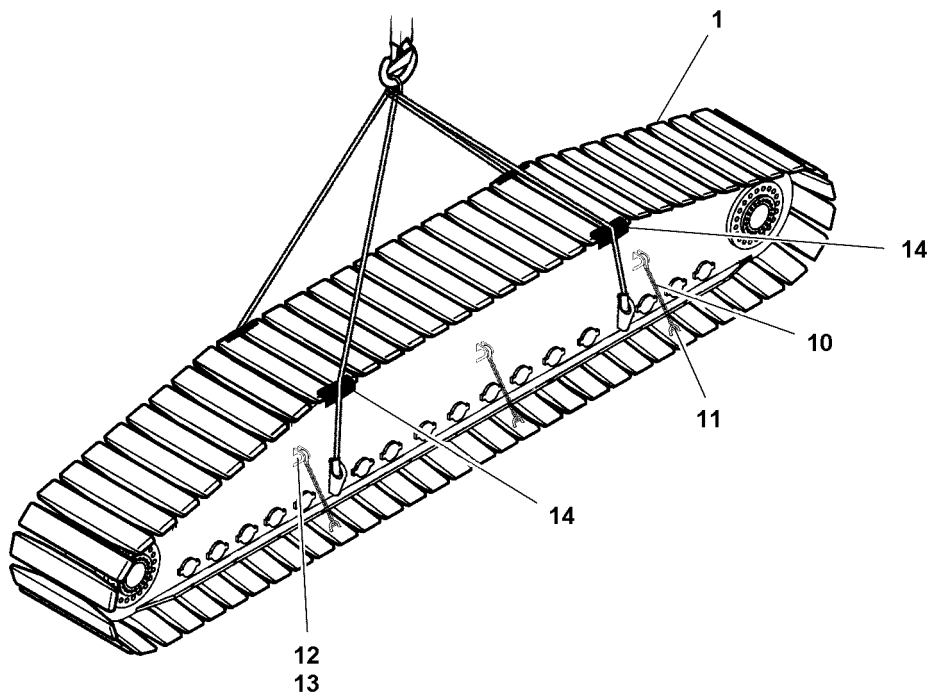
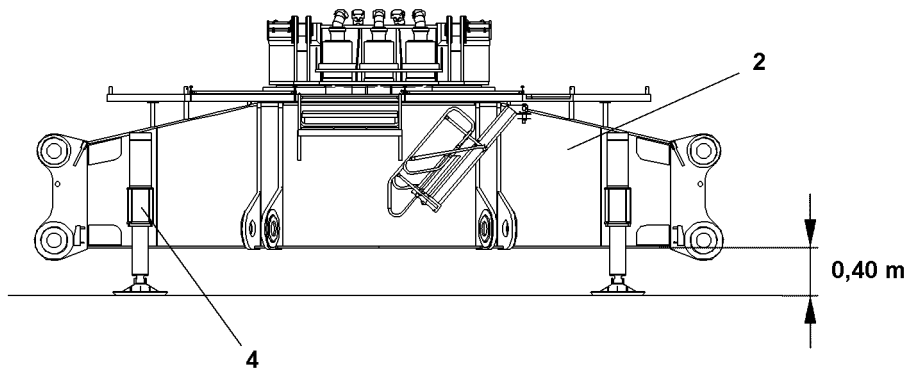


WARNING

Tipping of center section and cross carrier!

Without support with the assembly cylinders or without support below, the installed cross carrier can tip over! Personnel can be severely injured or killed!

- ▶ Support the cross carrier with the support cylinders or support it properly from below!
-
- ▶ Support the support plates properly from below.
 - ▶ Connect the hydraulic assembly support **4** to the hydraulic component of the pin pulling device - quick coupling **9**.
 - ▶ Actuate the hand lever **8** and extend both support cylinders to the ground or the foundation support.
 - ▶ **Hang the second** cross carrier **2** onto the auxiliary crane and swing it in to the pin points on the crawler center section **3** and attach.
 - ▶ Pin the cross carrier **2** on the crawler center section **3** “on top”: Insert the pins **5** with the hydraulic pin pulling device and secure with retaining pins **6**.
 - ▶ Secure the retaining pins **6** with spring retainers **7**.
 - ▶ Pin the cross carrier **2** on the crawler center section **3** “on the bottom”: Insert the pins **5** with the hydraulic pin pulling device and secure with retaining pins **6**.
 - ▶ Secure the retaining pins **6** with spring retainers **7**.
 - ▶ Support the support plates properly from underneath.
 - ▶ Operate the hand lever **8**, extend the assembly cylinders and horizontally lift the center section with the attached cross carriers.
 - ▶ Remove the support under the center section.



B102672

3.3 Assembling the crawler carrier

The crawler carriers can be installed two ways:

- The crawler carriers are installed with the auxiliary crane.
- The crawler carriers are installed with the SA-frame.



WARNING

Improper support!

If the crawler center section is not properly supported from below, it can sink into the ground and severely injure personnel!

- ▶ The support must be able to safely take on the weight of the crawler center section, the turntable and the crawler carrier!
- ▶ The support must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see Crane operating instructions, chapter 2.04!

3.3.1 Installing the crawler carrier with the auxiliary crane

Make sure that the following prerequisite is met:

- The turntable has been removed.

Preparing for the installation of the crawler carrier with the auxiliary crane

- ▶ Connect the hydraulic assembly support **4** on the hydraulic aggregate of the pin pulling device - quick couplings.



Note

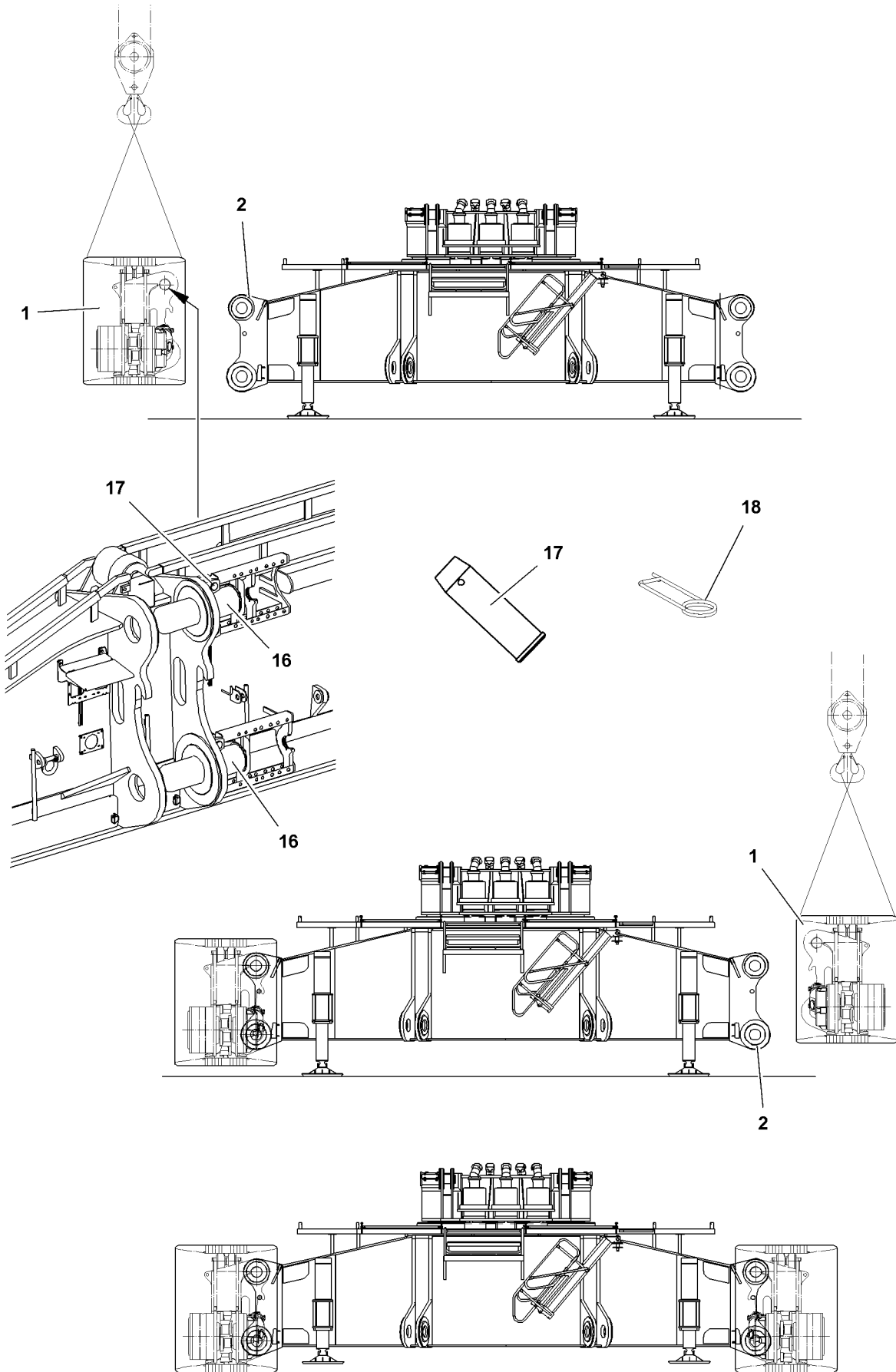
- ▶ Three chains must be hooked for each crawler carrier side!

- ▶ Secure the crawler carrier plates with chains **10** to prevent them from hanging down. Hang the chain **10** with bracket **11** on 3 lower track pads on both sides.
- ▶ Pin the other end of the chain on the crawler carrier: Insert the pin **12** and secure with spring retainer **13**.
- ▶ Attach the guard plate **14** on the upper track pads.



Note

- ▶ The retaining pins **15** are inserted at a track pad width of 2.0 m in bore **A**.
- ▶ The retaining pins **15** are inserted at a track pad width of 1.5 m in bore **B**.
- ▶ Insert spring retainer **15**.
- ▶ Pin the fastening equipment on the crawler carrier and guide over the guard plates **14**.
- ▶ Lift the crawler center section and cross carriers with the support cylinders to at least 0.40 m and align horizontally.



B102673

Installing the crawler carrier with the auxiliary crane



WARNING

The guard plates are not installed!

If the crawler carriers are lifted without the guard plates, then the fastening equipment can be damaged or rip off! Personnel can be severely injured or killed!

- ▶ It is prohibited for anyone to remain under the crawler carrier as well as within the complete danger zone during assembly and disassembly!
-

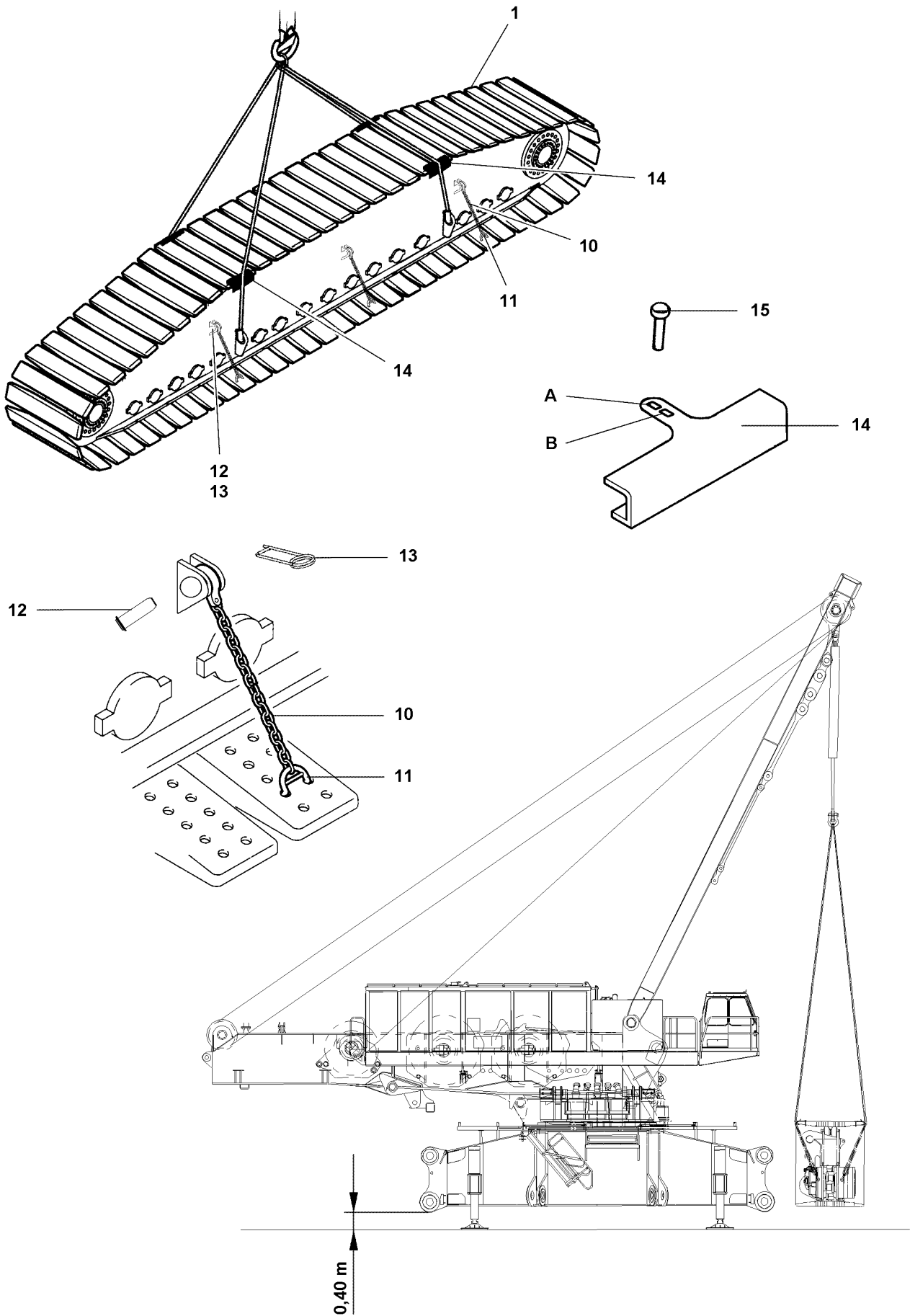
Make sure that the following prerequisites are met:

- The support cylinders are raised by at least 0.40 m and the crane is horizontally aligned.
- The track pads are secured with chains to prevent them from hanging down.
- The guard plates for the fastening equipment are installed on the upper track pads.



Note

- ▶ Note the identification on the crawler carrier and the cross carrier.
-
- ▶ Hang the first crawler carrier **1** onto the auxiliary crane and swing in to the pin points on the cross carrier **2** and attach.
 - ▶ Pin the crawler carrier **1** on the cross carrier **2** “on top”: Insert the pins **16** with the hydraulic pin pulling device and secure with retaining pins **17**.
 - ▶ Secure the retaining pins **17** with spring retainers **18**.
 - ▶ Fasten the second crawler carrier **1** onto the auxiliary crane and swing in to the pin points on the cross carrier **2** and attach.
 - ▶ Pin the crawler carrier **1** on the cross carrier **2** “on the bottom”: Insert the pins **16** with the hydraulic pin pulling device and secure with retaining pins **17**.
 - ▶ Secure the retaining pins **17** with spring retainers **18**.
 - ▶ Retract the support cylinders fully and set the crawler carrier **1** down on the ground.
 - ▶ Remove the fastening equipment and guard plates **14**.
 - ▶ Unpin the chains **10** and disengage the bracket **11** on the track pads.



B112753

3.3.2 Installing the crawler carrier with the SA-frame

Make sure that the following prerequisites are met:

- The cross carriers are installed.
- The crawler center section and the cross carriers are horizontally aligned.
- The turntable is installed.

**Note**

- ▶ Install the turntable, see Crane operating instructions, chapter 3.02!
-

Preparing for the installation of the crawler carriers with SA-frame

**WARNING**

The crane can topple over!

When turning the turntable with installed counterweight on the turntable, the crane can topple over!

Personnel can be severely injured or killed!

- ▶ Make sure that the counterweight on the turntable has been removed!
-

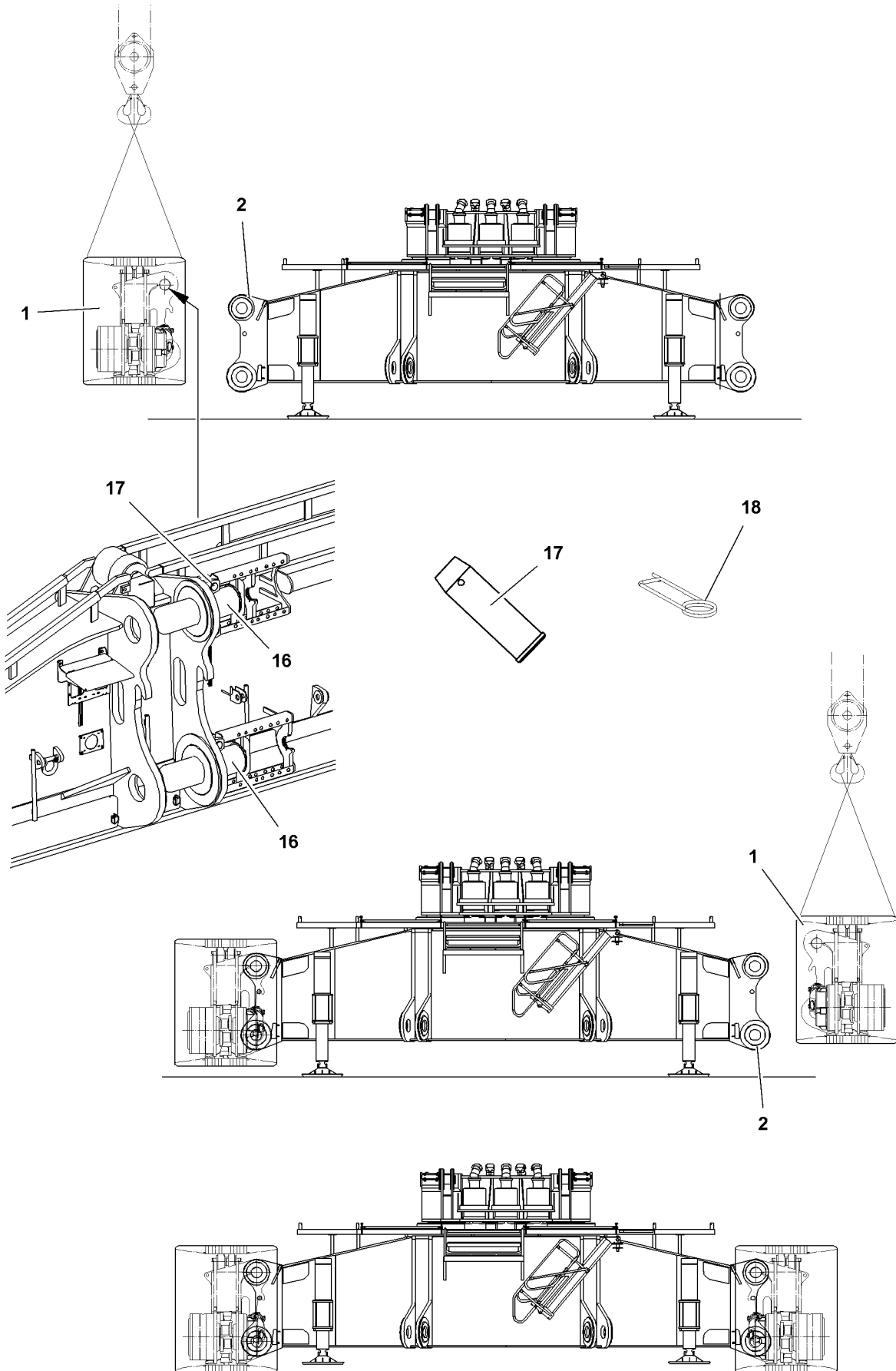
- ▶ Turn the turntable in lengthwise direction to the cross carriers.
 - ▶ Set the assembly operating mode on the LICCON computer system according to the load chart.
 - ▶ Set the SA-frame up and lower it forward above the crawler carriers to be lifted.
-

**Note**

- ▶ To set up the SA-frame, see Crane operating instructions, chapter 5.02!

- ▶ The maximum forward radius of the SA-frame is 9 m!
-

- ▶ Move the support cylinder out until the crawler center section and the cross carriers are raised horizontally by at least 0.40 m evenly above the ground.
- ▶ Attach the fastening equipment on the crawler carrier.
- ▶ Carry out the instructions, see section “Preparing for installation of the crawler carrier with the auxiliary crane”.



B102673

Installing the crawler carrier with the SA-frame

Make sure that the following prerequisites are met:

- The support cylinders are raised by at least 0.40 m and the crane is horizontally aligned.
- The track pads are secured with chains to prevent them from hanging down.
- The guard plates for the fastening equipment are installed on the upper track pads.



WARNING

The guard plates are not installed!

If the crawler carriers are lifted without the guard plates, then the fastening equipment can be damaged or rip off! Personnel can be severely injured or killed!

- ▶ It is prohibited for anyone to remain under the crawler carrier as well as within the complete danger zone during assembly and disassembly!



Note

- ▶ Note the identification on the crawler carrier and the cross carrier.
- ▶ Fasten the first crawler carrier **1** on the assembly cylinder and swing it in to the pin points on the cross carrier **2** and attach.
- ▶ Pin the first crawler carrier **1** on the cross carrier **2** “on top”: Insert the pins **16** with the hydraulic pin pulling device and secure with retaining pins **17**.
- ▶ Secure the retaining pins **17** with spring retainers **18**.
- ▶ Turn the turntable by 180°.
- ▶ Hang the second crawler carrier **1** on the auxiliary crane and swing it in to the pin points on the cross carrier **2** and attach.
- ▶ Pin the second crawler carrier **1** on the cross carrier **2** “on the bottom”: Insert the pins **16** with the hydraulic pin pulling device and secure with retaining pins **17**.
- ▶ Secure the retaining pins **17** with spring retainers **18**.
- ▶ Retract the support cylinders fully and set the crawler carrier **1** down on the ground.
- ▶ Remove the fastening equipment and guard plates **14**.
- ▶ Unpin the chains **10** and disengage the bracket **11** on the track pads.

B195219

3.3.3 Establish the electrical connections to the crawler carriers

**Note**

- ▶ To establish the electrical connections on the crawler carriers, see Electric wiring diagram!

Make sure that the following prerequisite is met:

- Both crawler carriers are properly installed, pinned and secured.
- ▶ Establish the electrical connections.

3.3.4 Establishing the hydraulic connections to the crawler carriers

When connecting and releasing hydraulic lines with quick-release couplings, make sure that the uncoupling procedure is carried out correctly.

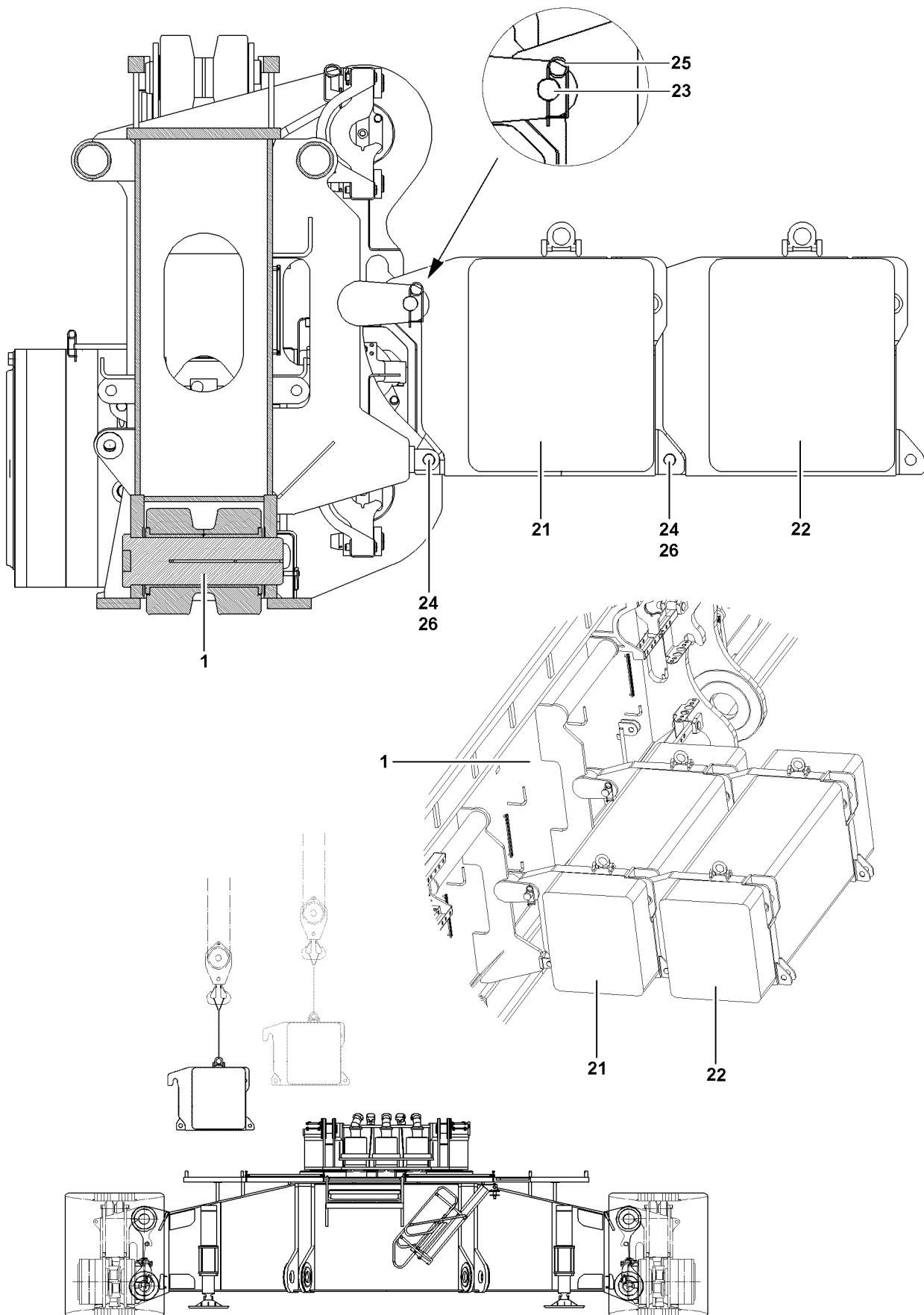
**WARNING**

Pressure in the hydraulic lines!

If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure!

Personnel can be severely injured or killed!

- ▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time!
- ▶ Connect the coupling components (sleeve and connector) and screw together with the hand-tightened nut.
- ▶ Tighten the hydraulic couplings by hand. Rotate the hand-tightened nut until it reaches a tangible, fixed stop position.
- ▶ Establish the hydraulic connections.



B112752

3.4 Installing the auxiliary weights

**WARNING**

Tipping of crawler carrier!

- ▶ If the auxiliary weights are installed on the freestanding crawler carrier, then the crawler carrier tips over! Personnel can be severely injured or killed!
- ▶ Install the auxiliary weights when the crawler carriers are pinned and secured on the cross carriers!

**WARNING**

Lifting of both auxiliary weights!

If both auxiliary weights are lifted together with the auxiliary crane, then the components can be overloaded! The auxiliary weights can fall down!

The crane can be damaged!

Personnel can be severely injured or killed!

- ▶ Install the auxiliary weights individually!

**WARNING**

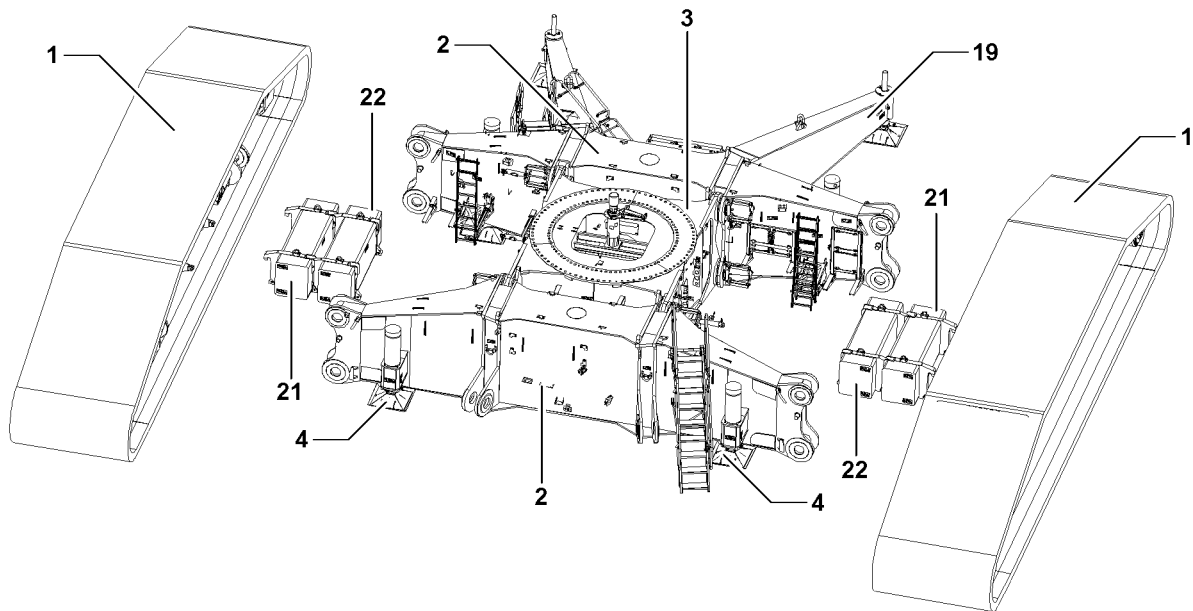
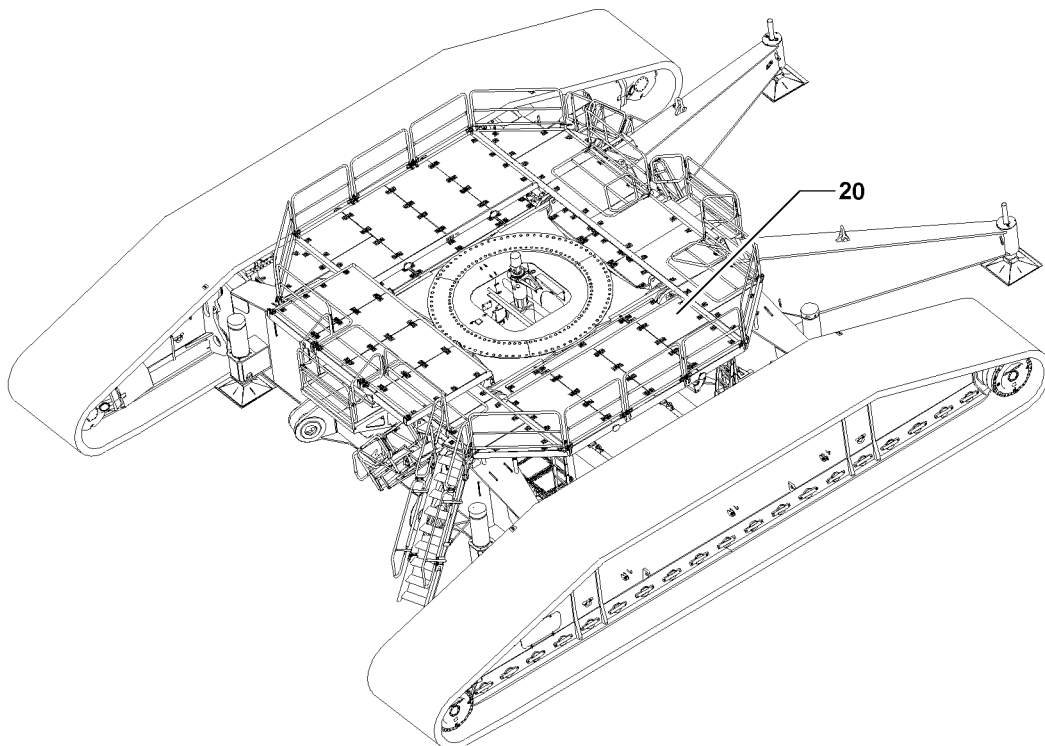
Staying between the cross carriers!

When lifting the auxiliary weights from the installation area between the cross carriers, limbs can be crushed or severed! Personnel can be severely injured or killed!

- ▶ It is prohibited for anyone to remain between the cross carriers when installing or removing the auxiliary weights!

Make sure that the following prerequisite is met:

- The crawler carriers are pinned on the cross carriers.
- ▶ Pin the auxiliary weight “on top” on the crawler carrier: Insert the pin **23** and secure with spring retainer **25**.
- ▶ Attach the auxiliary weight **21** on the auxiliary crane.
- ▶ Swing the first auxiliary weight with the auxiliary crane to the crawler carrier.
- ▶ Hang the auxiliary weight **21** on the pin **2**.
- ▶ Pin the auxiliary weight “on the bottom” on the crawler carrier: Insert the pin **24** and secure with linch pin **26**.
- ▶ Hang the second auxiliary weight on the first auxiliary weight and pin “on the bottom”: Insert the pin **24** and secure with linch pin **26**.
- ▶ Install the auxiliary weights on the second crawler carrier.
- ▶ Install the platforms, see Crane operating instructions, chapter 2.06.

1**2**

B112751

4 Removing the crawler travel gear



WARNING

Risk of falling!

During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling! If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!

- ▶ The assembly personnel must always move carefully and anticipatory on the crane, the crane components or lattice sections!
- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids!
- ▶ If fall arrest equipment is available, then it must be used!
- ▶ If aids are not available and work cannot be carried out from the ground, then the assembly personnel must secure themselves with the permissible fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04!
- ▶ The fall arrest system must be attached on the fastening and hook points as well as on the retaining ropes!
- ▶ Only step on the aids, ladders and catwalks with clean shoes!
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice!



WARNING

Danger of impact / crushing!

When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth!

When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing!

Personnel can be caught and severely injured or killed!

- ▶ Make sure that personnel cannot be caught by components!
- ▶ When working in danger zones: Use aids to protect limbs!
- ▶ Guide components with suitable aids to minimize oscillation!

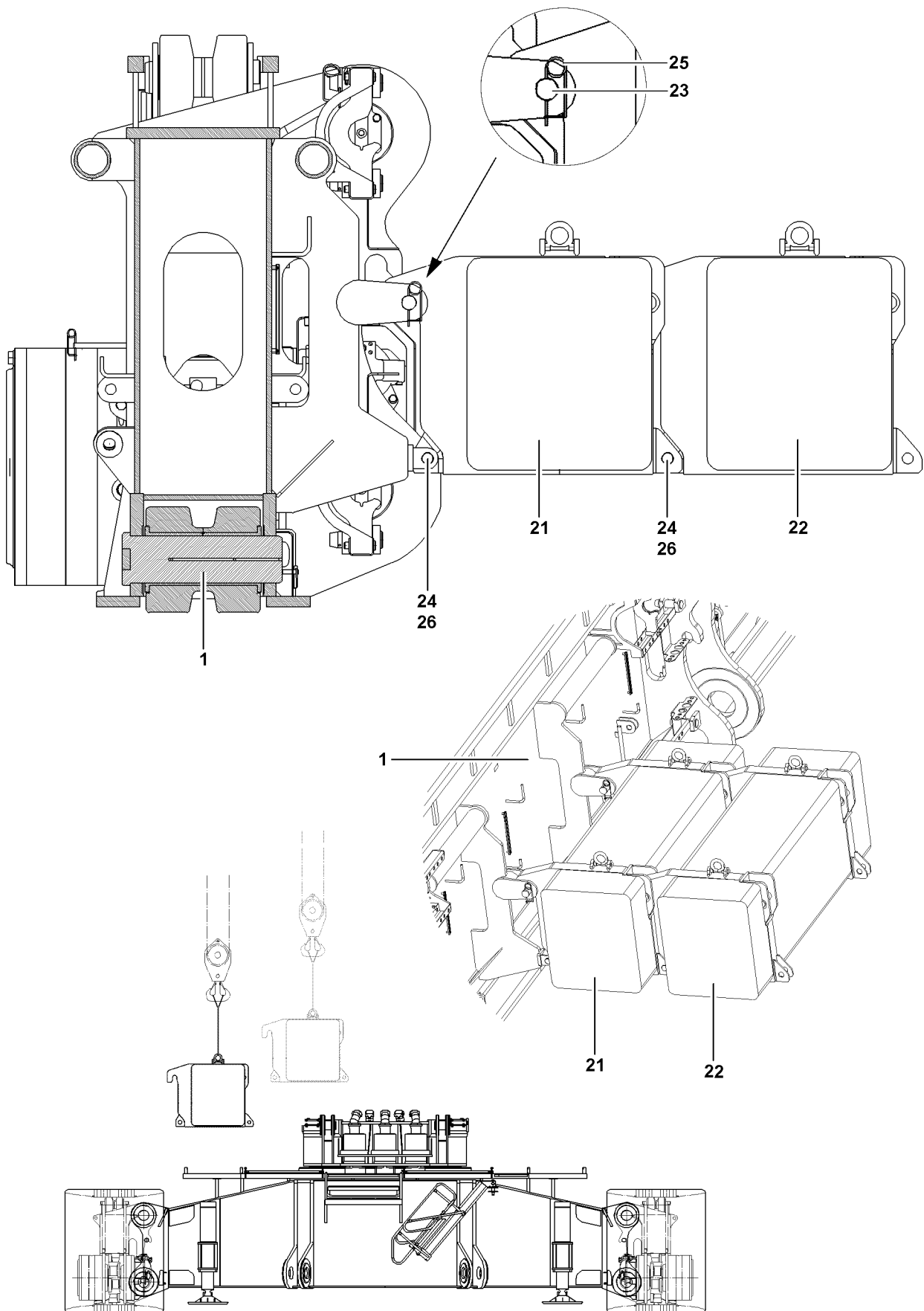


Note

- ▶ Remove the platforms, see Crane operating instructions, chapter 2.06!

Make sure that the following prerequisites are met:

- The platforms **20** on the crawler travel gear are removed.
- The placement location must be level and have adequate load bearing capacity.
- An auxiliary crane is available.



B112752

4.1 Removing the auxiliary weights

Make sure that the following prerequisite is met:

- The platforms on the crawler travel gear are removed.



WARNING

Lifting of both auxiliary weights!

If both auxiliary weights are lifted together with the auxiliary crane, then the components can be overloaded! The auxiliary weights can fall down!

The crane can be damaged!

Personnel can be severely injured or killed!

- ▶ Remove the auxiliary weights individually!



WARNING

Staying between the cross carriers!

When lifting the auxiliary weights from the installation area between the cross carriers, limbs can be crushed or severed! Personnel can be severely injured or killed!

- ▶ It is prohibited for anyone to remain between the cross carriers when installing or removing the auxiliary weights!

The auxiliary weight **22** is hung and pinned on the auxiliary weight **21**.

- ▶ Attach the auxiliary weight **22** on the auxiliary crane.
- ▶ Tension the fastening equipment until the auxiliary weight **22** is secured with the auxiliary crane.
- ▶ Unpin the auxiliary weight **22** “on the bottom”: Release and unpin the pin **24**.
- ▶ Lift the auxiliary weight **22** with the auxiliary crane and disengage on the auxiliary weight **21**.
- ▶ Remove the auxiliary weight **22**.

The auxiliary weight **21** is hung and pinned on the crawler carrier **1**.

- ▶ Attach the auxiliary weight **21** on the auxiliary crane.
- ▶ Tension the fastening equipment until the auxiliary weight **21** is secured with the auxiliary crane.
- ▶ Unpin the auxiliary weight **21** “on the bottom”: Release and unpin the pin **24**.
- ▶ Lift the auxiliary weight **21** with the auxiliary crane and disengage on the crawler carrier **1**.
- ▶ Remove the auxiliary weight **21**.
- ▶ Remove the auxiliary weights on the second crawler carrier.

4.2 Disconnecting the electrical connections on the crawler carriers



Note

▶ To disconnect the electrical connections on the crawler carriers, see Electric wiring diagram!

▶ Establish the electrical connections.

4.3 Disconnecting the hydraulic connections on the crawler carriers

When connecting and releasing hydraulic lines with quick-release couplings, make sure that the uncoupling procedure is carried out correctly.



WARNING

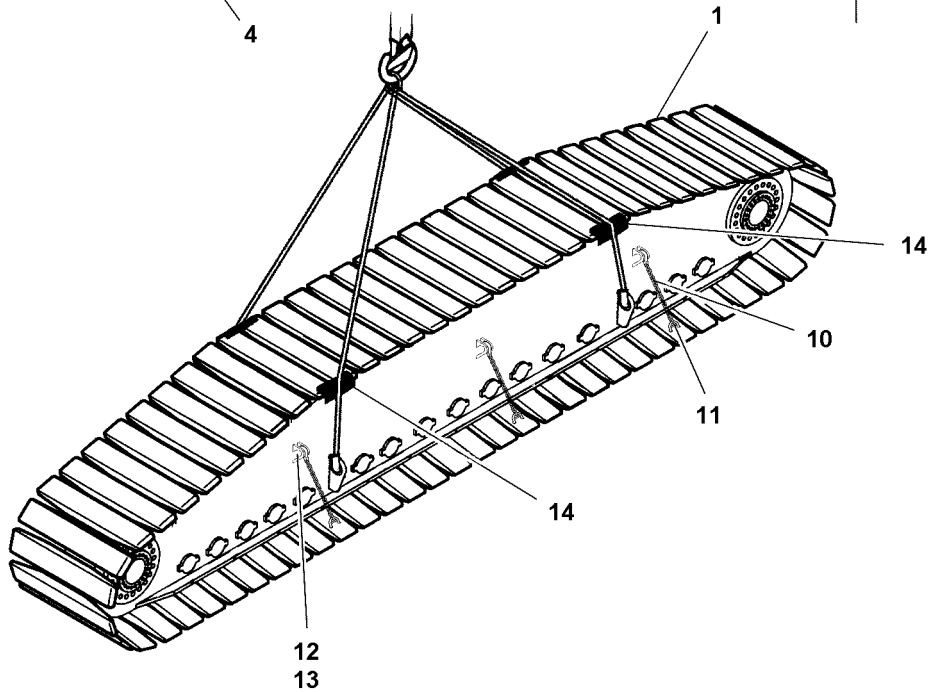
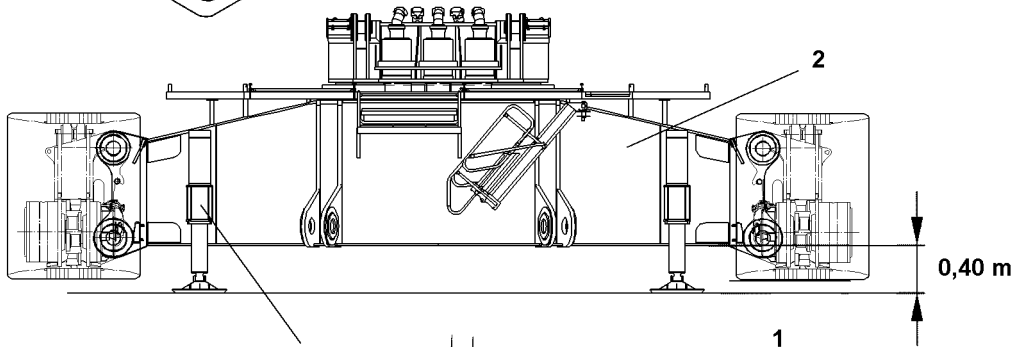
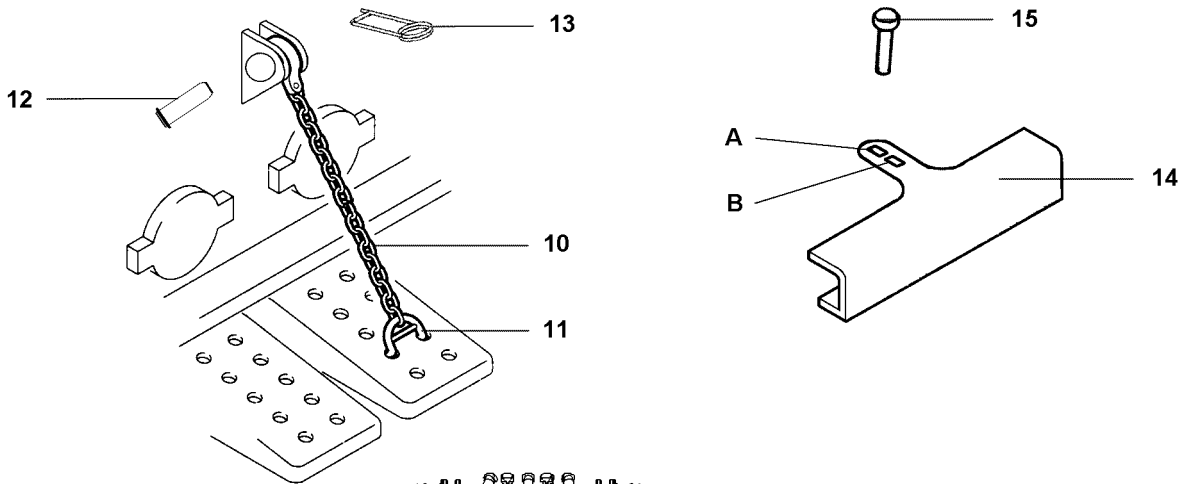
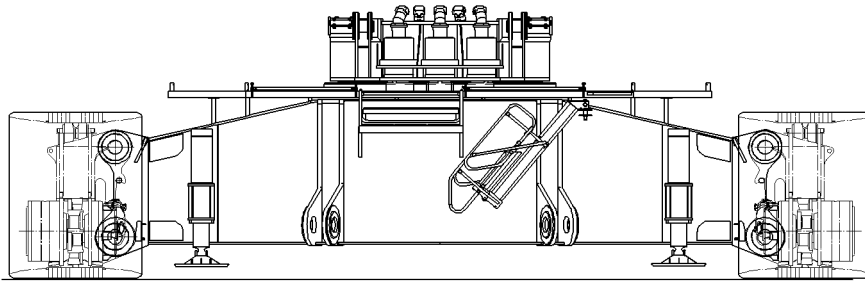
Pressure in the hydraulic lines!

If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure!

Personnel can be severely injured or killed!

▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time!

- ▶ Install the coupling components (sleeve and connector) with the hand-tightened nut.
- ▶ Disconnect the hydraulic connections.
- ▶ Install dust caps on the quick-release couplings.



B102766

4.4 Disassembling the crawler carrier

The crawler carriers can be removed two ways:

- The crawler carriers are removed with the auxiliary crane.
- The crawler carriers are removed with the SA-frame.



WARNING

Tipping of crawler carrier!

If the auxiliary weights are installed when removing the crawler carriers, the crawler carrier tips over! Personnel can be severely injured or killed!

- ▶ Remove the auxiliary weights before removing the crawler carriers!



WARNING

Improper support!

If the crawler center section is not properly supported from below, it can sink into the ground and severely injure personnel!

- ▶ The supporting base must be able to safely take on the weight of the crawler center section, the turntable and the crawler carrier!
- ▶ The support must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs, see Crane operating instructions, chapter 2.04!

Make sure that the following prerequisites are met:

- The auxiliary weights have been removed.
- Suitable material must be available for the supporting base of the crawler center section.

4.4.1 Removing the crawler carrier with the auxiliary crane

Make sure that the following prerequisites are met:

- The turntable has been removed.
- The crawler center section and the cross carriers are horizontally aligned.

Preparing for the removal of the crawler carriers with the auxiliary crane



Note

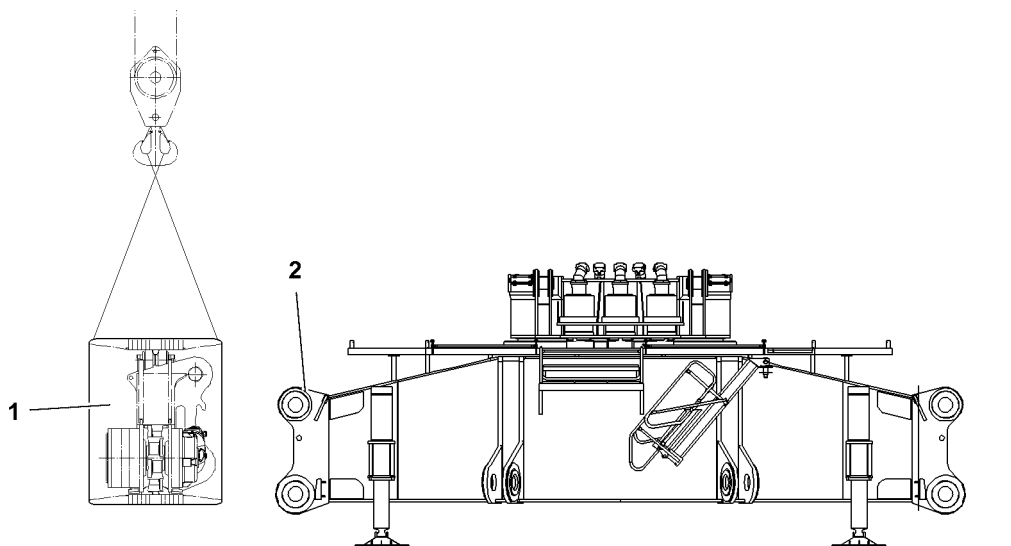
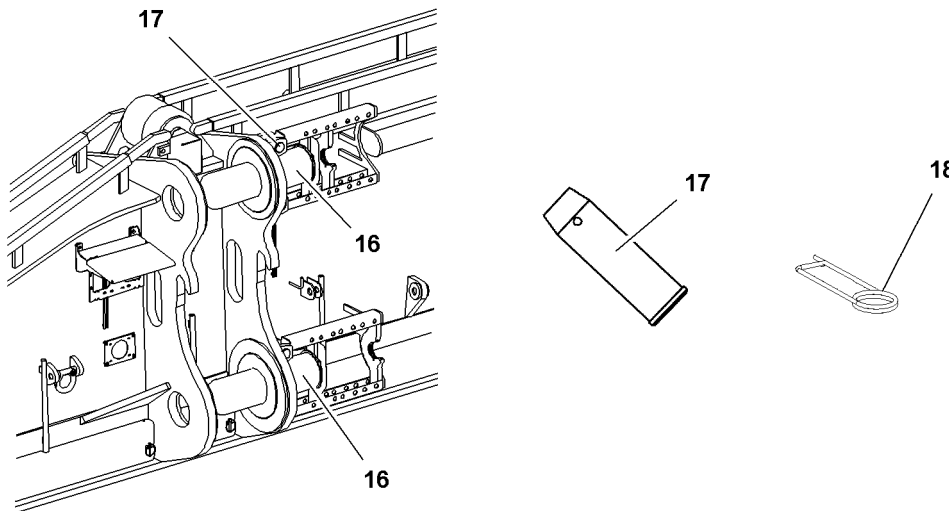
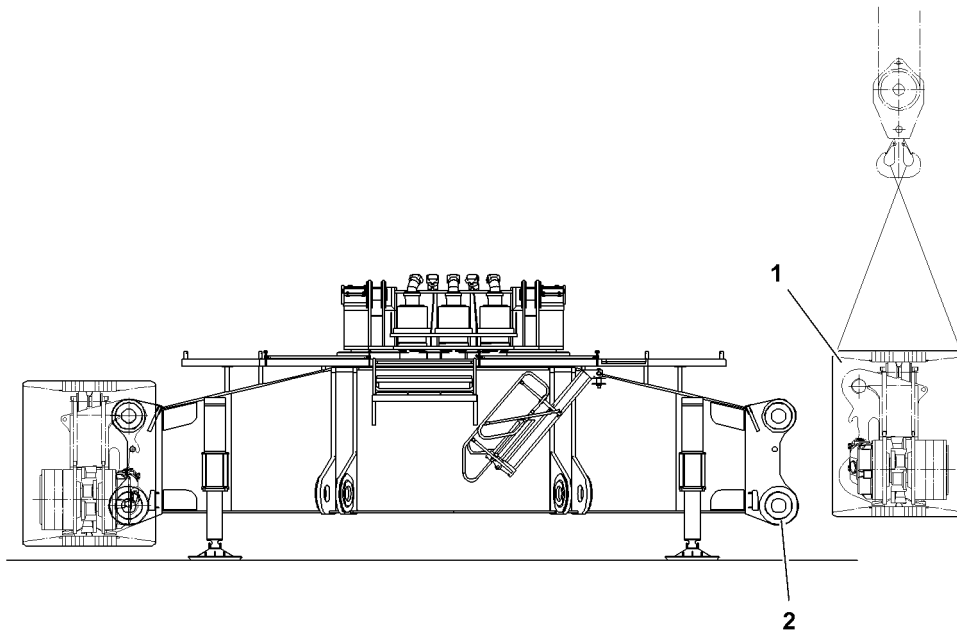
- ▶ Three chains must be hooked for each crawler carrier side!

- ▶ Secure the track pads with chains **10** to prevent them from hanging down. Hang the chain **10** with bracket **11** on 3 lower track pads on both sides.
- ▶ Pin the other end of the chain on the crawler carrier: Insert the pin **12** and secure with spring retainer **13**.



Note

- ▶ The retaining pins **15** are inserted at a track pad width of 2.0 m in bore **A**.
- ▶ The retaining pins **15** are inserted at a track pad width of 1.5 m in bore **B**.
- ▶ Fasten the guard plate **14** on the upper track pads: Insert spring retainer **15**.
- ▶ Pin the fastening equipment on the crawler carrier and guide over the guard plates **14**.
- ▶ Support the support plates properly from underneath.
- ▶ Connect the hydraulic assembly support **4** on the hydraulic aggregate of the pin pulling device - quick couplings.
- ▶ Lift the crawler center section and cross carriers with the support cylinders to at least 0.40 m and align horizontally.



B102769

Removing the crawler carrier with the auxiliary crane



WARNING

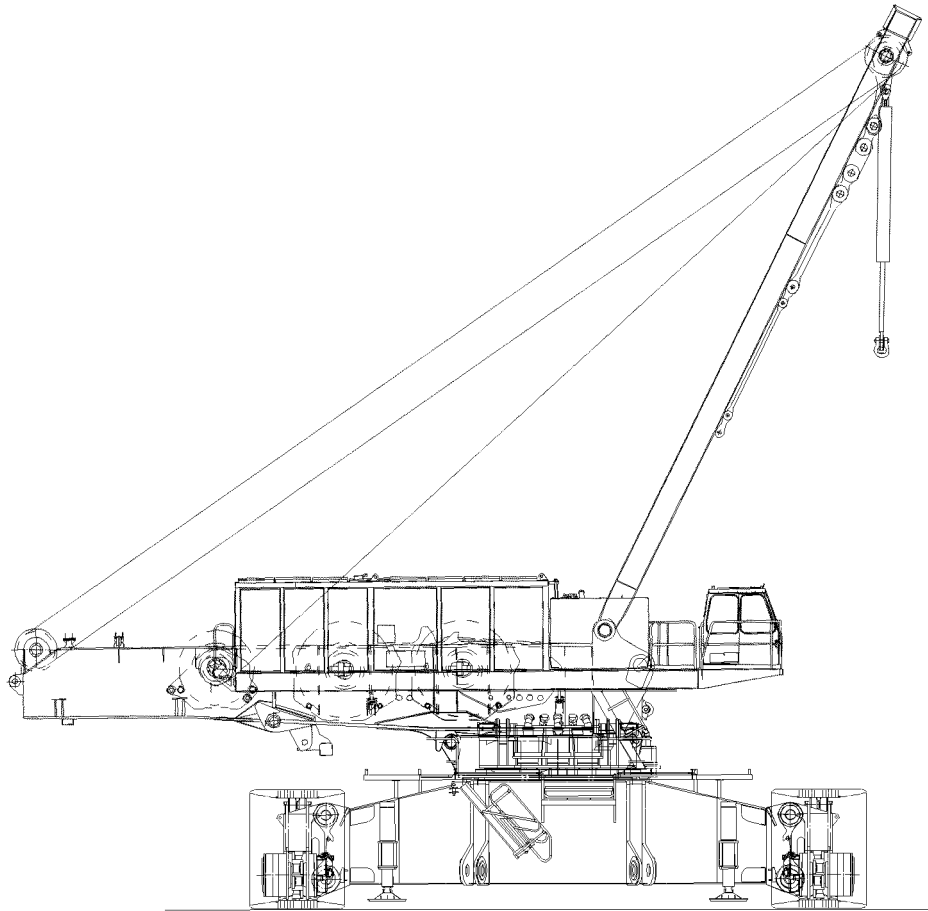
The guard plates are not installed!

If the crawler carriers are lifted without the guard plates, then the fastening equipment can be damaged or rip off! Personnel can be severely injured or killed!

- ▶ It is prohibited for anyone to remain under the crawler carrier as well as within the complete danger zone during assembly and disassembly!
-

Make sure that the following prerequisites are met:

- The crawler center section and the cross carriers are horizontally aligned.
- The crawler center section and cross carriers are lifted at least 0.40 m above the ground.
- ▶ Attach the **first** crawler carrier **1** on the auxiliary crane and tension with the fastening equipment.
- ▶ Release the pin **16** “on the bottom”: Remove the spring retainer **18** and unpin the retaining pin **17**.
- ▶ Unpin the crawler carrier **1** on the cross carrier **2** “on the bottom”: Unpin the pin **16** with the hydraulic pin pulling device.
- ▶ Release the pin **16** “on top”: Remove the spring retainer **18** and unpin the retaining pin **17**.
- ▶ Unpin the crawler carrier **1** on the cross carrier **2** “on top”: Unpin the pin **16** with the hydraulic pin pulling device.
- ▶ Carefully swing out the crawler carrier **1** on the pin points on the cross carrier **2**.
- ▶ Set the crawler carrier **1** down on the ground.
- ▶ Remove the fastening equipment.
- ▶ Attach the **second** crawler carrier **1** on the auxiliary crane and tension with the fastening equipment.
- ▶ Unpin the second crawler carrier.
- ▶ Carefully swing out the crawler carrier **1** on the pin points on the cross carrier **2**.
- ▶ Set the crawler carrier **1** down on the ground.
- ▶ Remove the fastening equipment.



B102860

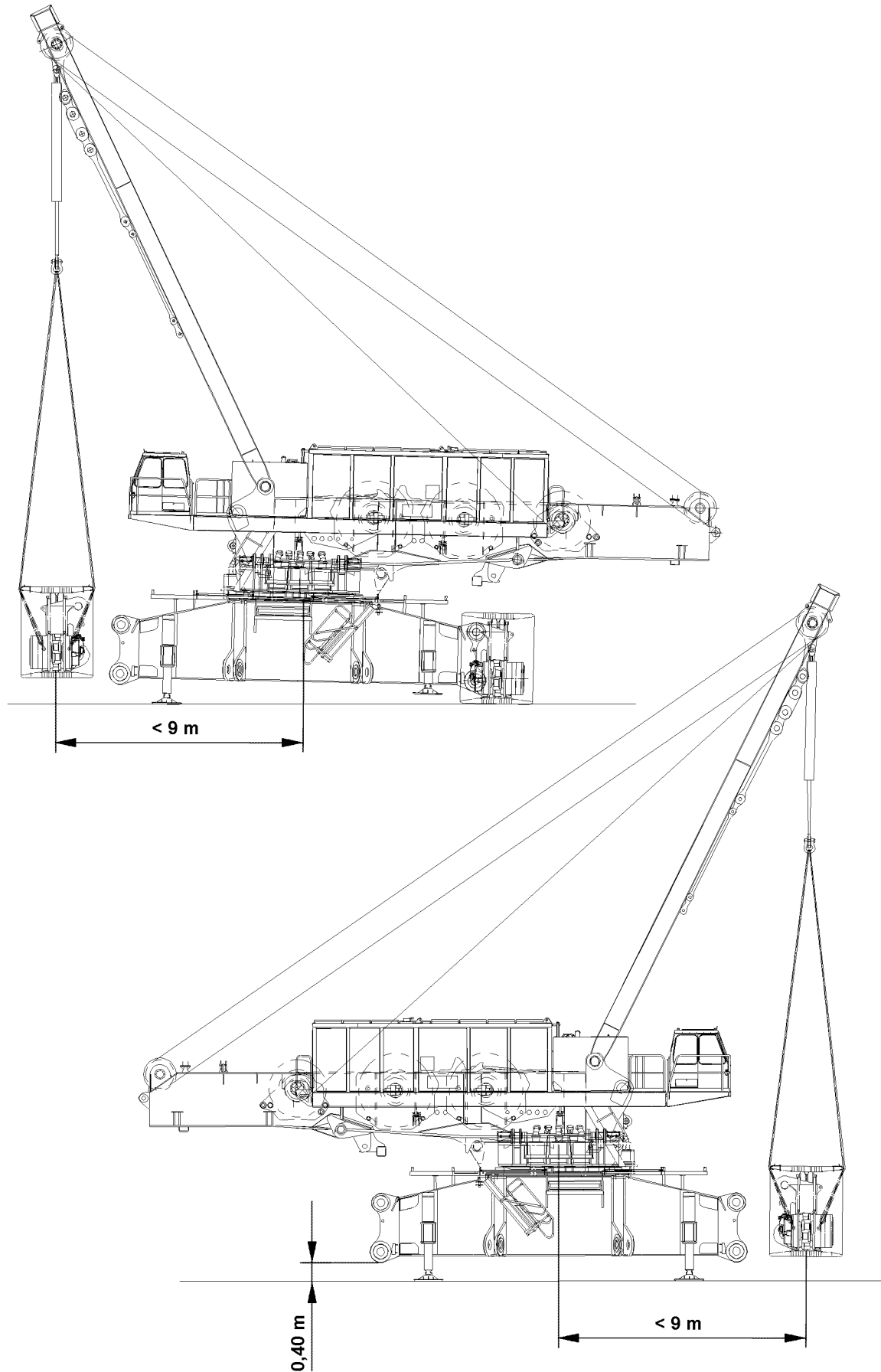
4.4.2 Removing the crawler carriers with the SA-frame

Make sure that the following prerequisites are met:

- The turntable is installed.
- The boom and the derrick are removed on the turntable.
- The counterweight on the turntable has been removed.

**Note**

- ▶ Install the turntable, see Crane operating instructions, chapter 3.02!
-



B102861

Preparing for the removal of the crawler carriers



WARNING

The crane can topple over!

When turning the turntable with installed counterweight on the turntable, the crane can topple over! Personnel can be severely injured or killed!

▶ Make sure that the counterweight on the turntable has been removed!

▶ Turn the turntable in lengthwise direction to the cross carriers.

▶ Extend the support cylinder on the side where the crawler carrier is being removed to the point where the crawler carrier can be removed without interference.

▶ Set the assembly operating mode on the LICCON computer system according to the load chart.



Note

▶ To set up the SA-frame, see Crane operating instructions, chapter 5.02!

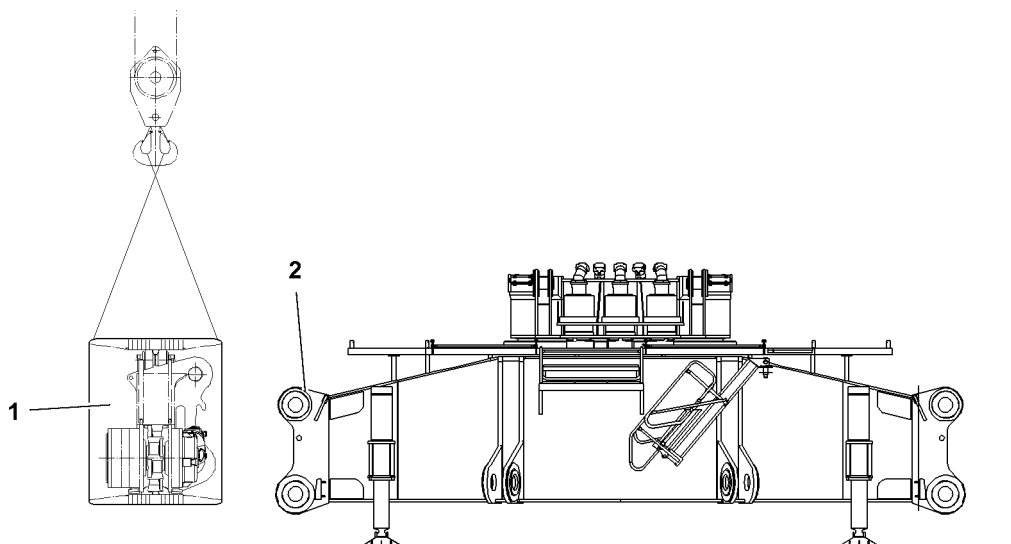
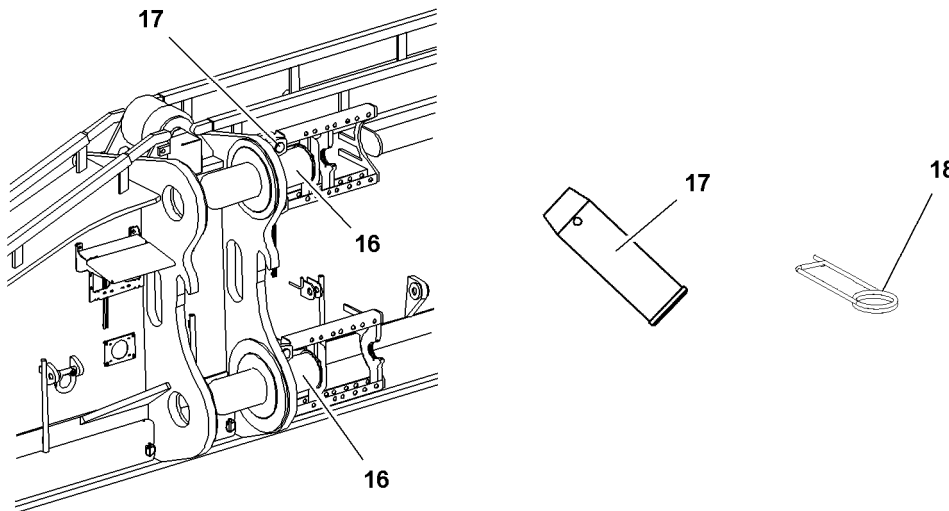
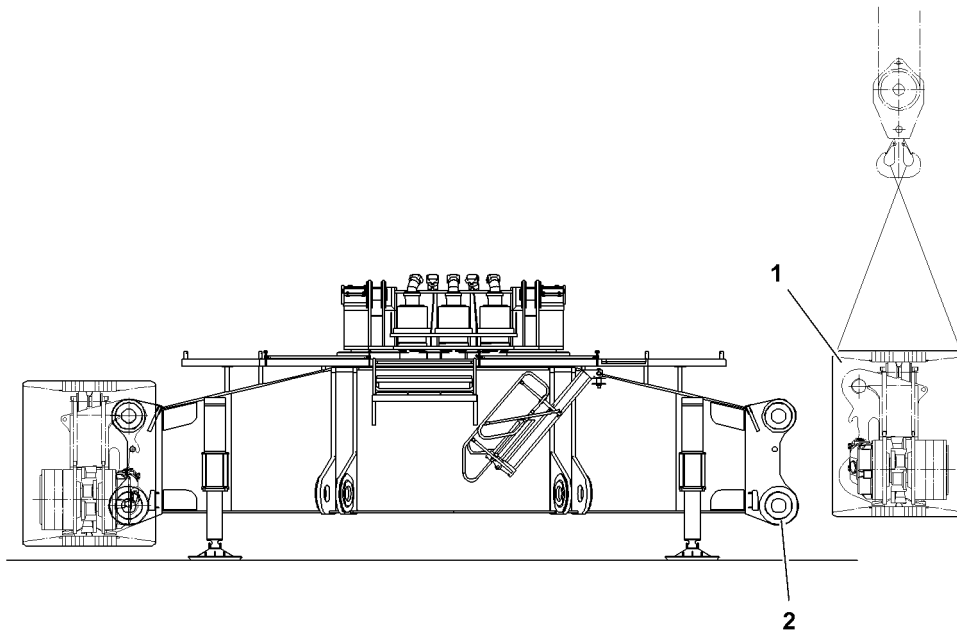
▶ The maximum forward radius of the SA-frame is 9 m!

▶ Set the SA-frame up and lower it forward above the crawler carriers to be lifted.

▶ Move the assembly cylinder out.

▶ Attach and tension the fastening equipment on the crawler carrier.

▶ Carry out the instructions, see section "Preparing for removal of the crawler carriers with the auxiliary crane".



B102769

Removing the crawler carriers with the SA-frame



WARNING

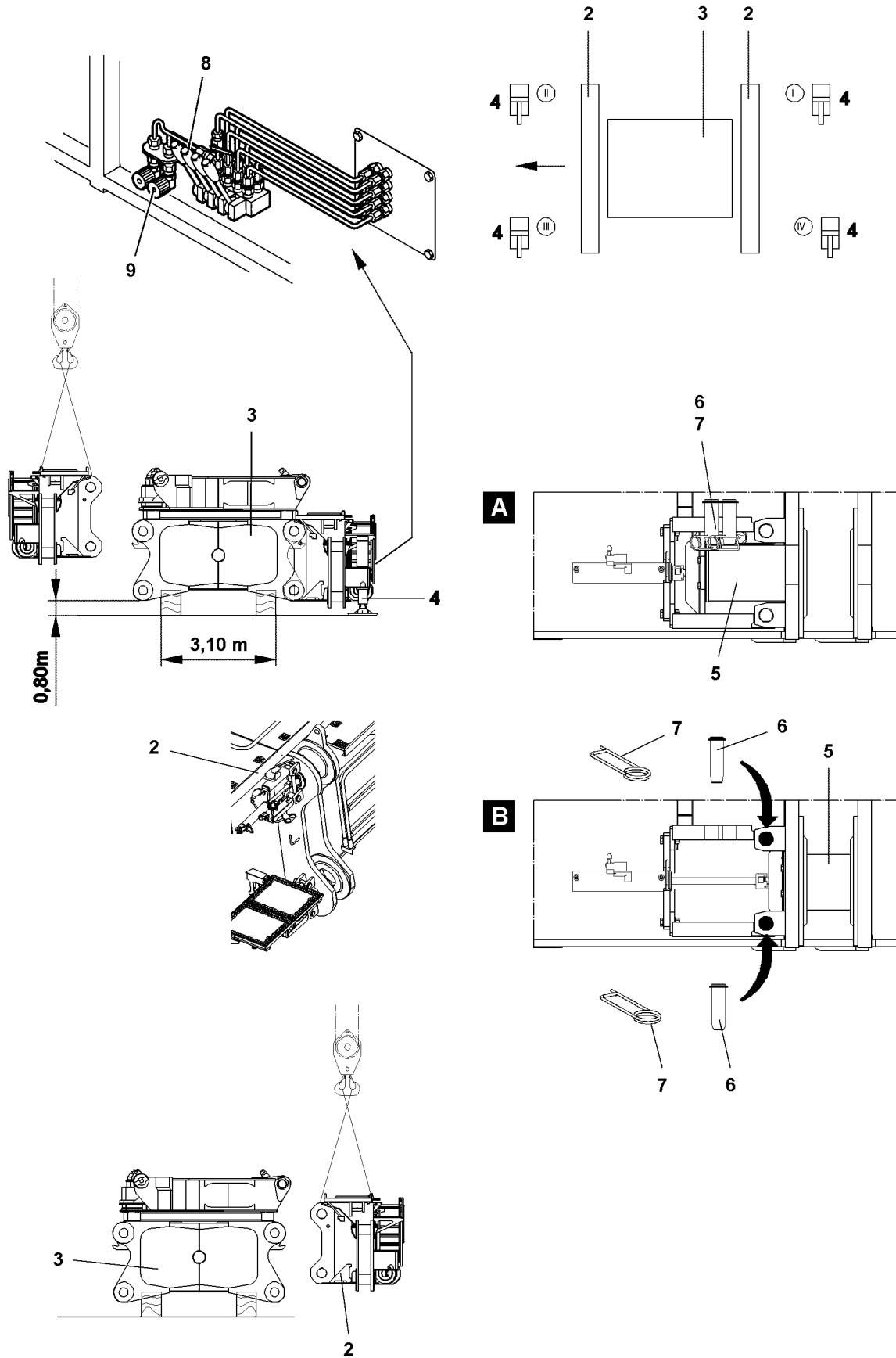
The guard plates are not installed!

If the crawler carriers are lifted without the guard plates, then the fastening equipment can be damaged or rip off! Personnel can be severely injured or killed!

- ▶ It is prohibited for anyone to remain under the crawler carrier as well as within the complete danger zone during assembly and disassembly!
-

Make sure that the following prerequisite is met:

- The crawler center section and the cross carriers are horizontally aligned.
- The crawler center section and cross carriers are lifted at least 0.40 m above the ground.
- ▶ Attach the **first** crawler carrier **1** on the assembly cylinder and tension with the fastening equipment.
- ▶ Release the pin **16** “on the bottom”: Remove the spring retainer **18** and unpin the retaining pin **17**.
- ▶ Unpin the crawler carrier **1** on the cross carrier **2** “on the bottom”: Unpin the pin **16** with the hydraulic pin pulling device.
- ▶ Release the pin **16** “on top”: Remove the spring retainer **18** and unpin the retaining pin **17**.
- ▶ Unpin the crawler carrier **1** on the cross carrier **2** “on top”: Unpin the pin **16** with the hydraulic pin pulling device.
- ▶ Carefully swing out the crawler carrier **1** on the pin points on the cross carrier **2**.
- ▶ Set the crawler carrier **1** down on the ground.
- ▶ Remove the fastening equipment and move the assembly cylinder in.
- ▶ Turn the turntable by 180°.
- ▶ Move the support cylinder out on the side where the second crawler carrier is being removed to the point where the crawler carrier can be removed without interference.
- ▶ Attach the **second** crawler carrier **1** on the assembly cylinder and tension with the fastening equipment.
- ▶ Unpin the second crawler carrier.
- ▶ Carefully swing out the crawler carrier **1** on the pin points on the cross carrier **2**.
- ▶ Set the crawler carrier **1** down on the ground.
- ▶ Remove the fastening equipment and move the support cylinder in.
- ▶ Remove the turntable, see Crane operating instructions, chapter 3.02!



B104443

4.4.3 Supporting the crawler center section

Make sure that the following prerequisites are met:

- The crawler carriers are removed.
- The turntable has been removed.



Note

- ▶ Remove the turntable, see Crane operating instructions, chapter 3.02!
-



Note

- ▶ The foundation must be constructed in such a way that the cross carriers can be removed on the left and right without interference!
 - ▶ The support for the crawler center section must be built up to at least 0.80 m!
 - ▶ The distance between the support must be at least 3.10 m!
-
- ▶ Support the crawler center section **3** with hardwood timbers (or other suitable materials) from below.
 - ▶ Move the support cylinder in and set the crawler center section **3** on the support foundation.
-

4.4.4 Removing the cross carriers



Note

- ▶ First remove the cross carrier without installed hydraulic connections!
 - ▶ Move the support cylinder in only on the cross carrier without installed hydraulic connections. The opposite cross carrier must be supported with the assembly cylinders or be supported from below!
-

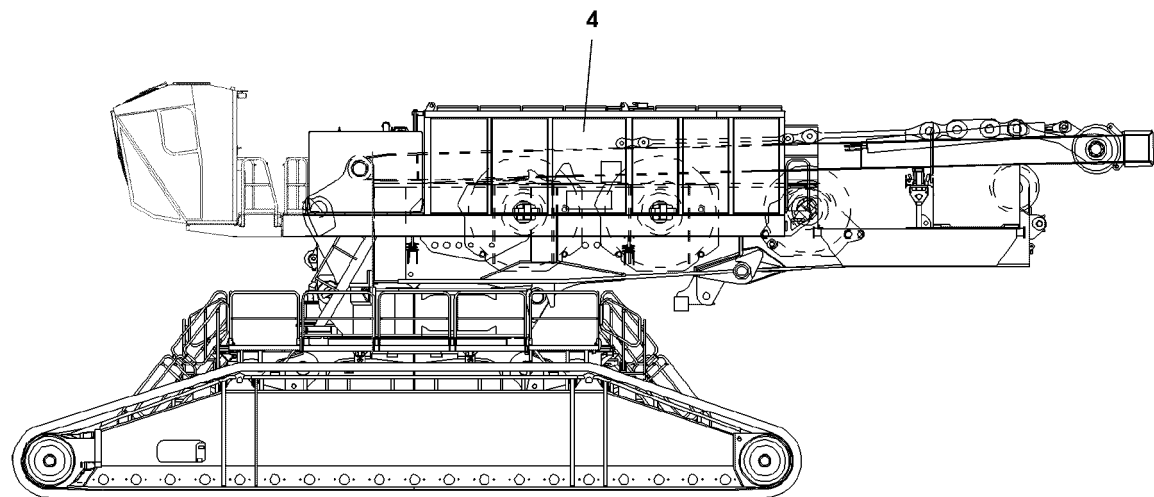
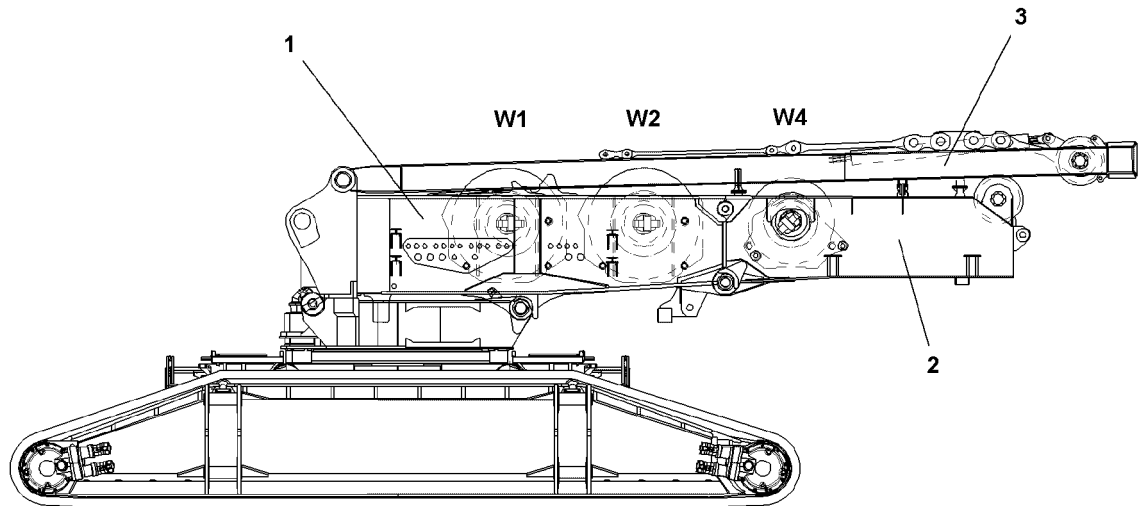


WARNING

Tipping of crawler travel gear!

Without support with the assembly cylinders the installed cross carrier can tip over! Personnel can be severely injured or killed!

- ▶ Support the cross carrier with the support cylinders or support it from below!
-
- ▶ Attach the **first** cross carrier **2** on the auxiliary crane and tension with the fastening equipment.
 - ▶ Release the pin **5** “on the bottom”: Remove the spring retainer **7** and unpin the retaining pin **6**.
 - ▶ Unpin the cross carrier **2** on the crawler center section **3** “on the bottom”: Unpin the pin **5** with the hydraulic pin pulling device.
 - ▶ Attach the **second** cross carrier **2** on the auxiliary crane and tension with the fastening equipment.
 - ▶ Release the pin **5** “on the bottom”: Remove the spring retainer **7** and unpin the retaining pin **6**.
 - ▶ Unpin the cross carrier **2** on the crawler center section **3** “on the bottom”: Unpin the pin **5** with the hydraulic pin pulling device.
 - ▶ Release the hydraulic connection of the pin pulling device to the assembly cylinders on the quick couplings **9**.
-

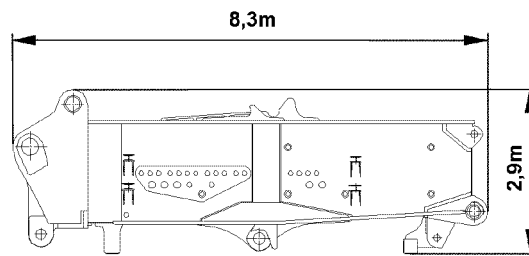
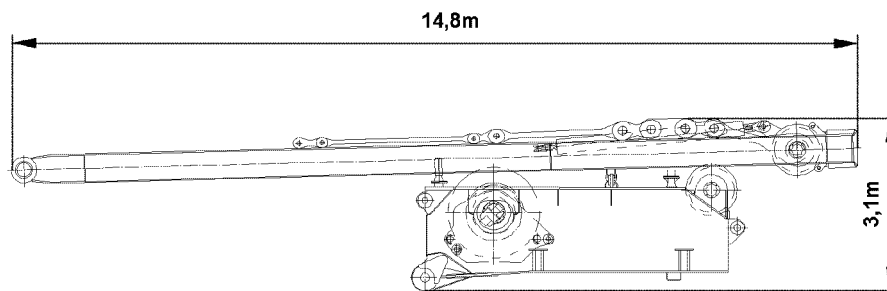
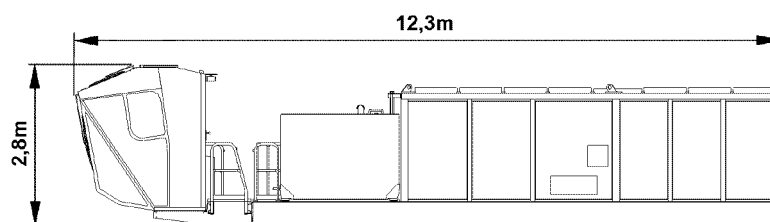
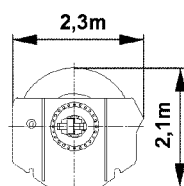
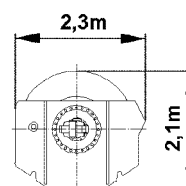


B102864

1 Component overview

1.1 Turntable

- 1 Turntable, front section
- 2 Turntable, rear section
- 3 SA-frame
- 4 Engine house
- W1** Winch 1
- W2** Winch 2
- W4** Winch 4

1**2****3****4****5**

2 Dimensions and weights

2.1 Turntable, front section

See figure 1

Weight **without** winch 1 and 2: 31 t

Width: 3.40 m

2.2 Turntable, rear section

See figure 2

Weight with winch 4 and SA-frame: 45 t

Width: 3.30 m

2.3 Engine house with catwalk and cab

See figure 3

Weight 17.6 t

Width: 2.50 m

2.4 Winch 1

See figure 4

Weight 23 t

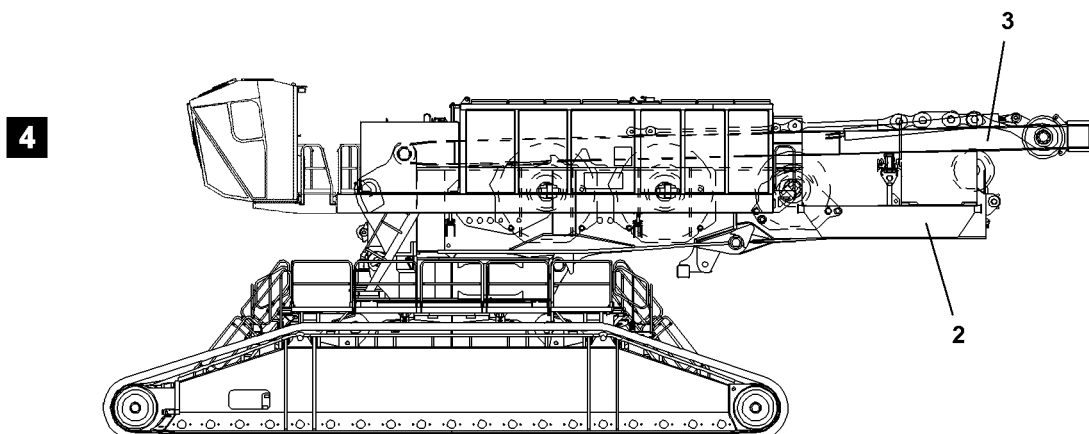
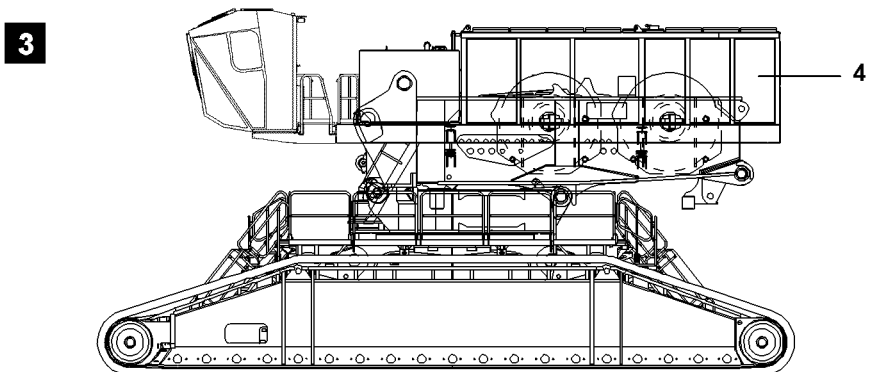
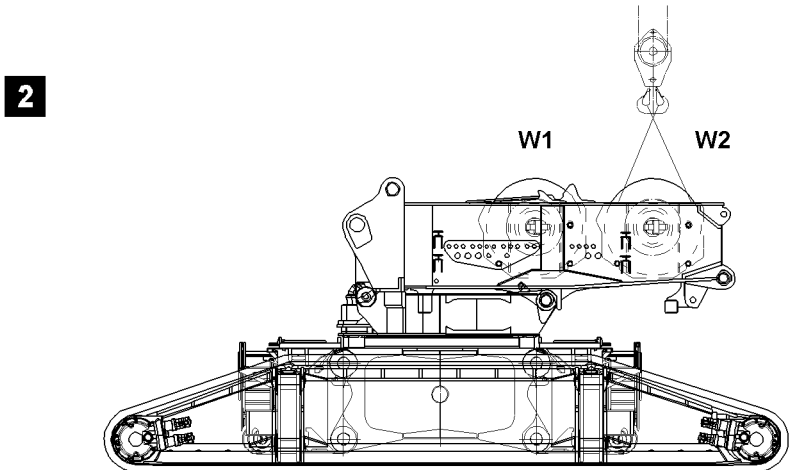
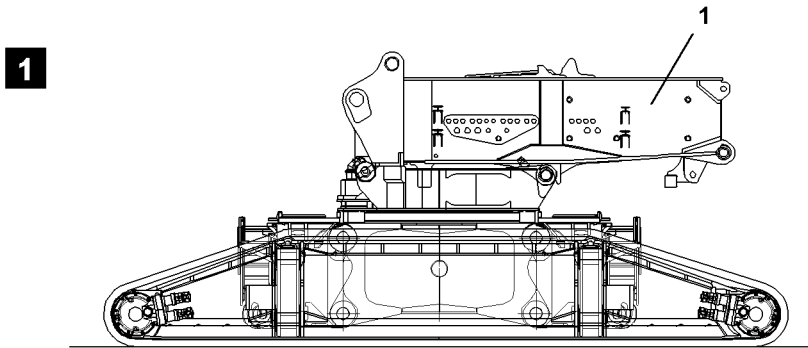
Width: 2.30 m

2.5 Winch 2

See figure 5

Weight 23 t

Width: 2.30 m



3 Assembly



DANGER

Risk of accident!

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 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!
- ▶ It is prohibited for anyone to remain within the complete danger zone during assembly and disassembly.

Ensure that the following preconditions are met:

- an auxiliary crane is available
- the placement location must be level and have adequate load-bearing capacity
- the pin bores are clean
- the connector pins are clean

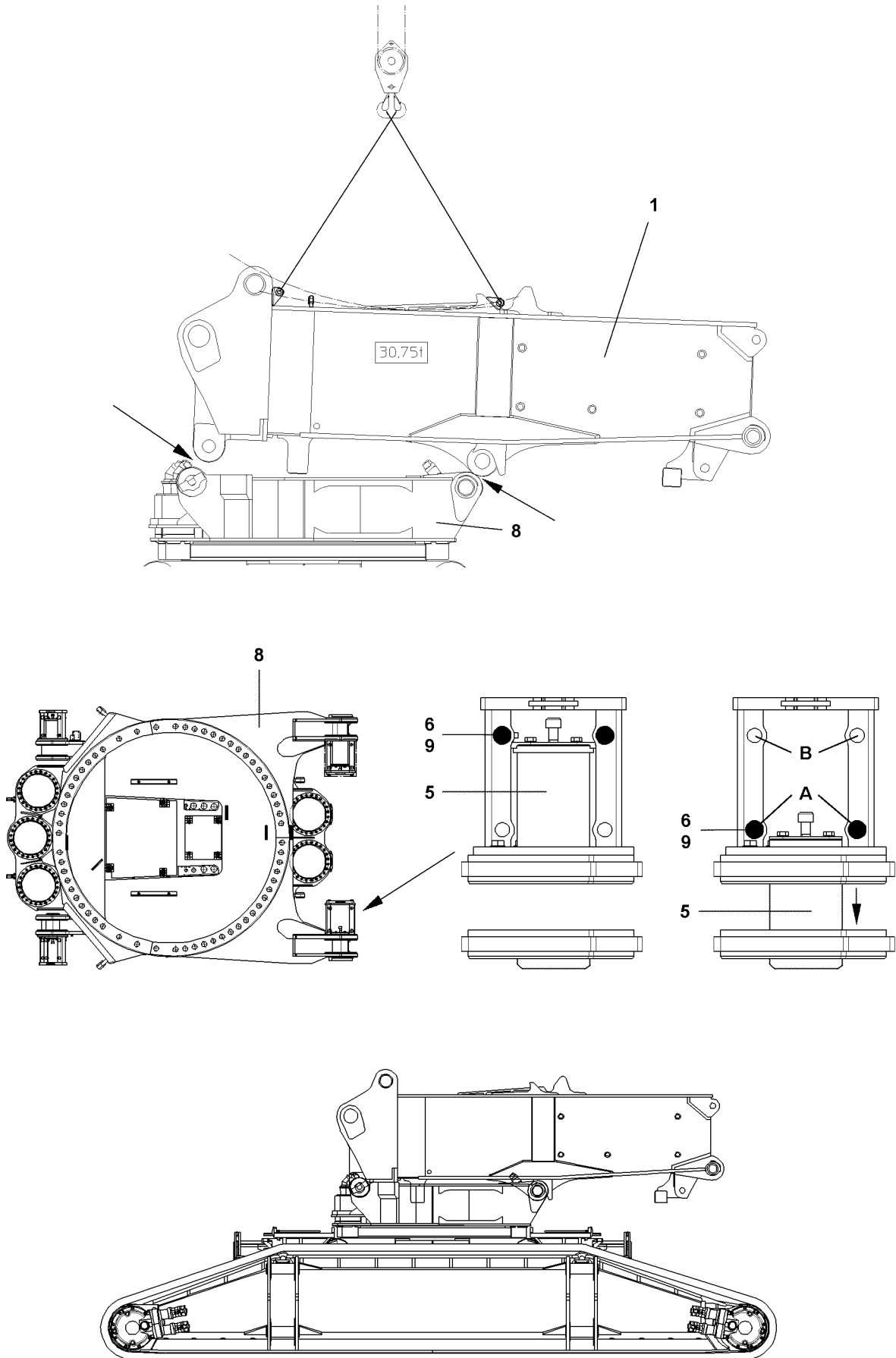
3.1 Short description of assembly procedure



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!

- ▶ **Fig. 1:** Install the turntable, front section **1**
- ▶ **Fig. 2:** Install winch 1 **W1** and winch 2 **W2**
- ▶ **Fig. 3:** Install the engine house **4**
- ▶ **Fig. 4:** Install the turntable rear section **2** and SA-frame **3**

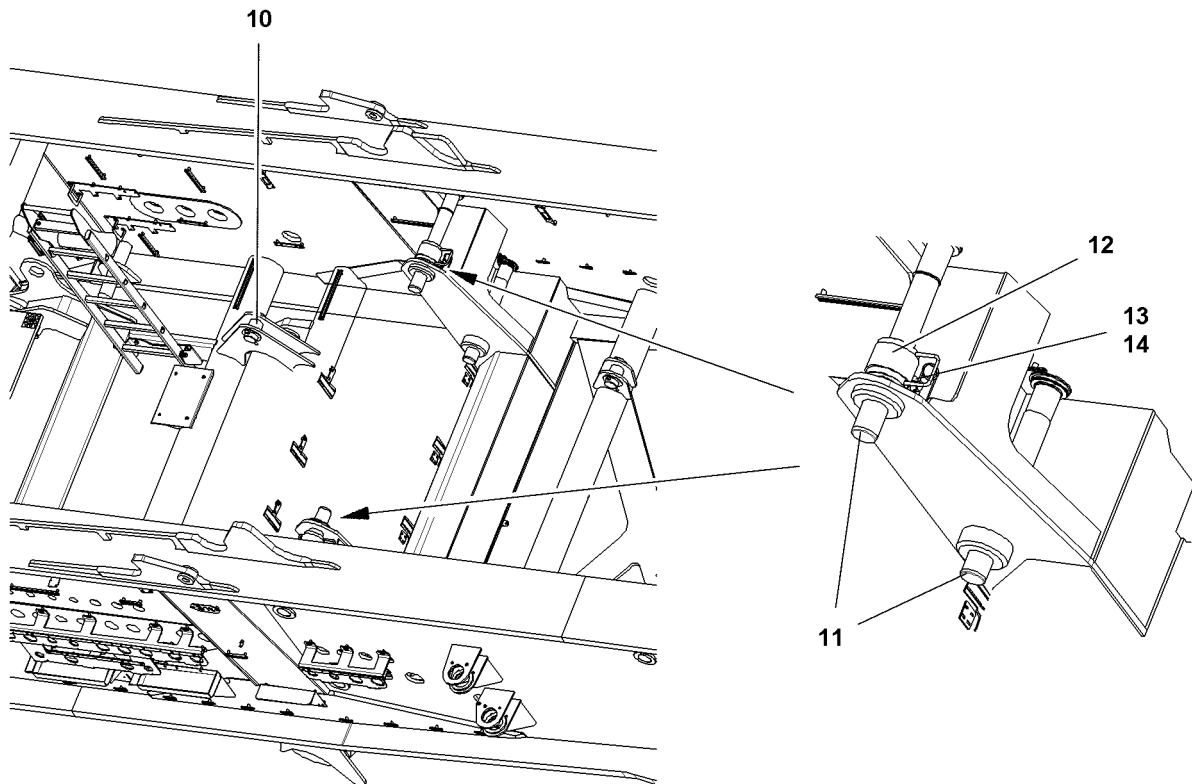
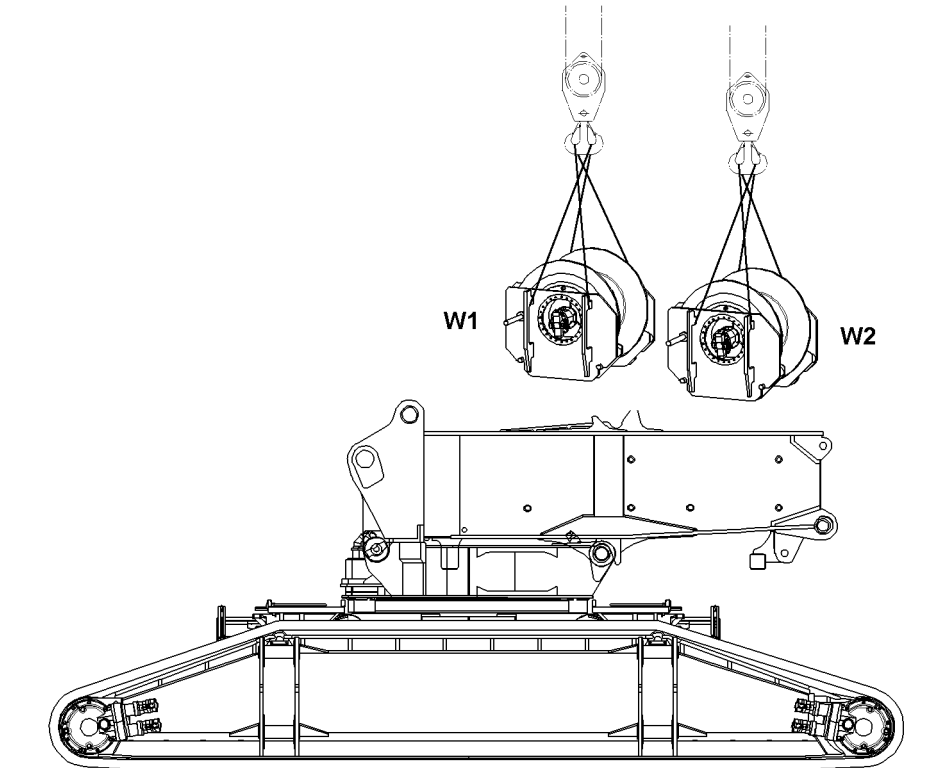


B102731

3.2 Assembly turntable, front section

Ensure that the following preconditions are met:

- the tackle is pinned and secured on the assembly eye hooks
- winches 1 and 2 are not installed
- ▶ Hang the turntable front section **1** onto the auxiliary crane and swing in to the pin points on the turn section **8** and attach.
- ▶ Pin and secure the front section **1** on the turn section **8** on the front and rear.
- ▶ Insert the pins **5** with the hydraulic pin pulling device and secure with retaining pins **6**.
- ▶ Unpin the retaining pin **6** on **B** and pin on **A** and secure with linch pin **9**.
- ▶ Establish the electrical and hydraulic connections on the rotary connection to the turntable.



B102732

3.3 Assembly winch 1

Ensure that the following preconditions are met:

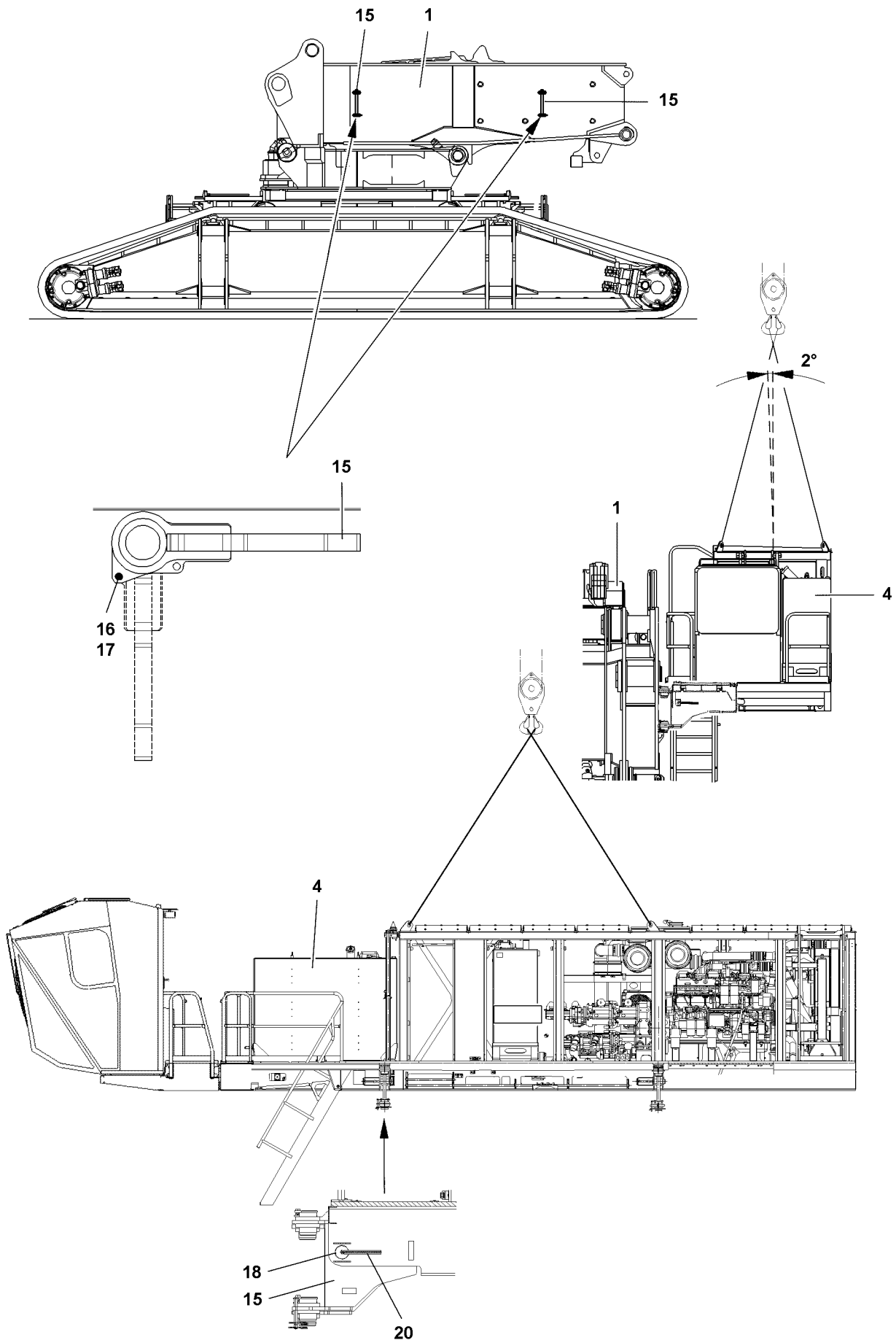
- the pins **11** are pushed back to install the winch without interference.
- ▶ Hang winch 1 **W1** on the auxiliary crane and swing in to the pin points in the turntable front section **1**, lower it and attach on pins **10**
- ▶ Pin and secure winch 1 **W1**
- ▶ Insert the pins **11** with a tappet **12** into the winch frame.
- ▶ Pin the tappet **12** to secure the pin **11** on the frame with a retaining pin **13**.
- ▶ Insert the retaining pin **13** and secure with spring retainer **14**.
- ▶ Establish the electrical and hydraulic connections to the winches

3.4 Assembly winch 2



Note

- ▶ The installation procedure of winch 2 corresponds to that of winch 1.
-



B103123

3.5 Assembly engine house

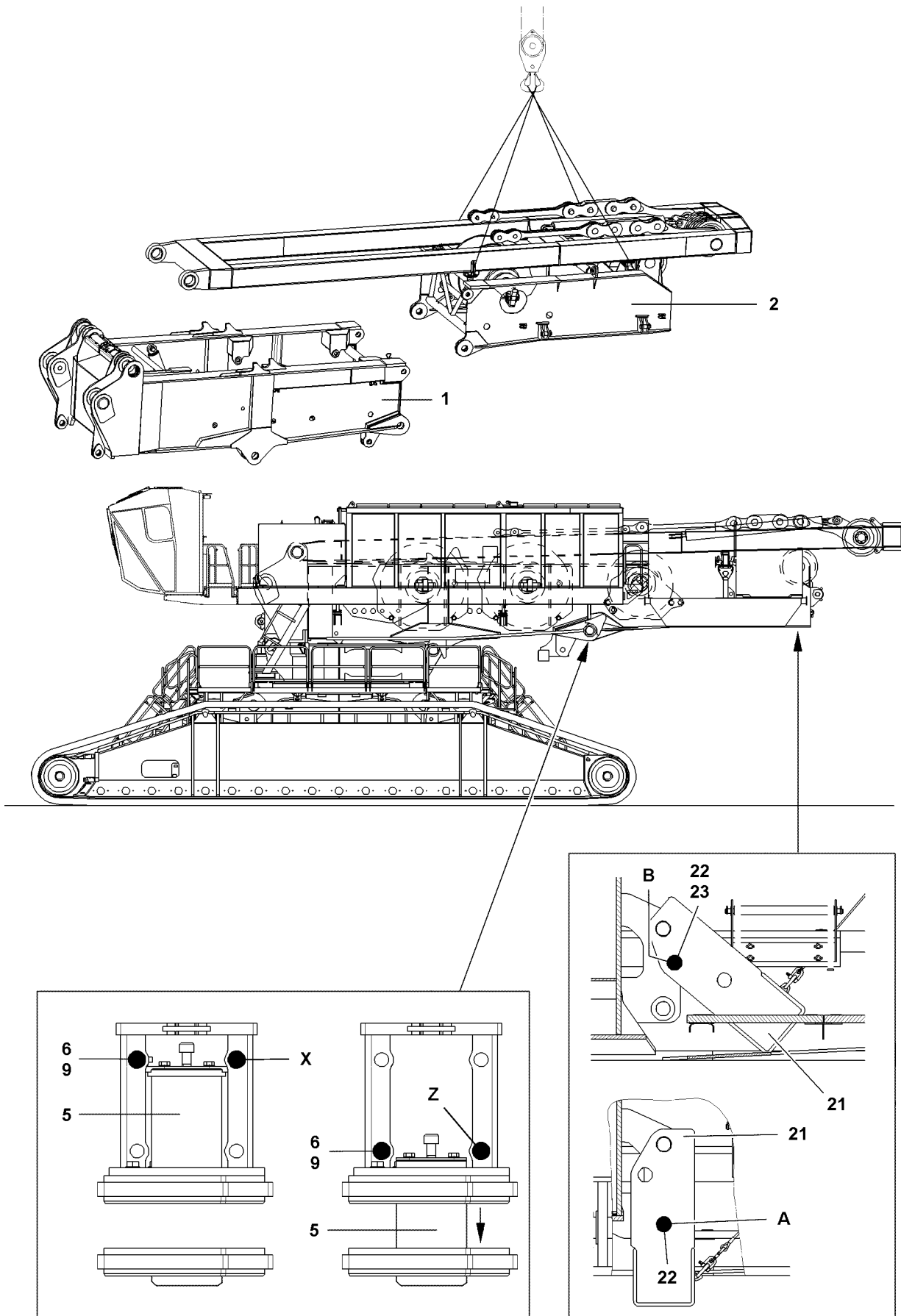
Ensure that the following preconditions are met:

- the tackle is pinned and secured on the assembly eye hooks
- the folding brackets **15** on the turntable front section **1** are folded out
- ▶ Fold the folding brackets out **15** by 90° and secure with the retaining pins **16**.
- ▶ Secure the retaining pins **16** with spring retainers **17**.
- ▶ Hang the engine house **4** onto the auxiliary crane and swing in to the folding brackets **15** on the turntable front section **1** and attach.



Note

- ▶ The engine house **4** must hang on the auxiliary crane so that it is inclined on the top about 2° to the turntable front section. This simplifies the assembly and disassembly on the folding brackets **15**.
-
- ▶ Pin and secure the engine house **4** on the folding brackets **15**.
 - ▶ Insert the pin **18** by hand and secure with spring retainer **19**.
 - ▶ Set the pin handle **20** horizontally.
 - ▶ Establish the electrical and hydraulic connections from the engine house **4** and the cab to the turntable.



B103303

3.6 Assembly turntable, rear section

Ensure that the following preconditions are met:

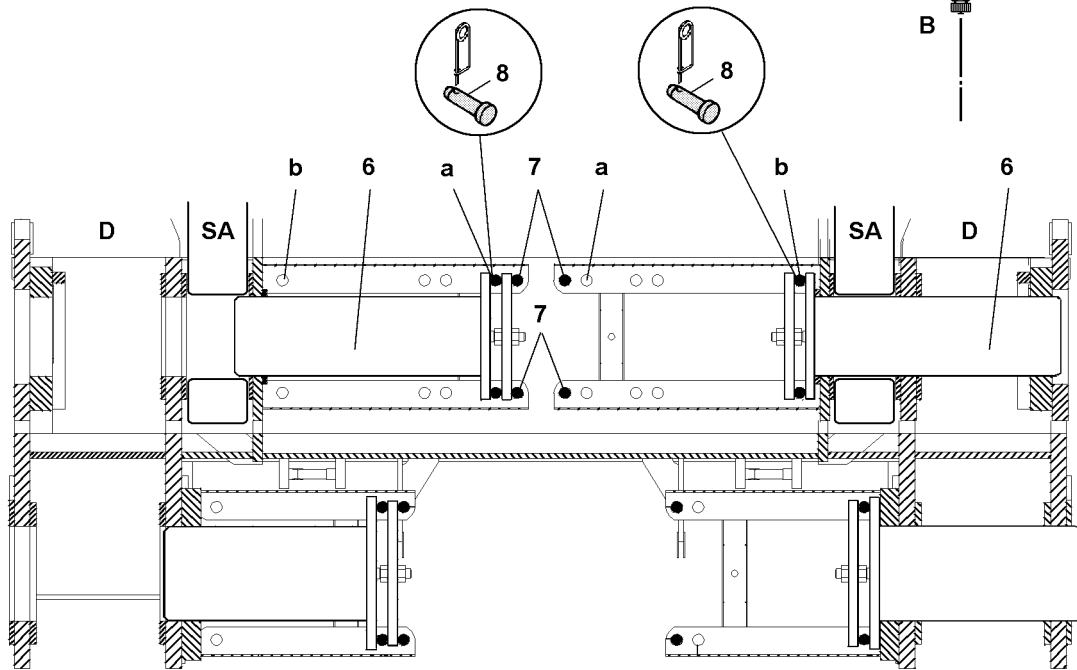
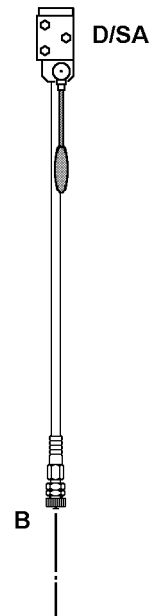
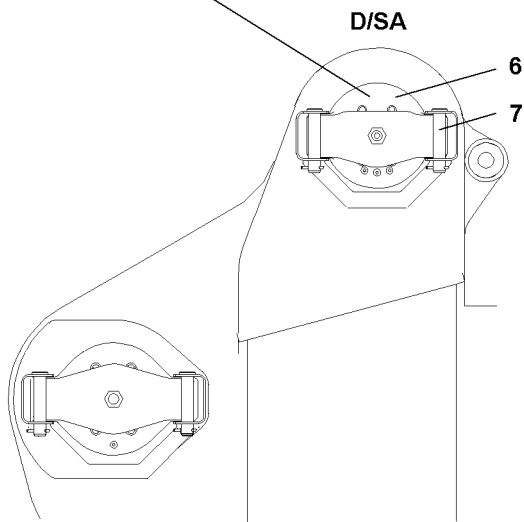
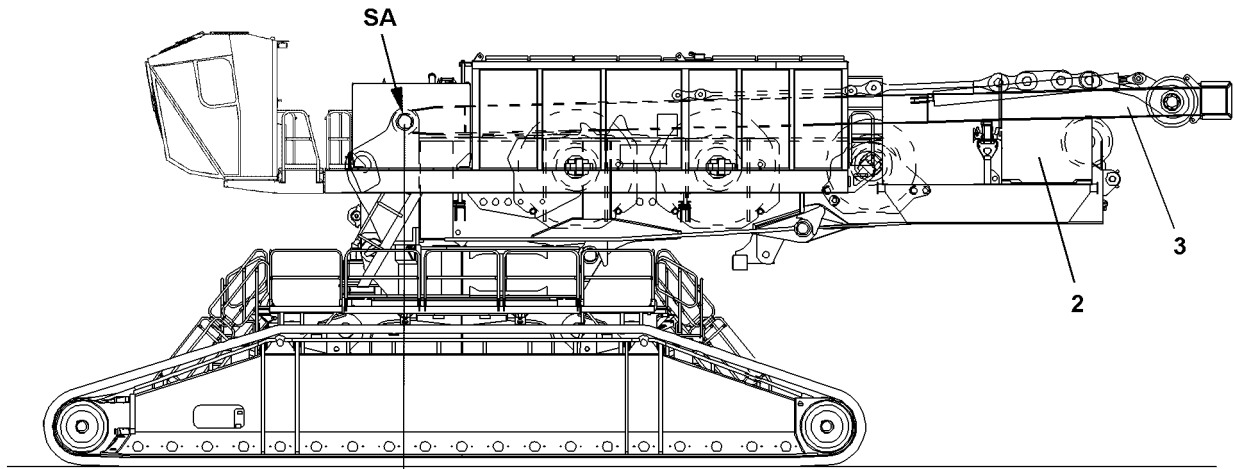
- the tackle is pinned and secured on the assembly eye hooks
- the SA-frame is placed and rigged on the rear section
- ▶ Hang the turntable rear section **2** onto the auxiliary crane and swing in to the pin points on the front section **1** and attach.
- ▶ Pin and secure the turntable rear section **2** on the front section **1** on the bottom and on top.
- ▶ Insert the pins **5** with the hydraulic pin pulling device and secure with retaining pins **6**.
- ▶ Secure the retaining pins **6** with linch pins **9**.
- ▶ Establish electrical and hydraulic connections.



CAUTION

If the turntable turns, the crane will be damaged!

- ▶ The shut off bracket **21** must be swung up and pinned for crane operation!
-
- ▶ Unpin the pin **22** on bore **A** and insert in bore **B**. Secure pin **22** with safety spring **23**.



B103304

3.7 Assembly SA-frame on turntable

Ensure that the following preconditions are met:

- the tackle is pinned and secured on the turntable rear section on the assembly eye hooks and on the SA-frame.
 - the SA-frame is unriggered on the rear section
 - the pins **7** are inserted and secured
 - the pins **8** are pinned and secured in bores **a**
- ▶ Hang the SA-frame **3** onto the auxiliary crane and swing it in to the pin points on the turntable and attach.



Note

- ▶ The hand levers **SA** and the hydraulic connections **B** for the pin pulling device are on the left side of the turntable.

-
- ▶ Establish the hydraulic connections from the pin pulling device to the turntable
 - ▶ Pin the SA-frame **3** on both sides with the pin pulling device.
 - ▶ Move the hand lever **SA** and push the pins **6** all the way out.

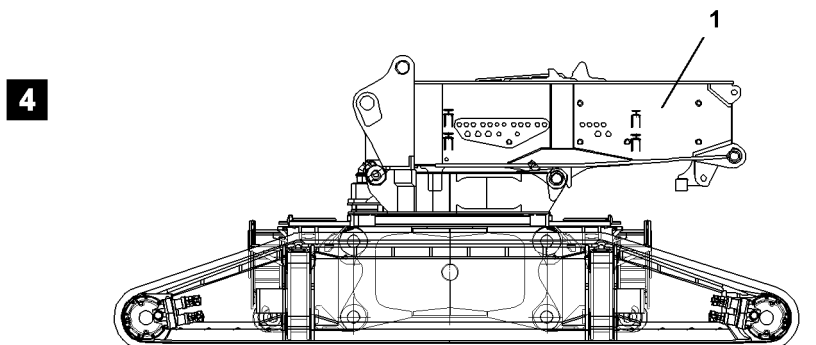
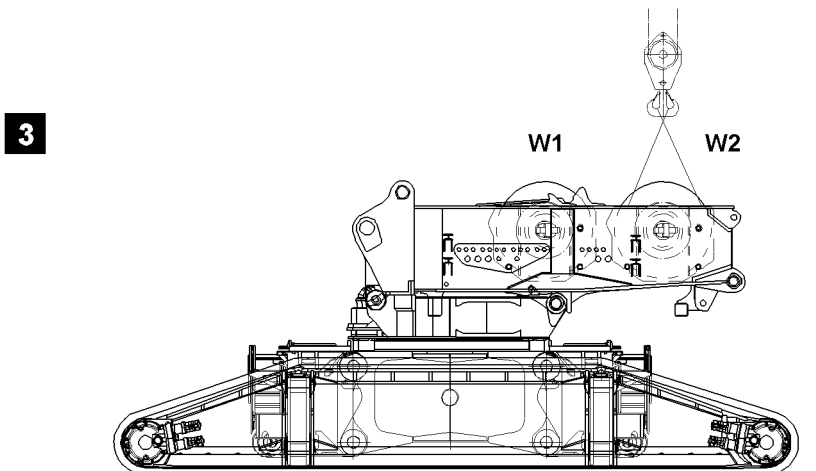
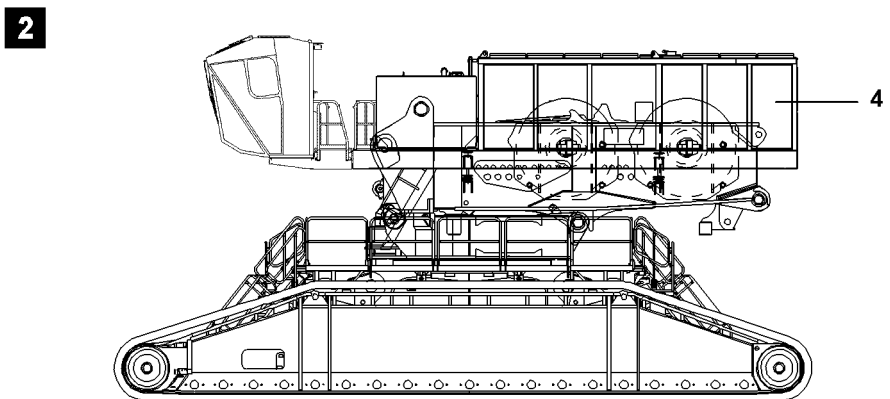
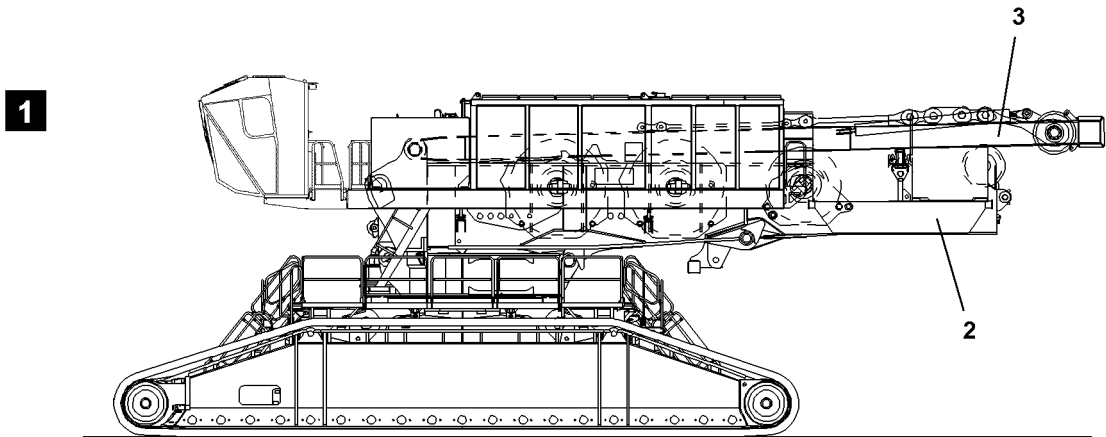


DANGER

Risk of accident!

- ▶ If the pins are not secured, they can loosen up and the SA-frame can fall down and fatally injure personnel.
- ▶ Never leave the pins unsecured!
- ▶ Do not stand under the SA-frame or within the complete danger zone during the pinning and unpinning procedure!

-
- ▶ Unpin the pins **8** from the bores **a** and insert in bores **b** and secure.



B103305

4 Disassembly



DANGER

Risk of accident!

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 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!
- ▶ It is prohibited for anyone to remain within the complete danger zone during assembly and disassembly.

Ensure that the following preconditions are met:

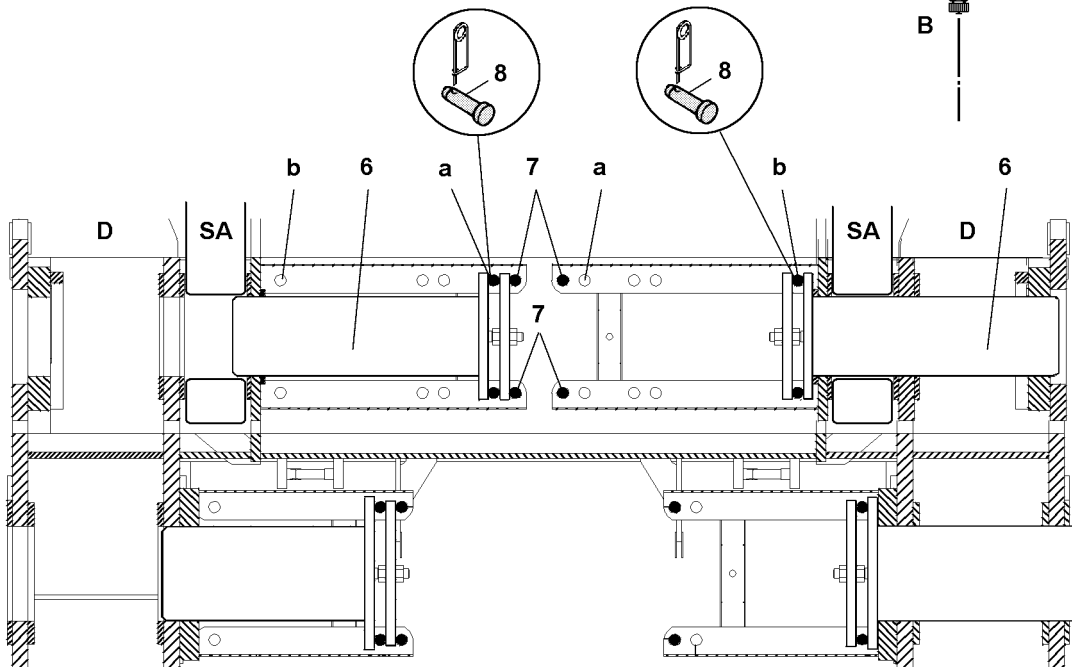
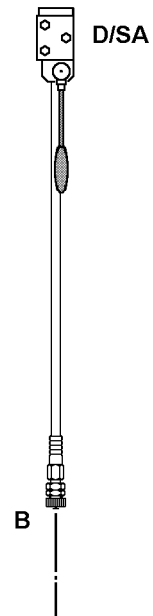
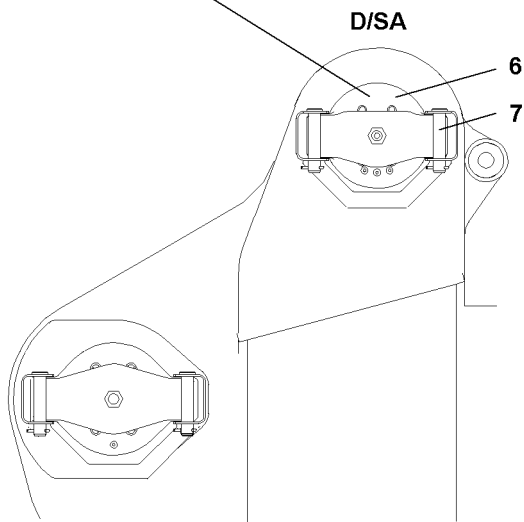
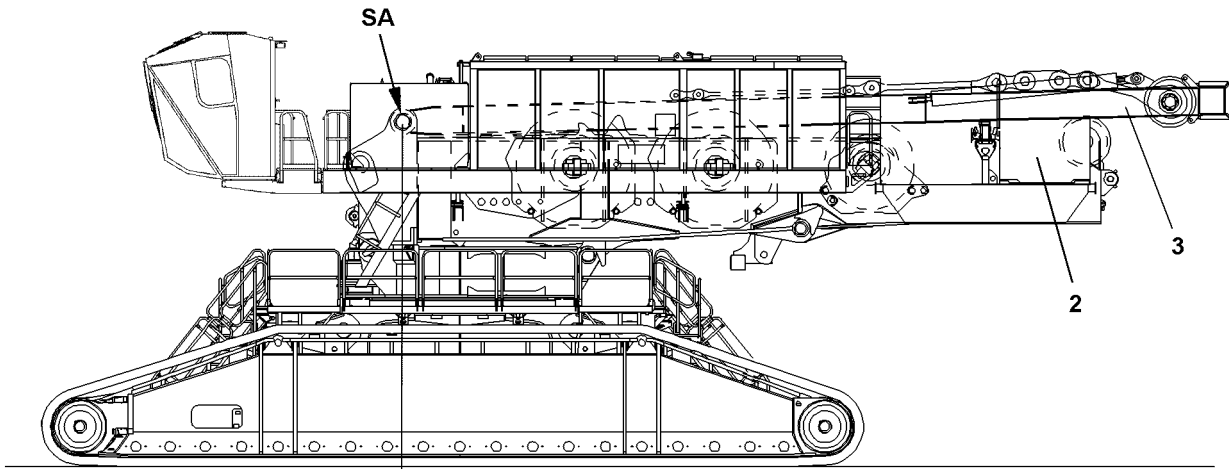
- an auxiliary crane is available
- the boom, the derrick and the suspended ballast are removed
- the turntable counterweight is removed

4.1 Short description of disassembly 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!
-
- ▶ **Fig. 1:** Remove the turntable rear section **2** with SA-frame **3**
 - ▶ **Fig. 2:** Remove the engine house **4**
 - ▶ **Fig. 3:** Remove winch 1 **W1** and winch 2 **W2**
 - ▶ **Fig. 4:** Remove the turntable front section **1**



B103304

4.2 Disassembly of SA-frame on turntable

Ensure that the following preconditions are met:

- the tackle is pinned and secured on the SA-frame.
 - the SA-frame is unriggered on the rear section
- ▶ Hang the SA-frame **3** on the auxiliary crane.



DANGER

Risk of accident!

- ▶ If the SA-frame **3** is not held by the auxiliary crane, then the SA-frame can fall down and fatally injure personnel.
- ▶ Do not stand under the SA-frame or within the complete danger zone during the pinning and unpinning procedure!

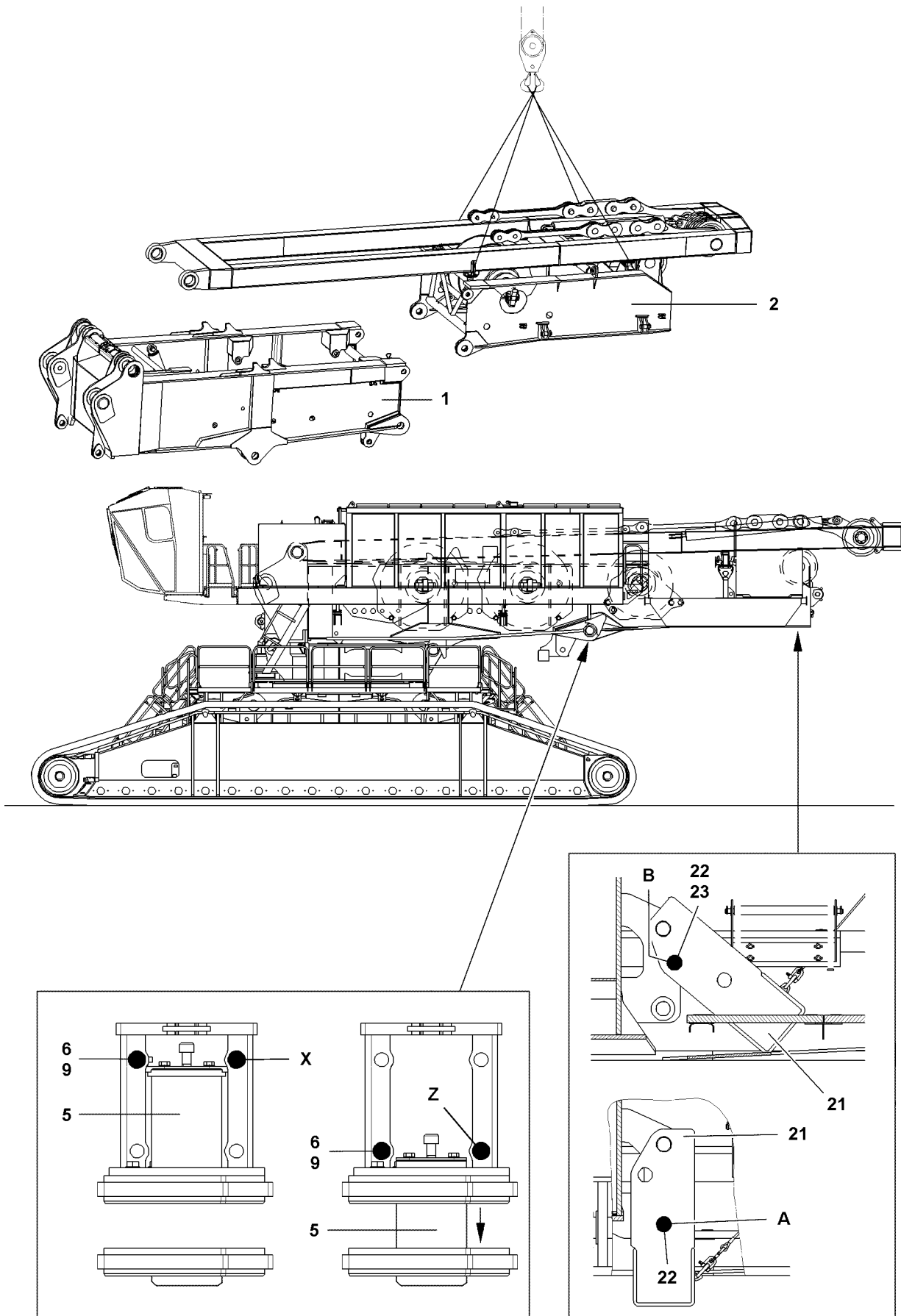
-
- ▶ Unpin the SA-frame **3** on the turntable.



Note

- ▶ The hand levers **SA** and the hydraulic connections **B** for the pin pulling device are on the left side of the turntable.

-
- ▶ Establish the hydraulic connections from the pin pulling device to the turntable.
 - ▶ Unpin the SA-frame **3** on both sides with the pin pulling device.
 - ▶ Unpin the pins **8** from the bores **b**.
 - ▶ Move the hand lever **SA** and unpin the pins **6** all the way.
 - ▶ Pin and secure pins **8** in bores **a**.
 - ▶ Place down and rig the SA-frame **3** on the turntable rear section **2**.
 - ▶ Disengage the tackle.

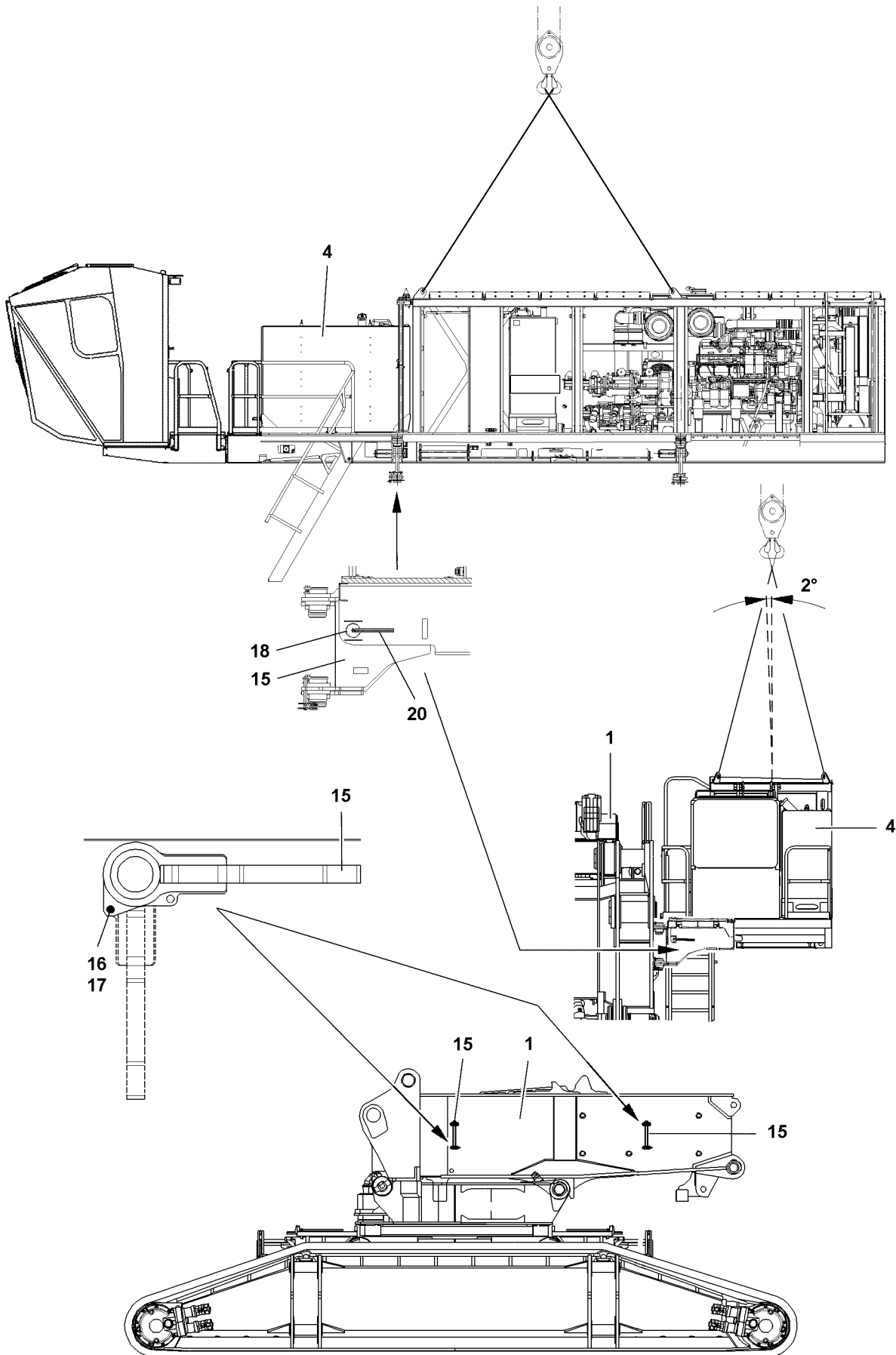


B103303

4.3 Disassembly turntable, rear section

Ensure that the following preconditions are met:

- the tackle is pinned and secured on the assembly eye hooks on the turntable rear section **2**
- disconnect the electrical and hydraulic connections
- the SA-frame is placed and rigged on the turntable rear section **2**
- ▶ For disassembly, swing the shut off bracket **21** down and pin.
- ▶ Unpin the pin **22** on bore **B** and insert in bore **A**. Secure pin **22** with safety spring **23**.
- ▶ Hang the turntable rear section **2** on the auxiliary crane and tension tackle.
- ▶ Unpin and release the turntable rear section **2** on the turntable front section **1** on the bottom and on top.
- ▶ Remove the lynch pins **9** and unpin the retaining pins **6** on Z and insert in X and secure.
- ▶ Unpin the pin **5** with the hydraulic pin pulling device.
- ▶ Secure the retaining pins **6** with lynch pins **9**.



B103306

4.4 Disassembly of engine house

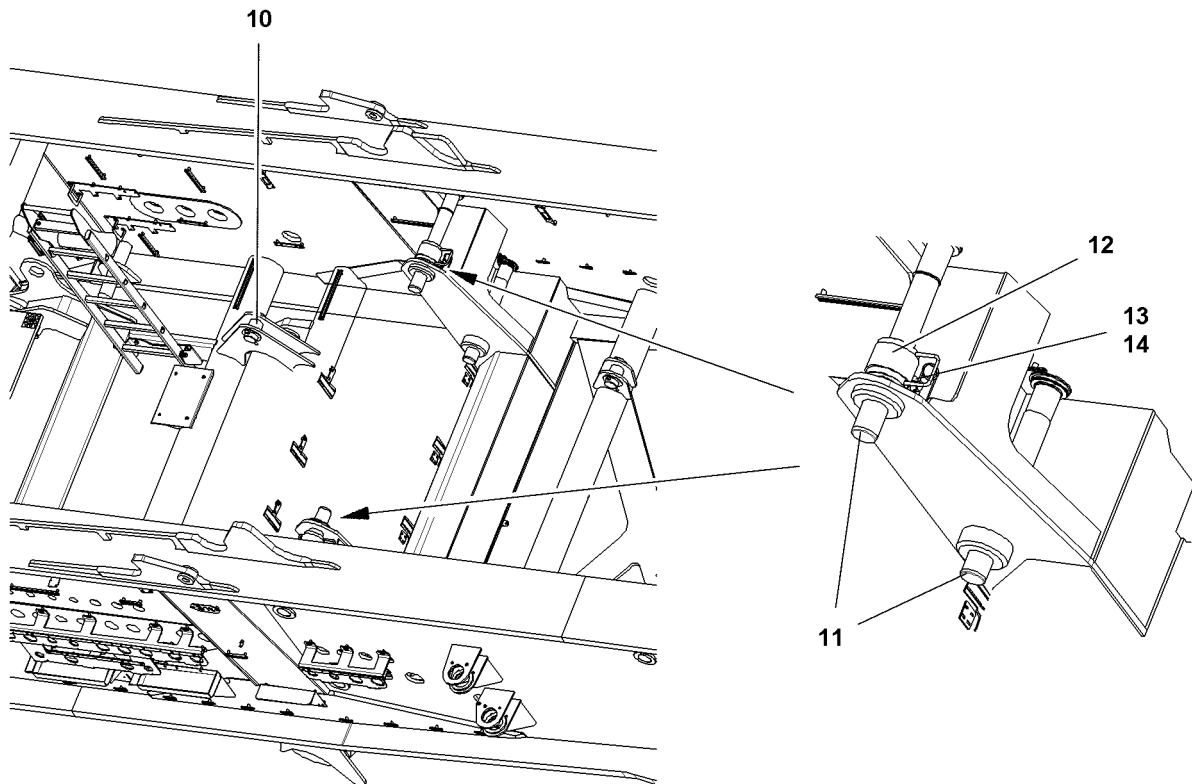
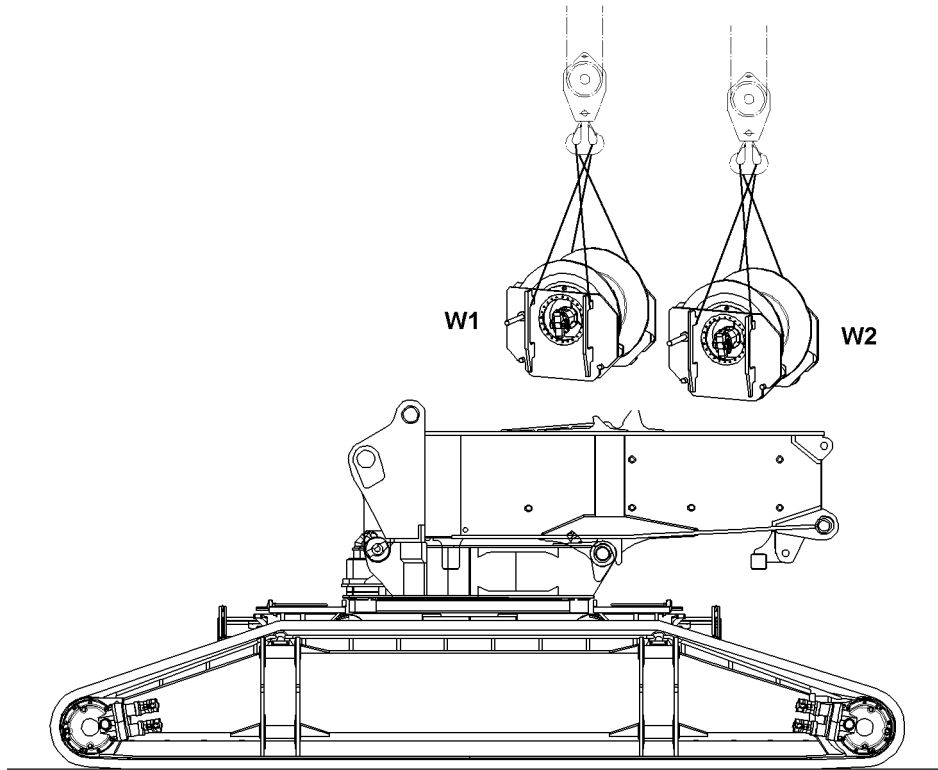
Ensure that the following preconditions are met:

- the tackle is pinned and secured on the assembly eye hooks
- the electrical and hydraulic connections from the engine house **4** and the cab to the turntable are disconnected



Note

- ▶ Hang the engine house **4** on the auxiliary crane so that it is inclined on the top about 2° to the turntable front section. This simplifies the assembly and disassembly on the folding brackets **15**.
-
- ▶ Release and unpin the engine house **4** on the folding brackets **15**.
 - ▶ Remove the spring retainer **19** and unpin the pin **18** by hand.
 - ▶ Swing the engine house **4** from the folding brackets **15** on the turntable front section **1**.
 - ▶ Fold the folding brackets **15** in and secure with the retaining pins **16**.
 - ▶ Secure the retaining pins **16** with spring retainers **17**.



B102732

4.5 Disassembly winch 1

Ensure that the following preconditions are met:

- disconnect the electrical and hydraulic connections to the winches
- winch 1 **W1** is pinned and secured on the auxiliary crane
- the tackle is tensioned

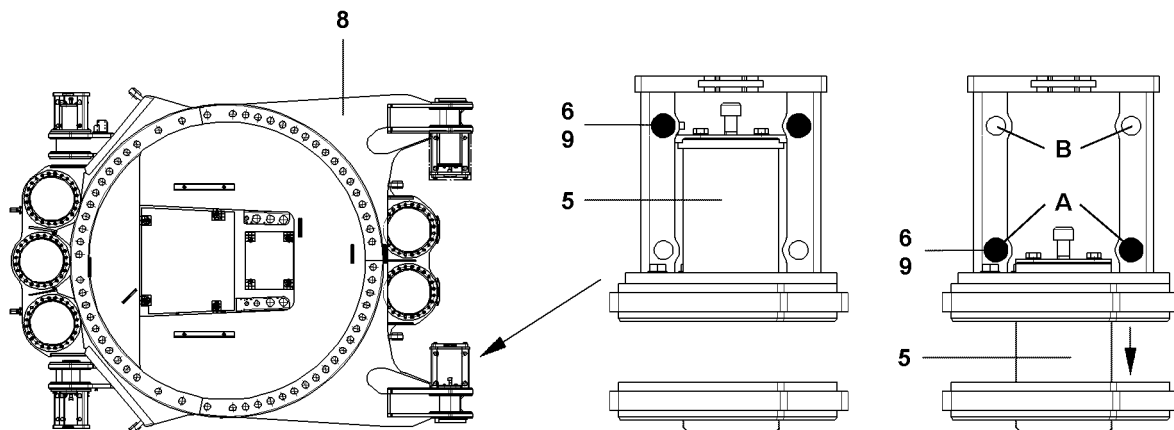
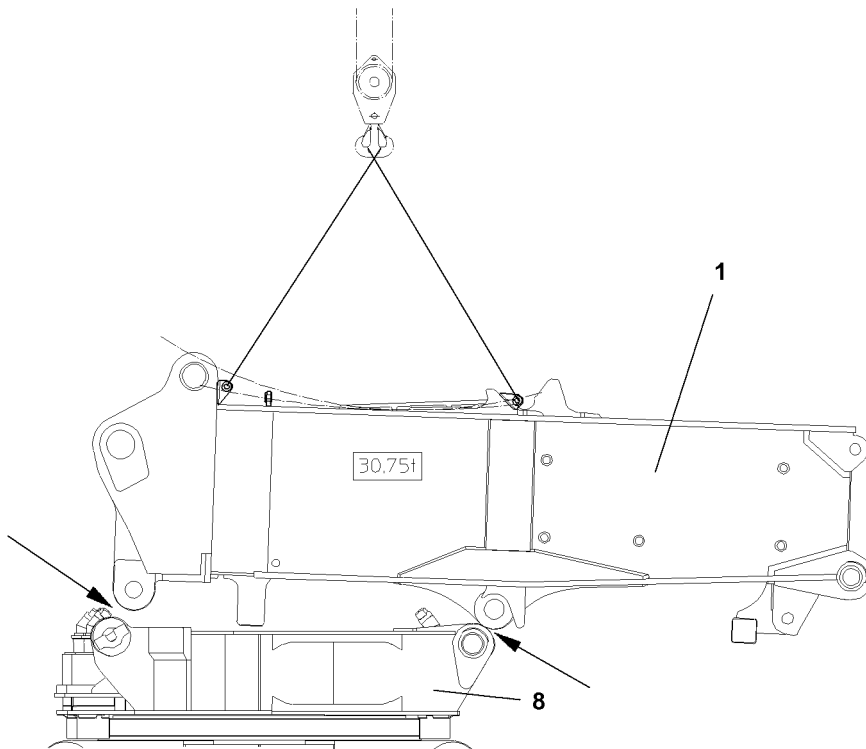
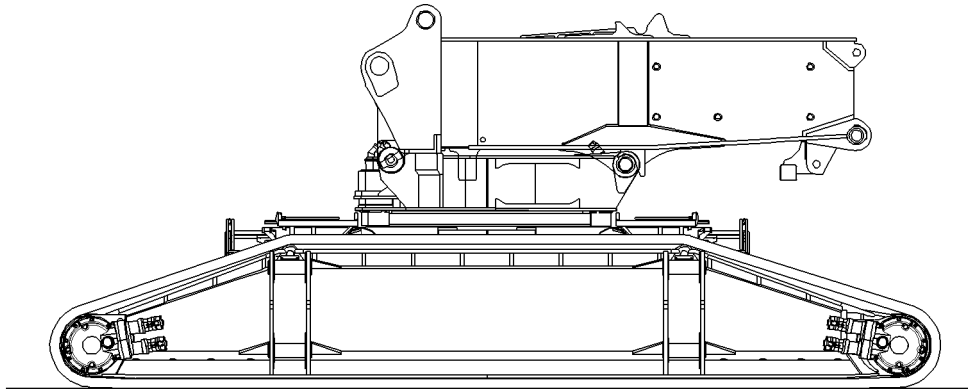
- ▶ Remove the spring retainer **14** and unpin the retaining pin **13**.
- ▶ Unpin the tappet **12** to secure the pin **11** on the frame with a retaining pin **13**.
- ▶ Unpin the pins **11** with the tappet **12** on the winch frame.
- ▶ Carefully lift winch 1 **W1** with the auxiliary crane from the turntable.

4.6 Disassembly winch 2



Note

- ▶ The disassembly procedure of winch 2 corresponds to that of winch 1.
-

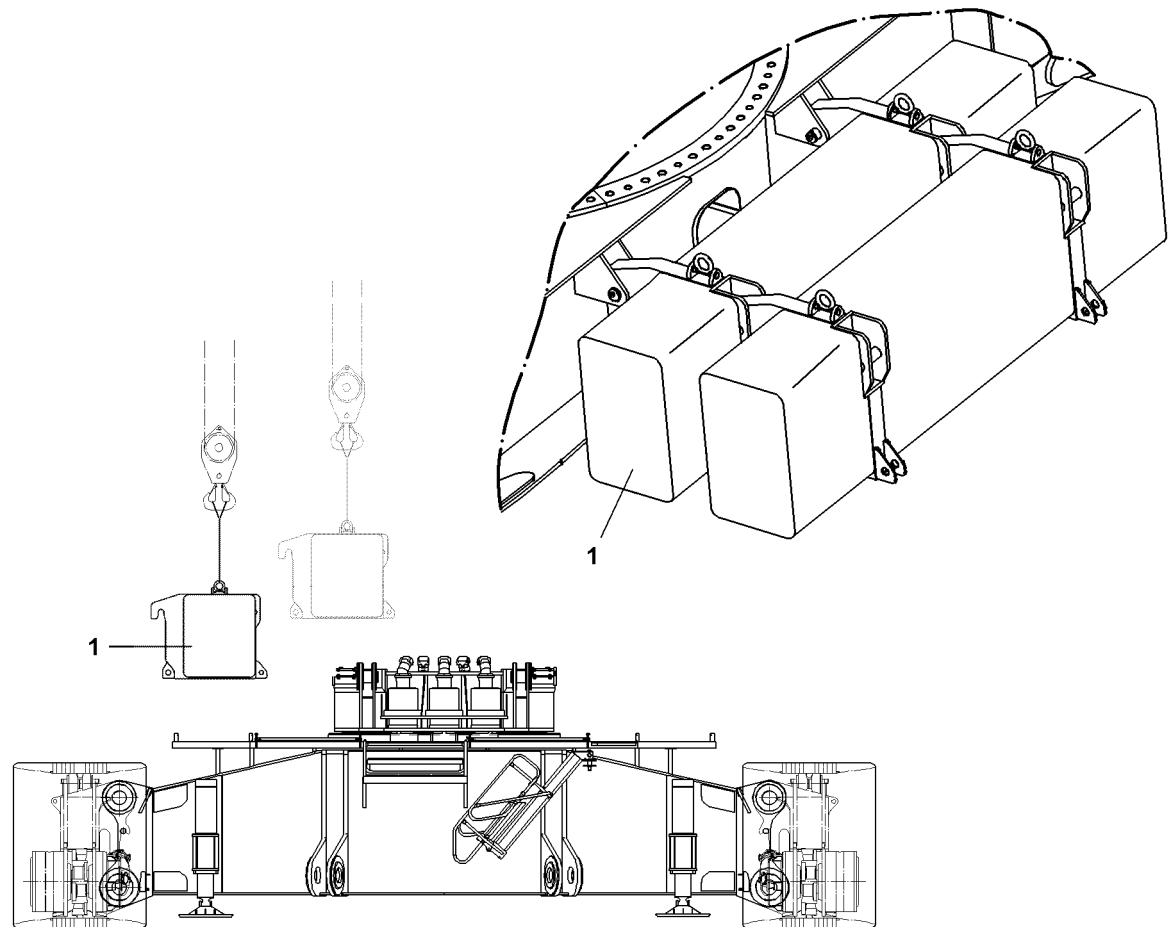
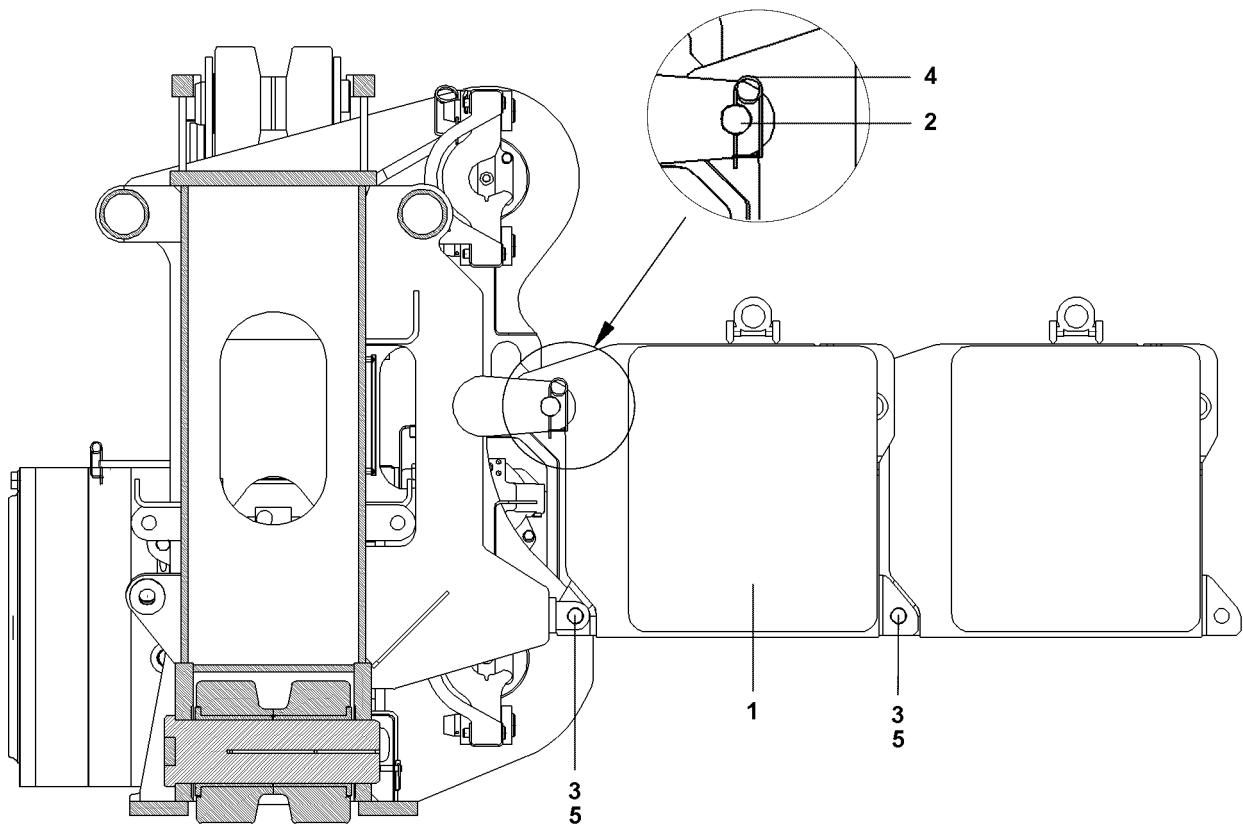


B102763

4.7 Disassembly turntable, front section

Ensure that the following preconditions are met:

- the tackle is pinned and secured on the assembly eye hooks
 - winches 1 and 2 are not installed
 - Disconnect the electric and hydraulic connections on the rotary connection to the turntable.
- ▶ Hang the turntable front section **1** on the auxiliary crane and tension tackle.
 - ▶ Release and unpin the turntable front section **1** on the turn section **8** on the front and rear.
 - ▶ Unpin the retaining pin **6** on **A** and pin on **B** and secure.
 - ▶ Unpin the pin **5** with the hydraulic pin pulling device.



B103307

1 Components

	Description	Weight
1	Ballast block	7.5 t
2	Pin, 55 mm	—
3	Pin, 45 mm	—
4	Safety spring	—
5	Linch pin	—

2 Assembly

Ensure that the following preconditions are met:

- the crawler carriers are pinned on the cross carriers
- the central ballast must be assembled according to the data in the load chart



DANGER

Risk of accident due to tipping of the crawler carrier!

- ▶ If the ballast blocks are installed on the freestanding crawler carrier, then they will tip over and can fatally injure personnel!
- ▶ The crawler carriers must be pinned and secured on the cross carriers!

2.1 Assembly procedure

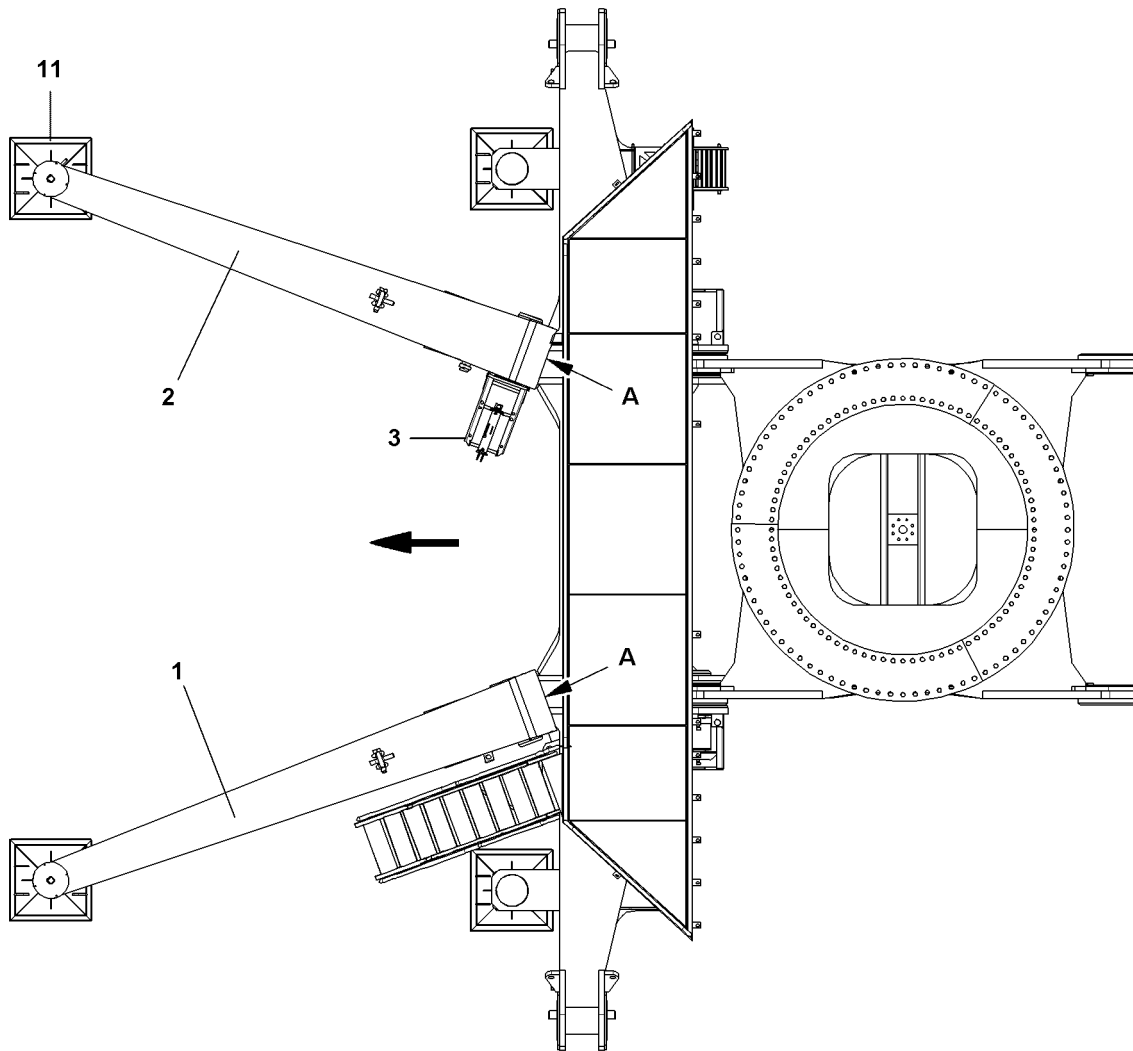
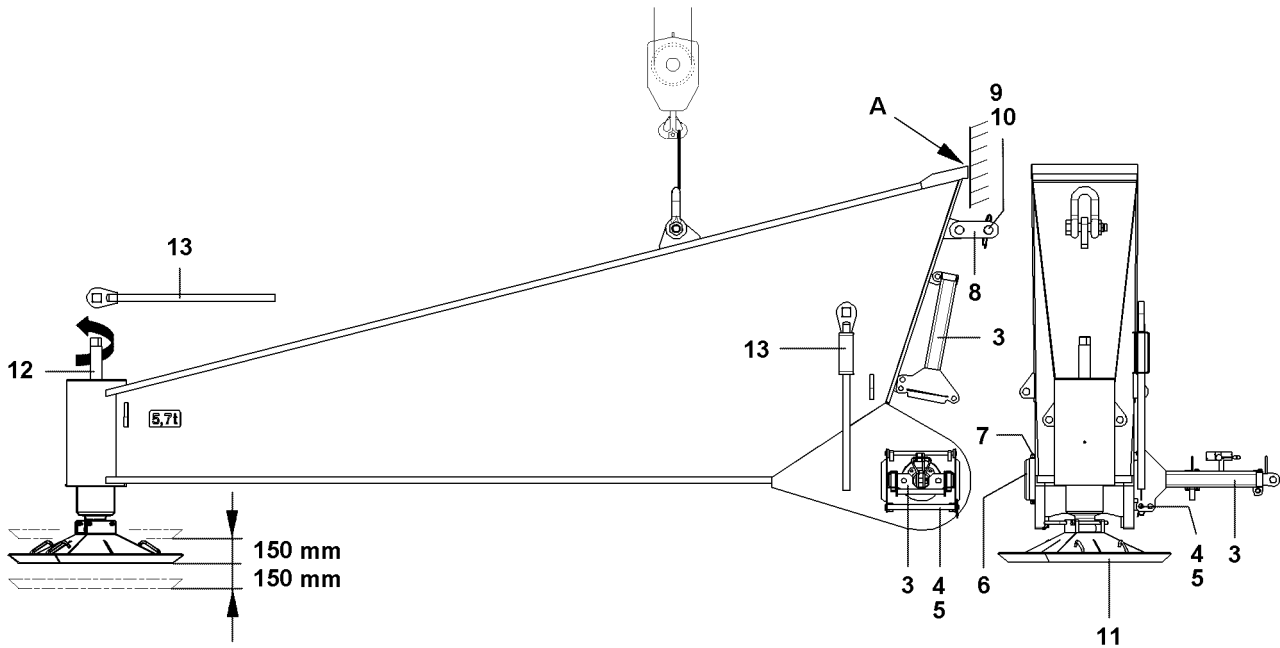
- ▶ Insert the pin **2** on the crawler carrier “**on top**” and secure with safety springs **4**.



DANGER

Danger of accident due to crushing and jamming!

- ▶ The ballast blocks must be hung correctly into each other, pinned and secured!
- ▶ It is prohibited for anyone to remain in the danger zone when engaging the ballast blocks.
- ▶ Hang the ballast block **1** onto the auxiliary crane.
- ▶ Swing the first ballast block with the auxiliary crane to the crawler carrier.
- ▶ Hang the ballast block on the pin **2**.
- ▶ Pin the ballast block “**on the bottom**” . Insert in the pin **3** and secure with linch pin **5**.
- ▶ Hang the second ballast block on the first ballast block and pin “**on the bottom**” . Insert in the pin **3** and secure with linch pin **5**.



B103423

1 Components

	Description	Weight
1	mech. auxiliary support, left	5.7 t
2	mech. auxiliary support, right	5.7 t
3	Cylinder retainer	—

2 Assembly

The mechanical auxiliary support is required to erect and take down long boom combinations.



Note

- ▶ Observe the data in the erection and take down charts!



DANGER

Risk of toppling the crane!

- ▶ If long boom combinations are erected or taken down without mechanical auxiliary support, the crane can tip over and fatally injure personnel.
- ▶ Pin the mechanical auxiliary support and turn the spindle to lay the support plates on the ground.

Ensure that the following preconditions are met:

- the crawler carriers are installed
- the crane is aligned in horizontal direction
- an auxiliary crane is available

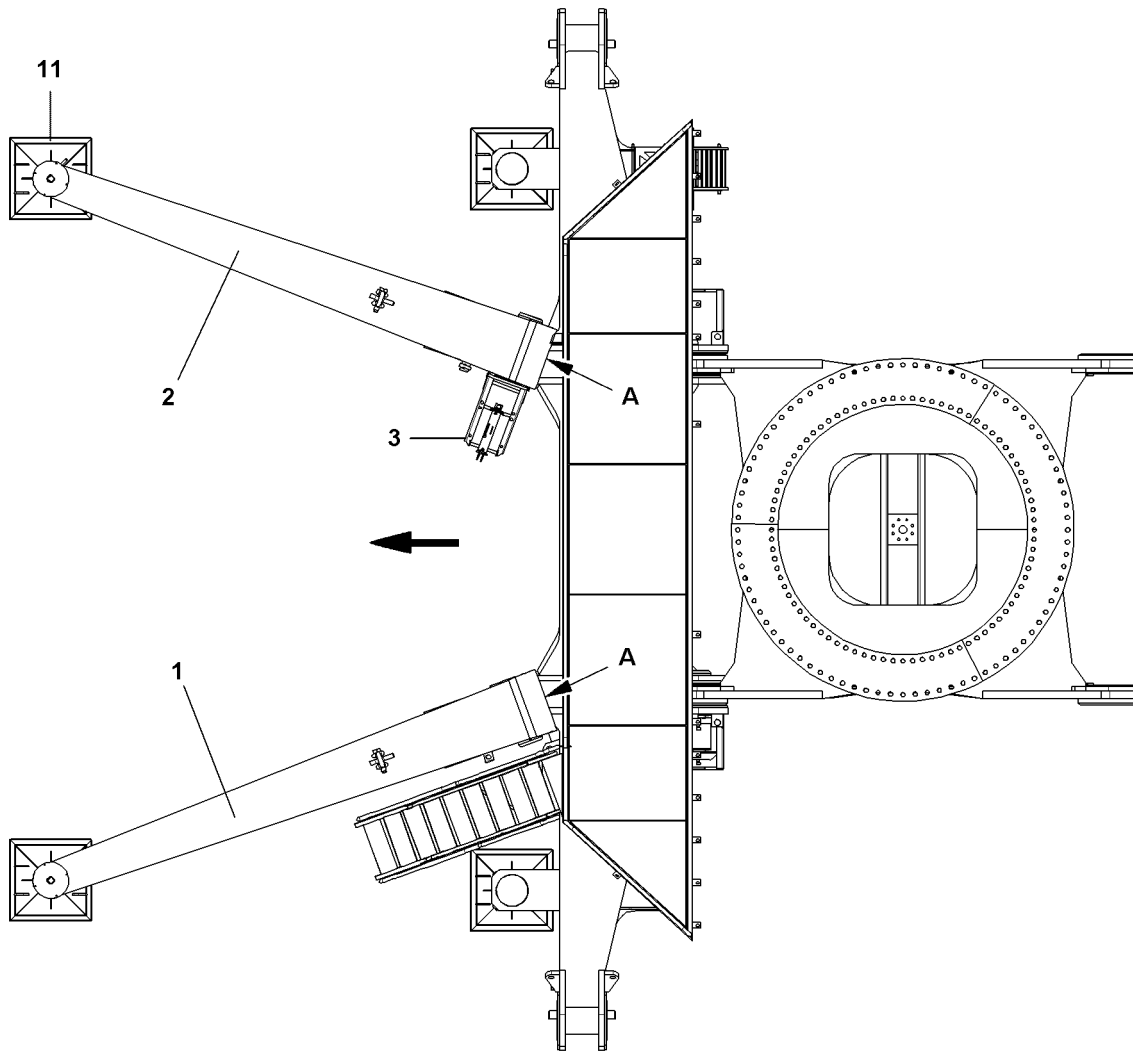
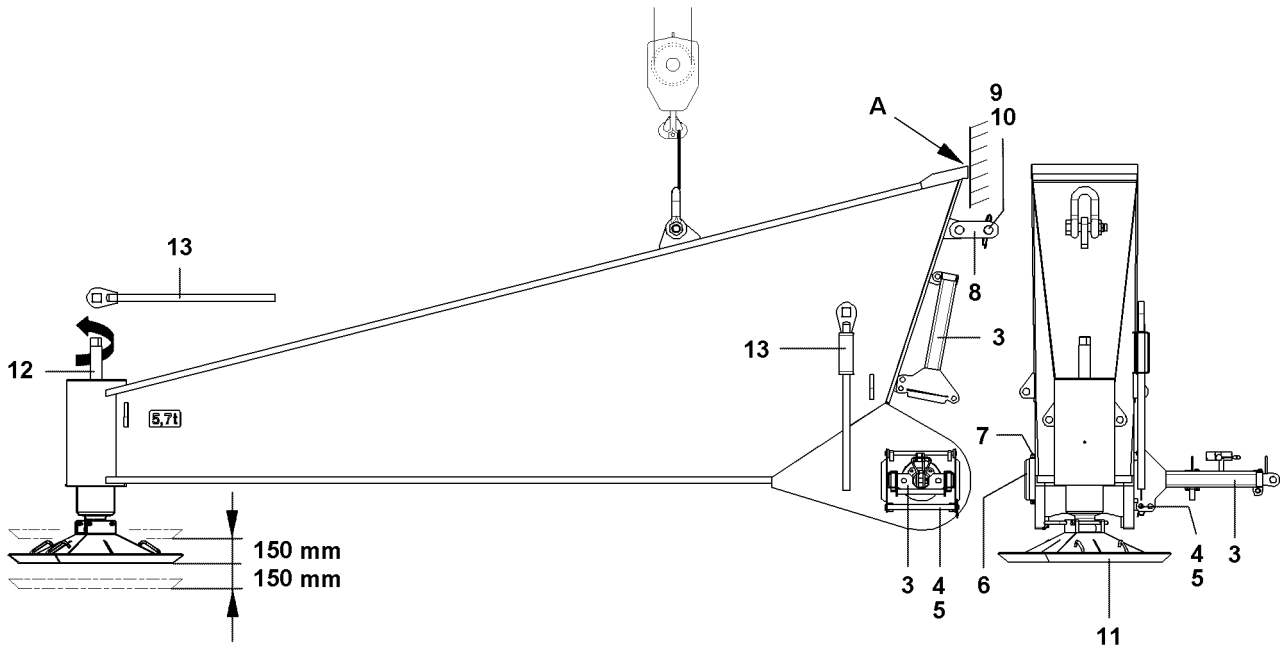
2.1 Assembly procedure

- ▶ Hang the mechanical auxiliary support **1** on the auxiliary crane and swing to the pin points on the cross carrier.
- ▶ Hang the cylinder retainer **3** on the auxiliary support, pin and secure. Insert the pin **4** and secure with safety spring **5**.
- ▶ Hang the pin pulling cylinder and establish the hydraulic connection to the pin pulling unit.
- ▶ Insert pin **6** and secure with retaining pin **7**.



Note

- ▶ Repeat the same procedure with the mechanical auxiliary support **2** as described for the mechanical auxiliary support **1**.



B103423

**DANGER**

Risk of toppling the crane!

- ▶ The mechanical auxiliary support is only an erection and take down aid device.
- ▶ The increase of stability momentum of the mechanical auxiliary support may not be used to increase the load momentum.
- ▶ If this is not observed, the crane can tip over and fatally injure personnel.
- ▶ The support pads must be made large enough for the ground conditions, with solid materials, such as wood, steel or concrete slabs.

- ▶ Pin bracket **8** on the cross carrier. Insert the pin **9** and secure with safety spring **10**.
- ▶ Lay the support pad **11** on the ground by turning the spindle **12** with the hand crank **13**.

**Note**

- ▶ Adjustment range of support pad: Height +/- 150 mm, incline 5 ° – 10 °

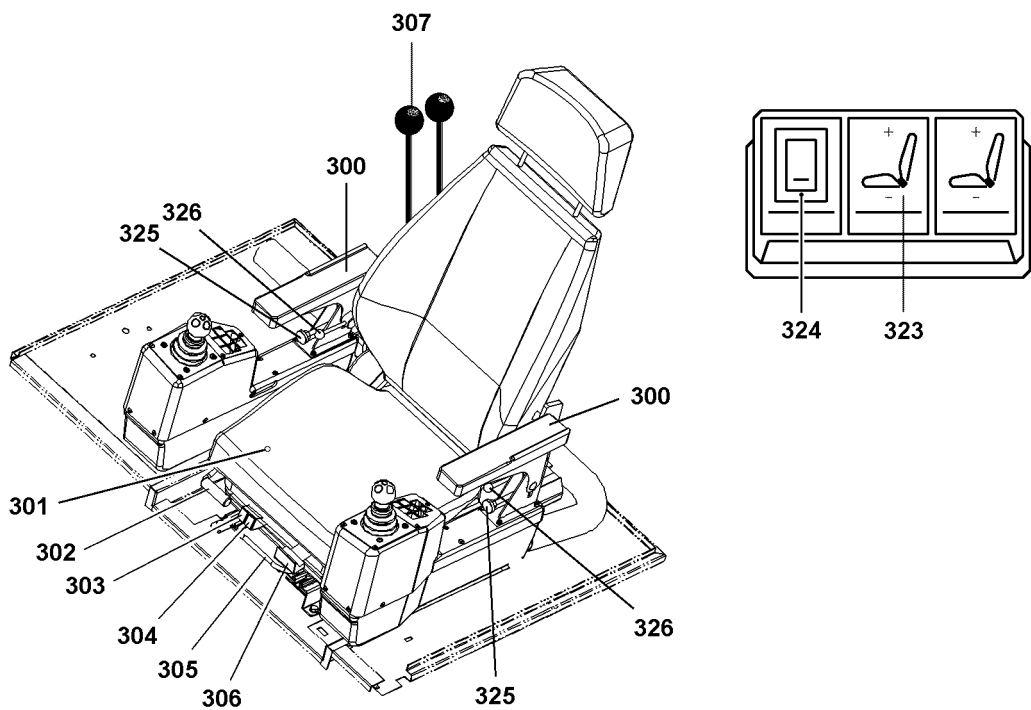
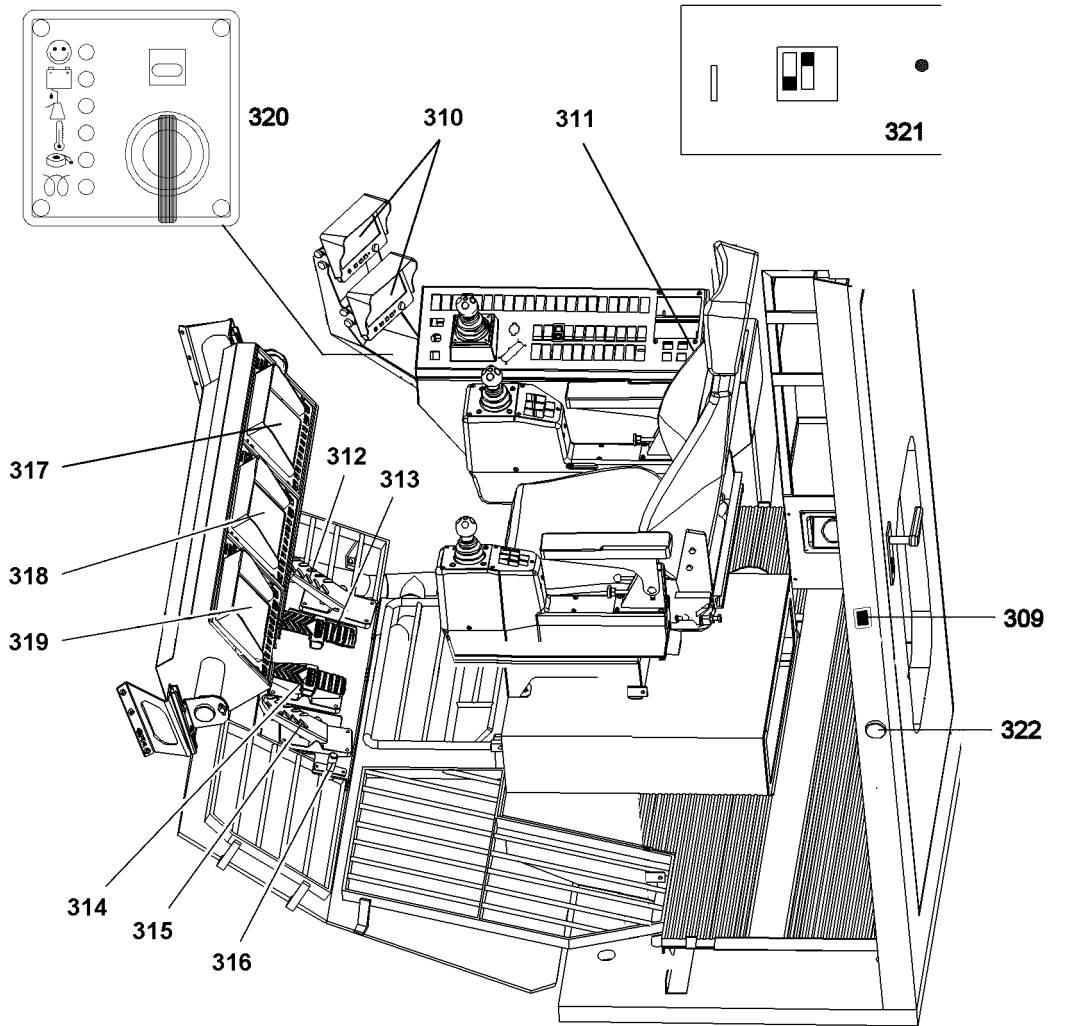
**DANGER**

Danger of accidents during erection and take down!

The auxiliary support must touch **on top A** on the cross carrier. If this is not observed, the boom can move jerkily during erection and take down.

- ▶ Adjust the support pad **11** with the spindle **12** until there is a tight contact with the ground.
- ▶ Lift the mechanical auxiliary support with the auxiliary crane until it touches **on top A** on the cross carrier.

4 Operation of crane superstructure

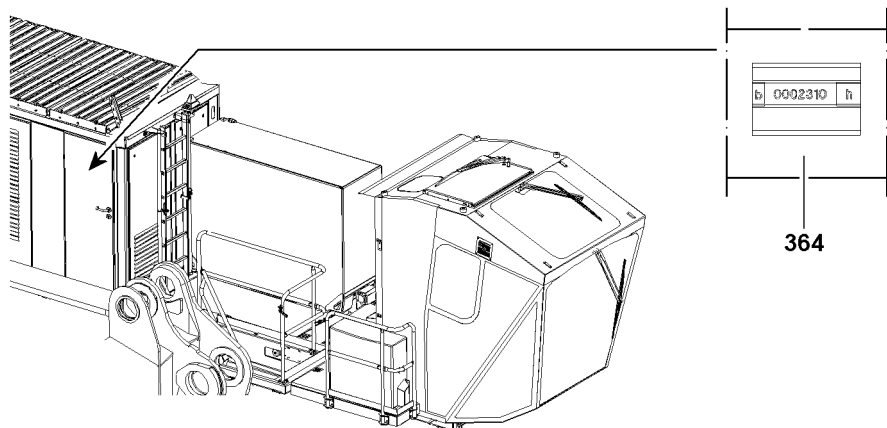
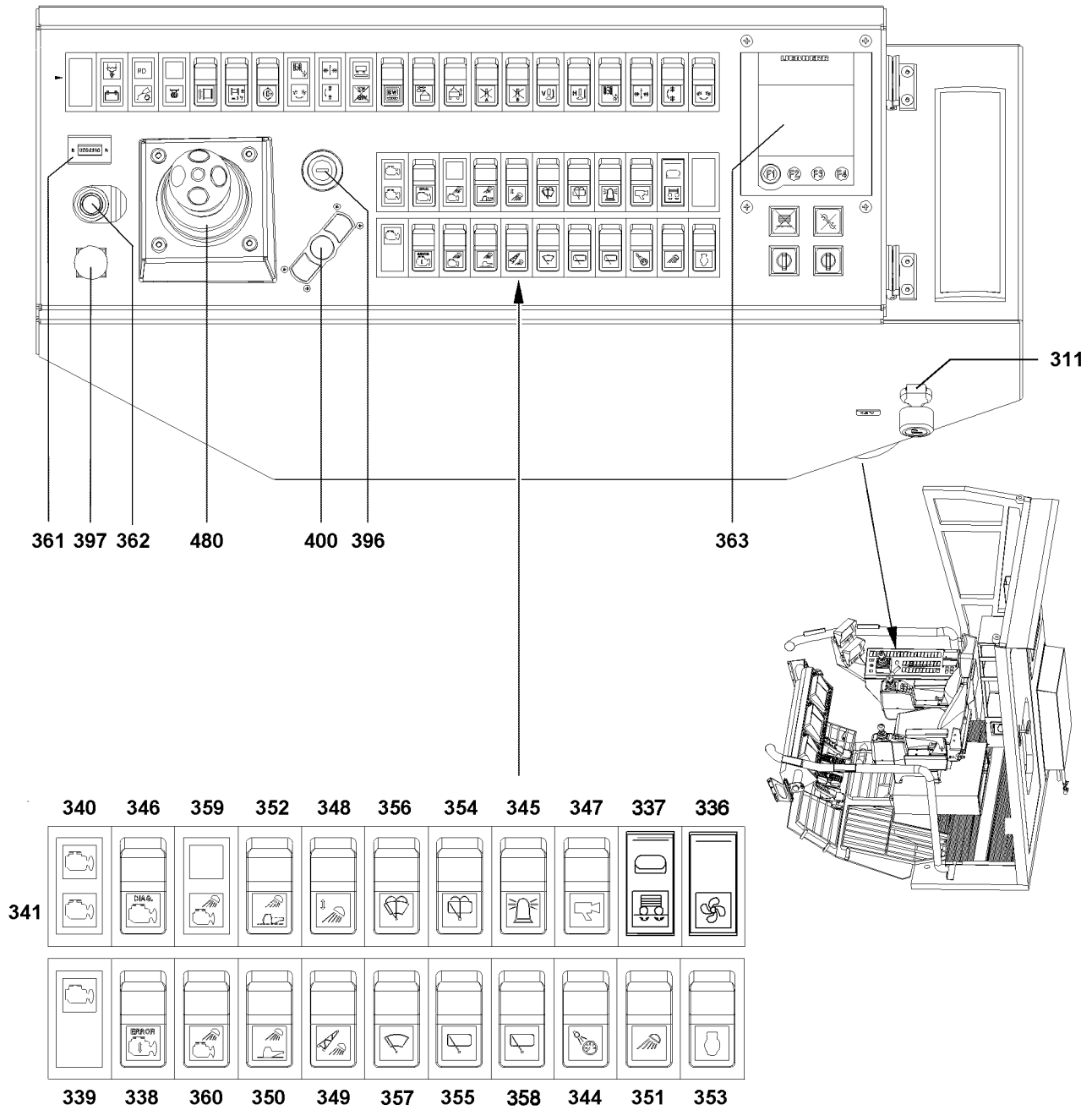


B106362

1 Operating and control instruments

1.1 General operating elements

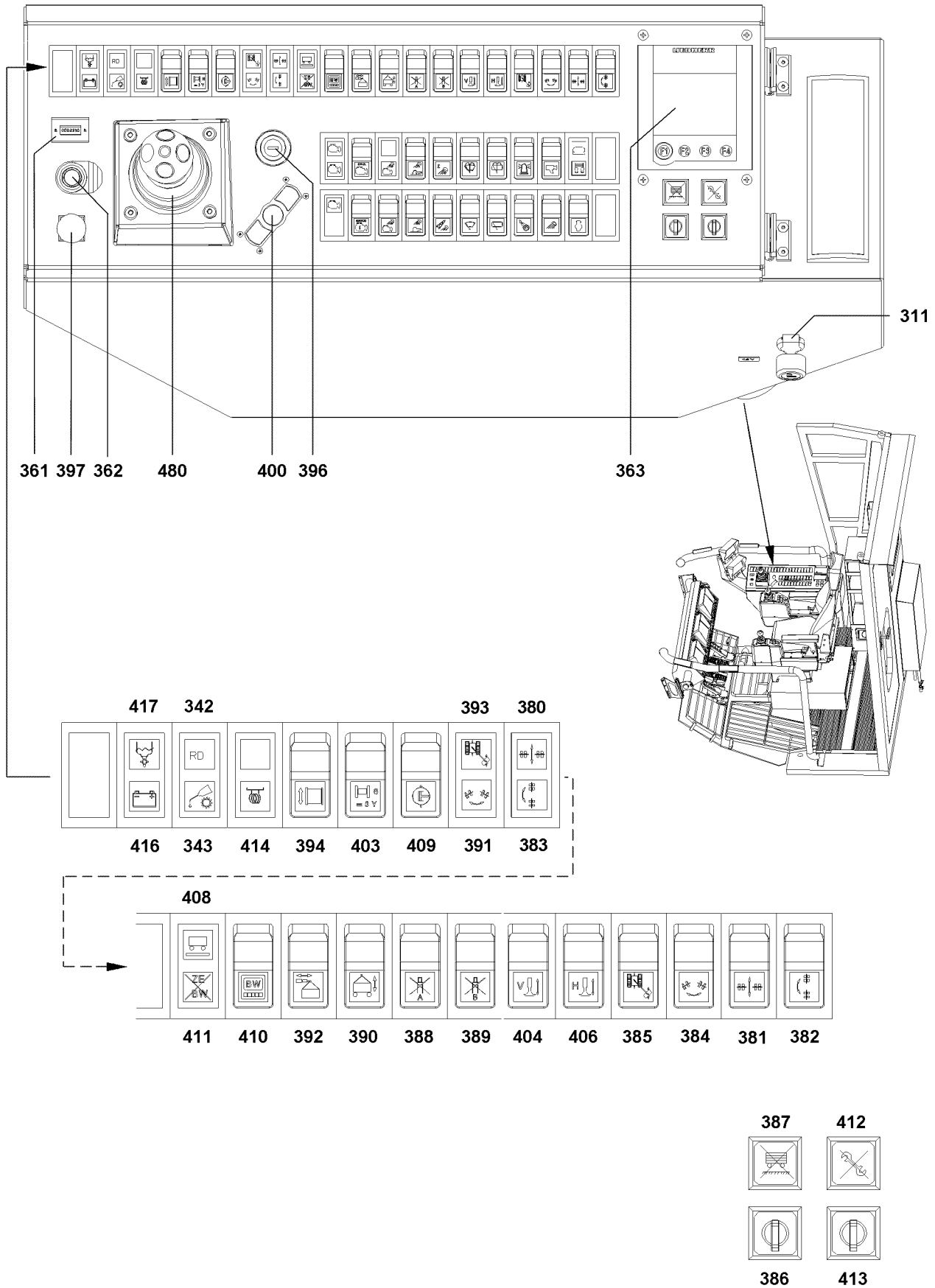
300 Armrest	
301 Seat contact button	
302 Hand lever	• Adjustment of seat cushion incline
303 Button	• Lumbar support in lower part of backrest
304 Button	• Lumbar support in upper part of backrest
305 Hand lever	• Lock for horizontal seat adjustment
306 Hand lever	• Backrest incline adjustment
307 Manual control lever	• Insert manual control lever in foot rocker 313 and foot rocker 314 . <ul style="list-style-type: none"> • Move the crawler forward or backward on the left hand side • Move the crawler forward or backward on the right hand side
309 Switch	• Cab lighting
310 Monitors	• Camera monitoring - winches
311 Socket 24 V	
312 Pedal	• Engine regulation
313 Foot rocker (MS 5)	• Move the crawler forward or backward on the right hand side
314 Foot rocker (MS 4)	• Move the crawler forward or backward on the left hand side
315 Pedal	• Foot brake - Slewing gear
316 Foot button	• Coasting slewing gear
317 LICCON Monitor 0	
318 LICCON Monitor 1	
319 LICCON Monitor 2	
320 Instrument box	• Hatz Diesel
321 Switch	• Climate control system
322 EMERGENCY OFF switch	
323 Button	• Suspension backrest
324 Switch	• Turn the seat heater on / off
325 Set screw	• Adjustment of armrest incline
326 Locking lever	• Armrest height adjustment



B108899

1.2 Control elements - instrument panel I

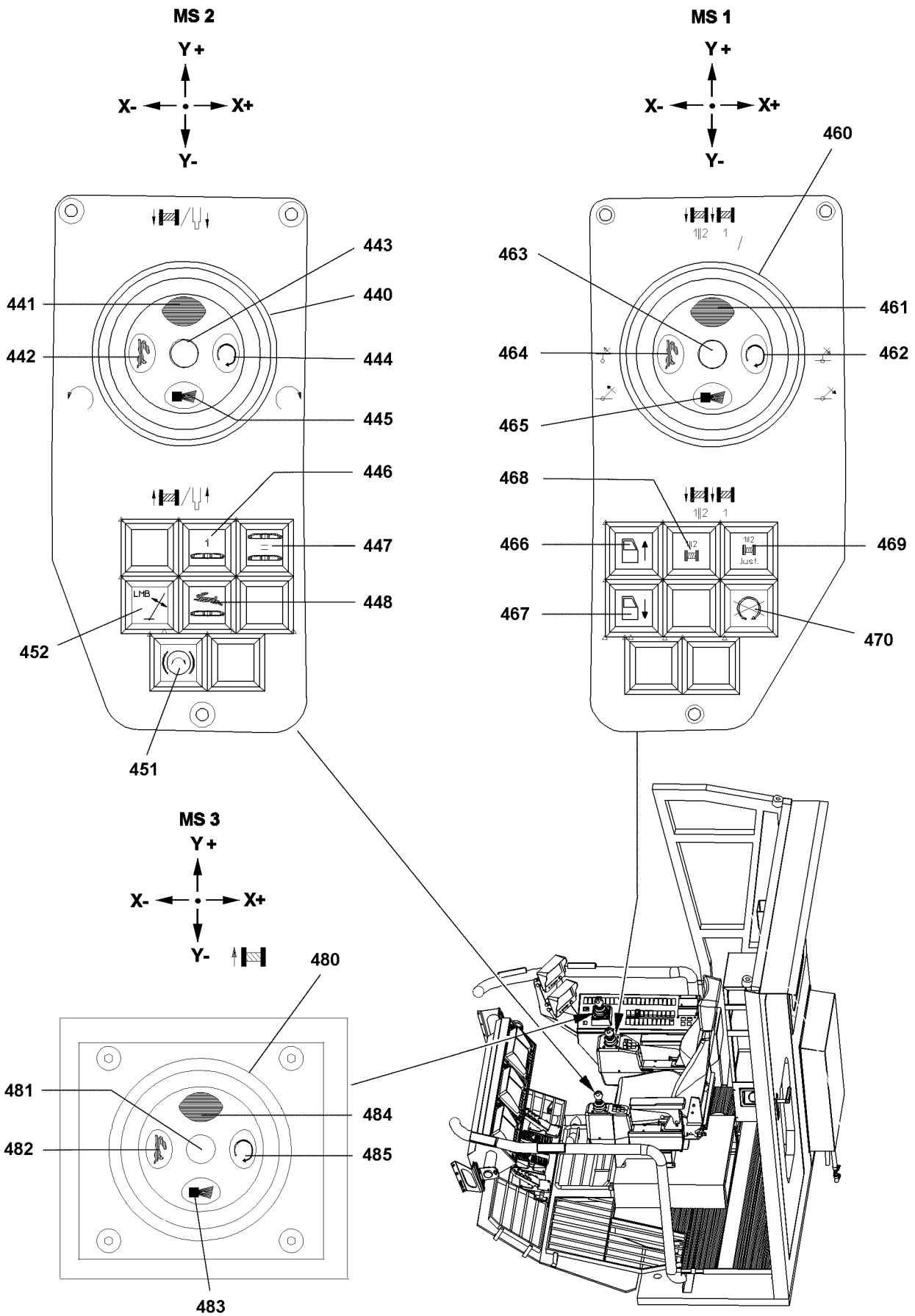
336 Switch	• Blower - front windshield
337 Switch	• Ballast trailer drive
338 Button	• ERROR Engine
	Note:
	Turn on switch 346 , press button 338 and search for engine error.
339 Error code light	• White, issue of error messages crane engine, see Crane operating instructions, chapter 7.15.
340 Error code light	• Red, issue of error messages crane engine, see Crane operating instructions, chapter 7.15.
341 Error code light	• Yellow, issue of error messages crane engine, see Crane operating instructions, chapter 7.15.
344 Switch	• Instrument panel illumination, reading light
345 Switch	• Airplane warning light
346 Switch	• DIAGNOSTICS engine
347 Switch	• Camera illumination
	• Position 1:
	• Illumination winch 3, winch 5, winch 6
	• Position 2:
	• Illumination winch 1 to winch 6
	• Illumination to the rear
348 Button	• Height adjustment working floodlight, boom pivot section
349 Switch	• Working floodlight on the boom pivot section
350 Switch	• Illumination turntable, access center section
351 Switch	• Illumination, pedestal, cab rear
352 Button	• Illumination, access center section
	• When the engine is turned off, the illumination is limited to 5 minutes.
353 Switch	• Electrical socket turntable
354 Button	• Windshield washer - system roof window
355 Switch	• Window wiper - roof window, 2 stages: 1 intermittent, 2 wipe
356 Button	• Windshield washer system front window
357 Switch	• Window wiper - front window, 2 stages: 1 intermittent, 2 wipe
358 Switch	• Window wiper skylight
359 Indicator light	• Illumination switch box and machine house
360 Switch	• Illumination switch box and machine house
361 Operating hour meter	• Recording of crane operating hours
362 Opener	• Instrument panel
363 Touch display	• Heater and air conditioning system
364 Operating hour meter	• Recording of crawler operating hours
	Note:
	The hour meter for the crawlers is located in the machine house!



B106364

1.3 Control elements - instrument panel II

342	Indicator light	• Problem central lubrication slewing ring
343	Indicator light	• Operation central lubrication slewing ring
380	Indicator light	• Ballast trailer wheels in towing position
381	Button	• Turn the ballast trailer wheels into towing position
382	Button	• Steering, turn ballast trailer wheels to the left and right
383	Indicator light	• Ballast trailer wheels turned to the left and right
384	Button	• Turn ballast trailer wheels in circular driving position
385	Button	• Turn ballast trailer wheels into parallel driving position
386	Key button	• Ballast trailer lifted off, see Crane operating instructions, chapter 5.11. <ul style="list-style-type: none"> • Press momentarily to turn on “Ballast trailer lifted off”, self retention. This is shown by the blinking warning light in button 387.
387	Button with warning light	• Ballast trailer not lifted off. <ul style="list-style-type: none"> • Press the button 387 to turn off “Ballast trailer lifted off”. The warning light in the button turns off.
388	Button	• Stop cylinder (A) on the derrick ballast
389	Button	• Stop cylinder (B) on the derrick ballast
390	Button	• Lower and raise the derrick ballast
391	Indicator light	• Ballast trailer wheels in circular driving position
392	Button	• Telescope the ballast trailer in and out
393	Indicator light	• Ballast trailer wheels in parallel driving position
394	Button	• Spool assembly winch up and out
396	Ignition switch	• Engine
397	EMERGENCY OFF switch	
400	Micro module (Mouse)	• Operation LICCON job planner
403	Switch	• Assignment of winch 6 on master switch MS3y
404	Button	• Support cylinder Ballast trailer front down and up
406	Button	• Support cylinder Ballast trailer rear down and up
408	Warning light	• Ballast trailer support retracted
409	Button	• Pressure supply for auxiliary users
410	Switch*	• Change over from Monitor 1 to Test system control ballast trailer <p>Note: Can only be switched over when the engine is off.</p>
411	Warning light	• Control ballast trailer is not running or one of the turn sensors or length sensors is defective or missing.
412	Button	• Turn off self-retention of the key button 413
413	Assembly key button	• Press momentarily to preselect Operating mode Assembly, self retention <p>Danger: The LICCON overload protection is not longer effective.</p> <p>• Note: Assembly turned on is shown by the indicator light in button 412, icon on monitor and one beacon.</p>
414	Warning light	• Engine preheating, flame start system
416	Warning light	• Charge monitoring
417	Indicator light	• Fuel condensation drainage

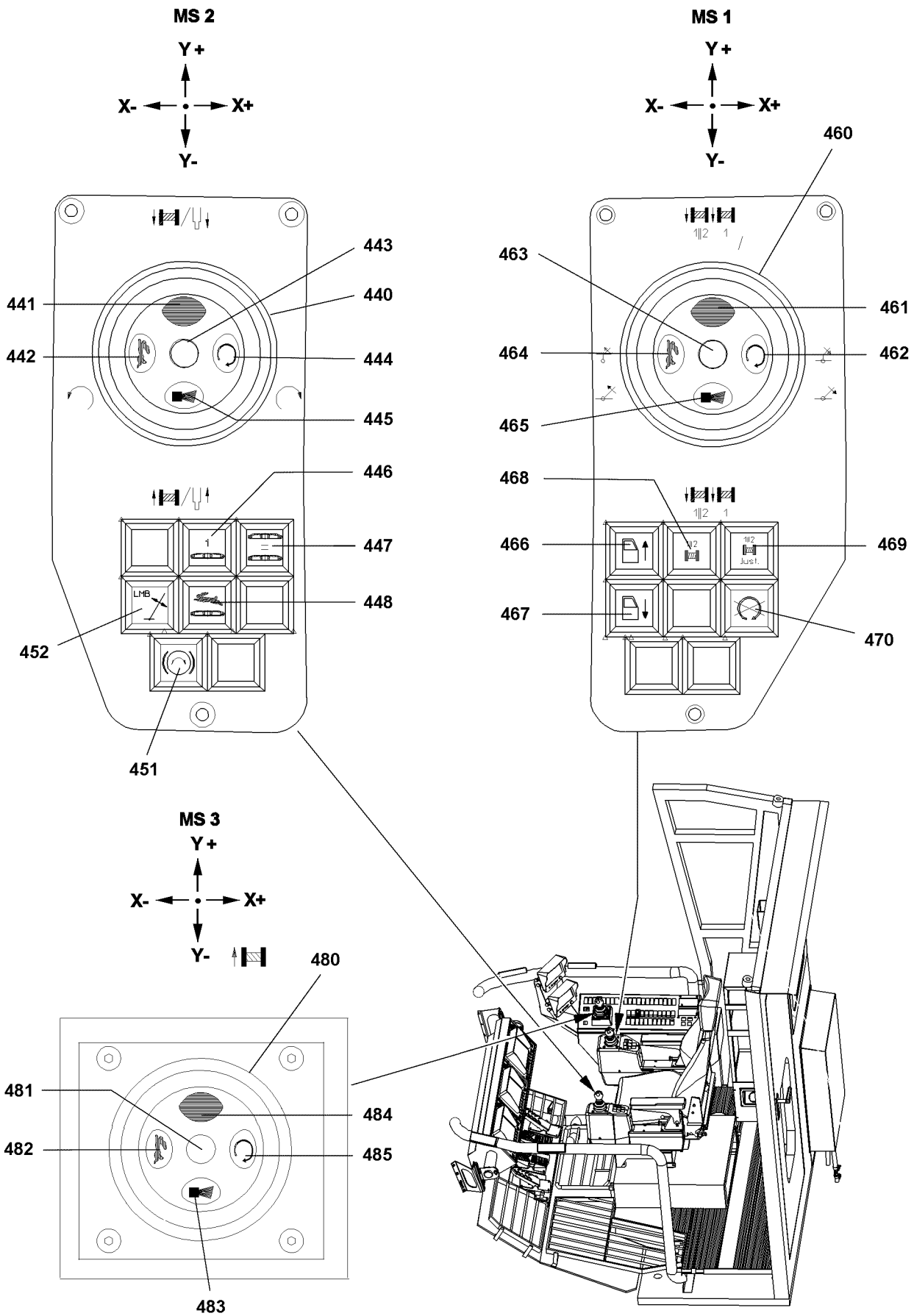


B102768

1.4 Operating elements Control panel

Control panel, left:

- | | |
|---------------------------------|--|
| 440 Master switch left (MS 2) | <ul style="list-style-type: none"> • Note:
For assignment of master switches to operating modes, see Crane operating instructions, chapter 4.05. |
| 441 Button | <ul style="list-style-type: none"> • Bypass of seat contact button. Or if the seat contact button is actuated: Addition of the vibration sensor 441 |
| 442 Button | <ul style="list-style-type: none"> • Power Plus addition, crane operation |
| 443 Vibration sensor | <ul style="list-style-type: none"> • Turn sensor, slewing gear and winches |
| 444 Button | <ul style="list-style-type: none"> • Engine rpm lock • Note:
By pressing the button 444 the engine rpm is locked in the current state. |
| 445 Button | <ul style="list-style-type: none"> • Horn |
| 446 Switch with indicator light | <ul style="list-style-type: none"> • Crawler operation On / Off • Note:
The indicator light lights up when crawler operation is "ON". |
| 447 Switch with indicator light | <ul style="list-style-type: none"> • Crawler parallel travel On / Off • Note:
The indicator light lights up when crawler parallel driving is "on". |
| 448 Switch with indicator light | <ul style="list-style-type: none"> • Crawler rapid gear On / Off • Note:
The indicator light lights up when crawler rapid gear is "on". |
| 451 Switch with indicator light | <ul style="list-style-type: none"> • Turn slewing brake Off / On • Note:
The indicator light lights up when the slewing brake is "On". |
| 452 Button | <ul style="list-style-type: none"> • Bypassing of overload protection, used to luff up at overload • Danger:
The bypass may only be used if the overload was caused by luffing down at freely suspended load and the crane operator is absolutely certain that luffing up the load will take it out of the overload range. |



B102768

Control panel, right:

460 Master switch - right
(MS 1)

461 Button

- Bypass of seat contact button. **Or** if the seat contact button is actuated: Addition of the vibration sensor **461**

462 Button

- Engine rpm lock

Note:

By pressing the button **462** the engine rpm is locked in the current state.

463 Vibration sensor

- Turn sensor, slewing gear and winches

464 Button

- Power Plus addition, crane operation

465 Button

- Horn

466 Button

- Tilting the cab upward

467 Button

- Move the cab into horizontal position

468 Switch with indicator light

- Parallel operation Winch 1 II 2

Note:

The indicator light lights up when parallel operation winch 1 II winch 2 is "On".

469 Button

- Adjusting parallel control Winch 1 II winch 2

Note:

Adjust only with parallel hook blocks, parallel control Winch 1 II winch 2.

470 Button

- Engine stop

480 Master switch 3 (MS 3)

481 Vibration sensor

- Turn sensor, slewing gear and winches

482 Button

- Power Plus addition, crane operation

483 Button

- Horn

484 Button

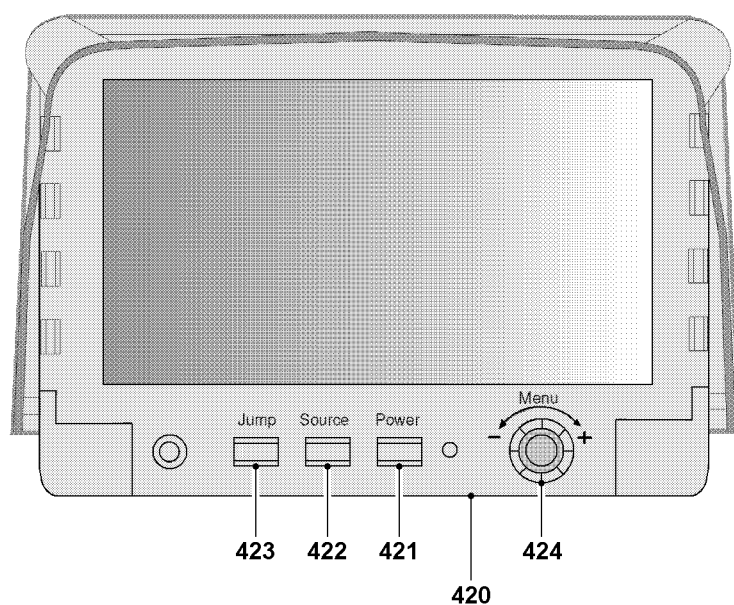
- Bypass of seat contact button. **Or** if the seat contact button is actuated: Addition of the vibration sensor **484**

485 Button

- Engine rpm lock

Note:

By pressing the button **485** the engine rpm is locked in the current state.



1.5 Camera monitoring

1.5.1 Monitor with rotary selection switch

420 TFT monitor

421 Button "Power"

422 Button "Source"

423 Button "Jump"

424 Selection knob / pressure switch

- Monitor On / Off
- By pressing the "Source" button in turned on condition, the view on the monitor is changed
- By pressing the "Jump" button, the preset camera inputs can be selected
- The selection menu on the monitor is activated by pressing the selection knob / pressure switch

Note:

If no adjustments are made after activation of selection on the monitor, then the selection turns off by itself after several seconds.

- When the selection menu is activated, a menu point can be selected by turning the selection knob / pressure switch. The selected menu point is highlighted in "yellow". Press the selection knob / pressure switch to change the color from "yellow" to "red". This selects the desired function.

Selection menu

• **Screen adjustments**

Note:

The following adjustments can be made in the menu "Screen adjustments".

- Brightness
- Contrast
- Color
- Hue
- Automatic brightness control
- Direction display
- Back

• **OSD settings**

Note:

The following adjustments can be made in the menu "OSD adjustments".

- Display
- Distance display
- Back

• **Camera adjustments**

Note:

The following adjustments can be made in the menu "Camera adjustments".

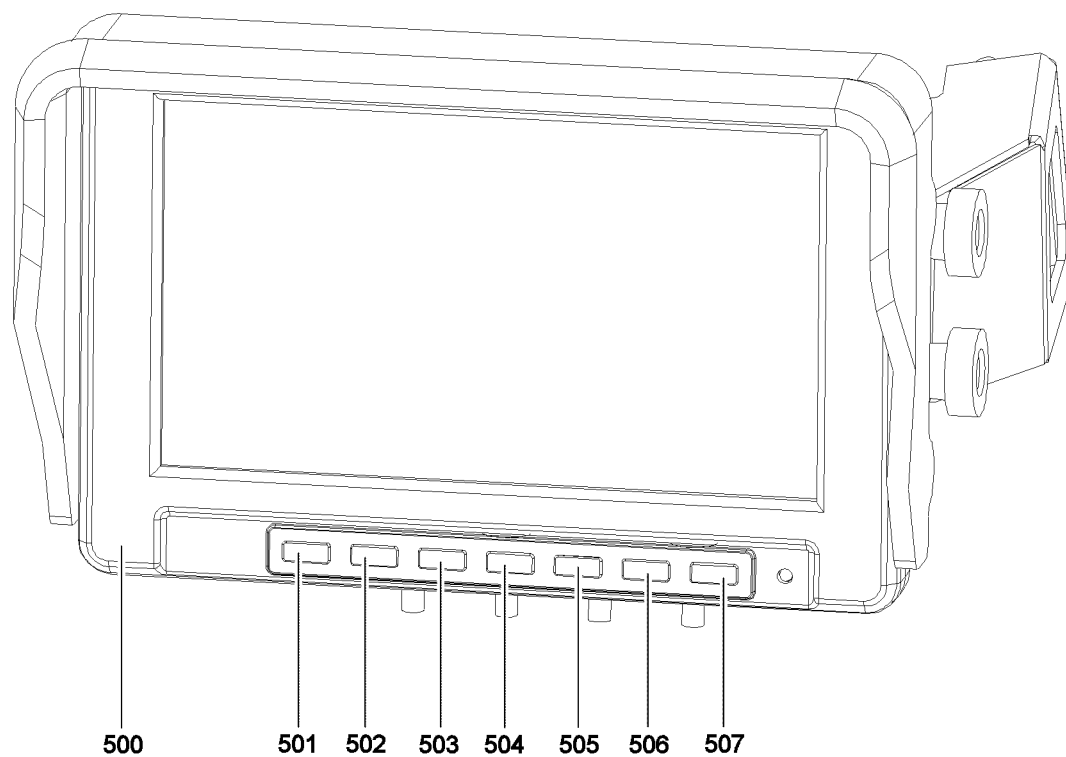
- Reflection
- Changeover
- Video outlet
- Back

• **Reset**

- The display is reset to default settings

• **Output**

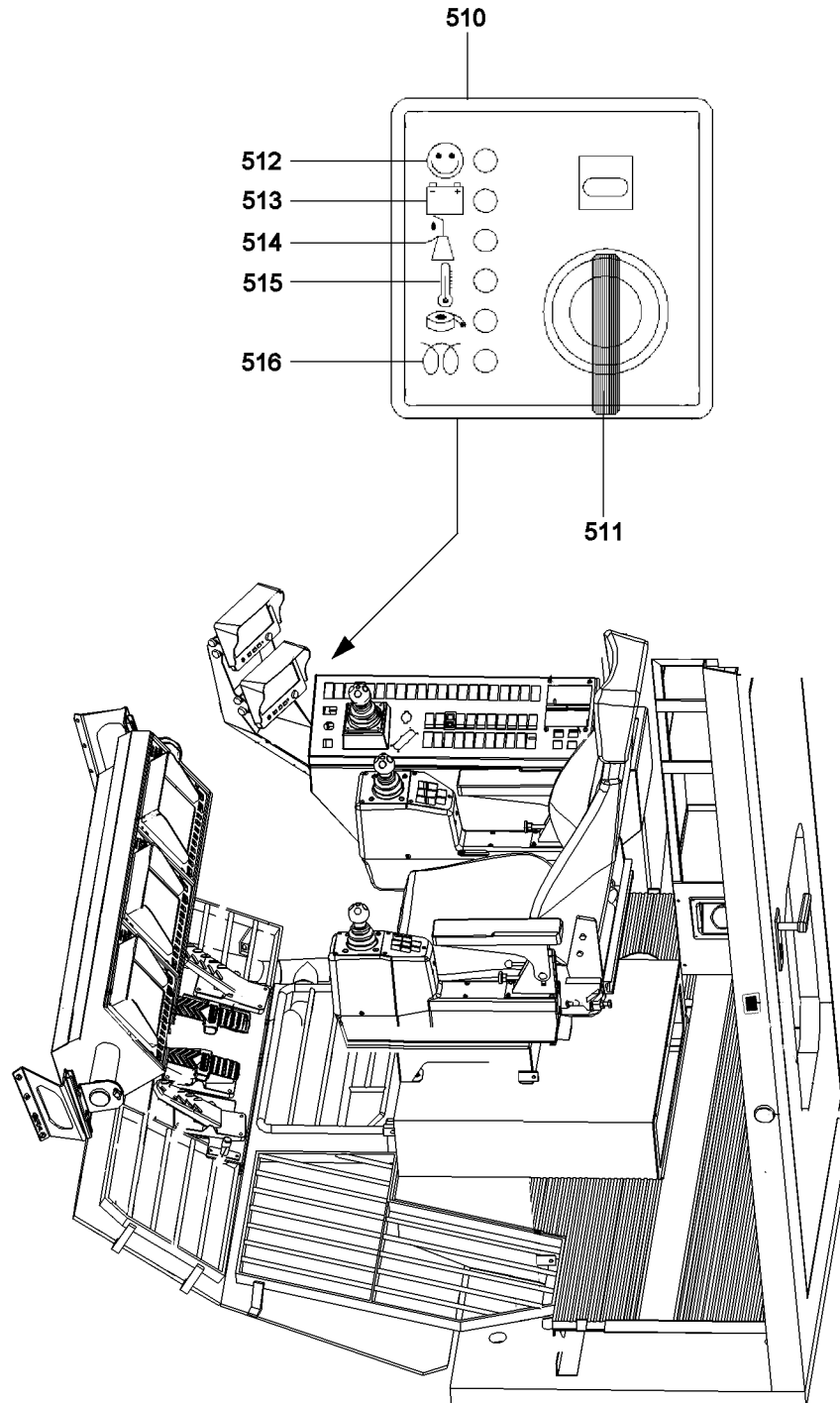
- OSD selection is ended



B107370

1.5.2 Monitor with keypad

- 500** TFT monitor
- 501** Button
- Monitor On / Off
- 502** Button “MODE”
- By pressing the button “MODE” the system changes between the individual display modes:
 - Single display mode
 - Split display mode
 - Tripled or quadrupled display mode
- 503** “Camera selection” button
- By pressing the button “Camera selection” the system changes between the cameras:
 - Single display mode:
Change between camera 1 and camera 2.
 - Split display mode:
Change between cameras 1/2, 2/3, 3/4 and camera 4/1.
 - Tripled or quadrupled display mode:
Button has no function.
- 504** Menu button
- By pressing the “Menu” button, menus for various adjustments are called up and changed over, in the following order:
 - Color:
Set color saturation.
 - Brightness:
Set brightness.
 - Contrast:
Set contrast.
 - Standard:
Reset to default settings.
 - Volume:
Set volume.
 - Language:
Set language (English, French, German, Spanish, Italian, Portuguese, Polish).
 - Mirroring:
Mirror (save) the camera screen. Return to the main menu with “Enter”. End menu with “End”.
- 505** “Minus” key
- By pressing the “Minus” key, the value of a setting is reduced.
- 506** “Plus” key
- By pressing the “Plus” key, the value of a setting is increased.
- 507** Button “Change between day / night”
- Press the button “Change over day / night” to match the brightness of the display to the time of day.



B107373

1.6 Operating elements power aggregate

510 Operating unit	• Power aggregate - diesel generator
511 Switch	• Start the Hatz Diesel engine
512 Indicator light	• Hatz Diesel engine in operation
513 Charge indicator light	
514 Indicator light	• Oil pressure
515 Warning light	• Cylinder head temperature too "high"
516 Indicator light	• The preglow display lights up at temperatures below 0 °C. Start the engine immediately after it turns off.

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 and crawler 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 on monitor **0**
- “Crane operation” program on monitor **1**
- “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 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 guying, which is measured by force test sensors.

The **boom momentum** is calculated from angle sensor information (boom angle) and the crane data (boom weights) for the set operating mode.

The **radius** is calculated with the aid of data from the angle sensors (boom angle) and the geometric 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.

1



2



3



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 .....
```

B199926

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. !!
```

B199927

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

```
LIEBHERR-WERK      EHINGEN
```

B199928

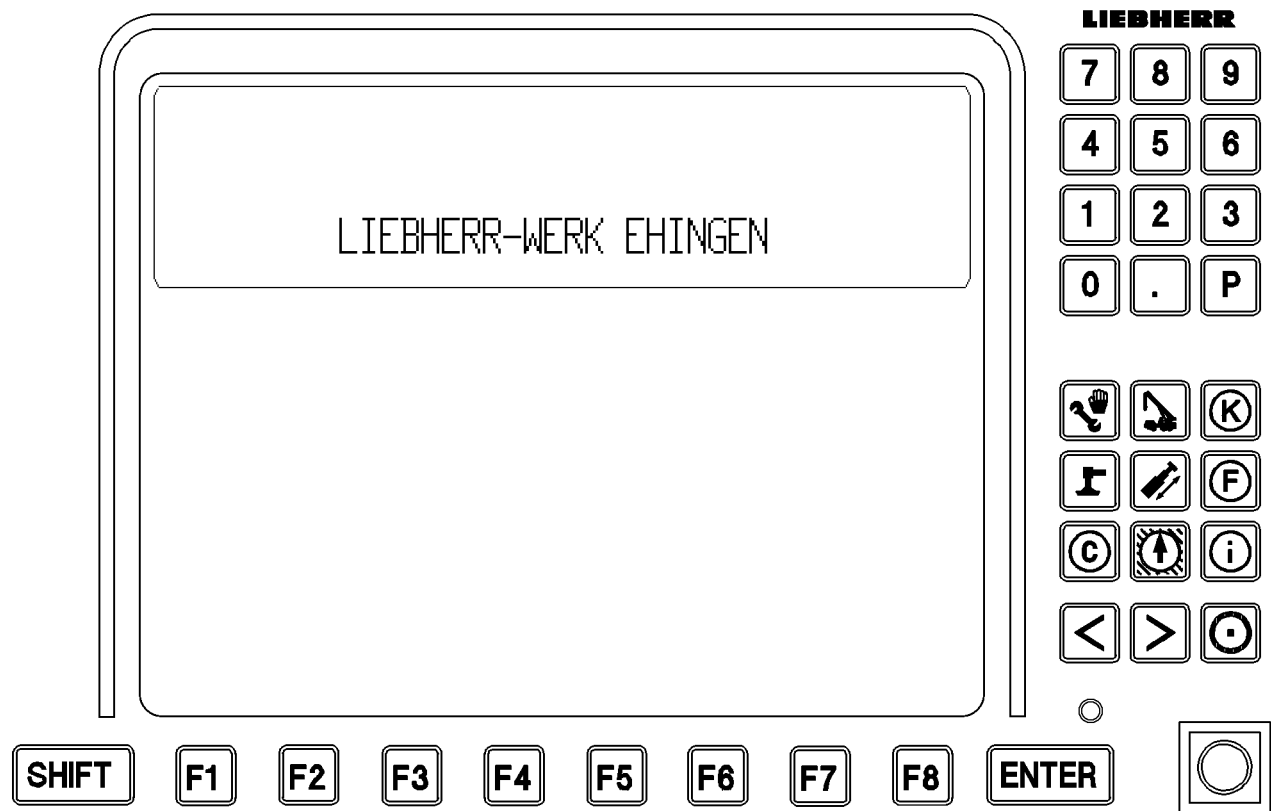
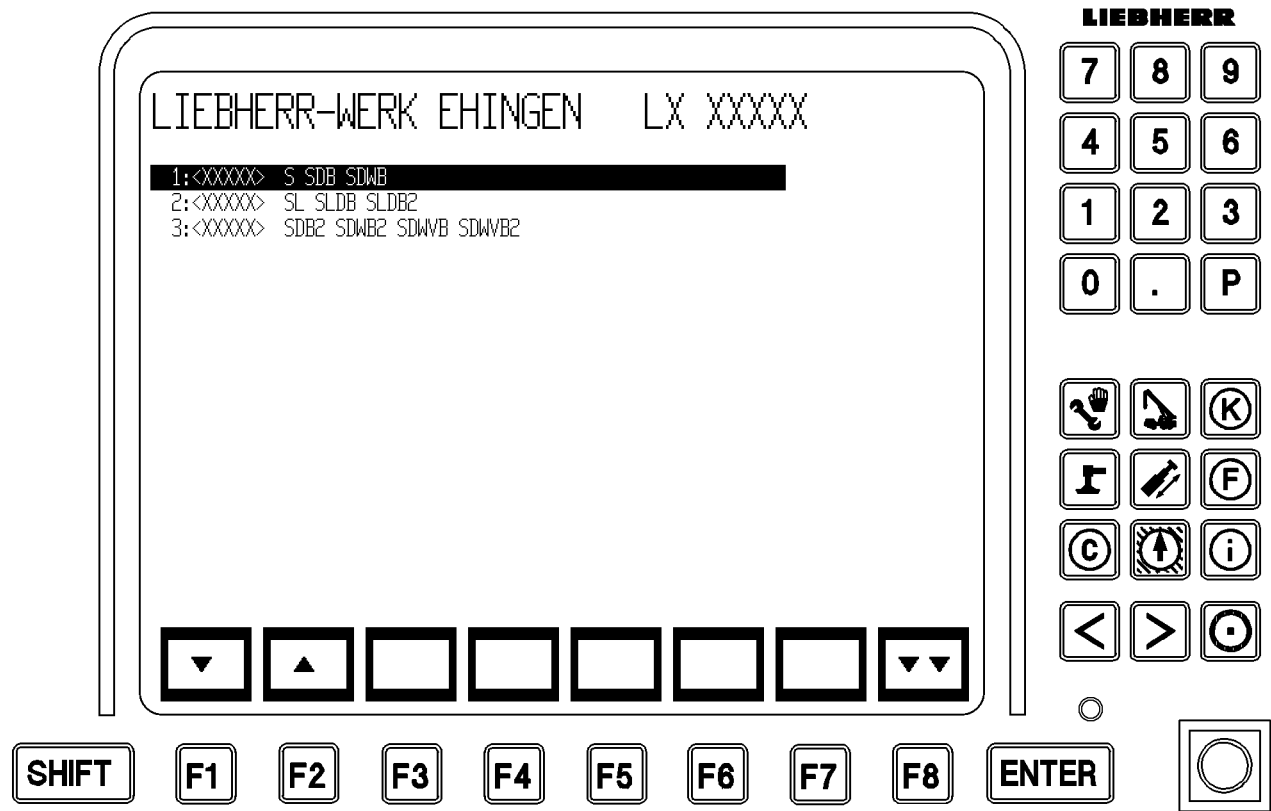


Note

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.



B199900

2.1 Operating mode preselection on the LICCON computer system



DANGER

Risk of accident!

- ▶ You may only select the operating mode selection corresponding to the actual crane setup condition.

When the starting procedure is completed successfully after a successful self test of the LICCON computer system, the following appears on:

2.1.1 Monitor 0

Monitor 0 for approx. 3 s the operating mode preselection screen.



Note

Note

- ▶ The operating mode preselection screen is skipped if the crane only has one level (for example: only S-operation) - without optional equipment - supplied. 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) and select the operating mode group required for the crane application.



Note

Note

- ▶ The selected operating mode group is highlighted in black in the operating mode preselection screen on the monitor.

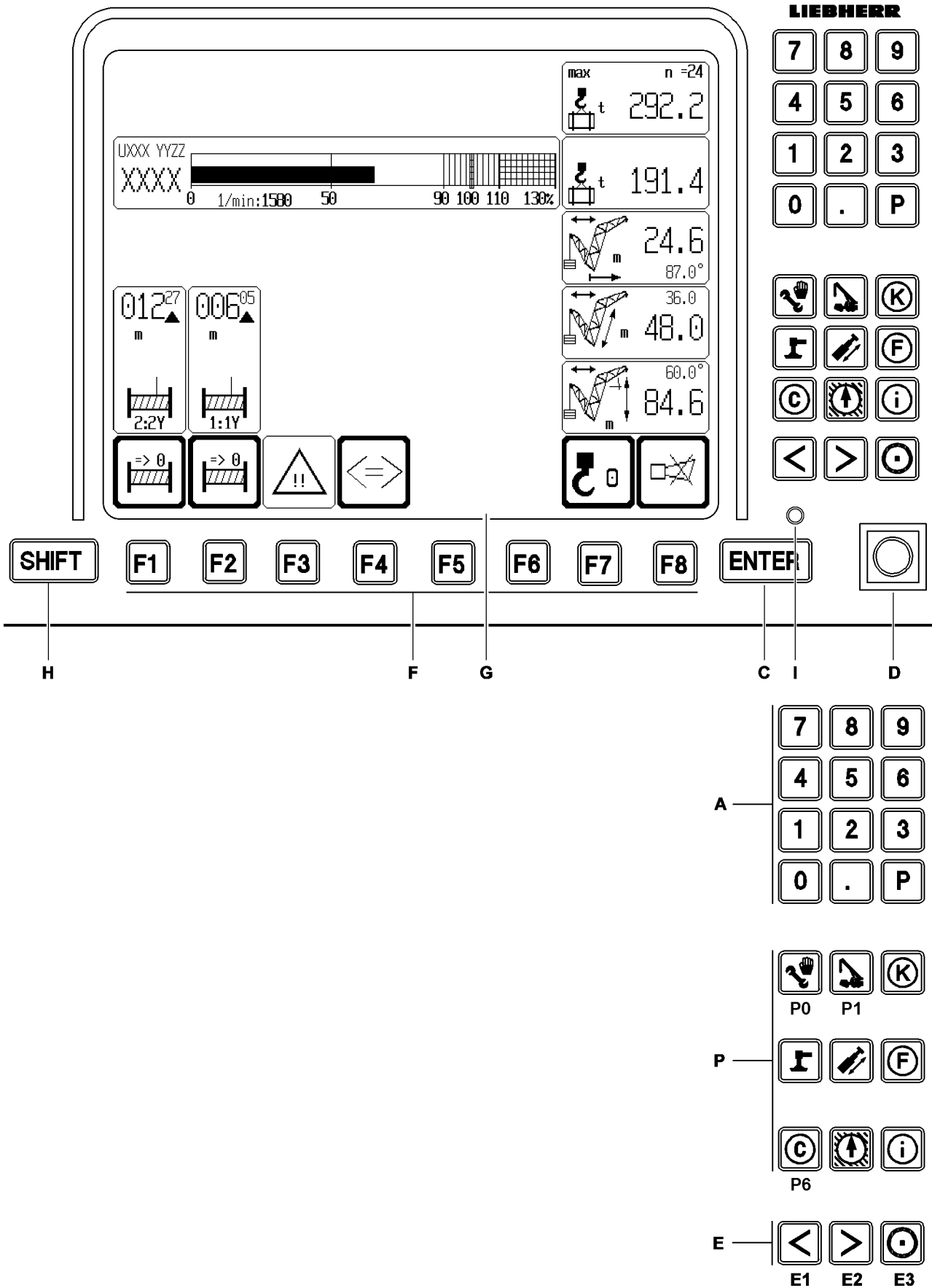
Press "F8" or "ENTER" .

Result:

- The set operating mode group is taken over into the LICCON computer system and the corresponding configuration screen appears.

2.1.2 Monitor 1

The **monitor 1** Title screen "LIEBHERR-WERK EHINGEN" .





B199901

3 Operating elements of the LICCON computer system on monitor 0

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).
P3 Not assigned	
P4 Not assigned	
P5 Not assigned	
P6 Control parameter	
P7 Not assigned	
P8 Test system	
C Input key "ENTER"	• Confirmation of changes.
D Bypass key button	• Position to right (touching) = The hoist limit switch and the LMB shut off are bypassed.
	• Centre position (self retaining) = Normal operation.
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 viewed 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 display = Power supply for monitor available	







m> t


CODE>XXXX<UXXX YYZZ .1(2)

	48°	48°	48°	48°	48°	48°	48°
14,0	! 356,0	! 455,0	! 554,0	! 586,0	! 586,0	! 586,0	! 586,0
16,0	356,0	455,0	554,0	586,0	586,0	586,0	586,0
18,0	315,0	404,0	493,0	562,0	574,0	574,0	574,0
20,0	282,0	363,0	444,0	519,0	551,0	562,0	562,0
22,0	255,0	329,0	403,0	477,0	514,0	538,0	543,0
24,0	232,0	300,0	369,0	438,0	474,0	508,0	527,0
26,0	212,0	276,0	340,0	403,0	441,0	474,0	497,0
28,0	195,0	255,0	314,0	374,0	410,0	442,0	466,0
30,0	180,0	236,0	292,0	348,0	383,0	414,0	436,0
32,0	167,0	220,0	273,0	326,0	359,0	388,0	405,0
* n *	* 13 *	* 17 *	* 21 *	* 22 *	* 22 *	* 22 *	* 22 *
1(63)							>>
xx	87,0	87,0	87,0	87,0	87,0	87,0	87,0
yy	15,0	15,0	15,0	15,0	15,0	15,0	15,0
zz	0,0	100,0	200,0	300,0	400,0	500,0	600,0



xx° SDB
48m W
36m





HHH n
24 x

O.K.

LIEBHERR

7

8

9

4

5

6

1


2


3

0


.


P






K







F

C



i





O

O

SHIFT

F1

F2

F3

F4

F5

F6

F7

F8

ENTER

O

4 “Configuration” program



Note

- ▶ All entries and settings, which are to be made by the crane operator in the configuration program can only be carried out on monitor 0.

After turning the LICCON computer system on and after correct 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 boot (change of battery or CPU, etc.), will the first valid equipment configuration screen with the first valid operating mode and the reeving number “0” appear on configuration screen.

Using the “Configuration” program, the crane operator can set the current operating mode, the current equipment configuration 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.

4.1 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.

$m > < t$

CODE>XXXX<UXXX YYZZ .1(2)

	48°	48°	48°	48°	48°	48°	48°
14,0	! 356,0	! 455,0	! 554,0	! 586,0	! 586,0	! 586,0	! 586,0
16,0	356,0	455,0	554,0	586,0	586,0	586,0	586,0
18,0	315,0	404,0	493,0	562,0	574,0	574,0	574,0
20,0	282,0	363,0	444,0	519,0	551,0	562,0	562,0
22,0	255,0	329,0	403,0	477,0	514,0	538,0	543,0
24,0	232,0	300,0	369,0	438,0	474,0	508,0	527,0
26,0	212,0	276,0	340,0	403,0	441,0	474,0	497,0
28,0	195,0	255,0	314,0	374,0	410,0	442,0	466,0
30,0	180,0	236,0	292,0	348,0	383,0	414,0	436,0
32,0	167,0	220,0	273,0	326,0	359,0	388,0	405,0
* n *	* 13 *	* 17 *	* 21 *	* 22 *	* 22 *	* 22 *	* 22 *
1(63)							>>
xx	87,0	87,0	87,0	87,0	87,0	87,0	87,0
yy	15,0	15,0	15,0	15,0	15,0	15,0	15,0
zz	0,0	100,0	200,0	300,0	400,0	500,0	600,0

xx° SDB
48m 36m

200
t

zz t
yy m

n
24 x

O.K.

LIEBHERR

7	8	9
4	5	6
1	2	3
0	.	P

SHIFT	F1	F2	F3	F4	F5	F6	F7	F8	ENTER	
-------	----	----	----	----	----	----	----	----	-------	--

$m > < t$
CODE>XXXX<UXXX YYZZ .1(2)
1

	48°	48°	48°	48°	48°	48°	48°
14,0							
16,0	356,0	455,0	554,0	586,0	586,0	586,0	586,0
18,0	315,0	404,0	493,0	562,0	574,0	574,0	574,0
20,0	282,0	363,0	444,0	519,0	551,0	562,0	562,0
22,0	255,0	329,0	403,0	477,0	514,0	538,0	543,0
24,0	232,0	300,0	369,0	438,0	474,0	508,0	527,0
26,0	212,0	276,0	340,0	403,0	441,0	474,0	497,0
28,0	195,0	255,0	314,0	374,0	410,0	442,0	466,0
30,0	180,0	236,0	292,0	348,0	383,0	414,0	436,0
32,0	167,0	220,0	273,0	326,0	359,0	388,0	405,0
* n *	* 13 *	* 17 *	* 21 *	* 22 *	* 22 *	* 22 *	* 22 *
1(63)							>>
xx	87,0	87,0	87,0	87,0	87,0	87,0	87,0
yy	15,0	15,0	15,0	15,0	15,0	15,0	15,0
zz	0,0	100,0	200,0	300,0	400,0	500,0	600,0

xx° SDB
48m 36m

200
t

zz t
yy m

n
24 x

O.K.

F1

F2

F3

F4

F5

F6

F7

F8

B199903

4.2 “Configuration” program areas

The monitor is divided into three areas in the “Configuration” program:

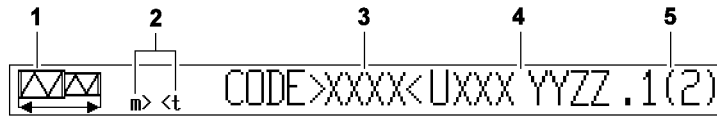
- General information line **1**
- Display area of load chart values **2**
- Function key line **3**



Note

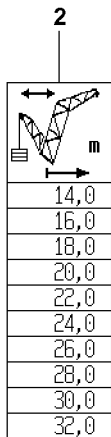
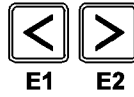
Note

- ▶ 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.
-



4.2.1 General information line

- | | |
|-------------------------------|--|
| 1 Icon "Main boom length" | <ul style="list-style-type: none">• The icon is identical for all operating modes. |
| 2 Abbreviations | <ul style="list-style-type: none">• For the programmed length units (LE) and weight units (GE).
Possible length units (LE) are [m] and [ft].
Possible weight units (GE) are [t] and [lbs]. |
| 3 4-digit short code | <ul style="list-style-type: none">• 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 organisation number | <ul style="list-style-type: none">• Relates to the set load chart.• Operating mode-dependent.• Example: BXXX YYZZ<ul style="list-style-type: none">• 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 | <ul style="list-style-type: none">• 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 stand in parentheses. |



48 ⁰	48 ⁰	48 ⁰	48 ⁰	48 ⁰	48 ⁰	48 ⁰	1
-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	---

356,0	455,0	554,0	586,0	586,0	586,0	586,0	
315,0	404,0	493,0	562,0	574,0	574,0	574,0	
282,0	363,0	444,0	519,0	551,0	562,0	562,0	
255,0	329,0	403,0	477,0	514,0	538,0	543,0	3
232,0	300,0	369,0	438,0	474,0	508,0	527,0	
212,0	276,0	340,0	403,0	441,0	474,0	497,0	
195,0	255,0	314,0	374,0	410,0	442,0	466,0	
180,0	236,0	292,0	348,0	383,0	414,0	436,0	
167,0	220,0	273,0	326,0	359,0	388,0	405,0	

* n *	* 13 *	* 17 *	* 21 *	* 22 *	* 22 *	* 22 *	* 22 *	4
-------	--------	--------	--------	--------	--------	--------	--------	---

1(63)							>>	5
-------	--	--	--	--	--	--	----	---

xx	87,0	87,0	87,0	87,0	87,0	87,0	87,0	6
----	------	------	------	------	------	------	------	---

yy	15,0	15,0	15,0	15,0	15,0	15,0	15,0	7
----	------	------	------	------	------	------	------	---

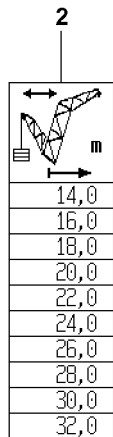
zz	0,0	100,0	200,0	300,0	400,0	500,0	600,0	8
----	-----	-------	-------	-------	-------	-------	-------	---

4.2.2 Display area of load chart values

- | | |
|--------------------------------|---|
| 1 Main boom lengths | <ul style="list-style-type: none"> • In [m] or [ft]. Maximum of 7 columns per display page. |
| 2 Icon "Boom radius" | <ul style="list-style-type: none"> • Operating mode-dependent. • In [m] or [ft]. • Maximum 10 lines of boom radius values. • Vertical axis of load value field. |
| 3 Load value field | <ul style="list-style-type: none"> • Columns beneath the boom lengths and in the lines to the right of radius values. • Load values depending on boom length and radii. |
| 4 Reeving number of hoist rope | <ul style="list-style-type: none"> • * 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 in single winch operation. • Note: <ul style="list-style-type: none"> • 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. • Note: <ul style="list-style-type: none"> • For parallel operation of winches I and II, always reeve in an even reeving. • If the minimum value of the reeving is uneven, then in parallel operation of the winches the next higher reeving must possibly be selected. • Enter and confirm the reeving on the LICCON monitor 0, according to the reeving on the boom head. |
| 5 Line for special displays | <ul style="list-style-type: none"> • 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 in this line indicate that there are additional chart 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, for example, 1(63) corresponds to the first of 63 columns. • Note: <ul style="list-style-type: none"> 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). |

SHIFT

< E1 > E2



48° 48° 48° 48° 48° 48° 48° — 1

14,0	356,0	455,0	554,0	586,0	586,0	586,0	586,0
16,0	315,0	404,0	493,0	562,0	574,0	574,0	574,0
18,0	282,0	363,0	444,0	519,0	551,0	562,0	562,0
20,0	255,0	329,0	403,0	477,0	514,0	538,0	543,0
22,0	232,0	300,0	369,0	438,0	474,0	508,0	527,0
24,0	212,0	276,0	340,0	403,0	441,0	474,0	497,0
26,0	195,0	255,0	314,0	374,0	410,0	442,0	466,0
28,0	180,0	236,0	292,0	348,0	383,0	414,0	436,0
30,0	167,0	220,0	273,0	326,0	359,0	388,0	405,0
32,0							

* n * * 13 * * 17 * * 21 * * 22 * * 22 * * 22 * * 22 * — 4

1(63) >> — 5

xx 87,0 87,0 87,0 87,0 87,0 87,0 87,0 — 6

yy 15,0 15,0 15,0 15,0 15,0 15,0 15,0 — 7

zz 0,0 100,0 200,0 300,0 400,0 500,0 600,0 — 8

6 Main boom angle

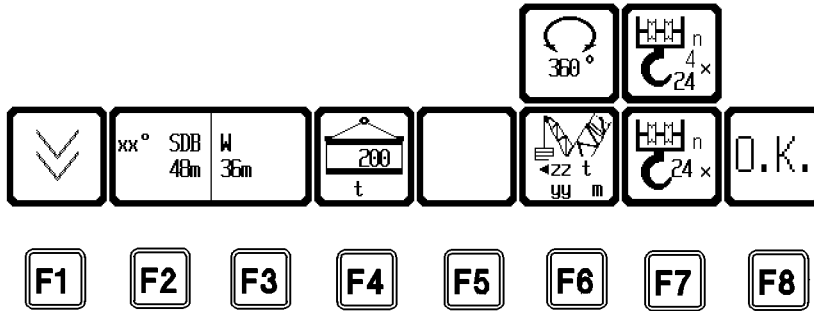
- Line **xx**
- In [°].
- **Note:**
Appears **only** in operating modes with luffing lattice jib.
 - **Main geometry:**
 - Appears “**xx**°” in main geometry icon (for example: “**xx**° **SDB**”) means “**xx**°” = main boom angle in [°].
 - In the line **xx** the main boom angles are listed, which must be set in order to be able to lift the load values in the corresponding load chart column.
 - **Auxiliary geometry:**
 - Appears “**xx**°” in auxiliary geometry icon (for example: “**WV**” “**xx**°”) means “**xx**°” = jib relative angle in [°].
- **Note:**
Jib relative angle means: The jib angle is determined relative to the main boom angle (main boom angle on pulley head, jib angle bottom).
- In the load chart columns, the jib relative angles, which must be set to be able to lift the load values in the corresponding load chart column are listed next to each other.

7 Derrick ballast radius

- Line **yy**
- In [m] or [ft].
- **Note:**
Appears **only** in operating modes with derrick ballast.
- In the line **yy** the derrick ballast radii are listed, which must be set in order to be able to lift the load values in the corresponding load chart column.

8 Derrick ballast weight

- Line **zz**
- In [t] or [lbs].
- **Note:**
Appears **only** in operating modes with derrick ballast.
- In the line **zz** the derrick ballast weights are listed, which must be attached in order to be able to lift the load values in the corresponding load chart column.



4.2.3 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.

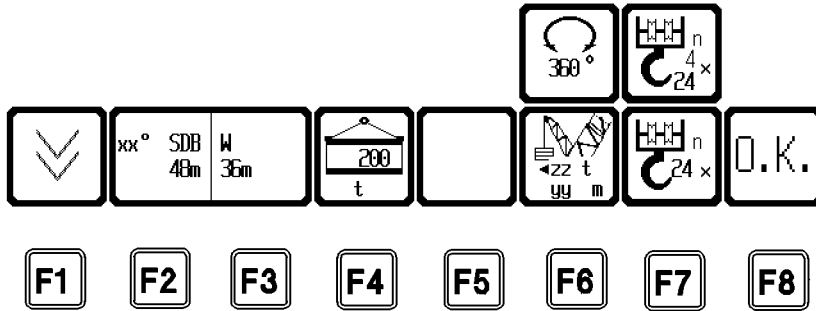
Various functions are indicated by the function key icons, or they may refer to changes of:

- Operating mode and
- equipment configuration.

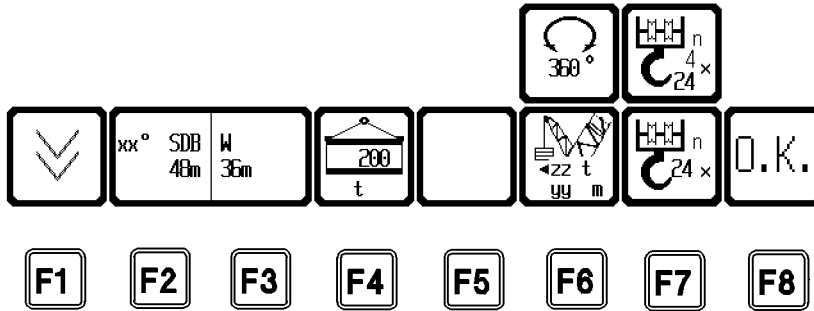
Not all function keys have to be assigned icons on the LICCON monitor. This depends on the program selection.

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

- | | |
|--------------------------------|--|
| F1 Vertical paging | <ul style="list-style-type: none"> • Depending on the size of the monitor, up to 10 load chart lines can be displayed at once. If a chart consists of more than 10 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 incremented by 1. When the last page is reached, page 1 will appear again after pressing the function key F1. |
| F2 Main geometry status | <ul style="list-style-type: none"> • Adjustment possibility of different main boom operating modes and main boom lengths of the crane (if available). The types are described by abbreviations and length data in the icon. • Example:
xx° SDB 48 m. |
| SHIFT and F2 | <ul style="list-style-type: none"> • Previous main geometry status (if present). |



- F3 Accessories**
- Options for selecting the different accessory types of the crane (if available). The types are described using abbreviations, angle and length data in the icon.
 - Example:
W 36 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:**
 - Boom length icon in the general information line.
 - Length units and weight units.
 - Load chart organisation number.
 - Boom radius icon.
 - Boom length data.
 - **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**
- F4 Counterweight**
- Previous accessory geometry status (if present).
 - Adjustment possibility for current counterweight, which must be on the turntable in order to obtain the values in the current chart. When pressing a key, the following icon appears with additional text in the counterweight icon.
 - Example:
"200.0 t" = total counterweight of 200.0 t.
- F5 Chassis**
- In operating modes, where there are various chassis versions (for example: Ballast on chassis), this can be set with "**F5**".



- F6** Slewing area or derrick ballast radius and weight
- In crane operating modes **without** derrick ballast, when pressing **F6**, the “slewing range icon 360°” appears.
 - In crane operating modes **with** derrick ballast, when pressing **F6**, the combined crane icon appears with:
Derrick ballast radius **yy** in [m] or [ft] and derrick ballast weight **zz** in [t] or [lbs].
- F7** Hoist rope reeving
- Adjustment possibility for the **number of hoist rope strands on the boom** (lower number) to obtain a certain load carrying 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”.



Note

- ▶ For parallel operation of hoist winches (11I2), at hoist rope reeving, enter the total reeving of winch 1 and winch 2 on the LICCON computer system (Example: Winch 1 and winch 2 are each reeved 7 ways, the total reeving is therefore n=14).
 - ▶ The total reeving **must** always show an even number value in parallel operation!
-

E3 and F7

- The reeving number (upper number) for the **hoist rope reeving of the boom nose*** is increased by 1 each time the key is pressed, see “F7”.
- **Note:**

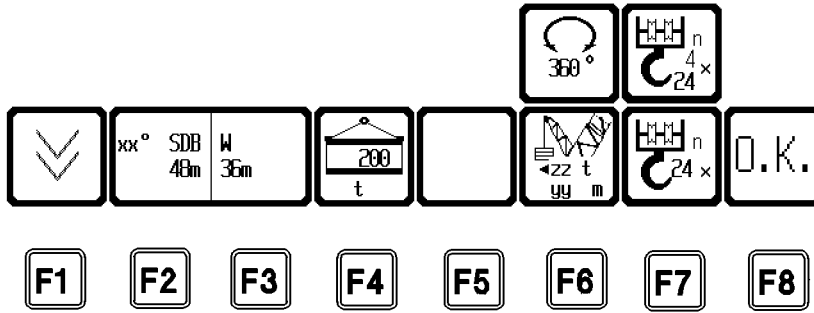
The reeving for the boom nose (upper number) is only shown if the boom nose is assembled. If the boom nose is assembled during operation, then the reeving of the boom nose must be correctly entered in the “Configuration” program.

SHIFT and F7

- Reeving number on boom (lower number in “Reeving” icon) is reduced by 1.

SHIFT and E3 and F7

- Reeving number on boom nose* (upper number in “Reeving” icon) is reduced by 1.



F8 Confirmation of selected equipment configuration**• Prerequisites:**

Setting the equipment configuration must be fully completed, i.e. a valid short code is displayed and load capacity values are in the chart field.

The external conditions for this equipment configuration, if stipulated, must be met.

The crane may not be utilised in the previous equipment configuration by more than 20 %. 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.

Note:

Make sure that after switching to the operating screen, the chosen equipment configuration (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 always placed on top in the error stack, see separate "Diagnostics manual".

CODE>XXXX<UXXX YYZZ .1(2)

	48°	48°	48°	48°	48°	48°	48°
14,0	! 356,0	! 455,0	! 554,0	! 586,0	! 586,0	! 586,0	! 586,0
16,0	356,0	455,0	554,0	586,0	586,0	586,0	586,0
18,0	315,0	404,0	493,0	562,0	574,0	574,0	574,0
20,0	282,0	363,0	444,0	519,0	551,0	562,0	562,0
22,0	255,0	329,0	403,0	477,0	514,0	538,0	543,0
24,0	232,0	300,0	369,0	438,0	474,0	508,0	527,0
26,0	212,0	276,0	340,0	403,0	441,0	474,0	497,0
28,0	195,0	255,0	314,0	374,0	410,0	442,0	466,0
30,0	180,0	236,0	292,0	348,0	383,0	414,0	436,0
32,0	167,0	220,0	273,0	326,0	359,0	388,0	405,0
* n *	* 13 *	* 17 *	* 21 *	* 22 *	* 22 *	* 22 *	* 22 *
1(63)							>>
xx	87,0	87,0	87,0	87,0	87,0	87,0	87,0
yy	15,0	15,0	15,0	15,0	15,0	15,0	15,0
zz	0,0	100,0	200,0	300,0	400,0	500,0	600,0

xx° SDB
48m W
36m

200
t

zz t
yy m

n
24 x

O.K.

LIEBHERR

7

8

9

4

5

6

1

2

3

0

.

P

K

F

C

i

<

>

⊙

SHIFT

F1

F2

F3

F4

F5

F6

F7

F8

ENTER

H

C

D

7

8

9

4

5

6

1

2

3

0

.

P

K

P0

P1

F

P6

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⊙

E1

E2

E3

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4.2.4 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.
 - **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.
 - **ENTER** 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 “Bxxx??”, and the acoustic signal “horn” sounds.
 - **ENTER** after a change in the equipment configuration using the function keys **F4** and **F5**, as well as 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.

CODE>XXXX<UXXX YYZZ .1(2)

	48°	48°	48°	48°	48°	48°	48°
14,0	! 356,0	! 455,0	! 554,0	! 586,0	! 586,0	! 586,0	! 586,0
16,0	356,0	455,0	554,0	586,0	586,0	586,0	586,0
18,0	315,0	404,0	493,0	562,0	574,0	574,0	574,0
20,0	282,0	363,0	444,0	519,0	551,0	562,0	562,0
22,0	255,0	329,0	403,0	477,0	514,0	538,0	543,0
24,0	232,0	300,0	369,0	438,0	474,0	508,0	527,0
26,0	212,0	276,0	340,0	403,0	441,0	474,0	497,0
28,0	195,0	255,0	314,0	374,0	410,0	442,0	466,0
30,0	180,0	236,0	292,0	348,0	383,0	414,0	436,0
32,0	167,0	220,0	273,0	326,0	359,0	388,0	405,0
* n *	* 13 *	* 17 *	* 21 *	* 22 *	* 22 *	* 22 *	* 22 *
1(63)							>>
xx	87,0	87,0	87,0	87,0	87,0	87,0	87,0
yy	15,0	15,0	15,0	15,0	15,0	15,0	15,0
zz	0,0	100,0	200,0	300,0	400,0	500,0	600,0

xx° SDB
48m W
36m

200
t

zz t
yy m

n
24 x

O.K.

LIEBHERR

7

8

9

4

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0

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P

K

F

C

i

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>

⊙

SHIFT

F1

F2

F3

F4

F5

F6

F7

F8

ENTER

H

C

D

7

8

9

4

5

6

1

2

3

0

.

P

K

P0

P1

F

P6

i

E1

E2

E3

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E Horizontal paging**• Note:**

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 (>>) or at the left edge of the line (<<) points to additional columns in either direction.
- Press "**E2**" to display the next right chart column.
- Press "**E1**" to display the next left chart column.

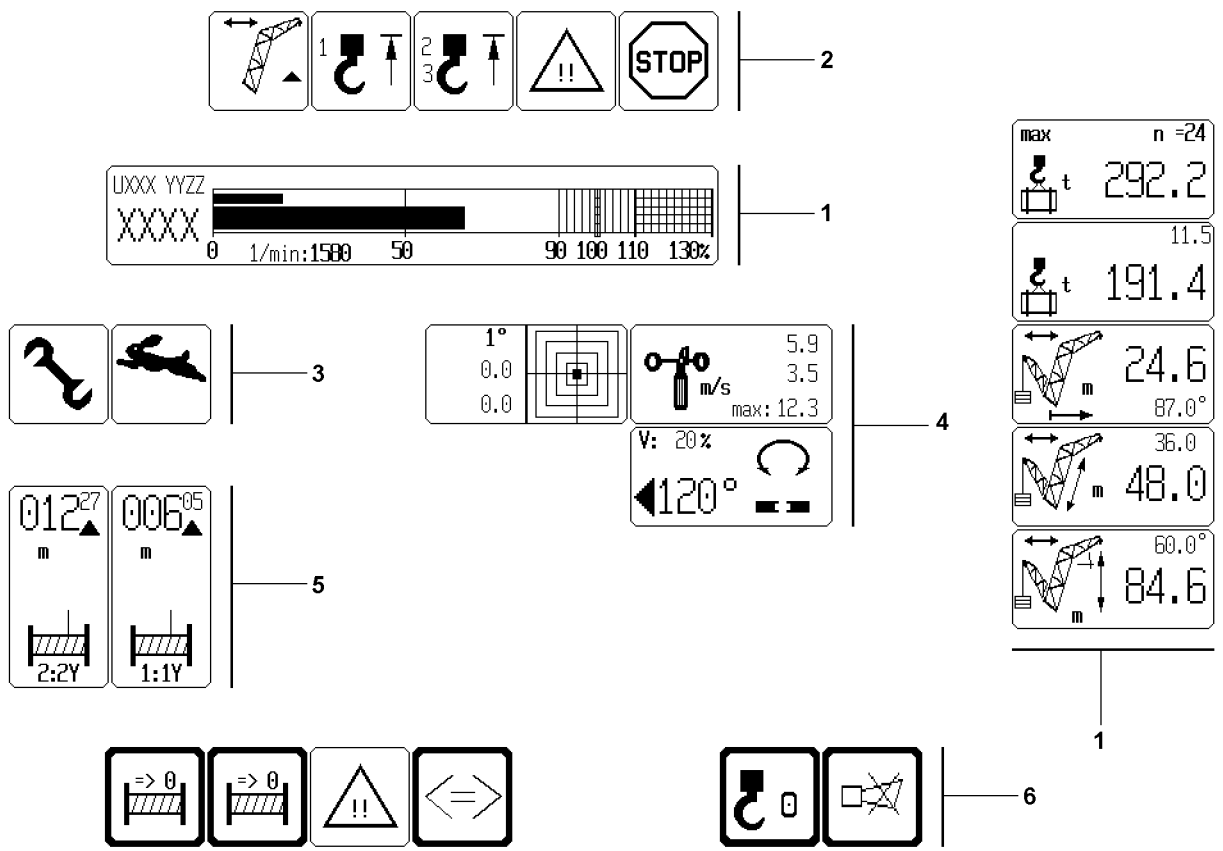
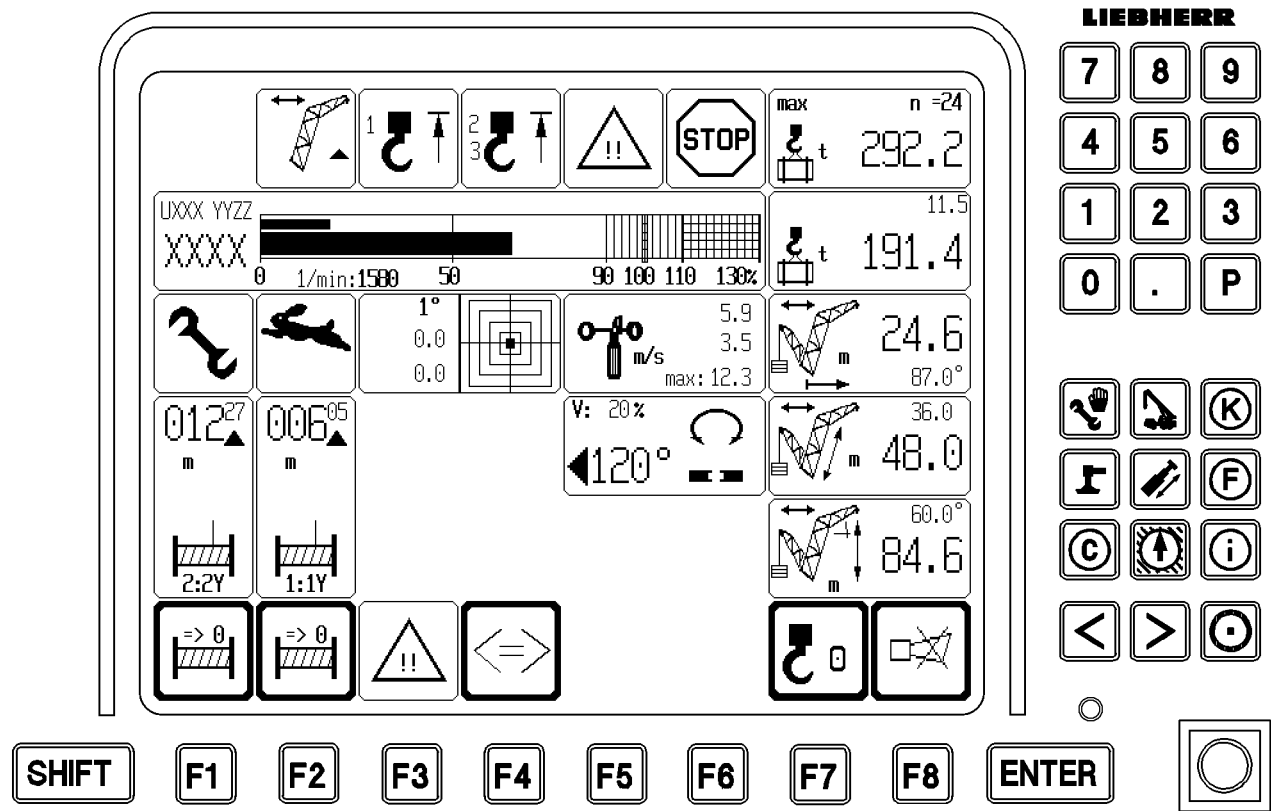
• Note:

Using the key combination **SHIFT** and **E1** (<<) or **SHIFT** and **E2** (>>), you can, where possible, page to the left or right by 7 load chart columns (corresponds to 1 page).

H SHIFT key

• For example Supervisory function.

- By pressing and holding down the **SHIFT** key and then pressing one of the function keys, which must correspond to the corresponding function, the previous main geometry status, the auxiliary geometry status and the previous reeving are reset.



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5 The “Crane operation” program on monitor 0

The LICCON program “Crane operation” assists the crane operator by displaying the data needed for operating the crane clearly on **Monitor 0**. 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:

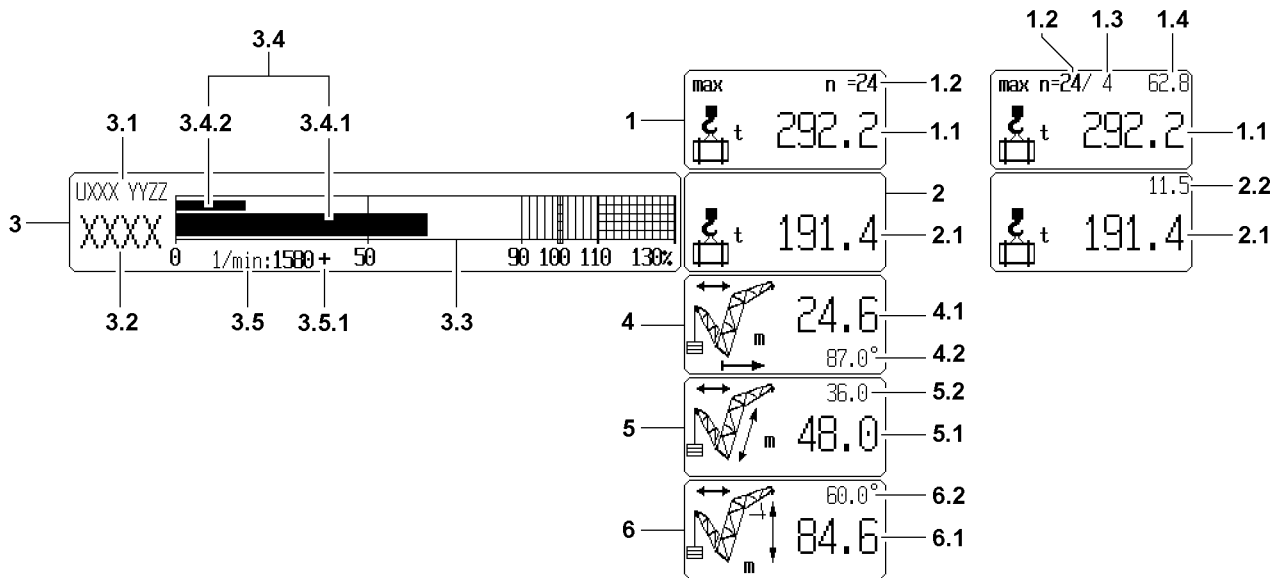
- Crane geometry and load information **1**
- Alarm functions **2**
- Special functions **3**
- Monitored auxiliary functions **4**
- Winch display **5**
- Function key line **6**



Note

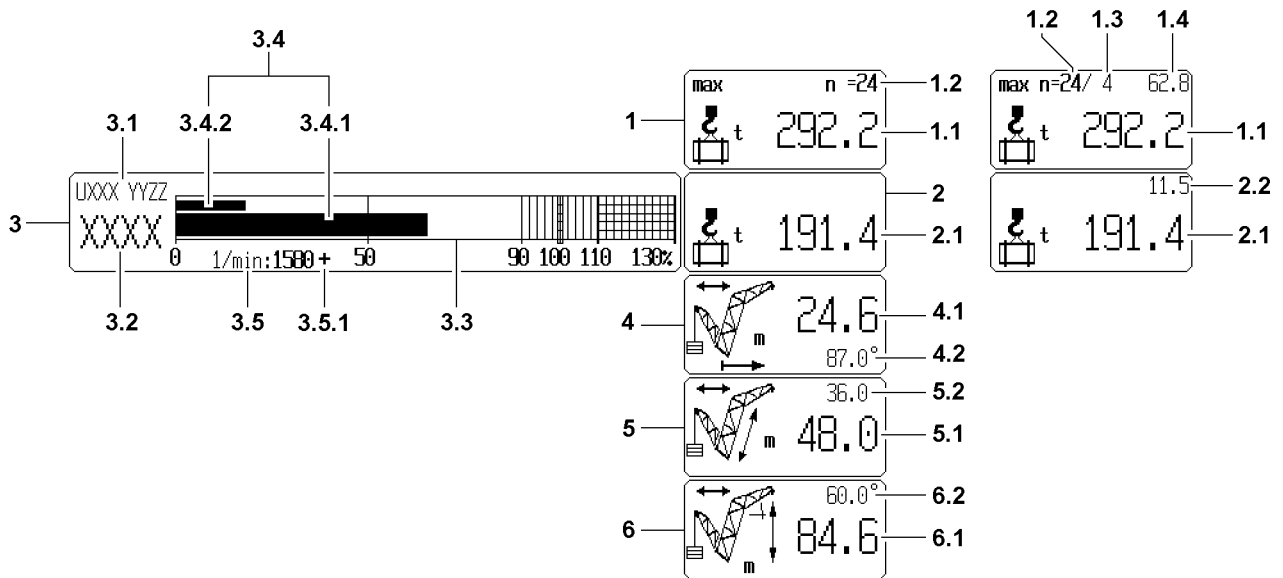
Note

- ▶ 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!
-

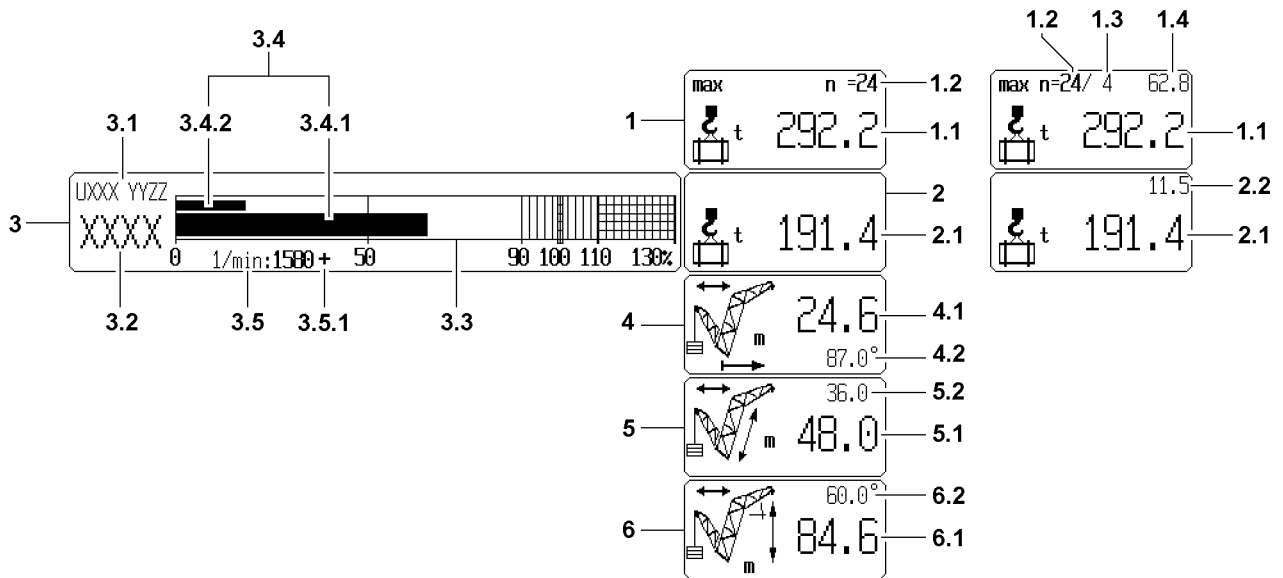


5.1 Crane geometry and load information

- 1** Icon "Maximum load"
- In [t] or [lbs].
- 1.1** Maximum load according to load chart and reeving on boom
- In [t] or [lbs].
 - It depends on:
 - The selected operating mode.
 - The selected configuration (load chart).
 - The boom radius.
 - The main boom angle or the jib relative angle*.
 - The derrick ballast radius*.
 - The currently pulled derrick ballast weight.
 - The reeving of the hoist rope on the boom.
 - **Note:**
The "maximum load according to the load chart and the reeving on the boom" is the maximum load, which the crane can lift in its current operating condition.
 - **Note:**
"???.?" is shown 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 or the current operating condition cannot be calculated.
- 1.2** Reeving number of the hoist rope on the boom
- n = reeving number of hoist rope that is reeved at the pulley head on the boom, which has been selected via the load chart (previously selected in the "Configuration" program).
- 1.3** Reeving number of hoist rope on boom nose*
- Reeving number of hoist rope, which has been set on the installed boom nose* (as been previously set in the "Configuration" program).
- 1.4** Maximum load carrying capacity of the installed boom nose*
- In [t] or [lbs].
 - **Note:**
The "maximum load carrying capacity" of the boom nose* depends only on the set reeving of the boom nose*.
 - **Note:**
The maximum load carrying capacities on the boom (1.1) and on the boom nose* (1.4) are monitored simultaneously. If the load carrying capacity is exceeded on the boom or on the installed boom nose*, then an LMB-Stop is triggered. Hoist gear up function is shut off on all hoist gears. Luffing down function is shut off on all booms.



- 2** Icon "Current load"
- 2.1** Current load on the boom
- In [t] or [lbs].
 - Actual or current load display = Load in [t] or [lbs] that is currently suspended on the selected boom.
 - Display of the calculated total load including the weights of the carrying equipment, the lifting equipment (hook block) and/or the tackle, but **without** the nominal weight of the hoist rope. 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.
- 2.2** Current load on the boom nose*
- Actual load display = Load in [t] or [lbs] that is currently suspended on the boom nose*.
 - Display of the calculated total load on the boom nose*, including the weights of the carrying equipment, the lifting equipment (hook block) and / or the tackle, **including** the hoist rope. 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.



- 3** Icon “Dynamic utilization bar display”
- In percent [%].
- 3.1** 8-digit organisation 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 with load of 100 %: **STOP shut-off.**
- 3.4** Utilization bar
- 3.4.1** Utilization bar of crane
- According to load chart and reeving.
 - **Note:**
The utilization bar is the measurement for the current utilization of the crane.

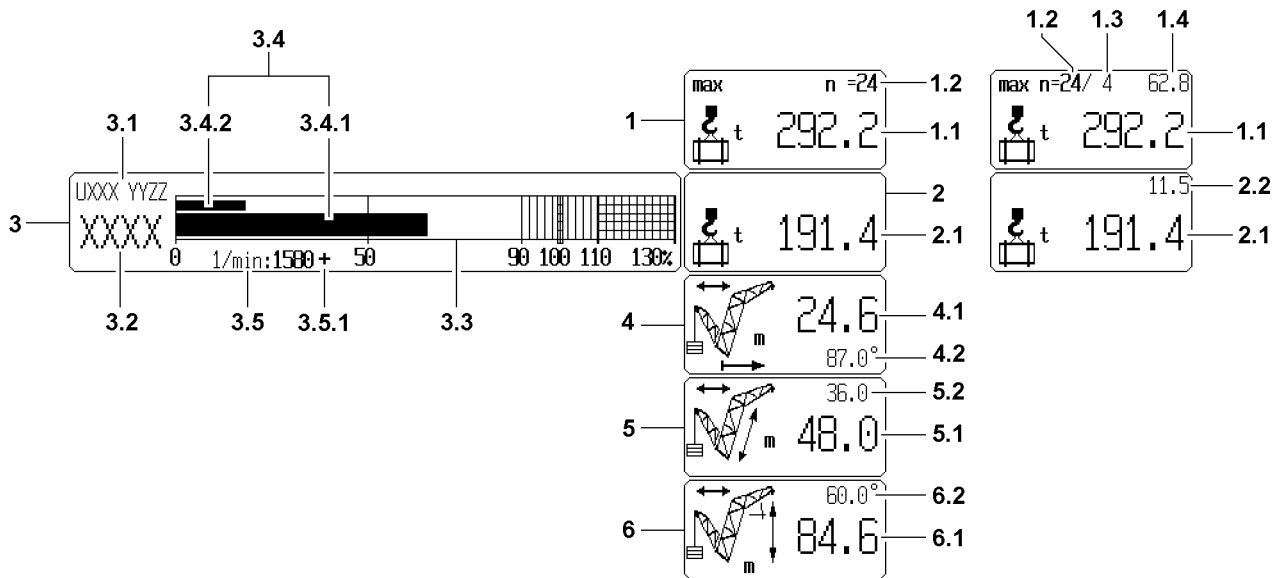
$$\text{Utilization of crane according to load chart and reeving} = \frac{\text{Current load on the boom head}}{\text{Maximum load according to load chart and reeving}}$$

3.4.2 Utilization bar boom nose*

• **Note:**

The maximum load carrying capacity of the boom nose* is the load, which the boom nose* can lift by itself at sufficiently high maximum load carrying capacity on the boom head.

$$\text{Utilization of the boom nose*} = \frac{\text{Current load carrying capacity of the boom nose*}}{\text{Maximum load carrying capacity of the boom nose*}}$$



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 centre of gravity distance of the load (on the load hook selected by the operating mode) from the centre 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

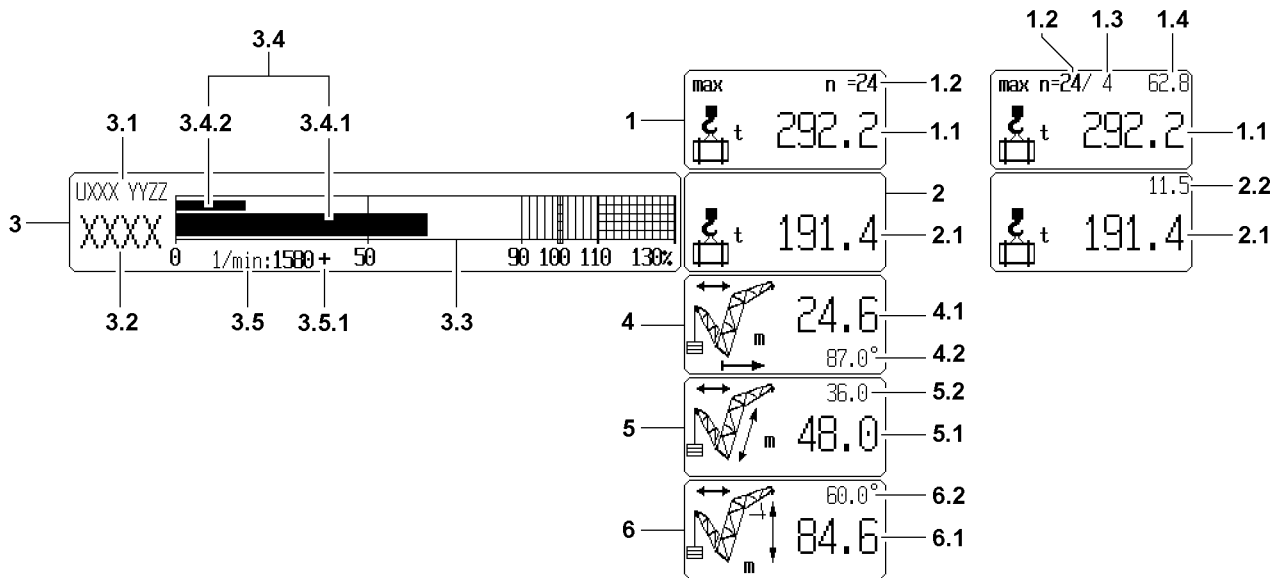
- In [°].

- Displayed is the medium value of the angle sensor in the main boom pivot section and the angle sensor in the main boom pulley head.

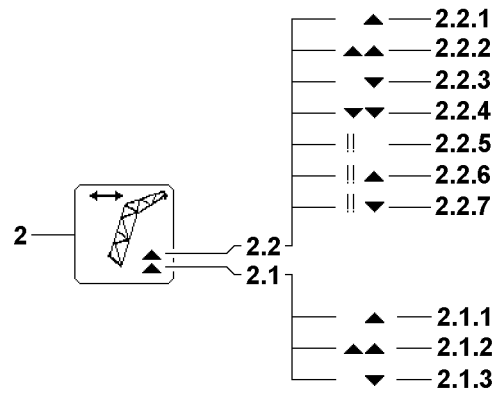
If one of these angle sensor values is invalid, then the value of the other angle sensor is shown.

- **Note:**

“? ? ? . ?” is shown if both angle sensor values are invalid or if the difference between the two angle sensors is unbelievably high.



<p>5 Icon "Main boom length"</p> <p>5.1 Length of main boom</p> <p>5.2 Length of accessories</p> <p>6 Icon "Pulley head height"</p> <p>6.1 Pulley head height</p>	<ul style="list-style-type: none"> • In [m] or [ft]. • In [m] or [ft].
<p>6.2 Angle of lattice jib to the horizontal*</p>	<ul style="list-style-type: none"> • 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. • In [°]. • Note: Display of the absolute angle always in operating modes with load chart for a fixed defined main boom angle (such as W). • Displayed is the medium value of the angle sensor in the lattice jib pivot section and the angle sensor in the lattice jib end section. If one of these angle sensor values is invalid, then the value of the other angle sensor is shown. • Note: "???.?" is shown if both angle sensor values are invalid or if the difference between the two angle sensors is unbelievably high.
<p>or</p> <p>6.2 Relative angle between main boom (α) and jib angle (β)*</p>	<ul style="list-style-type: none"> • ($= \alpha - \beta$) in [°] • Note: Display of the relative angle always in operating modes with load chart for a fixed defined jib relative angle (such as WV). • Note: "???.?" is shown if the relative angle cannot be calculated.



5.2 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.

2 Icon "Boom limitation"

- The luffing range of the boom is limited both upwards and downwards. The icon appears if an end position is reached when luffing the boom.

2.1 Limit signs main boom

2.1.1 Arrow pointing upward

The arrow shows that the shut off of the crane movement "luffing up the main boom" was triggered by:

- Triggering the upper load chart limit

or

Utilization larger than **95 %** and falling load carrying capacity when luffing up the main boom

RISK OF ACCIDENT!

The shut off of the crane movement "luffing up the main boom" is bypassed with actuated bypass key button.

The crane operator is obligated to carry out all crane movements with foresight and extreme caution!

Note:

Luffing down the main boom is still possible.

2.1.2 Two arrows pointing upward

The arrows show that the shut off of the crane movement "luffing up the main boom" was triggered by:

- Triggering a block limit switch of the main boom relapse cylinders (RFP) left / right

or

Due to an error in one block limit switch of the main boom relapse cylinders

Note:

Luffing down the main boom is still possible.

Luffing up the main boom is shut off and **cannot be bypassed**.

2.1.3 Arrow pointing downward

The arrow shows that the shut off of the crane movement "Luffing down the main boom" was triggered by:

- Triggering the lower load chart limit.

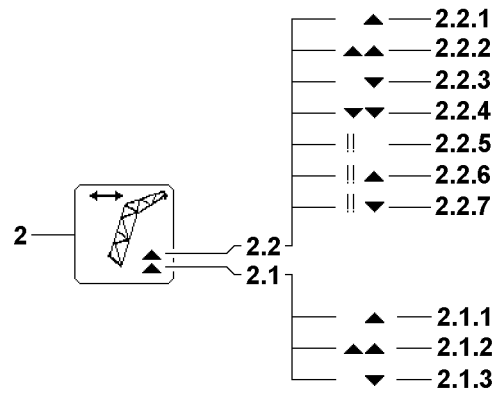
RISK OF ACCIDENT!

The shut off of the crane movement "Luffing down the main boom" is bypassed with actuated bypass key button.

The crane operator is obligated to carry out all crane movements with foresight and extreme caution!

Note:

Luffing up the main boom is still possible.



2.2 Limit sign equipment

2.2.1 Arrow pointing upward

The arrow shows that the shut off of the crane movement "Luffing up the equipment" was triggered by:

- Triggering the upper load chart limit

RISK OF ACCIDENT!

The shut off of the crane movement "Luffing up the equipment" is bypassed with actuated bypass key button.

The crane operator is obligated to carry out all crane movements with foresight and extreme caution!

Note:

Luffing down the equipment is still possible.

2.2.2 Two arrows pointing upward

The arrows show that the shut off of the crane movement "luffing up the equipment" was triggered by:

- Triggering a block limit switch of the luffing jib relapse cylinder

or

The retaining flap

or

An error in one of these limit switches

Note:

Luffing down the equipment is still possible.

Luffing up the equipment is shut off and **cannot be bypassed.**

2.2.3 Arrow pointing downward

The arrow shows that the shut off of the crane movement "Luffing down the equipment" was triggered by:

- Triggering the lower load chart limit.

RISK OF ACCIDENT!

The shut off of the crane movement "Luffing down the equipment" is bypassed with actuated bypass key button.

The crane operator is obligated to carry out all crane movements with foresight and extreme caution!

Note:

Luffing up the equipment is still possible.

2.2.4 Two arrows pointing down

The arrows show that the shut off of the crane movement "luffing down the equipment" was triggered by:

- Triggering a block limit switch of the monitoring of the "equipment on lower left / right"

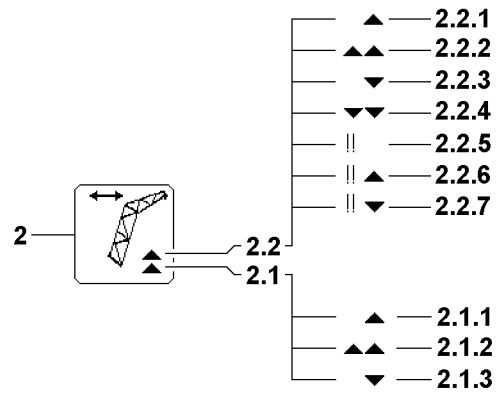
or

An error in one of these limit switches

Note:

Luffing up the equipment is still possible.

Luffing down the equipment is shut off and **cannot be bypassed.**



2.2.5 Two exclamation marks

The exclamation marks show that one or both of the double limit switches (right and left) or angle sensor (top and bottom) of the equipment* are not reported on the bus or are defective.

- **Note:**

If both limit switches are defective, the corresponding luffing movement is shut off unby-passable and an operating error message is issued when the master switch is deflected. If only one of the double limit switches or angle sensor is not ok, then the crane can continue to be operated with "normal function". However, the crane must be driven with increased caution, since only one of the limit switches is functioning. For that reason, the error must be remedied immediately. Along with the exclamation mark, a system error message is issued, which shows the defective limit switch or angle sensor.

2.2.6 Two exclamation marks and one arrow pointed upward

This icon show that the shut off of the crane movement "luffing up the equipment" was triggered by:

- Triggering the upper load chart limit

or

Triggering a block limit switch of the luffing jib relapse cylinder

or

The retaining flap

In addition, one or both of the limit switches or angle sensors of the equipment do **not** report on the LSB or they are defective

RISK OF ACCIDENT:

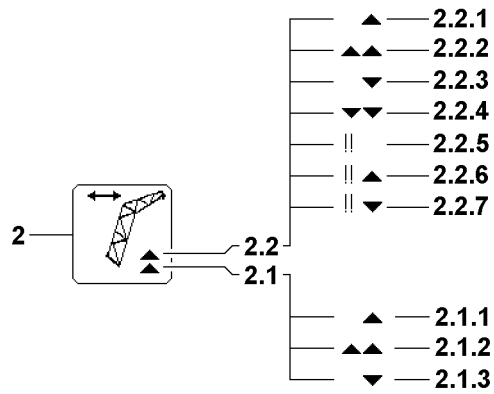
If the shut off has not been created by several block limit switches, then the crane movement "luffing up the equipment" is bypassed with actuated bypass key switch. The crane operator is obligated to carry out all crane movements with foresight and extreme caution!

Note:

If only one of the double limit switches or angle sensor is not operating properly, then the crane can continue to be operated with "normal function". However, it must be operated with increased caution, since only one of the double limit switches is functioning. For that reason, the error must be remedied immediately. Along with the exclamation mark, a system error message is issued, which shows the defective limit switch or angle sensor.

Note:

Luffing down the equipment is still possible.



2.2.7 Two exclamation marks and one arrow pointed downward

This icon show that the shut off of the crane movement “luffing down the equipment” was triggered by:

- Triggering the lower load chart limit

or

Triggering a block limit switch of the monitoring of the “equipment on lower left / right”

In addition, one or both of the limit switches or angle sensors of the equipment do **not** report on the LSB or they are defective.

RISK OF ACCIDENT:

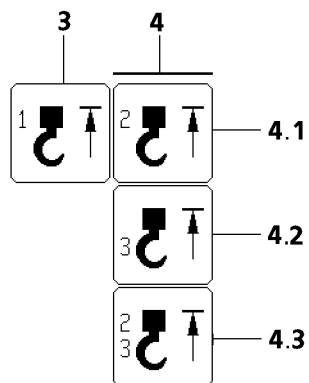
If the shut off has not been created by several block limit switches, then the crane movement “luffing down the equipment” is bypassed with actuated bypass key switch. The crane operator is obligated to carry out all crane movements with foresight and extreme caution!

Note:

If only one of the double limit switches or angle sensor is not operating properly, then the crane can continue to be operated with “normal function”. However, it must be operated with increased caution, since only one of the double limit switches is functioning. For that reason, the error must be remedied immediately. Along with the exclamation mark, a system error message is issued, which shows the defective limit switch or angle sensor.

Note:

Luffing up the equipment is still possible.



3 Icon “Hoist top on HES1”

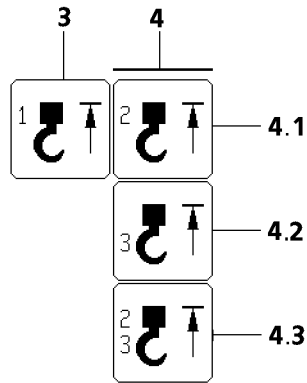
- In order to prevent the crane from being operated without hoist limit switches (HES), the minimum hoist limit switch configuration is continuously monitored. If a hoist limit switch required for a particular operating mode is not plugged in, therefore not active on the LSB bus system, an LMB STOP is triggered and an operating error report is also issued.

- **Note:**

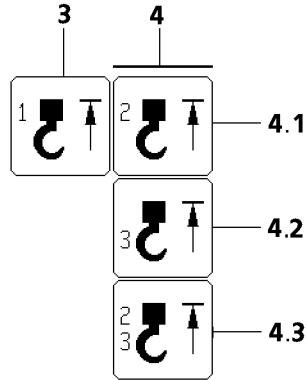
In all operating modes with installed main boom, the HES1A + HES1B **must** also be plugged in and turn off the same functions as the remaining hoist limit switches.

3 HES1 (1A / 1B)

- Location HES1A: Main boom head left.
Bus address: 27
- Location HES1B: Main boom head right.
Bus address: 28
- The “**HES1**” icon appears if:
 - The hook block moves against the HES1A on the left hand side of the telescopic boom head.
 - HES1A is not active, although it must be present on the bus.
 - HES1A has an internal error.
 - The hook block moves against the HES1B on the right hand side of the telescopic boom head.
 - HES1B is not active, although it must be present on the bus.
 - HES1B has an internal error.
- **Note:**
The crane movements spool up hoist winch, luff down the main boom as well as luff down the derrick are shut off.



- 4 Icon "Hoist top on HES2 / HES3"
- 4.1 Icon "Hoist top on HES2 (2A / 2B) " *
- In order to prevent the crane from being operated without hoist limit switches (HES), the minimum hoist limit switch configuration is continuously monitored. If a hoist limit switch required for a particular operating mode is not plugged in, therefore not active on the LSB bus system, an LMB STOP is triggered and an operating error report is also issued.
 - Location: Accessories, boom head left*
Bus address: 27
 - Location: Accessories, boom head right*
Bus address: 28
 - The "**HES2**" icon appears if:
 - The hook block moves against the HES2A on the accessories.
 - HES2A is not active, although it must be present on the bus.
 - HES2A has an internal error.
 - The hook block moves against the HES2B on the accessories.
 - HES2B is not active, although it must be present on the bus.
 - HES2B has an internal error.
 - **Note:**
The crane movements spool up hoist winches, luff down the main boom, luffing jib* as well as the derrick are shut off. The HES2 (2A / 2B) must be plugged in in the "accessories" operating mode. If this is not the case, an "LMB STOP" is triggered and an operating error message is also transmitted.



4.2 Icon "Hoist top on HES3"

Installation location(s):

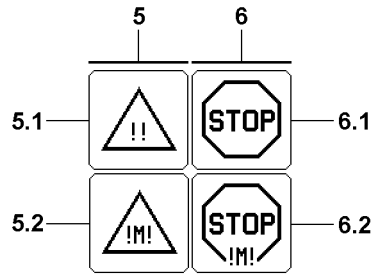
- Main boom boom nose 1, bus address: 24*
- Main boom boom nose 2, bus address: 25*
- Main boom boom nose 3, bus address: 26*
- Accessories boom nose 1, bus address: 24*
- Accessories boom nose 2, bus address: 25*
- Accessories boom nose 3, bus address: 26*
- The "**HES3**" icon appears if:
 - The hook block runs against the HES3 at the boom nose.
 - 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 the main and the derrick boom as well as the luffing jib are shut off. The HES3 must be plugged in in operation mode "Boom nose". If this is not the case, an "LMB STOP" is triggered and an operating error message is also transmitted.

4.3 HES2 and HES3

- The icon appears when icon HES2 and HES3 appear simultaneously.



- 5 Icon "Advance warning"**
- 5.1 Load charts advance warning**
- The current load chart utilization is calculated from the "current load" and the "maximum load according to the load chart and the reeving".
 - The "Advance warning" icon appears if:
 - The current load chart utilization of the crane, according to the "load chart and reeving" exceeds the programmed limit (**90 percent**) for the advance warning
 - or**
 - The current utilization of the boom nose* exceeds the programmed limit (**90 %**) for the 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 appears if:
 - The current load carrying capacity on the boom head ("current load" is **larger** "maximum load according to the load chart and the reeving") exceeds the **100 % mark**
 - or**
 - The current load on the boom nose exceeds the **100 % mark**
 - or**
 - If an error occurs, that triggers **LMB-STOP**
 - **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, the system automatically switches over (from the "Crane operation" program) to the "Engine monitoring" program.



7 Icon "Horn"

- Acoustical signal.
- Sounds in addition to the optical display for operating errors on monitor 0, which lead to the shut off of a movement (for example: LMB-STOP) and application errors with error number (for example sensor errors, which occur due to insufficient sensor signals or a defective sensor, for example: E:3TMS). "Horn" is a beeping sound of a duration of approximately 0.5 seconds, which is repeated in one second rhythm.

- **Operational errors are:**

- Overload.
- Boom outside the angle range of the load chart.
- Boom outside radius range of the load chart.

- **The following sensors are monitored:**

- Hoist limit switch
- Length sensors
- Angle sensors
- Pressure sensors
- Pull test brackets (force measuring boxes)
- Wind sensor
- Battery voltage
- Inductive sensors

"Short horn"

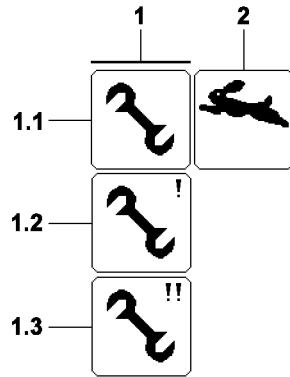
- Sounds in addition to the visual display of error messages without an error number and which do not lead directly to crane movement shut off by the LICCON overload protection. "Short horn" is a beeping sound that lasts for approximately 0.1 seconds and is repeated in one second rhythm.

- **The following errors are monitored:**

- Maximum permissible wind speed exceeded (only with activated wind sensors).
- Crane utilization value for "Advance warning" (90 %) reached.

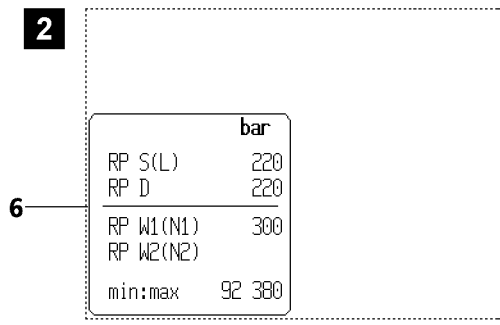
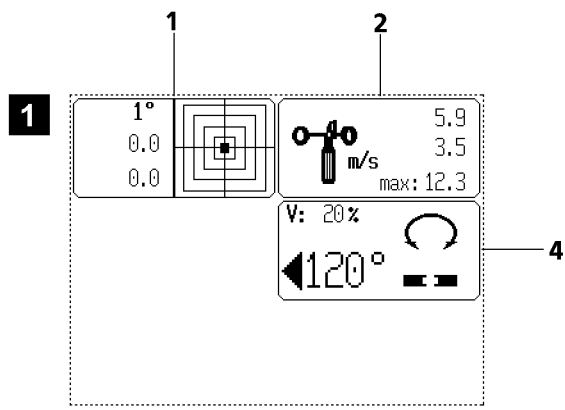
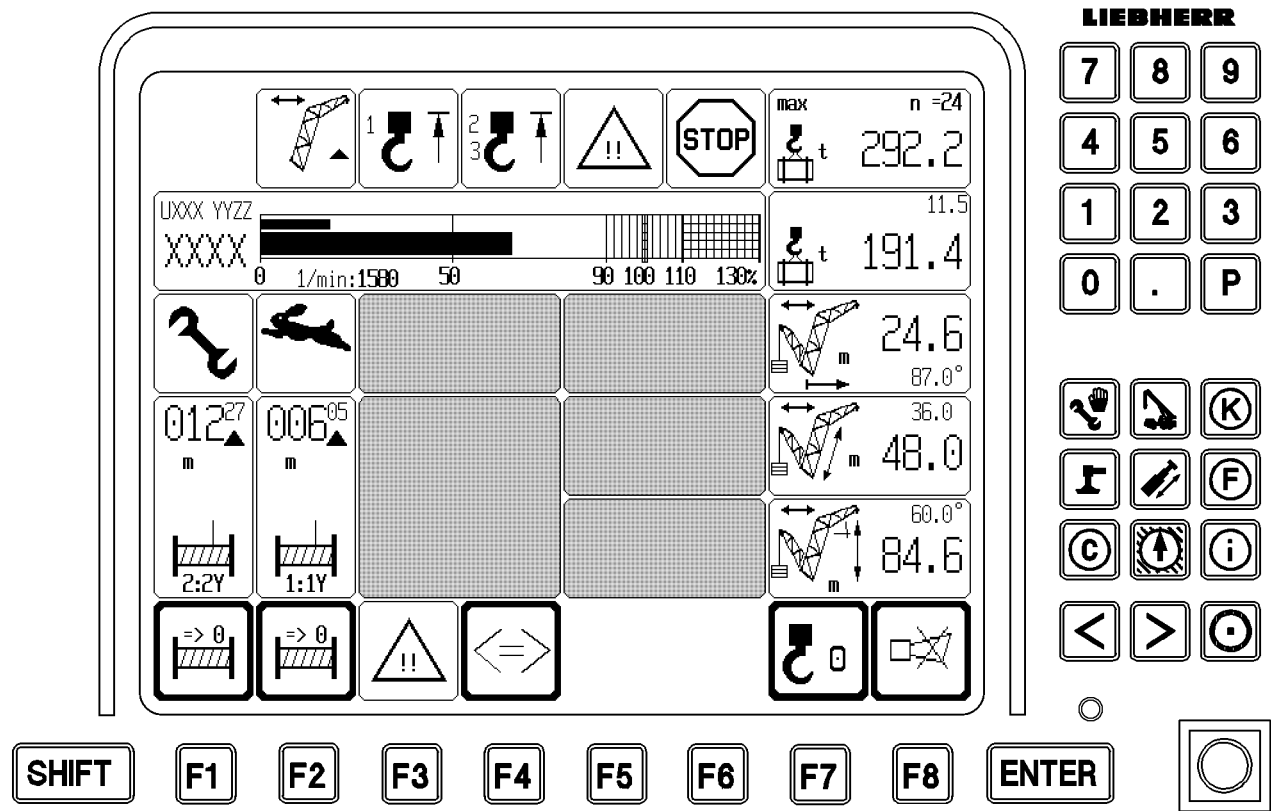
Priority and "Horn off"

- 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**.
- Pressing the function key **F8** again automatically changes the error determination screen of the testing 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.



5.3 Special functions

- 1 Icon "Assembly operation"
- 1.1 Assembly
- The icon blinks if, the crane control has been switched to the "assembly" position with the bypass key button. The "Crane operation" program is then locked, which means that no other program can be turned on via the program keys.
- 1.2 Emergency operation without assembly
- The icon blinks during emergency operation, if "assembly" has **not** been enabled with the bypass key button.
- Note:**
The program "Crane operation" is **not** locked in this case.
- 1.3 Emergency operation and assembly
- The icon blinks during emergency operation, if "assembly" has been enabled using the bypass key button.
- Note:**
Operating mode "without engine bypass" is active.
- 2 Icon "Rapid gear"
- The icon appears if rapid gear ("power plus") is enabled during a crane movement.
 -
 - The speed increase can be added for various crane movements on the master switches MS1, MS2, or MS3.
- Note:**
If a crane movement has reached its maximum speed due to the current utilization, then no speed increase is possible by adding the rapid gear.
If the total power requirement of all actuated crane movements is larger than the available power, then those crane movements are reduced which require the most power.
If another crane movement is added or taken back to one or more actuated crane movements then this has an influence on the other movements. For that reason, we recommend in situations in which an interference of the individual crane movements is troublesome, not to add the rapid gear or to turn the rapid gear off.



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5.4 Monitored auxiliary functions for crane operation

There are several monitored auxiliary functions, which can be displayed when needed or automatically.

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.

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 (illustration 1):

Crane incline **1**

Wind speed **2**

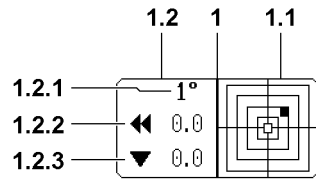
Slewing range **4**

Page 2 (illustration 2):

Relapse cylinder monitoring **6**

If an error occurs in one or more of these monitored functions, this is displayed in the “Crane operation” program, as follows:

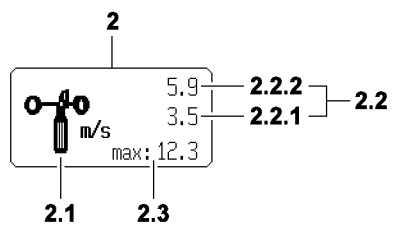
- Monitored auxiliary functions turned off **F3**:
 - Only error in one function on page 1:
Icon is displayed on page 1.
 - Only error in one function on page 2:
Icon is displayed on page 2.
 - Error in a function on page 1 and 2:
Icon is displayed on page 1 and icon for **F4** blinks (= indicates an error in a function on page 2).
- Monitored auxiliary functions turned on **F3**:
 - No error:
Optional icons (customer request) 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 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).



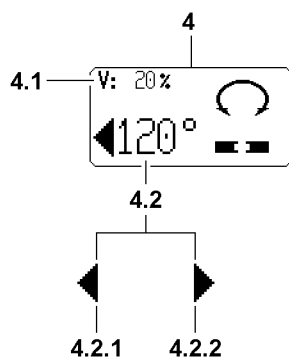
- 1 Icon "Incline"
 - Display of the incline of the superstructure to the horizontal in longitudinal and lateral direction. The display is graphic as well as numeric.
- 1.1 Graphic part
 - The graphic display is in the form of a spirit level, with a moving dot (small square) representing the air bubble. The centre 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. If at least one value exceeds the 1° limit, it switches to the 5° range.

Note:
The range change is automatic.
 - 1.2.2 Incline of crane superstructure in crosswise (lateral) direction
 - In [°].
 - The double arrow shows the direction of incline:
 - Double arrow to left = crane superstructure slopes to the left.
 - Double arrow to right = crane superstructure slopes to the right.
 - 1.2.3 Incline of crane superstructure in lengthwise (longitudinal) direction
 - In [°].
 - The arrow shows the direction of incline:
 - Up arrow = crane superstructure slopes to the rear.
 - Down arrow = crane superstructure slopes to the front.



- 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
- **Note:**
If no wind sensor is connected to the LSB bus or the wind speed sensor is defective, “????” appears in the display.
- 2.2.1** Current wind speed main boom or boom nose main boom
- **Note:**
If a wind sensor is assembled on a main boom and the main boom nose, then the value of the wind sensor is shown at **2.2.1**.
- 2.2.2** Current wind speed auxiliary equipment or boom nose auxiliary equipment
- **Note:**
If a wind sensor is assembled on an auxiliary equipment and the auxiliary equipment boom nose, then the value of the wind sensor is shown at **2.2.2**.
- 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!**



4 Icon "Slewing range"**4.1** Maximum slewing speed

- V: In percent [%].
 - 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 direction "to the front" (chain tension side).
- The value increased to a value of 180°.

4.2.1 Arrow for the crane superstructure position left of 0°

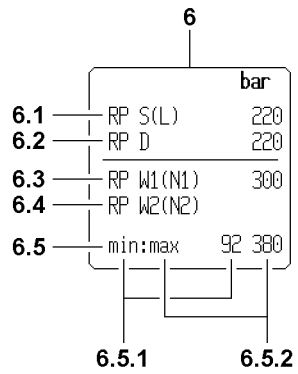
- The arrow in front of the value indicates the deviation direction (for example: left of 0°).

4.2.2 Arrow for the crane superstructure position right of 0°

- The arrow in front of the value indicates the deviation direction (for example: right of 0°).

**Note**

- ▶ At 0°, the crane superstructure is exactly in position "to the front".
- ▶ At 180°, the crane superstructure is exactly in position "to the rear".

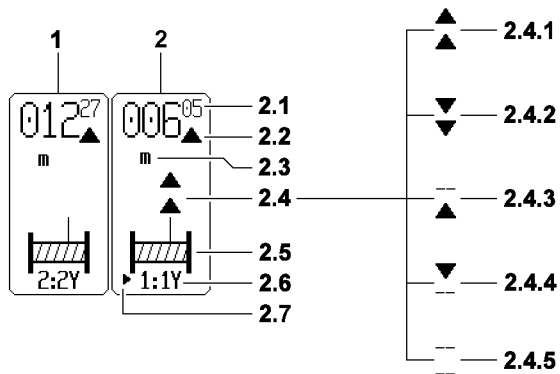


- 6** Icon "Relapse cylinder monitor"
- 6.1** Pressure display
- In [bar].
 - In the S- or L-boom relapse cylinders.
- 6.2** Pressure display
- In [bar].
 - In the derrick relapse cylinders.
- 6.3** Pressure display
- In [bar].
 - Pressure in the W1-lattice jib relapse cylinder (=RPW1) at W-operation
 - or**
 - Pressure in the N1-lattice jib relapse cylinder (=RPN1) at N-operation
- 6.4** Pressure display
- In [bar].
 - Pressure in the W2-lattice jib relapse cylinder (=RPW2), if available
 - or**
 - Pressure in the N2-lattice jib relapse cylinder (=RPN2), if available
- 6.5** Pressure limits
- In [bar].
 - Monitored relapse cylinders (RP) - pressure limits in the jib relapse cylinders (W/N).
Minimum / maximum pressure for RPW1 (RPN1) and RPW2 (RPN2).
- 6.5.1** Pressure display - minimum pressure for RP (W/N)
- This monitored minimum pressure is calculated from the angle of the main boom and the jib. If one of the angles is invalid and is shown in the display with "???", then no monitoring of the minimum pressure can occur.
- 6.5.2** Pressure display - maximum pressure for RP (W/N)
- If a pressure limit value is being exceeded, then this is shown by a blinking pressure actual value and an additional error message.



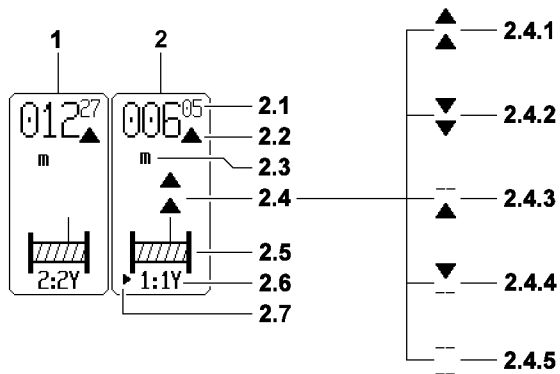
Note

- ▶ Pressure display = "???", if the pressure sensor signal is erroneous (broken wire or short circuit). There is an error display with error number.
-



5.5 “Winch display” icon

- | | |
|--|---|
| <p>1 Icon “Winch 2”</p> | <ul style="list-style-type: none"> • The winch 1 and winch 2 icons have the same meaning, which are explained for the icon “winch 1” 2. |
| <p>2 Icon “Winch 1”</p> | <ul style="list-style-type: none"> • The icon “Winch 1” is only shown if winch 1 is installed, plugged in and if the winch turn sensor is active. |
| <p>2.1 Travelled distance</p> | <ul style="list-style-type: none"> • 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 prerequisite for the correct display is that the entered value matches the actual number of rope strands between the boom head and the hook block. • 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. |
| <p>2.2 Direction of hook movement</p> | <p>The arrows on the length value show the direction of the hook movement in relation to the zero point:</p> <ul style="list-style-type: none"> • Arrow pointing up: Hook has moved upward from the zero point. • Arrow pointing down: Hook has moved down from the zero point. |
| <p>2.3 Length unit for hook path display</p> | <ul style="list-style-type: none"> • In [m] or [ft]. |



2.4 Winch status display**2.4.1 Spool out****2.4.2 Spool up****2.4.3 Spooled out****2.4.4 Spooled up****2.4.5 Winch is deactivated**

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

- Spooling out is blocked.
- Spooling up is blocked.
- 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.

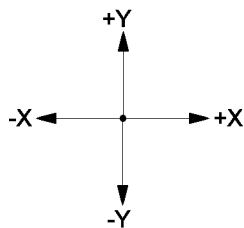
- (With rope end for winch status icon).

• Example: 1 : 1 Y

First digit: Winch number.

Second digit: Master switch number.

Letter: Master switch operating direction.

2.5 Winch icon**2.6 Winch number with master switch number and master switch operating direction**

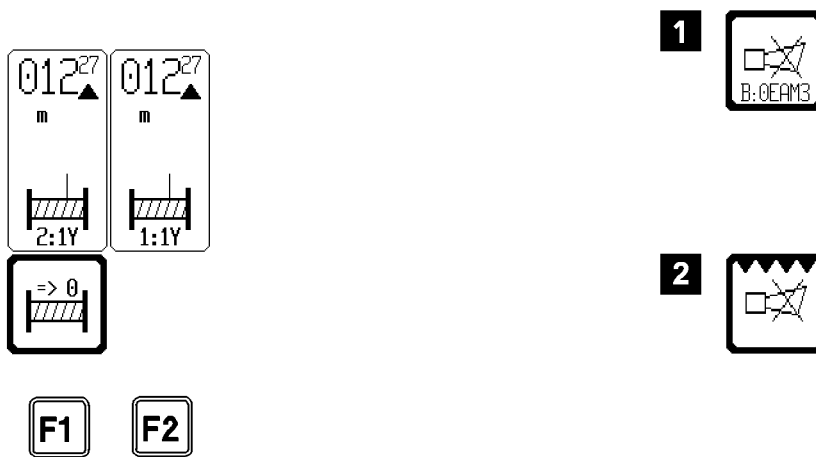
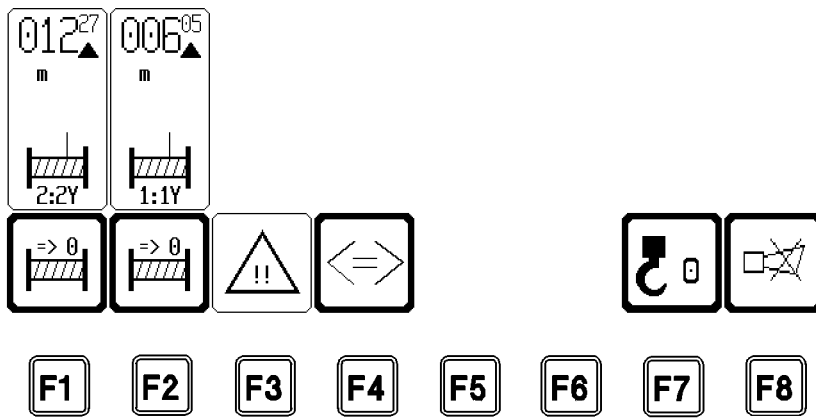
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2.7 Vibration sensor

- If the vibration sensor for a winch is added on the master switch, then the arrow **2.7** appears in this winch icon for the added vibration sensor.

• Note:

The vibration sensor is added at the first actuated crane function.



5.6 The function key line

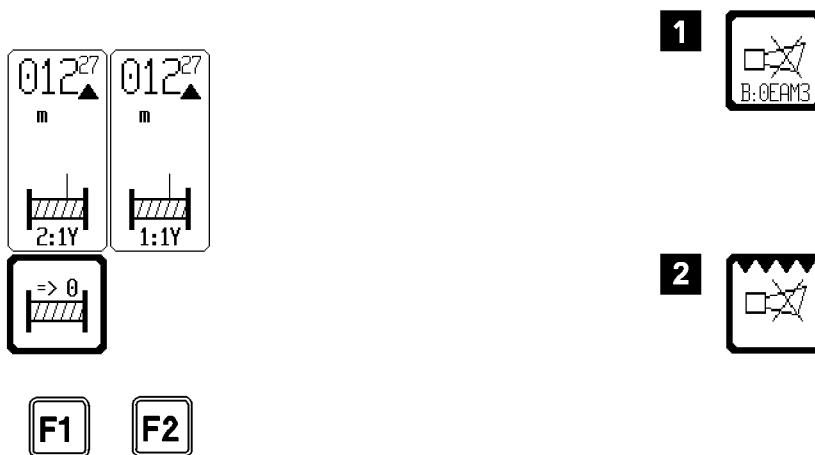
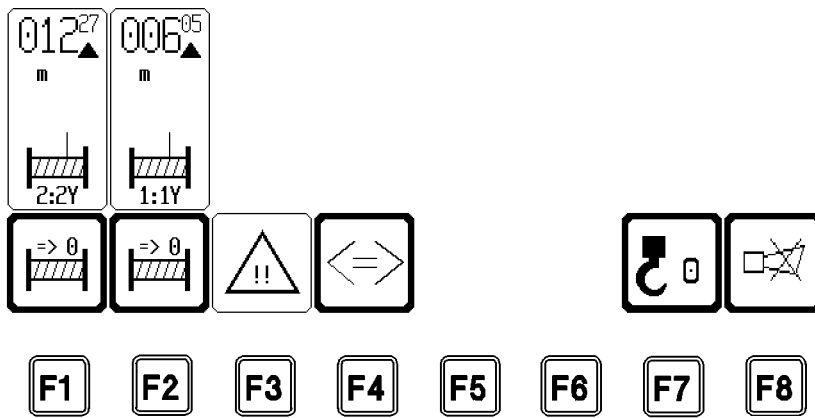
The function key line consists of function keys **F1** to **F8** and the function key icon bar above it. The function keys correspond to the various function key icons above them.

The function key icons may trigger a function or they change their appearance upon the push of a key (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.

- | | |
|------------------------|--|
| F1 Function key | <ul style="list-style-type: none"> • Zero point for hook travel display, winch 2. • Pressing the function key F1 causes the “Set winch display to zero” icon to appear, i.e. the winch 2 hook travel display in the winch icon above is set to “000.00” when the key is pressed. The path measurement begins here. |
| F2 Function key | <ul style="list-style-type: none"> • 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 winch 1 hook travel display in the winch icon above is set to “000.00” when the key is pressed. The path measurement begins here. • Note:
When winch 1 and winch 2 work in parallel operation, then the lengths displays of winch 1 and winch 2 can only be set together with the function key F1 to “000.00”. The function key F2 has no function, see illustration 3. |
| F3 Function key | <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • “Thick border” = auxiliary function icons turned off. • “Thin border” = auxiliary function icons turned on. • Note:
The monitoring system of all auxiliary functions is always active; only the icons can be faded out. If a monitored limit has been exceeded, an acoustical signal (horn) sounds and the corresponding icon is displayed, even if the monitoring symbols have been hidden. |
| F4 Function key | <ul style="list-style-type: none"> • Change monitoring page (if present).
See also section “Monitored auxiliary functions”. |
| F5 Function key | <ul style="list-style-type: none"> • Not assigned. |
| F6 Function key | <ul style="list-style-type: none"> • Not assigned. |

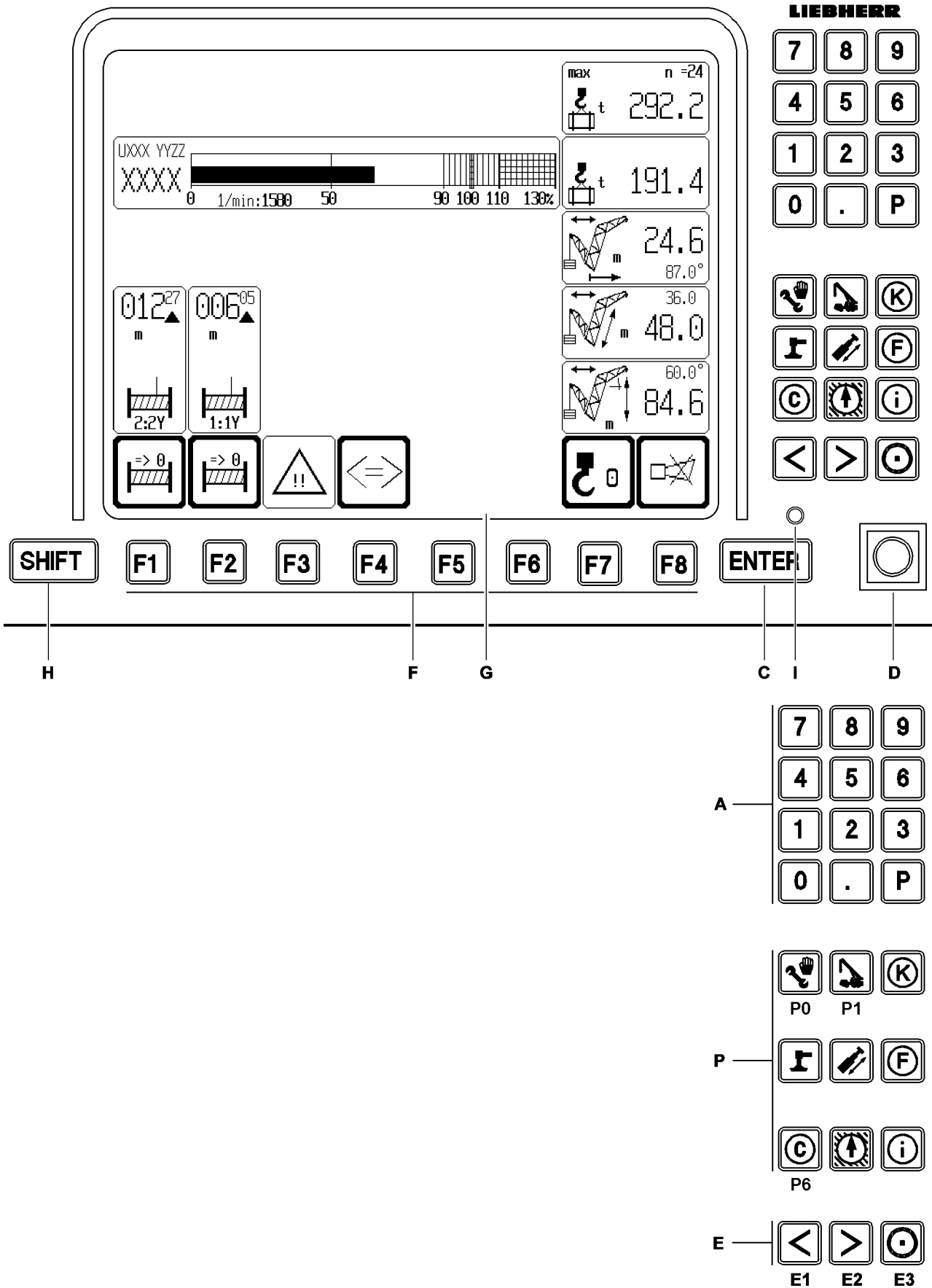


F7 Function key

- 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 two actions:
 - Pressing the function key **F7** again.
 - Luffing by more than $\pm 4^\circ$.
 - **Note:**
The function key **F7** acts the same way to the actual load display of the boom nose, if the boom nose is installed.

F8 Function key

- Turn off horn / error diagnostics.
- Turn off the acoustic warning.
The “horn” and “short horn” acoustic warnings can be turned off by pressing the function key **F8**.
Note:
A new error turns the acoustic warning on again.
- Error message in “Horn” icon.
If a system, application or operating error occurs, an error message appears in the “horn” (see illustration).
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 (**see separate diagnostics manual**).
- 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 mark is displayed in the “Horn” icon (talons along the upper margin, see illustration), 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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5.7 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 operating pattern will appear after 10 seconds or after pressing the key "." again.

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.

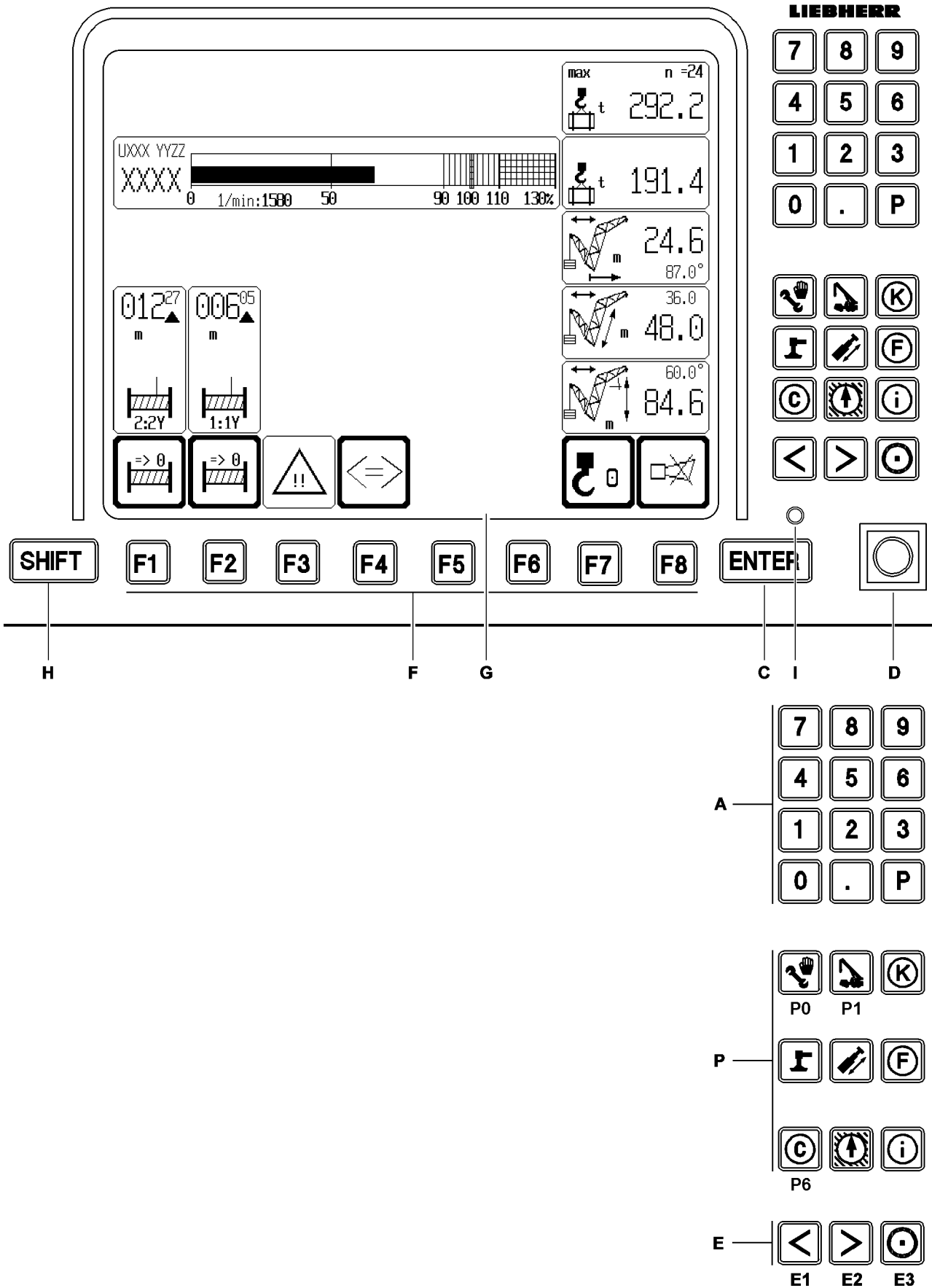
Note:

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 Enter key

- No function in "Crane operation" program.



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D Bypass key button

The bypass key button has two positions:

- Position to right (touching):
The hoist limit switch and the LMB shut off are bypassed.
- Centre position (self-retaining):
Normal operation.

**DANGER**

Increased danger of accidents!

With the bypass key button, the overload protection as well as the hoist limit switches can be bypassed.

In this event, continued protection against overloading the rope or the crane **no longer** exists!

- ▶ Please exercise extreme caution.

In position “touching right”, movement limiting shut offs may be bypassed.

- Bypassing the overload protection:

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

Note:

Bypassing overload protection may only be done if the crane supervisor is present and with utmost caution. All LICCON overload protection displays remain functional.

- Bypassing the hoist limit switch:

If the hook block touches the hoist limit switch weight during the upward movement, the hoist limit switch reacts. The crane movement “spool up winch” is turned off. This turn off can be bypassed by the Bypass key button **D** in the “right touching position”.

Note:

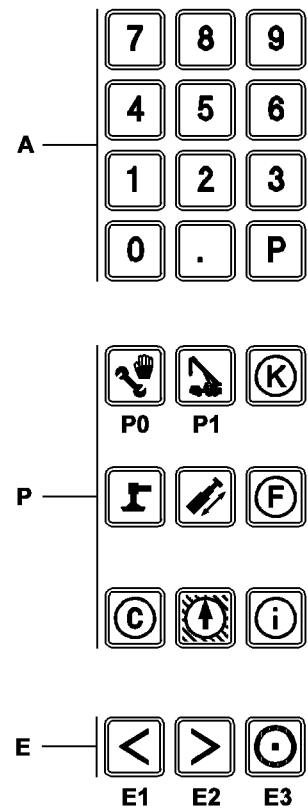
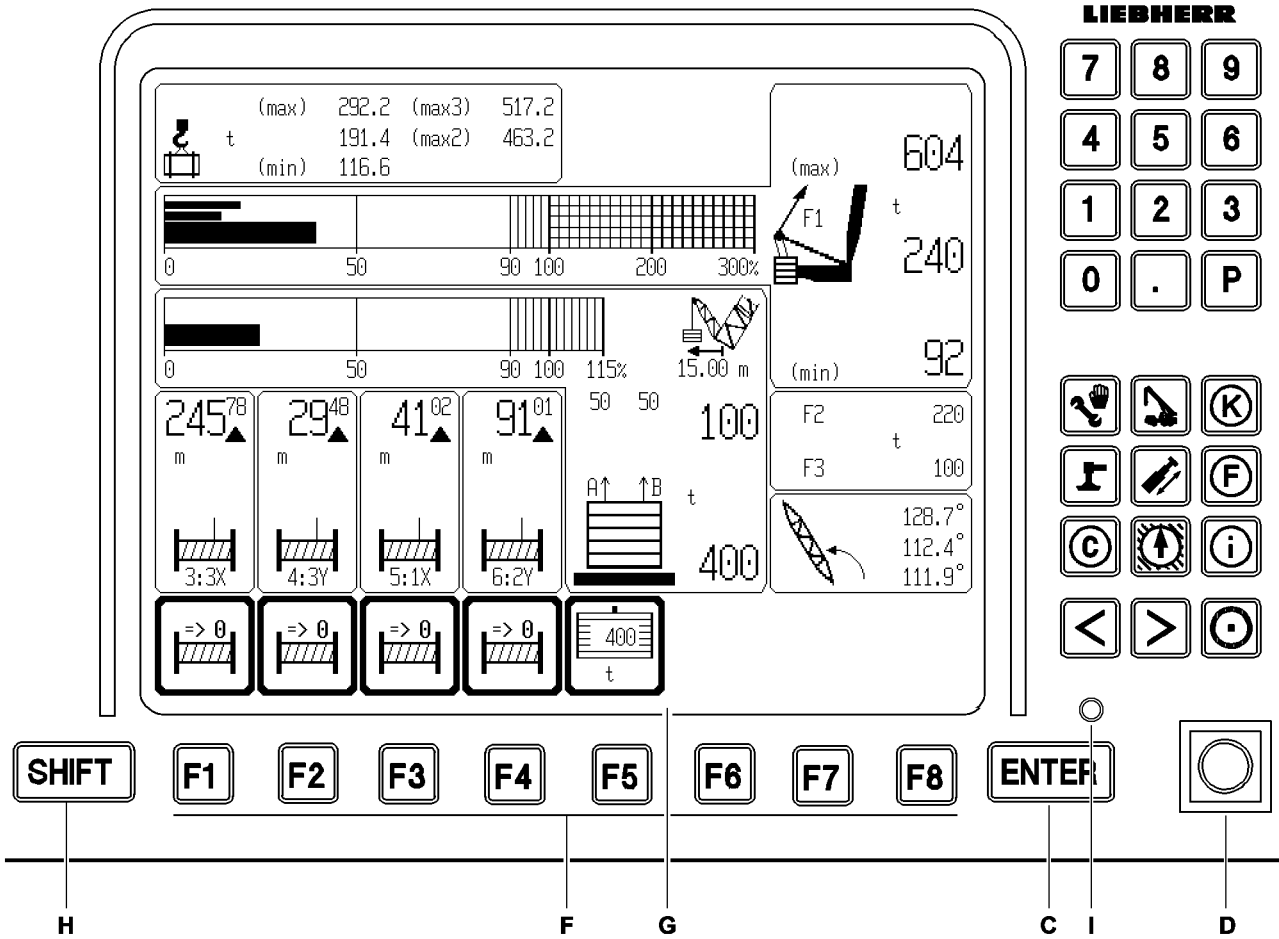
Bypassing the hoist limit switch may only be done if the crane supervisor is present, and with the help of a guide. The guide must be in direct contact with the crane operator and must continually monitor the distance between the hook block and the boom head. Carry out all crane movements with utmost care and at the least possible speed.

E Special function keys

- Monitor brightness adjustment (see section “Operating elements of the LICCON computer system”).

H “SHIFT” key

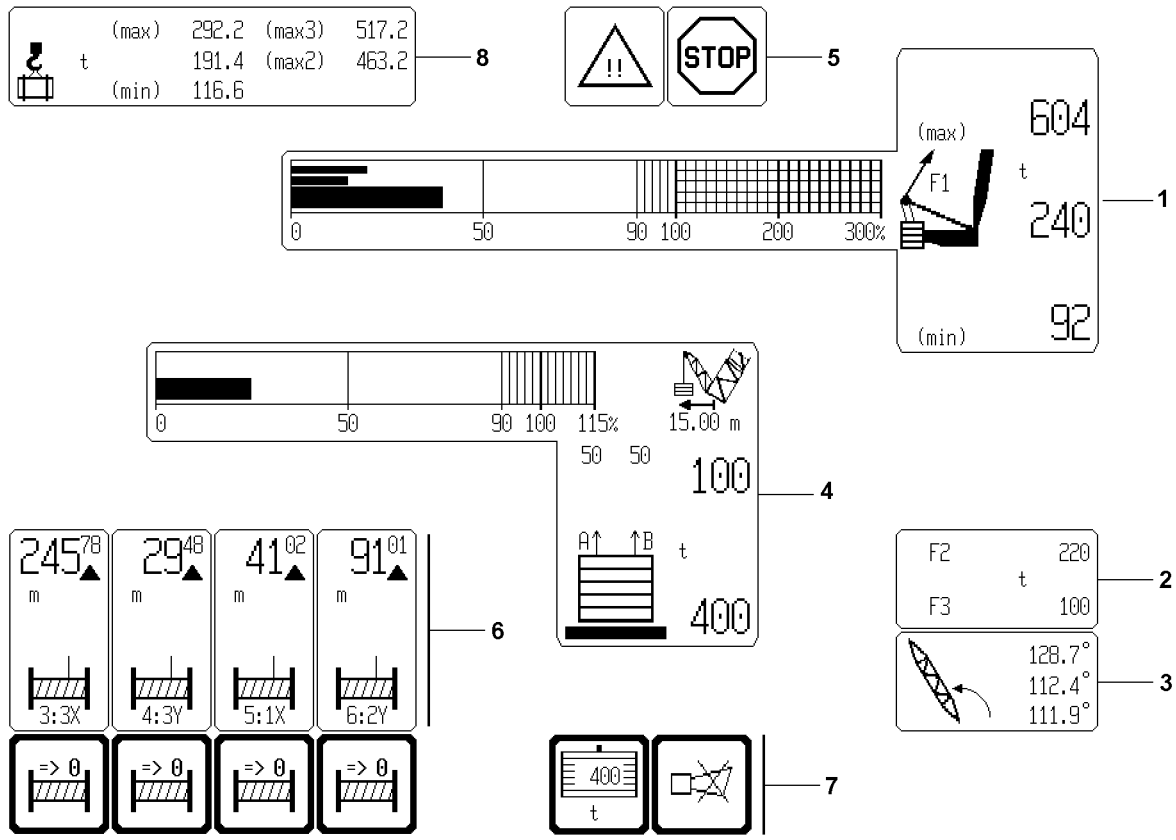
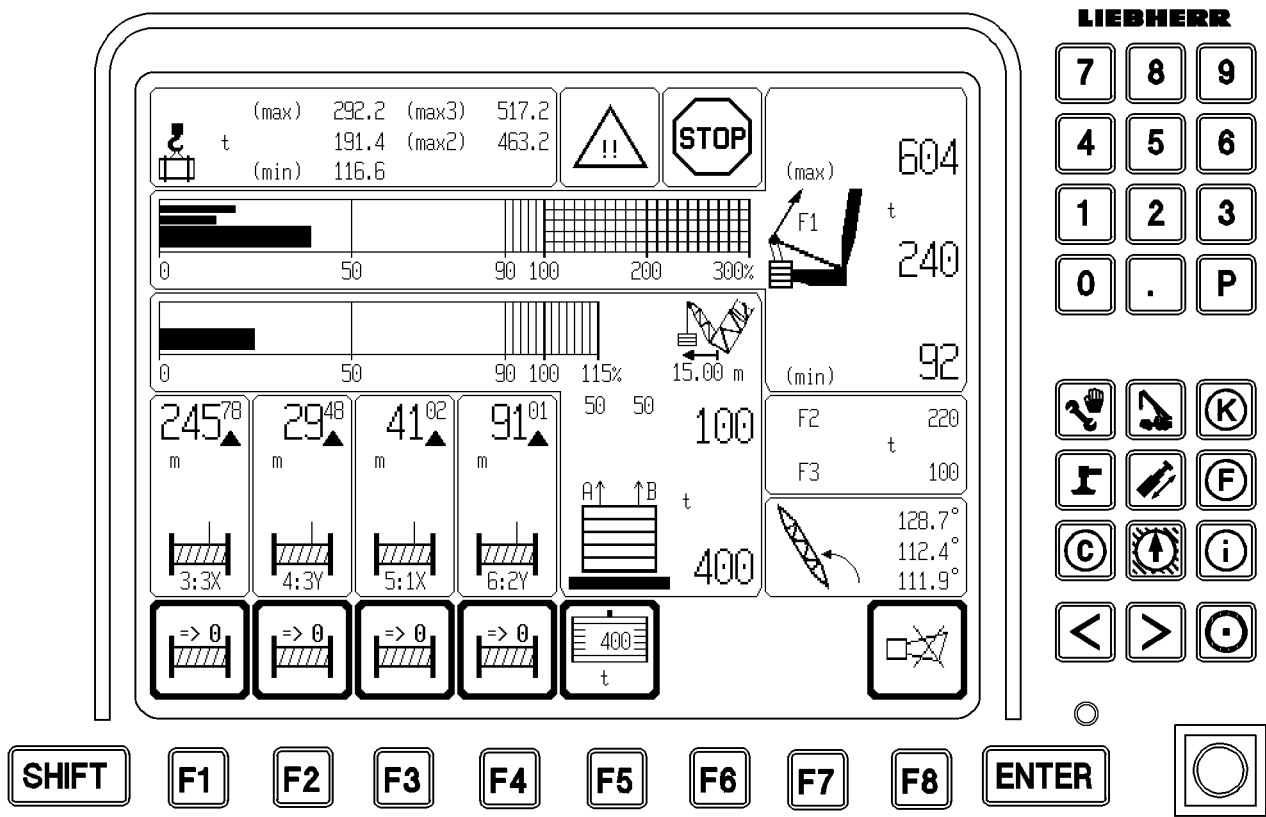
- Second level key assignments.
“SHIFT” and “P0”: Program call up for engine monitoring.



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6 Operating elements of the LICCON computer system on monitor 1

- | | |
|--|--|
| <p>A Keypad</p> <p>P Program keys</p> <p>C Input key "ENTER"</p> <p>D Key button</p> | <ul style="list-style-type: none">• To edit the derrick ballast input values.• No function.• Confirmation of changes.• Turn off the "horn". <p>Note:
The key button may not be in position "left"!</p> |
| <p>E Special function keys</p> | <ul style="list-style-type: none">• Monitor brightness adjustment (see section "Operating elements of the LICCON computer system on monitor 0"). |
| <p>F Function keys</p> | <ul style="list-style-type: none">• The function keys should always be viewed in conjunction with the function key icon line displayed on the monitor. |
| <p>G Monitor</p> | <ul style="list-style-type: none">• Monitor 1 shows "normally" the crane operating screen of monitor 1. <p>Note:
For diagnostics purposes, the monitor can be assigned to the ballast trailer control.</p> |
| <p>H SHIFT key</p> | <ul style="list-style-type: none">• No function. |
| <p>I LED display = Power supply for monitor available</p> | |



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7 The “Crane operation” program on monitor 1

The maximum or minimum load required to balance the crane can be increased or decreased on cranes with a derrick ballast* operating under load, by increasing or reducing the derrick ballast.

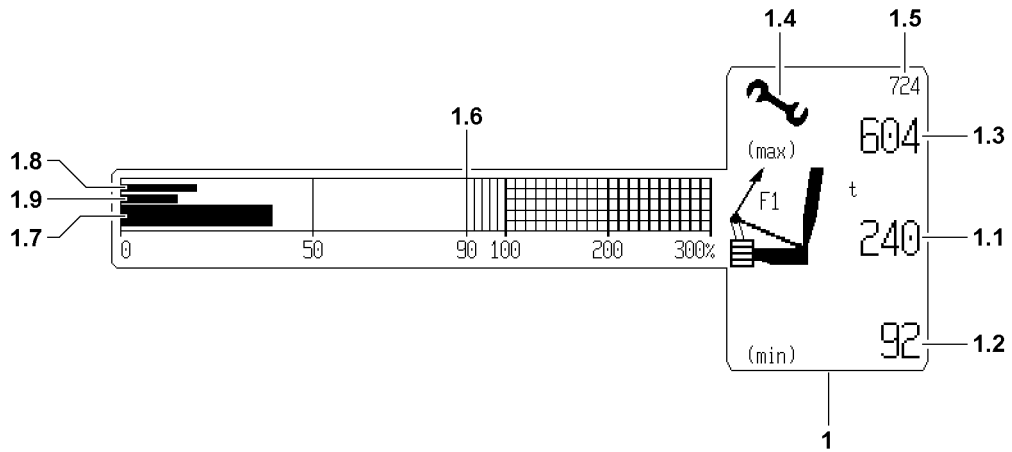


Note

- ▶ The suspended ballast and ballast trailer are generally referred to as the **derrick ballast**.
- ▶ The fixed compensation weight which is assembled on the turntable is generally referred to as the **counterweight**.

In the “Crane operation program on monitor 1”, the monitor is divided into eight areas:

- | | |
|---|---|
| 1 Test point 1 = F1. | • Pull test brackets on test points 1A and 1B in the SA frame guying. |
| 2 Test points 2/3 = F2/F3 | • Pull test brackets on test points 2A and 2B in the N/W guying.
• Pull test brackets on test points 3A and 3B in the S guying in derrick operation. |
| 3 Derrick boom angle | |
| 4 Derrick ballast, weight and utilization | • Derrick ballast, placed and pulled.
• Derrick ballast radius.
• Derrick ballast utilization.
• Forces in derrick ballast guying A and B. |
| 5 Alarm functions | • “Advance warning” and “ STOP ” icons. |
| 6 Winch displays | • Winch 3*
• Winch 4
• Winch 5*
• Winch 6* |
| 7 Function key line | |
| 8 Load carrying capacity min / max | |



7.1 Test point 1 = F1

7.1.1 F1-assembly maximum force, general



DANGER

Risk of accidents in assembly operation!

- ▶ In assembly operation, the crane operator must make sure that the crane is not subjected to loads up to the assembly limit without danger.
- ▶ The crane may always only be erected only **without loads**, according to the data in the operating instructions and the erection and take down charts.

7.1.2 F1-assembly maximum force values in operating modes without derrick

In operating modes without derrick, there are in part two different F1 assembly maximum force values.

F1-assembly maximum force value outside the operating range

For erection and assembly of the crane.

F1-assembly maximum force value inside the operating range

Within the boom angle range with load chart and few angle degrees aside.

Maximum **cannot** bypass F1-max limit in operating range.



Note

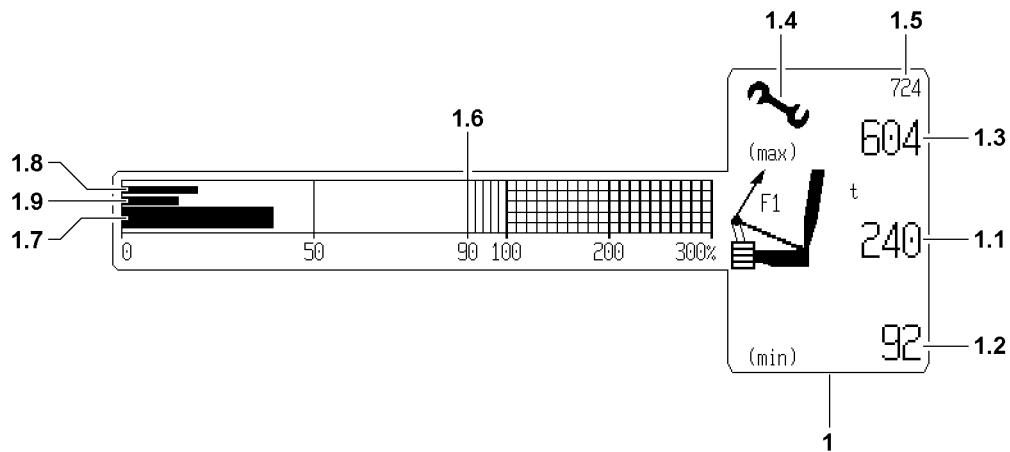
- ▶ For static reasons, in the operating range with load chart (and a few angle degrees aside) the F1-assembly maximum force value can be larger than outside the operating range, for example when lifting the main boom jib or needle jib off the ground.
- ▶ The selection of the F1-assembly maximum force value for inside or outside of the operating range is made on the basis of the values from the angle sensor on main boom and the angle sensor on jib.
- ▶ **In the operating range, the current F1-force can be above the F1-assembly maximum force outside the operating range.**
- ▶ When both angle sensor on the main boom are recognizably defective for the LMB, or if they are missing, or if both angle sensor on the needle are recognizably defective or missing then the LMB cannot determine if the boom is in the operating range or not.
- ▶ So that there is no unbypassable F1-assembly maximum force shut off in this case, the F1-assembly maximum force value of the operating range is used for the shut off.



DANGER

Risk of accident!

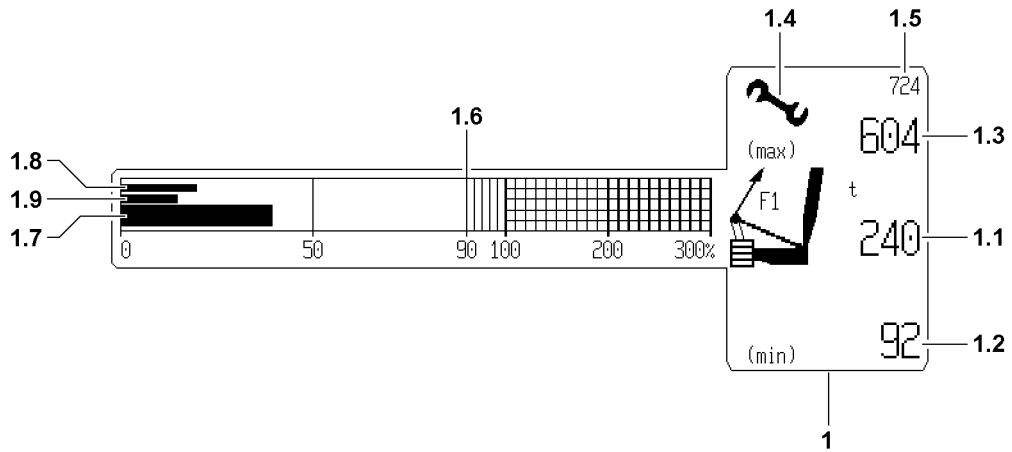
- ▶ When both angle sensors on the main boom are recognizably defective for the LMB or if they are missing, or if both angle sensors on the needle are recognizably defective or if they are missing, then the LMB will use the higher F1-assembly maximum force value within the operating range for the non-bypassable F1-assembly maximum force shut off.
- ▶ This ensures that the crane can always be erected or taken down in case of defective or missing sensors. However, in this case the F1-assembly maximum force value outside the operating range (F1max limit) for the erection is no longer shown or monitored. If the crane is not taken down exactly according to the data in the operating instructions, then it can be overloaded. There is an increased danger of accidents!



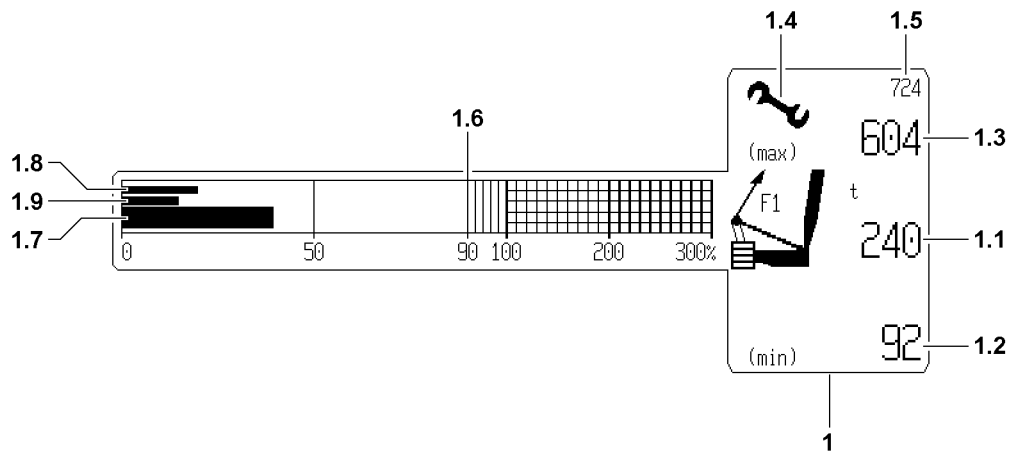
7.1.3 Test point 1 = F1 / icon description

Pull test brackets on test point 1A and 1B in the SA frame guying

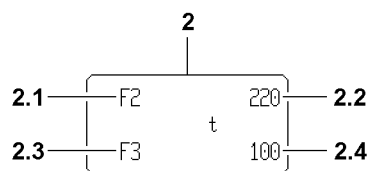
Position	Icons / display values	Type of display	Is shown
1	Icon "test point 1" = F1 in units of [t] or [kips]	Static	Always
1.1	Actual force: = $F1 = F1_{is}$ $F1 = F1A + F1B$ F1A = Force test point 1A (SA-bracket left) F1B = Force test point 1B (SA-bracket right)	Static	For valid value
		"???" blinking	For invalid value
1.2	Minimum force = $F1_{min}$	Static	Always: Note: A shut off by $F1_{min}$ only occurs in operating modes with derrick ballast. In all other operating modes, $F1_{min} = 0$. In these operating modes, the condition $F1 = F1_{min}$ cannot be reached in operation.



Position	Icons / display values	Type of display	Is shown
1.3	Maximum operating force = $F1_{\max}$ operation	Static	In operating modes with derrick ballast (DB) Note: The force $F1_{\max}$ operation is the maximum F1-force, which may be reached in operation. In $F1 = F1_{\max\text{-operation}}$ there is no shut off, because the crane monitoring is ensured by the shut off at utilization of more or the same as 100 %. For safety reasons, the $F1_{\max\text{-shut off}}$ at $F1_{is}$ is larger than $F1_{\max\text{-operation}} + F1_{\text{-addition}}$ for shut off occurs For cranes with maximum load carrying capacity larger than 1000 t applies $F1_{\text{-addition}}$ for shut off = 40 t
1.4	Assembly icon	Static	At "assembly and boom not in operating range" or At F1 larger or same as $F1_{\max\text{-assembly}}$



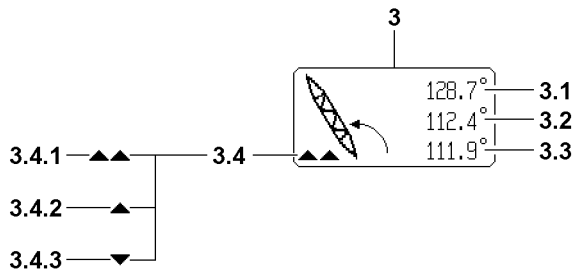
Position	Icons / display values	Type of display	Is shown
1.5	Maximum assembly force = $F1_{\text{max-assembly}}$	Static	At "assembly and boom not in operating range" and F1 smaller than $F1_{\text{max-assembly}}$
		Blinking	At F1 larger or same as $F1_{\text{max-assembly}}$
1.6	F1-utilization scale in percent [%]	Static	Always
1.7	F1-utilization bar display = $F1 / F1_{\text{max-operation}}$ 0 percent [%] for: $F1_{\text{max-operation}} = 0$ or F1 = invalid	Dynamic	In operating modes with derrick ballast (DB)
1.8	F1-Min-warning bar = $F1_{\text{min-warning value}} / F1_{\text{max-operation}}$ ($F1_{\text{min-warning value}} =$ $F1_{\text{min}} + \Delta_{F1}$) 0 percent [%] for: $F1_{\text{max-operation}} = 0$ or $F1_{\text{max-operation}} = \text{invalid}$	Dynamic	In operating modes with derrick ballast (DB) Δ_{F1} = for example: 15 t for cranes with max- load smaller than 1000 t 30 t for cranes with max- load ≥ 1000 t
1.9	F1-Min-Stop bar = $F1_{\text{min}} / F1_{\text{max-operation}}$ 0 percent [%] for: $F1_{\text{max-operation}} = 0$ or $F1_{\text{max-operation}} = \text{invalid}$	Dynamic	In operating modes with derrick ballast (DB)



7.2 Test point 2 = F2 / test point 3 = F3

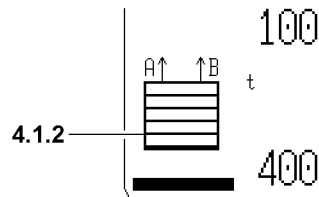
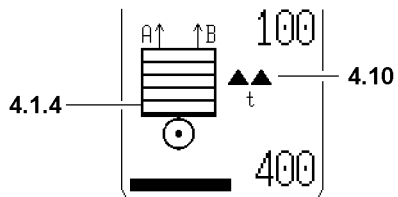
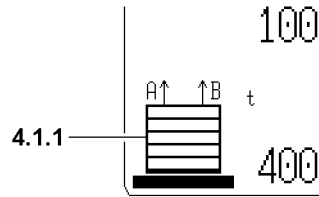
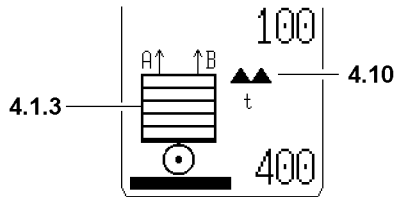
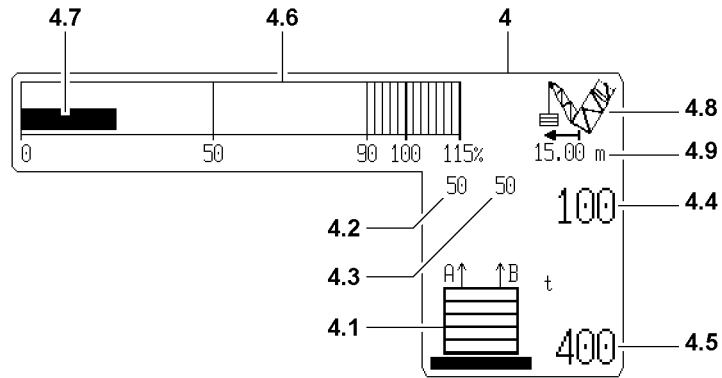
Pull test brackets test point 2A and 2B in the N / W-guying / pull test brackets test point 3A and 3B in the S-guying in derrick operation

Position	Icons / display values	Type of display	Is shown
2	Icon for N / W-guy force and main boom S-guy force in derrick operation in units [t] or [kips]	Static	In operating modes with lattice jib or derrick
2.1	Icon F2 for N / W-guy force test point 2	Static	In operating modes with lattice jib
2.2	F2-actual value	Static	In operating modes with lattice jib and valid F2-value
	$F2 = F2A + F2B$ Test point 2A / B is in the lattice jib guying on NA frame I (WA frame I) Test point 2A = left Test point 2B = right	"???" blinking	In operating modes with lattice jib and invalid F2-value
2.3	Icon F3 for main boom S-guy force test point 3	Static	In operating modes with derrick
2.4	F3-actual value	Static	In operating modes with derrick and valid F3-value
	$F3 = F3A + F3B$ Test point 3A/B is in the derrick main boom guying on the main boom head Test point 3A = left Test point 3B = right	"???" blinking	In operating modes with derrick and invalid F3-value



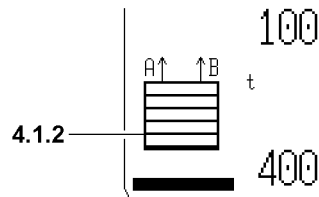
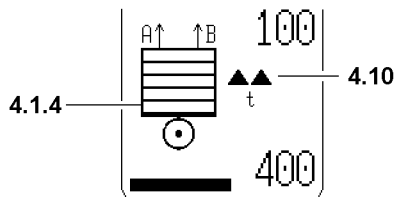
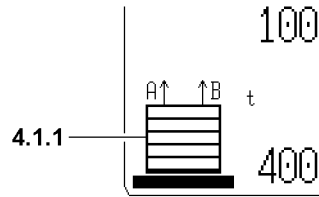
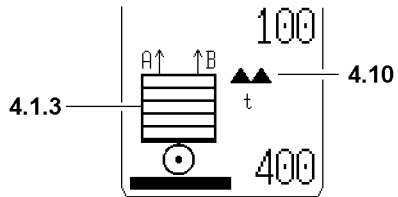
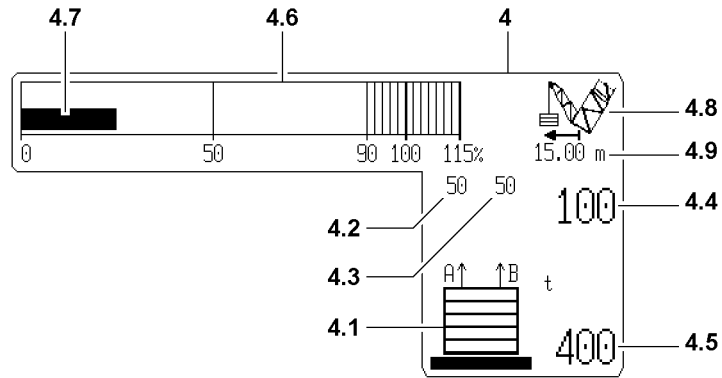
7.3 Derrick boom angle

Position	Icons / display values	Type of display	Is shown
3	“Derrick boom angle” icon	Static	In operating modes with derrick
3.1	Maximum derrick angle angle-D_{\max} during operation in [°]	Static	In operating modes with derrick and $\text{angle-D}_{\text{current}}$ smaller or same as angle-D_{\max}
		Blinking	In operating modes with derrick and $\text{angle-D}_{\text{current}}$ larger than angle-D_{\max}
3.2	Current derrick angle $\text{angle-D}_{\text{current}}$ in [°]	Static	In operating modes with derrick and valid value
		“???” blinking	In operating modes with derrick and invalid value
3.3	Minimum derrick angle angle-D_{\min} during operation in [°]	Static	In operating modes with derrick and $\text{angle-D}_{\text{current}}$ larger or same as angle-D_{\min}
		Blinking	In operating modes with derrick and $\text{angle-D}_{\text{current}}$ smaller than angle-D_{\min}
3.4	Limitation of relapse cylinders Derrick boom - condition icons		
3.4.1	Two arrows pointing up	Static	Relapse cylinder on block one limit switch actuated or defective
3.4.2	Arrow pointing up	Static	In $\text{angle-D}_{\text{current}}$ larger than angle-D_{\max}
3.4.3	Arrow pointing down	Static	In $\text{angle-D}_{\text{current}}$ smaller than angle-D_{\min}

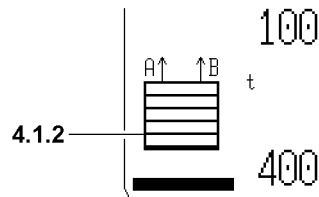
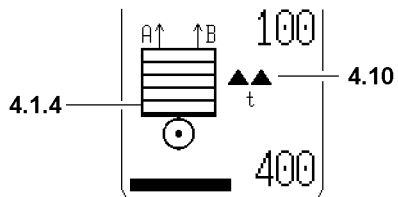
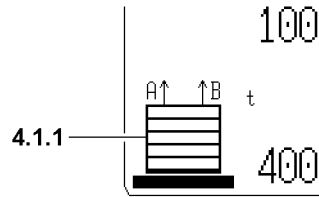
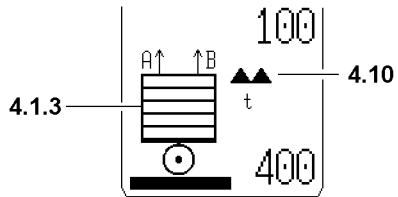
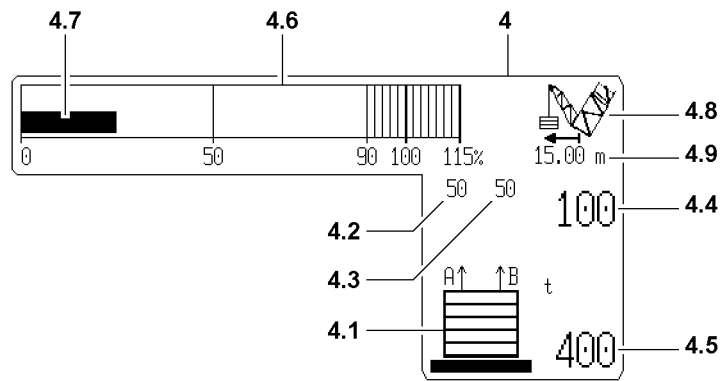


7.4 Derrick ballast, weight and utilization

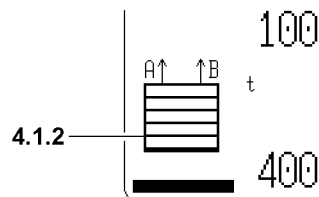
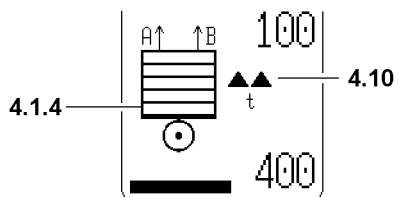
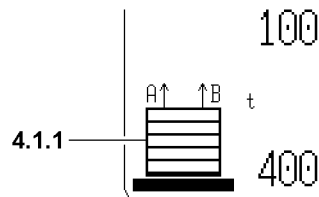
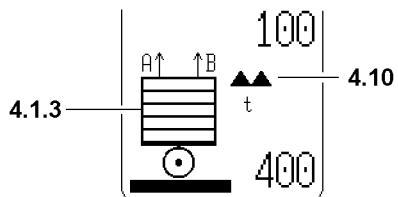
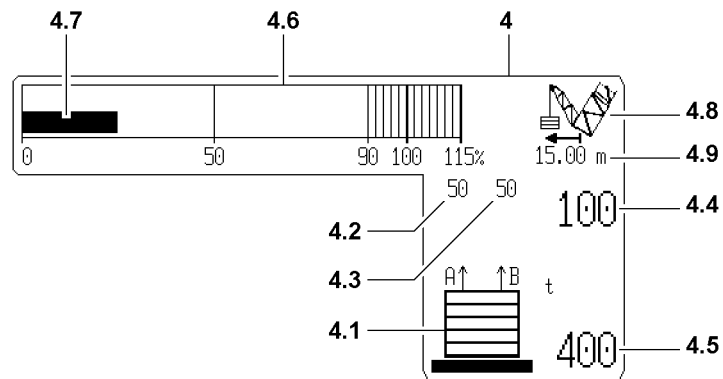
Position	Icons / display values	Type of display	Is shown
4	“Derrick ballast, weight and utilization” icon	Static	In operating modes with derrick ballast
4.1	“Derrick ballast” in unit [t] or [kips] icon Note: This force unit applies to all force or weight values shown within the frame.	Static	In operating modes with derrick ballast, depending on the type and the condition of the derrick ballast (see 4.1.1 - 4.1.4)
4.1.1	“Suspended ballast on the ground” icon	Static	In operating modes with suspended ballast and suspended ballast not suspended , according to limit switch
4.1.2	“Suspended ballast suspended” icon	Static	In operating modes with suspended ballast and suspended ballast suspended , according to limit switch
4.1.3	“Ballast trailer on the ground” icon	Static	In operating modes with ballast trailer and ballast trailer not suspended , according to key switch 386 (see crane operating instructions chapter 4.01)
4.1.4	“Ballast trailer suspended” icon	Static	In operating modes with ballast trailer and ballast trailer suspended , according to key switch 386 (see crane operating instructions chapter 4.01)



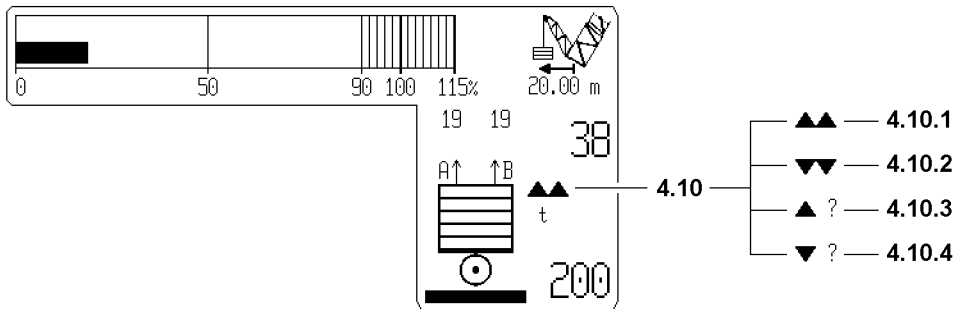
Position	Icons / display values	Type of display	Is shown
4.2	Force in derrick ballast guying A (left) = $F4A5A = F4A - F5A$	Static	Valid in operating modes with derrick ballast and F4A
		Blinking	Valid in operating modes with derrick ballast and F4A and F4B and the difference between the guy force A and B is larger than permitted
	Test point 4A = pressure sensor ring surface left Test point 5A = pressure sensor piston surface left If only test point 5A is invalid, then $F5A = F5B$ is accepted $F4A$ = Force 4A on ring surface left $F4B$ = Force 4B on ring surface right $F5A$ = Force 5A on piston surface left $F5B$ = Force 5B on piston surface right	"???" blinking	Invalid in operating modes with derrick ballast and F4A
4.3	Force in derrick ballast guying B (right) = $F4B5B = F4B - F5B$	Static	Valid in operating modes with derrick ballast and F4B
		Blinking	Valid in operating modes with derrick ballast and F4A and F4B and the difference between the guy force A and B is larger than permitted
	Test point 4B = pressure sensor ring surface right Test point 5B = pressure sensor piston surface right	"???" blinking	Invalid in operating modes with derrick ballast and F4B



Position	Icons / display values	Type of display	Is shown
4.4	Pulled derrick ballast $= BA_{\text{pulled}}$ = vertical force components of force in derrick ballast guying (= F4A5A + F4B5B) calculated from test points 4A, 4B, 5A and 5B Note: The sum of forces F4A5A and F4B5B is larger or the same as the pulled derrick ballast = BA_{pulled} .	Static	In operating modes with derrick ballast, if valid
		"???" blinking	In operating modes with derrick ballast, if value invalid or M4A or M4B defective or Operating mode with BW and derrick ballast radius invalid
4.5	Placed derrick ballast $= BA_{\text{placed}}$ Note: This value has been entered by hand and confirmed with the "ENTER" key. The value is saved when turning off and is valid again after turning on until it is changed with the function key "F5" .	Static	In operating modes with derrick ballast, if value BA_{placed} is permissible
		Blinking	In operating modes with derrick ballast, if value BA_{placed} is questionable
		"???" blinking	In operating modes with derrick ballast, if value BA_{placed} smaller than 0 or larger than 9999
4.6	Ballast utilization scale	Static	In operating modes with derrick ballast



Position	Icons / display values	Type of display	Is shown
4.7	<p>Derrick ballast utilization bar display = $BA_{pulled} / BA_{placed}$ in percentages [%]</p> <p>Derrick ballast utilization bar display is 0 at: BA_{placed} smaller than BA_{placed_min}</p> <p>or</p> <p>BA_{pulled} = invalid</p> <p>Note: The bar can show max. 115 %.</p>	Dynamic	<p>In operating modes with derrick ballast</p> <p>Note: BA_{placed_min} 5 t on cranes with max. load carrying capacity smaller than 1000 t BA_{placed_min} 10 t on cranes with max. load carrying capacity ≥ 1000 t</p>
4.8	"Derrick ballast radius" icon	Static	In operating modes with derrick ballast
4.9	Display derrick ballast radius in [m] or [ft]	Static	Valid in operating modes with derrick ballast and derrick ballast radius value
		Blinking	Invalid in operating modes with derrick ballast and derrick ballast radius value
4.10	Alarm functions ballast trailer		Note: See section "Alarm functions" .



7.5 Alarm functions

4.10 Limit signs ballast trailer



Note

- ▶ The “limit signs ballast trailer” are displayed exclusively for ballast trailer operation, to the extent that a corresponding event applies!
- ▶ The level difference between the placement surface of the crane and the ballast trailer is limited both upward and downward. In order to avoid damages to the crane or ballast trailer, the upper and lower stop positions are monitored by limit switches. If one of the stop positions is reached, the corresponding limit signs “ballast trailer block position” on LICCON monitor 1. Movements on the crane or on the ballast trailer described below are turned off!

4.10.1 Two arrows pointing upward

- Display the **switch off** of movements.
 - Driving the crawler.
 - Turning the turntable.
 - Telescoping ballast trailer guide.
 - Raising the ballast trailer using the support cylinders.
 - Raising the ballast trailer using the pull cylinders.
 - Derrick adjustment by spooling out winch 4, triggered by:

4.10.2 Two arrows pointing down

- Driving the “ballast trailer block position upward”.
- Display the **switch off** of movements.
 - Driving the crawler.
 - Turning the turntable.
 - Telescoping ballast trailer guide.
 - Lowering the ballast trailer using the support cylinders.
 - Lowering the ballast trailer using the pull cylinders.
 - Derrick adjustment by spooling up winch 4, triggered by:

4.10.3 Arrow pointing upward with?

- Driving the “ballast trailer block position downward”.
- There is at least one limit switch - “ballast trailer block position upward” - defective.

Note:

There is no shut off upon reaching block position upward or downward!

Defective limit switches are to be replaced immediately with new limit switches and subjected to a function test!

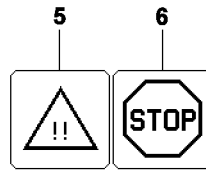
4.10.4 Arrow pointing downward with?

- There is at least one limit switch - “ballast trailer block position downward” - defective.

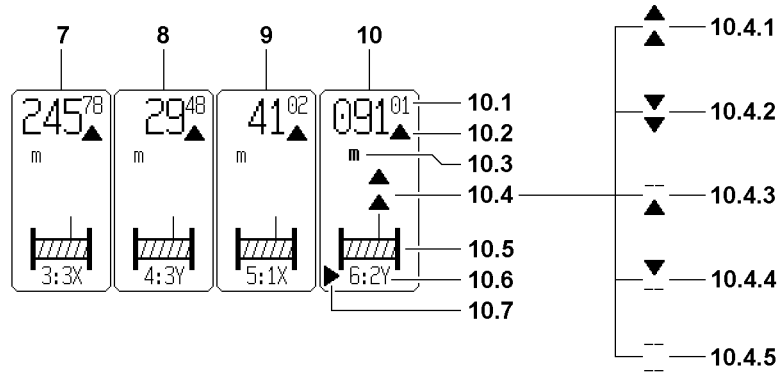
Note:

There is no shut off upon reaching block position upward or downward!

Defective limit switches are to be replaced immediately with new limit switches and subjected to a function test!



Position	Icons / display values	Type of display	Is shown
5	“Advance warning” icon	Blinking	At $M1_{\min}$ - advance warning ($F1_{is}$ smaller than $F1_{\min}$ -Warning value)
6	“STOP” icon	Blinking	At $F1_{\min}$ -Stop ($F1_{is}$ smaller than $F1_{\min}$) with after run 3 s or At $F1_{\max}$ - operation Stop ($F1_{is}$ greater than $F1_{\max}$ - operation shut off value) with after run 3 s or $F1_{\max}$ -assembly-stop ($F1_{is}$ greater than $F1_{\max}$ - assembly) with after run 3 s Note: $F1_{\max}$ -operation shut off value = $F1_{\max}$ -operation + 40 t .



7.6 Winch displays

7.6.1 Winches

The icons for winches 3*, 4, 5* and 6* are only shown on monitor 1, if the crane is equipped with these winches.

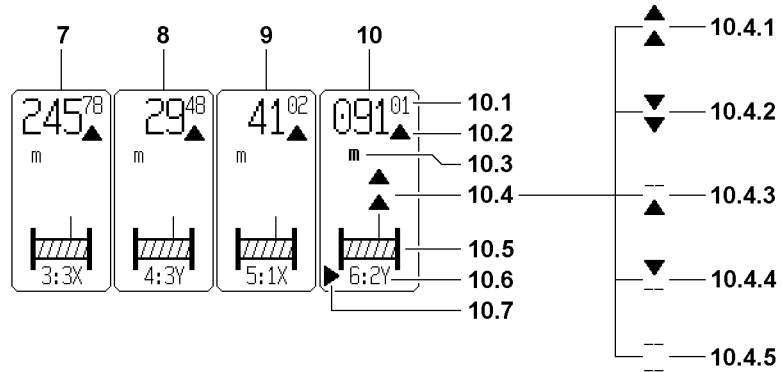
The display of winches is the same as the display of winches 1 and 2 on monitor 0.



Note

- ▶ The winch displays have only three positions before the comma, any positions before that are cut off.
- ▶ The crane operator must evaluate for himself if, for example 200 m rope are on a winch or 1200 m. **The display in both cases is identical with 200 m.**
- ▶ The length display is only exact if the winch has been calibrated and if there was no loss of data since then.

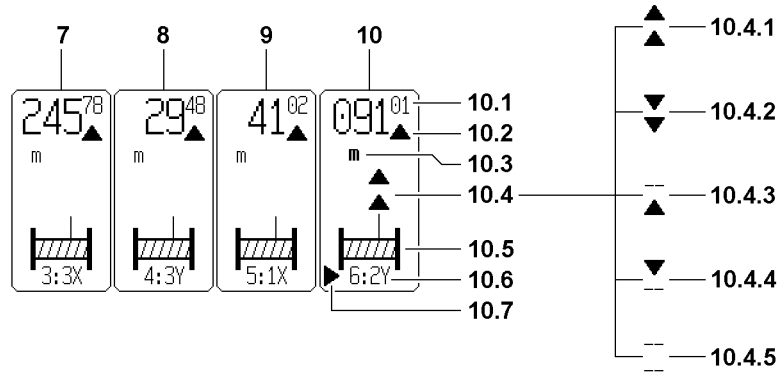
Position	Icons / display values	Type of display	Is shown
7	Winch display winch 3*	Static	With installed and plugged in winch 3 and winch turn sensor active*
8	Winch display winch 4	Static	With installed and plugged in winch 4 and winch turn sensor active
9	Winch display winch 5*	Static	With installed and plugged in winch 5 and winch turn sensor active*
10	Winch display winch 6* Note: Winch 6 in single operation of winch I and winch II, no master switch is assigned. If winch 1 and winch 2 are parallel operated, then winch 6 is assigned the master switch of winch 2, MS2Y.	Static	With installed and plugged in winch 6 and winch turn sensor active*



Position	Icons / display values	Type of display	Is shown
10.1	Hook path = rope length on winch / hoist rope reeving according to manual entry or Rope length on winch drum (for the intake gear, the rope length is valid evenly for the left and the right half of the rope drum)	Static	If winch is calculated as hoist winch (winch 6)
		Static	If the winch is calculated as control winch (winch 3* , winch 4, winch 5*)
		"???" blinking	In case of error in winch path measurement -> recalibrate winch

**Note**

- ▶ Winch 3, winch 4 and winch 5 are always calculated as control winches.
- ▶ Winch 6 is calculated as hoist winch, in operating system "boom nose".



7.6.2 Winch display icon

“Winches” icon

10 Icon “Winch 6”

10.1 Travelled distance

10.2 Direction of hook movement

10.3 Length unit for hook path display

• The winch 3, winch 4, winch 5 and winch 6 icons have the same meaning, which are explained for the icon “winch 6” **10**.

• 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 description for function key **F1**, function key **F2**, function key **F3** and function key **F4**).

• A prerequisite for the correct display is that the entered value matches the actual number of rope strands between the boom head and the hook block.

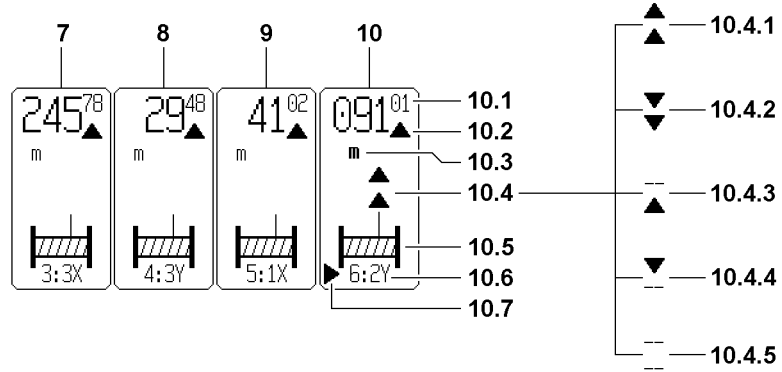
• The hook path calculation only works accurately if the load is suspended freely and is not luffed during the lifting procedure. Not taken into account are flexation and rope expansion.

The 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.

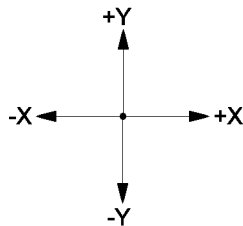
• In [m] or [ft].



- 10.4** Winch status display
- 10.4.1** Spool out
- 10.4.2** Spool up
- 10.4.3** Spooled out
- 10.4.4** Spooled up
- 10.4.5** Winch is deactivated

10.5 Winch icon

- 10.6** Winch number with master switch number and master switch operating direction

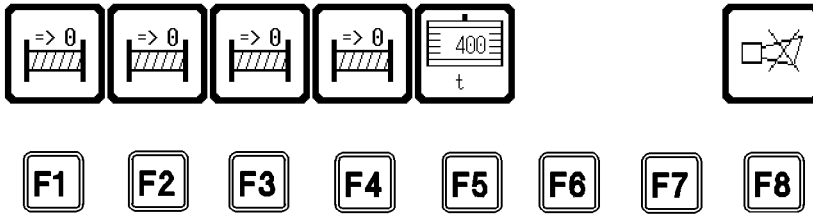


B199930

10.7 Vibration sensor

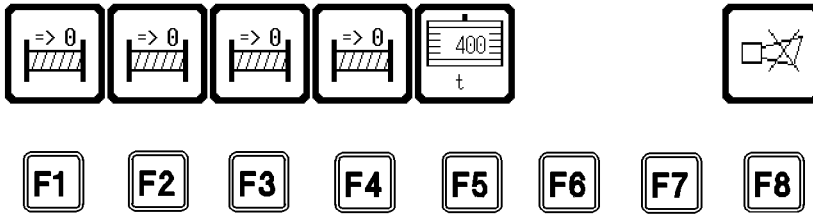
- There are five winch status icons (all flashing):
 - Spooling out is blocked.
 - Spooling up is blocked.
 - Spooling up and spooling out are blocked (via “Control parameter” program).
- **Note:**
 - If no winch status icon appears, the activated winch is inactive and is neither spooled up nor spooled out.
- (With rope end for winch status icon).
- Example: 6: 2Y
 - First digit: Winch number.
 - Second digit: Master switch number.
 - Letter: Master switch operating direction.

- If the vibration sensor for a winch is added on the master switch, then the arrow **10.7** appears in this winch icon for the added vibration sensor.
- **Note:**
 - The vibration sensor is added at the first actuated crane function.

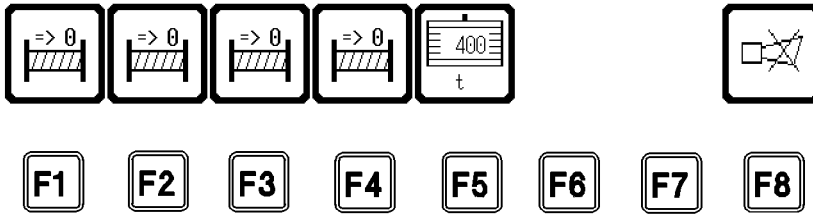


7.7 Function key line

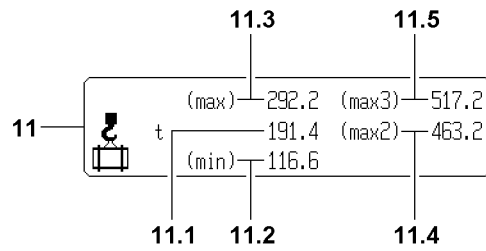
Position	Function / Function key line	Type of display	Is shown
F1	Tare length display of winch 3* Note: Tare = Length display is set to 0 ⁰⁰ .	Static	If winch display for winch 3* is shown
F2	Tare length display of winch 4	Static	If winch display for winch 4 is shown
F3	Tare length display of winch 5*	Static	If winch display for winch 5* is shown
F4	Tare length display of winch 6	Static	If winch display for winch 6* is shown



Position	Function / Function key line	Type of display	Is shown
F5	<p>Ballast editing key*</p> <p>When pressing function key F5, the thick icon frame changes to a thin icon frame. A blinking cursor appears in the ballast editing field. The value for the placed ballast can only be entered in the displayed weight unit [t] or [kips] via the key field on monitor 1.</p> <p>The ballast editing can be ended with:</p> <ul style="list-style-type: none"> - Pressing the "ENTER" key = take over value The entered value appears now as value for the placed ballast (BA_{placed}) in the ballast icon or - Pressing "F5" key = End editing The change is discarded The old value of BA_{placed} remains in the ballast icon <p>Note: When editing the ballast, make sure to observe the instructions regarding the derrick ballast in chapter 4.03!</p>	Static	In operating modes with derrick ballast
F5*	<p>Ballast input value (BA_{edit})*</p> <p>= edited ballast value in function key icon of "F5"</p>	Static	For valid ballast input value
		"???" blinking	For invalid ballast input value



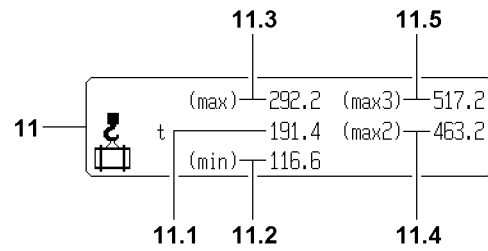
Position	Function / Function key line	Type of display	Is shown
F6-F7	Not assigned		
F8	"Horn" icon - Turn off the acoustical signal "Horn" on monitor 1 by pressing the "F8" key	Blinking	If the acoustical signal "Horn" sounds on monitor 1. See paragraph "Acoustical warning on monitor 1"



7.8 Load carrying capacity min / max

The “load carrying capacity min / max” **11** icon appears on monitor 1 only if an operating mode with derrick ballast has been selected.

- | | |
|---|--|
| <p>11 Load carrying capacity
min / max</p> | <ul style="list-style-type: none"> • In [t] or [kips]). |
| <p>11.1 Current load on the
boom</p> | <ul style="list-style-type: none"> • Actual load display = Load, which currently hangs on the selected boom. • Display of the calculated total load including the weights of the carrying equipment, the lifting equipment (hook block) and / or the tackle, but without the nominal weight of the hoist rope. • Note:
The “current load on the boom” 11.1 cannot “be tared” and set to zero on monitor 1.
If the “current load on the boom” 2.1 was not tared (“zeroed out”) on monitor 0, then the following applies:
The “current load on the boom” 11.1 of monitor 1 and the “current load on the boom” 2.1 of monitor 0 are identical. The displayed values must match. |
| <p>11.2 Min-load</p> | <ul style="list-style-type: none"> • Is the minimum load which the crane must pull in the current operating condition with the currently pulled derrick ballast, so that F_{1is} is larger than F_{1min} and no F_{1min}-shut off occurs as a result.
If this “min-load” is not reached, then the F_{1min}-shut off occurs. • The “min-load” is an approximate calculated value, which can still change slightly when lifting / setting down the load. • When the “min-load” is larger then the weight of the hook and the tackle, then this means that the load can only be set down if the pulled derrick ballast is also reduced. This means a suspended derrick ballast must be set down on the ground, otherwise the F_{1min}-shut off occurs. |



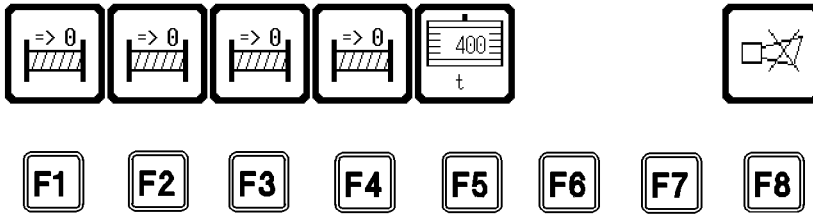
- 11.3 Max-load**
- Is the maximum load ("maximum load according to load chart and reeving on the boom" **1.1**), which the crane can lift in the current operating condition with the currently **pulled** derrick ballast.
- Note:**
Die "max-load" on monitor 1 and the "Maximum load" on monitor 0 are identical. The displayed values must always match.
- 11.4 Max2-load**
- Is the maximum load, which the crane can lift in the current operating condition, when the **placed** derrick ballast is fully **pulled**.
- 11.5 Max3-load**
- Is the maximum load, which the crane can lift in the current operating condition, when the **optimum** derrick ballast is placed and fully **pulled**.
- Note:**
The optimum derrick ballast is reached when a further increase of the derrick ballast results in **no higher maximum load**.



Note

The following display values of the "load min / max" **11** icon correspond:

- ▶ The "current load on the boom" **11.1** and the actual force " $F_{1_{is}}$ " **1.1**.
 - ▶ The "min-load" **11.2** and the minimum force " $F_{1_{min}}$ " **1.2**.
 - ▶ The "max-load" **11.3** and the maximum operating force " $F_{1_{max-operation}}$ " **1.3**.
-



7.9 Acoustical warning on monitor 1

7.9.1 "Horn"

7 Icon "Horn"

- Acoustical signal.
- For some operational errors found on the CPU 1, which can lead to a shut off of a movement, it is important to check the operating screen on monitor 1. These errors are also reported by the acoustical signal "Horn", in addition to the optical display.
"Horn" is a beeping sound of a duration of approximately 0.5 seconds, which is repeated in one second rhythm.
- **Operational errors with "horn" on monitor 1, but without LEC, are:**
 - Exceeding of test point 1 - assembly maximum threshold.
 - Exceeding of test point 1 - operation -max- shut off threshold.
 - Exceeding of test point 1 - minimum threshold.
 - Exceeding of maximum derrick angle.
 - Falling below maximum derrick angle.
- **Operational errors with "horn" on monitor 1, but with LEC, are:**
 - Derrick ballast input error.
 - Derrick ballast guy force: Difference between right (A) and left (B) too large.



Note

- ▶ The sensor monitored by CPU1 (pull test brackets, pressure sensors, angle sensors) are shown in case of an error by a LEC error on monitor 0. There is no acoustical signal "Horn" on monitor 1.

"Short horn" on monitor 1

- 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 that lasts for approximately 0.1 seconds and is repeated in one second rhythm.
- **The following errors are monitored:**
 - Advance warning threshold of test point 1 - Minimum force not reached (at approx. 30 t via $F1_{min}$).

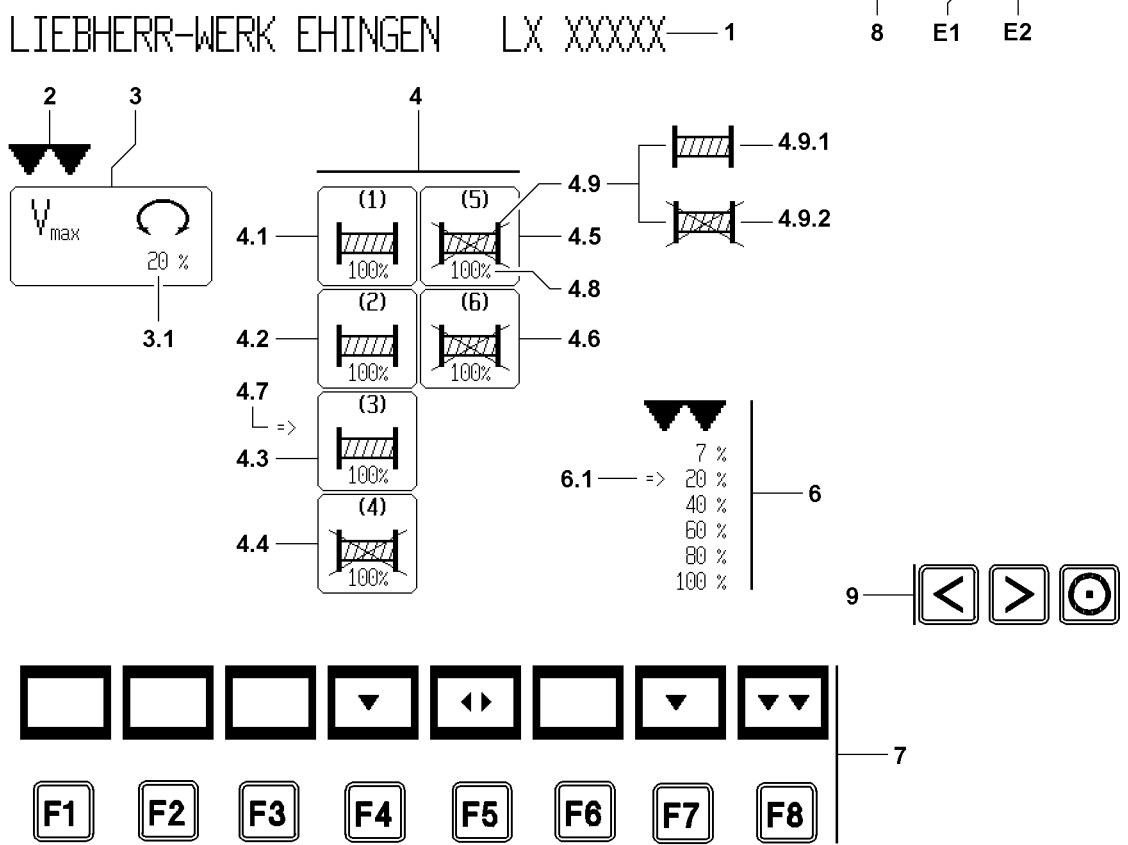
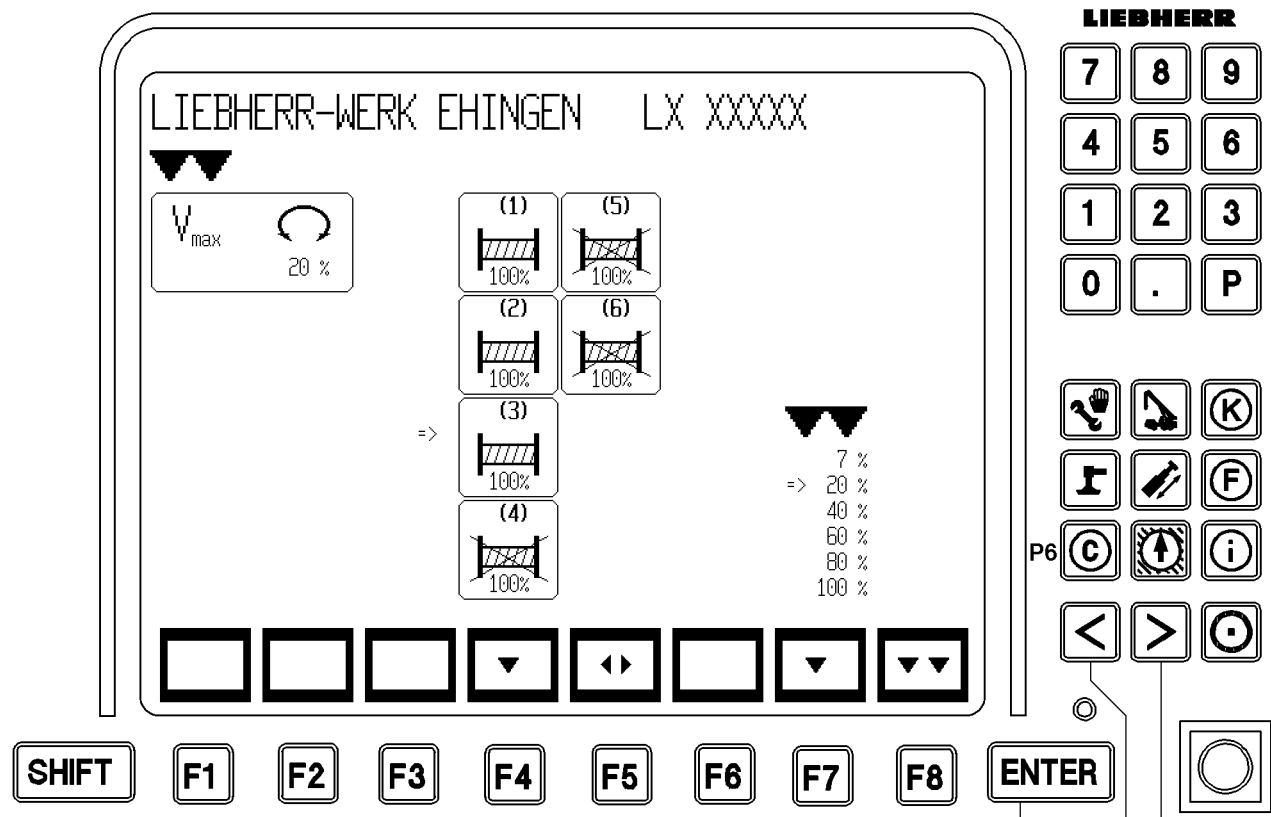
Priority and "horn off"

- 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 1 may be turned off by function key **F8**.
- **Note:**
The "horn", as well as the "short horn" immediately become active again if an error recurs.



Note

- ▶ Errors with **LEC** are shown on monitor 0 in the operation screen, above the "F8" key.



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8 “Control parameter” program

The “Control parameter” program offers the following possibilities:

- Preselection of maximum rotation speed of slewing gear.
- Preselection of maximum rotation speed of individual winches.
- Activation / deactivation of individual winches.

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.



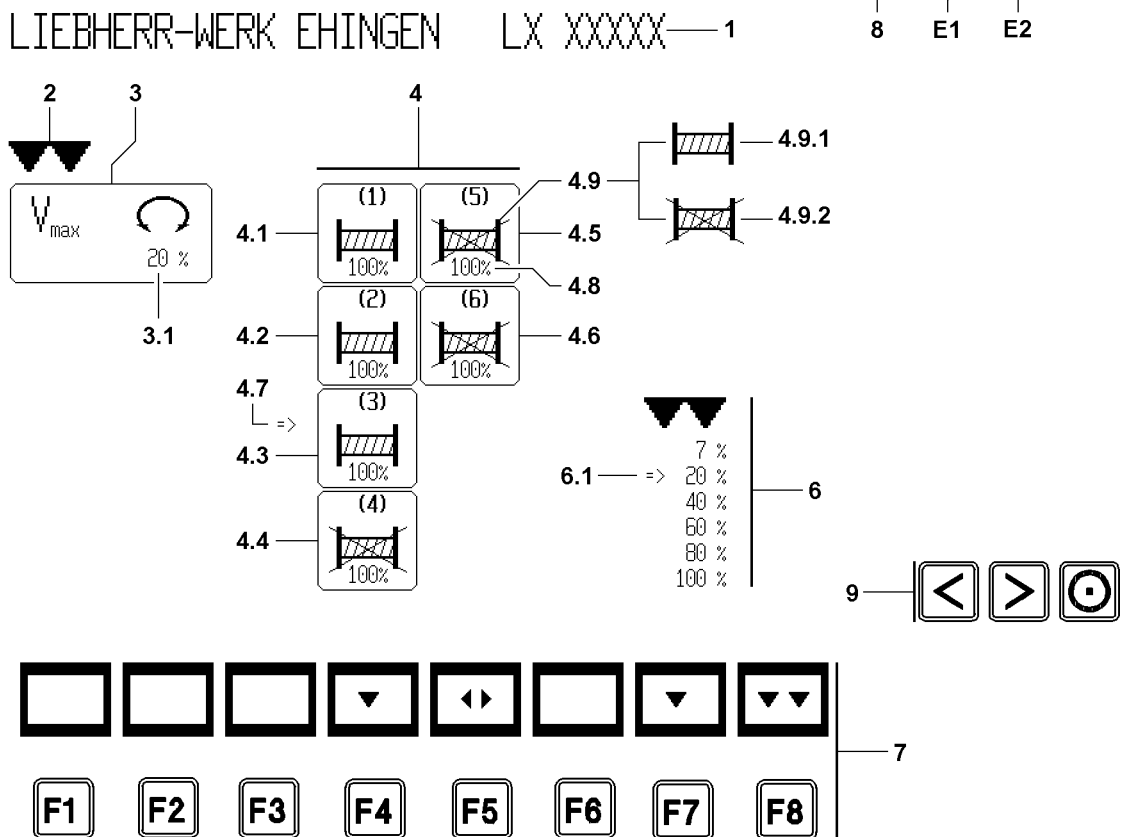
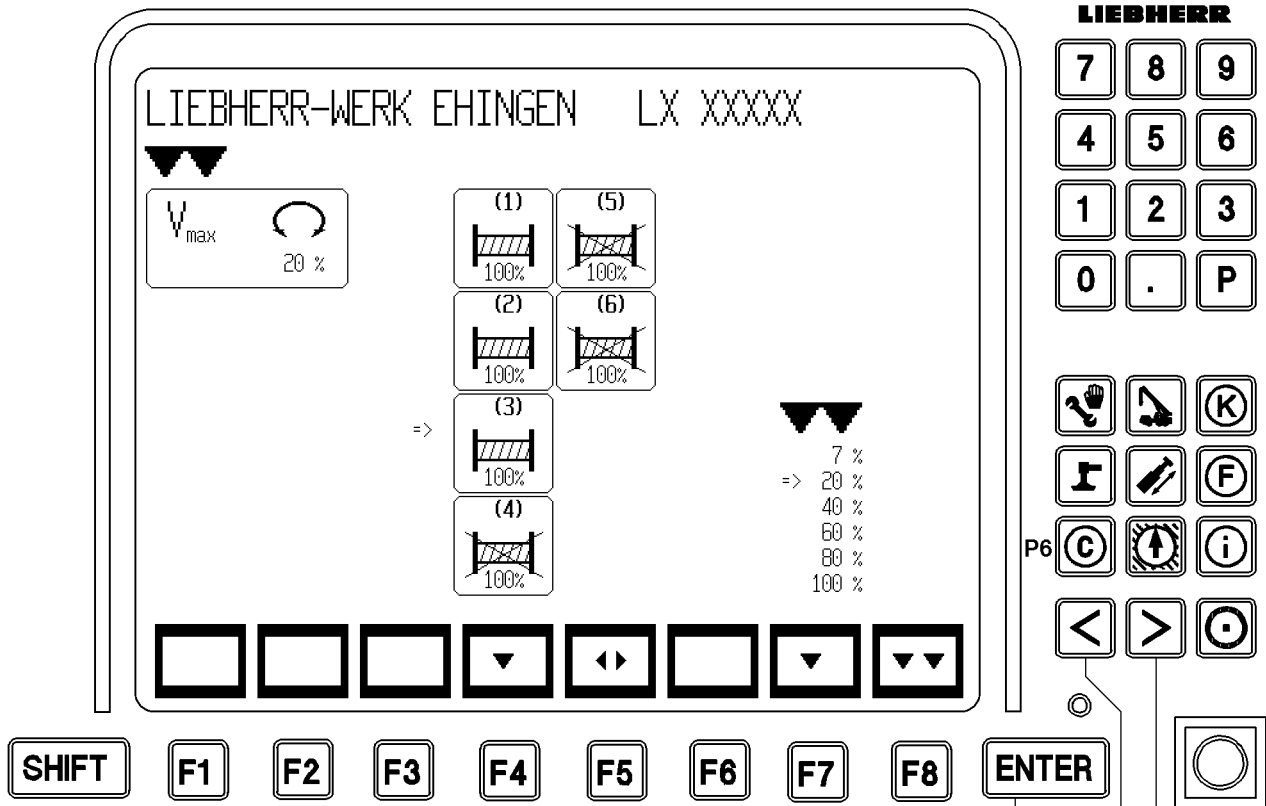
DANGER

Risk of accident!

- ▶ **Never** change the speeds or the activation / de-activation of the winches during control of a crane movement.
-

8.1 Starting the program

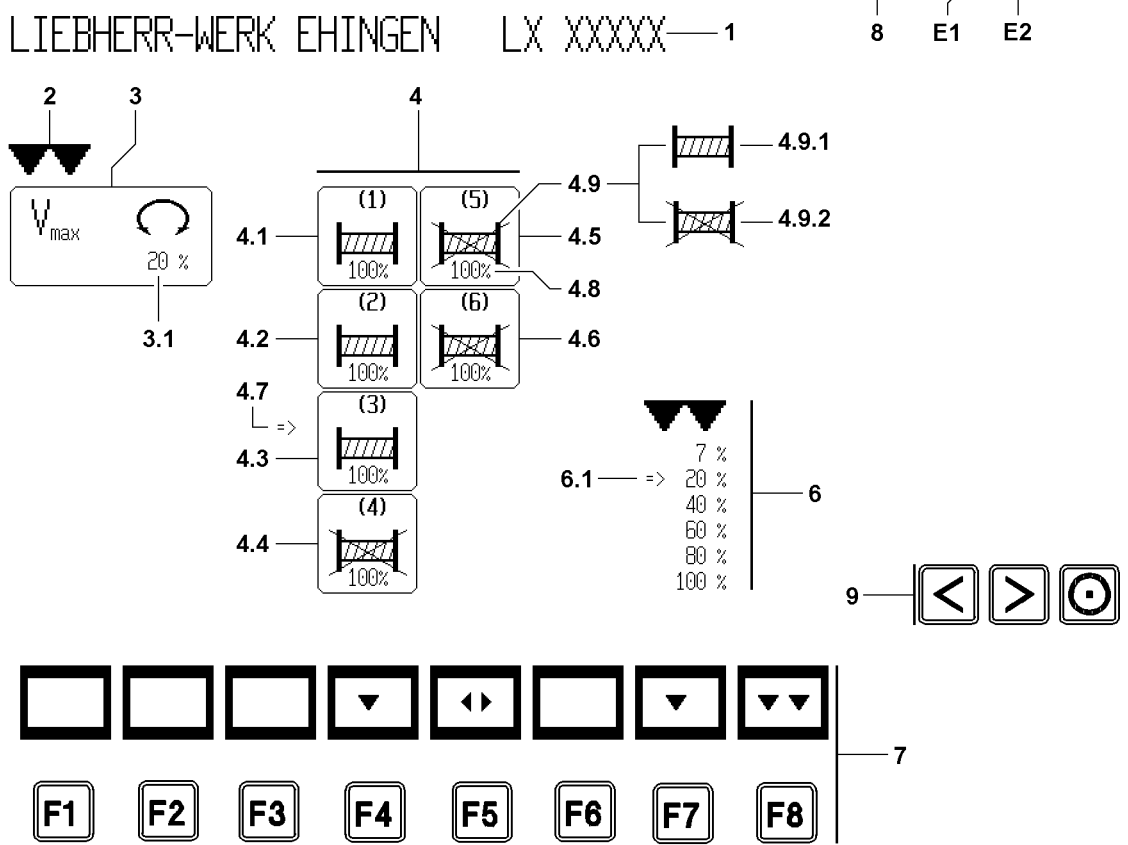
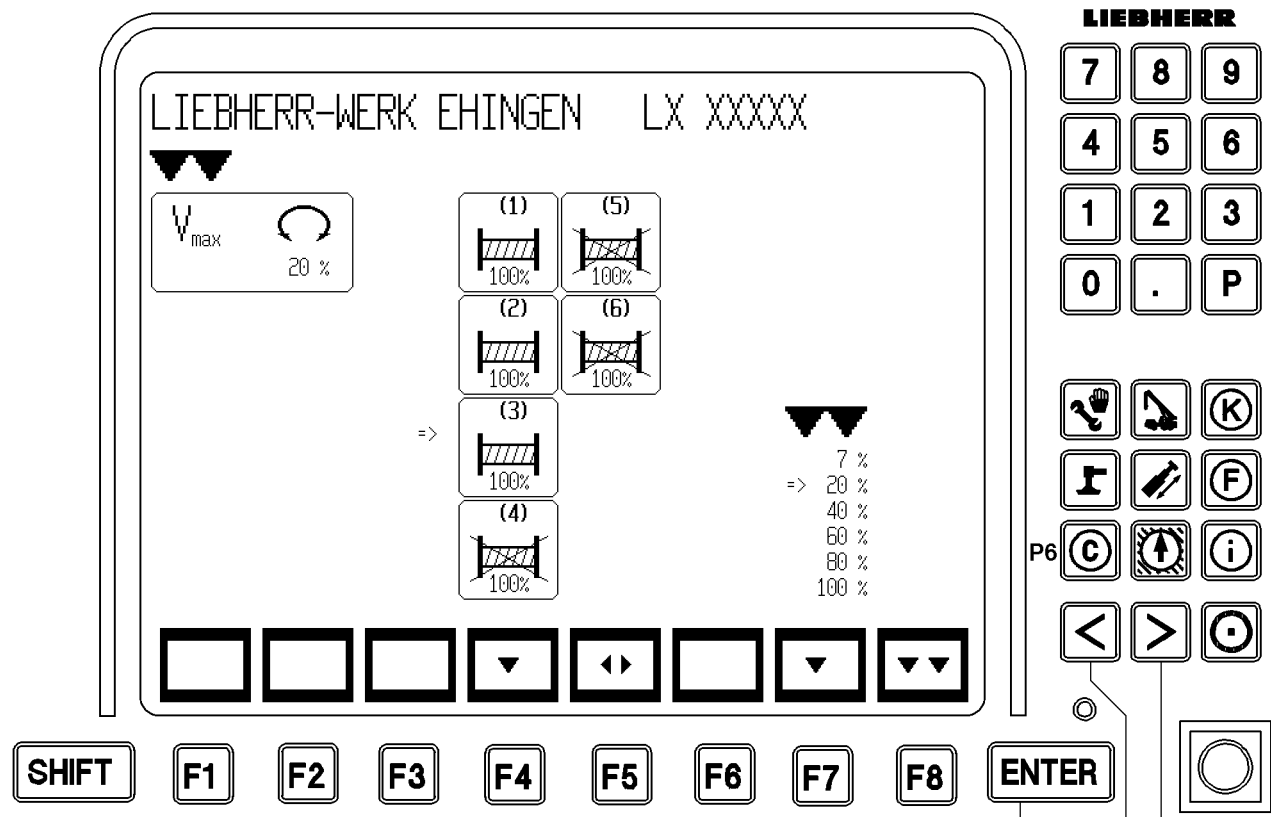
- ▶ Press program key **P6**.



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8.2 User interface

- 1 Crane type
- 2 Selector "icon selection"
 - Double arrow pointing down.
 - Select icon.
- 3 Icon "Slewing gear"
- 3.1 "Maximum rotation speed"
 - V_{\max} in percent [%].
- 4 Icon group "Winches"
 - 4.1 Winch 1
 - 4.2 Winch 2
 - 4.3 Winch 3*
 - 4.4 Winch 4
 - 4.5 Winch 5*
 - 4.6 Winch 6*
 - 4.7 Winch selector
 - Right arrow.
 - Select winch, which "properties" are to be changed.
 - 4.8 Speed
 - In percent [%].
 - See value field with selector.
 - 4.9 Winch icon
 - 4.9.1 Winch activated
 - 4.9.2 Winch deactivated
- 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. Six stages may be preselected.
 - 6.1 Speed selector
 - Right arrow.
 - Select percentage value(s) for speed stages.
- 7 Function key line
 - F4 Function key
 - Select winch.
 - F5 Function key
 - Activate / deactivate selected winch(es).
 - F7 Function key
 - Select percentage value of corresponding speed in value field.
 - F8 Function key
 - Return to the "Crane operation" program and take over parameter.
- 8 ENTER key
 - Take over the selected speed setting for the preset functions.
- 9 Special function keys
 - Take over the selected speed setting for the preset functions.
- E1 Special function key
 - Move the selector **2** for selecting icons to the left.
- E2 Special function key
 - Move the selector **2** for selecting icons to the right.



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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 percent [%] with function key **F7**.

Result:

- Selector (arrow to right) **6.1** shows the selected percentage value.

- ▶ Use the ENTER key **8** to confirm the maximum rotation speed selected.

Result:

- The value of the maximum rotation speed will be accepted.

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.

- ▶ With function key **F4** select the icon for winch 1, winch 2, winch 3*, winch 4, winch 5* and winch 6*.

Result:

- Selector (arrow to right) **4.7** shows the selected winch.

- ▶ Select the maximum rotation speed in percent [%] with function key **F7**.

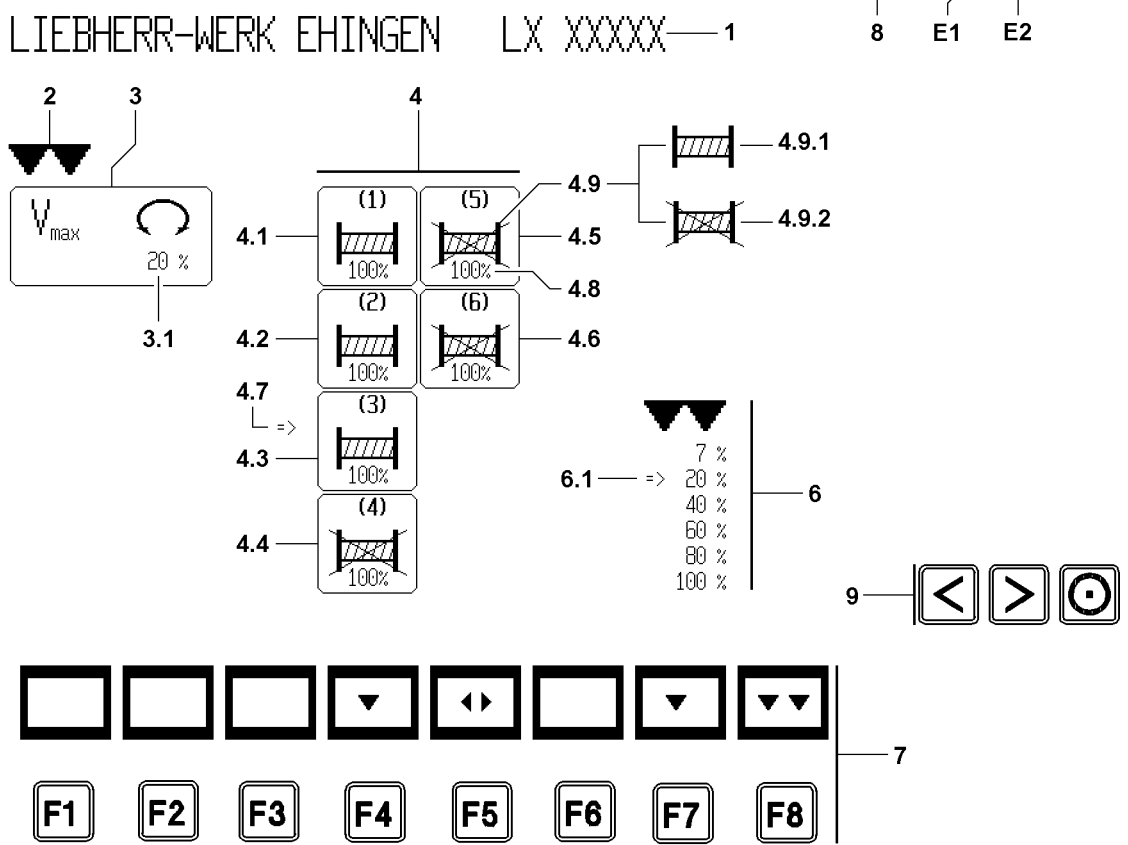
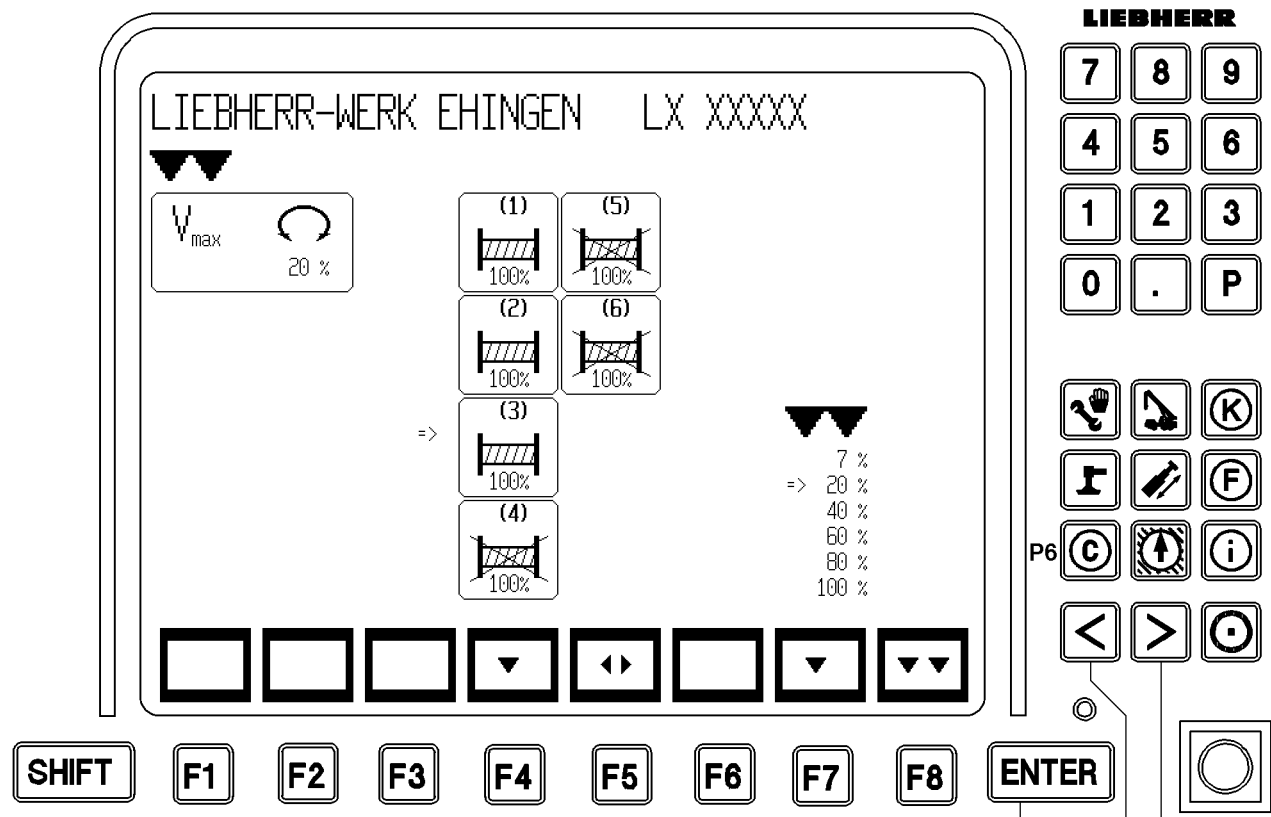
Result:

- Selector (arrow to right) **6.1** shows the selected percentage value.

- ▶ Use the ENTER key **8** to confirm the maximum rotation speed selected.

Result:

- The value of the maximum rotation speed will be accepted.



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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.

- ▶ With function key **F4** select the icon for winch 1, winch 2, winch 3*, winch 4, winch 5* and winch 6*.

Result:

- Selector (arrow to right) **4.7** 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 not crossed out = winch activated **4.9.1**.

Winch icon crossed out = winch deactivated **4.9.2**.

8.5 Switching back to the “Crane operation” program

- ▶ Press function key **F8**.

Result: The parameters previously confirmed using the ENTER key **8** will be accepted.

The main display panel is divided into several sections:

- Top Row:** Two warning icons (triangle with exclamation mark) labeled '5.2' and '6.2'. To the right, a 'max' indicator shows 'n = 24' and a temperature gauge reads '292.2'.
- Second Row:** A fuel level gauge on the left shows 'LXXX YZZ' and 'XXXX' with a scale from 0 to 130% (1/min:1500, 50, 90, 100, 110, 130%). To the right, a temperature gauge reads '11.5' and another reads '191.4'.
- Third Row:** Two hydraulic pressure gauges on the left show '012²⁷' and '006⁰⁵'. To the right, a hydraulic pressure gauge shows '24.6' and an angle indicator shows '87.0°'.
- Fourth Row:** Two hydraulic pressure gauges on the left show '2:2Y' and '1:1Y'. To the right, a hydraulic pressure gauge shows '36.0' and another shows '48.0'.
- Fifth Row:** Two hydraulic pressure gauges on the left show '=> 0' and '=> 0'. To the right, a hydraulic pressure gauge shows '60.0°' and another shows '84.6'.
- Sixth Row:** Two hydraulic pressure gauges on the left show '=> 0' and '=> 0'. To the right, two hydraulic pressure gauges show '0' and '0'.

LIEBHERR

7	8	9
4	5	6
1	2	3
0	.	P
P0	P1	(K)
(F)	(F)	(F)
(C)	(i)	(i)
<	>	(O)

SHIFT

F1

F2

F3

F4

F5

F6

F7

F8

ENTER

○

The main display panel is divided into several sections:

- Top Row:** Fuel level gauge shows '85%'. Hydraulic pressure gauge shows '4.3 bar'. Temperature gauge shows '50°C' and '75'. Battery voltage gauge shows '24.3 V'. Hydraulic oil temperature gauge shows '70°C HydOil'.
- Bottom Row:** A warning icon (triangle with exclamation mark) on the left and 'O.K.' on the right.

LIEBHERR

7	8	9
4	5	6
1	2	3
0	.	P
(K)	(K)	(K)
(F)	(F)	(F)
(C)	(i)	(i)
<	>	(O)

SHIFT

F1

F2

F3

F4

F5

F6

F7

F8

ENTER

○

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9 The “Engine monitoring” program

All engine-related data is displayed by the “Engine monitoring” program, such as the engine oil pressure, coolant temperature etc. In case of a problem, the change from the “Crane operation” program is made automatically.

If the chassis motor is turned off during the crane operation, only data for the crane engine is displayed in the event of a failure or when switching to the engine monitoring screen.

9.1 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 approx. 5 seconds and then automatically reverts to the 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).

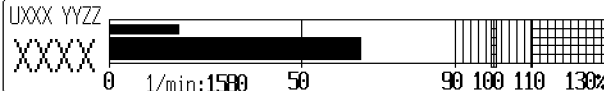
5.2
6.2





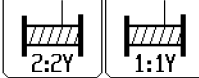
max n=24
292.2

UXXX YZZZ
XXXX



11.5
191.4


012²⁷ 006⁰⁵
m m




24.6
87.0°










36.0
48.0

60.0°
84.6





LIEBHERR

7	8	9
4	5	6
1	2	3
0	.	P
P0		P1
		
		
		
<	>	⊙

SHIFT

F1

F2

F3

F4


F5


F6


F7


F8


ENTER


 %
85


 bar
4.3


 °C
50
75














 V
24.3

 °C
HydOil
70



O.K.

LIEBHERR

7	8	9
4	5	6
1	2	3
0	.	P
P0		P1
		
		
		
<	>	⊙

SHIFT

F1

F2

F3

F4

F5

F6

F7

F8

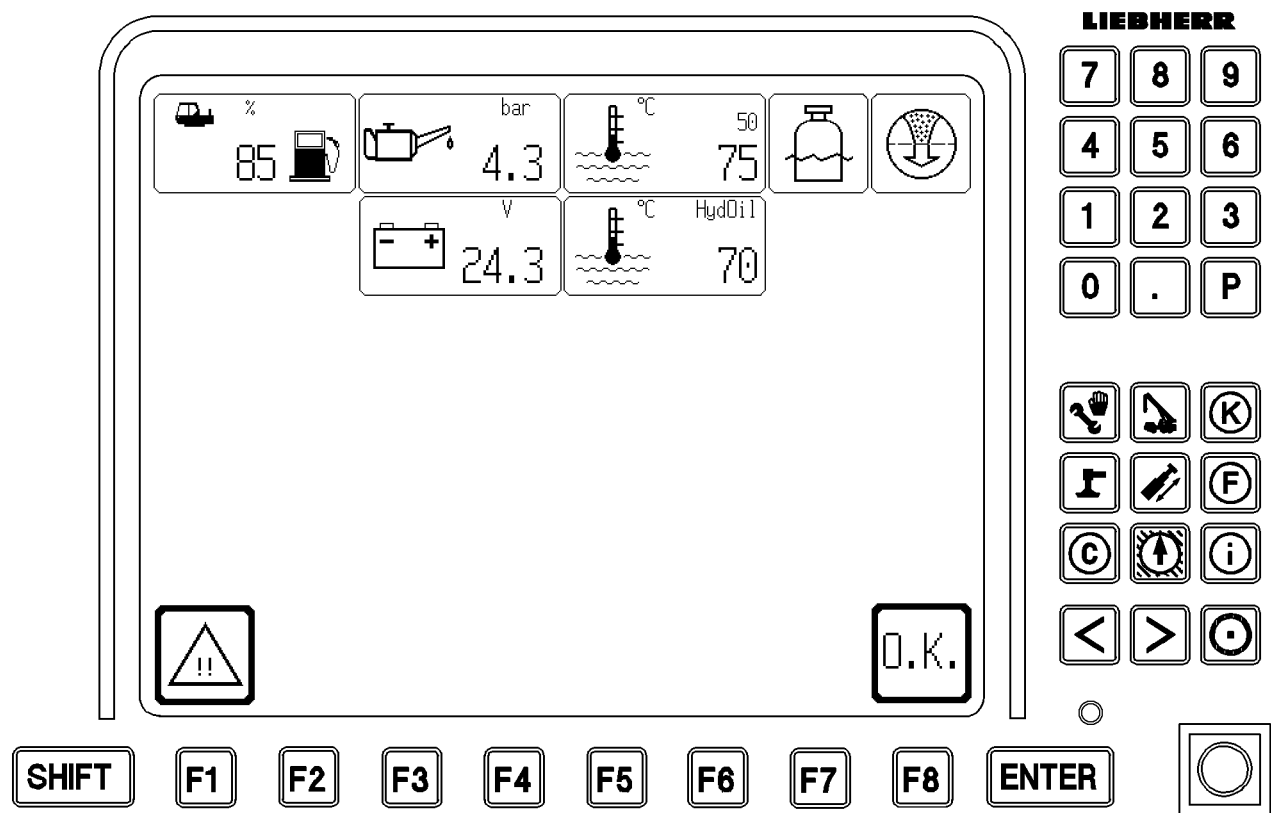
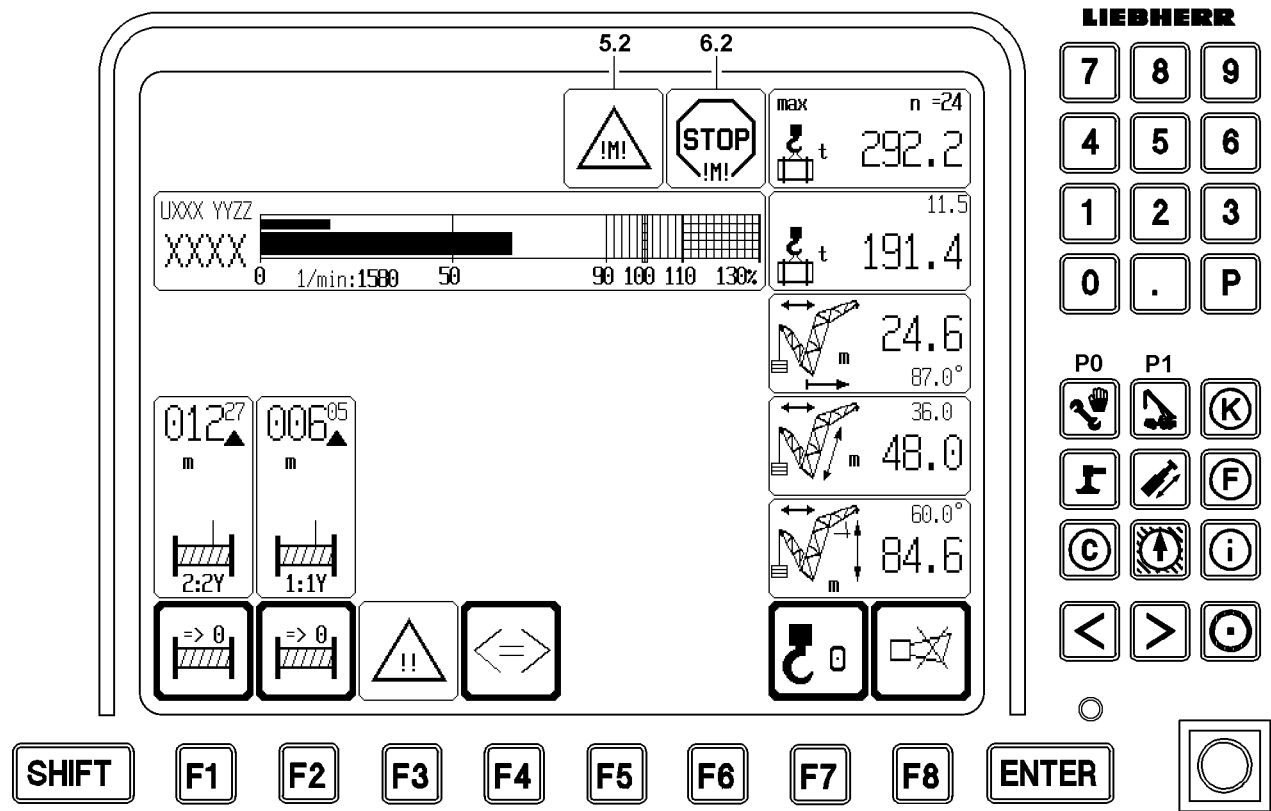
ENTER

B199923

9.2 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) missing	x		
Erroneous hydraulic oil temperature (display value)	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) 10 % or less	x		
Fuel reserve (display value) 6 % or less		x	
Fuel reserve (display value) 1 %			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 5 seconds (retaining the engine monitoring screen is achieved by pressing the function key **F1**). Switch back to the 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 5 seconds the system switches back automatically to the "Crane operation" program.



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9.3 Retaining the engine monitoring screen

The automatic change over into the engine monitoring screen is only made from the "Crane operation" program.

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. Advanced warnings are **not** pointed out in the "Crane operation" program.



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**.

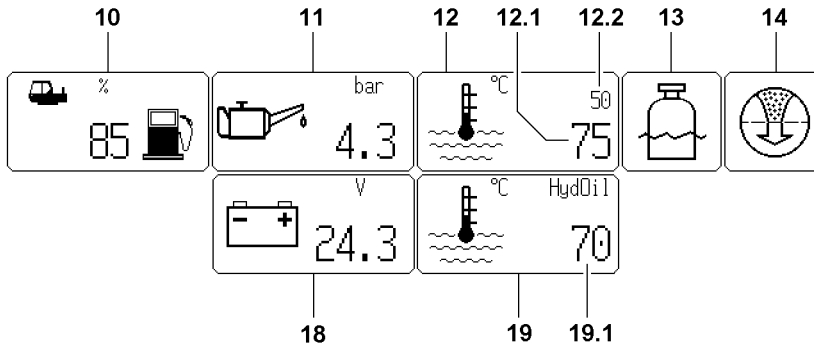
Result:

- Icon frames are displayed with a thin border.
- All crane movements that raise the load torque will be turned off or locked.

▶ 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 advance warning or STOP icons are faded into the "Crane operation" program.



9.4 Engine monitoring icons

9.4.1 Crane engine

10 Tank capacity	<ul style="list-style-type: none"> • In percent [%]. Icon blinks if the fuel reserve is less than 10 %.
11 Oil pressure	<ul style="list-style-type: none"> • In [bar]. Numeric display in icon blinks if the engine oil pressure is too low.
12 Coolant / charge air temperature	<ul style="list-style-type: none"> • In [°C].
12.1 Coolant temperature	<ul style="list-style-type: none"> • Numeric display blinks if the coolant temperature is too high.
12.2 Charge air temperature	<ul style="list-style-type: none"> • Numeric display blinks if the charge air temperature is too high.
13 Coolant level too low	<ul style="list-style-type: none"> • Icon appears if the coolant level is too low.
14 Air filter is dirty	<ul style="list-style-type: none"> • Icon appears if air filter is dirty.
18 Auxiliary function - Battery voltage	<ul style="list-style-type: none"> • In volts [V]. Numeric display in icon blinks if the operating voltage is less than 16 volts or above 36 volts.
19 Hydraulic oil temperature	<ul style="list-style-type: none"> • In [°C].
19.1 Hydraulic oil temperature	<ul style="list-style-type: none"> • Numeric display blinks if the hydraulic oil temperature is too high.

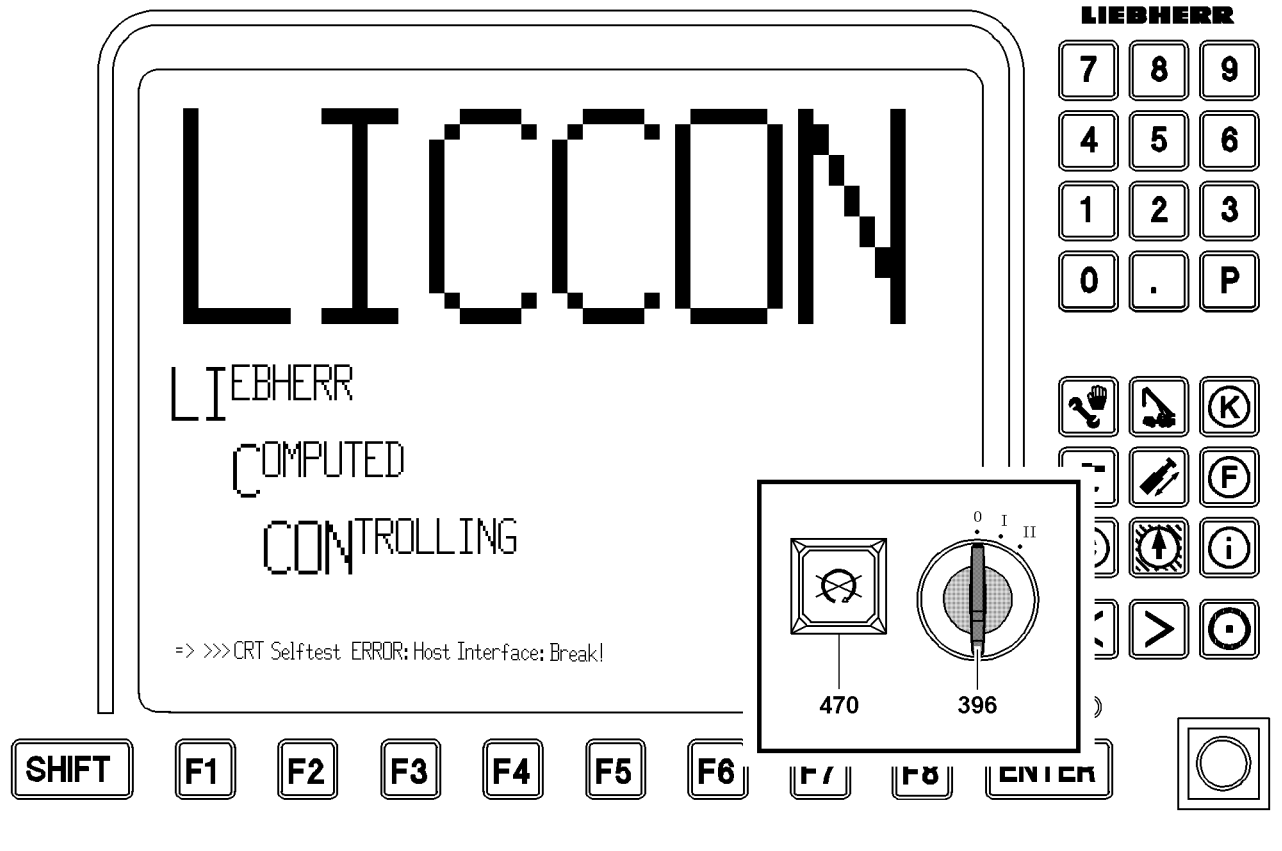
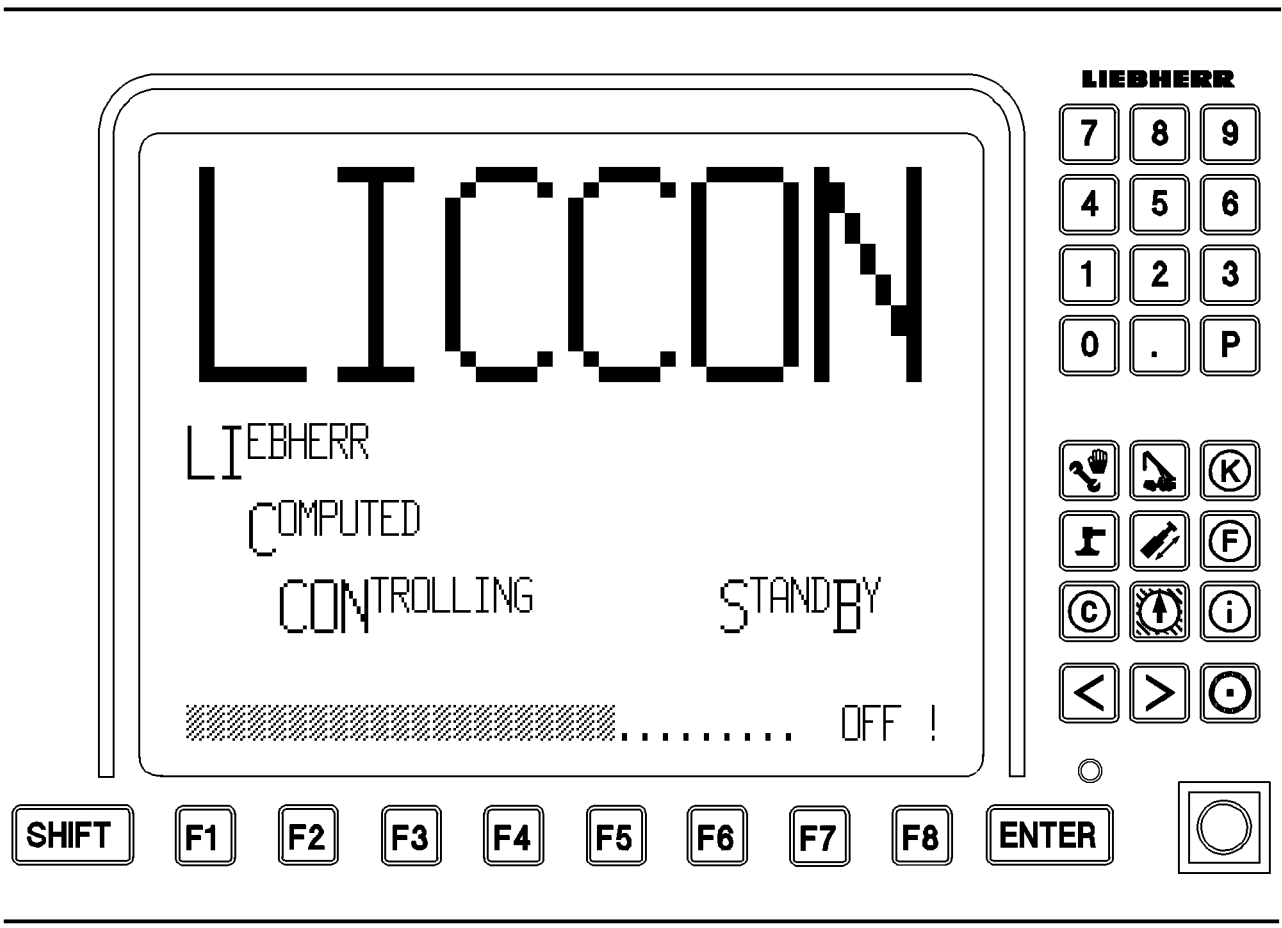
9.5 Function key line

F1 Function key	• Retaining the engine monitoring screen.
F8 Function key	• Switching back to the "Crane operation" program.



Note

- Function keys "F2" - "F7" are **not** used.



B105191

10 LICCON computer system in stand-by mode

10.1 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 **396** 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 button **470**.
- ▶ Leave the ignition key **396** in position "I".

Result: The engine is turned off.

10.2 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.

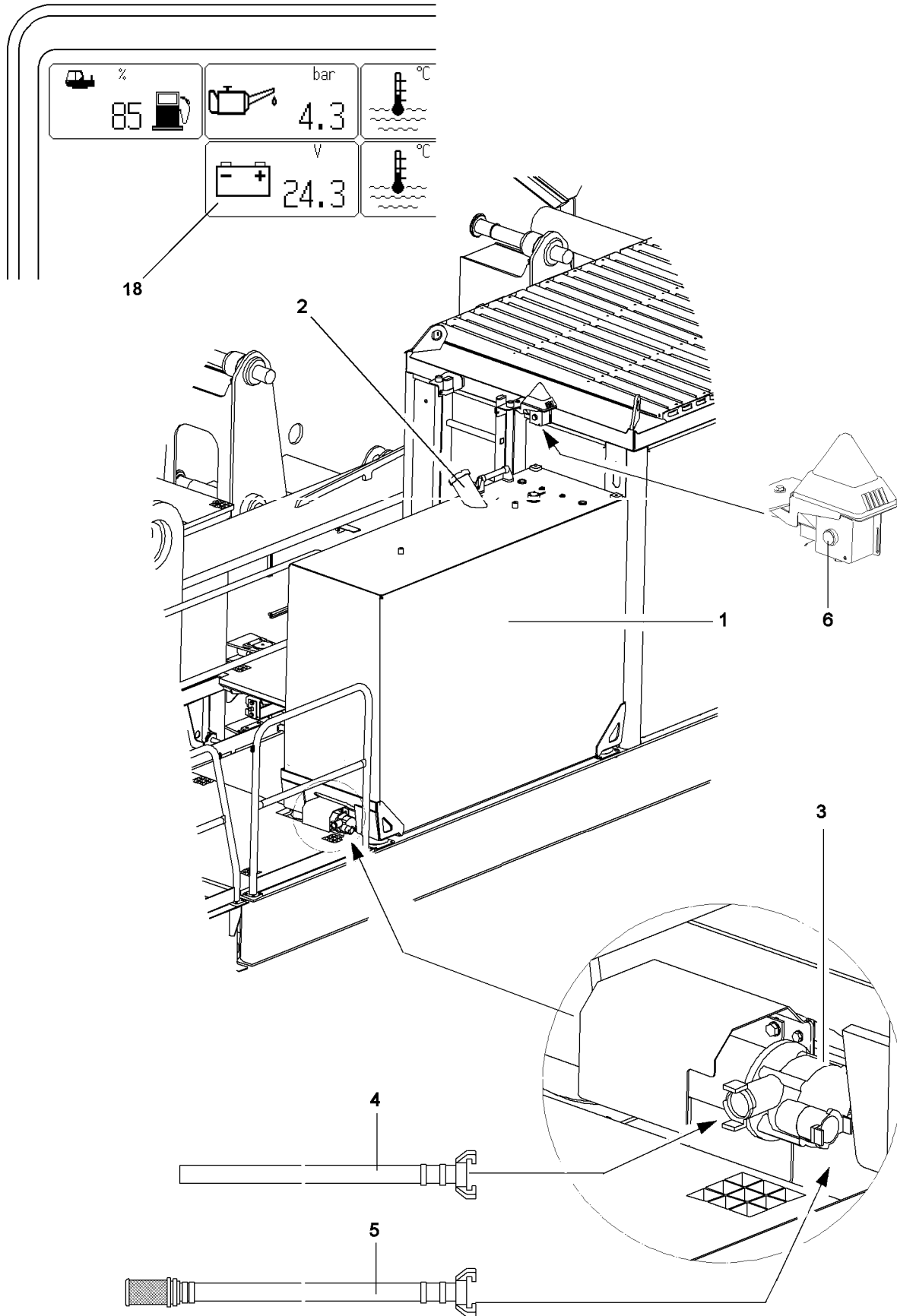
This screen appears on the LICCON monitor: **CRT self test: ERROR: Host Interface: Break!** (see illustration). In this case, this is not an error message from the LICCON computer system, the error message appears only on the monitor because the connection between the monitor and the CPU is broken.

10.3 Start prevention

Starting the engine again after complete shut down of the LICCON computer system:

- ▶ Return the ignition switch **396** first to position "0".
- ▶ Turn the ignition switch **396** to position "I" (note the preheating time).
- ▶ Turn the ignition switch **396** briefly to position "II".

Result: The engine starts.



B110810

1 Checks before start up

Various checks must be performed before operating the crane.

1.1 Checking the oil level and filters

- ▶ Check the engine oil level.
- ▶ Check the oil level in the hydraulic tank.
- ▶ Check the filter on the hydraulic tank.

1.2 Checking the fuel level



Note

Bleed the fuel system.

If the fuel tank has been run dry, then the fuel system must be bled.

- ▶ Do not run the fuel tank dry.

On the LICCON monitor, the tank content is given in the form of a numerical display in percent [%].

- ▶ Check the tank contents on LICCON monitor.

1.3 Filling the fuel tank

To refill fuel from a tanker, connect the tank hoses on the tank pump.

- ▶ Connect tank hose **4** and tank hose **5** on the tank pump **3**.
- ▶ Insert tank hose **4** into filler pipe **2**.
- ▶ Direct tank hose **5** to the tank car.
- ▶ Actuate the tank pump **3**: Press the button **6**.
- ▶ Check the tank contents on LICCON monitor.

1.4 Checking the coolant level



WARNING

Danger of injury due to scalding of the skin!

- ▶ Check the coolant level only when the engine is cold.

The coolant expansion tank must be filled up to overflow on the filler neck.

- ▶ Check the coolant level.

1.5 Checking the battery voltage



Note

The battery voltage must be checked in regular intervals - especially if the crane has been "out of service" for a longer period of time and users, such as the airplane warning light are turned on - and the battery must be recharged if necessary!

- ▶ Recharge the battery, see Crane operating instructions, chapter 7.05!

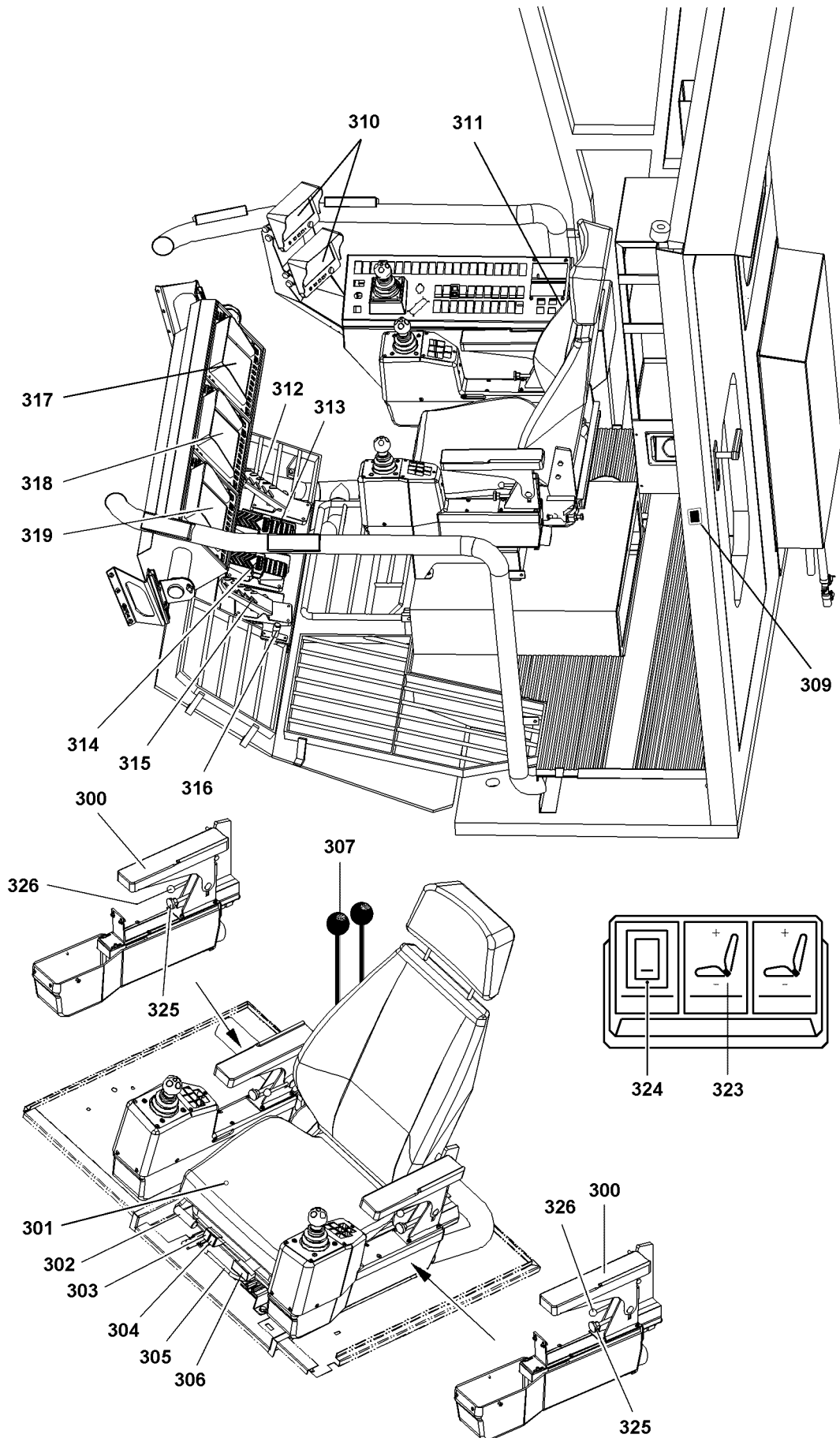


Note

Reduced battery performance requires greater power requirements!

- ▶ Ensure that batteries are well charged, particularly during the colder months!

- ▶ Check the battery voltage, see icon **18**.



B102765

1.6 Checking the central lubrication system

The grease container must always be filled with grease as specified in the lubrication chart, see Crane operating instructions, chapter 7.05.

- ▶ Check the grease container.

1.7 Checking the general condition of the crane



DANGER

Danger of accident due to falling parts!

- ▶ Before raising the boom, check that there are no loose parts on the main boom and / or the auxiliary boom, such as pins, spring retainers or ice.

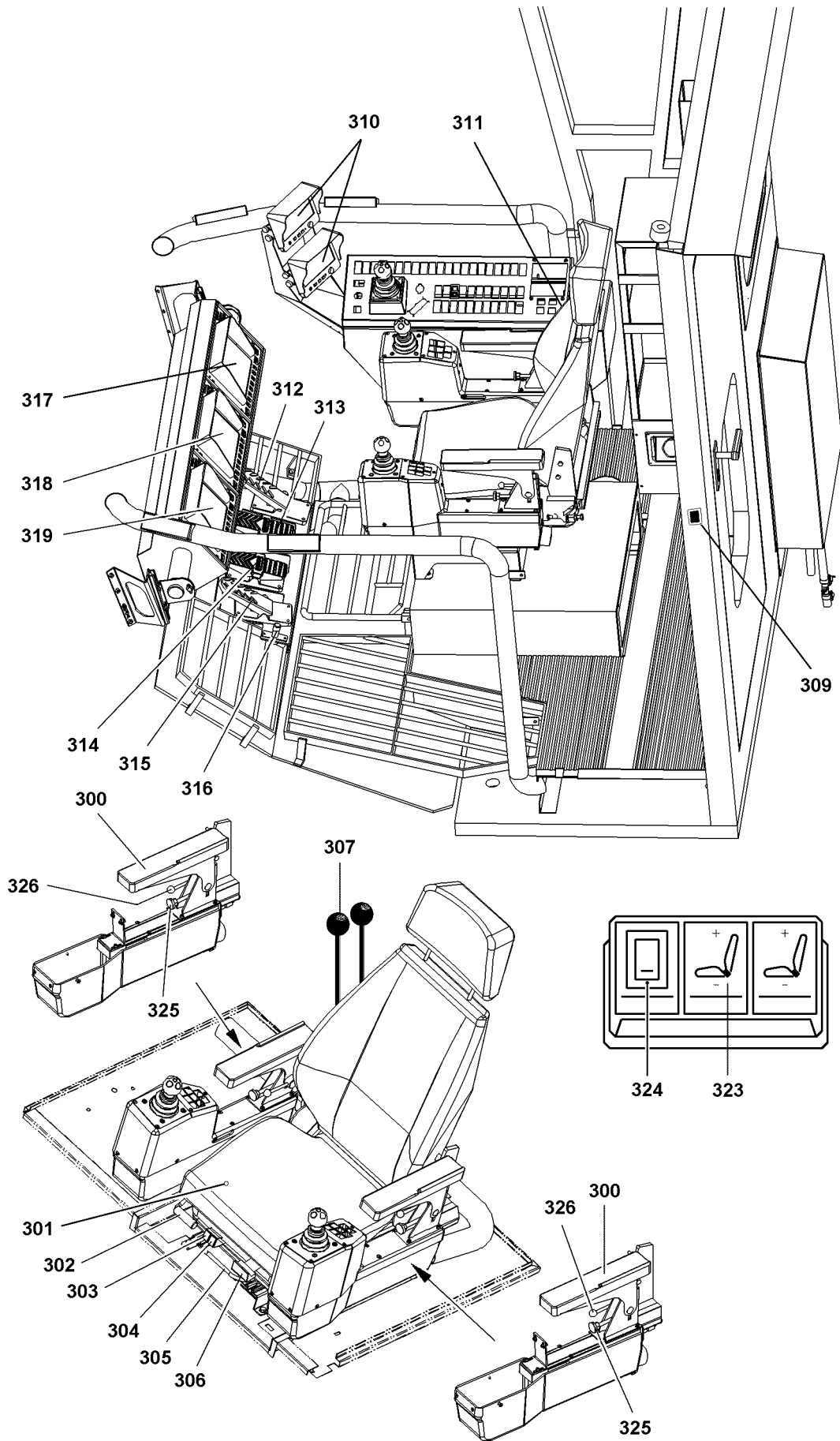
- ▶ Check if the crane is horizontally aligned.
- ▶ Check if the gear ring of the slewing ring connection is clean and greased.
- ▶ Check if the air supply to the oil and water cooler is clear.
- ▶ Check if the side covers are closed and locked.
- ▶ Ensure that there are no people or objects within the danger zone of the crane.
- ▶ Make sure that the cable / rope drum and the limit switches are free of snow and ice.
- ▶ Make sure that there are no loose parts on the superstructure and the boom.

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.
- ▶ Set with adjusting screw **325** to adjust angle of armrests.
- ▶ Set with lever **326** to adjust height of armrests.



B102765

2.2 Turning the seat heater* on

- ▶ Actuate the switch **324**.

Result:

- The seat is heated.

2.3 Turning the heater and climate control on

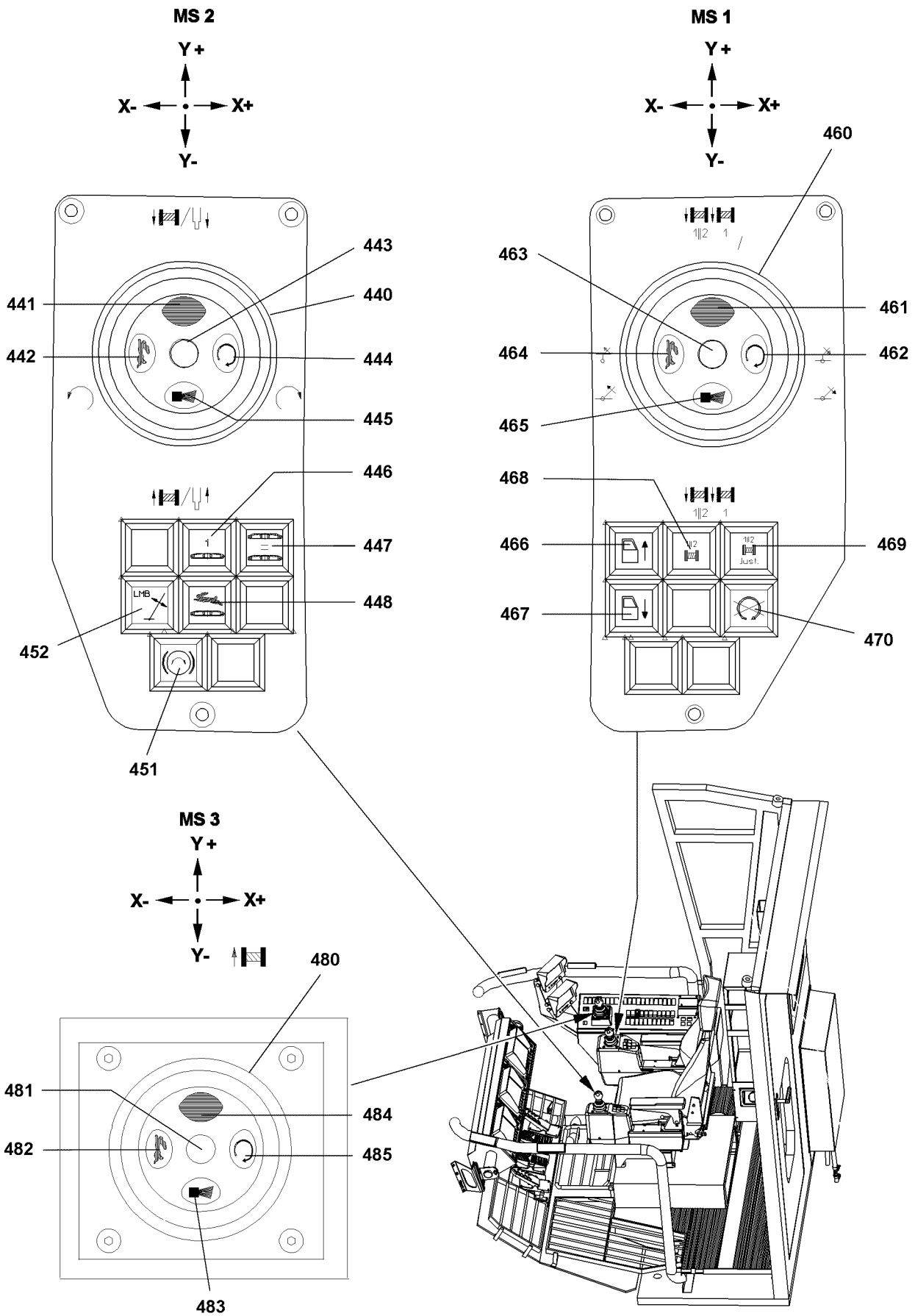
The crane operator's cab can be heated or ventilated, depending on the desired temperature. For a detailed description see Crane operating instructions, chapter 6.01.

2.4 Suspension backrest*

- ▶ Press the button **323**.

Result:

- The suspension of the backrest is adjusted.



B102768

2.5 Tilting the crane cab

To give the crane driver a better field of vision, the cab can be tilted upwards. When you have finished working with the crane, set it to horizontal.

2.5.1 Tilting the cab upward

▶ Press the button **466**.

Result:

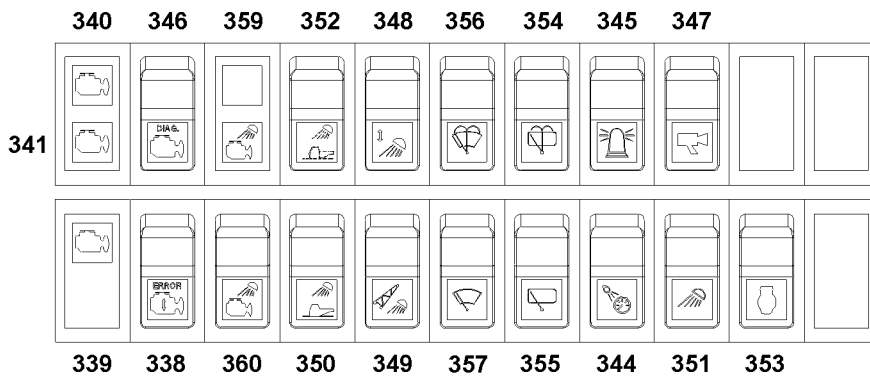
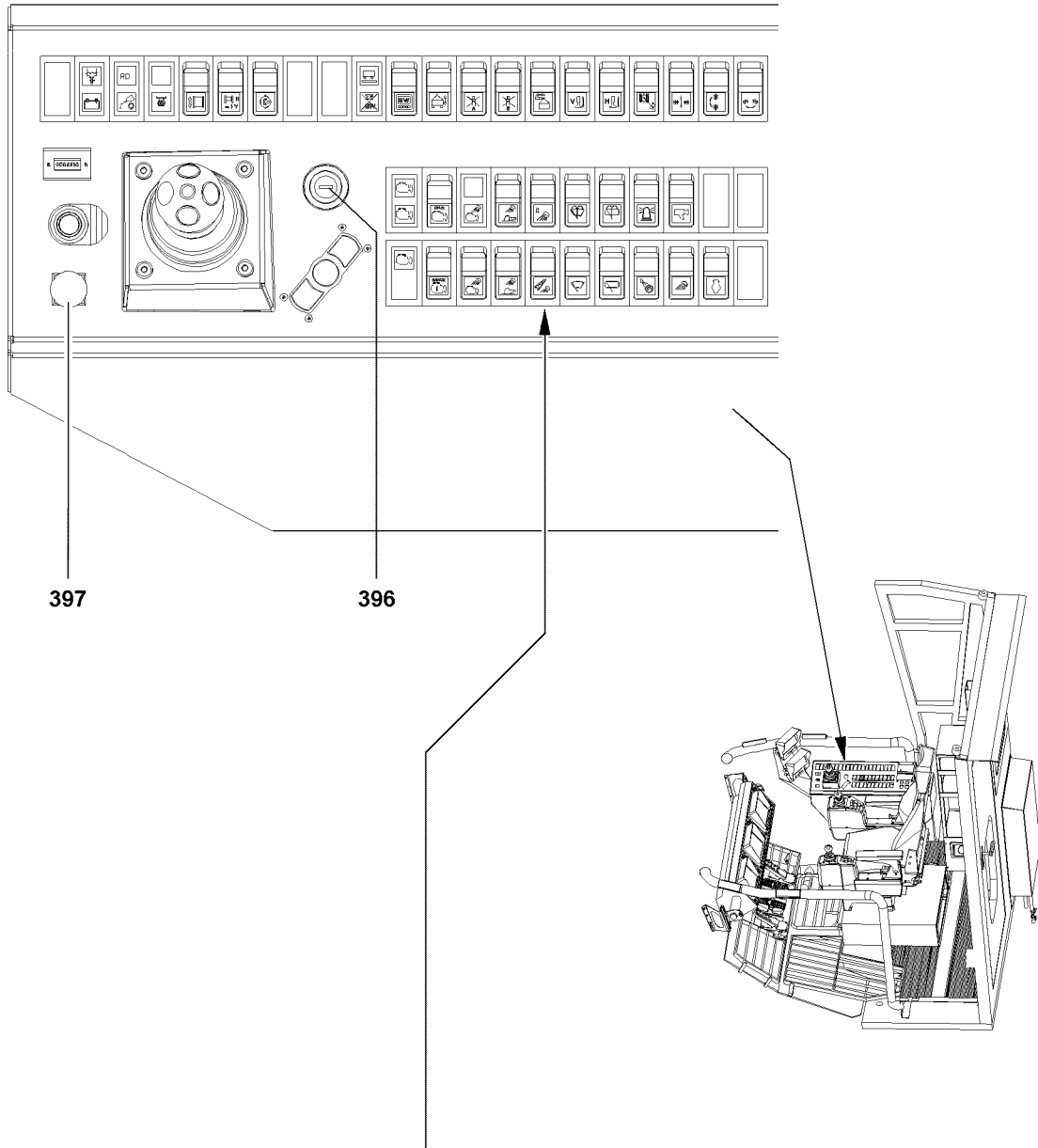
– The cab swings upward.

2.5.2 Setting the cab to horizontal position

▶ Press the button **467**.

Result:

– The cab swings downward.



2.6 Operating the windshield wiper / windshield washer system

2.6.1 Operating the windshield wiper

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 **357**.

or

To activate the windshield wiper on the roof window:

- Actuate the switch **355**.

2.6.2 Operating the windshield washer system

The windshield wipers on the front and roof windows can be assisted by a windshield washer system. Before the start of the cold season, fill the container for the window washer fluid with standard antifreeze mix.

- ▶ To activate the windshield washer system for the front window:
Press the button **356**.

or

To activate the windshield washer system for the roof window:

- Press the button **354**.

2.7 Opening the roof window



WARNING

Danger of injuring hands if they become trapped!

- ▶ Watch your hands when closing the roof window.

A pair of nitrogen gas cylinders support the lifting movement of the roof window.

- ▶ To open from inside, press on the roof window.

or

If you only want to partly open the window:

- Use the attached perforated strap to set the desired opening angle.

2.8 Checking the horn

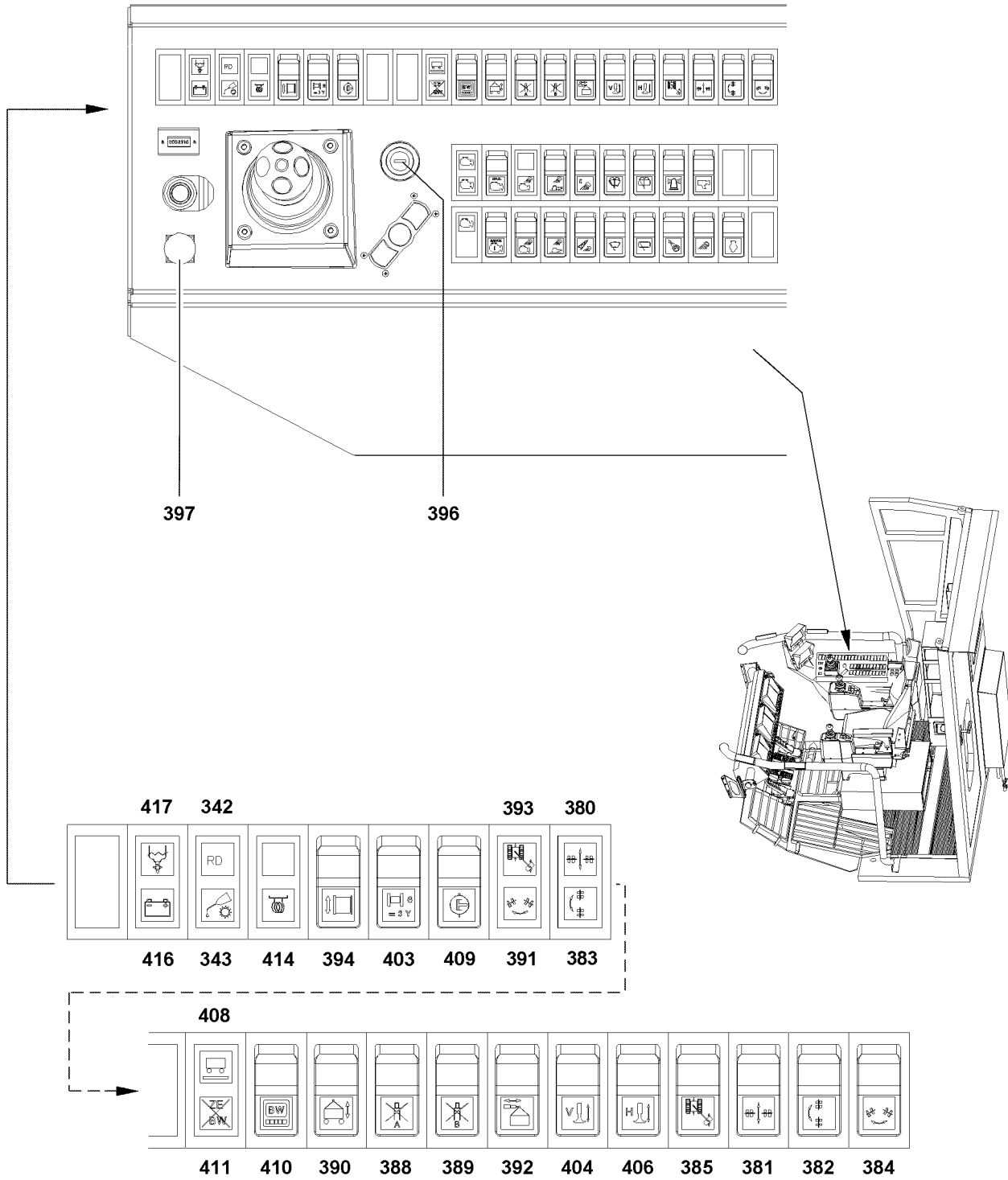


Note

Use of horn!

- ▶ Only use the horn in dangerous situations to maintain its warning effect.

- ▶ Before starting work, check that the horn is functioning.



B113072

3 Starting and stopping the engine

The engine must be operated according to the separately supplied Engine operating instructions.



Note

- ▶ If the engine is started while cold - for example at low temperatures, let the engine run for several minutes in low idle speed!
- ▶ The low idle speed of the engine is increased at first after a cold start, but regulates itself with increasing engine operating time!
- ▶ During the warm up phase of the engine, the full engine power is not available!

Make sure that the following prerequisite is met:

- The battery master switch is turned on.

3.1 Starting the engine

- ▶ Turn the ignition switch **396** to position "I".

Result:

- The control light **414** lights up.
 - The indicator light **416** lights up.
- The engine is ready to start.



Note

- ▶ The indicator light **414** turns off immediately at normal temperatures.
- ▶ In cold weather the indicator light **414** lights up for a longer period of time.
- ▶ Do not start the engine until the indicator light **414** has turned off.



CAUTION

Danger of property damage!

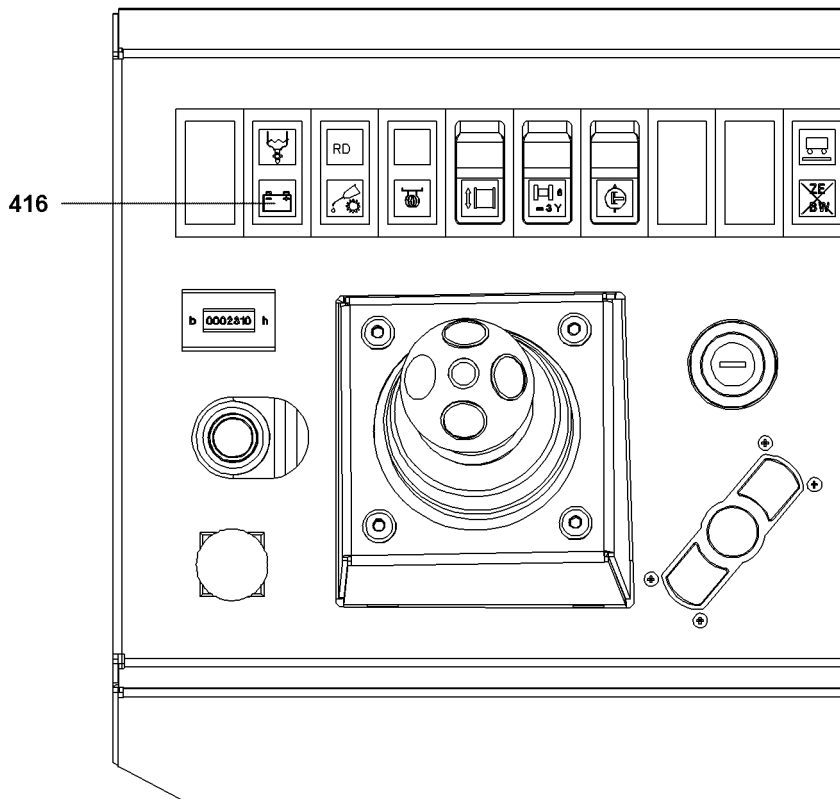
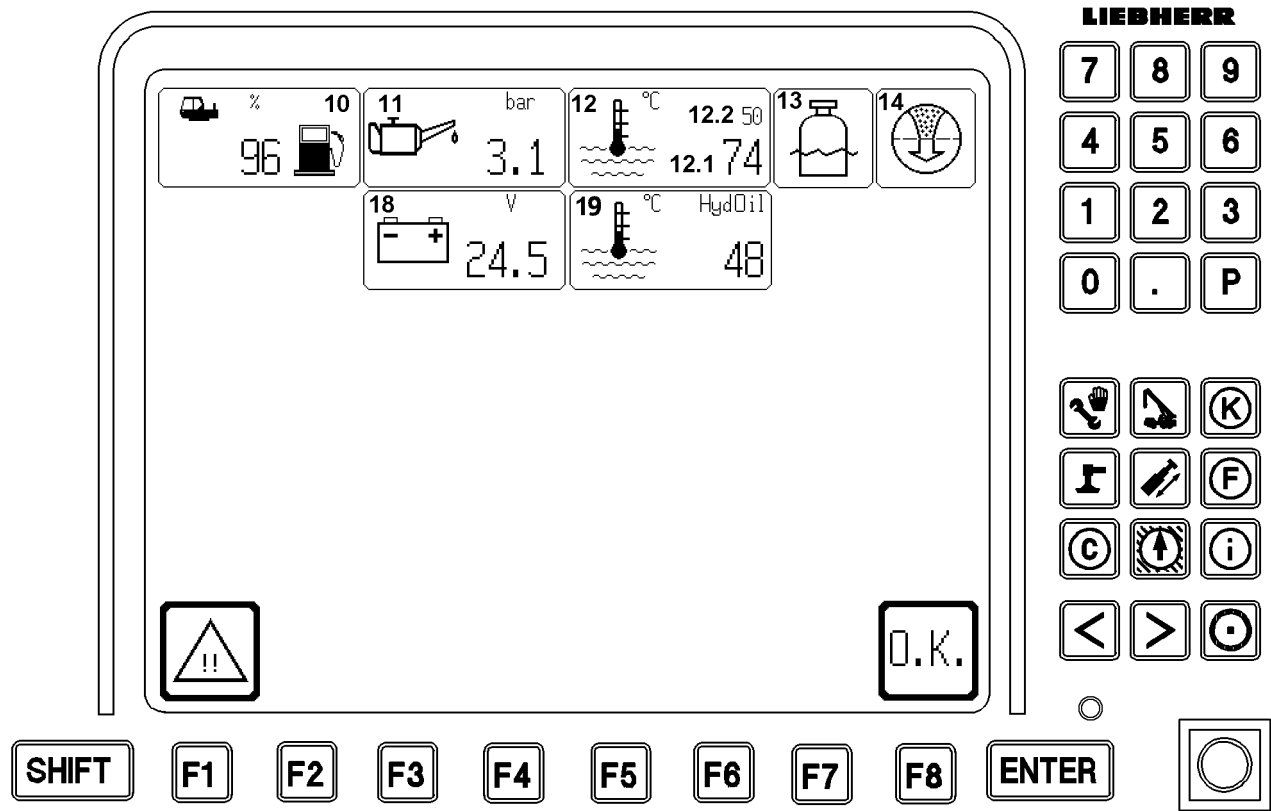
- ▶ Start the engine only if the indicator light **416** lights up and the indicator light **414** has turned off.
- ▶ Turn the ignition switch **396** to position "II".
- ▶ Start the engine.



CAUTION

Damage to engine!

- ▶ Do not press down on the gas pedal during starting.
- ▶ Do not actuate the starter for longer than 30 seconds.
- ▶ Always wait for 2 minutes between starting attempts.
- ▶ Let the engine run for 3-5 minutes at low idle before placing a full load on the engine.
- ▶ Check the instruments after starting the engine.



B102879

3.2 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 turned on automatically. A self-test of the microprocessor system follows and after a few seconds the set up screen appears on the monitor.

3.2.1 Checking the instruments on LICCON monitor

The following icons must turn off when the engine is running:

- ▶ Check the indicator light **416**.
- ▶ Check the icon **11** "Engine oil pressure" on the LICCON monitor.

Troubleshooting

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**.

Troubleshooting

Does the numerical display for the "coolant temperature" in the icon **12.1** blink during operation?

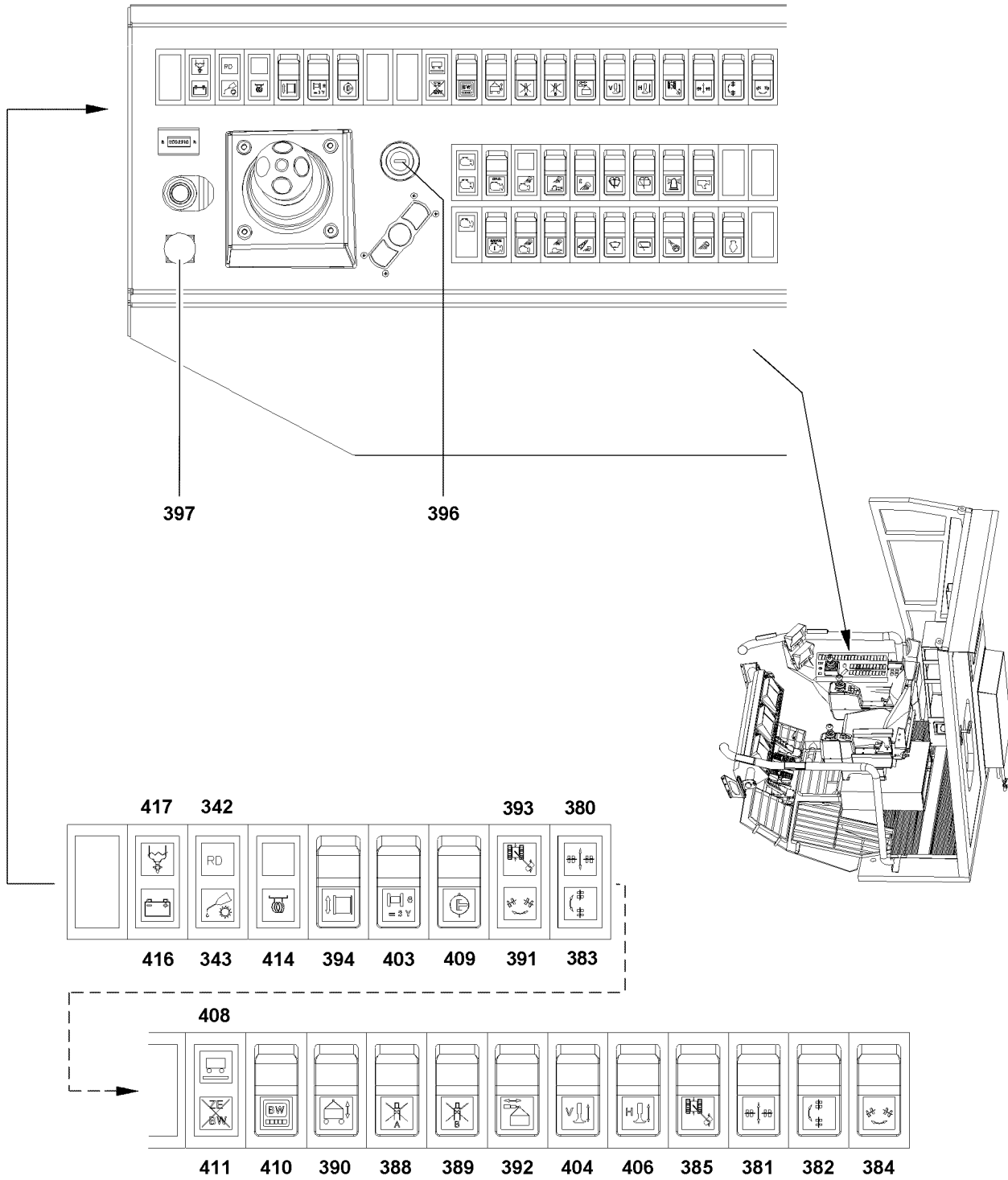
The coolant temperature is too high. Excessive coolant temperature can lead to engine damage.

- ▶ 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".

3.3 Engine monitoring

See Crane operating instructions, chapter 4.02.



B113072

3.4 Turning the engine off

3.4.1 Turning the engine off

After operation with full engine load, let the engine run without a load for 3-5 minutes at low idle rpm.

- ▶ Turn the ignition switch **396** back to the stop.
- ▶ Pull the ignition switch **396** off and store in a safe place.



Note

- ▶ Turn the engine off with the button **470** into “Stand by” mode, see Crane operating instructions, chapter 4.02!
-

3.4.2 Turning the engine off in the event of danger



CAUTION

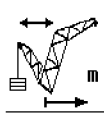
Operating the emergency off switch

- ▶ Only use the emergency off switch **397** in the event of a clear emergency. Use of the emergency off switch **397** for normal operation is not permitted!
-

- ▶ Press the emergency off switch **397**.

Result:


- The crane will be turned off immediately.




CODE >XXXX< UXXX YYZZ .1(2)


48° 48° 48° 48° 48° 48° 48°


14,0	!	356,0	!	455,0	!	554,0	!	586,0	!	586,0	!	586,0	!	586,0
16,0		356,0		455,0		554,0		586,0		586,0		586,0		586,0
18,0		315,0		404,0		493,0		562,0		574,0		574,0		574,0
20,0		282,0		363,0		444,0		519,0		551,0		562,0		562,0
22,0		255,0		329,0		403,0		477,0		514,0		538,0		543,0
24,0		232,0		300,0		369,0		438,0		474,0		508,0		527,0
26,0		212,0		276,0		340,0		403,0		441,0		474,0		497,0
28,0		195,0		255,0		314,0		374,0		410,0		442,0		466,0
30,0		180,0		236,0		292,0		348,0		383,0		414,0		436,0
32,0		167,0		220,0		273,0		326,0		359,0		388,0		405,0
* n *		* 13 *		* 17 *		* 21 *		* 22 *		* 22 *		* 22 *		* 22 *
1(63)														>>
xx		87,0		87,0		87,0		87,0		87,0		87,0		87,0
yy		15,0		15,0		15,0		15,0		15,0		15,0		15,0
zz		0,0		100,0		200,0		300,0		400,0		500,0		600,0



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
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SHIFT

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F2

F3

F4


F5

F6

F7

F8

ENTER



4 LICCON computer system after engine start

The LICCON computer system is operational.

4.1 Waiting for the boot up phase

After being turned on, the LICCON computer system boots up and carries out a self-test, see Crane operating instructions, chapter 4.02.

- ▶ Wait for the boot up phase.

Result:

- The operating mode preselection appears.
- The set up screen appears on the LICCON monitor.

Normally, the most recently set equipment 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 ignition off and start again.

Troubleshooting

An error message appears on the LICCON monitor?

- ▶ Turn the engine and ignition off and start again.
 - ▶ The LICCON computer system automatically displays the error determination screen.
-

Troubleshooting

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.
-


4.2 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, see Crane operating instructions, chapter 4.02.

- ▶ If the settings on the operating screen are correct:
Press the function key **F8**.

Result:

- The "Set up" program is terminated and the adjusted parameters are accepted for the newly started "Operation" program.



CODE >XXXX< UXXX YYZZ .1(2)

m> <t

	48 ⁰	48 ⁰	48 ⁰	48 ⁰	48 ⁰	48 ⁰	48 ⁰
14,0	! 356,0	! 455,0	! 554,0	! 586,0	! 586,0	! 586,0	! 586,0
16,0	356,0	455,0	554,0	586,0	586,0	586,0	586,0
18,0	315,0	404,0	493,0	562,0	574,0	574,0	574,0
20,0	282,0	363,0	444,0	519,0	551,0	562,0	562,0
22,0	255,0	329,0	403,0	477,0	514,0	538,0	543,0
24,0	232,0	300,0	369,0	438,0	474,0	508,0	527,0
26,0	212,0	276,0	340,0	403,0	441,0	474,0	497,0
28,0	195,0	255,0	314,0	374,0	410,0	442,0	466,0
30,0	180,0	236,0	292,0	348,0	383,0	414,0	436,0
32,0	167,0	220,0	273,0	326,0	359,0	388,0	405,0
* n *	* 13 *	* 17 *	* 21 *	* 22 *	* 22 *	* 22 *	* 22 *
1(63)							>>
xx	87,0	87,0	87,0	87,0	87,0	87,0	87,0
yy	15,0	15,0	15,0	15,0	15,0	15,0	15,0
zz	0,0	100,0	200,0	300,0	400,0	500,0	600,0

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F7

F8

ENTER

4.3 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.

4.3.1 Setting a new set up configuration with the function keys

- ▶ Press the function key **F2** until the desired main geometry status is selected.
- ▶ Press the function key **F3** until the desired accessory status is selected.
- ▶ Press the function key **F4** until the desired counterweight is selected.
- ▶ Press the function key **F5** until the desired derrick ballast weight is selected.



Note

- ▶ The function key **F5** is only functioning in operating modes with derrick.
- ▶ Press the function key **F6** until the desired slewing range is selected for crane operation **without** derrick ballast.
- ▶ Press the function key **F6** until the derrick ballast radius or the derrick ballast weight is selected for crane operation **with** derrick ballast.
- ▶ Press the **ENTER** key.
- ▶ Check the set load chart.

4.3.2 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**.
- ▶ Confirm with the **ENTER** key.

Result:

- The data of the selected load chart can be viewed.

For a more detailed description of the “Set up” program, see Crane operating instructions, chapter 4.02.

- ▶ Check the set load chart.

4.3.3 Setting a new hoist rope reeving

- ▶ Press the function key **F7** until the desired reeving number is selected.

or

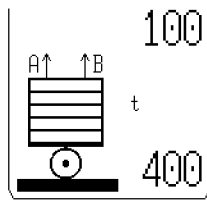
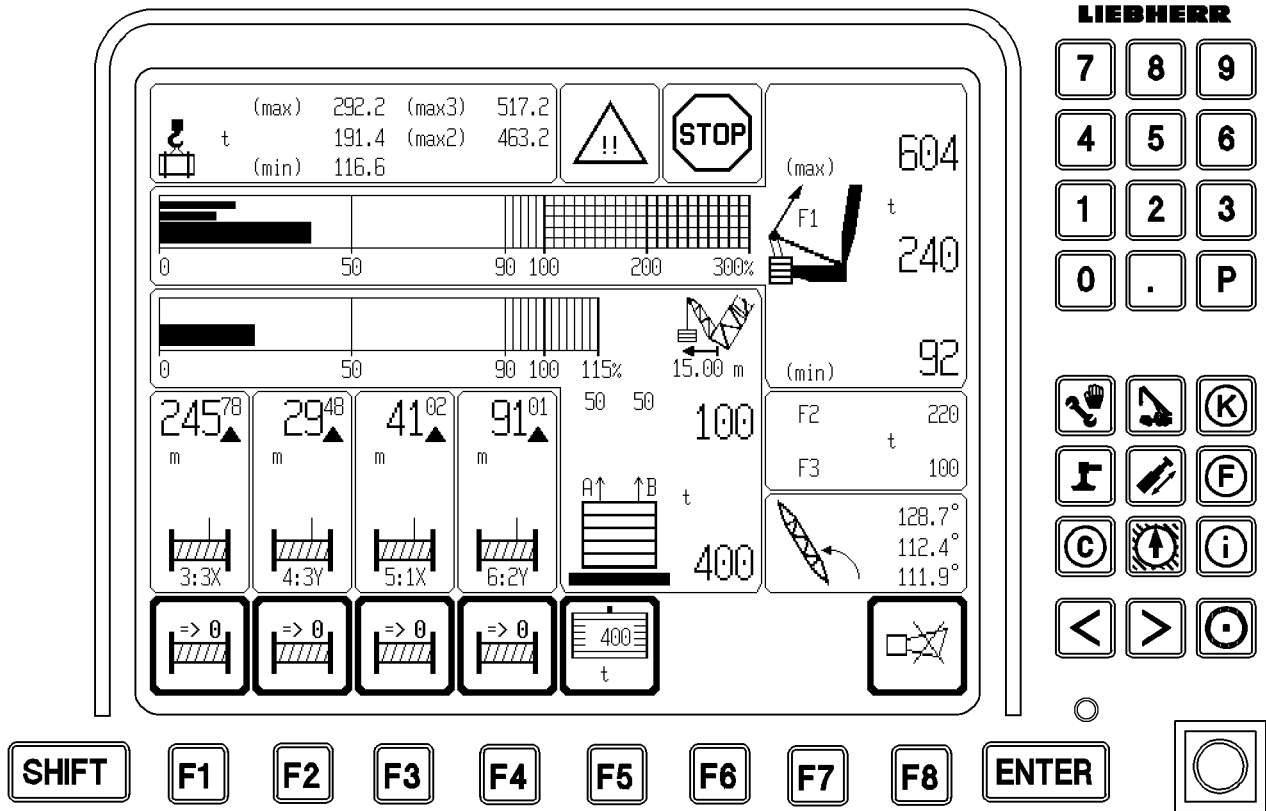
- Press the function key **SHIFT** and the function key **F7** until the desired reeving number is selected.

4.3.4 Checking and accepting the new set up configuration and hoist rope reeving

- ▶ If the settings on the set up screen are correct:
Press the function key **F8**.

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, see Crane operating instructions, chapter 4.02.



4.4 Adjusting the control parameters



Note

- ▶ For detailed description to adjust the control parameters, see Crane operating instructions, chapter 4.02.

4.5 Adjusting the derrick ballast



Note

- ▶ The entry of the derrick ballast is made on the LICCON monitor 1 with key **F5**, see Crane operating instructions, chapter 4.02.



CAUTION

Danger of accident due to incorrect derrick weight entry!

- ▶ For operation with derrick ballast, always set the current size of the derrick ballast. This includes the weight of the empty ballast pallet or the empty ballast trailer and the weight of the placed derrick ballast plates.



DANGER

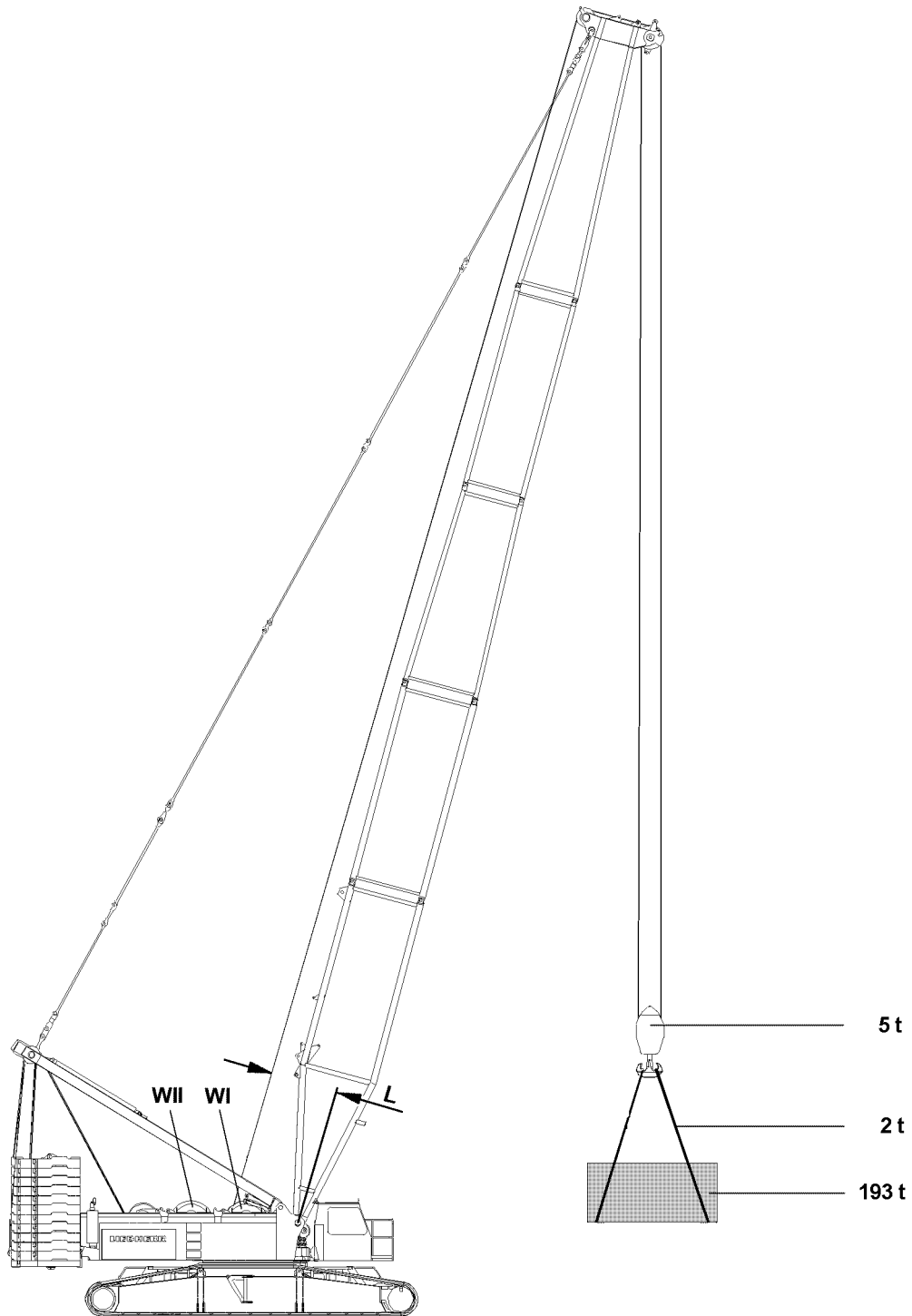
Risk of accident!

- ▶ The set derrick ballast value must match the actually installed derrick ballast weight. If a derrick ballast value is set, which is too low, then the derrick ballast utilization display is too large. If a derrick ballast value is set, which is too large, then the derrick ballast utilization display is too small and the ballast utilization dependent safety shut offs of test point 1 (F1min) are ineffective.



Note

- ▶ During ballast editing, the remaining monitor displays cannot be actualized. The operating view on the monitor is frozen for that time and may possibly simulate incorrect facts. Therefore: Complete ballast editing quickly. If a manual control lever is actuated during ballast editing, then ballast editing is automatically aborted. The old value of the placed ballast (BA_placed) remains in the ballast icon.



B103667

5 Load weighing and load display

Included in the load capacities given in the load charts are the weights of the load carrier, load take up equipment and fastening equipment.



Note

- ▶ The weight of the hook block and the weights of the fastening equipment must be subtracted from the load given in the load chart.

Example:	
Maximum permissible load according to chart	200 t
Weight of the hook block 5t	- 5 t
Weight of the fastening rope 2t	- 2 t
Actual load capacity of the crane	= 193 t

In this case, the load to be lifted may not exceed **193 t** .



Note

- ▶ In the LMB calculation, the lever arm to the winch **2** is not used, but always the lever arm **L** to the winch **1**.
- ▶ For that reason, to ensure an exact load weighing to lift the load on the main boom and on the fixed accessories (for example the fixed jib), winch 1 must be used.



DANGER

Danger of accidents due to overload!

In case of inaccurate load weighing or load display, a danger exists due to unrecognized overload of the crane!

- ▶ The crane operator must know the weight, the center of gravity and the dimensions of the load to be lifted before operating the crane.
- ▶ The crane operator must check, before lifting the load, if he may even lift the load according to the data in the load chart.

5.1 Load weighing

Make sure that the following prerequisites are met:

- The angle sensors are functioning.
- The incline sensors are functioning.
- The turn sensor in the turntable is functioning.
- The pressure sensors are functioning.
- The pull sensors are functioning.

The boom position where the relapse cylinders are actuated must be recognized by the LICCON exactly via the sensors, because otherwise the relapse cylinders have a strong effect on the load - weighing error.



Note

- ▶ If only one of these sensors is not functioning, the LEC error display is issued, then the load display and the load weighing are not exact.
- ▶ The calculation is made anyway, but the result is not exact.

5.1.1 Possible weighing errors

For an exact load weighing, exact signals of the pull test bracket, angle sensor, incline sensors and pressure sensors are required.

Since all sensor values are always within a certain tolerance, a weighing error can occur.

The weighing error is increasingly larger if:

- The hoist winch sits in the turntable instead of in the main boom.
- The reeving is small.
- The hoist winch sits far to the rear in the turntable.
- Several hoist winches are used (parallel operation).
- The boom, on which the load is suspended, is short.
- The boom, on which the load is suspended, is standing steeply.



DANGER

Danger of accidents due to overload!

Overload due to weighing error!

- ▶ When the prerequisites for small weighing errors not given, special caution must be exercised.

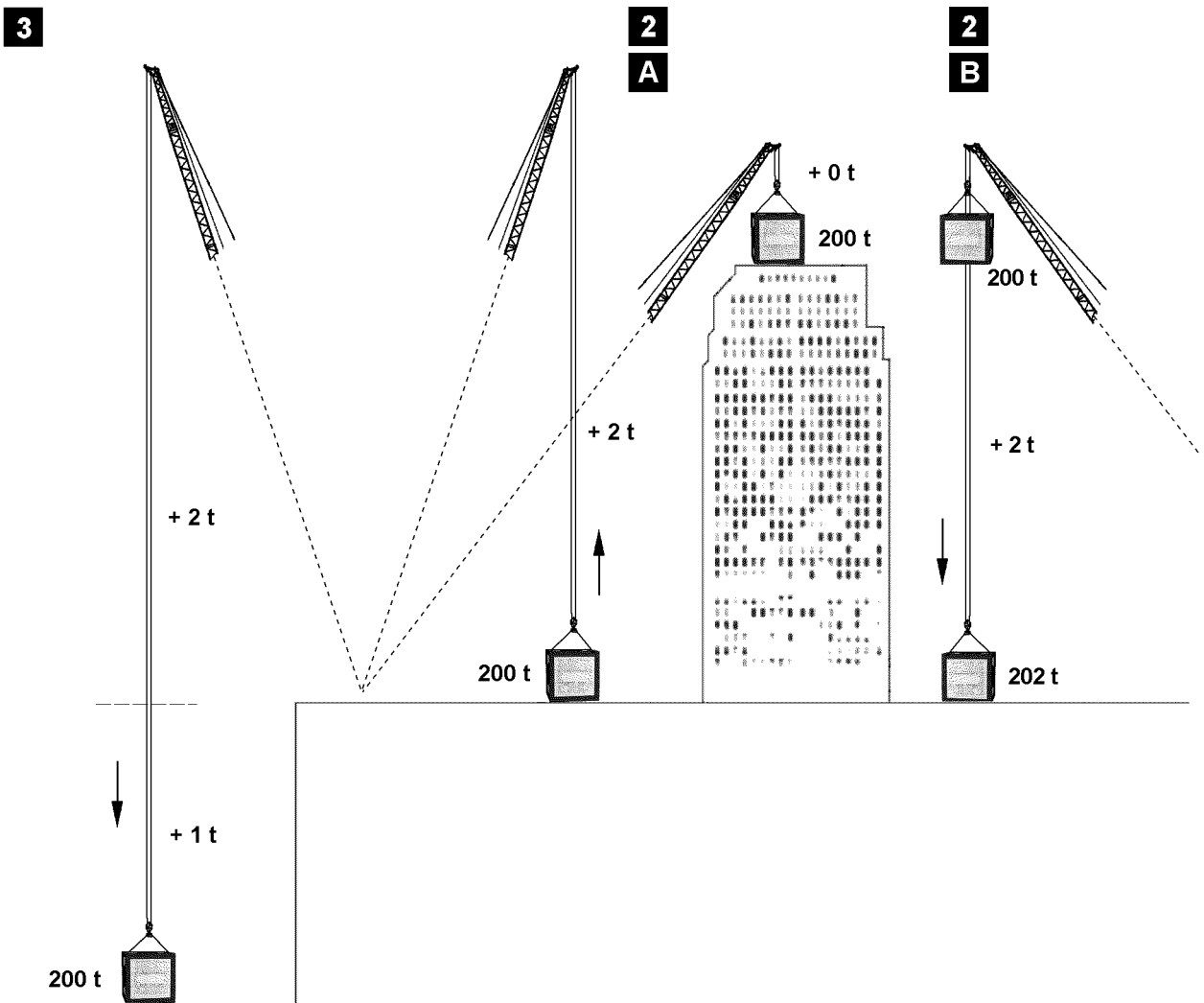
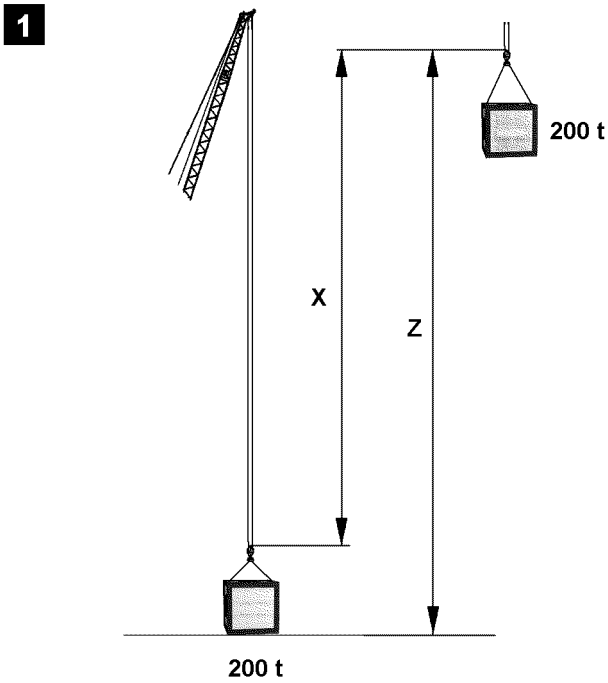
5.1.2 Adjustment of reeving

The number of reevings must be correctly set on the LICCON. The reeving should not be higher than the nominal reeving, otherwise the hoist ropes reeved above the nominal reeving count as part of the load.



Note

- ▶ The nominal reeving determines for which maximum reeving the load chart values of a load chart are valid.
- ▶ If the crane is in a position outside of the load chart, the hoist rope is added to the load, because no nominal reeving is recognized outside the load chart.



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5.2 Load display

5.2.1 Lifting, illustration 1

For the calculation of the displayed actual load, total load **Z**, that hangs on the pulley head **X**, the weight of the hoist rope to the ground, see illustration 1.

In that case, the number of the reevings set on the LICCON are taken into account, but no more than the nominal reeving.



Note

- If the load is raised far above the ground, see illustration 1, then the load display is too small by the weight of the hoist rope from the load to the ground.

5.2.2 Lifting above ground level, illustration 2A

When the load is raised above the crane level (high rise), then the hoist rope to the ground is always deducted anyway for the display, therefore the load seems increasing lighter when lifting than it did on the ground.

Therefore a somewhat larger load can be lifted in large heights than on the ground, without triggering the LMB overload shut off at 100 %.

This poses no danger because the load stress for the crane is the same if, for example 200 t if load on the bottom and 2 t rope or 202 t load on top and 0 t rope hang on the pulley head.

5.2.3 Load take up on high rise, illustration 2B

When a load is taken up on the high rise on top (=100 %), for example 200 t, and then lowered to the ground, the weight of the hoist rope below the high rise level is calculated as load and displayed.

5.2.4 Lifting below ground, illustration 3

When a load is lowered below the crane level (excavation), then the hoist rope below the crane level is calculated as load and displayed.

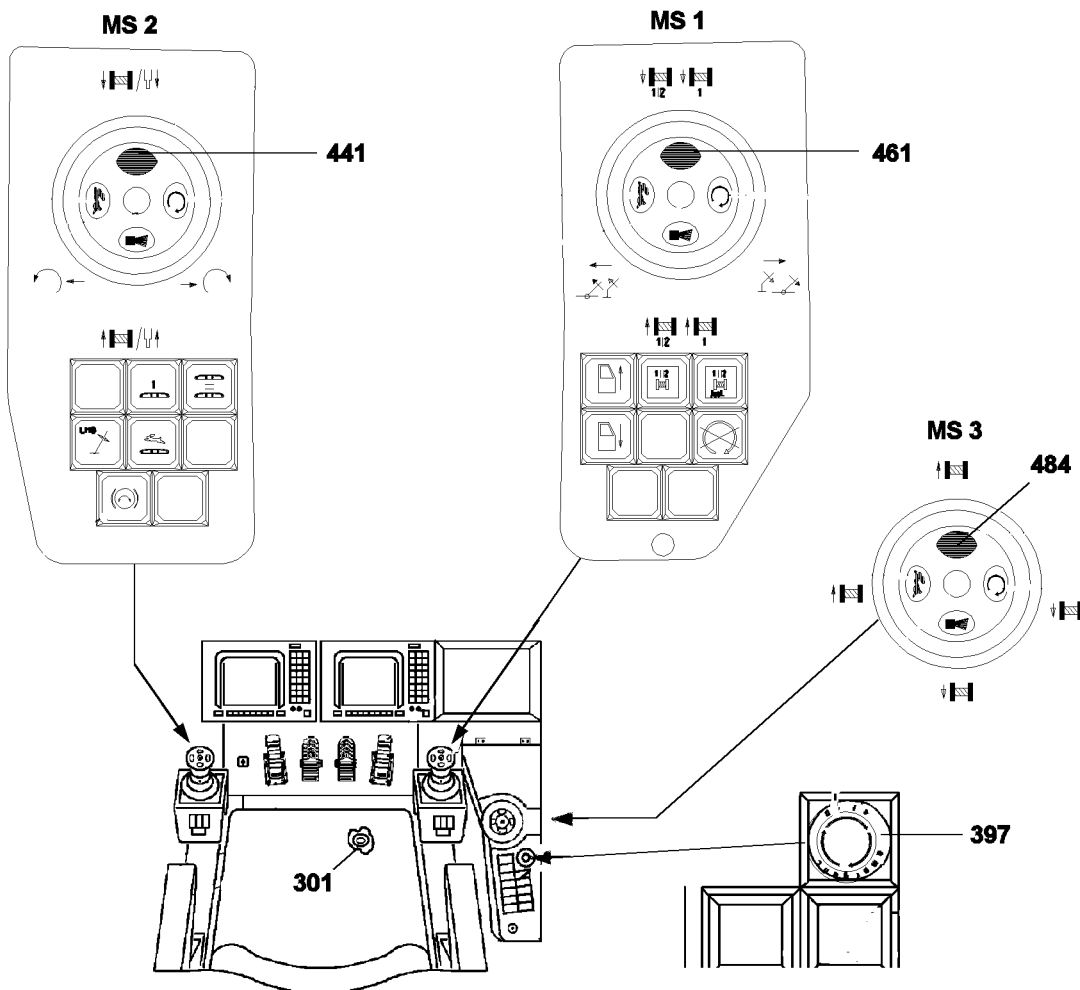
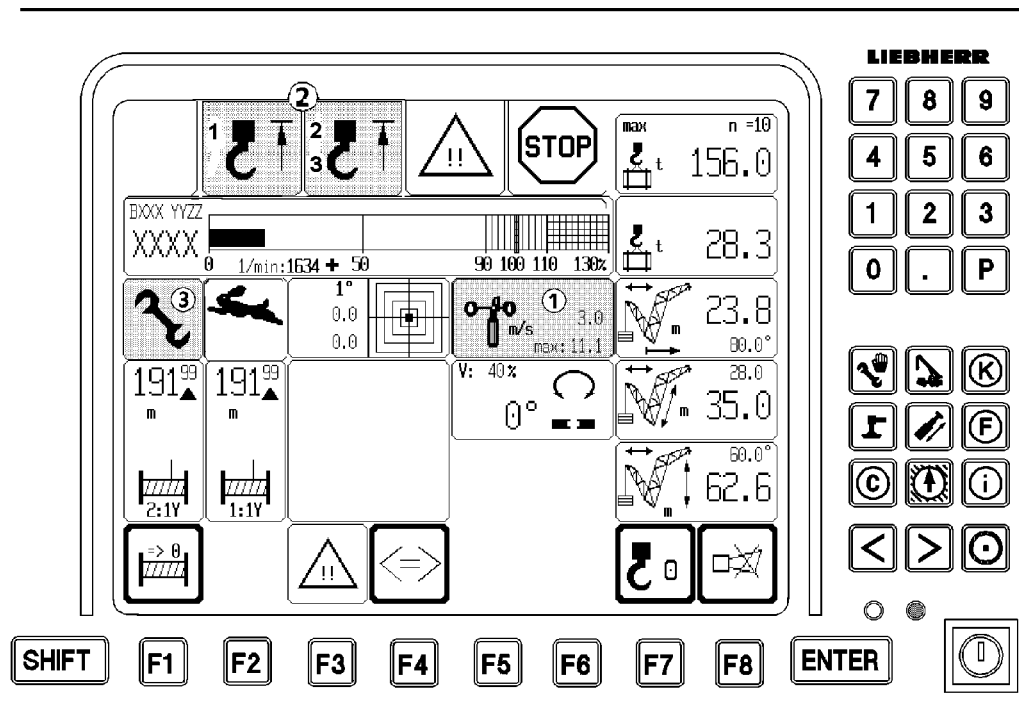


DANGER

Danger of accidents due to overload!

It must be noted that the load display in illustration 2B and illustration 3 is correct, the overload of the crane is also shown in the utilization bar, but no shut off of the lowering movement occurs.

- At LMB overload, all crane movements are shut off, which would increase the danger of overload, however, lowering the load at 100 % -LMB shut off remains clear because one normally assumes that the overload was caused by lifting the load.
- However, the crane can also be overloaded by lowering the load, especially in case of high reevings with high hoist rope weight on the pulley head. The crane operator must know this, so that he can relieve the crane by careful lifting again in this special case, even though the lifting and not the lowering of the load is automatically shut off.



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1 General

1.1 Safety equipment

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.



Note

- ▶ The crane operator must know and observe the shut off diagrams in the separately supplied electric wiring diagram.

1.2 Spirit levels

To ensure the working safety of the crane, it must be properly supported on a level load-bearing surface, and be set up horizontally.



DANGER

Risk of accidents if the crane topples over!

If the crane is not aligned horizontally, it may tip over. The maximum approved deviation from the horizontal position of the crane, refer to load charts.

- ▶ Ensure that crane is horizontally aligned.

1.2.1 Spirit levels on the superstructure

The horizontal alignment of the crane is displayed in the LICCON computer system both graphically and numerically.

2 LICCON computer system

The LICCON computer system is a system for controlling and monitoring cranes. As well as overload protection (Load torque limiter **LMB**) there are a number of application programs that can be used for controlling and monitoring the crane's movements, see chapter 4.02.

2.1 Overload protection

The sensors used for overload protection are:

- Pull test brackets
- Angle sensors
- Pressure sensors
- Length sensors

The electronic overload protection **switches off** all crane movements that **increase the load torque** if the permissible load torque is exceeded. Only crane movements that reduce load torque can be made.

**DANGER**

Risk of accident!

The presence of overload protection does not relieve the crane operator of his duty of care and attention.

- ▶ Before lifting a load, determine its approximate weight and radius, 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 includes, but:

- does not switch off, for example the wind speed
- does not monitor the crane incline, for example
- does not monitor the turntable rotating angle, for example

The overload protection does **not** include:

- hooking to the underside of the load or the lifting equipment
- excessive retarding forces
- loads falling onto the wire rope
- diagonal pulling
- using the crane on ground that is excessively sloped
- collapsing substrate

**DANGER**

Danger of toppling or destroying the crane!

- ▶ The overload protection is a mechanism complying with EN 13000. It must not be used operationally as a way of switching off crane movements of any kind.
- ▶ The overload protection must be adjusted before using the crane to the current set up condition, in accordance with the load chart. Only that way can it fulfil its protective task.
- ▶ After every set up condition change and/or boom configuration, the overload protection must be reset to the corresponding set up condition and/or boom configuration.
- ▶ The crane operator must meet his duty of care and attention, despite the overload protection.

2.1.1 Overload protection failure

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 an error in the LICCON monitor, the CPU or the power unit, in urgent situations the crane can be operated in emergency mode with maximum care.

- ▶ In that situation the crane operator bears full responsibility.
- ▶ The crane operator must **not** use the 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 LMB:

- the exact weight of the load, including lifting equipment, must be known
- the current crane geometry, such as the main boom angle, derrick angle, luffing jib angle, as well as the derrick ballast radius and the suspended derrick ballast weight must be known and correspond with the values entered in the load chart

The boom radius, angle and derrick ballast radius must be measured manually.

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 power unit with a functioning substitute power unit.

If one or more sensors fail, it is possible to carry on working 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 hoist

If the fault cannot be cleared using these measures, we recommend:

- before continuing the load hoist, contact the nearest LIEBHERR customer service location or the LIEBHERR plant in Ehingen

If this is not possible common the load hoist can be ended with maximum care as follows:

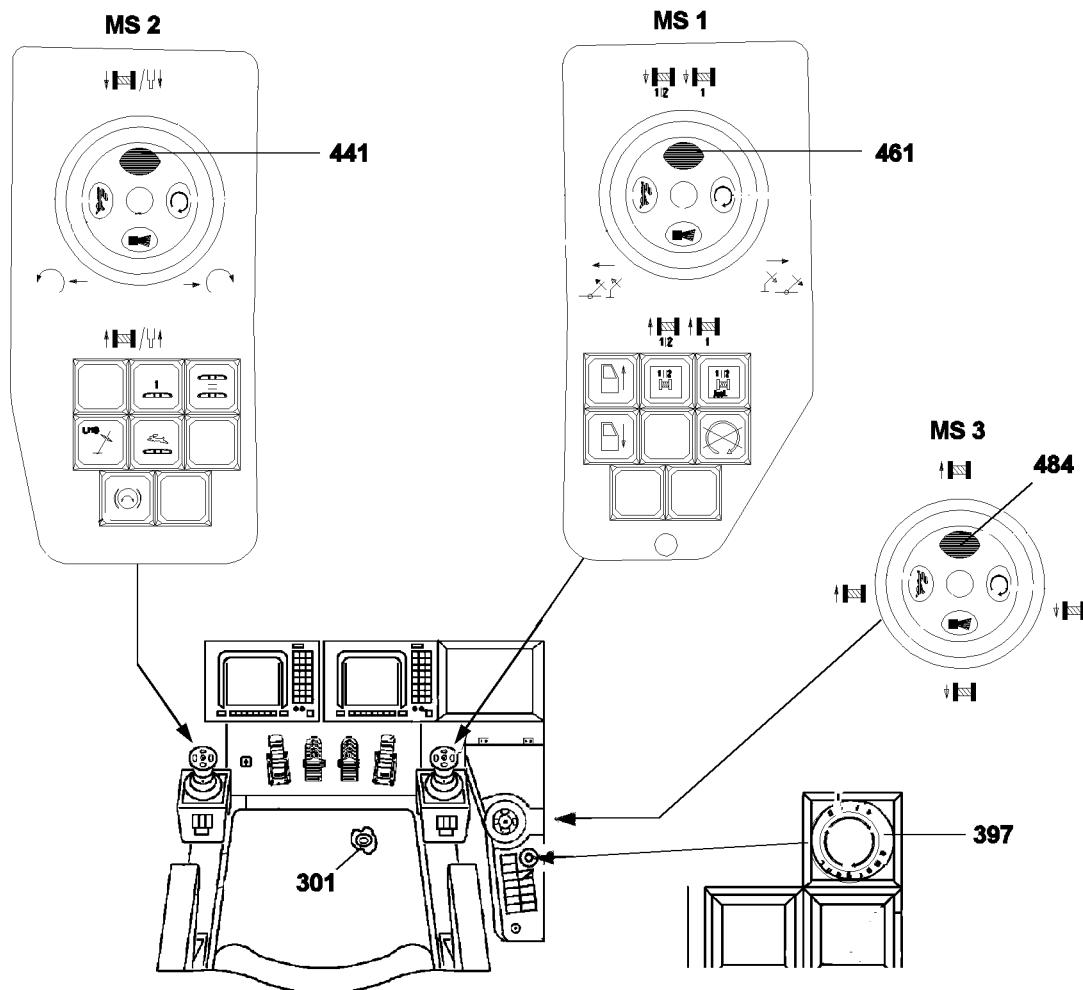
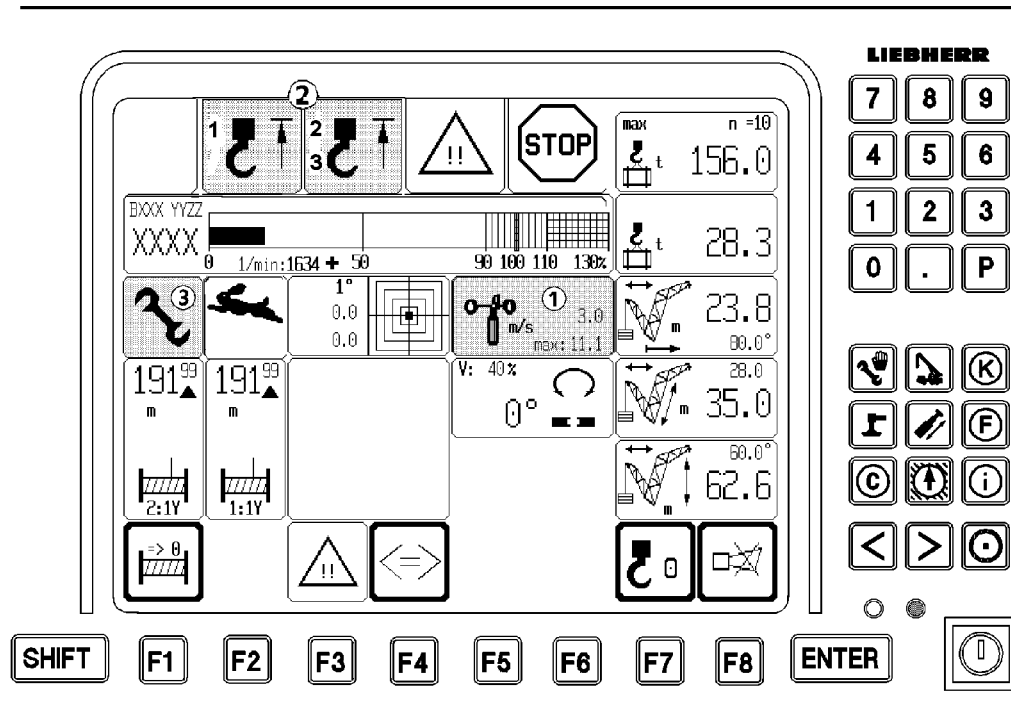
- all values that are needed for determining current crane condition and the associated load chart must be measured and/or manually determined.



DANGER

Risk of accident from overloading the crane!

- ▶ The exact weight of the load, including hook and fastening equipment, must be known!
-



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3 General safety equipment

3.1 Wind warning system

The wind warning appears in the operating screen of the LICCON computer system. If the actual wind speed value exceeds the displayed maximum value, the icon 1 “Wind warning” begins to flash, and the acoustic alarm emits “short horn” sounds. But there is **no switching off** of crane movements.



DANGER

Danger of accidents from exceeding the permitted wind speed!

There is **no** automatic switching off of crane movements.

- ▶ Stop crane operation and lower 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 use of the crane, the hoist limit switch functionality must be checked by moving the switch weight with the hook block.

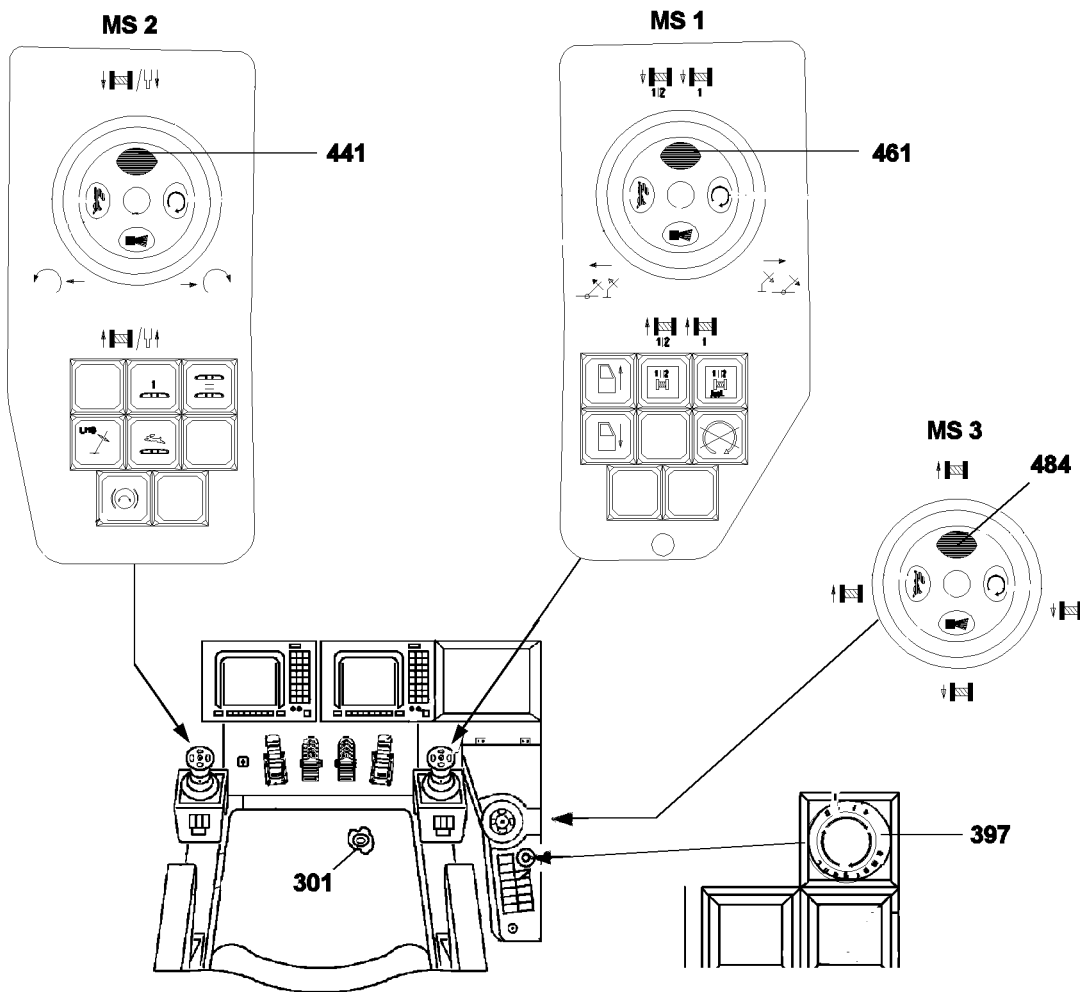
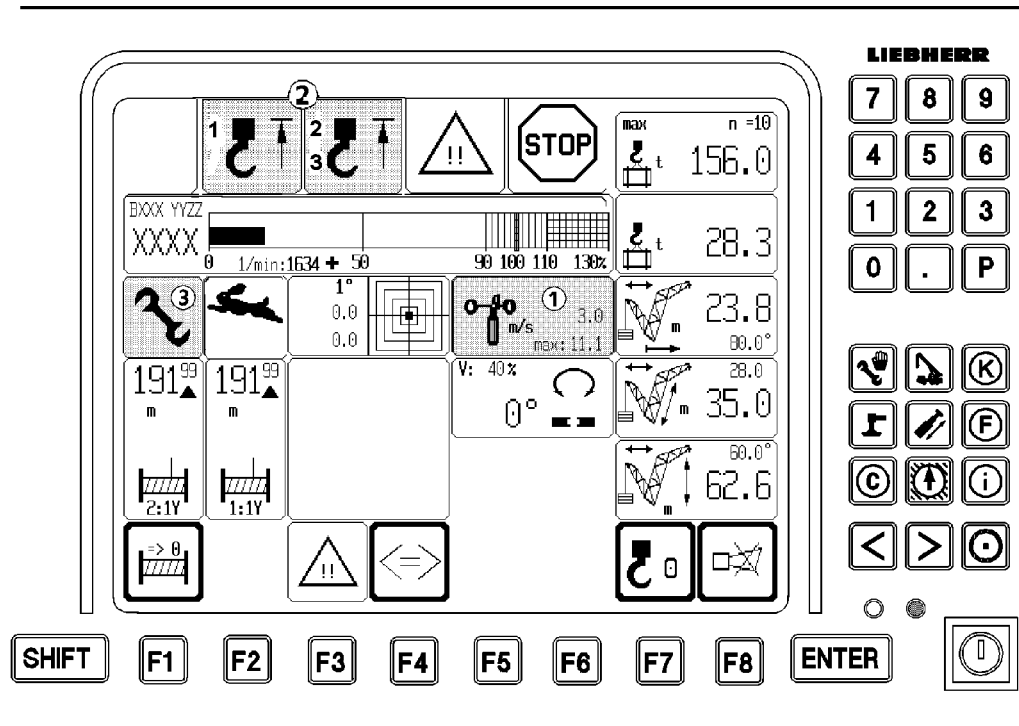
On activating the hoist limit switch, the icon 2 appears on the operating screen. The crane movements “lift” and “luffing down” are switched off.



DANGER

Danger of accidents in case of bypass of hoist limit switch ““Hoist top” ” due to the crane falling over or being destroyed!

- ▶ During crane operation, bypass the hoist limit switch only with the key switch if a guide is monitoring the distance between the hook block and the boom head. The guide must be in direct contact with the crane operator.
 - ▶ Carry out any hoist movement with utmost caution and at 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.
-



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3.3 Limit switch winch reeled off

The winch speed sensor is adjusted in the factory. If the equipment is used properly the winch speed sensor will not need readjustment.



DANGER

Risk of accident due to toppling load!

- ▶ The winch speed sensor must deactivate the reeling off of the winch when reaching the minimum cable winding.
- ▶ The cable attachment can otherwise be ripped out and the load may drop.



Note

- ▶ At adjustment with the key, the emergency shut off point is determined. The emergency shut off occurs 1 (winch 1,2,3,5 and 6) winding or 0.5 (winch 4) windings later.
- ▶ 3 minimum cable windings are adjusted on the winch speed sensor for winches 1, 2, 3, 5 and 6.
- ▶ 6.5 minimum winch cable windings are adjusted on the winch speed sensor for winch 4.
- ▶ The cable feed is marked on winch with an **A**.
- ▶ The measuring point for the cable locations is marked by an **X** on the shoulder ring of the winch.
- ▶ The adjusting information for the cable locations may be derived in the **special LICCON screen**.



DANGER

Paying attention to the following situations will also prevent winch speed sensor adjustments.

- ▶ **Do not** pull end of cable under the winch by reeling in the cable winch!
- ▶ **Do not** pull cable from "stationary" winch.
- ▶ The winch speed sensor must be readjusted, if it is determined that the winch movement is not deactivated in a minimum cable winding during the operation or when replacing a cable.



DANGER

Risk of accident from cable connection breaking off or uncontrolled winch shut off!

- ▶ Please verify that the winches are properly adjusted. Check the deactivation without a load on the hook.
- ▶ Operating the crane with an incorrectly adjusted or not adjusted winch is strictly prohibited!

3.3.1 Checking the deactivation of the minimum cable windings

Reel off the winch and check the shutoff point through a careful triggering.

Slowly unwind winch 1, 2, 3, 5 and 6 until the deactivation at 4 minimum cable windings.

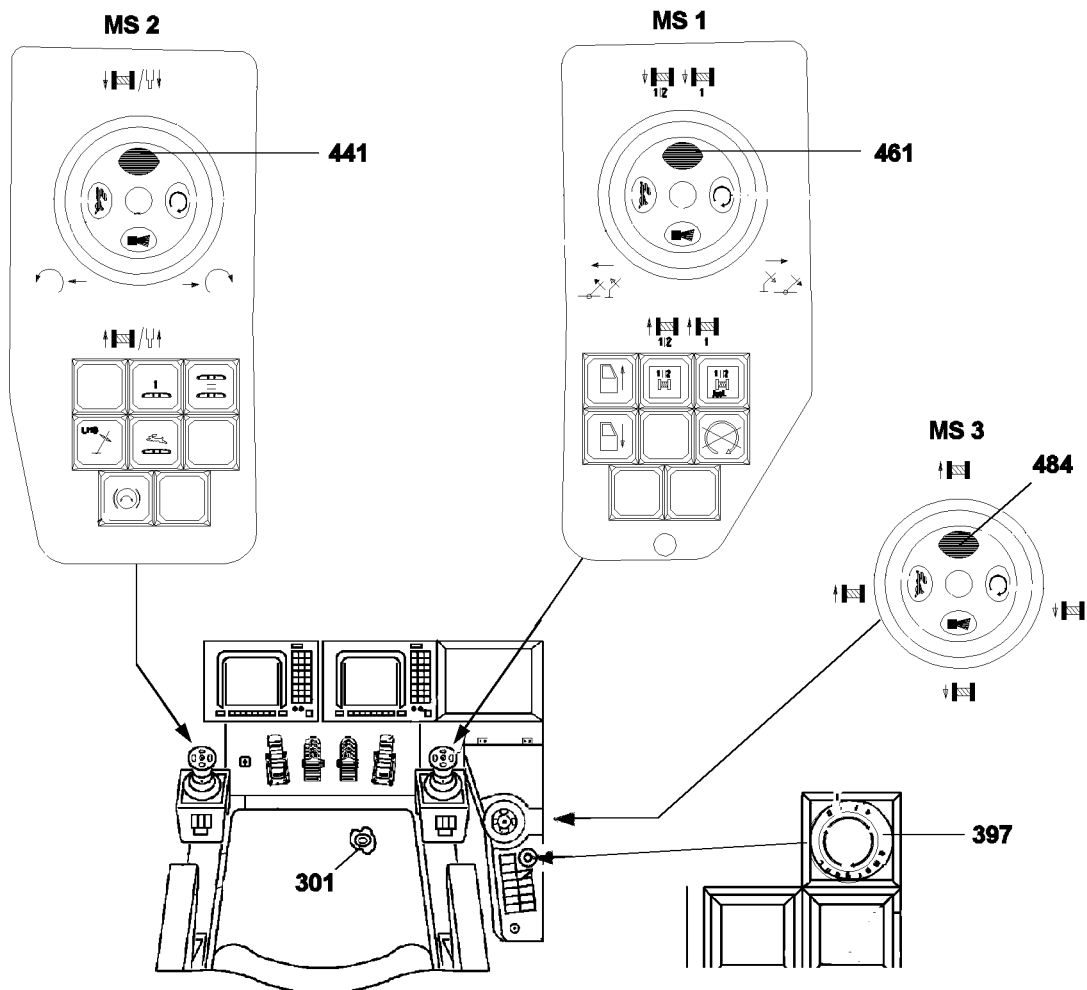
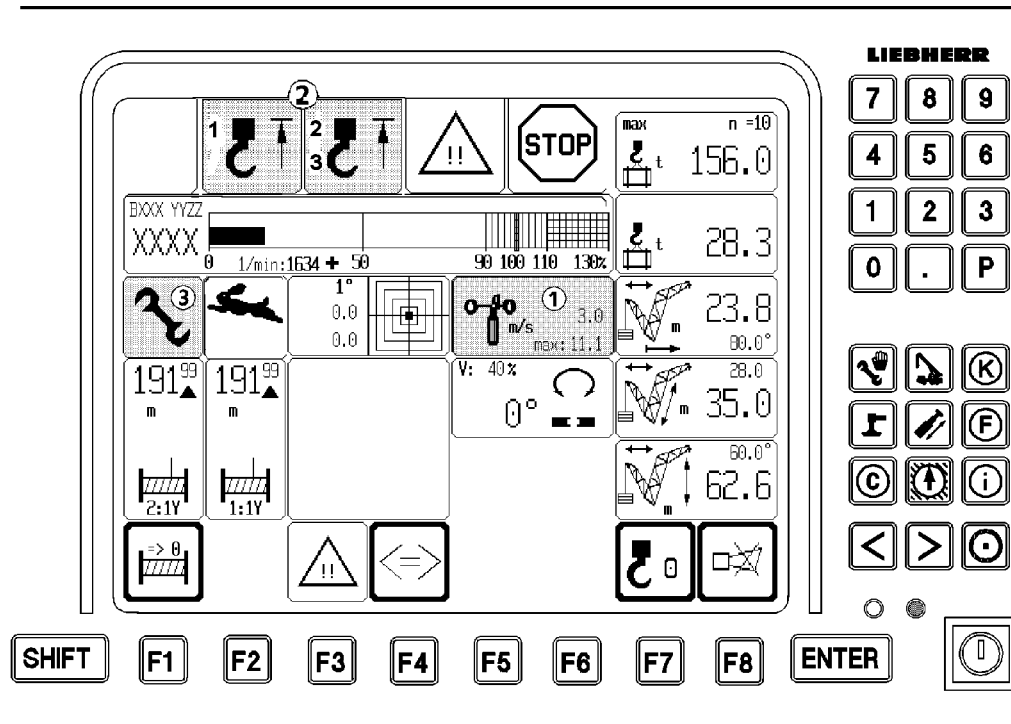
Slowly unwind winch 4 until the deactivation at 7 minimum cable windings.

Check shut off.



Note

- ▶ If the crane movement unwinding does **not** deactivate at the minimum cable windings, **Liebherr Customer Service** must readjust the winch speed sensor.



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3.4 EMERGENCY OFF switch

If the EMERGENCY OFF switch **397** is operated, the motor and the electrical crane control are switched off. Every movement carried out can be immediately stopped.

After operating the EMERGENCY OFF switch **397**, a release may only be granted by an authorized person.



DANGER

Danger of accidents due to actuation of the EMERGENCY OFF switch **397**.

- ▶ Do not actuate the EMERGENCY OFF switch at maximum speed of a crane movement.
 - ▶ 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** stops crane control as soon as the crane operator rises from the seat. This prevents unintended crane movements by accidentally touching the master switch when getting in or out of the cab.

The button **441**, button **461** and the button **484** bypass the seat contact switch **301**, if necessary, for example, when work must be performed standing.

3.6 Hydraulic safety valves

There are two types:

- Pressure limit valves for preventing pipe and hose breaks
- Stop valves in the hydraulic cylinders

3.6.1 Pressure monitoring in the fall-back cylinders

Pressure sensors are installed in the hydraulic cylinders. The pressure measured by the pressure sensor is displayed on the LICCON monitor, refer to chapter 4.02.



DANGER

Risk of accident from crane toppling or destruction of the crane!

- ▶ Continuously monitor the pressure in the fall-back cylinders during the crane operation.
-

3.6.2 Operating oil pressure monitoring system in the winches

If an operating oil pressure is not present when the master switch is activated, a relevant error message will appear.

3.7 Limit switches

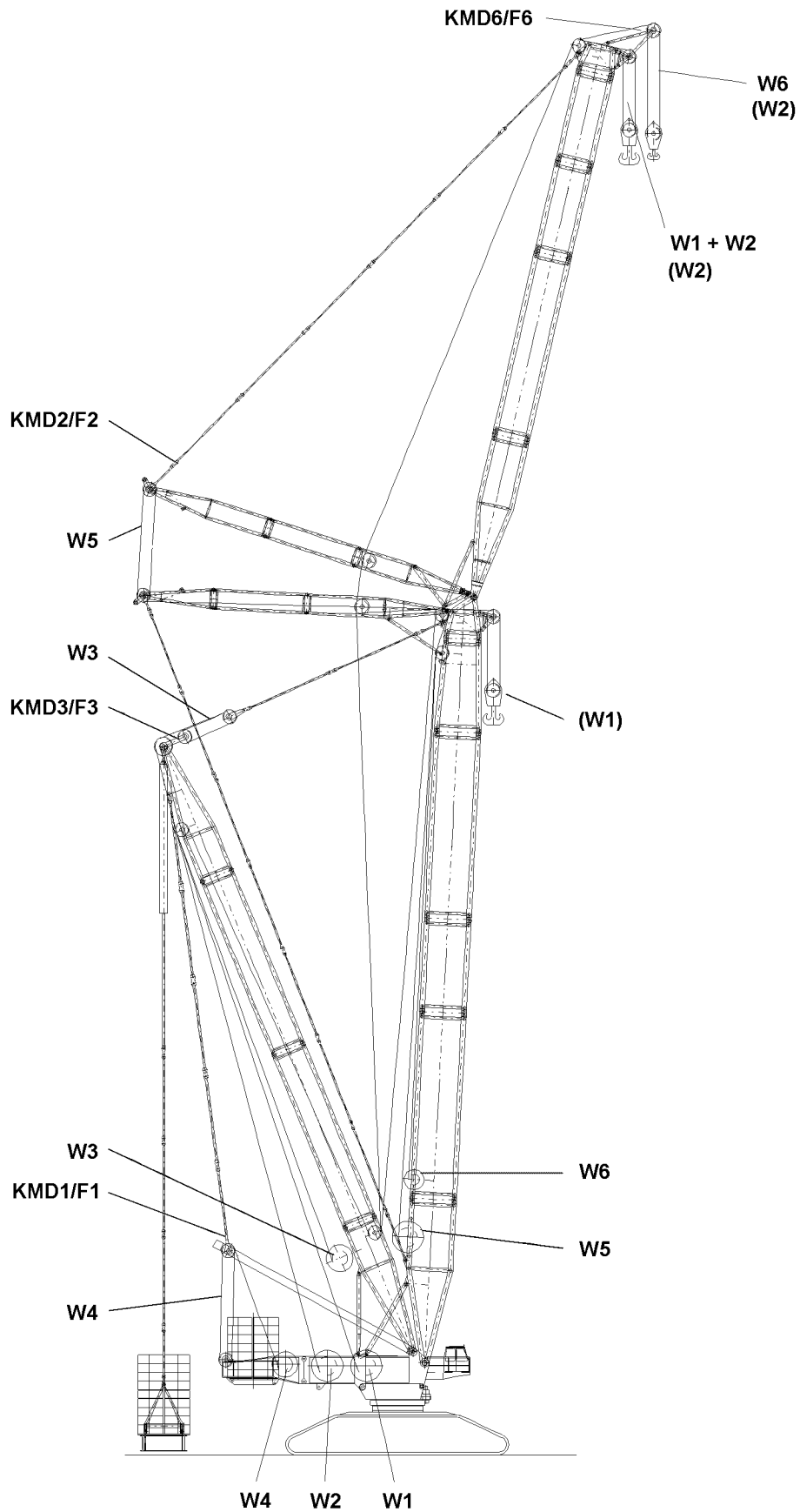
Limit switch	Position
Hoist "top"	on the main boom, lattice jib and on the boom nose
Boom "up" , steepest position	to boom fall-back cylinder
Lattice jib "up" , steepest position	to lattice jib fall-back cylinder
Lattice jib "up" , steepest mechanical position	mechanical valve on the lattice jib articulated piece
Lattice jib "down" , lowest position	to boom head piece
derrick, electric switch position 127.4°	at the derrick fall-back cylinder
SA-frame 25° , assembly position forward	on SA-frame



DANGER

Danger of toppling or destroying the crane!

- ▶ Do **not** use the hoist limit switch and the limit switch for the steepest boom position and luffing jib position as an operational shutoff function.
-



3.8 Angle sensors

Component	Description of angle sensor WG
S-articulated piece	Main boom bottom
S/W-head piece, if used on boom	Main boom top
S/W-head piece, if used on luffing jib	Luffing jib top
W-articulated piece	Luffing jib bottom
W-connecting head	Main boom top
D-articulated piece	Derrick bottom
D-head piece	Derrick top
SA-frame	SA-frame

3.9 Pull test brackets (KMD = power measuring socket)

The pull test brackets measure the force in the guying, which is combined by the load and the boom torque.

The pull test brackets are located:

- **KMD 1**, in the boom stay ropes, A-frame to the boom in all operating modes **without** derrick
- **KMD 1**, in the derrick stay ropes, A-frame to the derrick in all operating modes **with** derrick
- **KMD 2**, in the lattice jib stay ropes, WA-frame 1 to the lattice jib head piece
- **KMD 3**, in the boom stay ropes, derrick to the boom in all operating modes **with** derrick
- **KMD 6**, in the boom nose









4 Acoustical / optical warning



Note

- ▶ The crane operator must know and observe the overview, “acoustical / optical warning” for the crane operator and for personnel within the danger zone.

4.1 Crane operator

Signal	Crane operator							
	Acoustical warning		Optical warning - LICCON-monitor icons					
	slow	fast	Advance warning	Shut-off				Shut-off
								 <i>F1</i>
Load up to 90 %								
Load greater than 90%	X ²		X					
Load greater than 100%		X ²	X	X				
Assembly E1.6					X			
+ E1.7							X	
Emergency operation with LICCON E1.7						X		
+ E1.5							X	
LMB/hoist top bypass E1.5					X			
+ E1.7							X	
F1 _{max} Assembly								X
Bypass without motor						X		



X = cannot be switched off

X¹ = can be switched off after 5 seconds

X² = can be switched off immediately



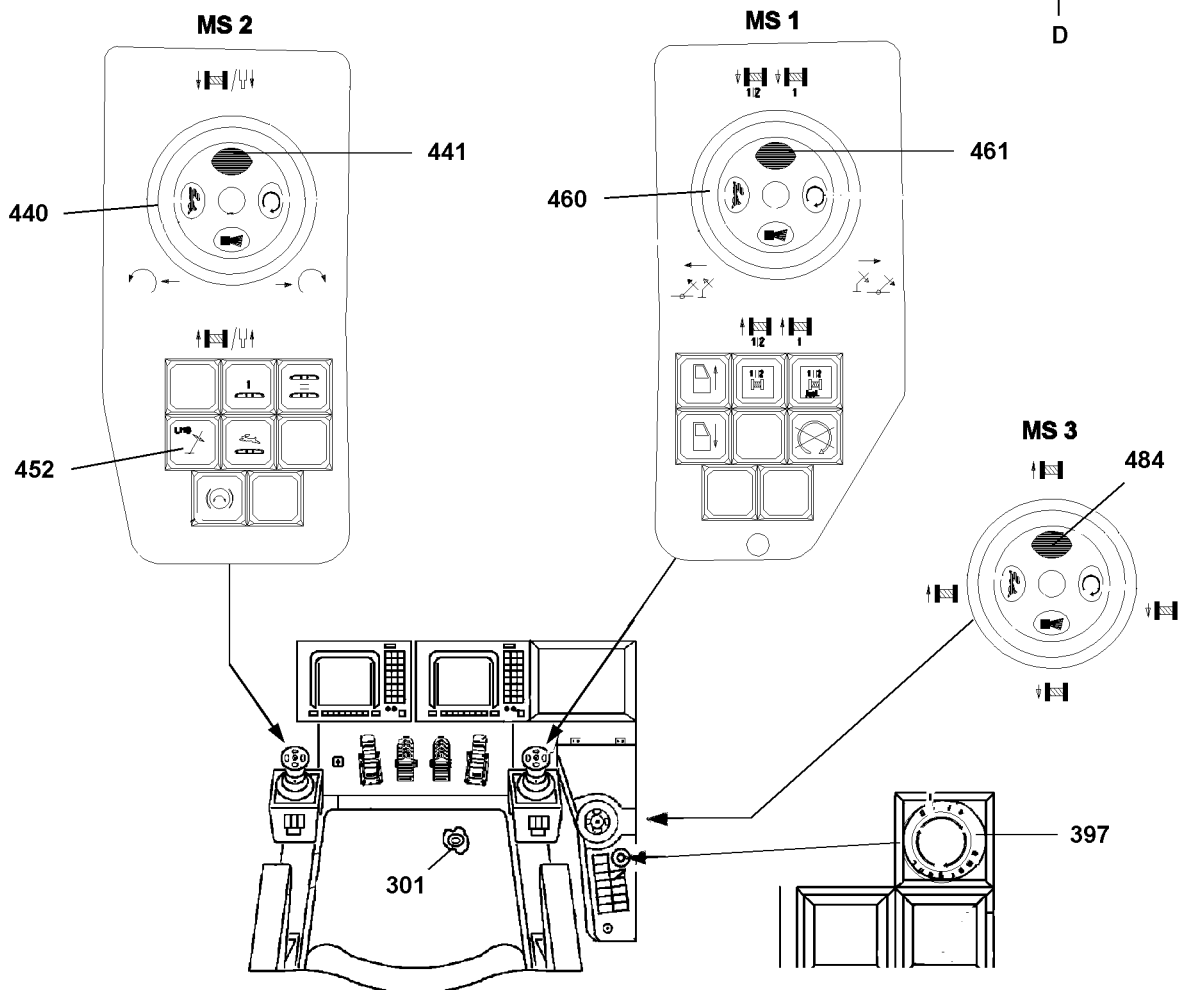
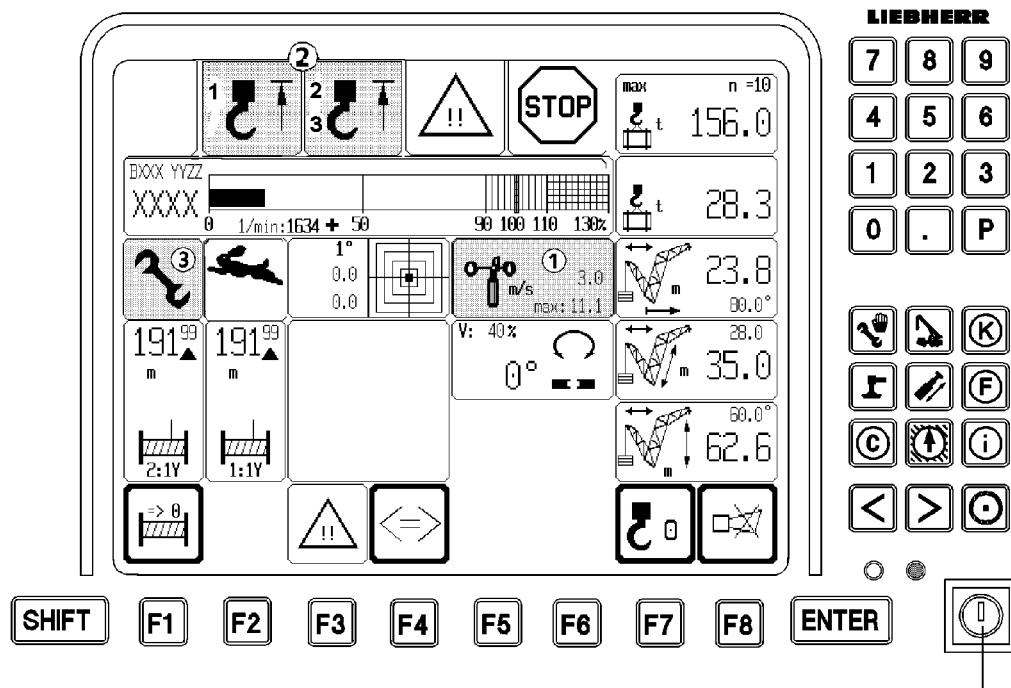
	Personnel present in danger zone				
	Acoustical warning	Optical warning - LICCON-monitor icons			
	Horn	Warning light			Warning light
Signal	Intervall	green	yellow	red	red
Load up to 90%		X			
LMB load greater than 90%			X		
LMB load greater than 100%	X ¹			X	
Assembly	X ²			X	X
Emergency operation with LICCON				X	X
LMB/hoist top bypass	X			X	X
F1 _{max} Assembly	X			X	
Remote control pinning					X
Bypass without motor					

X = cannot be switched off

X¹ = can be switched off after 5 seconds

X² = can be switched off immediately





B102492

5 Bypassing “Luff up if overload occurs”

5.1 Bypassing

The crane movement “Luff up” is switched off during overloads, although this almost always leads to an increase in the maximum load and is a load torque reducing crane movement for a free suspended load.



DANGER

Risk of accident from overloading and toppling the crane!

Never lift a load by luffing up the boom if, when trying to lift the load, the hoist gear would be switched off by the load torque limiter.

▶ Bypass with the button **452** is only permitted if the operator knows, that the utilization is reduced by luffing up. This is the case, if the load is suspended and the load capacity simultaneously increases during lifting.

▶ Bypass with the button **452**, “luffing up with the boom or the luffing jib” is only permitted if the overload occurred before by luffing the boom or the luffing jib down. The crane operator must clearly prove according to the load chart, that the luffing up movement will lead to an increase of the maximum load capacity and the overload will be thereby removed.

▶ In order to still perform the luffing up movement:

Press the button **452** “bypass of overload” and deflect the master switch “MS1 **460** ” in X-direction.

6 Bypass possibilities in the LICCON

The bypass key button **D** on the LICCON monitor has two positions:

- Center position - operating position (self-maintaining): crane is in normal operation
- Position to right (touching):
 - The hoist limit switch and the LMB shut-offs are bypassed



Note

▶ With the button **D** bypassable shut offs, see “shut off diagrams” in electric wiring diagram.

6.1 Bypassing the overload protection

If the maximum permissible load is exceeded, the LICCON overload protection switches off all crane movements that raise the load torque.



DANGER

Increased accident risk when bypassing the overload protection!

If overload protection is bypassed, there is no further protection against overloading the crane!

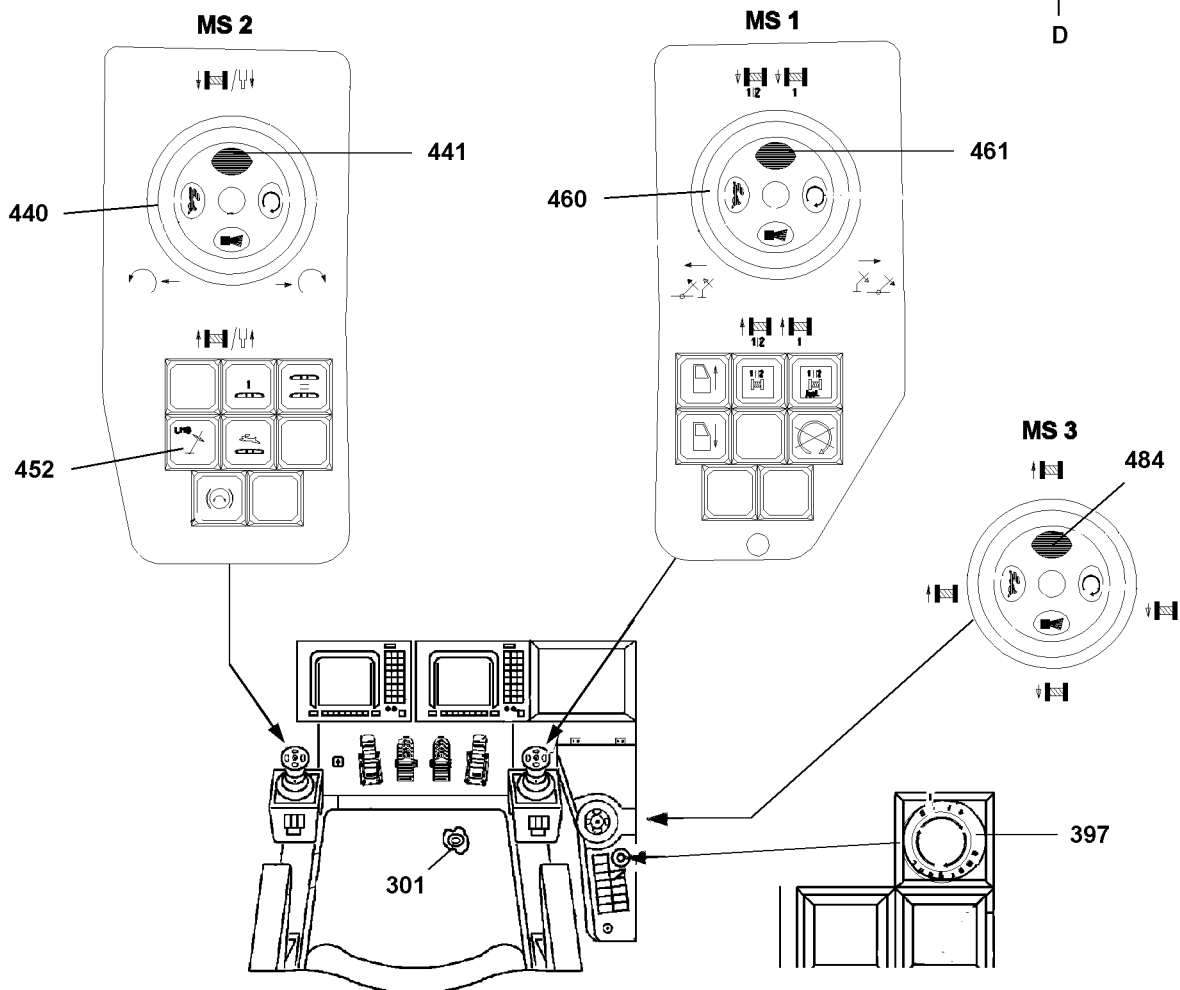
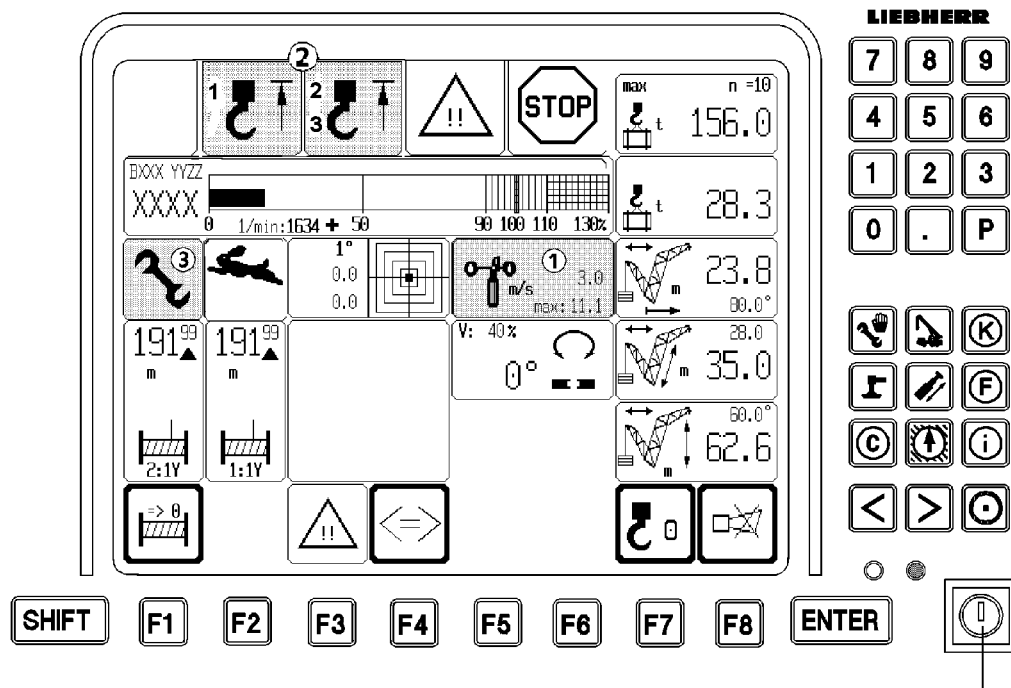
All LICCON overload protection displays remain functional!

▶ The bypass of the overload protection is only permitted in emergency cases!

▶ 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!



B102492

6.2 Bypassing the “hoist top” shut-off

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” and “Luff telescopic boom down” are switched off. Switch-off can be bypassed by the bypass key button **D** in the “right touching position”.



DANGER

Increased accident risk when bypassing the **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!

- ▶ Only bypass the hoist top shut-off in the presence of a crane supervisor 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.

6.3 Activating the LICCON bypass button

- ▶ Turn and hold the bypass key button **D** to the right.

Result:

- The LICCON overload protection is inactive.
- The Assembly symbol **3** in the LICCON monitor blinks.
- An acoustic signal sounds.
- The red flashing beacon on the crane cab is lit.

- ▶ If the bypass key button **D** is to be switched off:
Do not operate the bypass key button **D**.

Result:

- The LICCON overload protection is active.
- The assembly symbol **3** on the LICCON monitor extinguishes.
- The acoustic signal is switched off.
- The red flashing beacon on the crane cab extinguishes.

1 General

Make sure that the following prerequisites are met:

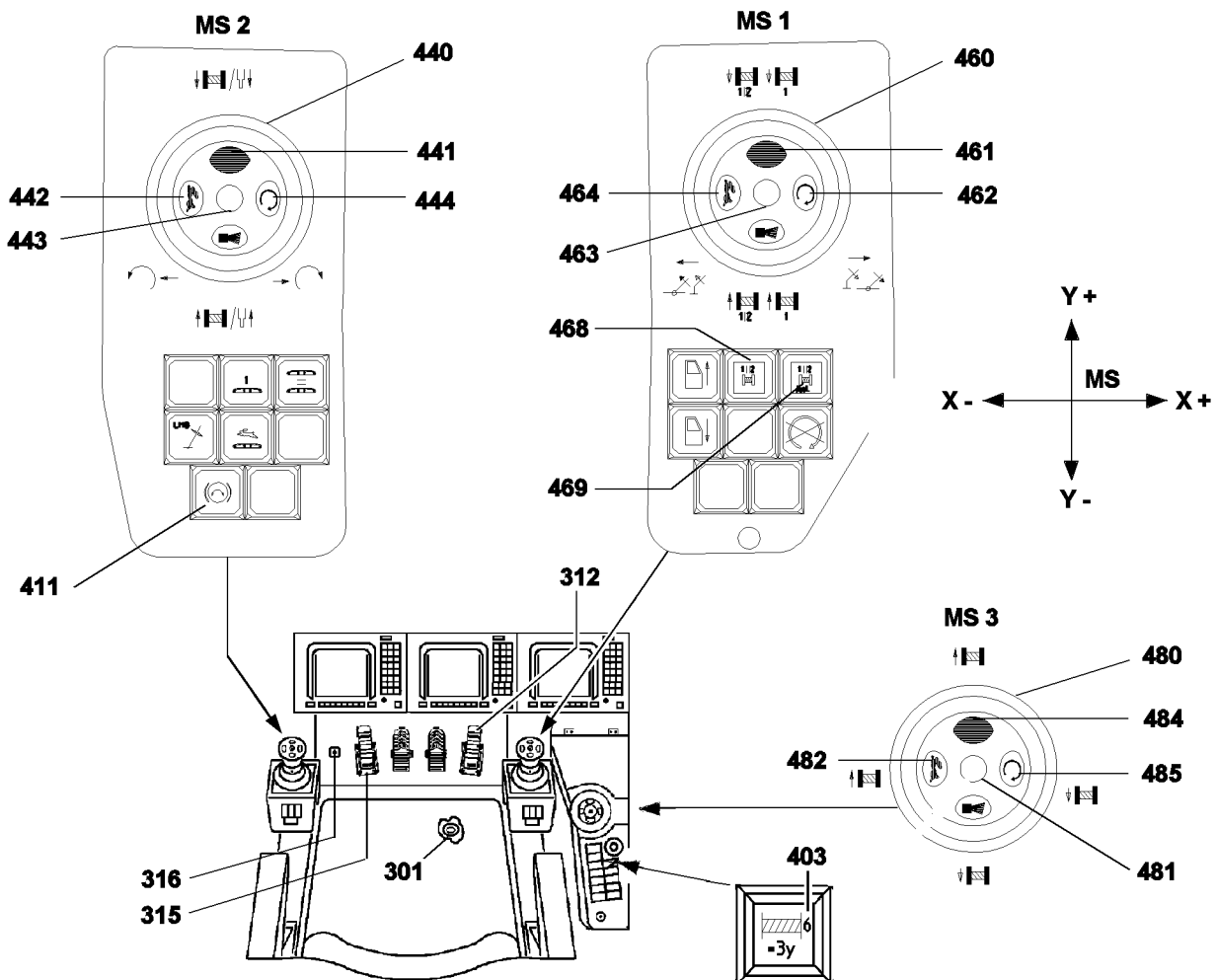
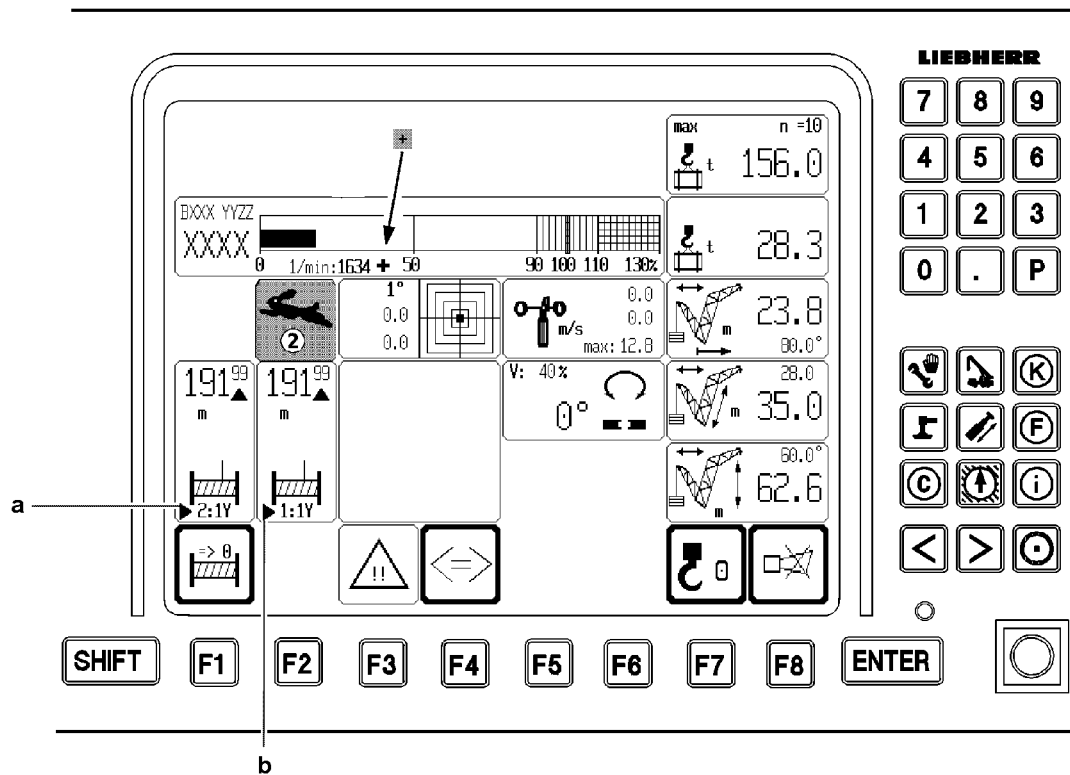
- The crane is aligned in horizontal direction.
- The counterweight is attached and secured according to the data in the load chart.
- The ground is able to carry the weight of the crane, the load and the load tackle.
- The hook block is correctly reeved as shown in reeving plan.
- The crawler operation is turned off.
- The crane engine is running.
- All safety systems have been adjusted according to the data in the load chart.
- There are no persons or objects in the danger zone.



DANGER

Danger 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.
 - ▶ Give a warning signal before initiating a crane movement.
 - ▶ Observe the danger notes for crane operation in chapter 5.01.
-



B113073

1.1 Engine speed

1.1.1 Locking the engine rpm

Locking the engine rpm relieves the crane operator if he needs to work for an extended period with constant rpm. The engine regulation can be locked in any position.

- ▶ Press the pedal **312** down for the engine regulation until the desired rpm is reached.
- ▶ Press the button **444**.

or

- Press button **462** or button **485**.

Result:

- The pedal **312** is locked.
- The “+” symbol appears on the monitor.

1.1.2 Releasing the engine rpm lock

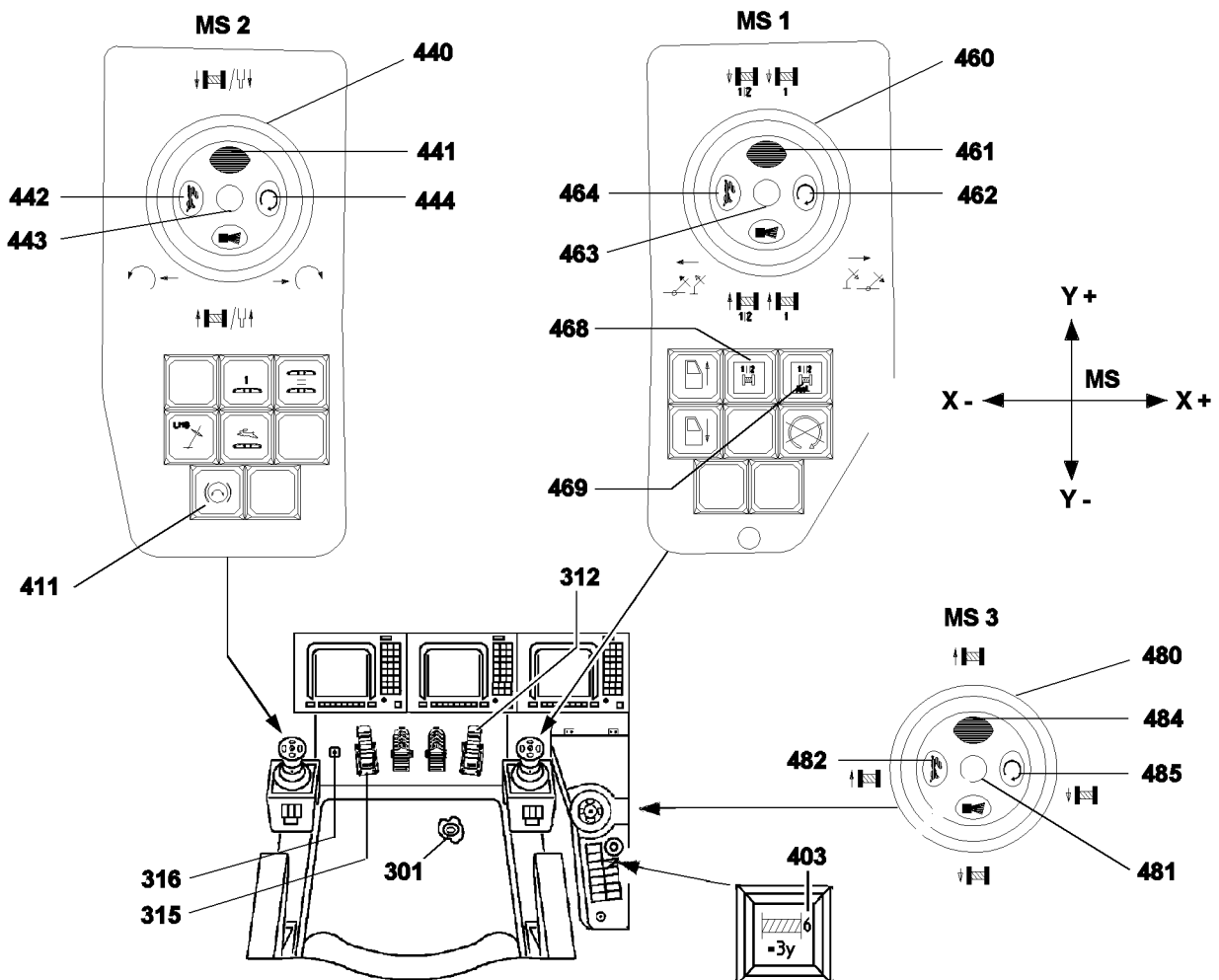
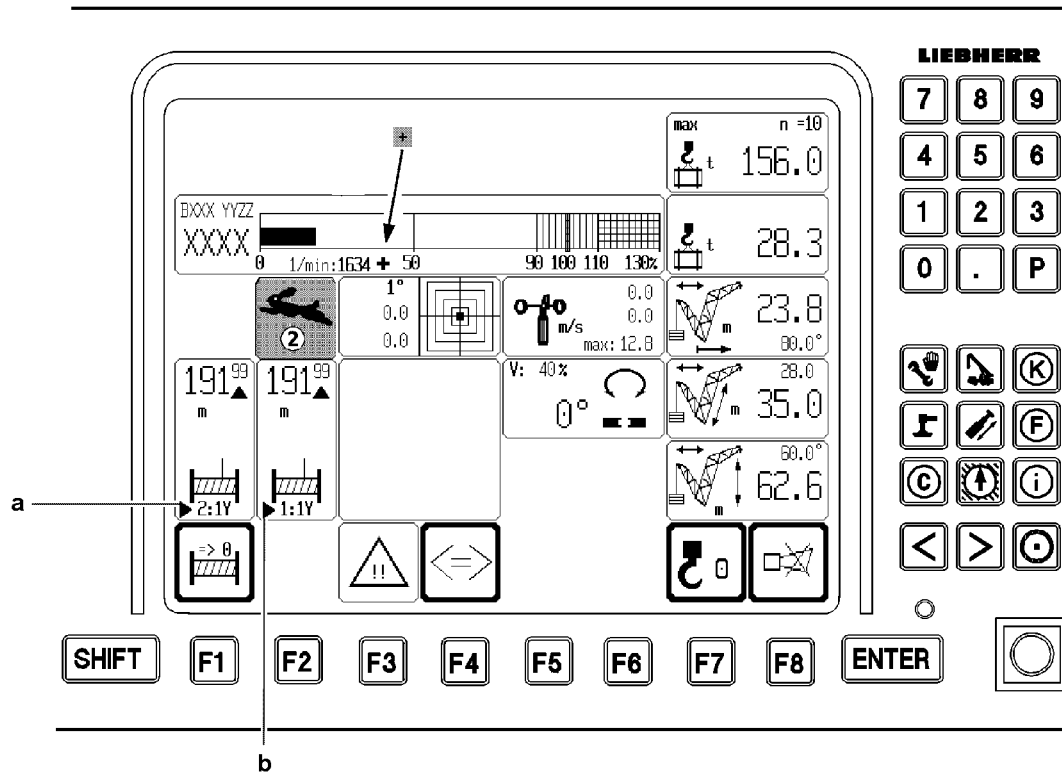
- ▶ If the engine rpm is locked:
Press the button **444** again.

or

- Press button **462** or button **485** again.

Result:

- The lock is released.
- The “+” symbol extinguishes on the monitor.



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1.1.3 Power Plus



Note

Please note!

- ▶ If a crane movement has reached its maximum speed due to the current utilization, then no speed increase is possible by adding the "Power Plus".
- ▶ If the total power requirement of all actuated crane movements is larger than the available power, then those crane movements are reduced which require the most power.
- ▶ If another crane movement is added or taken back to one or more actuated crane movements then this has an influence on the other movements. For that reason we recommend in situations in which an interference of the individual crane movements is troublesome, not to add the Power Plus or to turn the Power Plus off.

Adding "Power Plus"

Using the button **442** or the button **464** will increase the speed of the crane movement for "lifting / lowering".



DANGER

Danger of accidents in case of single to triple sheave reeving!

- ▶ Do **not** turn on Power Plus if the crane is loaded to more than 50 % of its maximum permitted load carrying capacity for the respective boom radius.

- ▶ Press the button **442**.

or

- Press the button **464** or **482**.

Result:

- Power Plus is added.
The icon **2** appears on the LICCON monitor.

Turning the "Power Plus" off

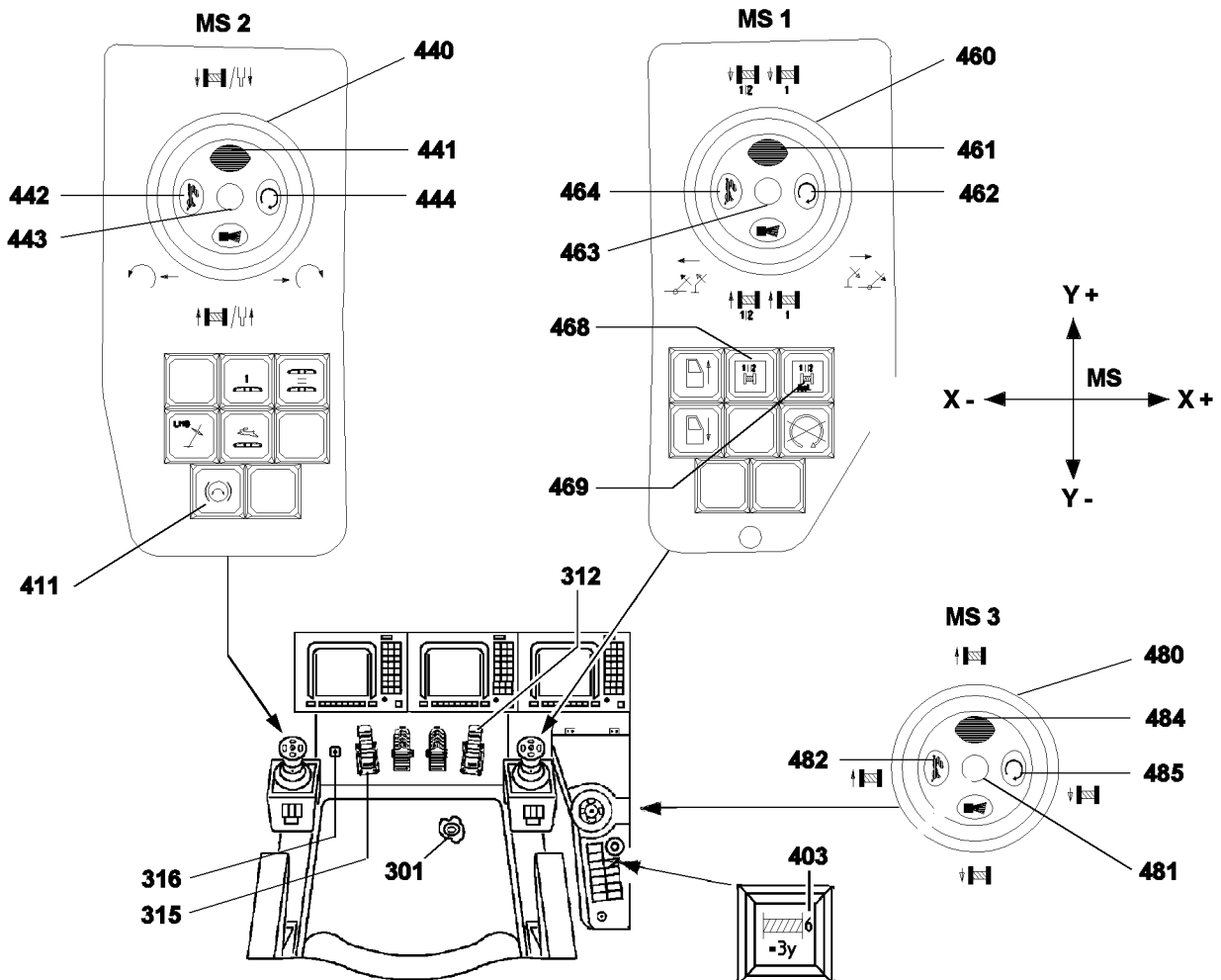
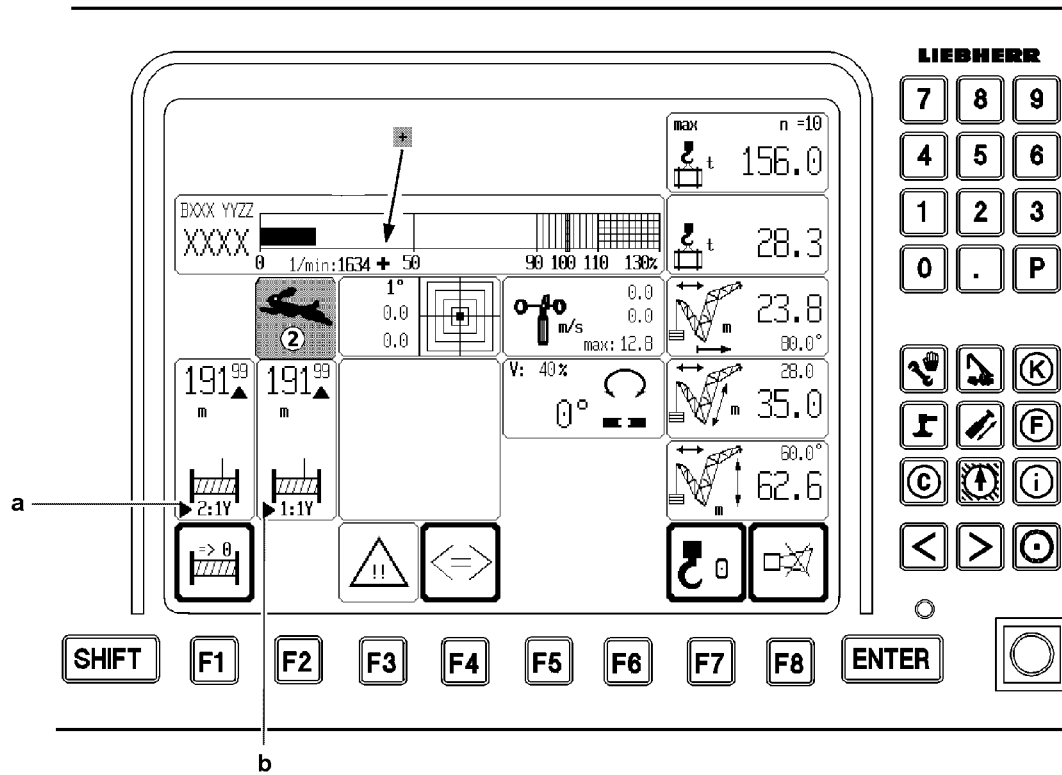
- ▶ If Power Plus is added:
Press the button **442** again.

or

- Press button **464** or **482** again.

Result:

- Power Plus is turned off.
The icon **2** turns off on the LICCON monitor.



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1.1.4 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.

Winch 1

- ▶ Press the button **461**.

Result:

- The vibration sensor **463** is turned on.
The icon **b** is turned on.

- ▶ When the vibration sensor **463** is turned on:
Press the button **461** again.

Result:

- The vibration sensor **421** is turned off.
The icon **b** is turned off.

Winch 2 or slewing gear

If winch 2 and the slewing gear are operated, the vibration sensor **443** will react to the first deflecting movement.

- ▶ Press the button **441**.

Result:

- The vibration sensor **443** is turned on.
The icon **a** is turned on.

- ▶ When the vibration sensor **443** is turned on:
Press the button **441** again.

Result:

- The vibration sensor **443** is turned off.
The icon **a** is turned off.

2 LICCON computer system

See chapter 4.02.



WARNING

Danger of accidents due to overload.

- ▶ Constantly monitor the displays on the LICCON monitor.
- ▶ Observe changing utilization conditions and forces.



Note

- ▶ The crane operator must evaluate constantly if the data shown in the operating view can even be correct. He may not rely blindly on the LICCON system but must think for himself and must recognize a possible error or overload conditions.

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.

2.2 Stand-by mode

No crane movements are possible, see chapter 4.02, section 10, “LICCON Computer system in Stand-by Mode”.

3 Winch and master switch assignment to operating modes

The assignment of the master switches to the winches is different, according to the operating modes.



WARNING

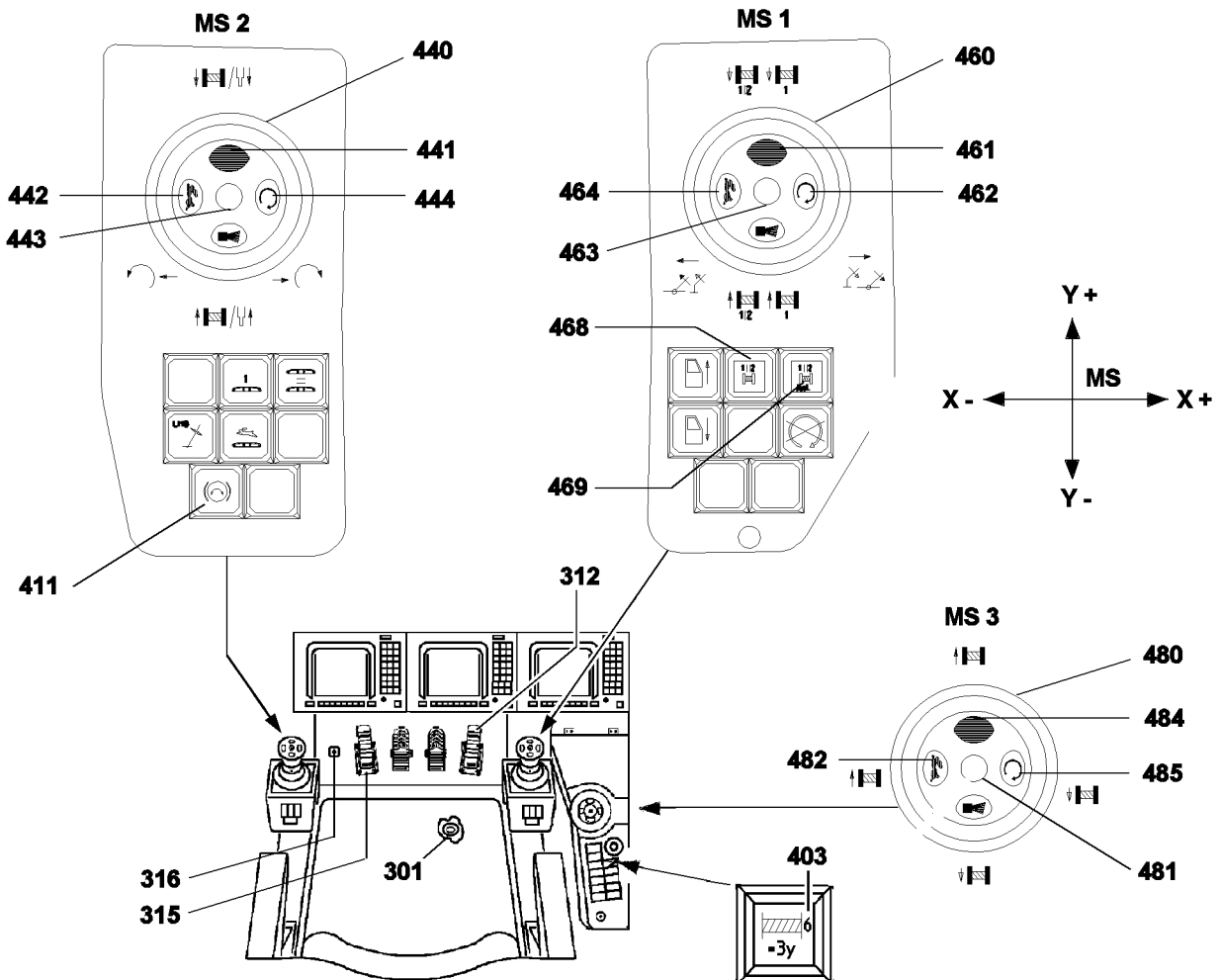
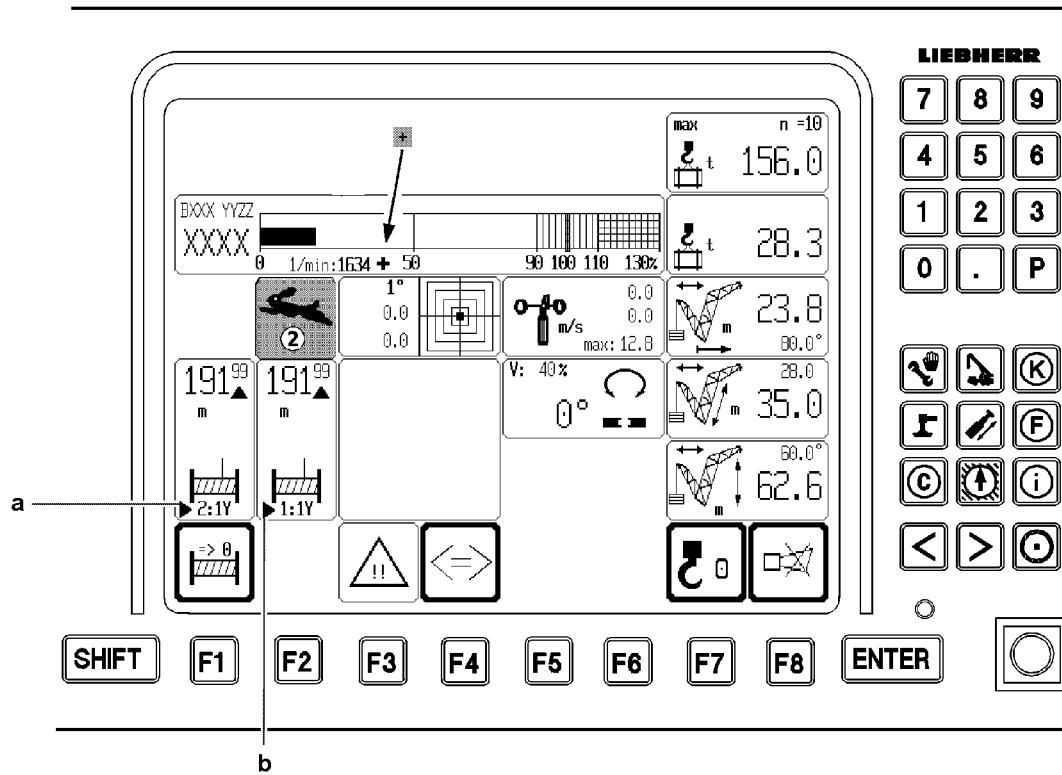
The crane can topple over!

If the master switch assignment in the electric wiring diagram is ignored, the crane can topple over!

Personnel can be severely injured or killed!

Severe damage on the crane can result!

- ▶ 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.



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4 Lifting / lowering



CAUTION

Risk of rope damage!

- ▶ When spooling the winches up or out, make sure that no slack rope forms.

The speed of crane movement “lifting and lowering” is controlled via the deflection of the corresponding master switch and via the pedal **312** of the engine regulation.

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 Winch 1 - hoist winch

In the winch icon is shown that the winch is turning, even if no hook movement is visible due to multiple reeving and low speed.

- ▶ Deflect master switch 1 **460** in direction Y+.

Result:

- Winch 1 spools out and the load is lowered.

- ▶ Deflect master switch 1 **460** in direction Y-.

Result:

- Winch 1 spools up, the load is raised.

4.2 Winch 2 - hoist winch

In the winch icon is shown that the winch is turning, even if no hook movement is visible due to multiple reeving and low speed.

- ▶ Deflect master switch 2 **440** in direction Y+.

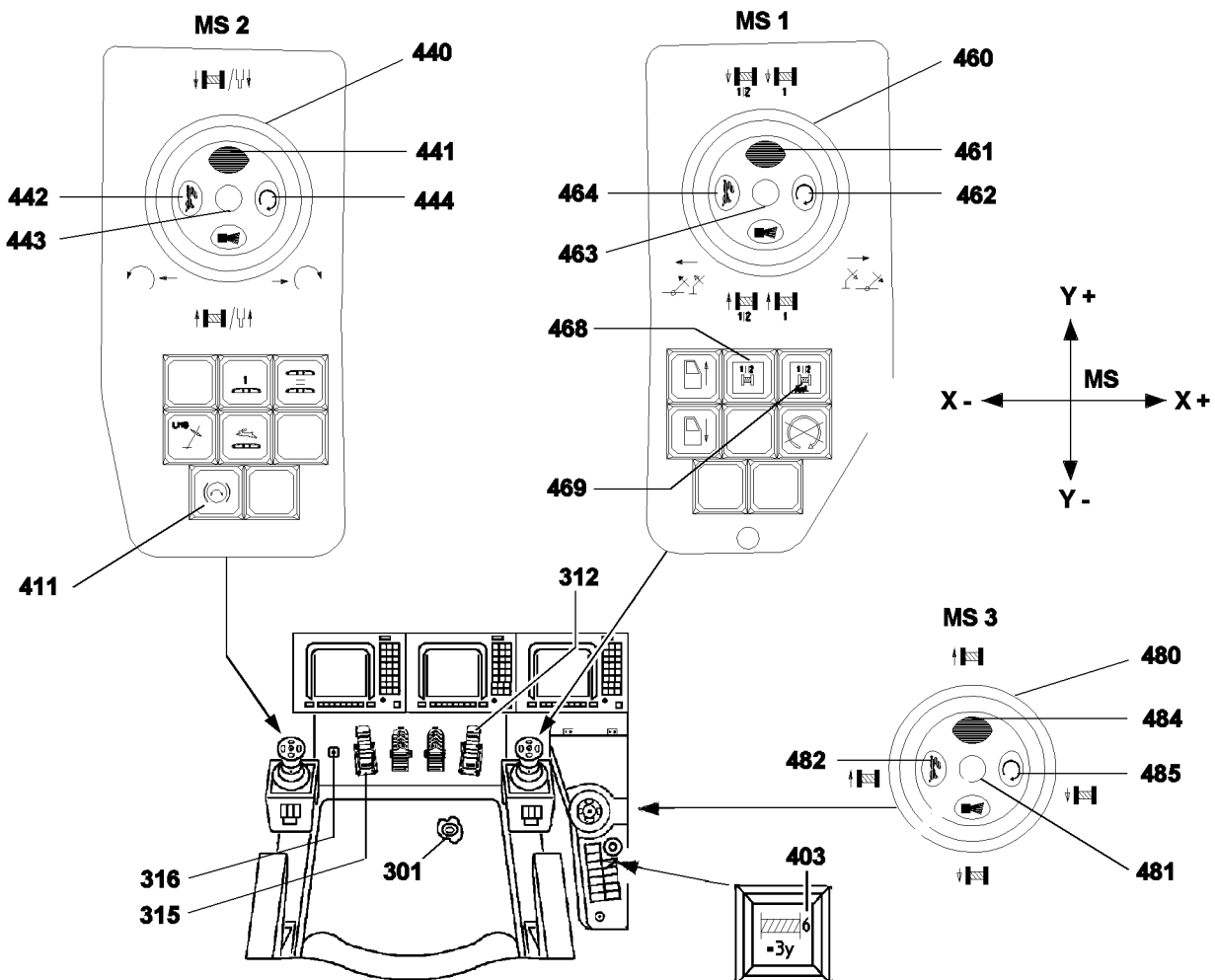
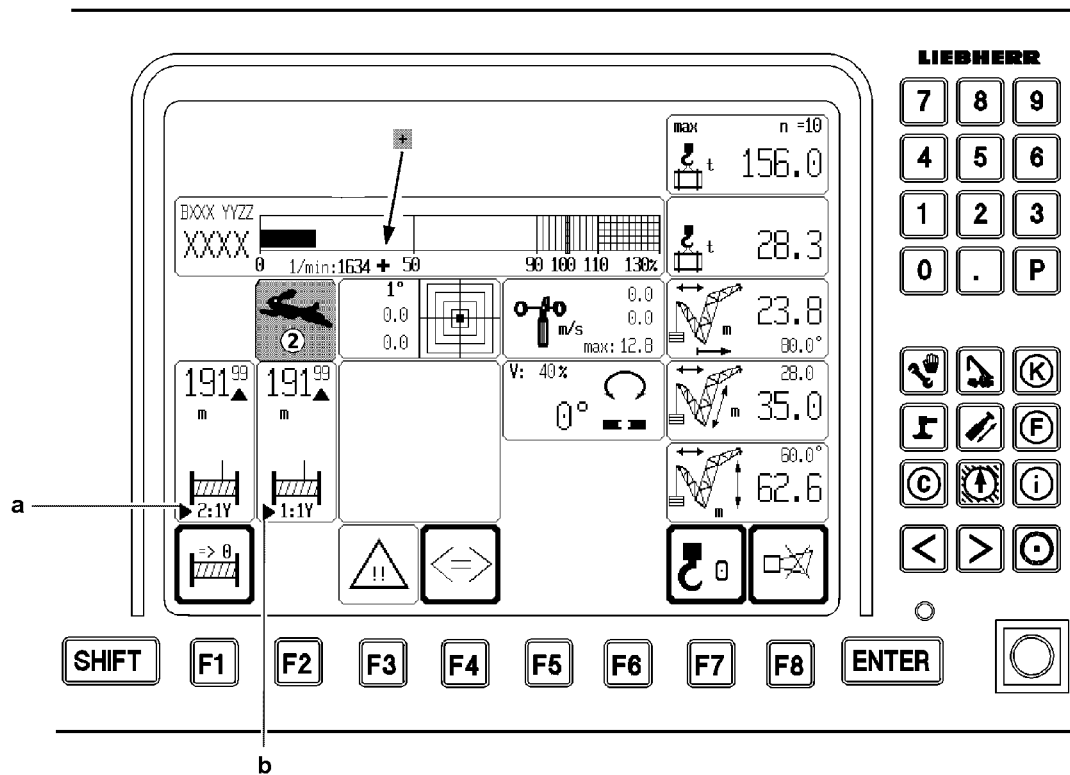
Result:

- Winch 2 spools out and the load is lowered.

- ▶ Deflect master switch 2 **440** in direction Y-.

Result:

- Winch 2 spools up and the load is lifted.



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4.3 Winch 6 - hoist winch boom nose

In the winch icon is shown that the winch is turning, even if no hook movement is visible due to multiple reeving and low speed.



Note

- ▶ In individual operation of winch 1 and winch 2, no master switch is assigned to winch 6.
- ▶ To be able to run winch 6 in individual operation, the **switch 403** must be turned on, this assigns winch 6 to the master switch MS3y.
- ▶ In parallel operation, winch 1 and winch 2 are actuated with the master switch MS1y. The master switch MS2y is then assigned to winch 6. The switch 403 is turned off.

4.3.1 Operation with winch 6 with turned on parallel operation of winch 1 II 2

- ▶ Turn on switch **468**.

Result:

- The parallel control of winch 1 and winch 2, **1II2** is turned on.
Master switch MS2y is assigned to winch 6.

- ▶ Deflect master switch 2 **440** in direction Y+.

Result:

- Winch 6 spools out and the load is lowered.

- ▶ Deflect master switch 2 **440** in direction Y-.

Result:

- Winch 6 spools up and the load is lifted.

4.3.2 Operation with winch 6 in individual operation of winch 1 + 2

- ▶ Turn the switch **403** on. Winch 6 is switched to master switch MS3y.
- ▶ Deflect master switch 3 **480** in direction Y+.

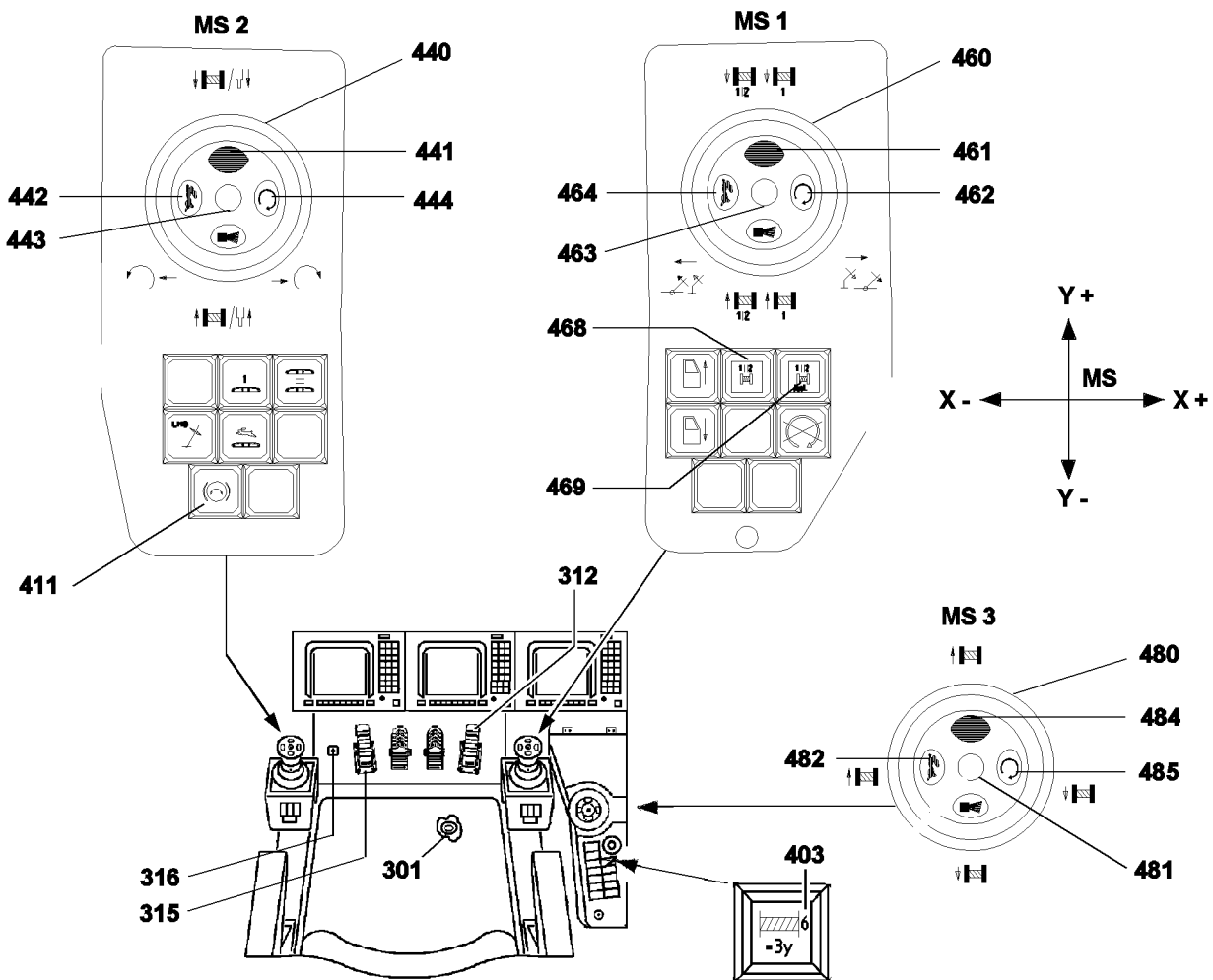
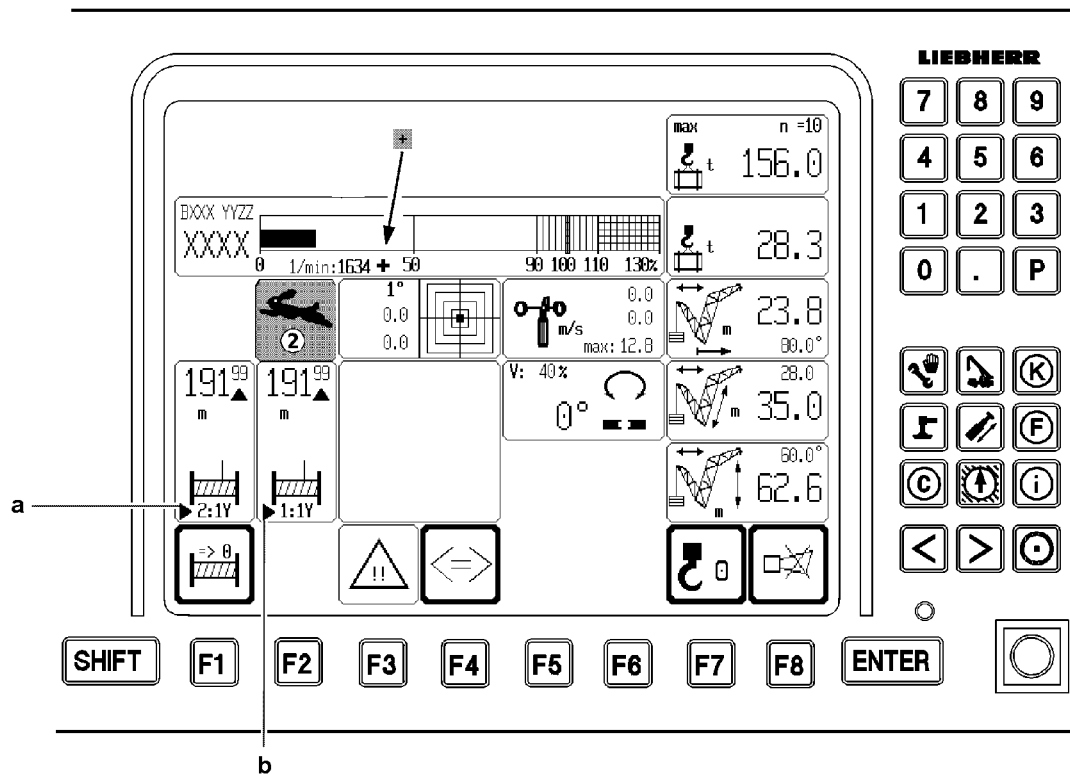
Result:

- Winch 6 spools out and the load is lowered.

- ▶ Deflect master switch 3 **480** in direction Y-.

Result:

- Winch 6 spools up and the load is lifted.



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4.4 Parallel operation

For parallel operation, winch 1 and winch 2 are used.

In parallel operation, winch 1 and 2 are only jointly activated only via master switch MS1y.

Make sure that the following prerequisites are met:

- The double hook blocks are assembled together, see chapter 4.06.
- The double hook blocks are reeved in according to the load charts.
- The double hook blocks are properly reeved according to the reeving plan, see chapter 4.06.
- The total reeving has been entered on the LICCON monitor.
- The reeving number on both winches 1 and 2 must be the same and even.



DANGER

Danger of accident!

- ▶ The total reeving number on both winches 1 and 2 must be the same and even in parallel operation. If the minimum value of the reeving is uneven, then - in parallel operation - the next higher, even reeving must be selected.
- ▶ Remove the transporting pin on the hook blocks prior to the horizontal alignment and prior to the crane operation.
- ▶ Make sure that the danger zone of the hook block is free of any personnel.

4.4.1 Aligning the hook blocks horizontally

Make sure that the following prerequisites are met:

- Individual operation for winch 1 and winch 2 is set.
- ▶ Manually align the hook blocks horizontally, visual check.
- ▶ Move master switch 1 **460** or master switch 2 **440** into direction Y.

Result:

- Winch 1 or winch 2 spools out or up until the hook blocks are horizontally aligned, visual check.

4.4.2 Adjusting the parallel control of winch 1 and winch 2

Make sure that the following prerequisites are met:

- The double hook blocks are horizontally aligned, visual check.
- There is no load on the hook.
- ▶ Turn on the switch **468** for the parallel operation. Press button **469** and adjust winch 1 and winch 2.

Result:

- The parallel control of winch 1 and winch 2 is adjusted.

4.4.3 Parallel operation

**WARNING**

Danger of accidents due to different level of hook blocks!

The electronic parallel control only monitors the same rotational speed of the two winches, however, it does **not** consider the following errors:

- Uneven rope length
- Different rope diameters
- Different winding behavior
- Uneven reeving

- ▶ The crane operator must ensure and is responsible for that the hook blocks are always on the same level, despite electronic monitoring!
-

**Note**

- ▶ The winch movement is shut off if the difference range of the parallel control is being exceeded. In that case, the winches must be again parallel adjusted.
-

**DANGER**

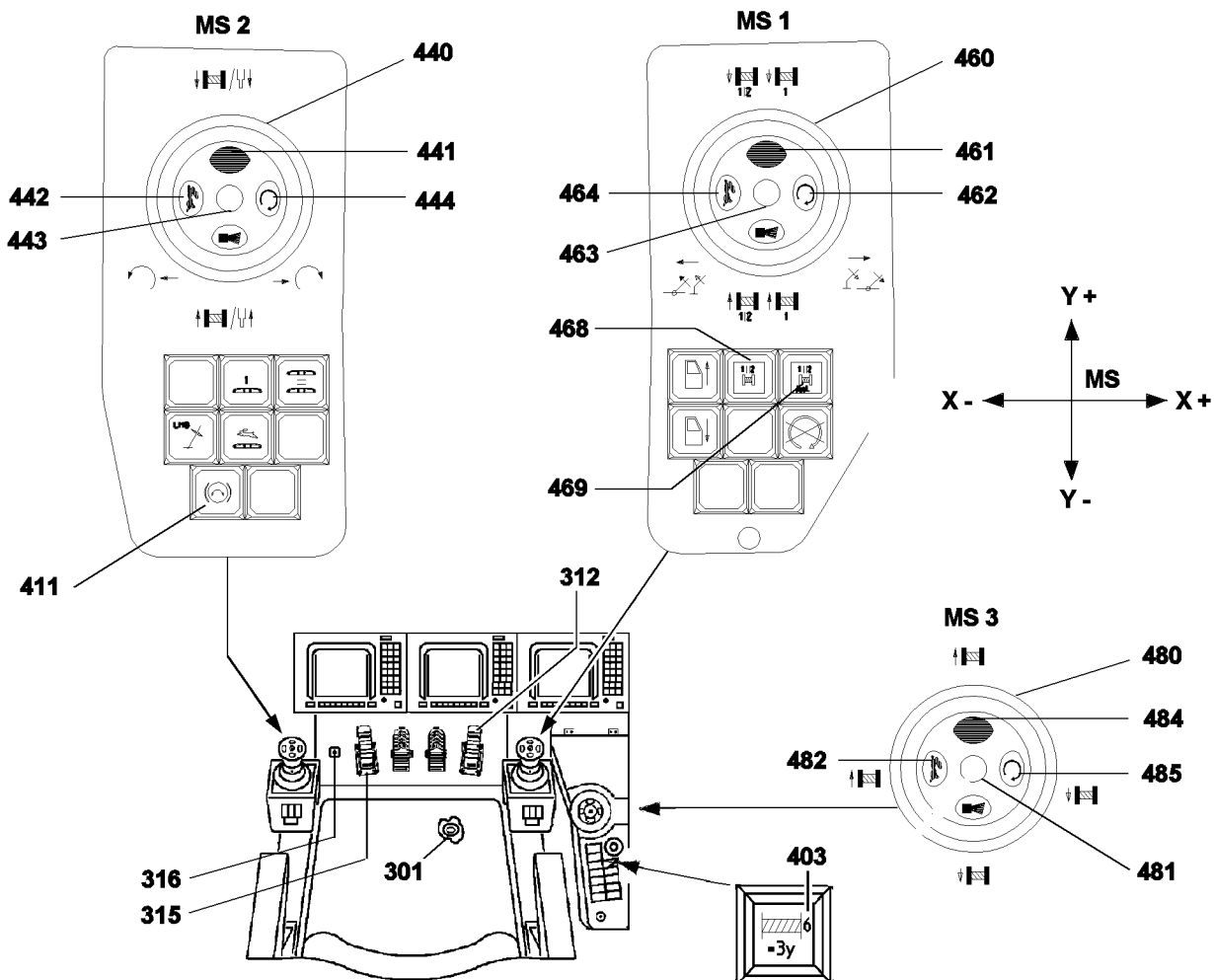
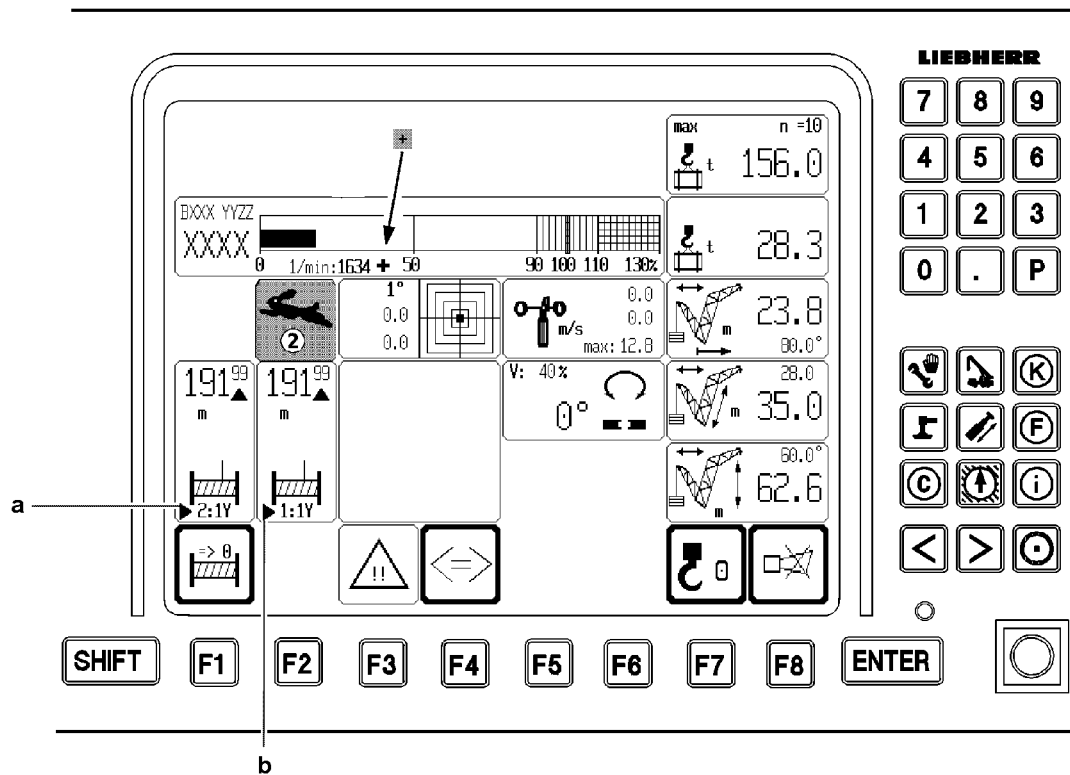
Danger of accident!

The compensating cross bar on the double hook blocks must always be horizontal.

Considerable load increases occur on individual hook blocks when the compensating cross bar is in an inclined position.

If this is not observed, then the hook block, boom or rope can be overloaded, resulting in property damage and personal injury.

- ▶ Make sure that the compensating cross bar is always horizontal.
-



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5 Luffing



DANGER

Crane can be damaged or topple over!

If the LICCON overload protection turns off when attempting to lift the load with the winch, do not luff up the boom.

- ▶ Do not lift the load by luffing up the boom, see chapter 4.04.

The speed of crane movement “luffing” is controlled by the deflection of the corresponding master switch and via the pedal **312** of the engine regulation.

5.1 Luffing the boom during S/SL/SD/SLD/SDWV(B/BW) operation

- ▶ Deflect the master switch 1 **460** in direction X-.

Result:

- The boom is luffed up.

- ▶ Deflect the master switch 1 **460** in direction X+.

Result:

- The boom is luffed down.

5.2 Luffing the boom in SW2-operation

Make sure that the following prerequisites are met:

- The switch **403** is **not** switched to winch 6, master switch MS3y.

- ▶ Deflect master switch 3 **480** in direction Y-.

Result:

- The boom is luffed up.

- ▶ Deflect master switch 3 **480** in direction Y+.

Result:

- The boom is luffed down.

5.3 Luffing the boom during SDW/(B/BW) operation

- ▶ Deflect the master switch 3 **480** in direction X-.

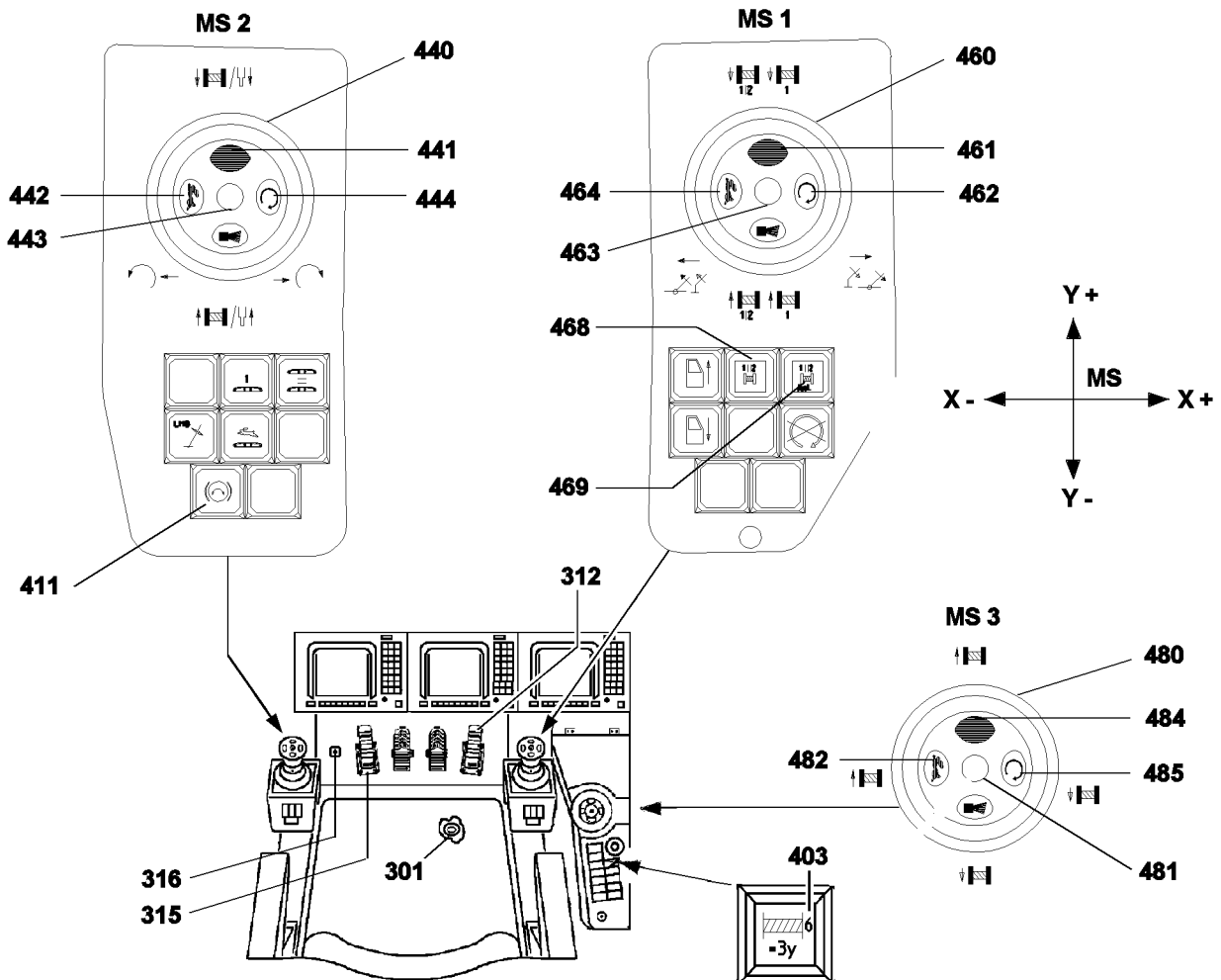
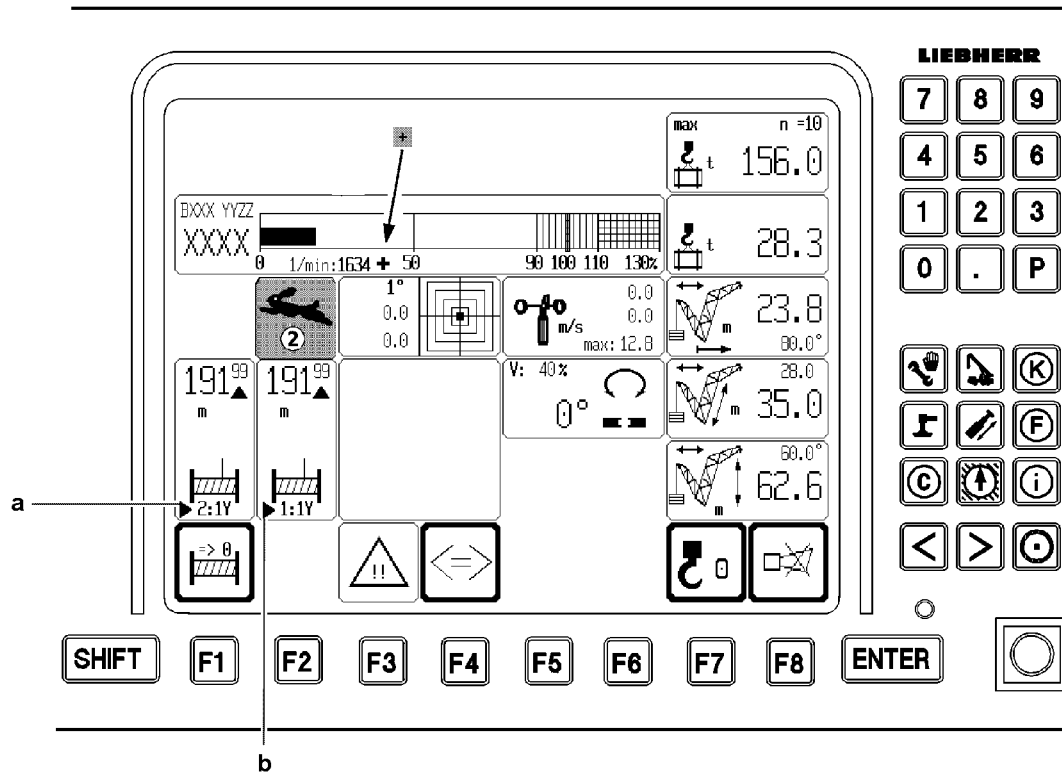
Result:

- The boom is luffed up.

- ▶ Deflect the master switch 3 **480** in direction X+.

Result:

- The boom is luffed down.



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5.4 Luffing the lattice jib during SW2/SDW/(B/BW) operation

- ▶ Deflect the master switch 1 **460** in direction X-.

Result:

- The lattice jib is luffed up.

- ▶ Deflect the master switch 1 **460** in direction X+.

Result:

- The lattice jib is luffed down.

5.5 Luffing the lattice jib during SDWV/(B/BW) operation

- ▶ Deflect the master switch 3 **480** in direction X-.

Result:

- The lattice jib is luffed up.

- ▶ Deflect the master switch 3 **480** in direction X+.

Result:

- The lattice jib is luffed down.

5.6 Luffing the derrick, for all D-operating modes

Make sure that the following prerequisites are met:

- The switch **403** is **not** switched to winch 6, master switch MS3y.

- ▶ Deflect master switch 3 **480** in direction Y-.

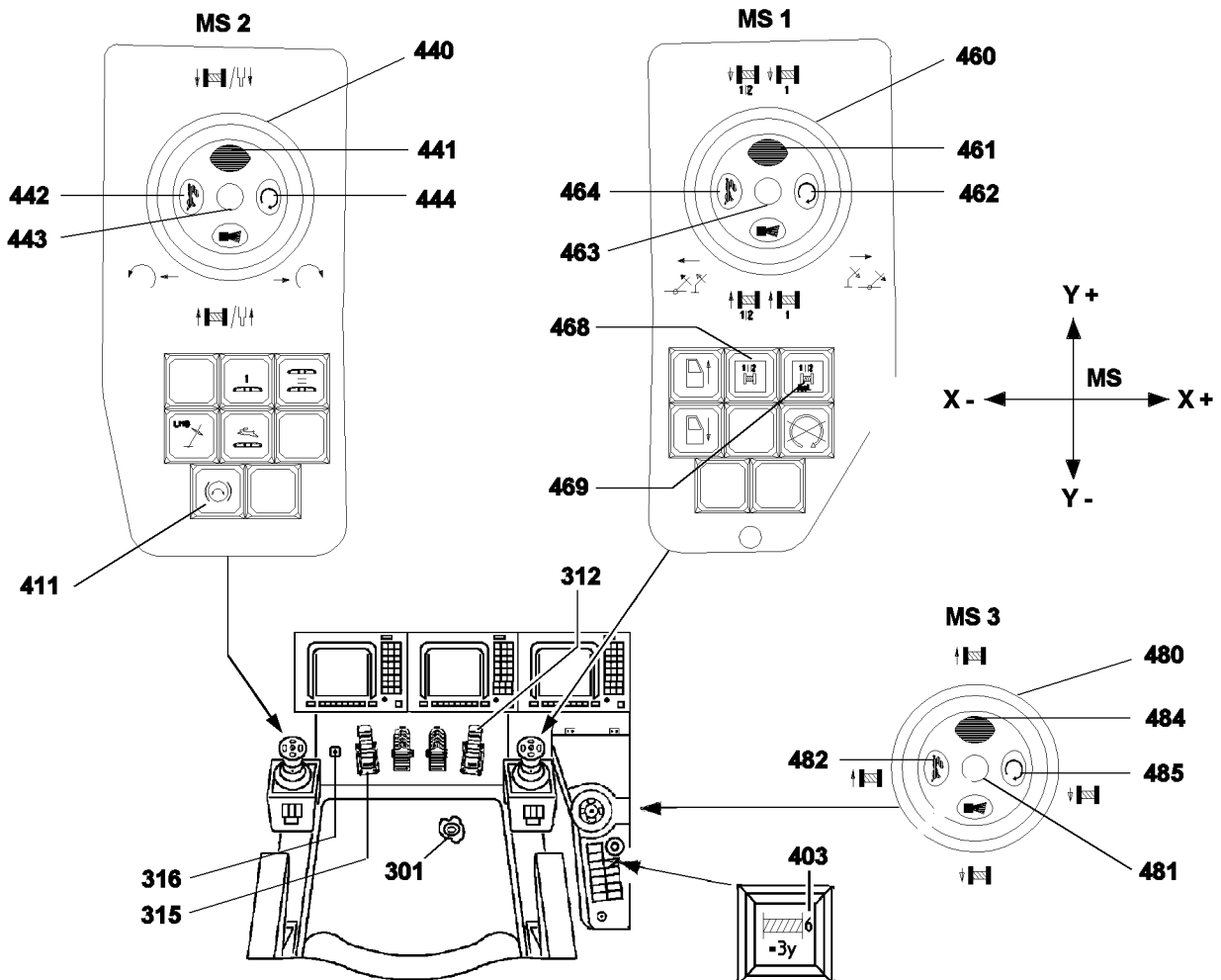
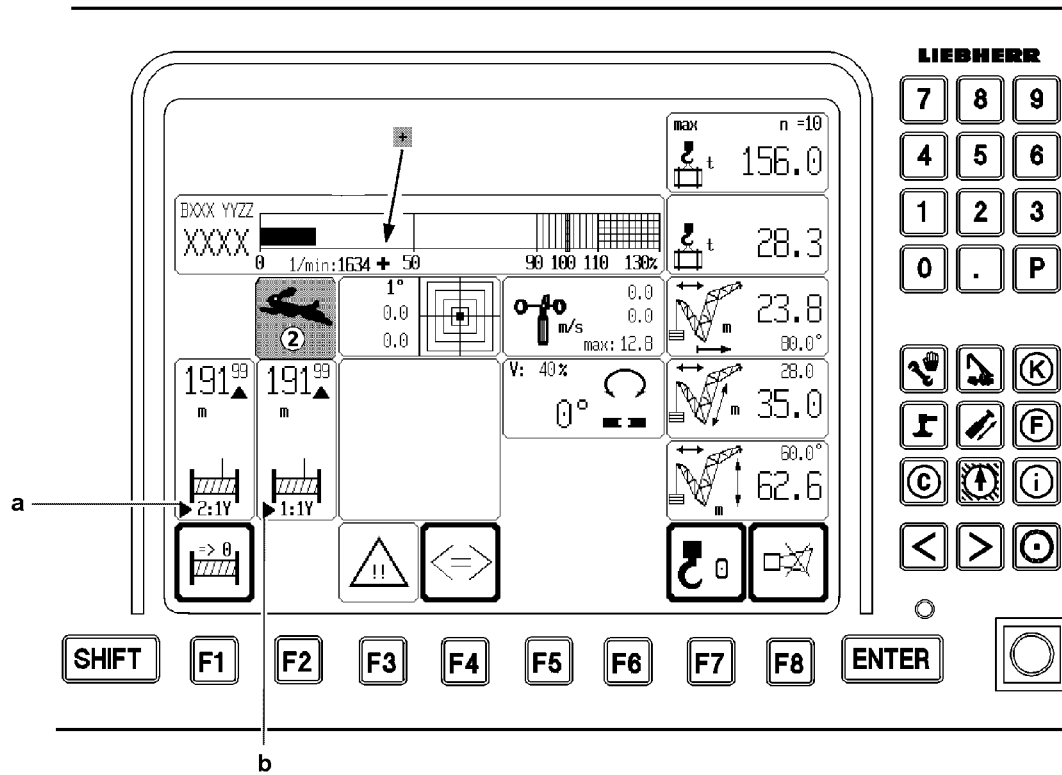
Result:

- The derrick is luffed up.

- ▶ Deflect master switch 3 **480** in direction Y+.

Result:

- The derrick is luffed down.



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6 Turning

The speed of the “turning” crane movement is controlled via the deflection of master switch 2 **440** and via the pedal **312** of the engine regulation.

The basic principle is that with a longer boom and a heavier load the crane should be operated at lower speed.

In the “Control Parameter” program, it is possible to preselect the maximum rotational speed.

See chapter 4.02 “LICCON computer system”, section “Control Parameters”.

The load chart manual lists the maximum slewing speeds in percentages. These values depend on the boom length and the operating mode, and may not be exceeded under any circumstances.

6.1 Turning the crane superstructure



DANGER

Danger of fatal injury!

- ▶ Ensure that there are no obstacles in the crane's working area and no persons in the danger zone.
- ▶ Give a short warning signal (horn) before starting a crane movement.



DANGER

Danger of fatal injury!

A swaying load can damage the crane and cause it to topple.

- ▶ When turning with a load, initiate and slow down the turning movement very sensitively.

- ▶ Deflect the master switch 2 **440** in direction X+.

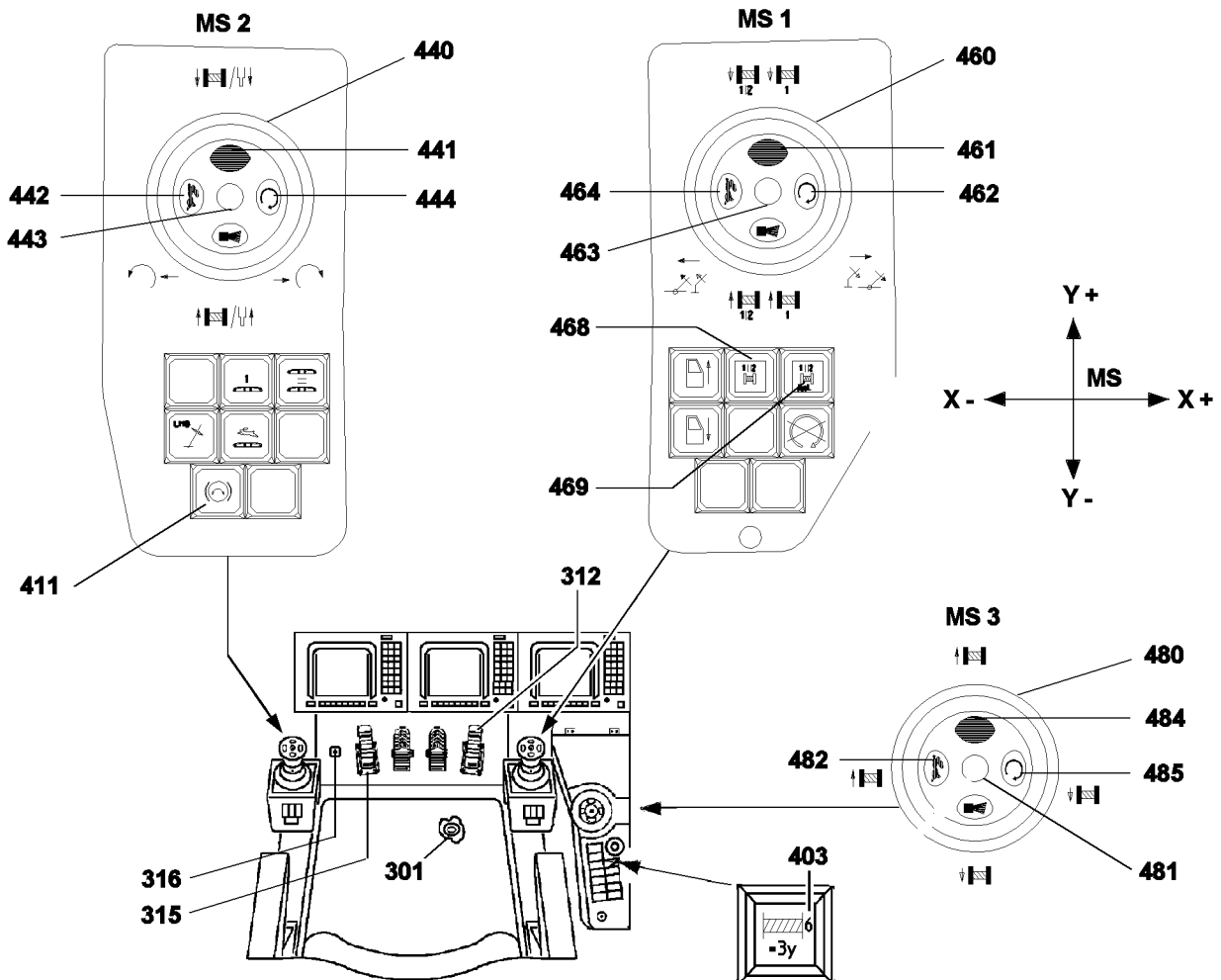
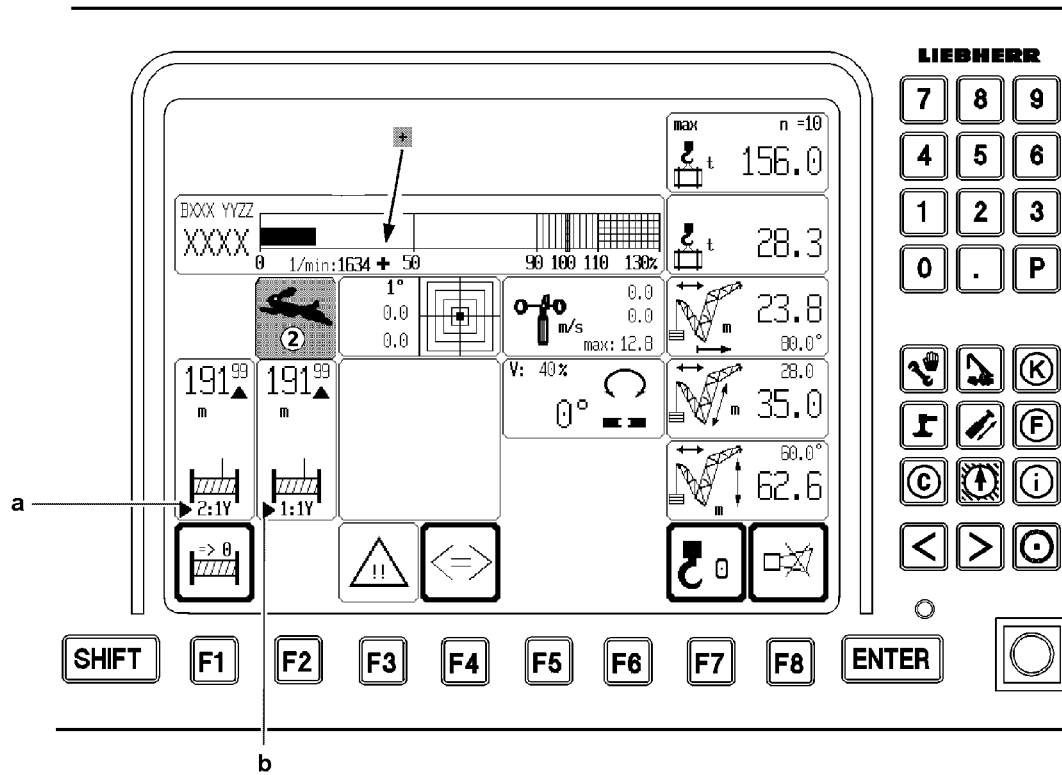
Result:

- The crane superstructure turns to the right.

- ▶ Deflect the master switch 2 **440** in direction X-.

Result:

- The crane superstructure turns to the left.



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6.2 Slewing gear, general

This crane is equipped with a “closed slewing gear”.

With a “closed slewing gear”, the braking effect starts as soon as master switch 2 **440** is moved towards the neutral position.

The parking brake is released as soon as master switch 2 **440** is moved away from the neutral position.

6.2.1 Turning the parking brake on / off

If the parking brake is turned off, then the load can be held by the slewing gear brake **315**.

The parking brake turns on automatically if:

- The seat contact switch is **not** activated.
- The engine is turned off.

The parking brake can **not** be turned off if:

- The slewing gear was turned off by the LICCON overload protection.
- The working range limitation is active.

- ▶ Actuate the switch **411**.

Result:

- The parking brake is turned off.



DANGER

Uncontrolled turning crane!

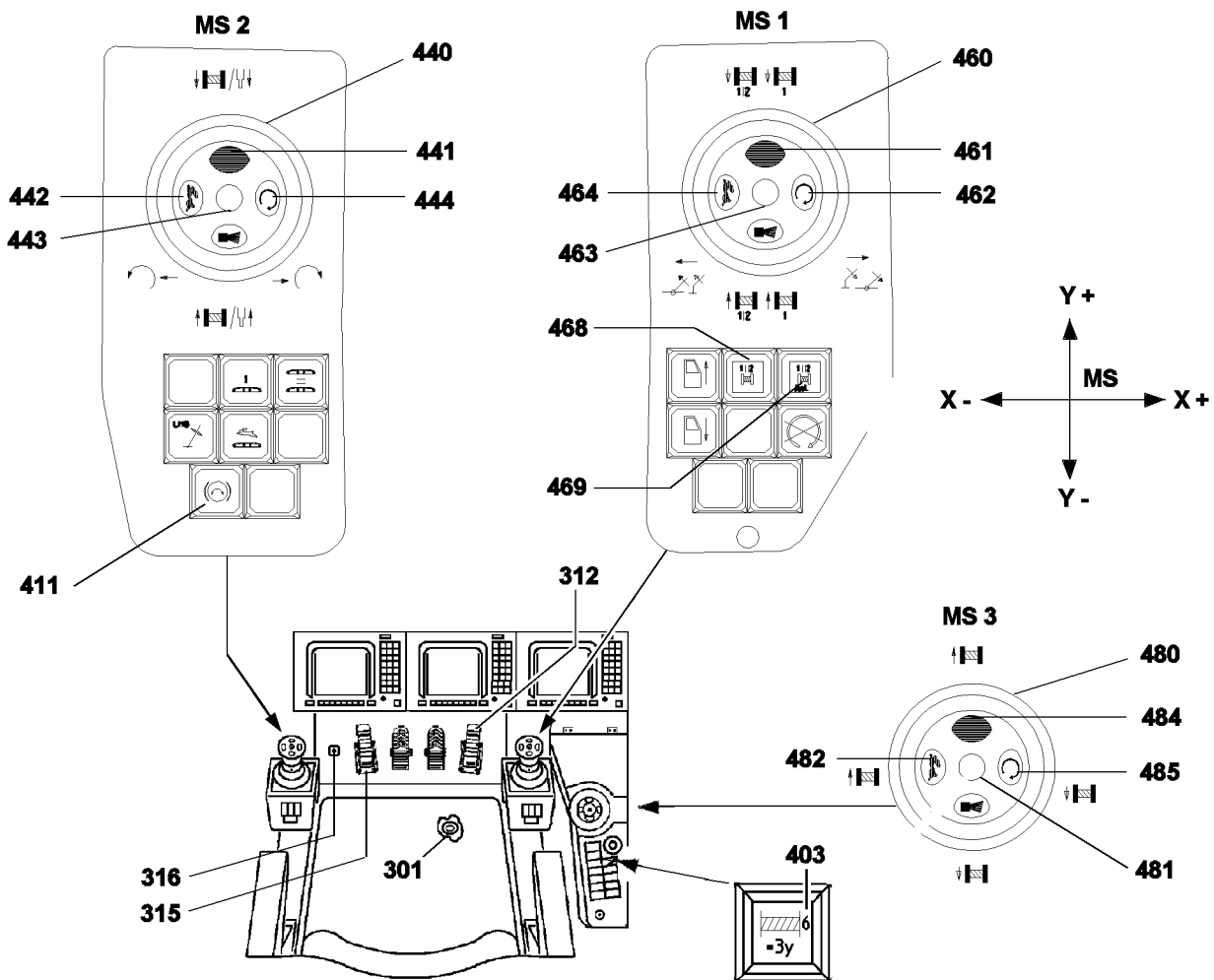
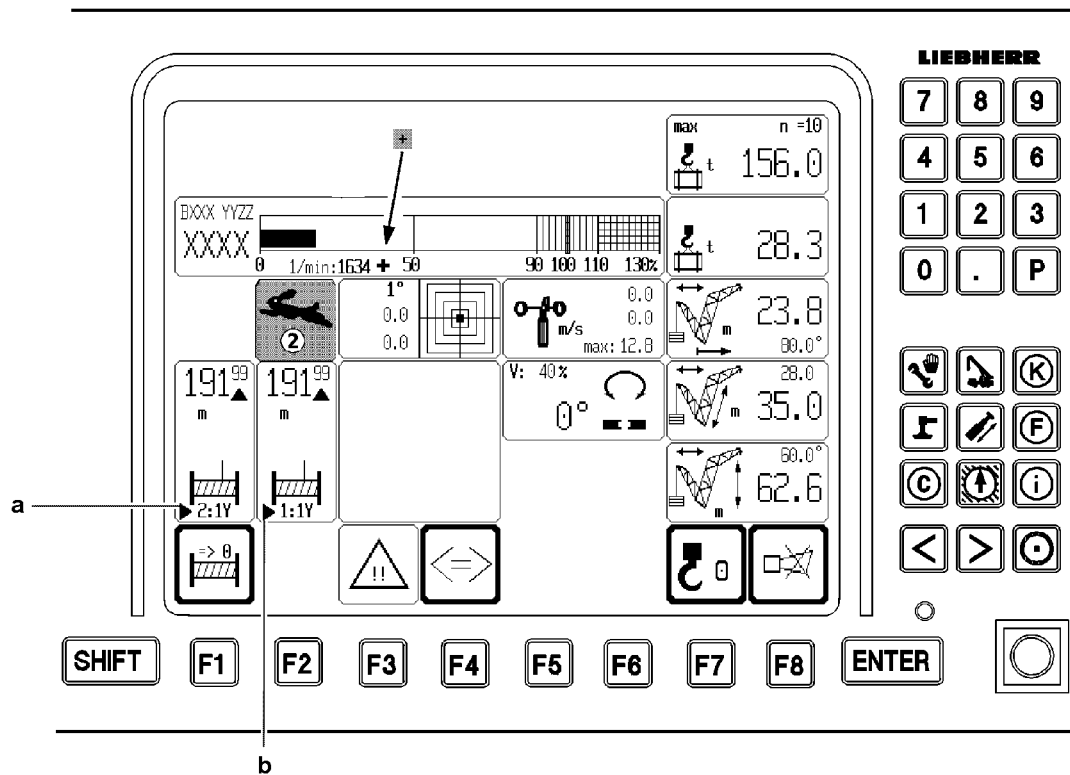
If the parking brake is turned off and the master switch 2 **440** is **not** deflected, the crane superstructure, as a result of external forces (such as wind, incline position of the crane, etc.), can turn slowly due to leakage in the closed hydraulic circuit.

- ▶ With the parking brake turned off and the master switch 2 **440 not** deflected, check that the crane does not turn uncontrollably!

-
- ▶ Press switch **411** again.

Result:

- The parking brake is turned on.



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6.3 Switching the slewing gear to coasting

In order to position the boom over the load more easily, the slewing gear can be switched to coasting. The master switch 2 **440** may not be deflected while doing so.

The slewing gear **cannot** be switched to coasting in these situations:

- The slewing gear was turned off by the LICCON overload protection.
- The working range limitation is active.

▶ Press the foot button **315**.

Result:

- The slewing gear is switched to coasting.

Troubleshooting

With the slewing gear released, the superstructure turns unintentionally to the side (for example due to wind).

- ▶ Do not release the foot button **315**.
 - ▶ Deflect the master switch 2 **440** in slewing direction and then release the foot button **315**.
 - ▶ Slow down the slewing movement by slowly resetting the master switch 2 **440**.
-

6.4 Applying the slewing gear brake



CAUTION

Risk of damaging the crane or the roller ring connection!

The slewing gear brake cannot brake all the torque.

- ▶ For that reason, the slewing gear brake **315** may only be used at minimum turning speeds, in other words with master switch 2 **440** almost at the neutral position.
 - ▶ Do not brake the slewing movement of the crane by moving master switch 2 **440** abruptly to the neutral position and / or by abruptly applying the slewing gear brake **315**!
-

The slewing gear brake **315** is only to be used in the following situations:

- 1.) Starting out in strong side wind
- 2.) Stopping the slewing movement in strong side wind

6.4.1 Starting out in strong side wind

When turning against the wind in strong side wind and with a long boom system, then the superstructure will turn into the opposite direction due to leakage in the hydraulic motor.

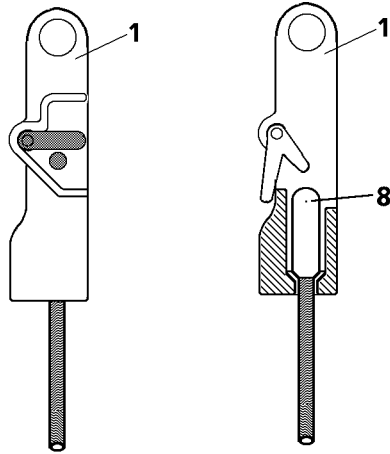
This can be avoided as follows:

- ▶ Actuate the slewing gear brake **315** and move master switch 2 **440** to the desired turning direction.
- ▶ Slowly release the slewing gear brake **315** until the superstructure turns in the desired slewing direction.

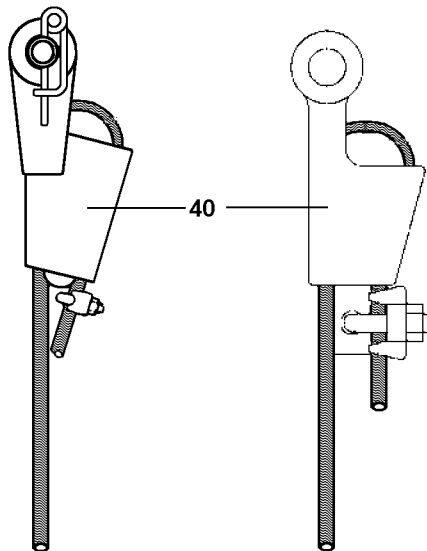
6.4.2 Stopping the slewing movement in strong side wind

- ▶ Slow down the crane with master switch 2 **440** to minimum slewing speed.
- ▶ Apply the slewing gear brake **315** carefully until the crane has come to a standstill at the desired position.

1



2



1 Wire ropes and rope end connections

1.1 Wire ropes

Please check if a **non-rotating** or a **rotation-resistant** 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

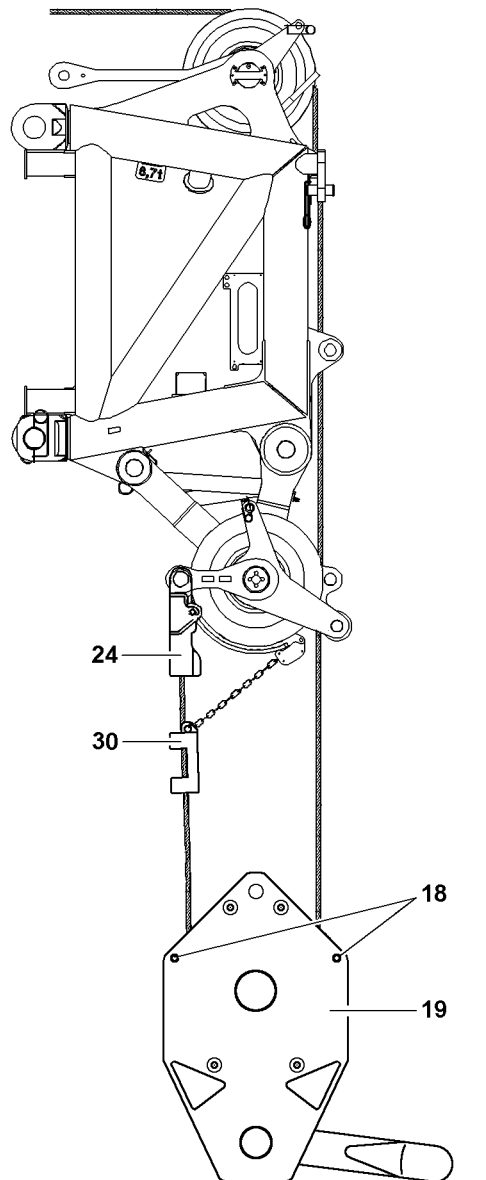
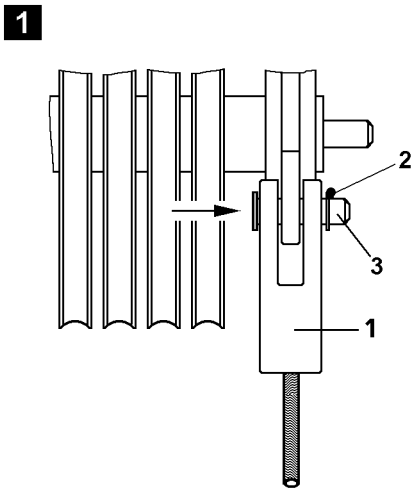
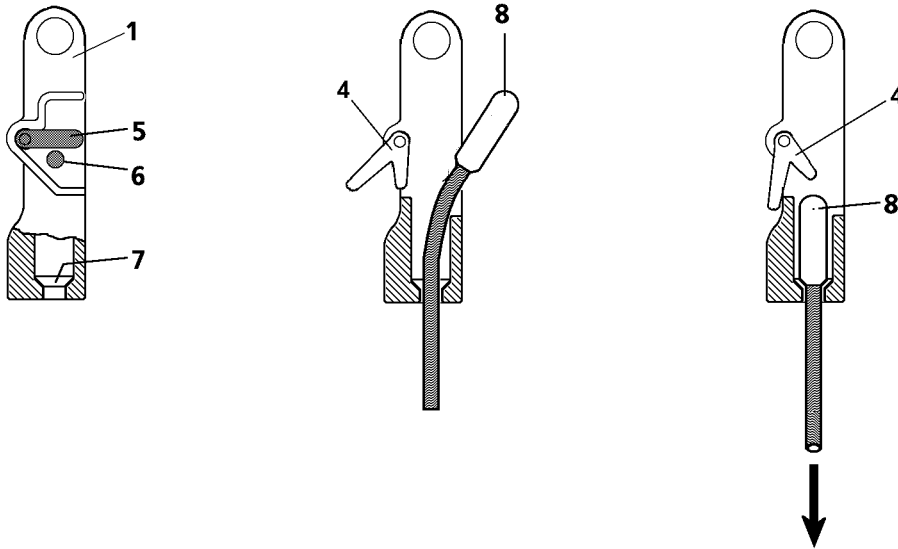
Danger of serious personnel injury and equipment damage!

- ▶ **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 locking clamp **8**.
For that, use a rope lock **1**, see illustration **1**.
- Rope end connections without locking clamp.
For that, use a wedge lock **40**, see illustration **2**.



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2 Reeving the hook block in and out



WARNING

Erroneous operation of crane function and danger of slipping on the boom!

If the following notes are not observed and adhered to, personnel can be severely injured or killed!

- ▶ Step on the boom only via the catwalks!
- ▶ The assembly personnel must secure themselves for all work on the lattice mast boom with approved antifall systems, on the safety ropes or on the lattice sections, with snap hook on both sides to prevent them from falling!
- ▶ Complete the assembly work from a stable location!
- ▶ Observe and adhere to the assembly guidelines in chapter 5.01 of the crane operating instructions!

2.1 Reeving in the hook block



WARNING

The hook block can fall over!

If the pins **2** are **not** inserted into the hook block before setting the hook block down, the hook block can fall over when unreeving the hoist rope!

Personnel can be severely injured or killed!

- ▶ Pin in the pin **2**, see chapter 5.19 of the crane operating instructions!



Note

- ▶ The reeving of the hoist rope can be carried out manually or with the aid of the assembly winch!
- ▶ Make sure that no slack rope forms during reeving!

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!

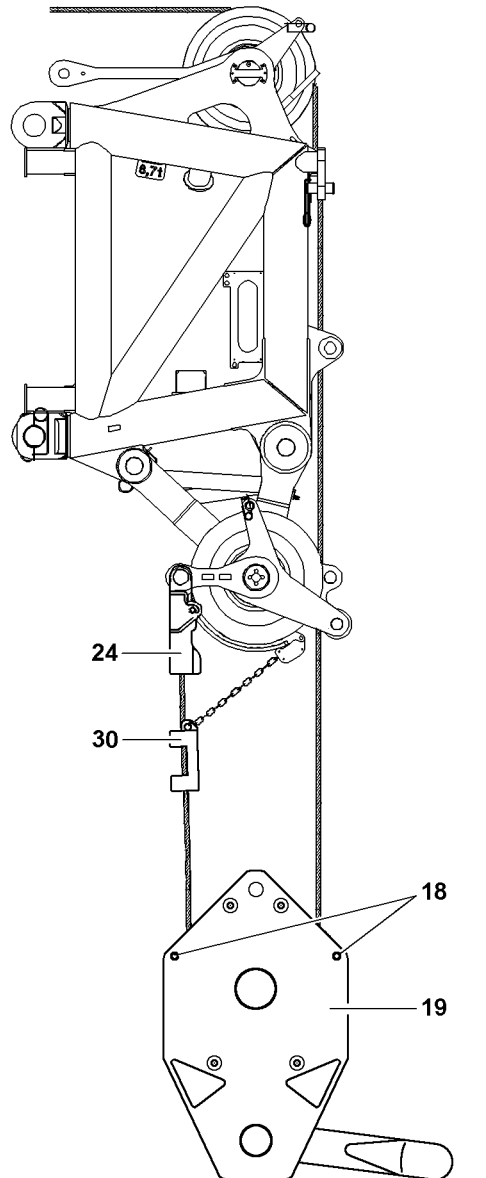
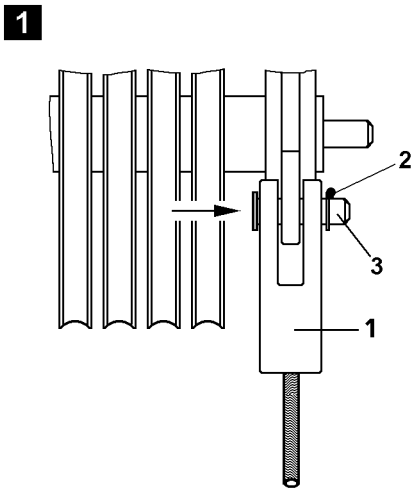
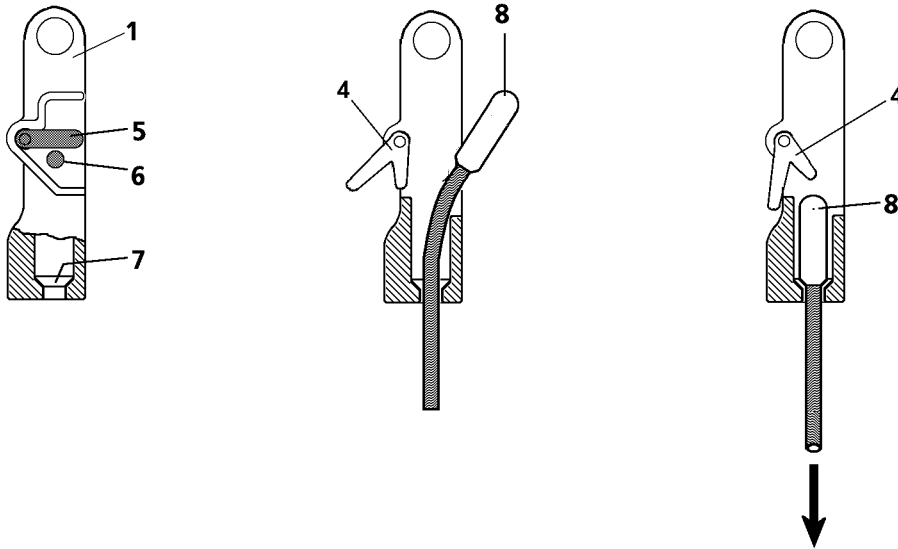
- ▶ Always carry out the reeving of the hoist rope according to the reeving plan!
- ▶ The rope fixed point on the hook block is to be selected in such a way that the last strand runs parallel to the remaining rope strands, as much as possible!

Make sure that the following prerequisites are met:

- the crane is aligned in horizontal direction,
- the hook block is set down on the ground properly,
- the boom is luffed down to the point where the pulley head is above the hook block,
- an assistant is present to guide the hoist rope.

2.1.1 Procedure

- ▶ Release and unpin the rope retaining pipe on the hook block.
- ▶ Release and unpin the rope retaining pipes on the back pulley and on the pulley head.



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2.1.2 Manual reeving

- ▶ An assistant guides the hoist rope over the boom to the pulley head and at the same time, the crane operator spools the hoist winch out.
- ▶ Place the hoist rope of the back pulley and reeve in according to the reeving plan between the pulley head and the hook block.
- ▶ When the hook block is completely reeved in:
Insert the rope retaining pipes again and secure with spring retainers.

2.1.3 Reeving with assembly winch

- ▶ Reeve in the auxiliary rope in the reverse direction between the hook block and the pulley head.
- ▶ Connect the auxiliary rope with the hoist rope.
- ▶ Unwind the hoist rope from the hoisting winch and simultaneously wind up the auxiliary rope of the assembly winch.
- ▶ When the hook block is completely reeved in:
Insert the rope retaining pipes again and secure with spring retainers.

2.1.4 Hook the hoist rope on the rope lock

NOTICE

Scraping of 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**!

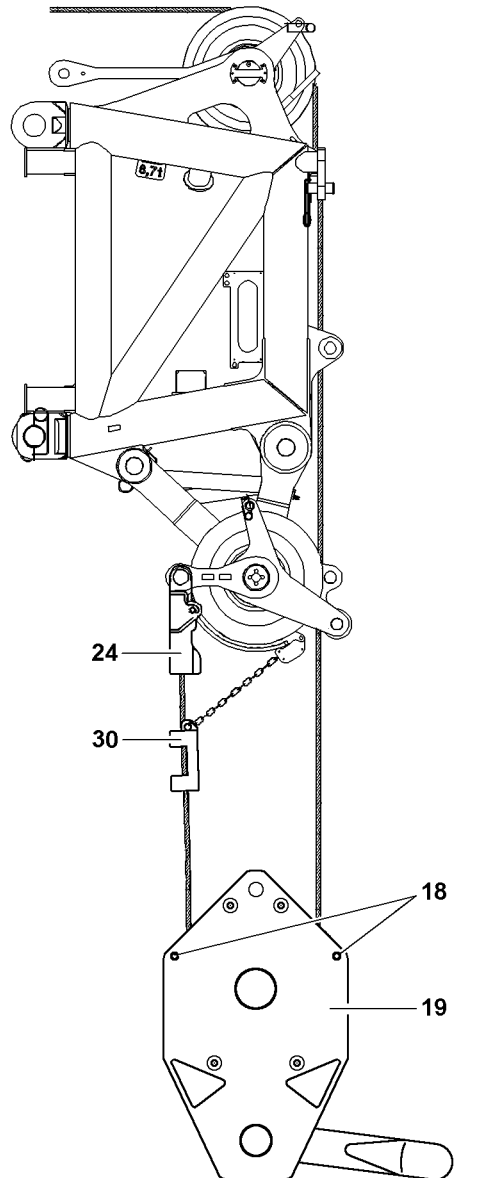
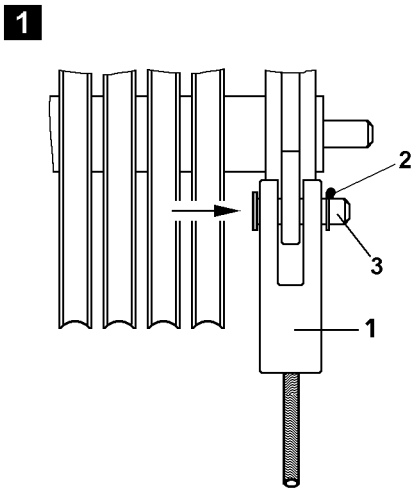
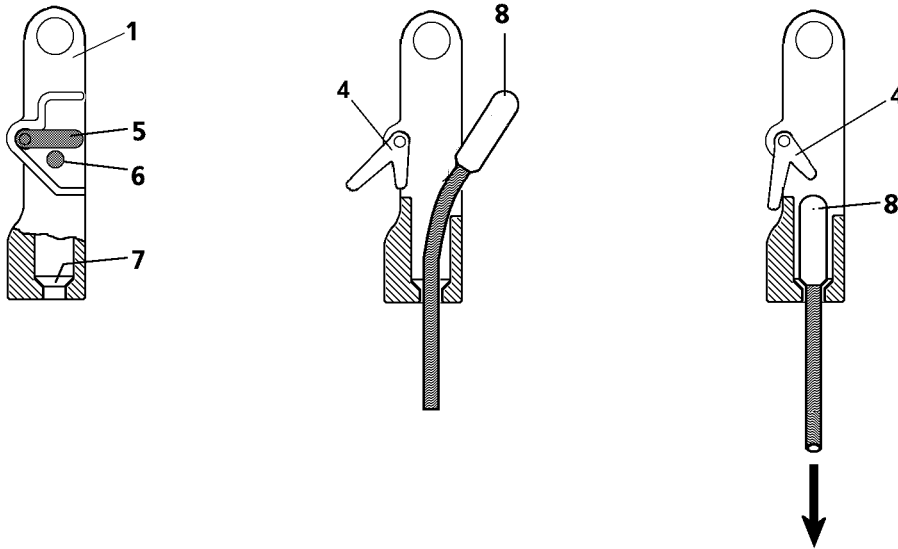
Hoist rope, pin **3** and linch pin **2** are damaged!

- ▶ Always insert pins **3** from "inside to outside" and secure them from the outside, see illustration **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.
- ▶ On the rope lock **1**, push the retaining pin **6** in.
- ▶ Swing the lever **5** "down" 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 **1** and pull "down" firmly (in direction of arrow), until the locking clamp **8** is touching in the cone **7**.



B108211

**WARNING**

Incorrectly secured locking clamp!

If the locking clamp **8** is hooked and secured incorrectly or insufficiently in the rope lock **1**, then the load and the hook block can fall down!

Personnel can be severely injured or killed!

- ▶ 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**.

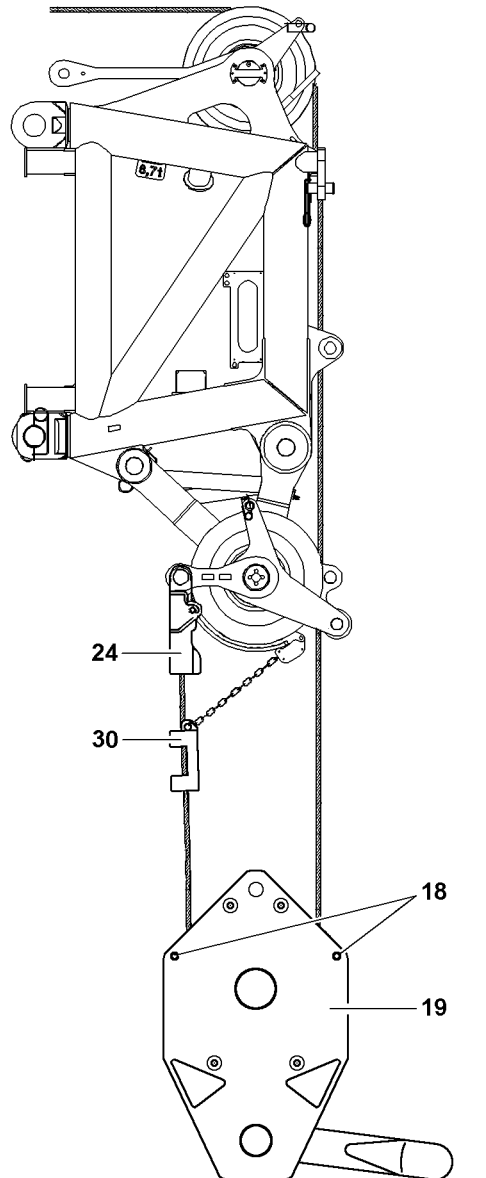
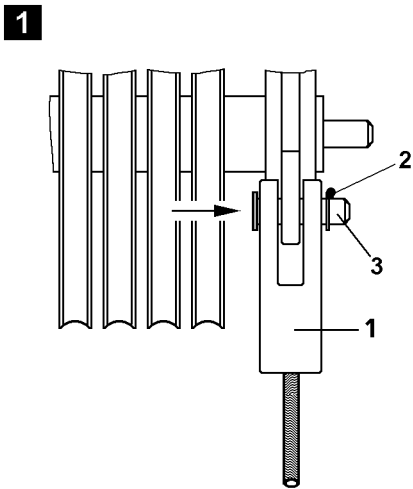
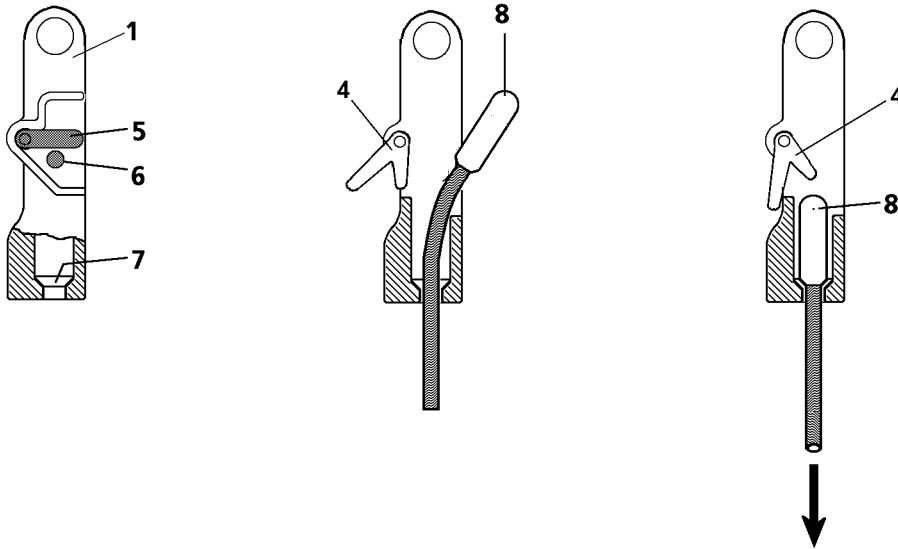
- ▶ Check the rope retainer. Check visually!

2.1.5 Preparing the hook block for crane operation

- ▶ Raise the boom or spool the hoist rope up until the hook block is completely lifted off the ground.

**Note**

- ▶ See chapter 5.19 of the crane operating instructions!



2.2 Unreeving the hook block

Make sure that the following prerequisites are met:

- the crane is aligned in horizontal direction,
- the ground is level and of sufficient load carrying capacity,
- the hook block is prepared for removal, see chapter 5.19 of the crane operating instructions,
- an assistant is present to guide the hoist rope.

2.2.1 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!

Personnel can be severely injured or killed!

- ▶ Use the handles in the safe area of the hook block!
- ▶ Make sure the hook block is safely positioned!

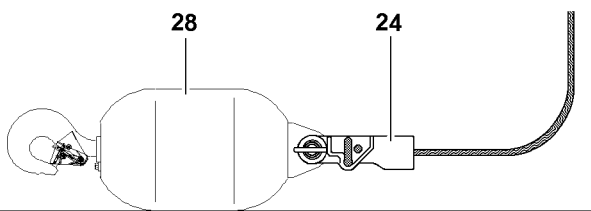
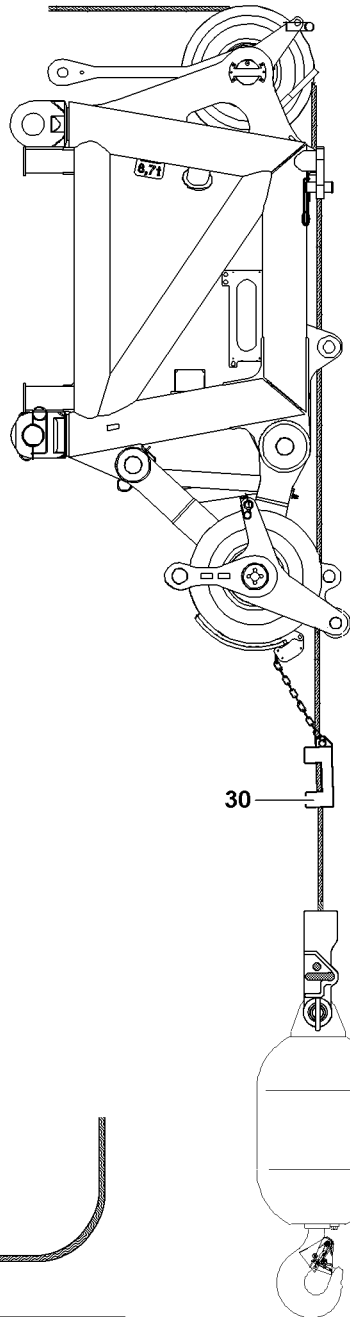
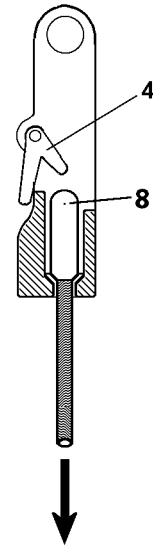
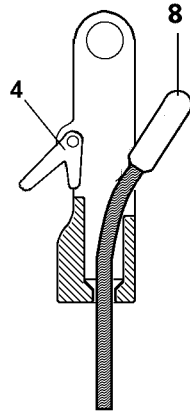
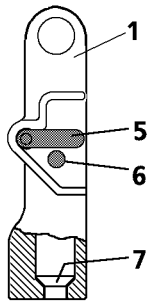
-
- ▶ Lower the hook block and set it on the ground.
 - ▶ Remove the hoist limit switch weight, see section "Removing the hoist limit switch weight".

2.2.2 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**.
- ▶ Release and unpin the rope retaining pipe on the hook block.
- ▶ Unreeve the hoist rope from the hook block and the pulley head.
- ▶ Insert the rope retaining pipes again and secure with spring retainers.



B108212

3 Securing and removing the load hook*

3.1 Securing the load hook*

3.1.1 Assembling the load hook*

- ▶ Place the load hook under the pulley head of the boom.
- ▶ Release and unpin the rope retaining pipes on the back pulley and on the pulley head.



WARNING

Erroneous operation of crane function and danger of slipping on the boom!

If the following notes are not observed and adhered to, personnel can be severely injured or killed!

- ▶ Step on the boom only via the catwalks!
 - ▶ The assembly personnel must secure themselves for all work on the lattice mast boom with approved antifall systems, on the safety ropes or on the lattice sections, with snap hook on both sides to prevent them from falling!
 - ▶ Complete the assembly work from a stable location!
 - ▶ Observe and adhere to the assembly guidelines in chapter 5.01 of the crane operating instructions!
-
- ▶ An assistant guides the hoist rope over the boom to the pulley head and at the same time, the crane operator spools the hoist winch out.
 - ▶ Place the hoist rope over the back pulley.
 - ▶ Insert the rope retaining pipes again and secure with spring retainers.
 - ▶ Pin the rope lock **1** in the load hook **26** and secure with spring retainers.

3.1.2 Fastening the hoist rope

- ▶ Push the retaining pin **6** in on the rope lock **1**, move the lever **5** to the side and hold it in this position.

Result:

- The latch **4** is moved to the side.

- ▶ Fasten 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

Incorrectly secured locking clamp!

If the locking clamp **8** is hooked and secured incorrectly or insufficiently in the rope lock **1**, then the load and the hook block can fall down!

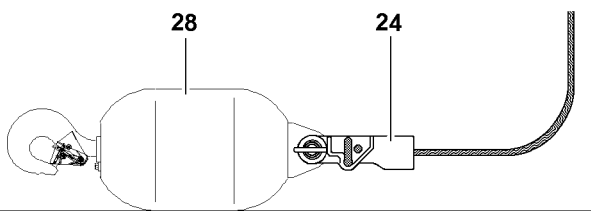
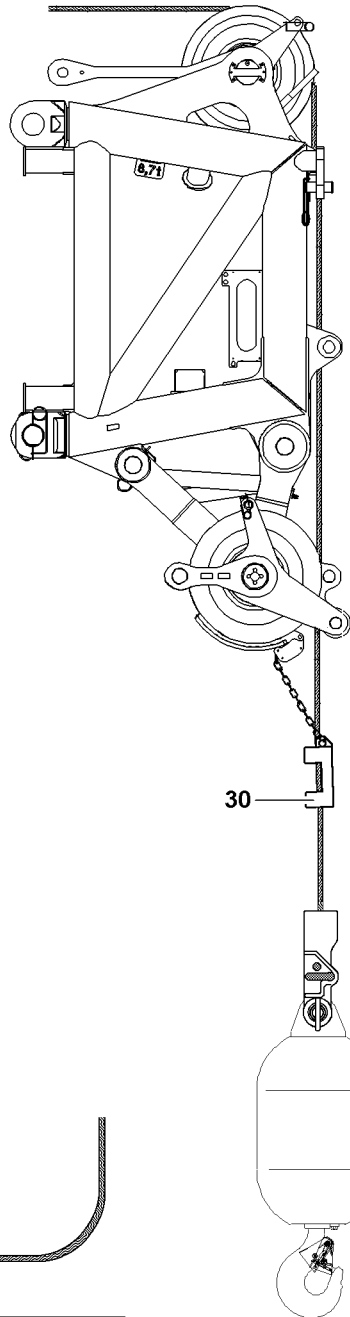
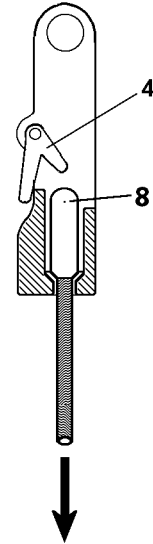
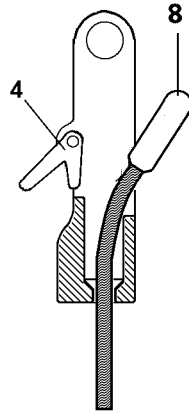
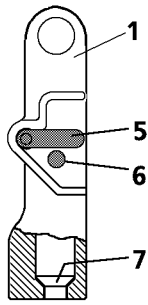
Personnel can be severely injured or killed!

- ▶ 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**.



B108212

3.2 Removing the load hook*

Make sure that the following prerequisites are met:

- the crane is aligned in horizontal direction,
- an assistant is present to guide the hoist rope,
- the ground is level and of sufficient load carrying capacity.

3.2.1 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 **28** 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 the retaining pin **6** in on the rope lock **1**, move the lever **5** to the side and hold it in this position.

Result:

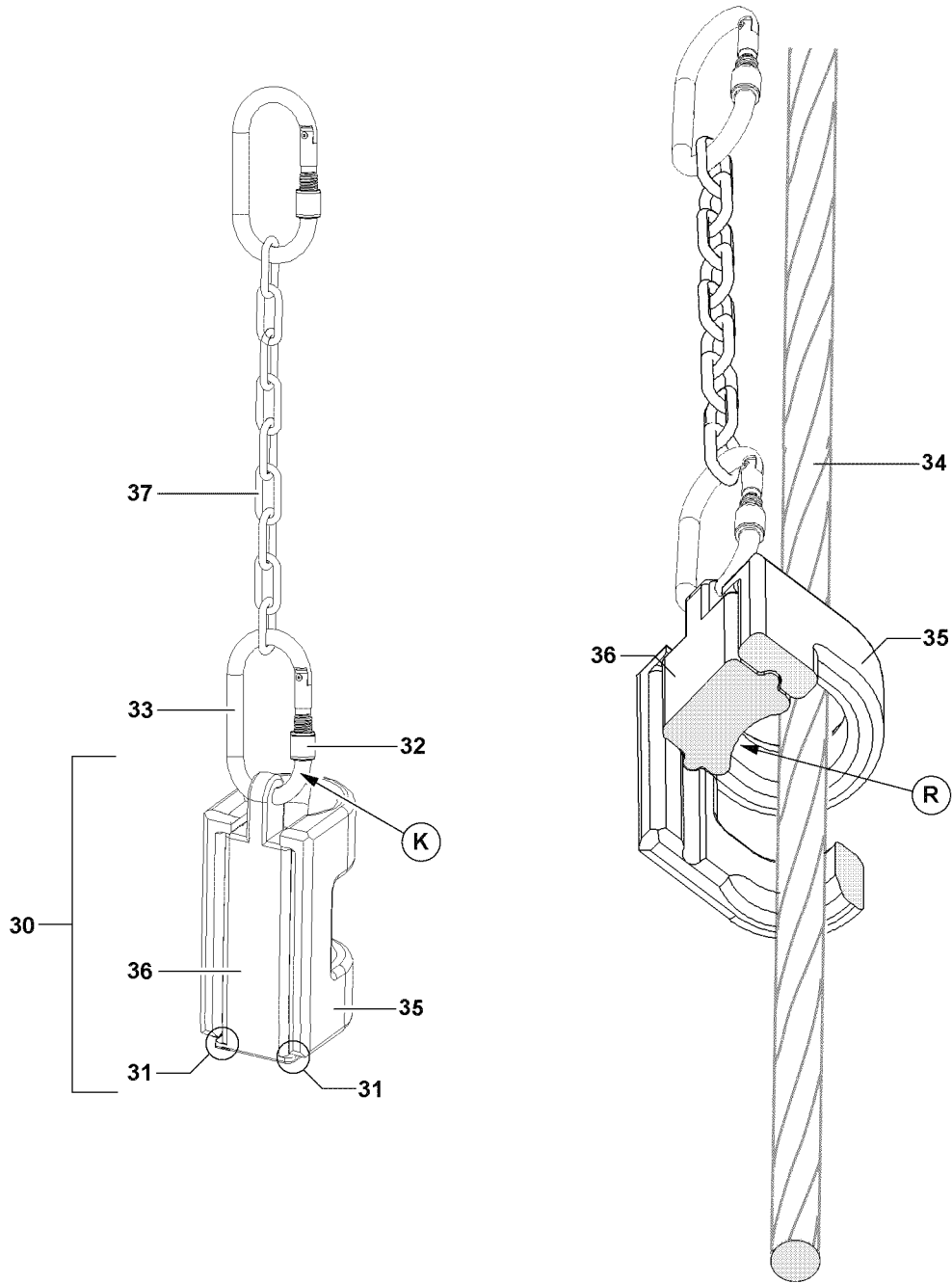
– The latch **4** is moved to the side and the locking clamp **8** is released.

▶ Push the hoist rope in the direction of the load hook and detach the locking clamp **8**.

▶ Remove the rope retaining pipes on the pulley head and on the back pulley.

▶ Lift the hoist rope from the rope pulleys.

▶ Insert the rope retaining pipes again and secure with spring retainers.



B106127

4 Attaching / removing the hoist limit switch weight

4.1 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 fastening 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.



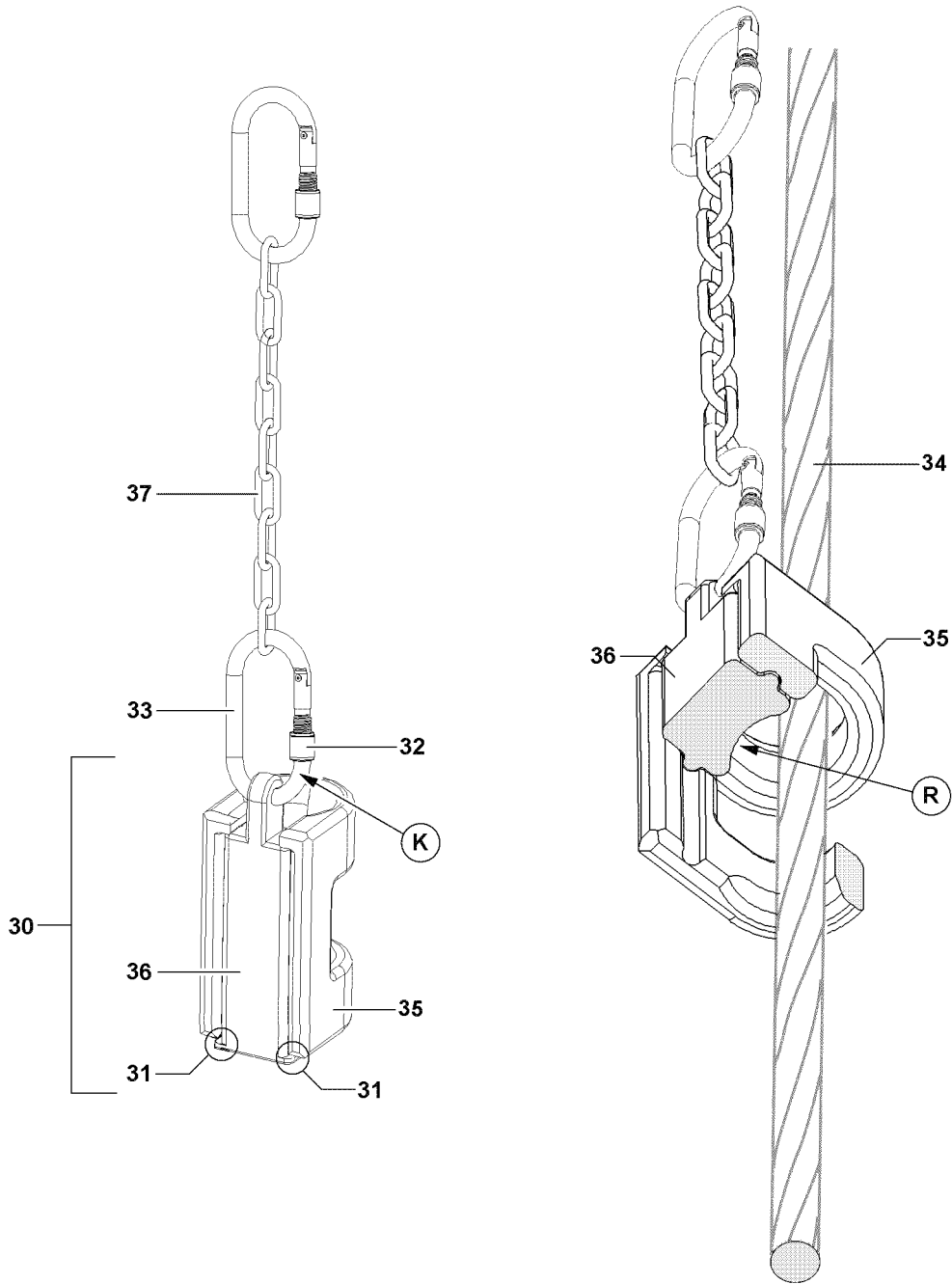
Note

- ▶ 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**.



B106127

4.2 Removing the hoist limit switch weight



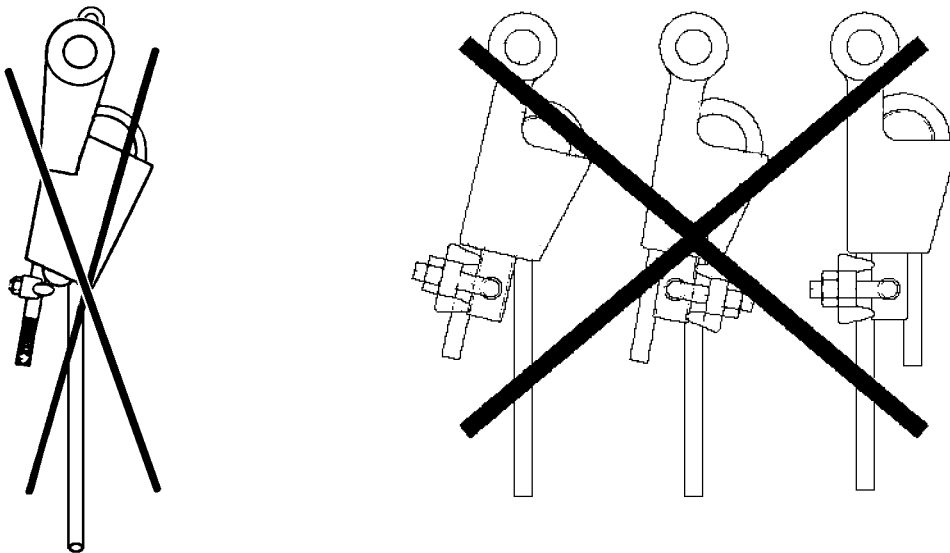
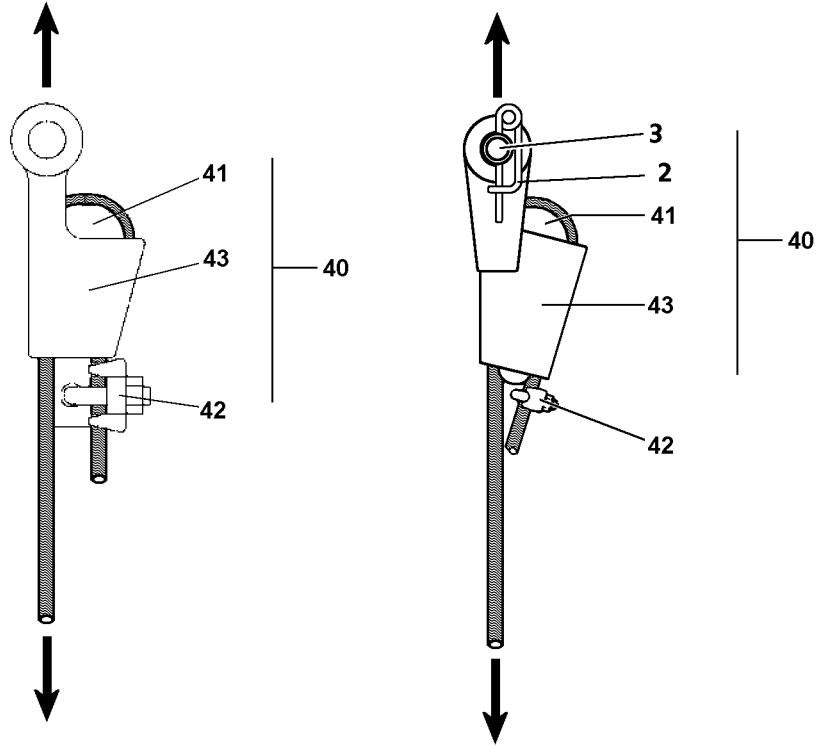
WARNING

The hoist limit switch can fall down!

If the hoist limit switch weight is incorrectly disassembled, components can fall down!

Personnel can be severely injured!

- ▶ When detaching or fastening 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.



5 Assembling / disassembling the wedge lock

Make sure that the following prerequisites are met:

- the locking clamp is cut off on the hoist rope,
- the hook block or the load hook are ready for assembly.

5.1 Assembling the wedge lock



WARNING

Danger of fatal accidents due 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 **LIEBHERR-Werk Ehingen GmbH**!
 - ▶ 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.

5.2 Disassembling the wedge lock

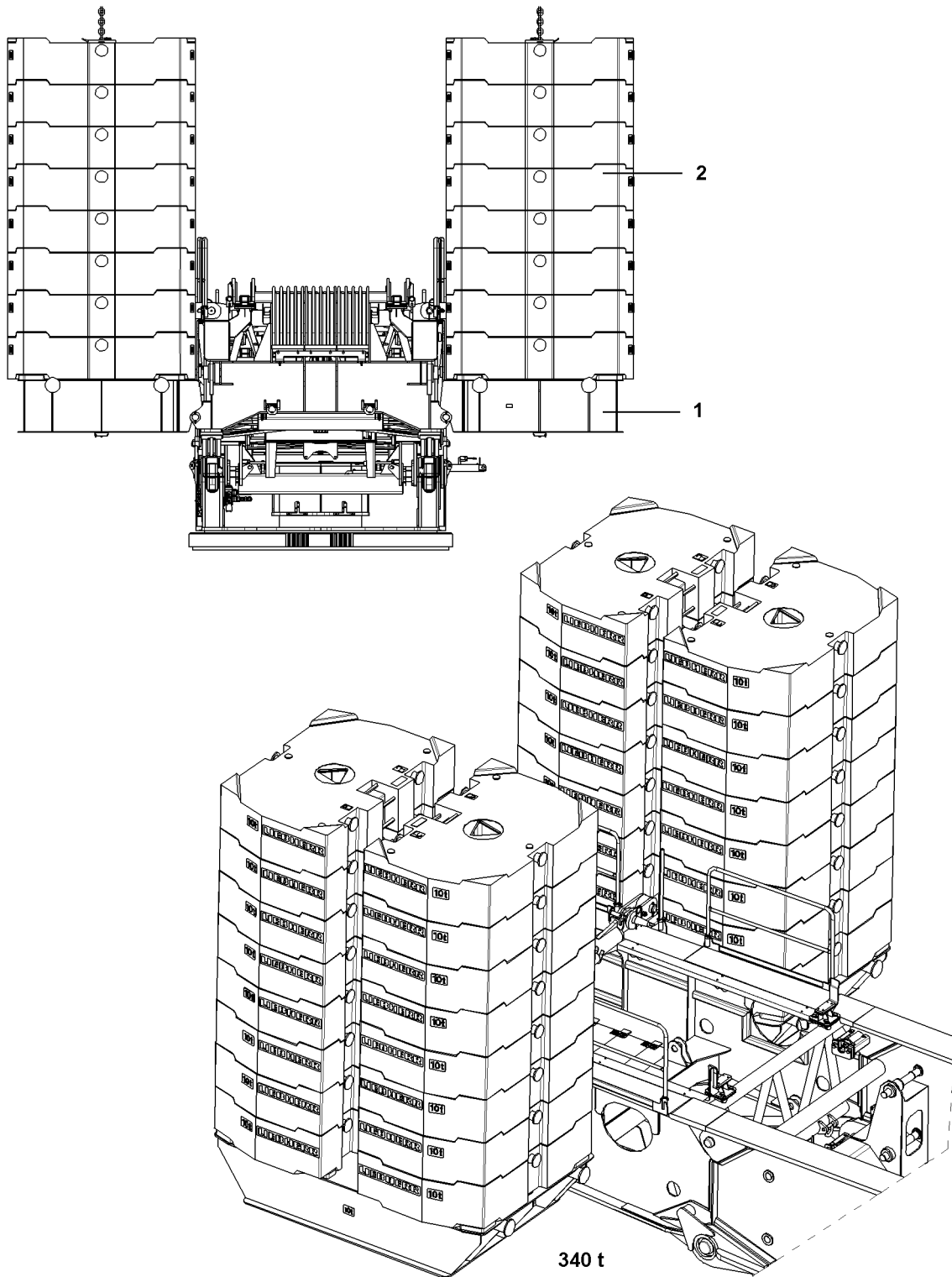
- ▶ Unpin the wedge lock **40** on the fixed point.
- ▶ Remove the clamp **42** and pull the hoist rope with the wedge from the housing.
- ▶ Store the wedge lock **40**.

6 Rope reeving



Note

- ▶ For reeving plans, see crane operating instructions, chapter 4.15!



B103023

1 General

The base plates and the counterweight plates are marked with their own weight.

Weights

- Base plate **1** 10 t
- Counterweight plate **2** 10 t



DANGER

Danger of tipping the crane over during rotation!

If more than 200 t counterweight are installed on the turntable, then the crane can tip over when turning, without installed S-boom or SL-boom!

- ▶ The maximum permissible counterweight, without installed S-boom or SL-boom on the turntable is 200 t!
 - ▶ It is prohibited, without installed S-boom or SL-boom, to place more than 200 t of counterweight on the turntable!
-



Note

- ▶ For the stabilization of the crane it is sufficient if the shortest S-boom or the SL-boom is installed on the turntable and if it is laying on the ground with its head piece. The S-guy rods do not have to be tensioned and can be slack, laying on the boom.
-

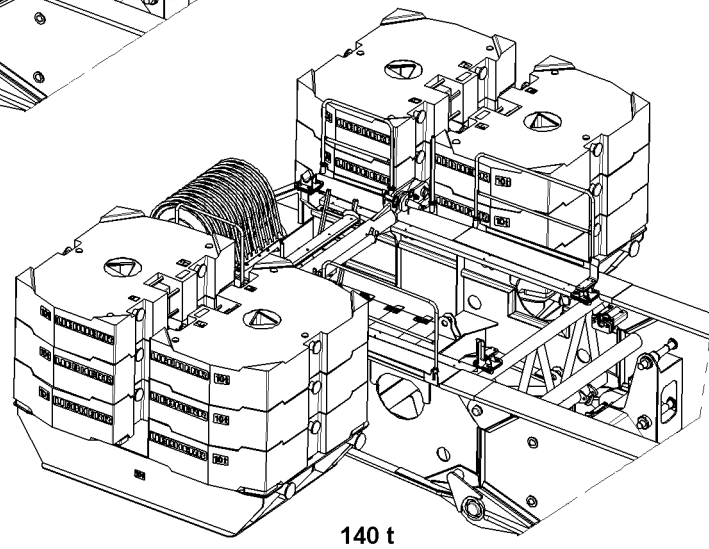
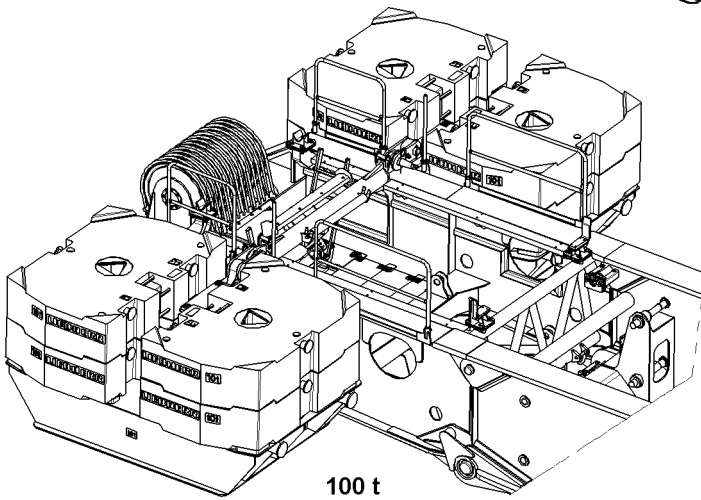
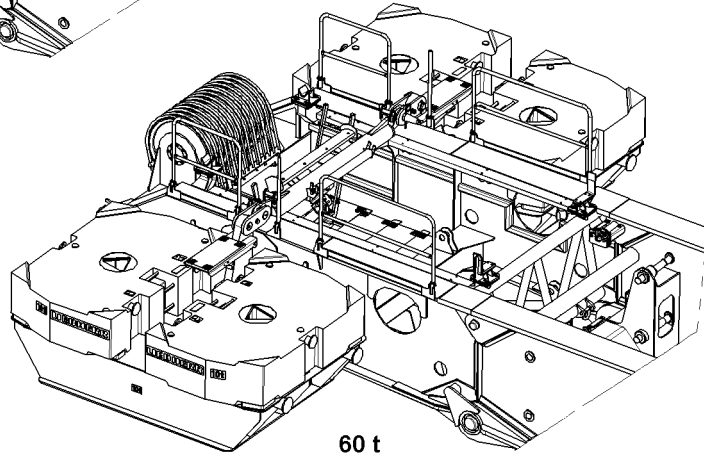
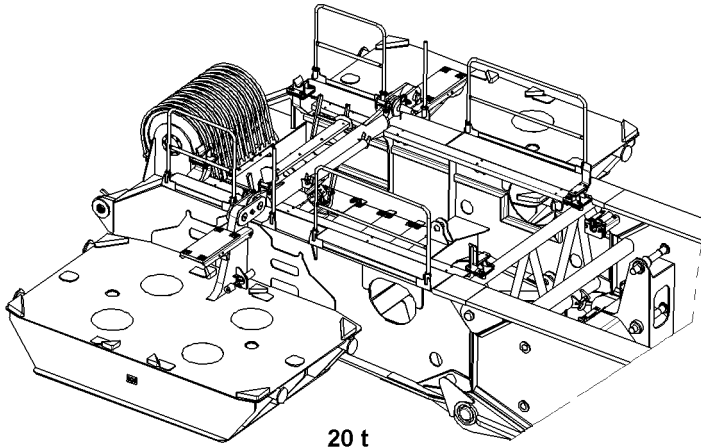


DANGER

Risk of accident if crane topples over!

The crane may be damaged or topple over if using a different counterweight than the one listed in the load chart.

- ▶ Attach counterweight in accordance with the information in the load chart!
 - ▶ Replace damaged counterweight plates!
-



B103024

1.1 Counterweight combinations



CAUTION

Danger of damage to the crane when ballasting on the turntable!

- ▶ When reballasting, an unbalanced ballast condition of more than 50 t is not permissible!
- ▶ The weight difference between the right and the left counterweight stack may not exceed 50 t!

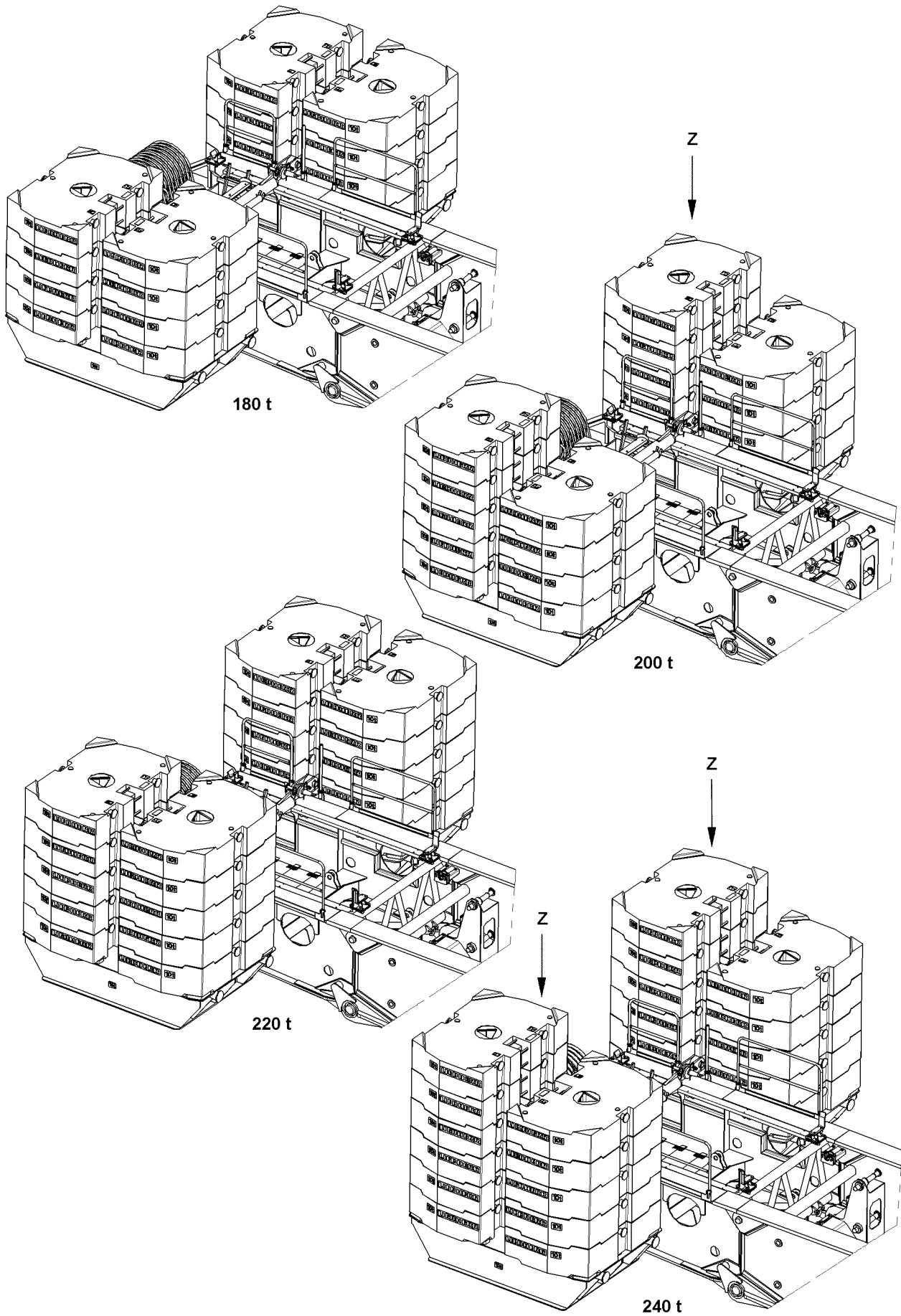
Counterweight [t]	Combination	Individual weight [t]
0	-	0

Counterweight [t]	Combination	Individual weight [t]
20	2 x base plate 1	10

Counterweight [t]	Combination	Individual weight [t]
60	2 x base plate 1	10
	4 x counterweight plate 2	10

Counterweight [t]	Combination	Individual weight [t]
100	2 x base plate 1	10
	8 x counterweight plate 2	10

Counterweight [t]	Combination	Individual weight [t]
140	2 x base plate 1	10
	12 x counterweight plate 2	10



B103025

Counterweight [t]	Combination	Individual weight [t]
180	2 x base plate 1	10
	16 x counterweight plate 2	10

Counterweight [t]	Combination	Individual weight [t]
200	2 x base plate 1	10
	18 x counterweight plate 2	10

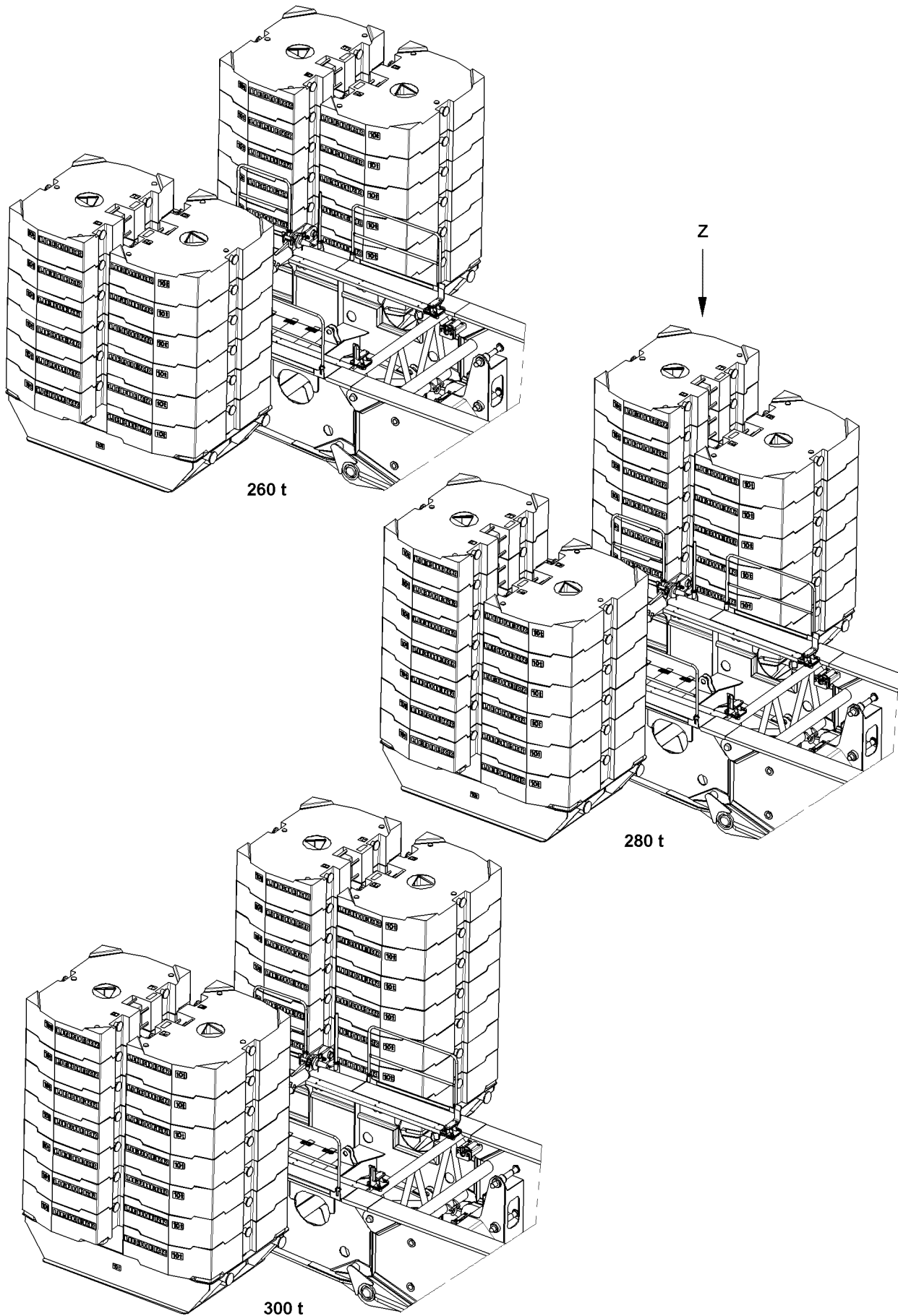
Counterweight [t]	Combination	Individual weight [t]
220	2 x base plate 1	10
	20 x counterweight plate 2	10

Counterweight [t]	Combination	Individual weight [t]
240	2 x base plate 1	10
	22 x counterweight plate 2	10

**DANGER**

Risk of accident

- ▶ In case of differing stack heights on one side, different numbers of counterweights, then the rear stack **Z** must always be the higher one.

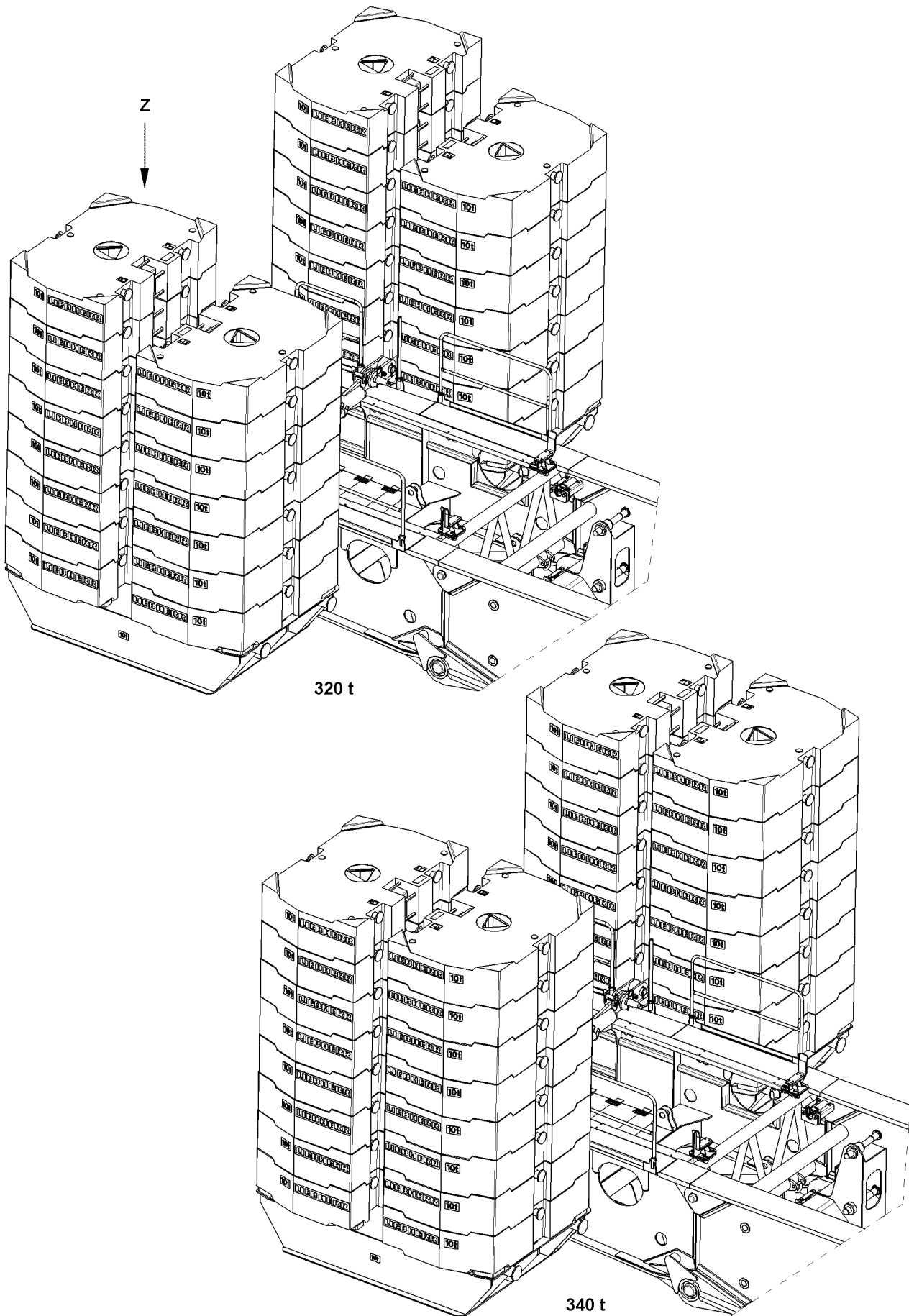


B103026

Counterweight [t]	Combination	Individual weight [t]
260	2 x base plate 1	10
	24 x counterweight plate 2	10

Counterweight [t]	Combination	Individual weight [t]
280	2 x base plate 1	10
	26 x counterweight plate 2	10

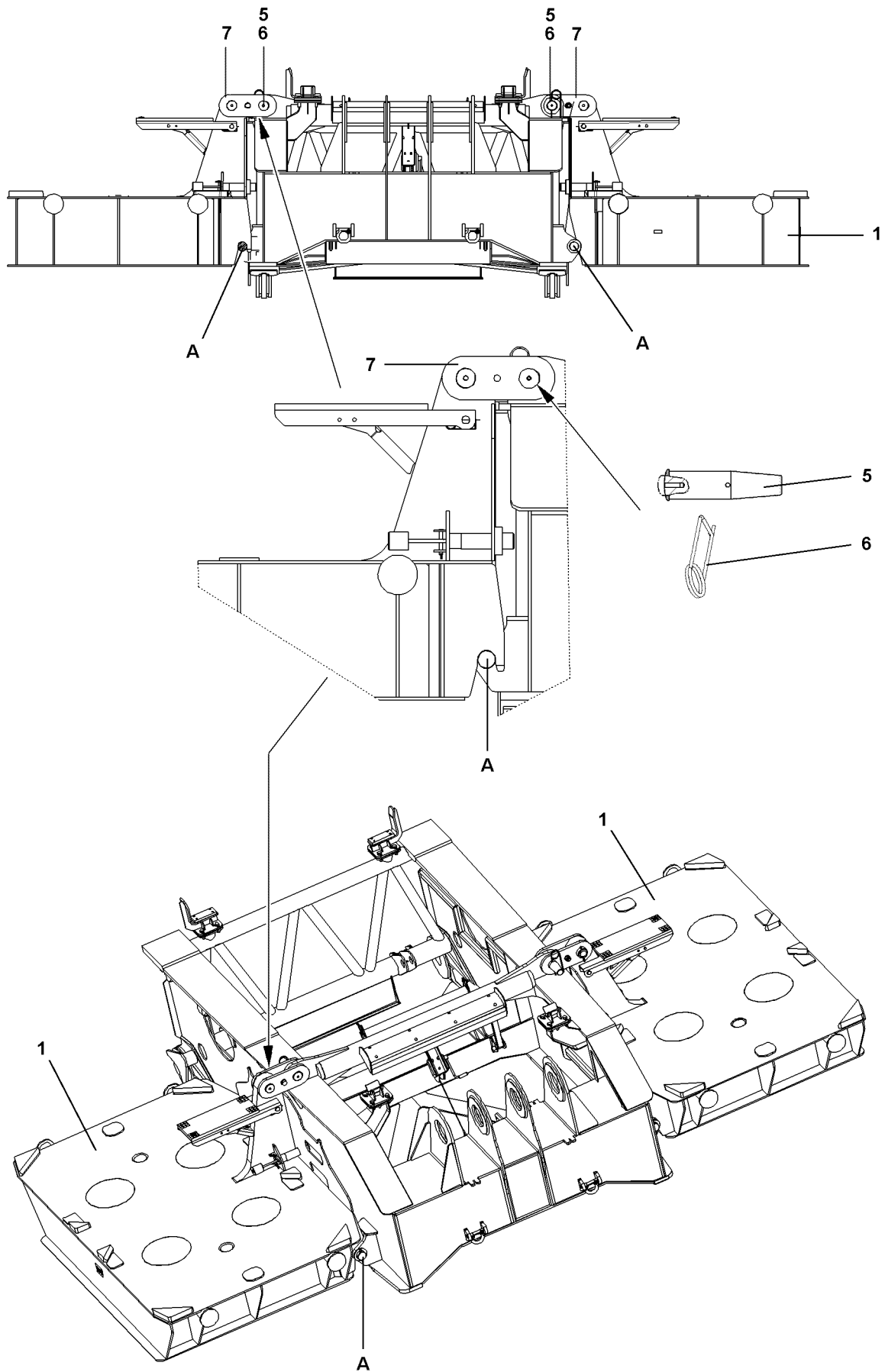
Counterweight [t]	Combination	Individual weight [t]
300	2 x base plate 1	10
	28 x counterweight plate 2	10



B103027

Counterweight [t]	Combination	Individual weight [t]
320	2 x base plate 1	10
	30 x counterweight plate 2	10

Counterweight [t]	Combination	Individual weight [t]
340	2 x base plate 1	10
	32 x counterweight plate 2	10



B103028

2 Assembly

Make sure that the following prerequisites are met:

- The crane is horizontally aligned.



DANGER

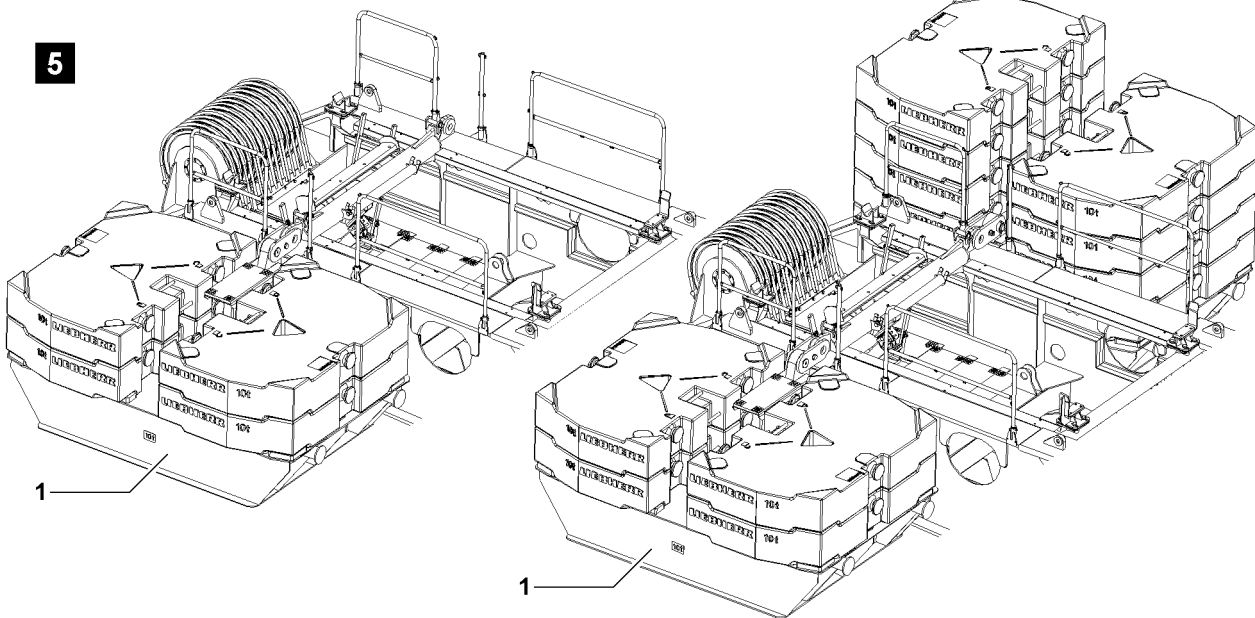
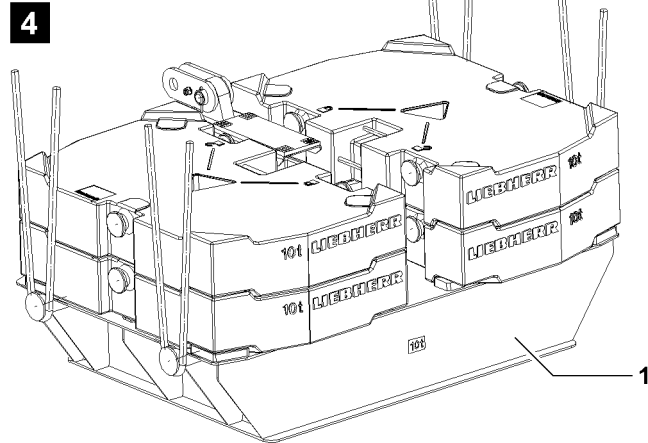
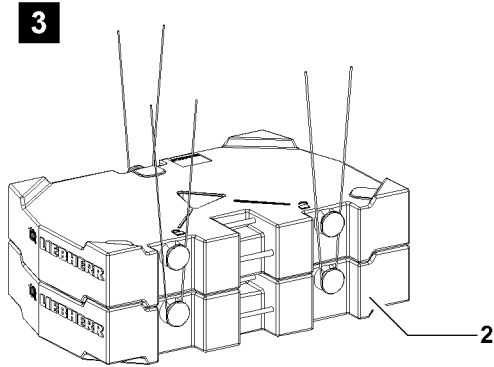
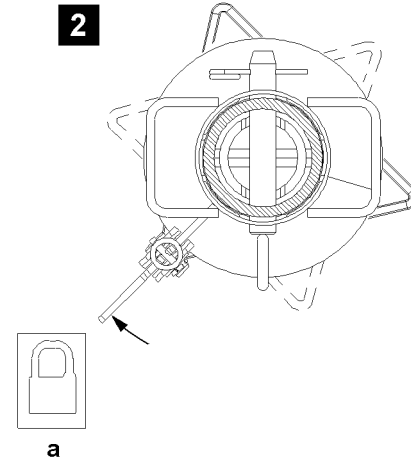
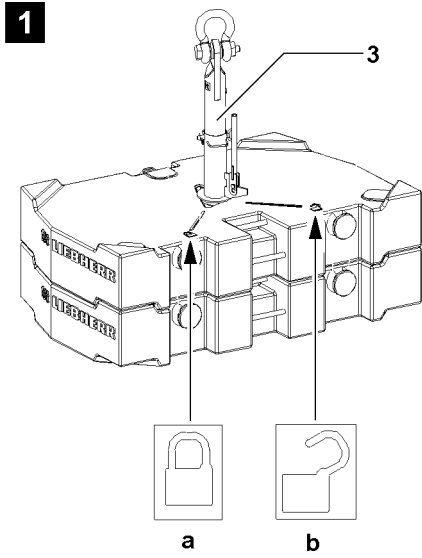
Risk of accident

- ▶ Ensure there are no personnel or objects within the danger zone when assembling and disassembling the counterweight!

2.1 Installing the base plate

	Component	Weight
1	Base plate	10 t
5	Pin	—
6	Cotter pin	—
7	Connector bracket	—

- ▶ Hang the base plate **1** onto the auxiliary crane.
- ▶ Hang the base plate **1** onto the turntable **A on the bottom**.
- ▶ Pin and secure the base plate **1** on the turntable **on top**.
- ▶ Insert the pin **5** and secure with spring retainer **6**.



B109394

2.2 Ballasting

Make sure that the following prerequisites are met:

- The base plates **1** are pinned and secured on the turntable.



DANGER

The crane can topple over!

If more than 50 t are placed in one hoist onto the base plate **1** or on the ballast plates **2** or if the counterweight is asymmetrically installed, then the crane can topple over and kill personnel!

- ▶ Place no more than maximum 50 t ballast plates alternately on the left and right on the counterweight stack.
- ▶ Attach counterweight symmetrically.
- ▶ A weight difference between the right and left counterweight stack of more than 50 t is prohibited!

Hang the counterweight plate **2** or ballast stack on the auxiliary crane and place on both sides on the base plates **1** or on an already placed counterweight plate **2**.



Note

- ▶ Place the counterweight plates individually or as a counterweight assembly, maximum 50 t.
- ▶ Weight difference maximum 50 t, see illustration **5**.

2.2.1 Permissible ballast assemblies



DANGER

Risk of accident

If more than the given loads are lifted with the receptacle stud **3** or the ropes, then they will be overloaded and the ballast plates can fall down and fatally injure personnel.

- ▶ Lift no more than maximum 20 t with the receptacle stud **3**.
- ▶ Lift no more than maximum 20 t with the ropes, 3 fastening points.
- ▶ Lift no more than maximum 50 t with the ropes over the base plate **1**, 4 fastening points.

Illustration **1**: 20 t Assembly **without** base plate



Note

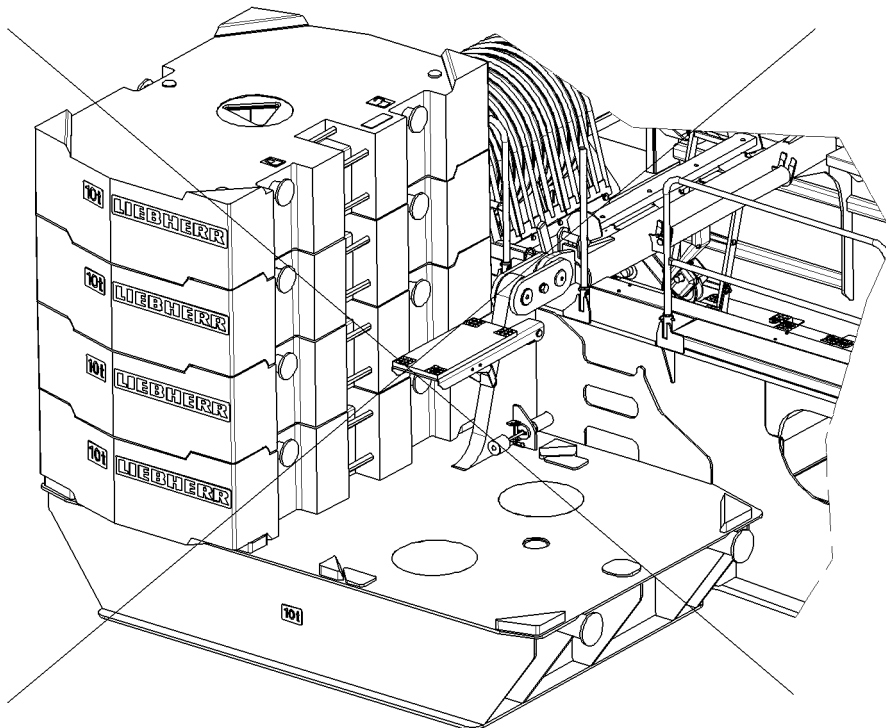
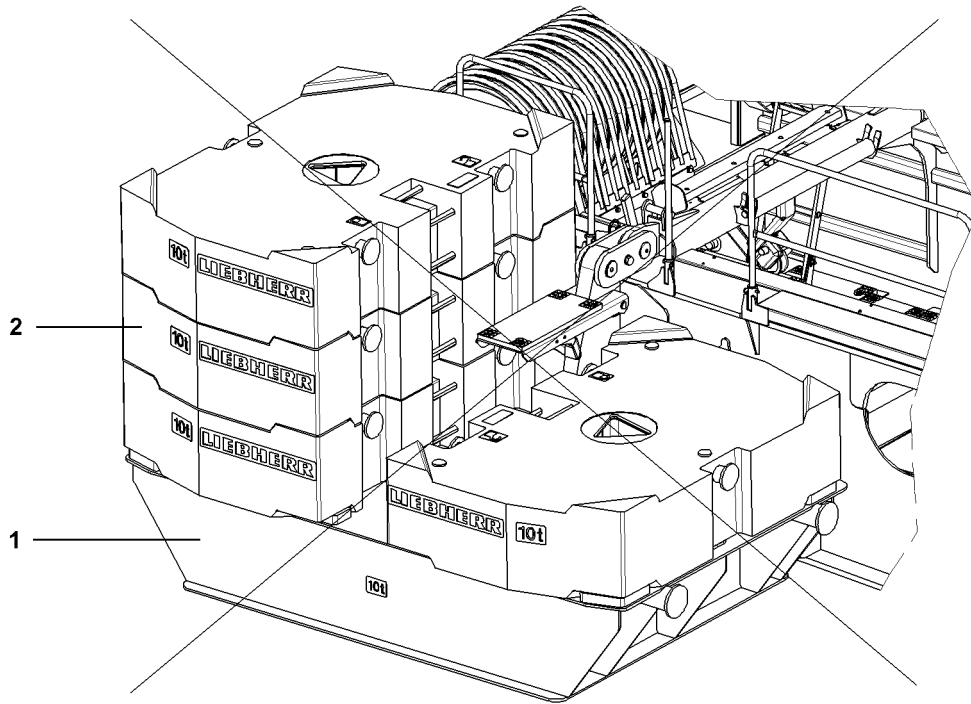
- ▶ Position **a** = receptacle stud **3** closed
- ▶ Position **b** = receptacle stud **3** open for moving in / out

Ensure that the following prerequisite is met for lifting:

- The receptacle stud **3** must be in position **a**: receptacle stud **3** closed, see illustration **2**.

Illustration **2**: 20 t Assembly **without** base plate

Illustration **3**: 50 t Packet **with** base plate



B103030

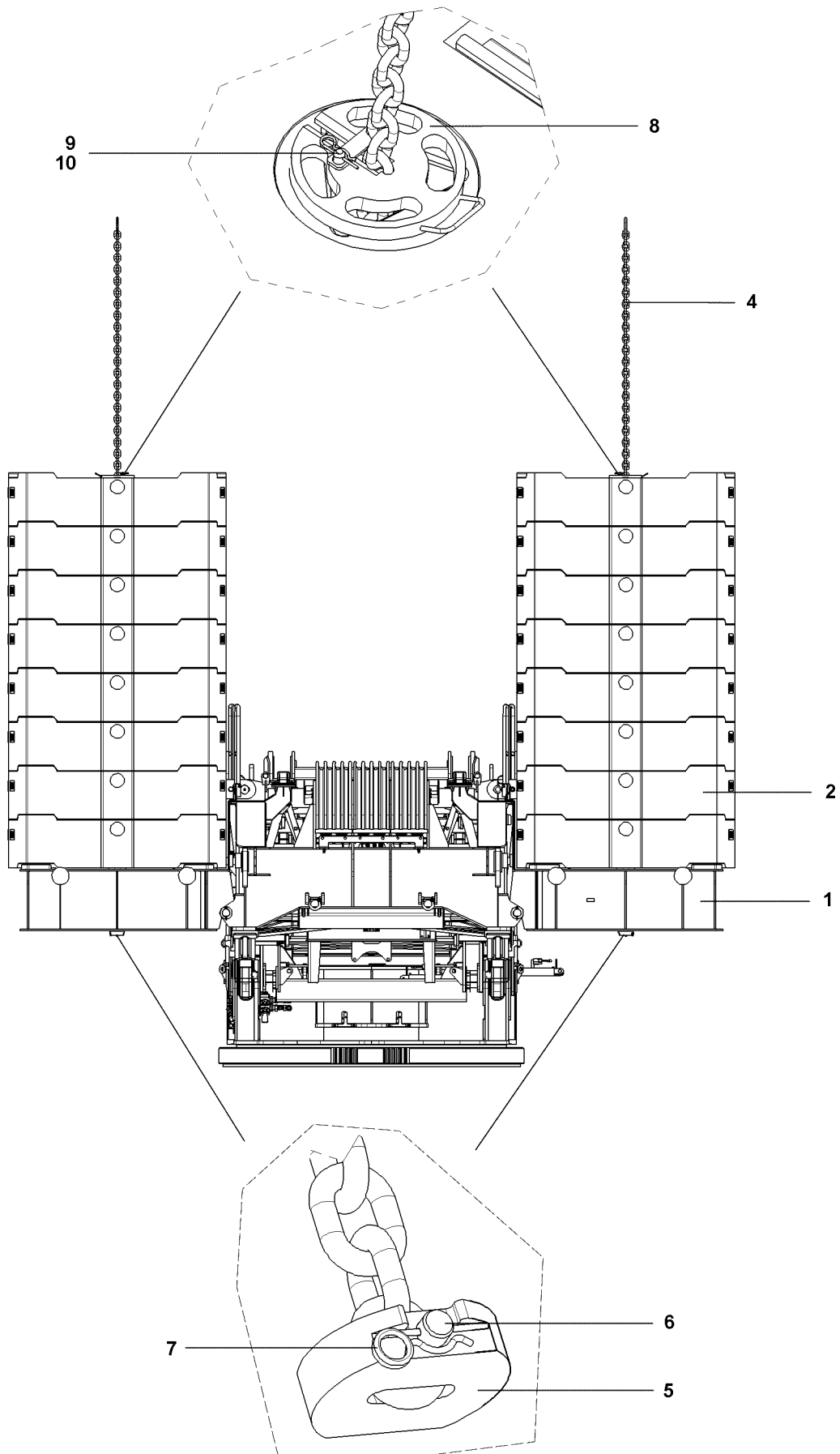
2.2.2 Ballasting on a base plate

**DANGER**

Damage to crane!

- ▶ The stack difference on a base plate **1** may not be more than one 10 t counterweight plate **2**.

Place the counterweight plates **2** alternately.



B103031

2.3 Securing the counterweight



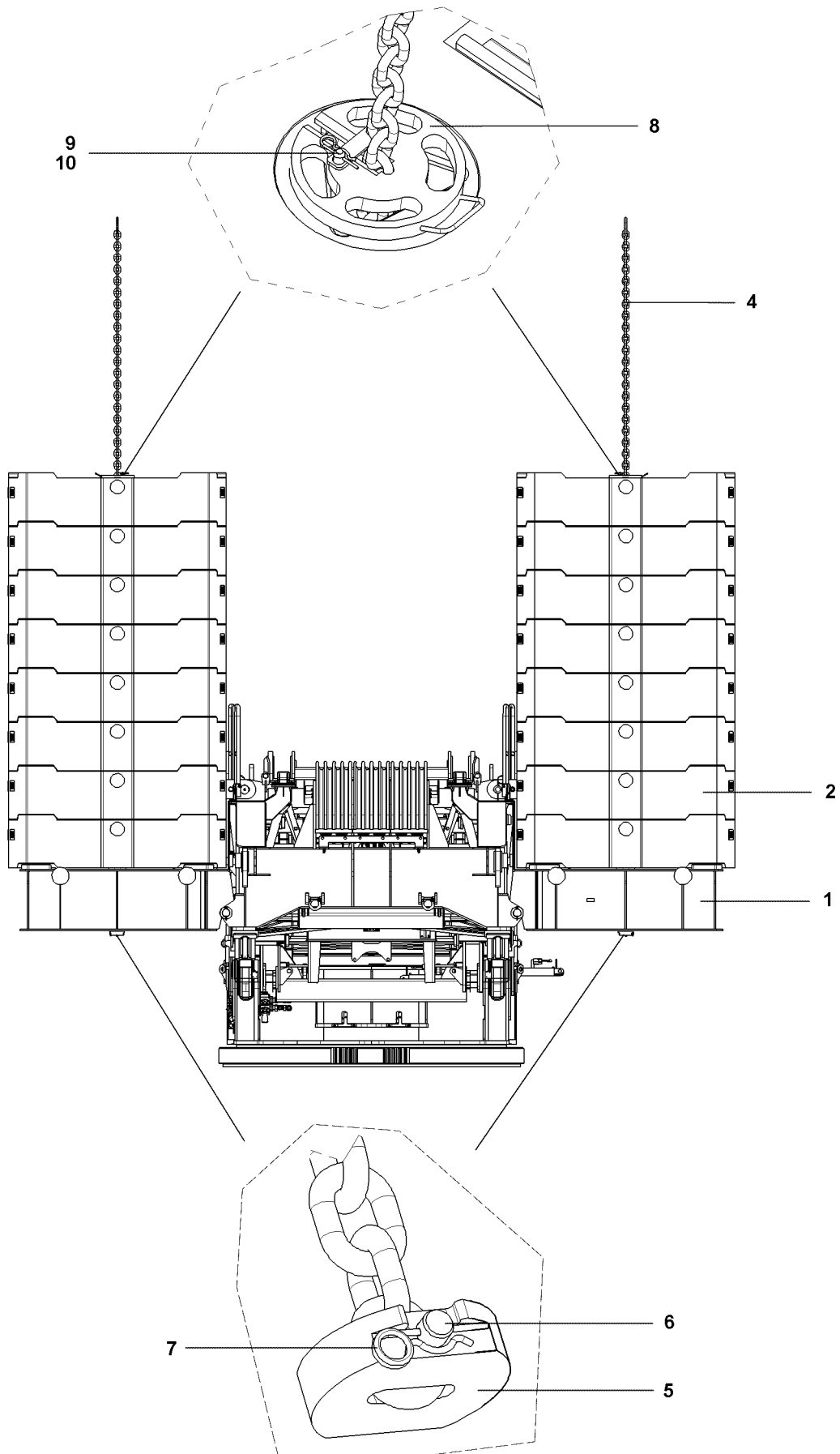
DANGER

Risk of accident due to tipping of counterweight!

- ▶ Secure the counterweights before starting to use the crane.
-

Secure the counterweight stack before crane operation.

- ▶ Attach the auxiliary crane on the retaining chain **4**.
- ▶ Guide the retaining chain **4** on both sides from the top to the bottom through the counterweight assembly.
- ▶ Pin the retaining chain **4** on both sides on the bottom with the retaining plate **5** and secure.
- ▶ Insert the pin **6** and secure it with a cotter pin **7**.
- ▶ Tighten the retaining chain **4**.
- ▶ Pin the retaining chain **4** on both sides on top with retaining plate **8** and secure.
- ▶ Insert the pin **9** and secure it with a cotter pin **10**.



B103031

3 Disassembly

Make sure that the following prerequisites are met:

- The crane is horizontally aligned.



DANGER

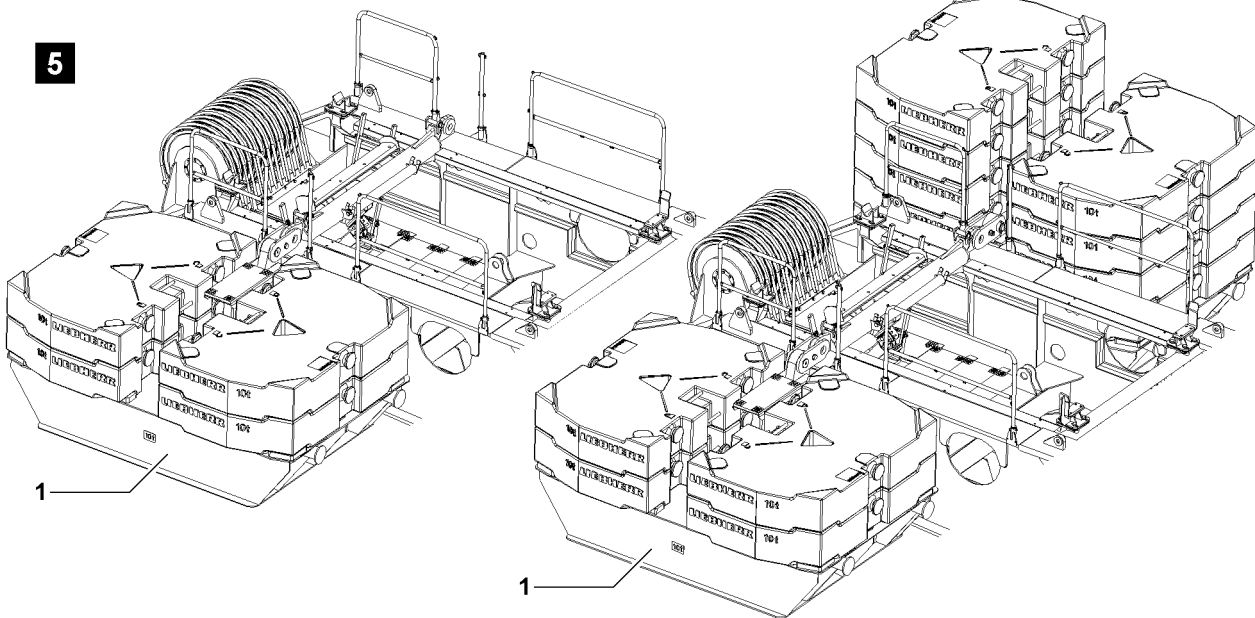
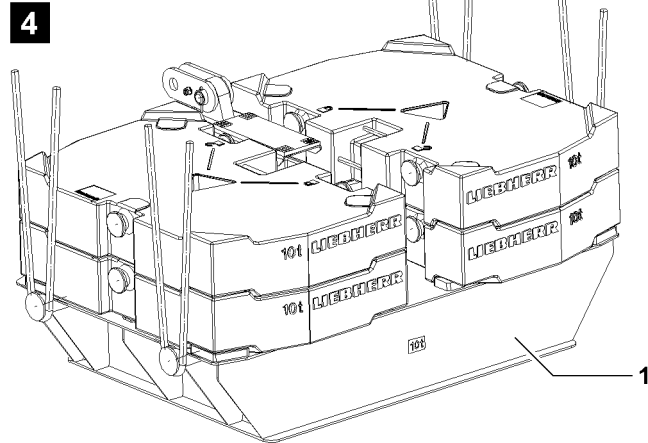
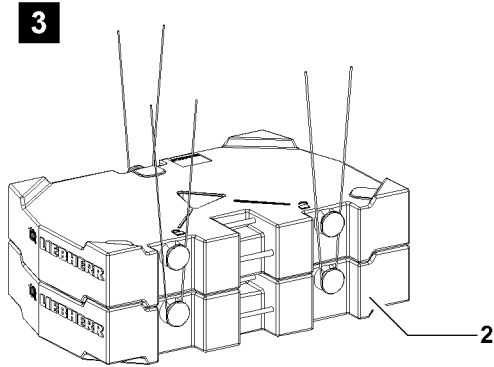
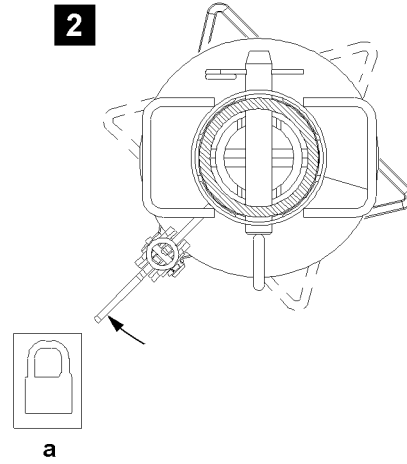
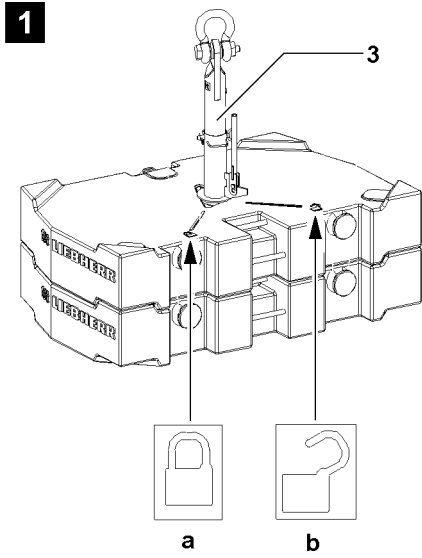
Risk of accident

- ▶ Ensure there are no personnel or objects within the danger zone when assembling and disassembling the counterweight!
-

3.1 Releasing the counterweight

Attach the auxiliary crane on the retaining chain.

- ▶ Unpin the retaining chain **4** on both sides on top.
- ▶ Remove the cotter pin **10** and unpin the pin **9**.
- ▶ Guide the retaining chain **4** on both sides through the counterweight assembly to the bottom.
- ▶ Unpin the retaining plate **5** on the retaining chain **4**.
- ▶ Remove the cotter pin **7** and unpin the pin **6**.
- ▶ Pull out the retaining chain **4** through the top.



B109394

3.2 Removing the counterweight plates

Ensure that the following prerequisite is met:

- The retaining chains are disassembled.



DANGER

The crane can topple over!

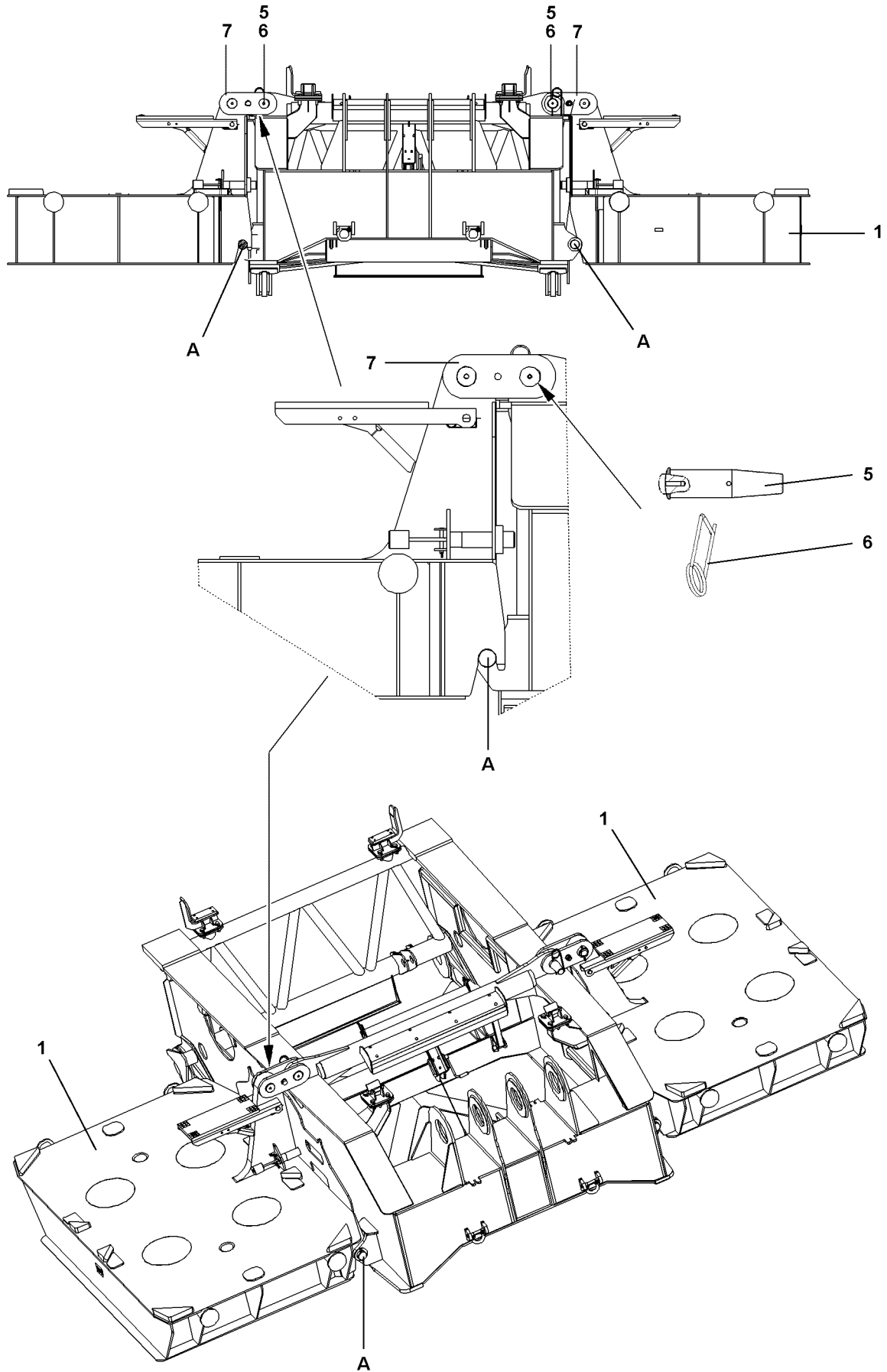
If more than 50 t counterweight plates are removed on sided with one lift, then the counterweight is asymmetrically distributed by more than 50 t. The crane can topple and fatally injure personnel!

- ▶ Take no more than maximum 50 t counterweight plates alternately on the left and right from the counterweight stack, see illustration 5!
 - ▶ A weight difference between the right and left counterweight stack of more than 50 t is prohibited!
-



Note

- ▶ Take the counterweight plates off individually or as an assembly, illustrations 1 to 4!
 - ▶ Observe the permissible ballast assemblies and the danger notes, see section “Ballasting” in this chapter!
-
- ▶ Hang the counterweight plates on the auxiliary crane and take them off alternately on both sides.



B103028

3.3 Removing the base plate

	Component	Weight
1	Base plate	10 t
5	Pin	—
6	Cotter pin	—
7	Connector bracket	—

- ▶ Hang the base plate **1** onto the auxiliary crane.
- ▶ Unpin the base plate **1** on the turntable **on top**.
- ▶ Remove the spring retainer **6** and unpin the pin **5**.
- ▶ Unhook the base plate **1** with the auxiliary crane from the turntable **A on the bottom**.

1 Safety technical instructions for working with a load

For more information, see chapter 2.04.



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 base 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 erroneous 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 windings 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.



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 slewing 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 that threaten operational safety, stop crane operation immediately!

The following deficiencies threaten the crane's operational safety:

- Damage to load-bearing parts of the crane design, such as booms, supports etc.
- Failure of the hoist gear brake and consequent slipping of the load
- Functional failures in the crane control system
- Functional failures in the indicator and warning lights
- Damage to the hoist ropes
- Functional failures 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 boom. 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 it must be ensured through a visual inspection before picking up the load that the boom is not showing signs of side deformation due to one-sided sun exposure.



WARNING

Danger of accident because of component overloading!

If the telescopic boom has become distorted because of one-sided sun exposure 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.
- There is no strong side wind.

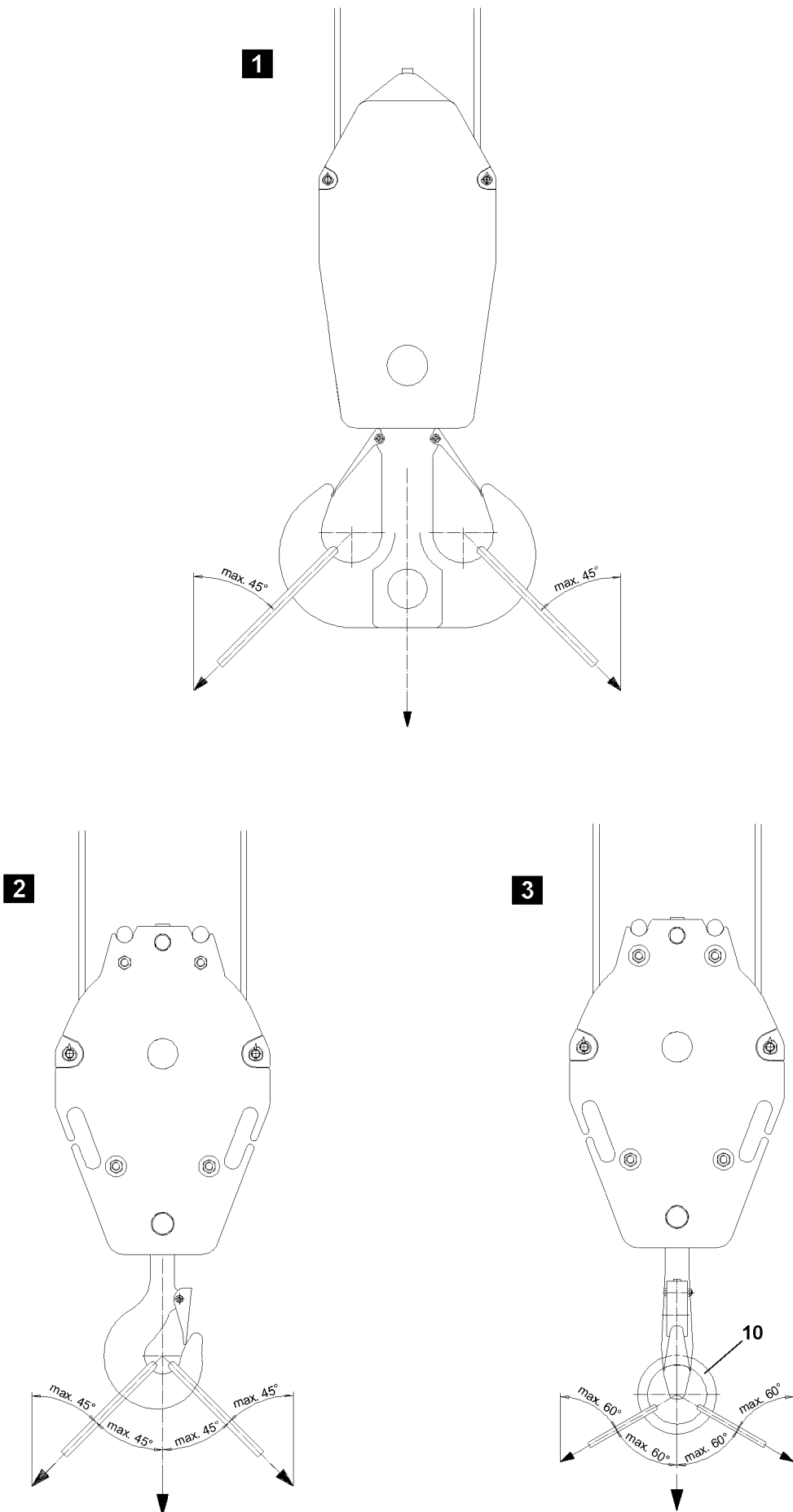


WARNING

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!
-



B112108

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 counterweight is installed according to the load chart.
- The hook block or the load hook is correctly reeved.

4.1 Attaching the load



WARNING

The crane can topple over!

If the following conditions are not met, the crane can topple over and cause fatal injuries!

This could result in high property damage!

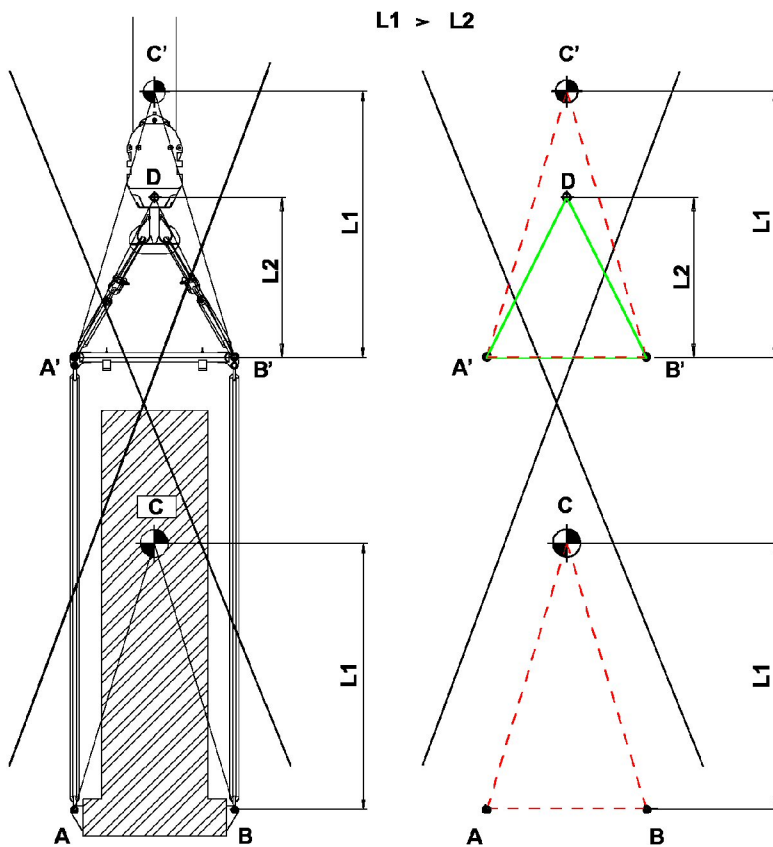
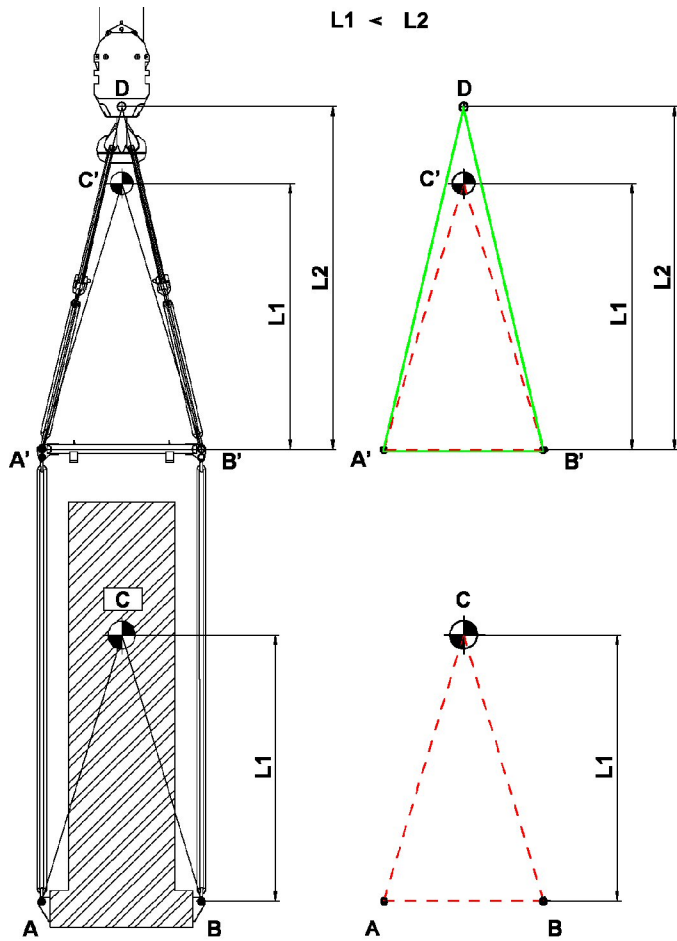
- ▶ Observe own weight of the load tackle!
- ▶ Observe own weight of the load tackle!
- ▶ The maximum permissible incline of the strands fastened on single or double hooks in the hook jaws is 45°! See illustration 1 and illustration 2.

If necessary for the single hook:

- ▶ Use fastening equipment with a suspension link **10**! The maximum permissible incline in this case is 60°! See illustration 3.
- ▶ Load a single and double hook symmetrically! A maximum deviation of $\pm 3^\circ$ from the direction of the center of gravity is permissible!

If necessary:

- ▶ Use crossbars or two cranes for taking up the load!
-



B116274

4.2 Load take up with cross bar

Cross bars are load lifting 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

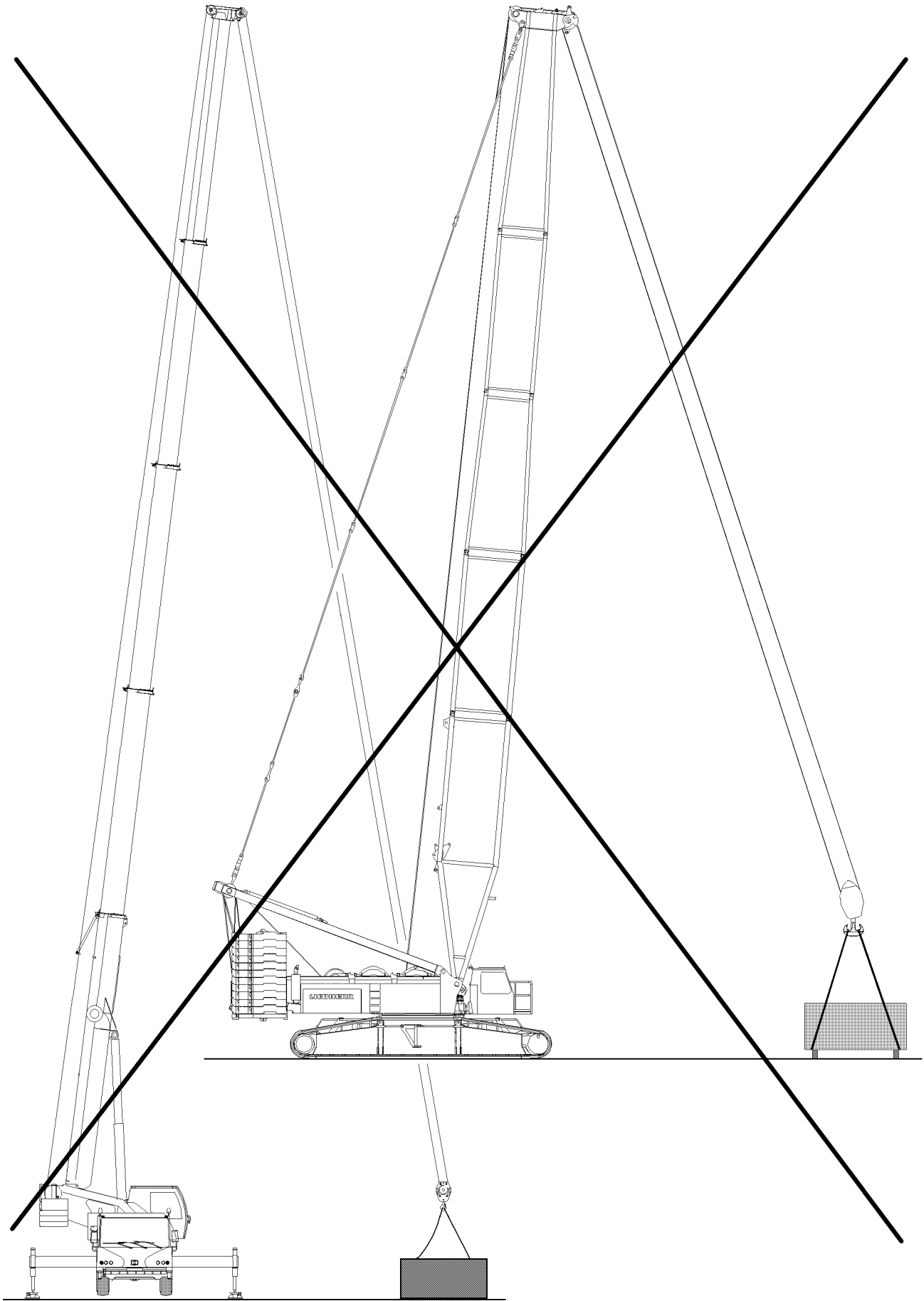


WARNING

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!



B102716

4.4 Lifting the load



WARNING

Danger of crushing for people in the load zone!

If personnel are located between the load to be lifted and a possible interfering edge (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 for anyone to remain in the danger zone!
- ▶ It is prohibited for anyone to be under the load! Keep a safety distance!
- ▶ Swinging of the load is prohibited!
- ▶ Exercise extreme caution when lifting a load!



WARNING

The crane can topple over!

If an attempt to lift a load above the hoist gear causes the LICCON overload protection to turn off, then the load may not be lifted by luffing up the boom. This leads to overloading and toppling of the crane!

Personnel can be severely injured or killed!

- ▶ Do not lift the load by luffing up the boom from 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

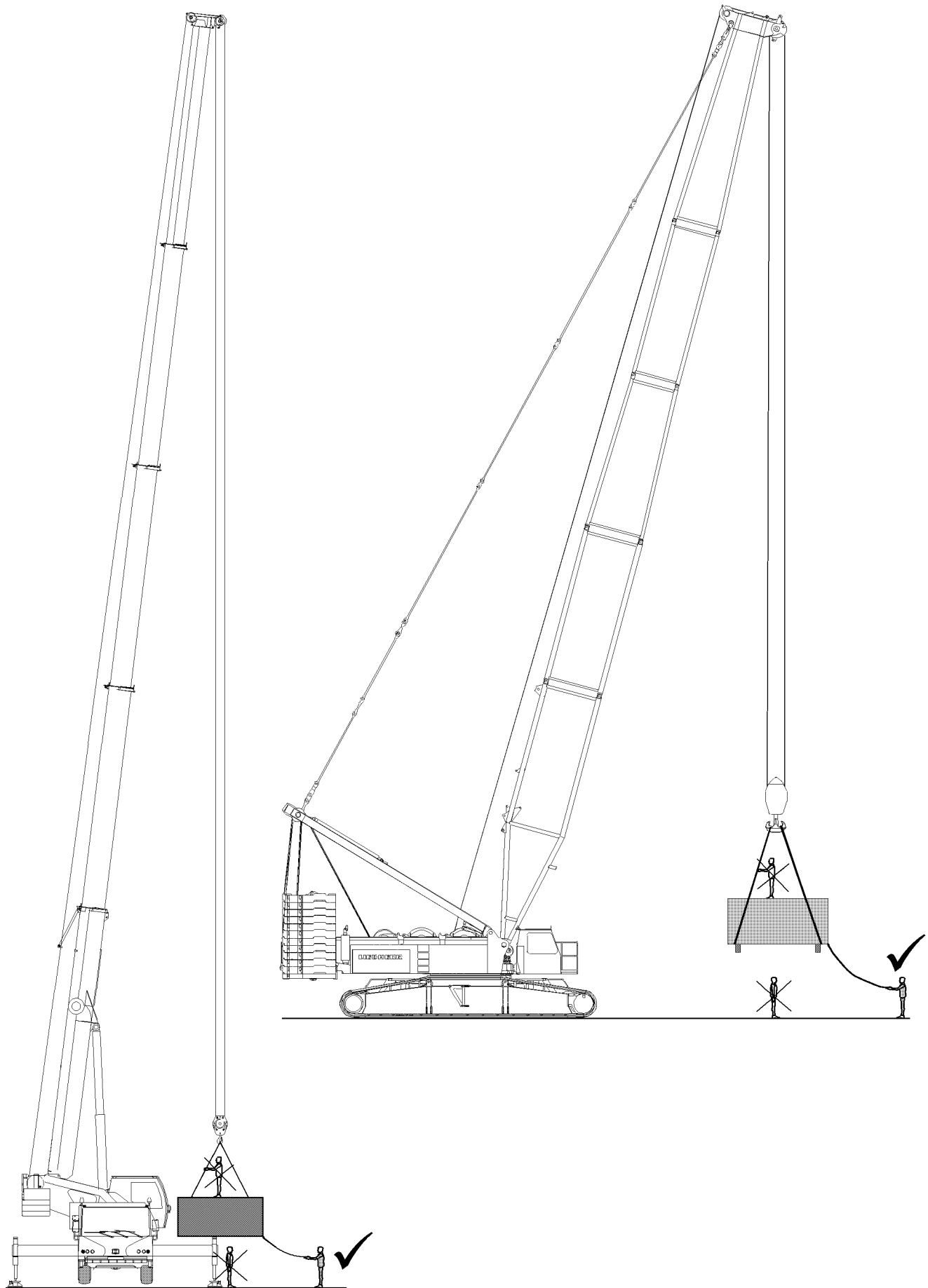
The crane can topple over!

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.



B102717

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 loads 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 to 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 being crushed!



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!

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 out 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.



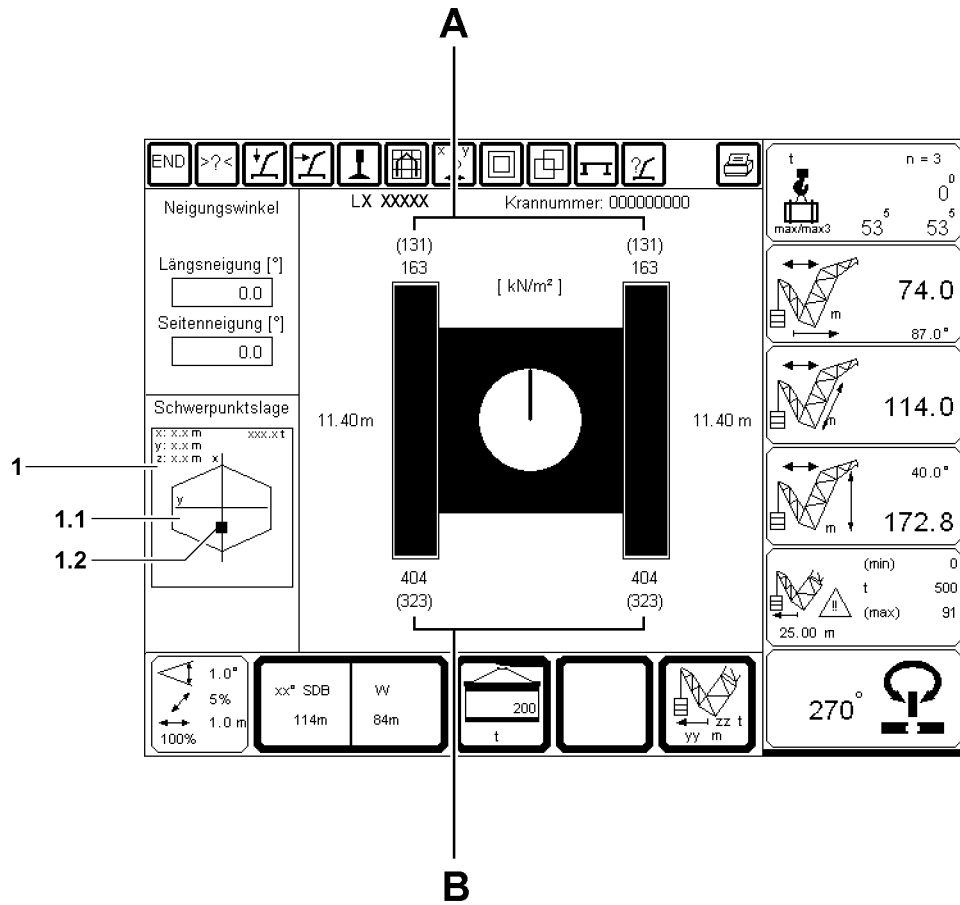
DANGER

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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B109839

1 Prerequisites for crawler operation



WARNING

The crane can topple over!

If the following instructions are not observed, the crane can topple over!

Personnel can be severely injured or killed!

- ▶ Before driving the crane with the attachment, the optimum boom position must be determined with the aid of the job planner, to obtain as even a ground pressure as possible!
- ▶ The crane operator is responsible for the correct and complete data input on the job planner, for the respective equipment configuration of the crane and for the ground condition during crane application and while driving!
- ▶ When driving crawler cranes, it must be ensured that the ground can take on the ground pressures safely, which have been calculated with the job planner, over the entire intended travel route. If this cannot be ensured, the appropriate measured must be taken to be able to transfer the forced into the ground!
- ▶ An additional monitor, who is connected by radio contact with the crane operator must ensure that there are no persons or objects within the danger zone of the crane!



WARNING

Crane with narrow crawler track!

- ▶ When driving cranes with narrow tracks and corresponding equipment, the special travel charts and danger notes must be observed and adhered to!

1.1 General prerequisites for driving of crawler cranes



WARNING

The crane can topple over!

If the turntable is not parallel to the crawler travel gear when driving the crane, the crawler crane can topple over!

- ▶ Make sure that the turntable is aligned parallel to the crawler travel gear in 0° or 180° position before driving the crawler crane!

Before driving on sloped terrain, it needs to be measured and a permissible equipment configuration on the crane must be established. If the display range of the inclinometer is not sufficient when driving uphill, then the actual incline can be determined with the aid of an angle spirit level. To determine the uphill angle, the angle spirit level must be placed in longitudinal direction on the slewing ring!



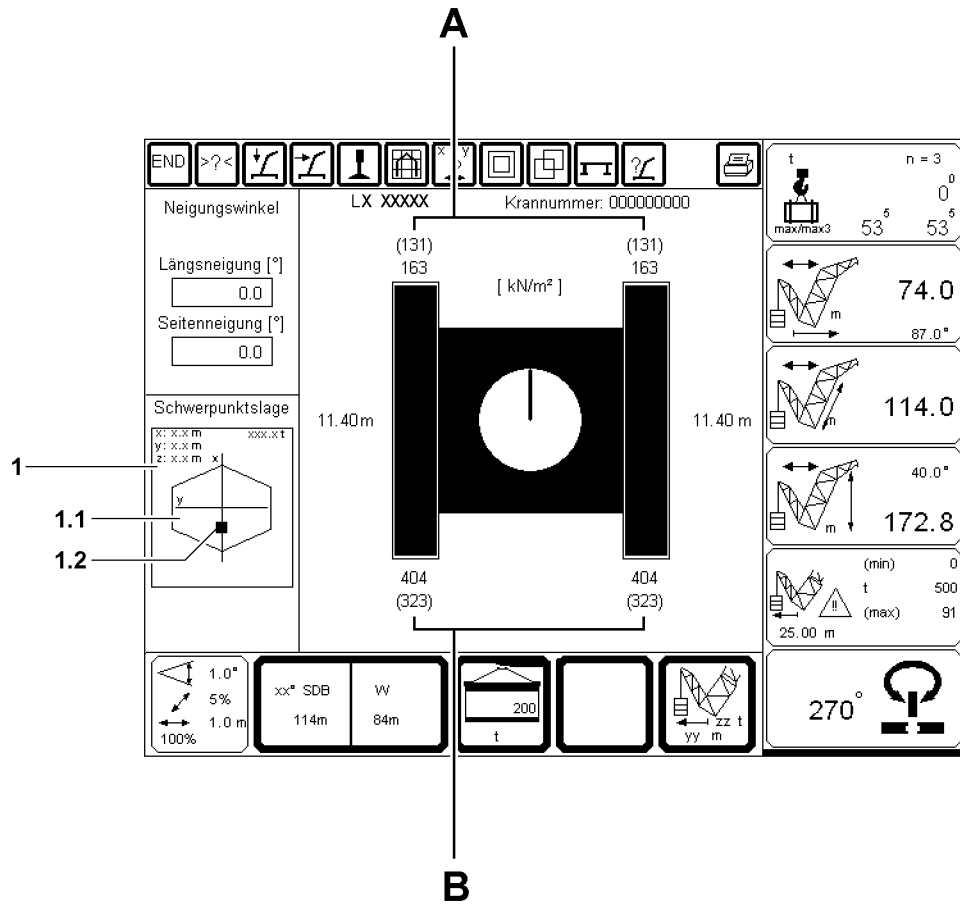
WARNING

The crane can topple over!

If the permissible inclines are exceeded, the crane can topple over!

Personnel can be severely injured or killed!

- ▶ Make sure that the permissible inclines are never exceeded!
- ▶ The crane operator is responsible for the adherence to the permissible inclines!



1.1.1 For Australia, the following applies for driving crawler cranes:

**Note**

- ▶ In Australia, driving crawler cranes is only permitted with 66 percent of the respective nominal load, for that reason, the loads in the respective load chart must be multiplied with a calculation factor of 0.88!
- ▶ The crane operator bears the sole and full responsibility for the observation of national regulations!

Driving crawler cranes with reduced load

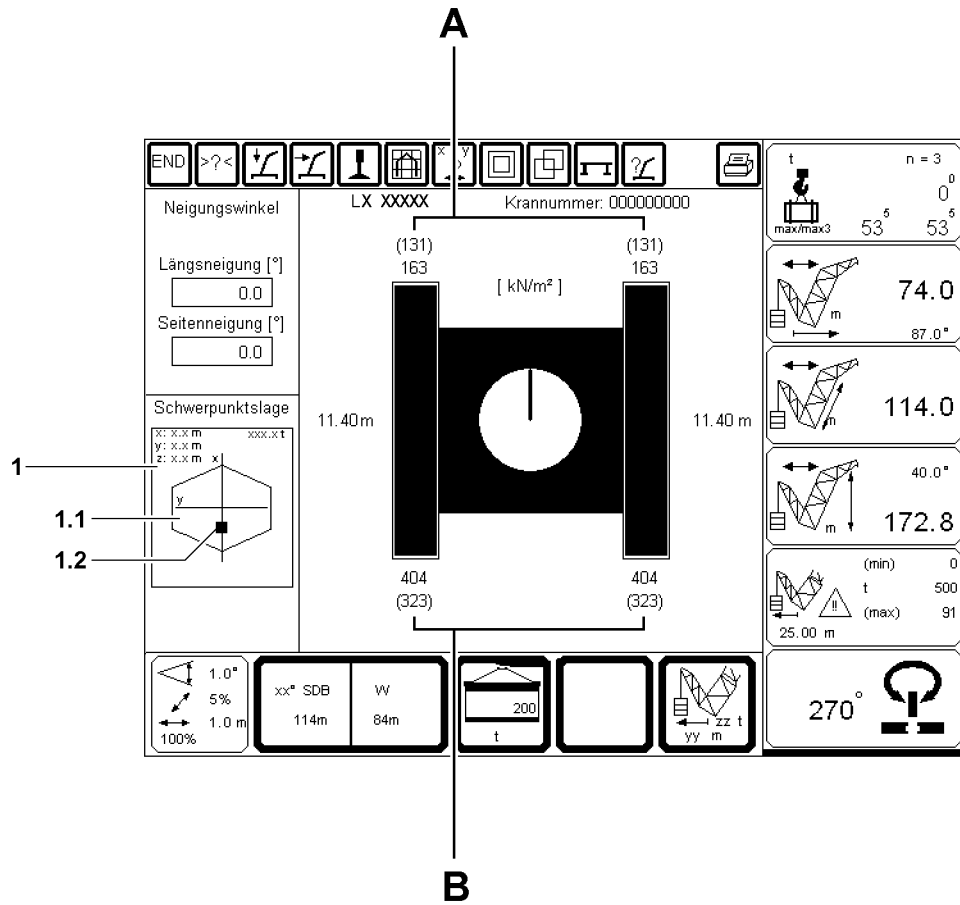
Calculation formula

$$T_V^{1)} = T_{ISO\,DIN}^{2)} * 0.88^{3)}$$

1) T_V = maximum permissible, drivable load (= 66 percent of the nominal load) Valid only for Australia!

2) $T_{ISO\,DIN}$ = Standard load charts according to ISO DIN

3) **0.88** = Calculation factor



B109839

1.1.2 Center of gravity display

Position	Description
1	Center of gravity display
1.1	Core surface
1.2	Center of gravity



WARNING

Center of gravity of the crane is outside the core area!

If the center of gravity **1.2** of the crane is outside the core area **1.1**, then the crane can topple over!

Personnel can be severely injured or killed!

- ▶ To drive the crane, the center of gravity **1.2** must always be within the core area **1.1**!
- ▶ If the center of gravity is outside the core area, then it is prohibited to drive the crane!



Note

- ▶ If the center of gravity **1.2** of the crane is within the core area **1.1**, then the center of gravity **1.2** is shown in green!
- ▶ If the center of gravity **1.2** of the crane is outside the core area **1.1**, then the center of gravity **1.2** is shown in red!

1.1.3 Distribution of the ground pressure



Note

- ▶ The boom must be luffed down before driving until the load is even distributed on the tracks!
- ▶ If the counterweight on the turntable is large, then it is required to position the boom in such a way that a suitable distribution of ground pressure for driving is obtained!



Note

For all driving conditions, the ratio between the front and rear or the rear and the front ground pressures should be greater than 0.3!

- ▶ A : B should 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

1.1.4 Steering ability

The steering ability depends on the following factors:

- Friction conditions under the chains
- Evenness of the ground:
 - Steering is not possible if the crawler track are only making contact with the ground at the front and rear.
- Load bearing capacity of the ground:
 - If the crawler tracks sink into the ground, then the steering ability is significantly restricted.
- Position of the total center of gravity:
 - If the total center of gravity - under consideration of the suspended load - is at the center of the crane, then steering is hard or not possible at all.

The steering ability can be improved by:

- Placing metal sheeting, sand, gravel, water underneath
- Through observation of the ground load bearing ability: Changing the position of the center of gravity by changing the radius

1.2 Prerequisites for driving with a load and / or derrick ballast



WARNING

The crane can topple over!

If load charts with side inclines of more than 0.3° are available, then the crane may be driving with a load within these load charts!

If the following points are not observed, the crane can topple over!

Personnel can be severely injured or killed!

- ▶ The following prerequisites for driving with a load must be adhered to.
- ▶ Driving the crane with side inclines of more than 0.3° - with installed derrick ballast - is prohibited.



Note

- ▶ The permissible inclines from the load charts apply for driving with a load!
- ▶ Take the maximum permissible wind speed from the load charts!

Permissible inclines for driving with a load	
Overall incline	$\pm 0.3^\circ$



WARNING

The crane can topple over!

If the following conditions are not observed, the crane can topple over!

Personnel can be severely injured or killed!

- ▶ The ground must be level ($\pm 0.3^\circ$) and have adequate load bearing capacity!
- ▶ The ground must be able to safely take on the maximum occurring ground pressures!



WARNING

The crane can topple over!

If the crane is driven uphill with a load or derrick ballast, the crane can topple over!

Personnel can be severely injured or killed!

- ▶ Driving uphill with a load and / or derrick ballast is prohibited!

**WARNING**

The crane can topple over!

The crane can be driven with the given loads from the load charts, if the following prerequisites are met!

If the following prerequisites are not observed, the crane can topple over!

Personnel can be severely injured or killed!

- ▶ The maximum permissible travel speed of the crawler with load and / or derrick ballast may **not** exceed 0.05 m/s **or** 3 m/min **or** 0.18 km/h!
- ▶ Steering the crawler with suspended load and / or installed derrick ballast is prohibited!
- ▶ Avoid jerky driving movements!
- ▶ Secure the suspended load to avoid oscillation!
- ▶ Lift the suspended ballast no more than maximum 250 mm off the ground!
- ▶ Luff the main boom up or down until a medium utilization is obtained on test point 1 (MS1)!

1.3 Prerequisites for driving without a load and without derrick ballast

Make sure that the following prerequisites are met:

- The maximum permissible oil fill quantity in the motor is present.
- The oil level in the hydraulic oil tank is lowered from the cylinders to the extent that an overflow is not possible.
- The contents of the fuel tank must be reduced so that an overflow is not possible.
- The maximum permissible wind speed of 9 m/s is not being exceeded.
- the travel speed may not exceed 0.4 m/s **or** 24 m/min **or** 1.44 km/h
- The turntable is aligned parallel to the crawler track, 0° or 180° position.

**Note**

- ▶ The center of gravity for driving without a load must be constantly checked with the LICCON job planner!
- ▶ If the total center of gravity of the crane is within the core area 1.1 and the permissible inclines are observed, then the placement stability of the crane is ensured!
- ▶ By luffing the main boom up and down, the position of the center of gravity 1.2 must be corrected in such a way that the overall center of gravity remains within the core surface 1.1!
- ▶ When driving the crane in terrain with a longitudinal and lateral slope, then the required boom position must be determined with the aid of the LICCON job planner via the position of the overall center of gravity, see section "Display of center of gravity"!

**WARNING**

Crane with narrow crawler track!

- ▶ When driving cranes with narrow tracks and corresponding equipment, the special travel charts and danger notes must be observed and adhered to!

Permissible inclines for driving without a load	
Overall length of boom	Maximum permissible lateral incline
shorter/ equal to 96 m	± 3°
97 m to 150 m	± 2°

**WARNING**

The crane can topple over!

If the following conditions are not met when driving the crawler crane on a hill, then the crane can topple over!

Personnel can be severely injured or killed!

- ▶ The ground must be able to absorb the ground pressures which will occur!

- ▶ 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!
- ▶ The turntable must be parallel to the crawler carriers and secured to prevent it from turning!
- ▶ 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 should be determined with the job planner before travel!
- ▶ The ground must be sufficiently load bearing and have sufficient traction to prevent the crane from slipping!
- ▶ The counterweight on the turntable must be secured with a chain, see chapter 4.07 of the Crane operating instructions!
- ▶ The center of gravity of the crane must lie within the core area **1.1** of the crane!
- ▶ The appropriate and permissible boom position for the respective equipment configuration must be determined with the job planner!



WARNING

Crane with narrow crawler track!

- ▶ When driving cranes with narrow tracks and corresponding equipment, the special travel charts and danger notes must be observed and adhered to.

1.4 Prerequisites for driving on uphill slopes

1.4.1 Maximum climbing ability

The maximum climbing ability of the crawler crane is limited by the following criteria:

- The location of the center of gravity for the complete crawler crane
- The friction coefficient between roadway and track pads
- The transit between the horizontal and the incline
- The maximum uphill incline of 10° to a boom length of 150 m

1.4.2 Calculation of required length for transfers



Note

- ▶ The required length **L** for transfers results from the existing uphill angle **α** and the length of the crawlers **LC**!

Abbreviation	Description
L	Required length of transfers
α	Angle of uphill slope in degrees
LC	Length of crawlers between drive wheels and steering wheels

Calculation example**Given:**

$$\alpha = 10^\circ$$

$$LC = 12.6 \text{ m}$$

Wanted:

$$L = ?$$

Formula:

$$L = 0.5 \times \alpha \times LC$$

Result:

$$L = 0.5 \times 10 \times 12.6 \text{ m} = 63 \text{ m}$$

1.4.3 Prerequisites for driving under observation of the boom position**Note**

- ▶ The illustrations in this section are only examples and may not match to your crane!
- ▶ The determining factor for driving uphill is the exact knowledge of the existing operational conditions on the jobsite and the ground pressures, permissible boom angles and inclines as well as the overall center of gravity which were determined from them with the job planner!

**WARNING**

The crane can topple over!

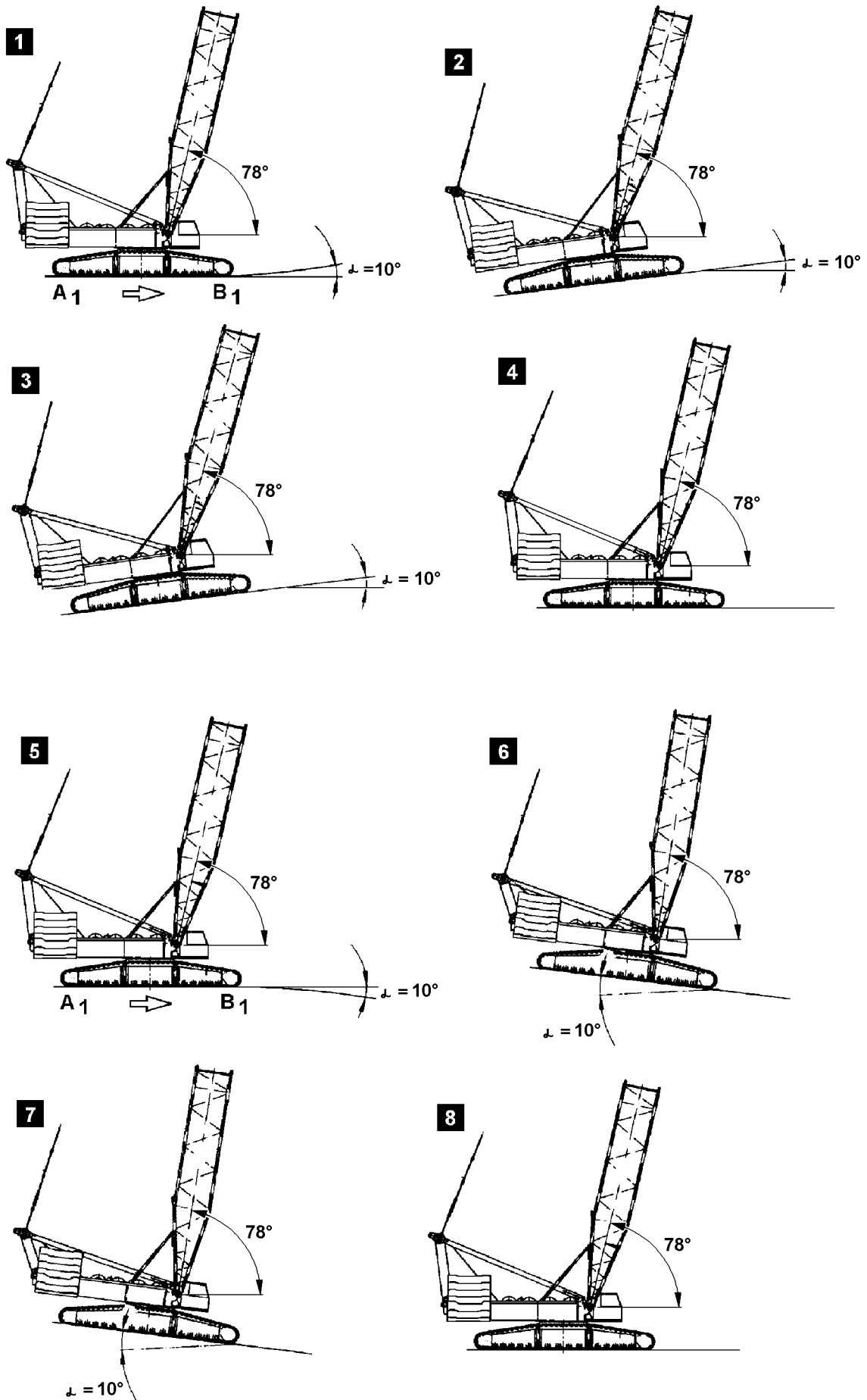
If the following note is not observed, the crane can topple over!

Personnel can be severely injured or killed!

- ▶ Driving uphill must always be anticipatory, with utmost caution and at the slowest speed!

There are two different possibilities to drive crawler cranes uphill (downhill):

- With main boom angle adjustment
- Without main boom angle adjustment



Examples

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Prerequisites for driving on uphill slopes with boom angle adjustment



Note

- ▶ When driving into an uphill slope, during the transition between the horizontal into the incline, the original main boom angle must be changed continuously in such a way that the original main boom angle always remains between the main boom and the horizontal! This angle must be retained in the incline!
- ▶ When driving out of an uphill slope, during the transition between the incline into the horizontal, the original main boom angle must be changed continuously in such a way that the original main boom angle always remains between the main boom and the horizontal!
- ▶ In addition, the overall center of gravity of the crane must be observed!



WARNING

The crane can topple over!

If the crane is driven uphill with a load or derrick ballast, the crane can topple over!

If the main boom angle is not matched to the incline when driving the crane in uphill slopes, then the crane can topple over!

Personnel can be severely injured or killed!

- ▶ Driving uphill with a load and / or derrick ballast is prohibited!
- ▶ Match the main boom angle to the incline!

Positive length incline (illustration 1 to 4)



Note

- ▶ When driving in positive length inclines (uphill slopes), the main boom must be luffed down continuously - maximum by the **incline angle α** !

Illustration	Status	Transition	Main boom angle
1	Driving on level ground (horizontal)	after uphill incline	match
2	Driving in uphill incline		
3	Driving in uphill incline	after horizontal	match
4	Driving on level ground (horizontal)		

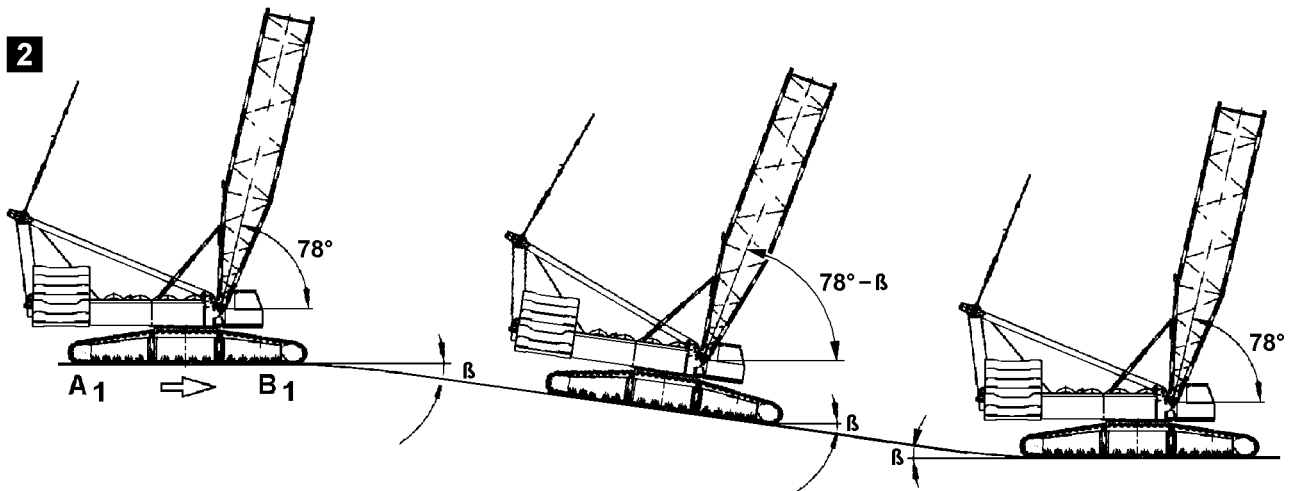
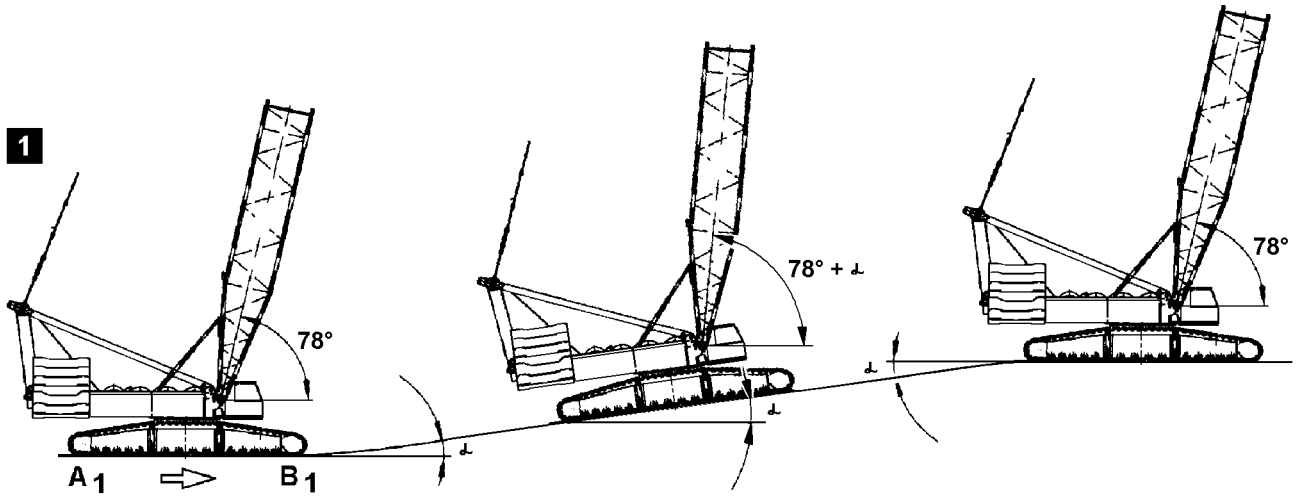
Negative length incline (illustration 5 to 8)



Note

- ▶ When driving in negative length inclines (downhill slopes), the main boom must be luffed up continuously - maximum by the **incline angle α** !

Illustration	Status	Transition	Main boom angle
5	Driving on level ground (horizontal)	after downhill slope	match
6	Driving downhill		
7	Driving downhill	after horizontal	match
8	Driving on level ground (horizontal)		



Prerequisites for driving on uphill slopes without boom angle adjustment



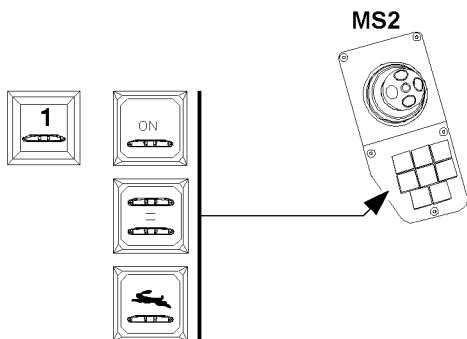
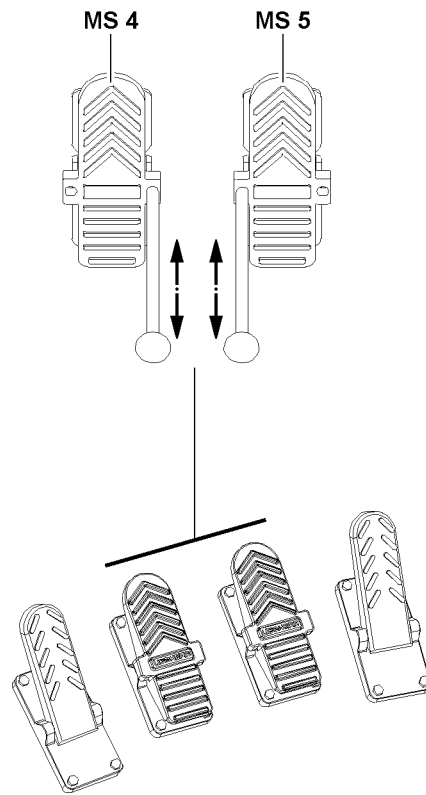
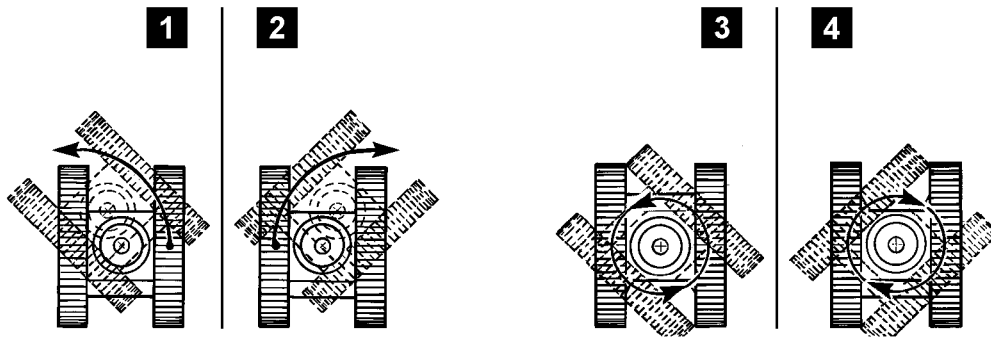
WARNING

The crane can topple over!

If the overall center of gravity of the crane is outside the core area when driving on inclines without main boom angle adjustment, then the crane can topple over!

Personnel can be severely injured or killed!

- ▶ Before driving into uphill or downhill slopes, check the change of the center of gravity with the job planner!
 - ▶ To be able to approximately determine the changes of the center of gravity in uphill slopes with the job planner, the main boom angle must be increased by the incline angle α when driving in inclines, illustration 1!
 - ▶ To be able to approximately determine the changes of the center of gravity in downhill slopes with the job planner, the main boom angle must be decreased by the incline angle β when driving in downhill slopes, illustration 2!
 - ▶ Before driving the crane, determine exactly with the job planner if the crane may drive on the intended route without changing the main boom angle!
 - ▶ If the intended incline cannot be driven without changing the main boom angle, then the main boom angle must be changed to be able to drive on the incline!
-



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2 Driving the crawler crane



WARNING

The crane can topple over!

When driving the crane - this also applies for "circular travel" - and the ballast trailer is raised due to ground unevenness, the force on test point 1 **MS1** (F1) increases very quickly and the crane will be overloaded!

If the ballast trailer sinks while driving due ground unevenness, the force on test point 1 **MS1** (F1) drops and the ballast trailer lifts off the ground, or the entire boom system is pulled backward!

There is no LMB shut off!

The crane can topple over and personnel can be severely injured or killed!

- ▶ The crane operator must constantly observe the displays on the LICCON monitor while driving the crawler crane!
- ▶ The crane operator must correct the force changes on test point 1 **MS1** (F1) to a permissible operating range already when an advance warning occurrence on the LICCON monitor is issued by actuating the pull cylinder in the derrick ballast guying!



WARNING

The crane can topple over!

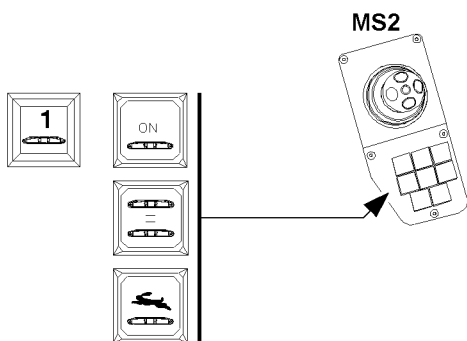
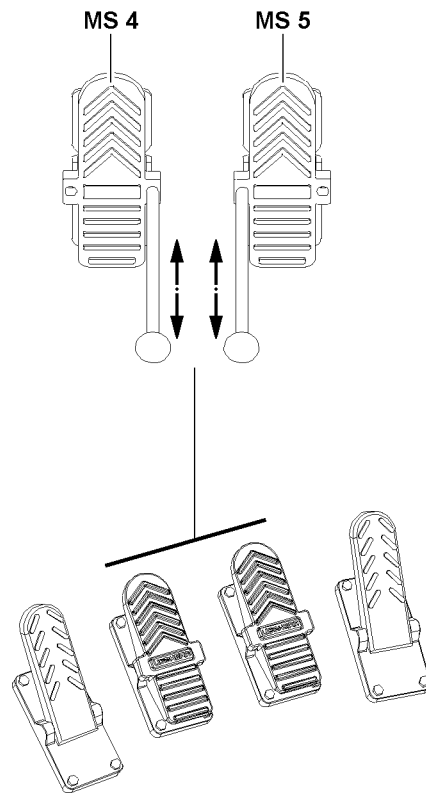
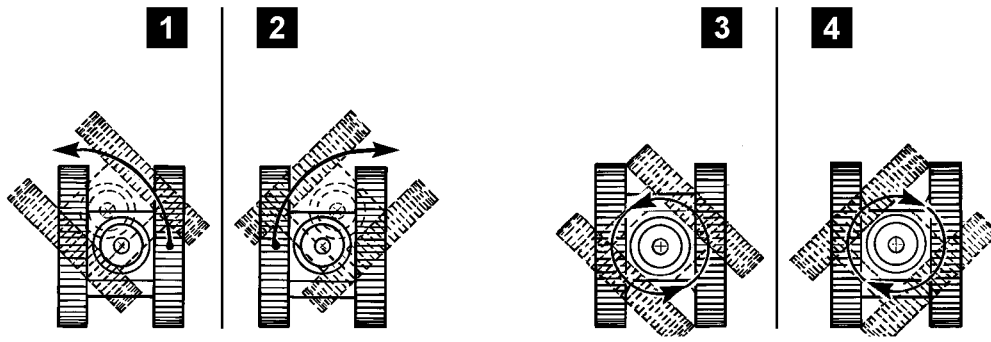
If the following instructions are not observed, the crane can topple over!

Personnel can be severely injured or killed!

- ▶ Before driving the crane with the attachment, the optimum boom position must be determined with the aid of the job planner, to obtain as even a ground pressure as possible!
- ▶ When driving crawler cranes, it must be ensured that the ground can take on the ground pressures, which have been calculated with the job planner, over the entire intended travel route. If this is not the case, appropriate measures must be taken to be able to discharge the forces into the ground!
- ▶ An additional monitor, who is connected by radio contact with the crane operator must ensure that there are no persons or objects within the danger zone of the crane!





Make sure that the following prerequisite is met:

- The crane engine is running.







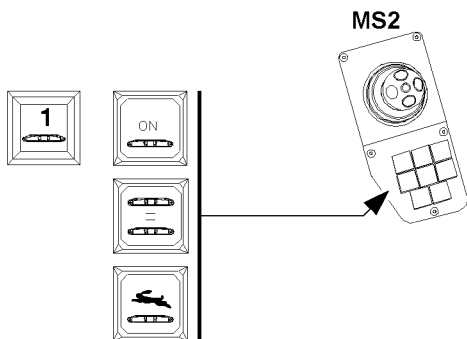
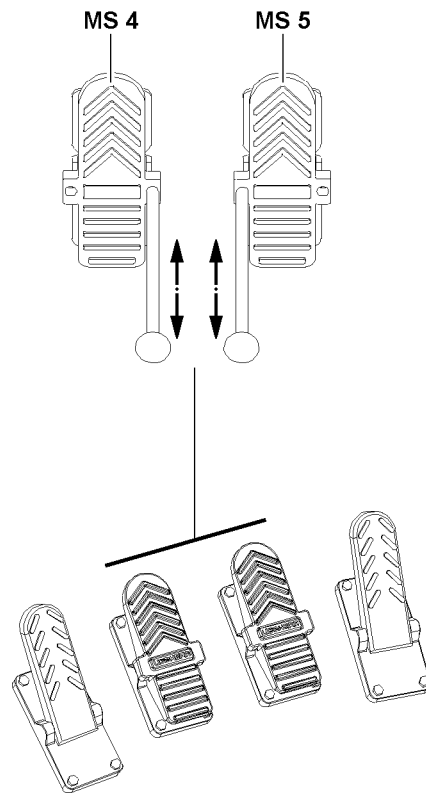
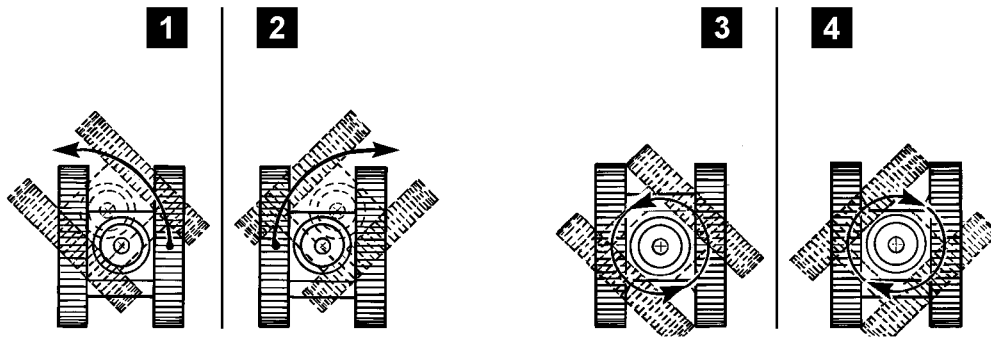
2.1 Operating elements for the crawler operation

2.1.1 Pedal carrier

Pedal carrier (Pedal assignment, see opposite illustration)				
				
	<i>Pedal</i>	<i>Foot rocker MS 4</i>	<i>Foot rocker MS 5</i>	<i>Pedal</i>
Function:	Slewing gear brake	Crawler travel "left"	Crawler travel "right"	Engine regulation:
	Note: Refer also to chapter 4.01 and chapter 4.05 of the Crane operating instructions.			

2.1.2 Switch for crawler operation

Control panel MS2			
			
	Switch "Crawler operation"	Switch "Parallel travel"	Switch "Rapid gear"
	or:		
			
	Switch "Crawler operation"		
Function:	On / Off	On / Off	On / Off
	Note: Also see Crane operating instructions, chapter 4.01.		



2.2 Activating crawler operation



Note

- ▶ The engine RPM is increased or decreased via the pedal "engine regulation"!
- ▶ The switch "crawler operation" can differ somewhat, depending on the crane type!

- ▶ Actuate the switch "Crawler operation".

Result:

- Crawler operation is activated.
- The indicator light in the switch "crawler operation" lights up.

- ▶ To deactivate crawler operation:
Actuate the switch "Crawler operation".

Result:

- Crawler operation is deactivated.
- The indicator light in the switch "crawler operation" turns off.

2.3 Selecting the travel speed

This crawler crane has 2 possible speeds:

- 1.) Speed stage 1:
Creeper gear
- 2.) Speed stage 2:
Fast mode (Rapid gear)

2.3.1 Activating the creeper gear

Make sure that the following prerequisites are met:

- The switch "Rapid gear" is not actuated.
- The indicator light in the switch "Rapid gear" is off.

- ▶ Actuate the switch "Crawler operation".

Result:

- The creeper gear is active.

2.3.2 Turning the rapid gear on



WARNING

The crane can topple over!

If the crane is driven in rapid gear with a load or derrick ballast, then the crane can topple over!

Personnel can be severely injured or killed!

- ▶ Travel with a load or derrick ballast in rapid gear is prohibited!

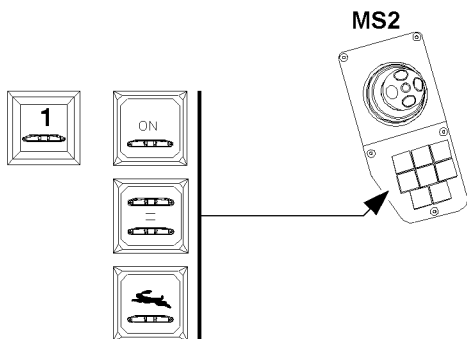
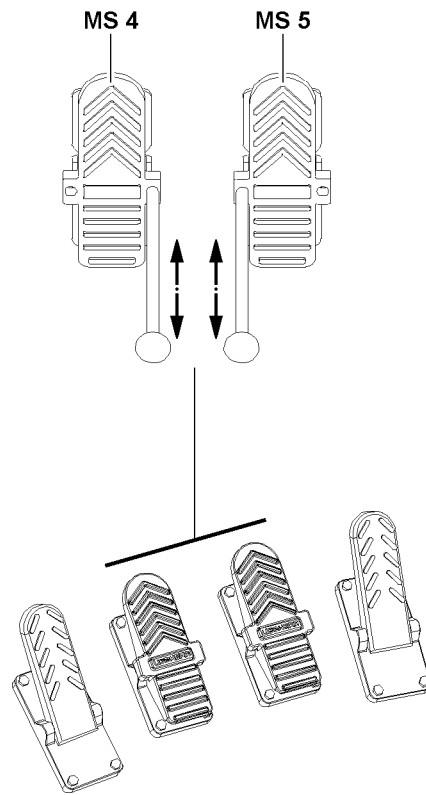
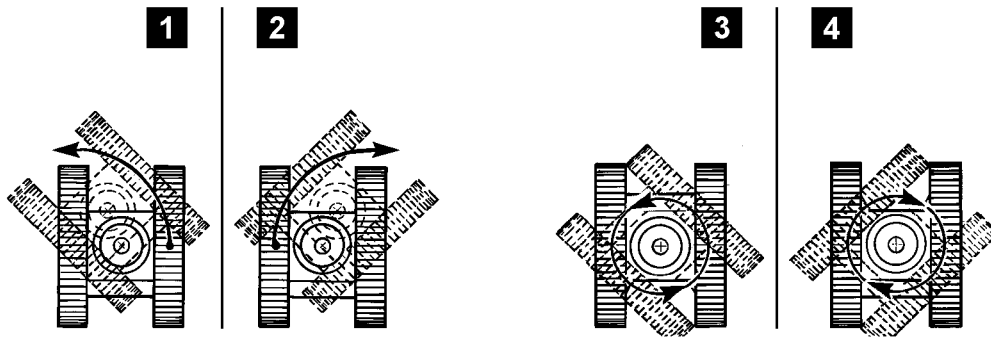
Make sure that the following prerequisites are met:

- The switch "Parallel travel" is not actuated.
- The indicator light in switch "Parallel travel" is off.
- The creeper gear is active.

- ▶ To select speed stage 2:
Actuate the switch "Rapid gear".

Result:

- The rapid gear is activated.
- The indicator light in the switch "Rapid gear" lights up.



2.4 Driving the crawler



WARNING

The crane can topple over!

If the crane is driven in rapid gear with a load and / or derrick ballast, then it can topple over!

Personnel can be severely injured or killed!

- ▶ Driving with a load and / or derrick ballast in rapid gear is prohibited!
- ▶ The maximum permissible travel speed of the crawler with load and / or derrick ballast may not exceed 0.05 m/s or 3 m/min or 0.18 km/h!
- ▶ Steering the crawler with suspended load and / or installed derrick ballast is prohibited!



WARNING

Personnel present in danger zone!

Personnel within the danger zone of the crane can be severely injured or killed!

- ▶ An additional monitor, who is connected by radio contact with the crane operator must ensure that there are no persons or objects within the danger zone of the crane!
- ▶ The observer may not remain in the crane danger zone!

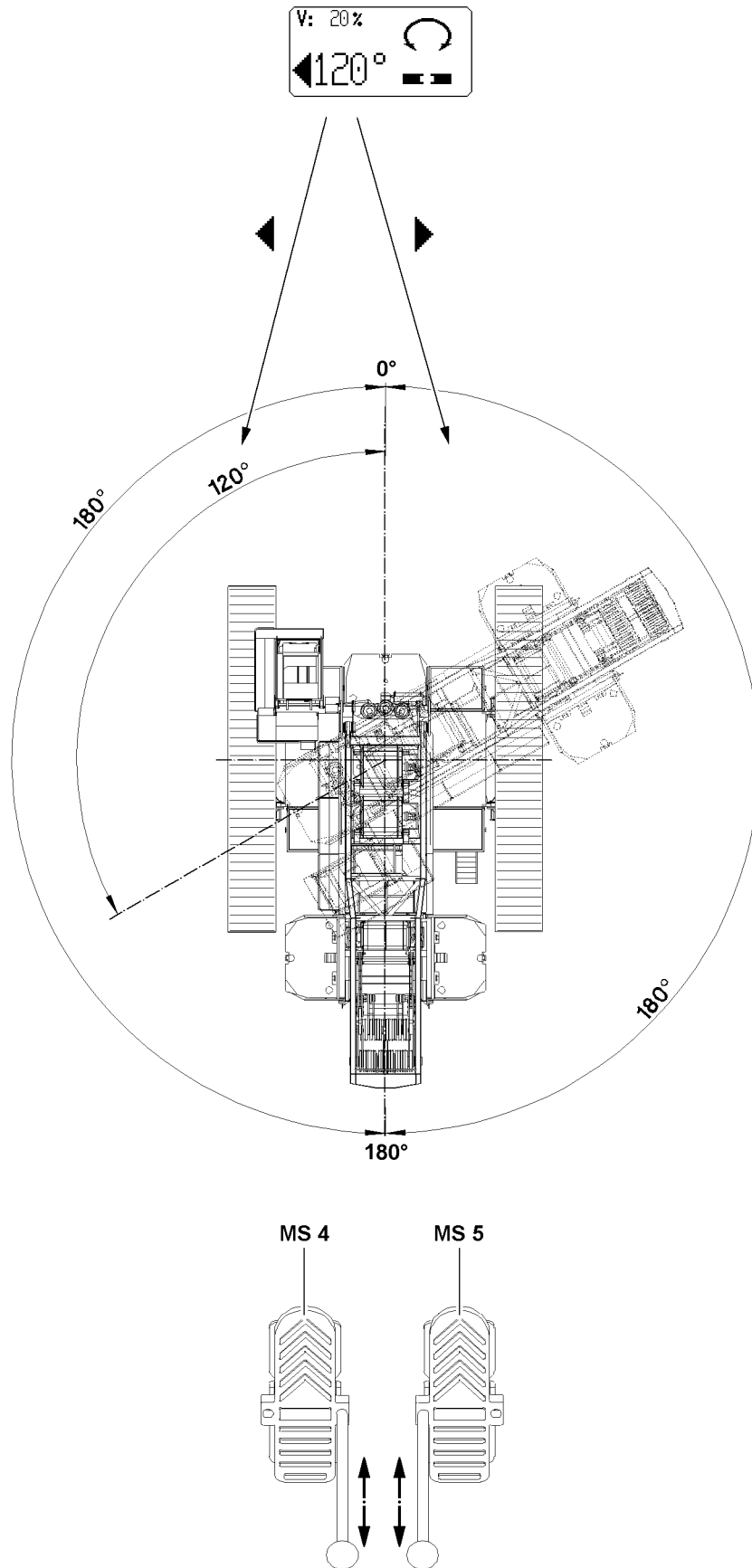


Note

- ▶ Take the manual level from the transport retainer in the crane operator's cab!
- ▶ The technical design of the hand levers is completely identical. The differentiation of the two hand levers is only in their assignment to the corresponding foot rockers in assembled (pushed on) condition!

Make sure that the following prerequisite is met:

- The switch “crawler operation” is actuated.



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2.4.1 Changing the travel direction



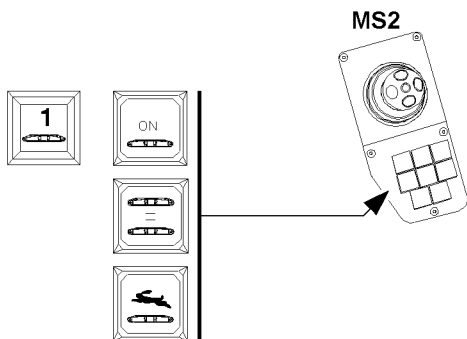
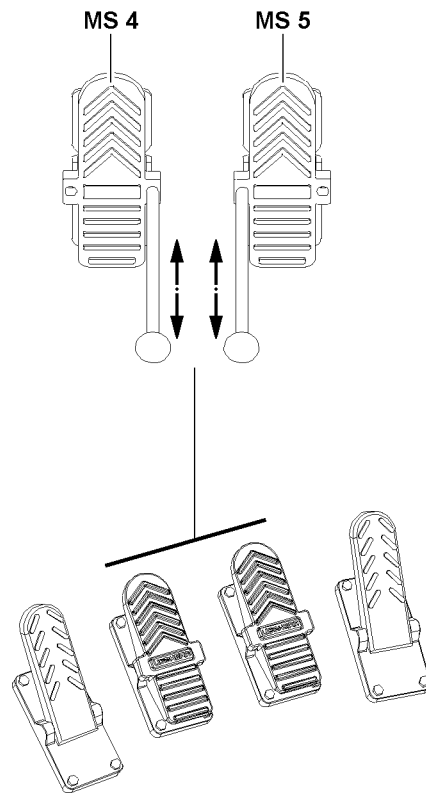
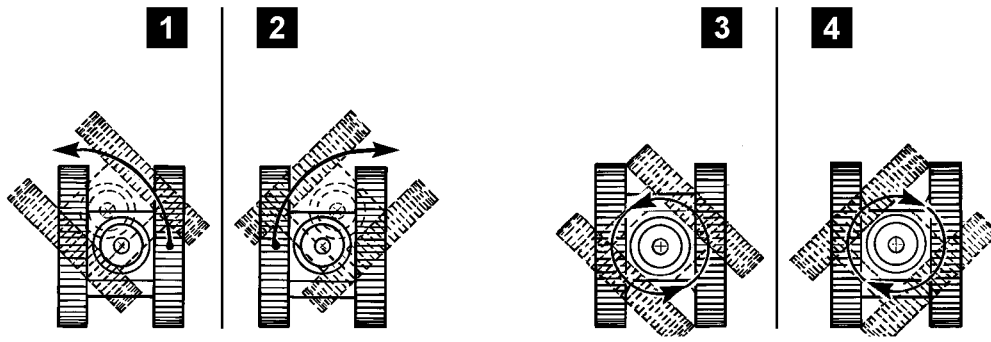
Note

- ▶ At 0°, the crane superstructure is exactly in position “to the front”.
- ▶ At 180°, the crane superstructure is exactly in position “to the rear”.

The travel direction relates to the position of the crane superstructure:

- If the crane superstructure is turned past 90°, then the “forward / reverse” travel direction changes.
- If the crane superstructure with actuated foot rocker **MS 4** or foot rocker **MS 5** is turned past 90°, then the travel direction remains until the corresponding foot rocker / manual control lever is “returned” to neutral position.

This means the new travel direction becomes active only if the corresponding foot rocker / manual control lever is no longer actuated.



2.4.2 Driving the crawler forward and backward

The tracks can be operated with the foot rockers:

- Crawler track left: Foot rocker **MS4**
- Crawler track right: Foot rocker **MS5**

Alternatively, a manual lever can be installed (inserted) on the foot rocker **MS4** and the foot rocker **MS5** in order to control the travel movements of the crawler precisely.

Driving the crawler forward

- ▶ Push the right foot rocker **MS5** forward.

or

- Move the manual lever on the foot rocker **MS5** forward.

Result:

- The right track moves forward.

- ▶ Push the left foot rocker **MS4** forward.

or

- Move the manual lever on the foot rocker **MS4** forward.

Result:

- The left track moves forward.

Move the crawler backward.

- ▶ Push the right foot rocker **MS5** back.

or

- Move the manual lever on the foot rocker **MS5** backward.

Result:

- The right track moves backward.

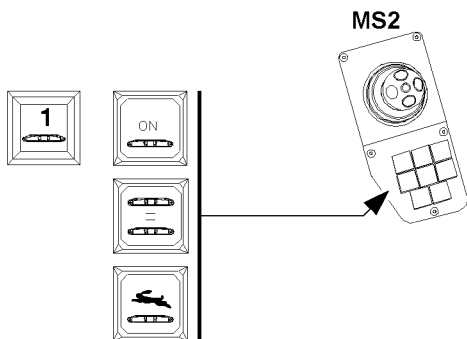
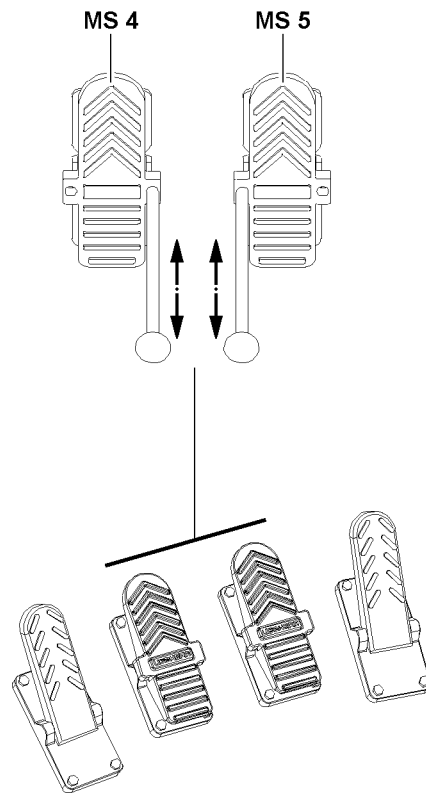
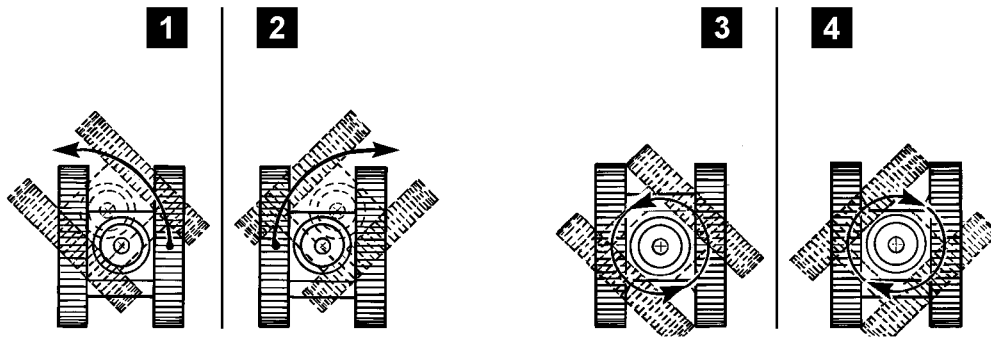
- ▶ Push the left foot rocker **MS4** back.

or

- Move the manual lever on the foot rocker **MS4** backward.

Result:

- The left track moves backward.



2.4.3 Activating parallel travel

If "parallel travel" is added, both tracks are simultaneously controlled by pressing down on foot rocker **MS4** or foot rocker **MS5**. The foot rocker, which is actuated first serves as the control for both crawler tracks. This makes it possible to drive the tracks exactly straight forward on suitable ground.



Note

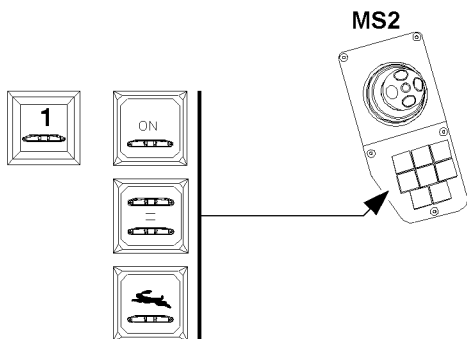
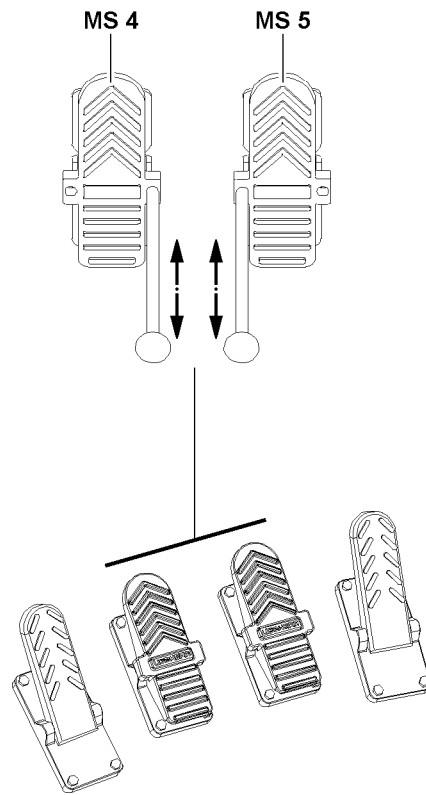
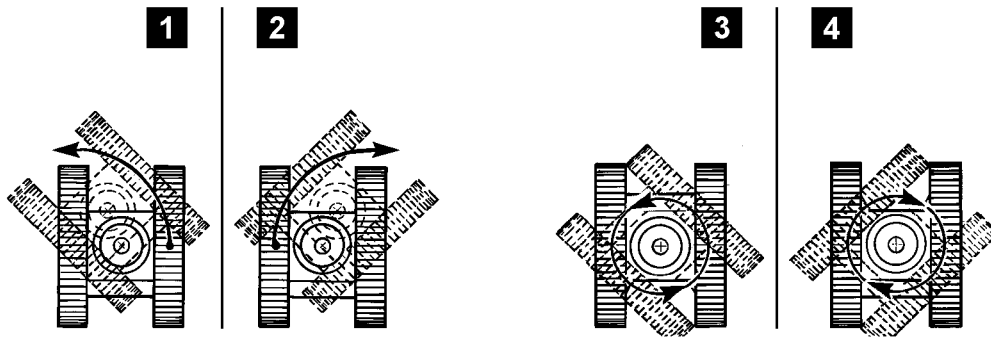
- ▶ If, with the "rapid gear" turned on, the function "parallel travel" is added, then the function "rapid gear" is deactivated: The indicator light in the switch "rapid gear" turns off. However, the switch remains actuated!
 - ▶ If the function "parallel travel" is turned off again, the rapid gear activates automatically: The indicator light in the switch "rapid gear" lights up!
-

Make sure that the following prerequisite is met:

- Rapid gear is deactivated: The indicator lights in switch "rapid gear" is off.
- ▶ Actuate the switch "parallel travel".

Result:

- Parallel travel is activated.
- The indicator light in the switch "parallel travel" lights up.



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2.4.4 Steering the crane



WARNING

The crane can topple over!

If the crane is steered with closed slewing gear brake, then the boom system can be damaged due to high side acceleration!

Personnel can be severely injured or killed!

- ▶ When steering the crawler, always activate the slewing gear coasting!



WARNING

The crane can topple over!

If the crawler chain sags on uneven ground, then the centering cams of the track pads can no longer be centered and guided sufficiently in the track rollers!

The centering cams will be damaged and the chain can jump out of its guide!

Personnel can be severely injured or killed!

- ▶ Stop steering movements immediately!
- ▶ Drive straight forward until all centering cams are centered again!
- ▶ When possible, retension the crawler chain, see chapter 7.04 of the Crane operating instructions!



WARNING

The crane can topple over!

When steering in small radii or when steering in counterrotation, the crawler tracks can "dig" into the ground and cause the crane to topple over!

Personnel can be severely injured or killed!

- ▶ Steer the tracks in as large a radius as possible!
- ▶ Avoid counterrotation!

Steering the tracks to the left

See illustration 1.

- ▶ Push the right foot rocker **MS5** forward.

or

- Move the manual lever on the foot rocker **MS5** forward.

Steering the tracks to the right

See illustration 2.

- ▶ Push the left foot rocker **MS4** forward.

or

- Move the manual lever on the foot rocker **MS4** forward.

Counter-rotating the tracks to the left

See illustration 3.

- ▶ Push the right foot rocker **MS5** forward and the left foot rocker **MS4** backward.

or

- Move the manual lever on the foot rocker **MS5** forward and move the foot rocker **MS4** backward.

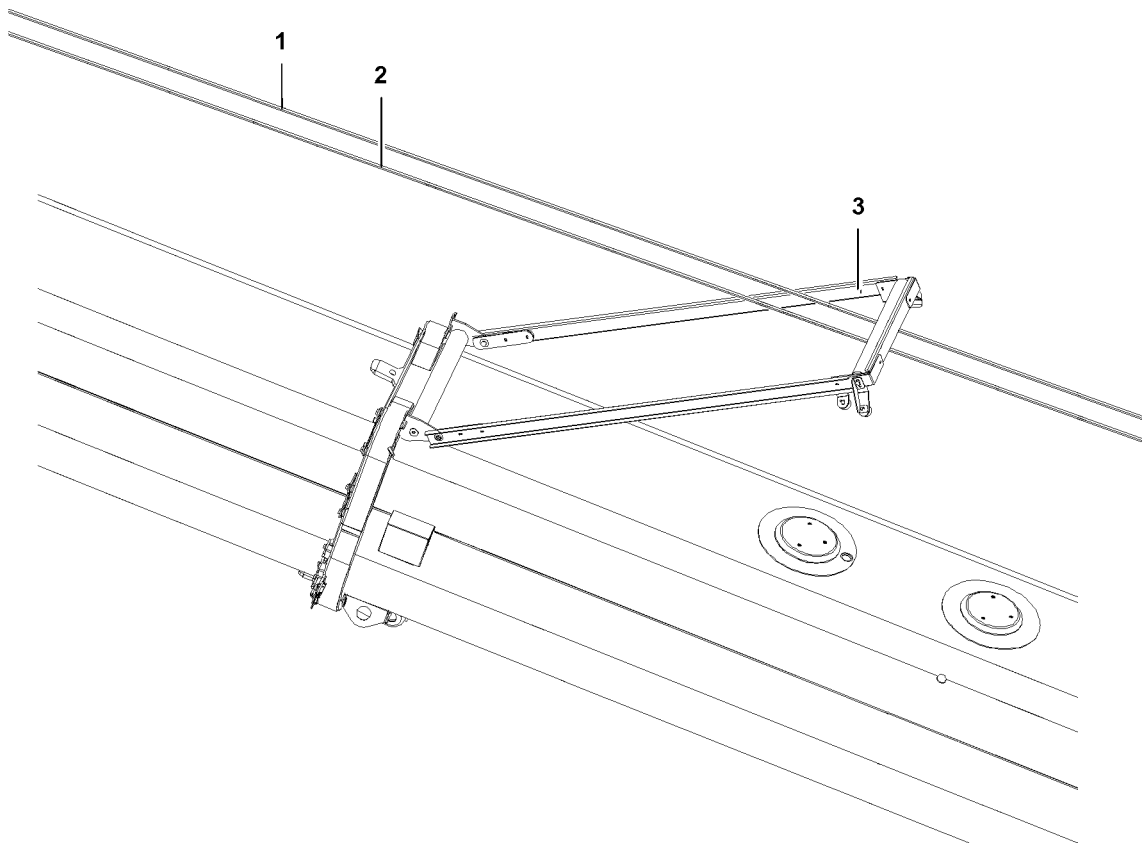
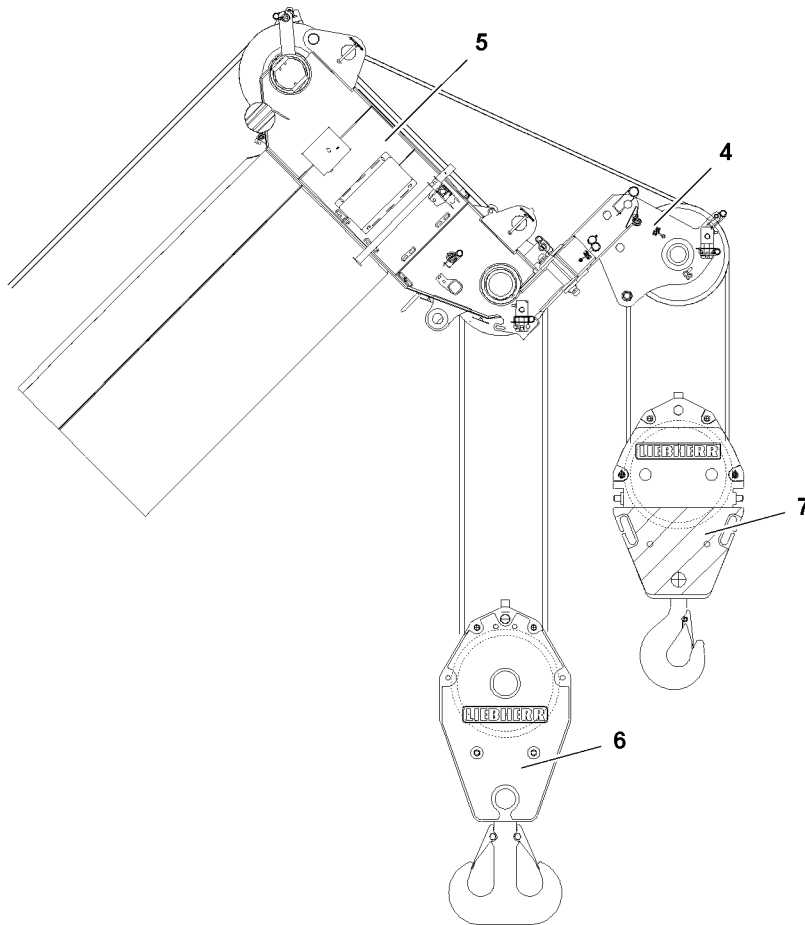
Counter-rotating the tracks to the right

See illustration 4.

- ▶ Push the left foot rocker **MS4** forward and the right foot rocker **MS5** backward.

or

- Move the manual lever on the foot rocker **MS4** forward and move the foot rocker **MS5** backward.



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1 Operating modes

A distinction is made between the following operating modes:

- Operation with boom nose* on the telescopic boom
- Operation with boom nose* on lattice jib
- “Two hook operation” with auxiliary boom* (folding jib, auxiliary jib, lattice jib)

2 Operation with boom nose* on the telescopic boom

NOTICE

Damage to the hoist ropes!

- ▶ Guide the hoist rope **1** and hoist rope **2** through the bracket **3** on the telescopic boom during reeving.

The operation “boom nose on telescopic boom” is set up for quick lifts via the boom nose **4**. The hook block **6** can remain reeved on the boom head **5**.

2.1 Setting the LICCON overload protection

Add the following weights to the load:

- Hook block **6** on boom head **5**
- Hook block (load hook) **7** on the boom nose **4**
- Boom nose **4**
- Fastening equipment



WARNING

Danger of accidents because of imprecise radius and load display!

In operation with “boom nose on telescopic boom” the radius and load display of the LICCON overload protection is not precise. The boom geometry is not taken into account!

- ▶ Do not overload the crane.

For operation “boom nose on telescopic boom” no special load charts are available. For operation “boom nose on telescopic boom” set operating mode “telescopic boom” on the LICCON overload protection.

- ▶ Set operating mode “telescopic boom” on the LICCON overload protection.



WARNING

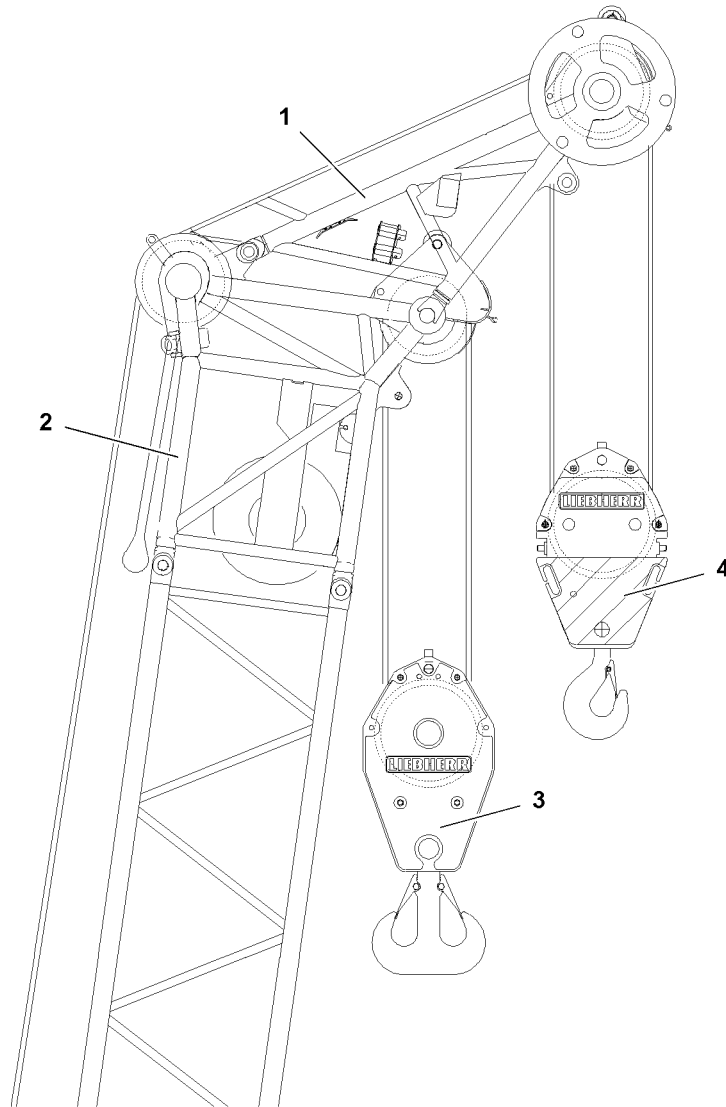
Overload of crane!

Protection through the LICCON overload protection is only possible when the reeving on the boom head **5**, is equal to / larger than the reeving on the boom nose **4**.

- ▶ Reeve in a boom head **5** equal to / larger than the boom nose **4**.

Setting it to the smaller reeving of the two hooks ensures that the crane cannot be overloaded.

- ▶ Set the LICCON overload protection to the smaller reeving (reeving on the boom nose **4**).



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3 Operation with boom nose* on lattice jib

The operation "boom nose on lattice jib" is set up for quick lifts via the boom nose **1**. The hook block **3** can remain reeved on the boom head **2**.

3.1 Setting the LICCON overload protection

Add the following weights to the load:

- Hook block **3** on boom head **2**
- Hook block (load hook) **4** on the boom nose **1**
- Boom nose **1**
- Fastening equipment



WARNING

Danger of accidents because of imprecise radius and load display!

In operation with "boom nose on lattice jib" the radius and load display of the LICCON overload protection is not precise. The boom geometry is not taken into account!

- ▶ Do not overload the crane.
-

For operation "boom nose on lattice jib" no special load charts are available. For operation "boom nose on lattice jib" set operating mode "lattice jib" on the LICCON overload protection.

- ▶ Set operating mode "lattice jib" on the LICCON overload protection.
-



WARNING

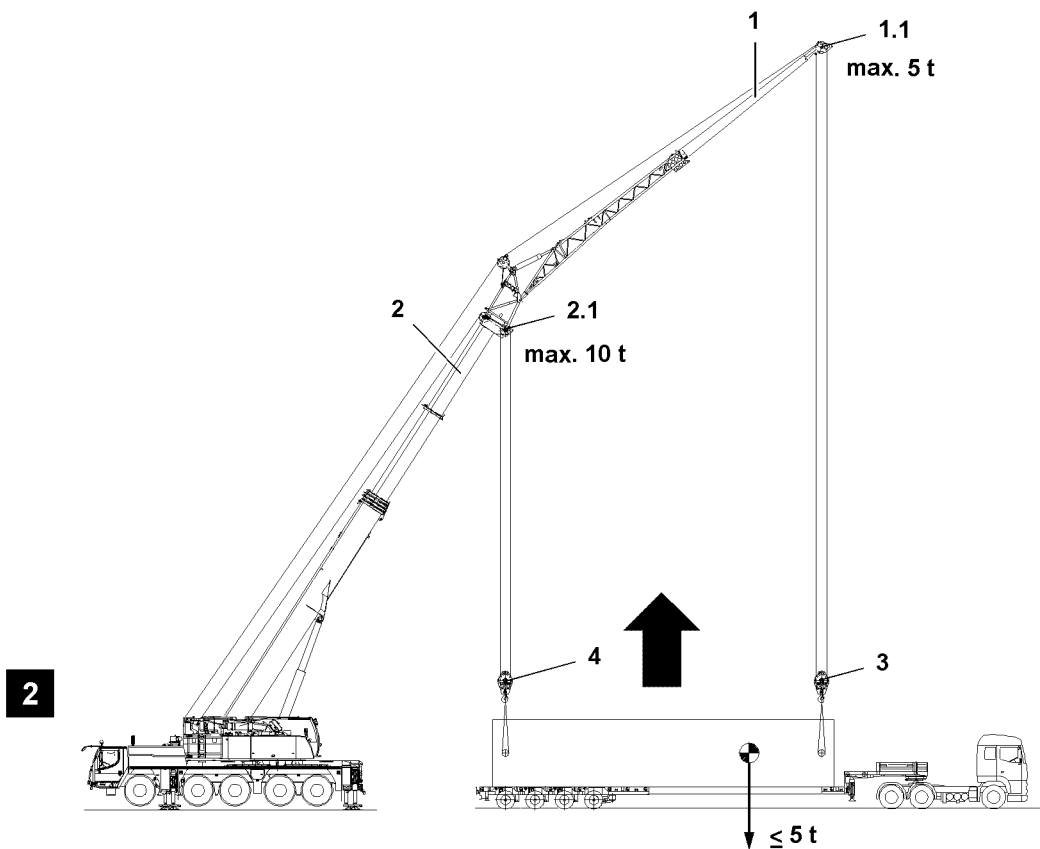
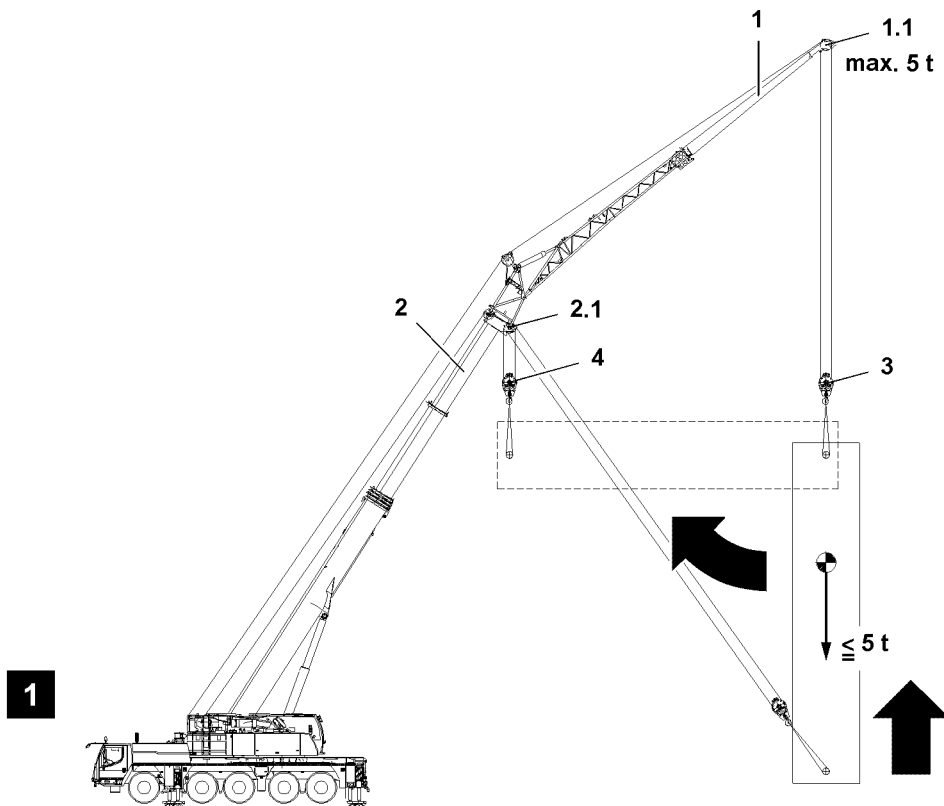
Overload of crane!

Protection through the LICCON overload protection is only possible when the reeving on the boom head **2**, is equal to / larger than the reeving on the boom nose **1**.

- ▶ Reeve in a boom head **2** equal to / larger than the boom nose **1**.
-

Setting it to the smaller reeving of the two hooks ensures that the crane cannot be overloaded.

- ▶ Set the LICCON overload protection to the smaller reeving (reeving on the boom nose **1**).



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4 “Two hook operation” with auxiliary boom*

The “two hook operation” with main boom and auxiliary boom 1 (folding jib, auxiliary jib, lattice jib) is set up for turning loads with simultaneous operation of both hoist gears.

For “two hook operation” with auxiliary boom 1 there are two possibilities:

- 1.) Lift / lower load exclusively with the auxiliary boom, illustration 1
- 2.) Lift / lower load with the main boom and auxiliary boom, illustration 2



WARNING

Danger of fatal accident due to overloading the crane!

The “two hook operation” is not monitored!

To avoid an overload of the crane, the information given in the operating instructions must be strictly adhered to.

- ▶ The total weight of the load must be smaller / equal to the maximum permissible load of the auxiliary boom 1.
- ▶ “Two hook operation” with a load larger than the maximum permissible load of the auxiliary boom 1 is prohibited!
- ▶ Lift the load no higher than to the height of the main boom head 2.1.
- ▶ If there is a load on both hooks, then it is prohibited to luff down the boom! There is no protection provided by the LICCON overload protection.
- ▶ Lift and lower the load vertically.
- ▶ “Two hook operation” with TY-guying and eccentric or spacer is prohibited!

Add the following weights to the load:

- Hook block 4 on main boom head 2.1
- Hook block (load hook) 3 on auxiliary boom head 1.1
- Fastening equipment

The minimum reeving can be obtained from the erection and take down charts.

For “two hook operation” with folding jib, auxiliary jib, fixed lattice jib, the minimum reeving in the erection and take down charts is sufficient.



WARNING

Danger of accident in case of incorrect minimum reeving!

For “two hook operation” with luffing lattice jib, the minimum reeving in the erection and take down charts is **not** sufficient!

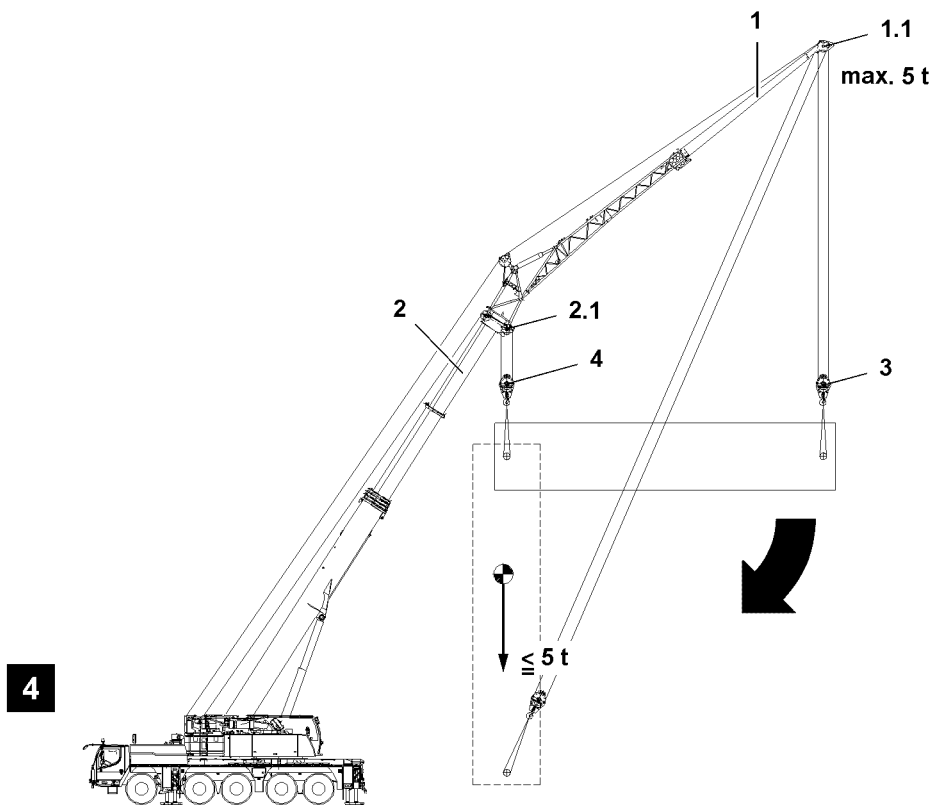
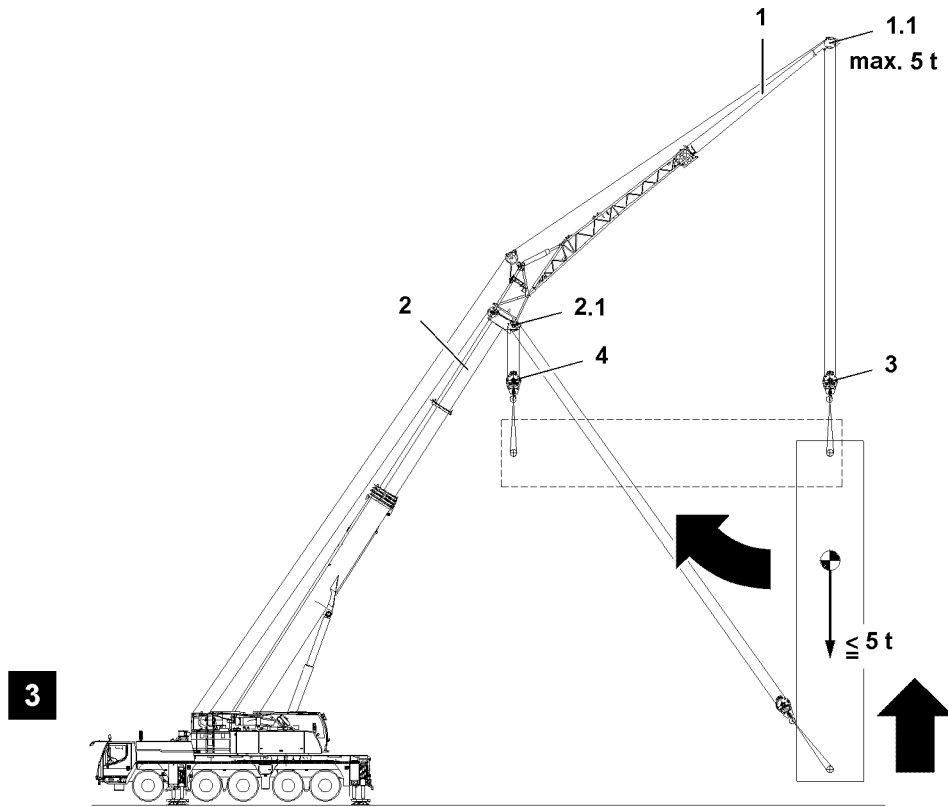
- ▶ Increase the specified minimum reeving according to the erection and take down charts by 1 rope strand.

NOTICE

Rubbing hoist ropes!

In “two hook operation” angular pull is only permissible in boom direction with raised load.

- ▶ Make sure that the hoist ropes do not rub on the rope retaining pipes of the rope pulleys during angular pull.



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4.1 Setting the LICCON overload protection

For “two hook operation” with main boom and auxiliary boom 1 the LICCON overload protection must be set to operating mode auxiliary boom (folding jib, auxiliary jib, lattice jib).

- ▶ Set operating mode “auxiliary jib” (folding jib, auxiliary jib, lattice jib) on the LICCON overload protection.

Result:

- The displayed boom radius is according to the installed auxiliary boom 1.



WARNING

Overload of crane!

Protection through the LICCON overload protection is only possible when the reeving on the main boom head 2.1, is equal to / larger than the reeving on the auxiliary boom head 1.1.

- ▶ Reeve in the main boom head 2.1 equal / larger than the auxiliary boom head 1.1.

Setting it to the smaller reeving of the two hooks ensures that the crane cannot be overloaded.

- ▶ Set the LICCON overload protection to the smaller reeving (reeving on the auxiliary boom head 1.1).

4.2 Lifting / lowering the load exclusively with the auxiliary boom

Make sure that the following prerequisite is met:

- The total weight of the load is smaller / equal to the maximum permissible load of the auxiliary boom 1.



WARNING

Danger of fatal accident due to overloading the crane!

If the total weight or the center of gravity of the load is not exactly known, then the load must first be lifted or lowered with the auxiliary boom 1.

- ▶ Lift the load with auxiliary boom 1 (folding jib, auxiliary jib, lattice jib) to 100 %.
- ▶ Lower the load with auxiliary boom 1 (folding jib, auxiliary jib, lattice jib) to 100 %.

- ▶ Lift the load with auxiliary boom 1 to 100 %, illustration 3.

- ▶ Take over the load with the main boom 2, illustration 4.

Result:

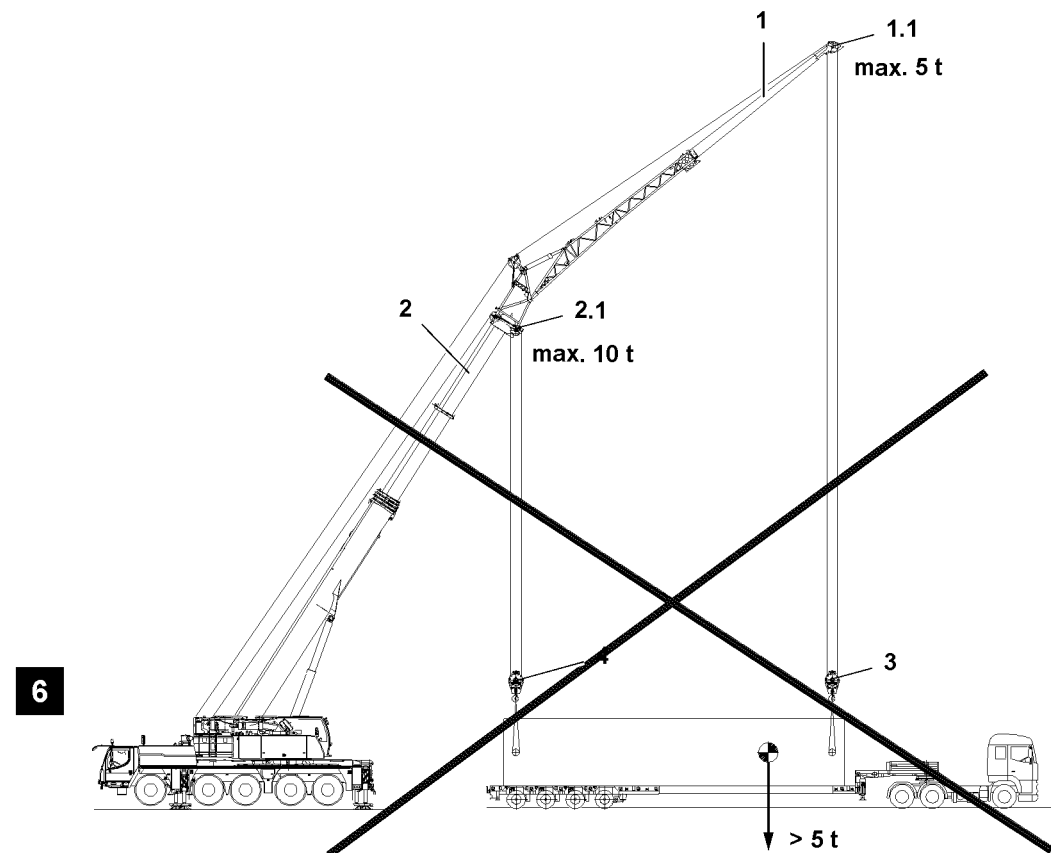
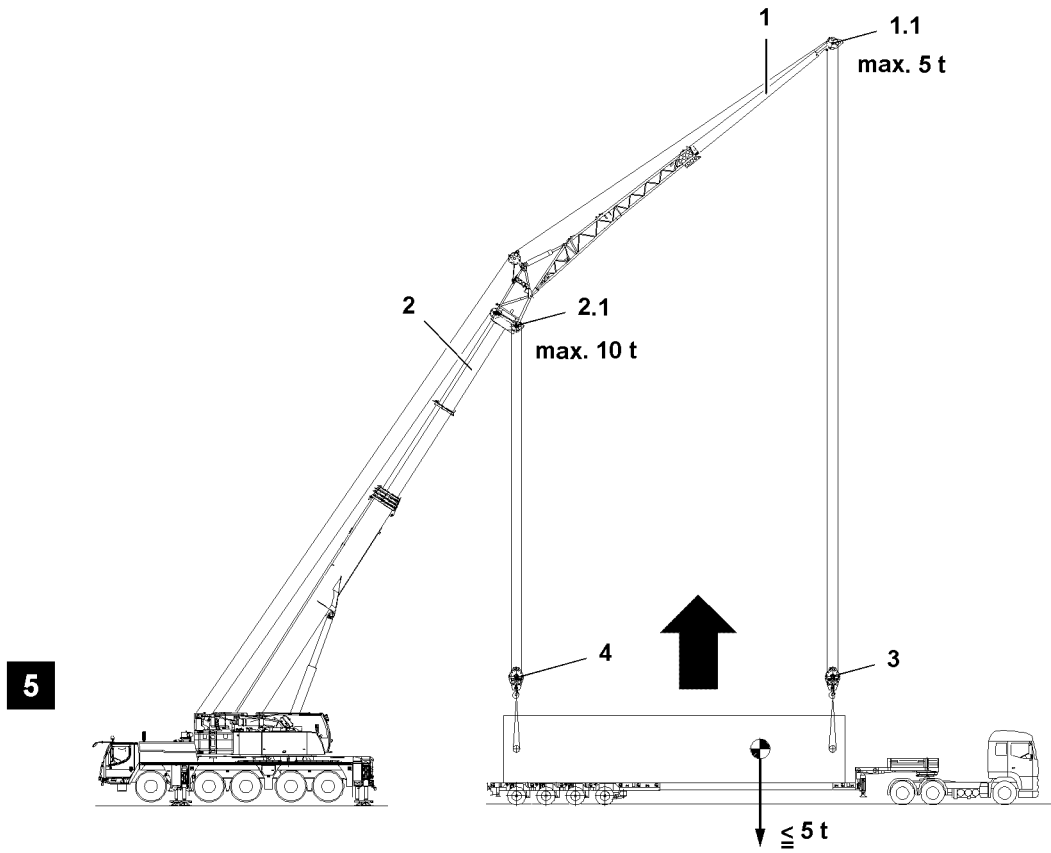
- As soon as the load hangs on the main boom 2.1 is the load display of the LICCON overload protection incorrect.

- ▶ When the load is to be lowered:

Take over the load with the auxiliary boom 1 to 100 % and then place it down.

Result:

- As soon as the load hangs by 100 % on the auxiliary boom head 1.1 is the load display of the LICCON overload protection correct.



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4.3 Lifting / lowering the load with the main boom and auxiliary boom

Make sure that the following prerequisite is met:

- The total weight of the load is smaller / equal to the maximum permissible load of the auxiliary boom **1**.



WARNING

Danger of fatal accident due to overloading the crane!

- ▶ The total weight and the center of gravity of the load must be known exactly.
- ▶ “Two hook operation” with a load larger than the maximum permissible load of the auxiliary boom **1** is strictly prohibited, illustration **6!**

-
- ▶ Lift the load with the main boom **2** and auxiliary boom **1**, illustration **5**.

Result:

- As soon as the load hangs on the main boom **2.1** is the load display of the LICCON overload protection incorrect.
- ▶ When the load is to be lowered:
Place the load down with the main boom **2** and auxiliary boom **1**.

1 Reeving plans



Note

▶ See separate reeving plans!

5 Equipment

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!

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.
- ▶ Never pull the hoist rope ends under the winch by spooling the winch up!
- ▶ Never pull the hoist rope 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 be overloaded, topple over or be 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!

**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.



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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 visible 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 drum and 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 the step, ladders and pedestals 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).
- Make sure that the track chains are secured to prevent them from sagging (crawler crane).

4.3 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.

4.4 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.

4.5 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.

4.6 Additional controls for certain crawler cranes

For existing crawler assembly key button:

- Make sure that the crawler assembly key button is turned off.

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 down the load onto 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!
-

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 sections) or folded together (for example the folding jib), then the total weight is given by the sum of the individual components!

NOTICE

False estimation of weights

- ▶ Contact the Service department at **Liebherr-Werk Ehingen GmbH** if the weight of the respective component is not stated on the tag or in the Crane operating instructions!
- ▶ Use an auxiliary crane with sufficient load carrying capacity including judicious reserve!

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!



WARNING

Unutilized guy rods on boom!

If guy rods are on the lattice sections which are not used for operation, then there is a risk 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!

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



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- 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.



DANGER

Increased danger of accident due to bypass of the overload protection!

As section 4.2.6.3.2 of EN 13000 does not put the requirements of appendix 1 of the EC machinery directive 89/37/EC into concrete terms, the overload protection has not been designed according to this definition.

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.

Prohibited 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 constructive 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!

12.1 Bypassing the overload protection

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:

- exceeding the shut off limits (utilization more than 100 % or leaving the load chart).
- activating an assembly operation.
- activating an emergency operation.

The displays of the LICCON overload protection remain functioning when all associated sensors and limit switches are active and a load chart is available.



WARNING

Increased danger of accident due to bypass of the overload protection!

If the overload protection is bypassed, there is no additional 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 for assembly or in emergencies!
- ▶ The bypass of the overload protection may only be carried out by persons who are aware of the effects of their acts!
- ▶ Bypassing the overload protection requires the presence of a person authorized by the crane operator and must be performed with utmost caution!
- ▶ Crane operation with bypassed overload protection is strictly prohibited!

12.1.1 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.

Result:

- The LICCON overload protection is bypassed / inactive.
- The “Assembly” icon appears on the LICCON monitor.
- Depending on the circumstances, acoustical and / or optical warning signals (blinkers, flashing lights, bells and horns).

- ▶ 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 acoustical and / or optical warning signals which were triggered by the bypass are turned off again.

12.1.2 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!

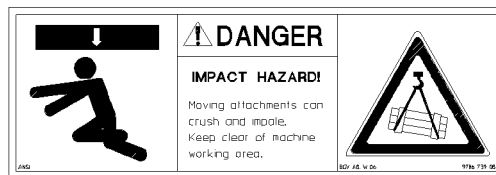
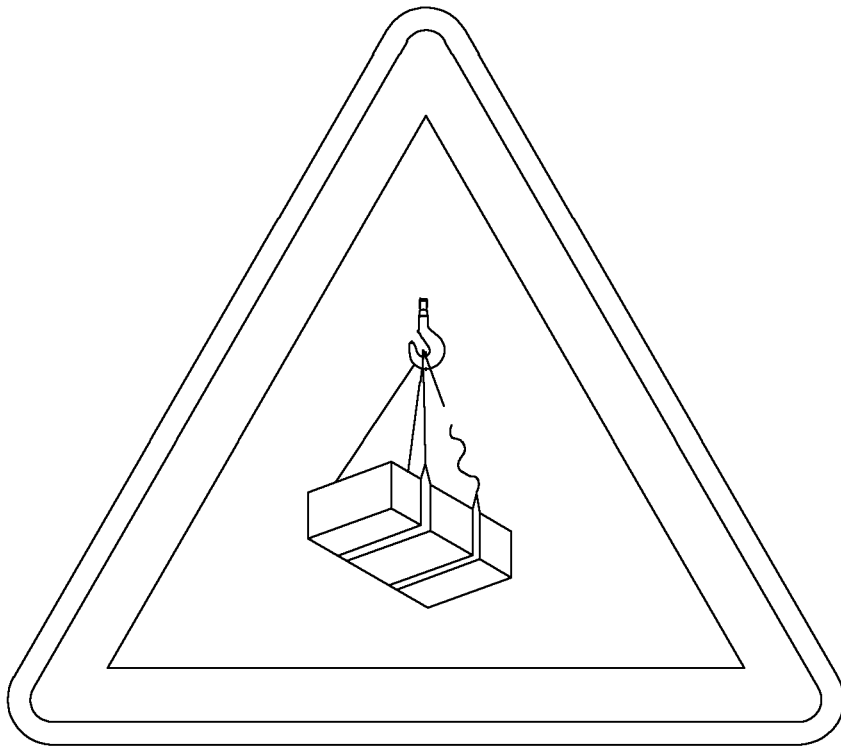
If the hook block contacts the hoist limit switch weight during its upward movement, the hoist limit switch is triggered. The crane movements "Spool up winches", "Luff boom down" and "Telescope telescopic boom out" are turned off. The shut off can be bypassed.

**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.



14 Assembly / disassembly



WARNING

Risk of fatal injury due to incorrect assembly or disassembly!

The assembly / disassembly of components may never be performed by untrained personnel.

Incorrect assembly / disassembly can result in death or severe injuries!

- ▶ Assembly and disassembly may only be carried out by authorized and trained expert personnel!
- ▶ 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!



WARNING

Danger of impact and crushing!

There is a risk of impact and crushing when standing in the vicinity of suspended loads moving sideways.

- ▶ 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



WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling! If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!

- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids!
- ▶ If fall protection equipment is available, then it must be used, 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 specified fall arrest system to prevent falling, see Crane operating instructions, chapter 2.04!
- ▶ The 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!
- ▶ Only step on the aids, ladders and catwalks with clean shoes!
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice!

- ▶ Remaining on a suspended load is 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!
 - ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited!
 - ▶ It is prohibited to walk on the telescopic or an auxiliary boom without suitable protective devices!
 - ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited!
-

**WARNING**

Components not pinned and secured!

If a component is released from the auxiliary crane before having been pinned and secured, the component will fall down! Personnel can be severely injured or killed!

- ▶ Do not disengage the auxiliary crane until the respective component is pinned and secured!
-

**WARNING**

The components can fall down!

If the corresponding component is unpinned without being secured by an auxiliary crane, the corresponding component can fall down and fatally injure personnel!

- ▶ 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. Personnel can be severely injured or killed.

- ▶ 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! Personnel can be severely injured or killed!

- ▶ 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 booms or equipment.
 - ▶ The detailed information and danger notes in the respective chapters must be observed and adhered to.
-

14.2 Pin connections



WARNING

Danger due to pin connections!

If the pins / pin connections are not properly greased or lubricated before assembly, then they can corrode, seize in the pin bores and / or be damaged!

This could result in high property damage!

Personnel can be severely injured or killed due to suddenly releasing pins at disassembly!

- ▶ 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.
-

14.3 Guiding crane sections, lattice sections or crane components



WARNING

Danger due to oscillating load!

During the assembly of crane sections, lattice sections or crane components with the auxiliary crane, they can start to swing back and forth!

Personnel can be severely injured or killed!

- ▶ To guide and position crane sections, lattice sections or crane components always use a guide rope.
 - ▶ Make sure that the guide rope is sufficiently long and that the assembly personnel does not enter the danger zone.
-

14.4 Assembly / disassembly of booms

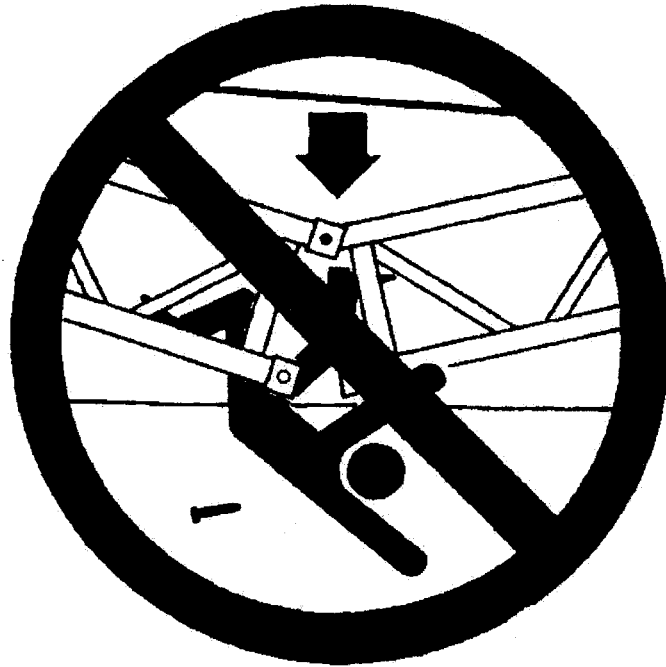


WARNING

The crane can topple over!

Angular pull can overload the crane. Overload can cause destruction of the crane or cause it to topple over.

- ▶ The hook block must always be attached vertically over the center of gravity of the load to be lifted!
 - ▶ Angular pull is prohibited!
-



B113444

**WARNING**

Danger of accident at assembly / disassembly of booms!

The disassembling of unsecured or unsupported booms may result in fatal injury or mutilation.

- ▶ 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 bearing points 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!

**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 detach themselves when the pins are unpinned. This represents a fatal injury risk to assembly personnel.

- ▶ 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.

14.5 Fastening positions for assembly / disassembly of the lattice jib



WARNING

Danger of fatal accidents due falling components!

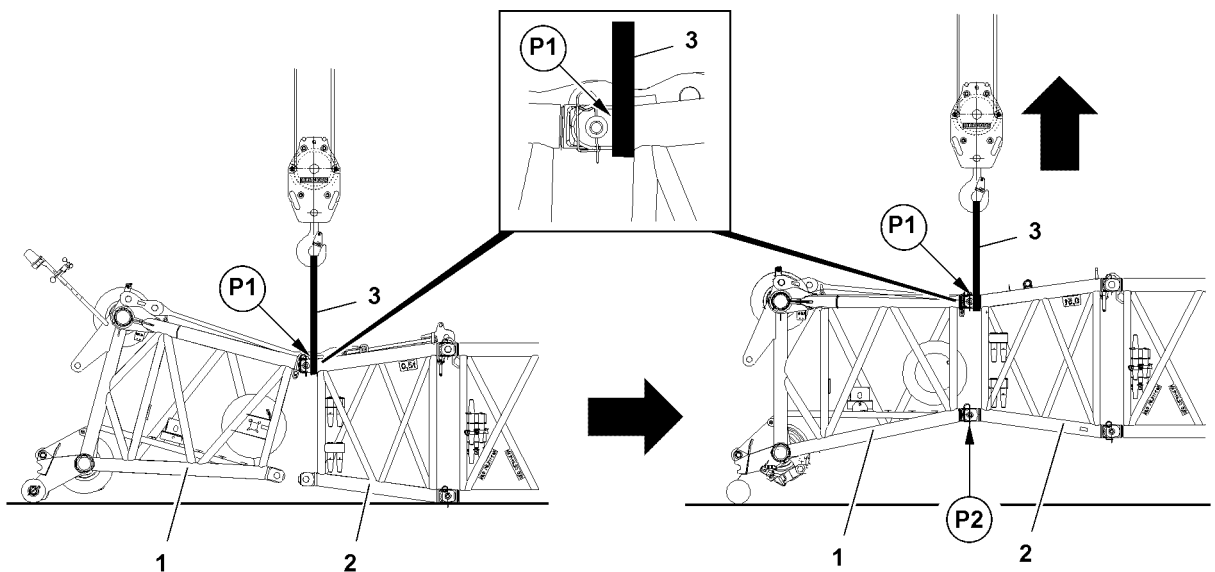
The maximum permissible tensile load on the fastening eye is engraved on the fastening eye.

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!

14.5.1 Closing the end section



B117840

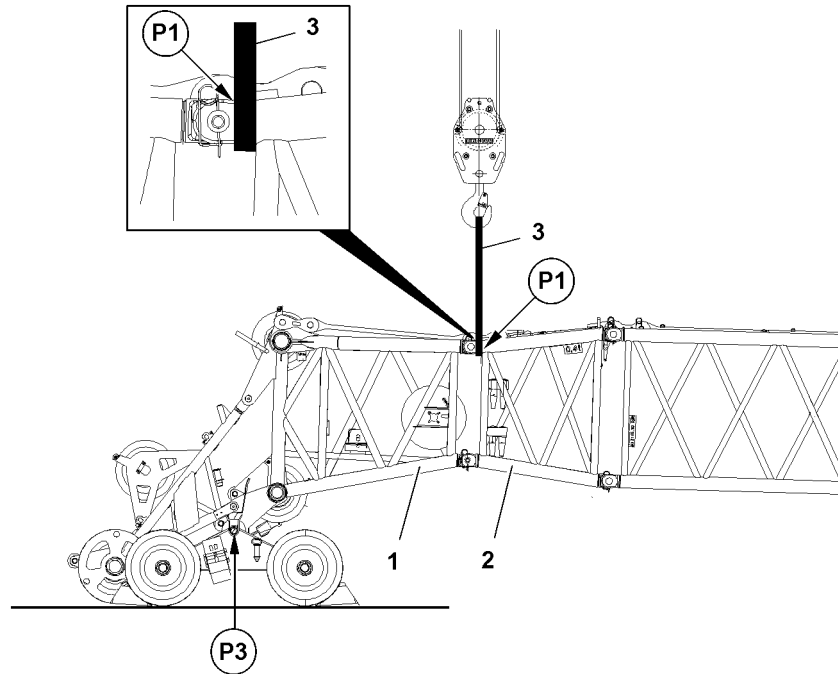
Closing the end section

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**.

14.5.2 Placing the lattice jib into the pulley cart



B117842

Placing the lattice jib into the pulley cart

When placing it into the pulley cart, observe the following:

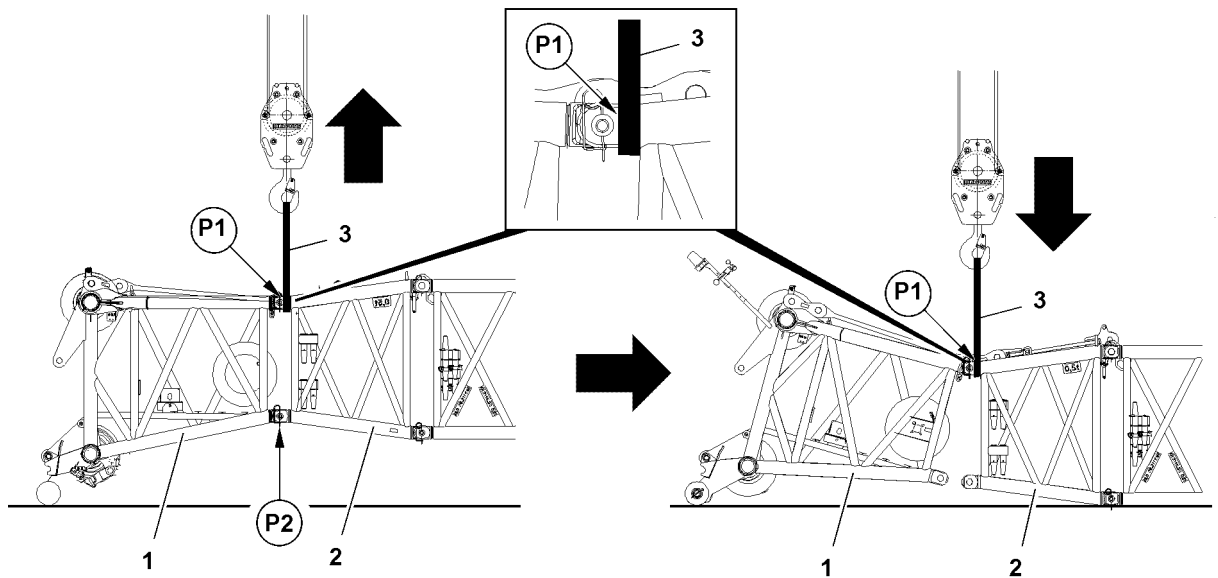
- The end section **1** is completely installed.
- Use textile type fastening equipment **3**.
- Loop the textile type fastening equipment **3** on the left and right around on the pin points.
- ▶ Before fastening:
Check the position of the spring retainers and correct, if necessary.
- ▶ Fasten the textile 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**.



Note

- ▶ The disassembly and removal of the pulley cart **4** is handled accordingly.

14.5.3 Opening the end section



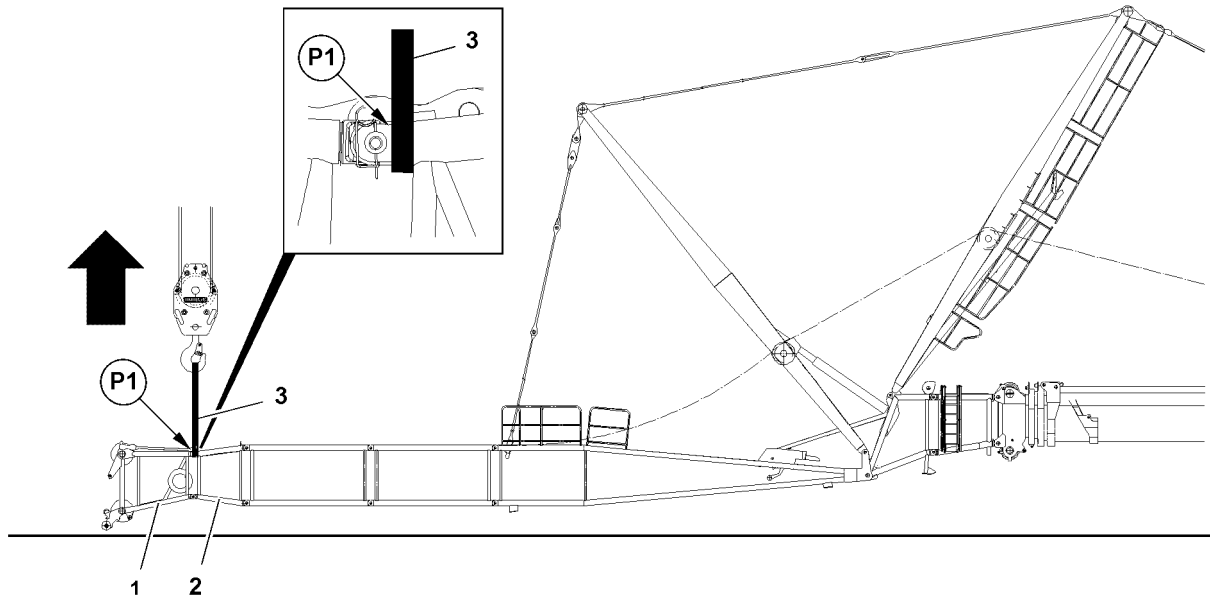
B117841

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**.

14.5.4 Holding the luffing lattice jib



B117843

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.

14.5.5 Assembling the fixed lattice jib on the TF-adapter



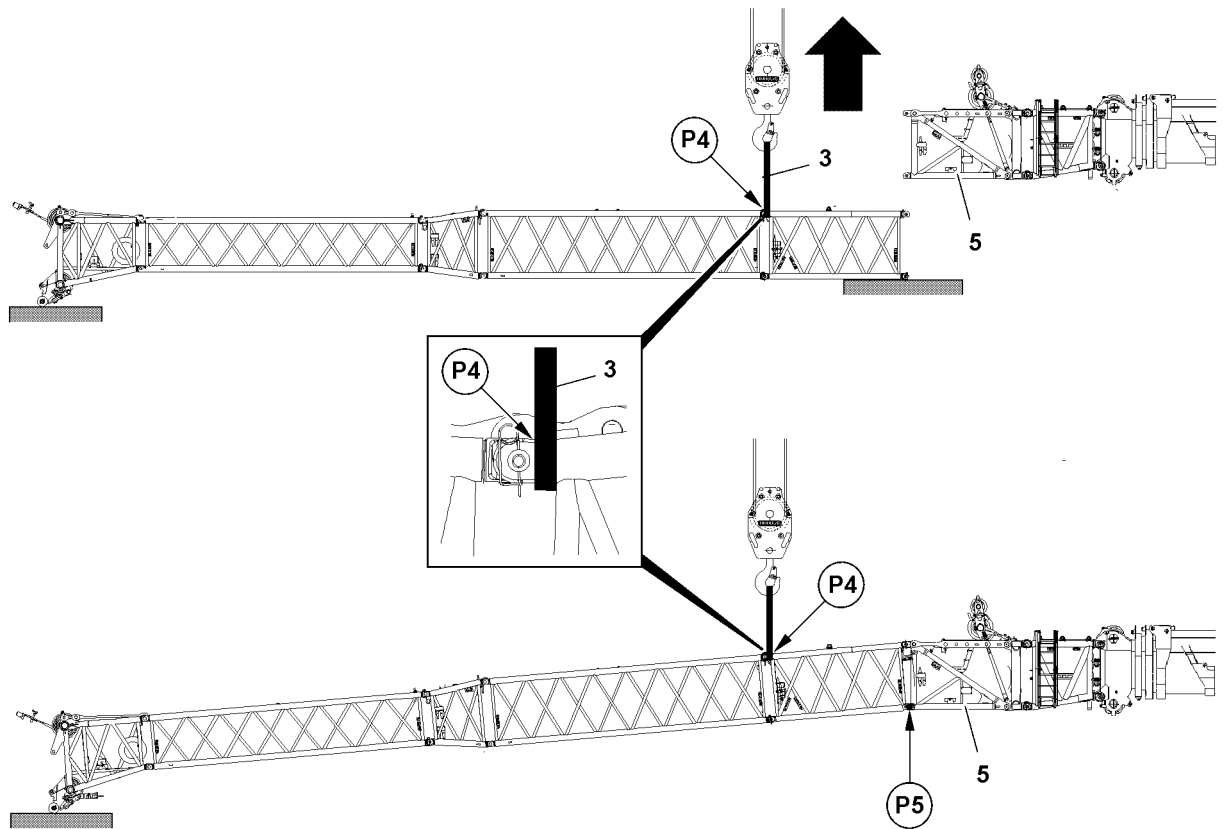
WARNING

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.



B117844

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**.



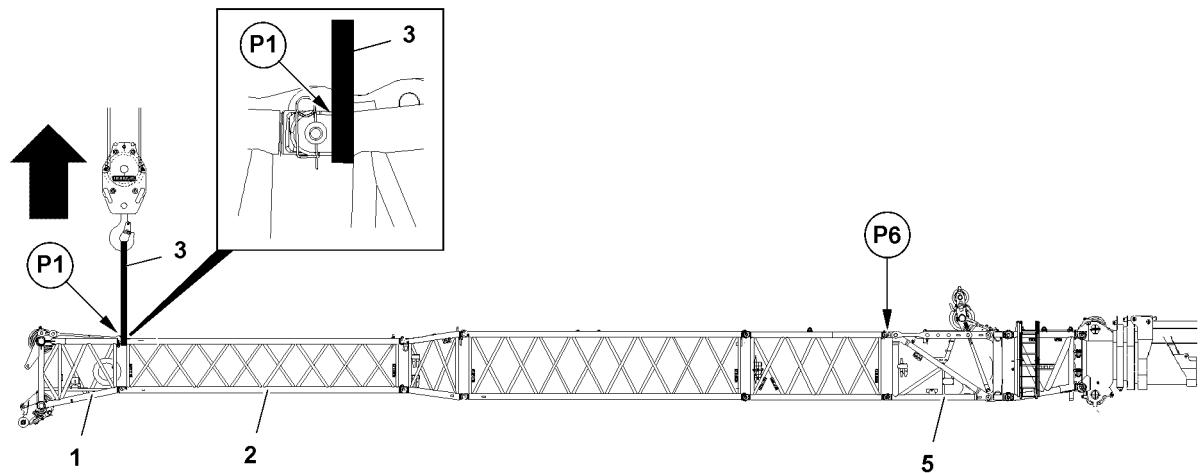
WARNING

Mortal danger if the lattice jib tilts over!

- Make sure to observe the permissible lattice jib length at disassembly.

- Disassemble accordingly.

14.5.6 Closing the fixed lattice jib



B117850

Closing the lattice jib

For installation on the TF-adapter, observe the following:

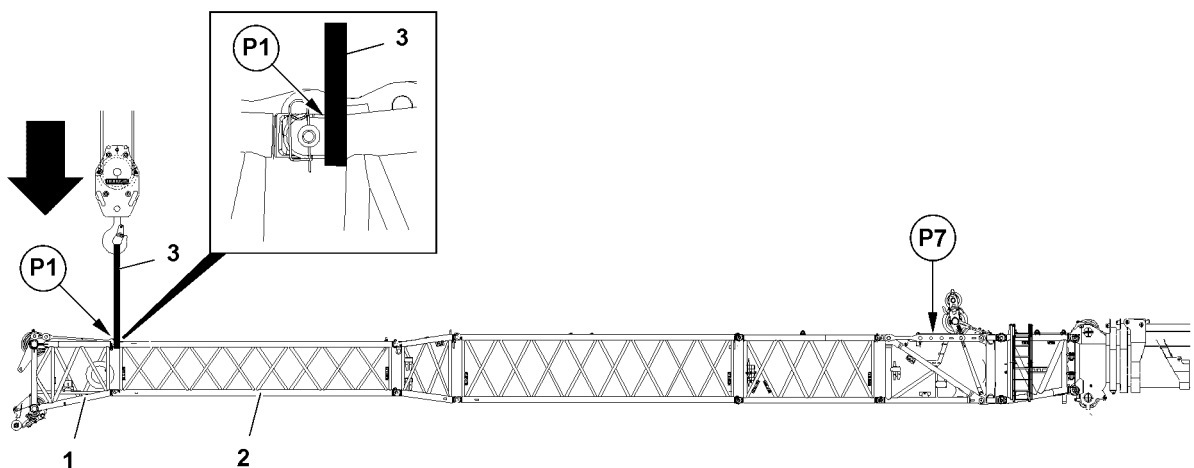
- The lattice jib is pinned on the lower pin points of the TF-adapter 5.
- Use textile type fastening equipment 3.
- Loop the textile type fastening equipment 3 on the left and right around on the pin points.
- ▶ Before fastening:
 - Check the position of the spring retainers and correct, if necessary.
- ▶ 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.

14.5.7 Angle adjustment on the fixed lattice jib



B117851

Angle adjustment on the fixed lattice jib

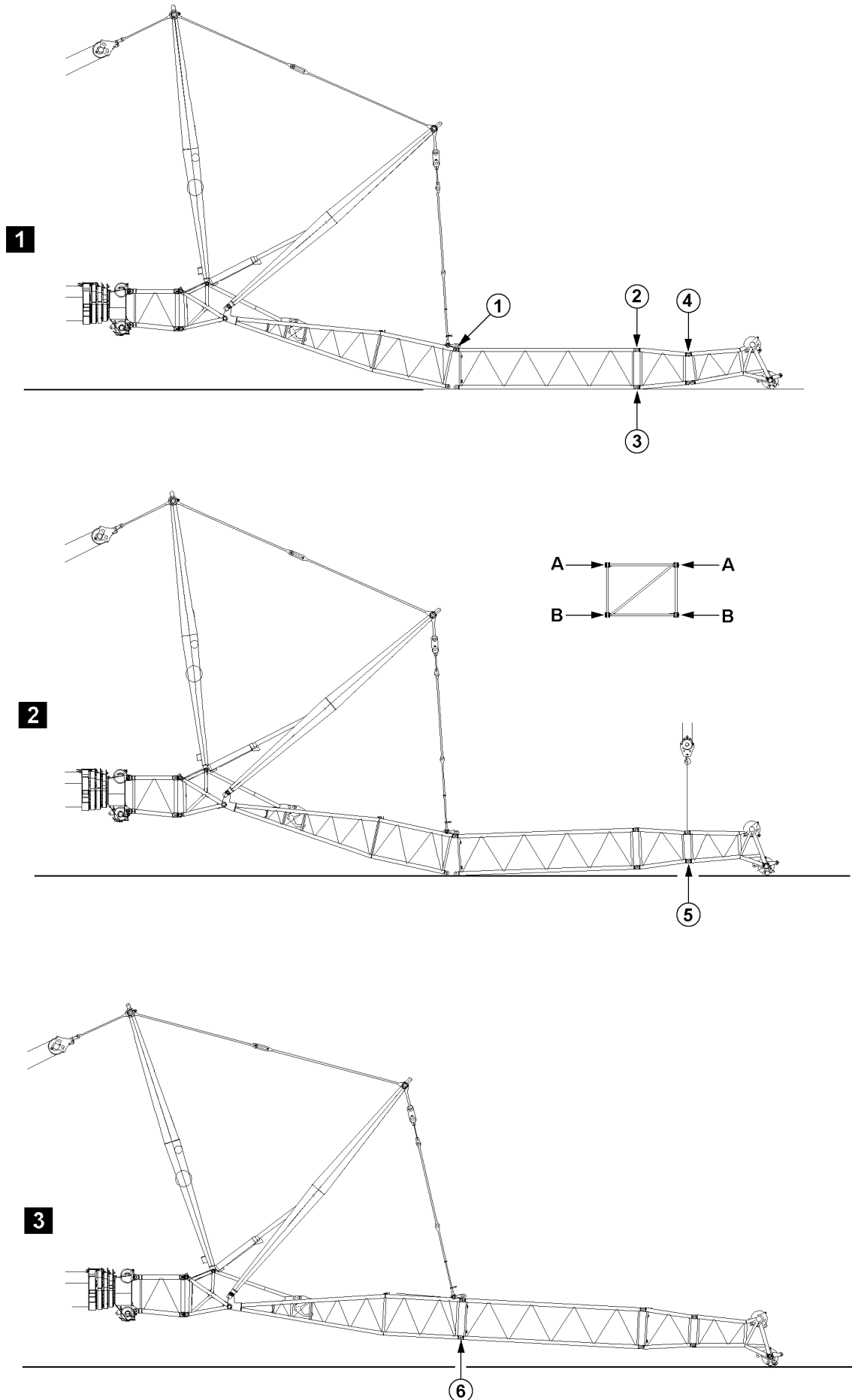
For the angle adjustment on the fixed lattice jib, observe the following:

- 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.
- ▶ Lower the lattice jib and adjust the respective angle on the lattice jib.
- ▶ Pin the angle adjustment **P7**, see Crane operating instructions, chapter 5.03.
- ▶ After pinning:
 - Remove the textile type fastening equipment **3**.

14.5.8 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.



B197718

Example for cranes with telescopic boom

14.6 Assembly of lattice sections for telescopic cranes

14.6.1 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

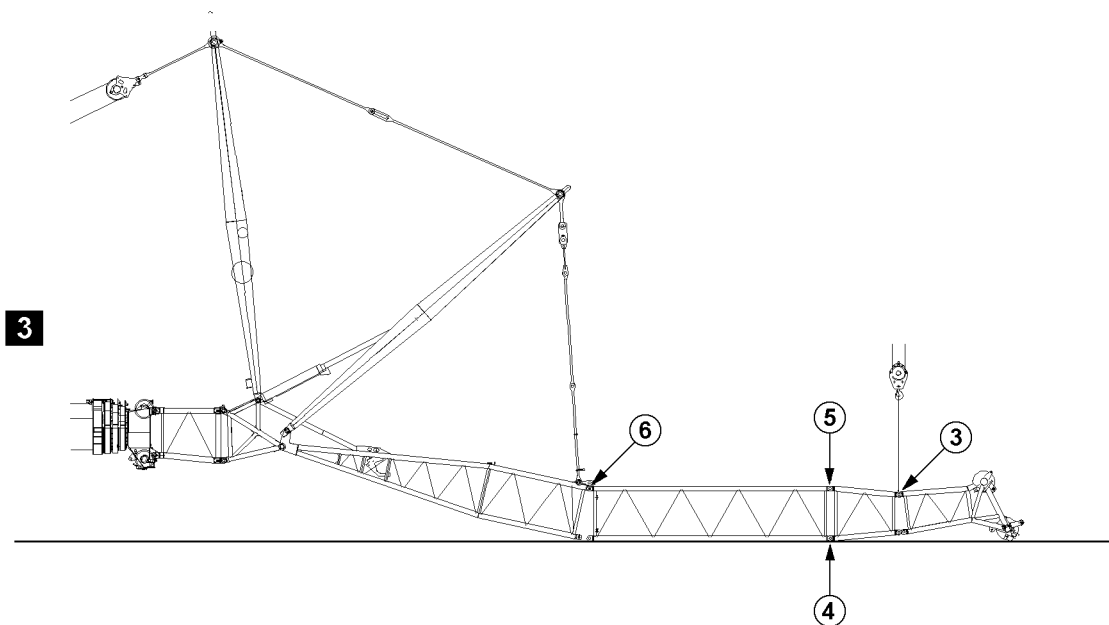
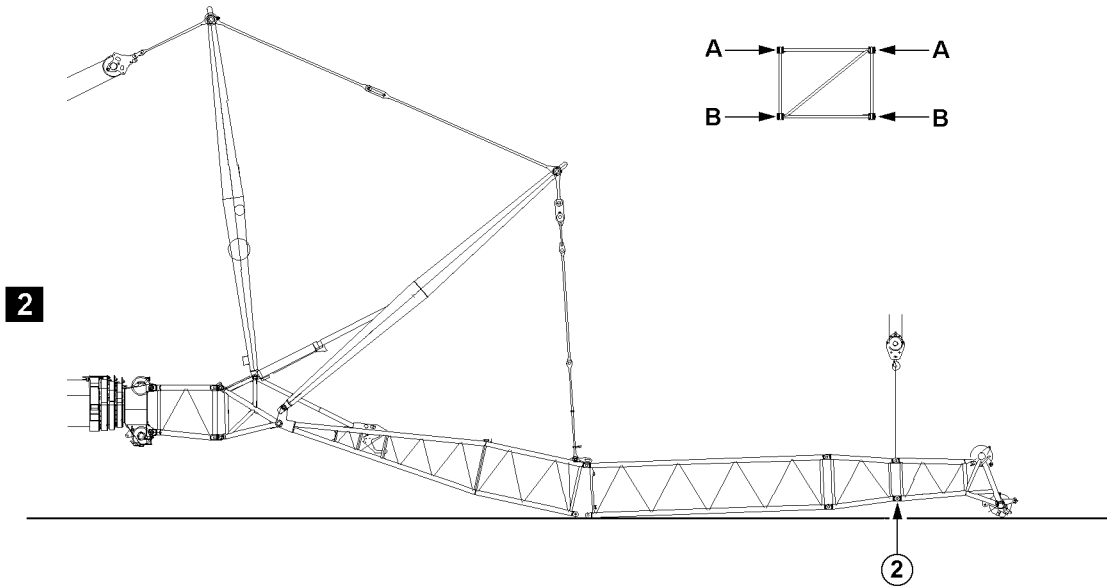
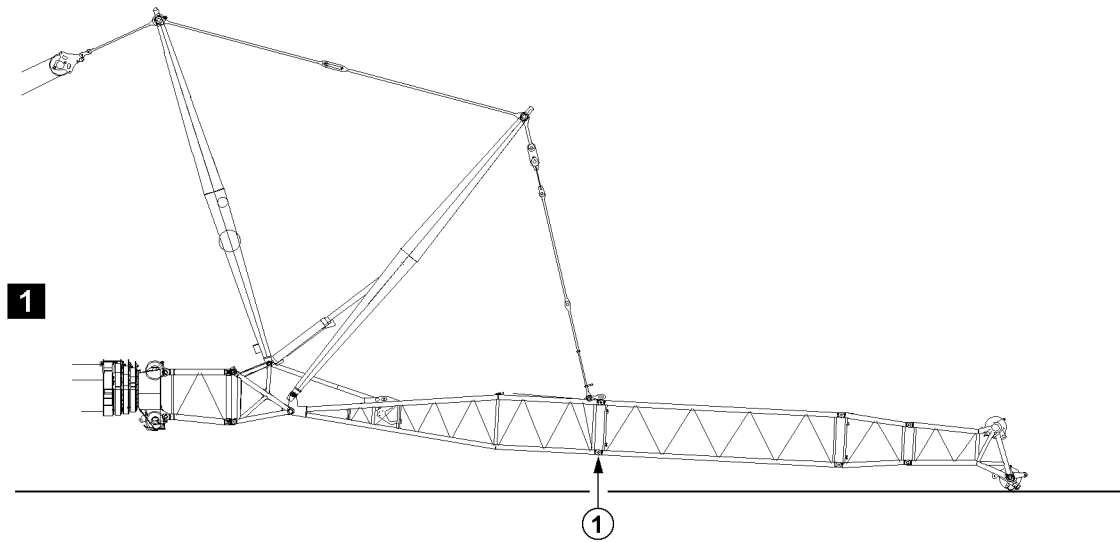
Danger of fatal injury when assembling auxiliary booms!

If the pins are not pinned in the given sequence, then lattice sections may suddenly fold down or fall down.

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**.
- ▶ 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**.



B197719

Example for cranes with telescopic boom

14.6.2 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

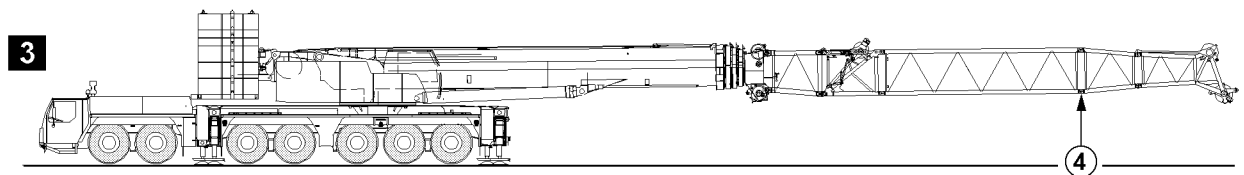
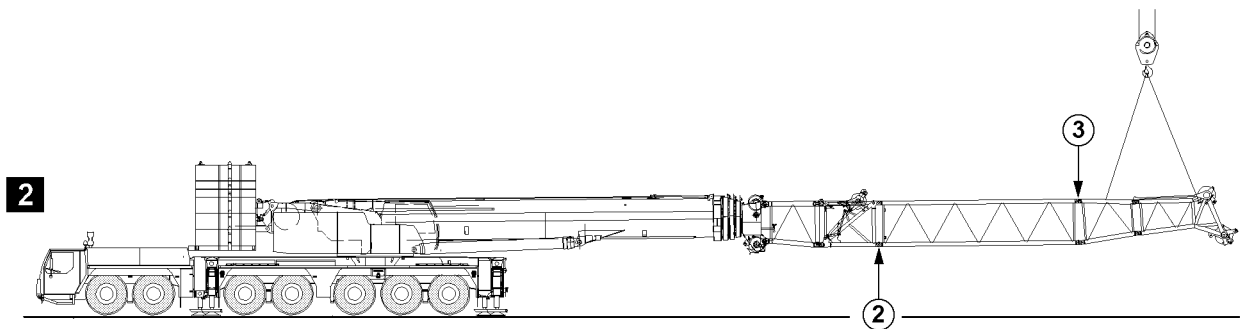
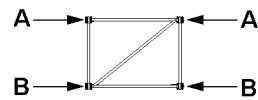
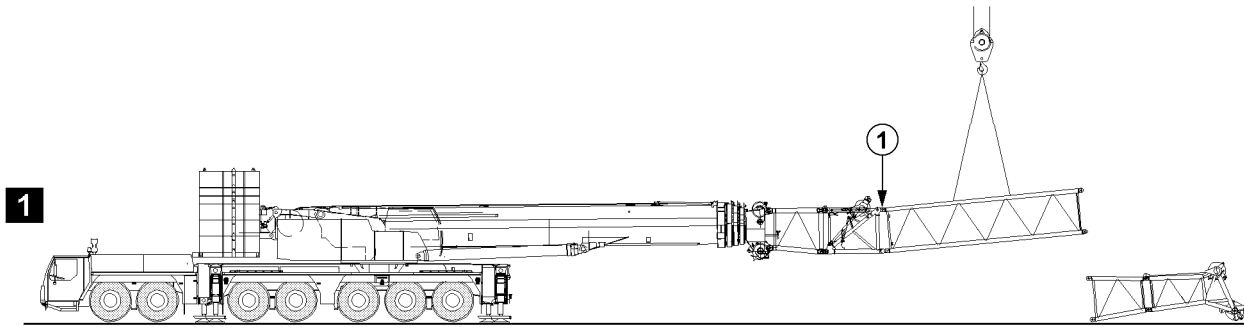
Risk of fatal injury when disassembling auxiliary booms!

If the pins are not unpinned in the given sequence, then lattice sections may suddenly fold down or fall down.

Personnel can be killed or seriously injured!

▶ 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.



14.6.3 Assembly of lattice sections on self-supporting auxiliary booms using an auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.



WARNING

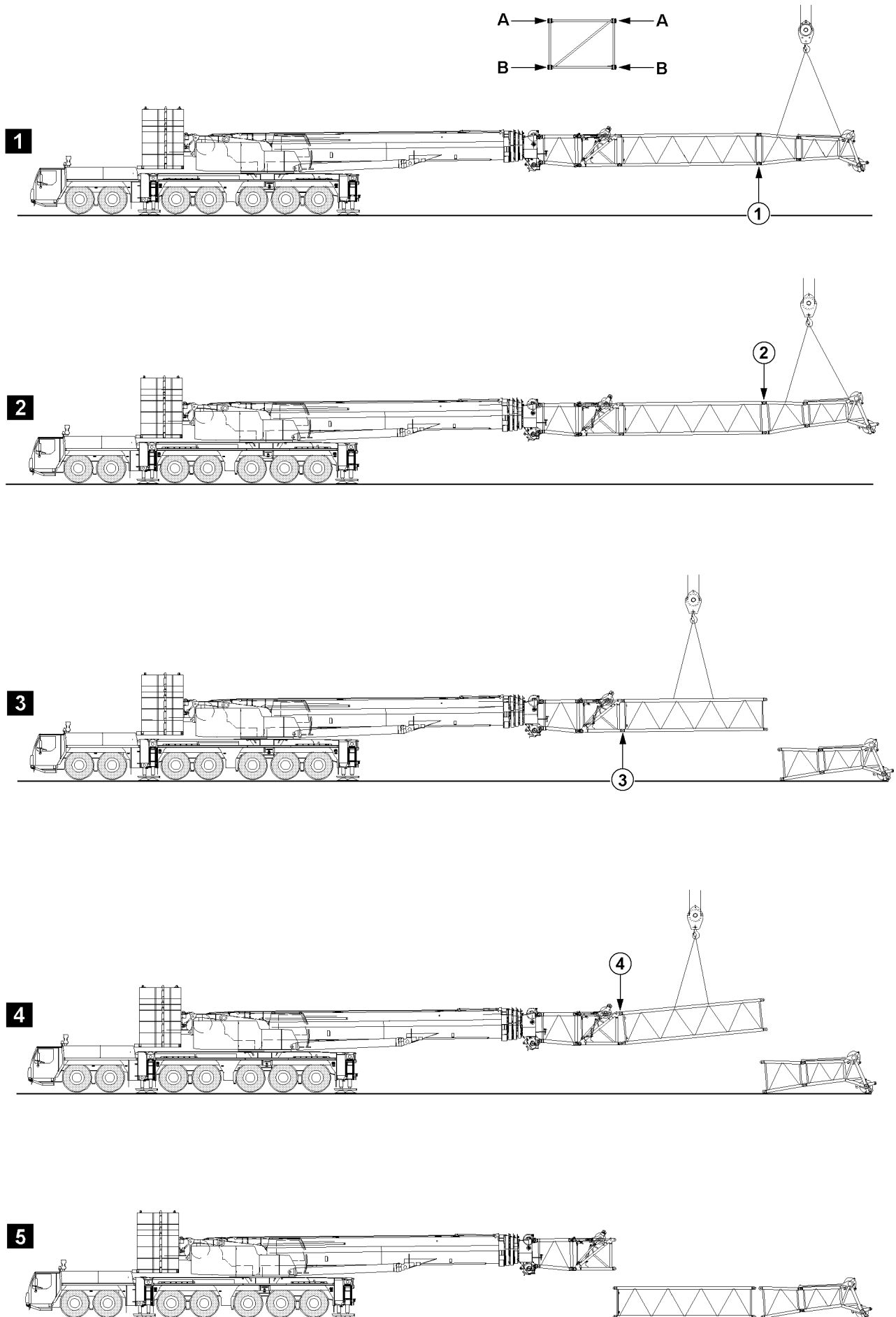
Danger of fatal injury when assembling auxiliary booms!

If the pins are not pinned in the given sequence, then lattice sections may suddenly fold down or fall down.

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**.



B105510

Example for cranes with telescopic boom

14.6.4 Disassembly of lattice sections on self-supporting auxiliary booms using an auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.



WARNING

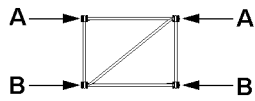
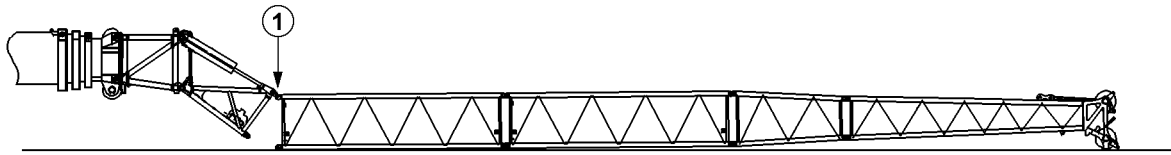
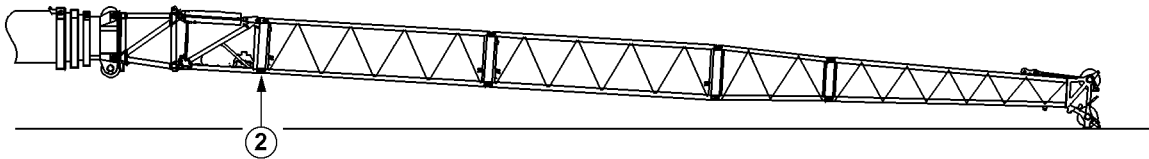
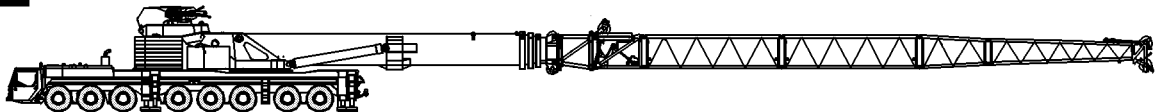
Risk of fatal injury when disassembling auxiliary booms!

If the pins are not unpinned in the given sequence, then lattice sections may suddenly fold down or fall down.

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**.

1**2****3**

14.6.5 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.

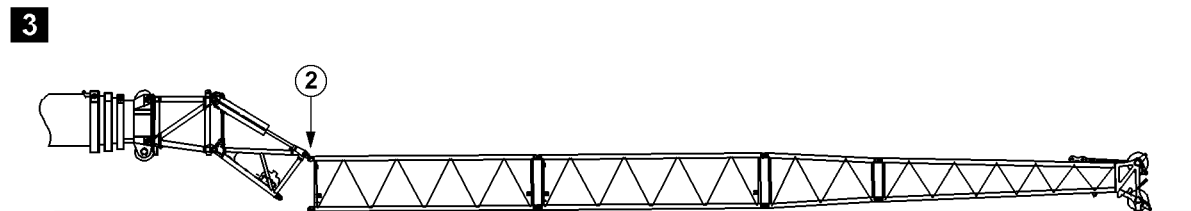
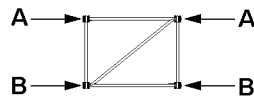
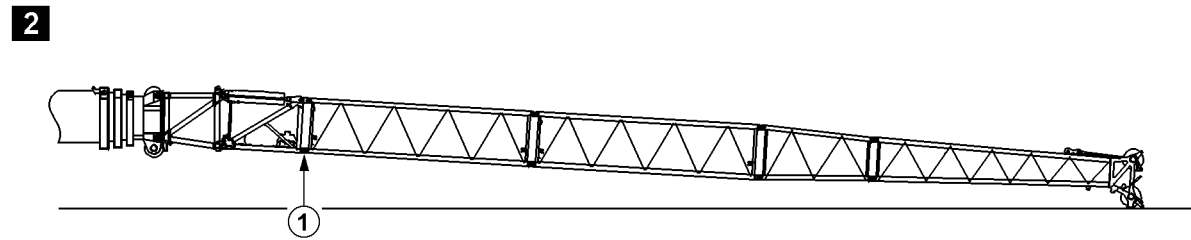
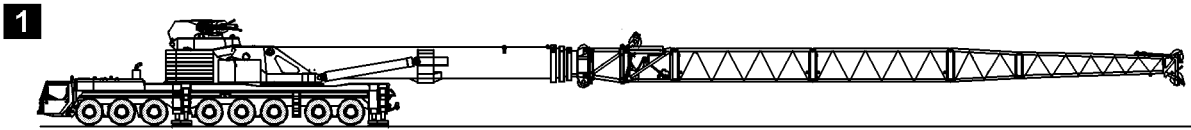
Personnel can be killed or seriously injured!

- ▶ 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**.



14.6.6 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

Risk 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.

Personnel can be killed or seriously injured!

- ▶ 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".
-

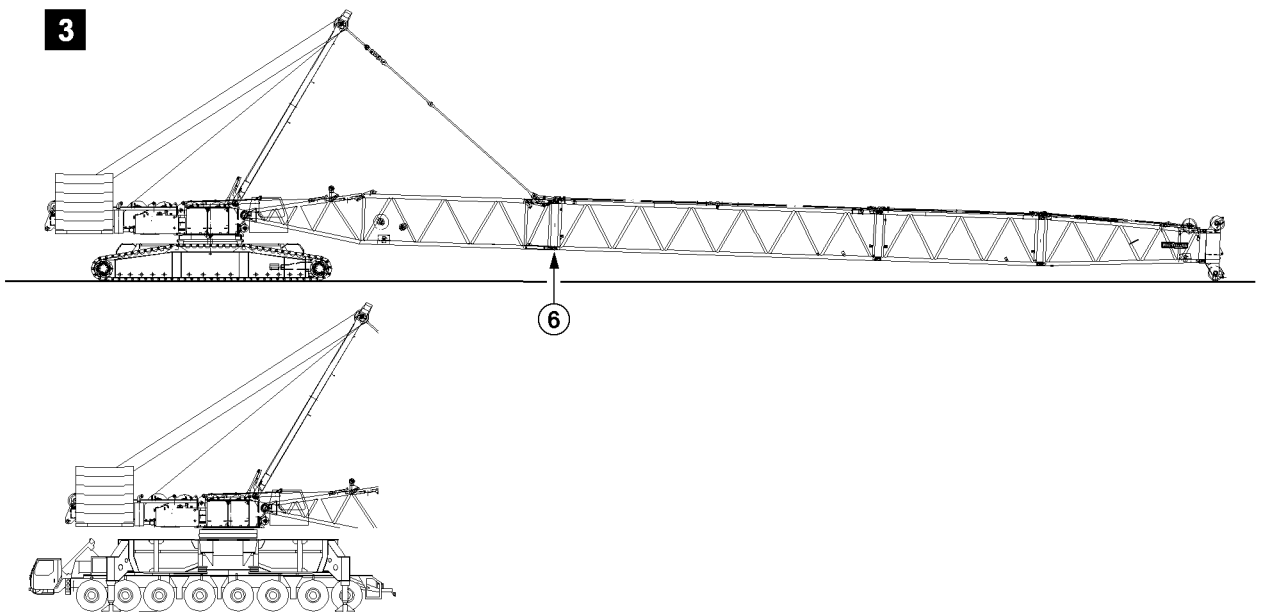
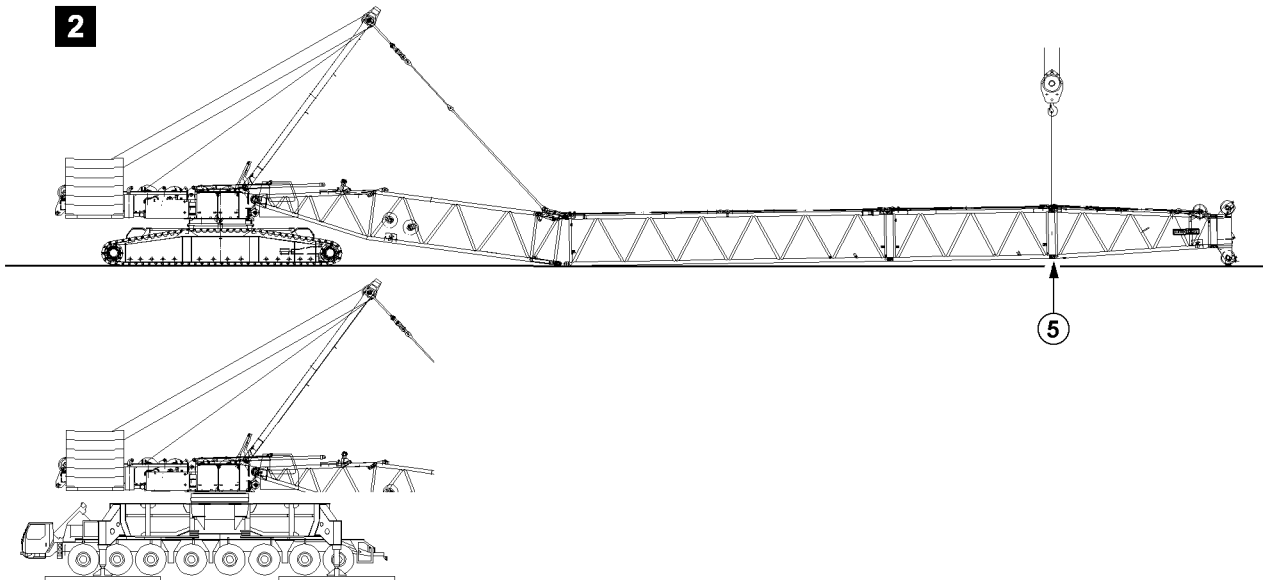
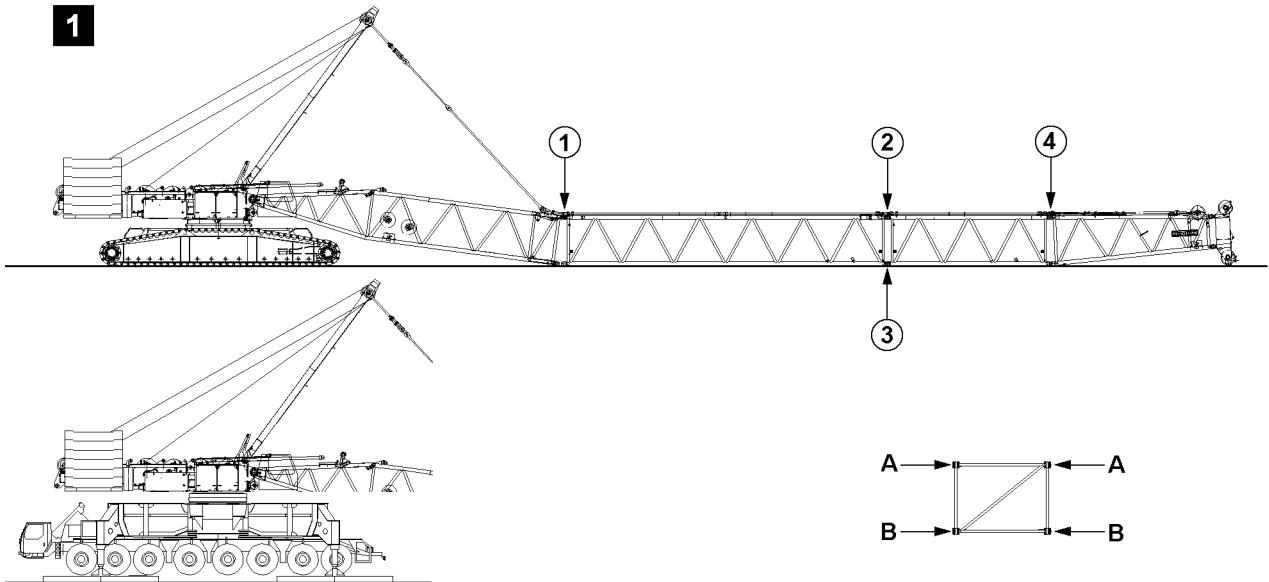
- ▶ Luff the main boom down until the end section touches the ground slightly, illustration 2.
 - ▶ Release and unpin the pins at both sides (level **B**) at point **1**, illustration 2.
-

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.



B197710

Example for cranes with lattice mast booms

14.7 Assembly of lattice sections for lattice mast cranes

14.7.1 Assembly of lattice sections

The illustrations serve as examples. The illustrations may differ depending on the crane.



WARNING

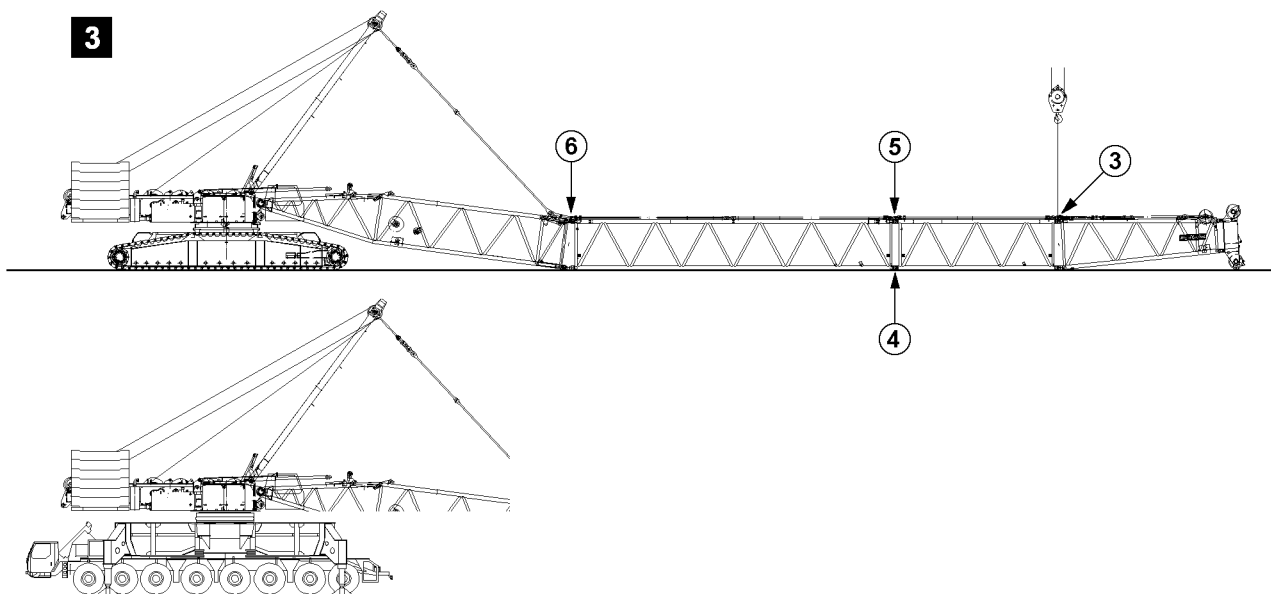
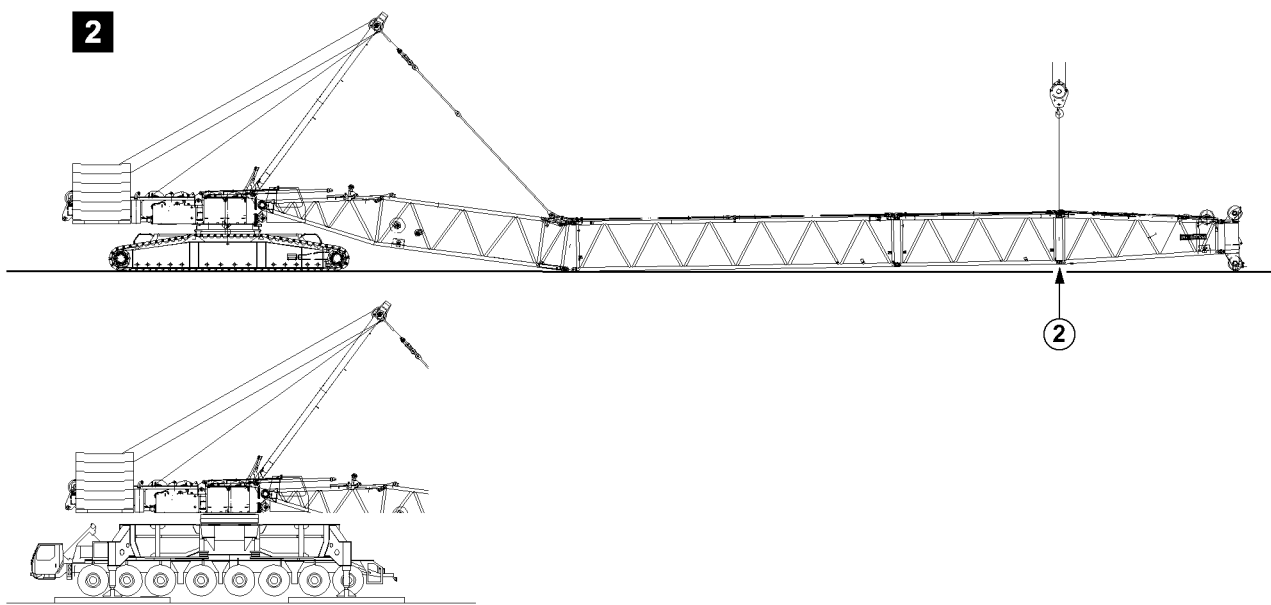
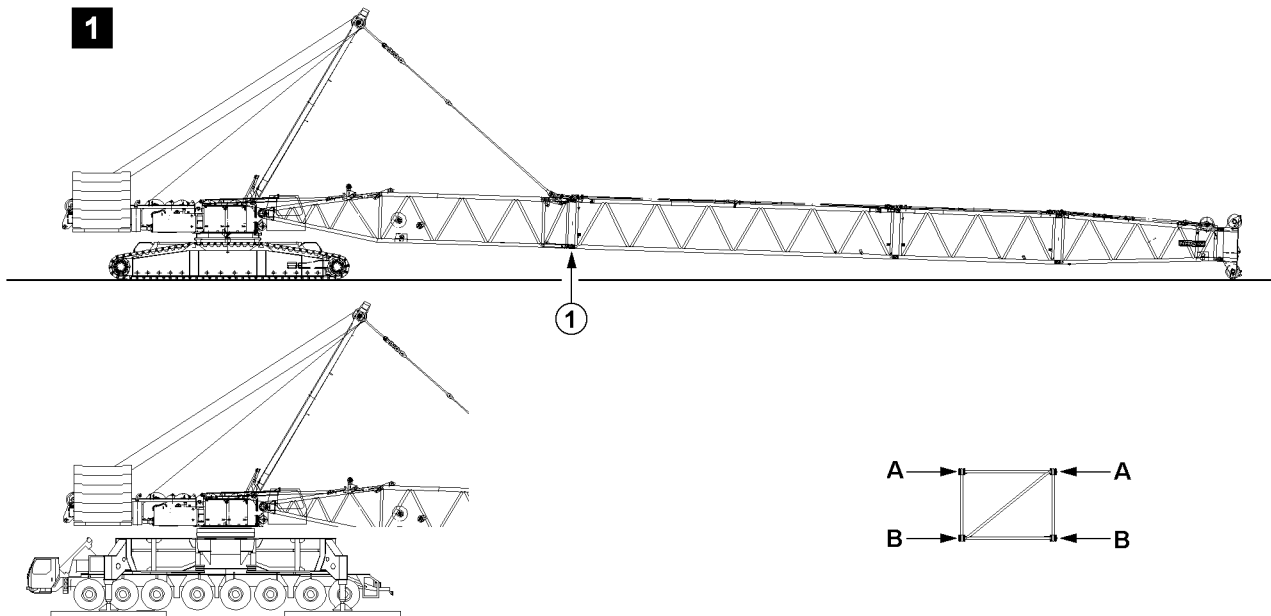
Risk of fatal injury when assembling booms!

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**.
 - ▶ Lift the lattice sections, illustration **3**.
 - ▶ Pin and secure pins at both sides (level **B**) at point **6**, illustration **3**.



B197711

Example for cranes with lattice mast booms

14.7.2 Disassembly of lattice sections

The illustrations serve as examples. The illustrations may differ depending on the crane.



WARNING

Risk of fatal injury when disassembling booms!

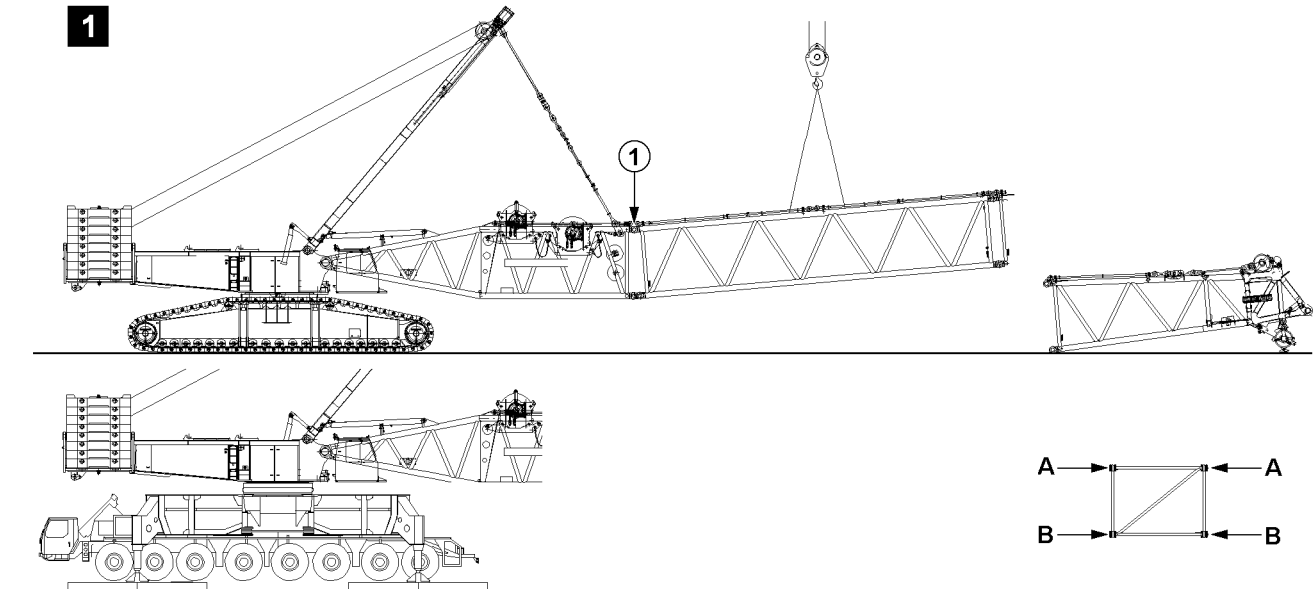
If the pins are not unpinned in the given sequence, then lattice sections may suddenly fold down or fall down.

Personnel can be killed or seriously injured!

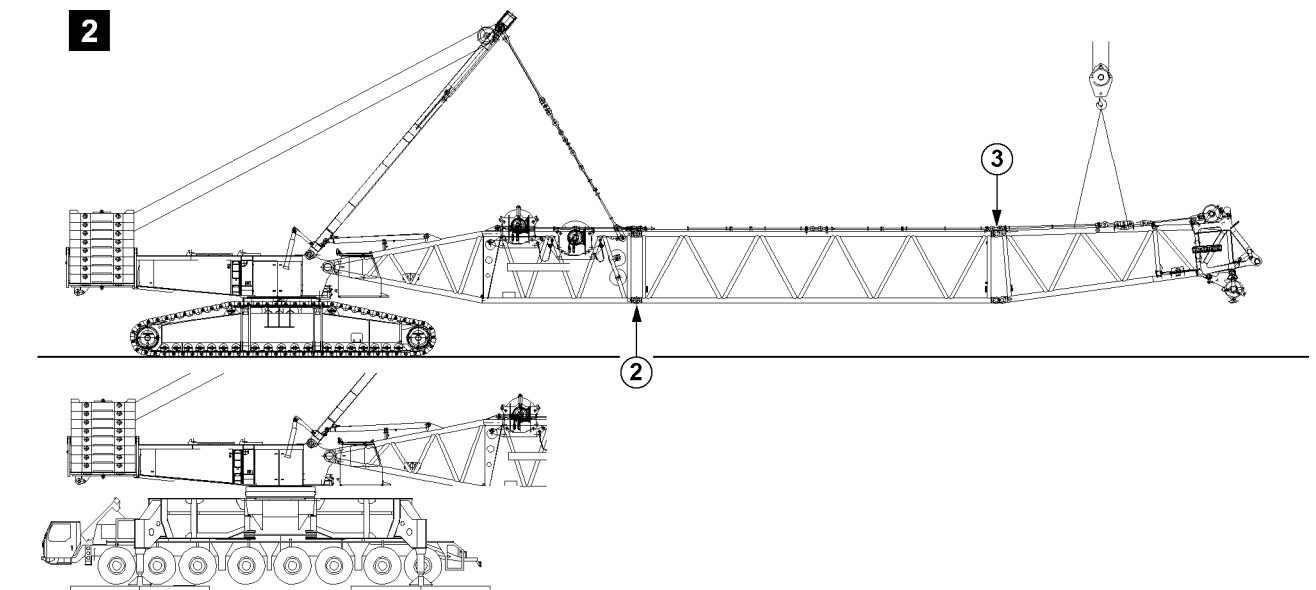
▶ Pins must be unpinned in the order specified!

- ▶ Luff the 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.

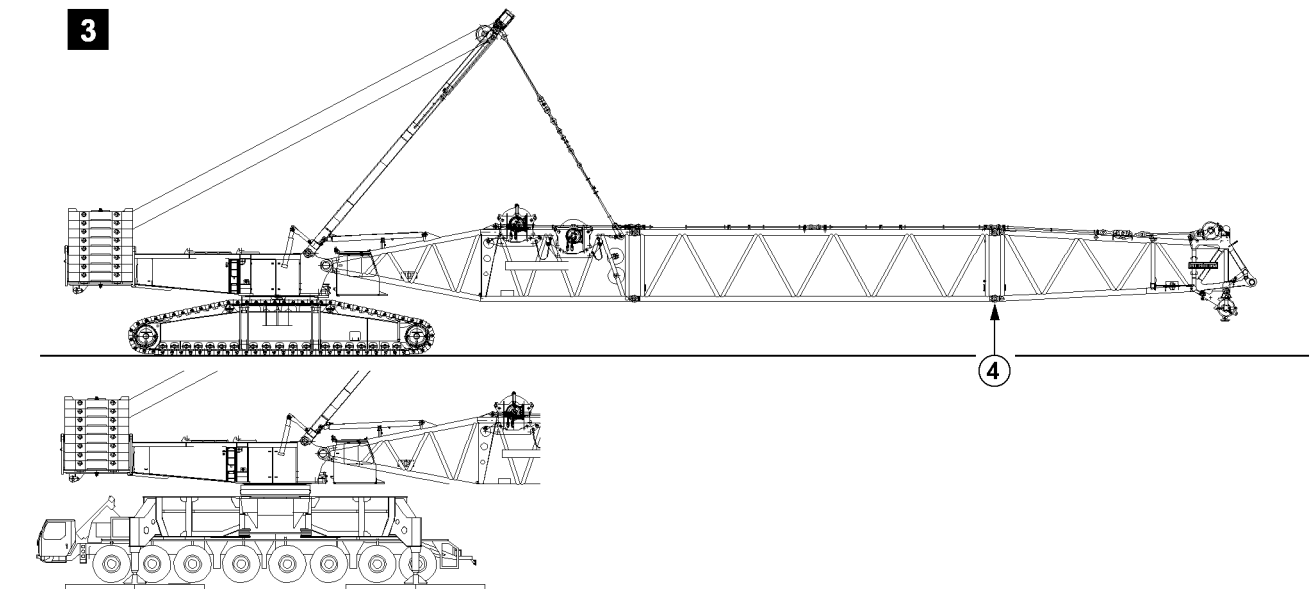
1



2



3



B198182

Example for cranes with lattice mast booms

14.7.3 Flying assembly of lattice sections

The illustrations serve as examples. The illustrations may differ depending on the crane.



WARNING

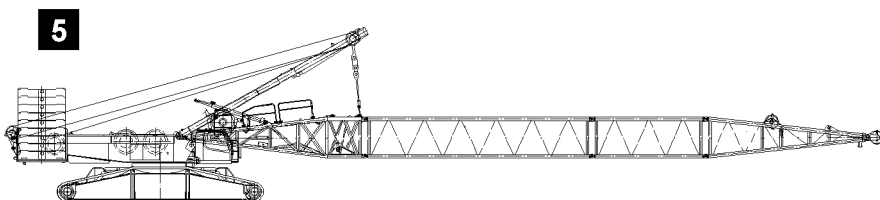
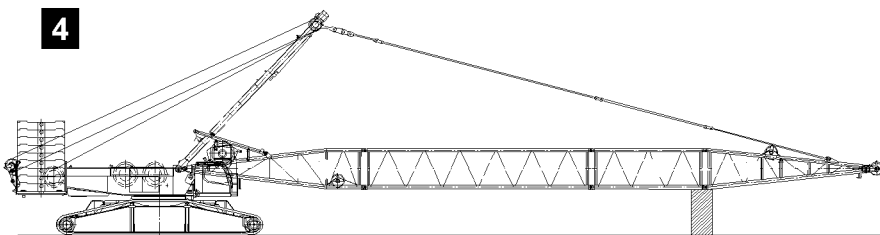
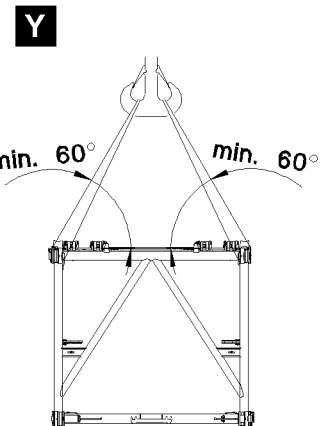
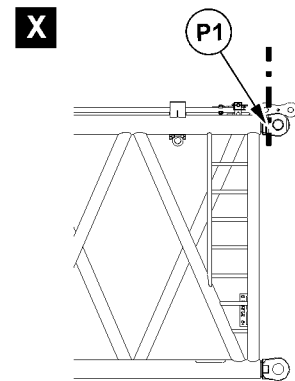
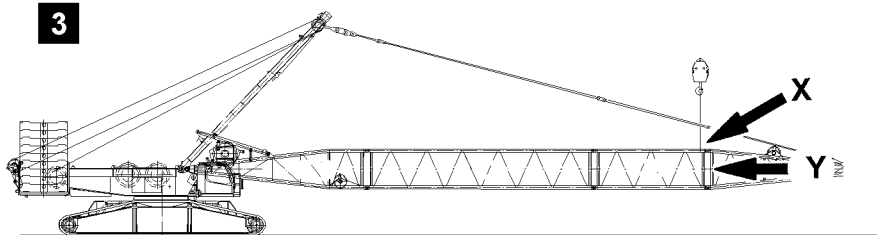
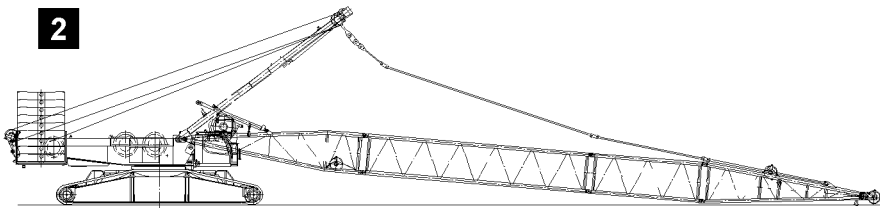
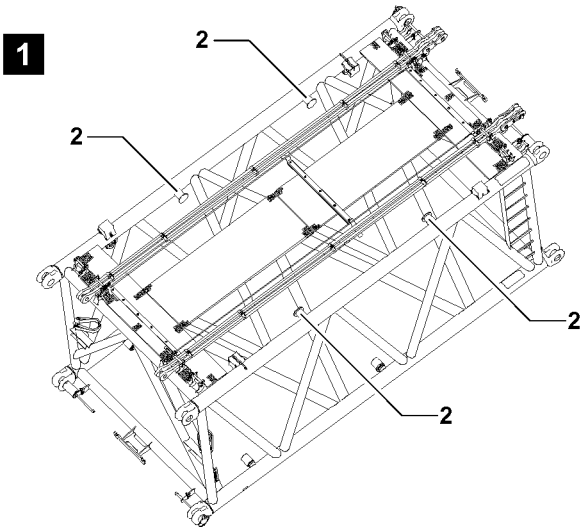
Risk of fatal injury when assembling booms!

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**.



B111448

Guying the pivot section with the SA-frame

14.7.4 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 bits **2** when securing the boom, then the bits 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 bits **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.

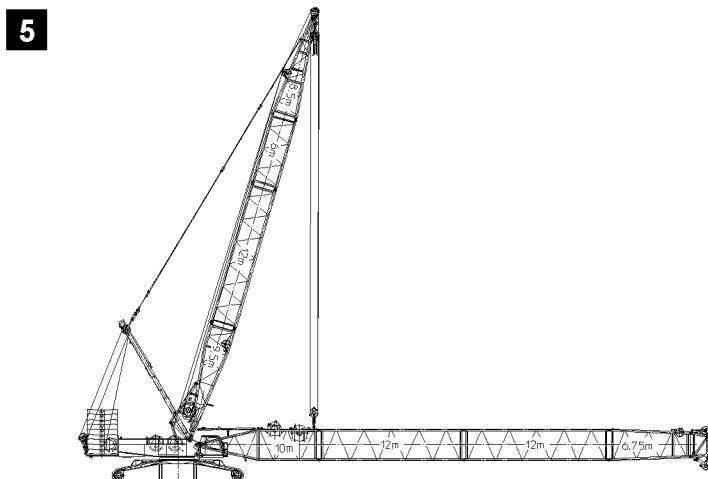
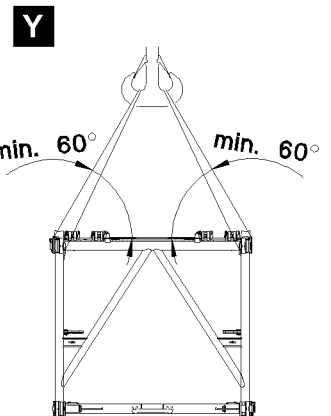
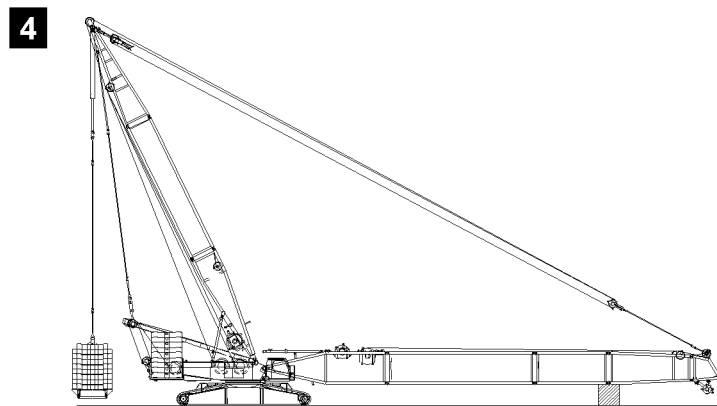
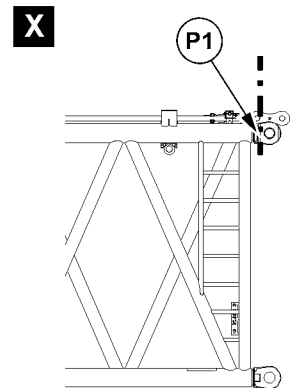
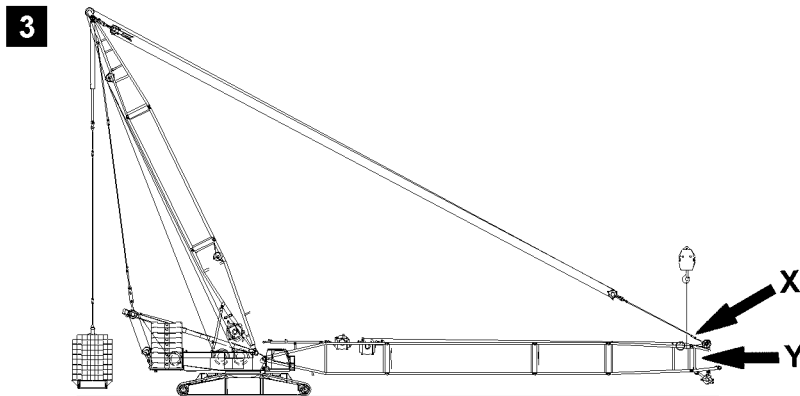
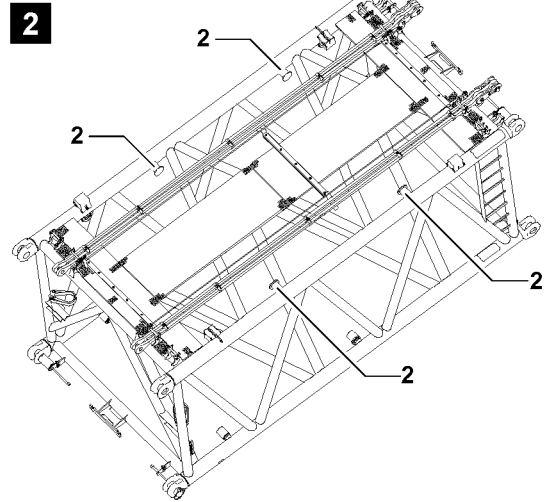
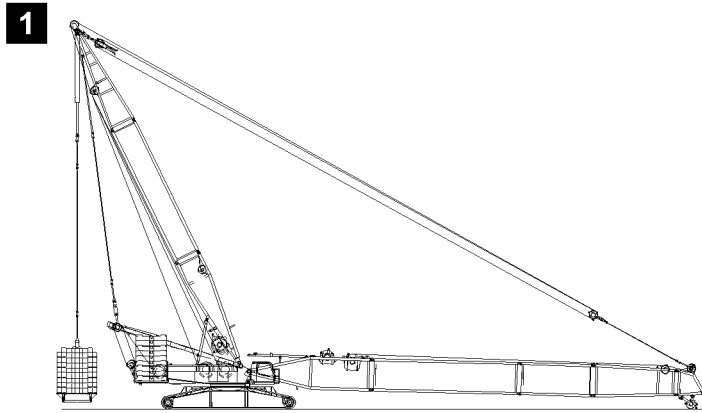
Result:

- 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.



Guying the pivot section with the derrick boom

B111449

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 bits **2** when securing the boom, then the bits 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 bits **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**.

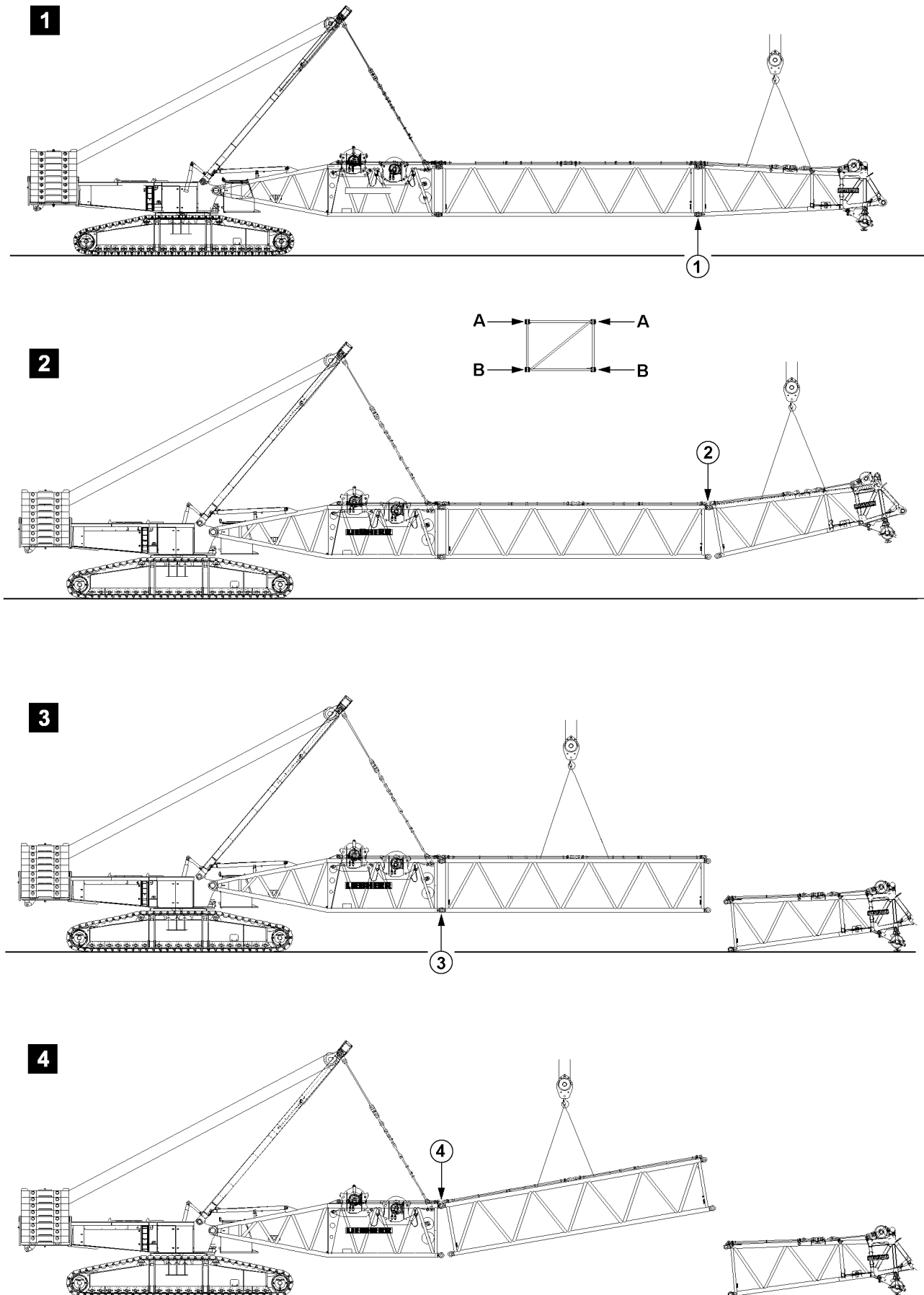
Result:

- 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 SA-frame, see illustration **5**.
- The lattice sections can be disassembled in flying mode.



B105511

Example for cranes with lattice mast booms

Unpinning the lattice components



WARNING

Risk of fatal injury when disassembling booms!

If the pins are not uninned in the given sequence, then lattice sections may suddenly fold down or fall down.

Personnel can be killed or seriously injured!

▶ Pins must be uninned 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**.

14.8 Bypass for assembly and 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.



WARNING

High risk of accident in crane operation with activated “Bypass at assembly and disassembly”!

At activated “Bypass at assembly and disassembly” the overload protection and possible the hoist limit switches are bypassed!

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)!

14.8.1 Activating the Bypass at assembly and disassembly



Note

- ▶ Applies only for cranes with LICCON overload protection.
- ▶ Indicator light “Assembly” is only present in the instrument panel for certain crane types.



B113438

- 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, acoustical and / or optical warning signals (blinkers, flashing lights, bells and horns).

14.8.2 Bypass at assembly and disassembly**Note**

- ▶ Applies only for cranes with LICCON overload protection.
- ▶ Indicator light “Assembly” is only present in the instrument panel for certain crane types.



B113437

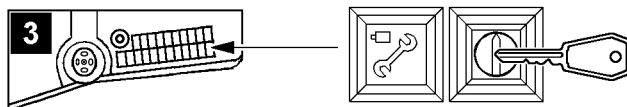
- ▶ No longer actuate the respective operating element or reset.

Result:

- The LICCON overload protection is active and the “Bypass at assembly and disassembly” is deactivated.
- The “Assembly” icon turns off in the LICCON monitor and / or the indicator light “Assembly” in the instrument panel no longer lights up.
- The acoustical and / or optical warning signals which were triggered by the bypass are turned off again.

14.9 Bypassing during crawler assembly**Note**

- ▶ Applies only for cranes with crawler assembly key button.



B113441

- Illustration 3: Crawler assembly key button and indicator light

Make sure that the following prerequisite is met:

- The LICCON overload protection is bypassed / inactive and the “Bypass at assembly and disassembly” is activated.

**WARNING**

High risk of injury in case of actuated crawler assembly key button!

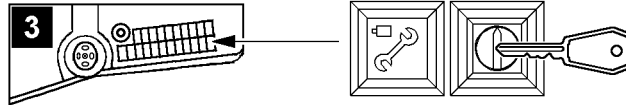
Operating the crawler assembly key button bypasses the overload protection! No shut off at overload will occur in assembly mode or in crane operations!

In the event of deliberate misuse, the crane can topple over!

Personnel can be killed!

This could result in high 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!



B113441

- ▶ Actuate the crawler assembly key button.

Result:

- The LICCON overload protection is inactive.
- The indicator light “Crawler assembly” lights up.

- ▶ If the bypass at crawler assembly is to be turned off:
Turn the crawler assembly off by pressing the off button.

Result:

- The indicator light in the button turns off.

14.10 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-release couplings (particularly return lines) can result in serious accidents due to component failure!

Personnel can be severely injured or killed!

- ▶ Check the quick-release couplings after installation for correct connection.



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!

Personnel can be severely injured or killed!

- ▶ 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.

14.11 Assembly / disassembly of electrical lines

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!

NOTICE

Corroding of plug connections!

The plug connections are only protected when plugged in. If the plug connections are not plugged in, then the contact surfaces can corrode!

- ▶ Always plug or screw the plug connections together properly!
- ▶ Keep plug connections clean and dry! Clean contact surfaces provide the best signal transfer.

- ▶ If a pull release for the cable drum is present:
Hang the pull release in on the fixed point and relieve the plug connections from the pull strain.
- ▶ After installing the plug connections:
Check all plug connections for proper connection.
- ▶ If a plug connection is not properly connected:
Plug or screw the plug connection together properly.
- ▶ After removing the plug connections:
Protect the electrical connections with dust caps or place them in intended parking retainers.
- ▶ If locking brackets are present:
Close the locking bracket.

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!
- ▶ 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

Danger of fatal injury!

- ▶ 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

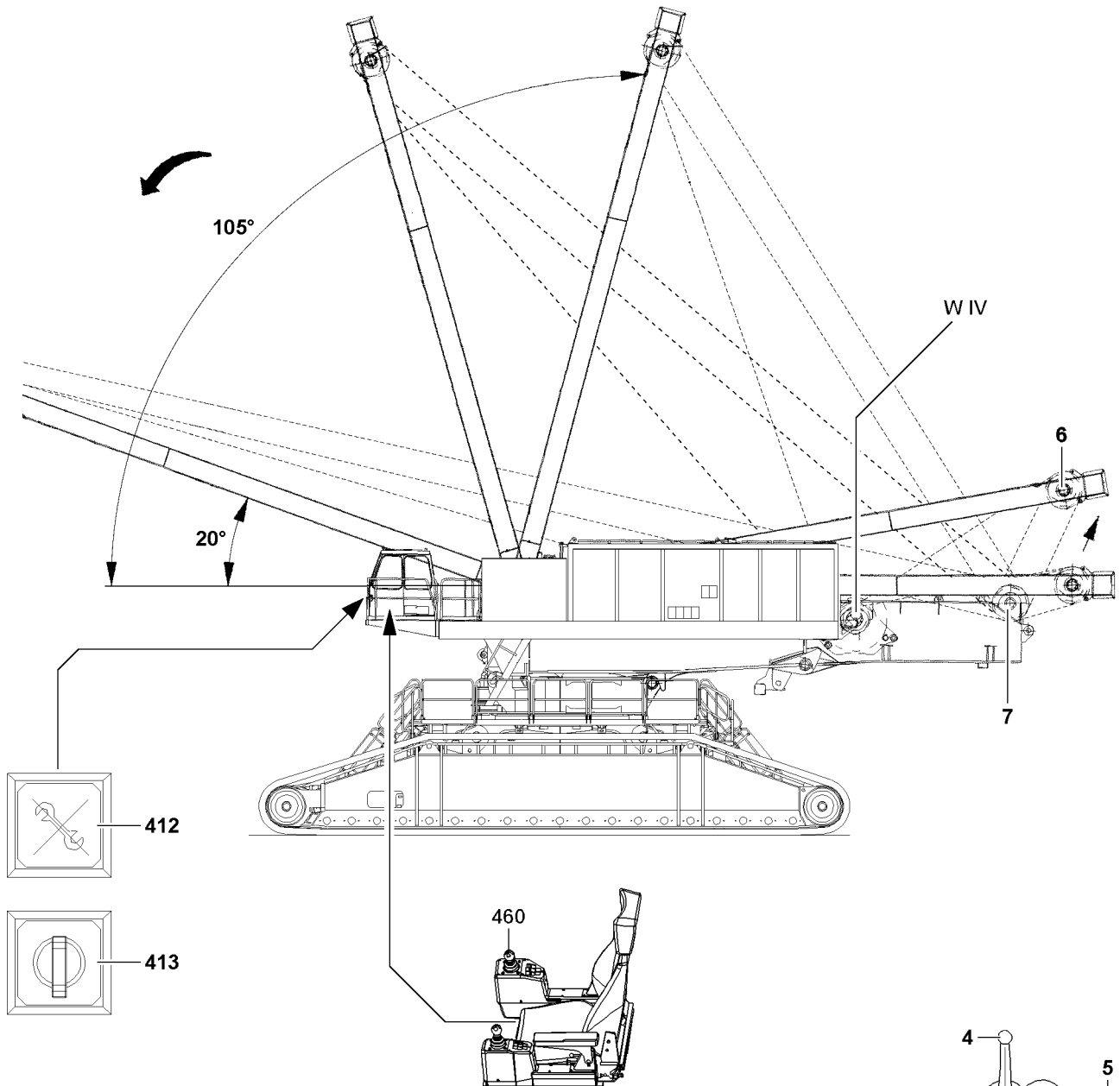
Make sure that the following prerequisites are met:

- 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.

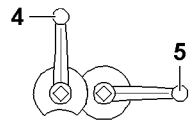
15.2 Erection / take down for crawler cranes

Make sure that the following prerequisites are met:

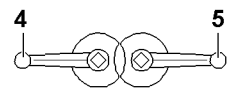
- The crane is horizontally aligned.
 - The crane is properly supported (cranes with support).
 - The counterweight has been installed on the turntable according to the load chart.
 - The central ballast has been installed according to the load chart.
 - The counterweight is installed according to the 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.



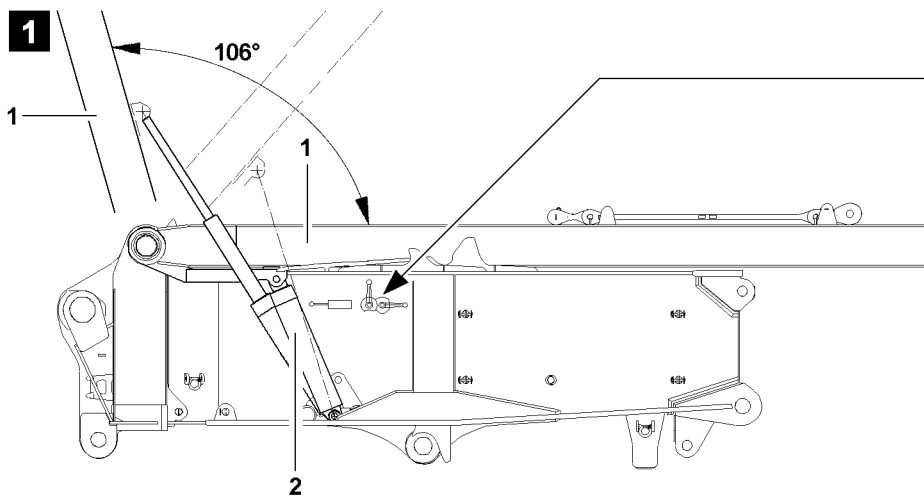
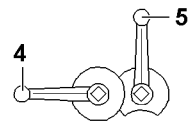
A



B



C



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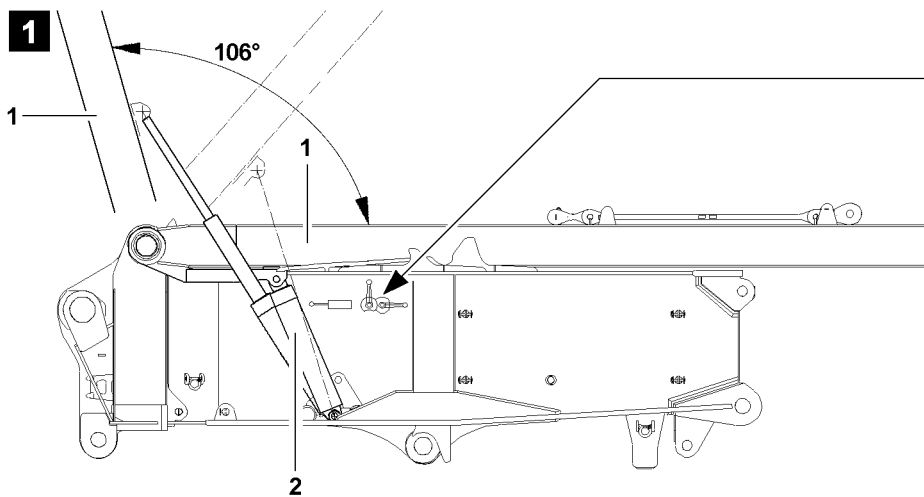
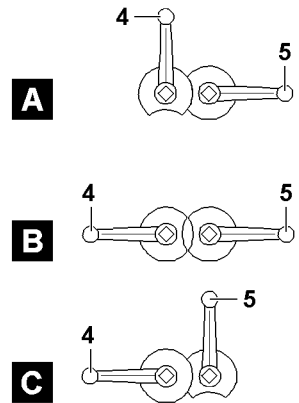
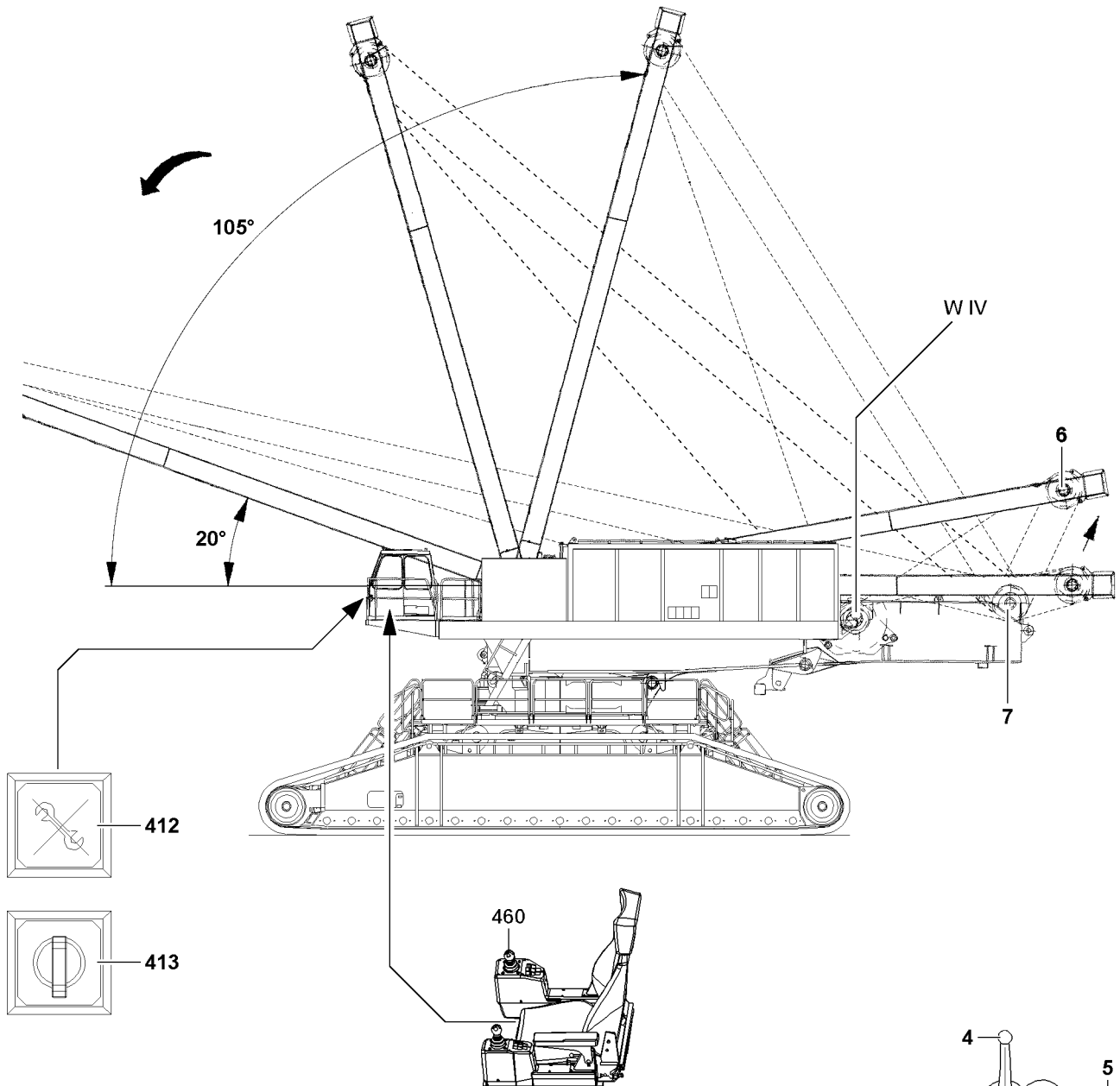
1 SA-frame



Note

- ▶ The SA-frame is used in assembly operation to install the crawler travel gear, see Crane operating instructions, chapter 3.01!
- ▶ In addition, the SA-frame is used in assembly operation for closing boom systems and for guying the boom in flying assembly of lattice sections, see Crane operating instructions, chapter 5.38.

Switch positions of ball valves	
Switch position	Function
A	Lower the SA-frame Transport position
C	SA-frame stop, cylinder stop Erection cylinders are blocked
B	Erecting the SA-frame Assembly and crane operation



B112567

1.1 Erecting the SA-frame

1.1.1 Erection procedure

Make sure that the following prerequisites are met:

- The turntable is installed.
- The SA-frame is in transport position.
- Winch 1 and winch 2 are installed in the turntable.
- There is no counterweight on the turntable.
- Winch 4 is reeved in on the pulley set of the SA-frame.
- The engine is running.
- The assembly key button **413** is actuated, indicator light assembly **412** lights up.
- The SA-operating mode has been set and confirmed on the LICCON computer system.



WARNING

Assembly with activated assembly key button!

When the assembly key button is engaged, the LICCON overload protection is exceeded!

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!

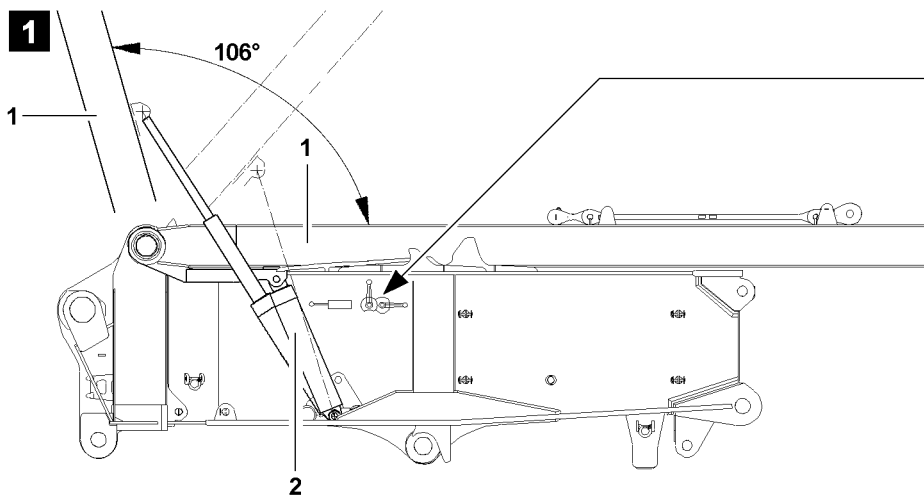
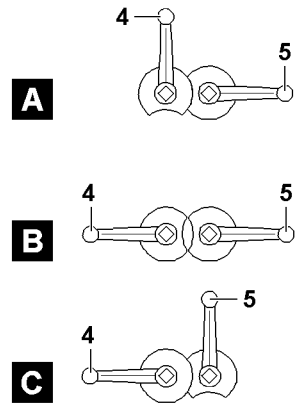
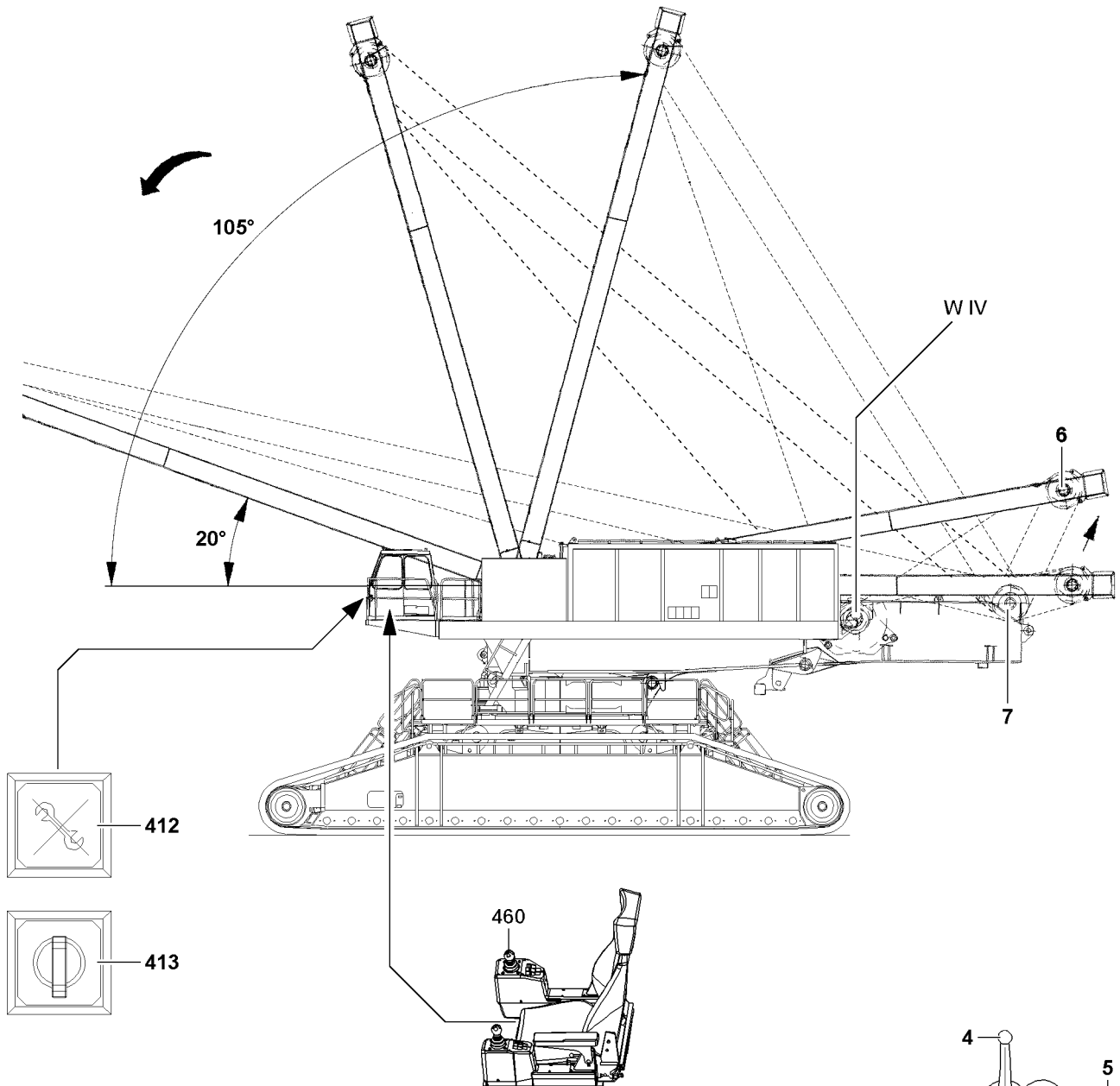
- ▶ The assembly key button **413** may only be operated by persons who are aware of the consequences of a bypass!
 - ▶ Press the assembly key button **413** only when the set up status was correctly entered into the LICCON computer system!
-

NOTICE

Danger of slack rope formation!

If winch 4 is spooled out too quickly during the erection procedure of the SA-frame, slack rope can form!

- ▶ The intake rope of winch 4 must be tensioned during the entire erection procedure!
 - ▶ The spool out speed of winch 4 must be matched to the erection speed of the erection cylinders!
-



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**WARNING**

Independent lowering of the SA-frame!

Due to incorrect ball valve positions during the erection procedure, the SA-frame can lower backward by itself!

Personnel can be severely injured or killed!

It can result in slack rope build-up!

- ▶ Ball valve **4** and ball valve **5** must be in position **B** during assembly and crane operation!
- ▶ Ball valve position **A** "lower" and ball valve position **C** "stop" are only permissible when lowering the SA-frame onto the turntable (transport position)!

- ▶ Set the ball valve **4** and ball valve **5** in position **B**.

Result:

- The SA-frame is pushed upward by the erection cylinders **2** until the ropes are tensioned between the rope pulleys **6** and the rope pulleys **7**.

NOTICE

Damage to ropes!

- ▶ Check the rope pulleys visually!
- ▶ The ropes must be laying correctly in the corresponding rope pulleys!

- ▶ Deflect the master switch MS1 **460** in direction X.

Result:

- Spool out winch **4 W IV** and SA-frame **1** is erected through the erection cylinder **2** up to 106° forward, see illustration **1**.
- The "???" turn off and the SA-operating mode is shown.

- ▶ Deflect the master switch MS1 **460** in direction X.

Result:

- The SA-frame is lowered to the front and is now in the operating range of operating mode-SA (20° to 105°).

**WARNING**

The crane can topple over!

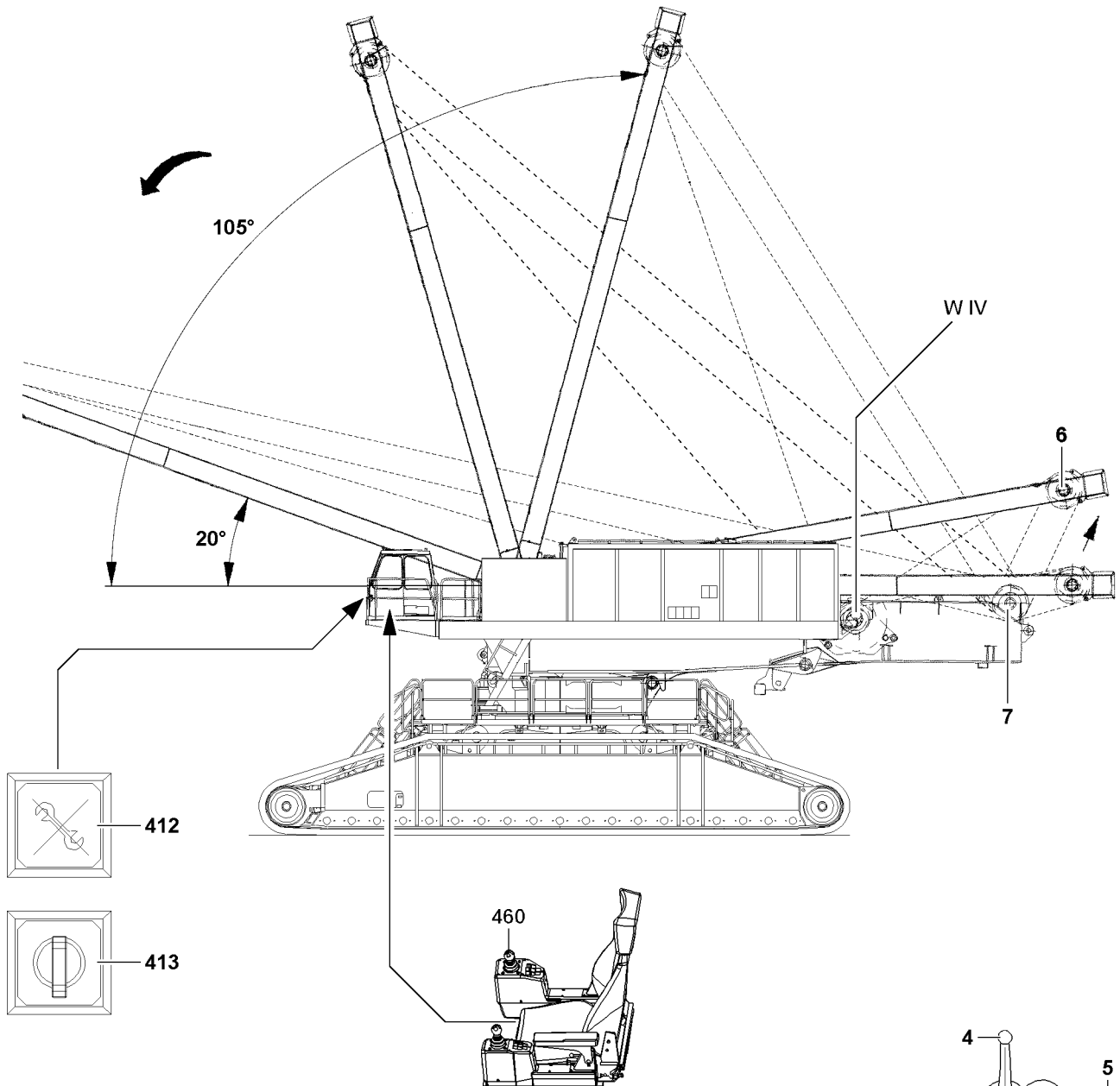
When the assembly key button **413** is engaged, the LICCON overload protection is exceeded!

If the Assembly key button **413** is not turned off when reaching the operating range-SA, then dangerous situations can occur, up to toppling the crane!

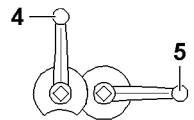
Personnel can be severely injured or killed!

- ▶ When reaching the operating range-SA, turn the Assembly key button **413** off immediately!

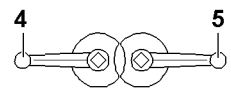
- ▶ Turn the assembly key button **413** off.



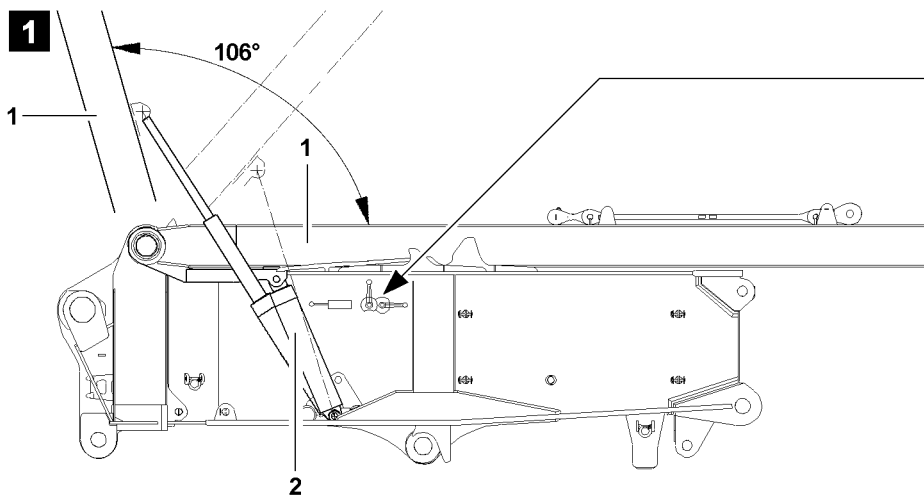
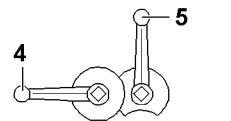
A



B



C



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**Note**

- ▶ Due to the own weight of the SA-frame and by spooling out winch 4 simultaneously, the SA-frame is lowered to the front.
- ▶ After reaching the SA-frame position 20°, an error message appears on the LICCON monitor and LMB - Stop is initiated.
- ▶ Spooling out winch 4 is turned off.
- ▶ Luffing down the SA-frame is blocked. Luffing the SA-frame up is only possible if the assembly key button **413** is turned on.
- ▶ If the minimum or maximum pressure is reached in the erection cylinder, winch 4 turns off. Error is shown.

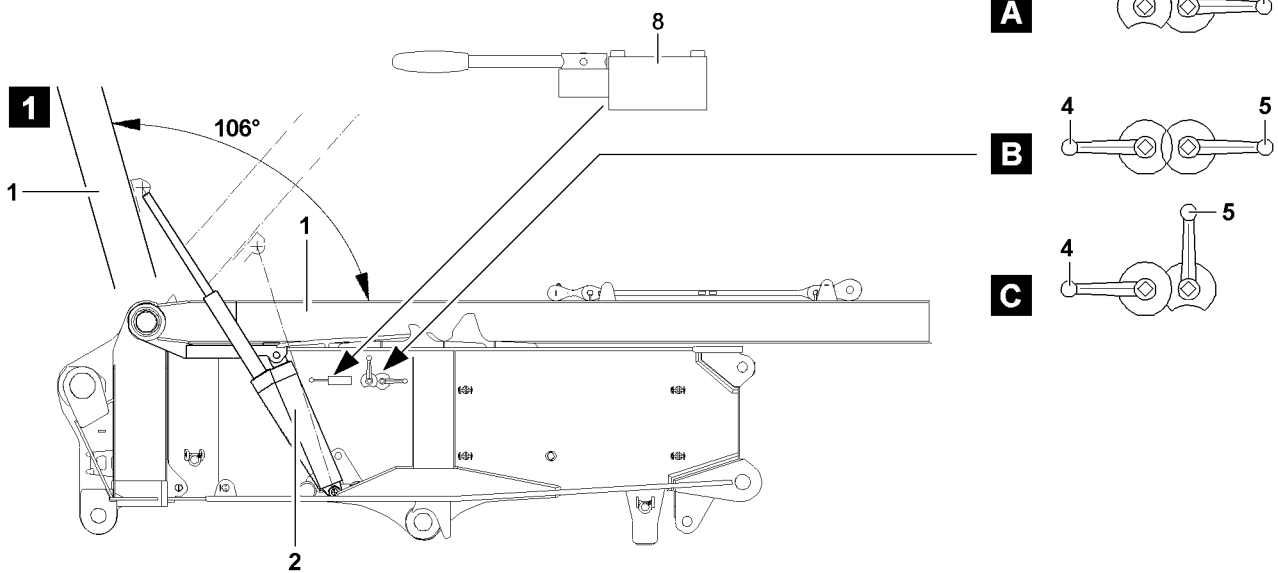
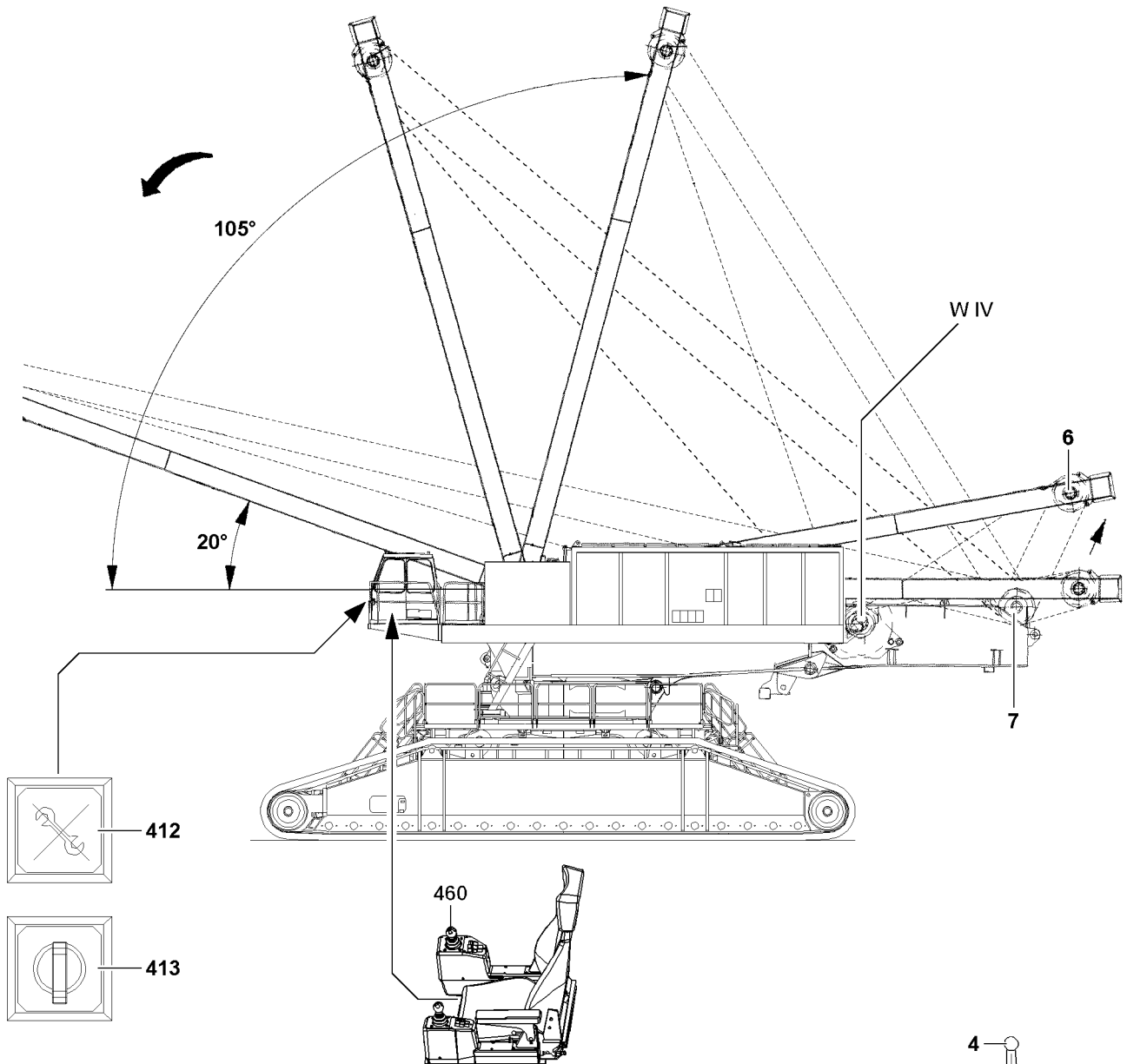
**WARNING**

Danger of accident!

Ball valve **4** and ball valve **5** must be in position **B** during assembly and crane operation.

Ball valve position **A** and ball valve position **C** are only permissible when lowering the SA-frame onto the turntable (transport position)!

- ▶ After assembly, secure the ball valves immediately with a lock.
- ▶ Secure the ball valves.



B112568

1.2 Placing the SA-frame onto the turntable

1.2.1 Take down procedure

Make sure that the following prerequisites are met:

- The SA-operating mode has been set and confirmed on the LICCON computer system.
- Ball valve **4** and ball valve **5** are in position **B**.
- The SA-frame is in operating range between 20° and 105°.

▶ Deflect the master switch MS1 **460** in direction X.

Result:

- Winch 4 spools up.
- The SA-frame is pulled back against the pressure in the erection cylinders.



Note

- ▶ When the SA-frame reaches the position 105° during luffing up, an **error message** and **LMB-STOP** is shown on the LICCON monitor.
 - ▶ Spooling up of winch 4 is turned off.
-



WARNING

Assembly with activated assembly key button!

When the assembly key button **413** is engaged, the LICCON overload protection is exceeded!

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!

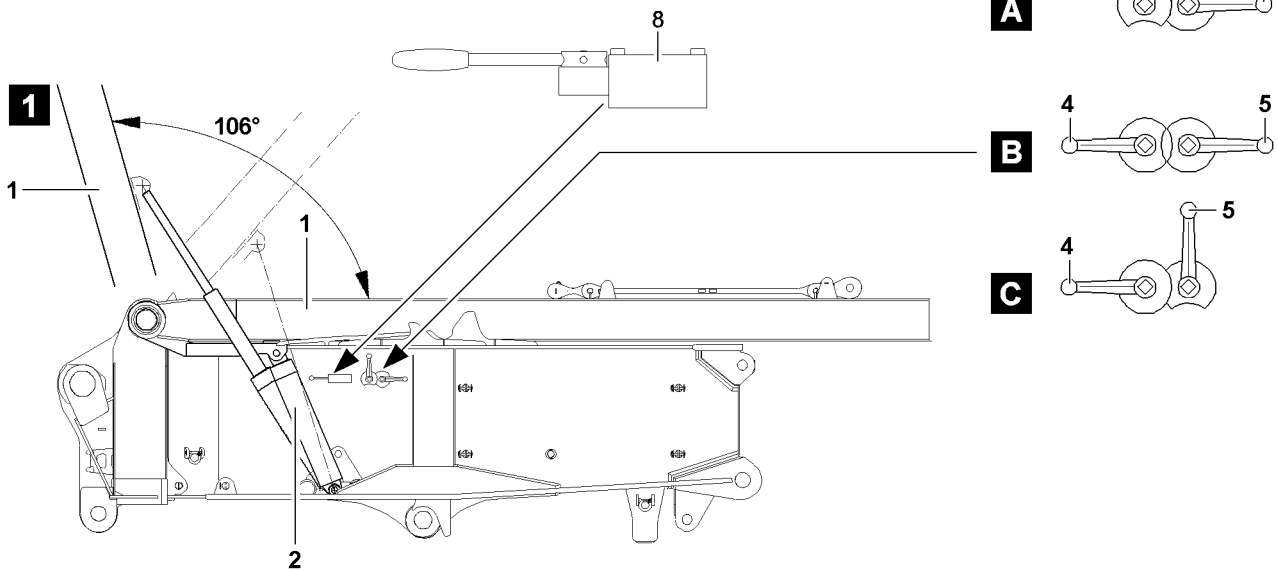
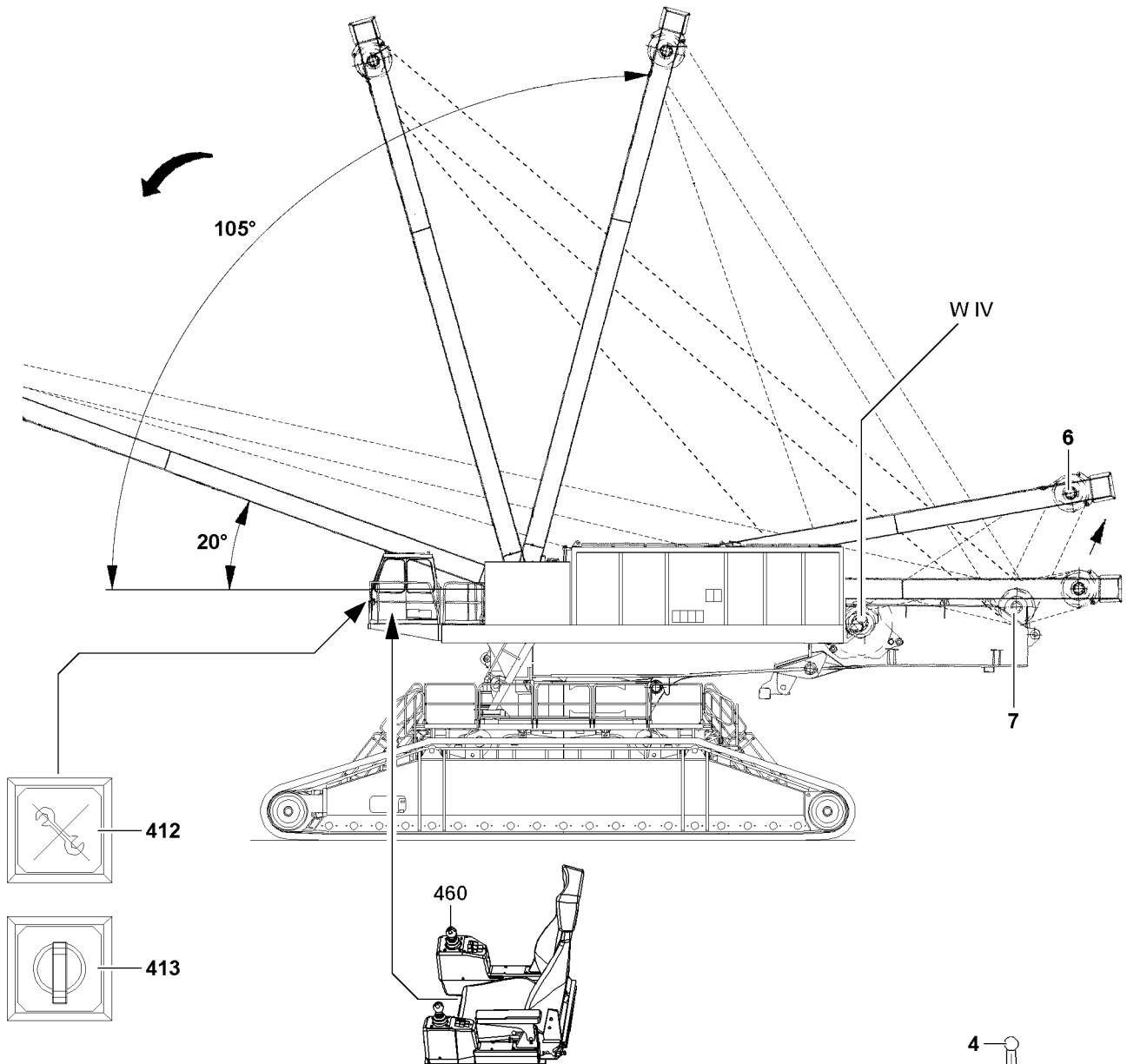
This could result in high property damage!

- ▶ The assembly key button **413** may only be operated by persons who are aware of the consequences of a bypass!
 - ▶ Press the assembly key button **413** only when the set up status was correctly entered into the LICCON computer system!
-

▶ Turn the assembly key button **413** to the right.

Result:

- The LICCON overload protection is exceeded.
- The indicator light assembly **412** lights up.



B112568

**WARNING**

Danger of fatal injury from SA-frame!

During the take down of the SA-frame, personnel can be severely injured or killed!

- ▶ The crane operator must make sure that no persons or objects are within the danger zone.

**WARNING**

Independent lowering of the SA-frame!

Due to an incorrect ball valve position, the SA-frame can lower backward by itself!

Personnel can be severely injured or killed!

It can result in slack rope build up and to destruction of crane components!

- ▶ Ball valve **4** and ball valve **5** must be in position **B** during assembly and crane operation!
- ▶ The ball valve position **A** and ball valve position **C** are only permissible when lowering the SA-frame onto the turntable (transport position)!

- ▶ When the LICCON overload protection is exceeded:
Deflect the master switch MS1 **460** in direction X.

Result:

- Due to the own weight of the SA-frame **1** and by spooling up winch 4 simultaneously, the SA-frame is lowered to the rear against the pressure in the erection cylinders!

NOTICE

Damage to crane!

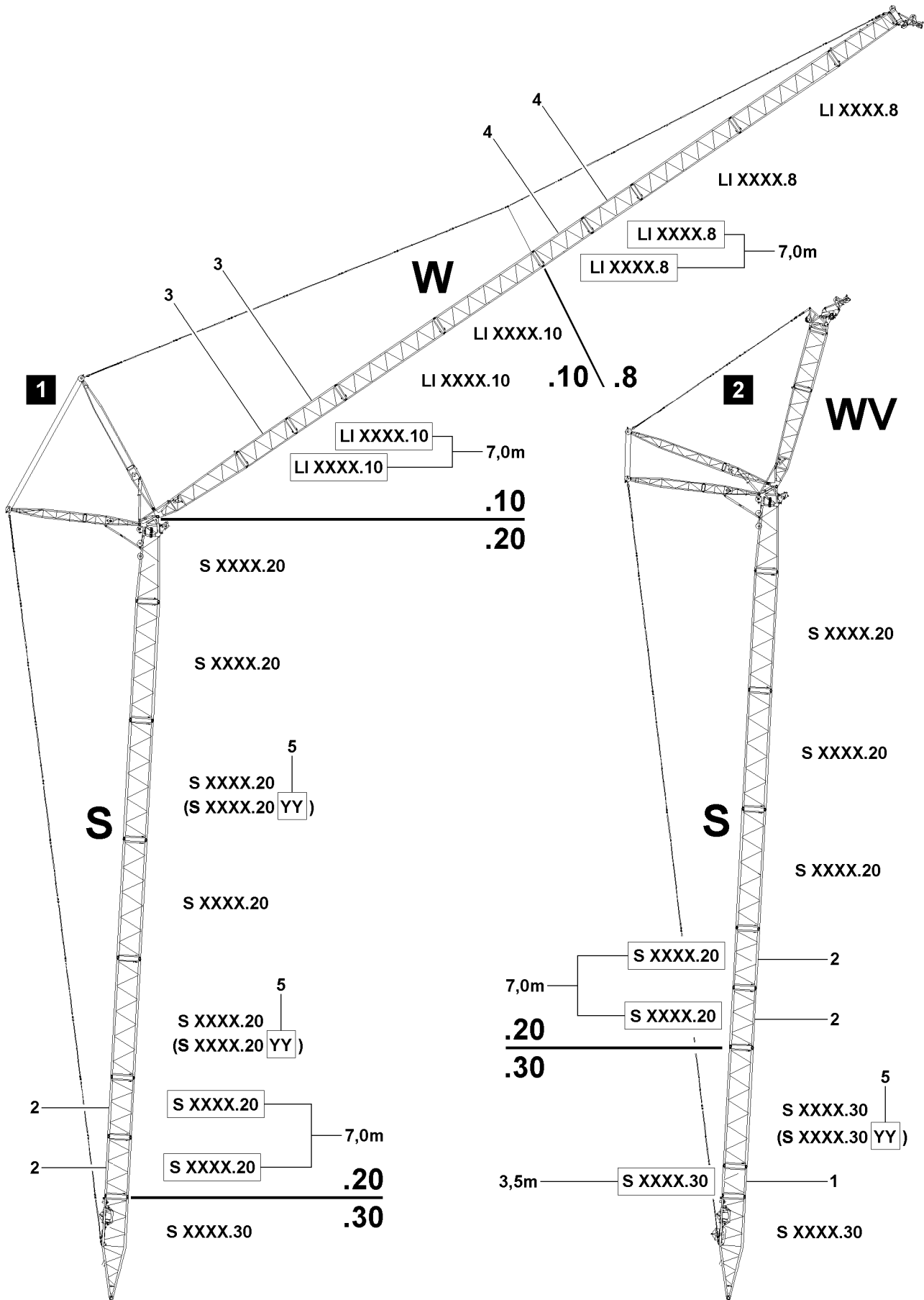
The ball valve position **C** and the ball valve position **A** are only permissible when lowering the SA-frame from 10° onto the turntable (transport position)!

- ▶ If this is not observed, parts of the crane will be destroyed.

- ▶ If the SA-frame is on approx. 10°:
Do not actuate winch 4 any longer.
- ▶ Turn the assembly key button **413** off.
- ▶ Lower the SA-frame **1** onto the turntable: Actuate the hand lever **8**.

Result:

- The erection cylinders move in.
- The SA-frame **1** lowers.
- ▶ When the SA-frame **1** is lowered completely on the turntable:
Set the ball valves into position (C) and secure.



B116151

1 Boom components



Note

- ▶ For boom components including associated system dimensions, lengths and component weights refer to the Crane operating instructions, chapter 1.03!

2 Arrangement of intermediate sections on the boom



Note

- ▶ The following description is an example and may not exactly match to your crane!
- ▶ Lengths, weights and system dimensions of the intermediate sections are examples and may differ from the data on your crane!
- ▶ For exact crane data refer to the respective rod plan!
- ▶ For dimensions and weights of crane components, see Crane operating instructions, chapter 1.03!



WARNING

Boom can break off!

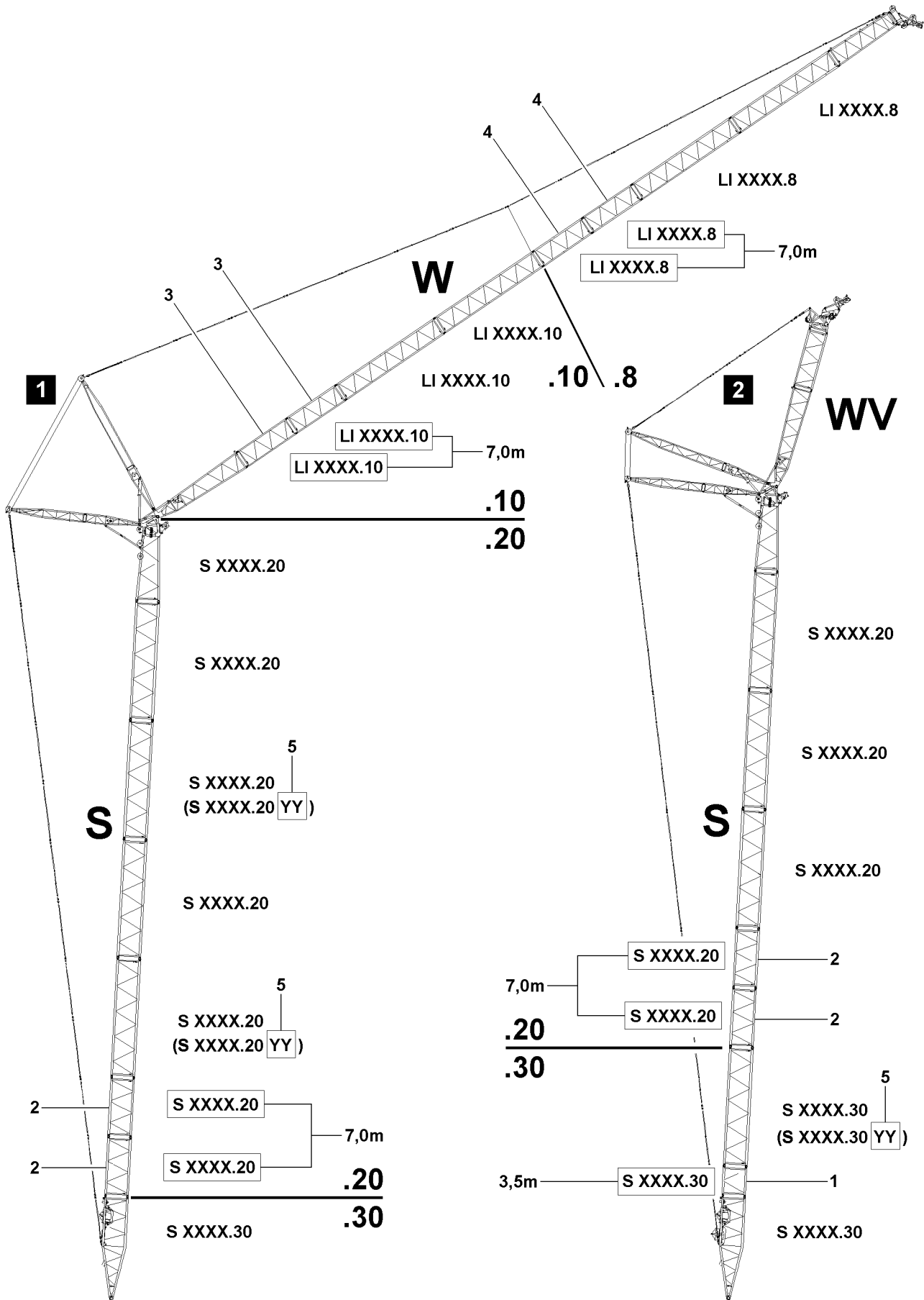
The arrangement of the intermediate sections on booms or boom systems are based on extensive static calculations! If the arrangement of the intermediate sections according to the rod plan is not observed, the crane can collapse, the boom can break off or the crane can topple over!

Personnel can be severely injured or killed!

- ▶ Always carry out the arrangement of the intermediate sections 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!

General specifications for the configuration of booms or boom systems:

- With the same system dimension, two short intermediate sections with a length of 3.5 m are heavier than one single intermediate section with a length of 7.0 m!
- With the same system dimension, two short intermediate sections with a length of 7.0 m are heavier than one single intermediate section with a length of 14.0 m!
- With the same system dimension, two short intermediate sections with a length of 3.5 m can be replaced by one single intermediate section with a length of 7.0 m!
- With the same system dimension, two short intermediate sections with a length of 7.0 m can be replaced by one single intermediate section with a length of 14.0 m!
- For intermediate sections with the same system dimension but different lengths, always install the short intermediate sections on the bottom in the boom, due to their weight, in direction of the slewing ring, see also illustration 1 and illustration 2!
- The heavier one intermediate section is, the higher is the value of the last two digits on the system dimension plate!
- Pay attention to the last two letters following the letter combinations (YY) 5 on the last two letters on the system dimension plate and observe them!



B116151

System dimensions and assignment			
Position	System	Heavy	Light
1	S XXXX .30	X	
2	S XXXX .20		X
3	LI XXXX .10	X	
4	LI XXXX .8		X
5	S XXXX .40 YY	X	

2.1 Arrangement of intermediate sections



WARNING

Danger of accidents due to incorrectly assembled intermediate sections!

- ▶ Any other arrangement of the intermediate sections and guy rods than specified in the operating instructions or the rod plans is prohibited!
- ▶ There is the danger that intermediate sections are mixed up, they are differently sized and do not differ externally!
- ▶ The intermediate sections differ externally only by the welded on plates (.8, .10, .12, .16, .20, .25, .30, .40 YY)!
- ▶ When assembling the boom, it must be ensured that the intermediate sections are arranged and installed according to their description as stated on the rod plan!
- ▶ Observe and adhere to the additional letter combinations (YY) 5 on the system dimension plate of the intermediate sections at assembly of the intermediate sections!



WARNING

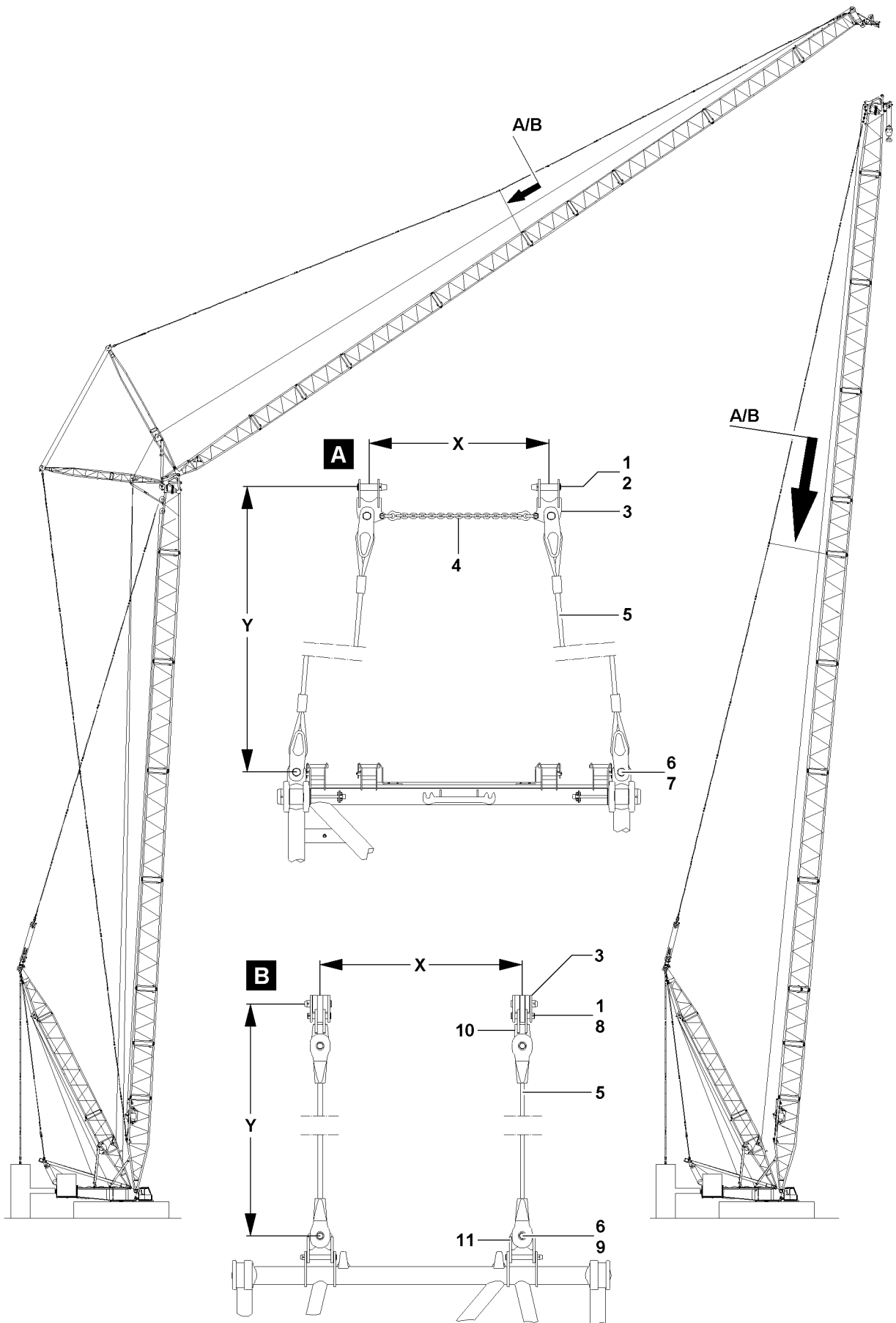
Arrangement of intermediate sections!

If the arrangement of the intermediate sections is not carried out according to the rod plan, then the boom can be overloaded, bend down and break off!

Personnel can be severely injured or killed!

This could result in high property damage!

- ▶ For intermediate sections with the same system dimension but different length, always install the shorter intermediate sections on the bottom in the boom, in direction of the slewing ring!



B112270

3 Auxiliary guying



Note

- ▶ The following description is an example and may not exactly match to your crane!
- ▶ For exact crane data refer to the respective rod plan!

3.1 Installing the auxiliary guying

The auxiliary guying, in regards to safe crane operation - especially for long boom systems - is of vital importance.

The auxiliary guying is a deciding factor in relieving the boom, or the boom system during erection and take down as well as during crane operation.



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!

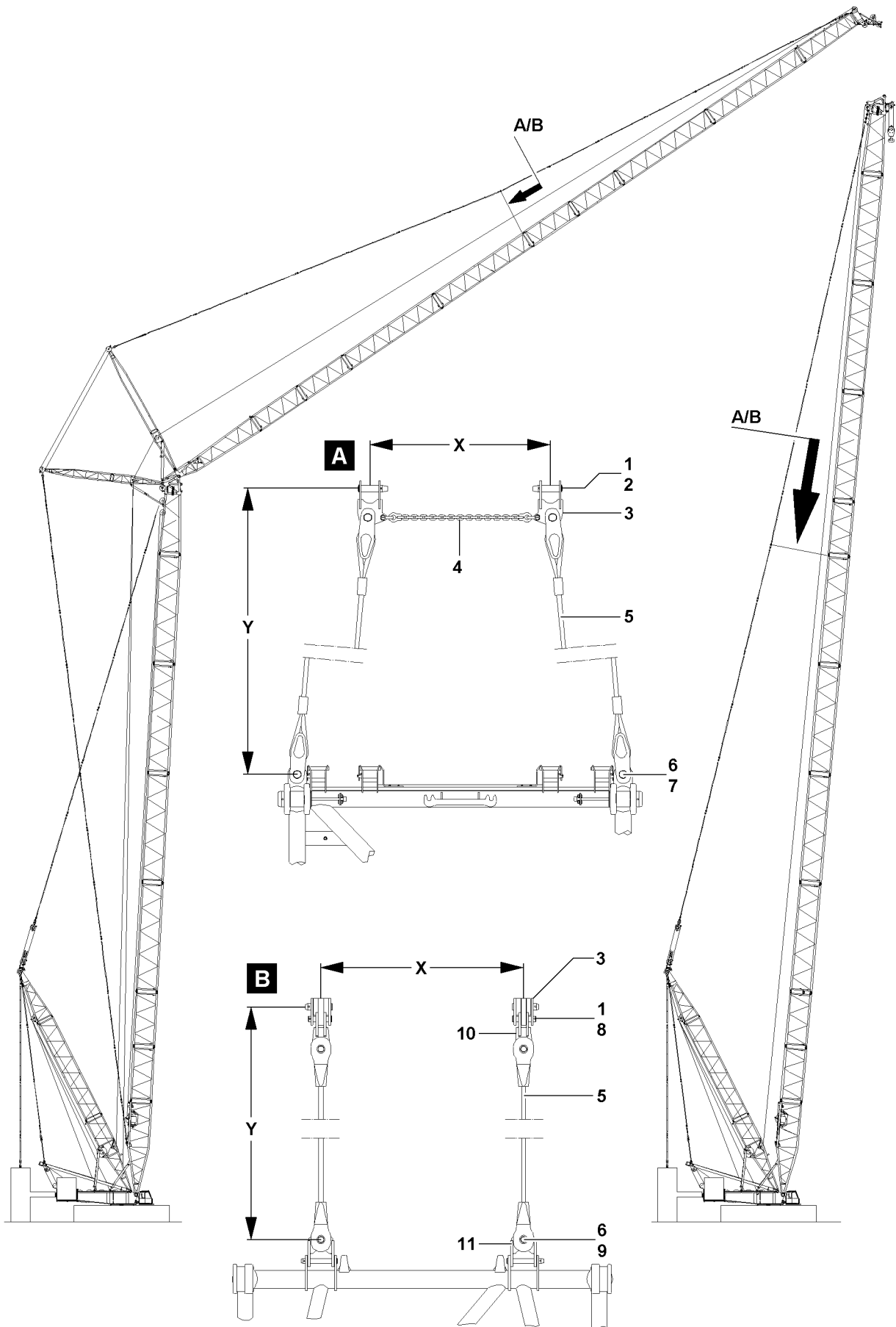
- ▶ If an auxiliary guying is specified in the rod plan for the required boom length, then it must be installed on the respective position!
- ▶ Make sure that the auxiliary guying is always completely installed and that all pins are properly pinned and secured!



Note

- ▶ The boom lengths, for which an auxiliary guying is required, can be seen in the rod plan!
- ▶ Depending on the crane type: To install the auxiliary guying, remove the standard lugs and install the "Lugs for the auxiliary guying"!

Components of auxiliary guying, illustration A	
Position	Description
1	Pin
2	Spring retainer
3	Bracket
4	Chain
5	Rope
6	Pin
7	Spring retainer



B112270

Components of auxiliary guying, illustration B	
Position	Description
1	Pin
3	Bracket
5	Rope
6	Pin
8	Linch pin
9	Linch pin
10	Cross-shaped lug
11	Cross-shaped lug

The lugs **3** must be installed in the guying instead of the standard lugs. The auxiliary guying is installed on the lugs **3**.

The guy ropes **5** are pinned on top on the lugs **3** of the guying or on the cross-shaped lugs **10**. The guy ropes **5** are pinned on the bottom on the lugs / connector points on the boom, see illustration **A** or on the cross-shaped lugs **11**, see illustration **B**.

► Install the guy ropes: Pin the guy ropes on top on the guying with pin **1** and secure with spring retainer **2**, see illustration **A**.

or

■ Install the guy ropes: Pin the guy ropes on top on the guying with pin **1** and secure with linch pin **8**, see illustration **B**.

► When the guy ropes **5** are pinned and secured on the lugs **3** of the guying or on the cross-shaped lugs **10**:

Pin the guy ropes **5** on the lugs / connection points on the boom, see illustration **A** with pin **6** and secure with locking spring **7**.

or

■ Pin the guy ropes **5** on the cross-shaped lugs **11** on the boom, see illustration **B** with pin **6** and secure with linch pin **9**.



WARNING

The crane can topple over!

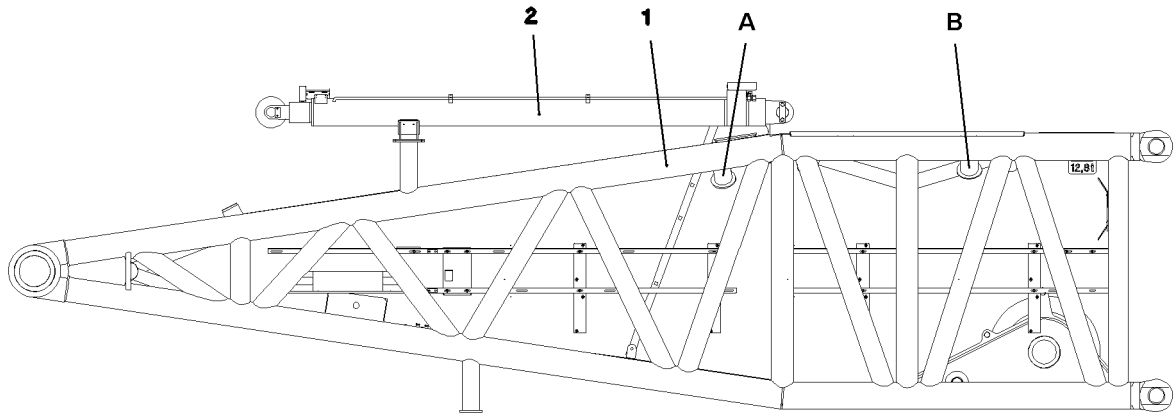
If the chain **4** is not installed in connection with the auxiliary guying, then the guying can be damaged, the boom can break off and the crane can topple over!

Personnel can be severely injured or killed!

► The auxiliary guying must be installed according to the rod plans!

► If a chain **4** is specified in the rod plan, then it must always be installed in connection with the auxiliary guying, otherwise the guy rods will be pulled apart!

► Recheck the proper and complete assembly of the auxiliary guying before erecting the boom / boom system.



B199959

1 General

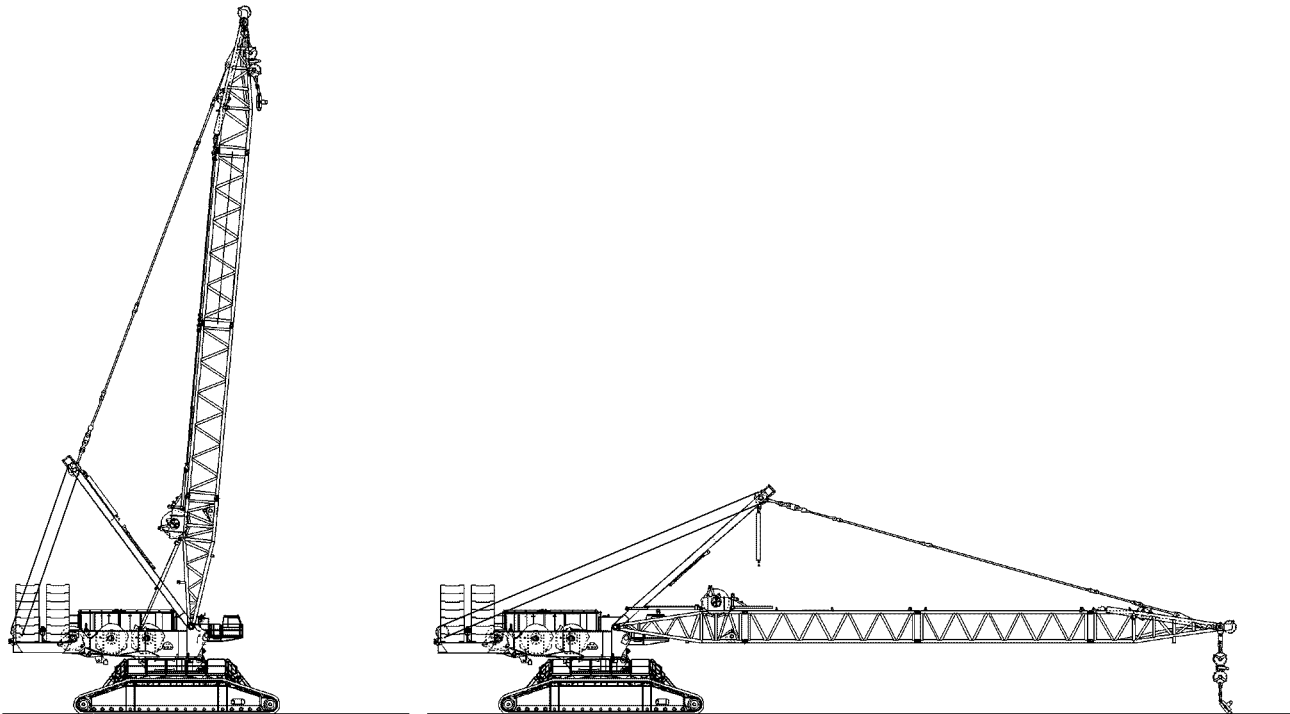
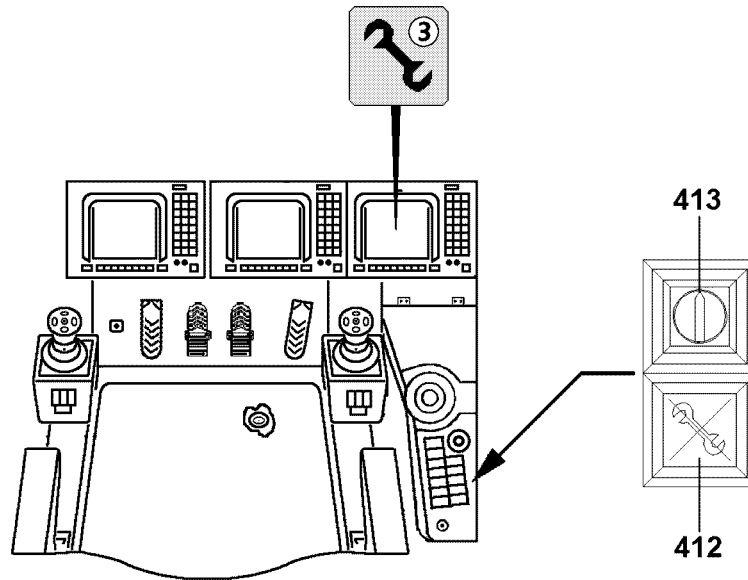
1.1 Component overview on D-articulated piece

The D-articulated piece consists of:

D-articulated piece		
	Component	Weight
1	D-articulated piece	10.65 t
2	D-relapse retainer	1.72 t
3	Winch 3 with cable	22.62 t
4	Pulley blocks	5.79 t
Total weight:		41.00 t

1.2 Fastening points on D-articulated piece

Fastening points	
A + B	for D-articulated piece without winch



2 Assembly



DANGER

Risk 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 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!



DANGER

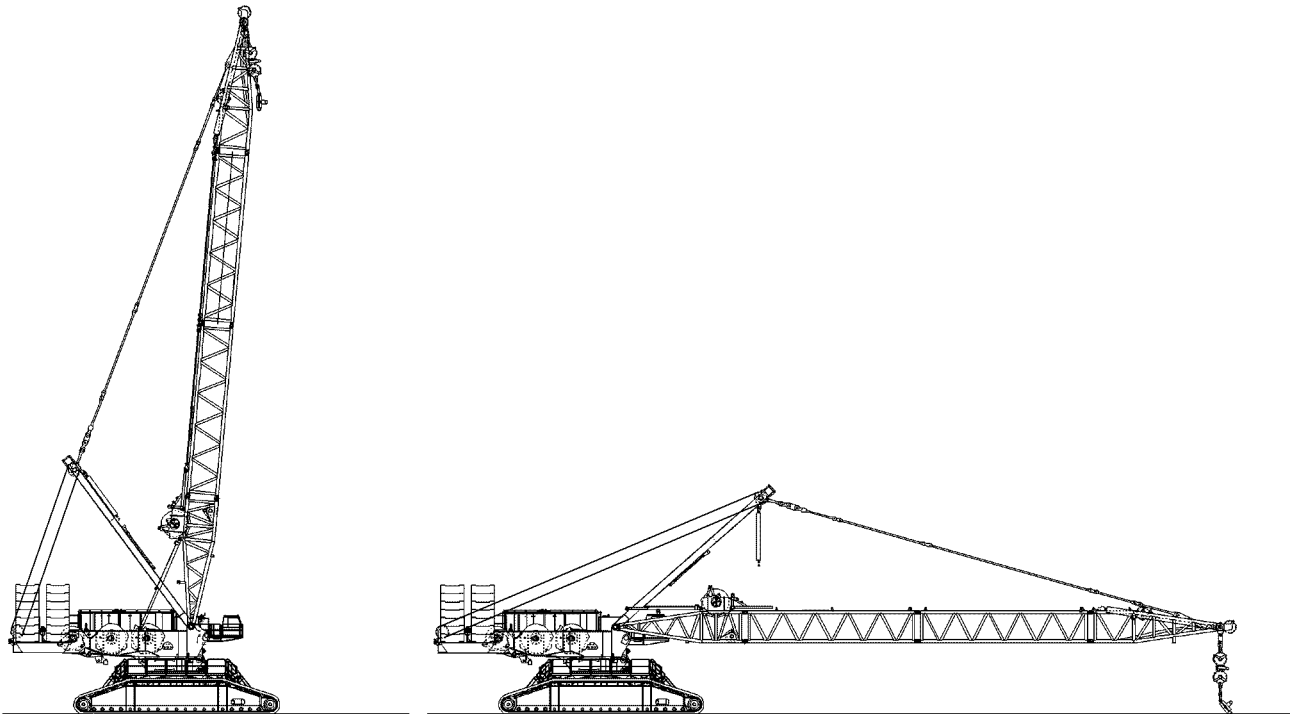
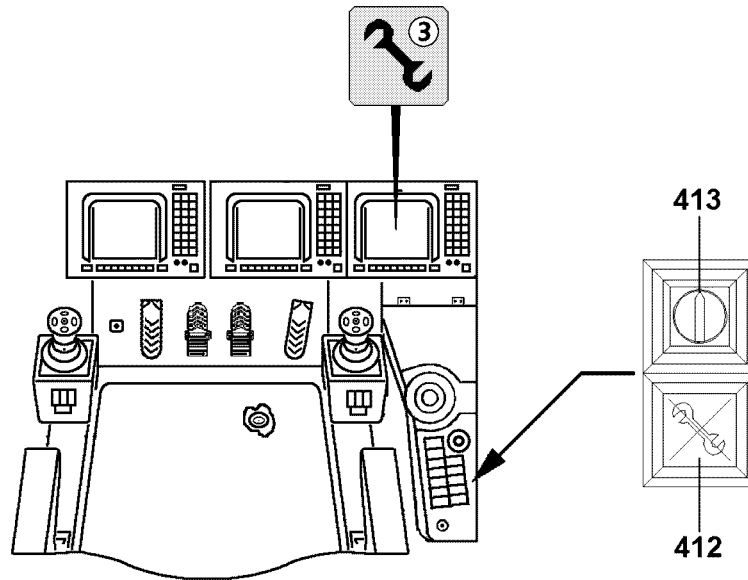
Danger of accident at assembly / disassembly of booms!

When you disassembly unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel.

- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under 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!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ Do not lean the ladder against the component being disassembled!

Ensure that the following preconditions are met:

- the crane is aligned in horizontal direction
- the counterweight has been attached to the turntable in accordance with the load chart
- the LICCON overload protection has been adjusted as per the information in the load chart
- an auxiliary crane is available



2.1 Installing the D-boom

2.1.1 Turning the turntable into assembly position



DANGER

Crane can topple over!

If the following conditions are not met before turning the turntable without installed derrick or boom, the crane can topple over and fatally injury personnel!

- ▶ Observe the maximum permissible ballast variations in chapter 3.06!
- ▶ Observe the data in the erection and take down charts!

- ▶ Turn the turntable in longitudinal direction of the crawler travel gear or to the side.

2.1.2 Adding the operating mode “Assembly”



DANGER

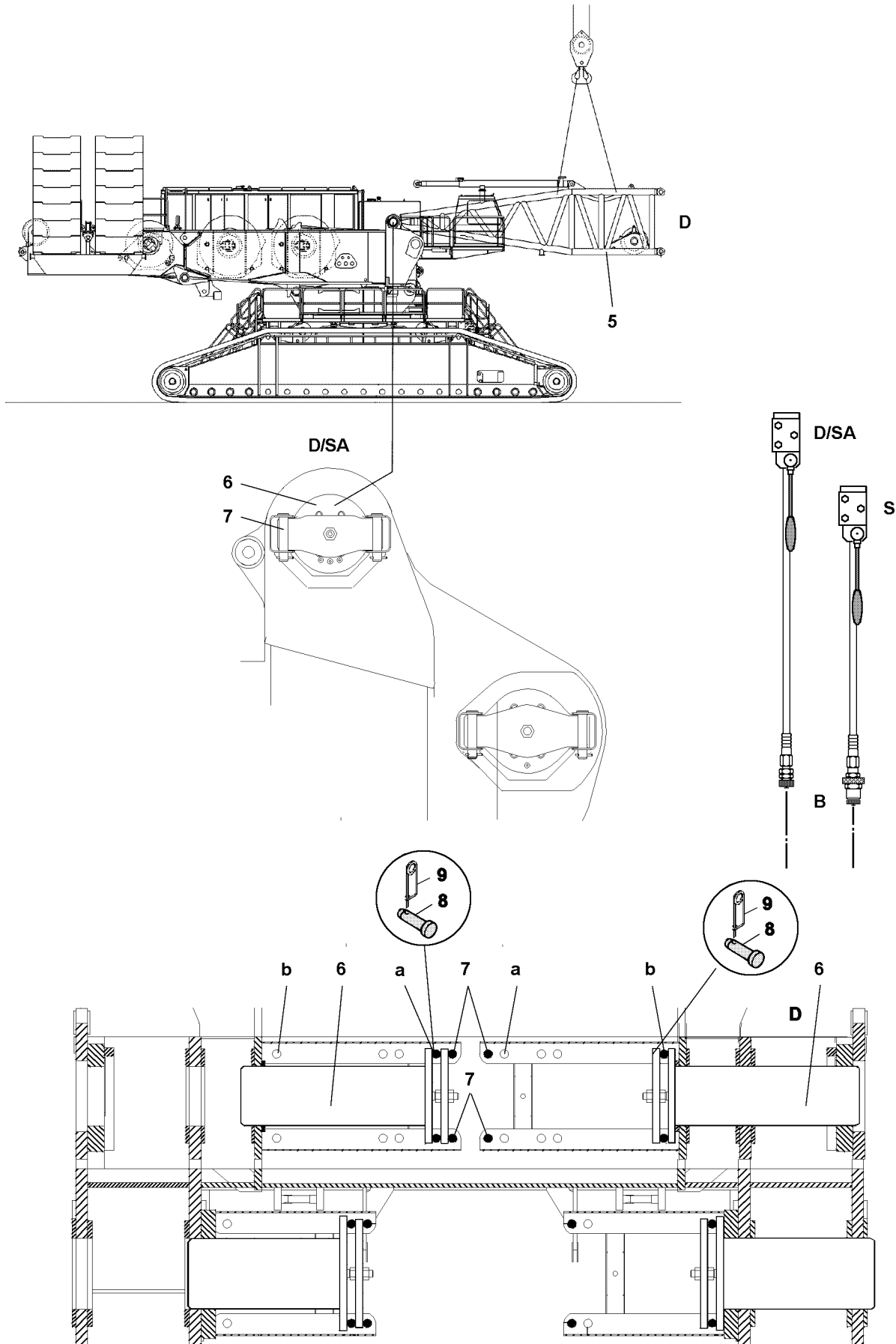
Danger of fatal injury at crane operation with turned on assembly keyed button.

- ▶ The actuation of the assembly keyed button **413** is only permitted for assembly tasks!
- ▶ The assembly keyed button may only be operated by persons, who are aware of the consequences of a bypass!
- ▶ When the assembly keyed button **413** is turned on, the hoist limit switch and the LICCON overload protection are bypassed!
- ▶ Crane operation with turned on assembly keyed button **413** is strictly prohibited!
- ▶ After assembly work is completed, the assembly keyed button **413** must be pulled immediately and turned over to an authorized person!

- ▶ Actuate the assembly keyed button **413**.

Result:

- The LICCON overload protection is inactive.
- The control light in the button **412** lights up.
- The Assembly symbol **3** in the LICCON monitor blinks.
- An acoustical signal sounds.
- The red beacon on the crane cab blinks.



B199961

2.2 Installing the D-boom



DANGER

General danger notes!

- ▶ Support the D-boom during assembly and disassembly with suitable materials!
- ▶ All pins must be secured after assembly!
- ▶ The guy posts must be checked regularly! See chapter 8.15.

2.2.1 Pinning on the D-articulated piece

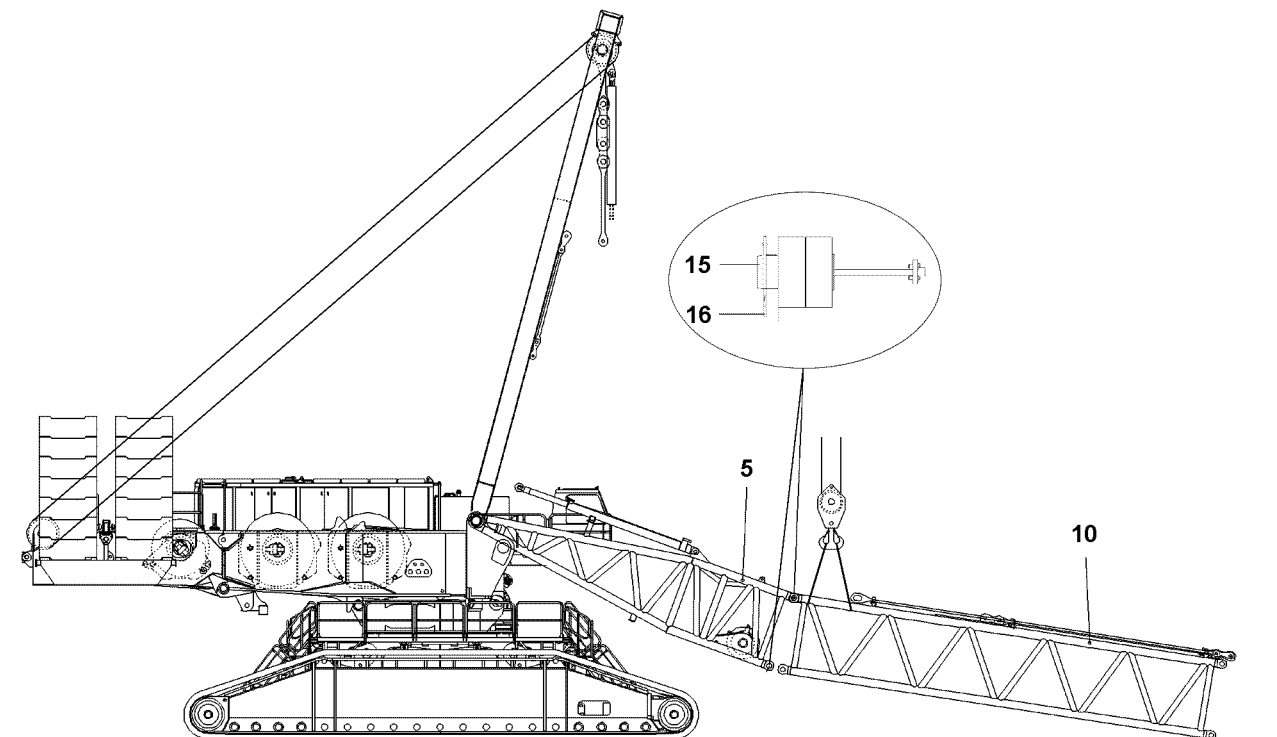
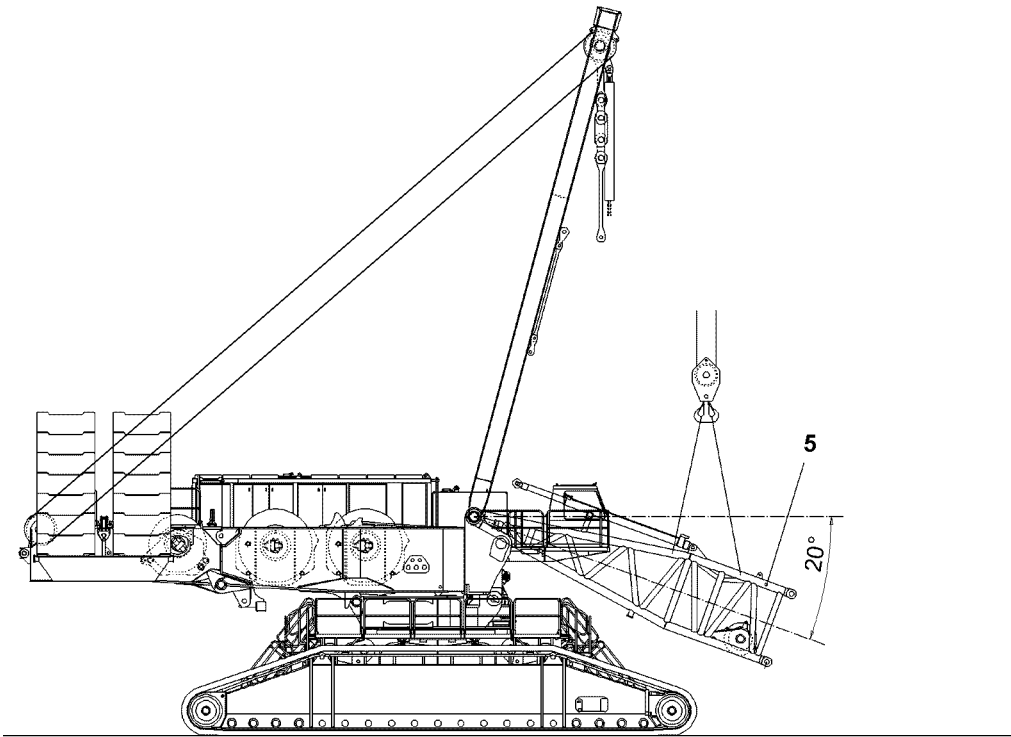
Ensure that the following preconditions are met:

- the pins **7** are inserted and secured
- the pins **8** are pinned and secured in the bores **a**
- ▶ Hang the D-articulated piece **5** onto the auxiliary crane and swing it in to the pin points on the turntable and attach.



Note

- ▶ The hand levers **S**, **D/SA** and the hydraulic connections **B** for the pin pulling device are on the left side of the turntable.
- ▶ Establish the hydraulic connections from the pin pulling device to the turntable
- ▶ Pin D-articulated piece **5** on both sides with the pin pulling device:
- ▶ Move the hand lever **D** and push the pins **6** all the way out.
- ▶ Unpin the pins **8** from the bores **a** and insert in bores **b** and secure.



B199962

2.2.2 Installing the D-lattice components on the D-articulated piece

Ensure that the following preconditions are met:

- the D-articulated piece is pinned and secured on the turntable
- the D-articulated piece hangs on the auxiliary crane
- the winch 3 is not installed in the D-articulated piece



DANGER

General danger notes!

- ▶ Support the D-boom during assembly and disassembly with suitable materials!
- ▶ All pins must be secured after assembly!
- ▶ The guy posts must be checked regularly! See chapter 8.15.

To pin and unpin the D-lattice components with the pin pulling device, see also chapter 5.30.

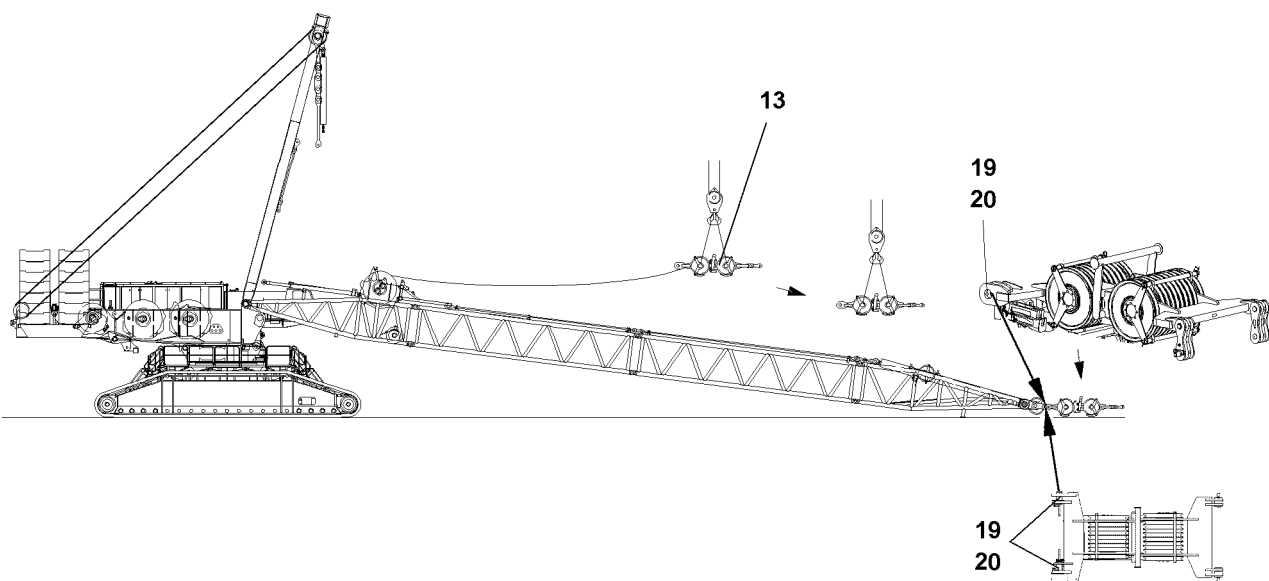
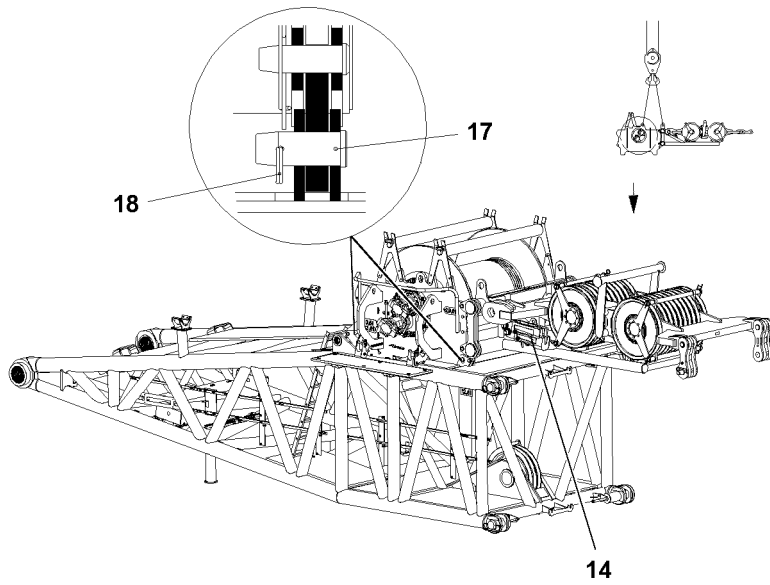
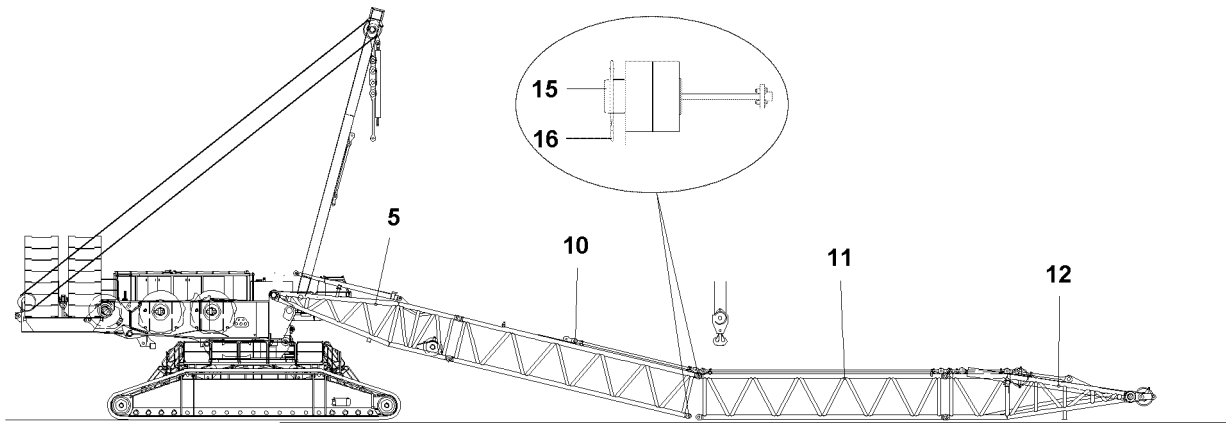


CAUTION

Damage to the D-articulated piece!

If the D-articulated piece with installed winch 3 and pinned D-intermediate piece **10** is laying on the turntable, the D-articulated piece will be damaged.

- ▶ The winch 3 may not be installed on the D-articulated piece.
 - ▶ The D-intermediate piece may not be installed on the D-articulated piece.
-
- ▶ Lower the D-articulated piece until it rests on the turntable.
 - ▶ Release the auxiliary crane and attach on the D-intermediate piece.
 - ▶ Pin the D-intermediate piece **10** on the D-articulated piece **5 on top**: Insert the pin **15** and secure with safety spring **16**.
 - ▶ Pull the D-intermediate piece **10** up and pin on both sides **on the bottom**: Insert the pin **15** and secure with safety spring **16**.



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- ▶ Pin the D-reduction piece **11** on the D-intermediate piece **10 on top**: Insert the pin **15** and secure with safety spring **16**.
- ▶ Pin the D-head piece **12** on the D-reduction piece **11 on top and bottom**: Insert the pin **15** and secure with safety spring **16**.
- ▶ Pull the D-reduction piece **11** up and pin on both sides **on the bottom**: Insert the pin **15** and secure with safety spring **16**.
- ▶ Pin winch 3 **W3** on the D-articulated piece **5**: Insert the pin **17** and secure with safety spring **18**.
- ▶ Hang the cable from winch **W3** into the cable lock **14** on the pulley blocks **13**.

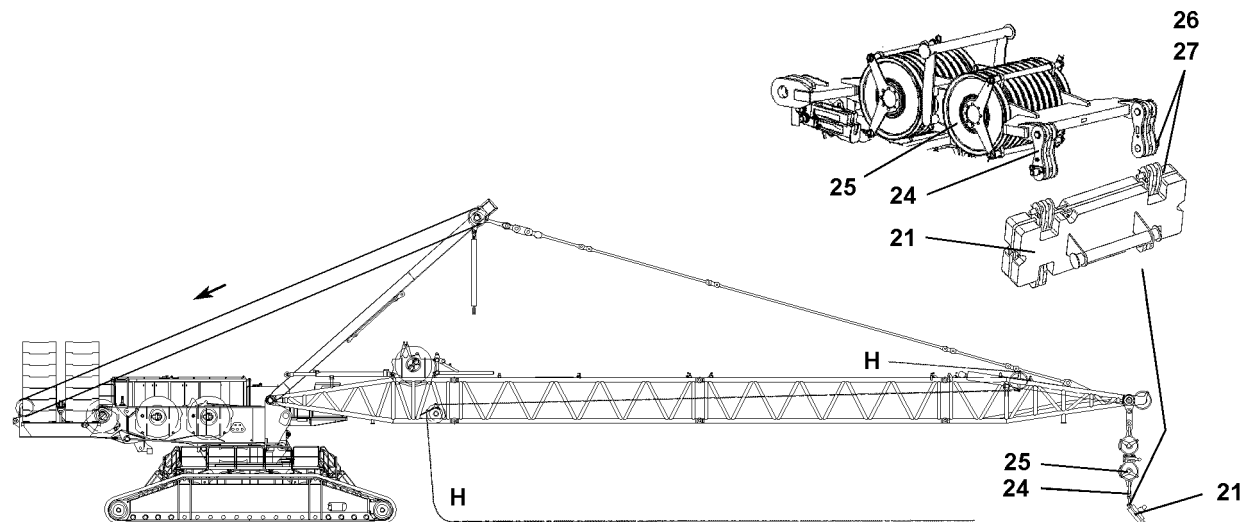
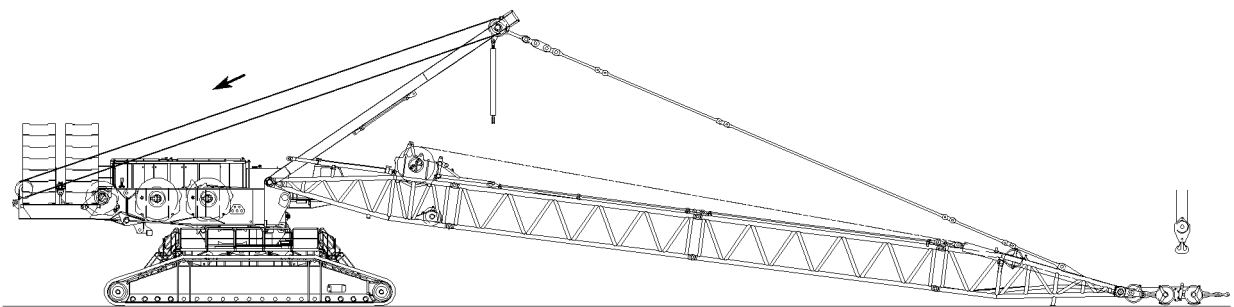
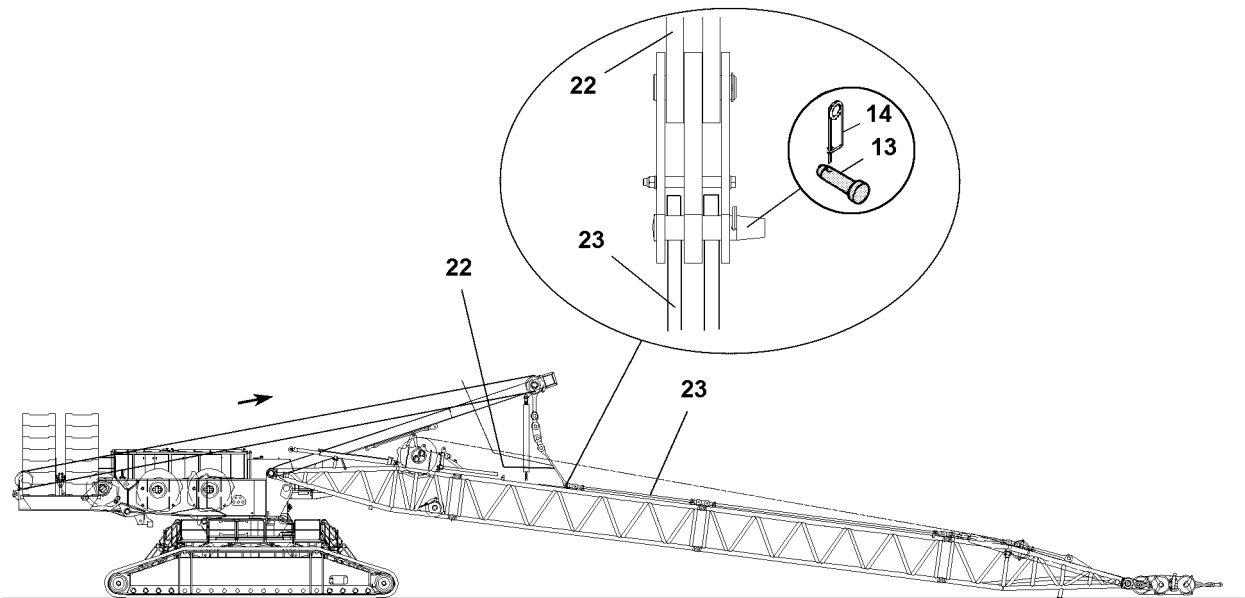


DANGER

General danger notes!

If the following conditions are not met before unpinning the pulley blocks, the pulley blocks can fall down and fatally injure personnel!

- ▶ The pulley blocks **13** must hang on the auxiliary crane!
-
- ▶ Hang the pulley blocks **13** onto the auxiliary crane.
 - ▶ Unpin the pulley blocks **13** on winch 3.
 - ▶ Pull the pulley blocks **13** with the auxiliary crane to the D-head piece **12** while spooling out winch 3 at the same time.
 - ▶ Pin pulley blocks **13** on the D-head piece **13**: Insert the pin **19** and secure with safety spring **20**.



B199964

2.2.3 Installing the D-guy posts



Note

- ▶ The D-guy posts must be installed and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy posts.

The D-guy posts are placed and secured for transport on the D-lattice components. Before assembly, the transport retainers must be released.

- ▶ Release the transport retainers on the guy posts.

The guy posts for the derrick ballast are placed and secured for transport **inside** on the D-lattice components. Before assembly, they must be placed on the folded out receptacles towards the **outside**.

- ▶ Lower the SA-frame **10** to the front.
- ▶ Pin the guy posts **22** with the guy posts **23**: Insert the pin **13** and secure with safety spring **14**.
- ▶ Luff up the D-boom until the D-pulley blocks **13** hang freely.
- ▶ Pin and secure the assembly weight **21** on the brackets **24**. Insert pin **26** and secure with safety spring **27**.

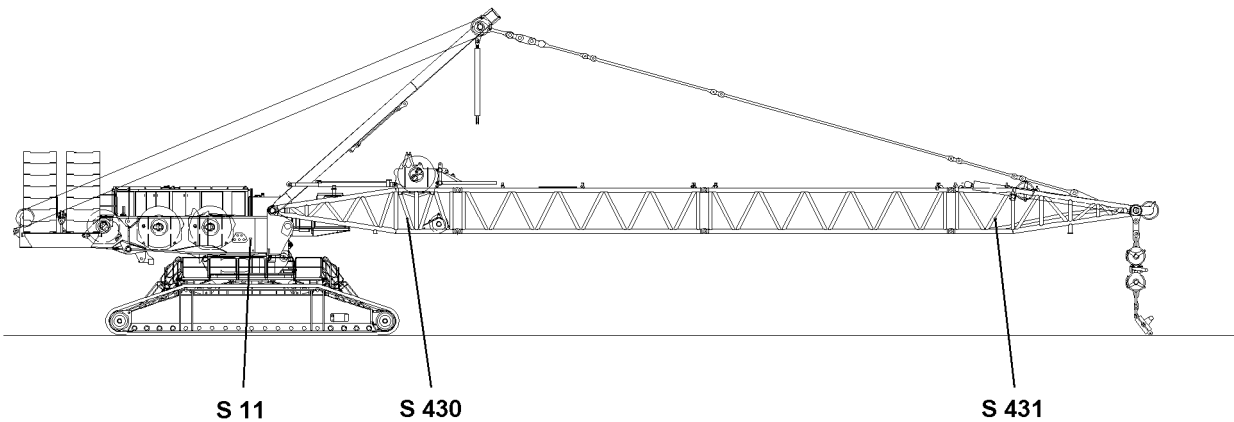
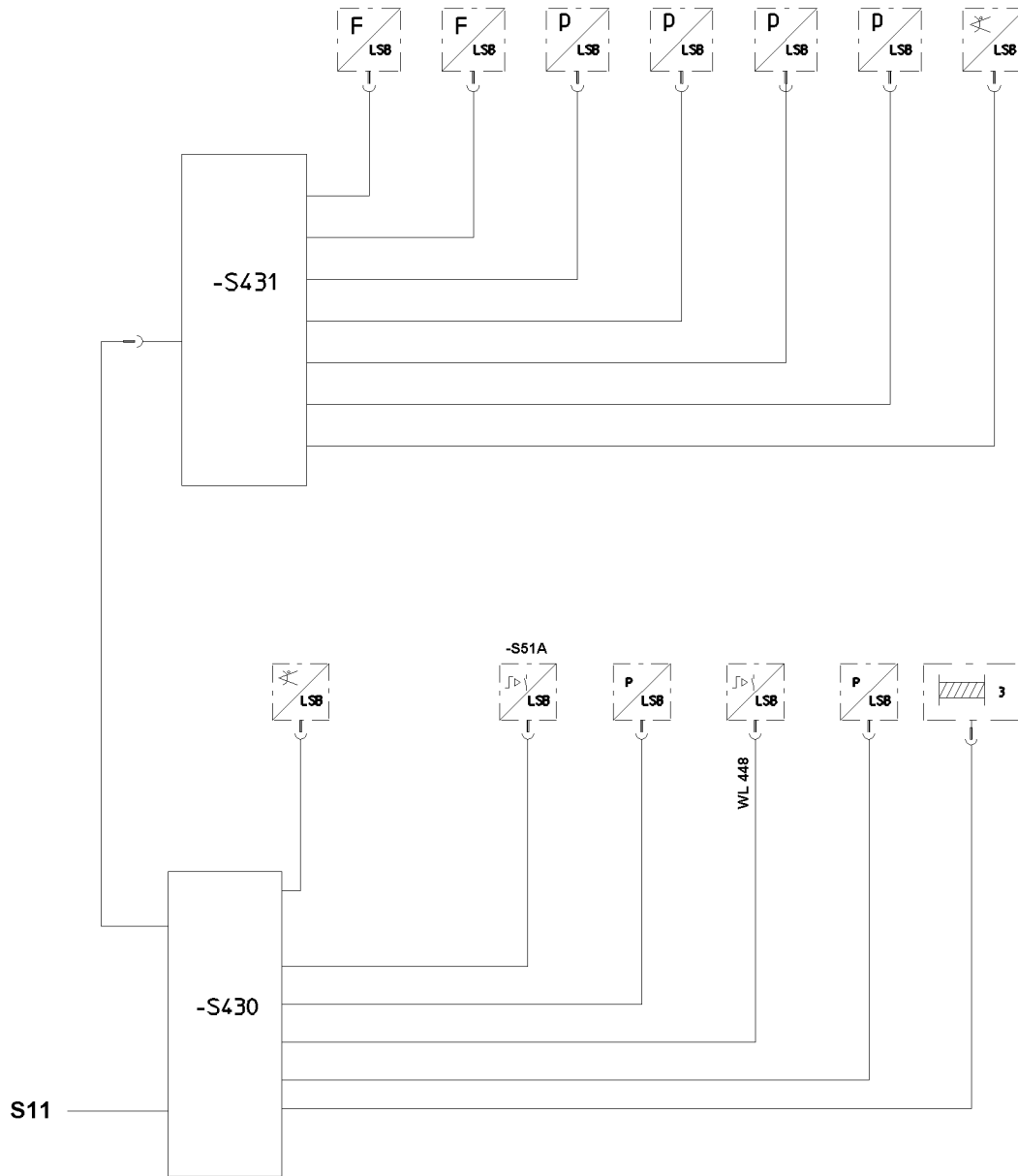


DANGER

General danger notes!

If the following conditions are not met before erecting the D-boom, the hoist rope can fall down and fatally injure personnel!

- ▶ Enough hoist rope **H** must be guided over the cable pulleys to prevent the hoist rope from being pulled back and fall down when erecting the D-boom!
- ▶ Pull the hoist rope over the cable pulleys on the D-head piece and the D-articulated piece.

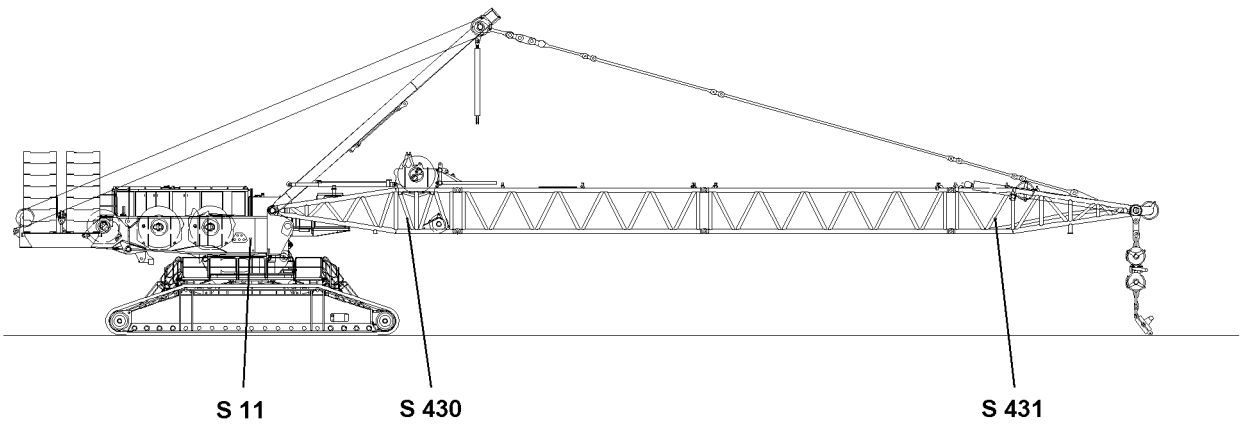
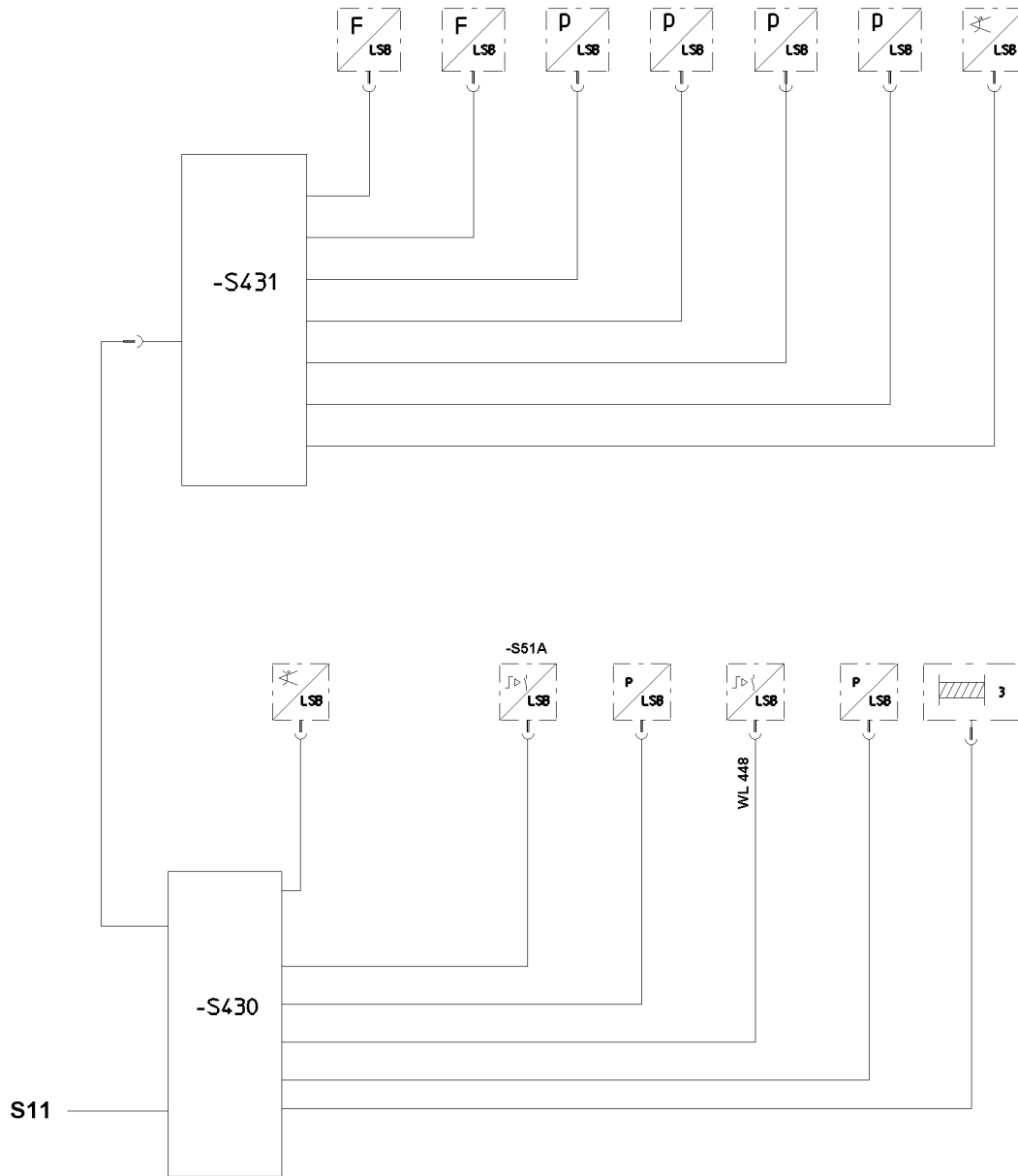


B103426

2.3 Establishing the electrical connections

Ensure that the following preconditions are met:

- the D-boom is completely assembled
- ▶ Establish the electrical connection from the switch box **S11** to the terminal box D-articulated piece **-S430**.
- ▶ Establish the electrical connection from the terminal box D-articulated piece **-S430** to the terminal box D-head piece **-S431**.
- ▶ Establish the electrical connection from the terminal box D-articulated piece **-S430** to winch 3.
- ▶ Establish the electrical connection from the terminal box D-articulated piece **-S430** to the D-relapse cylinders.
- ▶ Establish the electrical connection from the terminal box D-articulated piece **-S431** to the hydraulic cylinders for the suspended ballast.
- ▶ Establish the electrical connection from the terminal box D-articulated piece **-S431** to the pull test brackets.
- ▶ Establish the electrical connection from the terminal box D-articulated piece **-S431** to the angle sensor derrick **on top**.



B103426

2.4 Function check

Ensure that the following preconditions are met:

- all electrical connections have been made
- the appropriate operating mode is set

2.4.1 Limit switch - General



Note

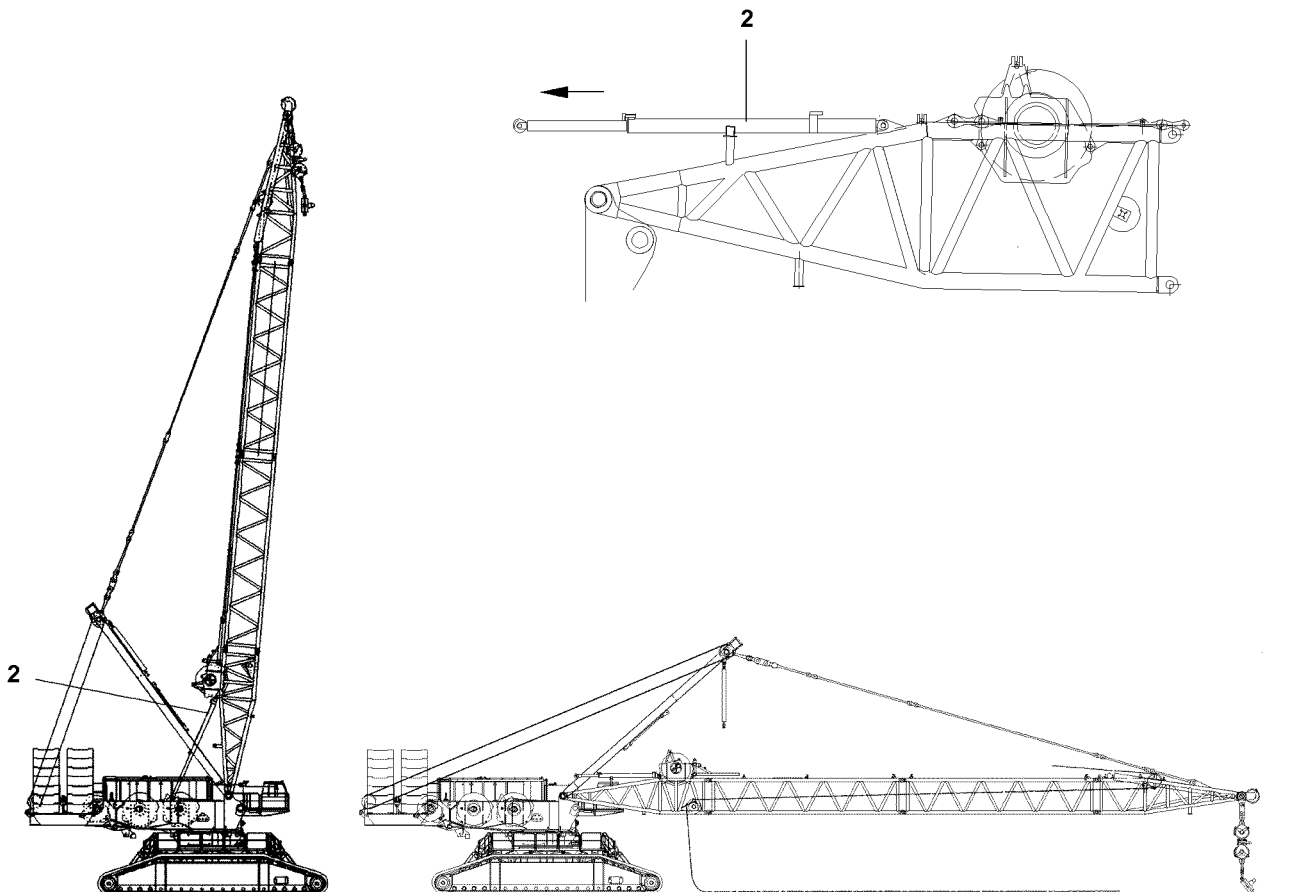
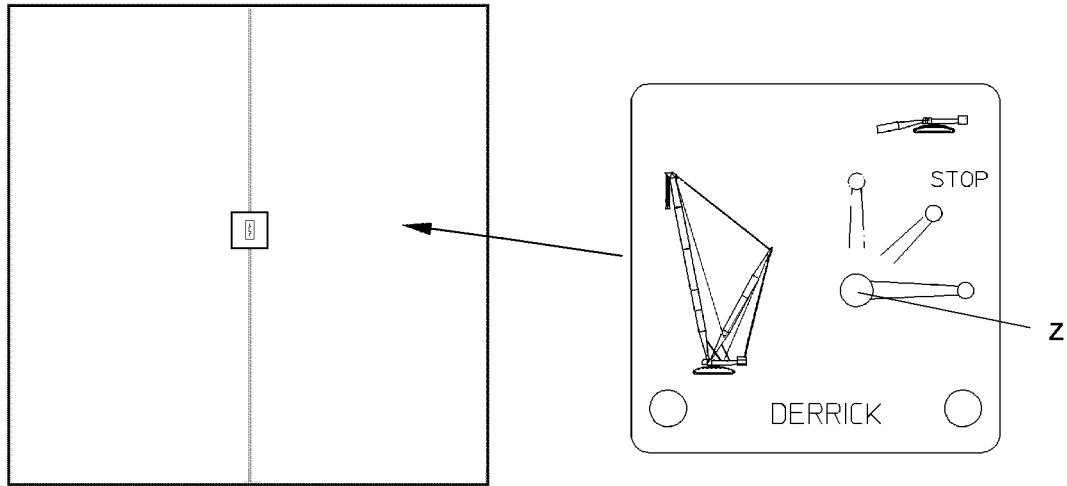
- ▶ The limit switch functions have to be checked individually before erection!
 - ▶ In the test system, the functions of the limit switch initiators must be checked as described in the separate "Diagnostics manual".
 - ▶ The limit switch initiators are checked manually as follows.
-

2.4.2 Limit switch D-boom, "steepest" position, relapse cylinder

- ▶ Cover the limit switch initiators individually with a metal plate. See chapter 8.12.

Result:

- The symbol appears on the LICCON monitor.
- The **spool up function** of the W-control winch turns off.



2.5 Erecting the D-boom



DANGER

Crane can topple over!

If the following conditions are not met before erecting the boom, the crane can topple over and fatally injure personnel!

- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!
- ▶ Extend the relapse cylinder before erection!

Ensure that the following preconditions are met:

- the crane is aligned in horizontal direction
- all electrical connections have been made
- all limit switches are functioning
- the counterweight has been attached to the turntable in accordance with the load chart
- all pin connections have been secured
- the hoist rope has been correctly placed in the cable pulleys and prevented from jumping out with the rope retaining pins
- the LICCON overload protection has been adjusted according to the data in the load chart
- the LICCON overload protection settings have been compared with the current crane configuration
- the assembly keyed switch **413** is actuated



DANGER

Crane can topple over!

- ▶ Observe the data in the erection and take down charts!
- ▶ It is not permitted to turn the crane during erection!
- ▶ Do not allow slack cable to build up on the adjusting winch.

2.5.1 Extending the D-relapse cylinder



Note

- ▶ The ball valve **Z** is in a locked compartment on the left hand side of the turntable. Always pull the key and hand it to an authorized person!

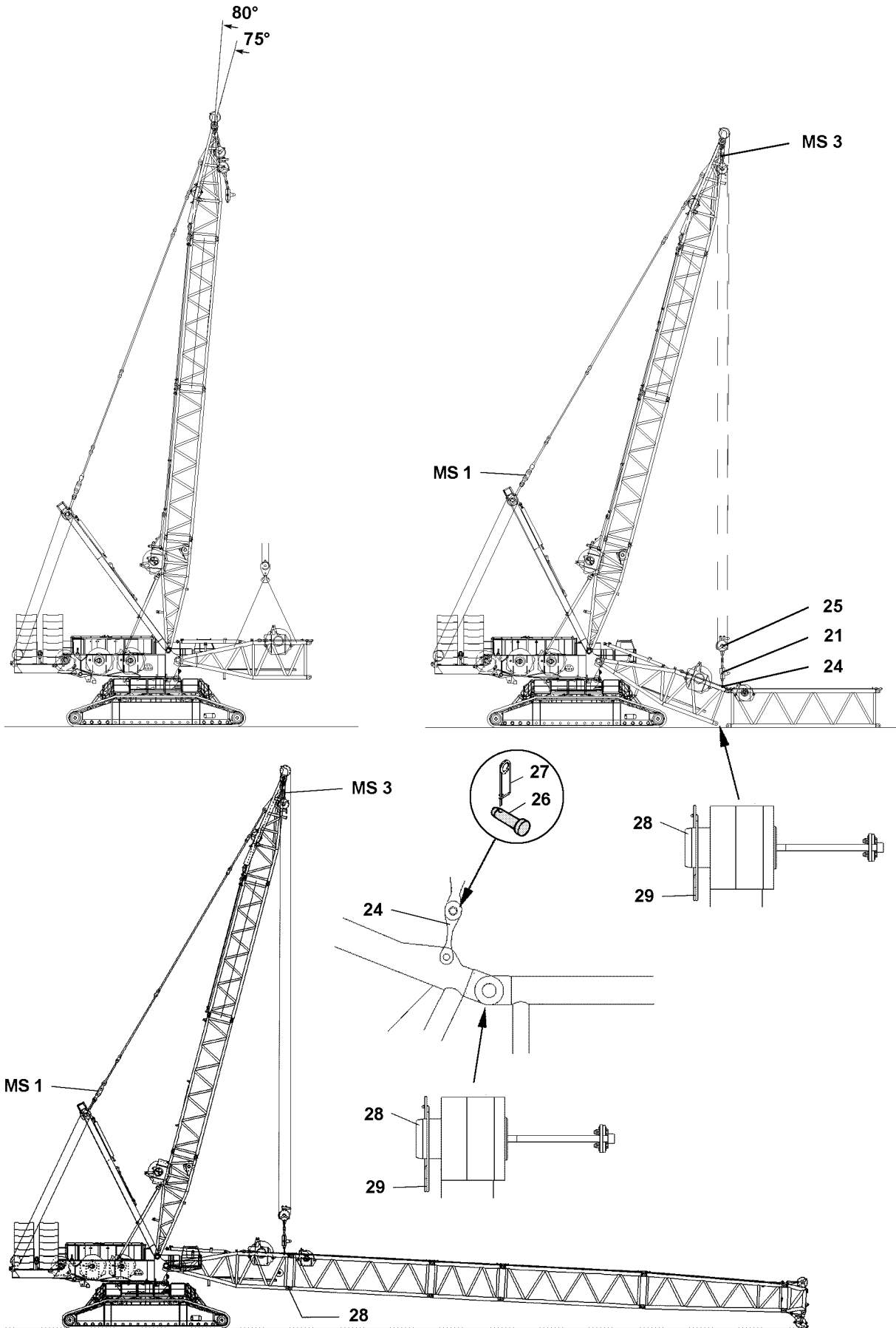
Ball valve position	
Horizontal	Extend piston rod, crane operation
Vertical	Retract piston rod, assembly
45 degree, stop	Piston rod retraction and extension is locked, transport position

Ensure that the following preconditions are met:

- all hydraulic connections have been made
- ▶ Move the ball valve **Z** into horizontal position.

Result:

- The piston rod of the D-relapse cylinder **2** extends.



B199965

2.5.2 Erection procedure

Ensure that the following preconditions are met:

- the D-relapse cylinders are extended before erection!



DANGER

Crane can topple over!

- ▶ Observe the data in the erection and take down charts!
 - ▶ It is not permitted to turn the crane during erection!
 - ▶ The D-boom is erected to approx. 75° to maximum 80° !
-
- ▶ Erect the D-boom to be able to install the S-articulated piece without restriction to approx. 75° to maximum 80° .

2.6 Pinning on the D-articulated piece



Note

- ▶ Pin on the D-articulated piece! See chapter 5.04.

2.7 Installing the S-lattice components on the S-articulated piece



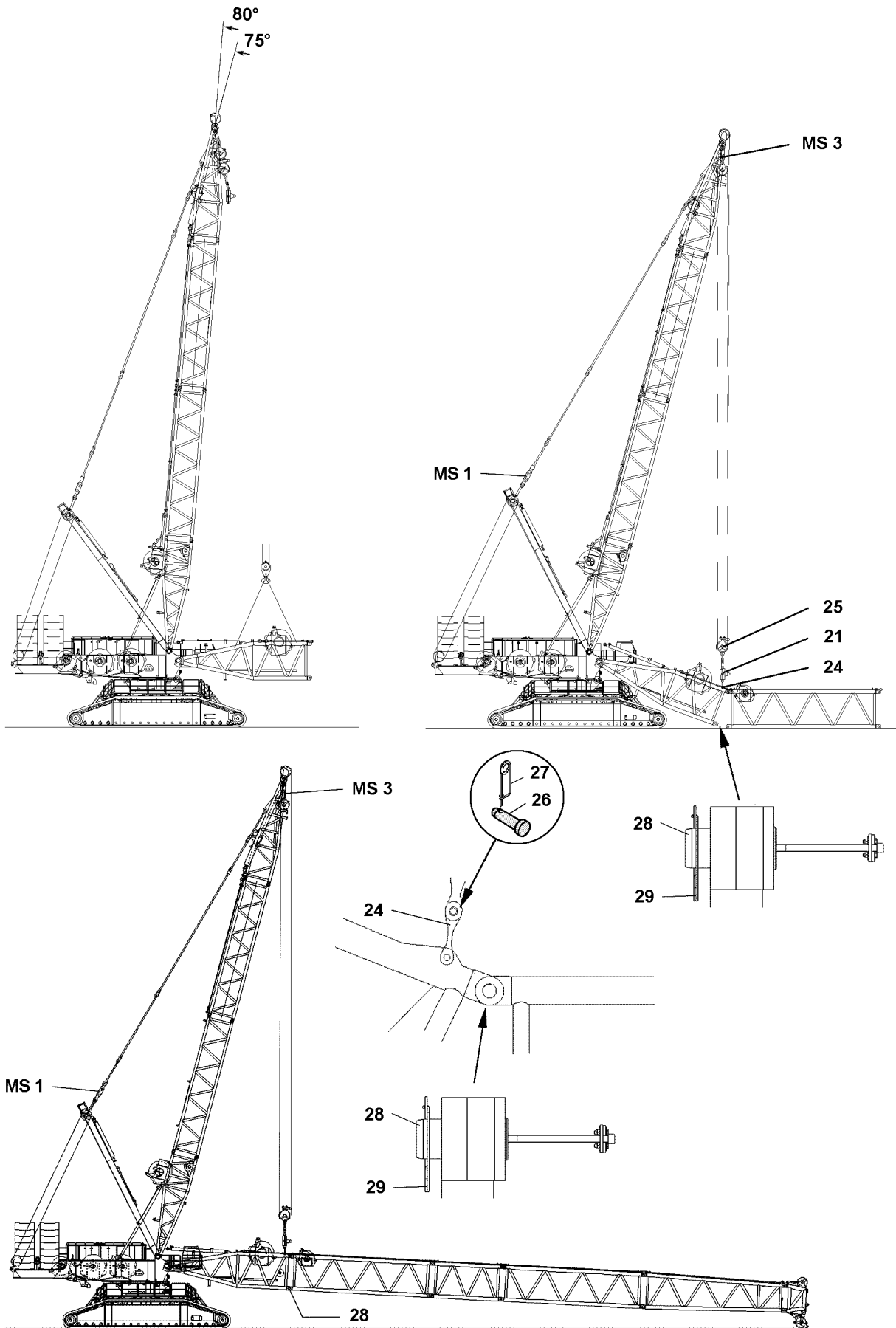
DANGER

General danger notes!

- ▶ Support the S-boom during assembly and disassembly with suitable materials!
- ▶ All pins must be secured after assembly!
- ▶ The guy posts must be checked regularly! See chapter 8.15.

To pin the S-lattice components with the pin pulling device, see also chapter 5.30.

- ▶ Lower the lower pulley block **25** to the S-articulated piece.
- ▶ Pin the assembly weight **21** on both sides on the brackets **24** on the S-articulated piece: Insert the pin **26** and secure with safety spring **27**.



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- ▶ Assemble the S-boom to the required length and pin on the S-articulated piece **on top**: Insert the pin **28** and secure with safety spring **29**.

**DANGER**

Damage to crane!

If the following conditions are not met, personnel can be fatally injured or the crane can be damaged.

- ▶ The maximum approved total force at the measuring point **MS1** may not exceed 136 t.
- ▶ The maximum approved total force at the measuring point **MS3** may not exceed 150 t.
- ▶ The head piece may not be raised, it must rest on the ground.

- ▶ Pull the S-articulated piece up with the pulley block **25** and pin on both sides **on the bottom**: Insert the pin **28** and secure with safety spring **29**.

**Note**

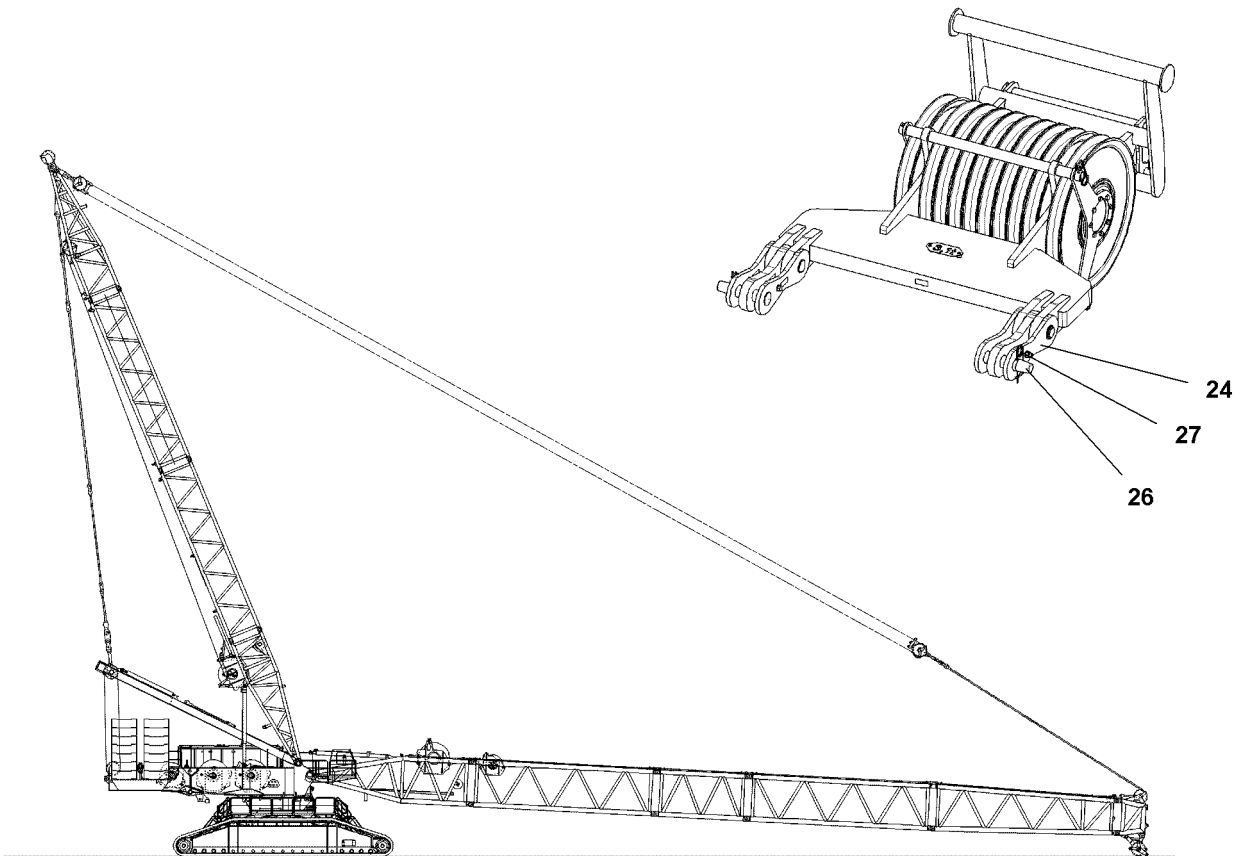
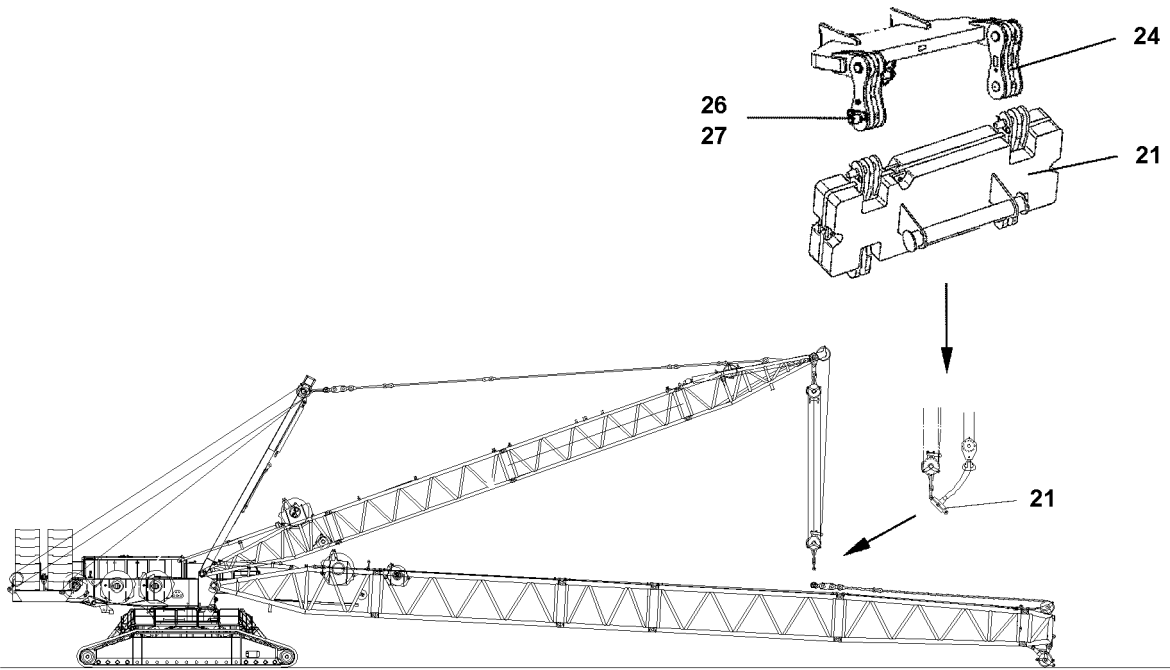
- ▶ The **ACTUAL** force on test point **MS3** is shown on monitor 1. Note the displayed **ACTUAL force**.
- ▶ Before **unpinning** the boom, tension the guying on the pulley block **25** with the same **ACTUAL force**!

**DANGER**

The boom can suddenly fold down!

If the pulley block is unpinned on brackets **24** before the lower pins **28** are pinned, the boom can fold down and fatally injure personnel!

- ▶ Do not unpin pins **26** until the lower pins **28** have been pinned and secured.
- ▶ Relieve the guying by lowering the pulley block **25**.
- ▶ Unpin the pins **26**.



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2.8 Installing the S-guy posts



Note

- ▶ The D-guy posts must be installed and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy posts.

Ensure that the following preconditions are met:

- the S-boom lattice components are pinned and secured
- the S-boom lays with the S-head piece on the ground or hangs on the auxiliary crane for flying installation
- the transport retainers on the guy posts are unpinned

2.8.1 Assembly procedure



Note

- ▶ For long S-booms, the lower pulley block must be guided with an auxiliary crane to the guy posts.

The guy posts are placed and secured for transport on the S-lattice components. Before assembly, the transport retainers must be released.

- ▶ Release the transport retainers on the guy posts.
- ▶ Lower the derrick **D** to the front until the pulley block with the assembly weight is above the guy posts which are to be connected.
- ▶ Hang the assembly weight **21** onto the auxiliary crane.
- ▶ Remove the assembly weight **21**. Remove the safety spring **27** and unpin the pin **26** on the bracket **24** on both sides.
- ▶ Pin the lower pulley block **25** with the guy posts from the S-head piece: Insert the pin **26** and secure with safety spring **27**.

2.8.2 Erecting the D-boom

Ensure that the following preconditions are met:

- the D-relapse cylinders are extended before erection!
- the D-pulley block is pinned and secured on the guy posts!



DANGER

Crane can topple over!

- ▶ Observe the data in the erection and take down charts!
- ▶ It is not permitted to turn the crane during erection!

- ▶ Erect the D-boom to the corresponding operating position.

To prevent that the S-boom from being pulled up, spool out winch 3.

- ▶ When the D-boom is in operating position, tension the guying.



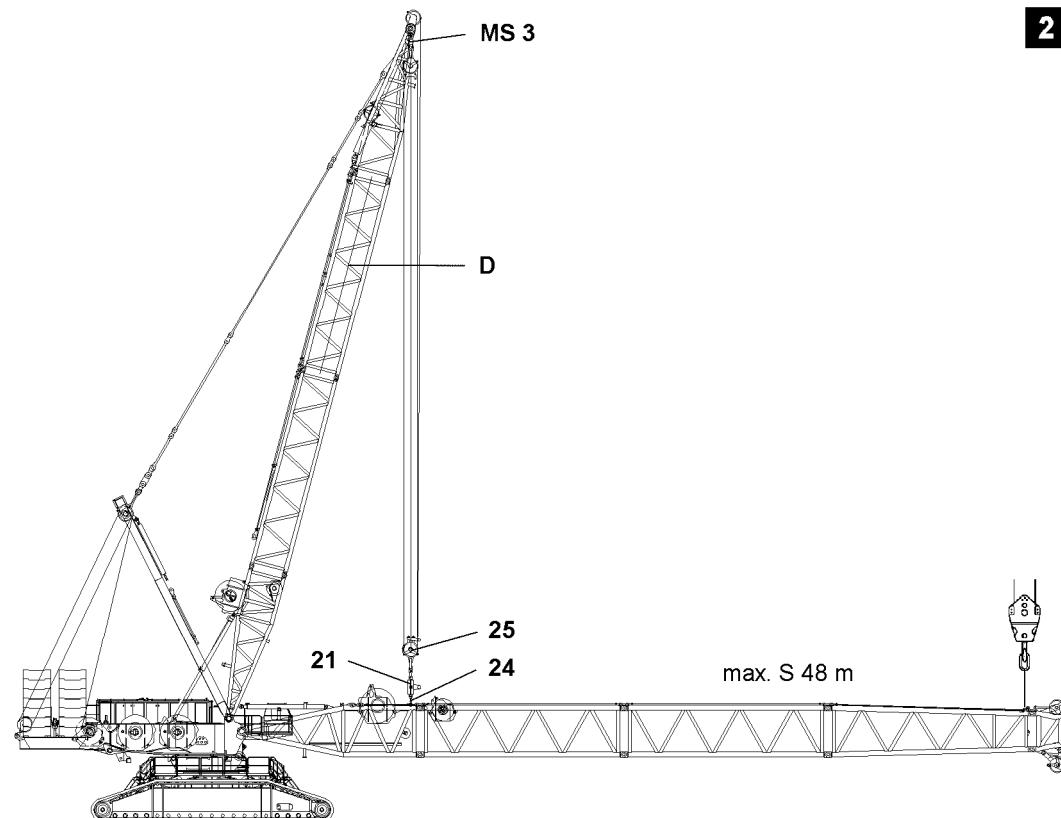
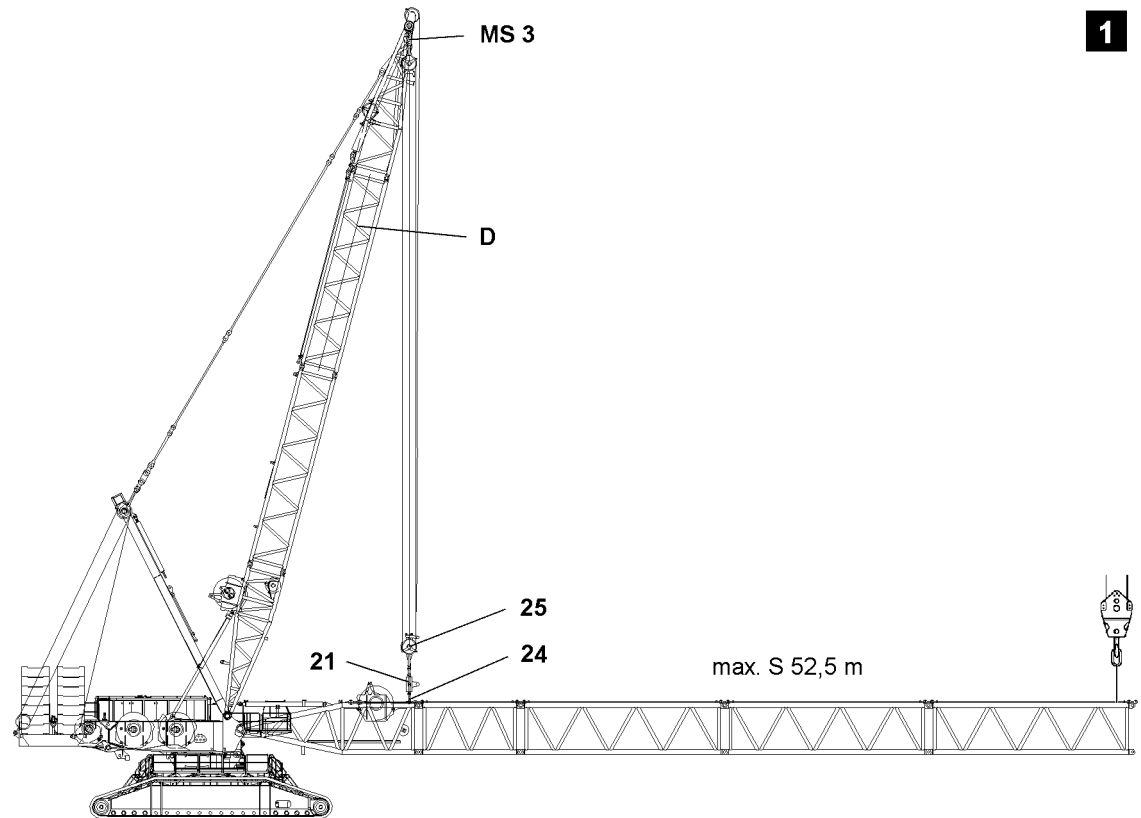
DANGER

General danger notes!

If the following conditions are not met before erecting the D-boom, the hoist rope can fall down and fatally injury personnel!

- ▶ Enough hoist rope **H** must be guided over the cable pulleys to prevent the hoist rope from being pulled back and fall down when erecting the D-boom!

- ▶ Pull the hoist rope **H** over the cable pulleys.



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2.9 S-boom assembly flying with derrick

2.9.1 Maximum permissible boom length - fig. 1



DANGER

General danger notes!

- ▶ Support the S-boom during assembly and disassembly with suitable materials!
- ▶ All pins must be secured after assembly!
- ▶ The guy posts must be checked regularly! See chapter 8.15.



DANGER

Damage to crane!

If the following conditions are not met, personnel can be fatally injured or the crane can be damaged.

- ▶ The maximum permissible total force on test point **MS3** may not exceed 200 t.
- ▶ A turntable weight of at least 200 t must be installed on the turntable.

Lifts of the following boom length with the derrick **D** are permissible:

- ▶ S 52.5 m without head piece, with installed S-guy posts and WA-bracket 2-guy posts.



2.9.2 Maximum permissible boom length - fig. 2



DANGER

Damage to crane!

If the following conditions are not met, personnel can be fatally injured or the crane can be damaged.

- ▶ The maximum permissible total force on test point **MS3** may not exceed 200 t.
- ▶ A turntable weight of at least 200 t must be installed on the turntable.

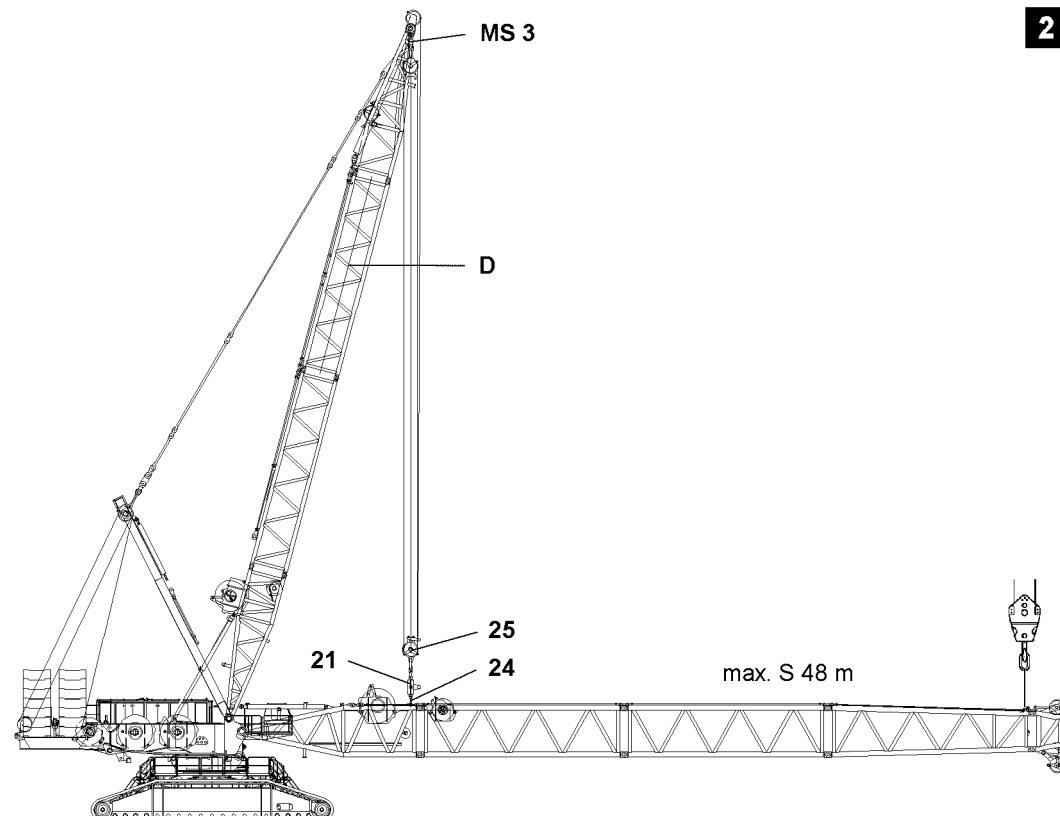
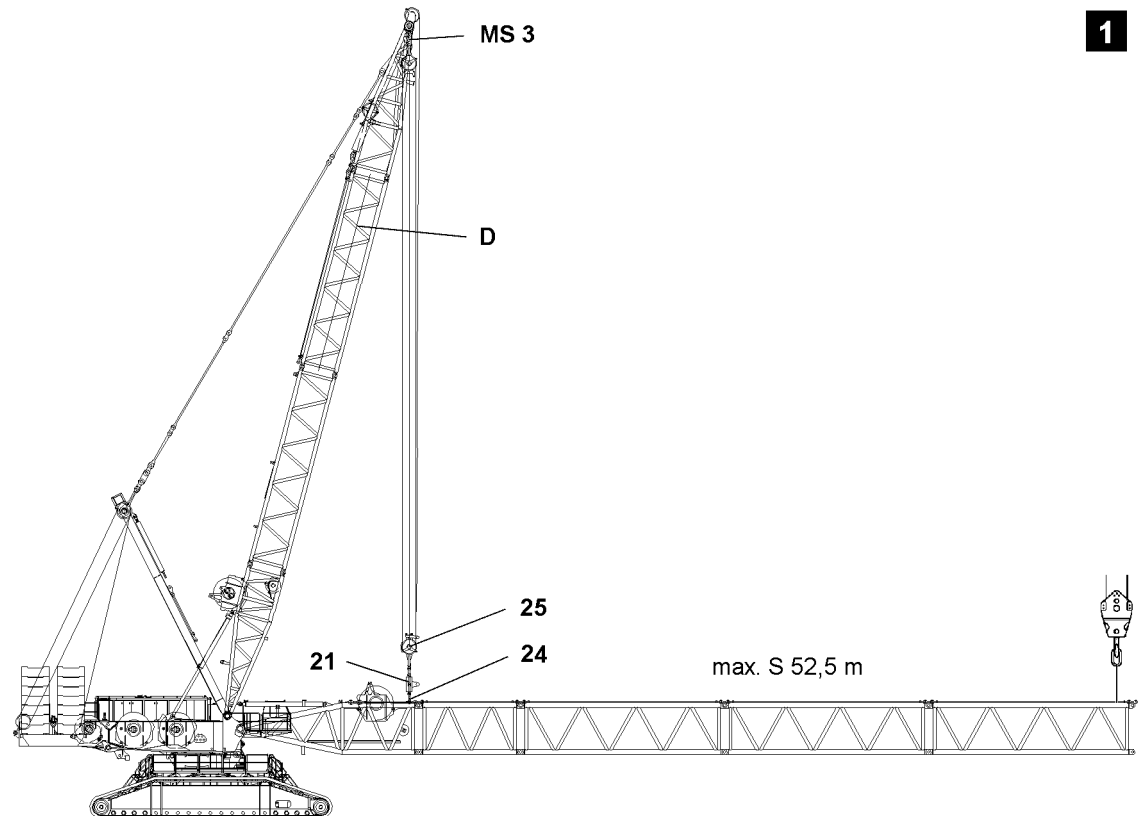
Lifts of the following boom length with the derrick **D** are permissible:

- ▶ S 48 m with head piece, S-guy posts, WA-bracket 2-guy posts without hook block.



Note

- ▶ The ACTUAL force on test point **MS3** is shown on monitor 1.



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2.9.3 Flying assembly

Ensure that the following preconditions are met:

- the S-articulated piece is pinned and secured on the lower pulley block
- the S-articulated piece is guyed in horizontal position
- an auxiliary crane is available



DANGER

Danger of accident at assembly / disassembly of booms!

When you assemble or disassemble unsecured or unsupported booms, then the boom can fall down and kill or severely injure personnel.

- ▶ Never pin or unpin the pins under unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure!
- ▶ Safely secure the pins in the bearing points as well as receptacles!

- ▶ Pin and secure individual intermediate pieces or the completely assembled boom on the S-articulated piece.
- ▶ Hang the auxiliary crane on the head piece or support the boom with solid materials.



DANGER

The boom can suddenly fold down!

If the pulley block **25** is unpinned on the brackets **24** before the auxiliary crane is hung on the head piece and held by it, the boom can fold down and fatally injure personnel!

- ▶ Only unpin the pulley block **25** on brackets **24** when the boom is held by the auxiliary crane.
- ▶ Relieve the guy posts by lowering the pulley block.



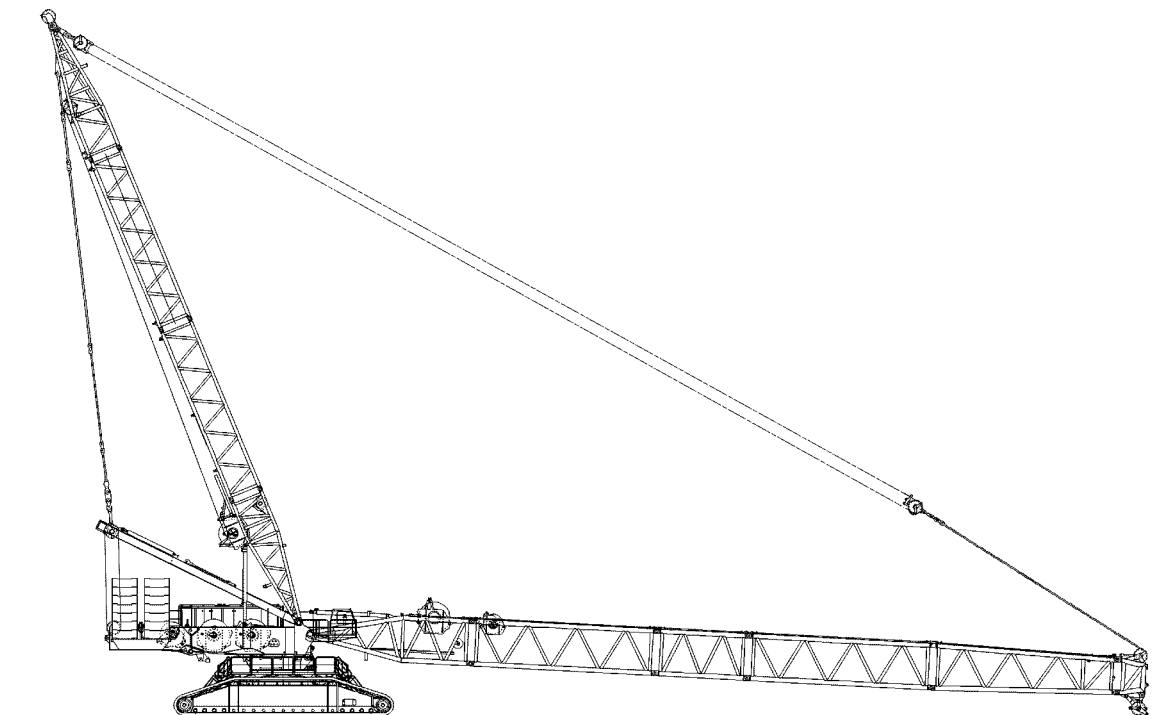
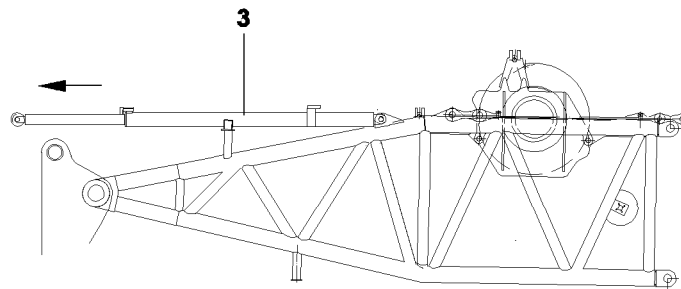
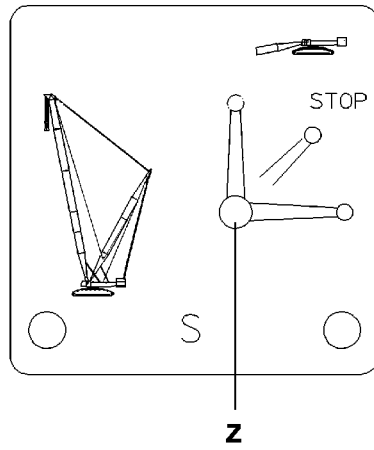
Note

- ▶ Before unpinning the S-guy posts with the pulley block **25**, remove the assembly weight **21** on the pulley block **25**. Remove the safety spring and unpin the pin.
- ▶ Hang assembly weight **21** onto the auxiliary crane and unpin on the pulley block **25**.
- ▶ Pin and secure the pulley block **25** to the S-guy posts.
- ▶ Erect the derrick and tension the guy posts.



Note

- ▶ To pin the pulley block with the guy posts and erect the derrick, see section 2.8.



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2.10 Erecting the S-boom



DANGER

Crane can topple over!

If the following conditions are not met before erecting the boom, the crane can topple over and fatally injure personnel!

- ▶ Observe the Safety technical guidelines in chapter 5.01!
 - ▶ Observe the data in the erection and take down charts!
 - ▶ Extend the relapse cylinder before erection!
-

Ensure that the following preconditions are met:

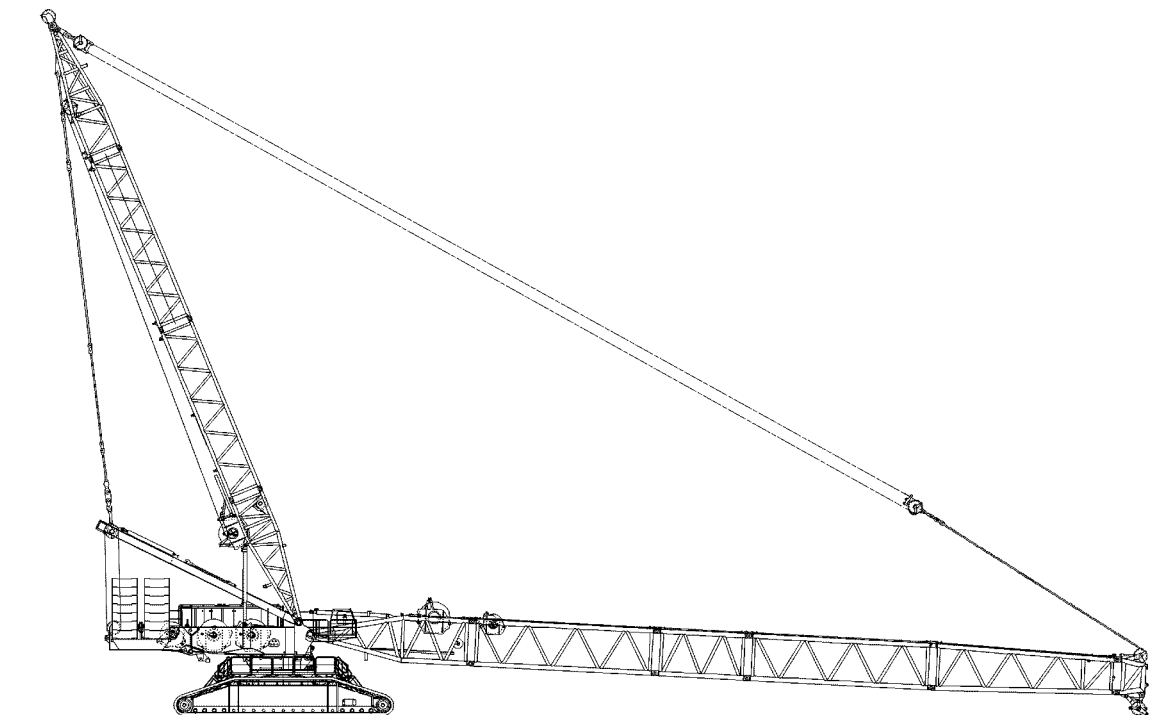
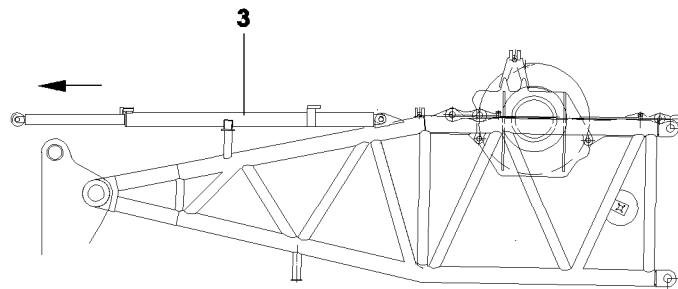
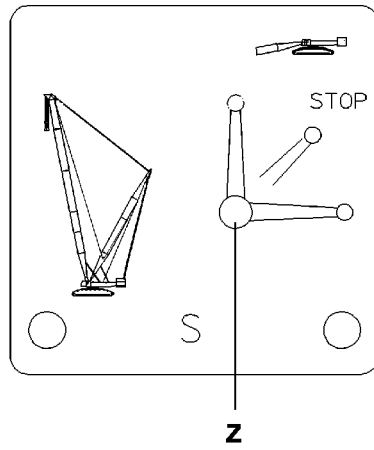
- all electrical connections have been made
 - all limit switches are functioning
 - the appropriate operating mode is set
 - the crane is aligned in horizontal direction
 - the counterweight has been attached to the turntable in accordance with the load chart
 - the LICCON overload protection has been adjusted as per the information in the load chart
 - all pin connections have been secured
 - the hoist rope has been correctly placed in the cable pulleys and prevented from jumping out with the rope retaining pins
 - the LICCON overload protection has been adjusted according to the data in the load chart
 - the LICCON overload protection settings have been compared with the current crane configuration
 - the assembly keyed switch **413** is actuated
 - the hoist rope has been correctly placed in the cable pulleys and prevented from jumping out with the rope retaining pins
-



DANGER

Crane can topple over!

- ▶ Observe the data in the erection and take down charts!
 - ▶ It is not permitted to turn the crane during erection!
 - ▶ Do not allow slack cable to build up on the adjusting winch.
-



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2.10.1 Extending the S-relapse cylinder


Note

- ▶ The ball valve **Z** is in a locked compartment on the left hand side of the turntable. Always pull the key and hand it to an authorized person!

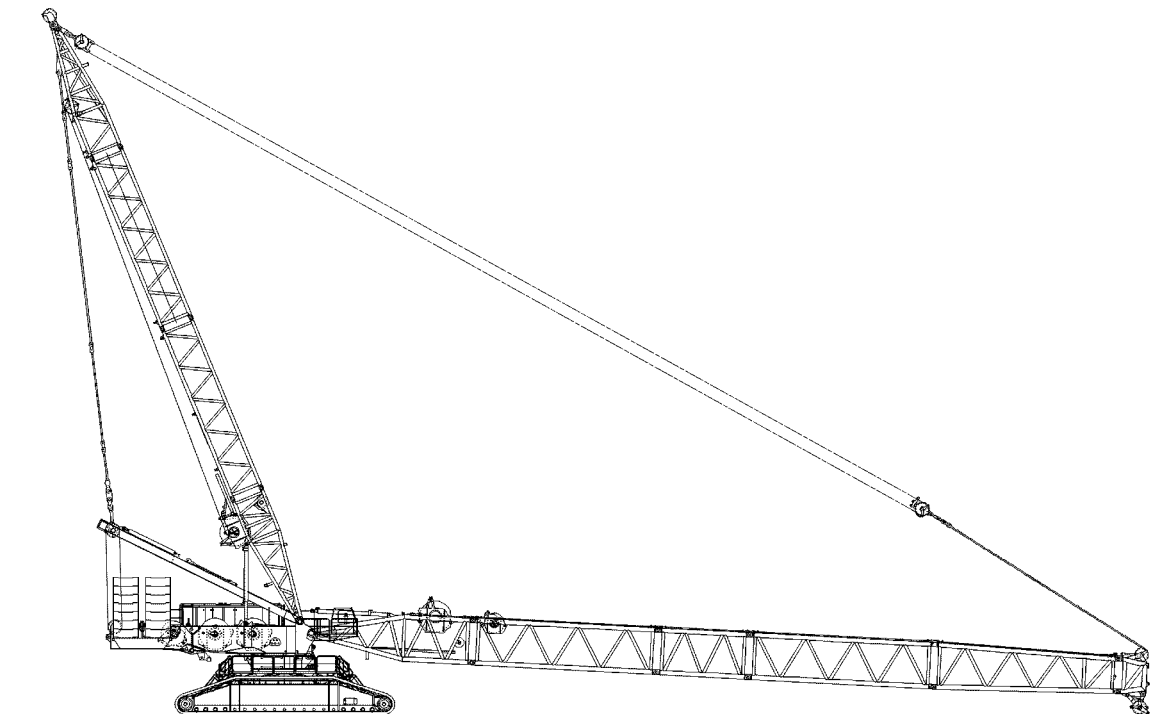
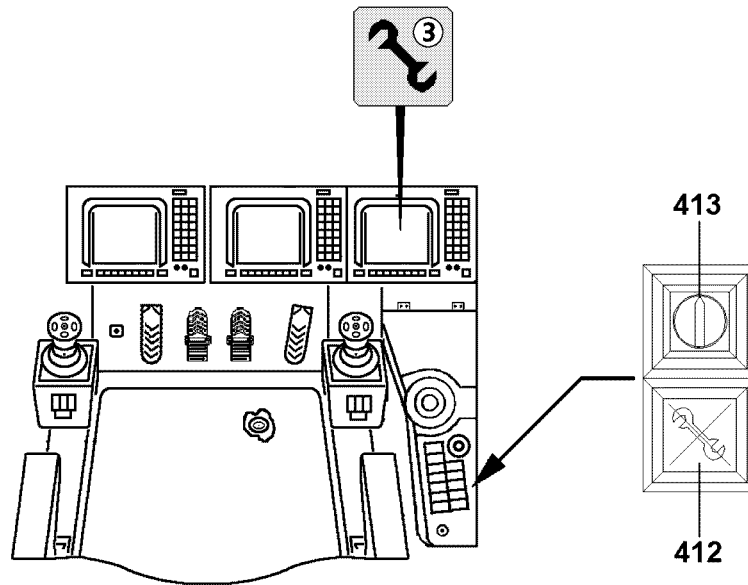
Ball valve position	
Horizontal	Extend piston rod, crane operation
Vertical	Retract piston rod, assembly
45 degree, stop	Piston rod retraction and extension is locked

Ensure that the following preconditions are met:

- all hydraulic connections have been made
- ▶ Move the ball valve **Z** into horizontal position.

Result:

- The piston rod extends.



2.10.2 Erection procedure

Ensure that the following preconditions are met:

- the D-boom is in operating position
- the LICCON overload protection has been adjusted according to the data in the load chart
- the LICCON overload protection settings have been compared with the current crane configuration
- the assembly keyed switch **413** is actuated



DANGER

Crane can topple over!

- ▶ Observe the data in the erection and take down charts!
- ▶ It is not permitted to turn the crane during erection!

- ▶ Luff up the S-boom until the S-head piece lifts off the ground.
- ▶ Reeve hook block properly and attach the hoist limit switch weight.
- ▶ Luff up the S-boom until the lowest operating position is reached.



DANGER

Crane can topple over!

- ▶ When the lowest operating position is reached, the assembly keyed button **413** must be turned off immediately.
- ▶ The assembly keyed button **413** bypasses the safety devices!
- ▶ The radii specified in the load chart may not be fallen below nor exceeded!



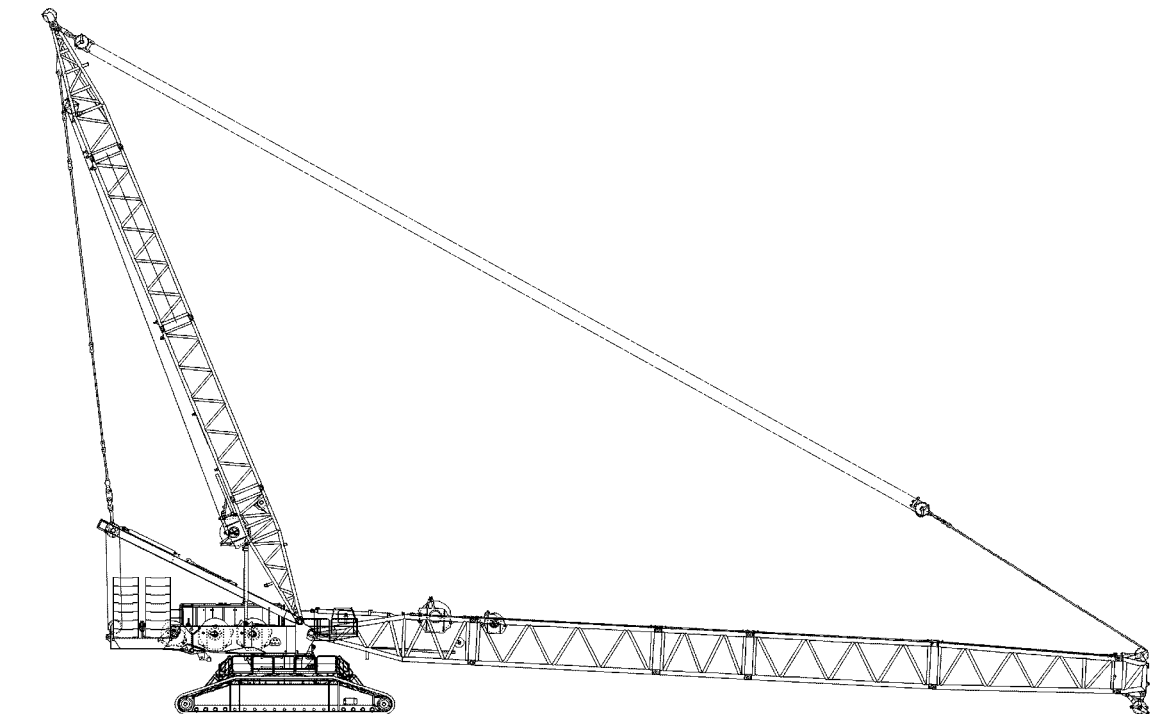
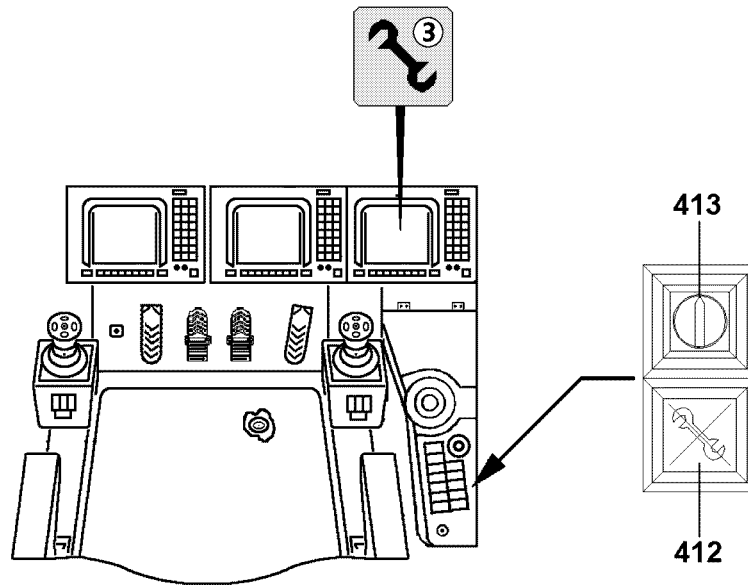
Note

- ▶ The operating position is reached if the blinking displays turn off and a load display appears in the “maximum load” symbol instead of question marks (???).

- ▶ Turn the assembly keyed button **413** off by pressing the button **412**.

Result:

- The LICCON overload protection is active.
- The Assembly symbol **3** on the LICCON display turns off.
- The acoustical signal turns off.
- The red beacon on the crane cab is off.



3 Crane operation

Observe the notes in chapter 4.05, 4.08 and 5.01.

Ensure that the following preconditions are met:

- The LICCON overload protection has been adjusted according to data in the load chart.
- The assembly keyed button **413** has been turned off by pressing the button **412**.
The Assembly Symbol **3** on the LICCON display is off.



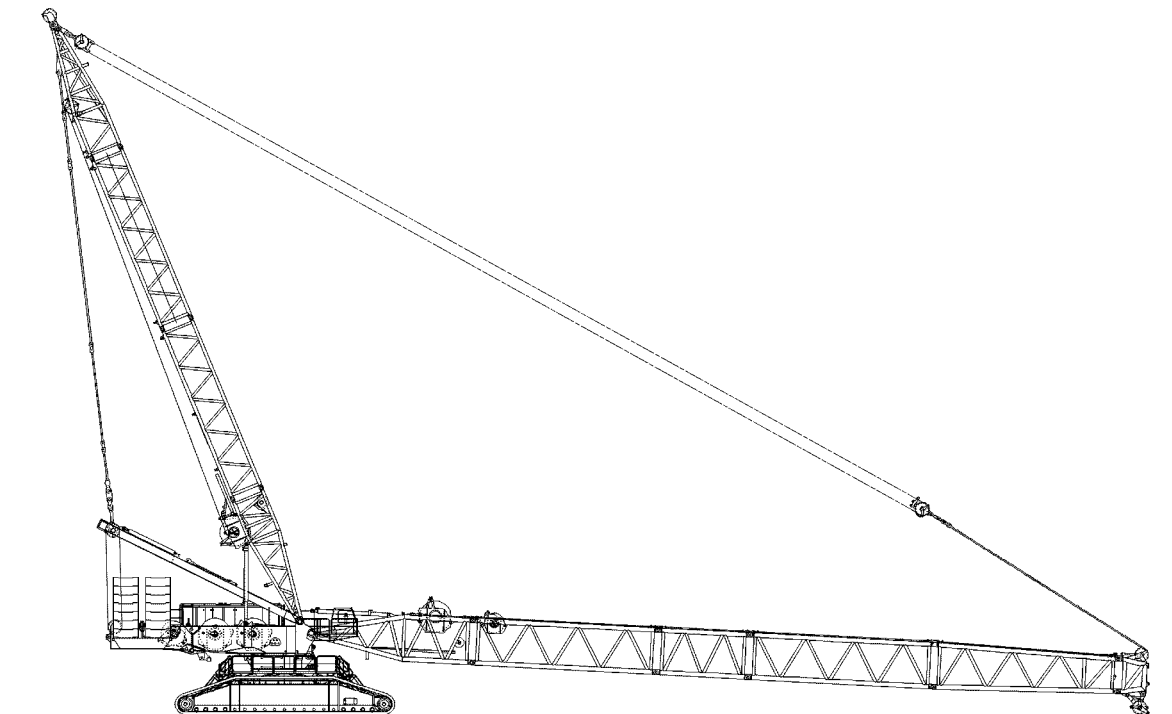
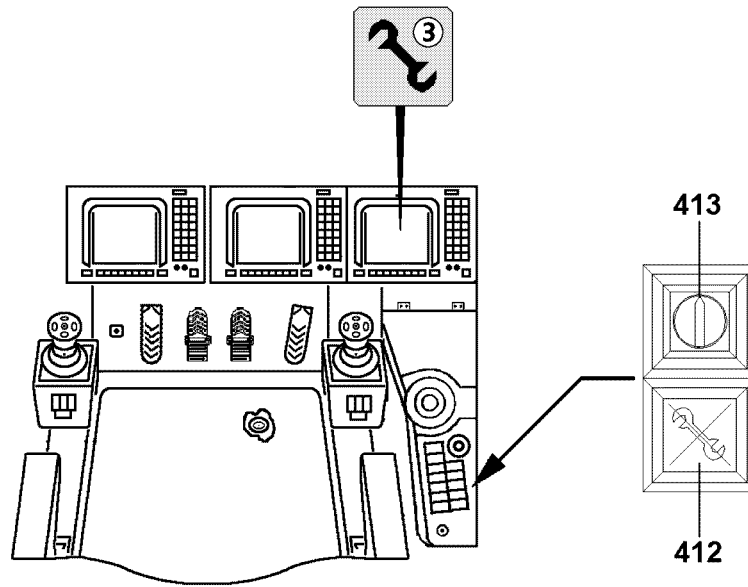
DANGER

Crane can topple over!

- ▶ Check the horizontal position of the crane before and during operation.
 - ▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset, if necessary, before resuming crane operation.
-

3.1 Checking the settings

- ▶ Check the function of the overload protection by running against the operating positions on top and bottom.
- ▶ Check the hoist limit switch by running against the hoist limit switch weight.
- ▶ Check the function of the limit switches on the relapse cylinders.



4 Disassembly



DANGER

Risk 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 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!



DANGER

Danger of accident at assembly / disassembly of booms!

When you disassembly unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel.

- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under 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!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ Do not lean the ladder against the component being disassembled!

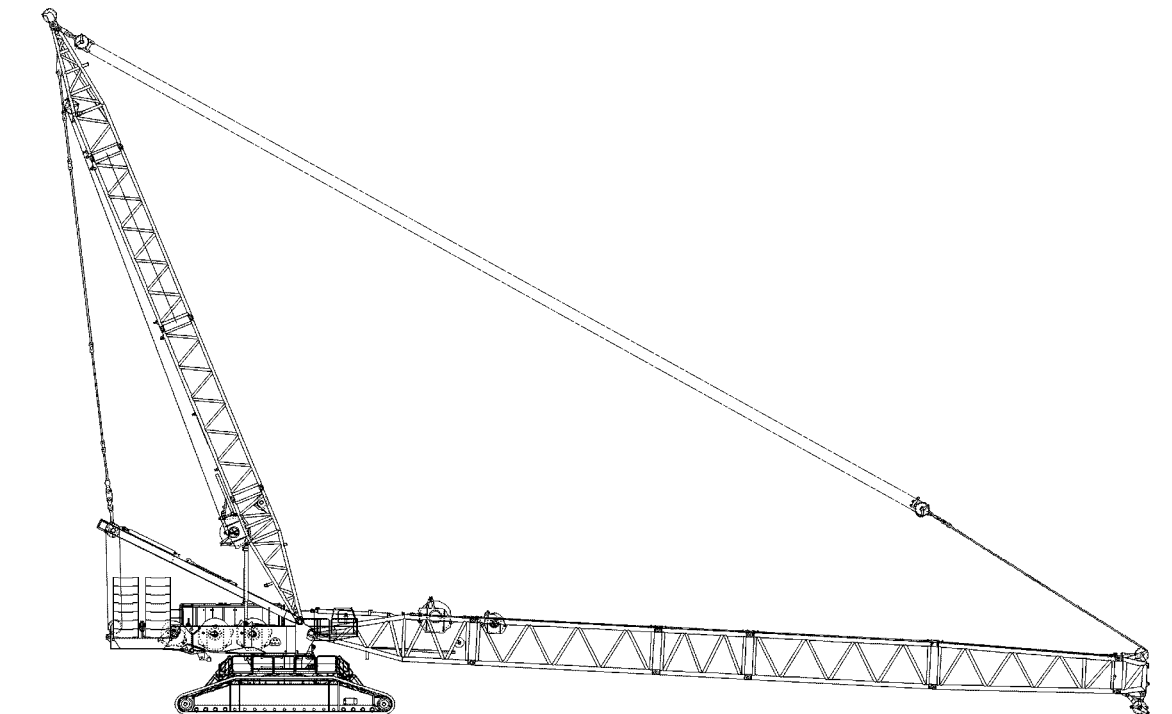
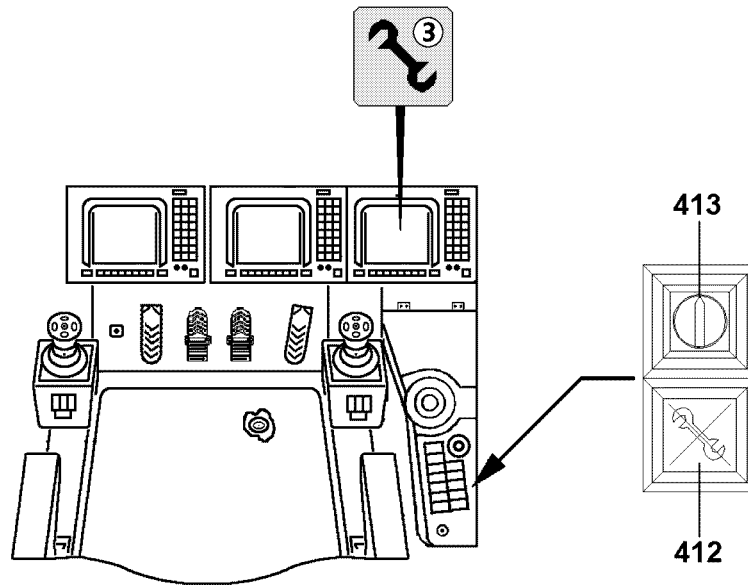


DANGER

Falling components!

If a component is removed without it being secured with the auxiliary crane to prevent it from falling, the component can fall and kill personnel!

- ▶ Secure components before removal with the auxiliary crane to prevent them from falling!



4.1 Taking the S-booms down



DANGER

Crane can topple over!

If the following conditions are not met before taking down the boom, the crane can topple over and fatally injure personnel!

- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!
- ▶ The D-boom must be in operating position!

- ▶ Luff the S-boom down to the **lowest** operating position.

When the lowest operating position is reached the luff down movement is shut off.

The load value in the "maximum load" symbol disappears and question marks appear (????).

The following alarm functions become active:

- "STOP"
- "Horn" and acoustical signal



DANGER

Danger of fatal injury at crane operation with turned on assembly keyed button.

- ▶ The actuation of the assembly keyed button **413** is only permitted for assembly tasks!
- ▶ The assembly keyed button may only be operated by persons, who are aware of the consequences of a bypass!
- ▶ When the assembly keyed button **413** is turned on, the hoist limit switch and the LICCON overload protection are bypassed!
- ▶ Crane operation with turned on assembly keyed button **413** is strictly prohibited!
- ▶ After assembly work is completed, the assembly keyed button **413** must be pulled immediately and turned over to an authorized person!

- ▶ Actuate the assembly keyed button **413**.

Result:

- The LICCON overload protection is inactive.
- The control light in the button **412** lights up.
- The Assembly symbol **3** in the LICCON monitor blinks.
- An acoustical signal sounds.
- The red beacon on the crane cab blinks.
- The Stop symbol **3** on the LICCON monitor flashes.
- The horn sounds.
- ▶ Continue to luff the S-boom down until the hook block touches the ground.
- ▶ Remove the hoist limit switch weight and unreeve the hook block.
- ▶ Luff the S-boom down until the S-boom head is laying on the support on the ground.

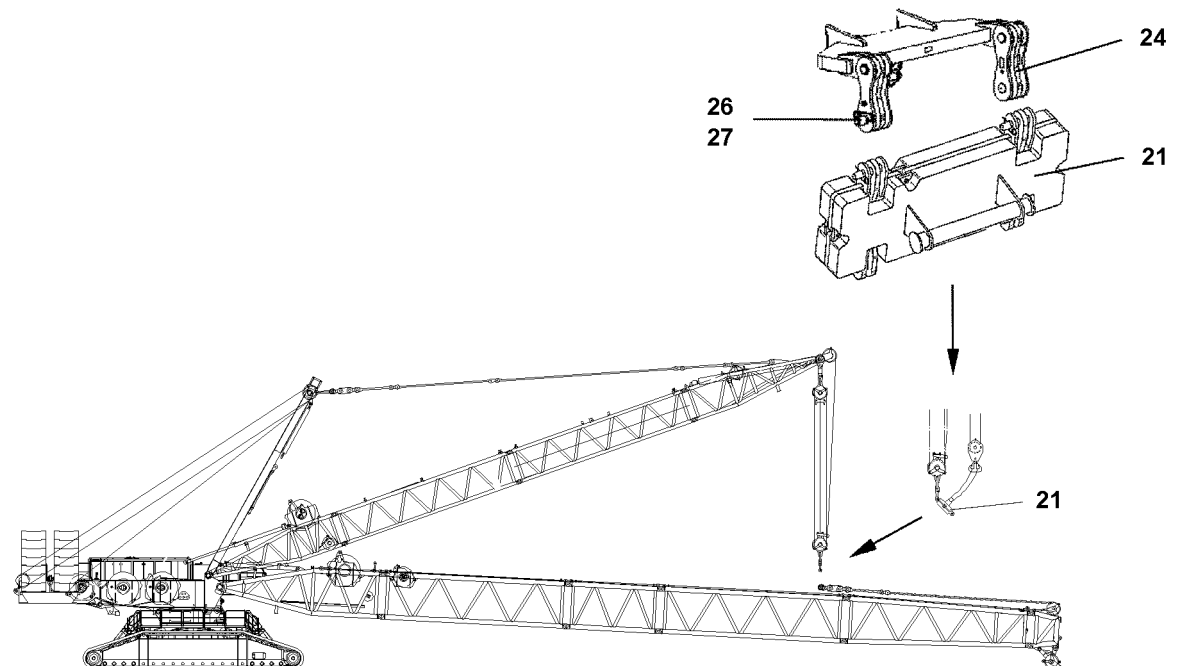
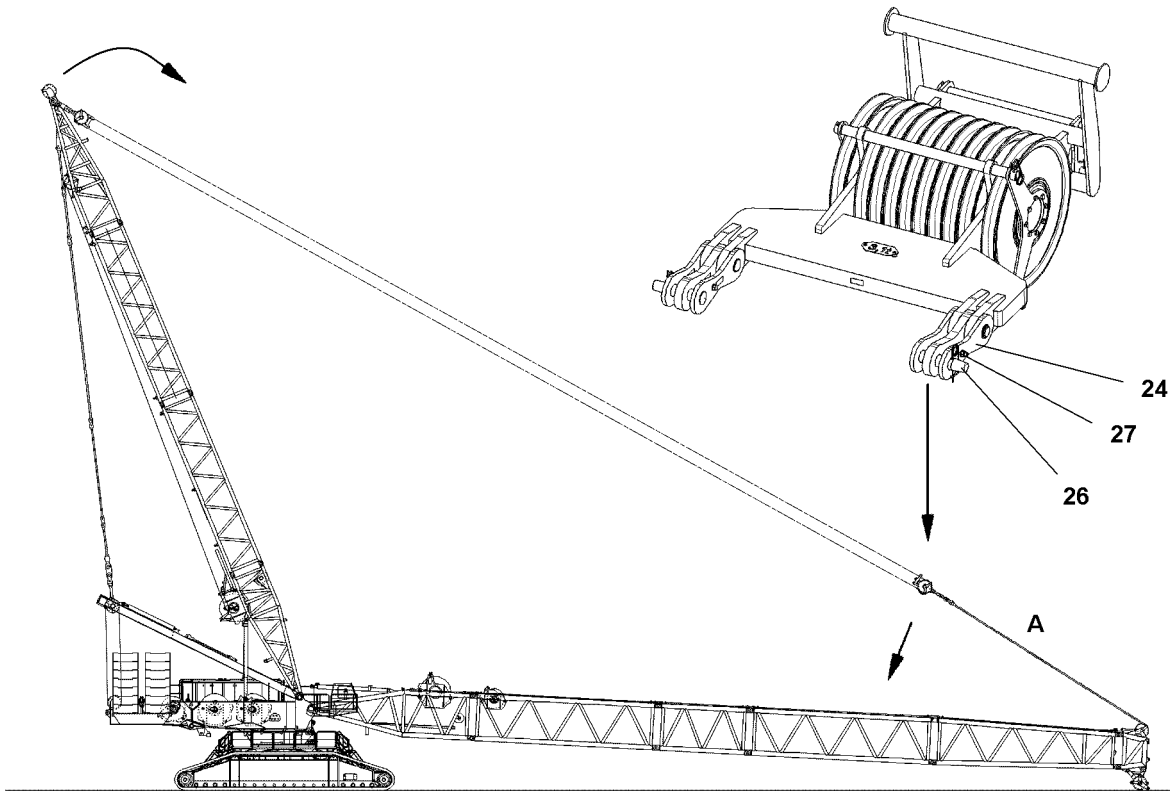


DANGER

Risk of accident!

- ▶ Make sure that no personnel is within the danger zone.
- ▶ Slowly spool up the hoist rope over the cable pulleys back to the winch.

- ▶ Remove the hoist rope.



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4.2 Removing the S-guy posts

Ensure that the following preconditions are met:

- the derrick ballast is disassembled
- the S-boom lays with the S-head piece on the ground or hangs on the auxiliary crane for flying installation

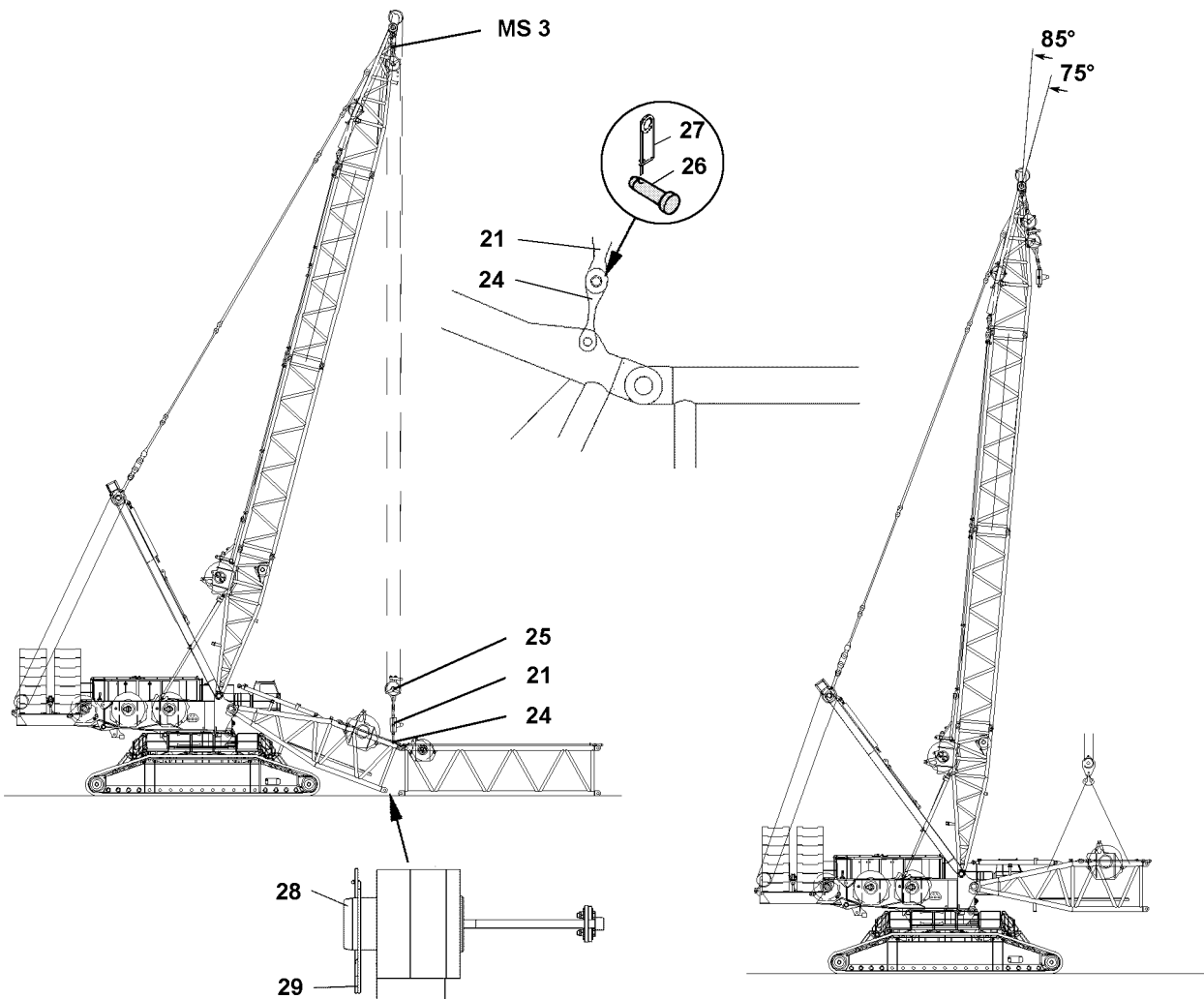
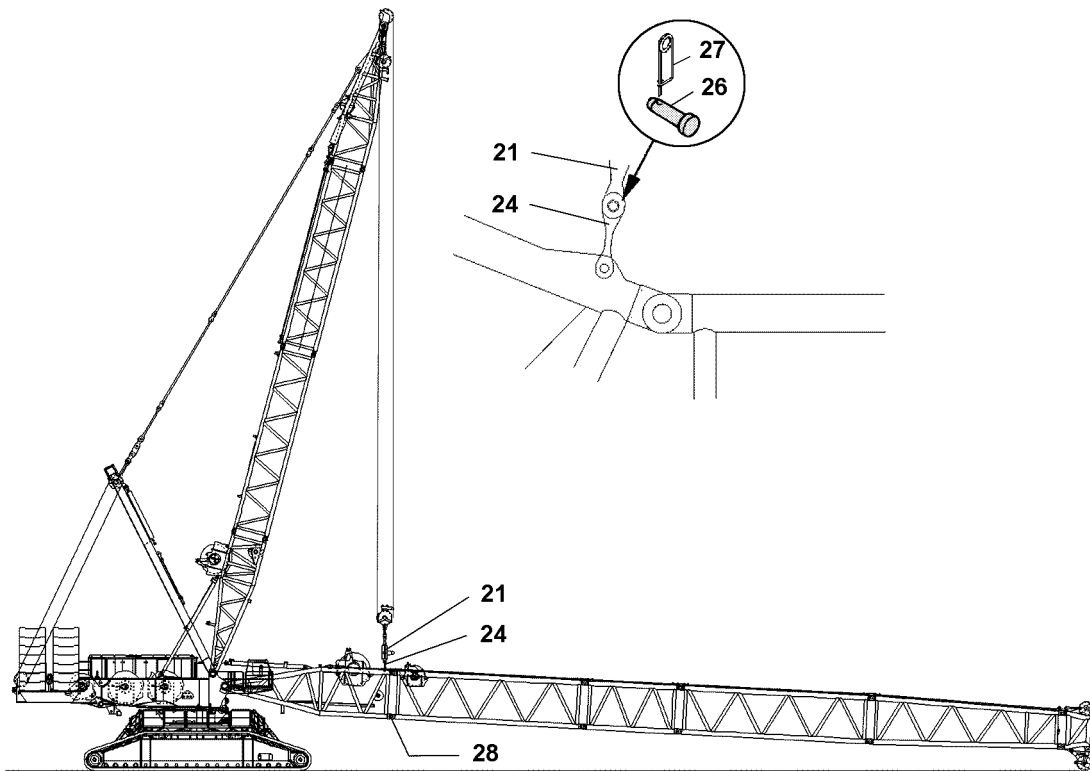
4.2.1 Luffing the D-boom down

- ▶ Lower the derrick **D** forward until the guy posts **D** lay on the S-lattice components.
- ▶ Release the safety spring **27** and unpin the pins **26** on both sides.

4.2.2 Disassembly procedure

The guy posts are placed and secured for transport on the S-lattice components. After disassembly, the transport retainers must be installed.

- ▶ Install the transport retainers on the guy posts.
- ▶ Hang the assembly weight **21** onto the auxiliary crane.
- ▶ Pin the assembly weight **21** on the bracket **24** on both sides. Insert pin **26** and secure with safety spring **27**.



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4.3 Erecting the D-boom



DANGER

Crane can topple over!

If the following conditions are not met before erecting the boom, the crane can topple over and fatally injure personnel!

- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!



DANGER

General danger notes!

If the following conditions are not met before erecting the D-boom, the hoist rope can fall down and fatally injure personnel!

- ▶ Enough hoist rope **H** must remain over the cable pulleys to prevent the hoist rope from being pulled back and fall down when erecting the D-boom!

4.3.1 Erection procedure

Ensure that the following preconditions are met:

- the D-relapse cylinders are extended before erection!
- ▶ Erect the D-boom and lower the pulley block at the same time.
- ▶ Erect the D-boom until the lower pulley block is above the S-articulated piece.

4.4 Removing the S-lattice components on the S-articulated piece



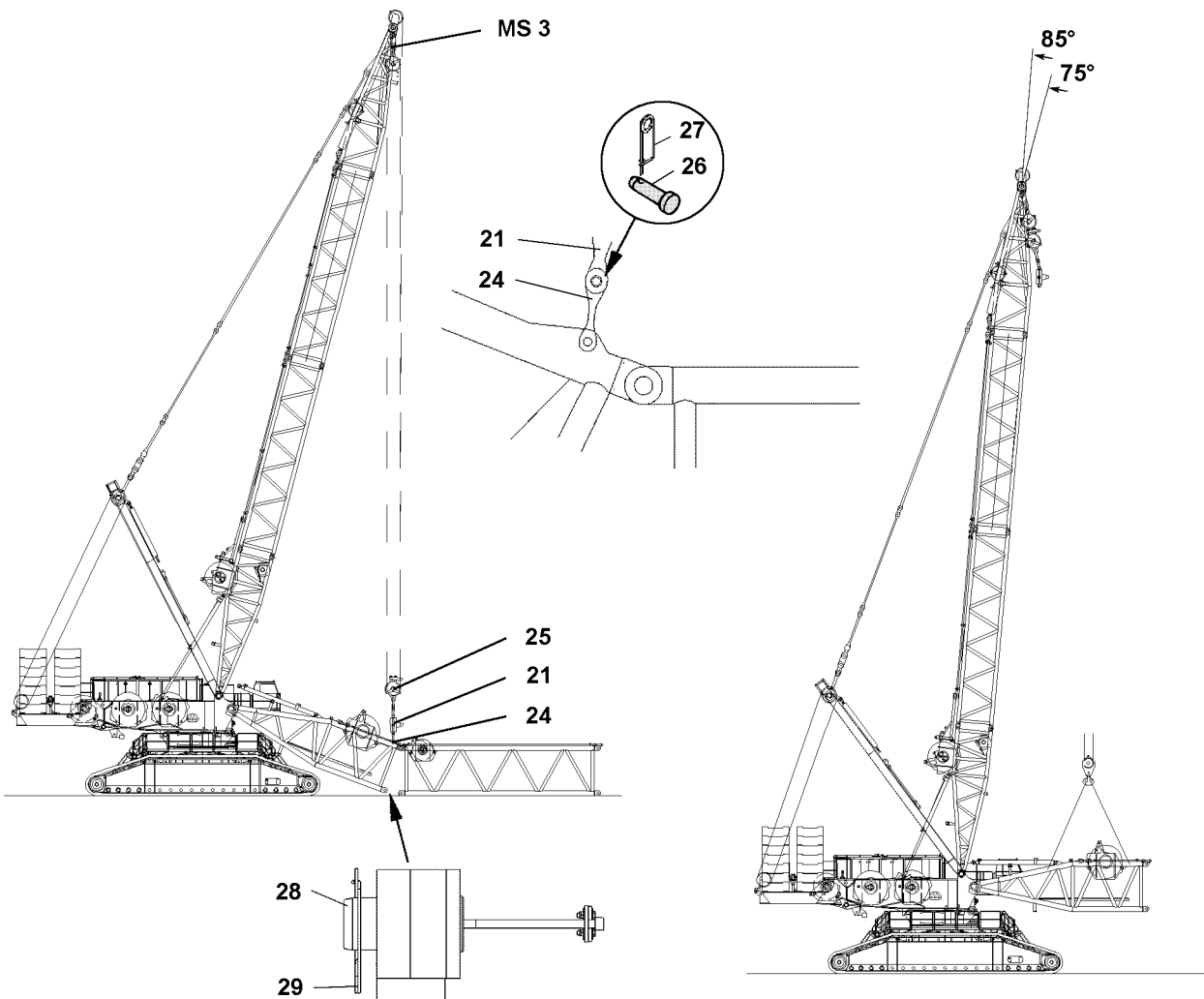
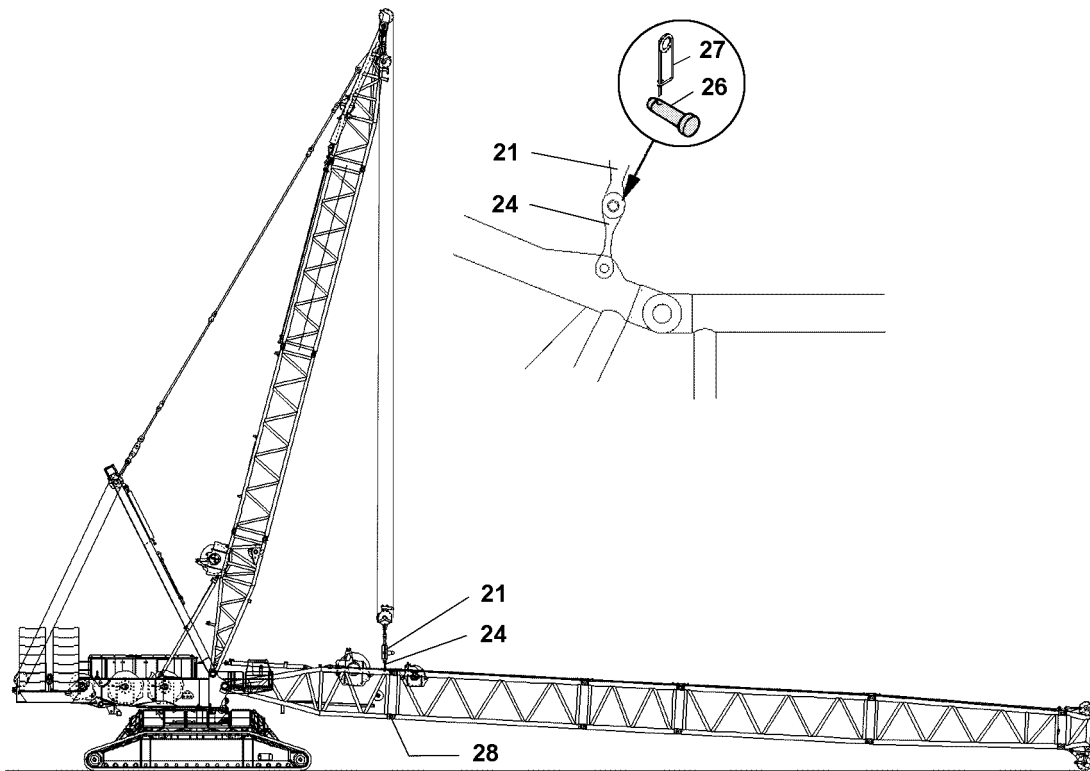
DANGER

General danger notes!

- ▶ Support the S-boom during assembly and disassembly with suitable materials!
- ▶ All pins must be secured after assembly!
- ▶ The guy posts must be checked regularly! See chapter 8.15.

To pin the S-lattice components with the pin pulling device, see also chapter 5.30.

- ▶ Lower the lower pulley block **25** to the S-articulated piece.
- ▶ Pin the assembly weight **21** on both sides on the brackets **24** on the S-articulated piece: Insert the pin **26** and secure with safety spring **27**.



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- ▶ Pull the S-articulated piece up with the pulley block **25** and unpin on both sides **on the bottom**: Release the safety spring **29**. Unpin the pins **28**.

**Note**

- ▶ Before **unpinning** the boom, tension the guying on the pulley block **25** with the same **ACTUAL force** as noted at assembly!

- ▶ The ACTUAL force on test point **MS3** is shown on monitor 1.
- ▶ Set the S-boom down on the ground by lowering the pulley block **25**.

**DANGER**

The boom can suddenly fold down!

if the pulley block is unpinned on S-articulated piece before the upper pins **28** are unpinned, the boom can fold down and fatally injure personnel!

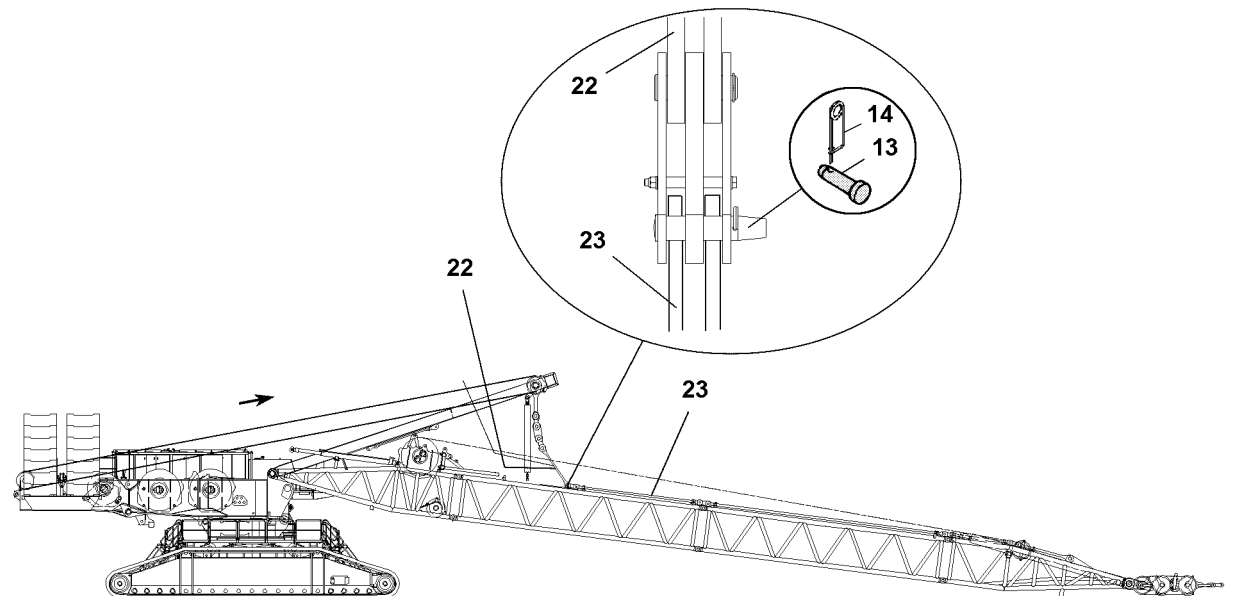
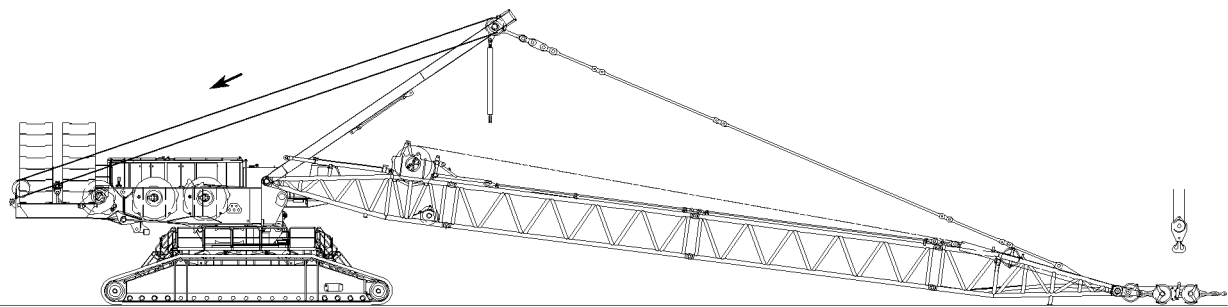
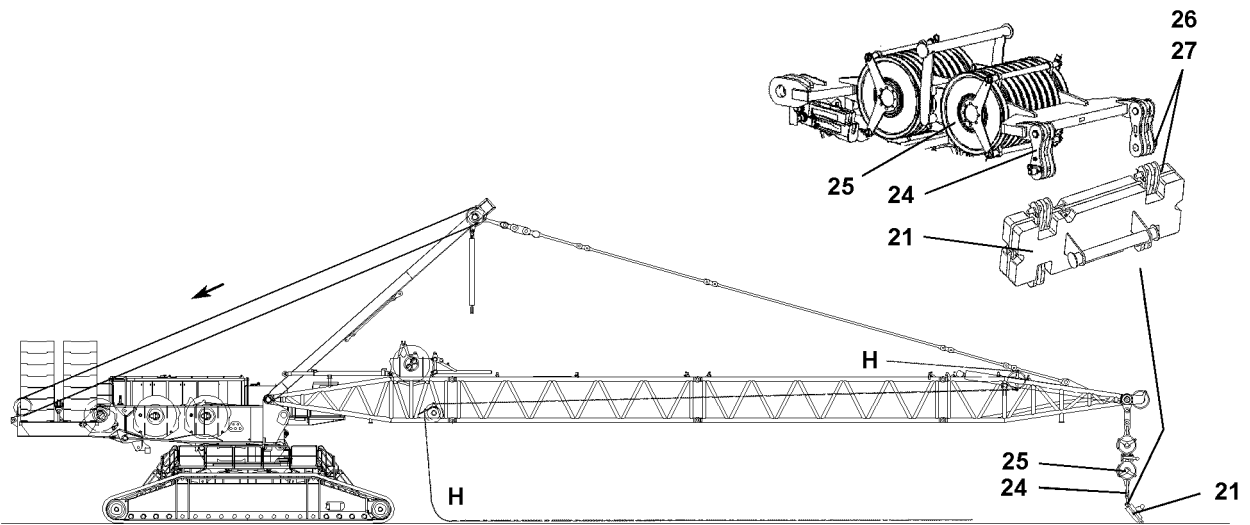
- ▶ Unpin the upper pins **28** only if the S-boom is on the ground.

- ▶ Unpin the pins **28** on both sides **on top**: Release the safety spring **29**. Unpin the pins **28**.
- ▶ Relieve the guying by lowering the pulley block **25**.
- ▶ Unpin the assembly weight **21** on the brackets **24**: Release safety spring **27** and unpin the pin **26**.

4.5 Unpinning the S-articulated piece

**Note**

- ▶ Unpin the S-articulated piece! See chapter 5.04.



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4.6 Disassembly of D-boom



DANGER

General danger notes!

- ▶ Support the D-boom during assembly and disassembly with suitable materials!
- ▶ All pins must be secured after assembly!
- ▶ The guy posts must be checked regularly! See chapter 8.15.

4.6.1 Luffing the D-boom down

- ▶ Lower the D-boom to the front and set it horizontally.
- ▶ Unreeve the hoist rope over the cable pulleys on the D-head piece and the D-articulated piece.
- ▶ Hang the assembly weight **21** onto the auxiliary crane.
- ▶ Unpin the assembly weight **21** on the brackets **24**: Release safety spring **27** and unpin the pin **26**.
- ▶ Luff the D-boom down until the D-head piece and the pulley block are laying on the ground.

4.6.2 Disassembling the D-guy posts



Note

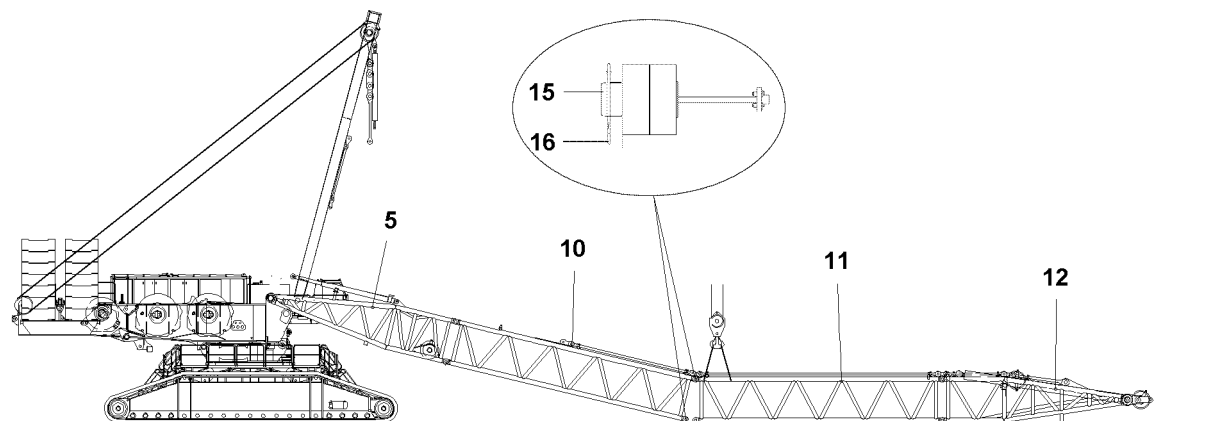
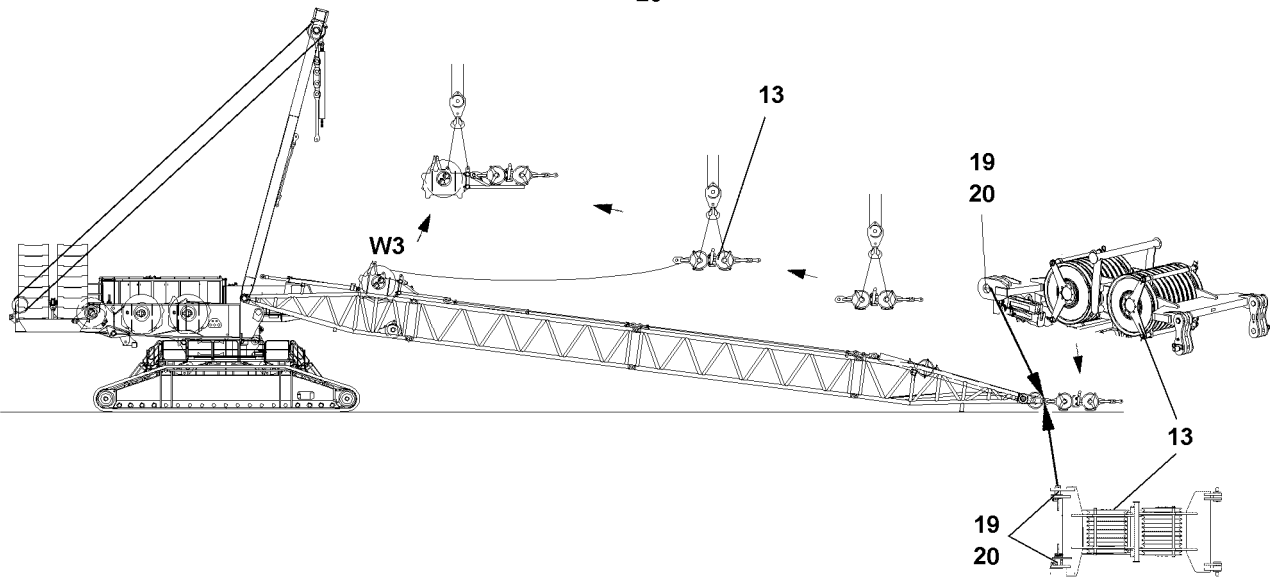
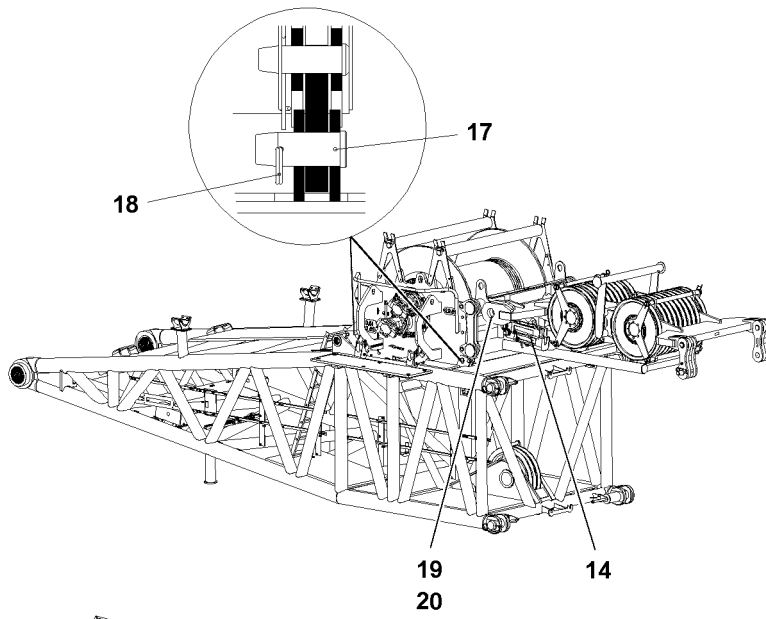
- ▶ The D-guy posts must be installed and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy posts.

The guy posts are placed and secured for transport on the D-lattice components.

- ▶ Lower the SA-frame **10** to the front.
- ▶ Unpin the guy posts **22** on the guy posts **23**: Release safety spring **14** and unpin the pin **13**.

The guy posts for the derrick ballast are placed and secured for transport **inside** on the D-lattice components.

- ▶ Attach the transport retainers on the guy posts.
- ▶ Erect the SA-frame **10** again.



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4.6.3 Removing the pulley blocks and winch 3



DANGER

General danger notes!

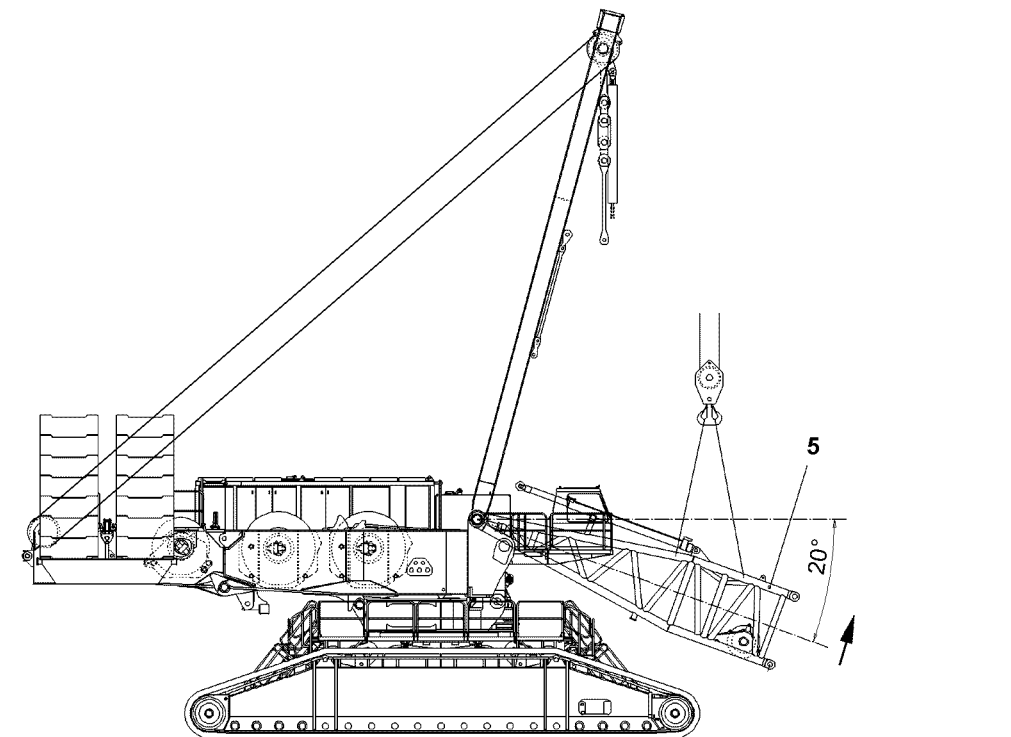
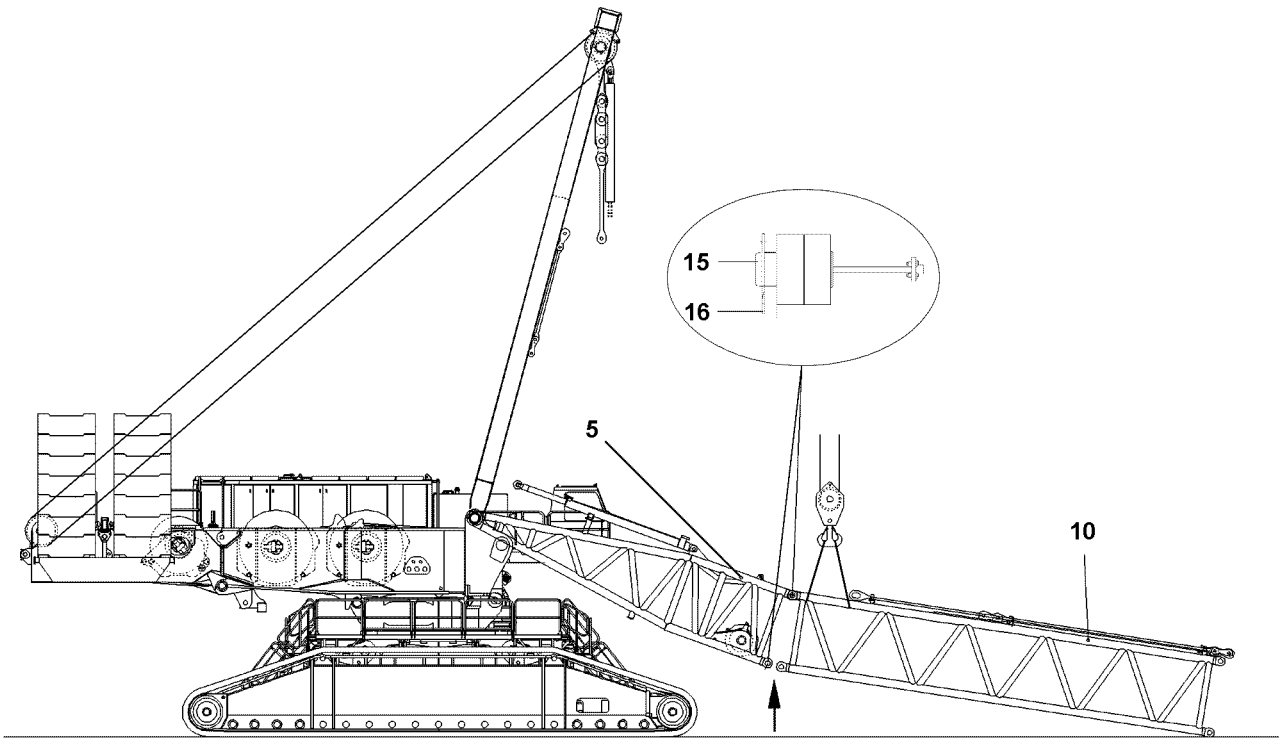
If the following conditions are not met before unpinning winch 3, the pulley blocks can fall down and fatally injure personnel!

▶ The pulley blocks **13** must be pinned and secured on winch 3!

- ▶ Attach the auxiliary crane onto the pulley blocks.
- ▶ Unpin pulley blocks **13** from D-head piece **12**: Release safety spring **20** and unpin the pin **19**.
- ▶ Pull the pulley blocks **13** with the auxiliary crane to the receptacle on winch 3 **W3** while spooling up winch 3 at the same time.
- ▶ Pin and secure the pulley blocks **13** on winch 3. Insert the pin **19** and secure with safety spring **20**.
- ▶ Hang the auxiliary crane on winch 3.
- ▶ Unpin winch 3 **W3** on the D-articulated piece **5**: Release safety spring **18** and unpin the pin **17**.
- ▶ Remove winch 3 complete with the pulley blocks with the auxiliary crane.

4.6.4 Disassembling the D-lattice components

- ▶ Unpin the D-head piece **12** on the D-reduction piece **11** **on the top and bottom**: Release safety spring **16** and unpin the pin **15**.
- ▶ Hang and tension the auxiliary crane on the D-reduction piece **11**.
- ▶ Unpin the D-reduction piece **11** on the D-intermediate piece **10** on both sides on the **bottom**: Release safety spring **16** and unpin the pin **15**.
- ▶ Lower the D-reduction piece **11** to the ground and unpin on both sides **on top**: Release safety spring **16** and unpin the pin **15**.



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4.6.5 Disassembling the D-intermediate piece

Ensure that the following preconditions are met:

- the D-intermediate piece hangs on the auxiliary crane
 - the D-articulated piece is not laying on the turntable
 - the D-articulated piece is pinned on both sides on the bottom and on top on the D-intermediate piece
- ▶ Disassemble winch 3 on the D-articulated piece.

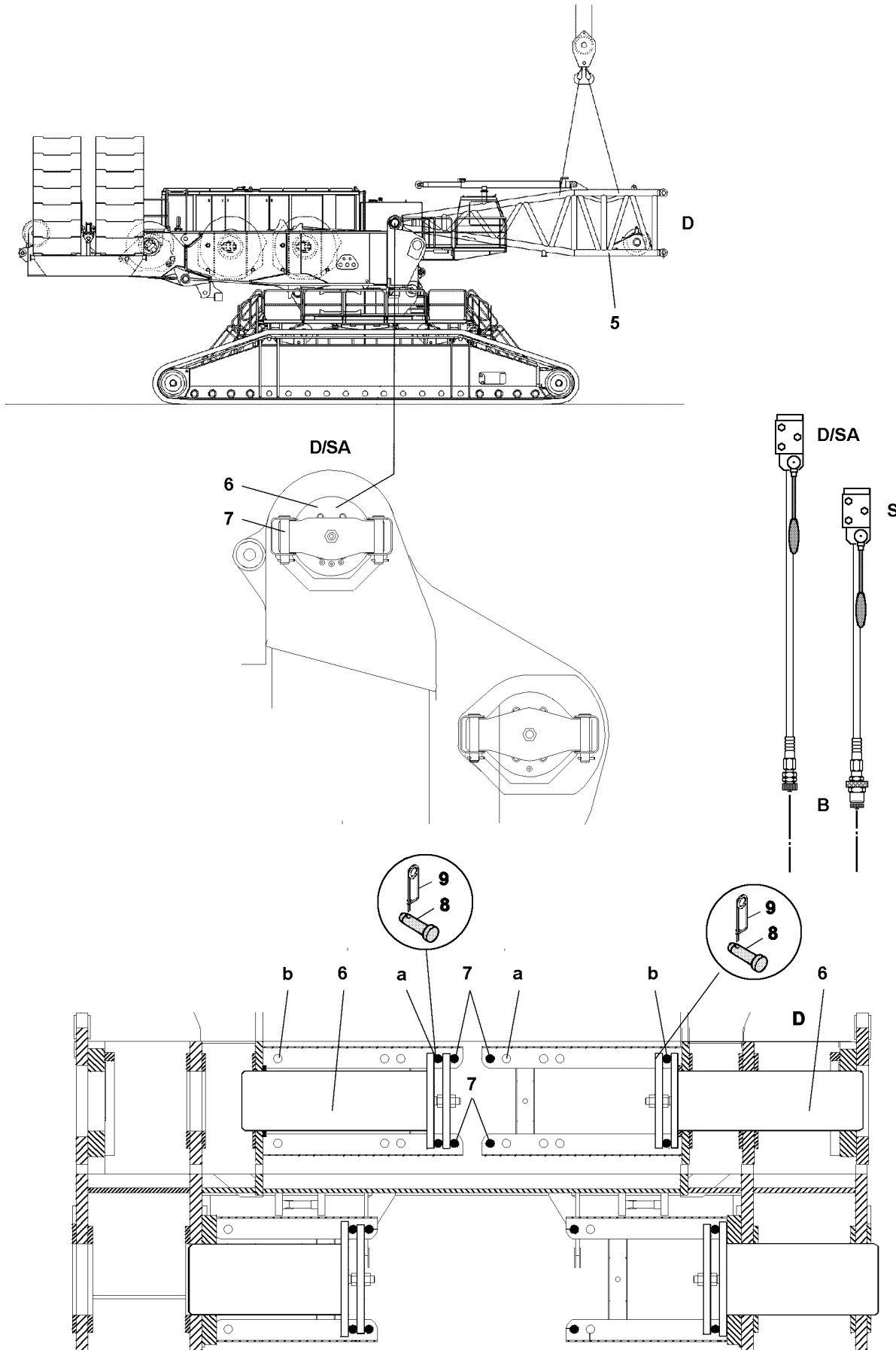


CAUTION

Damage to the D-articulated piece!

If the D-articulated piece with installed winch 3 and pinned D-intermediate piece **10** is laying on the turntable, the D-articulated piece will be damaged.

- ▶ The D-intermediate piece **10** must be held with an auxiliary crane!
 - ▶ Winch 3 must be removed!
-
- ▶ Unpin the D-intermediate piece **10** on both sides on the **bottom** on the D-articulated piece **5**:
Release safety spring **16** and unpin the pin **15**.
 - ▶ Lower the D-intermediate piece **10** until the D-articulated piece is laying on the turntable.
 - ▶ Unpin the D-intermediate piece **10** on the both sides on the top on the D-articulated piece **5**:
Release safety spring **16** and unpin the pin **15**.
 - ▶ Place the D-intermediate piece **10** on the ground.
 - ▶ Place the D-articulated piece **5** on the turntable and hang onto the auxiliary crane.



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4.7 Unpinning the D-articulated piece

Ensure that the following preconditions are met:

- the D-articulated piece **5** hangs on the auxiliary crane
- the pins **7** are inserted and secured

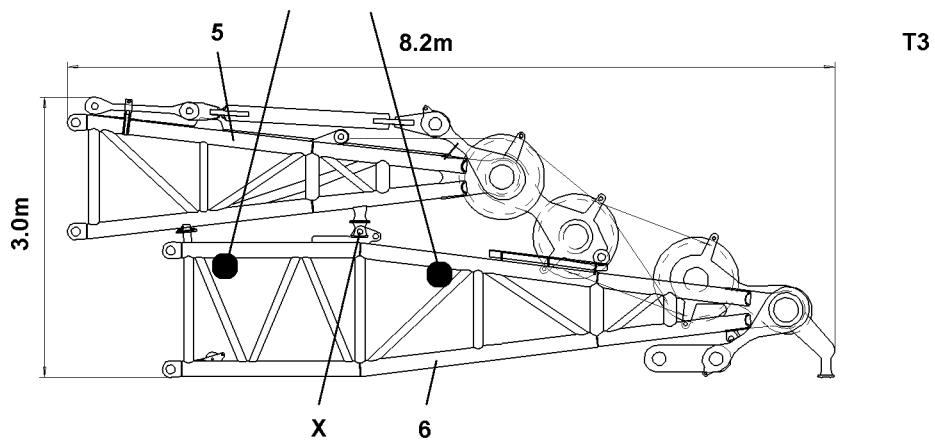
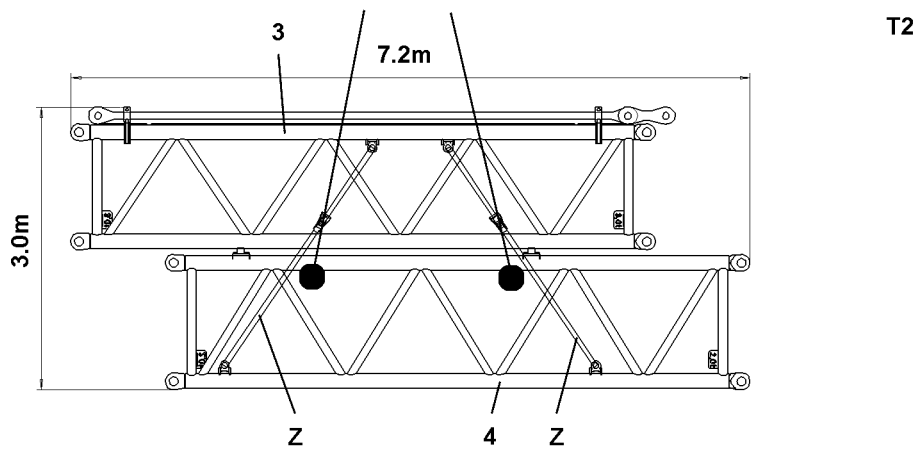
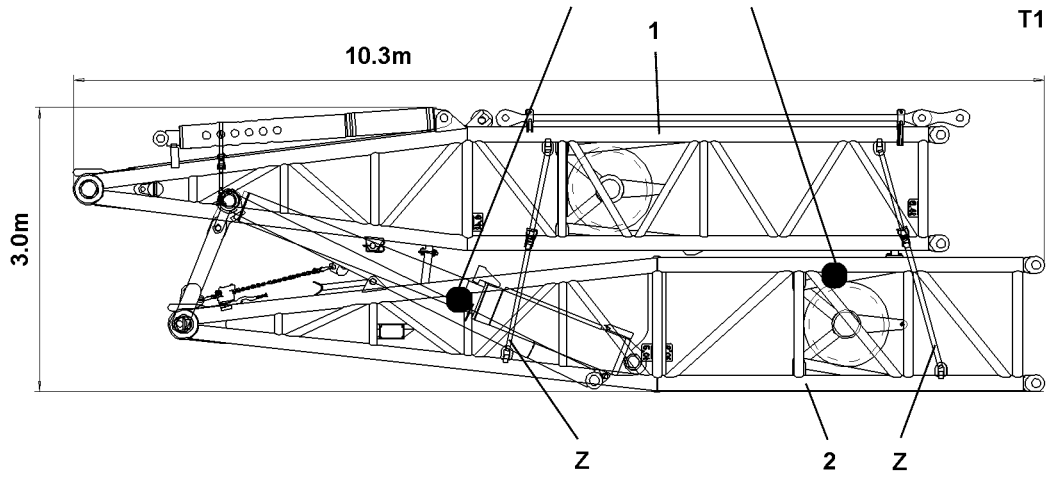
▶ Unpin the pins **8** from the bores **b**.



Note

▶ The hand levers **S**, **D/SA** and the hydraulic connections **B** for the pin pulling device are on the left side of the turntable.

-
- ▶ Establish the hydraulic connections from the pin pulling device to the turntable
 - ▶ Unpin the D-articulated piece **5** on both sides with the pin pulling device:
 - ▶ Move the hand lever **D** and push the pins **6** all the way in.
 - ▶ Pin and secure pins **8** in bores **a**.
 - ▶ Swing out the D-articulated piece **5** with the auxiliary crane from the pin points on the turntable.



1 General

1.1 Component overview of the transport units

Make sure that the following prerequisites are met:

- the transport units are braced by the lashing straps **Z**,
- the transport unit **T3** is pinned and secured by pins **X**,
- an auxiliary crane is available.

The transport unit **T1** consists of components WA-frame, 1 pivot section **1** and WA-frame 2 pivot section **2**.

The transport unit **T2** consists of components WA-frame, 1 intermediate section **3** and WA-frame 2 intermediate section **4**.

The transport unit **T3** consists of components WA-frame, 1 end section **5** and WA-frame 2 end section **6**.

Transport unit T1	
Component	Weight
WA-frame 1 pivot section 1	5.0 t
WA-frame 2 pivot section 2	6.4 t
W-relapse retainer	3.6 t
Total weight:	15.0 t

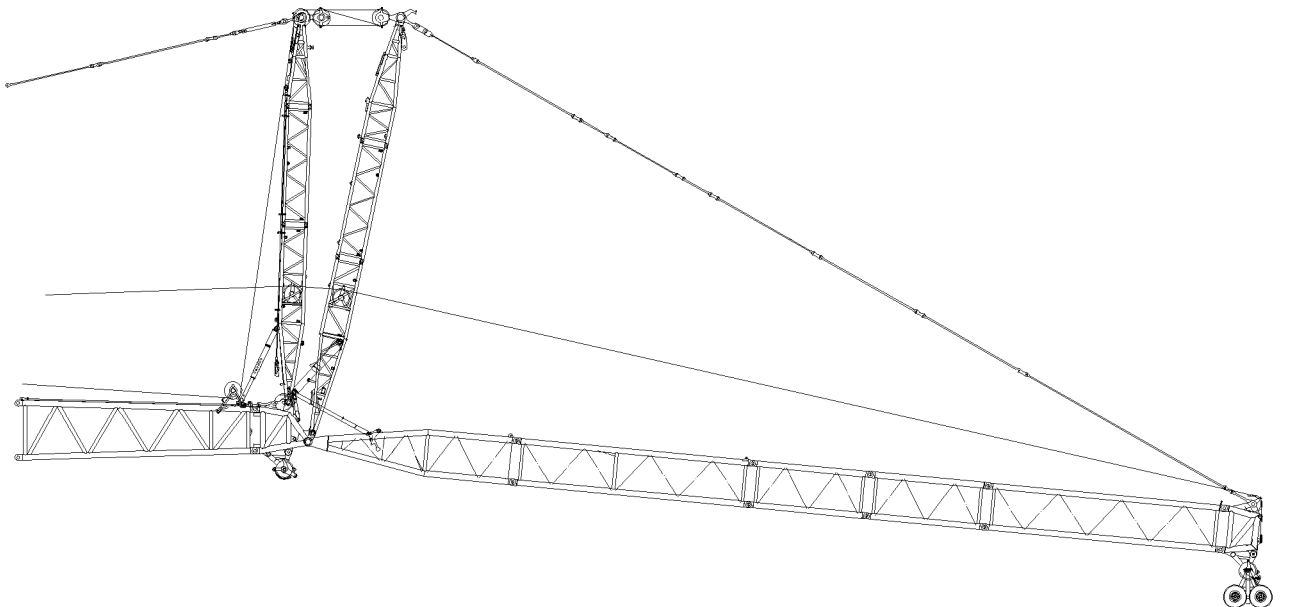
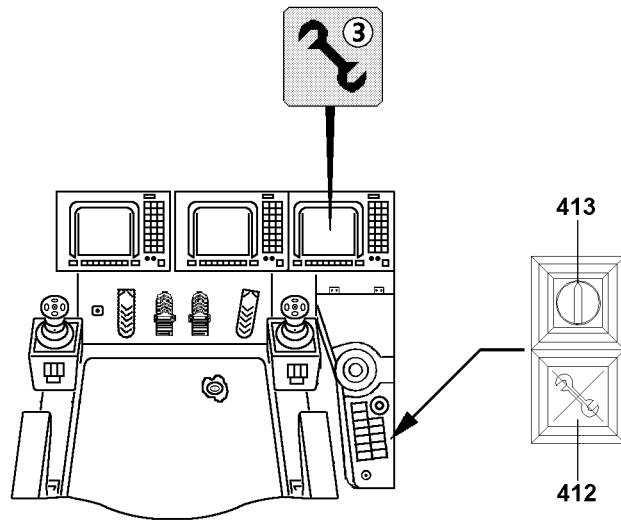
Transport unit T2	
Component	Weight
WA-frame 1 intermediate section 3	2.0 t
WA-frame 2 intermediate section 4	3.0 t
Total weight:	5.0 t

Transport unit T3	
Component	Weight
WA-frame 1 end section 6	6.3 t
WA-frame 2 head piece 5	3.0 t
Remaining parts	3.7 t
Total weight:	13.0 t

1.2 Attachment points on transport units

Various attachment studs are available for the relevant transport units:

- Transport unit **T1**
- Transport unit **T2**
- Transport unit **T3**



2 Assembly



DANGER

Risk 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 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!



DANGER

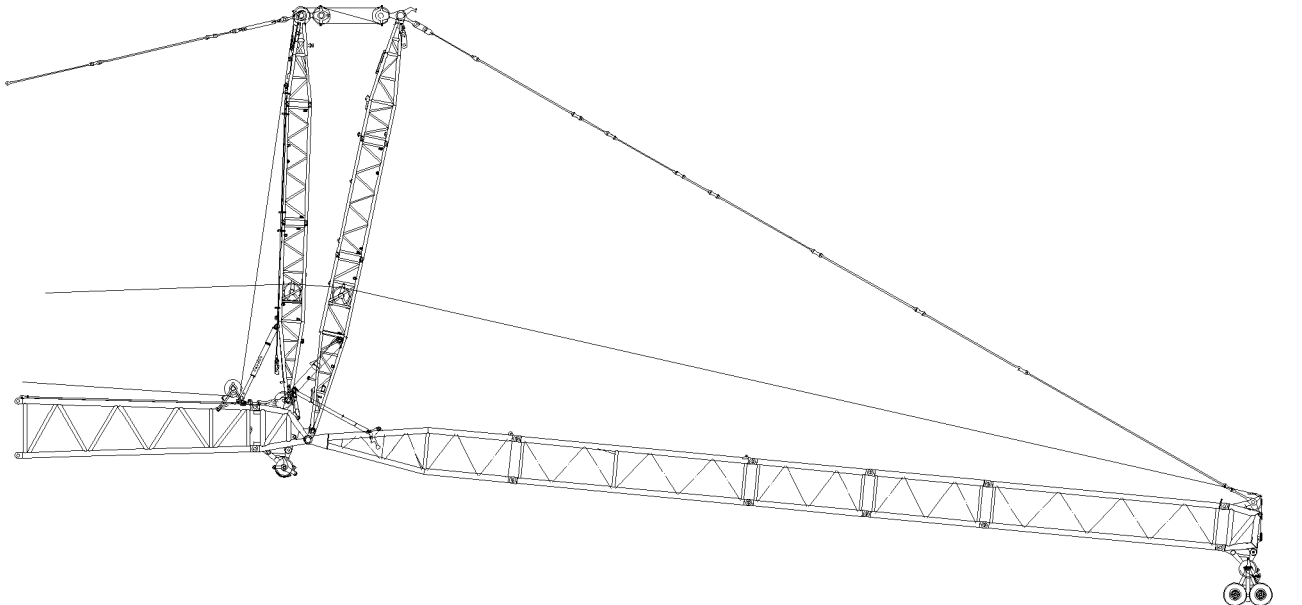
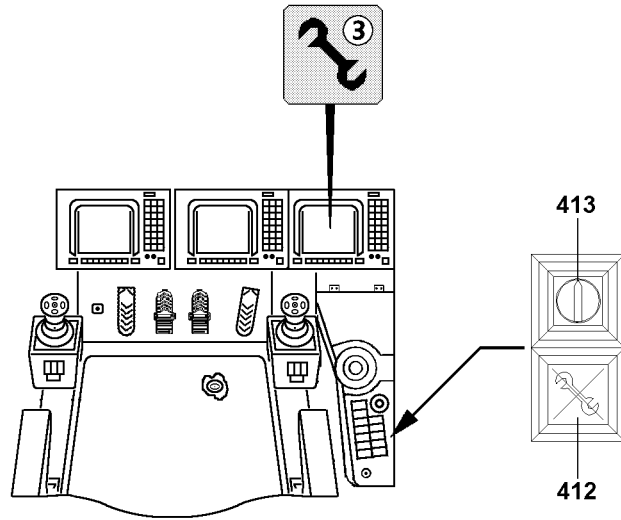
Danger of accident at assembly / disassembly of booms!

When you disassemble unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel.

- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under 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!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ Do not lean the ladder against the component being disassembled!

Make sure that the following prerequisites are met:

- the crane is aligned in horizontal direction,
- the S-boom is assembled and aligned horizontally,
- the counterweight is attached to the turntable according to the load chart and stored on the suspended ballast / ballast trailer,
- the LICCON overload protection has been set according to the data in the load chart,
- an auxiliary crane is available.



2.1 Attaching the W-assembly unit to the S-boom

2.1.1 Adding the operating mode “assembly”



DANGER

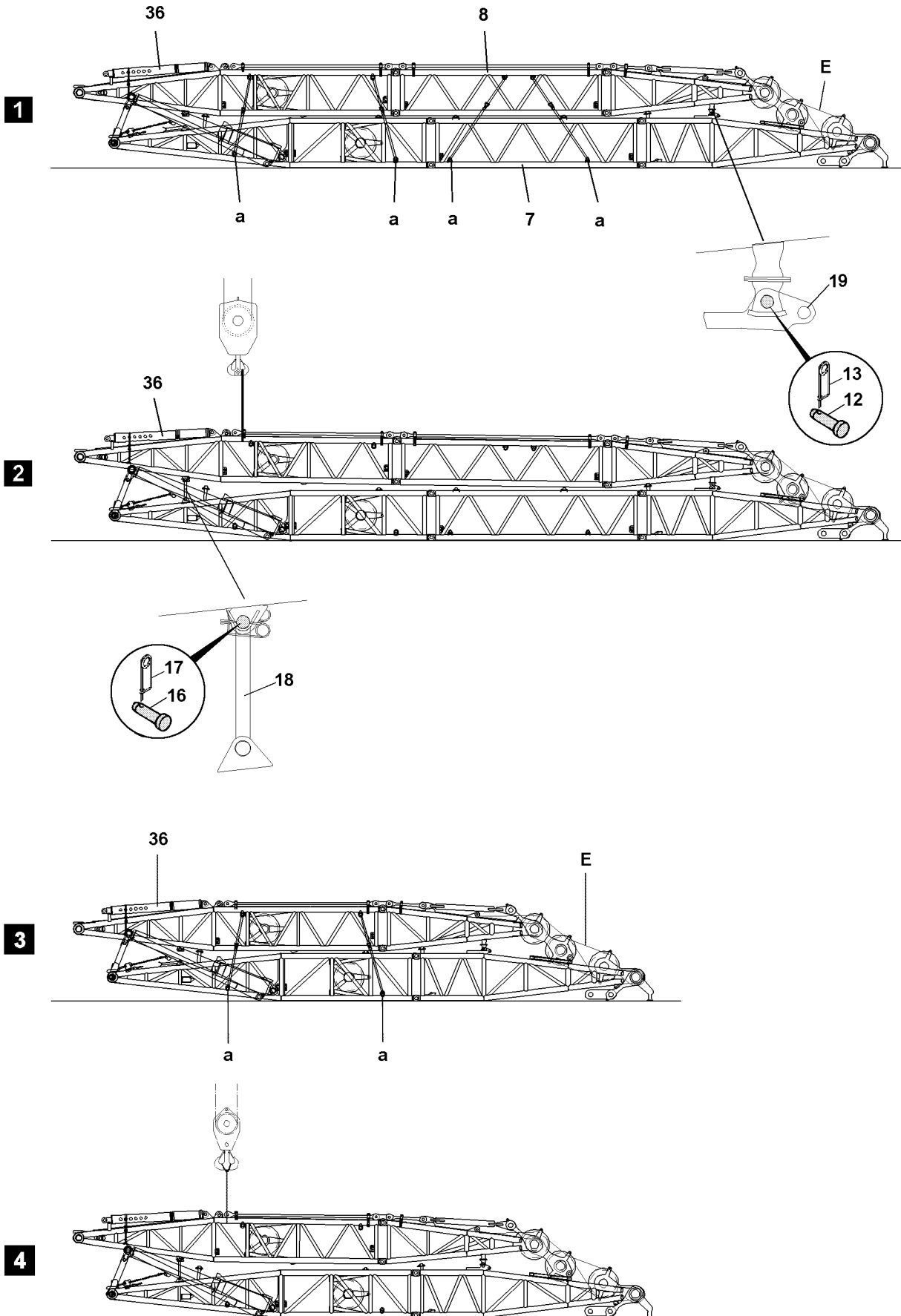
Risk of fatal injury when operating crane with assembly key button enabled!

- ▶ The actuation of the assembly key button **413** is only permitted for assembly tasks!
 - ▶ The assembly key button may only be operated by persons, who are aware of the consequences of a bypass!
 - ▶ If the assembly key button **413** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
 - ▶ Crane operation with the assembly key button **413** turned on is strictly prohibited!
 - ▶ The assembly key button **413** must be removed immediately after carrying out the assembly work and handed to an authorized person!
-

- ▶ Actuate the assembly key button **413**.

Result:

- The LICCON overload protection is inactive.
- The indicator light in the button **412** lights up.
- The Assembly symbol **3** in the LICCON monitor blinks.
- An acoustic signal sounds.
- The red beacon on the crane cab blinks.



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2.1.2 Transport unit WA-frame 1 and WA-frame 2

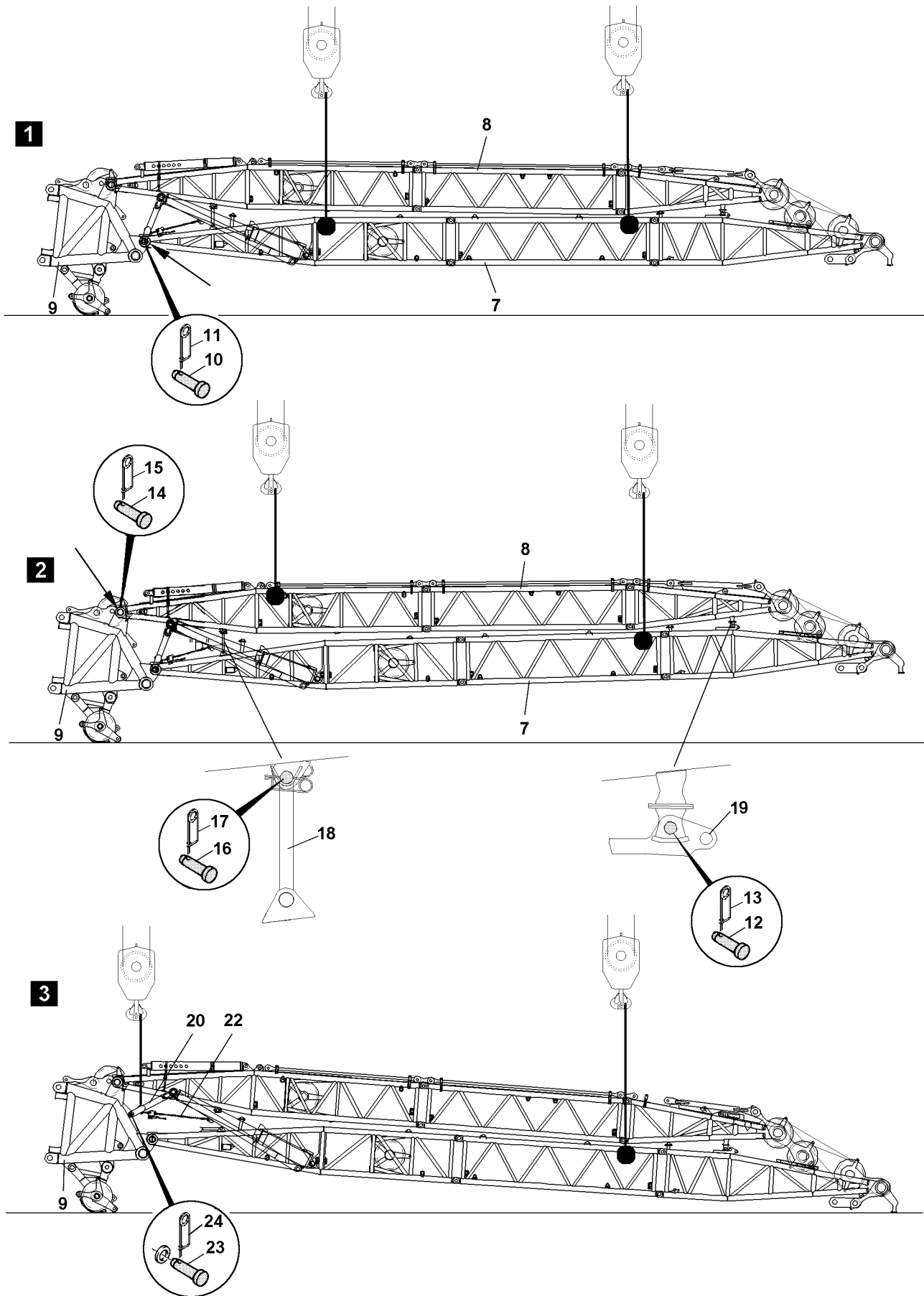
Make sure that the following prerequisites are met:

- the WA-frame 1 **7** and the WA-frame 2 **8** are pinned on the end sections with pins **12**, secured by spring retainers **13** and braced with lashing straps **a**,
 - the reeving rope **E** is reeved in the end sections of the WA-frame 1 and 2
 - the retaining supports **36** are secured on the WA-frame 2.
- ▶ Attach auxiliary crane to the pivot section on the WA-frame 2.
 - ▶ Remove lashing straps **a**.
 - ▶ Pull up the pivot section of the WA-frame 2 and set up the support **18** on both sides.
 - ▶ Insert the pins **16** on both sides and secure with spring retainers **17**.



Note

- ▶ The transport unit WA-frames – **long, fig. 1 and 2** consists of T1, T2 and T3.
 - ▶ The transport unit WA-frames – **short, fig. 3 and 4** consists of T1 and T3.
 - ▶ The assembly and disassembly of the short WA-frames is carried out according to the description for the long WA-frames.
 - ▶ Only the **long** WA-frames are shown in the illustrations in this chapter.
-



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2.1.3 Pinning WA-frames on the SW-connector head, illustrations 1 and 2

- ▶ Attach auxiliary cranes on the relevant studs of the WA-frames.



Note

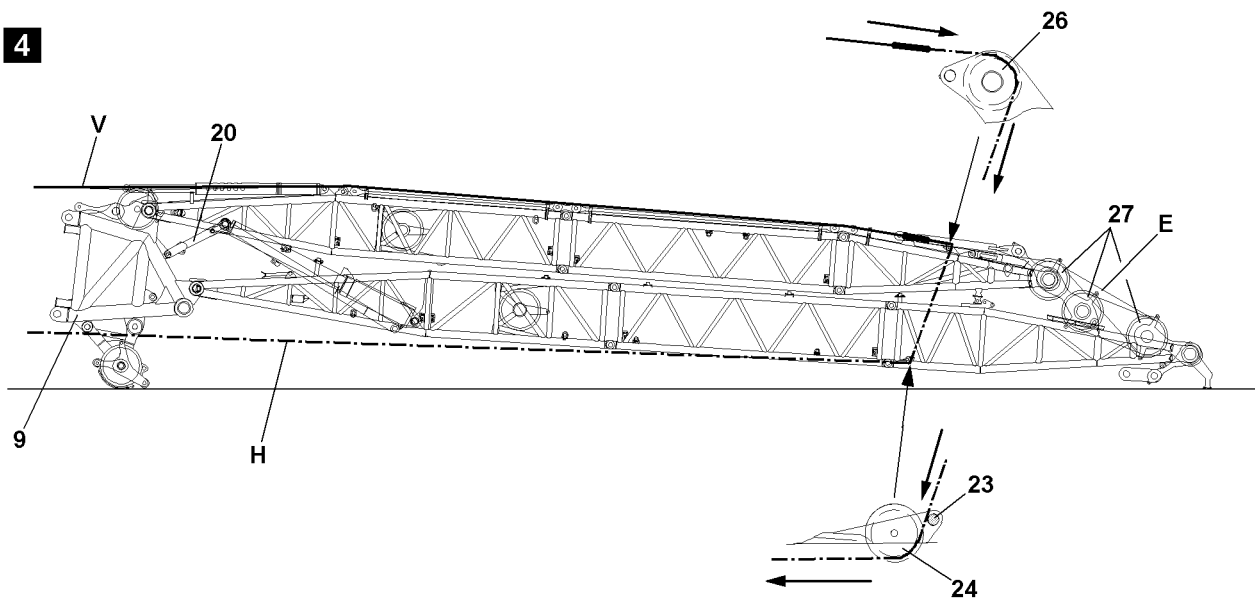
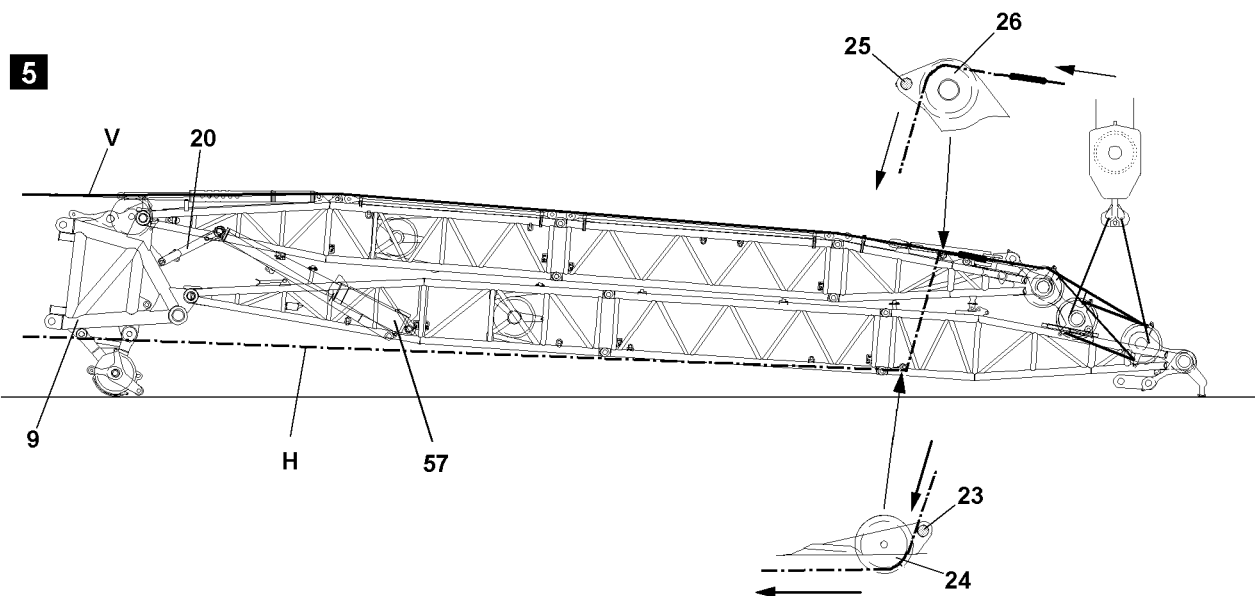
- ▶ The total weight of the WA frames is approximately: 33 t.
-

- ▶ Lift the WA frames and insert the WA frame 1 **7** into the yokes of the SW connector head **9**.
- ▶ Pin the WA-frame 1 **7** to the SW-connector head **9** on both sides with a pin pulling device. Please refer to Chapter 5.30.
- ▶ Secure the pins on the WA frame 1 **7** and the SW connector head **9** on both sides: Insert the pins **10** on both sides and secure with spring retainers **11**.
- ▶ Lift the WA-frames until the bores of the WA-frame 2 **8** and the SW-connector head **9** align.
- ▶ Pin the WA-frame 2 **8** to the SW-connector head **9** on both sides with a pin pulling device. Please refer to Chapter 5.30.
- ▶ Secure the pins on the WA frame 2 **8** and the SW connector head **9** on both sides: Insert the pins **14** on both sides and secure with spring retainers **15**.
- ▶ Release and unpin the pins **12** on both sides and pin and secure in the transport retainer **19**.

2.1.4 Pinning the retaining frame onto the SW-connector head, illustration 3

Ensure that the following prerequisite is met:

- the WA frames are pinned and secured on the SW connector head **9**.
- ▶ Place the WA-frames on the ground with the auxiliary crane.
- ▶ Attach the auxiliary crane on the retaining frame **20**.
- ▶ Pull the retaining frame **20** with the assistance of the auxiliary crane by opening the ratchet **22** of the pinning points on the SW-connector head **9**.
- ▶ Pin the retaining frame **20** on both sides: Pin the pins **23** on both sides and secure with washers and spring retainers **24**.
- ▶ Disconnect the auxiliary crane and remove the ratchet **22**.

4**5**

2.2 Reeving the W-adjusting rope on the WA-frames, illustrations 4 and 5

Make sure that the following prerequisites are met:

- the retaining frame **20** is pinned and secured on the SW-connector head **9**,
- the reeving rope **E** is reeved on the WA-frames,
- the W-pulley blocks are lifted by an auxiliary crane for better reeving.



CAUTION

Ropes may become slack!

The adjusting rope **V** could be damaged if any of the ropes are slack!

- ▶ Do not allow the ropes to become slack when spooling out the adjusting rope **V**!
- ▶ Maintain a tight adjusting rope **V** when spooling out!



Note

- ▶ You can find the reeving plan for the W-assembly unit in chapter 4.06.

- ▶ Release and unpin the rope retaining pin **23**.
- ▶ Run the auxiliary rope over change over pulley **24** and over the change over pulley **26**.
- ▶ Pin and secure the rope retaining pin **23**.
- ▶ Connect the adjusting rope **V** of winch 5 with the auxiliary rope **H**.
- ▶ Spool up the auxiliary rope **H** and reel off the adjusting rope **V** until the adjusting rope **V** has arrived at the change over pulley **26**.
- ▶ Release the connection from the auxiliary rope **H** and the adjusting rope **V**.
- ▶ Release and unpin the rope retaining pin **25**.
- ▶ Place the auxiliary rope from the left side over the change over pulley **26**. See illustration 5.
- ▶ Pin and secure the rope retaining pin **25**.
- ▶ Connect the adjusting rope **V** to the reeving rope **E**.
- ▶ Connect the auxiliary rope **H** to the reeving rope **E**.
- ▶ Release the rope retaining tubes on the pulley heads **27** and unpin.
- ▶ Lift the D-pulley blocks with the auxiliary crane.
- ▶ Spool up the auxiliary rope **H** and spool the adjusting rope **V** out until the adjusting rope is completely reeved.
- ▶ Pin in the rope retaining tubes on the pulley heads **27** and secure.
- ▶ Loosen the auxiliary rope **H** and the adjusting rope **V** from the reeving rope.
- ▶ Attach the adjusting rope **V** on the WA-frame 2 with the lock.
- ▶ Spool up the auxiliary rope **H** and store the reeving rope **E**.

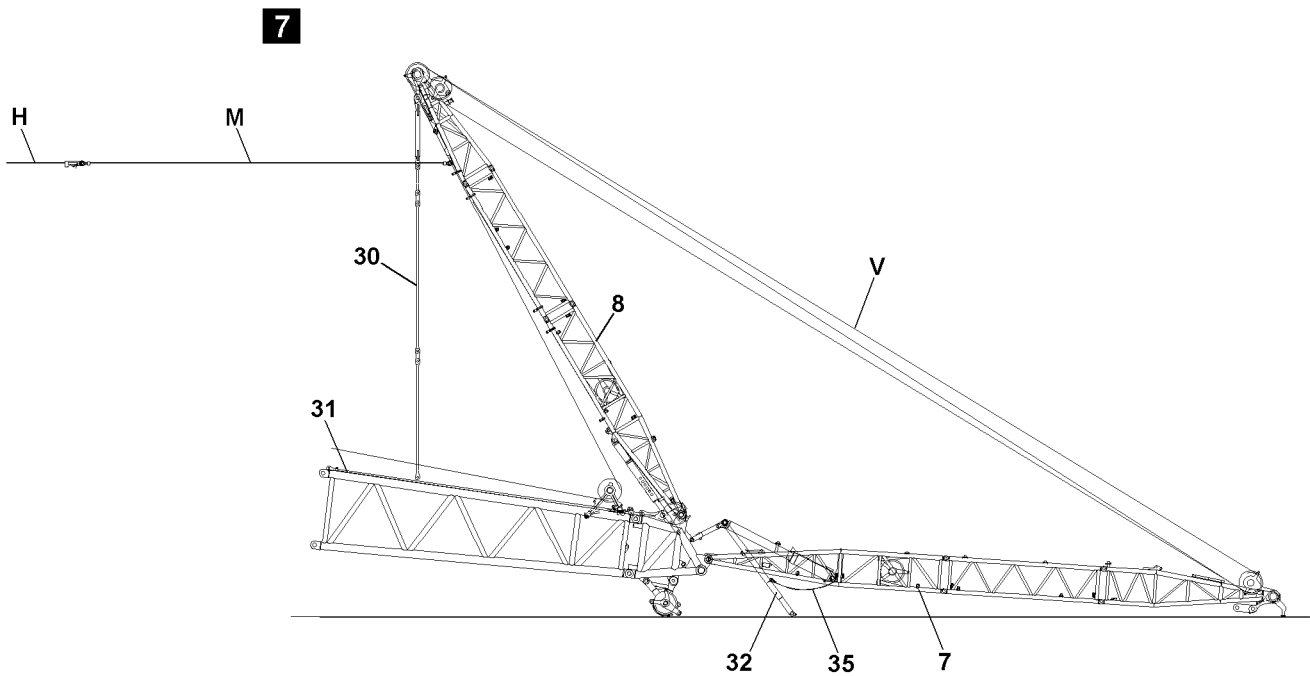
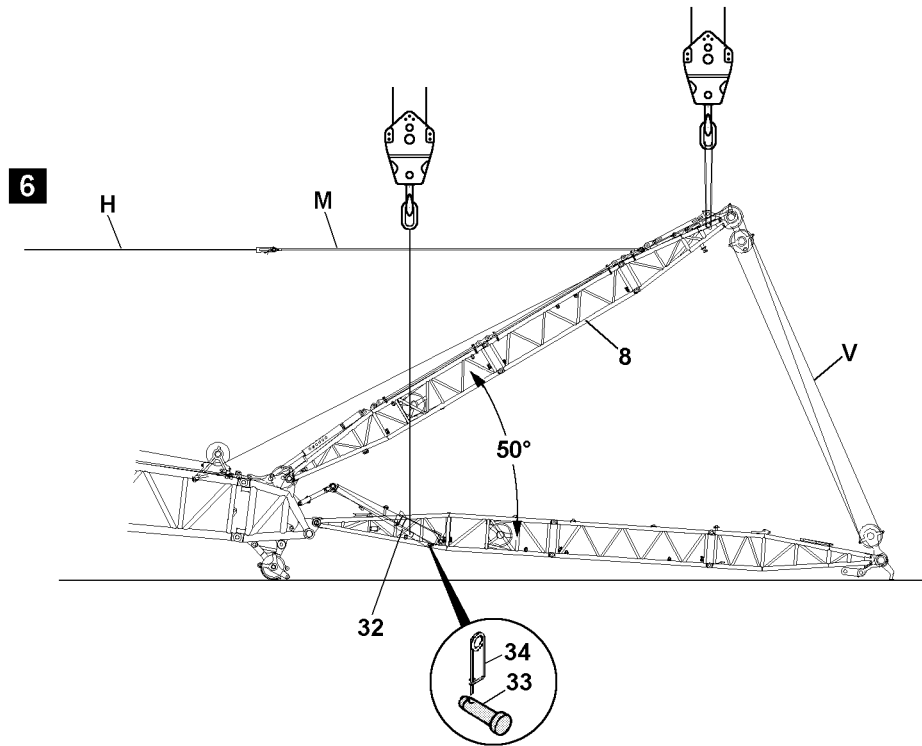


CAUTION

Damage to relapse cylinder!

Prior to setting up the WA-frame 1 **7** verify that the electrical connection for the limit switches of the relapse cylinder **57** is established. If this is **not** the case, the WA-frame 1 **7** can be pulled back over the mechanical stop of the relapse cylinder **57**, which may damage the relapse cylinder **57**.

- ▶ Establish the electrical connection for the limit switches of the relapse cylinder **57**.
- ▶ Establish the electrical connection for the limit switches of the relapse cylinder **57**.



2.3 Pinning WA-frame 2 guy rods, illustrations 6 and 7

Make sure that the following prerequisites are met:

- the WA-frame 2 **8** is laying on the WA-frame 1 **7**,
 - the attachment for the assembly rope **M** is released on the WA-frame 2 **8**,
 - the hoist rope **H** is hooked into the lock on the assembly rope **M** and attached,
 - the auxiliary crane is attached on the studs on the WA-frame 2 **8**.
- ▶ Lift the WA-frame 2 **8** with the auxiliary crane about 50° and simultaneously spool out the adjusting rope **V**.



Note

- ▶ The adjusting rope **V** must be spool out so that the WA-frame 1 **7** is not lifted.

- ▶ Tension the hoist rope **H** until the WA-frame 2 **8** is held by the hoist rope **H**.
- ▶ Detach auxiliary crane.
- ▶ Hang the mechanical retaining support **32** onto the auxiliary crane.



DANGER

The mechanical retaining support **32** may fall!

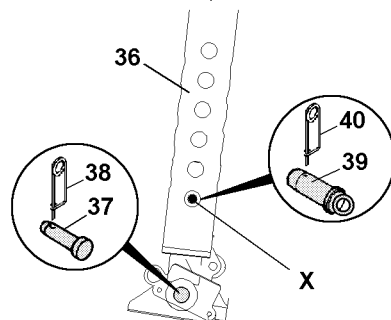
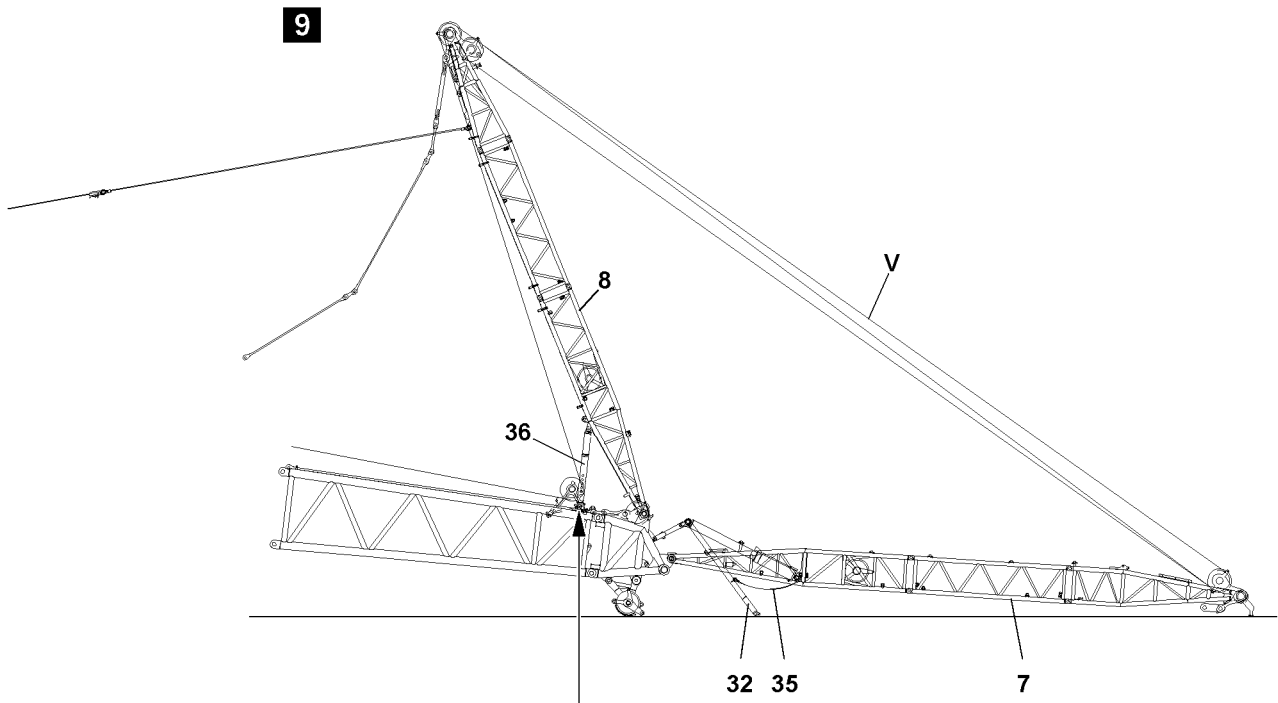
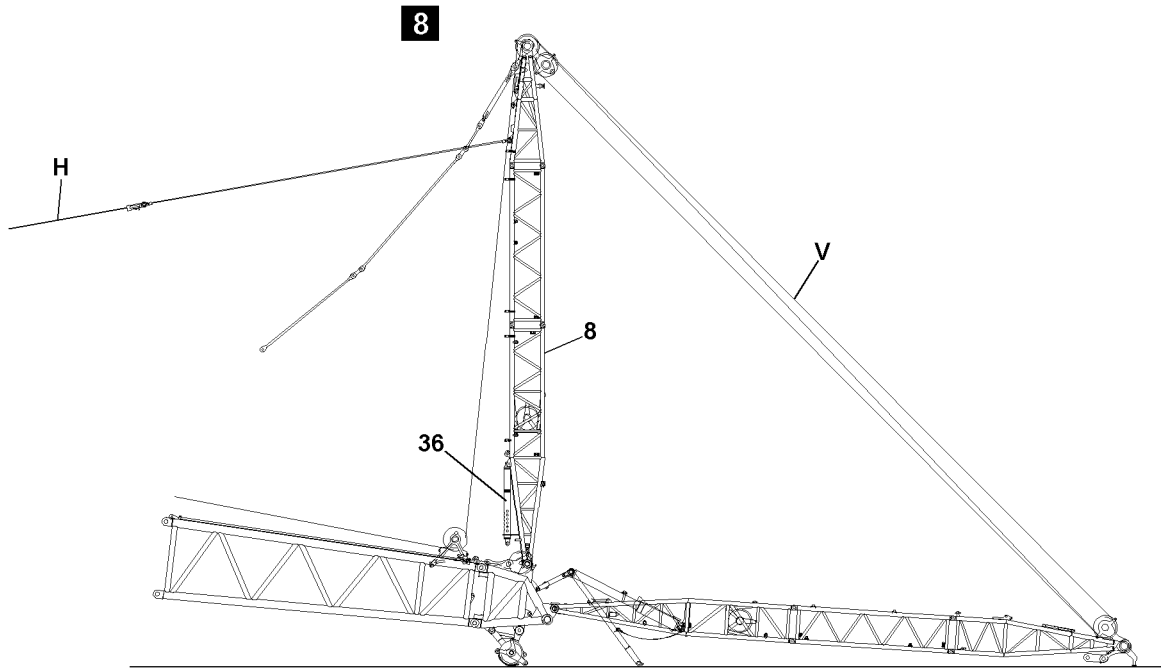
If the pin **33** is unpinning without securing the mechanical retaining support **32** with the auxiliary crane, the mechanical retaining support **32** may fall and cause fatal accidents!

- ▶ Only unpin the pin **33** when the mechanical retaining support **32** is secured against falling by the auxiliary crane.
- ▶ Release the pins **33** and unpin and attach the retaining rope **35** between the WA-frame 1 **7** and the mechanical retaining support **32**.
- ▶ Place the mechanical retaining support **32** on the ground and remove the auxiliary crane.
- ▶ Pull the WA-frame 2 **8** with the hoist rope **H** backward until the WA-frame 2 guy rods **30** can be pinned with the WA-frame 2 guy rods **31**.



Note

- ▶ The WA-frame 2 guy rods **30** are attached on the WA-frame -2 **8**.
- ▶ The WA-frame 2 guy rods **31** are attached on the S-boom.
- ▶ Pin the WA-frame 2 guy rods **30** to the WA-frame 2 guy rods **31** and secure.



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2.4 Pinning retaining supports to the S-boom, illustrations 8 and 9

- ▶ Spool up the adjusting rope **V** and spool out the hoist rope **H** until the WA-frame 2 **8** is vertical. See illustration 8.



DANGER

Uncontrolled swinging of the retaining supports **36**!

If the lashing straps on the retaining supports **36** are removed and the WA-frame 2 **8** is not vertical, the retaining supports **36** may swing uncontrolled to the side and cause fatal injuries!

- ▶ WA-frame 2 **8** must be vertical prior to removing the lashing straps!

- ▶ Remove the lashing straps on the retaining supports **36**.
- ▶ Pull back the WA-frame 2 **8** until the retaining supports **36** can be pushed to the pinning point on the S-boom by hand.
- ▶ Pin the retaining supports **36** on the S-boom: Insert the pin **37** and secure with spring retainers **38**.



CAUTION

Damage to the WA-frame 2 **8**!

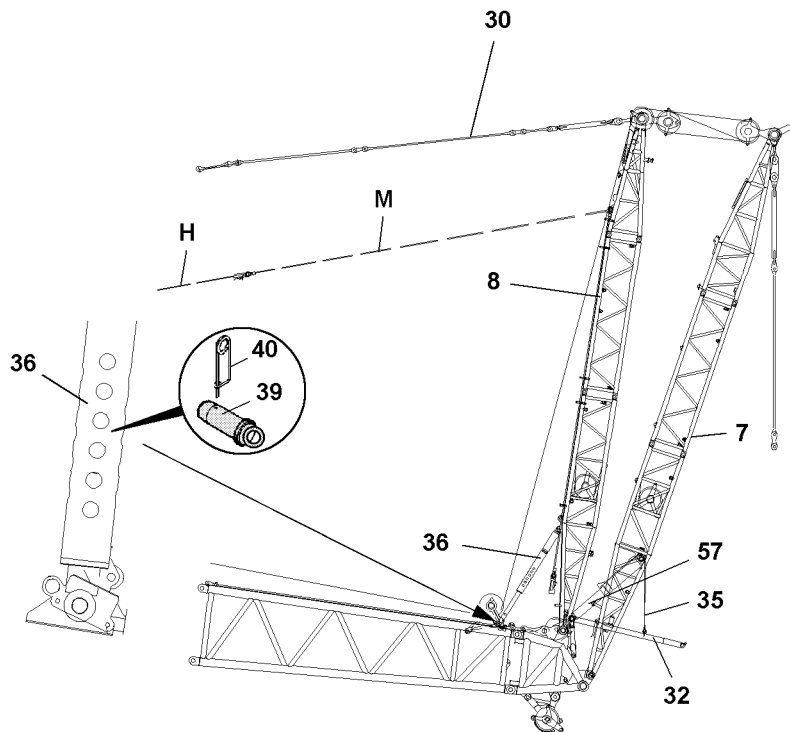
If the connecting pin **39** is not unpinned in the parking position **X** prior to erecting the WA-frame 2 **8**, the WA-frame 2 **8** can be damaged!

The connecting pin **39** may only be unpinned after the retaining supports are pinned on the S-boom!

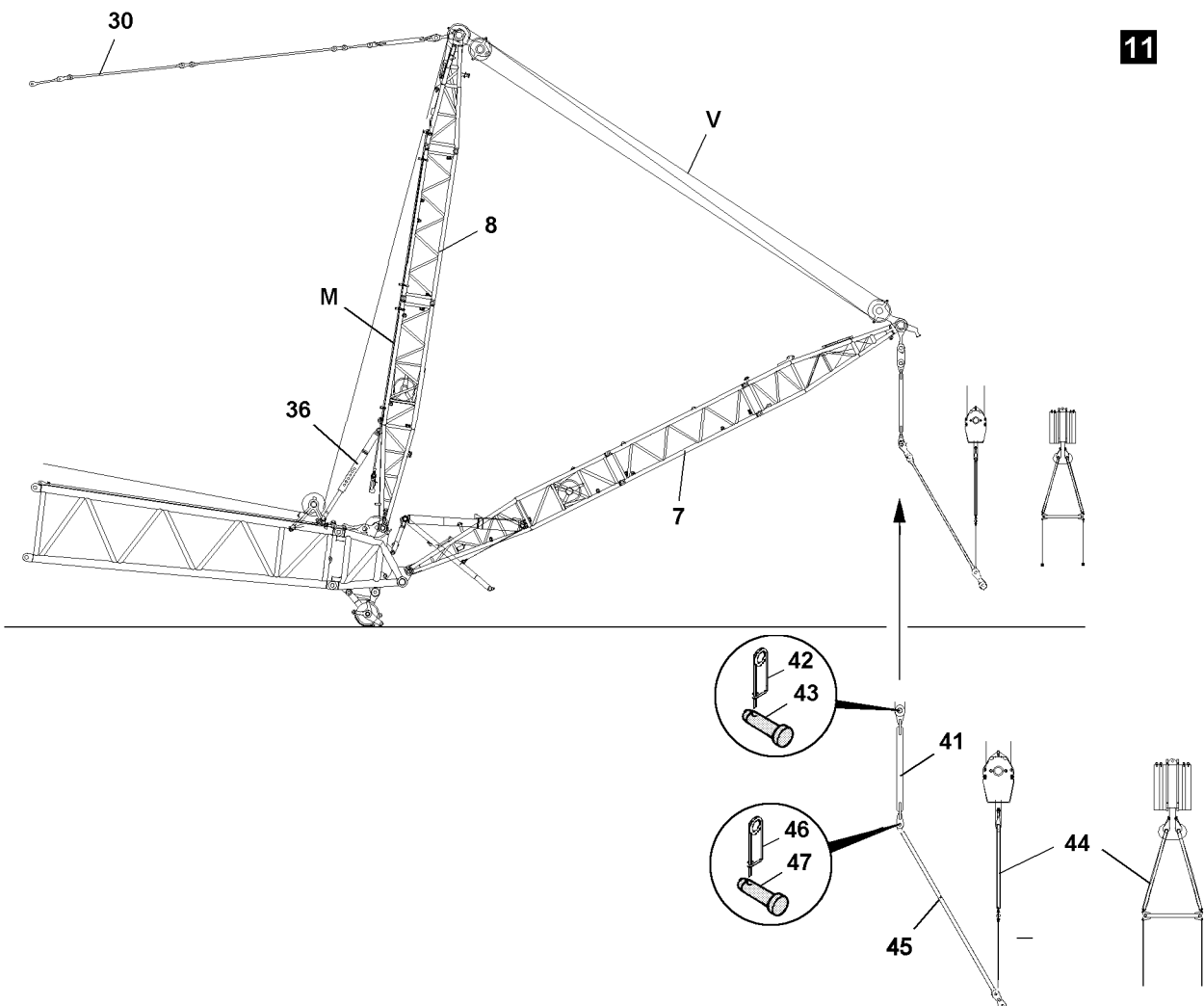


- ▶ Unpin the connecting pins **39** from the parking position **X** on the retaining supports **36**. Release and unpin the connecting pins **39** on both sides.

10



11



2.5 Assembling W-guy rods, illustrations 10 and 11

Make sure that the following prerequisites are met:

- the WA-frame 2 guy rods are pinned,
- the retaining supports **36** are pinned to the S-boom.



CAUTION

Damage to relapse cylinder!

Prior to setting up the WA-frame 1 **7** verify that the electrical connection for the limit switches of the relapse cylinder **57** is established. If this is **not** the case, the WA-frame 1 **7** can be pulled back over the mechanical stop of the relapse cylinder **57**, which may damage the relapse cylinder **57**.

- ▶ Establish the electrical connection for the limit switches of the relapse cylinder **57**.

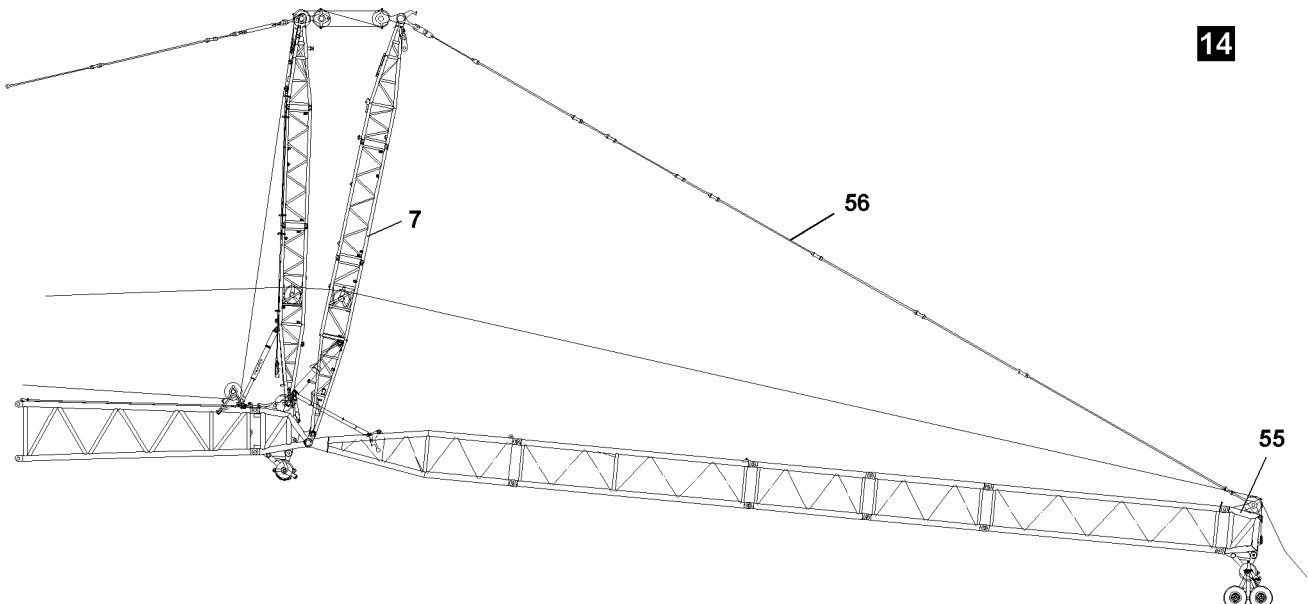
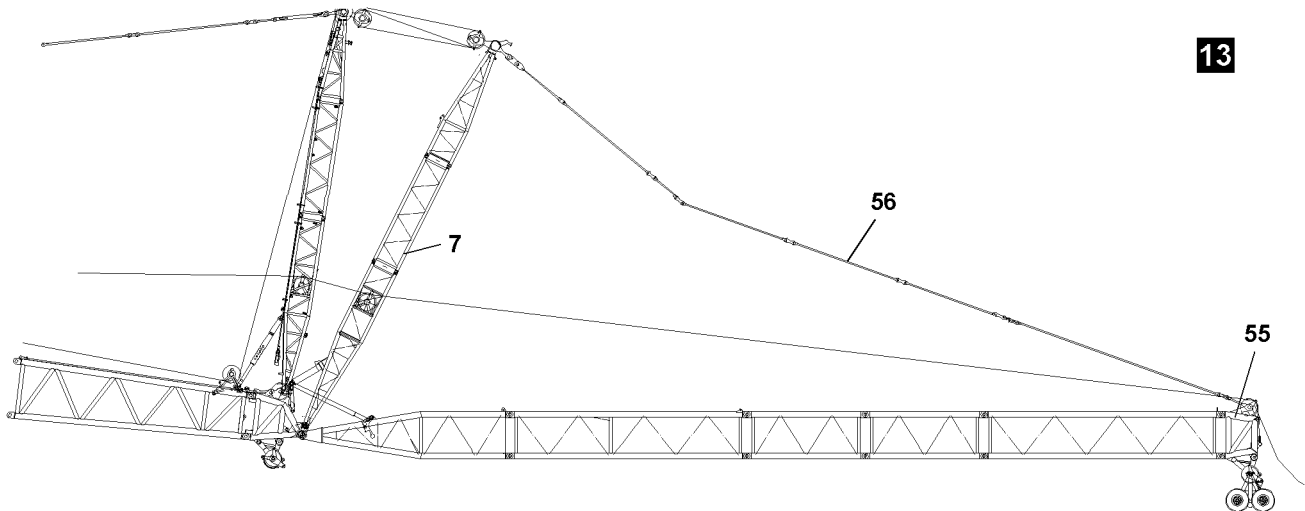
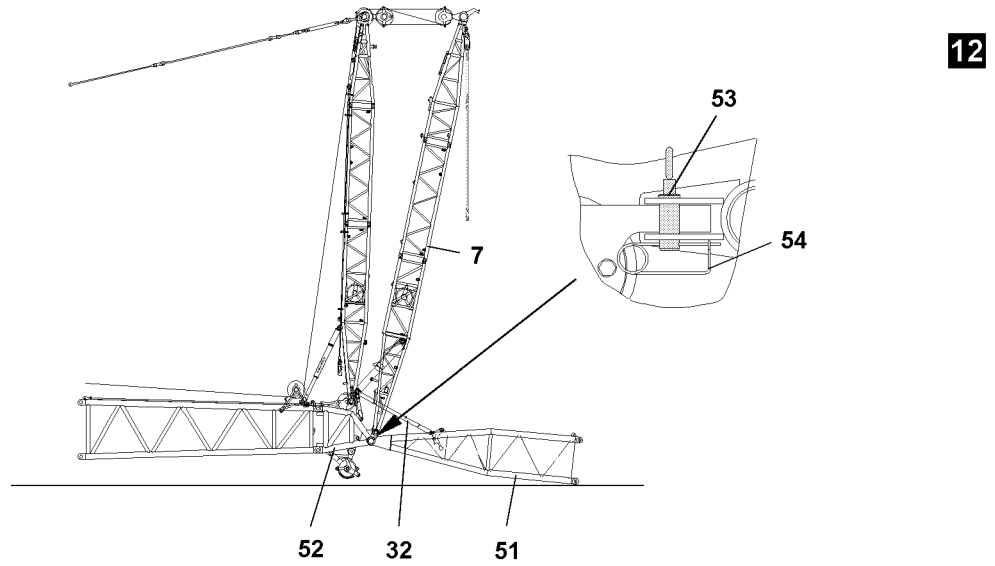
- ▶ Establish the electrical connection for the limit switches of the relapse cylinder **57**.
- ▶ Cover the limit switch initiators of the relapse cylinder **57** individually with a metal plate.

Result:

- The icon appears on the LICCON monitor.
- The **spool up function** of the W-control winch turns off.
- ▶ Spool out the hoist rope **H** and spool up the adjusting rope **V** until the WA-frame 2 guy rods **30** of the WA-frame 2 **8** are tensioned.
- ▶ Insert the connecting pins **39** in a maximum possible length on the next bore of the relapse supports **36** and secure with spring retainers **40**.
- ▶ Spool out the hoist rope **H** and remove from the lock of the assembly rope **M**.
- ▶ Attach the assembly rope **M** on the WA-frame 2 **8**.
- ▶ Lower the WA-frame 1 **7**.
- ▶ Assemble the W-guy rods **41** with the auxiliary crane on the WA-frame 1 **7**: Insert the pin **42** and secure with spring retainers **43**.
- ▶ Attach the cross-brace **44** on the auxiliary crane and lift the W-guy rods **41** so that they will not contact the ground when lifting.
- ▶ Assemble the W-guy rods **45** with the auxiliary crane on the W-guy rods **41**: Insert the pin **46** and secure with spring retainers **47**.
- ▶ Attach the cross-brace **44** on the auxiliary crane and lift the W-guy rods **45** so that they will not contact the ground when lifting.
- ▶ Pull up the WA-frame 1 **7** until the relapse cylinder **57** is completely retracted.

Result:

- The mechanical relapse support **32** is lifted by the retaining rope **35**, which provides more space for the assembly of the W-pivot section.



B199490

2.6 Assembling the W-lattice jib



Note

- ▶ Adhere to the pin sequence described in chapter 5.01 during the assembly of the W-lattice jib!

2.6.1 Pinning on the W-pivot section, illustration 12



DANGER

General danger notes!

- ▶ Support W-lattice jib during the assembly and disassembly with suitable materials!
- ▶ All pins must be secured after assembly!
- ▶ The guy rods must be checked regularly! See chapter 8.15.

- ▶ Pull up the WA-frame 1 7 until the relapse cylinder 57 is completely retracted.

Result:

- The mechanical relapse support 32 is lifted by the retaining rope 35, which provides more space for the assembly of the W-pivot section.
- ▶ Attach the W-pivot section 51 to the auxiliary crane and stabilize in the pinning points of the SW-connector head 52.
- ▶ Pin the W-pivot section 51 to the SW-connector head 52 on both sides with a pin pulling device. Please refer to Chapter 5.30.
- ▶ Secure the pins on the WA-pivot section 51 with the SW-connector head 52 on both sides: Insert the pins 53 on both sides and secure with spring retainers 54.
- ▶ Lower the WA-frame 1 7 and place the mechanical relapse support 32 on the W-pivot section 51.
- ▶ Remove the retaining rope on the relapse support 32.

2.6.2 Assembling the W-lattice jib on the W-pivot section, illustrations 13 and 14

Make sure that the W-end section 55 is placed in the roller cart when the W-lattice jib is assembled. For roller cart installation, see chapter 5.15.

Also refer to chapter 5.30 to pin the W-lattice jib with the pin pulling device.

- ▶ Assemble the W-lattice jib to the required length.
- ▶ Spool the hoist rope out and pull the respective length over the W-end section

The W-guy rods 56 are placed and secured for transport on the W-lattice sections. The transport retainers must be released prior to the assembly of the W-guy rods 56.

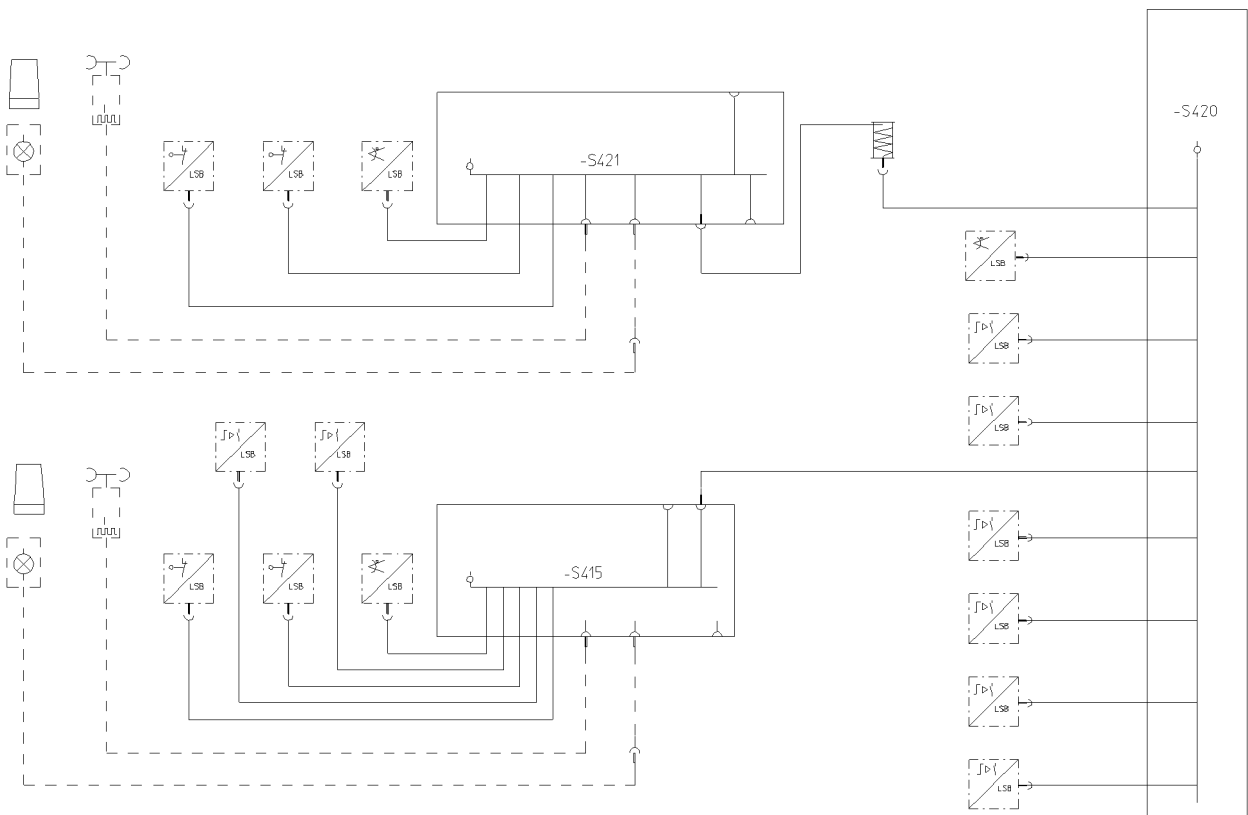
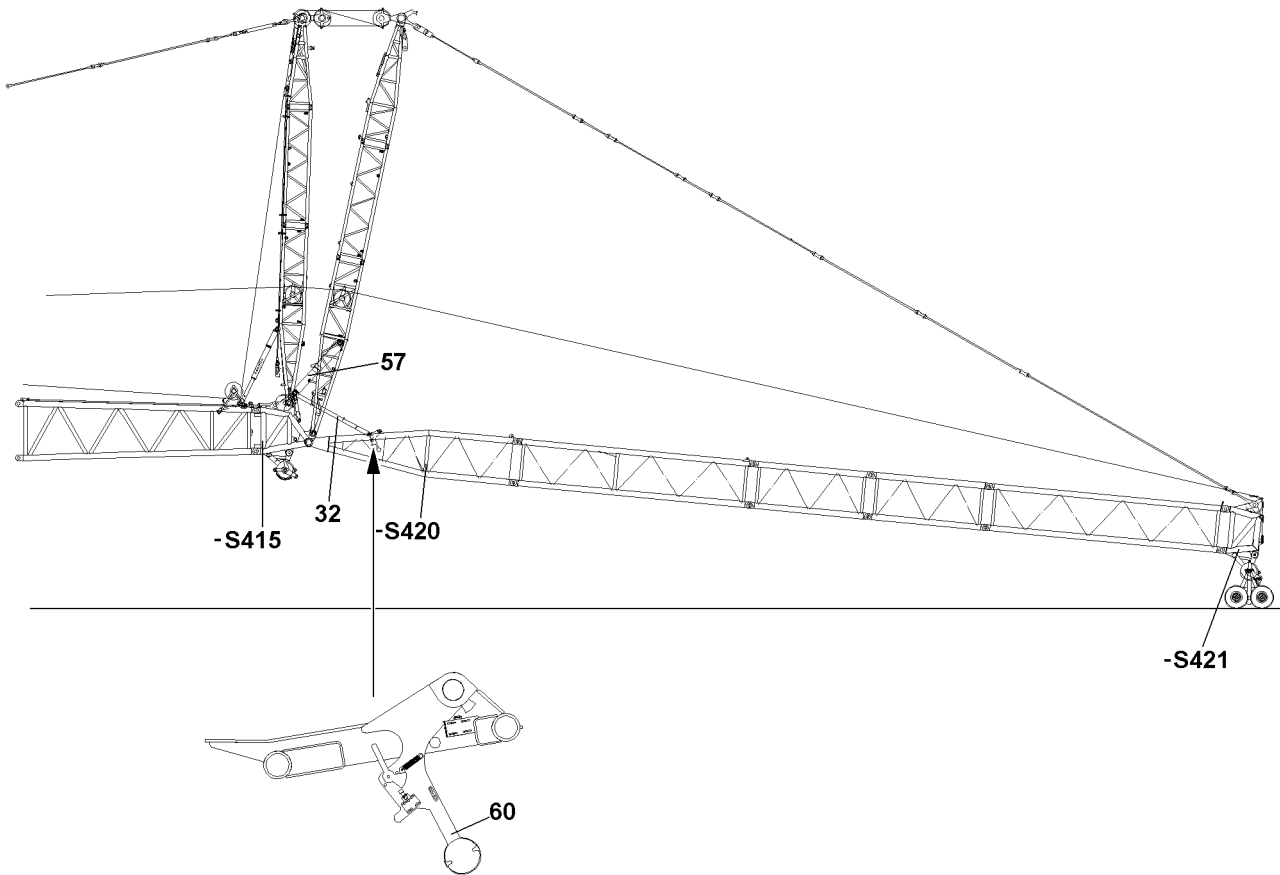
- ▶ Release the transport retainers of the W-guy rods 56.



Note

- ▶ The W-guy rods 56 must be assembled and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the W-guy rods 56.

- ▶ Pin the W-guy rods 56 of the W-end section 55 to the W-guy rods 56 of the WA-frame 1 7 and secure.
- ▶ Tension the W-guy rods 56.



B103427

2.7 Establishing the electrical connections

Ensure that the following prerequisite is met:

- the W-boom is completely assembled.
- ▶ Establish the electrical connection from the terminal box W-pivot section **-S420** to the terminal box W-connector head **-S415**.
- ▶ Make the electrical connection from the cable drum on the W-end section to the terminal box of the W-connector head **-S421**.



CAUTION

Damage to the electrical connection on the cable drum!

If the electrical connection from the cable drum to the terminal box of the W-pivot section **-S420** is made first and then the connection to the terminal box of the W-connector head **-S421**, the electrical connection of the cable drum may be damaged when spooling out the cable drum.

- ▶ Make the electrical connection from the cable drum to the terminal box of the W-end section **-S421** first and then the electrical connection from the terminal box of the W-pivot section **-S420** to the cable drum!
- ▶ Make the electrical connection from the terminal box of the W-pivot section **-S420** to the cable drum of the W-end section.
- ▶ Make the electrical connection for the airplane warning light on the W-end section* and on the SW-connector head.
- ▶ Make the electrical connection for the wind speed sensor* on the W-end section* and on the SW-connector head.

2.8 Function check

Make sure that the following prerequisites are met:

- all electrical connections have been established,
- the appropriate operating mode is set.

2.8.1 Wind speed sensor*

- ▶ Test the movement and the function of the wind speed sensor.

2.8.2 Airplane warning light*

- ▶ Turn the airplane warning light on and visually check the function.

2.8.3 Oscillation guard

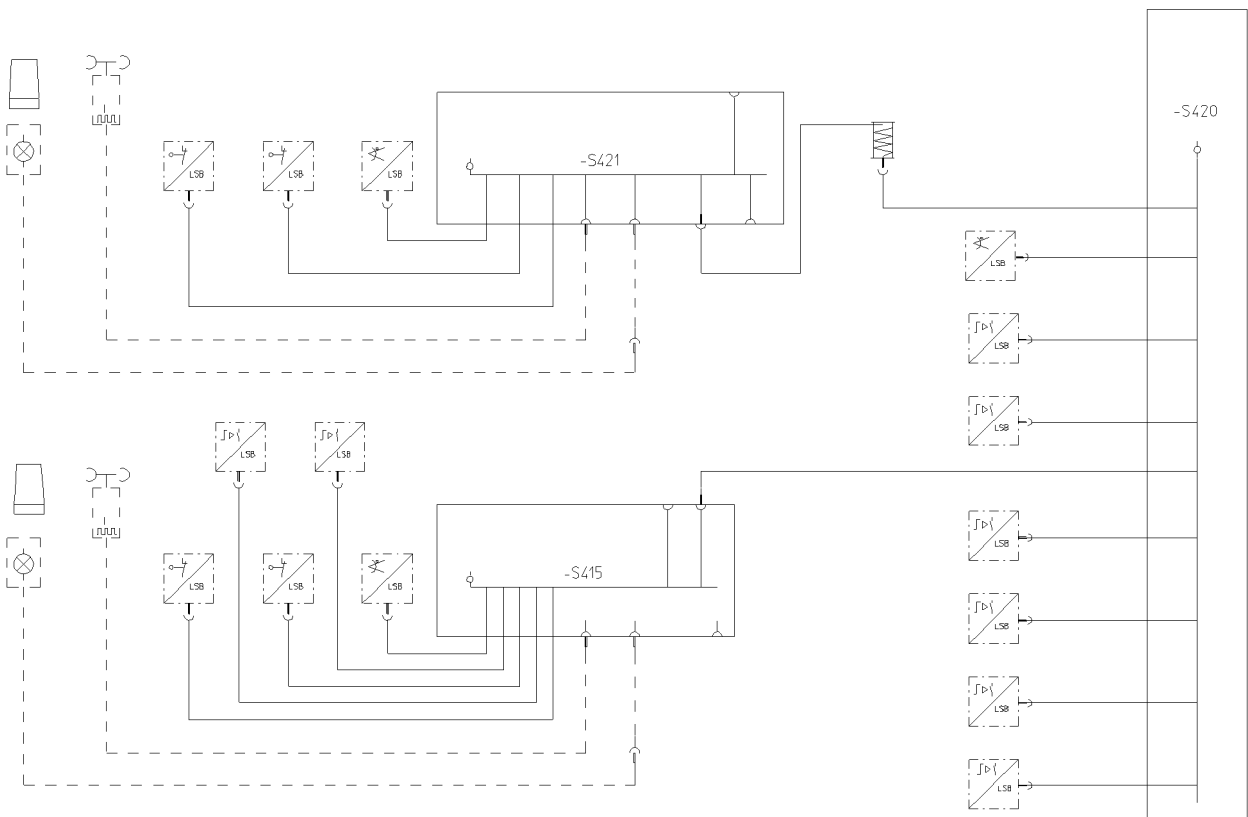
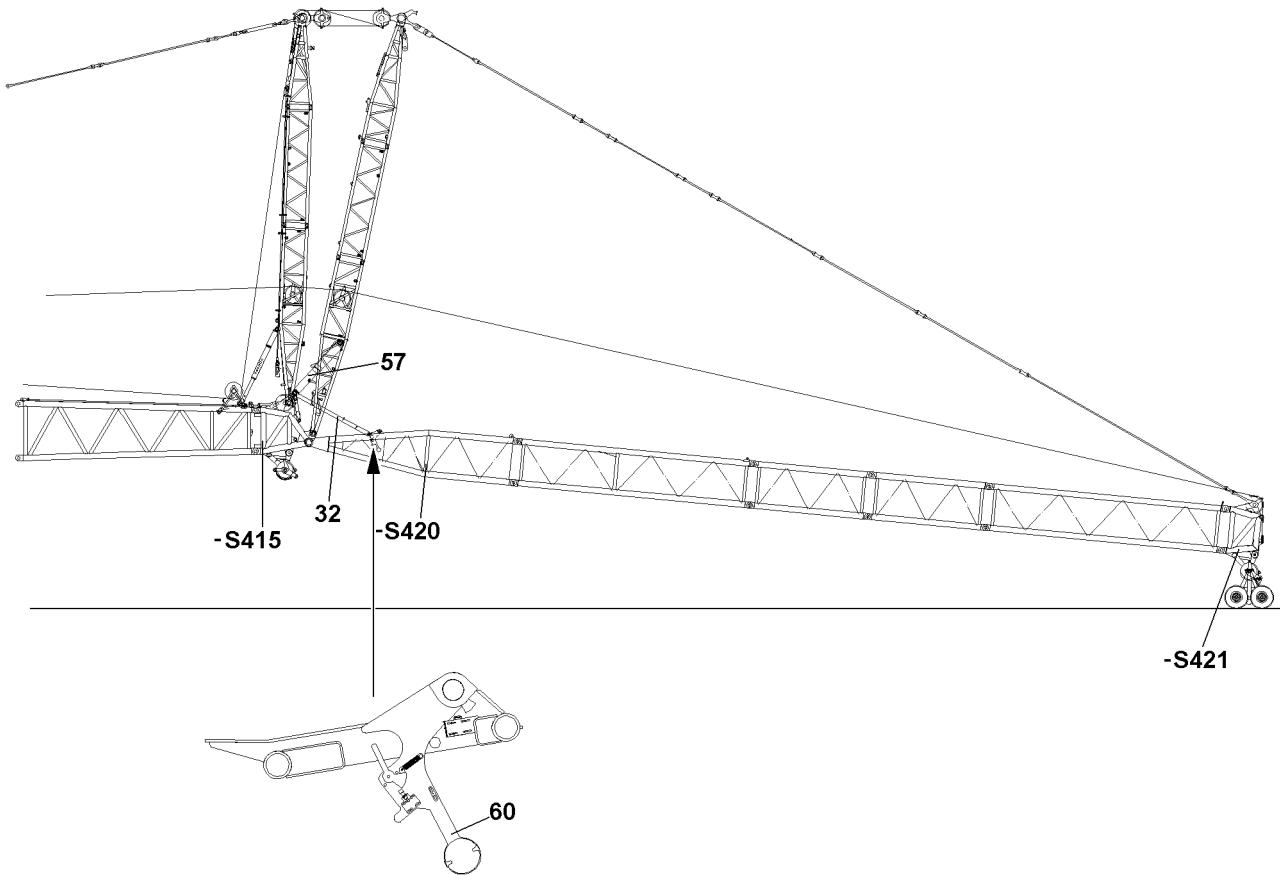


DANGER

Danger of tipping over if the oscillation guard is hard to move!

If the oscillation guard **60** is hard to move, the mechanical relapse retainer will no longer function. The W-lattice jib can tip backwards uncontrolled and cause the crane to topple over!

- ▶ Crane operation with hard to move oscillation guard **60** is prohibited!
- ▶ Check the oscillation guard **60** for easy movement.



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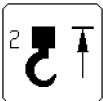
2.8.4 Limit switch - General



Note

- ▶ The limit switch functions have to be checked individually before erection!
- ▶ In the test system, the functions of the limit switch initiators must be checked as described in the separate "Diagnostics manual".
- ▶ The limit switch initiators are checked manually as follows.

2.8.5 Hoist limit switch



When replacing or changing the hoist limit switch (HES), the HES must have the correct bus address and the correct software version in order to be recognized again by the bus system (LSB).

- ▶ Manually operate hoist limit switch.

Result:

- The icon appears on the LICCON monitor.
- The **spool up function** of the hoist winch turns off.

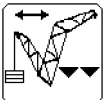
2.8.6 Limit switch W-lattice jib, "steepest" position, relapse cylinder

- ▶ Cover the limit switch initiators individually with a metal plate. See chapter 8.12.

Result:

- The icon appears on the LICCON monitor.
- The **spool up function** of the W-control winch turns off.

2.8.7 Limit switch W-lattice jib, "lowest" position, relapse cylinder



- ▶ Cover the limit switch initiators "lowest" position individually with a metal plate. See chapter 8.12.

Result:

- The icon appears on the LICCON monitor.
- The **spool out function** of the W-control winch turns off.

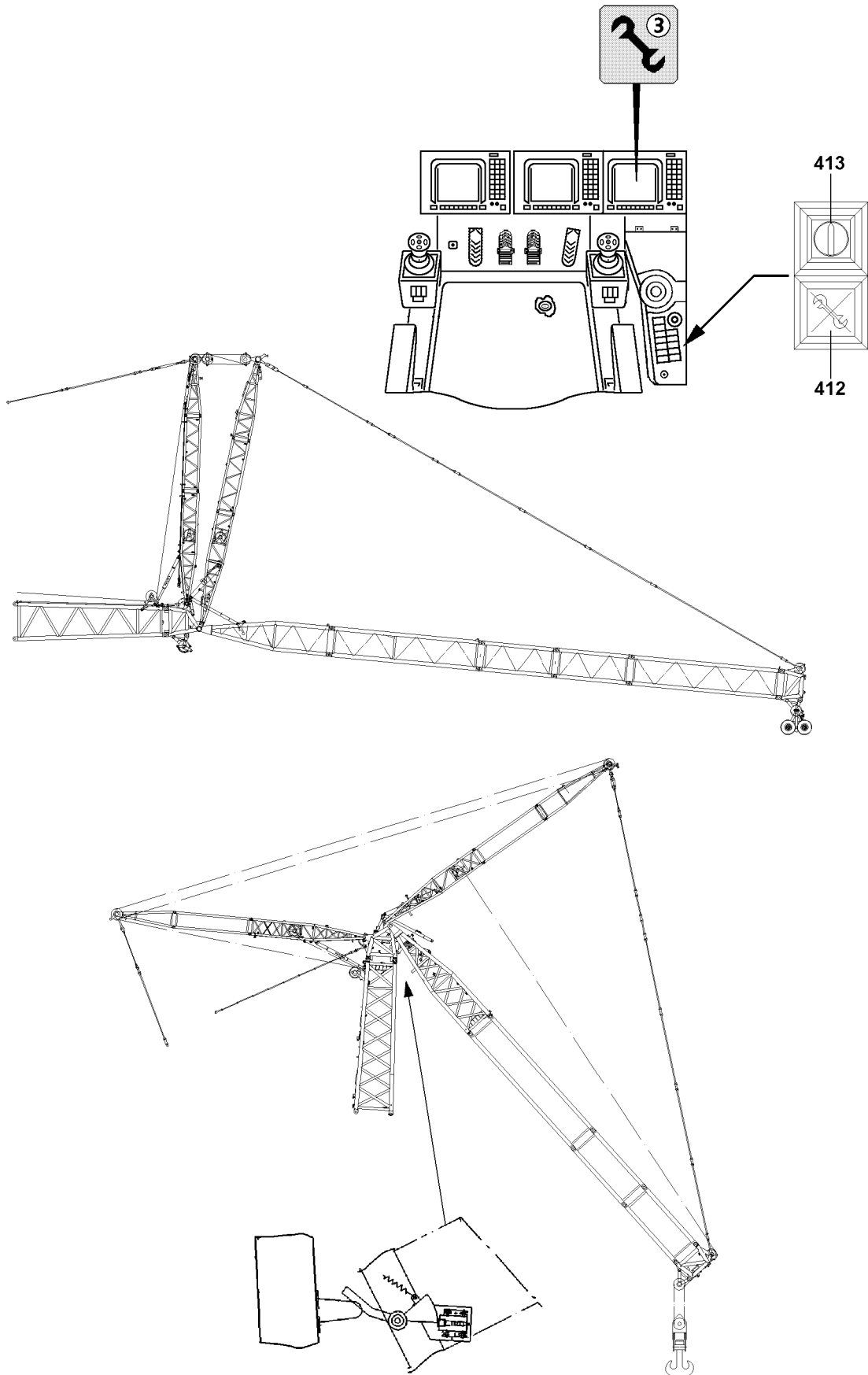
2.8.8 Limit switch flap in position W-lattice jib "steepest" position, mechanical relapse support



- ▶ Cover the limit switch initiators individually with a metal plate.

Result:

- The icon appears on the LICCON monitor.
- The **spool out function** of the W-control winch turns off.



B199424

2.9 Erecting the boom



DANGER

The crane can topple over!

- ▶ It is not permitted to turn the crane during erection!
- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!
- ▶ Extend the relapse cylinder before erection!



DANGER

The crane can topple over!

For certain boom lengths, the mechanical auxiliary supports must be assembled, see Erection and take down charts!

- ▶ The boom must be erected or taken down “to the side” “in the direction” of the mechanical auxiliary supports.
- ▶ Always erect or take down according to the data in the **Erection and take down charts!**



DANGER

Tipping lattice jib!

If the easy movement on the pendulum of the mechanical relapse support is not checked before erection or not reestablished, if necessary, then the mechanical relapse support will not engage in steep lattice jib position. As a result, the lattice jib can tip to the rear.

Personnel can be severely injured or killed!

- ▶ Check the easy movement on the pendulum of the mechanical relapse support before erection.
- ▶ If the pendulum does not move easily: Make the pendulum easy to move!

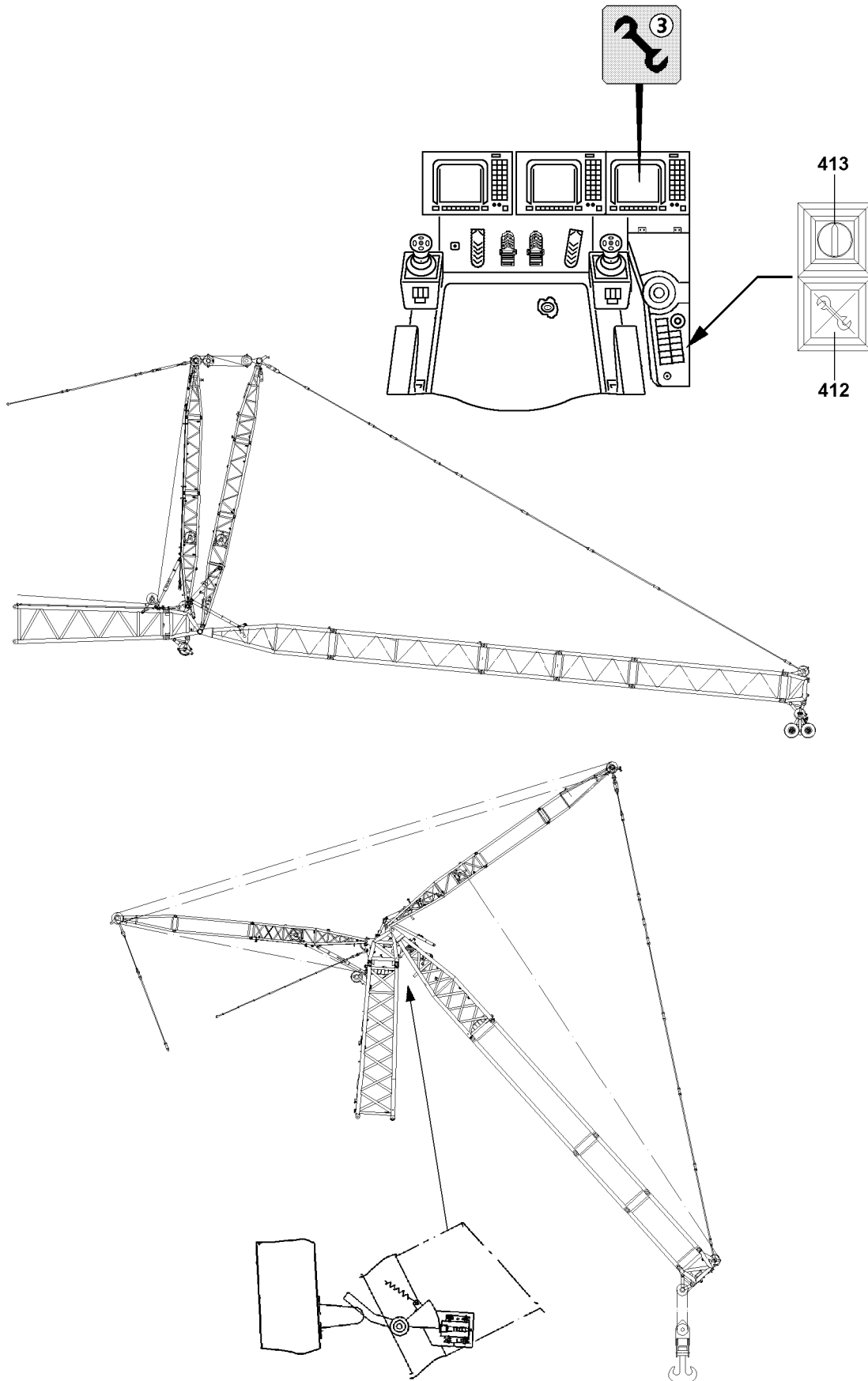


WARNING

Crane can topple over!

If the following conditions are not met before erecting the boom, the crane can topple over. Personnel can be severely injured or killed!

- ▶ The entire weight of the lattice jib must roll on the ground.
- ▶ Spool the lattice jib adjustment out in such that guy rods sag slightly.
- ▶ Do not allow slack cable to build up on the adjusting winch.



B199424

Make sure that the following prerequisites are met:

- the W-lattice jib is fully assembled,
- the pulley cart is installed on the W-head piece,
- no personnel is within the danger zone,
- the crane is aligned in horizontal direction,
- all electrical connections have been established,
- all limit switches are functioning,
- the counterweight is installed on the turntable and on the derrick according to the load chart and the erection chart,
- all pin connections have been secured,
- the hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins,
- the hoist rope has been pulled with the respective length over the W-end section,
- there are no loose parts on the boom or the lattice jib,
- boom, lattice jib and safety devices are free from snow and ice,
- the LICCON overload protection has been set according to the data in the load chart,
- the LICCON overload protection settings have been compared with the current crane configuration,
- the assembly key button **413** is actuated.



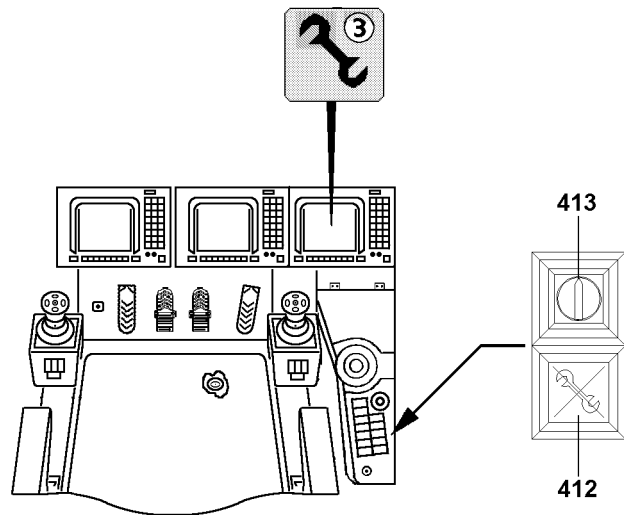
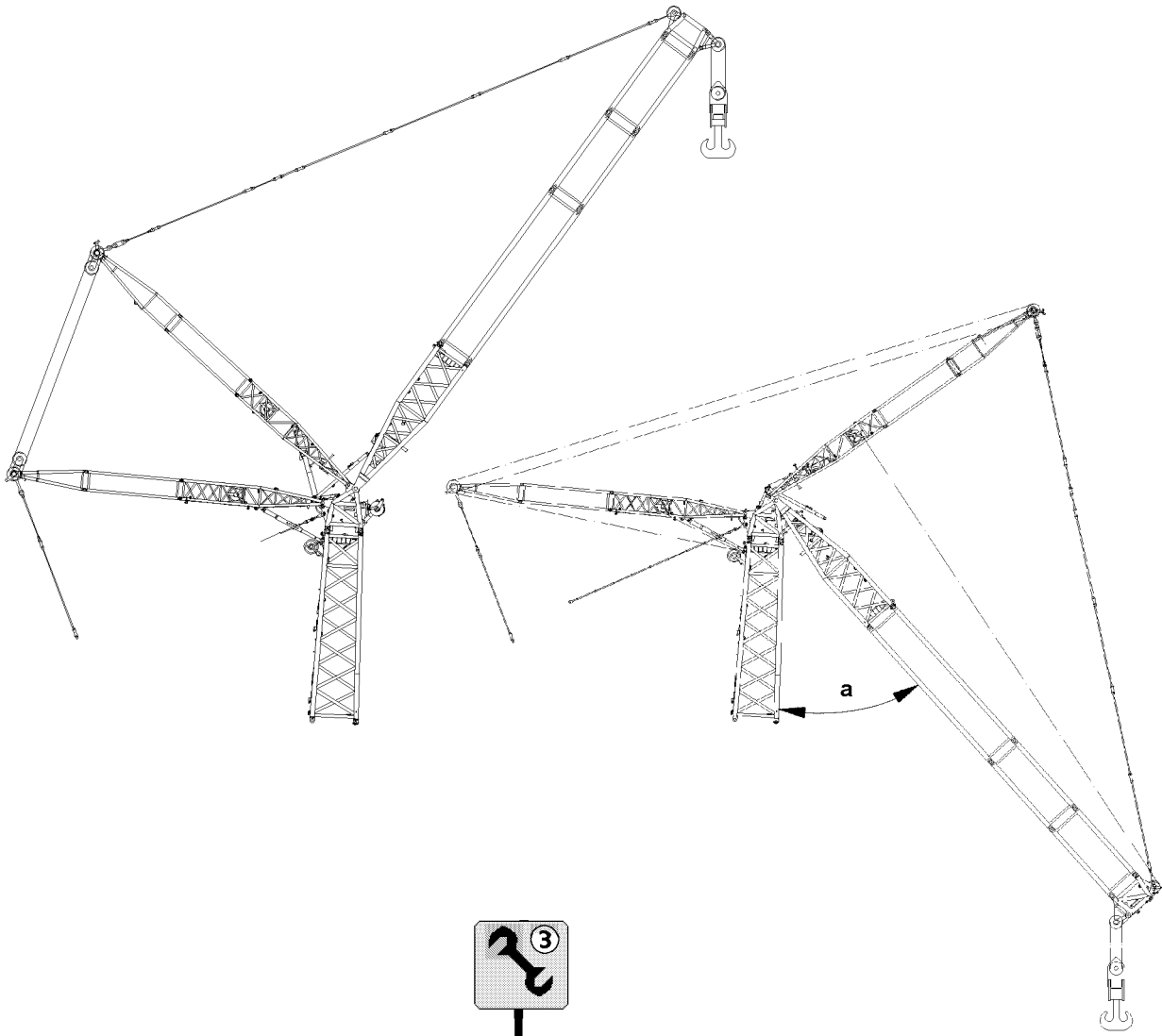
WARNING

Falling hoist rope!

If the hoist rope is not pulled with the respective length over the W-end section before the erection procedure, then it can fall backward due to its own weight.

Personnel can be severely injured or killed!

- ▶ Before the erection procedure, pull the hoist rope with sufficient length over the W-end section!
 - ▶ The hoist rope must be constantly monitored during erection!
 - ▶ Do not step into the danger zone!
-
- ▶ Luff up the S-boom and simultaneously unwind the W-adjusting winch around the lattice jib, keep on the ground with the W-end section deposited on the roller cart. Continue with this process until the S-boom and the W-lattice jib form an angle of approximately 50°, **switching position W-lattice jib bottom**, or until the W-end section lifts up from the ground or the W-frame 1 is in the **bottom** position.
 - ▶ Unpin the roller cart on the W-end section, see chapter 5.15 Roller cart.
 - ▶ Luff up the S-boom until the W-end section lifts off the roller cart.
 - ▶ Reeve the hoist rope properly into the hook block and attach the hoist limit switch weight.



B106837

- ▶ Luff the S-boom up

**CAUTION**

Damage to crane!

- ▶ Luff up the S-boom and simultaneously spool out the hoist winch to prevent the hook block from colliding with the W-end section.

- ▶ Luff up the S-boom to the operating position.
- ▶ Luff up W-lattice jib to the **lowest** operating position.

**DANGER**

The crane can topple over!

- ▶ When the lowest operating position is reached, the assembly key button **413** must be turned off immediately.
- ▶ The assembly key button **413** bypasses the safety devices!
- ▶ The radii specified in the load chart may neither fall below nor exceed the specified loads!

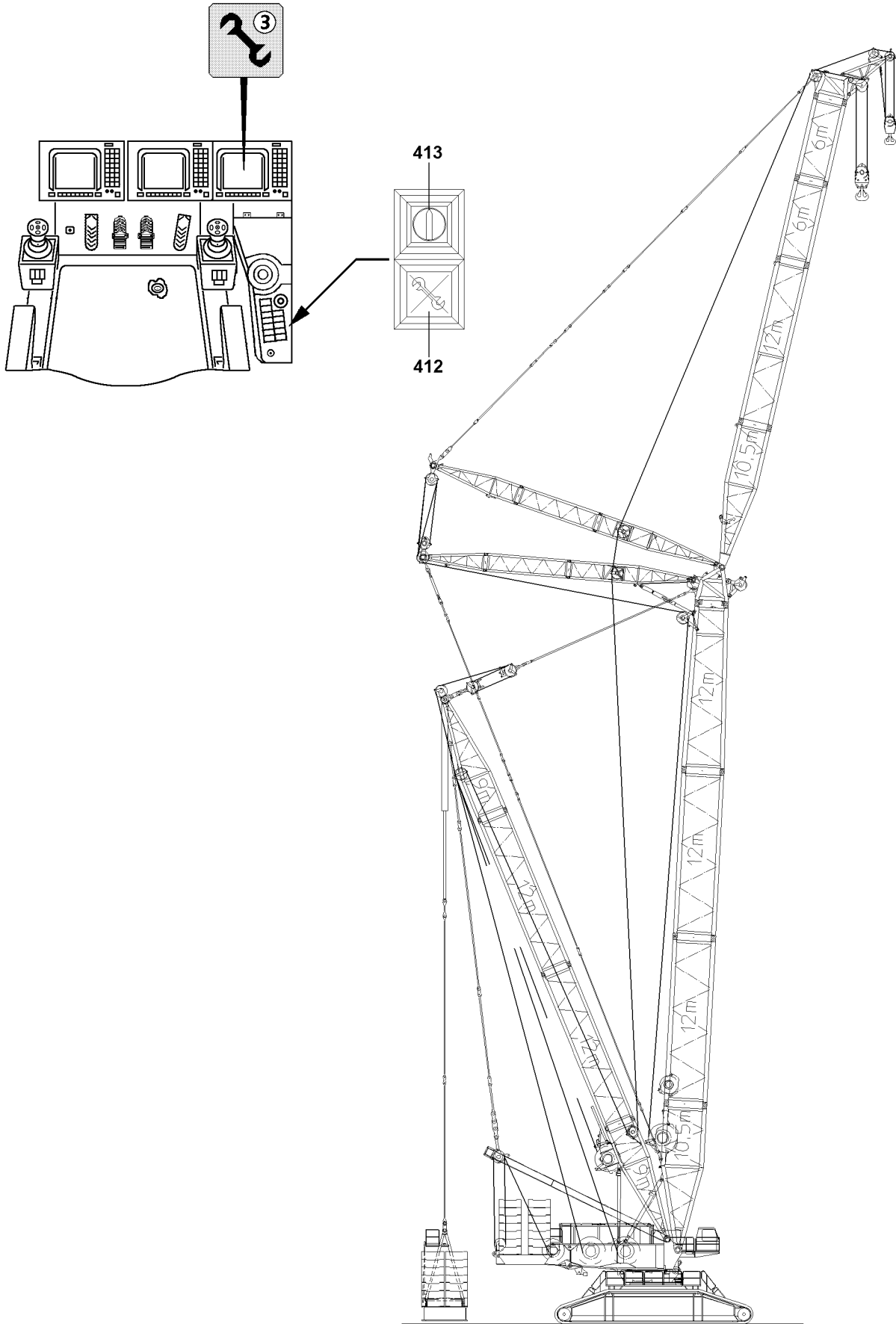
**Note**

- ▶ The operating position is reached if the blinking displays turn off and a load display appears in the "maximum load" symbol instead of question marks (???).

- ▶ Turn the assembly key button **413** off by pressing the button **412**.

Result:

- The LICCON overload protection is active.
- The Assembly symbol **3** on the LICCON display turns off.
- The acoustical signal turns off.
- The red beacon on the crane cab is off.



B103429

3 Crane operation

Observe the notes in chapter 4.05, 4.08 and 5.01.

Make sure that the following prerequisites are met:

- the LICCON overload protection has been adjusted according to data in the load chart.,
- the assembly key button **413** has been turned off by pressing the button **412**, the Assembly Symbol **3** on the LICCON display is off.



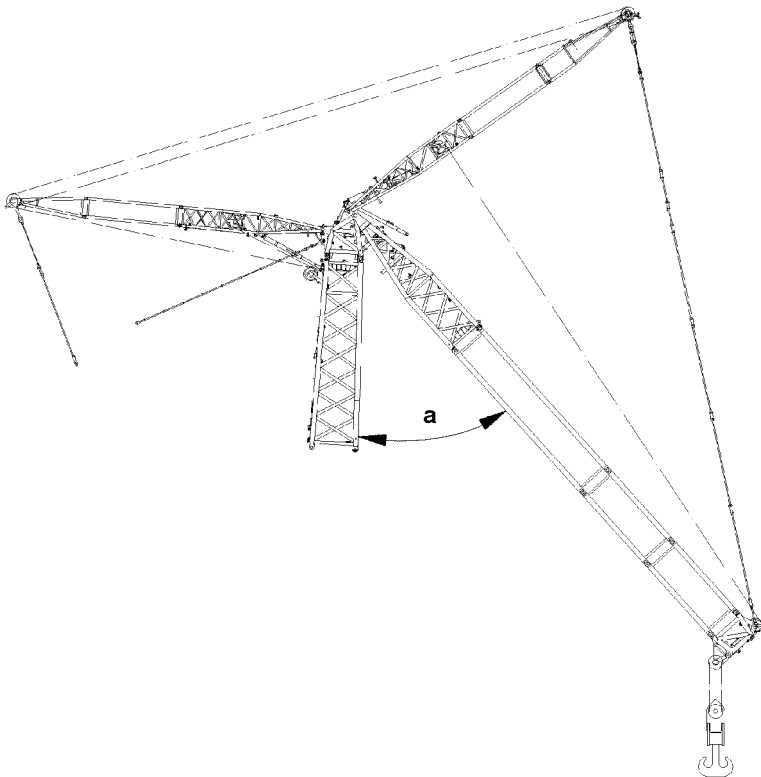
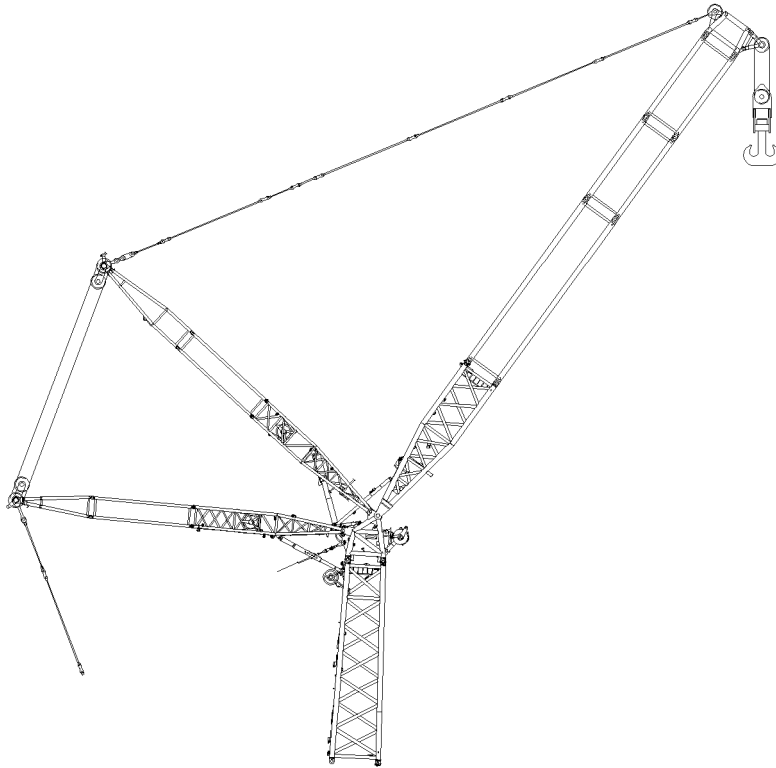
DANGER

The crane can topple over!

- ▶ Check the horizontal position of the crane before and during operation.
 - ▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset, if necessary, before resuming crane operation.
-

3.1 Checking the settings

- ▶ Check the function of the overload protection by running against the operating positions on top and bottom.
- ▶ Check the hoist limit switch by running against the hoist limit switch weight.
- ▶ Check the function of the limit switches on the relapse cylinders.



B199797

4 Disassembly



DANGER

Risk 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 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!



DANGER

Danger of accident at assembly / disassembly of booms!

When you disassemble unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel.

- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under 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!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ Do not lean the ladder against the component being disassembled!

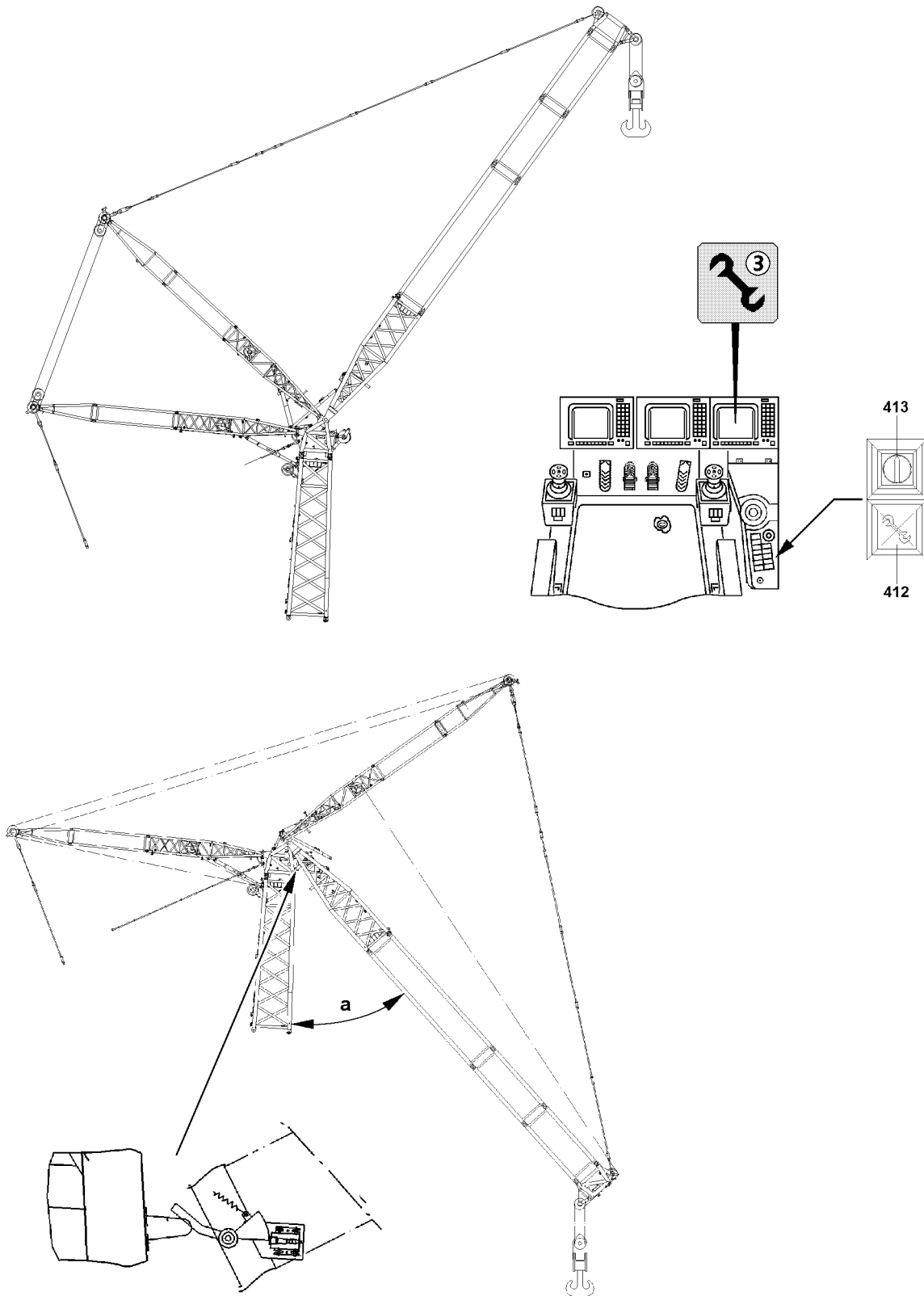


DANGER

Falling components!

If a component is removed without it being secured with the auxiliary crane to prevent it from falling, the component can fall and kill personnel!

- ▶ Secure components before removal with the auxiliary crane to prevent them from falling!



B199798

4.1 Setting down the boom



DANGER

The crane can topple over!

If the following conditions are not met before taking down the boom, the crane can topple over and fatally injure personnel!

- ▶ Observe the Safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!

Make sure that the following prerequisites are met:

- the S-boom is in the steepest position, 87°.
- ▶ Luff the W-lattice jib down to the **lowest** operating position.

When the lowest operating position is reached the luff down movement is shut off.

The load value in the “maximum load” icon disappears and question marks (????).

The following alarm functions become active:

- “STOP”
- “Horn” and acoustical signal



DANGER

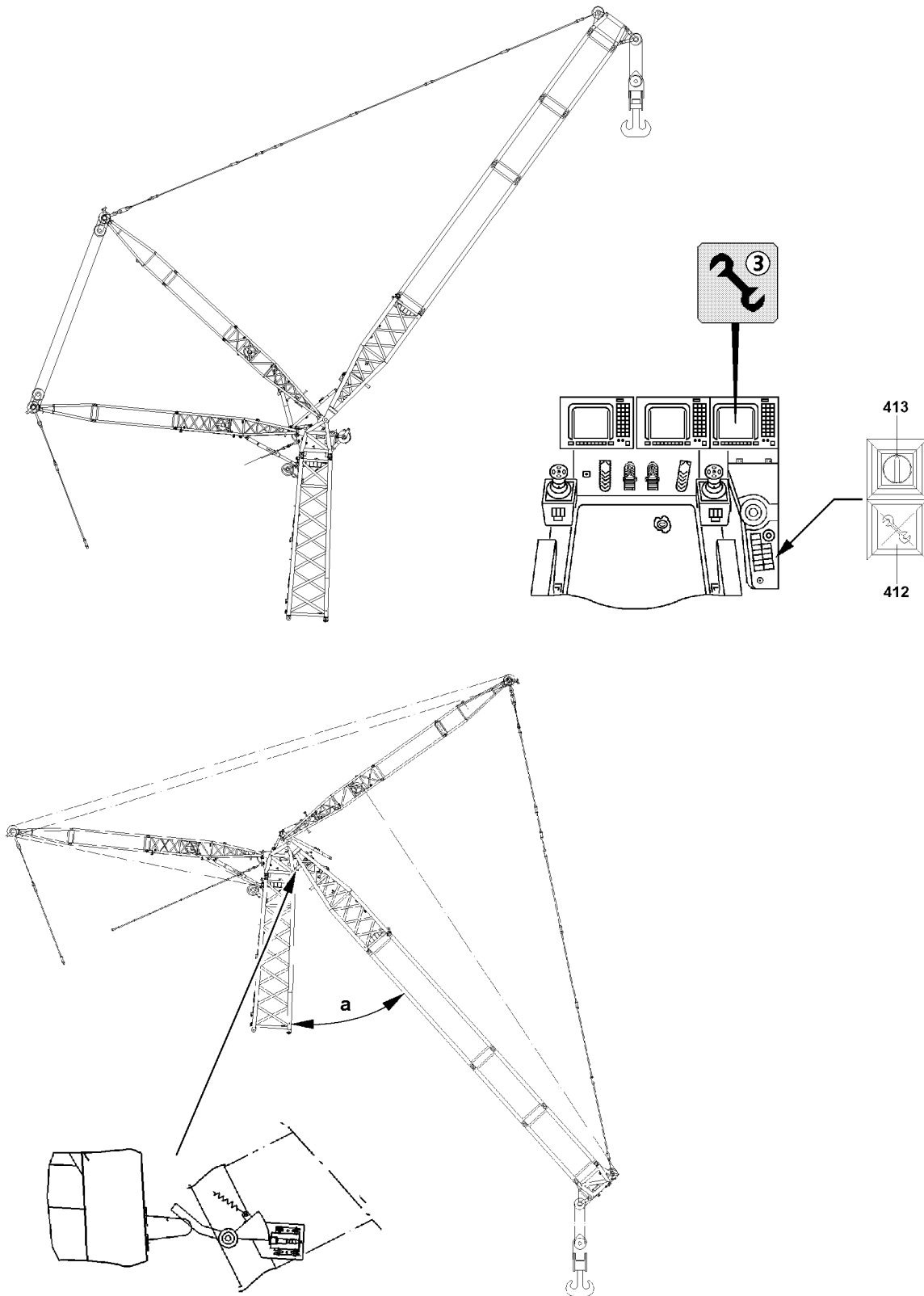
Danger of fatal injury at crane operation with turned on assembly key button.

- ▶ The actuation of the assembly key button **413** is only permitted for assembly tasks!
- ▶ The assembly key button may only be operated by persons, who are aware of the consequences of a bypass!
- ▶ If the assembly key button **413** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **413** turned on is strictly prohibited!
- ▶ The assembly key button **413** must be removed immediately after carrying out the assembly work and handed to an authorized person!

- ▶ Actuate the assembly key button **413**.

Result:

- The LICCON overload protection is inactive.
- The indicator light in the button **412** lights up.
- The Assembly symbol **3** in the LICCON monitor blinks.
- An acoustical signal sounds.
- The red beacon on the crane cab blinks.
- The Stop symbol **3** on the LICCON monitor flashes.
- The horn sounds.



B199798

- ▶ Continue to luff the W-lattice jib down until an angle α of approximately 50° is reached between the S-boom and the W-lattice jib.

When the angle is reached, the spooling out motion of the W-adjustment is turned off.

- ▶ Luff the S-boom down.



CAUTION

Damage to crane!

- ▶ Luff the S-boom down and simultaneously spool the hoist winch out to prevent a collision between the hook block and the W-end section.

-
- ▶ Luff the S-boom down until the hook block touches the ground.
 - ▶ Remove the hoist limit switch weight and unreeve the hook block.
 - ▶ Luff down the S-boom until the W-end section is resting on the roller cart.
 - ▶ Remove the roller cart on the W-end section, see chapter 5.15 Roller cart.



DANGER

The crane can topple over!

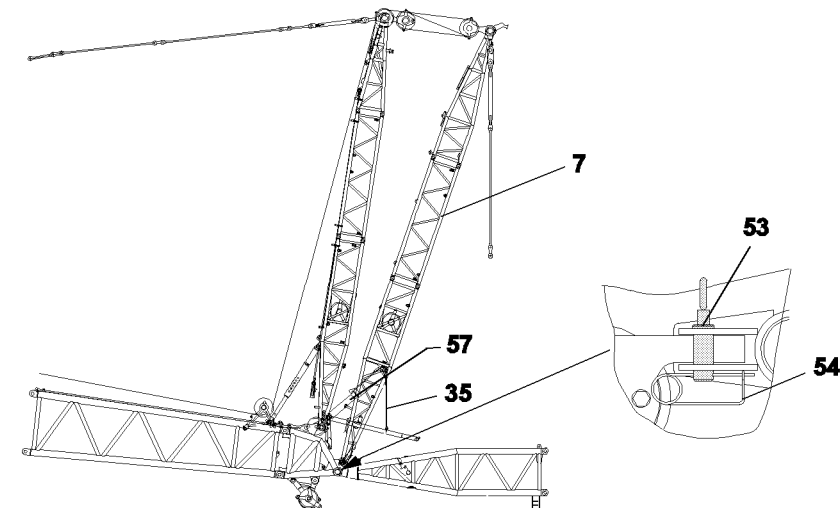
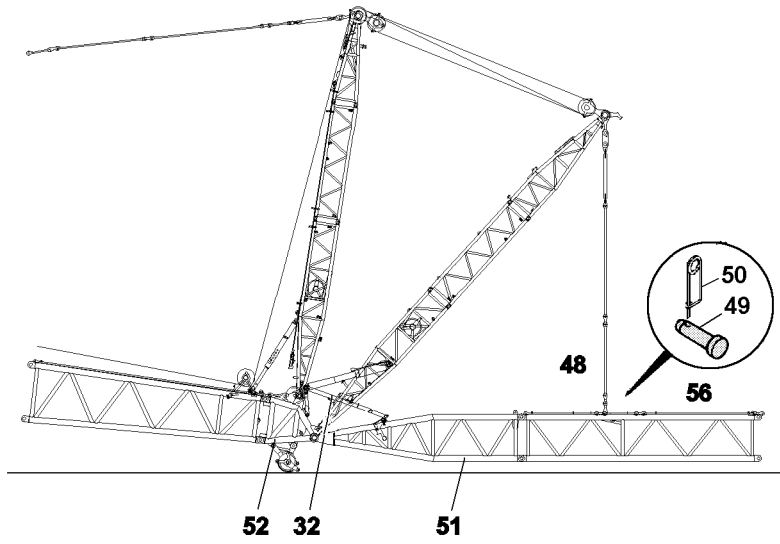
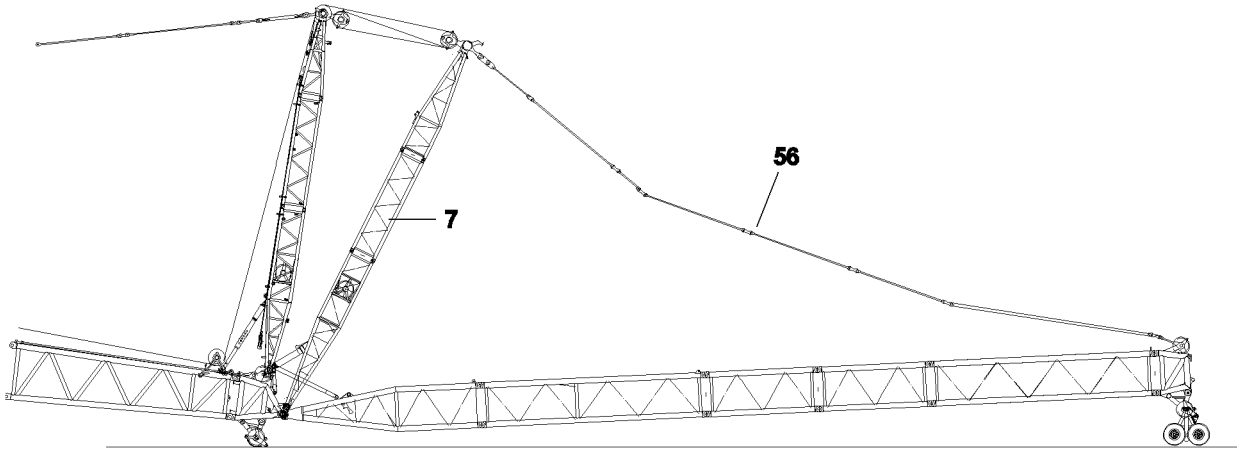
- ▶ Spool out the lattice jibs in such a way that the guy rods sag slightly!
 - ▶ The lattice jib must roll on the ground with its entire weight!
 - ▶ Do not allow slack cable to build up on the control winch!
-
- ▶ Continue to luff down the S-boom and simultaneously spool the W-lattice jib control out so that the guy rods sag slightly.
 - ▶ Luff the S-boom down until the S-boom head is laying on the support on the ground.



DANGER

Risk of accident!

- ▶ Make sure that no personnel is within the danger zone.
 - ▶ Secure the hoist rope with the auxiliary rope and pull it back slowly over the rope pulleys in the WA-frames and lower it toward the S-end section.
-
- ▶ Remove the hoist rope.



4.2 Disassembling the guy rods

- ▶ Relieve the guy rods **56** by lowering the WA-frame. Spool the adjusting winch out.
- ▶ Unpin the guy rods **56** on the guy rods **48**: Remove the spring retainer **50** and unpin the pin **49**.
- ▶ Place and secure the guy rods **56** for transporting on the W-lattice sections.
- ▶ Assemble the retaining rope **35** on the mechanical retaining support **32**.

Result:

- The mechanical relapse support **32** is raised by the retaining rope **35**, which provides more space for the assembly of the W-pivot section.
- ▶ Pull up the WA-frame **17** until the relapse cylinder **57** is completely retracted.
- ▶ Disconnect the electrical connection from the terminal box W-pivot section **-S420** to the terminal box W-connector head **-S415**.
- ▶ Disconnect the electrical connection from the cable drum on the W-end section to the terminal box of the W-connector head **-S421**.
- ▶ Unpin and remove the W-lattice sections.

To unpin the W-lattice sections with the pin pulling device, refer to chapter 5.30.



4.3 Unpinning the W-pivot section



DANGER

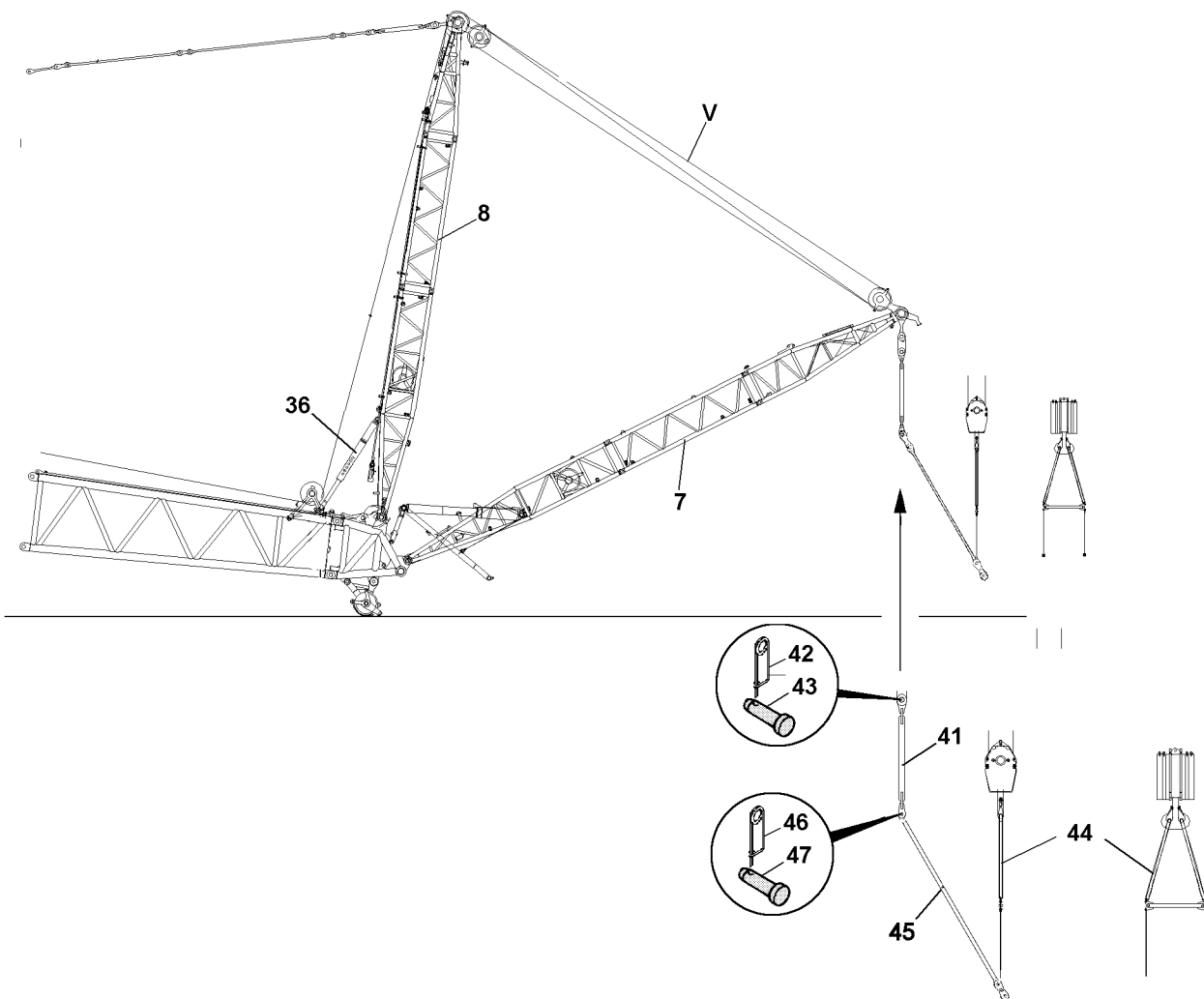
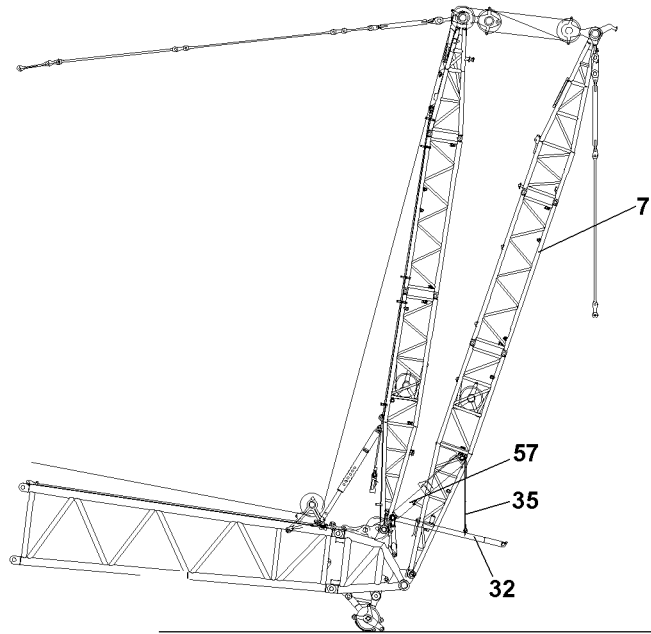
General danger notes!

- ▶ Support W-pivot section during disassembly with suitable materials!
- ▶ Hang the W-pivot section **51** onto the auxiliary crane.



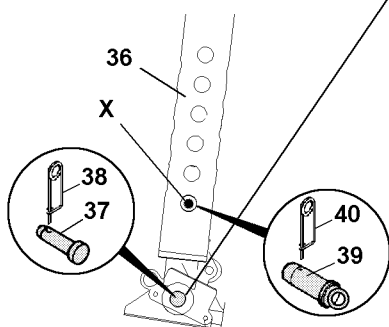
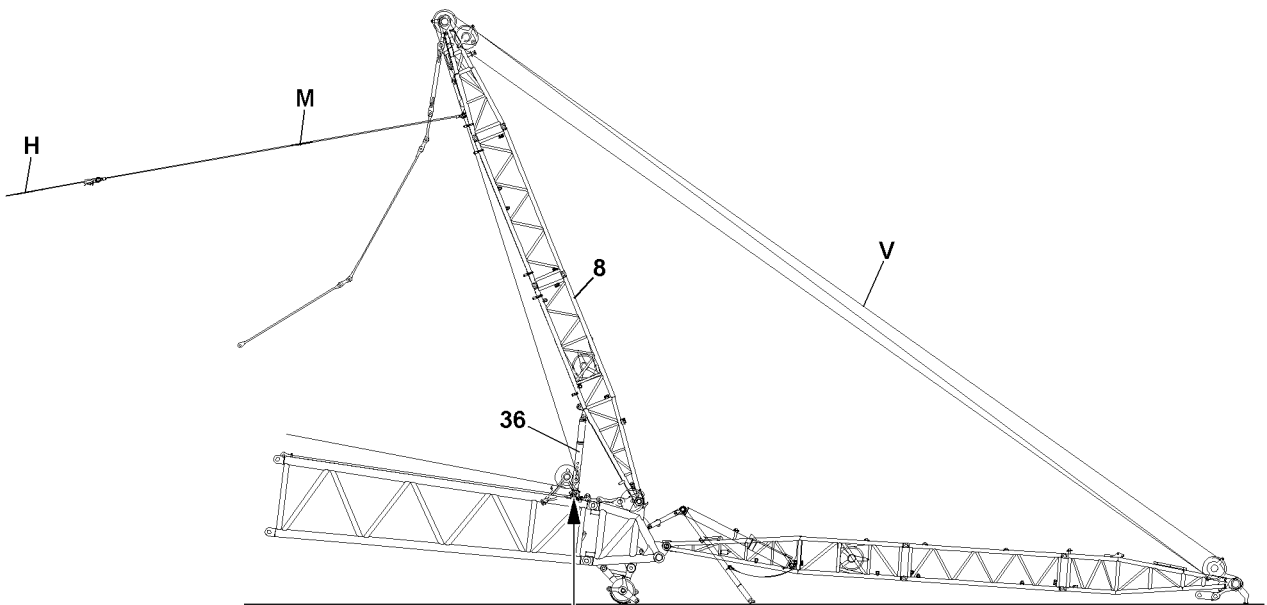
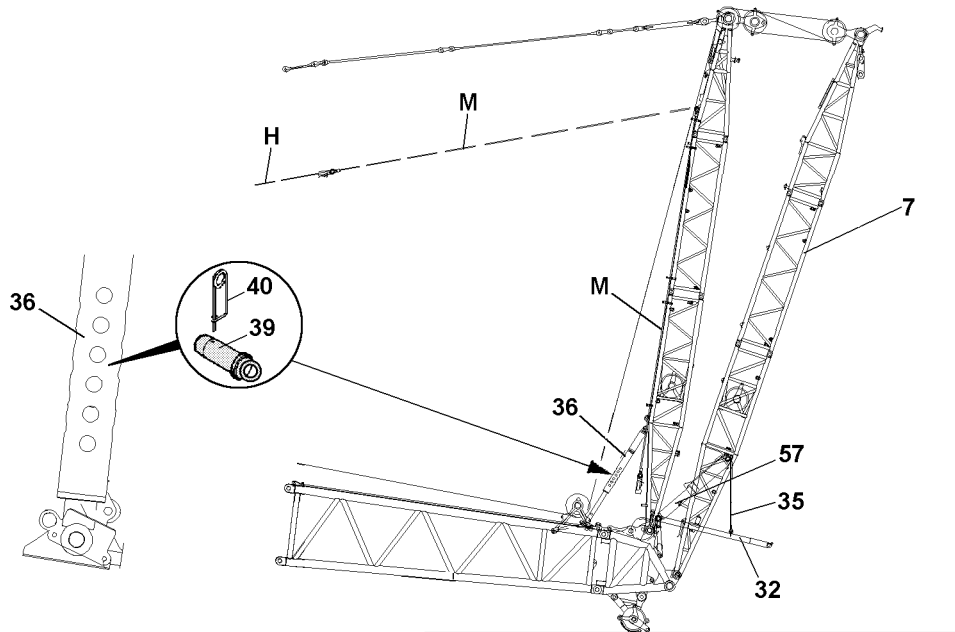
Note

- ▶ The weight of the W-pivot section is: 11.7 t.
- ▶ Unpin W-pivot section **51** on both sides with the pin pulling device.
- ▶ Remove spring retainers **54** on both sides.
- ▶ Actuate the manual lever and unpin the pin **53** completely.
- ▶ Place the W-pivot section **51** on the ground support and remove the auxiliary crane.



4.4 Disassembling the W-guy rods

- ▶ Lower the WA-frame 1 7.
- ▶ Attach cross-beam 44 to the W-guy rods 45, lower the WA-frame 1 and unpin on the W-guy rods 41.
- ▶ Remove spring retainers 46 and unpin pins 47.
- ▶ Attach cross-beam 44 to the W-guy rods 41, lower the WA-frame 1 and unpin on the W-guy rods 41.
- ▶ Place and secure the guy rods for transport on the W-lattice sections.



4.5 Unpinning the WA-frame 2 retaining supports

- ▶ Pull up the WA-frame 1 **7** until the relapse cylinder **57** is completely retracted.
- ▶ Release the assembly rope **M** on the WA-frame 2 **8**.
- ▶ Spool out the hoist rope **H** and attach and tighten on the lock of the assembly rope **M**.

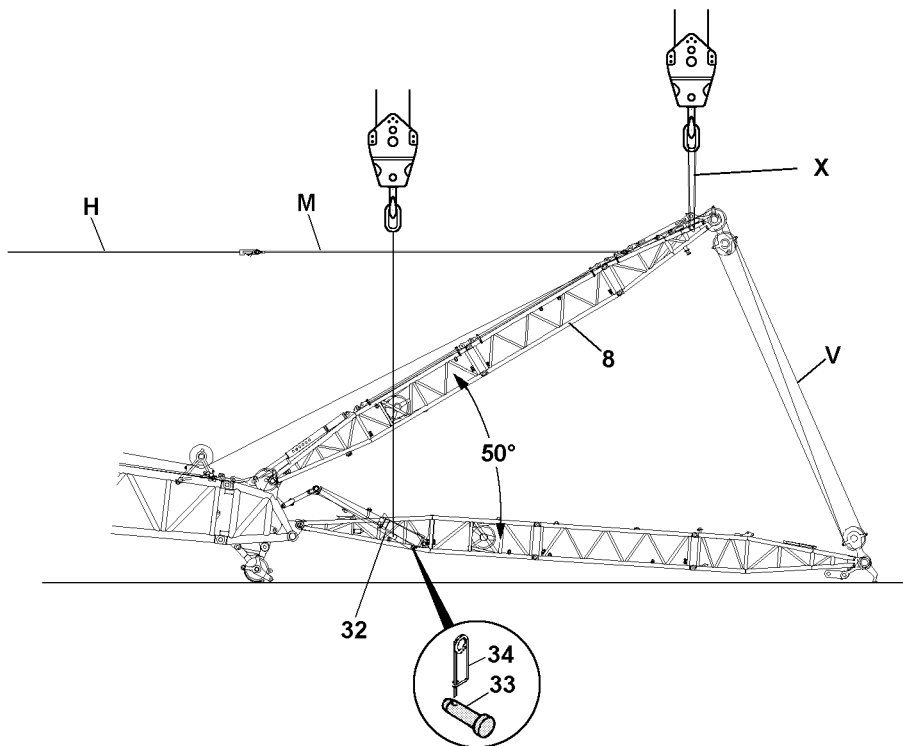
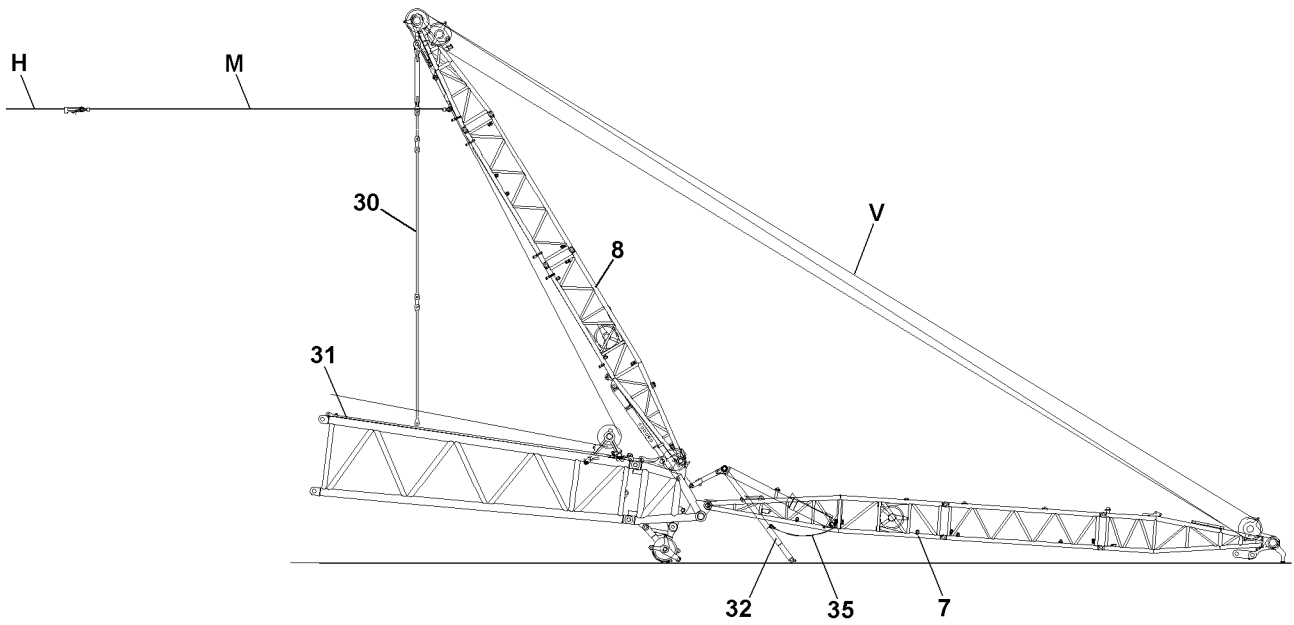


CAUTION

Damage to the WA-frame 2 **8**!

If the connecting pin **39** on the retaining supports **36** is not unpinned prior to pulling the WA-frame 2 **8** backward with the hoist rope **H** of winch 1, then the WA-frame 2 **8** can be damaged! Winch 1 will not be turned off!

- ▶ Unpin the connecting pins **39** on both sides before pulling the WA-frame 2 **8** backward! Remove the spring retainers **40** and unpin the connecting pins **39**.
-
- ▶ Spool out the adjusting rope **V** and spool up the hoist rope **H** until the retaining supports **36** are pushed together.
 - ▶ Pin and secure the pins **39** on both sides while pushed together in parking position **X**.
 - ▶ Unpin the retaining supports **36** on the S-boom: Remove spring retainers **38** and unpin pins **37**.
 - ▶ Spool up the adjusting rope **V** and spool out the hoist rope **H** until the WA-frame 2 **8** is vertical.
 - ▶ Attach the retaining supports **36** on the WA-frame 2 with the lashing straps.



4.6 Unpinning the WA-frame 2 guy rods

- ▶ Pull the WA-frame 2 **8** with the hoist rope **H** backward until the WA-frame 2 guy rods **30** can be uninned from the WA-frame 2 guy rods **31**.



Note

- ▶ The WA-frame 2 guy rods **30** are attached on the WA-frame 2 **8**.
 - ▶ The WA-frame 2 guy rods **31** are attached on the S-boom.
-
- ▶ Unpin the WA-frame 2 guy rods **30** from the WA-frame 2 guy rods **31**.
 - ▶ Hang the mechanical retaining support **32** onto the auxiliary crane.
 - ▶ Remove the retaining rope **35** between the WA-frame 1 **7** and the mechanical retaining support **32**.
 - ▶ Pull up the mechanical retaining support **32** with the auxiliary crane and pin together. Insert the pin **33** and secure with spring retainer **34**.

4.7 Lowering the WA-frame 2

- ▶ Hang the auxiliary crane on the assembly rope **X** of the WA-frame 2 **8**.
- ▶ Pull the WA-frame 2 forward by spooling out the hoist rope **H** and simultaneously spooling up the adjusting rope **V**.

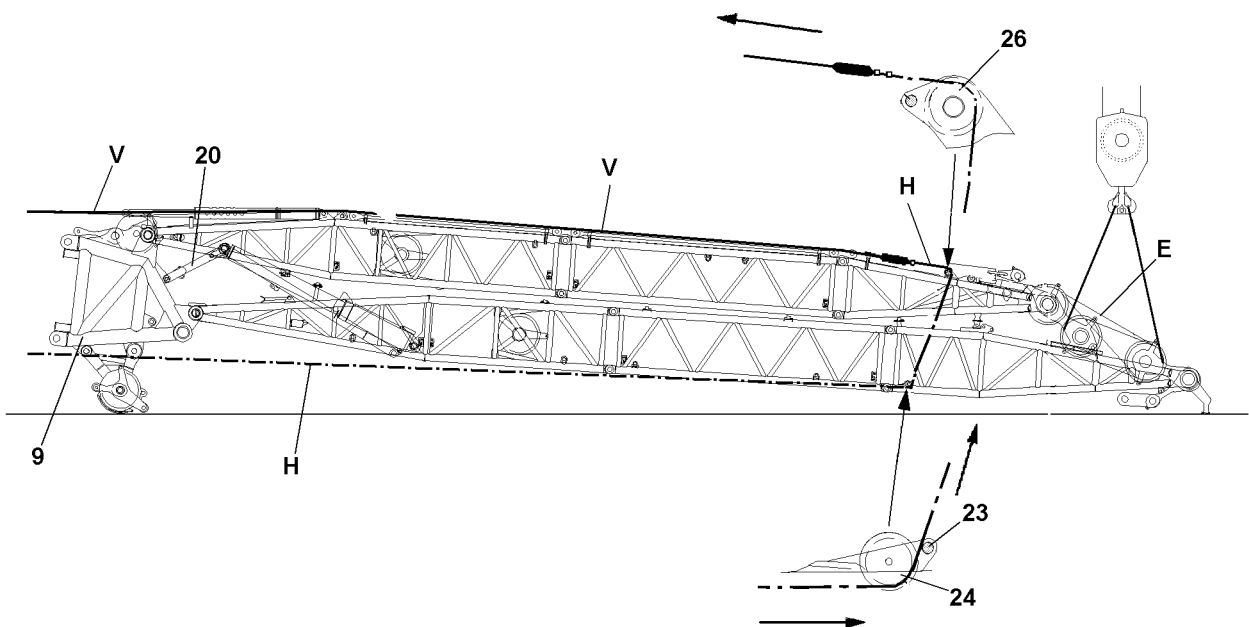
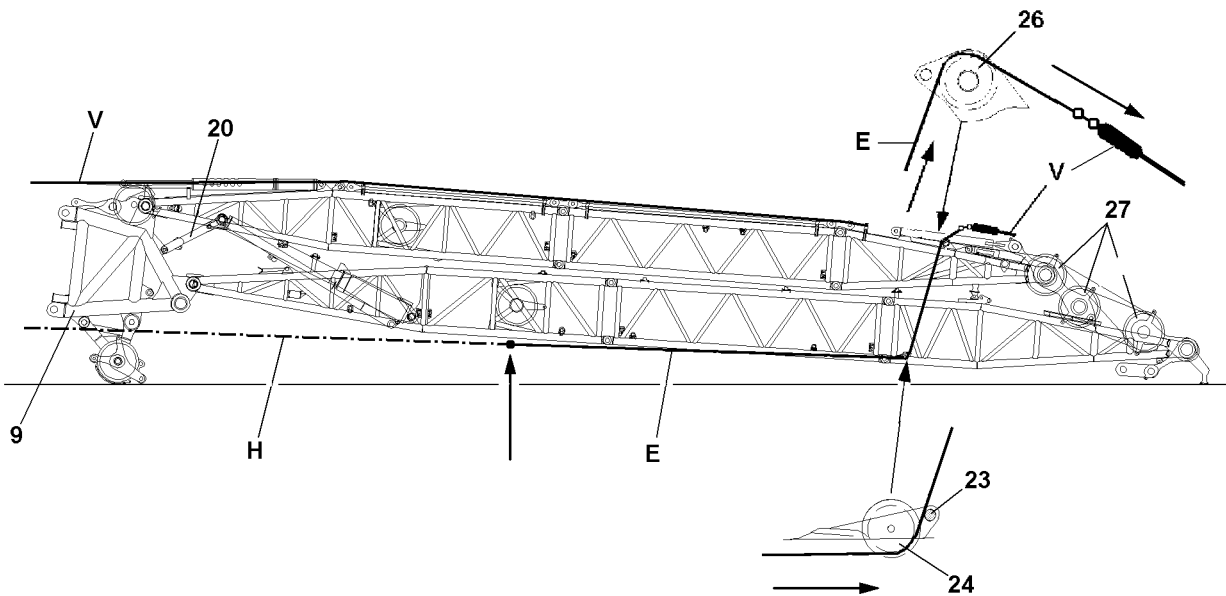


DANGER

WA-frame 2 **8** folding down!

If the WA-frame 2 **8** is lowered without being secured with the auxiliary crane from an angle of approximately 50°, the WA-frame 2 **8** can drop and cause fatal injuries!

- ▶ Lower the WA-frame 2 **8** to the stop on the WA-frame 1 **7**.
-
- ▶ Remove the hoist rope **H** on the lock of the assembly rope **M** and attach on the WA-frame 2.
 - ▶ Remove the auxiliary crane on the assembly rope **X** and attach on the WA-frame 2.



4.8 Reeving the W-adjusting rope out

Make sure that the following prerequisites are met:

- the retaining frame **20** is pinned and secured on the S-end section **9**,
- the adjusting rope **V** is removed from the lock,
- the rope retaining pins **23** and the rope retaining pins on the rope pulleys **27** are unpinned,
- the W-pulley blocks are lifted by an auxiliary crane for better reeving.



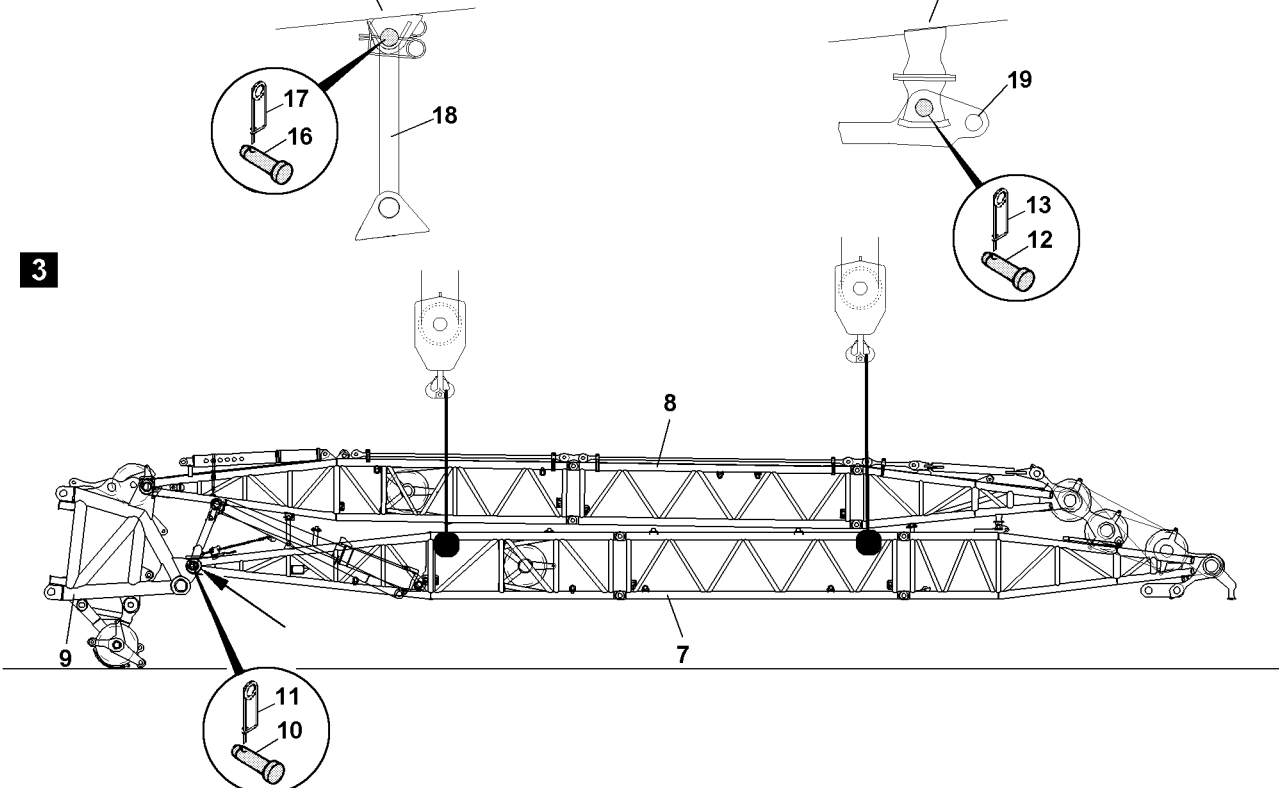
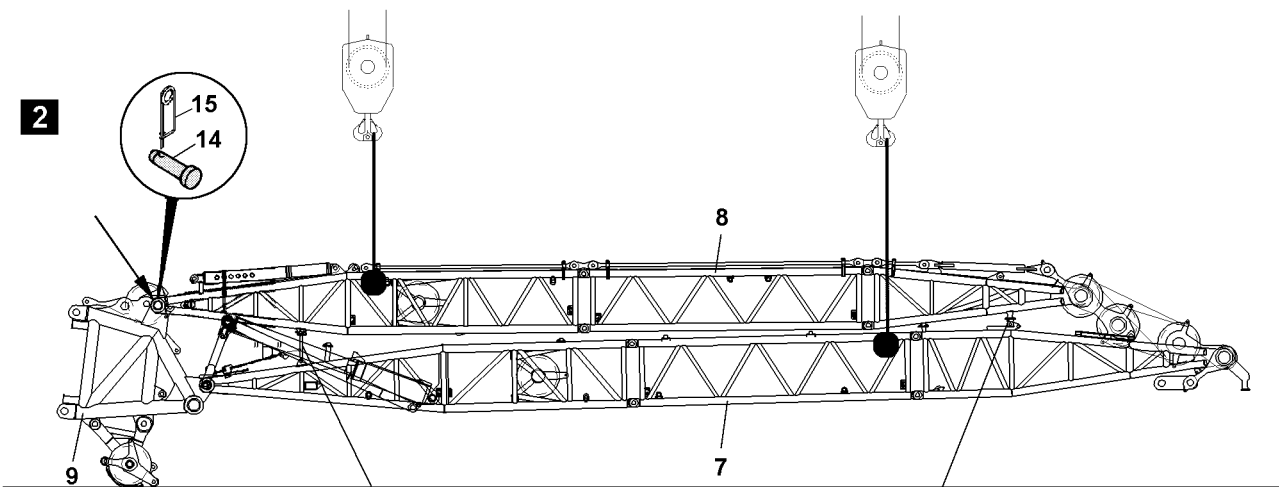
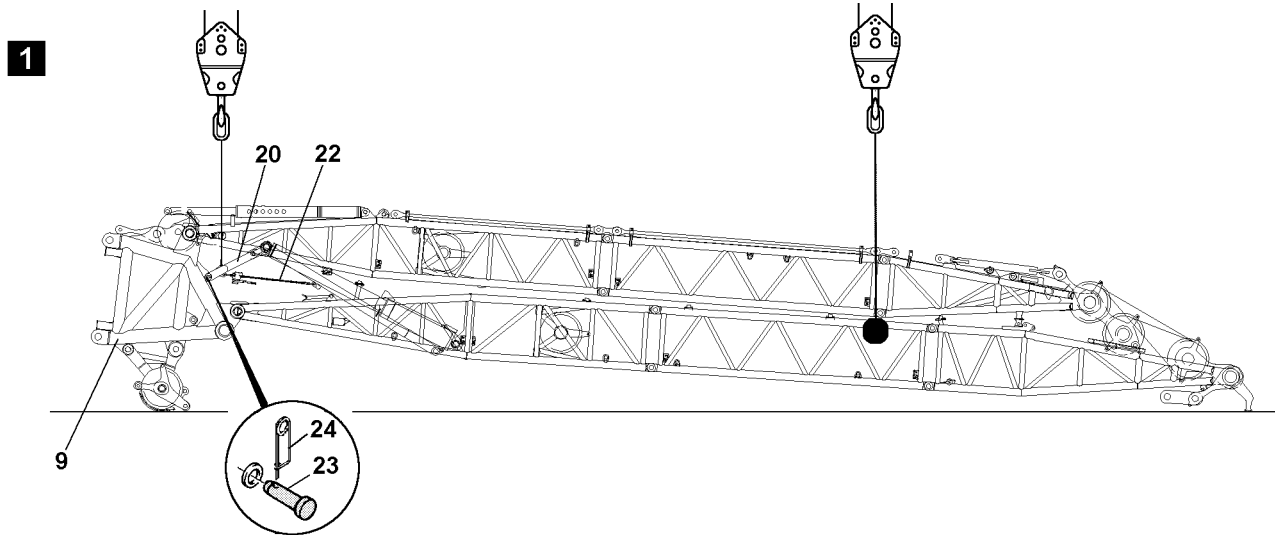
CAUTION

Ropes may become slack!

The adjusting rope **V** could be damaged if any of the ropes are slack!

- ▶ Do not allow the ropes to become slack when spooling up the adjusting rope **V**!
- ▶ Maintain a tight adjusting rope **V** when spooling up!

-
- ▶ Connect the auxiliary rope **H** to the reeving rope **E**.
 - ▶ Run the reeving rope **E** over change over pulley **24** and over the change over pulley **26**.
 - ▶ Connect the reeving rope **E** to the adjusting rope **V**.
 - ▶ Spool up the adjusting rope **V** and simultaneously spool out the auxiliary rope **H** and reeve the reeving rope **E** into the rope pulleys **27**.
 - ▶ Spool up the adjusting rope **V** until it is reeved out of the rope pulleys **27** and contacts the WA-frame 2 head.
 - ▶ Loosen the reeving rope **E** from the adjusting rope **V**.
 - ▶ Release the connection from the auxiliary rope **H** and the reeving rope **E**.
 - ▶ Run the auxiliary rope over change over pulley **24** and over the change over pulley **26**.
 - ▶ Establish the connection from the auxiliary rope **H** and the adjusting rope **V**.
 - ▶ Assemble the rope retaining pins to the rope pulleys.



B199840

4.9 Unpinning the retaining frame on the S-end section

Make sure that the following prerequisites are met:

- the WA-frames are pinned and secured on the S-end section **9**,
 - the WA-frames are placed on the ground.
- ▶ Attach the auxiliary crane on the retaining frame **20**.
 - ▶ Assemble the ratchet **22**.



DANGER

The retaining frame **20** can fall down!

If the retaining frame **20** is unpinned without it being secured with the auxiliary crane and the ratchet pull, then the retaining frame **20** can fall down and fatally injure personnel!

- ▶ Only unpin the retaining frame **20** when it is secured against dropping by the auxiliary crane and the ratchet pull.
-
- ▶ Unpin the retaining frame **20** on both sides: Release spring retainers **24** and washers and unpin pins **23** on both sides.
 - ▶ Pull the retaining frame **20** with the ratchet **22** backward.

4.10 Unpinning the WA-frames on the S-end section

- ▶ Attach the auxiliary crane on the relevant studs of the WA-frames.



Note

- ▶ The total weight of the WA frames is approximately: 33 t.

- ▶ Lift the WA-frames until the bores for the transport retainers align.
- ▶ Insert pins **12** into the transport retainers **19** at both sides and secure.

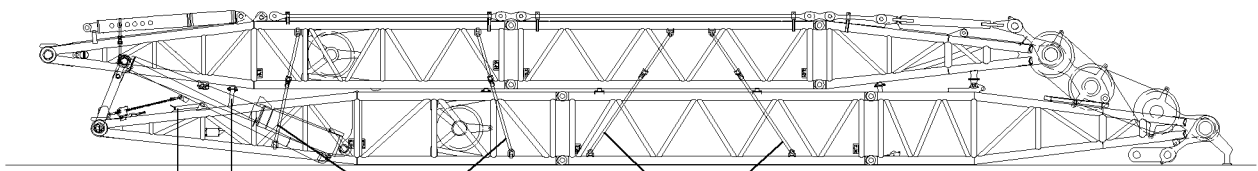
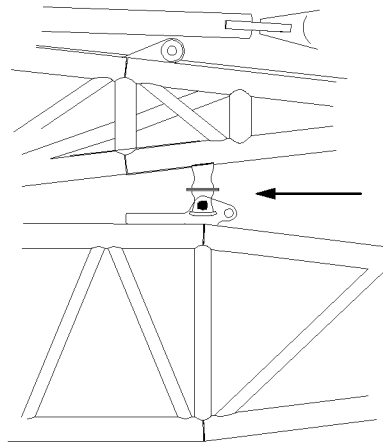
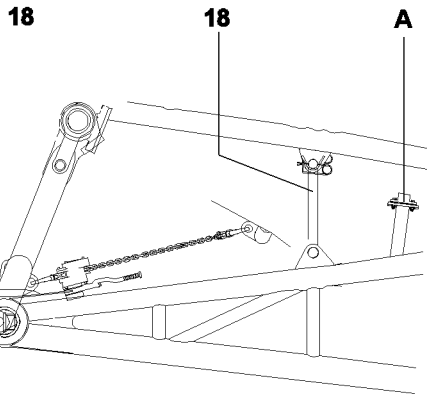
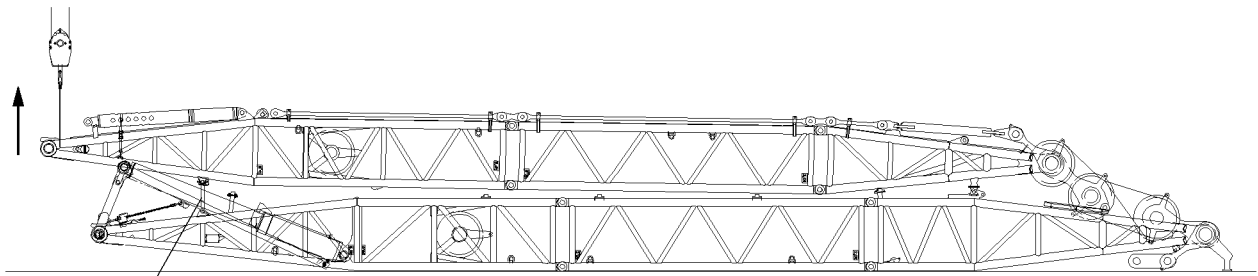


DANGER

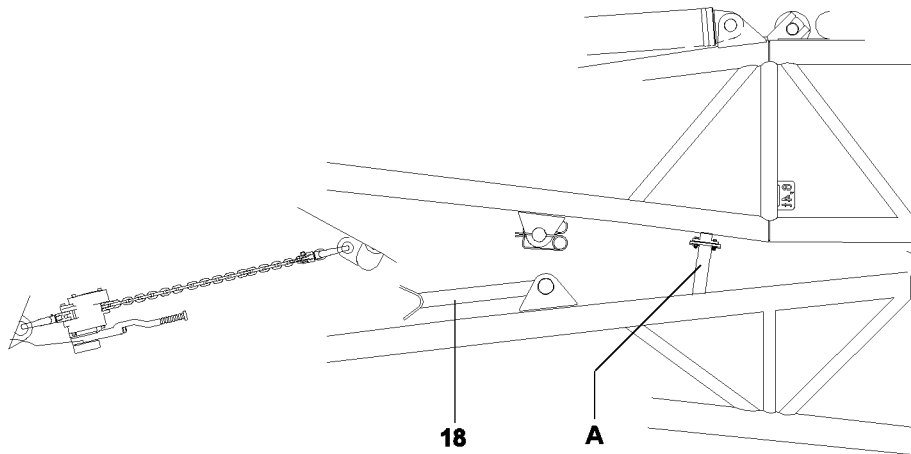
The WA-frame **1 7** can fall down!

If the WA-frame **1 7** is unpinned before setting up the support **18**, the WA-frame **1 7** can drop and cause fatal injuries!

- ▶ Do not unpin the WA-frame **1 7** until the support **18** is set up and secured.
-
- ▶ Fold the support **18** up on both sides.
 - ▶ Insert the pins **16** on both sides and secure with spring retainers **17**.
 - ▶ Raise the WA-frames and unpin the WA-frame **2 8** on the S-end section **9**: Unpin the pins **14** on both sides and remove the spring retainers **15**. Please refer to Chapter 5.30.
 - ▶ Raise the WA-frames and unpin the WA-frame **1 7** on the S-end section **9**: Unpin the pins **10** on both sides. Remove spring retainers **11**.



18 A a a

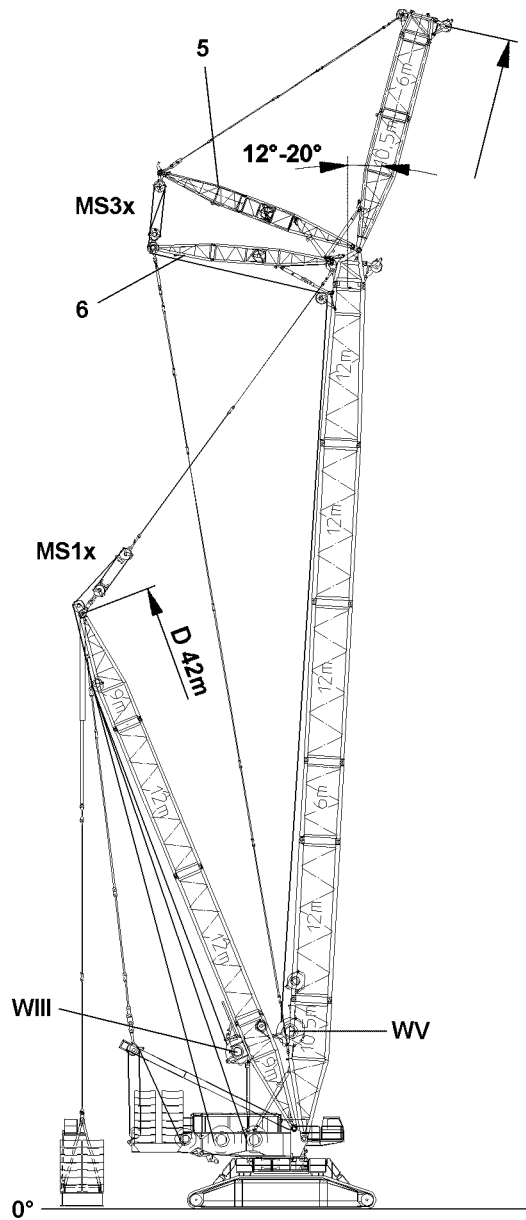
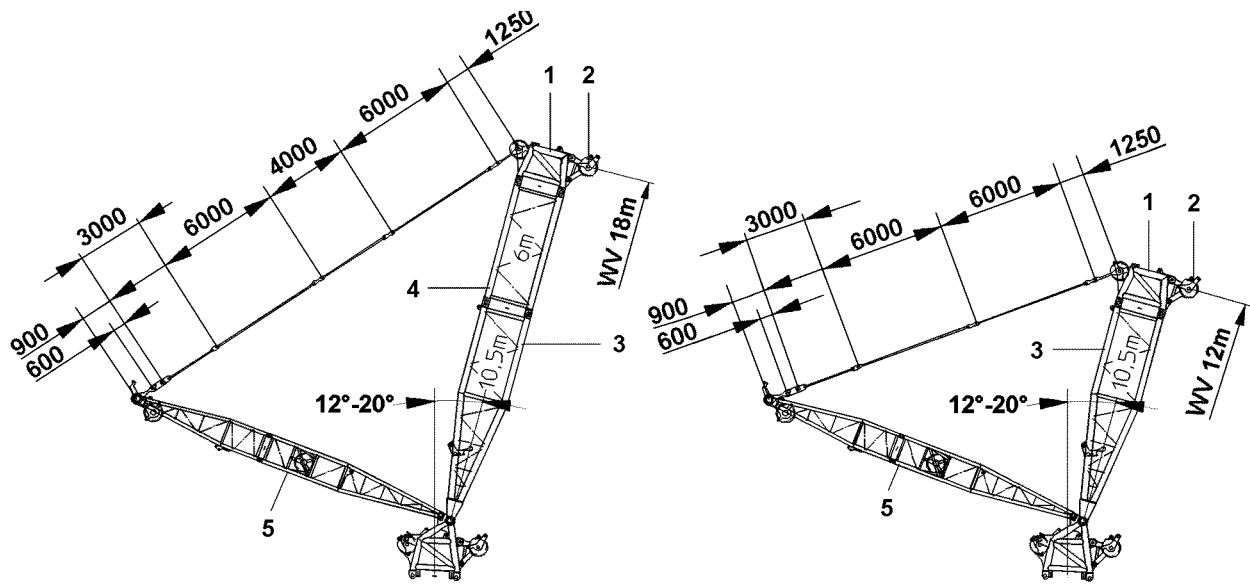


18 A

4.11 Disassembling the WA-frames

Make sure that the following prerequisites are met:

- the WA-frames are pinned together and secured on the WA-end section,
 - the WA-frames are placed on the ground.
- ▶ Hang the WA-frame 2 **8** onto the auxiliary crane.
 - ▶ Lift WA-frame 2 **8** somewhat and fold the support **18** down.
 - ▶ Lower the WA-frame 2 **8** to the transport support **A** and assemble and tighten the lashing straps **a**.



B113075

1 General

In WV-operation, the short WA-frames are used.

The length of the WA-frame 1 **5** is 15.5 m.

The length of the WA-frame 2 **6** is 13.5 m.

The length of the WV-lattice jib is 12 m or 18 m.

The operating range of the WV-lattice sections to the S-boom includes an angle range between 12° and 20°.

The movement of the WV-lattice jib is made by winch 5 with the master switch **MS3** in x-direction.

The movement of the S-boom, along with the WV-lattice jib is made by winch 3 with the master switch **MS1** in X-direction.



Note

- ▶ The boom combinations must be assembled according to the separately supplied set up drawings!
- ▶ The guy rods must be assembled according to the separately supplied guy rod diagrams!



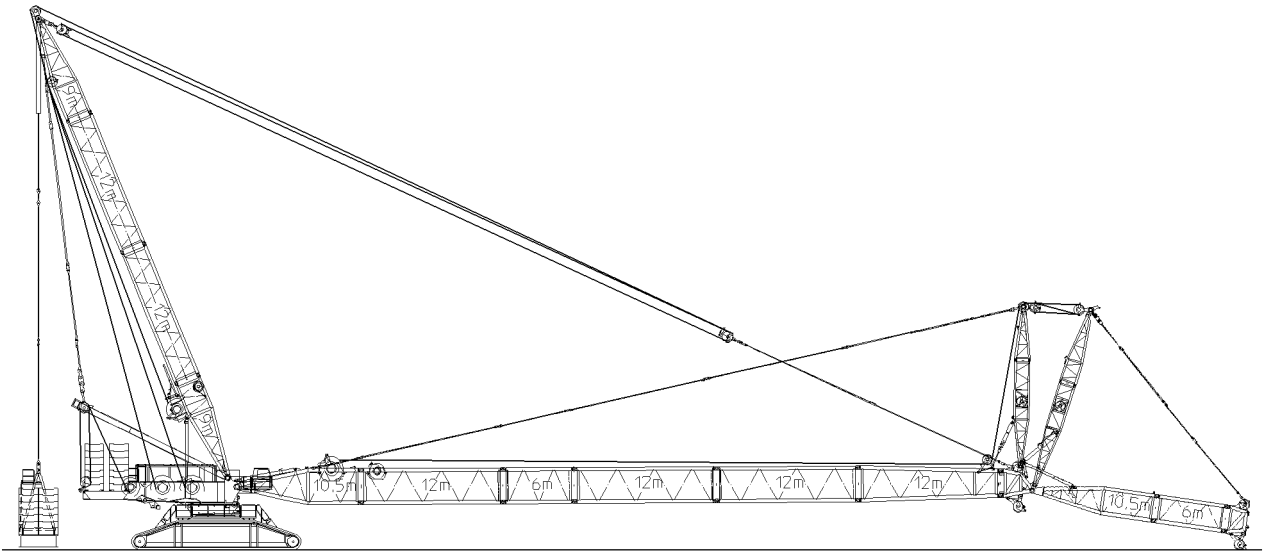
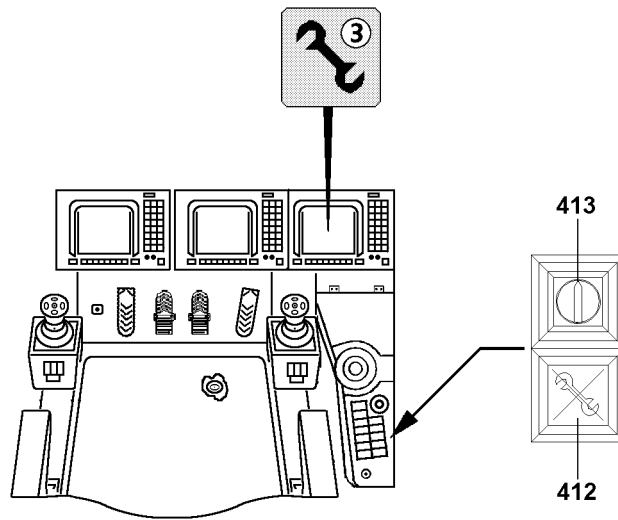
DANGER

Danger of accident due to incorrectly assembled lattice sections and guy rods!

- ▶ Any other arrangement of the lattice sections and guy rods than specified in the Operating instructions or the Erection drawings and Rod plans is prohibited!

1.1 Components

	Description	System	Length	Weight
1	SW-end section	—	1.5 m	8.8 t
2	Pulley set	—	—	2.5 t
3	W-pivot section	—	10.5 m	12.6 t
4	LI-intermediate section	LI 2621.10	6.0 m	5.9 t
5	WA-frame 1	—	15.5 m	—
6	WA-frame 2	—	13.5 m	—
W3	Winch3, S-control	—	—	—
W5	Winch5, WV-control	—	—	—
MS1	Master switch 1	—	—	—
MS3	Master switch 3	—	—	—



B102968

2 Assembly



DANGER

Danger of falling!

During assembly and disassembly, assembly personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening 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 on the ground or using such aids, then assembly personnel must be secured with suitable personal protective equipment (such as safety belts) to protect them against falling!



DANGER

Danger of accident at assembly / disassembly of booms!

When you disassemble unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel.

- ▶ 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 bearing points as well as in the receptacles!
- ▶ Do not lean the ladder against the component being disassembled!



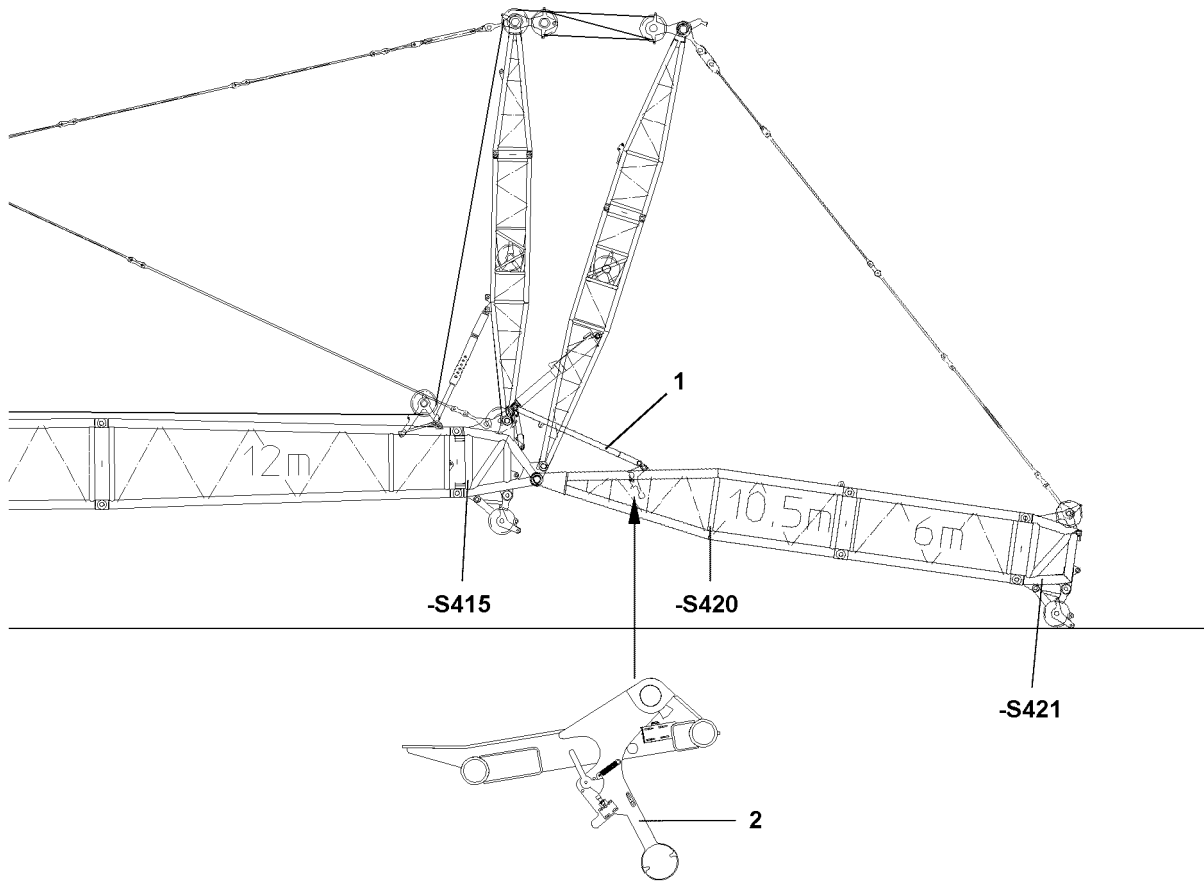
DANGER

Danger of fatal injury at crane operation with turned on assembly key button.

- ▶ The actuation of the assembly key button **413** is only permitted for assembly tasks!
- ▶ The assembly key button may only be operated by persons, who are aware of the consequences of a bypass!
- ▶ If the assembly key button **413** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **413** turned on is strictly prohibited!
- ▶ The assembly key button **413** must be removed immediately after carrying out the assembly work and handed to an authorized person!

Make sure that the following prerequisites are met:

- The crane is aligned in horizontal direction.
- The SD-boom combination is assembled, see chapter 5.04 and 5.05.
- The W-assembly unit, which consists of the short WA-frames and the W-pivot section is installed on the S-boom, see chapter 5.07.
- The SW-end section with the installed pulley set is pinned on the W-pivot section or on the L-intermediate section. For installation of roller set, see chapter 5.14
- The counterweight has been installed on the turntable according to the load chart.
- The derrick ballast is placed on the suspended ballast or the ballast trailer according to the load chart.
- The LICCON overload protection has been set according to the data in the load chart.
- An auxiliary crane is available.



2.1 Establishing the electrical connections

Make sure that the following prerequisite is met:

- The electrical connection to the WA-frames has been established before the W-pivot section assembly.
- ▶ Establish the electrical connection from the terminal box W-pivot section **-S420** to the terminal box W-connector head **-S415**.
- ▶ Establish the electrical connection from the cable drum to the terminal box W-connecting head **-S421**.



CAUTION

Damage to the electrical connection on the cable drum!

If the electrical connection from the cable drum to the terminal box W-pivot section **-S420** is established first before the connection to the terminal box SW-end section **-S421**, then the electrical connection can be damaged when spooling out the cable drum.

- ▶ Establish the electrical connection from the cable drum to the terminal box of the SW-end section **-S421** first and then the electrical connection from the terminal box of the W-pivot section **-S420** to the cable drum!
- ▶ Establish the electrical connection from the terminal box W-pivot section **-S420** to the cable drum.
- ▶ Establish the electrical connection for the airplane warning light on the SW-end section* and on the W-connector head.
- ▶ Establish the electrical connection for the wind speed sensor* on the SW-end section* and on the W-connector head.

2.2 Function check

Make sure that the following prerequisites are met:

- All electrical connections have been established.
- The appropriate operating mode is set.

2.2.1 Wind speed sensor*

- ▶ Test the movement and the function of the wind speed sensor.

2.2.2 Airplane warning light*

- ▶ Turn the airplane warning light on and visually check the function.

2.2.3 Oscillation guard

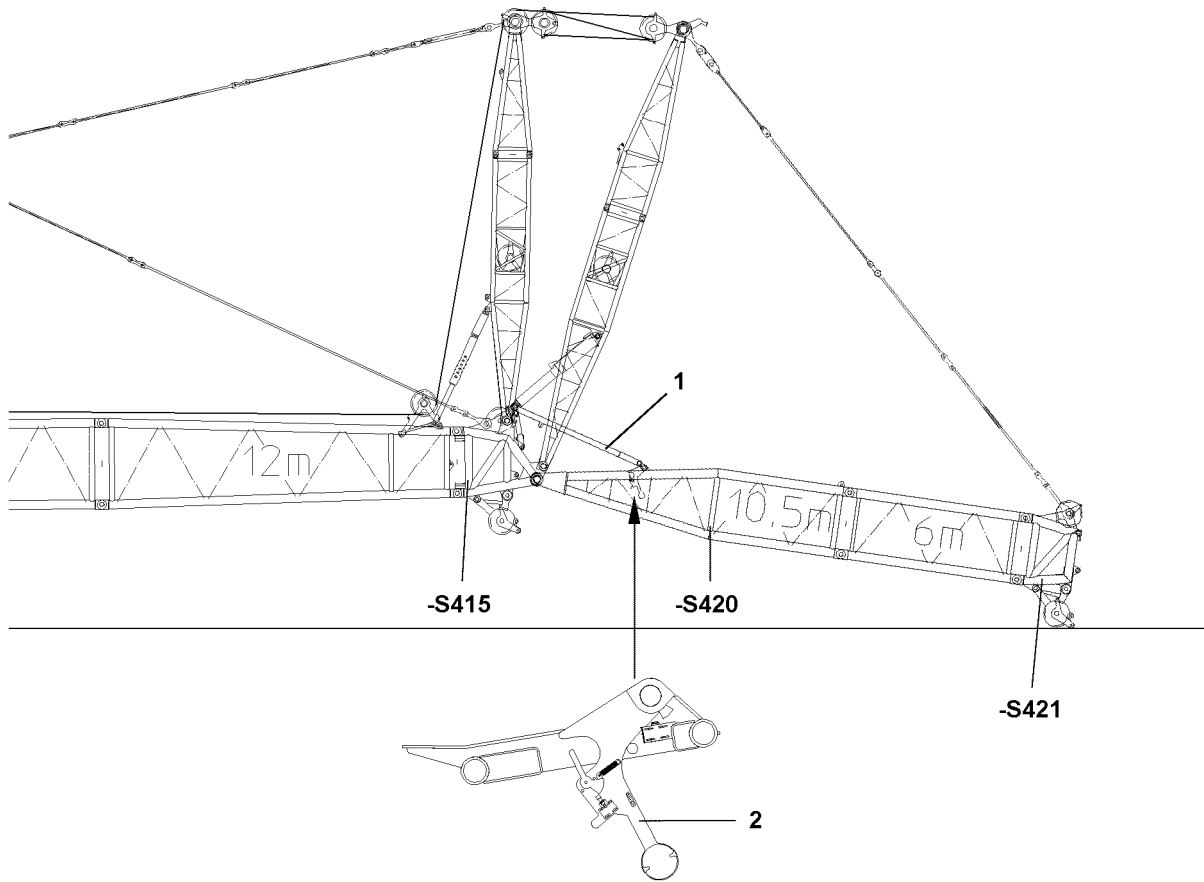


DANGER

Danger of tipping over if the oscillation guard is hard to move!

If the oscillation guard **2** is hard to move, the mechanical relapse retainer **1** will no longer function. The WV-lattice jib can tip backwards uncontrolled and cause the crane to topple over!

- ▶ Crane operation with hard to move oscillation guard **2** is prohibited!
- ▶ Check the oscillation guard **2** for easy movement.



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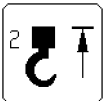
2.2.4 Limit switch, general



Note

- ▶ The limit switch functions have to be checked individually before erection!
- ▶ In the test system, the functions of the limit switch initiators must be checked as described in the separate "Diagnostics manual".
- ▶ The limit switch initiators are checked manually as follows.

2.2.5 Hoist limit switch



When replacing or changing the hoist limit switch (HES), the HES must have the correct bus address and the correct software version in order to be recognized again by the bus system (LSB).

- ▶ Actuate the hoist limit switch manually.

Result:

- The icon appears on the LICCON monitor.
- The **spool up function** of the hoist winch turns off.

2.2.6 Limit switch W-lattice jib, "steepest" position, relapse cylinder

- ▶ Cover the limit switch actuators individually with a metal plate. See chapter 8.12.

Result:

- The icon appears on the LICCON monitor.
- The **spool up function** of the W-control winch turns off.

2.2.7 Limit switch W-lattice jib, "lowest" position, relapse cylinder



- ▶ Cover the limit switch initiators "lowest" position individually with a metal plate. See chapter 8.12.

Result:

- The icon appears on the LICCON monitor.
- The **spool out function** of the W-control winch turns off.

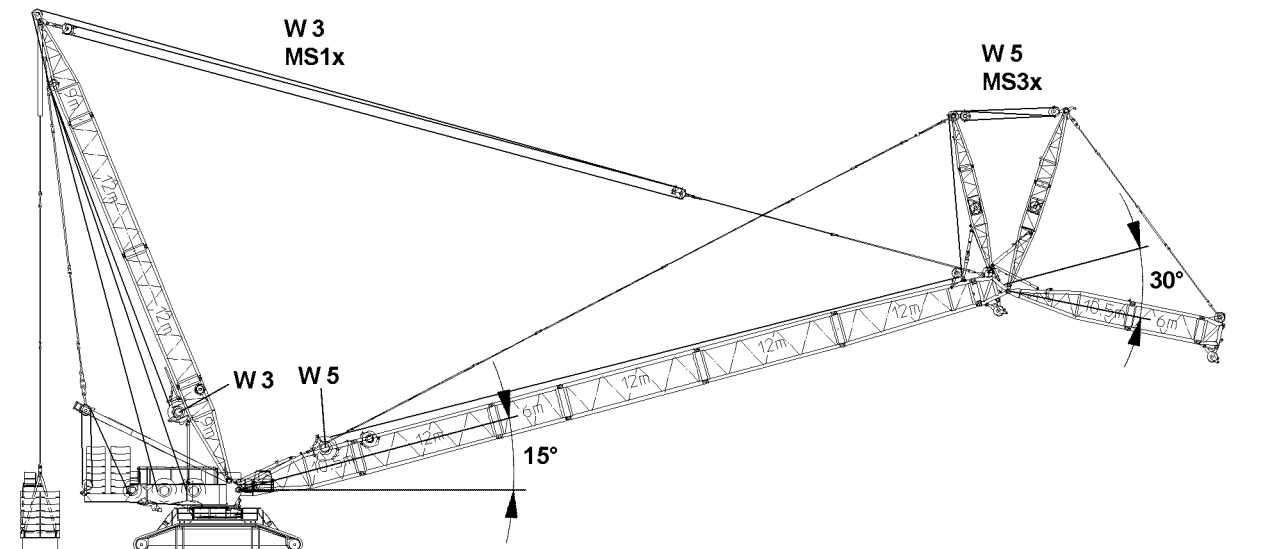
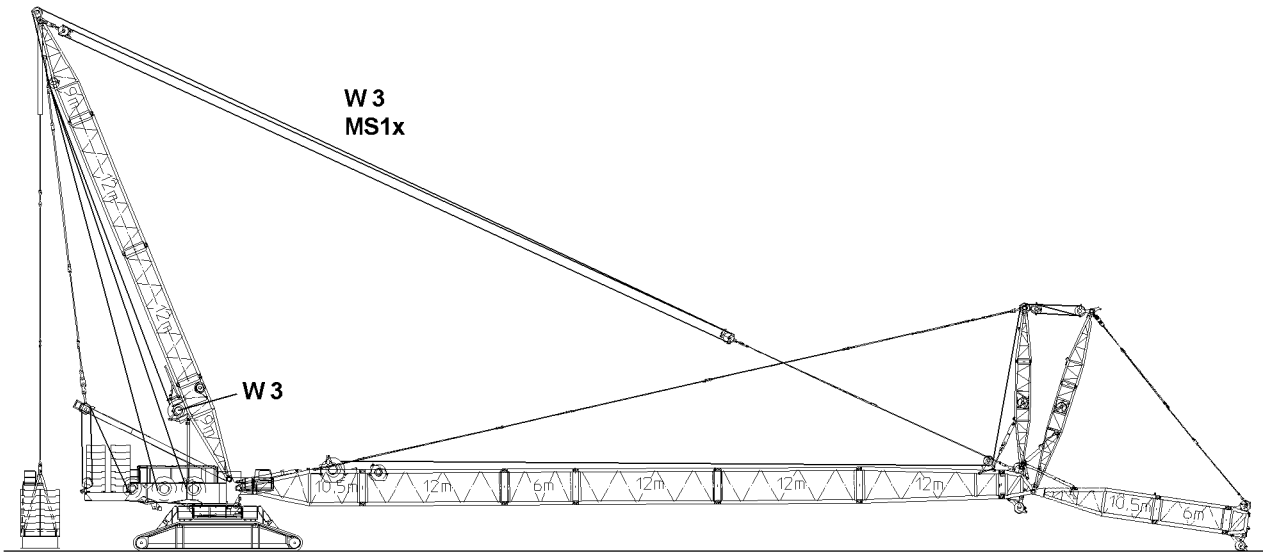
2.2.8 Limit switch flap in position W-lattice jib "steepest" position, mechanical relapse support



- ▶ Cover the limit switch actuators individually with a metal plate.

Result:

- The icon appears on the LICCON monitor.
- The **spool up function** of the W-control winch turns off.



B104483

2.3 Erecting the boom



DANGER

The crane can topple over!

If the following conditions are not met before erecting the boom, the crane can topple over and fatally injure personnel!

- ▶ Observe the safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!
- ▶ Move the relapse cylinder out before erection!

Make sure that the following prerequisites are met:

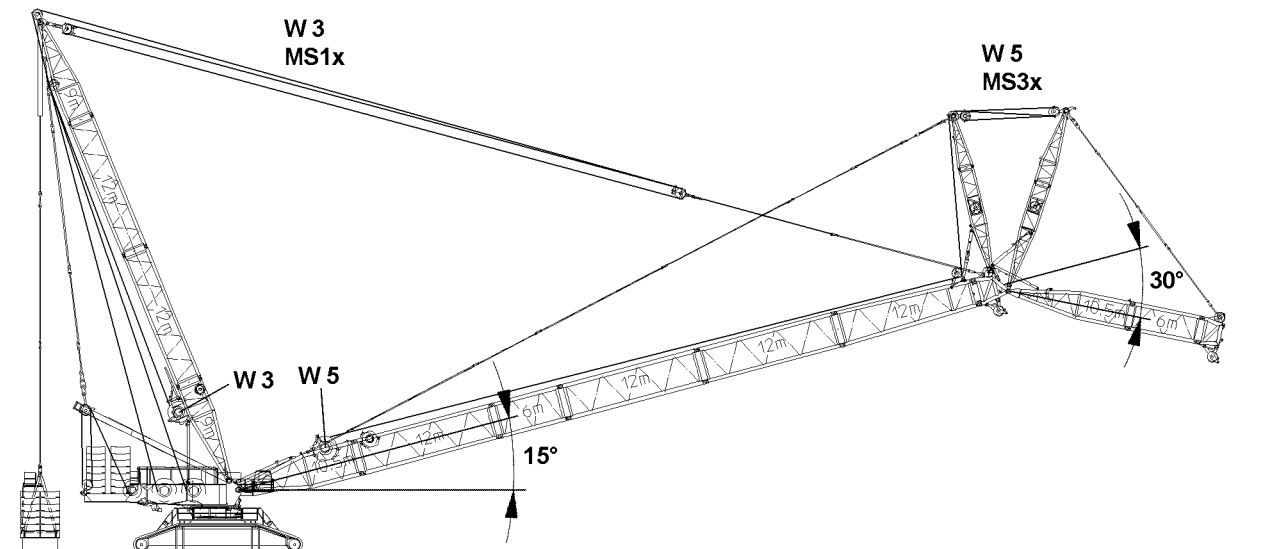
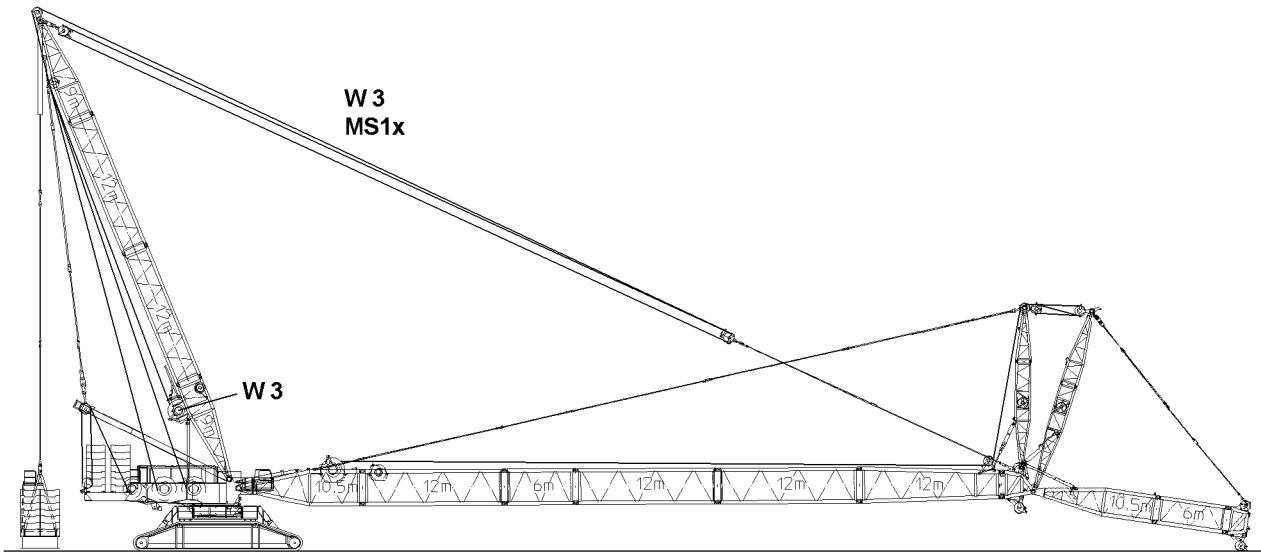
- The crane is aligned in horizontal direction.
- All electrical connections have been established.
- All limit switches are functioning.
- The appropriate operating mode is set.
- The counterweight is installed on the turntable and on the derrick according to the load chart and the erection chart.
- All pin connections have been secured.
- The hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection settings have been compared with the current crane configuration.
- The assembly key button **413** is actuated.



DANGER

The crane can topple over!

- ▶ The assembly key button **413** bypasses the safety devices!
- ▶ Observe the data in the erection and take down charts!
- ▶ It is not permitted to turn the crane during erection!

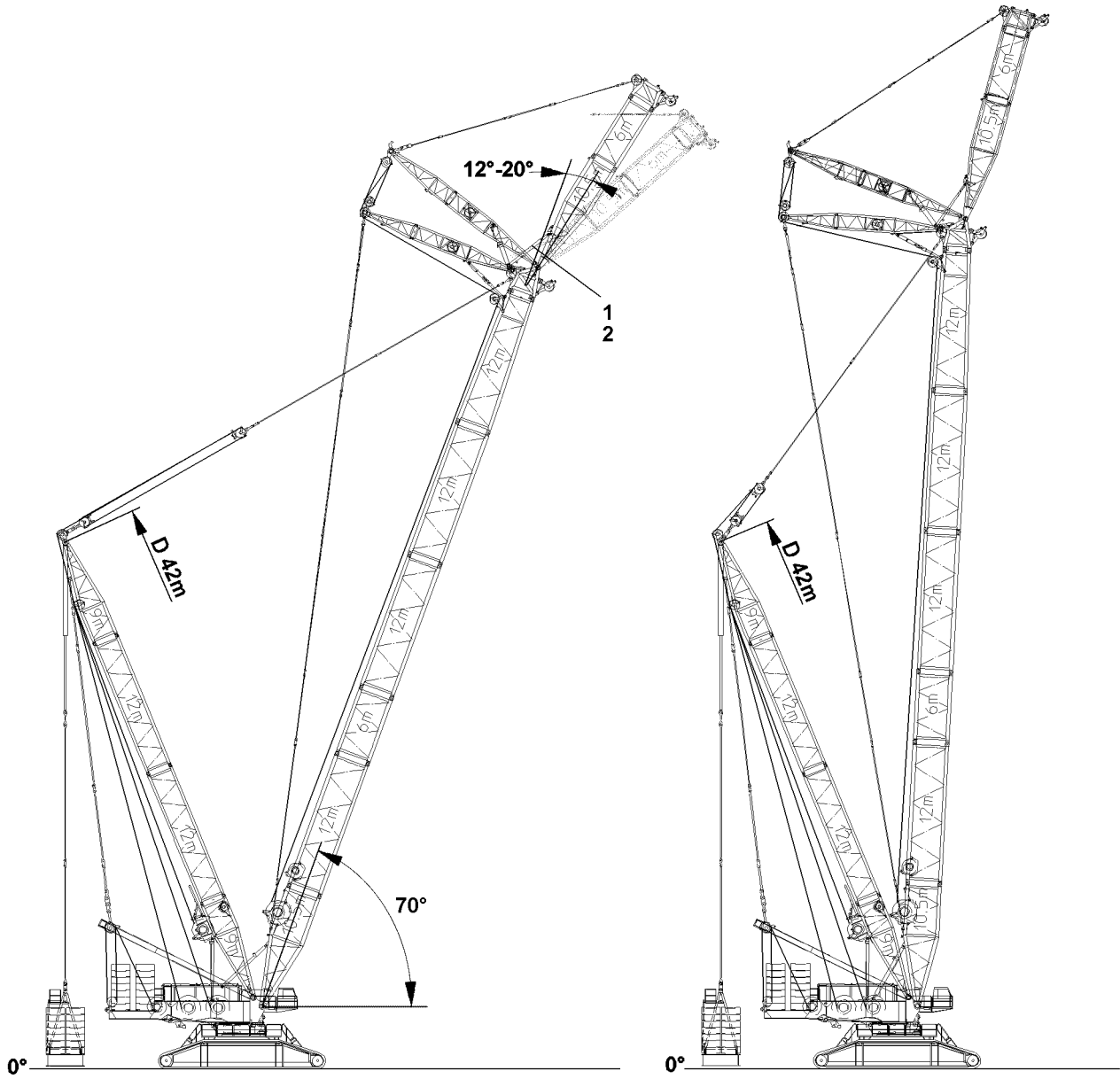


B104483

2.3.1 Erection

Make sure that the following prerequisites are met:

- All electrical connections have been established.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection settings have been compared with the current crane configuration.
- ▶ Reeve the hook block properly and attach the hoist limit switch weight.
- ▶ Luff the S-boom up to approx. 15°. Move master switch **MS1** in x-direction.
- ▶ Luff the WV-lattice jib down to approx. 30° to the S-boom. Move master switch **MS3** in x-direction.



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2.3.2 Erection - continuation

- ▶ Luff the S-boom up to 70°. Move master switch **MS1** in x-direction.



DANGER

Danger of collision!

If the angle between the S-boom and the WV-lattice jib is smaller than 30° at erection, then the mechanical relapse support **1** will collide with the flap on the oscillation guard **2**!

The WV-lattice jib can tip backwards uncontrolled and cause the crane to topple over! Personnel can be killed!

- ▶ The angle between the S-boom and the WV-lattice jib must be more than 30° during the complete erection procedure!
- ▶ Carry out visual inspection!

- ▶ When the S-boom is in operating position:

Luff the WV-lattice jib in into operating range. Move master switch **MS3** in X-direction.

- ▶ Turn the assembly key button **413** off.
- ▶ Luff the S-boom up to the lowest operating position. Move master switch **MS1** in x-direction.



DANGER

The crane can topple over!

- ▶ When the lowest operating position is reached, the assembly key button **413** must be turned off immediately.
- ▶ The assembly key button **413** bypasses the safety devices!
- ▶ The radii specified in the load chart may neither fall below nor exceed the specified loads!



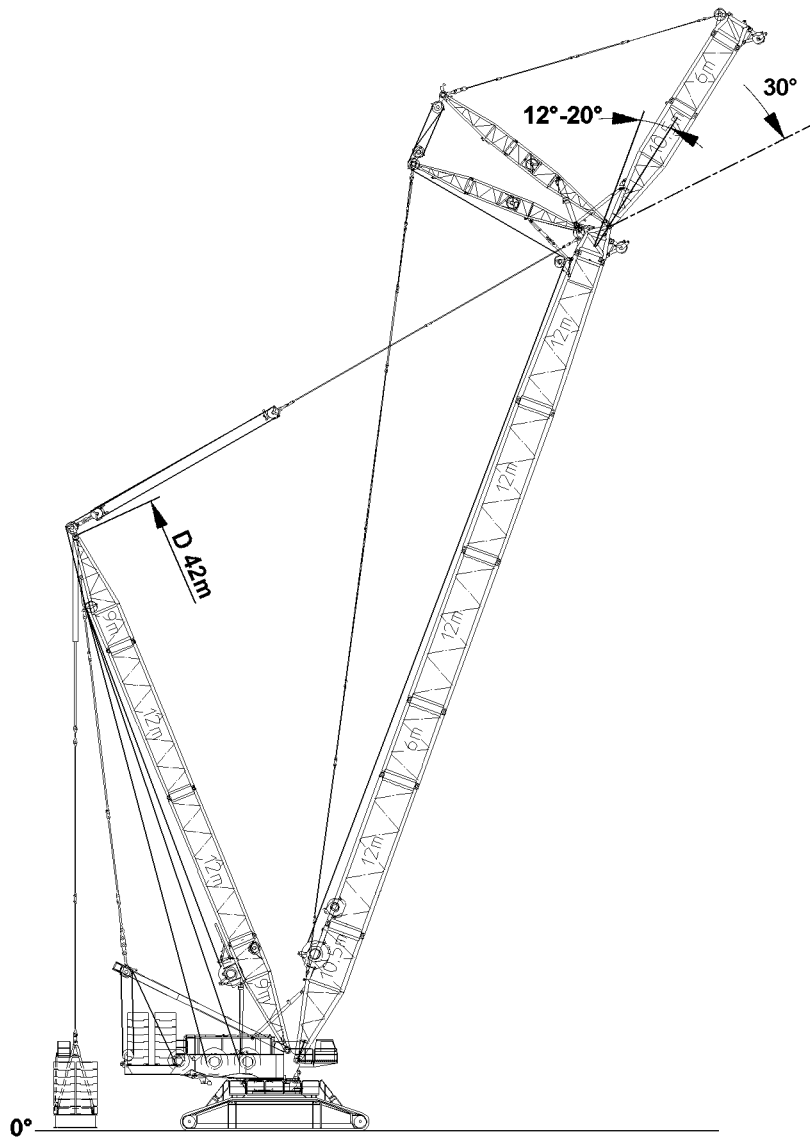
Note

- ▶ The operating position is reached if the blinking displays turn off and a load display appears in the "maximum load" icon instead of question marks (???).

- ▶ Turn the assembly key button **413** off by pressing the button **412**.

Result:

- The LICCON overload protection is active.
- The Assembly icon **3** on the LICCON display turns off.
- The acoustical signal turns off.
- The red beacon on the machine house is off.



B113081

3 Crane operation

Observe the notes in chapter 4.05, 4.08 and 5.01.

Make sure that the following prerequisites are met:

- The LICCON overload protection has been set according to the data in the load chart.
- The assembly key button **413** has been turned off by pressing the button **412**.
- The Assembly icon **3** on the LICCON display is off.
- The WV-lattice jib is in an operating range between 12° and 20°.



Note

- ▶ In crane operation, the movement of the S-boom system is made with the master switch **MS1**. The WV-lattice jib is in an operating range between 12° and 20°.
-



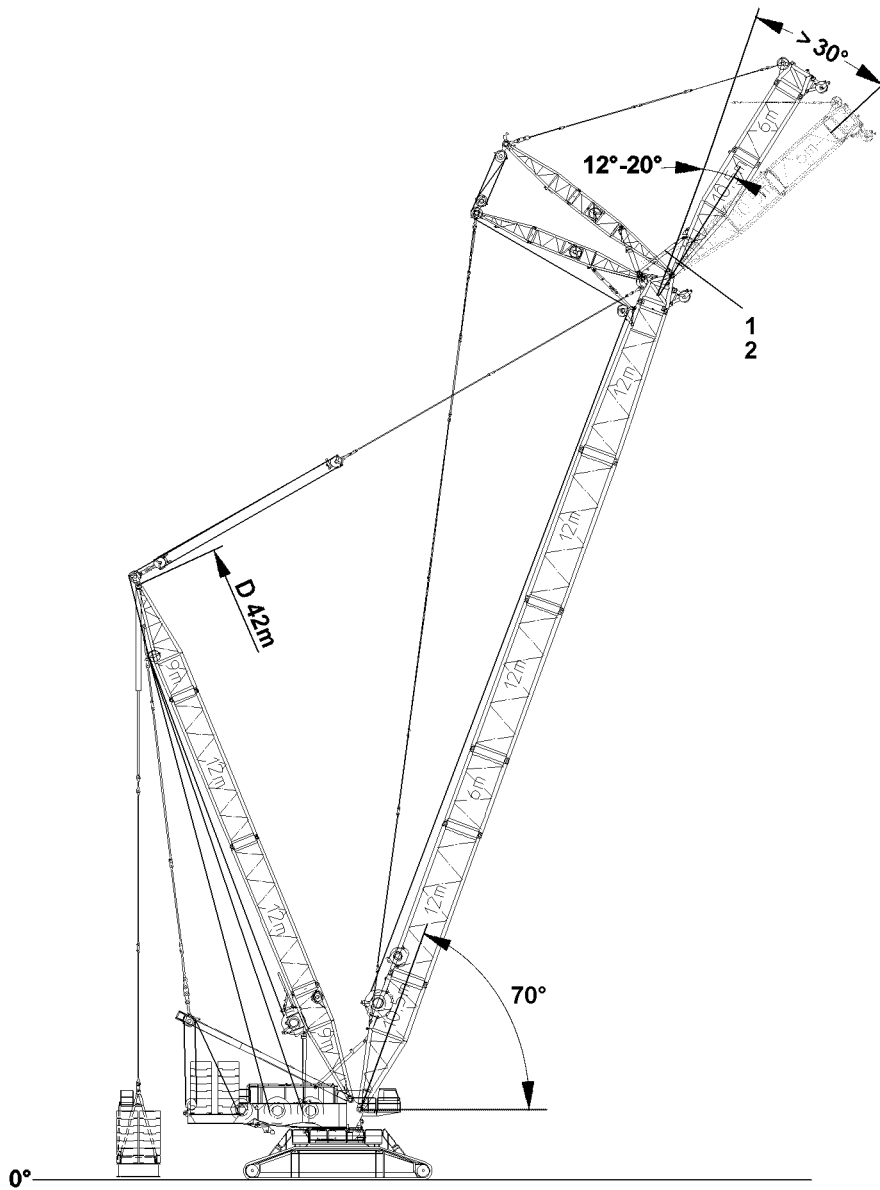
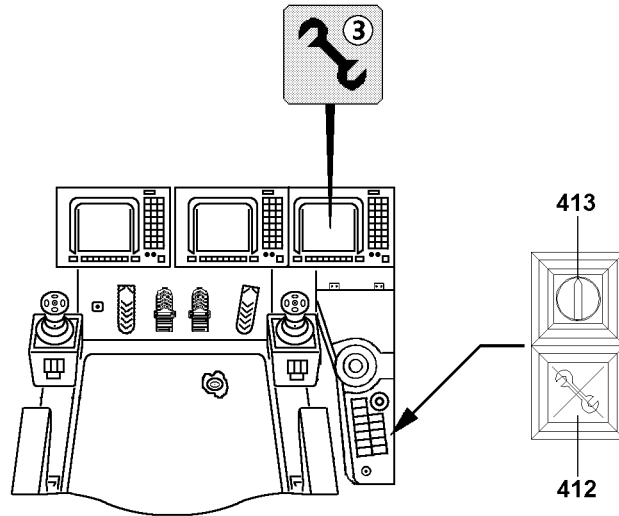
DANGER

The crane can topple over!

- ▶ Check the horizontal position of the crane before and during operation.
 - ▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset, if necessary, before resuming crane operation.
-

3.1 Checking the settings

- ▶ Check the function of the overload protection by running against the operating positions on top and bottom.
- ▶ Check the hoist limit switch by running against the hoist limit switch weight.
- ▶ Check the function of the limit switches on the relapse cylinders.



B113082

4 Disassembly



DANGER

Falling components!

If a component is removed without it being secured with the auxiliary crane to prevent it from falling, then it can fall down and kill personnel!

- ▶ Before removal, secure the component with the auxiliary crane to prevent it from falling!



DANGER

Danger of fatal injury at crane operation with turned on assembly key button.

- ▶ The actuation of the assembly key button **413** is only permitted for assembly tasks!
- ▶ The assembly key button may only be operated by persons, who are aware of the consequences of a bypass!
- ▶ If the assembly key button **413** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **413** turned on is strictly prohibited!
- ▶ The assembly key button **413** must be removed immediately after carrying out the assembly work and handed to an authorized person!

4.1 Luffing the boom down



DANGER

The crane can topple over!

If the following conditions are not met before taking down the boom, the crane can topple over and fatally injure personnel!

- ▶ Observe the safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!

- ▶ Luff the S-boom down to approx. 70°. Move master switch **MS1** in x-direction.
- ▶ Carry out visual inspection!



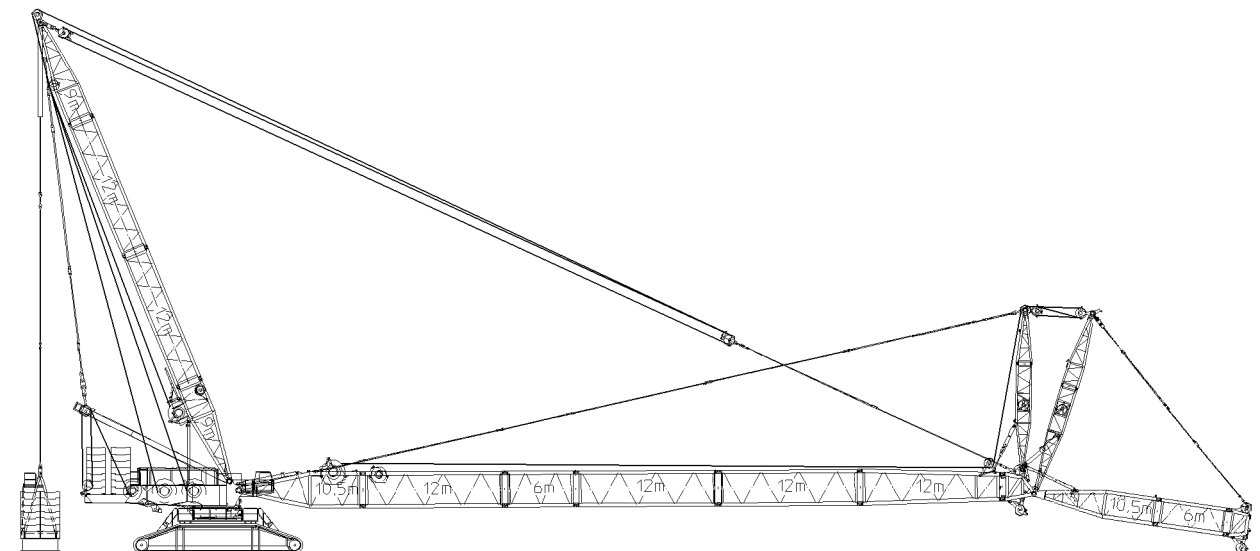
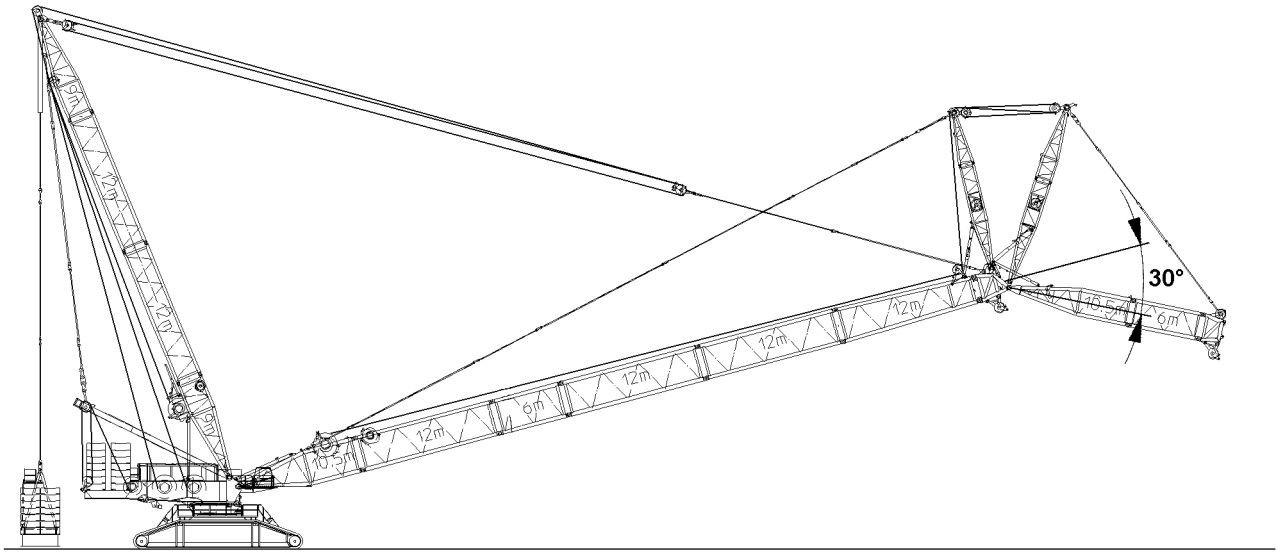
DANGER

Danger of collision!

If the angle between the boom and the lattice jib is smaller than or equal to 30°, the mechanical relapse support **1** will collide with the flap on the oscillating guard **2**!

- ▶ The angle between the S-boom and the WV-lattice jib must be more than 30° during the complete take down procedure!

- ▶ Luff the WV-lattice jib down to approx. 30° to the S-boom.



B102975

4.2 Luffing down

- ▶ Luff the S-boom down.



CAUTION

Damage to crane!

- ▶ Luff the S-boom down and watch that the hook block does not collide with the WV-end section.
-

- ▶ Luff the S-boom down to the **lowest** operating position.

When the lowest operating position is reached the luff down movement is shut off.

The load value in the "maximum load" icon disappears and question marks appear (????).

The following alarm functions become active:

- "STOP"
- "Horn" and acoustical signal

- ▶ Actuate the assembly key button **413**.

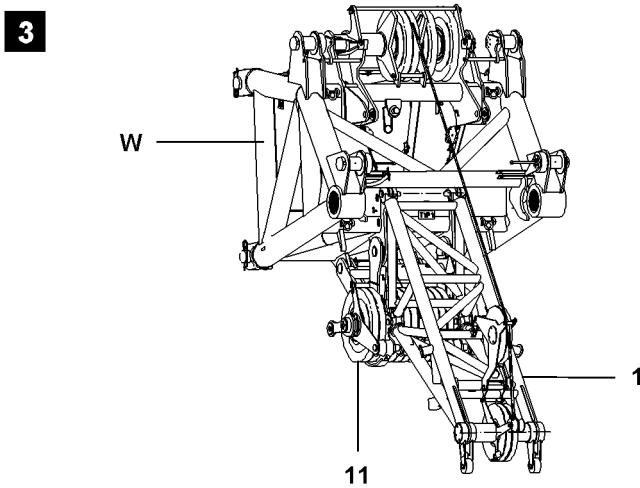
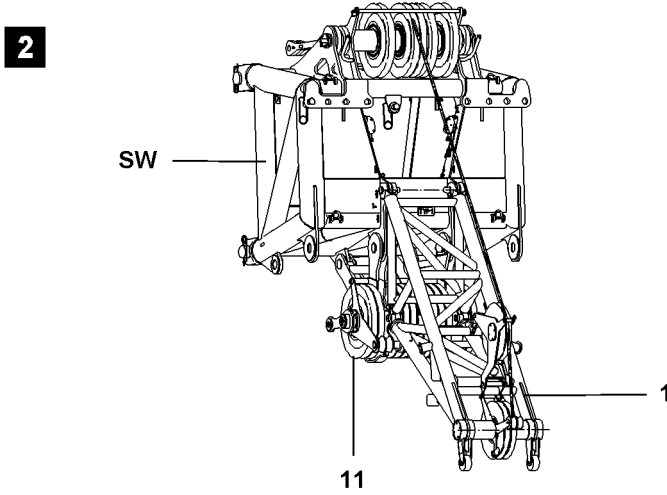
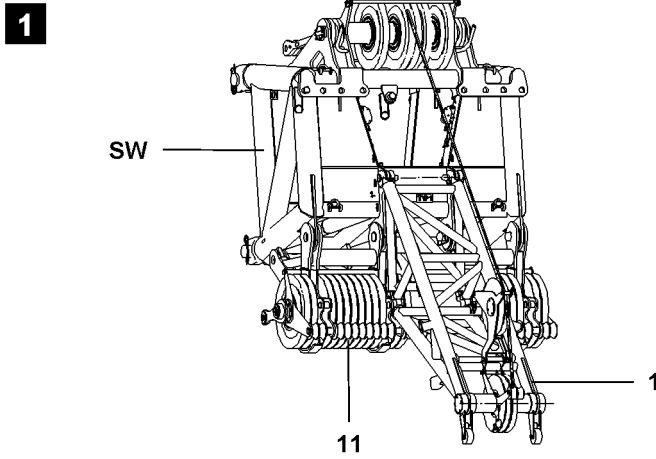
Result:

- The LICCON overload protection is inactive.
 - The assembly icon **3** in the LICCON monitor blinks.
 - An acoustical signal sounds.
 - The red beacon on the machine house blinks.
- ▶ Luff the S-boom down until the hook block touches the ground.
 - ▶ Remove the hoist limit switch weight and unreeve the hook block.
 - ▶ Luff the S-boom down until the WV-end section is laying on the ground.
 - ▶ Remove the hoist rope.
 - ▶ Remove the guy rods, WV-lattice jib and the WA-frames.



Note

- ▶ For removal of W-assembly unit, see chapter 5.07
-

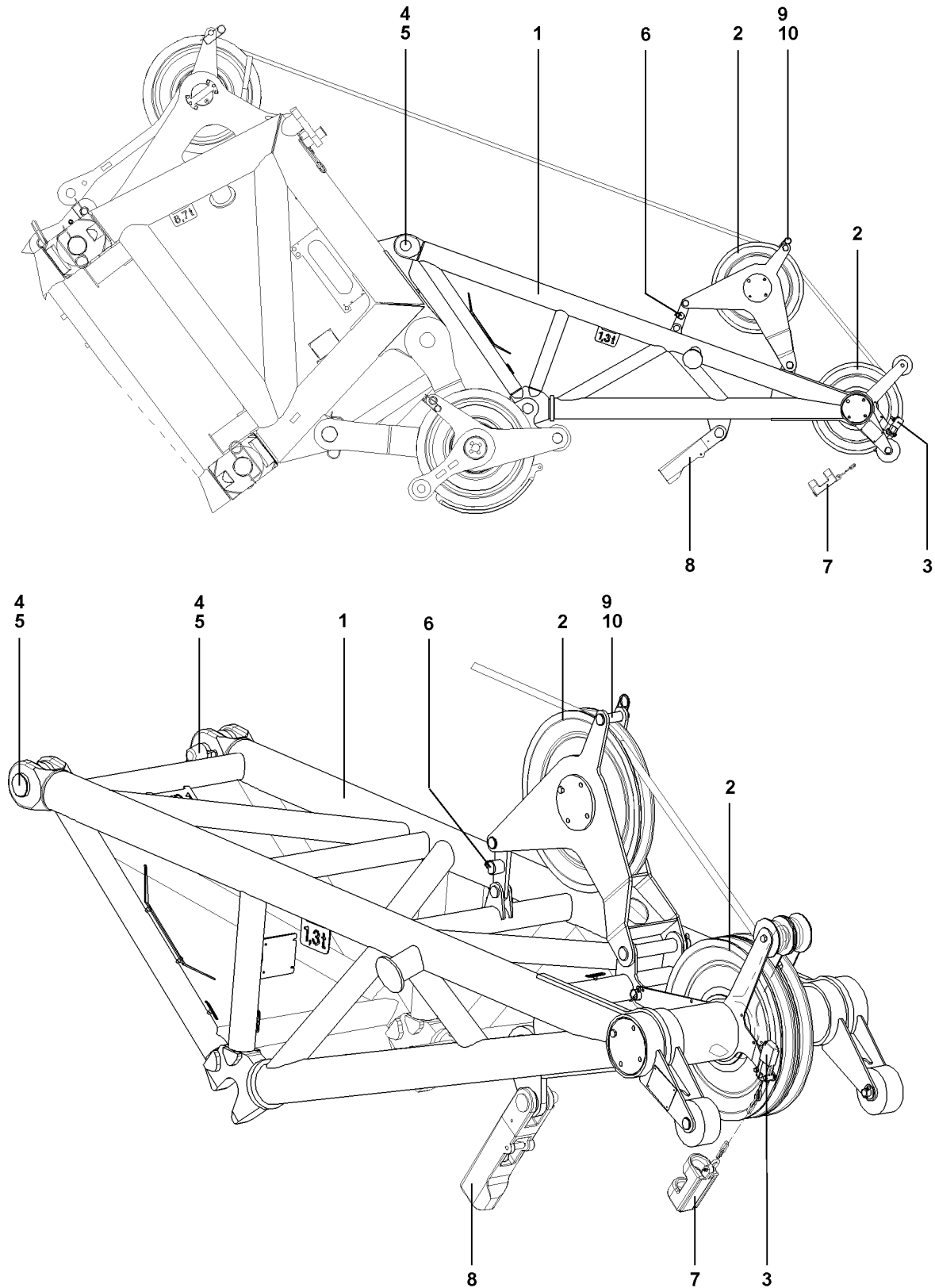


B102974

1 Boom nose 62 t

The boom nose **1** is installed on the **SW** -end section or the **W** -connector head:

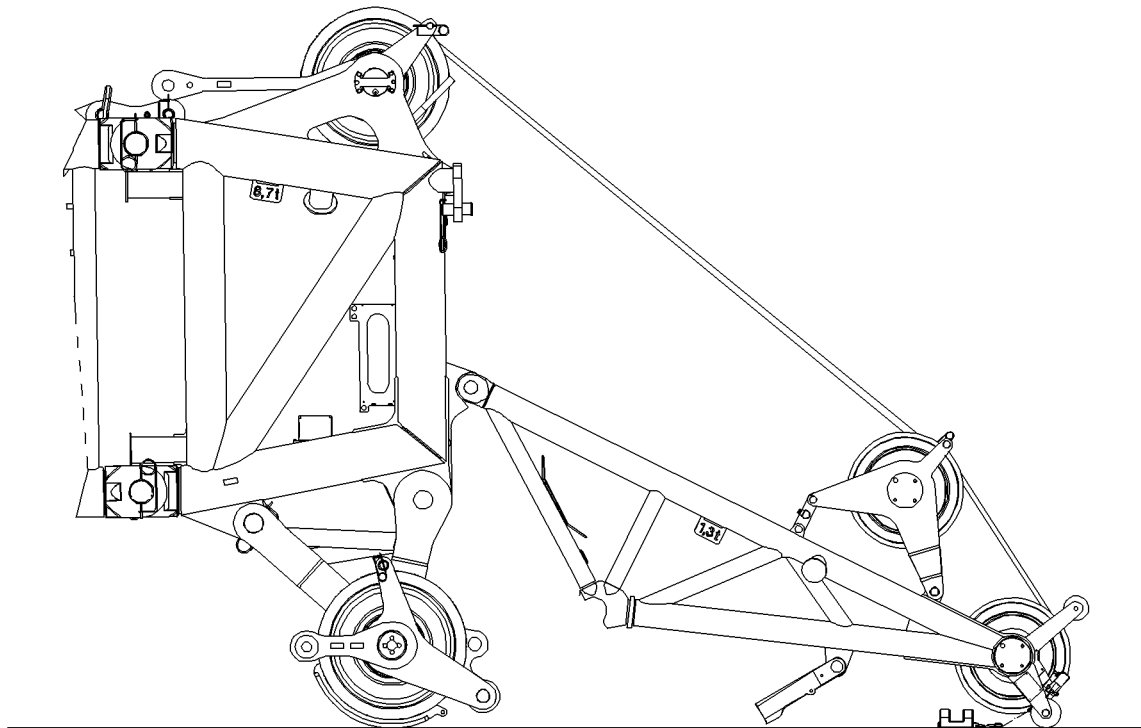
- Illustration 1
Boom nose **1** on **SW** -end section with two 625 t pulley sets **11**.
- Illustration 2
Boom nose **1** on **SW** -end section with one 625 t pulley set **11**.
- Illustration 3
Boom nose **1** on **W** -end section with one 625 t pulley set **11**.



B102970

1.1 Components

Position	Description	Weight
1	Boom nose 62 t	1.3 t
2	Rope pulley	—
3	Hoist limit switch	—
4	Pin 90 mm	—
5	Spring retainer 6 mm	—
6	Force test bracket	—
7	Hoist limit switch weight	—
8	Lock	—
9	Pin 32 mm	—
10	Spring retainer 4.5 mm	—



B112924

1.2 Assembly



WARNING

Risk of falling!

During assembly and disassembly, personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel can fall and suffer life-threatening or fatal injuries!

- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
 - ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved fall arrest systems to avoid falling, see Crane operating instructions chapter 2.04!
 - ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work!
 - ▶ Step on aids and fall protection equipment only with clean shoes!
 - ▶ Keep aids and fall protection equipment clean and free from snow and ice!
 - ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited!
-



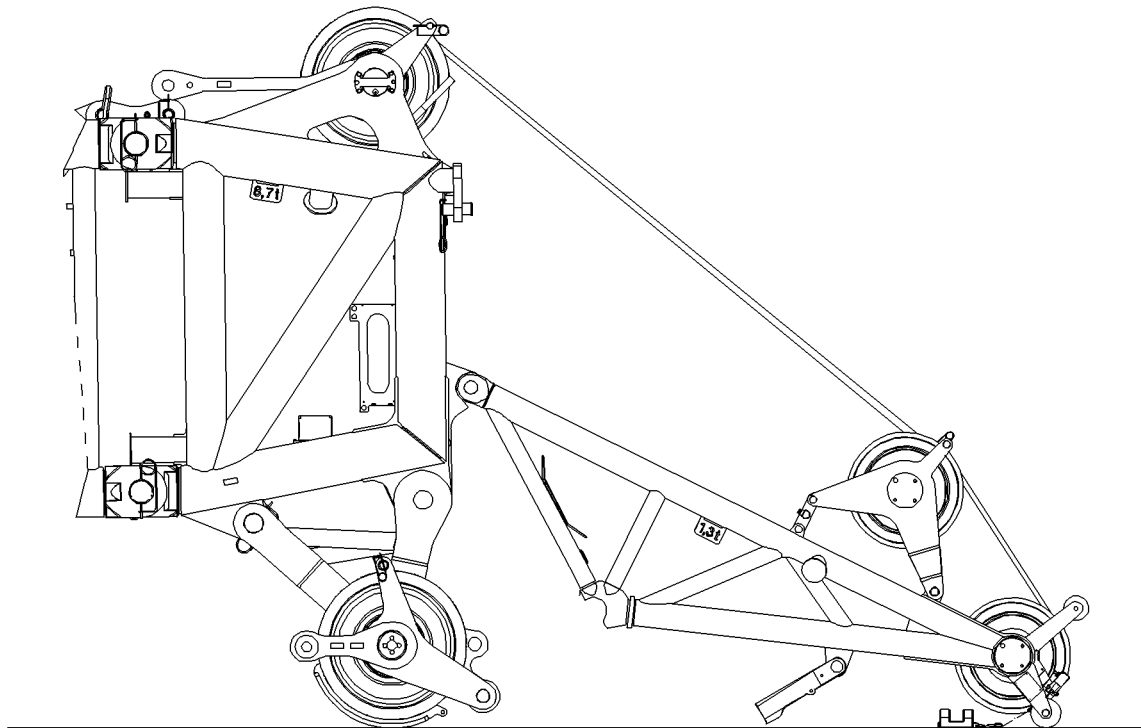
WARNING

Falling components!

If unsecured or non-supported components are installed or removed, they can fall down!

Personnel can be severely injured or killed!

- ▶ During pinning and unpinning of the lattice sections, it is prohibited for anyone to remain **under** or **on** the components as well as within the entire danger zone!
 - ▶ Support the boom and components before pinning / unpinning!
 - ▶ Pin or unpin both pins laying in a horizontal, i.e. **left** and **right**!
 - ▶ Secure the pins in the bearing points and in the receptacles!
 - ▶ Do not disengage the auxiliary crane until each component is pinned and secured!
 - ▶ It is prohibited to lean a ladder against the component being disassembled!
-



B112924

**WARNING**

Danger of impact / crushing!

When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth!

When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing!

Personnel can be severely injured or killed!

- ▶ 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!

**WARNING**

The crane can topple over!

If the turntable is turned during the assembly of the boom, then the crane can topple over and be severely damaged!

Personnel can be severely injured or killed!

- ▶ The turntable may not be turned during the assembly of the boom!

1.2.1 Assembly prerequisites for boom nose(s)

**WARNING**

Assembly with bypassed / exceeded LICCON overload protection!

With bypassed / exceeded LICCON overload protection, the crane can collapse due to overload, the boom can break off or the crane can topple over!

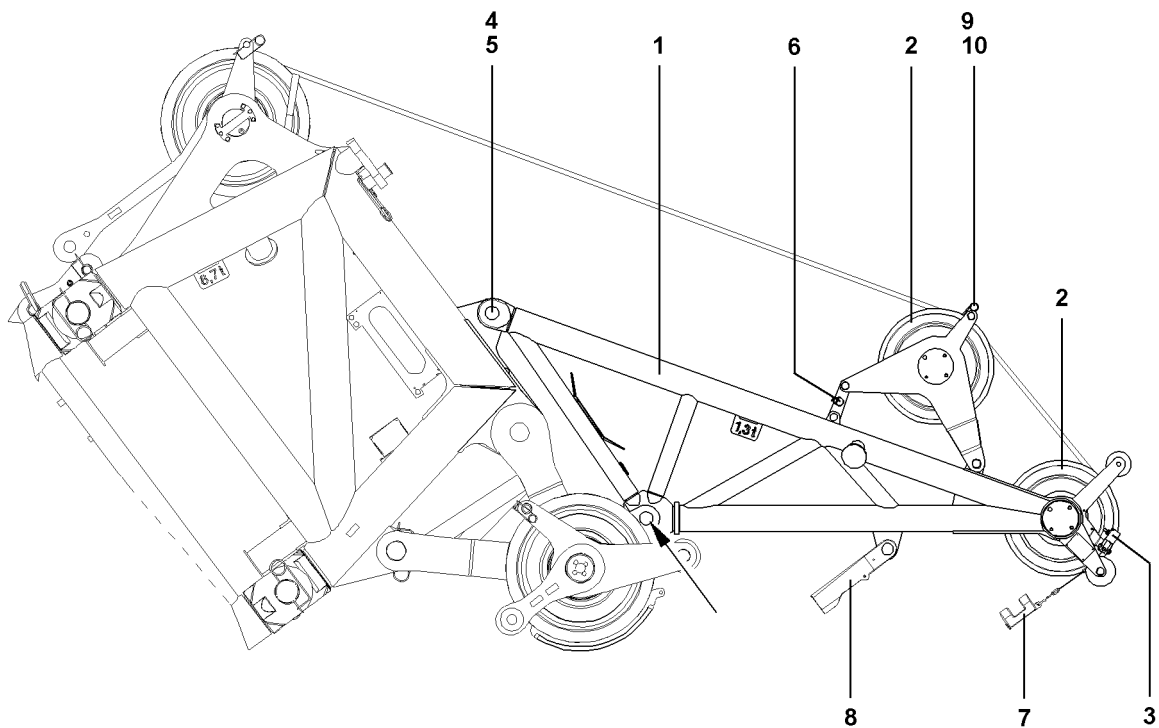
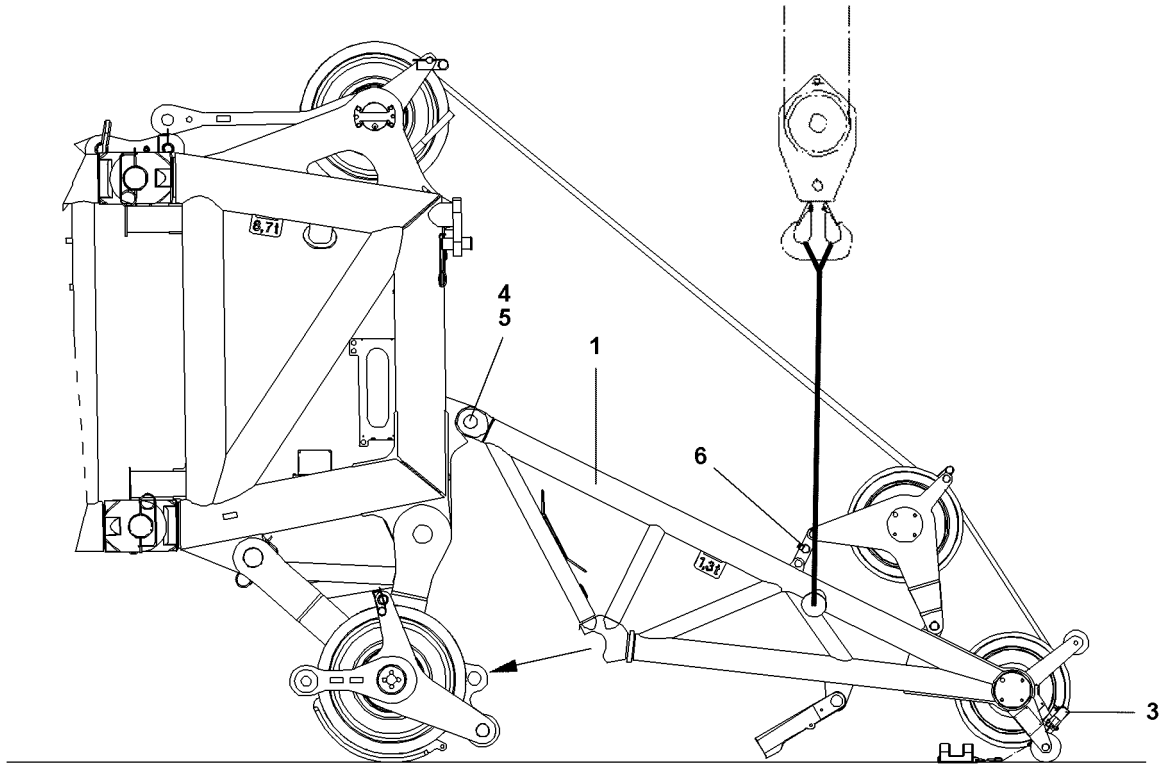
Personnel can be severely injured or killed!

This could result in high property damage!

- ▶ The LICCON overload protection may only be bypassed / exceeded by persons who are aware of the consequences of a bypass!
- ▶ Bypass / exceed the LICCON overload protection only when the set up status of the crane has been correctly entered into the LICCON computer system!
- ▶ Observe the erection / take down charts!
- ▶ Crane operation with bypassed / exceeded LICCON overload protection is strictly prohibited!

Make sure that the following prerequisites are met:

- The crane is aligned in horizontal direction.
- The boom including the respective end section are installed.
- The boom is placed on a load-bearing support.
- The counterweight has been installed on the turntable according to the load chart.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection is exceeded.
- The assembly icon is visible on the LICCON monitor.
- An auxiliary crane is available.



B103003

1.2.2 Assembly procedure

Make sure that the following prerequisite is met:

- The boom end section is laying on the ground.
- ▶ Hang the boom nose **1** on the auxiliary crane and insert the pin **4** on the end section **on top** and secure with spring retainer **5**.
- ▶ Secure the spring retainer **5**.
- ▶ Lay the boom nose on the ground, remove the auxiliary crane.
- ▶ Pull the hoist rope over the rope pulleys **2**.



Note

- ▶ Pull the hoist rope over the rope pulleys according to the Reeving plan.

- ▶ Luff up the boom until the boom nose is touching on the end section **on the bottom** in the receptacle.



WARNING

Falling hoist rope!

If the hoist rope is not properly secured with a corresponding length on the boom nose before the erection procedure, then it can fall backward due to its own weight!

Personnel can be severely injured or killed!

- ▶ Reeve in the hoist rope with sufficient length on the boom nose before the erection process!
- ▶ The hoist rope must be constantly monitored during erection!
- ▶ Do not step into the danger zone!

- ▶ Reeve hook block properly and attach hoist limit switch weight.



Note

- ▶ Reeve in the hoist rope according to the Reeving plan.

1.2.3 Establishing the electrical connections

NOTICE

Damage to the electrical connection on the cable drum!

If the electrical connection from the cable drum on the S-pivot section to the terminal box on the S-pivot section is established first before the connection to the terminal box on the respective end section, the electrical connection can be damaged when spooling out the cable drum!

- ▶ Establish first the electrical connection from the cable drum in the S-pivot section to the terminal box on the respective end section and then the electrical connection from the terminal box in the S-pivot section to the cable drum in the S-pivot section!



Note

- ▶ To establish the electrical connections, use the electrical wiring diagram!

Make sure that the following prerequisites are met:

- The boom is fully assembled.
- The airplane warning light and the wind speed sensor are assembled.
- ▶ Establish the electrical connections.
- ▶ Make sure that all electrical connections on the boom are established.

1.2.4 Function check



WARNING

Non-functioning safety devices!

If the function of the safety devices is defective, personnel can be severely injured or killed!

- ▶ Crane operation with non-functioning safety devices is **prohibited!**



Note

- ▶ The function of the individual limit switches must be checked before erection!
- ▶ The function of the limit switch initiators must be checked in the test system, see Diagnostics manual!



Note

- ▶ If a function check on the limit switches or on the safety devices does not lead to the desired shut offs, then the plug connections on the terminal boxes or the components itself must be checked!
- ▶ If no visible connection errors or component defects can be found, contact **LIEBHERR** service!

Make sure that the following prerequisites are met:

- All electrical connections have been made.
- The crane engine is running.
- The corresponding operating mode is set on the LICCON monitor.

Checking the wind speed sensor

- ▶ Test the movement and the function of the wind speed sensor.

Checking the airplane warning light

- ▶ Turn the airplane warning light on.
- ▶ Check the function visually.

Checking the hoist limit switch on the pulley head



Note

- ▶ When replacing or changing a hoist limit switch (HES), the corresponding hoist limit switch must have the correct bus address and the correct software version in order to be detected again by the bus system (LSB)!

- ▶ Actuate the hoist limit switch manually on the pulley head.

Result:

- The spool up function of the hoist winch turns off.
- The icon “Hoist top” appears on the LICCON monitor 0.
- The limit switch is functioning.

Checking the limit switch S-boom “Steepest position”



Note

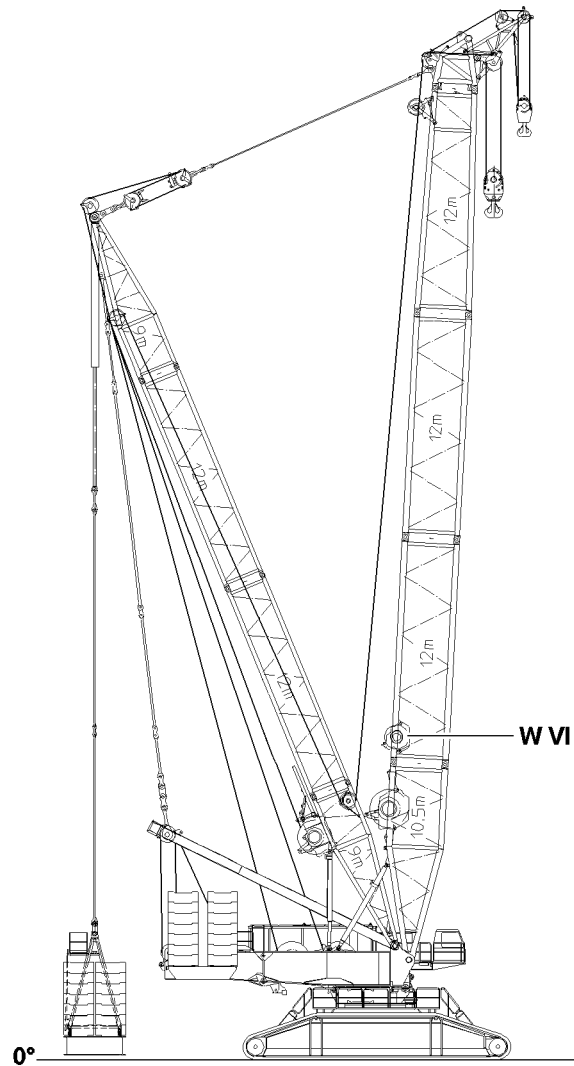
- ▶ The limit switch functions have to be checked individually before erection!

- ▶ Cover the limit switch initiators on the S-relapse cylinders individually with a metal plate.

Result:

- The limit switch is actuated manually.
- The spool up function of winch 4 turns off.
- The icon “Boom limitation” appears on the LICCON monitor 0.
- The limit switch is functioning.

blank page!



B112925

1.2.5 Erecting the boom



DANGER

The crane can topple over!

If the following conditions are not met before erecting the boom, the crane can topple over and fatally injure personnel!

- ▶ Observe and adhere to the safety technical notes, see Crane operating instructions, chapter 5.01!
- ▶ Observe the data in the erection and take down charts!
- ▶ Move the relapse cylinder out before erection!

Make sure that the following prerequisite is met:

- The LICCON overload protection is bypassed / exceeded.

Erection



WARNING

The crane can topple over!

In crane operation with exceeded LICCON overload protection, the crane can topple over!

Personnel can be severely injured or killed!

- ▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook!

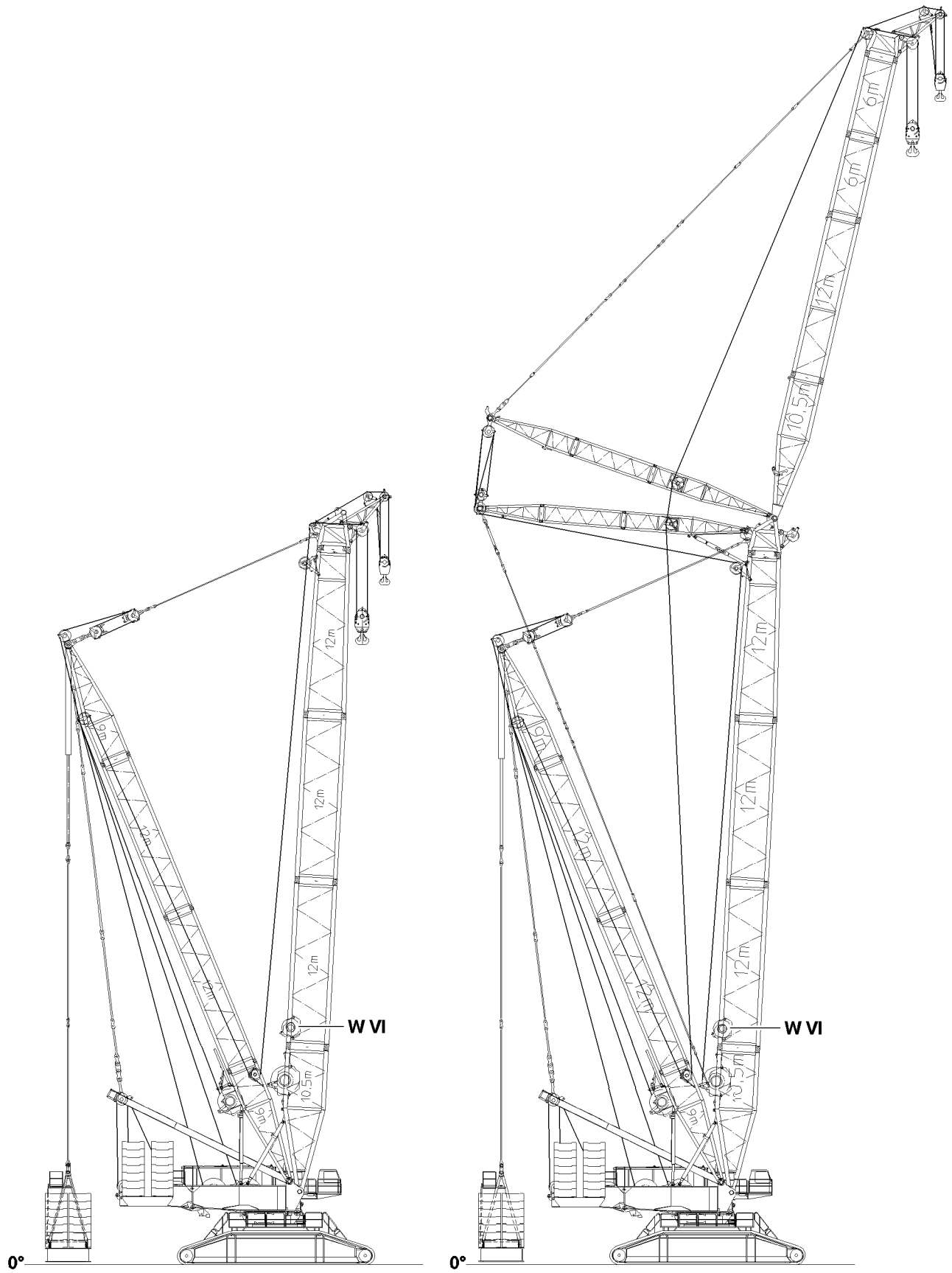


Note

- ▶ When the lowest operating position of the boom is reached, the LICCON overload protection is activated!
- ▶ In the maximum load icon appears a load number in "t" instead of the display "???"!
- ▶ Luff the S-boom up to the lowest operating position.
- ▶ When the boom has reached the lowest operating position: Make sure that the assembly icon turns off on the LICCON monitor.

Result:

- The LICCON overload protection is active.



B112926

1.3 Crane operation

Observe the instructions in chapter 4.05, chapter 4.08 and chapter 5.01.

Make sure that the following prerequisites are met:

- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection is active.
The Assembly icon **50** on the LICCON display is off.



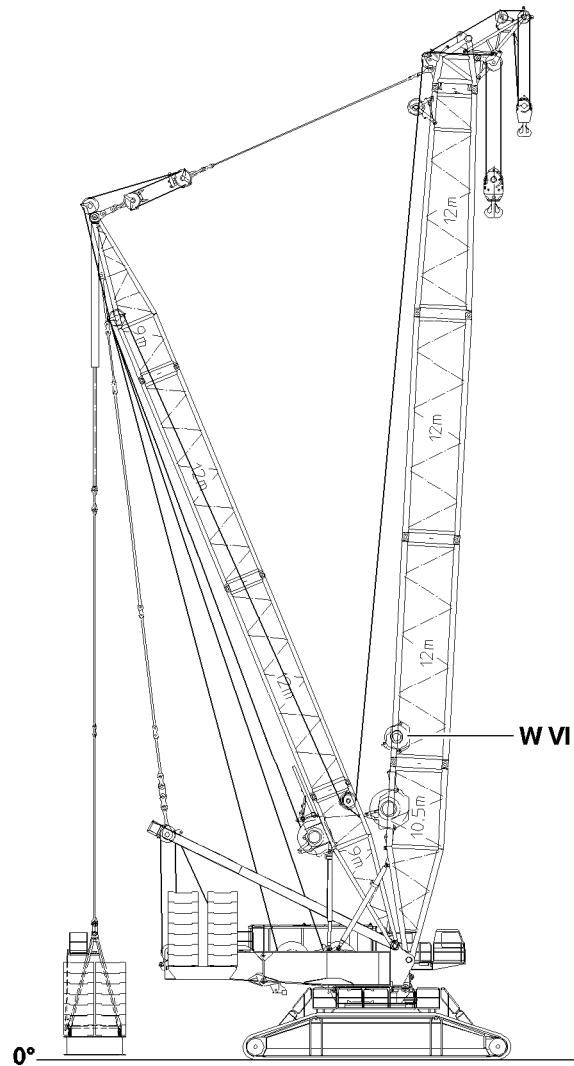
DANGER

The crane can topple over!

- ▶ Check the horizontal position of the crane before and during operation.
 - ▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset, if necessary, before resuming crane operation.
-

1.3.1 Checking the settings

- ▶ Check the function of the overload protection by running against the operating positions on top and bottom.
- ▶ Check the hoist limit switch by running against the hoist limit switch weight.
- ▶ Check the function of the limit switches on the relapse cylinders.
- ▶ Check the function of the force test bracket on the boom nose.



B112925

1.4 Disassembly



WARNING

Risk of falling!

During assembly and disassembly, personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel can fall and suffer life-threatening or fatal injuries!

- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
 - ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved fall arrest systems to avoid falling, see Crane operating instructions chapter 2.04!
 - ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work!
 - ▶ Step on aids and fall protection equipment only with clean shoes!
 - ▶ Keep aids and fall protection equipment clean and free from snow and ice!
 - ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited!
-



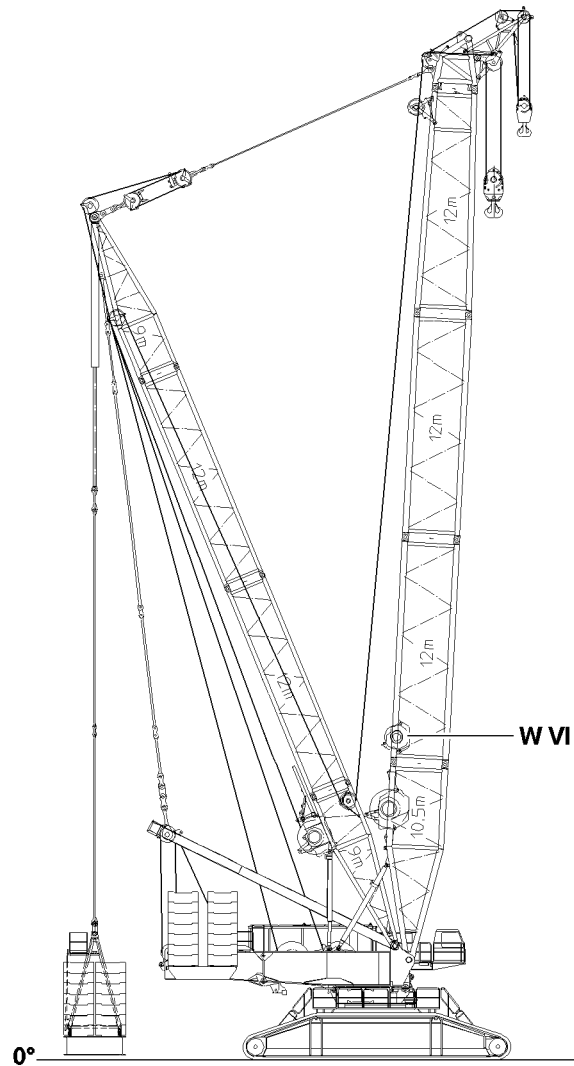
WARNING

Falling components!

If unsecured or non-supported components are installed or removed, they can fall down!

Personnel can be severely injured or killed!

- ▶ During pinning and unpinning of the lattice sections, it is prohibited for anyone to remain **under** or **on** the components as well as within the entire danger zone!
 - ▶ Support the boom and components before pinning / unpinning!
 - ▶ Pin or unpin both pins laying in a horizontal, i.e. **left** and **right**!
 - ▶ Secure the pins in the bearing points and in the receptacles!
 - ▶ Do not disengage the auxiliary crane until each component is pinned and secured!
 - ▶ It is prohibited to lean a ladder against the component being disassembled!
-



B112925

**WARNING**

Danger of impact / crushing!

When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth!

When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing!

Personnel can be severely injured or killed!

- ▶ 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!

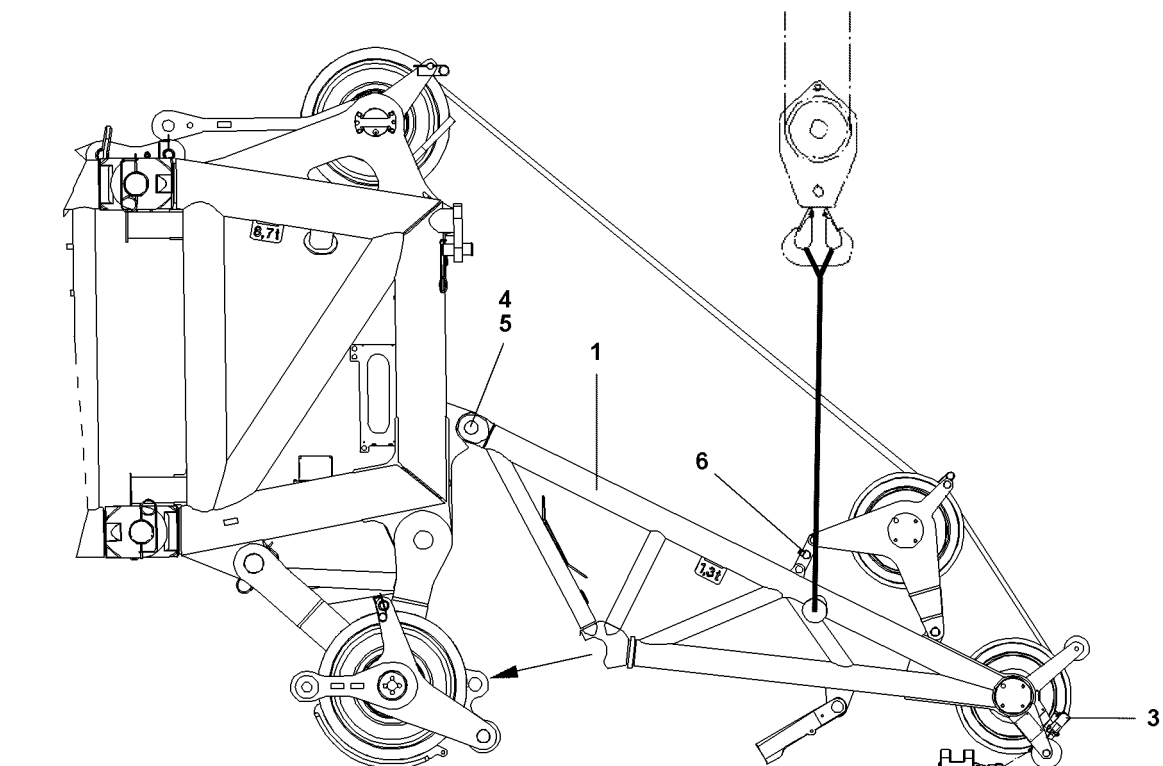
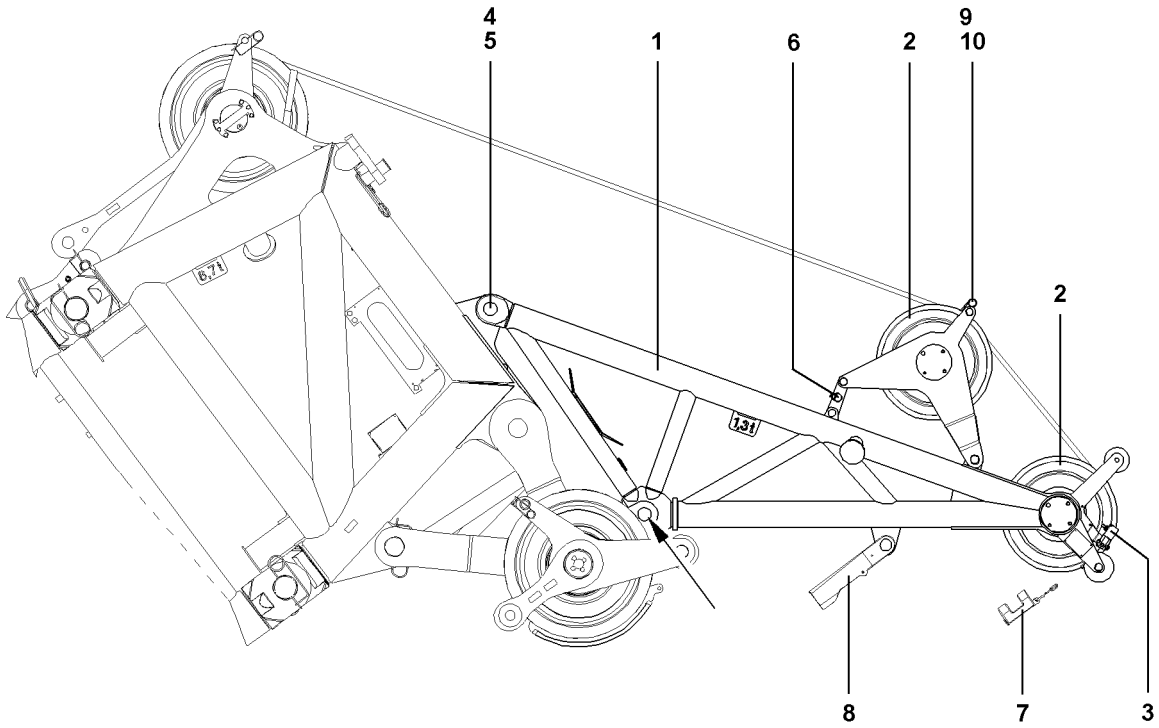
**WARNING**

The crane can topple over!

If the turntable is turned during the disassembly of the boom, then the crane can topple over and be severely damaged!

Personnel can be severely injured or killed!

- ▶ The turntable may not be turned during the disassembly of the boom!



B103007

1.4.1 Luffing the boom down



DANGER

The crane can topple over!

If the following conditions are not met before taking down the boom, the crane can topple over and fatally injure personnel!

- ▶ Observe and adhere to the safety technical notes, see Crane operating instructions, chapter 5.01!
- ▶ Observe the data in the erection and take down charts!

NOTICE

Damage of boom components!

Taking down the boom system can lead to a collision between the hook block and the pulley head. The boom components can be severely damaged!

- ▶ Luff the boom system down at the same time and spool the hoist winch out!



WARNING

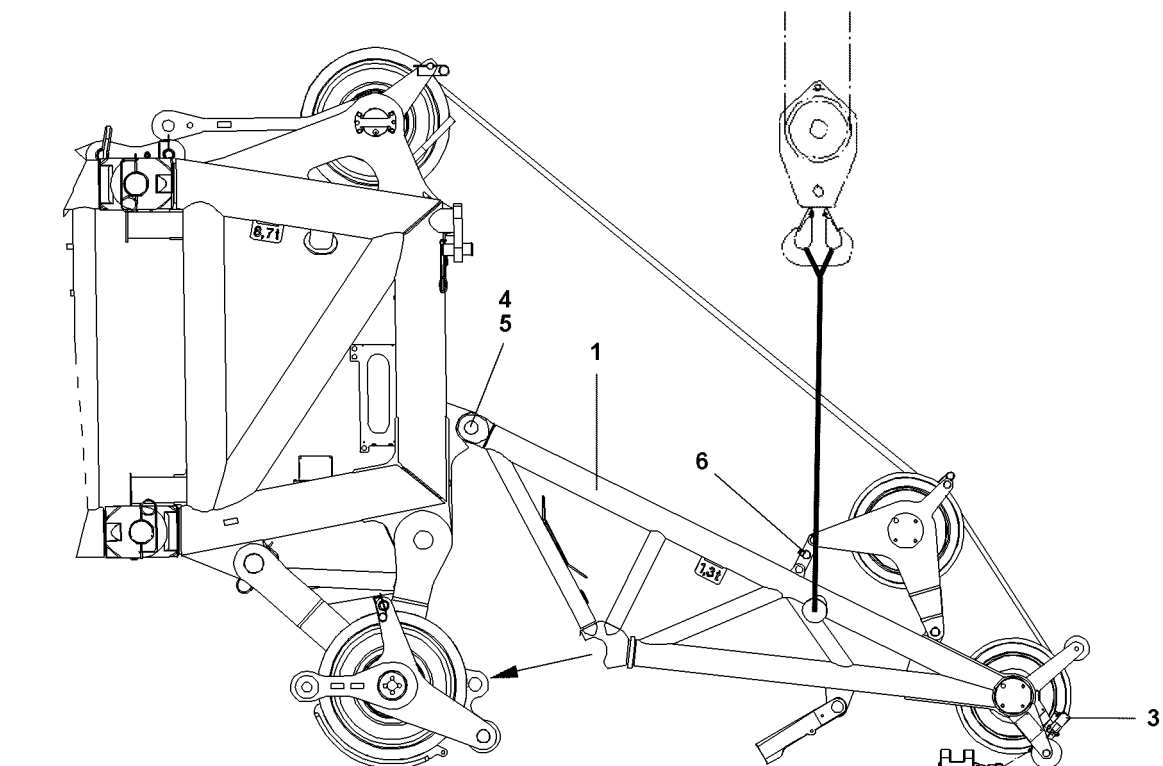
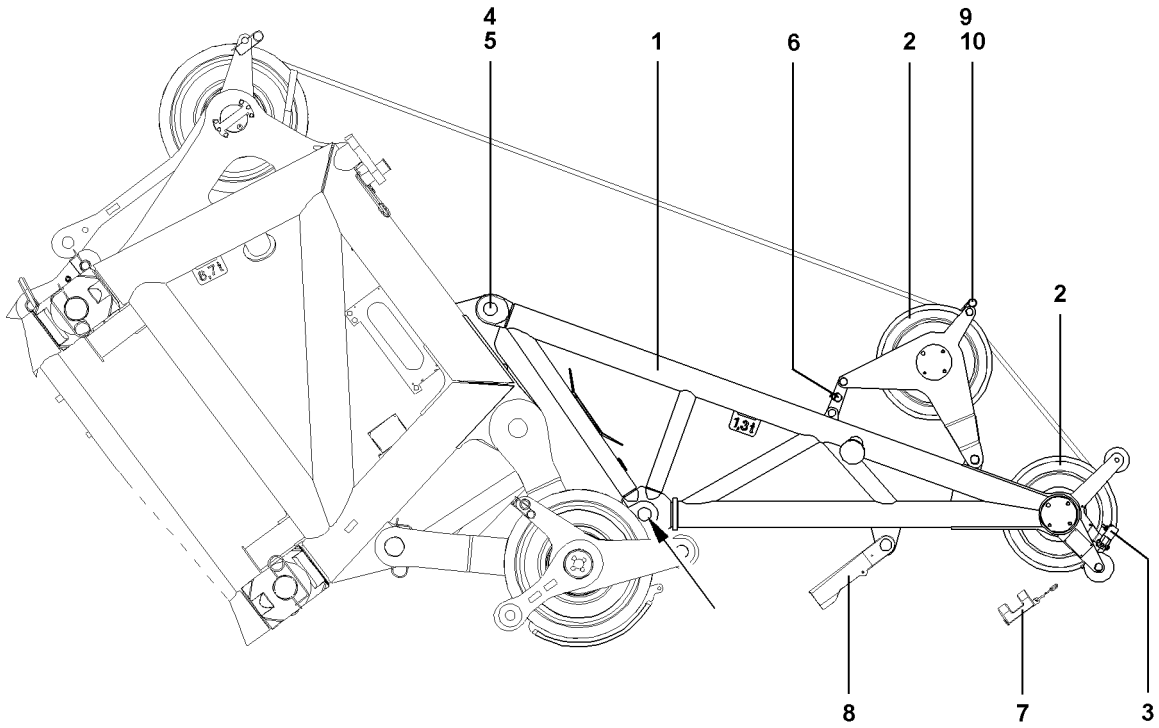
The crane can topple over!

If the danger notes for take down of the boom or the boom systems in the following chapters are not observed, then the crane can topple over!

Personnel can be severely injured or killed!

Boom nose installed on the SW-end section or on the W-connector head:

- ▶ Observe and adhere to the danger notes in the Crane operating instructions, chapter 5.38, chapter 5.39 or chapter 5.07!
- ▶ Luff the boom down according to the instructions in the above chapters.



B103007

**WARNING**

Assembly with bypassed / exceeded LICCON overload protection!

With bypassed / exceeded LICCON overload protection, the crane can collapse due to overload, the boom can break off or the crane can topple over!

Personnel can be severely injured or killed!

This could result in high property damage!

- ▶ The LICCON overload protection may only be bypassed / exceeded by persons who are aware of the consequences of a bypass!
- ▶ Bypass / exceed the LICCON overload protection only when the set up status of the crane has been correctly entered into the LICCON computer system!
- ▶ Observe the erection / take down charts!
- ▶ Crane operation with bypassed / exceeded LICCON overload protection is strictly prohibited!

- ▶ At the same time, spool the hoist winch out and luff the boom down until the hook block touches the ground.
- ▶ Remove the hoist limit switch weight and unreeve the hook block.
- ▶ Luff the boom down until the S-end section and the boom nose are laying on the ground.
- ▶ Remove the hoist rope.

1.4.2 Disconnecting the electrical connections

Make sure that the following prerequisite is met:

- The boom is properly placed down as specified.

NOTICE

Damage to the electrical connections on the cable drum!

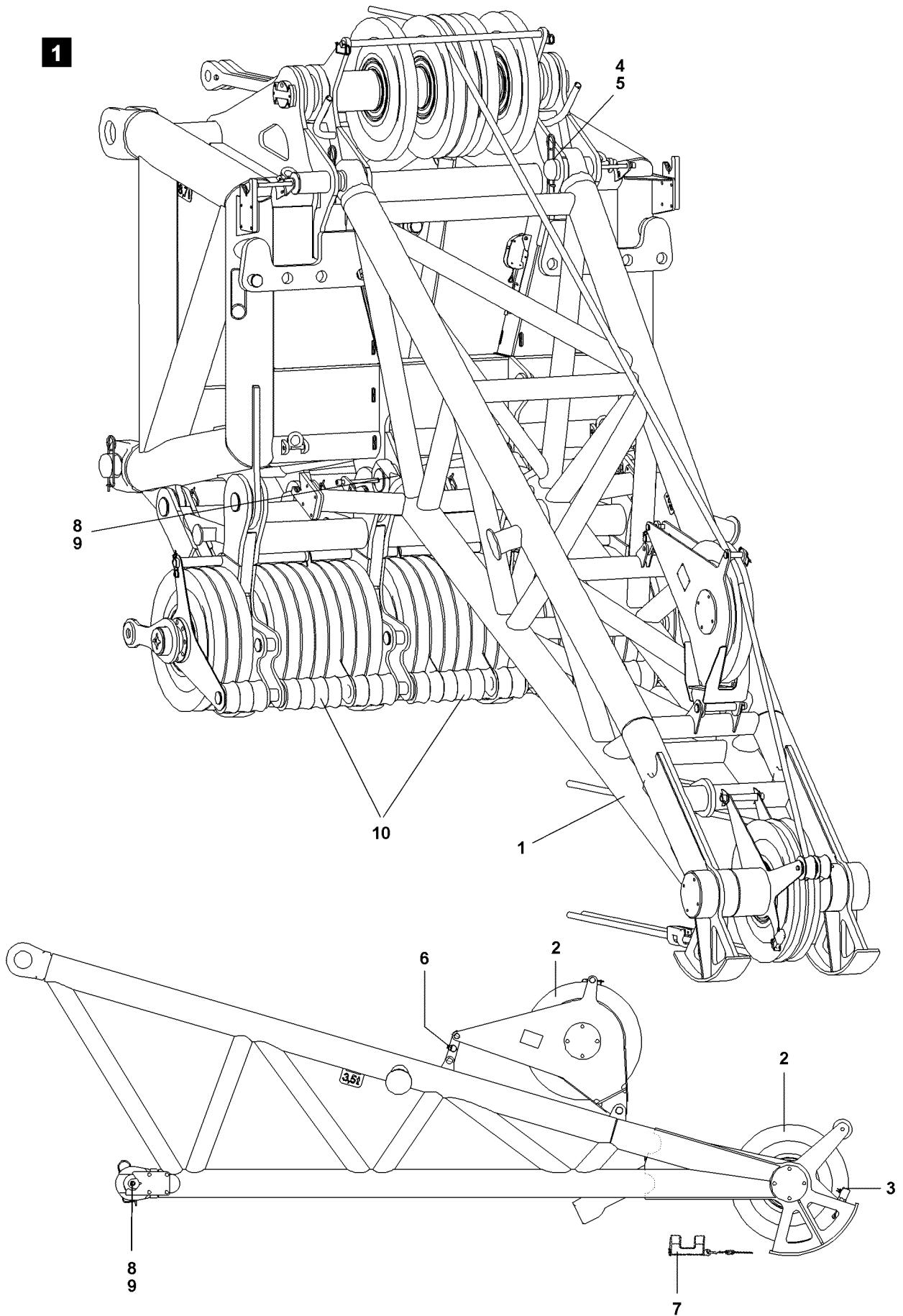
If the electrical connection from the cable drum on the S-pivot section to the terminal box on the respective end section is disconnected and spooled up, then the electrical connection from the cable drum to the terminal box on the S-pivot section can be damaged!

- ▶ Disconnect the electrical connection from the cable drum to the terminal box on the S-pivot section first and then the electrical connection from the terminal box to the respective end section!
- ▶ Store the cable from the terminal box on the S-pivot section properly.
- ▶ Spool the cable drum up and secure it to prevent inadvertent spooling out.

1.4.3 Removing the boom nose

Make sure that the following prerequisites are met:

- The boom nose hangs on the auxiliary crane.
- The boom end section and the boom nose are laying on the ground.
- The electrical connections are properly disconnected.
- ▶ Release the spring retainer **5** and unpin the pin **4** on the end section “**on top**” .
- ▶ Place the boom nose **1** on the ground, remove the auxiliary crane.



B103344

2 Boom nose 120 t

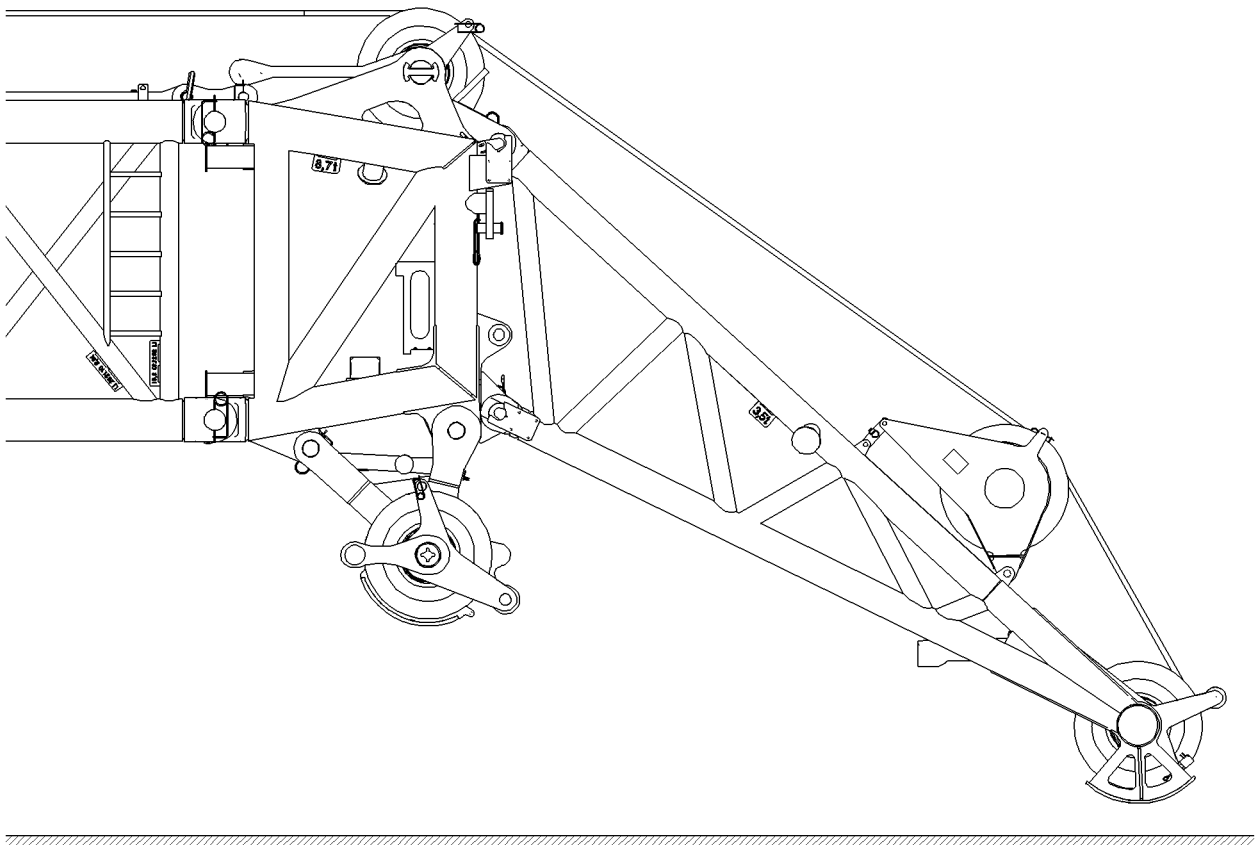
The boom nose 1 is installed on the **SW** -end section.

Illustration 1

Boom nose 1 on **SW** -end section with two 675 t pulley sets **10**.

2.1 Components

Position	Description	Weight
1	Boom nose 120 t	3.8 t
2	Rope pulley	—
3	Hoist limit switch	—
4	Pin 135 mm	—
5	Spring retainer 8 mm	—
6	Force test bracket	—
7	Hoist limit switch weight	—
8	Pin 135 mm	—
9	Spring retainer 8 mm	—
10	Pulley sets	—



B112927

2.2 Assembly



WARNING

Risk of falling!

During assembly and disassembly, personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel can fall and suffer life-threatening or fatal injuries!

- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
 - ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved fall arrest systems to avoid falling, see Crane operating instructions chapter 2.04!
 - ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work!
 - ▶ Step on aids and fall protection equipment only with clean shoes!
 - ▶ Keep aids and fall protection equipment clean and free from snow and ice!
 - ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited!
-



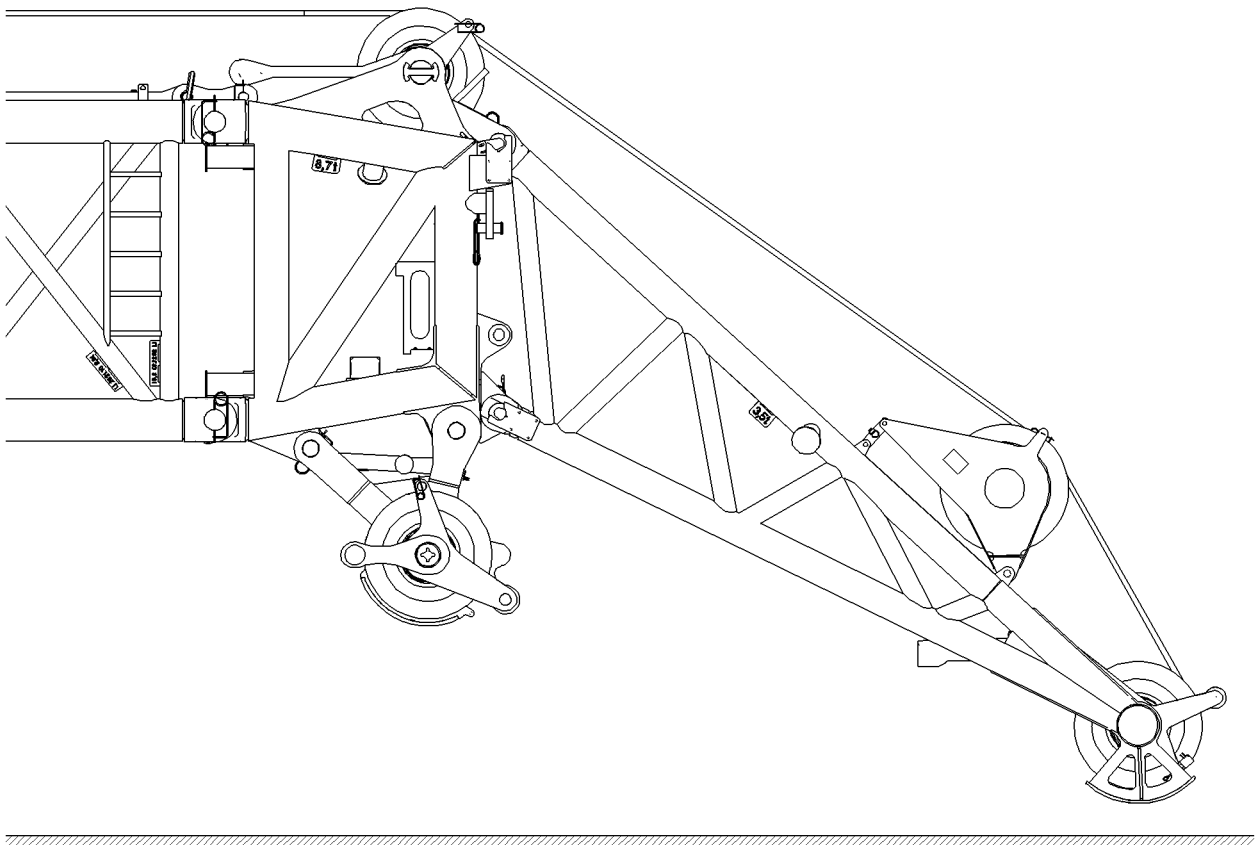
WARNING

Falling components!

If unsecured or non-supported components are installed or removed, they can fall down!

Personnel can be severely injured or killed!

- ▶ During pinning and unpinning of the lattice sections, it is prohibited for anyone to remain **under** or **on** the components as well as within the entire danger zone!
 - ▶ Support the boom and components before pinning / unpinning!
 - ▶ Pin or unpin both pins laying in a horizontal, i.e. **left** and **right**!
 - ▶ Secure the pins in the bearing points and in the receptacles!
 - ▶ Do not disengage the auxiliary crane until each component is pinned and secured!
 - ▶ It is prohibited to lean a ladder against the component being disassembled!
-



B112927

**WARNING**

Danger of impact / crushing!

When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth!

When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing!

Personnel can be severely injured or killed!

- ▶ 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!

**WARNING**

The crane can topple over!

If the turntable is turned during the assembly of the boom, then the crane can topple over and be severely damaged!

Personnel can be severely injured or killed!

- ▶ The turntable may not be turned during the assembly of the boom!

2.2.1 Assembly prerequisites for boom nose(s)

**WARNING**

Assembly with bypassed / exceeded LICCON overload protection!

With bypassed / exceeded LICCON overload protection, the crane can collapse due to overload, the boom can break off or the crane can topple over!

Personnel can be severely injured or killed!

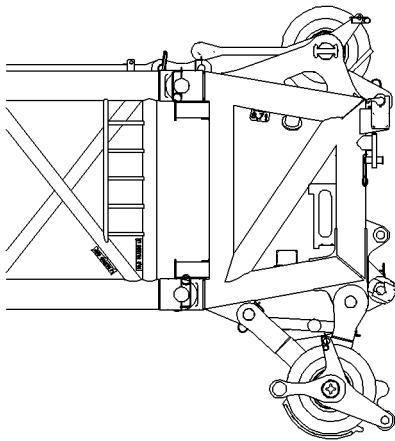
This could result in high property damage!

- ▶ The LICCON overload protection may only be bypassed / exceeded by persons who are aware of the consequences of a bypass!
- ▶ Bypass / exceed the LICCON overload protection only when the set up status of the crane has been correctly entered into the LICCON computer system!
- ▶ Observe the erection / take down charts!
- ▶ Crane operation with bypassed / exceeded LICCON overload protection is strictly prohibited!

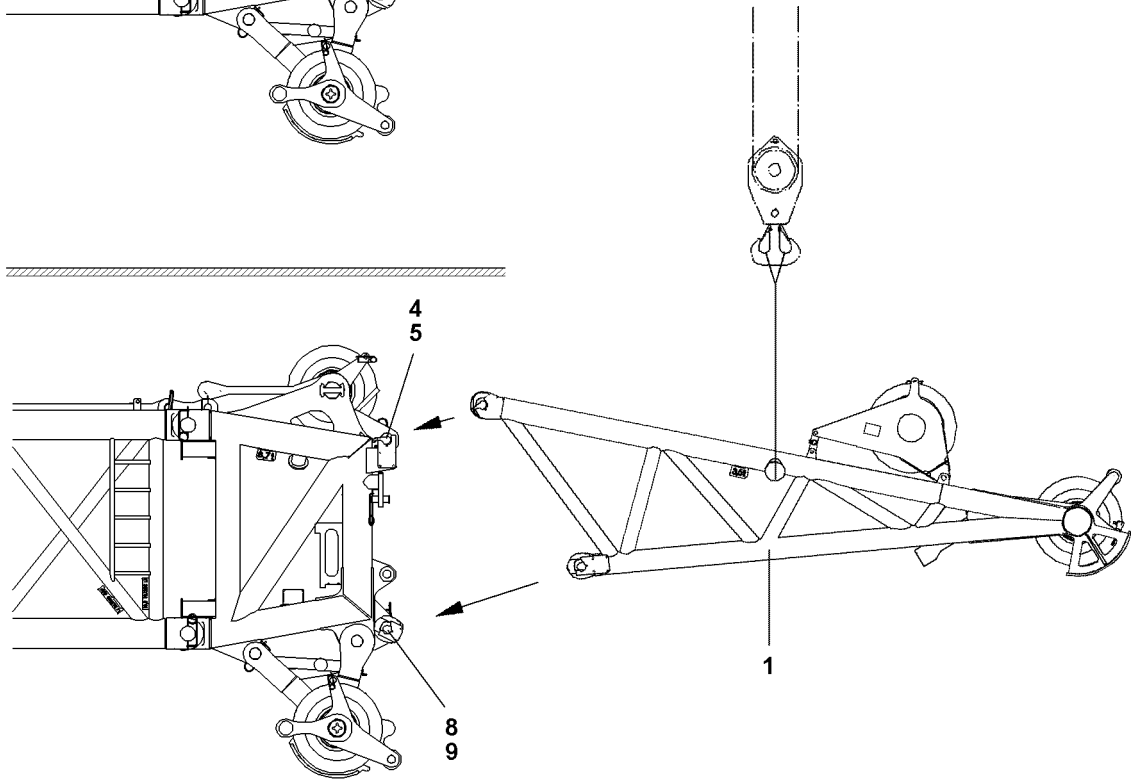
Make sure that the following prerequisites are met:

- The crane is aligned in horizontal direction.
- The boom including the respective end section are installed.
- The boom is placed on a load-bearing support.
- The counterweight has been installed on the turntable according to the load chart.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection is exceeded.
- The assembly icon is visible on the LICCON monitor.
- An auxiliary crane is available.

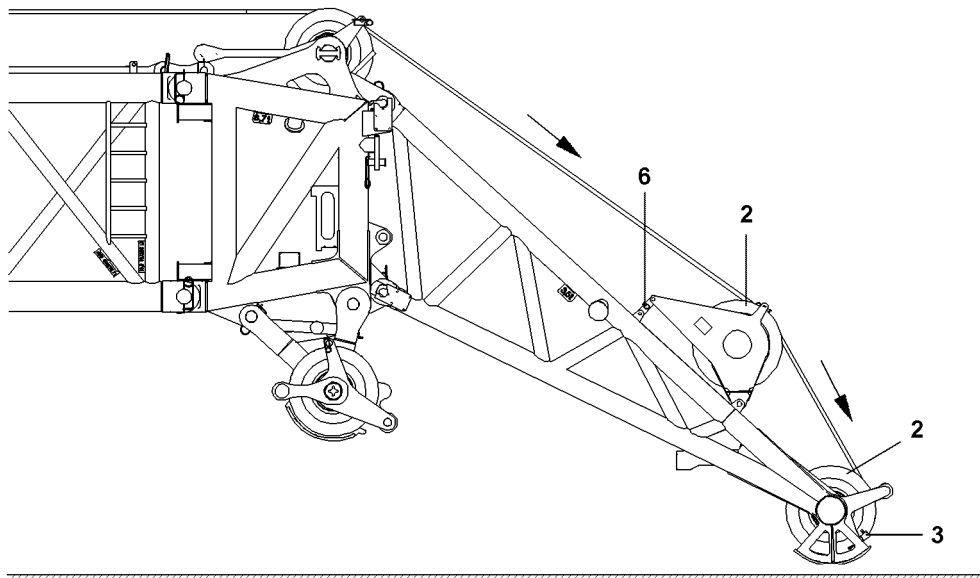
1



2



3



B103346

2.2.2 Assembly procedure

Make sure that the following prerequisite is met:

- The boom is luffed up to the point where it is parallel to the ground, see illustration 1.
- ▶ Hang the boom nose 1 on the auxiliary crane and insert the pin 4 on the end section “on top” and secure with spring retainer 5.
- ▶ Lower the boom nose 1 and insert the pin 8 on the end section “on the bottom” and secure with spring retainer 9, see illustration 2.



Note

- ▶ The boom can be taken down up to a maximum boom length of SL-102 m.
- ▶ For longer booms, the lower pins of the boom nose must be unpinned before take down.

NOTICE

Damage of boom nose!

- ▶ If the boom nose is pinned on top and bottom on the end section, then the boom may be luffed down only to the point where the boom nose is not laying on the ground.
- ▶ Pull the hoist rope over the rope pulleys 2, see illustration 3.



Note

- ▶ Pull the hoist rope over the rope pulleys according to the Reeving plan.



WARNING

Falling hoist rope!

If the hoist rope is not properly secured with a corresponding length on the boom nose before the erection procedure, then it can fall backward due to its own weight!

Personnel can be severely injured or killed!

- ▶ Reeve in the hoist rope with sufficient length on the boom nose before the erection process!
- ▶ The hoist rope must be constantly monitored during erection!
- ▶ Do not step into the danger zone!

- ▶ Reeve hook block properly and attach hoist limit switch weight.



Note

- ▶ Reeve in the hoist rope according to the Reeving plan.

2.2.3 Establishing the electrical connections

NOTICE

Damage to the electrical connection on the cable drum!

If the electrical connection from the cable drum on the S-pivot section to the terminal box on the S-pivot section is established first before the connection to the terminal box on the respective end section, the electrical connection can be damaged when spooling out the cable drum!

- ▶ Establish first the electrical connection from the cable drum in the S-pivot section to the terminal box on the respective end section and then the electrical connection from the terminal box in the S-pivot section to the cable drum in the S-pivot section!



Note

- ▶ To establish the electrical connections, use the electrical wiring diagram!

Make sure that the following prerequisites are met:

- The boom is fully assembled.
- The airplane warning light and the wind speed sensor are assembled.

- ▶ Establish the electrical connections.
- ▶ Make sure that all electrical connections on the boom are established.

2.2.4 Function check



WARNING

Non-functioning safety devices!

If the function of the safety devices is defective, personnel can be severely injured or killed!

- ▶ Crane operation with non-functioning safety devices is **prohibited!**



Note

- ▶ The function of the individual limit switches must be checked before erection!
- ▶ The function of the limit switch initiators must be checked in the test system, see Diagnostics manual!



Note

- ▶ If a function check on the limit switches or on the safety devices does not lead to the desired shut offs, then the plug connections on the terminal boxes or the components itself must be checked!
- ▶ If no visible connection errors or component defects can be found, contact **LIEBHERR** service!

Make sure that the following prerequisites are met:

- All electrical connections have been made.
- The crane engine is running.
- The corresponding operating mode is set on the LICCON monitor.

Checking the wind speed sensor

- ▶ Test the movement and the function of the wind speed sensor.

Checking the airplane warning light

- ▶ Turn the airplane warning light on.
- ▶ Check the function visually.

Checking the hoist limit switch on the pulley head



Note

- ▶ When replacing or changing a hoist limit switch (HES), the corresponding hoist limit switch must have the correct bus address and the correct software version in order to be detected again by the bus system (LSB)!

- ▶ Actuate the hoist limit switch manually on the pulley head.

Result:

- The spool up function of the hoist winch turns off.
- The icon “Hoist top” appears on the LICCON monitor 0.
- The limit switch is functioning.

Checking the limit switch S-boom “Steepest position”

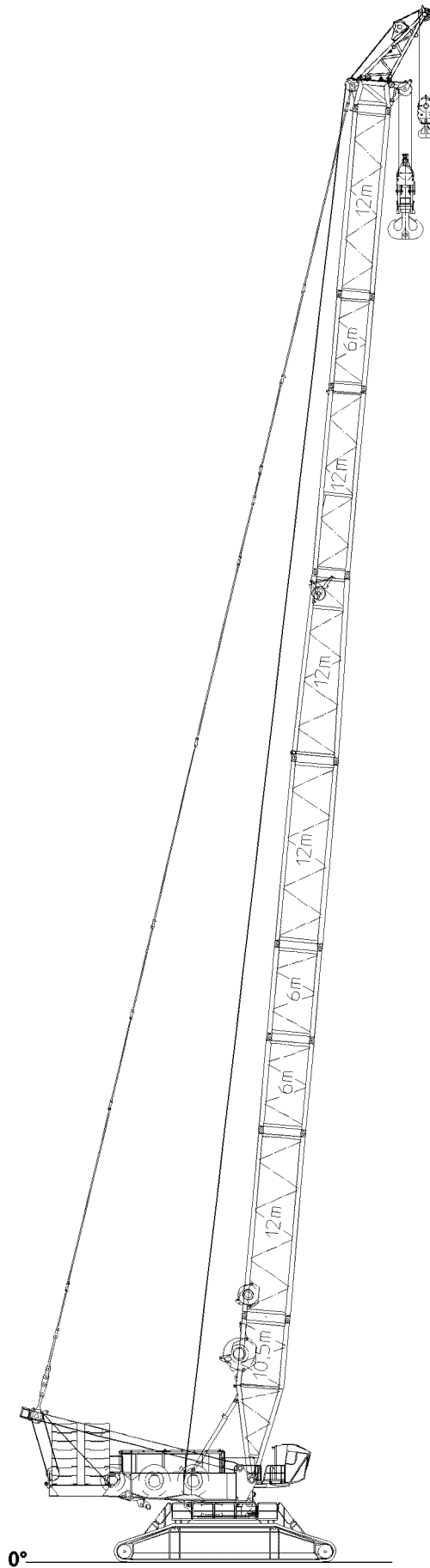


Note

- ▶ The limit switch functions have to be checked individually before erection!
- ▶ Cover the limit switch initiators on the S-relapse cylinders individually with a metal plate.

Result:

- The limit switch is actuated manually.
- The spool up function of winch 4 turns off.
- The icon “Boom limitation” appears on the LICCON monitor 0.
- The limit switch is functioning.



B112928

2.2.5 Erecting the boom



DANGER

The crane can topple over!

If the following conditions are not met before erecting the boom, the crane can topple over and fatally injure personnel!

- ▶ Observe and adhere to the safety technical notes, see Crane operating instructions, chapter 5.01!
- ▶ Observe the data in the erection and take down charts!
- ▶ Move the relapse cylinder out before erection!

Make sure that the following prerequisite is met:

- The LICCON overload protection is bypassed / exceeded.

Erection



WARNING

The crane can topple over!

In crane operation with exceeded LICCON overload protection, the crane can topple over!

Personnel can be severely injured or killed!

- ▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook!

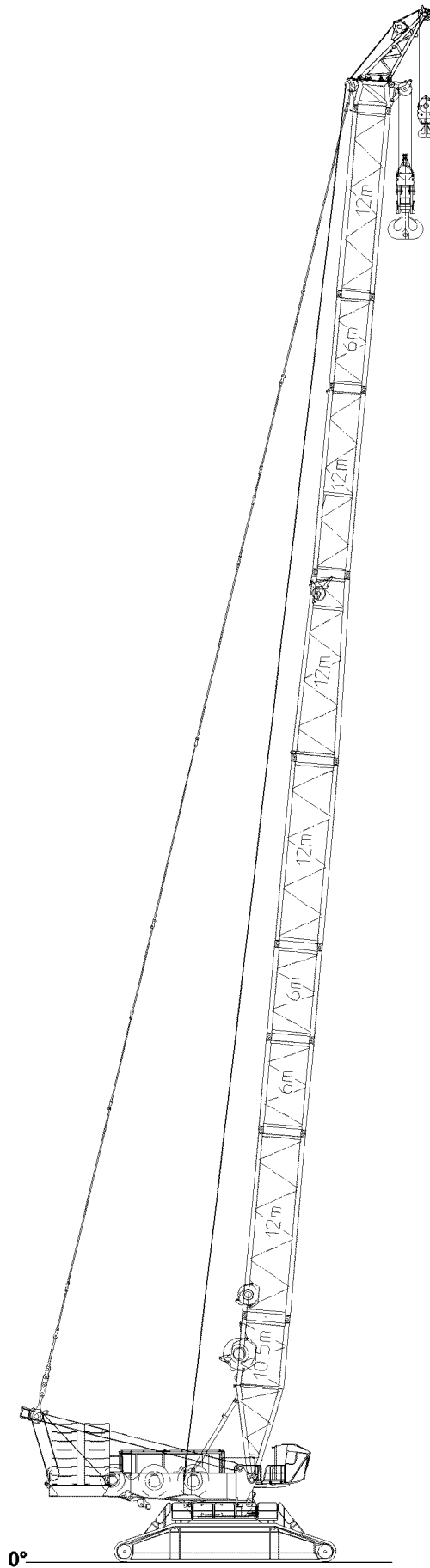


Note

- ▶ When the lowest operating position of the boom is reached, the LICCON overload protection is activated!
- ▶ In the maximum load icon appears a load number in "t" instead of the display "???"!
- ▶ Luff the S-boom up to the lowest operating position.
- ▶ When the boom has reached the lowest operating position: Make sure that the assembly icon turns off on the LICCON monitor.

Result:

- The LICCON overload protection is active.



B112928

2.3 Crane operation

Observe the instructions in chapter 4.05, chapter 4.08 and chapter 5.01.

Make sure that the following prerequisites are met:

- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection is active.
The Assembly icon **50** on the LICCON display is off.



DANGER

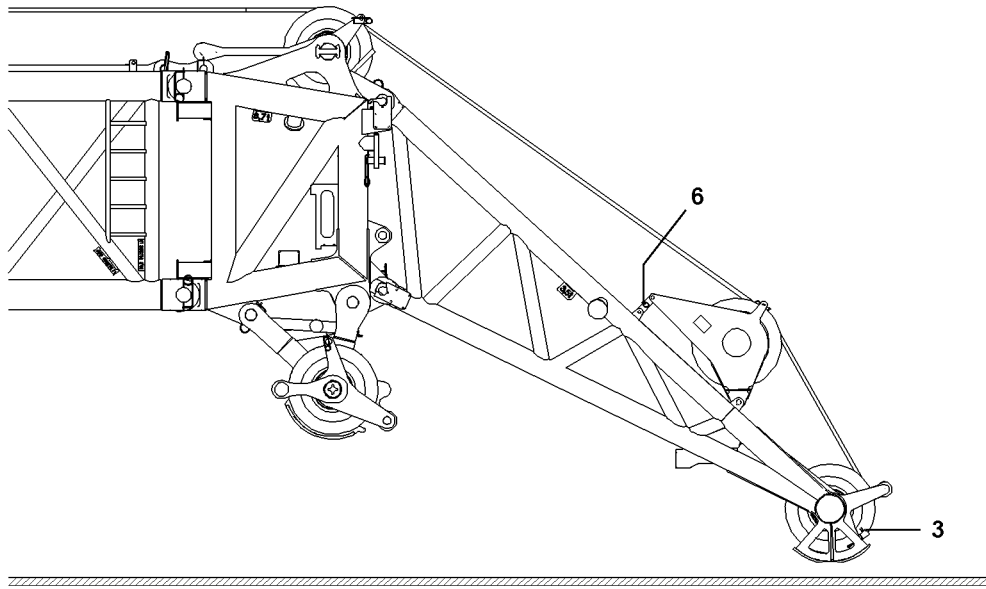
The crane can topple over!

- ▶ Check the horizontal position of the crane before and during operation.
 - ▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset, if necessary, before resuming crane operation.
-

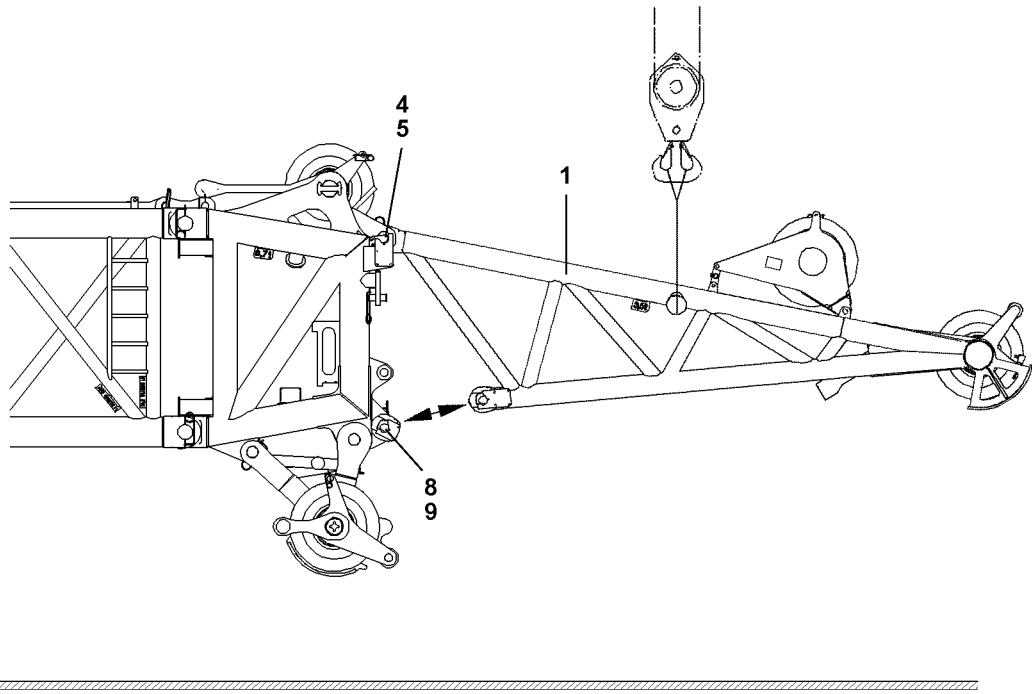
2.3.1 Checking the settings

- ▶ Check the function of the overload protection by running against the operating positions on top and bottom.
- ▶ Check the hoist limit switch by running against the hoist limit switch weight.
- ▶ Check the function of the limit switches on the relapse cylinders.
- ▶ Check the function of the force test bracket on the boom nose.

1



2



2.4 Disassembly



WARNING

Risk of falling!

During assembly and disassembly, personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel can fall and suffer life-threatening or fatal injuries!

- ▶ Any work, where there is a danger of falling must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
 - ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved fall arrest systems to avoid falling, see Crane operating instructions chapter 2.04!
 - ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work!
 - ▶ Step on aids and fall protection equipment only with clean shoes!
 - ▶ Keep aids and fall protection equipment clean and free from snow and ice!
 - ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited!
-



WARNING

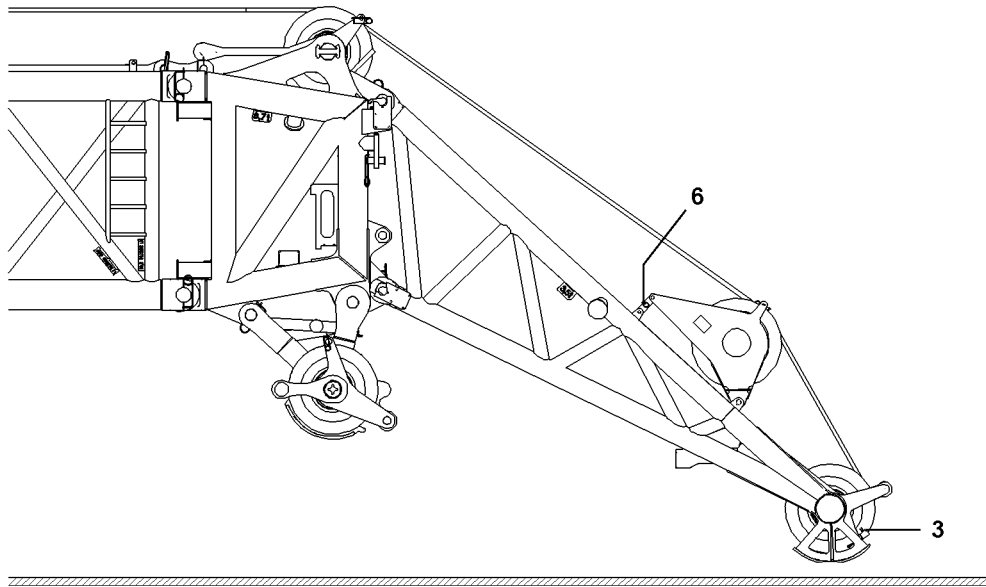
Falling components!

If unsecured or non-supported components are installed or removed, they can fall down!

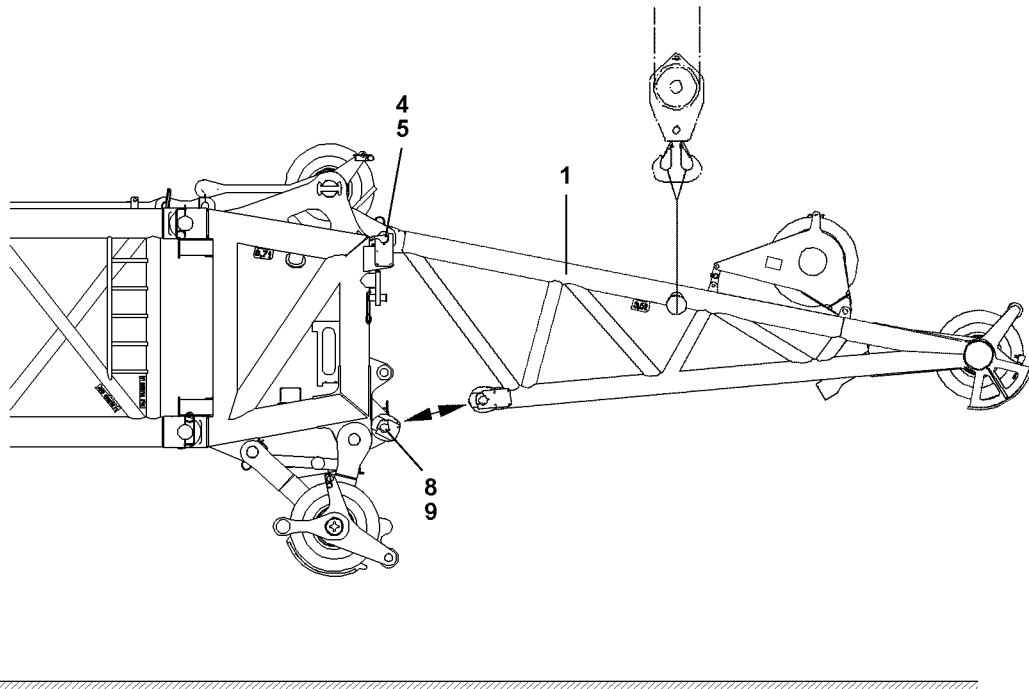
Personnel can be severely injured or killed!

- ▶ During pinning and unpinning of the lattice sections, it is prohibited for anyone to remain **under** or **on** the components as well as within the entire danger zone!
 - ▶ Support the boom and components before pinning / unpinning!
 - ▶ Pin or unpin both pins laying in a horizontal, i.e. **left** and **right**!
 - ▶ Secure the pins in the bearing points and in the receptacles!
 - ▶ Do not disengage the auxiliary crane until each component is pinned and secured!
 - ▶ It is prohibited to lean a ladder against the component being disassembled!
-

1



2



B112929

**WARNING**

Danger of impact / crushing!

When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth!

When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing!

Personnel can be severely injured or killed!

- ▶ 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!

**WARNING**

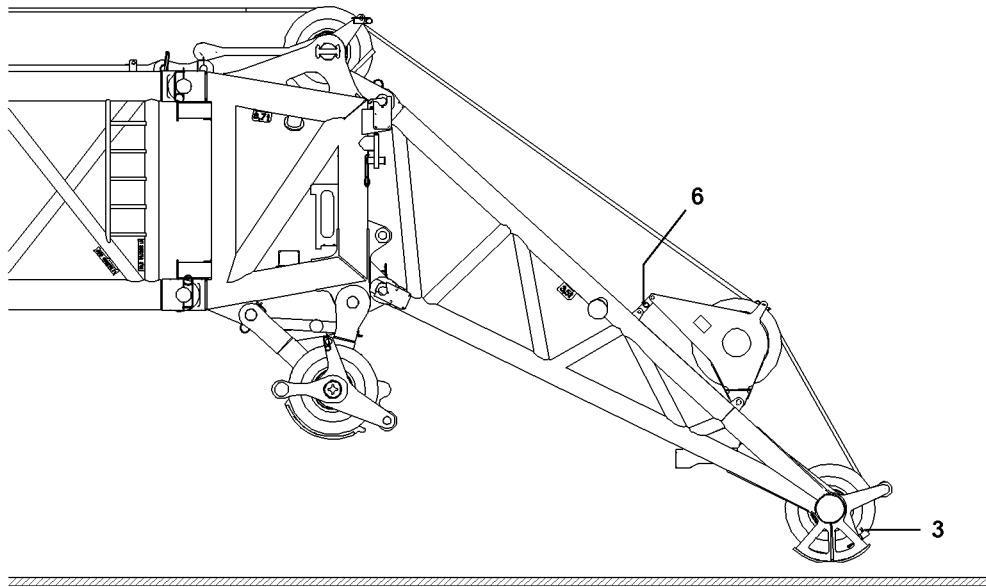
The crane can topple over!

If the turntable is turned during the assembly of the boom, then the crane can topple over and be severely damaged!

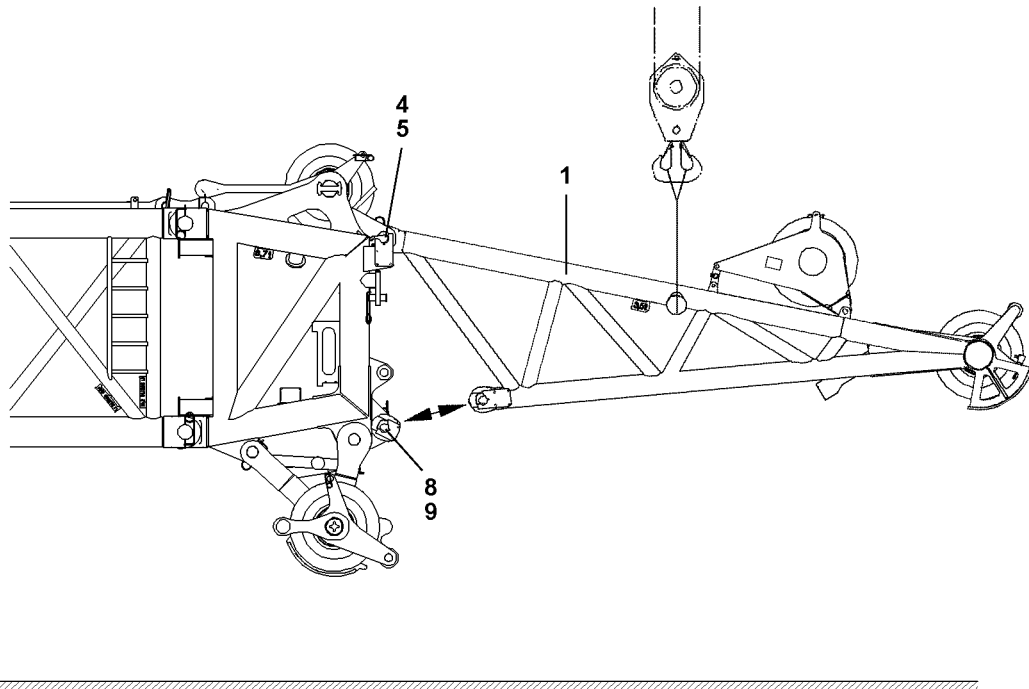
Personnel can be severely injured or killed!

- ▶ The turntable may not be turned during the assembly of the boom!

1



2



2.4.1 Luffing the boom down



DANGER

The crane can topple over!

If the following conditions are not met before taking down the boom, the crane can topple over and fatally injure personnel!

- ▶ Observe and adhere to the safety technical notes, see Crane operating instructions, chapter 5.01!
- ▶ Observe the data in the erection and take down charts!

NOTICE

Damage of boom components!

Taking down the boom system can lead to a collision between the hook block and the pulley head. The boom components can be severely damaged!

- ▶ Luff the boom system down at the same time and spool the hoist winch out!



WARNING

The crane can topple over!

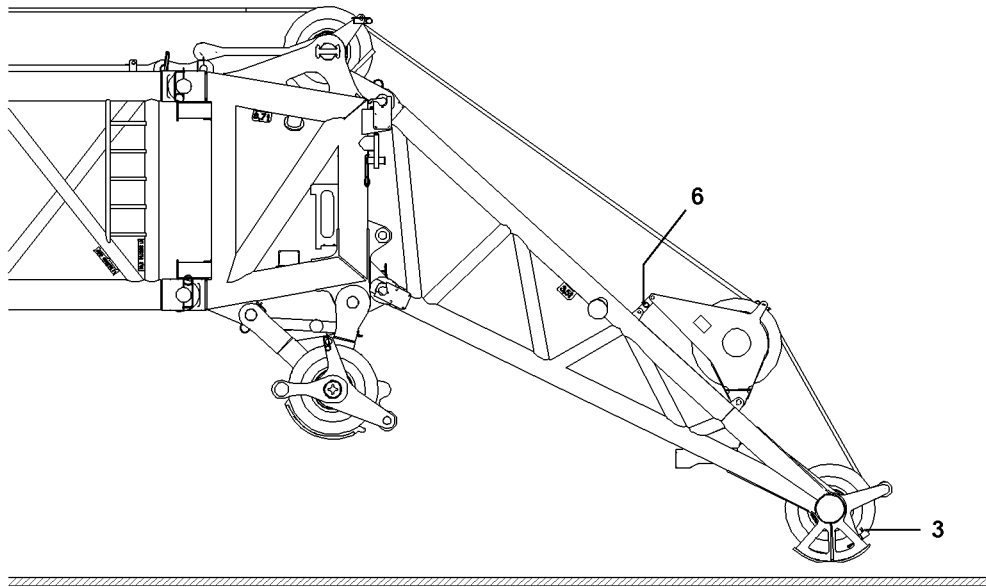
If the danger notes for take down of the boom or the boom systems in the following chapters are not observed, then the crane can topple over!

Personnel can be severely injured or killed!

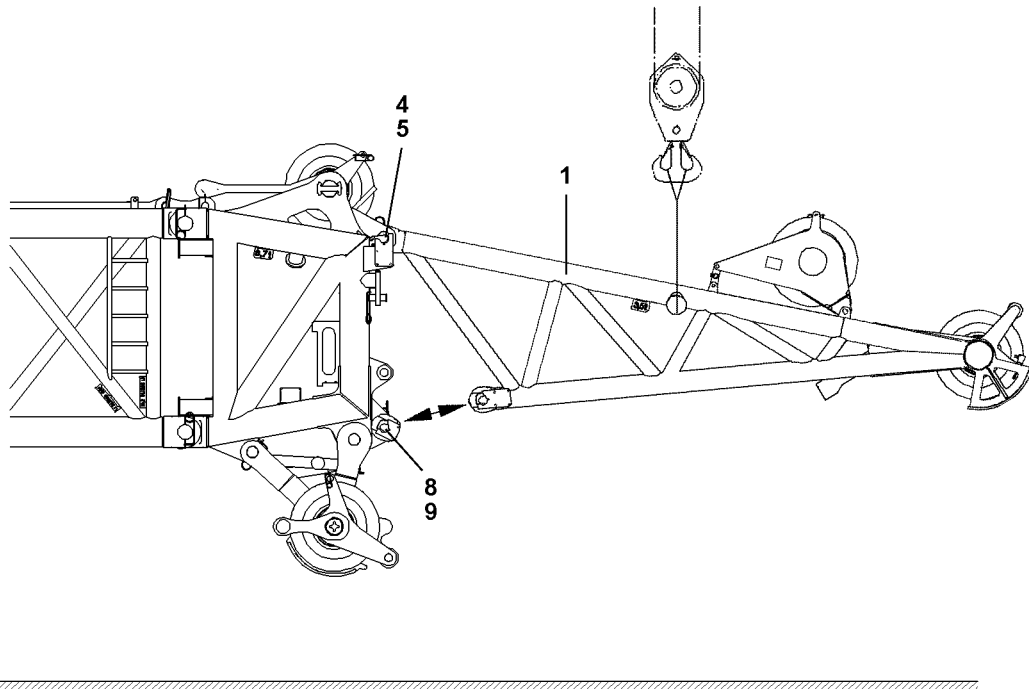
Boom nose installed on SW-end section:

- ▶ Observe and adhere to the danger notes in the Crane operating instructions, chapter 5.38, chapter 5.39 or chapter 5.07!
- ▶ Luff the boom down according to the instructions in the above chapters.

1



2



**WARNING**

Assembly with bypassed / exceeded LICCON overload protection!

With bypassed / exceeded LICCON overload protection, the crane can collapse due to overload, the boom can break off or the crane can topple over!

Personnel can be severely injured or killed!

This could result in high property damage!

- ▶ The LICCON overload protection may only be bypassed / exceeded by persons who are aware of the consequences of a bypass!
- ▶ Bypass / exceed the LICCON overload protection only when the set up status of the crane has been correctly entered into the LICCON computer system!
- ▶ Observe the erection / take down charts!
- ▶ Crane operation with bypassed / exceeded LICCON overload protection is strictly prohibited!

- ▶ Luff the boom down until hook block touches the ground.
- ▶ Remove the hoist limit switch weight and unreeve the hook block.

**Note**

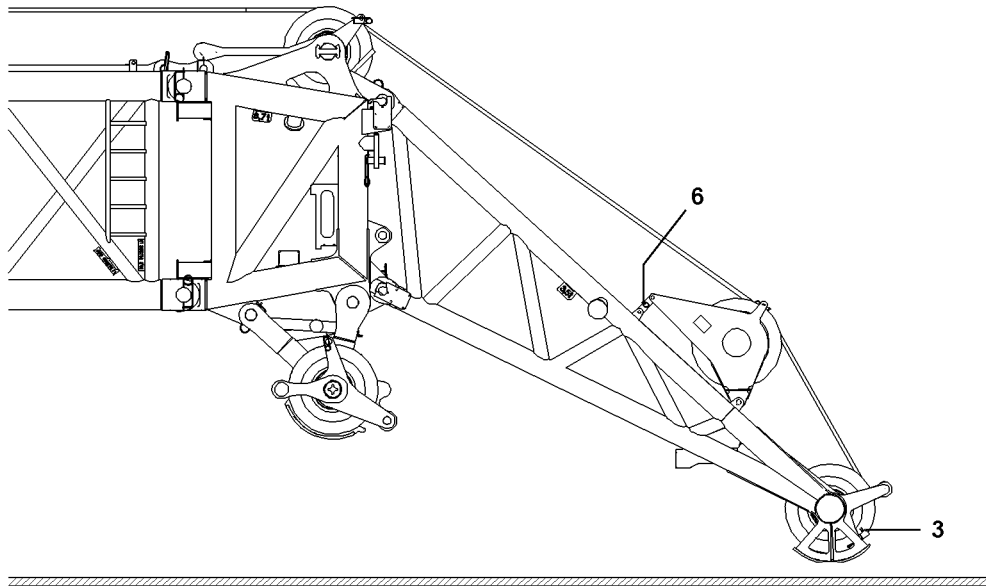
- ▶ The boom can be taken down up to a maximum boom length of SL-102 m.
- ▶ For longer booms, the lower pins of the boom nose must be unpinned before take down.

NOTICE

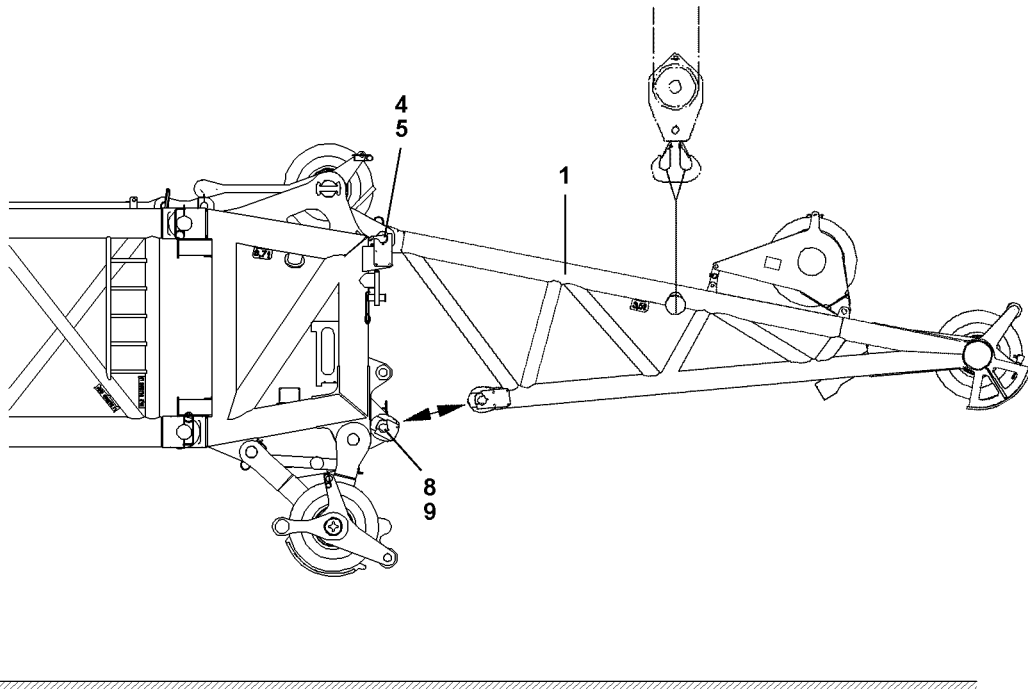
Damage of boom nose!

- ▶ If the boom nose is pinned on top and bottom on the end section, then the boom may be luffed down only to the point where the boom nose is not laying on the ground.
- ▶ Luff the boom down until the boom nose just above the ground.
- ▶ Remove the hoist rope.
- ▶ Hang the boom nose **1** onto the auxiliary crane.

1



2



2.4.2 Disconnecting the electrical connections

Make sure that the following prerequisite is met:

- The boom is properly placed down as specified.

NOTICE

Damage to the electrical connections on the cable drum!

If the electrical connection from the cable drum on the S-pivot section to the terminal box on the respective end section is disconnected and spooled up, then the electrical connection from the cable drum to the terminal box on the S-pivot section can be damaged!

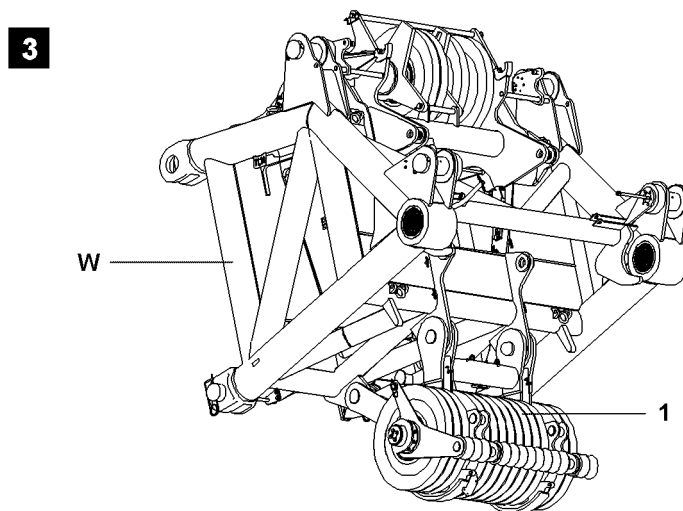
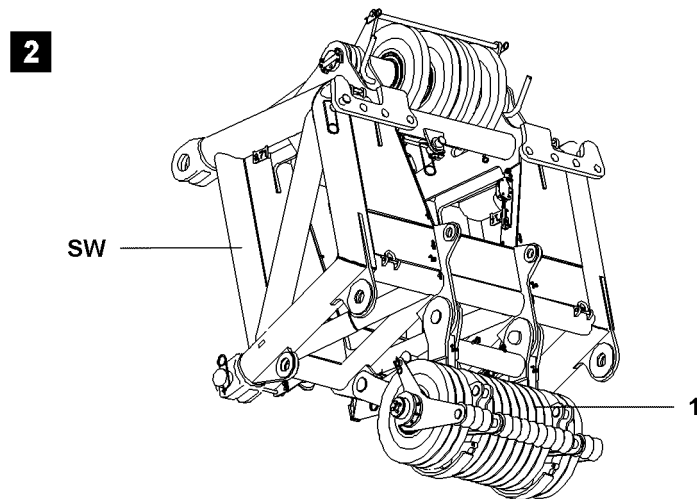
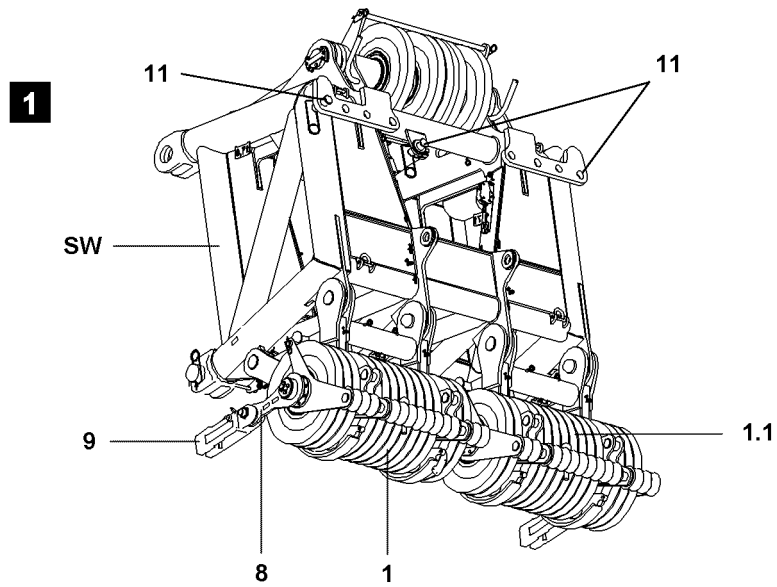
- ▶ Disconnect the electrical connection from the cable drum to the terminal box on the S-pivot section first and then the electrical connection from the terminal box to the respective end section!

-
- ▶ Store the cable from the terminal box on the S-pivot section properly.
 - ▶ Spool the cable drum up and secure it to prevent inadvertent spooling out.

2.4.3 Removing the boom nose

Make sure that the following prerequisites are met:

- The boom nose hangs on the auxiliary crane.
- The boom end section and the boom nose are laying on the ground.
- The electrical connections are properly disconnected.
- ▶ Release the spring retainer **9** and unpin the pin **8** on the end section “**on the bottom**” .
- ▶ Release the spring retainer **5** and unpin the pin **4** on the end section “**on top**” .



1 General

The pulley set **1 right** and the pulley set **1.1 left** are installed on the **SW** -head piece or the **W** -connector head.

Fig. 1

SW -head piece with two 675 t pulley sets **1** and **1.1**

Fig. 2

SW -head piece with one 675 t pulley set **1**

Fig. 3

W -connector head with one 675 t pulley set **1**

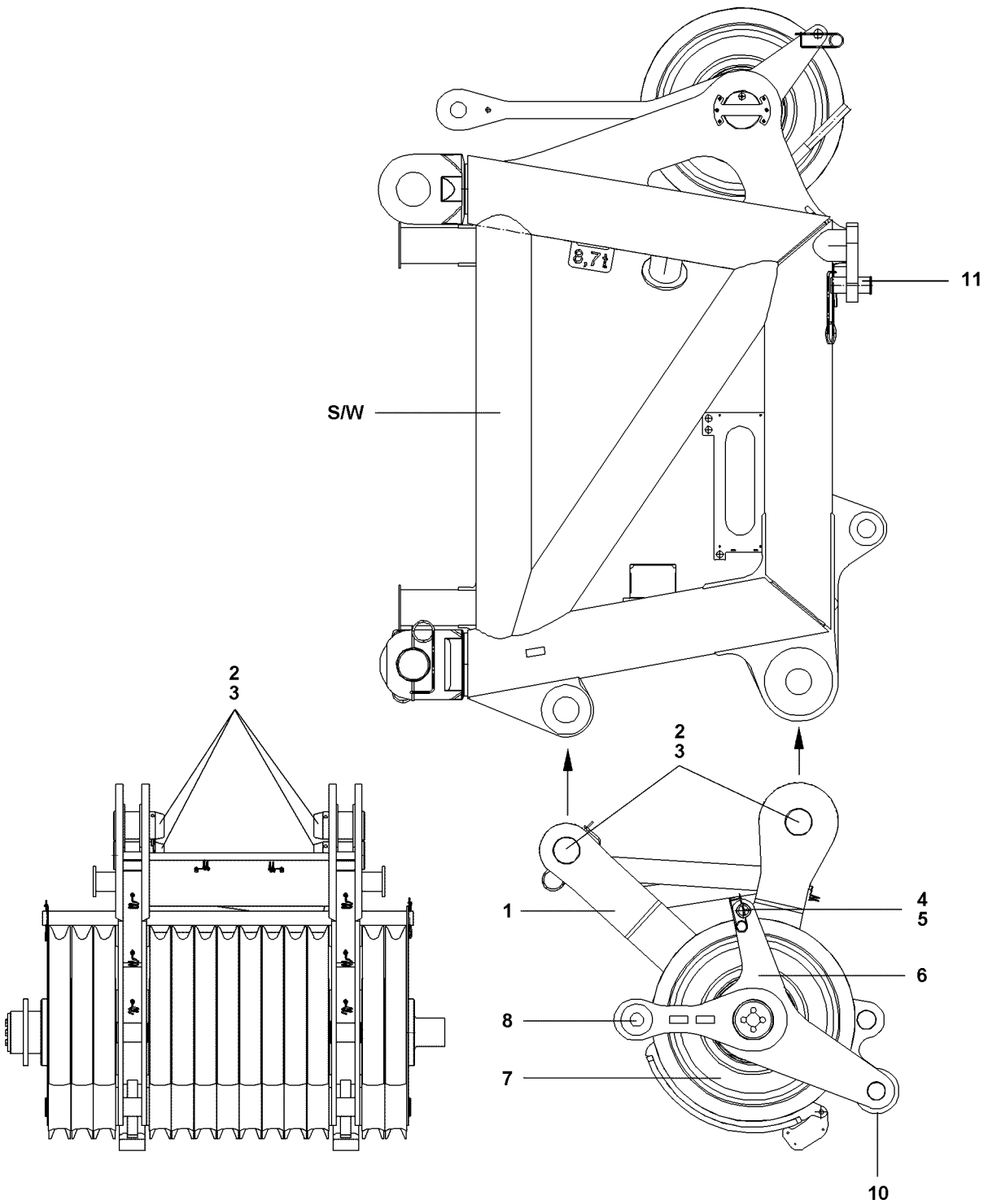


DANGER

Risk of collision!

The rope fixed point **8** at the W-connecting head must be removed if the luffing jib is installed. If this is not observed, it will collide with the **W** -articulated piece when the luffing jib is down!

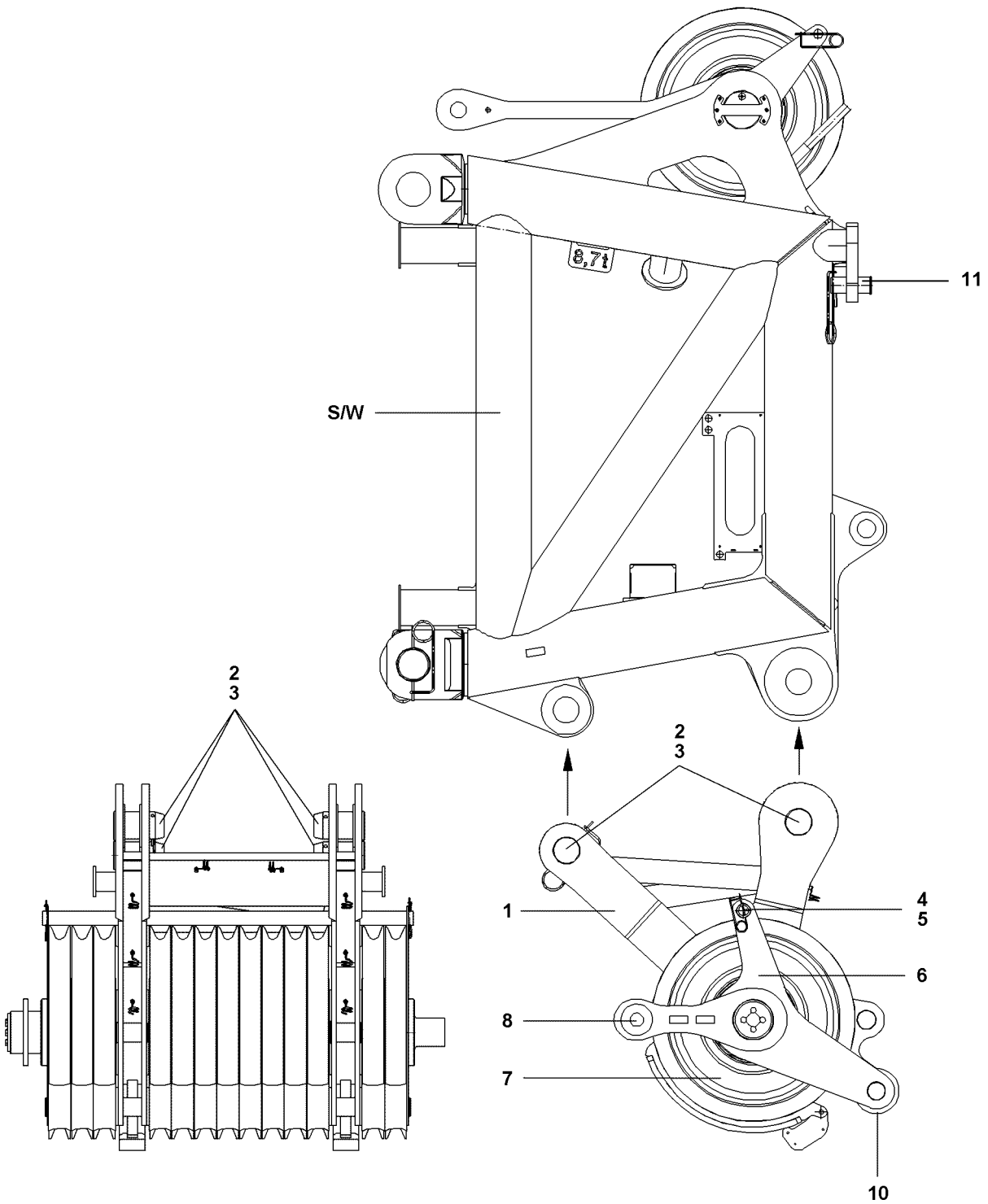
▶ Remove the rope fixed point **8**.



B103022

1.1 Components

	Description	Weight
1	Pulley set right, 675 t	2.8 t
1.1	Pulley set left, 675 t	2.8 t
2	Pin, 120 mm	—
3	Safety spring, 8 mm	—
4	Rope retaining pin	—
5	Safety spring, 4.5 mm	—
6	Retainer	—
7	Rope pulleys	—
8	Rope fixed point only for maximum load capacity	—
9	Lock	—
10	Rope guard pulleys	—
11	Rope fixed point	—



B103022

2 Assembly

2.1 Installing the pulley set

- ▶ Pin the pulley set **1** on the **SW** -head piece or the **W** -connector head.
- ▶ Insert the pin **2** from the outside to the inside and secure with safety spring **3**.
- ▶ Install the **SW** -head piece or the **W** -connector head on the boom.
- ▶ Pin and secure the lock **9** on the rope fixed point **8**.
- ▶ Pull the hoist rope over the rope pulleys **2**.

**Note**

- ▶ Pull the hoist rope over the rope pulleys according to the separately supplied reeving plans.
-
- ▶ Establish the electrical connection to the hoist limit switch.

**Note**

- ▶ For electrical connections on the **SW** -head piece or the **W** -connector head, see chapter 5.04, 5.07.
-
- ▶ Reeve hook block properly and attach the hoist limit switch weight.

**Note**

- ▶ Reeve the hoist rope according to the separately supplied reeving plans.
-

B195219

1 Minimum required hook block weight



WARNING

Falling components and hook block!

If the chosen hook block weight is not large enough, then the hoist rope pulls the hook block between the boom head and the winch from a certain hoisting height suddenly upward. As a result, the boom head and the hook block can be damaged. Damaged components and the hoist rope between the boom head and the winch can fall down.

If slack rope forms between the winch and the boom head when spooling the winch out, then the hook block can suddenly fall down.

Personnel can be severely injured or killed!

- ▶ Calculate the minimum required hook block weight before lifting the load!
- ▶ Select the weight of the hook block depending on the calculation!

If the weight of the hook block is not sufficient:

- ▶ Select a heavier hook block or increase the weight of the hook block with fastening items, load tackle, auxiliary weights or modification kits!

NOTICE

Rope damage due to insufficient weight of the hook block!

If the hook block is operated with a higher reeving than is required by the load on the respective boom length, the minimum required hook block weight increases.

If the hook block weight is too low to tighten the hoist rope sufficiently, spooling problems may occur on the winches when lowering and lifting the hook block due to slack rope formation. Rope damage can result.

If no minimum system-related hoist reeving is required for the operating mode:

- ▶ Reeve the hook block at the minimum depending on the maximum rope pull and the weight of the load to be lifted!

If loads are taken up at great heights:

- ▶ If possible, increase the reeving!

If the reeving was increased:

- ▶ Deduct the hoist rope weight for the additional strands from the load.

If the hook is lowered under the crane placement surface:

- ▶ Deduct the hoist rope weight of the hoist rope under the crane placement surface from the load.

If the weight of the hook block is not sufficient:

- ▶ Select a heavier hook block or increase the weight of the hook block with fastening items, load tackle, auxiliary weights or modification kits!



Note

Recommendation for selection of hook block weight!

If the maximum load capacity for the respective boom configuration is not exceeded by an additional weight increase of the hook block:

- ▶ Increase the minimum required hook block weight additionally by at least 10 %!

If an additional weight increase of the hook block due to the maximum load capacity for the respective boom configuration is not possible:

- ▶ Lower the hook block only with utmost caution!

**Note**

Observe the permissible hook block weights for erection and take down of the boom system!
If the permissible hook block weight for erection and take down of the boom system is exceeded due to the own weight increase of the hook block, then the boom system cannot be erected or taken down with this hook block weight.

- ▶ Observe the permissible hook block weights for erection and take down in the erection and take down charts!

If the permissible hook block weight for erection and take down is exceeded:

- ▶ Remove auxiliary weights for the erection and take down of the boom system!

1.1 Calculating the minimum required hook block weight

$$G = L \times M \times N \times F$$

B109881

Formula to determine the minimum required hook block weight

Abbreviation	Description	Unit
G	Minimum required hook block weight	kg
L	Overall boom length	m
M	Rope weight	kg/m
N	Reeving	-
F	Factor	-

Explanation of variables to calculate the minimum required hook block weight

1.2 Determining the rope weight for the rope diameter

Rope diameter	Rope weight M
13 mm	0.85 kg/m
15 mm	1.12 kg/m
17 mm	1.45 kg/m
19 mm	1.81 kg/m
21 mm	2.24 kg/m
23 mm	2.67 kg/m
25 mm	3.09 kg/m
28 mm	3.94 kg/m
30 mm	4.46 kg/m
32 mm	5.09 kg/m
38 mm	7.21 kg/m
40 mm	7.99 kg/m
52 mm	13.50 kg/m

Rope diameter and rope weight

1.3 Determining the factor for reeving

Reeving N	Factor F
1	1,31
2	1,34
3	1,36
4	1,39
5	1,41
6	1,44
7	1,46
8	1,49
9	1,52
10	1,54
11	1,57
12	1,60
13	1,63
14	1,65
15	1,68
16	1,71
17	1,74
18	1,77
19	1,80
20	1,83
21	1,87
22	1,90
23	1,93
24	1,96
25	2,00
26	2,03
27	2,06
28	2,10
29	2,13
30	2,17

Reeving and factor

1.4 Calculation examples

1.4.1 Calculating the required hook block weight for crane operation with 1 hoist rope winch in single operation with single hook block

Crane configuration:

- Length of main boom: 70 m
- Length of auxiliary boom: 28 m
- Rope diameter: 28 mm
- Reeving: 12 rope strands

Variables for calculation:

L = overall boom length = 98 m

M = rope weight for rope diameter 28 mm = 3.94 kg/m

N = reeving = 12

F = factor for 12 rope strands = 1.60

Calculation:

$$G = L \times M \times N \times F$$

$$G = 98 \text{ m} \times 3.94 \text{ kg/m} \times 12 \times 1.60$$

$$G = 7414 \text{ kg}$$

The minimum required hook block weight must be 7414 kg and must be increased additionally by at least 10 % (741 kg) to 8155 kg. The maximum load capacity for the respective boom configuration may not be exceeded by the additional weight increase of the hook block.

1.4.2 Calculating the required hook block weight for crane operation with 2 hoist rope winches in parallel operation with double hook block

Crane configuration:

- Length of main boom: 70 m
- Length of auxiliary boom: 28 m
- Rope diameter: 28 mm
- Reeving: 2 x 8 rope strands

Variables for calculation:

L = overall boom length = 98 m

M = rope weight for rope diameter 28 mm = 3.94 kg/m

N = reeving = (2 x 8)

F = factor for 8 rope strands = 1.49

Calculation:

$$G = L \times M \times (2 \times N) \times F$$

$$G = 98 \text{ m} \times 3.94 \text{ kg/m} \times (2 \times 8) \times 1.49$$

$$G = 9205 \text{ kg}$$

The minimum required hook block weight must be 9205 kg and must be increased additionally by at least 10 % (921 kg) to 10126 kg. The maximum load capacity for the respective boom configuration may not be exceeded by the additional weight increase of the hook block.

2 Procedure in case of slack rope

2.1 Lowering the hook block if slack rope forms

If the hook block can no longer be lowered due to slack rope formation, then the following steps must be carried out.

2.1.1 Spooling up loose hoist rope

- ▶ Spool up loose hoist rope between the boom head and the winch carefully onto the winch.



Note

- ▶ A slight rope slack must remain between the boom head and the winch!
-

2.1.2 Luffing the boom down

NOTICE

Danger of collision!

When luffing the boom down, the hoist rope length can shorten and pull the hook block against the boom head.

- ▶ Monitor the distance of the hook block to the boom head!
-

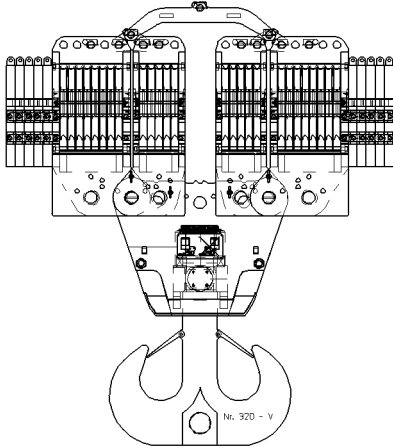
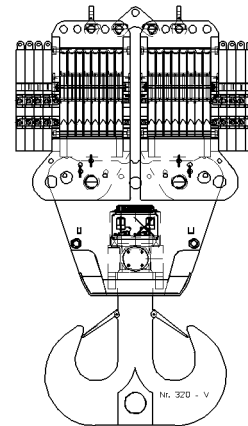
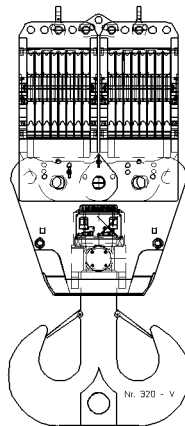
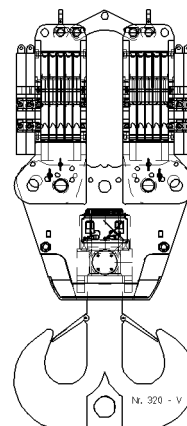
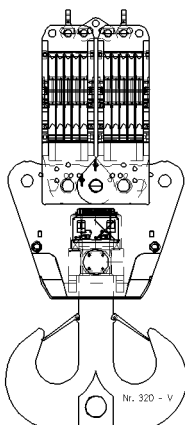
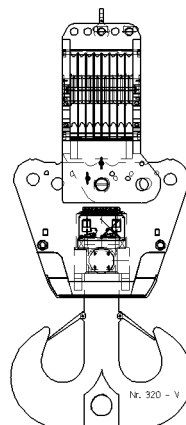
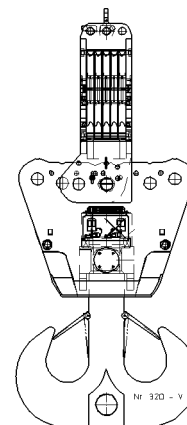
- ▶ Luff the boom down carefully.

Result:

- The hoist rope between the boom head and the winch is tensioned.

2.1.3 Lowering the hook block

- ▶ Lower the hook block carefully with the hoist gear.

1**2****3****4****5****6****7**

3 Hook block 1350 t

3.1 Possible combinations of the hook block 1350 t

The following combinations can be made with the 1350 t hook block:

Illustration 1		
Load	Strands	Rope pulleys
1350 t	2 x 26	2 x 13

Illustration 2		
Load	Strands	Rope pulleys
940 t	2 x 17	2 x 8

Illustration 3		
Load	Strands	Rope pulleys
815 t	1 x 33	2 x 8

Illustration 4		
Load	Strands	Rope pulleys
630 t	2 x 11	2 x 5

Illustration 5		
Load	Strands	Rope pulleys
560 t	1 x 21	2 x 5

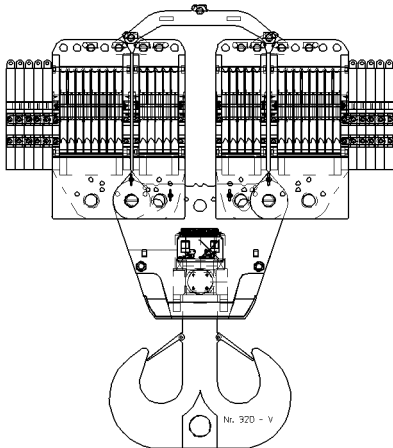
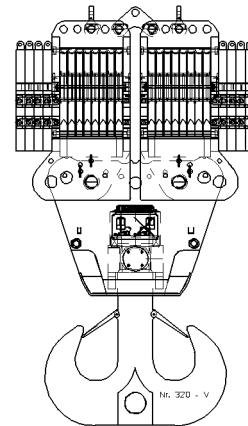
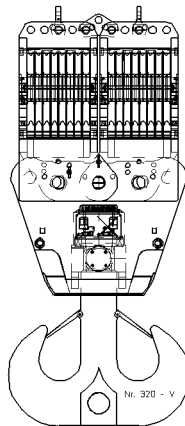
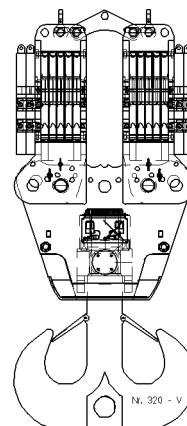
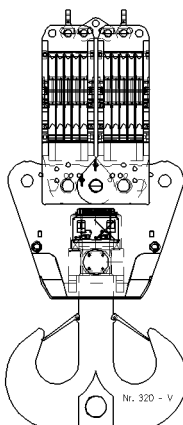
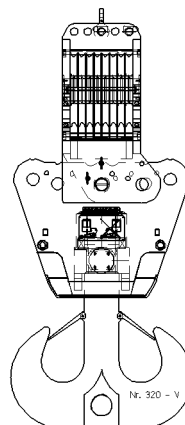
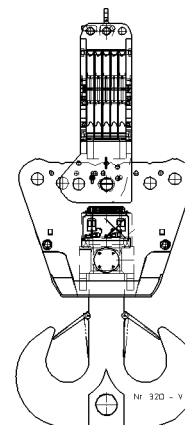
1**2****3****4****5****6****7**

Illustration 6		
Load	Strands	Rope pulleys
470 t	1 x 17	1 x 8

**Note**

- ▶ Hook block 320 t for a 1 winch operation with cross brace 320 t!

Illustration 7		
Load	Strands	Rope pulleys
320 t	1 x 11	1 x 5

3.2 Assembling / disassembling a 1350 t hook block

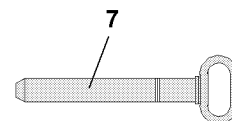
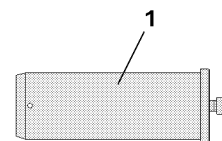
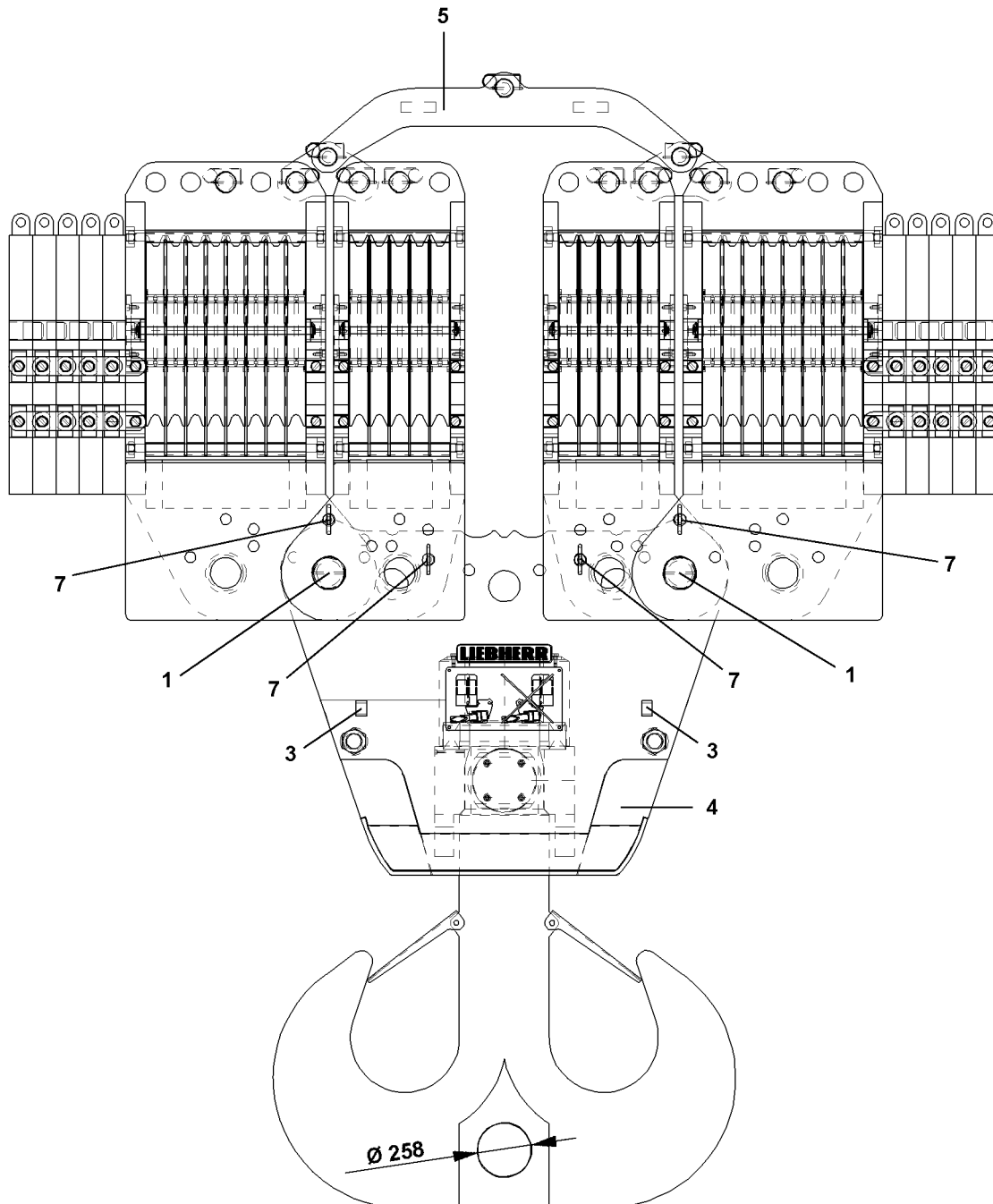
**WARNING**

Risk of accident when assembling/disassembling hook blocks!

When assembling / disassembling components on the hook block, for example: Components from pulley blocks or block connectors can fall down!

Personnel can be severely injured or killed!

- ▶ Never unpin the retaining pins on unsecured load components!
- ▶ Never unpin the connector pins on unsecured components!
- ▶ It is prohibited for anyone to remain within the entire danger zone while pinning and unpinning components on the hook block!
- ▶ Safely secure the pins in the bearing points as well as receptacles!



3.3 Hook block 1350 t

The 1350 t hook block is a double hook block with a double hook for the 2 winch operation.

Load	Strands	Rope pulleys	Hook number	Weight ¹⁾
1350 t	2 x 26	2 x 13	320	30 t

1) Hook block without auxiliary weights

3.3.1 Assembling a 1350 t hook block

- ▶ Pin the 5 roller pulley blocks (2x) and the 8 roller pulley blocks (2x) to the cross brace **4**: Insert and secure pin **1**.
- ▶ Install the block connector **5** to the hook block.

In order to prevent the hook block from tilting during assembling and reeving, the retaining pins **7** must be pinned into the hook block.

- ▶ Insert the retaining pins **7**.



WARNING

Shearing off of the retaining pins **7**!

If the retaining pins **7** are not unpinned before the crane operation, then the retaining pins **7** may be shorn off when lifting the load!

Personnel can be severely injured or killed!

- ▶ Unpin the retaining pins **7** before crane operation!

- ▶ Before starting the crane operation:
Insert the retaining pins **7** into the receptacles **3** and secure.

3.3.2 Assembling / disassembling the auxiliary weights



Note

- ▶ The assembly / disassembly of the auxiliary weights is described in section "assembling / disassembling the auxiliary weights"!
- ▶ Notice the minimum required hook block weight!

3.3.3 Disassembling a 1350 t hook block



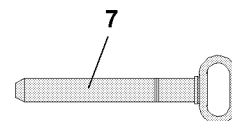
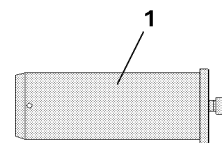
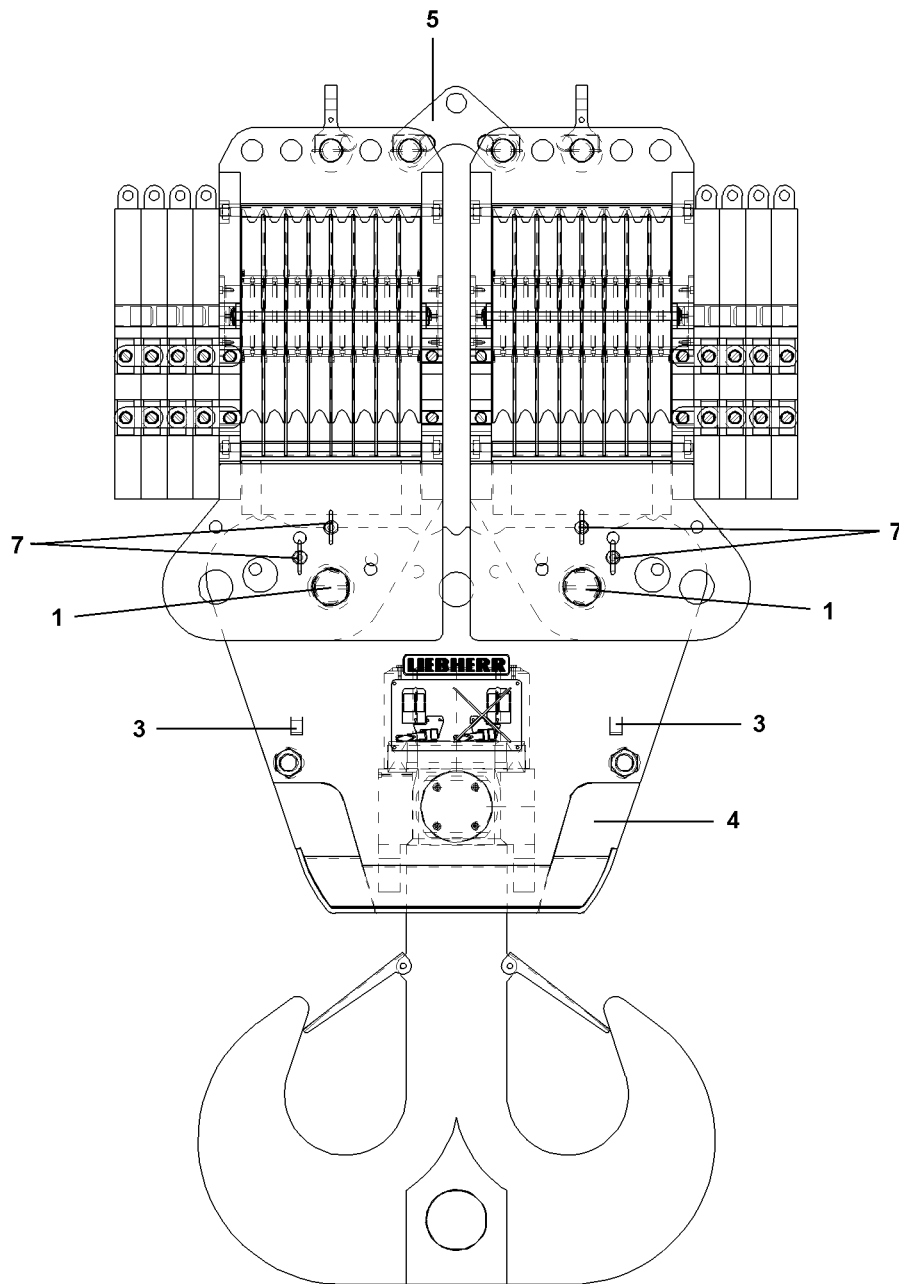
WARNING

The hook block can fall over!

If the retaining pins **7** are not inserted into the hook block before unreeving or disassembling, then the pulley blocks can tilt away to the side and cause the hook block to topple over!

Personnel can be severely injured or killed!

- ▶ Make sure that all auxiliary weights on the pulley blocks have been removed before disassembling the hook block!
- ▶ Insert the retaining pin **7** into the hook block before unreeving!
- ▶ Before starting hook block disassembly:
Insert the retaining pins **7** into the hook block.
- ▶ When the pulley blocks are secured by the retaining pins **7**:
Remove the block connector **5** on the hook block.
- ▶ Unpin the 5 roller pulley blocks (2x) and the 8 roller pulley blocks (2x) on the cross brace **4**:
Release and unpin the pin **1**.



B111453

3.4 Hook block 940 t

Hook block 940 t for a 2 winch operation with cross brace 1350 t.
The 940 t hook block is a double hook block with a double hook.

Load	Strands	Rope pulleys	Hook number	Weight ¹⁾
940 t	2 x 17	2 x 8	320	22 t

1) Hook block without auxiliary weights

3.4.1 Assembling a 940 t hook block

- ▶ Pin the 8 roller pulley blocks (2x) with the cross brace **4**: Insert and secure pin **1**.
- ▶ Install the block connector **5** to the hook block.

In order to prevent the hook block from tilting during assembling and reeving, the retaining pins **7** must be pinned into the hook block.

- ▶ Insert the retaining pins **7**.



WARNING

Shearing off of the retaining pins **7**!

If the retaining pins **7** are not unpinned before the crane operation, then the retaining pins **7** may be shorn off when lifting the load!

Personnel can be severely injured or killed!

- ▶ Unpin the retaining pins **7** before crane operation!

- ▶ Before starting the crane operation:
Insert the retaining pins **7** into the receptacles **3** and secure.

3.4.2 Assembling / disassembling the auxiliary weights



Note

- ▶ The assembly / disassembly of the auxiliary weights is described in section "assembling / disassembling the auxiliary weights"!
- ▶ Notice the minimum required hook block weight!

3.4.3 Disassembling a 940 t hook block



WARNING

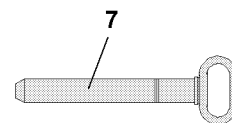
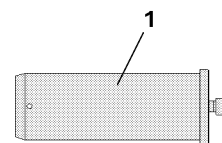
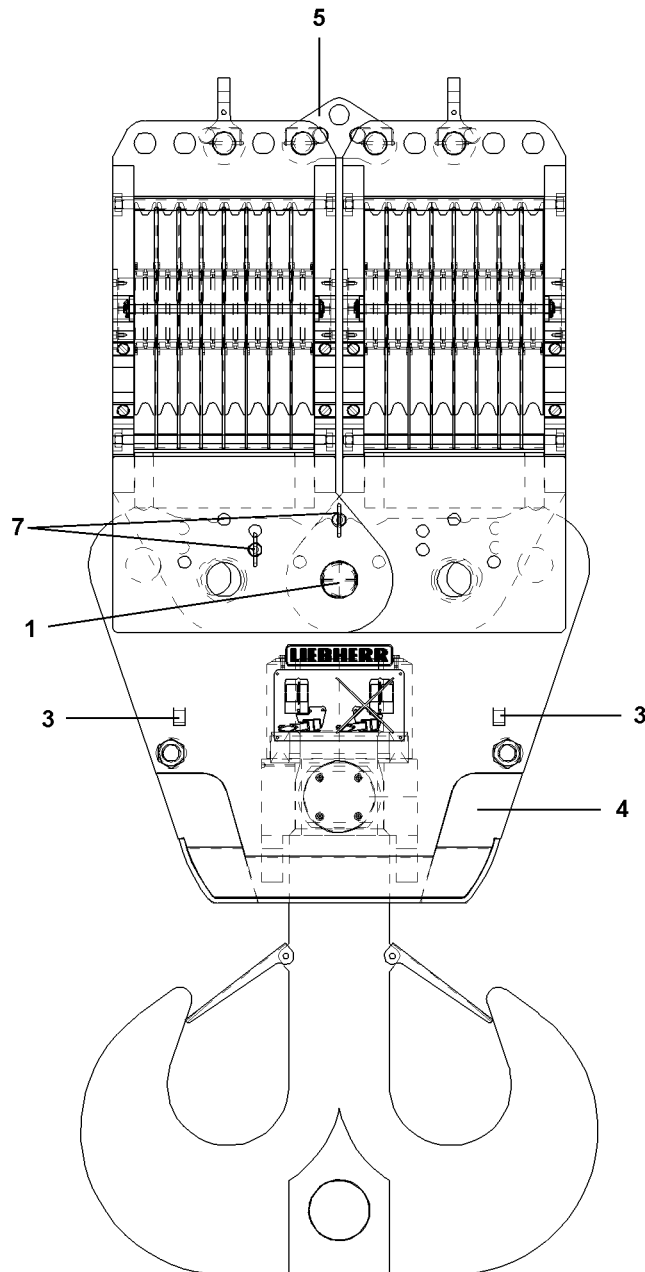
The hook block can fall over!

If the retaining pins **7** are not inserted into the hook block before unreeving or disassembling, then the pulley blocks can tilt away to the side and cause the hook block to topple over!

Personnel can be severely injured or killed!

- ▶ Make sure that all auxiliary weights on the pulley blocks have been removed before disassembling the hook block!
- ▶ Insert the retaining pin **7** into the hook block before unreeving!

- ▶ Before starting hook block disassembly:
Insert the retaining pins **7** into the hook block.
- ▶ When the pulley blocks are secured by the retaining pins **7**:
Remove the block connector **5** on the hook block.
- ▶ Unpin the 8 roller pulley blocks (2x) on the cross brace **4**: Release and unpin the pin **1**.



B111454

3.5 Hook block 815 t

Hook block 815 t for a 1 winch operation with cross brace 1350 t.
The 815 t hook block is a single hook block with a double hook.

Load	Strands	Rope pulleys	Hook number	Weight ¹⁾
815 t	1 x 33	2 x 8	320	22 t

1) Hook block without auxiliary weight

3.5.1 Assembling a 815 t hook block

- ▶ Pin the 8 roller pulley blocks (2x) with the cross brace **4**: Insert and secure pin **1**.
- ▶ Install the block connector **5** to the hook block.

In order to prevent the hook block from tilting during assembling and reeving, the retaining pins **7** must be pinned into the hook block.

- ▶ Insert the retaining pins **7**.



WARNING

Shearing off of the retaining pins **7**!

If the retaining pins **7** are not unpinned before the crane operation, then the retaining pins **7** may be shorn off when lifting the load!

Personnel can be severely injured or killed!

- ▶ Unpin the retaining pins **7** before crane operation!

- ▶ Before starting the crane operation:
Insert the retaining pins **7** into the receptacles **3** and secure.

3.5.2 Assembling / disassembling the auxiliary weights



Note

- ▶ The assembly / disassembly of the auxiliary weights is described in section "assembling / disassembling the auxiliary weights"!
- ▶ Notice the minimum required hook block weight!

3.5.3 Disassembling a 815 t hook block



WARNING

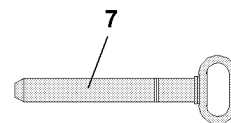
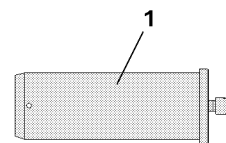
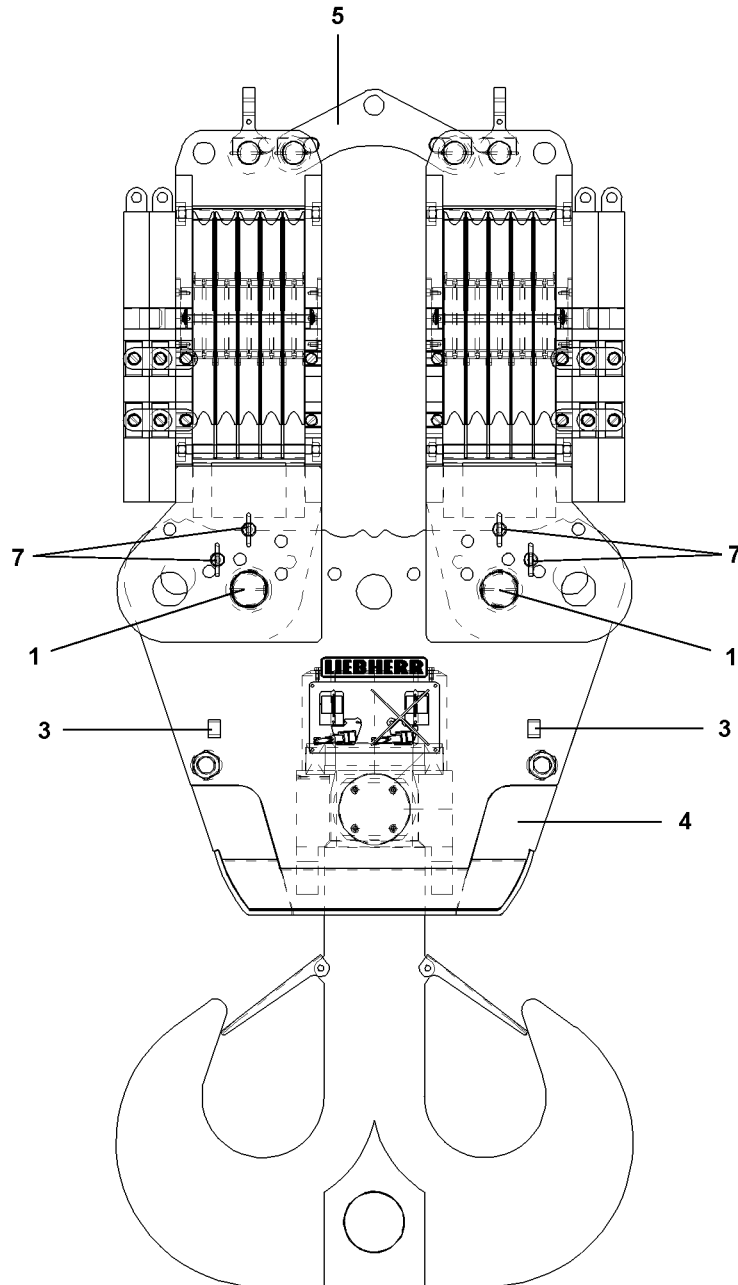
The hook block can fall over!

If the retaining pins **7** are not inserted into the hook block before unreeving or disassembling, then the pulley blocks can tilt away to the side and cause the hook block to topple over!

Personnel can be severely injured or killed!

- ▶ Make sure that all auxiliary weights on the pulley blocks have been removed before disassembling the hook block!
- ▶ Insert the retaining pin **7** into the hook block before unreeving!

- ▶ Before starting hook block disassembly:
Insert the retaining pins **7** into the hook block.
- ▶ When the pulley blocks are secured by the retaining pins **7**:
Remove the block connector **5** on the hook block.
- ▶ Unpin the 8 roller pulley blocks on the cross brace **4**: Release and unpin the pin **1**.



B111455

3.6 Hook block 630 t

Hook block 630 t for a 2 winch operation with cross brace 1350 t.
The 630 t hook block is a double hook block with a double hook.

Load	Strands	Rope pulleys	Hook number	Weight ¹⁾
630 t	2 x 11	2 x 5	320	20 t

1) Hook block without auxiliary weights

3.6.1 Assembling a 630 t hook block

- ▶ Pin the 5 roller pulley blocks (2x) with the cross brace **4**: Insert and secure pin **1**.
- ▶ Install the block connector **5** to the hook block.

In order to prevent the hook block from tilting during assembling and reeving, the retaining pins **7** must be pinned into the hook block.

- ▶ Insert the retaining pins **7**.



WARNING

Shearing off of the retaining pins **7**!

If the retaining pins **7** are not unpinned before the crane operation, then the retaining pins **7** may be shorn off when lifting the load!

Personnel can be severely injured or killed!

- ▶ Unpin the retaining pins **7** before crane operation!

- ▶ Before starting the crane operation:
Insert the retaining pins **7** into the receptacles **3** and secure.

3.6.2 Assembling / disassembling the auxiliary weights



Note

- ▶ The assembly / disassembly of the auxiliary weights is described in section "assembling / disassembling the auxiliary weights"!
- ▶ Notice the minimum required hook block weight!

3.6.3 Disassembling a 630 t hook block



WARNING

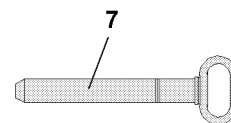
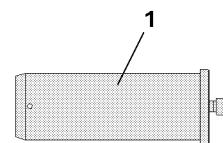
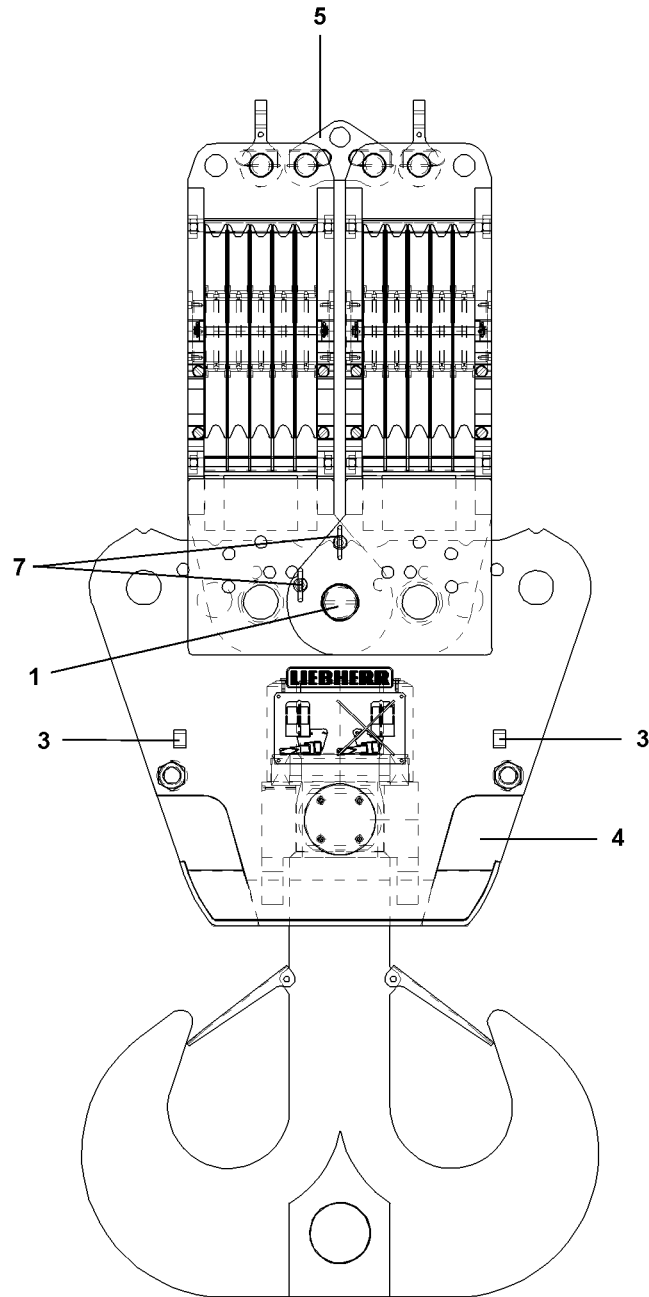
The hook block can fall over!

If the retaining pins **7** are not inserted into the hook block before unreeving or disassembling, then the pulley blocks can tilt away to the side and cause the hook block to topple over!

Personnel can be severely injured or killed!

- ▶ Make sure that all auxiliary weights on the pulley blocks have been removed before disassembling the hook block!
- ▶ Insert the retaining pin **7** into the hook block before unreeving!

- ▶ Before starting hook block disassembly:
Insert the retaining pins **7** into the hook block.
- ▶ When the pulley blocks are secured by the retaining pins **7**:
Remove the block connector **5** on the hook block.
- ▶ Unpin the 5 roller pulley blocks (2x) on the cross brace **4**: Release and unpin the pin **1**.



B111456

3.7 Hook block 560 t

Hook block 560 t for a 1 winch operation with cross brace 1350 t
The 560 t hook block is a single hook block with a double hook.

Load	Strands	Rope pulleys	Hook number	Weight ¹⁾
560 t	1 x 21	2 x 5	320	20 t

1) Hook block without auxiliary weights

3.7.1 Assembling a 560 t hook block

- ▶ Pin the 5 roller pulley blocks (2x) with the cross brace **4**: Insert and secure pin **1**.
- ▶ Install the block connector **5** to the hook block.

In order to prevent the hook block from tilting during assembling and reeving, the retaining pins **7** must be pinned into the hook block.

- ▶ Insert the retaining pins **7**.



WARNING

Shearing off of the retaining pins **7**!

If the retaining pins **7** are not unpinned before the crane operation, then the retaining pins **7** may be shorn off when lifting the load!

Personnel can be severely injured or killed!

- ▶ Unpin the retaining pins **7** before crane operation!

- ▶ Before starting the crane operation:
Insert the retaining pins **7** into the receptacles **3** and secure.

3.7.2 Assembling / disassembling the auxiliary weights



Note

- ▶ The assembly / disassembly of the auxiliary weights is described in section "assembling / disassembling the auxiliary weights"!
- ▶ Notice the minimum required hook block weight!

3.7.3 Disassembling a 560 t hook block



WARNING

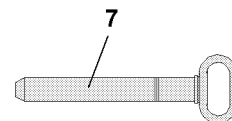
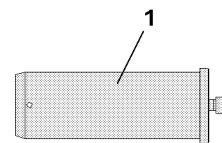
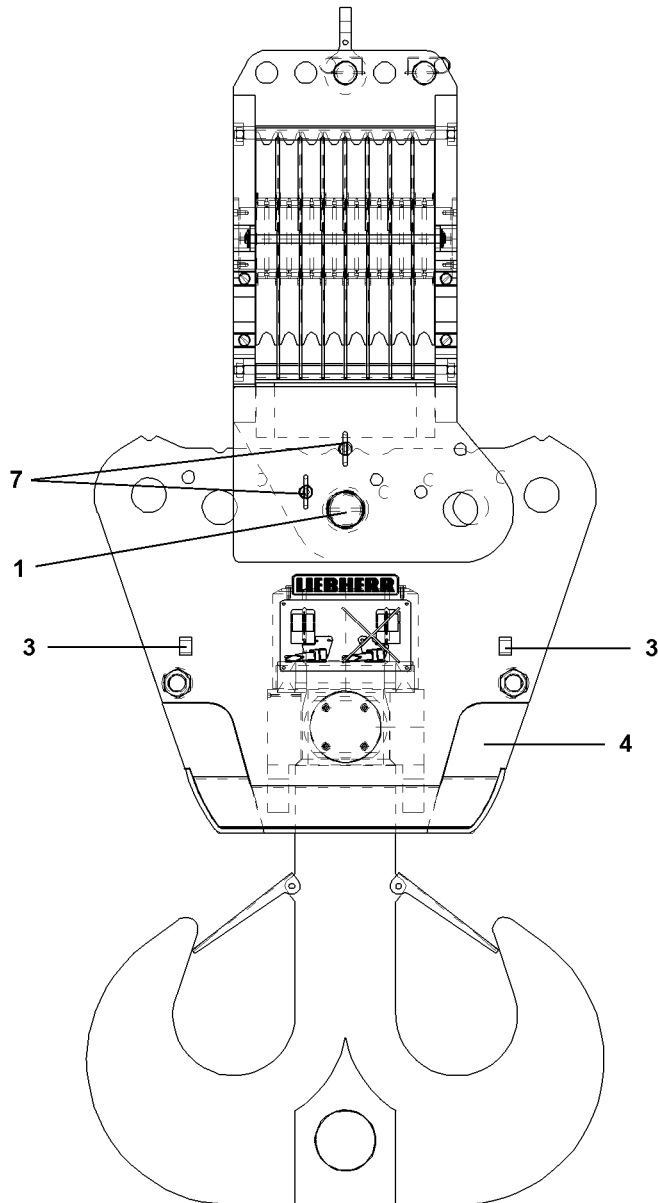
The hook block can fall over!

If the retaining pins **7** are not inserted into the hook block before unreeving or disassembling, then the pulley blocks can tilt away to the side and cause the hook block to topple over!

Personnel can be severely injured or killed!

- ▶ Make sure that all auxiliary weights on the pulley blocks have been removed before disassembling the hook block!
- ▶ Insert the retaining pin **7** into the hook block before unreeving!

- ▶ Before starting hook block disassembly:
Insert the retaining pins **7** into the hook block.
- ▶ When the pulley blocks are secured by the retaining pins **7**:
Remove the block connector **5** on the hook block.
- ▶ Unpin the 5 roller pulley blocks (2x) on the cross brace **4**: Release and unpin the pin **1**.



B111457

3.8 Hook block 470 t

Hook block 470 t for a 1 winch operation with cross brace 1350 t
The 470 t hook block is a single hook block with a double hook.

Load	Strands	Rope pulleys	Hook number	Weight ¹⁾
470 t	1 x 17	8	320	16.5 t

1) Hook block without auxiliary weights

3.8.1 Assembling a 470 t hook block

- ▶ Pin the 8 roller pulley block to the cross brace **4**: Insert and secure pin **1**.

In order to prevent the hook block from tilting during assembling and reeving, the retaining pins **7** must be pinned into the hook block.

- ▶ Insert the retaining pins **7**.



WARNING

Shearing off of the retaining pins **7**!

If the retaining pins **7** are not unpinned before the crane operation, then the retaining pins **7** may be shorn off when lifting the load!

Personnel can be severely injured or killed!

- ▶ Unpin the retaining pins **7** before crane operation!

- ▶ Before starting the crane operation:
Insert the retaining pins **7** into the receptacles **3** and secure.

3.8.2 Assembling / disassembling the auxiliary weights



Note

- ▶ The assembly / disassembly of the auxiliary weights is described in section "assembling / disassembling the auxiliary weights"!
- ▶ Notice the minimum required hook block weight!

3.8.3 Disassembling a 470 t hook block



WARNING

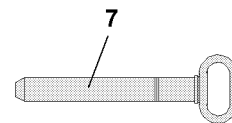
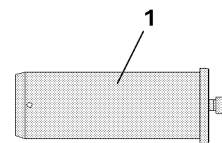
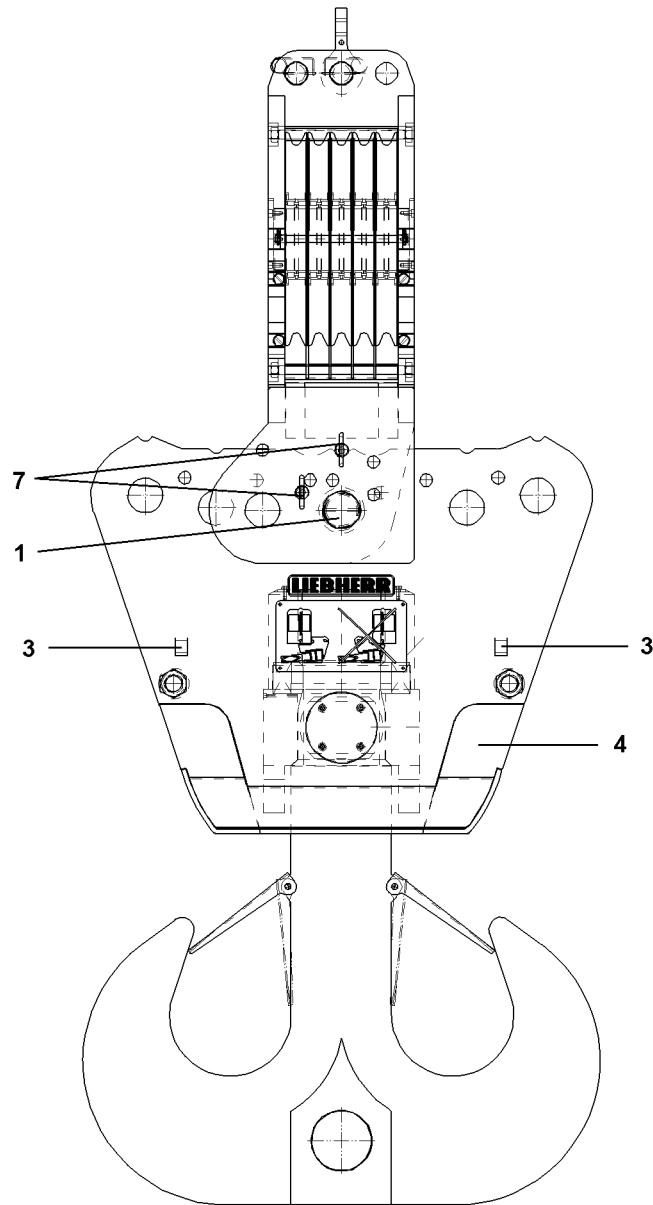
The hook block can fall over!

If the retaining pins **7** are not inserted into the hook block before unreeving or disassembling, then the pulley block can tilt away to the side and cause the hook block to topple over!

Personnel can be severely injured or killed!

- ▶ Make sure that all auxiliary weights on the pulley block have been removed before disassembling the hook block!
- ▶ Insert the retaining pin **7** into the hook block before unreeving!

- ▶ Before starting hook block disassembly:
Insert the retaining pins **7** into the hook block.
- ▶ Unpin the 8 roller pulley block on the cross brace **4**: Release and unpin the pin **1**.



B111458

3.9 Hook block 320 t

Hook block 320 t for a 1 winch operation with cross brace 1350 t
The 320 t hook block is a single hook block with a double hook.

Load	Strands	Rope pulleys	Hook number	Weight ¹⁾
320 t	1 x 11	5	320	15.5 t

1) Hook block without auxiliary weights

3.9.1 Assembling a 320 t hook block

- ▶ Pin the 5 roller pulley block to the cross brace **4**: Insert and secure pin **1**.

In order to prevent the hook block from tilting during assembling and reeving, the retaining pins **7** must be pinned into the hook block.

- ▶ Insert the retaining pins **7**.



WARNING

Shearing off of the retaining pins **7**!

If the retaining pins **7** are not unpinned before the crane operation, then the retaining pins **7** may be shorn off when lifting the load!

Personnel can be severely injured or killed!

- ▶ Unpin the retaining pins **7** before crane operation!

- ▶ Before starting the crane operation:
Insert the retaining pins **7** into the receptacles **3** and secure.

3.9.2 Assembling / disassembling the auxiliary weights



Note

- ▶ The assembly / disassembly of the auxiliary weights is described in section "assembling / disassembling the auxiliary weights"!
- ▶ Notice the minimum required hook block weight!

3.9.3 Disassembling a 320 t hook block



WARNING

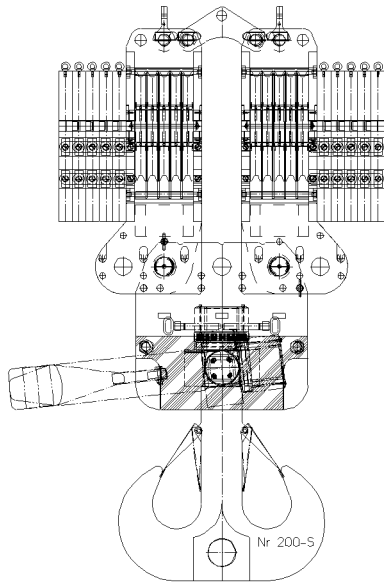
The hook block can fall over!

If the retaining pins **7** are not inserted into the hook block before unreeving or disassembling, then the pulley block can tilt away to the side and cause the hook block to topple over!

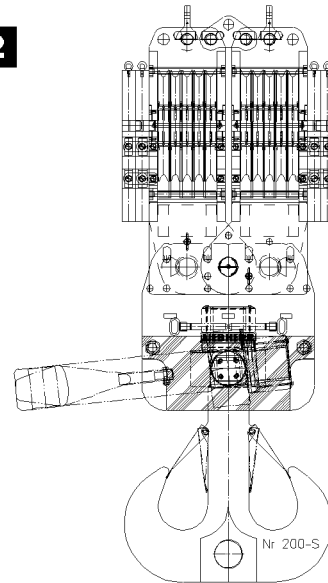
Personnel can be severely injured or killed!

- ▶ Make sure that all auxiliary weights on the pulley block have been removed before disassembling the hook block!
- ▶ Insert the retaining pin **7** into the hook block before unreeving!
- ▶ Before starting hook block disassembly:
Insert the retaining pins **7** into the hook block.
- ▶ Unpin the 5 roller pulley block on the cross brace **4**: Release and unpin the pin **1**.

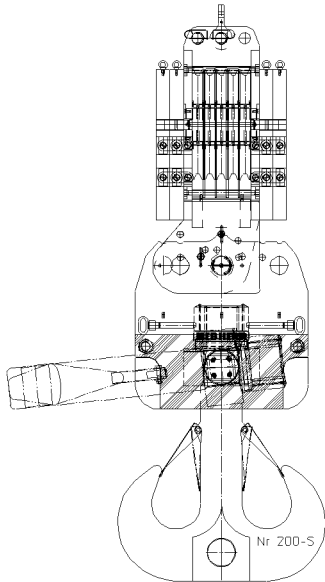
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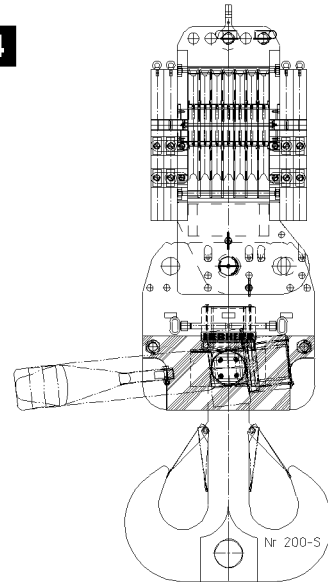
2



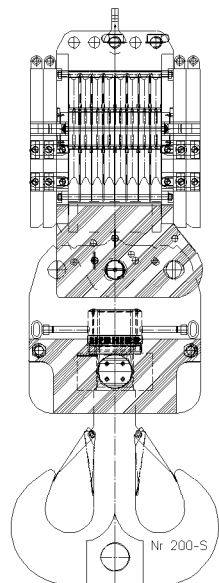
3



4



5



B105438

4 Hook block 630 t

4.1 Possible combinations of the hook block 630 t

The following combinations can be made with the 630 t hook block:

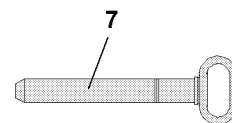
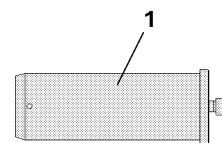
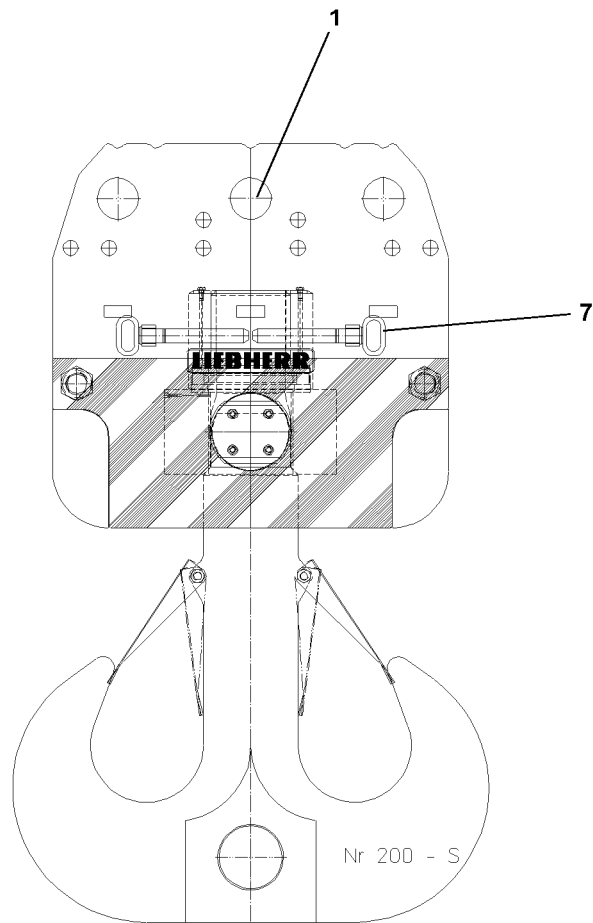
Illustration 1		
Load	Strands	Rope pulleys
630 t	2 x 11	2 x 5

Illustration 2		
Load	Strands	Rope pulleys
560 t	1 x 21	2 x 5

Illustration 3		
Load	Strands	Rope pulleys
470 t	1 x 17	1 x 8

Illustration 4		
Load	Strands	Rope pulleys
420 t	1 x 15	1 x 7

Illustration 5		
Load	Strands	Rope pulleys
320 t	1 x 11	1 x 5



B111459

4.2 Assembling / disassembling a 630 t hook block



WARNING

Risk of accident when assembling/disassembling hook blocks!

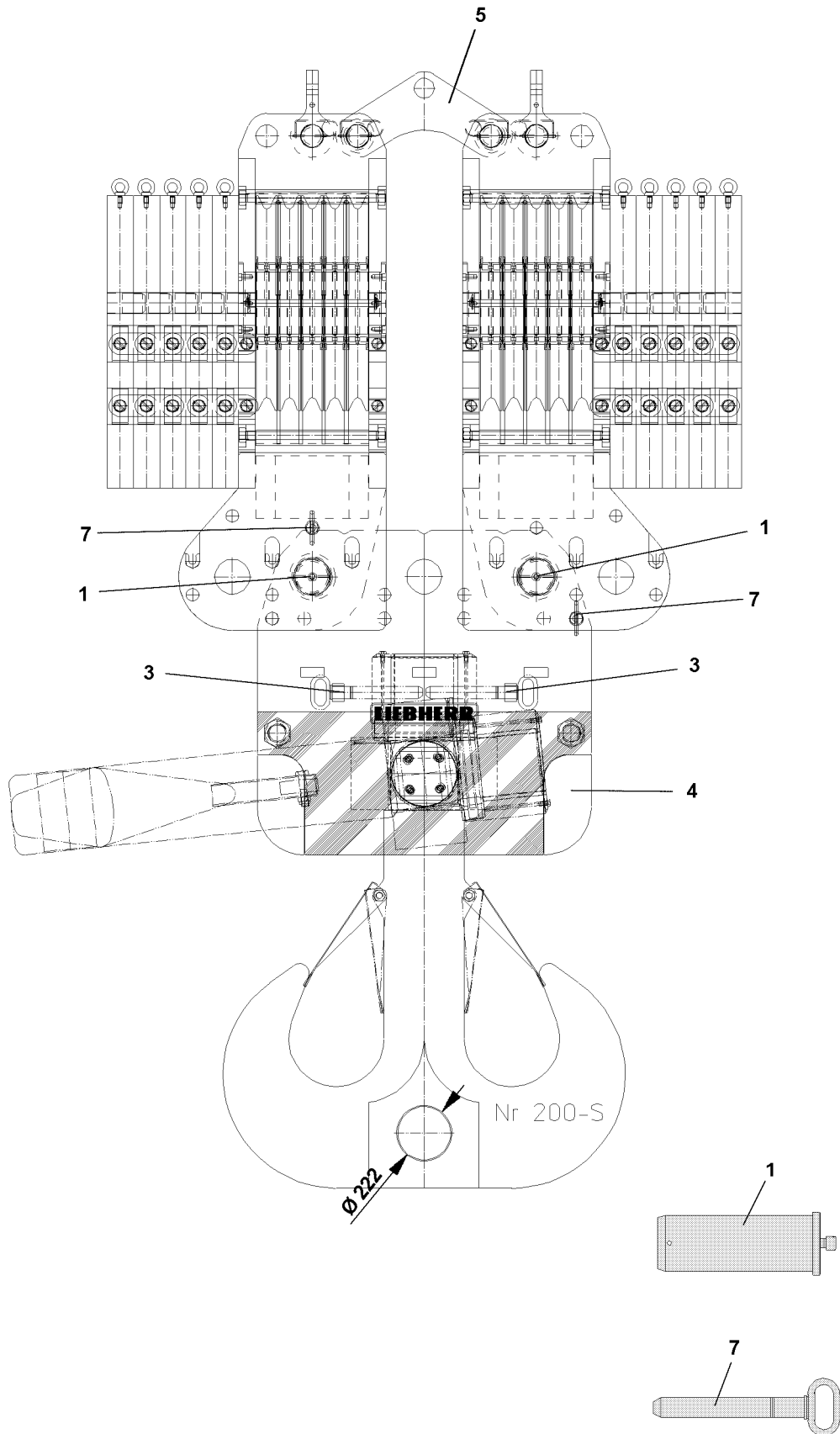
When assembling / disassembling components on the hook block, for example: Components from pulley blocks or block connectors can fall down!

Personnel can be severely injured or killed!

- ▶ Never unpin the retaining pins on unsecured load components!
- ▶ Never unpin the connector pins on unsecured components!
- ▶ It is prohibited for anyone to remain within the entire danger zone while pinning and unpinning components on the hook block!
- ▶ Safely secure the pins in the bearing points as well as receptacles!

4.3 Hook with cross brace 630 t, illustration 1

Load	Hook number
630 t	200



4.4 Hook block 630 t

The 630 t hook block is a double hook block with a double hook for the 2 winch operation.

Load	Strands	Rope pulleys	Hook number	Weight ¹⁾
630 t	2 x 11	2 x 5	200	14 t

1) Hook block without auxiliary weights

4.4.1 Assembling a 630 t hook block

- ▶ Pin the 5 roller pulley blocks (2x) with the cross brace **4**: Insert and secure pin **1**.
- ▶ Install the block connector **5** to the hook block.

In order to prevent the hook block from tilting during assembling and reeving, the retaining pins **7** must be pinned into the hook block.

- ▶ Insert the retaining pins **7**.



WARNING

Shearing off of the retaining pins **7**!

If the retaining pins **7** are not unpinned before the crane operation, then the retaining pins **7** may be shorn off when lifting the load!

Personnel can be severely injured or killed!

- ▶ Unpin the retaining pins **7** before crane operation!

- ▶ Before starting the crane operation:
Insert the retaining pins **7** into the receptacles **3** and secure.

4.4.2 Assembling / disassembling the auxiliary weights



Note

- ▶ The assembly / disassembly of the auxiliary weights is described in section "assembling / disassembling the auxiliary weights"!
- ▶ Notice the minimum required hook block weight!

4.4.3 Disassembling a 630 t hook block



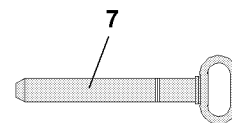
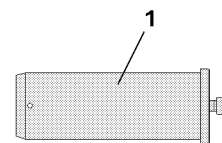
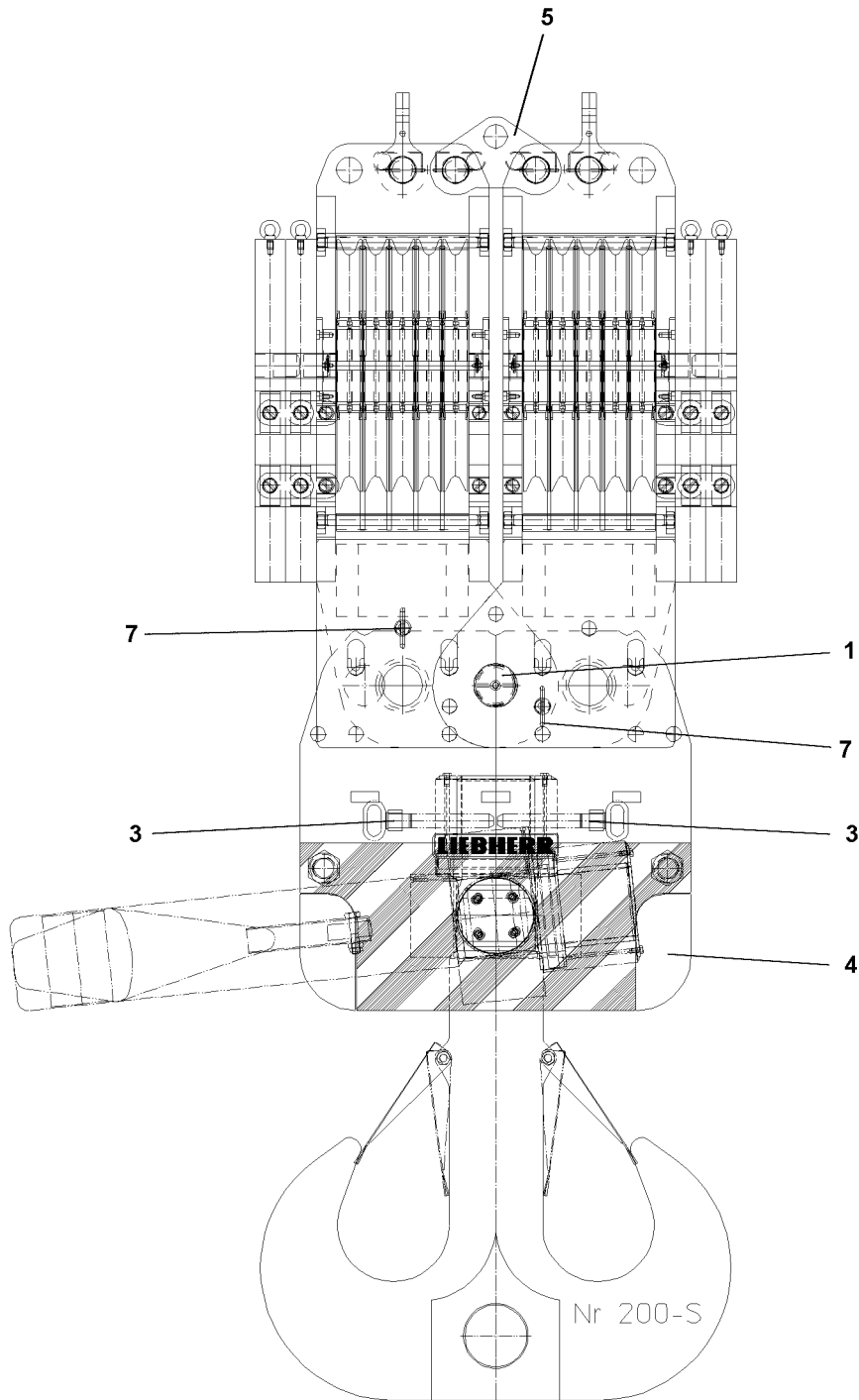
WARNING

The hook block can fall over!

If the retaining pins **7** are not inserted into the hook block before unreeving or disassembling, then the pulley blocks can tilt away to the side and cause the hook block to topple over!

Personnel can be severely injured or killed!

- ▶ Make sure that all auxiliary weights on the pulley blocks have been removed before disassembling the hook block!
- ▶ Insert the retaining pin **7** into the hook block before unreeving!
- ▶ Before starting hook block disassembly:
Insert the retaining pins **7** into the hook block.
- ▶ When the pulley blocks are secured by the retaining pins **7**:
Remove the block connector **5** on the hook block.
- ▶ Unpin the 5 roller pulley blocks (2x) on the cross brace **4**: Release and unpin the pin **1**.



4.5 Hook block 560 t

Hook block 560 t for a 2 winch operation with cross brace 630 t
The 560 t hook block is a double hook block with a double hook.

Load	Strands	Rope pulleys	Hook number	Weight ¹⁾
560 t	2 x 11	2 x 5	200	14 t

1) Hook block without auxiliary weights

4.5.1 Assembling a 560 t hook block

- ▶ Pin the 5 roller pulley blocks (2x) with the cross brace **4**: Insert and secure pin **1**.
- ▶ Install the block connector **5** to the hook block.

In order to prevent the hook block from tilting during assembling and reeving, the retaining pins **7** must be pinned into the hook block.

- ▶ Insert the retaining pins **7**.



WARNING

Shearing off of the retaining pins **7**!

If the retaining pins **7** are not unpinned before the crane operation, then the retaining pins **7** may be shorn off when lifting the load!

Personnel can be severely injured or killed!

- ▶ Unpin the retaining pins **7** before crane operation!

- ▶ Before starting the crane operation:
Insert the retaining pins **7** into the receptacles **3** and secure.

4.5.2 Assembling / disassembling the auxiliary weights



Note

- ▶ The assembly / disassembly of the auxiliary weights is described in section "assembling / disassembling the auxiliary weights"!
- ▶ Notice the minimum required hook block weight!

4.5.3 Disassembling a 560 t hook block



WARNING

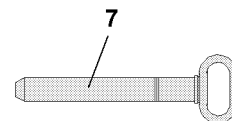
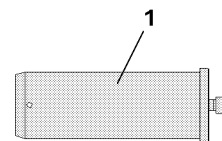
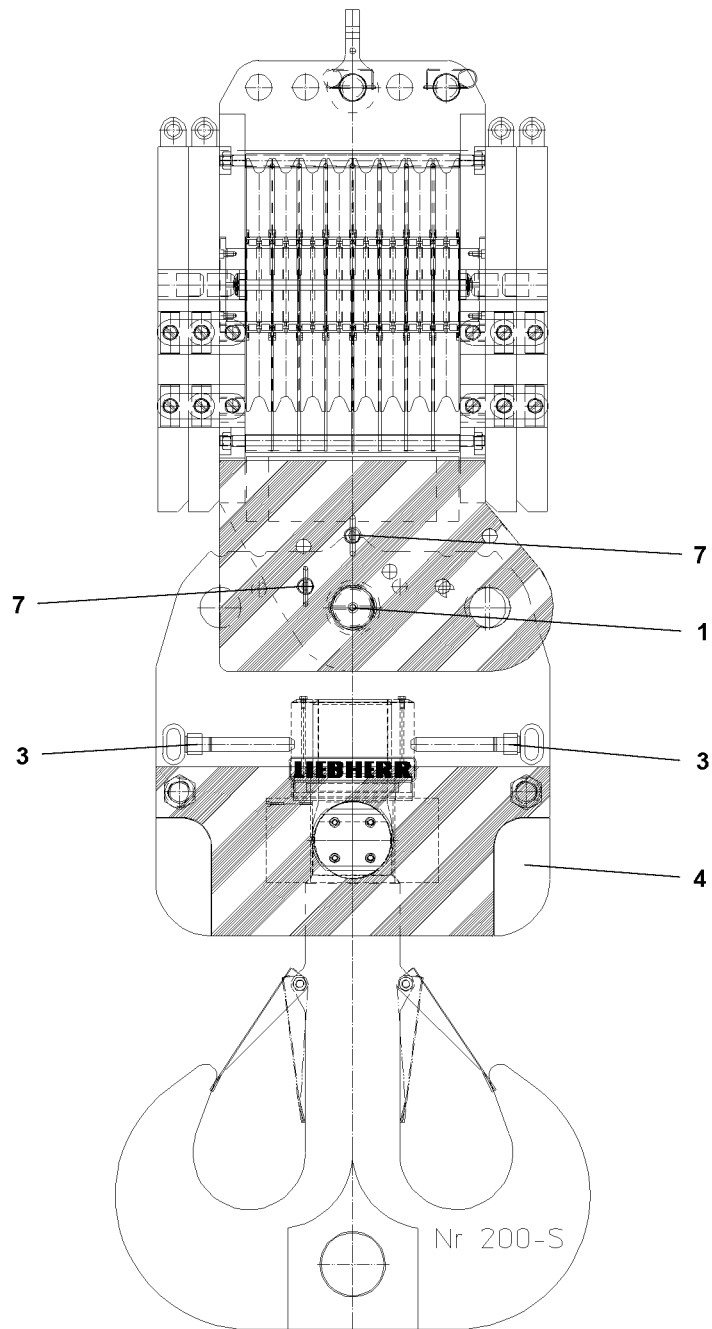
The hook block can fall over!

If the retaining pins **7** are not inserted into the hook block before unreeving or disassembling, then the pulley blocks can tilt away to the side and cause the hook block to topple over!

Personnel can be severely injured or killed!

- ▶ Make sure that all auxiliary weights on the pulley blocks have been removed before disassembling the hook block!
- ▶ Insert the retaining pin **7** into the hook block before unreeving!

- ▶ Before starting hook block disassembly:
Insert the retaining pins **7** into the hook block.
- ▶ When the pulley blocks are secured by the retaining pins **7**:
Remove the block connector **5** on the hook block.
- ▶ Unpin the 5 roller pulley blocks (2x) on the cross brace **4**: Release and unpin the pin **1**.



4.6 Hook block 470 t

Hook block 470 t for a 1 winch operation with cross brace 630 t
The 470 t hook block is a single hook block with a double hook.

Load	Strands	Rope pulleys	Hook number	Weight ¹⁾
470 t	1 x 17	8	200	12 t

1) Hook block without auxiliary weights

4.6.1 Assembling a 470 t hook block

- ▶ Pin the 8 roller pulley block to the cross brace **4**: Insert and secure pin **1**.

In order to prevent the hook block from tilting during assembling and reeving, the retaining pins **7** must be pinned into the hook block.

- ▶ Insert the retaining pins **7**.



WARNING

Shearing off of the retaining pins **7**!

If the retaining pins **7** are not unpinned before the crane operation, then the retaining pins **7** may be shorn off when lifting the load!

Personnel can be severely injured or killed!

- ▶ Unpin the retaining pins **7** before crane operation!

- ▶ Before starting the crane operation:
Insert the retaining pins **7** into the receptacles **3** and secure.

4.6.2 Assembling / disassembling the auxiliary weights



Note

- ▶ The assembly / disassembly of the auxiliary weights is described in section "assembling / disassembling the auxiliary weights"!
- ▶ Notice the minimum required hook block weight!

4.6.3 Disassembling a 470 t hook block



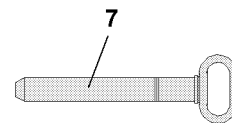
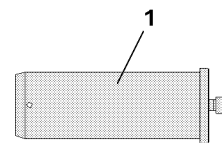
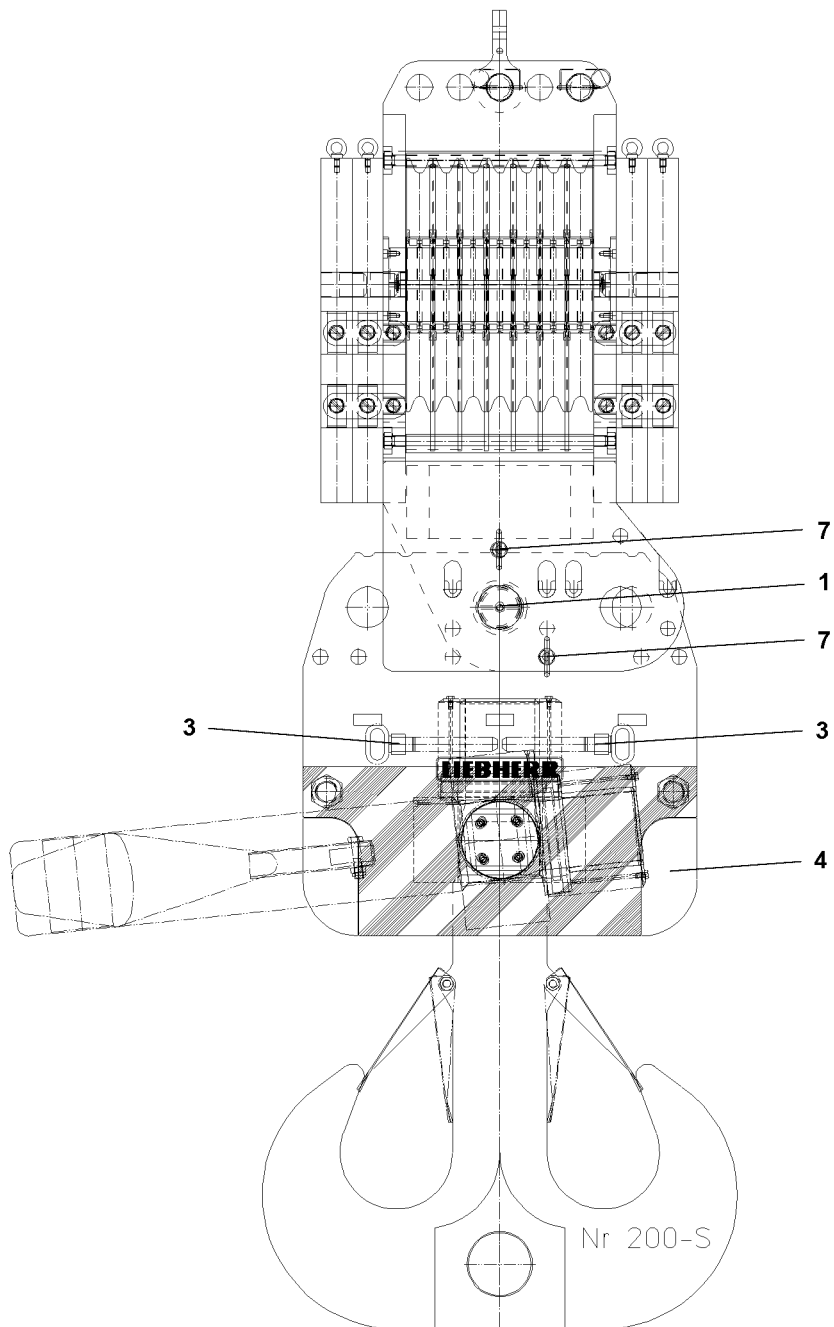
WARNING

The hook block can fall over!

If the retaining pins **7** are not inserted into the hook block before unreeving or disassembling, then the pulley block can tilt away to the side and cause the hook block to topple over!

Personnel can be severely injured or killed!

- ▶ Make sure that all auxiliary weights on the pulley block have been removed before disassembling the hook block!
- ▶ Insert the retaining pin **7** into the hook block before unreeving!
- ▶ Before starting hook block disassembly:
Insert the retaining pins **7** into the hook block.
- ▶ Unpin the 8 roller pulley block on the cross brace **4**: Release and unpin the pin **1**.



4.7 Hook block 420 t

Hook block 420 t for a 1 winch operation with cross brace 630 t
The 420 t hook block is a single hook block with a double hook.

Load	Strands	Rope pulleys	Hook number	Weight ¹⁾
420 t	1 x 15	7	200	12 t

1) Hook block without auxiliary weights

4.7.1 Assembling a 420 t hook block

- ▶ Pin the 7 roller pulley block to the cross brace **4**: Insert and secure pin **1**.

In order to prevent the hook block from tilting during assembling and reeving, the retaining pins **7** must be pinned into the hook block.

- ▶ Insert the retaining pins **7**.



WARNING

Shearing off of the retaining pins **7**!

If the retaining pins **7** are not unpinned before the crane operation, then the retaining pins **7** may be shorn off when lifting the load!

Personnel can be severely injured or killed!

- ▶ Unpin the retaining pins **7** before crane operation!

- ▶ Before starting the crane operation:
Insert the retaining pins **7** into the receptacles **3** and secure.

4.7.2 Assembling / disassembling the auxiliary weights



Note

- ▶ The assembly / disassembly of the auxiliary weights is described in section "assembling / disassembling the auxiliary weights"!
- ▶ Notice the minimum required hook block weight!

4.7.3 Disassembling a 420 t hook block



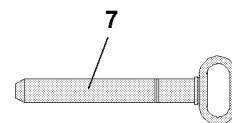
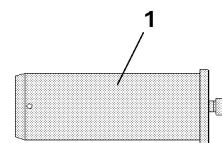
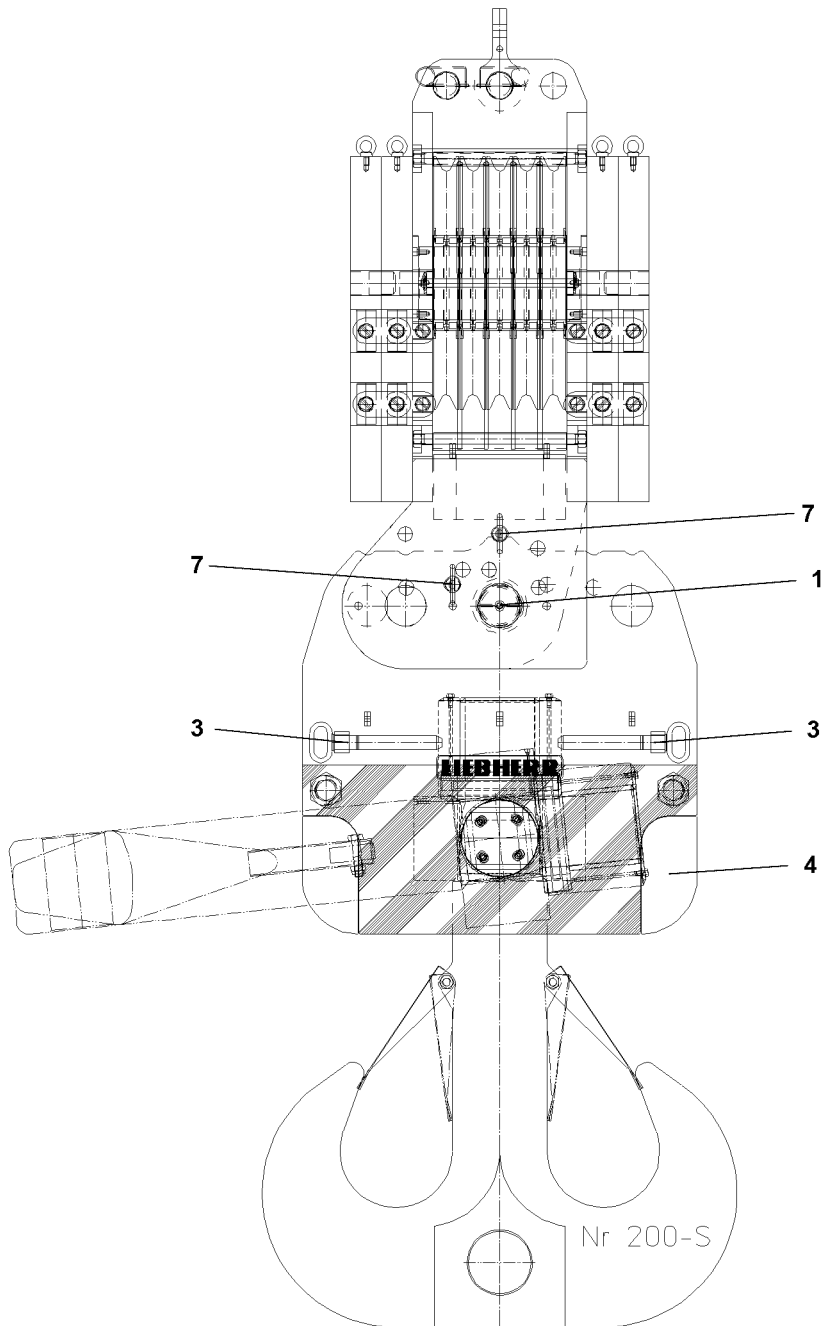
WARNING

The hook block can fall over!

If the retaining pins **7** are not inserted into the hook block before unreeving or disassembling, then the pulley block can tilt away to the side and cause the hook block to topple over!

Personnel can be severely injured or killed!

- ▶ Make sure that all auxiliary weights on the pulley block have been removed before disassembling the hook block!
- ▶ Insert the retaining pin **7** into the hook block before unreeving!
- ▶ Before starting hook block disassembly:
Insert the retaining pins **7** into the hook block.
- ▶ Unpin the 7 roller pulley block on the cross brace **4**: Release and unpin the pin **1**.



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4.8 Hook block 320 t

Hook block 320 t for a 1 winch operation with cross brace 630 t
The 320 t hook block is a single hook block with a double hook.

Load	Strands	Rope pulleys	Hook number	Weight ¹⁾
320 t	1 x 11	5	200	10 t

1) Hook block without auxiliary weights

4.8.1 Assembling a 320 t hook block

- ▶ Pin the 5 roller pulley block to the cross brace **4**: Insert and secure pin **1**.

In order to prevent the hook block from tilting during assembling and reeving, the retaining pins **7** must be pinned into the hook block.

- ▶ Insert the retaining pins **7**.



WARNING

Shearing off of the retaining pins **7**!

If the retaining pins **7** are not unpinned before the crane operation, then the retaining pins **7** may be shorn off when lifting the load!

Personnel can be severely injured or killed!

- ▶ Unpin the retaining pins **7** before crane operation!

- ▶ Before starting the crane operation:
Insert the retaining pins **7** into the receptacles **3** and secure.

4.8.2 Assembling / disassembling the auxiliary weights



Note

- ▶ The assembly / disassembly of the auxiliary weights is described in section "assembling / disassembling the auxiliary weights"!
- ▶ Notice the minimum required hook block weight!

4.8.3 Disassembling a 320 t hook block



WARNING

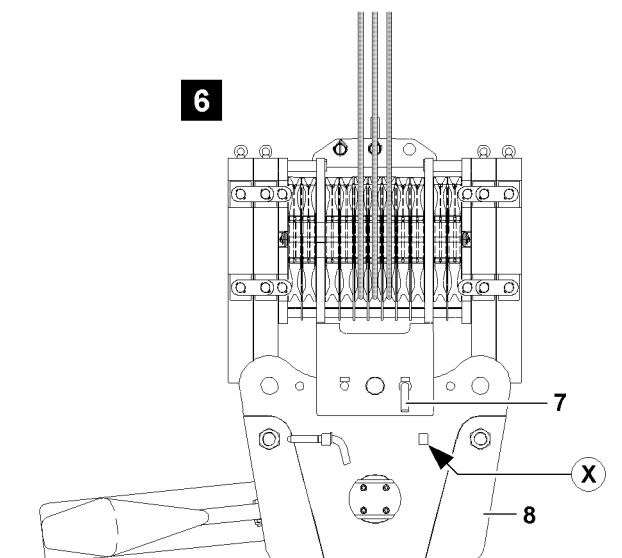
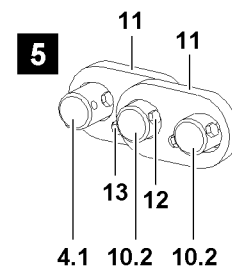
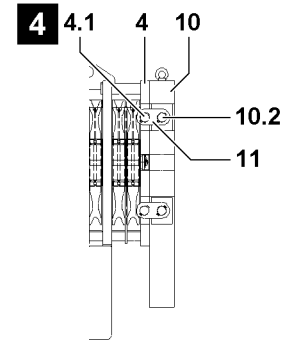
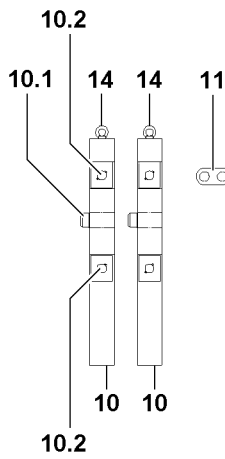
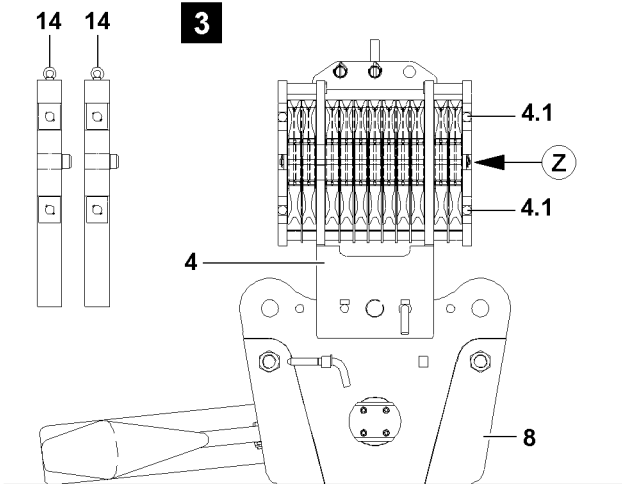
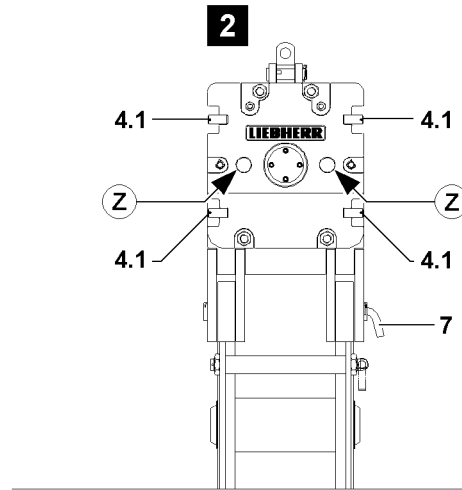
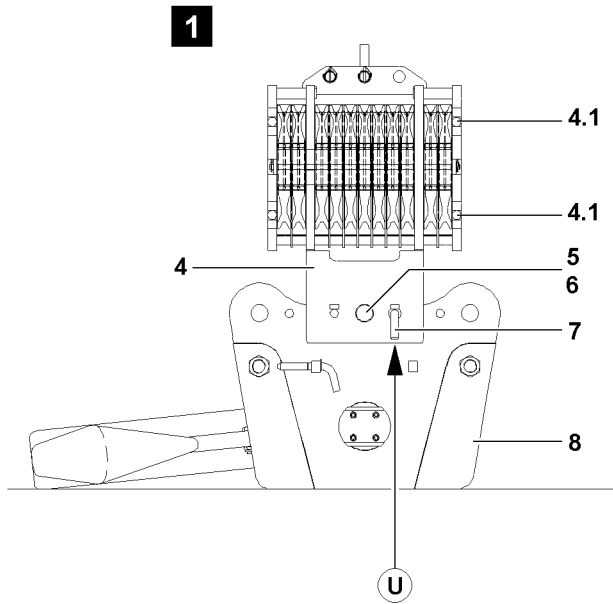
The hook block can fall over!

If the retaining pins **7** are not inserted into the hook block before unreeving or disassembling, then the pulley block can tilt away to the side and cause the hook block to topple over!

Personnel can be severely injured or killed!

- ▶ Make sure that all auxiliary weights on the pulley block have been removed before disassembling the hook block!
- ▶ Insert the retaining pin **7** into the hook block before unreeving!

- ▶ Before starting hook block disassembly:
Insert the retaining pins **7** into the hook block.
- ▶ Unpin the 5 roller pulley block on the cross brace **4**: Release and unpin the pin **1**.



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5 Assembling / disassembling the auxiliary weights



Note

- ▶ The assembly of the auxiliary weights is described in this section as an example!
- ▶ The hook blocks shown in this section may not exactly match your crane!

5.1 Assembling / disassembling auxiliary weights on the double hook block for single operation

5.1.1 Installing the auxiliary weights



Note

- ▶ The own weight for each auxiliary weight is marked on the auxiliary weight!



WARNING

Toppling of hook block!

If the auxiliary weights are installed one-sided, the hook block can topple over!

Personnel can be severely injured or killed!

- ▶ The auxiliary weights may only be installed **individually** and alternating left and right on the pulley block!
- ▶ When the required auxiliary weight is installed on the pulley block, the difference between the left and right side may never be more than one auxiliary weight!
- ▶ Asymmetrical installation of auxiliary weights is prohibited!

Make sure that the following prerequisites are met:

- The hook block is placed on the ground.
- The pulley block **4** is properly installed and secured.
- The retaining pin **7** is pinned and secured at point **U**.



WARNING

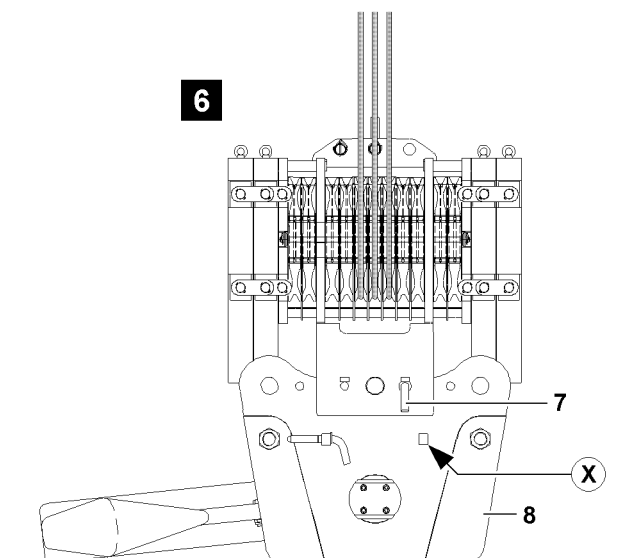
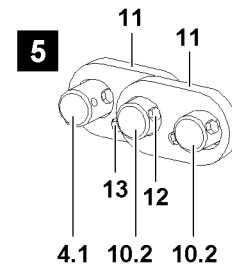
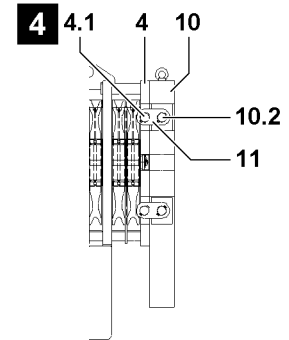
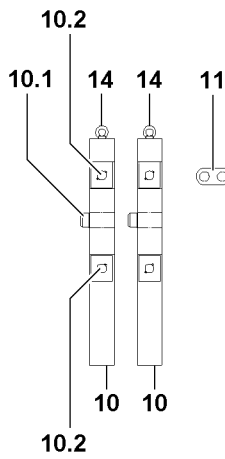
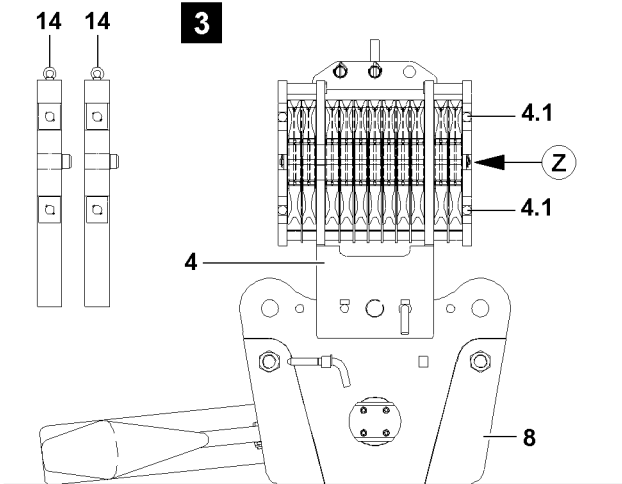
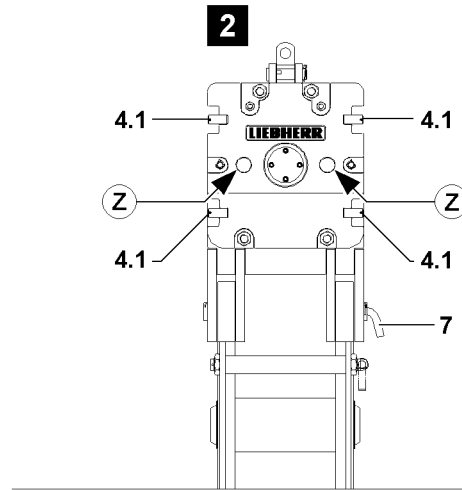
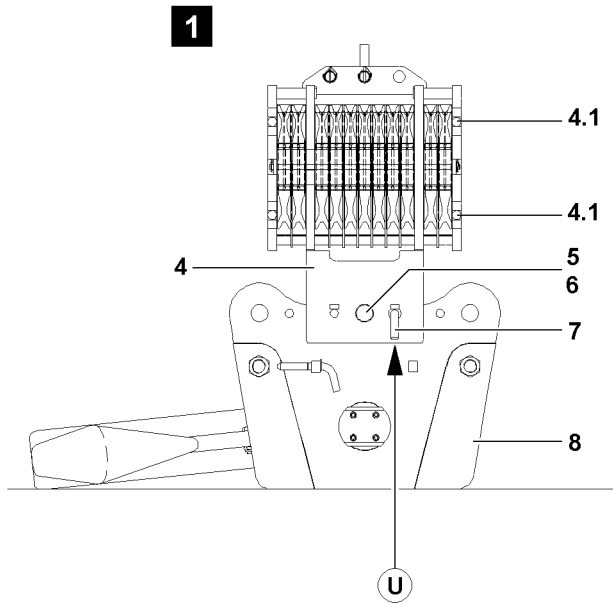
Falling auxiliary weights!

If the auxiliary weights are not properly installed on the pulley block, then they can fall down during installation or in crane operation!

Personnel can be severely injured or killed!

- ▶ Standing under a suspended auxiliary weight is prohibited!
- ▶ Make sure that the auxiliary weights are properly installed and secured!
- ▶ Crane operation with insufficiently secured auxiliary weights is prohibited!

- ▶ Attach the auxiliary weight **10** on the ring screw **14** on the auxiliary crane, illustration **3**.



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**WARNING**

Danger of crushing!

When swinging the auxiliary weights to the pulley block, personnel can be severely injured or killed! Fingers, hands and arms can be crushed or severed!

- ▶ It is prohibited for anyone to remain between the pulley block and the auxiliary weight!
- ▶ Swing auxiliary weights in to the pulley block with utmost caution and at the least possible speed!

- ▶ Align the auxiliary weight **10** on the pulley block **4**.
- ▶ Move the centering pin **10.1** of the auxiliary weight into the centering bores **Z** on the pulley block **4**, illustration **4**.

**WARNING**

Falling auxiliary weights!

If all mounting brackets are removed simultaneously on an unsecured auxiliary weight, then the auxiliary weight can fall down!

Personnel can be severely injured or killed!

- ▶ Never remove all mounting brackets of an unsecured auxiliary weight at the same time!
- ▶ Always install or remove the mounting brackets alternately!

- ▶ Install the mounting brackets **11** on the side and connect the pulley block **4** with the auxiliary weight **10**, illustration **5**.
- ▶ Secure the mounting brackets **11** with screws **12** and lock nuts **13**, illustration **5**.

**Note**

- ▶ Additional auxiliary weights must be connected with the mounting brackets **11**!

**WARNING**

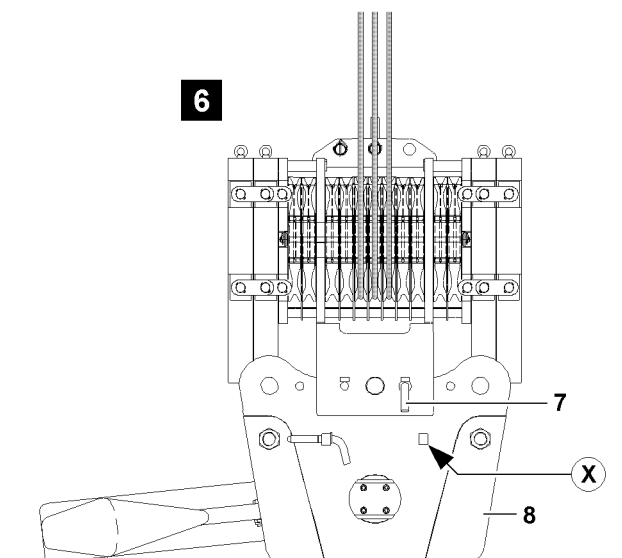
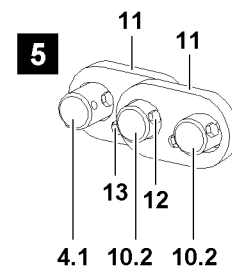
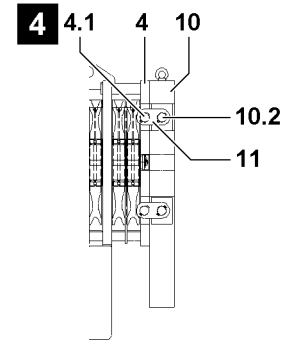
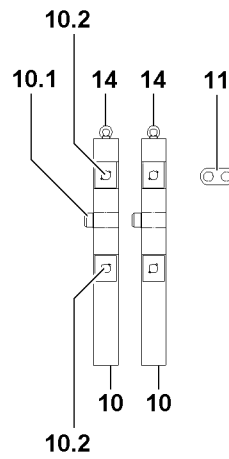
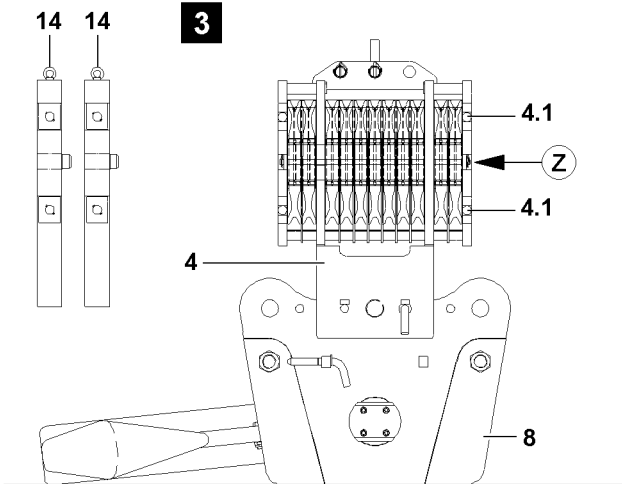
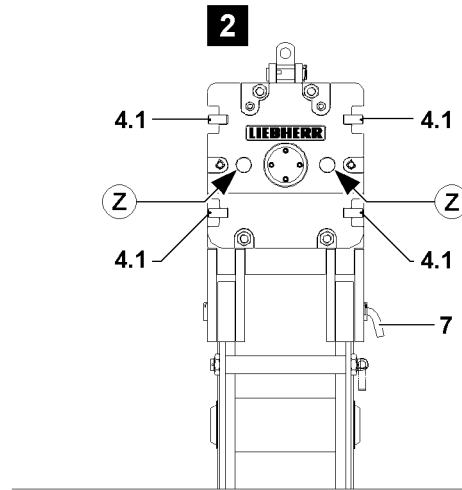
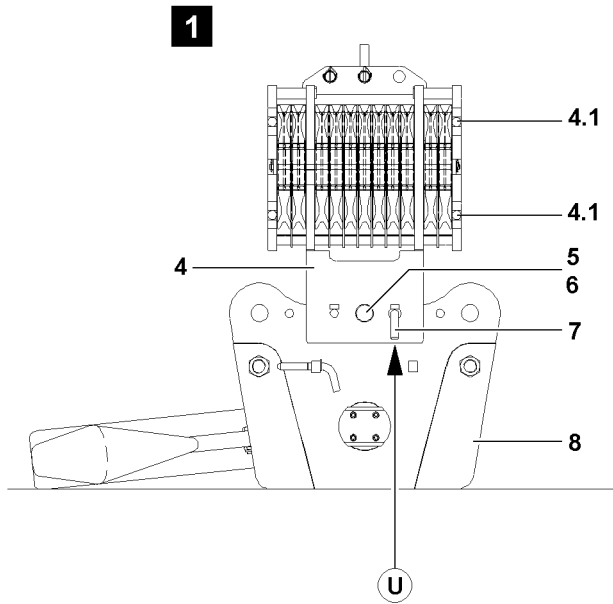
Falling auxiliary weights!

The auxiliary weights can fall down by removing the auxiliary crane!

Personnel can be severely injured or killed!

- ▶ Remove the auxiliary crane only when it is ensured that the auxiliary weight **10** is properly secured with the mounting brackets **11**!

- ▶ When the respective auxiliary weight is properly installed and secured:
Remove the auxiliary crane.



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5.1.2 Removing the auxiliary weights



Note

- ▶ The own weight for each auxiliary weight is marked on the auxiliary weight!



WARNING

Toppling of hook block!

If the auxiliary weights are removed one-sided, the hook block can topple over!

Personnel can be severely injured or killed!

- ▶ The auxiliary weights may only be removed **individually** and alternating left and right on the pulley block!
- ▶ The difference between the left and the right side at removal of the auxiliary weights may never be more than one auxiliary weight!
- ▶ Asymmetrical removal of auxiliary weights is prohibited!

Make sure that the following prerequisite is met:

- The retaining pin **7** is pinned and secured at point **U**.



WARNING

Falling auxiliary weights!

If the auxiliary weights on the pulley block are not properly removed, then they can fall down at removal!

Personnel can be severely injured or killed!

- ▶ Standing under a suspended auxiliary weight is prohibited!

- ▶ Attach the auxiliary weight **10** on the ring screw **14** on the auxiliary crane.

- ▶ Tension the fastening equipment carefully.



WARNING

Oscillating auxiliary weights!

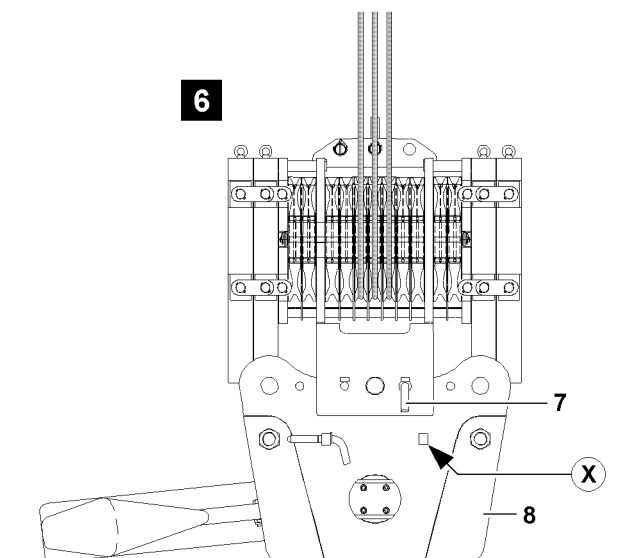
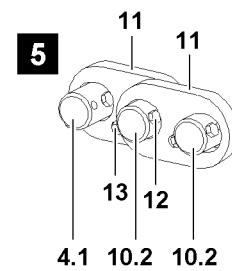
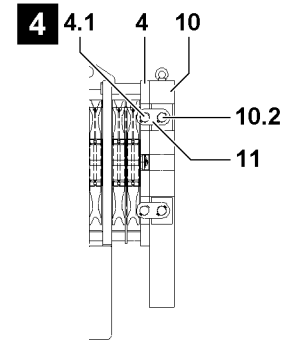
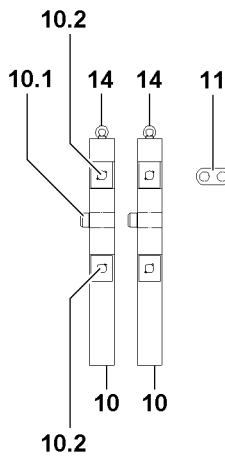
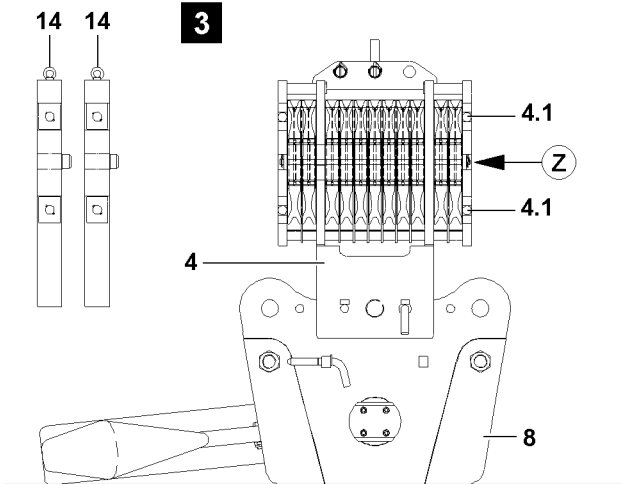
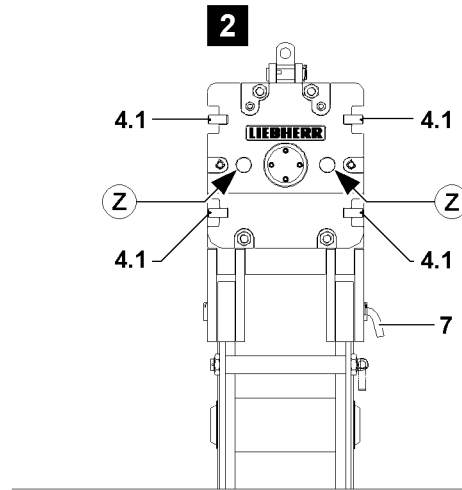
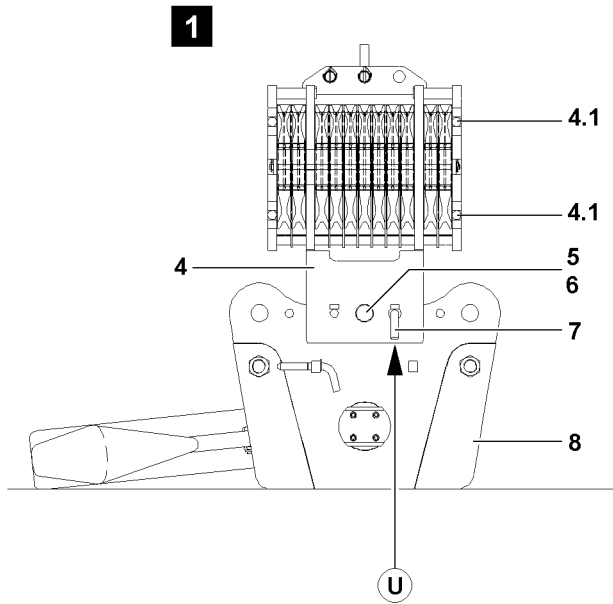
During the removal of the auxiliary weights, the auxiliary weights can start to swing back and forth!

Personnel can be severely injured or killed!

- ▶ It is prohibited for anyone to remain in the danger zone!
- ▶ Make sure that the auxiliary weight which is being removed is properly attached on the auxiliary crane before releasing the mounting brackets!
- ▶ Angular pull is prohibited!

- ▶ When the fastening equipment is tensioned on the auxiliary weight:

Release the screw connection on the mounting brackets of the outermost auxiliary weight and remove the screws.



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**WARNING**

Falling auxiliary weights!

If all mounting brackets are removed simultaneously on an unsecured auxiliary weight, then the auxiliary weight can fall down!

Personnel can be severely injured or killed!

- ▶ Never remove all mounting brackets of an unsecured auxiliary weight at the same time!
- ▶ Always install or remove the mounting brackets alternately!

- ▶ Pull the mounting brackets **11** off to the side.

**WARNING**

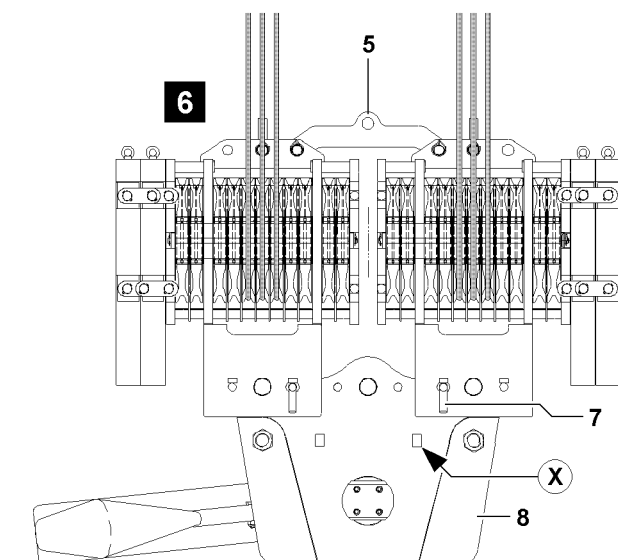
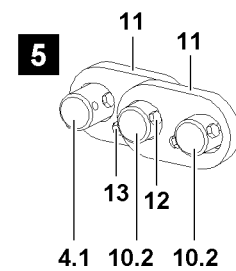
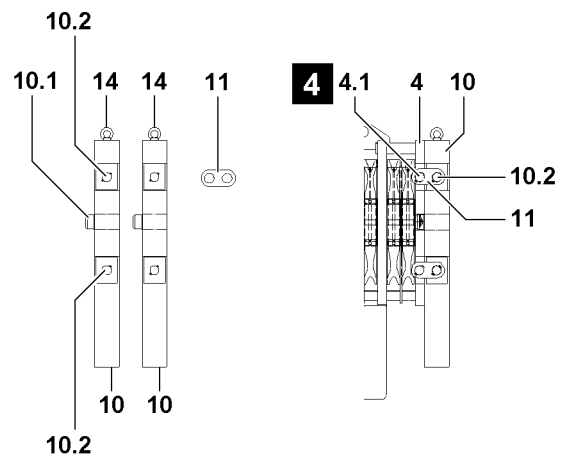
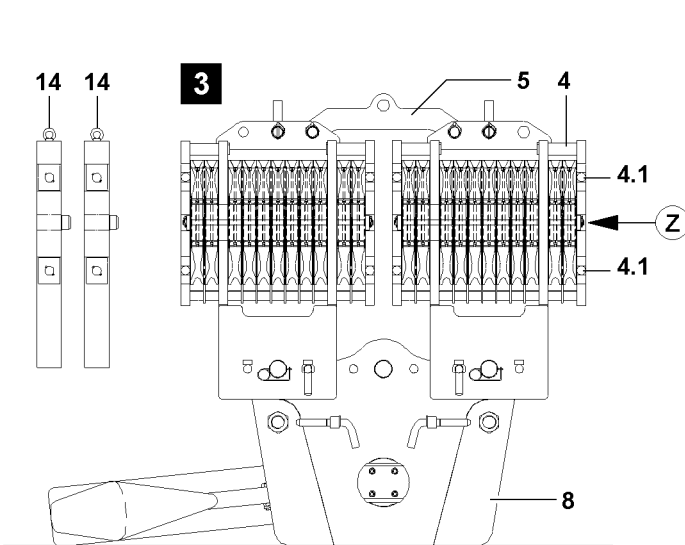
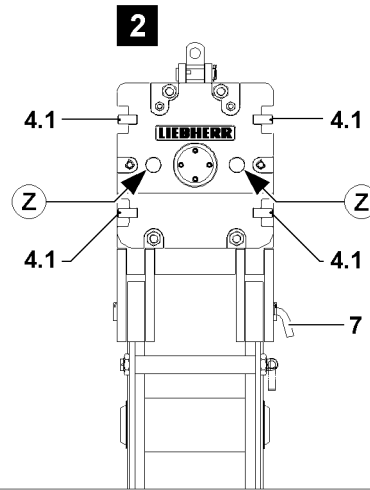
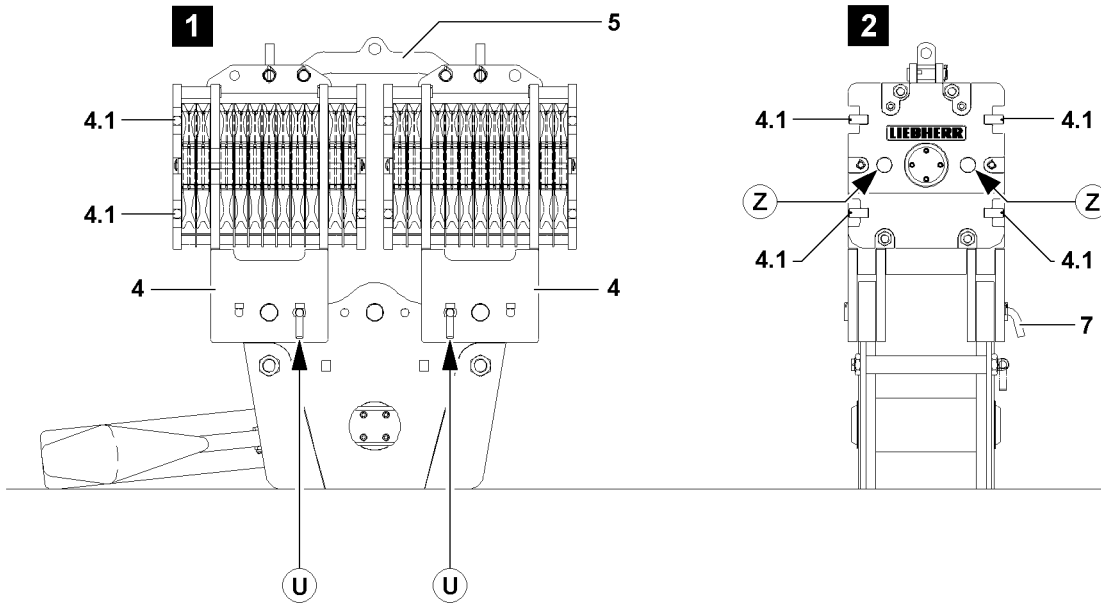
Falling auxiliary weights!

If additional auxiliary weights which are being removed are released, then these auxiliary weights can fall down!

Personnel can be severely injured or killed!

- ▶ Make sure, before removing the outermost auxiliary weight, that the other auxiliary weights are secured with the mounting brackets!

- ▶ If additional mounting brackets must be removed to release the outermost auxiliary weight: Reinstall the mounting brackets again immediately, so that only the auxiliary weight which is being removed is released.
- ▶ Lift the auxiliary weight with the auxiliary crane from the pulley block.
- ▶ Place the auxiliary weight onto the ground.
- ▶ Remove the auxiliary crane.
- ▶ Remove additional auxiliary weights as described above.



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5.2 Assembling / disassembling auxiliary weights on the double hook block for parallel operation

5.2.1 Installing the auxiliary weights



Note

- ▶ The own weight for each auxiliary weight is marked on the auxiliary weight!



WARNING

Toppling of hook block!

If the auxiliary weights are installed one-sided, the hook block can topple over!

Personnel can be severely injured or killed!

- ▶ The auxiliary weights may only be placed **individually** and alternating left and right on the pulley blocks of the hook block!
- ▶ When the required auxiliary weight is installed on the pulley blocks, the difference between the left and right side may never be more than one auxiliary weight!
- ▶ Asymmetrical installation of auxiliary weights is prohibited!

Make sure that the following prerequisites are met:

- The hook block is placed on the ground.
- The pulley blocks **4** are properly installed and secured.
- The retaining pins **7** are pinned in and secured at point **U**.
- The block connector **1** is properly installed and secured.



WARNING

Falling auxiliary weights!

If the auxiliary weights on the pulley blocks are not properly installed, then they can fall down during installation or during crane operation!

Personnel can be severely injured or killed!

- ▶ Standing under a suspended auxiliary weight is prohibited!
- ▶ Make sure that the auxiliary weights are properly installed and secured!
- ▶ Crane operation with insufficiently secured auxiliary weights is prohibited!

- ▶ Attach the auxiliary weight **10** on the ring screw **14** on the auxiliary crane.



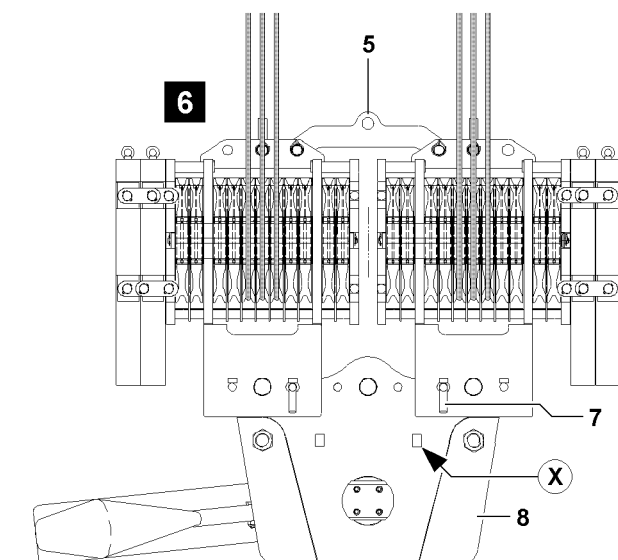
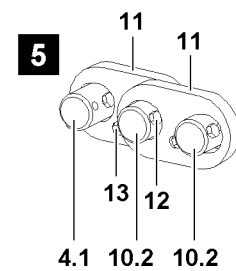
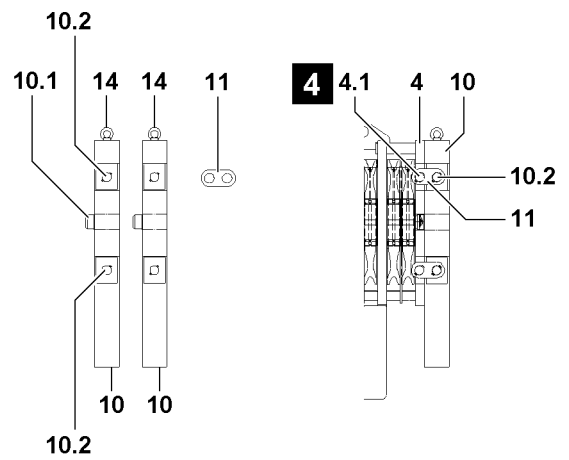
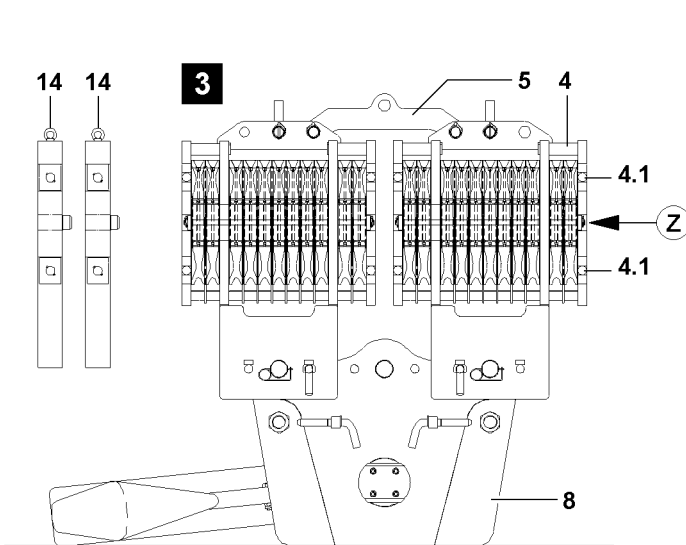
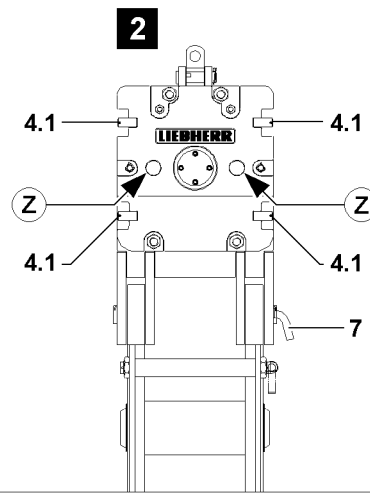
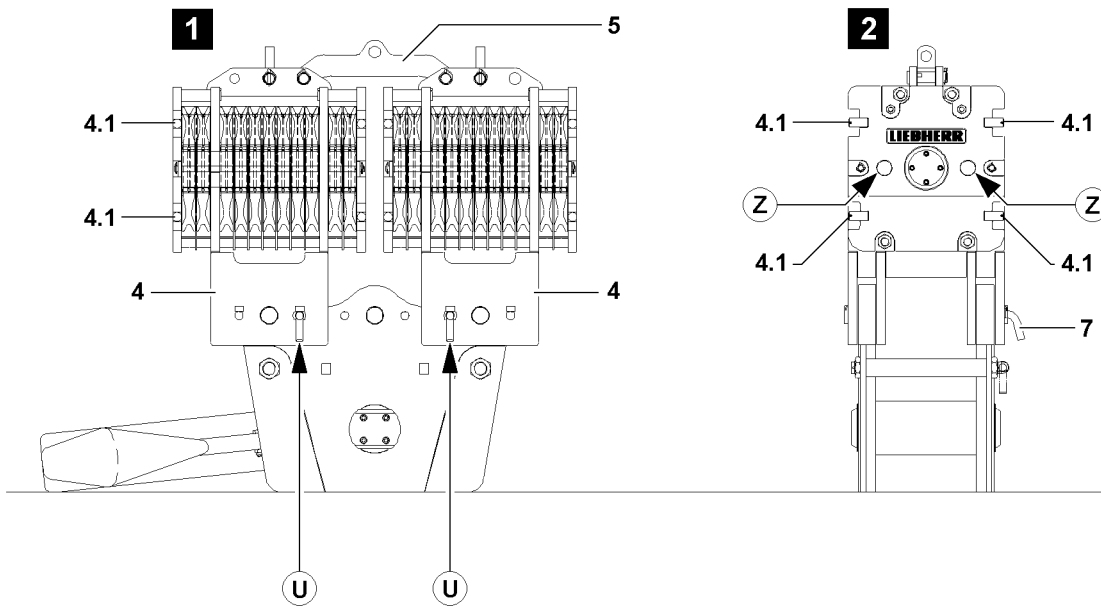
WARNING

Danger of crushing!

When swinging the auxiliary weights to the pulley block, personnel can be severely injured or killed!

Fingers, hands and arms can be crushed or severed!

- ▶ It is prohibited for anyone to remain between the pulley blocks and the auxiliary weight!
- ▶ Swing auxiliary weights in to the pulley block with utmost caution and at the least possible speed!



B111465

- ▶ Align the auxiliary weight **10** on the pulley block **4**.
- ▶ Move the centering pin **10.1** of the auxiliary weight into the centering bores **Z** on the pulley block **4**, illustration **4**.

**WARNING**

Falling auxiliary weights!

If all mounting brackets are removed simultaneously on an unsecured auxiliary weight, then the auxiliary weight can fall down!

Personnel can be severely injured or killed!

- ▶ Never remove all mounting brackets of an unsecured auxiliary weight at the same time!
- ▶ Always install or remove the mounting brackets alternately!

- ▶ Install the mounting brackets **11** on the side and connect the pulley block **4** with the auxiliary weight **10**, illustration **5**.
- ▶ Secure the mounting brackets **11** with screws **12** and lock nuts **13**, illustration **5**.

**Note**

- ▶ Additional auxiliary weights must be connected with the mounting brackets **11**!

**WARNING**

Falling auxiliary weights!

The auxiliary weights can fall down to the side when the auxiliary crane is removed!

Personnel can be severely injured or killed!

- ▶ Remove the auxiliary crane only when it is ensured that the auxiliary weight **10** is properly secured with the mounting brackets **11**!

- ▶ When the respective auxiliary weight is properly installed and secured:
Remove the auxiliary crane.

5.2.2 Removing the auxiliary weights

**Note**

- ▶ The own weight for each auxiliary weight is marked on the auxiliary weight!

**WARNING**

Toppling of hook block!

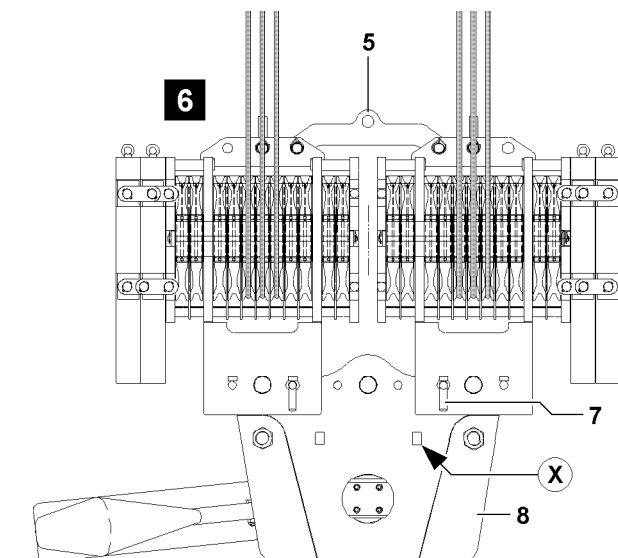
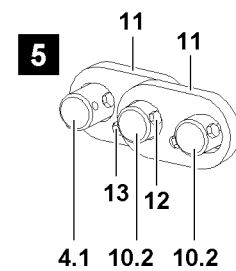
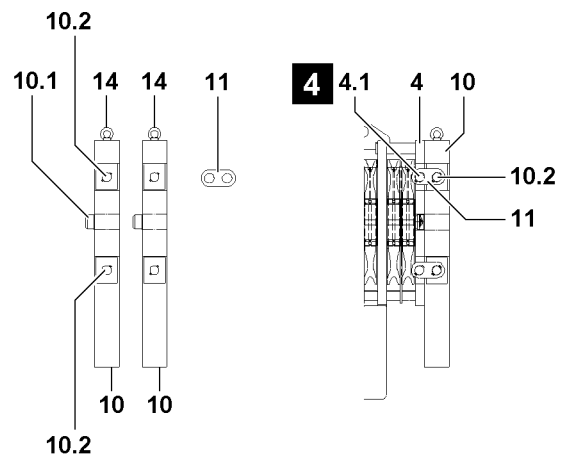
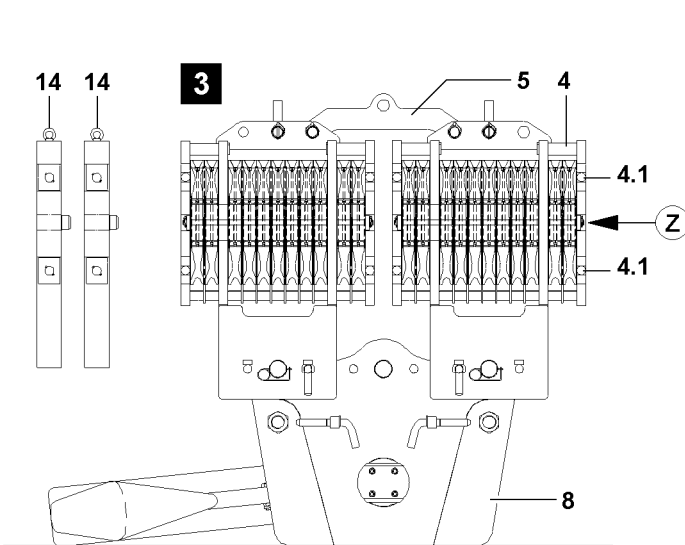
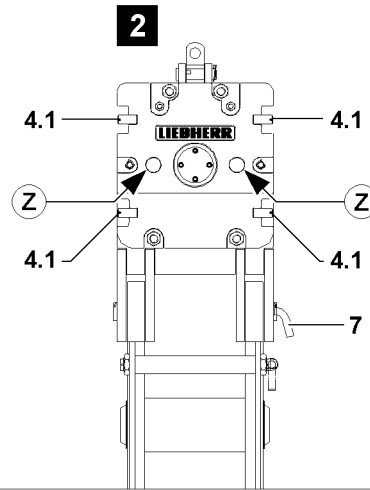
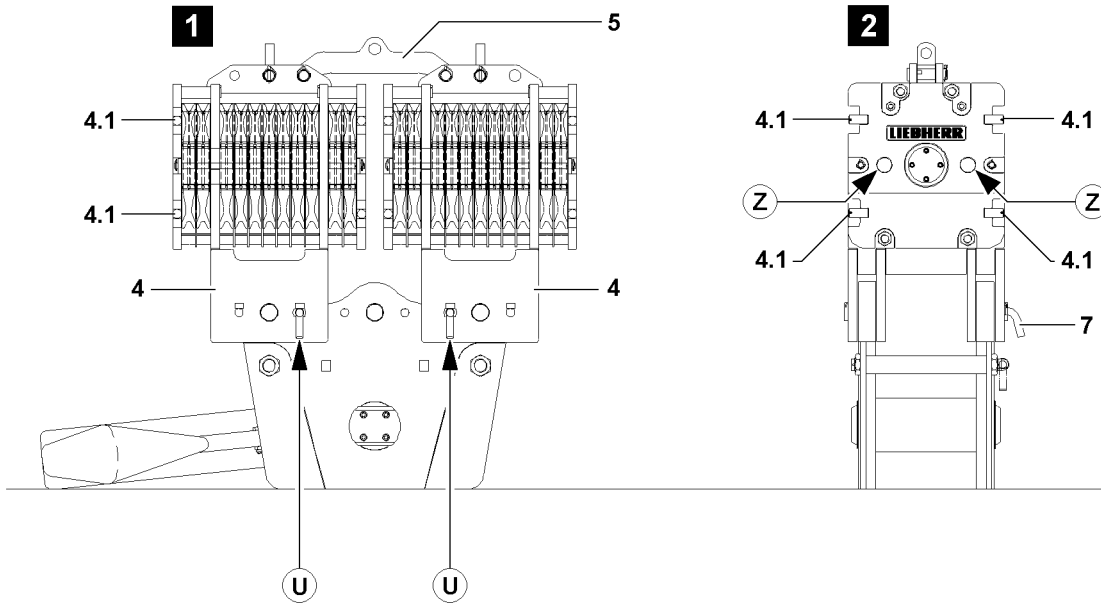
If the auxiliary weights are removed one-sided, the hook block can topple over!

Personnel can be severely injured or killed!

- ▶ The auxiliary weights may only be removed **individually** and alternating left and right on the pulley blocks of the hook block!
- ▶ The difference between the left and the right side at removal of the auxiliary weights may never be more than one auxiliary weight!
- ▶ Asymmetrical removal of auxiliary weights is prohibited!

Make sure that the following prerequisites are met:

- The retaining pins **7** are pinned and secured on both sides at point **U**.
- The block connector **1** has been removed.



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**WARNING**

Falling auxiliary weights!

If the auxiliary weights on the pulley blocks are not properly removed, then they can fall down at removal!

Personnel can be severely injured or killed!

▶ Standing under a suspended auxiliary weight is prohibited!

▶ Attach the auxiliary weight **10** on the ring screw **14** on the auxiliary crane.

▶ Tension the fastening equipment carefully.

**WARNING**

Oscillating auxiliary weights!

During the removal of the auxiliary weights, the auxiliary weights can start to swing back and forth!

Personnel can be severely injured or killed!

▶ It is prohibited for anyone to remain in the danger zone!

▶ Make sure that the auxiliary weight which is being removed is properly attached on the auxiliary crane before releasing the mounting brackets!

▶ Angular pull is prohibited!

▶ When the fastening equipment is tensioned on the auxiliary weight:

Release the screw connection on the mounting brackets of the outermost auxiliary weight and remove the screws.

**WARNING**

Falling auxiliary weights!

If all mounting brackets are removed simultaneously on an unsecured auxiliary weight, then the auxiliary weight can fall down!

Personnel can be severely injured or killed!

▶ Never remove all mounting brackets of an unsecured auxiliary weight at the same time!

▶ Always install or remove the mounting brackets alternately!

▶ Pull the mounting brackets **11** off to the side.

**WARNING**

Falling auxiliary weights!

If additional auxiliary weights which are being removed are released, then these auxiliary weights can fall down!

Personnel can be severely injured or killed!

▶ Make sure, before removing the outermost auxiliary weight, that the other auxiliary weights are secured with the mounting brackets!

▶ If additional mounting brackets must be removed to release the outermost auxiliary weight:

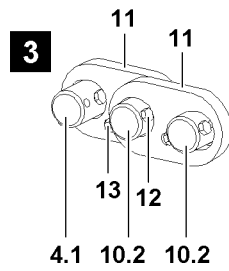
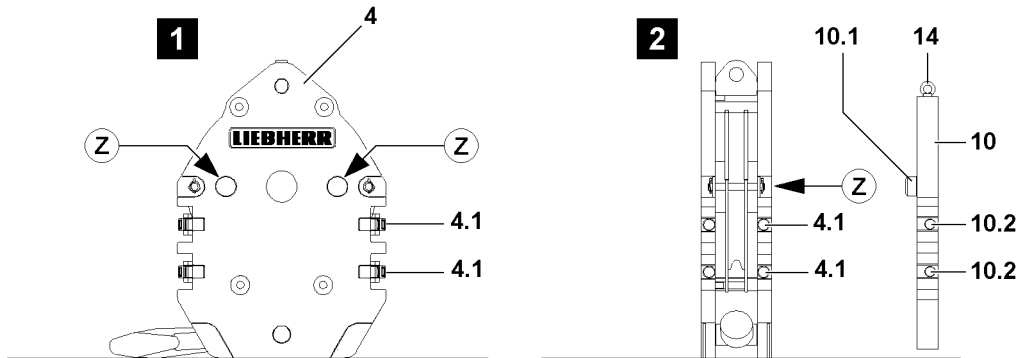
Reinstall the mounting brackets again immediately, so that only the auxiliary weight which is being removed is released.

▶ Lift the auxiliary weight with the auxiliary crane from the pulley block.

▶ Place the auxiliary weight onto the ground.

▶ Remove the auxiliary crane.

▶ Remove additional auxiliary weights as described above.



5.3 Installing the auxiliary weights on the single pulley blocks

5.3.1 Installing the auxiliary weights



Note

- ▶ The own weight for each auxiliary weight is marked on the auxiliary weight!



WARNING

Toppling of hook block!

If the auxiliary weights are installed one-sided, the hook block can topple over!

Personnel can be severely injured or killed!

- ▶ The auxiliary weights may only be installed **individually** and alternately on the left and right on the hook block!
- ▶ When the required auxiliary weight is installed on the hook block, the difference between the left and right side may never be more than one auxiliary weight!
- ▶ Asymmetrical installation of auxiliary weights is prohibited!

Make sure that the following prerequisite is met:

- The hook block is placed on the ground.



WARNING

Falling auxiliary weights!

If the auxiliary weights are not properly installed on the hook block, then they can fall down during installation or in crane operation!

Personnel can be severely injured or killed!

- ▶ Standing under a suspended auxiliary weight is prohibited!
- ▶ Make sure that the auxiliary weights are properly installed and secured!
- ▶ Crane operation with insufficiently secured auxiliary weights is prohibited!

- ▶ Attach the auxiliary weight **10** on the ring screw **14** on the auxiliary crane.



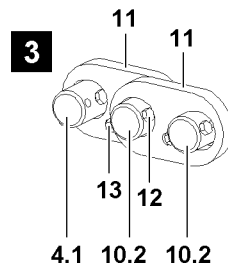
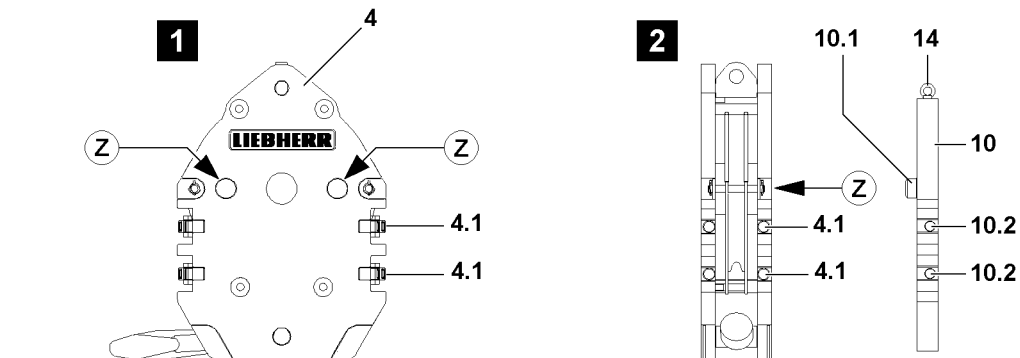
WARNING

Danger of crushing!

When swinging the auxiliary weights to the hook block, personnel can be severely injured or killed!

Fingers, hands and arms can be crushed or severed!

- ▶ It is prohibited for anyone to remain between the hook block and the auxiliary weight!
- ▶ Swing auxiliary weights in to the hook block with utmost caution and at the least possible speed!



- ▶ Align the auxiliary weight **10** on the hook block.
- ▶ Move the centering pin **10.1** of the auxiliary weight into the centering bores **Z** on the hook block.

**WARNING**

Falling auxiliary weights!

If all mounting brackets are removed simultaneously on an unsecured auxiliary weight, then the auxiliary weight can fall down!

Personnel can be severely injured or killed!

- ▶ Never remove all mounting brackets of an unsecured auxiliary weight at the same time!
- ▶ Always install or remove the mounting brackets alternately!

- ▶ Install the mounting brackets **11** on the side and connect the hook block with the auxiliary weight **10**, illustration **3**.

- ▶ Secure the mounting brackets **11** with screws **12** and lock nuts **13**, illustration **3**.

**Note**

- ▶ Additional auxiliary weights must be connected with the mounting brackets **11**!

**WARNING**

Falling auxiliary weights!

The auxiliary weights can fall down by removing the auxiliary crane!

Personnel can be severely injured or killed!

- ▶ Remove the auxiliary crane only when it is ensured that the auxiliary weight **10** is properly secured with the mounting brackets **11**!

- ▶ When the respective auxiliary weight is properly installed and secured:
Remove the auxiliary crane.

5.3.2 Removing the auxiliary weights

**Note**

- ▶ The own weight for each auxiliary weight is marked on the auxiliary weight!

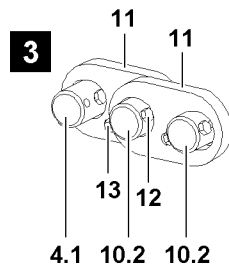
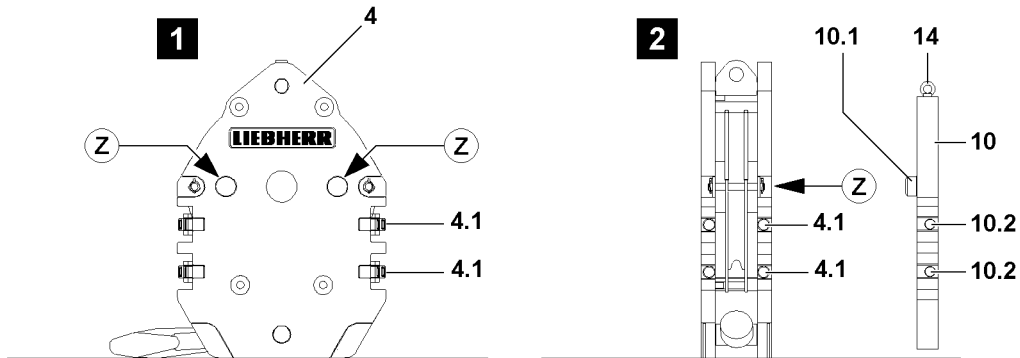
**WARNING**

Toppling of hook block!

If the auxiliary weights are removed one-sided, the hook block can topple over!

Personnel can be severely injured or killed!

- ▶ The auxiliary weights may only be removed **individually** and alternately on the left and right on the hook block!
- ▶ The difference between the left and the right side at removal of the auxiliary weights may never be more than one auxiliary weight!
- ▶ Asymmetrical removal of auxiliary weights is prohibited!



**WARNING**

Falling auxiliary weights!

If the auxiliary weights on the pulley block are not properly removed, then they can fall down at removal!

Personnel can be severely injured or killed!

▶ Standing under a suspended auxiliary weight is prohibited!

▶ Attach the auxiliary weight **10** on the ring screw **14** on the auxiliary crane.

▶ Tension the fastening equipment carefully.

**WARNING**

Oscillating auxiliary weights!

During the removal of the auxiliary weights, the auxiliary weights can start to swing back and forth!

Personnel can be severely injured or killed!

▶ It is prohibited for anyone to remain in the danger zone!

▶ Make sure that the auxiliary weight which is being removed is properly attached on the auxiliary crane before releasing the mounting brackets!

▶ Angular pull is prohibited!

▶ When the fastening equipment is tensioned on the auxiliary weight:

Release the screw connection on the mounting brackets of the outermost auxiliary weight and remove the screws.

**WARNING**

Falling auxiliary weights!

If all mounting brackets are removed simultaneously on an unsecured auxiliary weight, then the auxiliary weight can fall down!

Personnel can be severely injured or killed!

▶ Never remove all mounting brackets of an unsecured auxiliary weight at the same time!

▶ Always install or remove the mounting brackets alternately!

▶ Pull the mounting brackets **11** off to the side.

**WARNING**

Falling auxiliary weights!

If additional auxiliary weights which are being removed are released, then these auxiliary weights can fall down!

Personnel can be severely injured or killed!

▶ Make sure, before removing the outermost auxiliary weight, that the other auxiliary weights are secured with the mounting brackets!

▶ If additional mounting brackets must be removed to release the outermost auxiliary weight:

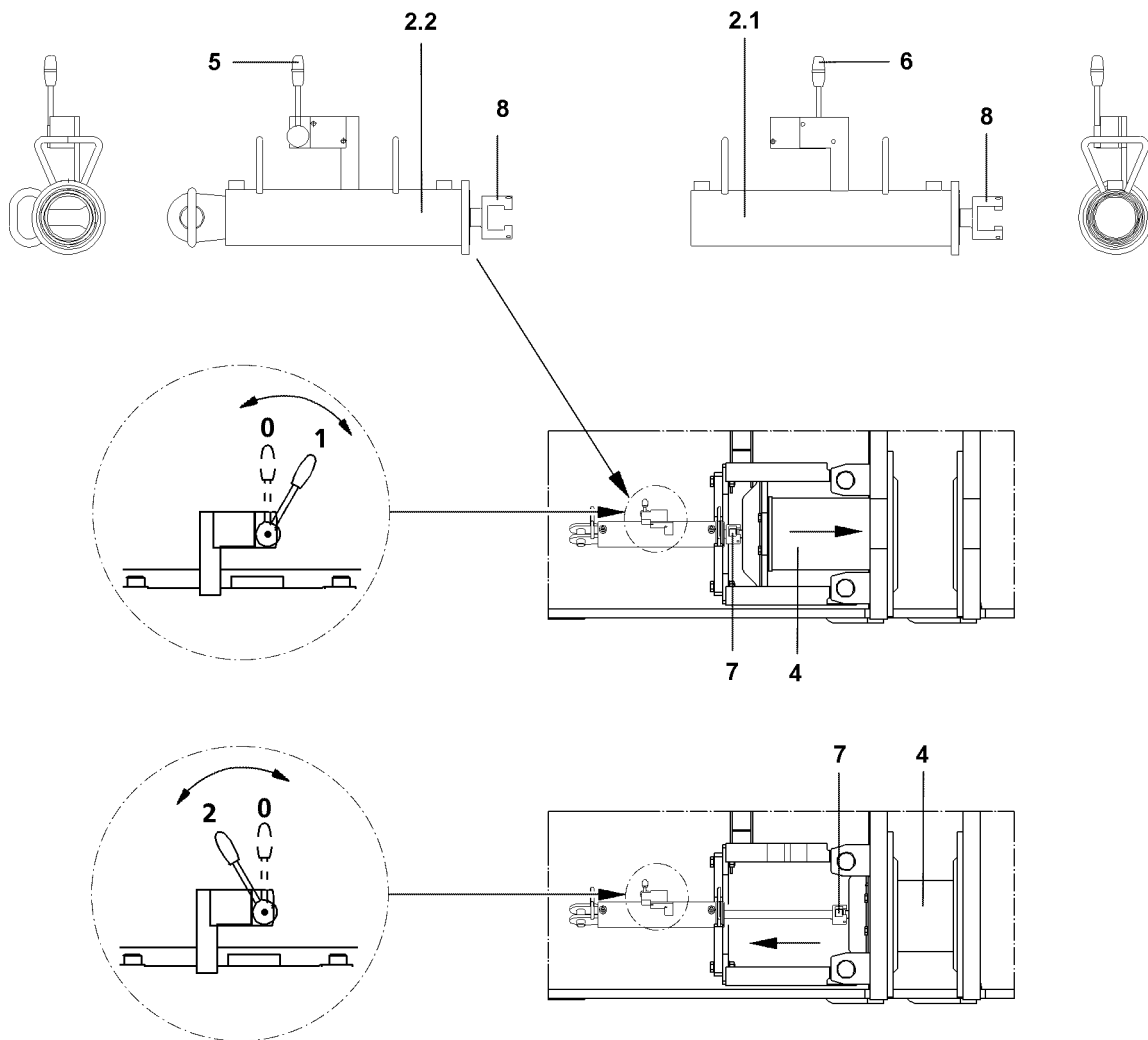
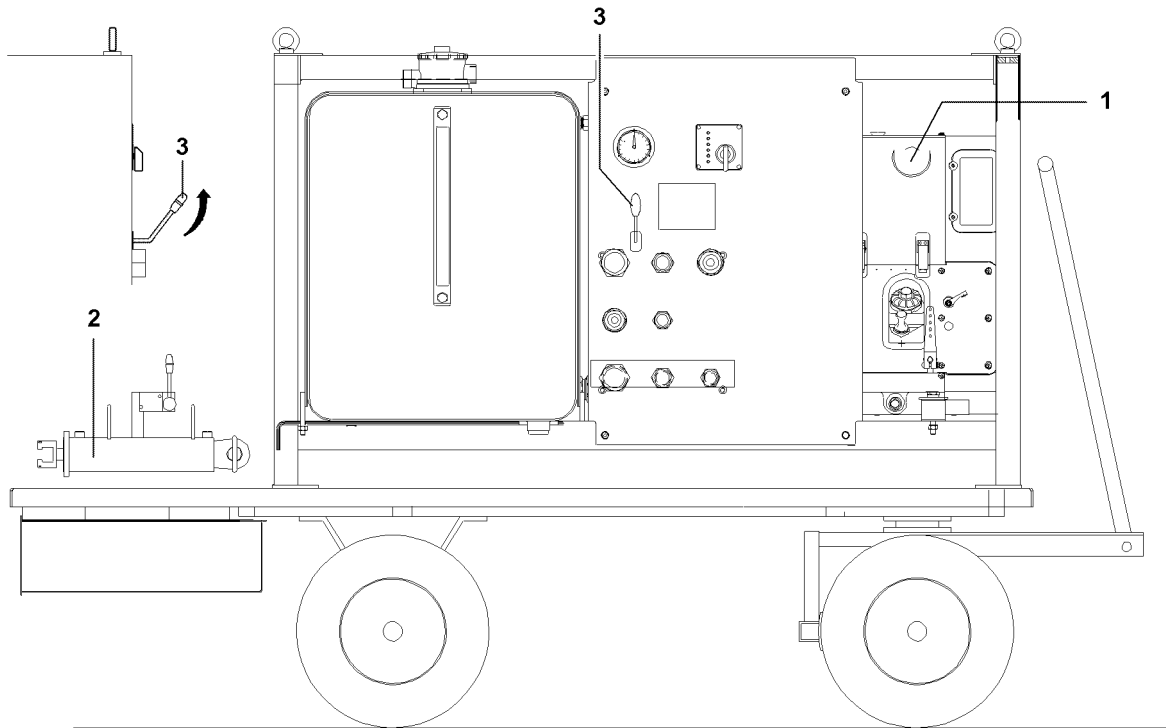
Reinstall the mounting brackets again immediately, so that only the auxiliary weight which is being removed is released.

▶ Lift the auxiliary weight with the auxiliary crane from the hook block.

▶ Place the auxiliary weight onto the ground.

▶ Remove the auxiliary crane.

▶ Remove additional auxiliary weights as described above.



B104261

1 Pinning and unpinning with pin pulling device

The pin pulling device consists of the device **1** and the pin pulling cylinders **2.1** und **2.2**. The connector pins on the crawler crane and on the lattice sections are pinned and unpinned with these cylinders.

The cylinder **2.1** is used to pin and unpin the connector pins on the crawler.

The cylinder **2.2** is used to pin and unpin the connector pins on the boom lattice sections and on the ballast trailer.



Note

- ▶ Before pinning and unpinning the lattice sections, engage the lever **5** in position **1** or **2**. For safety reasons, the cylinder **2.2** is actuated on the aggregate.

The cylinder **2.1** is actuated directly with the lever on the cylinder.

Ensure that the following prerequisites are met:

- the aggregate **1** is not yet started.
- the change over lever **3** is in **0-position**.



DANGER

Risk of accident!

When you disassemble unsecured or unsupported crane parts, they can fall down and kill or severely injure personnel.

- ▶ Never stand **under** unsecured or unsupported crane parts and unpin the pins!
- ▶ Never unpin the connecting pins of unsecured or unsupported booms!
- ▶ Do not stand under the crane parts or within the complete danger zone during the pinning and unpinning procedure!
- ▶ Do not lean the ladder against the crane part being disassembled!

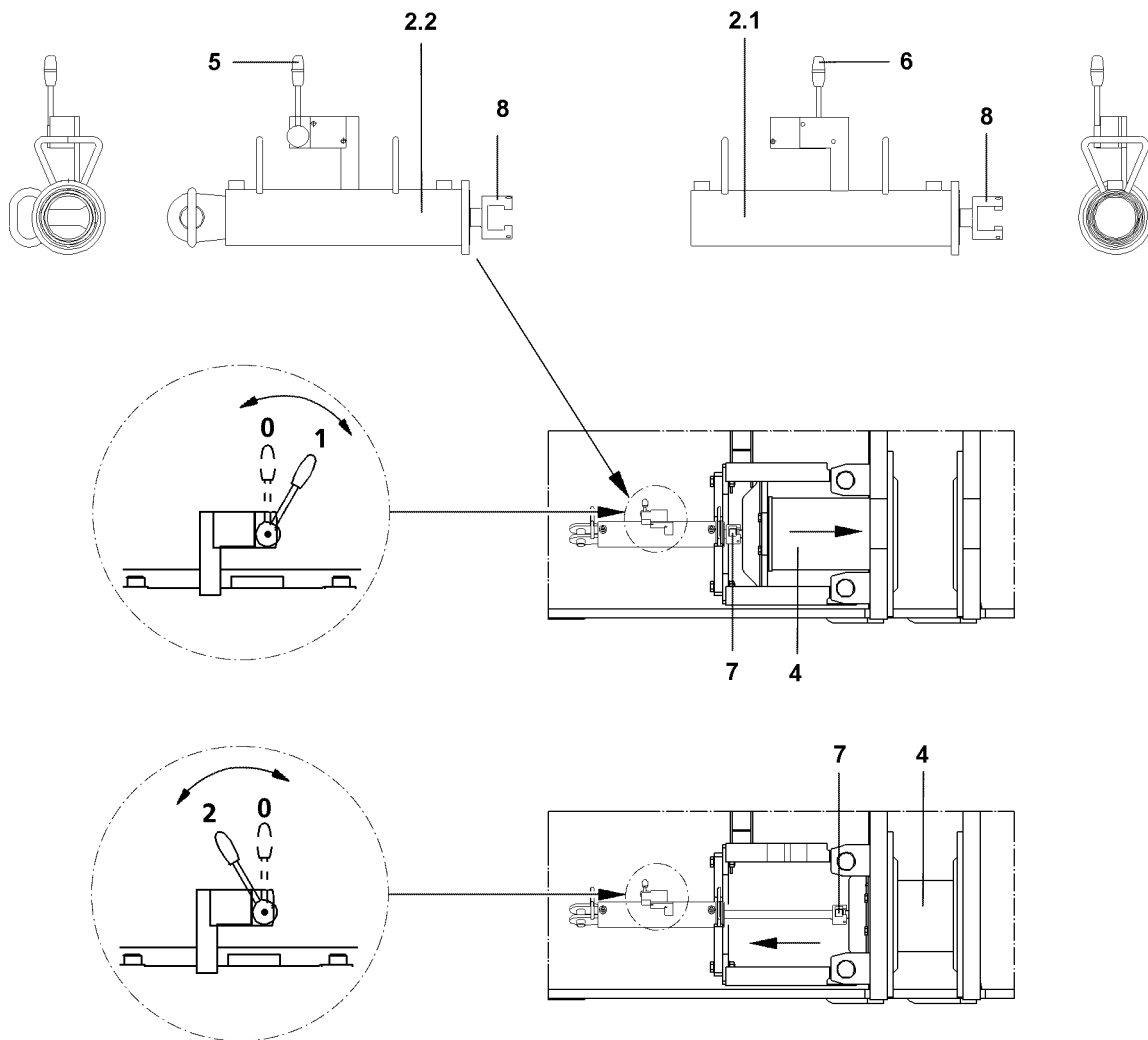
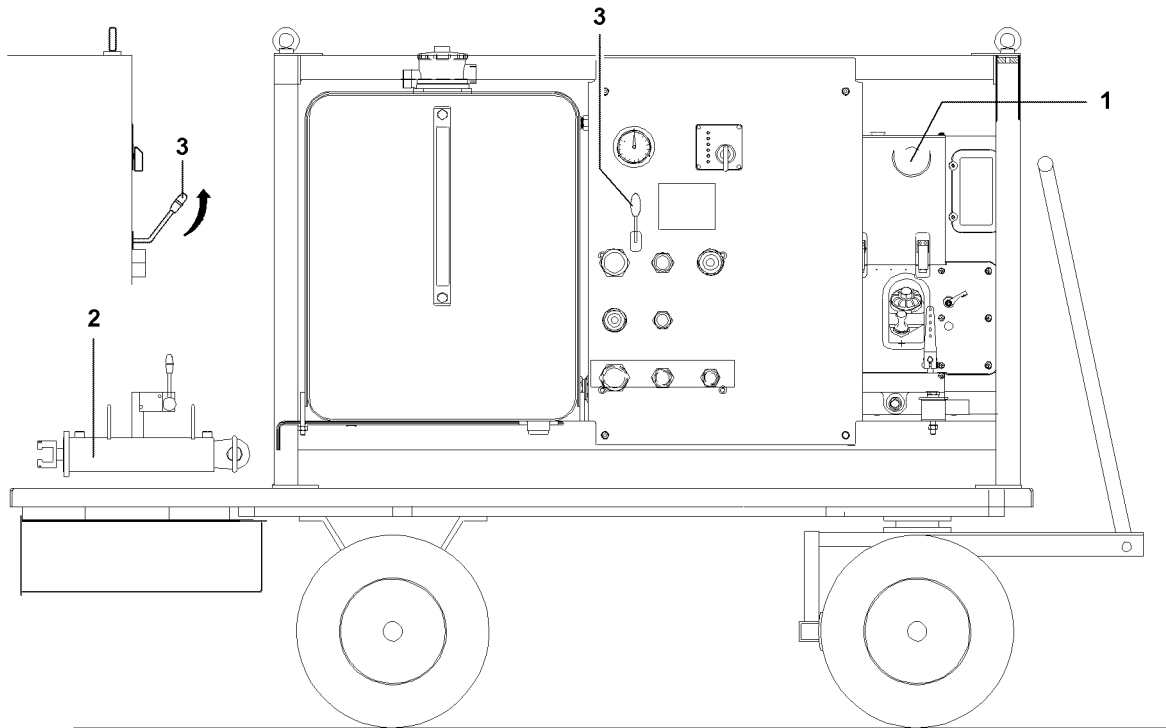
1.1 Preparatory work

- ▶ Connect hydraulic hoses of the required cylinder on the pin pulling device **1**.
- ▶ Hang or pin the cylinder into the retainer on the crawler or lattice section.
- ▶ Connect the piston rod head **8** with the screw **7** on the pin **4**.



Note

- ▶ Pin the cylinder **2.2** additionally on the lattice section.



B104261

1.2 Pin and unpin the pins on the boom lattice sections or on the ballast trailer

- ▶ Engage the lever **5** on the cylinder **2.2**.



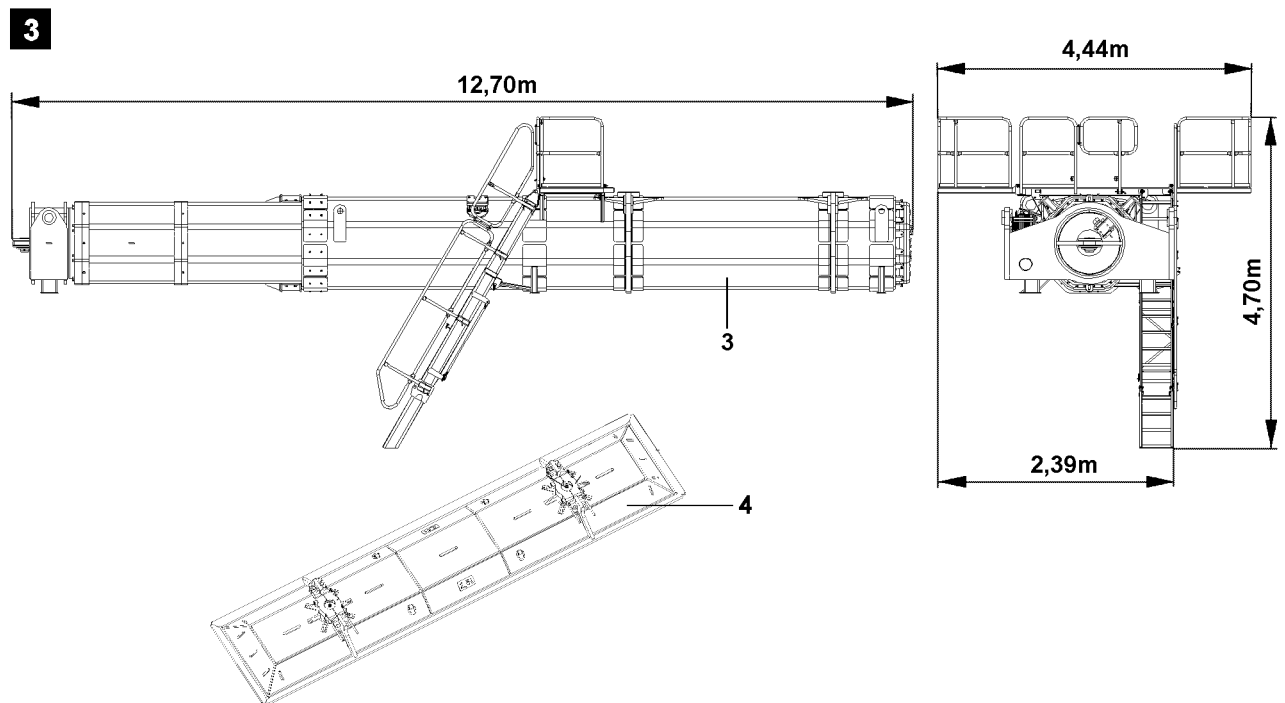
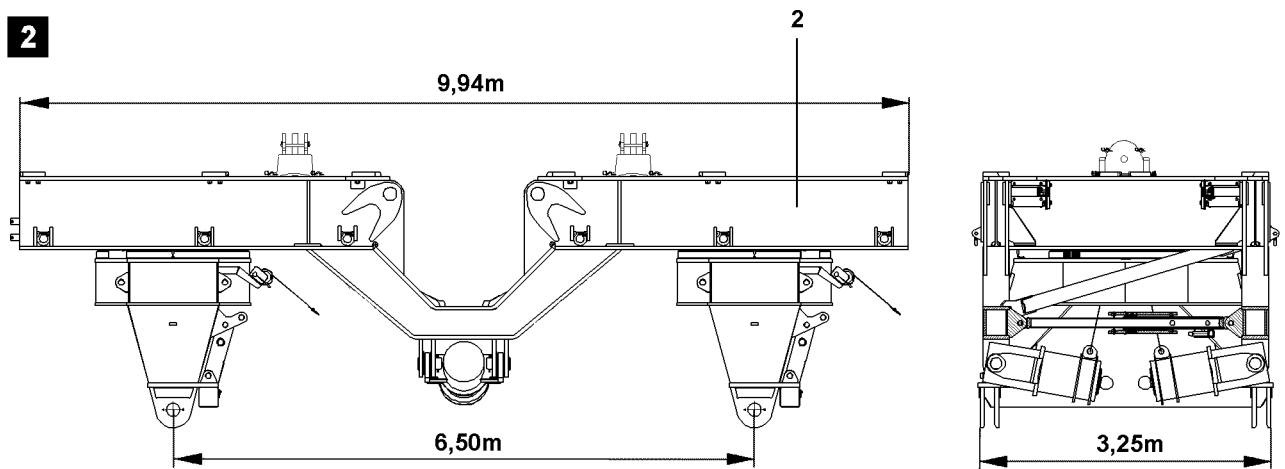
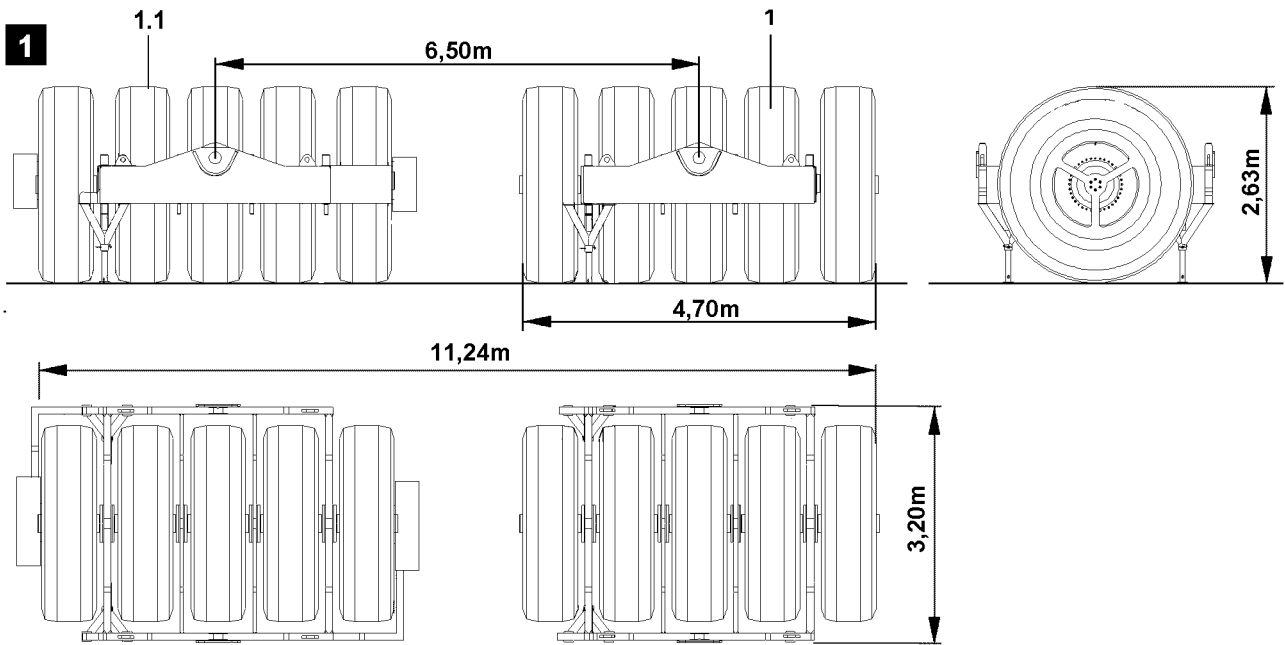
Note

- ▶ Position 1, insert pin **4**.
 - ▶ Position 2, remove pin **4**.
-

- ▶ Set the change over lever **3** in 0-position.
- ▶ Start the aggregate **1**.
- ▶ Move the change over lever **3 up** and unpin or pin the pin **4**.
- ▶ Set the engine RPM on the aggregate **1**.

1.3 Pinning and unpinning pins on the cross carriers or the crawler carriers

- ▶ Set the change over lever **3 upward**.
- ▶ Start the aggregate **1**.
- ▶ Set the engine RPM on the aggregate **1**.
- ▶ Actuate the lever **6** on the cylinder **2.1**.
- ▶ Pin or unpin the pin.



B106366

1 General

The ballast trailer consists of:

- 2 wheel sets, oscillating mounted
- Ballast frame
- Guide tube
- Support plate

Hydraulic, telescopeable guide for ballast trailer radii from R15 m - R25 m and R20 m -R30 m

The pull cylinders for the ballast trailer are assembled on the derrick end section and can be actuated under load.

Hydraulic, mechanical steering, electronically adjustable for:

- Towing
- Circular travel
- Parallel travel
- Corrective steering

1.1 Components, weights

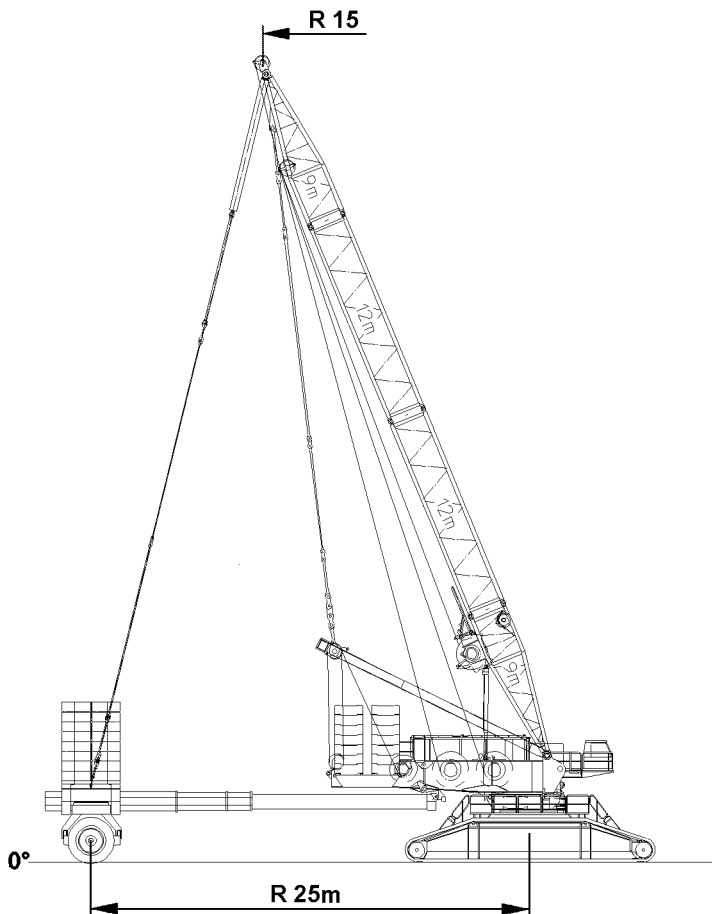
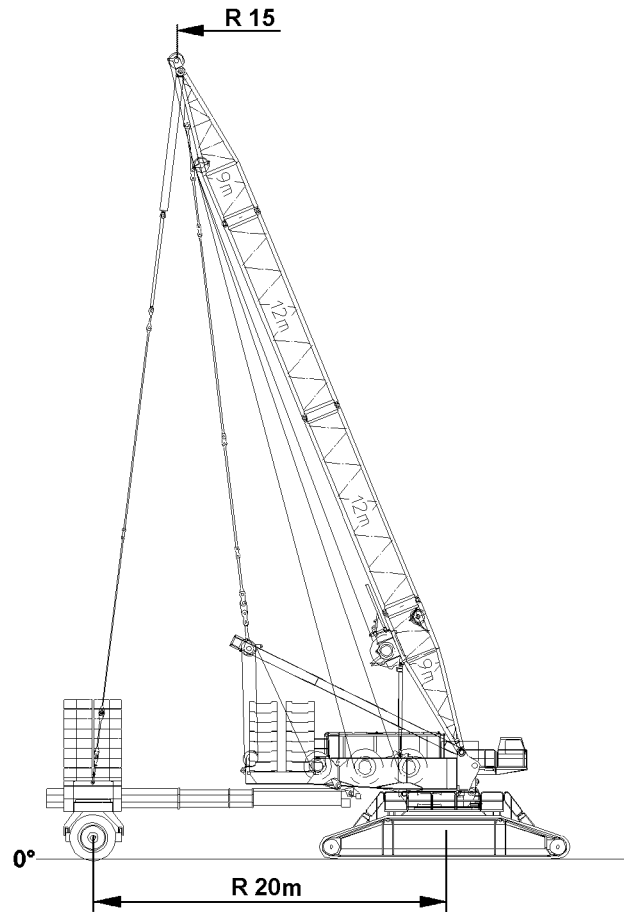
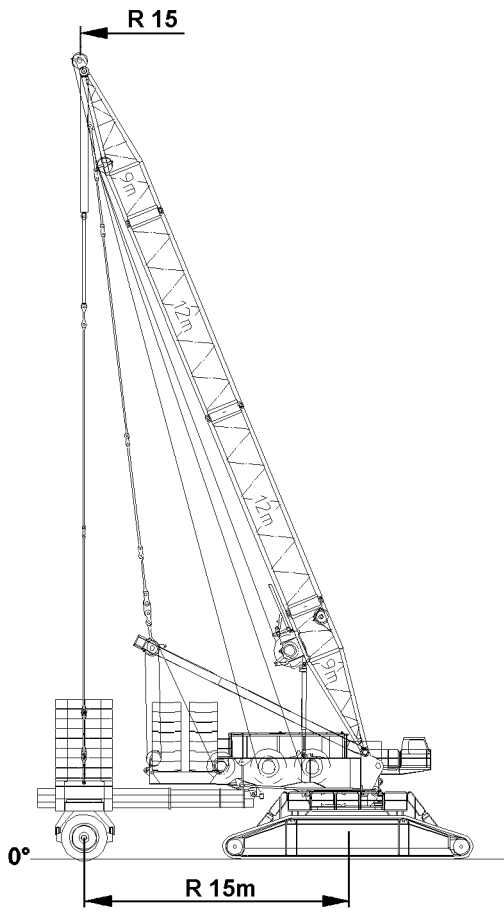
See illustration 1, 2 and 3.

Position	Components	Weight
1	Wheel set without drive	34.0 t
1.1	Wheel set with drive	37.0 t
2	Ballast frame	35.0 t
3	Guide	41.0 t
4	Support plate	2.7 t

1.2 Dimensions

See illustration 1, 2 and 3.

4



B103645

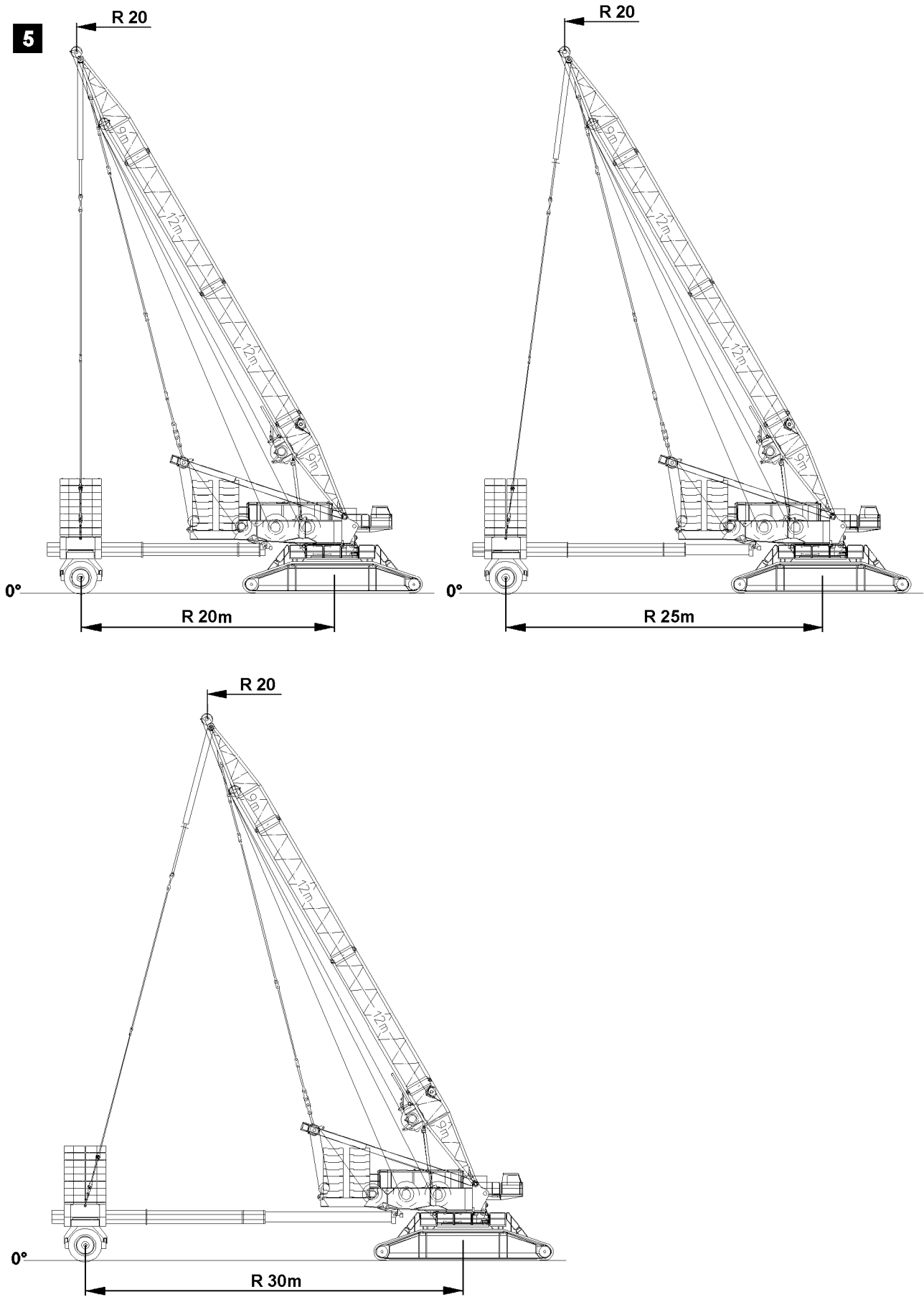
1.3 Radii

See illustration 4
Derrick = R 15 m
Ballast trailer = R 15 m
Ballast trailer = R 20 m
Ballast trailer = R 25 m



Note

► At a derrick radius of R 15 m, the ballast trailer can be telescoped out to maximum R 25 m!



B103646

1.4 Radii

See illustration 5

Derrick = R 20 m

Ballast trailer = R 20 m

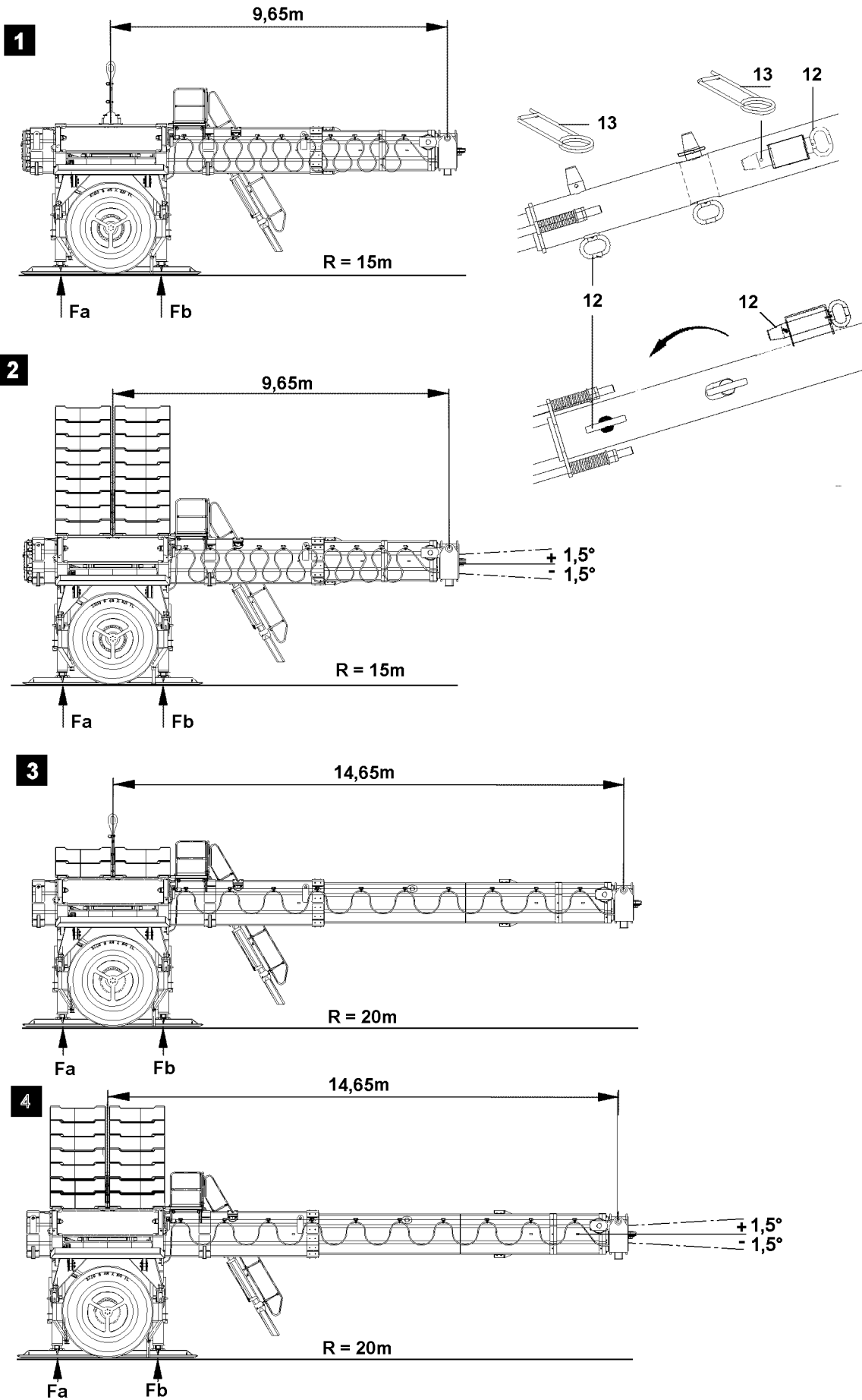
Ballast trailer = R 25 m

Ballast trailer = R 30 m



Note

- ▶ At a derrick radius of R 20 m, the ballast trailer can be telescoped out to maximum R 30 m!
 - ▶ R 30 m can only be obtained by changing the pins of the guide!
-



B106859

1.5 Stability and tipping safety for ballast trailer not assembled on the turntable

Make sure that the following prerequisites are met:

- The ballast trailer is supported and horizontally aligned.
- The hydraulic, telescopeable guide on the ballast trailer is fully telescoped in.

The strut between the support cylinders must be locked. The locking pin **12** must be inserted and secured with the spring retainer **13**, see section “retract support cylinder”.



DANGER

Danger of accident!

If the ballast trailer is not assembled on the turntable, it must be ensured that the locking pin is pinned and secured on the strut of the ballast trailer.

The ballast trailer can tip over if the locking pin is not pinned!

- ▶ Pin the locking pin and secure with the spring retainer!



WARNING

Danger of tipping over!

If the minimum ballast weight is not observed and the guide is not fully telescoped in, then the ballast trailer can tip over!

- ▶ The hydraulic, telescopeable guide on the ballast trailer is fully telescoped in!
- ▶ Observe the minimum ballast weight!



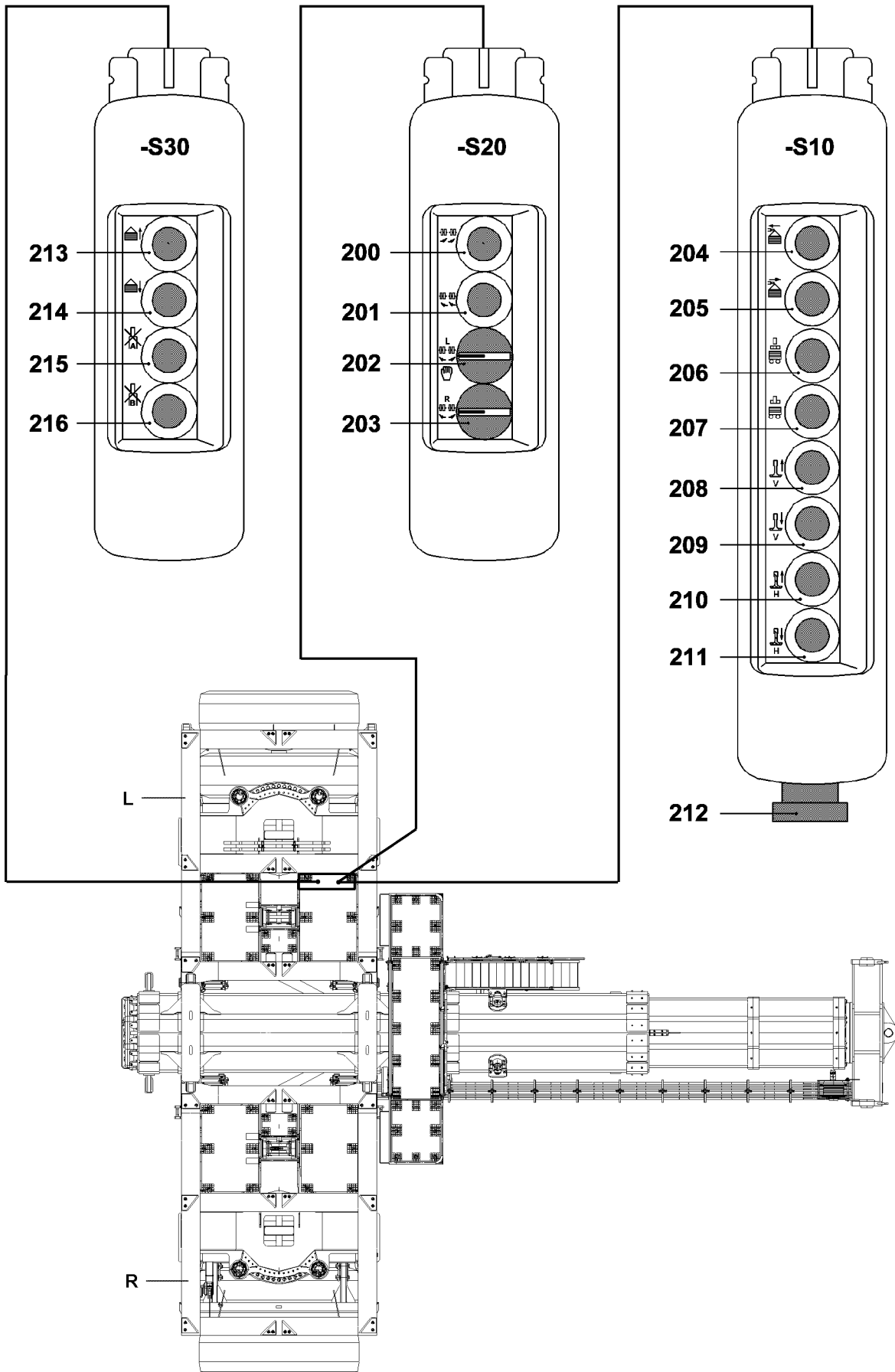
WARNING

Overload of support cylinders!

If the maximum ballast weight is not observed, the guide is not fully telescoped in and the horizontal position of the ballast trailer is larger than $\pm 1,5^\circ$, the support cylinder will be overloaded!

- ▶ The hydraulic, telescopeable guide on the ballast trailer is fully telescoped in!
- ▶ Observe the maximum ballast weight!
- ▶ Check the horizontal position on the sight gauge!

Illustration	Ballast trailer radius	Ballast	Fa	Fb
1	R = 15 m	0 t	24.5 t	122.5 t
2	R = 15 m	Max.480 t	264.5 t	362.5 t
3	R = 20 m	Min.140 t	63.0 t	225.0 t
4	R = 20 m	Max.400 t	171.5 t	375.5 t



B103461

1.6 Operating elements on the control panels

Control panel -

S20

200	Button	• Corrective steering, turn wheel sets to left
201	Button	• Corrective steering, turn wheel sets to right
202	Rotary switch	• Turn the wheel set left side L to the right or left, manual operation for assembly or emergency operation
203	Rotary switch	• Turn the wheel set right side R to the right or left, manual operation for assembly or emergency operation

Control panel -

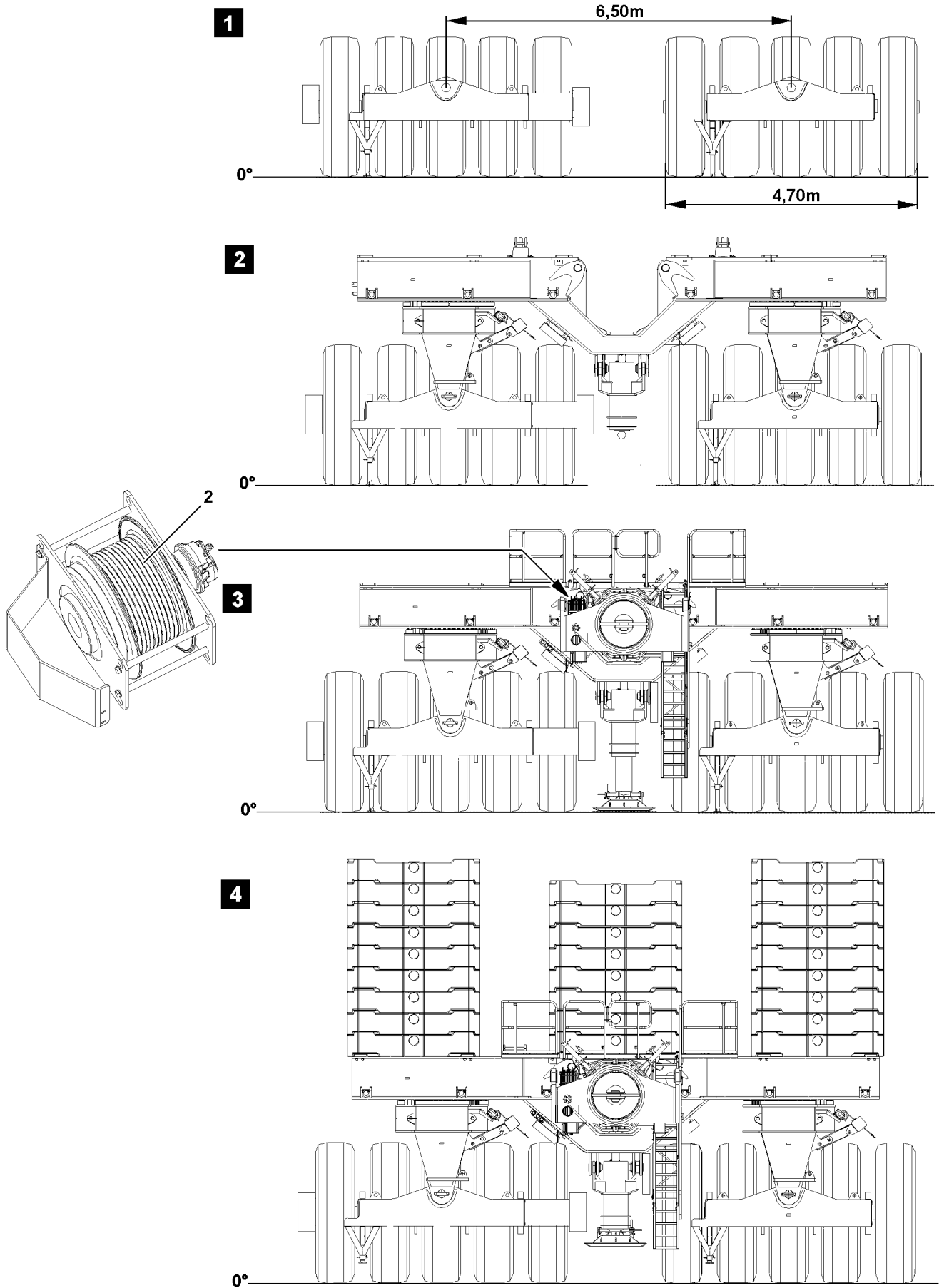
S10

204	Button	• Ballast trailer, move the guide cylinder in
205	Button	• Ballast trailer, move the guide cylinder out
206	Button	• Ballast trailer on turntable - unpin
207	Button	• Ballast trailer on turntable - pin
208	Button	• Move the front support cylinder in
209	Button	• Move the front support cylinder out
210	Button	• Move the rear support cylinder in
211	Button	• Move the rear support cylinder out
212	Switch	• EMERGENCY OFF

Control panel -

S30

213	Button	• Derrick ballast UP - retract both cylinders
214	Button	• Derrick ballast DOWN - extend both cylinders
215	Button	• Block cylinder A , cylinder A in left driving direction
216	Button	• Block cylinder B , cylinder B in right driving direction



B114078

2 Assembly



WARNING

Danger of falling!

During assembly and disassembly, assembly personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel can fall and suffer life-threatening or fatal injuries!

- ▶ Any work, where there is a danger of falling, must be carried out with suitable aids (for example: lifting platforms, scaffoldings, ladders, auxiliary crane)!
- ▶ If the work cannot be carried out with such aids nor from the ground, then the assembly personnel must secure themselves with approved fall arrest systems to avoid falling, see Crane operating instructions, chapter 2.04!
- ▶ If railings are present on the components, then they must be brought into the corresponding position and secured for assembly / disassembly work!
- ▶ Step on aids and fall protection equipment only with clean shoes!
- ▶ Keep aids and fall protection equipment clean and free from snow and ice!
- ▶ During all assembly and disassembly work, maintenance work and inspections, travel or crane operation is prohibited!



WARNING

Danger of tipping the ballast trailer!

Due to improperly carried out assembly or improper assembly conditions, the ballast trailer can tip over!

Personnel can be severely injured or killed!

- ▶ The assembly of the ballast trailer may only be carried out by authorized personnel!
- ▶ Carry out the assembly of the ballast trailer only on level ground of sufficient load bearing capacity!
- ▶ The ballast trailer has **no** brake system! The ballast trailer must be supported with the support cylinders if it is **not** pinned on the turntable!

Make sure that the following prerequisites are met:

- The ground must be level and of sufficient load bearing capacity.
- An auxiliary crane is available.

2.1 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!

Illustration 1

- Set the wheels sets with an auxiliary crane at a distance of 6.5 m next to each other and support with the support legs.

Illustration 2

- Pin the ballast frame with the wheel sets.

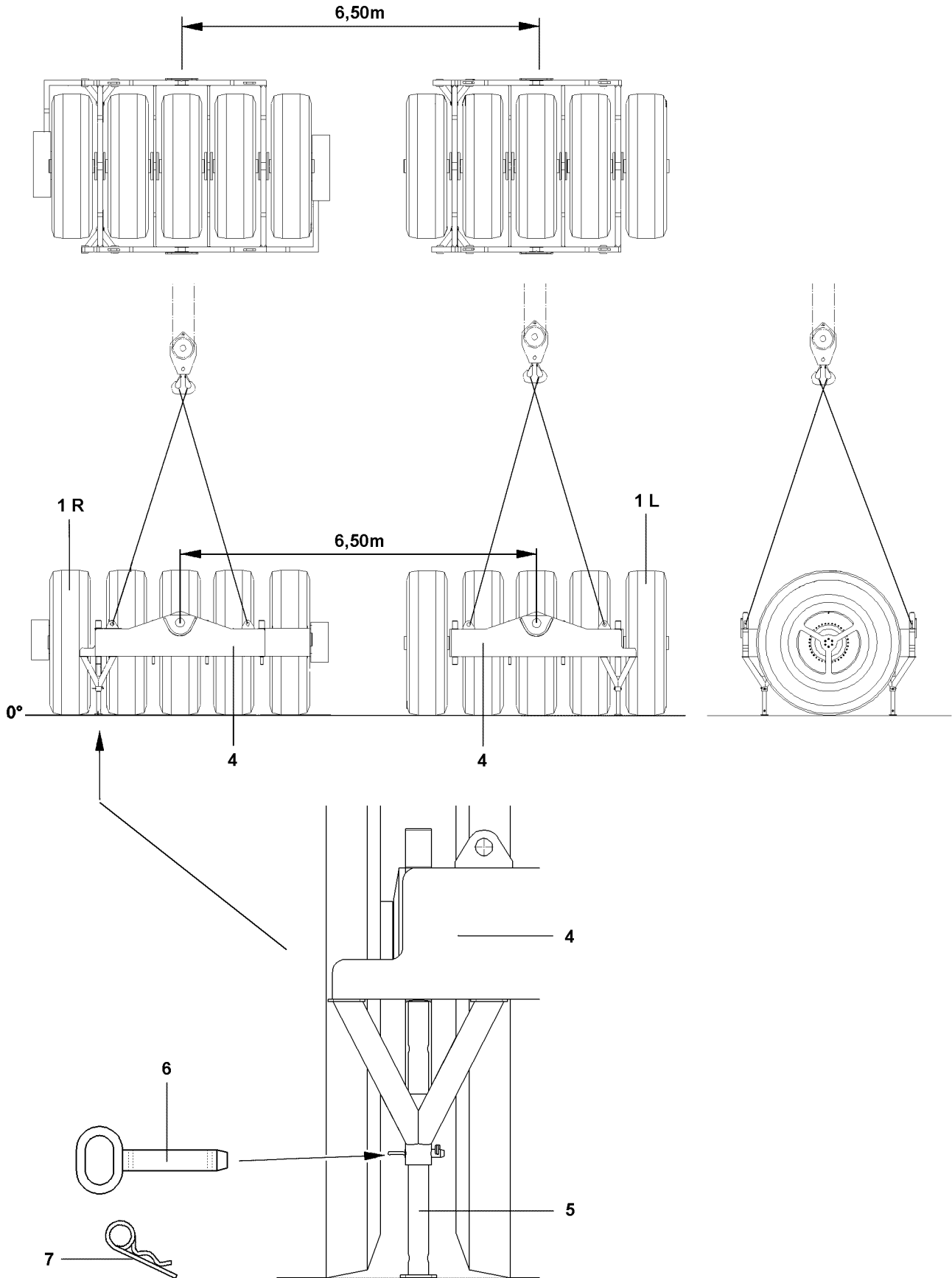
Illustration 3

- Pin the guide on the ballast frame.

Illustration 4

- Pin the ballast trailer to the turntable and place on the ballast plates.
- If necessary, adjust winch "hose guide-BW" **2** ¹⁾

1) Winch "Hose guide - ballast trailer"



B106368

2.2 Erecting the wheel sets



Note

- ▶ The wheel sets are not equipped with their own brake system!



DANGER

Danger of accident due to tipping the wheel sets!

There is a tipping hazard if the wheel sets are not resting on the mechanical support legs!

- ▶ Support the wheel sets on the support legs!

Make sure that the following prerequisites are met:

- The wheel set hangs on the auxiliary crane.
- The ground must be level and of sufficient load bearing capacity.
- The wheel sets are set as close as possible to the crane.

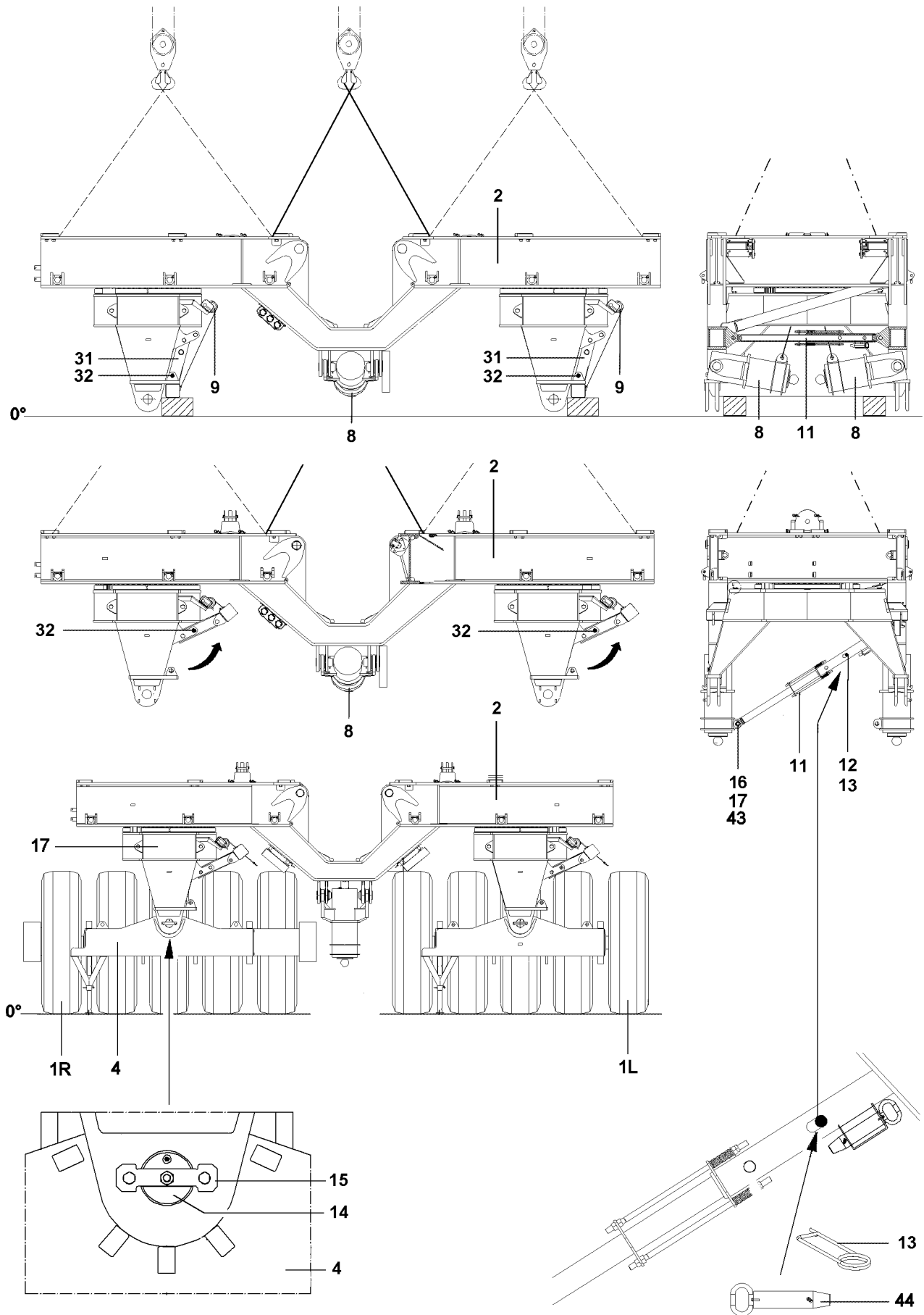
2.2.1 Assembling the support legs

- ▶ Unpin the inserted support legs **5** on the first wheel set **1R**.
- ▶ Release the cotter pin **7** and unpin the pin.
- ▶ Pull out the support legs **5** and re-pin.
- ▶ Insert the pin **6** and secure it with a cotter pin **7**.
- ▶ Set down the first wheel set on the support legs.
- ▶ Set up the second wheel set **1L** at a distance of 6.5 m in the direction of the axle.



Note

- ▶ In order to center the ballast frame, the wheel sets must be exactly 6.5 m apart with their axles aligned!
- ▶ Unpin the inserted support legs **5** on the second wheel set **1L**.
- ▶ Release the cotter pin **7** and unpin the pin.
- ▶ Pull out the support legs **5** and re-pin.
- ▶ Insert the pin **6** and secure it with a cotter pin **7**.
- ▶ Place the second wheel set on the support legs.

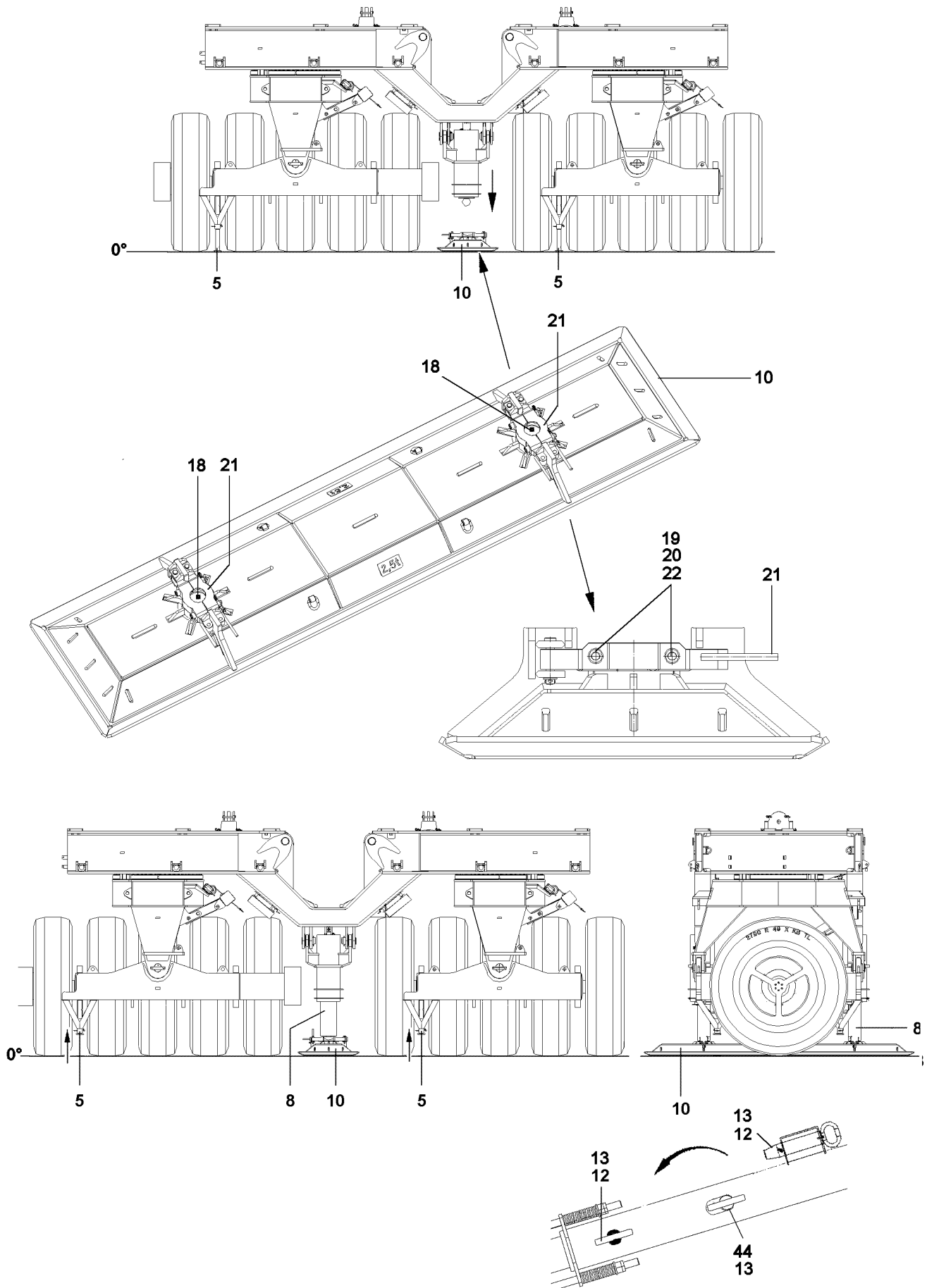


B106369

2.3 Assembly of ballast frame on the wheel sets

Make sure that the following prerequisites are met:

- The wheel sets are resting on the support legs.
 - The distance between the wheel sets is exactly 6.5 m.
 - The wheel set are positioned in direction of the axle to each other.
- ▶ Hang the ballast frame **2** from the auxiliary crane and lift.
 - ▶ Engage the rope winch on the transport support **31**.
 - ▶ Unpin the retaining pin **32** and pull up the transport support.
 - ▶ Pin and secure the retaining pin **32**.
 - ▶ Lower the ballast frame **2** and first center and pin it on the wheel set **1R** on the rocker **4**.
 - ▶ Insert the pin **14** and secure with the axle support **15**.
 - ▶ Lower the ballast frame **2** and first center and pin it on the wheel set **1L** on the rocker **4**.
 - ▶ Insert the pin **14** and secure with the axle support **15**.
 - ▶ Hang the grip hoist or the auxiliary crane on the support cylinder **8** and tension. Release the chain connection and lower the support cylinder from the transport position.
 - ▶ Hang the grip hoist or the auxiliary crane on the strut **11** and tension. Unpin the strut from the transport position and pin on the bottom on the support cylinder. Insert and secure pin.
 - ▶ Insert the pin **16**, place the washer **43** and secure with spring retainer **17**.
 - ▶ Insert the pin **44** in the slot and secure with spring retainer **13**.



B106365

2.4 Support the ballast trailer with the support cylinder



WARNING

Danger of tipping over!

The wheel sets must be supported with the mechanical support legs **5**, there is a danger of tipping over!

- ▶ Support the wheel sets with the mechanical support legs **5**!

Make sure that the following prerequisites are met:

- The pin **44** is inserted in the slot.
- The support legs **5** are extended and secured.
- The wheel sets are secured with wedges.
- The guide is not yet assembled.

2.4.1 Establishing the 24 volt power supply to the ballast trailer

- ▶ Insert the assembly plug A100 into the socket on the ballast frame.
- ▶ Connect the 15 m (WLFVS) cable on the assembly plug A100.
- ▶ Connect the cable 0.5 m (WLFVZ) on the 15 m cable.

On the 0.5 m cable is a KFZ (vehicle) plug.

- ▶ Connect the KFZ (vehicle) plug, the 24V supply, for example, on the crane, truck or other.

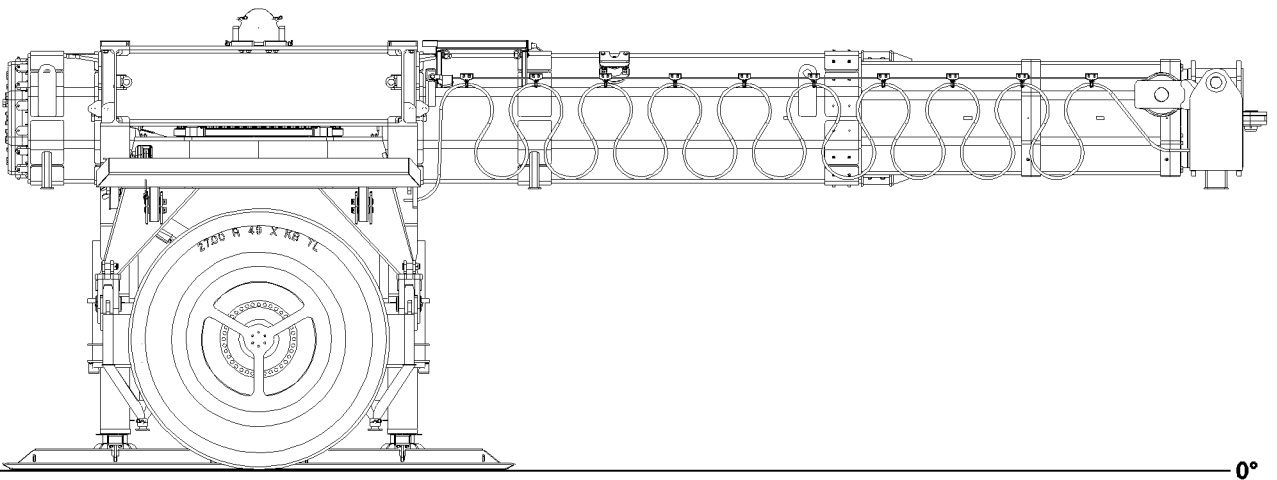
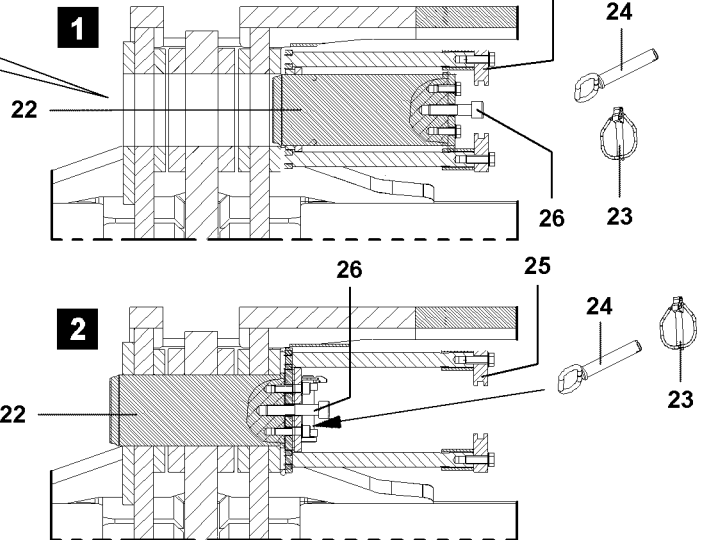
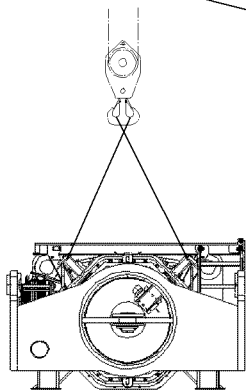
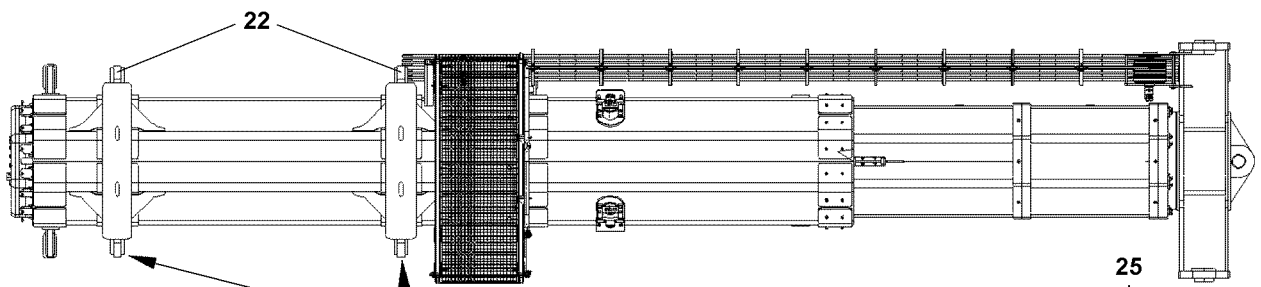
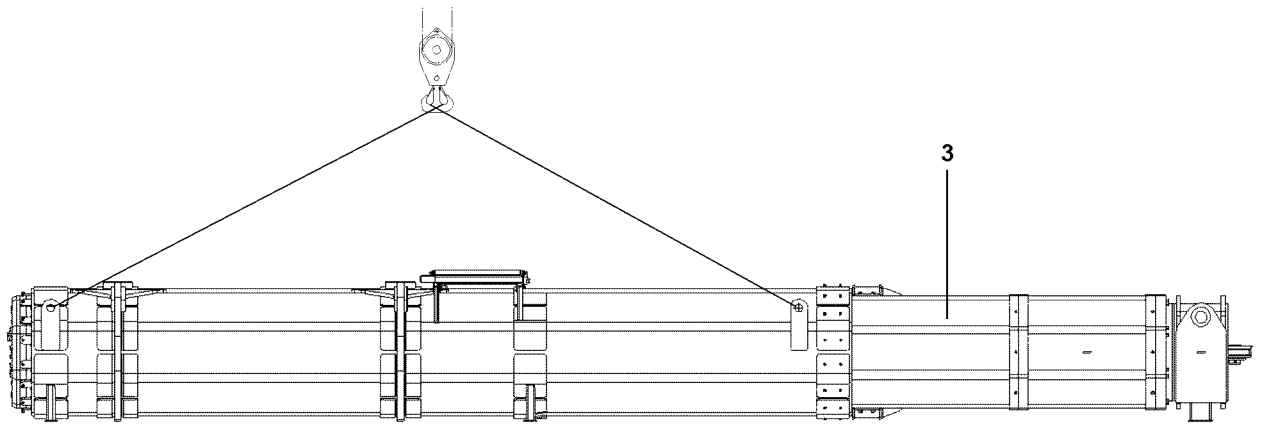
2.4.2 Assembly of support plate

- ▶ Establish the hydraulic connections from the pin pulling device to the ballast trailer.
- ▶ Place the support plate **10** under the support cylinder **8**.
- ▶ Swing the retaining plates **21** out.
- ▶ Extend the piston rod of the support cylinder **8** with the pin pulling device and enter it into the receptacle **18**.



Note

- ▶ Set the high pressure on the pin pulling device and extend the support cylinder **8** on the control panel!
- ▶ Swing both retaining plates **21** in and insert two retaining screws **20**. Install the crown nuts **22** and secure with cotter pin **19**.
- ▶ Align the ballast trailer horizontally.
- ▶ Insert and secure the locking pin **12** in the locking bore.
- ▶ Unpin and push in all support legs **5**.



B103782

2.5 Assembly of guide on the ballast frame

Make sure that the following prerequisites are met:

- The ballast trailer is supported with the support cylinders **8** and aligned in horizontal direction.
- The locking pin **12** is pinned in the strut **11**.



DANGER

Danger of tipping over!

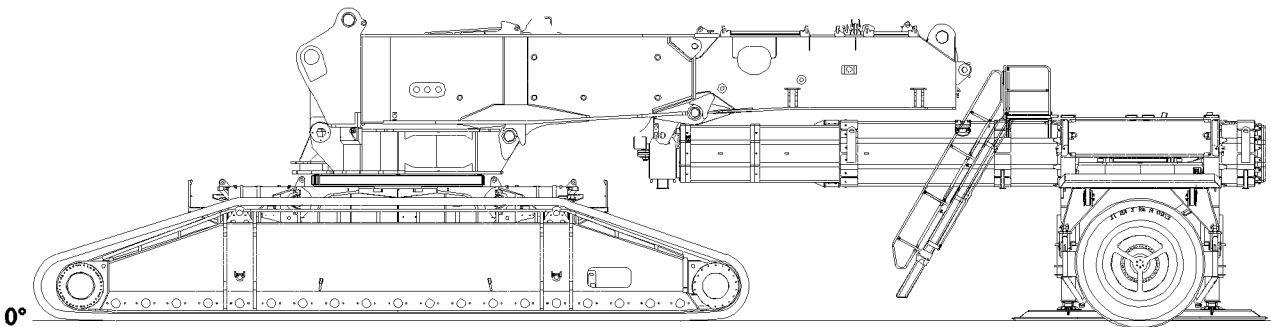
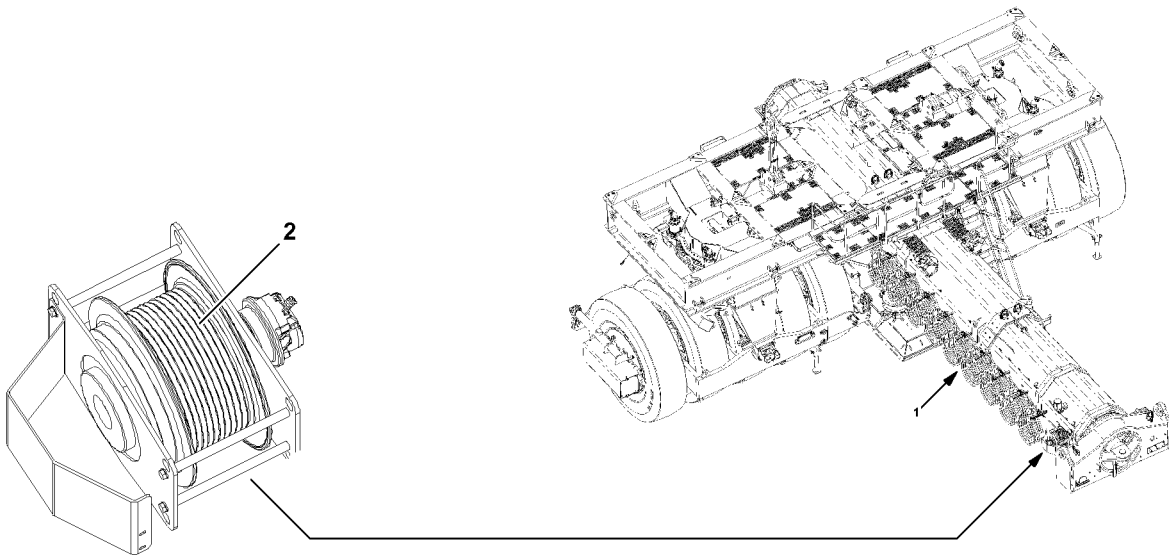
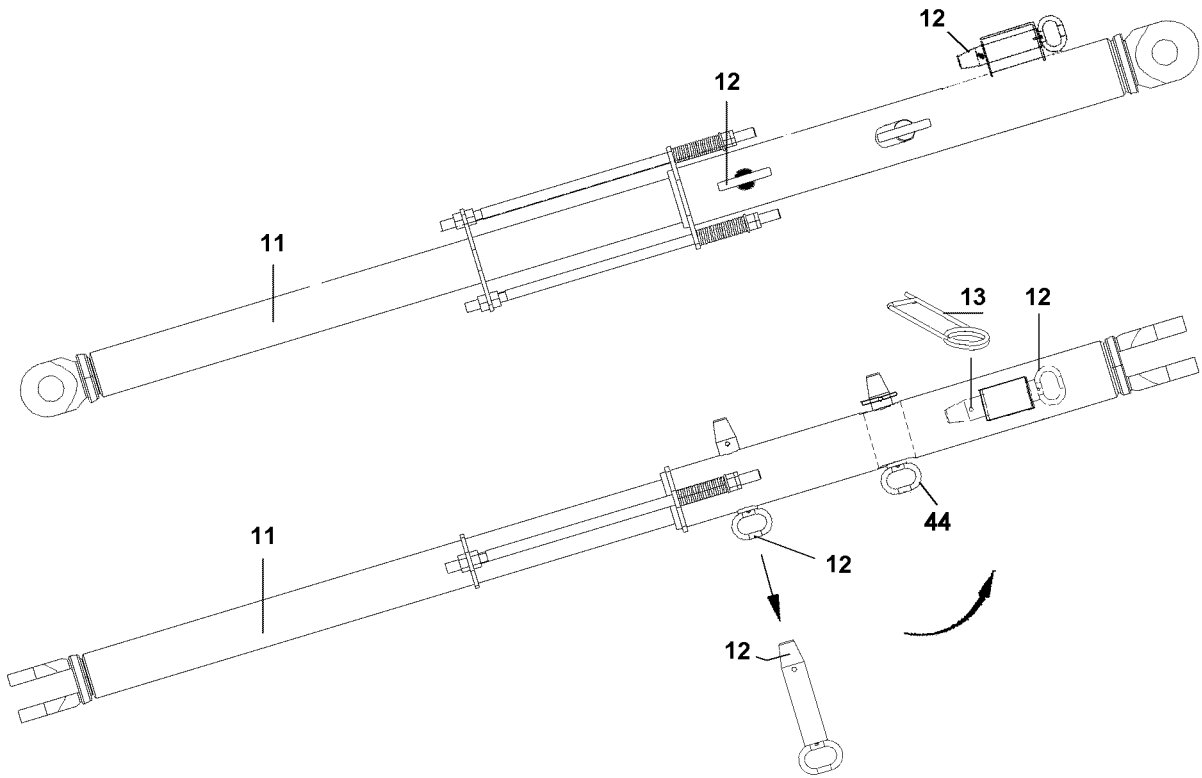
If the safety guidelines for the stability and tipping safety are not observed and the strut **11** is not pinned with the locking pin **12**, there is a danger of tipping over!

- ▶ Observe section “Stability and tipping safety for ballast trailer not assembled on the turntable”!
- ▶ Make sure that the locking pin **12** is pinned in the strut **11**!

2.5.1 Assembling the guide

Make sure that the following prerequisites are met:

- The retaining pins **24** are unpinned, see illustration **1**.
- The pins **22** are unpinned, the pin bores are clear, see illustration **1**.
- ▶ Hang the guide **3** onto the auxiliary crane and swing it in to the pin points on the ballast frame and affix.
- ▶ Hang the pin pulling cylinder on the retainer **25** and on the screw head **26**.
- ▶ Pin the guide **3** on all four pin points.
- ▶ Insert and secure pin **22**.
- ▶ Insert the retaining pin **24** and secure with the locking pin **23**, see illustration **2**.



B114079

2.6 Pinning the guide on the turntable



Note

Adjust winch "hose guide-BW" **2** ¹⁾!

If the ballast trailer is to be operated deviating from the initial commissioning - on another LR 11350 crane - then the winch "hose guide-BW" **2** must be readjusted!

- ▶ To adjust the winch "hose guide-BW" please contact Customer Service at **LIEBHERR-Werk Ehingen GmbH!**

1) Winch "Hose guide - ballast trailer"



Note

The winch "hose guide-BW" **2** must also be adjusted:

- ▶ After replacement of the winch turn sensor on the winch "hose guide-BW".
- ▶ After replacement of the power pack on the LICCON component group.

Make sure that the following prerequisites are met:

- Move the crane as close as possible to the ballast trailer guide.
- The engine is turned off.
- The ballast trailer is supported.
- The strut **11** is pinned with the locking pin **12**.

2.6.1 Establishing the electrical connection from the ballast trailer to the turntable



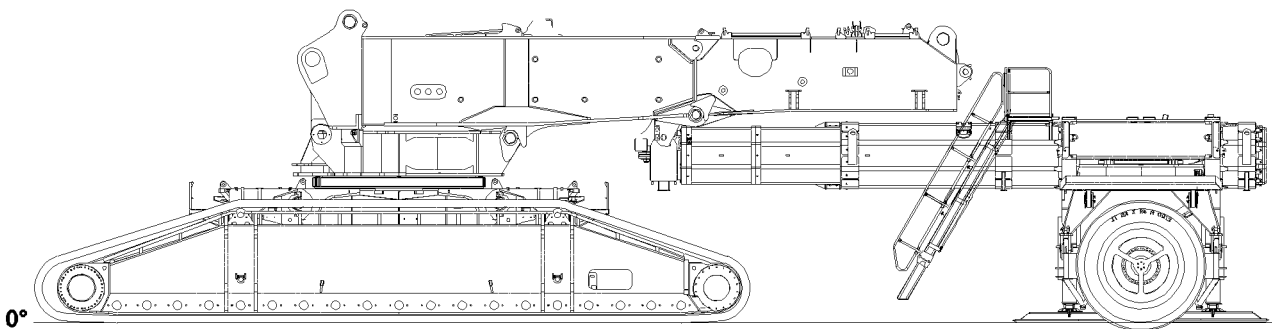
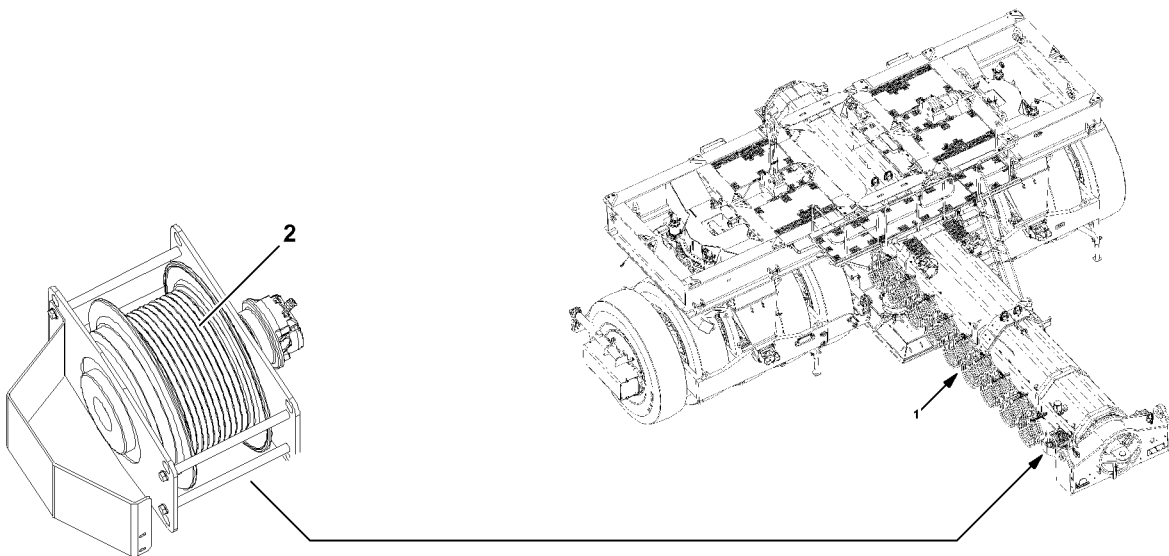
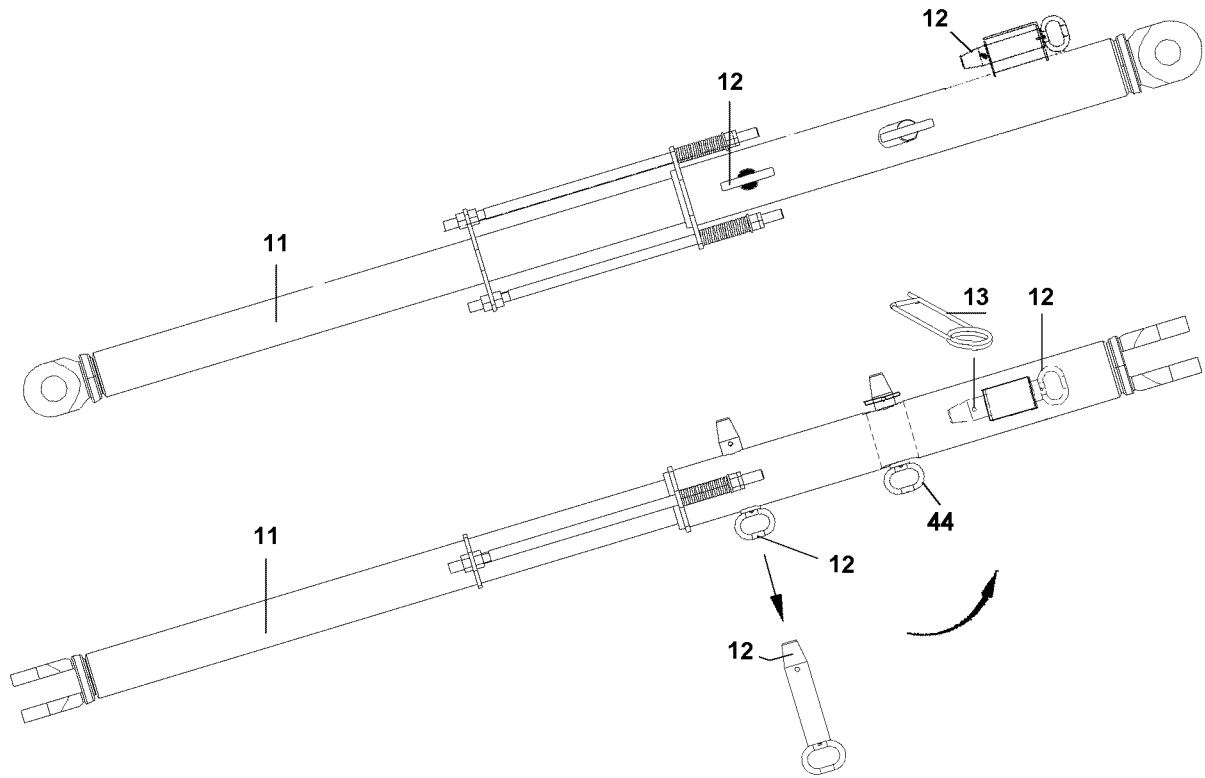
Note

- ▶ For assembly of the ballast trailer, the electrical connection from the ballast trailer to the turntable must be established to be able to control the support cylinders, if necessary!
- ▶ The "Ballast UP / DOWN" release is available, independent if the ballast trailer is assembled, providing the conditions in the shut off diagram are fulfilled!
- ▶ The "Ballast UP" release allows the entry of the pull and support cylinders!
- ▶ The release "Ballast DOWN" allows the extension of the pull and support cylinders!
- ▶ This means, the support cylinders and the pull cylinders can be moved, even if the "Ballast trailer pinned" signal is not yet present!



Note

- ▶ Establish the electrical connections, see Electric wiring diagram!
- ▶ Establish the electrical connections.



B114079

2.6.2 Establishing the hydraulic connection

When connecting and releasing hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.



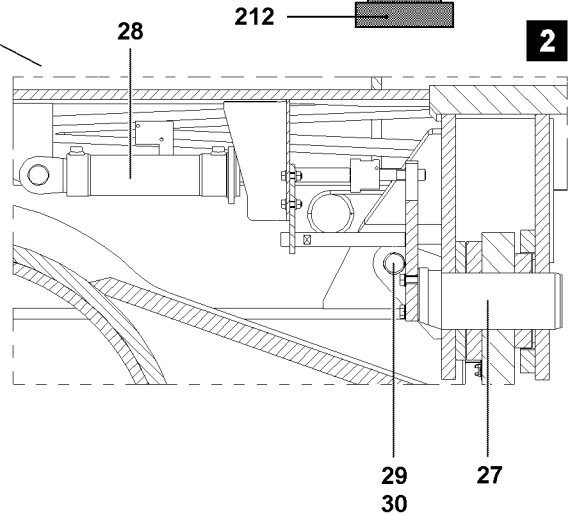
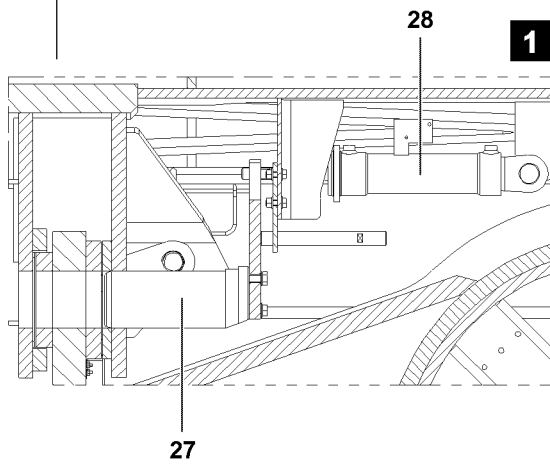
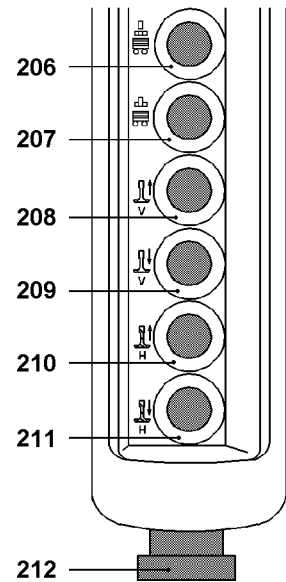
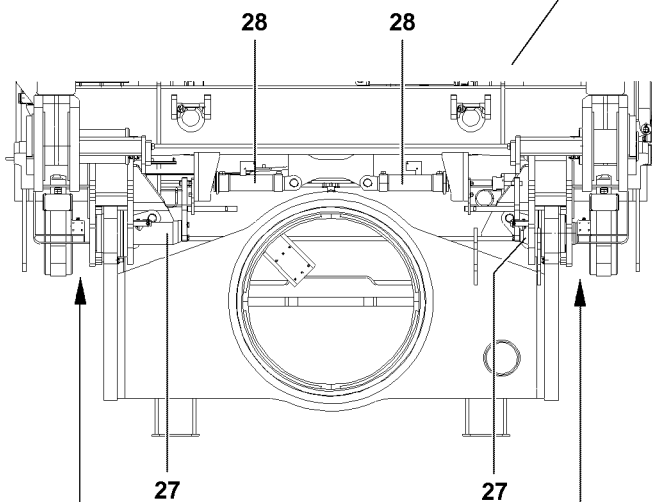
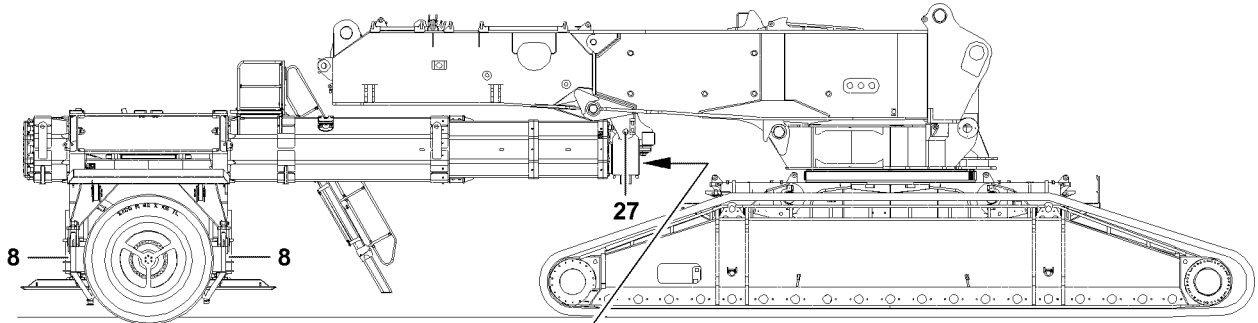
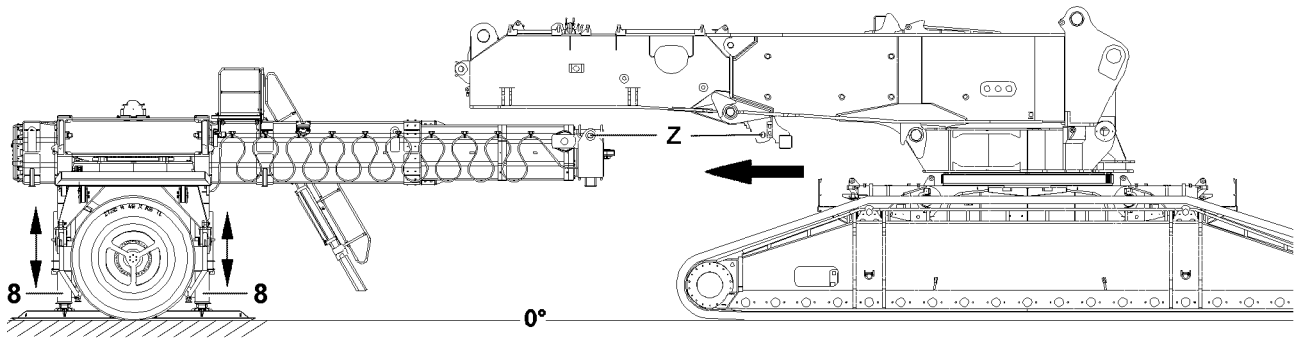
DANGER

Danger of accident due to loss of pressure or leakage!

Incorrectly coupled or self-loosening quick-release couplings (particularly return lines) can result in serious injury due to component failure!

- ▶ Check that the quick couplings have been properly connected before using the crane!

- ▶ Release the pressure in the hydraulic system before connecting or disconnecting. Turn the engine off and wait for short time.
- ▶ 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.



B103783

2.6.3 Aligning the ballast trailer

Make sure that the following prerequisites are met:

- The electrical and hydraulic connections have been established.
- The crane has been moved to the pin points on the guide of the ballast trailer.
- The hydraulic guide is telescoped out approx. 20 cm.
- The pin **44** is pinned in the slot of the strut.
- The locking pin **12** is unpinned on the strut.
- No ballast plates are placed.



Note

- ▶ Align the ballast trailer by raising or lowering the two support cylinders or by swinging the turntable or by telescoping the guide out / in until the pin bores match on both sides!
- ▶ The guide can be telescoped out / in with reduced pressure!

NOTICE

Danger of property damage due to incorrect operation!

If this is not observed, the crane or the ballast trailer can be damaged!

- ▶ The movements, swinging turntable, driving support cylinders and telescoping of the guide must be carried out with extreme caution!
- ▶ Insert the pins **27** on both sides.

2.6.4 Pinning procedure

- ▶ Press the button **207** and insert the pins **27** on both sides with the cylinders **28**.
- ▶ Then, insert the retaining pin **29** and secure with spring retainer **30**.



Note

- ▶ The crane control recognizes via the limit switch initiators on the left and right on the pin points if the pins are fully inserted on the turntable!
- ▶ After pinning, it must be rechecked if both pins are properly pinned and secured and if the connector lines are correctly and completely connected!
- ▶ If the two pins are pinned completely and correctly, then the crane control receives the message "Ballast trailer pinned", which means the turntable cannot be turned and the crawler cannot be driven!
- ▶ The release is issued only when the ballast trailer wheels are in the required position for circular, towing or parallel travel!



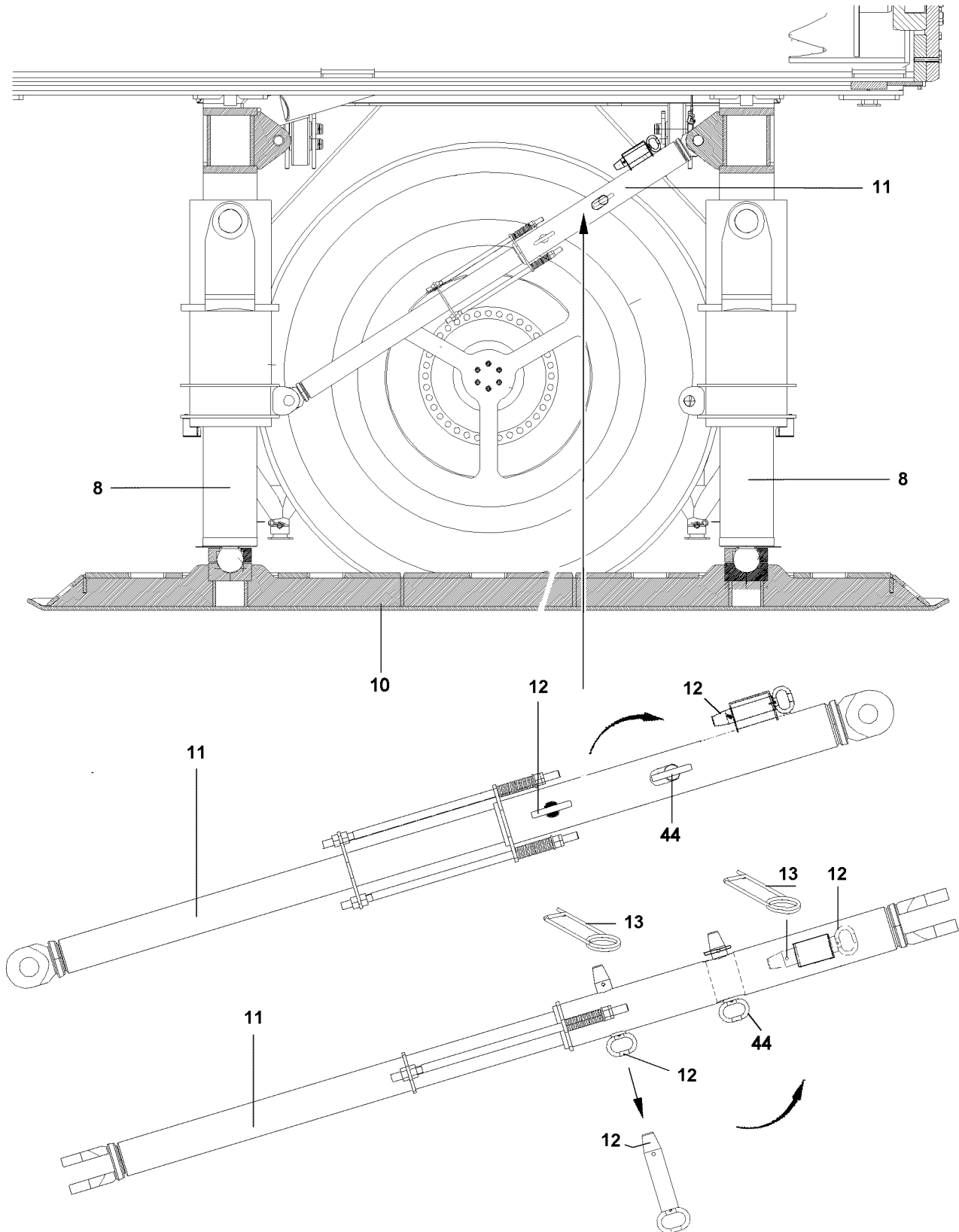
DANGER

Danger due to operating error!

As long as only one pin is pinned, the crane control does not receive the message "Ballast trailer pinned", which means that the turntable can be turned and the crawler can be driven to be able to pin the second pin.

- ▶ These movements must be carried out with extreme caution!
- ▶ If this is not observed, the crane or the ballast trailer can be damaged!

- ▶ Make sure that both pins are inserted completely!



B106913

2.7 Retracting the support cylinders

When the pin procedure between the ballast trailer and the turntable is completed, retract the support cylinders **8**.

Make sure that the following prerequisites are met:

- The ballast trailer is pinned and secured on the turntable on both sides.
- The electrical and hydraulic connections are connected.
- The pin **44** is inserted in the slot.
- The locking pin **12** is unpinned from the locking bore on the strut **11** and inserted into the transport retainer and secured with spring retainer **13**.



Note

- ▶ The locking pin **12** can only be unpinned if the support cylinders **8** are relieved!

NOTICE

Overload of support cylinders!

Both support cylinders, rear and front, must be retracted simultaneously and evenly!

- ▶ Retract both support cylinders simultaneously and evenly!



Note

- ▶ The support cylinders can also be retracted via the corresponding buttons on the instrument panel in the crane operator's cab!

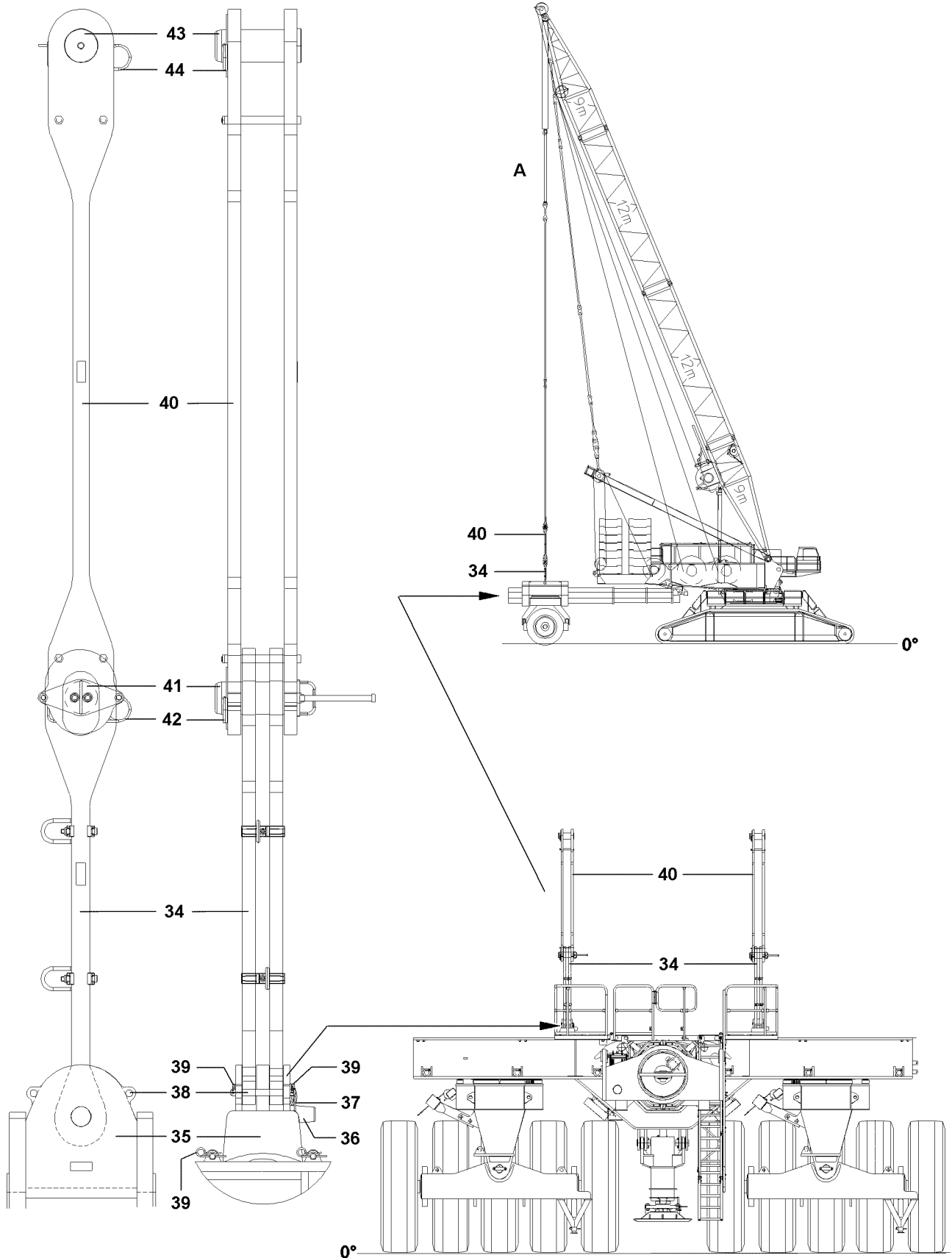
Retract the support cylinder **8**:

- Press the buttons **208/210** simultaneously, the front and support cylinders retract.

NOTICE

Danger of property damage!

- ▶ Before placing the ballast plates on the ballast trailer assembled on the turntable, it must be ensured that the locking pin **12** is unpinned on the strut **11**!
- ▶ The locking pin **12** must be unpinned before supporting the assembled ballast trailer, for example when changing the wheel position!
- ▶ This is necessary to allow a level adjustment between the strut **11** and the support cylinders **8** with supported and ballasted ballast trailer!
- ▶ If this is not observed, the strut will be damaged!
- ▶ Move the support cylinders in completely. The warning light in the cab lights up.



B103786

2.8 Assembling the ballast guy rods

Make sure that the following prerequisites are met:

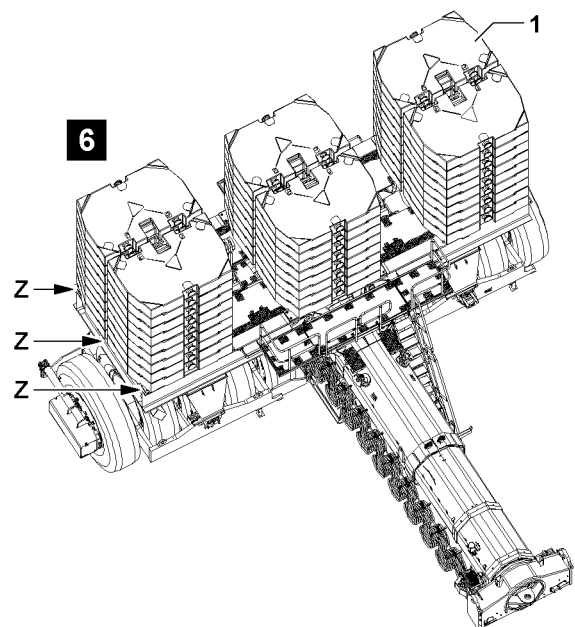
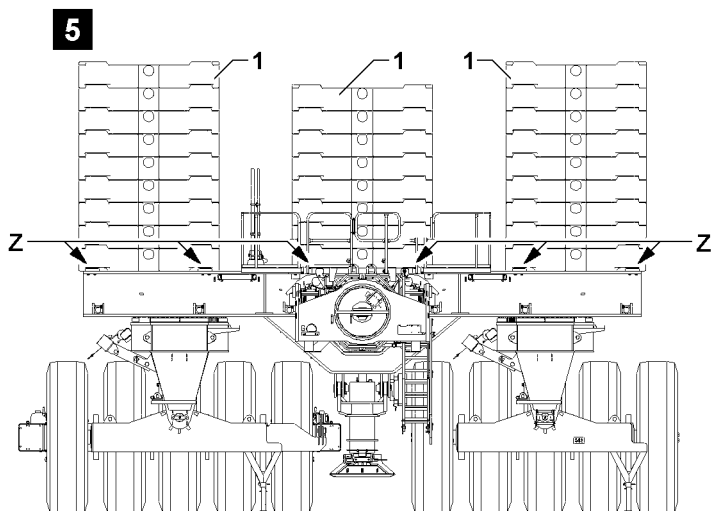
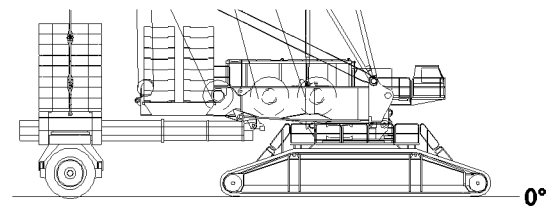
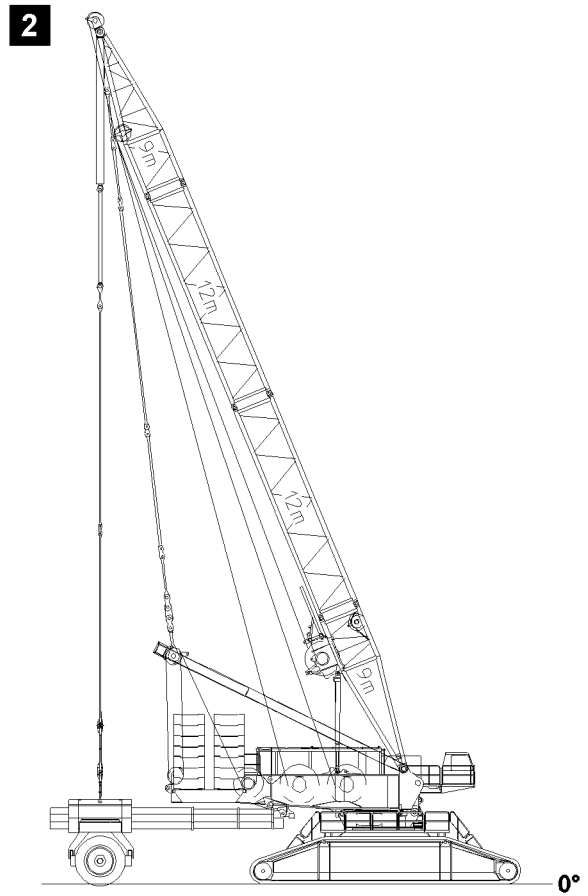
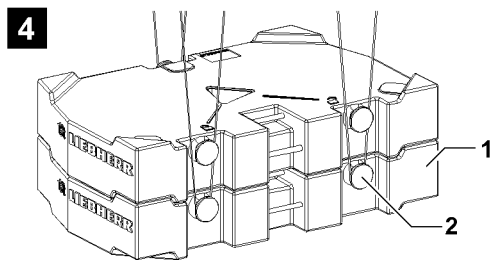
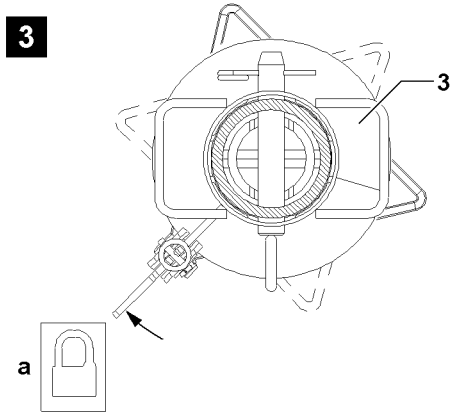
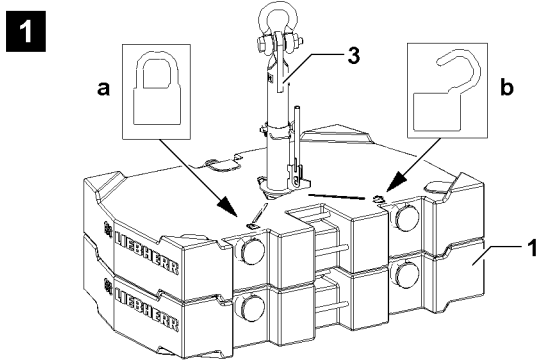
- The derrick is set to 15 m radius.
- The ballast trailer radius is R 15 m.



Note

- ▶ The ballast trailer guy rods must be assembled and secured according to the separately supplied assembly drawings! The numbering on the assembly drawings must be identical to the numbering on the guy rods!

-
- ▶ Assemble the guy rods **34** on both sides of the ballast trailer.
 - ▶ Hang the guy rods **34** on the auxiliary crane and position vertically over the cross bracket **35**.
 - ▶ Pin the guy rod **34**.
 - ▶ Insert the pin **36** and secure with spring retainer **37**.
 - ▶ Lock the guy rod **34**.
 - ▶ Insert the retaining pins **38** on both sides and secure with cotter pins **39**.
 - ▶ Extend the cylinder piston rod **A** to position the derrick guy rod **40** above guy rod **34**.
 - ▶ Insert the pin **41** and secure with spring retainer **42**.



B109592

2.9 Ballasting

The ballast plates are marked with their own weights:

- A ballast plate **1** weighs 10 t.

Make sure that the following prerequisites are met:

- The ballast trailer is pinned and secured to the turntable on both sides, see illustration **2**.
- The derrick guy rods are pinned and secured on both sides.



DANGER

Danger of accident!

If more than the specified loads are lifted with the receptacle stud **3** or the ropes via the bitts **2**, then components will be overloaded!

Ballast plates **1** can fall down and fatally injure personnel!

- ▶ Lift no more than maximum 20 t with the receptacle stud **3**, see illustration **1**!
- ▶ Lift no more than maximum 20 t with the ropes, 3 fastening points, see illustration **4**!

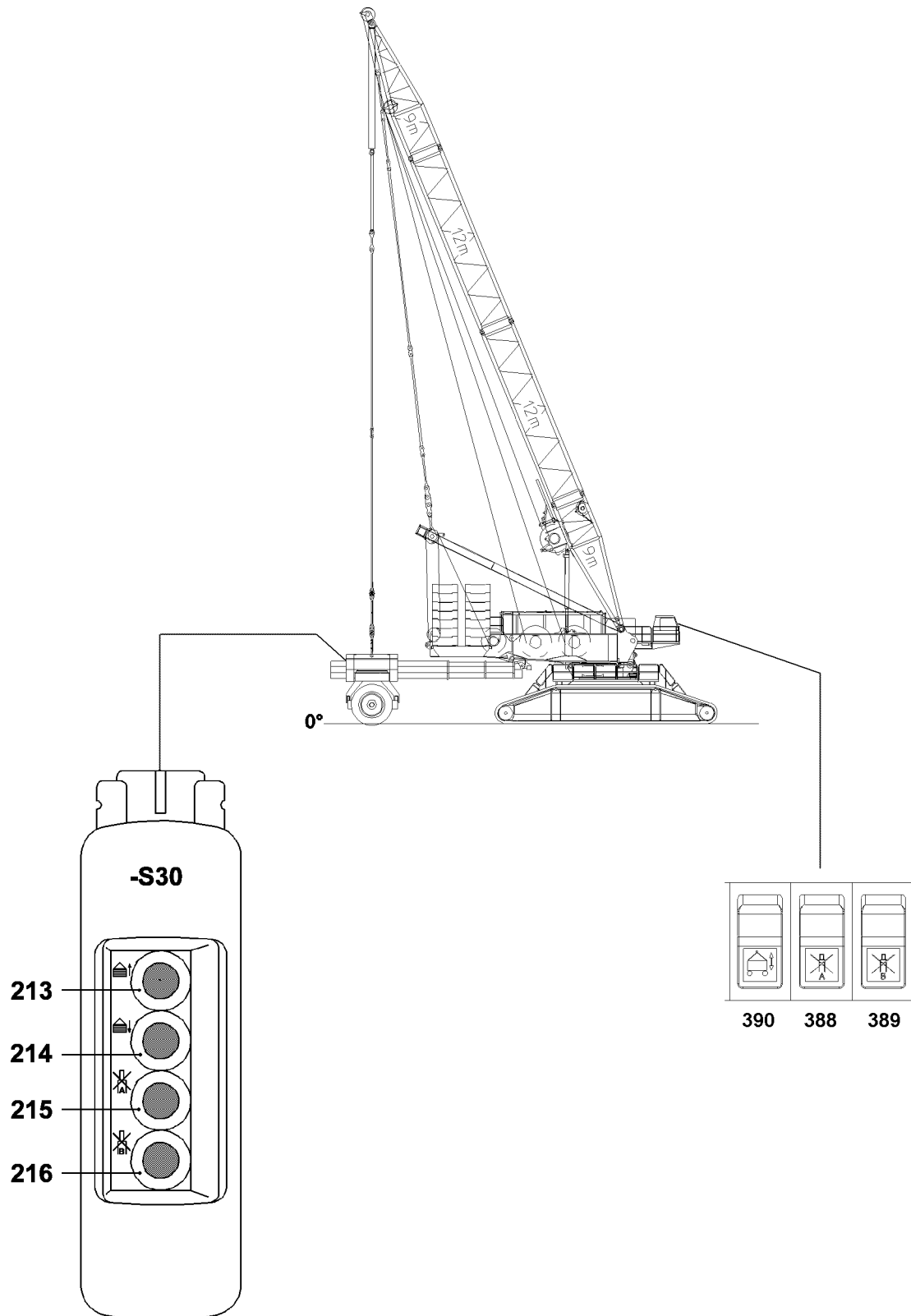


Note

- ▶ Position **a**, folded out lever points to the closed icon = receptacle stud **3** closed!
- ▶ Position **b**, folded out lever points to the open icon = receptacle stud **3** open to move in / out!

Ensure that the following prerequisite is met for lifting with the receptacle stud **3**:

- The receptacle stud **3** must be in position **a**: “Receptacle stud **3** closed”, see illustration **3**.
- ▶ Lift the ballast plates **1** individually or as an assembly, see illustration **1** and illustration **4**.
- ▶ Place the ballast plates **1** evenly distributed on the ballast trailer with the auxiliary crane and center them on the centering plates **Z** or an already placed ballast plate **1**, see illustration **5** and illustration **6**.



B105088

2.10 Lifting the derrick ballast off the ground



WARNING

The crane can topple over!

If the derrick ballast is lifted up by the **maximum permissible** 250 mm from the ground, the crane can be topple over to the rear of the load rips off!

If the following notes are not observed, personnel can be severely injured or killed!

- ▶ There may be no personnel, objects or obstacles within the entire slewing range of the crane, derrick ballast and the load!
- ▶ Do not lift derrick ballast more than 250 mm from the ground!
- ▶ The ground in the entire working area of the crane - including the derrick ballast and the load - must be even and of sufficient load carrying capacity, in order to be able to securely accept the encountered ground pressures and weight loads!



Note

- ▶ Lifting of the derrick ballast must be observed by a guide!

Actuate the pull cylinders from the crane cab:

- Press button **390 on front**, the derrick ballast is lifted using the pull cylinders.
- Press button **390 on rear**, the derrick ballast is lowered using the pull cylinders.

Actuate the pull cylinders from the control panel (**S30**):

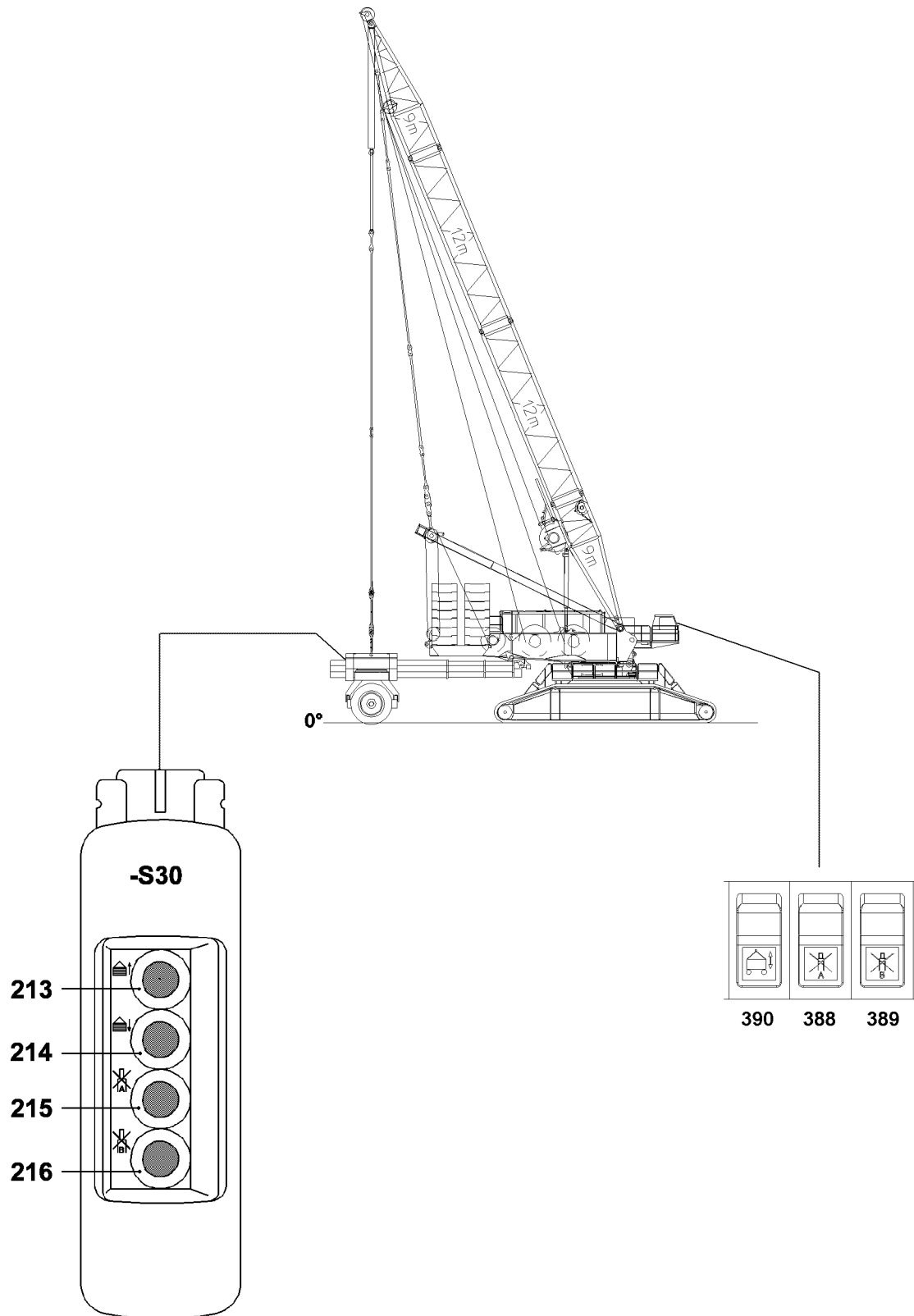
- Press button **213**, the derrick ballast is lifted using the pull cylinders.
- Press button **214**, the derrick ballast is lowered with pull cylinders.



DANGER

Danger of accident!

- ▶ The control panel may only be used for assembly!
- ▶ The crane operator should **not** use the control panel to raise or lower the derrick ballast when the crane is being operated. This is because the monitors cannot be seen there!
- ▶ Lifting and lowering during crane operation may **only** be carried out from the cab!
- ▶ When raising or lowering the derrick ballast, ensure there is no great difference in the forces exerted on the ballast guying!
- ▶ The LICCON indicates both forces and will issue a warning if the difference is excessive!
- ▶ See section "Differential force monitoring of ballast guying"!



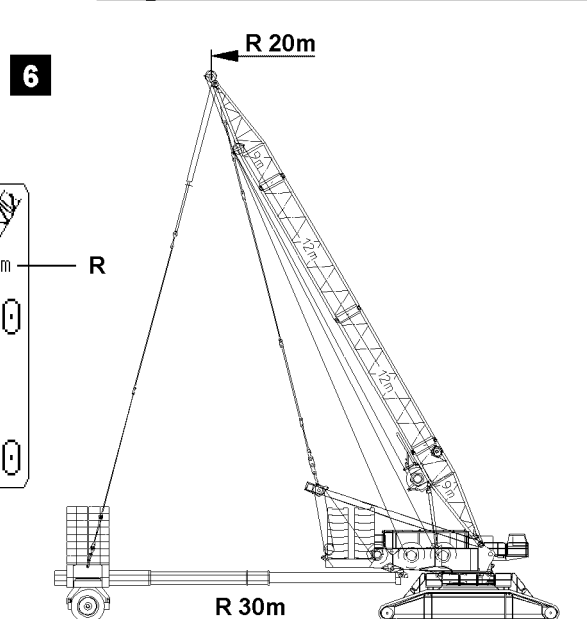
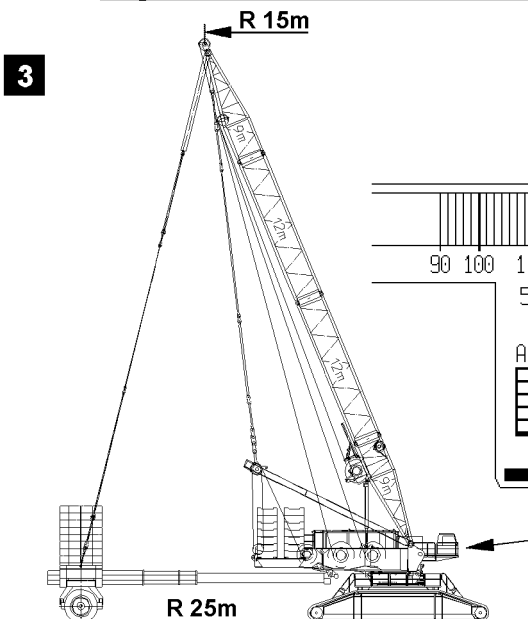
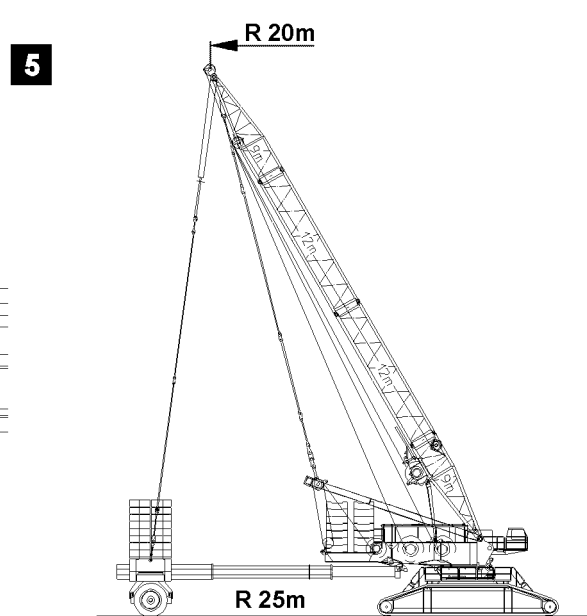
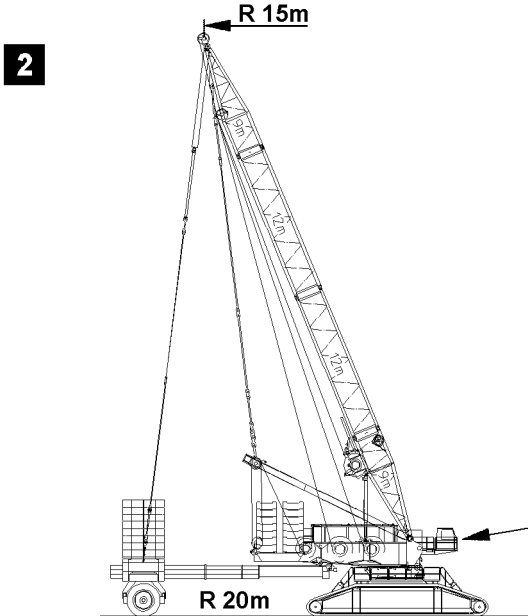
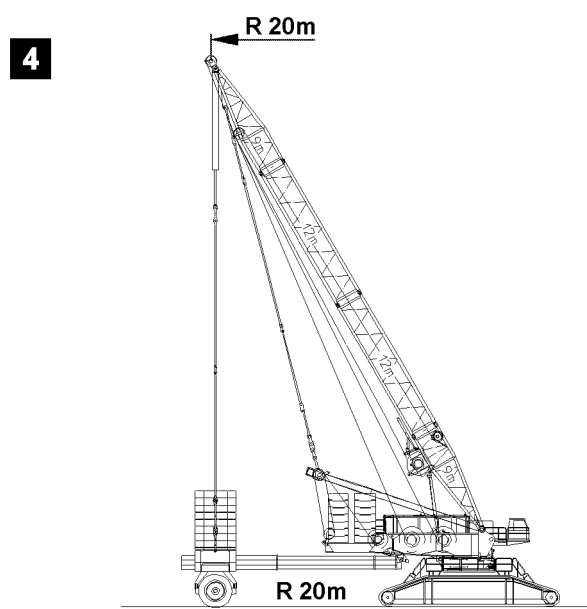
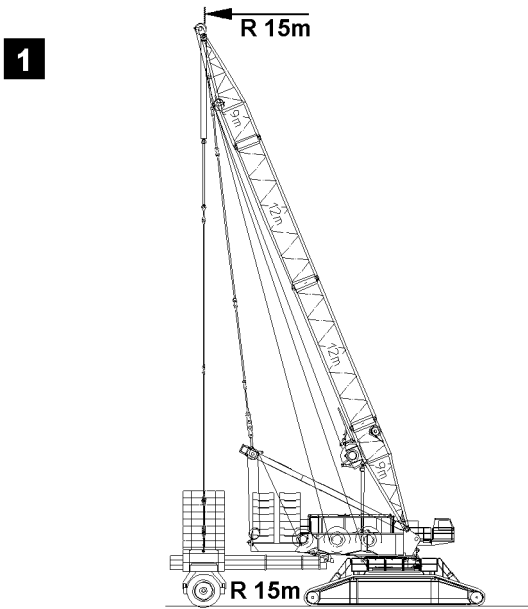
B105088

**DANGER**

Danger of accident!

- ▶ When lifting or lowering the derrick ballast, make sure that it is in a horizontal position!
- ▶ If the derrick ballast is only actuated via button **390**, button **213** and button **214** “derrick ballast UP / DOWN”, **without** simultaneously actuating button **388** or button **215**, “block cylinder (A) on derrick ballast” or button **389** or button **216** “block cylinder (B) on derrick ballast”, then the horizontal alignment of the derrick ballast is regulated with the aid of a level sensor!
- ▶ With a ballast utilization of more than 90 %, the level sensor regulates the derrick ballast level to $\pm 0.3^\circ$!
- ▶ With a ballast utilization of more than 90 %, the level sensor regulates the derrick ballast level to $\pm 2.5^\circ$. This makes it possible to set the ballast trailer down to a ground slope of 2.5° !
- ▶ By pressing the button **388** or button **215** “block cylinder (A) on derrick trailer”, or button **389** or button **216** “block cylinder (B) on derrick ballast”, the level sensor is bypassed and the ballast trailer can be set down intentionally on an incline. This is exclusively permitted for setting down the derrick ballast on uneven ground and only by observing utmost caution!
- ▶ If this is not observed, there is an increased danger of accidents!

- Press button **388** or button **215**, the left pull cylinder (A) is blocked.
- Press button **389** or button **216**, the right pull cylinder (B) is blocked.



B104089

3 Setting the ballast trailer radii

The ballast trailer can be steplessly telescoped hydraulically from R 15 m to R 25 m and by unpinning the center pipe **2** on the guide **1** from R 20 m to R 30 m.

Make sure that the following prerequisites are met:

- The ballast trailer wheels are in tow position.

Illustration 1: Derrick on R = 15 m, ballast trailer R = 15 m

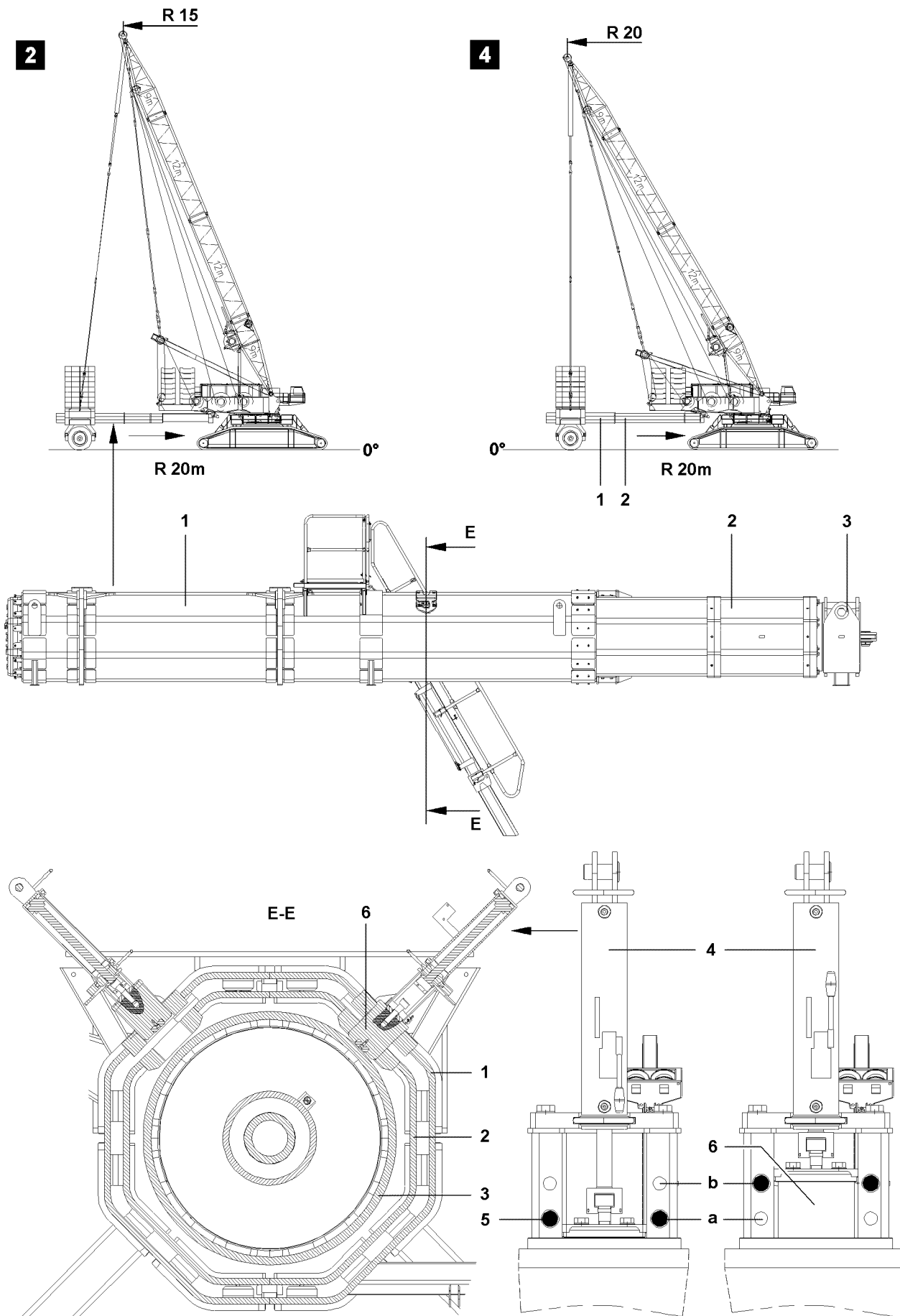
Illustration 2: Derrick on R = 15 m, ballast trailer R = 20 m

Illustration 3: Derrick on R = 15 m, ballast trailer R = 25 m

Illustration 4: Derrick on R = 20 m, ballast trailer R = 20 m

Illustration 5: Derrick on R = 20 m, ballast trailer R = 25 m

Illustration 6: Derrick on R = 20 m, ballast trailer R = 30 m



B104092

3.1 Unlocking / locking the center pipe

Make sure that the following prerequisites are met:

- The ballast trailer radius is 20m.
- The ballast trailer is supported.
- The locking pin is pinned on the strut in the locking bore.
- The guy rods between the derrick head and the ballast trailer are released.



Note

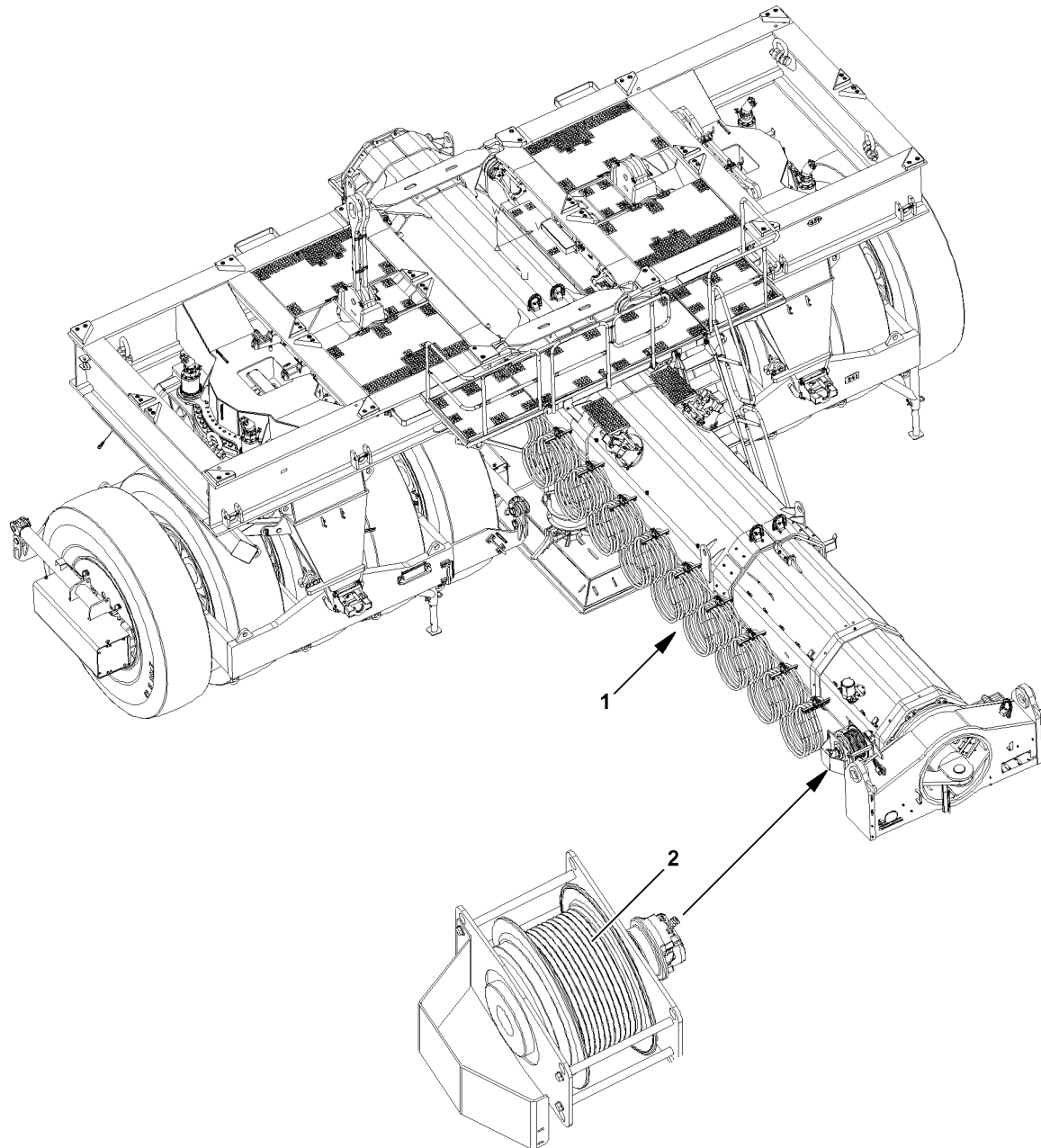
- ▶ The initial position is shown as in **illustration 2**, the ballast trailer radius is R 20 m!
 - ▶ The pushed-in center pipe **2** is locked with the guide **1**. The inner pipe **3** is telescoped out!
 - ▶ To be able to telescope out to R 30 m , the center pipe **2** must be unlocked. Telescoping in the hydraulic cylinder will pull the center pipe forward!
-

3.1.1 Unlocking

- ▶ Hang the pin pulling device in **4**.
- ▶ Release the retaining pins **5** and unpin from the bores **a**.
- ▶ Actuate the manual lever and unpin the pin **6** completely.
- ▶ Pin and secure the retaining pins **5** in the bores **b**.

3.1.2 Locking

- ▶ Hang the pin pulling device in **4**.
- ▶ Release the retaining pins **5** and unpin from the bores **b**.
- ▶ Actuate the manual lever and unpin the pin **6** completely.
- ▶ Pin and secure the retaining pins **5** in the bores **a**.
- ▶ Unpin the locking pin on the strut.
- ▶ Retract the support completely.



B114077

3.2 Telescoping the ballast trailer guide out and in

NOTICE

Damage of hose guide 1!

When using the ballast trailer on the crane for the first time or after a replacement of the winch turn sensor on the winch "hose guide-BW" ¹⁾ **2** or after replacement of the memory card on the power pack of the LICCON component group, the winch "hose guide-BW" **2** must be readjusted!

If the winch "hose guide -BW" is not adjusted, then the hose guide can be damaged!

► Please contact the Service Dept. at **LIEBHERR-Werk Ehingen GmbH!**

1) Winch "Hose guide - ballast trailer"

NOTICE

Damage of hose guide 1 on ballast trailer!

In cold weather, especially in snow and ice, the "glides" of the hose guide **1** can freeze stuck and rip off when telescoping the ballast trailer guide out or in!

► All "glides" of the hose guide must be checked for movement before telescoping the ballast trailer guide out or in!



Note

- The release to telescope the ballast trailer guide out and in is given when the wheel sets are in towing operation!
- If the ballast trailer is supported for assembly on the turntable, then it is possible to telescope out and in with reduced pressure 40 bar!



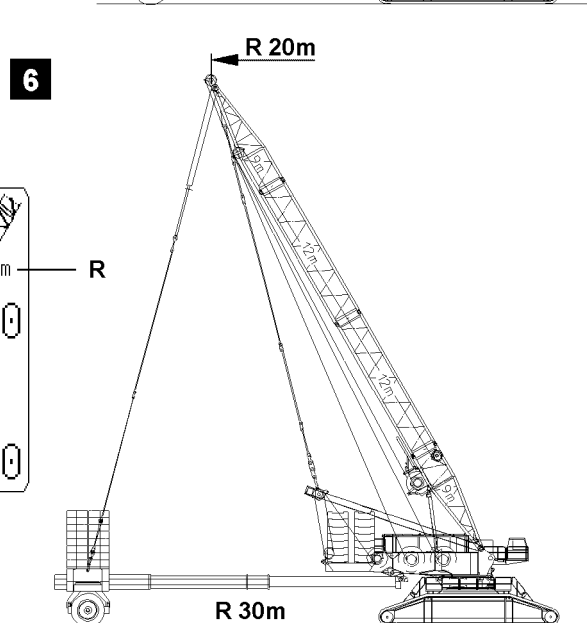
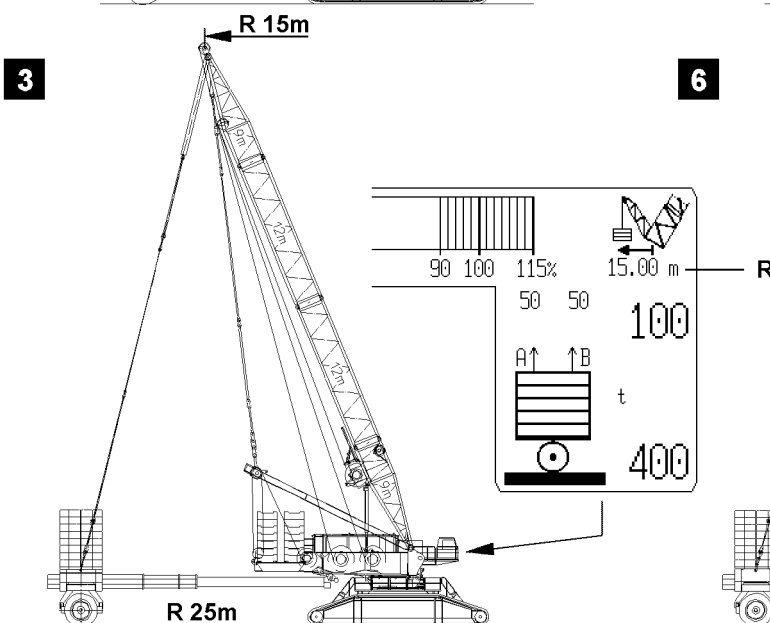
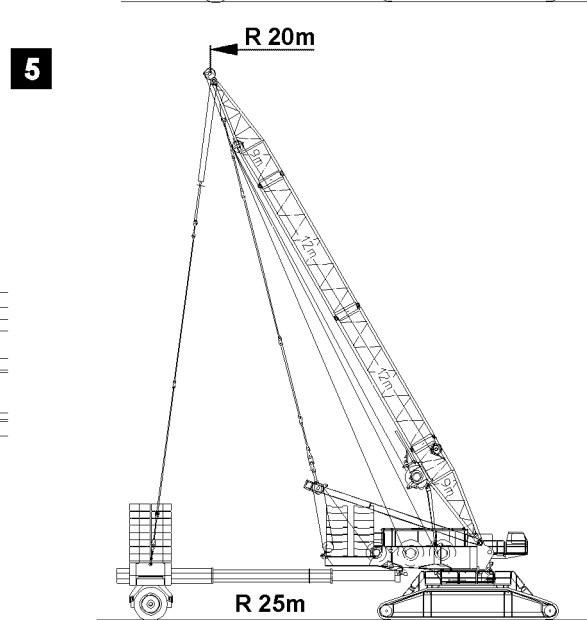
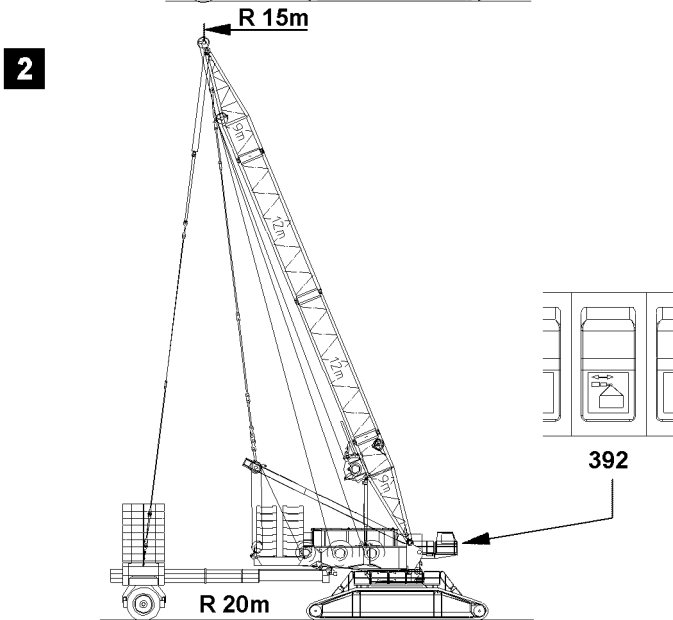
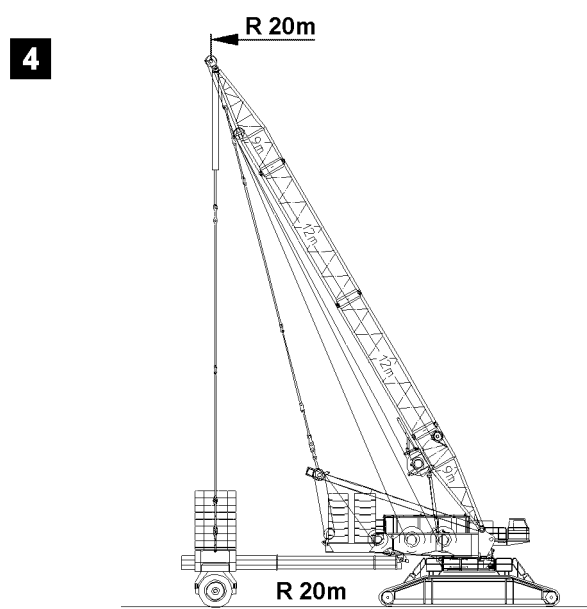
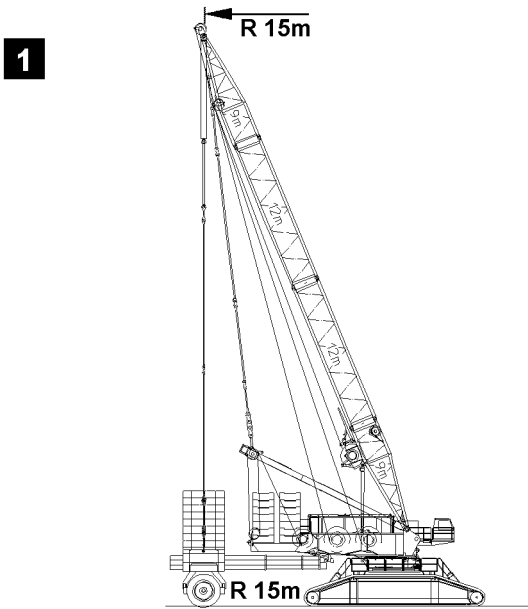
Note

- When telescoping the ballast trailer guide out, monitor the displayed actual length **R** on the LICCON monitor!
- The crane operator may not blindly rely on the radius measurement, he must think for himself and check if the length sensor measuring functions correctly, see Crane operating instructions, chapter 4.02!



Note

- Pushing out with suspended, maximum derrick ballast and maximum load is only possible up to 25 m!
- Pushing the derrick ballast out under load, between 25 m and 30 m is only possible at reduced force in the derrick guying!
- If the maximum derrick ballast for radii of ballast trailer above 25 m is required, then this can only occur for fixed ballast trailer radii!



B104089

3.2.1 Telescoping from R 15 m to R 25 m, illustration 1-3

- ▶ Press the button **392** and telescope the ballast trailer out to the required radius R 20 m or R 25 m.
- ▶ Observe the F1min.-max. force display in the derrick guying.

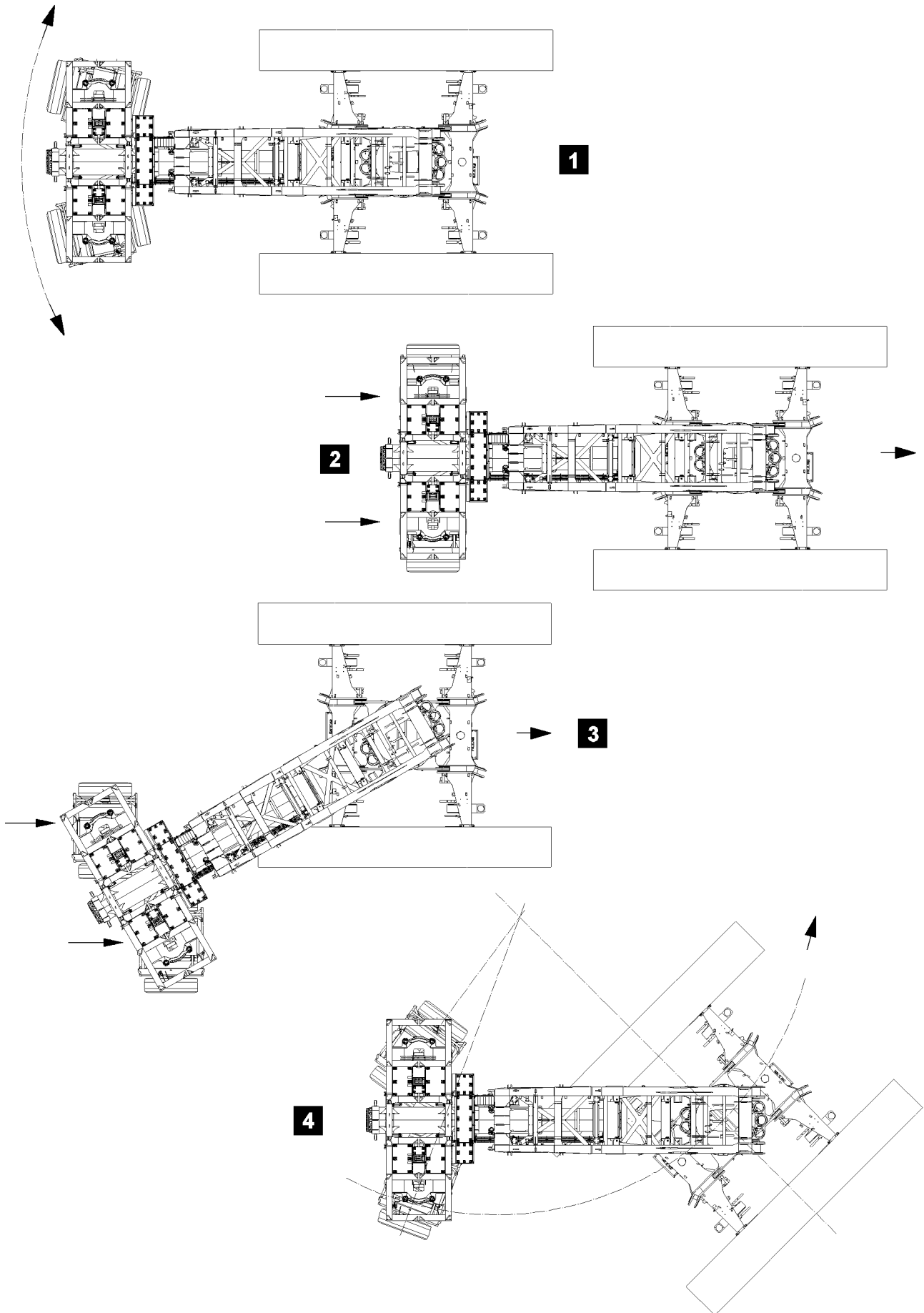
3.2.2 Telescoping from R 20 m to R 30 m, illustration 4-6

Initial position is illustration 2, derrick on R 15 m and ballast trailer on R 20 m. The pushed-in center pipe **2** is locked with the guide **1**. The inner pipe **3** is telescoped out.

- ▶ Move the derrick to R 20 m. The pushed-in center pipe **2** is locked with the guide **1**. The inner pipe **3** is telescoped out.
- ▶ Release the guy rods between the derrick head and the ballast trailer.
- ▶ Support the ballast trailer.
- ▶ Unpin the center pipe **2** on the guide **1** with the pin pulling device **4**.
- ▶ Press the button **392** and pull the center pipe **2** forward by telescoping the hydraulic cylinder in.
- ▶ Pin the center pipe **2** again on the guide **1** with the pin pulling device **4**, illustration 4.
- ▶ Press the button **392** and telescope the ballast trailer out to the required radius R 25 m or R 30 m.

Initial position is illustration 5.

- ▶ Release the guy rods between the derrick head and the ballast trailer.
- ▶ Support the ballast trailer.
- ▶ Unpin the center pipe **2** on the guide **1** with the pin pulling device **4**.
- ▶ Press the button **392** and pull the center tube **2** backward by telescoping the hydraulic cylinder out.
- ▶ Pin the center pipe **2** again on the guide **1** with the pin pulling device **4**, illustration 3.



B103457

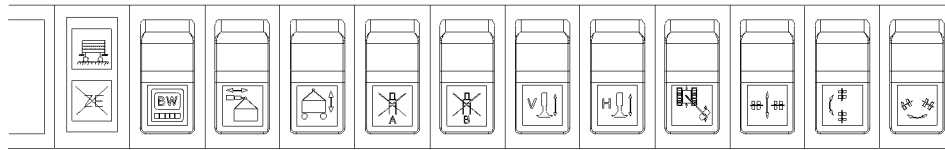
4 Changing the wheel sets

4.1 Steering programs

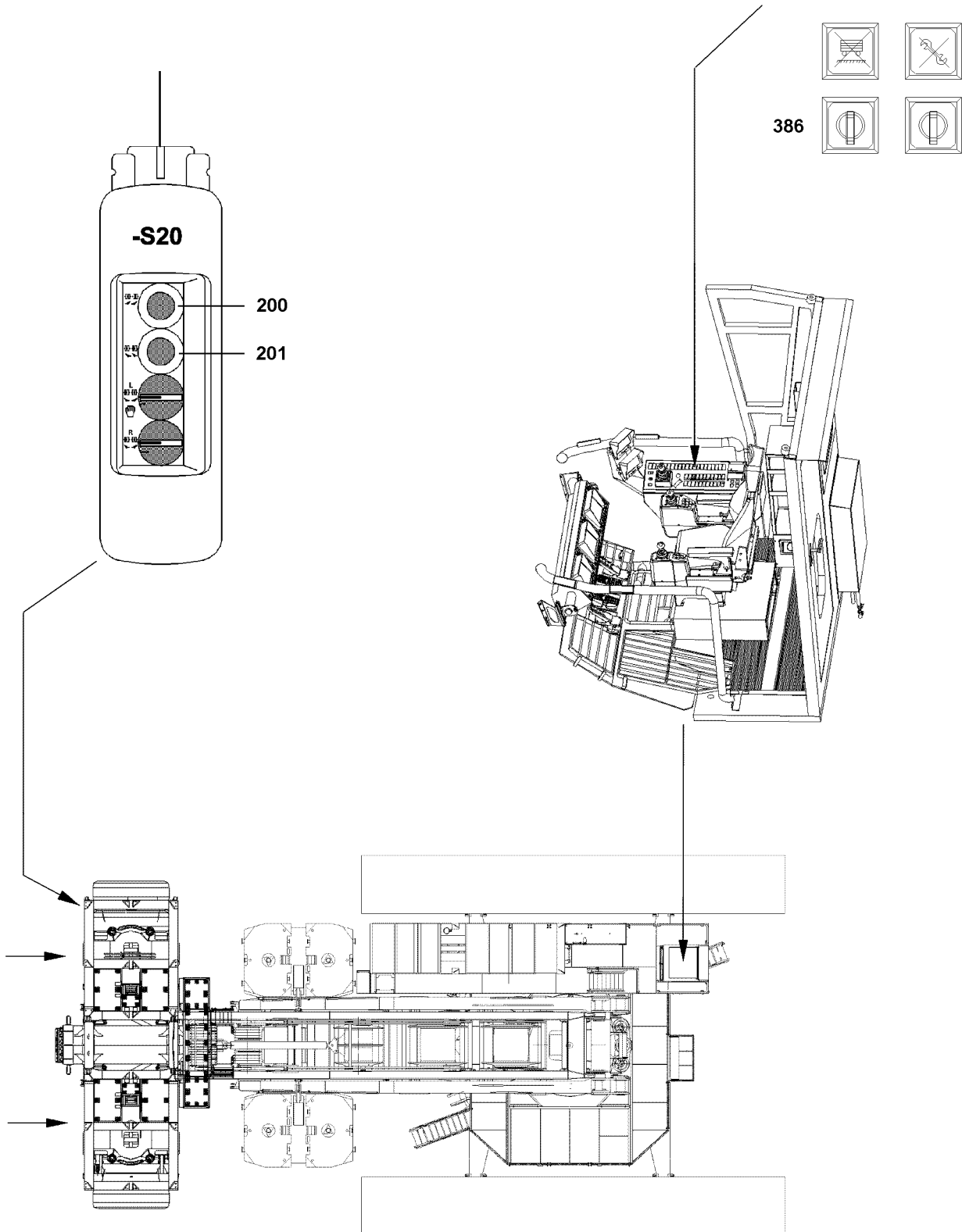
The ballast trailer is equipped with computer controlled steering programs.

- **Illustration 1:** Circular travel
- **Illustration 2:** Towing
- **Illustration 3:** Parallel travel
- **Illustration 4:** Corrective steering

The computer-controlled steering programs circular travel, towing and parallel travel can only be operated from the cab.



385 381 382 384



B103465

4.2 Notes to change the wheel sets

The change of the wheel sets for circular travel **384**, towing **381** and parallel travel **385** is only possible with the button **381**, button **384** and button **385** in the cab.

Corrective steering is possible with the button **382** in the cab or with the button **200** and button **201** from the control panel **-S20** on the ballast trailer.

The manual change of the wheel sets for assembly purposes is only possible with the buttons on the control panel **-S20** on the ballast trailer.



Note

- ▶ If the ballast trailer is suspended, the wheel sets can be positioned in any mode, if the key button **386** "Ballast trailer lifted off" was turned on!
- ▶ Turning and driving is possible!



DANGER

Danger of accidents when turning or driving!

If the ballast trailer scrapes on the ground during crane operation with turned on key button **386**, then the ballast trailer and the crane will be damaged!

- ▶ If the key button **386** "Ballast trailer lifted off" is turned on, it is imperative that a person monitors that the wheels **do not scrape on the ground!**

4.3 Changing the wheel sets

The change procedure is the same for all steering programs.



Note

- ▶ If the ballast trailer is **not loaded**, the wheel sets can be changed without relieving the tires!
- ▶ If the ballast trailer is **loaded**, the ballast trailer must be raised first with the support cylinders until the tires are relieved!
- ▶ Both support cylinders, rear and front, must be retracted or extended simultaneously and evenly!
- ▶ The support procedure is the same for all steering programs!

NOTICE

Overload of support cylinders!

Both support cylinders, rear and front, must be retracted or extended simultaneously and evenly!

If only one support cylinder is retracted or extended or if they are not retracted or extended simultaneously, then one support cylinder must take on the entire weight and will therefore be overloaded!

- ▶ Actuate both support cylinders simultaneously!



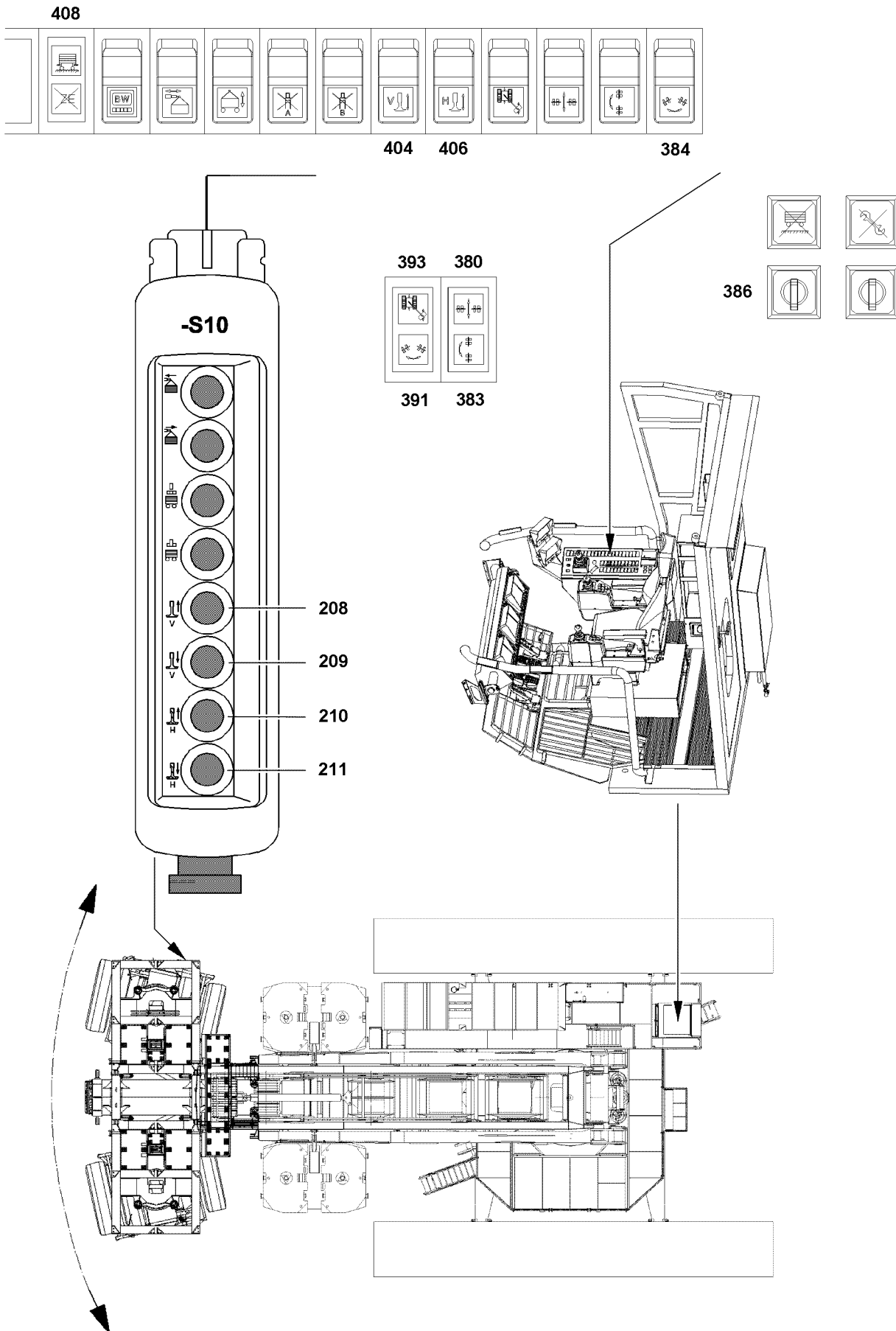
DANGER

Danger of accidents due to overload!

By raising the ballast trailer with the support cylinders, the force in test point F1 can increase to the maximum value. The extension of the support cylinders is then turned off!

- ▶ Stop the extension of the support cylinders before shut off!

- ▶ Actuate the support cylinders in the cab and watch the monitor display, Force in test point F1, at the same time.



B104027

4.4 Circular travel

Make sure that the following prerequisite is met:

- The ballast trailer guide is telescoped out to the required radius.

4.4.1 Raising the ballast trailer with the support cylinders

- ▶ Press button **404** and button **406** or button **209** and button **211** simultaneously and extend the support cylinders on the front and rear simultaneously.
- ▶ Raise the ballast trailer until the tires are relieved.

4.4.2 Setting the axles to circular travel position

- ▶ Press button **384**, the wheel sets are turned to the circular travel position.

Result:

- The indicator light **391** blinks until circular travel position is reached. The indicator light **391** lights up constantly when the circular travel position is reached.



Note

- ▶ If one of the wheel sets leaves the specified angle, then the indicator light **391** blinks and the axles must be reset as described above!

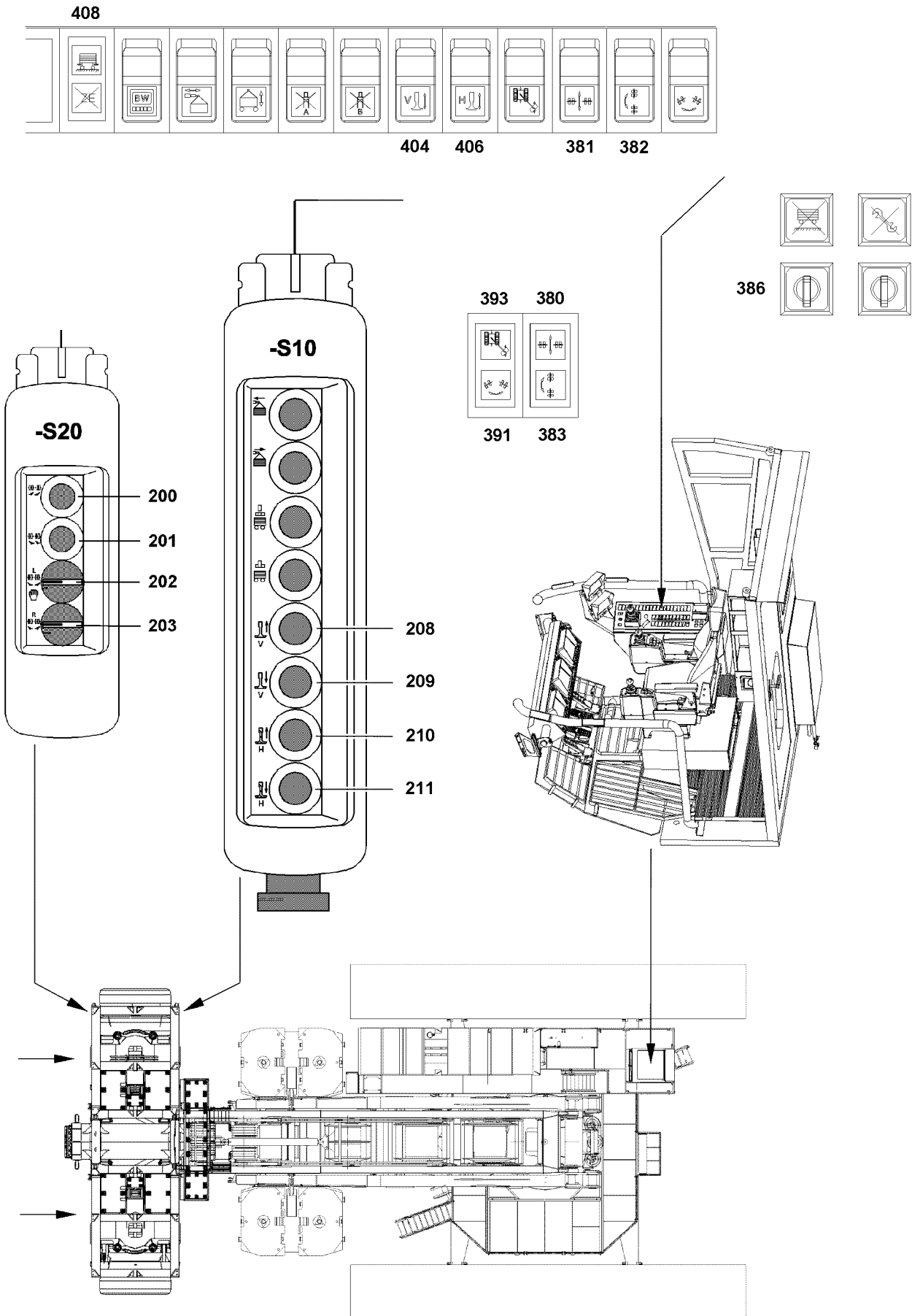
- ▶ Press the button **384** again.

4.4.3 Lowering the ballast trailer with the support cylinders

- ▶ Press button **404** and button **406** or button **208** and button **210** simultaneously and retract the support cylinders on the front and rear completely.

Result:

- The indicator light **408** lights up, the support cylinders are retracted.



B104028

4.5 Towing

4.5.1 Raising the ballast trailer with the support cylinders

- ▶ Press button **404** and button **406** or button **209** and button **211** simultaneously and extend the support cylinders on the front and rear simultaneously.
- ▶ Raise the ballast trailer, see circular travel.

4.5.2 Setting the axles to towing position

- ▶ Press button **381**, the axles are turned to the towing position.

Result:

- The indicator light **380** blinks until the towing position is reached. The indicator light **380** lights up constantly when the towing position is reached.

4.5.3 Lowering the ballast trailer with the support cylinders

- ▶ Press button **404** and button **406** or button **208** and button **210** simultaneously and retract the support cylinders on the front and rear completely.

Result:

- The indicator light **408** lights up, the support cylinders are retracted.



Note

- ▶ The release for "towing" is only made when both wheel sets are in travel position (neutral position) and the support cylinders are completely retracted!

- ▶ Check the setting of the wheel sets and the support cylinders.

4.5.4 Changing from corrective steering to towing position and vice-versa

NOTICE

Load on the ballast trailer wheels is too large!

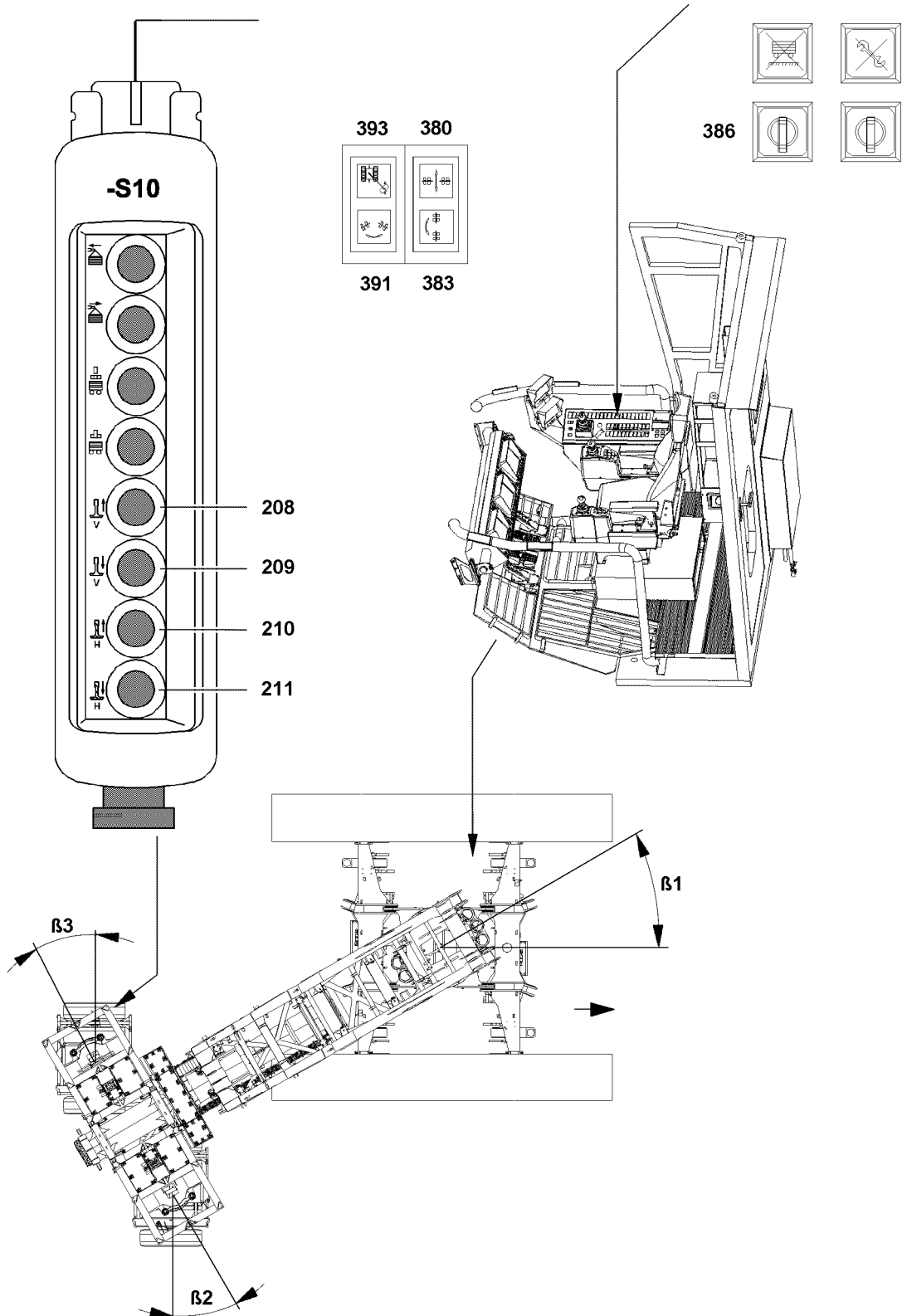
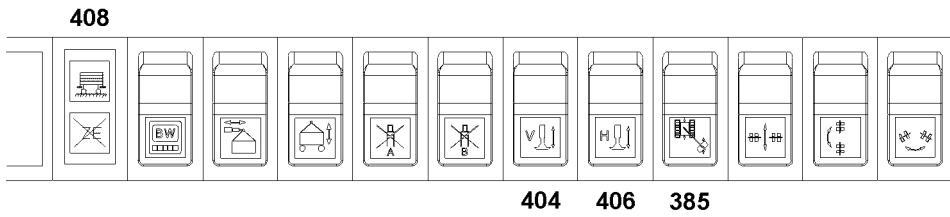
When correcting the steering with excessive load **at a standstill**, the ballast trailer will be damaged!

- ▶ In case of large load, correct the steering only **in travel operation!**
- ▶ Monitor the distortion of the wheels!



Note

- ▶ Changing from operating mode towing to operating mode corrective steering and back is possible while driving the crawler!
- ▶ If one of the wheel sets leaves the specified angle, then the indicator light **380** blinks and the axles must be reset as described above!
- ▶ If the operating mode towing is selected from operating mode corrective steering, then the indicator light **383** blinks!
- ▶ Generally, the wheels sets only move if either the button **382** or button **381** in the cab or button **200** or button **201** on the control panel in the corresponding operating mode are pressed or the crawler is driven!



B104029

4.6 Parallel travel

Make sure that the following prerequisite is met:

- Crawler operation is turned on.

NOTICE

Property damage!

- ▶ When driving parallel, steering the crawler is prohibited!
 - ▶ In parallel travel, a person must monitor the side tire distortion. In case of a distortion of more than 100 mm, the position of the axles must be corrected!
-



Note

- ▶ The wheel sets must be in parallel travel position, regardless if the “ballast trailer is on the ground” or if the “ballast trailer is suspended”. For other wheel set positions, the control system reverts to the same shut off functions as for towing!
 - ▶ Drive both crawlers at the same time in parallel!
-

4.6.1 Raising the ballast trailer with the support cylinders

- ▶ Press button **404** and button **406** or button **209** and button **211** simultaneously and extend the support cylinders on the front and rear.

4.6.2 Setting the axles to parallel position

- ▶ Press the button **393**, the axles are turned to parallel position.

Result:

- The indicator light **393** blinks until the parallel position is reached. The indicator light **393** lights up constantly when the parallel position is reached.
-



Note

- ▶ If one of the wheel sets leaves the specified angle, then the indicator light **393** blinks and the wheel sets must be reset as described above!
-

- ▶ Check the parallel position.

4.6.3 Lowering the ballast trailer with the support cylinders

- ▶ Press button **404** and button **406** or button **208** and button **210** simultaneously and retract the support cylinders on the front and rear completely.

Result:

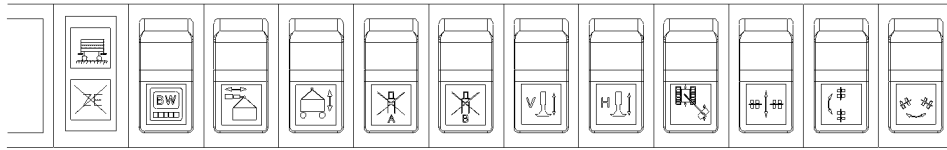
- The indicator light **408** lights up, the support cylinders are retracted.
-



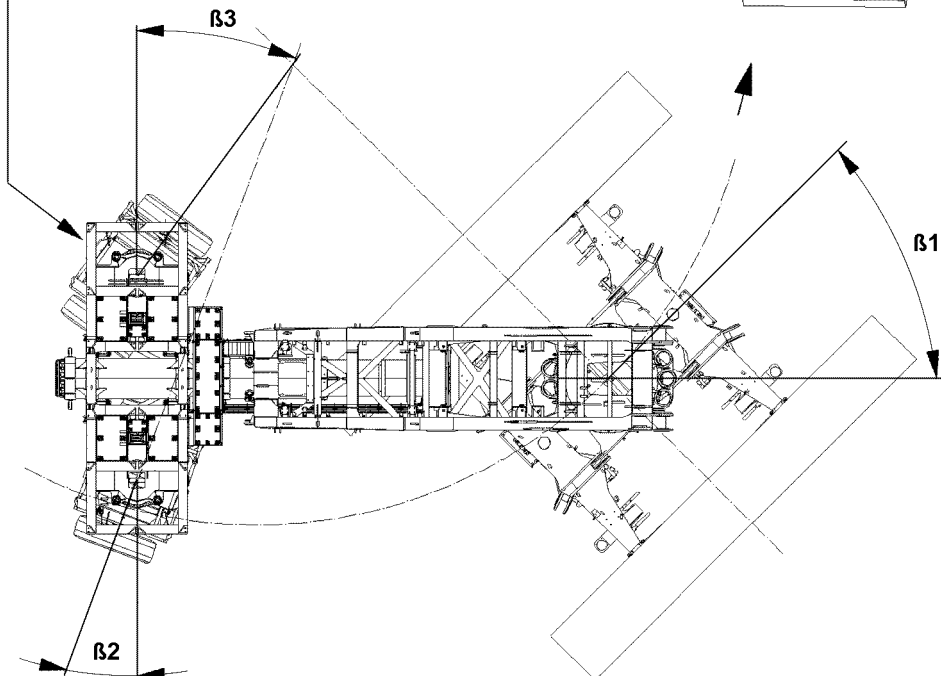
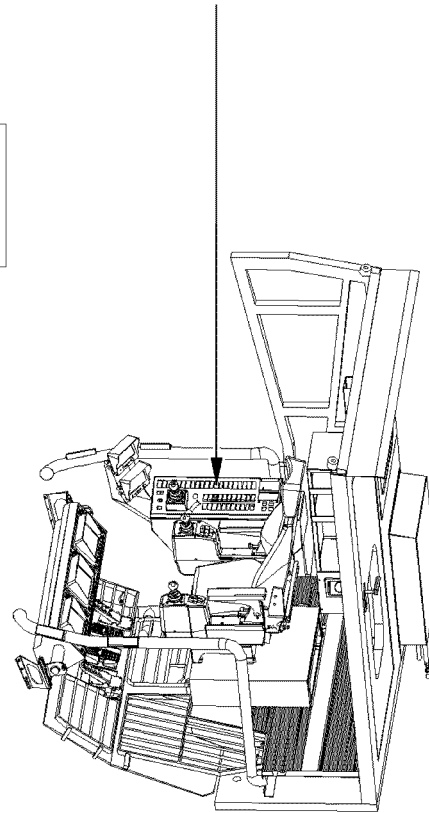
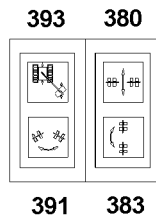
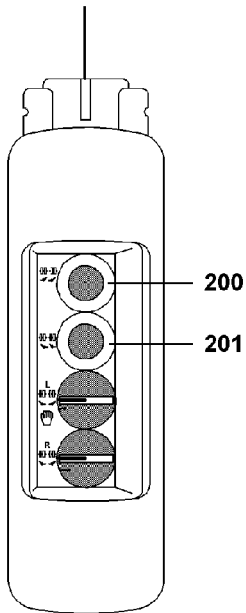
Note

- ▶ The travel drive of the crawler is locked until the axles are in parallel position. During “crawler driving” the slewing gear brake on the crane is engaged, the hydraulic coasting is opened!
 - ▶ If the angles β_2 , β_3 in relation to β_1 deviate by more than the permissible limit value, then the crawler track is stopped. The indicator light **393** blinks!
 - ▶ The crawler track is only released again by turning the axles to the specified angle, as described above!
 - ▶ If “Parallel operation crawler” is turned on, the crawler moves straight forward on appropriate terrain. This simplifies driving with the ballast trailer in operating mode “Parallel travel”!
-

- ▶ Check the settings.



381 382



B104030

4.7 Corrective steering

Make sure that the following prerequisite is met:

- Crawler operation is turned on.

4.7.1 Steering and corrective steering of the axles

Make sure that the following prerequisite is met:

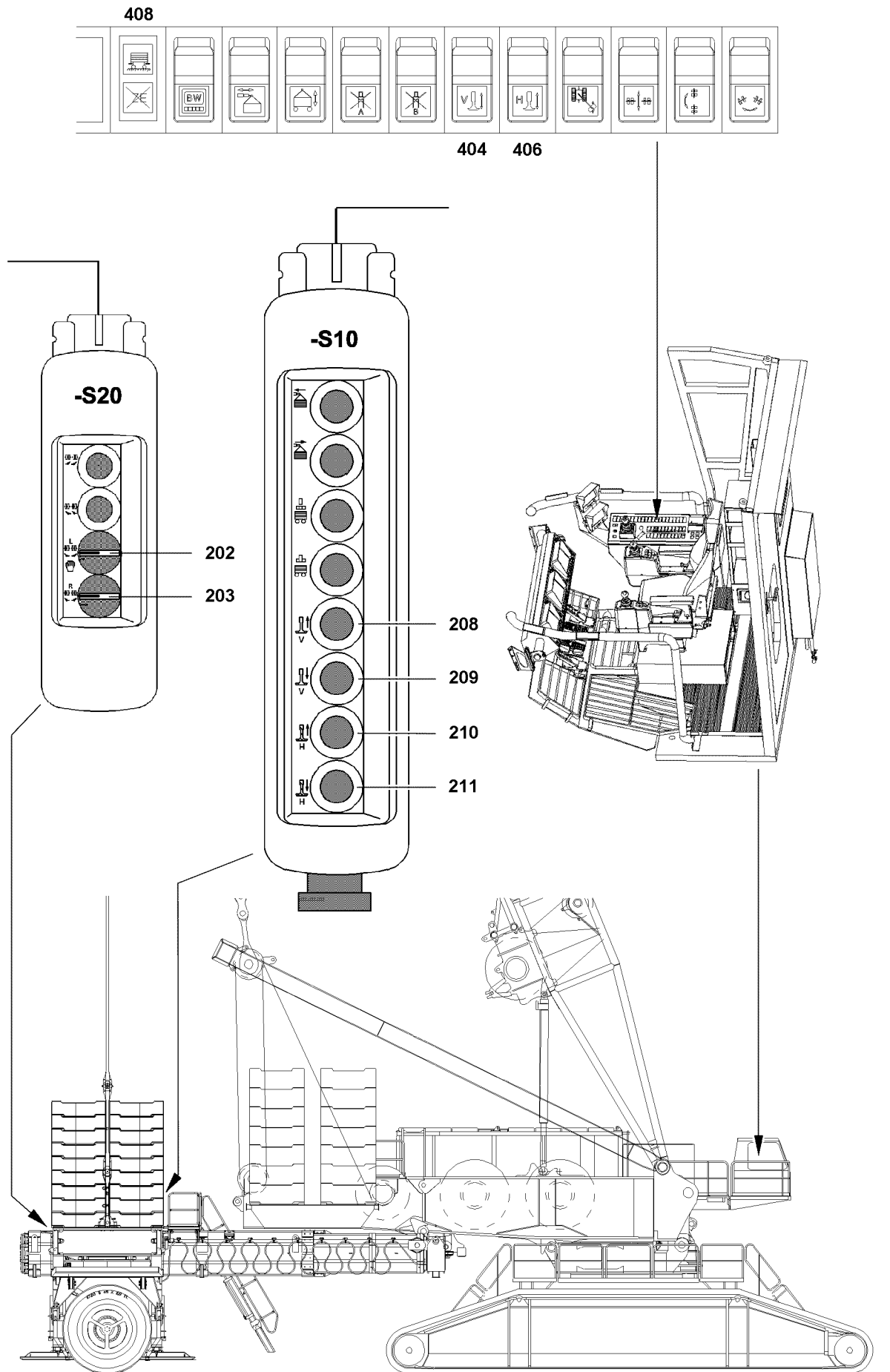
- Operating mode towing is selected **and** the ballast trailer axles have reached the towing position. The indicator light **380** lights up.
 - ▶ Press button **382** or button **200**, the ballast trailer wheels turn to the right.
 - ▶ Press button **382** or button **201**, the ballast trailer wheels turn to the left.

The right wheel set is regulated by the computer-controlled steering program so that there is always a center steering position. The angle β_1 is determined by the driving the crawler and angle β_3 by the operator steering, whereby angle β_2 is continually corrected. It is possible to switch between manual corrective steering and towing modes when driving the crawler once the towing position has been reached. If the operating mode manual corrective steering is selected from operating mode towing, then the indicator light **380** lights up.



Note

- ▶ The left wheel set can be steered to the specified angle β_3 . It is not possible to steer beyond this limit!
 - ▶ The right wheel set is corrected to follow the center steering position. If the right wheel set (corrective steering) cannot follow the left wheel set, the left wheel set is halted until the right wheel set (corrective steering) has caught up!
 - ▶ If the right wheel set leaves the specified angle anyway, then the indicator light **380** blinks and it must be started again with towing!
 - ▶ Operation automatically switches to towing mode if the crawler is being driven and turntable angle β_1 exceeds the specified value. The indicator light **380** blinks!
 - ▶ Manual corrective steering is possible again once the towing position is reached. The indicator light **380** lights up!
 - ▶ Generally, the wheels sets only move during corrective steering if either the button **382** or button **or** button **200** or button **201** on the control panel in the corresponding operating mode are pressed or the crawler is driven!
-
- ▶ Check the settings.



0°
B103464

4.8 Manual operation for assembly

The ballast trailer is equipped with a program that allows each wheel set to be individually turned during assembly.

4.8.1 Raising the ballast trailer with the support cylinders

- ▶ Press button **404** and button **406** or button **209** and button **211** and extend the support cylinders on the front and rear.

4.8.2 Setting the axles

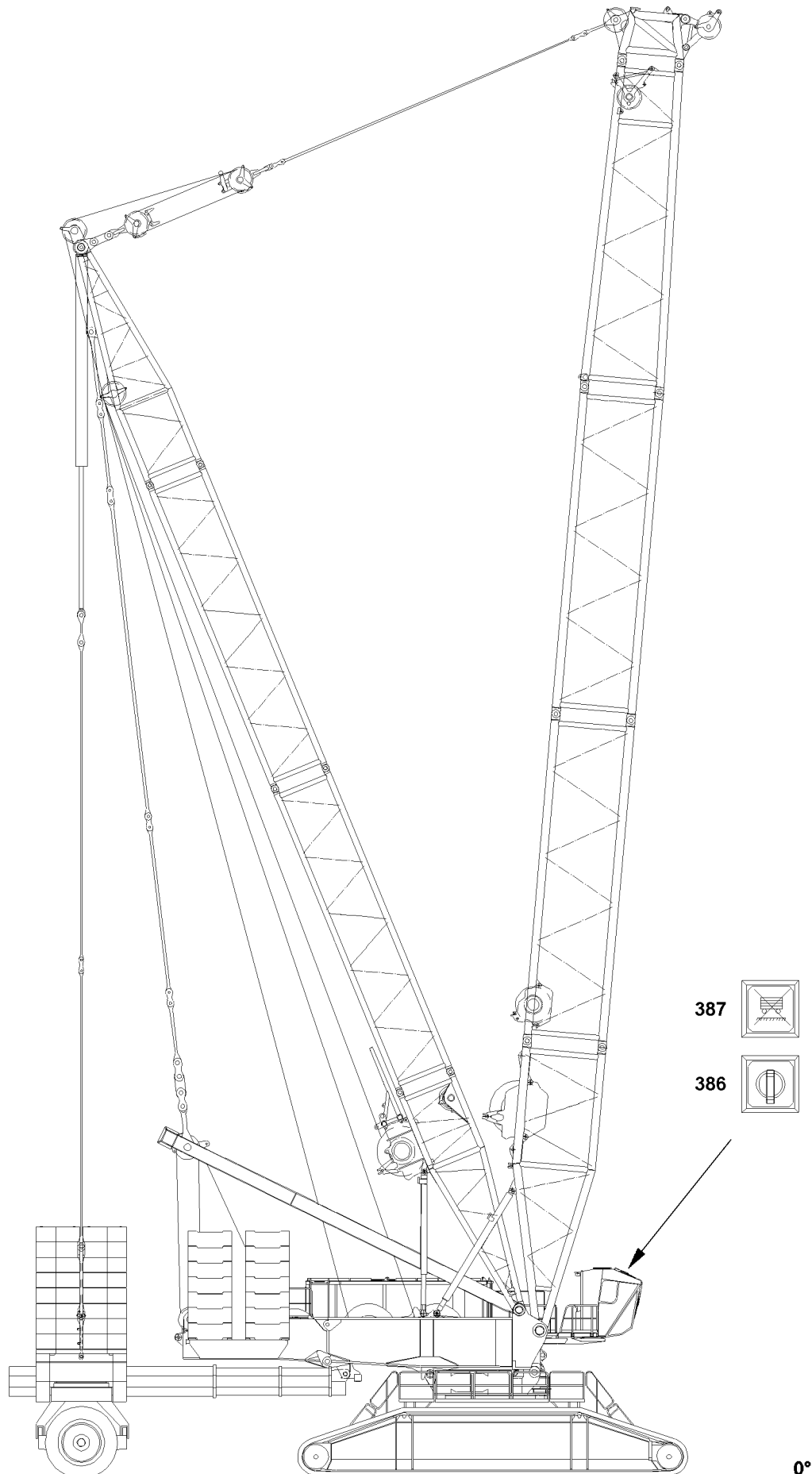
- ▶ Turn the rotary switch **202** to the right, the left axle turns to the right.
- ▶ Turn the rotary switch **202** to the left, the left axle turns to the left.
- ▶ Turn the rotary switch **203** to the right, the right axle turns to the right.
- ▶ Turn the rotary switch **203** to the left, the right axle turns to the left.

4.8.3 Lowering the ballast trailer with the support cylinders

- ▶ Press button **404** and button **406** or button **208** and button **210** and retract the support cylinders on the front and rear completely.

Result:

- The indicator light **408** lights up, the support cylinders are retracted.



B104026

5 Driving with the ballast trailer

5.1 Driving



Note

- ▶ It is only permitted to drive the ballast trailer on level ground capable of supporting the load!
- ▶ Driving over obstacles is not permitted!



DANGER

Block position of relapse cylinders!

In case of non-permissible level difference between the ballast trailer travel route and the crane position level, the entire crane system can be pulled back and the relapse cylinders can go mechanically in block position!

- ▶ Make sure that the permissible level difference in relation to the ballast trailer travel route and the crane position level is observed and adhered to!



WARNING

End position of extension cylinder!

If the extension cylinders is fully extended or retracted when driving in end position, then there is no pressure monitoring!

The extension cylinder can be damaged!

- ▶ Before driving, make sure that the extension cylinder is not in end position!

5.1.1 Pressure monitoring in extension cylinder

Due to the enormous propulsion force of the crawlers when driving forward or backward, the extension cylinder can be overloaded in pull or push direction if the ballast trailer moves over uneven ground or uphill or if it is stuck.



WARNING

Property damage!

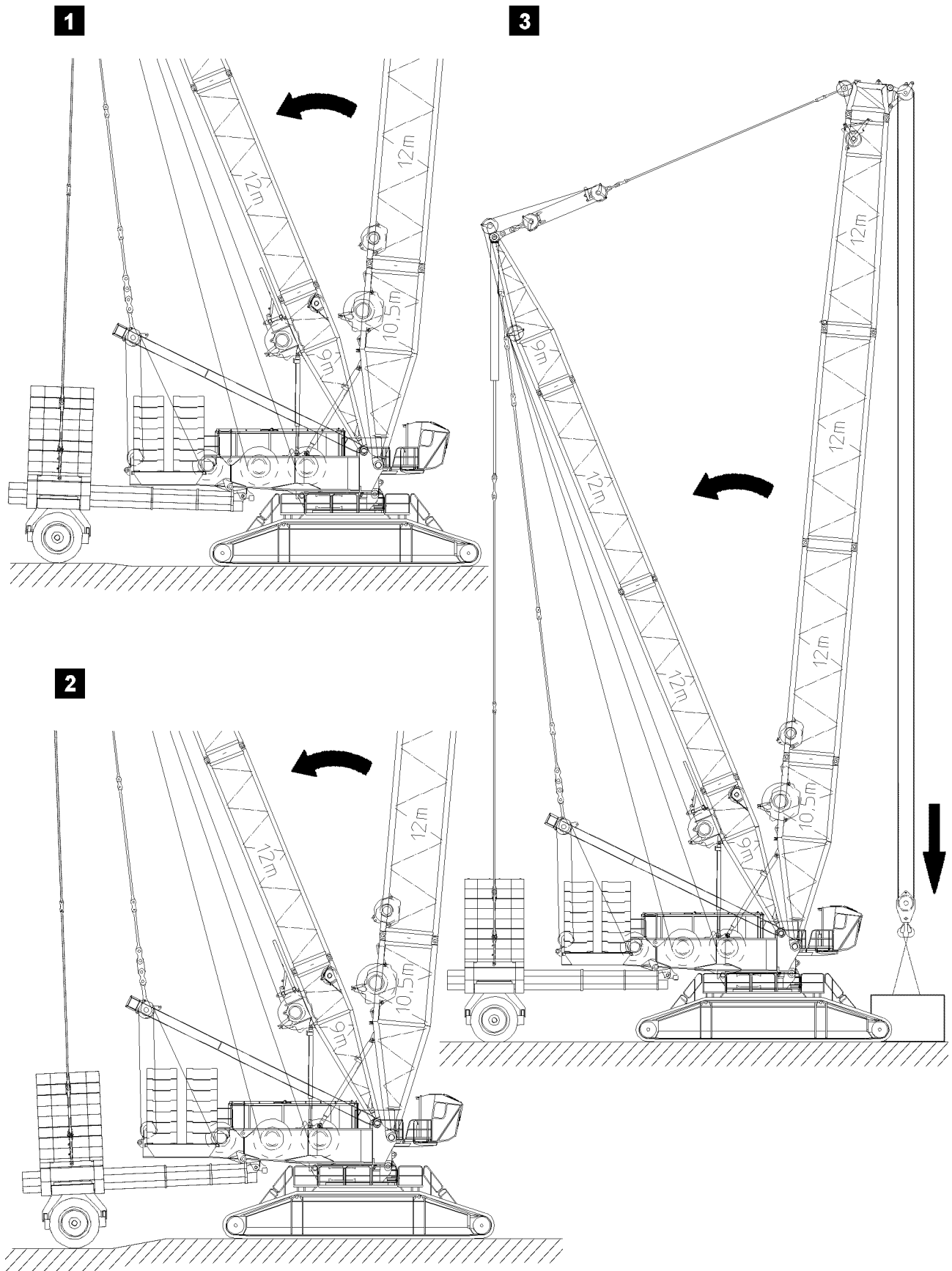
Do not pull a stuck ballast trailer loose through the enormous propulsion force of the crawlers!

- ▶ Do not overload the extension cylinder!



Note

- ▶ If the maximum permissible pressure in the extension cylinder is exceeded, a bell will sound and an error message appears!
- ▶ There is **no** shut off!



B104091

5.2 Safety guidelines for travel operation

5.2.1 Relapse cylinder

When the steepest operating position of the main boom is reached, luffing up is turned off by the overload protection in all operating modes.



Note

- ▶ However, there are cases when the relapse cylinders move mechanically to stop position, due to a movement of the entire crane system to the rear!
-

5.2.2 Block position relapse cylinders

In normal crane operation without bypass of the overload protection, a block position is not possible. Should a block position still occur, the movement is turned off and the boom limitation symbol shown on the operating screen indicates which block position has been reached.

With this boom limitation icon it is to be determined which limit switch on which relapse cylinder has been actuated. Reverse the last movement which was carried out until the corresponding limit switch is released again.

5.2.3 Case 1, illustration 1

When driving or turning the crane with steeply positioned boom, the ballast trailer can be lowered, due to the level differences. This causes the whole boom system to be pulled backward and there is a risk of reaching the block position in the relapse cylinders. The same risk applies when turning if the ballast trailer sinks due to level differences.



Note

- ▶ Due to the signals "Main boom relapse cylinder on block" or "Derrick relapse cylinder on block" in operation with ballast trailer, the drive and turn the crawler movements are automatically turned off!
-

5.2.4 Case 2, illustration 2

If the level under the crane increases, the boom system is also pulled back. There is a risk that the relapse cylinders reach the block position.

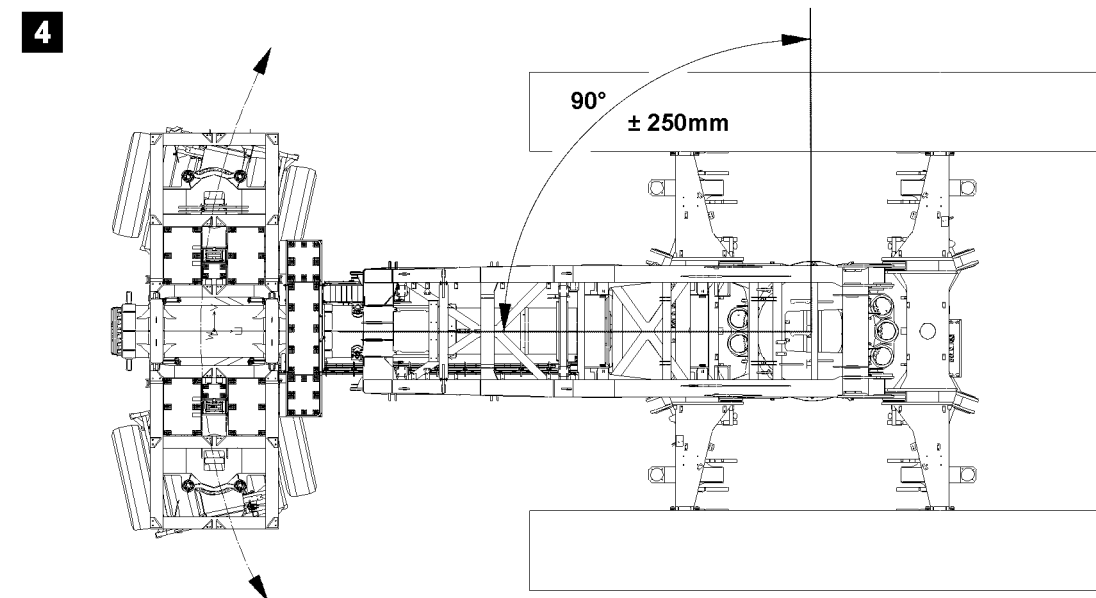
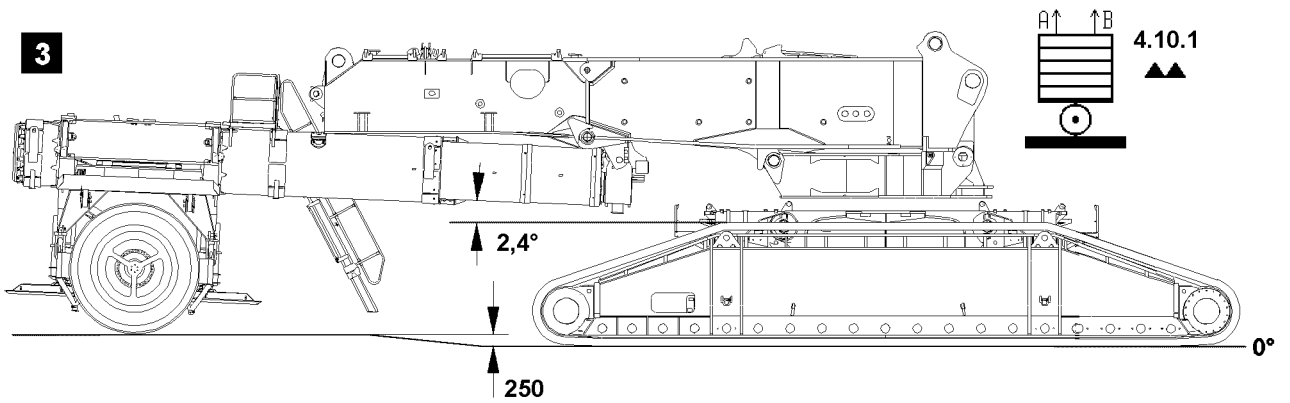
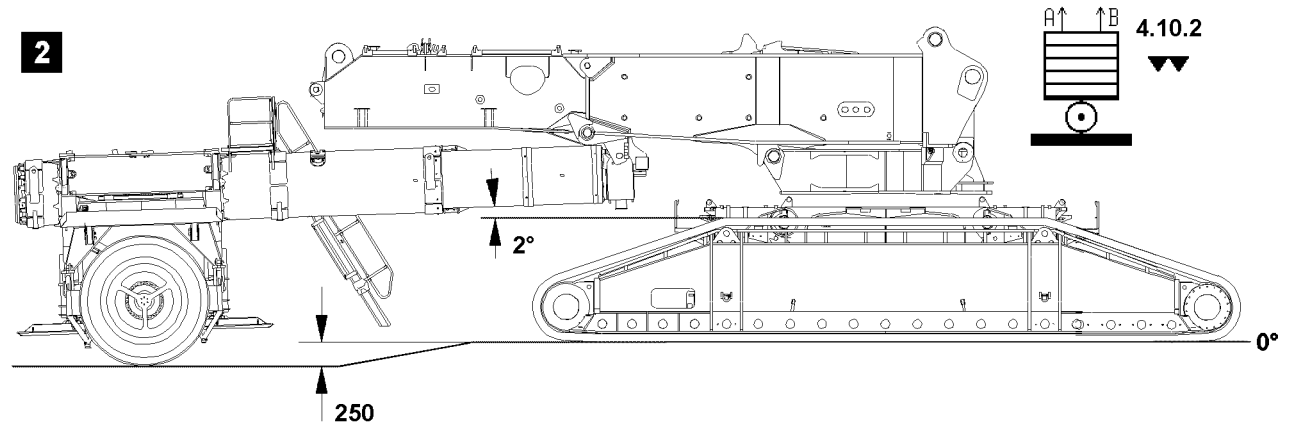
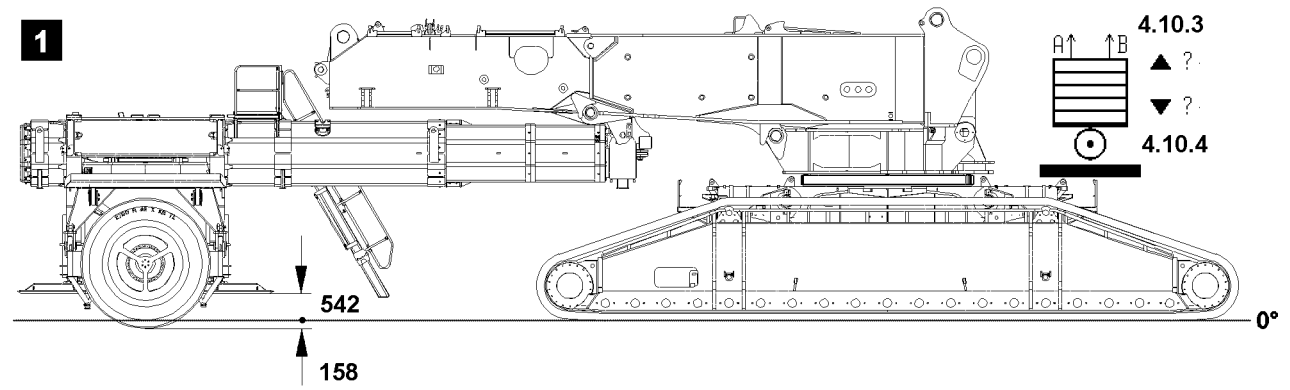


Note

- ▶ Due to the signals "Main boom relapse cylinder on block" or "Derrick relapse cylinder on block" in operation with ballast trailer, the drive and turn the crawler movements are automatically turned off!
-

5.2.5 Case 3, illustration 3

When the load is set down with the hoist gear, the crane is relieved. This causes the booms to move backward, refer to section "Monitoring lowest force F1".



B107455

5.3 Maximum permissible ground unevenness

Level changes between placement surface of crane and ballast trailer during towing, parallel travel and circular travel.

Limit switches prevent a collision of the ballast trailer guide with the turntable.



Note

- ▶ The level difference, ballast trailer route in relation to the crane driving route during **towing** and **parallel driving** may be no more than maximum ± 250 mm!
- ▶ The level difference of ballast trailer route in relation to the crane route for **circular travel** may be a maximum ± 250 mm, constant uphill or downhill slope for 90° slewing range!

Illustration 1

At 158 mm of tire suspension, the guide tube is parallel to the lower edge of the turntable.

Illustration 2

Limit switch actuation at 2° incline downward:

- Icon **4.10.2**, block position **downward** appears.
- Shut offs, see Crane operating instructions, chapter 4.02!

Illustration 3

Limit switch actuation at 2.4° incline upward:

- Icon **4.10.1**, block position **top** appears.
- Shut offs, see Crane operating instructions, chapter 4.02!

Illustration 4

Circular driving, maximum ± 250 mm, constant uphill or downhill slope, at 90° slewing range.

5.3.1 Alarm functions



Note

- ▶ The crane operator must know and observe the shut off diagrams in the separately supplied electric wiring diagram!
- ▶ See Crane operating instructions, chapter 4.02!

NOTICE

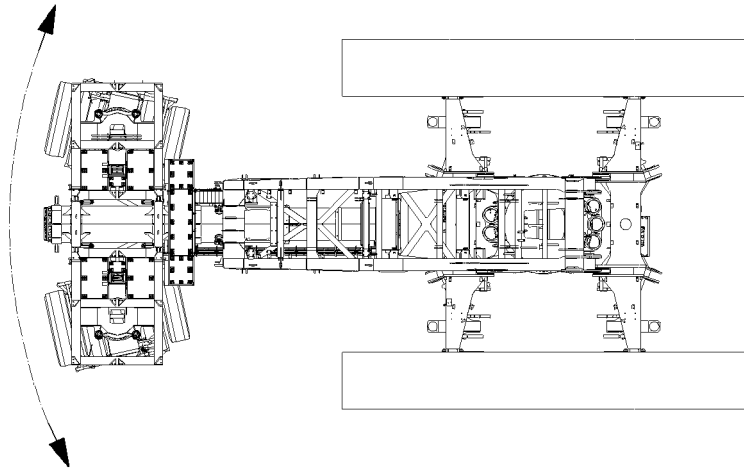
Damage of ballast trailer!

The icon **4.10.3** and icon **4.10.4** display that at least one limit switch is defective!

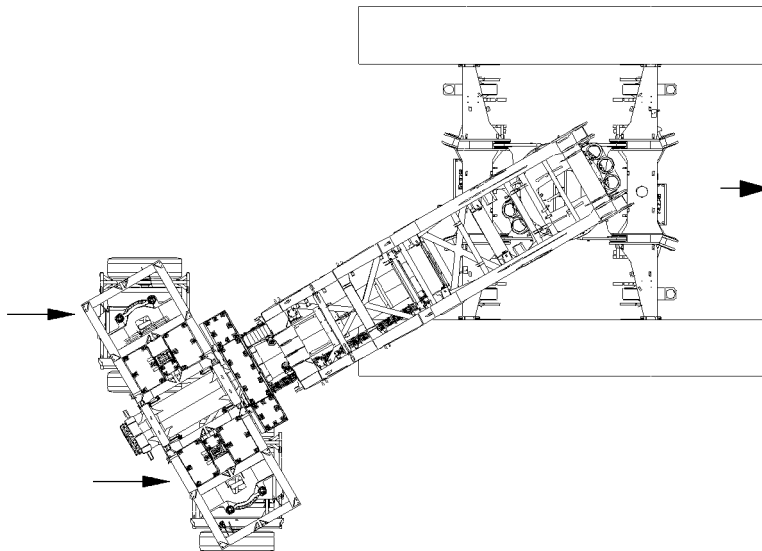
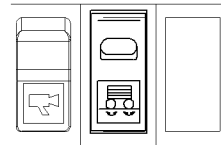
There is no shut off in block position **on the bottom and top!**

The ballast trailer and the turntable will be damaged!

- ▶ Replace defective limit switches immediately!
- ▶ Check the function!



337



B106376

5.3.2 Ballast trailer drive

A ballast trailer is equipped with a wheel set with its own drive. The drive is added in the crane cab.



Note

- ▶ The addition of the drive is only possible in circular and parallel driving mode!
 - ▶ The additional drive may be required when driving over uneven ground!
-

If the travel route is level, no additional drive is required.

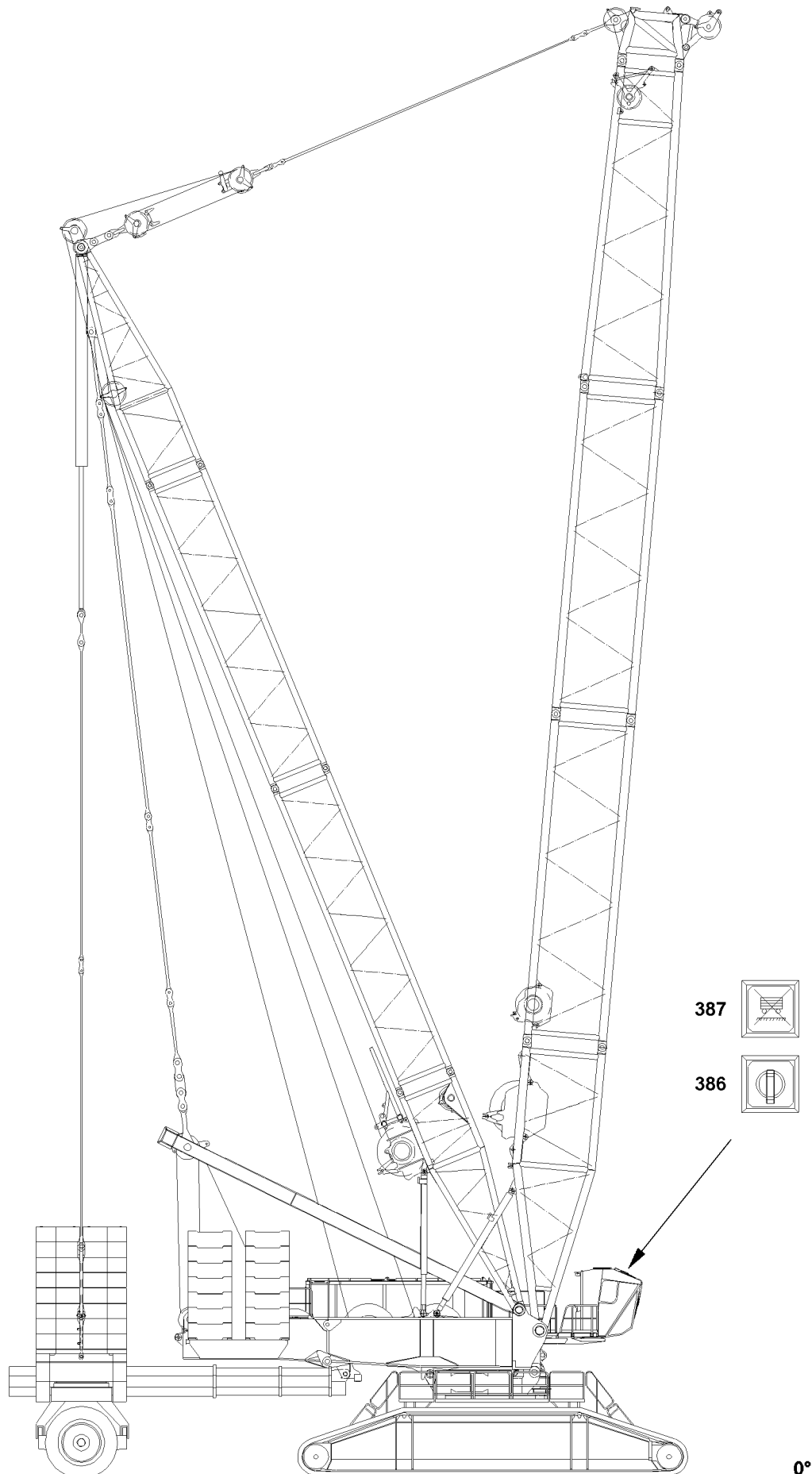
Add the drive only when no turning / travel movement occurs when the control lever is deflected.

Turn the drive on with switch **337** in the crane operator's cab.



Note

- ▶ Turn the drive off as soon as the unlevel ground has been passed!
-
- ▶ Turn the drive off with switch **337** in the crane operator's cab.



B104026

5.4 Key button “Ballast trailer lifted off”

When “crawler driving” and key button **386** is not operated, i.e. “Ballast trailer not lifted off”, the slewing gear brake and hydraulic coasting of the slewing gear are opened. For “Driving the crawler” with **lifted off ballast trailer** (constant visual check), the key button **386** “Ballast trailer lifted off” must be turned on.



DANGER

Danger of accident!

If the ballast trailer is lifted off the ground when driving the crawler - operating mode towing, there is the danger that the wind turns the turntable when “driving the crawler”, for that reason, the key button **386** “Ballast trailer lifted off” must be turned on!

- ▶ Therefore, when “driving the crawler”, the slewing brake remains applied, but the hydraulic slewing gear coasting remains open!
- ▶ If, when “driving the crawler”, the ballast trailer scrapes on the ground or gets stuck on the ground, so that the turntable twists with the ballast trailer against the crawler track, the slewing brake can slip. The slewing gear will not be damaged!
- ▶ If the wheels of the ballast trailer are not in towing position, the ballast trailer or the crane will be damaged!

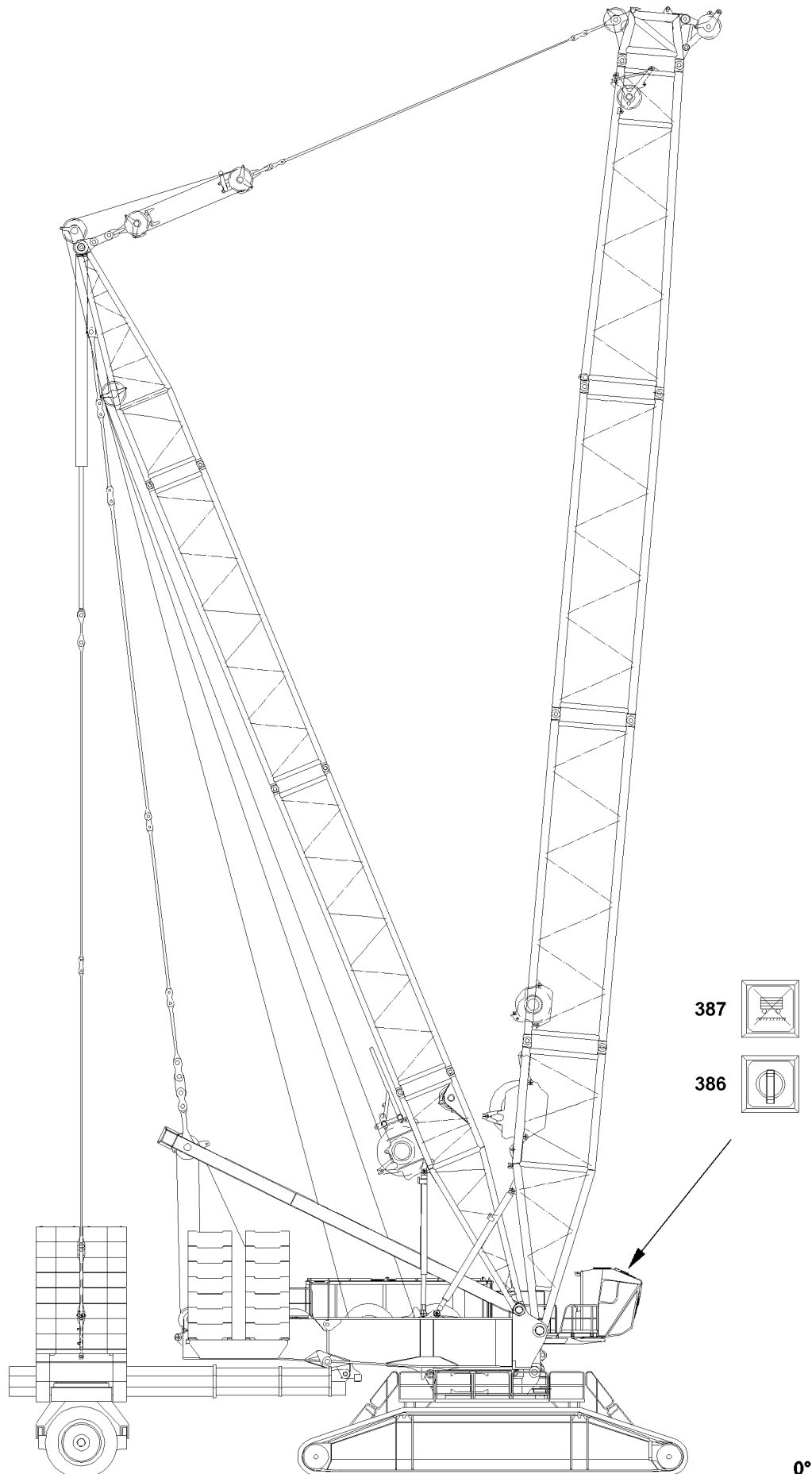


Note

- ▶ When the function “Ballast trailer lifted off” is turned on, the warning light in the button **387** blinks, it is possible to turn the crane superstructure or to move the crane even though the wheels of the ballast trailer are not on circular driving, towing or parallel driving!

If the key button **386** is turned on to “Ballast trailer lifted off”, then this is shown by the blinking warning light in the button **387**. The ballast trailer symbol on monitor 1 indicates a suspended state.

To turn “Ballast trailer lifted off” off, the button **387** must be pressed. The warning light in button **387** turns off. The LICCON monitor shows the derrick ballast symbol on the ground.



B104026

5.5 Defined ballast trailer operation

The ballast trailer may not be raised or set down while driving, instead this should be done before starting to drive.

1. The ballast trailer should be either

defined as set on the ground key button **386** not actuated "**Ballast trailer not lifted off**". This means that the ballast trailer and its residual load are resting on the ballast trailer tires. This residual load is large enough to prevent the wind from turning the crane superstructure even though the slewing gear brake opens when the crawler is actuated.

or

2. defined as lifted off the ground, key button **386** actuated "**Ballast trailer lifted off**". This means that the slewing gear brake does not open when crawler is being driven. The wind can therefore not turn the superstructure when the crawler is driven.



DANGER

Danger of accident!

- ▶ The ballast trailer must always be operated, as defined, either freely suspended or solidly on the ground!
- ▶ Operation of the ballast trailer in an undefined state is prohibited!
- ▶ There is an increased accident risk if the ballast trailer is not in a defined set down or raised state!

5.6 Undefined ballast trailer operation



DANGER

Danger of accident!

- ▶ The ballast trailer must always be operated in a defined mode!

Ballasted ballast trailer is still standing on the ground with 1 t.

1. In case of key button **386** not actuated "**Ballast trailer not lifted off**", the slewing brake opens when the crawler is driven. The wind can turn the superstructure and the load starts to swing.



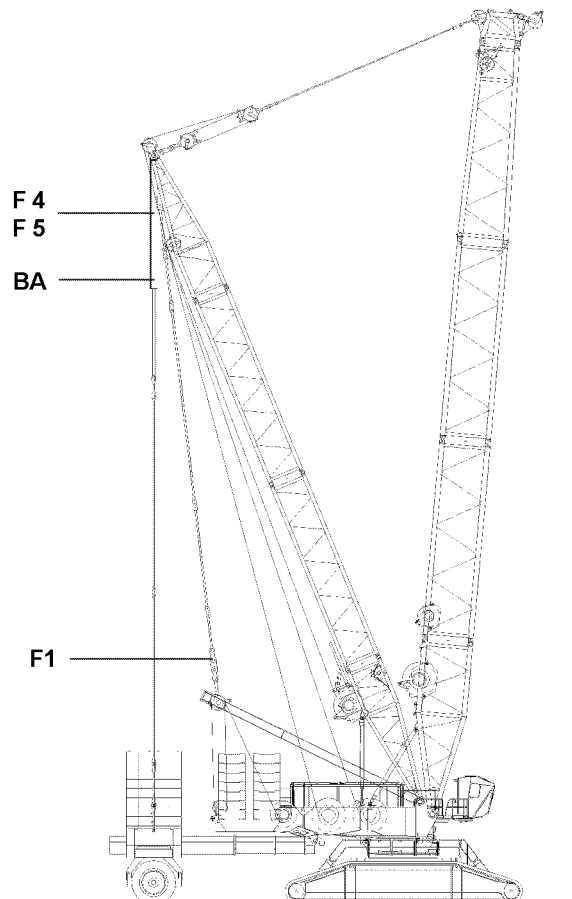
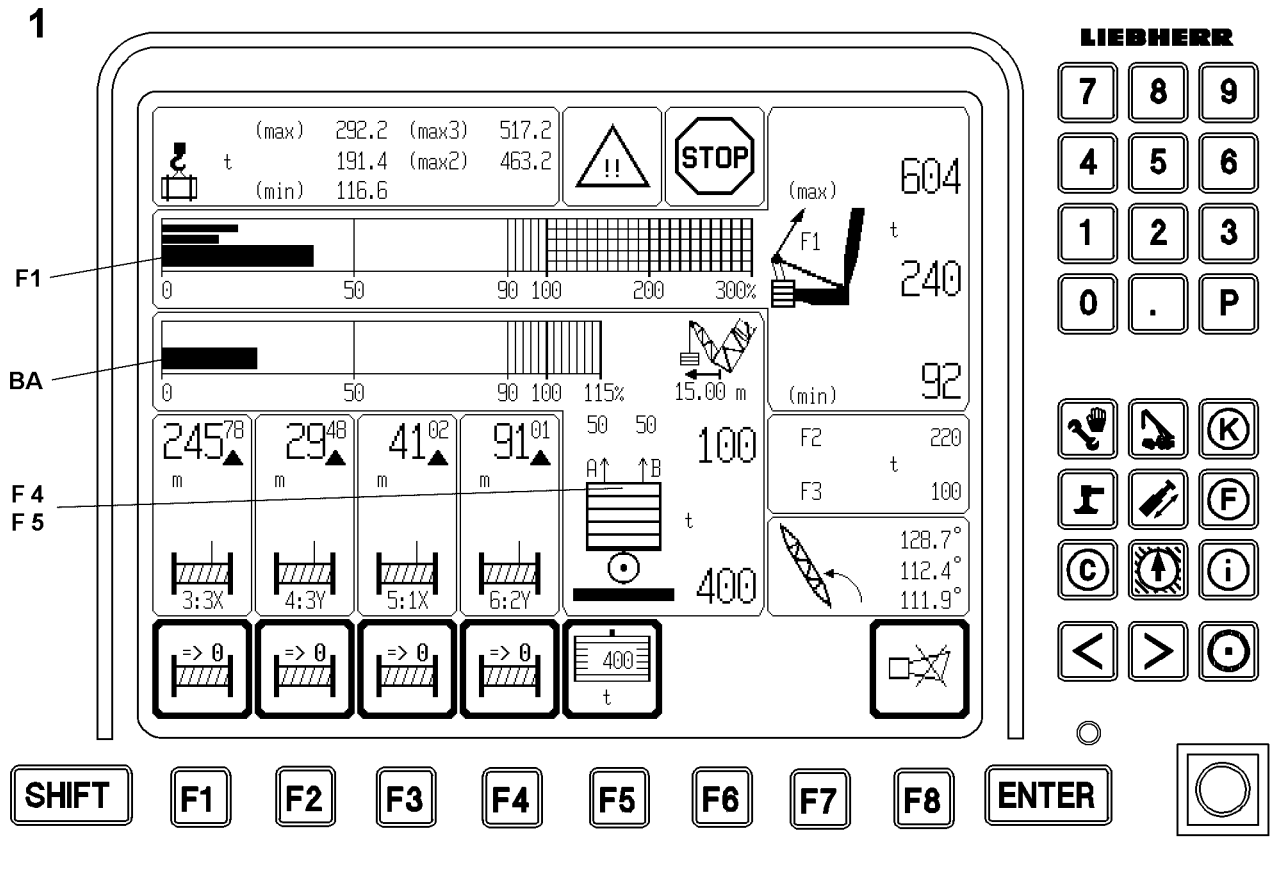
DANGER

Danger of accident!

- ▶ There is an increased danger of accidents due to collision!

or

2. In case of key button **386** actuated "**Ballast trailer lifted off**" The slewing brake remains closed when the crawler is driven. When driving the crawler around a curve, the ballast trailer tires or the slewing brake will slip.



B104755

6 Crane operation with derrick ballast

6.1 LICCON overload protection

On cranes with derrick ballast, during operation also under load, by increasing or reducing the derrick ballast, the maximum load or the minimum load required for the balance of the crane, can be increased or decreased.



Note

- ▶ The suspended ballast and the ballast trailer are generally described as **derrick ballast!**
- ▶ The fixed compensation weight which is assembled on the turntable is generally described as the **counterweight!**

Make sure that the following prerequisites are met:

- The required derrick ballast according the load chart is placed and exactly entered and confirmed in the LICCON.
- The derrick is in operating position.

6.1.1 Pre-adjustments

- ▶ Adjust the LICCON overload protection according to the data in the load chart and confirm.



Note

- ▶ Enter the actual derrick ballast weight in the LICCON!
- ▶ Enter the actual reeving in the LICCON!

To set the derrick ballast, see Crane operating instructions, chapter 4.03.



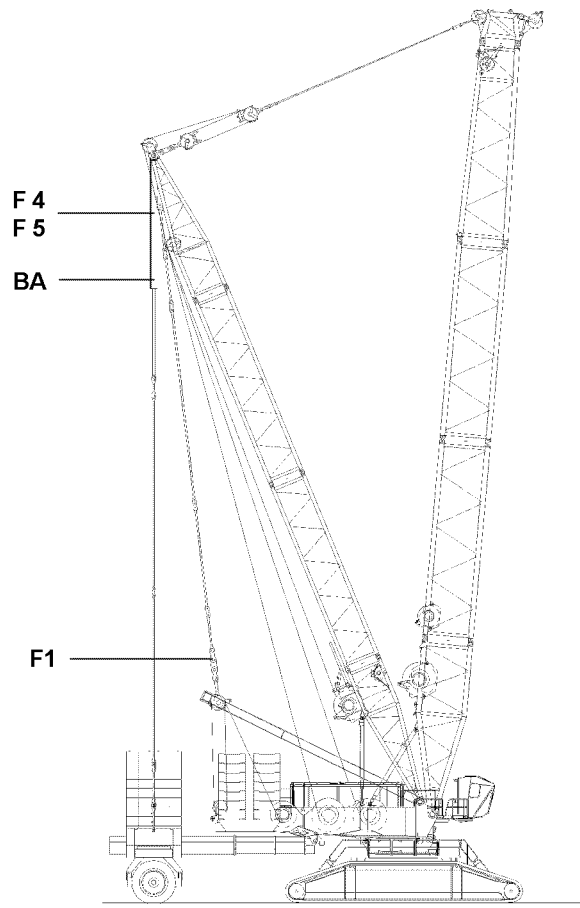
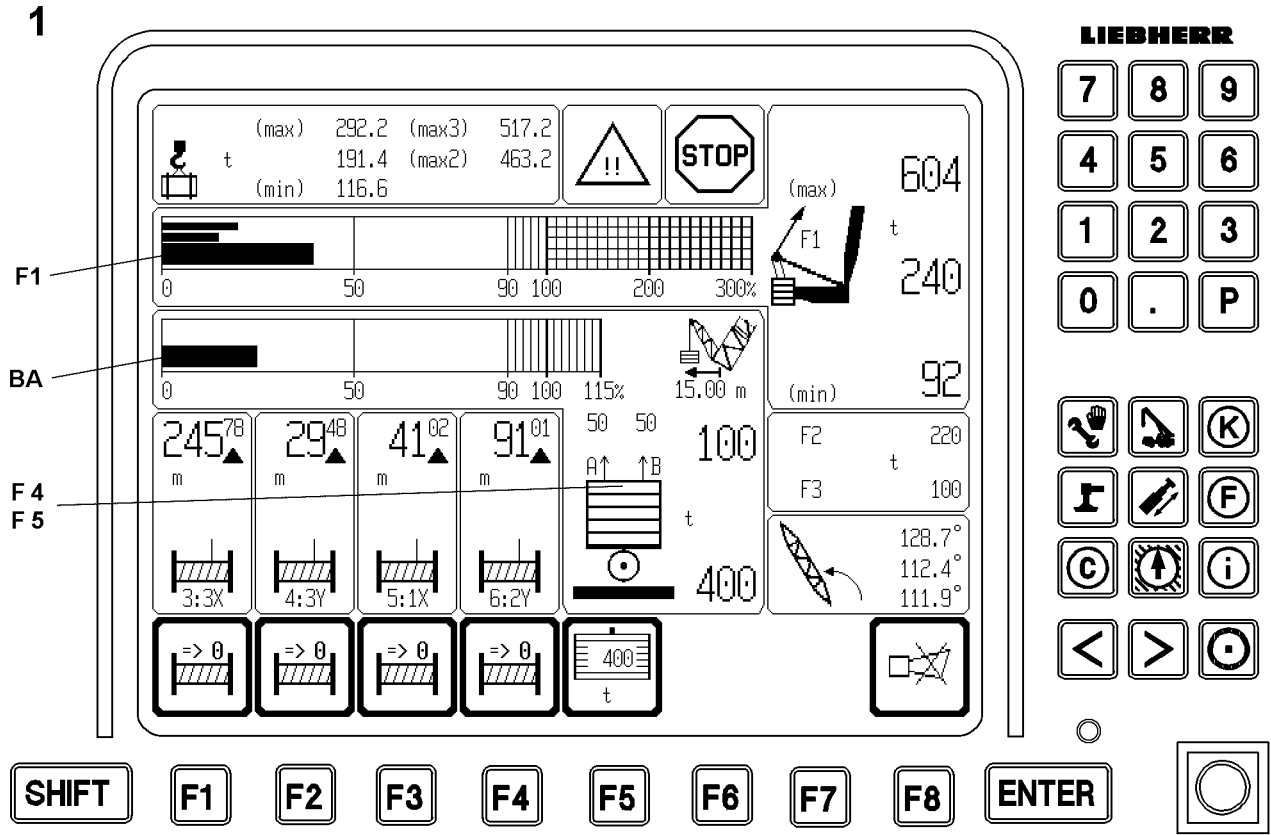
DANGER

Danger of accident!

The set derrick ballast value must correspond to the actual derrick ballast weight added!

- ▶ Incorrect entry of the ballast weight can result in dangerous operational situations!

- ▶ Check the settings.



B104755

6.1.2 Crane operation



Note

- ▶ For crane operation with derrick ballast, the data in the Crane operating instructions, chapter 4.02 must be observed and adhered to!



DANGER

Danger of accident!

There may be no persons or obstacles within the slewing range of the derrick ballast.

During the turn, a guide must watch the boom, derrick and derrick ballast for a danger of collision!

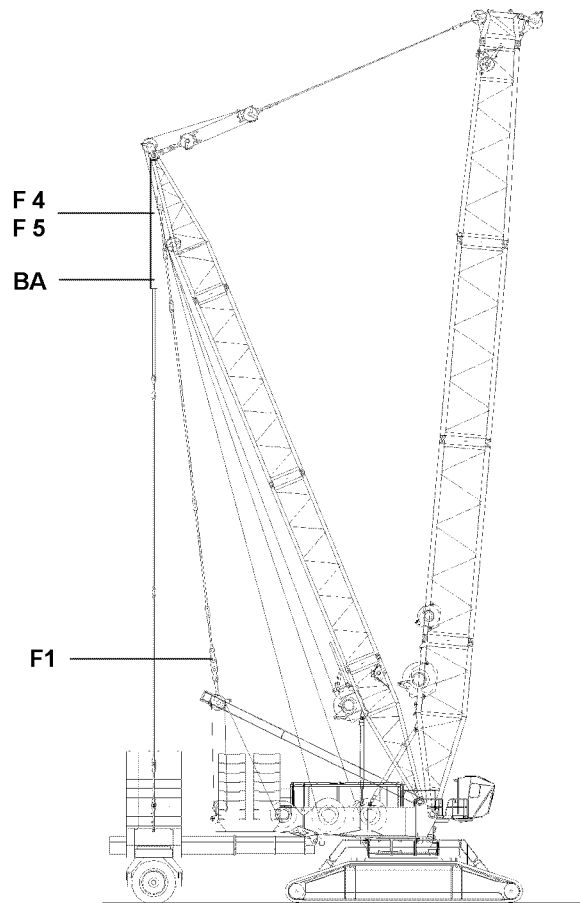
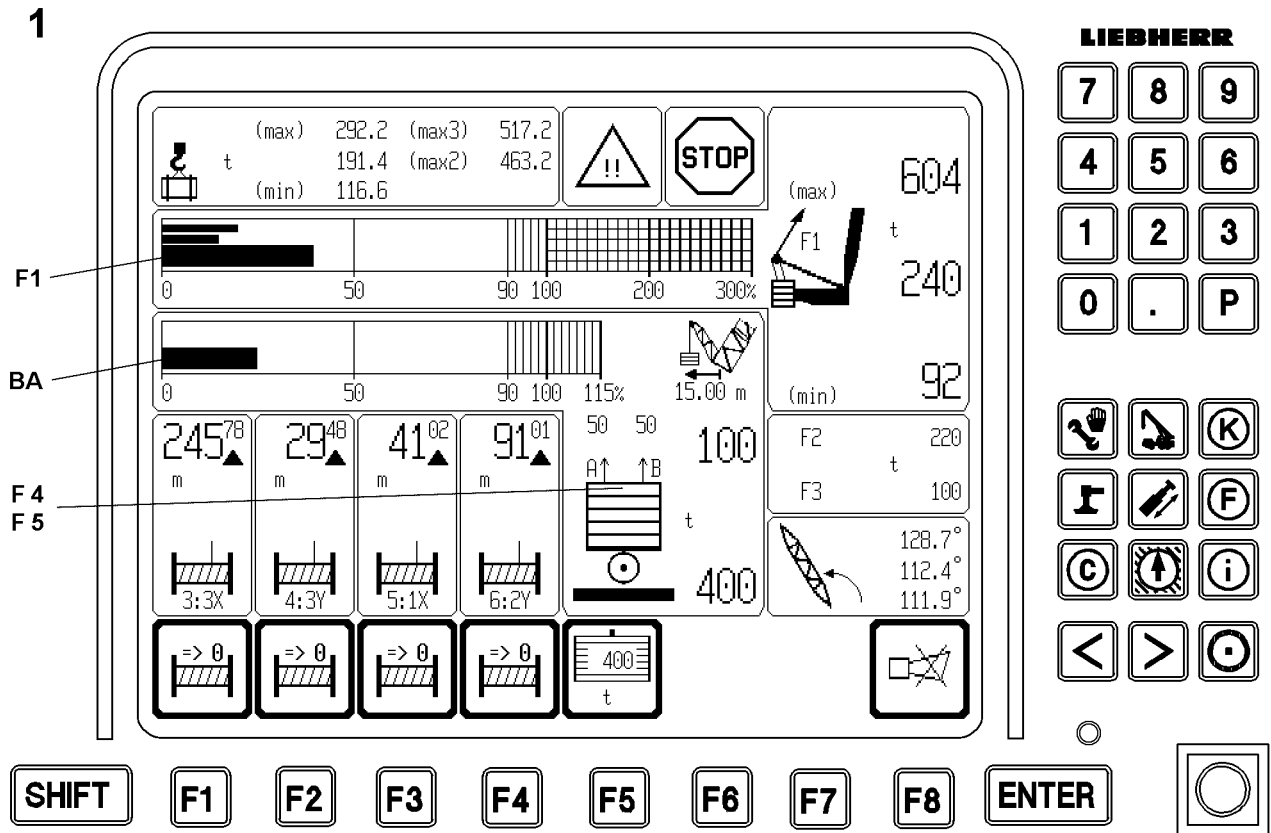
When turning with a load and suspended derrick ballast, the turning movement must be initiated or slowed down extremely carefully!

- ▶ The jerky execution / braking of turning maneuvers can cause the load or suspended derrick ballast to swing!
- ▶ This can cause the boom to break off or the crane to topple over!



Note

- ▶ See section "Lifting and lowering with pull cylinders" and section "Differential force monitoring for ballast guying"!
- ▶ Monitor the extension condition of the pull cylinders and the incline of the ballast trailer.



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6.2 Safety guidelines



Note

- ▶ The test points must be checked before crane operation for functionality!
- ▶ The weight of the load to be lifted must be known!
- ▶ The contact area of the ballast trailer should may be no more than maximum 0.25 m above - or 0.25 m below the level of the crane base!
- ▶ The set down location of the suspended ballast trailer, at the end of the load lift, must be level, horizontal and have sufficient load bearing capacity to safely take on the weight!

NOTICE

Danger of accident!

- ▶ Before setting down the load and the suspended derrick ballast, the crane operator must make sure that a safe placement of load and suspended derrick ballast is ensured!



Note

- ▶ There may be no obstacles within the slewing range of the crane, and the derrick ballast and the load!
- ▶ When the derrick ballast is raised, it must be observed by a guide or the crane operator!



DANGER

Danger of accidents due to angular pull!

Due to angular pull, impermissible side forces are initiated in the crane, which can lead to breakage of crane parts!

If this is not observed, there is a risk of tipping when lifting with ballast plates. This could cause the crane to topple over!

- ▶ Before taking on a load or the derrick ballast, make sure that the derrick ballast, the center of rotation of the turntable and the load are on one line!

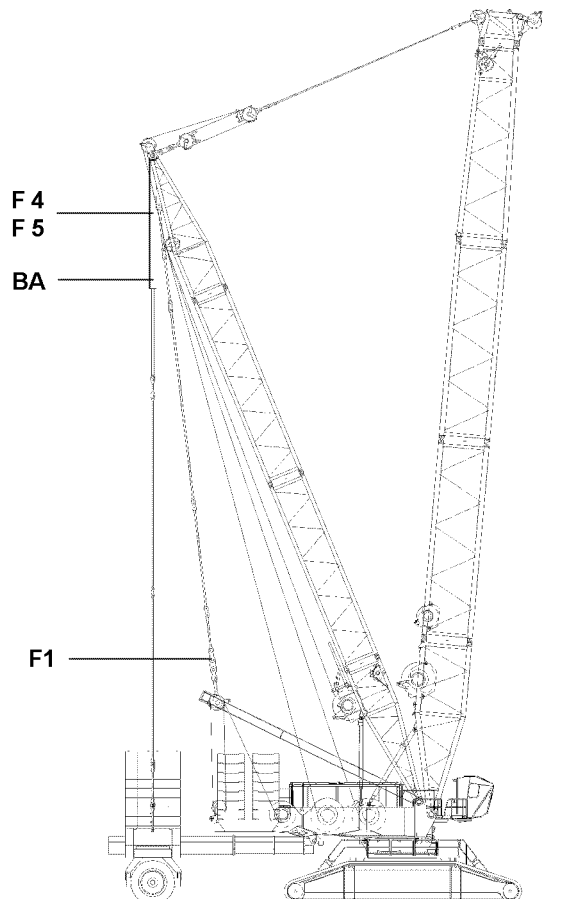
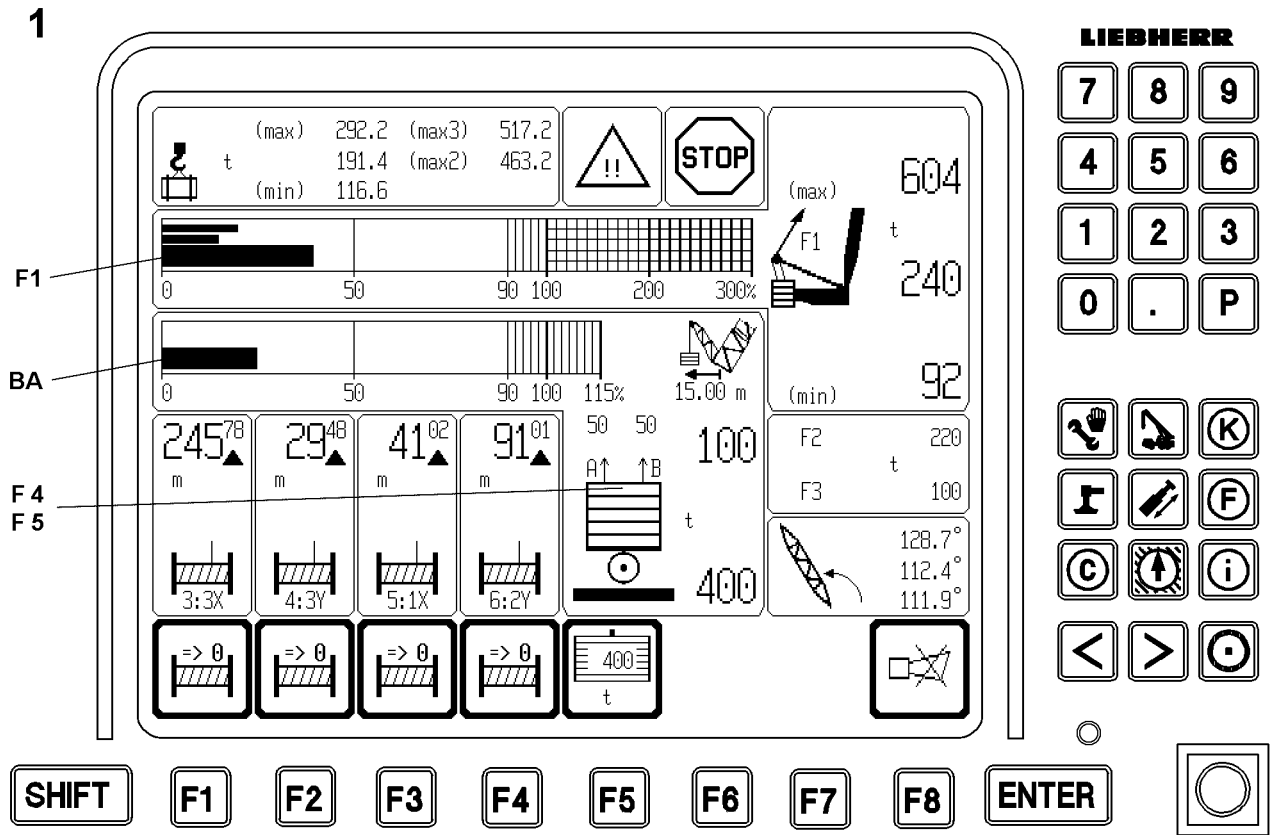
When taking on a load, the guying from the derrick ballast to the derrick head must be relieved to the point where the F1-actual force (F1-act) is larger than the F1-minimum force (F1-min).



DANGER

Danger of accident!

- ▶ The guying between the SA-frame and the derrick end section, test point 1, may never be without power!
- ▶ This can lead to uncontrolled movements of the boom system and cause an accident!



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6.3 Determination of forces in operating mode with derrick ballast

In all operating modes with derrick ballast, the load is divided between the guy posts from the derrick head to the SA-frame (F1) and the derrick ballast (F4/5).



Note

► See Crane operating instructions, chapter 4.02!

6.3.1 Force F1 (test point 1) between guying SA-frame - derrick head

The force F1 (test point 1) is determined in the guy rods from the SA-frame to the derrick head via 2 force test boxes and is shown on the LICCON as total force of the guying.

The F1 - utilization is determined from the F1 operating force and the F1-maximum operating force. This is shown on the LICCON in a utilization bar (F1) in percent.

6.3.2 Force F4/5 (measuring point 4/5) guying derrick ballast - derrick head

The forces F4/5 (test point 4/5) are effective in the guy rods from the derrick ballast to the derrick head.

The existing forces in the guy rods (A = left and B = right) are calculated from the four pressure sensors, which are installed on the pull cylinders and shown in the LICCON as individual forces.

The ballast being pulled is calculated from the forces in each guying, i.e. the proportion of ballast which is pulled up by the guying. The remaining part is on the ground. The derrick ballast utilization results from the pulled ballast and the placed ballast. This is shown on the LICCON monitor1 with a utilization bar (BA) in percent.

Pull cylinder on block



DANGER

The crane can topple over!

By completely moving one or both pull cylinders in (block position moved in), the pressure increases strongly on the ring surface of the pull cylinder and the weighing of the currently pulled derrick ballast is incorrectly calculated and displayed!

The LICCON overload protection therefore assumes that a larger derrick ballast is pulled than is actually the case, and calculates too large a load capacity as a result!

An overload of the crane is recognized too late by the LICCON overload protection and the crane can topple!

Personnel can be severely injured or killed!

- If the pull cylinder are in block position "moved in", **crane operation is explicitly prohibited!**
- The forces in the derrick ballast guying A and B are to be carefully observed on LICCON monitor!
- Potentially encountered error reports are to be heeded!



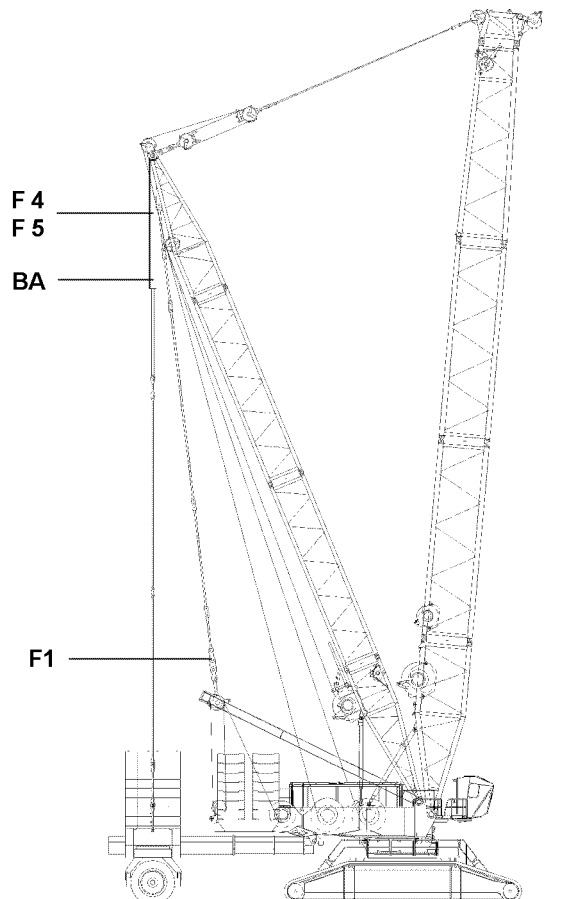
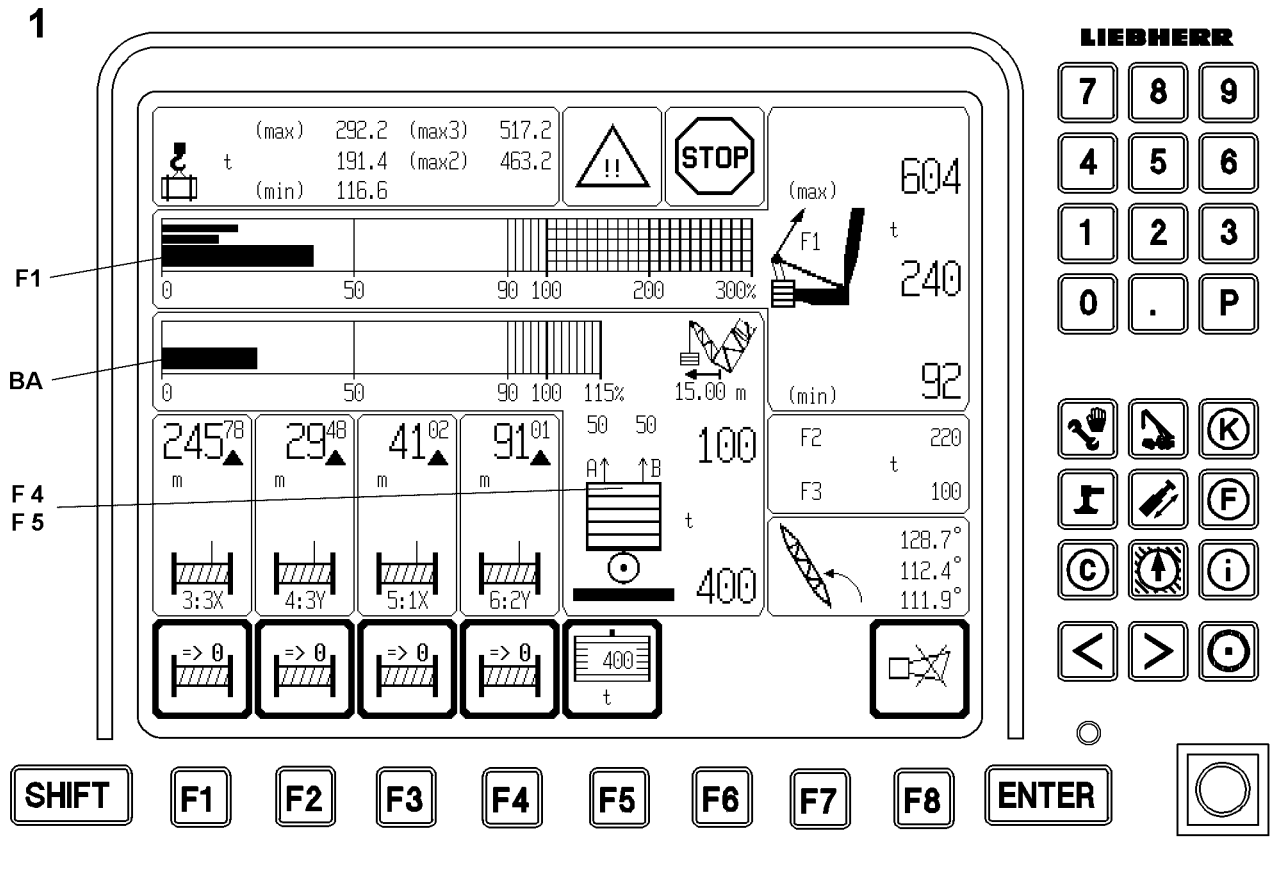
WARNING

The LICCON overload protection shuts off too early!

By moving one or two pull cylinder completely out (block position moved out), the LICCON overload protection calculates a load which is too low!

Possible shut off by the LICCON overload protection takes place too early!

- If the pull cylinders are in block position "moved out", crane operation on the basis of reduced load is not meaningful!



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6.3.3 Monitoring of minimum force F1

If more than 50 % of the set derrick ballast is being pulled (ballast utilization bar > 50 %) and the minimum force $F1_{min}$ (test point 1) is fallen below, all crane movements that **increase load torque** are turned off.



DANGER

Danger of accident!

It is prohibited to let the minimum force $F1_{min}$ (test point 1) fall below if more than 50 % of the derrick ballast is pulled. If this is not observed, in case of force-free guying of test point 1 (F1) and **derrick ballast on the ground**, the derrick ballast can suddenly lift off the ground due to the increased load torque and the boom system can suddenly move forward! This causes the load to swing back and forth too much, which could damage the boom and the crane!

- ▶ Do not fall below the minimum force - $F1_{min}$!

If more than 90 % of the set derrick ballast is being pulled (ballast utilization bar greater than 90 %) and the force drops below the minimum value $F1_{min}$ (test point 1), all crane **movements that increase load torque** and all **crane movements that decrease load torque** are turned off. The winch "spool out" movement is turned off too.



DANGER

Danger of accident!

It is prohibited to let the minimum force $F1_{min}$ (test point 1) fall below if more than 90 % of the derrick ballast is pulled. If this is not observed and the guying on test point 1 (F1) is slack and the suspended derrick ballast is suddenly set down on the ground and the boom system suddenly moves back by the reduction of the load torque of the derrick ballast! As a result, the relapse cylinders can be pressed on block and be overloaded. The relapse cylinders on the boom and D-boom may become damaged! This causes the load to swing back and forth too much, which could damage the boom and the crane!

- ▶ Do not fall below the minimum force - $F1_{min}$!



Note

- ▶ By actuating the assembly key button, the test point 1 - minimum force ($F1_{min}$) is reduced by several tons, this allows one to reverse the maneuver and retreat from the situation in which the $F1_{min}$ shut off occurred.
- ▶ This is the only exception on the crane, where, after a shut off, a load torque increasing movement may be continued with the assembly key switch!



DANGER

Danger of accident!

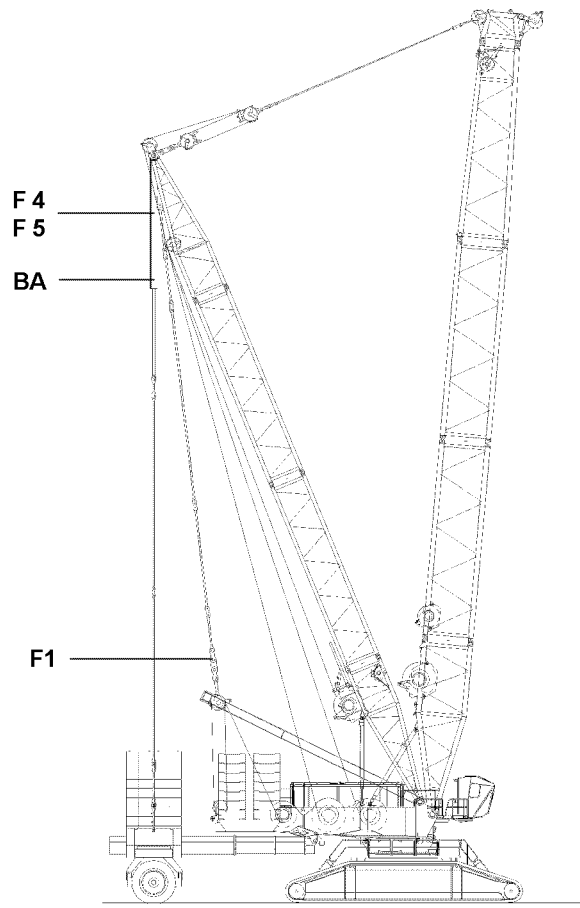
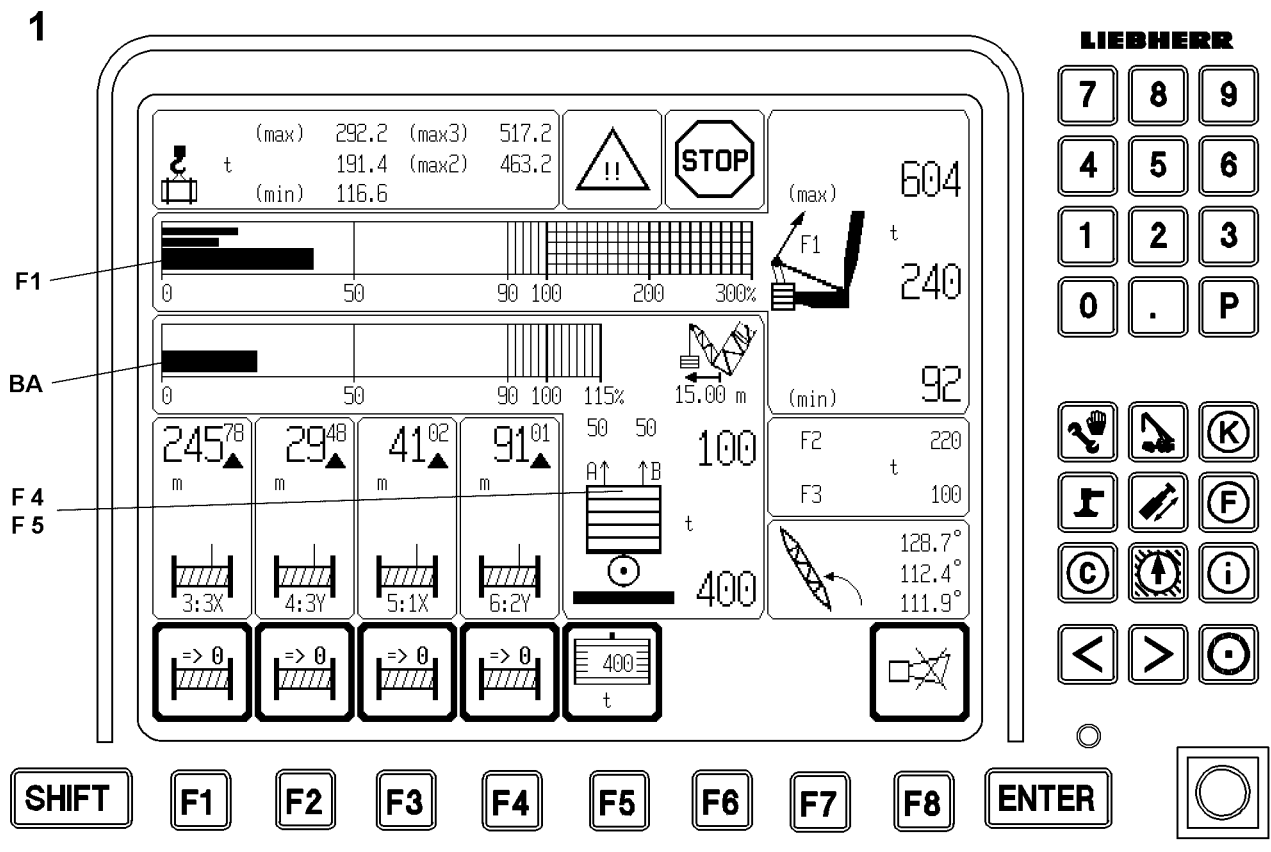
If the LICCON overload protection is bypassed, there is no further protection against crane overload! There is an increased danger of accidents!

Personnel can be severely injured or killed!

- ▶ The crane operator bears the complete and sole responsibility when bypassing the LICCON overload protection!

After shut off via $F1_{min}$ the force F1 on test point 1 must be increased by a movement. When the derrick ballast is suspended, this can be achieved by setting down the ballast.

If the assembly key button is already pressed and the $F1$ force under the reduced minimal force by the assembly key button $F1_{min}$ sinks further, then $F1_{min}$ switch off is no longer bypassed.



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6.4 Overload monitoring in operating mode with derrick ballast

In operating modes with derrick ballast, the “maximum load for the current crane condition” is monitored two ways:

- 1.) Monitoring of maximum load on the LICCON monitor 0
- 2.) Monitoring of test point 1-operational maximum force LICCON monitor 1

6.4.1 Monitoring of maximum load on the LICCON monitor 0

It monitors the “maximum load according to load chart and reeving”.

In operating modes with derrick ballast, this is the maximum load of the current crane condition. It is shown on LICCON monitor 0. The current utilization of the crane results from the load utilization bar (1) on LICCON monitor 0.

If the load utilization bar reaches 90 %, an advance warning is given in the form of a “caution icon” and a “SHORT HORN” on LICCON monitor 0.

At 100 % on the load utilization bar, the shut off of all load moment increasing movements with the “stop icon” and the acoustical warning “HORN” occurs on LICCON monitor 0.



Note

- ▶ The “maximum load of the current crane condition” can possibly be increased further, refer to section “Utilization conditions”!

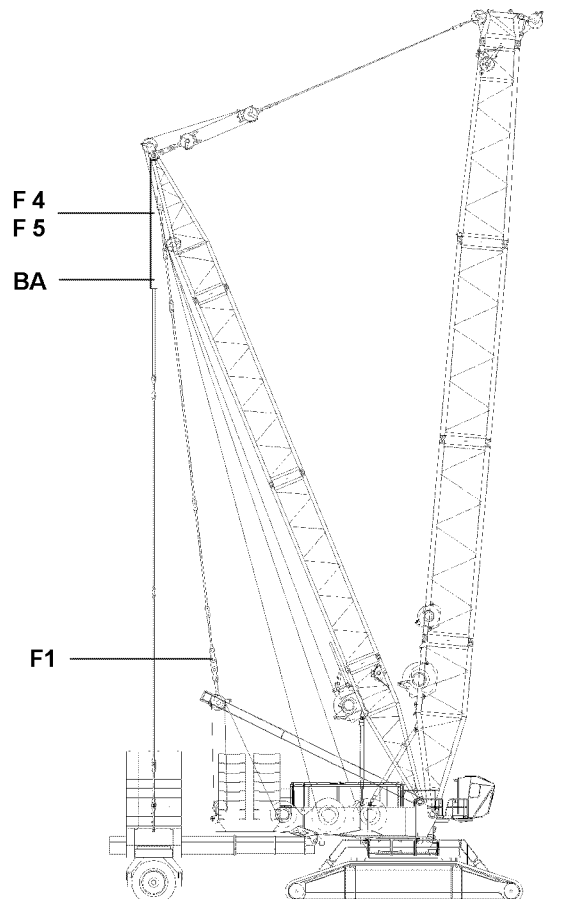
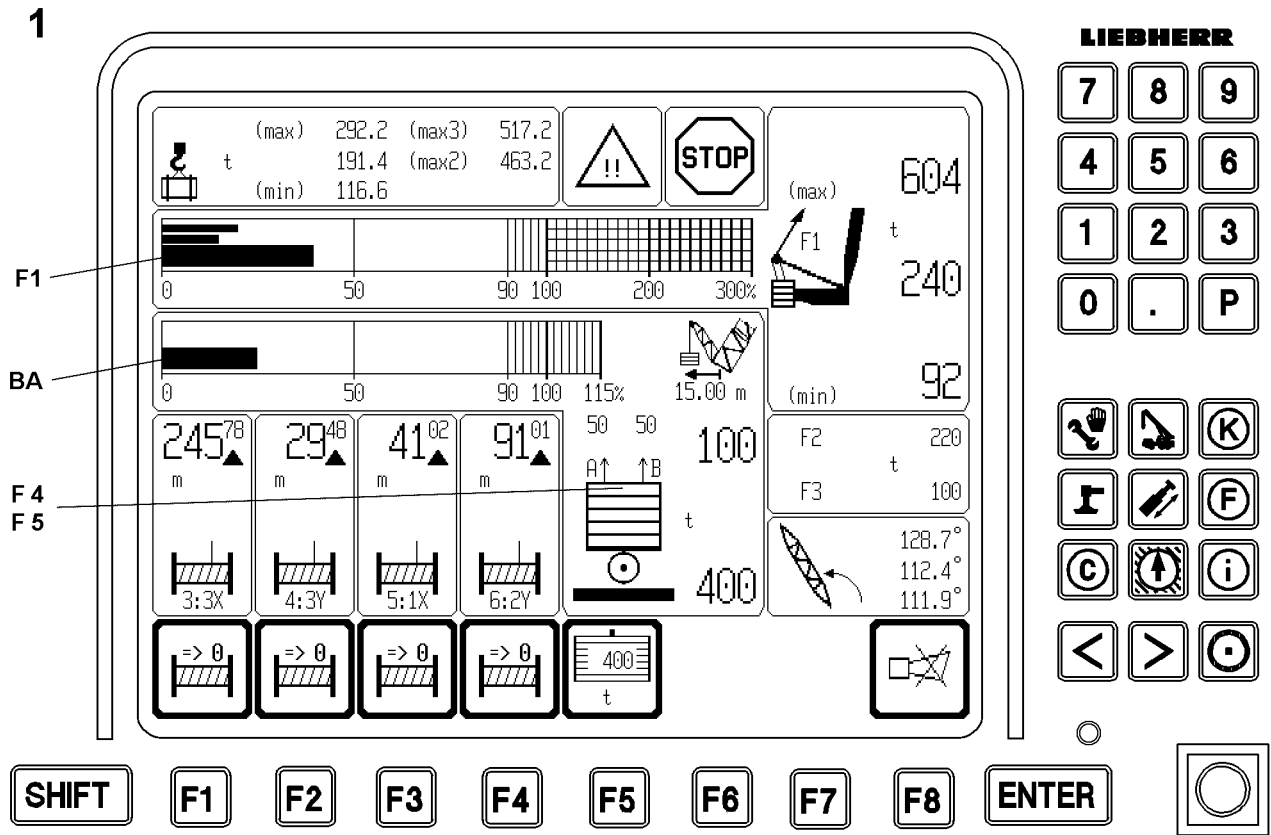
6.4.2 Monitoring of test point 1-operational maximum force (= $F1_{\max}$ operation)

It is shown on LICCON monitor 1. When $F1$ is greater than $F1_{\max\text{-shut off value}}$ shut off of all movements which could increase load torque with the stop icon and the acoustic warning “HORN” by LICCON monitor 1.



Note

- ▶ The maximum load can be safely monitored by the “LICCON overload protection” itself!
- ▶ The “ $F1_{\max}$ -monitoring” is an additional monitoring function which shows the overload parallel to the “LICCON overload protection”!
- ▶ In all cases where the maximum load capacity according to the load chart “max-load” is smaller than the maximum load of the current set up configuration with optimum derrick ballast “max3-load”, which means “max-load” appears smaller “max3-load”, when lifting the maximum load, the monitor display looks as if the “LMB utilization bar of the crane” is at 100 % and the “ $F1$ utilization bar” is approximately at 100 %!
- ▶ At the just completed LMB-Stop (“current load” / “max-load capacity” greater than 100 percent) $F1_{\text{actual}}$ already lies just over $F1_{\max}$ or just below. There is a certain tolerance due to the component weights and the wind influences. Since the maximum load can always be raised, shut off will not occur at $F1_{\text{actual}} / F1_{\max}$ greater than 100 %. Shut off will only occur at $F1_{\text{actual}} / F1_{\max\text{ operation shut-off value}}$. For this crane, the following applies: $F1_{\max\text{-operation shut off value}} = F1_{\max\text{-operation}} + F1_{\text{addition for shut off}}$ (also see Crane operating instructions, chapter 4.02). The $F1_{\text{addition for shut off}}$ is selected such that $F1_{\max\text{-operation shut off}}$ may normally never come about. This shut off provides a second safety, particularly in cases with “max-load capacity” smaller “max3-load capacity” as additional safety precaution. For example, if the weighed load is far too low due to a sensor failure, the actual load could be greater than the maximum permissible load without the LICCON overload protection shut off tripping. The crane could be overloaded. In this particular case, with the “max-load capacity” smaller than the “max3-load capacity”, with $F1_{\max}$ larger $F1_{\max\text{-operation shut off value}}$ the $F1_{\max\text{-shut off}}$ triggers. In this case, the crane is already slightly overloaded, however shut off prevents an overload in certain cases or toppling of the crane. This means that the $F1_{\max\text{-operation shut off}}$ can protect the crane from overload in certain cases!
- ▶ It is to be ensured that the load weight and the shut off upon maximum load capacity function reliably!



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**DANGER**

The crane can topple over!

In cases with “max-load capacity” = “max3-load capacity”, the $F_{1_{\max}}$ -shut off value does not offer protection! The $F_{1_{\max}}$ shut-off threshold is so high that the crane will probably topple over or be damaged before the shut-off threshold is reached!

- ▶ Carefully monitor the displays on the LICCON monitor!

**WARNING**

Danger of accident!

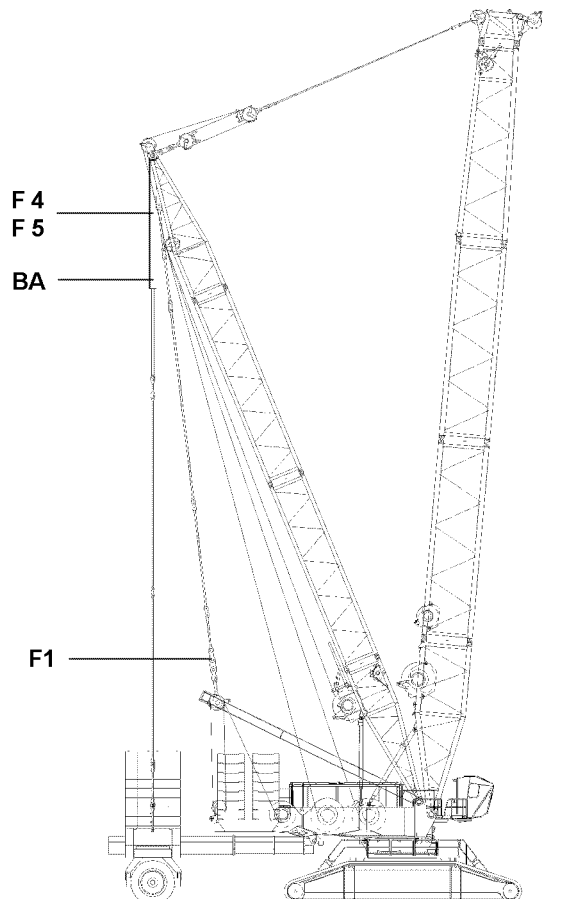
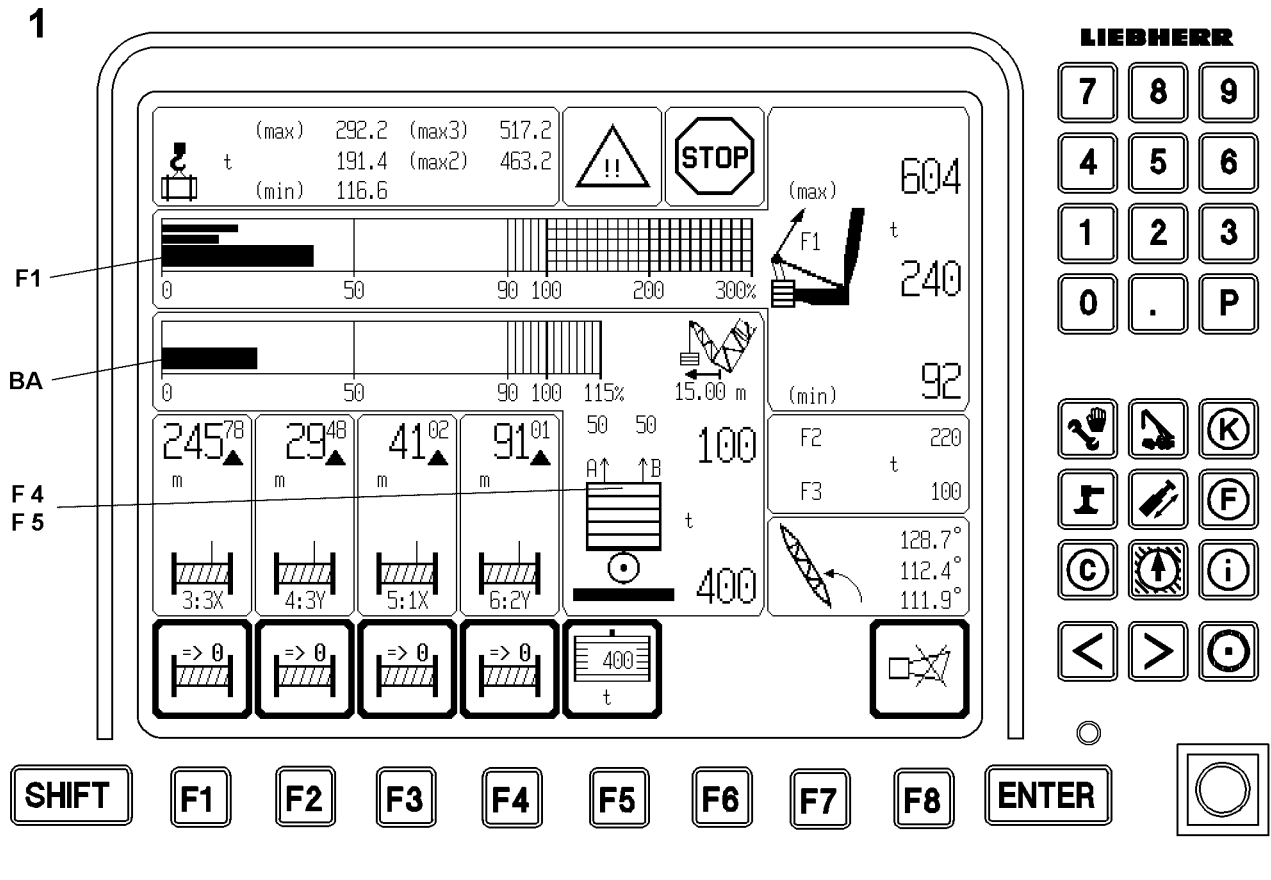
- ▶ Measuring point 1-Operation-Maximum force not only depends on the current crane configuration but also on the derrick ballast pulling force measured by the pressure sensors!
- ▶ If the pulled derrick ballast increases, the maximum permitted $F_{1_{\max}}$ removes force and vice-versa!
- ▶ It is therefore important to carefully monitor the ballast weighing process and the value for the pulled derrick ballast to ensure it is plausible!

**DANGER**

The crane can topple over!

If the pulled derrick ballast value has been incorrectly determined and is too low, the calculated $F_{1_{\max}}$ may be too high and the crane could be overloaded or topple over without this becoming evident!

- ▶ Carefully monitor the displays on the LICCON monitor!



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6.4.3 Utilization conditions

The current utilization of the crane results from the “utilization bar of the crane” **1** on the LICCON monitor **0**.

Max. load carrying capacity:

- The “maximum load carrying capacity in current operating condition (“**max-load carrying capacity**”)” is achieved, when the “utilization bar of the crane” **1** displays 100 percent. This is the case when the “utilization of the crane according to the load chart and reeving” reaches 100 % (“Current load” is equal to the “Maximum load”).

When the “max-load ” is smaller or equal to the “max2-load ”, then the “max-load ” can be increased through:

- Pulling up the derrick ballast, if the derrick ballast is not already suspended and the currently pulled derrick ballast is still smaller than the optimum derrick ballast.

Max2-load:

- The “maximum load carrying capacity of the current crane equipment ” (“**max2-load** ”) is achieved when the “crane utilization bar of the crane” **1** is at 100 % **and** the “derrick ballast utilization bar display” **BA** is greater than or equal to 100 % (the current derrick ballast is completely lifted off the ground), and the derrick ballast input value and the ballast weight are correct.

This is the case when the “current load” and the “max2-load” reaches 100 percent (“current load” is equal to the “max2-load”).

When the “max2-load” is smaller than the “max3-load”, then the “max-load” can be increased through:

- Increasing the derrick ballast by adding additional ballast plates if the placed derrick ballast is still smaller than the optimum derrick ballast.

Max3-load:

- The “maximum load carrying capacity of the current crane equipment with optimum derrick ballast” (“**max3-load**”) is reached when the “crane utilization bar” **1** stands at 100 % **and** the “derrick ballast utilization bar display” **BA** is at 100 % (the optimal derrick ballast is completely lifted off the ground), and the derrick ballast input value and the ballast weight are correct.

This is the case when the “current load” and the “max3-load” reaches 100 percent (“current load” is equal to the “max3-load”).

Here, the optimal derrick ballast is already entirely pulled!

Further increasing the derrick ballast at this derrick ballast radius will not increase the load further than “max3-load”!

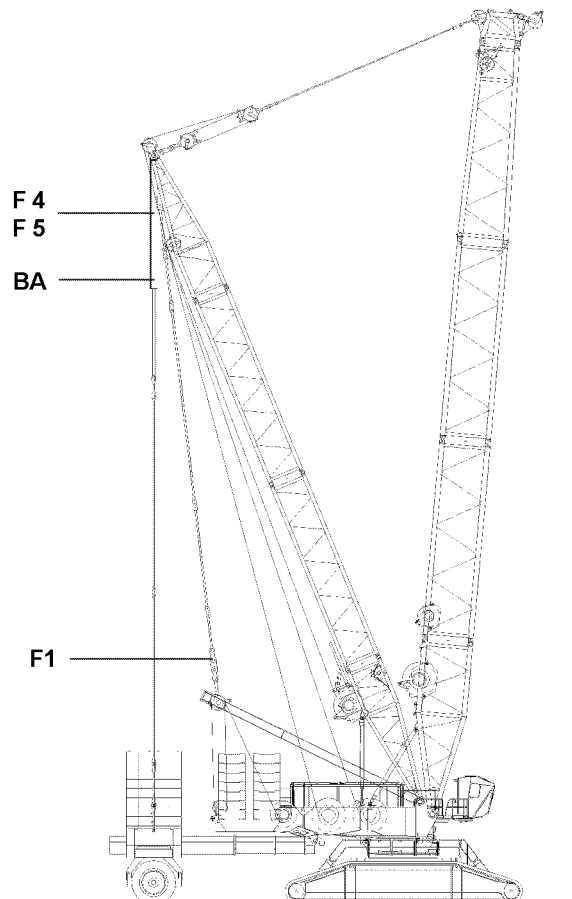
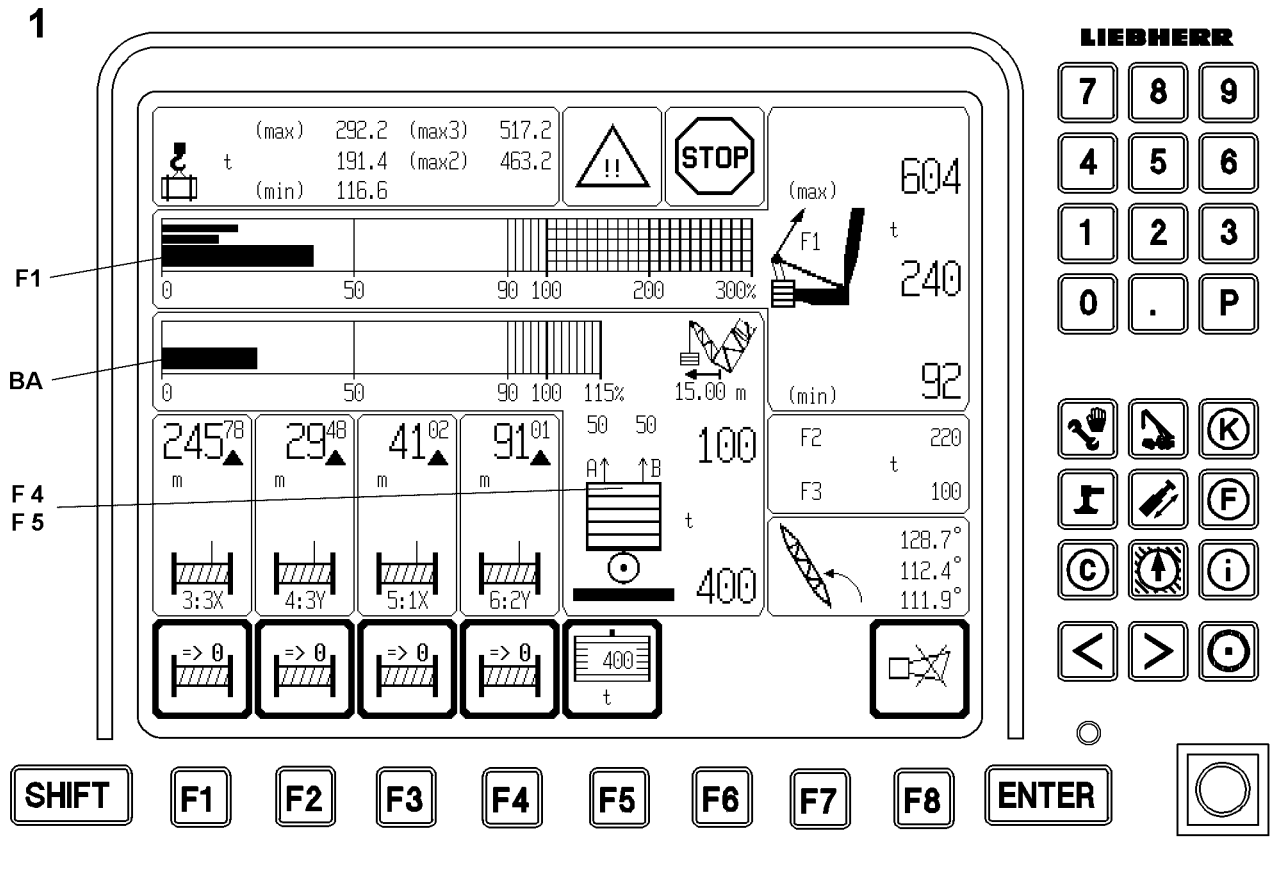


Note

- It may be possible to increase the load capacity by increasing the derrick ballast radius or in some cases by reducing the derrick ballast radius, see load chart or the LICCON job planner!

This also applies for:

- “Current load” equal to “max-load”.
- “Current load” equal to “max2-load ”.



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The bypass of the maximum load according to the load chart and reeving (crane utilization bar 1 is at 100 percent) can be bypassed by:

- 1.) Bypass key button D on the LICCON monitor 0.
- 2.) Assembly key button in the instrument panel.
- 3.) **Note:**

The test point 1-assembly - maximum force shut off (= F1 max-assembly) cannot be bypassed.

**DANGER**

The crane can topple over!

When the assembly key button is turned on, the LICCON overload protection is bypassed and is thereby no longer effective!

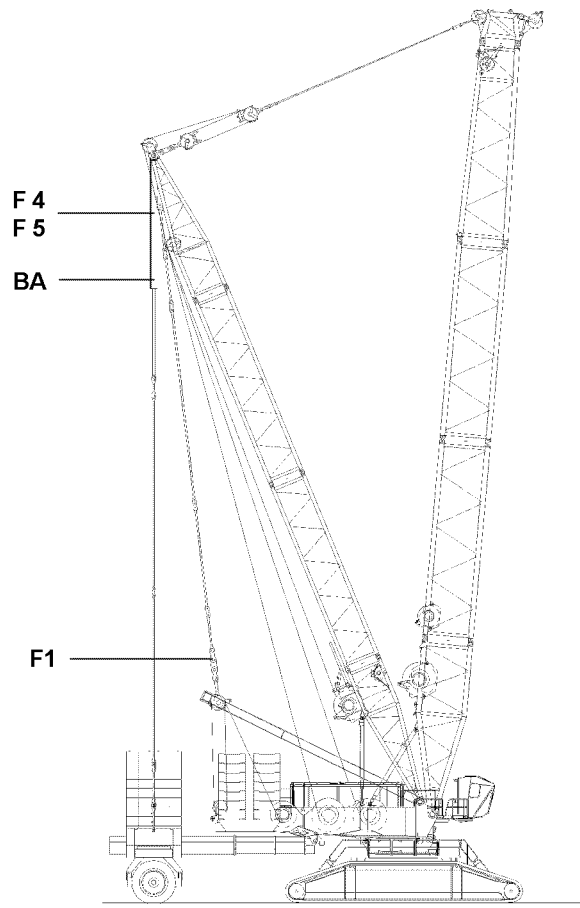
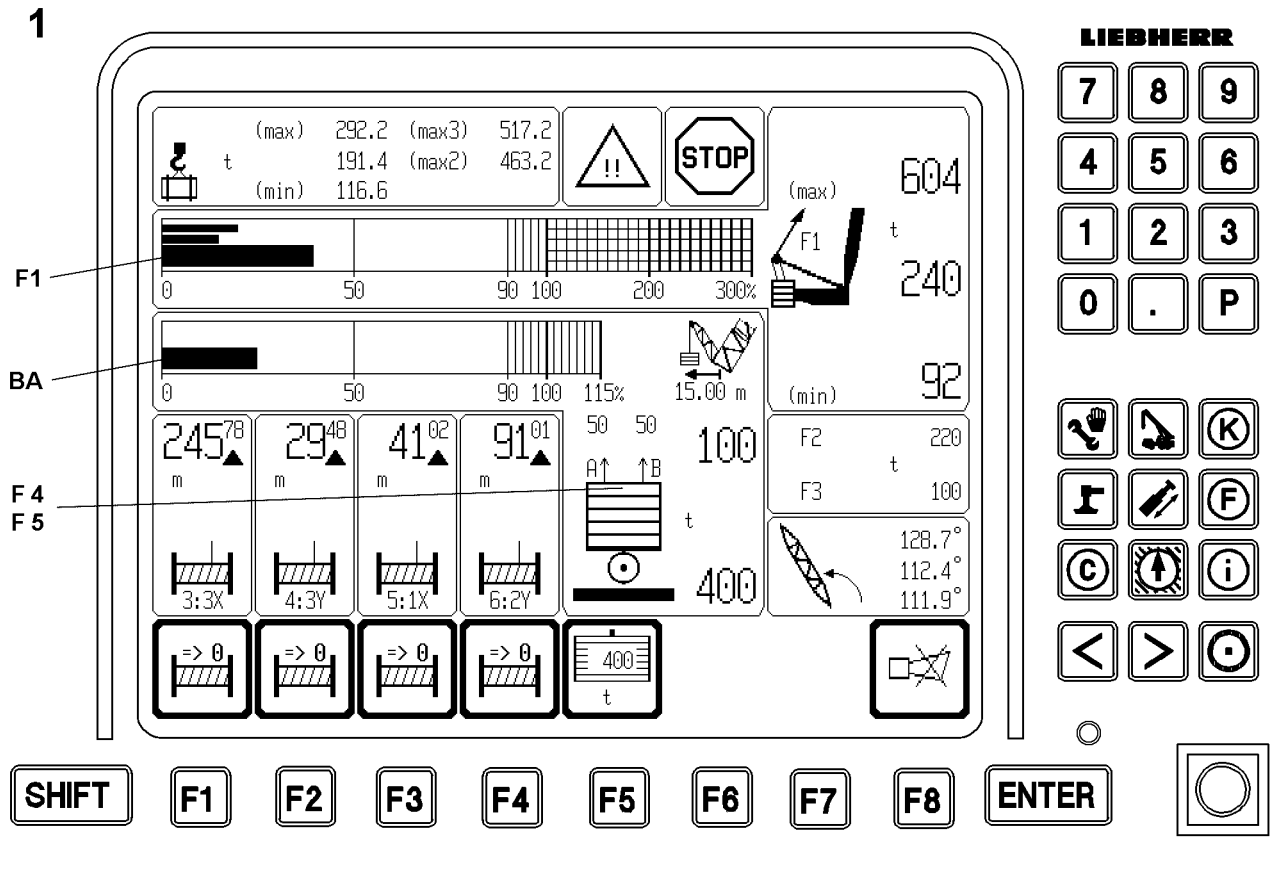
The crane can be overloaded unnoticed and topple over!

Personnel can be severely injured or killed!

- ▶ When the assembly key button is turned on, only load moment reducing crane movements may be carried out up to a permissible operating and load range!
 - ▶ The assembly key button must be turned off immediately after reaching the permissible load range!
 - ▶ The crane operator alone is responsible completely for his actions during bypass of LICCON overload protection!
-

**Note**

- ▶ The movement "Derrick ballast up" or "Derrick ballast down" requires utmost attention by the crane operator!
-



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6.5 Checking the length sensor value on the ballast trailer

When telescoping the derrick ballast in and out, the derrick ballast radius display must be monitored carefully.

When telescoping the derrick ballast, the display must change according to the movement. This allows the crane operator to immediately notice if the length sensor rope drum jams when spooling in or out.

When the derrick ballast is extended or retracted all the way, the derrick ballast display must show almost the exact end position, for example Radius = 15 m or 20 m.

The crane operator may not rely blindly on the derrick ballast radius measurement, but he must think for himself and check, if the measurement is still working correctly.

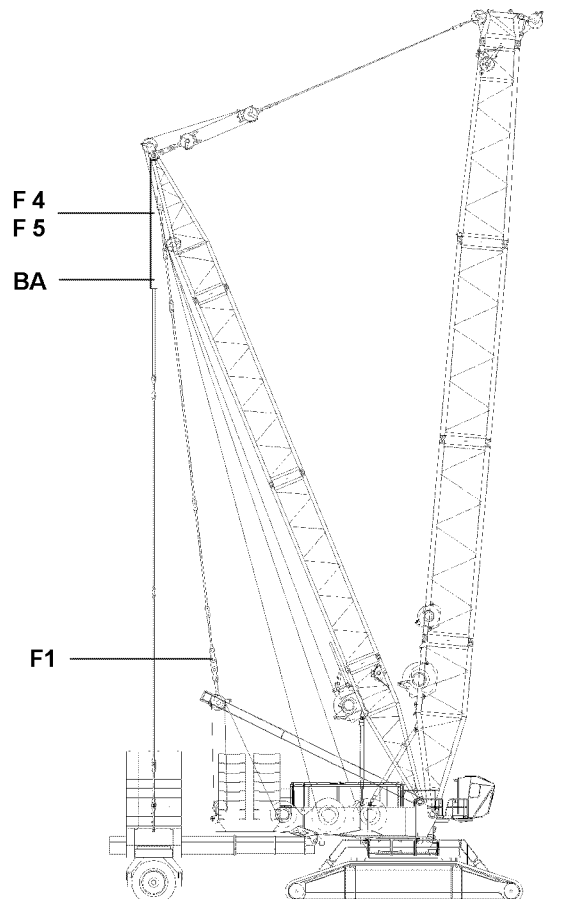
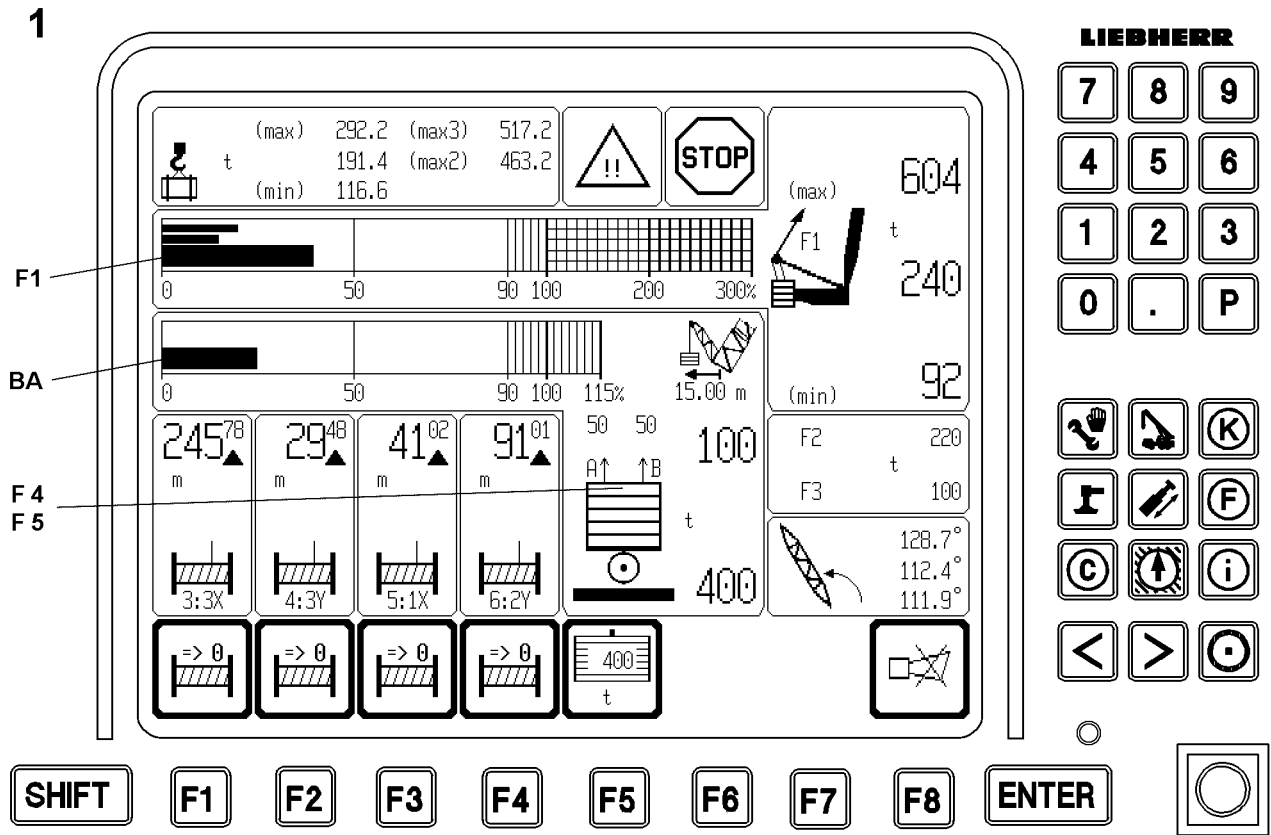


DANGER

Danger of accident!

If the derrick ballast radius is measured incorrectly, due to the incorrect radius a maximum load capacity and a F1-operational-max force which are too large will be calculated!

- ▶ The crane will be overloaded unnoticed!
 - ▶ There is an increased danger of accidents!
-



B104755

6.6 Difference force monitoring of ballast guying

In operating modes with derrick ballast, the difference of the forces of derrick ballast guying A and B, monitor 1, are monitored.



DANGER

Danger of accident!

If the difference of these forces is too high, it will damage the derrick end section or other crane components!

► Danger of accident!

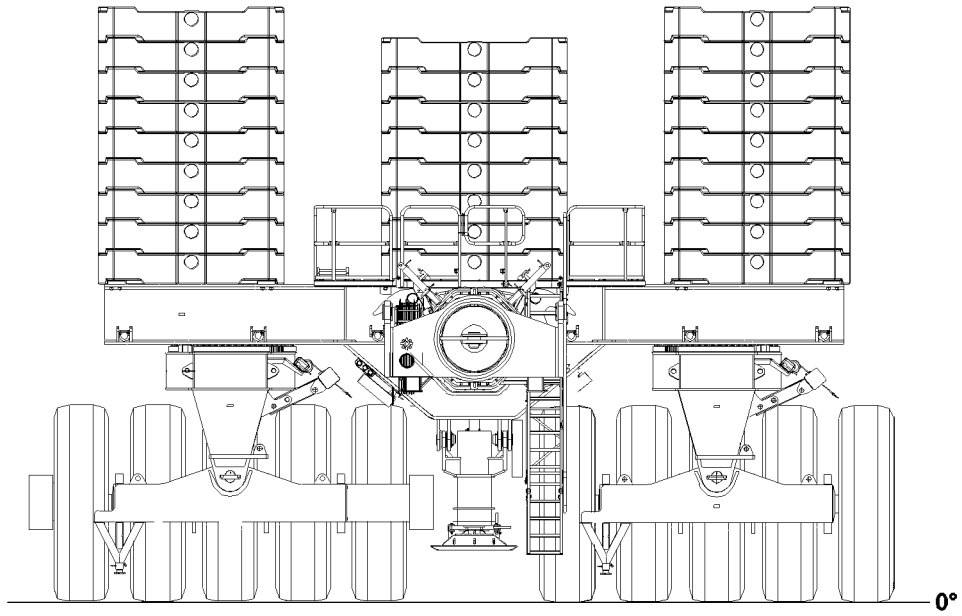
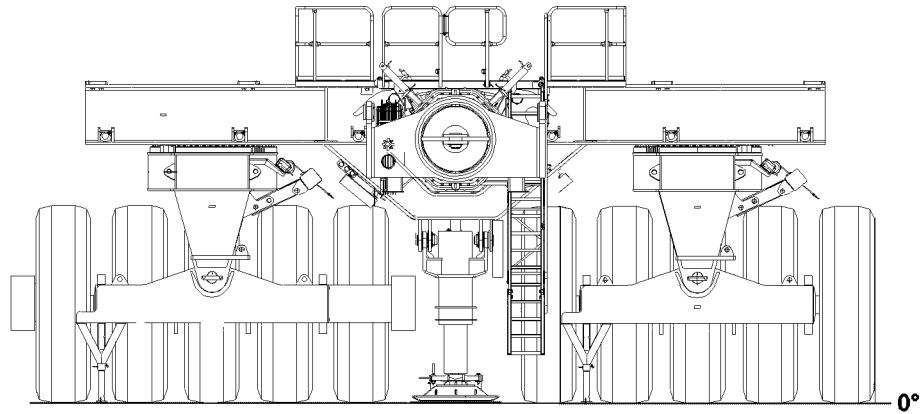
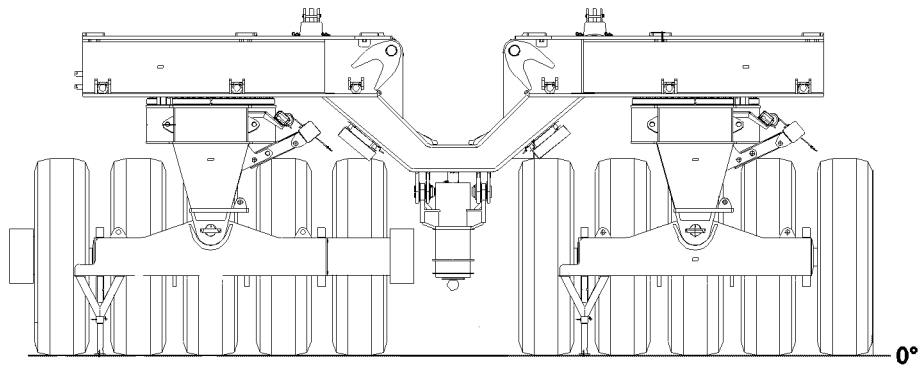
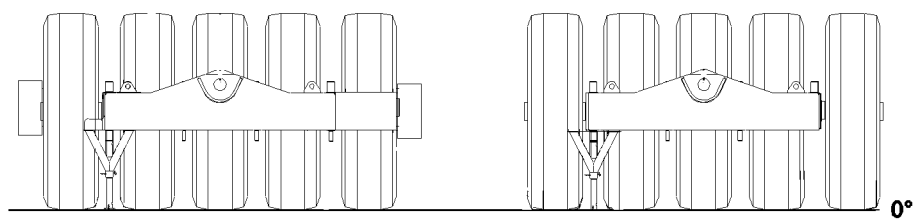
The forces in the derrick ballast guyings A and B are shown and compared on monitor 1. If the difference exceeds a permissible value, an acoustical warning is issued and the two force values blink. However **none of the movements are turned off**.

If the difference of the forces of the derrick ballast guyings A and B exceeds the specified limit value, then this can have various causes:

- Taking on the load by relieving the tires on the ballast trailer or flexation of the turntable.
- The ground under the derrick ballast is uneven.
- The crane is leaning to one side;
- The derrick ballast is loaded one-sided.
- The force measurement in one guying is incorrect.

The crane driver must recognize the correct cause and take countermeasures:

- Error message appears.
- The error, which caused the one-sided force, must be remedied.
- The following measures are permitted providing the ground is only slightly uneven:
Lock one ballast cylinder and with the other ballast cylinder actuate “Derrick ballast up” or “Derrick ballast down” in such a way that the difference between the forces becomes smaller. Ensure that the derrick ballast is not tilted at an impermissible angle with respect to the crane, otherwise the derrick ballast guide and components will be damaged.
- If sensor values are implausible: Check whether the ballast weighing pressure sensors or inputs are faulty. If necessary, detach the sensor or replace the CPU.

1**2****3****4**

B107174

7 Disassembly

Make sure that the following prerequisites are met:

- The placement surface for the derrick ballast must be level, horizontal and of sufficient load carrying capacity.
- The hydraulic, telescopeable guide on the ballast trailer is fully telescoped in.
- The derrick radius and the ballast radius are identical.
- an auxiliary crane and lifting platform are available



WARNING

Danger of toppling the ballast stack!

The placement surface for the derrick ballast must be level, horizontal and of sufficient load bearing capacity, otherwise the ballast stacks can tip over!

Personnel can be severely injured or killed!

- ▶ Check the horizontal position of the crane during the set down procedure!
- ▶ Check the horizontal position of the derrick ballast during the set down procedure!
- ▶ Constantly check the monitor for differential forces in the D-guying!
- ▶ It is strictly prohibited for anyone to stand under the derrick ballast or in any part of the danger zone during the set down procedure!



DANGER

Danger of tipping over!

If the ballast trailer is unpinning on the turntable, there is a danger of tipping over!

- ▶ Before unpinning, it must be ensured that the maximum or minimum ballast weights has been placed on the ballast trailer according to section "Placement and tipping safety for non-assembled ballast trailer on turntable"!
- ▶ Observe the maximum and minimum ballast weight!
- ▶ Support the ballast trailer before unpinning!

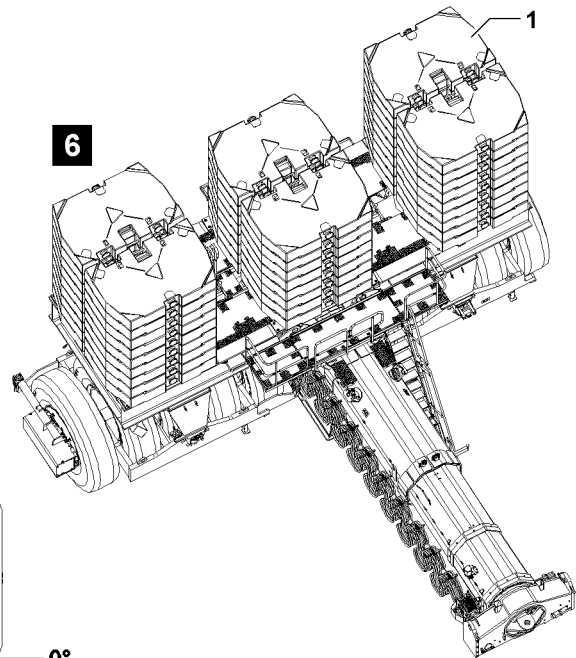
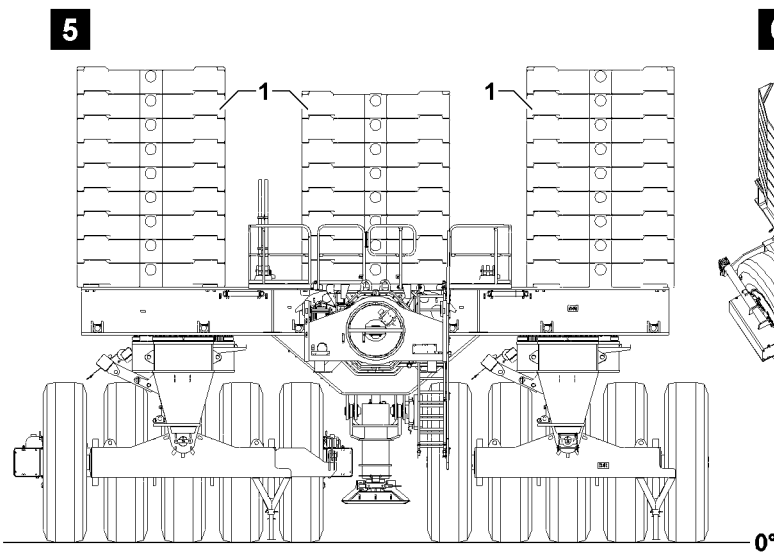
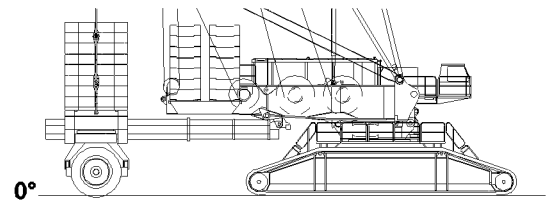
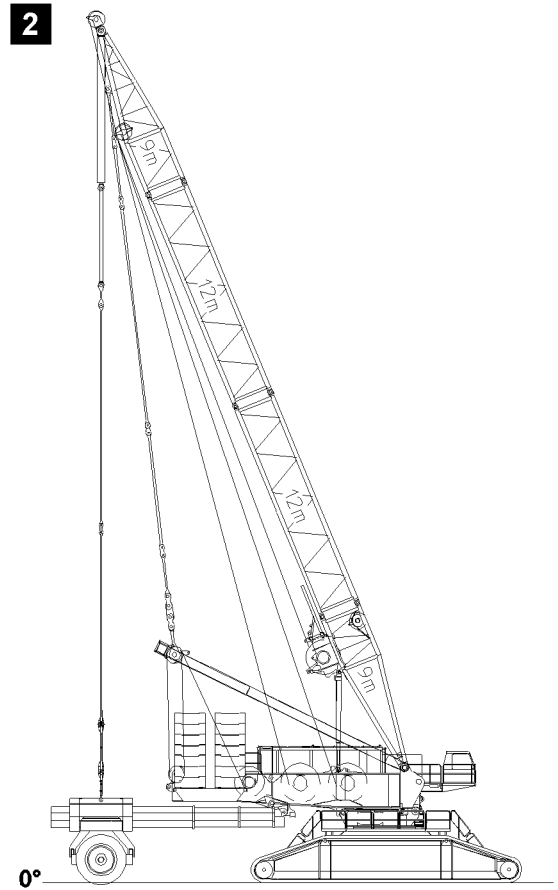
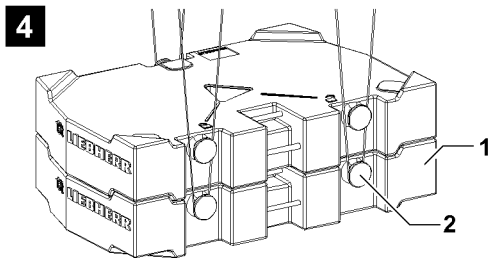
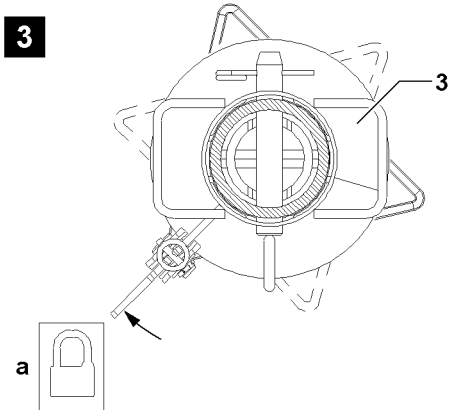
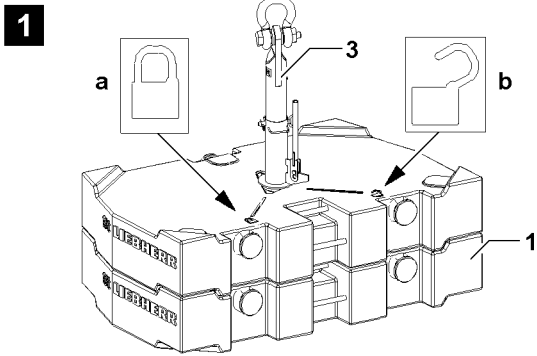
7.1 Short description of disassembly procedure



Note

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

- **Illustration 1**
 - Set down the ballast plates and unpin the ballast trailer from the turntable.
- **Illustration 2**
 - Unpin the guide on the ballast frame.
- **Illustration 3**
 - Support the wheel sets with the support legs.
- **Illustration 4**
 - Unpin the right and left wheel set and place the ballast frame in the transport position.



B109594

7.2 Removing the ballast

The ballast plates are marked with their own weights:

- Ballast plate **1** 10 t.

Make sure that the following prerequisites are met:

- The ballast trailer is pinned and secured to the turntable on both sides, see illustration **2**.
- The derrick guy rods are pinned and secured on both sides.
- The hydraulic, telescopeable guide on the ballast trailer is fully telescoped in.



DANGER

Danger of accident!

If more than the specified loads are lifted with the receptacle stud **3** or the ropes via the bitts **2**, then components will be overloaded!

Ballast plates **1** can fall down and fatally injure personnel!

- ▶ Lift no more than maximum 20 t with the receptacle stud **3**, see illustration **1**!
- ▶ Lift no more than maximum 20 t with the ropes, 3 fastening points, see illustration **4**!



Note

- ▶ Position **a**, folded out lever points to the closed icon = receptacle stud **3** closed!
- ▶ Position **b**, folded out lever points to the open icon = receptacle stud **3** open to move in / out!

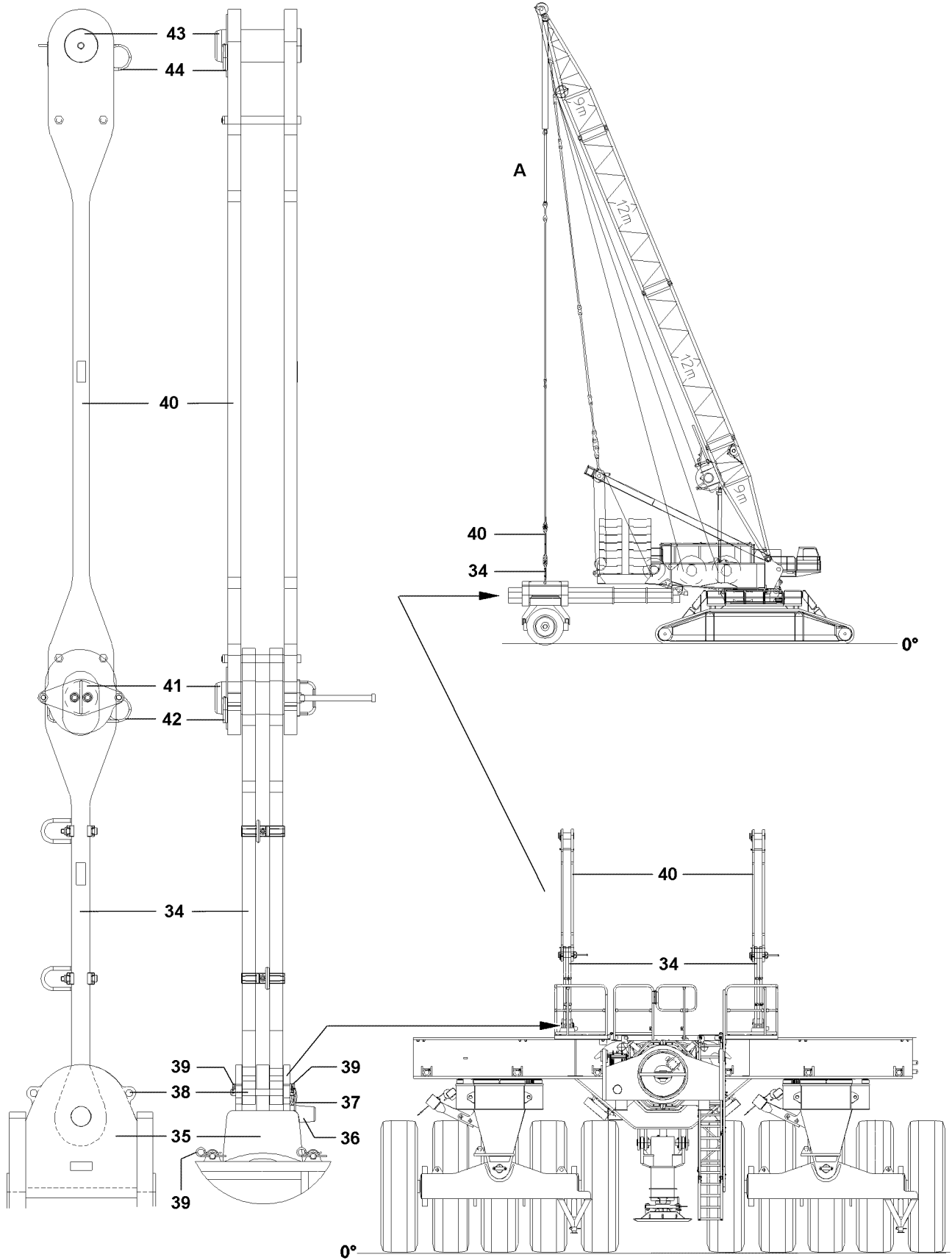
Ensure that the following prerequisite is met for lifting with the receptacle stud **3**:

- The receptacle stud **3** must be in position **a**: “Receptacle stud **3** closed”, see illustration **3**.



Note

- ▶ The maximum or minimum ballast weights required for tipping safety of the ballast trailer must remain on the ballast trailer!
- ▶ Make sure that the maximum or minimum ballast weights is placed, according to section “Placement and tipping safety for non-assembled ballast trailer on the turntable”.
- ▶ Lift the ballast plates **1** individually or as an assembly, see illustration **1** and illustration **4**.
- ▶ Remove the ballast plates **1** evenly from the ballast trailer with the auxiliary crane until the maximum or minimum ballast weight is reached.



B103786

7.3 Disassembling the D-guy rods

Make sure that the following prerequisites are met:

- The derrick radius and the ballast trailer radius are identical.
- The guy rod hangs vertically.
- An auxiliary crane is attached on the guy rod **34**.
- The guy rods are relieved by extending the cylinders.
- The hydraulic, telescopeable guide on the ballast trailer is fully telescoped in.

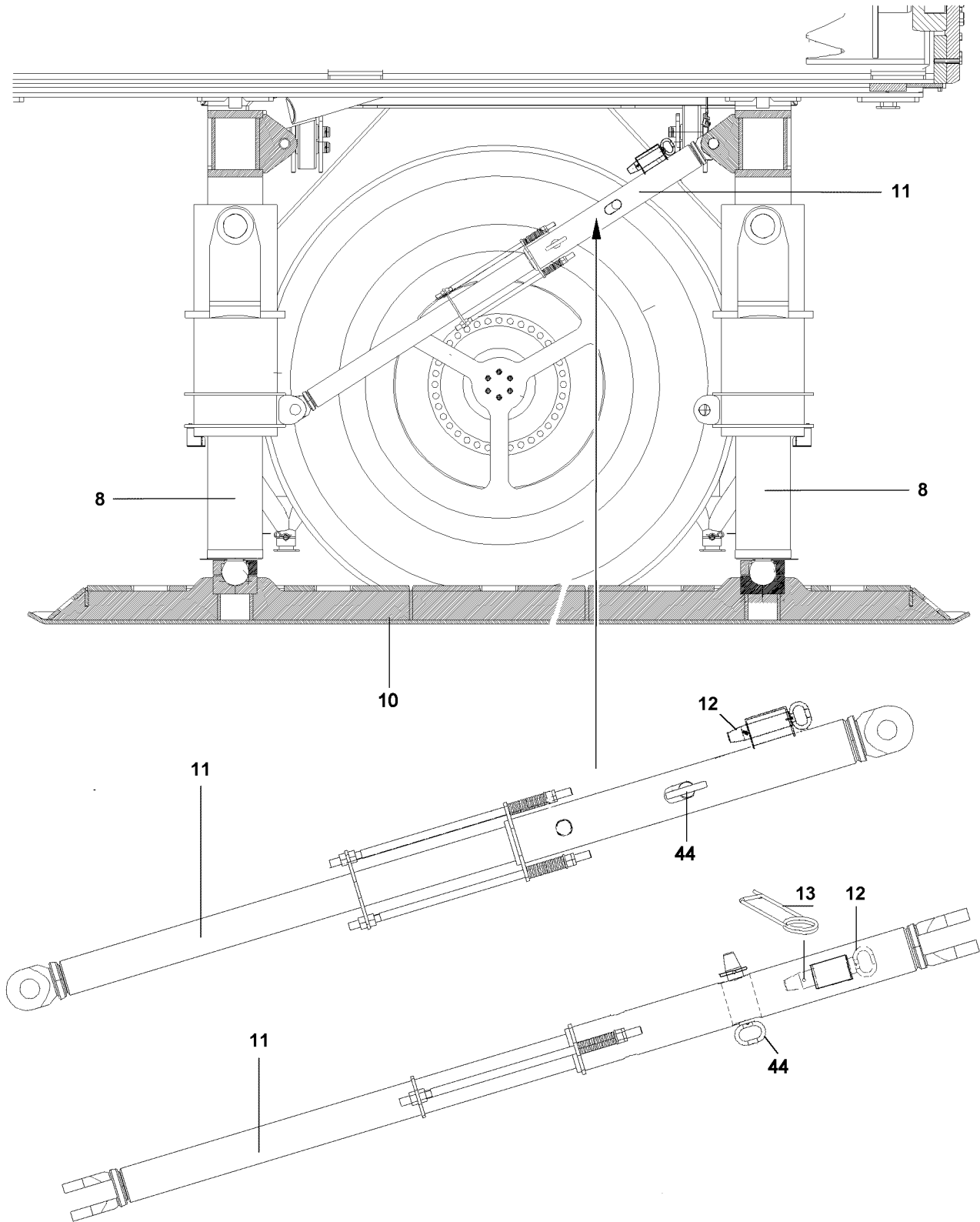


DANGER

Danger of accidents due to oscillation of the D-guy rods!

The D-guy rods must hang vertically before removal!

- ▶ Set the derrick and the ballast trailer to the same radius!
 - ▶ If this is not possible, secure the D-guy rods with the auxiliary crane!
-
- ▶ Unpin the D-guy rods **40** on the guy rods **34**.
 - ▶ Remove the cotter pin **42**, unpin the pin **41**, retract the cylinder and pull the guy rods up.
 - ▶ Unpin the guy rods **34** which are being held with an auxiliary crane on the brackets **35**.
 - ▶ Remove the cotter pin **39** and unpin the retaining pin **38**.
 - ▶ Remove the spring retainer **37** and unpin the pin **36**.



B106860

7.4 Supporting the ballast trailer

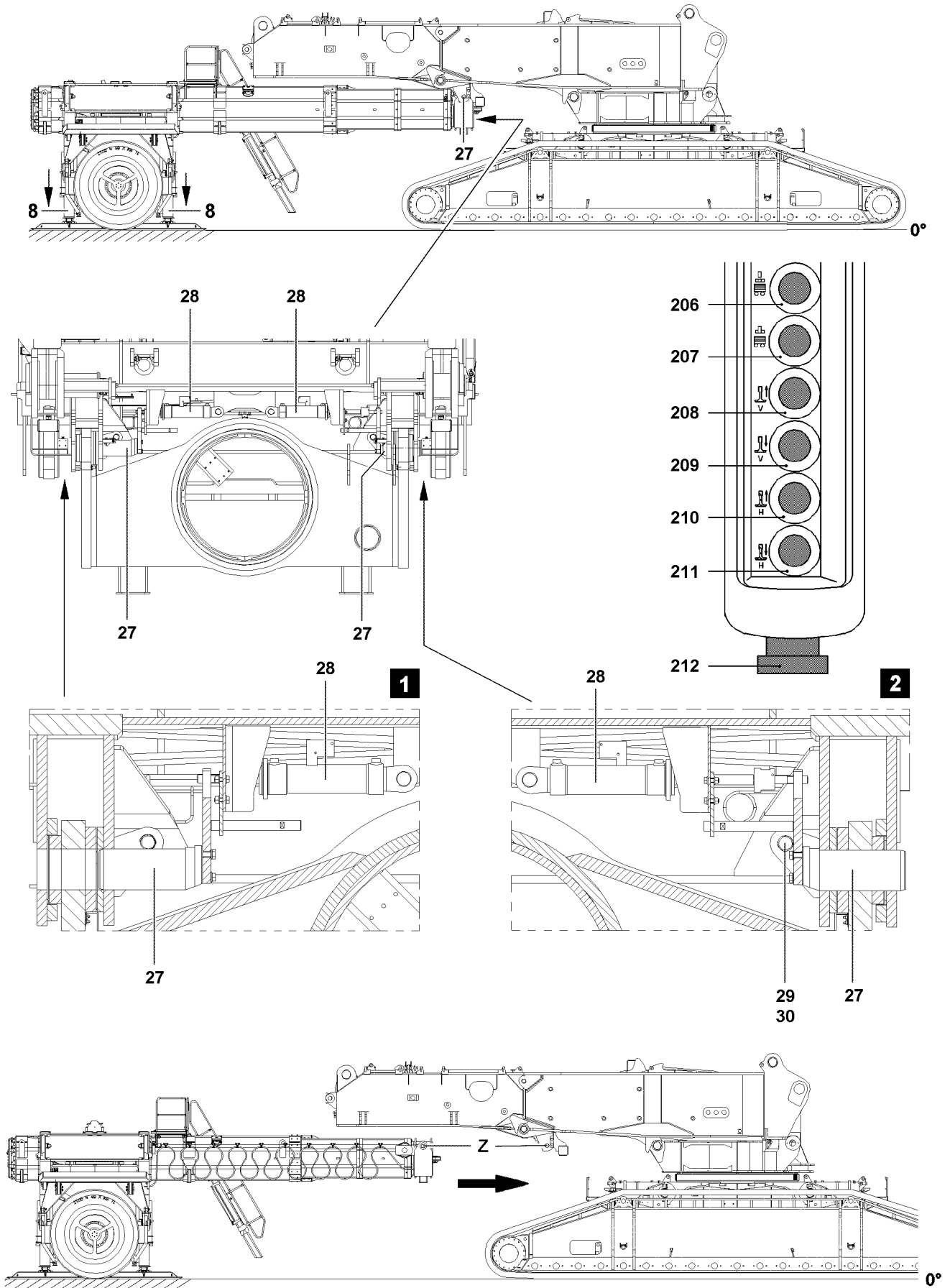
Make sure that the following prerequisites are met:

- The ballast trailer is pinned on the turntable.
 - The ballast plates are ballasted down to the maximum or minimum ballast weights required for the tipping safety.
 - The guy rods have been removed.
 - The crane is aligned in horizontal direction.
 - The pin **44** is inserted in the slot.
 - The locking pin **12** is unpinned, inserted in the transport retainer and secured with spring retainer **13**.
- ▶ Place the support plate **10** under the support cylinder **8**.
 - ▶ Extend the piston rod of the support cylinders **8** and enter into the receptacle of the support plate **10**.



Note

- ▶ For assembling the support plates, see section "Assembly of support plate"!
-
- ▶ Check the moved out support cylinder visually.



B106912

7.5 Unpin the ballast trailer guide on the turntable

Make sure that the following prerequisites are met:

- The ballast trailer is supported on the front and the rear.
- The pin **44** is pinned in the slot of the strut.
- The hydraulic and electrical connections are established.

7.5.1 Unpinning procedure

- ▶ Remove the spring retainer **30** and unpin the retaining pin **29**.
- ▶ Press the button **206** and unpin the pins **27** on both sides with the cylinders **28**.



DANGER

Danger due to operating error!

The crane control recognizes with the limit switch initiators on the left and right on the pin bores if the pins are fully unpinned on the turntable!

As soon as a pin is unpinned, the crane control no longer receives the message “Ballast trailer installed”, which means that the crane movements turn the turntable and drive the crawler are possible. This makes it possible to unpin the second cylinder in case it is twisted!

- ▶ These movements, turn the turntable and drive the crawler must be carried out with extreme caution!
 - ▶ If this is not observed, the crane or the ballast trailer can be damaged!
-
- ▶ Check visually if both pins are completely unpinned.

B195219

7.5.2 Disconnecting the electrical connections

- ▶ Disconnect the electrical connections from the ballast trailer to the turntable and store the plug and cable properly.

7.5.3 Disconnecting the hydraulic connections

When releasing hydraulic lines with quick couplings, make sure that the uncoupling procedure is carried out correctly.



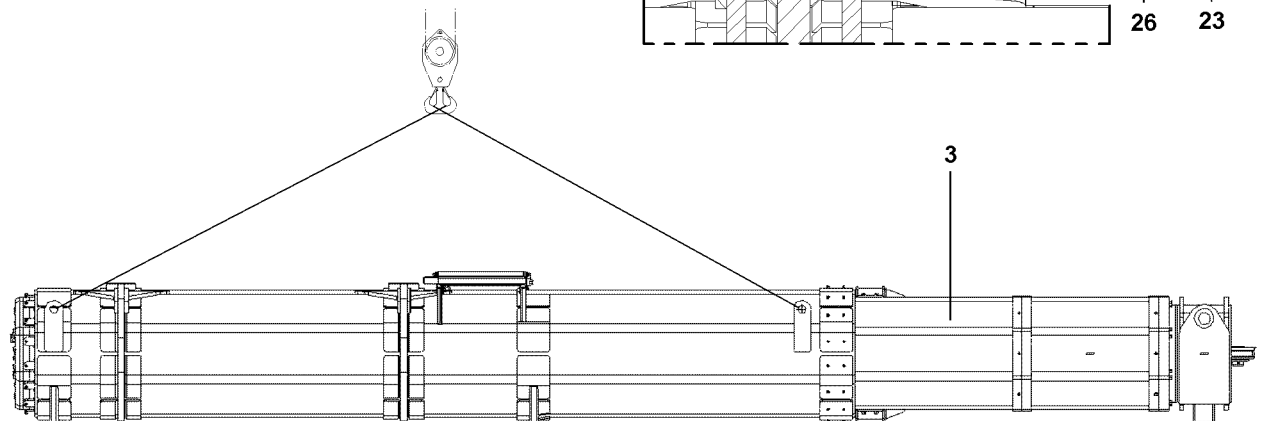
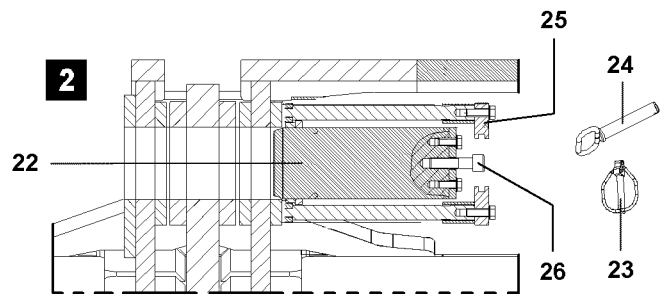
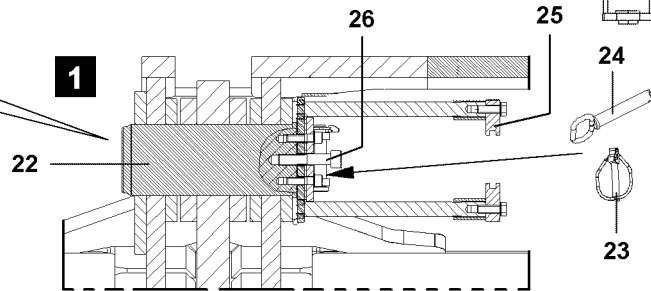
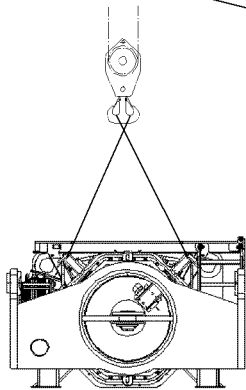
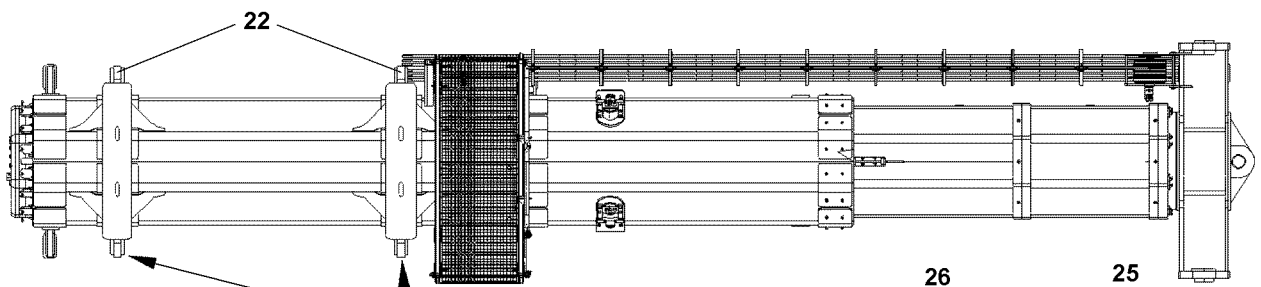
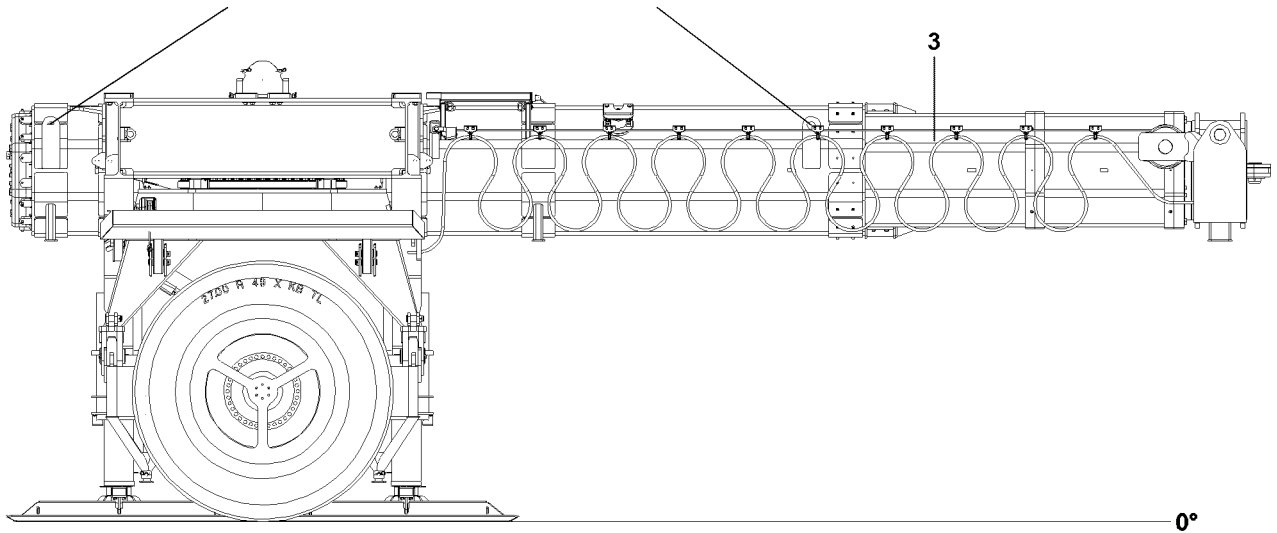
WARNING

Pressure in the hydraulic lines!

If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure!

Personnel can be severely injured or killed!

- ▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time!
-
- ▶ Release the hydraulic coupling by hand.
 - ▶ Disconnect the hydraulic connection.
 - ▶ Store the hydraulic hoses properly.



B104041

7.6 Disassembly of guide on ballast frame

Make sure that the following prerequisites are met:

- The ballast trailer is supported with the support cylinders **8** and aligned in horizontal direction.
- The wheel sets are relieved.
- The mechanical support legs are pushed in.
- The locking pin **12** is pinned in the strut **11**.



DANGER

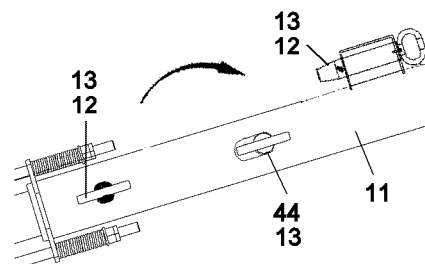
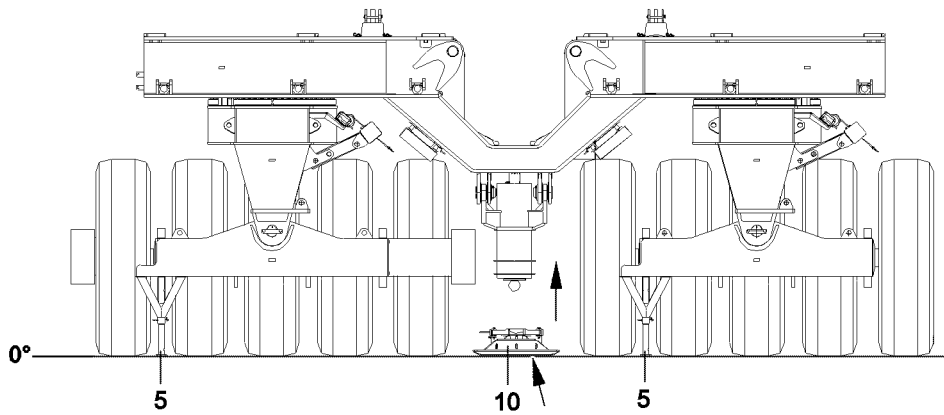
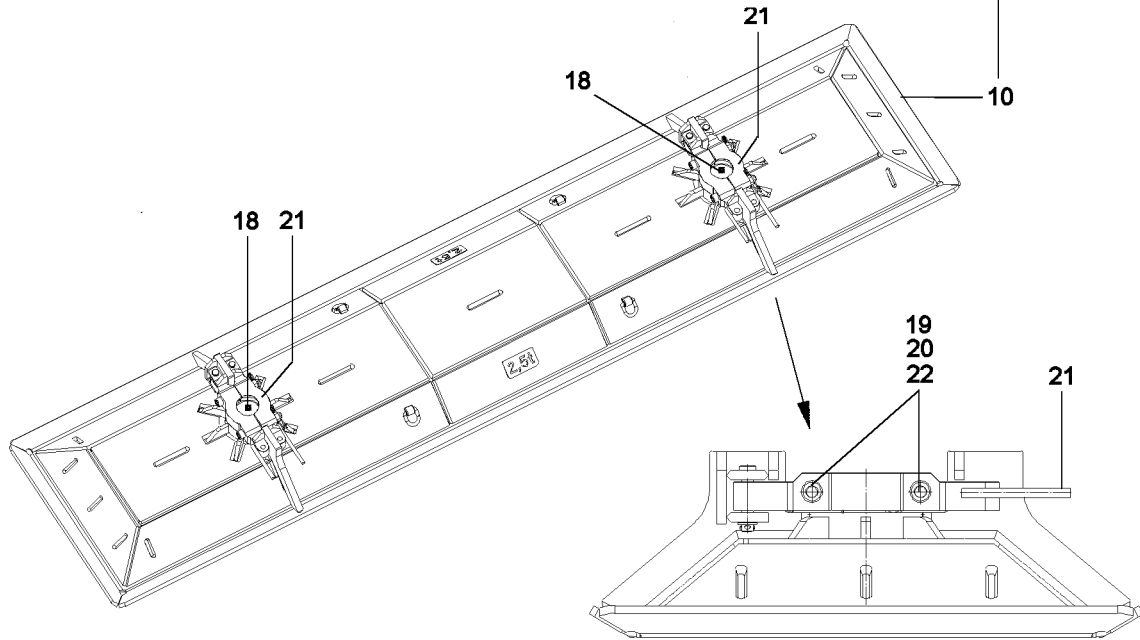
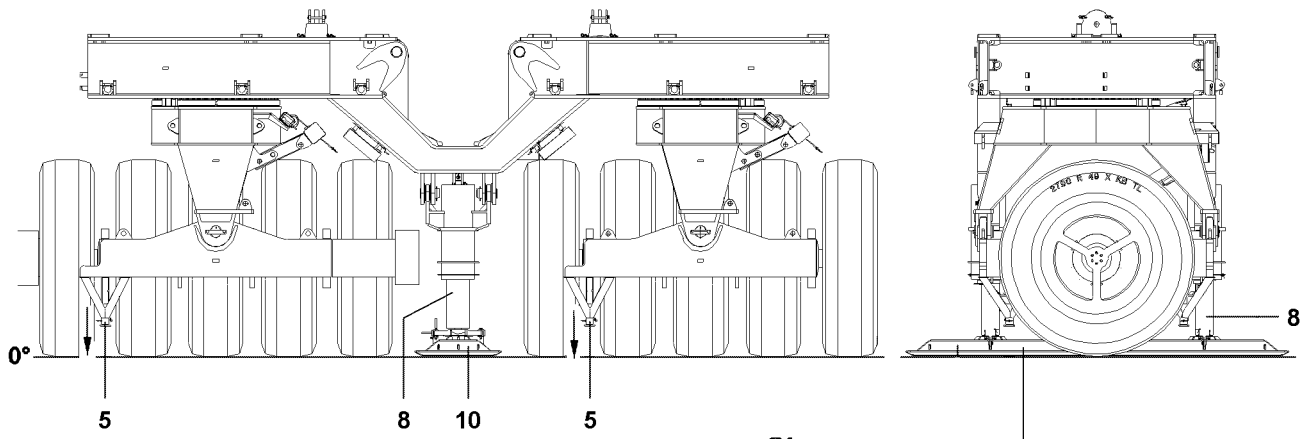
Danger of tipping over!

If the safety guidelines for the stability and tipping safety are not observed and the strut **11** is not pinned with the locking pin **12**, there is a danger of tipping over!

- ▶ Pay attention to the stability and tipping resistance if the ballast trailer is not fitted to the turntable, see section "Placement and tipping safety for ballast trailer not fitted onto the turntable"!
 - ▶ Make sure that the locking pin **12** is pinned in the strut **11**!
-

7.6.1 Disassembling the guide

- ▶ Hang the guide **3** onto the auxiliary crane.
- ▶ Unpin the guide **3** on all four pin points.
- ▶ Remove the locking pin **23** and unpin the retaining pin **24**, see illustration 1.
- ▶ Hang the pin pulling cylinder on the retainer **25** and on the screw head **26**.
- ▶ Unpin the pin **22**.
- ▶ Insert the retaining pin **24** and secure with the locking pin **23**, see illustration 2.
- ▶ Carefully lift the guide **3** out of the ballast frame with the auxiliary crane.



B107175

7.7 Disassembly of support plate



Note

- ▶ The wheel sets are not equipped with their own brake system!



DANGER

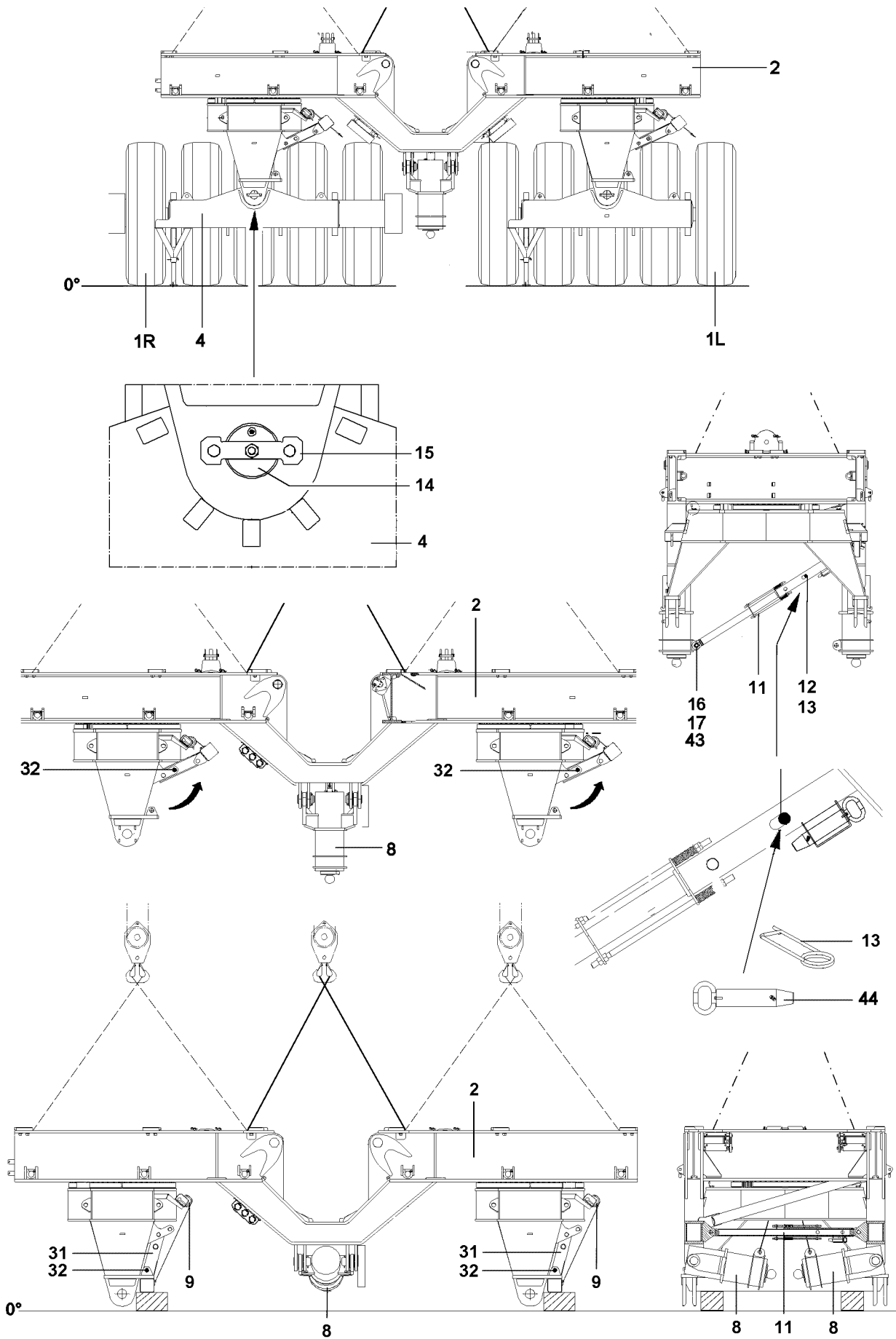
Danger of accident due to tipping the wheel sets!

When the wheel sets are not secured with wedges and not supported with the mechanical support legs, there is a danger of tipping over!

- ▶ Secure and support the wheel sets!

Make sure that the following prerequisites are met:

- The guide is removed.
- The wheel sets are secured with wedges.
- The ballast trailer is supported with the support cylinders **8**.
- The pin **44** is inserted in the slot and is secured with the spring retainer **13**.
- ▶ Unpin the locking pin **12** on the strut **11**.
- ▶ Push out all support legs **5**, pin and secure.
- ▶ Remove the cotter pin **19**, remove the castle nuts **22** and remove the retaining screws **20**.
- ▶ Open the retaining plates **21**.
- ▶ Extend the piston rod of the support cylinder **8** with the pin pulling device and remove it from the receptacle **18**.
- ▶ Fully retract the support cylinders **8**.

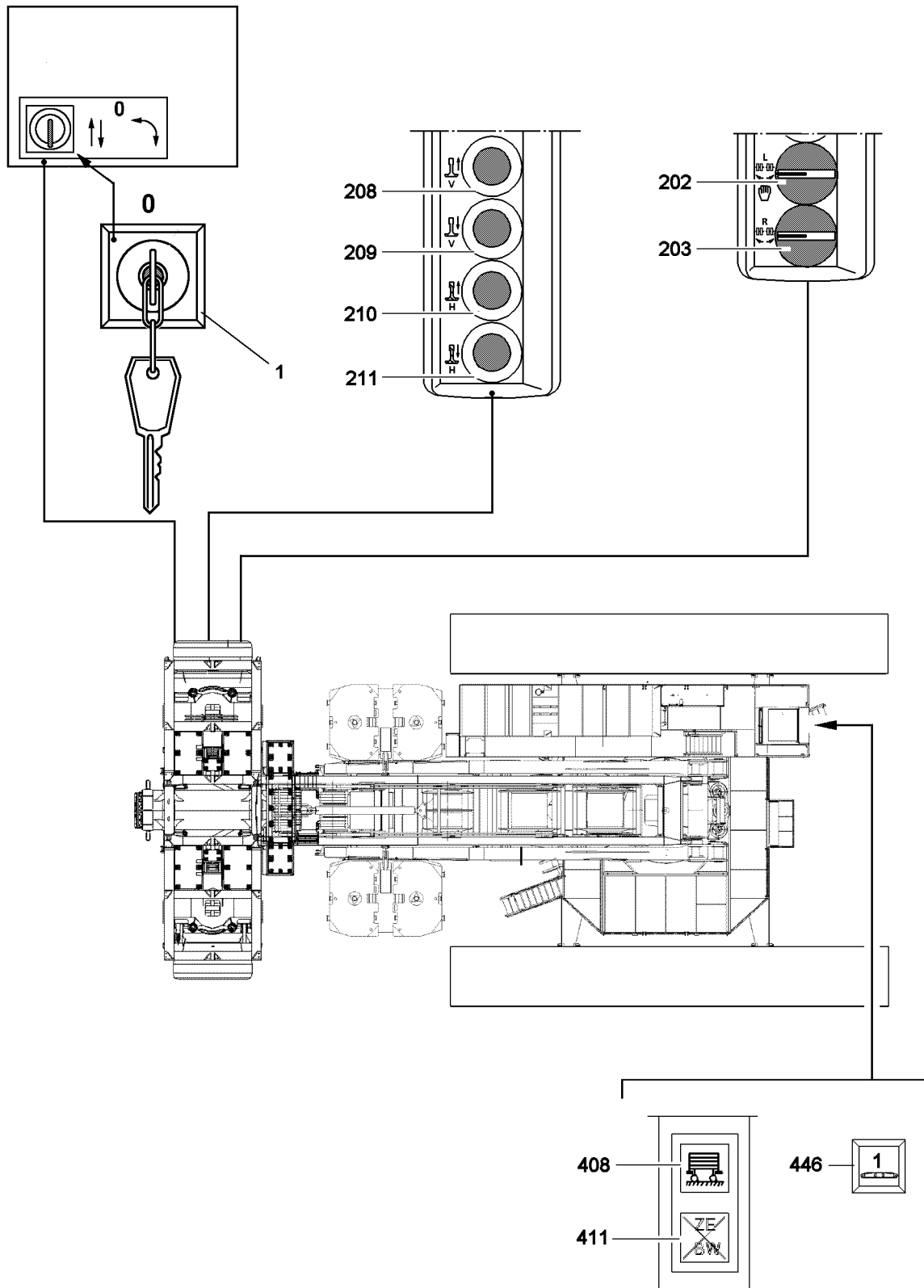


B107176

7.8 Disassembly of ballast frame on the wheel sets

Make sure that the following prerequisites are met:

- The wheel sets are secured with wedges and mechanically supported.
 - The ballast frame hangs on the auxiliary crane.
 - The pin **44** is pinned in the slot on the strut **11** and is secured with the spring retainer **13**.
- ▶ Remove the axle support **15** and unpin all 4 pins **14**.
 - ▶ Carefully lift the ballast frame **2** using the auxiliary crane and turn it away.
 - ▶ Hang in the rope of the rope winch **9** on the transport support **31**.
 - ▶ Release and unpin the retaining pin **32**.
 - ▶ Lower the transport support **31** until it is hanging vertically. Unhook the rope winch from the transport support, reeve and hook it back onto the transport support. Spool up the rope winch and pull the transport support to the rocker. Pin and secure the retaining pin **32**.
 - ▶ Hang the grip hoist or the auxiliary crane on the strut **11** and tension. Unpin the strut **11** on the support cylinder on the bottom. Loosen the spring retainer **17**, remove the washers **43** and unpin the pin **16**.
 - ▶ Pull the strut **11** up into transport position and repin.
 - ▶ Hang the grip hoist or the auxiliary crane on the support cylinder **8** and tension.
 - ▶ Pull the support cylinder **8** into transport position and attach with chains.
 - ▶ Lower the ballast frame on the support.



8 Emergency operation

8.1 Emergency operation of ballast trailer

In case of a failure or defect of the central unit on the ballast trailer, the warning light **411** lights up, the electronic steering of the ballast trailer can no longer be actuated.

The signals towing and circular travel can no longer be sent from the ballast trailer control to the crane control.

By actuating the key switch **1** in the switch box on the ballast trailer, the central unit can be bypassed.

Key switch positions

- 0 (center) = no emergency operation
- I (left) = emergency operation towing
- II (right) = emergency operation circular travel



Note

- ▶ Operate the key switch **1** only if the electronics fail!
 - ▶ The signal "towing" and "circular driving" is released on the crane, even though the wheels might be positioned incorrectly!
-

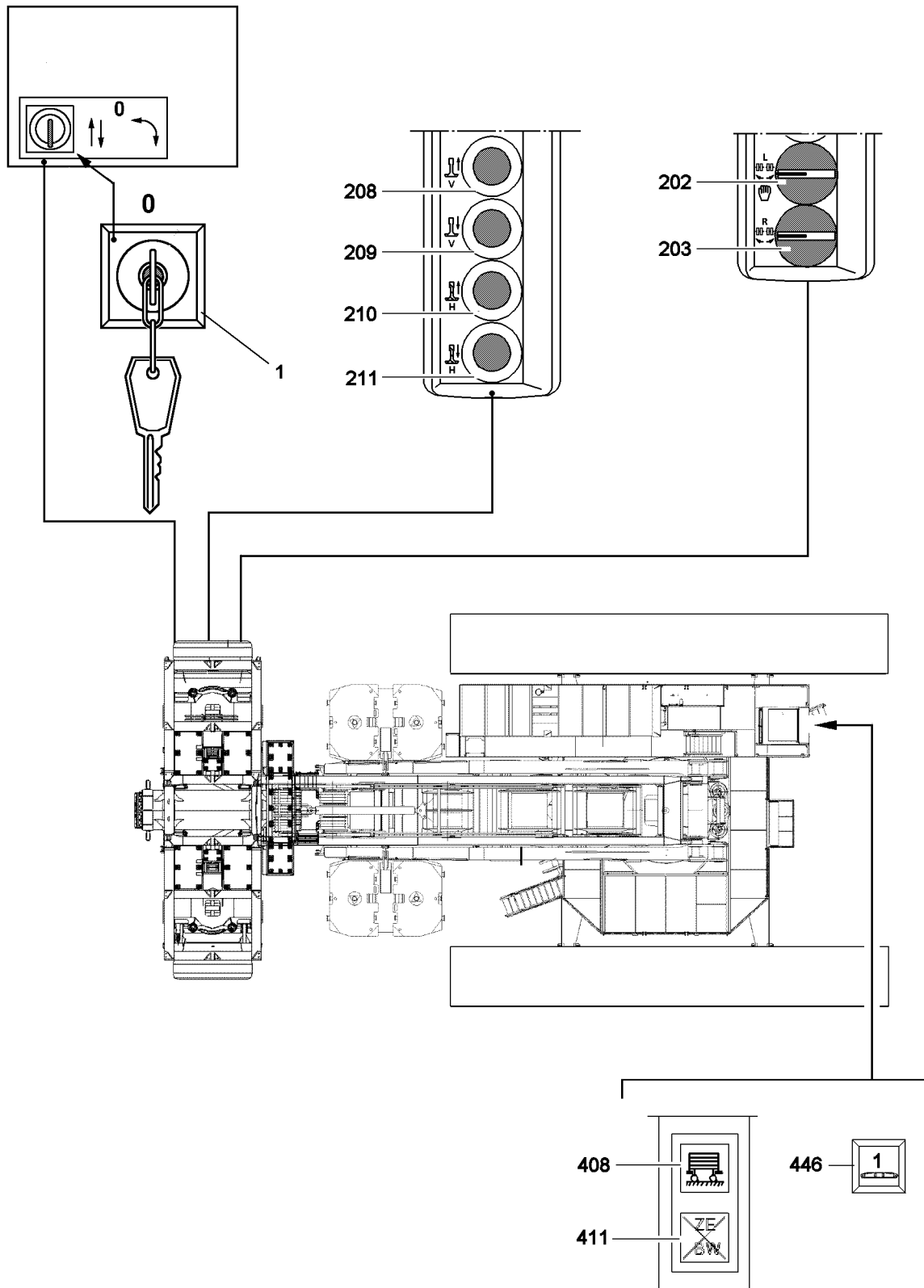


DANGER

Danger of accident due to faulty operation!

Emergency operation should only be carried out by authorized personnel. They must be aware of all related supervisory tasks and hazards!

- ▶ Make sure that no personnel is within the danger zone of the ballast trailer!
 - ▶ Carry out driving movements with utmost caution, the least possible acceleration and careful braking!
 - ▶ Monitor the wheel position manually, check visually. Observe the angle scale on the ballast trailer!
-



8.2 Emergency operation - towing

Make sure that the following prerequisites are met:

- The ballast trailer is properly assembled.
- The crawler operation is turned on. Switch **446** is turned on.

8.2.1 Setting the wheel sets to towing

- ▶ Raise the ballast trailer with the support cylinders.
- ▶ Turn the key switch **1** on the ballast trailer to position I "left".



Note

- ▶ By turning the key switch **1** to position I, the towing command is forwarded to the crane and the emergency operation is turned on!
- ▶ In emergency operation, the support can only be moved from the control panel on the ballast trailer!

-
- ▶ Press button **209** and button **211**, extend the support cylinders on the front and rear and relieve the wheels.
 - ▶ Set the axles to towing position.
 - ▶ Operate the rotary switch **202**, the left wheel set is moved to the towing position.
 - ▶ Operate the rotary switch **203**, the right wheel set is moved to the towing position.
 - ▶ Lower the ballast trailer with the support cylinders.
 - ▶ Press the button **208** and button **210**, retract the front and rear support cylinder.



Note

- ▶ The indicator light **408** lights up, the supports are retracted!
- ▶ Checking the settings

8.2.2 Towing

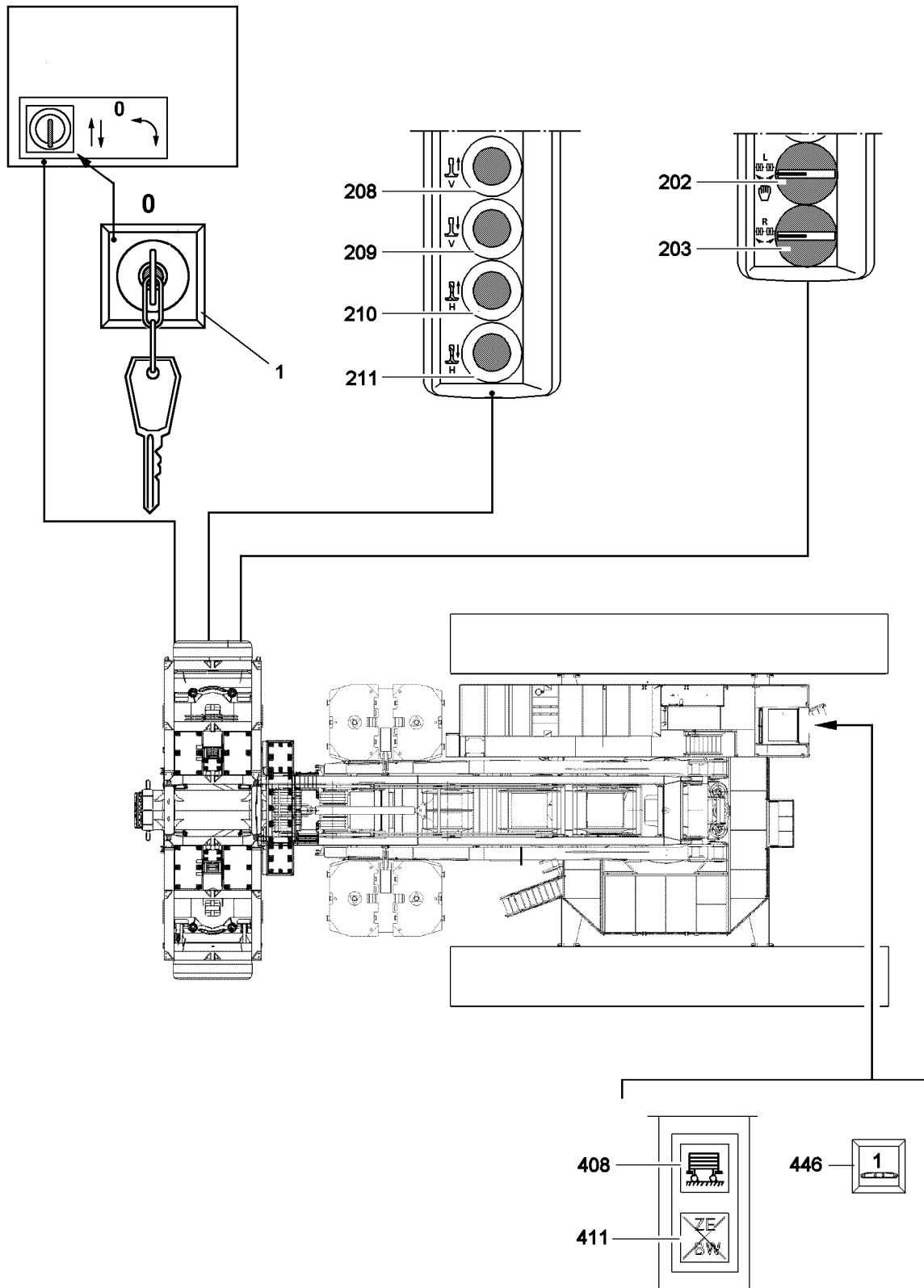
Make sure that the following prerequisite is met:

- The wheel sets are in towing position.



Note

- ▶ Monitor the wheel position of the wheel sets constantly while driving!
 - ▶ If the tires become excessively deformed, readjust the wheel position!
-



B104960

8.3 Emergency operation - circular travel

Make sure that the following prerequisites are met:

- The ballast trailer is properly assembled.
- The crawler operation is turned on. Switch **446** is turned on.

8.3.1 Setting the wheel sets to circular travel

- ▶ Raise the ballast trailer with the support cylinders.
- ▶ Turn the key switch **1** on the ballast trailer to position II "right".



Note

- ▶ By turning the key switch **1** to position II, the command for circular driving is forwarded to the crane and the emergency operation is turned on!
- ▶ In emergency operation, the support can only be moved from the control panel on the ballast trailer!

- ▶ Press button **209** and button **211**, extend the support cylinders on the front and rear and relieve the wheels.
- ▶ Set the axles to circular travel position.
- ▶ Operate the rotary switch **202**, the left wheel set is moved to the circular travel position.
- ▶ Operate the rotary switch **203**, the right wheel set is moved to the circular travel position.
- ▶ Lower the ballast trailer with the support cylinders.
- ▶ Press the button **208** and button **210**, retract the front and rear support cylinder.



Note

- ▶ The indicator light **408** lights up, the supports are retracted!
- ▶ Checking the settings

8.3.2 Circular travel

Make sure that the following prerequisite is met:

- The wheel sets are in circular travel position.



Note

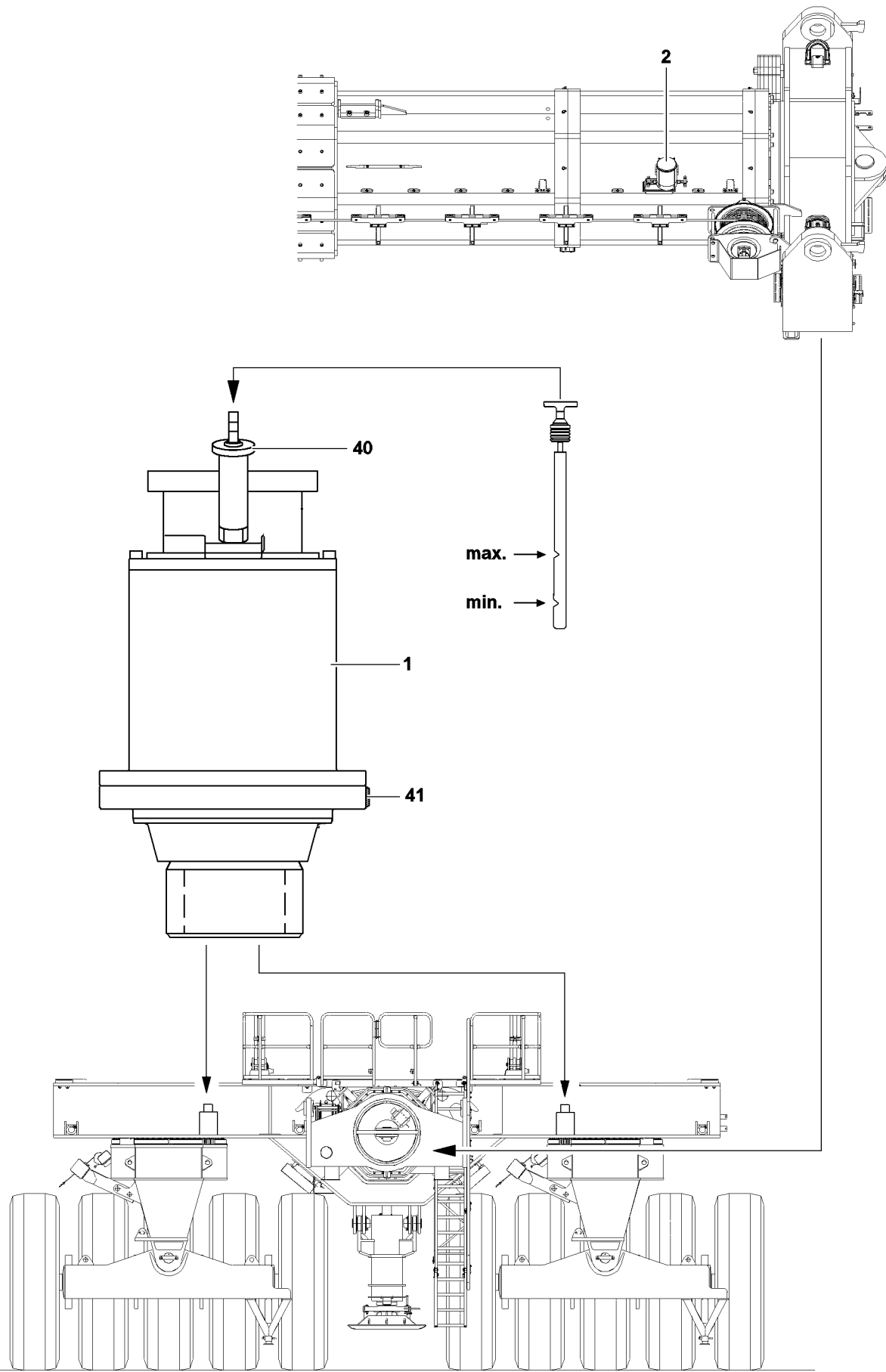
- ▶ Monitor the wheel position of the wheel sets constantly while driving!
- ▶ If the tires become excessively deformed, readjust the wheel position!

9 Maintenance intervals for the ballast trailer



Note

- ▶ See Crane operating instructions, chapter 7.02!



0°

B112905

10 Maintenance

10.1 Ballast trailer tires

10.1.1 Ballast trailer tires

**Note**

▶ See Crane operating instructions, chapter 2.15!

10.1.2 Ballast trailer tires and disk wheels

**Note**

▶ See Crane operating instructions, chapter 8.01!

10.2 Hydraulic hose lines

**Note**

▶ See Crane operating instructions, chapter 7.05!

10.3 Slewing gear

Please maintain utmost cleanliness during all work to prevent dirt from entering the interior of the gear system.

10.3.1 Checking the oil level

Make sure that the following prerequisite is met:

– The ballast trailer is in horizontal position.

- ▶ Remove the dipstick **40** and wipe it off.
- ▶ Reinsert the dipstick **40** and pull it out again.

The oil level must be between the min. and max. mark on the dipstick **40**.

- ▶ Check the oil level.

NOTICE

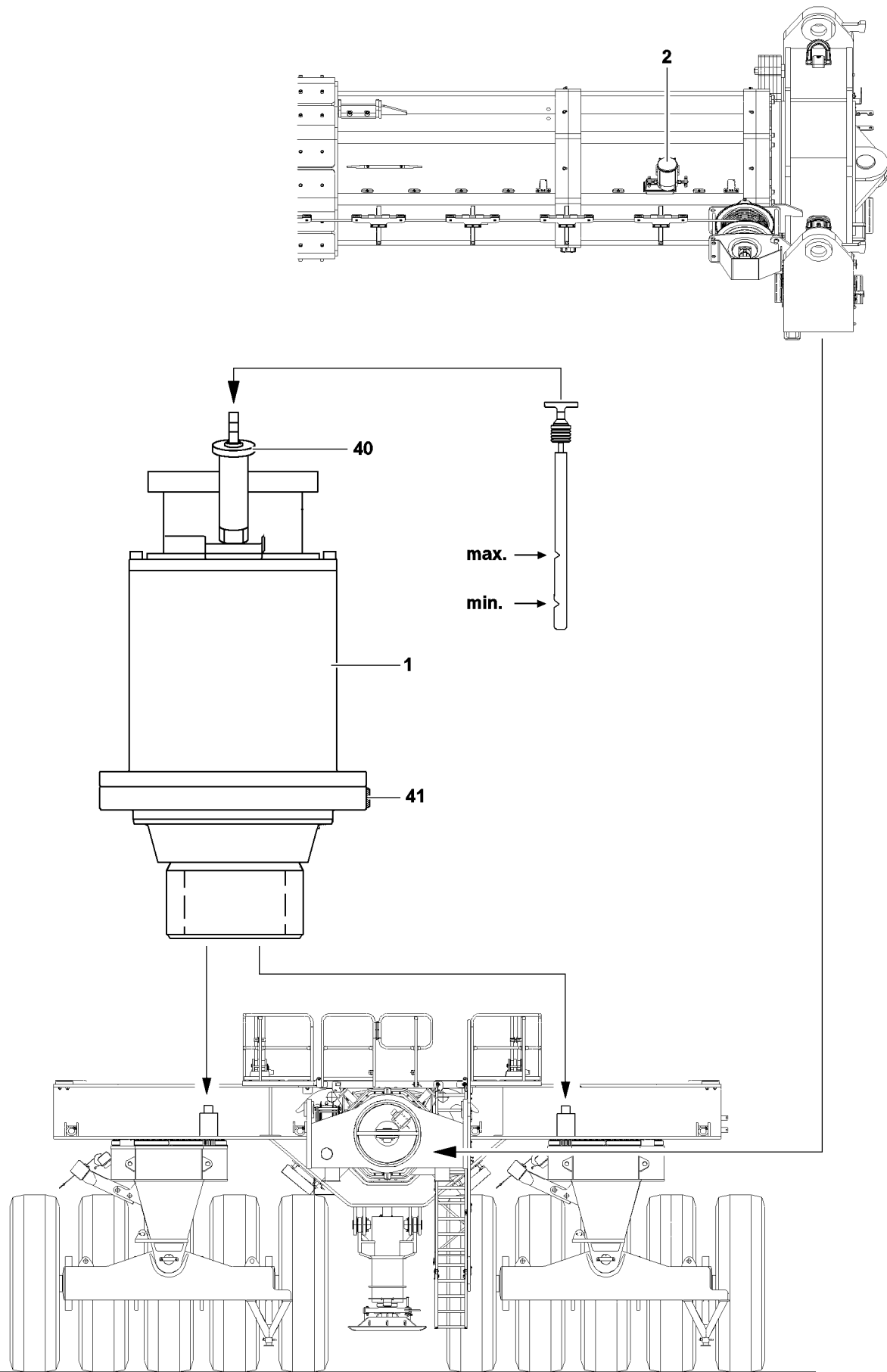
Danger of gear damage!

If the oil level has dropped below the minimum mark, add engine oil as specified in the lubrication chart until the oil level is between the minimum and maximum marks!

If the required minimum mark is fallen below, the gear will be destroyed!

- ▶ Add oil, wait a short time and then check the oil level again!

- ▶ Reinsert the dipstick **40**.



B112905

10.3.2 Changing the oil

Make sure that the following prerequisites are met:

- The ballast trailer is in horizontal position.
- The slewing gear is warm.
- ▶ Open the oil filler port by unscrewing the dipstick **40**.
- ▶ Remove the oil drain plug **41** with the seal ring and drain the oil completely.
- ▶ Clean the oil drain plug **41** and sealing surface on the housing.
- ▶ Screw in and tighten oil drain plug **41** with new seal ring.
- ▶ Add oil as specified in the lubricant chart at the oil filler port until the oil level is between the minimum and maximum mark on the dipstick **40**.
- ▶ Close the oil filler port by screwing in the dipstick **40**.
- ▶ Check the oil level as described in the section “Checking the oil level”.

10.4 Central lubrication system



Note

- ▶ See Crane operating instructions, chapter 7.05!

11 Fill quantities

11.1 Fill quantities for ballast trailer

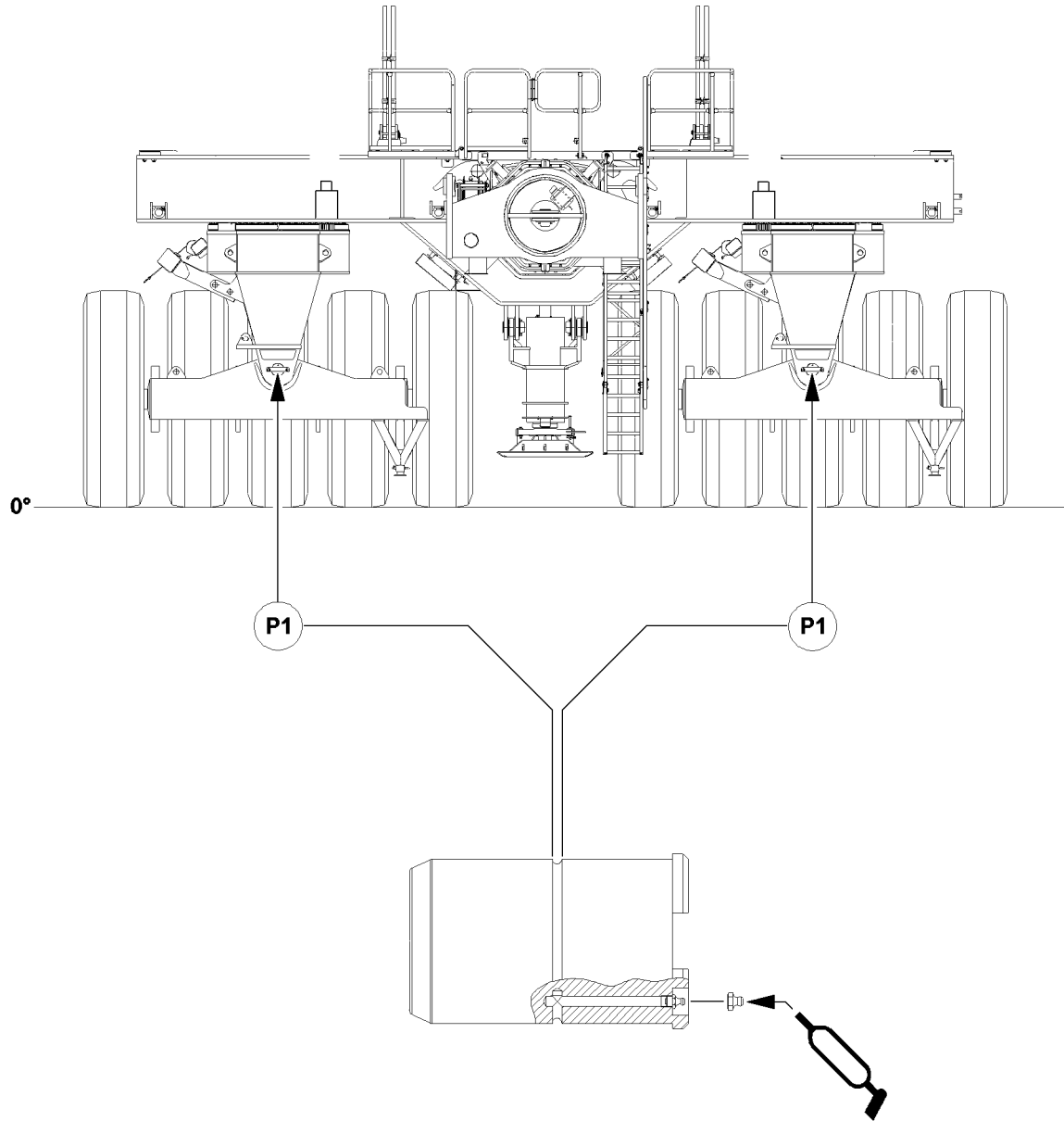
The specified fill quantities (change quantities) are orientation values. The markings on the dipsticks, inspection ports or sight gauges are decisive for filling.

NOTICE

Danger of property damage!

- ▶ Do not mix synthetic oils with mineral oils!

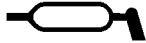
Position	Components	Fill quantity
1	Slewing gear	3.2 l
2	Central lubrication system	2.5 kg



B112907

12 Lubrication schedule

12.1 Lubrication chart Ballast trailer

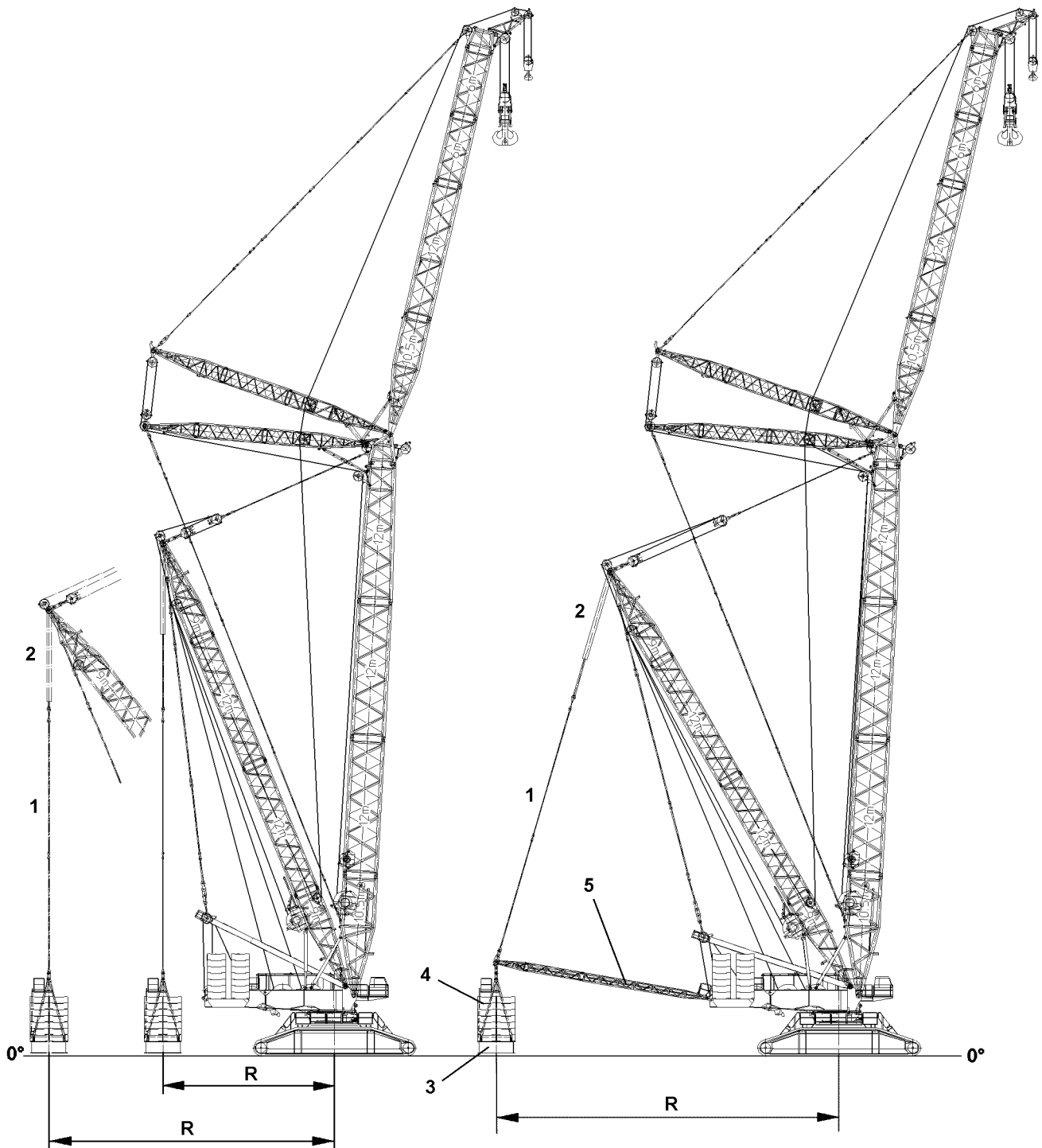


B107729



Note

▶ The lube points are marked with this icon!



B102167

1 General

1.1 Description

The required derrick ballast radius **R** is set by adjusting the derrick if the derrick ballast is **not** guided. The radius is fixed if the derrick ballast **is** guided.



Note

- ▶ **B** = Suspended ballast **without** guide!
- ▶ **B2** = Suspended ballast **with** guide!

The suspended ballast and ballast trailer are generally referred to as the derrick ballast. The fixed compensation weight which is assembled on the turntable is generally referred to as the counterweight.

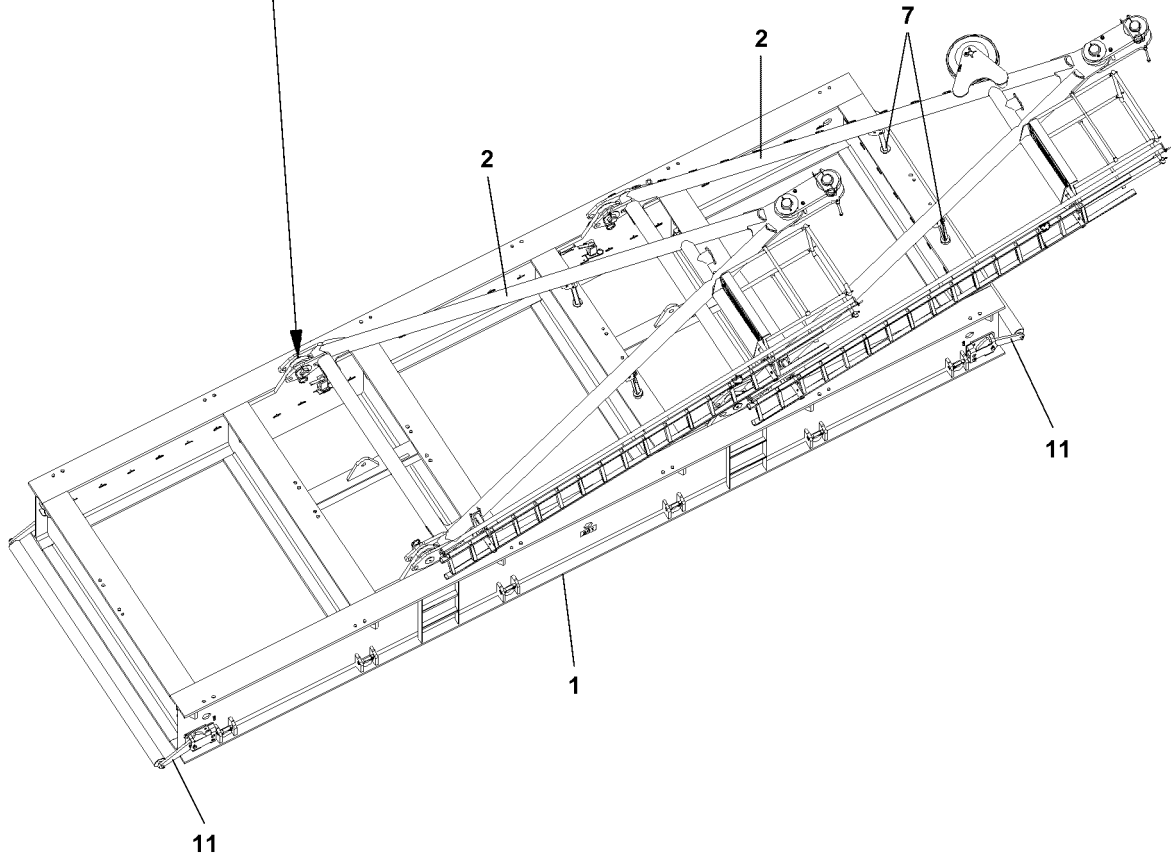
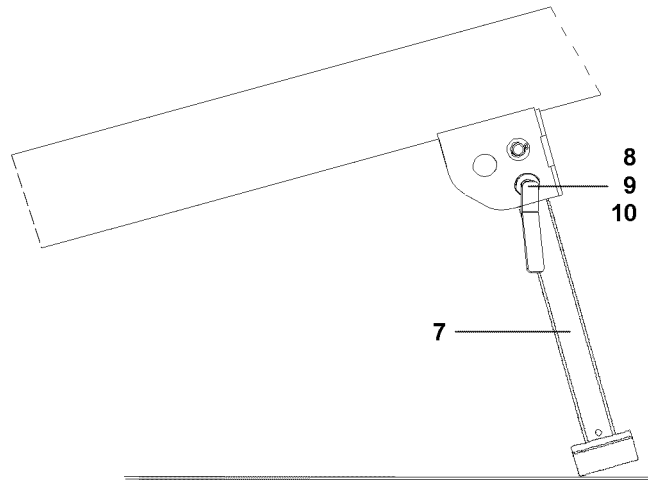
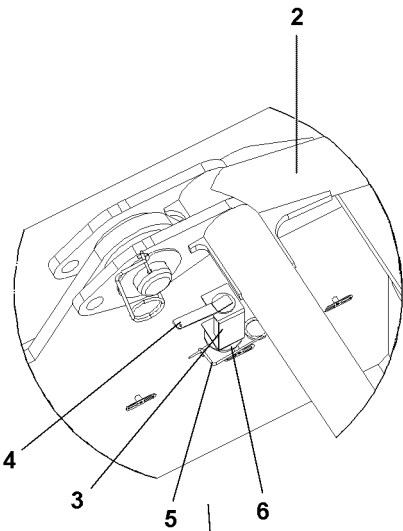
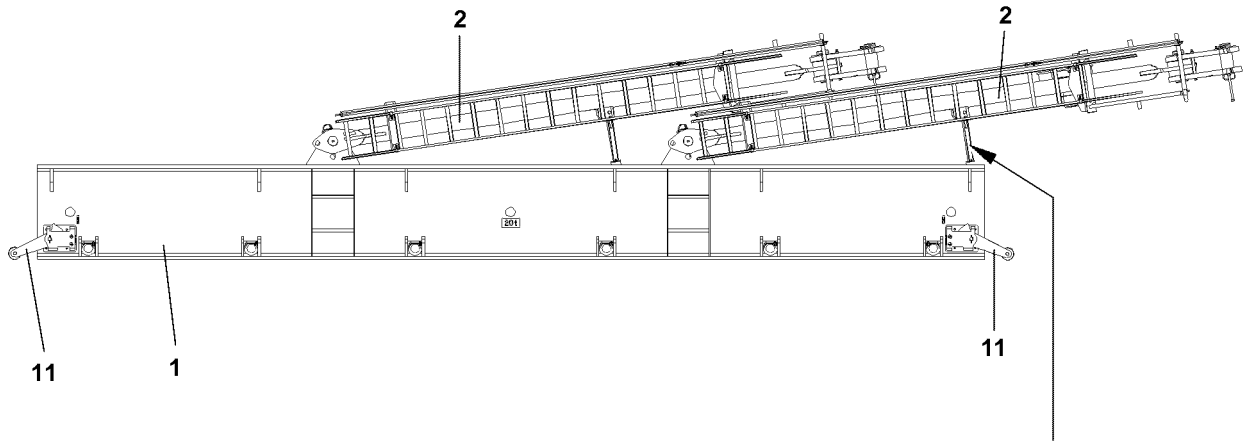
The derrick boom angle, the derrick ballast, weight and utilization are shown on monitor 1. After assembly on the ground, the derrick ballast is raised for operation using the hydraulic cylinders **2** in the guying **1**.

Operation with derrick ballast, also see chapter 4.02!

1.2 Component overview - Derrick ballast

The components for operation with derrick ballast are:

Position	Component
1	Guying
2	Hydraulic cylinder
3	Ballast pallet
4	Ballast plates
5	Guide

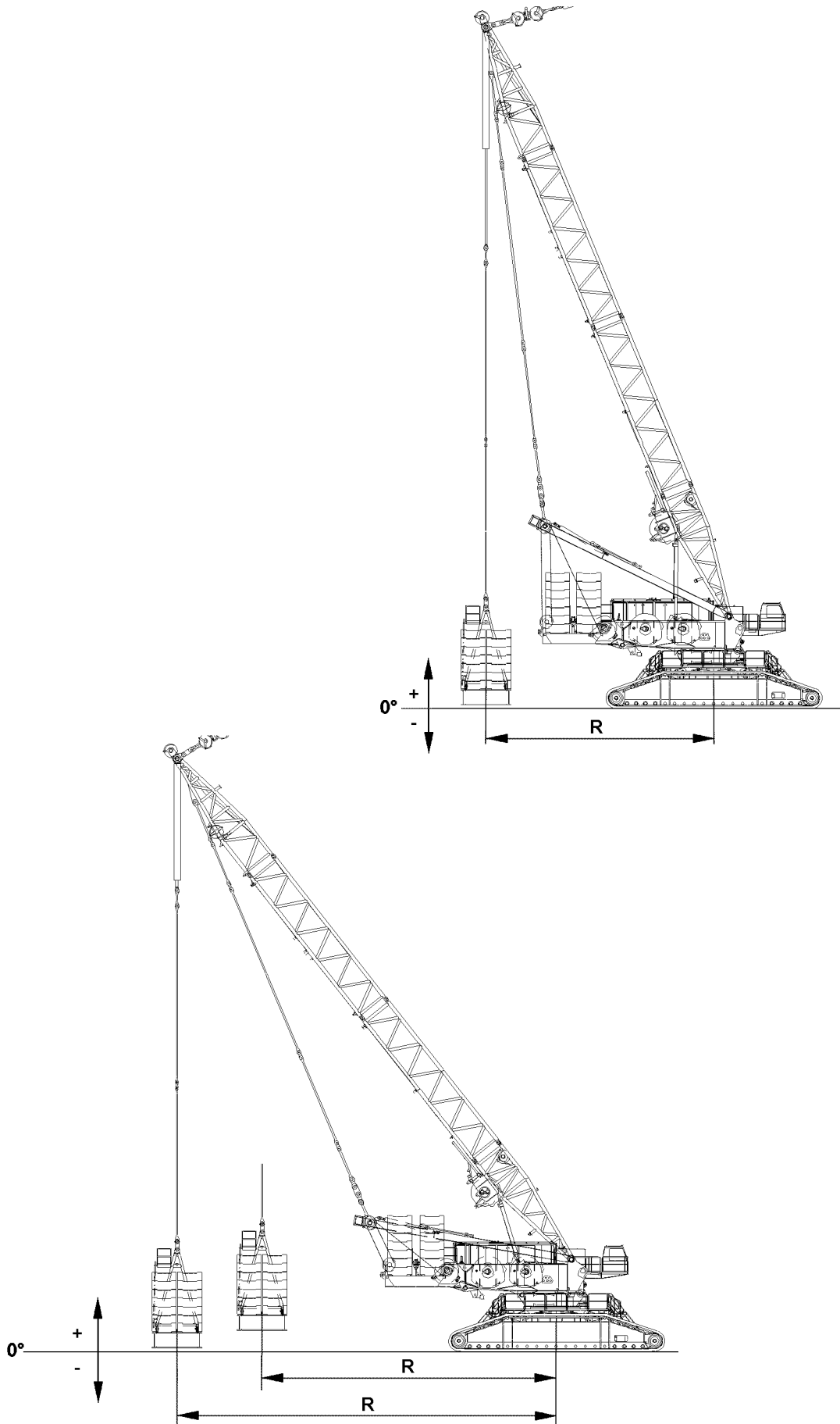


B104126

1.3 Component overview - Ballast pallet

The components for the ballast pallet are:

Components	
1	Ballast pallet
2	Erection rack
3	Support for retaining pin 4
4	Retaining pin
5	Washer
6	Spring retainer
7	Assembly support
8	Retaining pin
9	Cotter pin
10	Washer
11	Limit switch



B104127

2 Derrick radii

2.1 Derrick ballast without guide


Note

► No guide is fitted between the turntable and the ballast pallet!

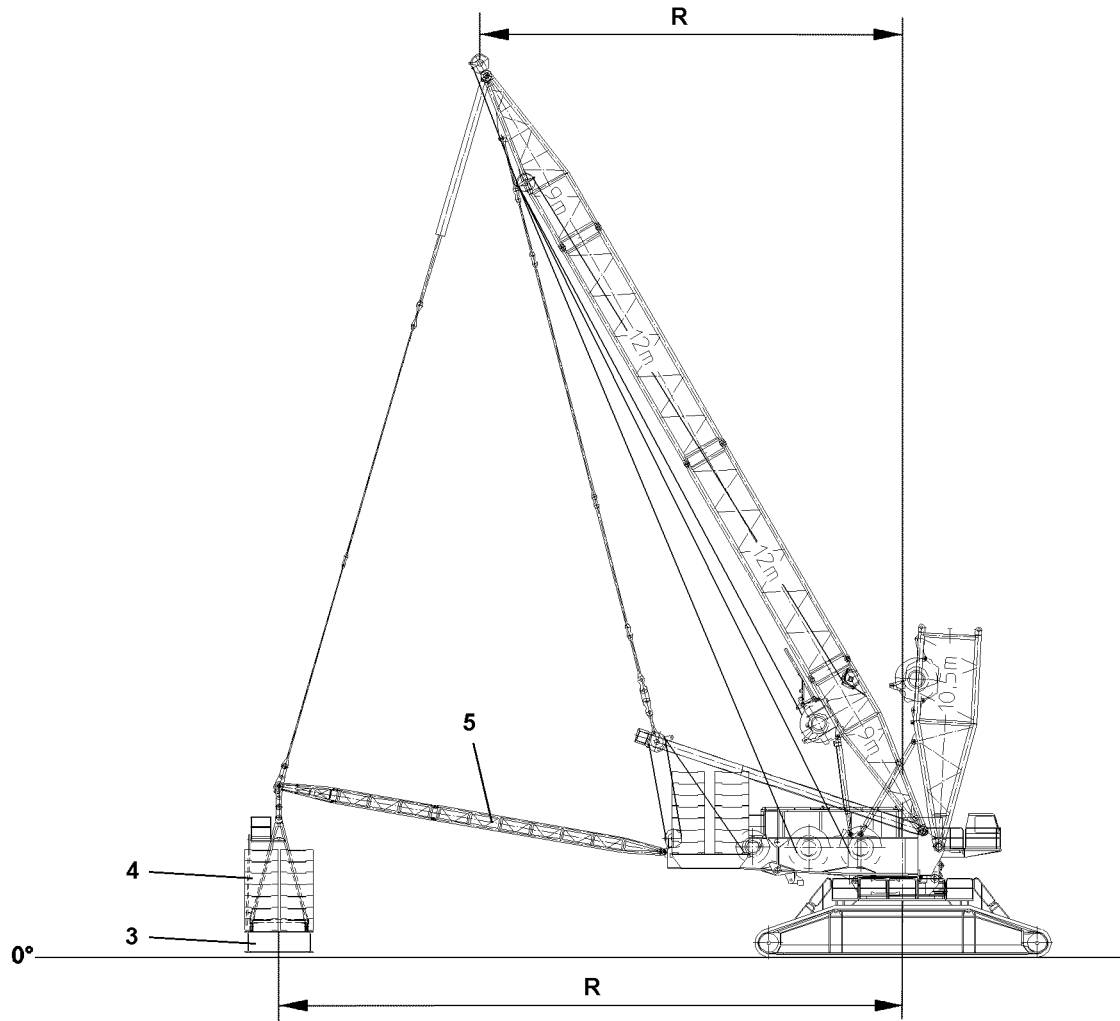
2.1.1 Derrick ballast lifting heights with respect to the base of the crawler

The derrick ballast radius and the derrick boom radius are identical.

Radius R = 15 m	
Above base	+6.50 m
Below base	-0.65 m

Radius R = 20 m	
Above base	+4.05 m
Below base	-3.10 m

Radius R = 25 m	
Above base	+0.66 m
Below base	-6.49 m



B102169

2.2 Derrick ballast with guide



Note

- ▶ A guide 5 is installed between the turntable and the ballast pallet 3!
 - ▶ The derrick ballast radius and derrick radius are **not** identical!
-

2.2.1 Derrick ballast lifting heights with respect to the base of the crawler

The derrick ballast radius R is 30 m and the derrick boom radius R is 20 m.

Above base	+4.85 m
Below base	-2.30 m

3 Assembly

**DANGER**

Risk of falling!

During assembly and disassembly, personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening 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 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!

**DANGER**

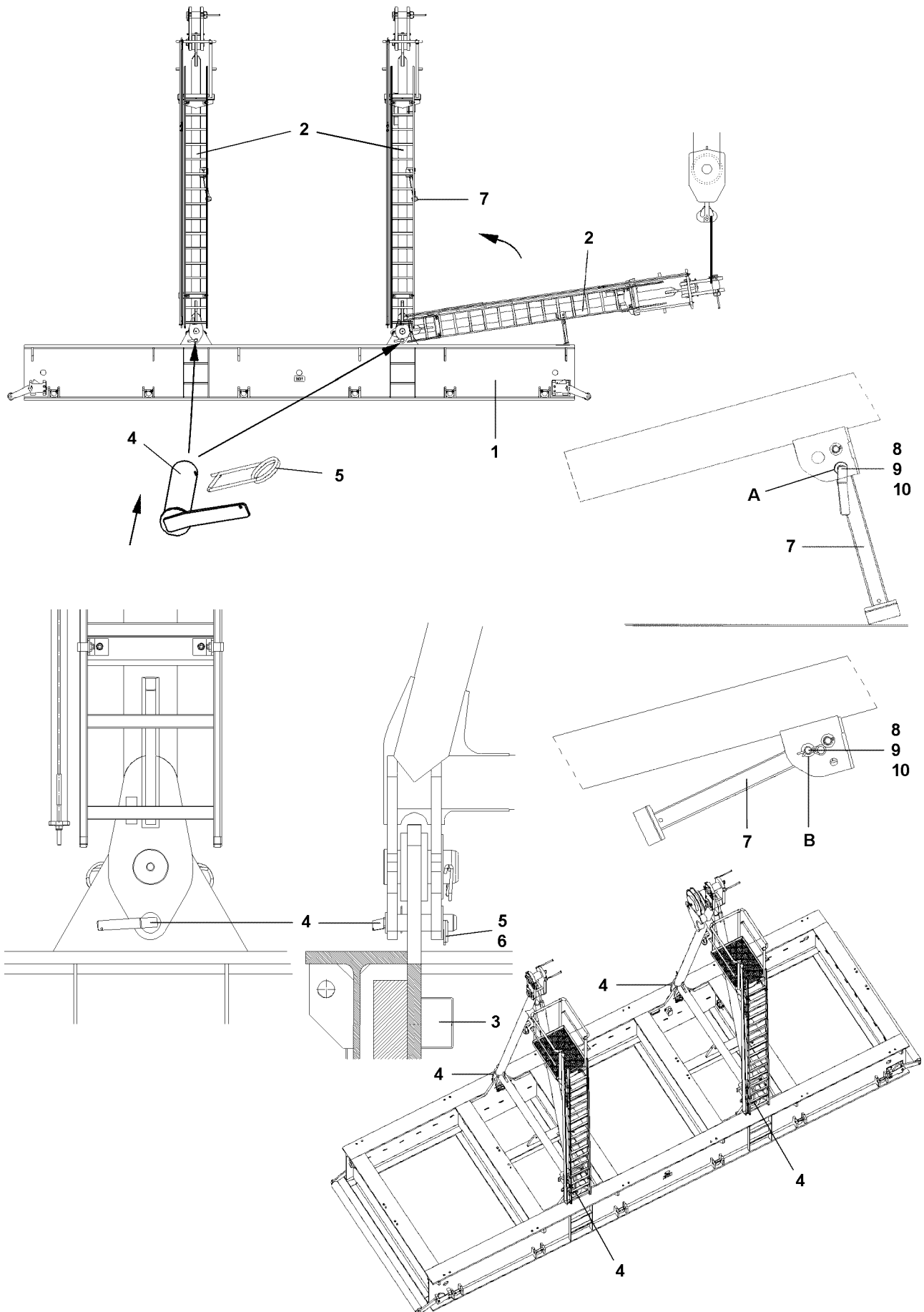
Danger of accident during assembly / disassembly of derrick ballast!

When you disassemble unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel.

- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins under 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!
- ▶ Safely secure the pins in the bearing points as well as receptacles!
- ▶ Do not lean the ladder against the component being disassembled!

Make sure that the following prerequisites are met:

- The crane is aligned in horizontal direction.
- The boom and the derrick are assembled on the turntable.
- The derrick is erected.
- The counterweight has been installed to the turntable according to the load chart.
- The LICCON overload protection has been set according to the data in the load chart.
- An auxiliary crane is available.



B104125

3.1 Installing the ballast pallet



DANGER

Danger of accidents when assembling / disassembling the erection racks!

The disassembly of unsecured or unsupported erection racks can cause the erection racks to fall down and kill or severely injure personnel!

- ▶ Never unpin the retaining pins under unsecured or unsupported erection racks!
- ▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure!

3.1.1 Placing the ballast pallet in the assembly position

- ▶ Set the derrick to the required radius.
- ▶ Hang the ballast pallet **1** onto the auxiliary crane and position it within the slewing range of the crane under the guy rods on the derrick.



Note

- ▶ Set down the ballast pallet **1** in the lengthwise direction of the turntable for easier assembly to the guy rods!

- ▶ Align the ballast pallet **1** horizontally.

3.1.2 Set up erection racks

- ▶ Hang erection rack **2** onto the auxiliary crane.
- ▶ Remove the spring retainer **9** and washer **10**, unpin the pin **8** from the hole **A**.
- ▶ Fold in the transport support **7** and pin to the erection rack.
- ▶ Pin and secure the pin **8** in the bore **B**.
- ▶ Vertically position the erection rack **2** using the auxiliary crane.



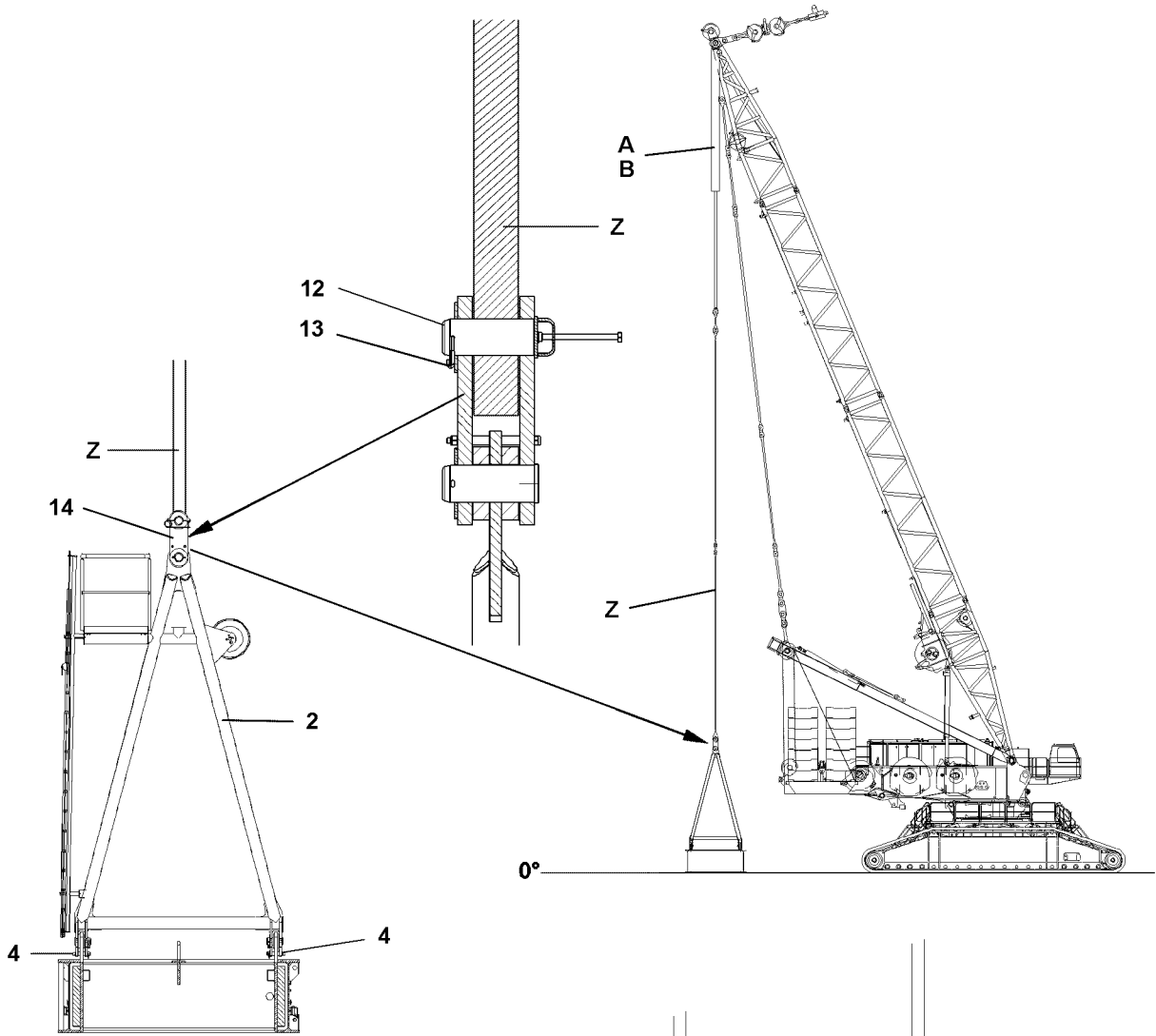
DANGER

Danger of accidents when assembling / disassembling the erection racks!

The erection racks must hang securely on the auxiliary crane, otherwise they could fall down and kill or severely injure personnel!

- ▶ The erection racks must be locked and secured in a vertical position using four retaining pins **4**! Only then should the auxiliary crane be removed!
- ▶ Never unpin the retaining pins of unsecured or unsupported erection racks!
- ▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure!

- ▶ Insert four retaining pins **4** on the erection racks **2** on both sides.
- ▶ Secure the retaining pin **4** with spring retainer **6** and washer **5**.



B104128

3.1.3 Assembling the guy rods to the ballast pallet without a guide

Make sure that the following prerequisites are met:

- The guy rods must be suspended above the brackets on the erection racks.
- The erection racks are set up and secured by four retaining pins **4**.
- ▶ Position the guy rods **Z** by extending the piston rods on the hydraulic cylinders **A** and **B** above the brackets **14**.
- ▶ Pin and secure the guy rods **Z** to the brackets **14** on both sides.



DANGER

Danger of accidents when pinning and unpinning the guying!

The guy rods must be pinned and secured on both sides, otherwise the ballast pallet can tip over and kill or severely injure personnel!

- ▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure!

-
- ▶ Insert the pin **12** and secure with spring retainer **13**.
 - ▶ Lift the empty ballast pallet with the hydraulic cylinder **A** and the hydraulic cylinder **B** and set it down again.

Result:

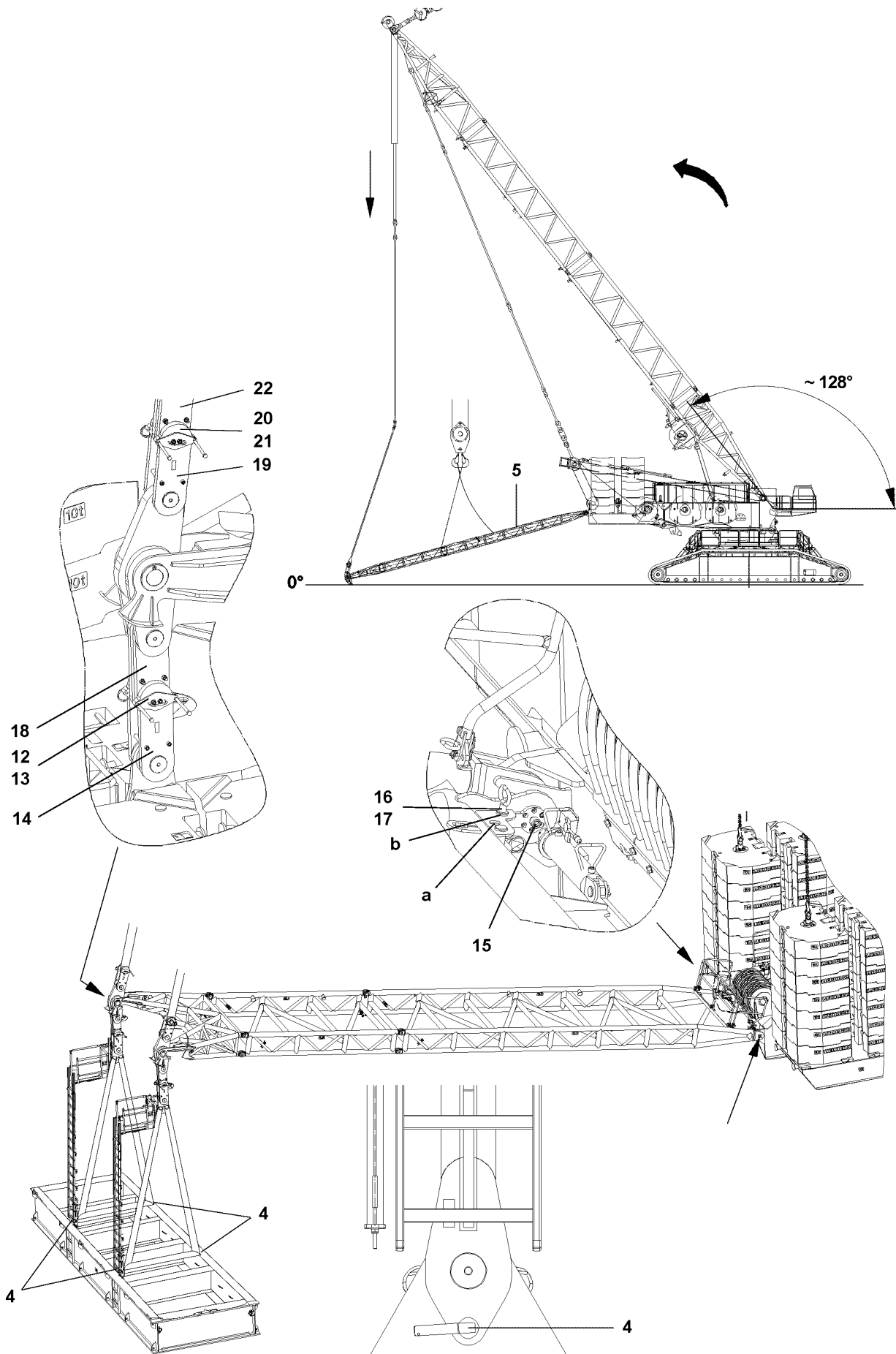
- The ballast pallet is thereby precisely placed vertically under the derrick head.
- ▶ Align the ballast pallet horizontally.

NOTICE

Damage to the retaining pins!

If the retaining pins **4** are not unpinned before crane operation, then they can be damaged in crane operation!

- ▶ Unpin the retaining pins **4** before start of crane operation!
-
- ▶ When the ballast pallet is pinned and secured on the D-guying:
Release the retaining pins **4** on the erection racks on both side and unpin.



B104129

3.1.4 Assembly of the derrick ballast guide and guy rods

Make sure that the following prerequisites are met:

- The ballast pallet is placed in the lengthwise direction of the turntable and set to the required radius.
- The erection racks are set up and secured by four retaining pins **4**.



Note

- ▶ Pin the guide **5** on the turntable first!
-

- ▶ Hang the guide **5** onto the auxiliary crane and swing it to the pinning points on the turntable and fasten in position.
- ▶ Pin the guide **5** to both sides on the turntable using the pin pulling device.
- ▶ Push the pin **15** in completely.
- ▶ Remove the retaining pin **16** from bore **a** and insert into bore **b** and secure retaining pin **16** with cotter pin **17**.
- ▶ Lower the guide **5** up to the support on the ground.
- ▶ Luff down the derrick to the rear to maximum radius, the electric shut off takes place at approximately R25.6 m, approximately corresponding to 128°.
- ▶ Extend the hydraulic cylinders, pin and secure the guy rods **22** to the brackets **19**.
- ▶ Insert the pins **20** on both sides and secure with spring retainers **21**.
- ▶ Pull up the guide **5** by retracting the hydraulic cylinders and luffing up the derrick R20 m.
- ▶ Swing the guide **5** over the pinning points on the ballast pallet.
- ▶ Pin bracket **18** to bracket **14**.
- ▶ Insert the pins **12** on both sides and secure with spring retainers **13**.
- ▶ Lift the empty ballast pallet with the hydraulic cylinder **A** and the hydraulic cylinder **B** again and set it down again.

Result:

- The ballast pallet is thereby precisely placed vertically under the derrick ballast guide.
-

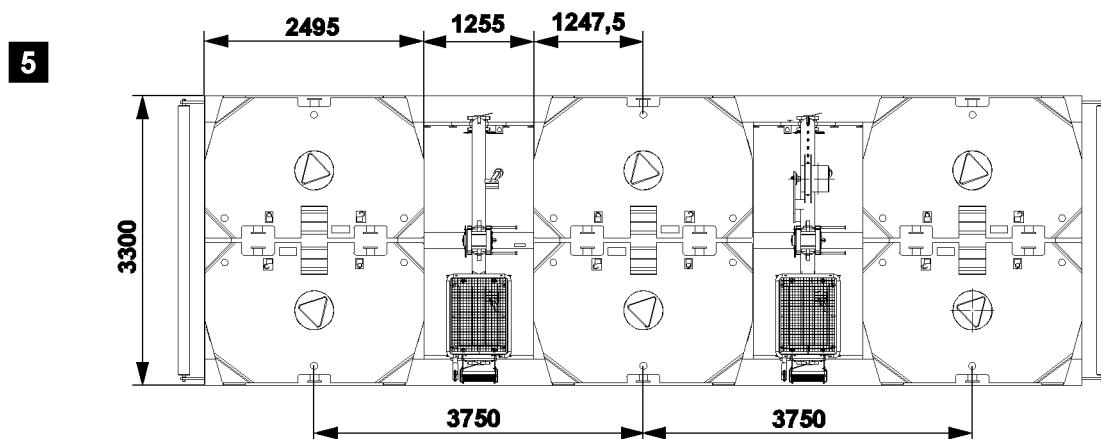
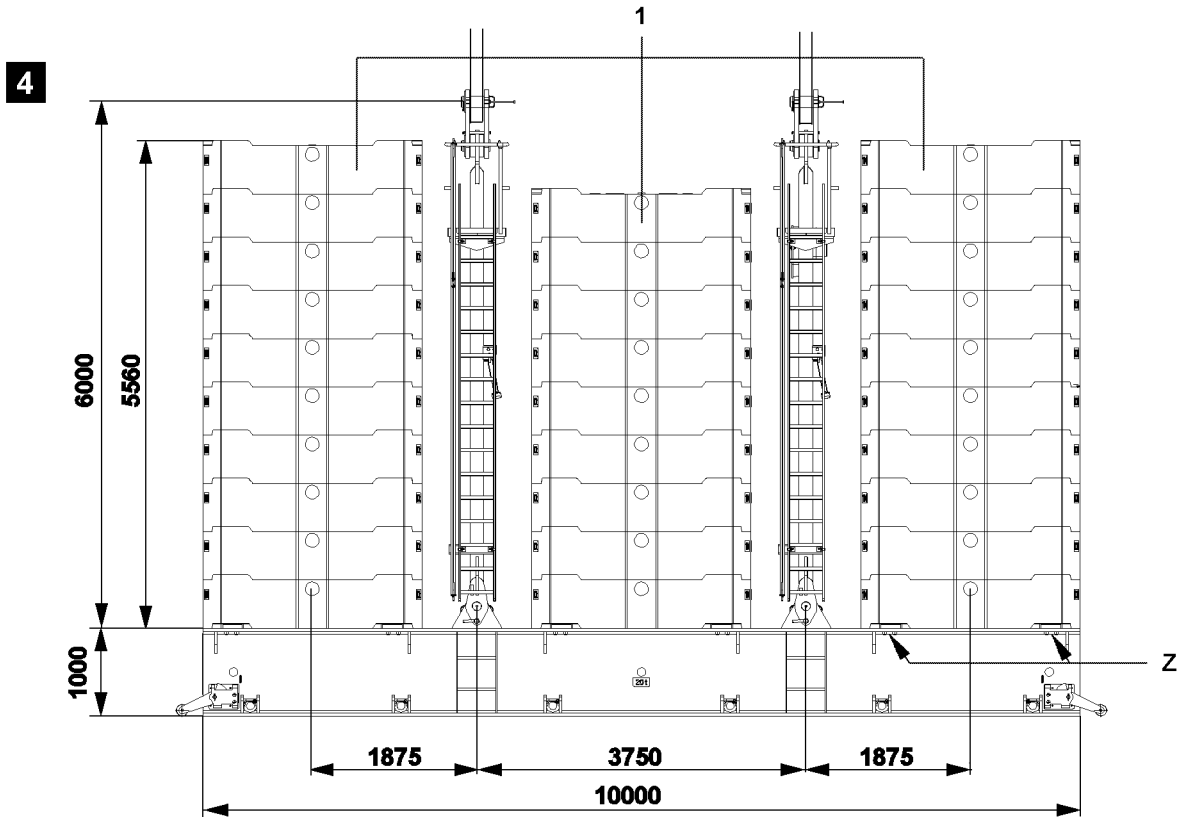
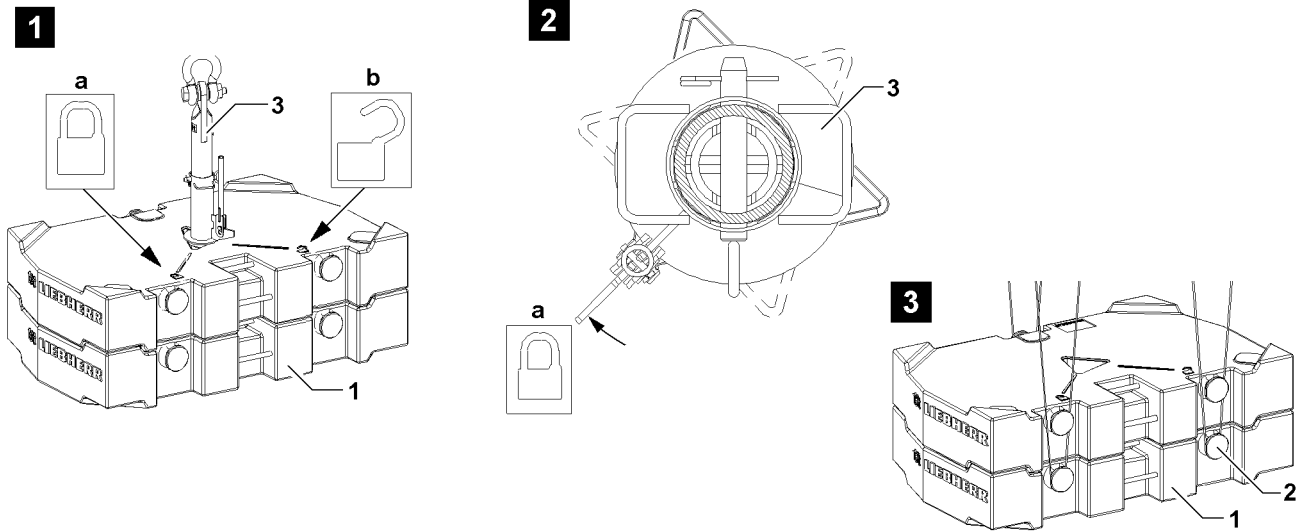
NOTICE

Damage to the retaining pins!

If the retaining pins **4** are not unpinned before crane operation, then they can be damaged in crane operation!

- ▶ Unpin the retaining pins **4** before start of crane operation!
-

- ▶ When the ballast pallet is pinned and secured on the D-guying:
Release the retaining pins **4** on the erection racks on both side and unpin.



B109595

3.1.5 Ballasting

The ballast plates are marked with their own weights:

- A ballast plate **1** weighs 10 t.

Make sure that the following prerequisites are met:

- The ballast pallet is positioned in the lengthwise direction of the turntable.
- The ballast pallet is horizontally aligned.
- The derrick is set to the required radius.
- The erection racks are set up and secured by retaining pins.
- The ballast pallet is pinned and secured to the guying.



DANGER

Risk of accident when loading and unloading the ballast plates!

- ▶ The maximum overall weight of the ballast plates is 580 t!
- ▶ The ballast stacks on the left and right hand side must weigh the same and be the same height after ballasting!
- ▶ The height of the ballast stack should not exceed 5.56 m, measured from the upper edge of the ballast pallet!
- ▶ The ballast plates **1** must be secured to prevent them from moving or falling down!
- ▶ The ballast plates **1** on the ballast pallet must be centered correctly on the centering plates **Z** or on another ballast plate **1**!
- ▶ Do not use damaged ballast plates **1** and replace them immediately!
- ▶ The difference between the right and left hand side when ballasting or removing the ballast in a **suspended condition** should not exceed a maximum of 20 t!



DANGER

Risk of accident!

If more than the specified loads are lifted with the receptacle stud **3** or the rope over the studs **2**, then components will be overloaded!

Ballast plates **1** can fall down and fatally injure personnel!

- ▶ Lift no more than maximum 20 t with the receptacle stud **3**, see illustration **1**!
- ▶ Lift no more than maximum 20 t with the ropes, 3 fastening points, see illustration **3**!

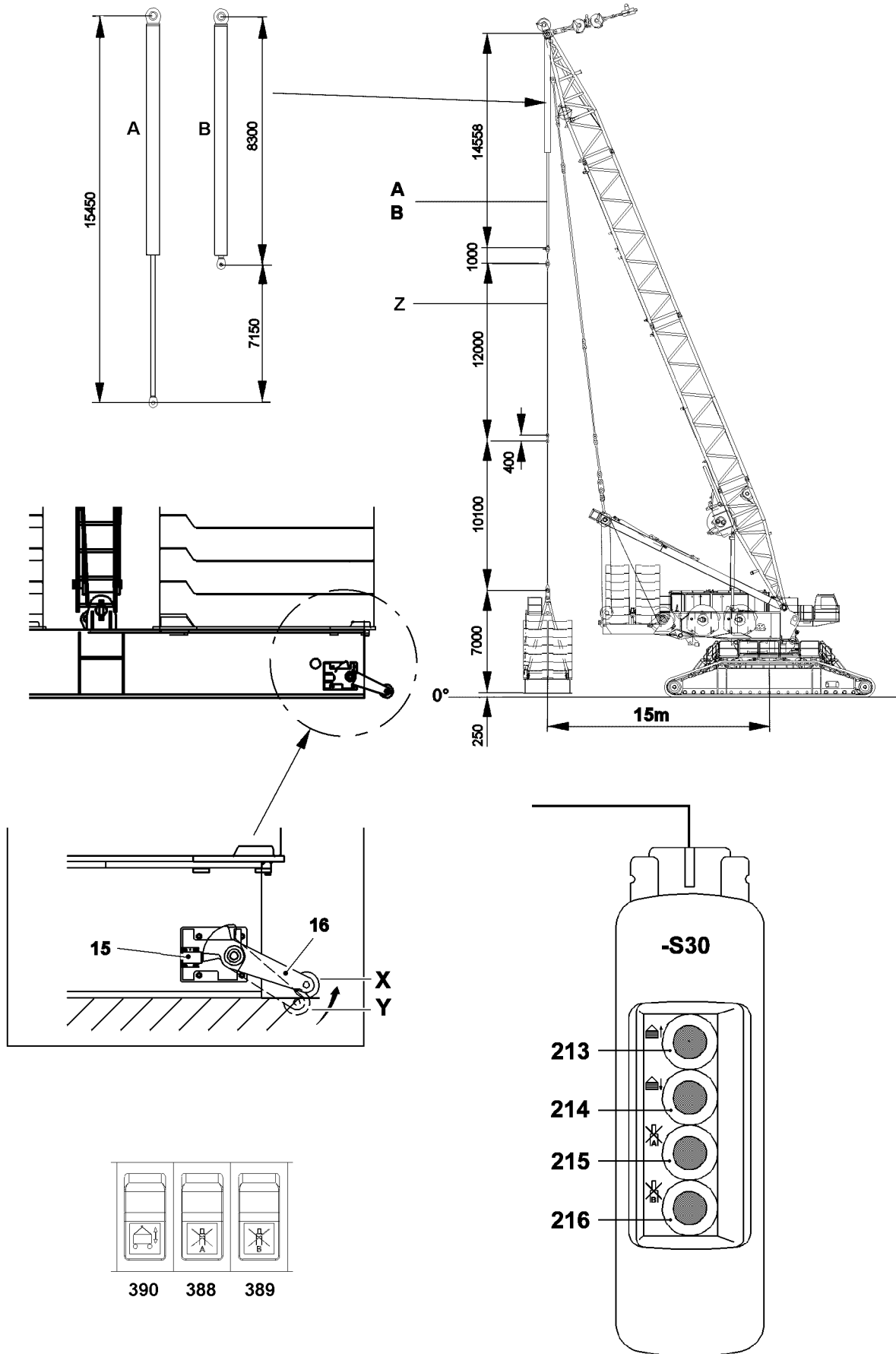


Note

- ▶ Position **a**, folded out lever points to the closed icon = receptacle stud **3** closed!
- ▶ Position **b**, folded out lever points to the open icon = receptacle stud **3** open to move in / out!

Ensure that the following prerequisite is met for lifting with the receptacle stud **3**:

- The receptacle stud **3** must be in position **a**: “receptacle stud **3** closed”, see illustration **2**.
- ▶ Lift the ballast plates **1** individually or as an assembly, see illustration **1** and illustration **3**.
- ▶ Place the ballast plates **1** evenly distributed with the auxiliary crane and center them on the centering plates **Z** or on an already placed ballast plate **1**.



B104258

3.1.6 Functional checks before lifting the derrick ballast

Make sure that the following prerequisites are met:

- The electrical connection between the derrick ballast and the turntable has been established.
- The cable drum cable is plugged into the turntable.
- The ground contact rollers must move easily.



DANGER

Risk of accident if the derrick ballast touches the ground!

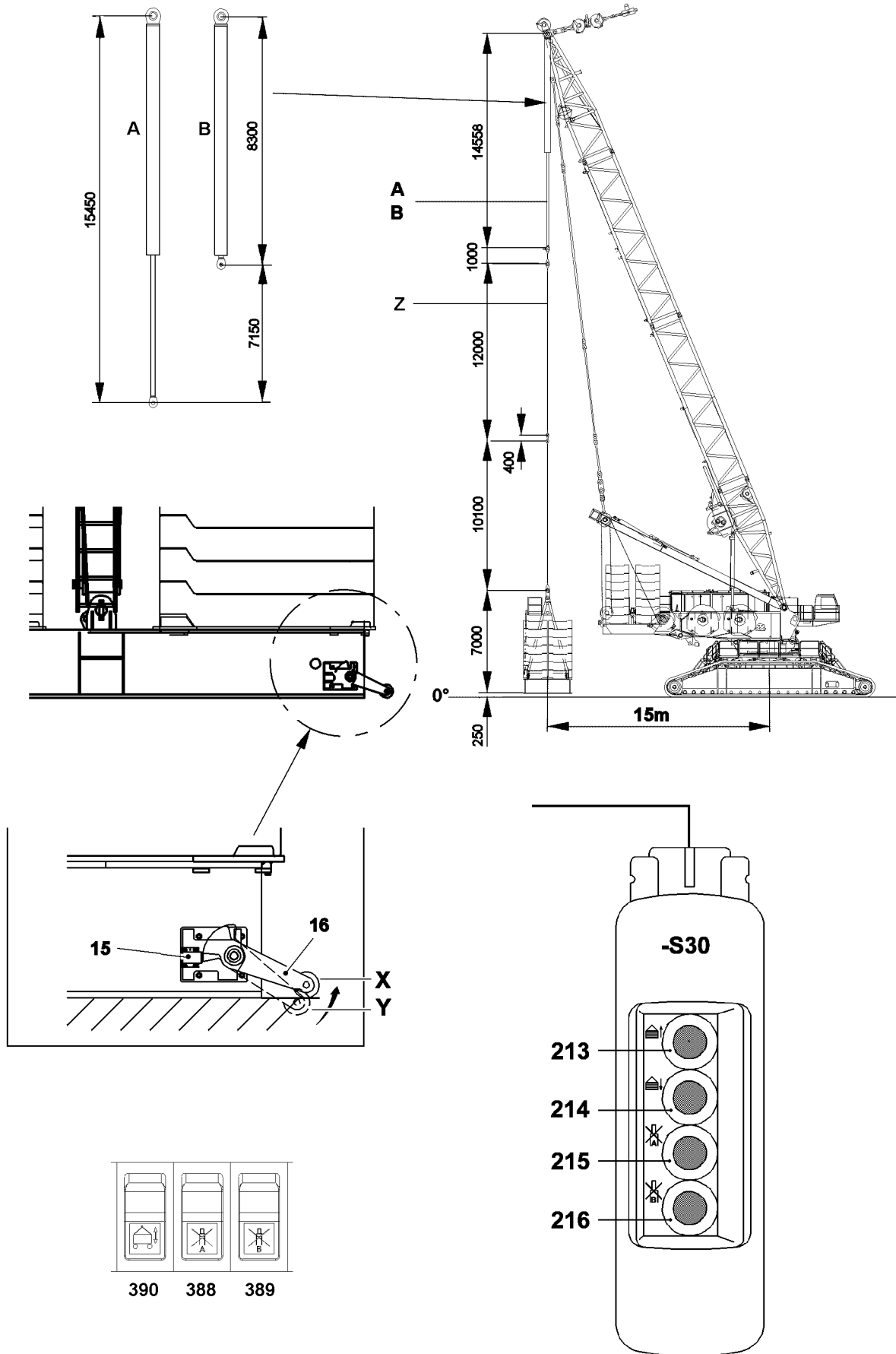
- ▶ If the ballast pallet touches the ground, **at least one** ground contact switch **15** must be actuated via the ground contact roller **16**!
- ▶ The crane movements **turning the turntable** and **driving the crawler** turn off.

-
- ▶ Manually lift the ground contact roller **16**.

- ▶ The ground contact switch **15** is actuated.

Result:

- The crane movements “turning the turntable” and “driving the crawler” turn off.



B104258

3.1.7 Lift the derrick ballast off the ground



WARNING

The crane can topple over!

If the derrick ballast is lifted up by the **maximum permissible** 250 mm from the ground, the crane can be toppled upon ripping of the load backward!

If the following notes are not observed, personnel can be severely injured or killed!

- ▶ There may be no personnel, objects or obstacles within the entire slewing range of the crane, derrick ballast and the load!
- ▶ Do not lift derrick ballast more than 250 mm from the ground!
- ▶ The subsoil in the entire working area of the crane - including the derrick ballast and the load - must be even and of sufficient load carrying capacity, in order to be able to securely accept the encountered ground pressures and weight loads!



Note

- ▶ Lifting of the derrick ballast is to be observed by a guide!

Actuate the pull cylinders from the crane cab:

- Press button **390 on front**, the derrick ballast is lifted using the pull cylinders.
- Press button **390 on rear**, the derrick ballast is lowered using the pull cylinders.

Operate the pull cylinder from the control panel:

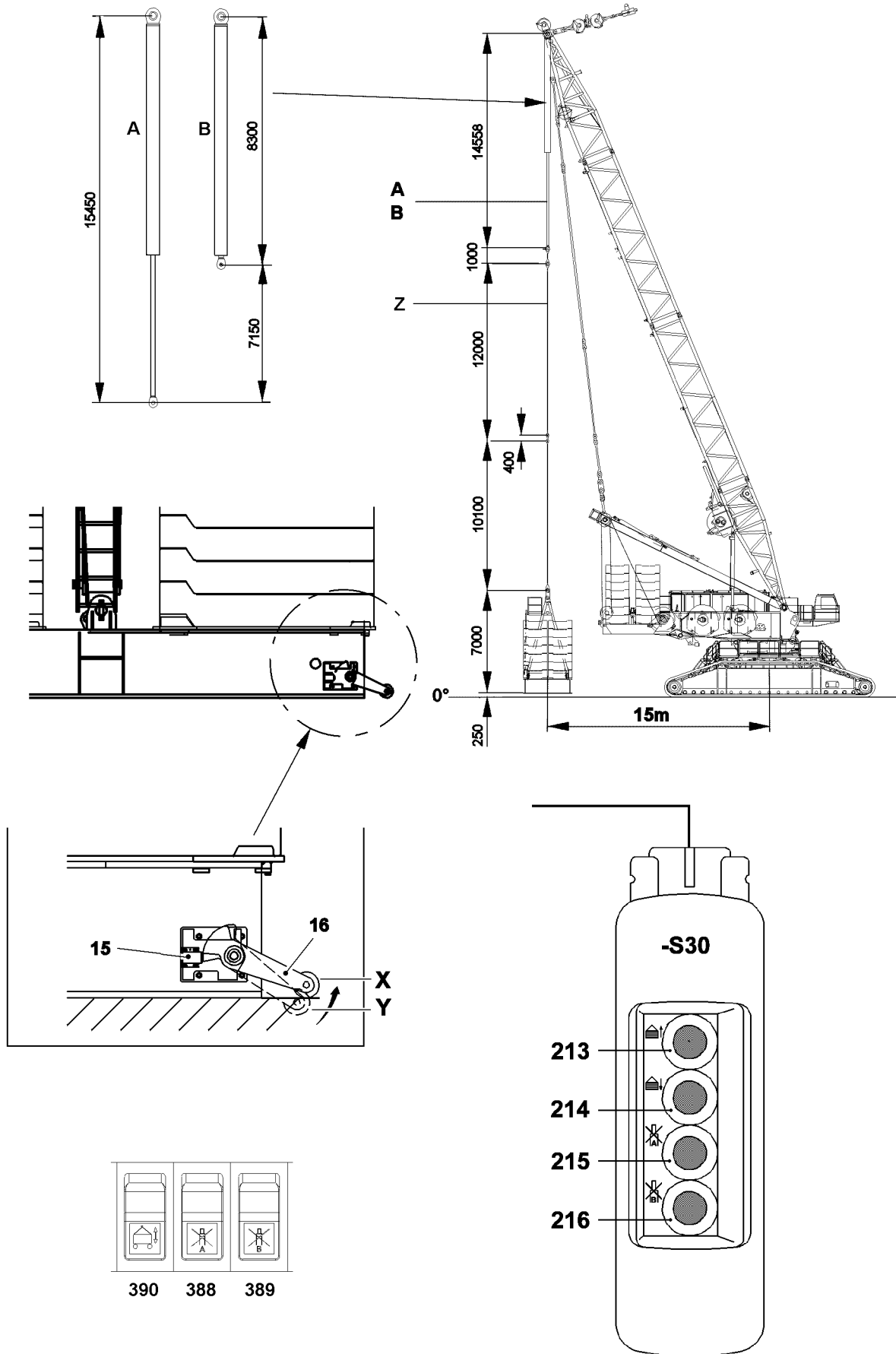
- Press button **213**, the derrick ballast is lifted using the pull cylinders.
- Press button **214**, the derrick ballast is lowered using the pull cylinders.



DANGER

Risk of accident!

- ▶ The control panel may only be used for assembly!
- ▶ The crane operator should **not** use the control panel to raise or lower the derrick ballast when the crane is being operated. This is because the monitors cannot be seen there!
- ▶ Lifting and lowering during crane operation may **only** be carried out from the cab!
- ▶ When raising or lowering the derrick ballast, ensure there is no great difference in the forces exerted on the ballast guying!
- ▶ The LICCON indicates both forces and will issue a warning if the difference is excessive!
- ▶ See section "Differential force monitoring of ballast guying".



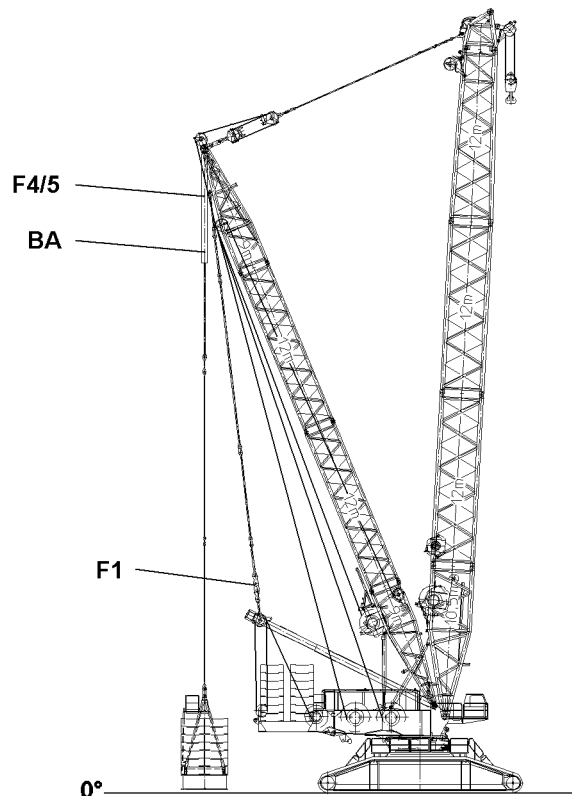
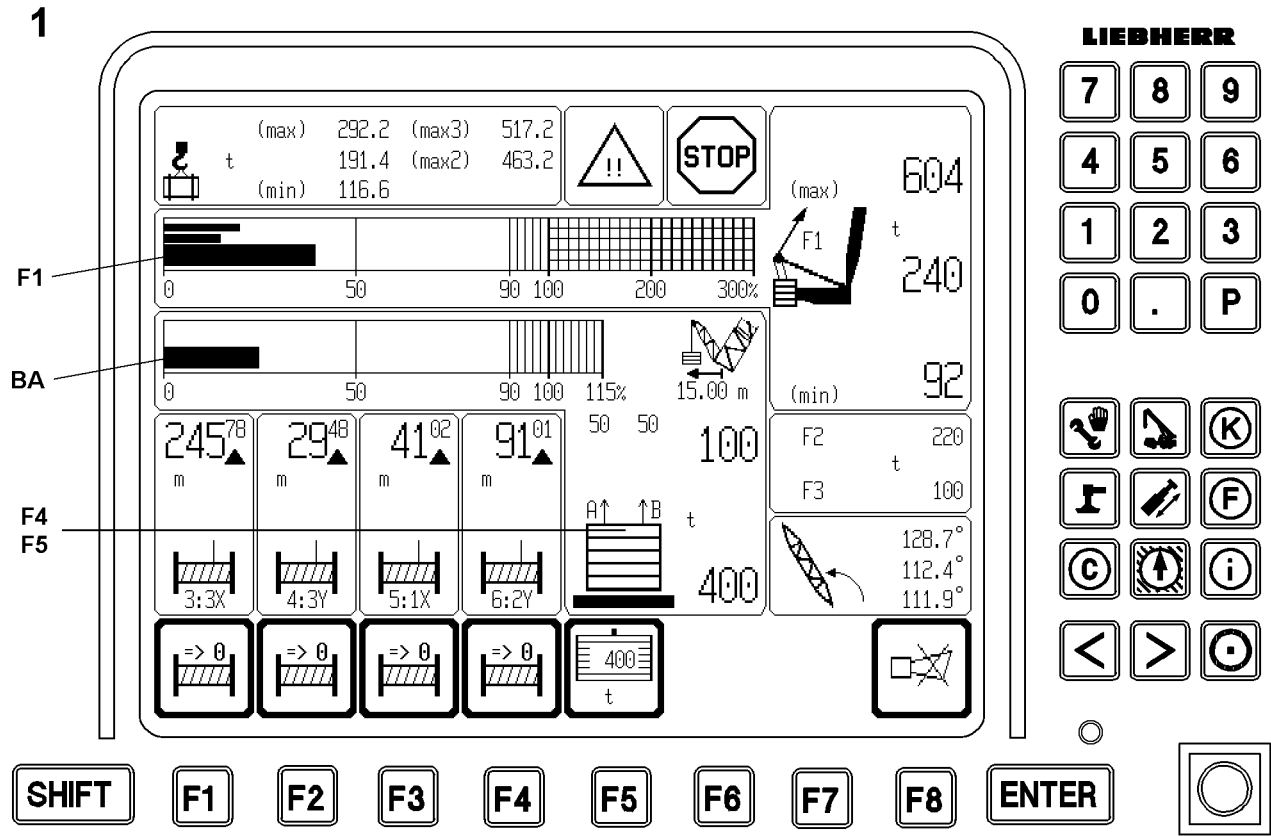
B104258

**DANGER**

Risk of accident!

- ▶ When lifting or lowering the derrick ballast, ensure it is maintained in a horizontal position.
- ▶ If the derrick ballast is only actuated via button **390**, button **213** and button **214** “derrick ballast UP / DOWN”, **without** simultaneously actuating button **388** or button **215**, “block cylinder (A) on derrick ballast” or button **389** or button **216** “cylinder (B) on derrick ballast”, then the horizontal alignment of the ballast trailer is regulated with the aid of a level sensor.
- ▶ With a ballast utilization of more than 90 %, the level sensor regulates the ballast trailer level to $\pm 0.3^\circ$!
- ▶ With a ballast utilization of more than 90 %, the level sensor regulates the ballast trailer level to $\pm 2.5^\circ$. This makes it possible to set the ballast trailer down to a ground slope of 2.5° .
- ▶ By pressing the button **388** or button **215** “block cylinder (A) on derrick trailer”, or button **389** or button **216** “block cylinder (B) on derrick ballast”, the level sensor is bypassed and the ballast trailer can be set down intentionally on an incline. This is exclusively permitted when setting down the derrick ballast on uneven ground and only under maintenance of utmost caution!
- ▶ If this is not observed, there is an increased danger of accidents!

-
- Press button **388** or button **215**, the left pull cylinder (A) is blocked.
 - Press button **389** or button **216**, the right pull cylinder (B) is blocked.
 - Press button **388** or button **215**, the left pull cylinder (A) is blocked.
 - Press button **389** or button **216**, the right pull cylinder (B) is blocked.



B102349

4 Crane operation with derrick ballast

4.1 LICCON overload protection

On cranes with derrick ballast, during operation also under load, by increasing or reducing the derrick ballast, the maximum load or the minimum load required for the balance of the crane, can be increased or decreased.

**Note**

- ▶ The suspended ballast and the ballast trailer are generally described as **derrick ballast!**
- ▶ The fixed compensation weight which is assembled on the turntable is generally described as the **counterweight!**

Make sure that the following prerequisites are met:

- The required derrick ballast according the load chart is placed and exactly entered and confirmed in the LICCON.
- The derrick is in operating position.

4.1.1 Pre-adjustments

- ▶ Adjust the LICCON overload protection according to the data in the load chart and confirm.

**Note**

- ▶ Enter the actual derrick ballast weight in the LICCON!
- ▶ Enter the actual reeving in the LICCON!

Setting the derrick ballast, see the crane operating instructions chapter 4.03.

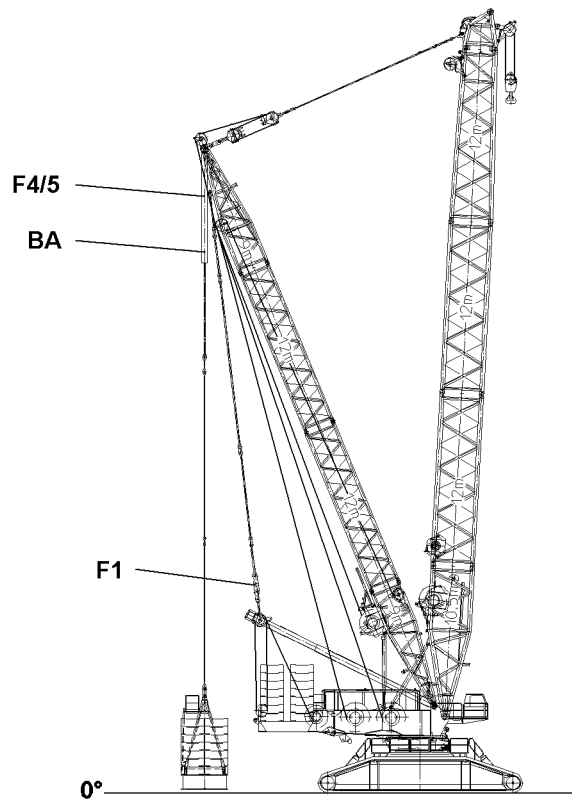
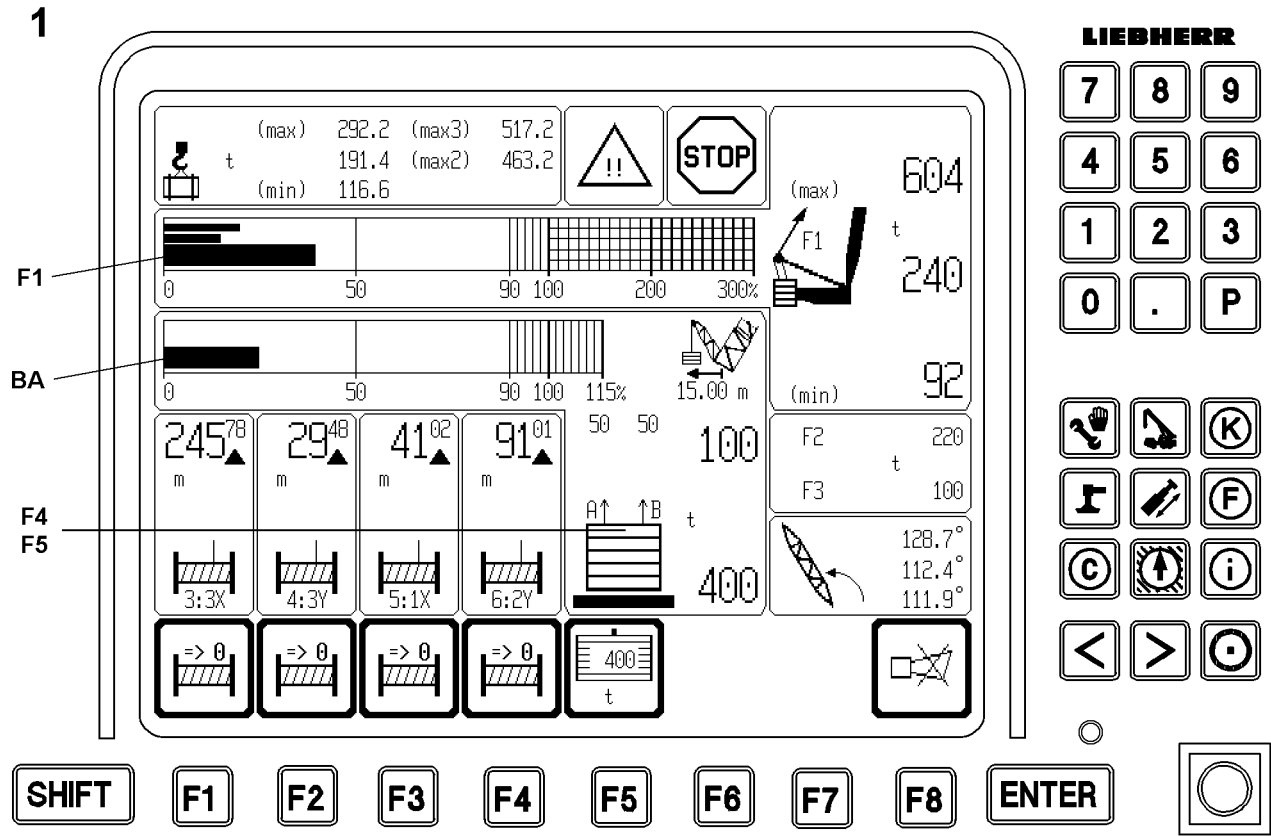
**DANGER**

Risk of accident!

The set derrick ballast value must correspond to the actual derrick ballast weight added!

- ▶ Incorrect entry of the ballast weight can result in dangerous operational situations!

- ▶ Check the settings.



B102349

4.2 Crane operation



Note

- ▶ For crane operation with derrick ballast, the data in chapter 4.02 of the crane operating instructions must be observed and maintained!
-



WARNING

Danger of toppling the crane!

The jerky execution / braking of turning maneuvers can cause the load or suspended derrick ballast to lead to swinging!

This can cause the boom to break off or the crane to topple over!

Personnel can be severely injured or killed!

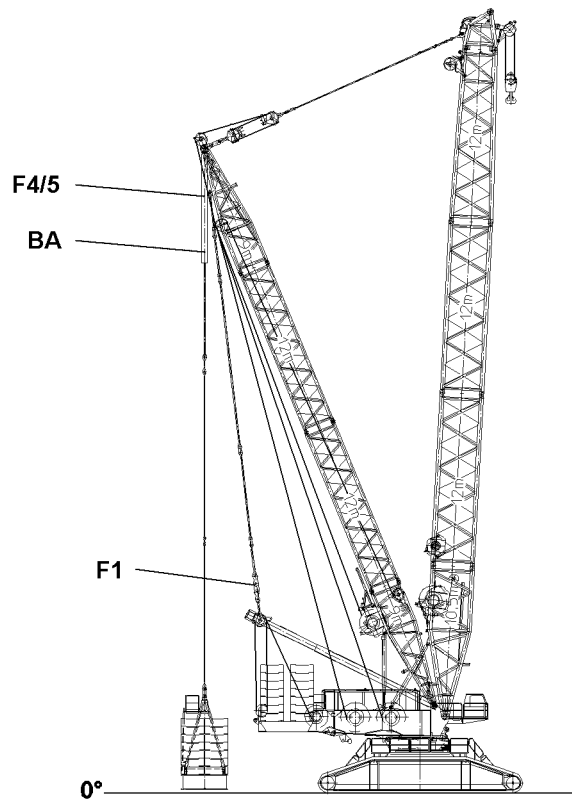
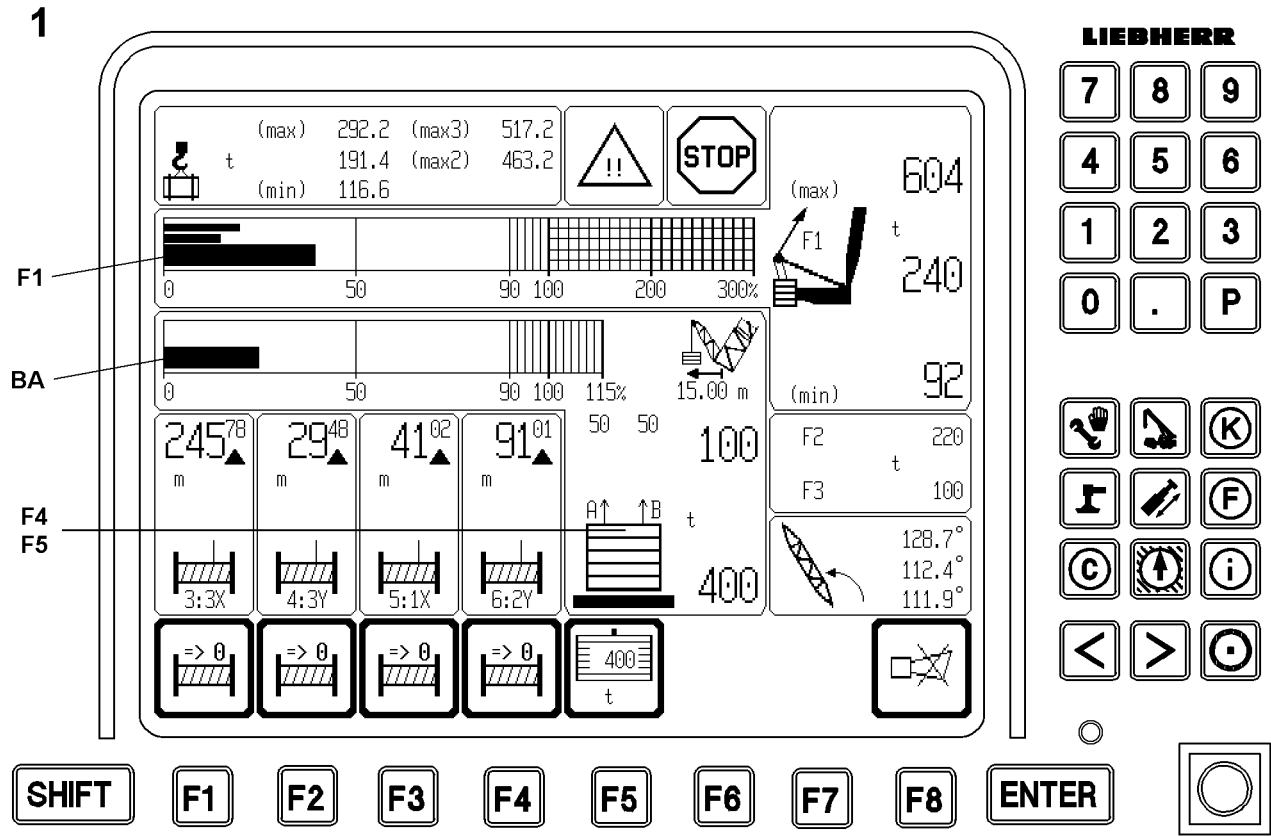
- ▶ There may be no persons or obstacles within the slewing range of the derrick ballast!
 - ▶ During the turning, a guide must watch the main boom, D-boom and derrick ballast for a danger of collision!
 - ▶ When turning with a load and suspended derrick ballast, the turning movement must be initiated or slowed down extremely sensitively.
-



Note

- ▶ For crane operation, observe the section "lifting and lowering the ballast trailer with pull cylinders" and "ballasting guying differential force monitoring"!
-

- ▶ Observe the move out condition of the pull cylinder and the inclination of the derrick ballast.



B102349

4.3 Safety guidelines



Note

- ▶ The test points must be checked before crane operation for functionality!
- ▶ The weight of the load to be lifted must be known!
- ▶ The placement surface of the ballast trailer may be no more than maximum 0.25 m above or 0.25 m below the placement level of the crane.
- ▶ The set down location of the suspended ballast trailer, at the end of the load lift, must be level, horizontal and have sufficient load bearing capacity to safely take on the weight.



CAUTION

Risk of accident!

- ▶ Before setting down the load and the suspended derrick ballast, the crane operator must make sure that a safe placement of load and suspended derrick ballast is ensured!



Note

- ▶ There may be no obstacles within the slewing range of the crane, and the derrick ballast and the load!
- ▶ When the derrick ballast is raised, it must be observed by a guide or the crane operator!



DANGER

Danger of accidents due to angular pull!

Due to angular pull, impermissible side forces are initiated in the crane, which can lead to breakage of crane parts!

If this is not observed, there is a danger of tipping over when lifting with placed ballast plates and it can cause the crane to topple over.

- ▶ Before taking on a load or the derrick ballast, make sure that the derrick ballast, the center of rotation of the turntable and the load are on one line.

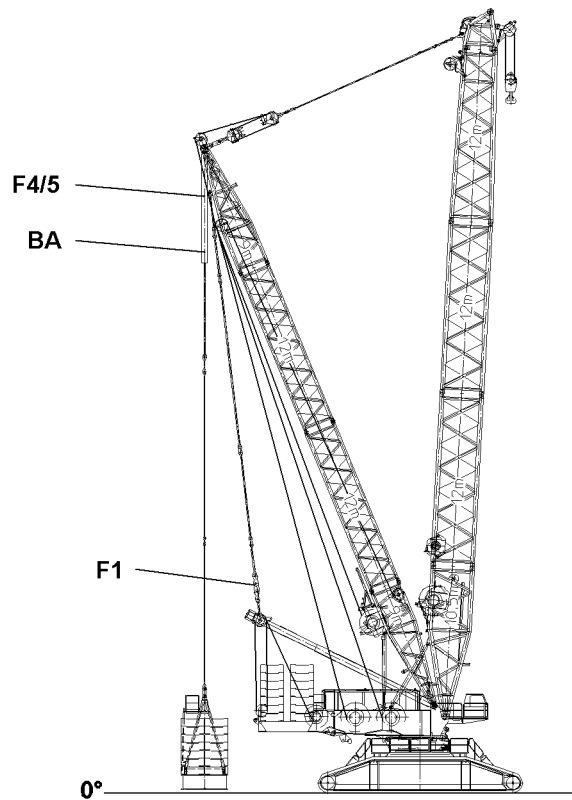
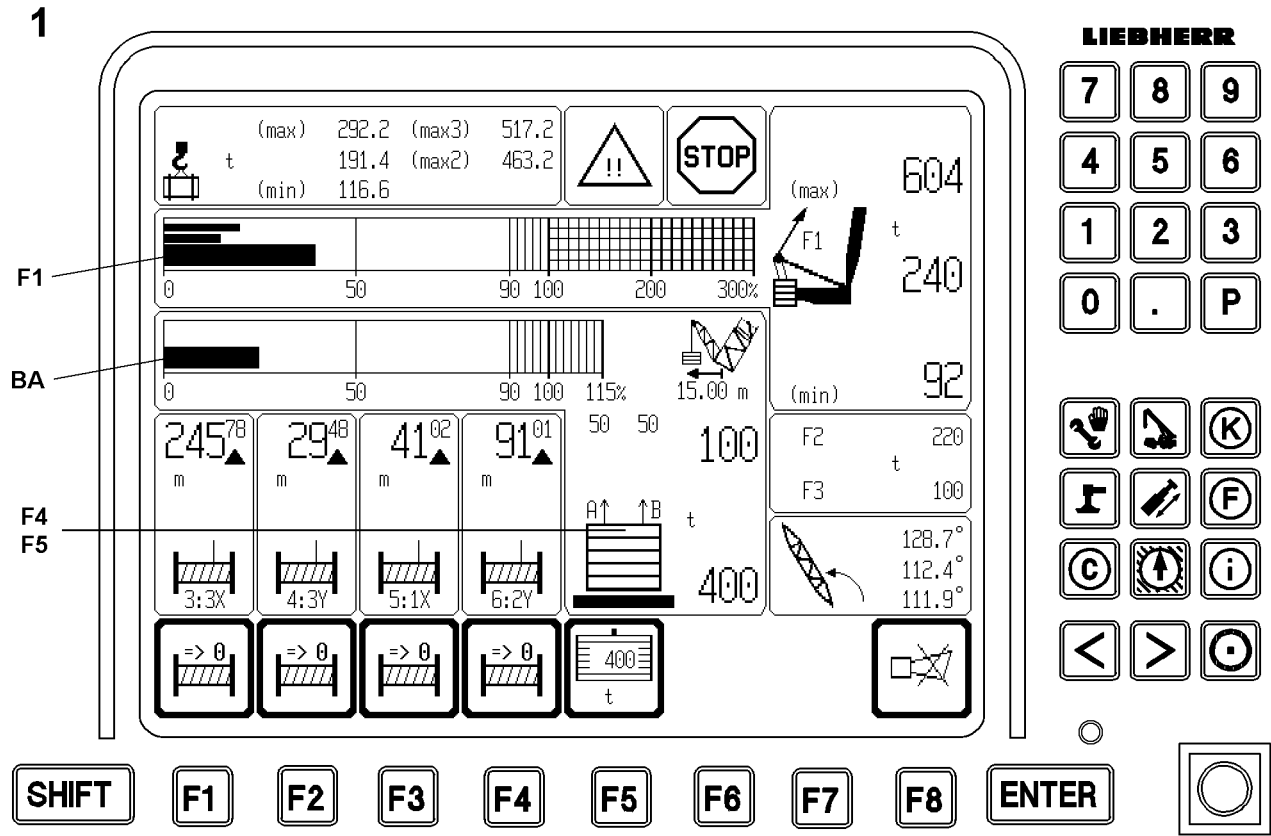
When taking on a load, the guying from the derrick ballast to the derrick head must be relieved to the point where the F1-actual force (F1-act) is larger than the F1-minimum force (F1-min).



DANGER

Risk of accident!

- ▶ The guying between the SA frame and the derrick end section, test point 1, may never be without power!
- ▶ This can lead to uncontrolled movements of the boom system and cause an accident!



B102349

4.4 Determination of forces in operating mode with derrick ballast

In all operating modes with derrick ballast, the load on the guy rods from the derrick head to the SA bracket (F1) and to the derrick ballast (F4/5) is distributed.



Note

► See the crane operating instructions "chapter 4.02"!

4.4.1 Force F1 (Test point 1) between guying SA-frame - Derrick end section

The force F1 (test point 1) is determined in the guy rods from the SA-frame to the derrick head by 2 force test boxes and is shown on the LICCON as total force of the guying.

From the operating force F1 and the force F1-operational maximum force results the F1 utilization. This is shown on the LICCON in a utilization bar (F1) in percent.

4.4.2 Force F4/5 (measuring point 4/5) guying derrick ballast - derrick head

The forces F4/5 (test point 4/5) are effective in the guy rods from the derrick ballast to the derrick head.

The existing forces in the guy rods (A = left and B = right) are calculated from the four pressure sensors, which are installed on the pull cylinders and shown in the LICCON as individual forces. The ballast being pulled is calculated from the forces in each guying, i.e. the proportion of ballast which is pulled up by the guying. The remaining part is on the ground. The derrick ballast utilization results from the pulled ballast and the placed ballast. This is shown on the LICCON monitor with a utilization bar (BA) in percent.

Pull cylinder on block



DANGER

The crane can topple over!

By completely moving one or both pull cylinders in (block position moved in), the pressure increases strongly on the ring surface of the pull cylinder and the weighing of the currently pulled derrick ballast is incorrectly calculated and displayed!

The LICCON overload protection therefore assumes that a larger derrick ballast is pulled than is actually the case, and calculates too large a load capacity as a result!

An overload of the crane is recognized too late by the LICCON overload protection and the crane can topple!

Personnel can be severely injured or killed!

- If the pull cylinder are in block position "moved in", **crane operation is explicitly prohibited!**
- The forces in the derrick ballast guying A and B are to be carefully observed on LICCON monitor!
- Potentially encountered error reports are to be heeded!



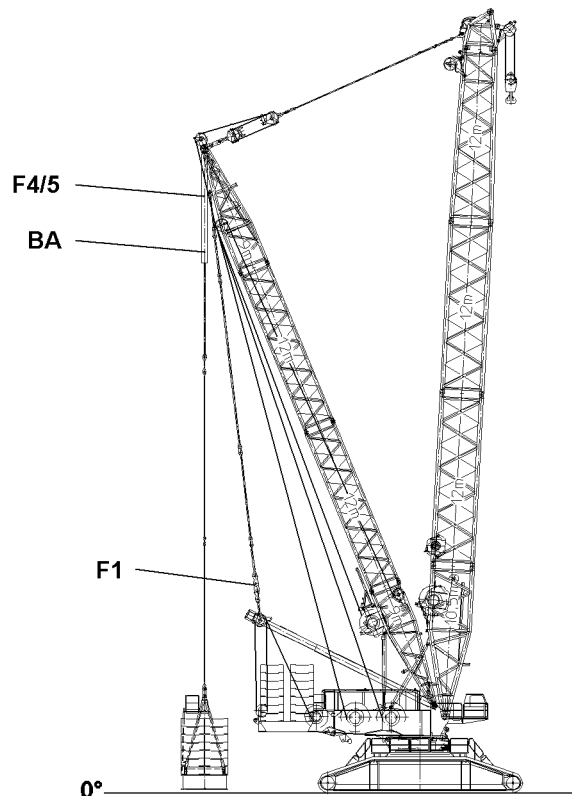
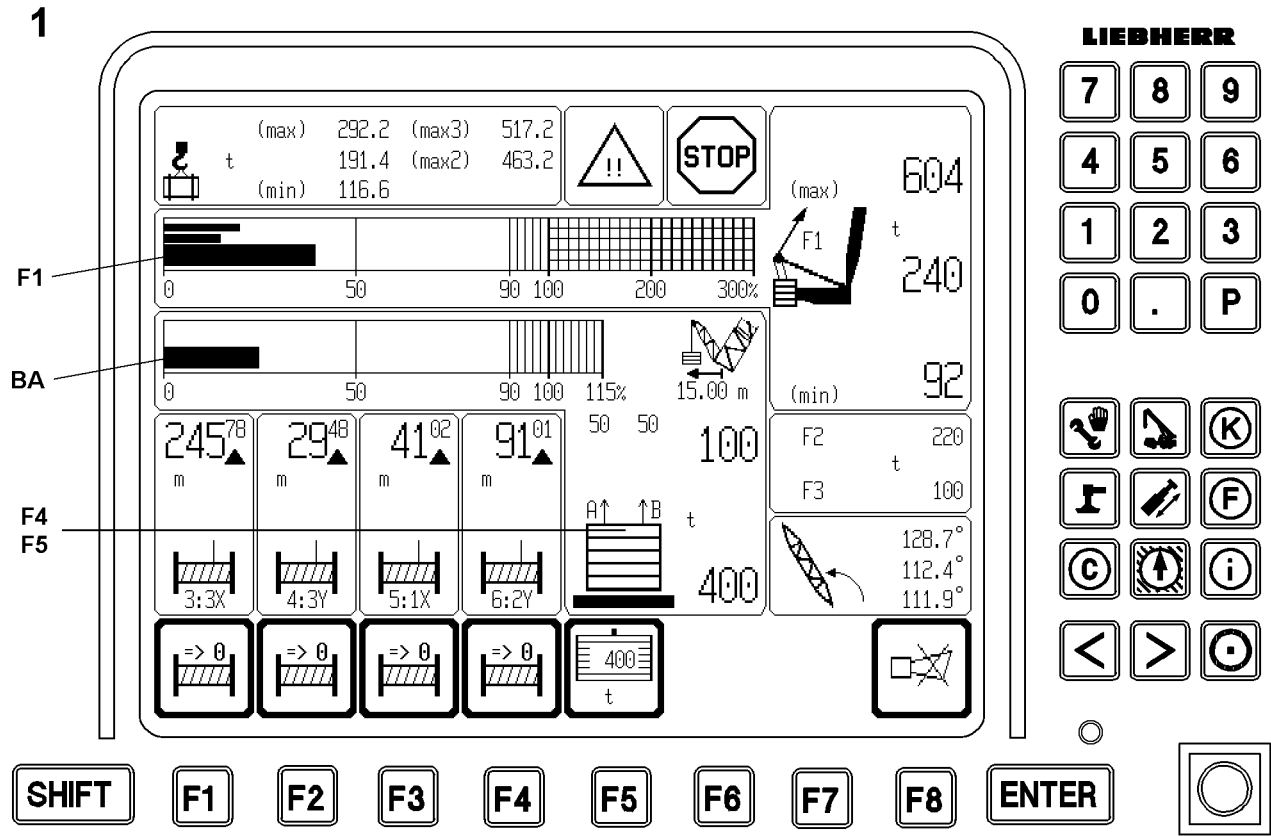
WARNING

Switching off the LICCON overload safety device too early!

By moving one or two pull cylinder completely out (block position moved out), the LICCON overload protection calculates and insufficient load capacity!

Possible shut off by the LICCON overload protection takes place too early!

- If the pull cylinders are in block position "moved out", crane operation on the basis of reduced load-bearing capacity is not meaningful!



B102349

4.4.3 Monitoring of minimum force F1

If more than 50 % of the set derrick ballast is being pulled (ballast utilization bar > 50 %) and the minimum force $F_{1_{min}}$ (test point 1) is fallen below, all crane movements that **increase load moment** are turned off.



DANGER

Risk of accident!

It is prohibited to let the minimum force $F_{1_{min}}$ (test point 1) fall below if more than 50 % of the derrick ballast is pulled. If this is not observed, in case of loose tension from test point 1 (F1) and **derrick ballast on the ground**, the derrick ballast can suddenly lift off the ground due to the increased load moment and the boom system can suddenly move forward! This will result in the load swinging violently and could damage the boom and crane!

► Do not fall below the minimum force - $F_{1_{min}}$!

If more than 90 % of the set derrick ballast is being pulled (ballast utilization bar greater than 90 %) and the force drops below the minimum value $F_{1_{min}}$ (test point 1), all **load moment increasing** and all **load moment decreasing** crane movements are shut off. This also turns the "spooling out" movement of the winch off.



DANGER

Risk of accident!

It is prohibited to fall below the minimum force $F_{1_{min}}$ (test point 1) if more than 90 % of the derrick ballast is pulled. If this is not observed and the load torque is increased when the guying is slack at test point 1 (F1) and the derrick ballast is suspended, the derrick ballast can suddenly drop to the ground, causing the boom system to suddenly lurch backwards! Thereby the relapse cylinders can be pressed on block and be overloaded. The relapse cylinders on the boom and D-boom may become damaged! This will result in the load swinging violently and could damage the boom and crane!

► Do not fall below the minimum force - $F_{1_{min}}$!



Note

- By actuating the assembly key switch, the test point 1 - minimum force ($F_{1_{min}}$) is reduced by several tons, this allows one to reverse the manoeuvre and retreat from the situation in which the $F_{1_{min}}$ shut off occurred.
- This is the only exception on the crane, where, after a shut off, a load moment increasing movement may be continued with the assembly key switch!



DANGER

Risk of accident!

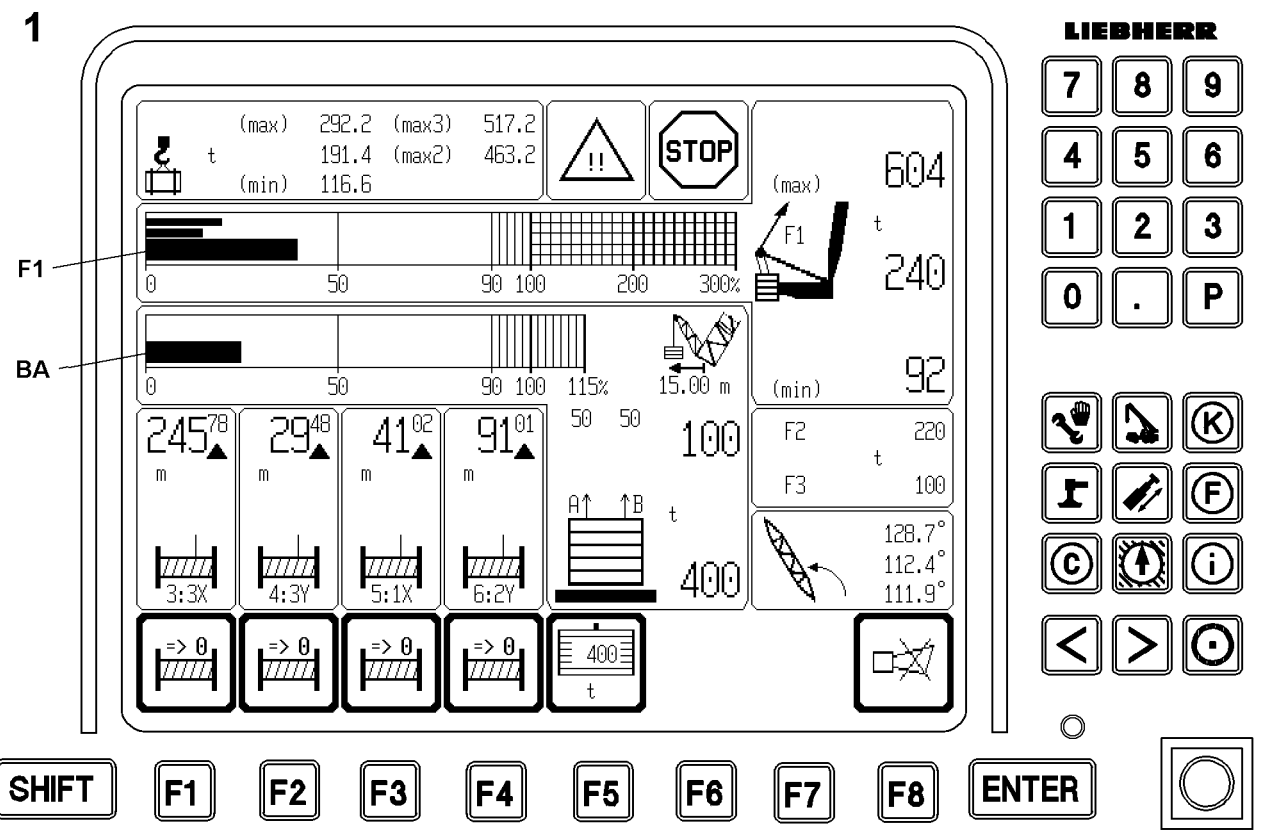
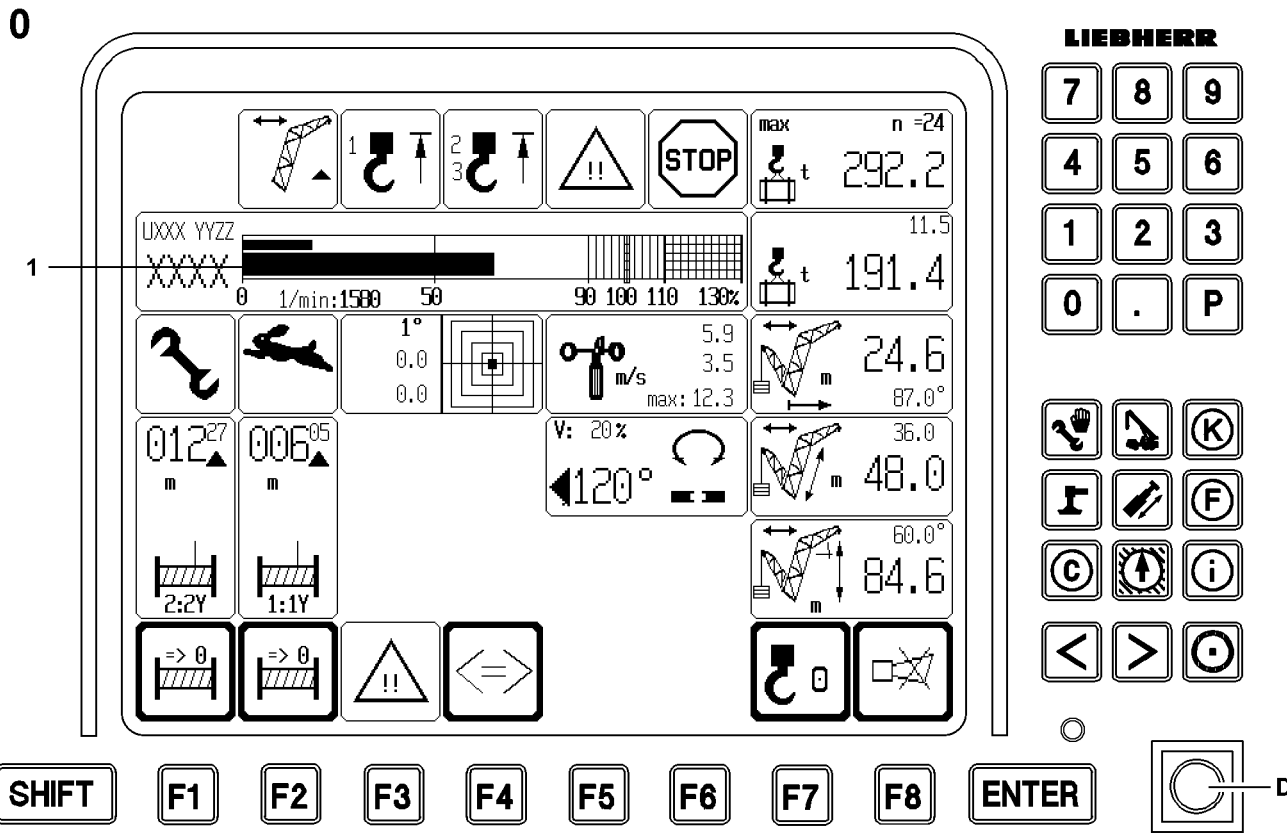
If the LICCON overload protection is bypassed, there is no further protection against crane overload! There is an increased danger of accidents!

Personnel can be severely injured or killed!

- The crane operator carries complete and sole responsibility for its handling upon bypass of LICCON overload protection!

After shut off via $F_{1_{min}}$ the force F1 on test point 1 must be increased by a movement. When the derrick ballast is suspended, this can be achieved by setting down the ballast.

If the assembly key switch is already pressed and the F1 force continues to drop under the minimum force $F_{1_{min}}$ which was reduced by the assembly key switch, the assembly key switch $F_{1_{min}}$ shut off can no longer be bypassed.



B104093

4.5 Overload monitoring in operating mode with derrick ballast

In operating modes with derrick ballast, the “maximum load for the current crane condition” is monitored two ways:

- 1.) Monitoring of maximum load on the LICCON monitor 0
- 2.) Monitoring of test point 1-operational maximum force LICCON monitor 1

4.5.1 Monitoring of maximum load on the LICCON monitor 0

It monitors the “maximum load according to load chart and reeving”.

In operating modes with derrick ballast, this is the maximum load of the current crane condition. It is shown on LICCON monitor 0. The current utilization of the crane results from the load utilization bar (1) on LICCON monitor 0.

If the load utilization bar reaches 90 %, an advance warning is given in the form of a “caution icon” and a “SHORT HORN” on LICCON monitor 0.

At 100% on the load utilization bar, the shut off of all load moment increasing movements with the “stop icon” and the acoustical warning “HORN” occurs on LICCON monitor 0.



Note

- ▶ The “maximum load of the current crane condition” can possibly be increased further, refer to section “utilisation conditions”!

4.5.2 Monitoring of test point 1-operational maximum force (= $F1_{\max}$ operation)

It is shown on LICCON monitor 1. When $F1$ is greater than $F1_{\max\text{-shut off value}}$ the shut off of all load moment increasing movements occurs with the stop icon and the acoustic warning “HORN” by LICCON monitor 1.



Note

- ▶ The maximum load can be safely monitored by the “LICCON overload protection monitoring” itself!
- ▶ The “ $F1_{\max}$ -monitoring” is an additional monitoring function which shows the overload parallel to the “LICCON overload protection”!
- ▶ In all cases, where the maximum load capacity according to the load chart “max-load” is smaller than the maximum load of the current equipment configuration with optimal derrick ballast “max3-load”, which means “max-load” appears smaller “max3-load”, when lifting the maximum load, the monitor display looks as if the “LMB utilization bar of the crane” is at 100 % and the “ $F1$ utilization bar” is approximately at 100 %!
- ▶ At the just completed LMB-Stop (“current load” / “max-load capacity” greater than 100 percent) $F1_{\text{actual}}$ already lies just over $F1_{\max}$ or just below. There is a certain tolerance due to the component weights and the wind influences. Since the maximum load can always be raised, shut off will not occur at $F1_{\text{actual}} / F1_{\max}$ greater than 100 %. Shut off will only occur at $F1_{\text{actual}} / F1_{\max\text{ operation shut-off value}}$. For this crane, the following applies: $F1_{\max\text{-operation shut off value}} = F1_{\max\text{-operation}} + F1_{\text{addition for shut off}}$ (also see Crane operating instructions chapter 4.02). The $F1_{\text{addition for shut off}}$ is selected such that $F1_{\max\text{-operation shut off}}$ may normally never come about. This shut off provides a second safety, particularly in cases with “max-load capacity” smaller “max3-load capacity” as additional safety precaution. For example, if the weighed load is far too low due to a sensor failure, the actual load could be greater than the maximum permissible load without the LICCON overload protection shut off tripping. The crane could be overloaded. In this particular case, with the “max-load capacity” smaller than the “max3-load capacity”, with $F1_{\max}$ larger $F1_{\max\text{-operation shut off value}}$ the $F1_{\max\text{-shut off}}$ triggers. In this case, the crane is already slightly overloaded, however shut off prevents an overload in certain cases or toppling of the crane. This means that the $F1_{\max\text{-operation shut off}}$ can protect the crane from overload in certain cases.
- ▶ It is to be ensured that the load weight and the shut off upon maximum load capacity function reliably!

0

LIEBHERR

7 8 9
4 5 6
1 2 3
0 . P

Hand icons, K, F, C, Up arrow, i, Left arrow, Right arrow, Circle

SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

D

0

1

max n =24
t 292.2
11.5
t 191.4

1/min:1500 50 90 100 110 130%

1° 0.0 0.0
5.9 3.5
max: 12.3
m/s
24.6 87.0°

V: 20% 120°

36.0 48.0
60.0° 84.6

2:2Y 1:1Y

=> 0 => 0 !! <=>

1

LIEBHERR

7 8 9
4 5 6
1 2 3
0 . P

Hand icons, K, F, C, Up arrow, i, Left arrow, Right arrow, Circle

SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

(max) 292.2 (max3) 517.2
t 191.4 (max2) 463.2
(min) 116.6

!! STOP

(max) 604
F1 t 240

0 50 90 100 200 300%

BA 0 50 90 100 115% 15.00 m (min) 92

245⁷⁸ 29⁴⁸ 41⁰² 91⁰¹
m m m m

50 50 100
A↑ B↑ t 400

F2 220
F3 t 100

128.7°
112.4°
111.9°

3:3X 4:3Y 5:1X 6:2Y

=> 0 => 0 => 0 => 0 t 400

**DANGER**

The crane can topple over!

In cases with “max-load capacity” = “max3-load capacity”, the $F1_{max}$ -shut off value does not offer protection! The $F1_{max}$ shut-off threshold is so high that the crane will probably topple over or be damaged before the shut-off threshold is reached!

- ▶ Carefully monitor the displays on the LICCON monitor!

**WARNING**

Risk of accident!

- ▶ Measuring point 1-Operation-Maximum force not only depends on the current crane configuration but also on the derrick ballast pulling force measured by the pressure sensors!
- ▶ If the pulled derrick ballast increases, the maximum permitted $F1_{max}$ removes force and vice-versa!
- ▶ It is therefore important to carefully monitor the ballast weighing process and the value for the pulled derrick ballast to ensure it is plausible!

**DANGER**

The crane can topple over!

If the pulled derrick ballast value has been incorrectly determined and is too low, the calculated $F1_{max}$ may be too high and the crane could be overloaded or topple over without this becoming evident!

- ▶ Carefully monitor the displays on the LICCON monitor!

0

LIEBHERR

7 8 9
4 5 6
1 2 3
0 . P

Hand icons, K, F, C, Up arrow, i, Left arrow, Right arrow, Circle

SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

D

1

LIEBHERR

7 8 9
4 5 6
1 2 3
0 . P

Hand icons, K, F, C, Up arrow, i, Left arrow, Right arrow, Circle

SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

4.5.3 Utilization conditions

The current utilization of the crane results from the “utilization bar of the crane” **1** on the LICCON monitor **0**.

Max. load carrying capacity:

- The “maximum load carrying capacity in current operating condition (“**max-load carrying capacity**”)” is achieved, when the “utilization bar of the crane” **1** displays 100 percent. This is the case when the “utilization of the crane according to the load chart and reeving” reaches 100 % (“momentary load” is equal to the “maximum load carrying capacity”). When the “max-load carrying capacity” is smaller or equal to the “max2-load carrying capacity”, then the “max-load carrying capacity” can be increased through:
 - Pulling up the derrick ballast, if the derrick ballast is not already suspended and the currently pulled derrick ballast is still smaller than the optimum derrick ballast.

Max2-load carrying capacity:

- The “maximum load carrying capacity of the current crane equipment ” (“**max2-load carrying capacity**”) is achieved when the “crane utilization bar” **1** is at 100 % **and** the “derrick ballast utilization bar display” **BA** is greater than or equal to 100 % (the current derrick ballast is completely lifted off the ground), and the derrick ballast input value and the ballast weight are correct. This is the case when the “current load” and the “max2-load carrying capacity” reaches 100 percent (“current load” is equal to the “max2-load carrying capacity”). When the “max2-load carrying capacity” is smaller than the “max3-load carrying capacity”, then the “max-load carrying capacity” can be increased through:
 - Increasing the derrick ballast by adding additional ballast plates if the placed ballast is still smaller than the optimum ballast.

Max3-load carrying capacity:

- The “maximum load carrying capacity of the current crane equipment with optimum derrick ballast” (“**max3-load carrying capacity**”) is reached when the “crane utilization bar” **1** stands at 100 % **and** the “derrick ballast utilization bar display” **BA** is at 100 % (the optimal derrick ballast is completely lifted off the ground), and the derrick ballast input value and the ballast weight are correct. This is the case when the “current load” and the “max3-load carrying capacity” reaches 100 percent (“current load” is equal to the “max3-load carrying capacity”). Here, the optimal derrick ballast is already entirely pulled! Further increasing the derrick ballast at this derrick ballast radius will not increase the permitted load as the “max3-load carrying capacity”!



Note

- ▶ In some cases it may be possible to increase the load capacity, in some cases reducing the derrick ballast radius as well; refer to the load chart manual or LICCON job planner!

This also applies with:

- “Current load” equal to “max-load carrying capacity”
- “Current load” equal to “max2-load carrying capacity”

0

LIEBHERR

max n =24
t 292.2
11.5

1
XXXX YYZZ
XXXX
0 1/min:1500 50 90 100 110 130%

t 191.4

1°
0.0
0.0

5.9
3.5
max: 12.3

24.6
87.0°

V: 20%

120°

36.0
48.0

60.0°
84.6

2:2Y 1:1Y

=> 0 => 0 !! <=>

SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

7 8 9
4 5 6
1 2 3
0 . P

⌨ ⌨ ⌨
⌨ ⌨ ⌨
⌨ ⌨ ⌨
< > ⌂

D

1

LIEBHERR

(max) 292.2 (max3) 517.2
t 191.4 (max2) 463.2
(min) 116.6

!! STOP

(max) 604
t 240

F1

0 50 90 100 200 300%

BA

0 50 90 100 115% 15.00 m (min) 92

245⁷⁸ 29⁴⁸ 41⁰² 91⁰¹
m m m m

50 50 100

F2 220
F3 t 100

A↑ B↑
t 400

128.7°
112.4°
111.9°

3:3X 4:3Y 5:1X 6:2Y

=> 0 => 0 => 0 => 0

400 t

SHIFT F1 F2 F3 F4 F5 F6 F7 F8 ENTER

7 8 9
4 5 6
1 2 3
0 . P

⌨ ⌨ ⌨
⌨ ⌨ ⌨
⌨ ⌨ ⌨
< > ⌂

The bypass of the maximum load according to the load chart and reeving (crane utilization bar 1 is at 100 percent) can be bypassed by:

- 1.) Bypass key switch D on the LICCON monitor 0
- 2.) Assembly key switch in the instrument panel
- 3.) **Note:**

The test point 1-assembly - maximum force shut off (= F1 max-assembly) cannot be bypassed.

**DANGER**

The crane can topple over!

When the assembly key switch is turned on, the LICCON overload protection is bypassed and is thereby no longer effective!

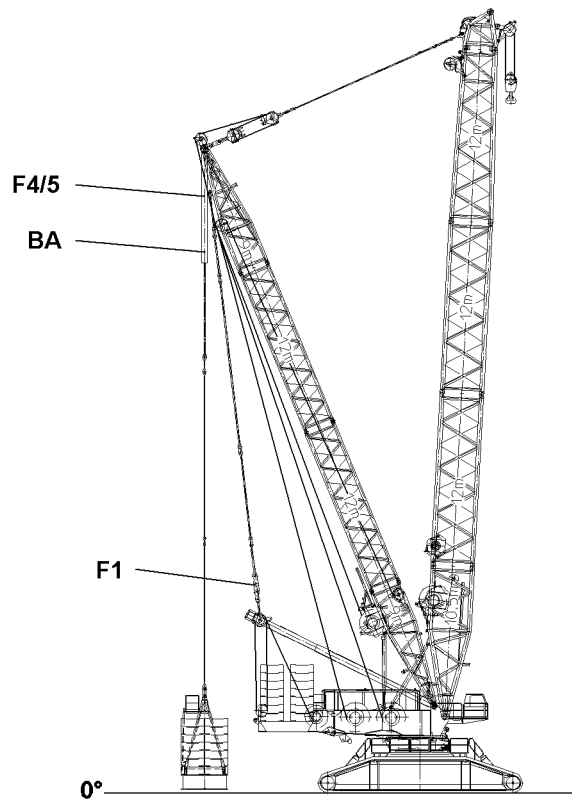
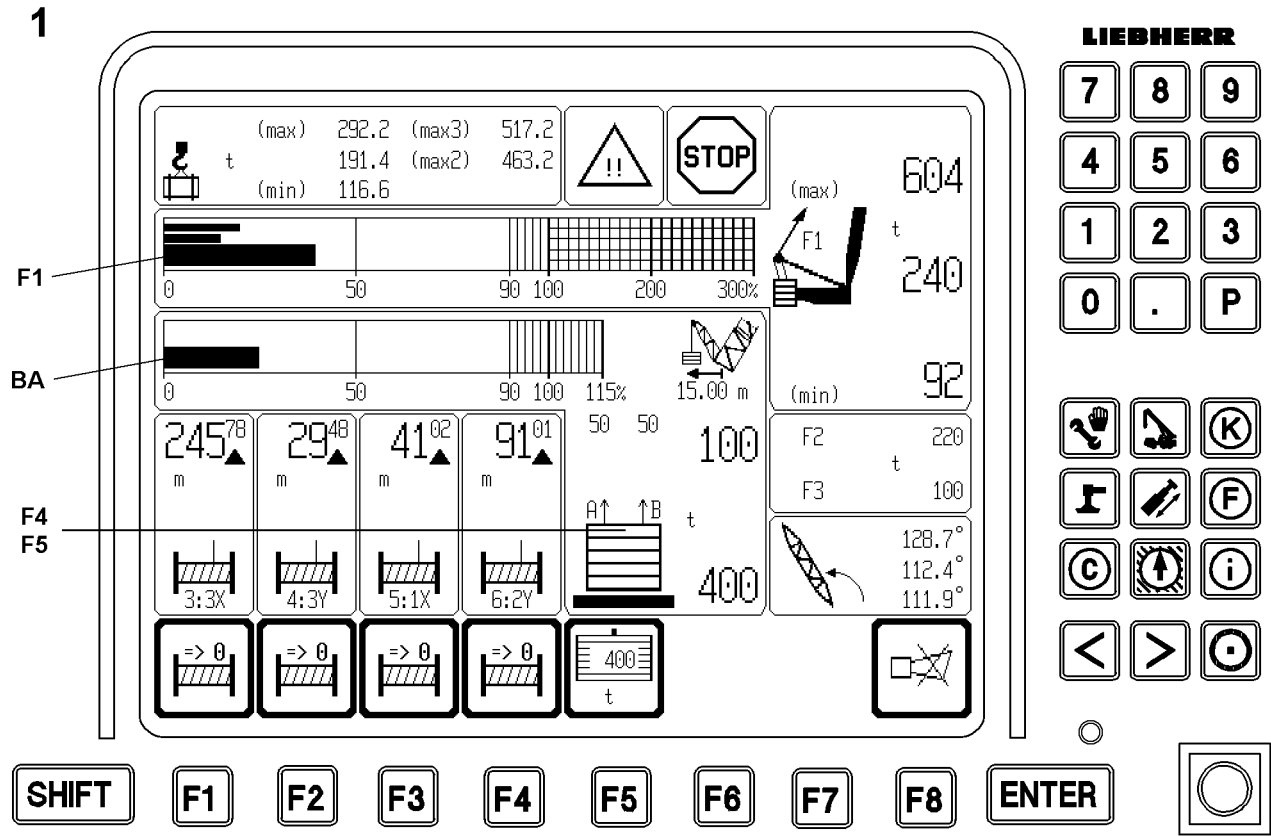
The crane can be overloaded unnoticed and topple over!

Personnel can be severely injured or killed!

- ▶ When the assembly key switch is turned on, only load moment decreasing crane movements up to a permissible operating and load range can be carried out!
 - ▶ Turn the assembly key switch off immediately after reaching the permissible load range!
 - ▶ The crane operator alone is responsible completely for his actions during bypass of LICCON overload protection!
-

**Note**

- ▶ The movement "ballast up" or "ballast down" requires utmost attention by the crane operator!
-



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4.6 Differential force monitoring for derrick ballast-guying

In operating modes with derrick ballast, the difference between the forces on derrick guying A and B is monitored on **Monitor 1**.



DANGER

Risk of accident!

If the difference of these forces is too high, it will damage the derrick head or other crane components.

► Danger of accidents!

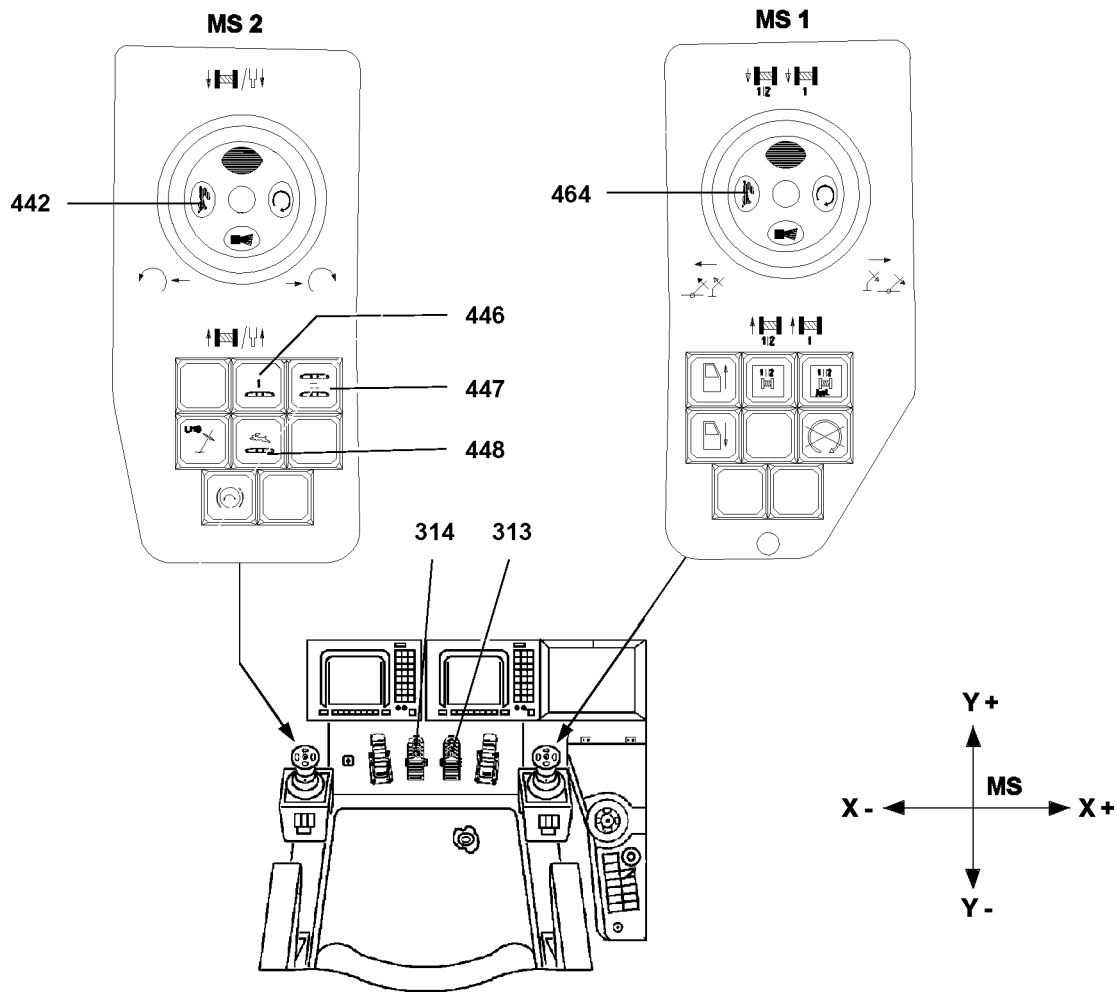
The forces in the derrick ballast guyings A and B are shown and compared on monitor 1. If the difference exceeds a permissible value, an acoustical warning is issued and the two force values blink. However **none of the movements are turned off**.

If the difference of the forces of the derrick ballast guyings A and B exceeds the specified limit value, then this can have various causes:

- Flexing of the turntable.
- The ground under the derrick ballast is uneven.
- The crane is leaning to one side.
- The derrick ballast has been loaded on one side.
- The force measurement in one guying is incorrect.

The crane operator must recognize the correct cause and take countermeasures:

- The error, which caused the one-sided force, must be remedied.
- In case of small ground unevenness only, the following measure is permissible:
Lock one ballasting cylinder and use the other ballasting cylinder to “Raise the ballast” or “Lower the ballast” until the difference between the forces reduces. Ensure that the derrick ballast is not tilted at an inadmissible angle with respect to the crane, otherwise the derrick ballast guide and attachments will be damaged.
- In case of implausible sensor values: Check whether the ballast weighing pressure sensors or inputs are faulty. If necessary, detach the sensor or replace the CPU.



5 Crawler operation with derrick ballast

5.1 Driving the crawler

Driving with raised and suspended derrick ballast.

Make sure that the following prerequisites are met:

- The derrick ballast has been lifted off the ground.
- The derrick ballast symbol on monitor 1 indicates a suspended state.
- The derrick ballast is aligned in a horizontal direction.
- The ground is able to support the weight of the crane, the load and the derrick ballast.



Note

- ▶ The hazard warnings described in crane operating instructions chapter 4.10 “Driving from the crane operator’s cab” must be observed!
- ▶ Release for driving the crawler takes place when all 4 ground contact rollers are no longer **in contact with the ground!**
- ▶ Press button **446** to turn on crawler operation!



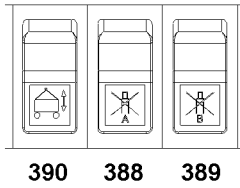
DANGER

Risk of accident

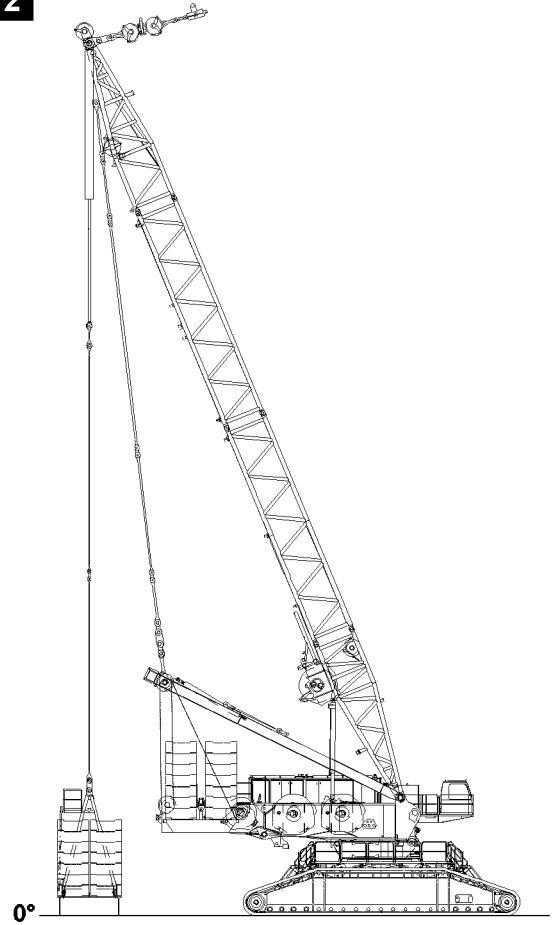
Observe and comply with the following points when driving with derrick ballast:

- ▶ There are no persons or objects in the danger zone!
- ▶ The driving area should be monitored by cameras or a supervisor!
- ▶ Only drive at the lowest possible speed!
- ▶ Avoid jerky driving movements!
- ▶ The attached load and suspended derrick ballast must be secured to prevent it from swinging! If the derrick ballast should swing by more than +/-0.5m, use the hydraulic cylinders to most rapidly set the derrick ballast down on the ground! Do not exceed the upper load threshold at measuring point F1!
- ▶ Steering manoeuvres are prohibited!
- ▶ Uphill or downhill travel is prohibited!
- ▶ If this is not observed, there is a danger of accidents!

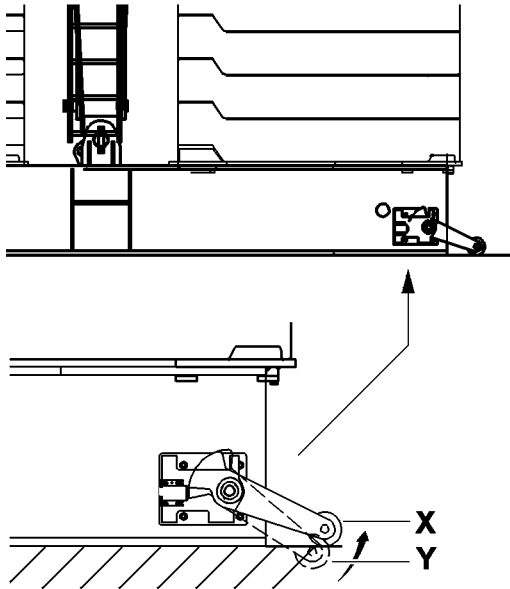
1



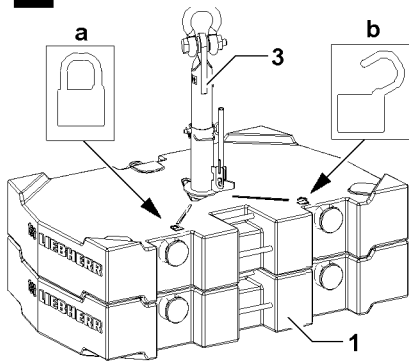
2



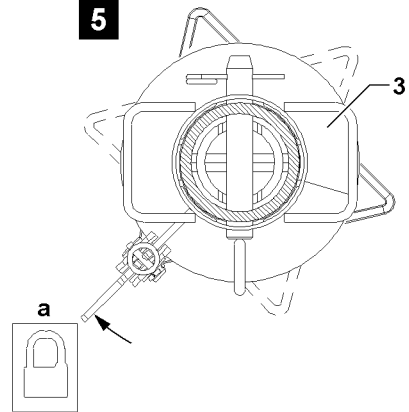
3



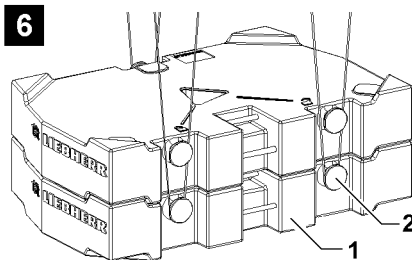
4



5



6



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6 Disassembly

6.1 Setting down the ballast pallet

**DANGER**

Risk of accident!

The placement surface for the ballast pallet must be level, horizontal and of sufficient load bearing capacity, otherwise the ballast pallet can tip over!

Personnel can be severely injured or killed!

- ▶ Check the horizontal position of the crane during the set down procedure!
- ▶ Check the horizontal position of the ballast pallet during the set down procedure!
- ▶ Constantly check the differential forces in the guying on the monitor!
- ▶ It is strictly prohibited for anyone to stand under the ballast pallet or in any part of the danger zone during the set down procedure!

The procedure for setting down the ballast pallet is the same, regardless of whether it is **without** or **with** a built-in derrick ballast guide.

Make sure that the following prerequisites are met:

- A guide or crane operator must monitor the setting down of the derrick ballast and the load.
- The placement surface for the ballast pallet must be level, horizontal and of sufficient load carrying capacity.

- ▶ Press the button **390**, see illustration 1.

Result:

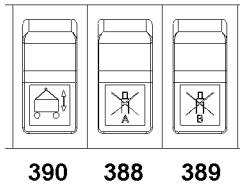
- The piston rods of the hydraulic cylinders extend.
- The derrick ballast is lowered.

- ▶ When the ballast pallet touches the ground, the ground contact switches are actuated, see illustration 2 and illustration 3.

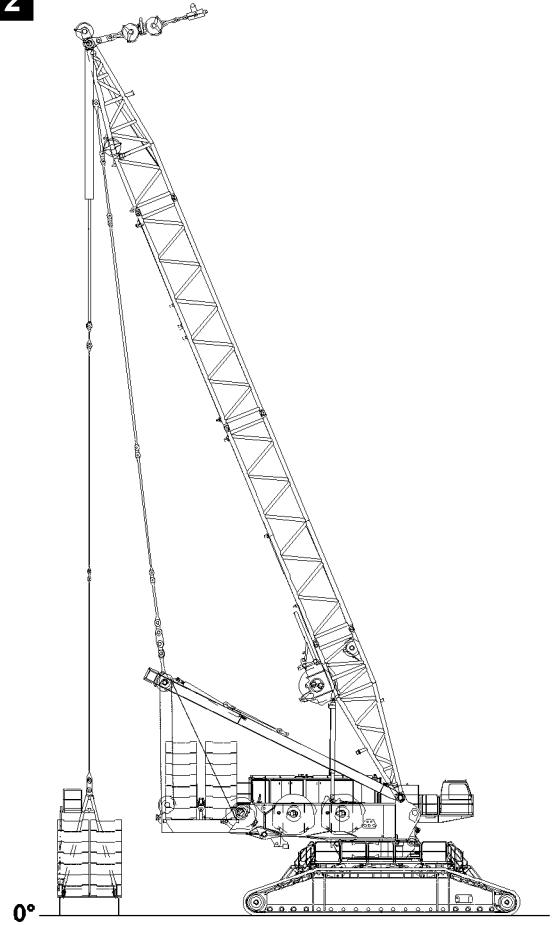
Result:

- The crane movements “turning the turntable” and “driving the crawler” turn off.

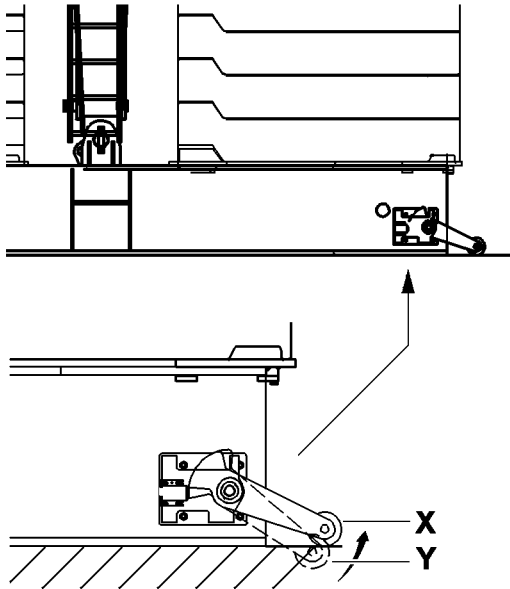
1



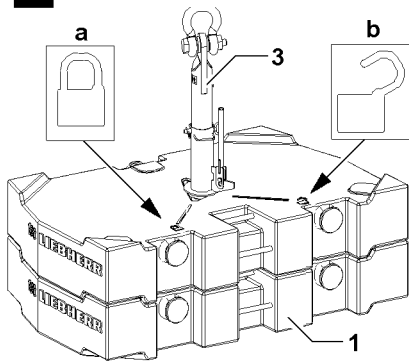
2



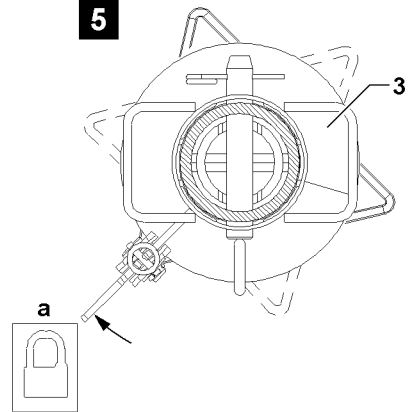
3



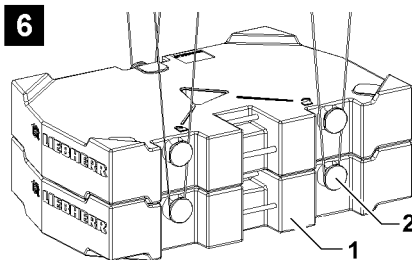
4



5



6



6.2 Removing the ballast plates



DANGER

Risk of accident!

If more than the specified loads are lifted with the receptacle stud **3** or the rope over the studs **2**, then components will be overloaded!

Ballast plates **1** can fall down and fatally injure personnel!

- ▶ Lift no more than maximum 20 t with the receptacle stud **3**, see illustration **4**!
 - ▶ Lift no more than maximum 20 t with the ropes, 3 fastening points, see illustration **6**!
-



Note

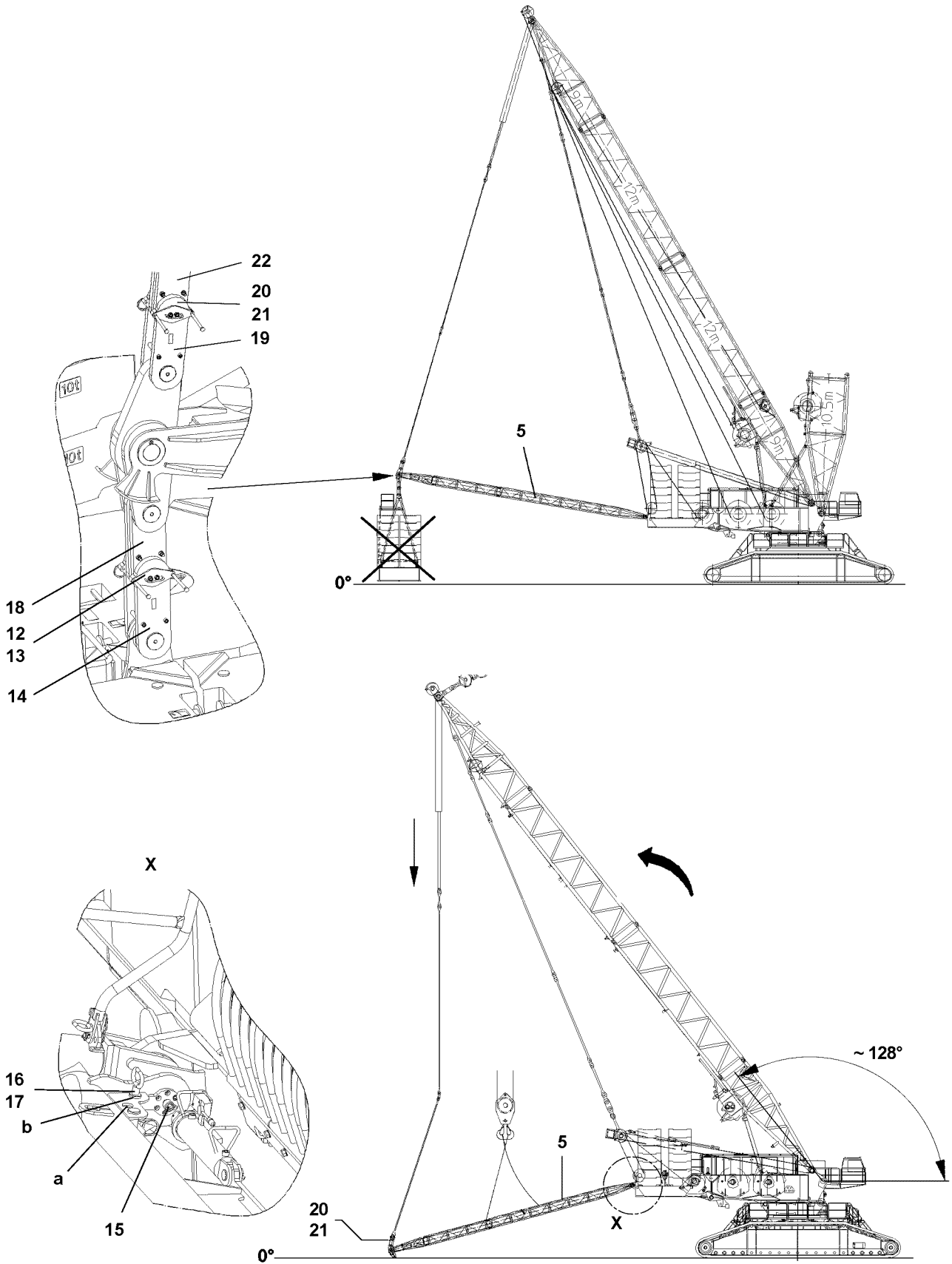
- ▶ Position **a**, folded out lever points to the closed icon = receptacle stud **3** closed!
 - ▶ Position **b**, folded out lever points to the open icon = receptacle stud **3** open to move in / out!
-

Make sure that the following prerequisites are met:

- The ballast pallet is standing horizontally on the ground, see illustration **2** and illustration **3**.
- The ground contact switches are actuated.

Ensure that the following prerequisite is met for lifting with the receptacle stud **3**:

- The receptacle stud **3** must be in position **a**: “receptacle stud **3** closed”, see illustration **3**.
- ▶ Lift the ballast plates **1** individually or as an assembly, see illustration **4** and illustration **6**.
- ▶ Remove the ballast plates **1** evenly with the auxiliary crane.



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6.3 Disassembly of the derrick ballast guide

Make sure that the following prerequisites are met:

- The guide is still pinned and secured to the derrick guying and erection racks.



DANGER

Accident risk when disassembling the guying!

Before unpinning the guide from the erection racks, the erection racks must be secured with retaining pins **4**, otherwise the erection racks can tip over and kill or severely injure personnel!

- ▶ Never unpin the retaining pins of unsecured or unsupported erection racks!
- ▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure!

- ▶ Both erection racks are secured by four retaining pins **4** to prevent them from tipping.



Note

- ▶ First unpin guide **5** from the erection racks!

- ▶ Unpin bracket **18** from bracket **14**.
- ▶ Remove spring retainer **13** and unpin pins **12** on both sides.



Note

- ▶ See section "Placing the erection racks down!"

- ▶ Remove the ballast pallet or swing the turntable.
- ▶ Luff down the derrick to the rear to maximum radius, the electric shut off occurs at approximately R25.6 m, approximately corresponding to 128°.
- ▶ Extend the hydraulic cylinder in the guying until the guide is resting on the ground or on a solid support surface.



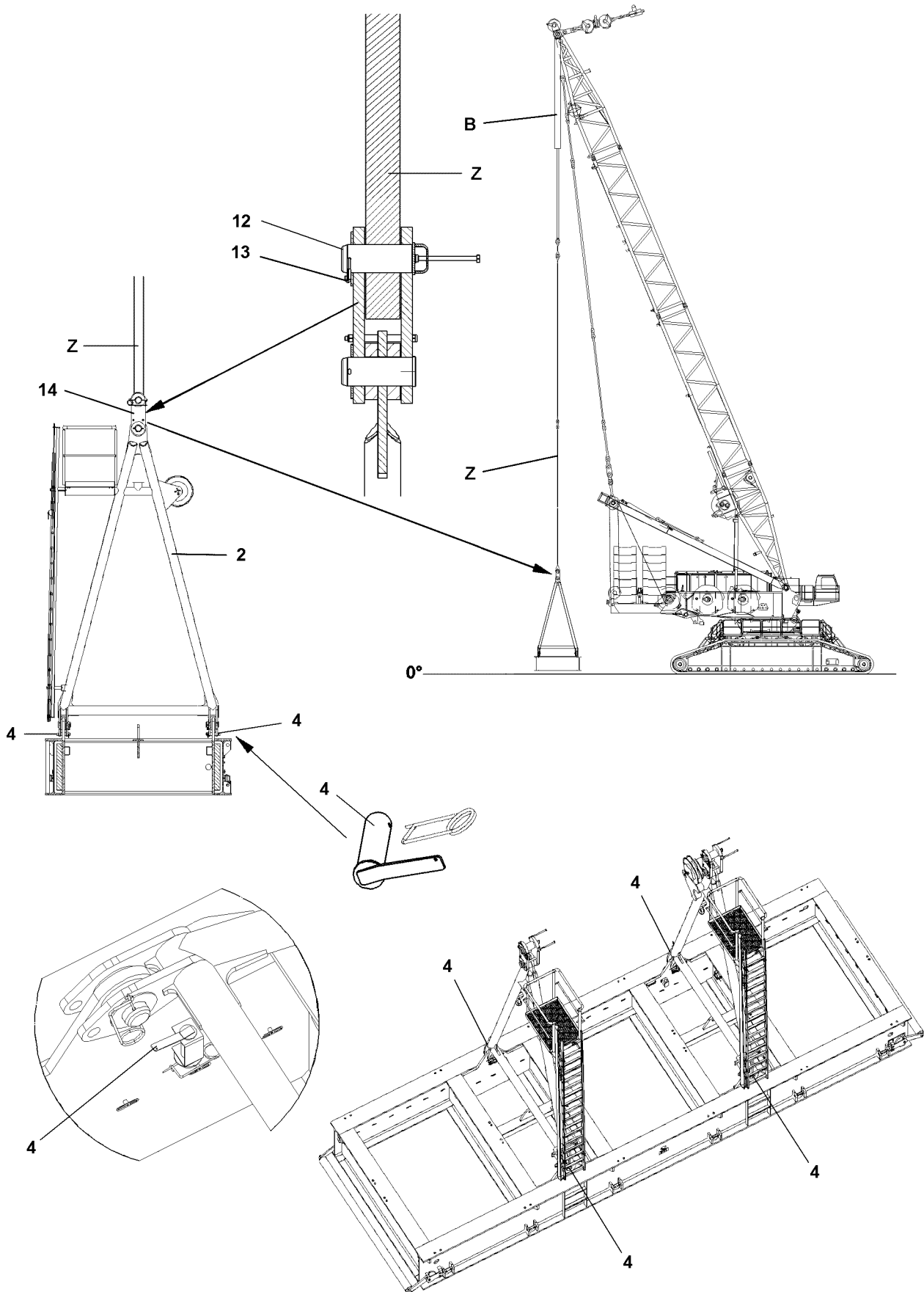
DANGER

Risk of accident

Sudden guy rod swing out when unpinned!

- ▶ Secure erection rods with an auxiliary crane before unpinning!

- ▶ Unpin the guy rods **22** on the bracket **19**.
- ▶ Remove spring retainer **21** and unpin pins **20** on both sides.
- ▶ Hang the guide **5** onto the auxiliary crane.
- ▶ Use the pin pulling device to unpin the guide **5** on both sides of the turntable.
- ▶ Remove the retaining pin **16** from the bore **b**.
- ▶ Push the pin **15** all the way out and insert the retaining pin **16** into the bore **a** and secure with cotter pin **17**.



B102172

6.4 Disassembly of guy rods on ballast pallet

The description of the disassembling procedure relates to a derrick ballast **without** a guide.



DANGER

Accident risk when disassembling the guying!

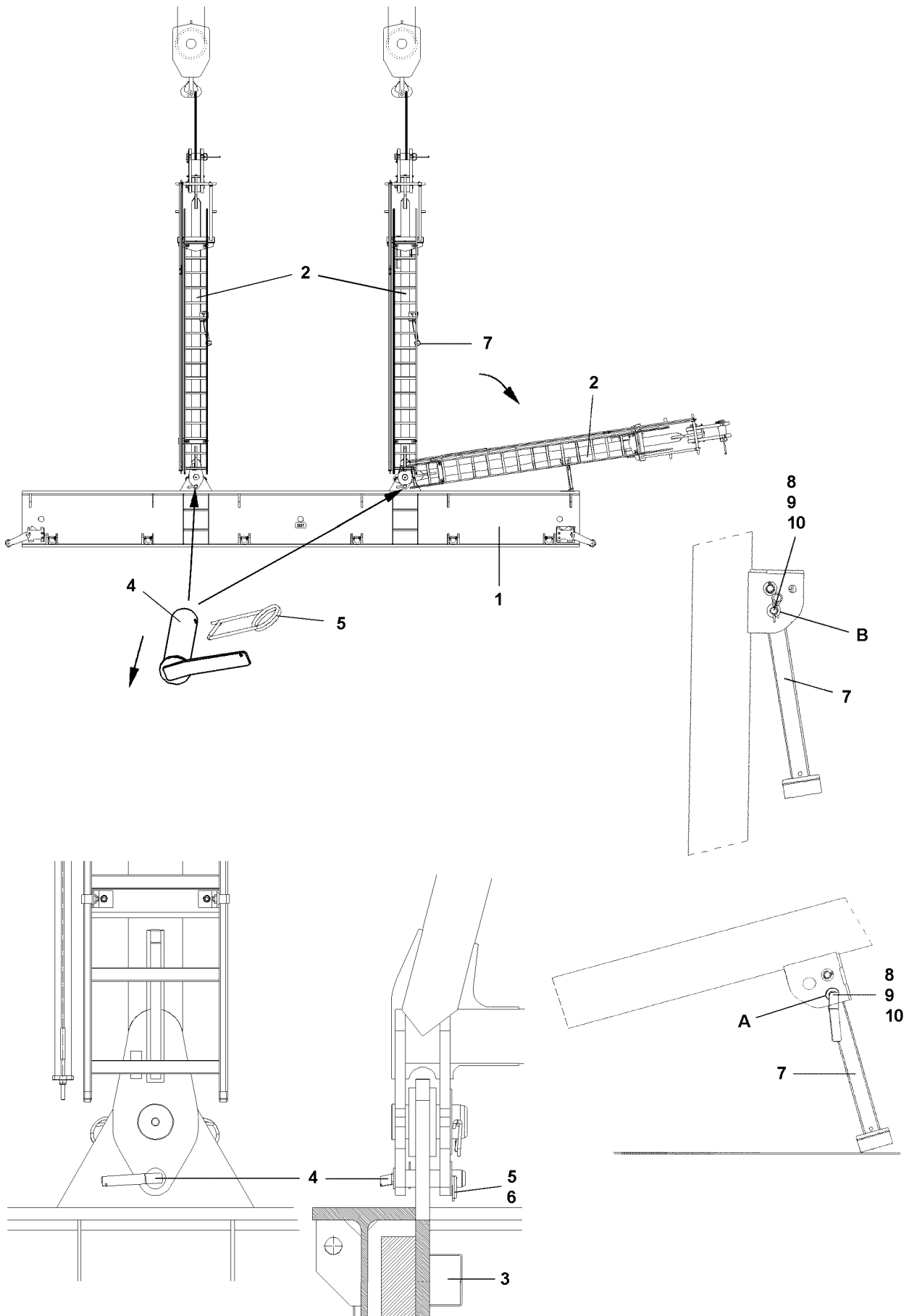
If the erection racks are not secured with the four retaining pins before unpinning, the erection racks tip!

Personnel can be severely injured or killed!

- ▶ Never unpin the retaining pins of unsecured or unsupported erection racks!
 - ▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure!
-

Ensure that the following prerequisite is met:

- the erection racks are secured using four retaining pins **4** to prevent them from tipping.
- ▶ Attach auxiliary crane to the erection rack.
- ▶ Unpin the guy rods **Z** on the brackets **14**.
- ▶ Remove the spring retainer **13** and unpin the pin **12**.



B104150

6.5 Placing down the erection racks

Ensure that the following prerequisite is met:

- the erection rack **2** hangs from the auxiliary crane which holds it in position.
- the transport support **7** is folded in and pinned.



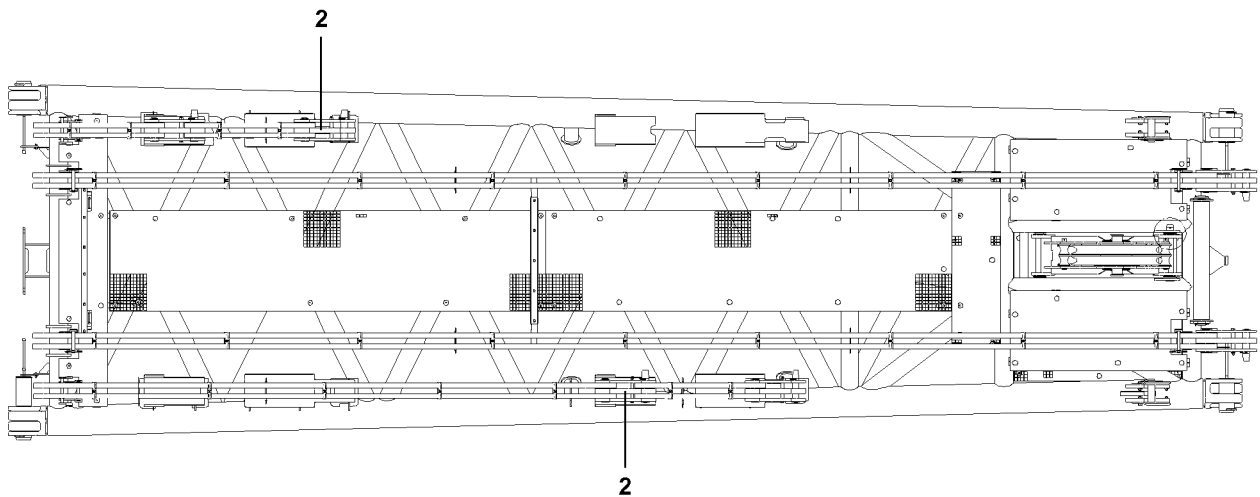
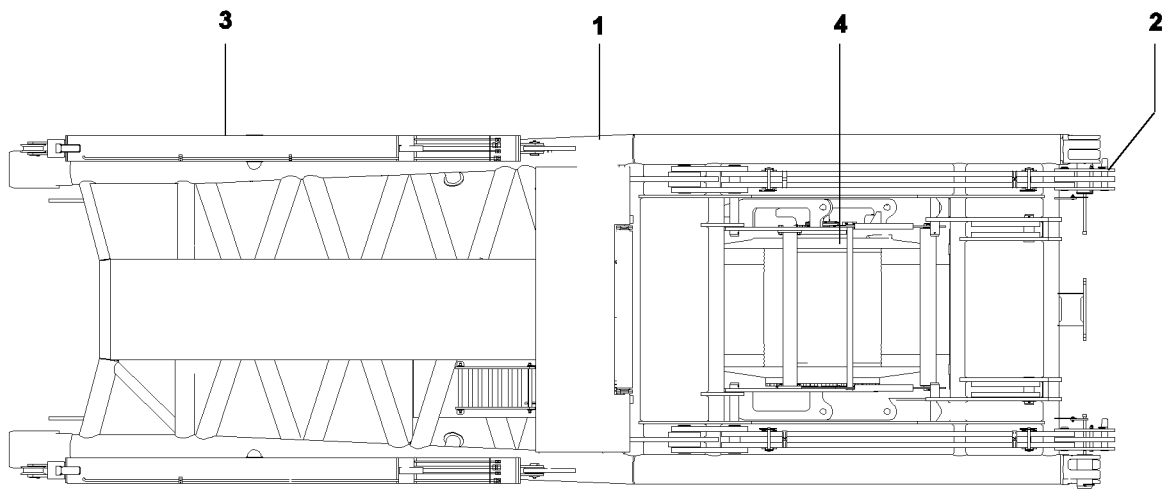
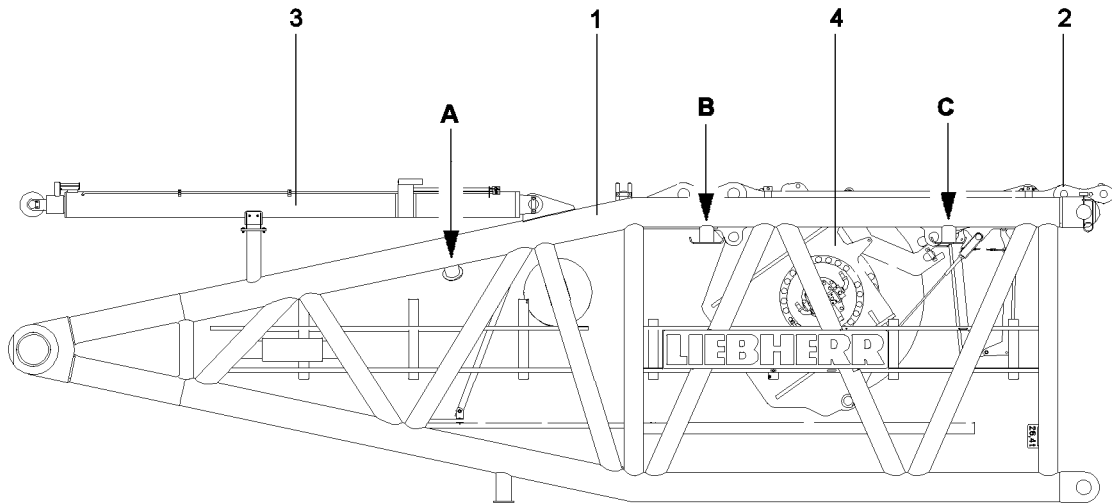
DANGER

Accident risk when disassembling the erection racks!

Before unpinning the retaining pins **4**, hang the erection racks onto the auxiliary crane, otherwise the erection racks can tip over and kill or severely injure personnel.

- ▶ Never unpin the retaining pins of unsecured or unsupported erection racks!
- ▶ It is prohibited for anyone to remain under the erection racks or within the complete danger zone during the pinning and unpinning procedure!

-
- ▶ Remove spring retainer **6** and washer **5**.
 - ▶ Unpin the retaining pin **4** and insert into the transport receptacle.
 - ▶ Lower the erection rack and fold out the transport support **7**.
 - ▶ Pin and secure the transport support **7** in this position.
 - ▶ Unpin the pin from hole **B** and pin in hole **A** and secure with washer **10** and spring retainer **9**.
 - ▶ Use the auxiliary crane to place the erection rack **2** on the transport support **7**.



B199414

1 General

1.1 Component overview on the S-pivot section

The S-pivot section consists of the components of S-pivot section welded construction, S-relapse cylinders, W-guy rods and winch 5 with rope

S-pivot section		
	Component	Weight
1	S-pivot section, welded construction	23.60 t
2	W-guy rods	0.87 t
3	S-relapse retainer	2.53 t
4	Winch 5 with rope	21.00 t
5	Assembly platform, foldable	–
Total weight:		48.00 t

1.2 Fastening points on the S-pivot section

Fastening points	
A + B	for S-pivot section without winch
A + C	for S-pivot section with winch and rope

1.3 W-guy rods on S-adapter

The W-guy rods **2** are placed and secured for transport and the S-adapter. In S/SL-operation, the W-guy rods **2** must be removed.

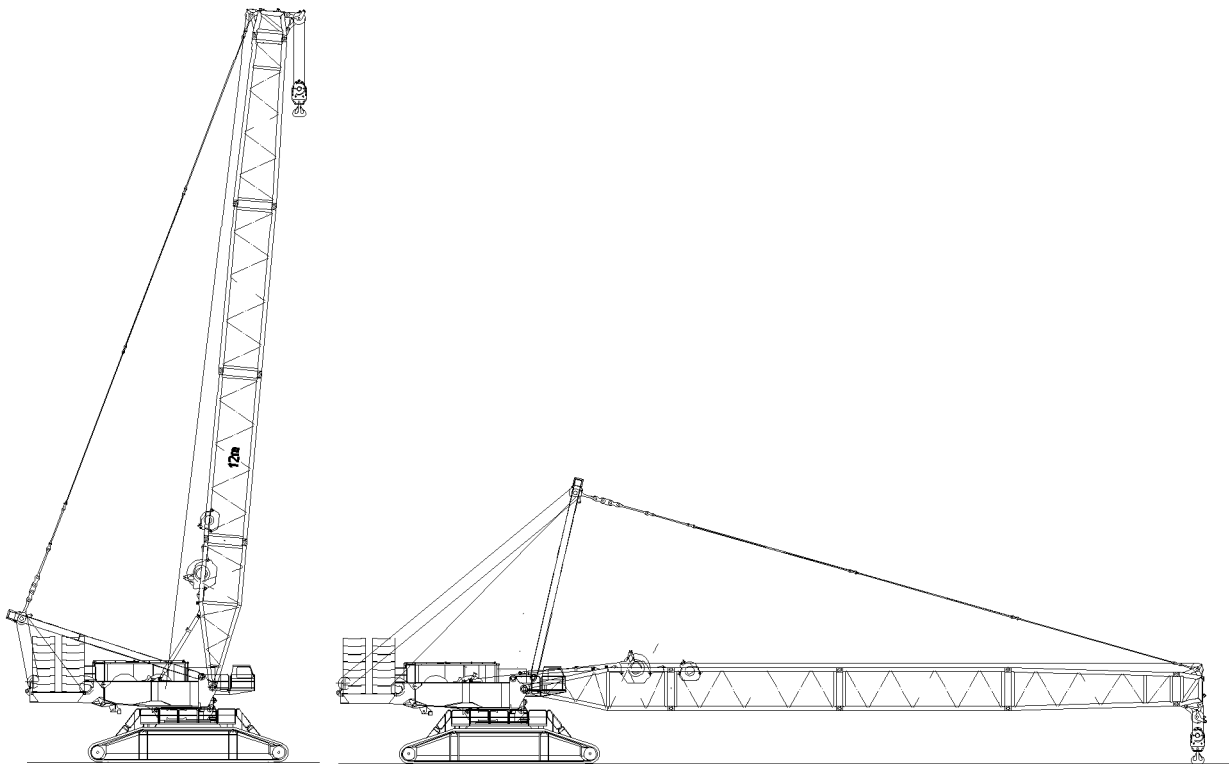
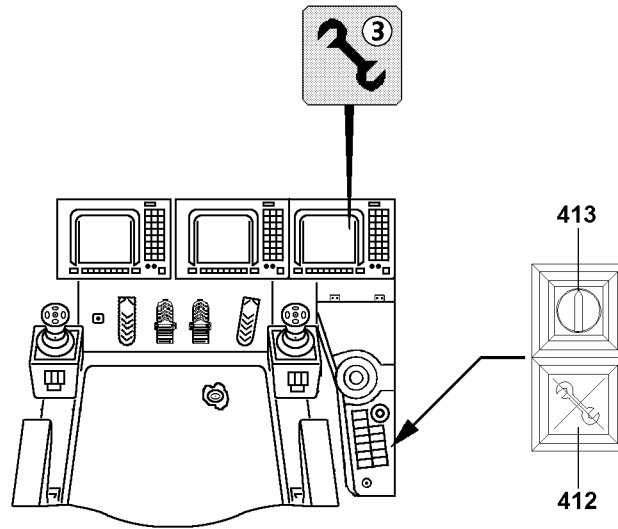


DANGER

Danger of accident!

If the W-guy rods **2** are not removed, then they will fall down and fatally injure personnel!

► Remove the W-guy rods **2** on both sides.



2 Assembly



DANGER

Danger of falling!

During assembly and disassembly, assembly personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening 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 on the ground or using such aids, then assembly personnel must be secured with suitable personal protective equipment (such as safety belts) to protect them against falling!



DANGER

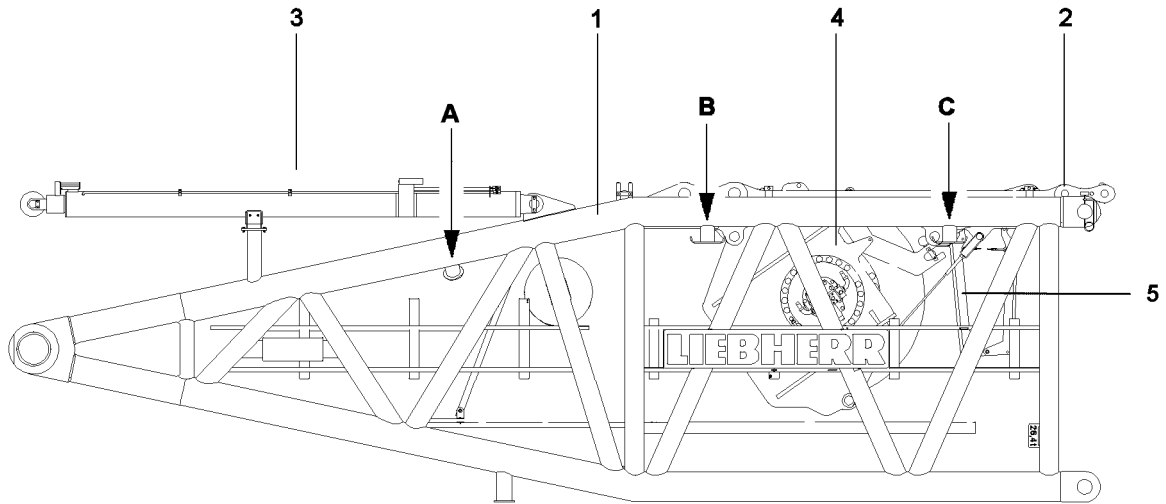
Danger of accident at assembly / disassembly of booms!

When you disassemble unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel.

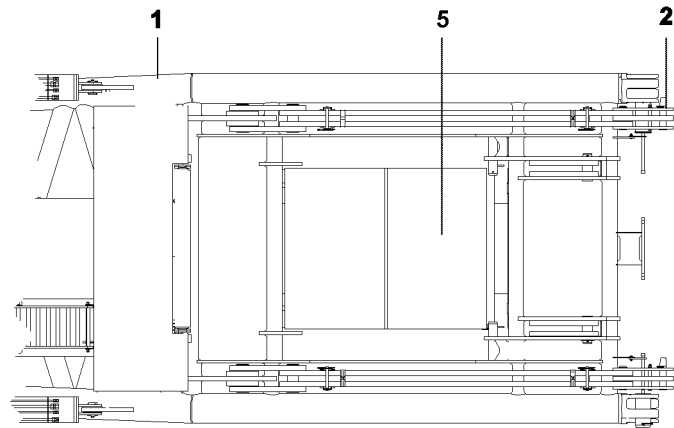
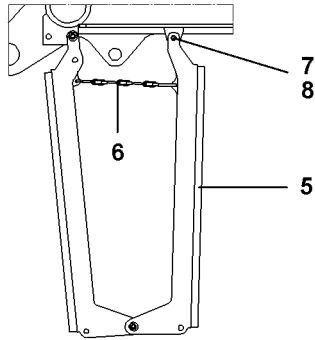
- ▶ Never unpin the pins under unsecured or unsupported booms!
- ▶ Never unpin the connecting pins on unsecured or unsupported booms!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!
- ▶ Secure the pins in the bearing points as well as in the receptacles!
- ▶ Do not lean the ladder against the component being disassembled!

Make sure that the following prerequisites are met:

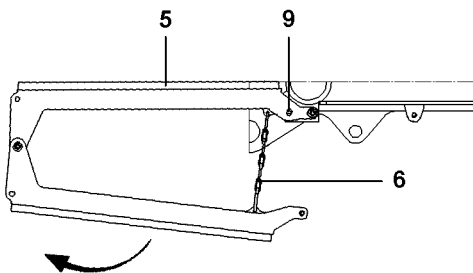
- The crane is aligned in horizontal direction.
- The counterweight has been installed on the turntable according to the load chart.
- The LICCON overload protection has been set according to the data in the load chart.
- An auxiliary crane is available.



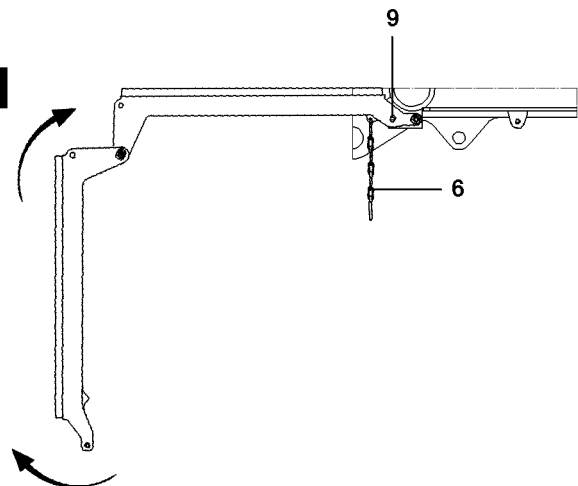
1



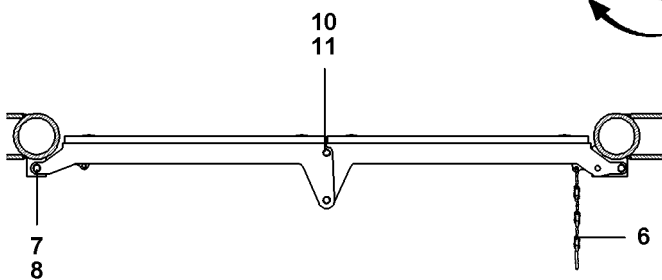
2



3



4



B103310

2.1 Assembling the assembly platform

Make sure that the following prerequisites are met:

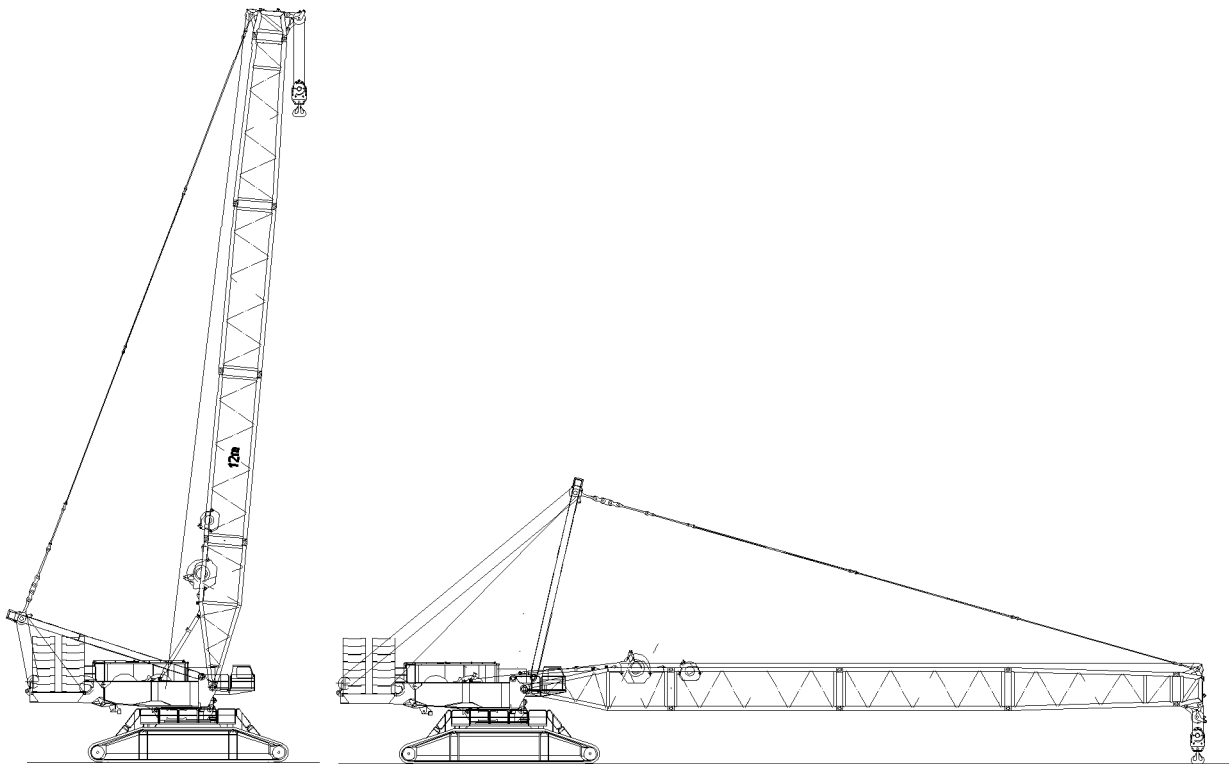
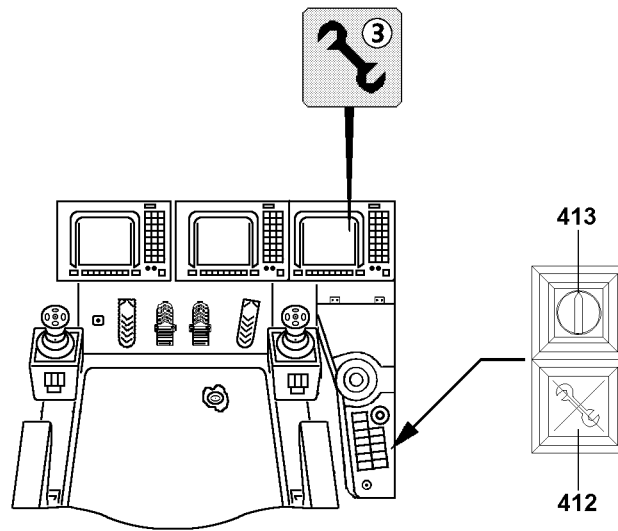
- Winch 5 is not installed.
- The assembly platform 5 is folded together and connected with a safety chain 6.
- ▶ Hang the folded assembly platform 5 on the auxiliary crane.
- ▶ Release the spring retainers 7 and unpin the pins 8.
- ▶ Pull the assembly platform 5 upward to horizontal position and insert and secure the retaining pins 9.



DANGER

Danger of falling!

- ▶ The assembly platform 5 may only be accessed when it is completely folded open, pinned and secured!
-
- ▶ Hang the auxiliary crane on the folded down section of the platform.
 - ▶ Remove the chain 6 and lower the lower section and then pull up to the horizontal position and pin.
 - ▶ Lock the platform in the center and pin.
 - ▶ Insert the locking pin 10 and secure with spring retainer 11.
 - ▶ Insert the pin 8 and secure with spring retainer 7.



2.2 Installing the S-boom

2.2.1 Turning the turntable into assembly position



DANGER

The crane can topple over!

If the following conditions are not met before turning the turntable without installed derrick or boom, the crane can topple over and fatally injury personnel!

- ▶ Observe the maximum permissible ballast variations in chapter 3.06!
- ▶ Observe the data in the erection and take down charts!

- ▶ Turn the turntable in longitudinal direction of the crawler travel gear or to the side.

2.2.2 Adding the operating mode “Assembly”



DANGER

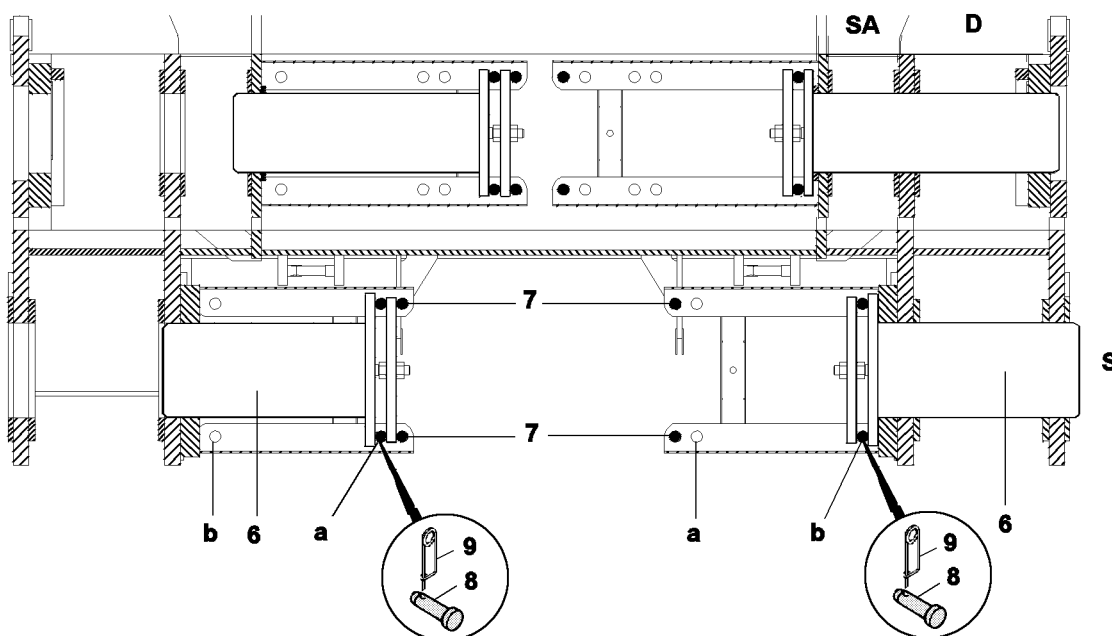
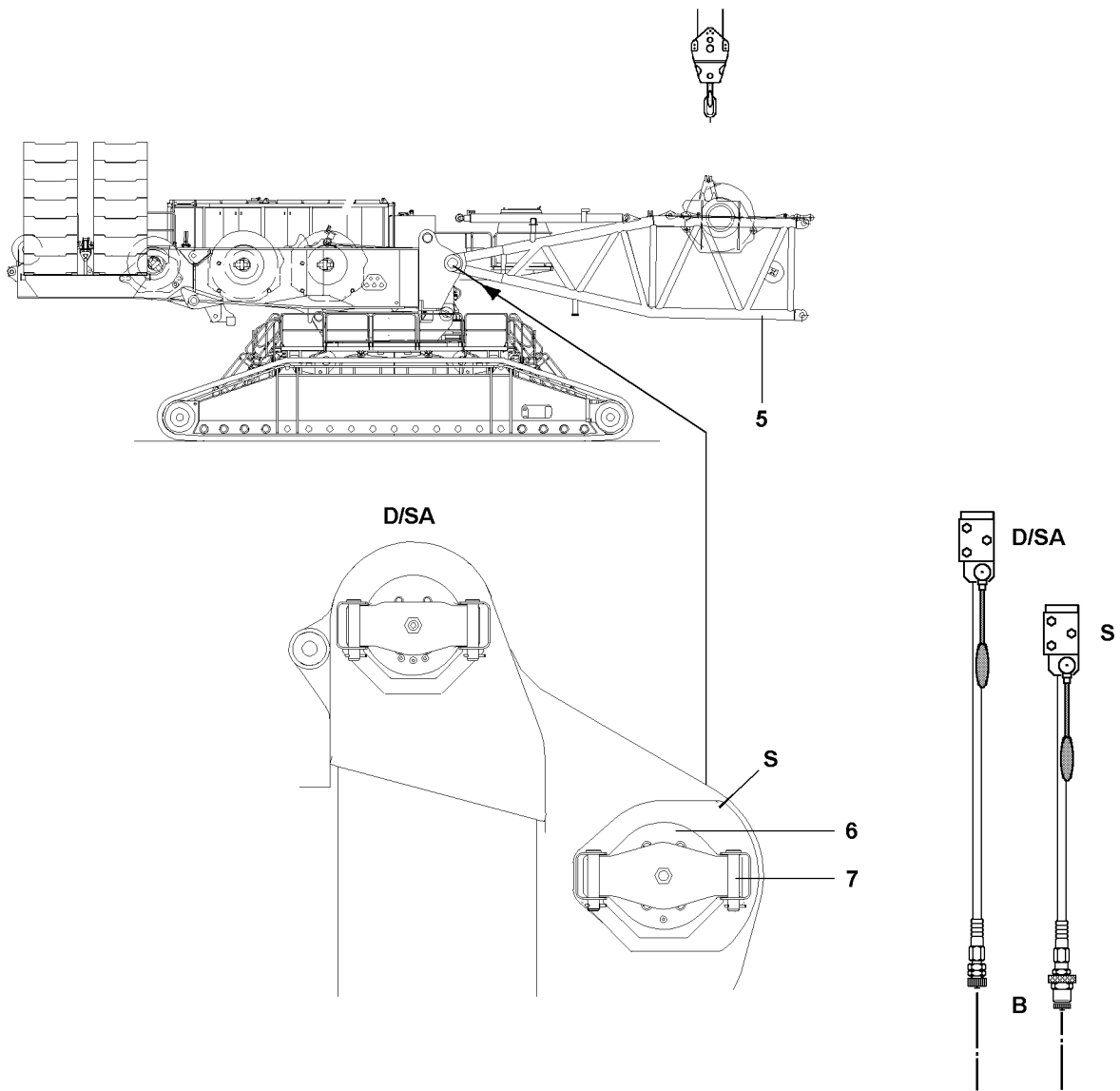
Danger of fatal injury at crane operation with turned on assembly key button.

- ▶ The actuation of the assembly key button **413** is only permitted for assembly tasks!
- ▶ The assembly key button may only be operated by persons, who are aware of the consequences of a bypass!
- ▶ If the assembly key button **413** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **413** turned on is strictly prohibited!
- ▶ The assembly key button **413** must be removed immediately after carrying out the assembly work and handed to an authorized person!

- ▶ Actuate the assembly key button **413**.

Result:

- The LICCON overload protection is inactive.
- The indicator light in the button **412** lights up.
- The assembly icon **3** in the LICCON monitor blinks.
- An acoustical signal sounds.
- The red beacon on the crane cab blinks.



B199416

2.3 Assembling the S-boom



DANGER

General danger notes!

- ▶ Support the S-boom during assembly and disassembly with suitable materials!
- ▶ All pins must be secured after assembly!
- ▶ The guy rods must be checked regularly! See chapter 8.15.

2.3.1 Pinning the D-pivot section

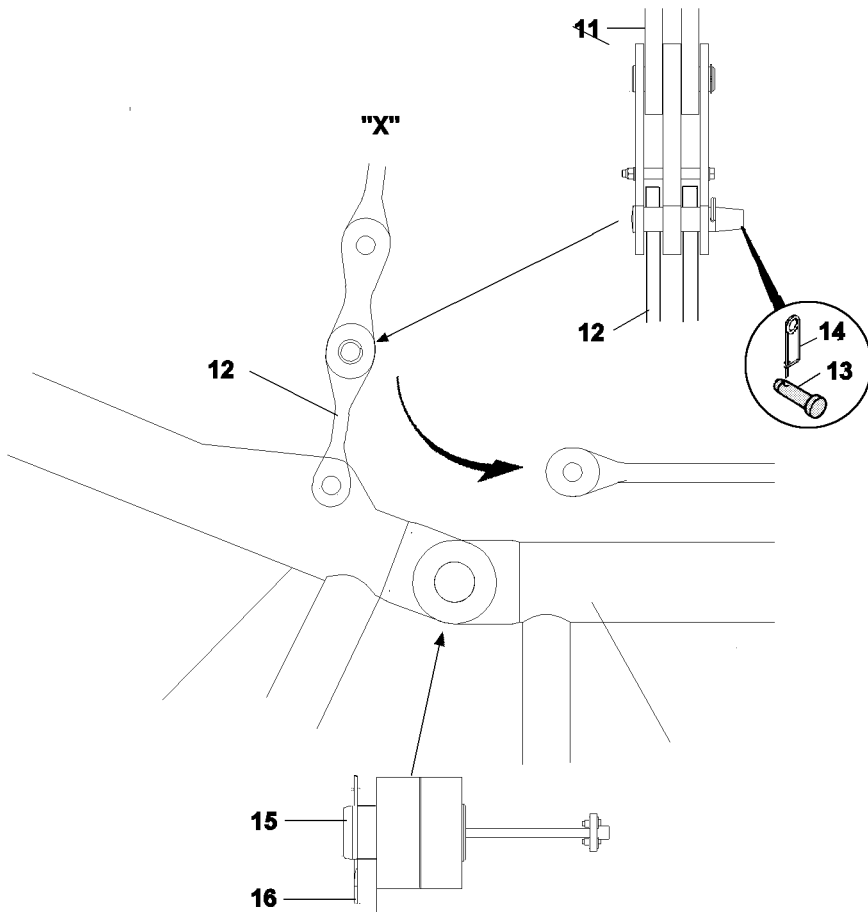
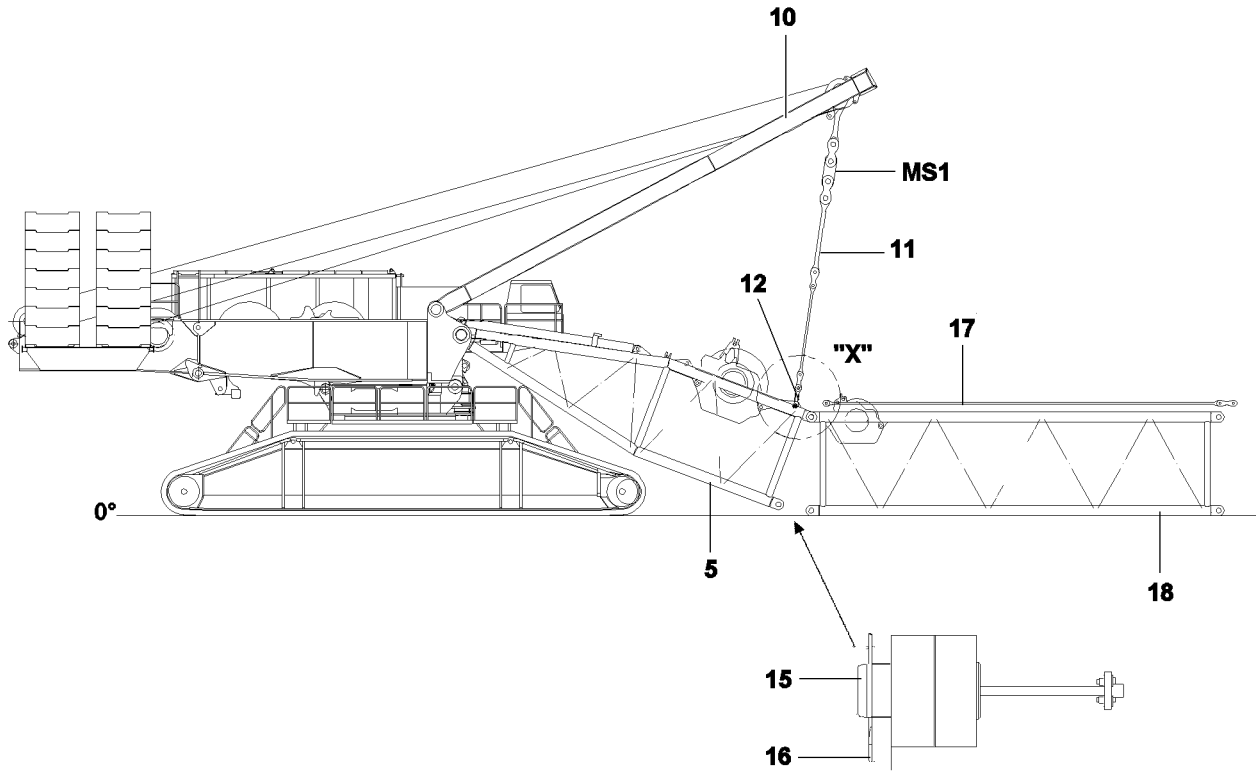
Make sure that the following prerequisites are met:

- The pins **7** are inserted and secured.
- The pins **8** are pinned and secured in the bores **a**.
- ▶ Hook the S-pivot section **5** onto the auxiliary crane and swing it in to the pin points on the turntable and affix.



Note

- ▶ The hand levers **S**, **D/SA** and the hydraulic connections **B** for the pin pulling device are on the left side of the turntable.
- ▶ Establish the hydraulic connections from the pin pulling device to the turntable
- ▶ Pin the S-pivot section **5** on both sides with the pin pulling device:
- ▶ Move the hand lever **S** and push the pins **6** all the way out.
- ▶ Unpin the pins **8** from the bores **a** and insert in bores **b** and secure.
- ▶ Place the S-pivot section **5** on the support on the ground and remove the auxiliary crane.



B199415

2.3.2 Assembling the S-lattice sections on the S-pivot section



DANGER

General danger notes!

- ▶ Support the S-boom during assembly and disassembly with suitable materials!
- ▶ All pins must be secured after assembly!
- ▶ The guy rods must be checked regularly! See chapter 8.15.

To pin the S-lattice sections with the pin pulling device, see also chapter 5.30.

- ▶ Lower the SA-frame **10** to the front.
- ▶ Pin the guy rods **11** on both sides with the brackets **12**: Insert the pin **13** and secure with spring retainer **14**.
- ▶ Release the transport retainers for the guy rods **17** on the lattice sections.
- ▶ Assemble the S-boom to the required length and pin on the S-pivot section **5 on top**: Insert the pin **15** and secure with spring retainer **16**.



Note

- ▶ The S-guy rods must be assembled and secured according to the separately supplied assembly drawings. The numbering on the assembly drawings must be identical to the numbering on the guy rods.

The guy rods **17** are placed and secured for transport on the S-lattice sections. Before assembly, the transport retainers must be released.

- ▶ Release the transport retainers of the S-guy rods.



DANGER

Damage to crane!

If the following conditions are not met, personnel can be fatally injured or the crane can be damaged.

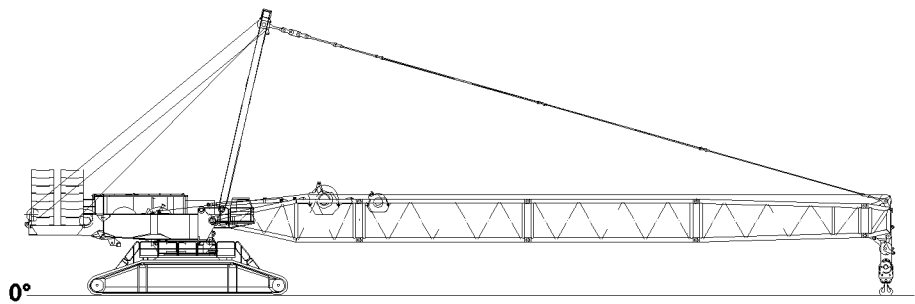
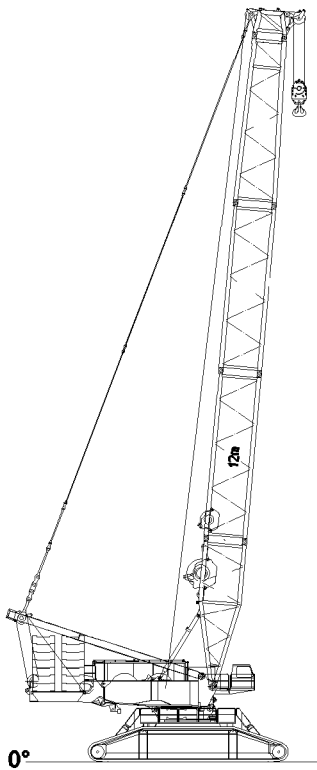
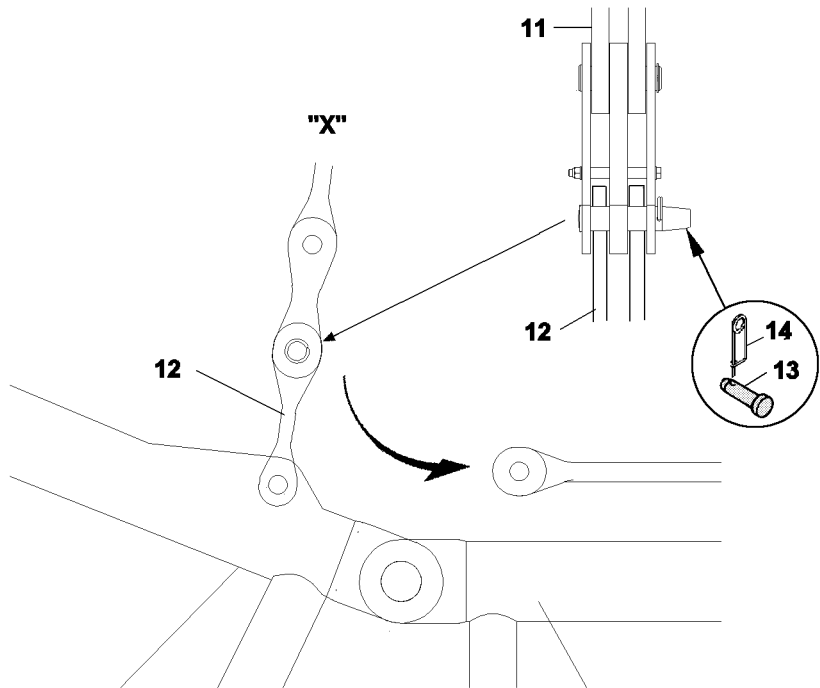
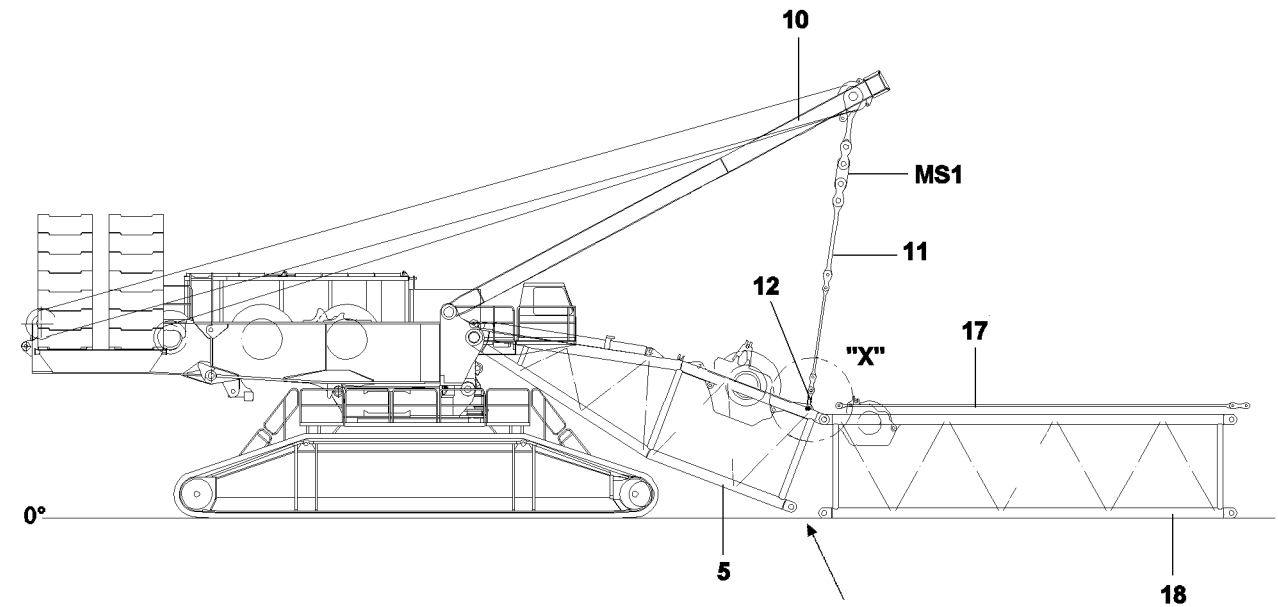
- ▶ The maximum permissible total force on test point **MS1** may not exceed 150 t.
- It is permissible to lift the following maximum boom lengths with the SA-frame **10**:
- ▶ S90 m with assembled S-guy rods and WA-frame 2 guy rods.
 - ▶ SL 102 m with assembled S-guy rods.
 - ▶ The end section may not be raised, it must rest on the ground.

- ▶ Pull the S-pivot section **5** up with the SA-frame **10** and pin on both sides **on the bottom**: Insert the pin **15** and secure with spring retainer **16**.



Note

- ▶ The ACTUAL force on test point **MS1** is shown on the LICCON monitor 1. Note the displayed ACTUAL force.
- ▶ When **unpinning** at the same ACTUAL force on test point **MS1**, tension the guying on the SA-frame **10**!



B199420

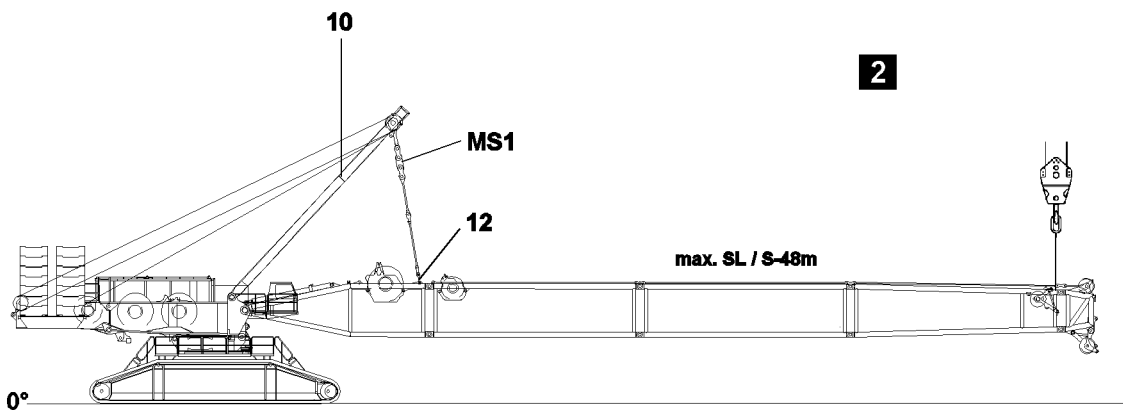
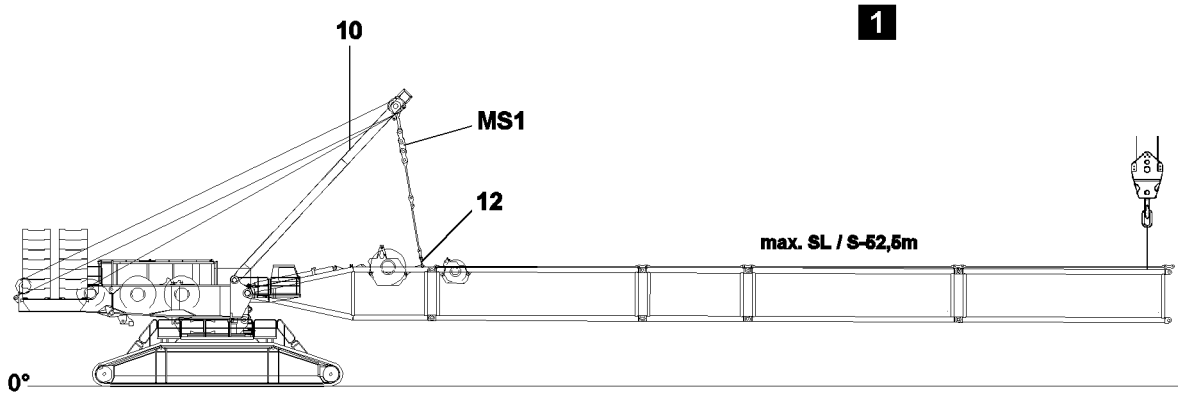
- ▶ Relieve the guy rods **11** by lowering the SA-frame **10**.

**DANGER**

The boom can suddenly fold down!

If the brackets **12** are unpinned, before the lower pins **15** are pinned, then the boom can fold down and kill people!

- ▶ Do not unpin pin **13** until the lower pin **15** has been pinned.
-
- ▶ Unpin the guy rods at the brackets **12**: Release and unpin the pin **13**.
 - ▶ Pin the guy rods **11** with the guy rods **17**: Insert the pin **13** and secure with spring retainer **14**.
 - ▶ Tension S-boom stay ropes.



B199943

2.4 S / SL boom "flying" assembly

2.4.1 S / SL boom "flying" assembly - illustration 1



DANGER

General danger notes!

- ▶ Support the S-boom during assembly and disassembly with suitable materials!
- ▶ All pins must be secured after assembly!
- ▶ The guy rods must be checked regularly! See chapter 8.15.



DANGER

Damage to the crane!

If the following conditions are not met, personnel can be fatally injured or the crane can be damaged.

- ▶ The maximum permissible total force on test point **MS1** may not exceed 200 t.
- ▶ A turntable counterweight of at least 200 t must be installed on the turntable.

It is permissible to lift the following maximum boom lengths with the SA-frame **10**:

- ▶ S/SL52.5 m without end section with assembled S-guy rods and WA-frame 2 guy rods.

2.4.2 S / SL boom "flying" assembly - illustration 2



DANGER

Damage to the crane!

If the following conditions are not met, personnel can be fatally injured or the crane can be damaged.

- ▶ The maximum permissible total force on test point **MS1** may not exceed 280 t.
- ▶ A turntable counterweight of at least 200 t must be installed on the turntable.

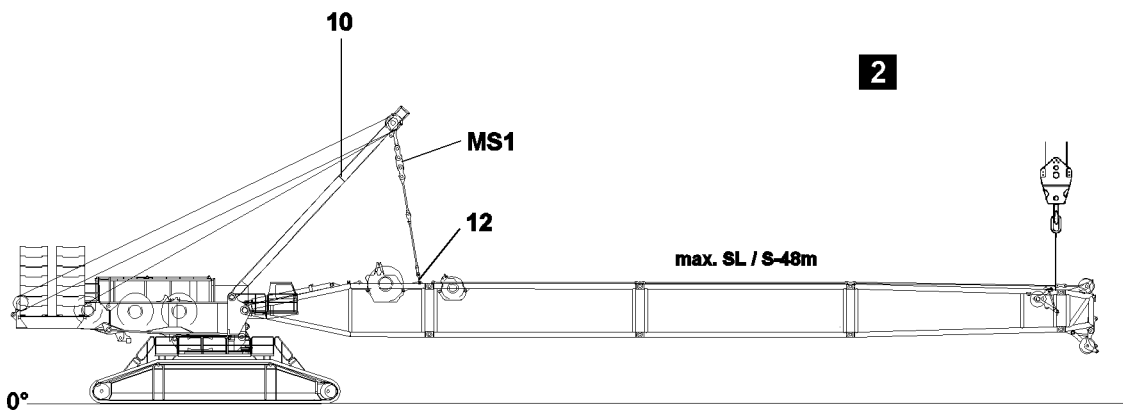
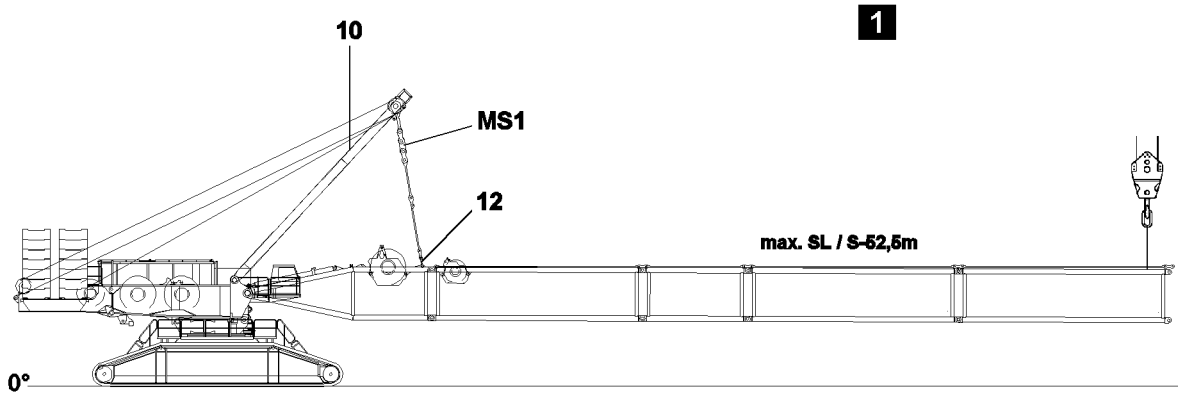
It is permissible to lift the following maximum boom lengths with the SA-frame **10**:

- ▶ maximum S48 m with end section, S-guy rods, WA-frame 2 guy rods without hook block.
- ▶ maximum SL 48 m with end section and S-guy rods without hook block.



Note

- ▶ The ACTUAL force on test point **MS1** is shown on monitor 1.



B199943

2.4.3 Flying assembly

Make sure that the following prerequisites are met:

- The S-pivot section is pinned and secured on the SA-frame guy rods.
- The S-pivot section is guyed in horizontal position.
- An auxiliary crane is available.



DANGER

Danger of accident at assembly / disassembly of booms!

When you assemble or disassemble unsecured or unsupported booms, then the boom can fall down and kill or severely injure personnel.

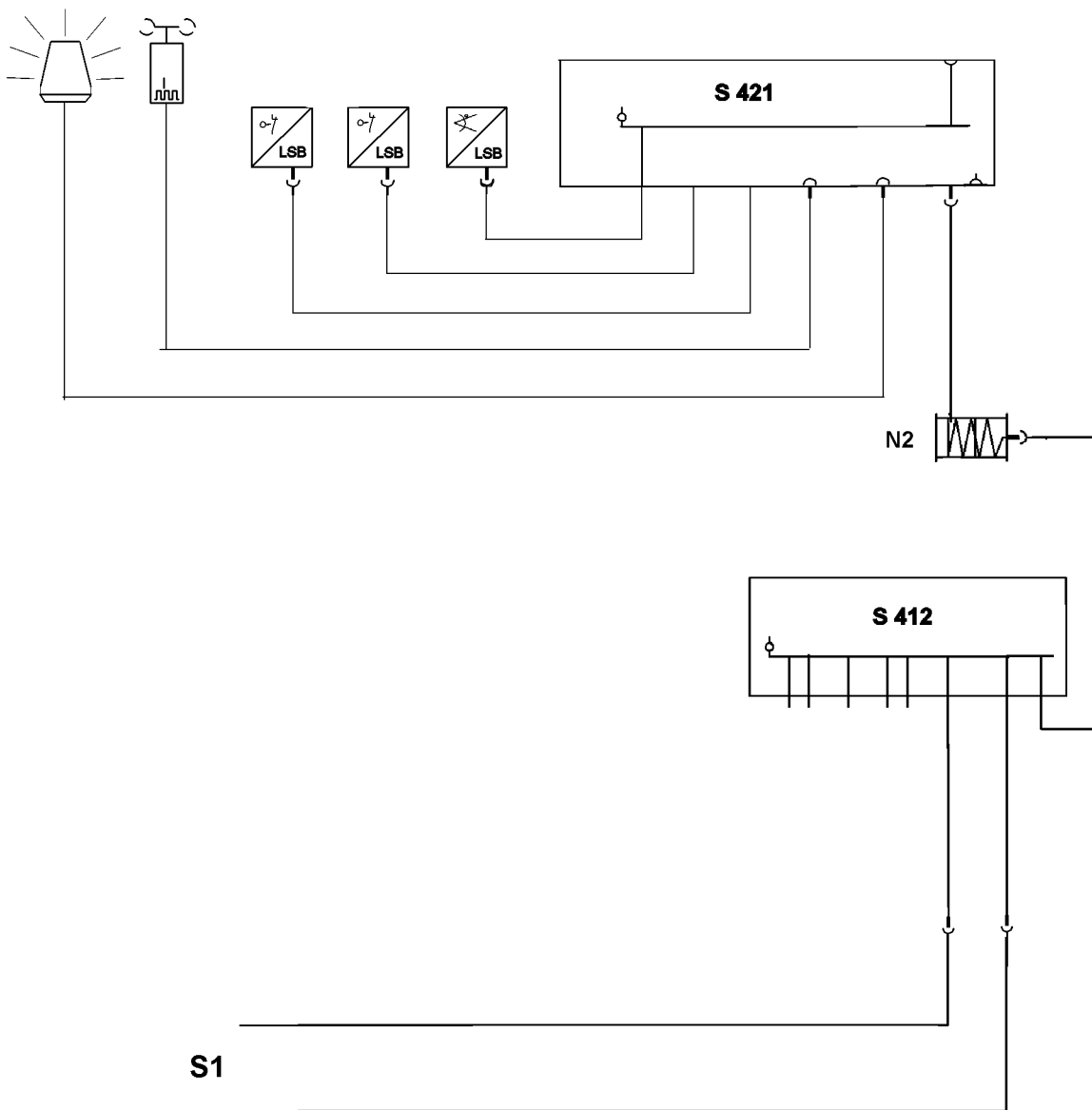
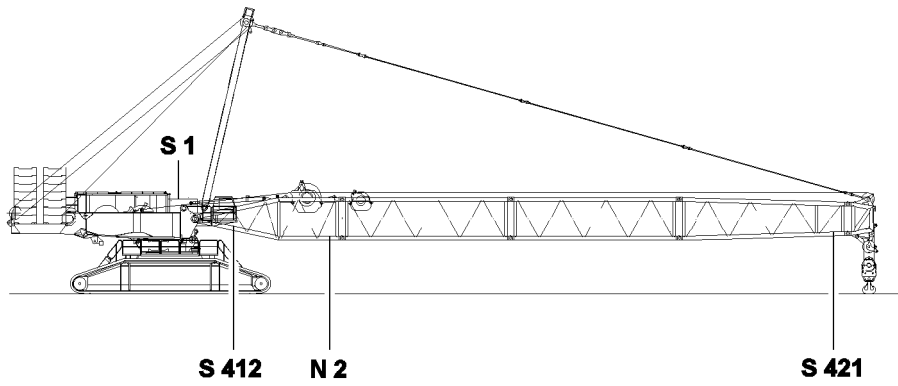
- ▶ Never pin or unpin the pins under unsecured or unsupported booms!
 - ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure!
 - ▶ Safely secure the pins in the bearing points as well as receptacles!
-
- ▶ Pin and secure individual intermediate sections or the completely assembled boom on the S-pivot section.
 - ▶ Hang the auxiliary crane on the end section or support the boom with solid materials.



DANGER

The boom can suddenly fold down!

- ▶ If the SA-frame guy rods are unpinned before the auxiliary crane is attached on the end section and held by it, the boom can fall down and kill personnel!
-
- ▶ Relieve the guy rods by lowering the SA-frame.
 - ▶ Unpin the SA-frame guy rods from the S-pivot section only when the boom is held by the auxiliary crane.
 - ▶ Pin the SA-frame guy rods with the guy rods from the end section and secure.



B103308

2.5 Establishing the electrical connections

Make sure that the following prerequisite is met:

- The S-boom is completely assembled.
- ▶ Make the electrical connection from the control cabinet **S1** to the terminal box **-S412** on the S-pivot section.
- ▶ Establish the electrical connection from the cable drum **N2** on the S-pivot section to the terminal box **-S421** on the S-end section.



CAUTION

Damage to the electrical connection on the cable drum!

If the electrical connection from the cable drum **N2** to the terminal box **-S412** on the S-pivot section is established first before the connection to the terminal box **-S421** on the S-end section, the electrical connection can be damaged when spooling out the cable drum.

- ▶ Establish the electrical connection from the cable drum **N2** to the terminal box **-S421** first and then the electrical connection from the terminal box **-S412** to the cable drum **N2**!
-
- ▶ Establish the electrical connection from the terminal box **-S412** on the S-pivot section to the cable drum **N2**.
 - ▶ Make sure that all electrical connections on the boom are established.

B195219

2.6 Function check

Make sure that the following prerequisites are met:

- All electrical connections have been made.
- The appropriate operating mode is set.

2.6.1 Wind speed sensor*

- ▶ Test the movement and the function of the wind speed sensor.

2.6.2 Airplane warning light*

- ▶ Switch on flashing beacon and visually inspect that it functions.

2.6.3 Limit switch, general



Note

- ▶ The limit switch functions have to be checked individually before erection!
 - ▶ In the test system, the functions of the limit switch initiators must be checked as described in the separate "Diagnostics manual".
 - ▶ The limit switch initiators are checked manually as follows.
-

2.6.4 Hoist limit switch

When replacing or changing the hoist limit switch (HES), the HES must have the correct bus address and the correct software version in order to be recognized again by the bus system (LSB).

- ▶ Actuate the hoist limit switch manually.

Result:

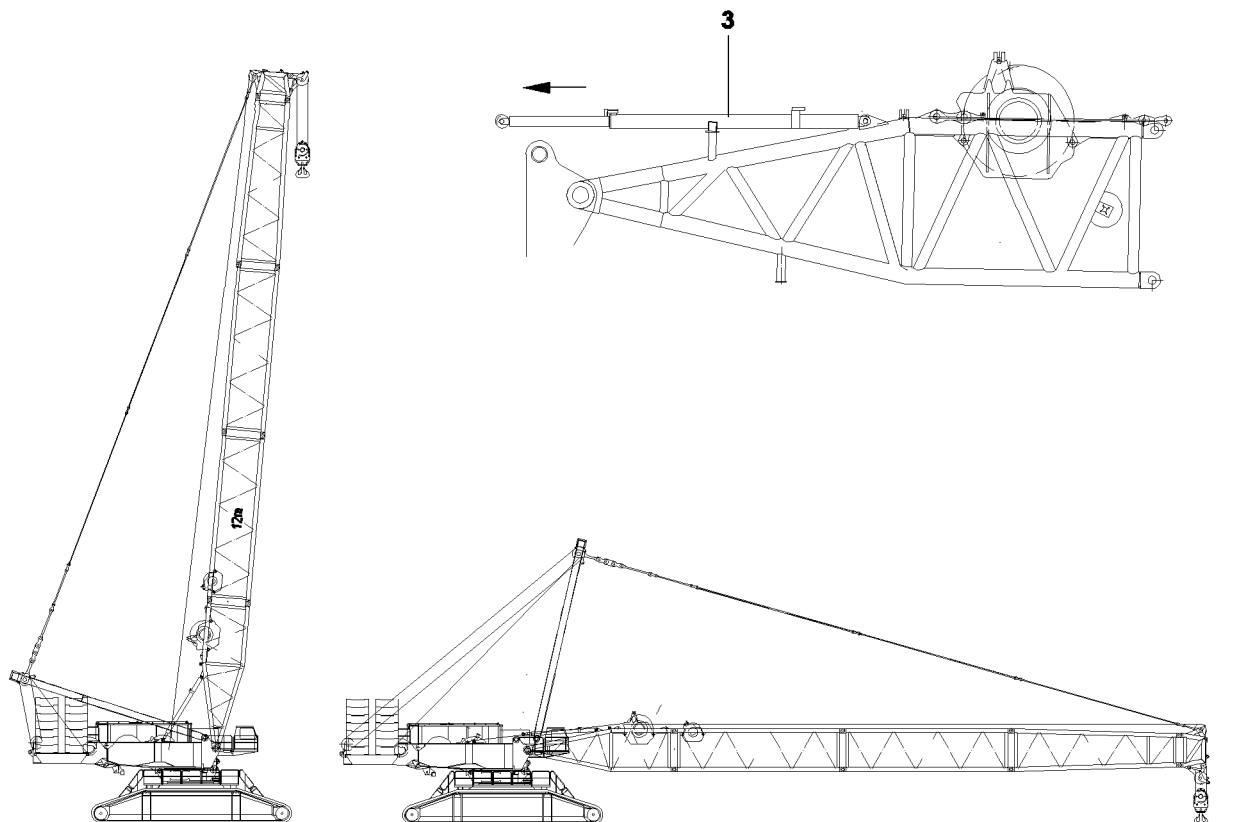
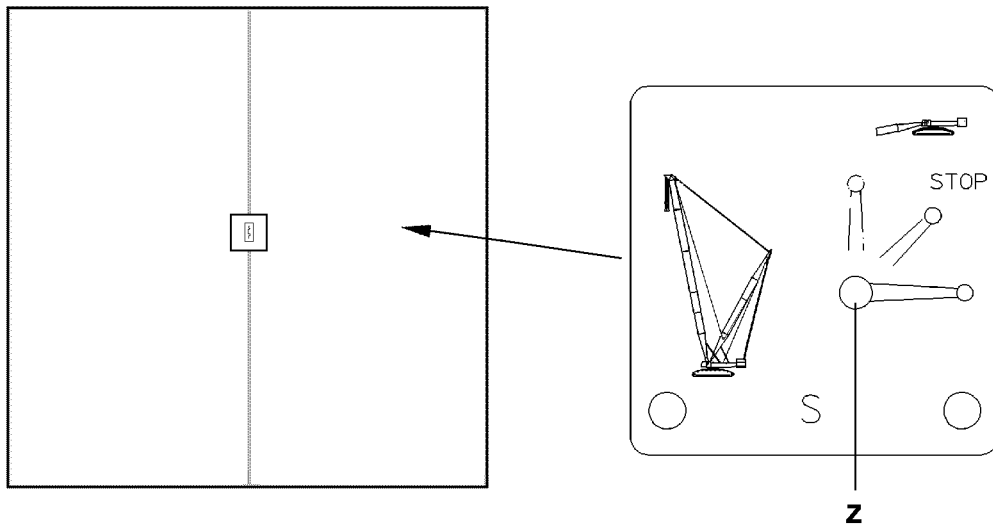
- The icon appears on the LICCON monitor.
- The **spool up function** of the hoist winch turns off.

2.6.5 Limit switch S-boom, "steepest" position, relapse cylinder

- ▶ Cover the limit switch actuators individually with a metal plate. See chapter 8.12.

Result:

- The icon appears on the LICCON monitor.
- The **spooling up** motion of the S-control winch turns off.



B199417

2.7 Erecting the boom



DANGER

The crane can topple over!

If the following conditions are not met before erecting the boom, the crane can topple over and fatally injure personnel!

- ▶ Observe the safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!
- ▶ Move the relapse cylinder out before erection!

Make sure that the following prerequisites are met:

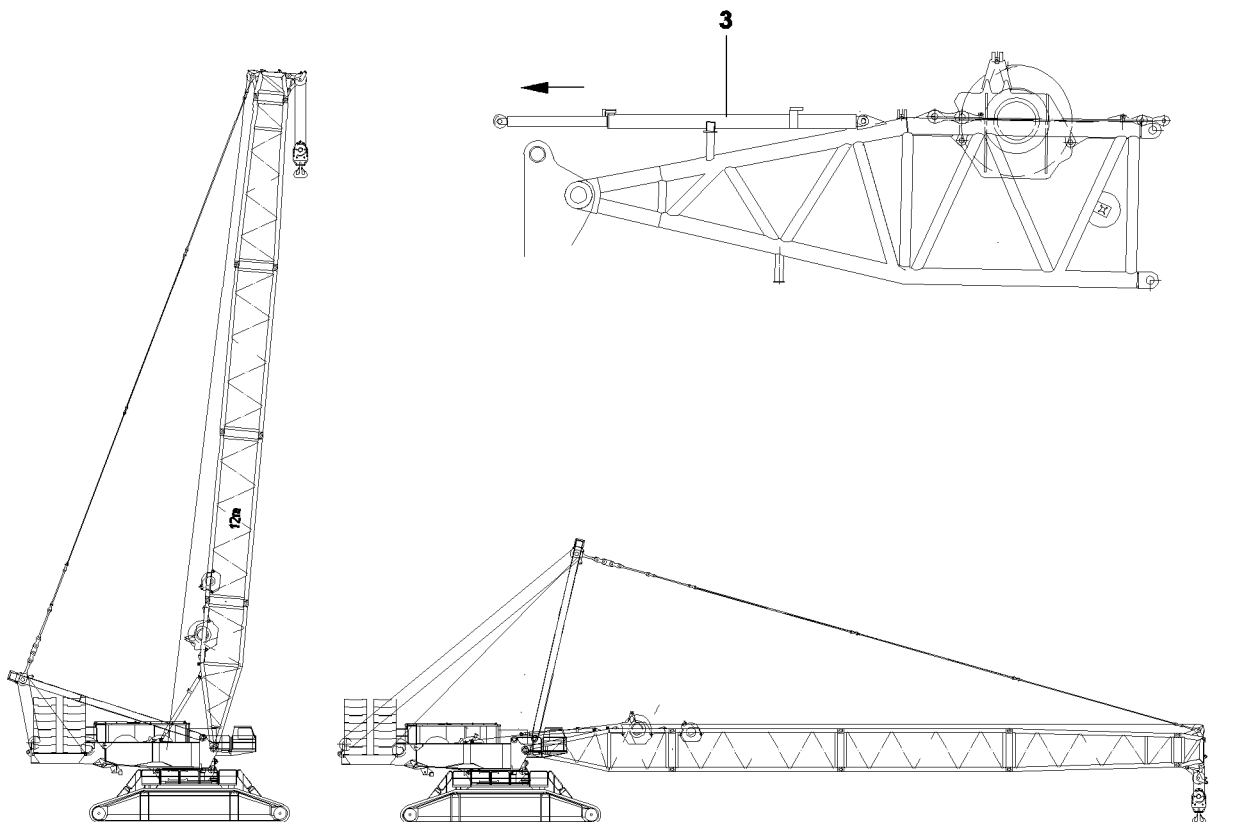
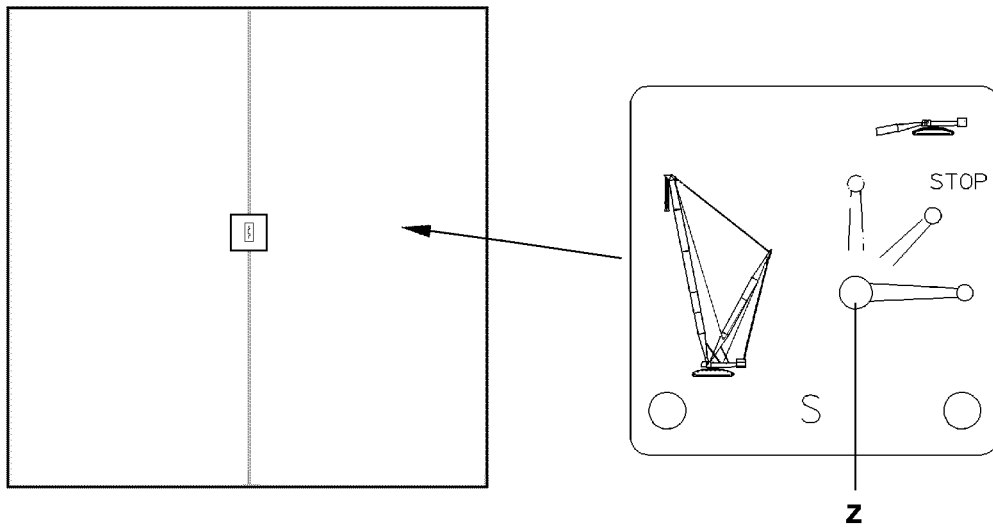
- The crane is aligned in horizontal direction.
- All electrical connections have been made.
- All limit switches are functioning.
- The counterweight has been installed on the turntable according to the load chart.
- All pin connections have been secured.
- The hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins.
- The LICCON overload protection has been set according to the data in the load chart.
- The LICCON overload protection settings have been compared with the current crane configuration.
- The assembly key button **413** is actuated.



DANGER

The crane can topple over!

- ▶ Observe the data in the erection and take down charts!
- ▶ It is not permitted to turn the crane during erection!
- ▶ Do not allow slack rope to form on the control winch!
- ▶ The ball valve cabinet must be locked! Always pull the key and hand it to an authorized person!



2.7.1 Extending the S-relapse cylinder



Note

- ▶ The ball valve **Z** is in a locked compartment on the left hand side of the turntable. Always pull the key and hand it to an authorized person!

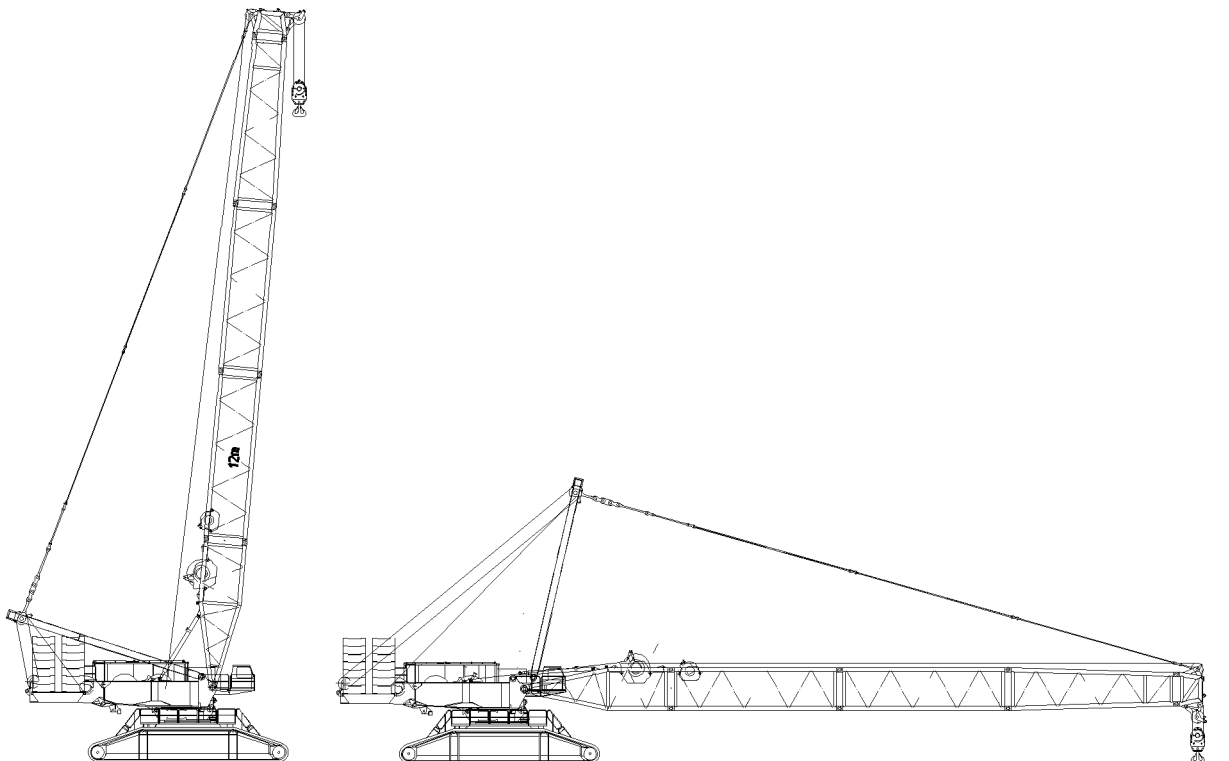
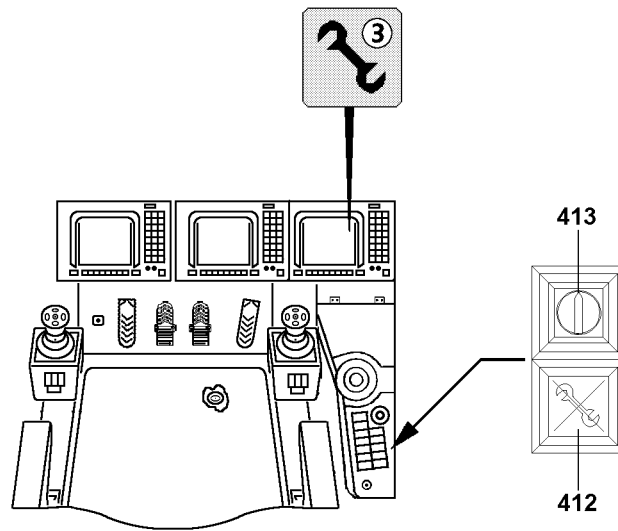
Ball valve position	
Horizontal	Extend piston rod, crane operation
Vertical	Retract piston rod, assembly
45 degree, stop	Piston rod retraction and extension is locked, transport position

Make sure that the following prerequisites are met:

- All hydraulic connections have been made.
- ▶ Move the ball valve **Z** into horizontal position.

Result:

- The piston rod of the S-relapse cylinder **3** extends.



2.7.2 Erection procedure



DANGER

The crane can topple over!

- ▶ Observe the data in the erection and take down charts!
- ▶ It is not permitted to turn the crane during erection!

- ▶ Luff up the S-boom until the S-end section lifts off the ground.
- ▶ Reeve the hook block properly and attach the hoist limit switch weight.
- ▶ Luff the S-boom up until the lowest operating position is reached.



DANGER

The crane can topple over!

- ▶ When the lowest operating position is reached, the assembly key button **413** must be turned off immediately.
- ▶ The assembly key button **413** bypasses the safety devices!
- ▶ The radii specified in the load chart may neither fall below nor exceed the specified loads!

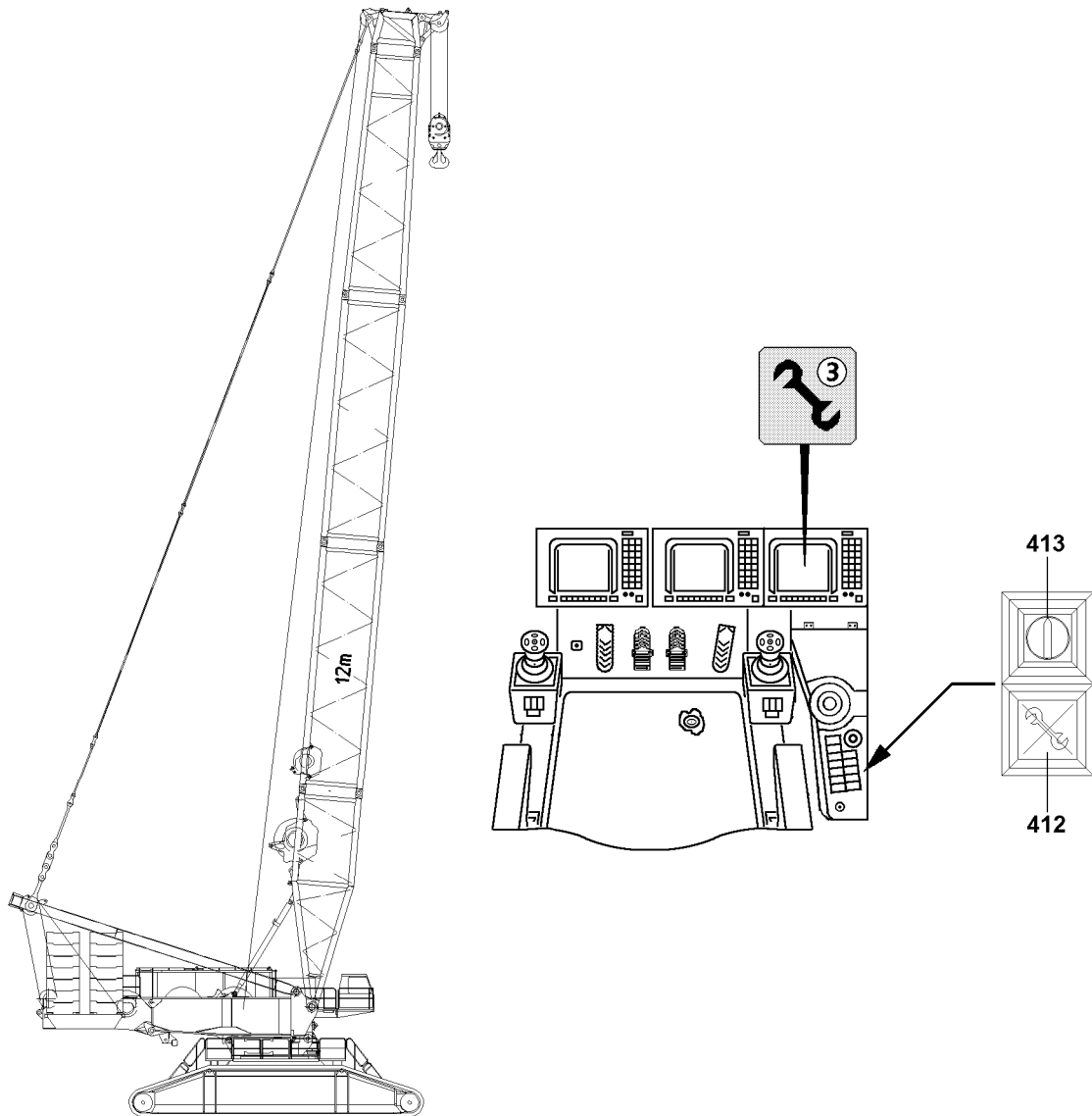


Note

- ▶ The operating position is reached if the blinking displays turn off and a load display appears in the “maximum load” icon instead of question marks (???).
- ▶ Turn the assembly key button **413** off by pressing the button **412**.

Result:

- The LICCON overload protection is active.
- The Assembly icon **3** on the LICCON display turns off.
- The acoustical signal turns off.
- The red beacon on the crane cab is off.



3 Crane operation

Observe the notes in chapter 4.05, 4.08 and 5.01.

Make sure that the following prerequisites are met:

- The LICCON overload protection has been set according to the data in the load chart.
- the assembly key button **413** has been turned off by pressing the button **412**,
The Assembly icon **3** on the LICCON display is off.



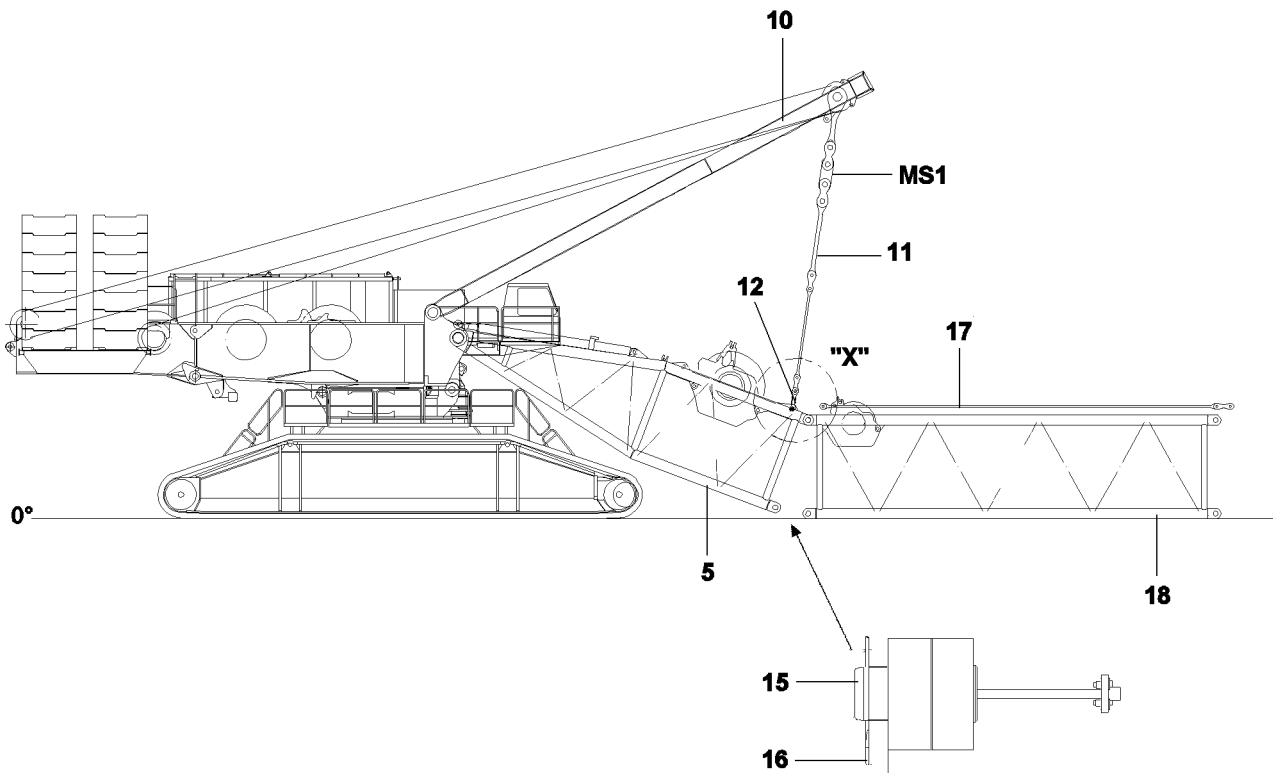
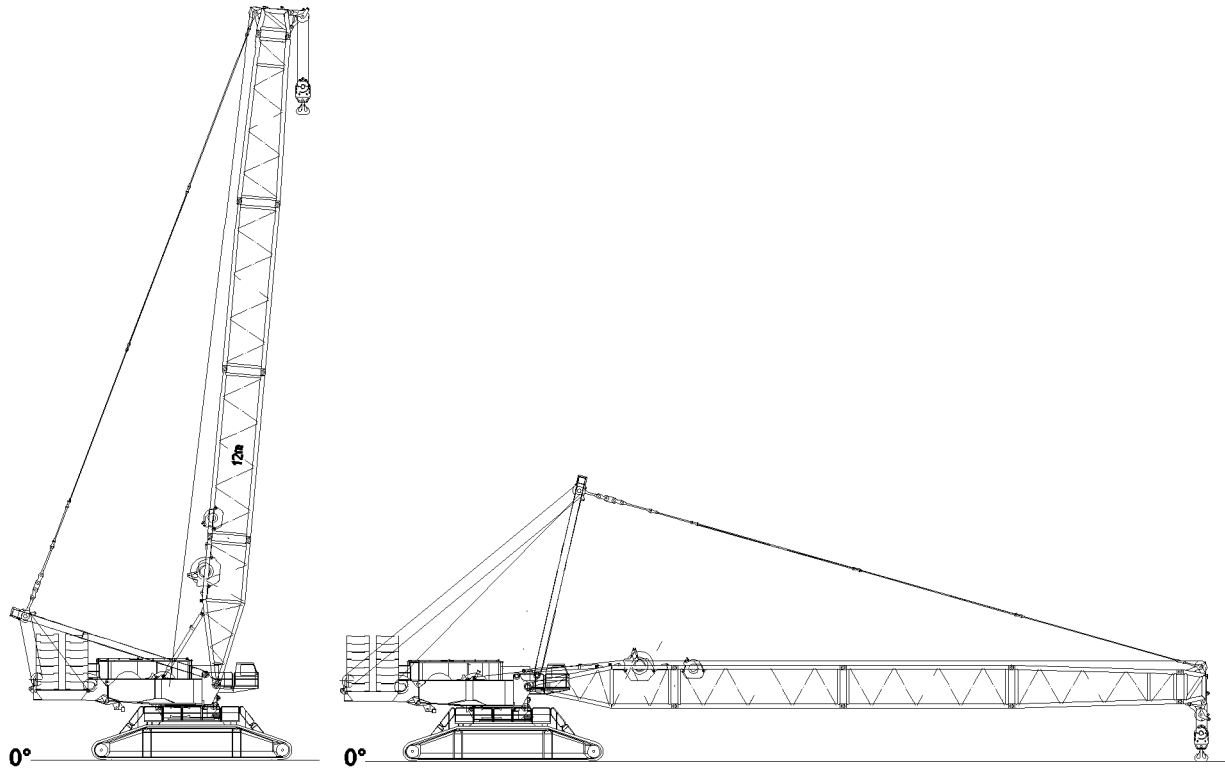
DANGER

The crane can topple over!

- ▶ Check the horizontal position of the crane before and during operation.
 - ▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset, if necessary, before resuming crane operation.
-

3.1 Checking the settings

- ▶ Check the function of the overload protection by running against the operating positions on top and bottom.
- ▶ Check the hoist limit switch by running against the hoist limit switch weight.
- ▶ Check the function of the limit switches on the relapse cylinders.



B199422

4 Disassembly



DANGER

Danger of falling!

During assembly and disassembly, assembly personnel must be secured with appropriate aids to prevent them from falling. If this is not observed, assembly personnel could fall and suffer life-threatening 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 on the ground or using such aids, then assembly personnel must be secured with suitable personal protective equipment (such as safety belts) to protect them against falling!



DANGER

Danger of accident at assembly / disassembly of booms!

When you disassemble unsecured or unsupported booms, then the booms can fall down and kill or severely injure personnel.

- ▶ 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 bearing points as well as in the receptacles!
- ▶ Do not lean the ladder against the component being disassembled!

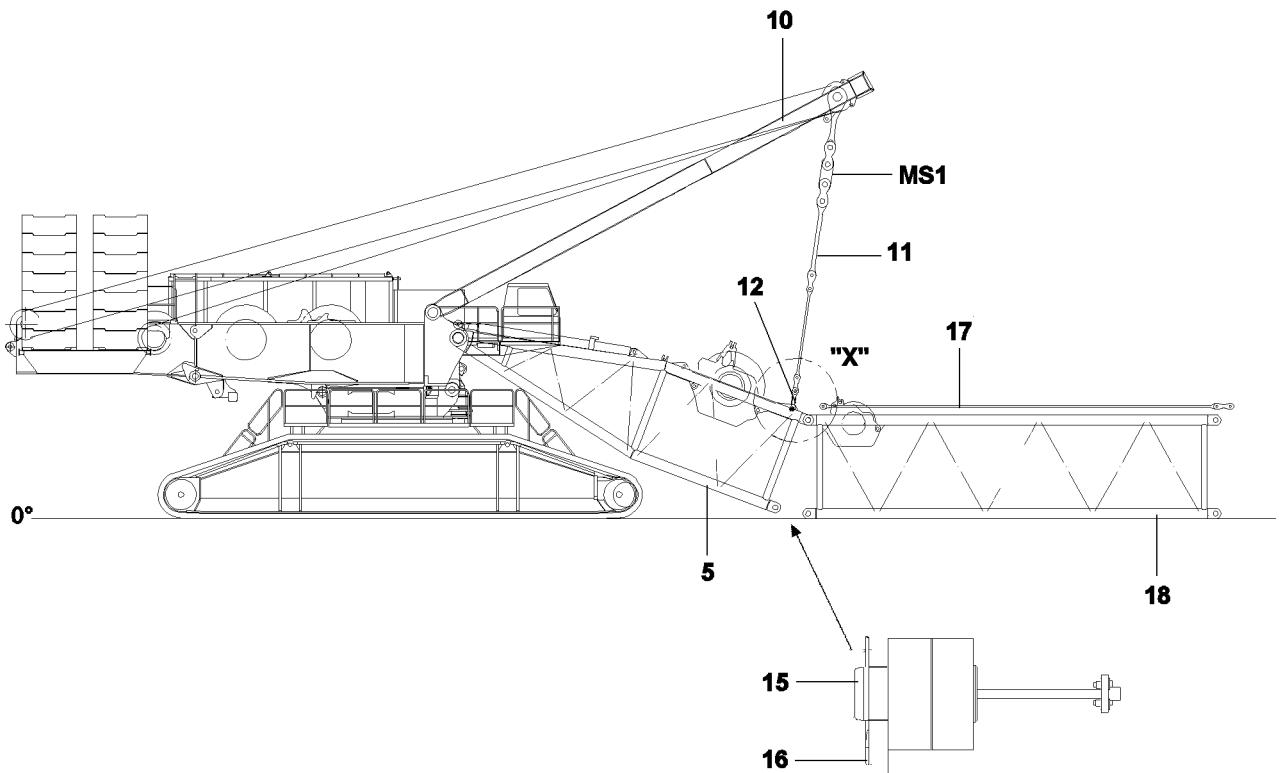
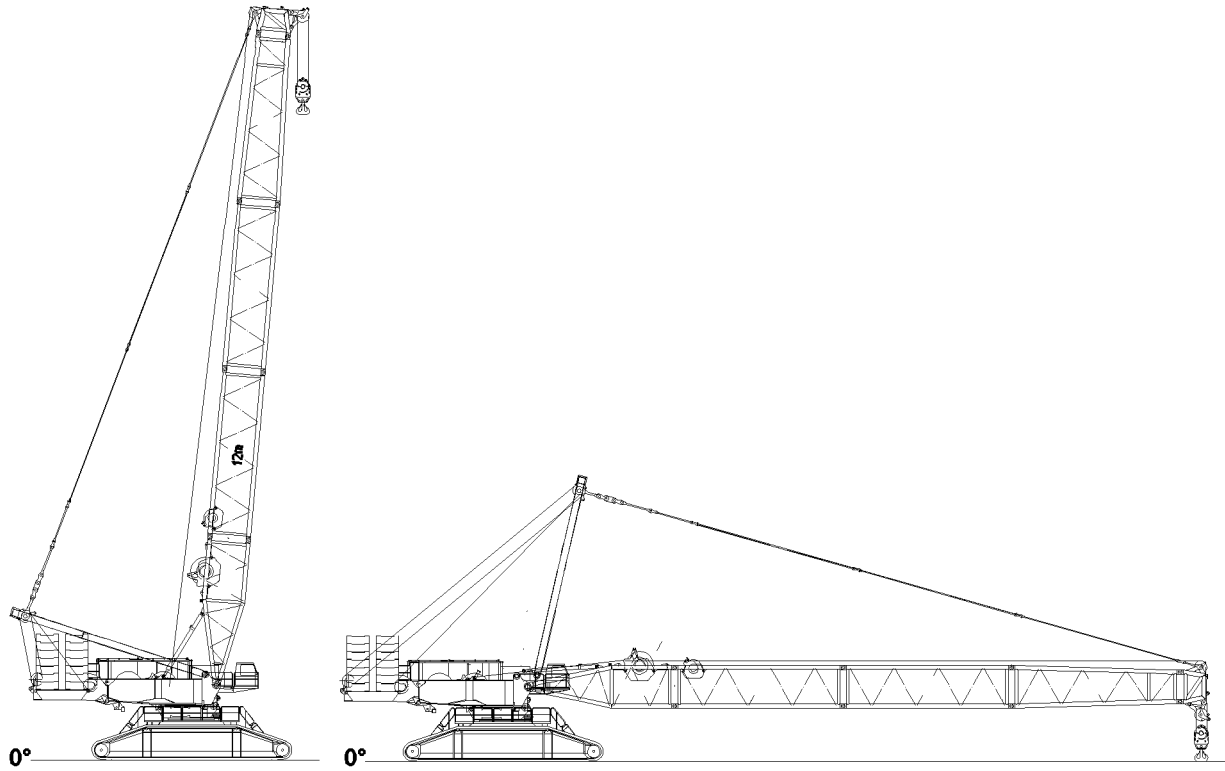


DANGER

Falling components!

If a component is removed without it being secured with the auxiliary crane to prevent it from falling, the component can fall and kill personnel!

- ▶ Secure components before disassembly with the auxiliary crane to prevent them from falling!



B199422

4.1 Taking the S-boom down



DANGER

The crane can topple over!

If the following conditions are not met before taking down the boom, the crane can topple over and fatally injure personnel!

- ▶ Observe the safety technical guidelines in chapter 5.01!
- ▶ Observe the data in the erection and take down charts!

- ▶ Luff the S-boom down to the **lowest** operating position.

When the lowest operating position is reached the luff down movement is shut off.

The load value in the “maximum load” icon disappears and question marks appear (????).

The following alarm functions become active:

- “STOP”
- “Horn” and acoustical signal



DANGER

Danger of fatal injury at crane operation with turned on assembly key button.

- ▶ The actuation of the assembly key button **413** is only permitted for assembly tasks!
- ▶ The assembly key button may only be operated by persons, who are aware of the consequences of a bypass!
- ▶ If the assembly key button **413** is turned on, the hoist limit switch and the LICCON overload protection is bypassed!
- ▶ Crane operation with the assembly key button **413** turned on is strictly prohibited!
- ▶ After assembly work is completed, the assembly key button **413** must be pulled immediately and turned over to an authorized person!

- ▶ Actuate the assembly key button **413**.

Result:

- The LICCON overload protection is inactive.
 - The indicator light in the button **412** lights up.
 - The assembly icon **3** in the LICCON monitor blinks.
 - An acoustical signal sounds.
 - The red beacon on the crane cab blinks.
 - The Stop icon **3** in the LICCON monitor blinks.
 - The horn sounds.
- ▶ Continue to luff the S-boom down until the hook block touches the ground.
 - ▶ Remove the hoist limit switch weight and unreeve the hook block.
 - ▶ Luff the S-boom down until the S-boom head is laying on the support on the ground.

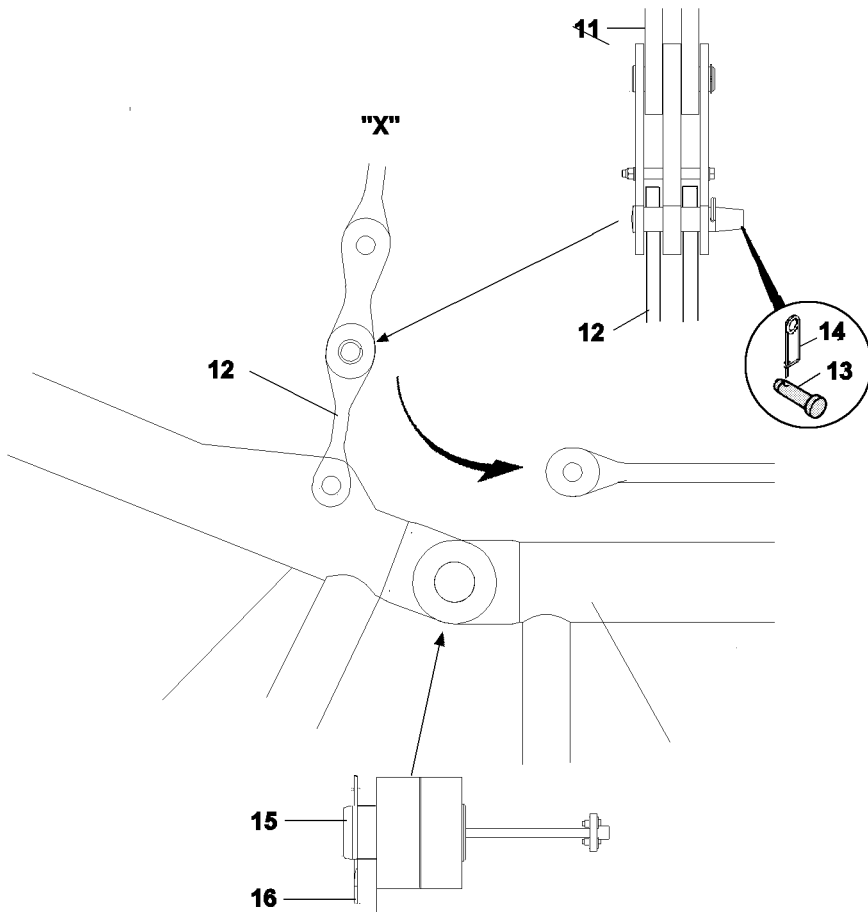
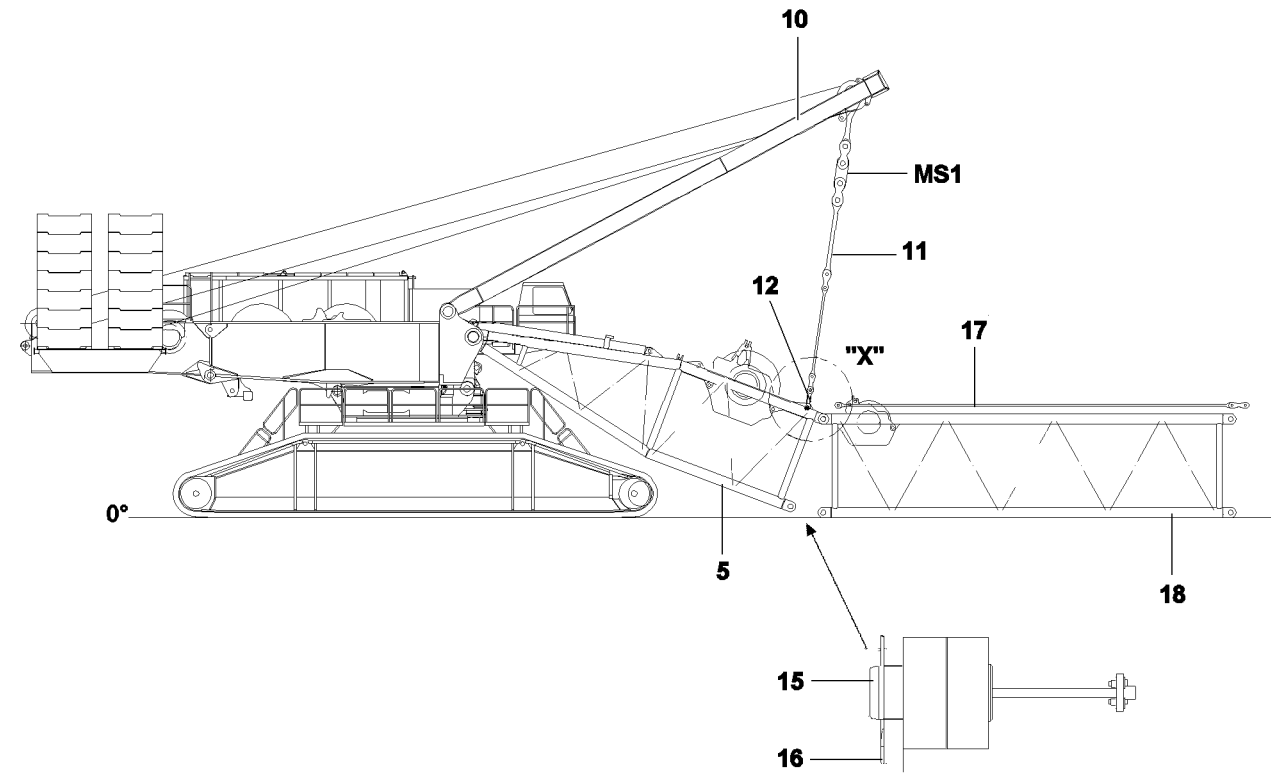


DANGER

Danger of accident!

- ▶ Make sure that no personnel is within the danger zone.
- ▶ Slowly spool up the hoist rope over the rope pulleys back to the winch.

- ▶ Remove the hoist rope.



B199415

4.2 Disassembling the S-boom



DANGER

The boom can suddenly fold down!

If the following conditions are not met before disassembling the boom, the boom can fold down and fatally injure personnel!

- ▶ Support the S-boom during disassembly with suitable materials!
- ▶ The guy rods must be pinned and secured on the brackets before unpinning the S-pivot section!
- ▶ Do not stand under the booms or within the complete danger zone during the pinning and unpinning procedure of the booms!

-
- ▶ Relieve the guy rods **11** by lowering the SA-frame **10**. Spool out winch **4**.
 - ▶ Unpin the guy rods **11** on the guy rods **17**: Remove the spring retainer **14** and unpin the pin **13**.
 - ▶ Pin the guy rods **11** on the brackets **12**: Insert the pin **13** and secure with spring retainer **14**.
 - ▶ Place the guy rods **17** for transport on the S-lattice sections and secure.



DANGER

Damage to the crane!

If the following conditions are not met, personnel can be fatally injured or the crane can be damaged.

- ▶ The maximum permissible total force on test point **MS1** may not exceed 150 t.

It is permissible to lift the following maximum boom lengths with the SA-frame **10**:

- ▶ S90 m with assembled S-guy rods and WA-frame 2 guy rods.
- ▶ SL 102 m with assembled S-guy rods.
- ▶ The end section may not be raised, it must rest on the ground.

To unpin the S-lattice sections with the pin pulling device, see also chapter 5.30.

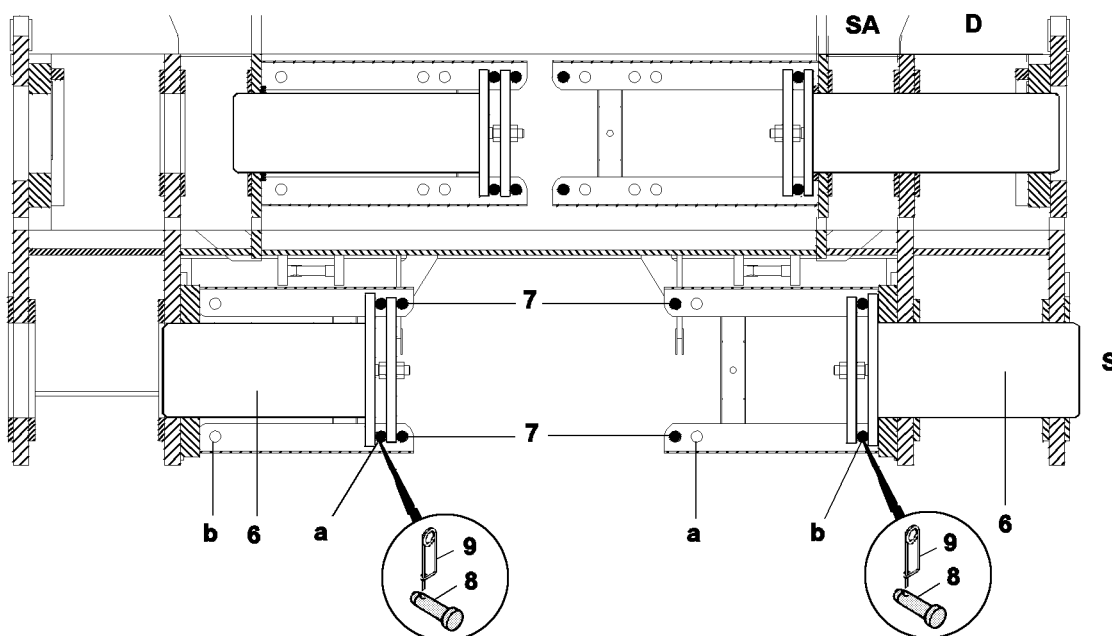
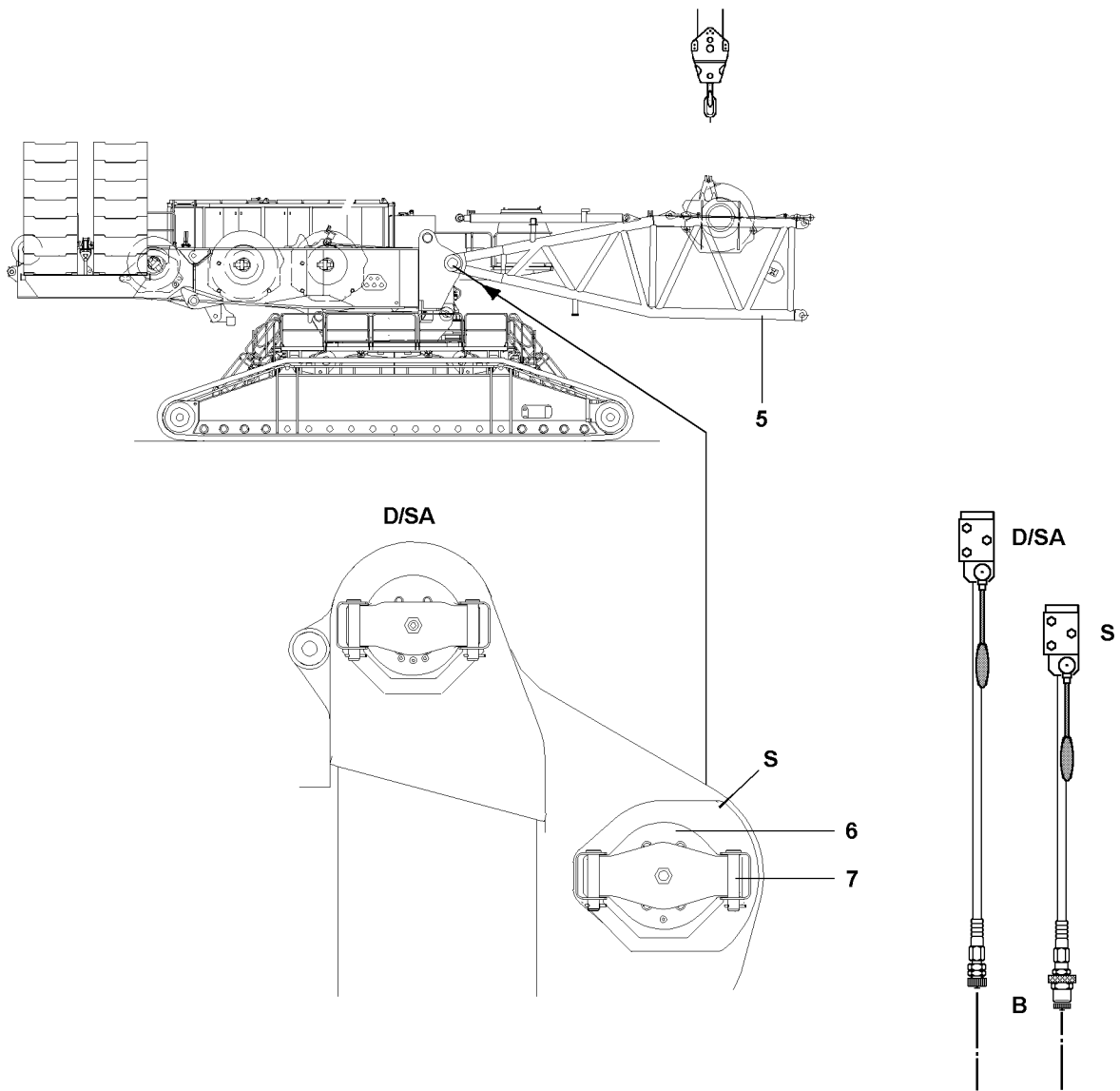
- ▶ Pull the S-pivot section **5** up with the SA-frame **10** and unpin on both sides **on the bottom**:
Remove the spring retainer **16** and unpin the pin **15**.
- ▶ Lower the S-pivot section on the support.



Note

- ▶ The ACTUAL force on test point **MS1** is shown on monitor 1.
- ▶ Tension the guy rods on the SA-frame **10** with the same force as during the assembly.
- ▶ Refer to the ACTUAL force measured and recorded during the assembly on test point (MS1).
- ▶ The pins can be pulled easier and the pins and brackets are therefore not damaged.

-
- ▶ Relieve the guy rods **11** by lowering the SA-frame **10**.
 - ▶ Unpin the guy rods **11** on the brackets **12**: Remove the spring retainer **14** and unpin the pin **13**.
 - ▶ Unpin the lattice sections and remove.



B199416

4.3 Unpinning the S-pivot section



DANGER

General danger notes!

- ▶ Support the S-pivot section during disassembly with suitable materials!

Make sure that the following prerequisites are met:

- The pins **7** are inserted and secured.
- The piston rods with guide plate are extended.
- The pins **8** are pinned and secured in the bores **a**.

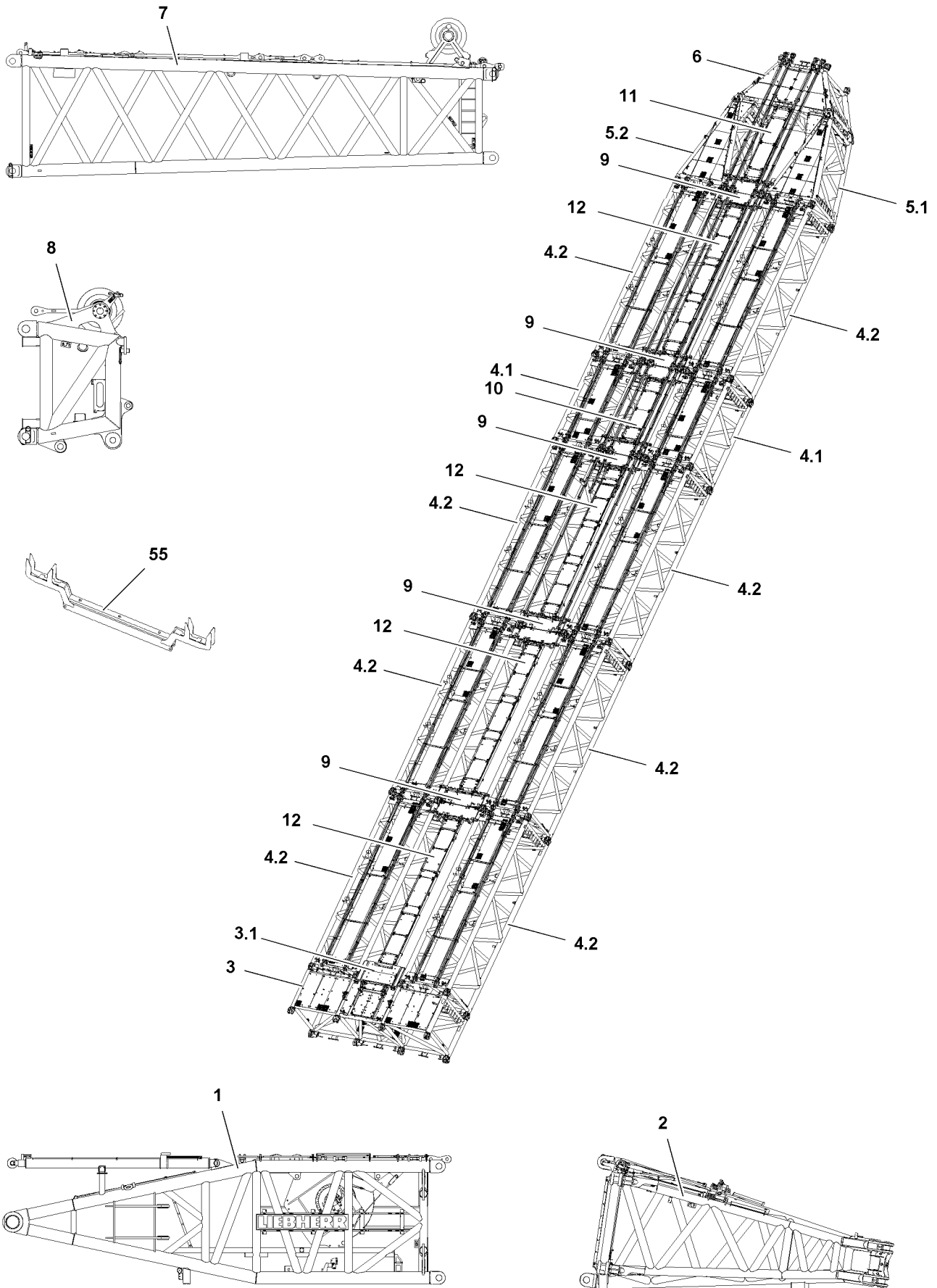
- ▶ Hang the S-pivot section **5** onto the auxiliary crane.



Note

- ▶ The hand levers **S, D/SA** and the hydraulic connections **B** for the pin pulling device are on the left side of the turntable.

- ▶ Establish the hydraulic connections from the pin pulling device to the turntable
- ▶ Unpin S-pivot section **5** on both sides with the pin pulling device:
- ▶ Move the manual lever **S** and completely pull out the pin **6**.
- ▶ Place the S-pivot section **5** on the support on the ground and remove the auxiliary crane.



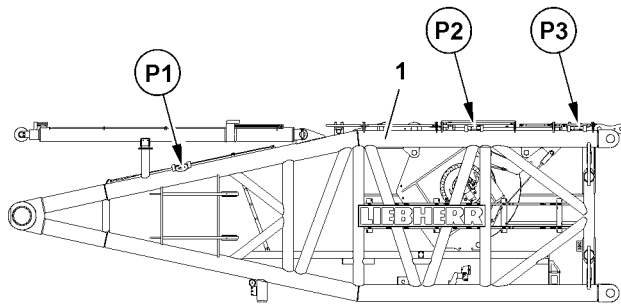
B117192

1 Components

Position	Component
1	S-pivot section
1.1	With winch 5
1.2	Without winch 5
2	Lower P-adapter
2.1	Right side
2.2	Left side
3	Cross carrier
3.1	Platform
4	S-intermediate sections
4.1	S-intermediate section 6.00 m
4.2	S-intermediate section 12.00 m
5	Upper P-adapter
5.1	Right side
5.2	Left side
6	Cross beam
7	S-adapter
8	SW-end section
9	Bridge lateral
10	Bridge 4.00 m
11	Bridge 4.75 m
12	Bridge 10.00 m
55	Carrier for rod placement (use only for 3 m auxiliary rods)

2 Fastening points

2.1 Fastening points S-pivot section

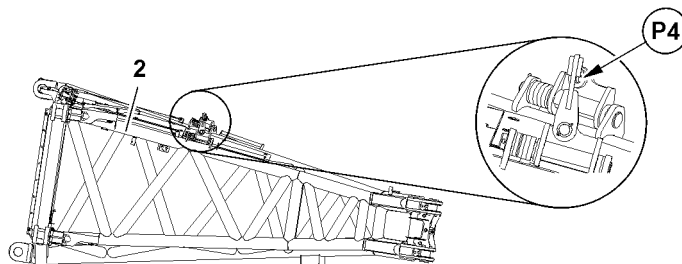


B114722

Fastening points S-pivot section

Fastening points	
P1 and P2	S-pivot section without winch 5
P1 and P3	S-pivot section with winch 5

2.2 Fastening points lower P-adapters

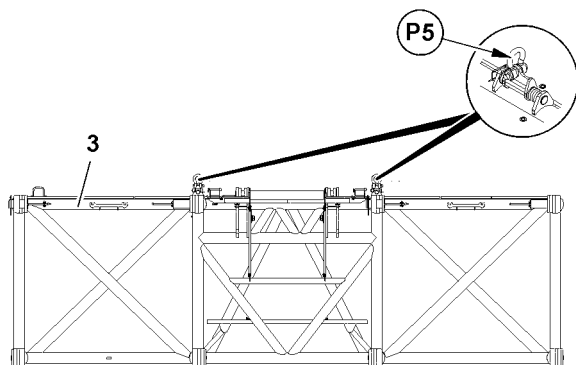


B114723

Fastening points lower P-adapters

Fastening points	
P4	Lower P-adapter left and lower P-adapter right

2.3 Fastening points cross carrier

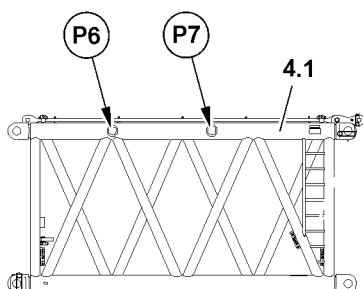


B114724

Fastening points cross carrier

Fastening points	
P5	Cross carrier

2.4 Fastening points S-intermediate section 6 m

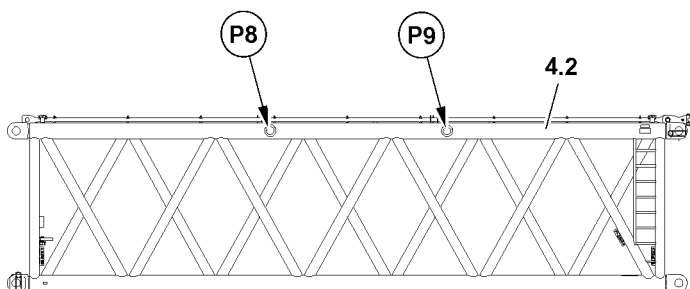


B114725

Fastening points S-intermediate section 6 m

Fastening points	
P6 and P7	S-intermediate section 6 m

2.5 Fastening points S-intermediate section 12 m

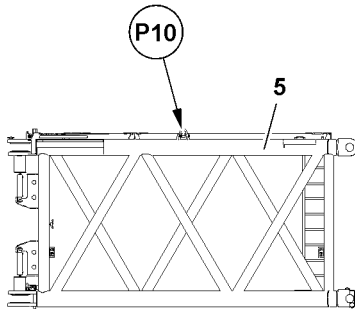


B114726

Fastening points S-intermediate section 12 m

Fastening points	
P8 and P9	S-intermediate section 12 m

2.6 Fastening points upper P-adapters

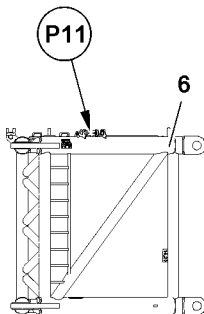


B114727

Fastening points upper P-adapters

Fastening points	
P10	Upper P-adapter left and upper P-adapter right

2.7 Fastening points - cross bar

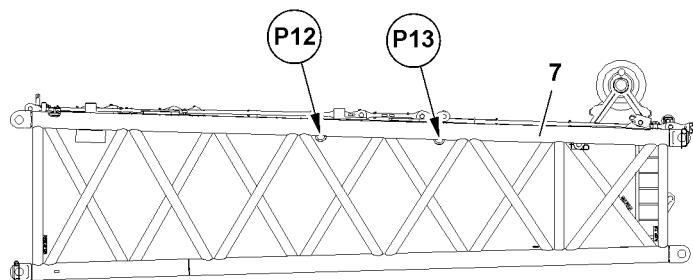


B114728

Fastening points - cross bar

Fastening points	
P11	Cross beam

2.8 Fastening points S-adapter

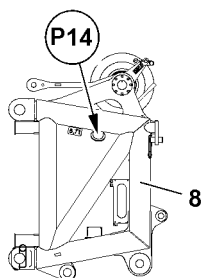


B114729

Fastening points S-adapter

Fastening points	
P12 and P13	S-adapter

2.9 Fastening points SW-end section



B114730

Fastening points SW-end section

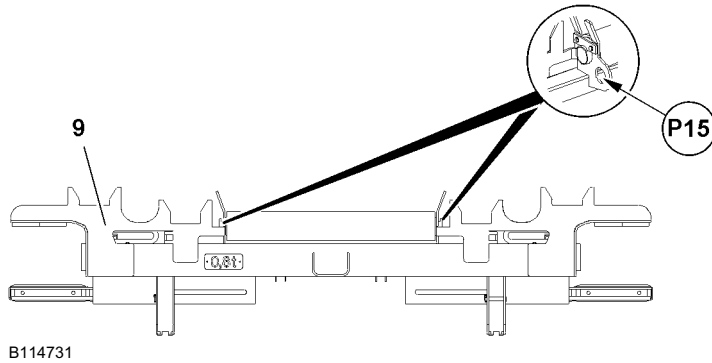
Fastening points	
P14	SW-end section

2.10 Fastening points bridge “lateral”

NOTICE

Damage of fastening points!

- ▶ Transport maximum two bridges 9 together.
-



Fastening points bridge

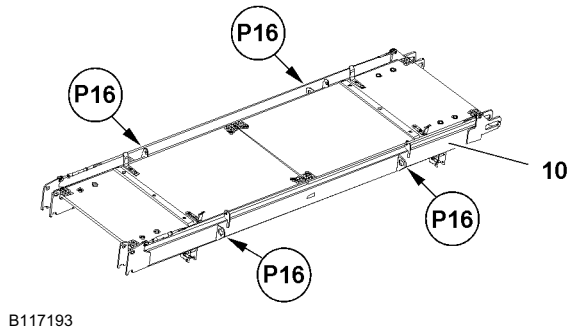
Fastening points	
P15	For transport and assembly

2.11 Fastening points bridge (4.00 m)

NOTICE

Damage of fastening points!

► Transport bridge **10** always individually.



Fastening points bridge

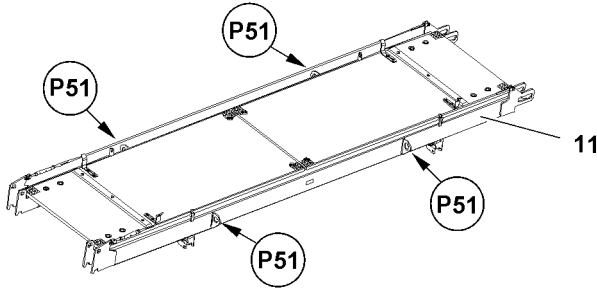
Fastening points	
P16	For transport and assembly

2.12 Fastening points bridge (4.75 m)

NOTICE

Damage of fastening points!

► Transport bridge **11** always individually.



B117194

Fastening points bridge

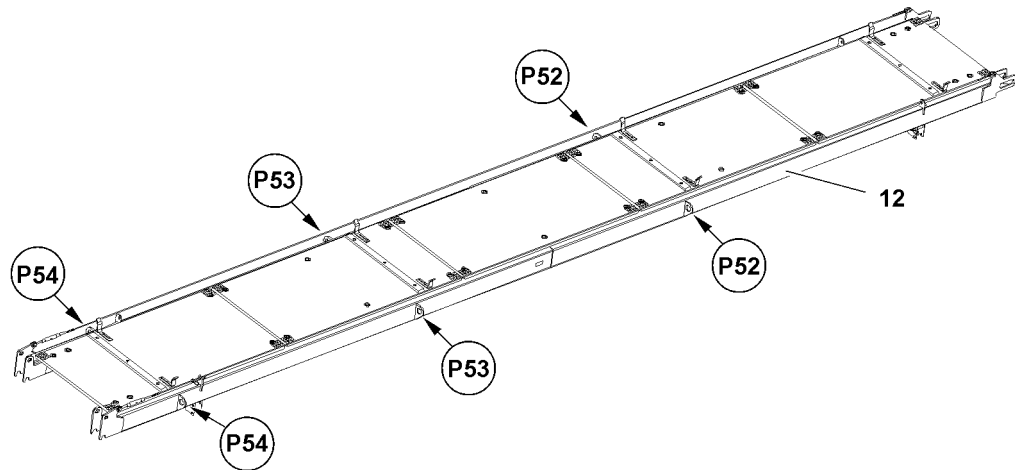
Fastening points	
P51	For transport and assembly

2.13 Fastening points bridge (10.00 m)

NOTICE

Damage of fastening points!

► Transport bridge 12 always individually.



B117195

Fastening points bridge

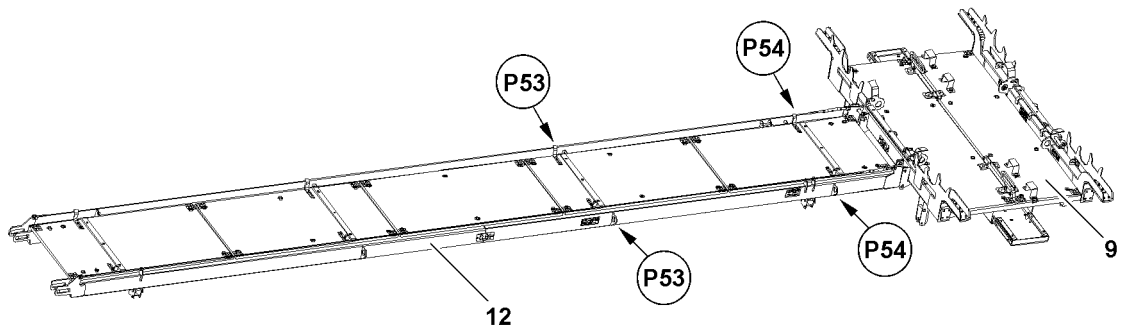
Fastening points	
P52 + P53	For transport and assembly bridge 12
P53 + P54	Exclusively for assembly: Bridge 12 pinned with bridge 9

2.14 Fastening points Bridge lengthwise and bridge lateral preassembled

NOTICE

Damage of fastening points!

► Transport preassembled bridges always individually.

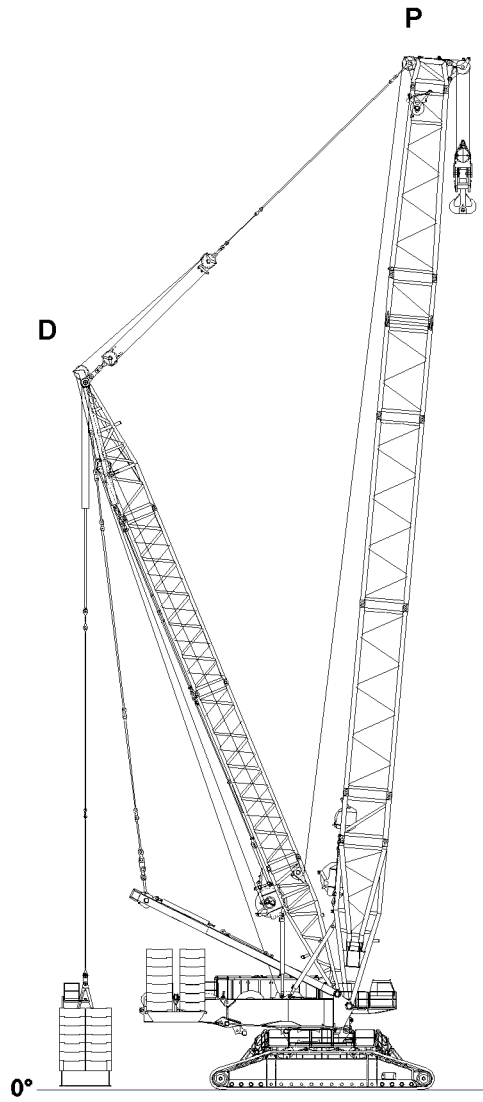


B117203

Fastening points bridge preassembled

Fastening points	
P53 + P54	For assembly bridge "lengthwise" and "lateral" preassembled

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B117196

3 Assembly PD-boom



WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling! If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!

- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids!
- ▶ If fall protection equipment is available, then it must be used, 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, see Crane operating instructions, chapter 2.04!
- ▶ The 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!
- ▶ Only step on the aids, ladders and catwalks with clean shoes!
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice!
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited!



WARNING

The lattice sections can fall down!

If the lattice sections are not pinned and secured correctly, then they can fall “down” and severely injure or kill personnel!

- ▶ Pin or unpin both pins at the same horizontal level, i.e. **left and right!**
- ▶ Do not stand under the lattice sections or within the entire danger zone during the pinning and unpinning procedure of the boom!
- ▶ Secure the pins in the bearing points and the receptacles!
- ▶ It is prohibited to lean the ladder against the components being disassembled!
- ▶ Do not remove the fastening equipment and the auxiliary crane until each component is pinned on and secured!



WARNING

Danger of impact / crushing!

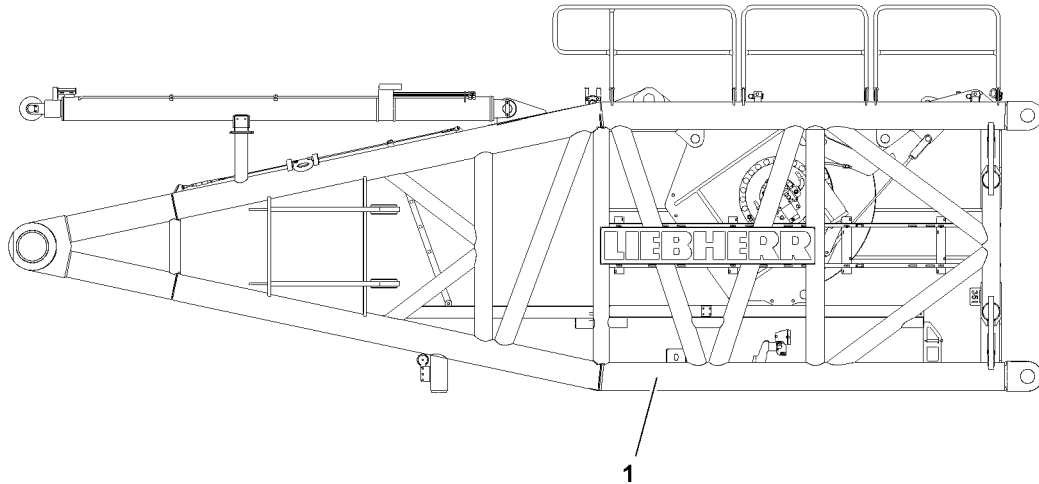
When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth!

When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing!

Personnel can be caught and severely injured or killed!

- ▶ 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!

3.1 Assembling the railing on the S-pivot section



B115416

Assembling the railing on the S-pivot section



WARNING

Danger of falling!

During assembly and disassembly of the railing, personnel must be secured with appropriate aids to prevent them from falling!

Even for assembly of protective devices there is a danger of falling!

Assembly personnel can fall and be severely injured or killed!

- ▶ For assembly and disassembly work, maintenance and inspection work on the S-pivot section, all railings must be assembled and secured!
 - ▶ Step on the S-pivot section **1** only with "clean shoes".
-
- ▶ Swing the railing on the S-pivot section **1** into operating position, pin with the grip pin and secure with spring retainer, see Crane operating instructions, chapter 2.06.

3.2 Installing the catwalk / assembly platform



WARNING

Disassembled or incompletely assembled catwalk!

If the catwalk is not assembled or incompletely assembled when winch 5 is missing, then personnel can fall and be severely injured or killed!

- ▶ For non-assembled winch 5 on the S-pivot section **1**: Assemble the catwalk!
 - ▶ The catwalk may only be accessed when it is pinned and secured in operating position, check visually!
-



WARNING

Catwalks swung down!

Catwalks which swing down by themselves can cause severe face or head injuries for the assembly personnel!

Personnel can be severely injured or killed!

- ▶ For safety reasons, assemble the catwalks always with two persons!
-

**Note**

- ▶ If winch 5 is installed in operating position on the S-pivot section, then the removed catwalk must be pinned and secured in transport position!
-

Make sure that the following prerequisites are met:

- The railings are pinned in operating position and secured.
- The assembly personnel is secured to prevent them from falling.

3.2.1 Assembling the catwalk / assembly platform in operating position

Make sure that the following prerequisite is met:

- The catwalk is in transport position.

**Note**

- ▶ For assembly of the catwalk / assembly platform, see Crane operating instructions, chapter 2.06!
-

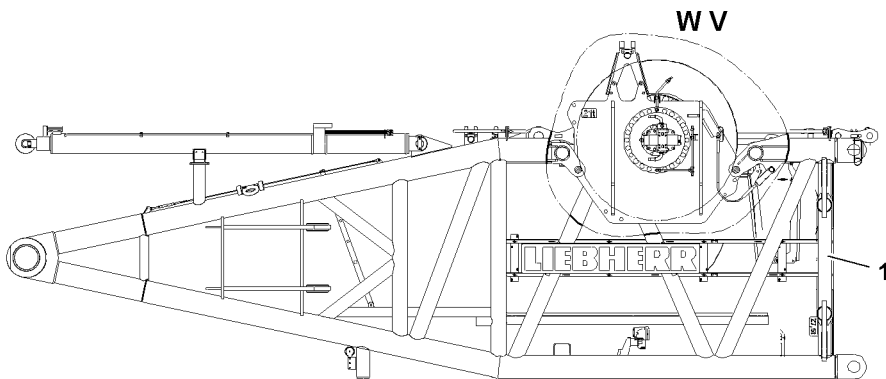
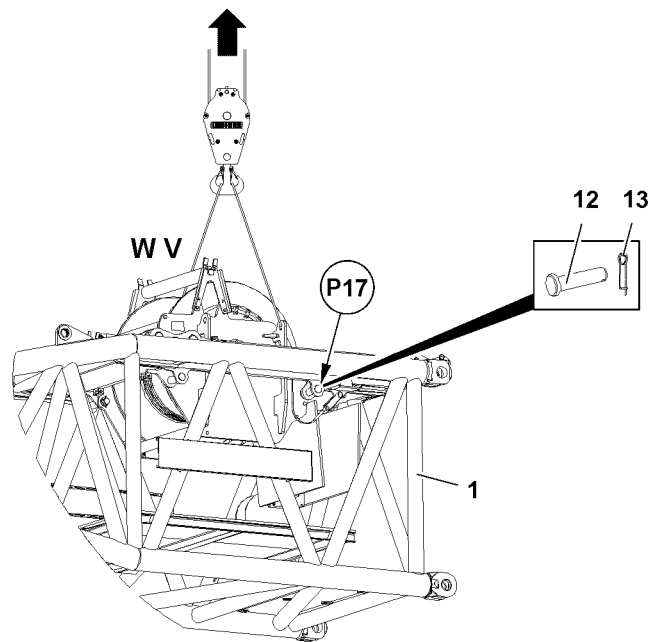
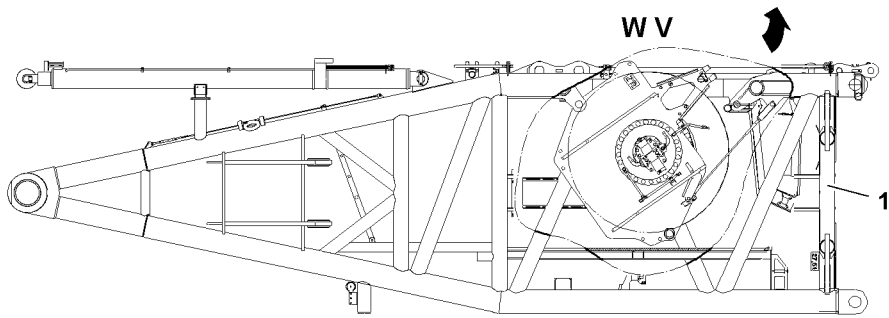
3.2.2 Assembling the catwalk / assembly platform in transport position

Make sure that the following prerequisite is met:

- The catwalk is in operating position.

**Note**

- ▶ For disassembly of the catwalk / assembly platform, see Crane operating instructions, chapter 2.06.
-

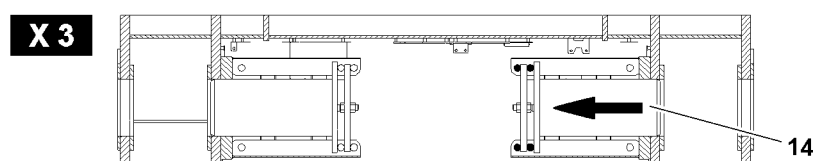
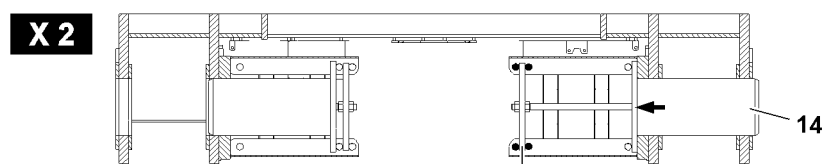
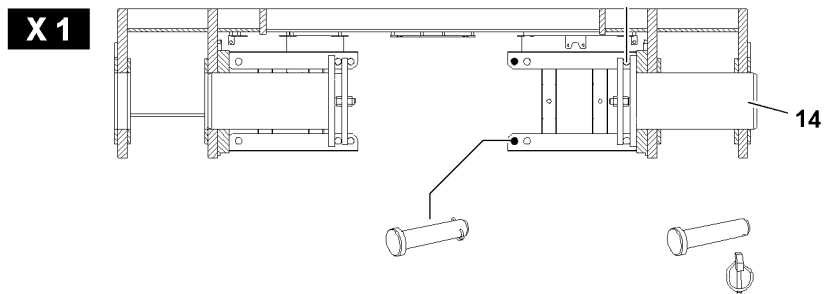
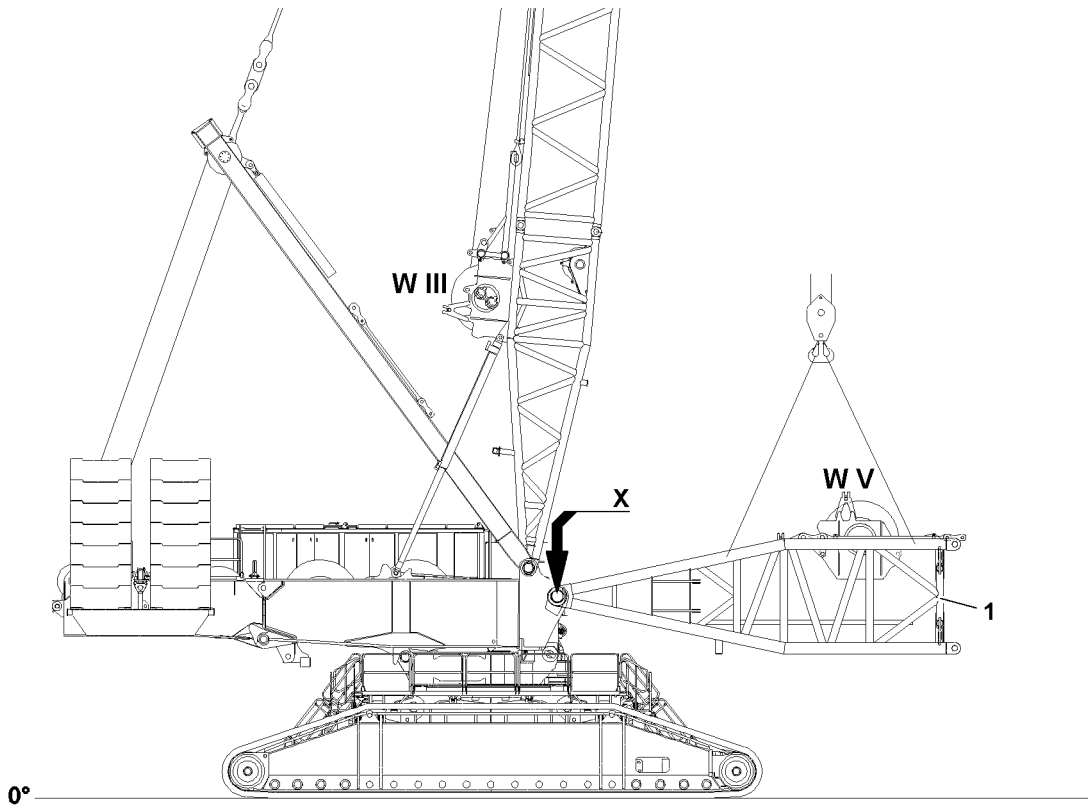


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3.3 Installing winch 5 in operating position

Make sure that the following prerequisite is met:

- The catwalk is in transport position.
- ▶ Attach winch 5 **W V** on the auxiliary crane.
- ▶ Bring winch 5 **W V** with the auxiliary crane into operating position.
- ▶ Pin winch 5 **W V** with the S-pivot section 1: Insert the pin **12** on both sides at point **P17** and secure with spring retainer **13**.
- ▶ When winch 5 **W V** is pinned and secured:
Remove the auxiliary crane.
- ▶ Establish the electrical connections from the terminal box in the S-pivot section 1 to winch 5 **W V**.
- ▶ Establish the hydraulic connections to winch 5 **W V**.



B117197

3.4 Installing the lattice sections of the PD-boom



Note

- ▶ Observe the arrangement of the intermediate sections of the boom system, see Crane operating instructions, chapter 5.03!



WARNING

The crane can topple over!

Personnel can be severely injured or killed!

- ▶ The turntable may not be turned during the assembly of the boom!



WARNING

Danger of accident!

If the following instructions are not observed, personnel can be severely injured or killed!

- ▶ For assembly of the boom combinations, the rod plan must be observed and adhered to!
- ▶ Depending on the condition of the ground, the boom and the lattice sections must be supported from below for the assembly of the boom!
- ▶ Observe the Safety technical notes, see Crane operating instructions, chapter 5.01!



WARNING

General danger notes!

Personnel can be severely injured or killed!

- ▶ Support the main boom during assembly / disassembly with suitable materials!
- ▶ All pins must be secured after assembly with the intended safety elements!
- ▶ The guy rods must be checked regularly, see Crane operating instructions, chapter 8.15!
- ▶ Secure the boom with support or auxiliary crane, see Crane operating instructions, chapter 5.01!
- ▶ It is prohibited for anyone to remain under the booms or within the complete danger zone during the pinning and unpinning procedure of the lattice section!

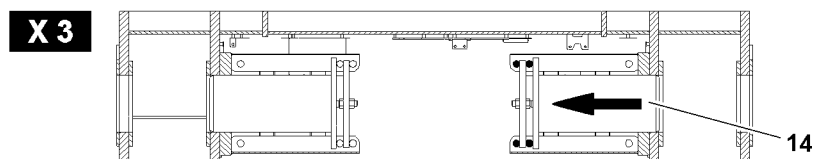
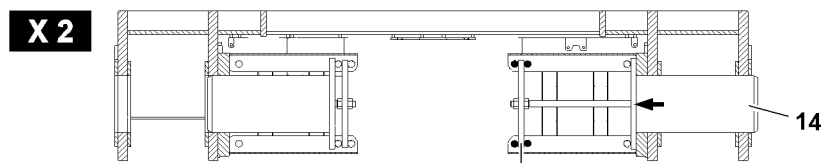
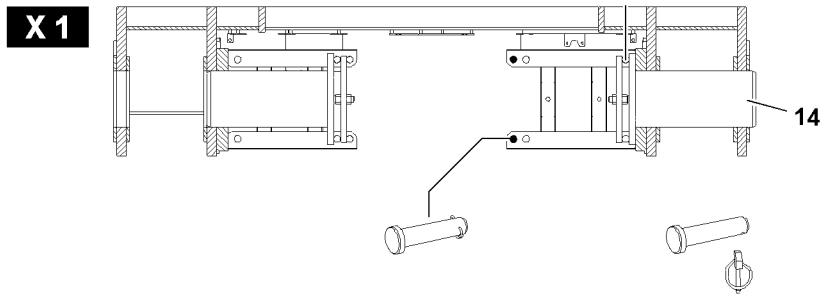
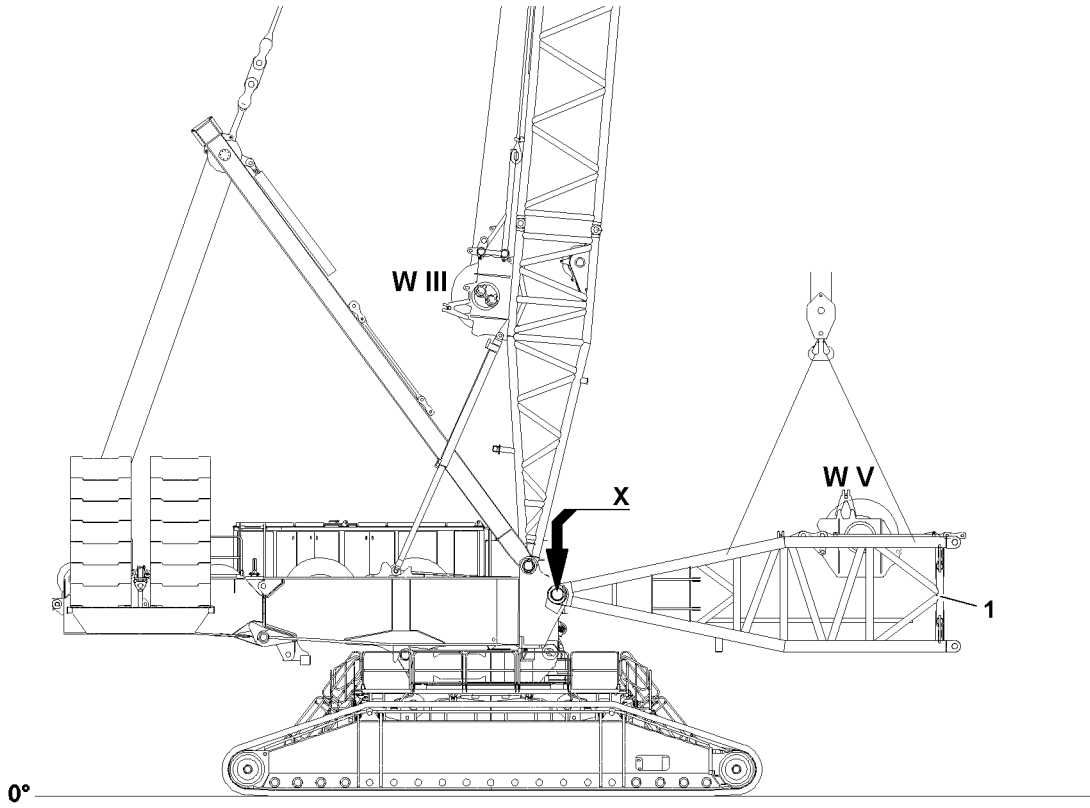


Note

- ▶ For weights of lattice sections with placed guy rods, see Crane operating instructions, chapter 1.03!
- ▶ The lattice sections are pinned with the aid of the pin pulling device, see Crane operating instructions, chapter 5.30!

Make sure that the following prerequisites are met:

- The crane is aligned in horizontal direction.
- An auxiliary crane with an adequate load-bearing capacity is available.
- An assembly scaffolding / work platform is available.
- The counterweight has been installed on the turntable according to the load chart.
- The D-boom is completely assembled and erected on the turntable, see Crane operating instructions, chapter 5.05.
- The LICCON overload protection has been set according to the data in the load chart.



B117197

3.4.1 Turning the turntable into assembly position



WARNING

The crane can topple over!

If the following conditions are not met before turning the turntable - **without** installed main boom, the crane can topple over!

Personnel can be severely injured or killed!

▶ Observe the data in the erection and take down charts!

▶ Turn the turntable into assembly position, see “Erection and take down charts”.

3.4.2 Activating the assembly operation



WARNING

The crane can topple over!

In assembly operation the LICCON overload protection is deactivated!

The crane can collapse, the boom can break off or the crane can topple over!

Death!

▶ Enter the set up configuration correctly into the LICCON computer system.

▶ Activate the assembly operation only when the consequences are known!

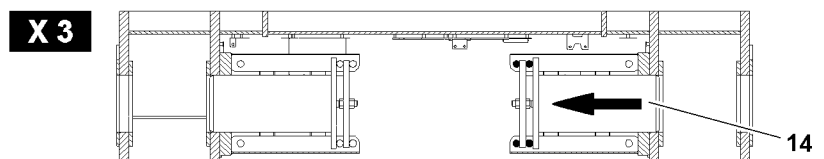
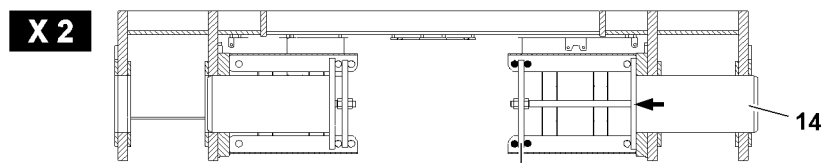
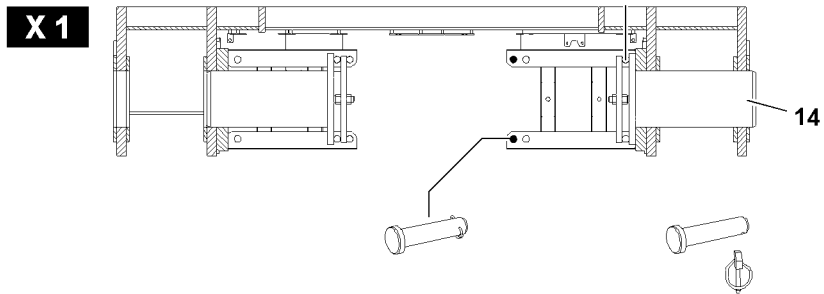
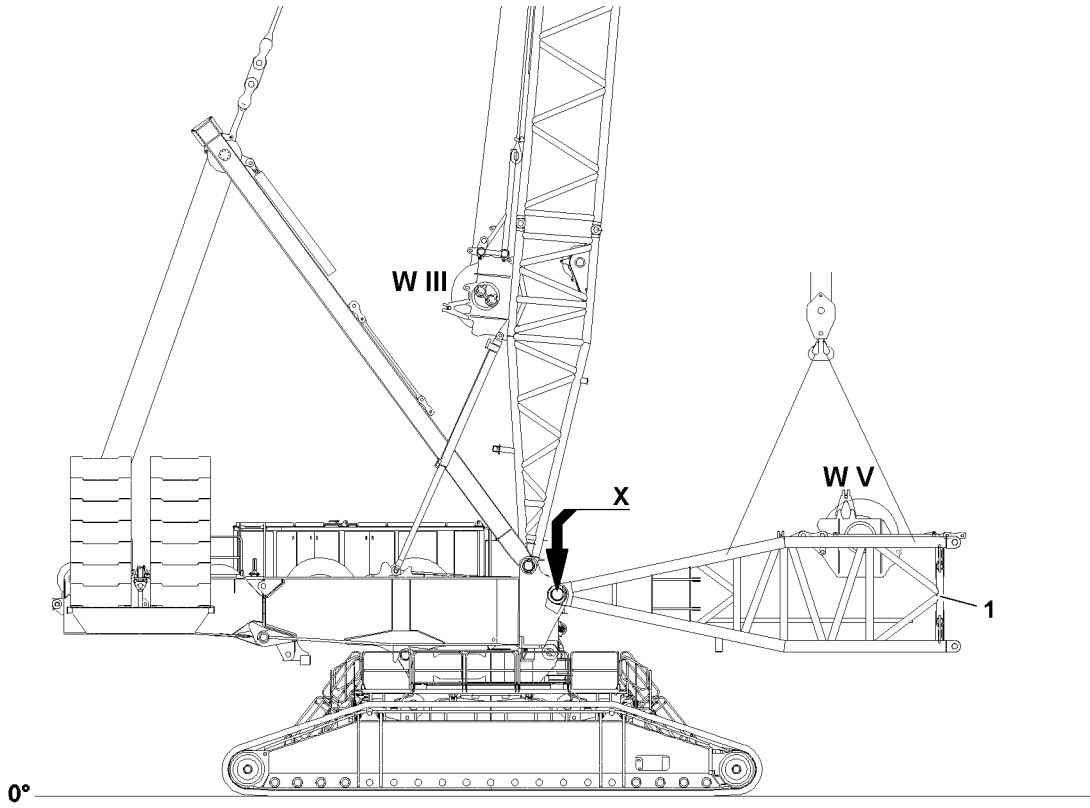
▶ Crane operation with deactivated LICCON overload protection is prohibited!

▶ Adding assembly operation: See Crane operating instructions, chapter 4.02.

Result:

– The LICCON overload protection is deactivated.

– The assembly icon appears on the LICCON monitor, see Crane operating instructions, chapter 4.02.



B117197

3.4.3 Installing the S-pivot section

Make sure that the following prerequisite is met:

- The connector pins **14** are unpinned on both sides on the turntable, see Crane operating instructions, chapter 5.38.



Note

- ▶ Select the fastening points on the S-pivot section **1** in such a way that the S-pivot section **1** hangs horizontally on the auxiliary crane at assembly, see section “Fastening points of lattice sections”!
- ▶ When winch 5 **W V** is deactivated:
Fasten the S-pivot section **1** on the fastening points **P1** and the fastening points **P2** on the auxiliary crane and swing in to the pin points on the turntable.

or

When winch 5 **W V** is installed:

- Fasten the S-pivot section **1** on the fastening points **P1** and the fastening points **P3** on the auxiliary crane and swing in to the pin points on the turntable.



WARNING

Falling S-pivot section!

Due to non-secured or insufficiently secured connector pins **14**, the S-pivot section **1** can fall down!
Personnel can be severely injured or killed!

- ▶ Secure the connector pins **14** between the S-pivot section **1** and the turntable after the pinning procedure with the stop pins!

- ▶ Pin the S-pivot section **1** on the turntable, see Crane operating instructions, chapter 5.38.

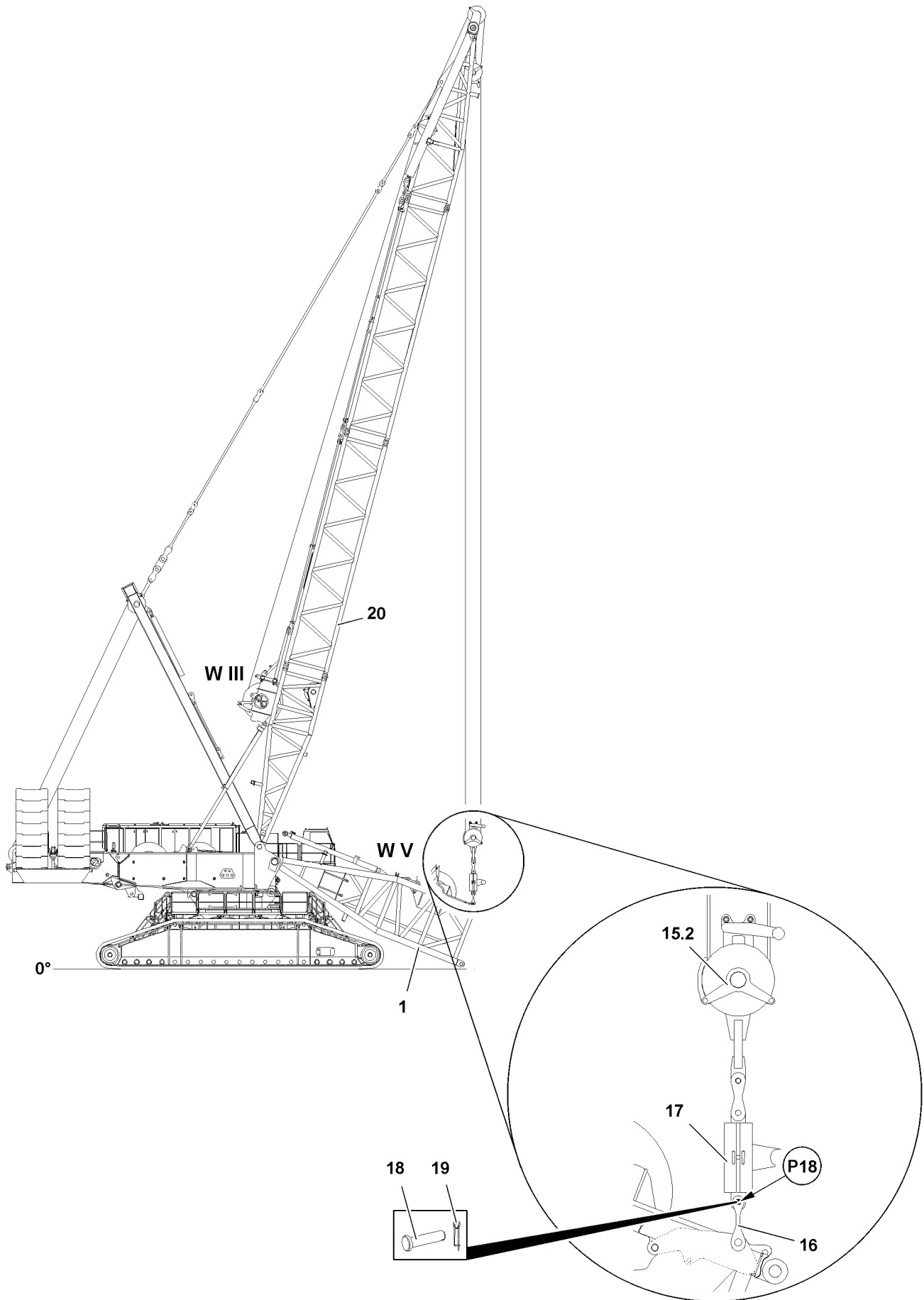
NOTICE

Damage to the S-pivot section **1**!

When the installed S-pivot section **1** is placed on the ground, the S-pivot section **1** can be damaged!

- ▶ Before placing the S-pivot section **1** down on the ground, make sure that the S-pivot section **1** cannot collide with the crane components during the take down procedure!
- ▶ Carefully place the S-pivot section **1** with the auxiliary crane and at low speed on the ground!
- ▶ Before placing it on the ground, support the S-pivot section **1**!

- ▶ When the S-pivot section **1** is pinned and secured properly on the turntable:
Carefully place the S-pivot section **1** with the auxiliary crane on the support.
- ▶ Remove the auxiliary crane.



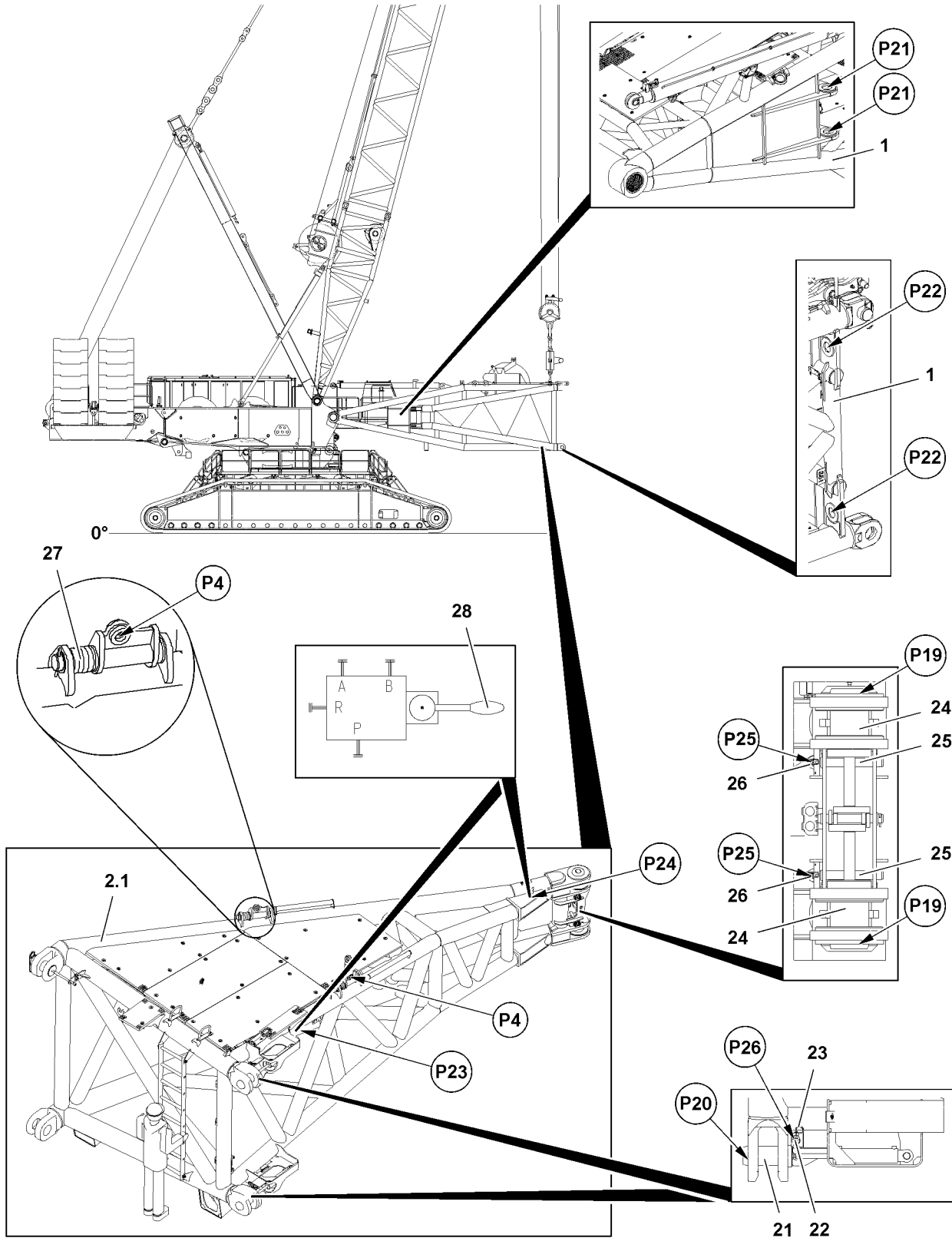
B114737

3.4.4 Pinning the upper pulley block on the S-pivot section

To be able to lift the S-pivot section **1** to install the two lower P-adapters on the S-pivot section **1** it is necessary to connect the upper pulley block **15.2** with the S-pivot section **1**. To do so, the D-boom **20** is luffed forward until the upper pulley block **15.2** can be pinned on the brackets **16** on the S-pivot section **1**.

Make sure that the following prerequisites are met:

- The S-pivot section **1** is pinned and secured on the turntable.
 - The S-pivot section **1** is placed on the ground on the support base.
 - The auxiliary crane is removed.
 - The railings on the S-pivot section **1** are in operating position, see Crane operating instructions, chapter 2.06.
 - The winch **5 W V**, if present, is installed in operating position.
 - The catwalk is in operating position (only if winch **5 W V** is not present), see Crane operating instructions, chapter 2.06.
- ▶ Luff the D-boom **20** down to the front until the upper pulley block **15.2** hangs freely with the assembly weight **17** over the bracket **16** on the S-pivot section **1**.
 - ▶ Pin the assembly weight **17** with the brackets **16**: Insert the pins **18** on both sides on point **P18** and secure with spring retainers **19**.
 - ▶ Spool winch **3 W III** up carefully until the S-pivot section **1** is aligned horizontally.



B114738

3.4.5 Installing the lower P-adapters

**Note**

- ▶ The hydraulic supply for the assembly of the lower P-adapters **2** is made via the external hydraulic aggregate!

**WARNING**

Pressure in the hydraulic lines!

If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure!

Personnel can be severely injured or killed!

- ▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time!

Make sure that the following prerequisites are met:

- The S-pivot section **1** is horizontally aligned.
- The two pins **21** are completely unpinned on the points **P20**.
- The two pins **24** are completely unpinned on the points **P19**.
- A hydraulic aggregate is available.

The assembly is described on the example of the right, lower P-adapter **2.1**.

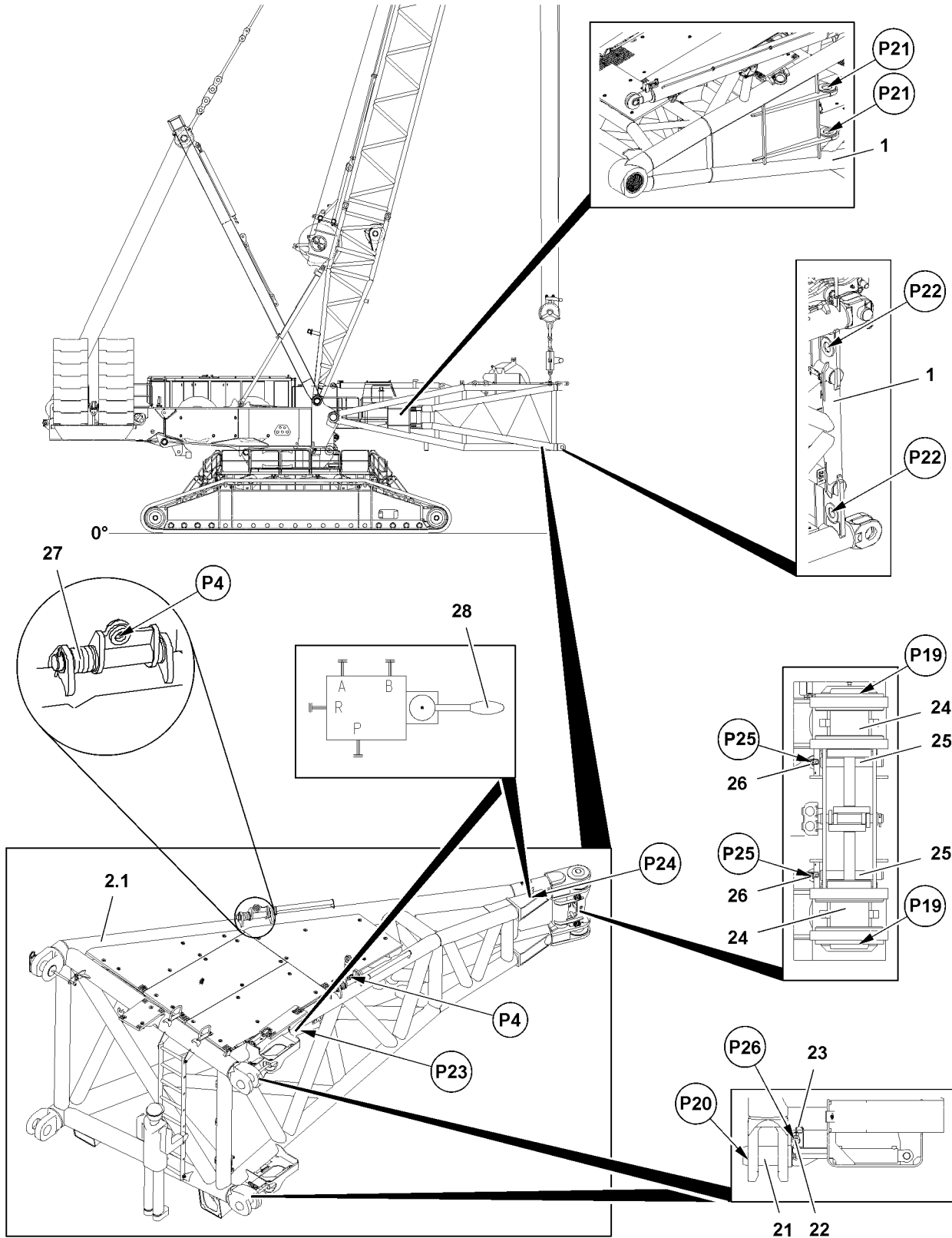
- ▶ Fasten the lower P-adapter **2.1** on both sides on the points **P4** and lift.
- ▶ Check if the lower P-adapter **2.1** hangs horizontally on the auxiliary crane.

Troubleshooting

The lower P-adapter **2.1** does not hang horizontally on the auxiliary crane:

- ▶ Place the lower P-adapter **2.1** down.
- ▶ With the disks **27** adjust the center of gravity so that the lower P-adapter **2.1** hangs horizontally during the lifting procedure.
- ▶ Lift the lower P-adapter **2.1**.

- ▶ Position the lower P-adapter **2.1** so that the pins **24** can be pinned in points **P21**.



B114738

- ▶ Establish the hydraulic connection on point **P24**: Connect the coupling parts (sleeve and plug) and screw together by hand until the hand nut is turned to a noticeable, fixed stop.



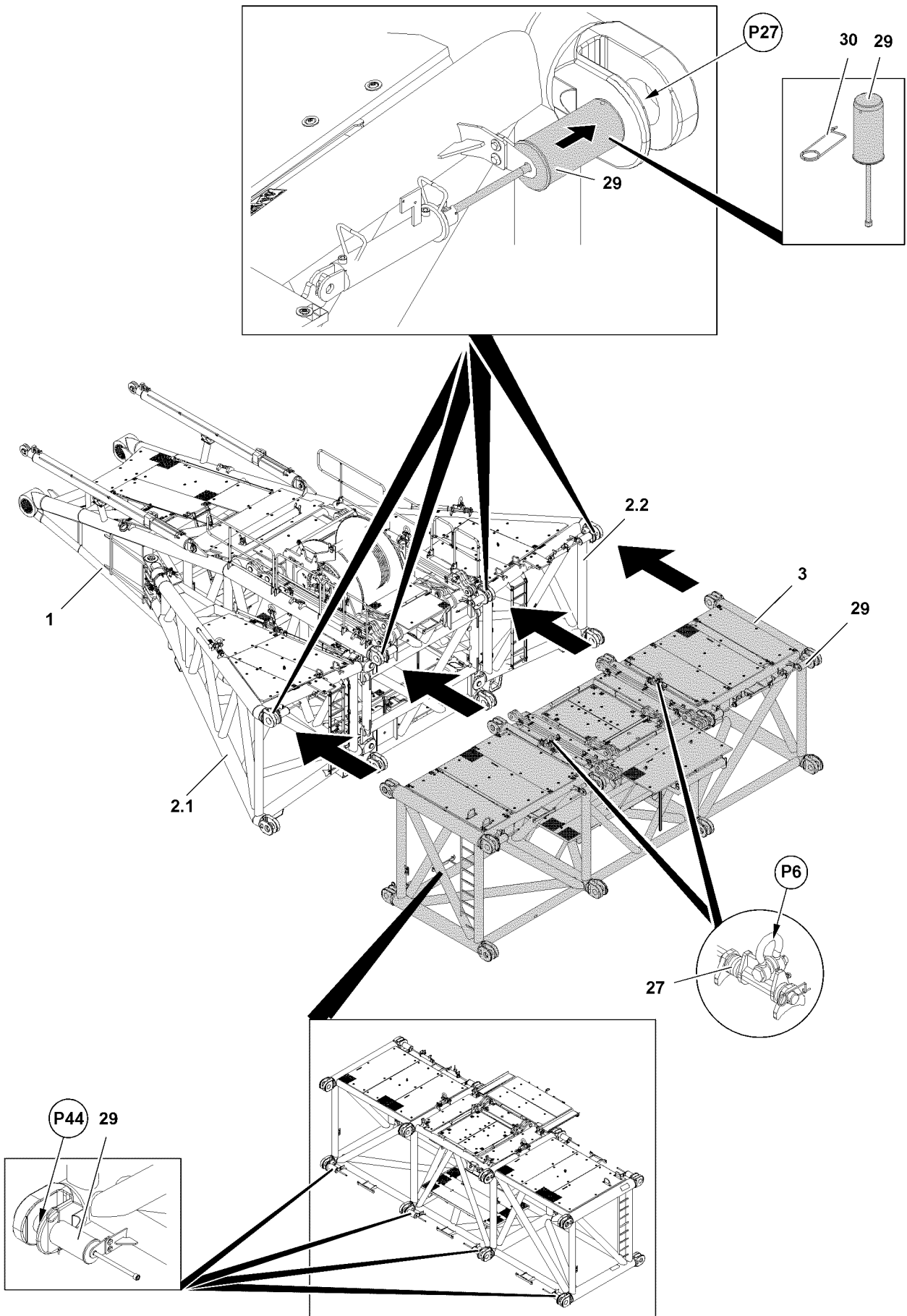
WARNING

General danger notes!

Personnel can be severely injured or killed!

- ▶ All pins **24** are to be secured after assembly of the lattice sections with the intended safety elements **25**!

-
- ▶ Actuate the hand lever **28** until the pins **24** are completely pinned.
 - ▶ Take both retaining pins **25** from the retainer.
 - ▶ Insert the retaining pins **25** on points **P25** and secure with locking pins **26**.
 - ▶ Disconnect the hydraulic connection on point **P24**: Install the coupling components (sleeve and plug) with the hand-tightened nut.
 - ▶ Install dust caps on the quick couplings.
 - ▶ Fold the lower P-adapter **2.1** on the S-pivot section **1** so that the pins **21** can be pinned on points **P22**.
 - ▶ Establish the hydraulic connection on point **P23**: Connect the coupling parts (sleeve and plug) and screw together by hand until the hand nut is turned to a noticeable, fixed stop.
 - ▶ Actuate the hand lever **28** until the pins **21** are completely pinned.
 - ▶ Take both retaining pins **22** from the retainer.
 - ▶ Insert the retaining pins **22** on points **P26** and secure with locking pins **23**.
 - ▶ Disconnect the hydraulic connection on point **P23**: Install the coupling components (sleeve and plug) with the hand-tightened nut.
 - ▶ Install dust caps on the quick couplings.
 - ▶ Remove the auxiliary crane.
 - ▶ Install the left, lower P-adapter **2.2** the same way as described in this section.



B117198

3.4.6 Installing the cross carrier



Note

- ▶ If the crane is to be operated with a boom nose after boom assembly, then winch 6 must be installed in the cross carrier!

Make sure that the following prerequisites are met:

- The P-adapter **2.1** and P-adapter **2.2** are properly installed on the S-pivot section **1**.
 - The S-pivot section **1** is horizontally aligned.
 - The four pins **29** are completely unpinned on position **P44**.
 - The four pins **29** are completely unpinned on position **P27**.
 - A hydraulic aggregate is available.
- ▶ Fasten the cross carrier **3** on both sides on the points **P6** and lift.
 - ▶ Check if the cross carrier **3** hangs horizontally on the auxiliary crane.

Troubleshooting

The cross carrier **3** does not hang horizontally on the auxiliary crane:

- ▶ Place the cross carrier **3** down.
- ▶ With the disks **27** adjust the center of gravity so that the cross carrier **3** hangs horizontally during the lifting procedure.
- ▶ Lift the cross carrier **3**.

- ▶ Position the cross carrier **3** so that the pins **29** can be pinned in points **P27**.



Note

- ▶ The pinning or unpinning is carried out with the pin pulling device, see Crane operating instructions, chapter 5.30!

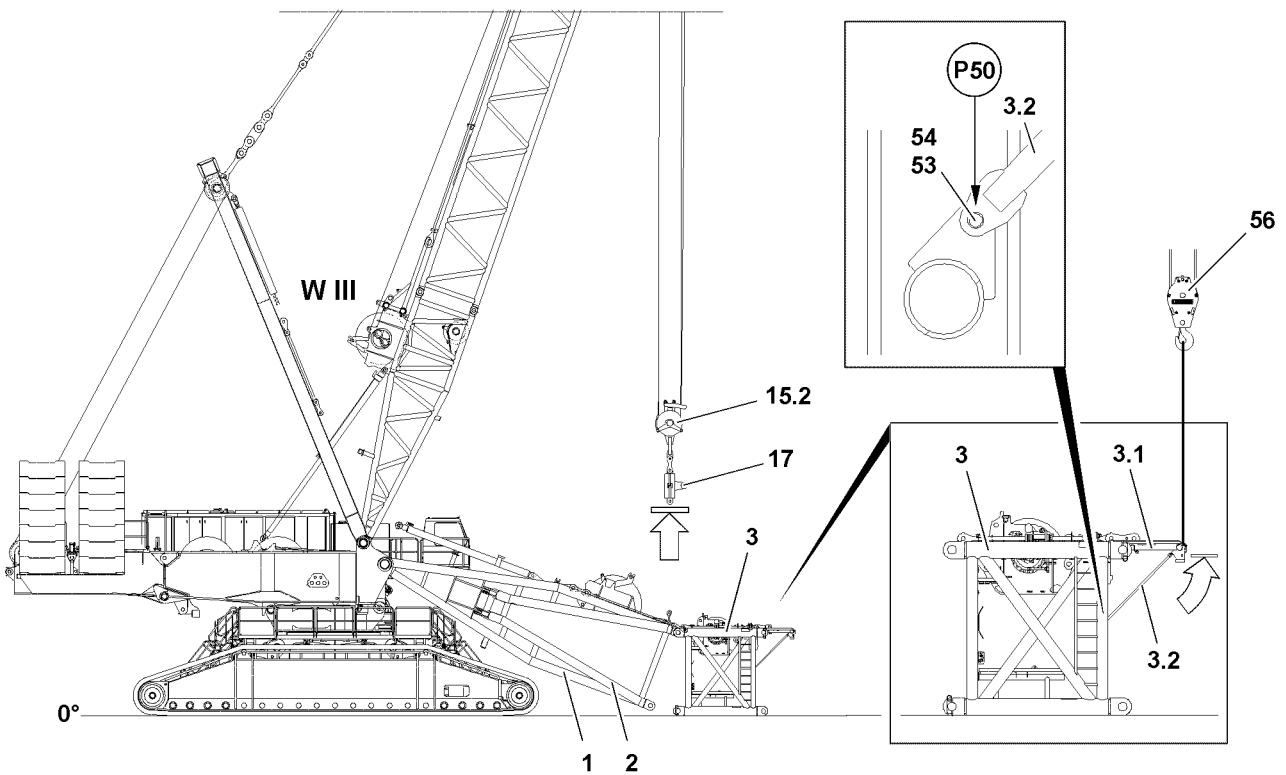
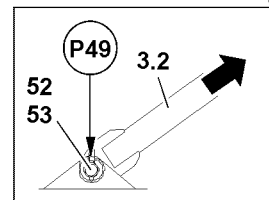
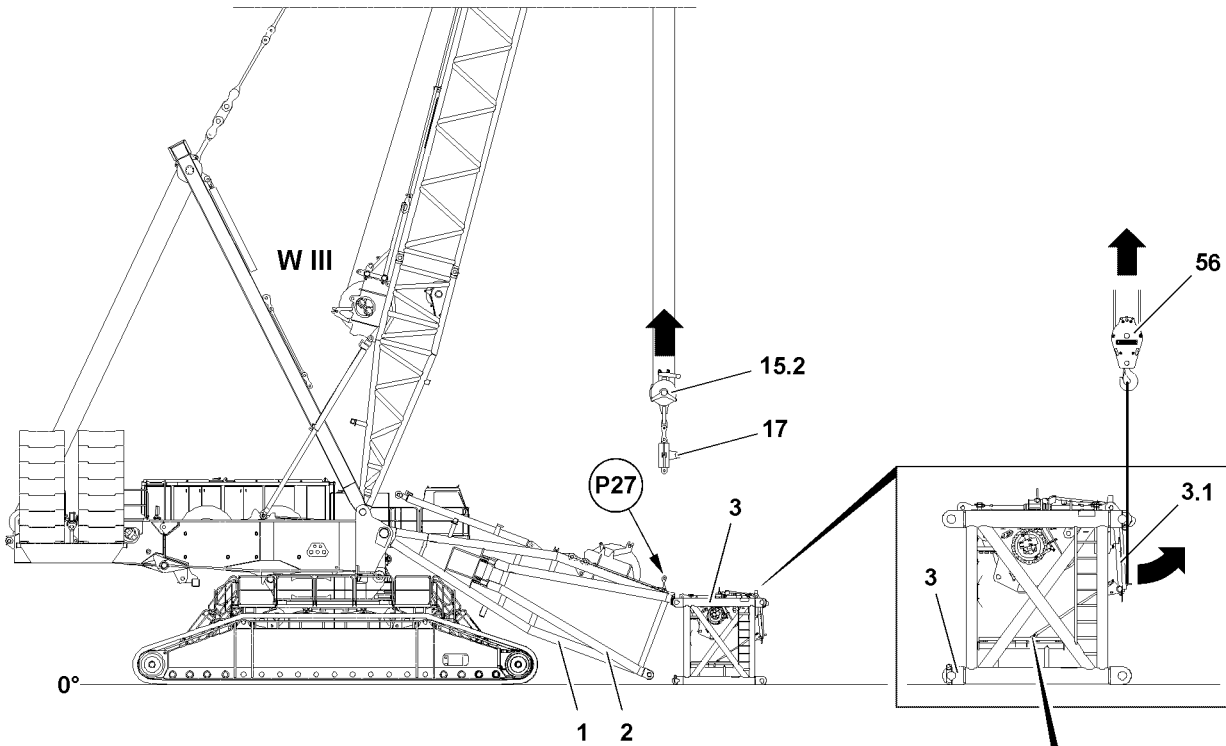


WARNING

General danger notes!

Personnel can be severely injured or killed!

- ▶ All pins **29** are to be secured after assembly of the lattice sections with the intended safety elements **30**!
- ▶ Pin the cross carrier **3** with the lower P-adapters **2** and with the S-pivot section **1**: Insert all four pins **29** on points **P27** and secure each with spring retainers **30**.
 - ▶ Place the cross carrier **3** on the support base:
 - ▶ Remove the auxiliary crane.



B117201

3.4.7 Removing the upper pulley block on the S-pivot section

Make sure that the following prerequisites are met:

- The cross carrier is properly installed on the S-pivot section and the lower P-adapters.
- The S-pivot section is lowered.
- The cross carrier is laying on the support on the ground.



WARNING

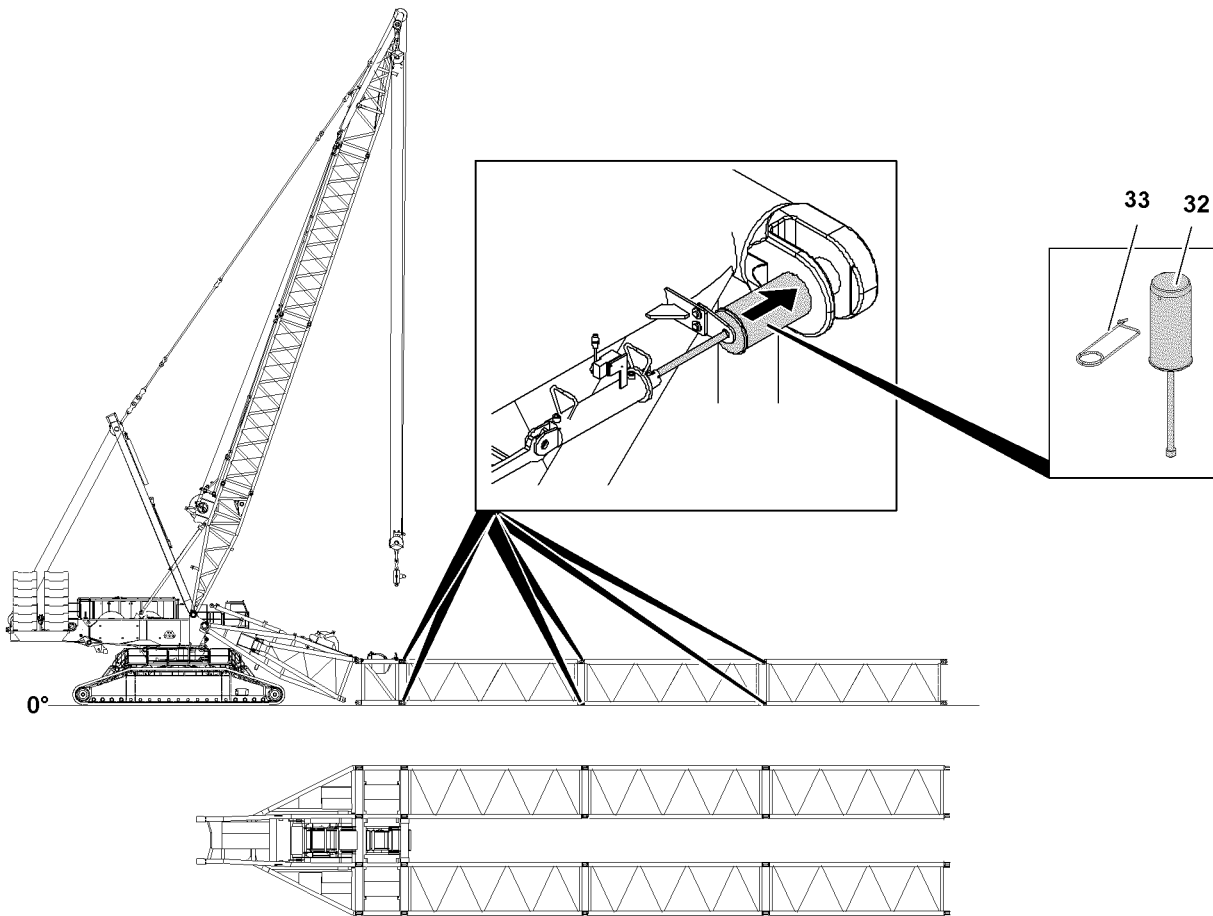
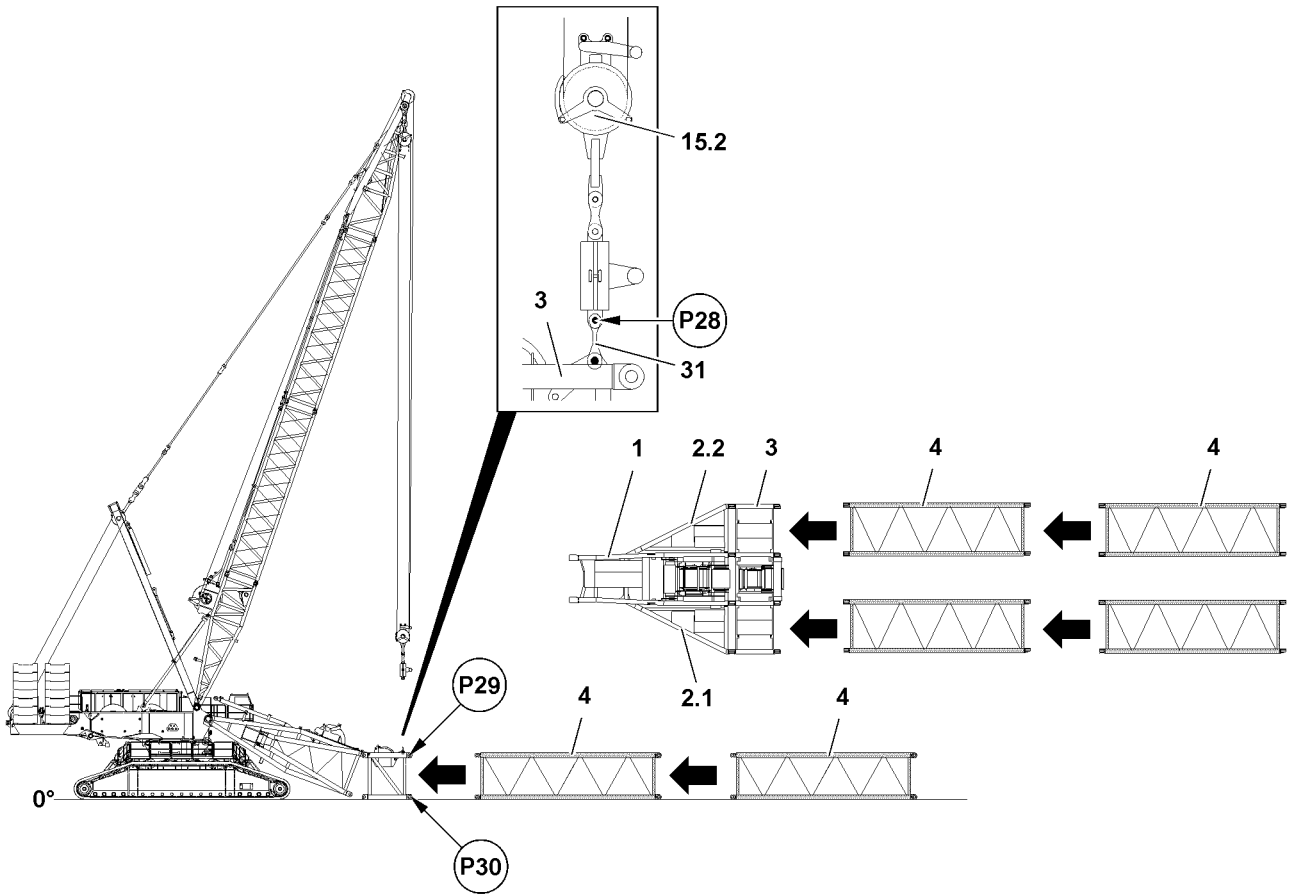
Danger of accident due to swaying upper pulley block!

- ▶ Make sure that the upper pulley block hangs exactly vertically before unpinning on the S-pivot section.
-
- ▶ Remove the upper pulley block **15.2** with the assembly weight **17** at point **P27**.
 - ▶ Lift the upper pulley block **15.2** with the assembly weight **17** past the assembly range.

3.4.8 Bringing the platform on the cross carrier into operating position

Make sure that the following prerequisites are met:

- The upper pulley block is removed on the S-pivot section.
 - The upper pulley block is raised.
- ▶ Attach the platform **3.1** on the auxiliary crane **56**.
 - ▶ Release pins **52** on both sides at point **P49** and unpin!
 - ▶ Lift the platform **3.1** with the auxiliary crane to the horizontal.
 - ▶ When the platform **3.1** is in operating position:
Pin the supports **3.2** on both sides at point **P50** and secure.
 - ▶ When the platform is properly pinned and secured:
Remove the auxiliary crane.



B117199

3.4.9 Installing the S-intermediate sections parallel on the cross carrier

Make sure that the following prerequisites are met:

- The cross carrier **3** is pinned and secured with the lower P-adapters - P-adapter **2.1** and P-adapter **2.2** - and the S-pivot section **1**.
- The cross carrier **3** is placed completely on a support on the ground.
- The upper pulley block **15.2** is pinned and secured with the bracket **31** on the guy point **P28**.



Note

- ▶ Observe the arrangement of the intermediate sections of the boom system, see Crane operating instructions, chapter 5.03!



Note

- ▶ The S-intermediate sections **4** are pinned with the pin pulling device, see Crane operating instructions, chapter 5.30!
- ▶ Support the S-intermediate sections **4** from below for easier assembly / disassembly!



WARNING

General danger notes!

Personnel can be severely injured or killed!

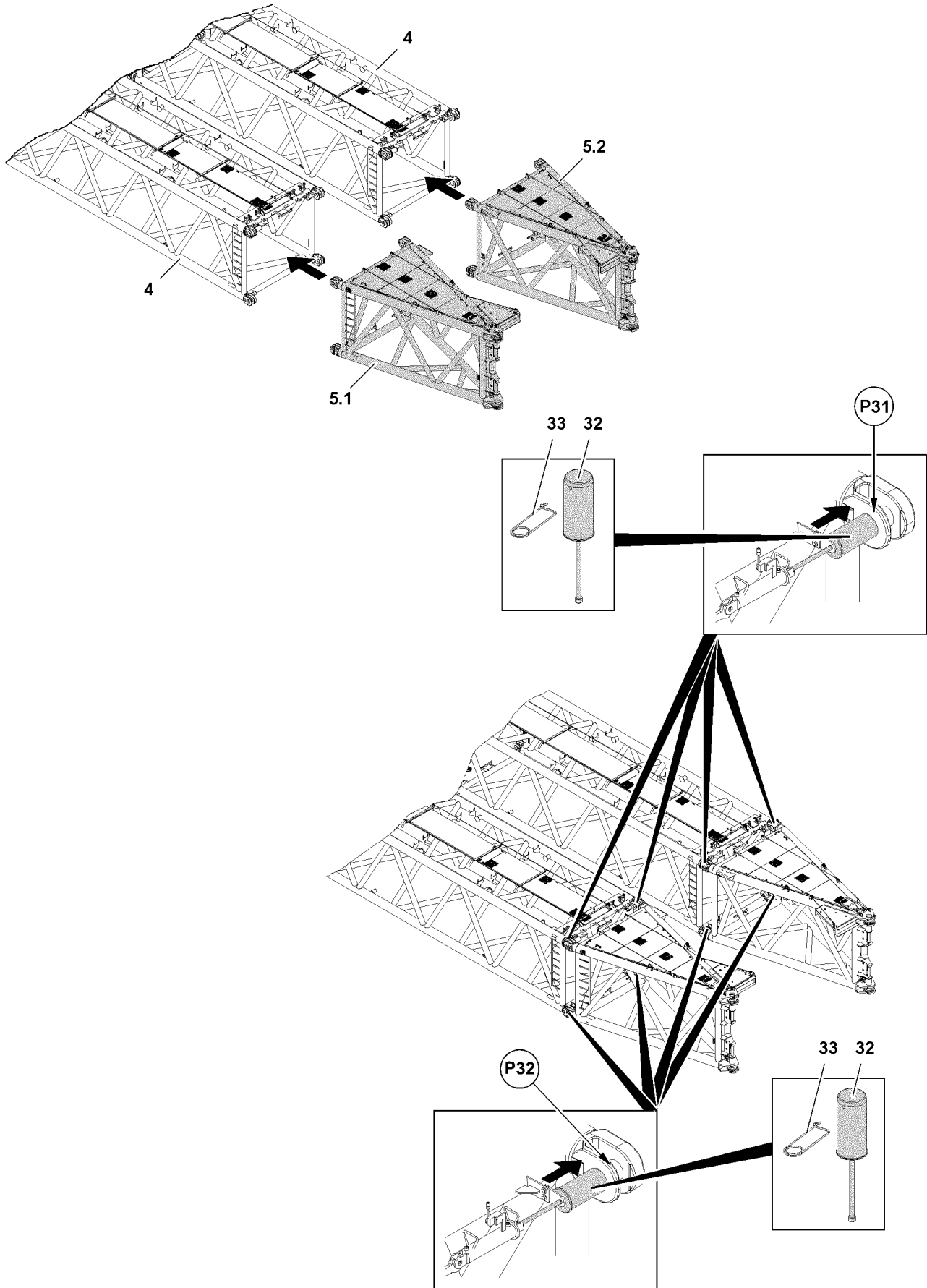
- ▶ All pins **32** are to be secured after assembly of the S-intermediate sections **4** with the intended safety elements **33**!

The S-intermediate sections **4** must be pinned on both sides of the cross carrier **3** on points **P29** and points **P30**.

- ▶ Attach the S-intermediate sections **4** on the auxiliary crane and align on the cross carrier **3**, see section "Fastening points of the lattice sections".
- ▶ When the pin bores on the respective side on the cross carrier **3** and on the S-intermediate section **4** align "on top" (point **P29**):
Pin the S-intermediate section **4** with the cross carrier **3**: Insert the pin **32** on point **P29** with the pin pulling device from the "inside" to the "outside" and secure with spring retainer **33**.
- ▶ Lower the S-intermediate section **4** with the auxiliary crane until it can be pinned on point **P30**.
- ▶ Pin the S-intermediate section **4** with the cross carrier **3**: Insert the pin **32** with the pin pulling device from the "inside" to the "outside" and secure with spring retainer **33**.

Assemble the parallel section of the main boom to the required length and pin and secure the S-intermediate sections **4** "on top" and "bottom".

- ▶ Insert the pin **32** with the pin pulling device from the "inside" to the "outside" and secure with spring retainer **33**.
- ▶ Remove the auxiliary crane.



B114589

3.4.10 Installing the upper P-adapters

Make sure that the following prerequisites are met:

- The parallel part of the main boom is installed from S-intermediate sections 4 to the required length.
- All S-intermediate sections 4 are pinned together and secured.



Note

- ▶ The upper P-adapters 5 are pinned with the pin pulling device, see Crane operating instructions, chapter 5.30!



WARNING

General danger notes!

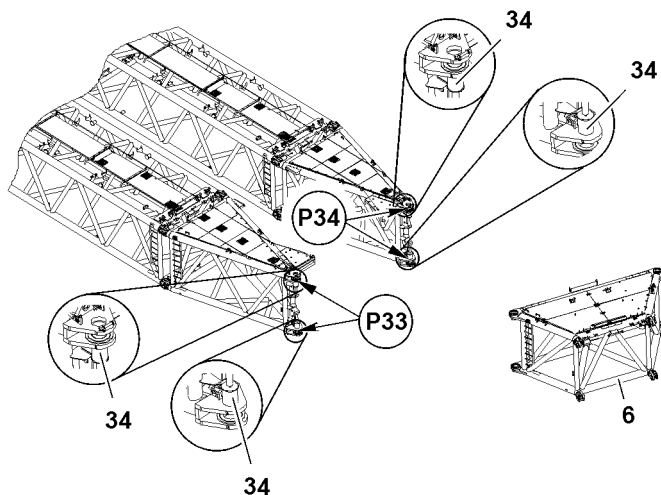
Personnel can be severely injured or killed!

- ▶ All pins 32 are to be secured after assembly of the S-intermediate sections 4 with the intended safety elements 33!

On both lattice sections of S-intermediate sections 4, install respectively an upper P-adapter 5 (left: upper P-adapter 5.2, right: upper P-adapter 5.1).

- ▶ Attach the upper P-adapter 5 on the auxiliary crane and align on the S-intermediate section 4, see section "Fastening points of the lattice sections".
- ▶ When the pin bores of the upper P-adapter 5 align on point P31 with those of the S-intermediate section 4:
Pin the upper P-adapter 5 with the S-intermediate section 4: Insert the pin 32 on point P31 with the pin pulling device from the "inside" to the "outside" and secure with spring retainer 33.
- ▶ Lower the upper P-adapter 5 with the auxiliary crane until it can be pinned on point P32.
- ▶ Pin the upper P-adapter 5 with the S-intermediate section 4: Insert the pin 32 with the pin pulling device from the "inside" to the "outside" and secure with spring retainer 33.
- ▶ Remove the auxiliary crane.

3.4.11 Installing the cross beam



B114590

Installing the cross beam



Note

- ▶ The hydraulic supply for the assembly of the cross beam is made via the external hydraulic aggregate!

**WARNING**

Pressure in the hydraulic lines!

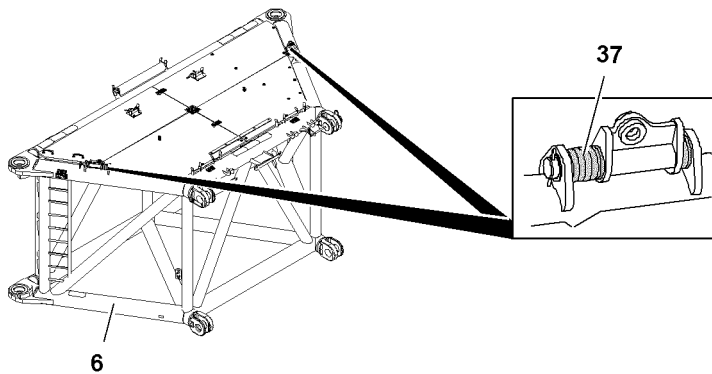
If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure!

Personnel can be severely injured or killed!

- ▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time!

Make sure that the following prerequisites are met:

- The two upper P-adapters are properly installed.
- The lattice sections are aligned in such a way that the cross beam **6** can be installed.
- The pins **34** are completely unpinned on the points **P33**.
- The pins **34** are completely unpinned on the points **P34**.



B114591

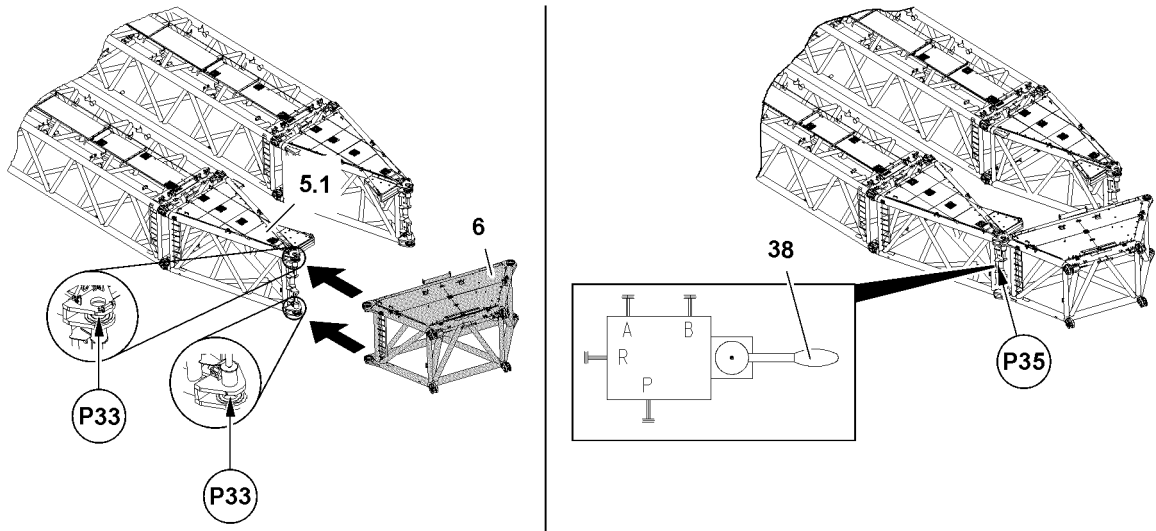
Install - fasten the cross beam

- ▶ Fasten the cross beam **6** on the auxiliary crane and lift, see section "Fastening points of the lattice sections".
- ▶ Check if the cross beam **6** hangs horizontally on the auxiliary crane.

Troubleshooting

The cross beam **6** does not hang horizontally on the auxiliary crane:

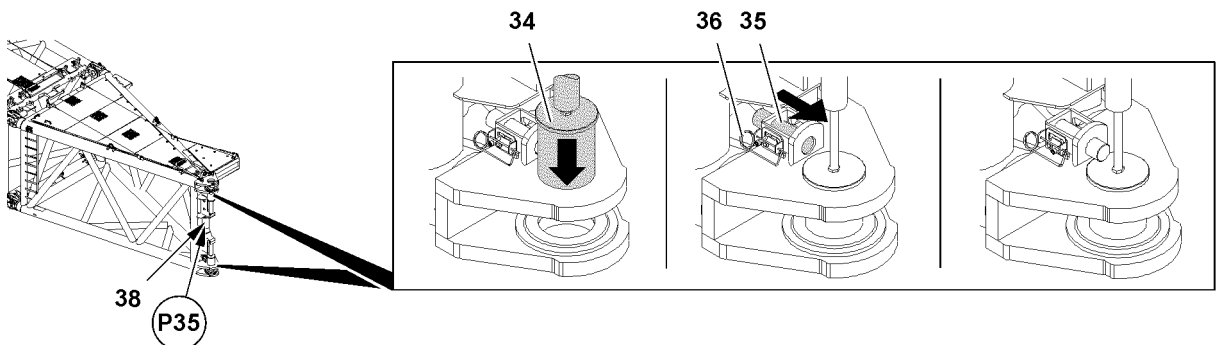
- ▶ Place the cross beam down **6**.
- ▶ With the disks **37** adjust the center of gravity so that the cross beam **6** hangs horizontally during the lifting procedure.
- ▶ Lift the cross beam **6**.



B114592

Install the cross beam - position the cross beam on the right

- ▶ Lift the cross beam 6 with the auxiliary crane on the right upper P-adapter 5.1.
- ▶ Position the cross beam 6 with the auxiliary crane in such a way that it can be pinned on points P33.
- ▶ Establish the hydraulic connection on point P35: Connect the coupling parts (sleeve and plug) and screw together by hand until the hand nut is turned to a noticeable, fixed stop.



B114593

Install the cross beam - pin the cross beam on the right



WARNING

General danger notes!

Personnel can be severely injured or killed!

- ▶ All pins 34 are to be secured after assembly of the cross beam 6 with the intended safety elements 35!

- ▶ Actuate the hand lever 38 until the pins 34 are completely pinned.

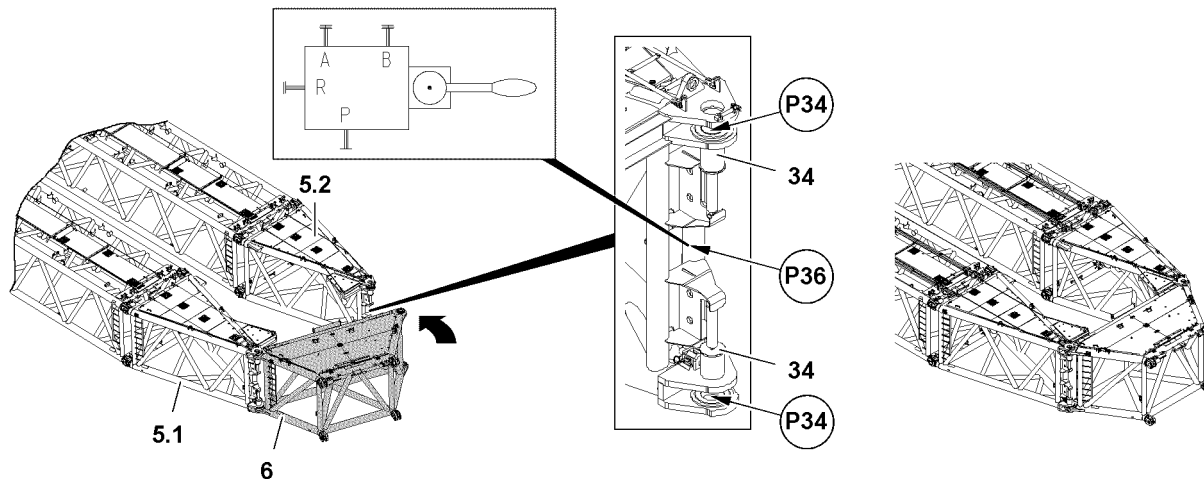
All pins 34 must be secured after pinning.

- ▶ Release the retaining pin 35.
- ▶ Slide the retaining pin 35 out to the stop and lock the screw in place "downward".
- ▶ Secure the retaining pin 35 with spring retainer 36.

Result:

- The pins 34 are secured.

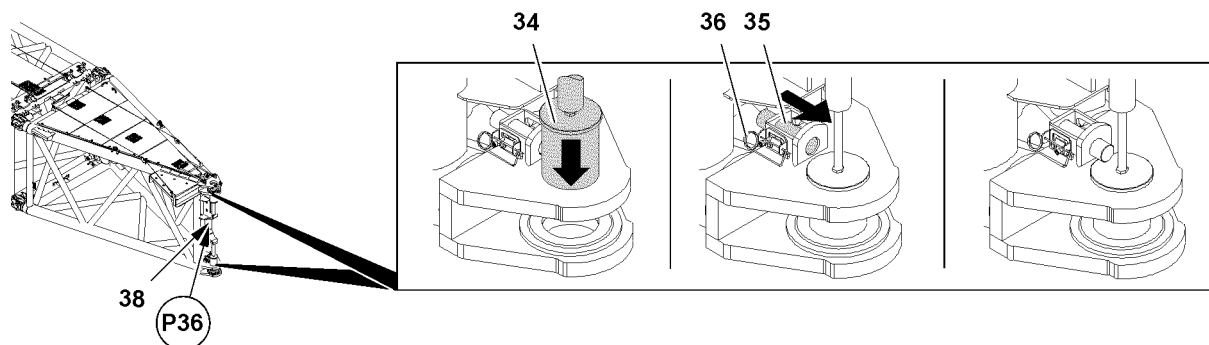
- ▶ Disconnect the hydraulic connection on point **P35**: Install the coupling components (sleeve and plug) with the hand-tightened nut.
- ▶ Install dust caps on the quick couplings.



B114594

Install the cross beam - position the cross beam on the left

- ▶ Fold the cross beam **6** with the auxiliary crane on the left, upper P-adapter **5.2** so that it can be pinned on the points **P34**.
- ▶ Establish the hydraulic connection on point **P36**: Connect the coupling parts (sleeve and plug) and screw together by hand until the hand nut is turned to a noticeable, fixed stop.



B114595

Install the cross beam - pin the cross beam on the left



WARNING

General danger notes!

Personnel can be severely injured or killed!

- ▶ All pins **34** are to be secured after assembly of the cross beam **6** with the intended safety elements **35**!

- ▶ Actuate the hand lever **38** until the pins **34** are completely pinned.

The pins **34** must be secured after pinning.

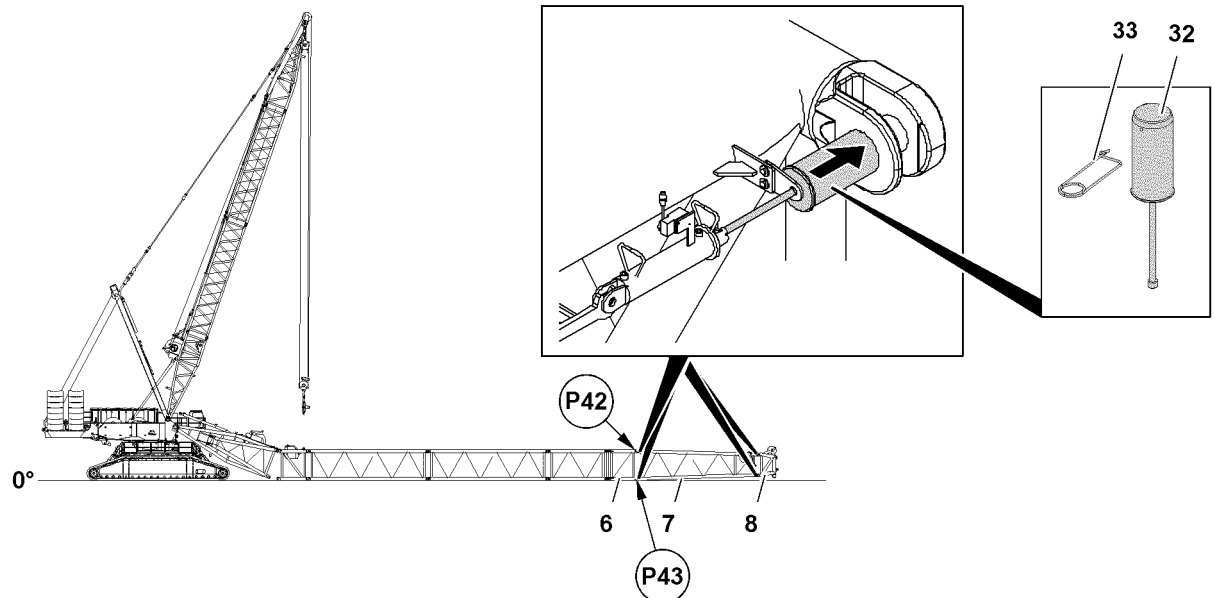
- ▶ Release the retaining pin **35**.
- ▶ Slide the retaining pin **35** out to the stop and lock the screw in place "downward".
- ▶ Secure the retaining pin **35** with spring retainer **36**.

Result:

- The pins **34** are secured.

- ▶ Disconnect the hydraulic connection on point **P36**: Install the coupling components (sleeve and plug) with the hand-tightened nut.
- ▶ Install dust caps on the quick couplings.
- ▶ Remove the auxiliary crane.

3.4.12 Installing the lattice sections on the cross beam



B117450

Install the lattice section on the cross beam - install the lattice sections

Make sure that the following prerequisites are met:

- The cross beam **6** is properly pinned and secured on both upper P-adapters **5**.
- The required bridges and pedestals are installed on the lattice sections.



Note

- ▶ The S-intermediate sections **4**, the S-adapter **7** and the SW-end section **8** are pinned with the pin pulling device, see Crane operating instructions, chapter 5.30!
- ▶ Support the lattice section from below for easier assembly / disassembly!



WARNING

General danger notes!

Personnel can be severely injured or killed!

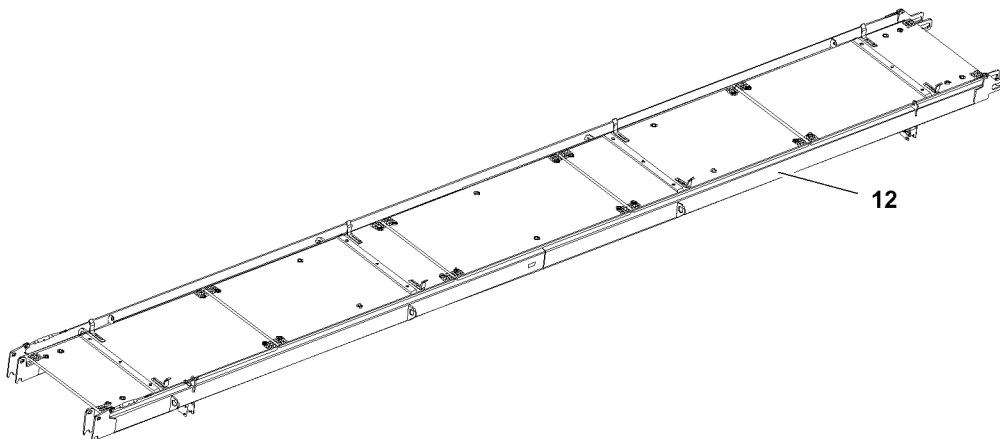
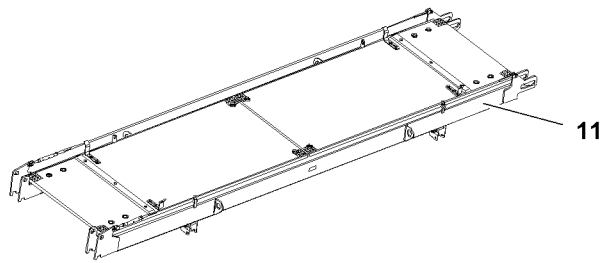
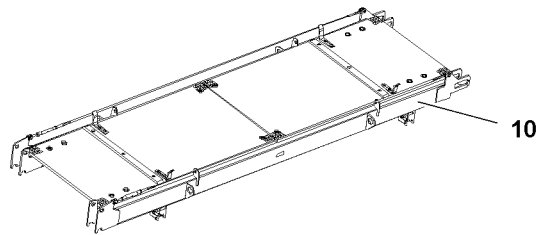
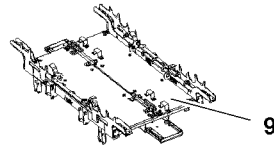
- ▶ All pins **32** are to be secured after assembly of the lattice sections with the intended safety elements **33**!
- ▶ Fasten the lattice section on the auxiliary crane and lift, see section “Fastening points of the lattice sections”.
- ▶ Align the lattice section on the cross beam **6**.
- ▶ When the pin bores of the cross beam **6** and the lattice section align “on top” on point **P42**: Pin the lattice section with the cross beam **6**: Insert the pin **32** on point **P42** with the pin pulling device from the “inside” to the “outside” and secure with spring retainer **33**.
- ▶ Lower the lattice section with the auxiliary crane until it can be pinned on point **P43**.

- ▶ Pin the lattice section with the cross beam **6**: Insert the pin **32** on point **P43** with the pin pulling device from the “inside” to the “outside” and secure with spring retainer **33**.

Assemble the main boom to the required length and pin and secure the lattice sections “on top” and “bottom”.

- ▶ Insert the pin **32** from the “inside” to the “outside” and secure with spring retainer **33**.

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B117313

3.5 Assembly of bridges



Note

- ▶ The following descriptions are an example for the installation of all bridges!
- ▶ The number of bridges used varies, depending on the main boom length, check the rod plan!



WARNING

Danger of falling!

- ▶ Make sure that the assembly personnel is secured with the supplied fall arrest system to prevent them from falling when installing the bridges.

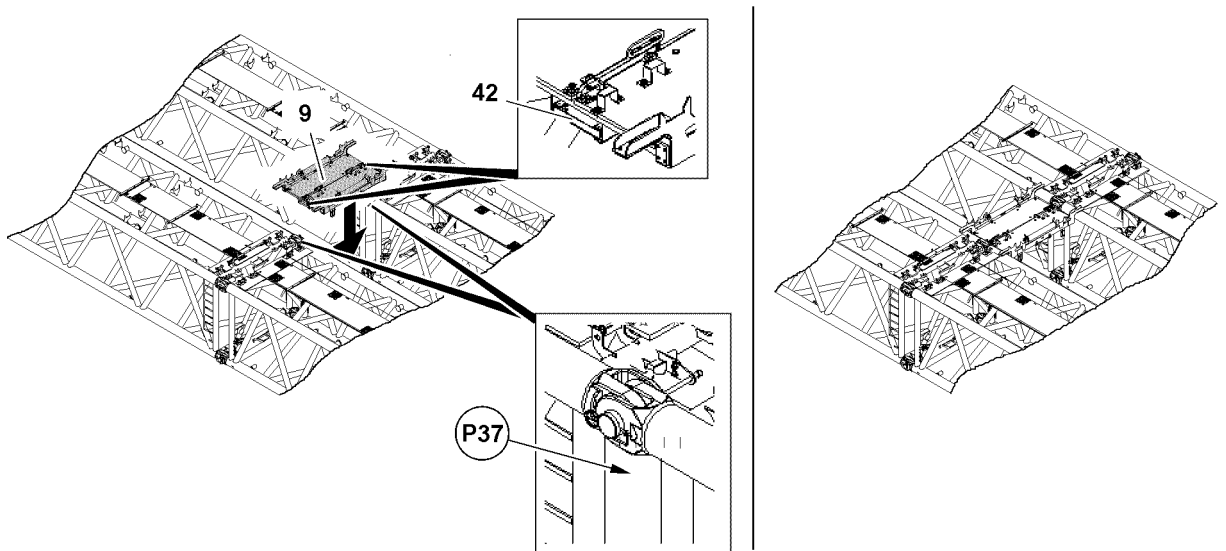
Make sure that the following prerequisite is met:

- The cross beam is properly pinned and secured on both upper P-adapters.

3.5.1 Individual assembly of bridges

Assembly of bridges “lateral”

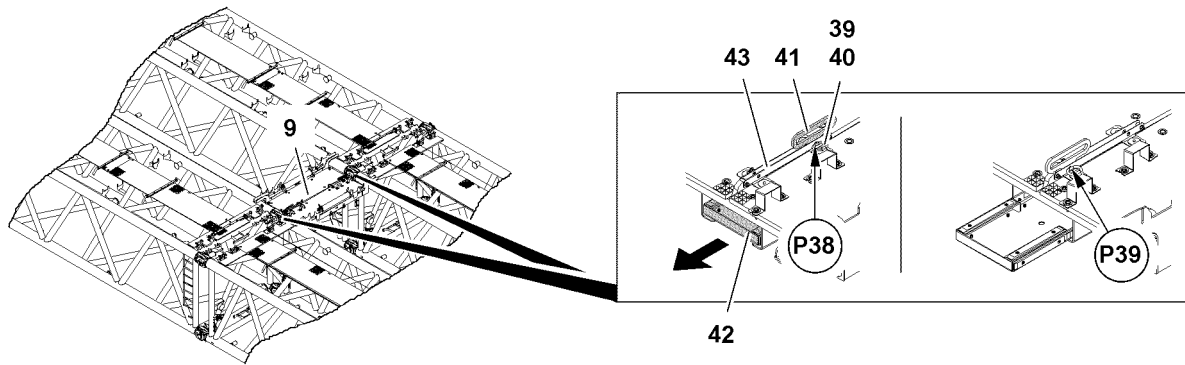
- ▶ Fasten the bridge “lateral” 9 on the auxiliary crane and lift, see section “Fastening points of the lattice sections”.



B114596

Position the bridge “lateral” — Install the bridge “lateral”

- ▶ Position the bridge 9 in such a way that the sliding section 42 can be extended between the lattice sections on point P37.



B114597

Install the bridge “lateral” — Secure the bridge “lateral”

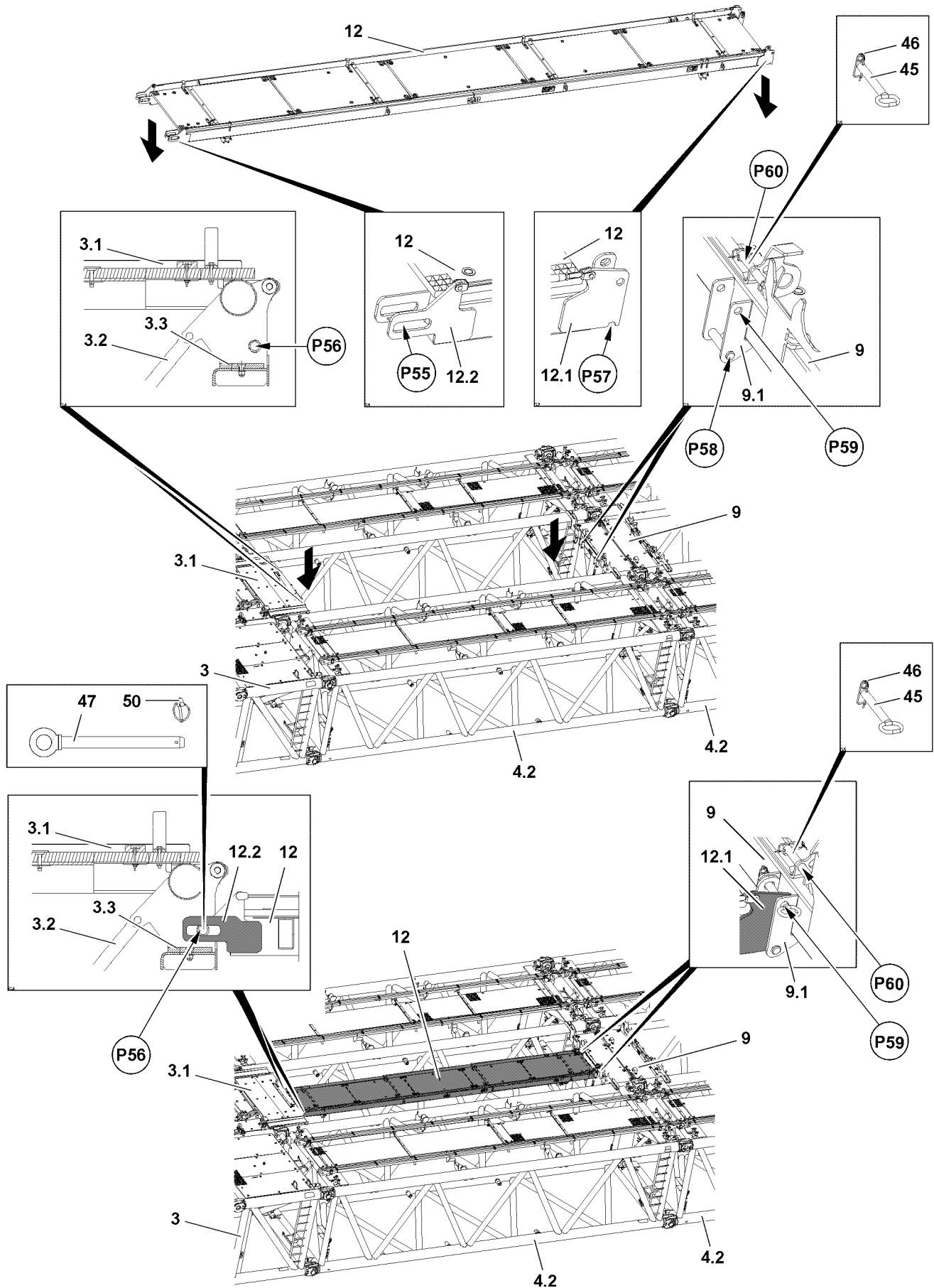
The bridge **9** must be secured after placing it on **both** lattice sections to prevent it from slipping. To do so, the sliding section **42** must be brought from transport position into operating position. This procedure is described on an example of one side.

- ▶ Unpin the handle **41** of the sliding section **42** on the guide bar **43**: Release and unpin the grip pin **39** on point **P38**.
- ▶ Bring the sliding section **42** from transport position into operating position: Slide the sliding section **42** out completely with the handle **41**.
- ▶ Pin the handle **41** of the sliding section **42** with the guide bar **43**: Insert the grip pin **39** on point **P39** and secure with locking pin **40**.
- ▶ Secure the opposite side of the bridge **9** the same way as described in this section to prevent it from slipping.

Result:

- The bridge **9** is secured to prevent it from slipping.
- ▶ If necessary: Install additional bridges “lateral” as specified.

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B117204

Assembly of bridges “lengthwise”



Note

- ▶ The assembly of all bridges “lengthwise” is identical.
- ▶ The assembly of the bridges “lengthwise” is described on the example of one bridge “lengthwise”.
- ▶ We recommend to install the bridges “lengthwise” - starting on the platform **3.1**.

Make sure that the following prerequisites are met:

- The platform **3.1** is properly installed and secured.
- The bridges “lateral” **9** are properly installed and secured on the P-boom.
- ▶ Attach the bridge “lengthwise” **12** properly on the auxiliary crane, see section Fastening points.
- ▶ Unpin pins **47** on both sides at point **P56**.
- ▶ Lift the bridge “lengthwise” **12** with the auxiliary crane and swing it in to the installation position on the P-boom.



Note

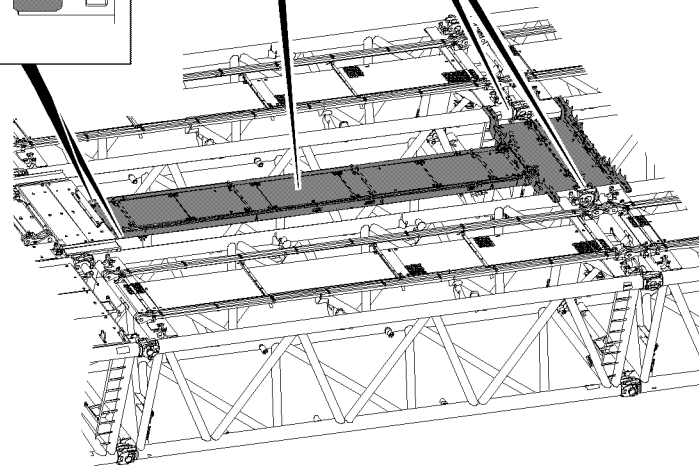
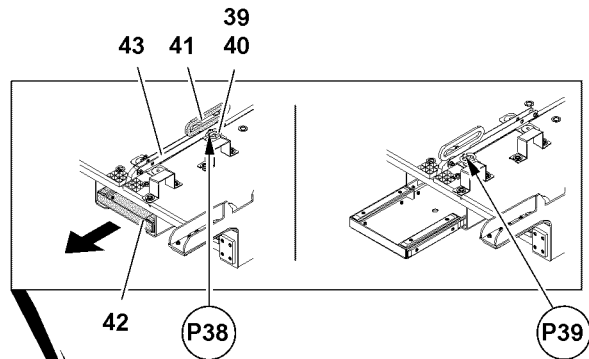
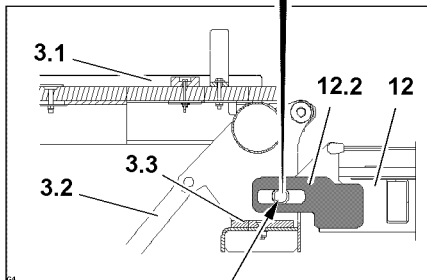
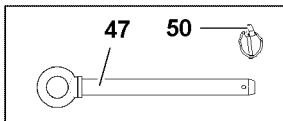
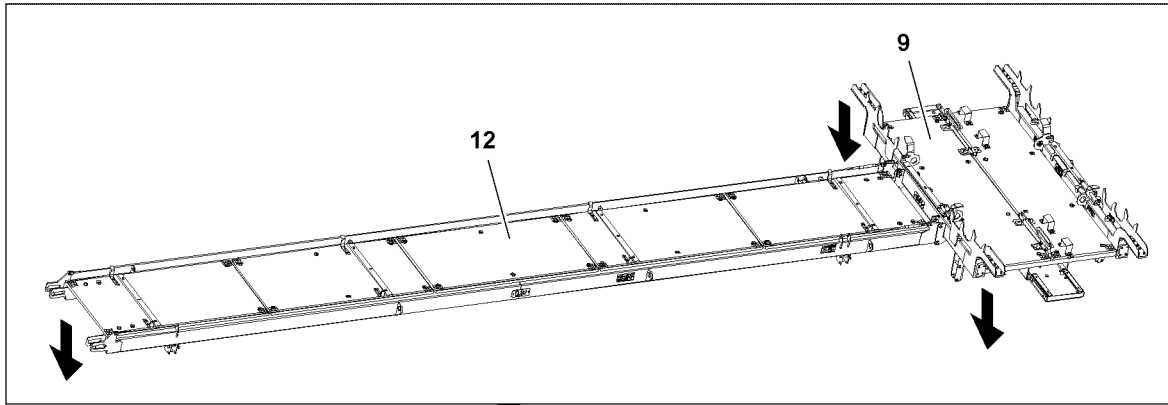
- ▶ Pay attention to the installation position of the bridge “lengthwise”!
- ▶ Move the bridge “lengthwise” **12** in the receptacles on the platform at point **P56**.
- ▶ Lower the bridge “lengthwise” **12** with the centering brackets **12.1** on the centering pins at point **P58**.

Pin the bridge “lengthwise” **12** on both sides at point **P59**.

- ▶ Unpin the pin **45** from park position at point **P60**.
- ▶ Insert and secure the pin **45** at point **P59**.
- ▶ Pin the bridge “lengthwise” **12** on both sides at point **P56**.
- ▶ Secure the pin **47** with linch pin **50**.

Result:

- The bridge “lengthwise” **12** is pinned and secured with platform **3.1** and bridge “lateral” **9** - Operating position.
- ▶ Install additional bridges “lengthwise” **12** as described above between the bridges “lateral” **9**.



3.5.2 Installation of preassembled bridges



Note

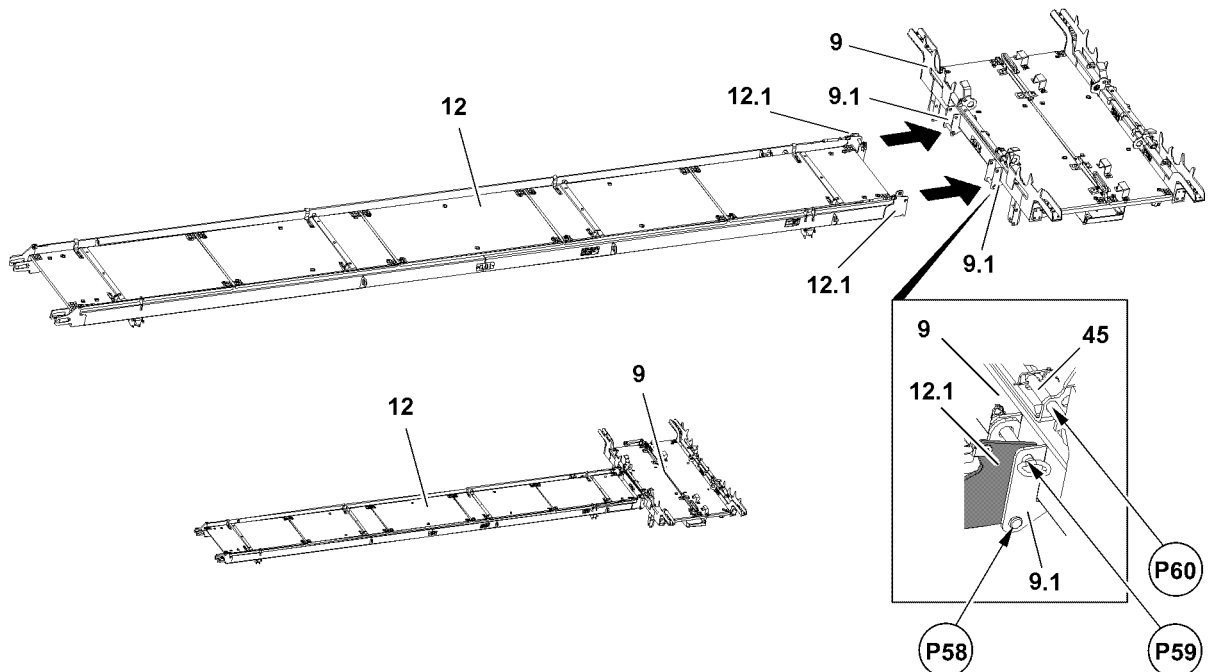
- ▶ The assembly of all preassembled bridges is identical.
- ▶ The assembly of the preassembled bridges is described on the example of one bridge.



WARNING

Danger of accident!

- ▶ Make sure that the installation of preassembled bridges is started on the platform **3.1**.



B117310

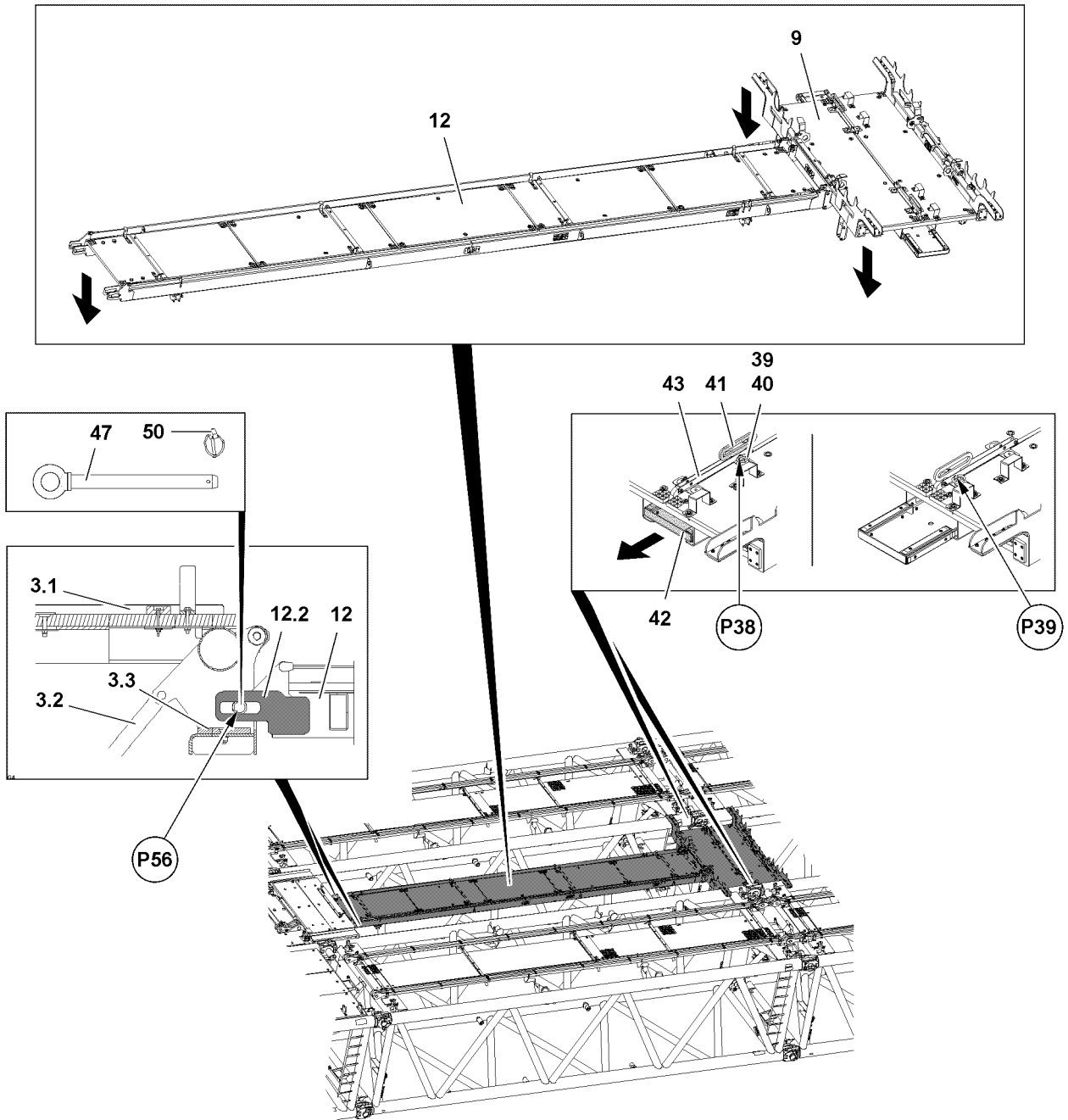
Preassembling the bridge “lengthwise” and bridge “lateral”

Make sure that the following prerequisites are met:

- An auxiliary crane is on hand.
- ▶ Place the bridge “lateral” **9** with the auxiliary crane on the support on the ground.
- ▶ Remove the fastening equipment on the bridge “lateral”.
- ▶ Fasten the bridge “lengthwise” **12** on the auxiliary crane.
- ▶ Swing the bridge “lengthwise” **12** with the auxiliary crane in to the bridge “lateral” **9**.
- ▶ Position the bridge “lengthwise” **12** on bridge “lateral” **9** at point **P58**.
- ▶ Unpin the pins **45** on both sides from park position at point **P60**.
- ▶ Insert the pins **45** on both sides at point **P59** and secure.

Result:

- Bridge “lengthwise” **12** and bridge “lateral” **9** are preassembled.



Installing preassembled bridges

Make sure that the following prerequisites are met:

- The platform is properly installed and secured.
- The cross beam is properly pinned and secured on both upper P-adapters.
- Bridges - bridge “lengthwise” **12** and bridge “lateral” **9** - are preassembled.



WARNING

Danger due falling bridges!

- ▶ Start the installation of bridges only at the platform **3.1**.
-

- ▶ Fasten the preassembled bridge on the auxiliary crane.
- ▶ Lift the preassembled bridge with the auxiliary crane.
- ▶ Move the preassembled bridge into the receptacles on the platform **3.1**.
- ▶ Lower the preassembled bridge until the bridges “lateral” **9** are laying completely on the lattice sections.
- ▶ Lock the bridges “lateral” **9** on both sides on the lattice strands with the sliding section **42**.
- ▶ Pin and lock the sliding section **42** on both sides in position **locked**, see section “Assembly of bridges lateral”.

Result:

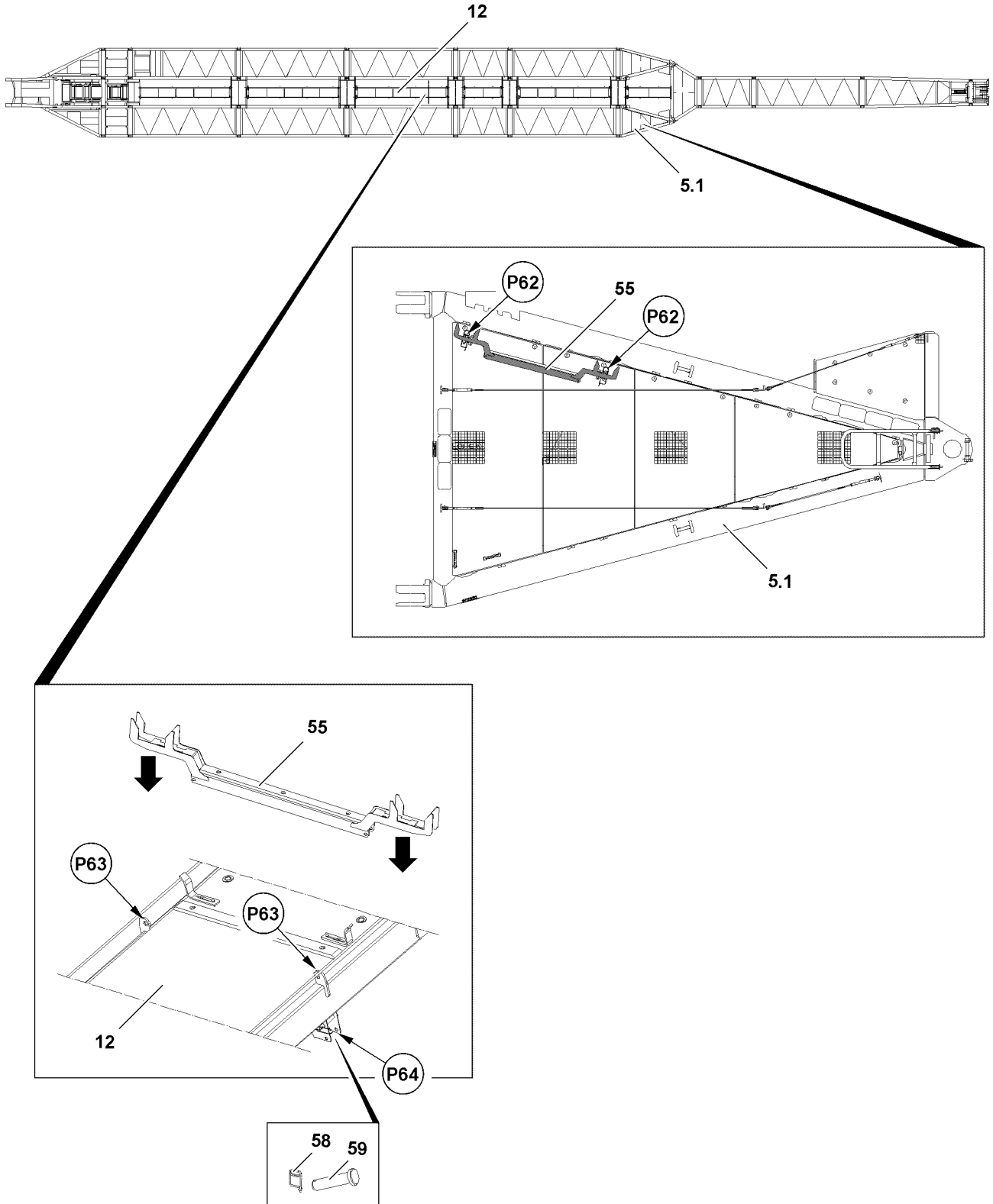
- The preassembled bridge is secured to prevent it from slipping.

- ▶ Pin and secure the preassembled bridge on platform **3.1** on both sides at point **P56**.

Result:

- The preassembled bridge is completely installed.

- ▶ Depending on the boom length: Install additional preassembled bridges as specified.



B117460

3.6 Installing the carrier for the rod placement



Note

- ▶ The carrier **55** for the rod placement is only required when using 3 m auxiliary rods.
 - ▶ The installation position of carrier **55** depends on the boom length, pay attention to the rod plan.
-

Make sure that the following prerequisites are met:

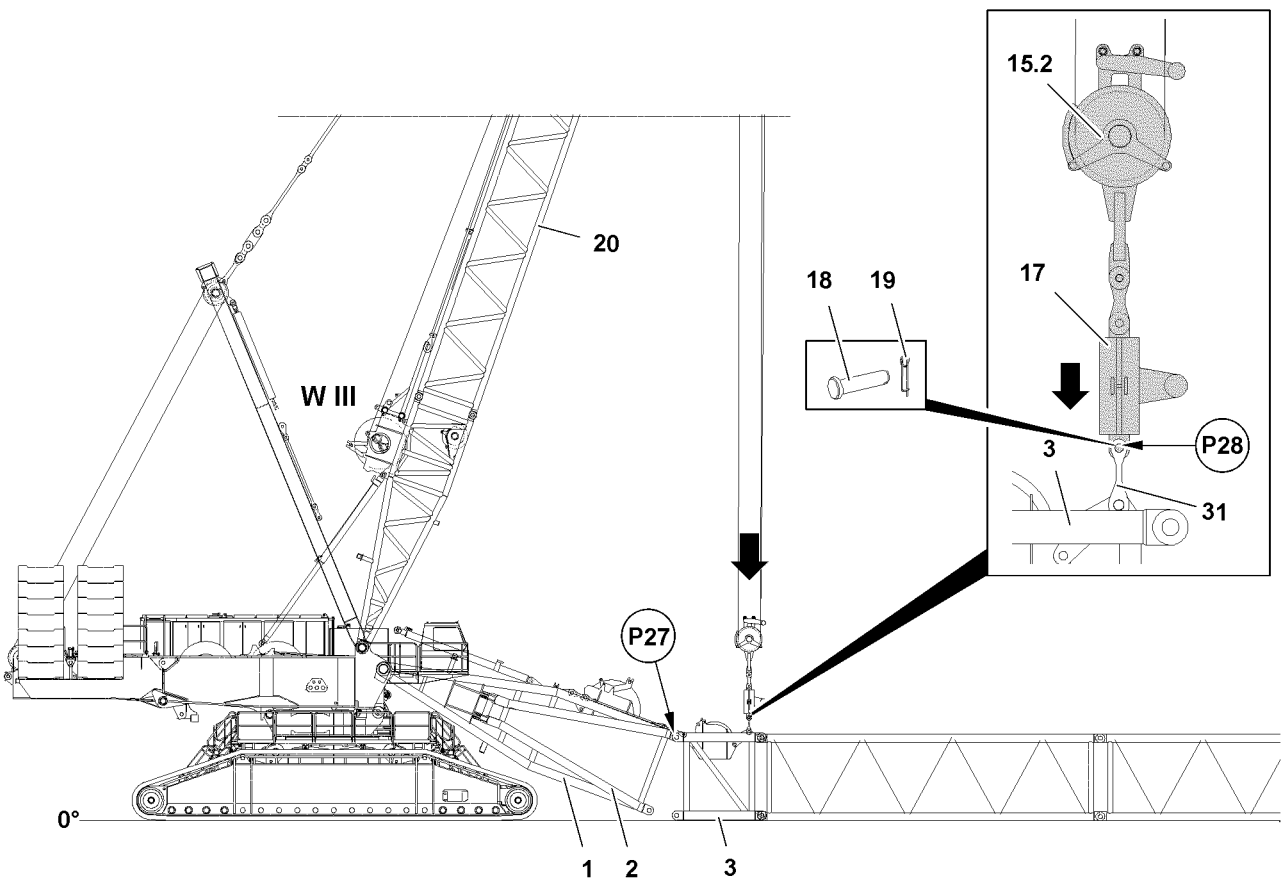
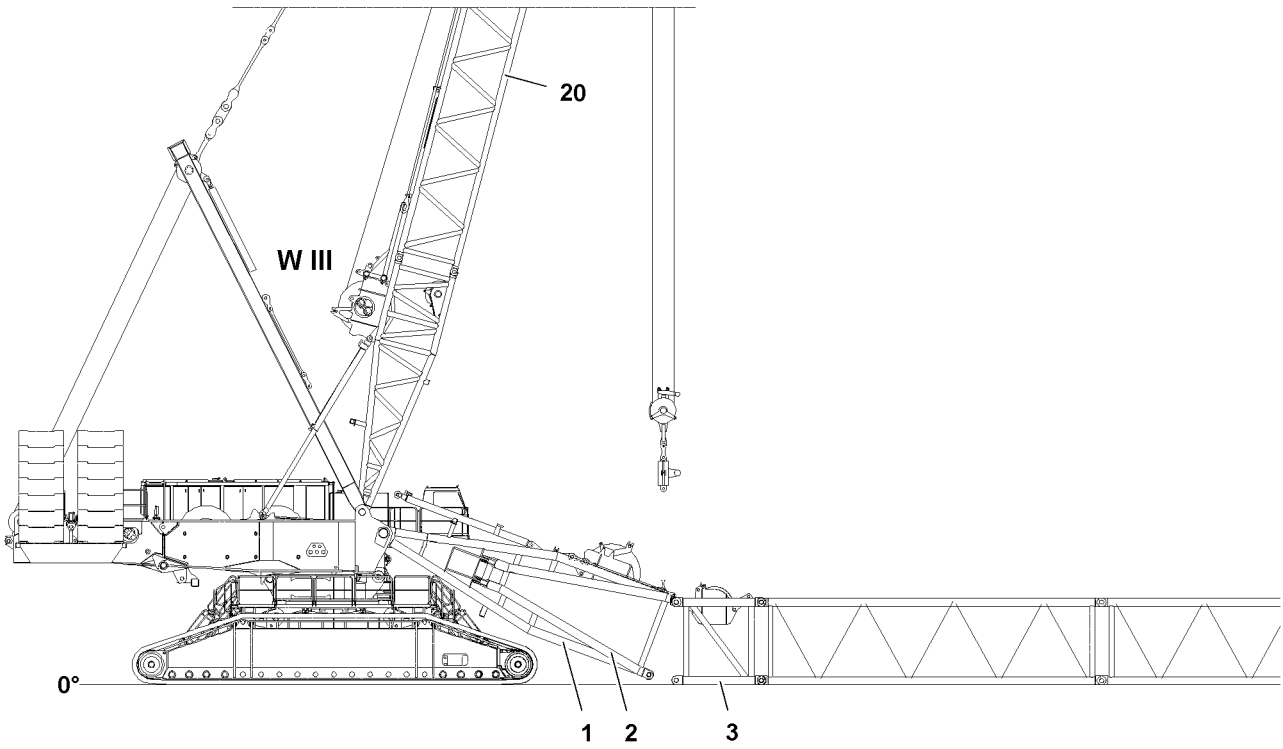
- The bridges are properly installed and secured.
- ▶ Release the carrier **55** on P-adapter right **5.1** on points **P62**.

Install the carrier **55** on bridge **12**.

- ▶ Set the carrier **55** on bridge **12** on points **P63**.
- ▶ Unpin pins **59** on both sides at point **P64**.
- ▶ Pin the carrier **55** with pins **59** at point **P63** on both sides and secure with spring retainers **58**.

Result:

- The carrier **55** is pinned on bridge **12**.



B117202

3.7 Installing the upper pulley block on the cross carrier

So that the main boom combination can be “closed” after assembly, it is necessary that the upper pulley block **15.2** is installed with the assembly weight **17** on the cross carrier **3**. To do so, the upper pulley block **15.2** is removed on the S-pivot section **1** and moved to the brackets **31** on the cross carrier **3** by luffing the D-boom **20**.

Make sure that the following prerequisites are met:

- The cross carrier **3** is pinned and secured on points **P27** with the lower P-adapters **2** and the S-pivot section **1**.
- The cross carrier **3** is placed completely on a support on the ground.
- The auxiliary crane is removed.
- The bridges - bridges “lengthwise” and bridges “lateral” - are completely installed and secured.



WARNING

Oscillating upper pulley block!

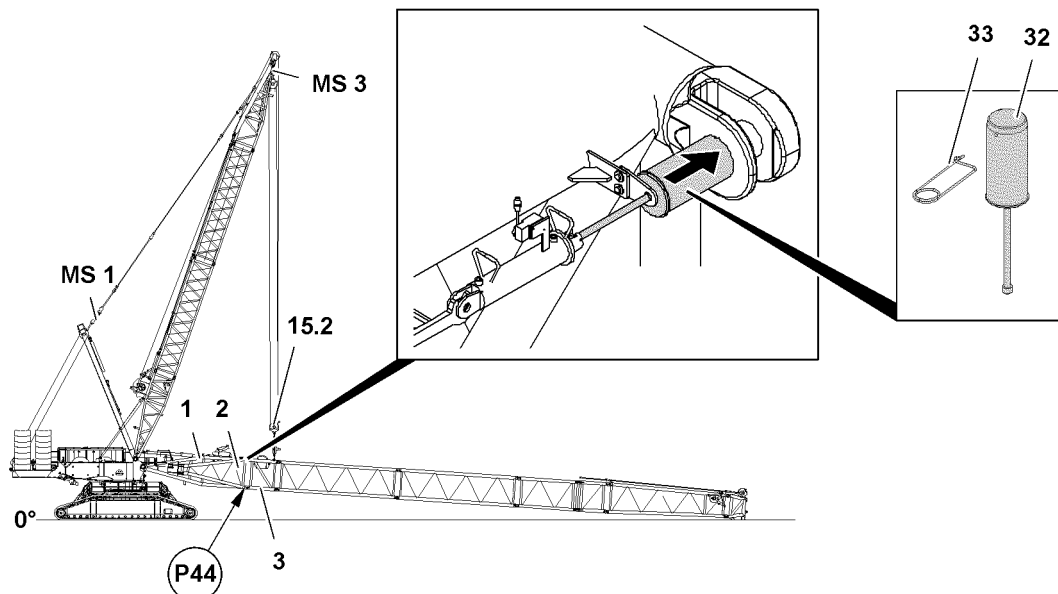
When unpinning the upper pulley block, it can start to swing back and forth!

Personnel can be severely injured or killed!

- ▶ Make sure that the derrick head is vertical above the upper pulley block during the unpinning procedure!

- ▶ Luff the D-boom **20** down to the front until the upper pulley block **15.2** hangs freely with the assembly weight **17** over the brackets **31** on the cross carrier **3**.
- ▶ Pin the assembly weight **17** with the brackets **31** on points **P28**: Insert the pins **18** on both sides on points **P28** and secure with spring retainers **19**.
- ▶ Carefully spool up winch **3 W III** until the control rope of winch **3 W III** is slightly tensioned.

3.8 Closing the main boom



B114601

Install the lattice sections on the cross beam - close the boom

**WARNING**

The crane can topple over!

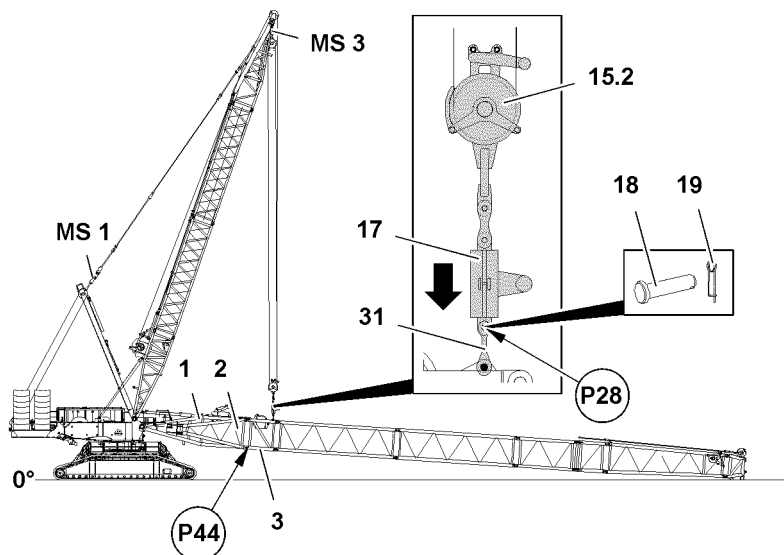
If the following conditions are not met, the crane can topple over or be significantly damaged!

Personnel can be severely injured or killed!

- ▶ The maximum permissible total force on test point 1 may not exceed 136 t during the “closing procedure”!
- ▶ The maximum permissible total force on test point 3 may not exceed 150 t during the “closing procedure”!
- ▶ Non-required guy rods must be removed from the lattice sections, see Crane operating instructions, chapter 5.01!
- ▶ The end section of the corresponding boom combination may **not** lift off the ground during the “Closing procedure”!

**Note**

- ▶ The value of test point 1 is shown as force F1 on the LICCON monitor 1, the value of test point 3 is shown as force F3, see Crane operating instructions, chapter 4.02!
- ▶ When the P-boom combination is assembled to the desired length:
Lift the cross carrier 3 with the upper pulley block 15.2 until the four pin bores align on points P44.
- ▶ Pin the lower P-adapter 2 and S-pivot section 1 with the cross carrier 3: Insert the pin 32 with the pin pulling device from the “inside” to the “outside” and secure with spring retainer 33.



B114602

Install the lattice sections on the cross beam - remove the assembly weight on the lattice section

**WARNING**

Mortal danger due to folding “down” of boom!

By unpinning the assembly weight 17 on the bracket 31 of the cross carrier 3, the boom can suddenly fold “down” if the boom is not pinned at point P44 “on the bottom”!

Personnel can be severely injured or killed!

- ▶ It is prohibited for anyone to remain under the raised boom combination during the pinning / unpinning procedure!
- ▶ Unpin the assembly weight 17 on the bracket 31 only when it is ensured that the S-pivot section 1 and the lower P-adapters 2 are safely pinned and secured on the “bottom” with the cross carrier 3!
- ▶ When the P-boom system is “closed”:
Slowly lower the upper pulley block 15.2 until the brackets 31 are relieved.

**WARNING**

Oscillating upper pulley block!

When unpinning the upper pulley block, it can start to swing back and forth!

Personnel can be severely injured or killed!

- ▶ Make sure that the derrick head is vertical above the upper pulley block during the unpinning procedure!
- ▶ Unpin the assembly weight **17** on the brackets **31**: Release pins **18** on both sides on point **P28** and unpin.

3.9 Establishing the electrical connections

NOTICE

Damage to the electrical connection on the cable drum!

If the electrical connection from the cable drum on the S-pivot section to the terminal box on the S-pivot section is established first before the connection to the terminal box on the S-end section, the electrical connection can be damaged when spooling out the cable drum!

- ▶ Establish first the electrical connection from the cable drum in the S-pivot section to the terminal box on the S-end section and then the electrical connection from the terminal box in the S-pivot section to the cable drum!

**Note**

- ▶ To establish the electrical connections on the main boom, use the Electric wiring diagram!

Make sure that the following prerequisites are met:

- The main boom is completely assembled.
- The airplane warning light and the wind speed sensor are assembled.
- ▶ Establish the electrical connections.
- ▶ Make sure that all electrical connections on the boom are established.

3.10 Establishing the hydraulic connections

When connecting and releasing hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.

**DANGER**

Danger of accident due to loss of pressure or leakage!

Incorrectly coupled or self-loosening quick-release couplings (particularly return lines) can result in serious accidents due to component failure!

- ▶ Check that the quick couplings have been properly connected before using the crane!

**Note**

- ▶ To connect or release the hydraulic lines with quick couplers, see Crane operating instructions, chapter 5.01!
- ▶ Release the pressure in the hydraulic system before connecting or disconnecting. Turn the engine off and wait for short time.
- ▶ Assembling coupling components (sleeve and connector) by using hand-tightened nut.
- ▶ Connect coupling components.

3.11 Function check



WARNING

Non-functioning safety devices!

If the function of the safety devices is defective, personnel can be severely injured or killed!

- ▶ Crane operation with non-functioning safety devices is **prohibited!**



Note

- ▶ The function of the individual limit switches must be checked before erection of the boom system!
- ▶ The function of the limit switch initiators must be checked in the test system, see Diagnostics manual!



Note

- ▶ If a function check on the limit switches or on the safety devices does not lead to the desired shut offs, then the plug connections on the connector boxes or the components itself must be checked. If no visible connection errors or component defects can be found, contact Liebherr Service!

Make sure that the following prerequisites are met:

- All electrical connections have been made.
- The crane engine is running.
- The corresponding operating mode is set on the LICCON monitor.
- The actuator levers of the limit switches have been checked for easy movement and are lubricated.

3.11.1 Wind speed sensor

- ▶ Test the movement and the function of the wind speed sensor.

3.11.2 Airplane warning light

- ▶ Turn the airplane warning light on, see Crane operating instructions, chapter 4.01.
- ▶ Check the function visually.

3.11.3 Hoist limit switch

- ▶ Actuate the hoist limit switch manually on the pulley head.

Result:

- The hoist winch turns off in upward movement.
- The hoist top icon blinks on the LICCON monitor 0.

3.11.4 Checking the limit switch D-boom “Steepest position”



Note

- ▶ The limit switch functions have to be checked individually before erection!

- ▶ Cover the limit switch initiators on the D-relapse cylinders individually with a metal plate.

Result:

- The limit switch is actuated manually.
- The spool up function of winch 4 (control winch) turns off.
- The “Boom limitation” icon appears on the LICCON monitor 0.

3.11.5 Checking the limit switch main boom “steepest position”

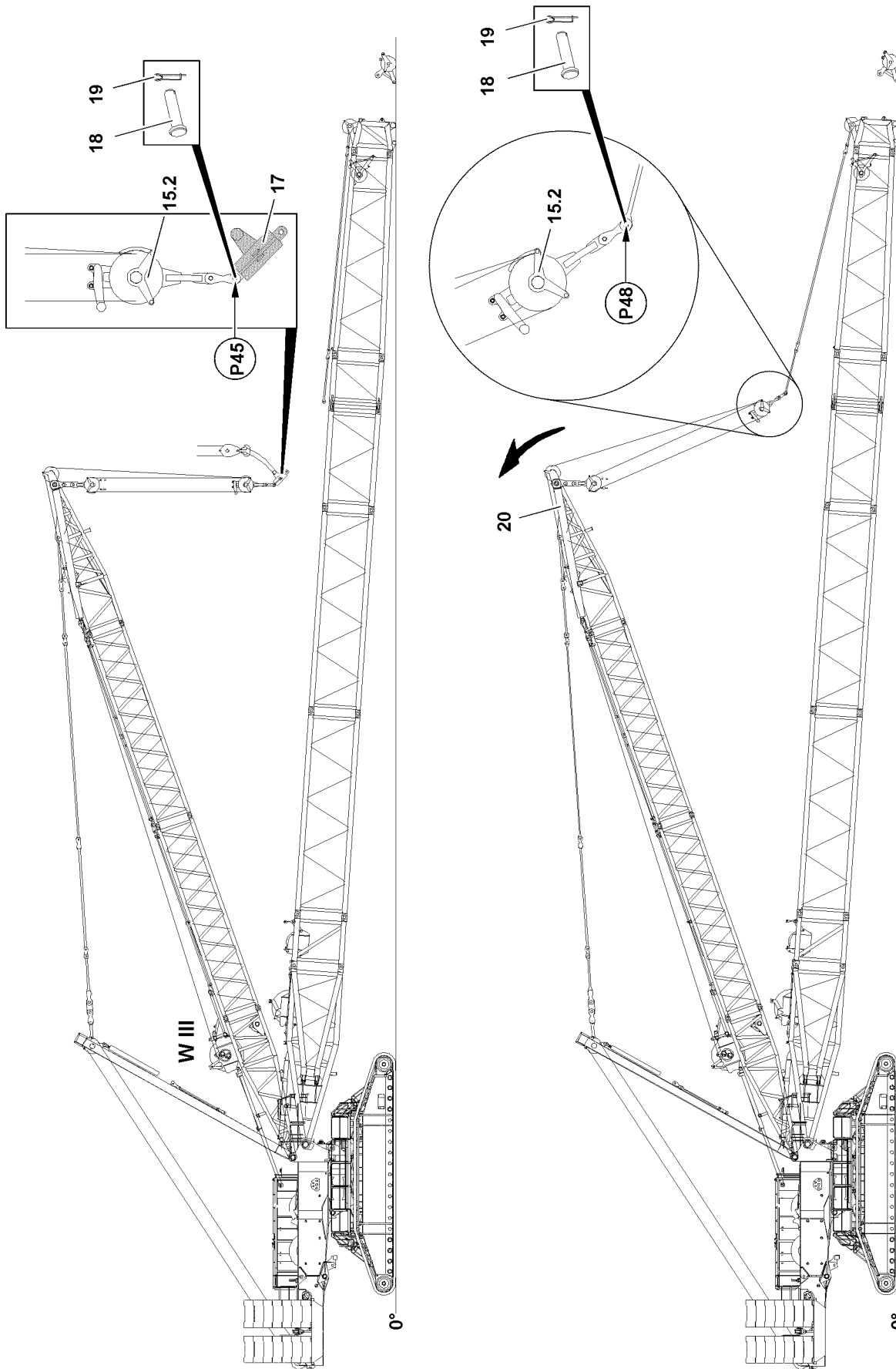
**Note**

▶ The limit switch functions have to be checked individually before erection!

▶ Cover the limit switch initiators on the relapse cylinders of the main boom individually with a metal plate.

Result:

- The limit switch is actuated manually.
- The spool up function of winch 3 turns off.
- The “Boom limitation” icon appears on the LICCON monitor 0.



B115391

3.12 Assembling the guy rods



WARNING

Neglected inspection and maintenance on guy rods!

If the regular inspection and maintenance of the guy rods is not carried out or only in irregular intervals, then severe accidents can occur due to existing and not recognized damage on the guy rods!

Personnel can be severely injured or killed!

- ▶ The guy rods must be checked before every assembly, see Crane operating instructions, chapter 8.15!



Note

- ▶ Assemble and secure the guy rods according to the supplied rod plans. The numbering on the rod plans must be identical to the numbering on the guy rods!

Make sure that the following prerequisites are met:

- The main boom is completely assembled.
- All lattice sections are properly pinned with each other.
- All bridges are properly installed.
- The carrier **55** for the rod placement is properly installed (only required when using 3 m rods).
- All pin connections have been secured.
- The upper pulley block **15.2** is completely unpinned on the cross carrier **3**.
- ▶ Luff the D-boom **20** down to the front.
- ▶ Lower the upper pulley block **15.2** to the boom: Spool out winch **3 W III**.
- ▶ Attach the assembly weight **17** onto the auxiliary crane.
- ▶ When the assembly weight **17** is safely held by the auxiliary crane:
Release and unpin the assembly weight **17** on the upper pulley block **15.2** on both sides on points **P45**.
- ▶ Remove the assembly weight **17** with the auxiliary crane.

The guy rods are placed and secured for transport on the corresponding intermediate sections. Before assembly, the transport retainers must be released.

- ▶ Release the transport retainers on the guy rods.

NOTICE

Danger of property damage!

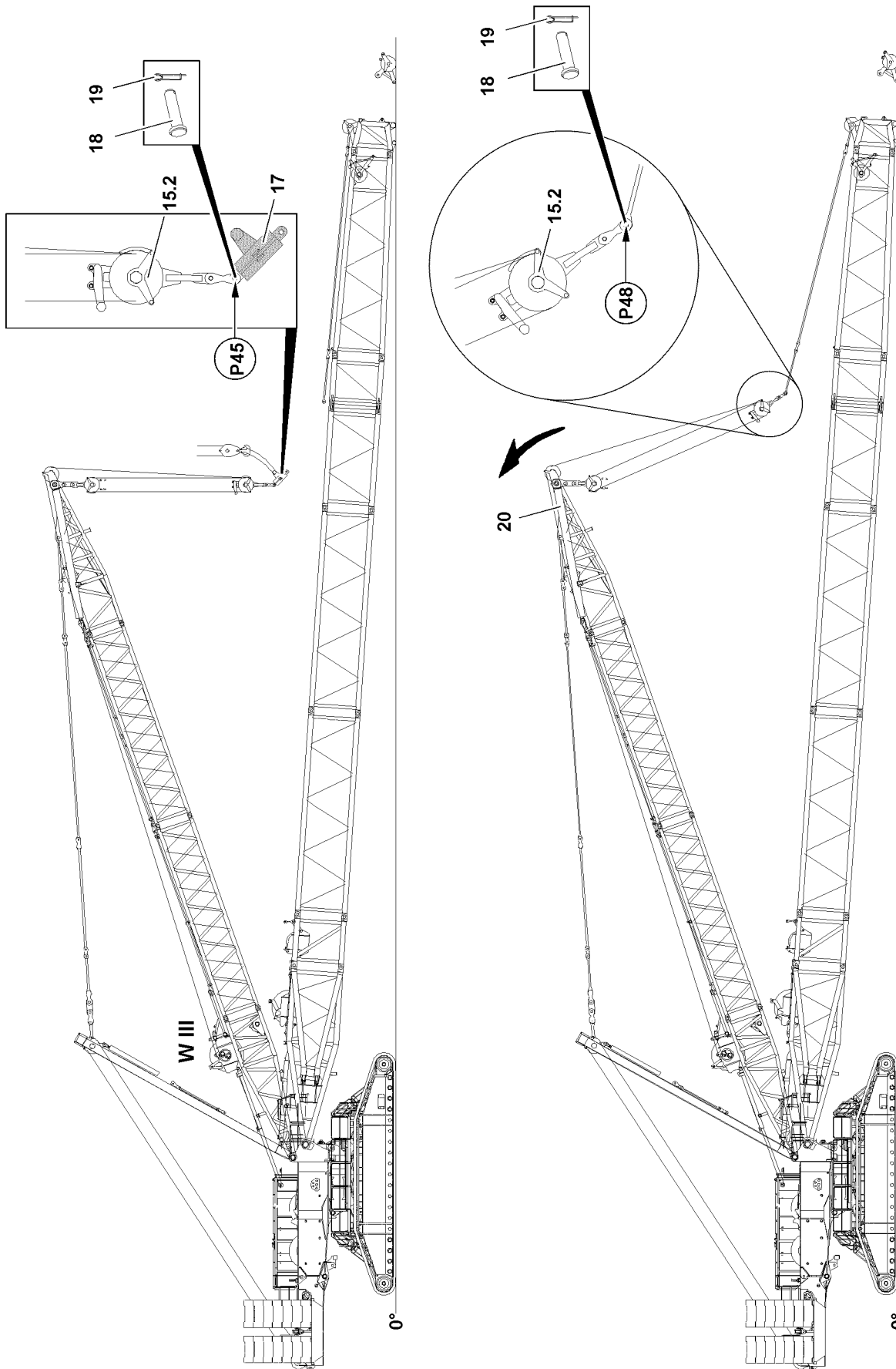
If the pins of the guy rods are not pinned from the “inside” to the “outside”, the hoist rope can scrape on the pin and be damaged!

- ▶ Always insert the pins of the guy rods from the “inside” to the “outside”!
- ▶ Pay attention to the Rod plan!



Note

- ▶ The guy rods of the S-intermediate sections are pinned and secured together starting from the brackets on the fixed point of the SW-end section!
- ▶ Pin and secure the guy rods for the intermediate sections according to the Rod plan.
- ▶ Pin and secure the guy rod **51** with the upper pulley block **15.2**: Insert the pins **18** on both sides on points **P48** and secure with spring retainers **19**.



B115391

**WARNING**

Falling boom!

If the auxiliary guying is not assembled on the boom or not according to the specifications, then the boom can buckle “downward”, break off and fall down!

Personnel can be severely injured or killed!

- ▶ Make sure that the auxiliary guying is assembled correctly, see Rod plan and Crane operating instructions, chapter 5.03!

- ▶ Assemble the auxiliary guying as specified, if it is required for the boom combination to be set up.

**Note**

- ▶ The main boom must remain on the ground when erecting the D-boom and may **not** be pulled up along!

- ▶ When the guy rods are pinned and secured on the upper pulley block **15.2**:
Erect the D-boom to operating position and at the same time, spool out winch 3 **W III**.
- ▶ When the D-boom has reached the operating position:
Tension the guying between the D-boom and the boom head.

**WARNING**

The boom can suddenly fold “down”!

If the following notes are not observed, the boom can suddenly fold “down” when the auxiliary boom or the supporting base is removed!

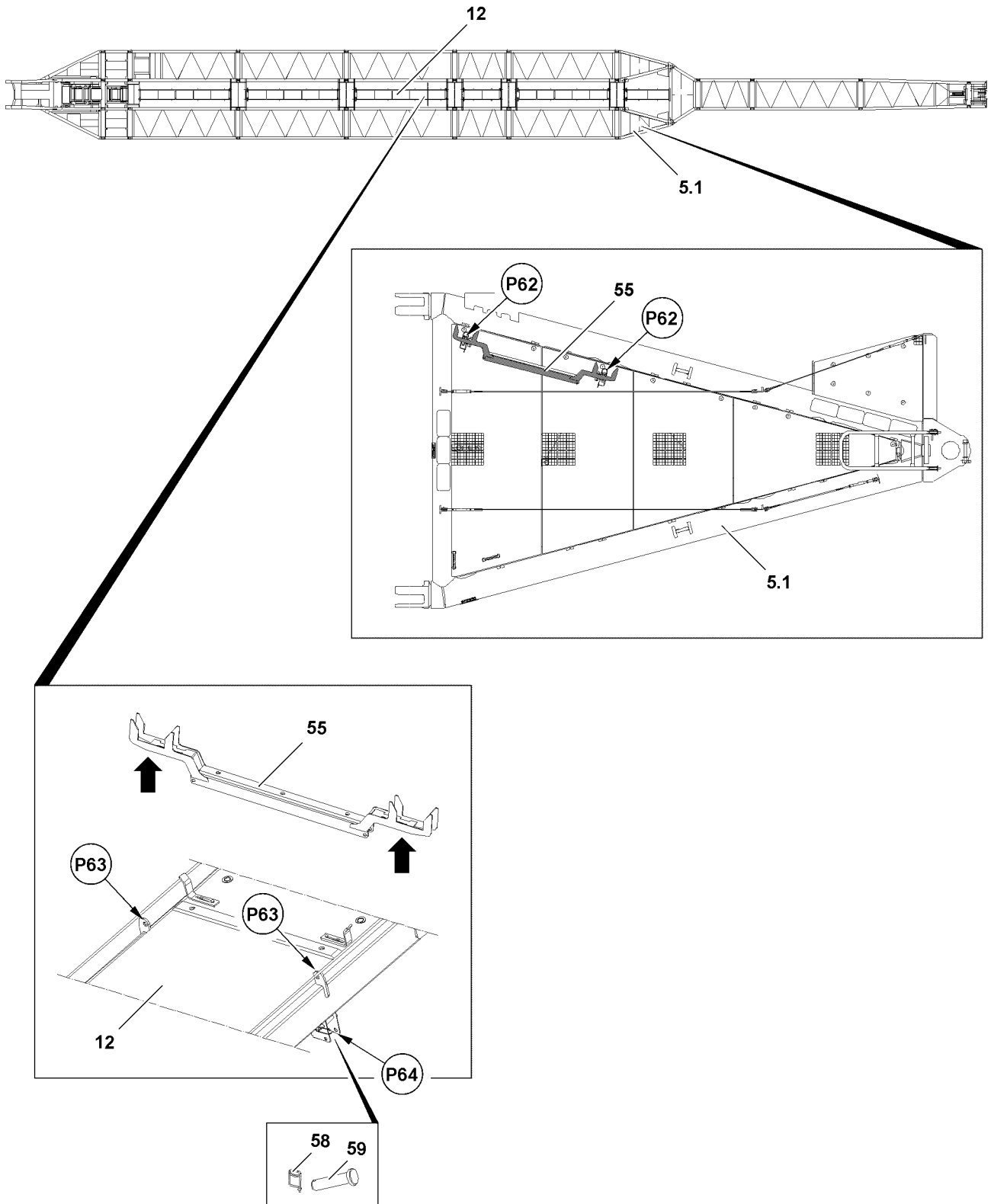
Personnel can be severely injured or killed!

- ▶ Remove the auxiliary crane or the supporting base only if it is ensured that the D-boom is in operating position and the main boom is safely being held by the guying!

- ▶ When the boom is safely held by the guying:
Remove the auxiliary crane on the boom head.

or

- Remove the support.
- ▶ Guide the hoist rope over the rope pulley(s) on the boom head, see Reeving plan.



B117461

3.13 Removing the carrier for the rod placement

**WARNING**

Falling carrier!

If the carrier **55** is not removed before erecting the boom, then the carrier can fall down in crane operation.

Death.

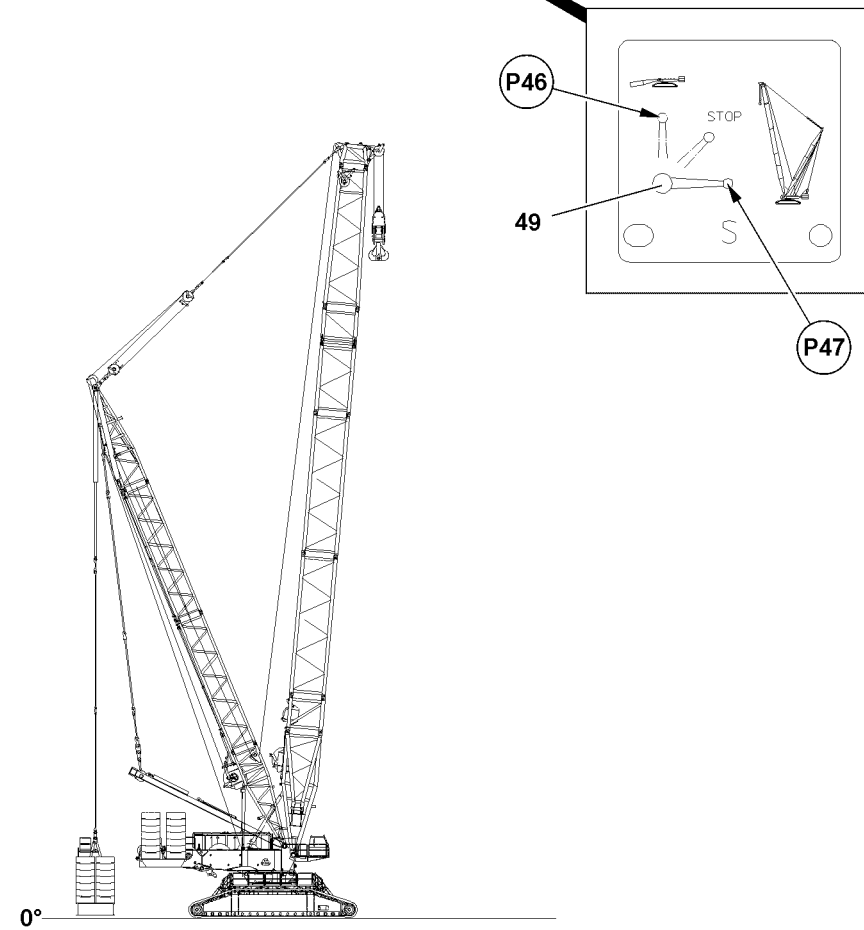
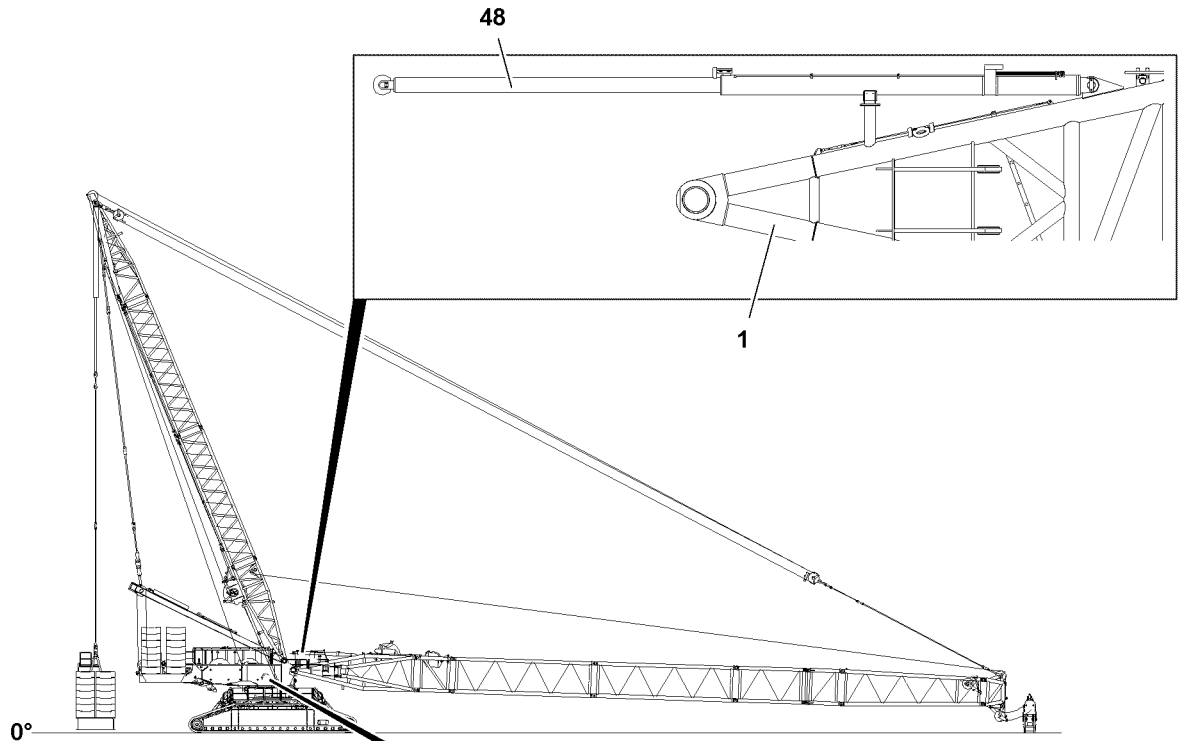
- ▶ Make sure that the carrier **55** is removed before erecting the boom.
 - ▶ Crane operation with the installed carrier **55** is prohibited.
-

Make sure that the following prerequisites are met:

- The guy rods are properly installed and secured.
- The boom is safely held by the guying.
- ▶ Release the carrier **55** on bridge **12** on points **P63**.
- ▶ Unpin pins **59** on both sides at point **P63**.
- ▶ Insert the pins **59** on both sides in the transport receptacle at point **P64** and secure.
- ▶ Place the carrier **55** in the transport receptacle on the P-adapter right **5.1** - points **P62** - and secure.

Result:

- The carrier **55** is secured on the P-adapter right **5.1** in transport position.



B115392

3.14 Erecting the main boom



WARNING

The crane can topple over!

In crane operation with deactivated LICCON overload protection, the crane can topple over!

Personnel can be severely injured or killed!

- ▶ The radii listed in the load chart may not be exceeded or fallen below, even if there is no load on the hook!

If required in the erection and take down chart:

- ▶ Carry the hook block along with the auxiliary crane!



WARNING

The crane can topple over!

If the following conditions are not met before erecting the boom, the crane can topple over!

Personnel can be severely injured or killed!

- ▶ Make sure that the Technical safety instructions are observed, see Crane operating instructions, chapter 5.01.
- ▶ Make sure that the relapse cylinders of the main boom are completely moved out before erection of the boom combination.
- ▶ Make sure that no slack rope formation occurs on the control winch.



WARNING

Falling hoist rope!

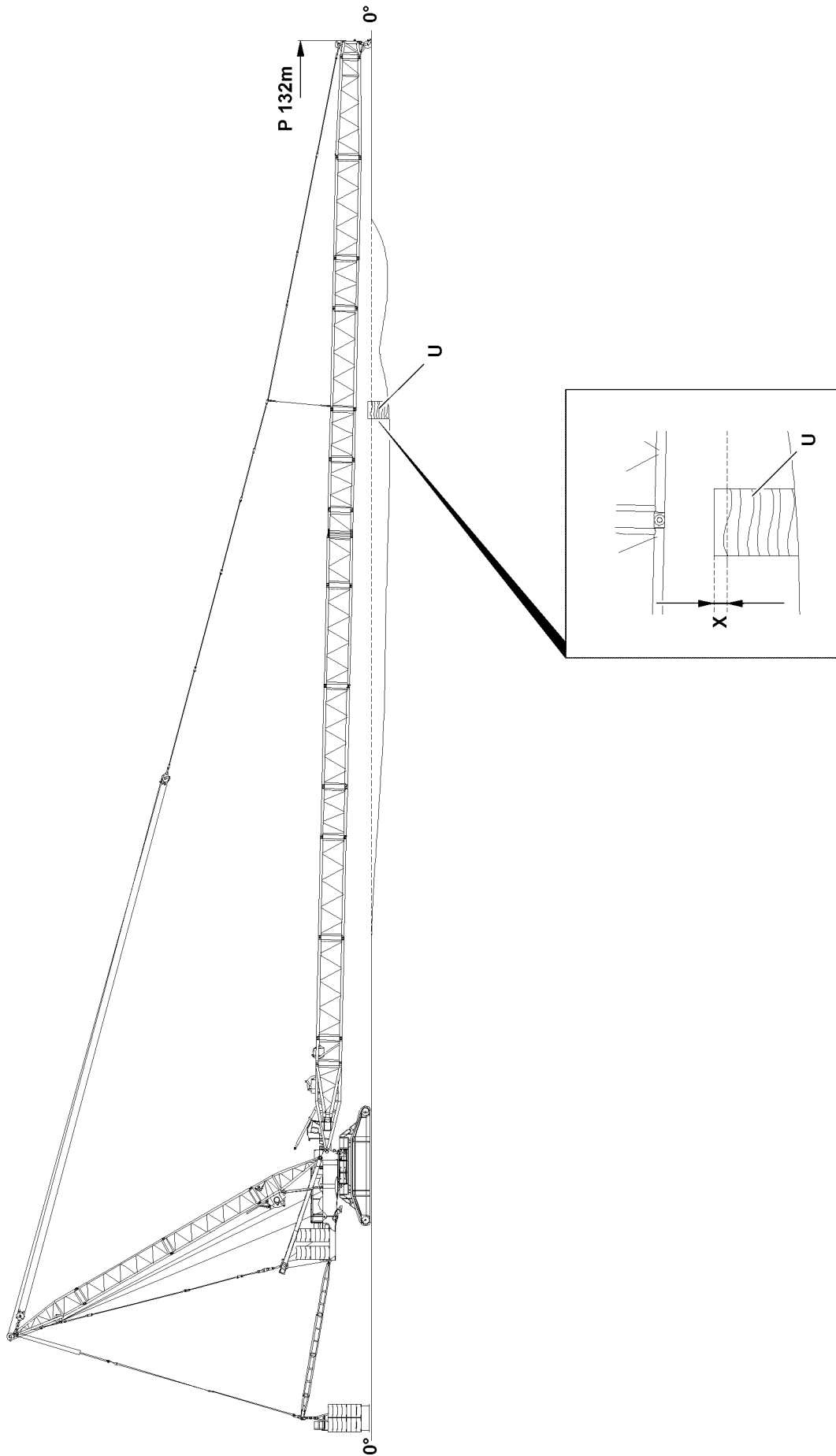
If the hoist rope is not reeved with the respective length on the main boom before the erection procedure, then it can fall down backward due to its own weight!

Personnel can be severely injured or killed!

- ▶ Reeve the hoist rope before the erection procedure with sufficient length on the main boom!
- ▶ The hoist rope must be constantly monitored during erection!
- ▶ Do not step into the danger zone!

Make sure that the following prerequisites are met:

- The crane is aligned in horizontal direction.
- All electrical connections have been made.
- All hydraulic connections have been made.
- All limit switches are functioning.
- The counterweight has been installed on the turntable according to the erection and take down chart.
- All pin connections have been secured.
- The hoist rope has been correctly placed in the rope pulleys and is prevented from jumping out with the rope retaining pins.
- Non-required guy rods are disassembled.
- The carrier **55** for the rod placement is removed on the bridge **12**.
- There are no loose parts on the boom.
- The boom is free of snow and ice.
- The LICCON overload protection has been set according to the data in the load chart.
- The load weighing was carried out on the boom and the hook block weight has been entered on the LICCON monitor, see Crane operating instructions, chapter 4.02.
- The LICCON overload protection settings have been compared with the actual crane configuration.
- The LICCON overload protection is deactivated.
- The assembly icon is visible on the LICCON monitor.
- No personnel is within the danger zone.



B117451

3.14.1 Supporting the boom before erection



WARNING

The crane can topple over!

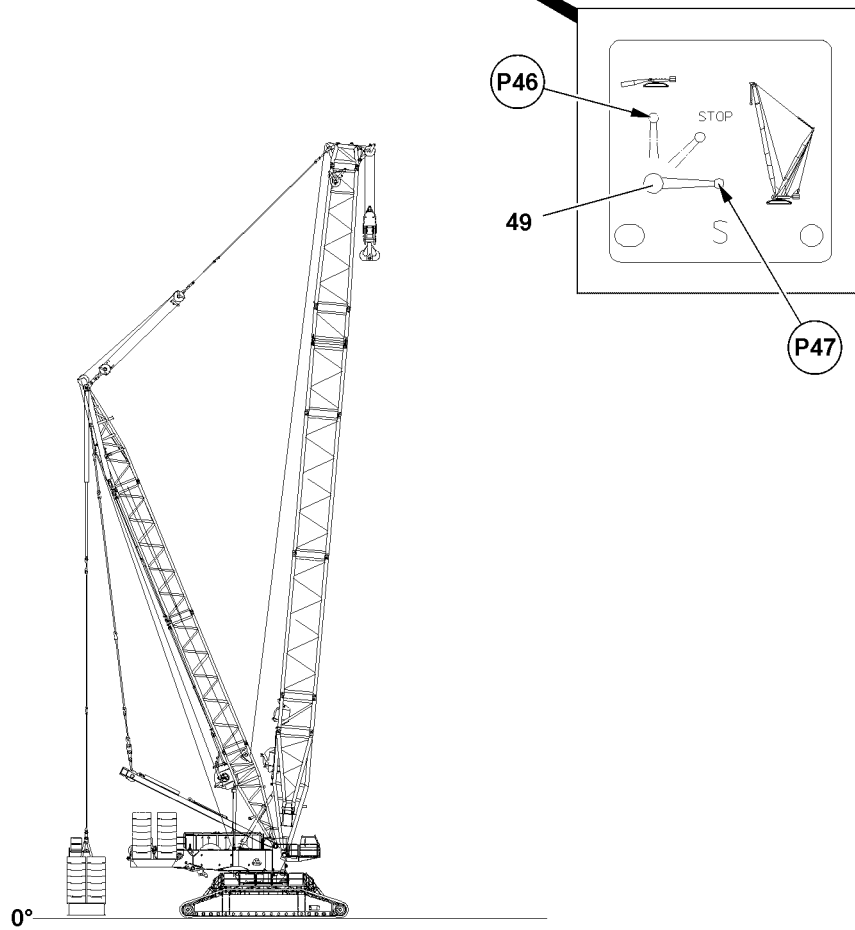
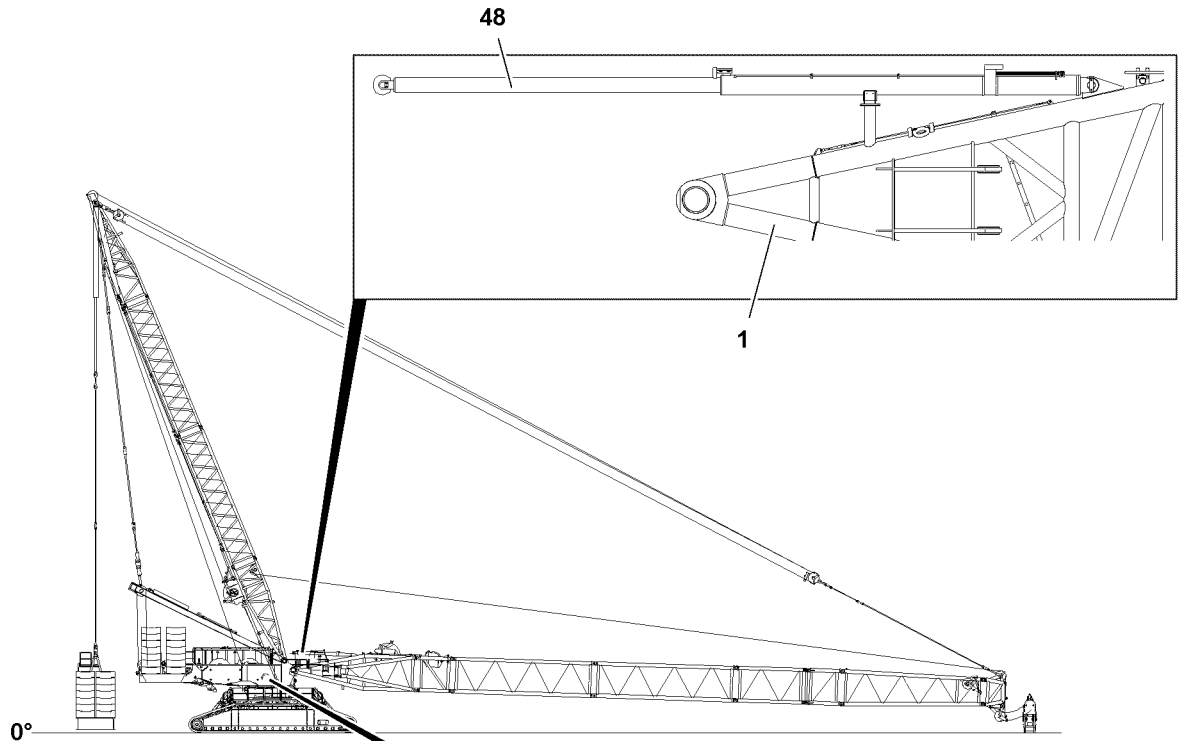
- ▶ Always support the P-boom from a length of 126 m.
- ▶ Support the P-boom only in the area of the auxiliary guying.
- ▶ Adhere to the support height **X**.

NOTICE

Property damage of boom!

- ▶ Always support the P-boom from a length of 126 m.
- ▶ Make sure that the support **U** withstands a maximum load of 1250 kN.

Boom length	Support height X
P126 m	65 cm
P132 m	55 cm
P138 m	40 cm
P144 m	30 cm
P150 m	20 cm



B115392

3.14.2 Extending the relapse cylinders of the main boom



WARNING

The crane can topple over!

If the relapse cylinders are not extended before erecting the main boom, then the main boom can fall to the rear during erection or in crane operation and the crane can topple over!

Personnel can be severely injured or killed!

- ▶ Extend the relapse cylinders **48** of the main boom before erecting the boom combination!
- ▶ Secure the ball valve **49** during crane operation to prevent inadvertent actuation!

Ball valve positions	
Position	Function
P47	Crane operation, extend the piston rod
P46	Assembly, retract the piston rod
STOP	The piston rod cannot be retracted / extended

Make sure that the following prerequisite is met:

- All hydraulic connections have been made.

- ▶ Set the ball valve **49** to position **P47**.

Result:

- The piston rods of the relapse cylinders **48** of the main boom extend.



Note

- ▶ The ball valve **49** is secured by closing the cabinet door and removing the key!
- ▶ When the piston rods of the relapse cylinders **48** of the main boom are fully extended:
Close the cabinet door and pull the key.
- ▶ Hand the key to an authorized person.

		$XX > <XX$	CODE >XXXX< ZXXX YYYY.1(3)				
XX,X	XX,X	XX,X	XX,X	XX,X	XX,X	XX,X	XX,X
XXX,X	XXX,X	XXX,X	XXX,X	XXX,X	XXX,X	XXX,X	XXX,X
XXX,X	XXX,X	XXX,X	XXX,X	XXX,X	XXX,X	XXX,X	XXX,X
XXX,X	XXX,X	XXX,X	XXX,X	XXX,X	XXX,X	XXX,X	XXX,X
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XXX,X	XXX,X	XXX,X	XXX,X	XXX,X	XXX,X	XXX,X	XXX,X
* n *	* XX *	* XX *	* XX *	* XX *	* XX *	* XX *	* XX *
xx	XXX,X	XXX,X	XXX,X	XXX,X	XXX,X	XXX,X	XXX,X
yy	XXX,X	XXX,X	XXX,X	XXX,X	XXX,X	XXX,X	XXX,X

LIEBHERR

7	8	9
4	5	6
1	2	3
0	.	P

		K
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SHIFT

F1

F2

F3

F4

F5

F6

F7

F8

ENTER

⊙

	XX		XX		STOP	max	$n = XX$	$XXX.X$
ZXXX YYYY							$XXX.X$	
XXX	θ	$1/min: XXX$	50	90	100	110	130%	$XXX.X$
	X°			XX/s	$XX.X$	$max: XX.X$		$XX.X$
XXX	XX	XXX	XX	$V: XXz$	XXX°			$XX.X$
	$2:2Y$		$1:1Y$		$XX.X$	v		$XX.X$
$\Rightarrow \theta$	$\Rightarrow \theta$					XX		

LIEBHERR

7	8	9
4	5	6
1	2	3
0	.	P

		K
F		F
C		i
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	XX°		XX		XX		XX		XX	
--	------------	--	------	--	------	--	------	--	------	--

SHIFT

F1

F2

F3

F4

F5

F6

F7

F8

ENTER

⊙

B112775

3.14.3 Erection procedure



DANGER

The crane can topple over!

- ▶ It is prohibited to turn the crane superstructure while erecting the boom!
- ▶ Adhere to the data in the erection and take down charts!

Make sure that the following prerequisite is met:

- The load weighing was carried out on the boom and the hook block weight has been entered on the LICCON monitor, see Crane operating instructions, chapter 4.02.

Reeving in the hook block

- ▶ Erect the boom until the end section lifts off the ground.



WARNING

Falling hoist rope!

If the hoist rope is not reeved with the respective length on the main boom before the erection procedure, then it can fall down “backward” due to its own weight!

Personnel can be severely injured or killed!

- ▶ Reeve the hoist rope before the erection procedure with sufficient length on the main boom!
 - ▶ The hoist rope must be constantly monitored during erection!
 - ▶ Do not step into the danger zone!
-
- ▶ Reeve in the hoist rope properly and secure on the rope fixed point, for reeving, see Reeving plan.
 - ▶ Pin and secure the rope retainers on the rope pulleys.
 - ▶ Attach the hoist limit switch weight, see section Crane operating instructions, chapter 4.06.

Erecting the boom



WARNING

The crane can topple over!

In assembly operation the LICCON overload protection is deactivated!

The crane can collapse, the boom can break off or the crane can topple over!

Death!

- ▶ Enter the set up configuration correctly into the LICCON computer system.
- ▶ Activate the assembly operation only when the consequences are known.
- ▶ Observe the erection / take down charts.



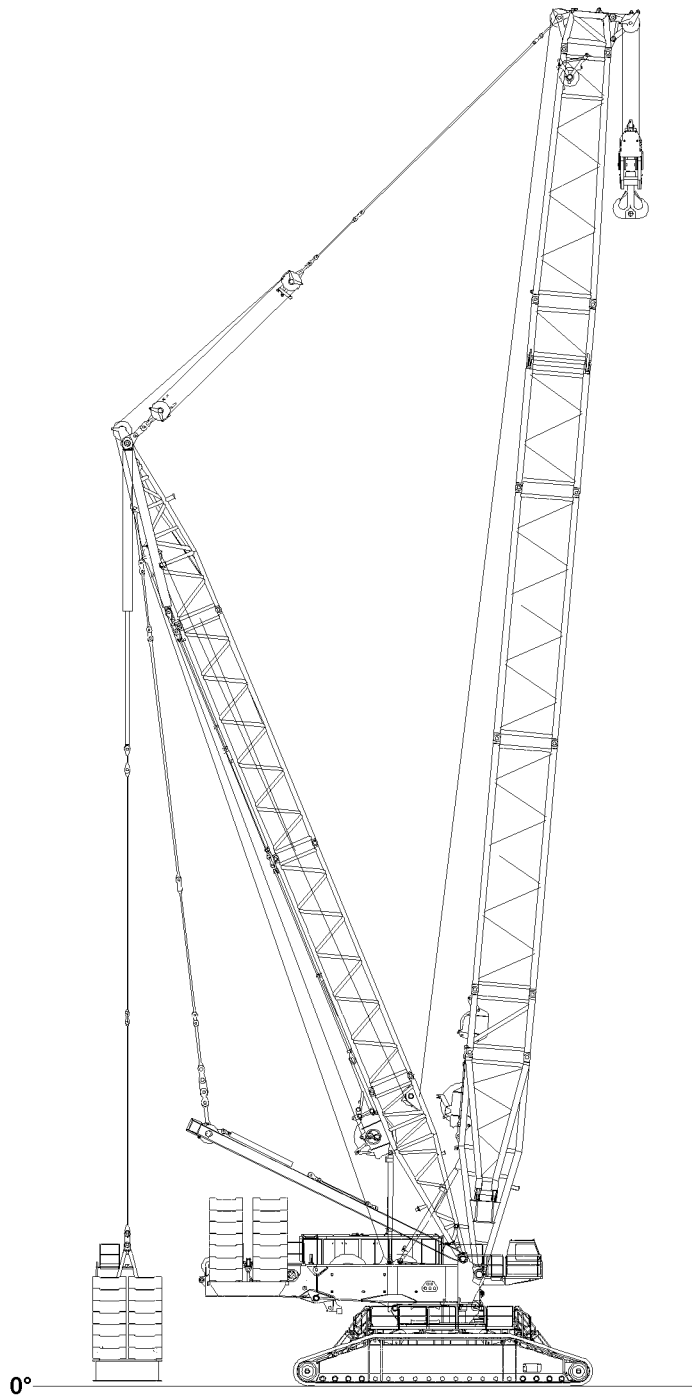
Note

- ▶ When the lowest operating position of the boom is reached, the LICCON overload protection is activated!
- ▶ In the maximum load icon appears a load number in “t” instead of the display “???”!

- ▶ Luff the boom up to the lowest operating position.
- ▶ When the boom has reached the lowest operating position:
Make sure that the assembly icon on the LICCON monitor turns off.

Result:

- The LICCON overload protection is active.



B115393

4 Operating the crane

4.1 Preparing for crane operation

**Note**

- ▶ Observe the notes, see Crane operating instructions, chapter 4.02, chapter 4.05, chapter 4.08 and chapter 5.01!

Make sure that the following prerequisites are met:

- The LICCON overload protection is active.
- The LICCON overload protection has been set according to the data in the load chart.

**WARNING**

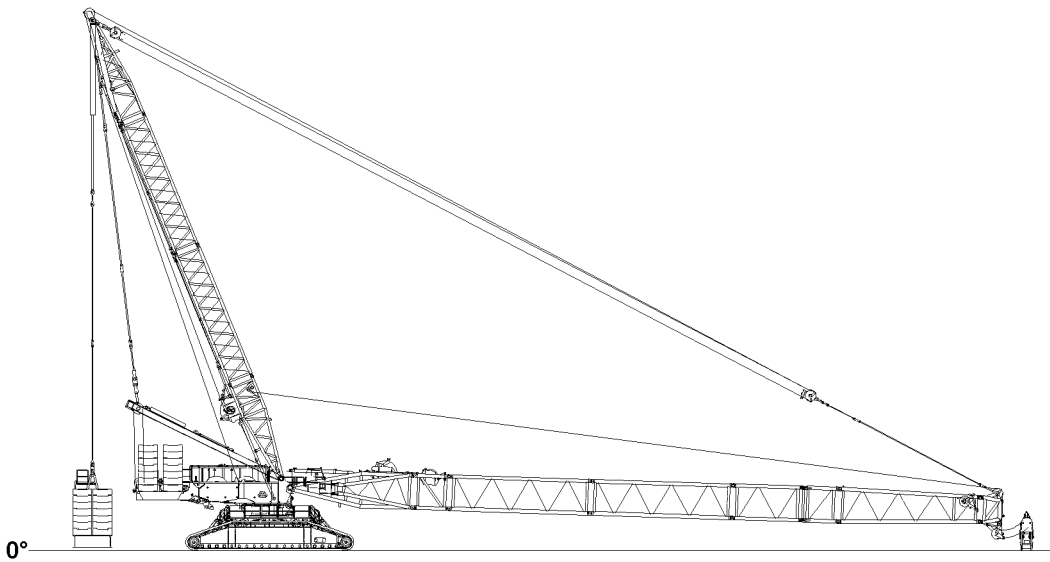
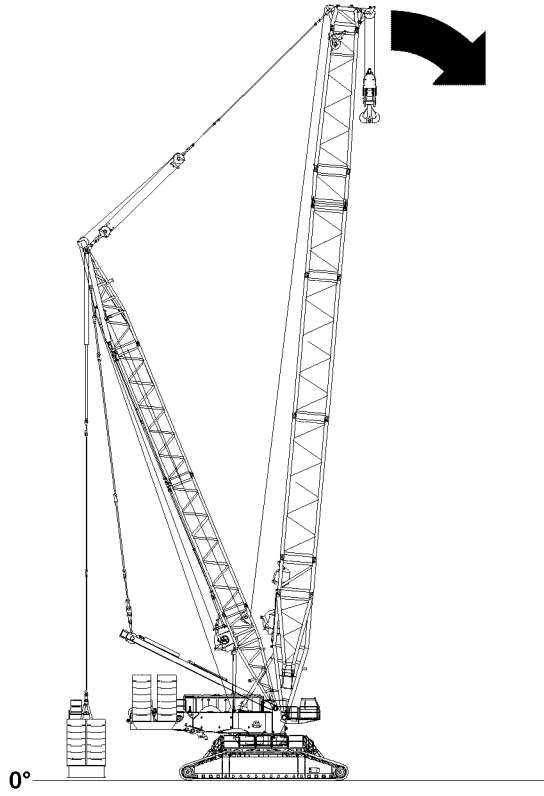
The crane can topple over!

Personnel can be severely injured or killed!

- ▶ Check the horizontal position of the crane before and during operation!
- ▶ If the crane operator leaves the cab, even for a short time, the operating mode setting must be checked and reset if necessary before resuming crane operation!

4.1.1 Checking the settings

- ▶ Check the function of the overload protection by running against the operating positions “on top” and “bottom”.
- ▶ Check the hoist limit switch by running against the hoist limit switch weight.
- ▶ Check the function of the limit switches “Boom steep” on the relapse cylinders of the main boom.



B115394

5 Disassembly PD-boom



WARNING

Danger of falling!

During assembly / disassembly, inspection and maintenance work, personnel must be secured with appropriate aids to prevent them from falling! If this is not observed, assembly personnel could fall and suffer life-threatening or fatal injuries!

- ▶ All work aloft, where there is a danger of falling must be carried out with suitable aids!
- ▶ If fall protection equipment is available, then it must be used, 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, see Crane operating instructions, chapter 2.04!
- ▶ The 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!
- ▶ Only step on the aids, ladders and catwalks with clean shoes!
- ▶ Keep aids, ladders and catwalks free of heavy dirt, snow and ice!
- ▶ Stepping or walking on crane components and lattice sections, which have an incline of more than 20° is prohibited!



WARNING

The lattice sections can fall down!

If the lattice sections are not pinned and secured correctly, then they can fall “down” and severely injure or kill personnel!

- ▶ Pin or unpin both pins at the same horizontal level, i.e. **left and right!**
- ▶ Do not stand under the lattice sections or within the entire danger zone during the pinning and unpinning procedure of the boom!
- ▶ Secure the pins in the bearing points and the receptacles!
- ▶ It is prohibited to lean the ladder against the components being disassembled!
- ▶ Do not remove the fastening equipment and the auxiliary crane until each component is pinned on and secured!



WARNING

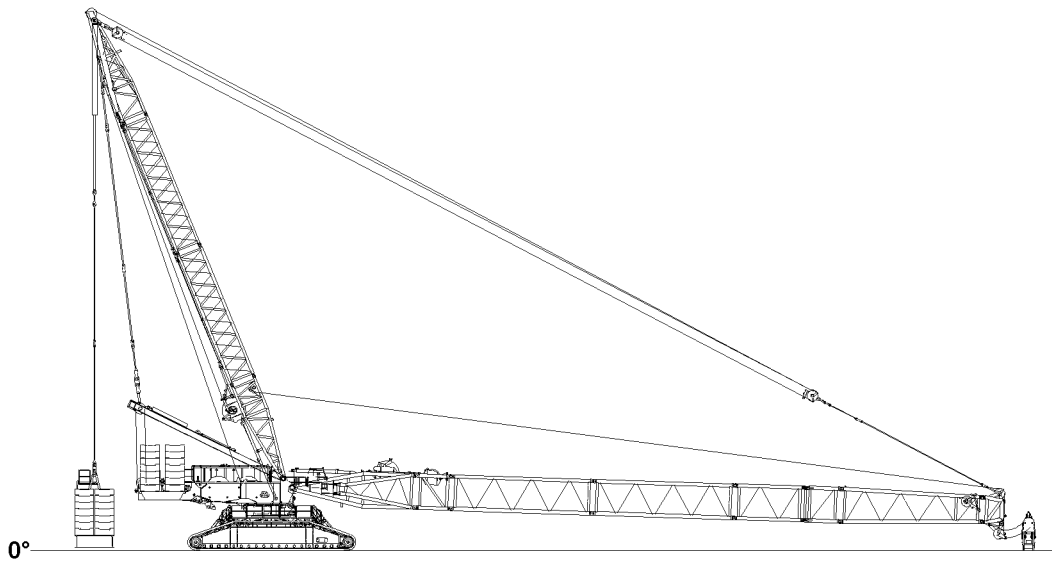
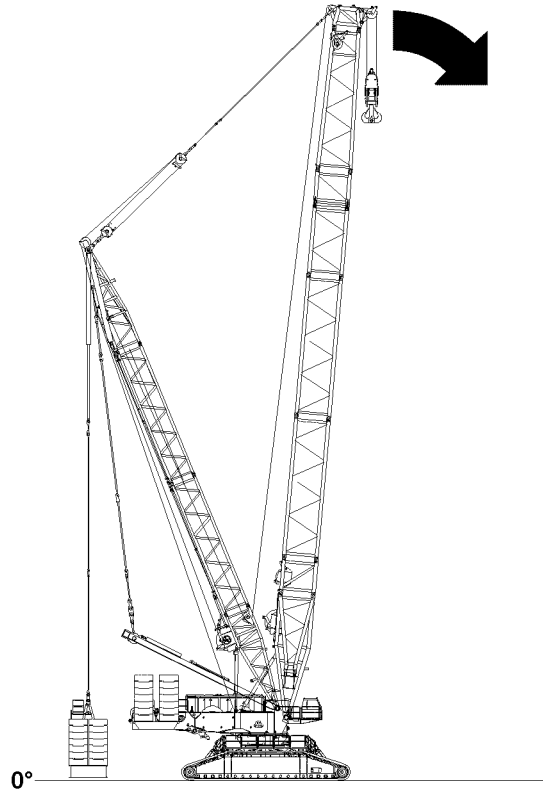
Danger of impact / crushing!

When installing / removing crane components with the auxiliary crane, crane components can start to swing back and forth!

When lifting / lowering and positioning crane components, there is an increased danger of impacts / crushing!

Personnel can be caught and severely injured or killed!

- ▶ 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!



B115394

5.1 Turning the turntable into disassembly position



WARNING

The crane can topple over!

If the following conditions are not met before turning the turntable, then the crane can topple over!

Personnel can be severely injured or killed!

▶ Observe the data in the erection and take down charts!

▶ Turn the turntable into disassembly position, see “Erection and take down charts”.

5.2 Placing the main boom down



WARNING

The crane can topple over!

If the following conditions are not met before taking down the main boom, the crane can topple over!

Personnel can be severely injured or killed!

▶ Observe the Safety technical notes, see Crane operating instructions, chapter 5.01!

▶ Observe the data in the erection and take down charts!

NOTICE

Damage of boom components!

Taking down the boom system can lead to a collision between the hook block and the pulley head!

The boom components can be severely damaged!

▶ Luff the boom system down at the same time and spool the hoist winch out!

▶ When luffing the boom system down, the D-boom must remain in operating position until the SW-end section is laying on the ground or on a supporting base or it is safely held by an auxiliary crane!



Note

▶ The luff down movement is turned off as soon as the lowest operating position of the main boom is reached!

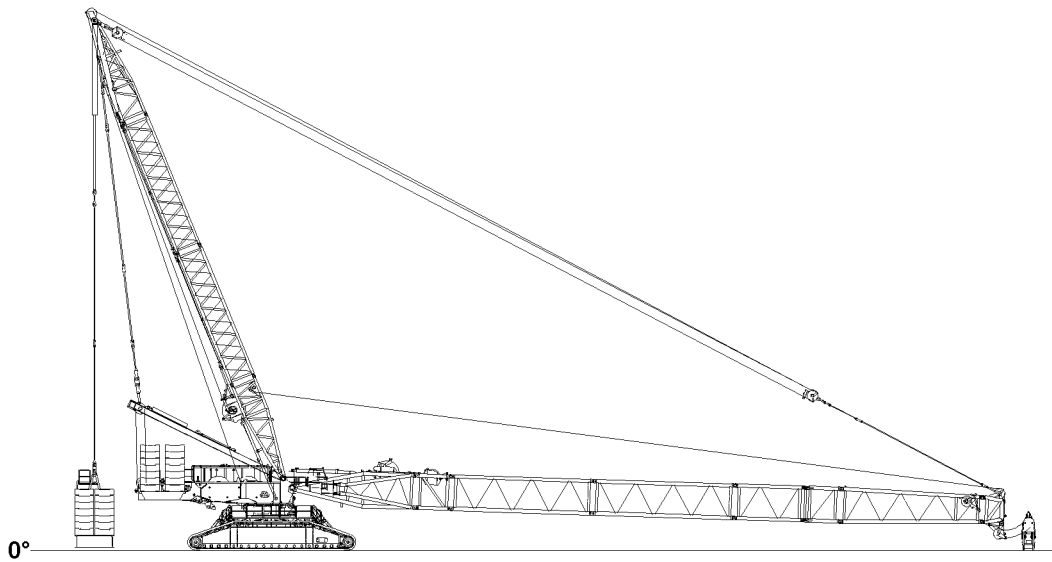
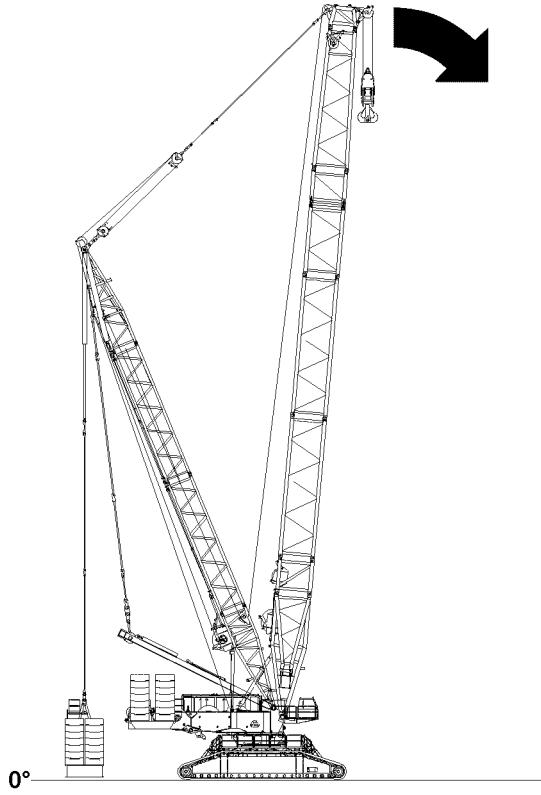
▶ When the lowest operating position of the main boom is reached, the load display in the maximum load icon turns off and instead of the load display appears the display “???”!

▶ In the crane operating screen appear alarm functions!

▶ Luff the main boom down to the **lowest** operating position.

Result:

- The luff down movement is turned off.
- The “STOP” icon appears on the LICCON monitor.
- The horn icon appears on the LICCON monitor.



B117312

**WARNING**

The crane can topple over!

In assembly operation the LICCON overload protection is deactivated!

The crane can collapse, the boom can break off or the crane can topple over!

Death!

- ▶ Enter the set up configuration correctly into the LICCON computer system.
- ▶ Activate the assembly operation only when the consequences are known!
- ▶ Only activate assembly operation when the set up configuration was correctly entered into the LICCON computer system, see Crane operating instructions, chapter 4.02!
- ▶ Observe the erection / take down charts!
- ▶ Operating the crane with enabled assembly is strictly prohibited!

- ▶ Activate the assembly operation.

Result:

- The LICCON overload protection is deactivated.
- The assembly icon appears on the LICCON monitor.
- ▶ At the same time, spool the hoist winch out and luff the main boom down until the hook block touches the ground.
- ▶ Remove the hoist limit switch weight and unreeve the hook block.
- ▶ Luff the main boom down until the main boom or the boom head is laying on the support.

**WARNING**

Spooling up of hoist rope!

By spooling the hoist rope up, personnel can be severely injured or killed!

- ▶ All rope retaining pins / pipes on the main boom are removed!
- ▶ Slowly spool up the hoist rope over the rope pulleys back to the winch!
- ▶ Make sure that no personnel is within the danger zone!

NOTICE

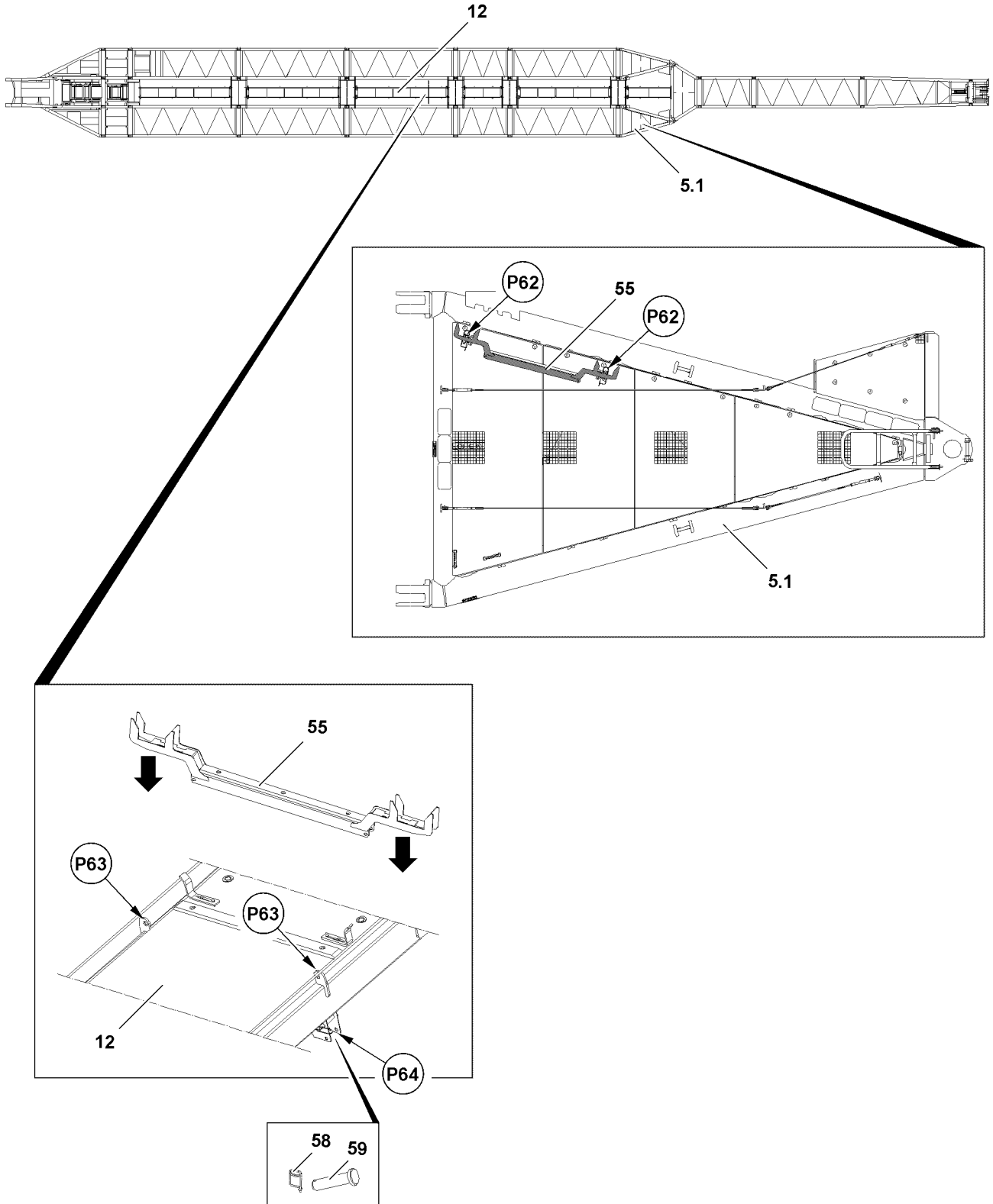
Overspooled winch!

If the hoist rope is pulled under the winch when spooling up, then the adjustment of the winch turn sensor is incorrect!

A new adjustment by **Liebherr Service** is required!

- ▶ Stop the winch in time, with sufficient rope reserve!
- ▶ Do not overspool the winch!

- ▶ Spool the hoist rope up.



B117460

5.3 Installing the carrier for the rod placement



Note

- ▶ The carrier **55** for the rod placement is only required when using 3 m auxiliary rods.
 - ▶ The installation position of carrier **55** depends on the boom length, pay attention to the rod plan!
-

Make sure that the following prerequisites are met:

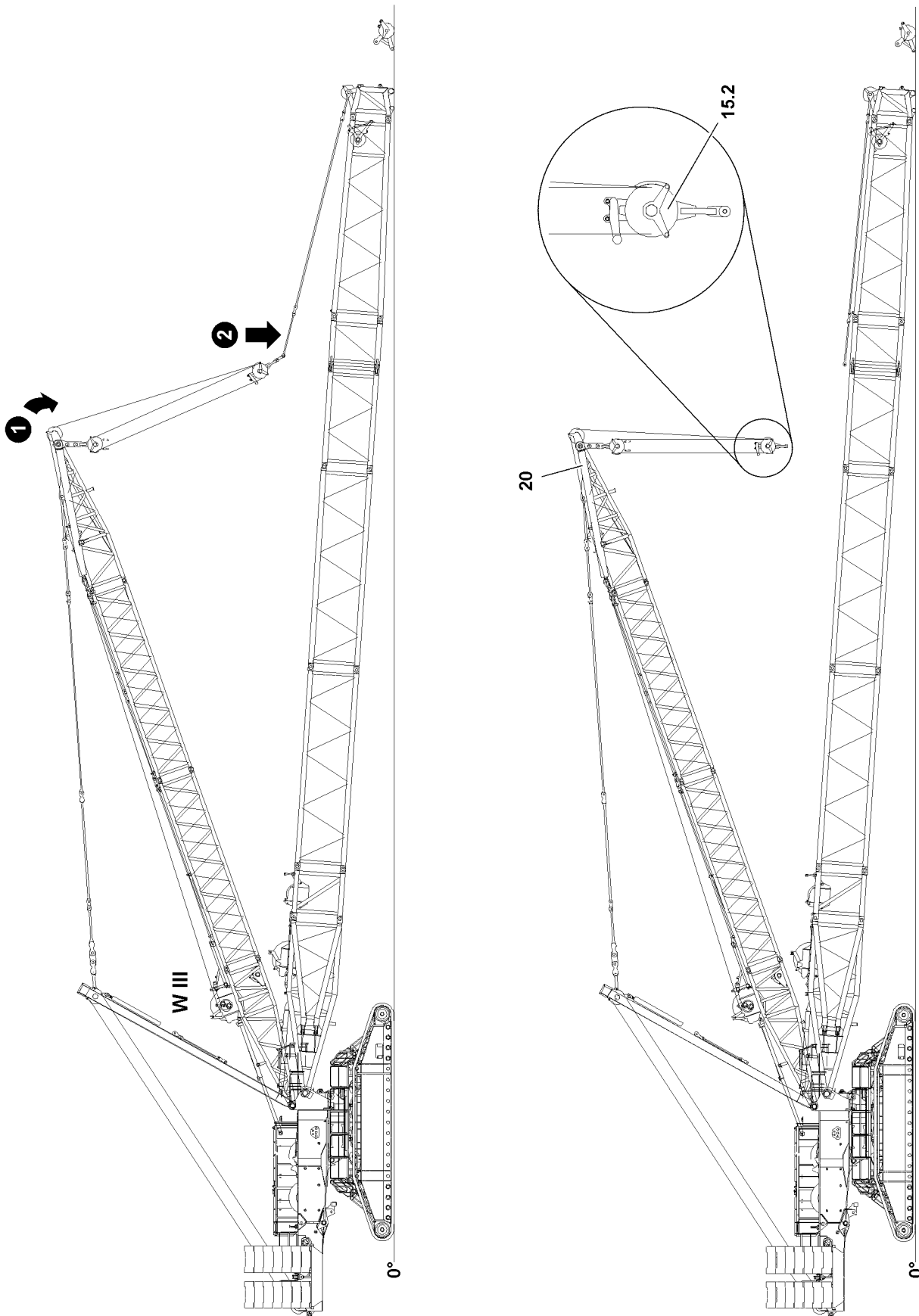
- The bridges are properly installed and secured.
- ▶ Release the carrier **55** on P-adapter right **5.1** on points **P62**.

Install the carrier **55** on bridge **12**.

- ▶ Set the carrier **55** on bridge **12** on points **P63**.
- ▶ Unpin pins **59** on both sides at point **P64**.
- ▶ Pin the carrier **55** with pins **59** at point **P63** on both sides and secure with spring retainers **58**.

Result:

- The carrier **55** is pinned on bridge **12**.



B115396

5.4 Disassembling the guy rods

NOTICE

Slack rope formation!

The control rope could be damaged if any of the ropes are slack!

- ▶ When placing the guy rods down into the transport receptacles, don't let the ropes become slack!
-

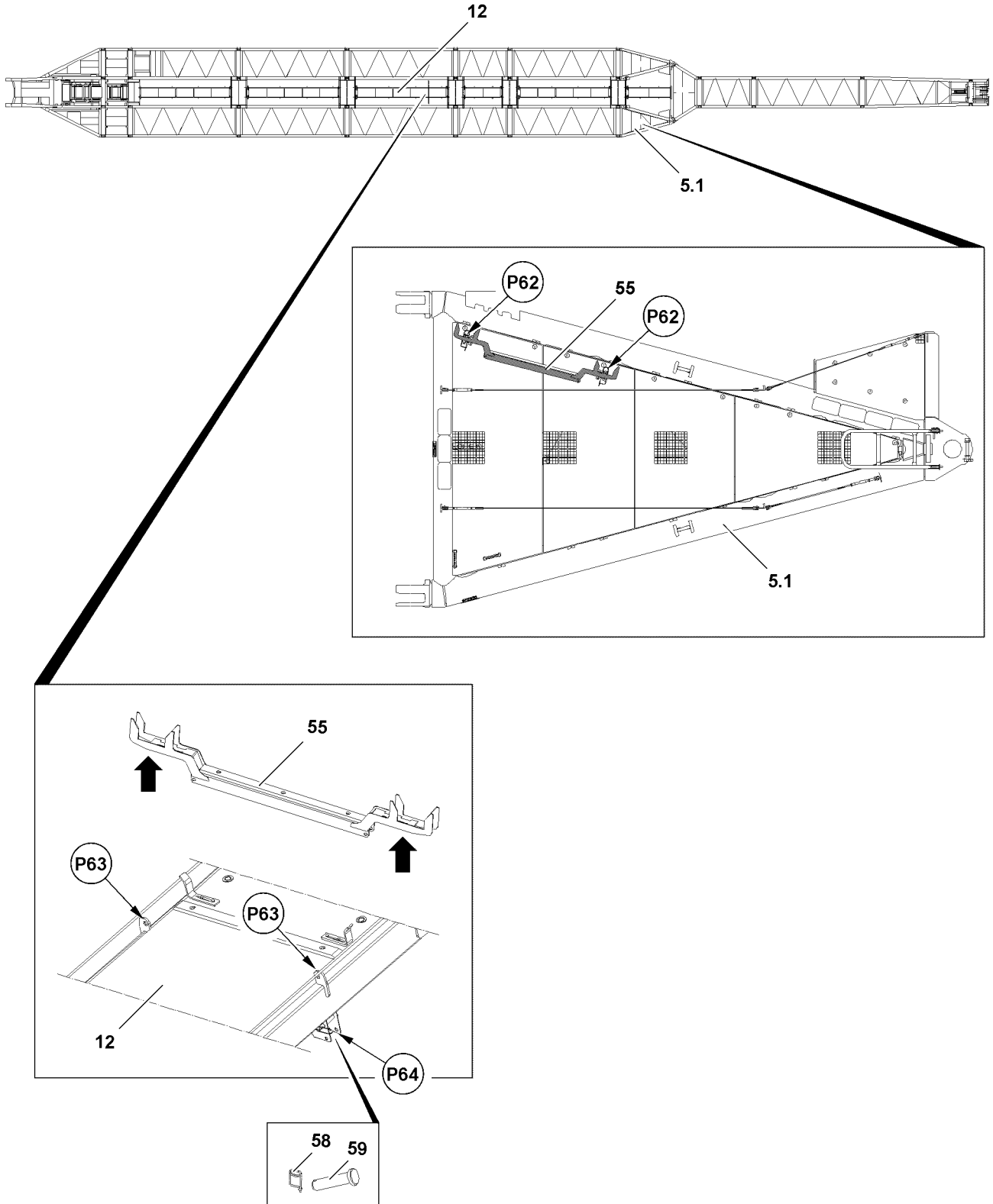
- ▶ Relieve the guying: Luff the D-boom down to the front until the guy rods are placed in the transport receptacles.
 - ▶ When the guy rods on the main boom are in the transport receptacles: Stop the luff down movement of the D-boom.
 - ▶ Carefully spool out winch 3 **W III** until the guying is relieved.
 - ▶ When the guying is relieved: Disassemble the auxiliary guying (if present on the main boom).
 - ▶ Unpin the upper pulley block **15.2** on the guy rods.
 - ▶ Place the guy rods on the S-lattice sections and secure with transport retainers.
 - ▶ Disconnect the guy rods according to their association to the S-lattice sections.
-

NOTICE

Damage to the intermediate sections!

- ▶ Do not pull the upper pulley block **15.2** over the intermediate sections, rather guide them with the auxiliary crane!
 - ▶ Make sure when erecting the D-boom, that the upper pulley block **15.2** is not pulled against the D-end section!
-

- ▶ When the guy rods are placed in the transport retainers and secured: Erect the D-boom and spool out winch 3 **W III** at the same time.



B117461

5.5 Removing the carrier for the rod placement

Make sure that the following prerequisites are met:

- The guy rods are removed.
- ▶ Release the carrier **55** on bridge **12** on points **P63**.
- ▶ Unpin pins **59** on both sides at point **P63**.
- ▶ Insert the pins **59** on both sides in the transport receptacle at point **P64** and secure.
- ▶ Place the carrier **55** in the transport receptacle on the P-adapter right **5.1** - points **P62** - and secure.

Result:

- The carrier **55** is secured on the P-adapter right **5.1** in transport position.

5.6 Disconnecting the hydraulic connections

When connecting and releasing hydraulic lines with quick couplings, make sure that the coupling procedure is carried out correctly.



DANGER

Danger of accident due to loss of pressure or leakage!

Incompletely coupled quick couplings (particularly return lines) as well as self-loosening of quick couplings can result in serious injury due to component failure!

- ▶ Check that the quick couplings have been properly connected before using the crane!



Note

- ▶ To connect or release the hydraulic lines with quick couplers, see Crane operating instructions, chapter 5.01!
- ▶ Release the pressure in the hydraulic system before connecting or disconnecting. Turn the engine off and wait for short time.
- ▶ Assembling coupling components (sleeve and connector) by using hand-tightened nut.
- ▶ Connect coupling components.

5.7 Disconnecting the electrical connections

Make sure that the following prerequisite is met:

- The main boom is placed on the support / the supports.

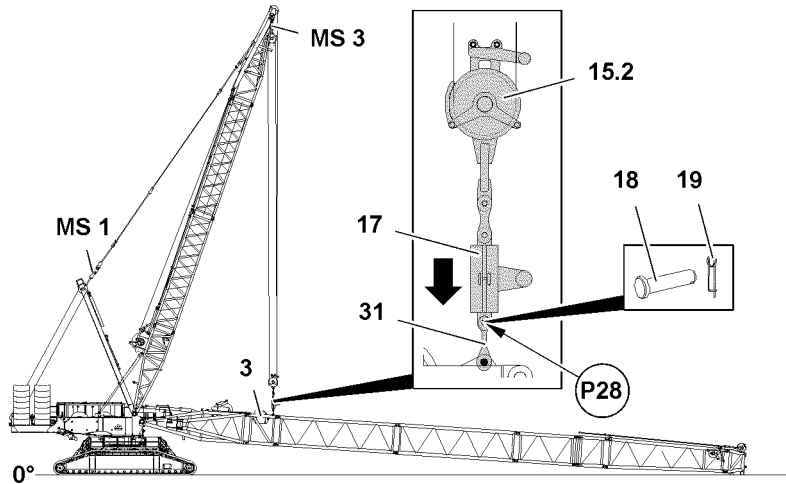
NOTICE

Damage to cable drum or cable!

If the cable drum cable is not properly spooled up on the cable drum after disconnection on the SW-end section, the cable drum or the cable can be significantly damaged!

- ▶ Spool the cable drum up after unplugging!
- ▶ Spool the cable drum up and secure it to prevent inadvertent spooling out.
- ▶ Disconnect the electrical connections and store the plug and cable properly.

5.8 Opening the main boom



B115397

Open the boom - install the upper pulley block on the cross carrier



WARNING

The main boom can suddenly fold “down”!

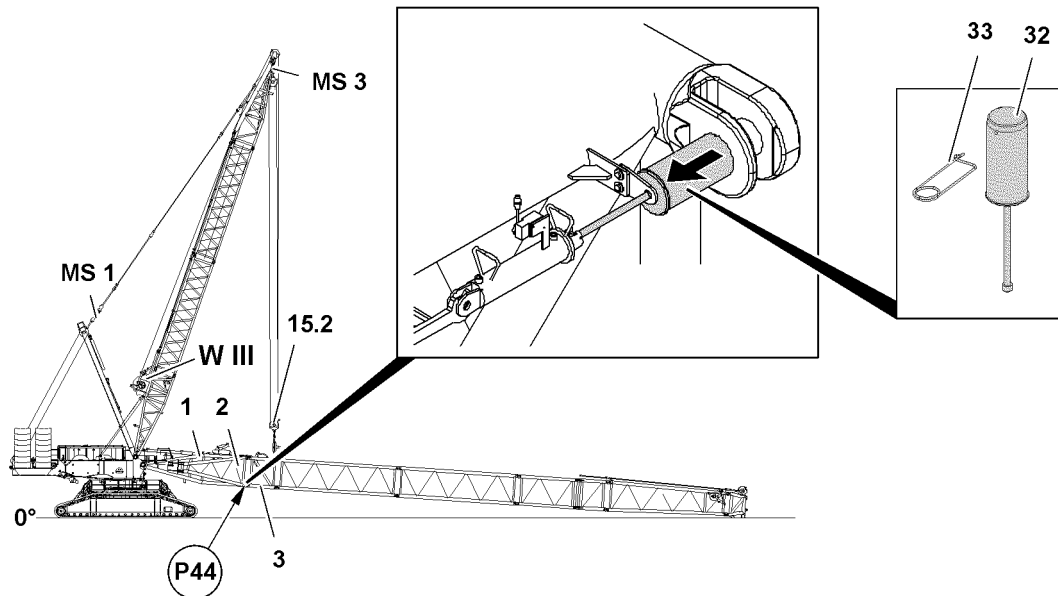
If the following conditions are not met before disassembling the main boom, the main boom can fold “down”!

Personnel can be severely injured or killed!

- ▶ Support the main boom during disassembly with suitable materials!
- ▶ During pinning and unpinning of the lattice sections, it is prohibited for anyone to remain **under** or **on** the components as well as within the entire danger zone!

Make sure that the following prerequisites are met:

- All electrical and hydraulic connections have been disconnected.
- The auxiliary guying is disassembled.
- The guy rods are placed in the transport receptacles.
- The guy rods are placed in the transport retainers and secured.
- ▶ Lower the upper pulley block **15.2** until it is over the brackets **31** on the cross carrier **3**.
- ▶ Swing the assembly weight **17** with the auxiliary crane in to the upper pulley block **15.2**.
- ▶ Pin the assembly weight **17** on both sides on the upper pulley block **15.2** and secure.
- ▶ Pin the assembly weight **17** with the brackets **31**: Insert the pins **18** on both sides on points **P28** and secure with spring retainers **19**.



B115398

Open the boom - release the lower pin connection



WARNING

The crane can topple over!

If the following conditions are not met, the crane can topple over or be significantly damaged!

Personnel can be severely injured or killed!

- ▶ The maximum permissible total force on test point 1 is 136 t and may **not** be exceeded!
- ▶ The maximum permissible total force on test point 3 is 150 t and may **not** be exceeded!
- ▶ Lifting and opening the respective boom is only permissible by observing the maximum permissible boom lengths and total forces!



Note

- ▶ The value of test point 1 is shown as force F1 on the LICCON monitor 1, the value of test point 3 is shown as force F3, see Crane operating instructions, chapter 4.02!
- ▶ Tension the guying on the test points at disassembly with the same forces as for assembly!
- ▶ For this, refer the ACTUAL forces measured and recorded on the test points during the assembly!
- ▶ The pins can be pulled easier and the pins and lugs are therefore not damaged!



Note

- ▶ Unpin the intermediate sections with the pin pulling device, see Crane operating instructions, chapter 5.30!

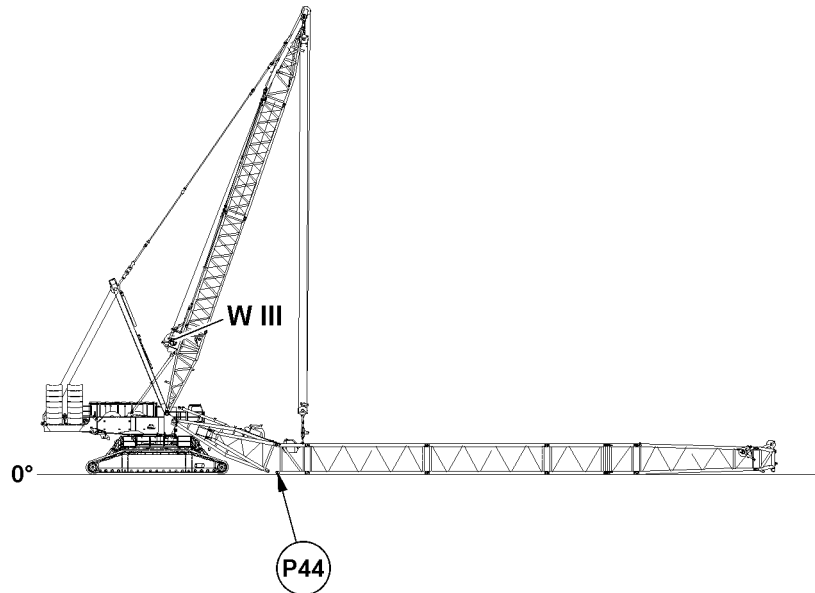
NOTICE

Danger of property damage!

If the maximum permissible total forces is not observed when lifting the boom system for disassembly, then crane components can be severely damaged!

- ▶ Do not exceed the maximum permissible total forces!

- ▶ Spool winch 3 W III up until the rope is tensioned and the pins 32 are relieved on point 44.
- ▶ Unpin both lower P-adapter 2 and the S-pivot section 1 on the cross carrier 3: Release all four pins 32 on point P44 and unpin.



B117314

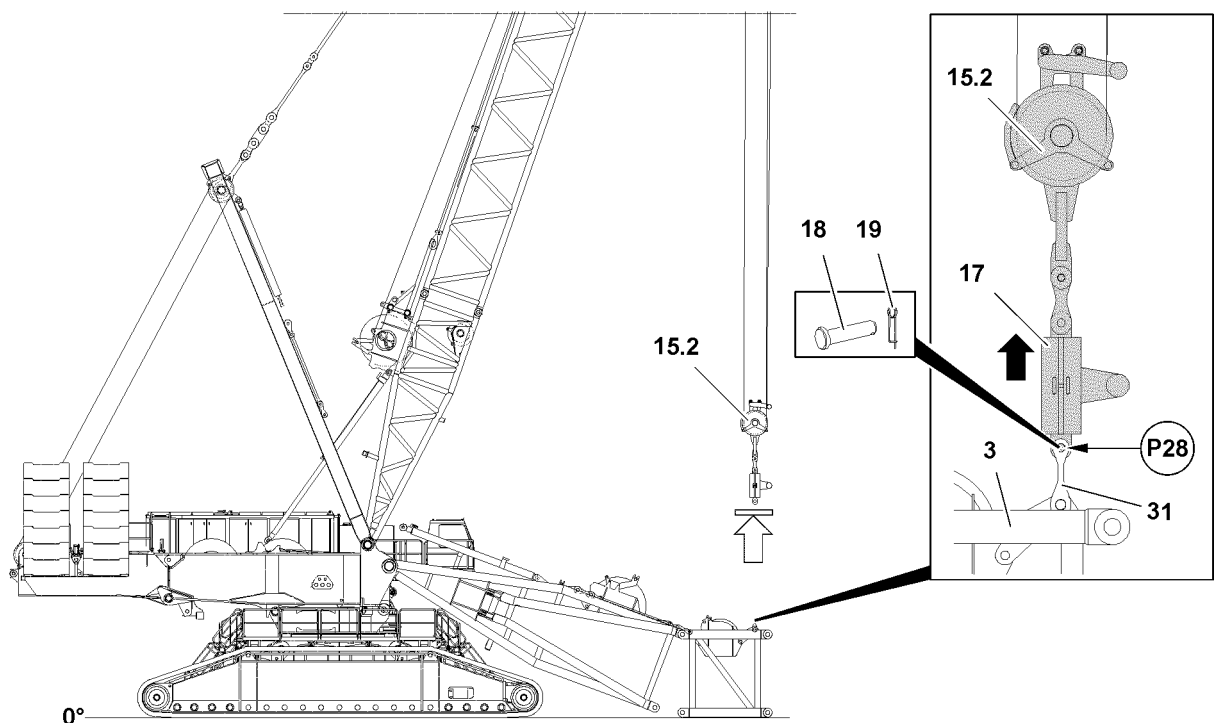
Open the boom - place the boom on the ground

- ▶ When the pins **32** are unpinned on point **P44**:
Spool out winch **3 W III** slowly until the main boom is laying on the ground.

5.9 Removing the upper pulley block on the cross carrier

Make sure that the following prerequisite is met:

- The boom is laying completely on the support on the ground.

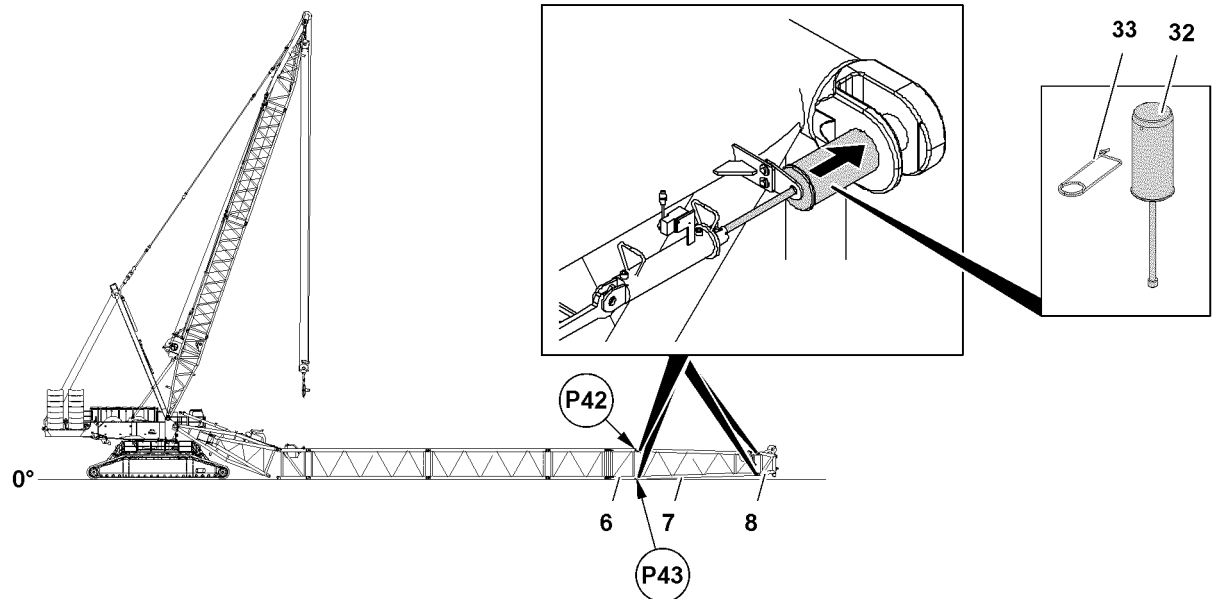


B117434

Removing the upper pulley block on the cross carrier

- ▶ Unpin the assembly weight **17** on the brackets **31**: Release the pins **18** on both sides on points **P28** and unpin.
- ▶ Lift the upper pulley block **15.2** with the auxiliary weight **17** from the assembly range.

5.10 Removing the lattice sections on the cross beam



B117435

Removing the lattice sections on the cross beam

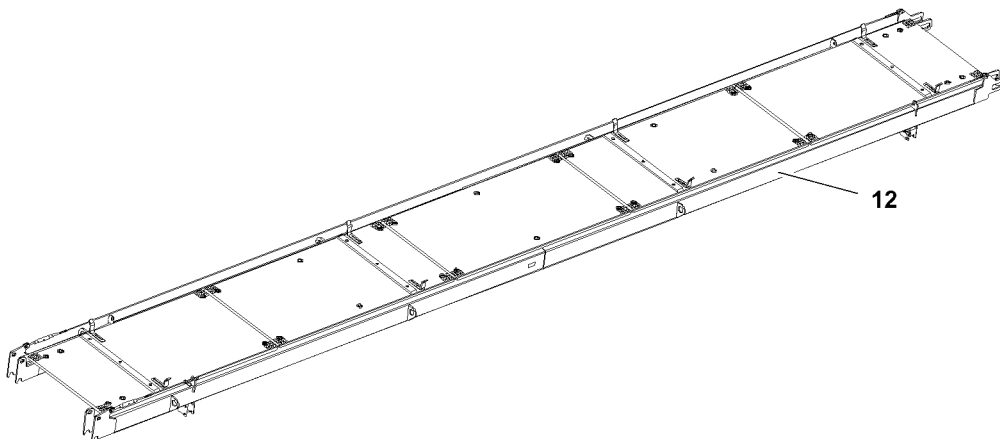
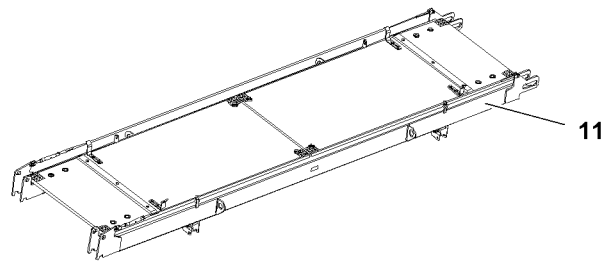
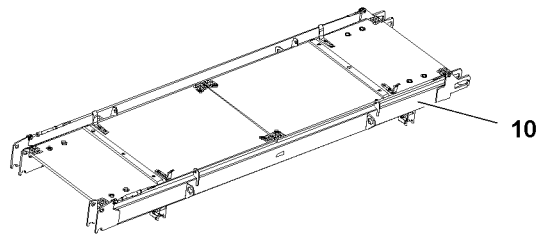
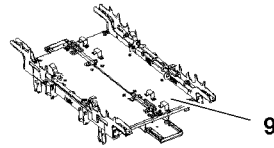
Make sure that the following prerequisite is met:

- The boom has been placed down properly.



Note

- ▶ The S-intermediate sections, the S-adapter **7** and the SW-end section **8** are unpinned with the pin pulling device, see Crane operating instructions, chapter 5.30!
 - ▶ All pins **32** are to be secured after disassembly of the lattice section with the intended safety elements **33**!
-
- ▶ Fasten the lattice section on the auxiliary crane, see section “Fastening points of the lattice sections”.
 - ▶ Release the pin connection of the lattice section: Release all four pins **32** on point **42** and point **43** and unpin.
 - ▶ Lift the lattice section and place down on a suitable storage location.
 - ▶ Additional lattice sections - disassemble the same way as described in this section.



B117313

5.11 Disassembly of bridges



Note

► The following descriptions are an example for the removal of bridges!



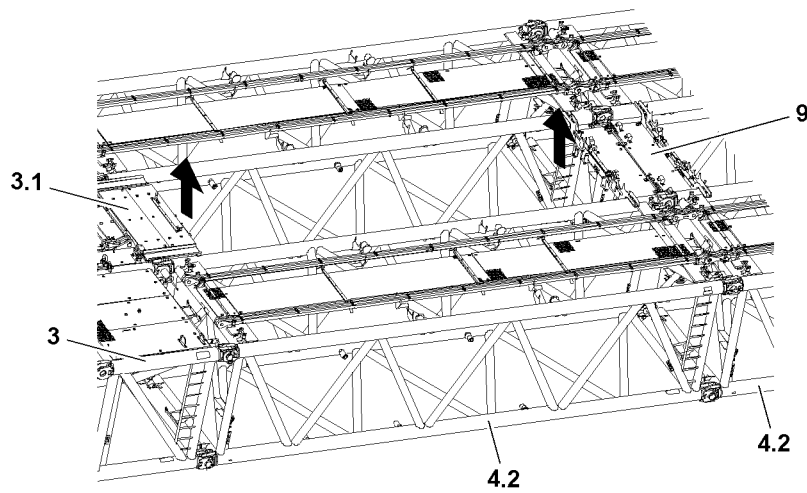
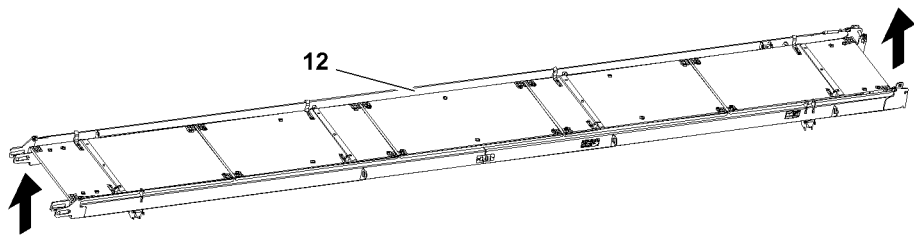
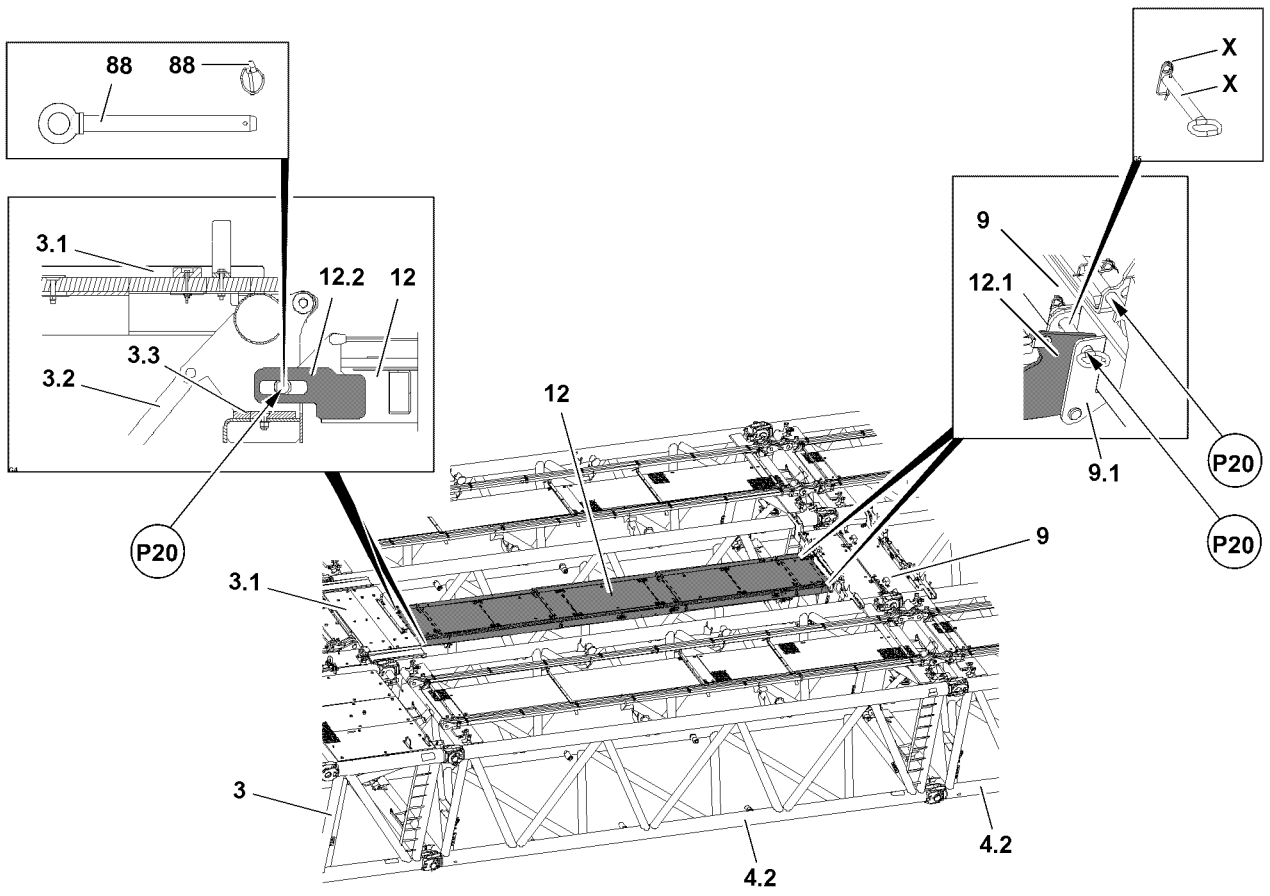
WARNING

Danger of falling!

► Make sure that the assembly personnel is secured with the supplied fall arrest system to prevent them from falling when removing the bridges.

Make sure that the following prerequisites are met:

- The upper pulley block is removed on the cross carrier.
- The upper pulley block is lifted out from the assembly area of the bridges.



B117436

5.11.1 Disassembly of bridges individually

Disassembly of bridges "lengthwise"



Note

- ▶ The disassembly of all bridges "lengthwise" is identical.
- ▶ The disassembly of the bridges "lengthwise" is described on the example of one bridge "lengthwise".



WARNING

Falling bridges!

Unpinned bridge can fall down.

Personnel can be severely injured or killed!

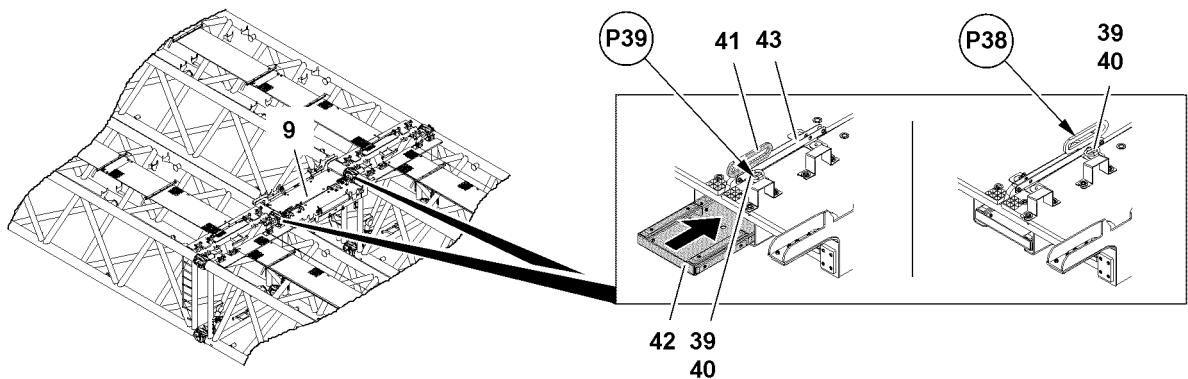
- ▶ Make sure that the bridge is fastened properly on the auxiliary crane.
- ▶ Make sure that the pins are unpinned only when the fastening equipment on the bridges is tensioned.

- ▶ Attach the bridge "lengthwise" **12** properly on the auxiliary crane, see section Fastening points.
- ▶ Carefully bring fastening equipment to tension.
- ▶ Unpin pins on both sides at point **P**.
- ▶ Insert the pins on both sides at point **P** in park position and secure.
- ▶ Unpin pins on both sides at point **P**.
- ▶ Lift the bridge "lengthwise" **12** out with the auxiliary crane.
- ▶ Swing the bridge "lengthwise" **12** out and place it on the support on the ground.

or

- Swing the bridge "lengthwise" **12** out and place it on the transport vehicle.
- ▶ Remove additional bridges "lengthwise" **12** as described above.

Disassembly bridge "lateral"

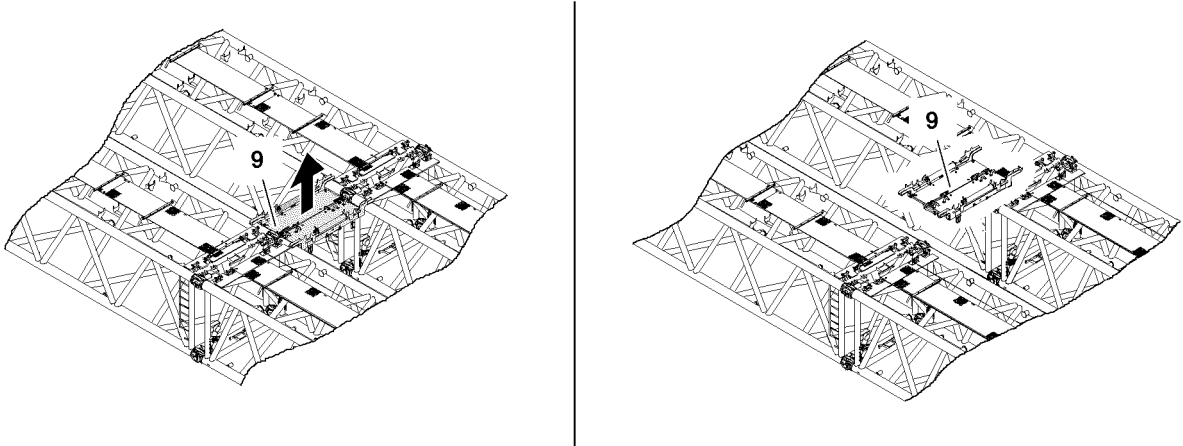


B115402

Remove the bridge - release the bridge

**Note**

- ▶ The following description is an example for the removal of all bridges!
-
- ▶ Unpin the handle **41** of the sliding section **42** on the guide bar **43**: Release and unpin the grip pin **39** on point **39**.
 - ▶ Bring the sliding section **42** from operation position into transport position: Slide the sliding section **42** in completely with the handle **41**.
 - ▶ Pin the handle **41** of the sliding section **42** with the guide bar **43**: Insert the grip pin **39** on point **P38** and secure with locking pin **40**.

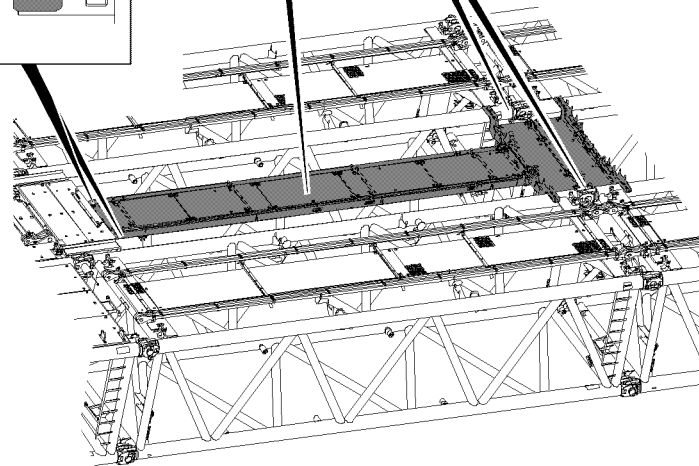
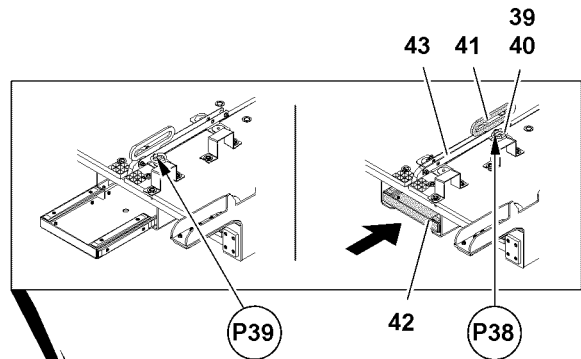
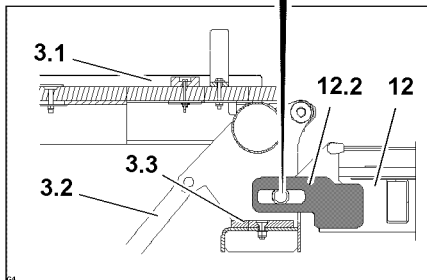
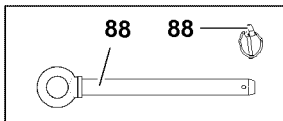
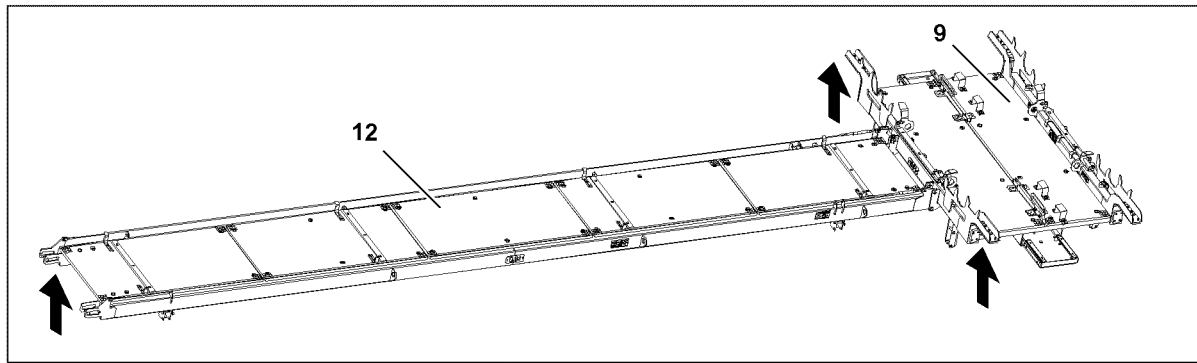


B115403

Remove the bridge - fasten and remove the bridge

- ▶ Fasten the bridge **9** on the auxiliary crane and lift, see section "Fastening points of the lattice sections".
- ▶ Swing the bridge out with the auxiliary crane and place it on a suitable support.

blank page!



5.11.2 Disassembly of preassembled bridges



Note

- ▶ The disassembly of all preassembled bridges is identical.
- ▶ The disassembly of the preassembled bridges is described on the example of one preassembled bridge.



WARNING

Danger of accident!

- ▶ Make sure that the removal of preassembled bridges is started from the cross bar **6**.



WARNING

Falling bridges!

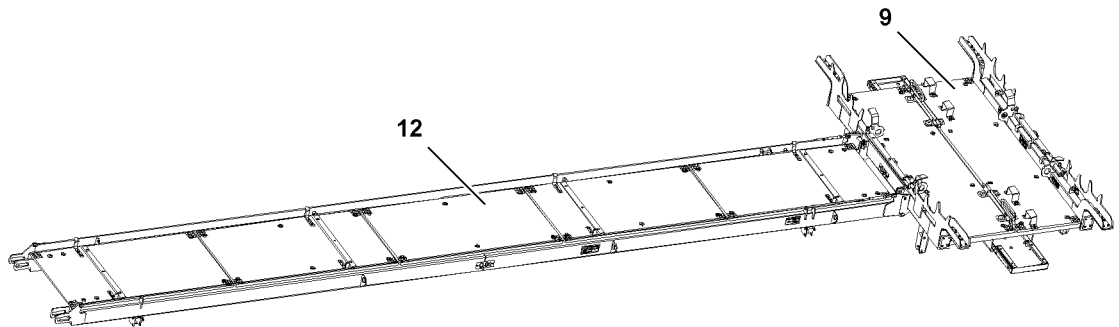
Unpinned bridge can fall down.

Personnel can be severely injured or killed!

- ▶ Make sure that the preassembled bridge is fastened properly on the auxiliary crane.
- ▶ Make sure that the pins are unpinned only when the fastening equipment on the bridges is tensioned.

Make sure that the following prerequisite is met:

- The cross beam is properly pinned and secured on both upper P-adapters.



B117437

- ▶ Attach the preassembled bridge properly on the auxiliary crane, see section “Fastening points”.
- ▶ Carefully bring fastening equipment to tension.
- ▶ Release the preassembled bridge at point **P** and slide the sliding sections in completely on bridge “lateral”.

Result:

- The preassembled bridge is completely released.
- The preassembled bridge can be lifted out.
- ▶ Lift the preassembled bridge with the auxiliary crane.
- ▶ Swing the preassembled bridge out with the auxiliary crane and place it on a suitable support.
- ▶ Disconnect the preassembled bridge.
- ▶ Additional preassembled bridges - disassemble the same way as described in this section.

5.12 Removing the lattice sections of the PD-boom

5.12.1 Removing the cross beam



Note

- ▶ The hydraulic supply for the disassembly of the upper P-adapters **5** is made via the external hydraulic aggregate!



WARNING

Pressure in the hydraulic lines!

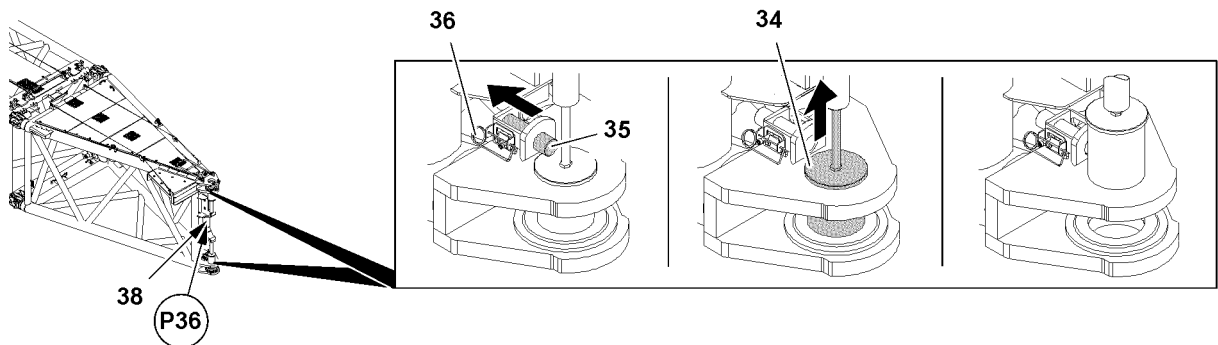
If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure!

Personnel can be severely injured or killed!

- ▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time!

Make sure that the following prerequisite is met:

- The bridges are completely removed on the P-boom.



B115404

Remove the cross beam - remove the left retaining pin

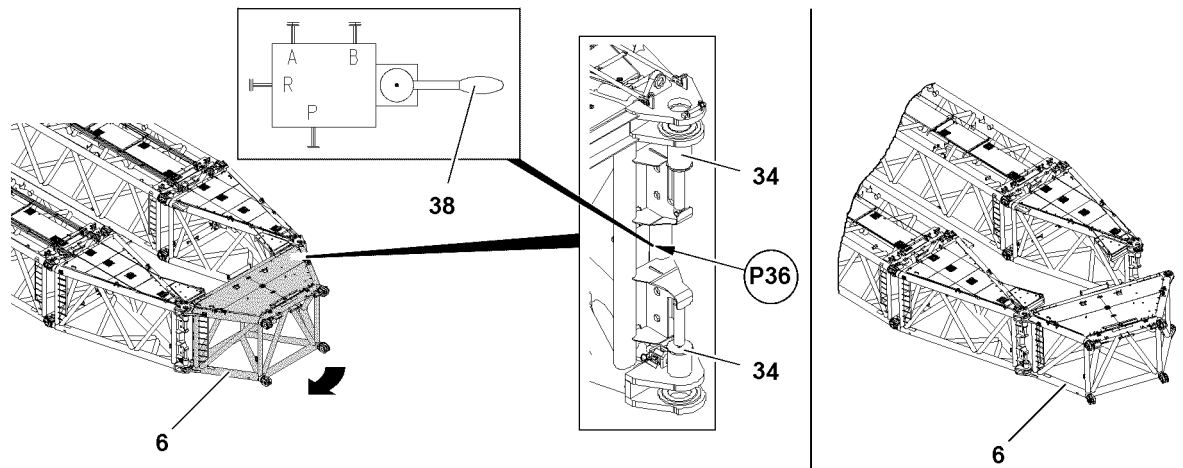
- ▶ Fasten the auxiliary crane, see section "Fastening points of the lattice sections".

The pins **34** must be released before unpinning.

- ▶ Release the retaining pin **35**.
- ▶ Slide the retaining pin **35** in to the stop and lock the screw in place "downward".
- ▶ Secure the retaining pin **35** with spring retainer **36**.

Result:

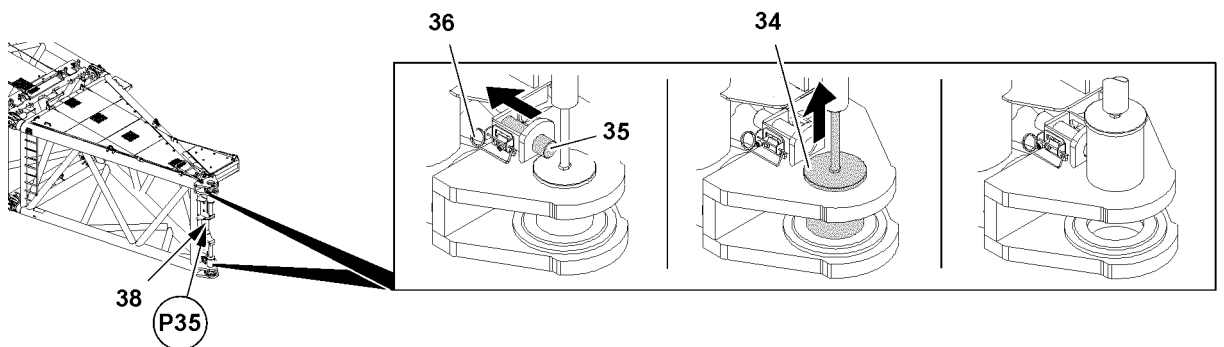
- The pins **34** are released.



B117440

Remove the cross beam - unpin the cross beam on the left

- ▶ Establish the hydraulic connection on point **P36**: Connect the coupling parts (sleeve and plug) and screw together by hand until the hand nut is turned to a noticeable, fixed stop.
- ▶ Actuate the hand lever **38** until the pins **34** are completely uninned.
- ▶ Disconnect the hydraulic connection on point **P36**: Install the coupling components (sleeve and plug) with the hand-tightened nut.
- ▶ Install dust caps on the quick couplings.
- ▶ Swing the cross beam up.



B115406

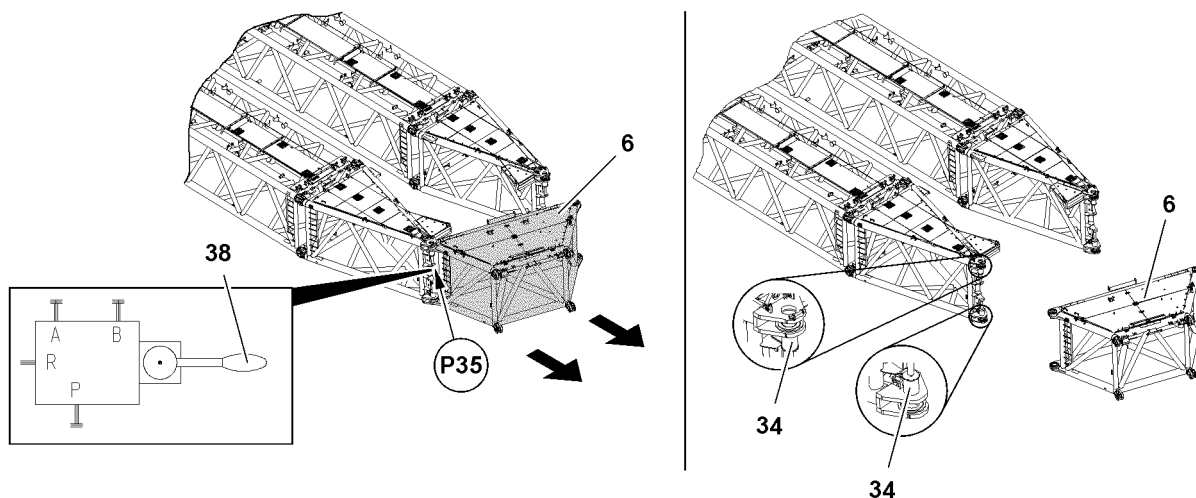
Remove the cross beam - remove the right retaining pin

The pins **34** must be released before unpinning.

- ▶ Release the retaining pin **35**.
- ▶ Slide the retaining pin **35** in to the stop and lock the screw in place "downward".
- ▶ Secure the retaining pin **35** with spring retainer **36**.

Result:

- The pins **34** are released.

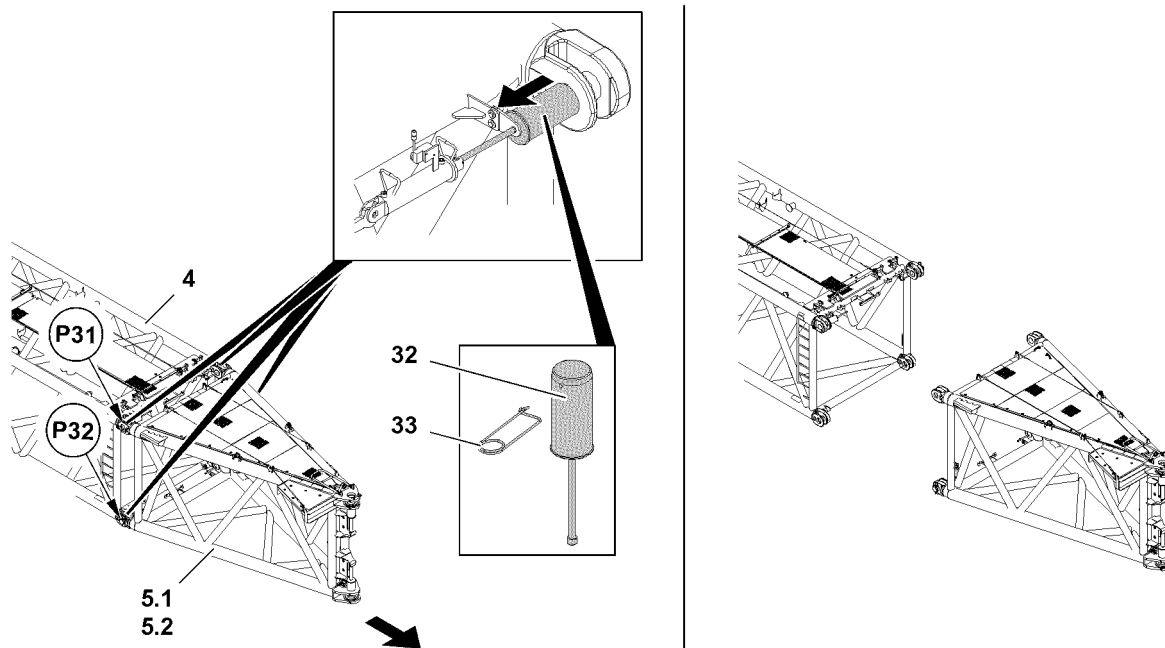


B117441

Remove the cross beam - unpin the cross beam on the right

- ▶ Establish the hydraulic connection on point **P35**: Connect the coupling parts (sleeve and plug) and screw together by hand until the hand nut is turned to a noticeable, fixed stop.
- ▶ Actuate the hand lever **38** until the pins **34** are completely uninned.
- ▶ Disconnect the hydraulic connection on point **P35**: Install the coupling components (sleeve and plug) with the hand-tightened nut.
- ▶ Install dust caps on the quick couplings.
- ▶ Lift and remove the cross beam **6**.

5.12.2 Removing the upper P-adapters



B115408

Removing the upper P-adapters

Make sure that the following prerequisites are met:

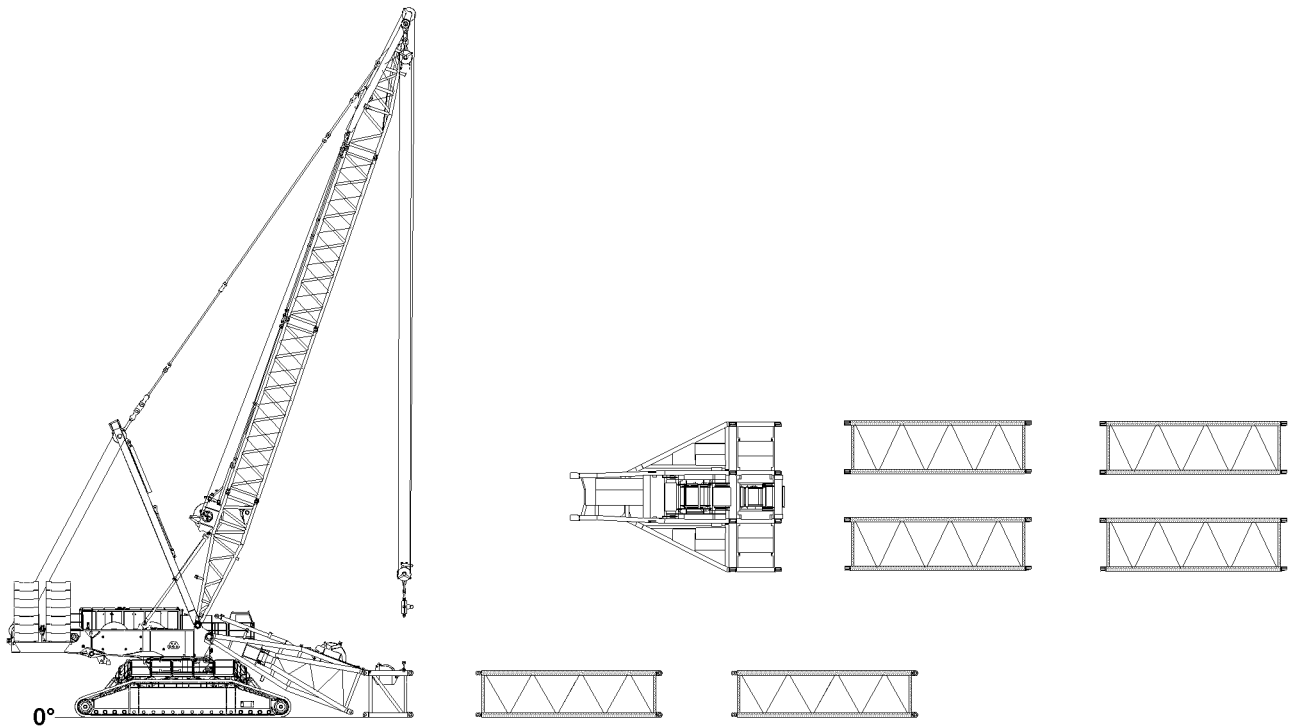
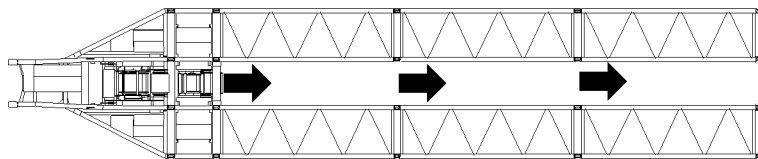
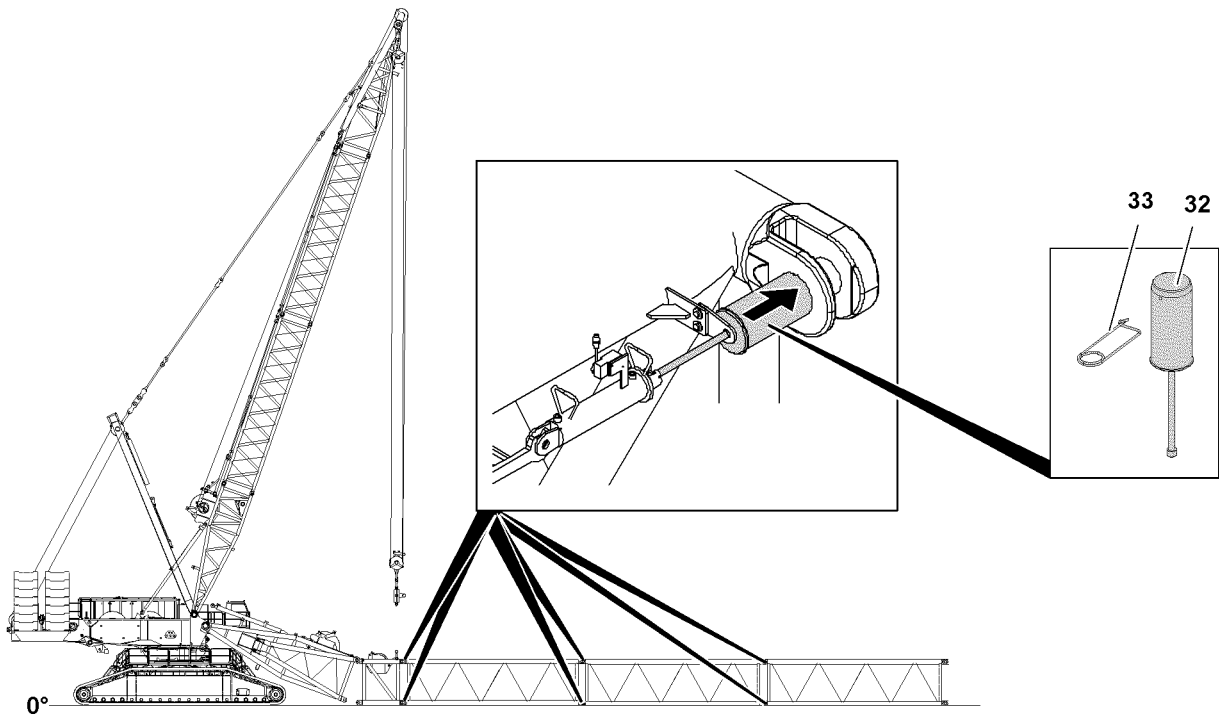
- The cross beam is completely disassembled.
- The hydraulic connection to the upper P-adapter is completely separated.

**Note**

- ▶ The upper P-adapters **5** are unpinned with the pin pulling device, see Crane operating instructions, chapter 5.30!

On both lattice sections of S-intermediate sections **4**, remove respectively the upper P-adapter **5** (left: upper P-adapter **5.2**, right: upper P-adapter **5.1**).

- ▶ Fasten the upper P-adapter **5** on the auxiliary crane, see section “Fastening points of the lattice sections”.
- ▶ Unpin the upper P-adapter **5** on the S-intermediate section **4**: Release the pin **32** on both sides on point **P31** and on point **P32** and unpin with the pin pulling device.
- ▶ Lift the upper P-adapter **5** and place down on a suitable storage location.



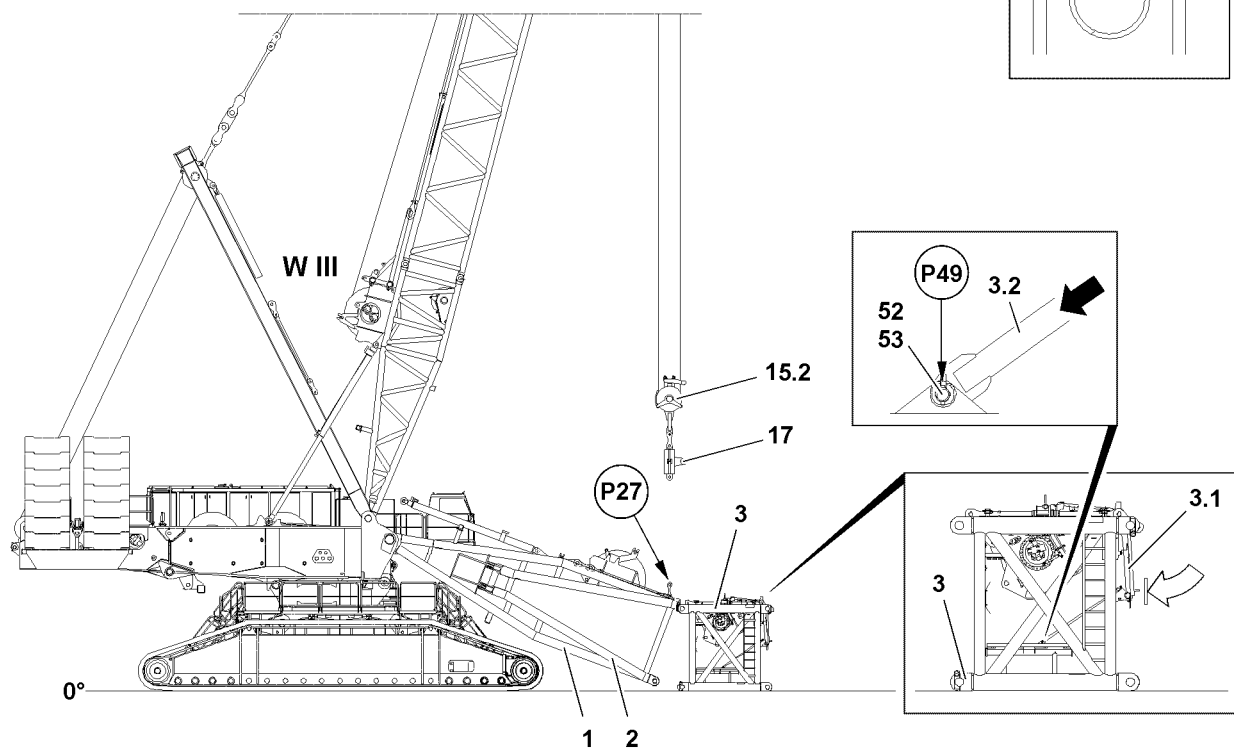
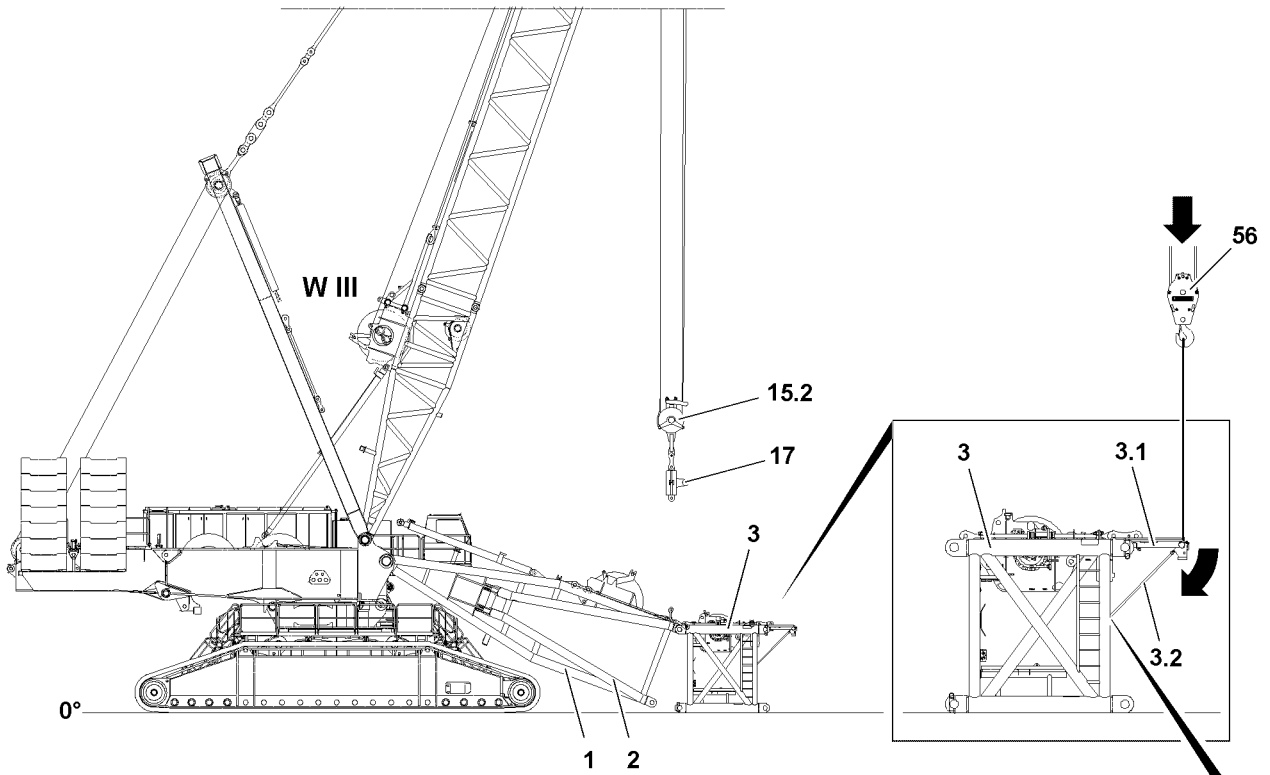
5.12.3 Removing the S-intermediate sections on the cross carrier

**Note**

- ▶ The S-intermediate sections **4** are unpinned with the pin pulling device, see Crane operating instructions, chapter 5.30!
-

The disassembly is described on the example of an intermediate section.

- ▶ Fasten the lattice section on the auxiliary crane, see section “Fastening points of the lattice sections”.
- ▶ Unpin the S-intermediate section **4** on both sides on the “bottom”: Remove the spring retainer **33** and unpin the pin **32**.
- ▶ Unpin the S-intermediate section **4** on both sides on “top”: Remove the spring retainer **33** and unpin the pin **32**.
- ▶ Lift the S-intermediate section **4** and remove.
- ▶ If additional lattice sections are disassembled: Disassemble additional lattice sections the same way as described in this section.



B117458

5.12.4 Bringing the platform on the cross carrier into transport position

Make sure that the following prerequisites are met:

- The upper pulley block is removed on the S-pivot section.
- The upper pulley block is raised.
- ▶ Attach the platform **3.1** on the auxiliary crane **56**.
- ▶ When the platform **3.1** is safely held by the auxiliary crane **56**:
Release pins **54** on both sides at point **P50** and unpin!

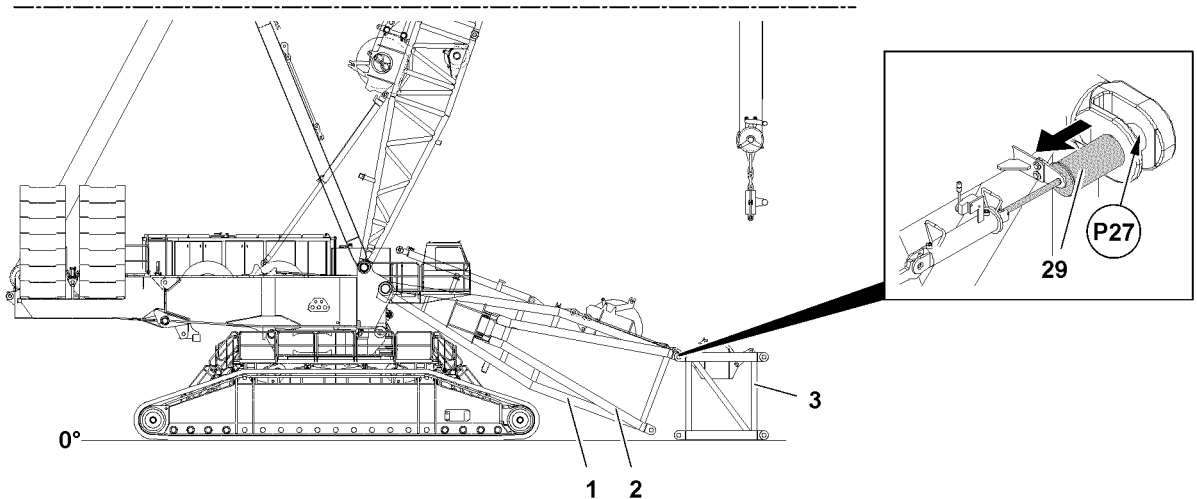
NOTICE

Danger of property damage!

- ▶ Guide the supports **3.2** to point **P49** when lowering the platform **3.1**.

- ▶ Lower the platform **3.1** with the auxiliary crane.
- ▶ When the platform **3.1** is in transport position:
Pin the supports **3.2** on both sides at point **P49** and secure.
- ▶ When the platform **3.1** is properly pinned and secured:
Remove the auxiliary crane.

5.12.5 Removing the cross carrier



B115411

Removing the cross carrier

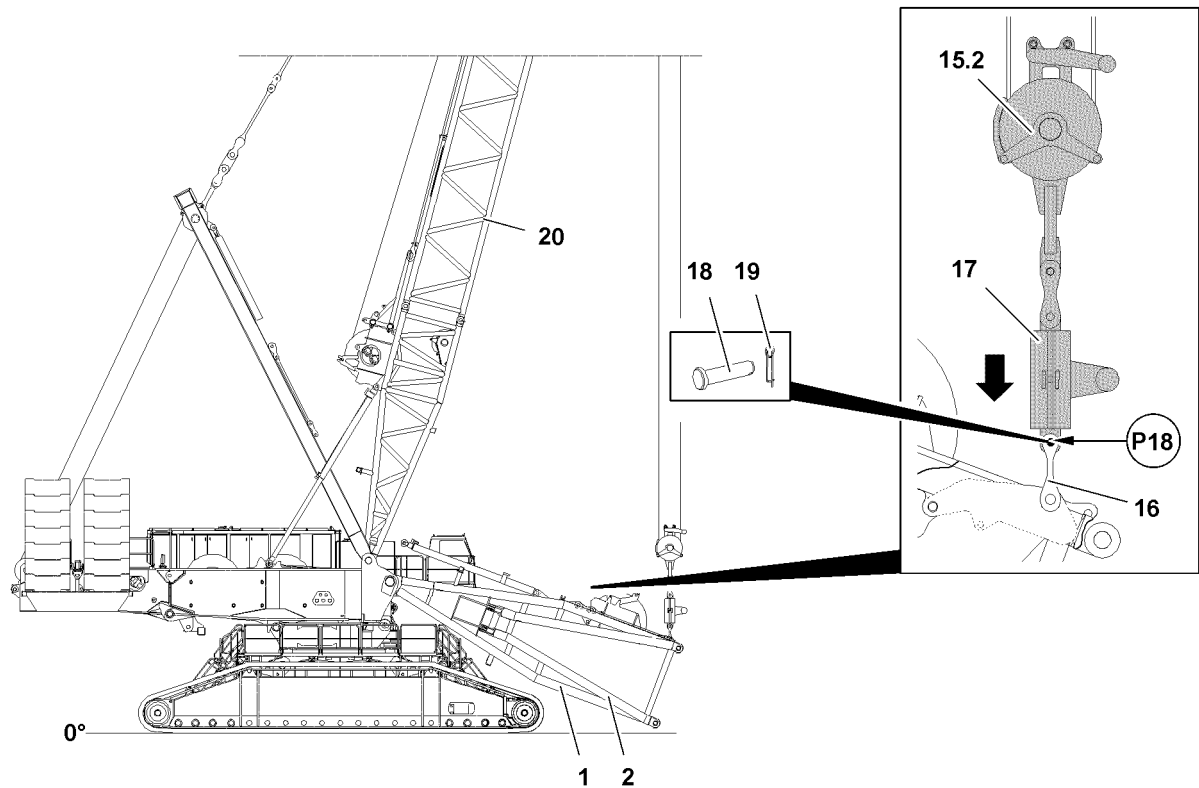
- ▶ Fasten the cross carrier **3** on the auxiliary crane, see section “Fastening points of the lattice sections”.



Note

- ▶ The pinning or unpinning is carried out with the pin pulling device, see Crane operating instructions, chapter 5.30!
- ▶ Unpin the cross carrier **3** on the lower P-adapters **2** and on the S-pivot section **1**: Release and unpin all four pins **29** on points **P27**.
- ▶ Lift the cross carrier **3** and remove.

5.12.6 Pinning the upper pulley block on the S-pivot section



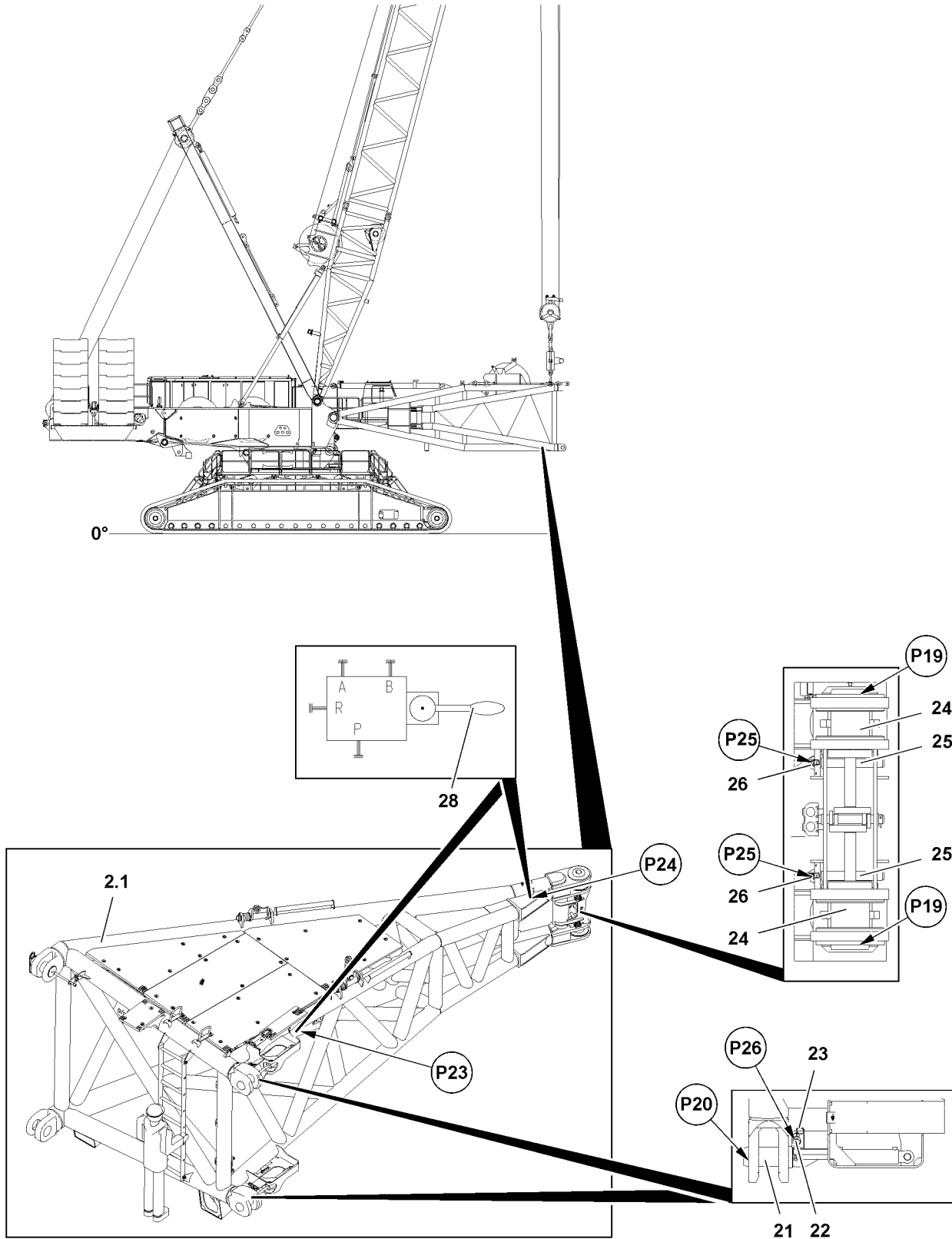
B115412

Pinning the upper pulley block on the S-pivot section

Make sure that the following prerequisites are met:

- The S-pivot section **1** is placed on the ground on the support base.
- The auxiliary crane is removed.
- ▶ Luff the D-boom **20** up until the upper pulley block **15.2** hangs freely with the assembly weight **17** over the bracket **16** on the S-pivot section **1**.
- ▶ Pin the assembly weight **17** with the brackets **16**: Insert the pin **18** on both sides on points **P18** and secure with spring retainer **19**.
- ▶ Spool winch **3 W III** up carefully until the S-pivot section **1** is aligned horizontally.

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B115413

5.12.7 Removing the lower P-adapters



Note

- ▶ The hydraulic supply for the disassembly of the lower P-adapters **2** is made via the external hydraulic aggregate!



WARNING

Pressure in the hydraulic lines!

If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure!

Personnel can be severely injured or killed!

- ▶ Release the pressure in the hydraulic system before connecting / disconnecting: Interrupt the pressure supply and wait for a short time!

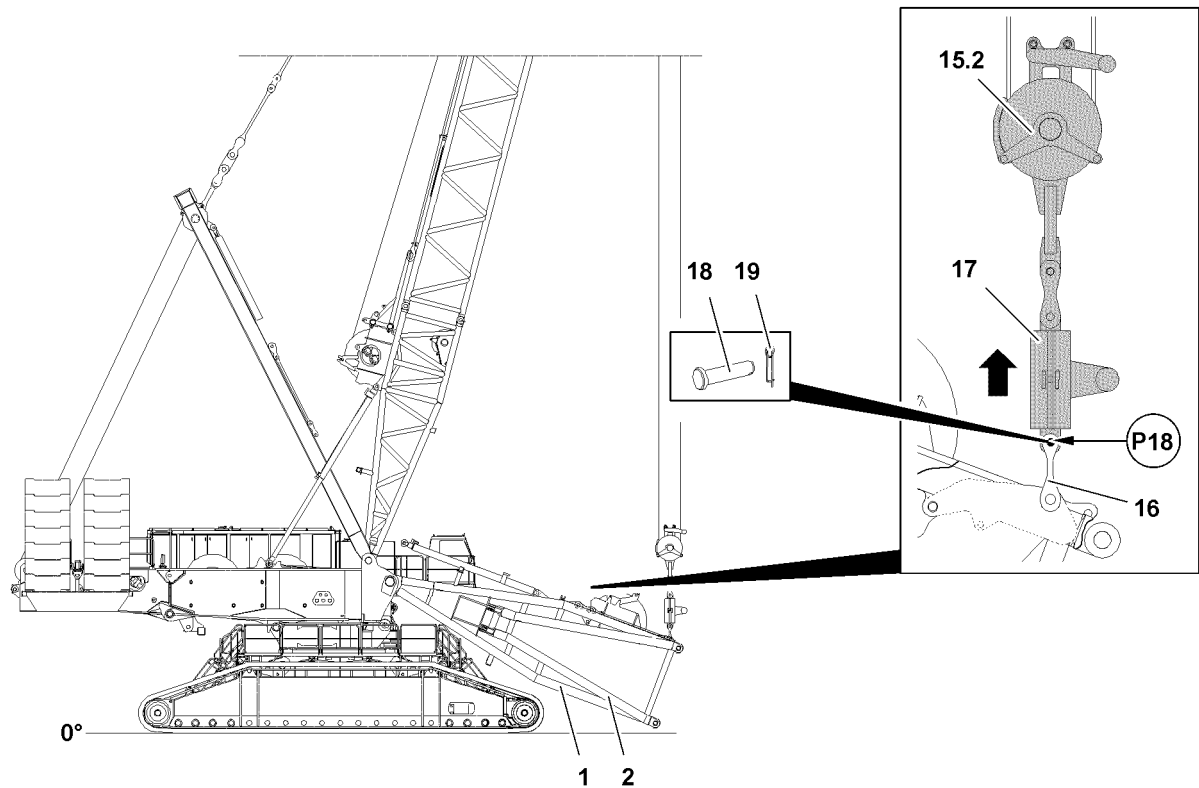
Make sure that the following prerequisites are met:

- The S-pivot section **1** is horizontally aligned.
- A hydraulic aggregate is available.

The disassembly is described on the example of the right, lower P-adapter **2.1**.

- ▶ Fasten the lower P-adapter **2.1** on the auxiliary crane, see section "Fastening points of the lattice sections".
- ▶ Establish the hydraulic connection on point **P23**: Connect the coupling parts (sleeve and plug) and screw together by hand until the hand nut is turned to a noticeable, fixed stop.
- ▶ Release the retaining pins **22** on both sides on points **P26** and unpin.
- ▶ Insert both retaining pins **22** in the retainer and secure with locking pin **23**.
- ▶ Actuate the hand lever **28** until the pins **21** on point **P20** are completely unpinned.
- ▶ Disconnect the hydraulic connection on point **P23**: Install the coupling components (sleeve and plug) with the hand-tightened nut.
- ▶ Install dust caps on the quick couplings.
- ▶ Establish the hydraulic connection on point **P24**: Connect the coupling parts (sleeve and plug) and screw together by hand until the hand nut is turned to a noticeable, fixed stop.
- ▶ Release the retaining pins **25** on both sides on points **P25** and unpin.
- ▶ Insert both retaining pins **25** in the retainer and secure with locking pin **26**.
- ▶ Actuate the hand lever **28** until the pins **24** on point **P19** are completely unpinned.
- ▶ Disconnect the hydraulic connection on point **P24**: Install the coupling components (sleeve and plug) with the hand-tightened nut.
- ▶ Install dust caps on the quick couplings.
- ▶ Lift the lower P-adapter **2.1** and remove.
- ▶ Remove the left, lower P-adapter **2.2** the same way as described in this section.

5.12.8 Unpinning the upper pulley block on the S-pivot section



B115414

Unpinning the upper pulley block on the S-pivot section

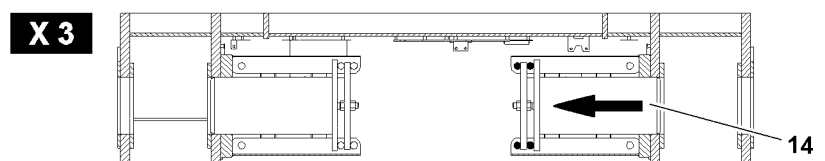
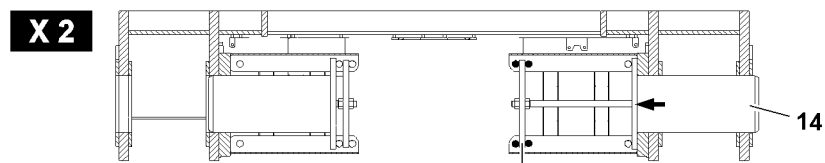
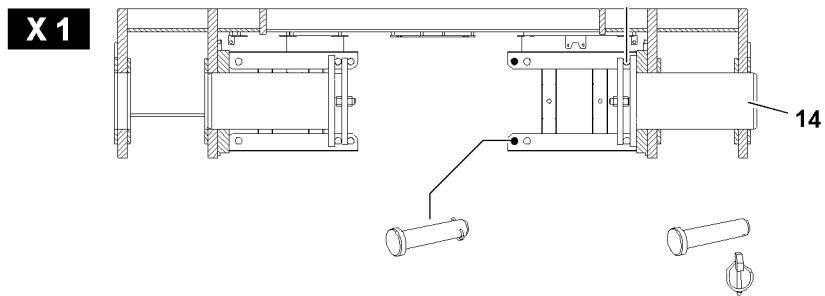
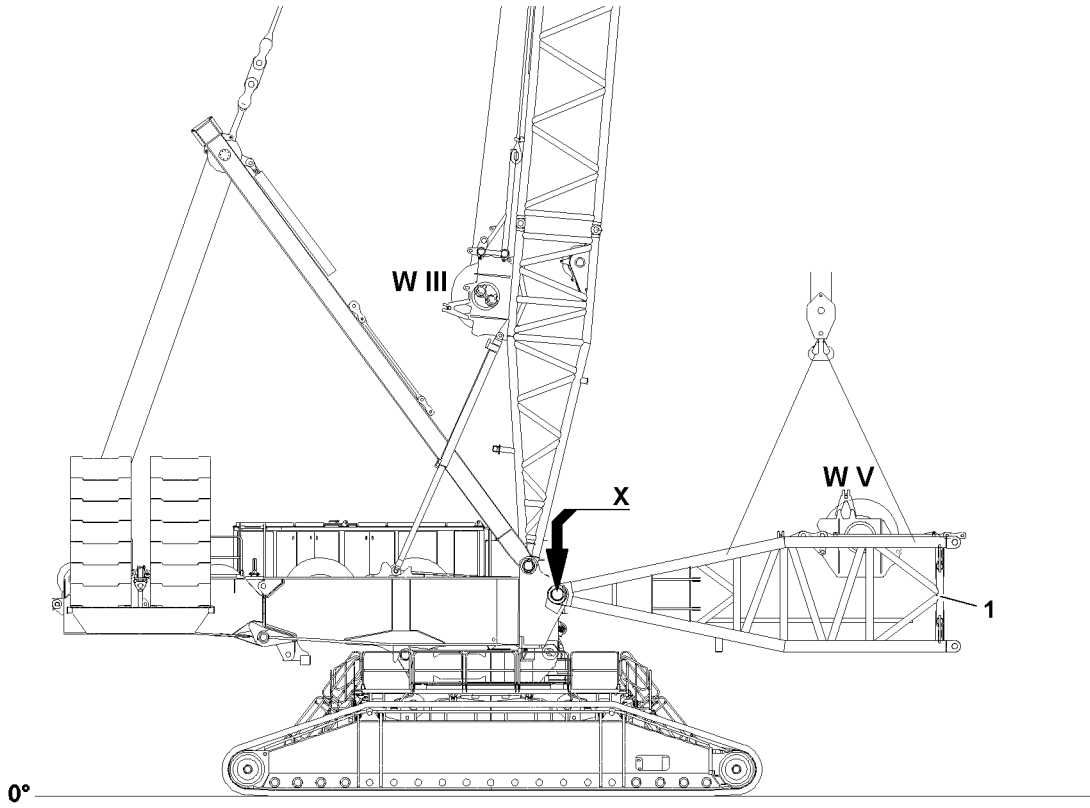
Make sure that the following prerequisite is met:

- The S-pivot section **1** is placed completely on the ground on the support base.
- ▶ Unpin the assembly weight **17** on the brackets **16**: Release pins **18** on both sides on point **P18** and unpin.

Result:

- The upper pulley block **15.2** is completely unpinned.

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B117197

5.12.9 Disassembling the S-pivot section



WARNING

General danger notes!

Personnel can be severely injured or killed!

- ▶ Insert and secure all pins after disassembly in the intended transport receptacles!

Make sure that the following prerequisite is met:

- The D-boom is erected to the point where the S-pivot section can be disassembled without obstructions.



Note

- ▶ Select the fastening points on the S-pivot section in such a way that the S-pivot section hangs horizontally on the auxiliary crane at disassembly. See section "Fastening points of the lattice sections"!

- ▶ When winch 5 **W V** is deactivated:

Attach the S-pivot section **1** on the fastening points **P1** and fastening points **P2** on the auxiliary crane.

or

When winch 5 **W V** is installed:

- Attach the S-pivot section **1** on the fastening points **P1** and fastening points **P3** on the auxiliary crane.
- ▶ Lift the S-pivot section **1** with the auxiliary crane to the horizontal.
- ▶ Establish the hydraulic connection to the pin pulling device.



WARNING

Falling pivot section!

Personnel can be severely injured or killed!

- ▶ Make sure that the S-pivot section **1** is safely held by the auxiliary crane before unpinning the pins **14**!

- ▶ Unpin the S-pivot section **1** on the turntable, see Crane operating instructions, chapter 5.38.

NOTICE

Damage of the turntable and the S-pivot section!

- ▶ Slowly swing the S-pivot section out with the auxiliary crane and at low speed on the turntable!
- ▶ Before placing it on the ground, support the S-pivot section!

- ▶ When the connector pins **14** on the S-pivot section **1** are fully unpinned on both sides:

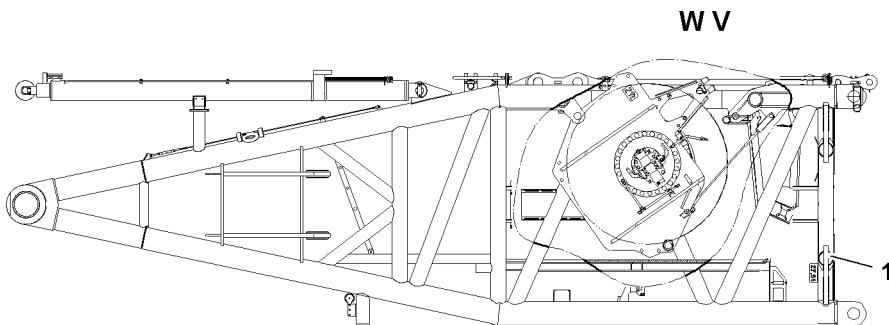
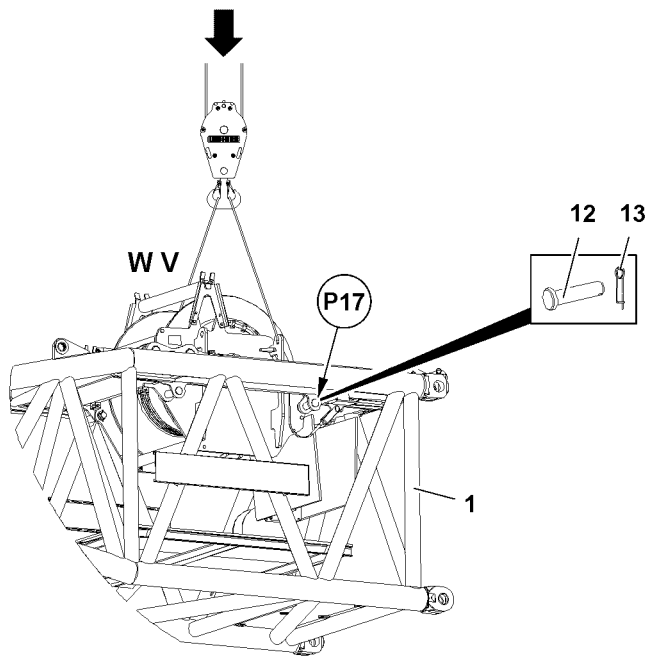
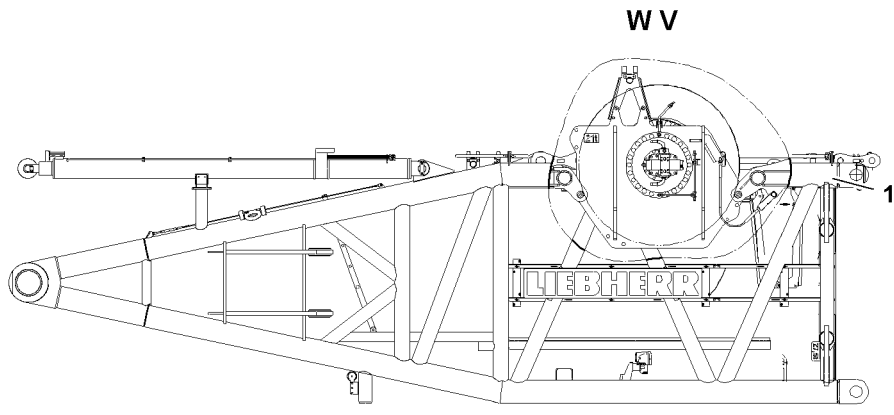
Swing the S-pivot section **1** out on the turntable with the auxiliary crane and place it down.

- ▶ Remove the auxiliary crane.



Note

- ▶ Disassemble the D-boom, see Crane operating instructions, chapter 5.05!



B115415

5.13 Final tasks on the S-pivot section

5.13.1 Installing winch 5 in transport position

Make sure that the following prerequisite is met:

- The S-pivot section 1 is placed on the ground.
- ▶ Disconnect the hydraulic connection to winch 5 **W V**.
- ▶ Disconnect the electrical connection to winch 5 **W V**.
- ▶ Attach winch 5 **W V** on the auxiliary crane.
- ▶ Bring winch 5 **W V** with the auxiliary crane into transport position.
- ▶ Unpin winch 5 **W V** on the S-pivot section 1: Release pins **12** on both sides on point **P17** and unpin.
- ▶ Lower winch 5 **W V** with the auxiliary crane until winch 5 **W V** hangs on the retaining ropes.
- ▶ Remove the auxiliary crane.

5.13.2 Assembling the catwalk / assembly platform in transport position



Note

- ▶ For disassembly of the catwalk / assembly platform, see Crane operating instructions, chapter 2.06.

5.13.3 Installing the railings in transport position



WARNING

Danger of falling!

During assembly and disassembly of the railings, personnel must be secured with appropriate aids to prevent them from falling (for example: with personal protective equipment)!

Even for assembly/disassembly of protective devices there is a danger of falling!

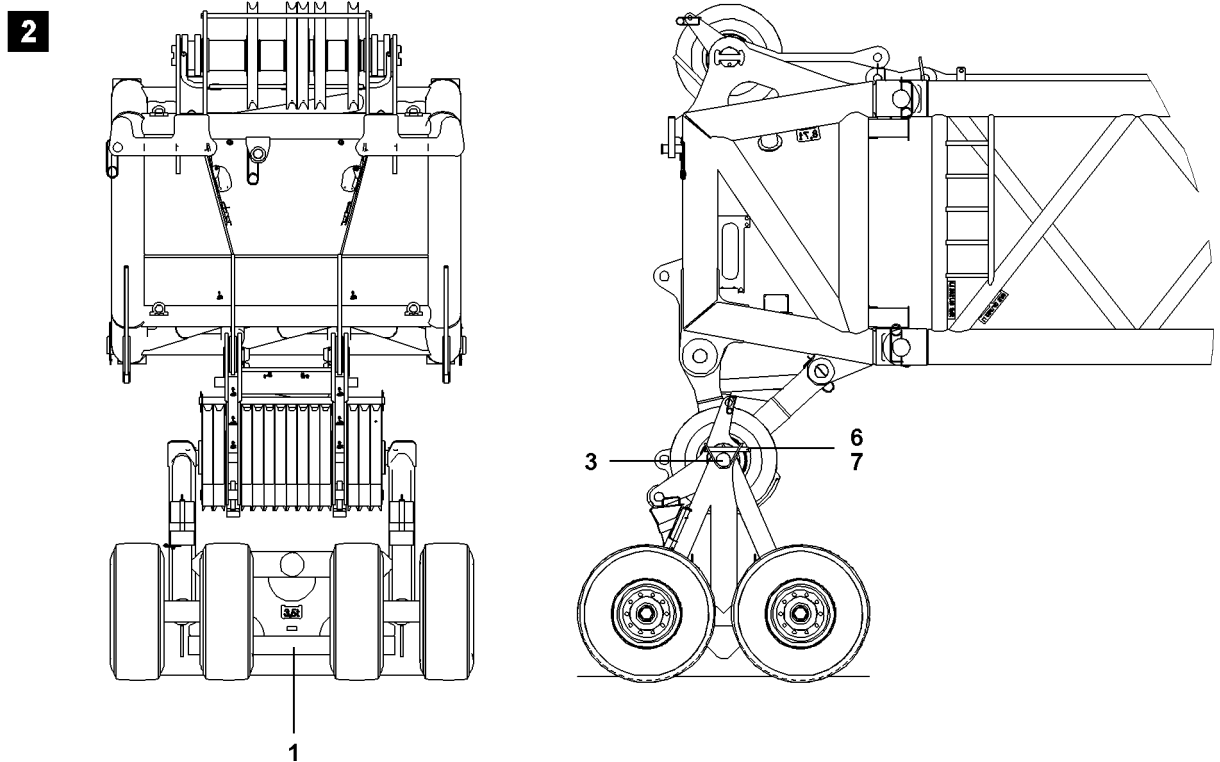
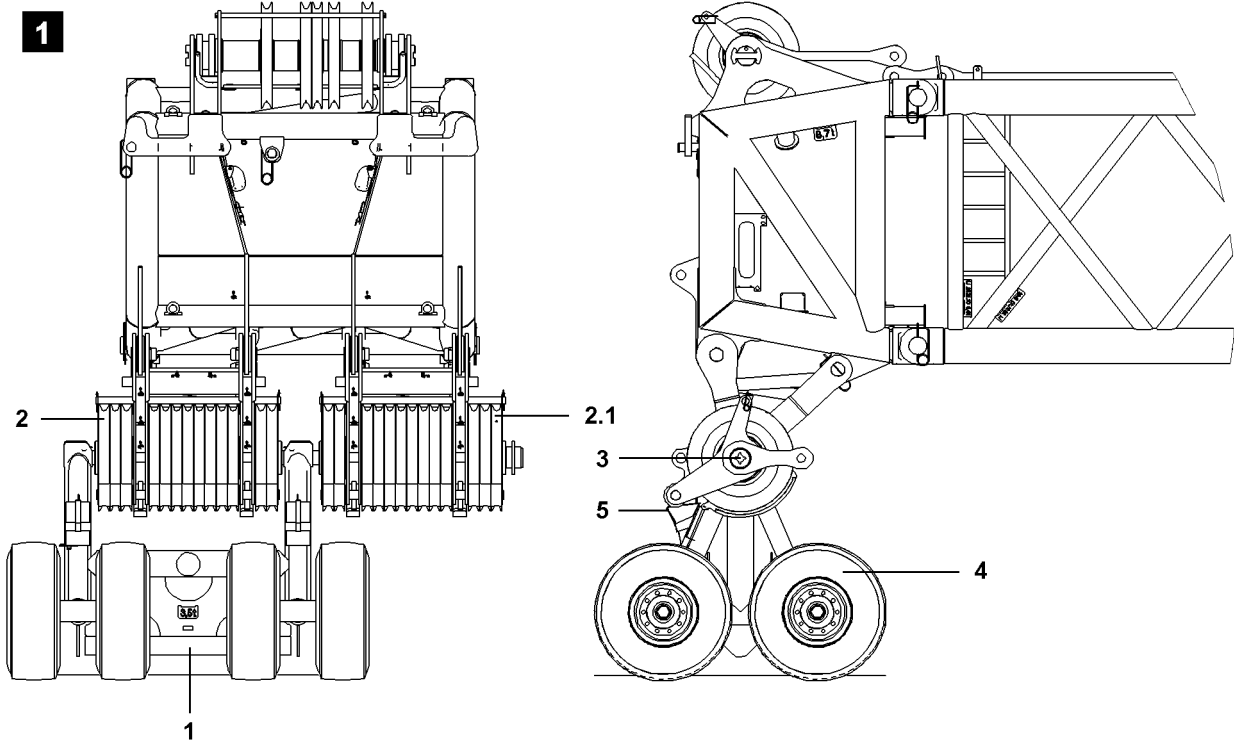
Assembly personnel can fall and be severely injured or killed!

- ▶ For assembly and disassembly work, maintenance and inspection work on the S-pivot section, all railings and the assembly platform must be assembled and secured!
- ▶ Only step on S-pivot section with "clean shoes"!



Note

- ▶ See Crane operating instructions, chapter 2.06!
- ▶ Disassemble the railings properly.



B103424

1 General

Assembly of the pulley truck at the SW-head piece with one or two pulley sets.

Figure 1

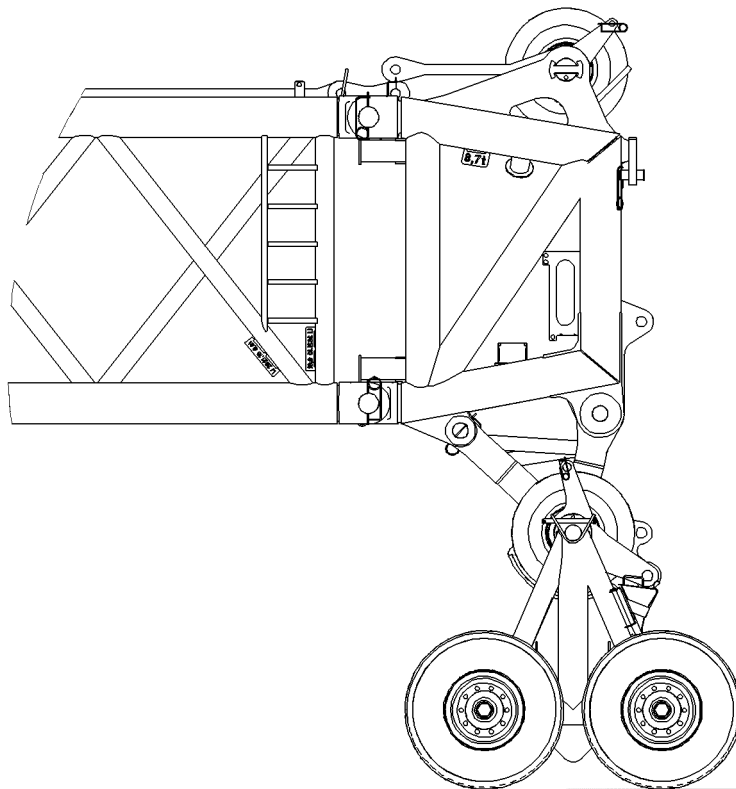
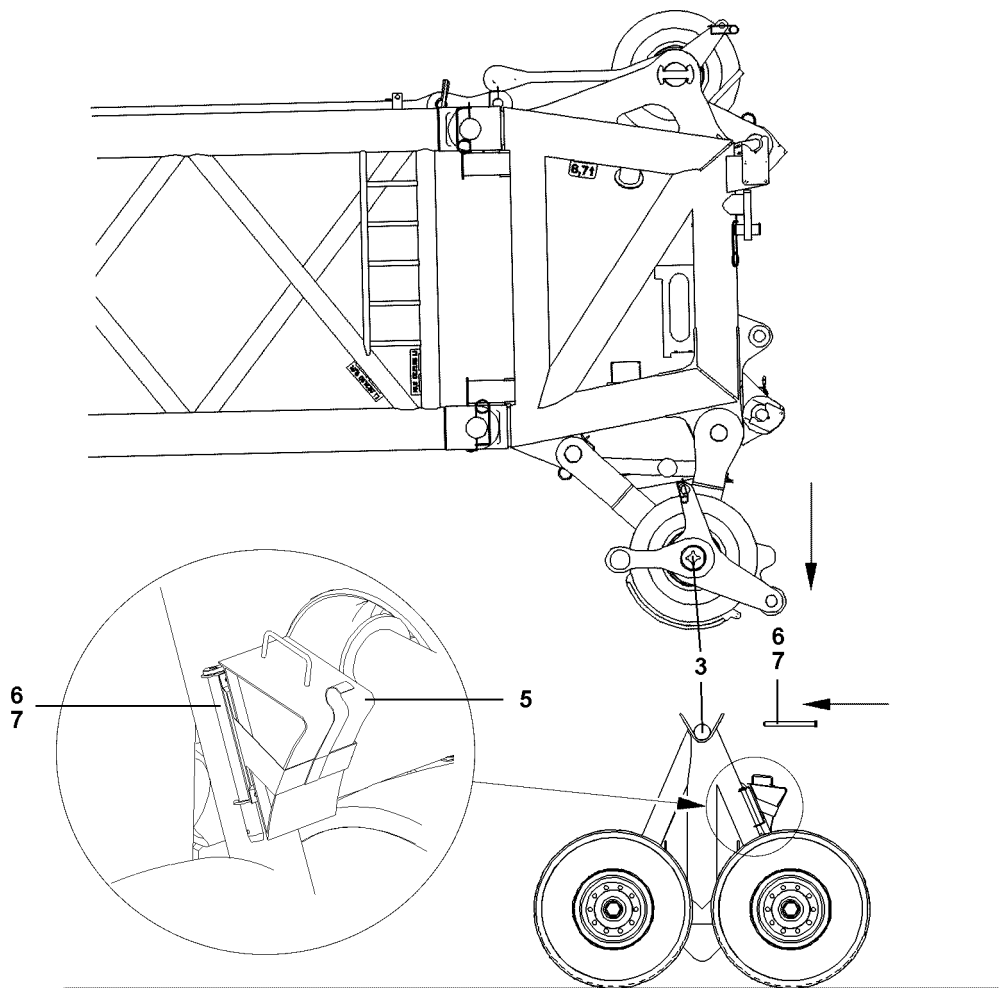
Lateral assembled pulley truck 1 in case of two pulley sets 2 and 2.1

Figure 2

Central assembled pulley truck 1 in case of one pulley set 2

1.1 Components

	Bezeichnung
1	Pulley truck
2	Pulley set right
2.1	Pulley set left
3	Shaft
4	Tyres
5	Chock
6	Safety pin
7	Linch pin



B103425

2 Assembly

2.1 Assembling of the pulley truck

- ▶ Place the pulley truck **1** under the SW-head piece and fix with chocks **5**.
- ▶ Lower W-lattice fly jib slowly until the shaft **3** of the pulley set is touching the pulley truck **1** mounting.
- ▶ Secure the pulley truck at the pulley set.
- ▶ Insert pin **6** and secure with linch pin **7**.
- ▶ Remove chocks **5**.

3 Disassembly

3.1 Disassembling of the pulley truck

- ▶ Raise the boom combination to an specific angle between the S-boom and the W-lattice fly jib.
- ▶ Fix the pulley truck **1** with chocks **5**.
- ▶ Release the linch pin **7** and remove pin **6**.



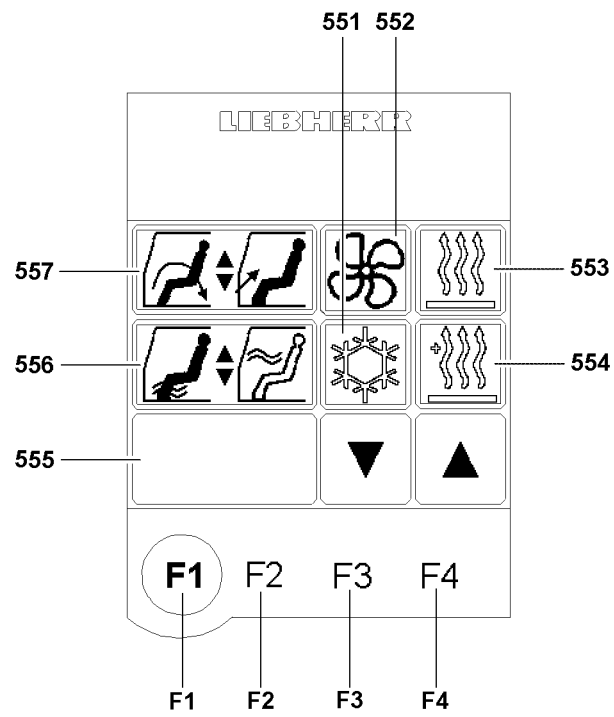
DANGER

Overloading of the crane!

- ▶ In case of a not disassembled pulley truck the crane will be overloaded.
-

- ▶ Unpin the safety pin **6** at the pulley truck.
- ▶ Continue raising the boom combination.

6 Additional equipment



1 Heating the crane cab

The cab can be heated with three independent types of heat:

- Engine-dependent heater.
- Engine-independent auxiliary heater with engine pre-heating, at ambient temperatures of up to -40 °C, WEBASTO; Thermo 90 ST*.
- Engine-independent auxiliary heater for cab preheating, at ambient temperatures of less than -40 °C, WEBASTO; DBW 2020*.

The individual heat adjustment (both for engine-dependent as well as the engine-independent auxiliary heater*) are made solely via the “Air conditioning settings” menu on the touch display.

NOTICE

Risk of damage in the electrical / electronic component area when carrying out electrical welding work on the crane!

- ▶ Disconnect the negative and positive cables from the batteries and place the positive cable on the vehicle ground!
-

2 The “Air conditioning settings” menu

2.1 General

The “Air conditioning settings” menu is accessed - with the ignition turned on - by pressing the function key **F1** on the touch display.



Note

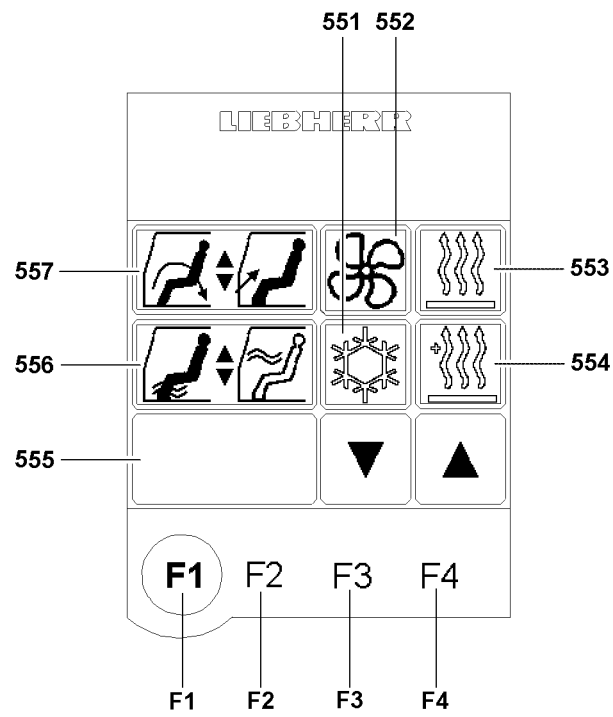
- ▶ The “Air conditioning settings” menu is faded out automatically after 30 sec. if no settings are changed during this time.
-

If the crane ignition is turned off, the LICCON computer system as well as the touch display also turn themselves off. The settings made in the “Air conditioning settings” menu are retained.



Note

- ▶ If the auxiliary heater has been programmed, the settings are saved when the ignition is turned “OFF”.
-

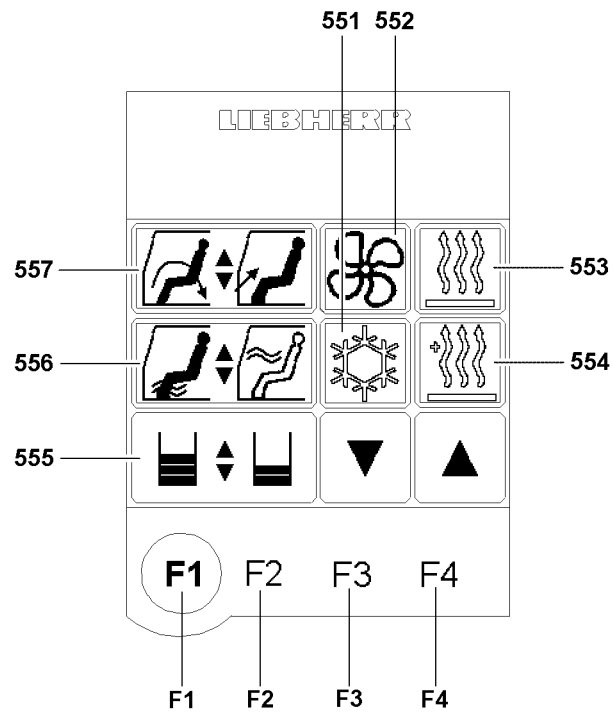


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2.2 Operating the touch display

On the touch display, all functions are available for making and operating all heating, ventilation and air conditioning settings and for programming the auxiliary heater on the crane:









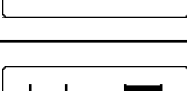
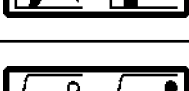
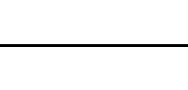
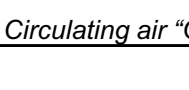
- Circulating air / fresh air **557**
 - Function selection
- Air distribution “upper” / “lower” **556**
 - Function selection
- Status display **555**
 - Display function
 - The status indicator **555** contains the following depending on the function that is selected:
 - The adjustment rates between the head and floorboard area for circulating air / fresh air
 - The adjustment rates for air distribution
 - The temperature setting in manual heating mode
 - The temperature setting in AUTOMATIC heating mode
 - Air conditioning on - “ON”
 - Air conditioning off - “OFF”
 - The programming display for the auxiliary heater
- Air conditioning system **551**
 - Function selection
- Fan / blower **552**
 - Function selection
- Heater **553**
 - Function selection
- Auxiliary heater **554**
 - Function selection



2.3 Adjusting the circulating air / fresh air

The “circulating air / fresh air” function is selected by “touching” the icon **557** on the left touch display. The adjustment rate is displayed in the Status display **555** as a double bar display for “circulating air” and “fresh air”.

The adjustment rate between “circulating air / fresh air” is changed with the function key **F3** and the function key **F4**.

Adjustment rates for circulating air / fresh air			
Status display	Circulating air	Fresh air	Icon display
	5	0	 <i>Fresh air “OFF”</i>
	4	1	
	3	2	
	2	3	
	1	4	
	0	5	 <i>Circulating air “OFF”</i>

- ▶ Select “circulating air / fresh air” **557** function by “touching”.

Result:

- The “circulating air / fresh air” icon is surrounded with a black border.
- The current adjustment rate is displayed in the Status display **555** as a double bar display for “circulating air” and “fresh air”.

- ▶ Press the function key **F3**.

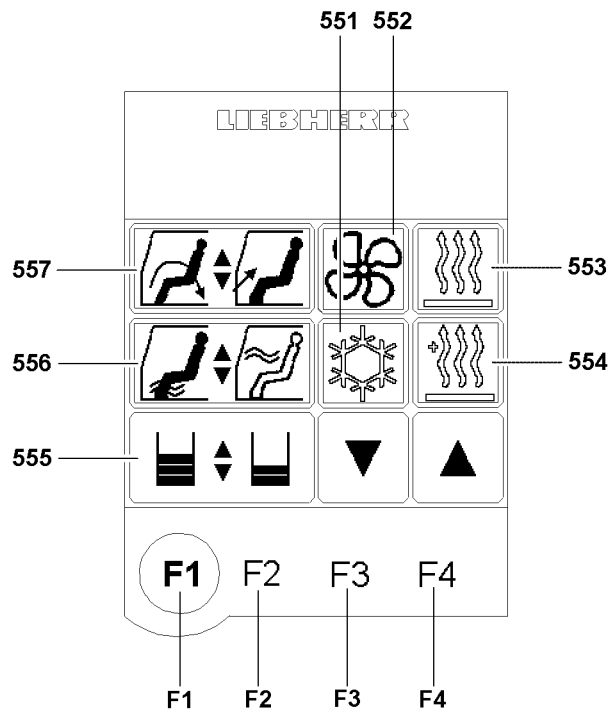
Result:

- The “proportion of circulating air” is reduced and the “proportion of fresh air” increases at the same time.

- ▶ Press the function key **F4**.

Result:

- The “proportion of fresh air” is reduced and the “proportion of circulating air” increases at the same time.



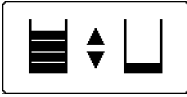

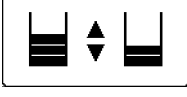









2.4 Adjusting the “lower” / “upper” air distribution

The “lower” / “upper” air distribution function is selected by “touching” the icon **556** on the left touch display.

The adjustment ratio is displayed in the Status display **555** - as a double bar display - for the “lower” and “upper” air distribution.

The “lower” and “upper” adjustment rate is changed with the function key **F3** and the function key **F4**.

Air distribution adjustment rates			
Status display	“lower”	“upper”	Icon display
	5	0	 <i>upper “OFF”</i>
	4	1	
	3	2	
	2	3	
	1	4	
	0	5	 <i>lower “OFF”</i>

- ▶ Select Air distribution “upper / lower” **556** function by “touching”.

Result:

- The “lower / upper” air distribution icon is surrounded with a black border.
- The current adjustment rate is displayed in the Status display **555** - as a double bar display - for “lower” and “upper”.

- ▶ Press the function key **F3**.

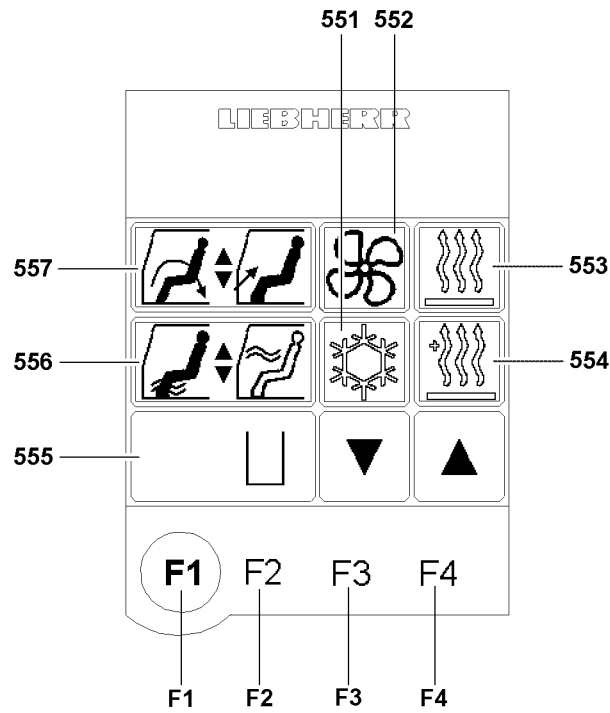
Result:

- The proportion of “lower” air is reduced; while the proportion of “upper” air increases at the same time.

- ▶ Press the function key **F4**.

Result:

- The proportion of “upper air” is reduced, while the proportion of “lower air” increases at the same time.

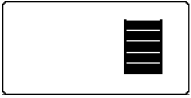

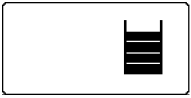

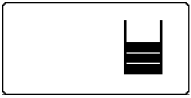



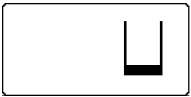

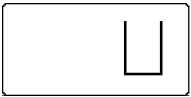



2.5 Fan / blower adjustment

The “fan / blower” function is selected by “touching” the icon **552** on the left touch display.

The current “fan” / “blower setting” is shown as a bar display in the Status display **555**.

The “fan” / “blower setting” is reduced with the function key **F3** and increased with the function key **F4**.

“Fan” / “blower setting”		
Status display	Stage	Icon display
	5	
	4	
	3	
	2	
	1	
	0	 <i>Fan “OFF”</i>

- ▶ Select “fan / blower **552**” by “touching”.

Result:

- The “fan / blower” icon is surrounded with a black border.
- In “fan” / “blower stage” appears as a bar display in the Status display **555**.

- ▶ Press the function key **F3**.

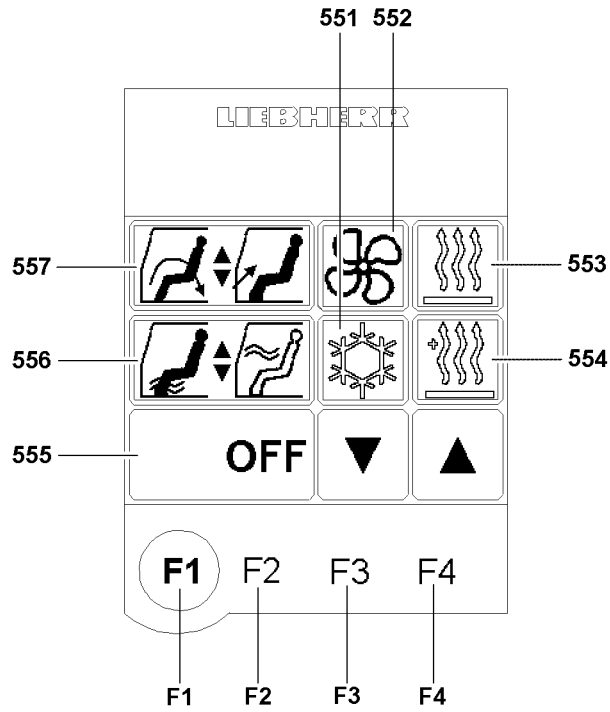
Result:

- The “fan” / “blower stage” is reduced.

- ▶ Press the function key **F4**.

Result:

- The “fan” / “blower stage” is increased.



2.6 Operating the air conditioning system



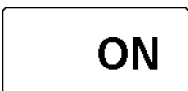

The "Air conditioning system" function is selected by "touching" the icon **551** on the left touch display. The status of the air conditioning system is displayed in the Status display **555**.

The "Air conditioning system" is turned off with the function key **F3** ("OFF") and turned with the function key **F4** ("ON").



Note

- ▶ The air conditioning system turns itself on automatically if the "AUTO" heating mode is activated.

Air conditioning system		
Status display	State	Icon display
	"OFF"	
	"ON"	

Make sure that the following preconditions are met before starting up the air conditioning system:

- The air intake opening for circulating air operation is clear.
- All windows and the cab door are closed.
- The circulating air / fresh air adjustment rate is 5:0.

- ▶ Select "Air conditioning system **551**" function by "touching".

Result:

- The "Air conditioning system" icon is surrounded with a black border.
- The switch status of the air conditioning system appears in the status display **555**.

- ▶ Press the function key **F3**.

Result:

- The air conditioning system is turned off.

- ▶ Press the function key **F4**.

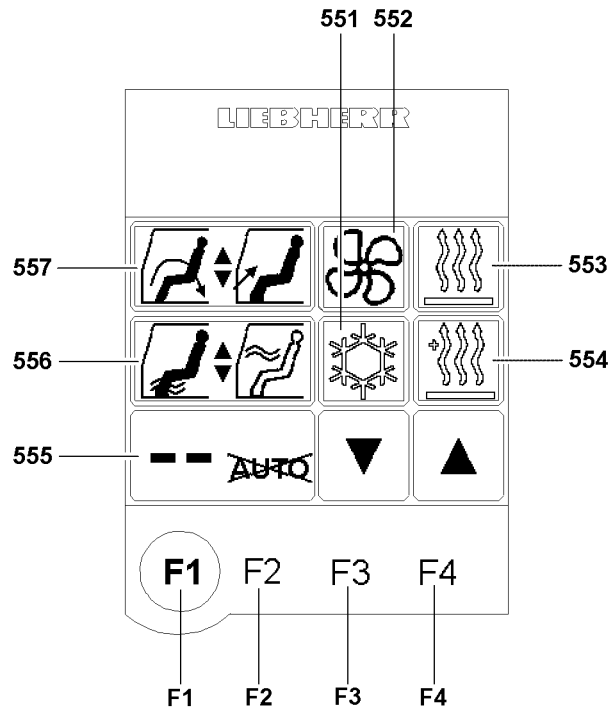
Result:

- The air conditioning system is turned on.

- ▶ Open or close the air vents as desired.
- ▶ Open the appropriate air vent for upward air distribution.
- ▶ Turn the fan / blower on.
- ▶ Select heater and change into "MANUAL" heating mode.
- ▶ Set the temperature stage.

or

- Select heater and change into "AUTO" heating mode.
- ▶ Set the temperature in [°C] or [°F].



2.7 Turning the heater on

2.7.1 General

The "heater" function is selected by "touching" the icon **553** on the left touch display.

The heater status is displayed in the Status display **555**.

The temperature is regulated in "MANUAL" heating mode via the function key **F3** ("reduce" temperature) and function key **F4** ("increase" temperature).

Function key **F2** is used to switch from "MANUAL" heating mode to "AUTO" heating mode and vice versa.

2.7.2 Manual heating mode

In "MANUAL" heating mode, the temperature stages - from stage 1 to stage 16 - are available to the crane operator for temperature adjustment.

With the function key **F3**, the temperature stages can be reduced from stage 16 in increments until "heater OFF".

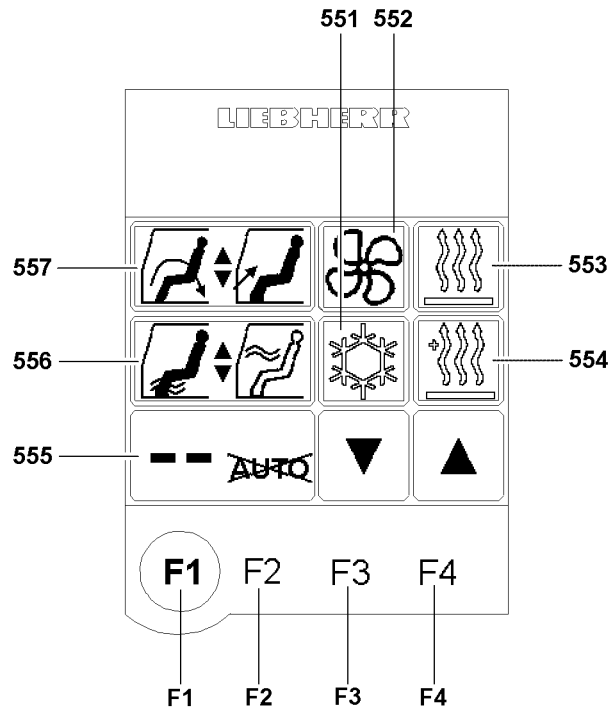


Note

- ▶ If the status "heater OFF" is reached, the heater does not operate.
- ▶ The crane cab is **not** heated.

Press the function key **F4** to leave the "OFF" status and to increase the temperature stages incrementally from stage 1 to maximum stage 16.

Heating mode "MANUAL"			
Status display	State	Stage	Icon display
	"OFF"	---	
	"ON"	1	
	"ON"	16	



- ▶ Select “heater **553**” function by “touching”.

Result:

- The “Heater” icon is surrounded with a black border.
- In the status display **555** appears the current status of the “Heater”.

- ▶ Press the function key **F2**.

Result:

- Switch from heating mode “AUTO” to heating mode “MANUAL”.

- ▶ Press the function key **F3**.

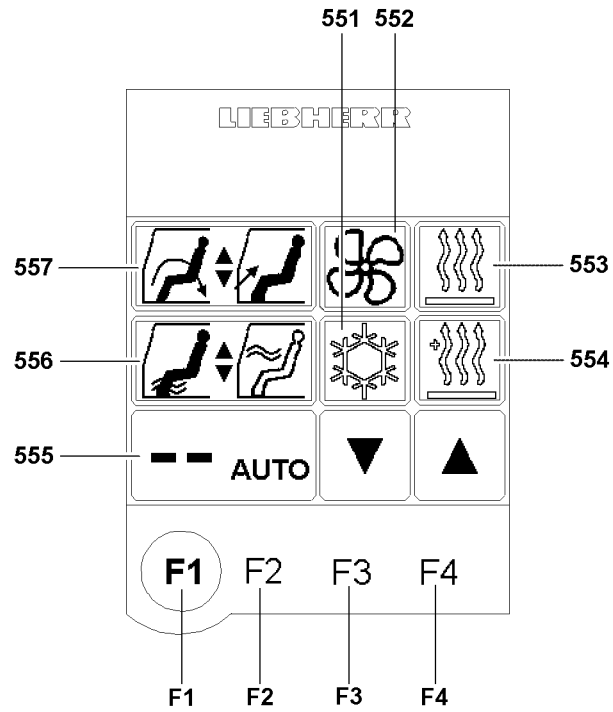
Result:

- The “temperature stages” are reduced incrementally by one stage.
- The amount of heat supplied into the cab is reduced accordingly.

- ▶ Press the function key **F4**.

Result:

- The “temperature stages” are increased incrementally by one stage.
- The amount of heat supplied into the cab is increased.



2.7.3 AUTO heating mode

If heating mode "AUTO" is selected, the air conditioning system is automatically enabled.



Note

- ▶ The blower / fan stage is automatically regulated in the "AUTO" heating mode, whereby the maximum blower / fan stage is available, which was set before manually.

In "AUTO" heating mode, the crane operator can adjust the temperature infinitely variable.







By pressing the function key **F3**, the temperature is reduced steplessly from maximum value to minimum value and if the function key **F3** is pressed again, the heater is turned off.

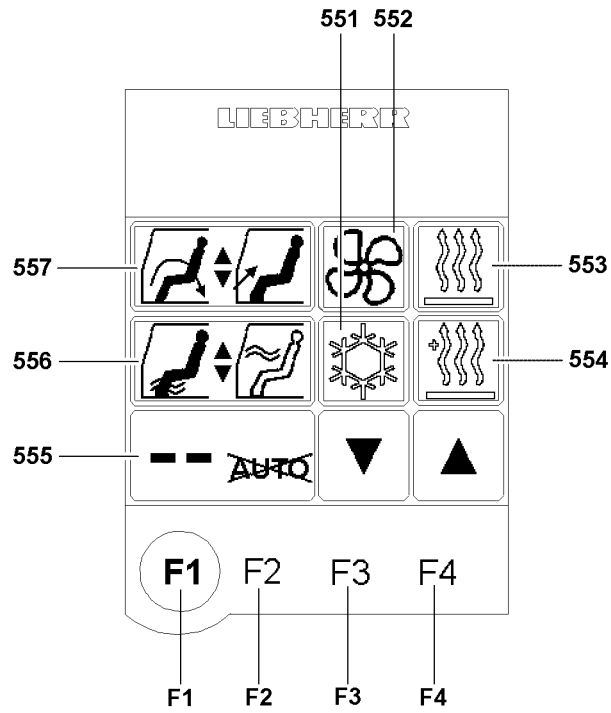


Note

- ▶ If a status "Heat OFF" has been reached, the heater does **not** operate but the cab can continue to be cooled.
- ▶ The crane cab is **not** heated.

Leave the "OFF" state by pressing the function key **F4** and the temperature can be increased infinitely variable from minimum value to maximum value.

Heating mode "AUTO"			
Status display	State	Temperature in [°C] or [°F]	Icon display
	"OFF"	—	 <i>Heater "OFF"</i>
 <i>Minimum value</i>	"ON"	15	
 <i>Maximum value</i>	"ON"	30	



- ▶ Select “heater **553** ” function by “touching”.

Result:

- The “Heater” icon is surrounded with a black border.
- In the status display **555** appears the current status of the “Heater”.

- ▶ Press the function key **F2**.

Result:

- Change from heating mode “MANUAL” to heating mode “AUTO”.

- ▶ Press the function key **F3**.

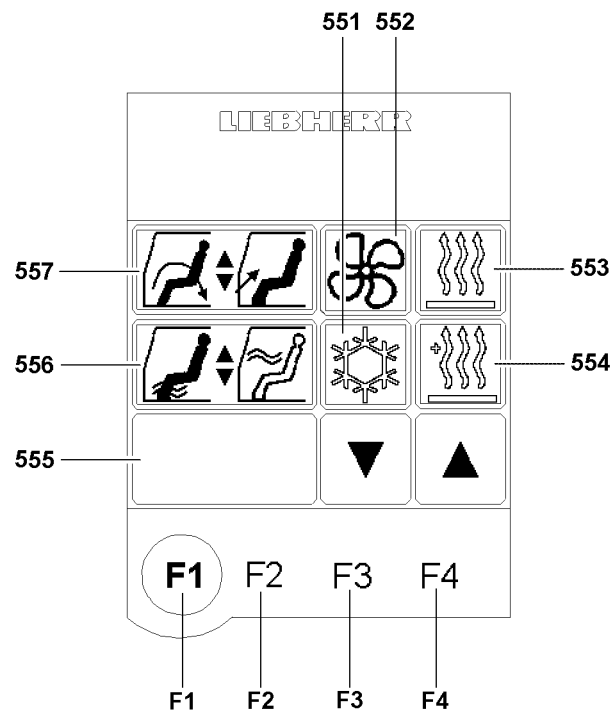
Result:

- The “temperature setting” is reduced in stages in steps of 1 °C.
- The amount of heat that is led to the cab is controlled according to the current temperature setting.

- ▶ Press the function key **F4**.

Result:

- The “temperature setting” is increased in stages in steps of 1 °C.
- The amount of heat that is led to the cab is controlled according to the current temperature setting.



2.8 Procedure for fogged windows

2.8.1 General

A certain sequence of adjustments must be followed to clear the windows quickly in order to use the crane.

The settings can be made manually or semi-automatically.

2.8.2 Manual adjustments in the “Air conditioning settings” menu

- ▶ Set air distribution **556** to maximum level “upwards” - level 5.
- ▶ Open the air vents.
- ▶ Set circulating air **557** to maximum level - level 5.
- ▶ Set fan / blower **552** to maximum level - level 5.
- ▶ Set Air conditioning system **551** to “ON”.
- ▶ Set heater **553** to maximum possible level in “**manual**” heating mode.
- ▶ If the crane engine is cold, add the auxiliary heater **554**, if required.

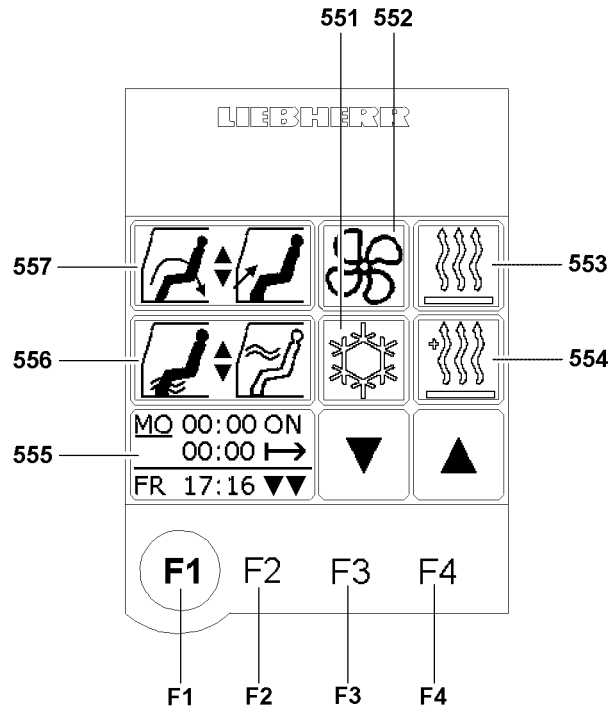
2.8.3 Making adjustments semi-automatically in the “Air conditioning settings” menu

- ▶ Set heater **553** to “**AUTO**” heating mode.
- ▶ Set air distribution **556** to maximum level “upwards” - level 5.
- ▶ Open the air vents.
- ▶ If the crane engine is cold, add the auxiliary heater **554**, if required.



Note

- ▶ The other functions are automatically added by the system.
-



2.9 Operating the engine-independent auxiliary heater

The engine-independent auxiliary heater is used to heat the crane cab when the engine is turned off and to provide additional heat at low ambient temperatures if the engine-dependent heater is not sufficient.

At ambient temperatures of below -20 °C , the crane engine must be pre-heated by the engine-independent auxiliary heater. In this case, the crane cab does not have to be heated too.



Note

- ▶ In summer, run the auxiliary heating once a month for approx. 15 to 20 minutes.
-

Carry out maintenance work on the auxiliary heater according to the supplied manufacturer's operating instructions.

2.9.1 General

NOTICE

Damage of auxiliary heater!

- ▶ Fill all units with sufficient service fluids for winter operation, as specified in the lubricant chart!
-



DANGER

Risk of poisoning and suffocation in enclosed areas!

- ▶ Operate the engine-independent auxiliary heater in enclosed areas such as garages or workshops only if a exhaust emission suction is present, even in "programming mode".
-

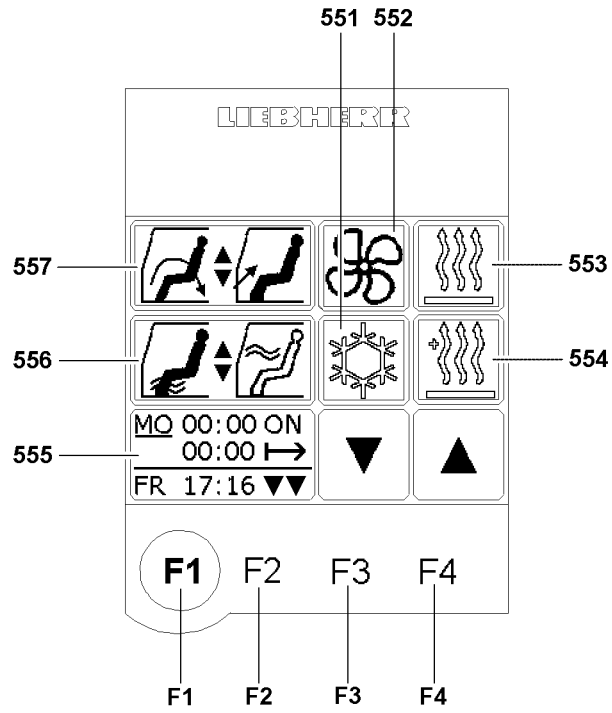


DANGER

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.
-



2.9.2 Turning the engine-independent auxiliary heater on manually

The engine-independent auxiliary heater can be turned on manually in driving or crane operation. The auxiliary heater, icon 554, must be selected and turned on.




If the auxiliary heater is in the "OFF" state, pressing function key **F4** once adds the cab auxiliary heater.

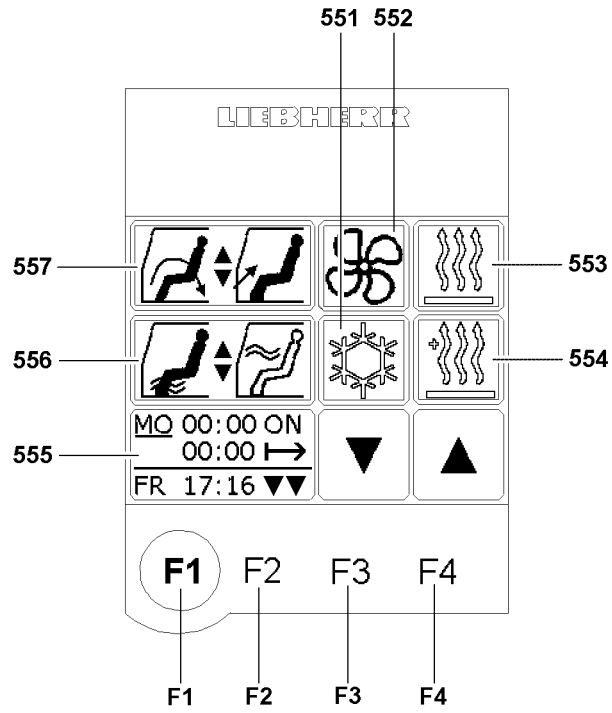
Pressing the function key **F4** again turns engine preheating auxiliary heater on.



Note

► If the auxiliary heater is turned on for engine pre-heating, then the crane cab is **not** heated.

Manual auxiliary heater			
Status display	Function key F4	Function key F3	Icon display
MO 06:45 ON 00:30 → FR 17:16 OFF	▲ (F4)	---	 Auxiliary heater "OFF"
MO 06:45 ON 00:30 → FR 17:16 ON	▲ (F4)	▼ (F3)	 Auxiliary heater - cab "ON"
MO 06:45 ON 00:30 → FR 17:16 ON≅	▲ (F4)	▼ (F3)	 Auxiliary heater - engine pre-heating "ON"



Adding the auxiliary heater

- ▶ Select heat **553** and set the required temperature via function key **F3** or function key **F4** (see section entitled "Turning the heater on").

**Note**

- ▶ The temperature adjustment via function key **F3** or function key **F4** is only needed to heat the crane cab!

-
- ▶ Select auxiliary heater **554** and press function key **F3** or function key **F4** until the required setting is displayed in the status display **555** (see chart).

Result:

- The auxiliary heater is added.
- The crane cab or the engine is heated, depending on the setting.

**Note**

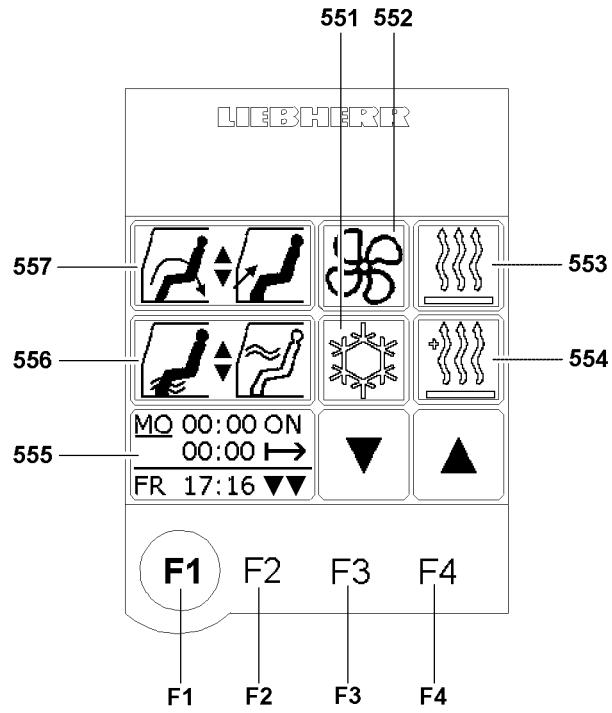
- ▶ When the crane cab is "warm" and the engine is at the operating temperature, turn the auxiliary heater off.
 - ▶ This increases the service life of the auxiliary heater!
-

Turning the auxiliary heater off

- ▶ Select auxiliary heater **554** and press the function key **F3** until the status display **555** shows the setting auxiliary heater "OFF" (**OFF**).

Result:

- The auxiliary heater is turned off.
 - An afterrun is carried out each time the auxiliary heater is turned off.
- ▶ Turn the battery master switch off if the crane is temporarily not being used.



2.9.3 Turning the engine-independent auxiliary heater on in programming mode

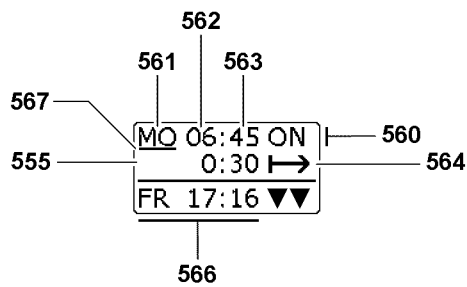
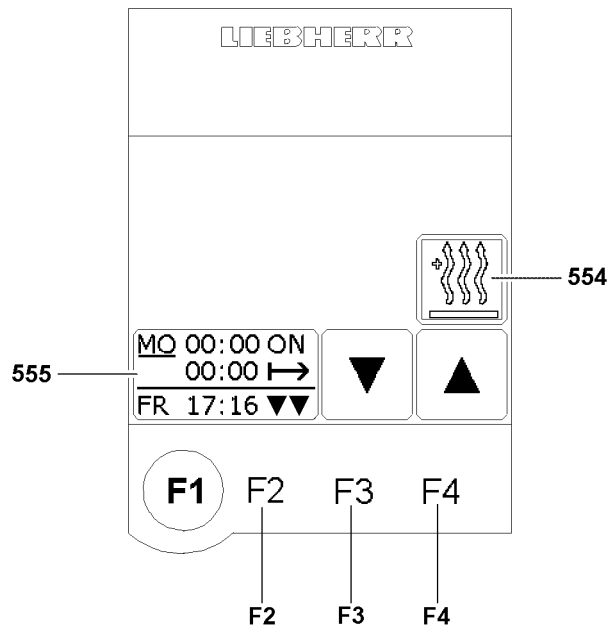
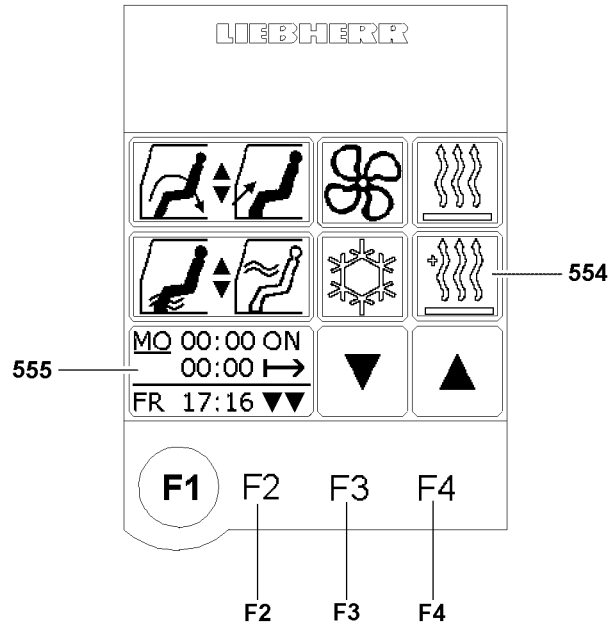
The engine-independent auxiliary heater to heat the cab or to preheat the engine can be programmed a **maximum** of one week in advance.



Note

- It is advisable to restrict the auxiliary heater programming to two days, since there is a risk that the battery discharge extremely quickly at freezing temperatures.

Auxiliary heater programmed			
Status display	Function key F4	Function key F3	Icon display
		---	 Auxiliary heater "OFF"
			 Auxiliary heater - cab
	---		 Auxiliary heater - engine preheating



Programming the auxiliary heater

In order to access auxiliary heater programming mode, press the function key **F4** until the status display shows the “clock” (programming mode for cab heater), or the “clock with wave” (programming mode for engine preheating), fig. 1.

The status display **555** shows the current day of the week with the time **566**. The time in the status display **555** is coupled to the “real-time clock” in the test system.



Note

- ▶ The procedure for programming the auxiliary heater - to heat the crane cab or to preheat the engine - is identical in both cases.

Make sure that the following preconditions are met **before** the auxiliary heater is programmed:

- The required temperature of the heater has been set.
- The fan / blower is set to stage 0 (“OFF”).
- The required programming mode, cabin heater (“clock”) or engine preheating (“clock with wave”) has been selected.

- ▶ Press the function key **F2**.

Result:

- The auxiliary heater programming interface is displayed, fig. 2.
- In the status display **555** appears the cursor **567** under the modifiable input value.



Note

- ▶ The cursor **567** is positioned to day programming **560** by default.

- ▶ Press the function key **F4** and select the required day of the week **561** (**ascending** order).

or

- Press the function key **F3** and select the required day of the week **561** (**descending** order).

Result:

- The selected day of the week is “set”.

- ▶ Press the function key **F2**.

Result:

- The cursor **567** changes from day programming **561** to hour programming **560**.

- ▶ Press the function key **F4** and select the desired hour **562** (**ascending** order).

or

- Press the function key **F3** and select the desired hour **562** (**descending** order).

Result:

- The selected hour is “set”.

- ▶ Press the function key **F2**.

Result:

- The cursor **567** changes from hour programming **562** to minute programming **563**.

- ▶ Press the function key **F4** and select the desired minute **563** (**ascending** order).

or

- Press the function key **F3** and select the desired minute **563** (**descending** order).

Result:

- The selected minute is “set”.

- ▶ Press the function key **F2**.

Result:

- The cursor **567** changes from minute programming **563** to turn on duration **564**.

- ▶ Press the function key **F4** and select the desired turn on duration **564** (ascending).

or

- Press the function key **F3** and select the desired turn on duration **564** (descending).

Result:

- The selected turn on duration **564** is “set”.



Note

- ▶ The turn on duration **564** of the auxiliary heater is restricted to a maximum of **0:55 minutes!**
- ▶ The cursor **567** automatically changes to the minutes setting for the turn on duration **564**.
- ▶ The turn on duration **564** can only be changed in 5 minute increments.

- ▶ Press the function key **F2**.

Result:

- The cursor **567** changes from turn on duration **564** to day programming **560**.
- The auxiliary heater programming is complete.

- ▶ Select the auxiliary heater **554** by “touching”.

Result:

- The programmed settings are taken over.
- The “Air conditioning settings” menu is displayed.
- The auxiliary heater starts to operate when the programmed turn on time for heater operation is reached and turns the heater operation off again when the selected turn on duration has expired.
- In automatic regulation, the auxiliary heater operates according to the “manual” or “AUTO” heat setting.



Note

- ▶ The auxiliary heater programming must be manually reset to “zero” after programmed heating has taken place. Otherwise, the auxiliary heater is automatically turned on according to the programming.

Resetting the auxiliary heater programming

To reset the auxiliary heater programming, proceed as described in “Programming the auxiliary heater”.

- ▶ Reset the values in the status display **555** to “zero”.

Result:

- The programming is turned off.



Note

- ▶ The programming can be modified manually or turned off altogether at any time.

2.10 Bleeding the heating system

When draining 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 should be carefully bled.

- ▶ Add coolant via the expansion tank of the engine cooling system according to the lubricant chart.
- ▶ Start the engine as described in Chapter 3.04.
- ▶ Set the heater to “warm”.
- ▶ Check the expansion tank for air bubbles.

Result:

- The engine is bled as soon as no more air bubbles rise.

- ▶ When no more air bubbles rise in the expansion tank:
Set the heater to “cold”.

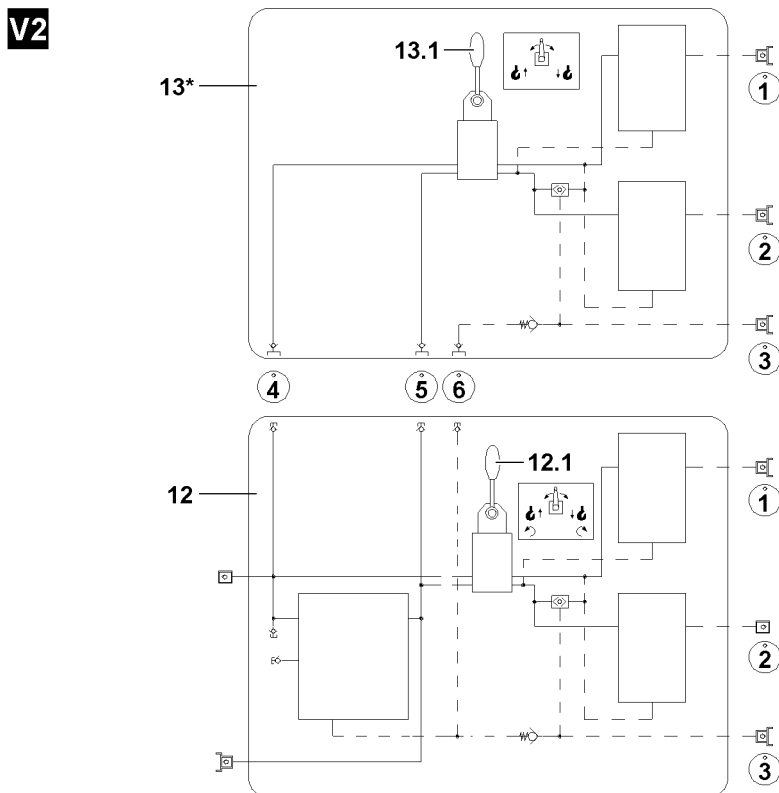
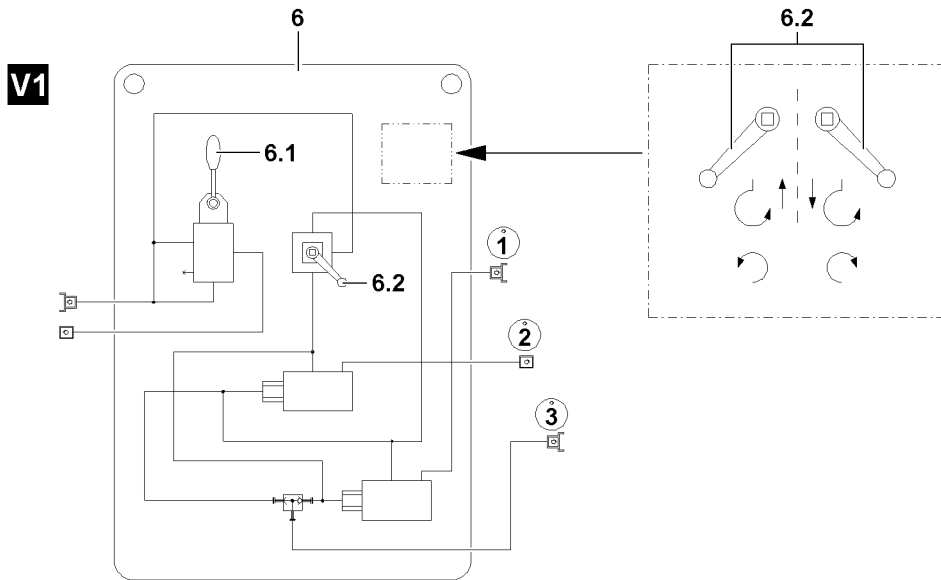
Result:

- The heating circuit will be vented.

- ▶ Check the expansion tank for air bubbles.

Result:

- The heating circuit is vented as soon as no more air bubbles rise.



B109407

1 Emergency operation



Note

- ▶ The illustrations in this chapter are examples and may not apply exactly to your crane!



Note

- ▶ Before you start with preparations for emergency operation, check which of the following assembly plates you have available to carry out the emergency operation!

There are two **different** variations of assembly plates.

With variation 1 **V1**, all winches, which are equipped with the respective auxiliary hydraulic for emergency operation and the slewing gear can be actuated, each individually.

With variation 2 **V2**, which consists of two assembly plates, all winches, which are equipped with the respective auxiliary hydraulic for emergency operation can be actuated, each individually, **or** winch 1 **WI** and winch 2 **WII** can be actuated in parallel operation or the slewing gear can be actuated individually.

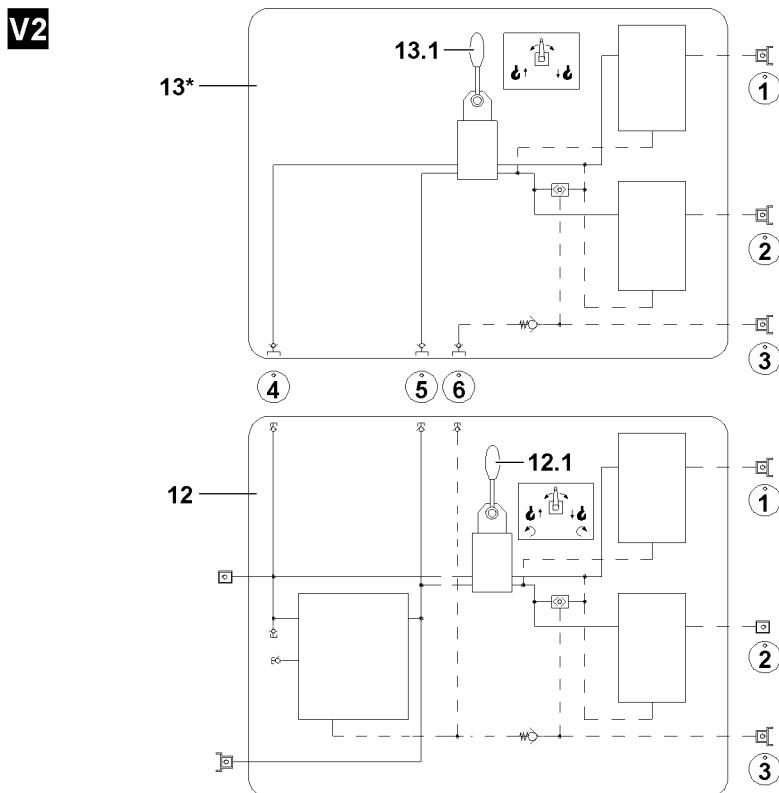
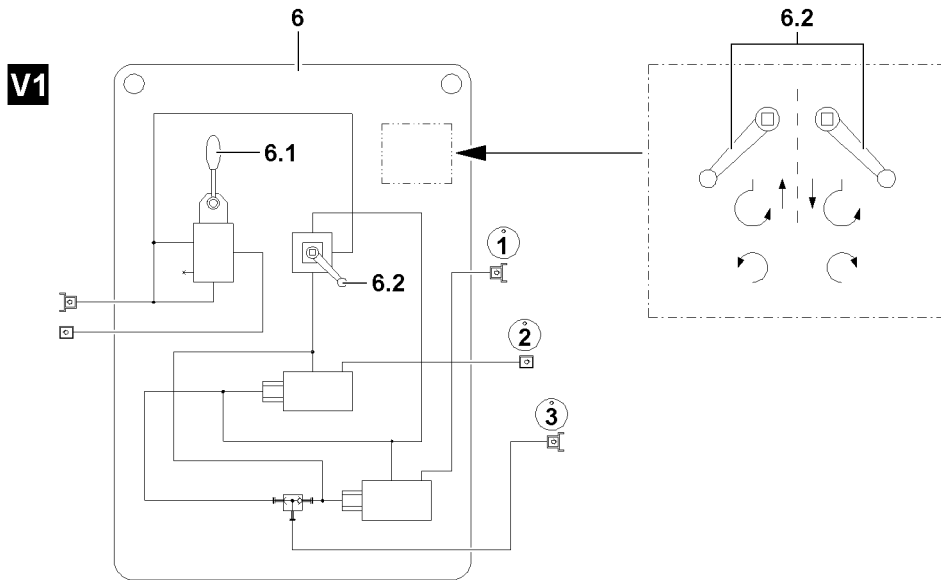


Note

- ▶ Observe the following charts!

	Variation 1 (V1) each in individual operation	Variation 2(V2) each in individual operation
Winch 1	X	X
Winch 2	X	X
Winch 1II2 ¹⁾	—	X
Winch 3	X	X
Winch 4	X	X
Winch 5	X	X
Winch 6	X	X
Slewing gear	X	X

1) Parallel operation Winch 1 and winch 2 (1II2)



B109407

1.1 General danger notes



DANGER

Significant accident risk during emergency operation!

During an emergency operation, crane movements are no longer monitored by the LICCON computer system!

In the event of improper operation or deliberate misuse, the crane can topple over!

There is an increased risk of accident if the following danger notes are not observed!

Personnel can be severely injured or killed!

This could result in high property damage!

► All hazard warnings are to be observed and maintained!

General danger notes!

- 1.) **Emergency operation of the crane superstructure may only be carried out:**
 - To remove a dangerous situation.
 - After consultation with customer service at LIEBHERR-Werk Ehingen GmbH.
 - By authorized personnel who are knowledgeable of the hydraulic circuit diagram, the connection diagram and carrying out emergency operation.
 - By authorized personnel who are aware of the risks of emergency operation.
 - To carry out load reducing movements.
- 2.) **The danger zone must be blocked off!**
- 3.) **No persons or objects may remain in the danger zone!**
- 4.) **If a load is on the hook, then it must first be set down to relieve the boom!**
- 5.) **During emergency operation, all safety devices, with the exception of “winch spooled out” are automatically bypassed!**
- 6.) **In the event of a defect or failure of the LICCON computer system, each step must be carried out and monitored with extreme caution and care, since a visual check on the LICCON monitor is no longer possible. Visual check!**
- 7.) **All crane movements must be travelled with extreme caution and at the lowest speed!**
- 8.) **The crane operator must be in visual contact with auxiliary personnel or guides person!**



Note

Please note!

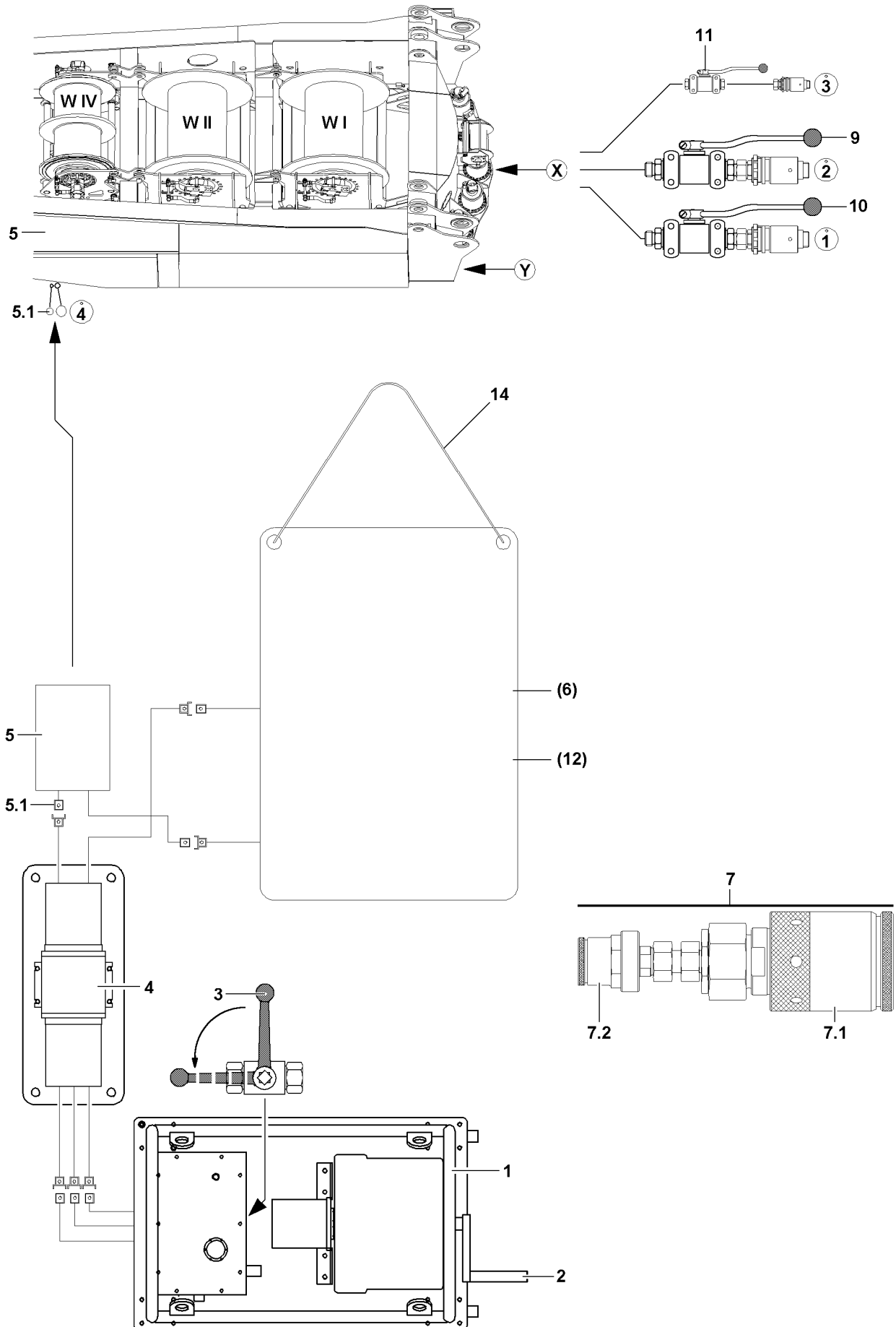
► The hydraulic supply for the crane can, to the extent that the crane has been equipped, take place through an emergency unit*. If this is not the case, the crane must be taken down by using additional auxiliary cranes!



WARNING

The crane can topple over!

- The boom may only be luffed down if the stability of the crane permits this action, observe information in the load tables and maintain them!
- When taking down the boom, the information in the erection and take down charts are to be observed and followed!



B109408

1.2 Handling of assembly plates



WARNING

Falling assembly plates!

Non-secured assembly plates can fall down when carrying out the emergency operation!

Personnel can be severely injured or killed!

- ▶ For emergency operation, secure the assembly plates with the chains **14** to prevent them from falling down!
- ▶ Do not secure the assembly plates near movable crane components!

1.3 Prerequisites for emergency operation



Note

- ▶ On the basis of different line diameters on the hydraulic lines, false couplings are prevented, additionally the hydraulic connections are identified with numbers!

Make sure that the following prerequisites are met:

- The hydraulic circuit diagram is available.
- The hydraulic system is functioning.
- An emergency operation aggregate **1** is available.
- A “Hydraulic transformer **4** ” is available.
- The assembly plate(s) are available.
- Reducer sections **7** (adapter) are available.
- The dust plugs for the hydraulic connections are removed.

1.4 Establishing the hydraulic connections

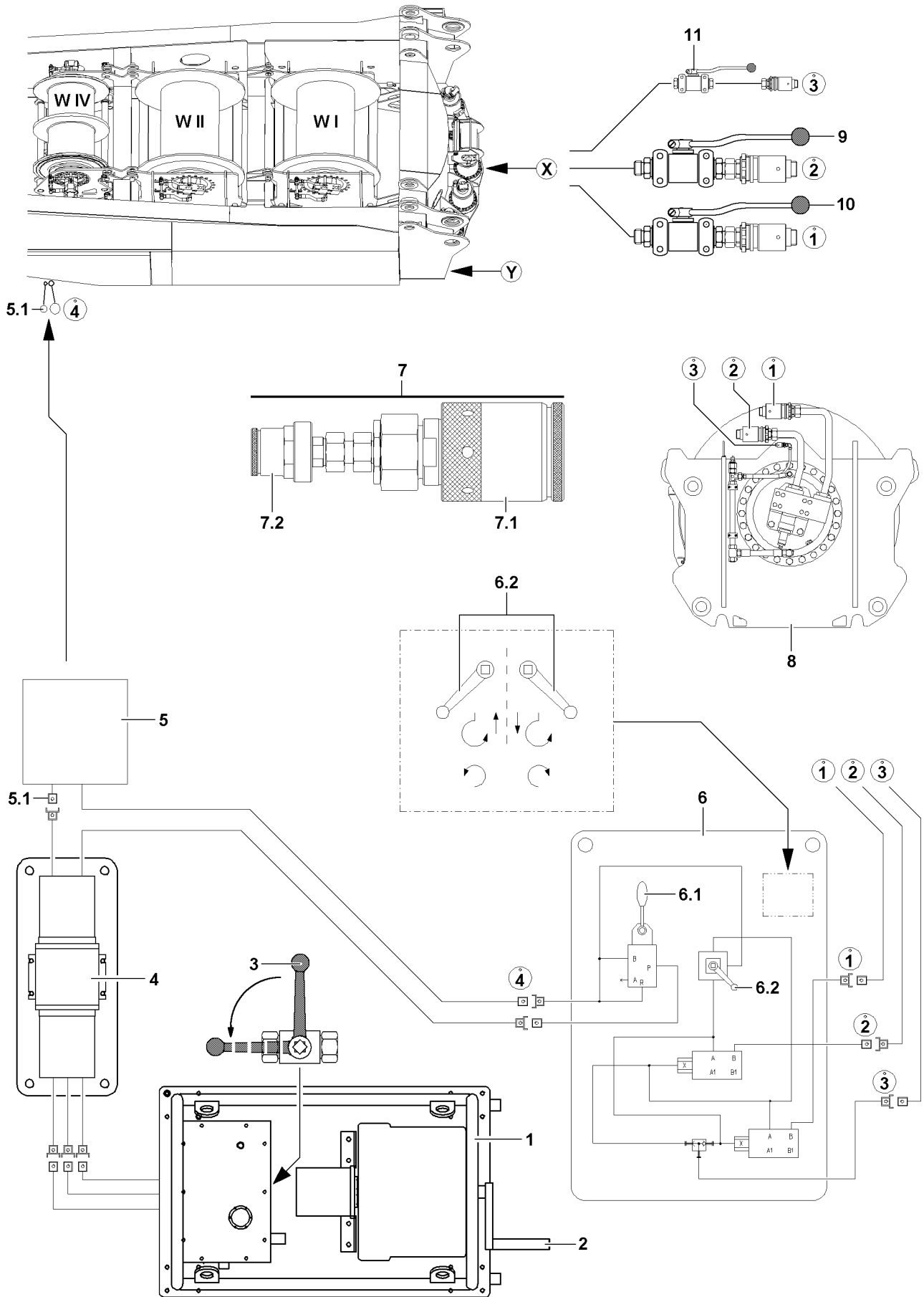


WARNING

Danger due to hydraulic pressure!

If the hydraulic lines are pressurized when releasing the connections, it can lead to severe injuries to assembly personnel!

- ▶ Relieve the pressure in the hydraulic lines before releasing!
- ▶ Establish the hydraulic connections from the emergency operation aggregate* **1** to the transformer **4**.
- ▶ Establish the hydraulic connection from the transformer **4** to the (suction line) on the turntable **5** of the crane, connection **5.1**.
- ▶ Hydraulic connection (return line, number **4**) from the turntable of the crane to the assembly plate **6** or to the assembly plate **12**.
- ▶ Establish the hydraulic connection (pressure line) from the transformer **4** to the assembly plate **6** or to the assembly plate **12**.



B108301

2 Emergency operation with assembly plate Variation 1 (V1)



Note

- ▶ The procedure of the emergency operation - except winch 4 on the LR1600/2 and LR1600/2-W - is identical for all winches and is described on the example of one winch!

Exception LR1600/2 and LR1600/2-W:

- ▶ Before emergency operation of winch 4 **W IV** on the LR1600/2 and LR1600/2-W, in addition to the hydraulic connections to lift, lower and for the control pressure of the brake, a control line must be connected, see section: "Emergency operation of winch 4 **W IV** on the LR1600/2 and LR1600/2-W!"

To carry out the emergency operation, use an emergency operation aggregate **1**, a hydraulic transformer **4** and the assembly plate **6**.

2.1 Functional selection on the assembly plate

With the ball valve **6.2** on the assembly plate **6** the following movements are preselected:

- Lift or lower
- Turn left or right

- ▶ Preselect crane movement: Activate ball valve **6.2** in the corresponding direction.

Moving the hand lever **6.1** determines the speed of the each crane movement.

- ▶ Operate the hand lever **6.1** and carry out the respective crane movement carefully.

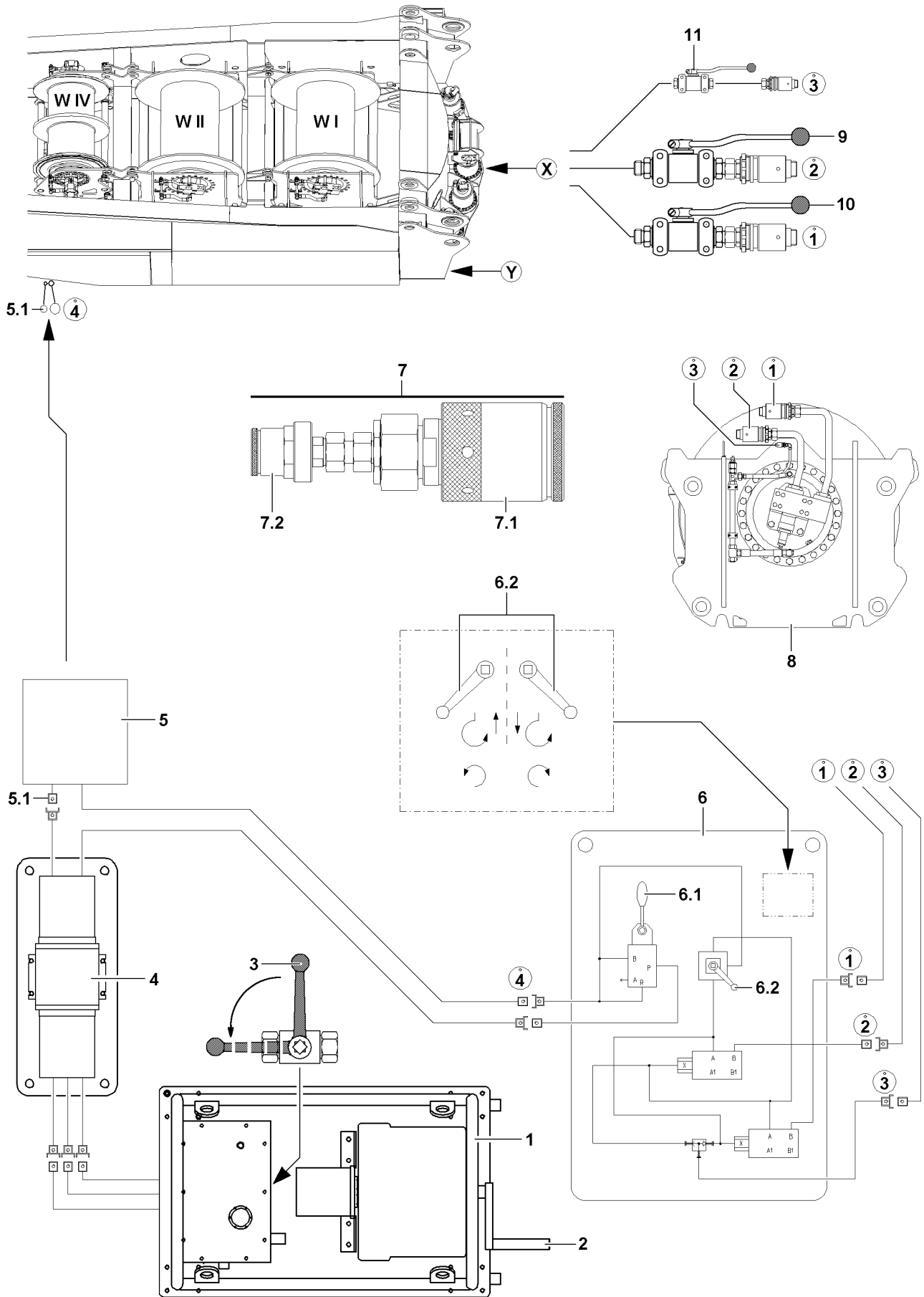
2.2 Start the emergency operation aggregate

- ▶ Turn the crank **2** on the emergency operation aggregate* **1**.
- ▶ Switch the ball valve **3** to "horizontal" position.



Note

- ▶ The engine rpm on the emergency operation aggregate can be set via a separate speed regulator!



B108301

2.3 Emergency operation of winch 4 on the LR1600/2 and LR1600/2-W



WARNING

Emergency operation winch 4 **W IV!**

- ▶ Observe the section “Emergency operation of winch 4 (W IV) on the LR1600/2 and LR1600/2-W”!
-

2.4 Emergency operation winches

2.4.1 Establishing the hydraulic connections to the winch

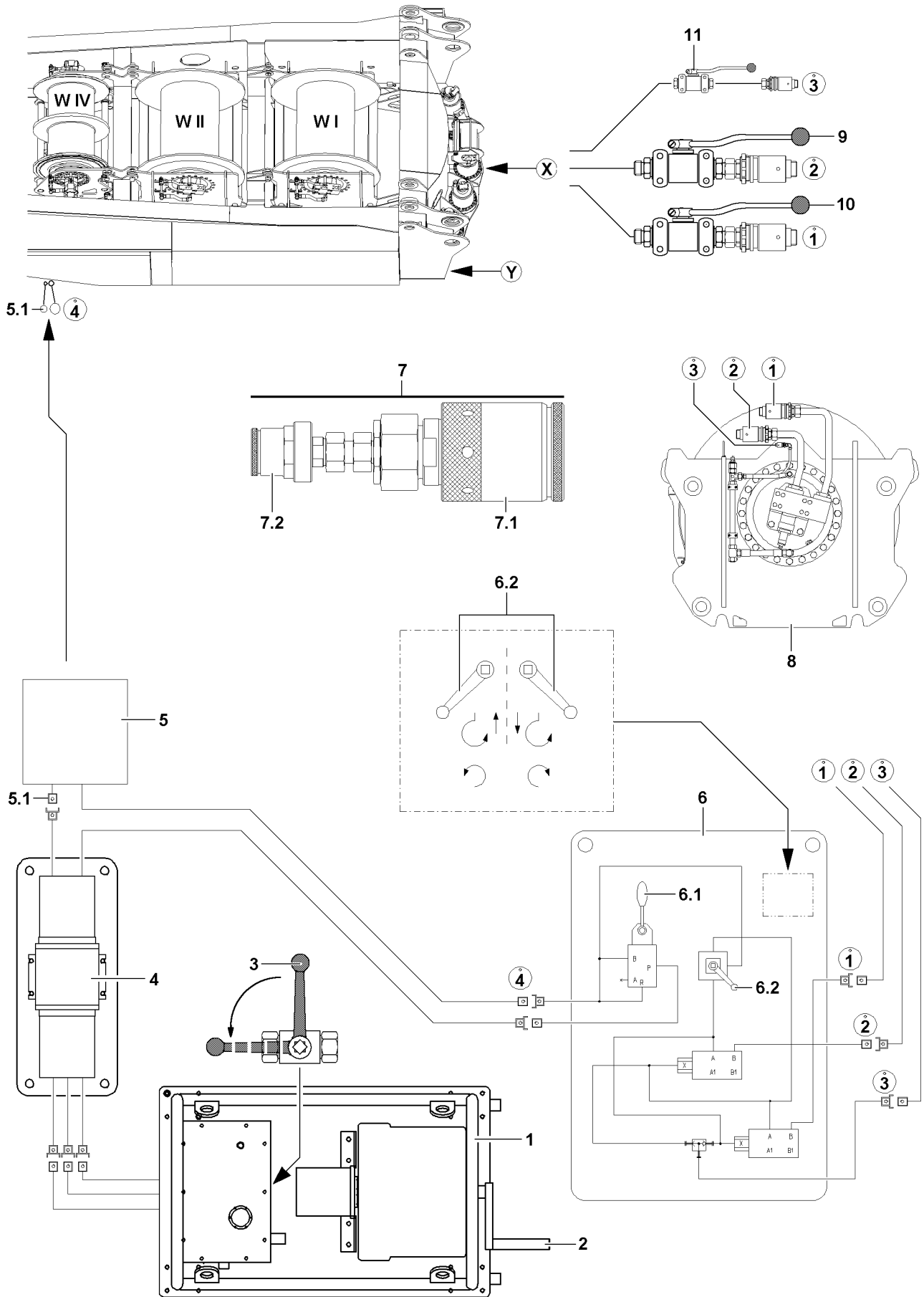
Make sure that the following prerequisite is met:

- The pressure in the hydraulic system has been relieved.
- ▶ Release the hydraulic connections on the corresponding winch.
- ▶ Install the reducer sections **7** (adapter) with coupling sleeve **7.1** on the connection **1** and on the connection **2** of the winch **8**.



Note

- ▶ Observe the numbering of the hydraulic lines!
- ▶ Establish the hydraulic connections for the assembly plate **6** (connection **1**, connection **2** and brake **3**) to the winch **8**.



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2.4.2 Spooling the winch out

- ▶ Set the ball valve **6.2** for the assembly plate **6** on “lower”.
- ▶ Move the manual lever **6.1** carefully.

Result:

- The winch spools out.

2.4.3 Spooling the winch up

- ▶ Set the ball valve **6.2** for the assembly plate **6** on “lift”.
- ▶ Move the manual lever **6.1** carefully.

Result:

- The winch spools up.

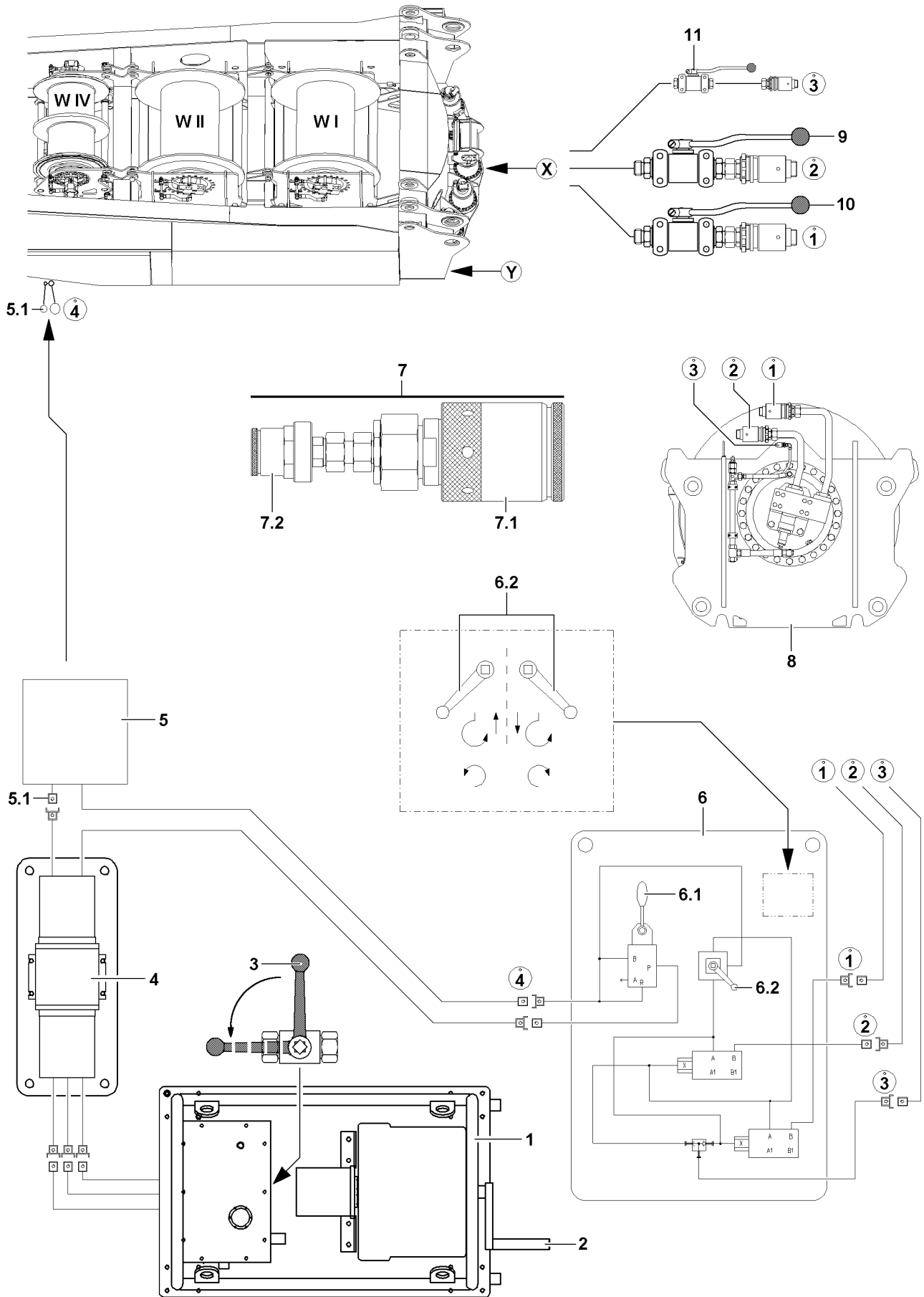
2.5 Disconnecting the hydraulic connections

Make sure that the following prerequisites are met:

- The emergency operation is completed.
- The pressure in the hydraulic system has been relieved.
- ▶ Disconnect the hydraulic connections from the winch **8** to the assembly plate **6**.
- ▶ Remove the reducer sections **7** (adapter).
- ▶ Close off the hydraulic connections of the winch **8** with dust caps.

or

- Reconnect the winch **8** onto the hydraulic system of the crane.



B108301

3 Emergency operation of slewing gear(s) with assembly plate Variation 1 (V1)



WARNING

Danger due to hydraulic pressure!

If the hydraulic lines are pressurized when releasing the connections, it can lead to severe injuries to assembly personnel!

- ▶ Relieve the pressure in the hydraulic lines before releasing!



Note

- ▶ For each crane type, the installation position of the ball valves for emergency operation of the slewing gear on the turntable varies!
- ▶ Possible installation positions of the ball valve: Point **X** or point **Y**!

3.1 Establishing the hydraulic connection to the slewing gears

Make sure that the following prerequisite is met:

- The pressure in the hydraulic system has been relieved.



Note

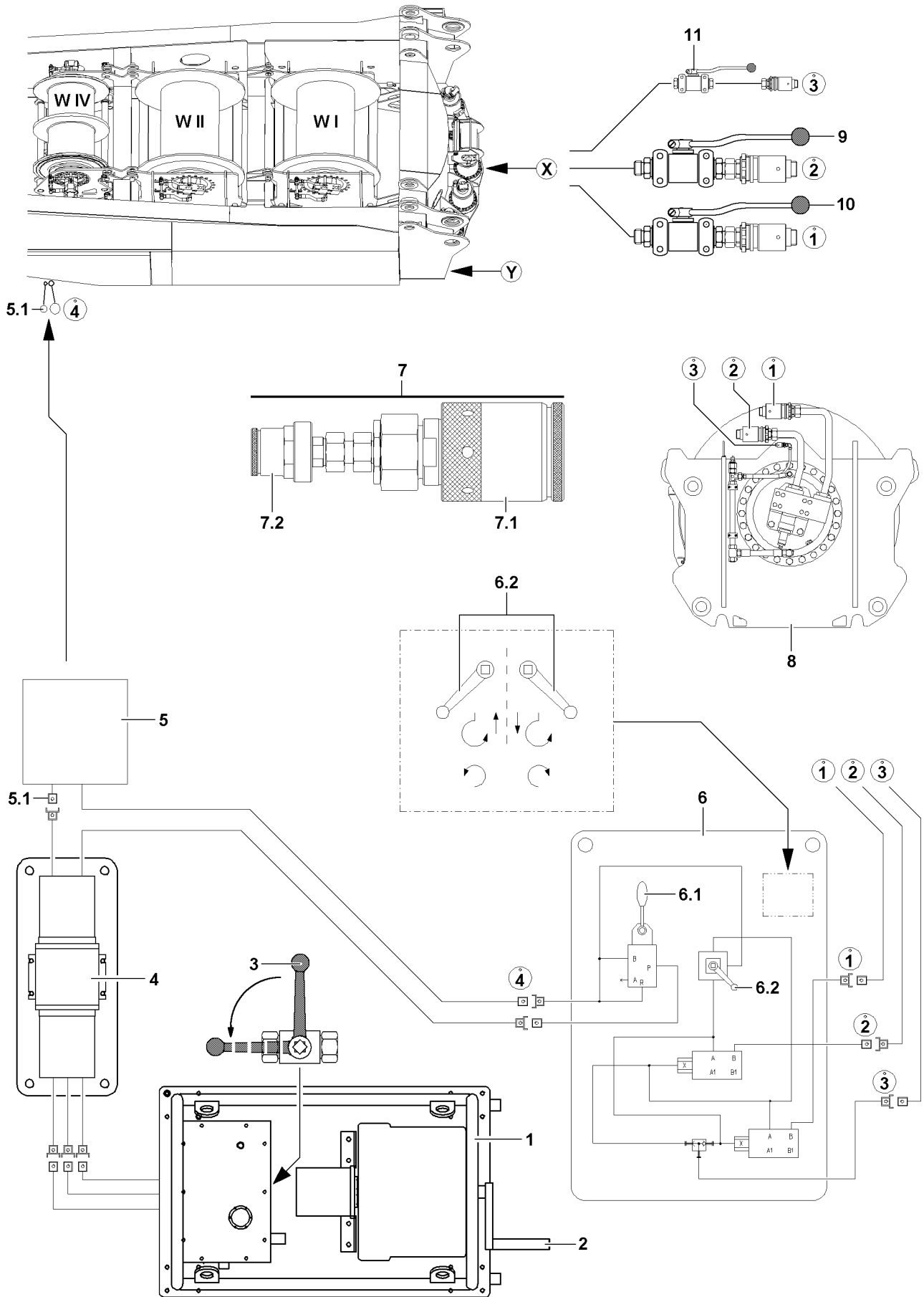
- ▶ Observe the numbering of the hydraulic lines!
- ▶ Establish the hydraulic connections of the assembly plate **6** (connection **1**, connection **2** and brake **3**) to the “Ball valves” on the turntable.

3.2 Turning the turntable to the left

- ▶ Set the ball valve **9** into emergency operation position.
- ▶ Set the ball valve **10** into emergency operation position.
- ▶ Set the ball valve **11** into emergency operation position.
- ▶ Set the ball valve **6.2** for the assembly plate **6** on “turn left”.
- ▶ Move the manual lever **6.1** carefully.

Result:

- The turntable turns to the left.



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3.3 Turning the turntable to the right

- ▶ Set the ball valve **9** into emergency operation position.
- ▶ Set the ball valve **10** into emergency operation position.
- ▶ Set the ball valve **11** into emergency operation position.
- ▶ Set the ball valve **6.2** for the assembly plate **6** on “turn right”.
- ▶ Move the manual lever **6.1** carefully.

Result:

- The turntable turns to the right.

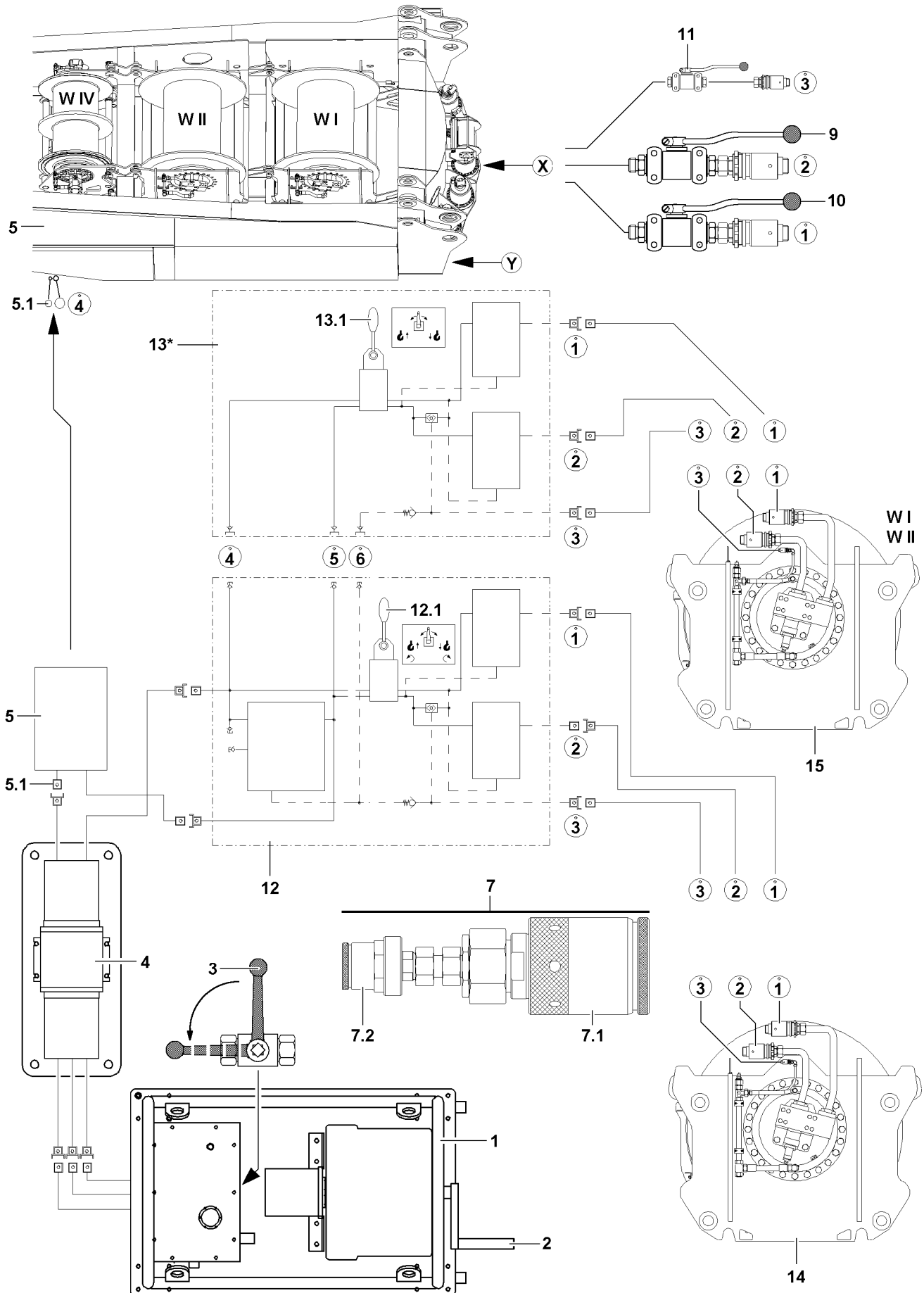
3.4 Disconnecting the hydraulic connections

Make sure that the following prerequisites are met:

- The emergency operation is completed.
- The pressure in the hydraulic system has been relieved.

Disconnect the hydraulic connections to the assembly plate **6**.

- ▶ Reposition the ball valve **9** in position for crane operation.
- ▶ Reposition the ball valve **10** in position for crane operation.
- ▶ Reposition the ball valve **11** in position for crane operation.
- ▶ When the ball valve **9**, ball valve **10** and ball valve **11** are repositioned into crane operation position:
 - Disconnect the hydraulic connections to the assembly plate **6**.
- ▶ Close off the hydraulic connections with dust plugs.



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4 Emergency operation with assembly plate(s) Variation 2 (V2)



Note

- ▶ The procedure of the emergency operation - except winch 4 on the LR1600/2 and LR1600/2-W - is identical for all winches and is described on the example of one winch!

Exception LR1600/2 and LR1600/2-W:

- ▶ Before emergency operation of winch 4 **W IV** on the LR1600/2 and LR1600/2-W, in addition to the hydraulic connections to lift, lower and for the control pressure of the brake, a control line must be connected, see section: "Emergency operation of winch 4 **W IV** on the LR1600/2 and LR1600/2-W!"

To carry out the emergency operation, use an emergency operation aggregate **1**, a hydraulic transformer **4** and the assembly plate **12**. To carry out the emergency operation from winch **1 W I** and winch **2 W II** in parallel operation (1|1|2), in addition to the assembly plate **12**, the assembly plate **13** is needed. Connect the assembly plate **12** with the assembly plate **13** hydraulically on hydraulic connections 4, 5 and 6.

4.1 Start the emergency operation aggregate

- ▶ Turn the crank **2** on the emergency operation aggregate* **1**.
- ▶ Switch the ball valve **3** to "horizontal" position.



Note

- ▶ The engine rpm on the emergency operation aggregate can be set via a separate speed regulator!

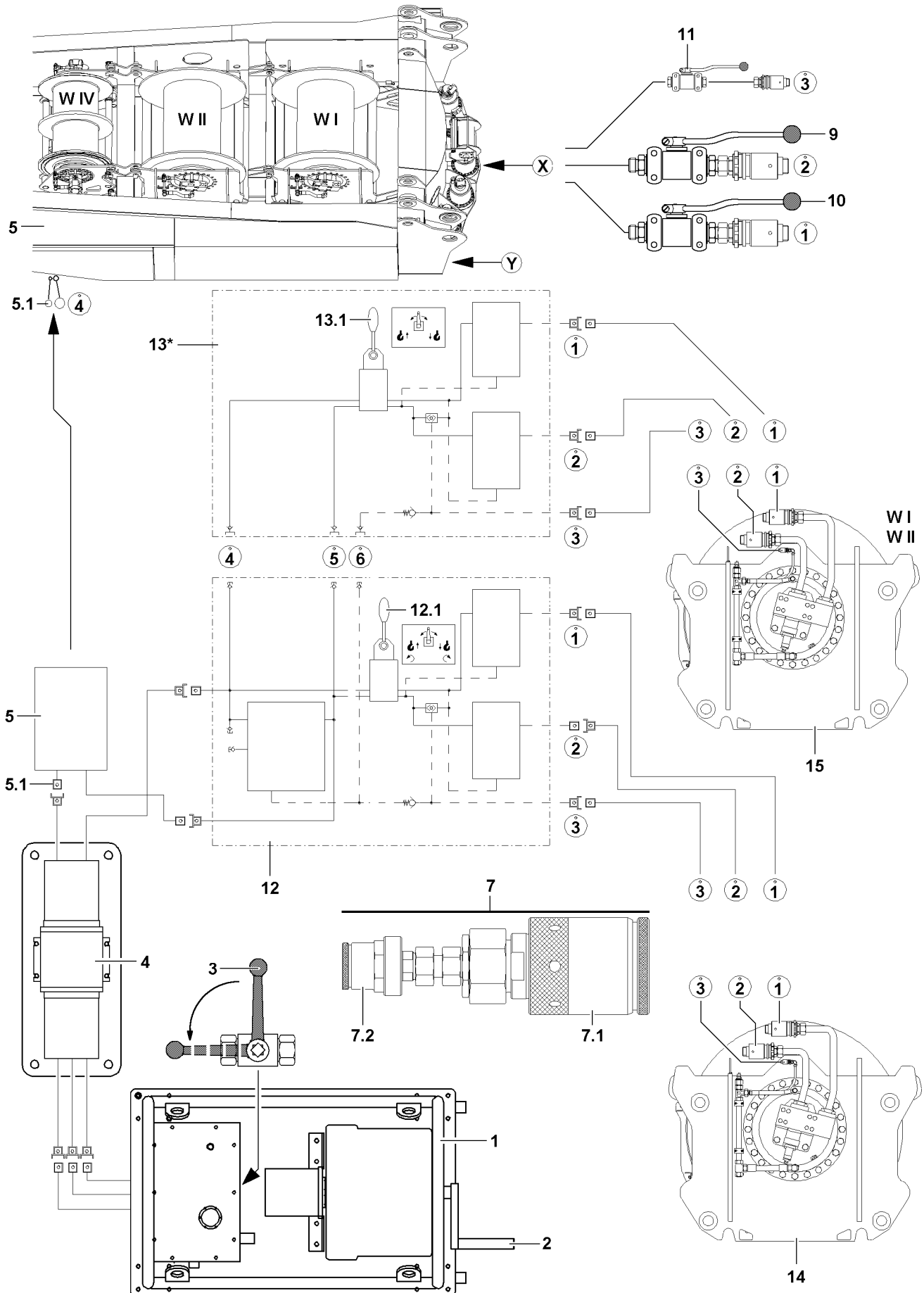
4.2 Emergency operation of winch 4 on the LR1600/2 and LR1600/2-W



WARNING

Emergency operation winch 4 **W IV**!

- ▶ Observe the section "Emergency operation of winch 4 (W IV) on the LR1600/2 and LR1600/2-W"!



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4.3 Emergency operation of winches, individual operation

**Note**

- ▶ The crane movements are actuated and the speed of the respective crane movement is determined via the ball valve **12.1** and ball valve **13.1**!
-

4.3.1 Establishing the hydraulic connections to the winch

Make sure that the following prerequisite is met:

- The pressure in the hydraulic system has been relieved.
 - ▶ Release the hydraulic connections on the corresponding winch.
 - ▶ Install the reducer sections **7** (adapter) with coupling sleeve **7.1** on the connection **1** and on the connection **2** of the respective winch.
-

**Note**

- ▶ Observe the numbering of the hydraulic lines!
 - ▶ Establish the hydraulic connection of the assembly plate **12** (connection **1**, connection **2** and brake **3**) to the respective winch.
-

4.3.2 Spooling the winch out

- ▶ Set the ball valve **12.1** for the assembly plate **12** on “lower”.

Result:

- The winch spools out.

4.3.3 Spooling the winch up

- ▶ Set the ball valve **12.1** for the assembly plate **12** on "lift".

Result:

- The winch spools up.

4.3.4 Disconnecting the hydraulic connections

Make sure that the following prerequisites are met:

- The emergency operation is completed.
- The pressure in the hydraulic system has been relieved.
- ▶ Separate the hydraulic connections from the respective winch to the assembly plate **12**.
- ▶ Remove the reducer sections **7** (adapter).
- ▶ Close off the hydraulic connections of the winch with dust plugs.

or

- Reconnect the winch to the hydraulic system of the crane.

4.4 Emergency operation of winches, parallel operation winch 1|12



Note

- ▶ The crane movements are actuated and the speed of the respective crane movement is determined via the ball valve **12.1** and ball valve **13.1**!



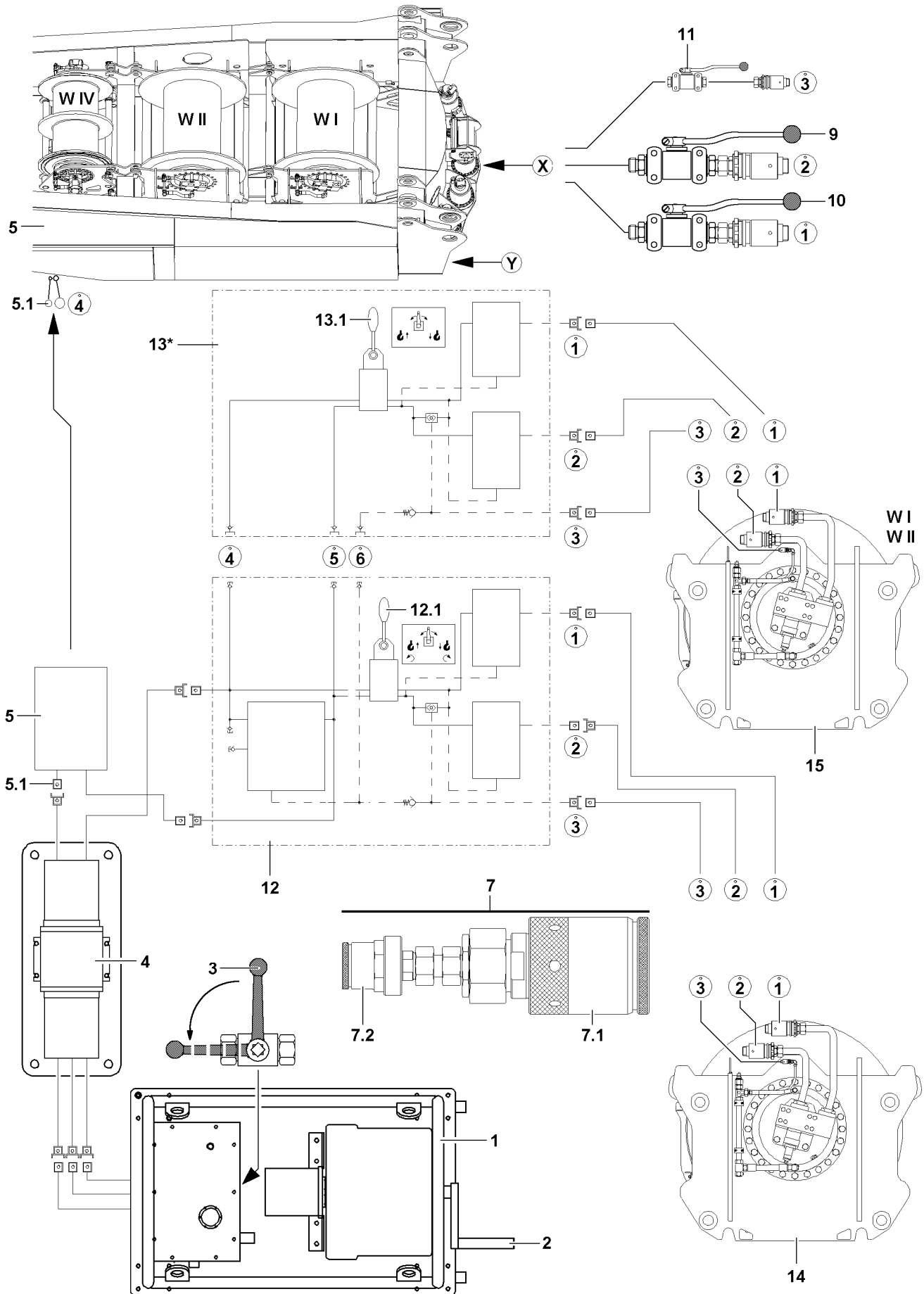
WARNING

Risk of accident!

If the following notes are not observed, dangerous situations can arise!

Personnel can be severely injured or killed!

- ▶ If winch 1 and winch 2 are actuated in emergency operation in parallel operation, then it must be ensured that the hook blocks are horizontally aligned!
- ▶ Always actuate winch 1 and winch 2 simultaneously!



B109393

4.4.1 Establishing the hydraulic connections to the winches

Make sure that the following prerequisite is met:

- The pressure in the hydraulic system has been relieved.
- ▶ Release the hydraulic connections on winch 1 and winch 2.
- ▶ Install the reducer sections **7** (adapter) with coupling sleeve **7.1** on the connection **1** and on the connection **2** of the respective winch.



Note

- ▶ Observe the numbering of the hydraulic lines!

-
- ▶ Establish the hydraulic connections for the assembly plate **12** (connection **1**, connection **2** and brake **3**) to winch 1.

or

- Establish the hydraulic connections for the assembly plate **12** (connection **1**, connection **2** and brake **3**) to winch 2.
- ▶ Establish the hydraulic connections for the assembly plate **13** (connection **1**, connection **2** and brake **3**) to winch 1.

or

- Establish the hydraulic connections for the assembly plate **13** (connection **1**, connection **2** and brake **3**) to winch 2.

4.4.2 Spooling the winches out



Note

- ▶ Check which winch you have connected to which assembly plate!

-
- ▶ Set the ball valve **12.1** for the assembly plate **12** on “lower”.

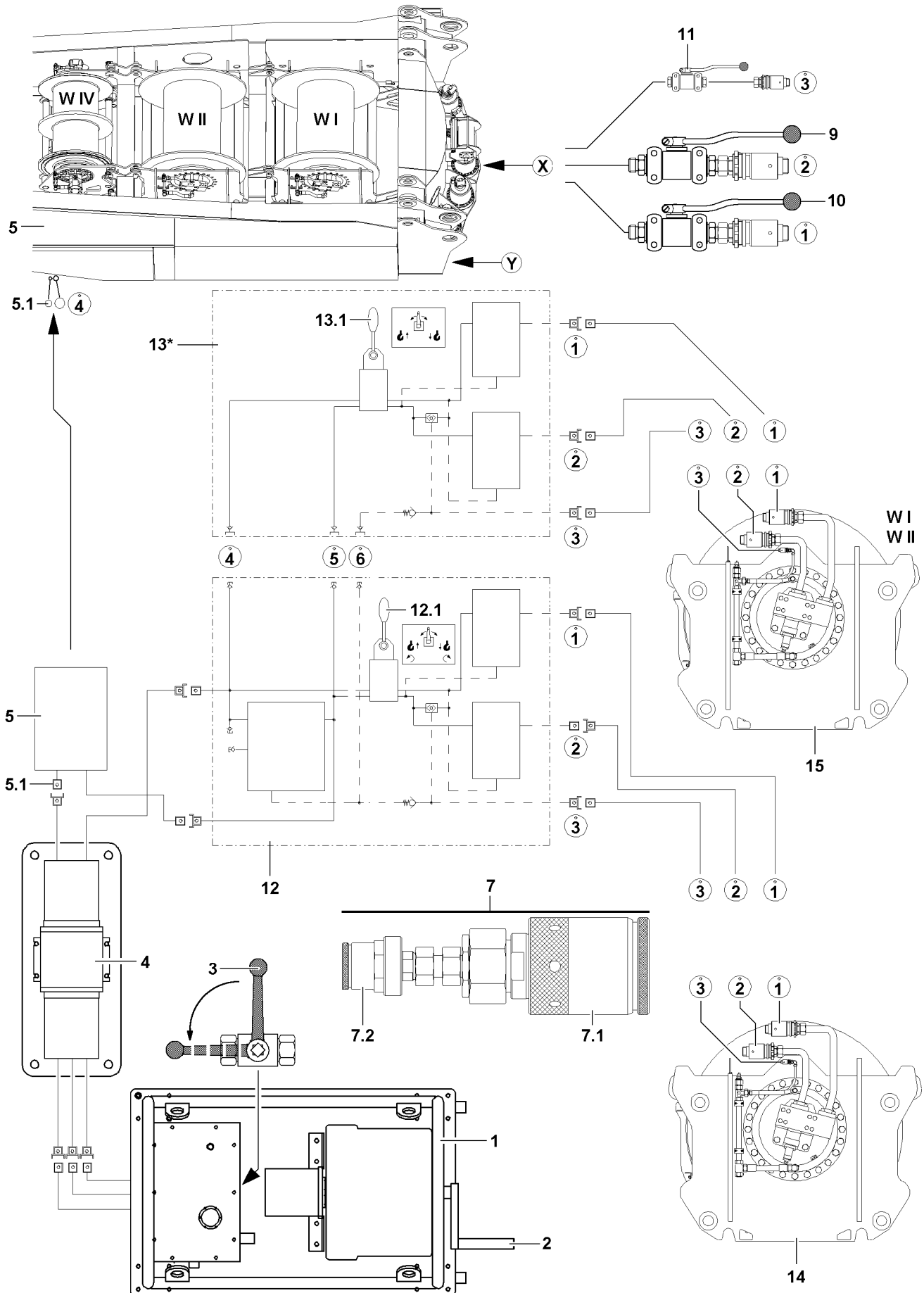
Result:

- Winch 1 or winch 2 spools out.

- ▶ Set the ball valve **13.1** for the assembly plate **13** on “lower”.

Result:

- Winch 2 or winch 1 spools out.



B109393

4.4.3 Spooling the winches up

- ▶ Set the ball valve **12.1** for the assembly plate **12** on "lift".

Result:

- Winch 1 **or** winch 2 spools up.

- ▶ Set the ball valve **13.1** for the assembly plate **13** on "lift".

Result:

- Winch 2 **or** winch 1 spools up.

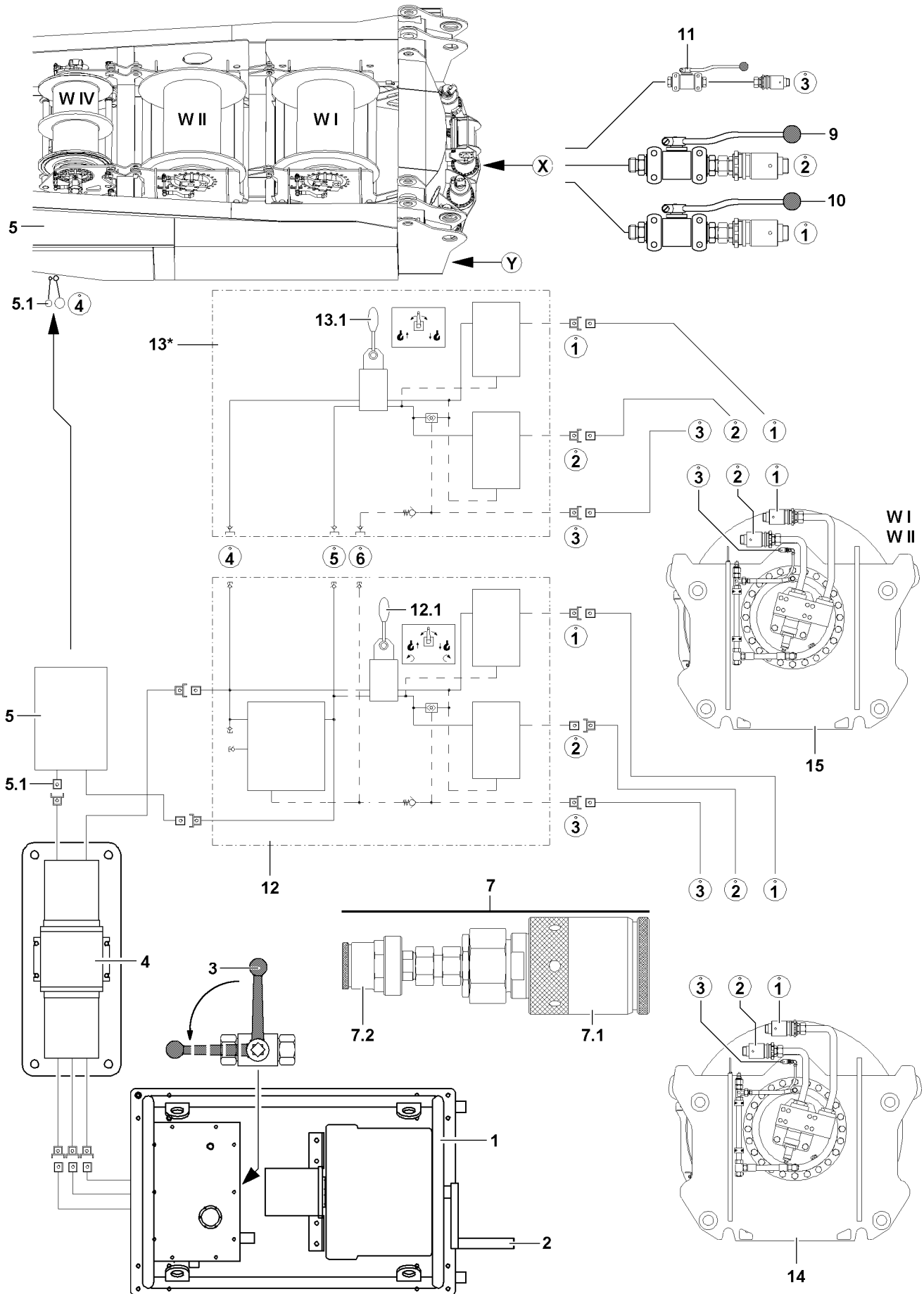
4.4.4 Disconnecting the hydraulic connections

Make sure that the following prerequisites are met:

- The emergency operation is completed.
- The pressure in the hydraulic system has been relieved.
- ▶ Disconnect the hydraulic connections of winch 1 and winch 2 to the respective assembly plates.
- ▶ Remove the reducer sections **7** (adapter).
- ▶ Close off the hydraulic connections of the winches with dust plugs.

or

- Reconnect the winches to the hydraulic system of the crane.



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5 Emergency operation slewing gear(s) with assembly plate(s) Variation 2 (V2)



WARNING

Danger due to hydraulic pressure!

If the hydraulic lines are pressurized when releasing the connections, it can lead to severe injuries to assembly personnel!

- ▶ Relieve the pressure in the hydraulic lines before releasing!



Note

- ▶ For each crane type, the installation position of the ball valves for emergency operation of the slewing gear on the turntable varies!
- ▶ Possible installation positions of the ball valve: Point **X** or point **Y**!



Note

- ▶ The slewing movement is actuated and the speed of the slewing movement is determined via the ball valve **12.1**!

5.1 Establishing the hydraulic connection to the slewing gears

Make sure that the following prerequisite is met:

- The pressure in the hydraulic system has been relieved.



Note

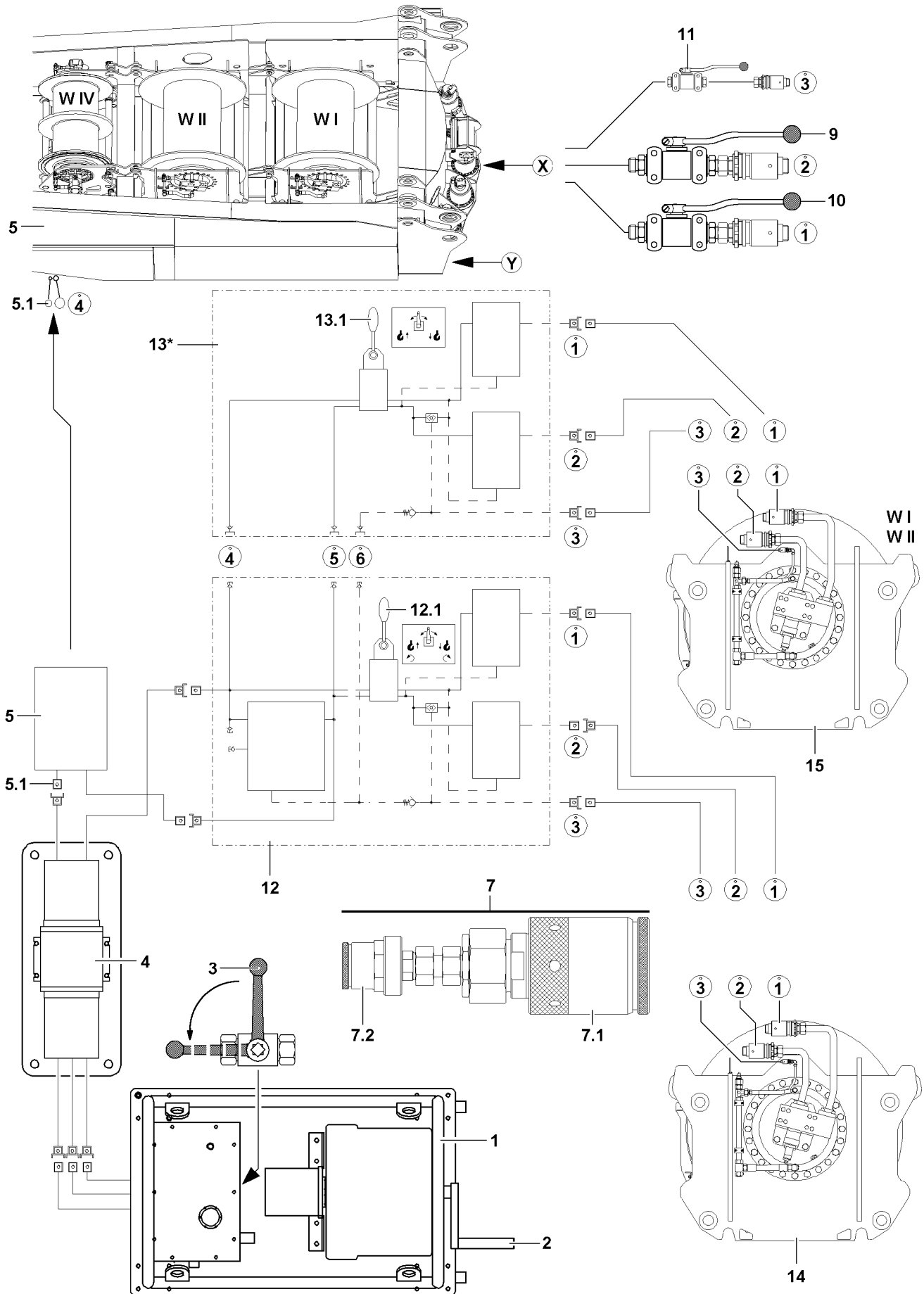
- ▶ Observe the numbering of the hydraulic lines!
- ▶ Establish the hydraulic connections of the assembly plate **12** (connection **1**, connection **2** and brake **3**) to the “Ball valves” on the turntable.

5.2 Turning the turntable to the left

- ▶ Set the ball valve **9** into emergency operation position.
- ▶ Set the ball valve **10** into emergency operation position.
- ▶ Set the ball valve **11** into emergency operation position.
- ▶ Set the ball valve **12.1** for the assembly plate **12** on “turn left”.

Result:

- The turntable turns to the left.



B109393

5.3 Turning the turntable to the right

- ▶ Set the ball valve **9** into emergency operation position.
- ▶ Set the ball valve **10** into emergency operation position.
- ▶ Set the ball valve **11** into emergency operation position.
- ▶ Set the ball valve **12.1** for the assembly plate **12** on “turn right”.

Result:

- The turntable turns to the right.

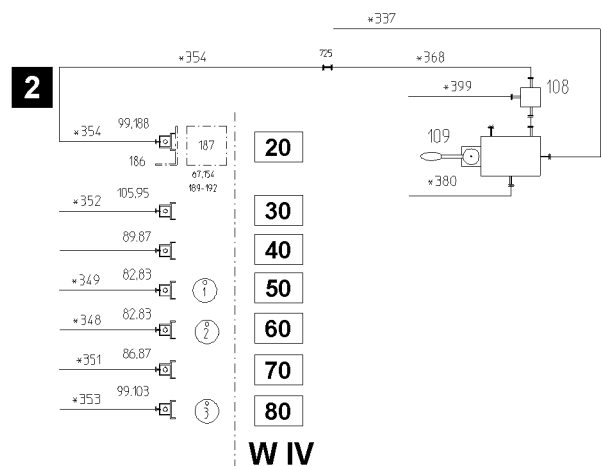
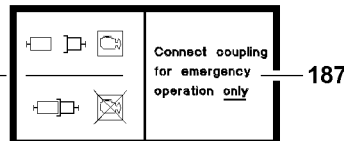
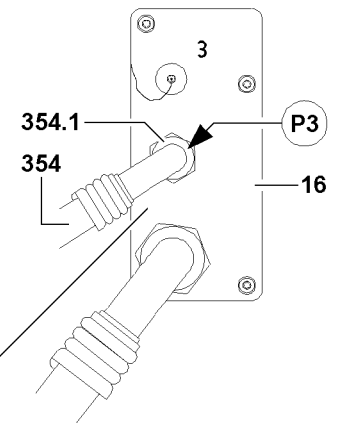
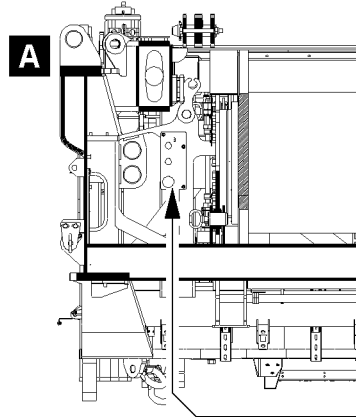
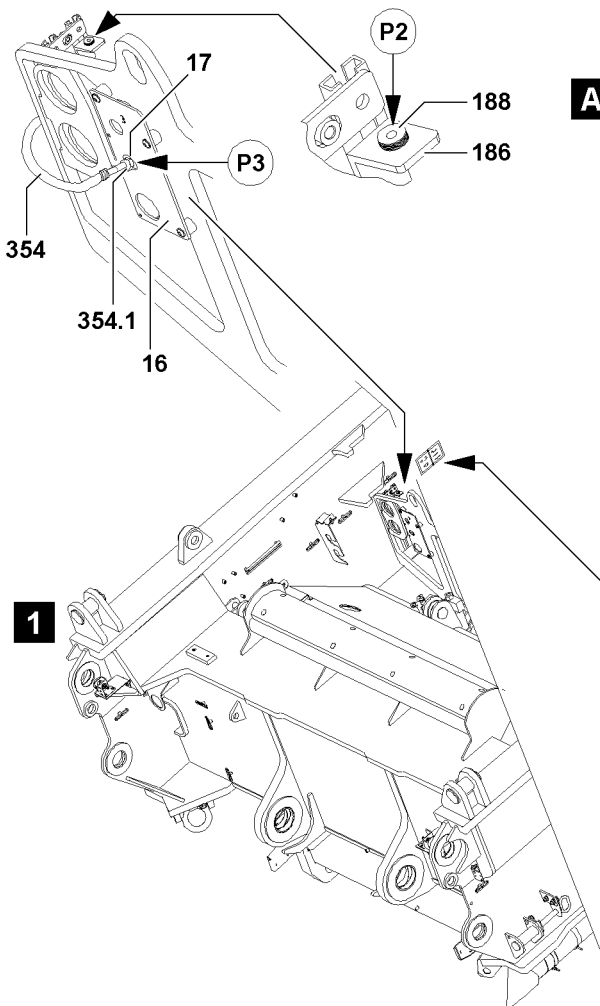
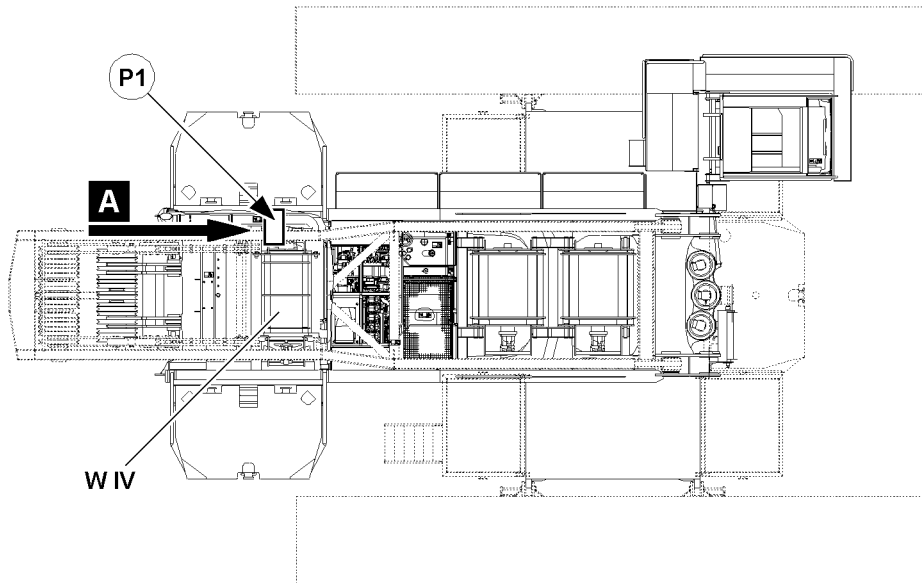
5.4 Disconnecting the hydraulic connections

Make sure that the following prerequisites are met:

- The emergency operation is completed.
- The pressure in the hydraulic system has been relieved.

Disconnect the hydraulic connections to the assembly plate **12**.

- ▶ Reposition the ball valve **9** in position for crane operation.
- ▶ Reposition the ball valve **10** in position for crane operation.
- ▶ Reposition the ball valve **11** in position for crane operation.
- ▶ When the ball valve **9**, ball valve **10** and ball valve **11** are repositioned into crane operation position:
 - Disconnect the hydraulic connections to the assembly plate **12**.
- ▶ Close off the hydraulic connections with dust plugs.



B112453

6 Emergency operation of winch 4 (W IV) on the LR1600/2 and LR1600/2-W

NOTICE

Damage of crane components!

If the hydraulic hose (control line) **354** for the emergency operation is not connected properly, then hydraulic parts or crane components can be damaged!

- ▶ Make sure, before starting the emergency operation, that the hydraulic hose **354** is properly connected!
-

6.1 Emergency operation winch 4 (WIV)

6.1.1 Establishing the hydraulic connections to winch 4 (WIV)



Note

- ▶ The hydraulic connections to winch 4 - connection 1, connection 2 and brake - have been established, see section "Emergency operation of winches"!
 - ▶ Pay attention to the different variations of the assembly plates!
-

Before emergency operation of winch 4 **W IV**, in addition to the hydraulic connections for the emergency operation of the winch, the hydraulic hose **354** must be connected.

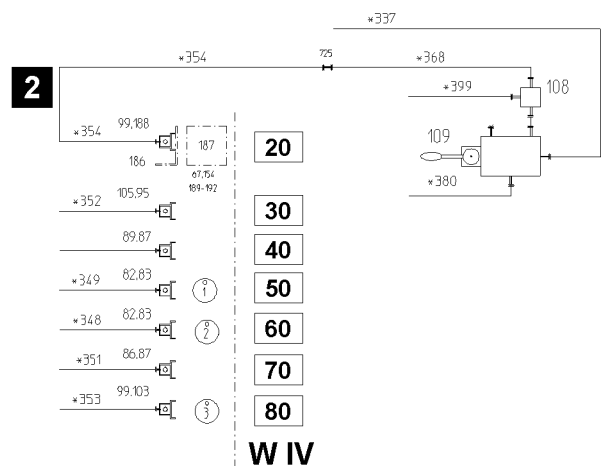
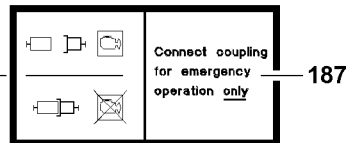
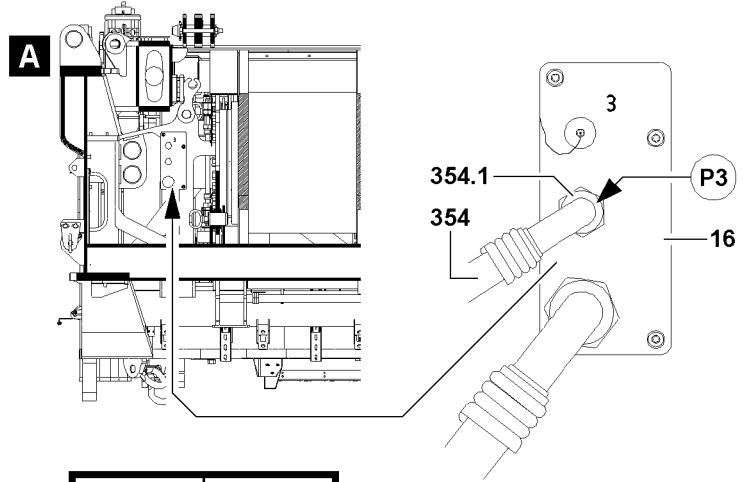
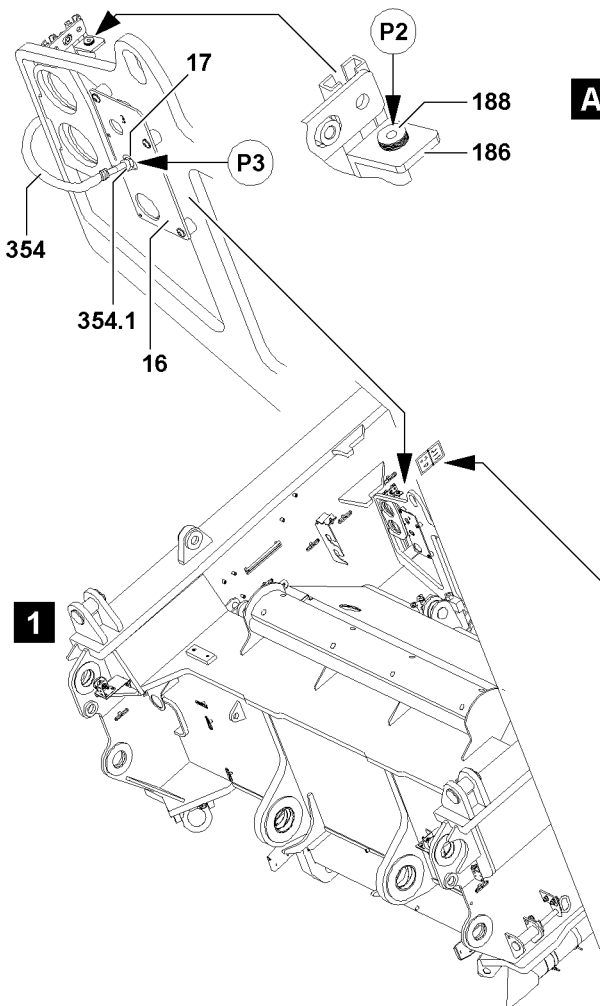
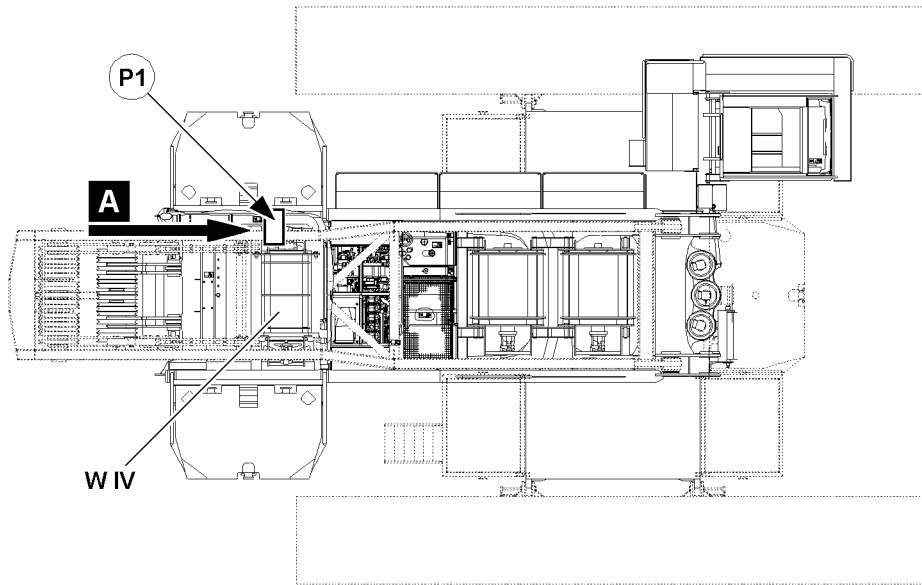
Make sure that the following prerequisites are met:

- The hydraulic connections to winch 4 are established.
 - The hydraulic hose **354** is in park position, point **P2**.
 - ▶ Release the hydraulic hose **354** with the fitting **354.1** on the plug **188** (park position), point **P2**.
 - ▶ Guide the hydraulic hose **354** to the front to the connector plate **16**.
 - ▶ Connect the hydraulic hose **354** with the fitting **354.1** on the supply line **17**, point **P3**, of the connector plate **16**.
-



Note

- ▶ Observe the notes in the sections "Emergency operation of winches"!
-



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6.1.2 Spooling the winch out

- ▶ See section: "Emergency operation with assembly plate Variation 1 (V1)"
- or
- See section: "Emergency operation with assembly plate Variation 2 (V2)"

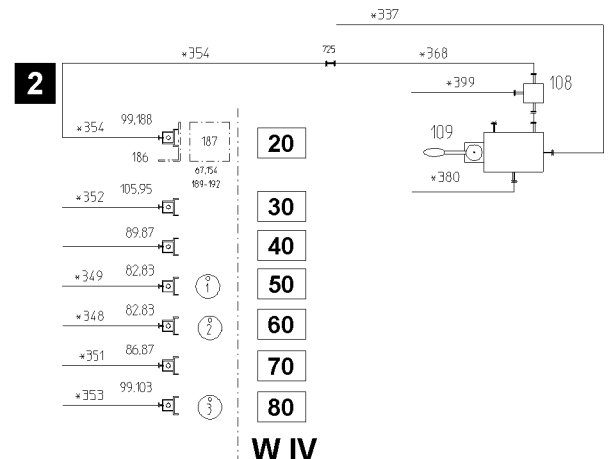
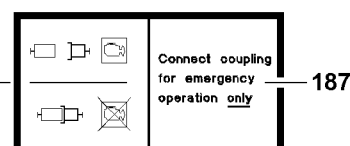
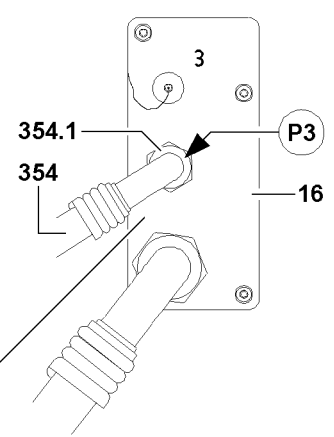
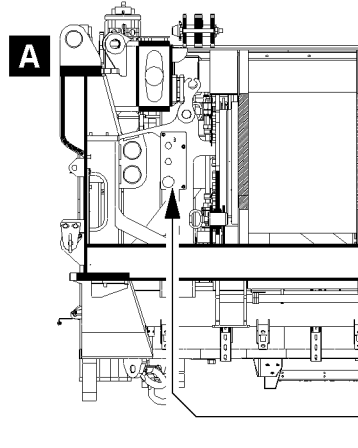
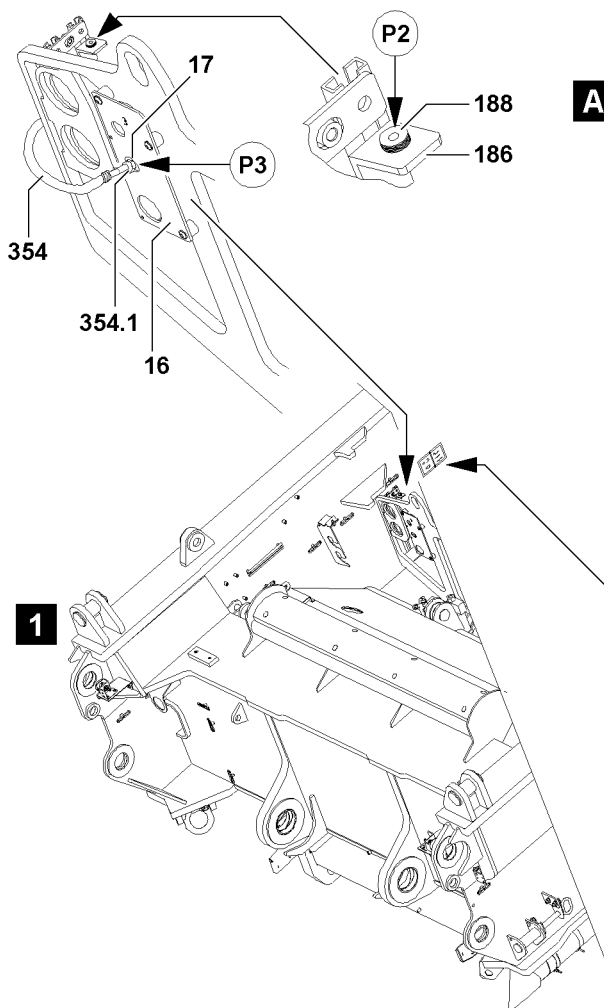
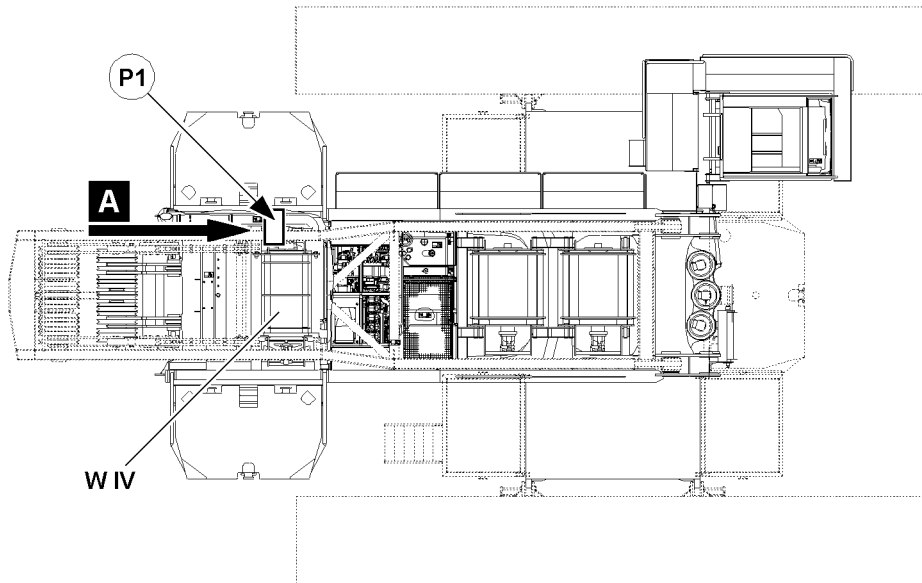
6.1.3 Spooling the winch up

- ▶ See section: "Emergency operation with assembly plate Variation 1 (V1)"
- or
- See section: "Emergency operation with assembly plate Variation 2 (V2)"

6.2 Disconnecting the hydraulic connections

Make sure that the following prerequisites are met:

- The emergency operation is completed.
- The pressure in the hydraulic system has been relieved.
- ▶ Disconnect the hydraulic connections from the winch 4 to the assembly plate.
- ▶ Remove the reducer sections (adapter).
- ▶ Close off the hydraulic connections of the winch 4 **W IV** with dust caps.
- or
- Reconnect the winch 4 **W IV** onto the hydraulic system of the crane.
- ▶ Disconnect the hydraulic hose **354** at point **P3**.
- ▶ Bring the hydraulic hose **354** in parking position: Install the fitting **354.1** onto the plug **188**.



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6.3 Connection schematic for emergency operation, illustration 2



Note

- ▶ See also Hydraulic schematic!

Position	Connection / description
20	Control pressure SA-frame
50	Lifting
60	Lowering
80	Replenishing pressure brake

7 Ending emergency operation

7.1 Procedure

- ▶ Turn the emergency operation aggregate* 1 off.
- ▶ Close the ball valve 3.
- ▶ Disconnect the hydraulic connections and close them off with dust plugs.

7 Service and maintenance

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1 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.

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.

Check the antislip coverings before stepping on them regarding their antislip properties and cleanliness. If dirty, clean antislip coverings with a strong brush to retain the antislip properties. For cleaning the surfaces, use commercially available cleaners. Flush with water.

2 General specifications



Note

Customers claims for warranties and refunds!

The buyer only has a claim to warranties and possible refund if only original Liebherr replacement parts, Liebherr service items and Liebherr lubricants are used for the Liebherr crane!

- ▶ Only original Liebherr replacement parts have been tested for crane operational use, and may be used without risking safety!



Note

Exclusion of liability!

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 only original Liebherr spare parts!



WARNING

Danger of fatal injury due to damaged crane components!

If crane components, which were damaged, for example due to maintenance errors, are not replaced immediately, personnel can be fatally injured!

- ▶ Maintain mobile crane components according to the data in the maintenance intervals, the maintenance notes and the lubrication chart!
- ▶ Replace damaged crane components immediately!

NOTICE

Damage of crane components!

If mobile crane components are not maintained according to the maintenance intervals and maintenance guidelines in the individual chapter, or if other lubricants are used than specified in the lubrication chart, the respective crane components can be damaged and/or functionally fail!

The warranty for the respective crane components are voided!

- ▶ Maintain mobile crane components according to the data in the maintenance intervals, the maintenance notes and the lubrication chart!

What does “checking” mean

The term “checking” includes all required work, such as:

- Determining a specified value
- Cleaning
- Adjusting
- Refilling
- Replacing

3 Cleaning and care of the crane

3.1 Care instructions for sound insulation (soundproofing)

Sound insulation in the area of engines and other noise sources is an integral part of the total construction. It is your task to limit 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. They are therefore an integral part for the construction permits for the machines. They may not be removed, and if damaged, they must be replaced by original Liebherr replacement parts. From a construction point of view, they have been designed to be maintenance-free. They have been equipped with surfaces that repel dirt, oil and water. They are very flame-resistant and some of them, depending on application, are fireproof.

For these reasons, these parts need minimal care. Any small dirt deposits can be disregarded, as the acoustic effectiveness of the parts is not reduced.

NOTICE

Sound insulation (soundproofing) damage!

By using unsuitable tools or cleaning methods, sound insulation can be destroyed or damaged during cleaning!

- ▶ Remove severe contamination with suitable tools, for example with soft plastic scrapers!
- ▶ Do not use tools with sharp edges!
- ▶ Only use steam cleaners with extreme care and with a sufficient distance to the sound insulation and with low water pressure!
- ▶ Do **not** use **solvents** for cleaning!

**WARNING**

Impurities from solvents or foreign substances!

For example, if sound insulation is polluted by solvents, motor oils, gear oils, hydraulic oils or fuels, such substances can ignite and significantly detrimentally change the fire performance of the sound insulation!

- ▶ If such contamination of the sound insulation occurs, **remove immediately** and replace it immediately with **original parts**!

3.2 Care instructions for the driver's cab and the crane cab



Note

- ▶ The steering wheel, center console, instrument panel cover, floor covering and dirty upholstery in the driver's cab and the crane cab should only be cleaned with warm water mixed with dishwashing detergent!
- ▶ Do not use any scouring agents!

3.3 Care instructions for cleaning the crane

NOTICE

Damage to exhaust system on engines with exhaust aftertreatment SCR!

If water gets into the exhaust pipe, sensors of the exhaust aftertreatment can be destroyed and the coating of the SCR catalytic converter can be washed out!

- ▶ Make sure that no water gets into the exhaust pipe!
- ▶ During cleaning, keep sufficient distance to the exhaust pipe!

4 Measures for work interruption or transport

4.1 Hydraulic cylinder

NOTICE

Corrosion danger to the hydraulic cylinders!

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!

Expensive and extensive repairs can result!

If the crane is taken out of operation for an extended period of time:

- ▶ Disassemble the crane!
- ▶ Fully retract all crane hydraulic cylinders! If the hydraulic cylinders can not be completely retracted, protect exposed areas of the piston rod from corrosion, for example by applying grease!
- ▶ Grease any exposed areas on the piston rods, for example on luffing cylinders and ballasting cylinders, especially carefully!

5 Maintenance work on gear components

The gear oils in travel, slewing and winch gears must be checked regularly through an oil or lubricant analysis. For interval data, check the Crane operating instructions, chapter 7.02 and 7.03. The intervals must be adhered to.

Through the oil analysis, degrees of wear of gear components, the composition of the mechanical wear debris, the viscosity of the oil, the degree of oil contamination and additional relevant properties of the oil can be determined. The oil analysis results therefore allow for a technical evaluation about the continued use of the gear or the oil.

Advantages of oil or lubricant analysis:

- 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.
- An earlier repair of gear components protects from larger and unforeseen damage.
- Subsequent damage can therefore be avoided to the greatest possible extent.

NOTICE

Danger of property damage!

If oil analysis and oil change intervals are not adhered to, there is the danger of gear damage!

If the analysis results and possibly resulting recommendations for an earlier oil change or further maintenance work are not observed, there is the danger of gear damage!

- ▶ The oil analysis and oil change intervals must be strictly observed.
- ▶ If an earlier oil change is required due to oil analysis results: Change the oil.

5.1 Recommendations for taking oil samples

**WARNING**

Danger of burns!

When working on crane components at operating temperature, there is a danger of burns due to components or service fluids!

Personnel can be severely injured or killed!

- ▶ Carry out all work with utmost caution!
- ▶ Wear protective clothing!

Take oil sample:

- Immediately after stopping the gear.
- At normal operating temperature.
- Always take oil on the same location of the gear.
- Take oil always according to the same method.
- On gears with double slipping seal, also take sample from the slipping seal area.
- Take oil not right after an oil change.
- Take oil not right after adding larger amounts of oil.
- Fill oil only in a clean and dry sample container (recommendation: Fill oil into original sample containers!)

6 Maintenance work on the crane superstructure or boom

**WARNING**

Danger of falling!

During maintenance work 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, take suitable safety measures!
- ▶ The crane superstructure or 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 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 maintenance personnel must secure themselves with approved catch systems to avoid falling, 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!

7 Maintenance and inspection guidelines



Note

- ▶ Carry out the maintenance and inspection work on the crane chassis according to operating hours or kilometers driven!
- ▶ Carry out the maintenance and inspection work on the crane superstructure according to operating hours!

Observe the following chapters for maintenance and inspection of the crane:

- Chapter 7.02: Maintenance intervals - Crane chassis ¹⁾
- Chapter 7.03: Maintenance intervals - Crane superstructure ¹⁾
- Chapter 7.04: Maintenance guidelines - Crane chassis ²⁾
- Chapter 7.05: Maintenance guidelines - Crane superstructure ²⁾
- Chapter 7.06: Fill quantities, lubrication chart
- Chapter 7.07: Service items and lubricants

¹⁾ These chapters contain a list of service intervals for all maintenance work. Only the relevant work is to be carried out.

²⁾ For individual components, the manufacturer's specifications must be observed.



WARNING

Danger of accidents during maintenance and inspection of crane components!

During maintenance and inspection work on crane components, there exists increased danger of accidents if maintenance and inspection guidelines are not observed!

Personnel can be severely injured or killed!

- ▶ Observe and adhere to the following listed warning notes and the generally applicable safety rules!

7.1 Warning notes

7.1.1 Preparatory work



WARNING

Fatal injury when driving or operating the crane during maintenance, inspection or repair work!

If the mobile crane is operated during maintenance, inspection or repair work, then personnel can be killed or severely injured!

This could result in high property damage!

- ▶ During maintenance, inspection or repair work, it is strictly prohibited to drive or operate crane!
- ▶ Show clearly with signs that maintenance, inspection or repair work is being carried out on the mobile crane!
- ▶ Use signs which show without a doubt that it is prohibited to drive and operate the crane! The national regulations regarding labeling on mobile cranes and on the signs must be observed!
- ▶ Carry out maintenance, inspection or repair work only with authorized and trained expert personnel.
- ▶ It is prohibited for unauthorized personnel to remain in the danger zone!

- ▶ 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.

7.1.2 Warning notes on risk of burns



WARNING

Risk of burns during maintenance or inspection work!

While carrying out maintenance or inspection work, you can get severe burns on hot surfaces of the crane components! This applies especially for the exhaust system or the travel gear!

- ▶ Let any components to be maintained or inspected cool off!
- ▶ Do not spill any service fluids over the hot components!
- ▶ Avoid short circuits in the electrical system, especially on the battery!
- ▶ Replace or change missing or defective protective insulation!

7.1.3 Warning notes for rotating parts



WARNING

Risk due to rotating parts!

If inspection work must be carried out while the engine is running, a significant danger exists due to rotating parts and the ignition system!

Personnel can be severely injured!

- ▶ Proceed especially careful!
- ▶ Never reach into rotating parts!
- ▶ Never reach into the cooler fan when the engine is warm! The cooler fan could turn on suddenly!

7.1.4 Warning notes for scalding risk



WARNING

Risk of scalding during maintenance or inspection work!

The cooling system is under pressure!

When the coolant reservoir is opened, hot coolant can escape explosively!

The most severe scalding on the entire body can result!

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!

7.1.5 Warning notes on fire danger



DANGER

Danger of fire!

When working on fuel systems or on electrical systems, an increased danger of fire exists if the general safety rules are not observed!

Personnel can be severely injured or killed!

This can result in increased property damage!

- ▶ Disconnect the battery from the power supply!
- ▶ Do not smoke!
- ▶ Do not work near open flames!
- ▶ Keep a functioning fire extinguisher ready!

7.1.6 Improper maintenance

NOTICE

Damage of components!

In case of incorrect maintenance, severe functional defects and damage on the components can occur!

- ▶ Add correct and sufficient service fluids during maintenance!
- ▶ For all maintenance work, observe utmost cleanliness to prevent dirt from entering the inside of the components!
- ▶ Check components for leaks!
- ▶ Have leaking components sealed immediately and properly!

7.2 Checking the battery voltage



Note

If a crane is taken "out of service" and a user, such as the airplane warning light is turned on:

- ▶ Check the battery voltage in regular intervals. If necessary, recharge the battery.

7.3 Checking the antislip coverings

Check the antislip coverings before stepping on them regarding their antislip properties and cleanliness. If dirty, clean antislip coverings with a strong brush to retain the antislip properties. For cleaning the surfaces, use commercially available cleaners. Flush with water.



WARNING

Danger of falling!

If the following measures are not observed, personnel can fall down and be killed or severely injured!

- ▶ Keep antislip coverings clean and free of snow and ice!
- ▶ Only step on antislip coverings with clean shoes!
- ▶ Replace or renew missing or damaged antislip coverings!

7.4 Refueling



WARNING

Danger of fire!

Fuel is easily flammable and can cause fatal accidents in case of fire or open flames!

This could result in high property damage!

- ▶ Before refueling, turn the auxiliary heater or the engine preheating off!
- ▶ Fire, open flames and smoking are prohibited during the refueling procedure!



WARNING

Danger of poisoning!

Fuel is poisonous and hazardous to health!

- ▶ Do not allow for fuel to come in contact with skin, eyes or clothing!
- ▶ Do not breathe in fuel vapors!
- ▶ Keep children away from fuel!

If persons did come in contact with fuel:

- ▶ In case of eye contact, flush out the eyes immediately and consult a physician if necessary!
- ▶ Clean affected skin areas with clear water!

If fuel was swallowed:

- ▶ Go to a physician immediately!

NOTICE

Engine damage!

When using incorrect fuel, the engine and the fuel system can be severely damaged!

- ▶ Do not use gasoline on vehicles with Diesel engine!
- ▶ Do not mix Diesel fuel with gasoline!

If you have added incorrect fuel inadvertently:

- ▶ Do not turn the ignition on, have the fuel tank and fuel lines emptied completely by qualified expert personnel!

7.5 Refueling fuel tanks*

**Note**

- ▶ See danger notes in section "Refueling".

7.6 Adding Urea solution

**WARNING**

Skin irritation and eye injuries!

Urea can cause skin irritation and eye injuries at contact!

- ▶ Do not allow for Urea to come in contact with skin, eyes or clothing!

If persons did come in contact with Urea:

- ▶ In case of eye contact, flush out the eyes immediately and consult a physician if necessary!
- ▶ Clean affected skin areas with clear water!

If Urea was swallowed:

- ▶ Flush the mouth with a lot of water! Then drink a lot of water and consult a physician, if necessary!

**WARNING**

Irritation of eyes and mucous membranes!

If the Urea tank cover is opened at high temperatures, ammonia vapors can emerge! If ammonia vapors are breathed in, then it can cause burning eyes, nose, throat and coughing!

- ▶ Do not breathe in ammonia vapors!

NOTICE

Danger of corrosion!

If Urea is spilled during refueling, affected surfaces can corrode!

- ▶ Flush affected areas immediately with lots of water!
- ▶ Do not overfill the tank!

If possible:

- ▶ Refuel on a gas pump with nozzle!

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1 Crane chassis 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!
- ▶ For the operating hour intervals, the hour meter of the crawler travel gear is the determining factor!
- ▶ The operating hour meter "crawler travel gear" * is located in the control cabinet!

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	10 h	100 h	1000 h	Daily	Weekly	Annually	
Safety systems							
						X	Personal protective equipment Follow the instructions of the manufacturer
						X	Height rescue system Follow the instructions of the manufacturer
Fall protection equipment							
						X	Check protection points
						X	Check safety ropes
						X	Check the ladders for technically immaculate condition
						X	Check railings, steps and pedestals for safe function
						X	Check catwalks and open mesh flooring for safe function
Crane surface							
					X		Check accessible surfaces for cleanliness
						X	Check accessible surfaces for completeness and slip resistance
						X	Check labels for completeness and legibility
Travel gear							
		X					Check for leaks
	X						Grease the sprocket bearing if it is not lubricated via the central lubrication system

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	10 h	100 h	1000 h	Daily	Weekly	Annually	
		X					Check the mounting screws for tight seating
		500 h					Check the gear oil via oil analysis
200 h			4000 h			Every 4 years	Replace the gear oil
Crawler carrier							
		X					Check track rollers, carrier rollers with oil lubrication for leaks
	X						Grease the track rollers, carrier rollers if it is not lubricated via the central lubrication system
	X				Every 4 weeks		Check the wear on the roll off surfaces of the track rollers / carrier rollers, replace the track rollers / carrier rollers if necessary
						X	Grease guide rails on sliding section
						X	Lubricate the consoles
					Every 4 weeks		Lubricate the connector pins between crawler carrier and crawler center section or crawler carrier and cross carriers
Track chain							
		X					Check the retention of the connector pins
		X					Check for damage
	X				Every 4 weeks		Check the chain tension, retension the track chain if necessary
	X						Check the wear on the bores of the track pads, replace track pads if necessary
	X						Check the wear on the connector pins of the track pads, replace pins if necessary
	X				Every 4 weeks		Check the wear on the roll off surfaces of the track pads / track rollers, replace track pads if necessary
Assembly support							
					X		Check the hydraulic cylinder for leaks

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	10 h	100 h	1000 h	Daily	Weekly	Annually	
						X	Check support beam for ease of movement, grease
						X	Lubricate the bearing points of the support beams
						X	Check sight gauge, adjust if necessary
Crane support							
					X		Check the hydraulic cylinder for leaks
						X	Check support beams for ease of movement, grease
						X	Lubricate the struts
						X	Lubricate the mounting pins on the struts
						X	Lubricate the support pad bearing
Rotary connection							
			X				Lubricate
Hydraulic cylinder							
					X		Check for leaks
Hydraulic hose lines							
				X			Check for leaks and damage
						X	Have safe working condition checked by expert
Central lubrication system							
				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

2 Ballast trailer maintenance and inspection schedule

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	10 h	100 h	1000 h	Daily	Weekly	Annually	
Fall protection equipment							
						X	Check protection points
						X	Check safety ropes
						X	Check the ladders for technically immaculate condition
						X	Check railings, steps and pedestals for safe function
						X	Check catwalks and open mesh flooring for safe function
Ballast trailer surface							
					X		Check accessible surfaces for cleanliness
						X	Check accessible surfaces for completeness and slip resistance
						X	Check labels for completeness and legibility
Tires							
					X		Check for external damage and distortion
					X		Check the tire pressure
	X						Check lug nuts for tight seating, retighten if necessary
						Every 5 years	Replace tires; have further service life confirmed by a tire manufacturer expert
Axle link							
		250 h				X	Lubricate
Hydraulic cylinder							
					X		Check for leaks
Hydraulic hose lines							
				X			Check for leaks and damage
						X	Have safe working condition checked by expert
Slewing gear							

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	10 h	100 h	1000 h	Daily	Weekly	Annually	
250 h						X	Check the mounting screws for tight seating
				X			Check for leaks
					X		Check the oil level
		500 h					Check the gear oil via oil analysis
			4000 h			Every 4 years	Replace the gear oil
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
Emergency control							
						X	Check for correct function

1 Crane superstructure maintenance and inspection schedule



Note

- ▶ Carry out maintenance work after reaching the specified operating hours or calendar intervals. The interval which occurs first is the deciding factor!
- ▶ The maintenance intervals complement each other. If a higher interval is coming up, then carry out the work according to the lower interval also!

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	250 h	500 h	1500 h	Daily	Weekly	Annually	
Safety systems							
						X	Personal protective equipment Follow the instructions of the manufacturer

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	250 h	500 h	1500 h	Daily	Weekly	Annually	
						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
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
				X			Check the coolant level in the expansion tank
						Every 2 years	Replace coolant
SCR Exhaust after-treatment							
			4500 h			Every 2 years	Replace foam and filter element of urea pump

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	250 h	500 h	1500 h	Daily	Weekly	Annually	
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
Slewing ring connection							
	X						Lubricate the gears
						X ¹⁾	Lubricating the slewing ring connection
250 h			X			X	Check the mounting screws for tight seating
						X	Check the tilt play
Rope winches							
250 h						X	Check the mounting screws for tight seating
				X			Check for leaks
					X		Check the oil level
			200 h			X	Check the condition of the tooth flanks; determining factor is operating hours of the winch. (only LR 13000)
		X					Check the gear oil via oil analysis
			3000 h			Every 4 years	Replace the gear oil
						X	Check the remaining theoretical utilization life by a technical expert
						Every 4 years	Check the remaining theoretical utilization life by authorized specialist
Hoist gear brakes							

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	250 h	500 h	1500 h	Daily	Weekly	Annually	
				X			Check for leaks
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
Relapse supports							
		X				X	Lubricate the bearings
X ^(2), 6)							Check the oscillation guard for easy movement
Relapse cylinder							
X ^(2), 6)					X		Check for leaks
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							

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	250 h	500 h	1500 h	Daily	Weekly	Annually	
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
Press on pulleys of rope winches							
	X					X	Grease guides
Rope pulleys							
			X			X	Check for wear, damage, cracks and easy movement
			X			X	Grease
Crane ropes							
				X			Check cracks, damage and distortion
					Monthly		Check, grease by expert personnel
						X	Check by technical expert
						Every 4 years	Check by authorized inspector
Hook blocks							
		X				X	Lubricate the hook
						X	Check distance dimension (y)
Crane cab							
				X			Check instruments for function
				X			Check indicator lights for function
						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

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	250 h	500 h	1500 h	Daily	Weekly	Annually	
		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
Overload protection							
				X			Check for correct function
		X				X	Check length sensor for function
		X				X	Check length sensor rope for damage
Remote diagnostics device							
						X	Check for correct function
						X	Check the validity of the SIM card
Electrical system							
						X	Cable connections
					Every 6 months ³⁾		Service the batteries
					Every 6 months ³⁾		Empty the acid 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							

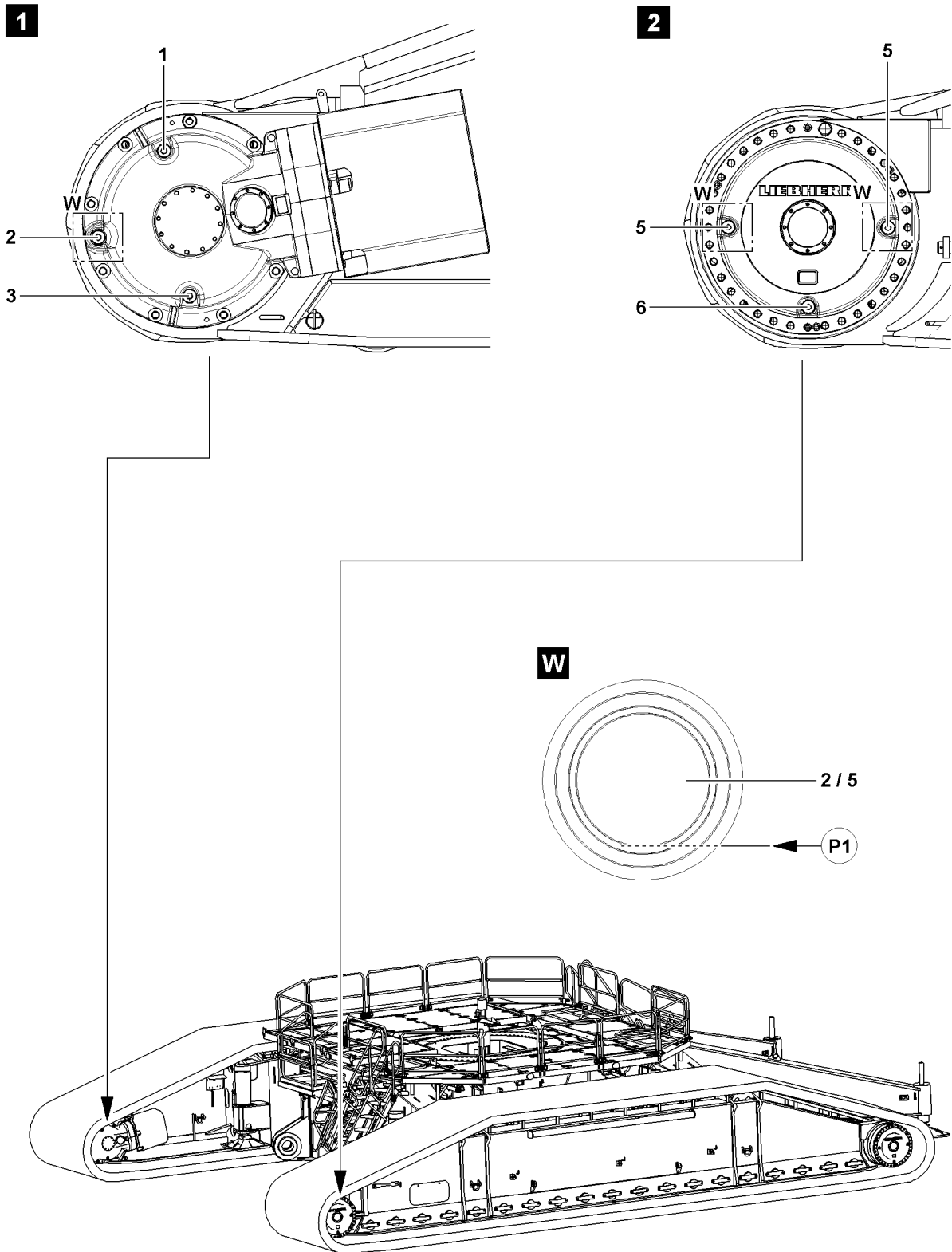
First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	250 h	500 h	1500 h	Daily	Weekly	Annually	
250 h						X	Check the mounting screws for tight seating
				X			Check for leaks
					X		Check the oil level
		X					Check the gear oil via oil analysis
			4000 h			Every 4 years	Replace the gear oil
Turntable lock							
		X				X	Grease
		X				X	Check for correct function
Bearings							
						X	Checking the retaining elements
Pump distributor gear							
				X			Check for leaks
					X		Check the oil level
500 h			X			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
Hydraulic pressure accumulator (nitrogen)							

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	250 h	500 h	1500 h	Daily	Weekly	Annually	
		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
Central lubrication system							
		X					Check for correct function
					X		Check the grease container fill level
Emergency control							
						X	Check for correct function
Lattice mast boom system							
X ⁶⁾						X	Grease the lube points of lattice sections
Telescopic boom with rope mechanism							
						X	Check telescopic boom for distortions and cracks
	X					X	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	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
Telematik telescopic boom system							
						X	Check telescopic boom system for distortion, damage and cracks

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	250 h	500 h	1500 h	Daily	Weekly	Annually	
						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 locking pins and locking bores for proper condition
		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
Telescopic boom guying							
						X	Check for distortions and cracks
					Every 3 months 5), 6)		Lubricate the TA/TY-guying on the grease fittings
				X			Check guy winch for leaks
					Every 6 months		Check the oil level on the guy winch
250 h		X				X	Check the mounting screws for tight seating
						X ⁴⁾	Check the rope connection between the guy rope and the auxiliary rope (only LTM 1400-7.1)

First maintenance after	Operating hour intervals			Calendar intervals			Work to be carried out
	250 h	500 h	1500 h	Daily	Weekly	Annually	
						Every 4 years	Replace gear oil of guy winch
Derrick ballast							
						X	Check frame, suspension and guide section for distortion and cracks

- 1) if the crane is not moved: Every 3 months
- 2) before every operation: Check visually
- 3) in hot climate zones: Every 3 months
- 4) note chapter 7.05, Crane superstructure maintenance instructions
- 5) and as necessary
- 6) during assembly
- 7) in Great Britain: Every 6 months



B110052

1 Servicing the travel gear



Note

- ▶ Use service items and lubricants according to the chart, see Crane operating instructions, chapter 7.07!
- ▶ Observe the maintenance intervals, see Crane operating instructions, chapter 7.02!

The travel gear consists of:

- Miter gear with brake, illustration 1
- Planetary gear, illustration 2



WARNING

- Danger of burns during maintenance and inspection work!
Severe burns can result due to the travel gear and oils at operating temperatures!
- ▶ Avoid direct body contact to heated components and fluids!

NOTICE

Dirt in travel gear!

If any dirt gets into the inside of the travel gear, gear damage can occur!

- ▶ Make sure that no dirt gets into the inside of the travel gear during maintenance work!

The following maintenance openings are on the miter gear with brake, see illustration 1:

- 1 Oil filler plug, oil filler port
- 2 Oil level plug, oil level port
- 3 Oil drain plug, oil drain port

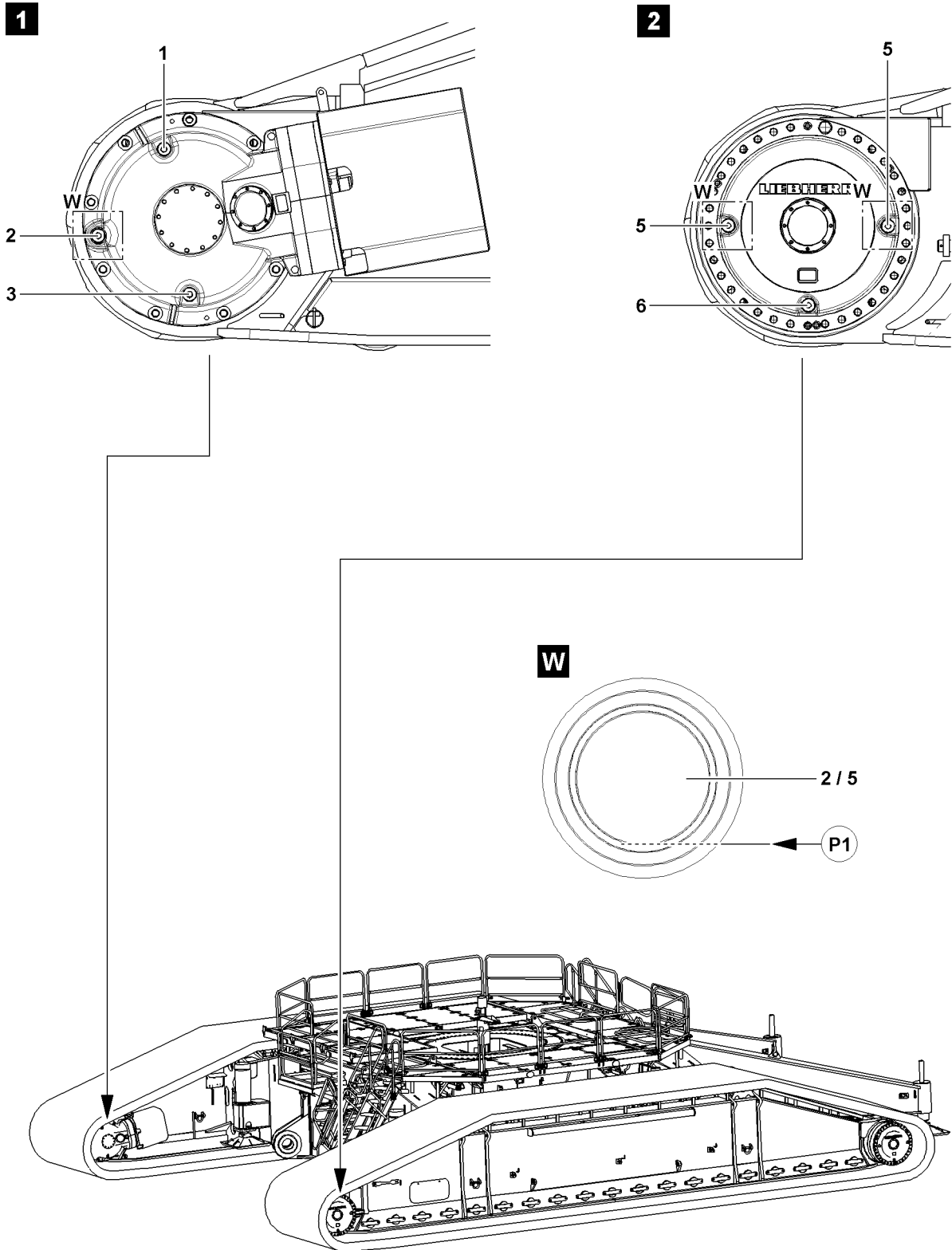
The following maintenance openings are on the planetary gear, see illustration 2:

- 5 Oil level plug, oil level port
- 6 Oil drain plug, oil drain port



Note

- ▶ No separate oil filler port is located on the planetary gear, the oil level port is used for this purpose!
- ▶ Oil level ports on planetary gears and miter gears can be constructed differently!
- ▶ The planetary gear and the miter gear have separate, different sized oil chambers! The oil levels in gears must be checked independently of each other!



B110052

1.1 Checking for leaks

- ▶ Check visually to ensure that the travel gears do not leak.

1.2 Checking oil level

NOTICE

Damage to the travel gear!

If seals are used repeatedly, it can result in loss of oil!

Due to loss of oil, the travel gears can wear significantly and / or be damaged!

- ▶ Use the seals on the maintenance ports only once!
-

NOTICE

Varying oil level in planetary gear!

Depending on the position of the gears in the planetary gear, the oil level can vary slightly upward!

When opening the oil level plug, oil can emerge despite correct fill quantity!

- ▶ The fill height must be at least on the height of the point **P1**!
 - ▶ If any oil emerged during the check, replace the same amount!
-

Make sure that the following prerequisites are met:

- The crane is in horizontal position.
- The travel gear is at a standstill.



Note

- ▶ To ensure a reliable oil level check, it must be ensured that the travel gears have been at a standstill for at least two minutes. This ensures that the oil has returned to the oil chamber completely!
-

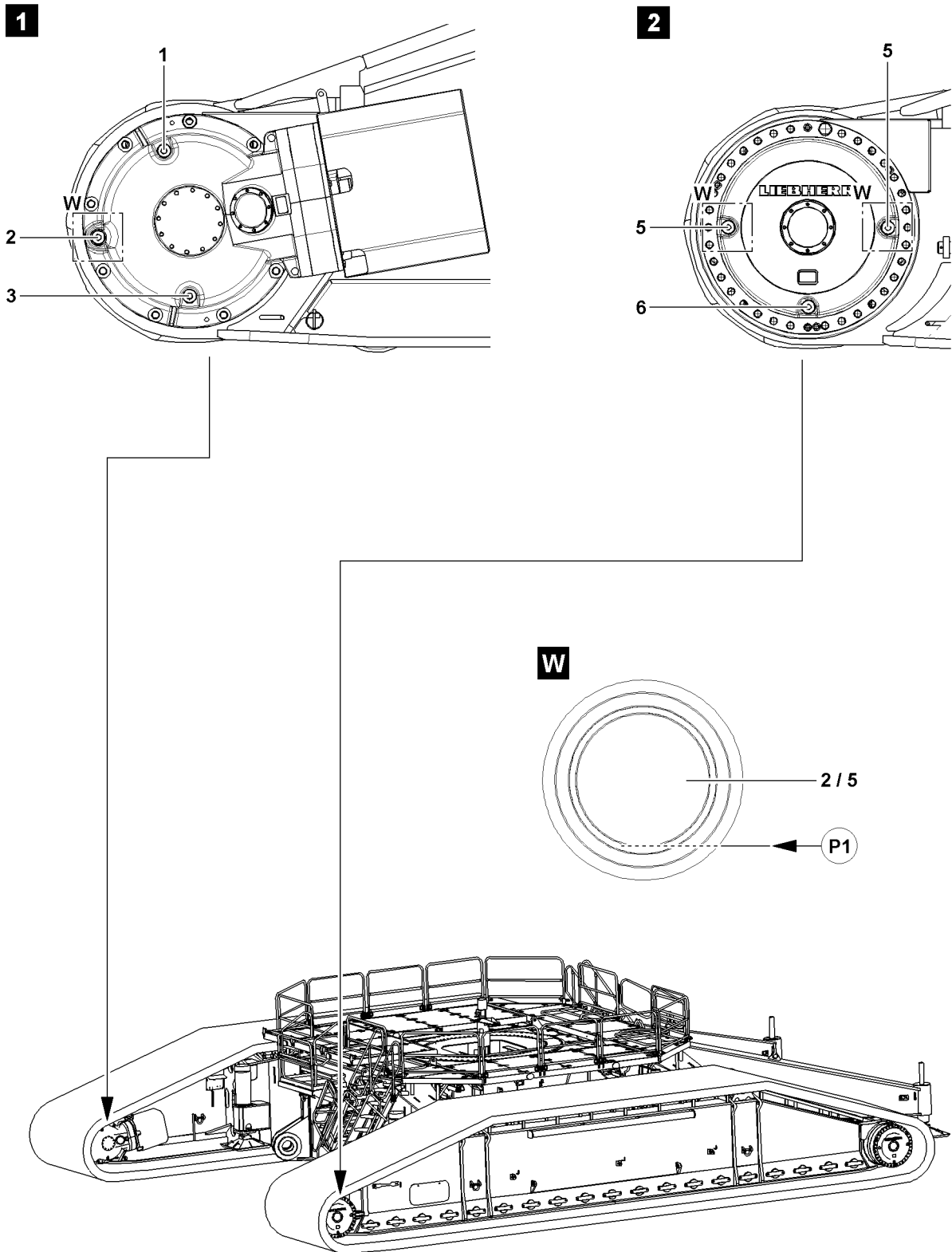
- ▶ Open the oil level port carefully.
-

NOTICE

Insufficient oil fill quantity!

If the oil level drops below the fill level on point **P1**, the travel gears can be damaged!

- ▶ Add gear oil until the oil level is again on the fill level on point **P1**!
 - ▶ If gear oil must be added:
Add oil on the oil filler port.
 - ▶ If the oil level is on the fill level on point **P1**, then the oil level on the travel gear is OK.
 - ▶ Close the maintenance ports tightly.
-



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1.3 Changing the oil

NOTICE

Damage to the travel gear!

If seals are used repeatedly, it can result in loss of oil!

Due to loss of oil, the travel gears can wear significantly and / or be damaged!

- ▶ Use the seals on the maintenance ports only once!
-

1.3.1 Changing oil on the miter gear

Make sure that the following prerequisites are met:

- The crane is in horizontal position.
- The travel gear must be at a standstill.
- The travel gear is at operating temperature.
- A container to catch the used oil is available.



Note

- ▶ When selecting the container to catch the use oil, make sure that the container is sufficiently sized to be able to catch all the used oil!
 - ▶ For fill quantity of miter gear, see Crane operating instructions, chapter 7.06!
-

- ▶ Remove the oil filler plug **1**.

- ▶ Remove the oil drain plug **3** and drain oil into a suitable container.
-



Note

- ▶ Allow the miter gear to empty completely!
-

- ▶ Clean the oil drain plug **3** and the sealing surface.

- ▶ Close off the oil drain port **3** tightly.

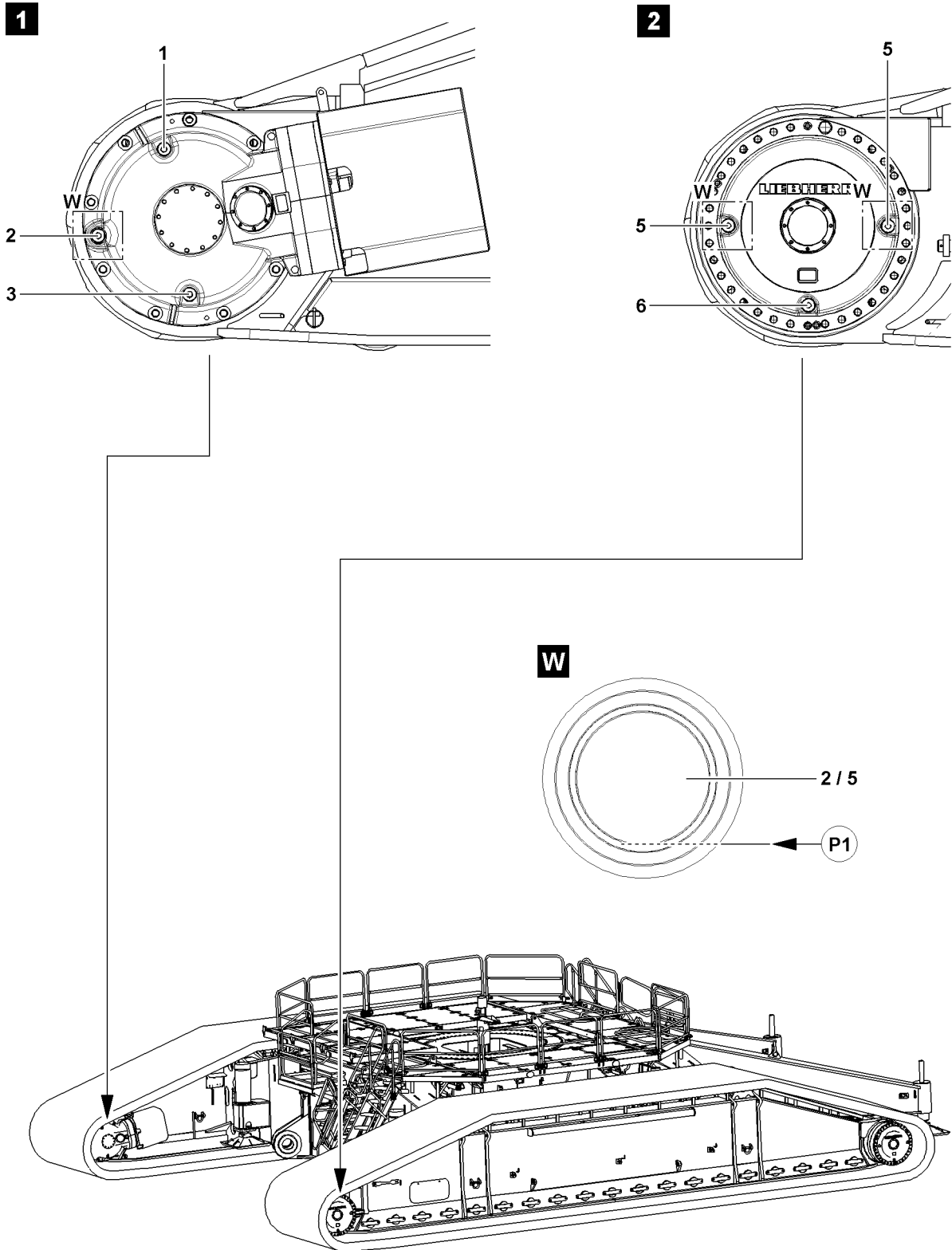
- ▶ Open the oil level port **2**.

- ▶ Add oil on the oil filler port **1** until it “stands” at the height of the fill level on point **P1** of the oil level port **2** or until it starts to run over.

- ▶ Clean the sealing surfaces.

- ▶ Close off the oil level port **2** tightly.

- ▶ Close off the oil fill port **1** tightly.



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1.3.2 Changing oil on the planetary gear

Make sure that the following prerequisites are met:

- The crane is in horizontal position.
- The travel gear must be at a standstill.
- The travel gear is at operating temperature.
- A container to catch the used oil is available.

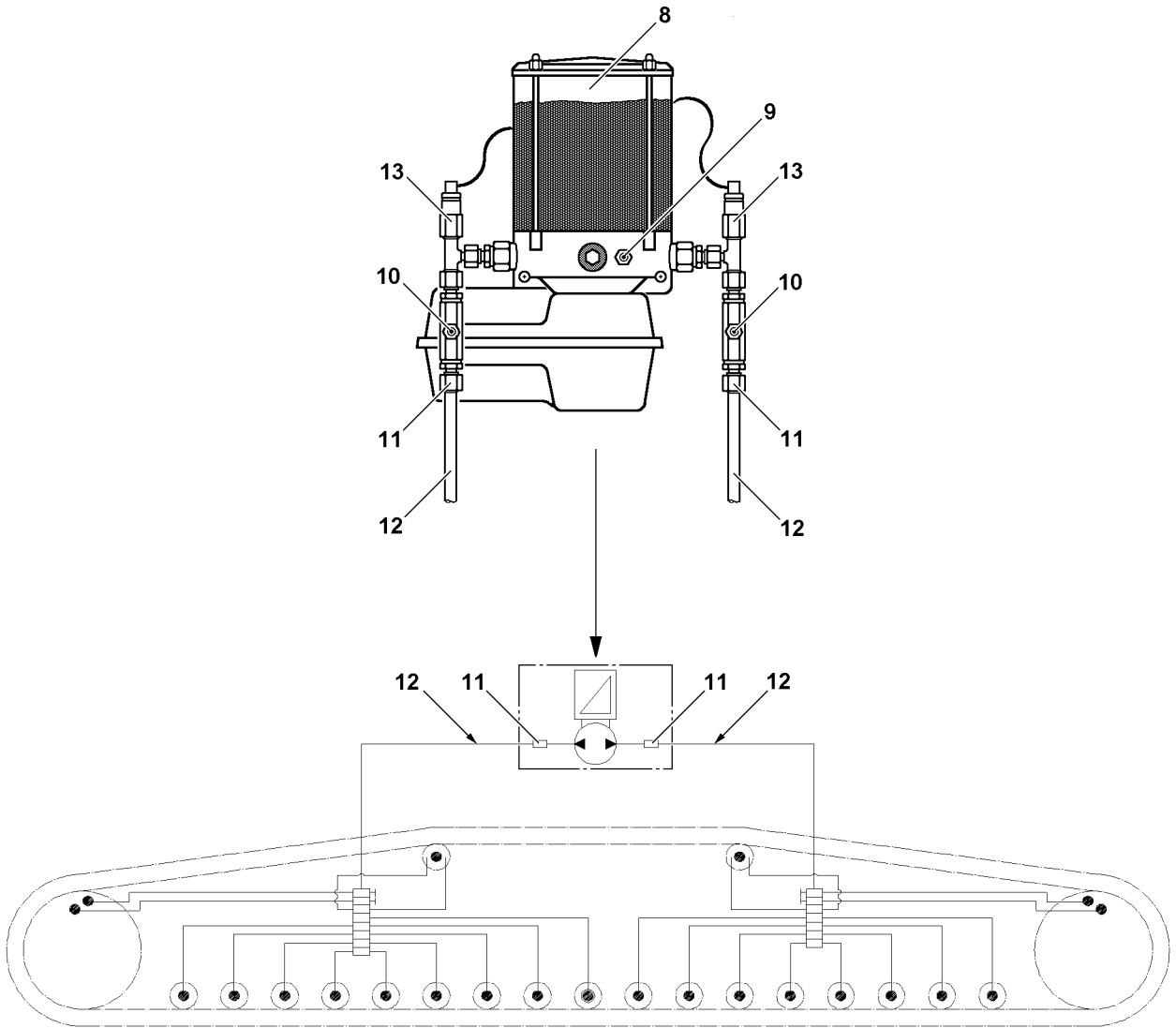
**Note**

- ▶ When selecting the container to catch the use oil, make sure that the container is sufficiently sized to be able to catch all the used oil!
- ▶ For fill quantity of planetary gear, see Crane operating instructions, chapter 7.06!

-
- ▶ Remove the oil level plugs **5**.
 - ▶ Remove the oil drain plug **6** and drain oil into a suitable container.

**Note**

- ▶ Allow the planetary gear to empty completely!
-
- ▶ Clean the oil drain plug **6** and the sealing surface.
 - ▶ Close off the oil drain port **6** tightly.
 - ▶ Add oil on the oil level port **5** until it “stands” at the height of the fill level **P1** of the oil level ports **5** or until it starts to run over.
 - ▶ Clean the sealing surfaces.
 - ▶ Close off the oil level ports **5** tightly.



B110102

2 Servicing the central lubrication system of the crawler carrier



Note

- ▶ The illustrations in this chapter are examples and may not apply exactly to your crane!
- ▶ Use service items and lubricants according to the chart, see Crane operating instructions, chapter 7.07!
- ▶ Observe the maintenance intervals, see Crane operating instructions, chapter 7.02!

If the crane is driven via the crawler travel gear, then the central lubrication system for the crawler carrier turns on automatically and supplies all grease points with the correct amount of grease.

NOTICE

Insufficient lubrication!

The lubrication film is removed over time due to environmental influences!

Due to insufficient lubrication, the crawler carriers are exposed to significant wear and can be damaged!

- ▶ If the crawler carriers are not moved for a period of more than three months, then it must be lubricated every quarter, possibly with an external grease pump!



Note

- ▶ When putting the crane back into service after an extended downtime, check the central lubrication system for function!
- ▶ When working on the central lubrication system, observe utmost cleanliness!
- ▶ Every crawler carrier has a separate grease pump with several lubrication circuits!
- ▶ Every lubrication circuit has its own main line **12**!

On the grease pump, see illustration, there are the following maintenance relevant components:

- | | |
|---------------------------------|--------------------------------|
| 8 Grease container | |
| 9 Grease fitting | • Filling the grease container |
| 10 Grease fitting | • Filling the lube lines |
| 11 Main line connection | |
| 12 Main line | |
| 13 Pressure relief valve | |

2.1 Filling the grease container

NOTICE

Insufficient lubrication!

In case of insufficient lubrication, the grease lubrication points can run dry!

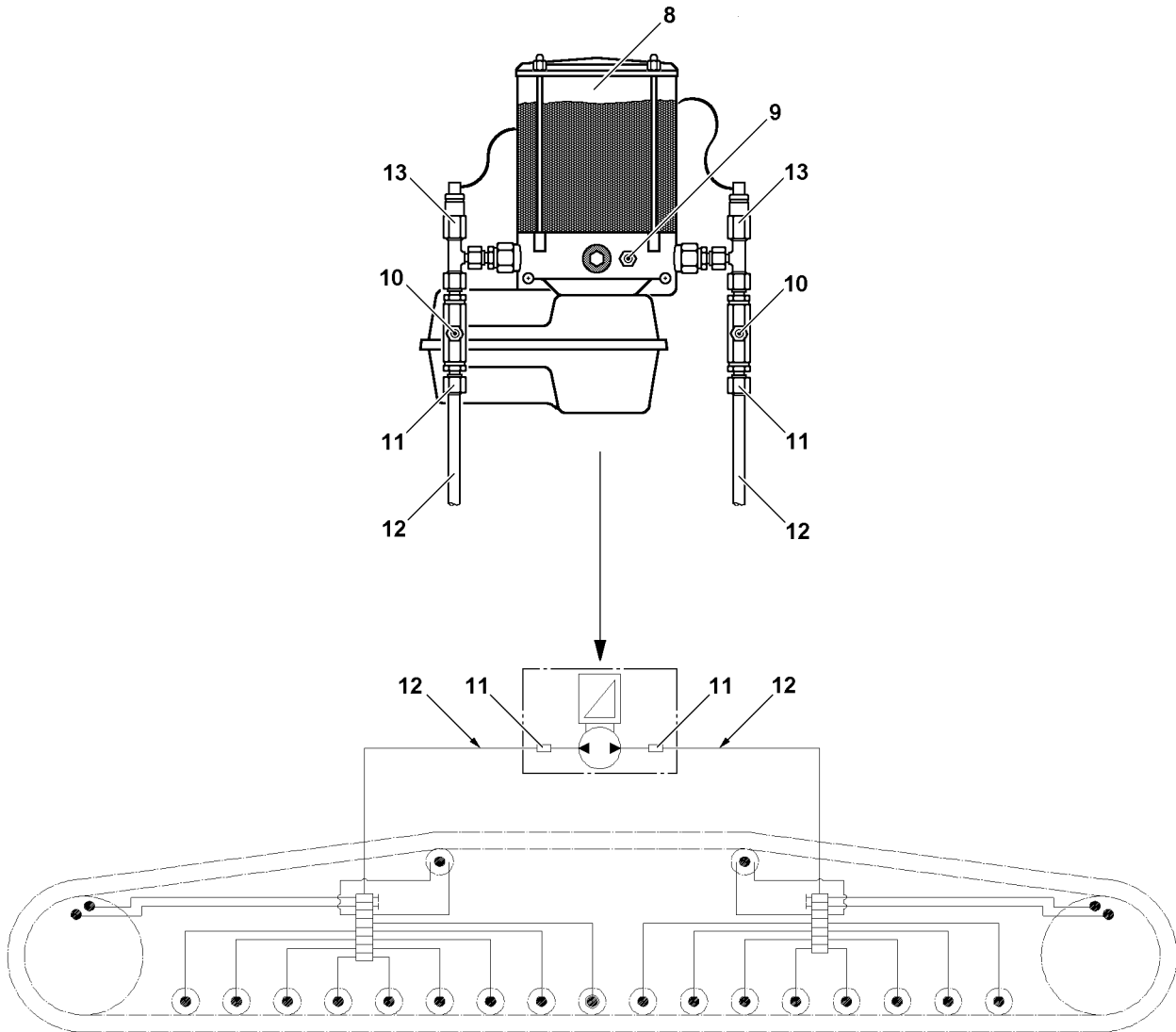
This could result in high property damage!

- ▶ Fill the grease container **8** before it is completely empty!



Note

- ▶ Do not deplete the grease container **8**!
- ▶ If the grease container **8** is empty, the central lubrication system must be bled!
- ▶ Fill the grease container **8** using an external grease pump via the grease fitting **9**.



B110102

2.2 Bleeding the central lubrication system

NOTICE

Insufficient lubrication!

If there is air in the grease pump, lubrication points can run dry!

- ▶ Bleed the central lubrication system carefully!
-

The central lubrication system of the crawler travel gear can be bled two ways:

- By actuation of the grease pump by simulating the crawler operation
- By separate actuation of the grease pump with the aid of the electric wiring plan

2.2.1 Bleeding by simulating crawler operation



WARNING

Crane can start to drive unintentionally!

If the foot rocker in the crane operator's cab or the manual control lever on the radio remote control console* is moved too far while bleeding the grease pump, then the track chain can start to move!

The crane can start to drive and catch personnel!

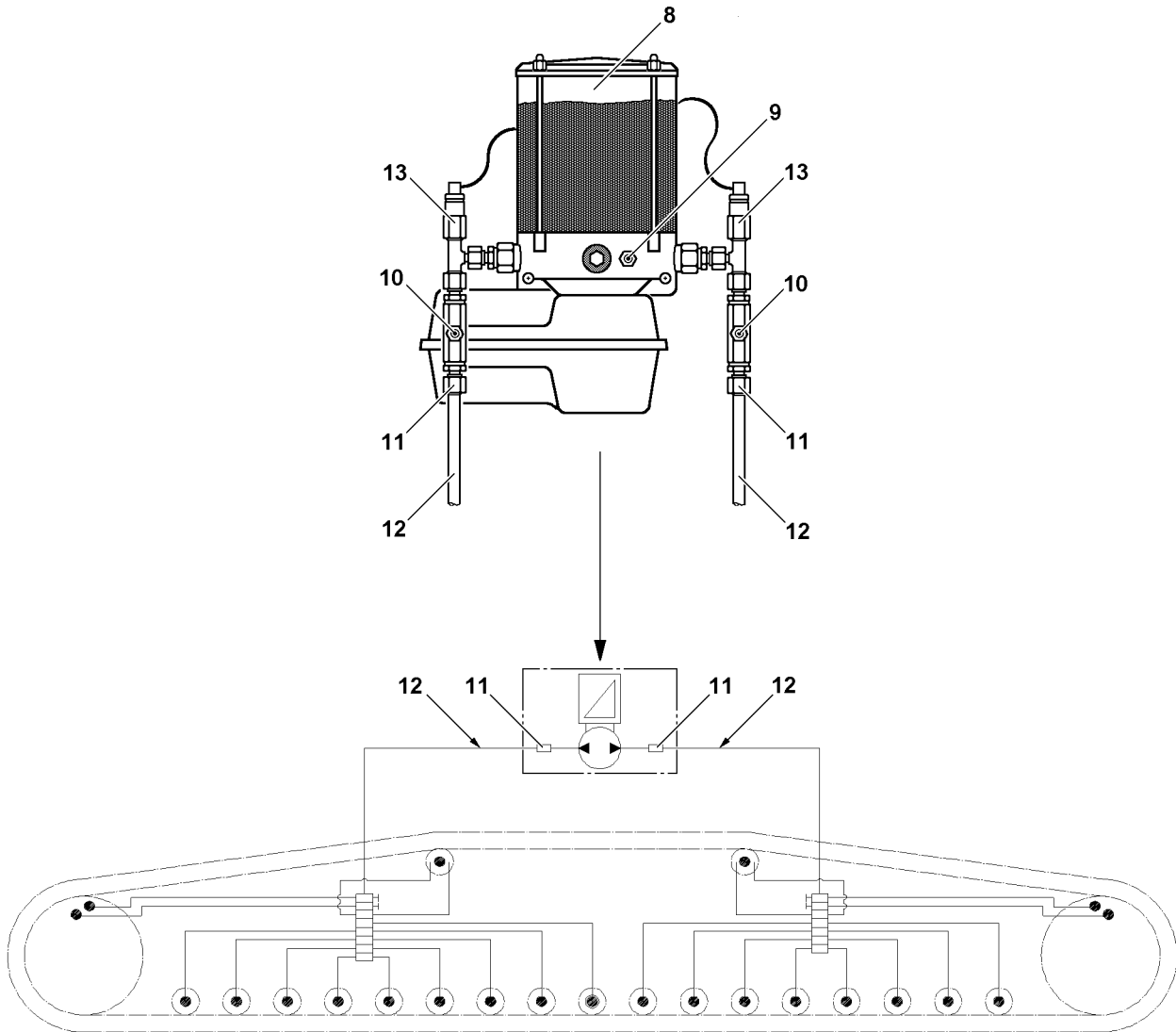
Personnel can be severely injured or killed!

- ▶ Actuate the foot rocker carefully while bleeding the grease pump!
 - ▶ Watch the emergence of grease from the grease pump from a safe position!
-
- ▶ Fill the grease container **8** using an external grease pump via the grease fitting **9**.
 - ▶ Fill the main lines **12** with an external grease pump via the grease fittings **10** until grease free of air bubbles emerges on all grease points.



Note

- ▶ Carry out the bleeding procedure individually for each main line connection **11**!
 - ▶ Every crawler carrier has a separate grease pump!
-
- ▶ Unscrew the main line **12** from the main line connection **11**.
 - ▶ Start the crane engine.
 - ▶ Select crawler operation.
 - ▶ Actuate the foot rocker / manual control lever of the crawler carrier of the grease pump which is being bled only so far that the track chain does not start to move.
- Result:**
- The grease pump starts to supply.
 - The acoustic signal crawler operation sounds.
- ▶ Actuate the foot rocker / manual control lever only until grease free of air bubbles emerges on the main line connection **11**.
 - ▶ Connect the main line **12** again.
 - ▶ Actuate the foot rocker / manual control lever again until grease emerges again on at least one of the grease points in the bled lubrication circuit.



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2.2.2 Bleeding by separate actuation of the grease pump



Note

- ▶ Work on the electrical system of the crane may only be carried out by authorized and trained expert personnel!

Make sure that the following prerequisite is met:

- The separate electric wiring diagram of the crane is available.
- ▶ Fill the grease container **8** using an external grease pump via the grease fitting **9**.
- ▶ Fill the main lines **12** with an external grease pump via the grease fittings **10** until grease free of air bubbles emerges on all grease points.



Note

- ▶ The bleeding procedure must be carried out individually for each main line connection **11**!
- ▶ Every crawler carrier has a separate grease pump!

- ▶ Unscrew the main line **12** from the main line connection **11**.
- ▶ Actuate the grease pump separately, see crane electric wiring plan.

Result:

- The grease pump starts to supply.
- ▶ Actuate the grease pump until grease free of air bubbles emerges on the main line connection **11**.
- ▶ Connect the main line **12** again.
- ▶ Actuate the grease pump again until grease emerges again on at least one of the grease points in the bled lubrication circuit.

2.3 Bleeding repaired lubrication lines

NOTICE

Insufficient lubrication!

If there is air in the lube lines, lubrication points can run dry!

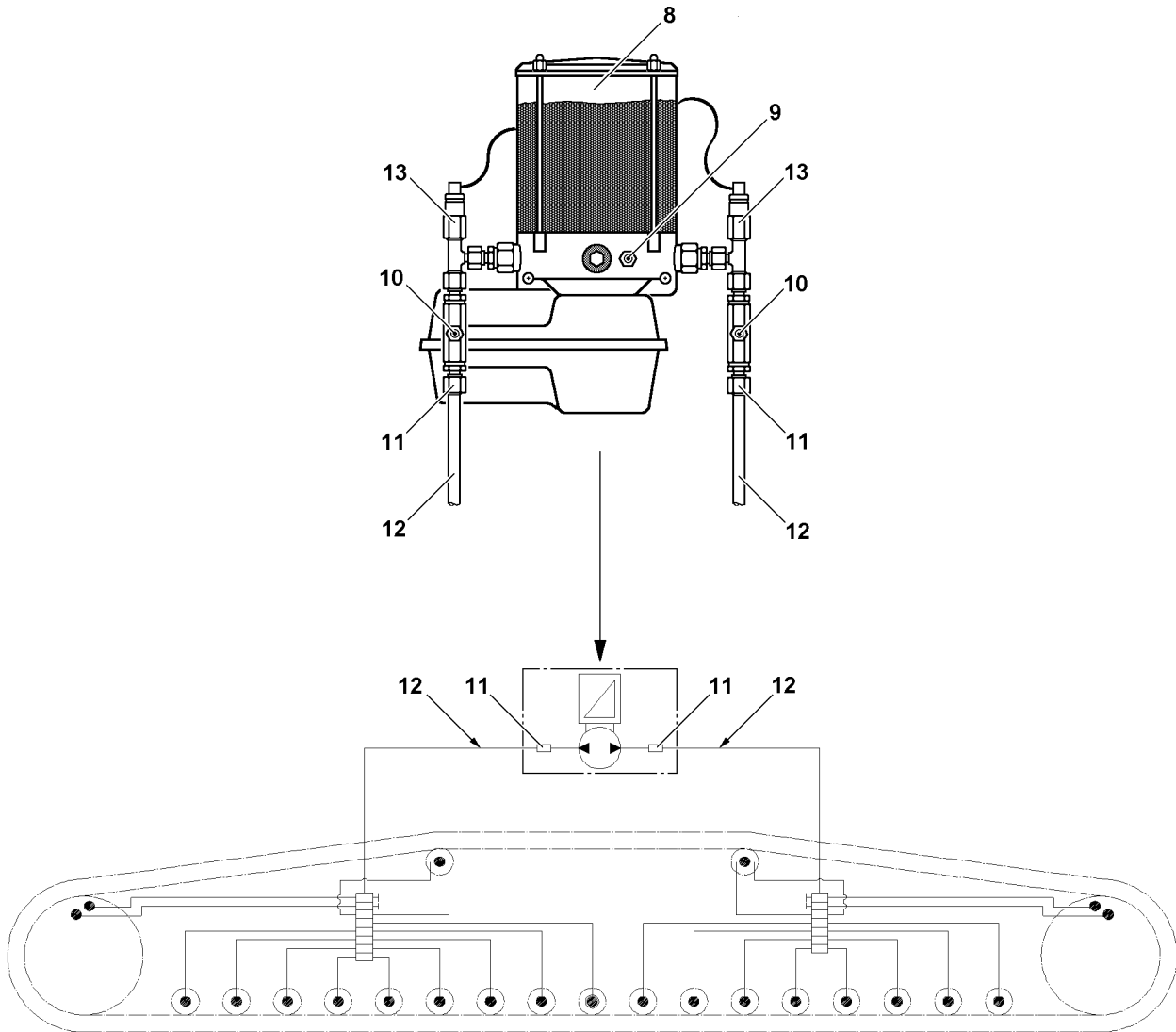
- ▶ If the lubrication lines are repaired or replaced, make sure that they are completely filled with grease!
- ▶ Fill lubrication lines completely with grease before installation.
- ▶ Check repaired lubrication lines for function and leaks.

2.4 Intermediate lubrication of crawler carriers

- ▶ Fill the main line **12** with an external grease pump via the grease fitting **10** until grease free of air bubbles emerges on all grease points.

or

- Actuate the foot rocker / manual control lever in crawler operation until the grease pump starts to supply, but the track chain does not yet start to move. Continue actuation until grease emerges on all lube points.



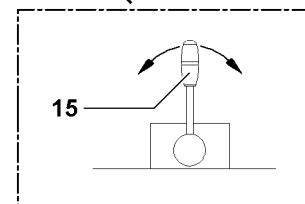
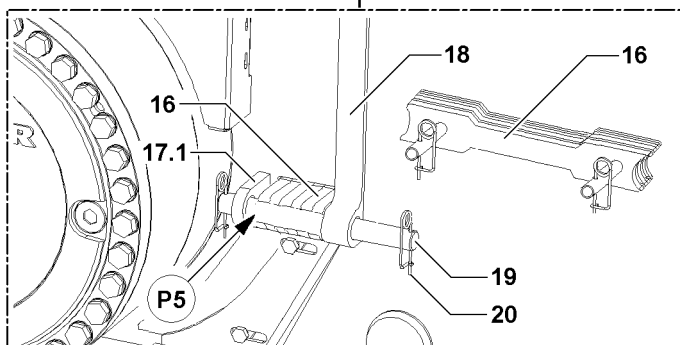
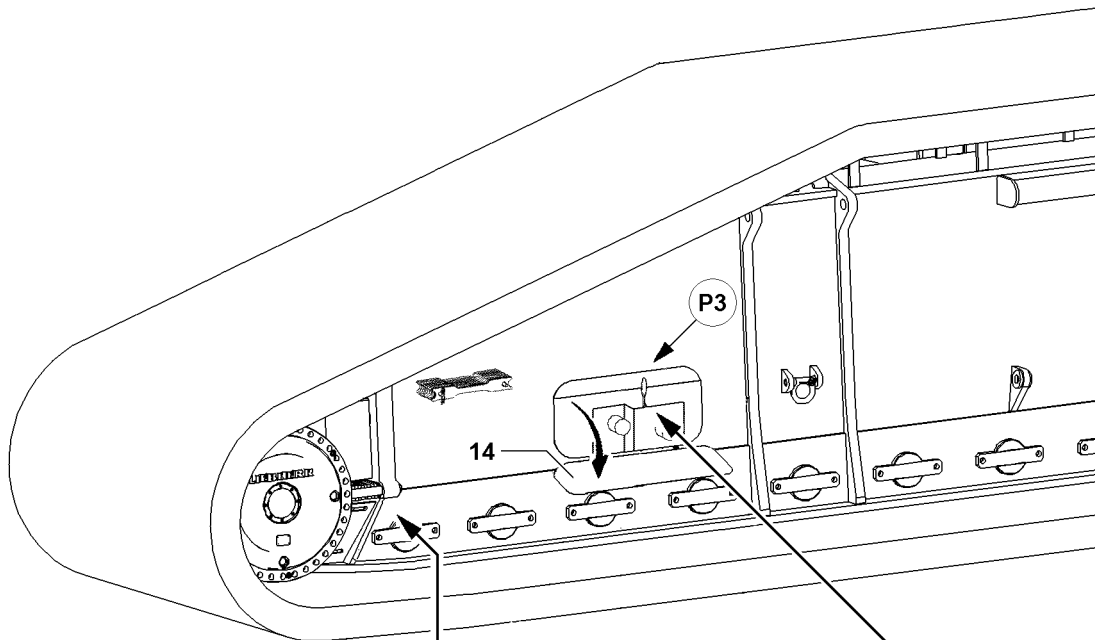
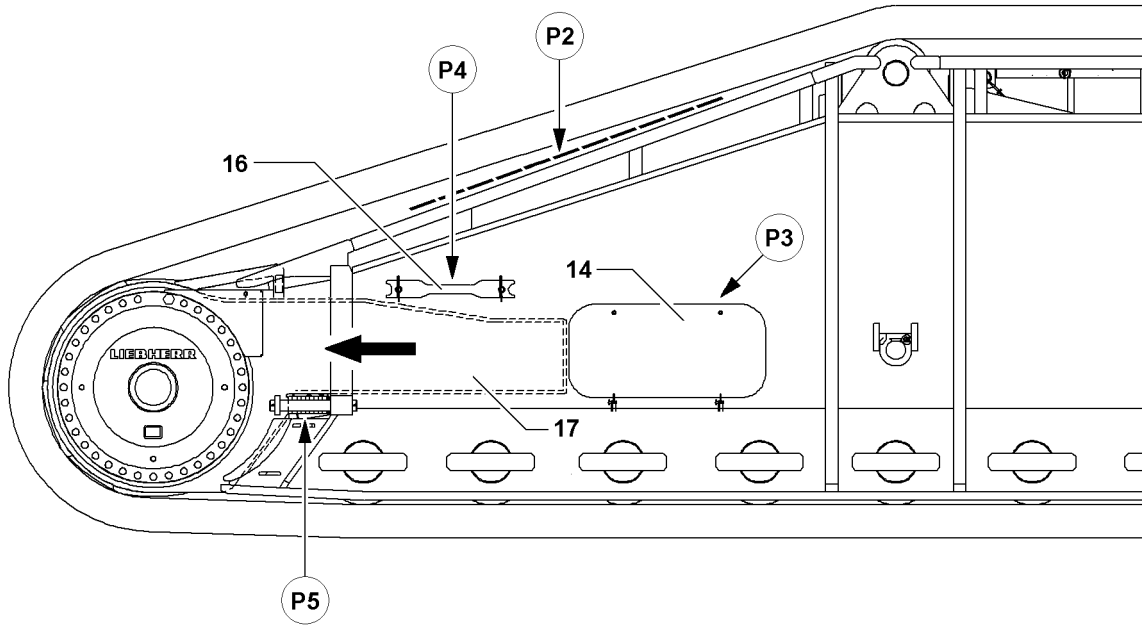
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2.5 Troubleshooting on the central lubrication system

Problem	Cause	Remedy
The grease pump does not work	Electrical line interrupted, grease pump defective	Fix or replace the electrical line, replace the grease pump
Grease pump operates, but does not deliver	Air cushion in delivery piston, minimum fill level fallen below, grease pump element defective	Bleed grease pump, fill reservoir, replace grease pump element
No grease collar on all lube points	Grease pump does not work, system blocked	See "Grease pump does not work" or "Grease emerges via 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
Grease pump speed reduced	Higher system pressure, lower ambient temperature	Check system / bearing points, no damage: Lubricate once or twice in between if necessary ¹⁾
Grease emerges on pressure relief valve	System pressure too high, distributor blocked, system blocked, defective valve spring on pressure relief valve	Check system, replace distributor, repair blocked / seized bearing point, replace pressure relief valve

1) See section "Intermediate lubrication of crawler carriers".

If a problem cannot be remedied, contact the Service Dept. at Liebherr-Werk Ehingen.



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3 Servicing the track chain



Note

- ▶ The illustrations in this chapter are examples and may not apply exactly to your crane!

In crawler operation, the components of the track chain wear and must therefore be checked in specified intervals, see Crane operating instructions, chapter 7.02 and replaced with new components, if necessary.

3.1 Tensioning the track chain

NOTICE

Damage to the track chain!

If the chain tension is not checked within the specified maintenance intervals, the track chain or the steel structure of the crawler carrier can be damaged!

- ▶ Observe the maintenance intervals, see Crane operating instructions, chapter 7.02!
- ▶ If the track chain of the steel structure of the crawler carrier gets close to point **P2** or if it has already made contact with the steel structure, then the track chain must be retensioned **immediately!**



Note

- ▶ By extending the tension cylinder which is integrated in the crawler carrier, the sliding section **17** is moved in direction of the arrow!
- ▶ The chain tension is held by spacer plates **16!**

NOTICE

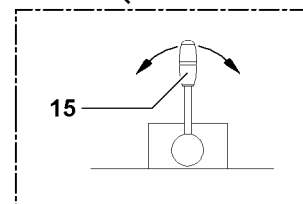
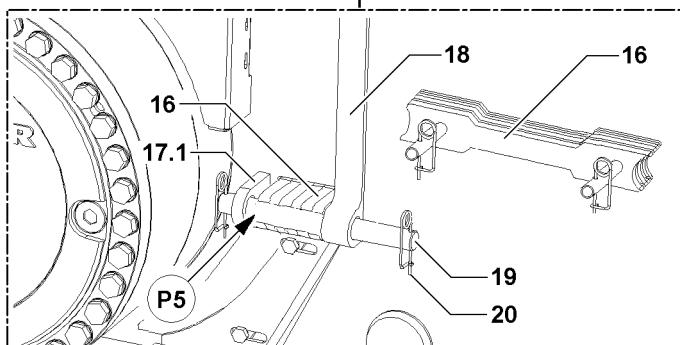
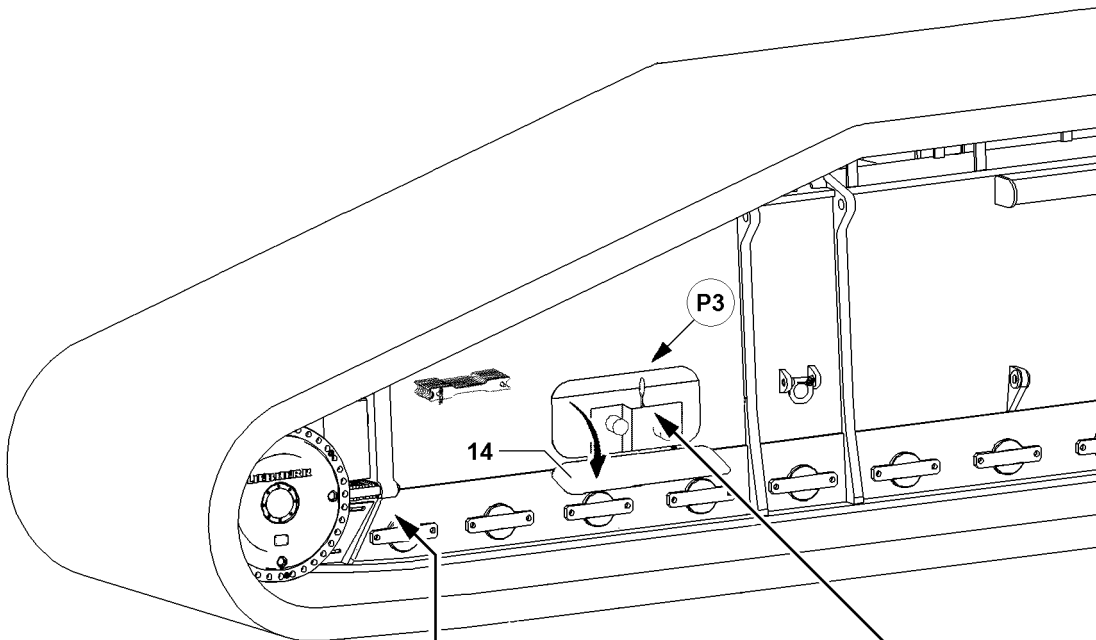
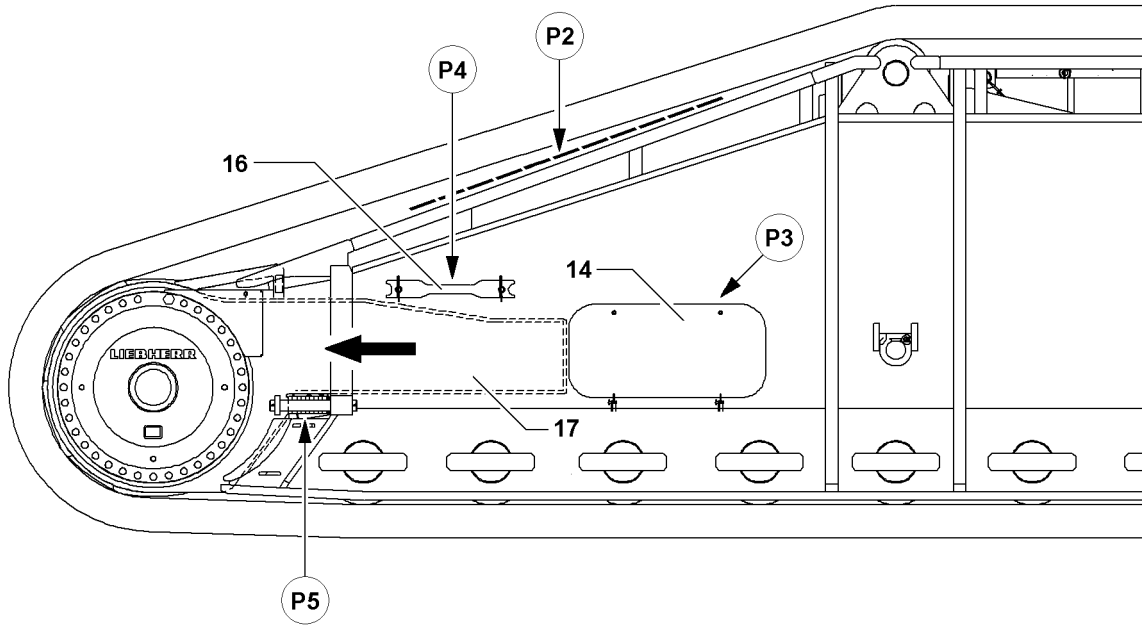
Foreign particles in track chains!

Foreign particles in the track chains and on the travel drive can cause damage!

- ▶ Before tensioning the track chains, check the track chains and the travel drives for foreign particles, such as rocks and clean them, if necessary!

Make sure that the following prerequisites are met:

- The crane is in horizontal position.
- The hydraulic aggregate is available.



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3.1.1 Hydraulic connection tension cylinder

When hydraulic lines are connected / disconnected using quick-release couplings, please ensure that the coupling procedure is being performed correctly.



WARNING

Pressure in the hydraulic lines!

If the pressure supply is not interrupted before connecting / releasing the hydraulic lines, the hydraulic oil can escape with high pressure!

Personnel can be severely injured or killed!

- ▶ Release the pressure in the hydraulic lines before connecting / disconnecting: Interrupt the pressure supply and wait for a short time!



WARNING

Loss of pressure or leakage!

Incorrectly coupled or self-loosening quick-release couplings (particularly return lines) can result in serious accidents due to component failure!

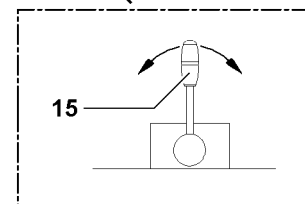
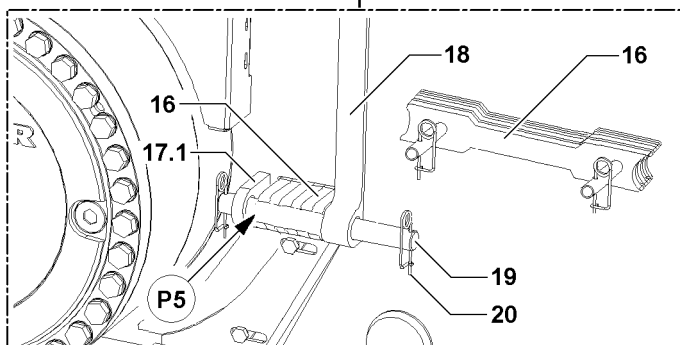
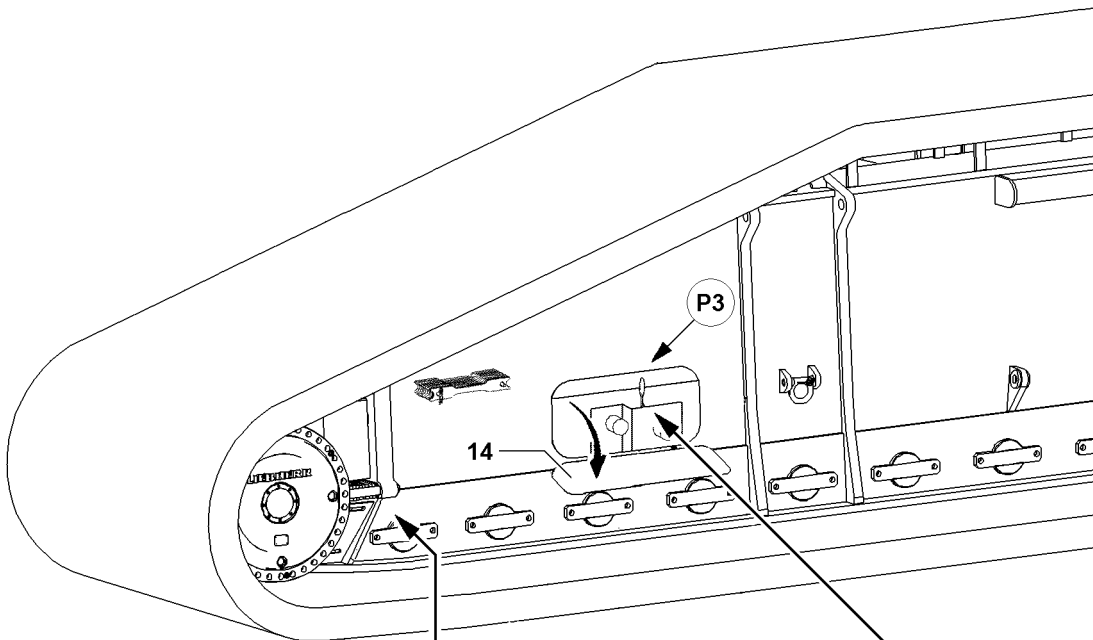
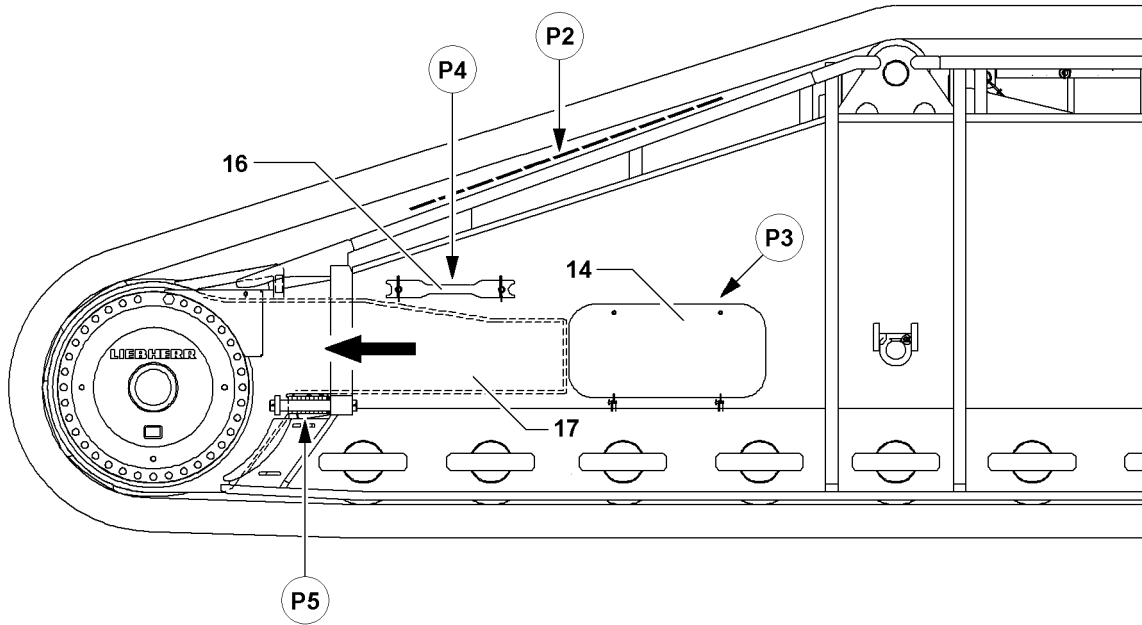
- ▶ Check that the quick-release couplings have been properly connected before starting the tension procedure!

Establishing the hydraulic connection

- ▶ Open the maintenance hatch **14** on point **P3**.
- ▶ Connect the quick-release coupling components (sleeve and connector) and screw together with the hand-tightened nut.
- ▶ Tighten quick-release couplings by hand: Rotate the hand-tightened nut until it reaches a tangible, fixed stop position.
- ▶ Add the pressure supply.

Disconnecting the hydraulic connection

- ▶ When the tension procedure has been completed: Interrupt the pressure supply.
- ▶ Disconnect the coupling parts (sleeve and connector).
- ▶ Install dust caps on the quick-release couplings.
- ▶ Close the maintenance hatch on point **P3**.



B110054

3.1.2 Carrying out the tension procedure

- ▶ Extend the tension cylinder completely with the manual lever **15.1**.

Result:

- The crawler chain is tensioned.

- ▶ Remove the spacer plates **16** from the transport receptacle on point **P4**.
- ▶ On point **P5**, insert as many spacer plates **16** as fit into the gap between the stop sliding section **17.1** and the stop crawler carrier **18**!
- ▶ Secure the spacer plates **16** with pin **19** and spring retainer **20**.



WARNING

Danger of crushing!

When retracting the tension cylinder, body parts, such as: Fingers, hands and arms can be crushed or severed!

- ▶ When retracting the tension cylinder, any work on the crawler carrier is prohibited!

-
- ▶ Retract the tension cylinder with the manual lever **15**.
 - ▶ After the tension procedure, drive the crawler back and forth about one crawler length in operating mode "Straight forward travel".

Result:

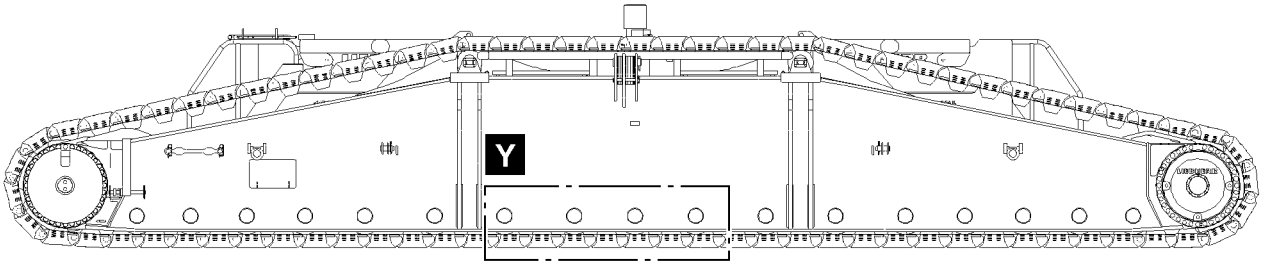
- The tension of the track chain is reduced.

- ▶ Check the distance of the track chain to the steel construction of the crawler carrier again at point **P2**.

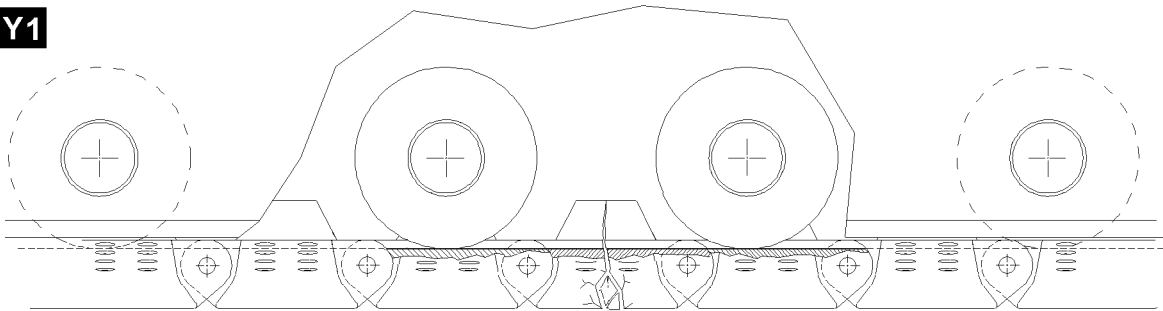


Note

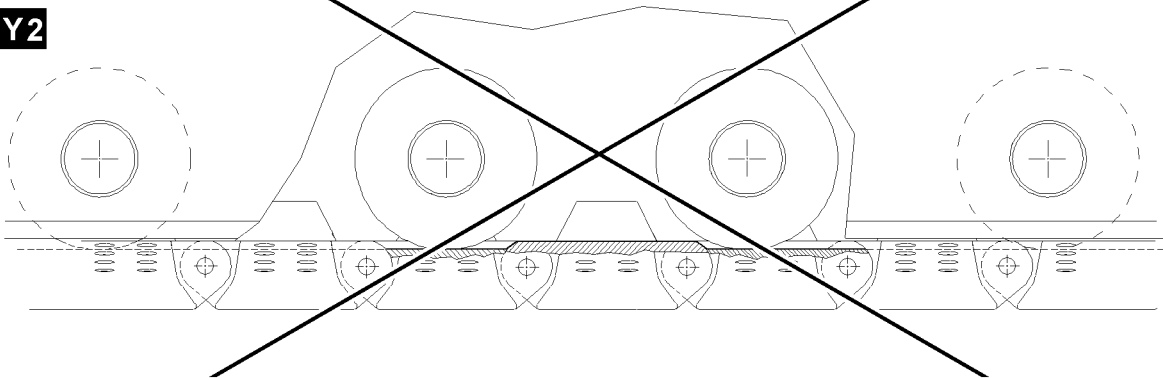
- ▶ If necessary, repeat the tension procedure of the track chain and insert additional spacer plates **16**!
 - ▶ If the lift on the tension cylinder is no longer sufficient to tension the track chain, then trained expert personnel must remove one track pad!
-



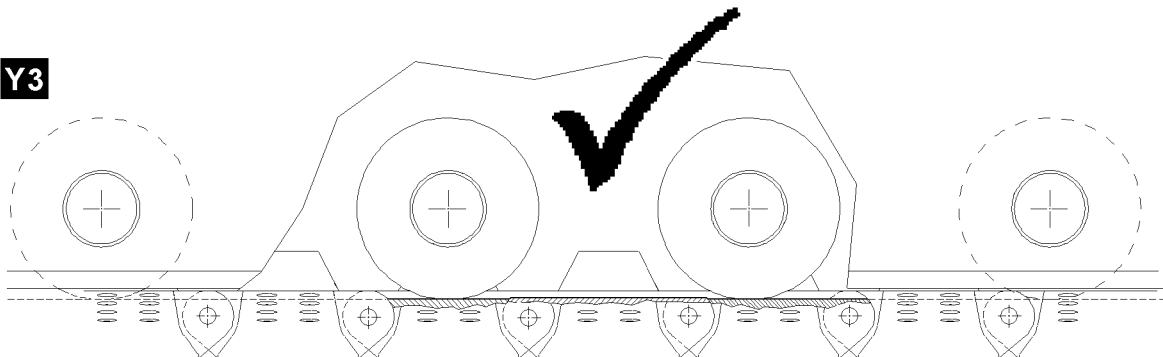
Y1



Y2



Y3



B109917

3.2 Checking wear on the track chain



WARNING

Track chain can be ripped off!

If the wear limit on the track pads **21**, bolts **22** or track rollers **23** is exceeded, then the track chain can break off during crawler operation!

The crane can topple over and personnel can be severely injured or killed!

- ▶ Random checks of the track pads **21**, bolts **22** and track rollers **23** must be carried out within the specified intervals!
- ▶ During the random inspection of the track rollers, the first and last track roller on the crawler carrier must be included in the inspection!
- ▶ If a wear limit on the component is reached, then the component must be replaced or remachined!

NOTICE

Significant wear of crawler travel gear!

If an individual track pad **21** must be replaced then it may not be replaced with a track pad **21** which shows a much lower degree of wear!

Significant height differences between the individual track pads **21**, see illustration **Y2**, lead to an increased mechanical stress on the track pads **21** and the track rollers **23** of the crawler carrier!

- ▶ Replace a defective track pad **21** with a track pad **21** which shows a similar degree of wear, see illustration **Y3**!

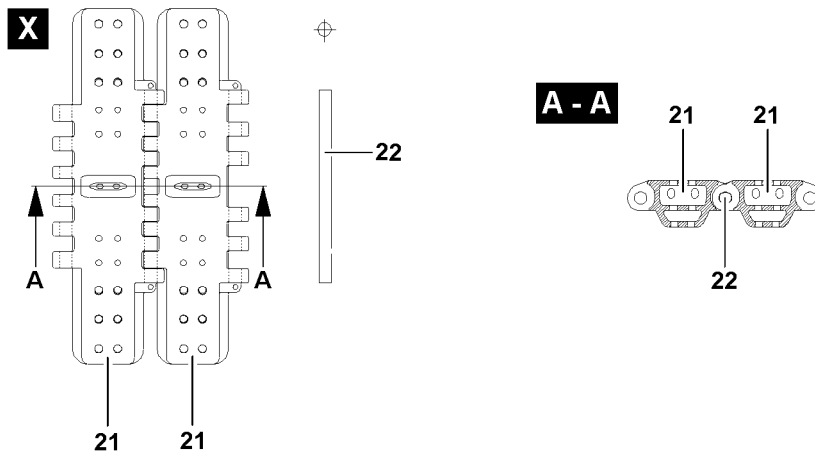
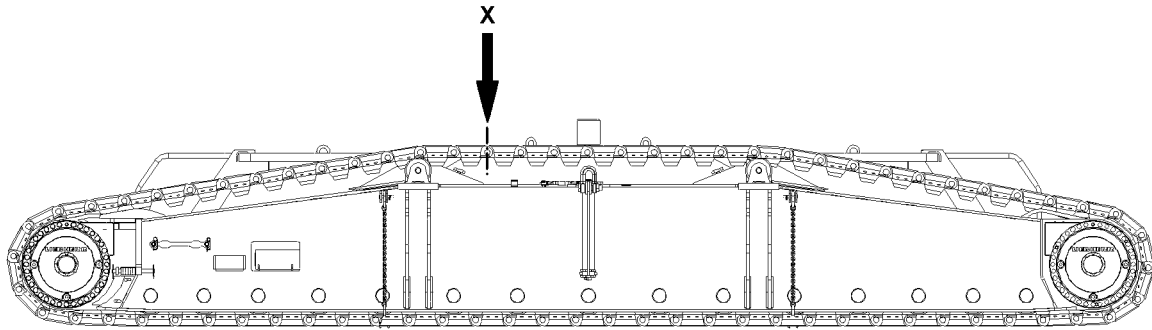


Note

- ▶ Due to the break-in period of the components toward each other, a larger stretch of the track chains occurs on a new crawler travel gear. For that reason, it may be necessary to remove a track pad **21** earlier to be able to tension the track chain correctly!

The wear of the track pad **21**, bolts **22** and track rollers **23** depends a various factors:

- Length of travel route
- Frequency of driving in curves
- Friction ratios track pad **21** - ground
- Evenness of the ground
- Type of ground
- Load bearing capacity of the ground / base
- Position of the total center of gravity
- Load on the hook
- Placed ballast on the crane



B108536

3.2.1 Checking the wear on the connections of the track pads

NOTICE

Damage to the sprocket!

If the wear limit on the connections to the track pads is achieved, it can lead to increased wear on the sprocket and on the transporting lugs of the track pads due to excessive chain stretch!

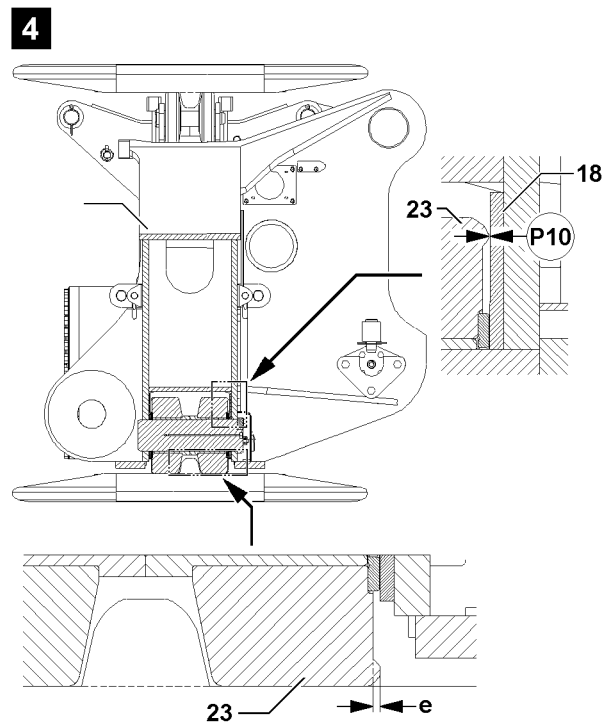
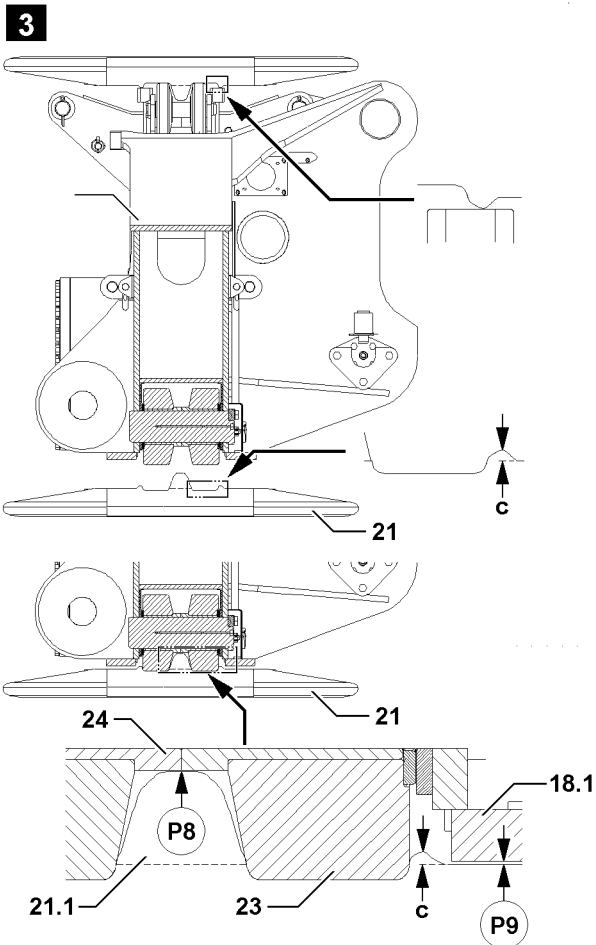
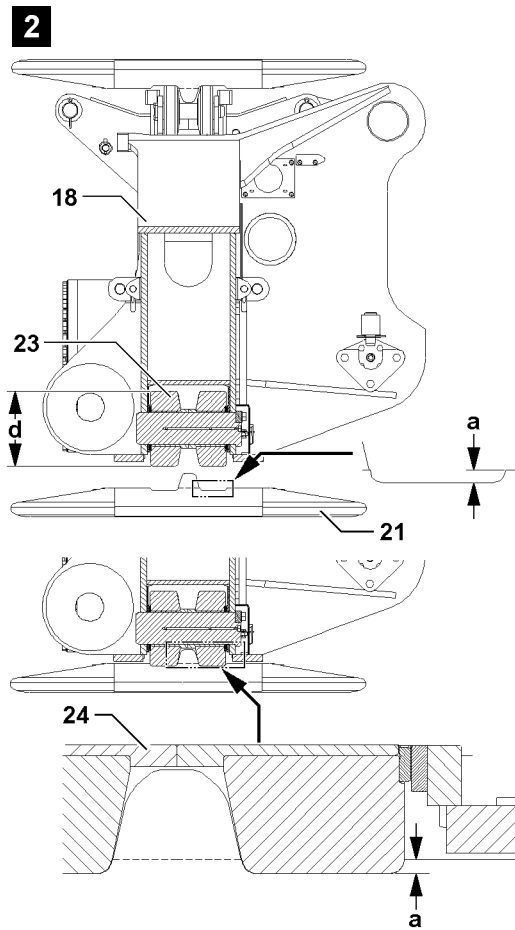
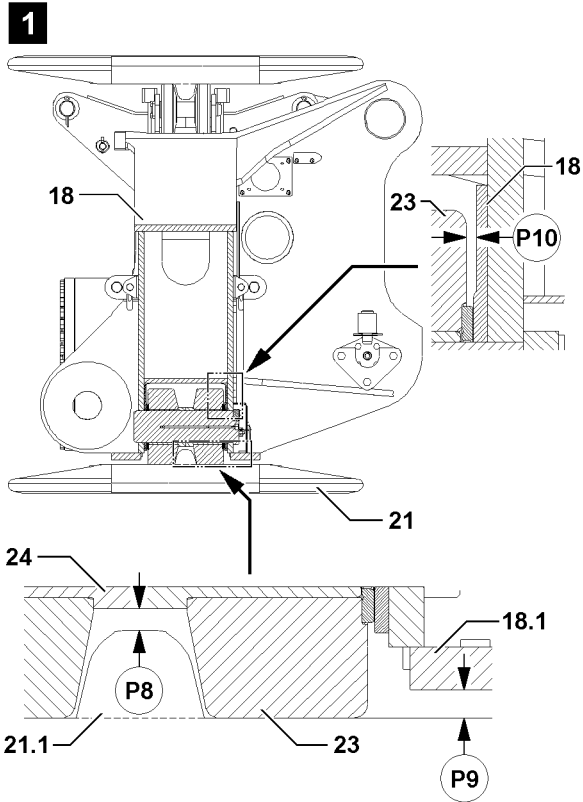
Expensive and extensive repairs can result!

- ▶ The random inspection of the bolt diameter must be made within the specified intervals!
- ▶ If one bolt **22** falls below the minimum permissible dimension, then it must be replaced with a new bolt **22**!
- ▶ The random inspection of the bore diameter must be made within the specified intervals!
- ▶ If the bore diameter exceeds the maximum permissible dimension, then the track pad **21** must be replaced!

The track pads **21** of the crawler track are connected by bolts **22**.

Wear limit bore for the track pad	
Initial diameter	53 mm
Maximum permissible upper limit	56 mm

Wear limit bolt	
Initial diameter	50 mm
Maximum permissible minimum dimension	49 mm



B109882

3.2.2 Checking the wear on the roll off surfaces of the track pads / track rollers

NOTICE

Destruction of track pad!

If a track pad **21** is not fixed or replaced after reaching the wear limit, then the track pad **21** will be destroyed and can cause damage to the crawler carrier **18**!

This could result in high property damage!

- ▶ Fix or replace the track pad **21** after reaching the wear limit!
-

NOTICE

Failure of track rollers!

If the track rollers **23** are not replaced after reaching the wear limit, then they can fail and cause damage to the crawler carrier **18** and track pad **21**!

This could result in high property damage!

- ▶ Replace track rollers **23** after reaching the wear limit!
-

NOTICE

Increased wear!

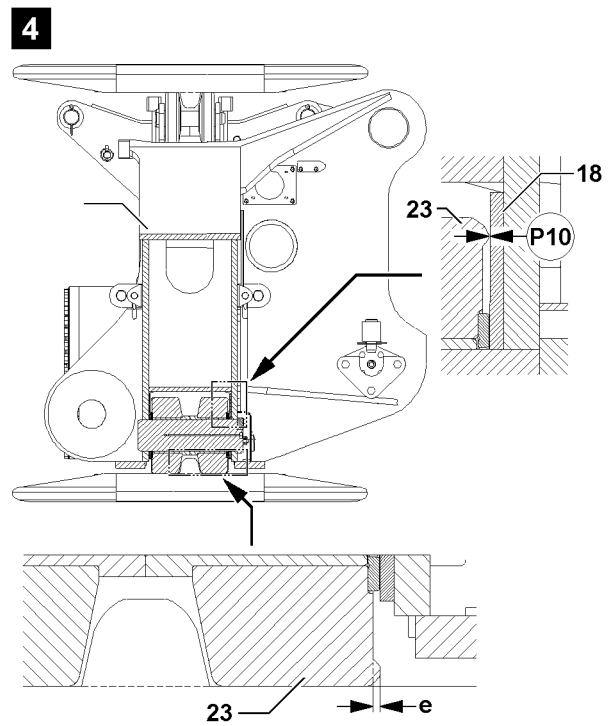
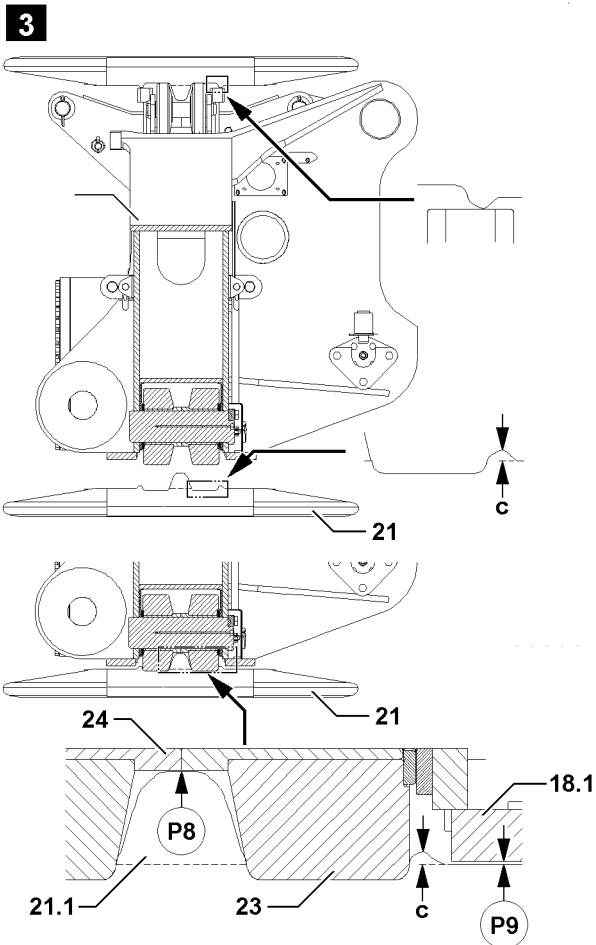
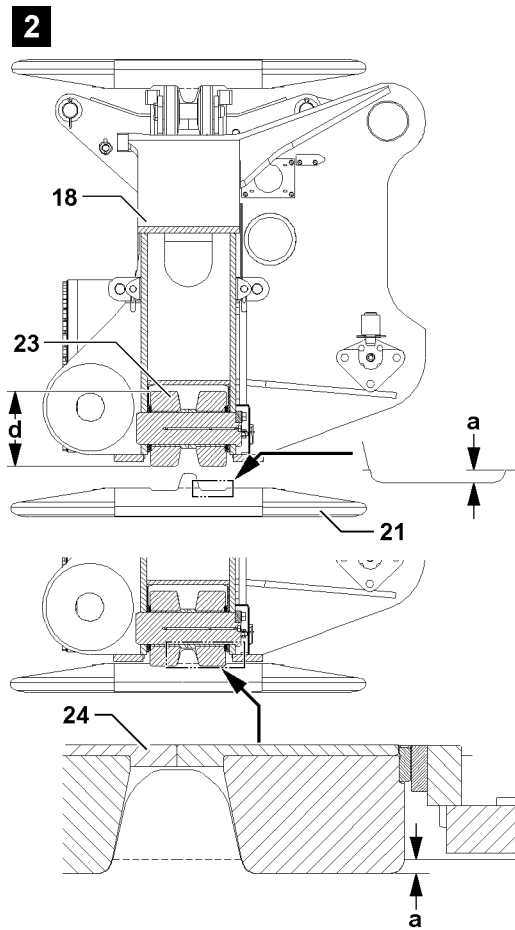
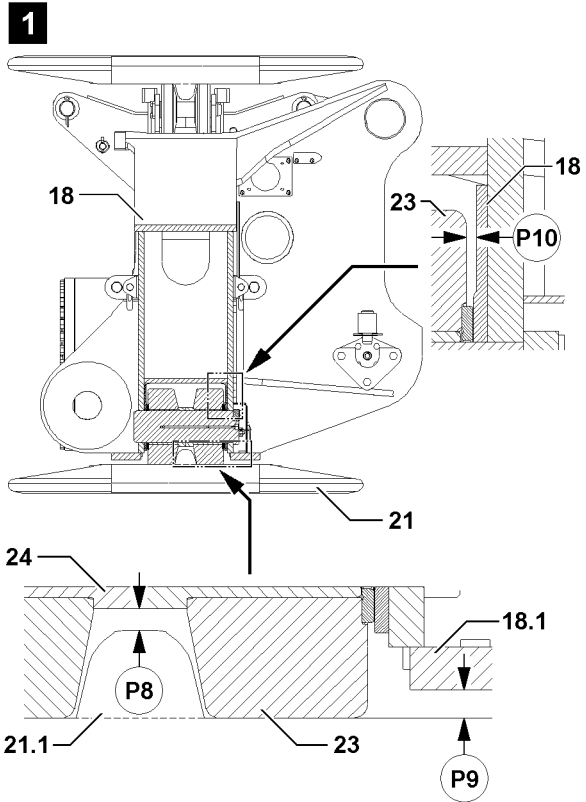
If the bulges on the track pads **21** and the track rollers **23** become too large, see illustration **3** and illustration **4**, then it results in increased wear on the crawler travel gear!

This could result in high property damage!

- ▶ Grind off / remove bulges in time!
-

If the wear limits are not adhered to, the minimum distances are fallen below:

- On point **P8** between the transporting lugs **21.1** and track roller body **24**
- On point **P9** between the track pad **21** and base belt **18.1**
- On point **P10** between the track rollers **23** and crawler carrier **18**



B109882

Wear limit track pad	
Maximum permissible run in depth a	8 mm
Maximum permissible bulge c	1)

Wear limit track roller	
Initial diameter	400 mm
Permissible minimum diameter d (measured in the center of the running surface)	396 mm
Maximum permissible bulge e	3 mm ²⁾

1) As soon as the bulge scrapes on the base belt of the crawler carrier, **grind bulge off!**

2) Valid for all travel gear systems: If bulge is more than 3 mm, **grind bulge off!**



WARNING

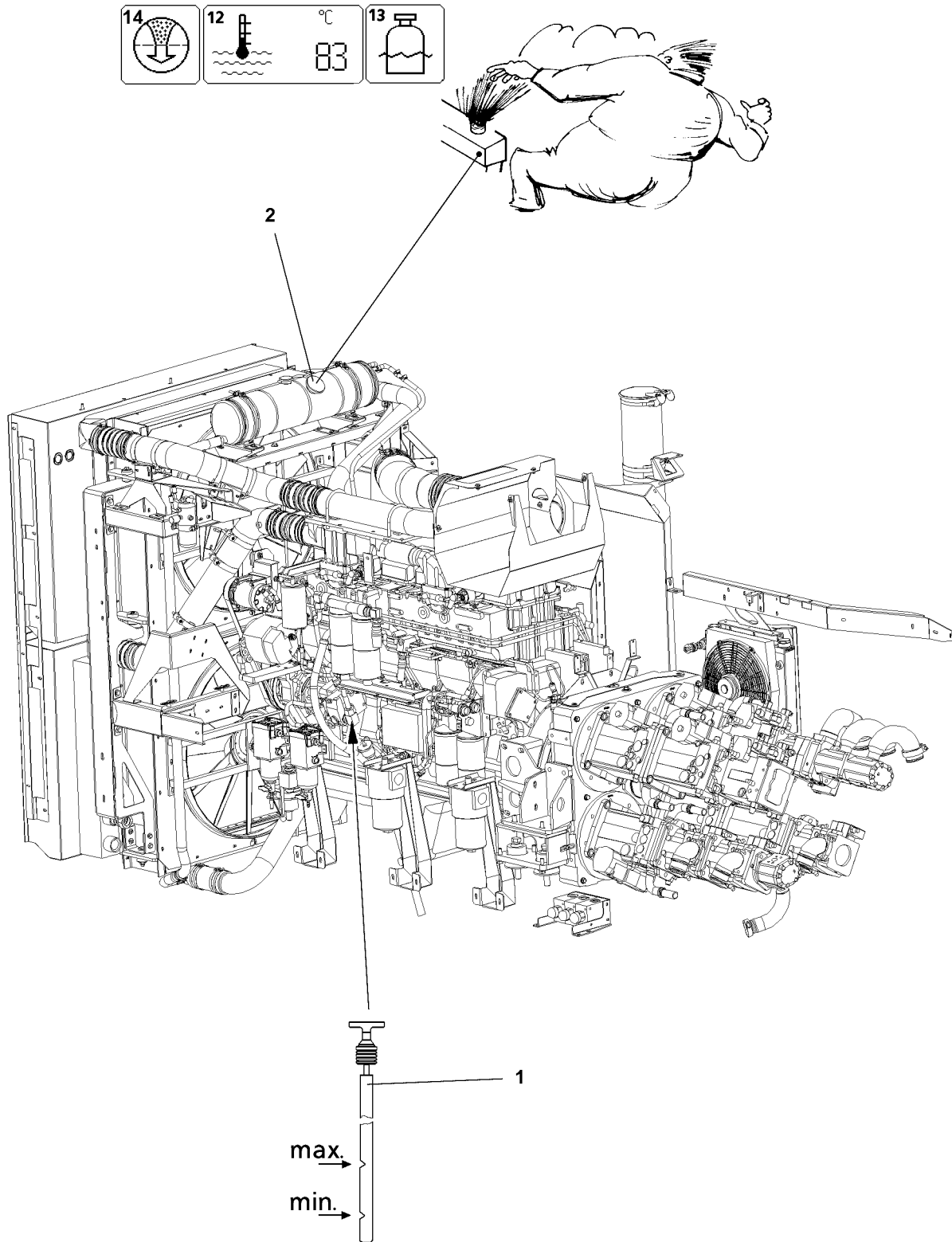
Danger of injury due to improper procedure!

- ▶ All work on the track chains must be carried out by trained expert personnel!



Note

- ▶ Track pads, which have reached the maximum run in depth or whose running surface is heavily worn can be repaired by repair welds according to welding guideline or repair instructions of **LIEBHERR-Werk Ehingen GmbH!**
- ▶ Damage on sprocket and track pads - caused by operational wear - can be repaired by repair welds according to welding guidelines or repair instructions of **LIEBHERR-Werk Ehingen GmbH!**
- ▶ Please contact the Service Dept. at **LIEBHERR-Werk Ehingen GmbH!**
- ▶ Replace worn track rollers **23**.
- ▶ Grind off excessive bulges, see illustration **3** and illustration **4**.



B102652

1 Crane engine

Never step on fuel lines during maintenance or repair work in the engine area!



DANGER

Risk 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

Risk 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!

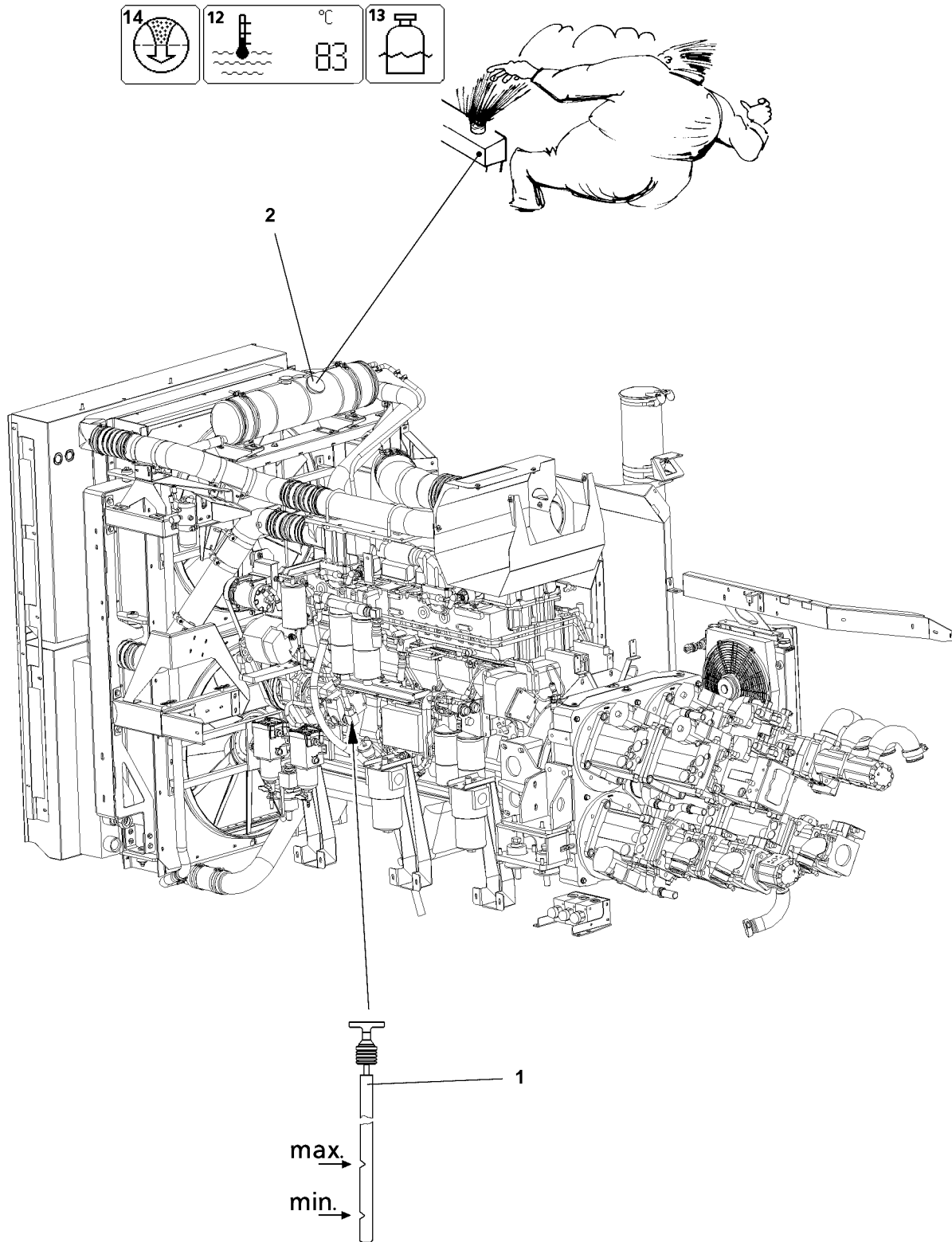
- ▶ Add engine oil and check again!
- ▶ Reinsert the dipstick **1**.

1.1.2 Changing the oil



Note

- ▶ Refer to the separate operating instructions for “CUMMINS Diesel engines”!



B102652

1.2 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

Risk of skin burns!

▶ Check the coolant only when the engine is cold!

- ▶ 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.

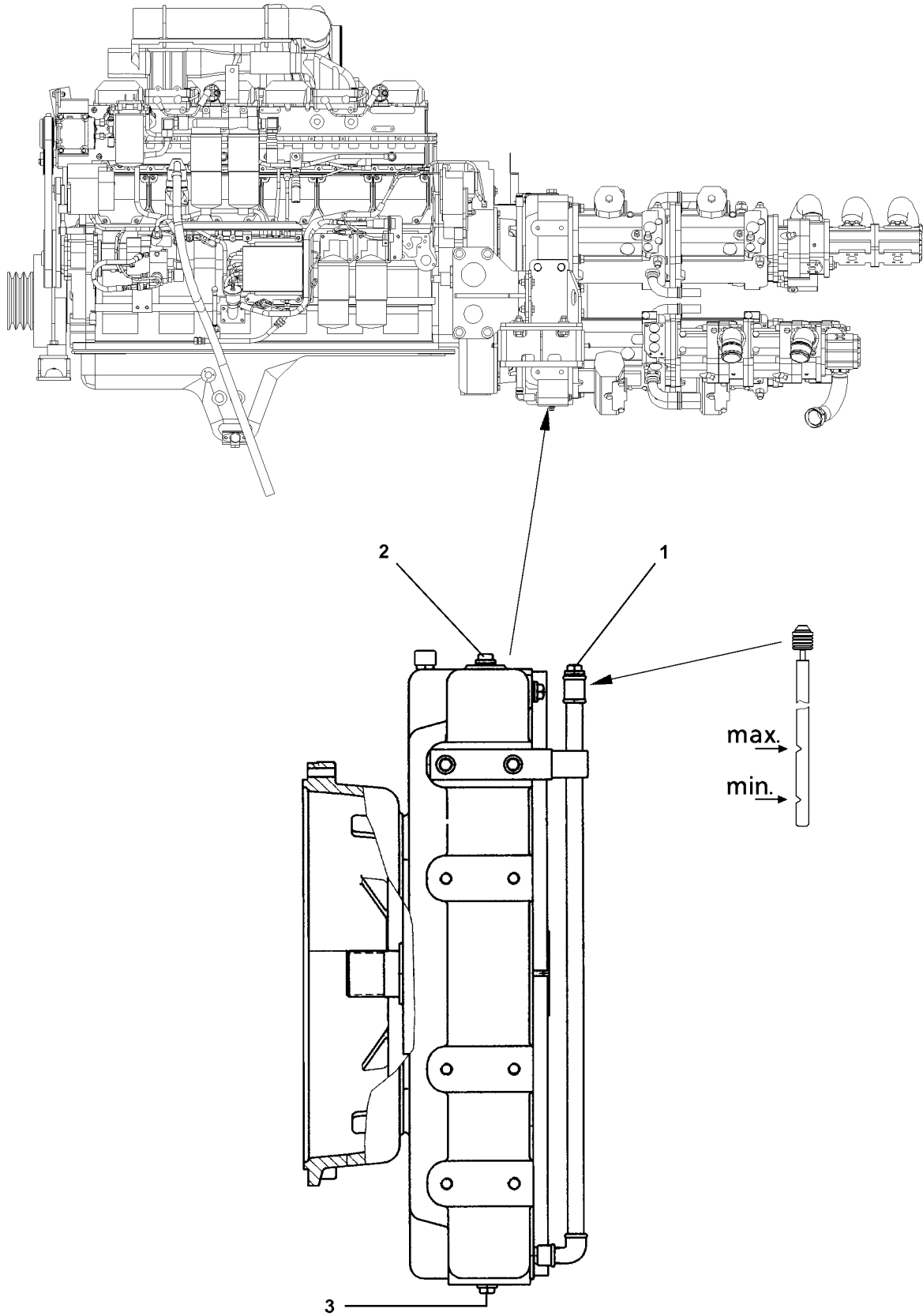
Add coolant as specified in the lubrication chart only on the filler neck of the water cooler expansion tank.

- ▶ Add coolant to overflow level if necessary.
- ▶ Close the cover **2** tightly.

1.3 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 unit.



B102653

2 Pump distributor gear

Maintain utmost cleanliness during all work to prevent any dirt from entering the inside of the gear.

2.1 Checking the oil level

**Note**

▶ Make sure that 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 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 engine oil as specified in the lubrication chart until the oil level is between the minimum and maximum marks!

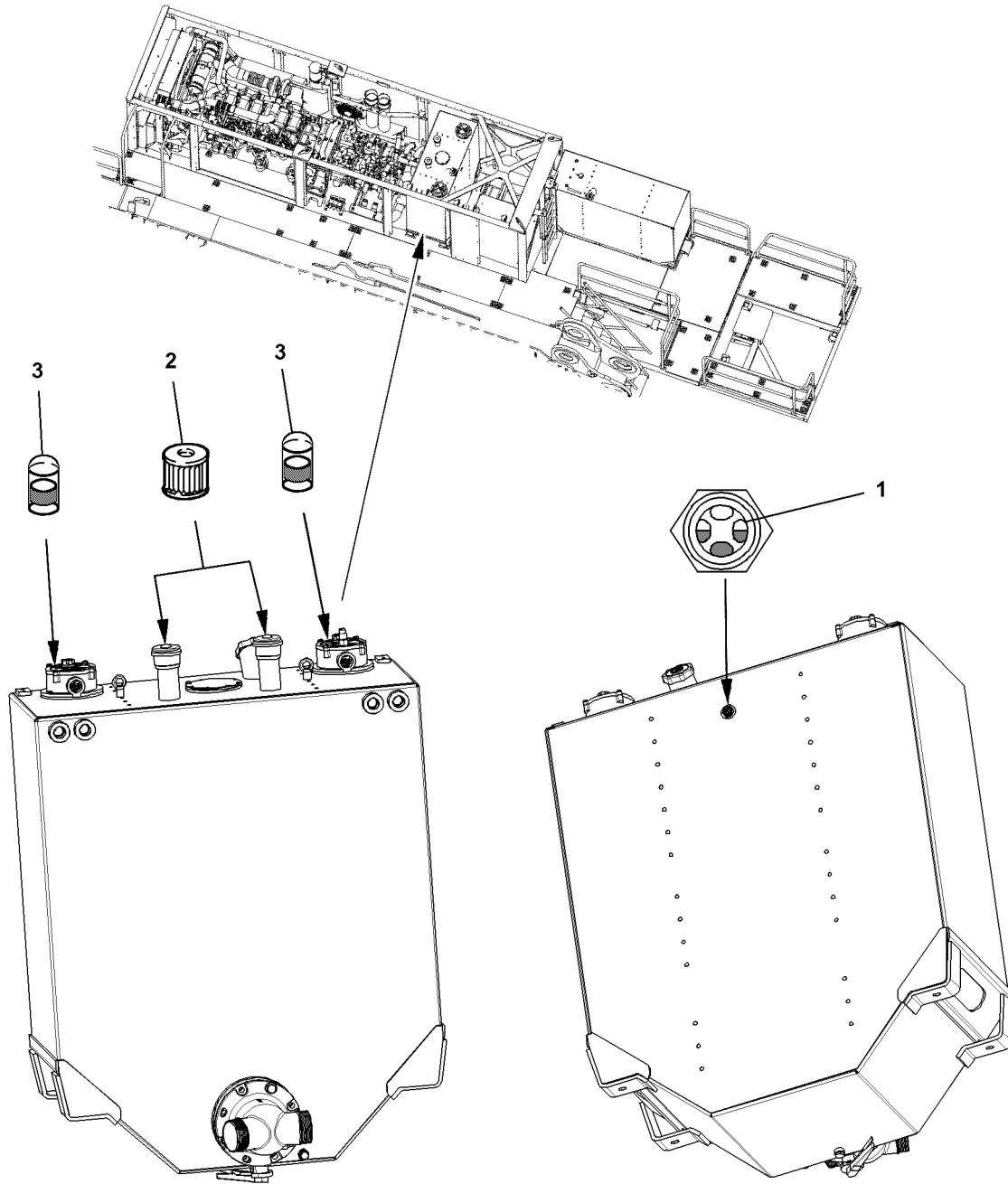
- ▶ Add oil and check again!

- ▶ Reinsert the dipstick **1**.

2.2 Changing the oil

Make sure that the following prerequisites are met:

- The crane is in horizontal position.
- The gear is warm.
- ▶ Remove the oil filler plug **2**.
- ▶ Remove the oil drain plug **3** and drain the oil.
- ▶ Install the oil drain plug **3** with new seal and tighten.
- ▶ Add oil as specified in the lubrication chart on the oil filler plug **2** until the oil level is between the min. and max. marks on the dipstick **1**.
- ▶ Install the oil filler plug **2** with new seal.
- ▶ Check the oil level.



B102654

3 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!

3.1 Hydraulic tank

3.1.1 Checking the oil level

Make sure that the following prerequisites are met:

- The crane is in horizontal position.
- All hydraulic cylinders 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.

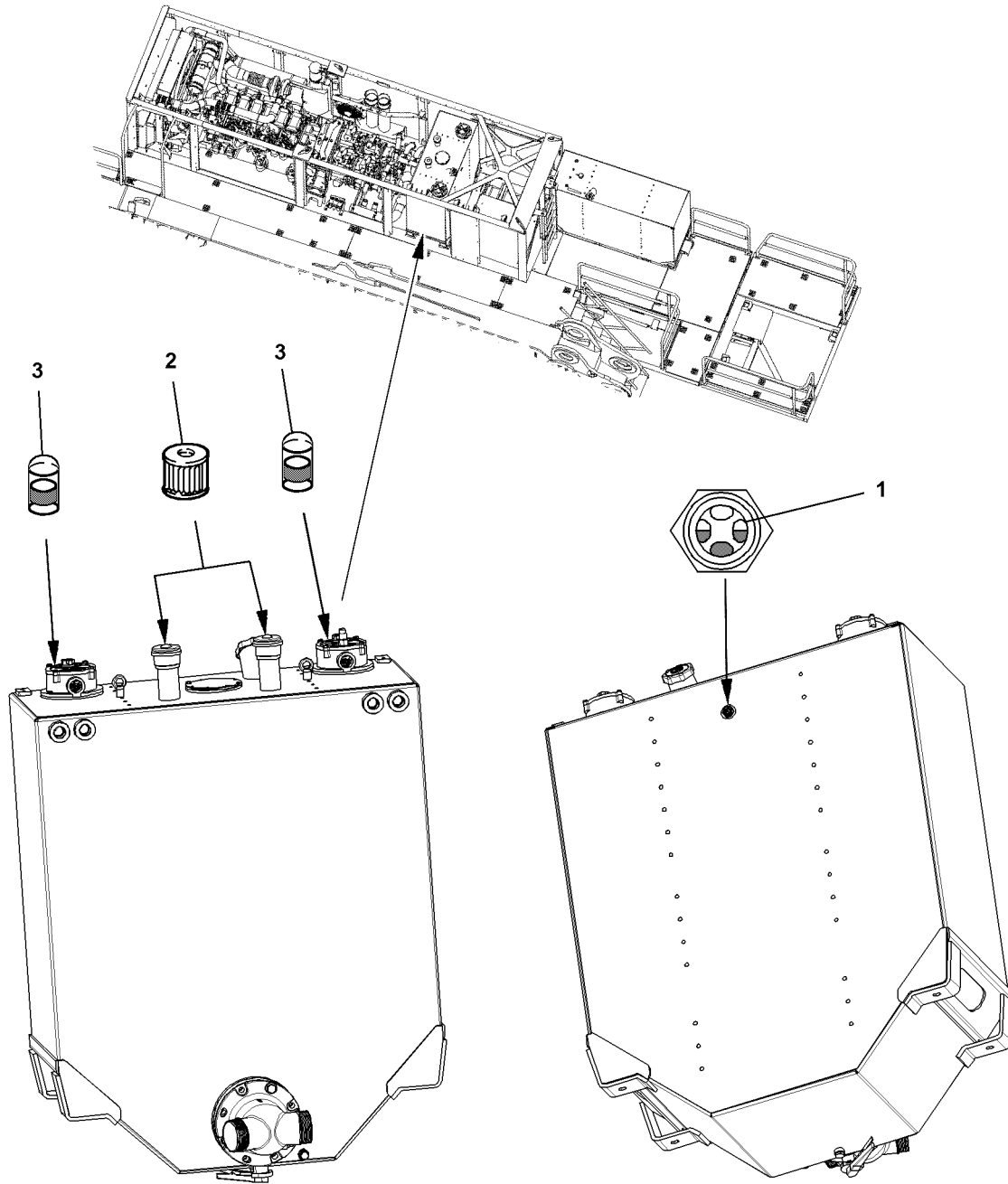
Troubleshooting

No oil is visible in the oil level sight gauge **1**?

- ▶ Add oil as specified in the lubrication chart using a fine-mesh strainer until oil level is in center of the oil level sight gauge **1**.

3.1.2 Checking the breather / vent 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.

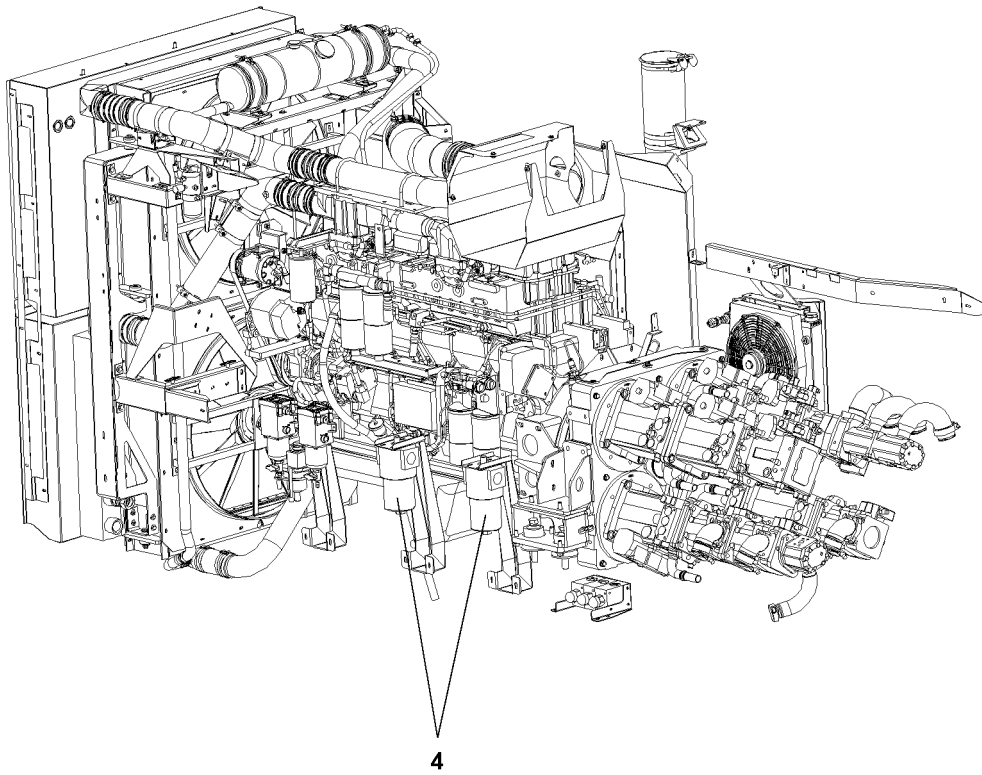


B102654

3.1.3 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 and remove 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.
- ▶ Replace both filter covers and screw tight.
- ▶ Start the engine and check the filter for leaks.
- ▶ Check the oil level and add oil if necessary.



B102655

3.2 Pressure filter in the crane hydraulic

The pressure filter 4 is 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.
- ▶ 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.
- ▶ Screw on and tighten new filter cartridge.
- ▶ 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.

3.3 Diaphragm reservoir

Various diaphragm reservoirs are installed in the hydraulic system. The pretension pressures are specified in the hydraulic circuit diagram as well as on the individual diaphragm reservoirs. The pretension pressure must be measured separately in each diaphragm reservoir.



CAUTION

Risk of damaging the hydraulic system!

If the ambient temperatures fluctuate considerably, for example after transfer to countries with extremely hot or cold temperatures or in countries with considerable differences between the summer and winter temperatures, the accumulator pressures may change!

- ▶ Check the 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

Risk 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 it, if necessary.

3.4 Hydraulic hose lines

The hydraulic hose lines must be checked according to ISO 9927-1 by an **experienced technician** or **expert mechanic**, as required, depending on the duration of use and the operating conditions, but at least once a year.

Experienced technicians are persons who have adequate knowledge of cranes because of their professional background and experience and are adequately familiar with the relevant settings to detect deviations from the correct situation (i.e. specially trained personnel).

Expert mechanics are mechanics who have experience in the design, construction or maintenance of cranes and have adequate knowledge of the relevant settings and standards and the necessary equipment to perform an inspection, and are in a position to assess the safety standards of the crane and decide which action needs to be taken to ensure that the crane can continue to be operated safely.



Note

► The applicable national regulations must also be complied with!

3.4.1 Checking the hydraulic hose lines within area of responsibility of the German employer's liability insurance associations

At least once a year, an **expert** must check whether the hydraulic hoses are in a safe condition. The crane must be inspected by an **authorized inspector** every four years from the day it was first licensed. After the 12th year of operation, the crane must be inspected annually by an authorized inspector.

The **expert** or **authorized inspector** must document the fact that the hydraulic hoses can continue to be used in the crane!

An expert is someone whose technical training and experience means that they have adequate knowledge in the field of hydraulic hoses and hose systems and are adequately familiar with the relevant national work safety regulations, accident prevention regulations, directives and generally accepted technical regulations (e.g. DIN standards, VDE regulations, technical regulations of other EU member states or other countries that have signed the European Economic Community agreement) that they are in a position to assess whether hydraulic hoses and hose systems are safe to work with.

An authorized inspector is someone employed by supervisory authorities. In Hamburg this is the Amt für Arbeitsschutz (work safety office) and in Hessen it is the technical supervisory offices or an authorized inspector employed by the professional associations.

3.4.2 Examples of possible defects in hose lines



DANGER

Risk of fire or accident!

If problems are discovered during inspections, then they must be remedied immediately or suitable measures are to be taken!

Failure to do this can result in serious injury to persons, death or damage to property!

► Remedy problems or take suitable measures!

- Damage to the outer layer as far as the intermediate layer (e.g. chafing, cuts and cracks)
- Outer layer brittleness (crack formation of the hose material)
- Deformation that differs from the natural shape of the hose or hose line, in depressurized as well as in pressurized condition or in bends, for example layer separation, bubbling, crushing or kinking
- Leaks
- Failure to follow installation instructions
- Damage or deformation of hose fittings that inhibit the function and strength of the fitting or the hose / fitting connection
- Hose slipping out of fitting
- Fitting corrosion that inhibits function and strength
- Storage time or usage period exceeded

3.4.3 Maintenance of hose lines

- We recommend to check all hoses, hose lines and screw fittings daily, but at least every two weeks for leaks and externally recognizable signs of damage.
- Damaged parts must be replaced immediately! Oil spray can lead to injuries and fires!
- Hydraulic lines and hoses may not be repaired!
- Hoses that have already been used in a hose system may not be reinstalled in hose systems.
- Always use original Liebherr spare parts when replacing hoses and hose systems.
- Always ensure that the hoses are routed free of torsion. If high pressure hoses are being used, attach screws of half clamps or full flange at both ends of hose and then tighten.
- When using high pressure hoses with a bent fitting, tighten the end with the bent fitting first when tightening the flanges, then the end with the straight fitting.
- Any mounting clamps in the hose center may be attached and tightened only thereafter.
- Route the hoses in such a way that chafing with other hoses or other structures is prevented. Maintain a minimum clearance of approximately $\frac{1}{2}$ the outer diameter of the hose to other parts. The clearance should never be less than 10 mm to 15 mm.

3.4.4 Replacing the hose lines



DANGER

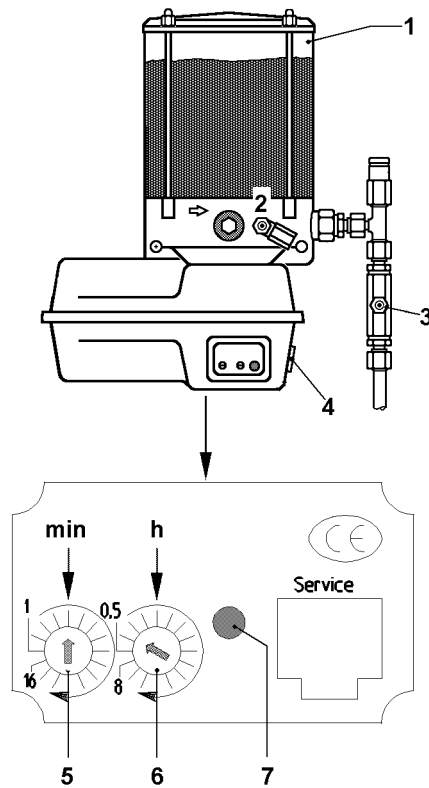
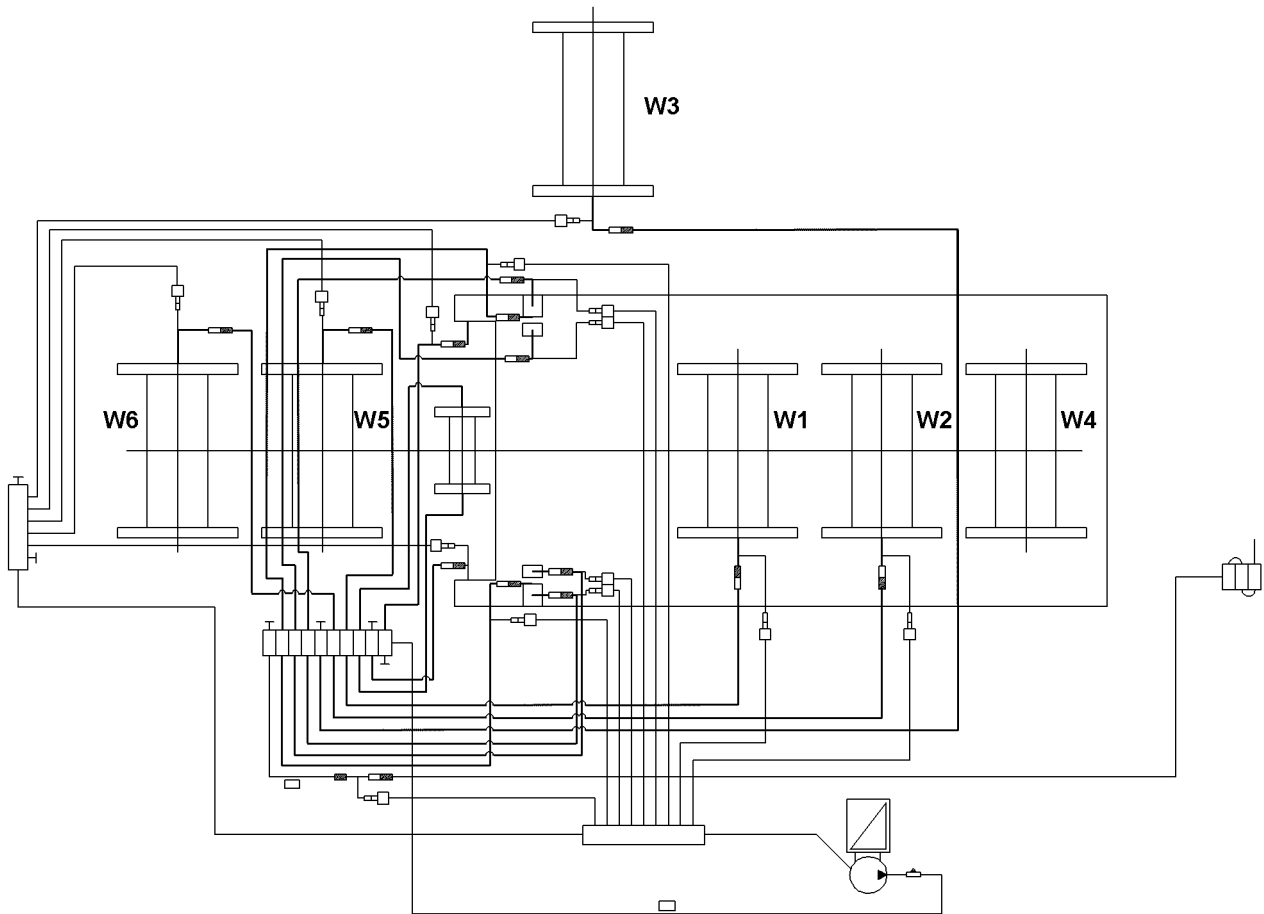
Risk of fire or accident!

Failure to replace hose lines at appropriate intervals can cause serious injury to persons, death or damage to property!

- ▶ Replace hose lines at appropriate intervals!
-

This must be documented in the crane's log book by the **expert** or the **authorized inspector**.

The service life of a hose system may not exceed six years, including a storage period of a maximum of two years (observe the manufacturing date on the hoses). The duration of use can also be defined by the **expert** or **authorized inspector** in accordance with existing test and empirical data in the individual application areas, taking the usage conditions into consideration.



B102656

4 Central lubrication system

The turntable, the rotary connection and the winches are equipped with a central lubrication system. All grease points (see illustration on the left) are automatically provided 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.

4.1 Central lubricating system - turntable

Lubricating time: 5 min

Break period: 1 h

4.1.1 Components of the system

Grease container **1**

Grease fitting **2**: - Filling the central lubricating system

Grease fitting **3**: - Filling the lubrication lines

Push button **4**: - Intermediate lubrication

Latched switch **5**: - Lubricating time min

Latched switch **6**: - Break period h

LED **7** yellow

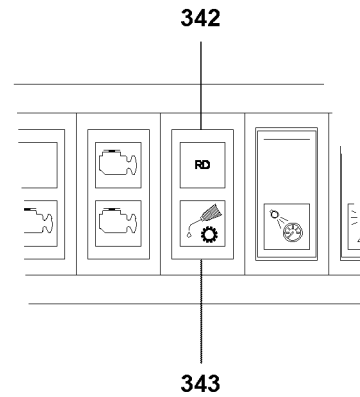
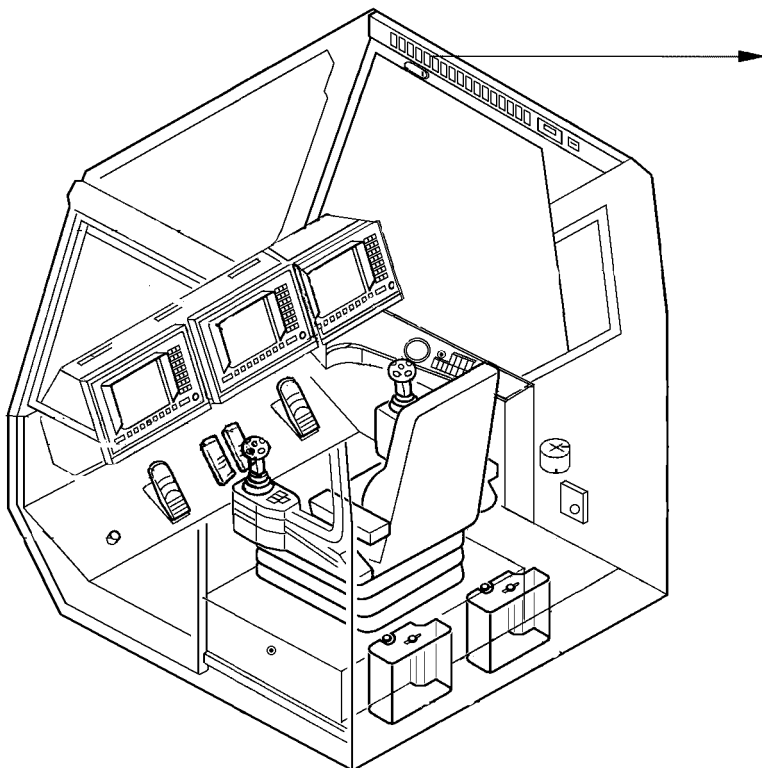
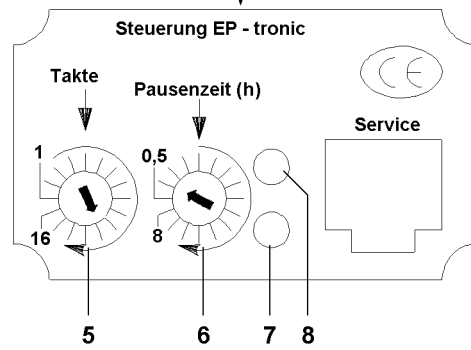
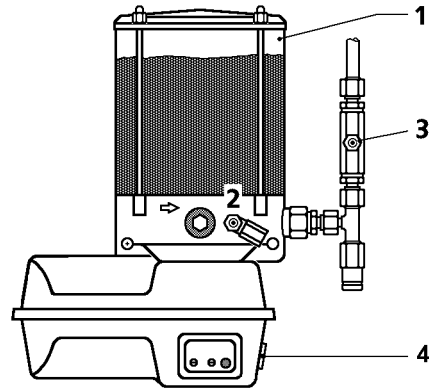
4.1.2 Setting the lubrication and break periods

The LED **7** 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 **5** and latched switch **6**.

► Turn on the engine ignition.

Result:

- When turning on the ignition, the LED **7** lights up for approximately 1.5 s and displays the operational readiness.



B102499

4.2 Central lubricating system - slewing ring connection

Lubrication pump run time: 12 cycles

Cycle time: 0.5 h

4.2.1 Components of the system

Grease container **1**

Grease fitting **2**: - Filling the central lubricating system

Grease fitting **3**: - Filling the lubrication lines

Push button **4**: - Intermediate lubrication

Latched switch **5**: - Cycles

Latched switch **6**: - Break period h

LED **7** green

LED **8** red

4.2.2 Adjusting the lubrication and break period

The lubrication and break period is set in the factory.

▶ Adjust the lubrication pump run time with the latched switch **5**.

▶ Adjust the break period with the latched switch **6**.

4.2.3 Cycle control

The central lubrication system is progressively monitored. This means that a proximity switch converts the piston strokes of the central lubrication system distributor into electric control signals and relays them to the control unit. If the control signals are not present or incomplete the control light **343** and the control light **342** indicate a malfunction.

Blinker code - cycle control

The LED **7** performs the equivalent function of the indicator light **343**.

The LED **8** performs the equivalent function of the indicator light **342**.

During operation

Ignition on, ready for operation:

Indicator light **342** lights up for 1.5 s and turns off.

Indicator light **343** lights up for 1.5 s and turns off.

Lubrication:

Indicator light **342** does not light up.

Indicator light **343** lights up during the lubricating period.

In case of a problem

Error in monitoring time cycle input:

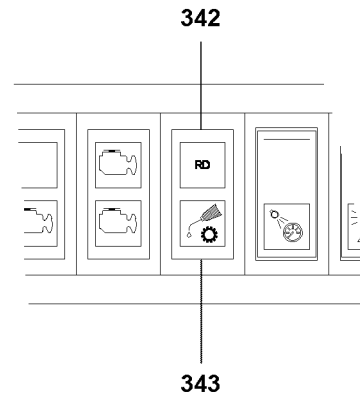
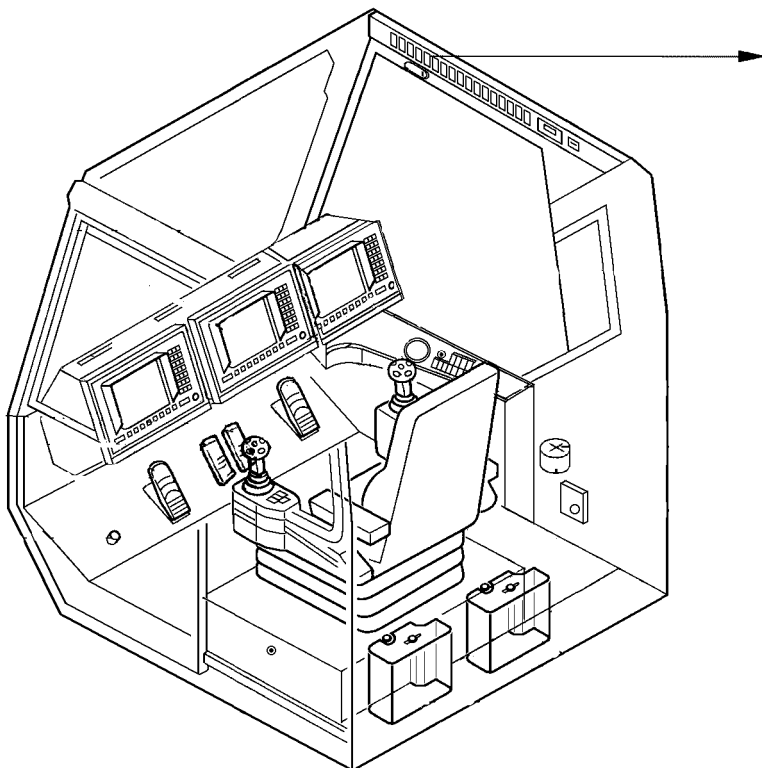
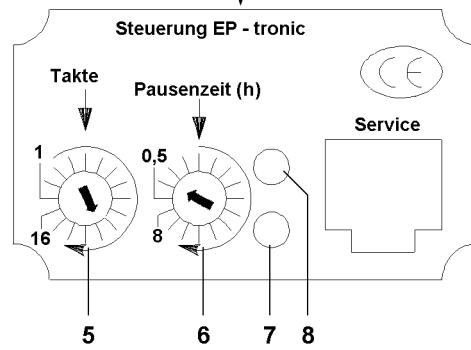
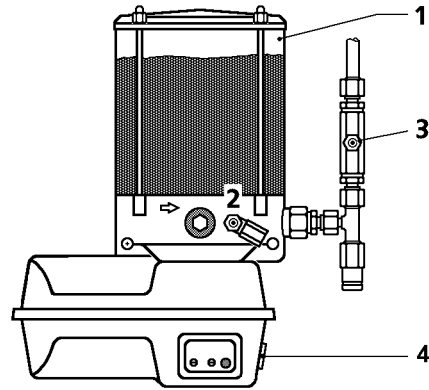
The indicator light **342** lights up for 1 s and is off for 1 s etc.

The indicator light **343** lights up for 1 s and is off for 1 s etc.

Memory error, battery error:

The indicator light **342** lights up for 0.5 s and is off for 0.5 s etc.

Indicator light **343** does not light up.



4.3 Central lubricating system in general

4.3.1 Intermediate lubrication

Intermediate lubrication can be carried out manually after washing the crane, for example.

- ▶ Press the push button 4.

Result:

- Components are greased.

4.3.2 Function check



Note

- ▶ Ensure that the ignition is turned on!

- ▶ Trigger 2 or 3 grease pulses via the push button 4.

Result:

- Grease exits from the pressure relief valve.

4.3.3 Filling the grease container



CAUTION

Risk of damage due to insufficient lubrication!

- ▶ There must always be sufficient grease in the grease container 1!
- ▶ Observe utmost cleanliness when filling the grease container 1!

- ▶ Fill grease container 1 using grease pump via the grease fitting 2.

4.3.4 Filling the lubrication 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 components!
- ▶ Observe utmost cleanliness when filling the grease lines!

- ▶ Add grease with an external grease pump via the grease fitting 3.

or

- Push the red button on the engine protection housing of the grease pump while the ignition is on.

4.3.5 Bleeding the central lubricating system

If the grease container 1 has been emptied, then it may be necessary to bleed the central lubrication system.

- ▶ Fill the grease container 1.
- ▶ Unscrew the main line from the grease pump outlet.
- ▶ Activate intermediate greasing until bubble-free grease exits from the grease pump outlet.
- ▶ Reconnect the main line.
- ▶ Trigger intermediate lubrication.

4.4 Troubleshooting on the central lubrication system

Problem	Cause	Remedy
The grease pump does not work	Integrated electronic control defective, electrical line interrupted, grease pump defective	Replace lower part of motor protection housing, replace electrical line, replace grease pump
Grease pump operates, but does not deliver	Air cushion in delivery piston, minimum fill level fallen below, grease pump element defective	Bleed grease pump, fill reservoir, replace grease pump element
No grease collar on all lube points	Grease pump not operating, interval time too high or cycle time too short, system blocked	See "Grease pump not operating", reduce interval 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
Grease pump speed reduced	Higher system pressure, lower ambient temperature	Check system / bearing points, no damage: Grease intermediately once or twice, if necessary
Grease emerges on 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
The red LED blinks very fast	Error CPU / memory	Consult Liebherr Service
The red LED and the indicator light blink fast	Error in the monitoring period from cycle start	The proximity switch is defective, consult Liebherr Service

5 Slewing ring connection

5.1 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.

5.2 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!**
-

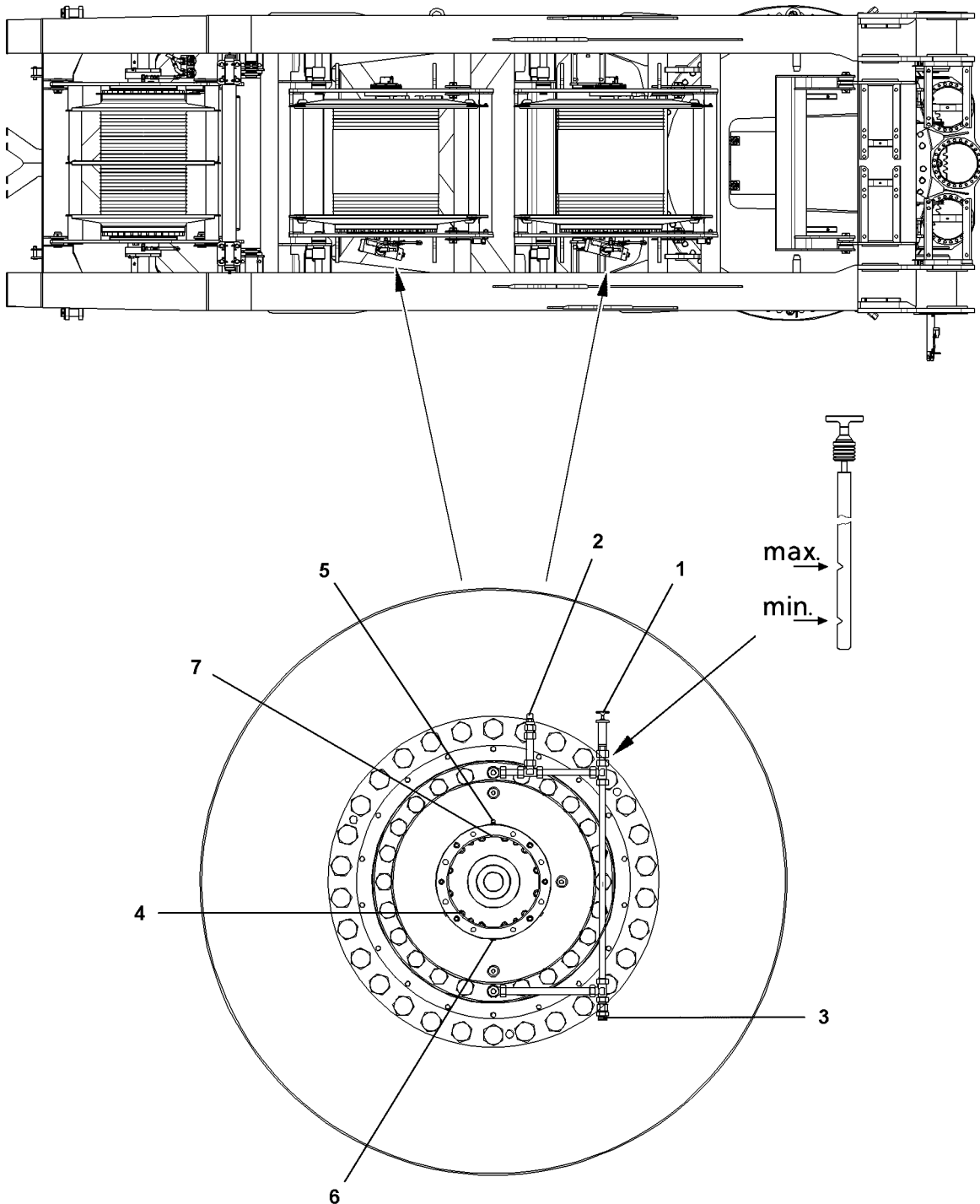


DANGER

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!
-

1

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6 Winches

Maintain utmost cleanliness during all work to prevent any dirt from entering the inside of the gear.

6.1 Illustration overview - winches

Winch 1 + 2, illustration 1

Winch 3, illustration 2

Winch 4, illustration 3

Winch 5, illustration 4

Winch 6, illustration 5

6.1.1 Overflow container

When the oil heats up in the hydraulic motor of the winch, the oil can enter the overflow container via a check valve, but cannot flow back into the hydraulic system after cooling off. For this reason the oil that has collected in the overflow container must be disposed of at regular intervals.

6.2 Hoist gear

Make sure that the following prerequisites are met:

- The hoist gear is inactive.
- The crane is in horizontal position.

6.2.1 Checking 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!

▶ Check the oil level!

▶ Remove and wipe the dipstick **1** off.

▶ Reinsert the dipstick **1** and pull out again.

The oil level must be between the min. and max. marks on the dipstick **1**.

▶ Check the oil level again.

6.2.2 Changing the oil

▶ Unscrew the breather screw **2**.

▶ Remove the oil drain plug **3** with seal ring and drain the oil into a suitable container.

▶ Reinstall the oil drain plug **3** with new seal ring and tighten.



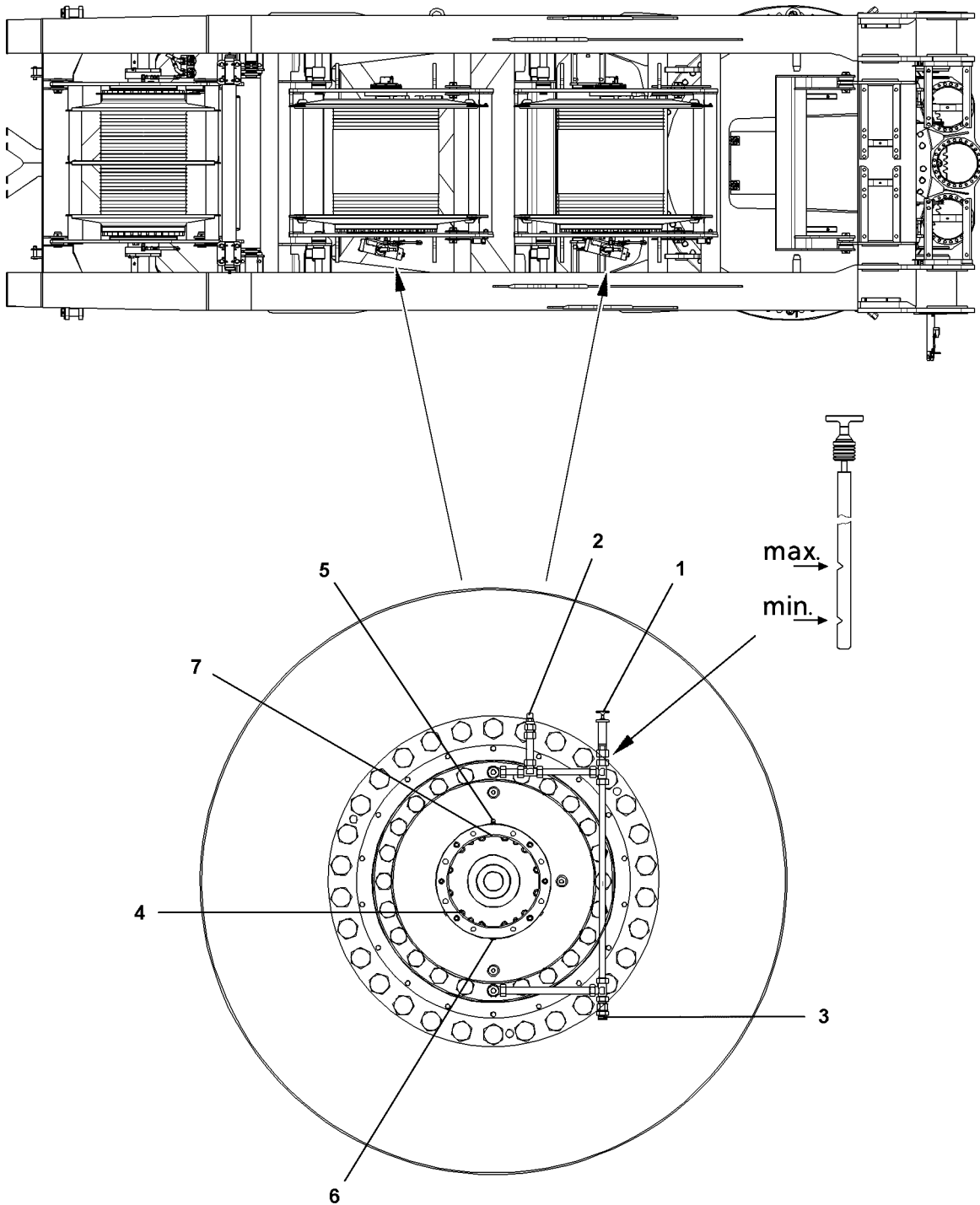
Note

▶ Remove the dipstick **1** to open the oil filler port!

▶ Add oil at oil filler port according to the lubrication chart.

▶ Reinstall the breather screw **2** and tighten.

▶ Check the oil level as described above.

1

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6.3 Hoist gear brake

Make sure that the following prerequisites are met:

- The hoist gear is inactive.
- The crane is in horizontal position.

6.3.1 Checking the oil level

- ▶ Remove screw **4**.

The oil level must reach the edge of the bore.

- ▶ Perform a visual inspection.



CAUTION

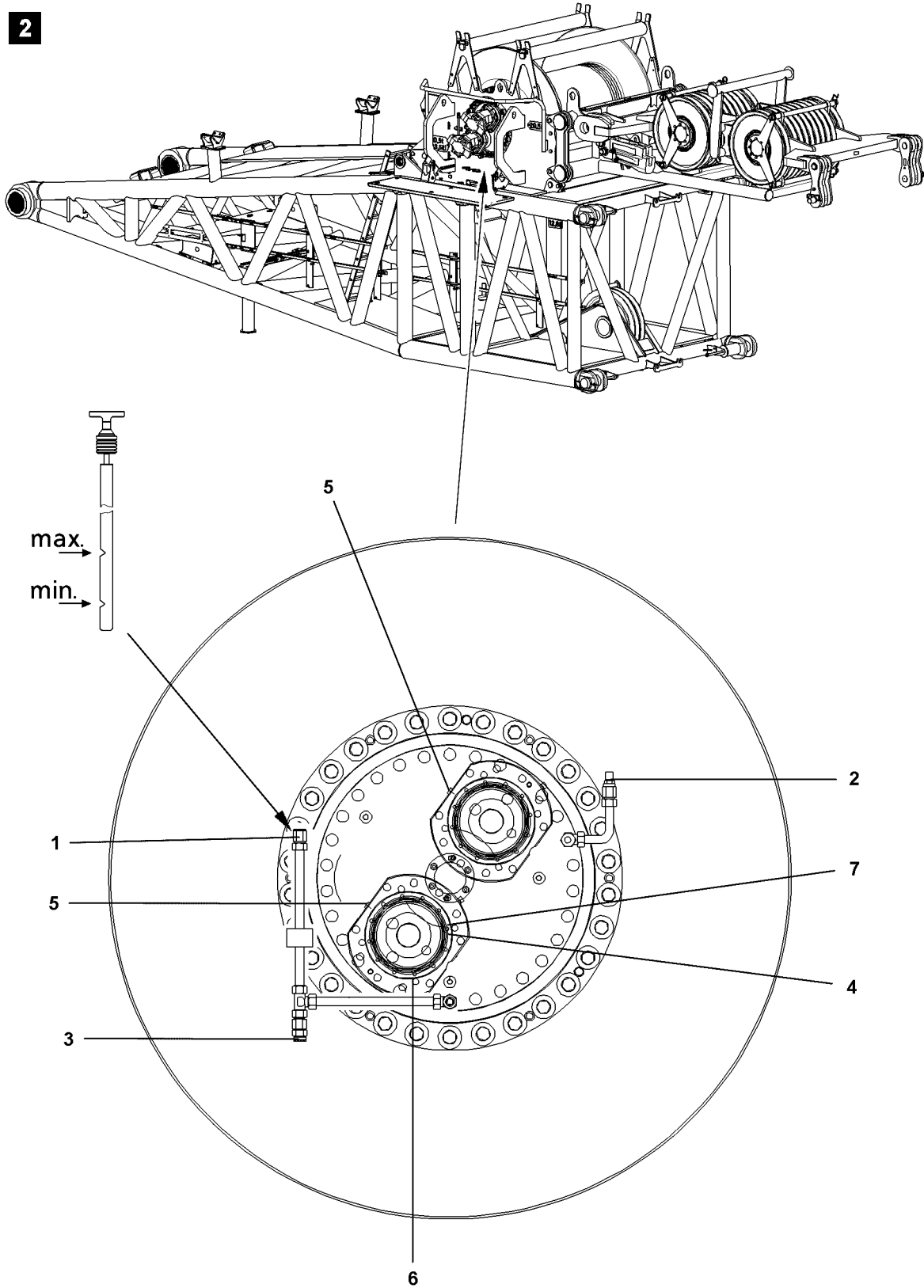
Danger of gear damage!

If the oil level is too low, the gear can be damaged!

- ▶ If the oil level has dropped, add the 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 screw **4** and tighten.

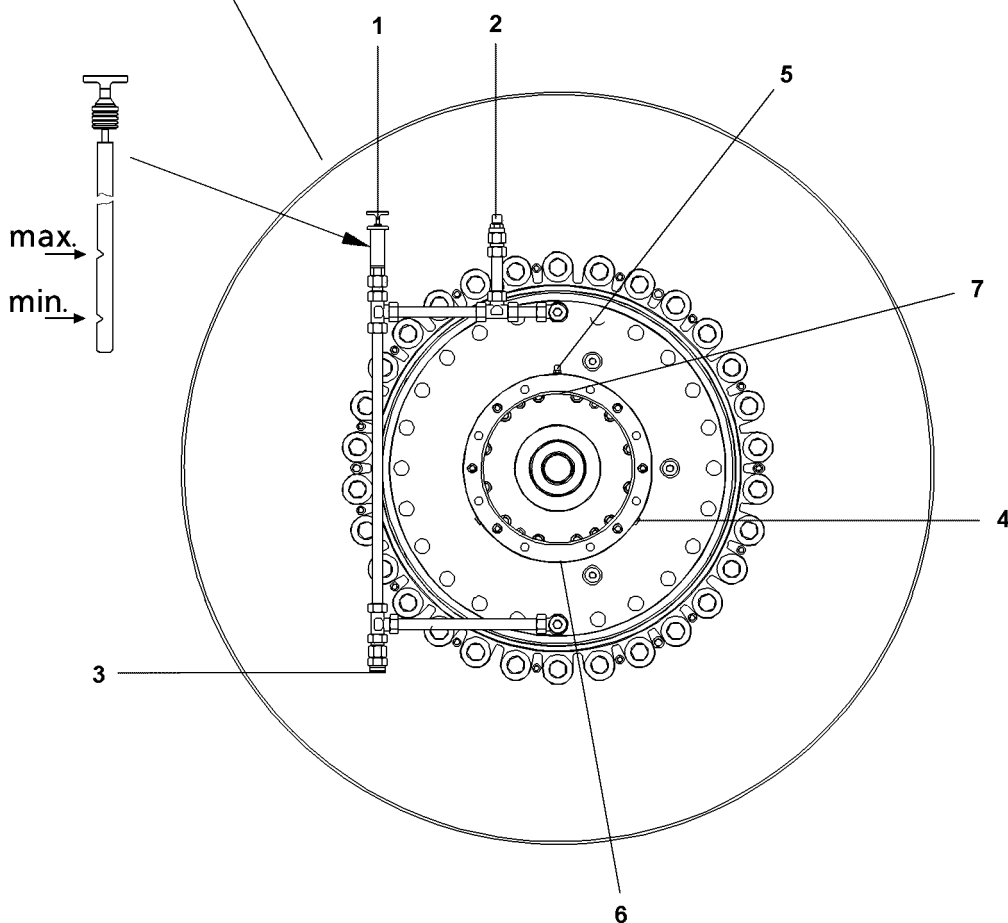
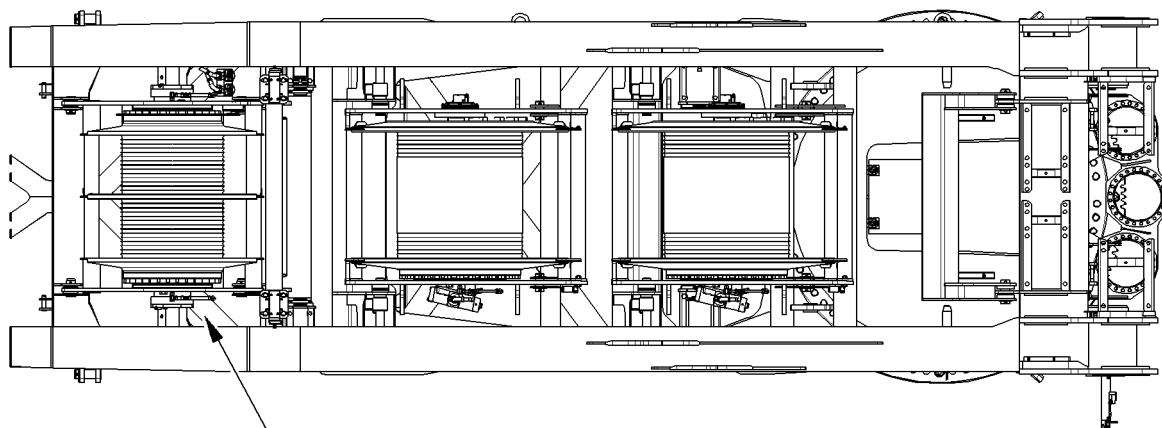
6.3.2 Changing the oil

- ▶ Remove the oil filler plug **5** and clean the sealing surface.
- ▶ Remove the oil drain plug **6** with seal ring and drain the oil into a suitable container.
- ▶ Clean the oil drain plug **6** and sealing surface on the housing.
- ▶ Reinstall the oil drain plug **6** with new seal ring and tighten.
- ▶ Add oil at the oil filler port as specified in the lubrication chart until the oil begins to overflow at the port **4**.
- ▶ Clean the oil filler plug **5** and reinstall it with a new seal ring and tighten.
- ▶ Check the oil level as described above.

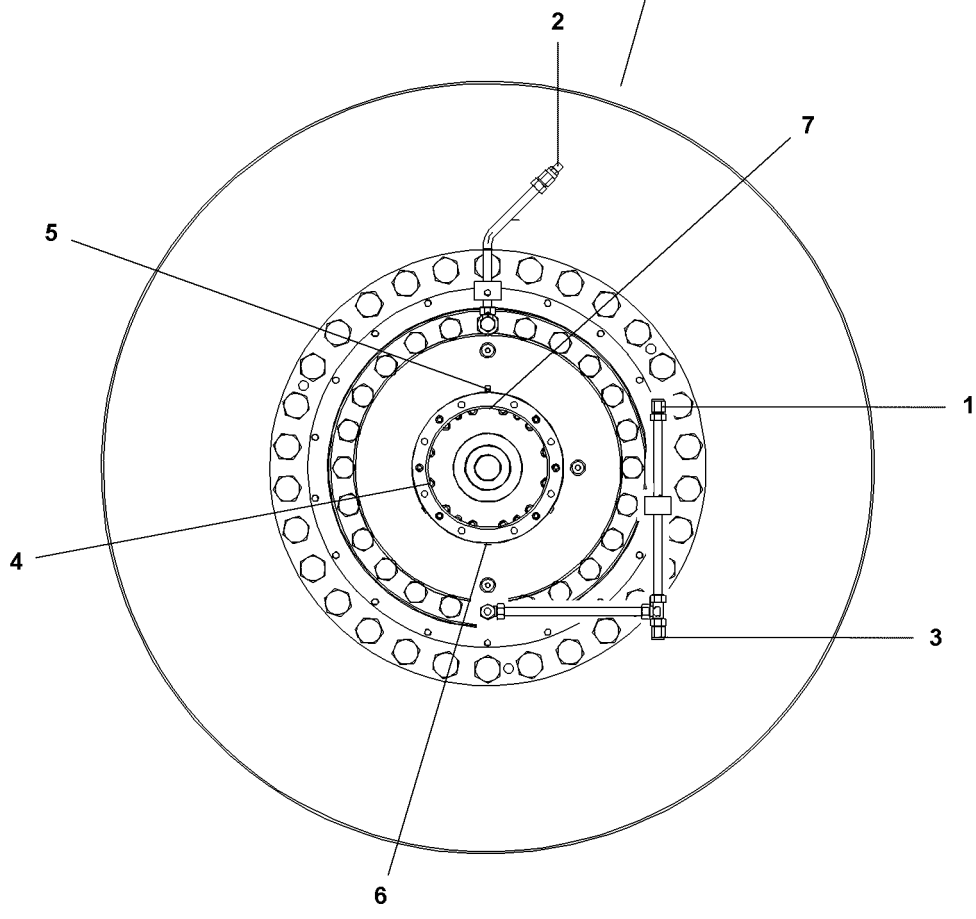
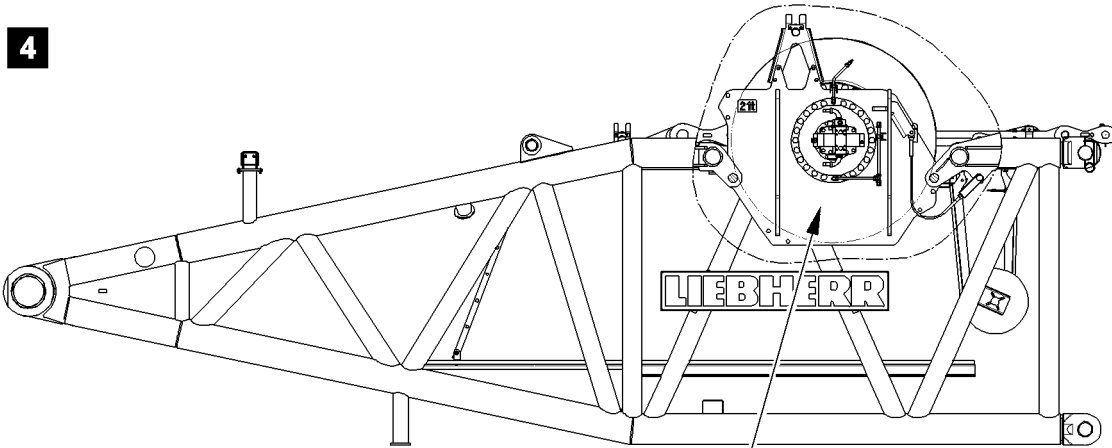


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3

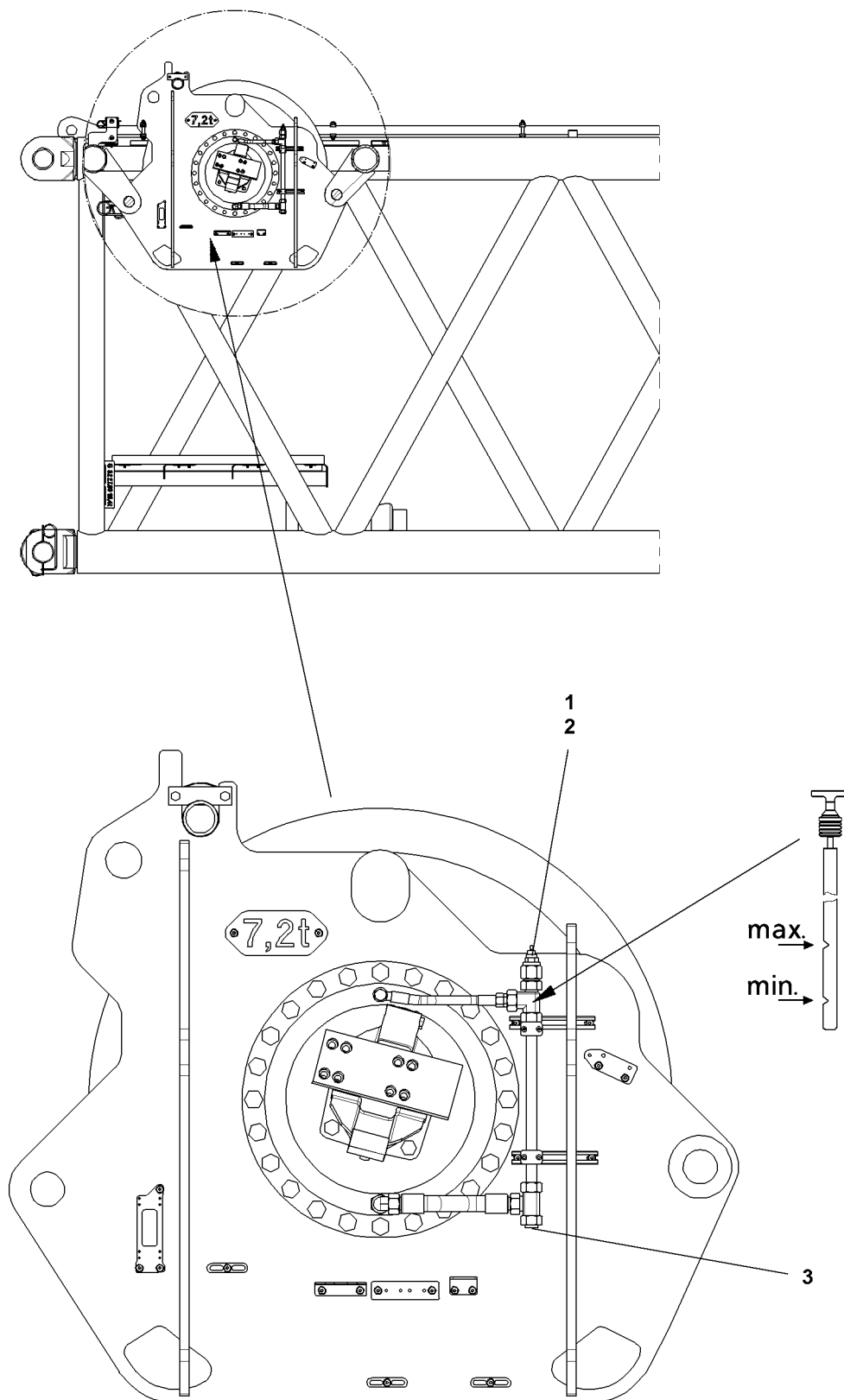


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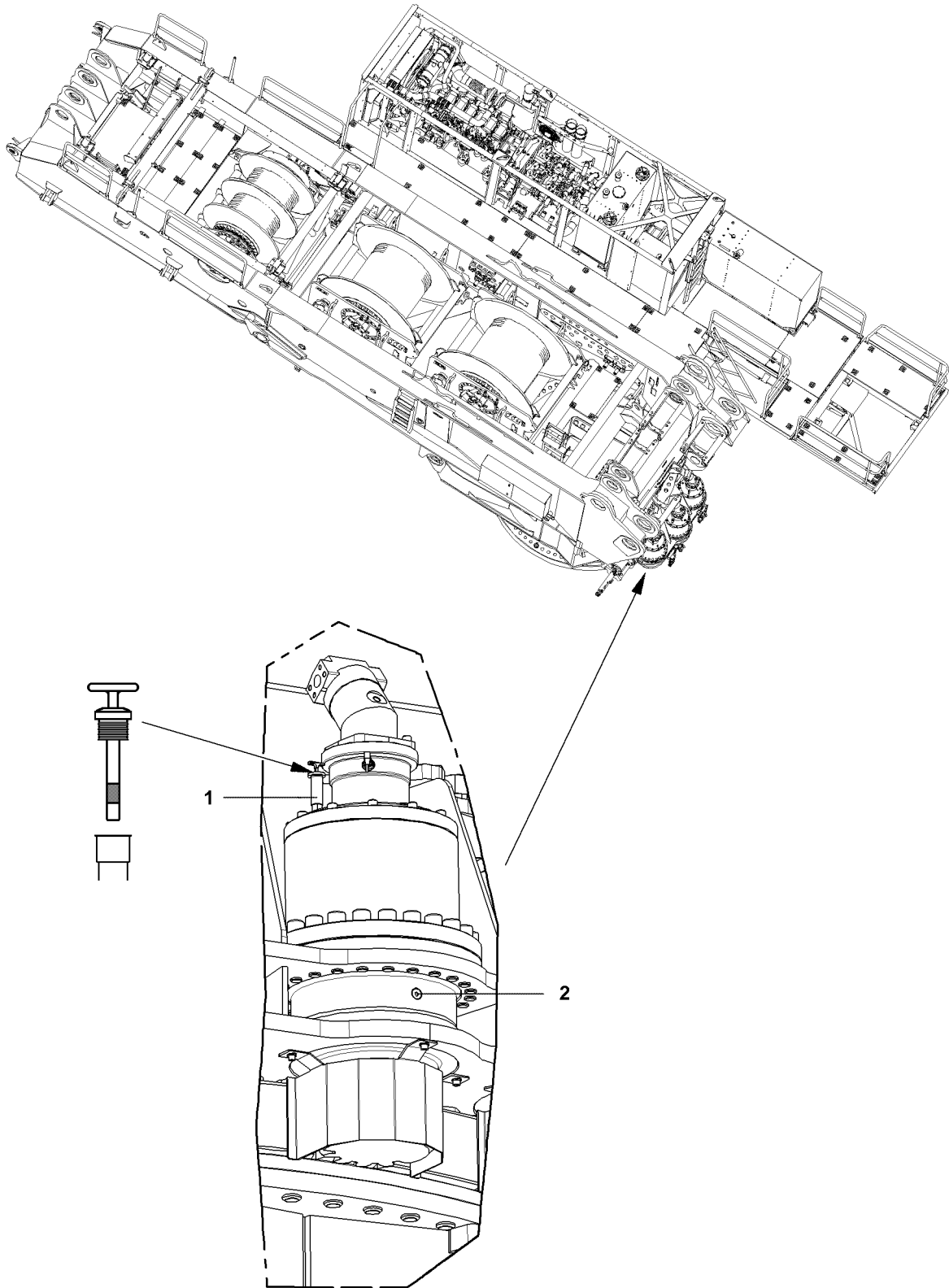


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5



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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.



CAUTION

Danger of gear damage!

If the oil level has dropped below the lower notch, then the gear can be damaged!

- ▶ Add oil according to the lubrication chart until the oil level is between the two notches!
- ▶ Add oil and check again!

-
- ▶ 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.
- ▶ 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.

8 Electrical system - Lighting

The maintenance of the electrical system is essentially limited to replacing defective fuses and bulbs and maintaining the batteries.

NOTICE

Damage to electrical system!

Never short circuit defective fuses with wire or similar items!

- ▶ Always replace defective fuses with fuses of the same amperage!
 - ▶ If there is a repeat problem with the same fuse, check the electrical system!
-

8.1 Battery maintenance



DANGER

Risk of fatal injury!

- ▶ Always disconnect the batteries from the power circuits when working on the electrical system of the crane and during all welding work!
-
- ▶ Keep batteries dry and clean.
 - ▶ Do not bring oil, grease, fuel or solvents into contact with the battery casting compound.
 - ▶ Release dirty terminals, clean and grease them with an acid-free and acid-resistant grease.
 - ▶ Check the acid levels in batteries at least once a year. In summer and in hot climate zones, check it at least twice a year.
 - ▶ On conventional batteries, check electrolyte level at regular intervals and add distilled water to the specified "Max mark", if necessary.
 - ▶ When adding distilled water:
Measure the acid concentration only after 30 minutes. The acid temperature for measuring should be +20 °C if possible.

Proceed as follows when checking the battery charge:

Specific weight	Charge condition
1.28/1.23*	Well charged
1.20/1.16*	Semi-charged, recharge
1.12/1.08*	Discharged, recharge immediately

* in tropical countries

Reduced battery performance requires greater power requirements.

- ▶ Ensure that batteries are well charged, particularly during the colder months.

8.2 Mixing battery acid

- ▶ Ensure that work area is well ventilated.



DANGER

Risk of explosion!

- ▶ When mixing battery acid, always pour distilled water into the container first, then the concentrated sulphuric acid!
 - ▶ Observe this order, otherwise explosions and spattering can occur!
-
- ▶ Stir the mixture with an acid-proof stick (glass or plastic).

Desired acid concentration kg/l	1.23	1.24	1.25	1.26	1.27	1.28
Volume ratio of concentrated sulphuric acid (96 %) to distilled water	1:3.8	1:3.6	1:3.4	1:3.2	1:3.0	1:2.8

When adding the battery acid, the acid level should be 15 mm above the top edge of the battery plates and the temperature of the acid should be approximately 15 °C.

- ▶ Add battery acid to battery.

Wait approximately 20 minutes before connecting the battery. By that time, it will be balanced out.

- ▶ Connect the battery after approximately 20 minutes.

8.3 Removing and recharging the battery



WARNING

Danger of injuries!

- ▶ Do not place tools on batteries and keep open flames away!

8.3.1 Removing the battery

Make sure that the following prerequisites are met:

- The engine is turned off.
- All electrical consumers are turned off.

NOTICE

Damage to alternator!

- ▶ Do not disconnect batteries unless the engine has been turned off!
- ▶ Carry out work in well ventilated rooms and avoid sparks.
- ▶ Disconnect the negative terminal first (ground cable), then the positive terminal.
- ▶ Remove the battery.
- ▶ Avoid spark formation caused by electrostatic charge. To avoid this, touch the ground support point in the driver's cab.
- ▶ Do not tilt or shake the battery.

8.3.2 Recharging the battery

NOTICE

Damage to battery!

- ▶ Recharge only with direct current, the strength of which does not exceed 1/10 of the battery capacity!

Recharging example: A battery with 170 Ah should be charged with a maximum charging current of 17.0 A.

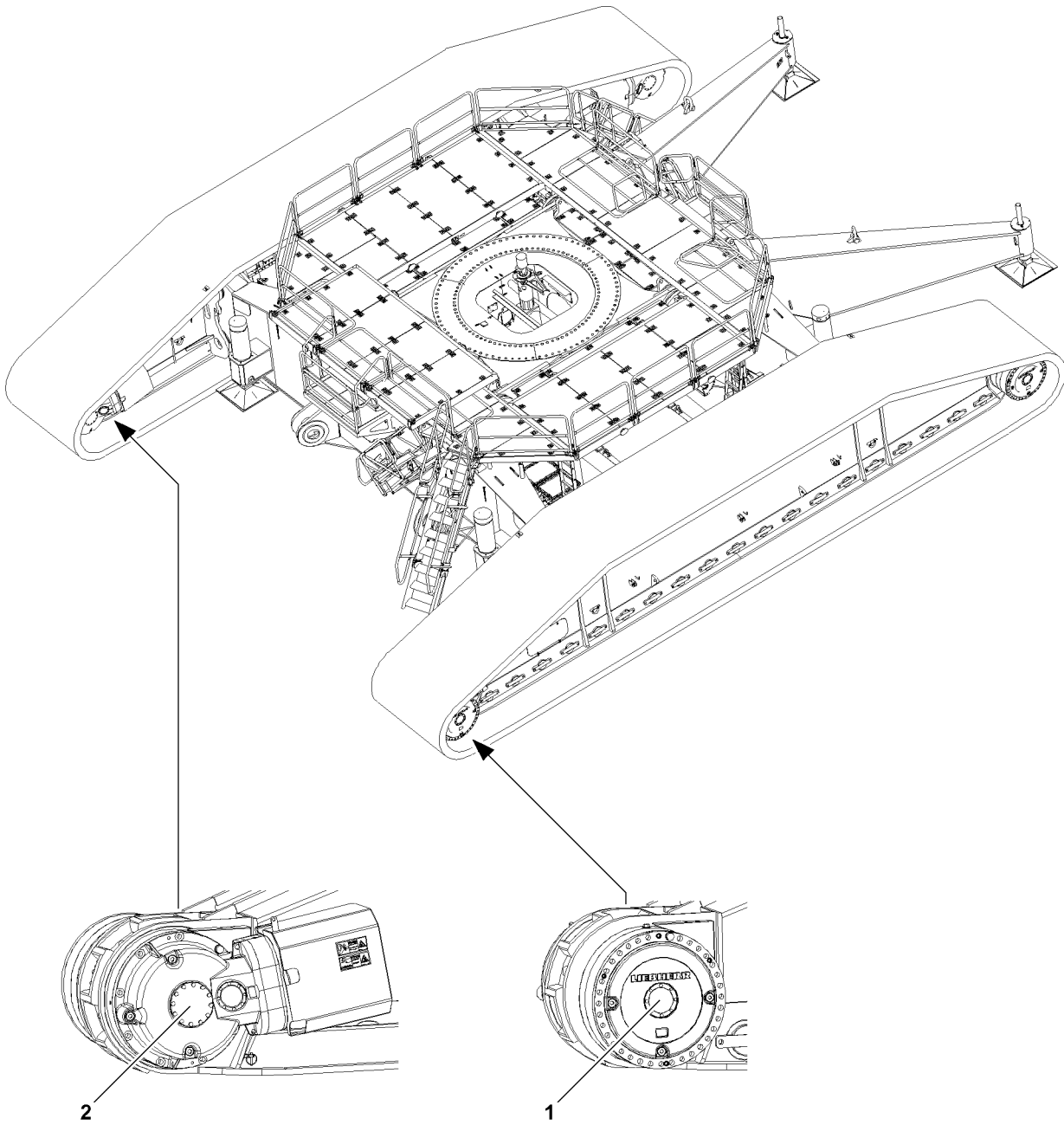
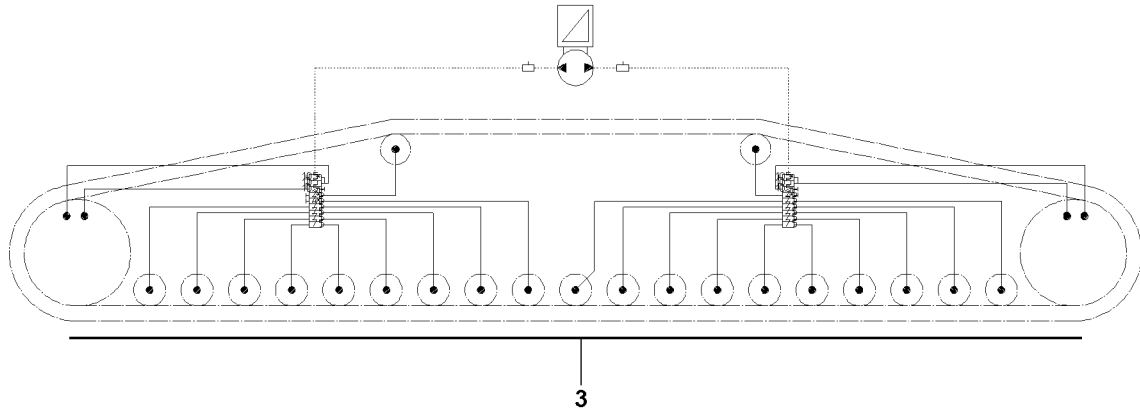
- ▶ Frozen batteries must be thawed out before charging.
- ▶ Remove all plugs before charging.
- ▶ Provide ventilation during charging (risk of oxyhydrogen gas explosion!).
- ▶ Connect the battery to a battery charger (positive to positive and negative to negative).
- ▶ Turn on the battery charger after 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 acid 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.

8.3.3 Installing the battery

- ▶ Reinstall the battery tightly in the vehicle.
- ▶ Avoid spark formation caused by electrostatic charge. To avoid this, touch the ground support point in the driver's cab.
- ▶ Connect the positive terminal to the battery first, then the negative terminal (ground cable).
- ▶ Check that the terminals are tightly seated (low contact resistance).
- ▶ Grease the terminals and terminal posts with acid-free and acid-resistant grease (use corrosion protection even for modern maintenance-free batteries).



B111692

1 Fill quantities

1.1 Crawler chassis fill quantities

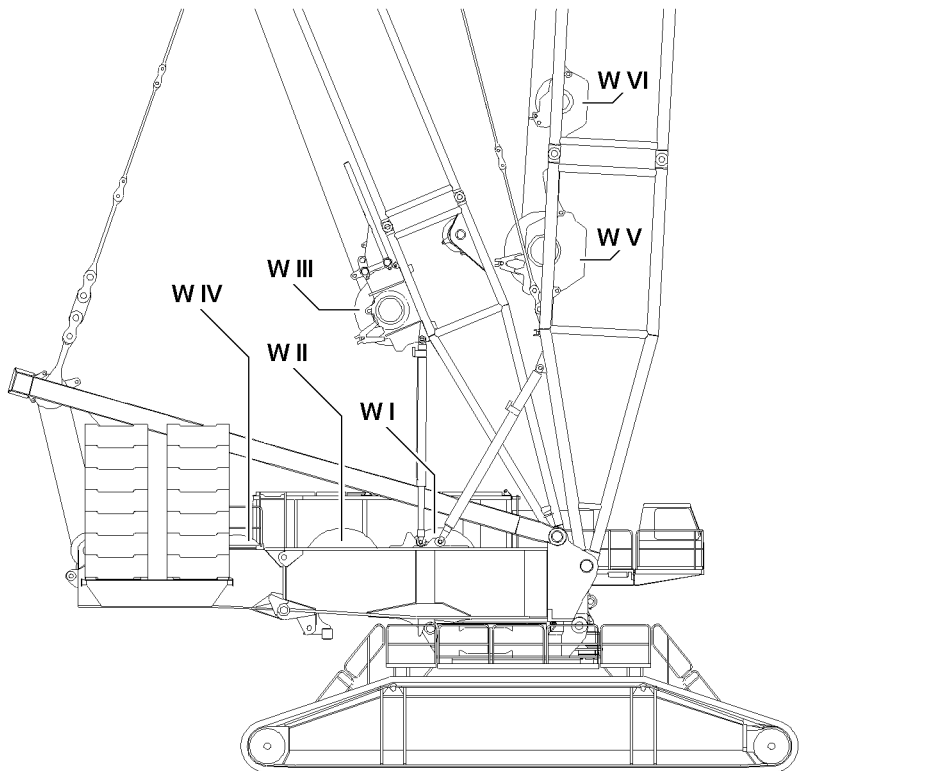
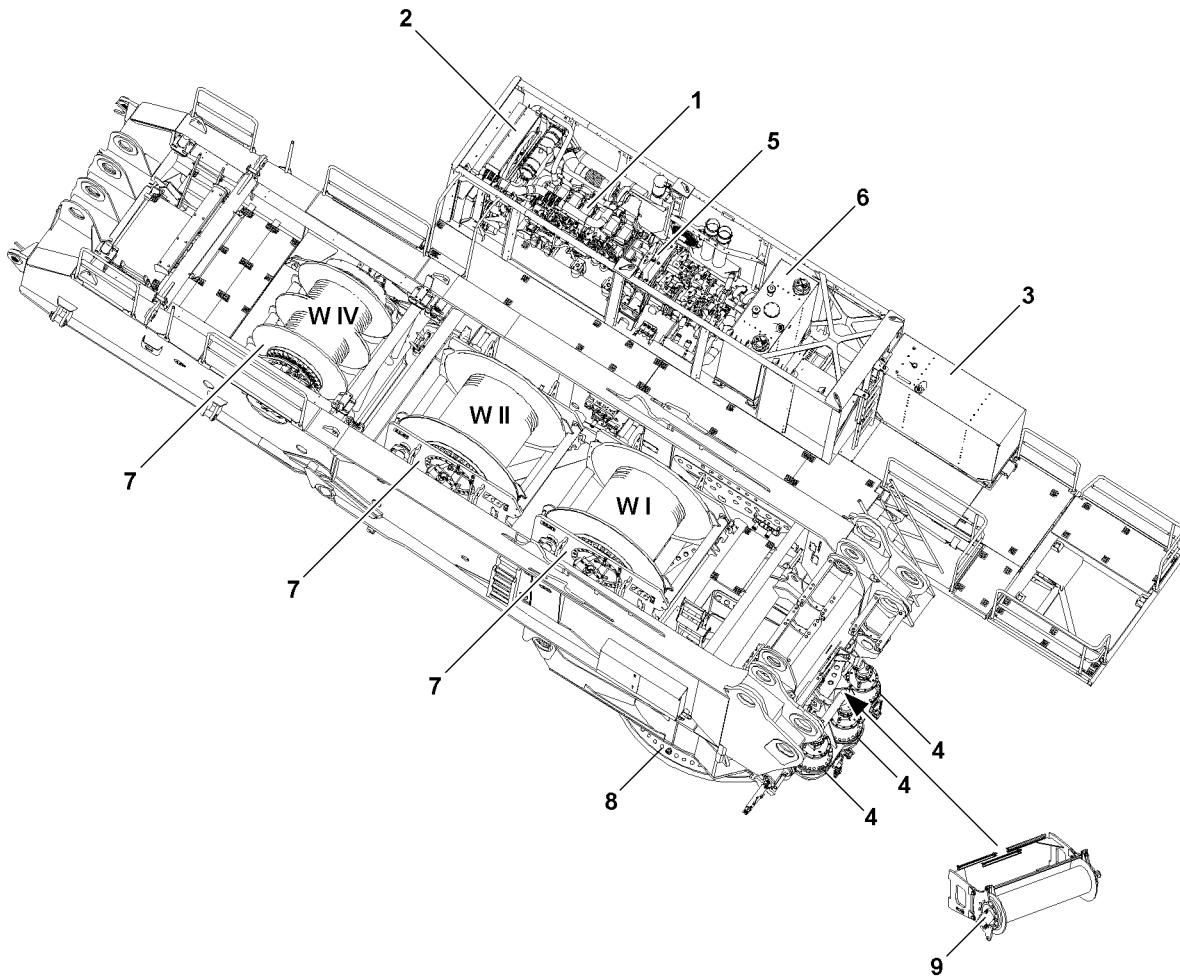
The specified fill quantities (change quantities) are orientation values. The marks on the dipsticks, inspection ports and sight gauges are decisive for filling.

NOTICE

Danger of property damage!

► Do not mix synthetic oils with mineral oils!

Position	Components	Fill quantity
1	Planetary gear	42.0 l
2	Miter gear	30.0 l
3	Central lubrication system	2.5 kg



B111693

1.2 Fill quantities crane superstructure

The specified fill quantities (change quantities) are orientation values. The marks on the dipsticks, inspection ports and sight gauges are decisive for filling.

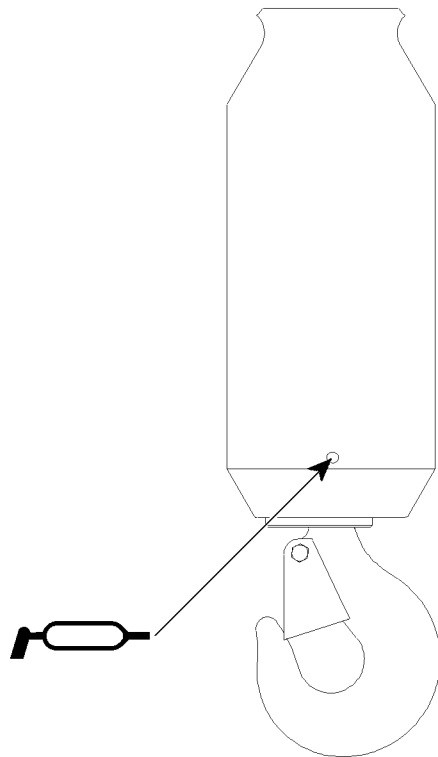
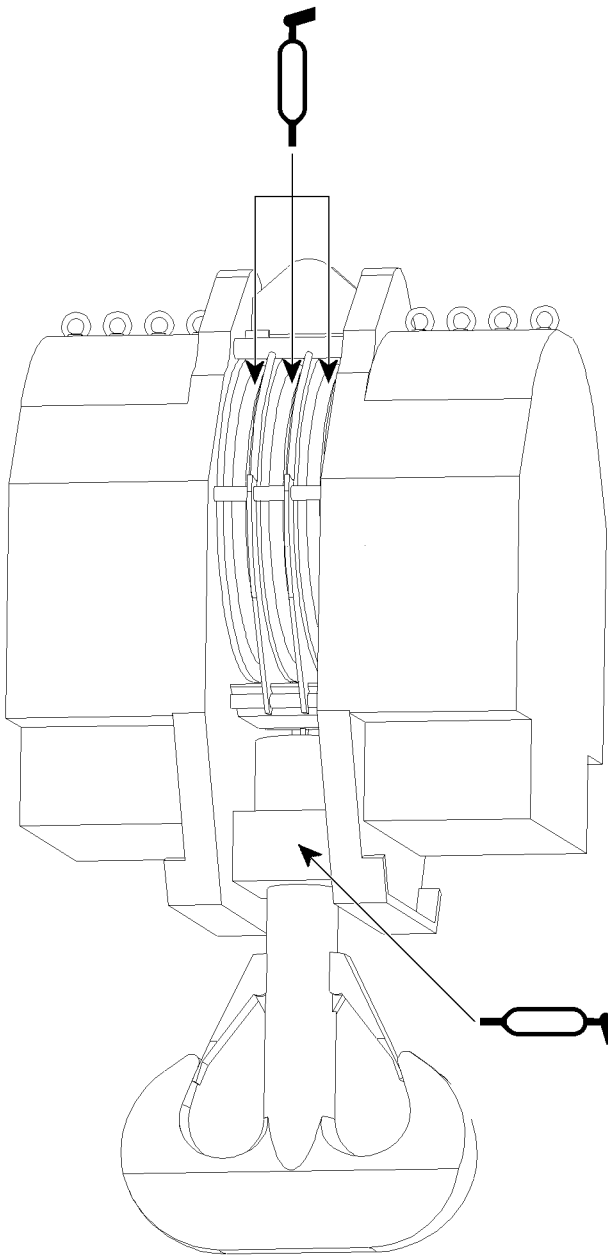
NOTICE

Danger of property damage!

- ▶ Do not mix synthetic oils with mineral oils!

Position	Components	Fill quantity
1	Diesel engine	52.0 l
2	Cooling system	135.0 l
3	Fuel tank	2000.0 l
4	Slewing gear	31.0 l
	Slewing gear brake	0.2 l
5	Pump distributor gear	11.0 l
6	Hydraulic oil tank ¹	1500.0 l
7	Central lubricating system - winches	4.0 kg
8	Central lubricating system - slewing ring connection	4.0 kg
9	Assembly winch	0.4 l
W I	Winch 1 W I	45.0 l
	Winch brake	0.8 l
W II	Winch 2 W II	45.0 l
	Winch brake	0.8 l
W III	Winch 3 W III	28.0 l
	Winch brake	0.8 l
W IV	Winch 4 W IV (double winch)	2 x 31.0 l
	Winch brake	2 x 0.8 l
W V	Winch 5 W V	45.0 l
W VI	Winch 6 W VI	22.0 l

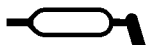
¹When the oil level is checked, all hydraulic cylinders must be retracted. The oil level must be in the center of the sight gauge.



2 Lubrication chart

2.1 Lubrication schedule - Equipment

2.1.1 Hook block / load hook

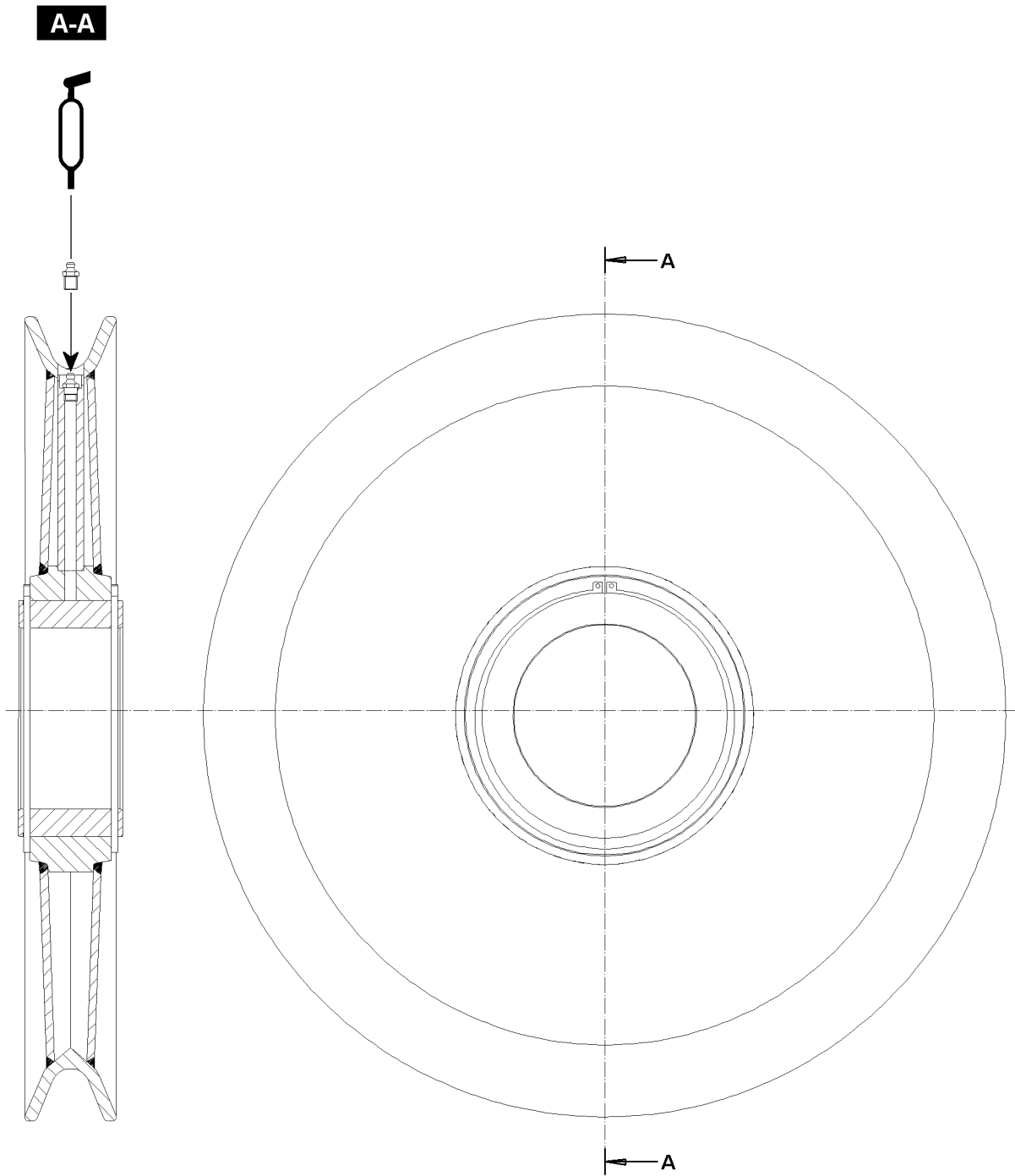


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Note

▶ The lube points are marked with this icon.



B108928

2.1.2 Rope pulley

**Note**

- ▶ The rope pulley shown in this chapter is only an example and can deviate in type and version from other rope pulleys. The lubrication schedule is generally valid for all rope pulleys.
-



B107729

**Note**

- ▶ The lube points are marked with this icon.
-

B195219

1 Specified service items and lubricants for Liebherr cranes



Note

- ▶ To improve the cold start ability of the diesel engine at an ambient temperature below -10 °C, we recommend the use of the following engine oil:
- ▶ Viscosity grade SAE 5W-30 low ash according to specification ACEA E6.
- ▶ Liebherr Motoroil 5W-30 low ash, **LWE Id. No.: 11100934!**

No.	Crane components	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
1.1	Diesel engine	LWE Id. No.: 10663796 Liebherr Motoroil 10W-40 low ash SAE 10W-40 low ash and ACEA E6 Observe the instructions of the engine manufacturer Below -20 °C with pre-heating	LWE Id. No.: 11100934 Liebherr Motoroil 5W-30 low ash SAE 5W-30 low ash and ACEA E6 Observe the instructions of the engine manufacturer Below -20 °C with pre-heating
1.2	Diesel engine without Exhaust aftertreatment optionally also	LWE Id. No.: 861005308 Liebherr Motoroil 10W-40 SAE 10W-40 and ACEA E4 Observe the instructions of the engine manufacturer Below -20 °C with pre-heating	LWE Id. No.: 10425715 Liebherr Motoroil 5W-30 SAE 5W-30 and ACEA E4 Observe the instructions of the engine manufacturer Below -20 °C with pre-heating
2	Drive axle with differentials, planetary gear and installed distributor gear	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
3	Axle drive ZF DK-7	LWE Id. No.: 861901008 Liebherr Gear Hypoid 90 EP ZF TE-ML 05	LWE Id. No.: 10425142 Liebherr Syntogear Plus 75W-90 ZF TE-ML 05
4.1	Vehicle distributor gear KESSLER VG 1800, VG 2400, VG 2550, VG 2600, VG 3750	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

No.	Crane components	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
	W 3750		
4.2	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	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
6.1	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
6.2	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!
6.3	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
7.1	Powershift transmission ZF Torque converter transmission WG 120, WG 150, WG 180, WG 181, WG 200, WG 201	LWE Id. No.: 8610240 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
7.2	Powershift transmission ZF torque converter WG 251* ZF ERGOPOWER WG 210, WG 260, WG 310	LWE Id. No.: 861900608 Liebherr Hydraulic-Gear ATF ZF TE-ML 03	LWE Id. No.: 861900608 Liebherr Hydraulic-Gear ATF ZF TE-ML 03

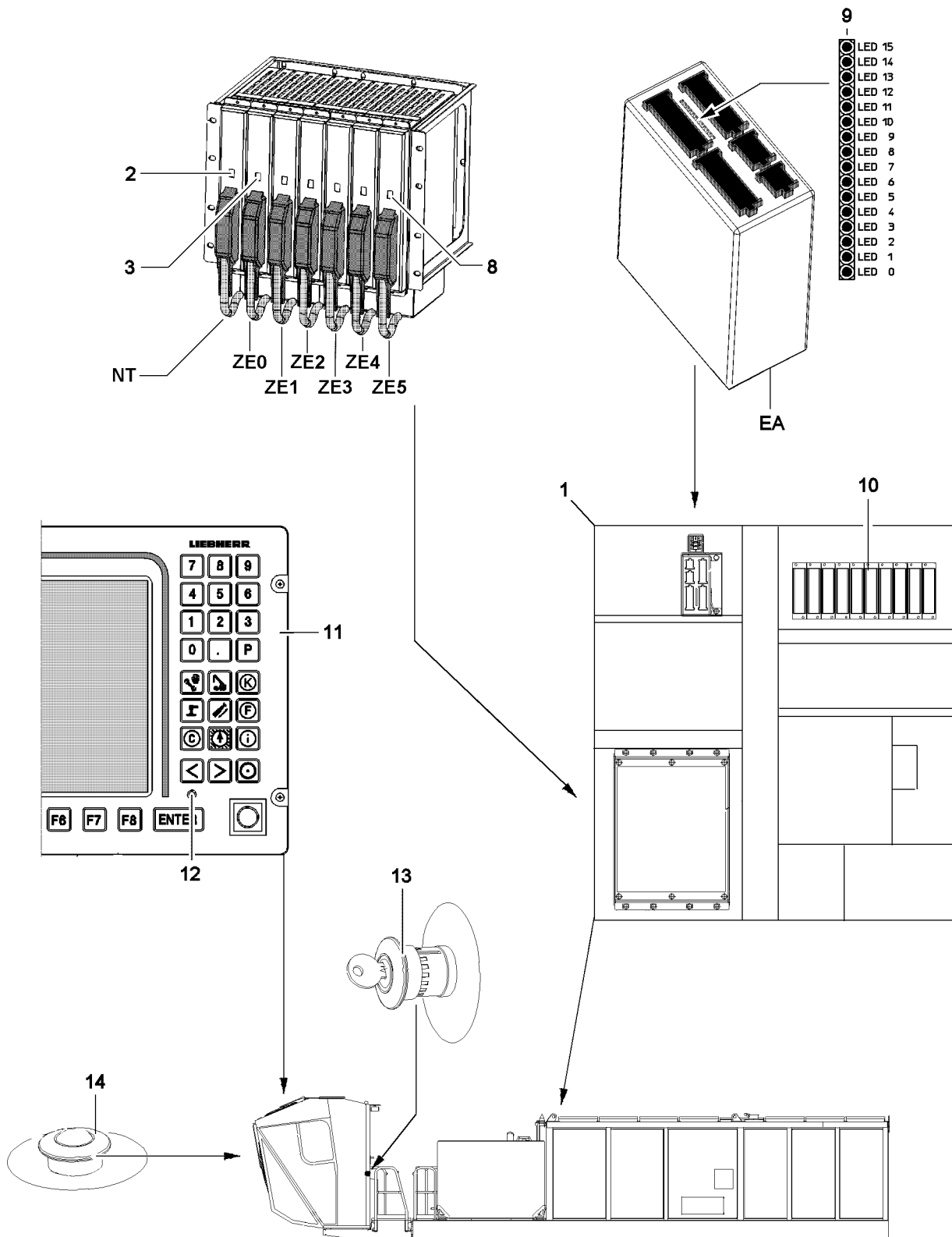
No.	Crane components	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
	* also for ambient temperatures above -10 °C	Below -20 °C run until warm according to operating instructions	Below -20 °C run until warm according to operating instructions
8	Powershift transmission CLARK	LWE Id. No.: 8610240 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
9	Offset gear (drop box) ALLISON	LWE Id. No.: 8610240 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
10.1	Automatic transmission ALLISON CLBT 740, 750, 754, 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
10.2	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
11	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
12.1	Torque converter coupling ZF TC HD	LWE Id. No.: 10218305 ZF-Ecofluid M	LWE Id. No.: 10218305 ZF-Ecofluid M

No.	Crane components	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
		ZF TE-ML 02	ZF TE-ML 02 below -20 °C preheat gear according to operating instructions
12.2	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
13	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
14	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!
15.1	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!
15.2	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
16	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!
17.1	Crane hydraulics Crane chassis and crane super-structure	LWE Id. No.: 861903508 Liebherr Hydraulic 37 HVLP, DIN 51524-3	LWE Id. No.: 10293807 Liebherr Hydraulic Plus Arctic HVLPD HC, DIN 51524-3
17.2	Crane hydraulics Crane chassis and crane super-structure LTM 11200-9.1 LTR 11200	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

No.	Crane components	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
	LR 13000, LR 1600/2, LR 1600/2-W LTC 1055-3.1		
18	Brake system if hydraulically actuated	LWE Id. No.: 861000108 DOT 4 SAE J 1703e	LWE Id. No.: 861000108 DOT 4 SAE J 1703e
19	Clutch actuator	LWE Id. No.: 861000108 DOT 4 SAE J 1703e	LWE Id. No.: 861000108 DOT 4 SAE J 1703e
20	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
21	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	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
23.1	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
23.2	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
24	Support plate with equalization Glide shoes of cab guide 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
25	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
26.1	Telescopic boom	LWE Id. No.: 861303608	LWE Id. No.: 861303608

No.	Crane components	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
	Plastic glide bearing Corner guide top	Liebherr Teleskopfett 9613 Plus KP2K-30, DIN 51502	Liebherr Teleskopfett 9613 Plus KP2K-30, DIN 51502
26.2	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
26.3	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
27	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
28	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
29	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
30	Running rope	LWE Id. No.: 10173371 Liebherr WR-Lube SC Adhesive grease	LWE Id. No.: 10173371 Liebherr WR-Lube SC Adhesive grease
31.1	Radiator fluid Diesel engine and heating system Color: Blue green	LWE Id. No.: 11001829 Liebherr Antifreeze Mix Pre-mixed corrosion inhibitor / antifreeze WARNING: May not be diluted and / or mixed with other corrosion inhibitors / antifreeze!	LWE Id. No.: 11001829 Liebherr Antifreeze Mix Pre-mixed corrosion inhibitor / antifreeze WARNING: May not be diluted and / or mixed with other corrosion inhibitors / antifreeze!
31.2	Radiator fluid Diesel engine and heating system	LWE Id. No.: 11494696 Liebherr Antifreeze Organic SF Mix	LWE Id. No.: 11494696 Liebherr Antifreeze Organic SF Mix

No.	Crane components	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
	Color: Magenta When changing to Liebherr Anti-freeze Organic SF Mix , empty the cooling system completely and flush.	Pre-mixed corrosion inhibitor / antifreeze WARNING: May not be diluted and / or mixed with other corrosion inhibitors / antifreeze!	Pre-mixed corrosion inhibitor / antifreeze WARNING: May not be diluted and / or mixed with other corrosion inhibitors / antifreeze!
32.1	Travel gears Crawler crane	see data tag	see data tag
32.2	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
32.3	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!
33	Recovery winch	See data tag and manufacturer's instructions	See data tag and manufacturer's instructions
34	Recovery winch rope	See manufacturer's instructions	See manufacturer's instructions
35	Steering uncoupling LTC 1045-3.1	LWE Id. No.: 10800345 Teflon-Spray	LWE Id. No.: 10800345 Teflon-Spray



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1 Procedure to follow in case of a problem

This chapter answers the following questions:

- What to do in case of a problem?
- Which data is important for communication with Liebherr Service?
- Which displays and component groups are relevant for error diagnostics?
- Which measures are to be taken in clear problem cases?
- How to proceed in case of error messages of the LICCON computer system?
- How can an error diagnostics be carried out?
- Which measures are to be taken for defective components?



DANGER

Incorrect operation!

Incorrect operation of the crane can result in death or serious injuries!

- ▶ The crane may only be operated 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 severely injured or killed!

- ▶ If problems remain or in case of error messages, consult Liebherr Service to determine the cause of the problem and further procedure.



Note

Error diagnostics without the help of Liebherr Service!

- ▶ For information regarding error diagnostics and error remedy, see "Diagnostics manual".

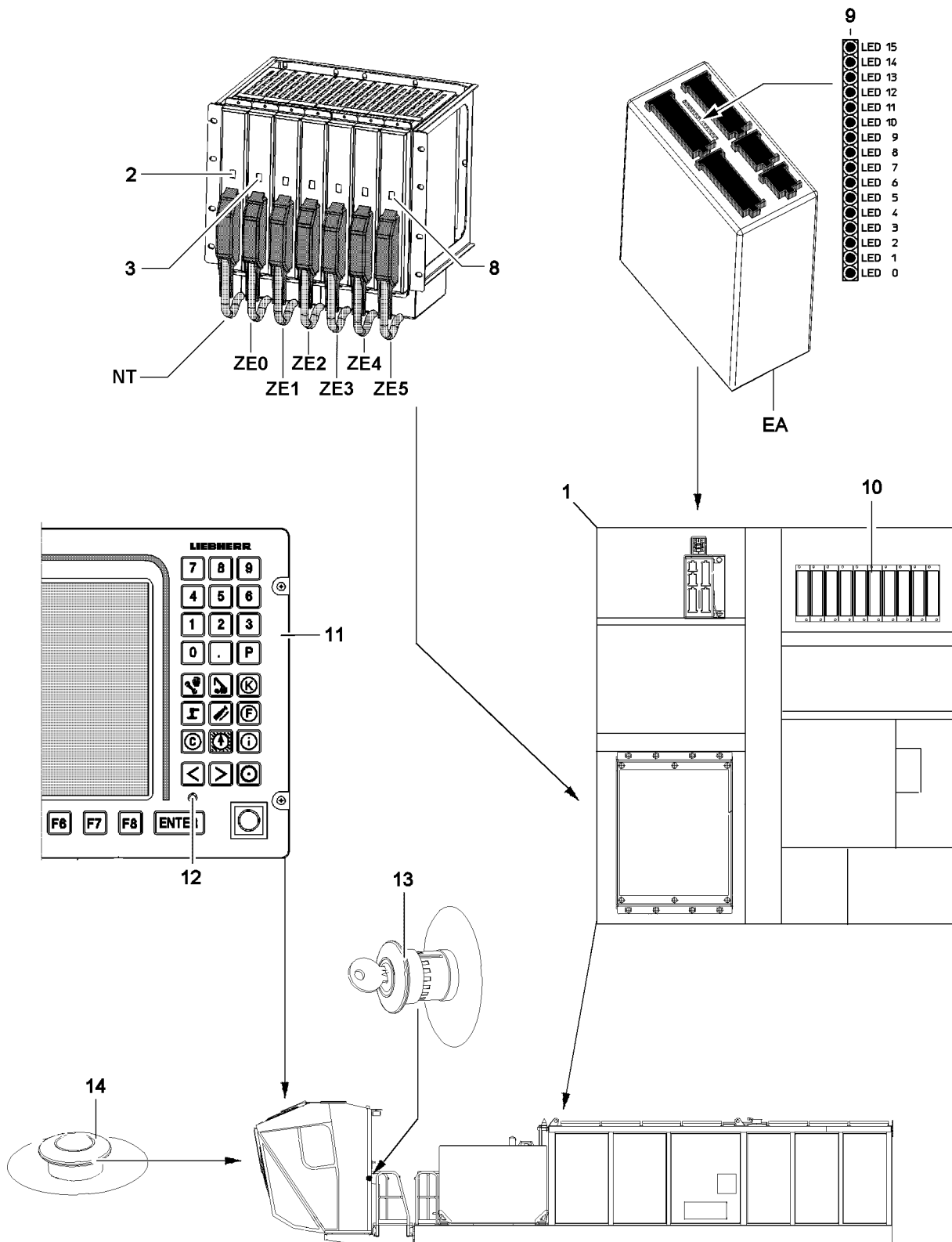


Note

- ▶ The monitor illustrations in this section are only examples. The error codes shown in the monitor illustrations and the corresponding error descriptions might not exactly match the crane.

1.1 Procedure to follow in case of a problem

- ▶ Observe and adhere to the notes and instructions in this chapter.
- ▶ Before contacting Liebherr Service: Determine relevant data about the problem.
- ▶ Carry out the error diagnostics with the aid of Liebherr Service or the "Diagnostics manual".
- ▶ Follow the instructions given by Liebherr Service.
- ▶ After error diagnostics: Replace defective components, which are supplied as spare parts.



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1.2 Overview of displays and component groups for error diagnostics

Various displays and component groups allow the crane driver:

- To localize error messages.
- To communicate quicker and more precise with Liebherr Service.
- With the aid of the “Diagnostics manual”: Diagnostics and remedy errors.



Note

Error diagnostics without the help of Liebherr Service!

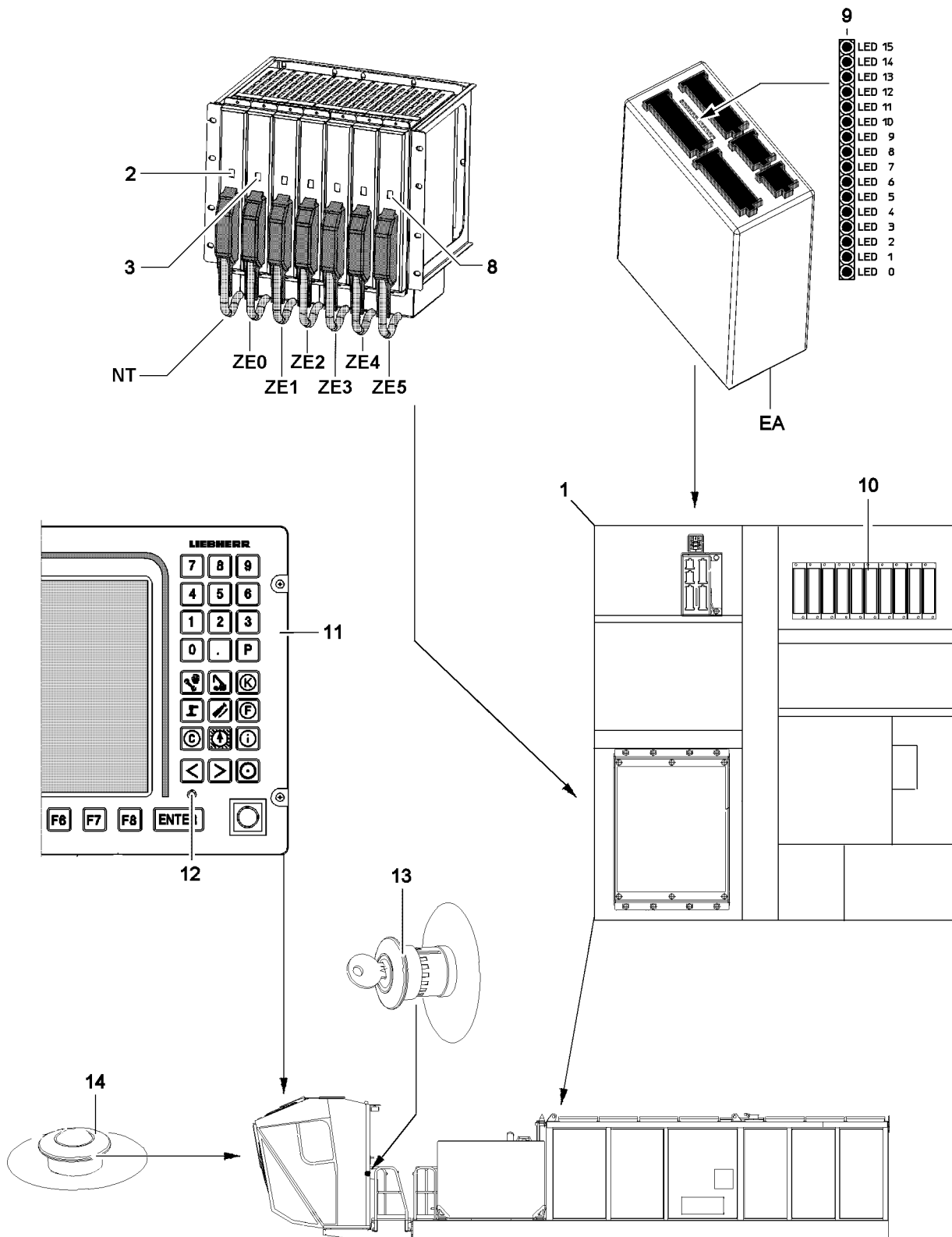
- ▶ For information regarding error diagnostics and error remedy, see “Diagnostics manual”.

- 1** Switch box
- 2** LED display power supply
- 3-8** LED displays CPU0 to CPU5
- 9** LED display I / O module
- 10** Fuses
- 11** LICCON Monitor 0
- 12** LED monitor 0
- 13** EMERGENCY OFF switch outside on the cab
- 14** EMERGENCY OFF switch in the cab
- EA** I / O module
- NT** Power supply
- ZE** CPUs ZE0 to ZE5

1.3 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 code and any error message displayed on the LICCON monitor 0 **11**.
- For certain errors: LED displays of power supply **NT** and CPUs **ZE**.
- Application conditions of the crane.
- Action during which the error occurs.
- Frequency of error.



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2 Measures in clear problem cases

Measures, which are taken in clear problem cases, are described in this section.



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.
-

Clear problem cases are:

- Engine does not start.
- Hydraulic, electric or engine failed.
- An alarm function occurs.
- LICCON computer system shows an error message.

2.1 The engine does not start?

- ▶ Make sure that the EMERGENCY OFF switch **13** and the EMERGENCY OFF switch **14** are not actuated.
- ▶ Make sure that the crane driver is seated on the crane driver's seat.
- ▶ Turn the ignition off.
- ▶ Start the engine again.



Note

- ▶ For Problem remedy, see chapter 4.03, section "Starting the engine and turning it off".
-

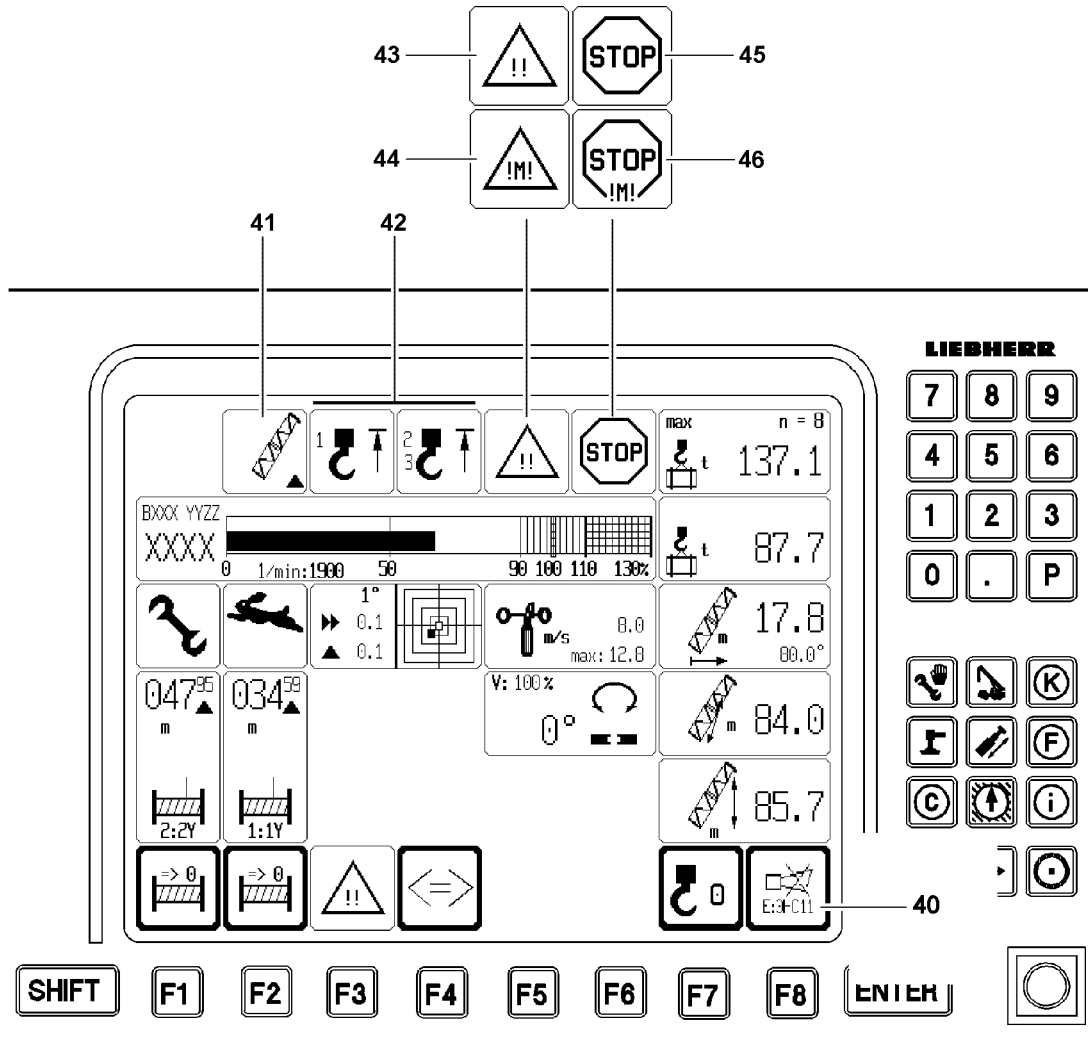
- ▶ If the error cannot be remedied:
Contact Liebherr Service to determine the cause of the problem and further procedure.

2.2 Have the hydraulic, electric or engine failed?



Note

- ▶ Is the equipment for hydraulic emergency control part of the scope of delivery, the crane can be taken down when the crane hydraulic, crane electric and crane engine failed.
 - ▶ Emergency down, see chapter 6.05.
-



2.3 Did an alarm function occur?



Note

- ▶ For a detailed description of alarm functions, see chapter 4.02.
- ▶ In case of an alarm function, an error message **40** with LICCON error code appears at the same time.

The following alarm functions are indicated by blinking icons on the LICCON monitor 0:

- Boom limitation **41**
- Hoist top limit switch **42**
- Advance warning load **43** / Advance warning engine **44**
- Stop load **45** / Stop engine **46**

The limit ranges of the crane movements are monitored by:

- Hoist limit switch.
- Angle sensors.
- Pressure sensors.
- Pull test brackets (force measuring boxes).
- Wind sensor.
- Inductive sensors.

If the limit ranges for these sensors are exceeded, the crane movements are turned off (LMB-STOP). The load moment limiter (LMB) is a program of the LICCON computer system to monitor the permissible load moment. If the permissible load moments of the load chart are exceeded, the LMB-STOP turns the crane movements off.



Note

- ▶ In case of certain shut offs, you can only continue to work by bypassing the safety devices.



WARNING

Risk of accident!

Personnel can be severely injured or killed!

- ▶ All instructions and data in chapter 4.04 must be observed and adhered to!



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 severely injured or 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 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 the crane supervisor and must be performed with utmost caution!
- ▶ Crane operation with bypassed overload protection is prohibited!
- ▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

- ▶ If a LMB-STOP occurs due to boom limitation:
Carry out load moment reducing crane movements.

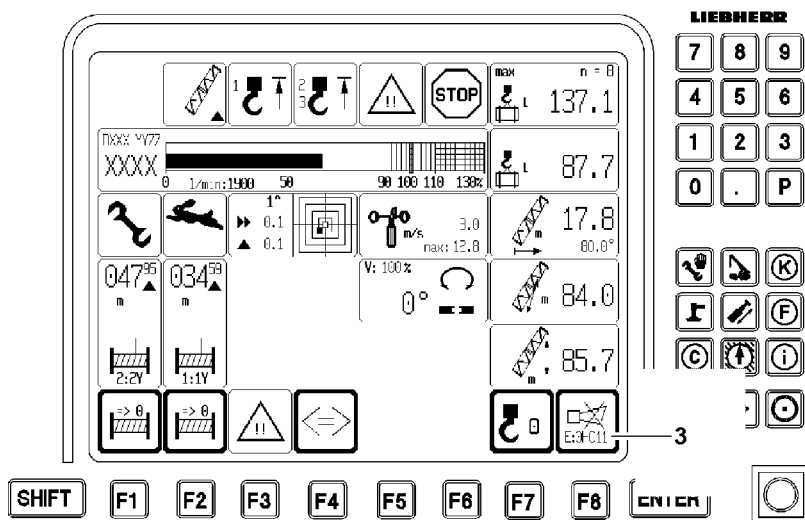
1



2



3



2.4 LICCON computer system shows an error message?



DANGER

Risk of accident!

Personnel can be severely injured or killed!

The crane can be severely damaged or destroyed!

▶ All instructions and data in chapter 4.04 must be observed and adhered to!

Examples of error messages:

- While the LICCON computer system starts up, see error display illustration 1, example 1.
- During operation, see error display illustration 2, example 2.
- During operation, see operating screen illustration 3, example 3.

Differentiation of error messages on the LICCON monitor:

- Error without LICCON Error Code (LEC), see example 1.
- Error with LICCON Error Code (LEC), see example 2 and example 3.

Differentiation of errors in crane operation:

- Errors which lead to shut down: The shut down icon is shown.
- Errors which do not lead to shut down: The crane operator is warned.

2.4.1 Remedy temporary errors during system start



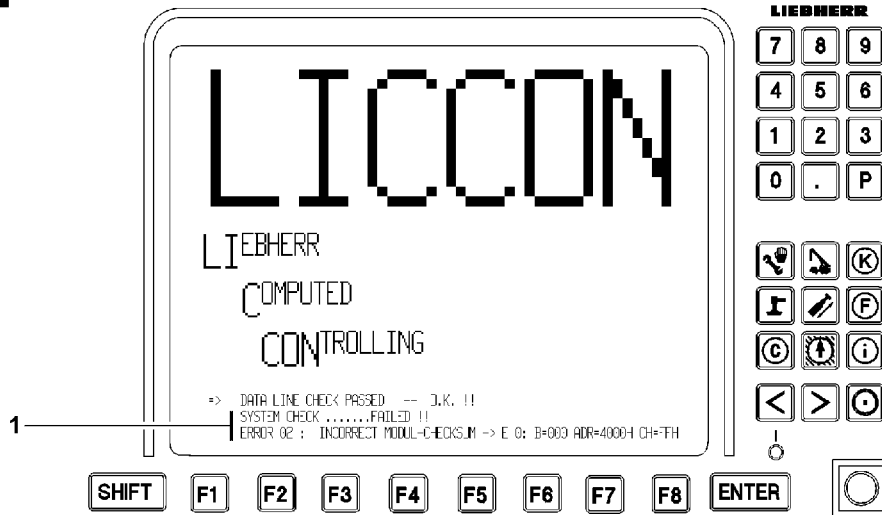
Note

▶ While the LICCON computer system starts, temporary errors can occur, see illustration 1.

Errors, which occur temporarily, can have the following causes:

- Loosen contact.
 - 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 view appears several times:
Turn the LICCON computer system off.
- ▶ Call up the test system, see section “Calling up the test system program”.
- ▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

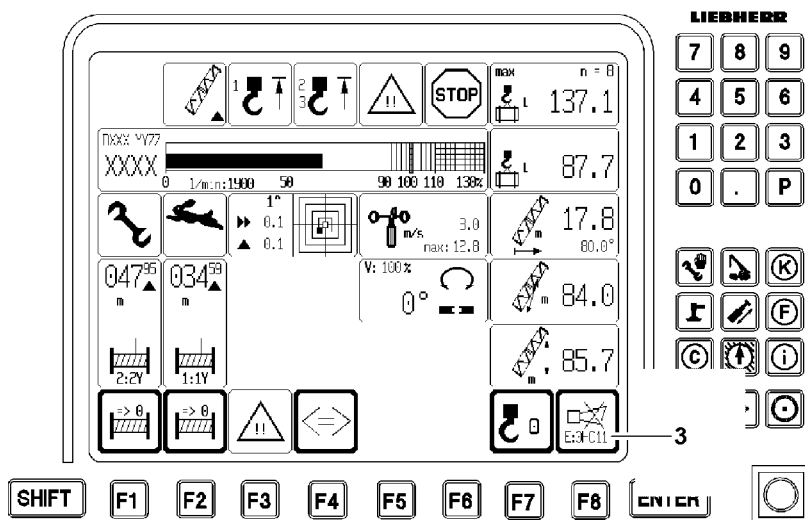
1



2



3



2.4.2 Procedure in case of error messages with LEC

Two different types of errors are differentiated with the LEC:

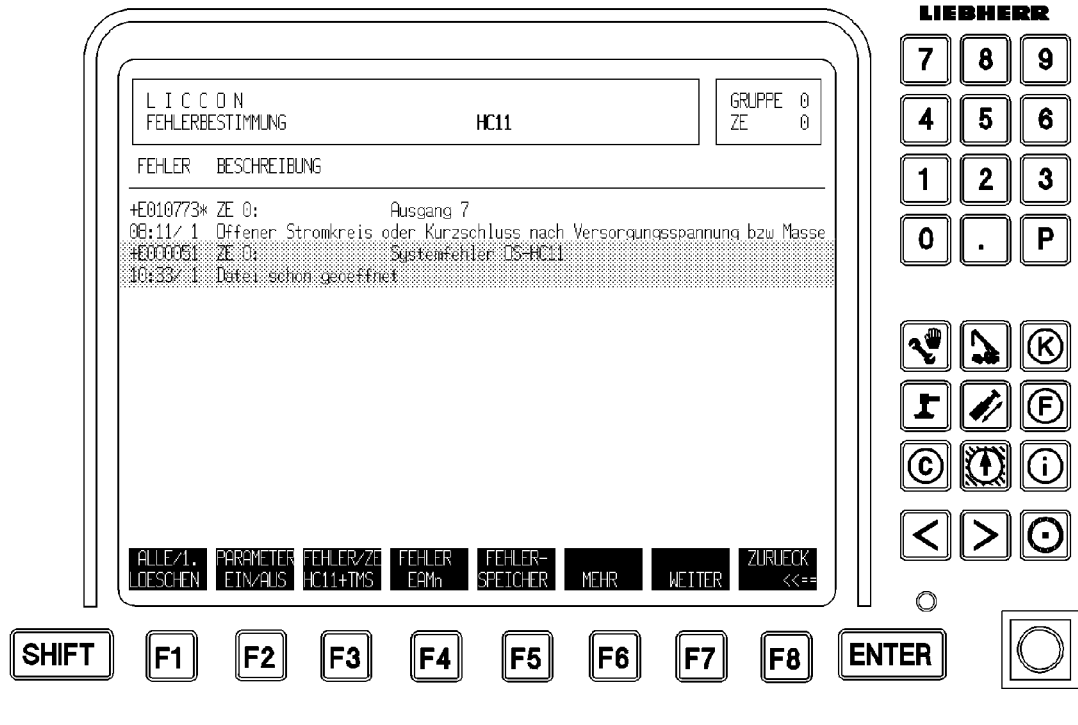
- Operating errors - Error code starts with a "B".
- System errors / application errors - Error code starts with an "E".

A LEC is always 6-digit.

Example of an error code: E:OHC11	
Element	Description
E:	Error class
0	CPU
HC11	I / O module and number, or processor of CPU

- ▶ 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 section "Calling up the test system program".
- ▶ Contact Liebherr Service to determine the cause of the problem and further procedure.

4



2.4.3 Calling up the “Test system” program

Error messages of the LICCON computer systems with LEC are described in the error determination screen, illustration 4. To do so, change into the test system program.

Listed errors in the error determination screen are differentiated by:

- Active errors - Error code starts with a “+” .
- Inactive errors - Error code starts with a “-” .

**Note**

- ▶ Active errors have higher priority than inactive errors and must be taken care of.
-

Calling up the “Test system” from the operating screen

Make sure that the following prerequisites are met:

- error message visible in the icon element “Horn”, see illustration 3,
- warning signal “Horn” is audible.

- ▶ Press function key **F8** once.

Result:

- Horn is turned off.

- ▶ Press function key **F8** twice.

Result:

- Change into the error determination screen.
- Listing of errors with LEC and error text.

Calling up the “Test system” after an error screen

Make sure that the following prerequisites are met:

- the operating screen changes into the error screen (system error), see illustration 2,
- crane functions are interrupted,

or:

- error screen, while the LICCON computer system starts up, see illustration 3.

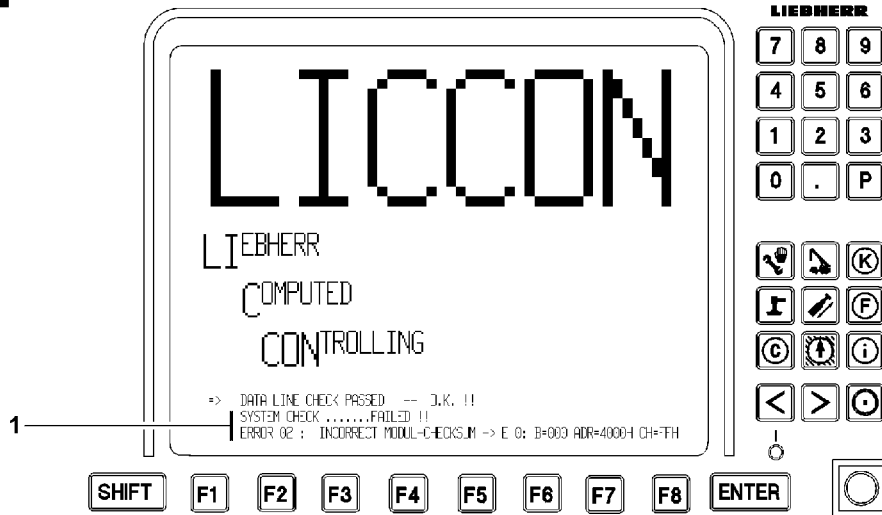
- ▶ Turn the LICCON computer system off.

- ▶ Turn the LICCON computer system back on after approx. 5 s.

Result:

- Change into the error determination screen.
- Listing of errors with LEC and error text.

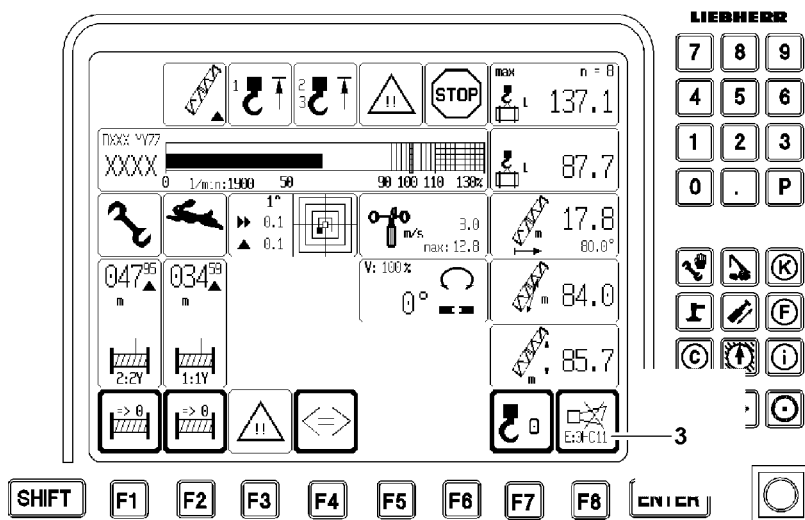
1



2



3



3 Carrying out an error diagnostics

Several possibilities exist for an error diagnostics:

- With the help of Liebherr Service.
- With the help of Liebherr Service via remote diagnostics.
- Without the help of Liebherr Service.

3.1 Error diagnostics with the help of Liebherr Service

3.1.1 Error diagnostics by phone

- ▶ Contact Liebherr Service to determine the cause of the problem and further procedure.
- ▶ Follow the instructions given by Liebherr Service.

3.1.2 Remote diagnostics

The remote diagnostics makes it possible for Liebherr Service to check Liebherr cranes from a remote location in case of problems.

Activation of the remote diagnostics device is first carried out by Liebherr Service.

Make sure that the following prerequisites are met:

- the crane operator has a valid SIM-card (telephone card for mobile telephones) from a current mobile network operator,
- the telephone number of the data service is known,
- the PIN code request of the SIM-card is deactivated,
- the SIM-card is built into the GSM module,
- for information for remote diagnostics, see “Diagnostics manual”,
- follow the instructions given by Liebherr Service.



Note

- ▶ For information for remote diagnostics, see “Diagnostics manual”.
 - ▶ Follow the instructions given by Liebherr Service.
-

3.2 Error diagnostics without the help of Liebherr Service



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 severely injured or killed!

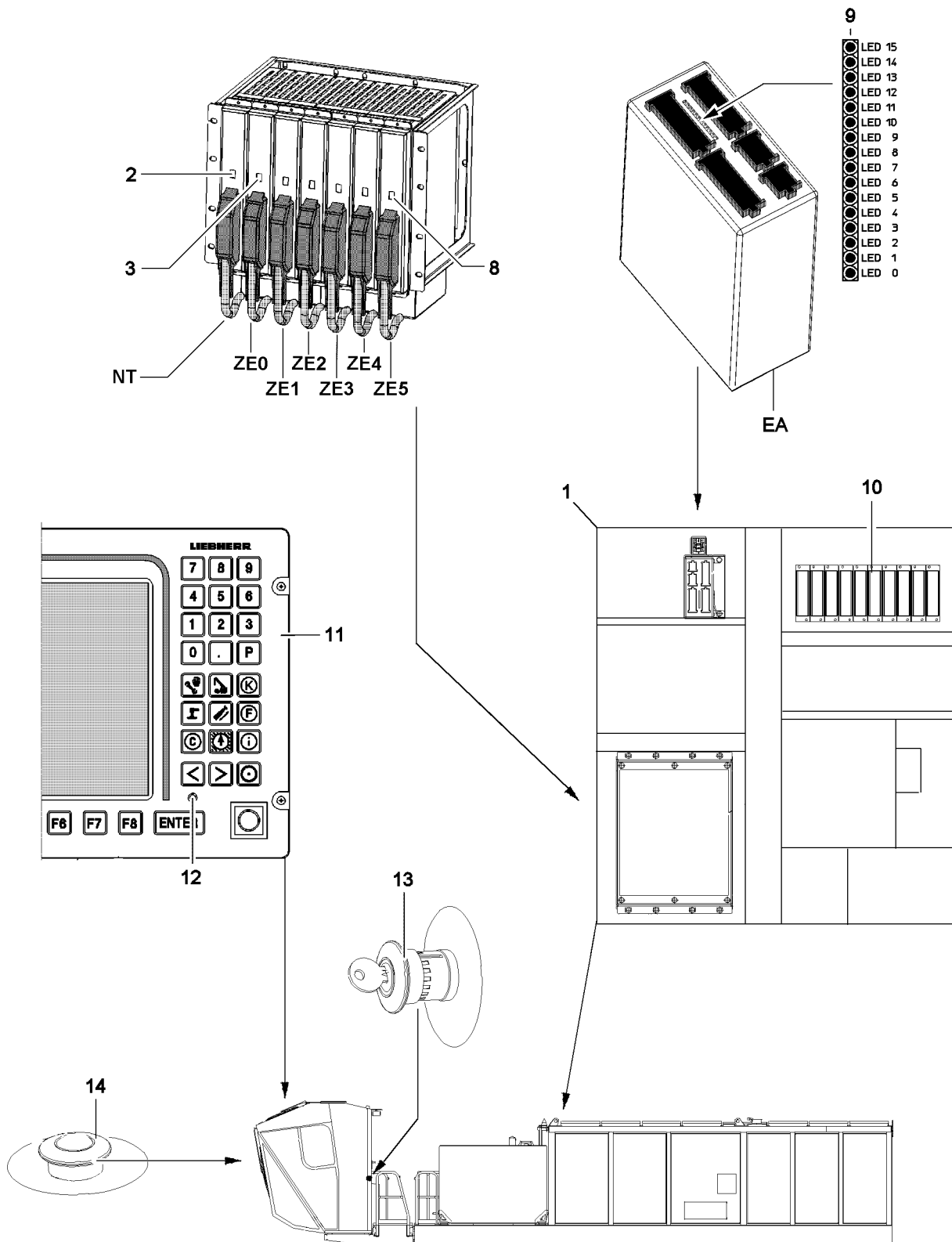
- ▶ If problems remain or in case of error messages, consult Liebherr Service to determine the cause of the problem and further procedure.
-



Note

Error diagnostics without the help of Liebherr Service!

- ▶ For information regarding error diagnostics and error remedy, see “Diagnostics manual”.
-



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4 Measures for defective components

The following components are part of the scope of delivery as spare parts:

- LICCON monitor **349**
- Power supply **NT**
- CPU **ZE**



DANGER

Danger to life if original attachment parts are **not** used!

If the crane is operated with attachment 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 attachment parts!
- ▶ Crane operation with attachment parts, which do **not** belong to the crane is prohibited!



DANGER

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!



Note

- ▶ For instructions describing the replacement of a defective LICCON monitor **11**, a defective power supply **NT** or a defective CPU **ZE**, see "Diagnostics" manual.

Make sure that the following prerequisites are met:

- error diagnostics has been carried out,
- defective component has been determined.

4.1 Is the LICCON monitor defective?

- ▶ Replace the LICCON monitor **11** with a functioning substitute monitor.

4.2 Is the power supply defective?

- ▶ Replace the power supply **NT** with a functioning power supply.

4.3 Is the CPU defective?

- ▶ Replace the CPU **ZE** with a functioning spare CPU.

4.4 Is the electrical connection of a cable drum interrupted?

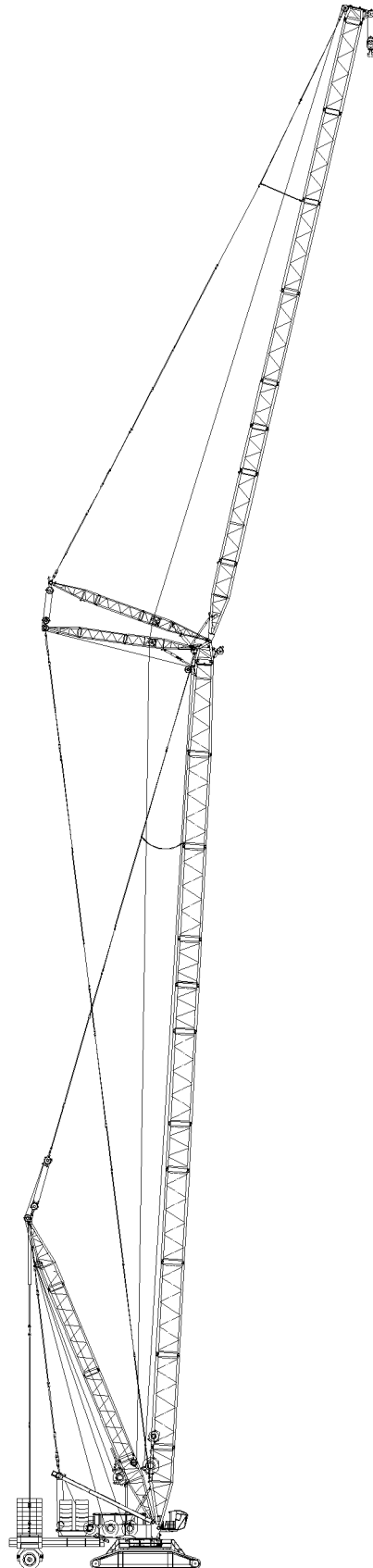


WARNING

Interrupted electrical connection!

If the electrical connection of a cable drum is interrupted, then this causes a shut off (LMB STOP). No further crane movements are possible.

- ▶ Contact Liebherr Service to determine further procedure.



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4.5 Is a sensor or limit switch defective?

Certain crane functions are monitored with two sets of sensors and limit switches.



Note

► For double version: If only one of the two limit switches or sensor defective, then work can continue with the crane.

► Replace the defective limit switch or sensor.



Note

► For single version: If a limit switch or sensor is defective, then this causes a shut off (LMB STOP).
 ► For double version: If both limit switches or sensors are defective, then this causes a shut off (LMB STOP).



DANGER

Bypassing the overload protection!

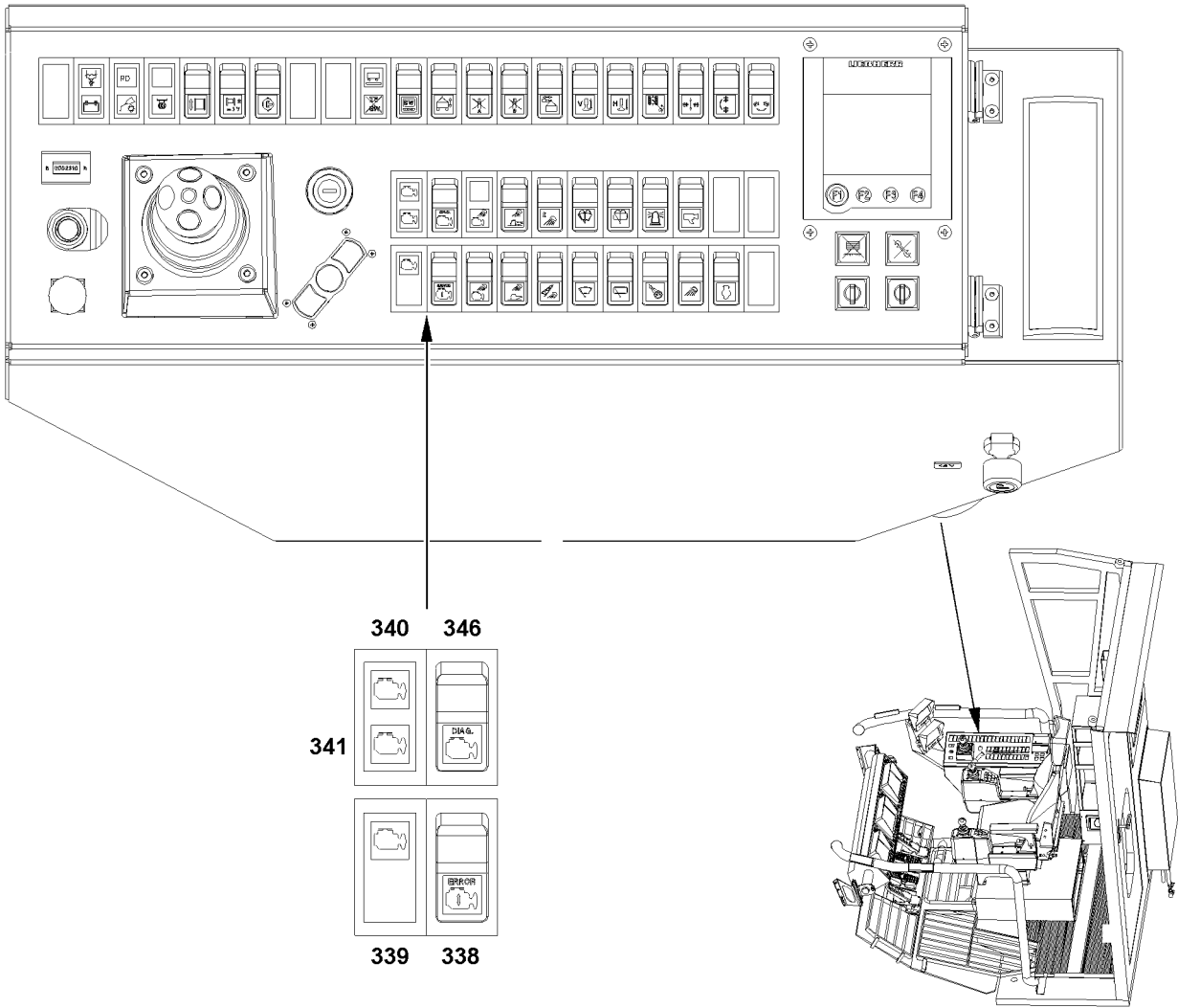
If the overload protection is bypassed, there is no further protection against crane overload!

In the event of deliberate improper use, the crane could collapse, the boom can break off or the crane can topple over!

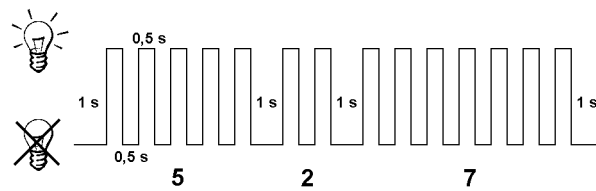
Personnel can be severely injured or killed!

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 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 the crane supervisor 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!
 - Contact Liebherr Service to determine the cause of the problem and further procedure.
 - All instructions and data in chapter 4.04 must be observed and adhered to!
- Contact Liebherr Service to determine further procedure.



1



5 Error messages Crane engine

If an error message is present on the crane engine, then the error can be read with the aid of a blinker code on the Error code light **339**, Error code light **340** or Error code light **341**. The error messages are classified into three categories. Depending on the category, the blinker code is shown on the Error code light **339**, Error code light **340** or Error code light **341**. The blinker code must be noted and checked in section "Error messages", where the error is documented.

Position	Color	Description
339	White	Shows excessively high fluid temperatures and excessively low fill levels
340	Red	Shows severe errors on the crane engine. Turn the crane engine off immediately !
341	Yellow	Shows warnings on the crane engine.

5.1 Design of blinker code

- The error code light **341** blinks once before every error.
- Every number is shown with a blinker sequence in 0.5 second cycles. The number of blinker signs results in the value of the number, see illustration 1.
- There is a 1 second break between every number.
- After every error, the error code light **341** blinks once.

5.2 Procedure in case of error messages

An existing error message on the crane engine is shown by illumination of the error code light **341**.

- ▶ If the error code light **341** lights up:
Actuate the switch **346**.

Result:

- The existing error message is shown on the error code light **339**, error code light **340** or error code light **341** by a blinker code, see section "Design of blinker code".
- ▶ Note the blinker code and check section "Error messages".

If additional error messages are present, use the button to change to the next error message. If not additional error messages are present, then the current blinker code is repeated.

- ▶ Press the button **338**.

Result:

- If present, the next error message is shown on the error code light **339**, error code light **340** or error code light **341** by a blinker code, otherwise the current blinker code is repeated.
- ▶ Note the blinker code and check section "Error messages".

5.3 Error messages

Error code	Position	Reason	Effect
111	340	Internal hardware error of electronic control module.	Possibly no effect or engine is not running quietly or does not start.
112	340	The control link of the injection timing regulation does not react to regulation changes. Discrepancy between measured and desired regulation pressure.	Adjustment dependent engine stop or RPM reduction or no effect.
113	341	Control link of injection timing regulation has short circuit to power supply.	No effect. Control link is open or closed or partially opened. Output fluctuates. Error code 112 is also created.
115	340	No RPM or position signal found on connections 27, 28 and 37, 38 of the engine wiring harness.	Engine is turned off and cannot run.
116	340	Pressure sensor injection timing regulation has short circuit to power supply. More than 4.78 V on Pin 33.	Adjustment dependent engine stop or RPM reduction or no effect.
117	340	Pressure sensor injection timing regulation has short circuit to ground. Less than 0.15 V on Pin 33.	Adjustment dependent engine stop or RPM reduction or no effect.
118	341	Pressure sensor fuel pump short circuit to power supply. More than 4.78 V on Pin 32.	No effect. Possible loss of power.
119	341	Pressure sensor fuel pump short circuit to ground. Less than 0.30 V on Pin 32.	No effect. Possible loss of power.
121	341	Only RPM or position signal. Inductive sensors Input not present on Pins 27, 28 or 37, 38.	No effect by regulator.
122	341	High voltage on connection 35 (charge pressure sensor signal) found on engine wiring harness.	The engine output is restricted to the setting without air supply.
123	341	Low voltage on connection 35 (charge pressure sensor signal) found on engine wiring harness.	The engine output is restricted to the setting without air supply.
131	340	High voltage found on connection 29 gas pedal position signal of wiring harness.	Adjustment dependent output and / or RPM reduction.
132	340	Low voltage found on connection 29 gas pedal position signal of wiring harness.	Adjustment dependent output and / or RPM reduction.

Error code	Position	Reason	Effect
133	340	High voltage on connection 30 (gas pedal position signal at remote control) found on wiring harness.	Engine does not react to remote control of gas pedal.
134	340	Low voltage on connection 30 (gas pedal position signal at remote control) found on wiring harness.	Engine does not react to remote control of gas pedal.
135	341	High signal voltage on connection 24 found in switch circuit of engine oil pressure sensor.	Preadjusted value for oil pressure is used. No protective function for oil pressure.
141	341	Low signal voltage on connection 24 found in switch circuit of engine oil pressure sensor.	Preadjusted value for oil pressure is used. No protective function for oil pressure.
143	339	Oil pressure signal shows that the oil pressure has dropped below the engine protection limit value.	Reduction of output and / or RPM and possible engine shut off if shut off is activated.
144	341	High signal voltage on connection 22 found in switch circuit of engine coolant temperature sensor.	Preadjusted value for coolant temperature is used. No engine protection for coolant temperature.
145	341	Low signal voltage on connection 22 found in switch circuit of engine coolant temperature sensor.	Preadjusted value for coolant temperature is used. No engine protection for coolant temperature.
147	340	On connection 17 of the engine wiring harness (throttle control lever signal), a frequency below the minimum value is found.	The engine does not react to changes in RPM frequency regulation. The engine is running at low idle speed.
148	340	On connection 17 of the engine wiring harness (throttle control lever signal), a frequency above the maximum value is found.	The engine does not react to changes in RPM frequency regulation. The engine is running at low idle speed.
151	339	The engine coolant temperature signal signals that the coolant temperature has increased past the critical limit to protect the engine.	Output reduction possibly engine shut off specified value of engine if it is activated in the engine protection function protection function exceeded.
153	341	High signal voltage on connection 23 found in switch circuit of intake manifold temperature sensor.	Preadjusted value for intake air temperature is used. No engine protection for intake manifold temperature.

Error code	Position	Reason	Effect
154	341	Low signal voltage on connection 23 found in switch circuit of intake manifold temperature sensors.	Preadjusted value for intake air temperature is used. No engine protection for intake manifold temperature.
155	339	Intake manifold temperature above the critical limit value for protection of engine.	RPM reduction or engine shut off if engine protection function is activated.
219	341	Oil level auxiliary oil reservoir too low.	Centinel oil combustion is deactivated.
221	341	High signal voltage on connection 34 found in switch circuit of air pressure sensor.	Output and / or RPM reduction.
222	341	Low signal voltage on connection 34 found in switch circuit of air pressure sensor.	Output and / or RPM reduction.
223	341	Insufficient voltage on Pin 8 of spool of oil combustion valve.	Centinel oil combustion is turned off.
225	341	Insufficient voltage on Pin2 of spool of oil equalization valve.	Centinel oil combustion is turned off.
231	341	Excessive voltage on coolant pressure sensor.	No engine protection function for coolant pressure.
232	341	Insufficient voltage on coolant pressure sensor.	No engine protection function for coolant pressure.
233	339	Coolant pressure too low.	Output reduction and possible engine shut off.
234	340	Engine RPM signal signals that the engine RPM of the engine protection limit is being exceeded.	Interruption of fuel injection until the RPM has dropped below the limit value for excessive RPM.
235	339	Coolant level signal on connection 23 and 24 of the engine wiring harness shows too low coolant level.	Output and / or RPM reduction with possible engine shut off if engine protection shut off is activated.
252	341	Engine oil level display incorrect.	No engine protection for oil level. Centinel, engine oil combustion is turned off.
253	339	Very low oil level in engine.	Output and / or RPM reduction with possible engine shut off if engine protection shut off is activated. Centinel, engine oil combustion is turned off.

Error code	Position	Reason	Effect
254	341	Fuel shut off solenoid valve voltage too low.	Engine possible stalls or turns off badly.
259	340	Fuel shut off solenoid valve open is blocked.	No measure in regulation. Engine turns off badly.
261	339	Fuel temperature too high.	Output and / or RPM reduction with possible engine shut off if the engine protection shut off is activated.
263	341	More than 4.95 V on connection 26 of fuel temperature sensor found.	For fuel temperature, the standard value is used. No protective function for fuel temperature.
265	341	Less than 0.21 V on connection 26 of fuel temperature sensor found.	For fuel temperature, the standard value is used. No protective function for fuel temperature.
292	339	Signal voltage of auxiliary temperature on Pin 27 is outside specified limit value.	Output and / or RPM reduction with possible engine shut off if the engine protection shut off is activated.
293	341	Signal voltage of auxiliary temperature on Pin 27 is too high.	No protective function for OEM temperature.
294	341	Signal voltage of auxiliary temperature on Pin 27 is too low.	No protective function for OEM temperature.
316	341	High voltage on Pin 11 or Pin 40. Control link of fuel pump open or short circuited.	No actuation of engine regulation. Possible loss of power.
318	341	Control link of fuel pump mechanically seized.	No actuation of engine regulation. Possible loss of power.
343	341	Engine control module has internal error.	No actuation of engine regulation. Possible loss of power. Engine might not start.
346	341	Electrical connection to engine control module separated too quickly	Engine data not properly saved at shut off. Possibly saved files damaged.
349	341	Frequency signal of RPM from gear shows that the frequency is above a programmed threshold value.	Output and / or RPM reduction depends on the measure set in programming.
384	341	Error in switch circuit starting aid.	No starting aid present any more.
415	339	Oil pressure has dropped below the critical limit to protect the engine.	RPM reset of engine, possibly engine shut off, if it is activated in the engine protection function.

Error code	Position	Reason	Effect
422	341	Signal coolant level not correct. In-correct voltage between Pin 14 and Pin 23.	No monitoring of coolant level.
423	341	Control link ignition timing control is seized. Voltage on Pin 33 not correct.	Output and / or RPM reduction possibly irregular engine run.
426	341	Data bus connection J1939 interrupted.	No actuation of engine regulation, possibly loss of output.
431	341	Error in switch circuit - gas pedal idle position. Voltage determined simultaneously on both switches "in idle" and "not in idle".	The engine is running only in idle.
432	340	Discrepancy of gas pedal position between RPM specification and idle.	Engine does not react to gas pedal and runs only in idle.
441	341	Low battery voltage, below 12 V .	Engine regulation can be disturbed resulting in irregularities.
442	341	Battery voltage too high, more than 38 V .	Engine control module could be damaged.
451	340	Pressure sensor injection amount regulation has short circuit to power supply. More than 4.78 V on Pin 31.	Adjustment dependent shut off or RPM reduction or no effect.
452	340	Pressure sensor injection boost regulation has short circuit to ground. Less than 0.15 V on Pin 31.	Adjustment dependent shut off or RPM reduction or no effect.
455	340	Injection amount regulation has short circuit to ground or to battery. Pin 3 or Pin 10 short circuited.	Control links is partially or completely closed. Engine does not start or runs only at one speed. Error code 514 is also created.
467	341	Value injection timing regulating pressure is not correct. Discrepancy between „nominal“ and „actual“ value.	Adjustment dependent shut off or RPM reduction or no effect.
468	341	Value injection amount regulating pressure is not correct. Discrepancy between „nominal“ and „actual“ value.	Adjustment dependent shut off or RPM reduction or no effect.
471	339	Low oil level in engine.	Output and / or RPM reduction with possible engine shut off if engine protection shut off is activated. Centinel, engine oil combustion is turned off.

Error code	Position	Reason	Effect
473	341	Error in switch circuit of oil level display auxiliary oil tank.	Centinel, engine oil combustion is turned off.
489	341	Frequency signal of RPM from gear shows that the frequency is below the pre-programmed threshold value.	Output and / or RPM reduction depends on the measures set in programming.
497	341	Synchronous control is erroneous.	Synchronous control is deactivated.
498	341	Engine oil level sensor has short circuit to power supply.	No monitoring of engine oil level. Centinel, engine oil combustion is turned off.
499	341	Engine oil level sensor has short circuit to ground.	No monitoring of engine oil level. Centinel, engine oil combustion is turned off.
514	340	Control link fuel amount regulation is seized. Discrepancy between „nominal“ and „actual“ value.	Adjustment dependent shut off or RPM reduction or no effect.
527	341	Error in switch circuit of additional outlet #2. Less than 17 V on Pin 1.	No actuation of engine regulation
529	341	Error in switch circuit of additional outlet #3. Less than 17 V on Pin 9.	No actuation of engine regulation
551	340	Error in switch circuit of idle control of gas pedal.	No actuation of engine regulation
553	340	Pressure in fuel amount regulation circuit too high.	Shut off solenoid valve is closed until pressure is normal again. Engine turns off also.
554	341	Error in fuel amount regulation circuit.	Adjustment dependent output reduction.
555	339	Crankcase pressure is too high.	Adjustment dependent shut off or output reduction.
649	341	Maintenance display oil and oil filter change due.	No actuation of engine regulation.

Error code	Position	Reason	Effect
719	341	Error in switch circuit of crankcase pressure sensor Short circuit against voltage.	No monitoring for crankcase pressure.
729	341	Error in switch circuit of crankcase pressure sensor Short circuit against ground.	No monitoring for crankcase pressure.
753	341	Error of RPM sensors.Synchronization error.	No actuation of engine regulation.

8 Inspections of cranes

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 legally 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 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.

**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!

A checklist for periodic inspections recommended for Liebherr mobile and crawler cranes is included in the appendix to assist the inspectors.

If the inspector has any questions they should be directed through our Service Department to Liebherr-Werk Ehingen GmbH's 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 structures 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.

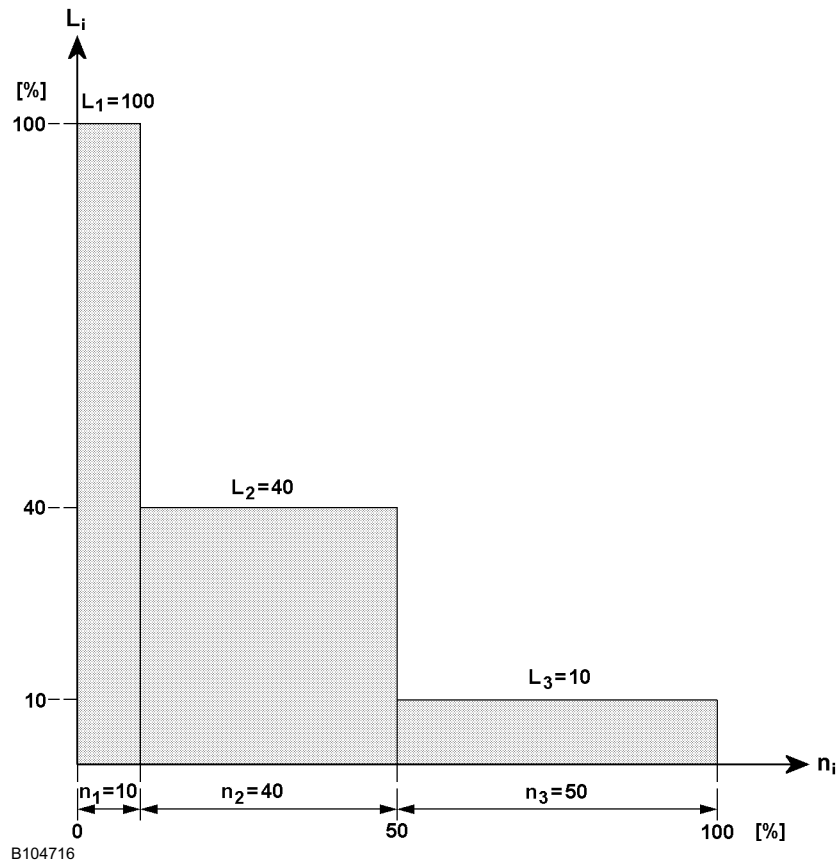
If disassembly and assembly work on the crane is required to carry out the inspections, then they must be carried out by taking the manufacturer's data into account or in coordination with the crane manufacturer.

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.

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 $Q_1 = \text{light}$ ($k_p = 0.125$).

Example of a load collective according to grouping in collective class $Q_1 = \text{light}$ ($k_p = 0.125$).



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 basic sketches are samples of the load-bearing welding structures. The welding joints or seams or steel structural zones that require inspection may be present more than once and in various forms. The joints or zones must be inspected all around at the locations identified by arrows.



Note

- ▶ The scope and extent of all inspections remain the sole responsibility of the inspectors!
- ▶ The scope and results of tests should be documented to permit reproducibility. This documentation forms part of the crane records and should be safely stored during the entire service life of the crane!
- ▶ The following basic sketches are provided to assist the inspector. The illustrations are only examples and are not necessarily 100 % complete!

2.2 Repair welds

If defects such as cracks or permanent deformation are detected on load-bearing steel components, they should be immediately reported to the Service Department at **Liebherr-Werk Ebingen GmbH** (hereinafter called **LWE**).

Furthermore, the defect must immediately be appraised by an authorized inspector in accordance with standard welding technology rules. The inspector must immediately ascertain whether or not the crane can continue to be safely operated until the time of the repair.

The following items apply to the repair weld:

- Repair welds may only be carried out by **LWE** personnel or third party personnel contracted by **LWE**, with appropriate welding qualifications according to EN 287-1 for the subject material and welding method!
- The repair weld must be carried out in accordance with the latest revision of **LWE's** internal welding guideline ISR B 010!
- The repaired structural component must subsequently be subjected to a load test. The required test loads and boom configurations are to be determined by **LWE Service!** Successful test results are to be documented in the crane inspection log!
- We also refer to observing the accident prevention regulations "Principles for testing cranes by authorized inspectors or experts in accordance with UVV **Cranes** BGV D6 and BGG 905"!



WARNING

Danger of accidents in case of defective repair welds!

Due to defective repair welds, severe personnel and property damage can result!

- ▶ Observe and adhere to the instructions and welding regulations!
-



Note

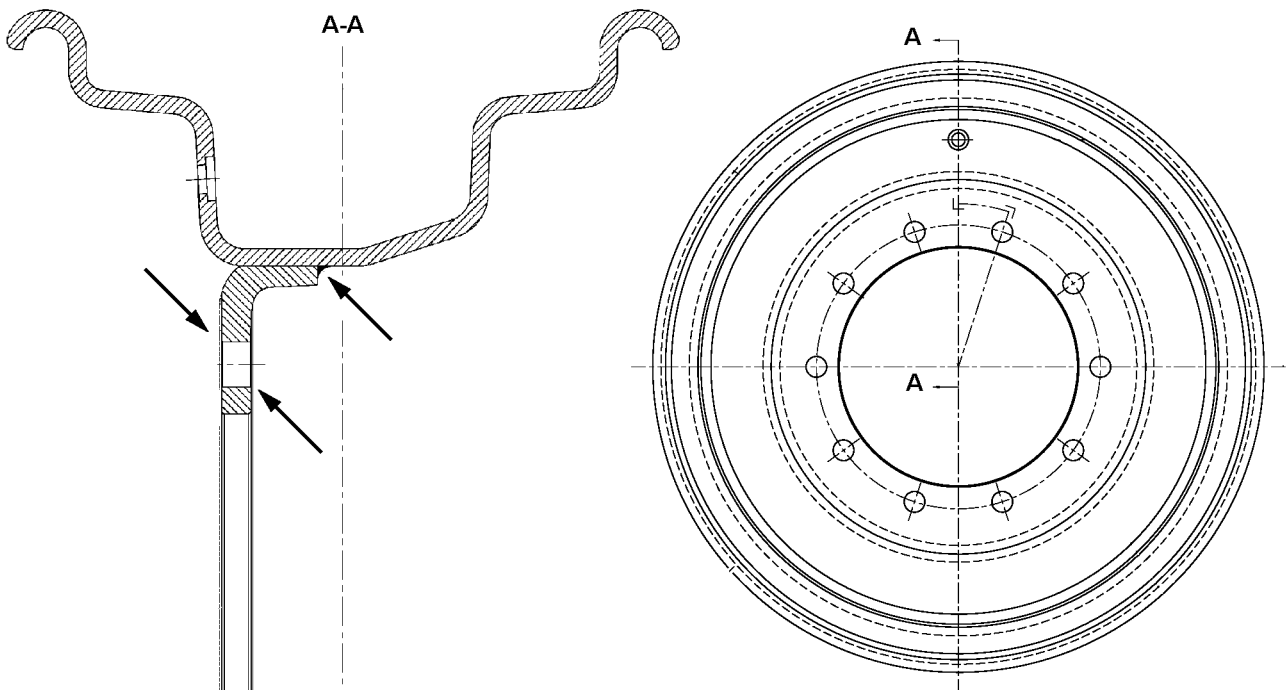
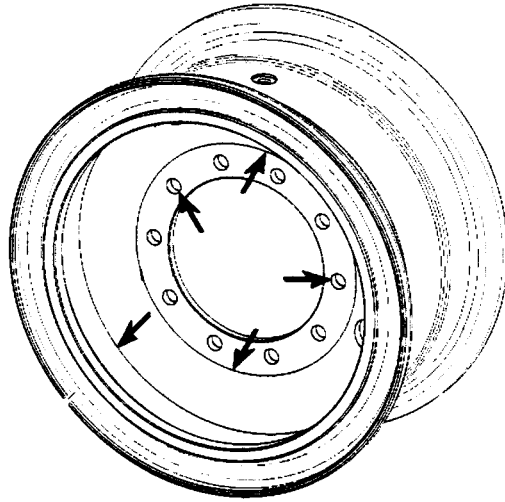
Exclusion of liability!

For repair welds, which are not made by **LWE** personnel or by personnel authorized by **LWE**, Liebherr-Werk Ebingen GmbH excludes liability for the system functionality as well as for the parts!

- ▶ Have repair welds only made by **LWE** personnel or by personnel authorized by **LWE**!
-

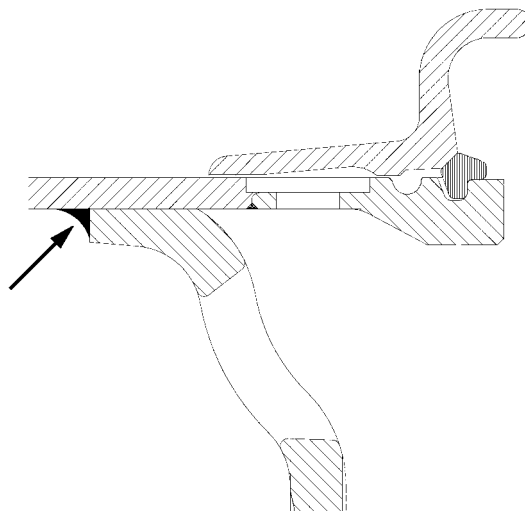
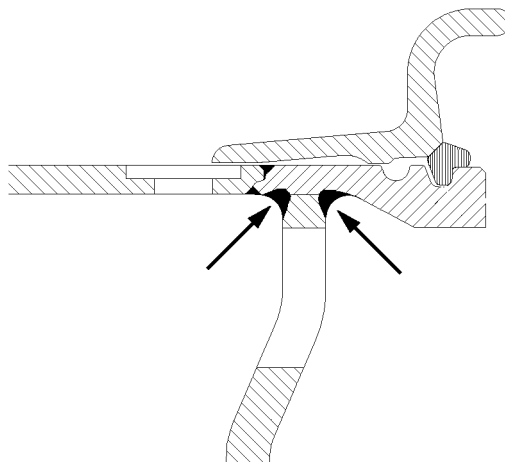
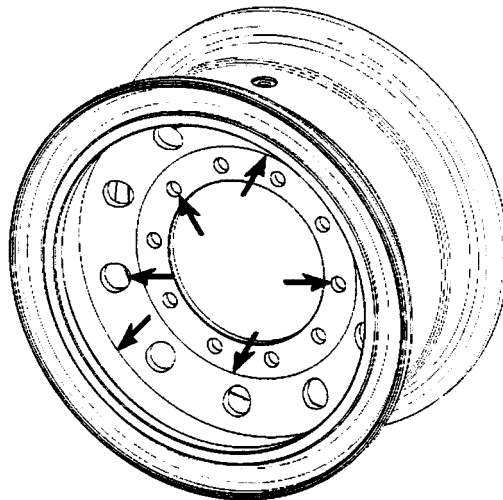
2.3 Example for test points

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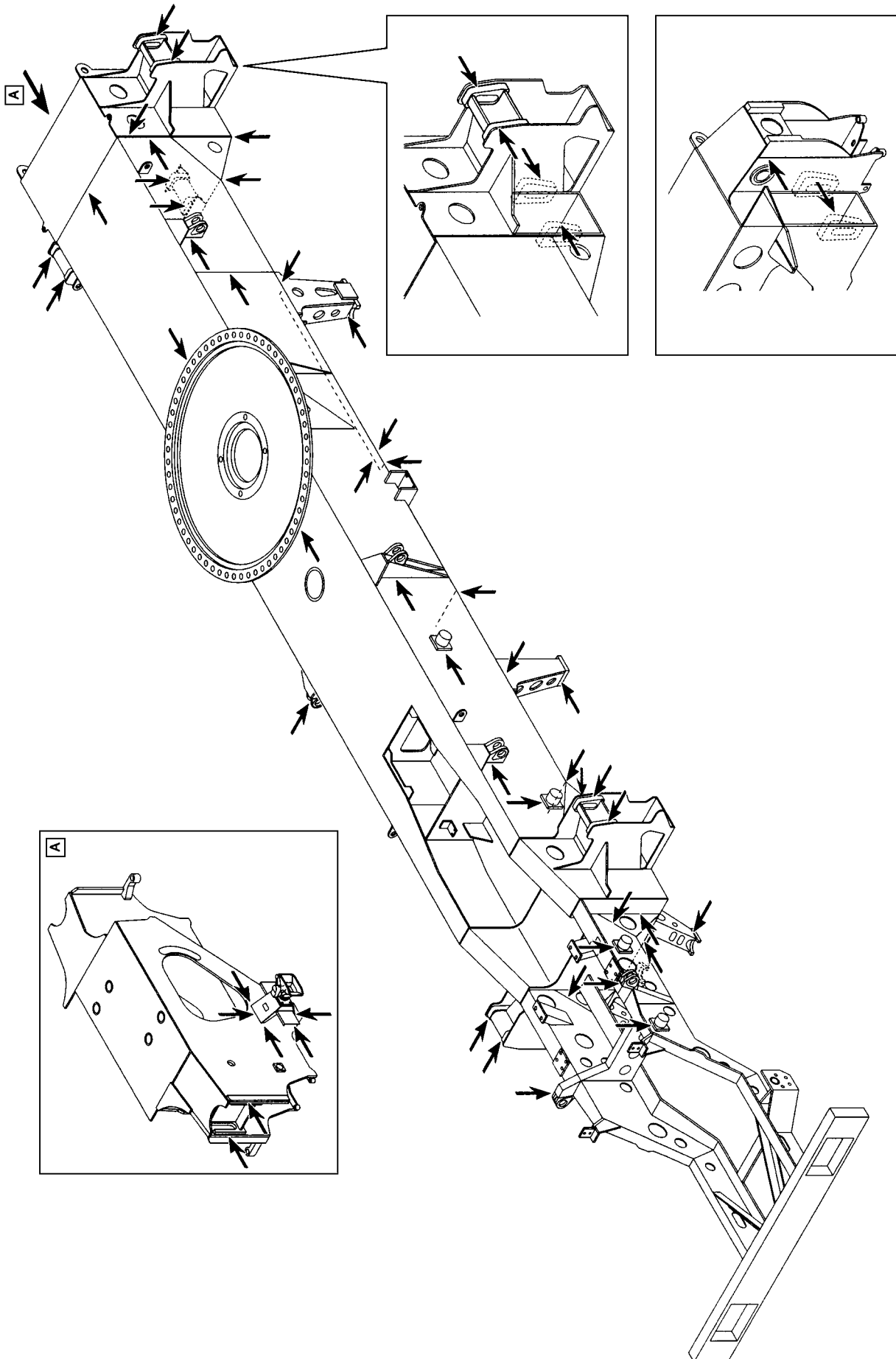
B118052

Example for 1-part disk wheel



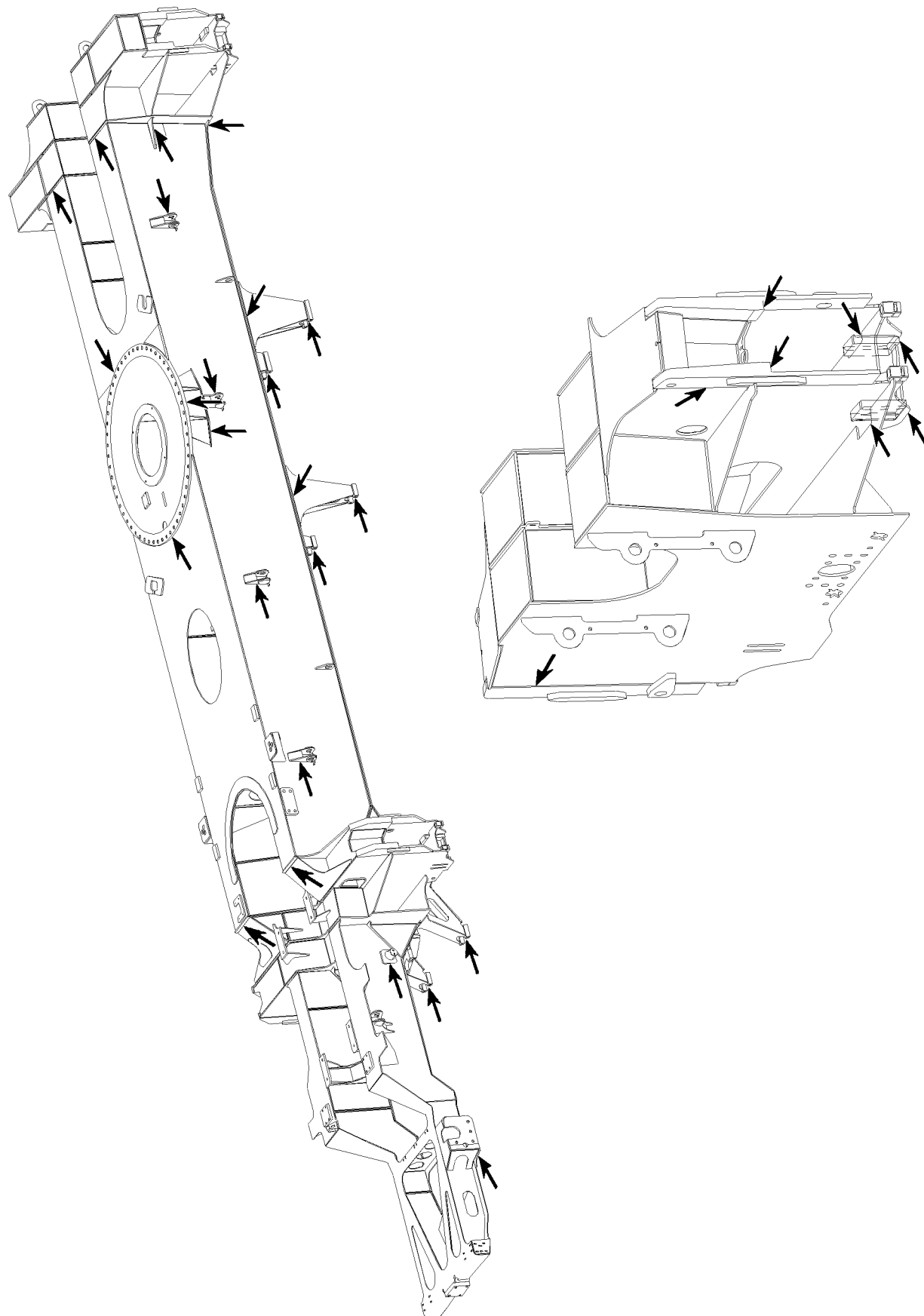
B118053

Example for 3-part disk wheel



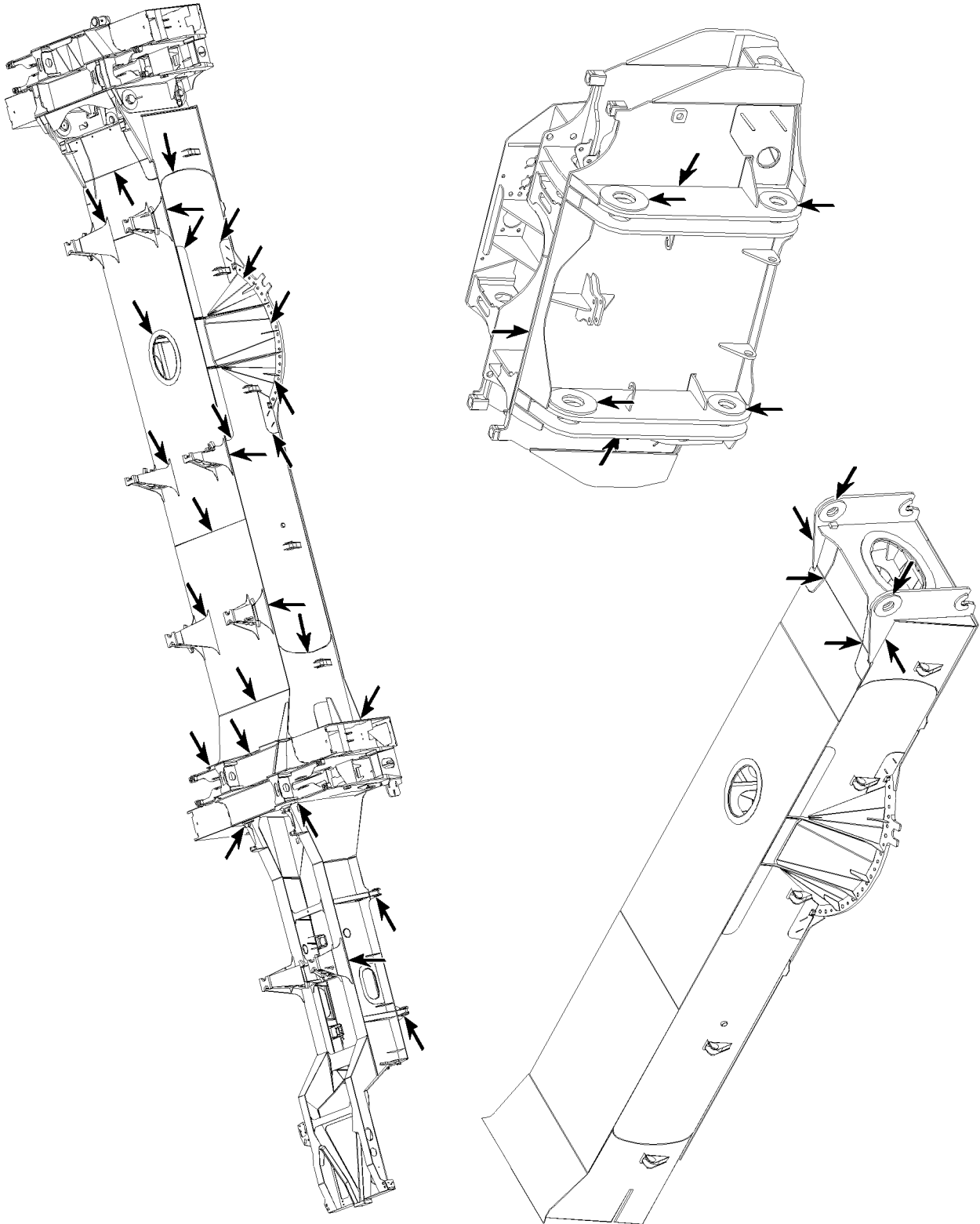
B185046

Example for vehicle frames



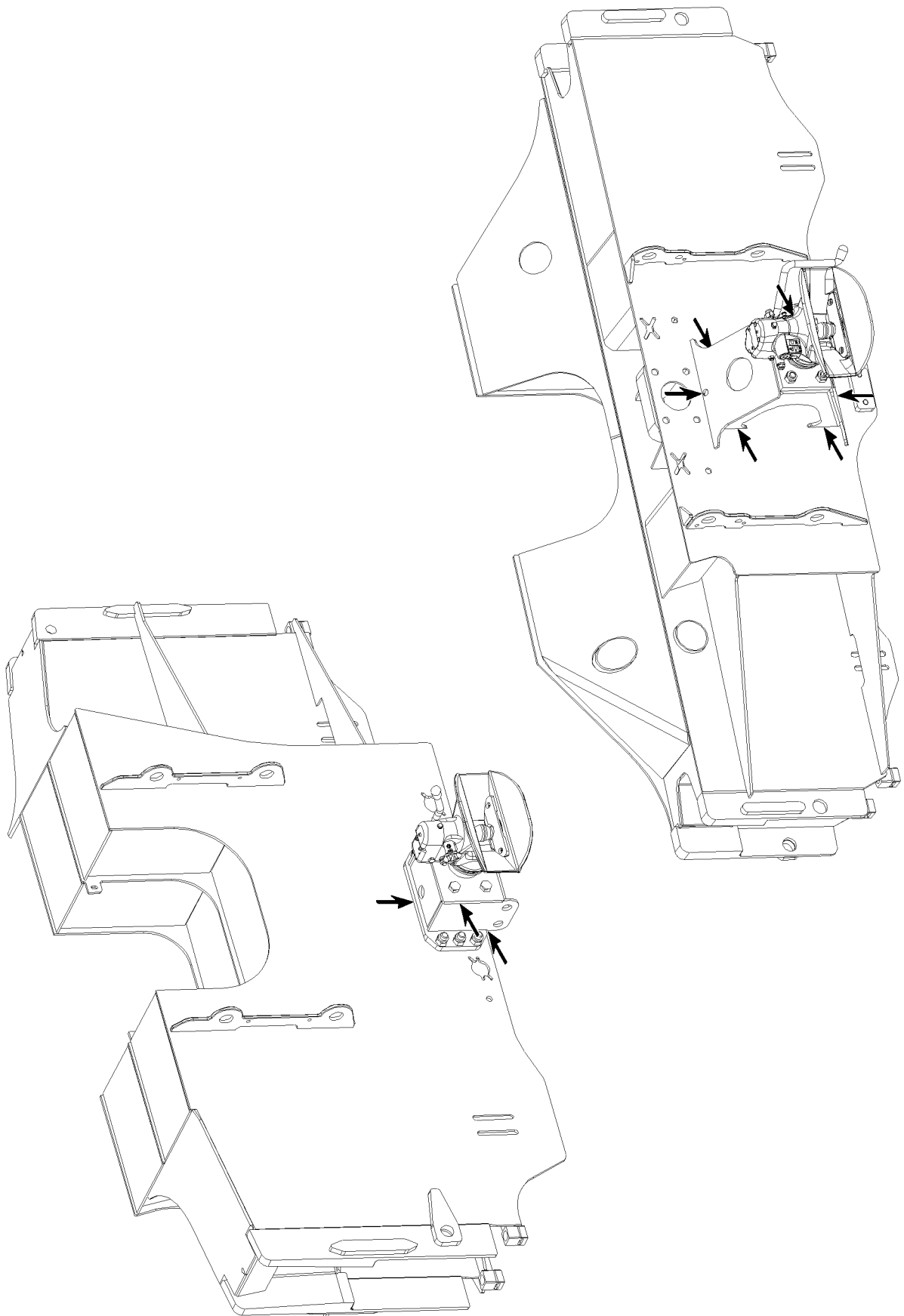
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Example for vehicle frames



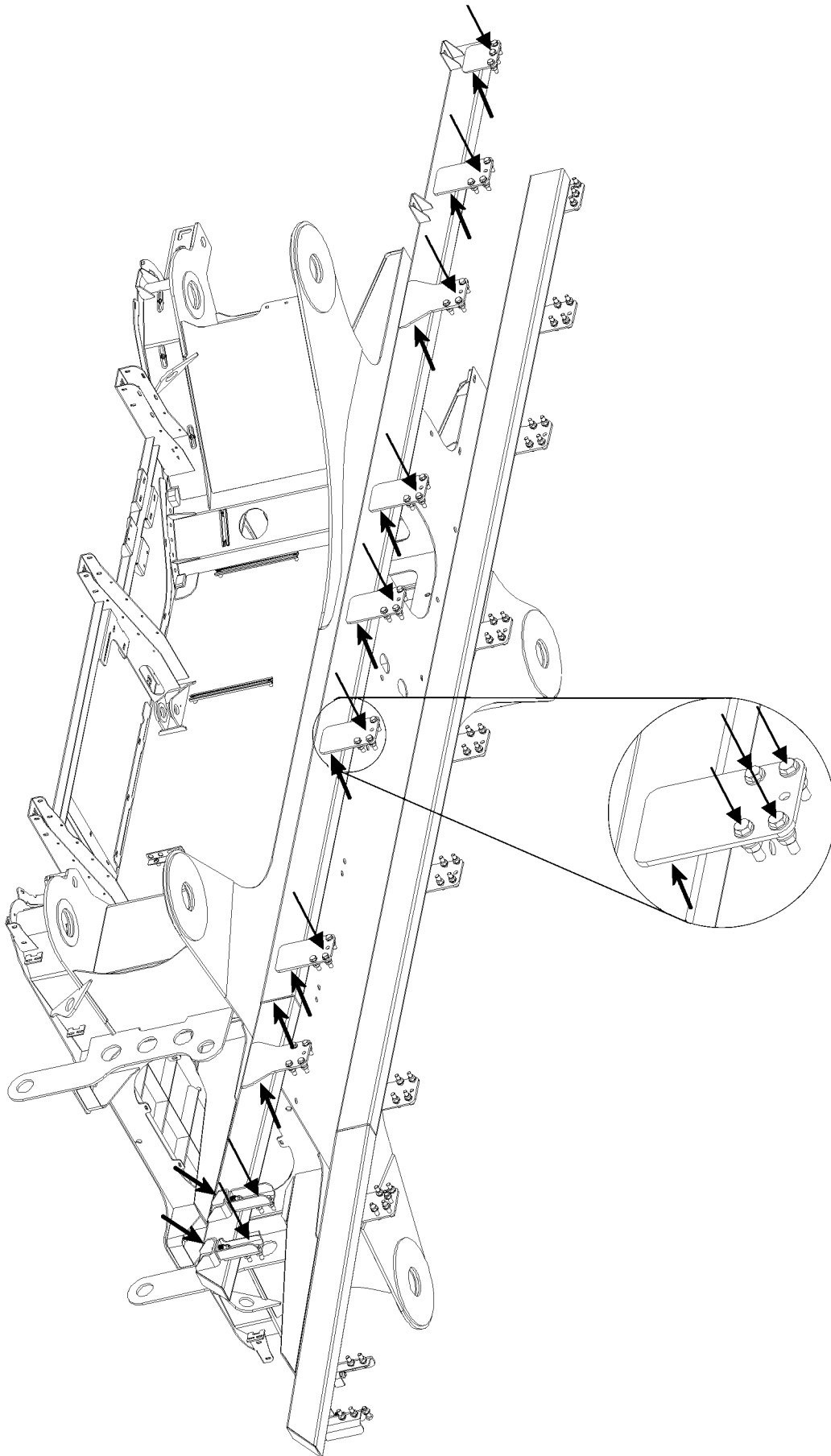
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Example for vehicle frames



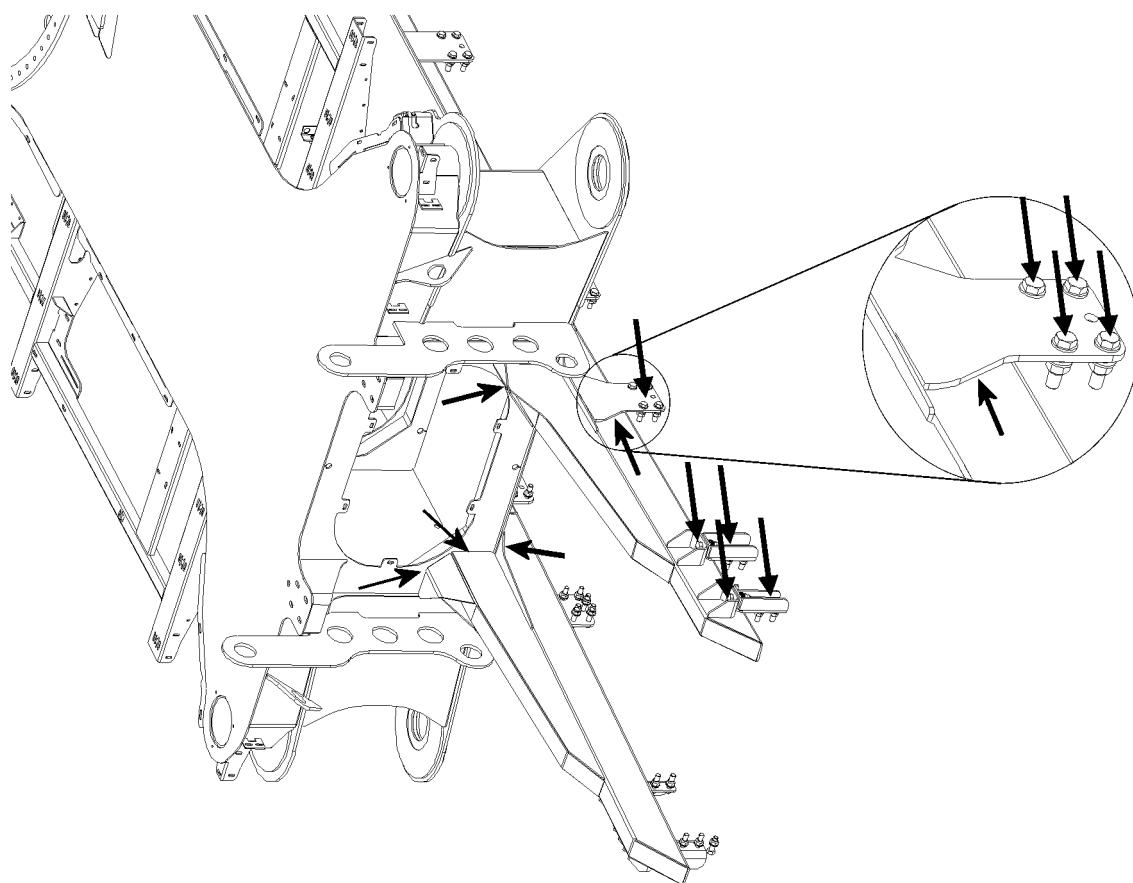
B105687

Example for tow coupling



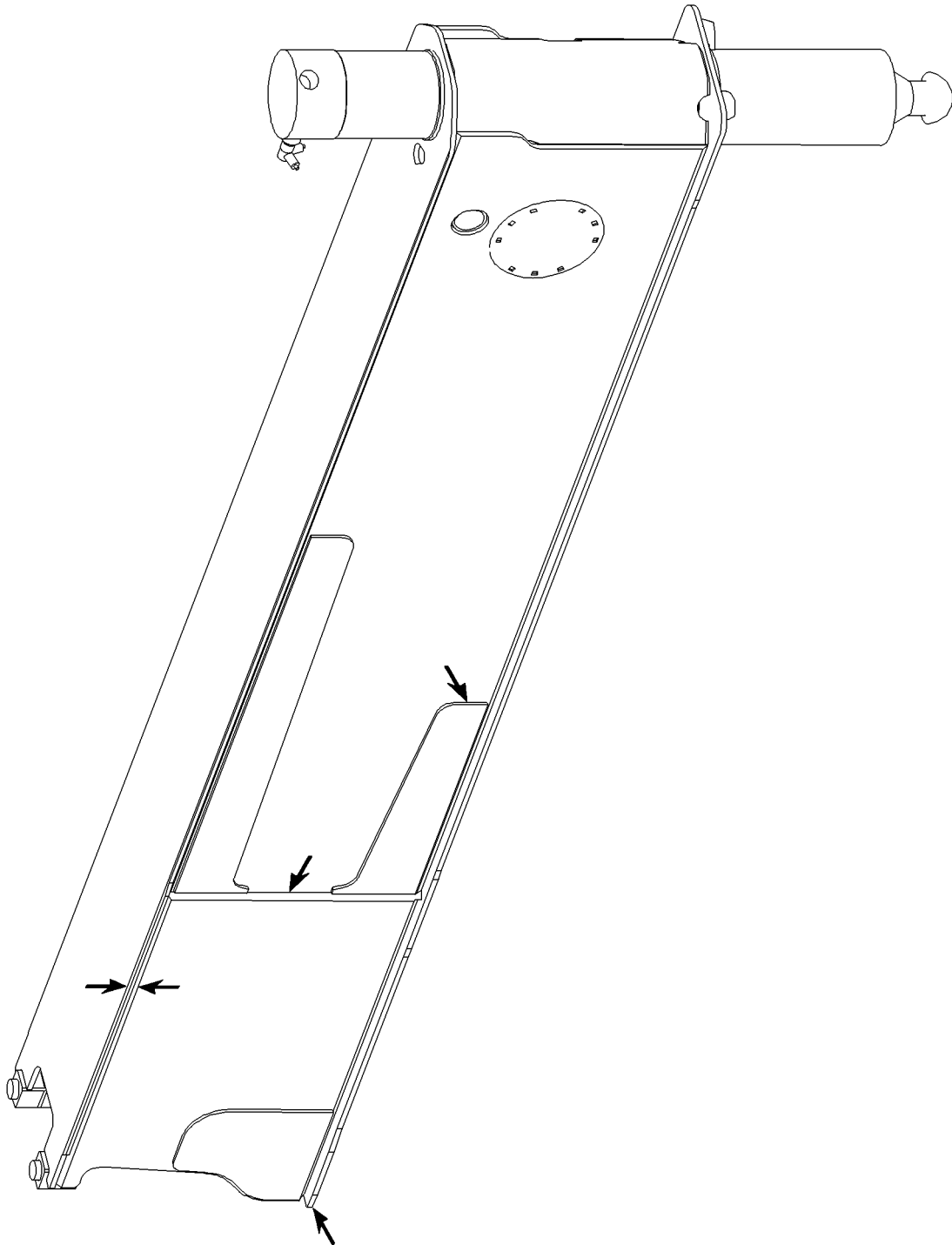
B113940

Example for intermediate frame



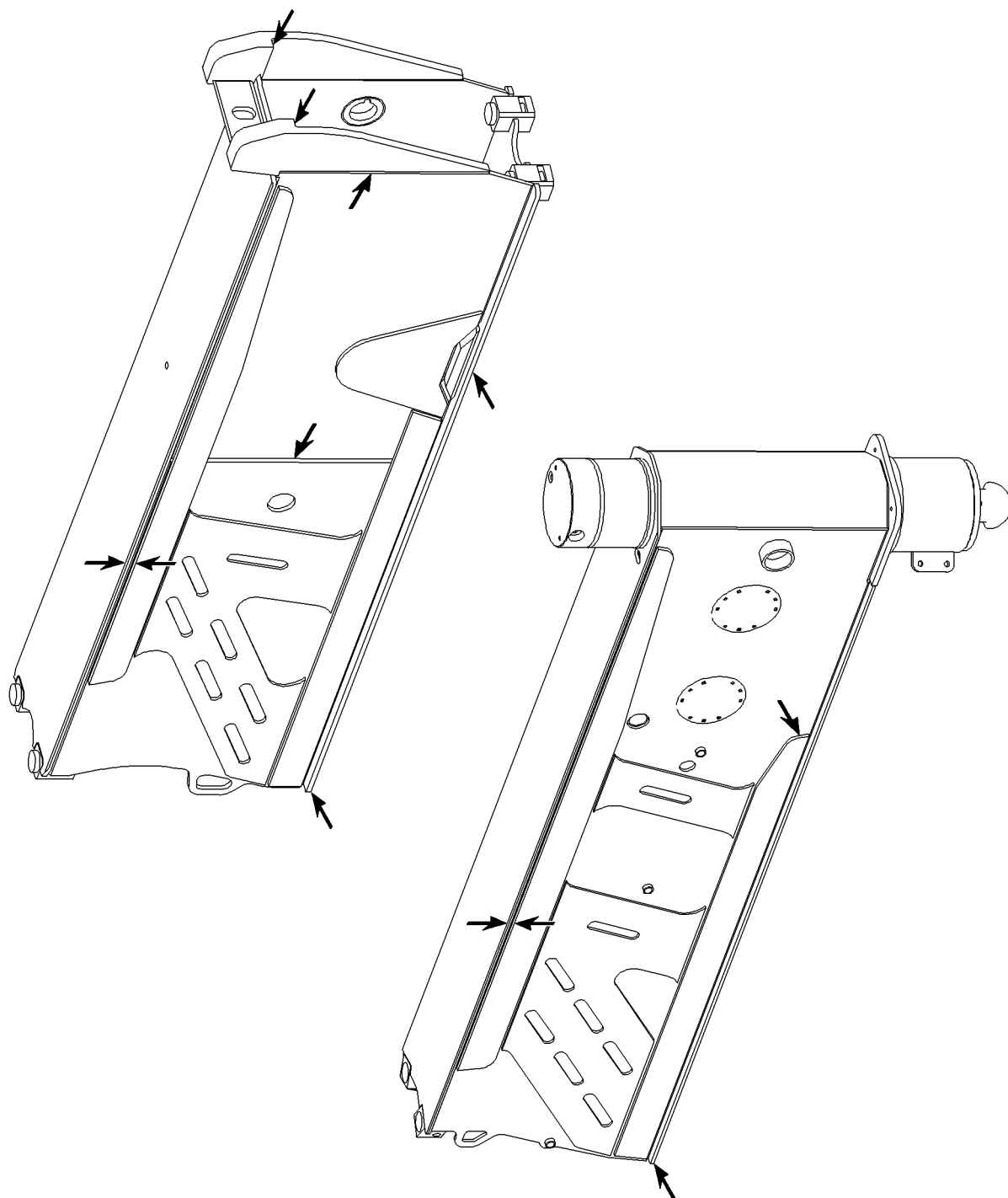
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Example for intermediate frame



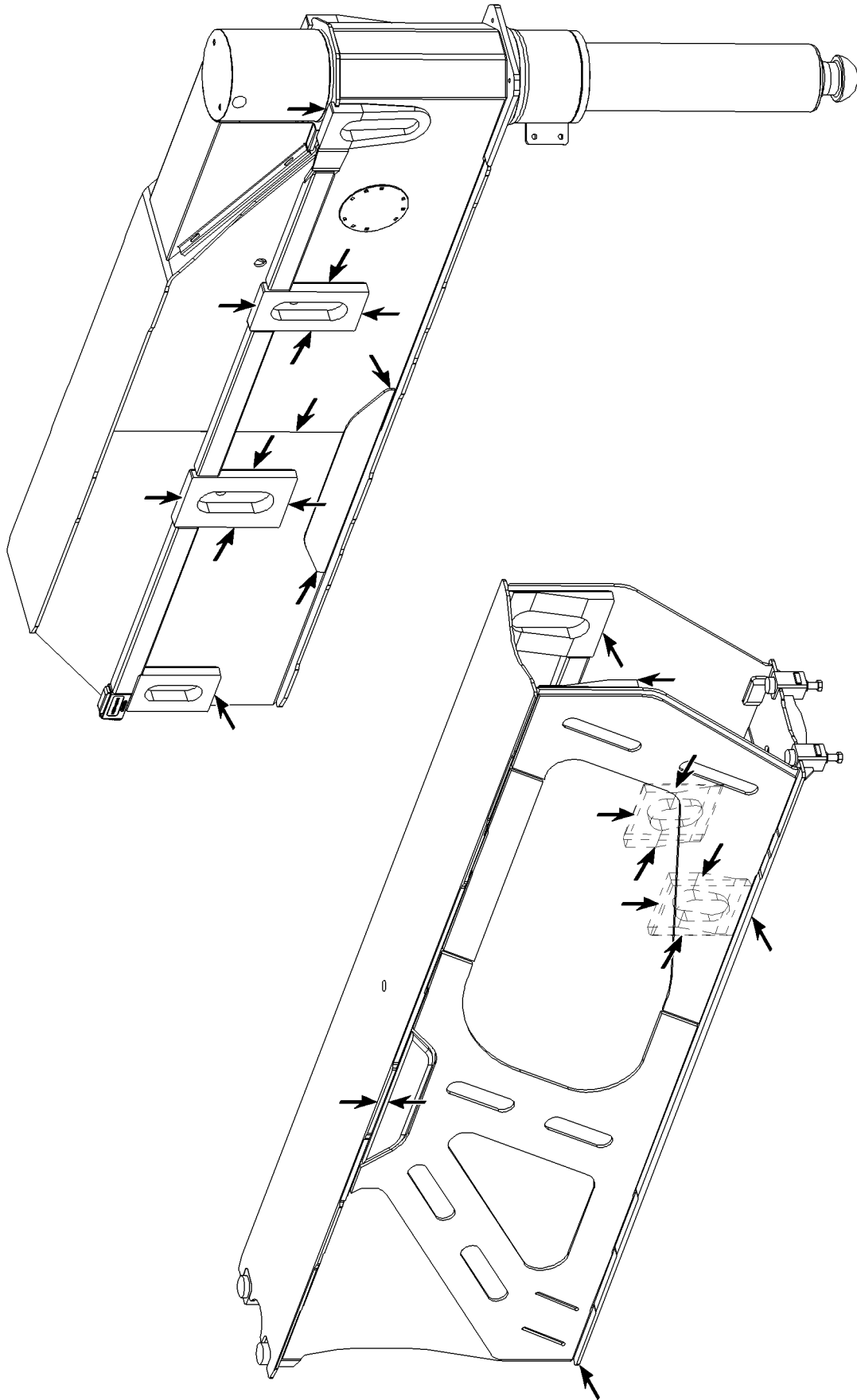
B105698

Example for sliding beam



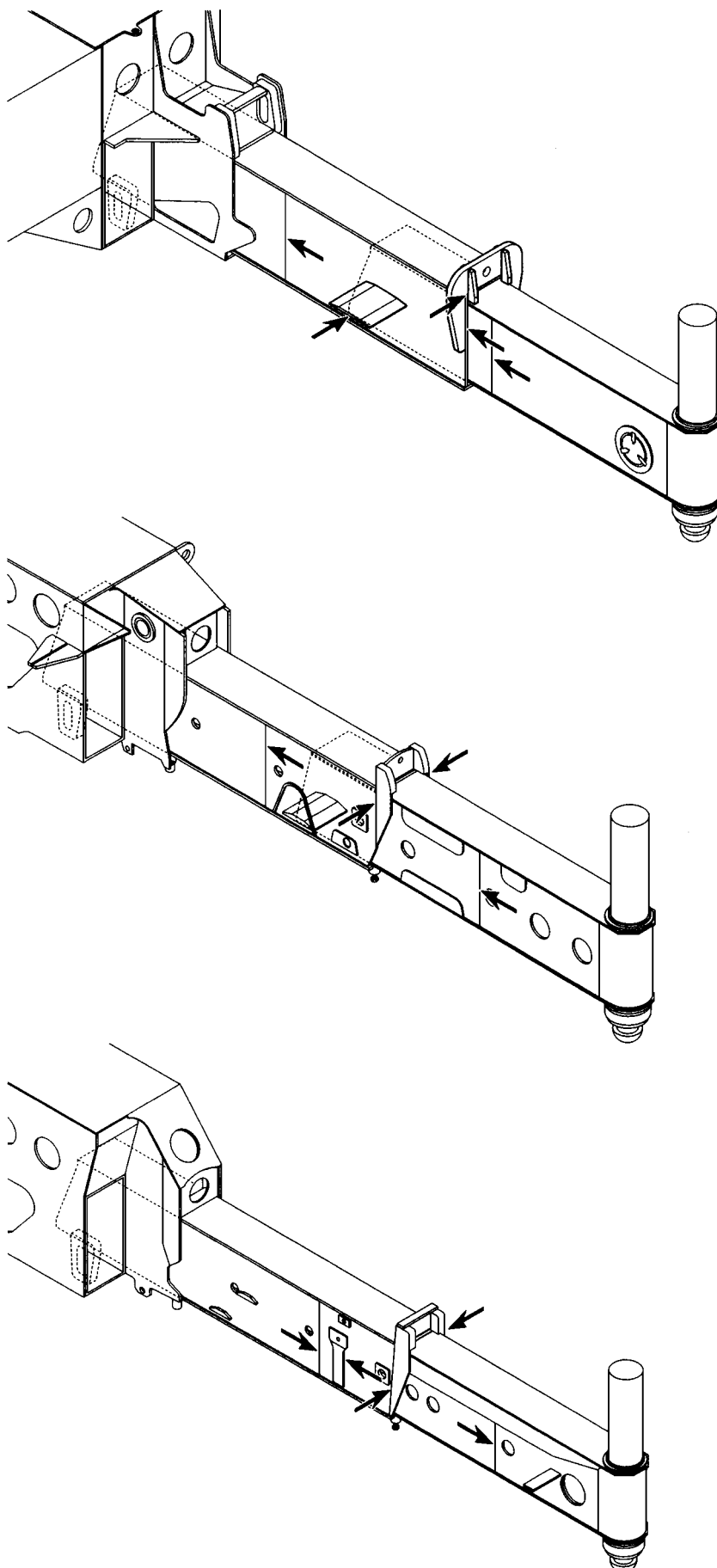
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Example for sliding beam



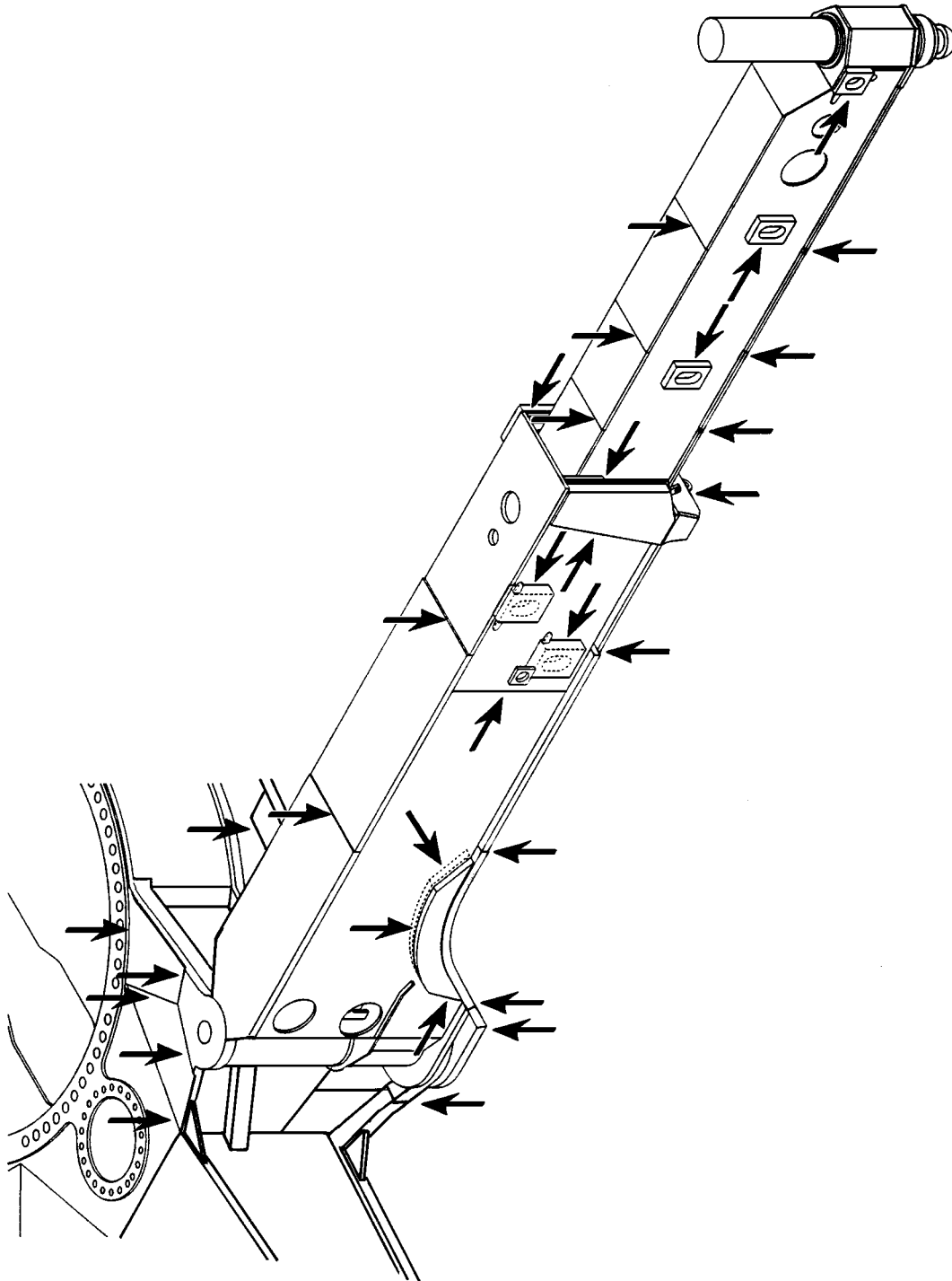
Example for sliding beam

B105718



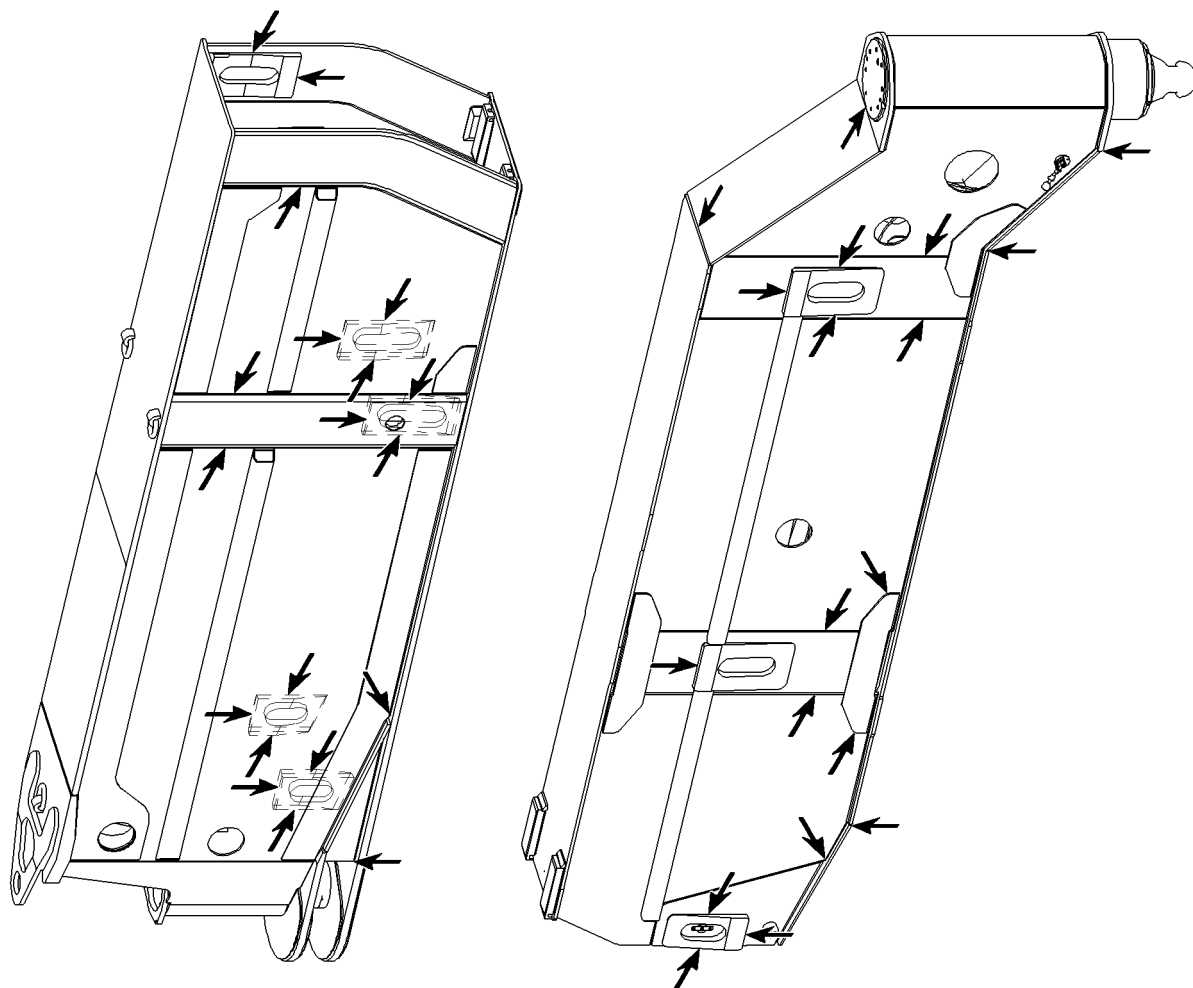
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Example for sliding beam



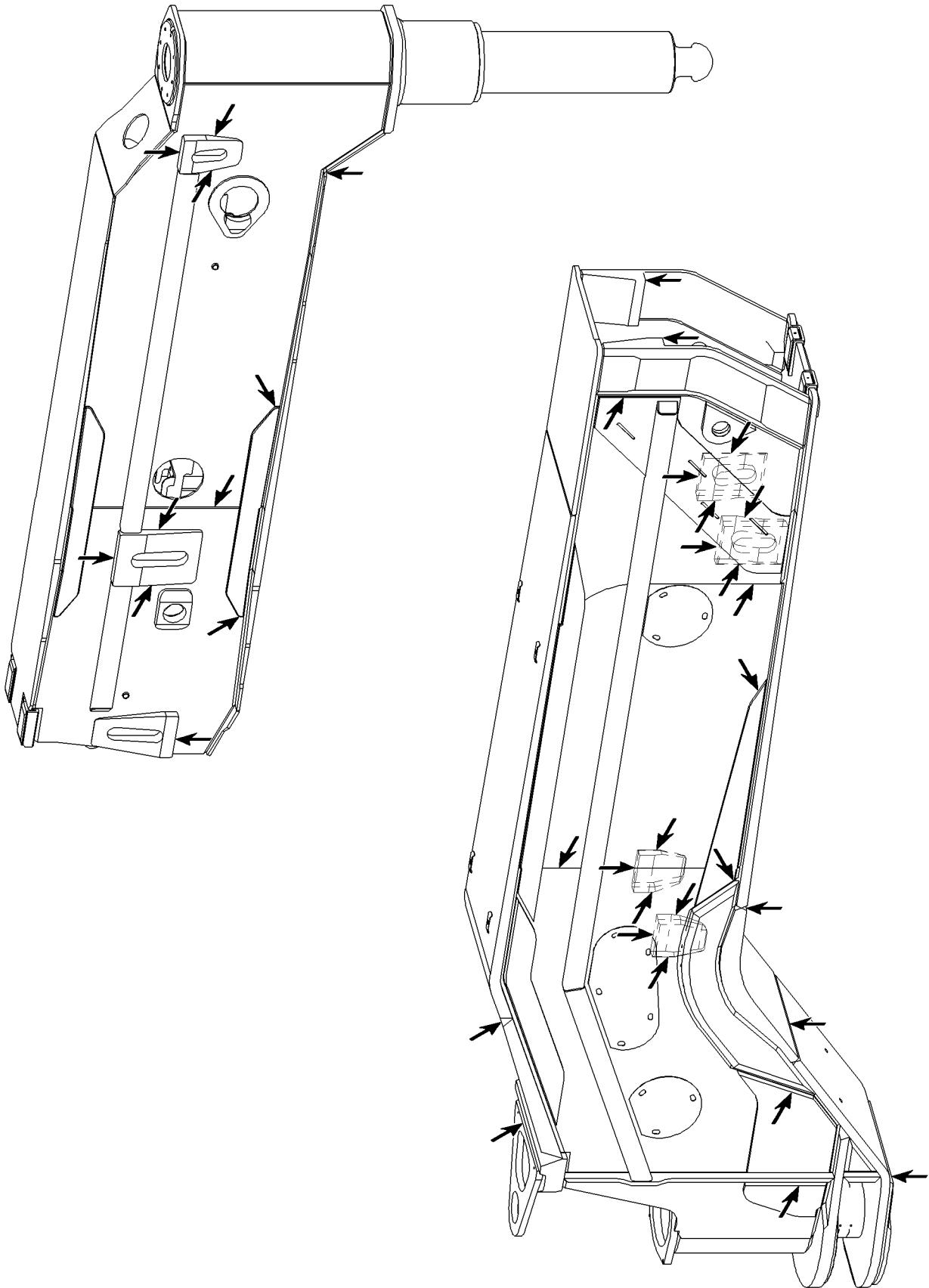
B185060

Example for swingable sliding beam



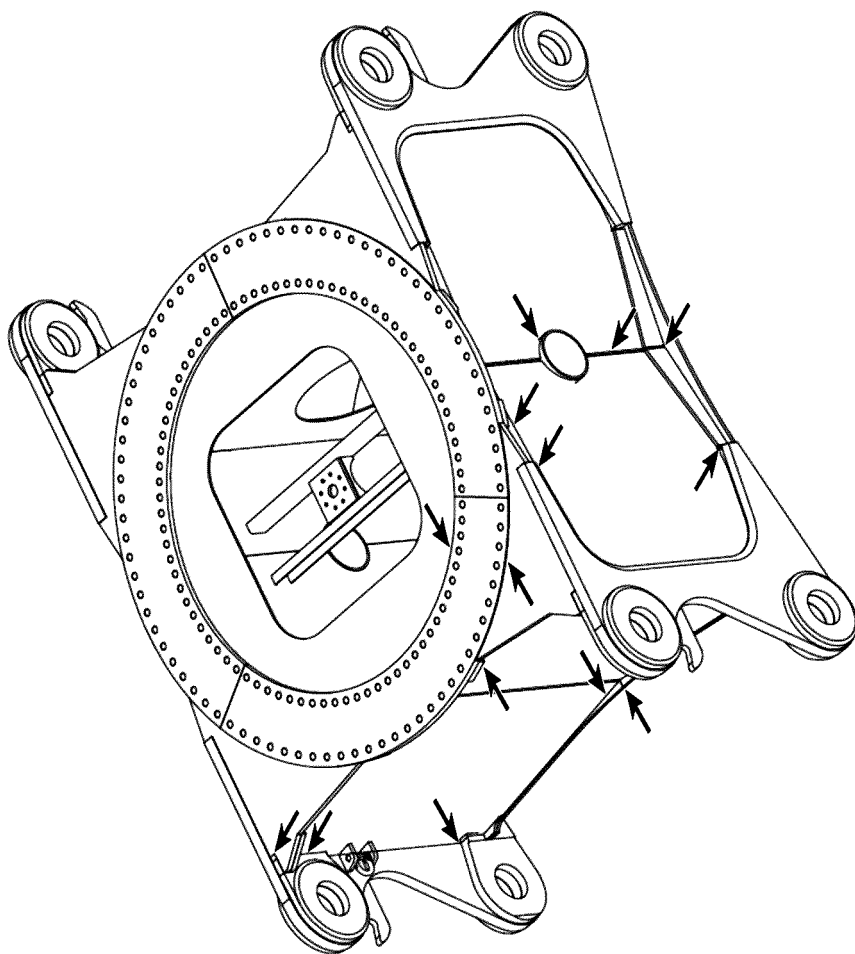
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Example for swingable sliding beam



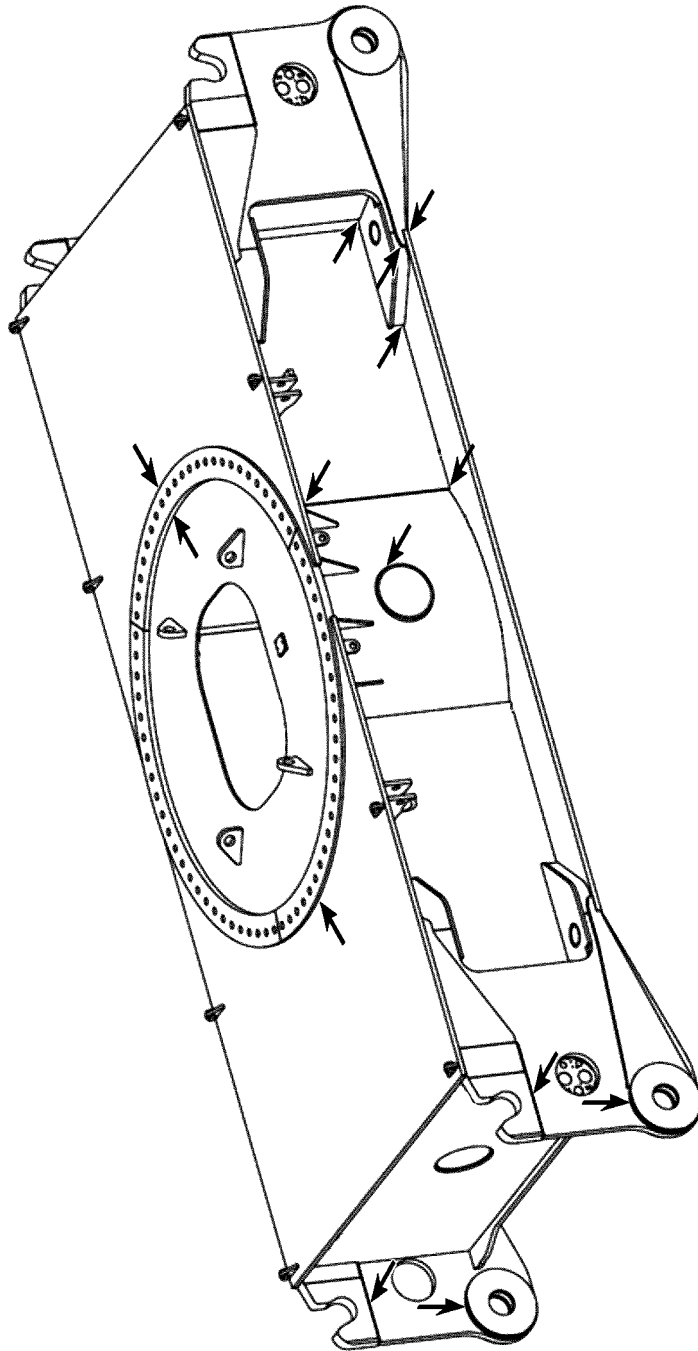
B105704

Example for swingable sliding beam



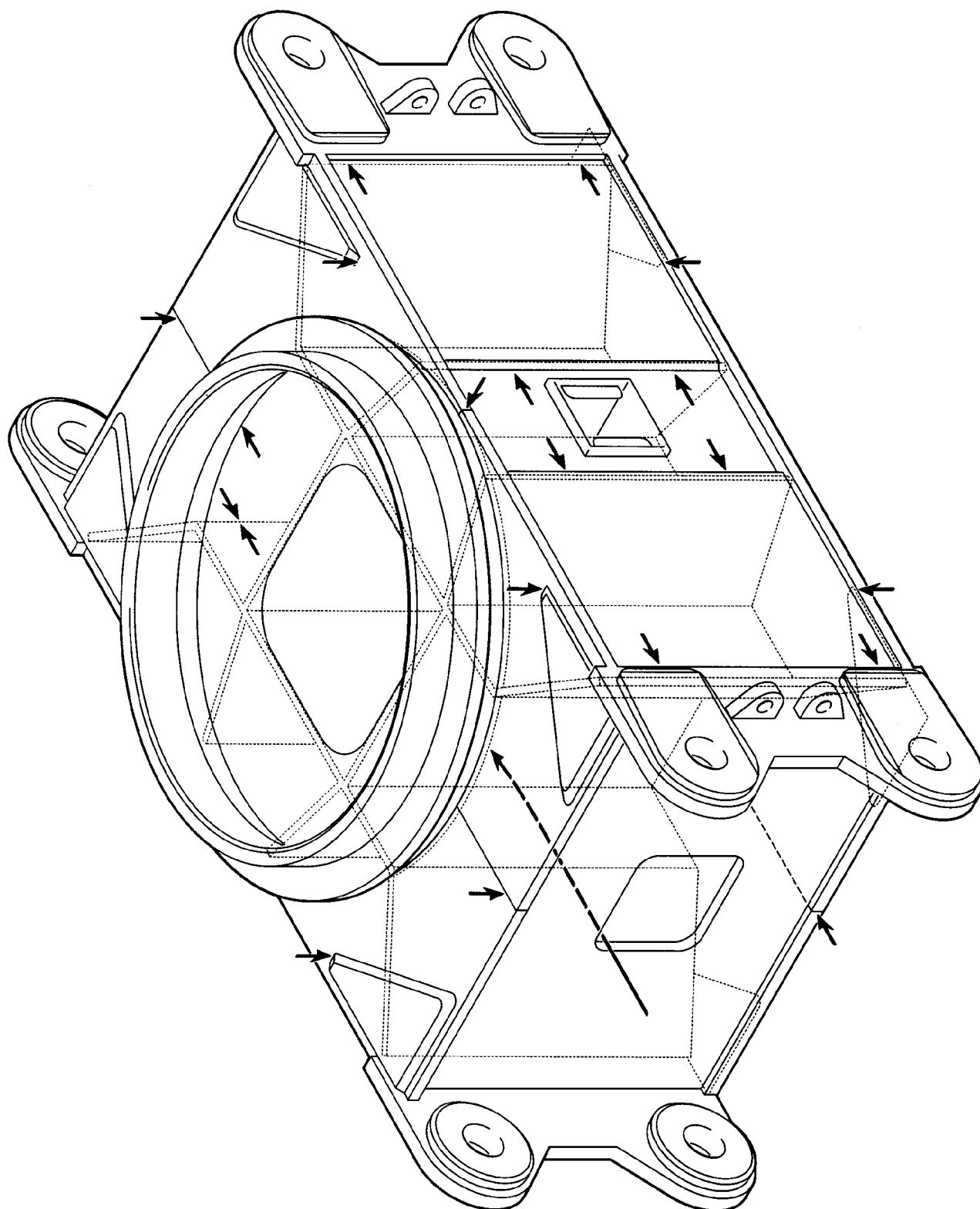
B105725

Example for crawler center section



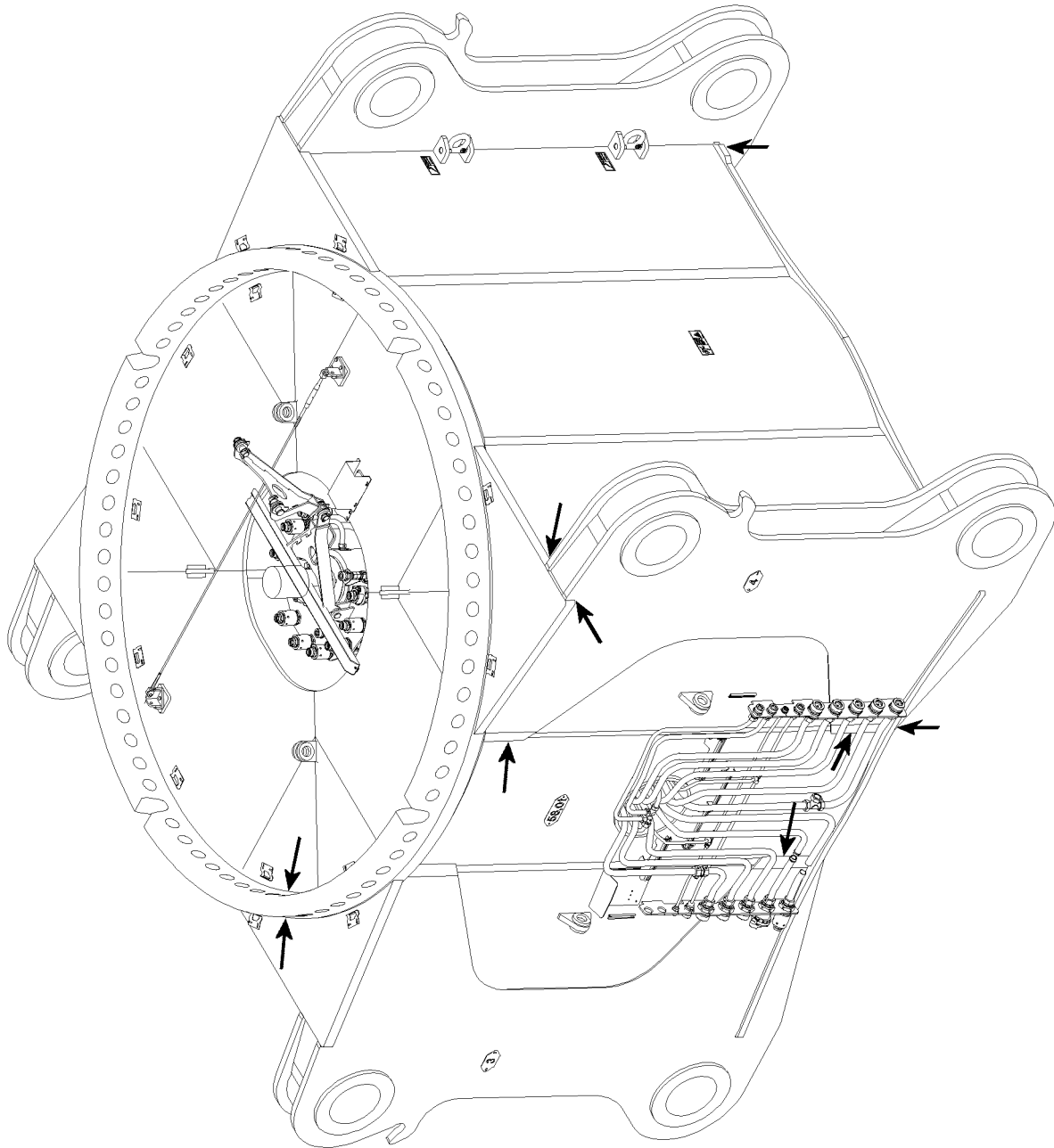
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Example for crawler center section



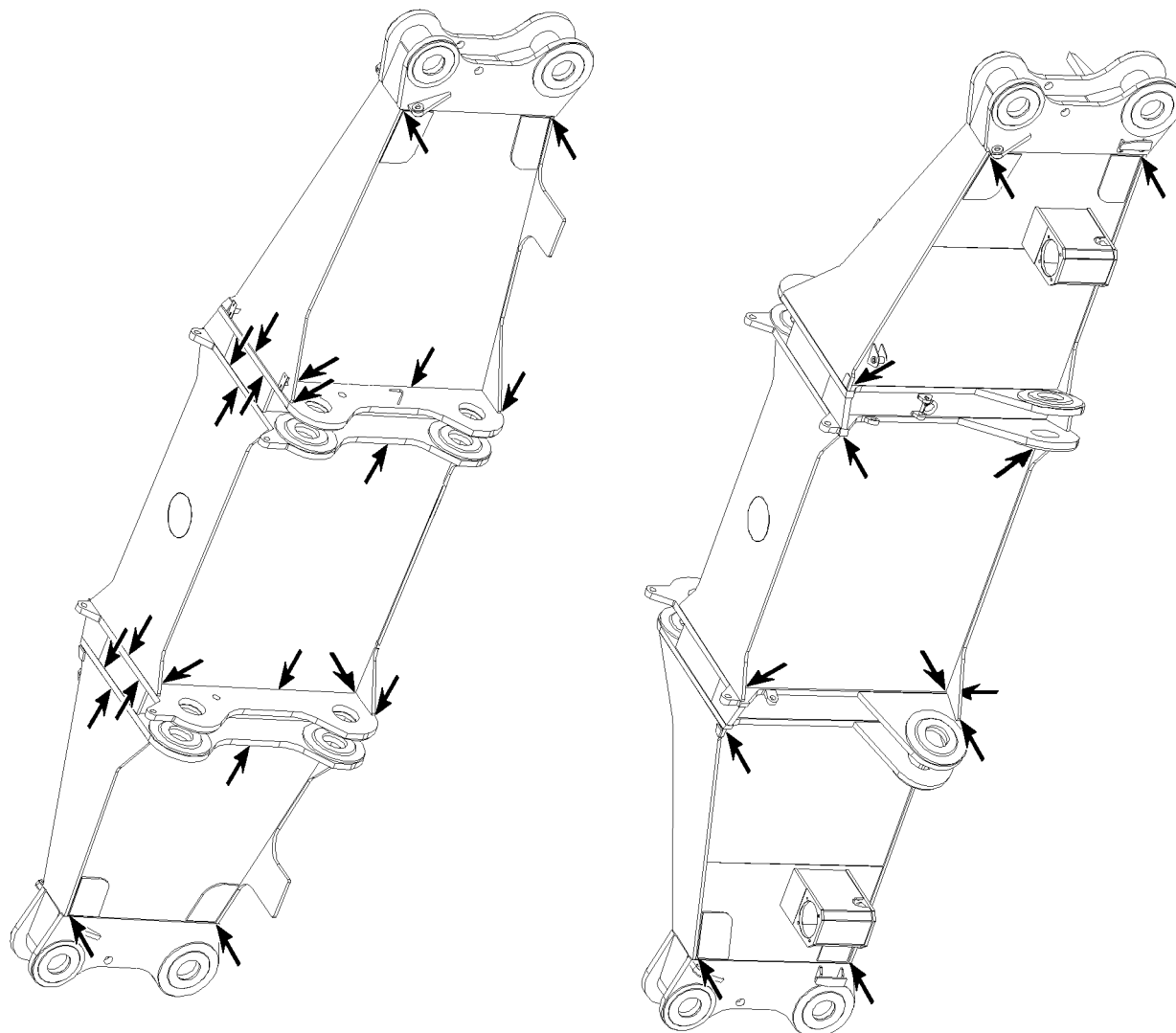
B187347

Example for crawler center section



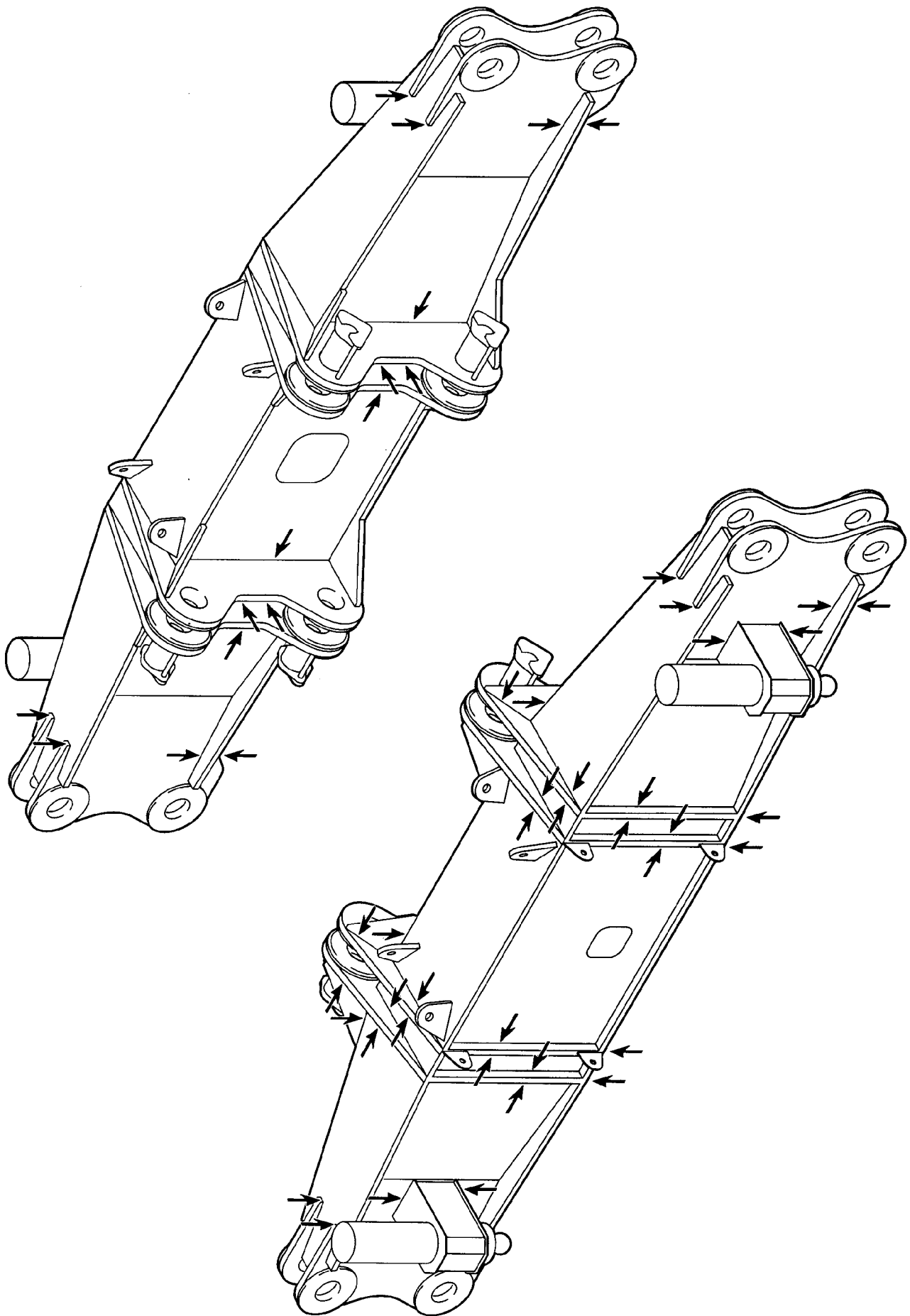
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Example for crawler center section



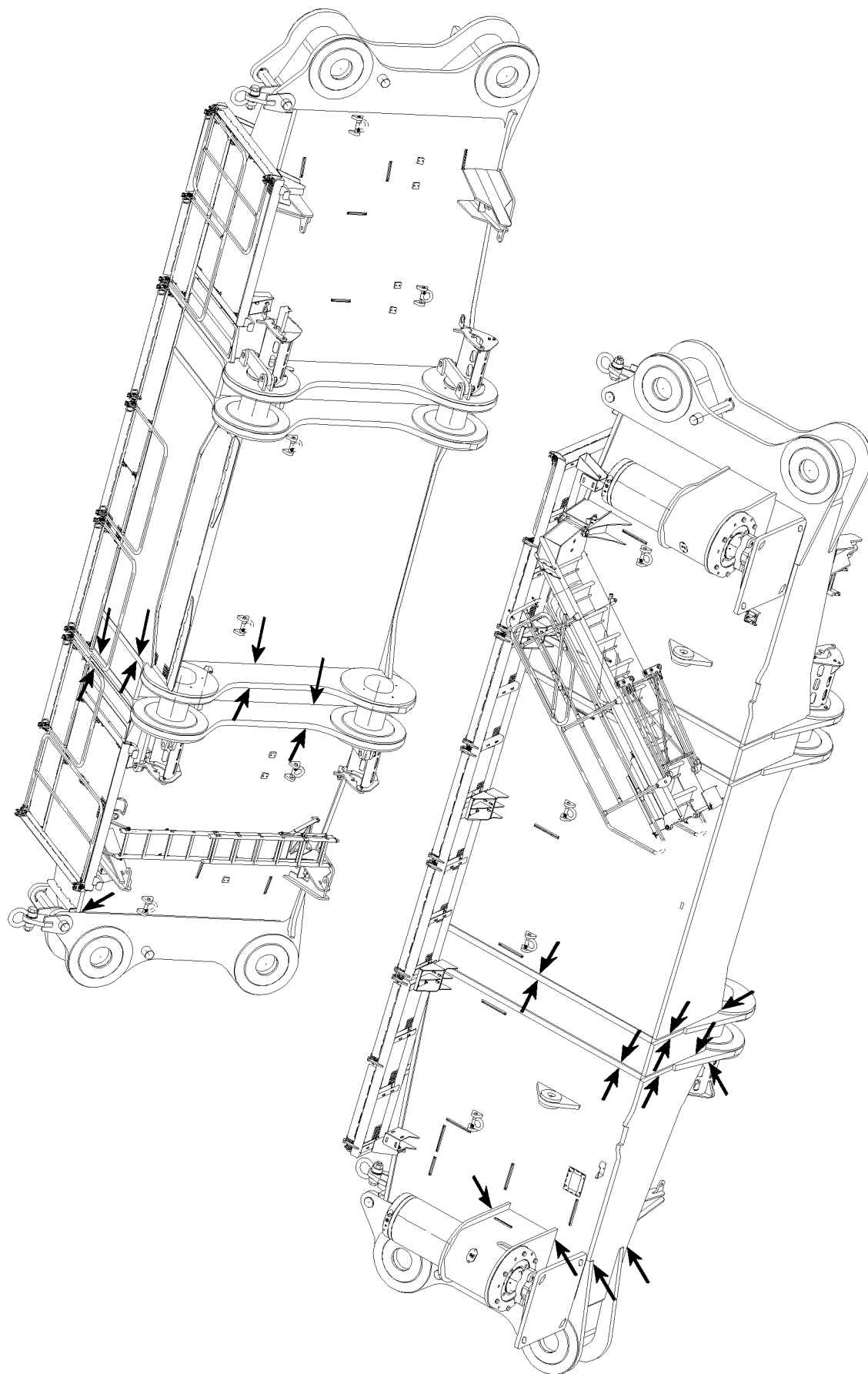
B105727

Example for cross carrier



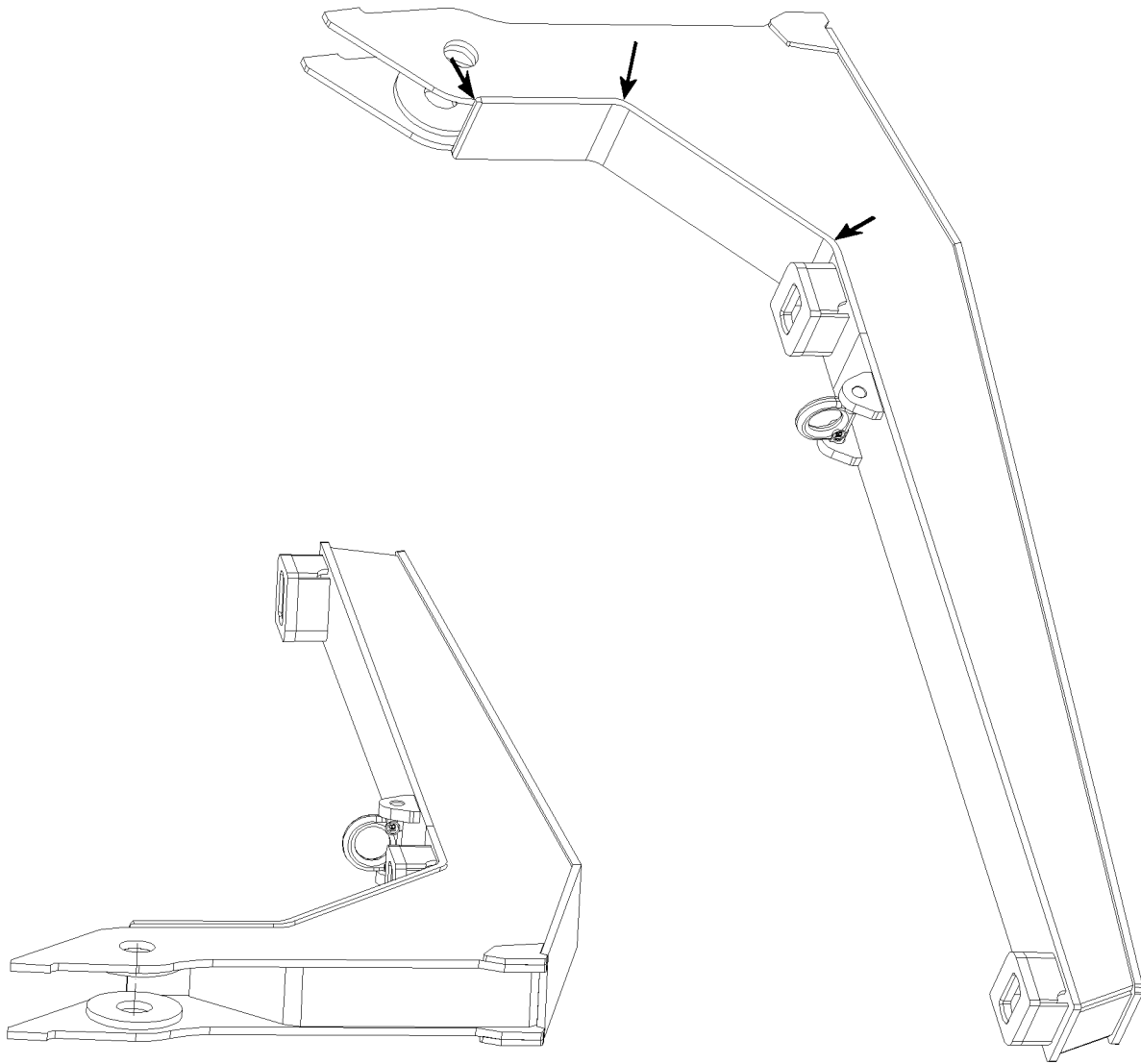
Example for cross carrier

B187348



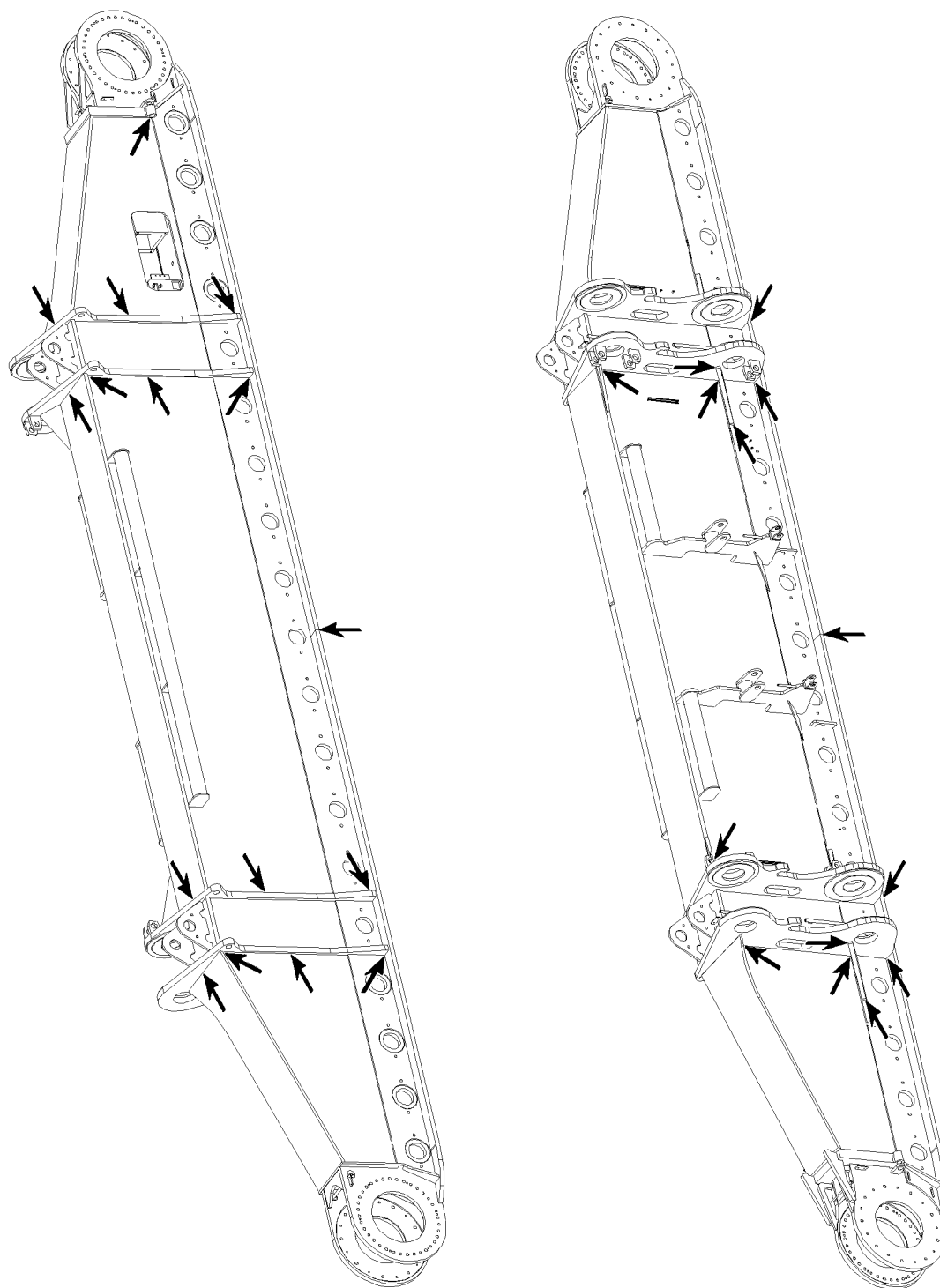
B115921

Example for cross carrier



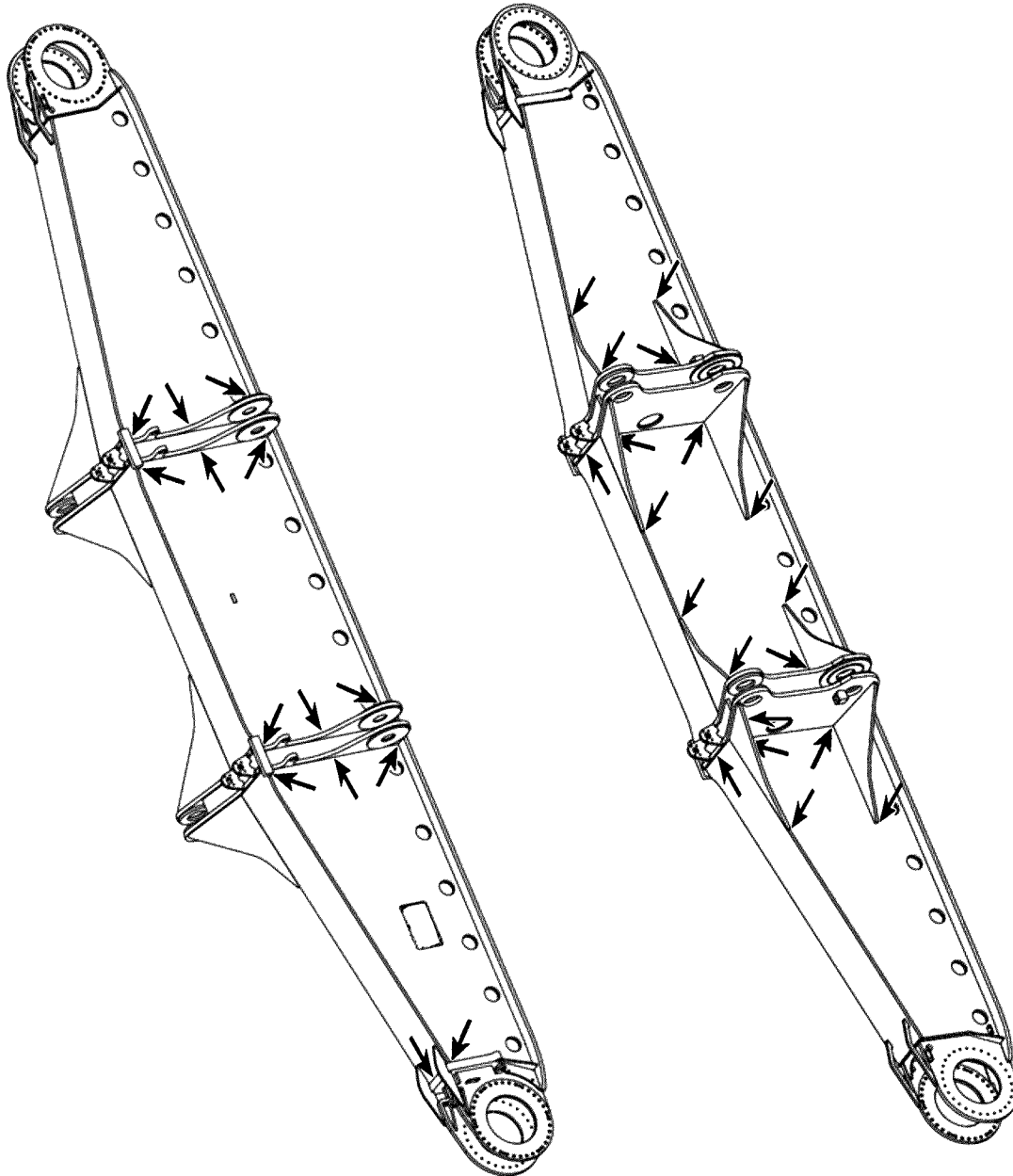
B115919

Example for carrier for central ballast



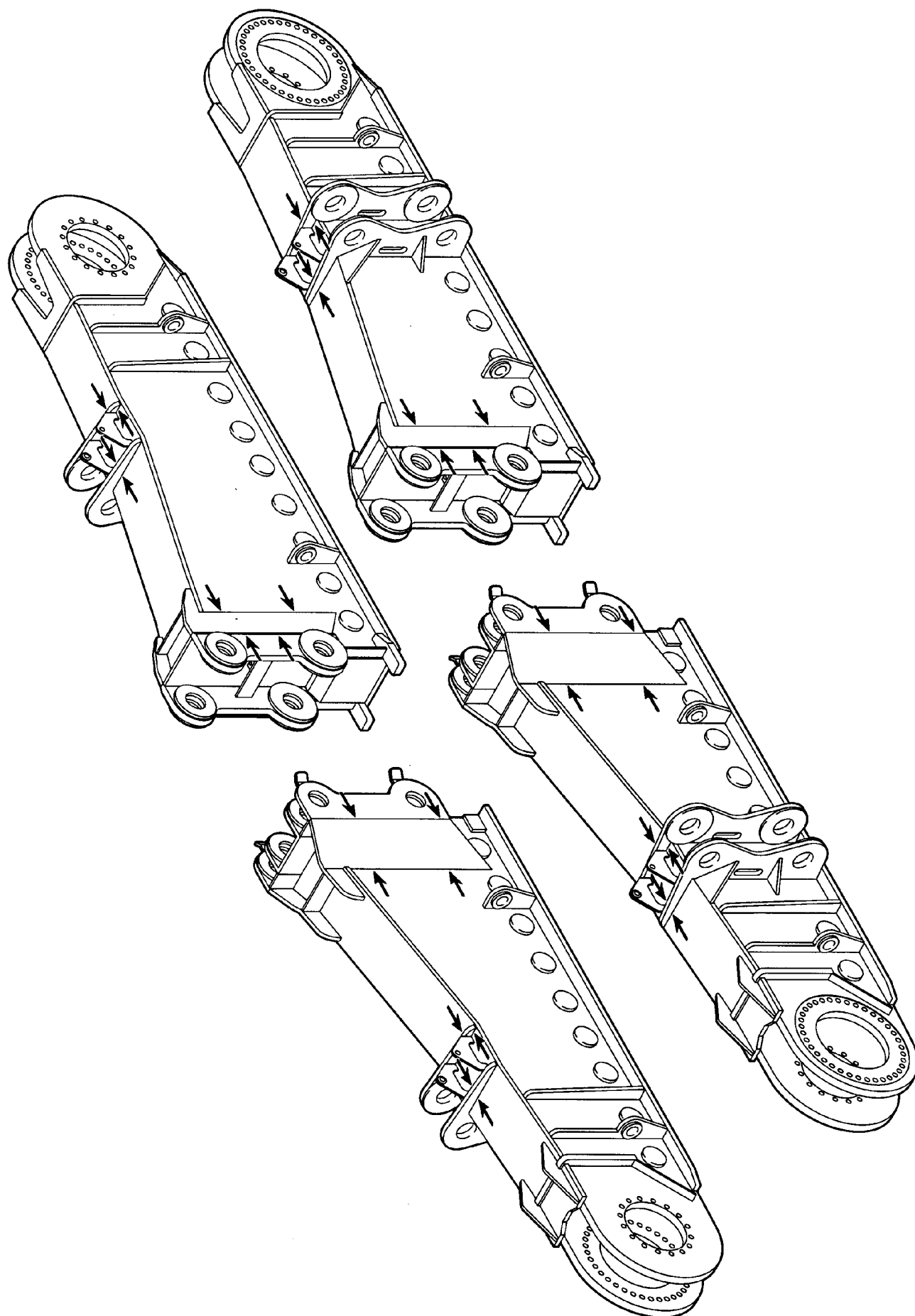
B105728

Example for crawler carrier



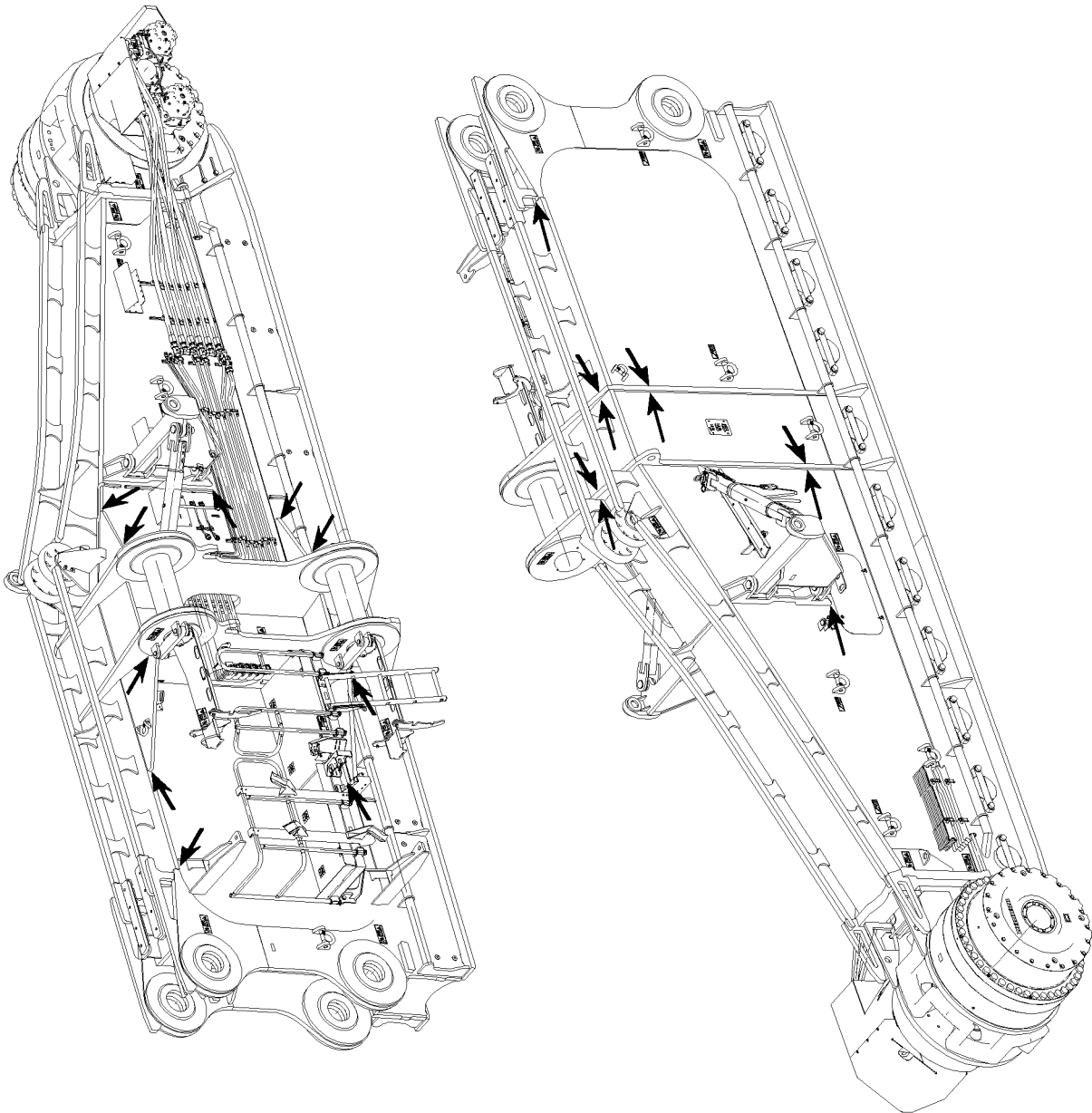
B105729

Example for crawler carrier



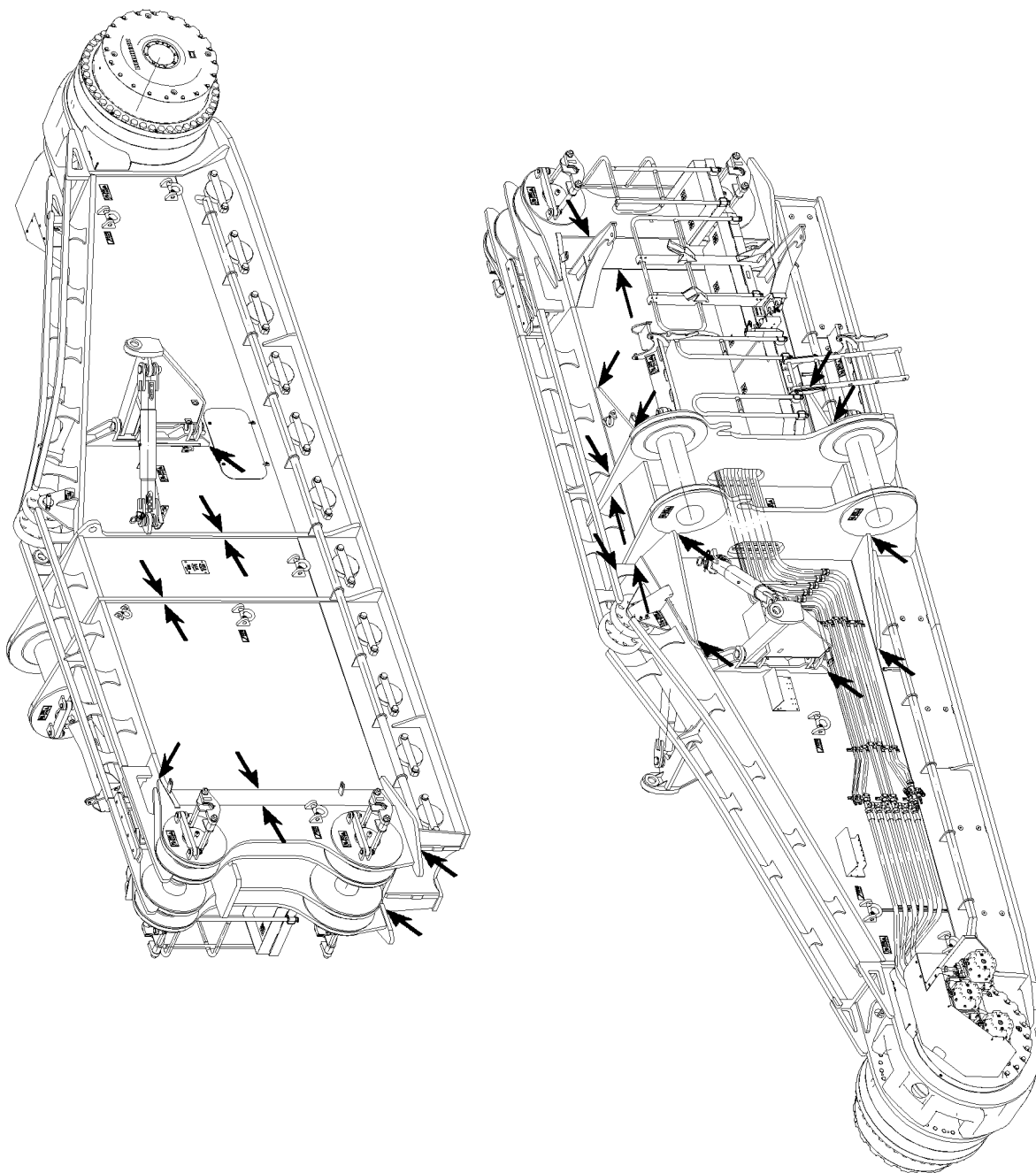
B187349

Example for crawler carrier



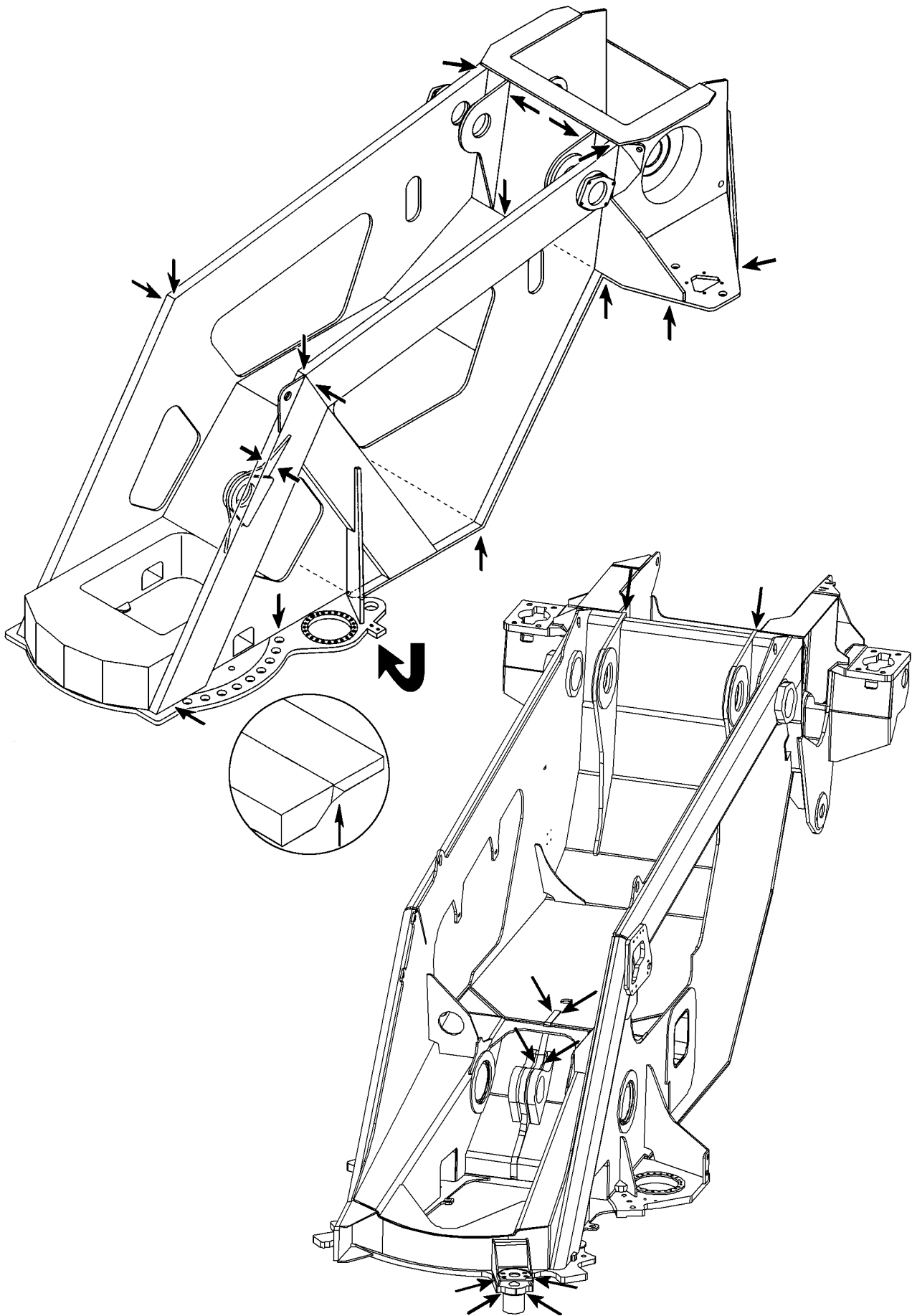
B115917

Example for crawler carrier



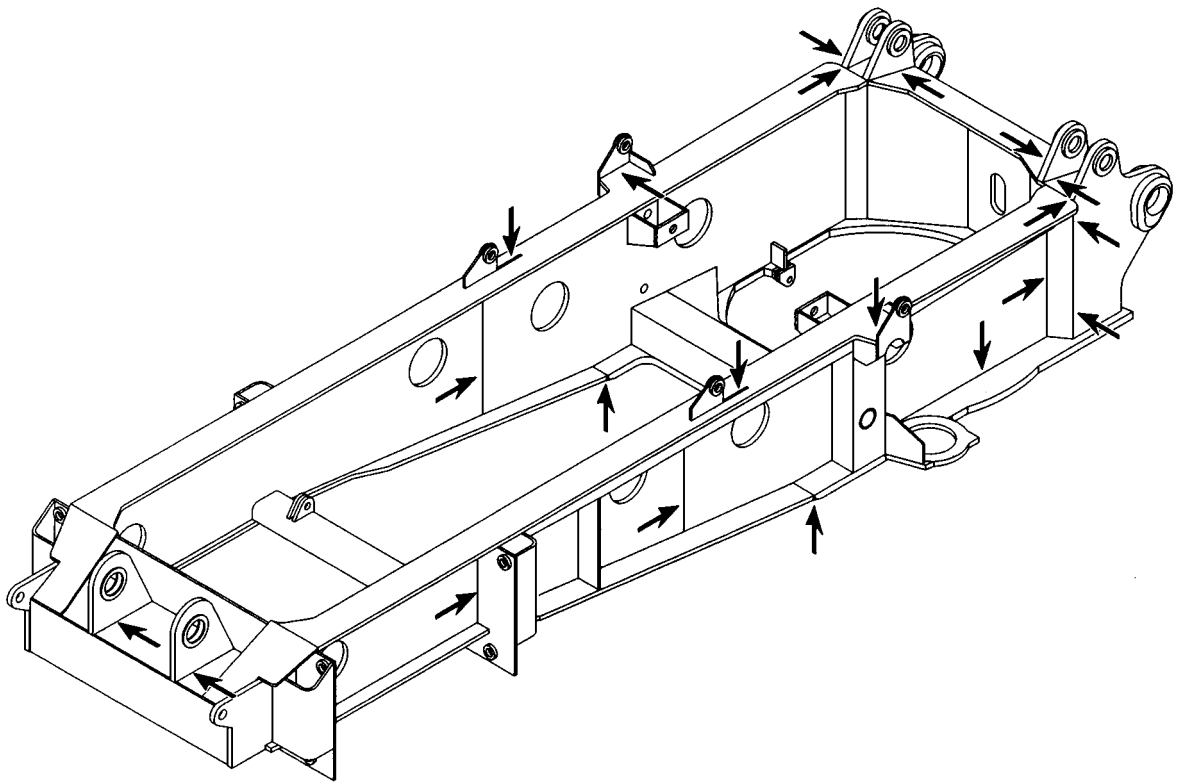
B115918

Example for crawler carrier



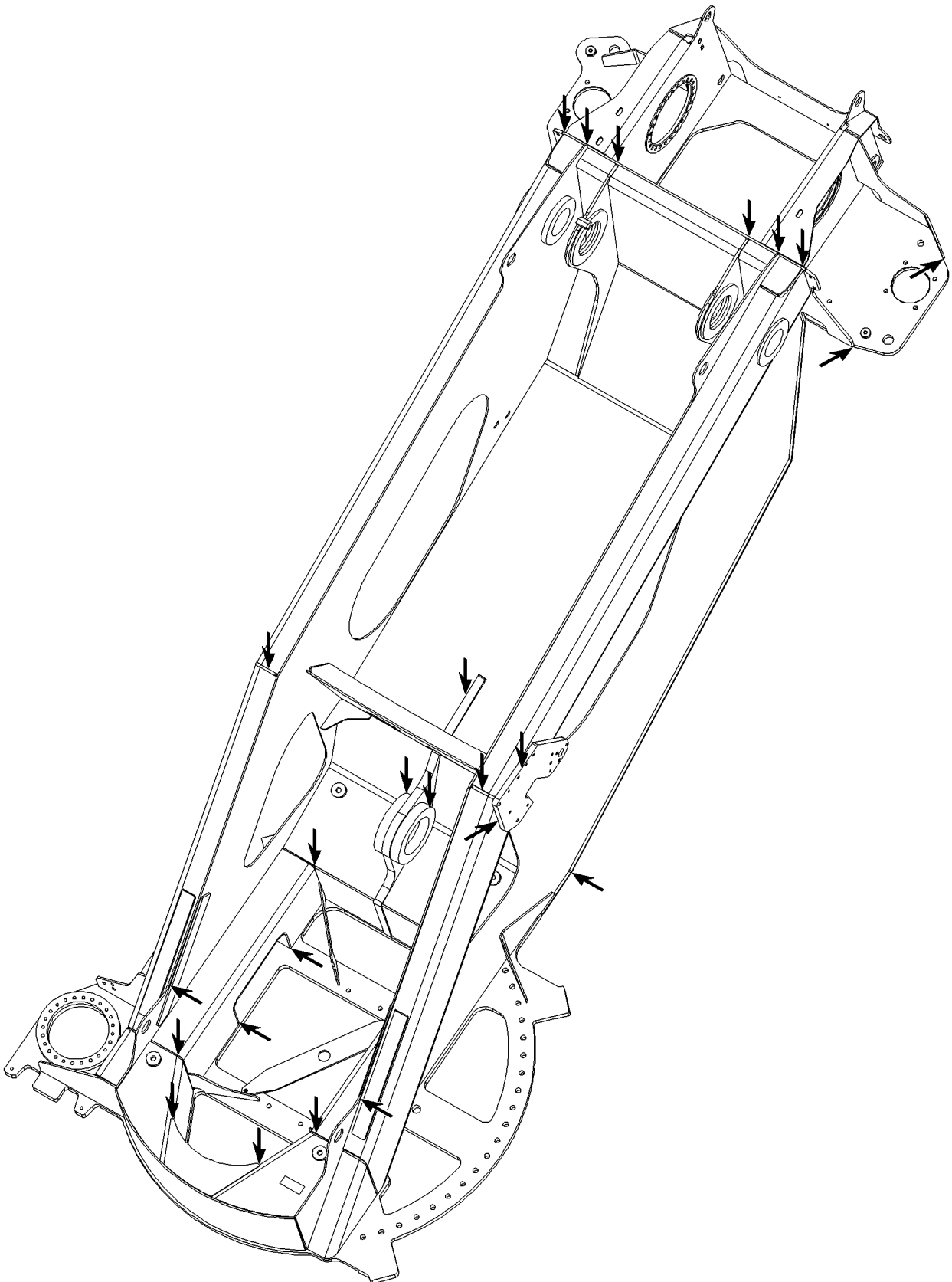
B185048

Example for turntable frame



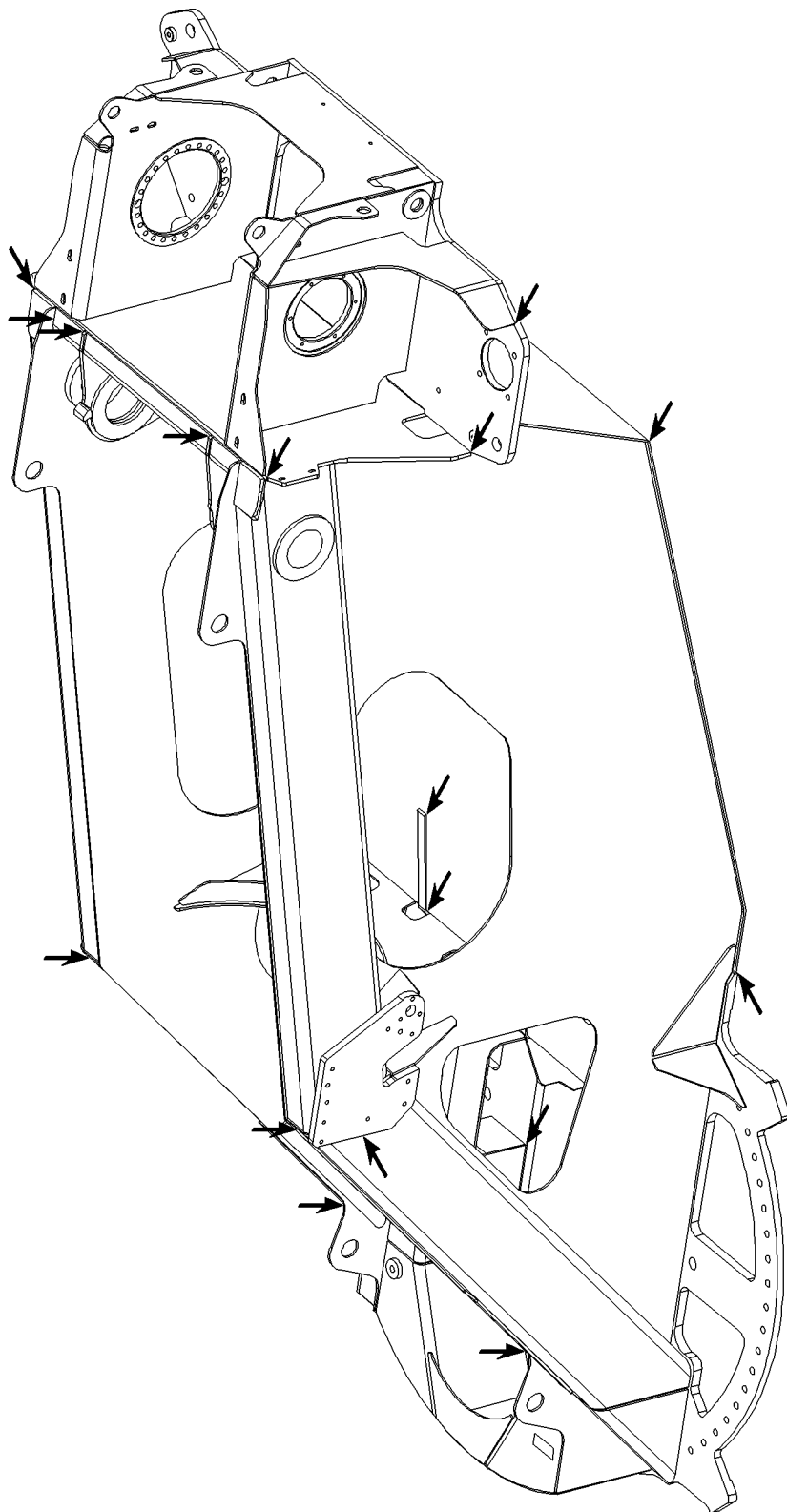
B185049

Example for turntable frame



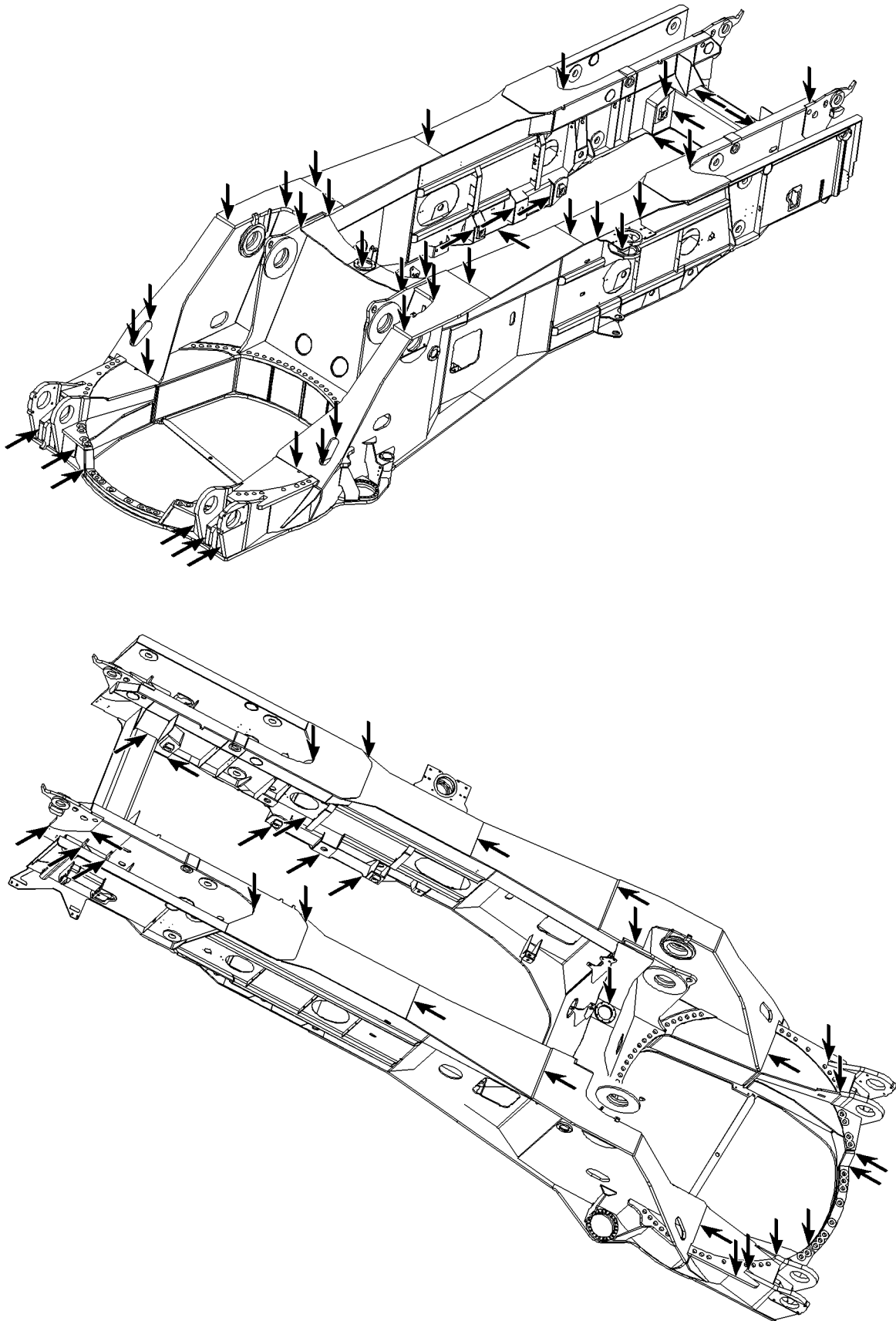
B105700

Example for turntable frame



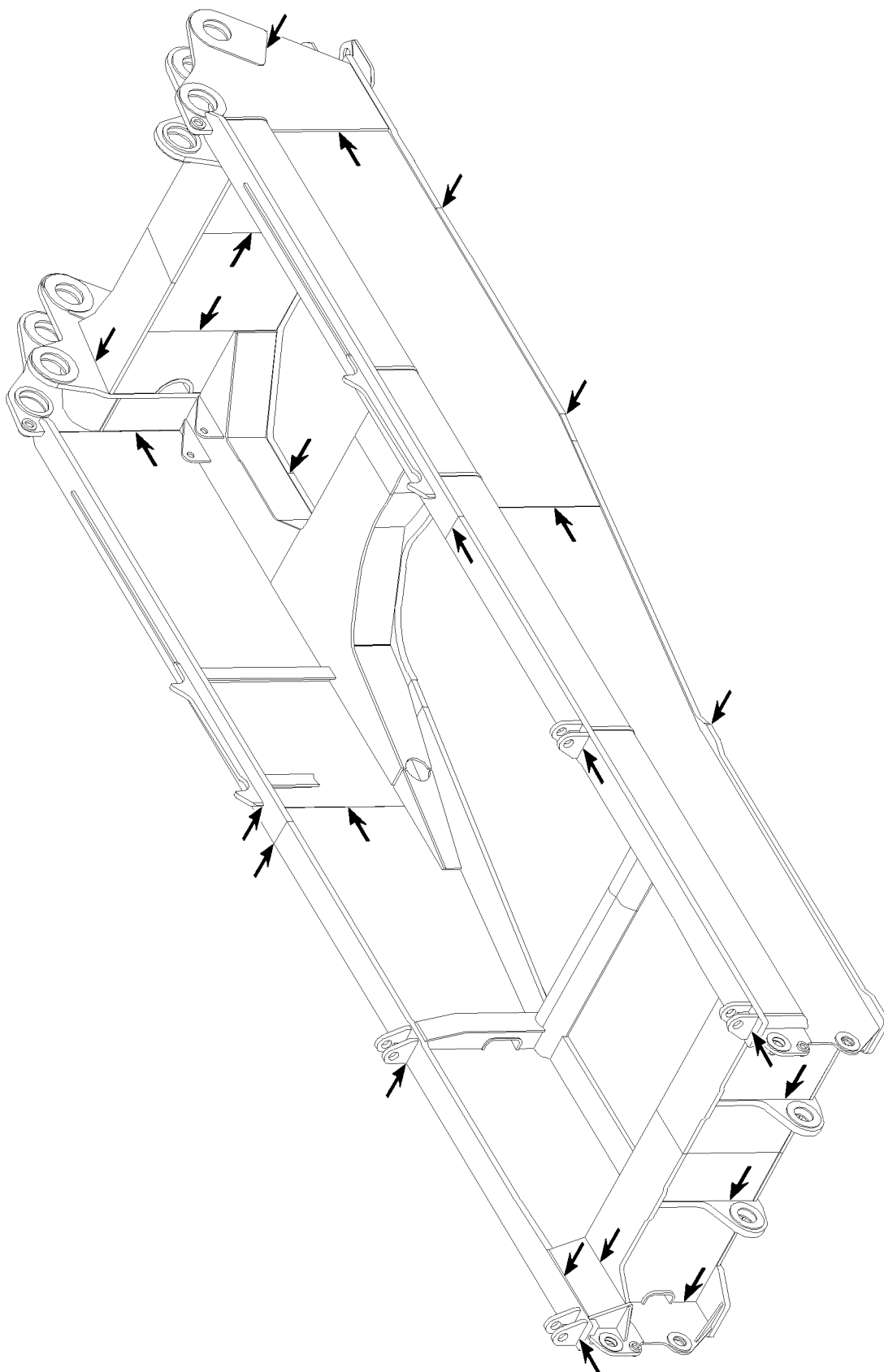
B105701

Example for turntable frame



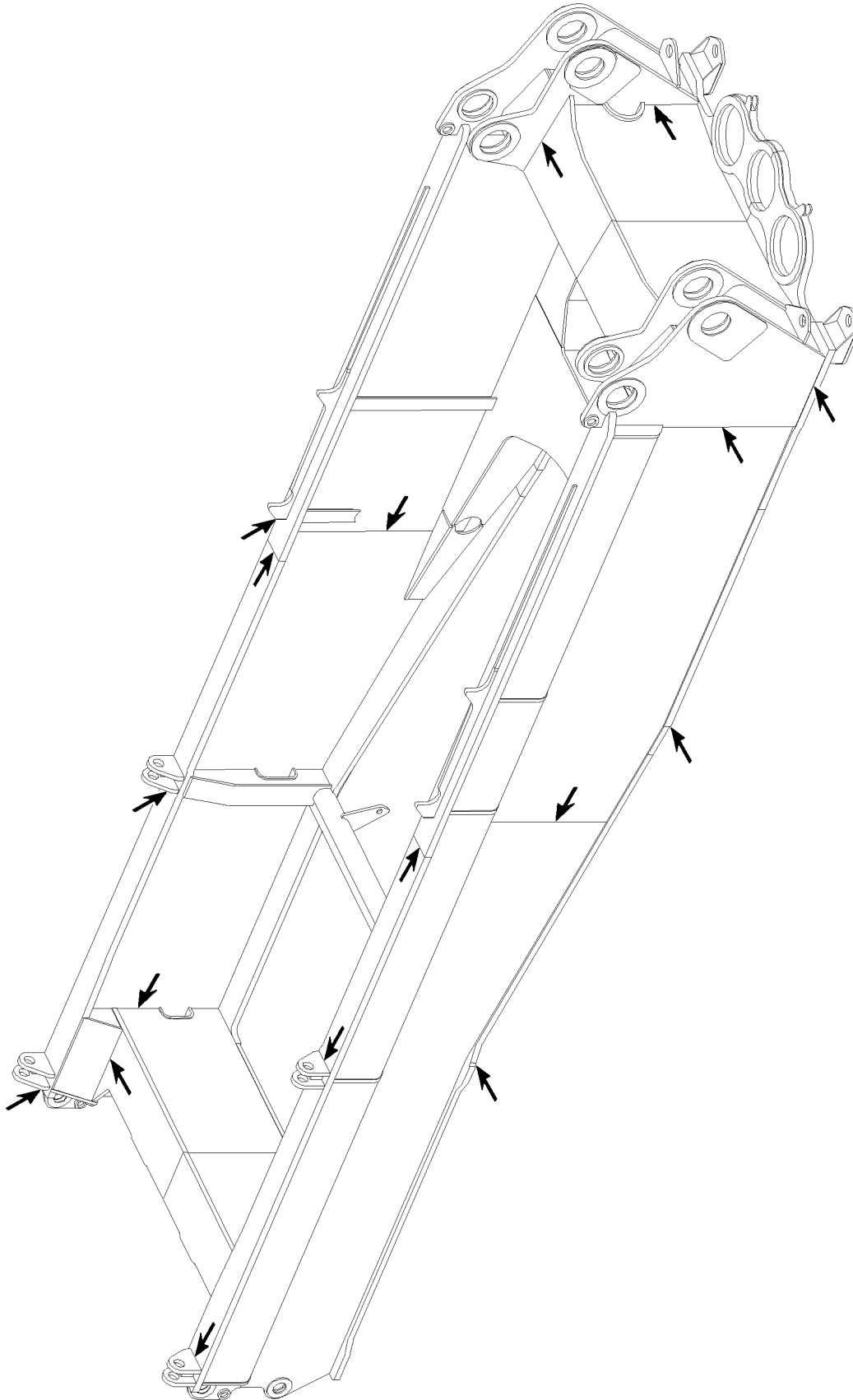
B105706

Example for turntable frame



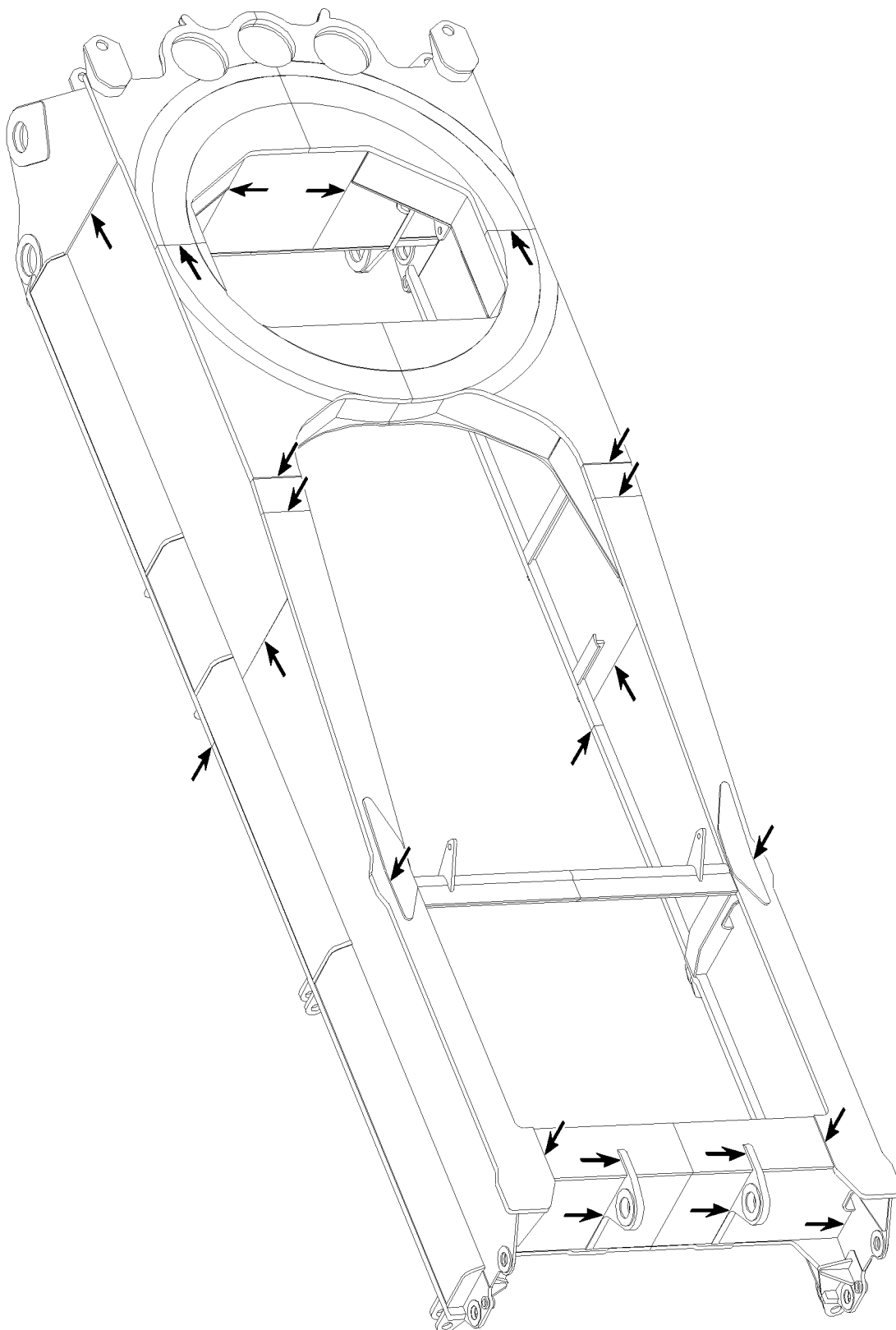
B105694

Example for turntable frame



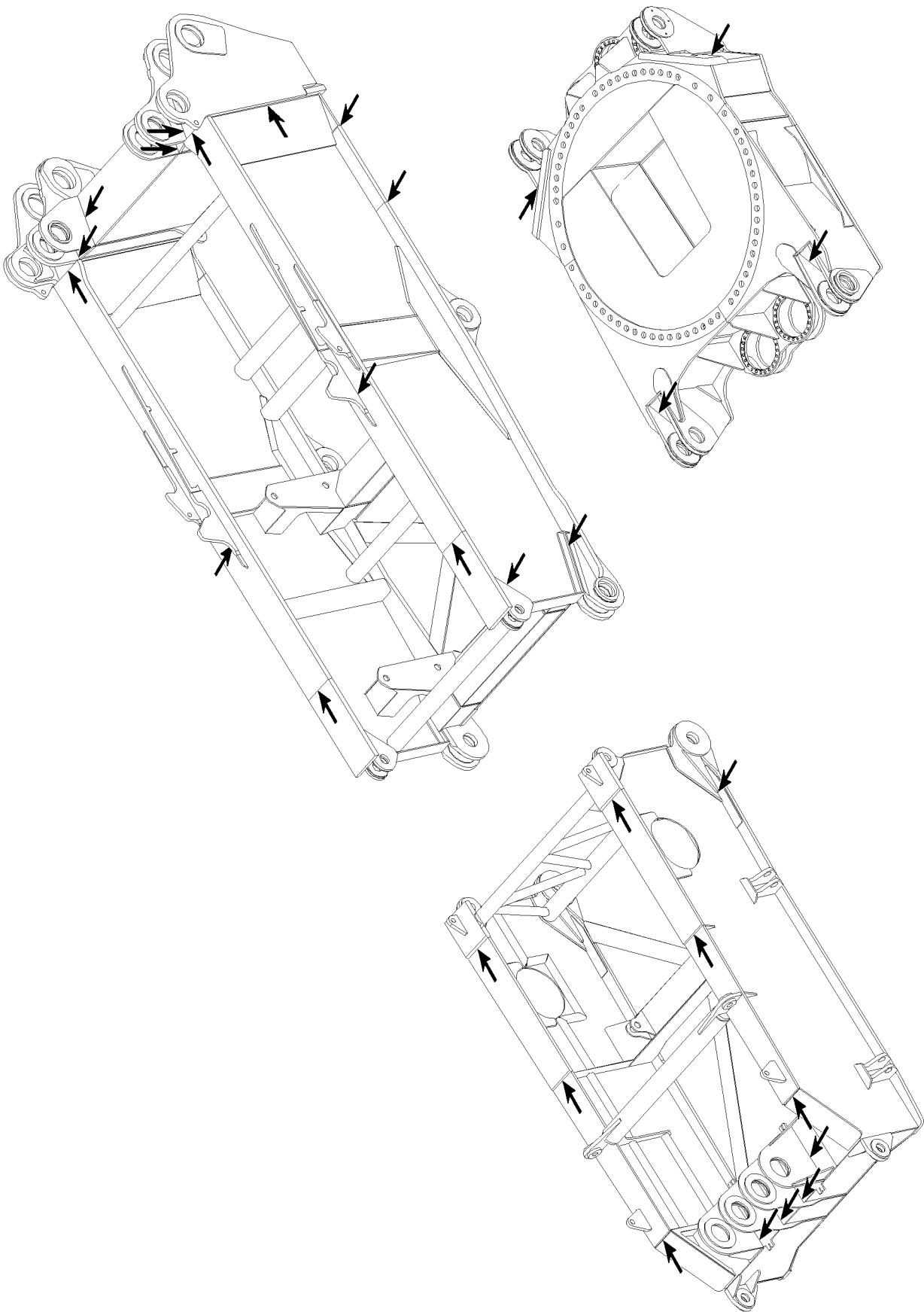
B105695

Example for turntable frame



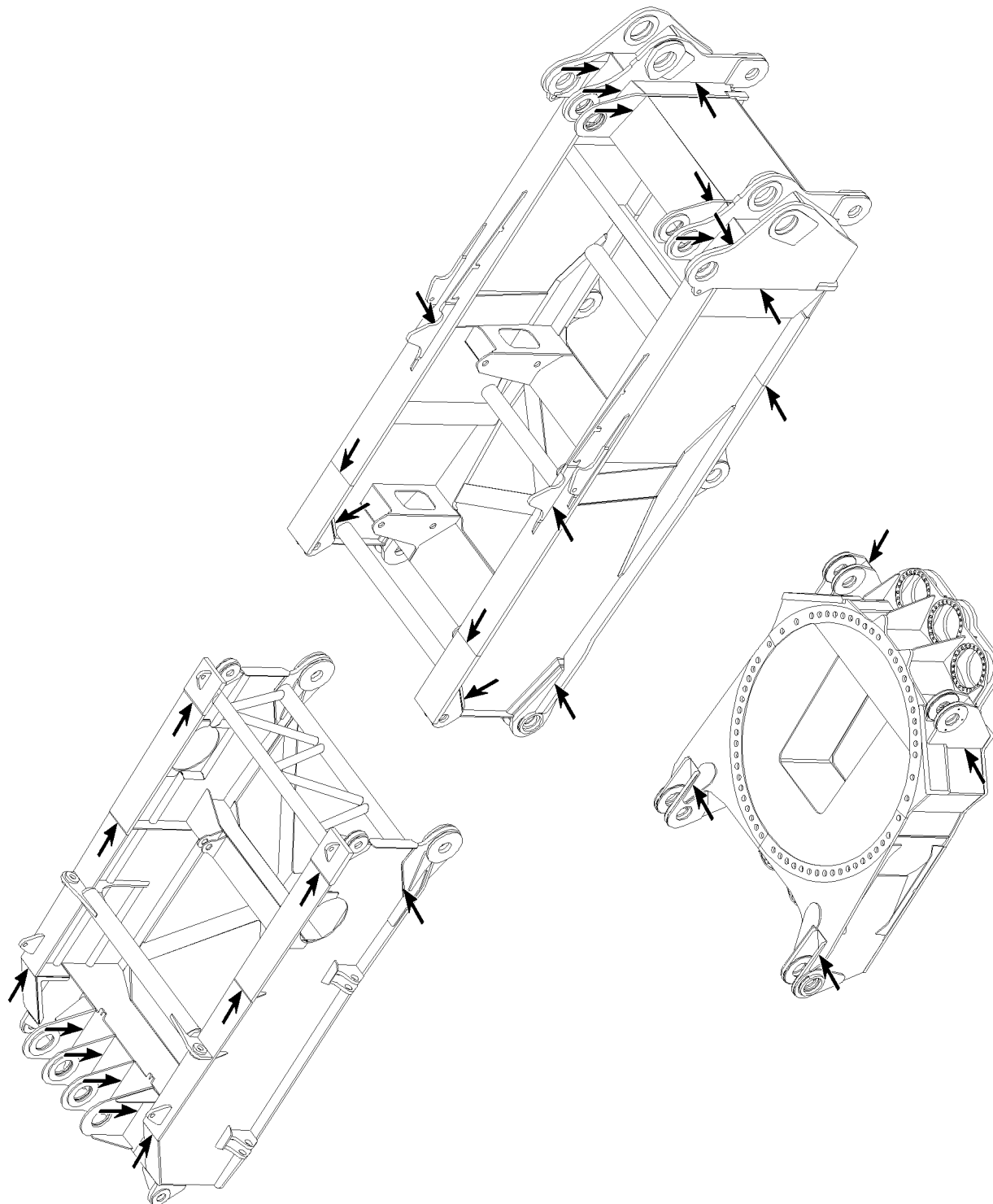
B105696

Example for turntable frame



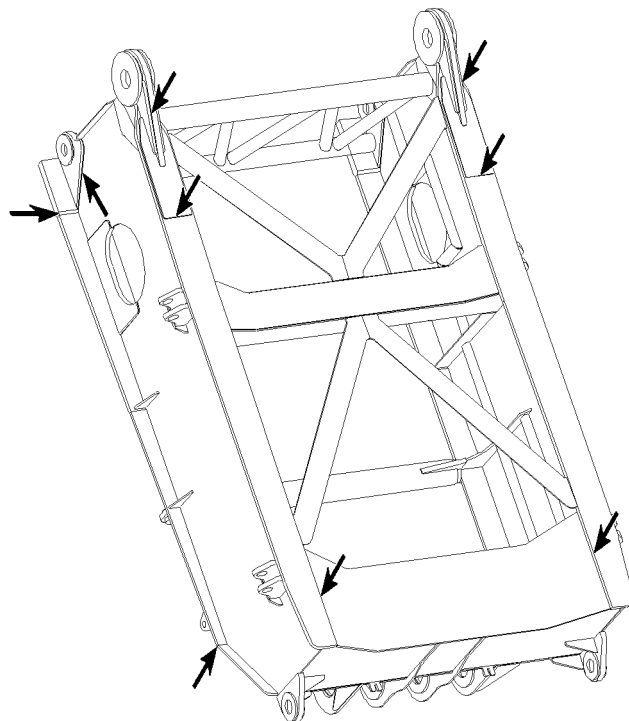
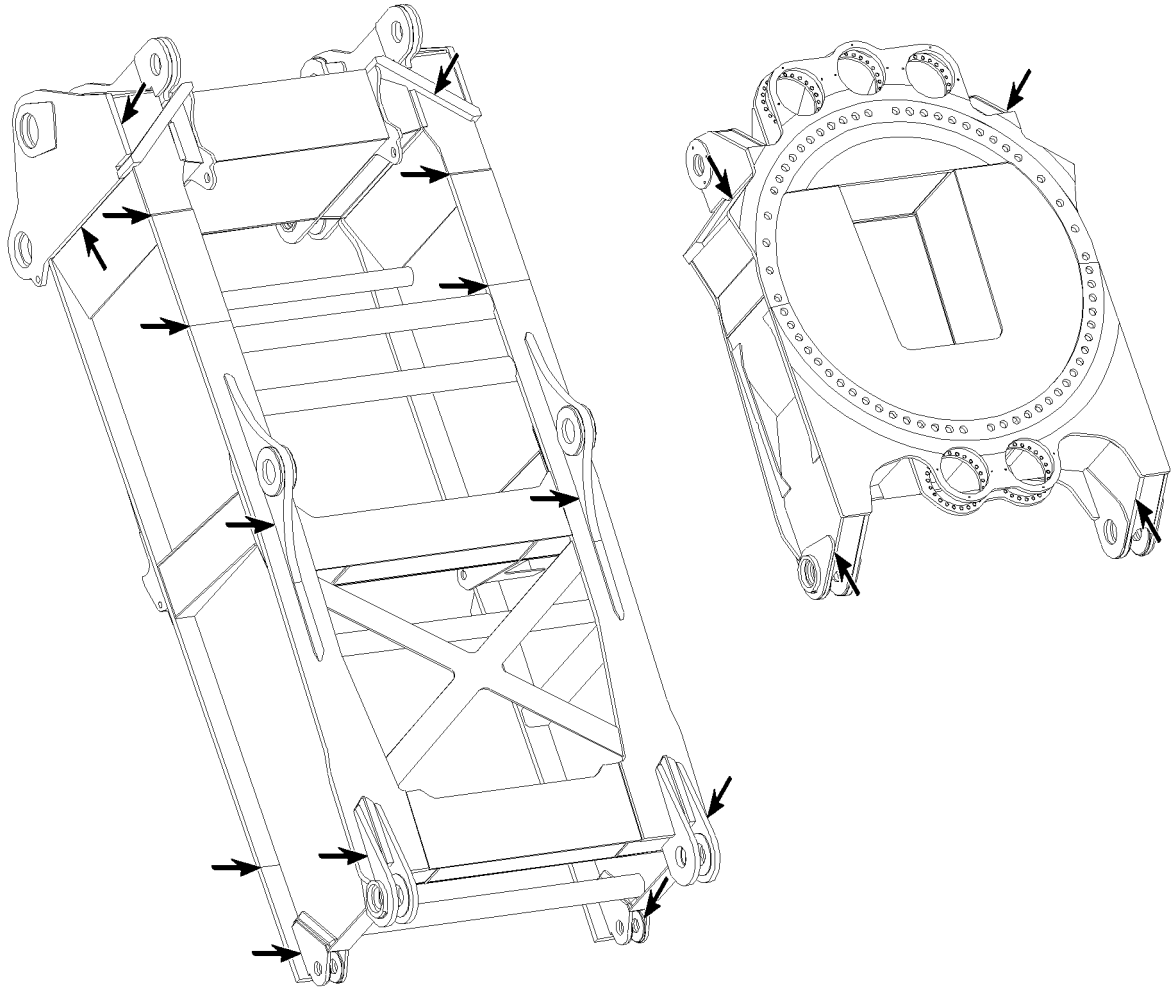
B105691

Example for turntable frame



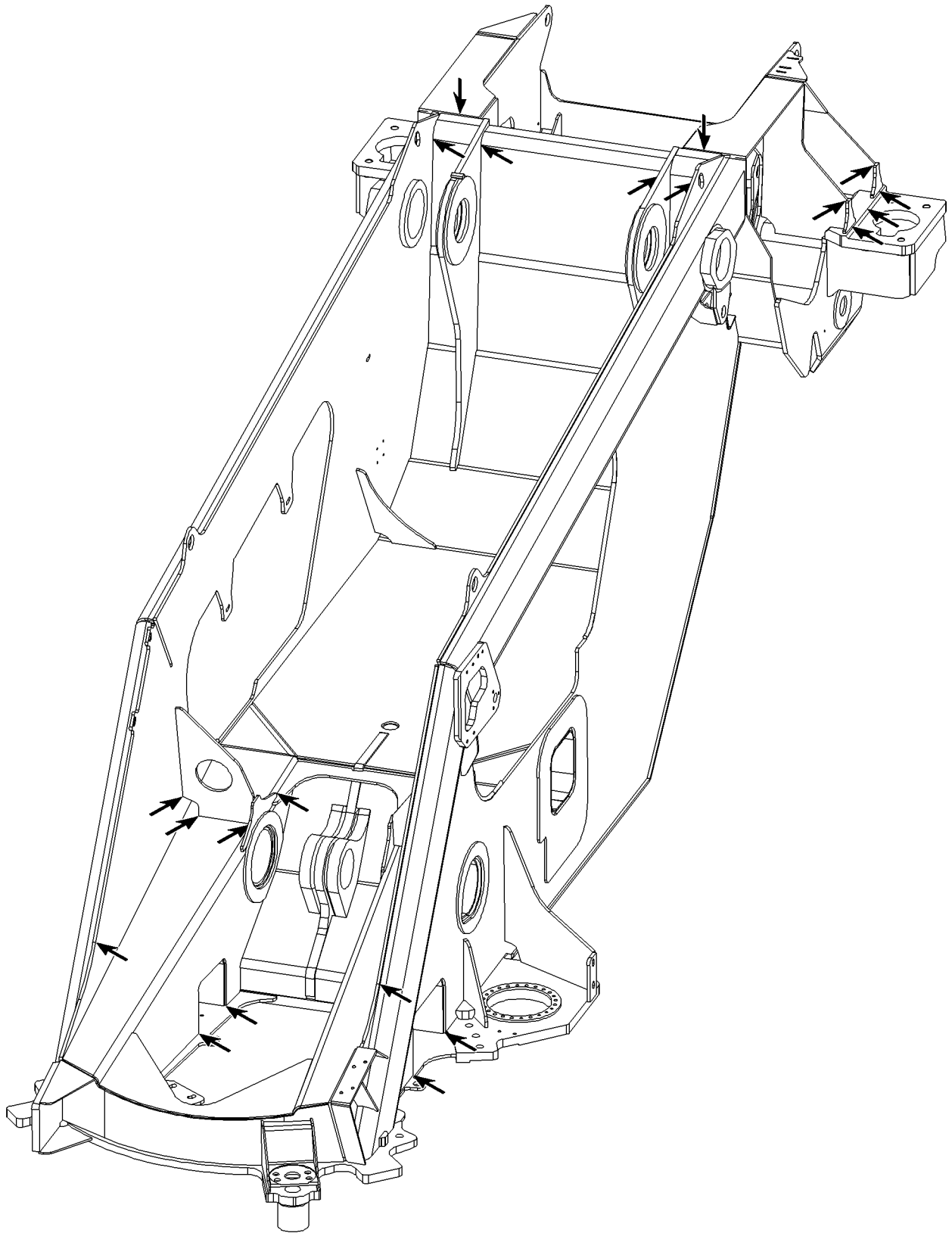
B105692

Example for turntable frame



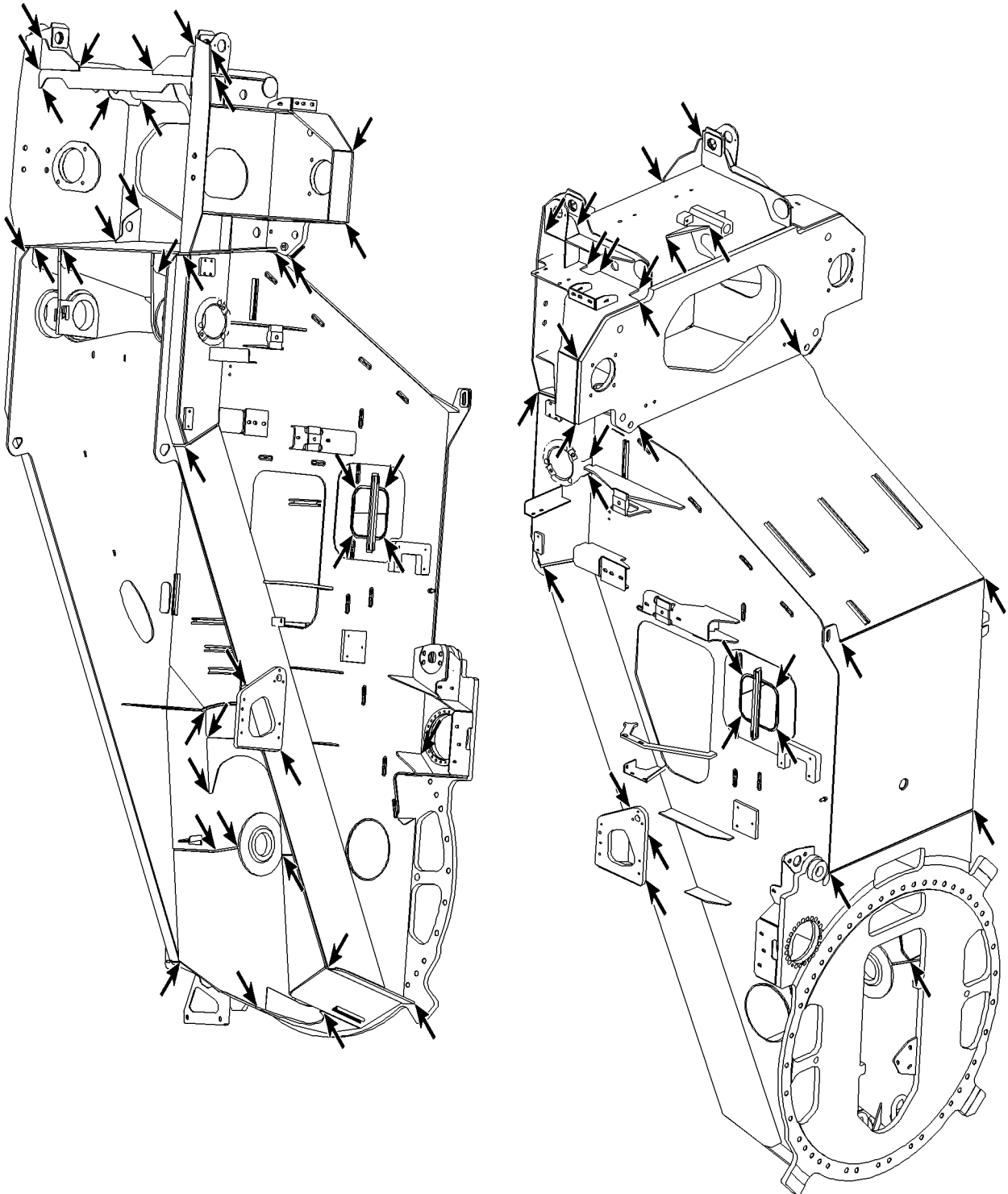
B105693

Example for turntable frame



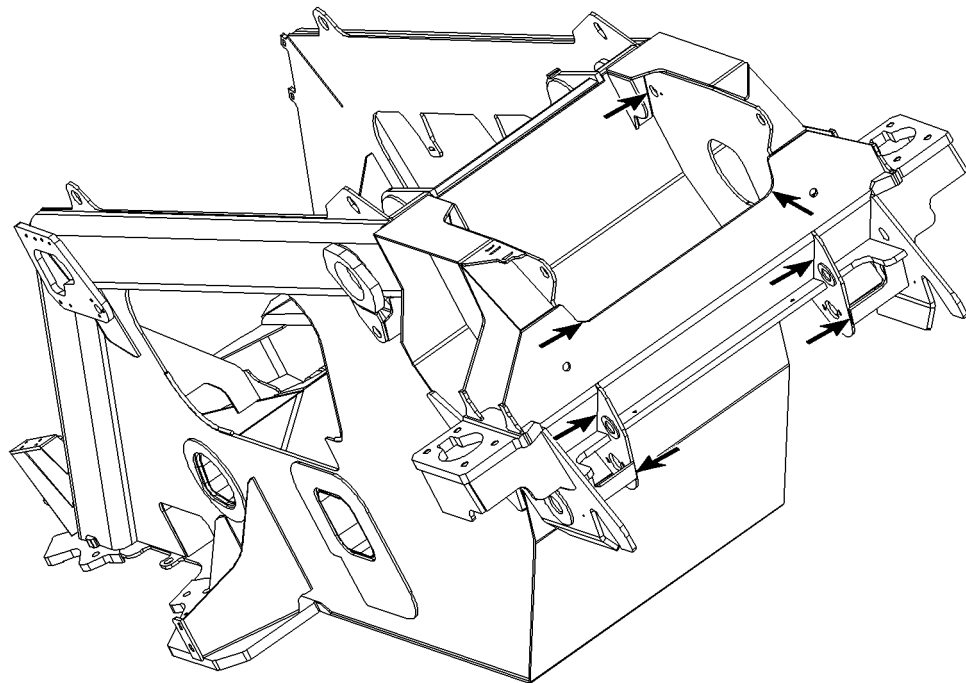
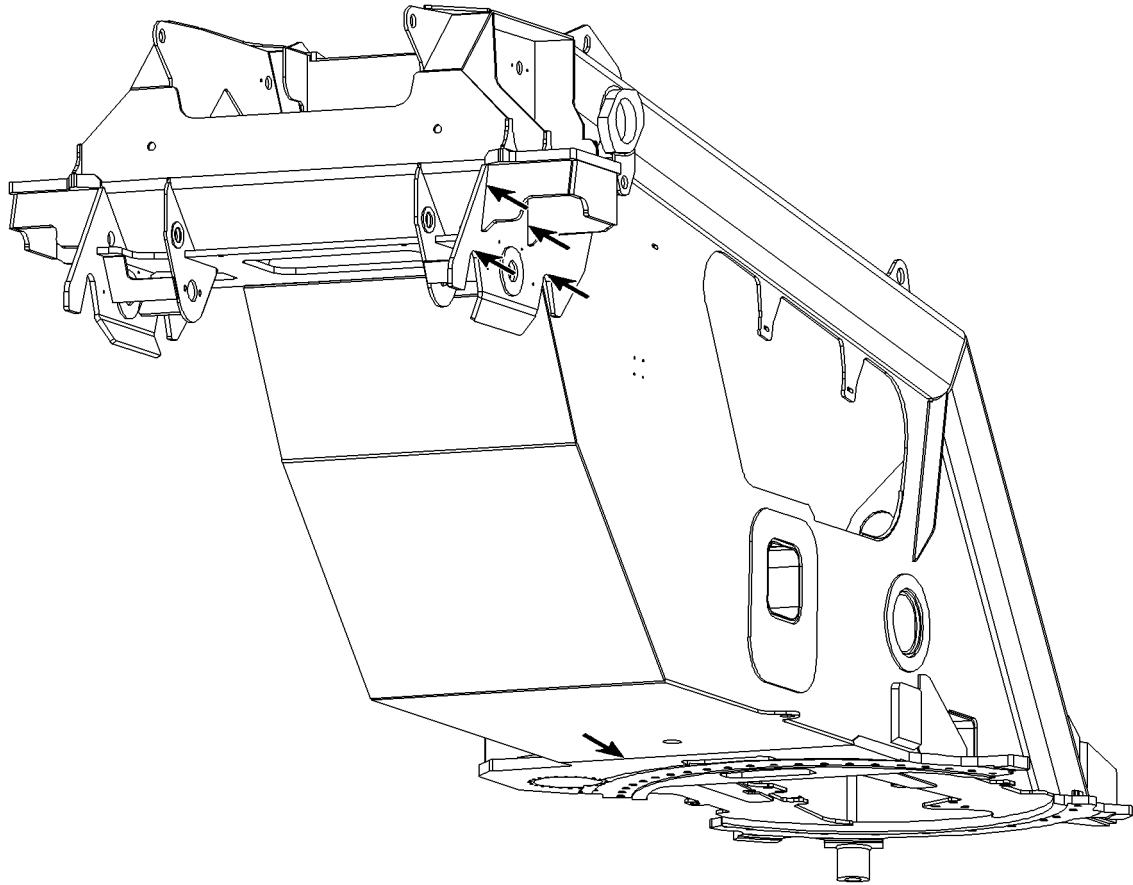
B105722

Example for turntable frame



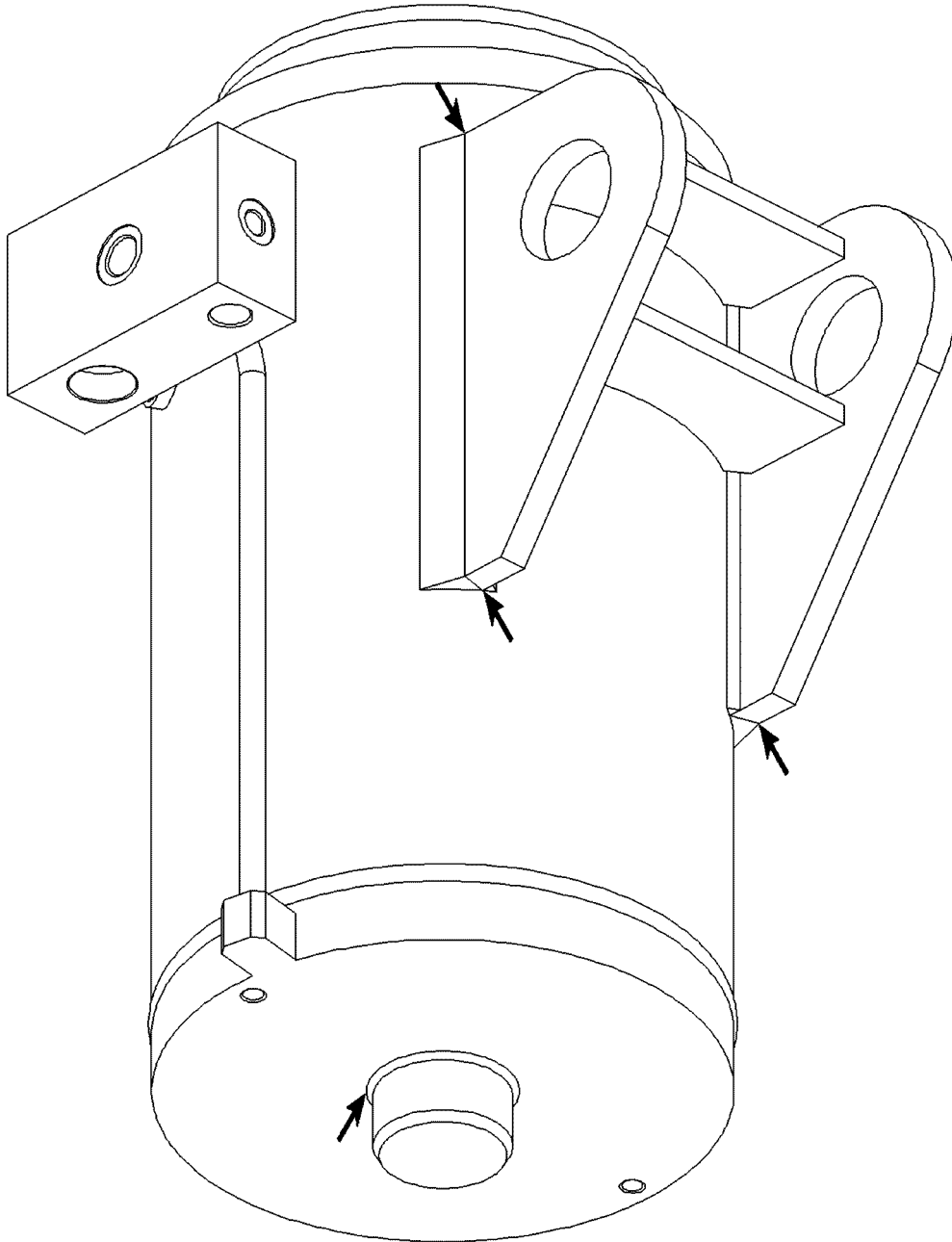
B105932

Example for turntable frame



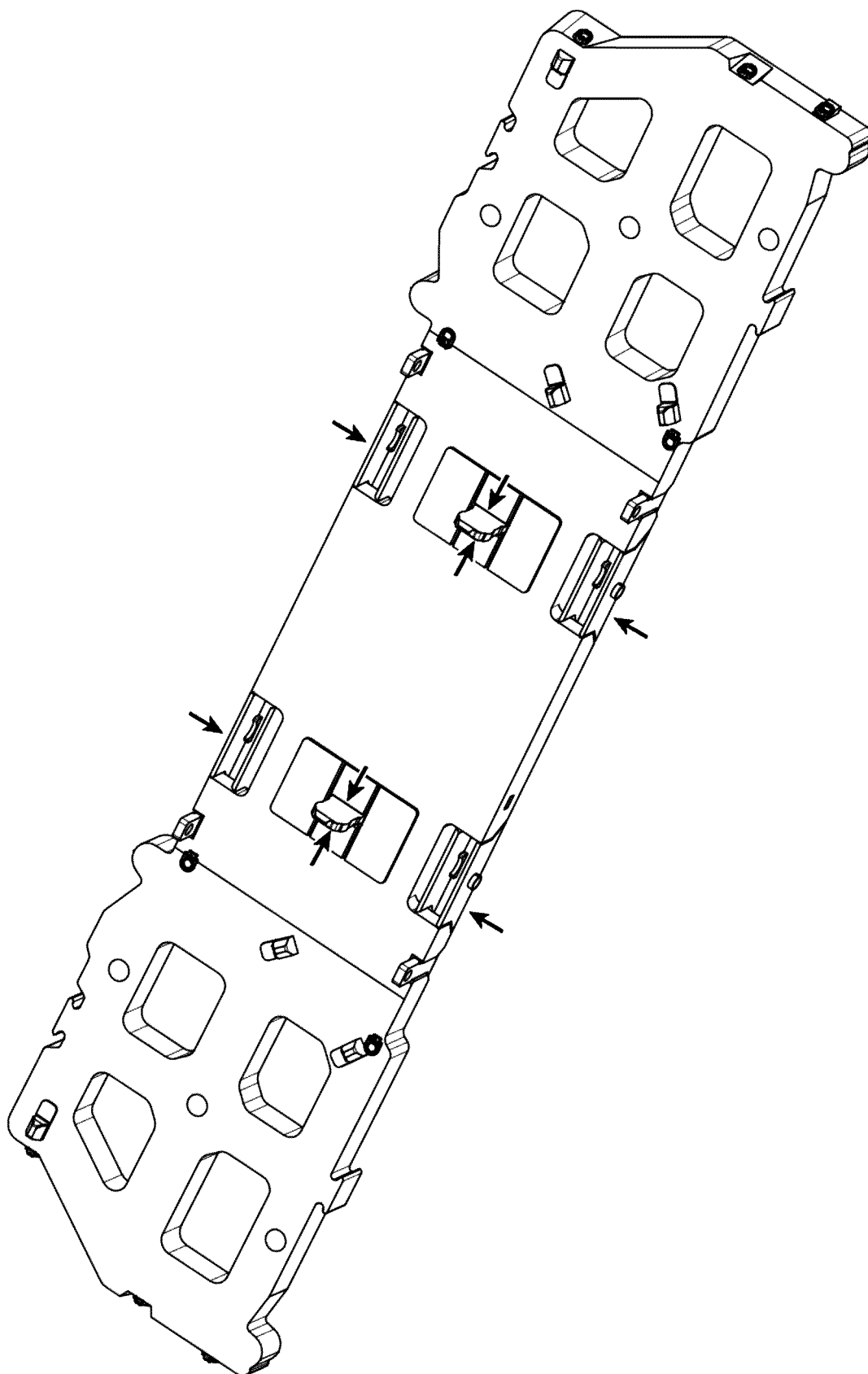
B105723

Example for turntable frame



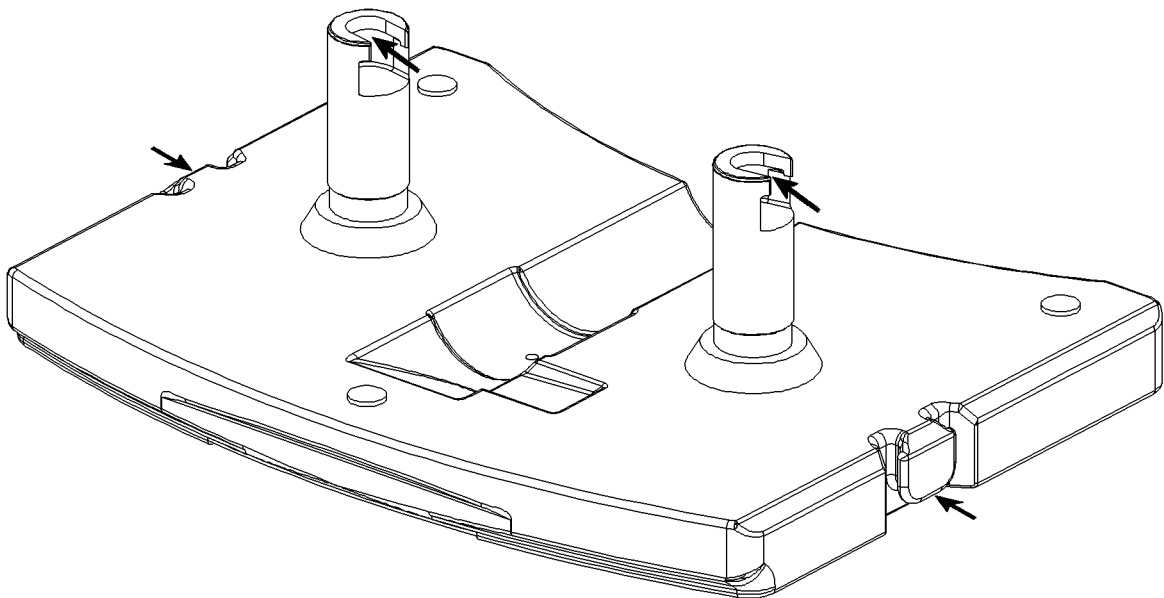
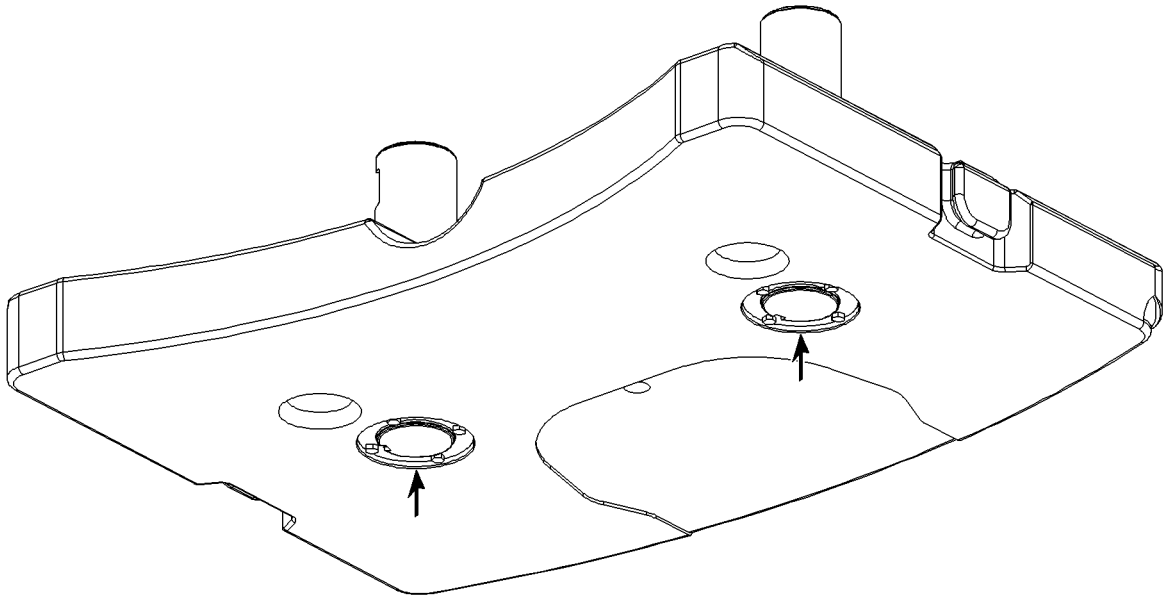
B105801

Example for ballasting cylinder



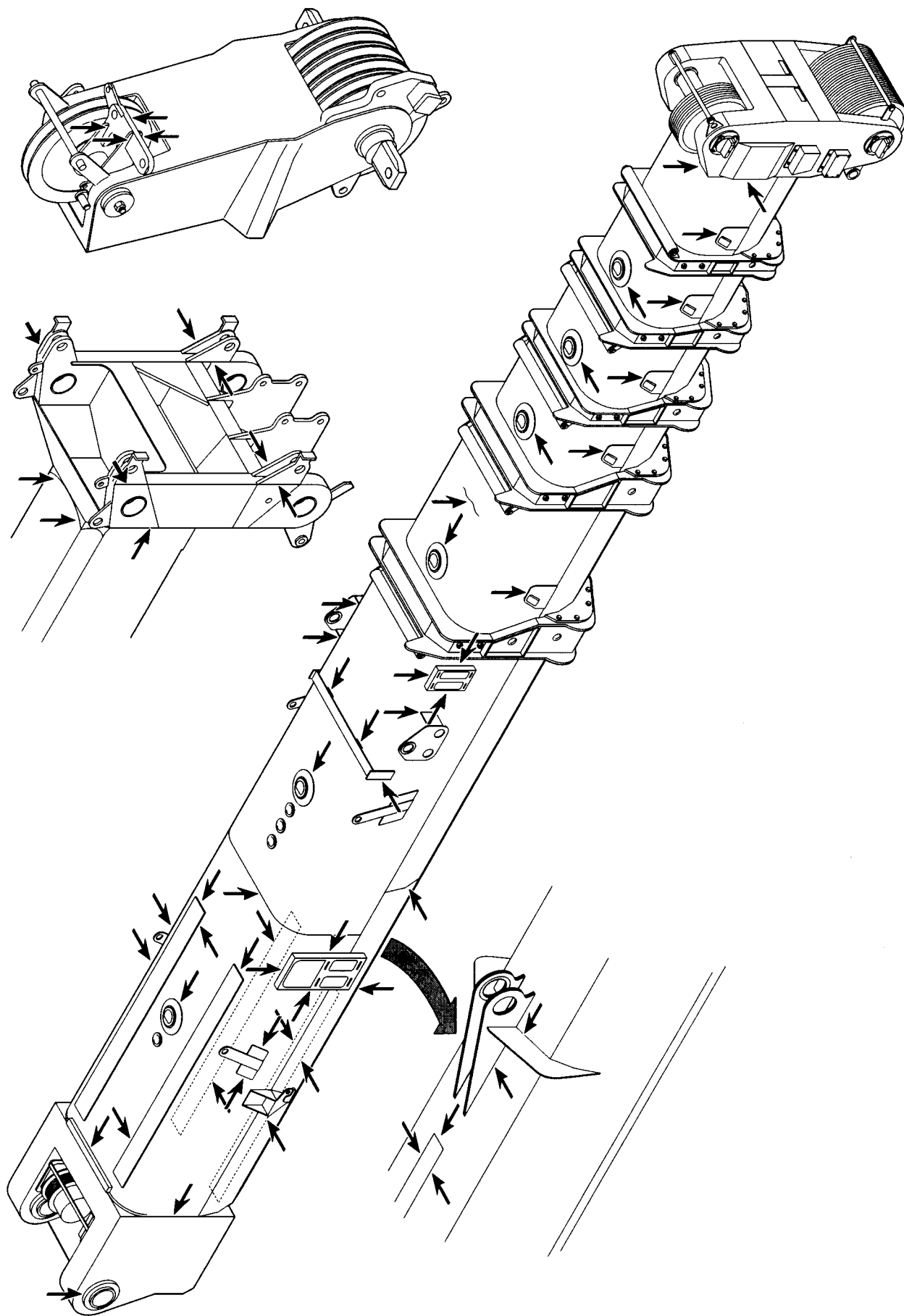
B105705

Example for mounting plate



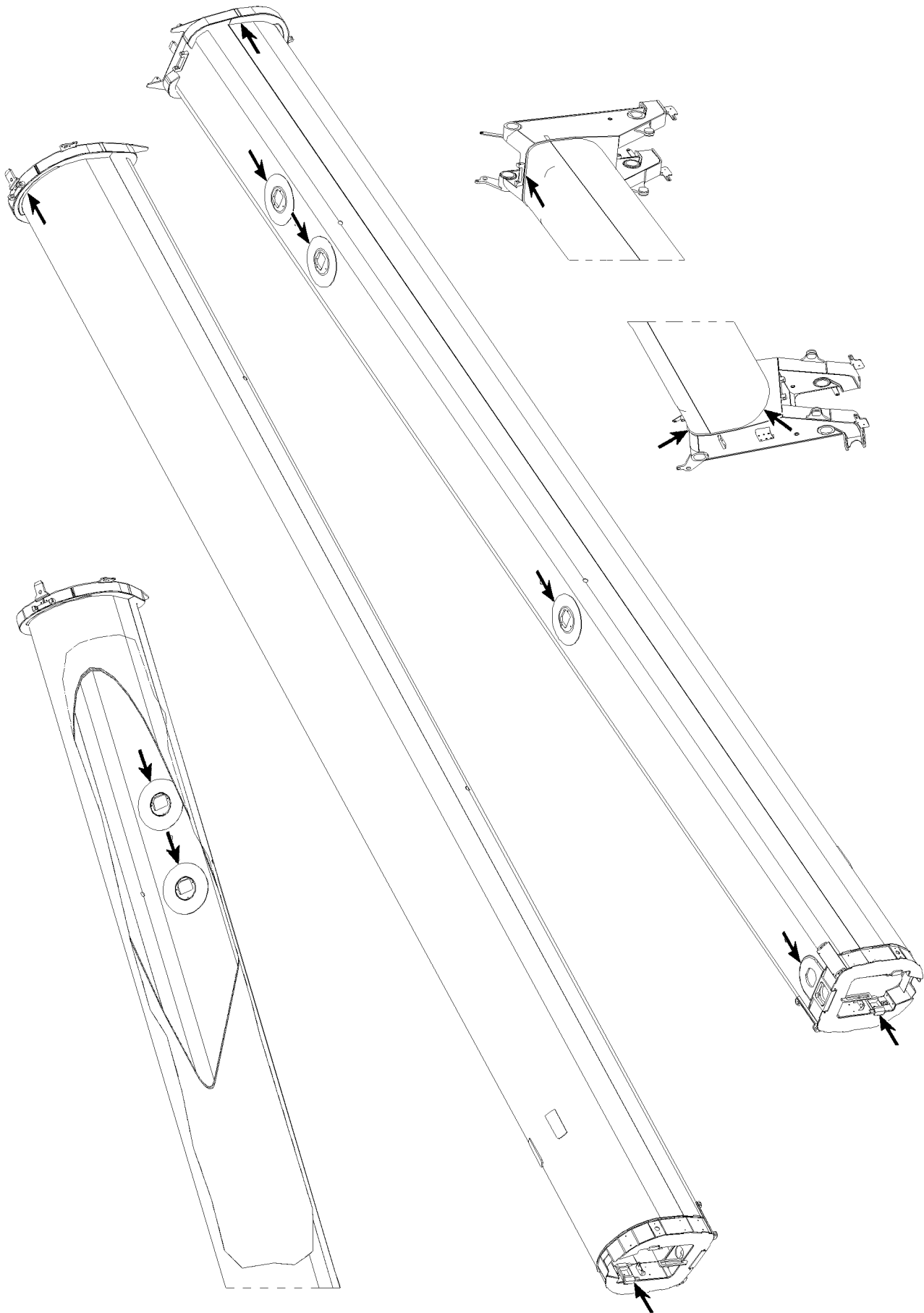
B105807

Example for base plate



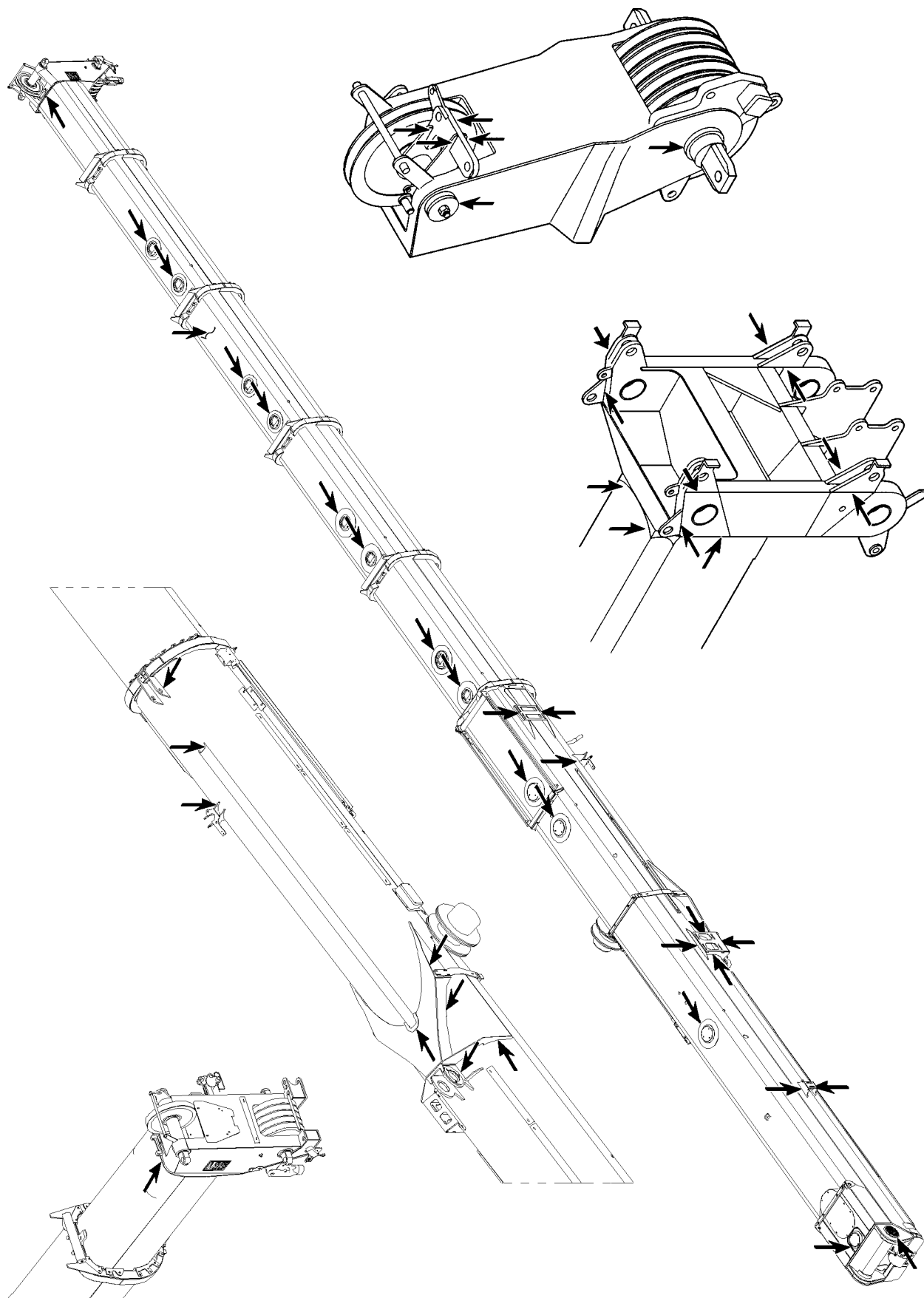
B185050

Example for telescopic boom



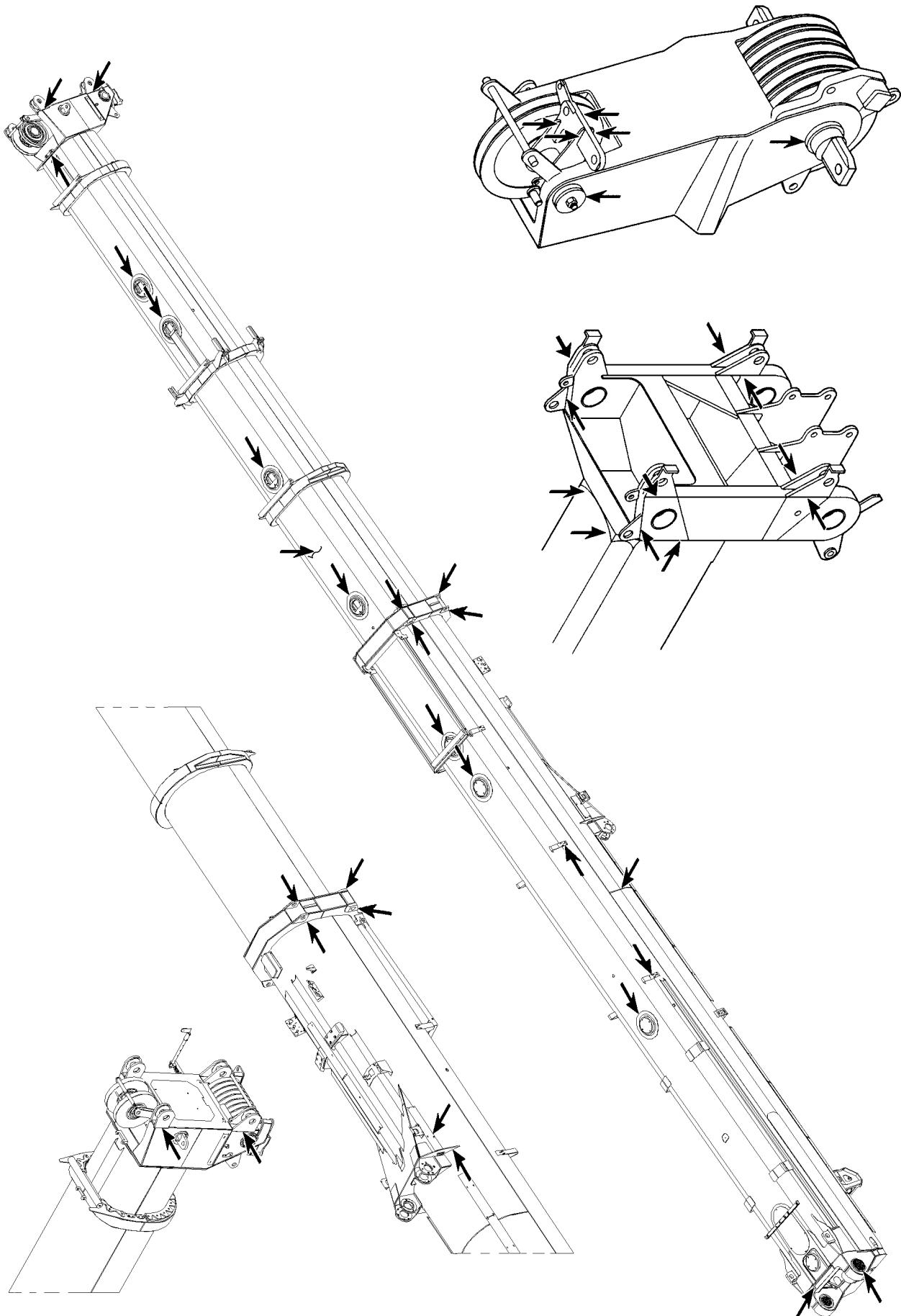
B105710

Example for telescopic boom



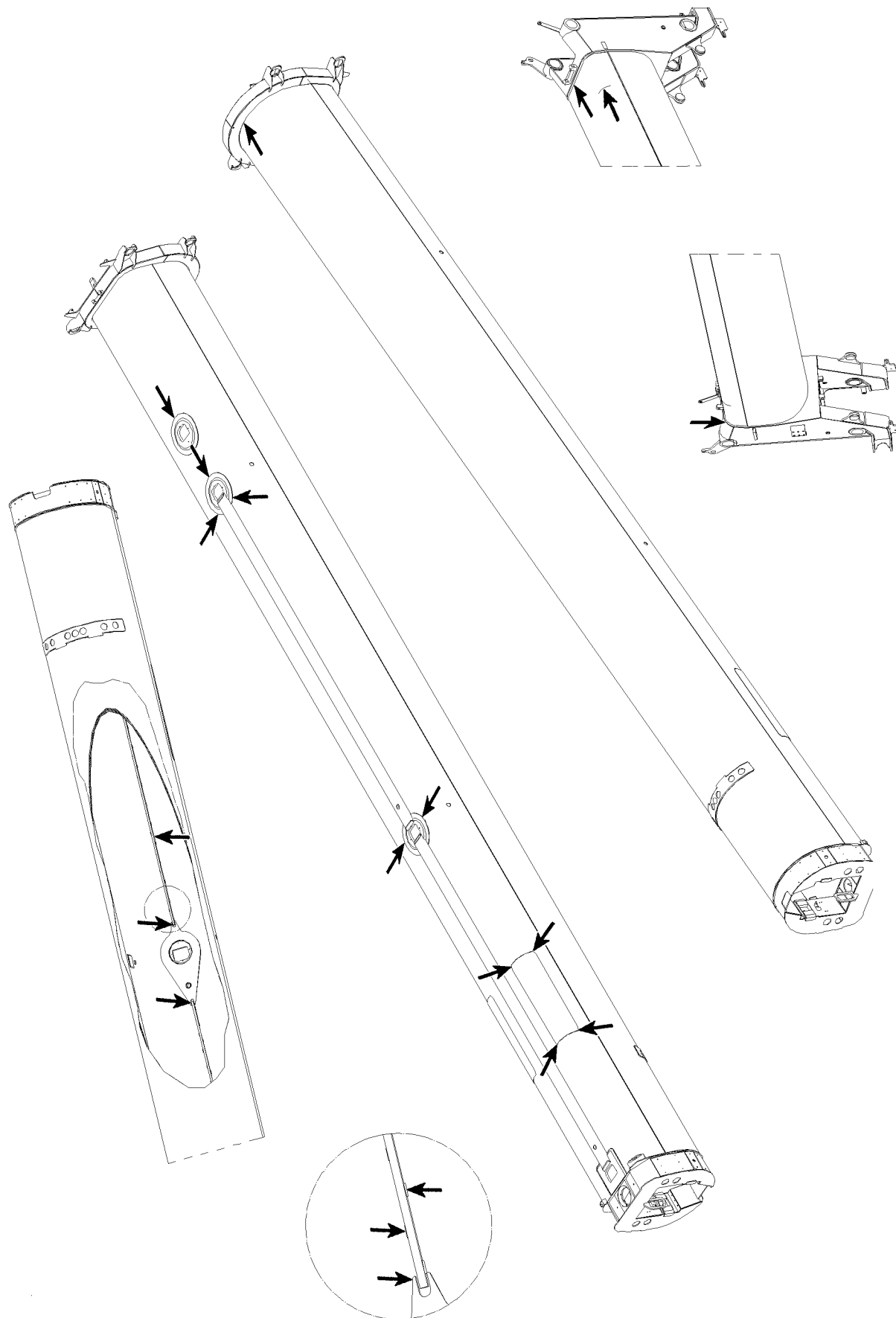
B105711

Example for telescopic boom



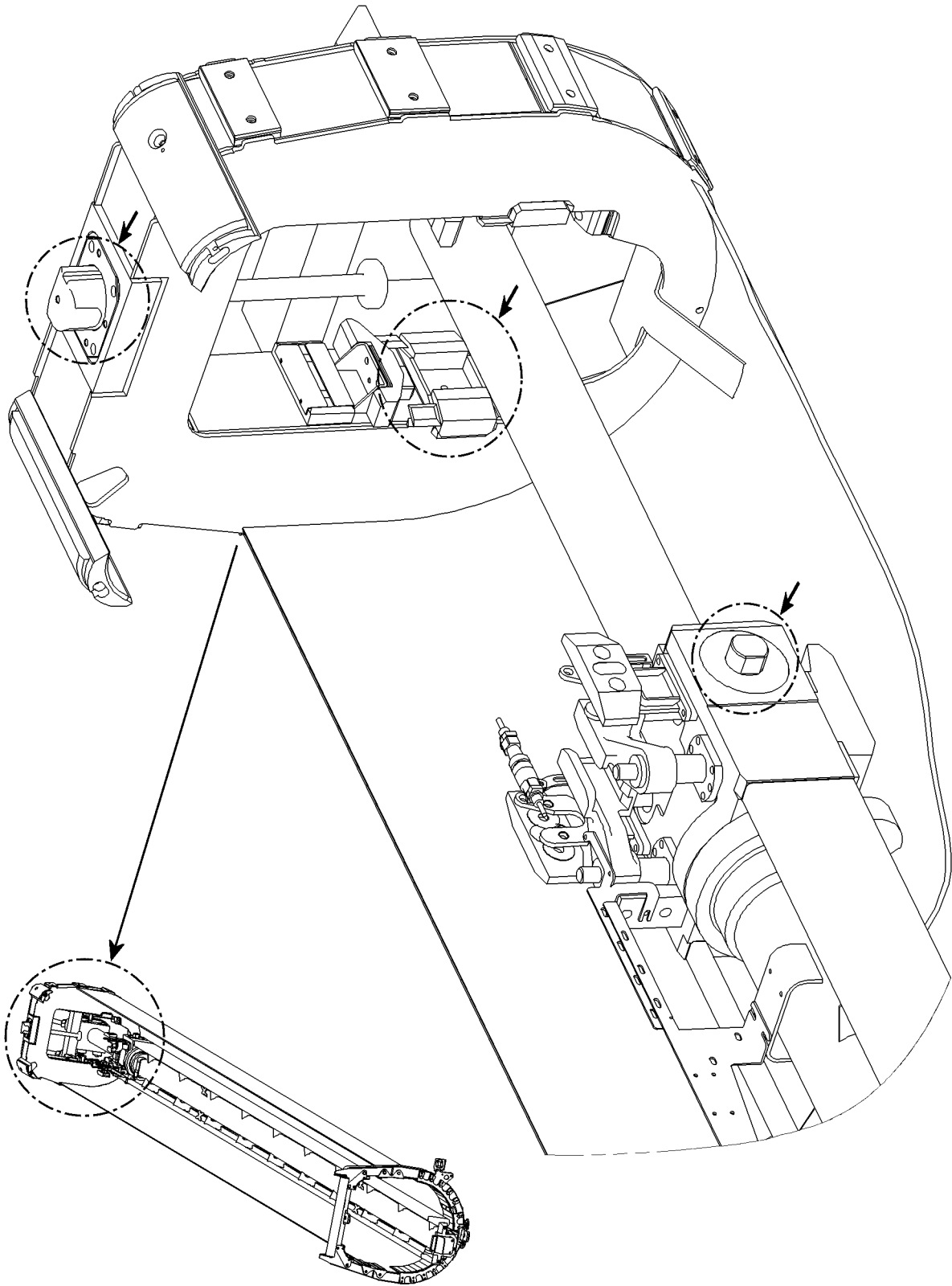
B105720

Example for telescopic boom



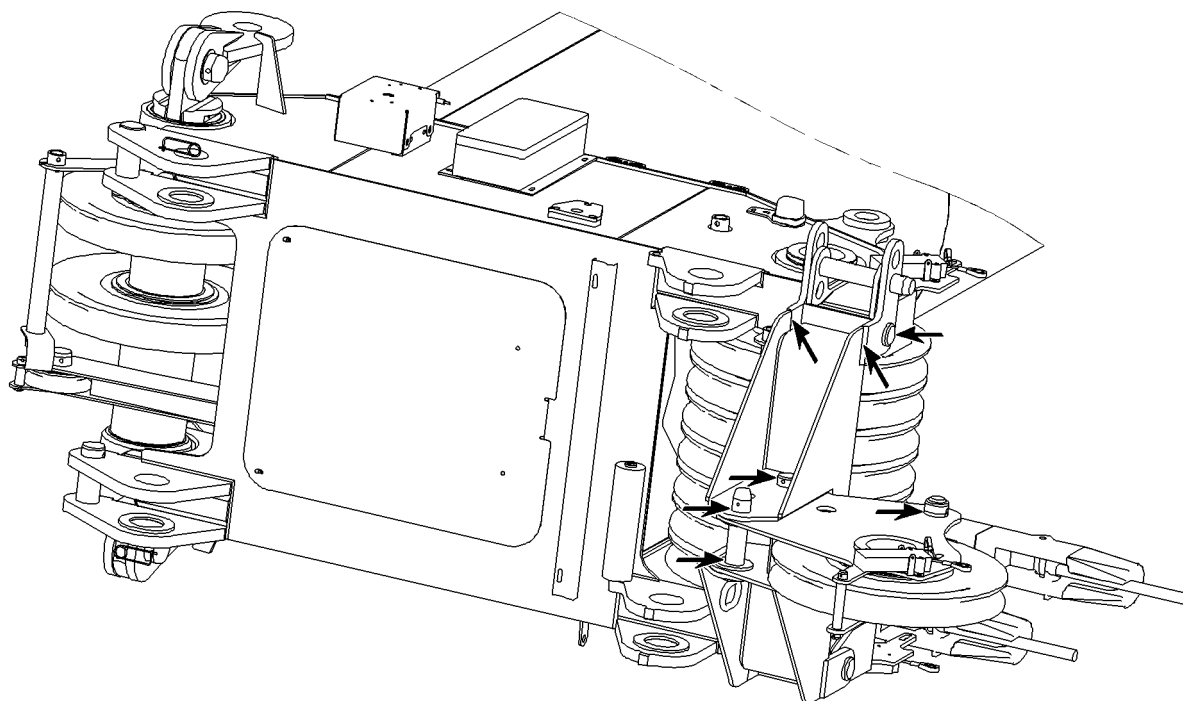
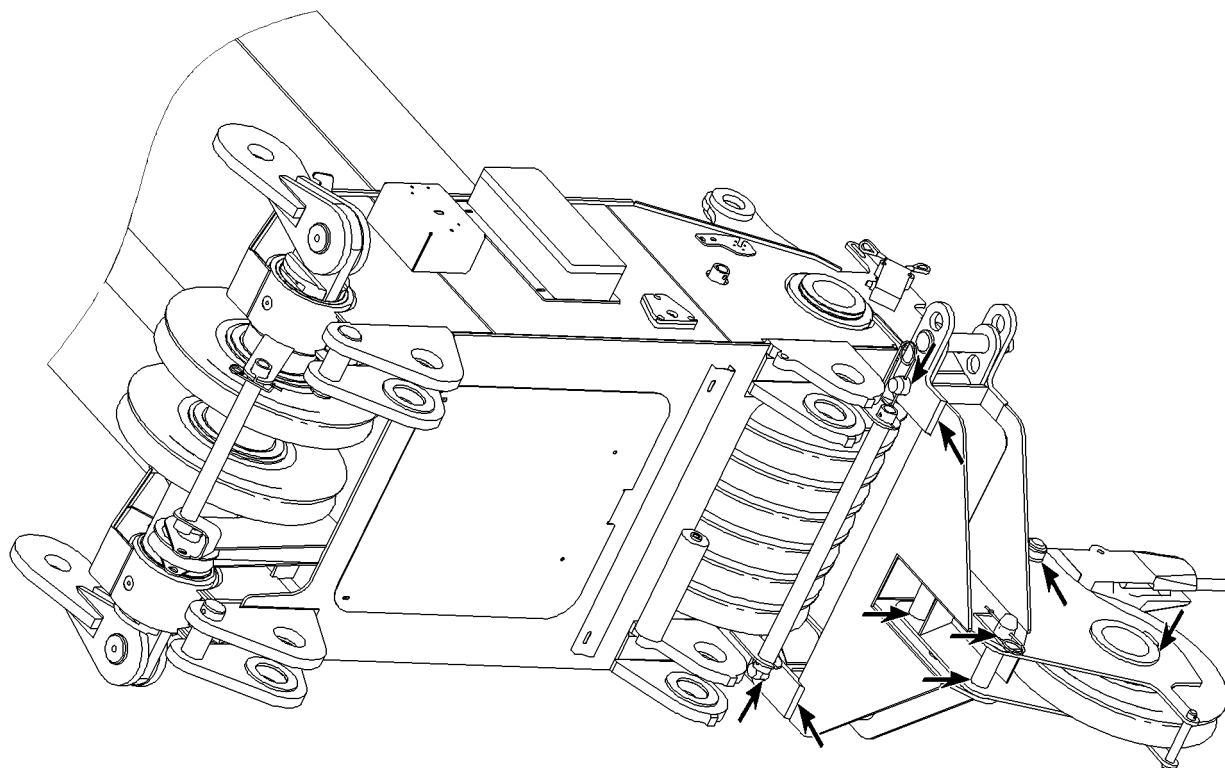
Example for telescopic boom

B105721



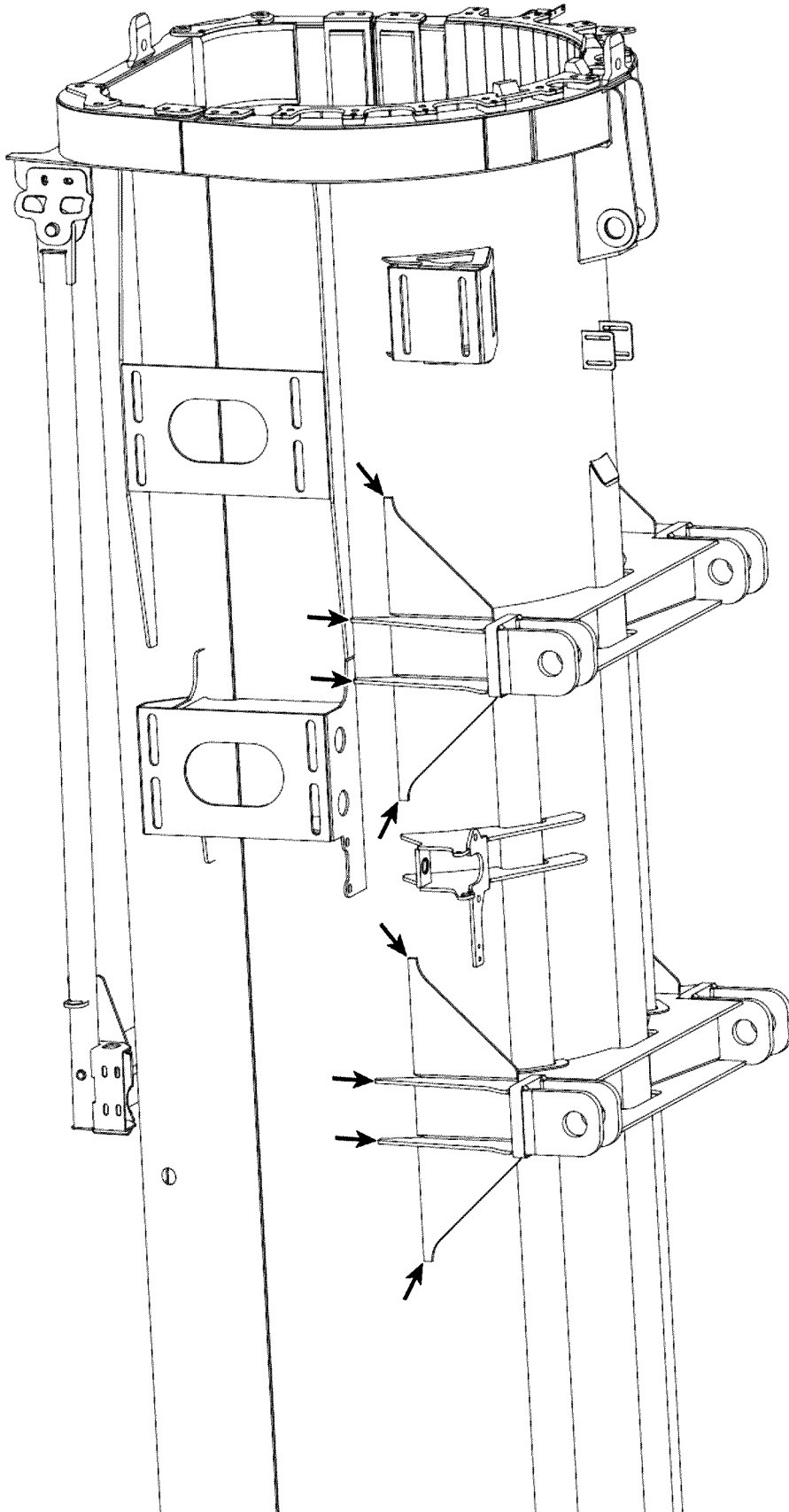
B105891

Example for push out mechanics telescopic boom



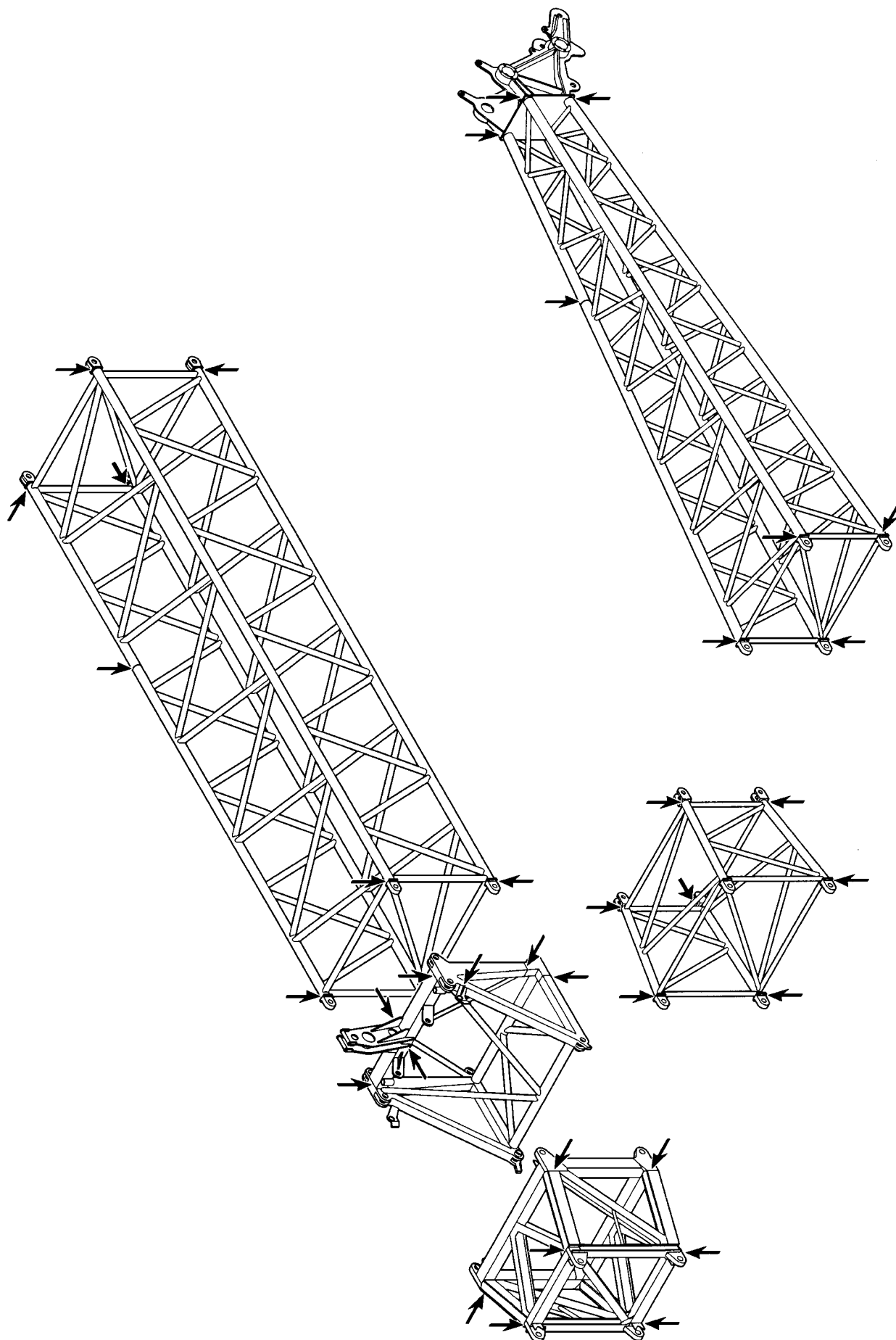
B105892

Example for boom nose



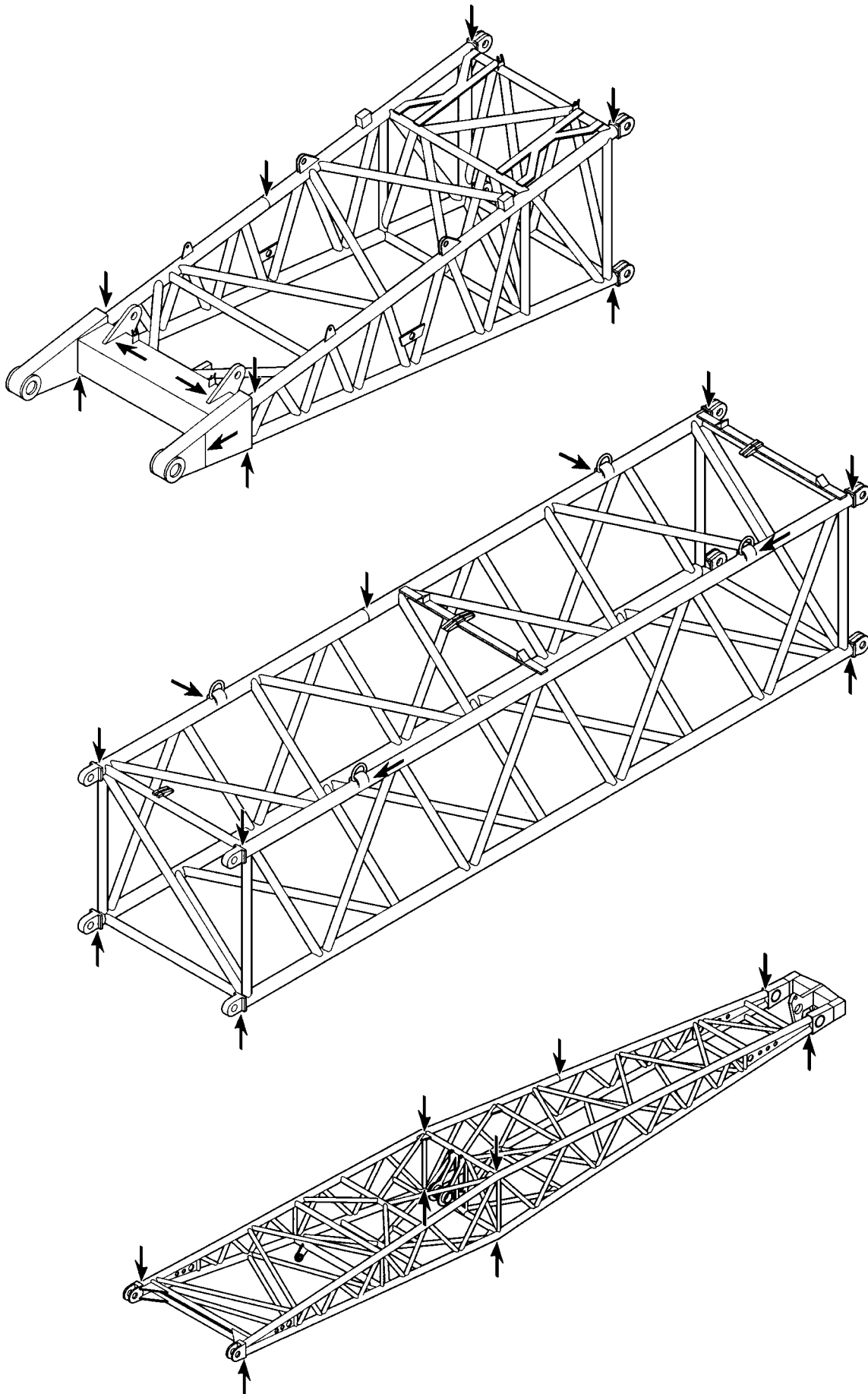
Example for dolly console

B105689



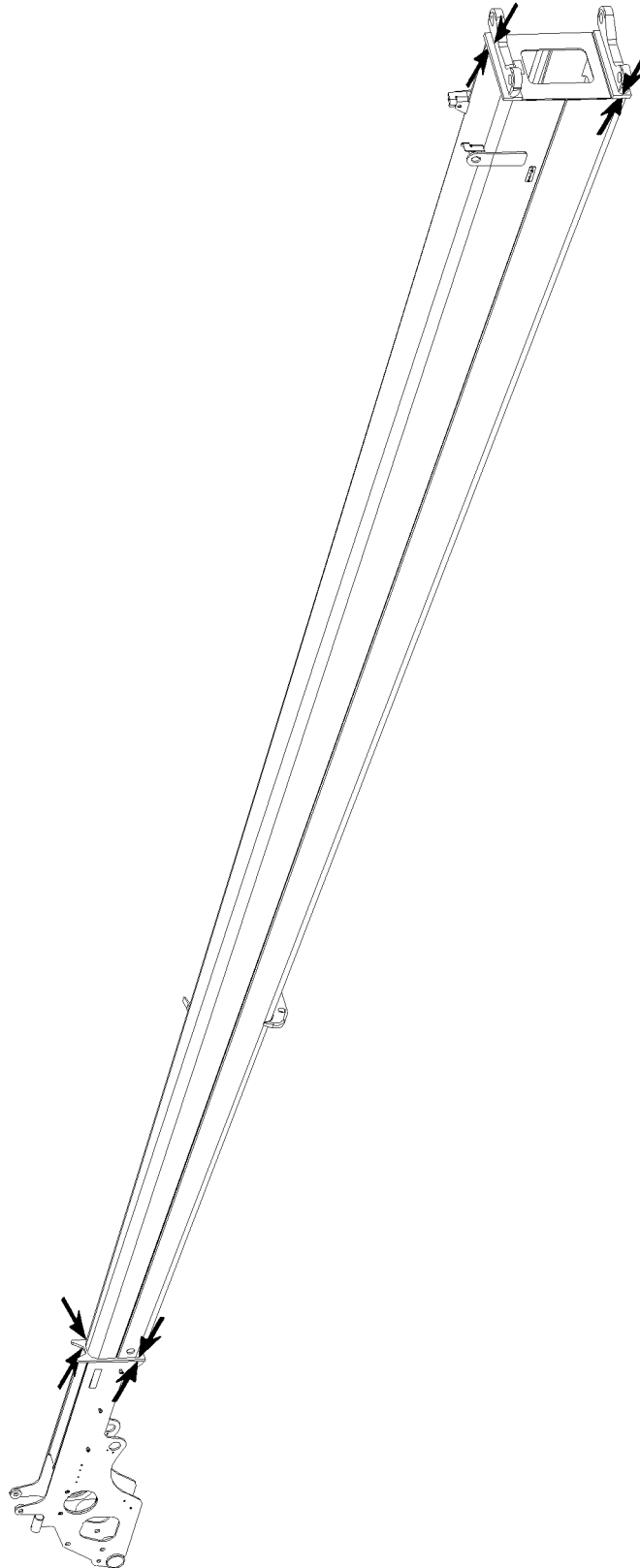
Example for lattice jib

B185051



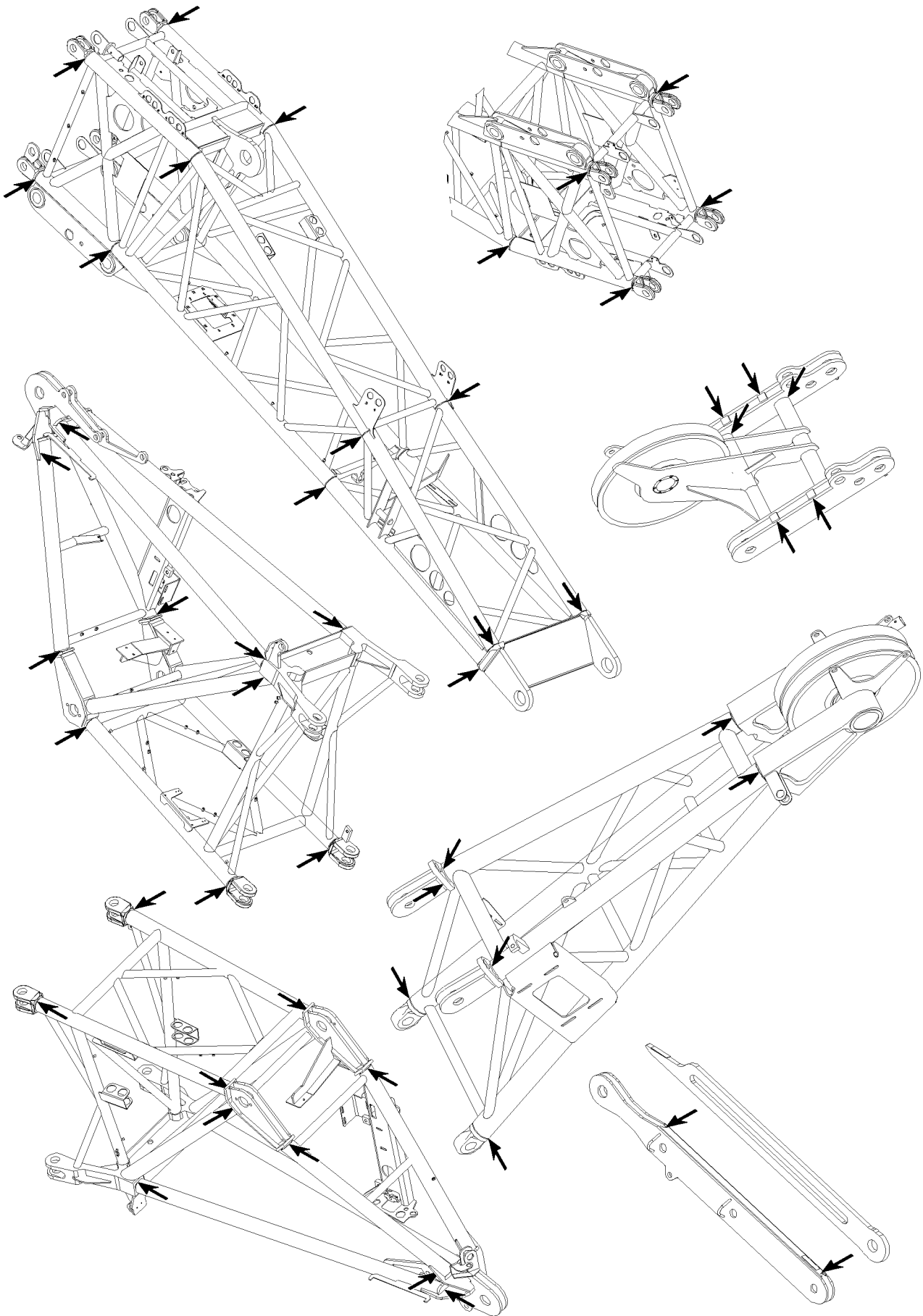
Example for NA / WA-frame

B185052



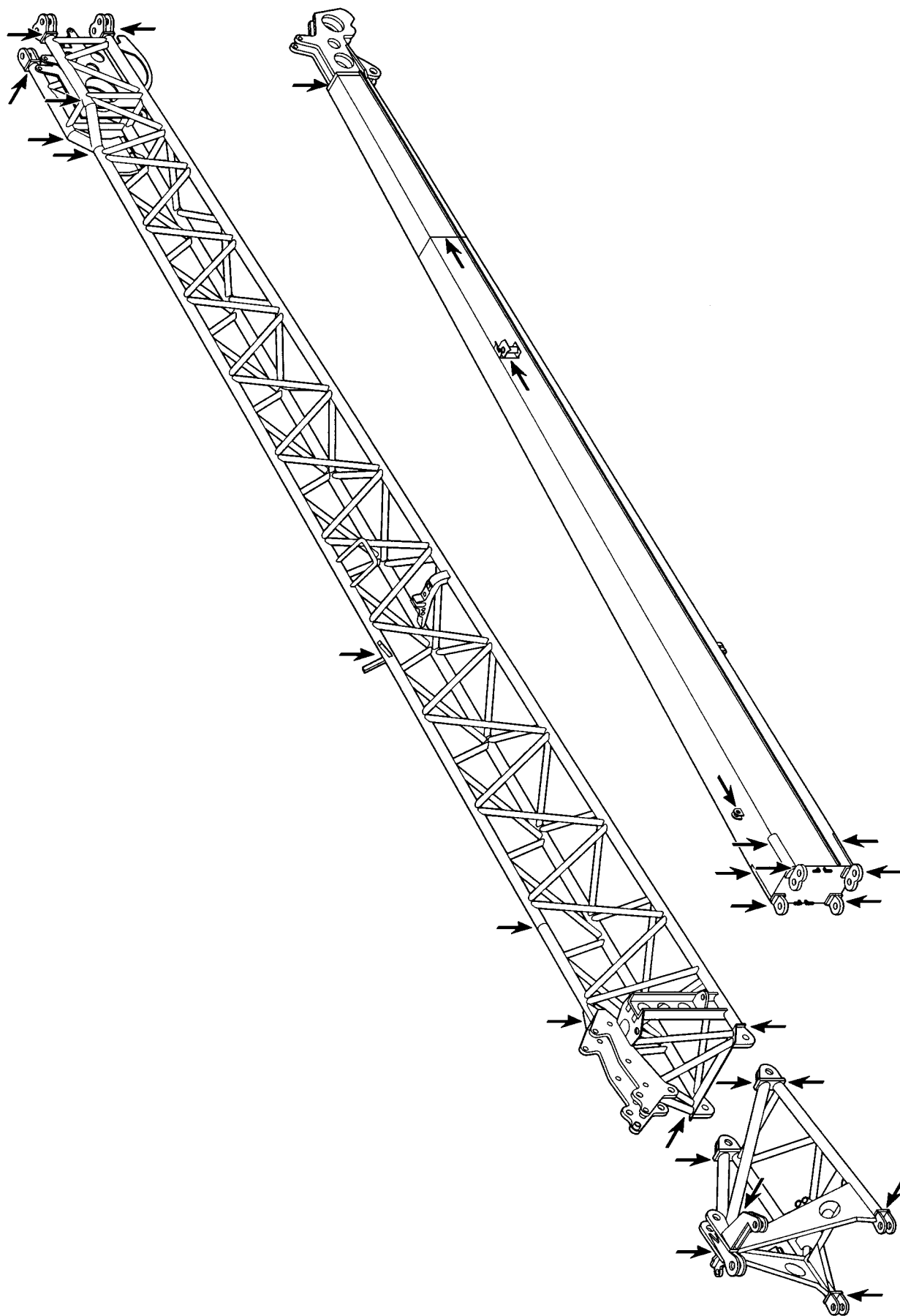
B105713

Example for end section



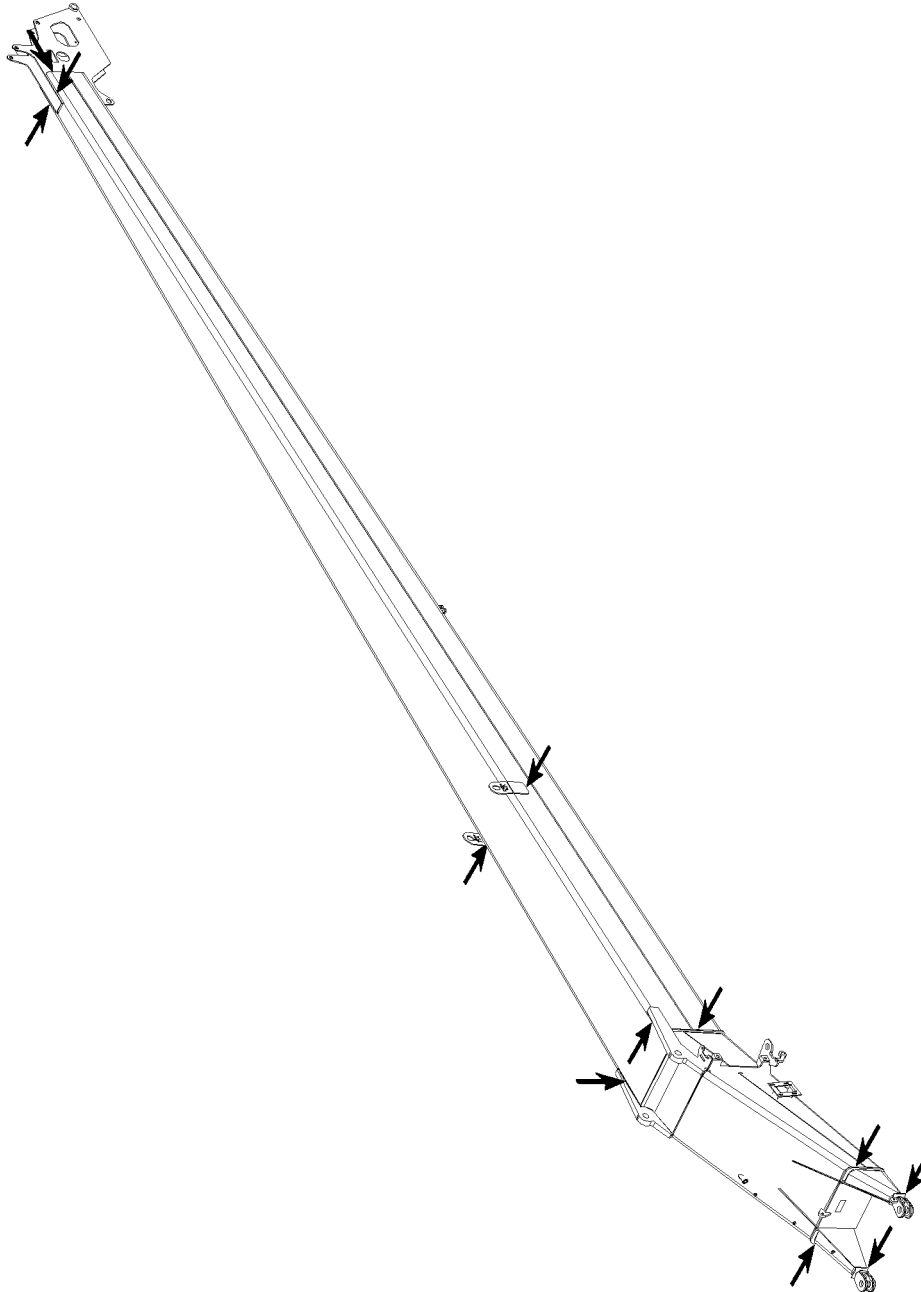
B105836

Example for pivot section, adapter and boom nose



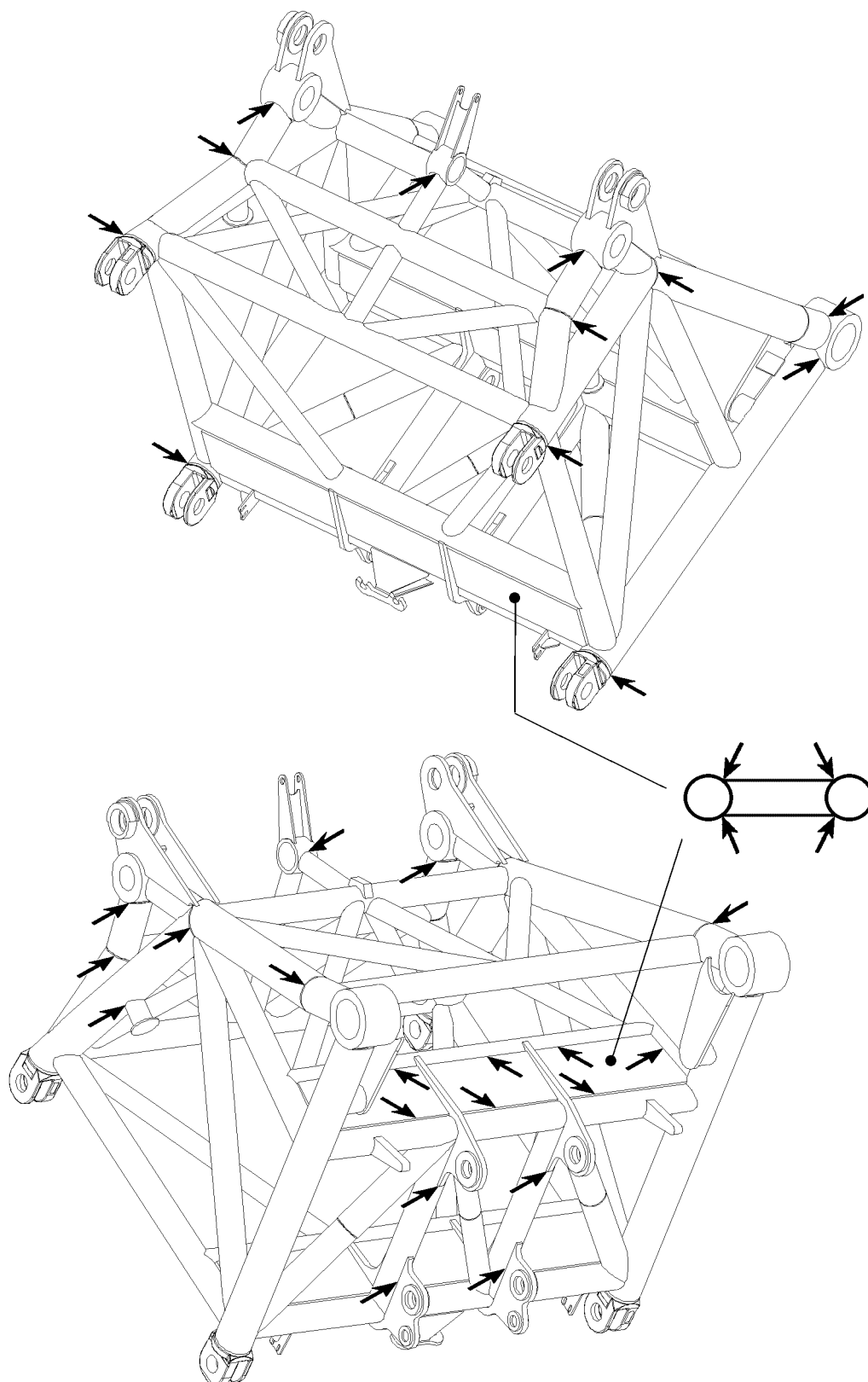
B185058

Example for folding jib



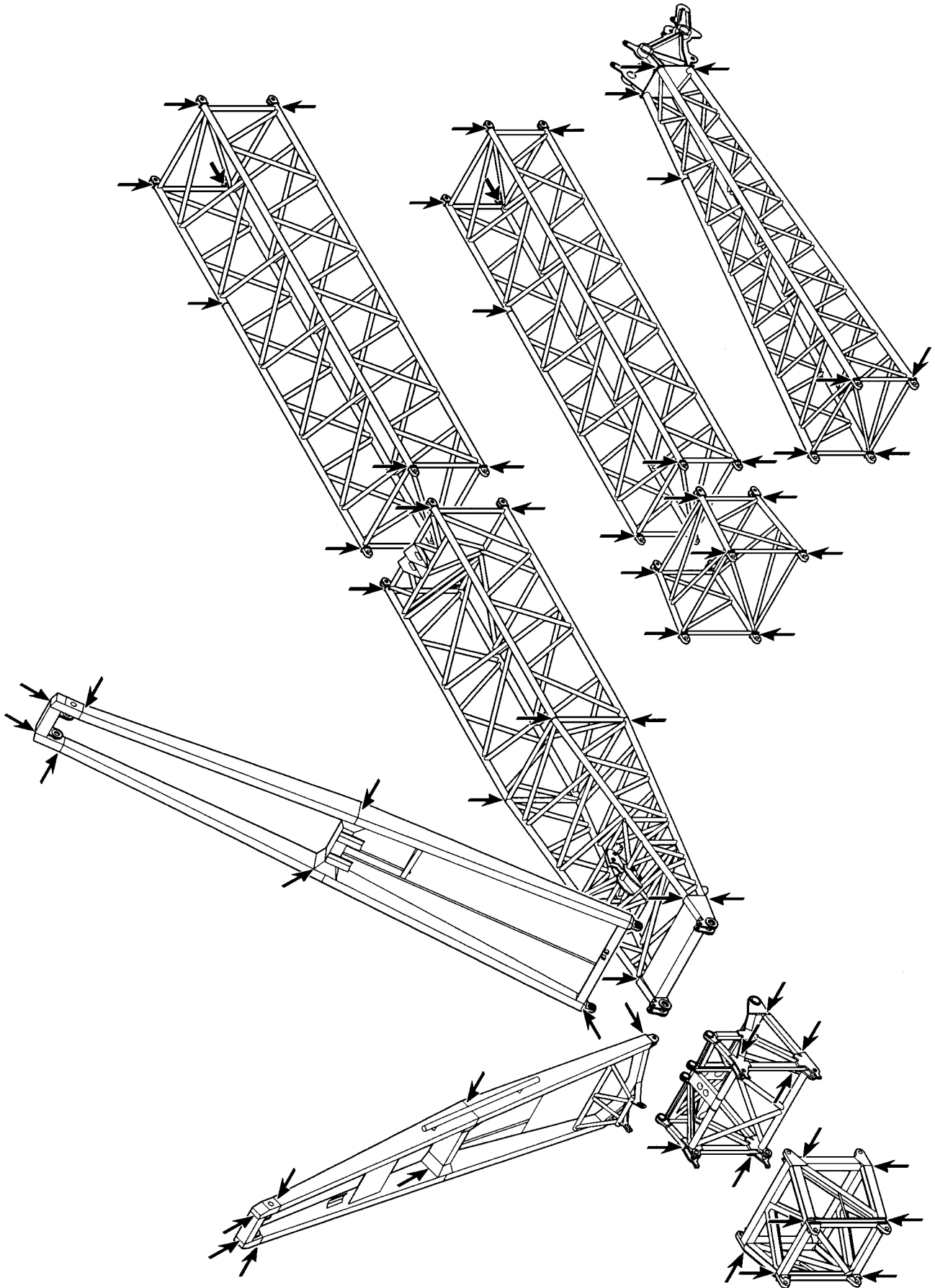
B105697

Example for folding jib



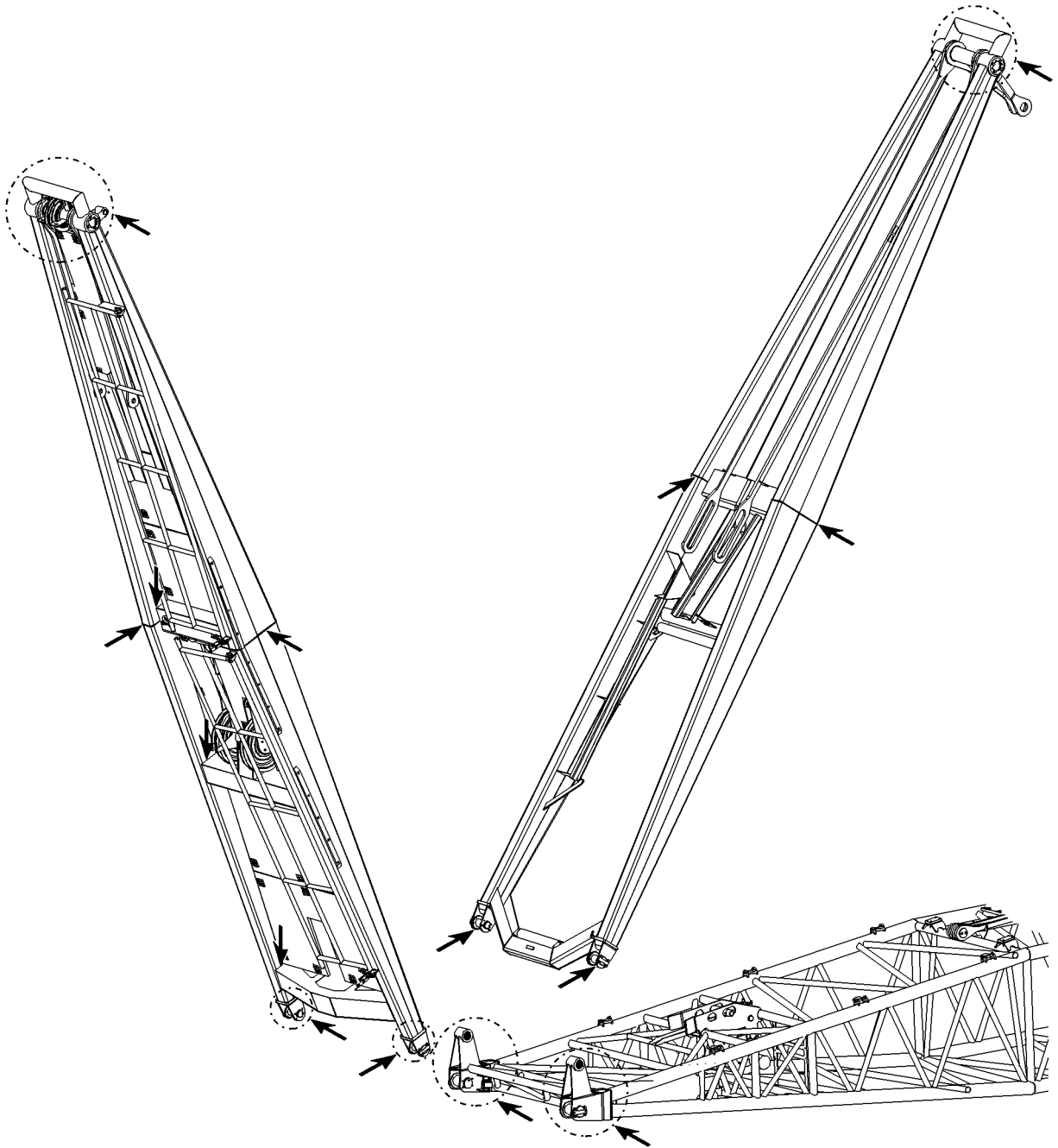
B105732

Example for W-connector head



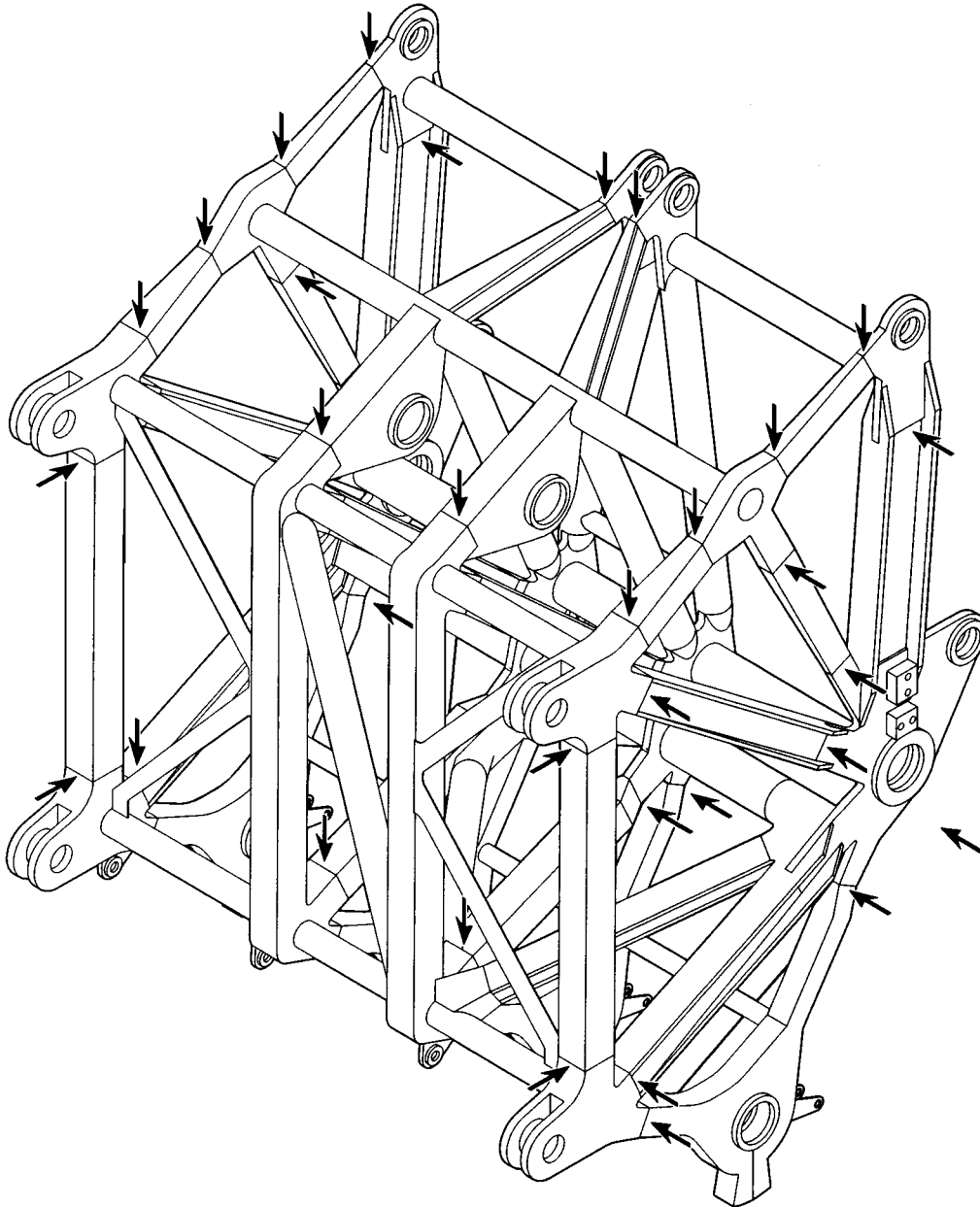
B185053

Example for assembly unit with lattice jib



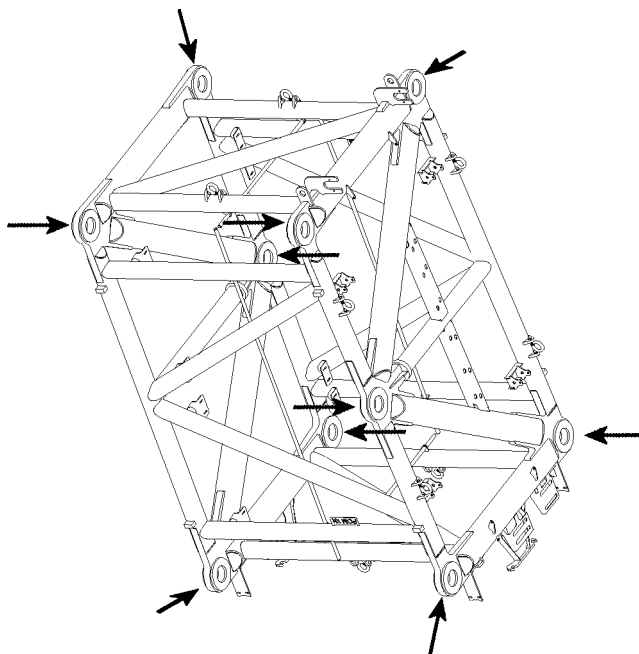
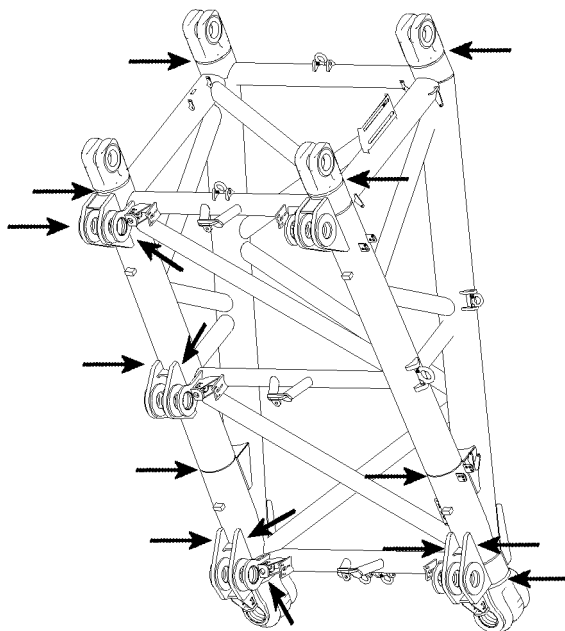
B105838

Example for NA frames



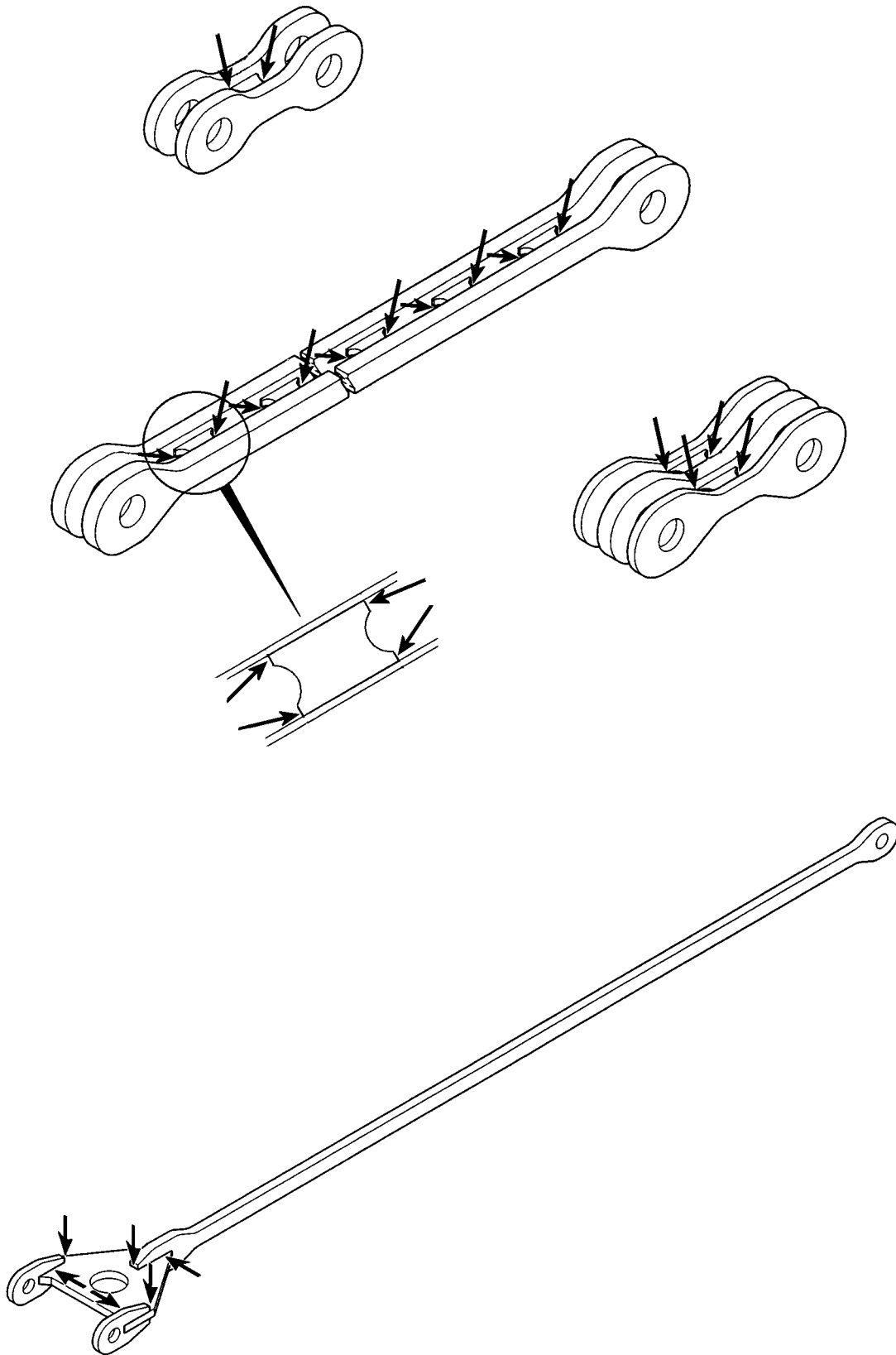
B185054

Example for pulley head



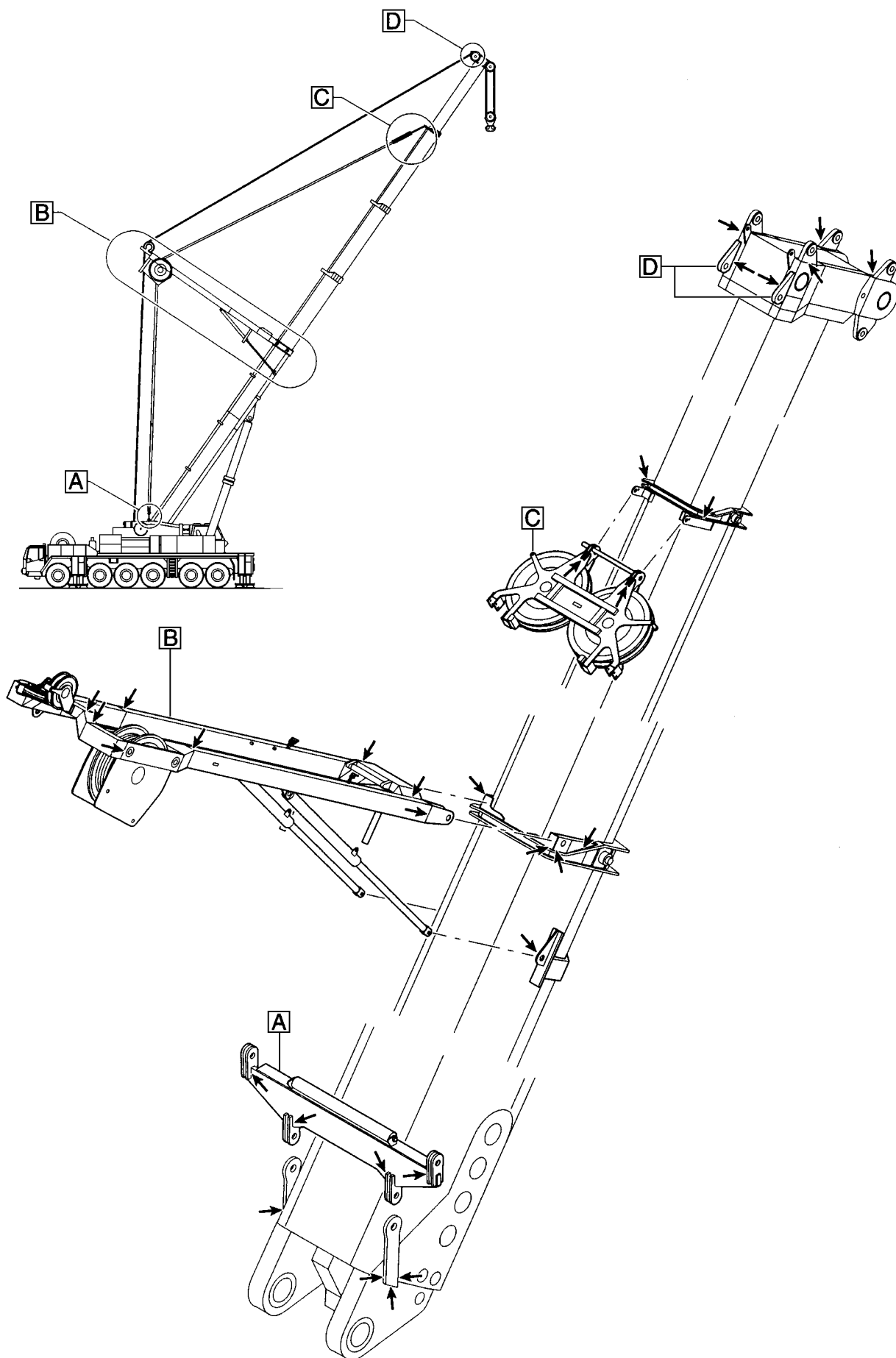
B116609

Example for P-adapter



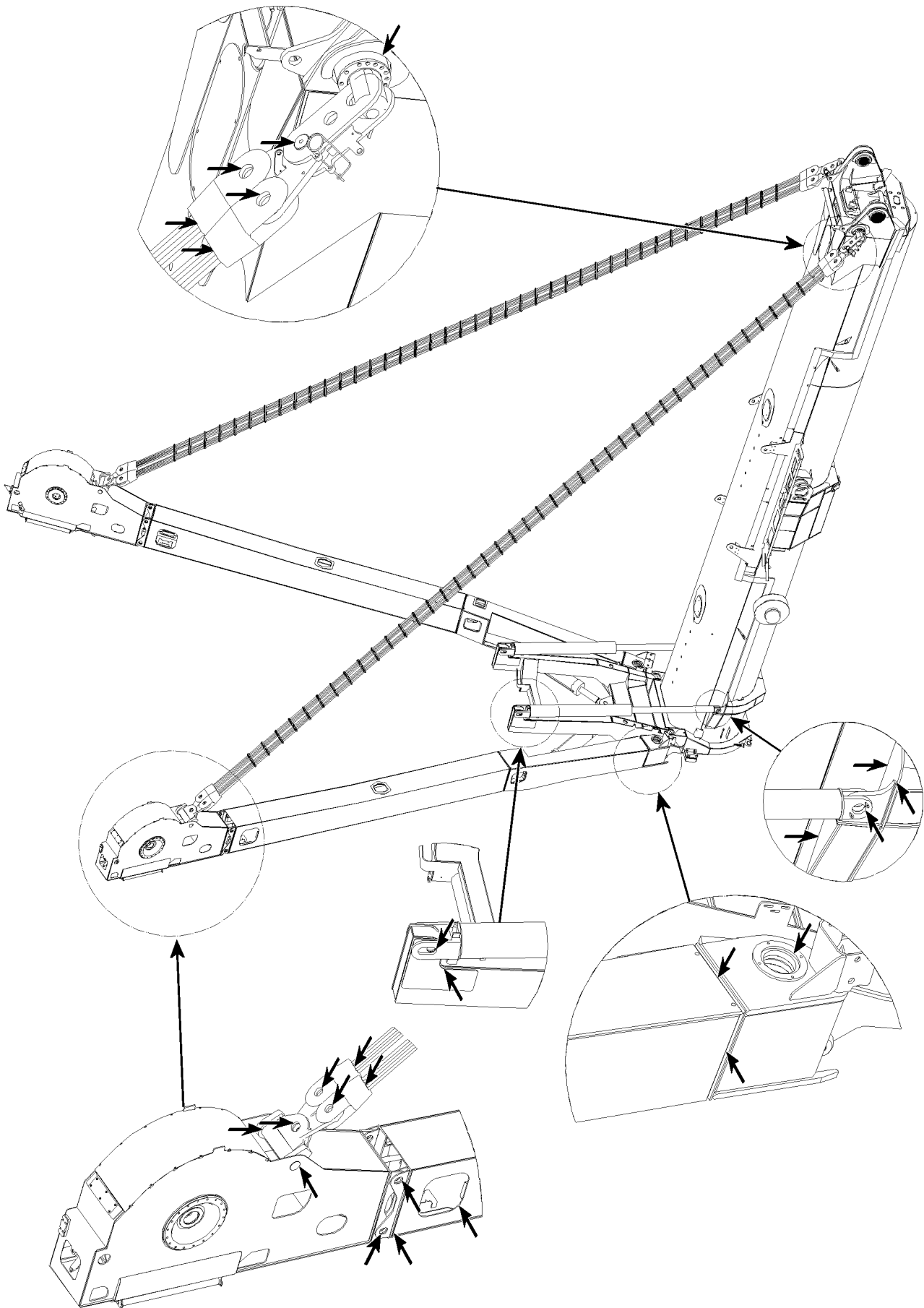
Example for guy rod

B185055



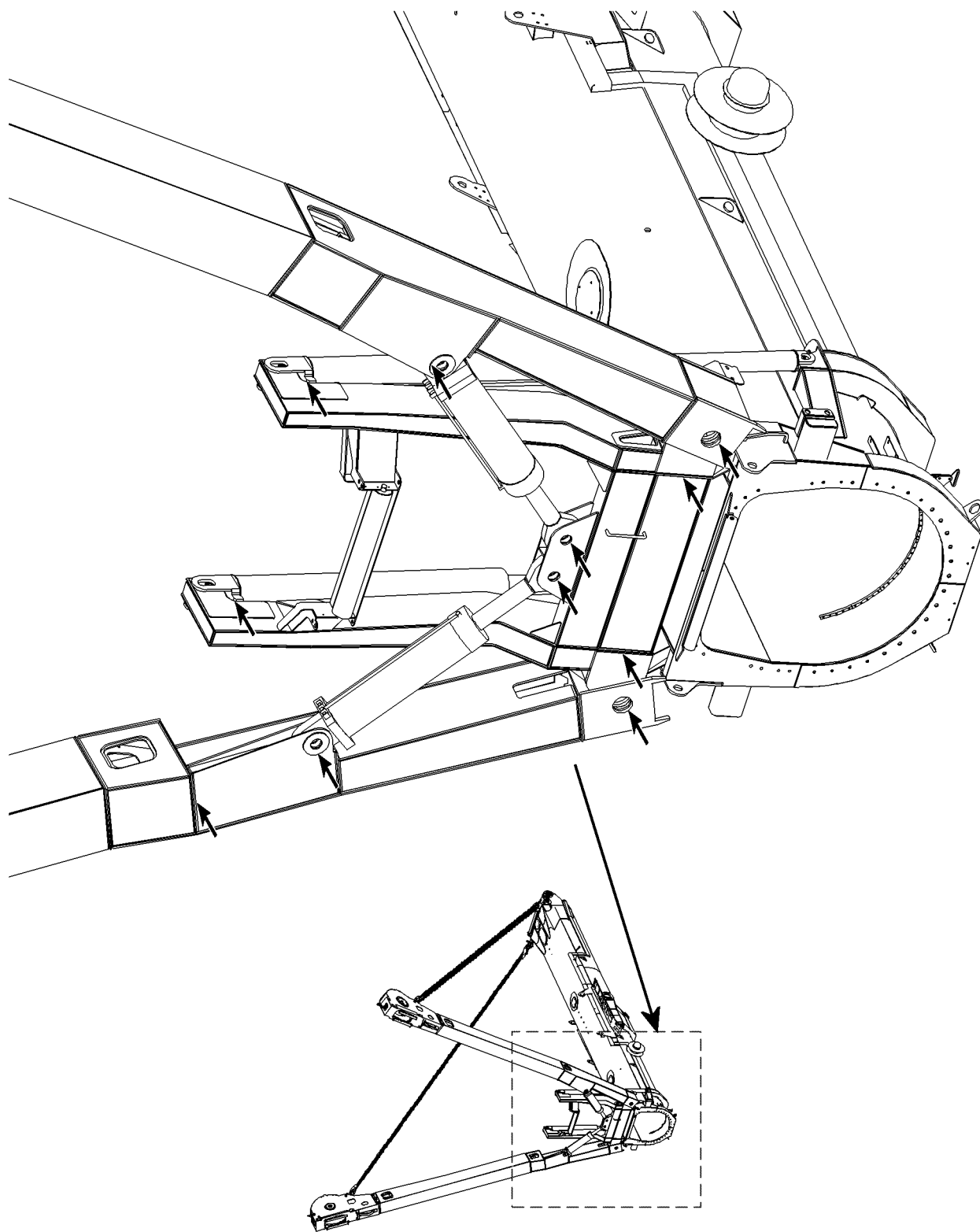
B185059

Example for TA-guying



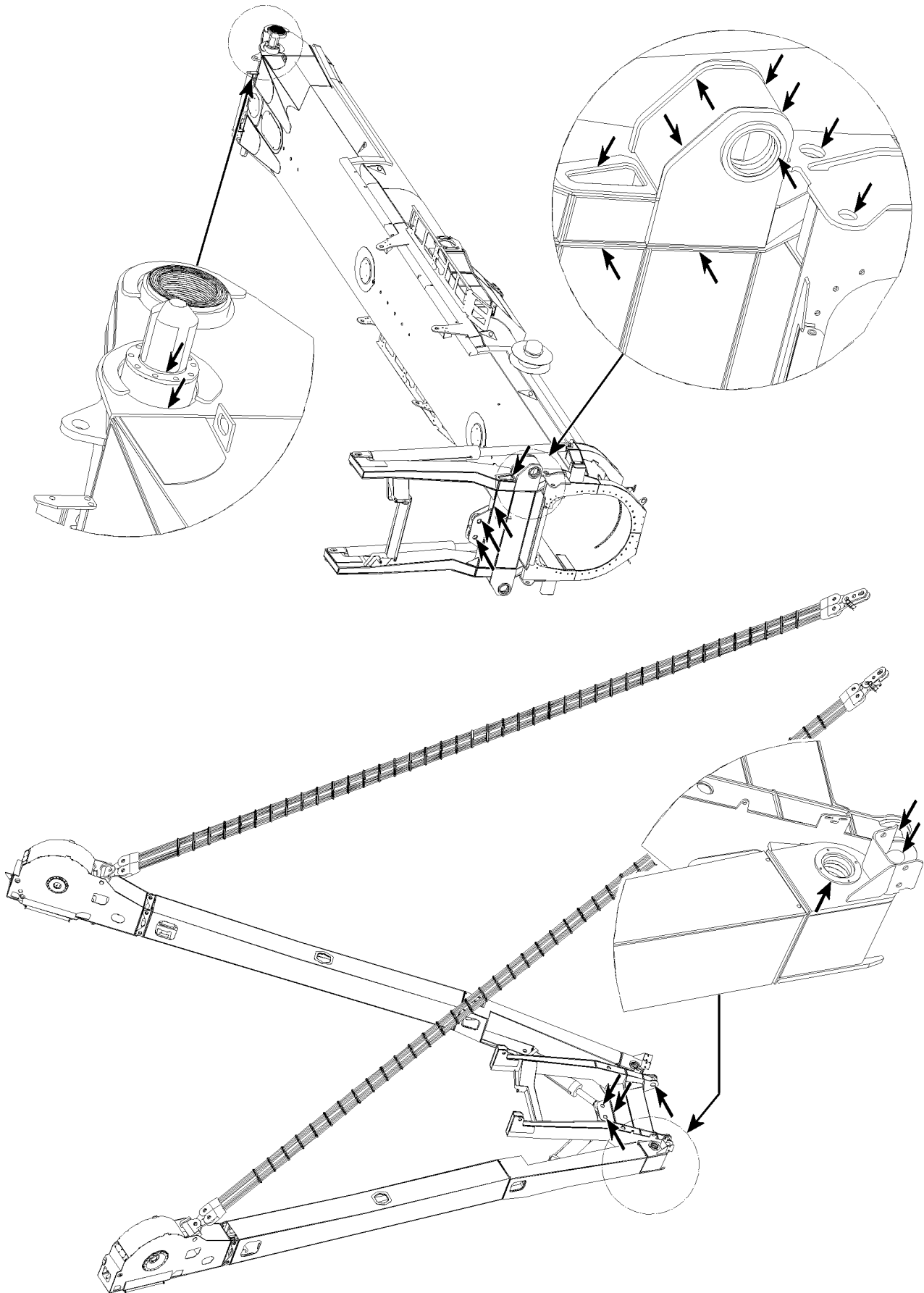
B105707

Example for TY-guying



B105708

Example for TY-guying



B105709

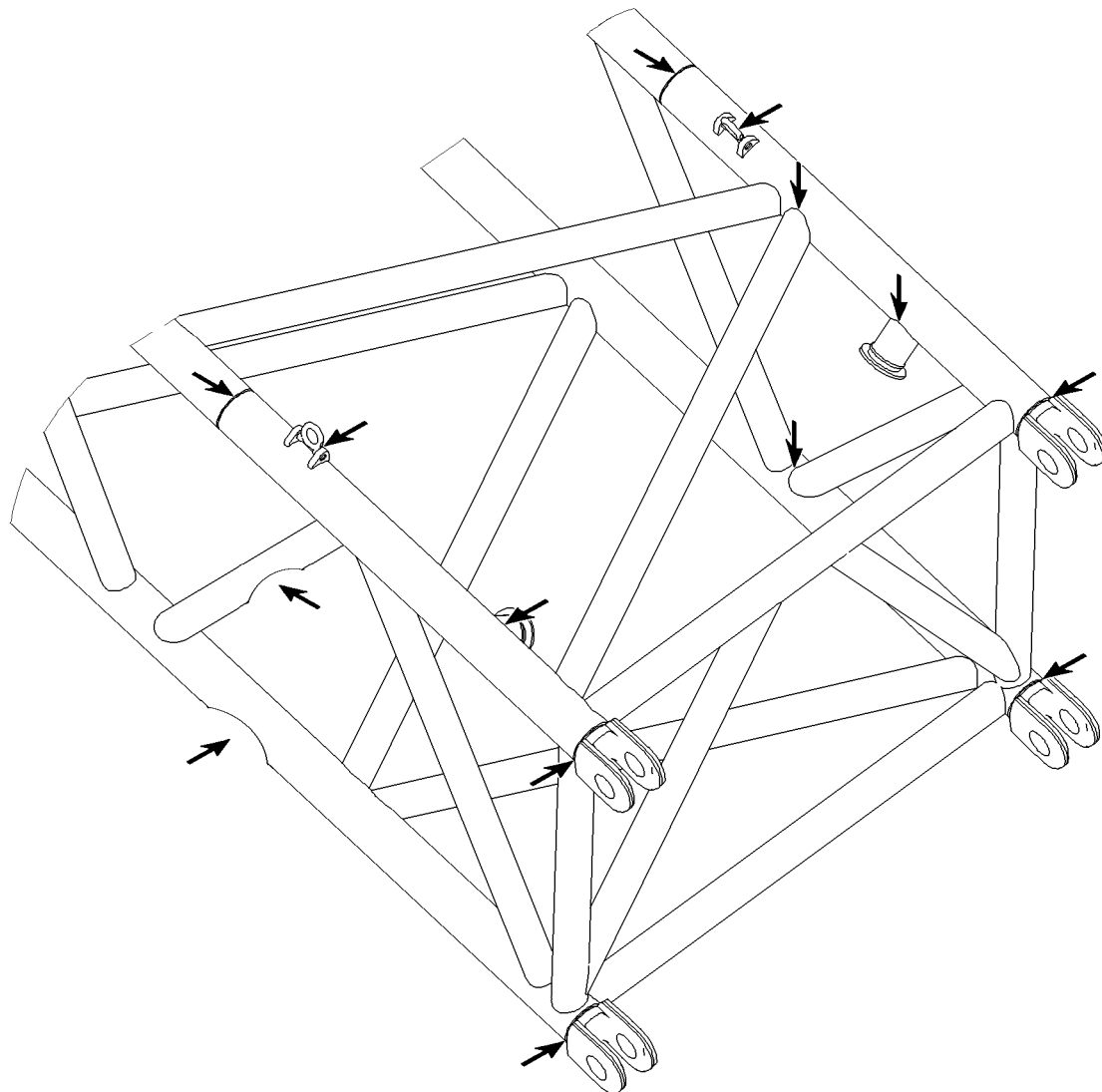
Example for TY-guying

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!



B105688

Example for lattice sections

3 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**.

3.1 Inspections

3.1.1 Inspection intervals

At least once a year, see Crane operating instructions, chapter 7.03.

3.1.2 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.

3.1.3 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.

3.1.4 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!

3.1.5 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.

3.1.6 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!

3.1.7 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".

3.2 Requirements for monitoring the winches

3.2.1 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

3.2.2 Actually used part of the theoretical Service life

The crane operator is obligated to carry out an inspection of the crane at least once a year.

At this time, the actually used part of the theoretical service life must also be calculated. If necessary, the crane operator must contract an authorized inspector.

For the determination of the used part of the theoretical service life, the actual operating conditions (load spectrum) and the hoist gear operating hours for each inspection interval are to be determined. The operator is responsible for the documentation in the crane inspection log.

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

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)

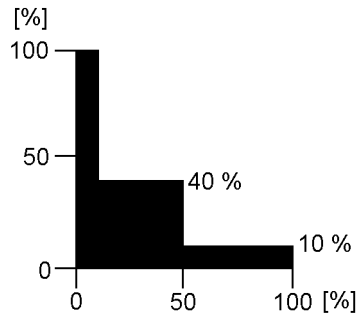
40 % of the time with dead load and 1/3 working load

50 % of the time only with dead load

Factor of load spectrum:

$K_m = 0.125$

Graphic view:



B195234

**Note**

- Load spectrum L1 with load spectrum factor $K_m = 0.125$ is normally applied to cranes used for assembly operations!

Load spectrum class: Medium 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).

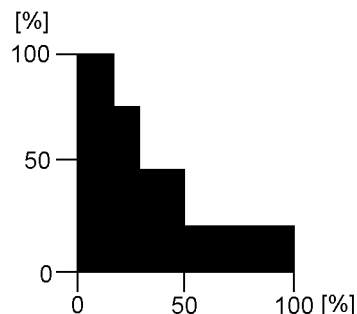
1/6 of the time with dead load and 2/3 working load.

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:

$K_m = 0.25$

Graphic view:

B195235

Load spectrum class: Heavy L3**Definition:**

Power train or parts thereof are frequently subjected to maximum load and normally operate at medium load.

Operating time rates:

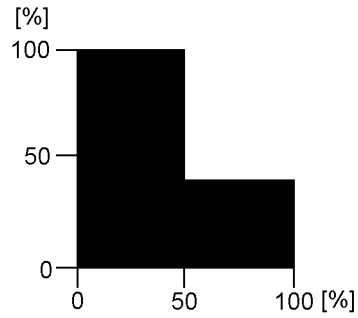
50 % of the time at maximum load (dead load and 1/1 working load)

50 % of the time only with dead load

Factor of load spectrum:

$K_m = 0.5$

Graphic view:



B195236

Load spectrum class: Very heavy L4**Definition:**

Power train or parts thereof are regularly subjected to near maximum loads.

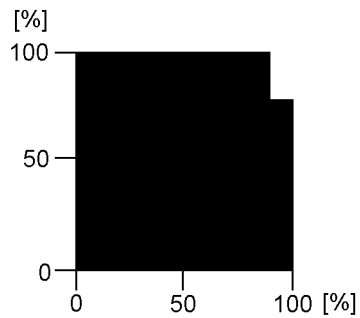
Operating time rates:

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:

$K_m = 1$

Graphic view:

B195237

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.

Determining the used proportion of the theoretical service life

For an inspection interval i (max. 1 year), the actually used proportion S_i of the theoretical Service life is derived from the formula:

$$S_i = \frac{K_{m_i}}{K_m} \times T_i$$

B195230

Abbreviation	Explanation
S_i	Used proportion of the theoretical service life.
K_m	Load spectrum factor that was used to calculate the winch rates. This factor is provided in the Operating instructions.
K_{m_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.

3.2.3 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: $K_m = 0.125$
- Theoretical service life: $D = 3200$ h

Actual usage proportion S of the theoretical service life is calculated using the individual inspection intervals as follows:

First inspection (first year)

The crane was used for assembly work during the past year:

Load spectrum L1, in other words $K_{m1} = 0.125$.

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:

$$S_1 = \frac{0,125}{0,125} \times 160 \text{ h} = 160 \text{ h}$$

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Remaining theoretical service life:

$$D_1 = 3200 \text{ h} - 160 \text{ h} = 3040 \text{ h}$$

The above values are recorded in the crane inspection log.

Second inspection (second year)

The crane was used at a harbor for unloading work:

Load spectrum L3, in other words $K_{m2} = 0.5$.

The superstructure hour meter indicates 2000 h; i.e., during this period: $2000 \text{ h} - 800 \text{ h} = 1200 \text{ h}$ (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:

$$S_2 = \frac{0,5}{0,125} \times 480 \text{ h} = 1920 \text{ h}$$

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Remaining theoretical service life:

$$D_2 = 3040 \text{ h} - 1920 \text{ h} = 1120 \text{ h}$$

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:

$3000 \text{ h} - 2000 \text{ h} = 1000 \text{ h}$ (2000 h were used in the first two years of operation)

The winch was operated about 30 % of the time; i.e. $T_3 = 300 \text{ h}$.

The actual usage proportion S_3 of the theoretical service life at the time of the third inspection is therefore:

$$S_3 = \frac{0,25}{0,125} \times 300 \text{ h} = 600 \text{ h}$$

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Remaining theoretical service life:

$$D_3 = 1120 \text{ h} - 600 \text{ h} = 520 \text{ h}$$

3.2.4 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.

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: Q 1 (L1)
 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)	Date of initial service data of inspection	Operating conditions since last inspection (load collective)	Factor of load collective Km_i	Total crane operating hours	Operating hours of super-structure since last inspection	Operating hours of winch	Operating hours of winch since last inspection T_i	Used part of theoretical service life $D: S_i = \frac{Km_i}{Km} \times T_i$	Remaining theoretical service life $D_i = D_{i-1} - S_i$	Name of inspector	Signature	Remarks	Name of expert	Signature
i			Km_i	[h]	[h]	[h]	[h]	[h]	[h]					
(*) 0	10.06.90	-	-	-	0	-	-	0	3200					
1	05.06.91	L1	0,125	-	800	-	160 (20 % of 800)	160	3040	Müller				
2	20.05.92	L3	0,5	-	2000	-	480 (40 % of 1200)	1920	1120	Huber				
3	18.05.93	L2	0,25	-	3000	-	300 (30 % of 1000)	600	520	Majer				
4														

CAUTION: Perform general overhaul at least once every 10 years. In case of deviation, see guidelines in this chapter.

General overhaul last performed on :

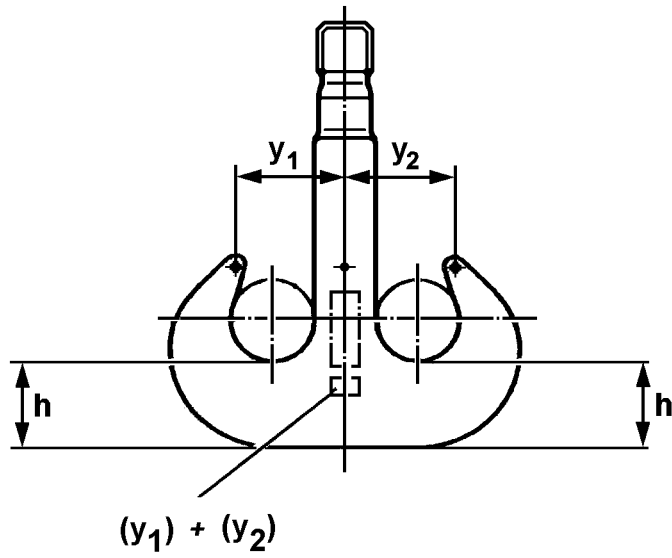
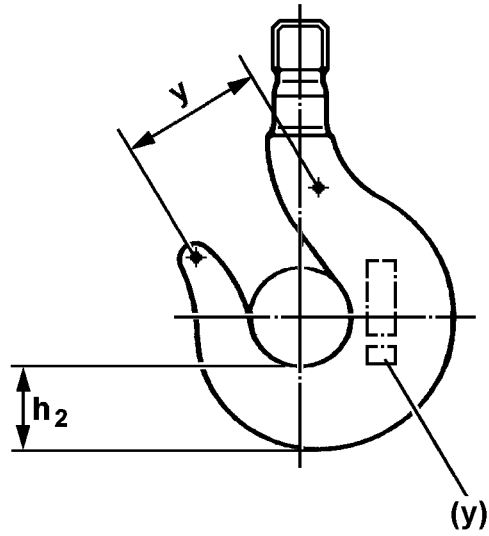
Chart to determine the remaining theoretical service life of winch No.

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: Q.....(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)	Date of initial service data of inspection	Operating conditions since last inspection (load collective)	Factor of load collective	Total operating hours	Operating hours of super-structure since last inspection	Operating hours of super-structure	Operating hours of winch	Operating hours of winch since last inspection T _i	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	
i			Km _i	[h]	[h]	[h]	[h]	[h]	[h]	[h]						
(*)																

CAUTION: Perform general overhaul at least once every 10 years. In case of deviation, see guidelines in this chapter.

General overhaul last performed on :



4 Inspecting the load hooks

Load hooks must be inspected as needed, but at least once a year by an expert.
 The inspection must be carried out by an authorized expert every 4 years.
 The purpose of the inspections is to avoid accidents by detecting deficiencies early on.
 Any defects found must be remedied and documented.
 An inspection must be carried out before operation.

4.1 Inspections and monitoring procedures

4.1.1 Deformation

The initial dimension (y) for single hooks and (y_1) and (y_2) for double hooks is noted on the load hook.
 Hook jaw expansion may not exceed 10 % of the original dimensions (y) or (y_1) and (y_2).
 Measure between the punch marks.



DANGER

Danger of accident due to expansion of hook jaw!

- ▶ Replace the load hook in case of impermissible expansion!
- ▶ Contact the Service department at Liebherr-Werk Ehingen GmbH!

4.1.2 Surface cracks

If distortions were found on the hook jaw, then an inspection must be made for surface cracks according to a suitable procedure or the respective part must be replaced.



DANGER

Danger of accident due to surface cracks on the load hook!

- ▶ Replace the load hook in case of surface cracks and damage!
- ▶ Contact the Service department at Liebherr-Werk Ehingen GmbH!

4.1.3 Wear

The wear on the hook base may be no more than 5 % of the initial nominal dimension (h_2) for single hooks or (h) for double hooks.
 The initial 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
40	—	190

Hook Number	Single hook h_2 [mm]	Double hook h [mm]
50	—	212
63	—	236
80	—	265
100	—	300
125	—	335
160	—	375
200	—	425
250	—	475
320	—	545

Dimensions (h_2) for single hooks and (h) for double hooks



DANGER

Danger of accidents due to hook base wear!

- ▶ Replace the load hook in case of impermissible wear!
- ▶ Contact the Service department at Liebherr-Werk Ehingen GmbH!

4.1.4 Corrosion and wear

Check the load hook thread and hook nut for corrosion and wear.

Wear on the hook nut is impermissible!

If recondition is required to remove corrosion grooves, then carry out an inspection for dimensional accuracy.

To check the threads regarding corrosion and wear, the nut must be unscrewed from the hook shaft.



DANGER

Danger of accidents due to corrosion and wear on the threads!

- ▶ Replace load hooks which are not dimensionally accurate!
- ▶ Replace hook nuts in case of impermissible axial play!
- ▶ Contact the Service department at Liebherr-Werk Ehingen GmbH!

4.1.5 Weldings

Weldings on load hooks, for example to repair wear, are impermissible!



DANGER

Danger of accident due to weldings on the load hook!

- ▶ Replace the load hook in case of impermissible wear!
- ▶ Contact the Service department at Liebherr-Werk Ehingen GmbH!

5 Inspection of the rope feed mechanism in the telescopic boom

5.1 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.

5.2 Checking the change over pulleys of the rope feed mechanism

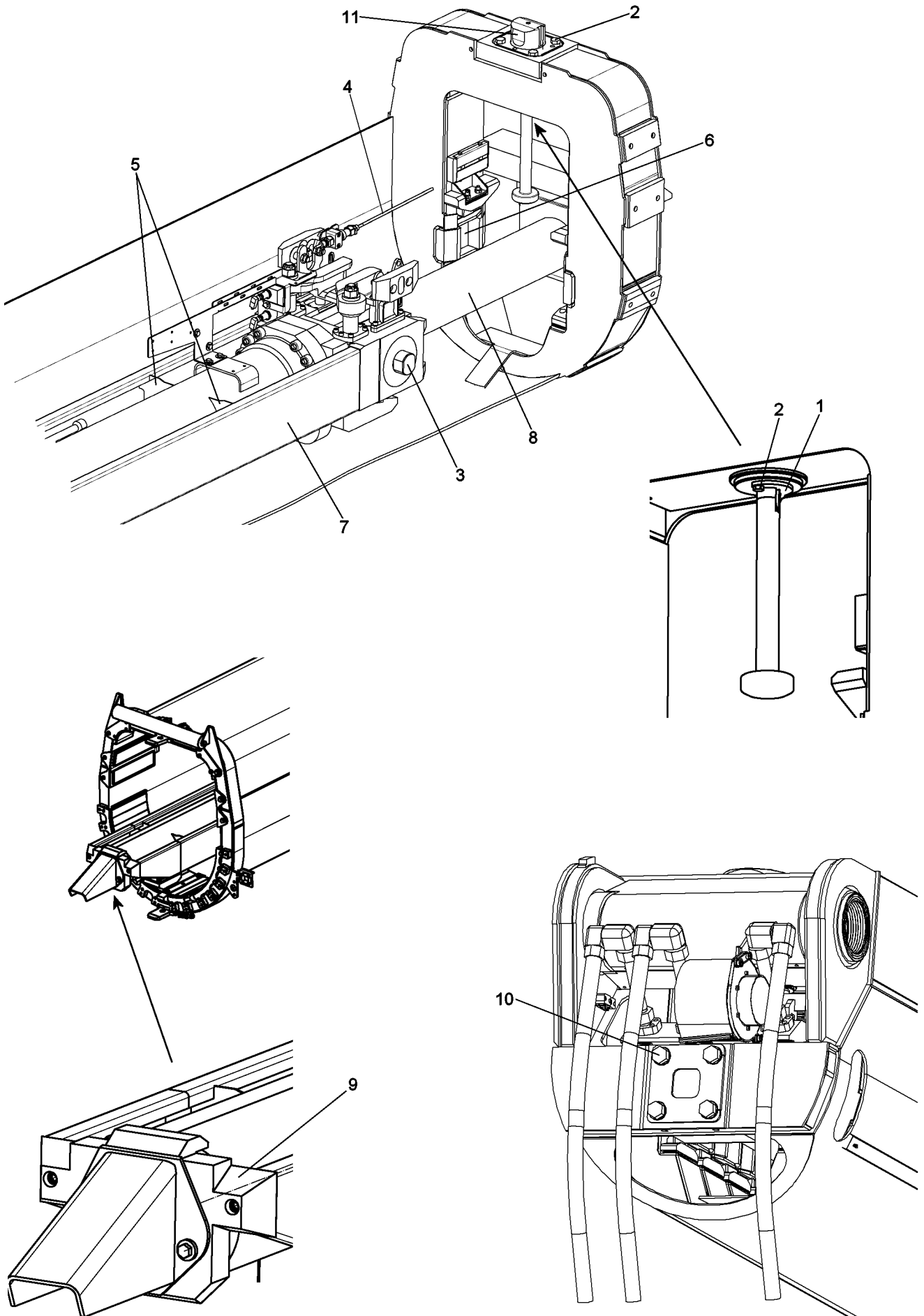


DANGER

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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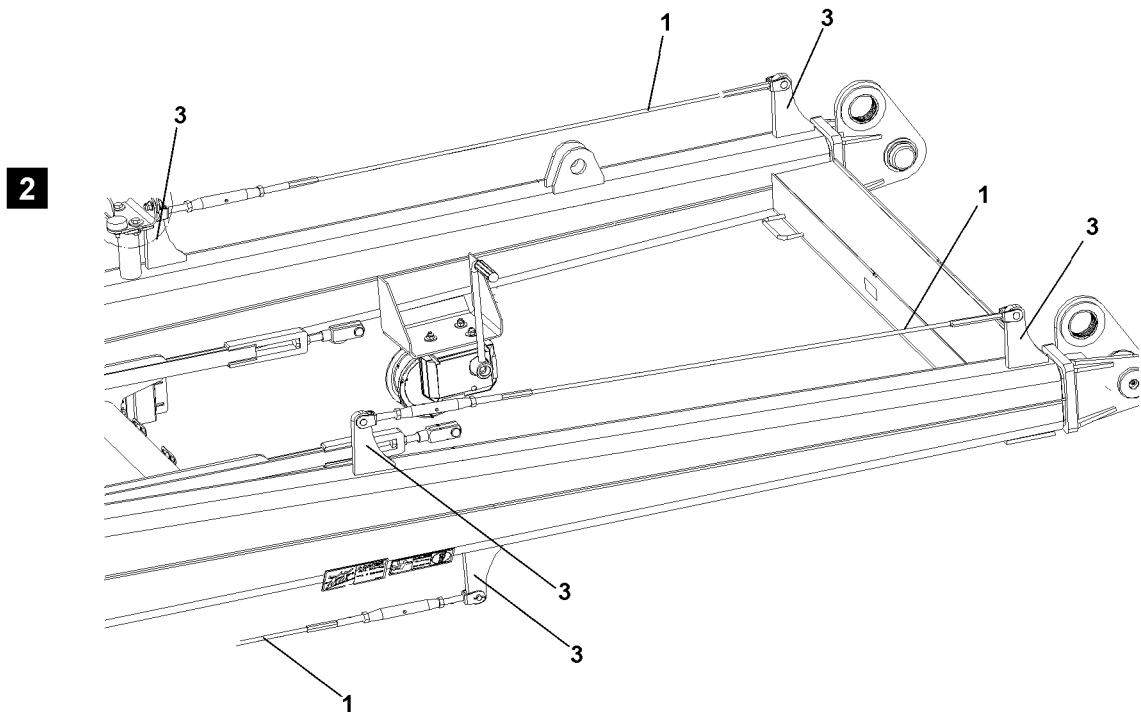
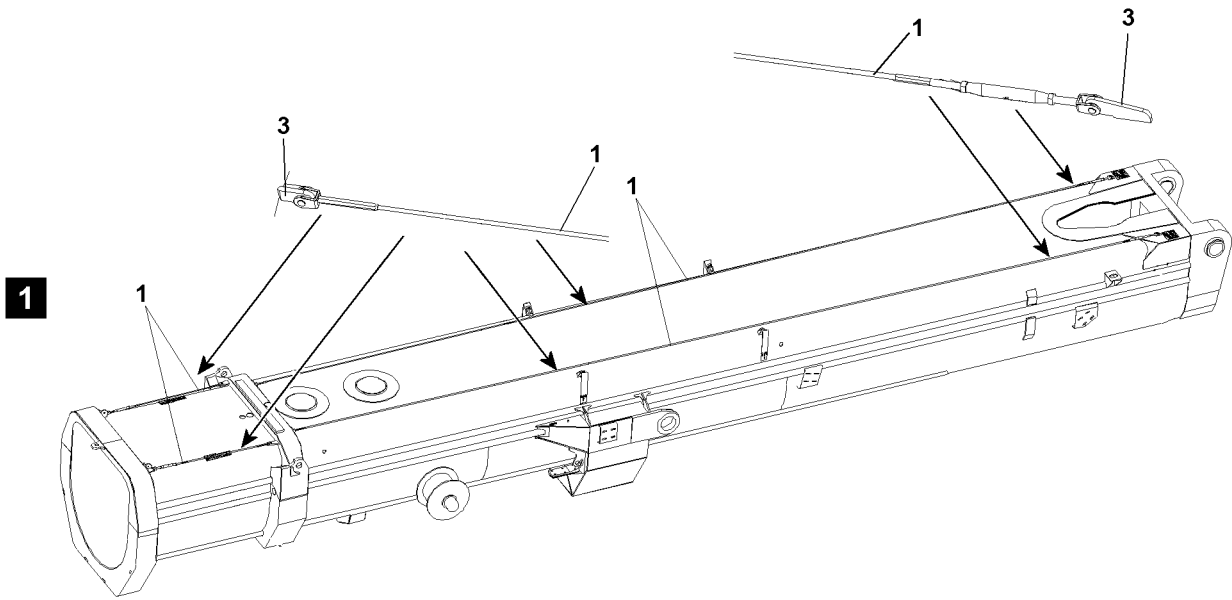
6 Inspection of locking system of telescopic boom

6.1 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.

6.2 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



7 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!**

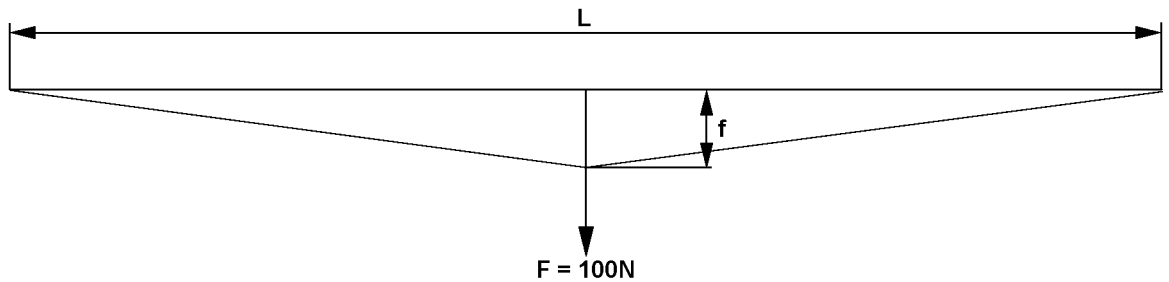


Note

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.

7.1 Check of rope pretension on telescopic booms, illustration 1

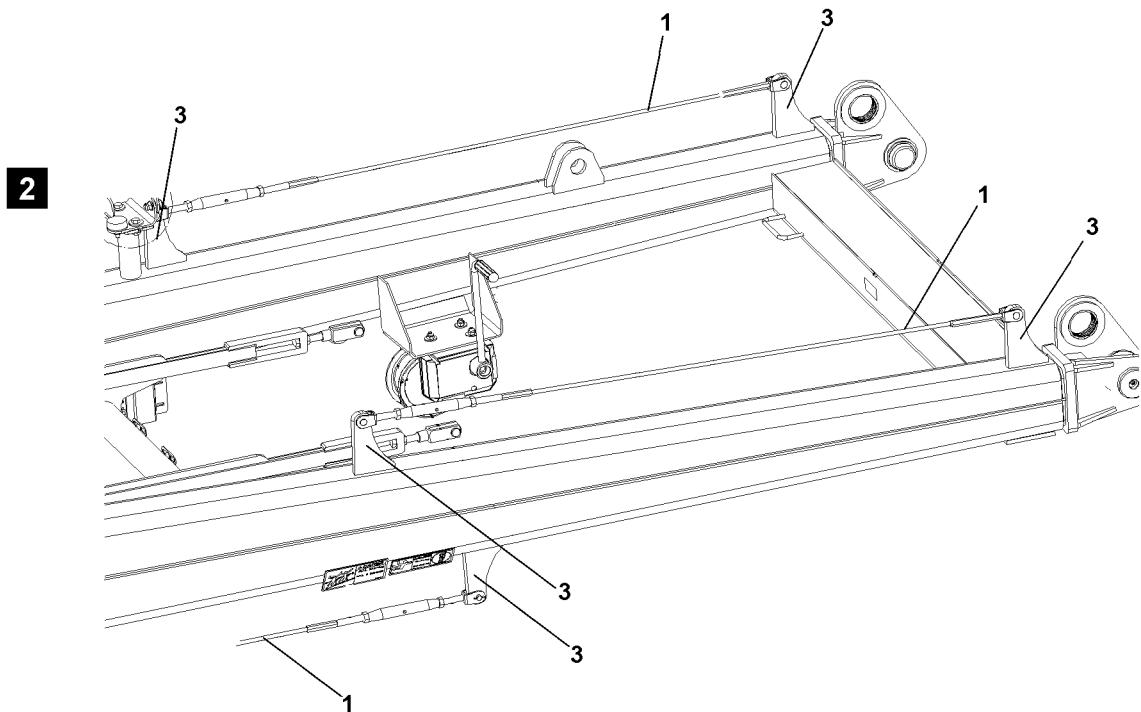
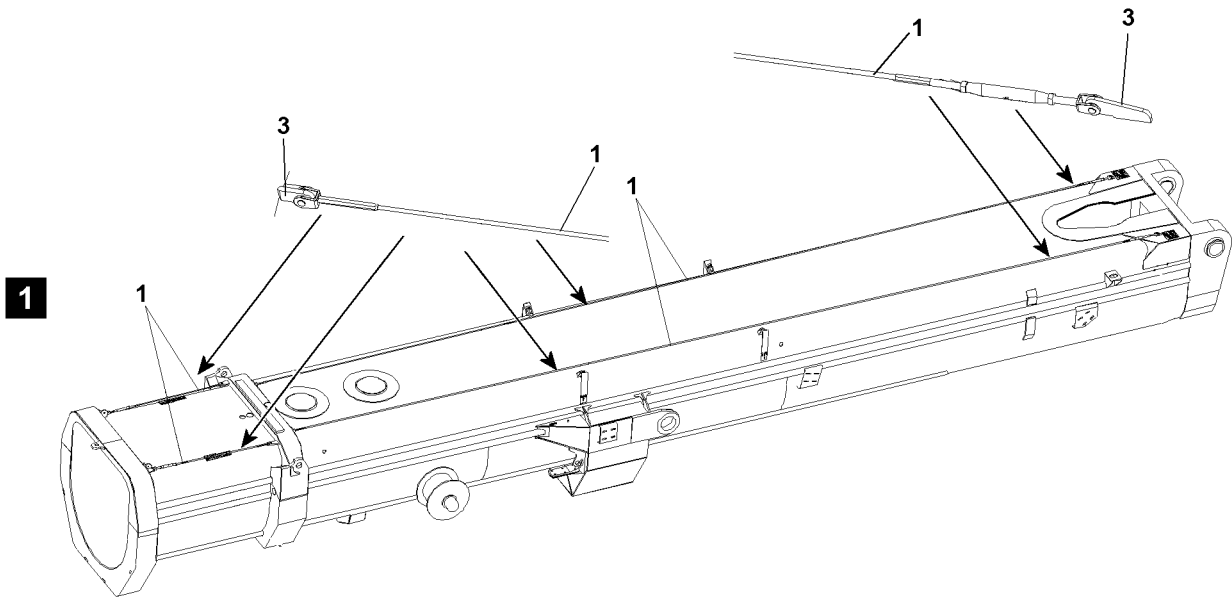


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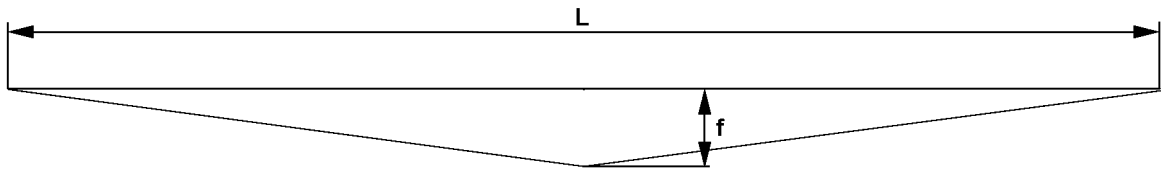
The rope pretension must be 800 N. This can be checked with the aid of a spring balance, which is pulled centered on the safety rope. If the specified deflection (f) depending on the rope length (L) according to the following charts results for the raised load $F = 100\text{ N}$ then the rope pretension 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



7.2 Check of rope pretension on lattice sections, illustration 2



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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

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!

The gas pressure and the oil fill must be checked by authorized and trained expert personnel for pressure tanks.

10 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.

11 Inspection of rope pulleys



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.

Also check for wear in the rope groove. Replace the rope pulley if the bottom of the rope groove has been run down up to 1/4 of the rope diameter.

12 Inspecting the function of the overload protection

Position the longest boom at minimum and maximum radius: Check the load indicator, using the hook block as a test load.

The 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.

13 Inspecting the roller slewing ring connection

For tilt play measurement, see Crane operating instructions, chapter 7.05

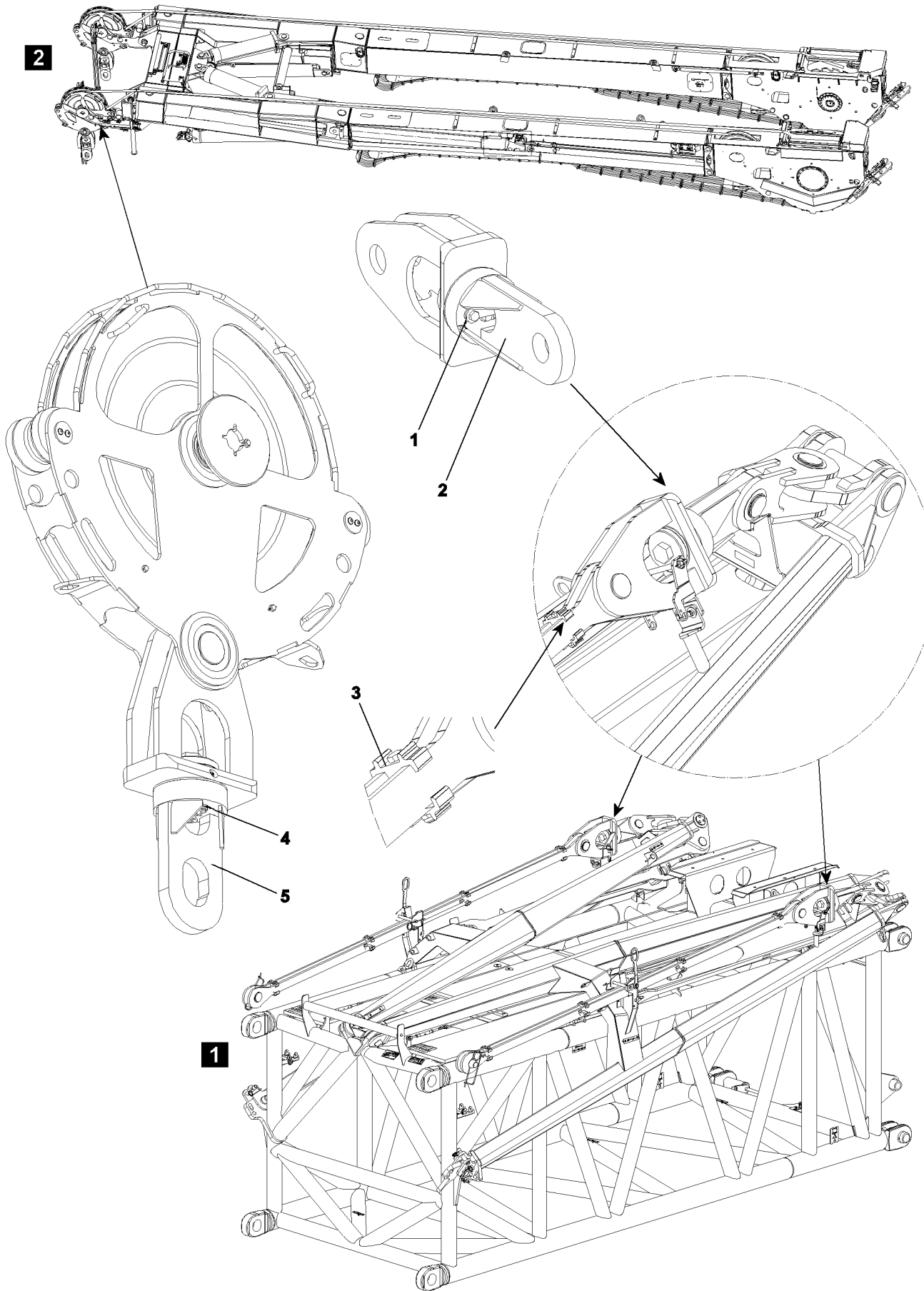
14 Inspection of the mounting of the load bearing equipment

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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15 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.

16 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.

17 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!

18 Inspection of the auxiliary reeving winch, recovery winch and spare gear winch

Determine the service life of the auxiliary reeving winch, the recovery and spare gear winches from their respective original manufacturer.

19 Appendix

The following is a checklist to assist the inspector during the periodic inspections of Liebherr mobile and crawler cranes.

19.1 Inspection recommendations for periodic inspections of Liebherr mobile and crawler cranes

Company:	Inspector:
Crane manufacturer: LIEBHERR	Crane type:
Serial number:	Stock number:
Construction year:	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						

3. Inspection category: Travel gear¹						
Component to be inspected	A	B	C	D	E	Comments
Tires						
Bearings						
Transmission						
Universal drive shaft						
Leaf springs / springs						
Shock absorbers						
Steering						
Brakes						
Hydraulic axle suspension						

4. Inspection category: Chassis¹						
Component to be inspected	A	B	C	D	E	Comments
Coverings						
Treads						
Counterweight holders ²						
Towing devices						
Accesses, ladders						
Retainer for hook block ²						
Boom support ²						

5. Inspection category: Chassis - driver's cab¹						
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						

5. Inspection category: Chassis - driver's cab¹						
Component to be inspected	A	B	C	D	E	Comments
Spare bulbs						
Hazard warning triangle						
Safety vest						

6. Inspection category: Chassis - drive¹						
Component to be inspected	A	B	C	D	E	Comments
Combustion engine						
Exhaust system						
Fuel tank						
Filters						
Sound absorber						
Engine mount						
Oil levels						
Fuel lines						

7. Inspection category: Chassis - hydraulics¹						
Component to be inspected	A	B	C	D	E	Comments
Oil container						
Filters						
Pumps						
Motors						
Valves						
Lines						
Hoses						
Cylinder						
Pressure limiting valves						

8. Inspection category: Chassis - pressurized air system¹						
Component to be inspected	A	B	C	D	E	Comments
Compressor						
Filters						
Air tanks						
Valves						

8. Inspection category: Chassis - pressurized air system¹						
Component to be inspected	A	B	C	D	E	Comments
Lines						
Hoses						
Cylinder						

9. Inspection category: Chassis - electrical system¹						
Component to be inspected	A	B	C	D	E	Comments
Motors						
Generators						
Battery						
Switch						
Lines						
Fuses						
Resistors						
Lighting						
Brake lights						
Indicator lights						
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 devices¹						
Component to be inspected	A	B	C	D	E	Comments
Engine regulation						
Transmission						
Couplings						
Circuits						
Brakes						
Steering						
Indicator displays						
Engine shut off line						

10. Inspection category: Chassis - control devices¹						
Component to be inspected	A	B	C	D	E	Comments
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						
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						
Filters						
Sound absorber						
Engine mount						
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						
Switch						
Lines						
Fuses						
Resistors						
Lighting						

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						
Monitoring indicators						

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						
Rope pulleys						
Rope end connection						
Rope for winch 1						
Rope for winch 2						
Rope for winch 3						
Rope for winch 4						
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						

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						
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 criteria:

- A = present / complete
- B = condition / maintenance
- C = function
- D = repair / replace
- E = reinspection 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.

1 Introduction



DANGER

Danger of fatal injury due to defective crane ropes!

► Please observe the following criteria.

The rope should be considered to be a wear part, which must be replaced if the inspection shows that its strength has reduced to such an extent that continued use may be dangerous.

Regular inspection of the rope is required in order to safely carry loads with correctly deployed equipment, meaning that the rope must be taken out of service at an appropriate point in time.

The take-down criteria with regard to wire breaks, wear, corrosion and deformation can be applied immediately under all application conditions. The different factors are dealt with in ISO 4309, which is intended to serve as a guideline to competent experts who are involved in the maintenance and inspection of cranes.

We recommend to carry out an annual inspection by an **expert** according to the following standard (ISO 4309).

The ropes should be inspected every 4 years by an **authorized inspector**.

The scope of the inspection and the inspection results must be traceably documented, see addendum 2. This documentation must be retained as part of the crane records!

The criteria that are covered here are intended to provide an appropriate safety margin for movement of loads with cranes until the rope is taken down.

2 Wire rope

2.1 Condition before installing

The rope is usually replaced with a rope that is of the same type as the original. If the spare part is of another type, the user must ensure that the rope characteristics are at least as good as those of the rope that was taken down.

Before installing a new wire rope, the grooves of the rope drums and pulleys must be checked in order to ensure that the spare ropes is placed correctly in the rope grooves (see section entitled "Inspection").

2.2 Installation

When the rope is removed from the spool or unwound from a reel, it must be ensured that the rope is not twisted, otherwise loops, reverse bends or kinks could originate in the rope.

If the rope is looped over any part of the system when it is not under strain, these areas must be protected accordingly.

Before starting to use the rope on the system, the user must ensure that all components that are functionally associated with the wire rope in connection with the standing components have been set up in such a way that they will operate correctly.

To stabilize the wire rope, a few lifting procedures should be carried out at approximately 10 % of the normal load.

2.3 Maintenance

The maintenance of the wire ropes depends on the type of lifting device, its application, the environment as well as the type of rope that is used. If no other instructions from the crane or rope manufacturer are provided, the wire rope should be cleaned, if possible, and lubricated with grease or oil, particularly in areas in which the rope is subjected to bending when it runs over pulleys.

The kind of grease that is used must be suitable for steel ropes.

Lack of maintenance will reduce the service life of the rope, particularly if the crane is used in a corrosive environment and if re-lubricating is not possible because of the nature of the respective crane application.

2.4 Inspection according to ISO 4309

2.4.1 Frequency

Daily inspection

If possible, all visible parts of the ropes must be checked for general wear and distortion every working day. Special attention must be paid to the rope end connections. Any suspected changes in the condition of the rope must be reported and the rope must be inspected by a trained expert inspector in accordance with the section "Points to check on the rope".

If the lower rope layers on the drum are used infrequently or not at all, periodically unwind and rewind the entire drum under pretension. A rope is most cost-effective if it is used over its entire length. For that reason, it is recommended to use an appropriate rope length when operating the crane over longer periods.



Note

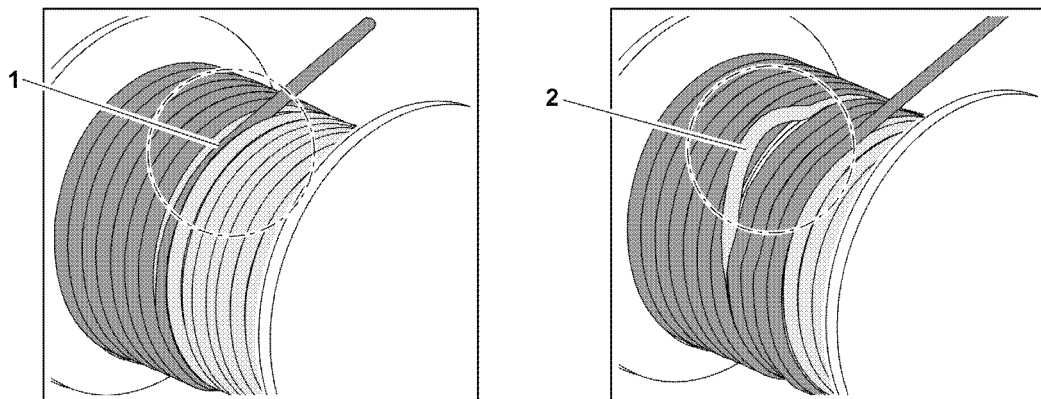
- ▶ If a rope is newly placed, then it must be pretensioned and placed with a pretension of at least 10 % of the maximum rope pull.

Special inspection as described in section "Points to check on the rope"

The rope must be checked after any events that may have led to damage to the rope and / or the rope ends and whenever the rope is taken back into service after being taken down and then re-installed.

2.4.2 Checking the spooling behavior of the rope on the cable drum

To avoid spooling errors and associated rope damage, it is necessary to check the spooling behavior daily. If spooling errors are determined, the rope must be reeled off until there are only 3 rope coils on the winch. Thereafter, the rope is to be tensioned with a pretension of at least 10 % of the maximal rope pull and then placed again.



B103456

Possible spooling errors:

- Cutting into the lower rope layers 1
- Loop formation in the lower rope layers 2

2.4.3 Points to check on the rope

General

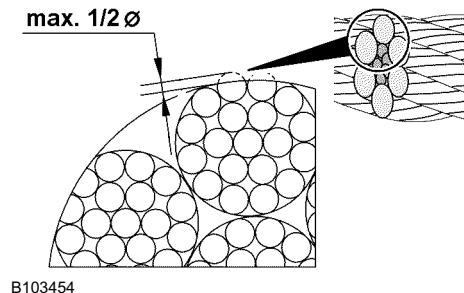
Although the entire length of the rope must be checked, particular attention must be paid to checking the following areas:

- At the rope end points on both sides, for movable as well as fixed ropes.
- The part of the rope that runs through the block or over rope pulleys; particular attention must be paid to parts of the rope that are on rope pulleys when under load (see appendix 1) in systems that carry out repeated movements.
- Parts of the rope that run over a compensation pulley.
- All parts of the rope that can be subjected to wear caused by external elements (e.g. protruding hatch surrounds).
- All parts of the rope that are subjected to the effects of heat.
- On the contact positions of the ropes when spooling up.
- Check the inside of the rope for corrosion and material fatigue.

The results of the inspection must be entered in the inspection log for the system (for typical example see section entitled "Rope inspection log" and appendix 2).

Checking the rope in the uphill pitch zones of the rope coil for flat sections

In the cross area of the coiled up rope layers, the rope is under more strain and can therefore be flattened. To void flat sections, the rope can be shortened on the rope drum fixed point.



If the wires in the outer braids are flattened to no more than maximum half the wire diameter:

- Shorten the rope by a length of 1/3 of the rope drum circumference and reset.



DANGER

Rope breakage!

If the following measures are not observed, the rope can break, the load can fall down and fatally injure personnel!

- ▶ Take the rope down when the take down criteria is reached, as described in section "Take down criteria"!
- ▶ Take the rope down when the wires in the outer braids are flattened by more than half the wire diameter!

Rope suspension and connection systems - except loops

The rope must be examined at the exits of the rope suspension and connection system, since this area is particularly susceptible to initial signs of material fatigue (wire breaks) and corrosion. The rope suspension and connection systems must also be examined for signs of deformation or wear.

Rope suspension and connection systems with pressure sleeves must undergo the same checking, and the sleeve must be checked for cracks in the sleeve material and possible slippage of the rope in the sleeve.

Detachable rope suspension systems (cotters, rope clamps) must be checked for wire breaks inside and beneath the mount or fastening; it must also be examined whether the cotters and screwed-on rope clamps are firmly connected to the rope. This check should also ensure that the requirements of the rope suspension and connection systems standards and procedural guidelines are complied with.

2.5 Take-down criteria

The safe use of the rope is assessed in accordance with the following criteria:

- 1.) Number of wire breaks
- 2.) Broken wire nests
- 3.) Wire break increase rate
- 4.) Strand breaks
- 5.) Rope diameter reduction, including the reduction caused by damage to the rope core
- 6.) External and internal wear
- 7.) External and internal corrosion
- 8.) Deformation
- 9.) Damage caused by the effects of heat or arc welders

These individual factors must be taken into consideration in accordance with the relevant criteria during all examinations. However, rope quality deterioration frequently results from a combination of the individual factors, meaning that a worsening effect occurs that must be detected by an expert and that influences the decision as to whether the rope has reached its rope removal limit and whether it can continued to be used.

The inspector must investigate if the deterioration has been caused by a fault in the system; if this is the case remedial action should be recommended before placing a new rope.

2.5.1 Number of wire breaks

The number of wire breaks must be determined by visually inspecting the entire length of the rope. When a wire break is found, sections that are $30 \times d$ (d = nominal rope diameter) in length are marked at both sides of this point. These sections must be examined extremely carefully. All wire breaks are now carefully counted in each section. Please compare the number of visible wire breaks with appendix 4. If the number of visible wire breaks is less than the number specified in the chart, then the area in which the most broken wires are found is marked over a length of $6 \times d$. Count the number of visible wire breaks again and compare the result with appendix 4. If the number of visible wire breaks is less than the number specified in the chart, then the rope does not have to be taken down yet.



Note

Defining the interval until the next inspection

- ▶ The interval until the next inspection is set depending on the number of visible wire breaks.

2.5.2 Broken wire nests

If the wire breaks are extremely close together and form wire nests, the rope must be taken down. If the frequency of such wire breaks occurs over a rope length of less than $6d$ or is concentrated on one strand, taking the rope down is recommended, even if the number of wire breaks is less than the maximum number specified in the tables.

2.5.3 Wire break increase rate

For applications in which the main reason for damage to the rope is material fatigue, the first wire breaks will not occur until a certain time has elapsed, but the number of wire breaks will increase rapidly at ever-decreasing intervals.

Careful checking and logging of the increased number of wire breaks over time is recommended in these cases.

2.5.4 Strand breaks

If an entire strand breaks, the rope must be taken down.

2.5.5 Reduction in rope diameter caused by damage to core rope

The rope diameter can be reduced as a result to damage to the core because of:

- 1.) Internal wear and notching
- 2.) Internal wear due to friction between individual strands and wires in the rope, particularly if it is subjected to bending
- 3.) Steel core breakage
- 4.) Break in internal layers of multi-strand ropes

If the rope diameter (average of two diameter measurements) is reduced by 3 % of the nominal diameter (rotation resistant ropes) or 10 % of the nominal diameter of other ropes due to these factors, the ropes must be taken down, even if no wire breaks are visible.



Note

Diameter of new ropes

- ▶ New ropes can have an actual diameter that is greater than the nominal diameter, meaning that proportionally greater wear is possible.

2.5.6 External wear

Abrasion of outer wires of outer rope strands as a result of rubbing contact under pressure with the grooves in the rope reels and drums. This condition is particularly evident in moving ropes in the areas in which they come into contact with rope pulleys when the load is being moved and braked, and manifest themselves as flattened surfaces on the outer wires. Abrasion is exacerbated by a lack of or incorrect lubrication as well as the effects of dust.

Wear reduces the breaking strain of steel ropes because the cross section of the steel is reduced. The rope must be taken down if the actual rope diameter has reduced by 7 % or more because of outer wear, even if no wire breaks are visible.

2.5.7 External and internal corrosion

Corrosion is a particular problem in maritime climates and atmospheres that are polluted by industrial emissions, reducing breaking strain and accelerating material fatigue because of the reduction in the rope material cross section, leading to irregular surfaces which are the starting point for stress cracks. Extreme corrosion can reduce the elasticity of the rope.

- 1.) External corrosion
Corrosion of the outer rope wires can be determined by visual inspection.
- 2.) Internal corrosion
This condition is more difficult to detect than external corrosion.



Note

Internal corrosion

- ▶ If there are any signs of internal corrosion the rope must be checked by a competent expert.



DANGER

Occurrence of internal corrosion!

- ▶ If the suspicion of extreme internal corrosion is confirmed, the rope must be taken down immediately.

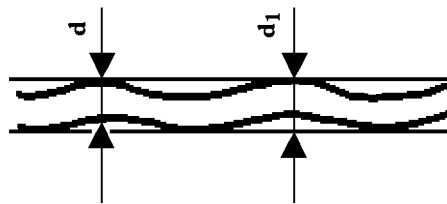
2.5.8 Rope deformations

A visible change to the rope structure is referred to as “rope deformation” and can cause a change at the deformation point that results in irregular rope tension.

A distinction is made between the following important types of cable deformation on the basis of the cable appearance (see following sections):

- 1.) Corkscrew-like deformation
- 2.) Basket formation
- 3.) Strands protruding from the rope
- 4.) Wire loop formation
- 5.) Flattening
- 6.) Reverse bends or knots
- 7.) Kinks

Corkscrew-like deformation (see appendix 3, table 1)



B195723

Corkscrew-like deformation

If there is any corkscrew-like deformation the rope must be taken down if the following condition is met:

$$d_1 > \frac{4d}{3}$$

B195722

d = nominal diameter of rope

d₁ = rope sheath diameter of the distorted rope

Basket formation (see appendix 3, table 2)

If there are kinks in the rope, it must be replaced immediately.

Strands protruding from the rope (see appendix 3, table 3)

The rope must be replaced immediately if this kind of deformation occurs.

Wire loop formation (see appendix 3, tables 4 and 5)

In this case, certain wires or groups of wires protrude from the rope at the side facing the rope pulley in the form of loops - this is normally the result of sudden strain. If serious deformation occurs, the rope must be taken down.

Flattening (see appendix 3, tables 8 and 9)

Flattening is the result of mechanical damage; if it is pronounced the rope must be replaced.

Reverse bends or knots (see appendix 3, tables 6 and 7)

If the rope has any reverse loops or knots it must be taken down immediately.

Kinks (see appendix 3, table 10)

Kinks are angled deformations in the rope caused by external influences. If there are kinks in the rope, it must be replaced immediately.

2.5.9 Damage caused by the effects of heat or arc welders

Steel ropes that have been subjected to extremely high temperatures, which can be detected externally because of the coloring that it causes, must be taken down.

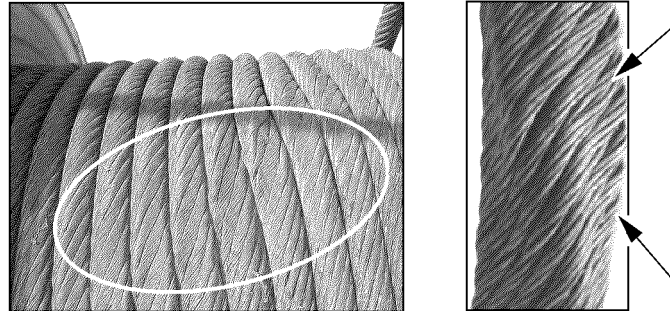
2.5.10 Distortion on non-rotation resistance control ropes



Note

- The erection and control procedure must be carried out with a pretension of at least 10 % of the maximum rope pull.

For crane types with control winches for the boom control, especially the first rope layer of the control winch must be checked for rope dents and / or rope distortions.



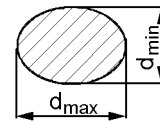
B114002

Distortions on control ropes

- At a distortion of more than 5 %, the control rope must be checked before every assembly and erection procedure and the distortion must be documented. Example for inspection protocol: See Addendum 2.
- At a distortion of more than 10 %, the control rope must be taken down.

Calculation formula for rope distortion

$$[V] \% = \frac{(d_{\max} - d_{\min})}{d} \times 100$$



B114001

[V] % = rope distortion in %
 d = control rope nominal diameter
 d_{max} = largest diameter of distortion area
 d_{min} = smallest diameter of distortion area

3 Operating behavior of steel ropes

Exact logging of information by the checker can be useful for predicting the behaviour of a certain type of steel rope on a crane. This information is useful for planning and adapting maintenance instructions and controlling the stocking of spare ropes. The use of such a prediction system should not cause the examinations to be less strict or the rope usage time to be extended beyond the criteria that are specified in the previous sections of this guideline for monitoring and taking down of crane ropes.

4 Condition of equipment that is functionally associated with the rope



Note

Groove radius

- ▶ The radius must not be smaller than the actual diameter of the rope.

Rope drums and pulleys must be checked at regular intervals in order to ensure that all these components rotate correctly in their bearings. Stiff or blocked rope pulleys wear rapidly and unevenly and cause serious rope abrasion. Ineffective compensation pulleys can lead to irregular rope tension. The radius at the bottom of the rope grooves of all rope pulleys and the drum must be suitable for the nominal diameter of the rope. If the radius has become too big or too small the rope groove must be reworked or the rope pulley replaced.

5 Rope inspection log

The user must provide a log for each of the regular inspections in which all rope inspection information is recorded. Typical example of a log - see appendix 2.

6 Rope storage and marking

Clean, dry rope storage facilities must be provided in order to prevent damage to ropes that are not in use; it must also be ensured that the ropes can be clearly and unambiguously assigned to their checking logs.

7 Wire ropes and rope end connections



DANGER

Risk 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 selected in accordance with their usage. It must be determined whether a rotation-resistant or non-rotation free rope is required. The type of rope that is selected then determines the type of rope end connections that are used.

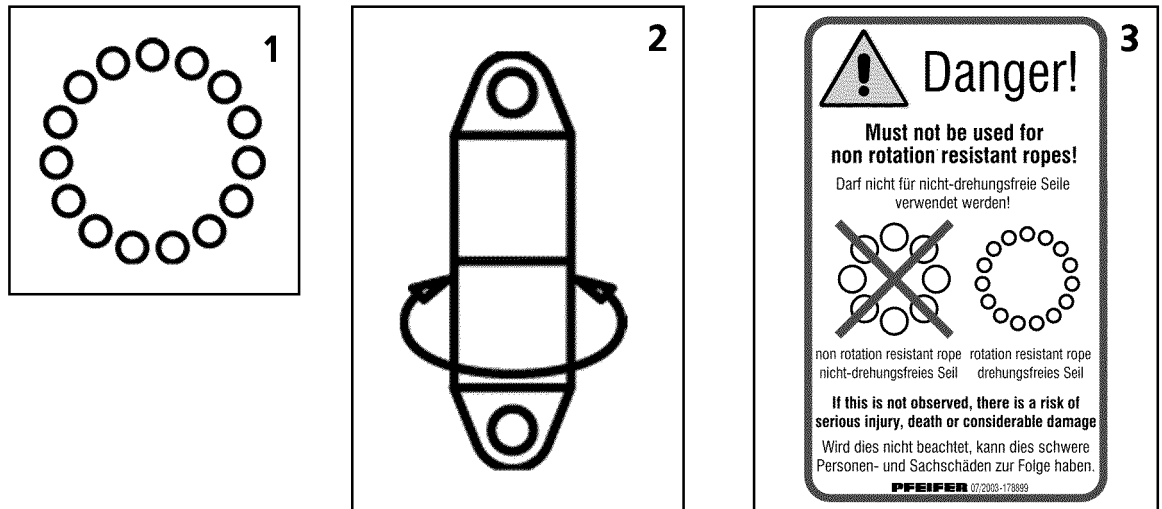
7.1 Rotation-resistant ropes and their rope end connections

Rotation-resistant ropes are special ropes that produce extremely little torque and twisting at the rope end connection when they are under strain.



Note

- ▶ Rotation-resistant ropes are used as **hoist ropes**.



B195653

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:

- Rope end connection **rotating** in the form of a PFEIFER link **with** swivel or spin stabiliser / swivel.
- Rope end connection **non-rotating** in the form of a PFEIFER link **without** swivel or gib and cotter.

If possible, preference should be given to the use of a twisting rope end connection to reduce torsional stress with **rotation-resistant ropes** (see table 2).

**DANGER**

Danger of severe injuries to personnel and property damage!

- ▶ **Never** use rotating rope end connections with non-rotation free ropes!

**Note**

Usage warning notes

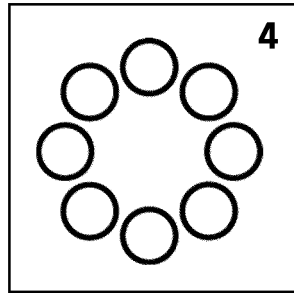
- ▶ The usage warning notes on the rotating PFEIFER link with pulley indicates that this rope end connection may **not** be used for non-rotation free ropes (see table 3)!

7.2 Non-rotation free ropes and their rope end connections

Non-rotation free ropes generate high torque levels at the rope end connection when they are under load. 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**

- ▶ Non-rotation free ropes are used as **guy ropes** or **control ropes**.



B195654

Typical non-rotation free wire rope structures are ropes with 8 to 10 outer strands. Twisting ropes are symbolically depicted with 8 outer strands (circles) (see table 4).

Non-rotation free ropes can only be used with the following rope end connections:

- Rope end connection **non-rotating** in the form of a PFEIFER link **without** swivel or gib and cotter.
A non-rotating rope end connection is also the mount of the rope on the fixed point of the winch drum.

**DANGER**

Danger of severe injuries to personnel and property damage!

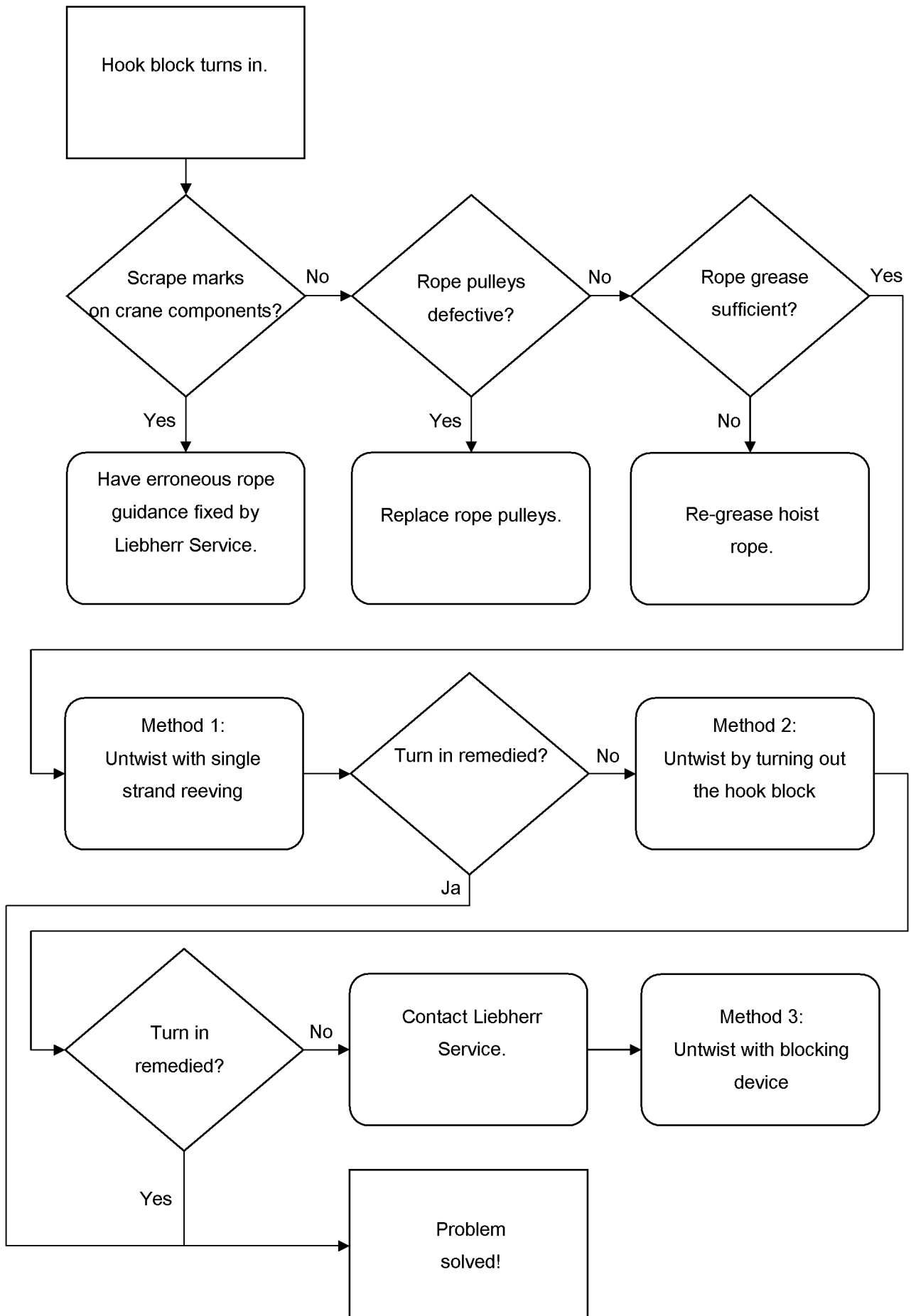
- ▶ **Never** use rotating rope end connections with non-rotation free ropes!
- ▶ Never install a twist compensator / swivel!

**Note**

Usage warning notes

- ▶ The usage warning note on PFEIFER links without swivel and cotter indicates that this rope end connection may **not** be used for non-twist free ropes **in combination** with a twist compensator / swivel (see table 5)!

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B106181

8 Twisting caused by stretching in rotation-resistant ropes and its remedy

For procedure, see illustration opposite.



WARNING

Damage to the rope!

- ▶ Please proceed with extreme caution when performing the following actions.
- ▶ Observe the following instructions exactly.

8.1 General

The cause for the turn-in of the hook block can have various reasons. For that reason, check the crane first 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 pathway and rectify.
- Rope pulleys: Has the groove diameter become too small, or do the rope pulleys exhibit a negative profile?
 - Groove diameter dimensional stability must be present.
 - The rope groove must be uniformly smooth without a hoist rope negative profile.
 - If this is not the case, the rope pulley must be exchanged.
- Rope greasing: Has the hoist rope been sufficiently greased? If the rope surface is dry, the hoist rope must be re-greased.

If the crane does not display other features, the hoist rope must be spun out. Following, two methods are described by which the hoist rope can be spun out. The methods must be applied in the described sequence.

8.2 Turning out extremely rotation-resistant hoist ropes

8.2.1 Method 1: Spinning out with one strand reeve

- 1.) Reeve in the one strand hoist rope.
- 2.) Extend the boom to the maximal boom length and hook height.
- 3.) Lower hooks to approximately 1 m above the ground and allow the hoist rope to spin out.
- 4.) With an empty hook block, carry out one complete hoist cycle.
- 5.) Lower the hook again to approximately 1 m above the ground and allow the hoist rope to spin out again.
- 6.) Reeve the number of strands of hoist rope carefully and spin free where the twisting of the hook block is largest.
- 7.) Carry out at least two complete hoist cycles at maximum boom length and hook height, in order to divide the spin out onto the entire rope length.

If the hook block turns in further, method 2 must be used.

8.2.2 Method 2: Spinning out by turning out the hook block

- 1.) The hook block is reeved with the largest number of strands are twisted.
- 2.) Extend the boom completely and lower the hook block.
- 3.) Attach a load of approximately 10 % of the nominal rope pull on the hook block.
- 4.) Before lifting the load, an assistant must carry out the following measures: Rotate the twisted hook block to a straight position by hand until the rope strands no longer touch each other.
- 5.) Rotate the hook block further by a complete revolution, the rope strands touch each other again.
- 6.) Hold the hook block in the prescribed position until the load lifts off the ground.
 - **CAUTION:**
When the hook block comes under load, it will attempt to rotate back to a straight position. Release the hook block.
- 7.) Move the load until approximately 15 m before the uppermost hook position of the completely extended boom.
- 8.) Lower load and set it down. The twisting should now be remedied.

If the hook block turns in further, then the process must be repeated. If this does not remedy the problem, contact Liebherr Service.

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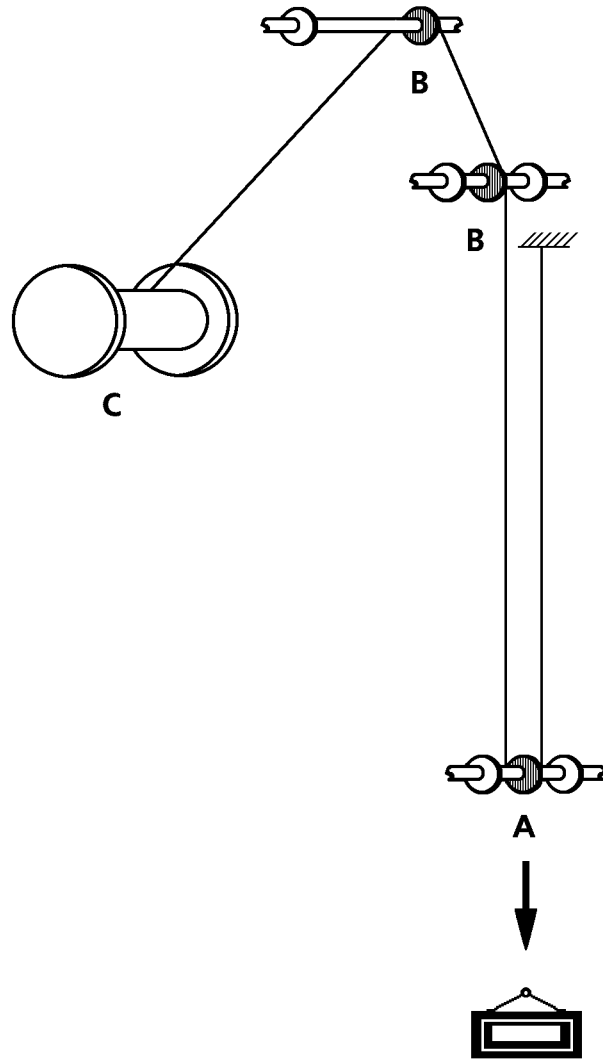


Fig. 1

B193940

A Hook block

B Rope pulley

C Rope drum

9 Appendix 1

Diagram of possible defects, with reference to different areas that must be considered during inspection:

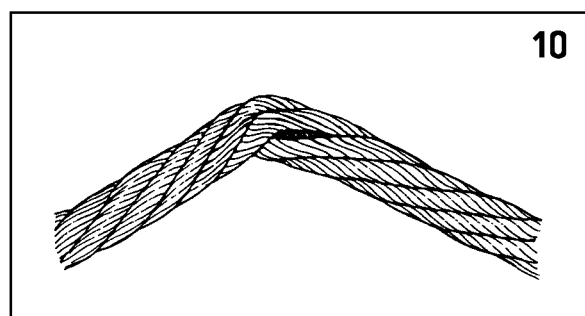
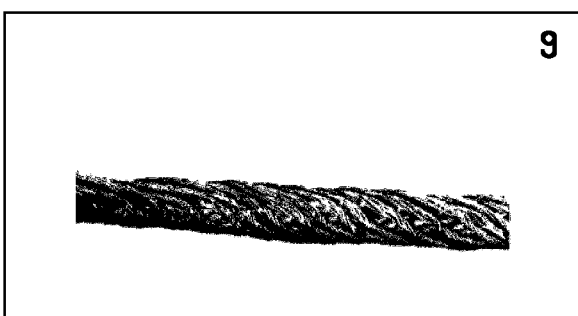
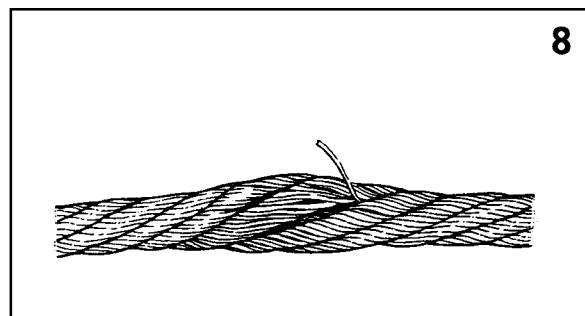
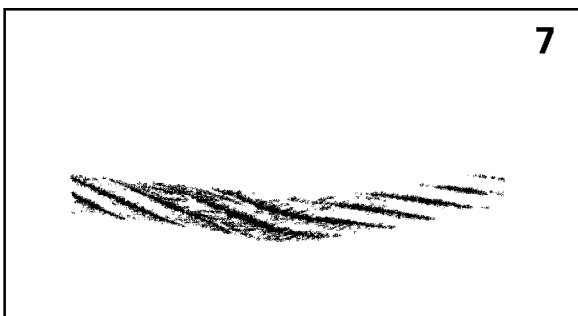
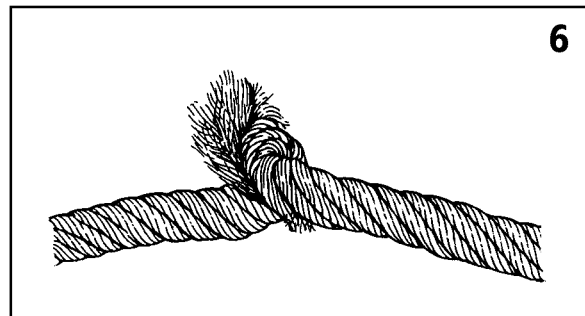
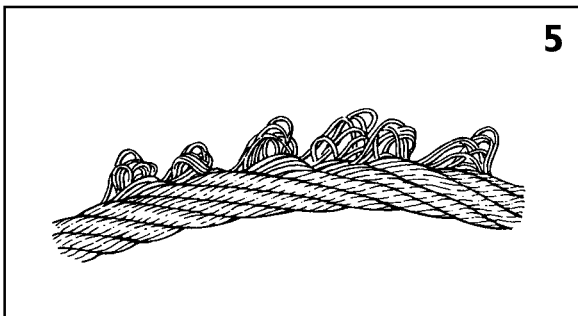
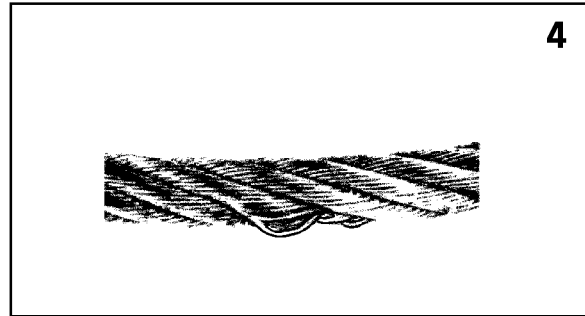
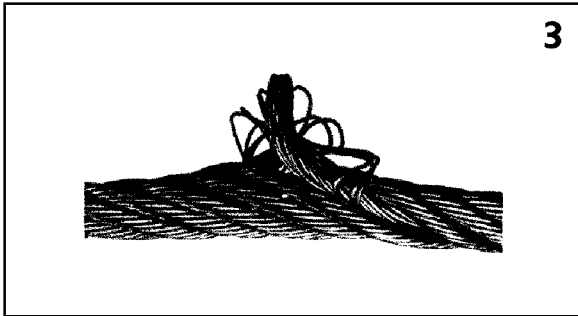
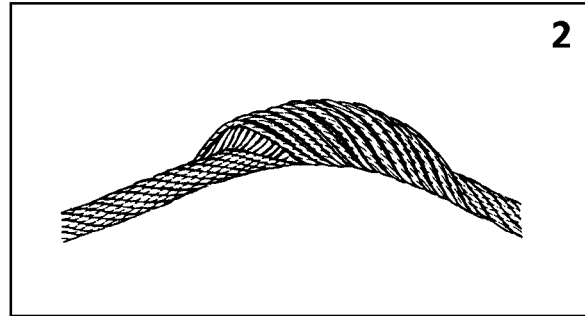
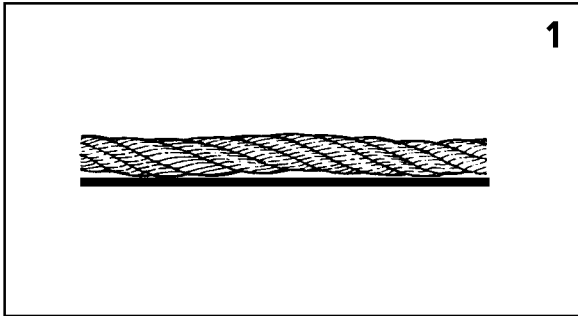
- 1.) Check rope end connection at rope drum
- 2.) Examine for incorrect spooling up, which causes deformation (crushing) and wear, which can have serious consequences at rope crossing points
- 3.) Examine for wire breaks
- 4.) Examine for corrosion
- 5.) Look for deformation as a result of hook block loading
- 6.) Inspect parts of rope that run over rope pulleys for wire breaks and wear
 - Rope suspension and rope mountings:
 - Check for wire breaks and corrosion
 - Also inspect parts of rope that run on or next to compensating pulleys
- 7.) Look for deformation
- 8.) Check rope diameter
- 9.) Carefully check length of rope that runs through the hook block, particularly the part that rests on the rope pulley under load
- 10.) Check for wire breaks and surface wear
- 11.) Check for corrosion

Datasheet for ropes		Machine: Application:					
Construction: Direction of rope lay: RH / LH ¹⁾ Type of lay: Ordinary / Langs ¹⁾ Nominal diameter: Tensile grade: Quality: ungalvanized / galvanized ¹⁾ Type of core: steel / natural or synthetic textile / mixed ¹⁾ Preformation: Length of rope: Type of termination:		Date fitted: Date discarded: Minimum breaking load: Working load: Diameter measured: under a load of:					
Visible broken wires		Abrasion of outer wires	Corrosion	Reduction of rope diameter	Positions measured	Overall assessment	Damage and deformations
Number in length of 6 d	Number in length of 30 d	Degree of deterioration ²⁾	Degree of deterioration ²⁾	%		Degree of deterioration ²⁾	Nature
Date:					Signature:		
Rope supplier:				Number of working hours:			
Other observations:				Reasons for discard:			

1) Delete as applirope
 2) In these columns, describe the latter as: slight, medium, high, very high, discard.

10 Appendix 2

Typical example for an inspection log



11 Appendix 3



Note

Depiction of deformation

The deformation that is depicted on many pictures is exaggerated in order to show it more clearly.

► The ropes that are shown would have had to be taken down long before they reached this stage.

Typical examples of damage that can occur to wire ropes:

- Picture 1:
Corkscrew-like deformation: deformation where rope is in the form of a spiral along its longitudinal axis.
The rope must be taken down if the deformation exceeds the value that is mentioned in chapter “Take-down criteria”, section entitled “Corkscrew-like deformation”.
- Picture 2:
Basket formation on a multi-strand rope.
Reason for immediate rope take-down.
- Picture 3:
Steel core rope exit, generally in combination with basket formation in the immediate vicinity.
Reason for immediate rope take-down.
- Picture 4:
Only one strand is affected by loop formation, although the examination of a longer section of rope shows that the deformation is visible at regular intervals; normally deformation along the length of a lay.
Reason for immediate rope take-down.
- Picture 5:
Serious worsening of the previous problem (see picture 4) (typical of hoist rope in a ram system).
Reason for immediate rope take-down.
- Picture 6:
A serious reverse bend or knot.
Note the destroyed lay that leads to the exit of the fibre layer.
Reason for immediate rope take-down.
- Picture 7:
A wire rope that has been kinked during installation but still taken into operation, and now suffers from localised wear and substandard rope tension.
Reason for rope take-down.
- Picture 8:
Crushing as a result of local mechanical damage causing imbalance beneath the strands, resulting in wire breaks.
Reason for rope take-down.
- Picture 9:
Crushing of a multi-strand rope caused by incorrect spooling up on the rope drum.
Note increase in length of outer strands of lay. Here too, imbalance would occur under load.
Reason for rope take-down.
- Picture 10:
Example of serious kinking.
Reason for rope take-down.

12 Appendix 4

Guideline for number of wire breaks in accordance with ISO 4309 for power train classification groups M1, M2, M3 and M4

12.1 Wire ropes

12.1.1 Hoist ropes

Rope diameter	Number of visible broken wires requiring rope removal, over a length of	
	6 x rope diameter	30 x rope diameter
See chapter 1.03	2	4



Note

- ▶ If a rotation resistant hoist rope is placed on winch 5, then it can be used for the jib adjustment or as a hoist rope for the boom nose!



WARNING

Use of hoist rope as control rope!

Frequent jib adjustment movements with a rotation resistant hoist rope lead to significant wear and require premature take down of the hoist rope!

If it is not recognized in time that the rope needs to be taken down, the hoist rope can rip!

The crane can topple over and personnel can be severely injured or killed!

- ▶ In case of frequent jib adjustment movements, a non-rotation free control rope must be placed!
- ▶ Make sure that no spin stabilizer / swivels are used as rope end connections when using a non-rotation free control rope!
- ▶ Remove spin stabilizer or swivels!

12.1.2 Telescoping ropes



Note

- ▶ Installed in cranes with telescopic boom with rope mechanism!

Rope diameter	Number of visible broken wires requiring rope removal, over a length of	
	6 x rope diameter	30 x rope diameter
See chapter 1.03	7	14

12.1.3 Boom retraction ropes



Note

- ▶ Installed in cranes with telescopic boom with rope mechanism!

Rope diameter	Number of visible broken wires requiring rope removal, over a length of	
	6 x rope diameter	30 x rope diameter
See chapter 1.03	6	13

12.1.4 Assembly ropes


Note

- ▶ Installed in cranes with auxiliary winch!

Rope diameter	Number of visible broken wires requiring rope removal, over a length of	
	6 x rope diameter	30 x rope diameter
See chapter 1.03	2	4

12.1.5 Guy ropes, control ropes


Note

- ▶ Installed in cranes with boom guying and / or luffing lattice jib!

Rope diameter	Number of visible broken wires requiring rope removal, over a length of	
	6 x rope diameter	30 x rope diameter
See chapter 1.03	6	13


WARNING

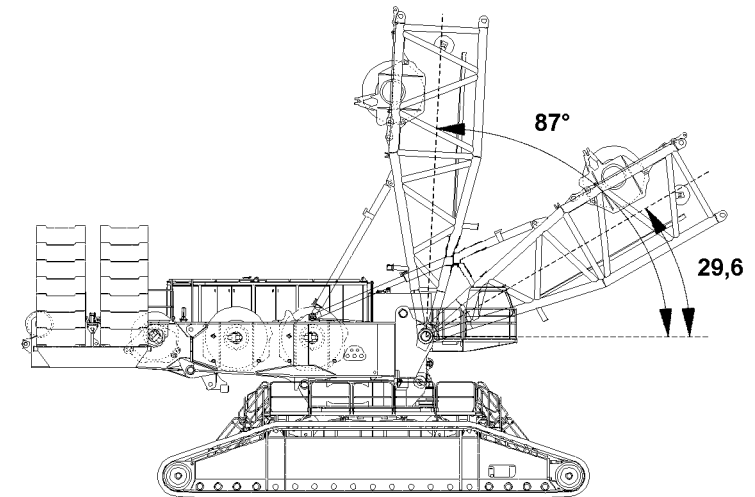
Non-rotation free control ropes can rip off!

If a non-rotation free control rope is used in connection with a rotating rope end connection, the rope damage can occur or the control rope can rip off!

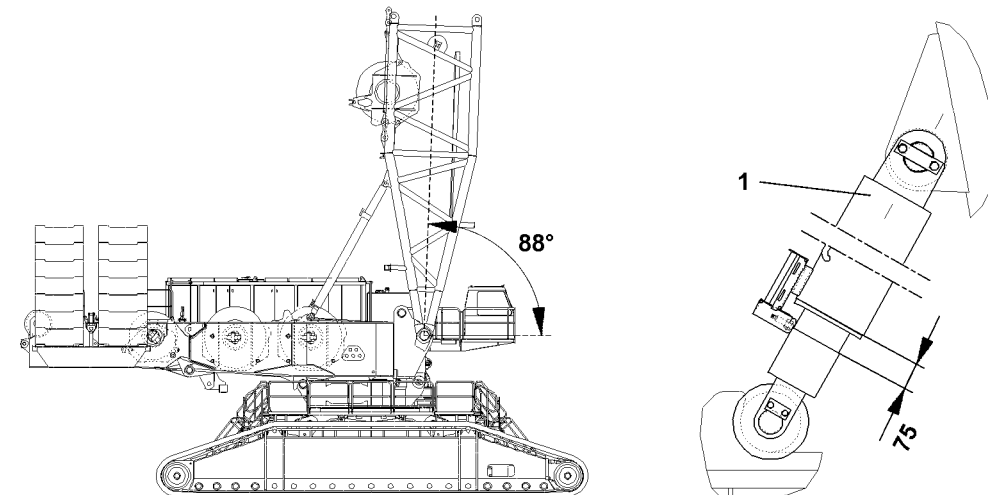
The crane can topple over and personnel can be severely injured or killed!

- ▶ Make sure that no spin stabilizer / swivels are used as rope end connections when using a non-rotation free control rope!
- ▶ Remove spin stabilizer or swivels!

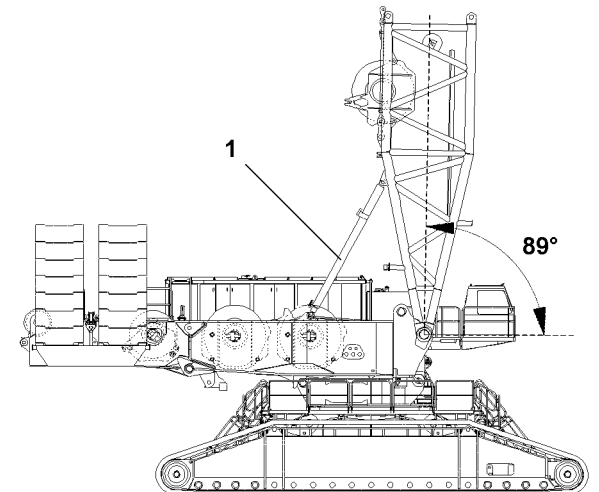
1



2



3



1 S-boom relapse retainer

Two hydraulic cylinders prevent the boom from falling backward.

They are controlled on high or low pressure, depending on the operating mode or boom length.

In steepest boom position, the luffing up movement is turned off by the actuated limit switches in the cylinders.

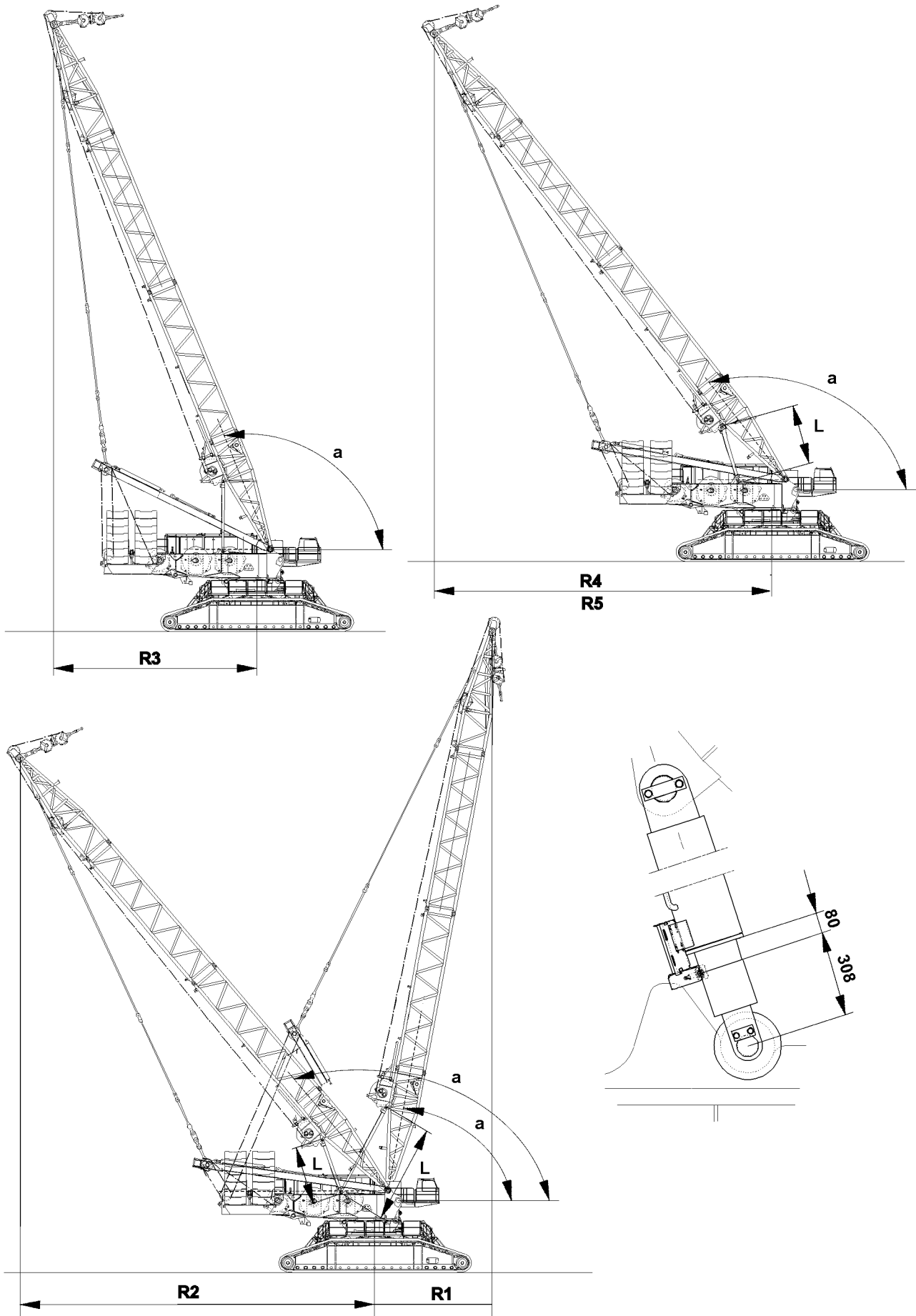
Icon appears on the LICCON monitor.

1.1 Checking limit switch initiators for function

Cover limit switch initiators on the S-relapse cylinder individually with a metal plate.

- The S-boom “luffing up” movement must turn off.
- The icon must appear on the LICCON monitor.

Illustration	Boom angle	Cylinder length
1 flattest position	29,6 °	8010 mm
1 steepest position	87 °	5135 mm
2 electric switch position	88 °	5073 mm
3 block position	89 °	5010 mm



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2 Derrick relapse retainer

Two hydraulic cylinders prevent the derrick from falling backward.

- If the limit switches on the cylinders are actuated, the winch IV “spool up” movement is shut off.
- The icon appears on the LICCON monitor.

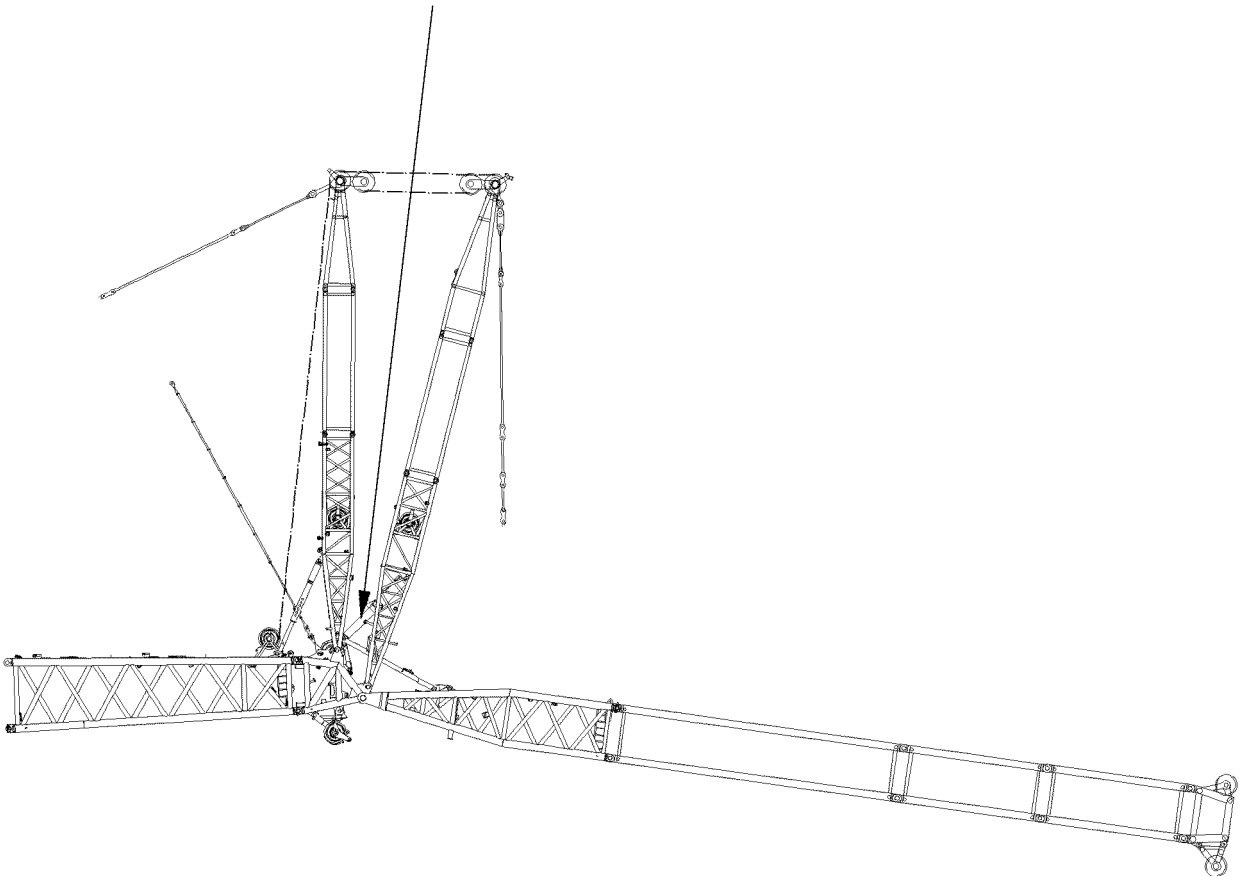
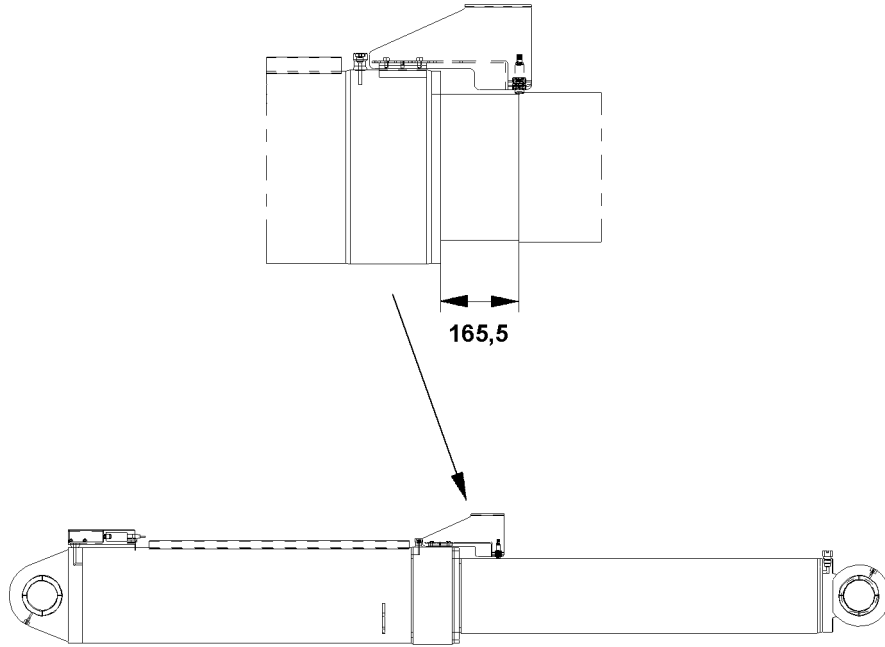
2.1 Checking limit switch initiators for function

Cover limit switch initiators on the D-relapse cylinder individually with a metal plate.

- The D-boom “luffing up” movement must turn off.
- The icon must appear on the LICCON monitor.

2.2 Illustration

	Slewing radius R		Angle a	Cylinder length L
Cylinder extended	R 1	–8.7 m	79,4°	7100 mm
Nominal position	R 3	15 m	112,4°	5192 mm
Nominal position	R 4	25 m	128,2°	4231 mm
Electric switch position	R 5	25.6 m	127,4°	4165 mm
Block position	R 2	26.3 m	130,5°	4100 mm



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3 W-lattice jib

3.1 Checking limit switch initiators for function

Cover limit switch initiators on the W-relapse cylinder individually with a metal plate.

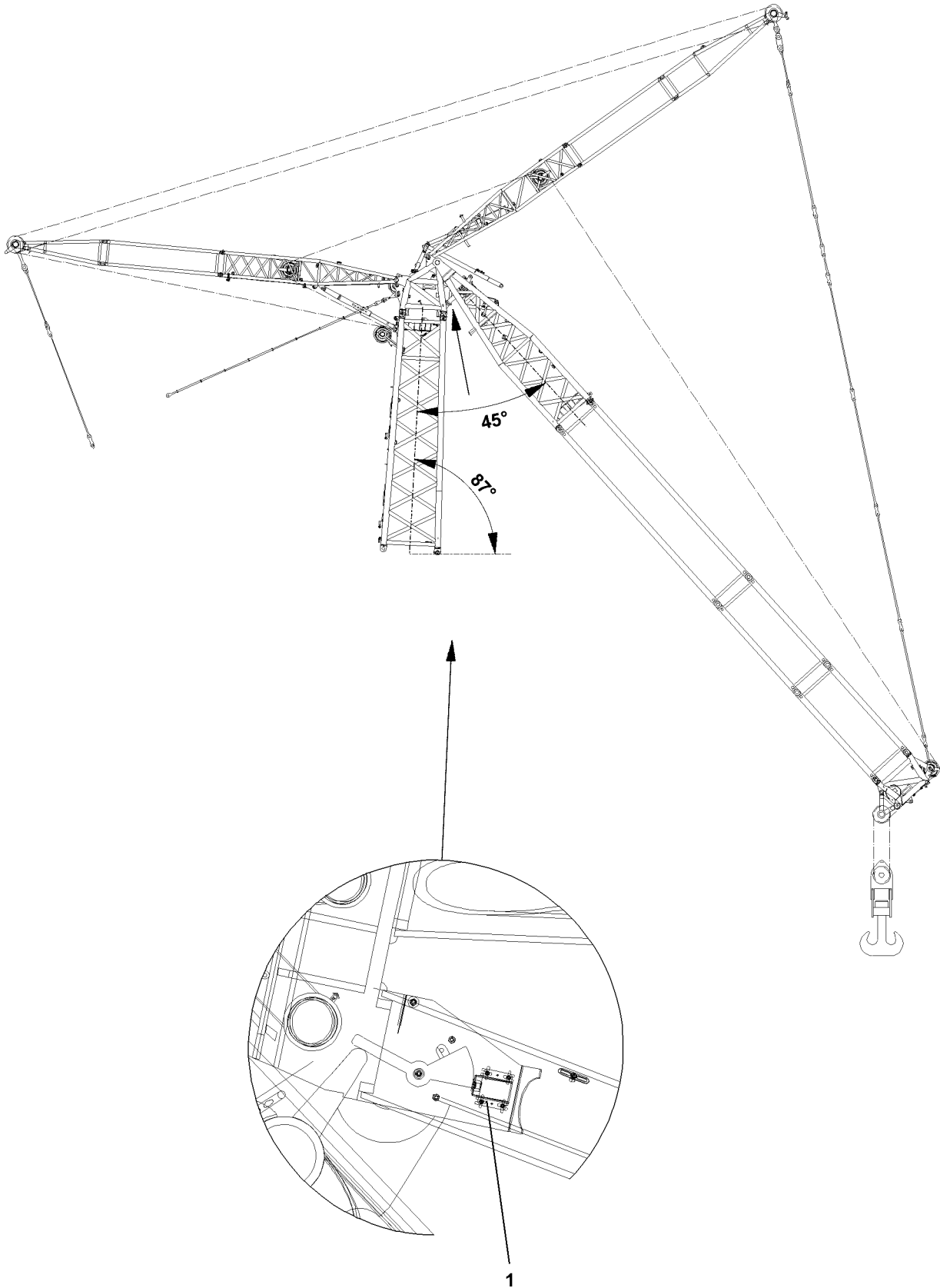
- The W-control winch “spool up” movement must turn off.
- The icon must appear on the LICCON monitor.

3.2 Checking limit switch initiators on switch point “steepest position”

Before erecting the boom, check the function of the limit switch initiators in installed condition. Pull up both SA-brackets to the specified dimension (see illustration) until the switch contact opens.

- The W-control winch “spool up” movement must turn off.
- The icon must appear on the LICCON monitor.

After successful check, reset the SA-brackets to set-up condition.

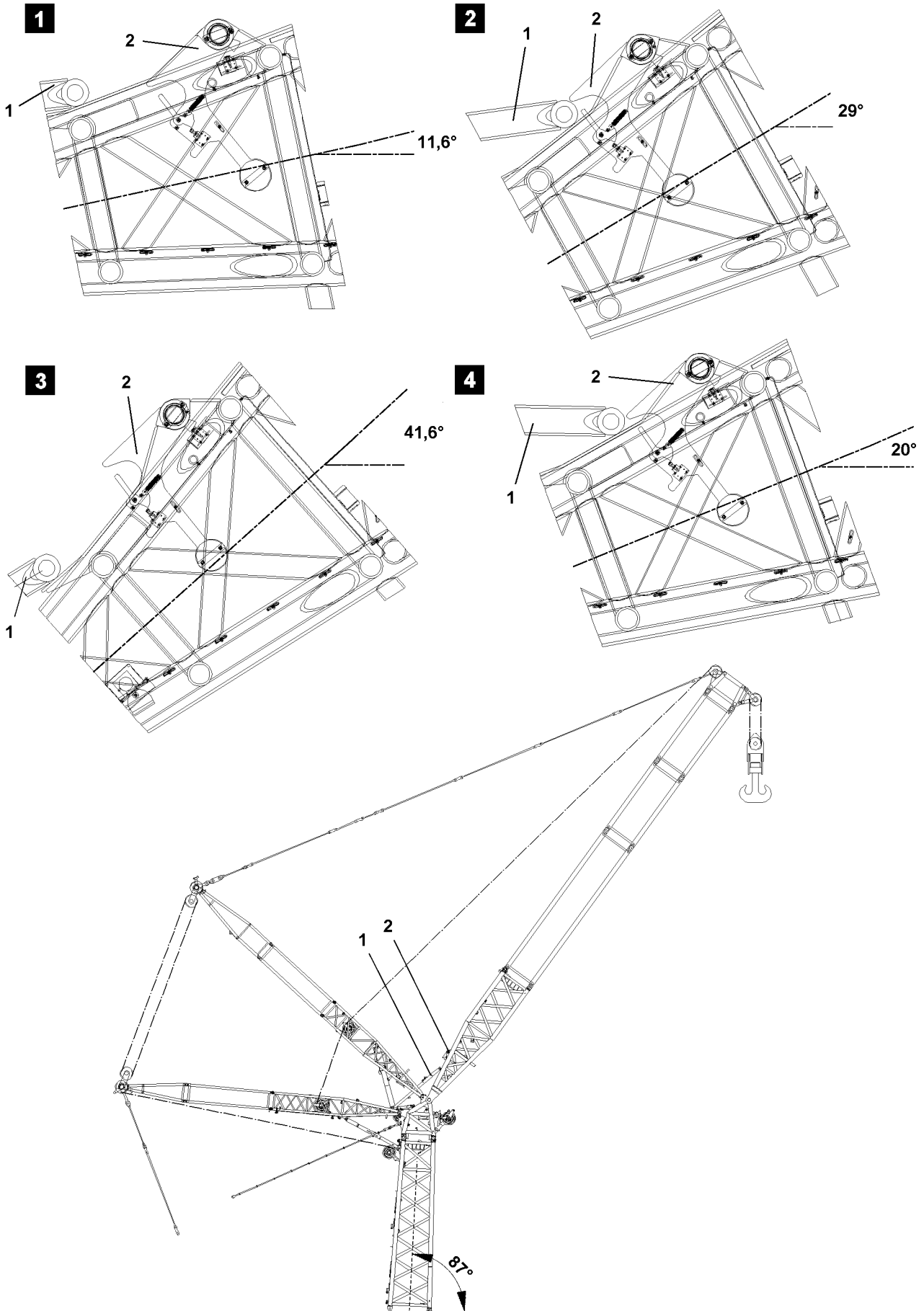


3.3 W-lattice jib “bottom”

3.3.1 Checking limit switch initiators for function

Cover the limit switch initiators individually with a metal plate.

- The W-control winch “reel off” movement must turn off.
- The icon must appear on the LICCON monitor.
- Switch position “luffing jib bottom”, approx. 45 °
Limit switch (initiator) **1**, see illustration.



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3.4 Function check of limit switch initiators on the mechanical relapse retainer

Mechanical relapse support 1

Oscillating safety for mechanical relapse support 2

In addition to the relapse cylinders, the lattice jib is also secured by a mechanical relapse support 1, which engages in steepest lattice jib position into the flap of the oscillating safety 2. The luffing up movement is turned off by the actuated limit switches on the oscillating safety.



DANGER

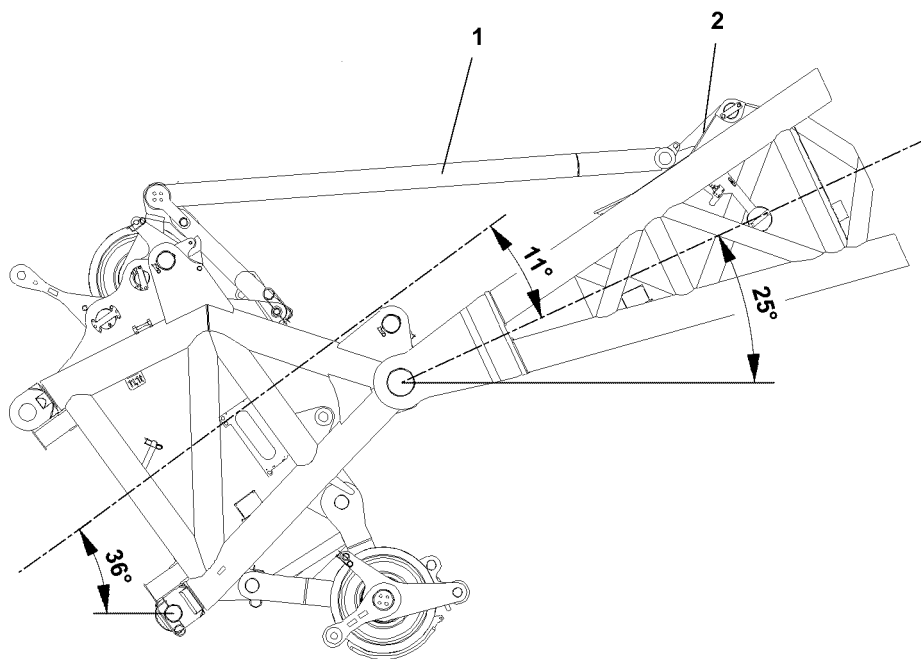
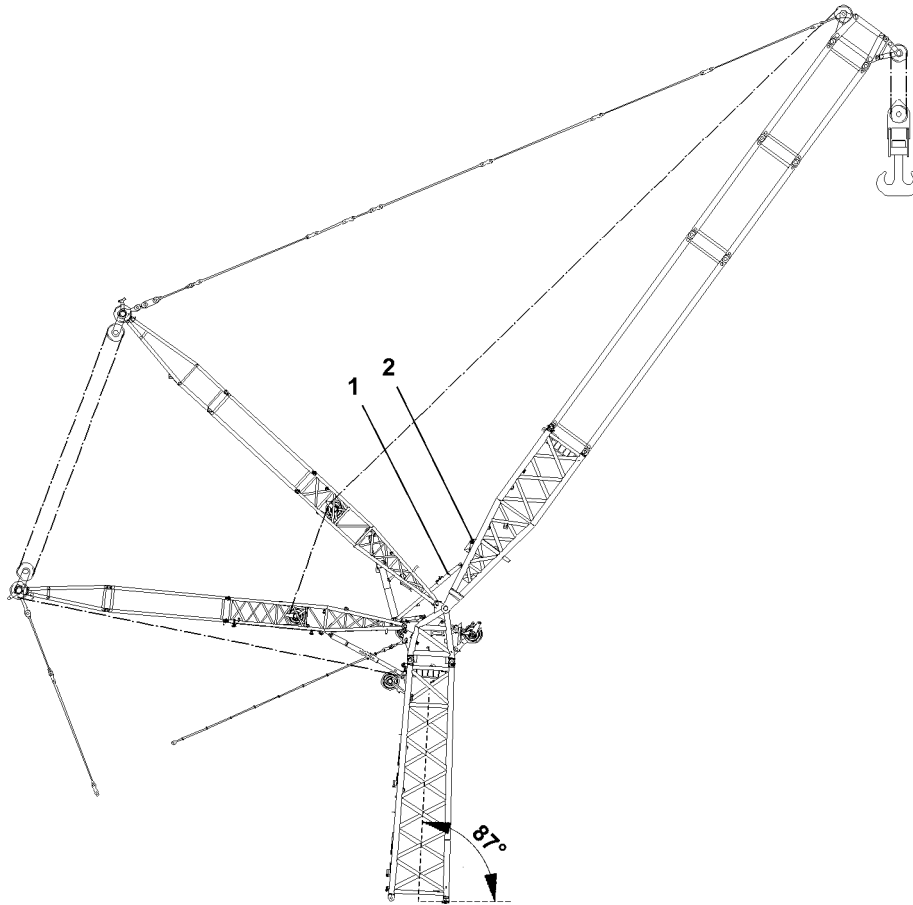
Danger of tipping over if the oscillating safety is hard to move!

If the oscillating safety 2 is hard to move, the mechanical relapse retainer will no longer function. The W-lattice jib can tip backwards uncontrolled and cause the crane to topple over!

- ▶ Crane operation with hard to move oscillation safety 2 is prohibited!
 - ▶ Before erection, the pendulum of the mechanical relapse retainer must be checked for easy movement over the complete swing range of the pendulum.
-

Depending on the lattice jib position (boom position = 87°), the flap on the oscillation safety is swung out by the weight of the pendulum:

- 11.6° the flap is swung in, see illustration 1
- 29.0° the flap can be pushed open, see illustration 2
- 41.6° the flap is swung out, see illustration 3
- 20.0° the flap can be pushed closed, see illustration 4



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3.5 Flap of oscillating safety 2 on collision with mechanical relapse support 1

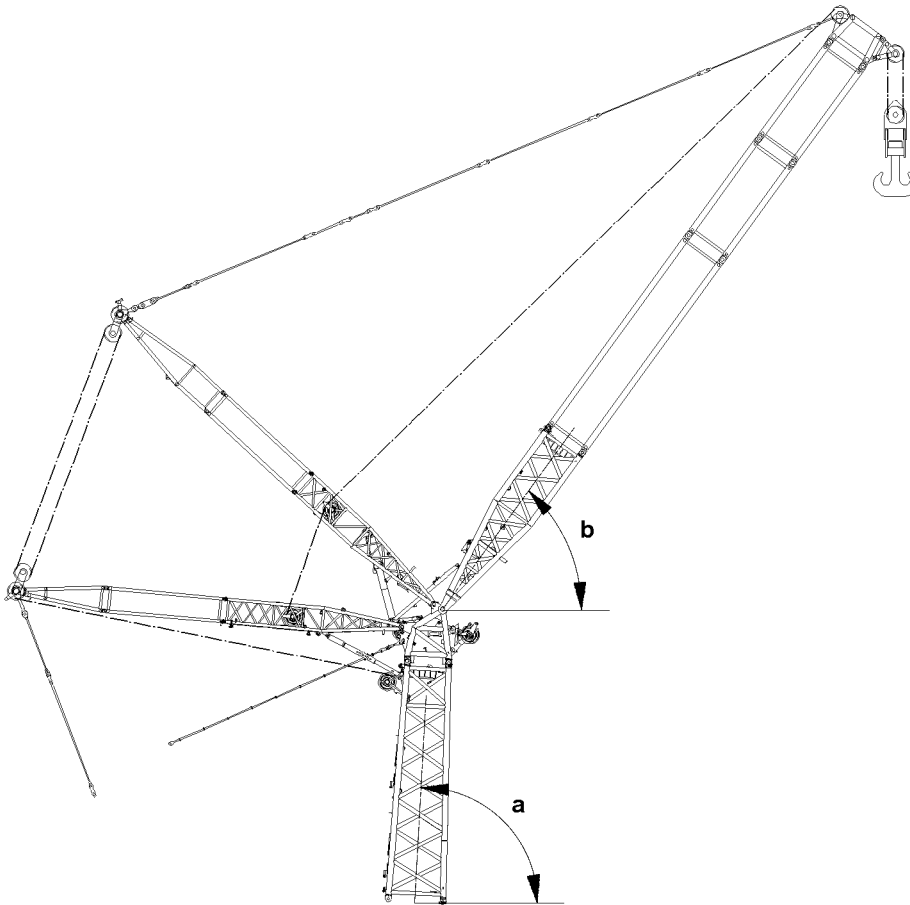
**DANGER**

Risk of collision!

If the angle between the boom and the lattice jib is smaller than or equal to 11 °, the mechanical relapse support 1 will collide with the flap on the oscillating safety 2. The lattice jib can tip backwards uncontrolled and cause the crane to topple over!

Personnel can be killed!

- ▶ Never fall below an angle of 11 ° when luffing up!
 - ▶ Check visually!
-



	bar
RP S(L)	220
RP D	220
RP W1(N1)	300
RP W2(N2)	300
min:max	92 300

1 Checking jib stop cylinder pressure

The jib stop cylinder pressure must be checked using the LICCON operation display before and after crane operation. (**see diagnosis**)

The actual pressure displayed on the LICCON operation display must correspond with the target pressure in the table.



Note

- ▶ The specified target pressure depends on the outside temperature.
- ▶ The maximum permitted difference between the target pressure and the actual pressure is +/- 10 bar.

The jib stop cylinder pressure is checked as follows:

- Checking cylinder pressure with “jib stop extended to maximum limit”
- Checking cylinder pressure with “jib stop in test position”

1.1 Checking cylinder pressure with “jib stop extended to maximum limit”

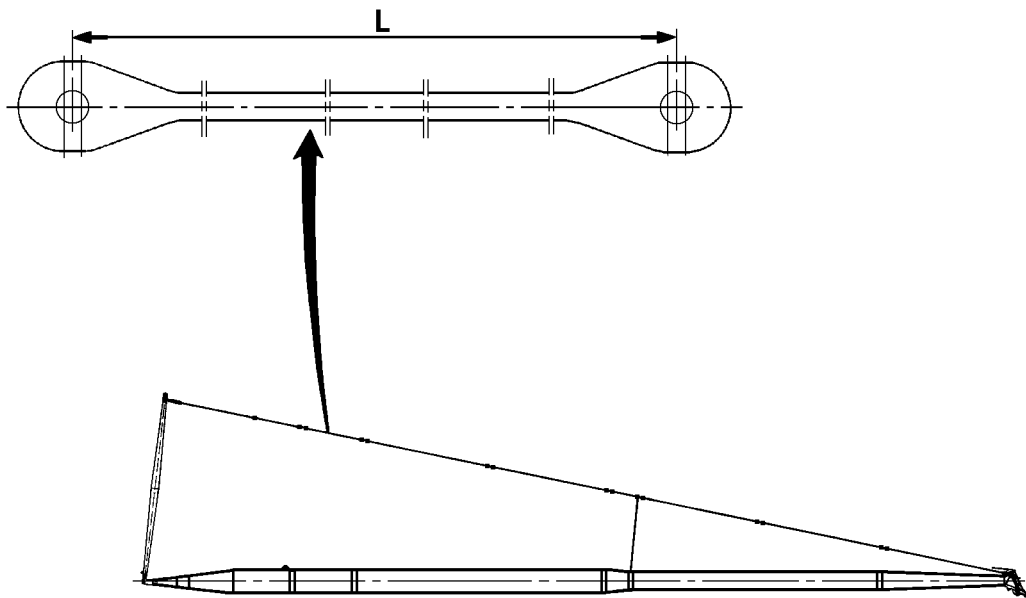
- Set main boom and lattice jib to angles specified in table.
- Compare target pressure in table with actual pressure in LICCON operation display.

“Extend jib stop to maximum limit”								
Boom an- gle α °	Lattice jib an- gle β °	Cylinder length mm	Lift mm	Target pressure in bar				
				-40° C	-20° C	0° C	20° C	40° C
87	52,2	4600	1150	112,5	122,2	131,8	141,5	151,2

1.2 Testing cylinder pressure with “jib stop in test position”

- Set main boom and lattice jib to angles specified in table.
- Compare target pressure in table with actual pressure in LICCON operation display.

“Jib stop in test position”								
Boom an- gle (α) °	Lattice jib an- gle (β) °	Cylinder length mm	Lift mm	Target pressure in bar				
				-40° C	-20° C	0° C	20° C	40° C
87	54	4519	1069	118,1	128,1	138	148,3	158,4



1 General

Always check the entire length of the guy rods before every assembly.
Also check the concealed bearing surfaces and bores.

2 Repeat inspection of guy rods

The guy rods must be checked at least once a year by an expert according to VGB D6.
The inspection must be carried out by an authorized expert every 4 years.
If a load was dropped or if the crane was overloaded, an additional inspection by an expert is required.
The inspections must be documented.



DANGER

Risk of accident in case of guy rod failure!

- ▶ If the following damage is found, the guy rods may no longer be used and must be replaced immediately!

2.1 Cracks and dents

The guy rods must be thoroughly inspected visually for cracks and dents.
If cracks are present, the guy rods must be replaced. Repairs are not permitted.



Note

- ▶ In case of doubt, the relevant areas must be carefully examined, for example with magnetic crack detection!

2.2 Stretching

Check for guy rod stretching by measuring the guy rods.
The stretch may be no more than max. 0.2 %, for example 14 mm, for an initial dimension (L) of 7000 mm.



Note

- ▶ The initial dimension (L) of the guy rods is noted in the separate rod diagram!

2.3 Wear

Check the bores, pins and pin retainers for signs of wear.

2.4 Damaged paint

Check the paint on the guy rods at regular intervals (signs of corrosion).
Repair damaged paint.



Note

- ▶ The guy rods may not be stored in aggressive media, such as salt water!

2.5 Ductile distortion

After a ductile distortion, such as bending, the guy rods must be replaced.

9 General notes

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1 Checks before start up

We recommend to carry out the following visual inspections in the engine compartment before start up:

- Check if all oil and fuel lines are leak-free and dry.
- Check if the injection pump, fuel and oil filters are leak-free.
- Check if the hydraulic units, the hydraulic motors for the fan drives and their supply lines are leak-free.
- Check if the exhaust system and exhaust flange are leak-free.
- Check if the exhaust flap retention flap is moveable.

The return springs that open the exhaust flaps must function properly, because seized (therefore closed) exhaust flaps during engine operation will result in considerable overheating.

- Inspect electrical wiring and ensure that there is sufficient clearance to hot exhaust system piping and that it is properly fastened and that there is no insulation damage.
- Inspect the soundproofing mats for soiling from solutions and large quantities of oil or fuel, as well as other damage.

Immediately remove any soundproofing mats that are excessively damaged or soiled and replace them with original parts.

When cleaning the engine and gear compartments, observe the care instructions for the sound insulation, see Crane operating instructions, chapter 7.01.

2 Repair and maintenance tasks



Note

- Repair and maintenance tasks are to be carried out carefully!
-

Take particular precautions regarding cleanliness when replacing diesel and oil filters. Remove any diesel fuel or oil that has leaked. Perform a test run on the systems to ensure that there are no leaks. The diesel engine V-room must be inspected regularly, and any oil or diesel fuel must be cleaned up, particularly after repairs and servicing. Any fuel that has collected in V-room can spread throughout the engine room while the crane is travelling on the road and can ignite if it comes into contact with hot surfaces.

We stress that all electrical wiring must be installed according to the regulations and must be properly fastened. Immediately repair any wiring insulation that exhibits signs of chafing or brittleness as a result of operational activities. Any wiring that is not in perfect condition is to be immediately and professionally replaced.

We would like to particularly emphasise that over time fuel and oil lines can become brittle or porous as they age. Any hoses that appear to be excessively porous should be replaced immediately, see crane maintenance chapter.

3 Important servicing

The following service tasks are to be carried out regularly:

- Check gearbox and engine oil levels regularly.
Add oil as required during normal operation. If oil consumption or loss is unusually high, determine the cause and correct.

4 Maintenance notes for replacement parts

The following is to be considered when replacing drive components such as engine, gearbox or axles:

- Before start up, be sure to refill with the correct type of oil to the center of the min. - max. marks.
For type of oil, refer to the data tag and service items and lubricants.
- Conduct initial maintenance according to chapter "Maintenance intervals"; thereafter, maintain in accordance with the specified periodic maintenance intervals.
- Maintain break-in instructions, see Crane operating instructions, chapter 2.02.

5 Recommendations for travel operation

NOTICE

Risk of engine damage!

If the permissible engine speed is exceeded, the engine can be seriously damaged!

- ▶ Do not exceed the permissible engine rpm!
-

6 Disposal of fuels and greases



Note

Engine, gearbox and hydraulic oils, brake fluids, grease and fuels are dangerous waste materials!

- ▶ These materials must be disposed of separately!
 - ▶ These materials may not be disposed of in the ground or in any bodies of waters: wastewater systems, sewers or groundwater!
 - ▶ Comply with the regulations specified by local authorities before disposing of any of these items or substances!
-



Note

Radiator fluid for diesel motors and heating systems are dangerous waste materials!

- ▶ Undiluted antifreeze / corrosion inhibitor must be handled as dangerous waste materials!
 - ▶ Follow the regulations of the local authorities when disposing of used cooling fluids (mixture of antifreeze / corrosion inhibitor and tap water).
-

90 Appendix

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 Ebingen 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.



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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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